




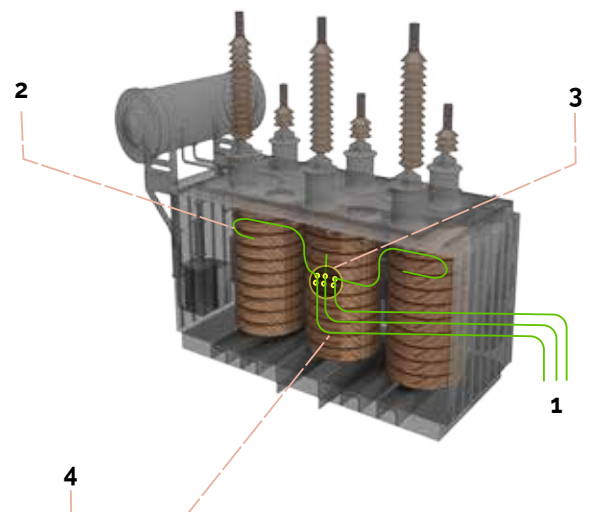
# Transformer Hot Spot Monitoring System

We are an industry leading team of fiber optic experts with 100+ years of combined experience, and are committed to deliver customizable solutions for challenging applications. Our team of experts leads through product innovation to deliver best in class reliability. We deliver reliable, high performance, precision sensors and monitoring solutions. Our mission is to:

• <b>Customer Service</b>	At Rugged Monitoring customers come first. Deliver best in class customer service, be first in mind and choice for customers.
• <b>Rugged Design</b>	Deliver Rugged, intrinsically safe sensors / solutions for the toughest applications.
• <b>Innovation</b>	Leading next generation product innovations with patented technologies.
• <b>Fiber Optic Experts</b>	Our team has extensive knowledge of Power Transformer Industry and viewed as leaders in fiber optic sensing technology.
• <b>Quality Focus</b>	Provide peace of mind to our customers by delivering quality products consistently.

## Start Here to Build Your System (Component Description)

1		T301 Monitor
2		T301 Sensors
3		<ul style="list-style-type: none"> <li>• Feedthroughs</li> <li>• Tank Wall Plate</li> </ul>
4		Extension Cables



## T301 Monitor

- Transformer dynamic loading response
- System Integrity Self Check
- Transformer life optimization
- Detect early life failures
- Thermal model reflecting operating conditions
- Accuracy of  $\pm 1^\circ\text{C}$ , resolution of  $0.1^\circ\text{C}$
- Rugged cast aluminum construction
- Supports from 4 to 24 optical temperature sensors
- 8 programmable form-C relays (5A)
- Dedicated system fault relay
- Based on market leading GaAs technology for long term reliability
- Light sources have an estimated life of 300 years
- 8 GB memory (enough for at least 10 years of data, @10sec rate) industrial grade removable microSD card
- Standard USB and serial RS-485 interfaces (with Modbus)
- 24 to 48 VDC, ~ 20 watts
- Optional built in webserver, with 1 gigabit optical ethernet
- Optional advance communication protocols (i.e. 61850) / Optional fiber SFP transceiver



### Ordering Code

**Number of Channels**

Ex: 08 = 8 Channels

**Number of Analog Outputs**

0 = No Analog Outputs

8 = 8 Analog Outputs

**T 3 0 1**

**E A R M**

**Memory Size**

4 = 4 GB

8 = 8 GB

**Ethernet Protocols**

0 = No Ethernet

1 = Ethernet Board RJ45

2 = Ethernet Board RJ45 & SFP

**Number of Relays**

0 = No Relays

8 = 8 Relays

## Transformer Sensor (Tsens)

### Features

- Suitable for dry-type and oil-filled transformers
- Compatible with all types of transformer oil, including ester type
- Meets and surpasses ASTM D3426 and D-149 standards
- Extremely low PD performance
- Compatible with kerosene vapor drying process
- With or without disk tip

### Specifications

- Improved design (patent pending)
- Measuring range:  $-80^\circ\text{C}$  to  $250^\circ\text{C}$
- Response time of ~ 1 sec
- Available in any lengths, up to 25 meters
- With industry standard ST connector
- Solid Torlon disk tip, diameter 9 mm
- Designed to exceed Transformer life

### Ordering Code

**Length in Meters, Ex: 02 = 2 Meters**

**Transformer Probe Cable Diameter**

X = 3 for 3 mm

**TFS = Transformer Fiber Sensor**

**T F S**

**G = Gallium Arsenide**  
**T = Temperature**

**Options**

YY = 00, Metal ST Connector (Default)

YY = DT, Dielectric Connector TORLON

**Options**

Z = 1, for 9 mm Disc (Default)

Z = 0, for no retaining Disc



## Feed Through



### Features

- Easy installation
- No O-rings design
- Optional pre-installation in TWP
- Designed to reduce loss of light, critical to reliability

### Specifications

- With zirconia connectors for better optical transmission
- Stainless steel 316L construction
- Wide temperature and pressure ranges

### Ordering Code

**T F F T** - **014** = 1/4" NPT Feedthrough, SS 316  
**TFFT = Transformer Feedthrough**

## Tank Wall Plate



### Features

- With O-Ring or customer supplied gasket
- Compatible with RM Interface Box (optional bolting provision)

### Specifications

- Diameter of 275 mm
- Stainless steel 316L construction
- Up to 25 feedthroughs

### Ordering Code

**Number of OFT's**  
 Example: 08 = 8 OFT's

**Assembly Options**  
 0 = Welded  
 1 = Bolted with Viton O-ring  
 2 = Bolted and Flat for gasket seal

**Interface Box (i-Box)**  
 0 = No i-Box  
 1 = With i-Box (bolting provision)

**T P L T** - **08** - **A** - **I B**  
**TPLT = Transformer Tank Wall Plate**

## Extension Cable



### Features

- PVC sheathing (outside transformer)
- Teflon sheathing is mandatory with dielectric connector (inside transformer)

### Specifications

- 3 mm OD
- Maximum temperature: +85 °C
- Available in any lengths, up to 99 meters

### Ordering Code

**Length in Meters, Ex: 02 = 2 Meters**

**Cable Sleeve**  
 P = PVC (Default)  
 T = PTFE Teflon

**F O X T** - **02** - **P** - **S T X X**  
**FOXT = Fiber Optic Extension Cable**  
 XX = ST, Metal Connector (Default)  
 XX = DC, Dielectric Connector at one end

## Interface Box



### Features

- Leak proof design

### Ordering Code

**T I B X - A C C**

Transformer Interface Box

### Specifications

- Size 200 x 200 mm, 150 mm high
- With neoprene gasket
- Stainless steel 316L construction throughout

## Configurations

		Non Critical Transformers	Standard Transformers	Critical Transformers
Probe Positions	Equipment			
	Central Winding - LV	2	2	6
	Central Winding - HV	2	2	6
	Lateral Windings - LV	1 per Phase	1 per Phase	2 per Phase
	Central Winding - HV	1 per Phase	1 per Phase	2 per Phase
	Top Yoke Core		1	1
	Top Oil		1	1
	Spare		2	2
	Total Probes	8	12	24
	Optical Feedthroughs	8	12	24
	Tank Wall Plate	8 hole version	12 hole version	24 hole version
	Interface Box( i-Box)	1	1	1
Extension Cables		8	12	24
Number of Channels in the monitor		8	16	24



### Rugged Monitoring Services

Rugged Monitoring provides customization of sensors, monitors & software. In addition we offer on-site commissioning services, maintenance contracts and technical support to all customers worldwide.



### About Rugged Monitoring

Industry leading team of fiber optic experts with 100+ years of combined experience committed to delivering customizable solutions for challenging applications. We offer a range of reliable, high performance, customizable sensors and monitoring solutions that are immune to external influence.