

QUALITROL® 509 DW

Intelligent transformer monitor with direct winding



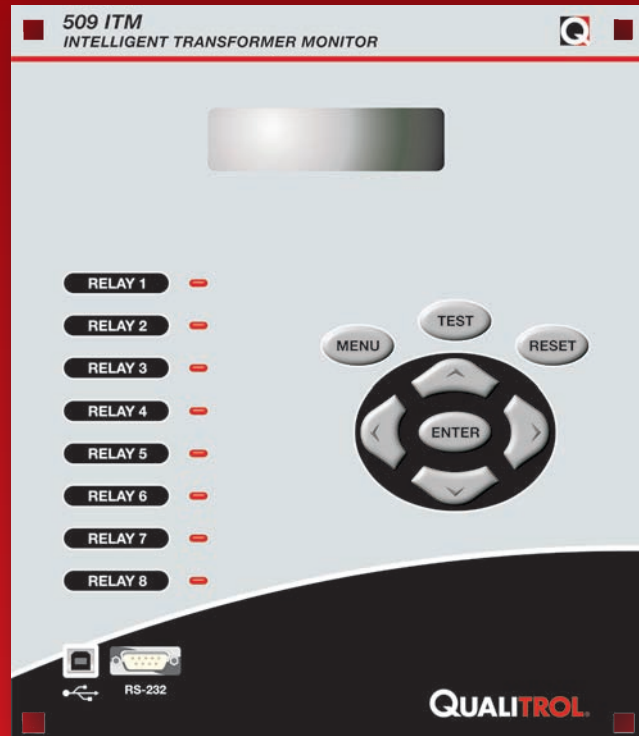
Real time comparison of calculated and direct winding temperatures

- Maximize cooling efficiency with more accurate hot spot temperature measurement
- Safely optimize loading without compromising transformer life
- Avoid emergency shutdowns by monitoring long-term, gradual transformer deterioration

Product Summary

Description Measures transformer temperatures (direct winding, calculated winding, main tank oil, load tap changer, ambient). Consolidates temperature information with alarm contacts and other information using customizable relays. Accepts most third party sensors for other parameters.

Application Remote and local monitoring of oil-filled transformer and load tap changer parameters, including alarming and advanced control of cooling systems.



QUALITROL®
Defining Reliability

QUALITROL® 509 DW intelligent transformer monitor with direct winding

Real time comparison of calculated and direct winding temperatures

- Real time comparison of direct (what the temperature actual is) and calculated (what the temperature should be) winding temperatures insures that the transformer continues to operate within OEM specifications and sends an alarm if it is not
- QUALITROL advanced calculated winding temperature uses IEEE and IEC models to estimate the winding temperature based on information provided by the transformer OEM
- QUALITROL hot spot temperature measures the actual temperatures wherever the probe is installed directly

Maximize cooling efficiency with more accurate hot spot temperature measurement

- Improved control of transformer cooling through fast and accurate measurements, keeping transformers from damaging peaks in winding temperature
- Automatic cooling bank switching normalizes fan and pump usage for maximum life
- Pre-cooling functionality can mitigate damaging high temperatures produced by high transient overloads by initiating the cooling system when load currents exceed configurable set points, rather than waiting for oil or winding temperatures to rise
- Low temperature lock out insures oil pumps remain off at cold temperatures to prevent static electrification and arcing
- Seasonal setback allows for customized cooling schemes depending on the time of the year, helping to optimize cooling system settings
- Adaptive setback improves cooling system efficiency by measuring ambient temperature and then adapting cooling and alarm set points based on temperature trends
- Cooling monitor series learns as it operates; automatically calculates maximum, minimum, and average values for determining set points

Safely optimize loading without compromising transformer life

- Improved accuracy gained by use of direct winding temperature measurements permits less contingency for measurement error, enabling safe operation at higher loads. This can increase revenue and savings by deferring capacity upgrades

Avoid emergency shutdowns by monitoring long-term, gradual transformer deterioration

- Continuous monitoring allows for the utilization of a predictive maintenance program, optimizing maintenance performance and costs
- Calculated life consumption based on IEEE or IEC standards aids predictive maintenance programs by providing a representation of the consumed life span of the transformer

Insure proper load tap changer operation

- Load tap changer monitor series monitors tap position, mechanism and motor performance
- Can detect proper tap movement and contact wear, and logs tap position history
- Alarms for contact loading (instantaneous and cumulative), excessive tap counts over time, false tap movements, false or no motor movement, motor and mechanism problems (overloading, breakage, binding) and worn tap contacts or coking

Real-time transformer status

- Utilizes digital protocols over Ethernet, RS-232, RS-485 or fiber optics to eliminate costly trips to the substation and integrate with today's communication systems

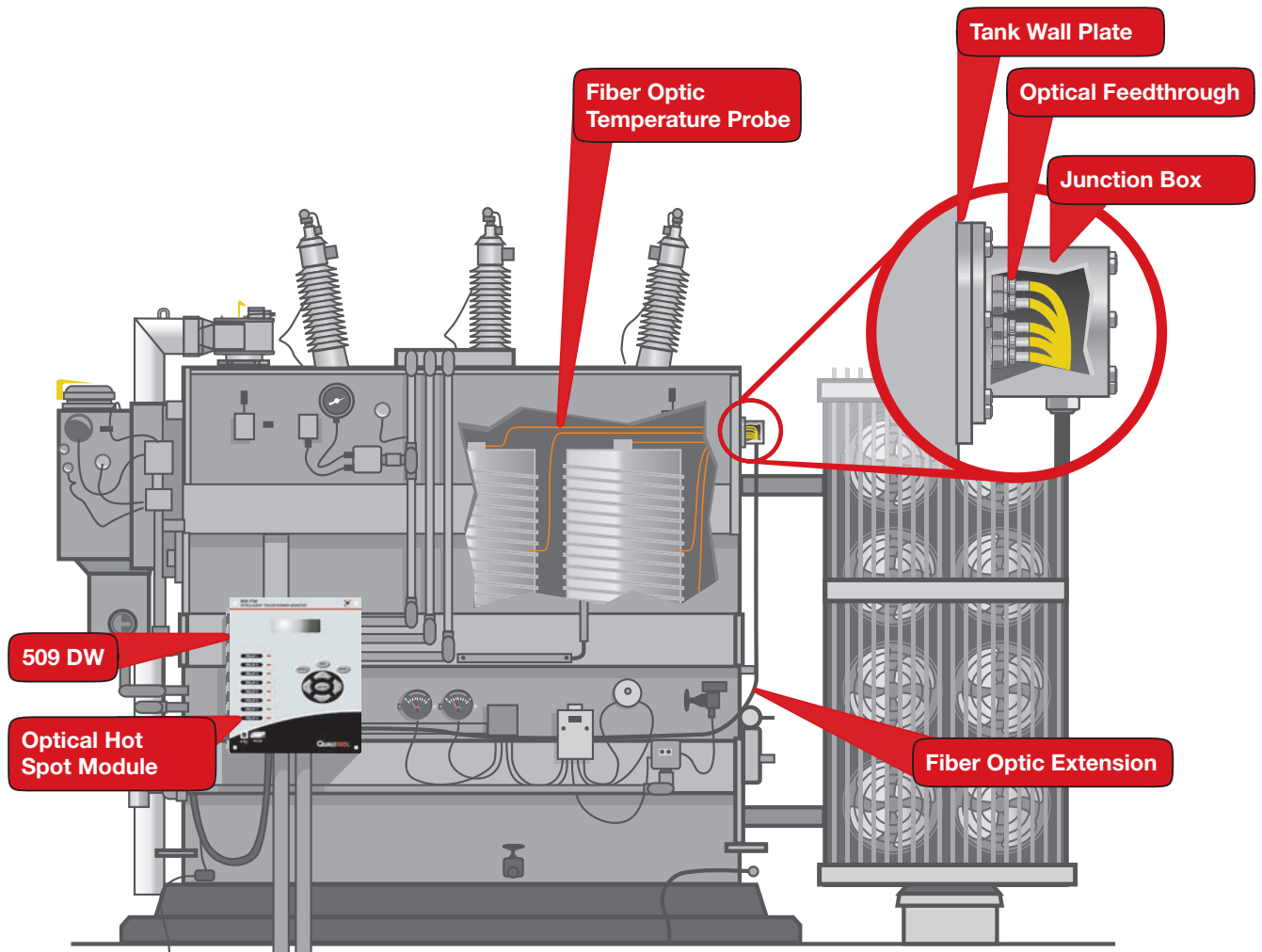
Real-time automated control

- Flexible inputs (compatible with RTDs, CTs, voltages, current loops and switch contacts) enable all parameters of transformers to be monitored in one integrated device
- Configurable relays can be set to alarm based on customizable set points, a matrix of set points and difference calculations. Improves identification of transformer issues and reduces false trips

System alarm diagnostics

- Self-diagnostic function continuously tests internal circuitry, processor and external sensors for proper function. If abnormal conditions detected, transformer will be placed in safe mode with fans and alarms on but without false tripping

System overview



Winding temperature uncertainty

Winding temperature is a prime concern for transformer operators, a variable that needs to be known under all loading conditions. It is particularly important in unusual conditions involving rapid dynamic load changes. Accurate measurement of the winding's hottest temperature is critical for calculating the insulation's rate of aging. The hot spot temperature is also important in assessing the risk of bubble evolution and in the short term forecasting of overload capability.

Use of fiber optic sensors for temperature measurement within the winding is the only method of directly measuring the hot spot within a transformer. QUALITROL 509 DW fiber optic sensors provide dependable information wherever they are placed, under any loading condition.

Transformer life

Several factors can reduce a transformer's life: Deteriorating paper insulation (due to elevated temperatures), inaccurate winding temperatures (negatively affecting cooling system efficiency) and fan/pump failure (due to inappropriate on/off switching), to name just a few.

The versatile QUALITROL 509 DW intelligent transformer monitor integrates direct winding measurement and cooling management technology to increase both insulation and cooling system life.



Components and accessories

Fiber optic temperature probe (CAB-699)



- Life-long accuracy with drift-free GaAs technology
- Surpass ASTM D2413 and D149 dielectric strength tests
- Successfully tested for transformer use by WEIDMANN
- Continuous slit jacket allows uniform oil impregnation
- Accuracy of $\pm 1^{\circ}\text{C}$
- Solvent and chemical resistant

Optical feedthrough (CON-159-1)



- Reliably withstands the most demanding conditions without leaking
- Optically bonded with no seals or epoxies
- Survives full vacuum and up to 16 Bar (200 PSI)
- Glass solder seals without gaskets or glue

Tank wall plate (PLT-201 & PLT-202)



- Standard plate can hold up to 12 optical feedthrough connectors
- Machined holes are numbered and identify oil side
- Provides clear to read identifiers even if painted
- Available in bolted or welded versions
- Custom plates available upon request

Junction box (COV-121-1)



- Robust neoprene gaskets
- Removable feedthrough access plate for access without disturbing conduit
- Designed to mate with tank wall plate
- 14 gage powder coated steel
- Flat side for easy, leak free, conduit connection

QUALITROL 509 ITM (ITM509)



- Integrated calculated and direct winding measurement comparison
- Up to 8 flexible inputs: liquid temperature, calculated winding temperature, differential temperature and more
- Cooling system and load tap changer monitor versions available
- Matrix relays allow for maximum flexibility, control and alarming
- All the functionality of the QUALITROL 509 Series ITMs

Optical hot spot module (MOD-638)



- Based on Neoptix field proven technology
- Up to 8 channels of fiber inputs
- Robust, machined aluminum enclosure
- Data logging capable with OptiLink™ software
- Compatible with any Neoptix probes (with no calibration)
- Light source has a MTBF of 300 years
- Up to 2 modules (16 channels) can connect to one 509 ITM

Portable fiber optic thermometer (KIT-057-1)



- Perfect for probe verification during installation
- Up to 8 hours of battery operation
- Data logging with secure digital card
- Large LCD display with backlight
- RS-232 communications port for use with OptiLink™ software
- No calibration required
- Accuracy of $\pm 0.5^{\circ}\text{C}$



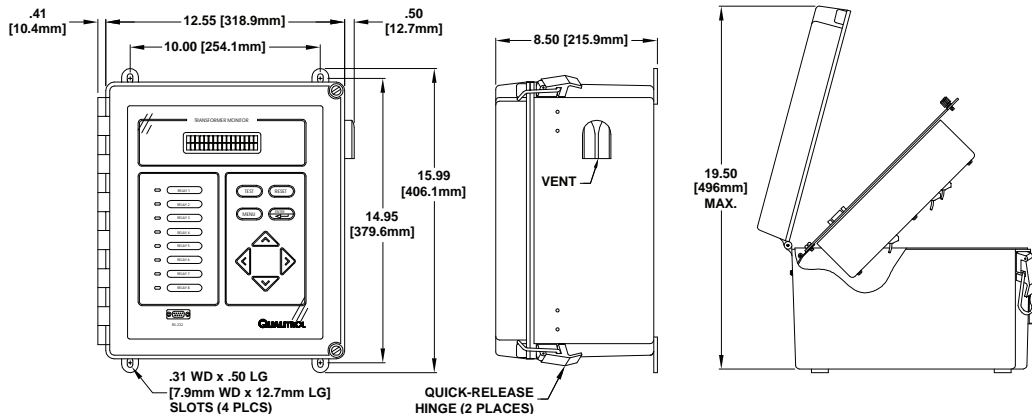
TECHNICAL SPECIFICATIONS

Power Supply	Type	Universal; 90 to 264 watts VAC; 47-63 Hz, 40-290 VDC
	Consumption	<35 watts
Input module parameters	Number of inputs	Accepts up to 8 input modules of various, configurable types
	Accuracy	± 0.5% full-scale input range
	RTD	10 ohm copper & 100 ohm platinum (-40°F to 248°F/-40°C to 120°C range)
	AC voltage	0 to 140 and 0 to 360 VAC ranges
	Potentiometer	Accepts potentiometers from 5K to 15K
	Dry switch contact	Measures a dry switch contact as wither open or closed
	Powered switch contact	Optically isolated; detects AC or DC from 120 to 250 volts
	Tap position	Detects resistor bridges of 40 to 1 K; up to 32 resistors
Output relays	Number of relays	8 programmable, 1 system status, 1 for heater control
	Type	Form C, 10 amps @ 120/240 VAC, 10 amps @ 30 VDC
Output current Loop	Number of loops	4 magnetically-isolated current loops
	Type	Customer configurable in software to hoose between 0-1 mA (max load 450Ω) and 4-20 mA (max load 10,000Ω)
Communications	RS232 port	1 port for set-up communications located on the front panel; varying baud rates
	RS485 port	1 port, 4-wire optically isolated for digital protocols
	Fiber optic port	ST connectors, 820 nm wavelength, max distance 1500m
	USB ports	1 type B (slave) for local setup, 1 type A (master) for data logging download and configuration upload with USB flash drive
	Protocols	DNP 3.0 level 1 slave, Modbus RTU, ASCII, IEC 61850, IEC 60870
User Interface	Control	8 pushdown buttons located on front panel
	Local display	2 x 16 character backlit LCD
Environmental	Operating temperature	-40°F to 161.6-40°F (-40°C to + 72°C)
	Storage temperature	-58°F to 185°F (-50°C to + 85°C)
	Humidity	5% to 90% non-condensing
	Shock	10 G's half-sine, in three orthogonal planes
	Vibration	60/120 Hz @ .004 inch displacement; 10/150 Hz at 1G
Immunity	Dielectric isolation	2500 VAC, 60 seconds to ground
	Certifications	IEEE C37.90.1, IEC 61000-6-1, IEC 61000-6-2, IEC 61010-1, CE approved
Data logging	Number of points	Logs up to 20 parameters
	Log rate	Selectable from one minute to 24 hours
	Memory capacity	Memory size capable of storing 8 parameters at one hour log rate for over 19 months. Shared 32MB non-volatile flash memory
Event Recording	Number of points	Logs up to 8 events
	Record types	2 record types: time and date or complete system snapshot
	Memory capacity	Memory size capable of storing 62,500 time and date events, shared 32 MB non-volatile flash memory
Direct winding	Fiber optic probes	Neoptix T2® fiber optic temperature probe Up to 16 channels via 2 optical hot spot modules
	Fiber optic extension cable	Polyurethane sheath, Kevlar reinforcement and PVC liner

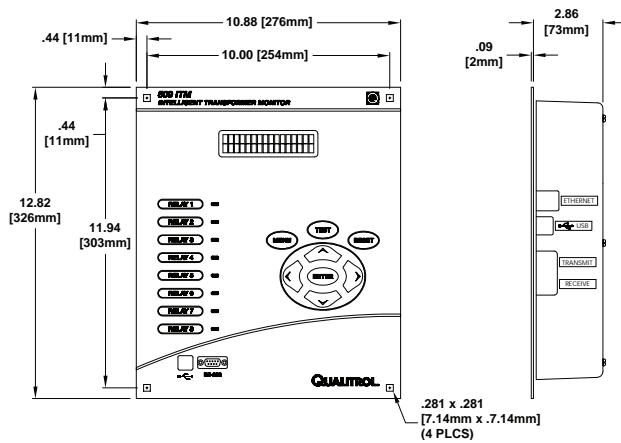
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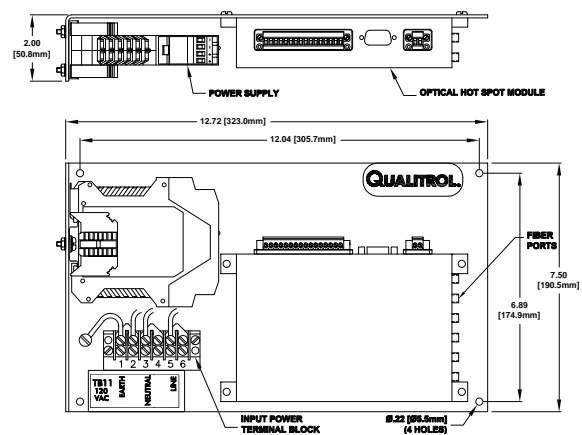
Weatherproof enclosure



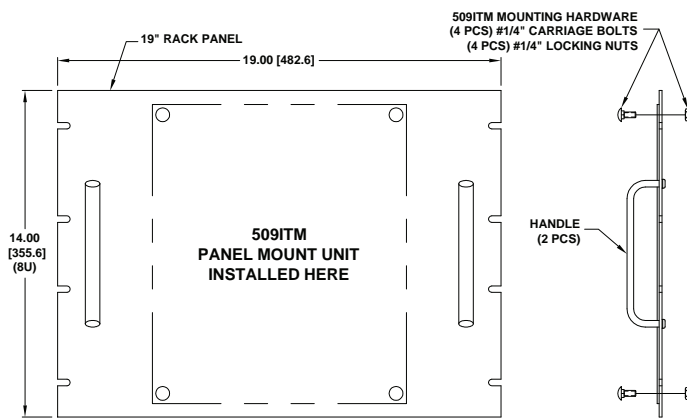
Panel mount



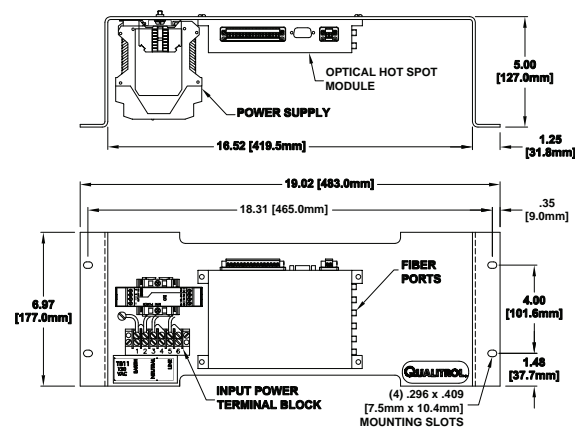
DW component



19" rack mount



DW component



About QUALITROL®.

QUALITROL Company LLC 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 Company produces thousands of different types of products on demand, each customized to customers' unique requirements.

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