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FIBER OPTICS SENSOR

Fiber Temperature Sensor

TEMPSENS

TEMPSENS Business areas 2021

TEMPERATURE SENSORS

SHARE OF REVENUES

53%

TEMPSENS

AST AccuOpt

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CABLES

SHARE OF REVENUES

33%

TEMPSENS

HEATING SOLUTIONS

SHARE OF REVENUES

14%

Marathon TempSens

TEMPSENS

TEMPSENS

600
EMPLOYEES

SALES IN OVER
75
COUNTRIES
AROUND THE GLOBE

36 MILLION US$
SALES

3 GLOBAL LOCATIONS

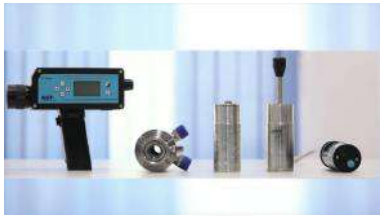
OVER
6500
CUSTOMERS

9
PATENTS APPLIED

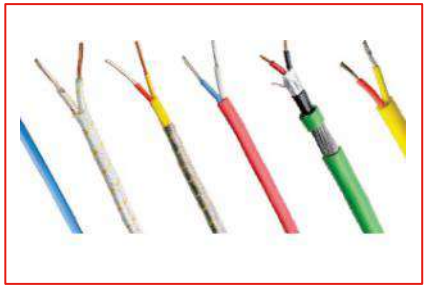
> 40
YEARS EXPERIENCE

~25%
YOY GROWTH

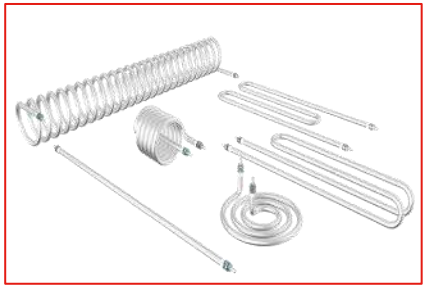
Key Products – Temperature sensors

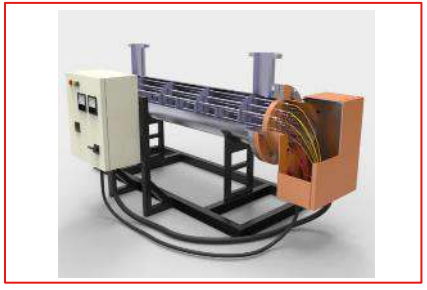


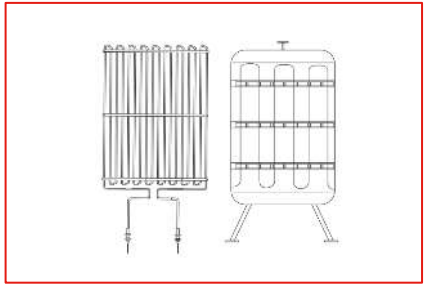
Key Products - Cables

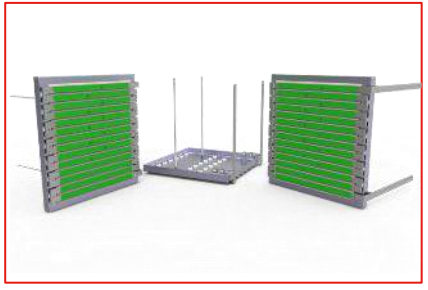


Key Products – Heating systems

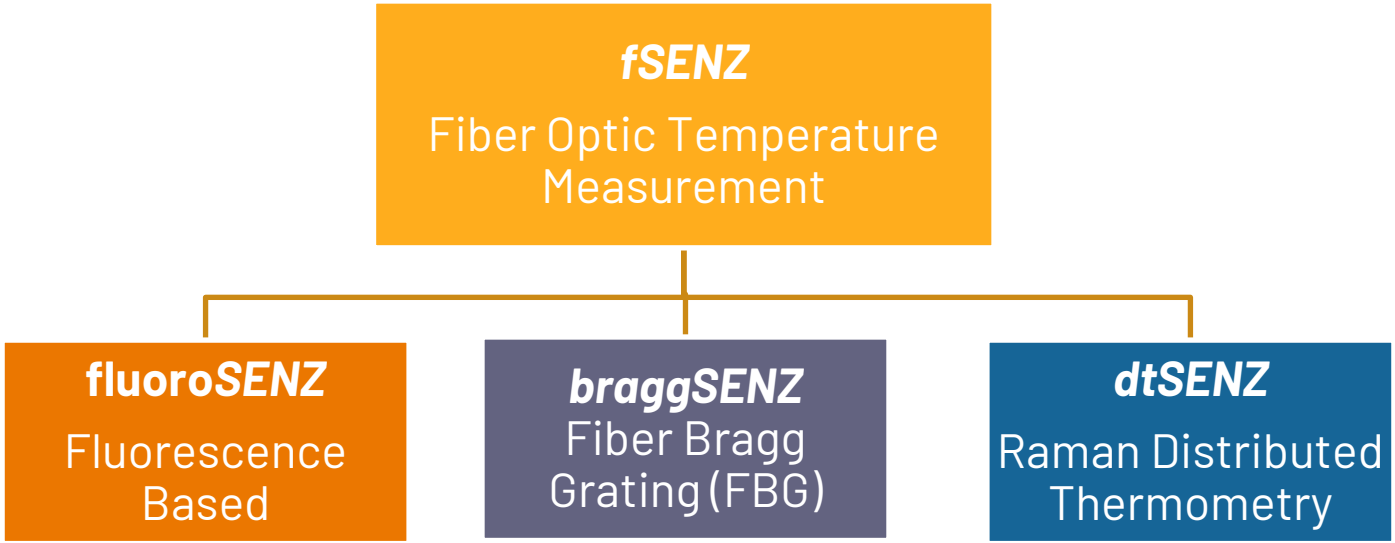








Fiber optic, Temperature Measurement Technologies



Fiber Temperature sensors – Why ?

- Insensitive to Electric Current, Electromagnetic Radiations such as Microwaves and RFI.
- Technology offers multipoint, and distributed temperature measurement.
- Robust and offers an alternative way to conventional temperature measurement techniques.

Advantages Over other Temperature Sensors

Technology	Fluorescence	Fiber Bragg Grating	Raman DTS
Sensing Point	Single Point Tip Sensor	Upto 20 Sensing Points on a Single Fiber	Whole Cable
Temperature Range	-40 to 260°C	-20° to 900°C	-200° to 700°C
Type of Fiber	Single Mode	Single Mode	Multimode
Application	Temperature	Temperature, Strain, Pressure, Vibration	Temperature

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fluoro*SENZ*
Fluorescence Based Temperature Measurement

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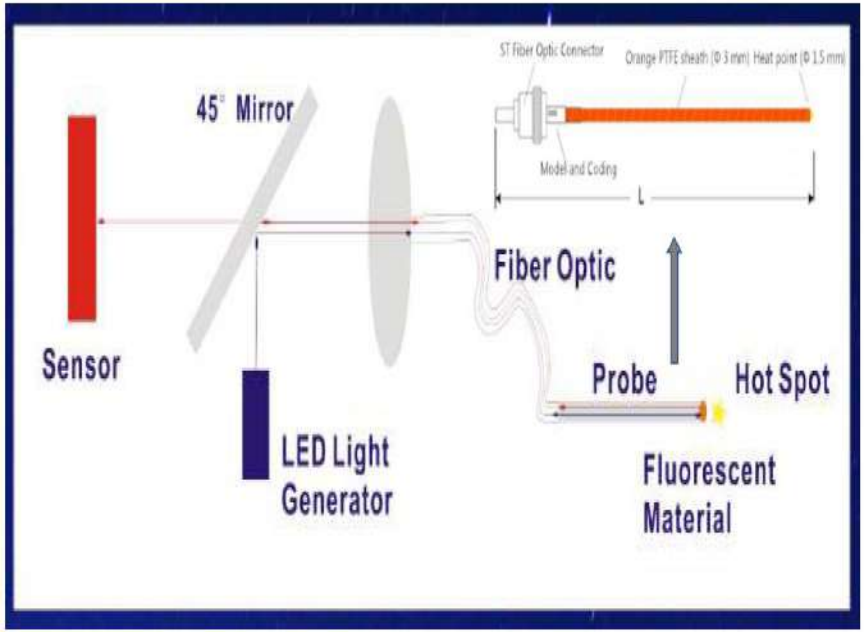
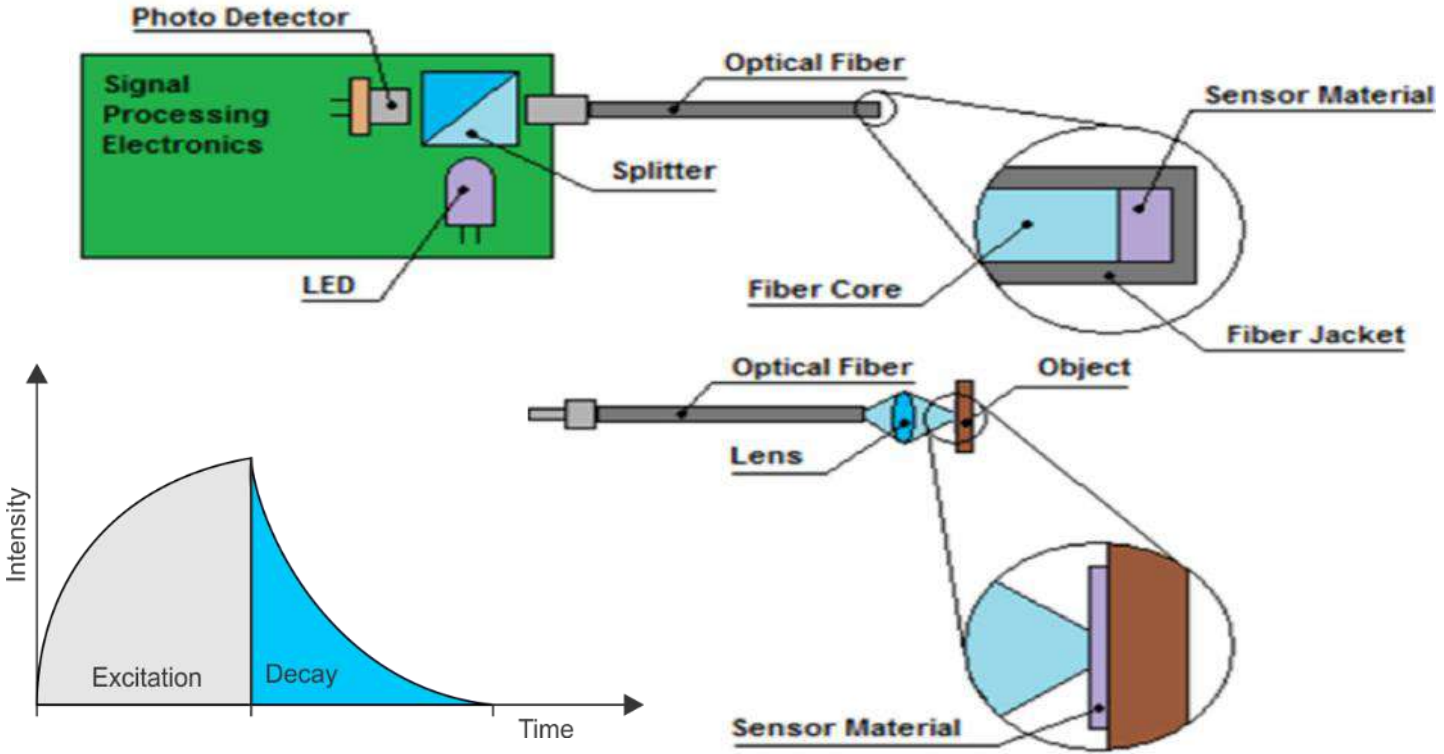
Working Principle

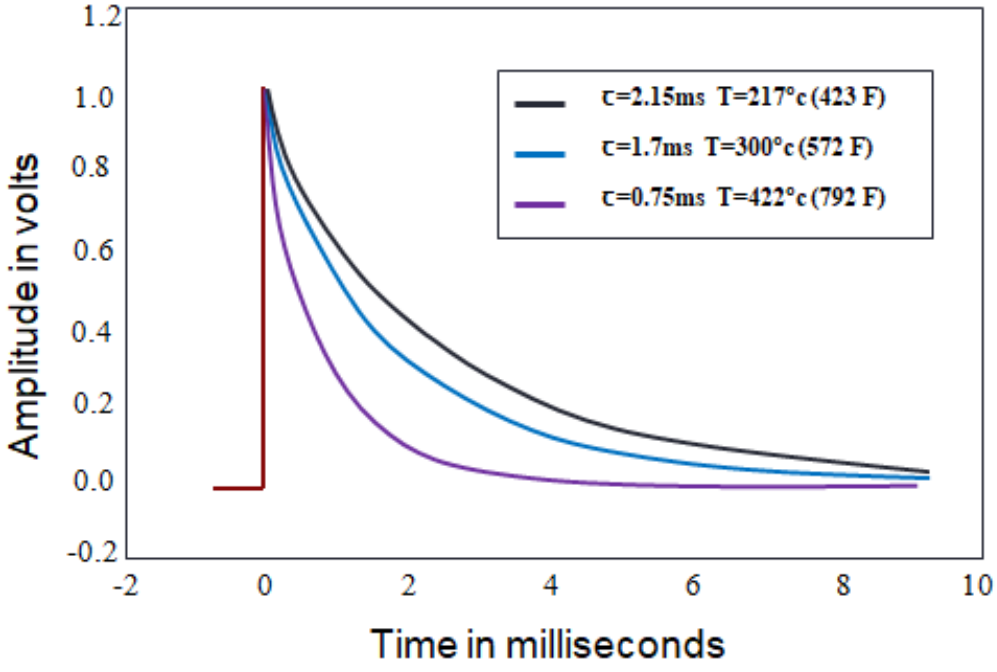
- It is a single point contact temperature measurement system.
- A Fluorescent sensor is formed at the tip of the Optical Fiber.
- The other end of the fiber is attached to a light source . The light source is used to excite the Fluorescent material.
- After excitation, the Fluorescent material tends to return to its ground state by emitting a photon (light).
- The time taken to return to ground state varies according to temperature.



Working Principle

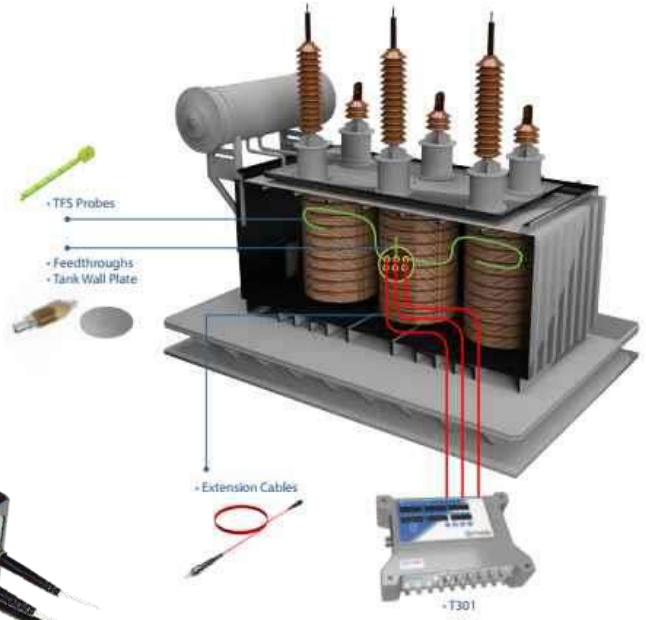


Working Principle



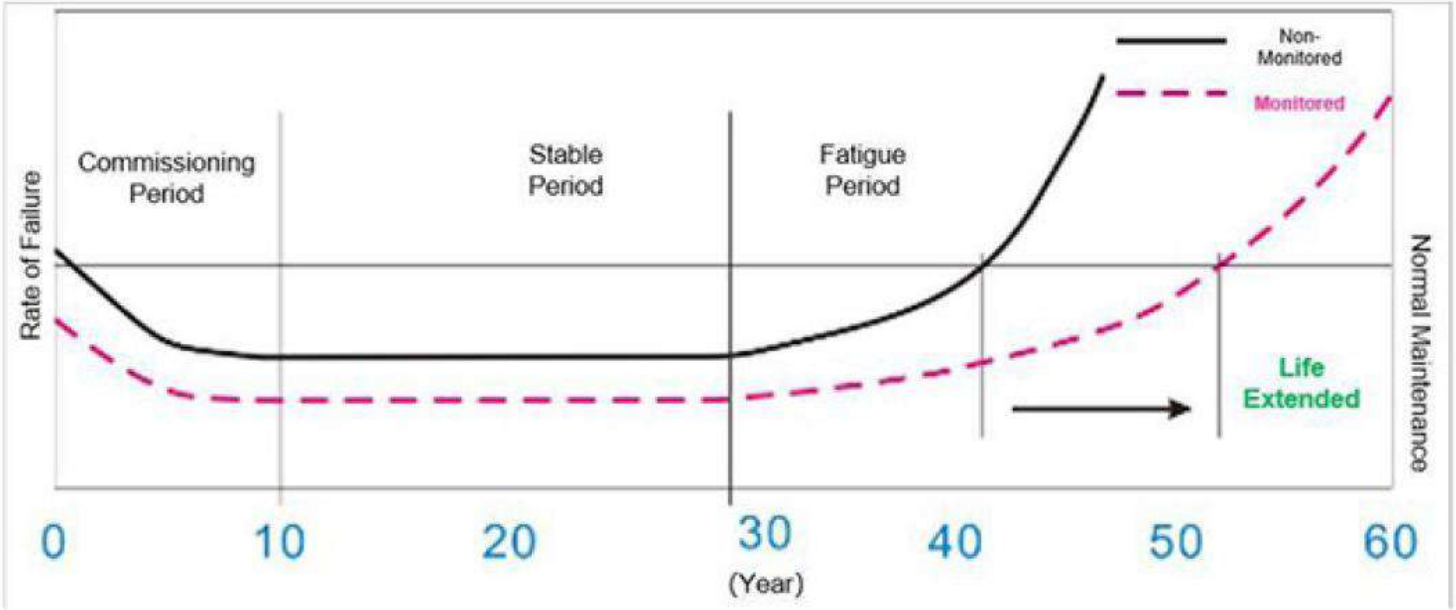
Applications

- Transformer Winding Temperature Measurement
- Switchgear Hot Spot Temperature Monitoring
- Energy Industry
- Industrial Microwave Industry
- Medical Industry

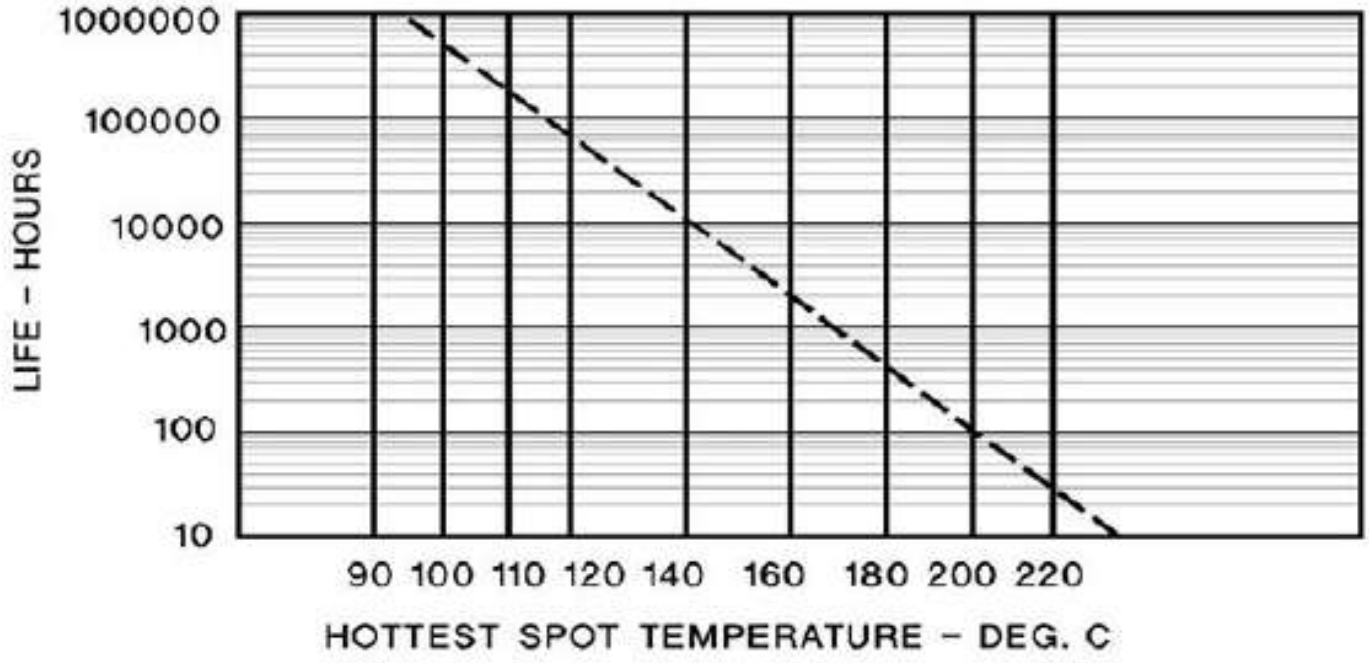


Why Monitoring required ?

The operational life of Transformer will be decreased by HALF when its inner temp. increases every 6°C.



Why Monitoring required ?



TQ-E116
Transformer Winding Hot Spot Temperature Monitoring

Temperature Range	-40° - 260°C
Temperature Accuracy	± 1°C
Temperature Resolution	0.1°C
Display	Seven Segment Display
Number Of Channels	1-16
Response Frequency	2 Second Per Channel
Communication Protocol	MODBUS
Power Supply	DC 24V
Digital Interface	RS 485, USB, Analog O/P , 4-20 mA Relay O/P
Memory	1 GB Memory Space , USB Port Accessible
Power Consumption	≤10 W
Fiber Optic Length	1 m to 25 m
Operating Temperature	-20°C – 65°C

TQ-E116 Components

FluoroSenz Probe TP1

Temperature Range	-40°C ~ 260°C
Probe Cover	PFA
EMI	No Effect
Probe Diameter	3.0mm
Optic connector	ST
Standard Length	3m, 6mm, 9m

FluoroSenz Probe TP2

Temperature Range	-40°C ~ 200°C
Probe Cover	Silicon Fiber Casing, Teflon or PFA
EMI	No Effect
Probe Diameter	02.3mm
Optic connector	ST
Standard Length	3m, 6mm, 9m

TQ-E116 Components

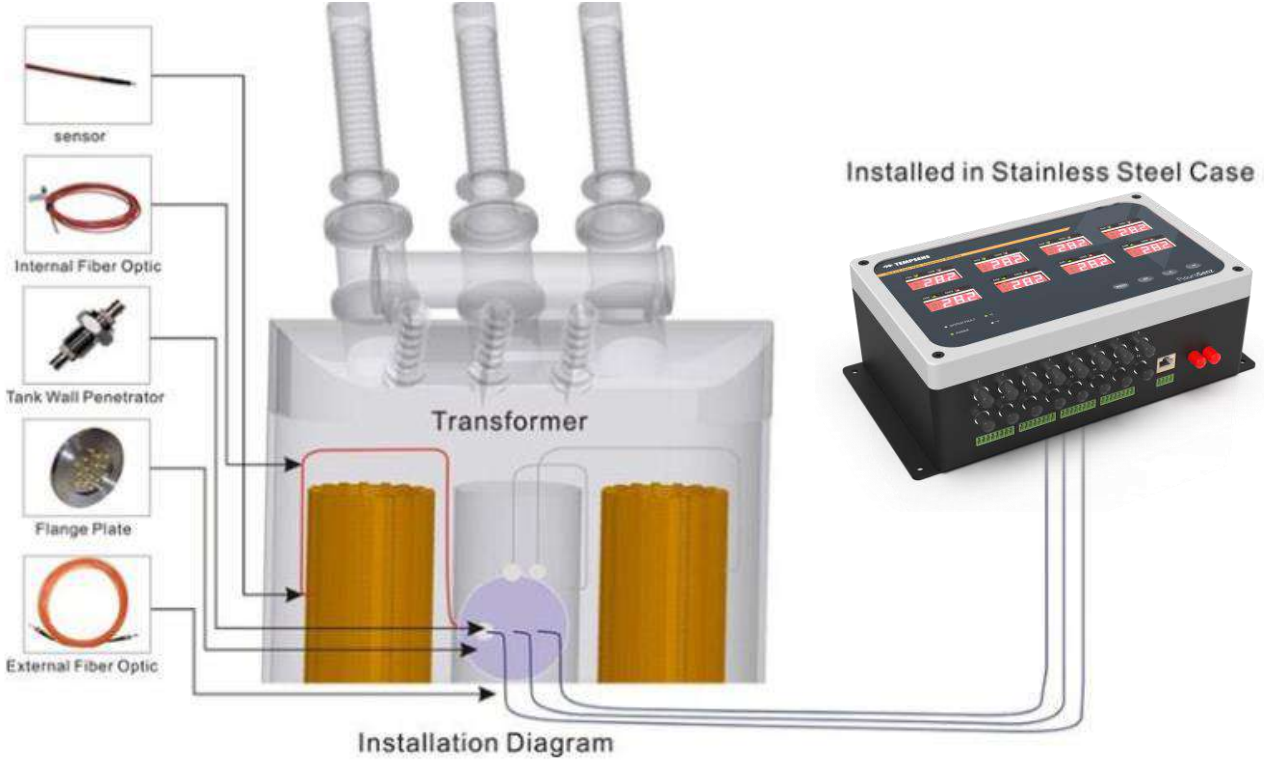
FluoroSenz Probe TP3

Temperature Range	-40°C ~ 260°C
Probe Cover	PFA
EMI	No Effect
Probe Diameter	02.3mm
Optic connector	ST
Standard Length	3m, 6mm, 9m

FluoroSenz Probe TP4

Temperature Range	0°C ~ 70°C/ 30°C ~ 50°C
Probe Cover	PFA
EMI	No Effect
Probe Diameter	1.1mm, 0.5mm
Optic connector	ST
Standard Length	3m, 6mm, 9m

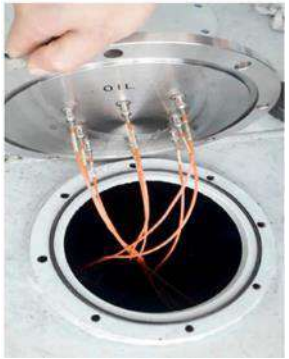
Installation Diagram



Installation Diagram

1

2



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7

Other Models

TQ-12 for Switchgear Busbar

TQ-39 for RMU Hotspot

Advantages

- Highly stable, with great degree of accuracy, calibration-free, interchangeability.
- Immune to EMI, Microwaves.
- Accurate and Reliable Temperature Reading where Thermocouple and RTD's cannot be used.
- Long service life, maintenance-free.
- Small Probe size and can be used to measure the hot spot in depth.
- Real Time readings.

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braggSENZ
Fiber Bragg Grating(FBG) Temperature Sensor

Technology 1

- A fiber Bragg grating is an optical sensor made by laterally exposing a core of single mode fiber to periodic pattern of intense UV laser light.
- The exposure forms an increase in the refractive index of fiber's core creating fixed index modulation known as grating.
- The grating inside core of fiber optic shall reflect particular wavelength of laser, correlating to grating period and transmits all other.
- When period of grating expands or shrinks due to change in temperature/strain, change in reflected wavelength is observed.

Technology 2

- A Fiber Bragg Grating (FBG) is a type of Distributed reflector that reflects a particular wavelength of light and transmits all other .
- This is done by adding a periodic variation to the refractive index of the fiber core

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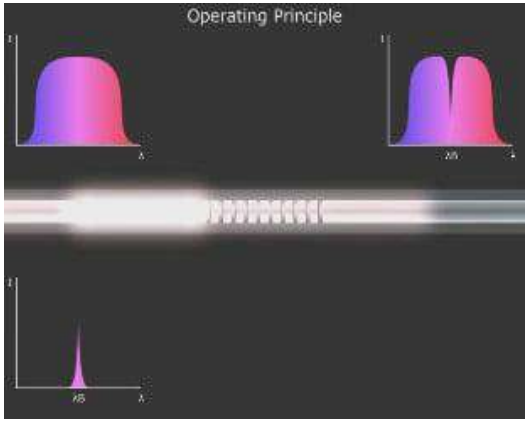
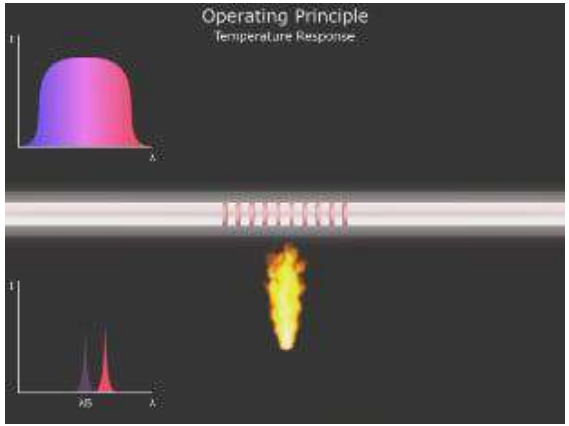




When temperature/strain around Grating changes , change in reflected wavelength is observed.

Advantages

- One of the main advantages of this technology is its intrinsic multiplexing capability. In fact, hundreds of fiber Bragg gratings can be written on a single optical fiber
- Low loss relative to the fiber length
- Immunity to electromagnetic and radio frequenc interference
- Small size and Weight
- Intrinsically safe operation in
- High sensitivity and long-term reliability.

bragg*SENZ* System Configuration

Parameter	Remark
No. of channels	Upto 4
Maximum no. of FBGs per channel	Upto 20
Length of grating	10-15 mm
Wavelength Range	1525-1570 nm
Wavelength Resolution	1 pm
Wavelength Accuracy	5 pm
Measurement Frequency	6 KHz max
Sensor cable length	500 m
Fiber Type	9/125 µm SM Fiber
Fiber connector	FC/APC
Size (LxWxH)	260x160x92 mm
Communication interface	USB 2.0, RJ45, RS485

Sensor Cables

Temperature Sensor Cable

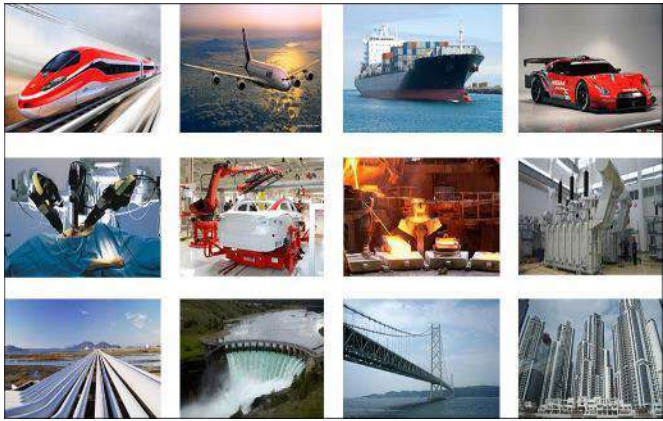
Parameter	Remark
Cladding Coating	Acrylate or polyimide
Outer sleeve	900 µm PTFE sleeve
Spectral width	<0.6 nm
SLSR	>15 dB
Wavelength	1500-1600 nm

Strain Sensor Cable

Parameter	Remark
Coating	Acrylate or Polyimide
Sleeve option	Stainless steel or composite
Spectral width	<0.6 nm
Operating Temperature	Upto 80°C
Measurement range	2000-5000 µm/m
Wavelength	1500-1600 nm

Applications

- Gas Sector
- Hydro Power Plant Monitoring
- Power Transmission and Distribution
- Commercial Transportation



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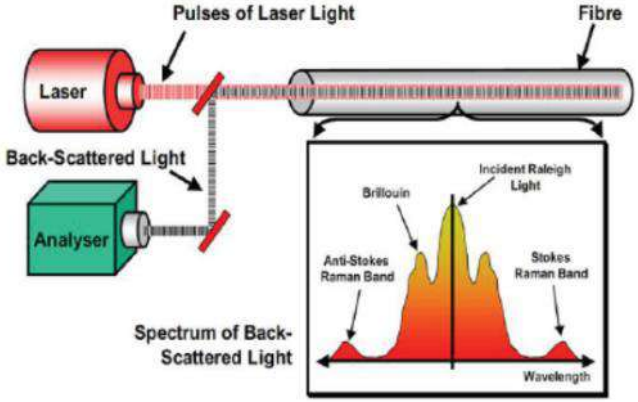
dtSENZ
Raman Optical Fiber
Distributed Temperature Sensor

dt*SENZ* Technology

Raman Effect -

An optical laser pulse propagating through the fiber gets scattered light back to the transmitting end, where it is analyzed. Their occurs Rayleigh scattering and Raman scattering and Raman signals: Stokes and Anti-stokes indicates the temperature of that point.



Optical Time Domain Reflectometry -

The position of the temperature reading can thus be determined by measuring the time taken for the backscatter to return to the source.

Temperature $\Longrightarrow$ $\frac{\text{Anti-stokes}}{\text{Stokes}}$

Location $\Longrightarrow$ round trip time

Features

Intrinsically Safe

Widely used for petrochemical, nuclear power, and electric power.

01

02

Fiber as Sensor

Use exsiting fiber as continuous sensors; Easy to install and maintenance free

Linear Monitoring

Suitable for monitoring large linear assets, such as tunnels, metros, cables, conveyor belts, etc.

03

04

Chemically Stable

Good for well monitoring, chemical process, etc.

DTSenz System Configuration

Optical Specifications

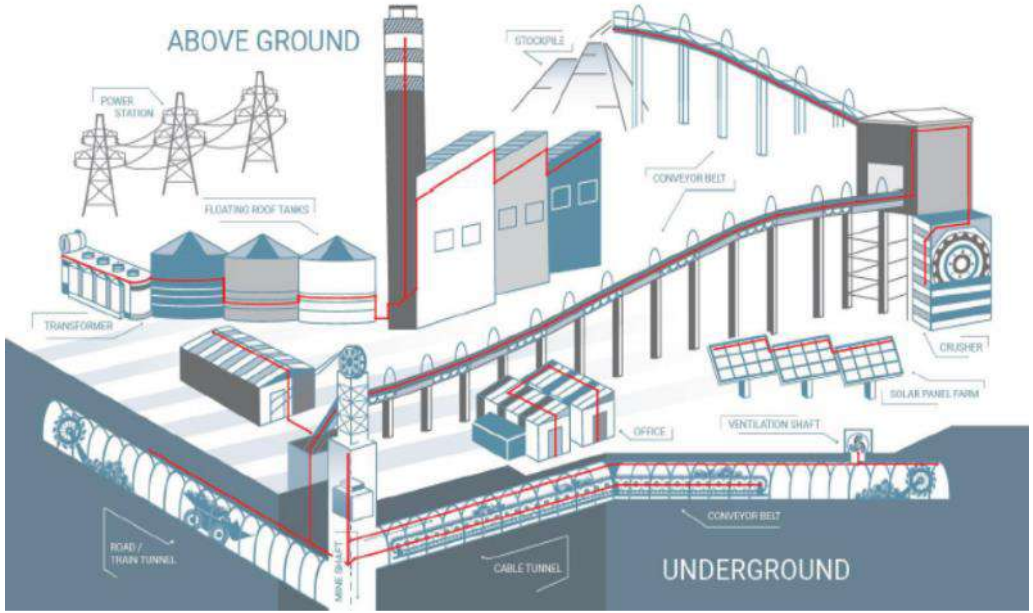
Parameter	Remarks
Sensing Range	10 km
Measurement Time	1 sec per channel
Temperature Accuracy	±2 ℃ @10 km, 6s
Temperature Resolution	0.1 ℃
Sampling Resolution	0.4 m
Spatial Resolution	2 m
Position Accuracy	±1 m
Sensing Temperature Range	-20 to120 ℃ standard cable
Number of Channels[1]	4 ch w/ optical switch
Sensing Fiber	MMF
Fiber Type	62.5/125/ 900um MMF
Fiber Length	1000±10mm
Fiber Connector	FC/APC
Working Temperature	-10 to +50℃
Storage Temperature	-40 to +70 ℃
Relative Humidity	5 to 90%
Power Supply	240 V AC
Power Consumption	15 W

Electrical Specifications

Parameter	Remark
Outputs	RS485 (Modbus), RJ45(UDP/TCP-IP)
POWER	3PIN (GND, NC, 12V)
RS232	4PIN (RXD, TXD, GND, NC)

Applications

- Fire Detection/ Prevention.
- Power Transmission Lines.
- Oil and Gas Pipelines.
- Conveyer Belt Monitoring.
- Oil Leakage Detection.
- Plant Temperature Monitoring.
- Freezer Warehouse.
- Battery Storage.



For further any query, please contact :

Hitaish Kr. Singh

Cell : +91-9928157455

Email : digital@tempsens.com

THANK YOU