Qualitrol T/Guard2 System

Fiber Optic Power Transformer Winding Temperature Monitoring System

A multichannel fiber optic system for high voltage and transformer hot spot temperature measurement

- Tough and ruggedized sensors
- No gage factor or calibration
- Serial communication: RS-232, RS-485, Modbus, DNP3 or IEC-60870-5-101
- Ethernet communication: HTTP and IEC-61850 (Through Q-Gate module)
- Voltage or current output
- Accuracy of ±1°C
- Available with 1 to 16 channels
- 1 GB internal datalogging memory and 0.5 GB internal event logging memory
- Quick and easy web-based configuration
- 16 Form-C optically isolated relay block (remotely located)

Product Summary

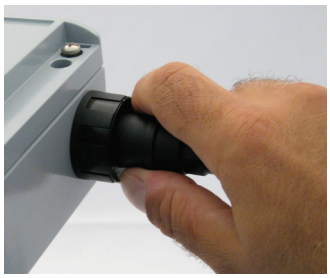
Description The T/Guard 2 is a full-featured fiber optic transformer hot spot monitoring system. It has 16 user-configureable Form-C relays along with analog and digital outputs. It features a web-based configuration and control interface.

Application Direct transformer windings hot spot monitoring with relays and TCP/IP access

Fibers by neoptix

QUALITROL®
Defining Reliability

- The Qualitrol T/Guard2™ is a multichannel fiber optic temperature monitoring system for power transformer hot spot measurements. The T/Guard2 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.
- Coupled with the T/Guard2 system, the Neoptix™ T2™ fiber-optic temperature probes provide 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.
- Qualitrol T/Guard2 gives the exact temperature of optical probes in 250 milliseconds per channel. Peak load or emergency overloads are thus detected almost instantaneously. With Qualitrol technology, you have a new tool to optimize high-voltage transformer performance and life expectancy.
- The T/Guard2 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 far superior (>300 years) to the expected life of the transformer. Moreover, compared to other technologies available on the market, such as fluorescent decay, our sensor, based on solid-state semiconductor, do not fade or drift over time, allowing a constant and absolute temperature measurement of your transformer windings over the lifespan of the equipment.
- Neoptix 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 system is based on the proven GaAs technology. An original algorithm is used to analyze the signal and provides repeatable and reproducible measurements.
- The T/Guard2 system is available with 1 to 16 optical channels and comes standard with a large (320 x 240 pixels) LCD display with LED based backlight. Signal conditioner power consumption of the system is 12 watts; up to 48 Watts with all relays enabled.
- The mounting brackets are integrated directly into the T/Guard2 enclosure, which allows a clean and robust installation into your control cabinet or substation. It is optionally available mounted in a NEMA4-12 enclosure. Automatic cooling and heating could be ordered with this protective enclosure.

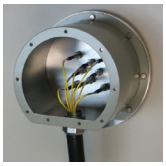


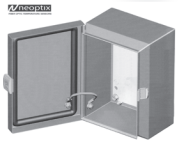
The space-efficient T/Guard2 system allows perfect integration into control cabinet

- The T/Guard2 system can be delivered with a built-in 1GB data logging memory that allows utilities and transformer operators to record temperature data points and alarm status information directly into their T/Guard2 temperature monitoring system, without the need for permanent connection to a remote acquisition system. One GB memory represents more than twenty years of data logging for a transformer instrumented with eight temperature probes. The information can be accessed through any web browser. Moreover, data points are saved with a time stamp that comes from the internal real-time clock of the T/Guard2 system.
- The T/Guard system is easy to interface to an existing marshaling or substation system through its 4-20 mA analog outputs (0-10 Volts optional) or its Modbus, DNP3 or IEC 80670-5-101 communication interfaces. It also has RS-232 or RS-485 communication. The T/Guard2 is Ethernet savvy and incorporates the newest IEC-61850 protocol Q-Gate option requised. Information collected by the system can also be accessed through any web browser using TCP/IP.
- With its small footprint, the T/Guard2 is a space-efficient instrument. It is specifically designed to be installed inside the control cabinet; no need to add a large supplementary enclosure to protect the system. The T/Guard can also be delivered with DIN rail mount brackets for a clean and streamlined layout.
- The T/Guard2 system has 16 Form-C (SPDT) industrial relays with galvanic isolation that can also be set up as Form-A or Form-B relays by user. The system has a fail safe mode whereby relays can be activated in case of system problem.
- System's configuration is made through the industrial grade front panel keypad, serial terminal or the built-in web-based server.

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 300-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 length 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. No O-ring are used
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 should be routed into protective conduits or tracks.
Tank wall mounting plate & JBox	Up to 16 feedthroughs can be mounted on a tank wall mounting plate. The plate is made with carbon or stainless 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™ protective enclosure.
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.



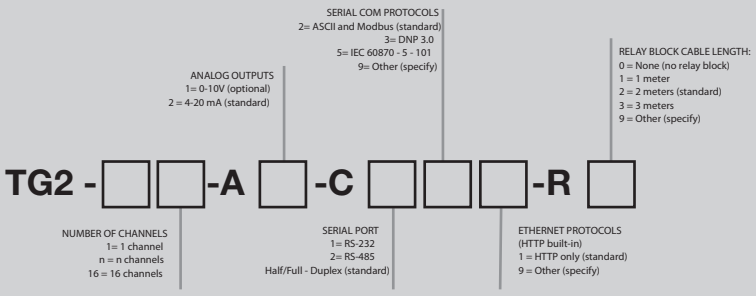


TECHNICAL SPECIFICATIONS		
System specifications	Model name:	T/Guard2 Transformer Hot Spot Monitoring System
	Number of channel:	Multi-channel instrument ; from 1 to 16 optical channels
	Resolution:	0.1°C (0.1°F)
	Accuracy:	±1.0°C (1.6°F)
	Calibration:	No system recalibration needed over lifespan to remain within specications
	System sampling rate:	250 ms switching rate between each channel;
	Data output rate:	Data output rate can be adjusted by user from one point every 250 milliseconds to one point per week.
	Built-in calculations and algorythms:	Averaging, data smoothing, delta between probes, min/max per channel and global, internal temperature.
	Upgradability - Firmware:	Flash ROM upgradeable through Ethernet communication
	Display:	One 320 pixels by 240 pixels graphical liquid crystal display (LCD), FSTN Positive, Transective, Wide Temperature LCD with white LED Backlight
	Units:	User selectable, Metric or Imperial
	Data logging memory :	1 GB on-board datalogging memory. Logging feature available for probes, alarms, system status, internal temperature, relays fonctions in an ASCII file. (equivalent to 20 years of logging on 16 channels at every 5 minutes)
	Temperature measurement range:	-80 to 300°C (-112 to 572°F)
Communication and I/O	Operating Mode:	System front panel keypad, ASCII commands over RS-232/RS-485 or Ethernet (web-based conguration)
	Communication (hardware):	Ethernet (RJ-45); Serial (RJ-45) on optically isolated RS-232/RS-485
	Communication protocols:	SERIAL: - ASCII (terminal console) - Modbus RTU (Full or Half-Duplex) - DNP 3.0 (optional) - IEC 80670-5-101 (optional)

TECHNICAL SPECIFICATIONS

Communication and I/O	Communication protocols:	ETHERNET: - HTTP (Web based) - Option: IEC 61850, Modbus over Ethernet (through Q-Gate module) - Option: 60870-5-101 and DNP3 on serial port
	Relays:	16 built-in relay drivers for transformer cooling control, enclosure cooling/heating, trips, alarms, etc. DIN rail relay block : 16 Form-C (SPDT) relays (5A/240VAC or 0.3A/240VDC or 34 A/24VDC max @ 50°C) Relays are indepently user replaceable Fail safe mode
	Relay drive:	Direct with system's built-in calculation algorythms
	Analog Outputs:	Detachable header connector blocks, 5.08 mm pitch. One analog output per channel; Standard: 4-20 mA, Optional : 0-10 Volts.
	System status reading and indicators:	System has internal built-in temperature sensor; info can be logged into internal memory or sent through serial communication. Built-in thermocouple temperature sensor can control enclosure's cooling and heating apparatus; Light Emitting Diodes (LED) status: One for the system and one for each probe; can be linked to serial communication
Mechanical and environmental	Operating temperature:	-40 to +75°C, 5-90% humidity, non-condensing
	Storage temperature:	-50 to +85°C, 5-90% humidity, non-condensing
	Board level environmental protection:	MIL-I-46058C (IPC-CC-830) Type SR silicone conformal coating
	Light source MTBF:	Light source lifespan and optimal system performance superior to 300 years of continuous use. No degradation of total system accuracy over light source lifespan.
	Vibration:	60/120 Hz @ 0.1 mm displacement
	Shock:	10 G half-sine in three orthogonal planes
	Form factor:	Enclosure must be protected from water and dust. It can be mounted on a back panel using M6 bolts
	Front membrane:	UV stabilized polyester with 5 million push MTBF keys
	Connectors:	Optical: Standard ST connector Analog and power-in: 5.08 mm pitch connectors socket for headers with screw terminals Relays: 19-pins circular connector Ethernet, serial and external display: 3x RJ-45
	Dimensions/weight:	Width: 250 mm ; Height: 150 mm; Thickness: 60 mm Mounting holes: 4x M6/ANSI 1/4-20 bolts Mounting hole specs: 265 mm x 130 mm; Weight: 1.6 Kg
Compliance	Conducted/Radiated Emissions and Surge Withstand:	IEC 61000-4-2 ESD; IEC 61000-4-3 Radiated RFI; IEC 61000-4-4 Burst; IEC 61000-4-5 Surge; IEC 61000-4-6 Induced RFI; IEC 61000-4-8 Mag field; IEC 60255-5 Dielectric strength; IEEE C37.90 Dielectric strength; IEEE C37.90.1-2002 Fast transient; IEEE C37.90.1-2002 Oscillatory
	Environmental:	IEC 60068-2-1 Cold temperature; IEC 60068-2-2 Dry heat; IEC 60068-2-30 Humidity (damp heat, cyclic); IEC 60255-21-1 Vibration; IEC 60255-21-2 Shock; UL 60950 Temperature range
Power	Power requirements:	24 VDC
	Power consumption:	12 Watts (18 Watts with all relays energized)
Other	Probe compatibility:	Compatible with all of Neoptix GaAs ber optic temperature probes and transducers.
	Probe signal optimization:	System has built-in Neoptix™ WTune™ probe optimization algorithm
	Warranty:	Five-year Limited international warranty; Extended warranty available
Accessories/ options		Panelmount support brackets; DIN Rail mounting brackets;

System ordering codes:



QUALITROL® Field Services

QUALITROL® provides on-site commissioning/ start-up and comprehensive maintenance contracts to all customers worldwide. To further improve reliability, an extended warranty is available on selected products commissioned by QUALITROL®.

About QUALITROL®:

QUALITROL® manufactures substation and transformer monitoring and protection devices used by electric utilities and manufacturing companies. It is the global leader in sales and installations of transformer asset protection equipment, fault recorders, and fault locators. Established in 1945, QUALITROL® produces thousands of different types of products on demand, each customized to customers' unique requirements.

Qualitrol Company LLC is an ISO 9001 system certified company. AP-M09-10L-02F

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