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T/Guard+ System

Fiber Optic
Power Transformer
Winding Temperature
Monitoring System
with relays

T/Guard+™ Fiber Optic Power Transformer Winding Temperature Monitoring System with relays and datalogging

The Neoptix™ T/Guard+™ is a multi-channel fiber optic temperature monitoring system for power transformer hot spot measurements. The T/Guard+™ system has been developed with long-term performance and stability in mind. This fiber optic temperature monitoring system for power transformers offers accuracy, toughness and long-term resistance to failure.

T/Guard+™ shown insttaled into optional NEMA 4-12 enclosure

Coupled with the T/Guard+™ system, the Neoptix™ T2™ fiber-optic temperature probe provides accurate and direct temperature monitoring of transformer windings. This solution provides a realistic, real-time view of winding conditions that is quicker and more accurate than top oil thermocouple measurements, and greatly complements indirect measurements based on thermal models.

Neoptix™ fiber-optic probes give exact temperature in less than a second. Peak load or emergency overloads are thus detected almost instantaneously. With Neoptix technology, you have a new tool to optimize high-voltage transformer performance and life expectancy.

The Neoptix™ T/Guard+™ system is specifically designed to meet power transformer industry requirements: extended intervals between servicing, low maintenance, rugged components and the ability to withstand the harshest conditions. All components have been specifically selected for long term performance, including the light source that has an MTBF superior to transformer's life. Moreover, compared to other technologies available on the market, like fluorescent decay, our sensor, based on solid state semi-conductor, do not fade over time, allowing a constant and absolute temperature measurement of your transformer windings over the lifespan of the equipement.

Our fiber-optic probes are made only with dielectric materials and are designed to withstand initial manufacturing conditions, including kerosene desorption and heat runs, as well as long term oil immersion and vibration. Moreover, the Neoptix temperature probes are interchangeable and no calibration or inconvenient gage factors are required when changing sensors.

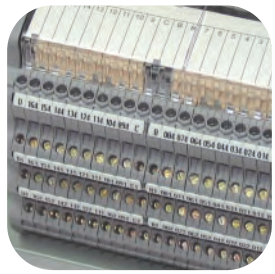
The T/Guard+ system is available with 1 to 16 channels. It can be mounted in an optional NEMA-4 enclosure with a see-through window door. The system is based on the proven solid state technology. An original algorithm is used to analyze the signal and provide repeatable and reproducible measurements.

The T/Guard™ system is available with data logging on MMC/SD card

The Neoptix T/Guard+ system is available with a data logging option that relies on removable flash cards. This option allows recording of temperature data points and alarms status information directly into the T/Guard+ system without the need for permanent connection to a remote acquisition system or to a PC. Data collected by the T/Guard+ is saved in a standard SD multimedia flash card. The system can accept memory cards of up to 128 megabytes, which is sufficient to log over 6 millions data points. This represents more than twenty years of data logging for a transformer instrumented with 16 temperature probes! The SD card can be read by any PC through a standard MMC/SD card reader. Moreover, data points are saved with a time stamp that comes from the internal real-time clock of the T/Guard+ system.

The T/Guard+ system has 16 Form-C (SPDT) industrial relays with galvanic isolation which can also be set up as Form-A or Form-B relays by user. The system can be easily connected to any acquisition system, like a SCADA, through its built-in OPC server, its RS-232C communication port or by the standard 4-20 mA analog outputs (0-10 Volts on request). The T/Guard+™ system may also be ordered with DNP 3.0 and IEC 61850 connectivity.

System's configuration is made through the indutrial grade front panel keypad or the communication port. The T/Guard+™ front panel features a 4 lines by 20 characters backlight LCD display.



The T/Guard™ system comes with industrial-grade relays featuring galvanic isolation

A multichannel fiber optic system for high voltage and transformer hot spot temperature measurement incorporating 16 Form-C relays

Features

- **Tough and ruggedized sensors**
- **No gage factor or calibration**
- **Standard RS-232 communication**
- **Voltage or current output**
- **Accuracy of ±1°C**
- **Available with 1 to 16 channels**
- **16 Form-C (can be set as A or B relays) with galvanic isolation**
- **Data acquision optional**
- **OPC Server ready**

Benefits

Accurate, direct temperature reading in the winding's hot spot:

- Predicts or adjusts the dynamic loading of high voltage transformers
- Prevents premature failures
- Provides cost effective monitoring of transformer temperature

Extends transformer life:

- Helps estimate the insulation degradation rate
- Complements predictive hot-spot algorithm simulations

Accessories

T2™ Temperature probe

This temperature probe is designed to withstand initial manufacturing conditions, including kerosene desorption and heat runs, as well as long term oil immersion and vibration. The T2 probe consists of a 400-microns OD solid-state crystal and optical fiber sheathed with an oil permeable protective PTFE Teflon sheath. Only chemical resistant dielectric materials are used for these temperature probes. The temperature range is -80ºC to +250ºC. The probes can be embedded in a standard spacer or attached directly onto any other location inside power transformer copper windings. All T2 optical temperature probes are available in custom lengths from 1 to 25 meters.

Tank wall optical feedthrough

Specifically designed for tank wall transformers, this feedthrough has a simple design that provides both toughness and long-term leak-free operation. It is made from 316 stainless steel and relies on proven glass-to-metal bonding techniques. The feedthrough uses 1/4" NPT ANSI threads and can be installed directly into the tank wall or on a tank wall mounting plate.

NEMA-4 Enclosure

The T/Guard system can be mounted in a NEMA-4 enclosure that houses and protects the instrument for long-term exterior use. All fiber-optic extension cables are connected inside this enclosure. The NEMA-4 enclosure includes a clear polycarbonate window-door and is compliant with NEMA/EEMAC Type 4 and 12 standards.

External fiber-optic extension cables

These cables are made with a polyurethane jacket reinforced with Kevlar threads and are designed to withstand the harshest conditions. External fiber-optic extension cables come in standard 5 or 10 meter lengths. Custom lengths are also available from 1 meter to 1 kilometer. The temperature range is -50ºC to +85ºC. Cables can be routed into protective conduits or tracks.

Tank wall mounting plate

Up to 12 feedthroughs can be mounted on a tank wall mounting plate. The plate is made with carbon steel and has a standard size of 25.4 cm (10 inches) diameter. Tank wall mounting plates can be customized in size or material according to customer specifications, with larger plates allowing more feedthroughs. The mounting plate comes with the JBox™ (patent pending) protective enclosure.

The tank wall mounting plate shown with JBox™ protective enclosure

Technical Specifications

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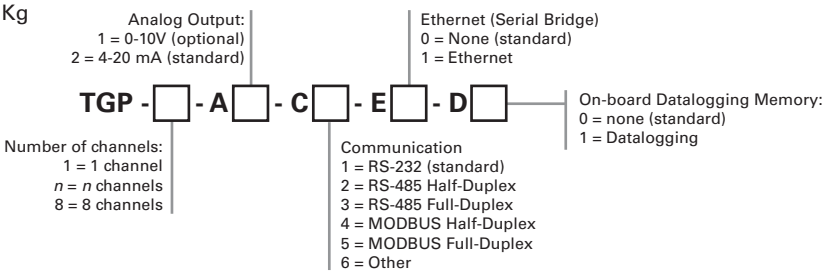
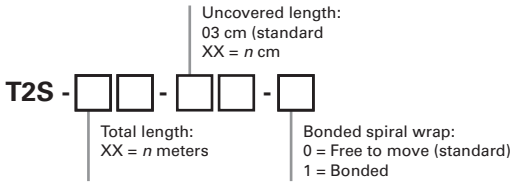
System

Model:	T/Guard+™ system
Number of channels:	Available with 1 to 16 channels
Resolution:	0.1°C (0.2°F)
Precision:	±1°C (1.6°F) or 1 % FS
Response time:	250 milliseconds; probe dependent
Operating temperature:	-40 to 65°C; non-condensing
Environmental control:	Automatic heating/cooling optional with NEMA 4-12 enclosure
Storage temperature:	-40 to 70°C; non-condensing
Display:	4 lines X 20 characters LCD with backlight
Units:	User selectable; Metric or Imperial
Operating mode:	Front panel keypad, RS-232 (OPC Server)
Communication:	OPC Server and CANopen (DeviceNet) or MODBUS; DMP 3.0, IEC 61850 and TCP/IP optional
Analog Outputs:	4-20 mA (0-10 Volts on request)
Relays:	16 Form-C (SPDT) relays with galvanic isolation; can also be set up by user as Form-A or Form-B relays.
Data logging :	Optional; Up to 1 gigabytes on SD removable flash card
Calibration:	No system recalibration needed over lifespan to remain within specifications
Light source MTBF:	> 25 years of continuous use
Probe compatibility:	T2™ temperature probes
Power input:	21~28VDC (nominal); 24VDC, 2A; Universal power supply optional.
Enclosure:	Powder coated Gage 16 steel enclosure with direct access to relays and analog outputs
	NEMA-4 Enclosure with see-through window optional
Dimensions:	Width: 250 mm; Height: 350 mm; Depth: 150 mm
Weight:	6.1 Kg
Ordering Codes:	



Probes

Model:	T2™ Fiber Optic Temperature Sensor
Temperature range:	-80 to 250 °C (-112 to 482 °F)
Accuracy:	±1 °C or 1 % FS
Response time:	≤500 milliseconds
Probe length:	Any length up to 25 meters by 1 meter increment
Connector type:	ST
Probe material:	Chemically resistant, inert and dielectric material; Quartz optical fiber
Probe sheathing material:	Oil permeable optical cable sheath and supplementary spiral wrap reinforcement made out of PTFE Teflon™
Probe dimensions:	1.21 mm O.D. for the first 3 cm; 3.10 mm O.D. spiral wrap protection afterwards
Probe sensitive area:	Direct point measurement with a sensitive area of 400 microns O.D.
Probe permeability:	Longitudinal continuous slit (patent pending) on cable insures perfect oil flow into the sheath
Certification:	ASTM-D 149 and ASTM-D 2413
Probe compatibility:	Compatible with all Neoptix signal conditioners
Ordering codes:	



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