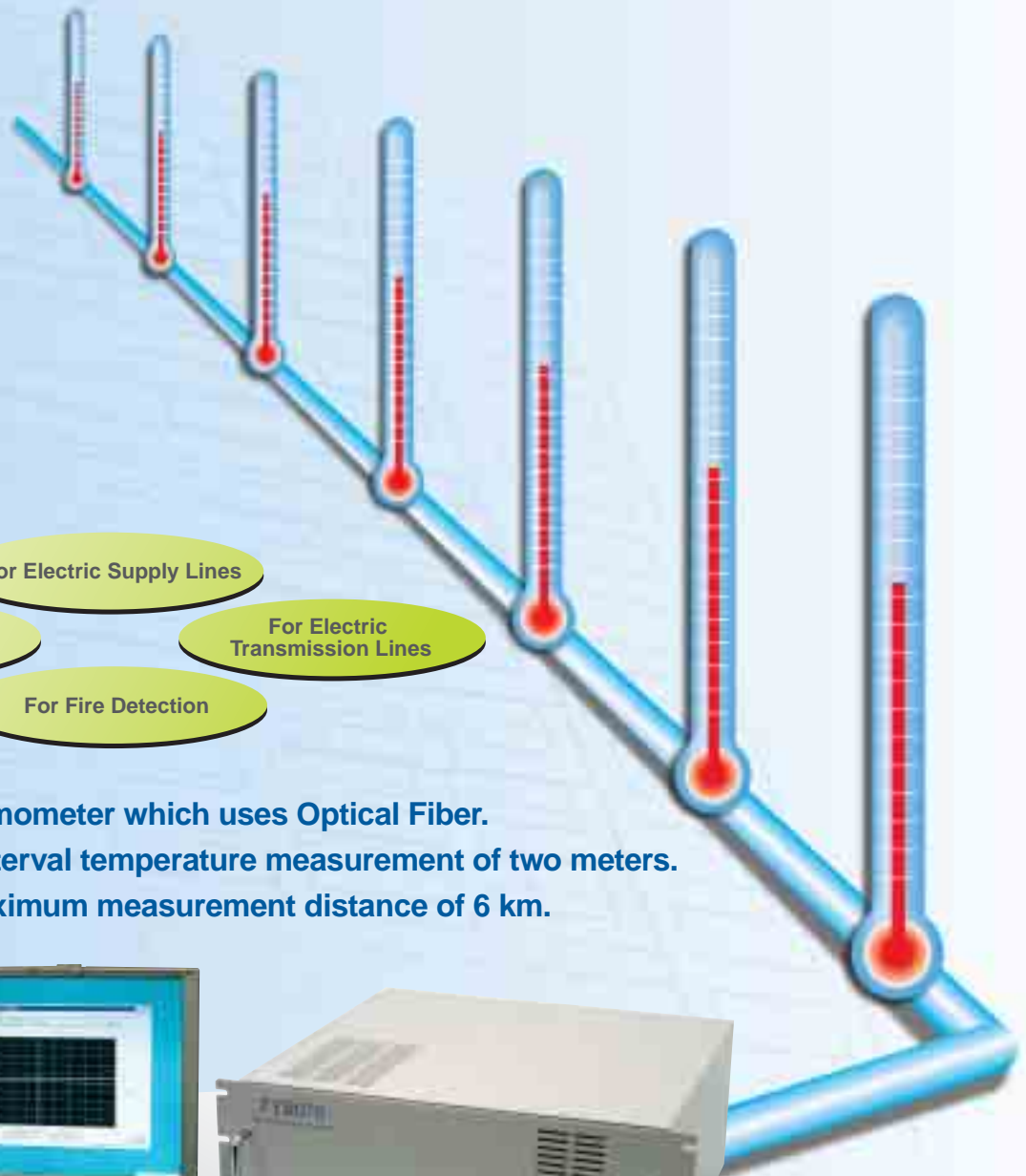


# **FTR** *Fiber Optic Temperature Laser Radar*



For Electric Supply Lines

For Manufacturing and Processing Facilities

For Electric Transmission Lines

For Fire Detection

**FTR is a Thermometer which uses Optical Fiber.**  
**FTR has an interval temperature measurement of two meters.**  
**FTR has a maximum measurement distance of 6 km.**



# FTR

## Fiber Optic Temperature Laser Radar

In addition to functioning with GI fiber, the new FTR system can be easily used with the latest SM fiber at a much lower cost.

- The FTR system is composed of an Optical Fiber for temperature sensing a measuring unit and a PC to display temperature distribution.
- FTR technology has brought about reliable measurement to be within 2m intervals.
- It is a readily available Optical Fiber cable for communication.

### Optical Fiber

Optical fiber cables are laid in the place where temperature measurement is to be monitored.

SM type

GI type

Fiber Type

SM type Optical Fiber can be used at a low cost in comparison to the usual GI type Optical Fiber.

- The cost of the new Optical Fiber being introduced can be reduced using the existing Optical Fiber which has already been laid. (NB: mainly SM type Optical Fiber)
- The measurement device for SM fiber can detect a minute optical signal compared with the usual measurement device for GI fiber.

### FTR

FTR can measure temperatures between -200 and + 300 degree centigrade\* covering an area of up to 6.0km at 2m intervals.

\*Temperature monitoring varies depending on the jacket material of the Optical Fiber.



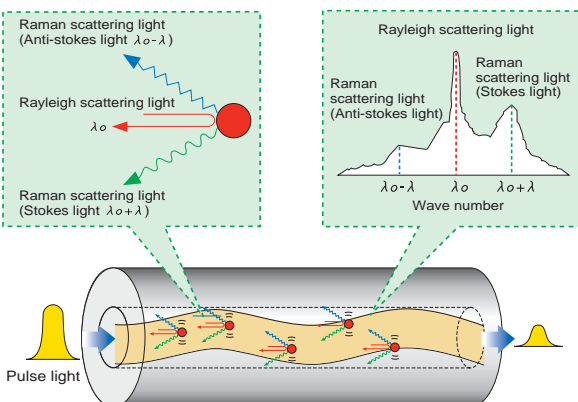
- Temperature distribution can be measured over a long span. (Measurement accuracy is  $\pm 1$  degree centigrade within 2m intervals)
- Temperature can be measured of several thousand points simultaneously. (Measurement can be monitored at up to 6.0km)
- Accurate temperature measurement can be made without the influence of electromagnetic induction.
- Since the Fiber is non-explosive it can be installed in dangerous places that are not accessible to people.
- Absolute temperature measurement can be made because of internal standard temperature within the device.

## Measurement Principle

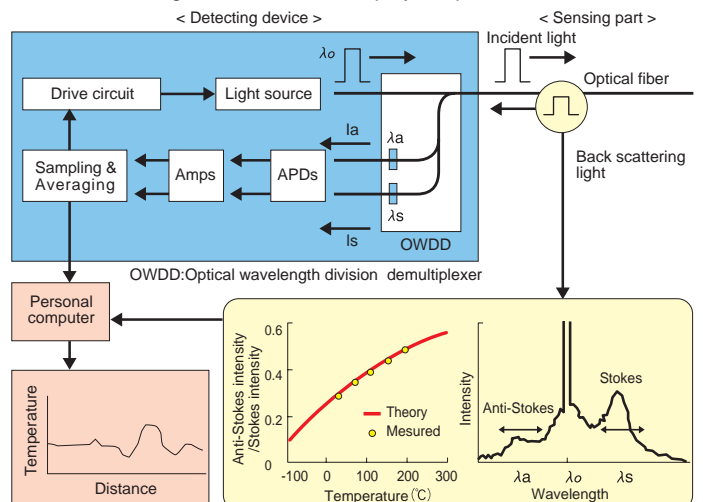
The FTR device irradiates optical pulse into the Optical Fiber, and calculates the temperature with a change at nm\* order of the reflection light.

It calculates the distance of the measuring point based on the time it takes for the reflection light to return.

\* nm:  $10^{-8}$ m



This system consists of an Optical Fiber for temperature sensing, a main measuring unit and a PC to display temperature distribution.



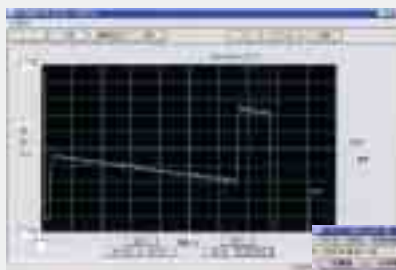
Principle and Configuration of FTR

## Software for Control

Measurement results such as temperature distribution are monitored and displayed on the PC screen.



Systems can be custom-made according to the Users request.



### Standard Software

- Temperature Distribution Value
- Temperature Distribution Map
- Data Memory and Communication



### Optional Software

- Display of Trends
- Display of Graphics
- Decision of Abnormality
- Output of Daily and Weekly Reports



## The Measuring Method of FTR

### The Single Pulse Method (Existing method.)

This uses the pulse laser of high output.

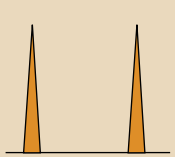

### The CW Method (New method)

This adopts the method which FTR irradiates dividing an optical pulse in a period using digital modulation.

Peak strength of a optical pulse is restrained low, and semiconductor laser communication is available as the light source instead of an existing high output pulse laser. As a result, longer life and reduction in costs are achieved.

These are further characteristics:

- Functions with SM type Optical Fiber.
- Functions with an Optical Fiber for communication which has already been laid.
- It accomplishes high level performance even over a long-distance measurement exceeding 2km.

	The Single Pulse Method	The CW Method
Wave Shape of Light Source		Digital Modulation 
Peak Output	Big	Little
Length of Life of Light Source	About 3 years	About 10 years

# FTR

Fiber Optic  
Temperature Laser Radar

Temperature measurement over 2m intervals is available utilizing Optical Fiber. The PC manages measured data in accordance with purposes.

The FTR system is a temperature-monitoring system which utilizes Optical Fiber. The FTR is able to control temperature and prevent fires in various fire hazardous places, from high-risk locations such as factories and power plants to lower-risk locations such as office buildings.

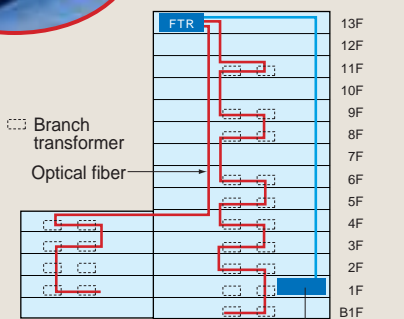
## Case 1

### Electric Facilities of Buildings and Factories

- FTR surveys temperature abnormalities of electrical facilities in locations such as in buildings, department stores, computer centers, hotels, and hospitals.
  - FTR ensures maximum safety and reliability of electrical facilities by monitoring the entire building with Optical Fiber Sensors and Spot Sensors\*
- \* Spot sensor : The sensor is a coil of an Optical Fiber.



Installing spot sensor on transformer



The central surveillance



Installing fiber sensor on Busduct

#### Example

Sensor	Non-metallic Spacer Type
Wiring Cable	Spacer Type
Optical Switch	Up to 40ch
Bay	Optional
Software	Optional
Alarm Output	Optional
The Joint Box	Indoor Type

## Case 2

### Fire Detection

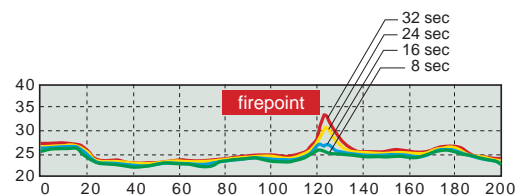
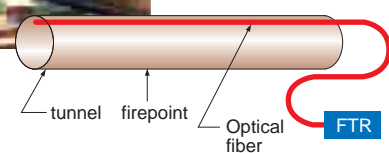
- FTR quickly detects areas of fire in tunnels, coal mines, underground shopping centers, buildings, etc.
- An immediate temperature distribution is detected and therefore prevents a secondary fire hazard or disaster from happening.
- Since the detector does not explode it is useful for tunnels in which there may be some danger of explosion.



Installing fiber sensor on the motor of coal-mine shaft



Field experiment of fire detection in a highway tunnel



#### Example

Sensor	Optical Fiber covered with a Metallic Tube
Wiring Cable	Spacer Type
Optical Switch	Not applicable
Bay	Optional
Software	Optional
Alarm Output	Optional
The Joint Box	Outdoor Type



- Conducts temperature measurement over 2m intervals.
  - Measuring distance is up to 6.0km.
  - Measurement of several thousand points is possible.

### Case 3

#### Temperature-Monitoring of Electric Facilities.

- FTR contributes to the efficient use of facilities and the improvement of reliability with temperature-monitoring of generators and electric power cables.
- FTR is able to detect the precise fault points where trouble has or may occur.
- FTR is able to be used in such places where operation equipment is unmanned like in a nuclear power plant.



Installing fiber sensor on a power cable



High-voltage power cable in a tunnel

#### Example

Sensor	Non-metallic Spacer Type
Wiring Cable	Spacer Type
Optical Switch	Up to 40ch
Bay	Optional
Software	Optional
Alarm Output	Optional
The Joint Box	Indoor Type

### Case 4

#### Temperature Control of a Plant.

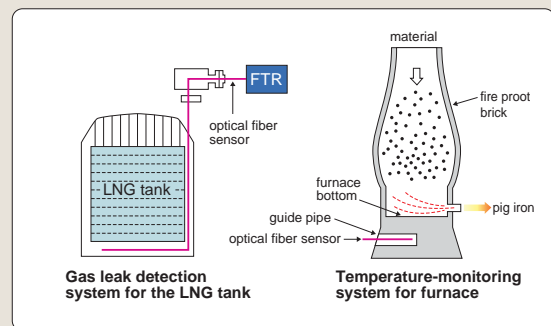
- FTR is an integral part of temperature control systems of tanks, pipelines and furnaces.
- FTR contributes to energy-saving and efficiency in repairs through the early discovery of abnormal heat.
- FTR is able to monitor temperature over a wide range.



Temperature monitor for chemical plants



Gas leak detection system of the LNG tank



Gas leak detection system for the LNG tank

Temperature-monitoring system for furnace

#### Example

Sensor	Optical Fiber covered with a Metallic Tube
Wiring Cable	Spacer Type
Optical Switch	Up to 40ch
Bay	Optional
Software	Optional
Alarm Output	Optional
The Joint Box	Outdoor Type

### Specifications of Measurement Unit

Item	Specification	
	FTR1000	FTR070
Type	FTR1000	FTR070
Measurement distance	6km max. (without optical switch)	1km max.
	4km max. (with optical switch)	
Sampling distance	2m	1m
Temperature accuracy	±3.0℃	±1.0℃
Temperature resolution	0.1℃	
Measurement time	about 300sec.	about 60sec.
Measuring temperature range	-200~+300℃ (depending on fiber sheath materials)	
Main unit working temperature	20 ~ 30℃	
Main unit working humidity	0 ~ 90% (non-condensing)	
Power source voltage	AC100V ±10% 50/60Hz	
Power consumption	AC100V 1.5A	
Weight	approx. 10kg	approx. 15kg
Optical fiber	GI-50/125 (and SM)	GI-50/125
External dimensions	480W×370D×199H mm	480W×400D×181H mm

(Note)

- The above specifications are an example.
- Performance of measuring distance, accuracy, and time varies in Optical Fibers and Optical Switches.
- Measuring accuracy is under the following conditions:
  - Measuring temperature range is between 0 and 70 degree centigrade.
  - Measuring unit working temperature is between 20 and 30 degree centigrade.
- The system has an internal alarm and a communication port (RS-232C)
- The PC for a monitor is optional.
- FTR1000(SM) is the pigtail structure.

### Specifications of Optical Fiber Sensor

Application	Type of Optical Fiber Sensor	Outside diameter	Measuring Temperature Range
Electric Supply of Building or Works	Code type (Round type)	about φ3mm	normal temp. ~ 60℃
	Code type (Flat type)	major axis 5.6mm minor axis 3.6mm	normal temp. ~ 60℃
Power Plants	Slotted core type	about φ1mm	normal temp. ~ 75℃
Fire Detection	Metallic tube type (Stainless steel)	ID 1.4mm/OD 1.8mm	normal temp. ~ 300℃
High Temperature Monitor		ID 3.0mm/OD 3.6mm	normal temp. ~ 300℃
Low Temperature Monitor		ID 3.0mm/OD 3.6mm	-196℃ ~ normal temp.
Concrete Temperature Monitor	Wire armored type	about φ8mm	-10~60℃

Spot Sensor : size : 60W × 84L × 12t

### Options

- Multi-channel Optical Switch (2ch ~ 40ch)
- Application software
- PC Monitor for FTR

Please contact us regarding system composition, application software, etc.

 **Hitachi Cable, Ltd.** Internet: <http://www.hitachi-cable.co.jp/>

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**Hitachi Cable America, Inc.** Internet: <http://www.hitachi-cable.com/>

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**Hitachi Cable Asia, Ltd.**

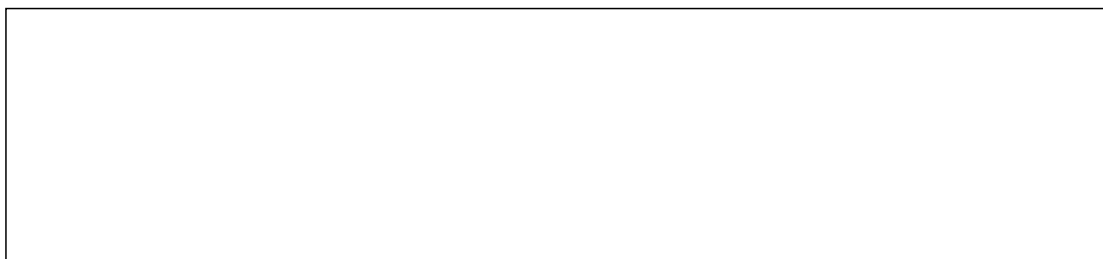
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※Specifications subject to change without notice.