QUALITROL® T/GUARD 408 and 408XT

Fiber Optic Temperature Monitoring System

Real time direct winding fiber optic temperature monitoring system

- 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™ software
- Available with 4, 6, 8, 10, 12, 14 or 16 channels
- Flexible interfacing options: Serial RS485, Ethernet 10/100Base-T, Ethernet 100Base-FX

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 408 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 408 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® 408 gives the exact temperature of optical probes in 250 milliseconds per channel. Peak load or emergency overloads are thus detected almost instantaneously.

- The 408 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 408 system is available with 4, 6, 8, 10, 12, 14 or 16 optical channels. There are a total of eight four-digit high power LED display, one for each channel for systems that have up to 8 channels, or intelligently multiplexed for systems that have more than 8 channels. The large display size allows easy viewing from a distance.

- System's power consumption is 18 watts with all relays enabled. It accepts a broad range of AC and DC inputs

- The 408 can be mounted directly on the cabinet swing doors using the four bolts anchors, or bolted directly on a back mounting plate inside the cabinet.

- The 408 comes standard 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 408 temperature monitoring system, without the need for permanent connection to a remote acquisition system. This memory represents more than thirty years of data logging at every minute for a transformer configured with eight temperature probes. The information can be accessed through the serial port (408) or any web browser (408XT). Moreover, data points are saved with a time stamp emanating from the internal real-time clock.

- The 408 T/Guard system is easy to interface to an existing marshalling or substation system through its 4-20 mA analog outputs or through its RS-485 serial port using Modbus or DNP3 communication interfaces. The 408XT version is Ethernet / Smart Grid ready and incorporates, among others, IEC-61850 protocol. Information collected by the system can also be accessed through any web browser over TCP/IP. 100Base-FX fiber communication is available as an option.

- With its small footprint, the 408 is a space-efficient and versatile instrument. All connections are made through detacheable plugs for an easy and seamless installation or service. Both 8 and 16 channel versions have the same footprint.

- The 408 system has eight built-in Form-C (SPDT) industrial relays with galvanic isolation that can also be set up as Form-A or Form-B relays by the user. Each relay has a fail safe mode whereby relays can be activated in case of a system problem. Furthermore, a ninth relay is available as a dedicated system fault relay.

- System's configuration is made through the industrial grade front panel keypad, serial terminal, Q-Link software (408/408XT) or the built-in web-based server (408XT).

	408	408XT
Large LED display	✓	✓
Form C Relays (8)	✓	✓
4-20 mA Outputs	✓	✓
RS-485 Port	✓	✓
AC or DC input	✓	✓
2GB datalogging	✓	✓
RJ-45 port		✓
Web server		✓
Smart Grid protocols		✓

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

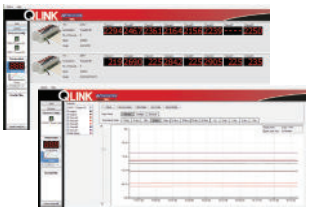
The T/Guard system can be mounted in a NEMA-4 enclosure that houses and protects the instrument for long-term exterior use. All fiber-optic extension cables are connected inside this enclosure. The NEMA-4 enclosure includes a clear polycarbonate window-door and is compliant with NEMA/EEMAC Type 4 and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

Q-Link software

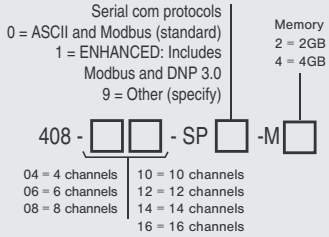
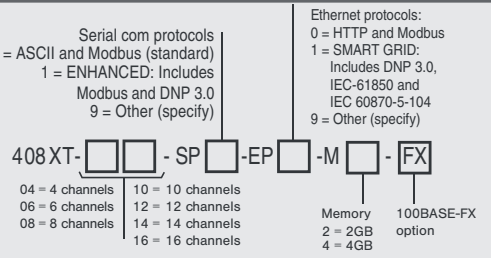
Q-Link™ is a user-friendly software that allows to interface your 408 to a Windows PC, via its serial port. It is the ideal complement to your 408 without Ethernet. It adds the following capabilities to your system:

- Supports up to 4 T/Guards (different models) and up to 64 channels (via the serial port or Ethernet link)
- Enables data logging directly to an Excel spreadsheet
- Visualizes and graphs (2D and 3D) on your PC screen up to 64 channels
- Allows configuration without the use of 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 408	T/GUARD 408XT
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 between -20°C and 150°C; ±2.5°C below -20°C or above 150°C	
	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	Flash upgradeable through serial port or Ethernet/Web browser
	Display	One four-digit block per channel. 7-segment (LED). Multiplexed display for channels 9 to 16	
	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 30 years of continuous logging on 8 channels at every minute). Option: 4GB	
	Temperature measurement range	-50°C to 200°C (-58°F to 392°F)	

TECHNICAL SPECIFICATIONS		T/GUARD 408	T/GUARD 408XT
Communication and I/O	**Operating Mode**	System front panel keypad, ASCII commands over RS-485 (HyperTerminal or Q-Link)	System front panel keypad, ASCII commands over RS-485 (HyperTerminal or Q-Link), Ethernet (web-based configuration)
	Communication (hardware)	- Isolated RS-485 serial port on screw terminal	- Isolated RS-485 serial port - Ethernet 10/100BASE-T - Option: Ethernet 100BASE-FX (Duplex, for 50 or 62.5 µ fibers)
	Communication protocols	SERIAL: - ASCII (terminal console and OptiLink) - Modbus RTU (2 or 4-wire config) - DNP 3.0 (optional)	SERIAL: - ASCII (terminal console and OptiLink) - Modbus RTU (2 or 4-wire config) - DNP 3.0 (optional) ETHERNET: - HTTP (Web based) - Modbus over Ethernet - DNP 3.0 (optional) - IEC 60870-5-104 (optional) - IEC 61850 (optional)
	Relays	8 built-in relay drivers for transformer cooling control, enclosure cooling/heating, trips, alarms, etc. ; Form-C (SPDT) relays (8A/240VAC or 0.2A/125VDC or 8A/24VDC max @ 50 °C), Programmable fail safe mode. 9th 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)	
Mechanical and Environment	**Operating temperature**	-40 to +72°C, 5-90% humidity, non-condensing	
	Storage temperature	-40 to +72°C, 5-90% humidity, non-condensing	
	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 mounted on a back panel or from the front, using M6 or M8 bolts	
	Front membrane	UV stabilized polyester with 5 million push MTBF keys	
	Connectors	Optical: Standard ST connector Analog, relays, serial and power-in: 5.08 mm pitch connectors socket for headers with screw terminals	Optical: Standard ST connector Analog, relays, serial and power-in: 5.08 mm pitch connectors socket for headers with screw terminals Ethernet FX option: multimode ST duplex connectors
	Dimensions/weight	Width: 280 mm ; Height: 110 mm; Depth: 70 mm (1-8 ch) or 95 mm (9-16 ch) Mounting holes: 4x M8 from front or 4x M6 if bolted from back of system Mounting hole specs: 255 mm x 85 mm; Weight: 2.5 kg	
Compliance	**Conducted/Radiated Emissions, surge withstand and environmental**	CISPR 11 RADIATED EMISSIONS CISPR 11 CONDUCTED IMMUNITY IEC 61000-4-2 ESD IMMUNITY IEC 61000-4-3 REFI IEC 61000-4-4 EFT IEC 61000-4-5 SURGE IMMUNITY IEC 61000-4-6 CONDUCTED RF IEC 61000-4-8 MAGNETIC FIELD IEC 61000-4-9 IMPULSE MAGNETIC IEC 61000-4-10 DAMPED OSCILLATORY IEC 61000-4-11 VOLTAGE DIP IEC 61000-4-16 IMMUNITY IEC 61000-4-17 DIFF MODE DC RIPPLE IEC 61000-4-18 DAMPED OSCILLATORY IEC 61000-4-29 VOLTAGE DIPS IEC 61180 5KV HIGH VOLTAGE IMPULSE FCC 47 CFR PART 15, SUB B	
	European Directives	DIRECTIVE 2014/35/EU FOR LOW VOLTAGE EQUIPMENT SAFETY (PER EN 601010-1:2010) DIRECTIVE 2014/30/EU FOR EMC (PER EN 61000-6-5) DIRECTIVE 2011/65/EU FOR ROHS	
Power	**Power requirements**	95 - 240 Vac, 50/60 Hz or 135 - 240 Vdc; accepted voltage variation ±10% of rated	
	Power consumption	18 Watts	
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 408	RS-485 to USB bridge - Neoptix part number NXP-341 Ethernet 100BASE-FX to 10/100BASE-T converter - Neoptix part number CNVQ-004-1	

Qualitrol Company LLC is an ISO 9001 system certified company. AP-M09-20L-07E-2409-408_408XT

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