QUALITROL® T/Guard-2B System

Fiber Optic Temperature Monitoring System

Real time direct winding optical temperature monitoring system

- Direct mechanical and functional replacement for the Neoptix T/Guard2
- Provides essential data during transformer heat run
- Maximizes cooling efficiency with accurate hot spot temperature measurement
- Optimizes loading dynamically without compromising transformer life
- Complements predictive hot-spot algorithm simulations
- Compatible with Qualitrol Q-Link™ for Apple® iPhone®, OptiLink and OptiLink-II
- Available with 4, 6, 8, 10, 12, 14 or 16 channels

Product Summary

Description: **Rugged and full featured multi-channel fiber optic real-time hot spot monitoring system for dry-type and oil-filled transformers**

Application: **Local monitoring of oil-filled transformer and load tap changer with Qualitrol T2 temperature probes**

Fibers by neoptix

QUALITROL®
Defining Reliability

- The Qualitrol® T/Guard-2B is a multichannel fiber optic temperature monitoring system for power transformer hot spot measurements. It 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/Guard system, the Qualitrol® 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/Guard gives the exact temperature of optical probes in 250 milliseconds per channel. Peak load or emergency overloads are thus detected almost instantaneously.

- The 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 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, does not fade or drift over time, allowing a constant and absolute temperature measurement of your transformer windings over the lifespan of the equipment.

- Qualitrol fiber-optic probes are based on the proven GaAs technology and made only with dielectric materials. They are designed to withstand initial manufacturing conditions, including kerosene desorption and heat runs, as well as long term oil immersion, temperature cycles and vibrations.

- The T/Guard2 system is available with 4 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 is delivered with a built-in 2GB 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. This memory represents more than forty 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 powerful web based software includes some sophisticated tools, such as **TransLife**™, which will estimate your transformer insulation remaining life based on real hot spot temperature data; it will report the loss of life rate, life consumed, remaining asset life and hours of operation. Historical temperature information can be displayed in graphical form.

- 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 software selectable) or its Modbus, DNP3 or IEC 80670-5-101 communication interfaces. It also has RS-485 communication. The T/Guard2 is Ethernet savvy and incorporates the newest IEC-61850 protocol as an option. 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/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 problems.

- 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 tube. Only chemical resistant dielectric materials are used for these temperature probes. The temperature range is -80 °C to +250 °C. 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 transformer tank walls, 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-rings are used.

External fiber-optic extension cables

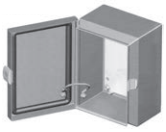
These cables are made with a polyurethane jacket reinforced with Kevlar threads and are designed to withstand the harshest conditions. External fiber-optic extension cables come in standard 5 or 10 meter lengths. Custom lengths are also available from 1 meter to 1 kilometer. The temperature range is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

Tank wall mounting plate & JBox2

Up to 24 feedthroughs can be mounted on a tank wall mounting plate. The plate is made with carbon or stainless steel 316. 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 JBox2™ 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.



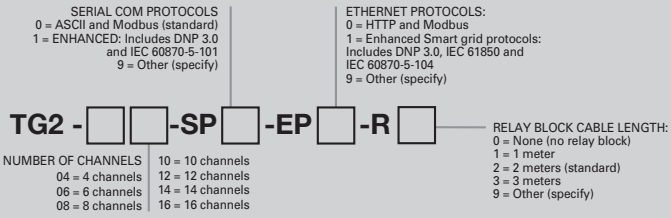
OptiLink-II software

OptiLink-II is a user-friendly software that allows to interface your T/Guard2 to a Windows PC, via its serial port. It is the ideal complement to your T/Guard2 without Ethernet. It adds the following capabilities to your system:

- Supports up to 4 T/Guards (different models) and up to 64 channels (via the serial port or Ethernet link)
- Does data logging, directly to an Excel spreadsheet
- Displays and graphs (2D and 3D) on your PC screen up to 64 channels
- Allows to configure your T/Guard2 without remembering serial commands
- The next best feature after a web server

* Can download and upload files, such as a firmware upgrade, temperature log files, the status file, configuration files, etc.

TECHNICAL SPECIFICATIONS		T/GUARD-2B
System specfications	Number of channel	4, 6, 8, 10, 12, 14 or 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 specifications
	System sampling rate	250 ms switching rate between each channel; Variable if set to "WTune" feature
	Data logging rate	Data logging rate can be adjusted by user from one point every second to one point per hour period.
	Built-in calculations	Min/Max, Global values
	Upgradability -Firmware	Flash upgradeable through serial port or Ethernet/Web browser
	Display	320 pixels by 240 pixels graphical liquid crystal display (LCD), FSTN Positive, Transmissive, Wide Temperature LCD with white LED Backlight
	Units	User selectable, Metric or Imperial, LED indicators on front panel
	Data logging memory	2 GB on-board datalogging memory. Logging feature available for probes, alarms, system status, relays functions in an ASCII file (equivalent to 40 years of continuous logging on 8 channels at every minute).
	Temperature measurement range	-80 to 300 °C (-112 to 572 °F)

TECHNICAL SPECIFICATIONS		T/GUARD-2B
Communication and I/O	**Operating Mode**	System front panel keypad, ASCII commands over RS-485 (HyperTerminal or OptiLink-II), Ethernet web-based configuration
	Communication (hardware)	- Isolated RS-485 serial port (2 or 4-wire config) - Ethernet (100BASE-TX)
	Communication protocols	SERIAL: - ASCII (terminal console and OptiLink) - Modbus RTU - DNP 3.0 (optional) - IEC 60870-5-101 (optional) ETHERNET: - HTTP (Web based) - Modbus over Ethernet - DNP 3.0 (optional) - IEC 60870-5-104 (optional) - IEC 61850 (optional) - Qualitrol Q-Link for Apple® iPhone® (viewer only) Available on the App Store
	Relays	15 relay drivers for transformer cooling control, enclosure cooling/heating, trips, alarms, etc. ; Form-C (SPDT) relays (5A/240 VAC or 0.3A/240 VDC or 8A/24 VDC max @ 50 °C), Programmable fail safe mode. 16th built-in relay for dedicated system fault
	Relay drive	Direct with system's built-in calculation algorithms
	Analog Outputs	4-20 mA; Detachable header connector blocks, 5.08 mm pitch. Up to 16 analog outputs (one per channel) User can set to 0-10 Volts, by software
Mechanical and Environment	**Operating temperature**	-40 to +72 °C, 5-90% humidity, non-condensing
	Storage temperature	-40 to +85 °C, 5-90% humidity, non-condensing
	PCB env. 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.
	Form factor	Mounting details: Enclosure must be protected from water and dust. It can be easily mounted on the back or on the swing panel of your marshaling cabinet
	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 Ethernet and serial port: RJ-45 Relays: 19 pin circular connector
	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, surge withstand and environmental**	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 (Conducted) RFI IEC 61000-4-8 Magnetic field IEC 60068-2-14 Temperature -40 to +72 °C IEC 61000-4-11 Voltage dip IEEE C37.90 Dielectric strength (high pot) IEEE C37.90.1-2002 Fast transient IEEE C37.90.1-2002 Oscillatory FCC 47 CFR Part 15, Sub B ICES-003 Issue 4, Feb 2004
Power	**Power requirements**	Nominal 24 VDC (20 to 28 VDC)
	Power consumption	48 Watts maximum
Other	**Probe compatibility**	Compatible with all Qualitrol / Neoptix GaAs fiber optic temperature probes and transducers
	Probe signal optimization	System has built-in Neoptix WTune™ probe optimization algorithm
	Warranty	5 years Limited International warranty; Extended warranty available
Ordering Codes		
	Options for the T/Guard-2B	RS-485 to USB bridge - Neoptix part number NXP-343 Power Supply 24 VDC, 2.5A - Neoptix part number TG2-DPS

Qualitrol Company LLC is an ISO 9001 system certified company. AP-M09-10L-03E-1409-TG2B

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