HARDWARE
SOFTWARE
XPERT SERVICES
PREDICTIVE MONITORING SOLUTIONS FOR THE ELECTRICAL GRID
QUALITROL
Defining Reliability
QUALITROLCORP.COM | WHATSAPP – QUALITROLBOT - +1 585 643-3717

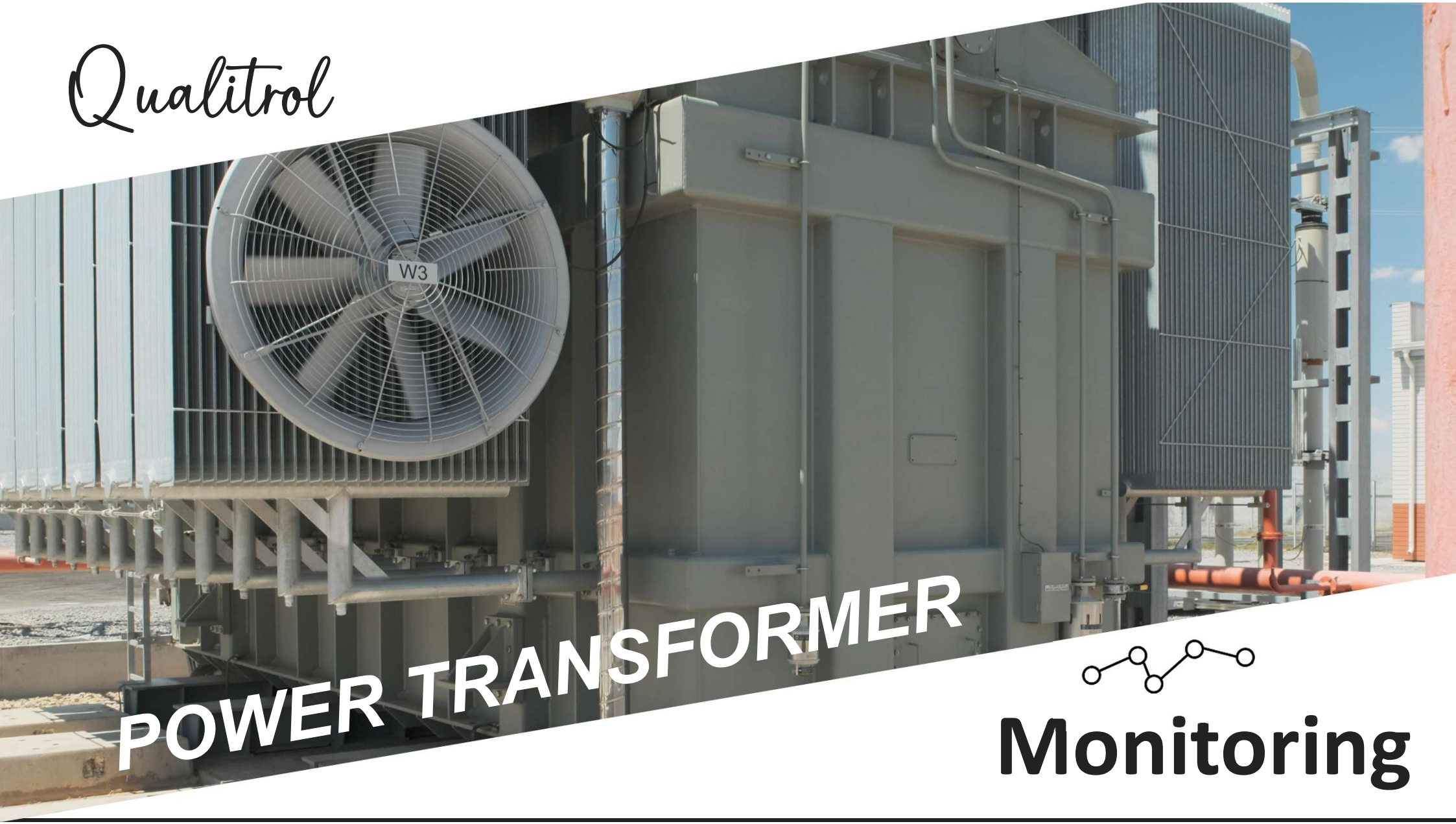
WHO WE ARE

Monitoring and protection for the global grid.

Established in 1945, Qualitrol ensures grid reliability and the transition from scheduled to condition based maintenance practices within the power generation and energy industry.

We are the largest and most trusted global provider of monitoring systems including sensors, monitors and software for wherever you are in your maintenance strategy.

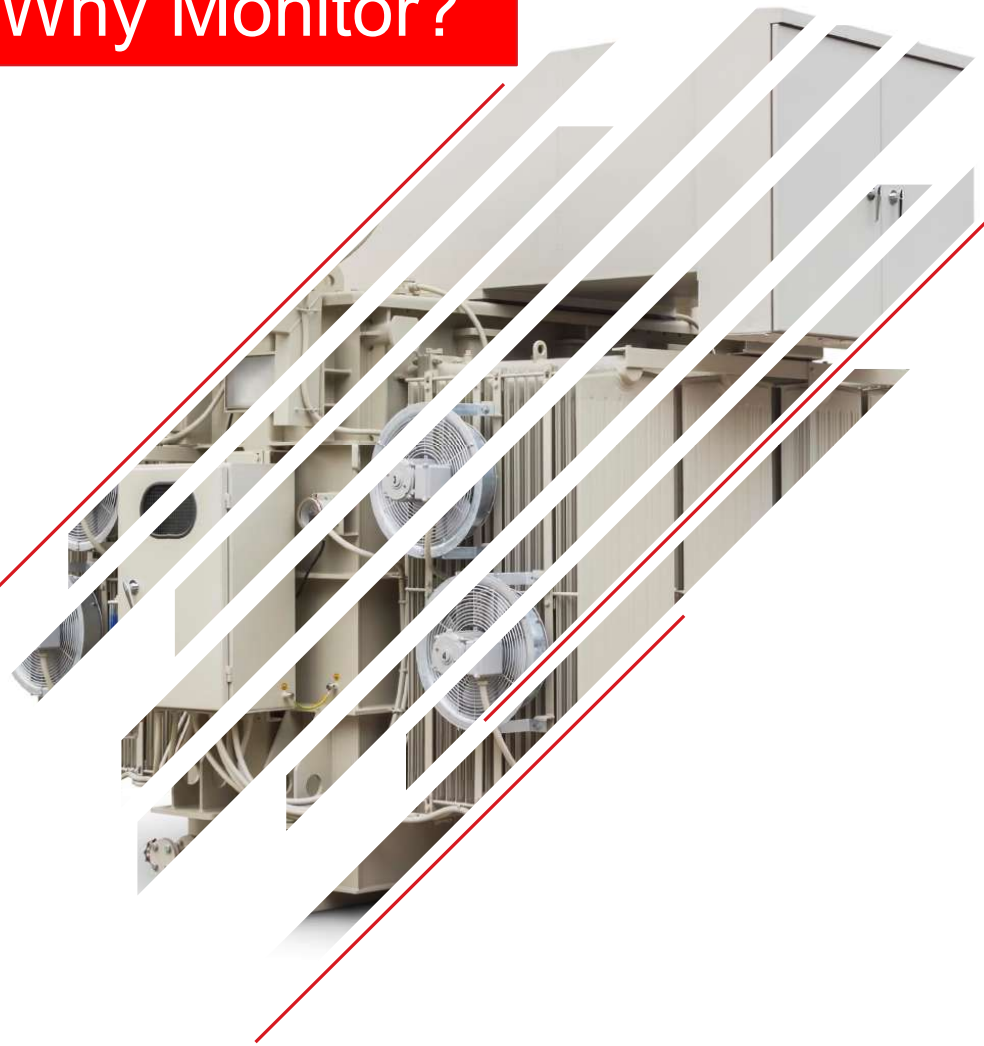
Qualitrol



POWER TRANSFORMER

Monitoring

Why Monitor?



Aging Infrastructure

IEEE estimates the average transformer age in North America is 43 years old

Unscheduled Power Outages

DOE estimates power outages cost to the NA businesses in excess of $50 billion annually

Rising Operation Costs

Operating expenses continue to escalate as O&M budgets shrink YOY

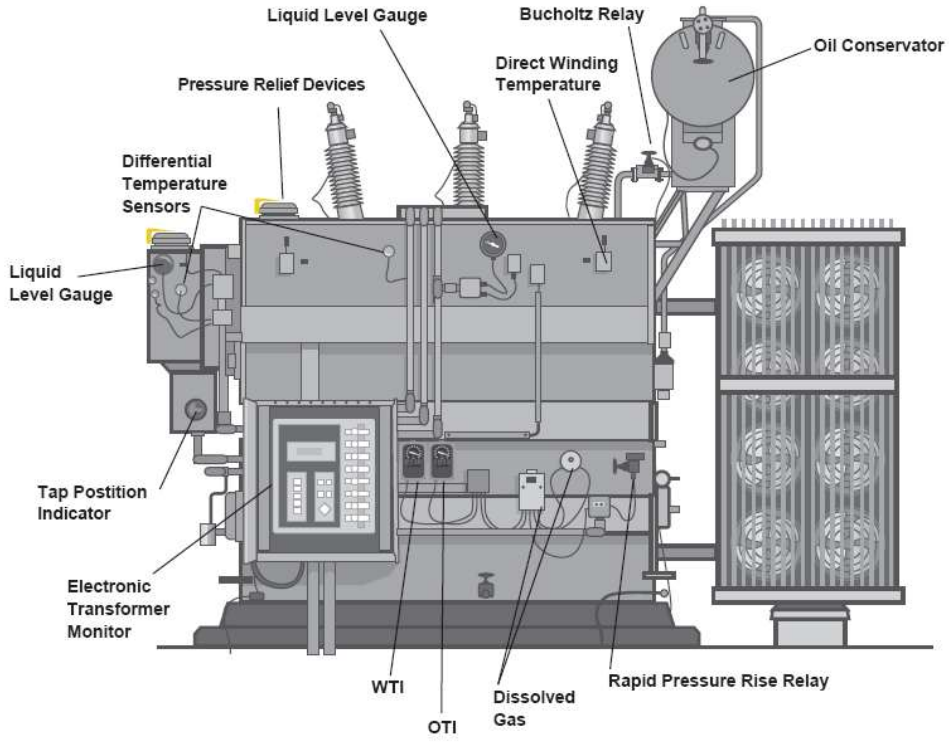
Make informed decisions on maintenance and asset priority ranking based on factual data

Condition Monitoring

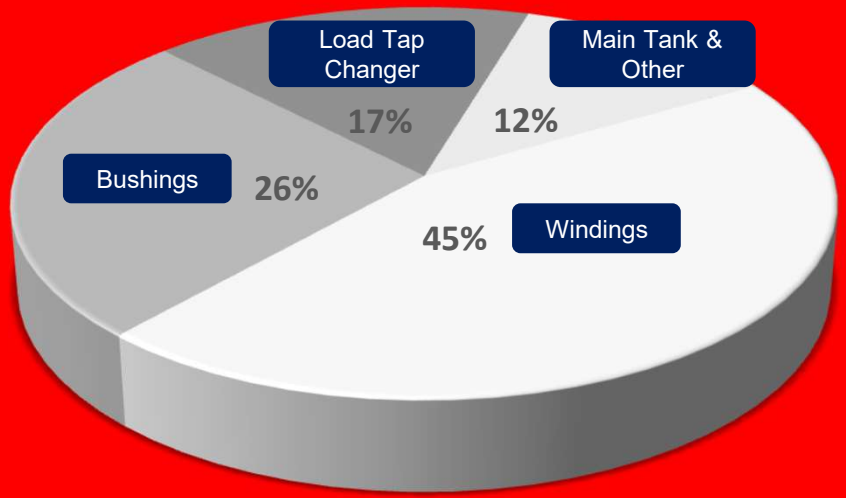
- Improve Grid
- Real-time Reliability
- Data-driven
- Asset Management

Importance of Online Monitoring

The most common transformer failures may manifest themselves over time and can be detected with multiple monitoring methods available today.



Common Transformer Failure Modes



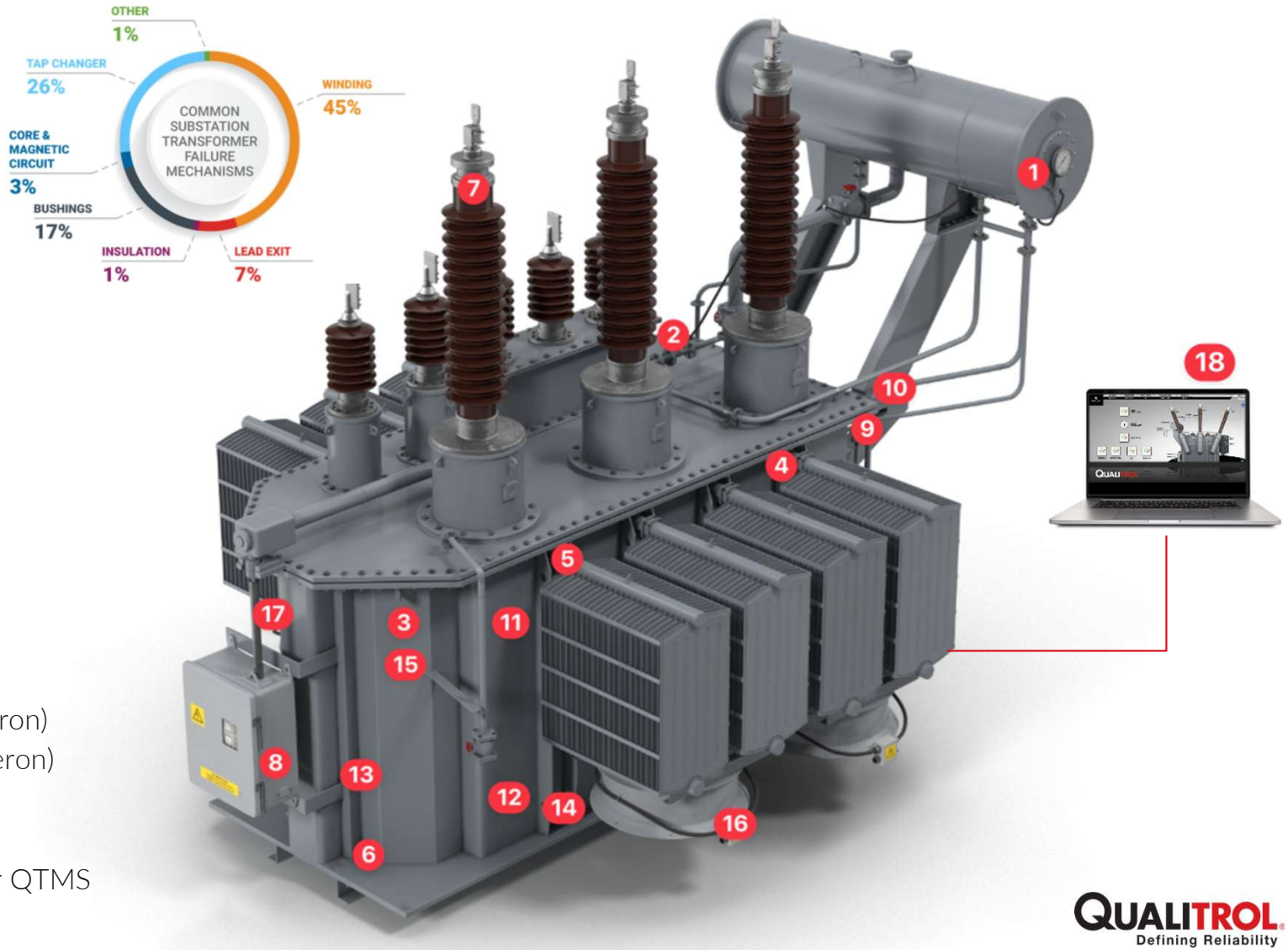
Source: WG A2.37, Transformer Reliability Survey: Interim Report, No. 261 - April 2012 ELECTRA

Key Parameters to Monitor

- Temperature Changes; premature aging
- DGA; gas formation and accumulation
- Partial Discharge (PD)
- Bushing Health
- LTC Functionality
- Cooling System Health

End To End Monitoring

1. Liquid Level Gauges
2. Pressure Relief Devices
3. Winding temp. Thermometers
4. Rapid Pressure Rise Relay
5. Flow Gauges
6. Pressure Vaccum Switches
7. Bushing Monitoring
8. OLTC Monitoring
9. Smart Breather
10. Smart Breather OLTC
11. Fiber Optic Temp. (Neoptix)
12. UHF Partial Discharge
13. Multi-Gas DGA Monitor (Serveron)
14. Single Gas DGA Monitor (Serveron)
15. AKM345 Thermometer
16. Cooling System Monitoring
17. Transformer Monitoring 509 or QTMS
18. APM Platform (SmartSUB)



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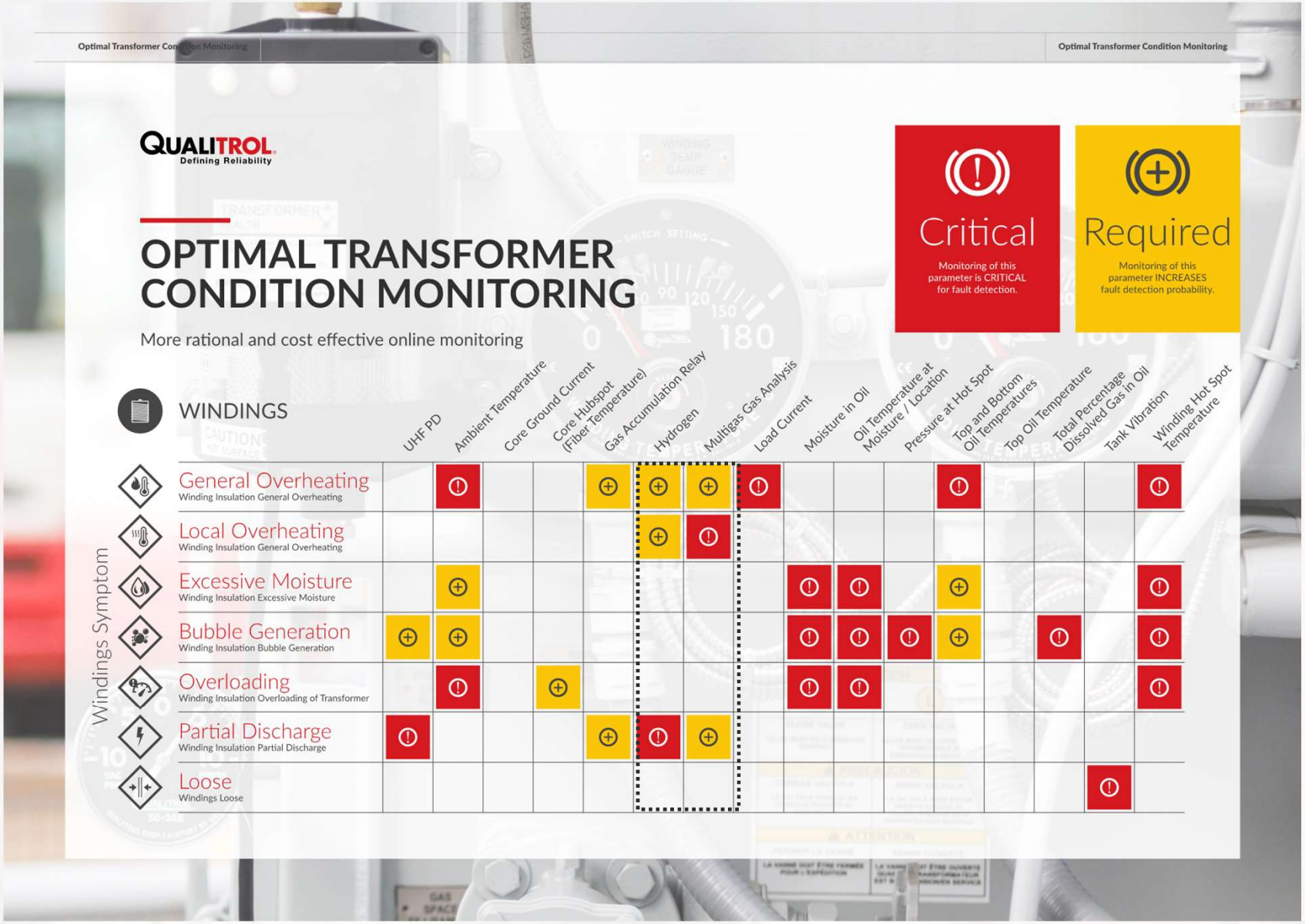
Defining Reliability



FAILURE MODE

Optimal Transformer Condition Monitoring

QUALITROL
Defining Reliability

OPTIMAL TRANSFORMER CONDITION MONITORING

More rational and cost effective online monitoring

Critical
Monitoring of this parameter is CRITICAL for fault detection.

Required
Monitoring of this parameter INCREASES fault detection probability.

LTC ON LOAD TAP CHANGER

OLTC Symptom

	Tan Delta (Power Factor) Absolute Value & RoC	Capacitance Absolute Value & RoC	Bushing Temperature	Oil Pressure (OIP Bushings and LTC)	Dissolved Gases (Oil Bushings and LTC)	Partial Discharge	Moisture Model	Ambient Temperature	LTC Operational Model	LTC Motor Current	LTC Motor Power Consumption	LTC Motor Torque	LTC Temperature Differential	Vibro-Acoustic Model	Switching Time
Contact Coking OLTC Contact Coking				⊕	!	!		⊕					!		⊕
Motor Drive OLTC Motor Drive Issues									!	⊕	!			!	⊕
Excessive Arcing OLTC Excessive Arcing						!									
Insulation OLTC Weak Insulation					!	⊕									
Tap Movement OLTC Multiple Tap Movement						⊕			⊕	⊕	⊕	⊕	!	!	
Aging OLTC Aging								!	⊕	⊕	⊕				

FAILURE MODE

Optimal Transformer Condition Monitoring

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Defining Reliability

OPTIMAL TRANSFORMER CONDITION MONITORING

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BUSHINGS

Bushing Symptom

	Tan Delta (Power Factor) Absolute Value & RoC	Capacitance Absolute Value & RoC	Bushing Temperature	Oil Pressure (OIP Bushings and LTC)	Dissolved Gases (Oil Bushings and LTC)	Partial Discharge	Moisture Model	Ambient Temperature	LTC Operational Model	LTC Motor Current	LTC Motor Power Consumption	LTC Motor Torque	LTC Temperature Differential	Vibro-Acoustic Model	Switching Time
Overheating Bushing Overheating and Insulation Failure	!		!	+	+			+							
Insulation Decay Bushing Insulation Decay / Normal Aging	!		!		+		+	+							
Excessive Moisture Moisture in Bushings	+		!	+			!	+							
Bad Contact Bushing Bad Contact	!	!	!		+		!								
Partial Discharge Bushing Partial Discharge	+	!			+	!									
Short Circuit Bushing Short Circuit in Capacitive Layers		!													

FAILURE MODE

New Build's, preparing for the future :

Direct Temp. Measurement – Fibers, Partial Discharge couplers
2 drain valves for oil circulation - DGA
Cooling Efficiency – In/Oil Temp.
Accessories **ready for digitalization**
Breather unit - Regeneration Silica Gel
Bladder rupture detection

Basic Level 1: Planning & preparing

Digital Temp. monitoring: WTI, OTI, Hot-Spot Fiber, Cooling
Oil Level - Potentiometer
Load - Voltage and Current
OLTC Position & Operation Status
Single gas H2 with Moisture
All Accessories I/O's
Cooling control

Basic Level 2: + 1

Bushing Monitoring
- *TanD/ Power Factor & Capacitance*

OLTC
- *Oscillography*
- *Torque*
- *Contact wear*

Cooling efficiency & status
- *Motor Current*
- *Pump Current*
- *Operations Control & status*
- *Position*
- *Contact Wear*

TX Condition Status
- *All alarms condition status*

Dissolved Gases 3
- *TM3 – Acetylene, Ethylene & Methane*

Medium Level 3: + 2

Dissolved Gases 8
- *TM8 > All 8 Fault Gases plus N2*

Top 4: + 3

Partial Discharge Monitoring
- *Between 2 to 4 Online Couplers*

MONITORING SCALABILITY LEVEL & VISIBILITY

1 Thermometers

REMOTE MOUNT THERMOMETER
OTI/WTI™

- Bellow type measurement of OTI, WTIs
- 75+ years experience
- Up to 6 independent switches

REMOTE MOUNT THERMOMETER
104/TR6000

- Bourdon tube capillary measurement of OTI, WTIs
- 40+ years experience
- Polar, stainless and C5M paint options

2 Pressure Relief Devices

LARGE PRESSURE RELIEF DEVICE
LPRD

- Pressure relief device with alarming capability
- Over 50 years field experience with over 500k installations
- Optional shield for oil diversion

EXTRA PRESSURE RELIEF DEVICE
XPRD

- Pressure relief device with alarming capability
- Patented 2x flowrate of the LPRD
- Built in shield for oil diversion and optional piping kits

3 Liquid Level Gauges

LARGE OIL LEVEL INDICATORS
AKM 44712

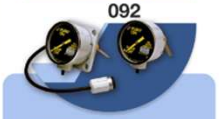
- Large dial face for easy viewing at a distance
- Lever or gear driven float arms with a high level of customization
- Up to 4 switches

LARGE OIL LEVEL INDICATORS
032/042/045

- Magnetically coupled gear or lever driven float arms
- Custom dials and configurations available
- Up to 3 switches

4 Flow Gauge

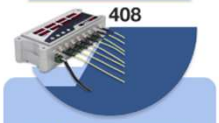
FLOW INDICATORS
092



- Magnetically coupled dial assembly and flange with adjustable vane
- Provides up to two switches for alarming capability

5 Fiber Optics

FIBER OPTIC TEMPERATURE MONITOR
408



- Up to 16 channels for accurate fiber optic hot spot measurement
- 8 form C relays
- Available web server and multiple communication options

DIRECT WINDING MONITOR
509 DW

- Up to 16 fiber optic sensors integrate with 509 ITM capability
- Cooling and LTC monitoring options available
- NERC compliant

6 Sudden Pressure/ RPRR

RAPID PRESSURE RISE RELAYS
900/910

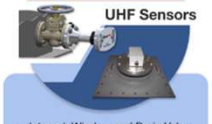
- Detection and alarming of sudden pressure rises
- Flange or thread mounting options for oil or gas space
- Original creator of technology

ELECTRONIC PRESSURE MONITOR
930

- Electronic detection and alarming of sudden pressure rises
- Settable sensitivity
- Two out of Three logic options available

7 Partial Discharge

IN-HOUSE DEVELOPED PDM SENSORS
UHF Sensors



- Internal, Window and Drain Valve
- Protection from high transient signals
- Support in sensor location and sensitivity testing

PARTIAL DISCHARGE MONITOR
609 PDM

- AI and NN based PD detection
- Real time trending of PD activity
- Expert Analysis display options
- IEC 61850 compliant – KEMA Certified

8 Bushing Monitor

BUSHING MONITOR ADAPTORS
408

- Custom designed
- Double protection from transients
- Dual earth connections from bushing tap adaptor
- Relay alarms for protection failure

ON-LINE BUSHING MONITOR
QCM-T-BM

- Higher accuracy
- Programmable Alarm criterion
- Time trend of the bushing parameters
- Temperature compensation

OFFSHORE Xtreme
Hardened for Offshore Use

- Robust materials to survive saline environment
- Made of 316 stainless steel or C5M painted
- Conformal coated electronics options available

POLAR Xecution
Hardened for Polar Use

- Rated to -60°C
- Robust materials to survive harsh cold
- Additional heaters when required

9 Transformer Monitors

INTELLIGENT TRANSFORMER MONITOR
505 ITM

- Up to 4 inputs
- 4 current loop outputs
- TransLife calculations based on IEEE calculations
- NERC compliant

INTELLIGENT TRANSFORMER MONITOR
509 ITM

- Up to 8 inputs (16 with expansion module)
- 4 current loop outputs
- Cooling and LTC monitoring options available

10 Smart Breathers

SMART TRANSFORMER BREATHER
STB Series

- Maintenance free regenerating silica gel desiccant
- 1, 2, and 4 kg models available
- Bright LED alarm indication lights and color changing desiccant

SMART TRANSFORMER BREATHER
Offshore Xtreme

- Designed for harsh marine environments
- Enhanced materials made of stainless steel glass, and robust gaskets

11 DGA Monitors

SINGLE DISSOLVED GAS ANALYSIS
TM1

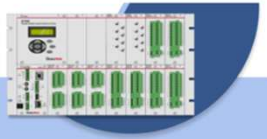
- Online hydrogen monitoring
- Alarm on PPM or Rate of Change
- Low cost of ownership with no membrane or consumables

8 GAS DISSOLVED GAS ANALYSIS
TM8

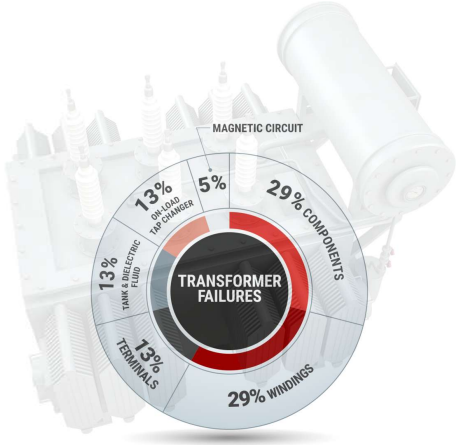
- Correlates 8 fault gases, plus moisture in oil
- Supports IEC and IEEE diagnostic tools
- Software for fleet management

12 TMS

TRANSFORMER MONITORING SYSTEM
QTMS



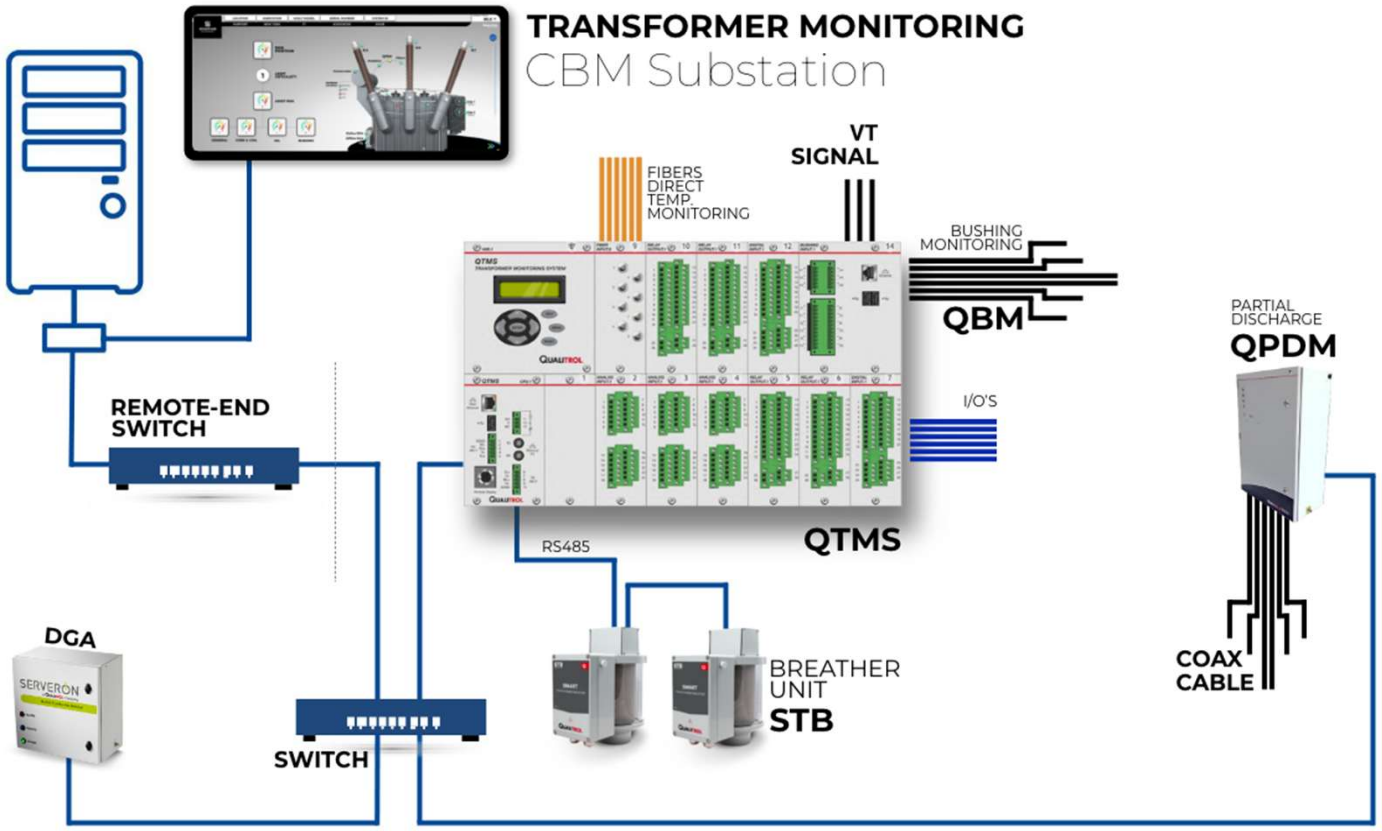
- Modular based, highly configurable transformer monitor
- Brings all smart sensor data into a central location
- Web based configuration



A COMPLETE AND FLEXIBLE PORTFOLIO

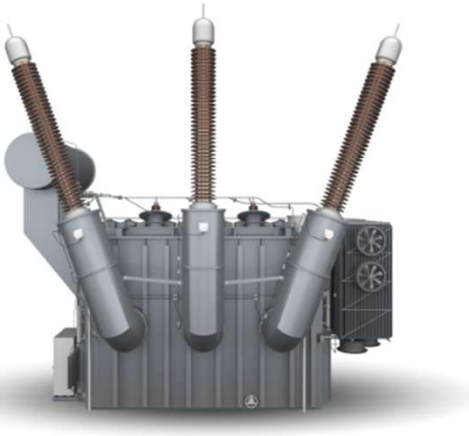
ATTENDING DIFFERENT LEVELS OF NEEDS

QUALITROLCORP

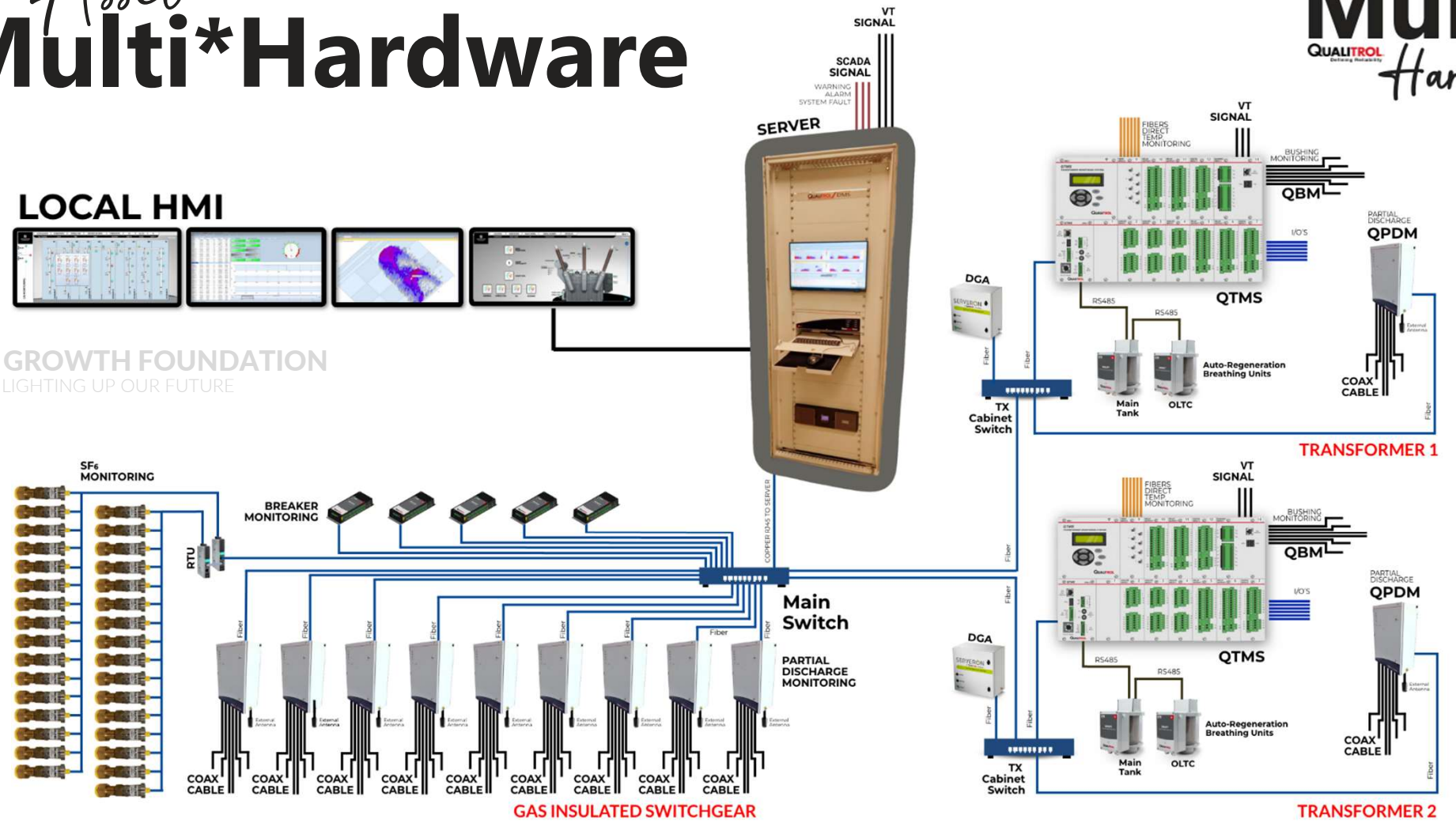


VARIABLES:

SmartSUB

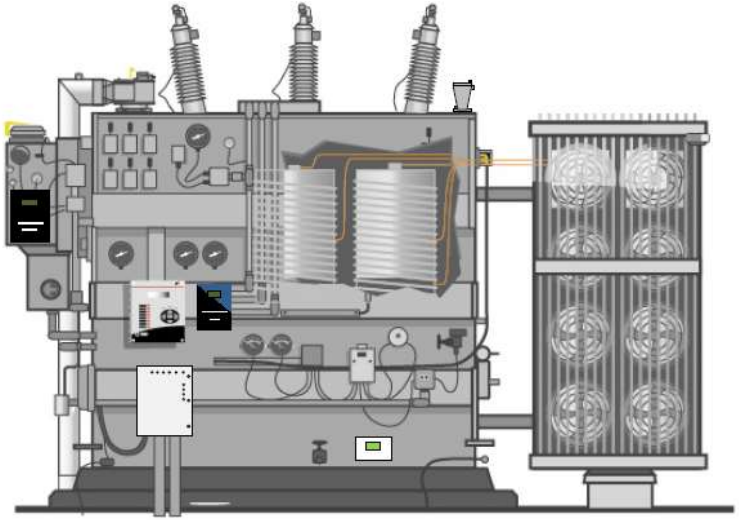


Asset Multi*Hardware



Why DGA Test?

Transformer Failures Happen



In 2011 CIGRE WG A2.37 reported:

“The failure rate for substation transformers is 0.53% per year and for GSU’s its 0.95% per year”.

Data based on a worldwide population of 23,884 transformers from the respondents to the survey and 964 major failures (where a major failure would require at least the opening of the tank, including the tap changer tank or an exchange of bushings).

Dissolved Gas Analysis

Lab-based DGA

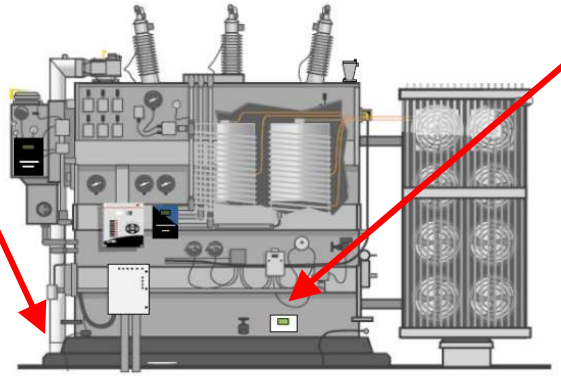
Multi Gas DGA Lab GC

Manual Sampling of oil

- Samples are manually collected from Transformer on a periodic basis
- Sent to an oil lab for analysis
- Typically 3 -6 days turn around
- Challenges, failures in between sampling

TREND

DGA is transitioning from being exclusivly lab-based to including significant levels of online monitoring



Online DGA

Single Gas Monitor

Multi Gas Monitor

- Sensors are directly connected to transformer often to drain valve (single gas) or available sampling points (multigas)
- The monitor itself draws tank oil on a continuous basis and transmits results to monitoring center

- Transformer tank is filled with oil to provide insulating properties and cooling
- As faults develop within a transformer, a cascade of up to 8 gases are released into oil
- Various technologies can be used to sense these gases

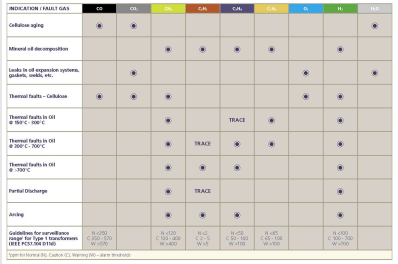
TM8™ Introduction

- 9 Gas, Gas Chromatography (GC) based Dissolved Gas Analyzer!
- “Lifetime accurate” online DGA monitor
- Moisture-in-oil, Optional ambient temperature and transformer load tracking
- Robust design suited to widest possible range of environments
- Low lifetime total-cost-of-ownership

Dissolved Gas Analysis Interpretation

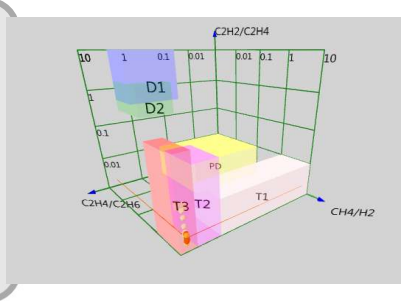
Simple gas concentration limits

e.g. IEEE C57.104



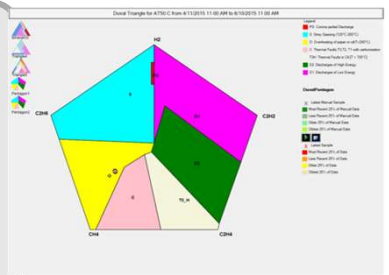
Basic Ratio diagnostic methods

e.g. Rogers Ratios

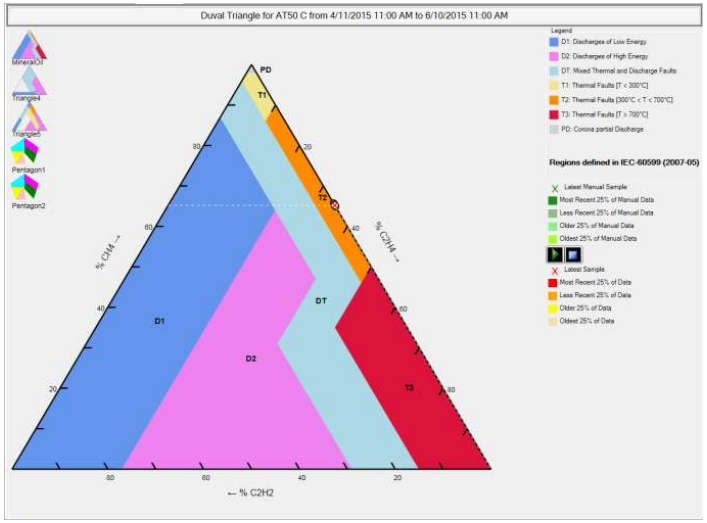


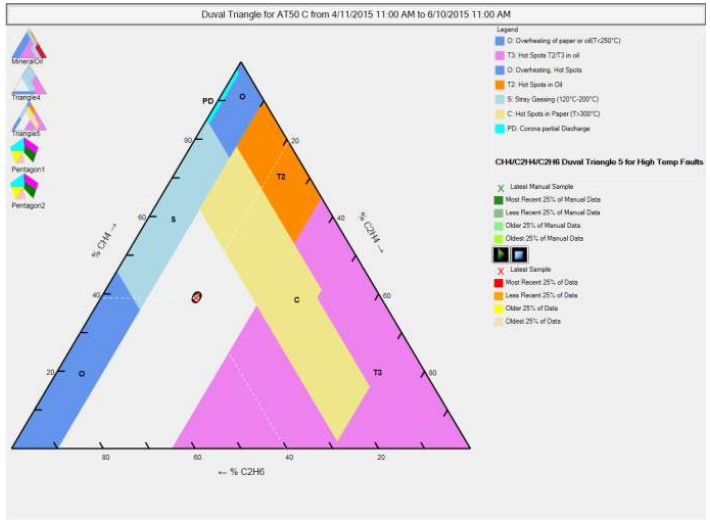
Sophisticated ratio-based techniques

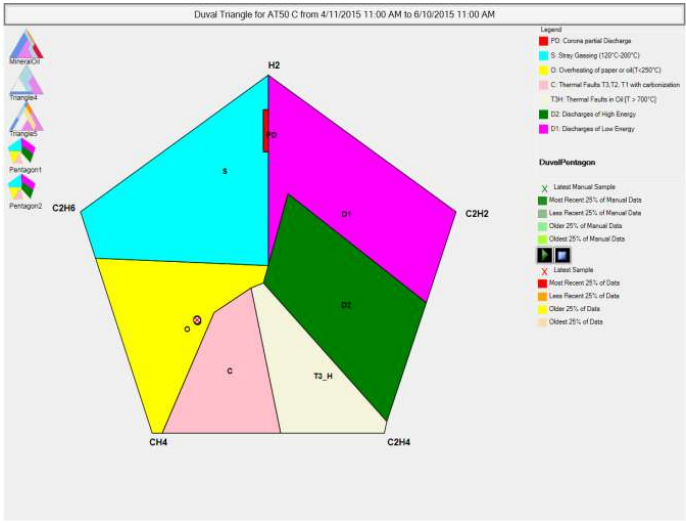
e.g. Duval's Triangle 1,4,5 Pentagons 1&2

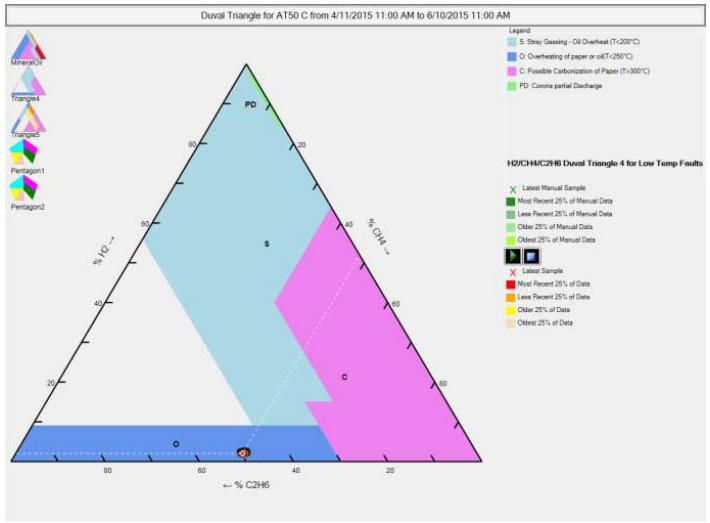


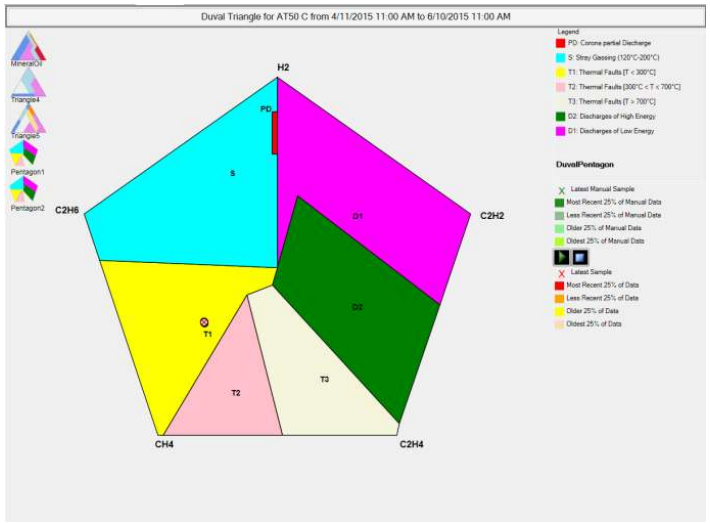
Examples of diagnostics you can get with TM8 / TMView











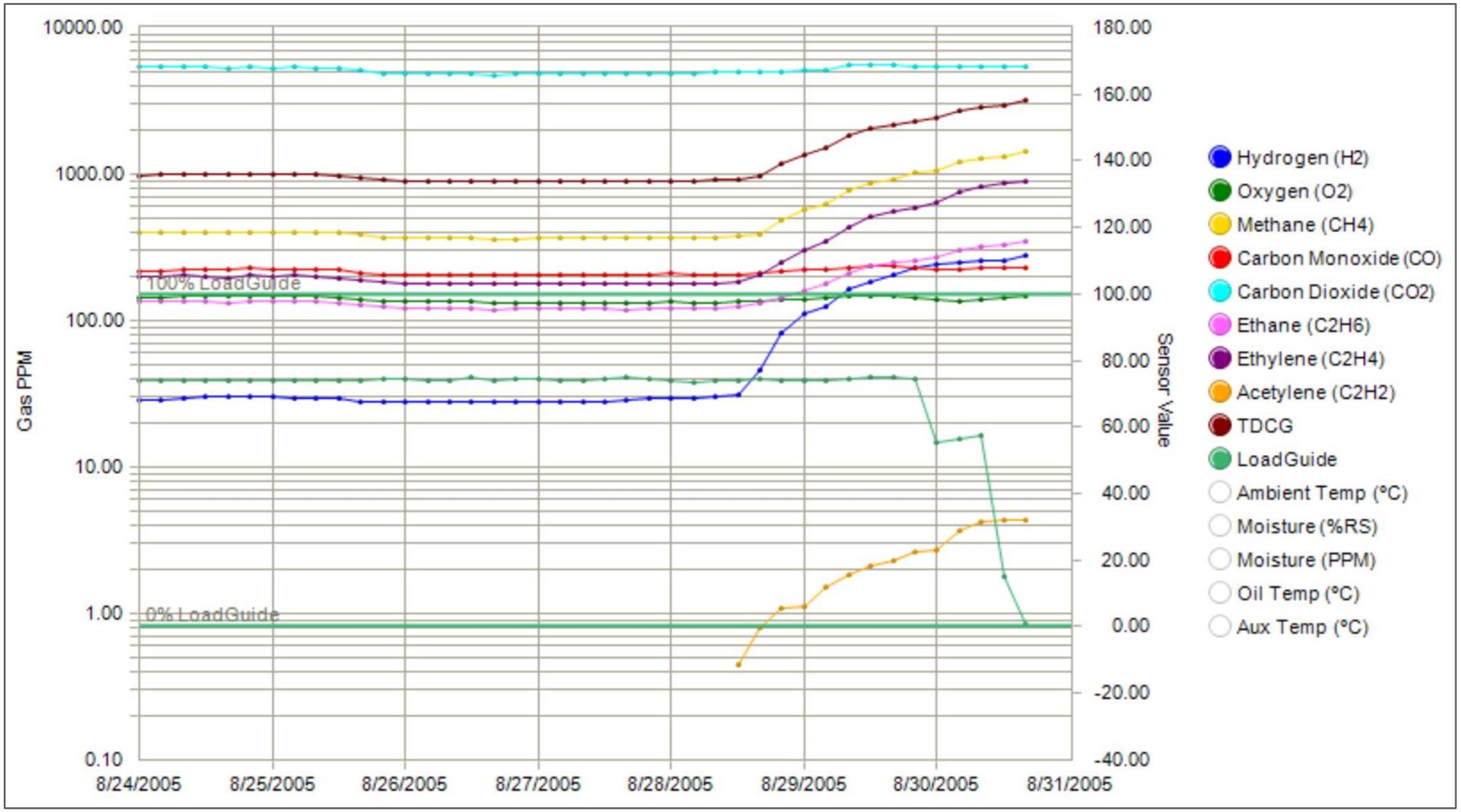
Duval Triangle 1,4 & 5

Duvals Pentagon 1 & 2

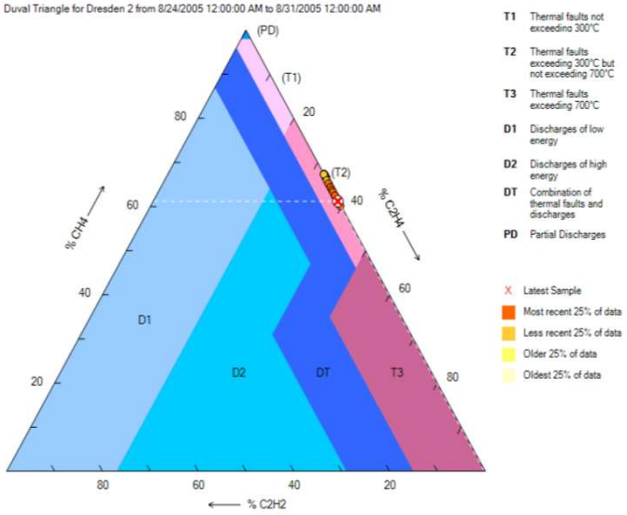
Case Study

SERVERON® Story #12

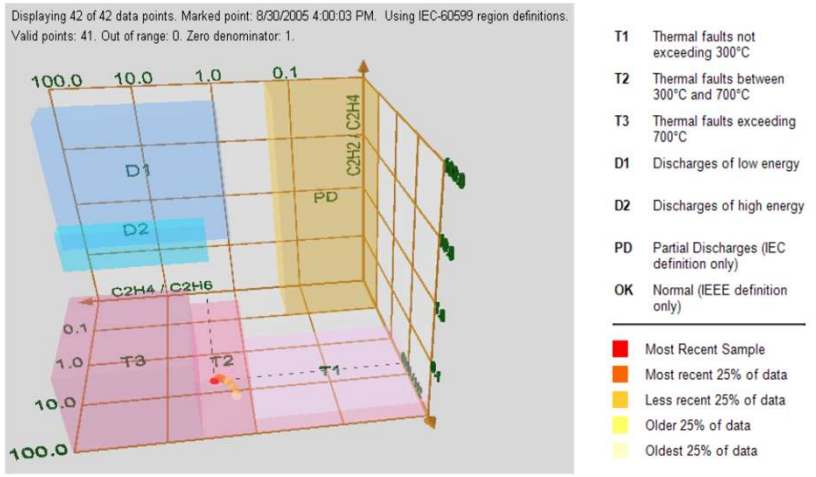
(3-phase, 1100 MVA, 345 kV GSU Transformer)



SERVERON® Story #12 Analysis



The Duval Triangle is a DGA tool included in the IEC 60599 Gas Guide.



Rogers Ratios are included in IEEE 57.104 Gas Guide (similar to Basic Gas Ratios in IEC-60599)

1. Both the Duval Triangle and Rogers Ratio analysis shows the fault condition is in T2 indicating a thermal problem getting worse in the range of 300˚C to 700˚C

2. Combustible gas levels were rising very quickly, exceeding preset rate of change limits. Transformer load reduction began approximately 32 hours after levels began to change and was fully de-energized within approximately 52 hours

3. Root cause; Overheating of LV crimped connections caused by the combination of high eddy losses in the crimps & over-insulation + poor oil circulation in crimped bundled areas.

SERVERON® Story #12

(3-phase, 1100 MVA, 345 kV GSU Transformer)

Cost Benefits of On-Line Monitoring of Transformers

Avoid Catastrophic Failure:

- The On-Line Monitoring Solutions help to provide ALARM in advance which can avoid catastrophic failures in the GRID.

Deferred replacement of transformer

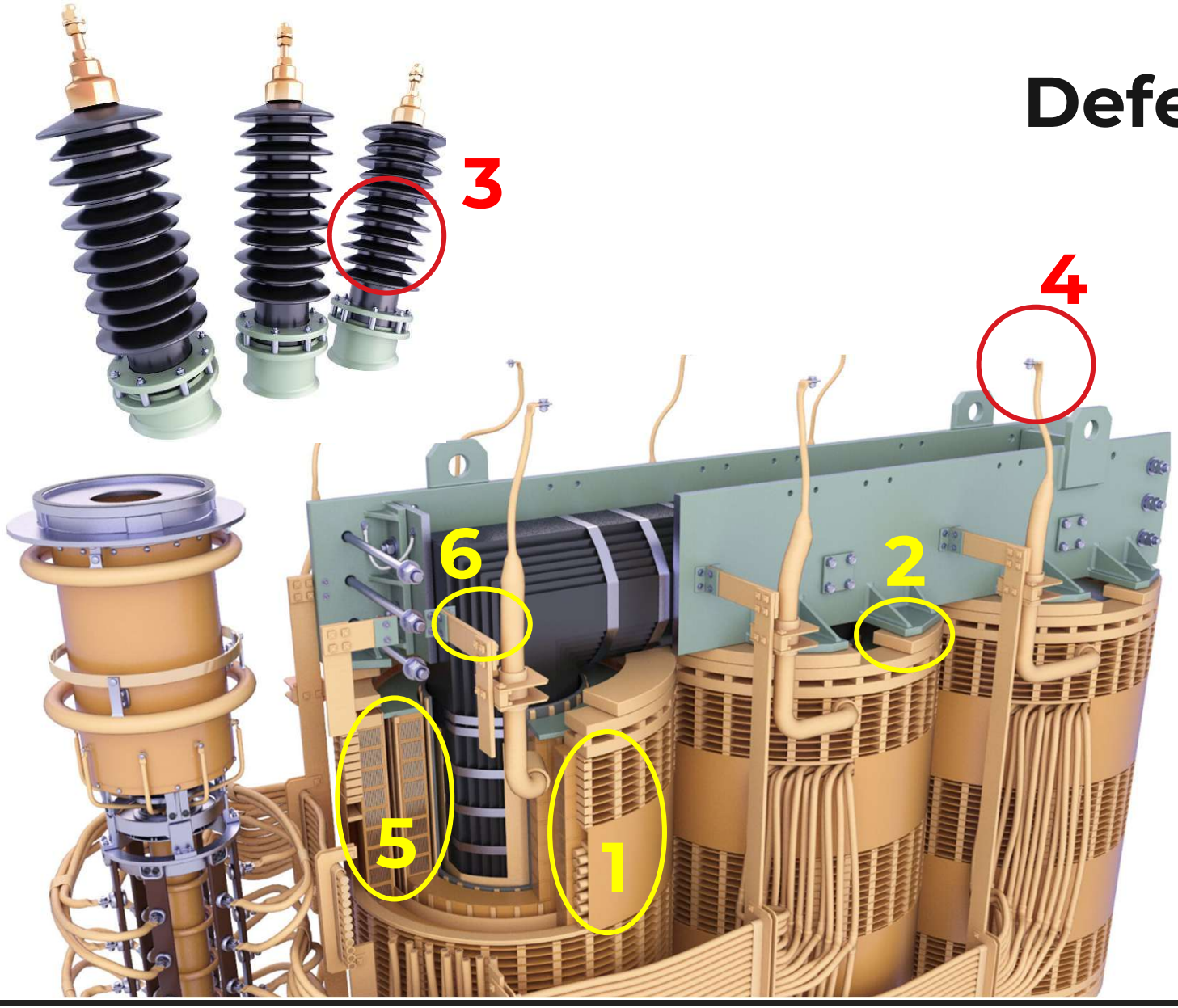
- The benefit from deferred replacement is directly proportional to the current interest rate and the capital cost of a new unit.
- If $2,000,000 is defined as the cost of a new/replacement unit including the cost of removing the old transformer and installation costs on the replacement unit, value of deferring replacement at a current interest rate of 6% is worth $120,000 annually.
- As the transformer population grows older, the replacement scenario becomes even more relevant.

Taken from the IEEE Std. C57.143-2012

Qualitrol Partial Discharge Monitoring System (QPDM) For Power Transformers

Dielectric faults

Defects Type in TX



1. PD in the Coils
2. discharges on sharp edges (corona) to ground or other potential
3. Discharges in openings (voids) in the bushings
4. Floating parts (not properly connected to potential or ground)
5. Discharges in holes in the solid insulating material
6. Surface Discharges (on insulating material)

Methods to detect Partial Discharge

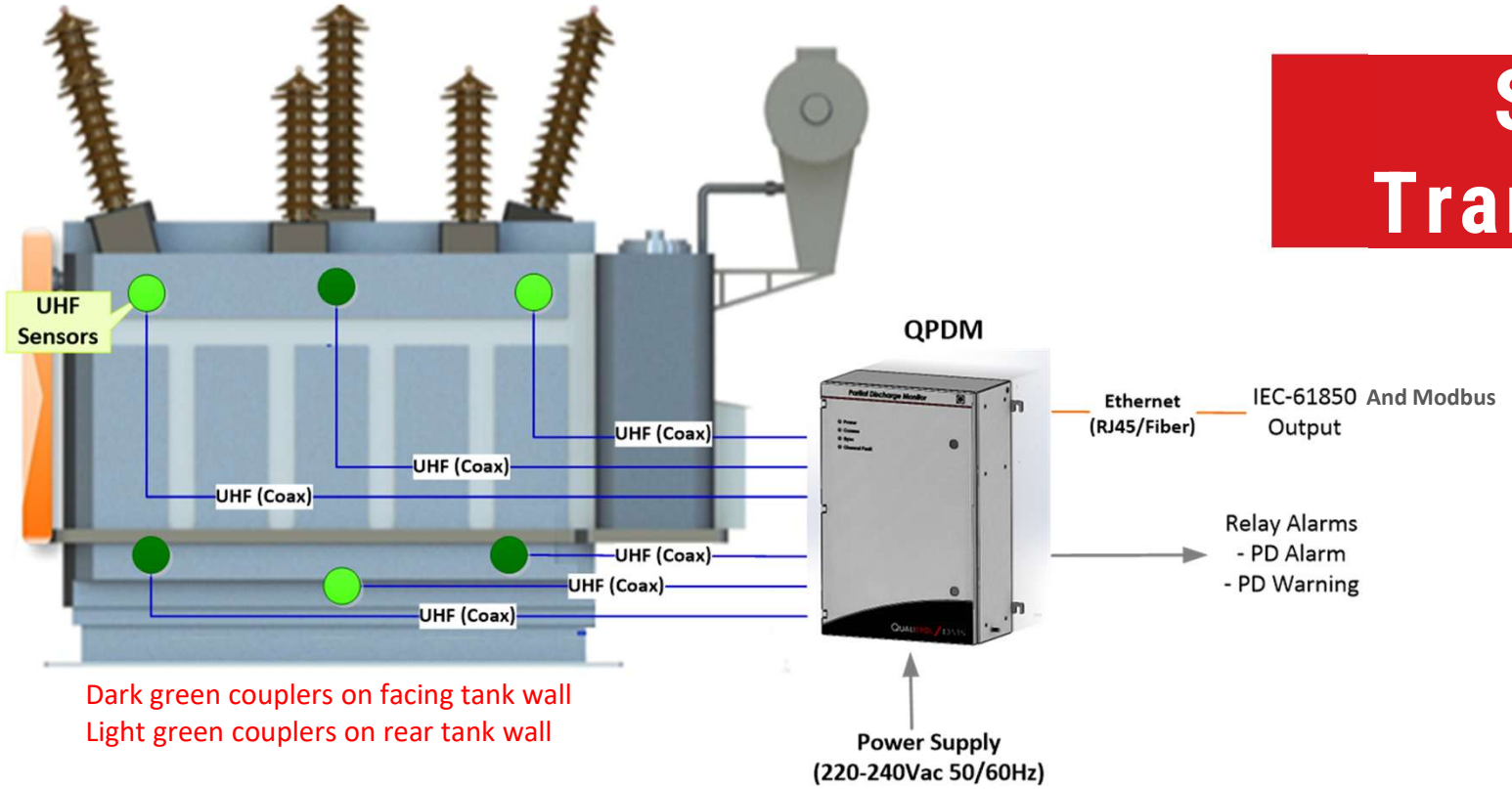
Qualitrol DMS: Introduction

- Who we are?

  - •DMS: Diagnostic Monitoring System
  - •Qualitrol operating company in Glasgow, UK
  - •Founded in 1994, after pioneering the use of UHF technology for identifying PD over 10 years prior
  - •Pioneer in UHF based PD (Partial Discharge) detection and analysis technology
  - •World leader in Partial Discharge Monitoring of GIS
    - •Over 500 substations with over 60,000 UHF sensors monitored online in last 30 years
    - •First commercial installation in continuous service for over 337,600 hours
    - •Chosen for major projects including Itaipu (Brazil), Gulf Link, 800 & 1000kV test stations in China
    - •Has collected over 4.0 million real in service data records from many different types of GIS
  - •Acquired by Qualitrol in 2009
  - •All assembly manufacturing in-house to ISO 9001
  - •Won numerous awards for enterprise and in particular the prestigious Queen's Award to Industry (Enterprise) in 2006

QPDM System Architecture

Single Transformer



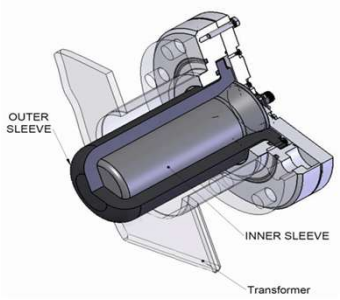
Dark green couplers on facing tank wall
Light green couplers on rear tank wall

NOTES:
- QPDM is compatible with any UHF PD Couplers/Sensor
- Allowable cable distance between sensor and QPDM (Co-ax cable) is 25 meter.
- Ethernet output from QPDM is configurable for RJ-45 and Fiber Optic (MM or SM)
- System also provides serial output (Modbus Protocol)
- Relay Alarms are configurable Dry Contacts

Can control up to 6 inputs simultaneously

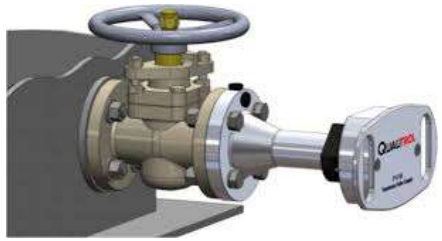
QPDM UHF Sensors

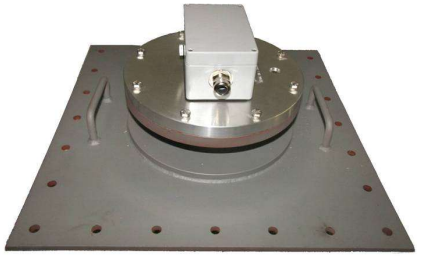
Internal/Window - Installed in new transformers



Internal/Window/Drain Valve Sensors

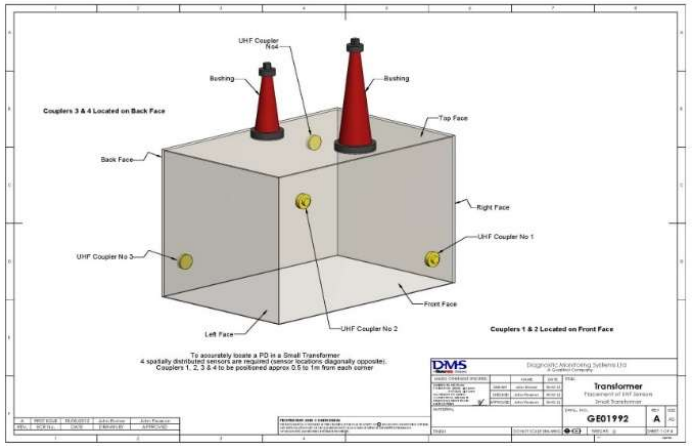
Hatch Cover/Drain Valve – Can be used for Retrofit purpose

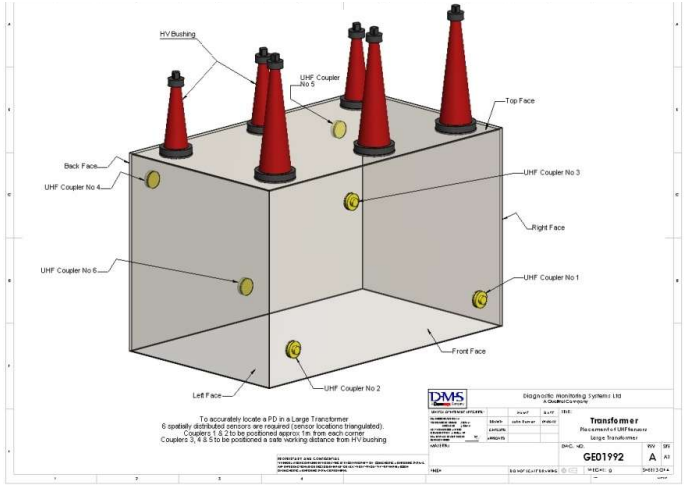




Placement of UHF Sensors in Transformers

- Sensors are fitted with maximum possible spacing between them to allow better triangulation of signal. In general:
  - 4 sensors for single phase transformers up to 4m x 2m x 3m
  - 6 sensors for large or 3-phase transformers up to 5m x 2m x 3m or larger
  - number may change in special cases depending on complexity of internal parts, separate tap changers etc
- Standard sensors must not intrude into high field areas – special sensors are available for such areas
- Sensors near top of tank are more sensitive to defects in bushing connection area
- Lower sensors can be installed using drain valves (this does not need oil to be drained)*





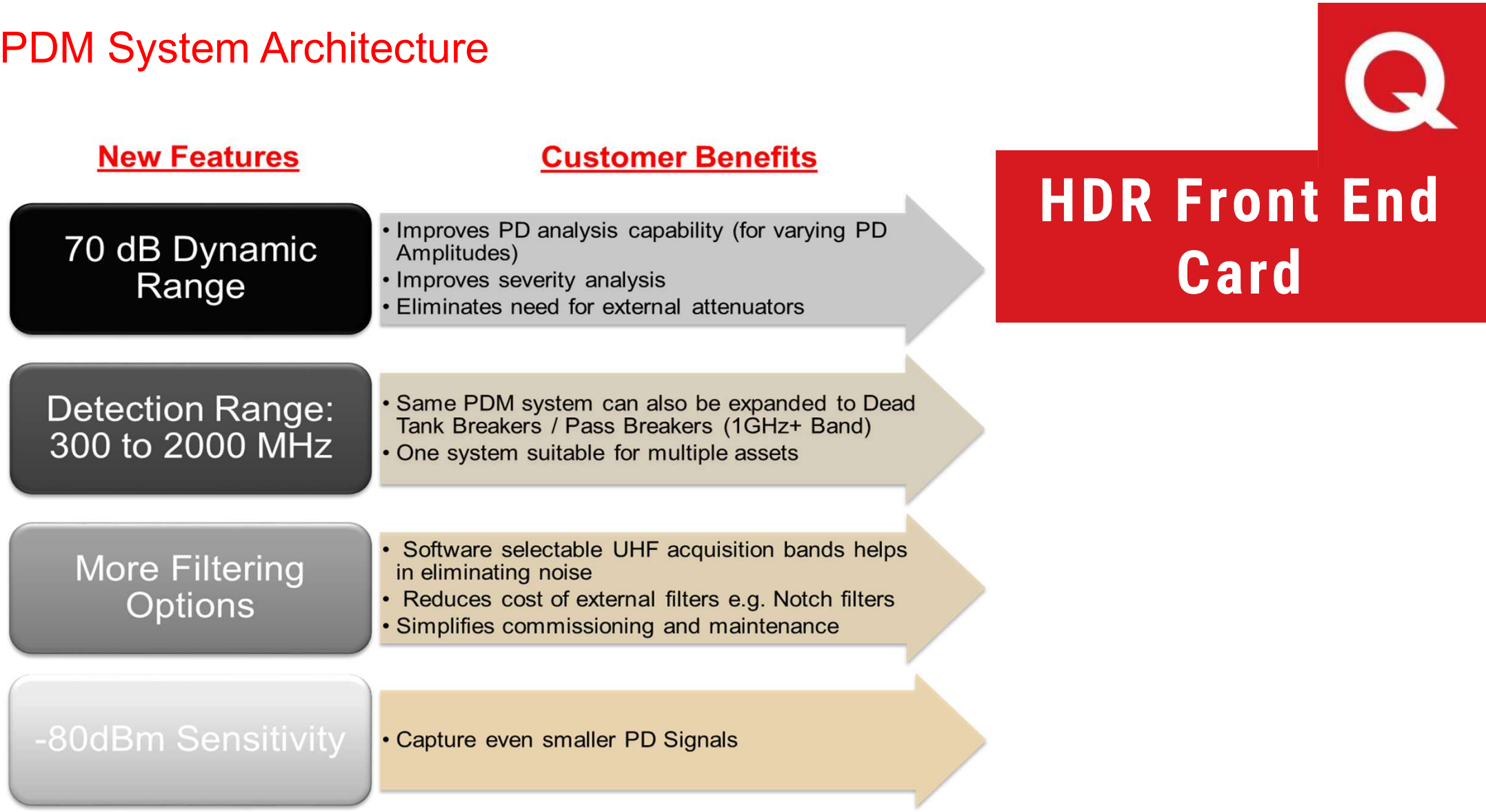
* Subject to Utility safety procedures

QPDM System Architecture

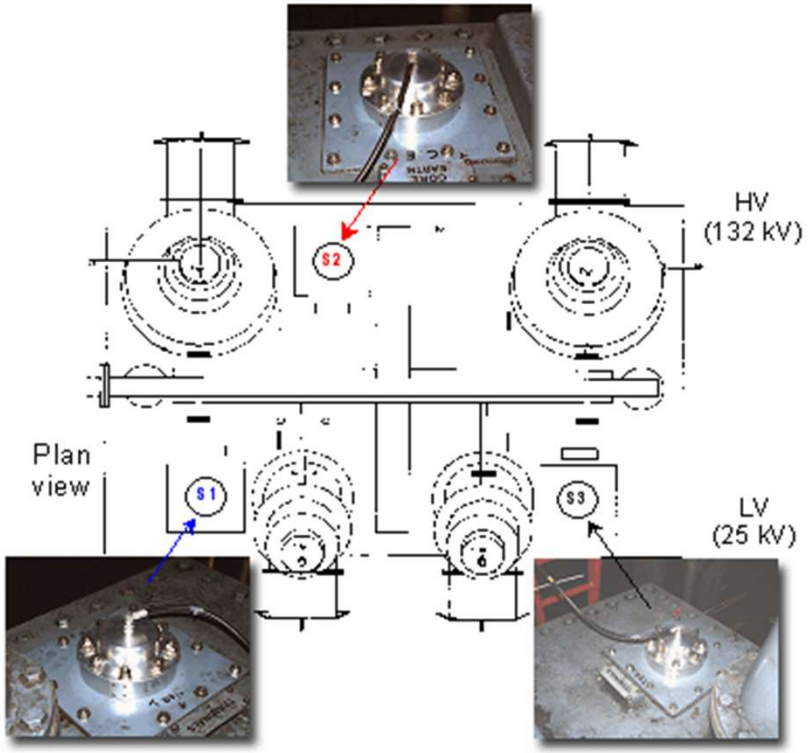
Monitor

- *IP-66 rated box with environmental shield – suitable for outdoor installation*
- *Self sufficient system for PD Detection and analysis*
- *Up to 6 sensors -> sufficient for one large power transformer*
- *LED indicators for PD and system fault conditions*
- *4 x Relay alarm output option to connect to SCADA systems*
- *Protocols: IEC61850 data output, Modbus*
- *Single Mode, Multimode Fiber or copper only options*
- *Remote client -full user interface as per Gen3 PDM - trending / alarms / analysis*
- *Live Streaming / POW / Live PRPD/ History etc.*
- *Suitable for extreme environmental conditions*

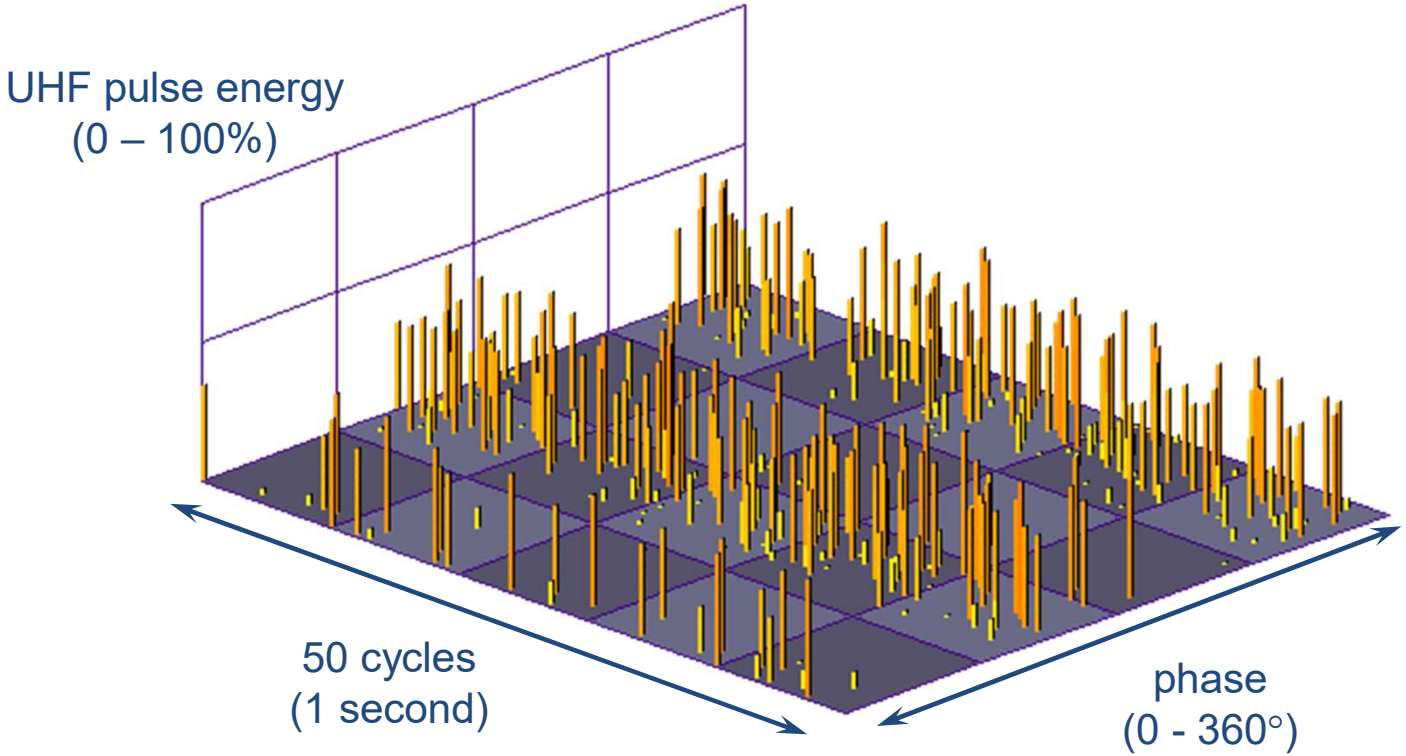
QPDM System Architecture



Case study #2 - 18 MVA Transformer 132/ 25 kV with 3 UHF couplers



Case History: #2

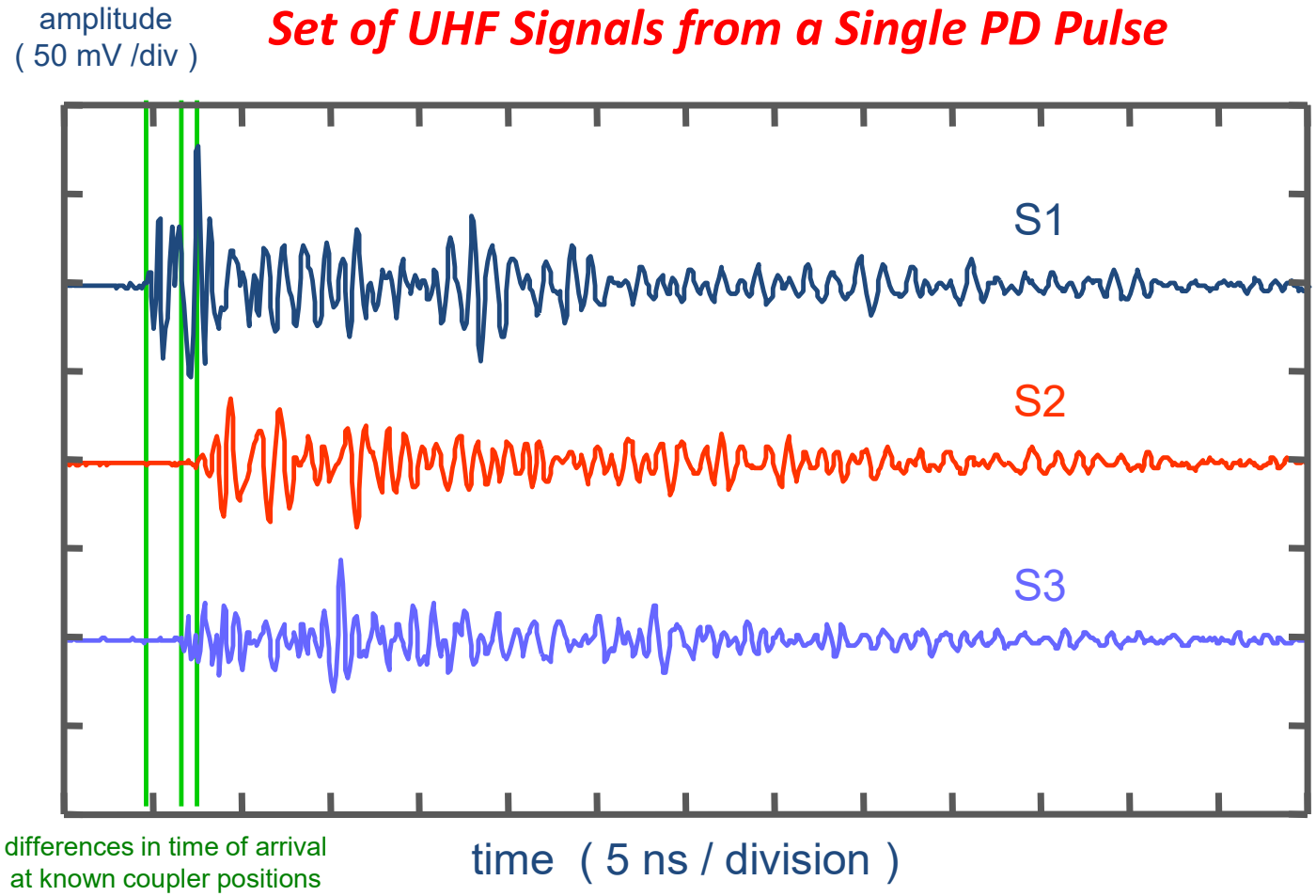


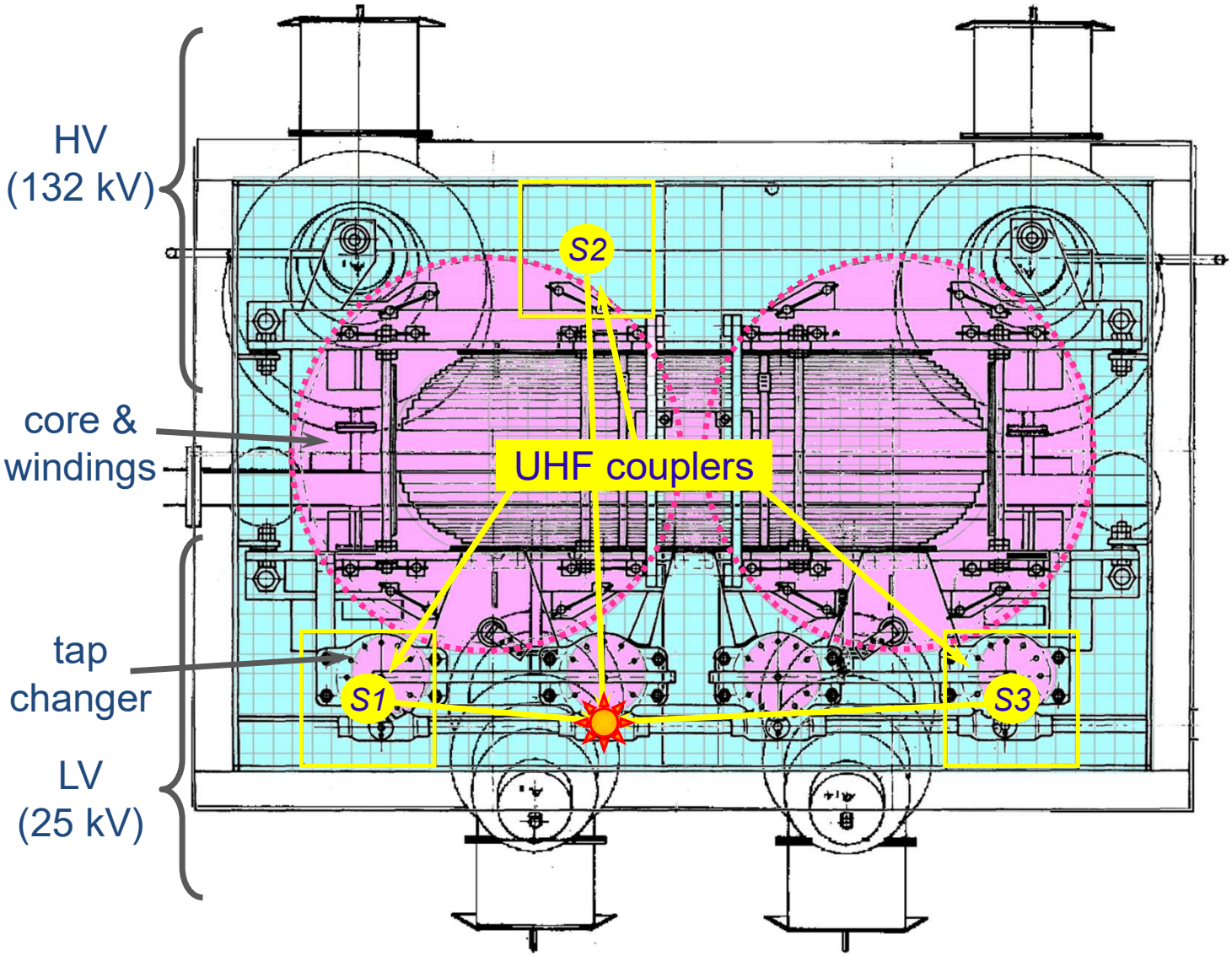
Sensor 1

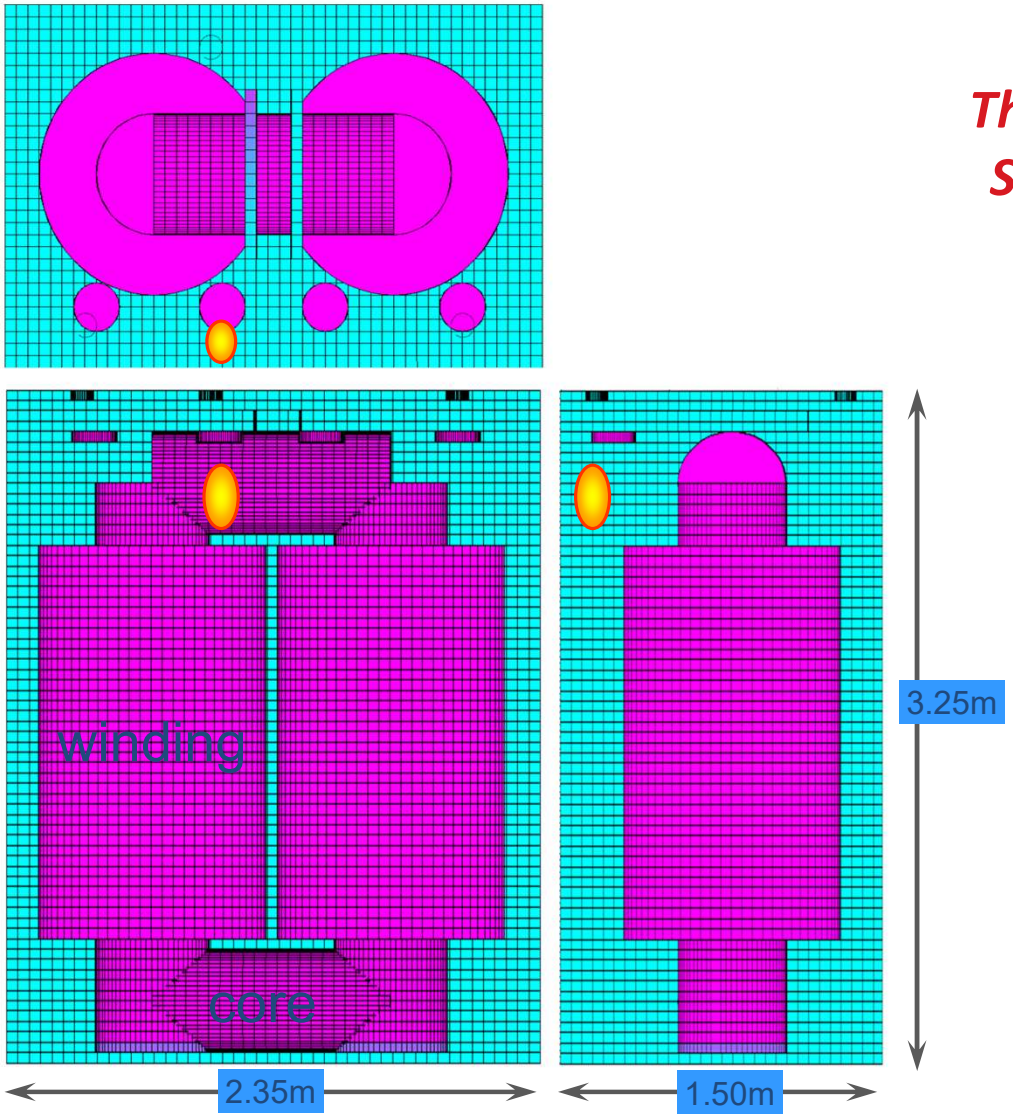
PD pattern with strong 180 degree phase symmetry

Case History: #2

Set of UHF Signals from a Single PD Pulse



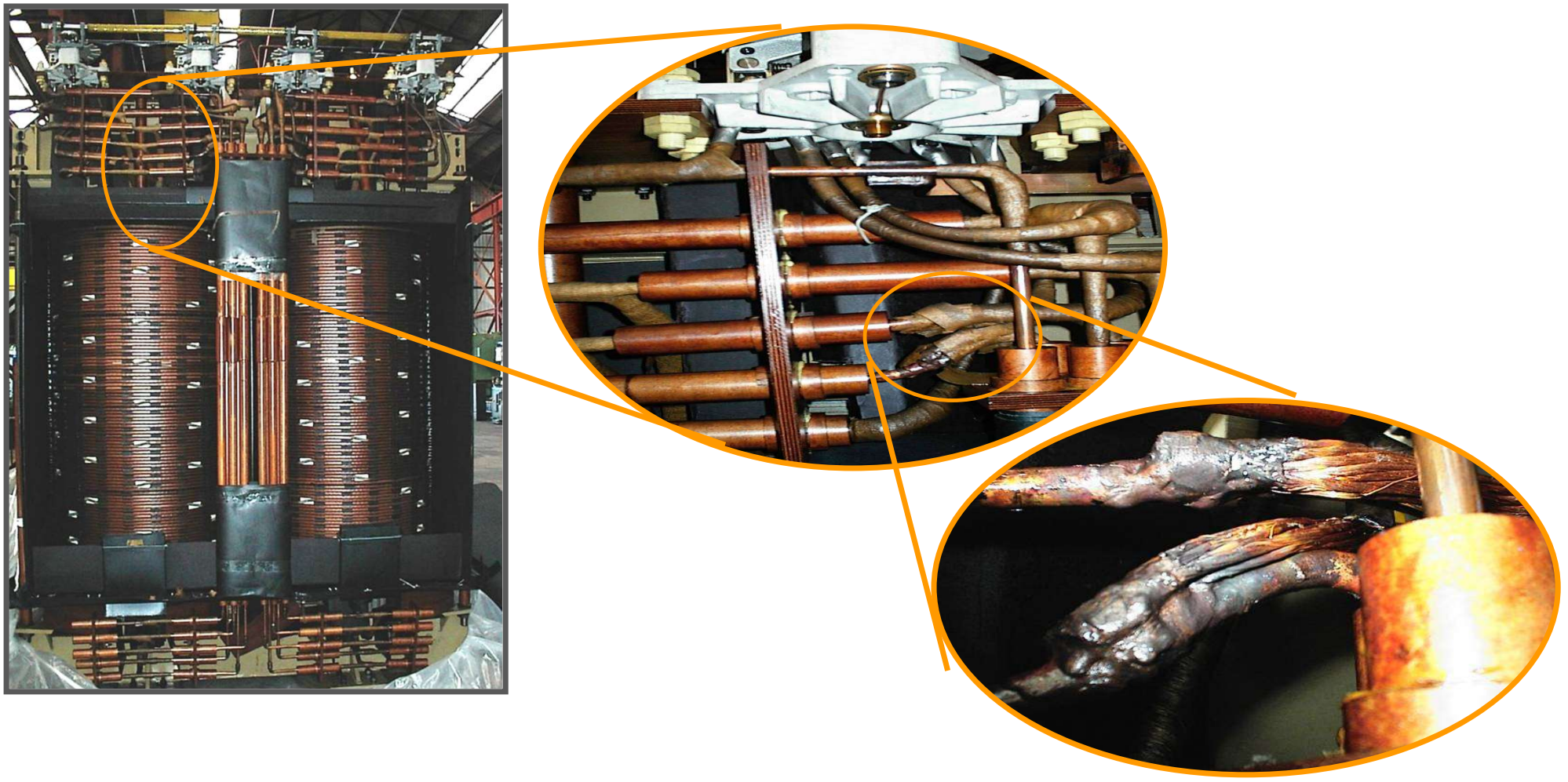

HV
(132 kV)
core &
windings
tap
changer
LV
(25 kV)
S2
UHF couplers
S1
S3



Third-Angle Projection Showing the Suspect Volume

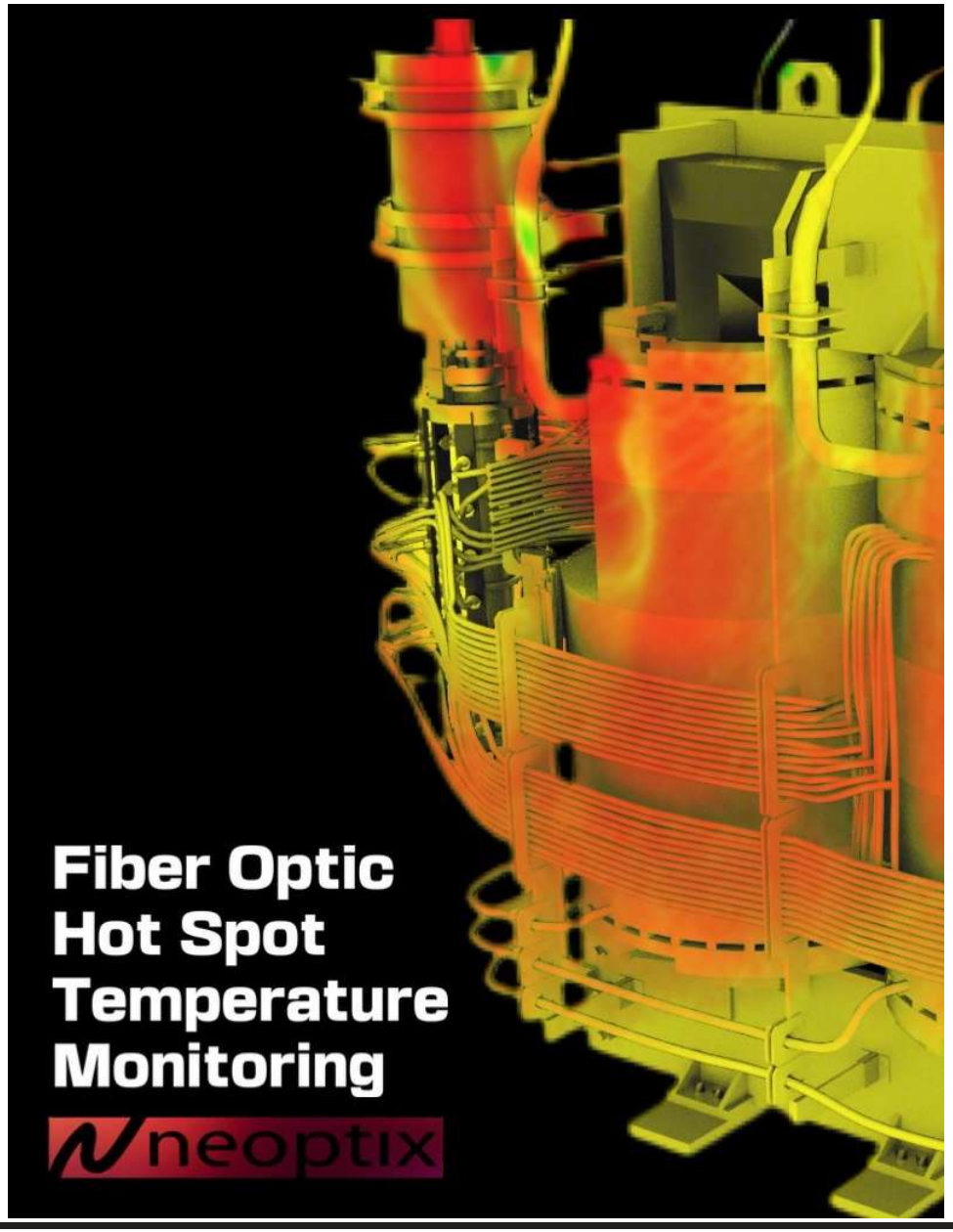
(Mesh size = 5 cm)

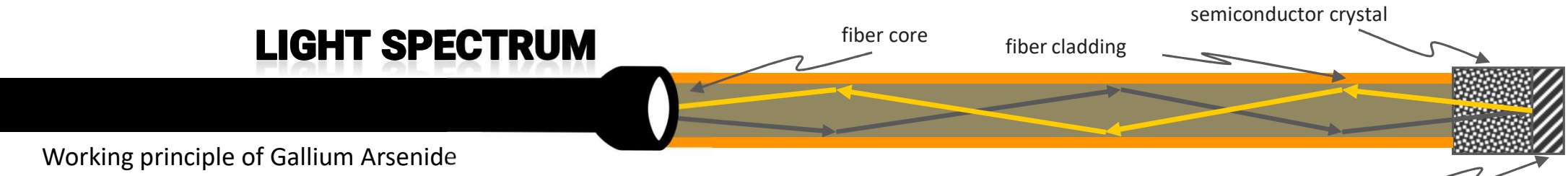
Inspection of Detanked Assembly



HOT-SPOT DIRECT

Temperature Monitoring

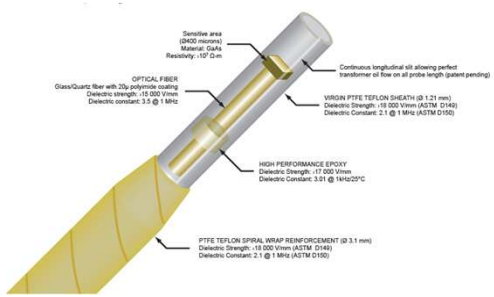


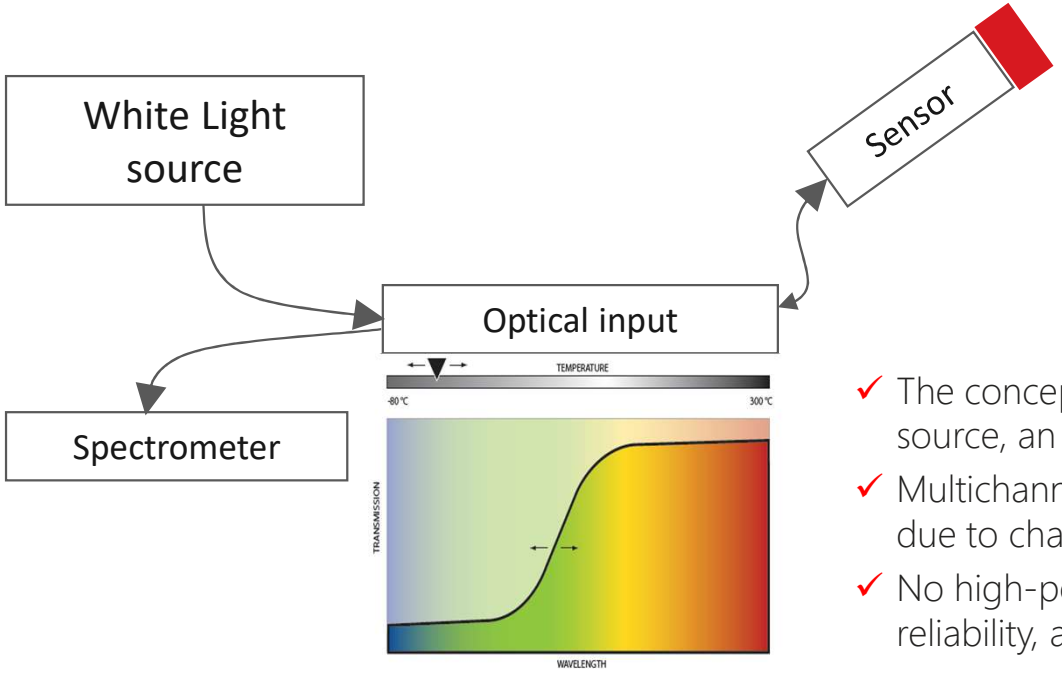


Working principle of Gallium Arsenide

Sensor GaAs

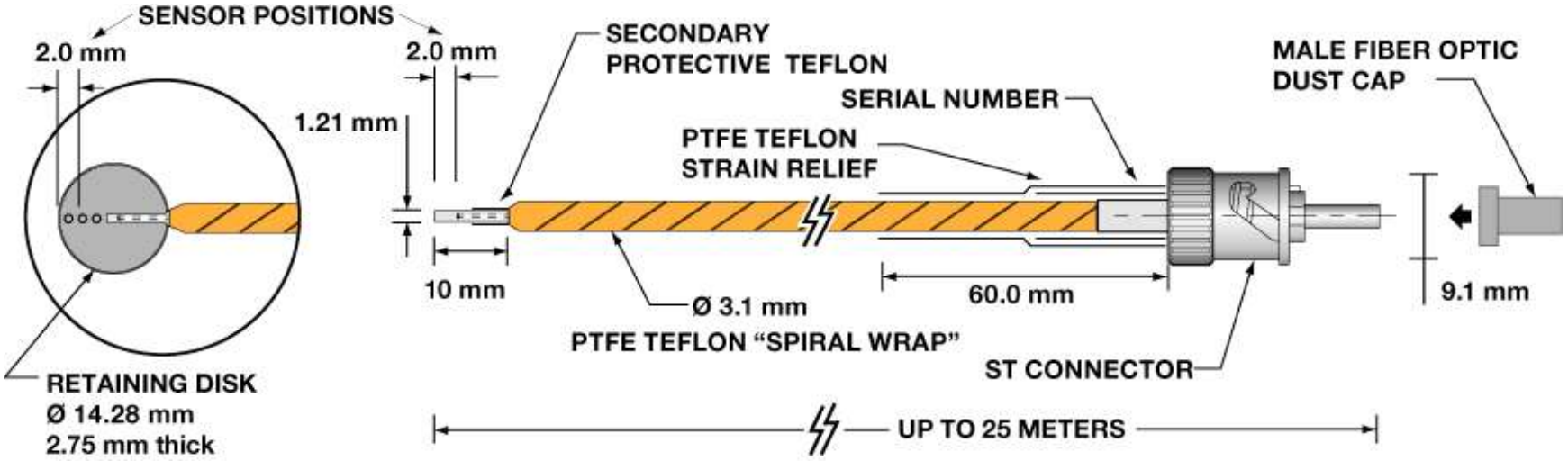
dielectric mirror (coating)





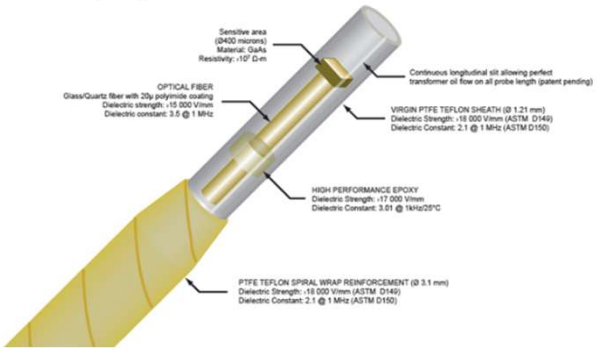
- ✓ The concept of the system is very simple but elegant; It consists of a light source, an optical coupler, the probe and a sturdy spectrometer.
- ✓ Multichannel models use the same design but share most components due to channel multiplexing
- ✓ No high-power electronics that are unreliable are used, which increased reliability, and the light source has an estimate of 300 years – MTBF

T2 Series Fiber Optic Construction Details

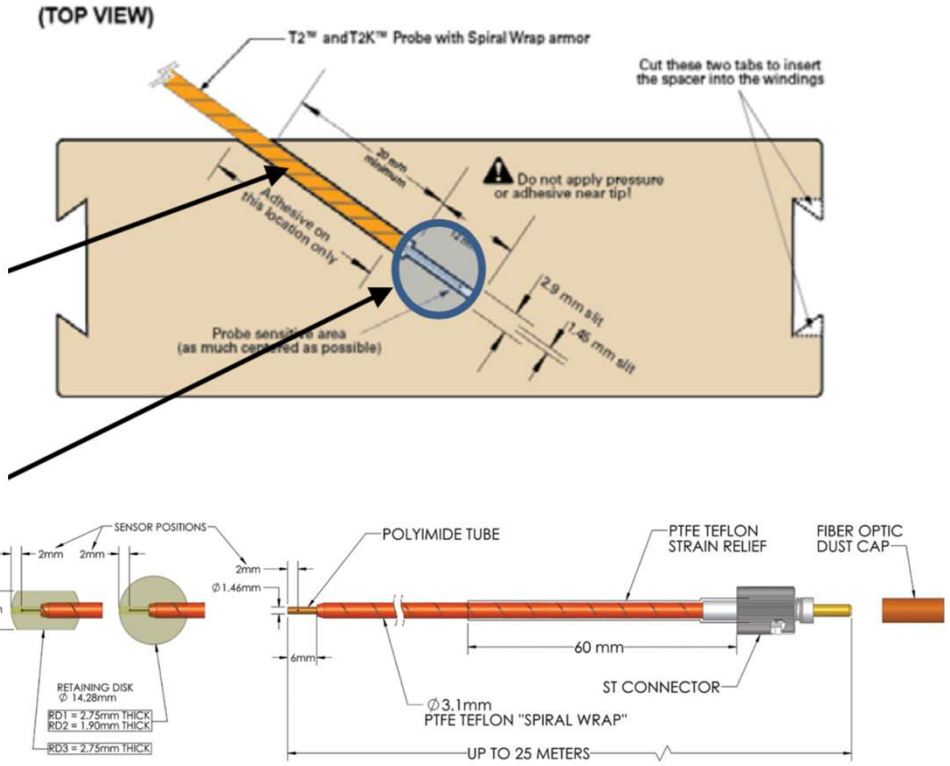


Designed to allow full oil penetration, fast response time and high dielectric strength and chemical resistance

US patent # 8,568,025



T2K PROBBE SPIRAL WRAP ARMOR

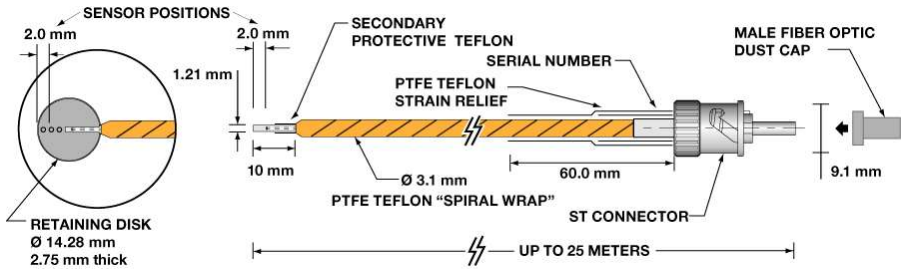


T2 probes, with a retention disk (-RD1 option)

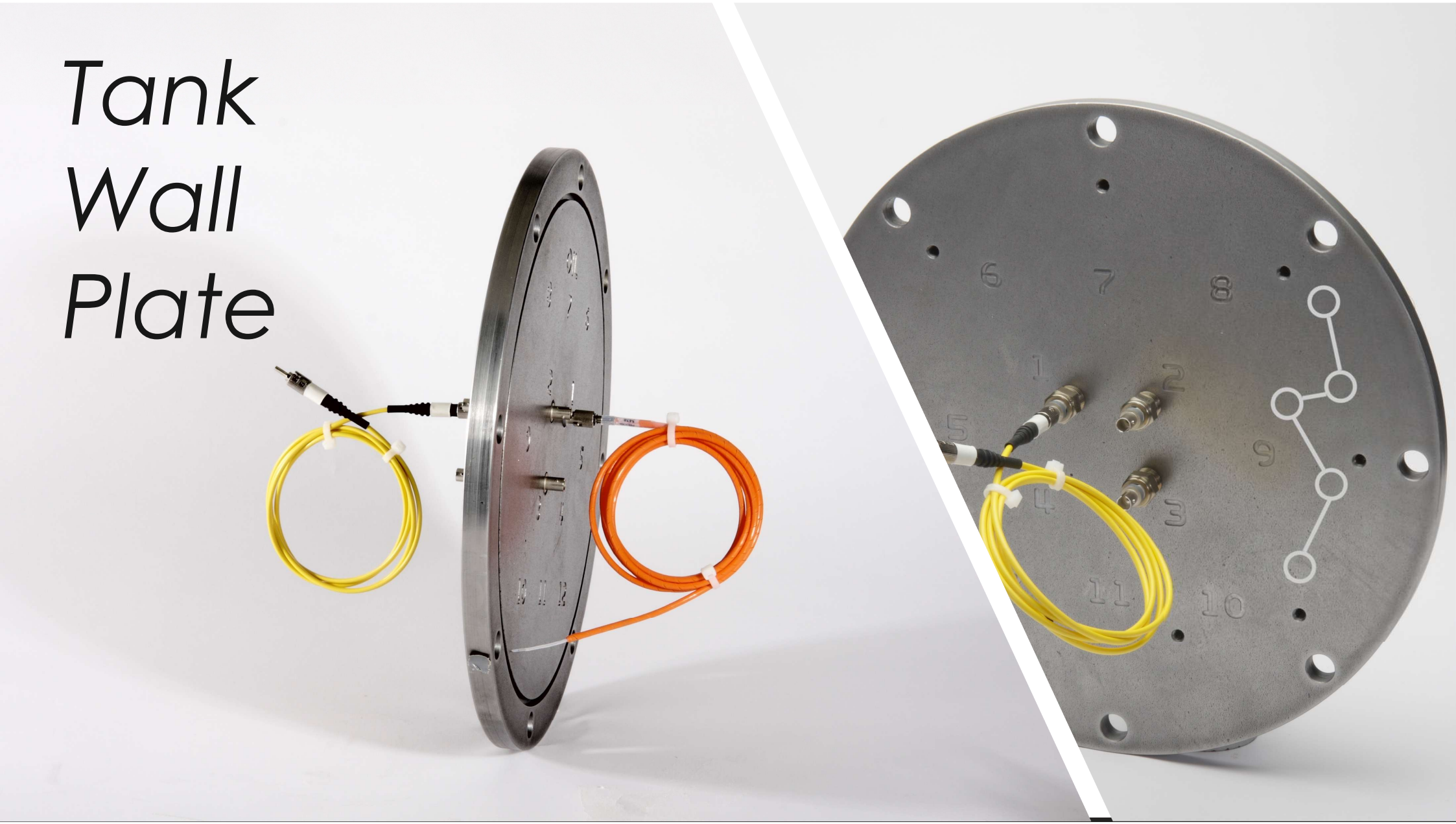
- This is the easiest way to install probes in radial spacers
- No duct tape or glue is required to keep the probe in position
- Rotor disc, designed without the need for glue.
- Non-friable like other material, such as Nomex
- PD tested by Weidmann
- Disc diameter is 14.3 mm (9/16 in.)
- Maximum tensile force ~ 20 N (~ 2 kg-f)
- NXP-631: Disk installation kit, with:
- 9/16-inch drill, with key
- Double cutting tool (or use of band saw)

Warning: Do not attempt to remove the disc, as this will damage the probe!

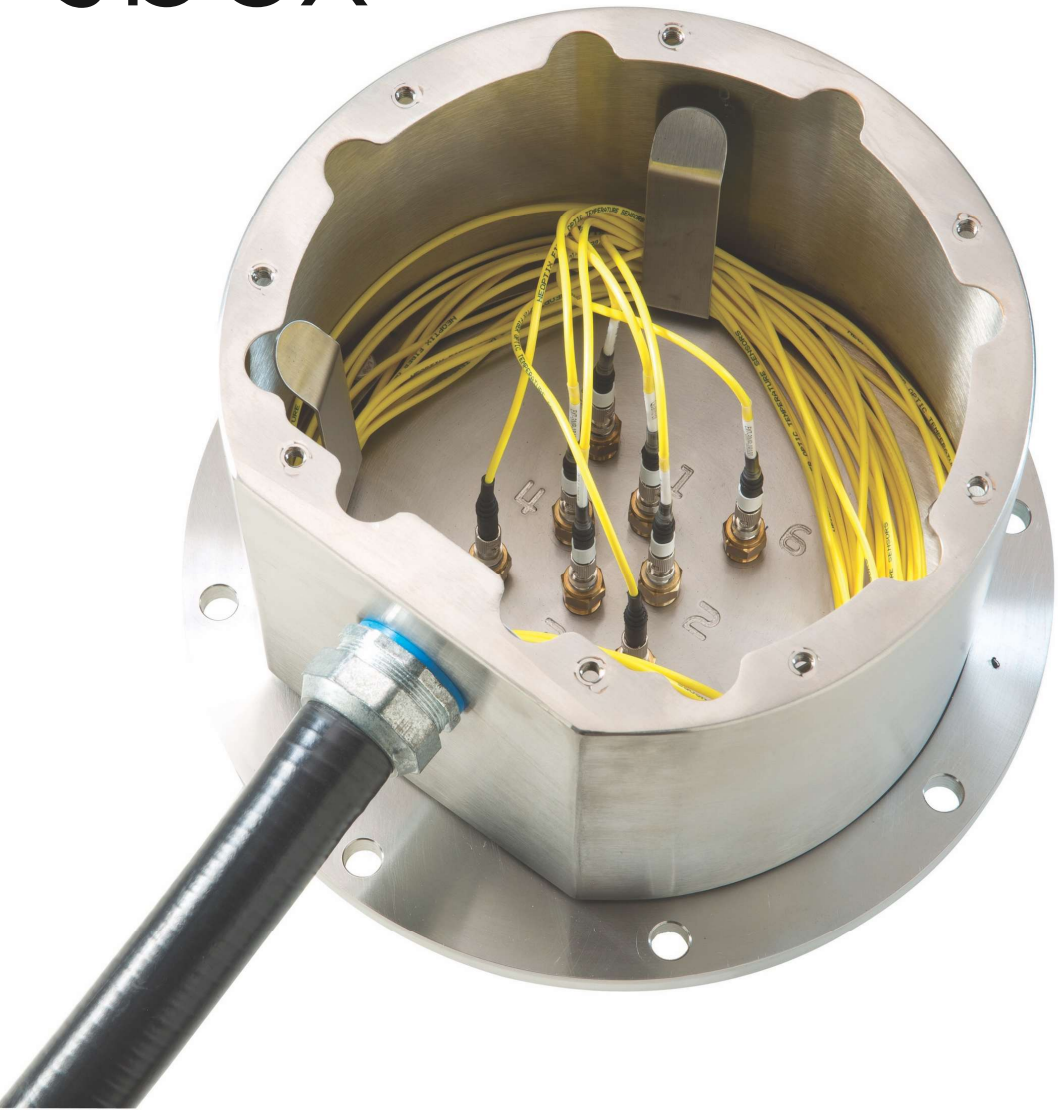
Mini-knockout

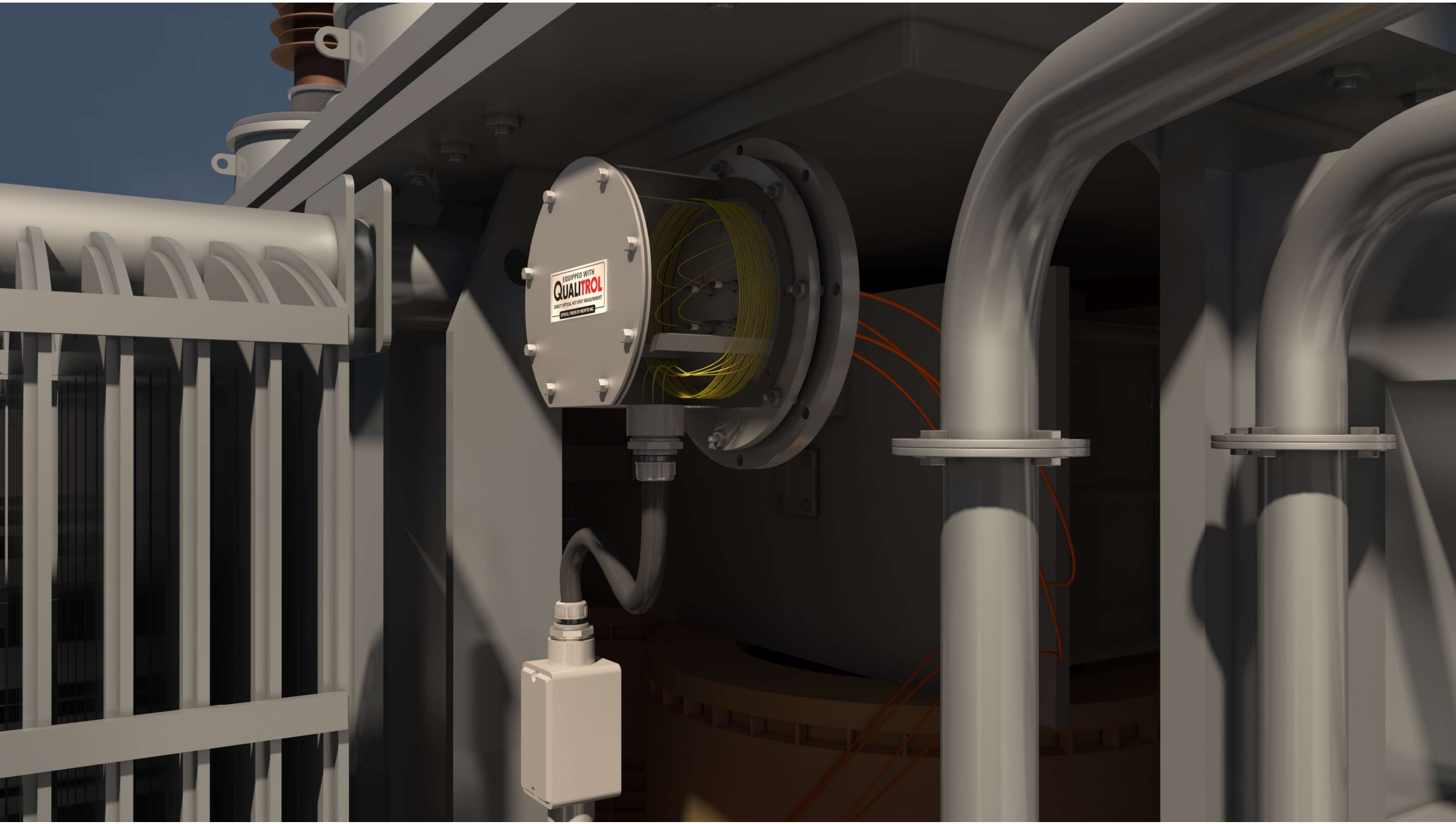


Tank Wall Plate

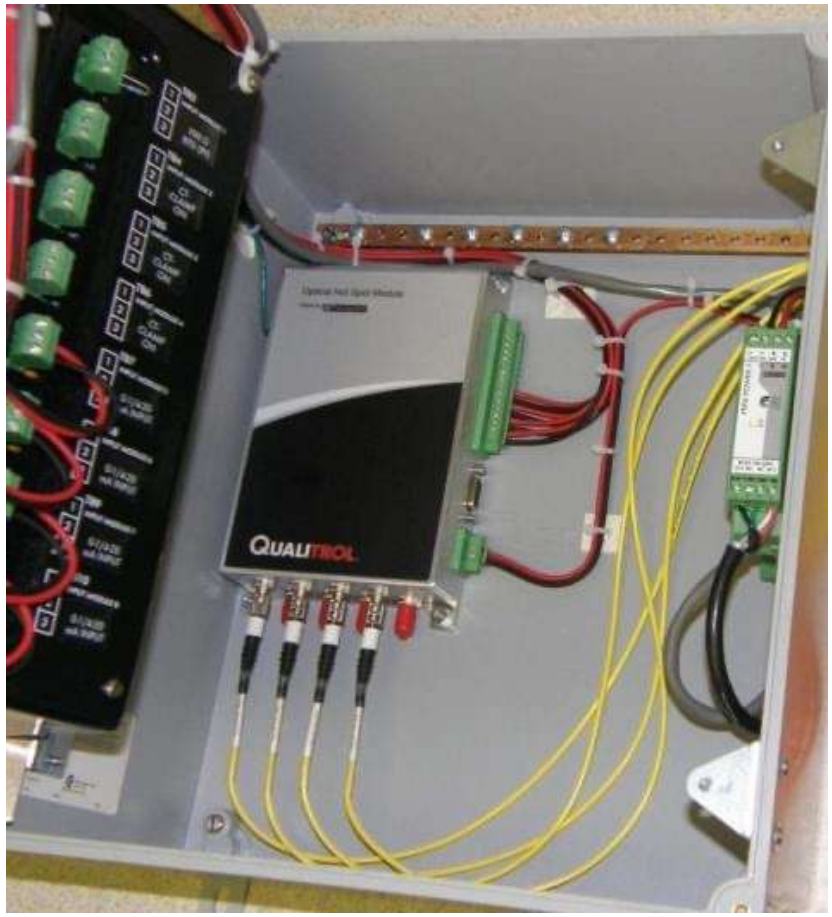


Jbox




EQUIPPED WITH
QUALITROL
DIRECT OPTICAL HOT SPOT MEASUREMENT
OPTICAL FIBERS BY NEOPTIX INC.

Installation on local TR cabinet



THE MOST FLEXIBLE PORTFOLIO

Multi-Channel OmniFlex

Upgradeable and stackable fiber optic signal conditioner system

- Hot swapeable fiber optic modules
- Choices of 5 different modules:
  - 1, 2 and 4 channels modules at 10 Hz sampling rate on each channel
  - 4 or 8 channels modules at 250 ms switching rate between each channel
- Modules can be moved and mixed in chassis
- OmniFlex chassis can be cascaded to form an array of up to 1024 optical channels
- With USB interface and flexible OmniLink software

Portable Nomad

Portable battery-powered fiber optic signal conditioner with SD card datalogging

- One optical channel
- Run on 4 AA rechargeable batteries
- Large LCD display
- RS-232 communication link
- Datalogging on SD flash card
- No gage factor or calibration needed
- Compatible with Neoptix OptiLink™ control and datalogging software

T/Guard Link

Small form factor fiber optic signal conditioner for winding monitoring for small and medium size transformer

- 2 versions: Fluorescence and GaAs technologies
- Available with 1 to 8 optical channels
- Multiple modules can be linked together with Modbus
- Small footprint (190 x 113 mm)
- 4-20 mA analog outputs
- RS-485 port, with ASCII and Modbus communication
- Compatible with Neoptix OptiLink(tm) control and datalogging software

T/Guard 405

Cost-effective fiber optic signal conditioner for winding monitoring

- Replacement for the original Neoptix T/Guard system
- Available with 2 to 16 optical channels
- Large LED high visibility display
- 4-20 mA analog outputs
- RS-485 port, with ASCII and Modbus communication
- 32 MB datalogging is standard
- Compatible with Neoptix OptiLink(tm) and OptiLink-II control and datalogging software

T/Guard 408 & 408XT

Full-featured multi-channel system for transformer monitoring, with laram and cooling control

- Available with 4, 6, 8, 10, 12 or 16 optical channels
- Large LED high visibility display
- 8 Form-C relays with galvanic isolation
- 4-20 mA analog ouptput
- Serial protocols including Modbus and 61870
- Smart Grid protocols (XT) including IEC 61850
- Light source superior to transformer's life
- 2 or 4 GB data logging on-board memory
- Integrated Web Server with IP Adress (XT)
- Compatible with Qualitrol OptiLink™ control and datalogging software

507DW & 509DW

Intelligent transformer monitor with direct winding

- All the features of the QUALITROL 509 ITM
- Real time comparison of calculated and direct hot spot winding temperatures for verification of transformer operation to OEM specification
- Available with 1 to 16 optical channels
- 4 X 20 display with backlight
- Cooling monitor model 509-200 for advanced control or load tap changer monitor model 509-300 for detailed performance monitoring
- Now supports GaAs and Fluorescence technologies

T2™ oil-immersed probe

Ruggedized temperature probe specifically designed for oil filled and dry type transformers

- 1 to 25 meters length
- Oil-permeable PTFE Teflontm jacket with 3 mm Teflontm spiral-wrap reinforcement
- Surpass ASTM D149 and D2413

TX panel feedthrough temperature probe

Tx model panel feedthrough fiber optic temperature probe has been specifically designed for monitoring temperature through panel or tank walls.

- Built-in ST connector
- No moving parts
- Vacuum or pressure
- Compatible with all systems

Optical feedthrough

Tranformer tank wall optical feedthrough for T2tm temperature probe

- Based on solder glass bonding technology for a permanent oil-tight sealing
- Uses no epoxy or O-ring
- 1/4 NPT-M ANSI threads

Transformer tank wall plate

Transformer tank wall plate

- Up to 24 feedthroughs on a single plate
- Designed to mate with our JBox2™ feedthrough protective enclosure
- Custom-made upon your specifications
- Carbon steel, stainless or aluminium

External extension cable

Ruggedized optical extension cable for linking transformer to signal conditioner

- 1 to 500 meters length
- 3 mm O.D. polyurethane jacket reinforced with Kevlar thread
- ST connectors

JBox2™ protective box

Tank wall plate and feedthrough protective junction box

- Up to 24 feedthroughs in same enclosure
- Flat section for conduit flange installation
- Specifically designed to mate with Neoptix transformer tank wall plate

NEMA protective enclosure

NEMA 4-12 protective enclosure custom made for the T/Guard product family

- Protects equipment against water, dust, dirt and oil splashing
- Available with automated environmental control
- Meets NEMA 4-12/IP66 standards

Monitoring for the global grid

QUALITROL
Defining Reliability

ITM & QTMS

TRANSFORMER MONITORING SOLUTIONS

ITM SERIES

Complete transformer monitors for all parameters required to accurately track and control power transformers

Remote communications, integrated data logging and event recording capabilities

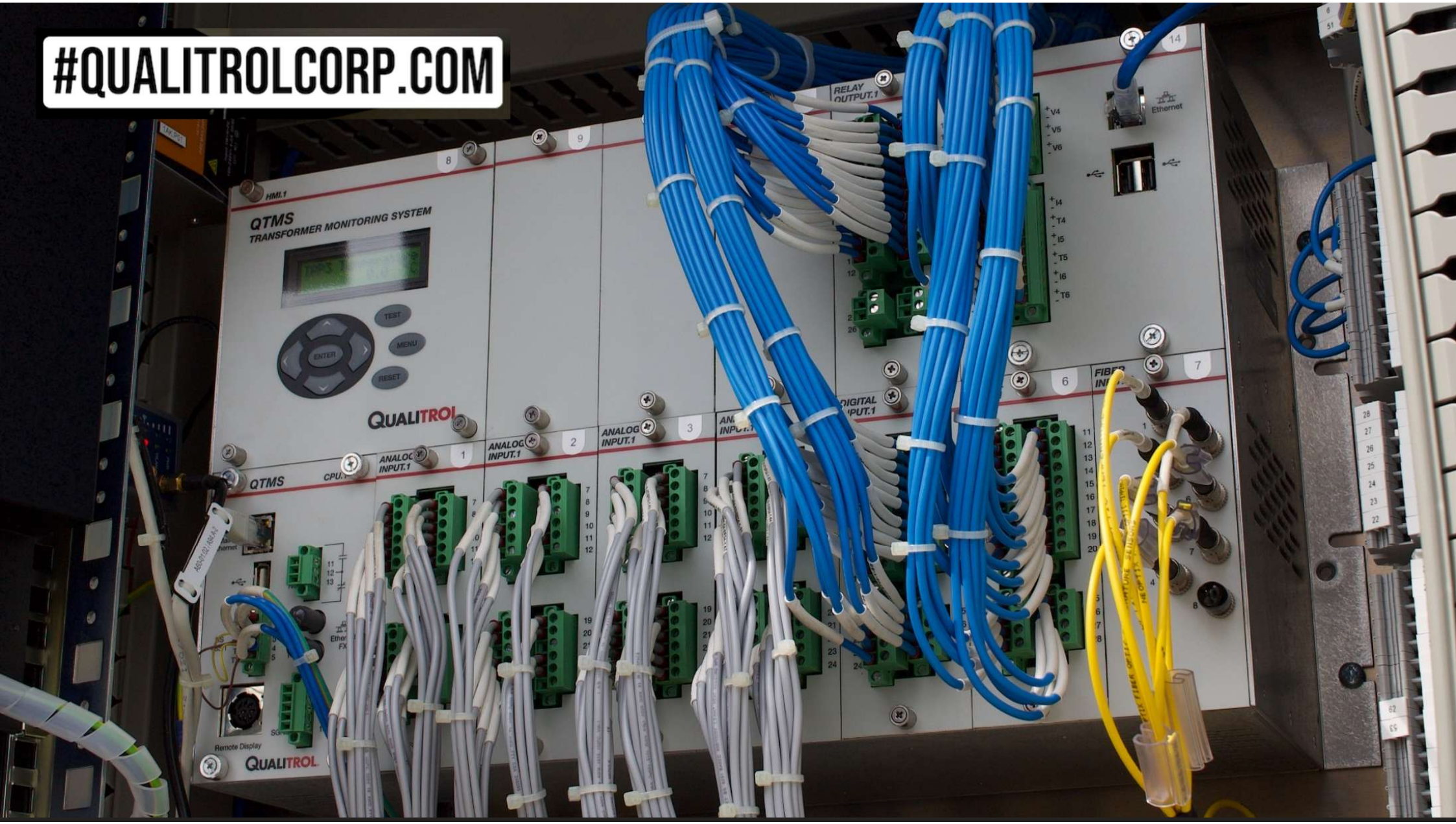
Seamless integration with Qualitrol Neoptix Fibers for direct winding temperature and DGA-150 for single gas hydrogen measurements

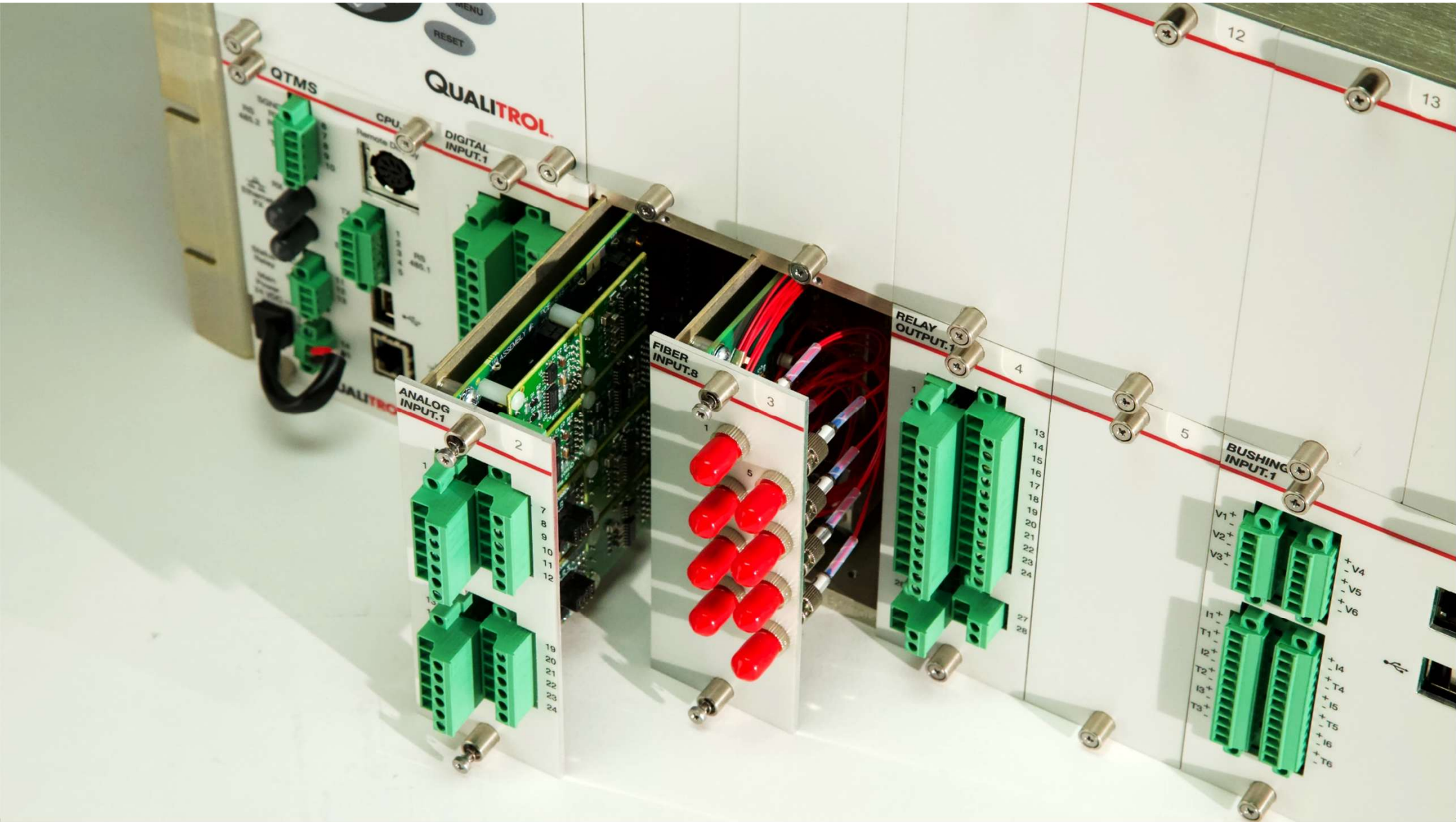
QTMS SERIES

Advanced modular transformer monitors for condition based, continuous online monitoring of asset health

Bring all sensor data into one single monitoring solution, including Partial Discharge and Bushing monitoring

Bring data from multiple QTMS devices into a centralized location with scalable Qualitrol SmartSub enterprise software


#QUALITROLCORP.COM
QTMS
TRANSFORMER MONITORING SYSTEM
TEST
MENU
ENTER
RESET
QUALITROL
HMI.1
QTMS
CPU.1
ANALOG INPUT.1
RELAY OUTPUT.1
Ethernet
Remote Display


QTMS
QUALITROL
MENU
RESET
CPU
DIGITAL INPUT.1
ANALOG INPUT.1
FIBER INPUT.8
RELAY OUTPUT.1
BUSHING INPUT.1
2
3
4
5
12
13

DISPLAY

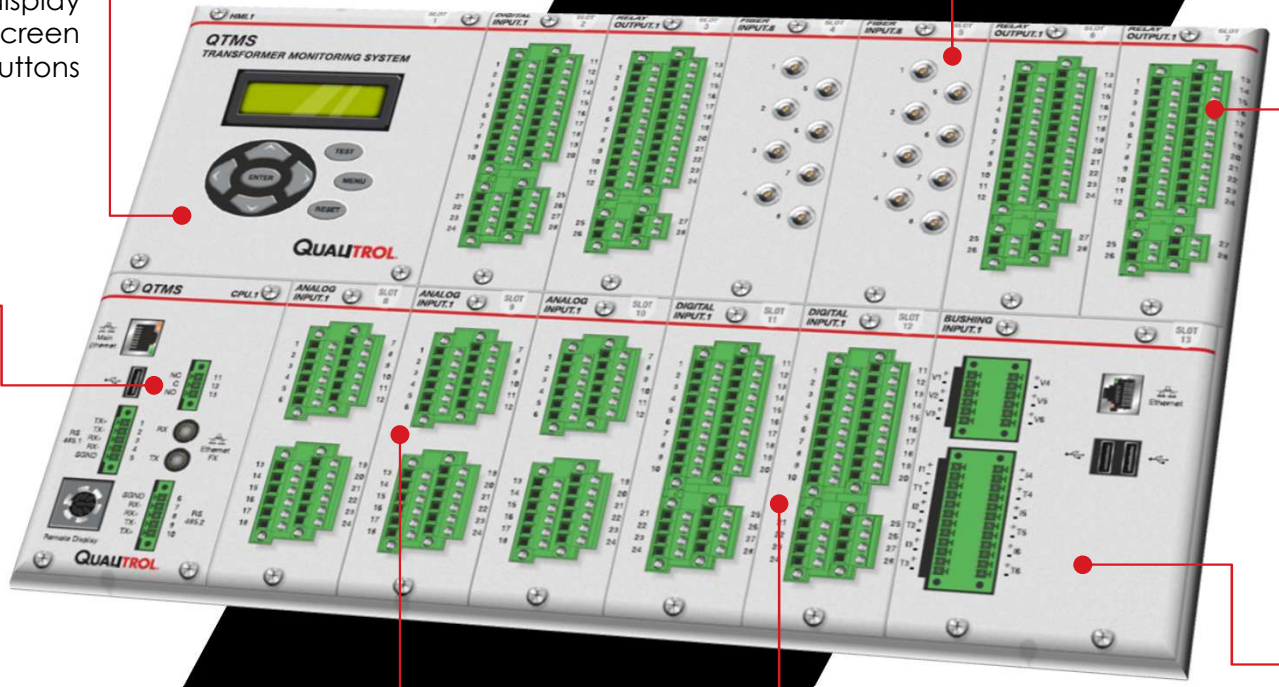
Optional push button display
Large backlit LCD screen
Integrated overlay buttons

FIBER OPTICS

Available in 4, 6, or 8 inputs
Accurately characterize asset aging
Accurate direct winding temperature

RELAYS

8 relays per module
Up to 112 relays available per system
Versatile control of cooling systems, alarms, and trip signals



CPU

Modbus, IEC60870
Web based interface
USB and serial port 3.0,
Universal power supply connections;
IEC61850, DNP

Graphs & trends

Web-base

Analytics

BUSHING MONITOR

Detect early changes in:
Tan Delta & capacitance
Real time bushing health

ANALOG INPUTS

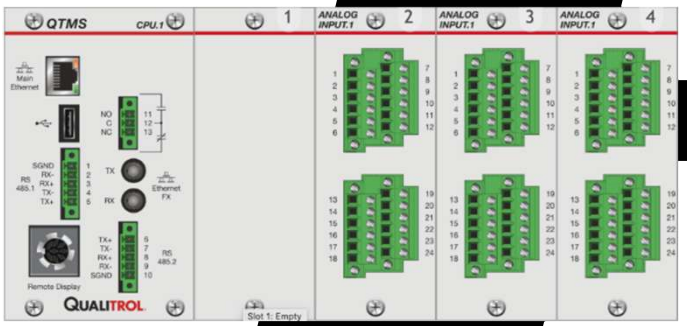
Accepts a variety of analog input types with flexible configuration
8 analog inputs per module
Up to 112 analog inputs per system

DIGITAL INPUTS

Configurable per specification with wiring on front panel
14 digital inputs per module
Up to 196 digital inputs per system

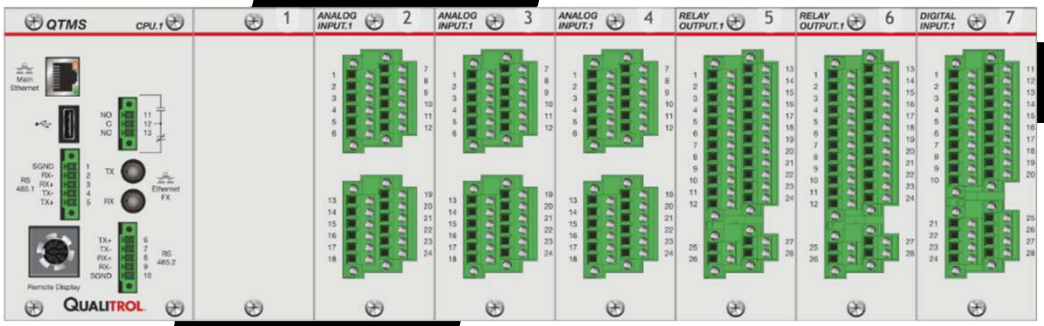
CHASSIS SIZES

A Size for Every Application



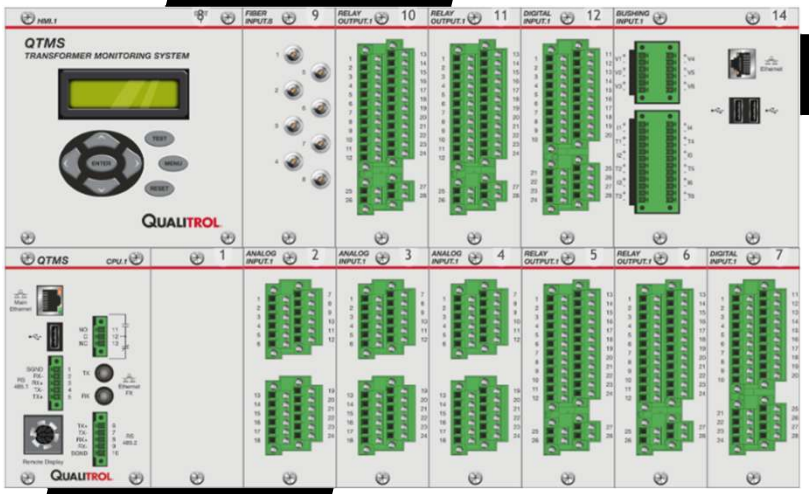
QTMS STX

4 Modules
Remote Display



QTMS MTX

7 Modules
Internal or Remote Display



QTMS LTX

14 Modules
Internal or Remote Display

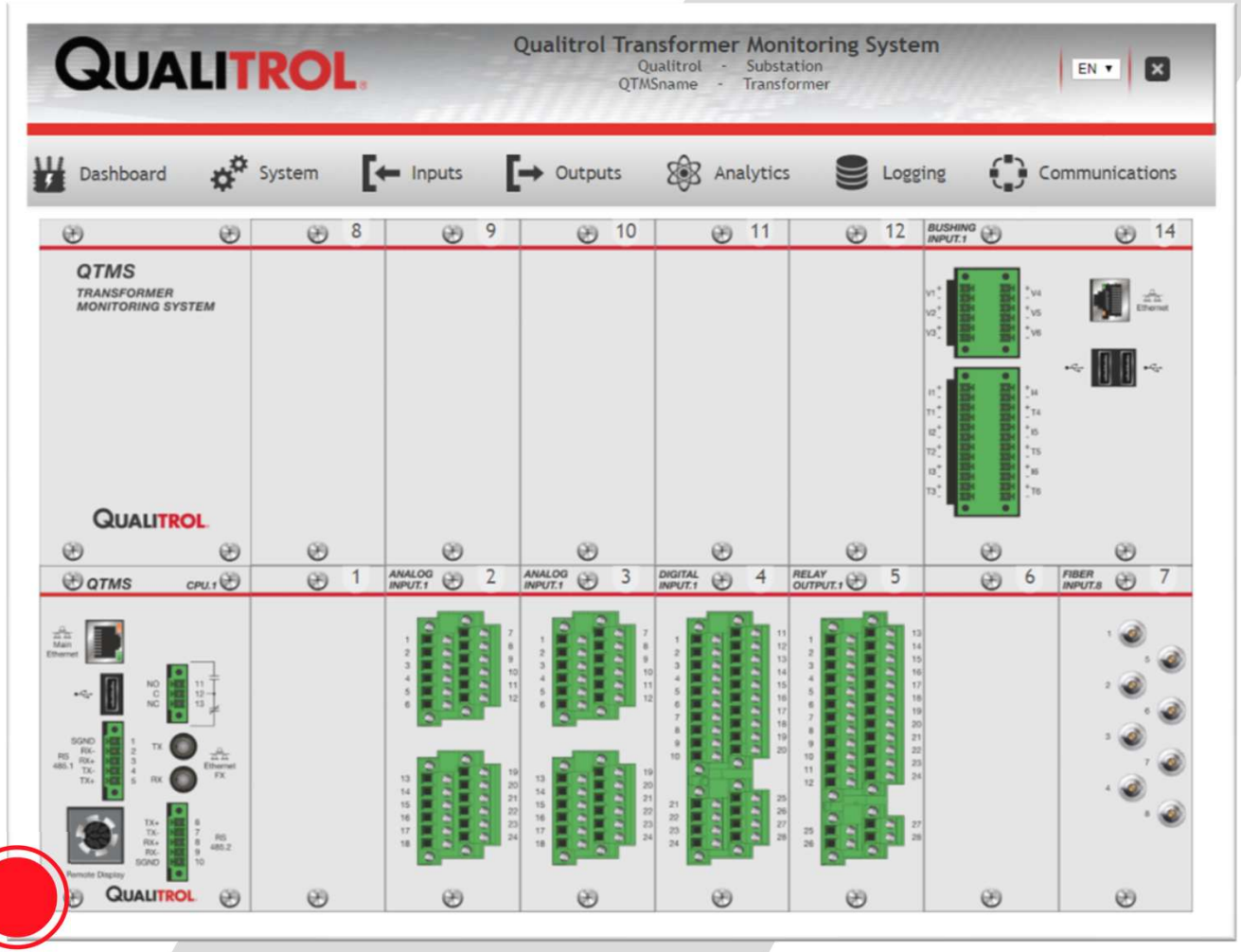
From basic transformer application all the way to Transformer bank monitoring or multi-asset integration

WEB-BASED SOFTWARE

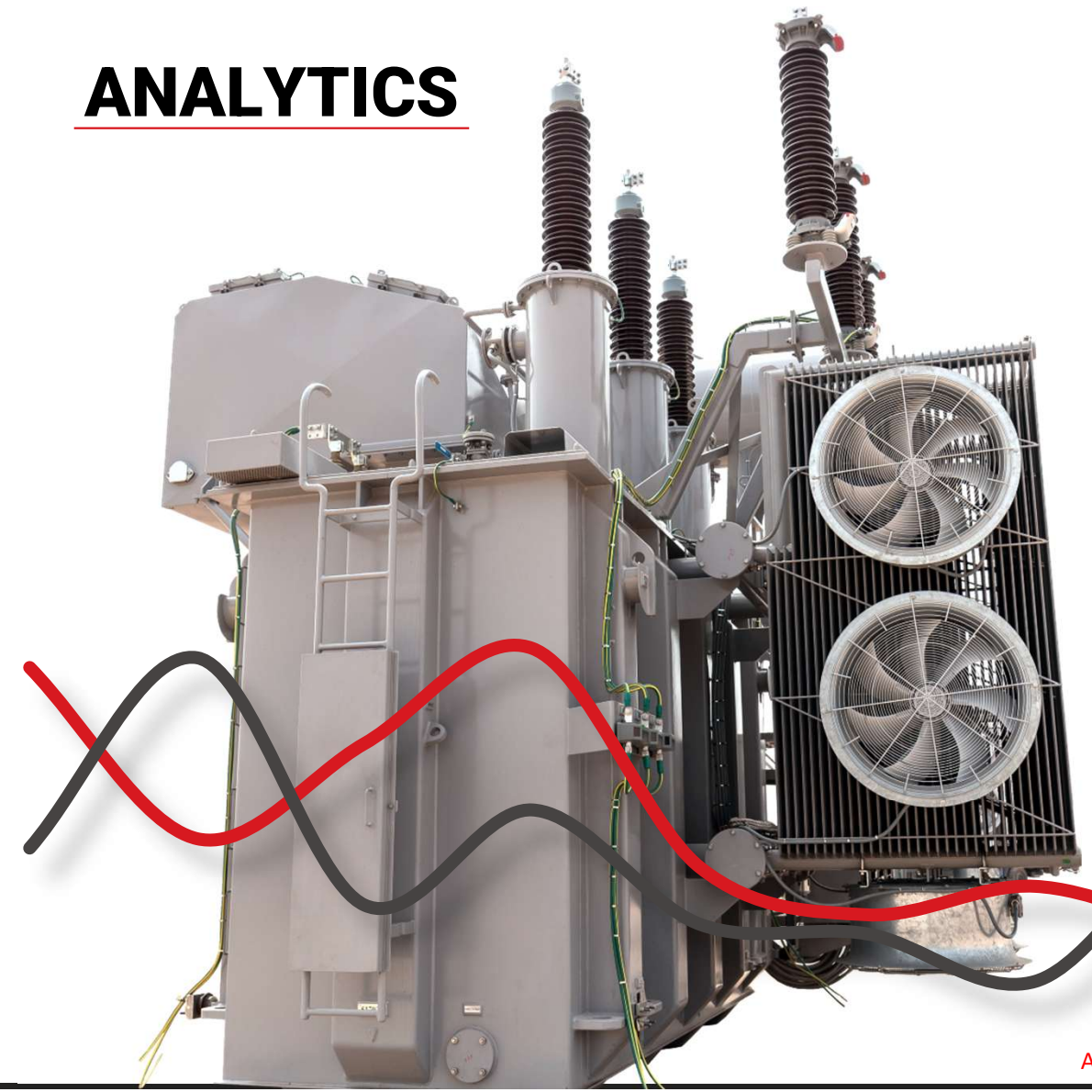
Friendly-User Interphase (UI)

- ✓ Multiple Comms. Protocols & Set-up
- ✓ All easy configurations
- ✓ Applicable Calibrations
- ✓ Input Signal Simulation
- ✓ Network Set-up
- ✓ Time Zinc NTP/PTP
- ✓ User Accounts
- ✓ Software Upgrades
- ✓ Copy/Loading Identical Config.

User friendly software provides perfect platform for customization and ease of configuration



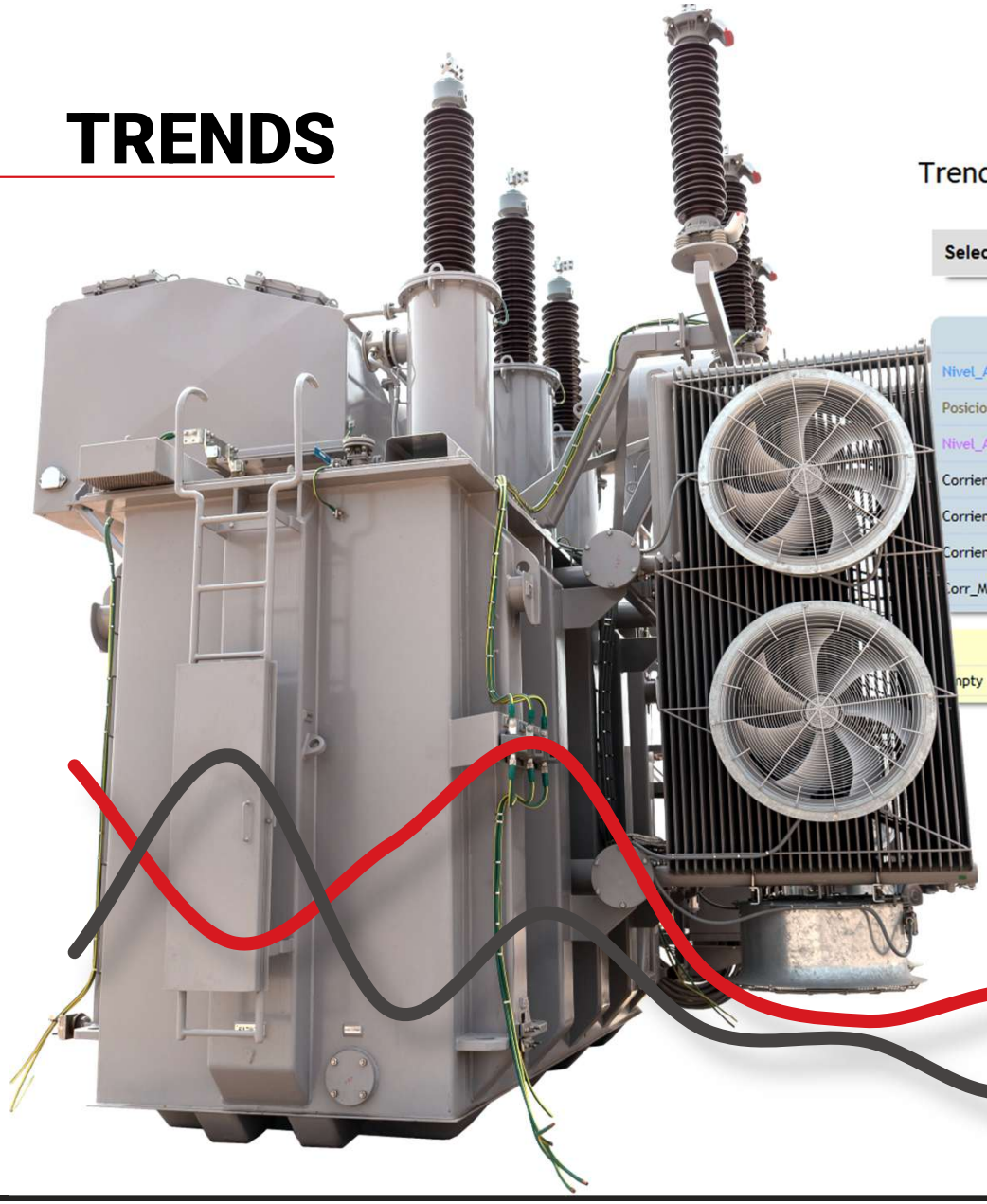
ANALYTICS



- Analytics (2)
  - (2) Cooling Monitoring
  - Bank Switching
  - SW Temperature
  - Translife
  - Load Tap Changer
  - Critical Forecast
  - Calculations
  - Power Monitor
  - Moisture in Paper
  - Bubbling Temperature

ALGORITHM - ..\CATALOGUE\ALGORITHM_QTMS_SMARTSUB_6.1.2024.xlsx

TRENDS



Trending — General Status Center

Please select one or more signals for trending chart display OR
Select a new dashboard tab for list of new signals from "Select new tab".

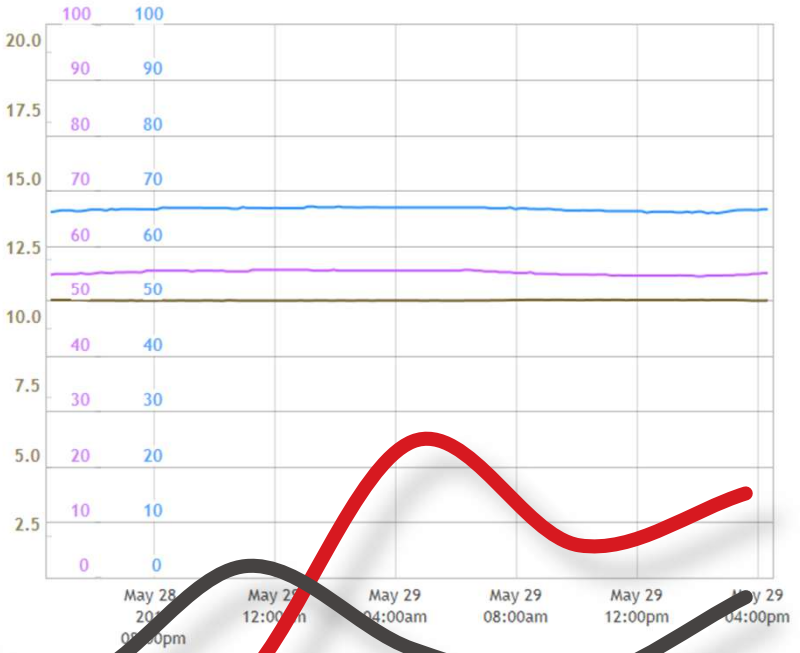
Select new tab

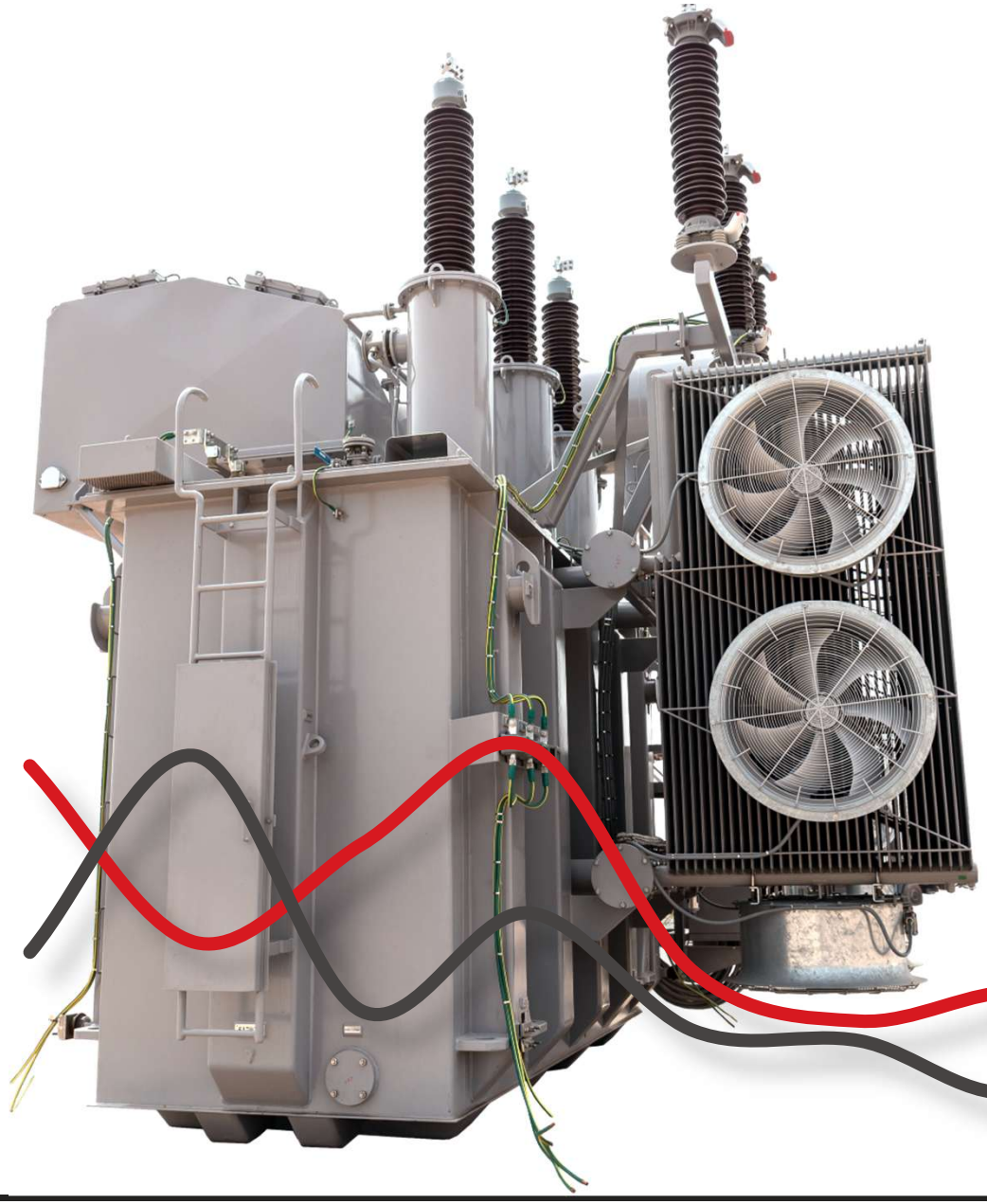
General Status Center		
Nivel_Aceit_OLTC	66.6 %	☑
Posicion_OLTC	11 Pos	☑
Nivel_Aceit_Traf	55.2 %	☑
Corriente_Dev-AT	0.04	☐
Corriente_Dev-BT	0	☐
Corriente_Dev-TT	0.28	☐
Corr_Motor_OLTC	0.02 Amp	☐

Additional Signals

Empty

☐ Points Scale: 3h 1d 1w 1m

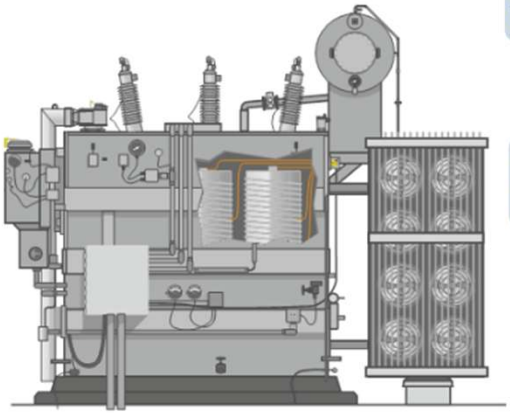




Bushing System	HV	LV
H1, capacitance	0 pF	
H1, tan delta	-173.5 %	
X1, capacitance	0 pF	
X1, tan delta	-3.15 %	

General Status Center	
TEMP ACEITE SUP	52 °C
TEMP ACEITE INF	35.1 °C

Conservative Tank Status	
NIV ACEITE TRAFO	73.2 %
NIV ACEITE LTC	46.9 %
POS LTC TR-86, tap position	10



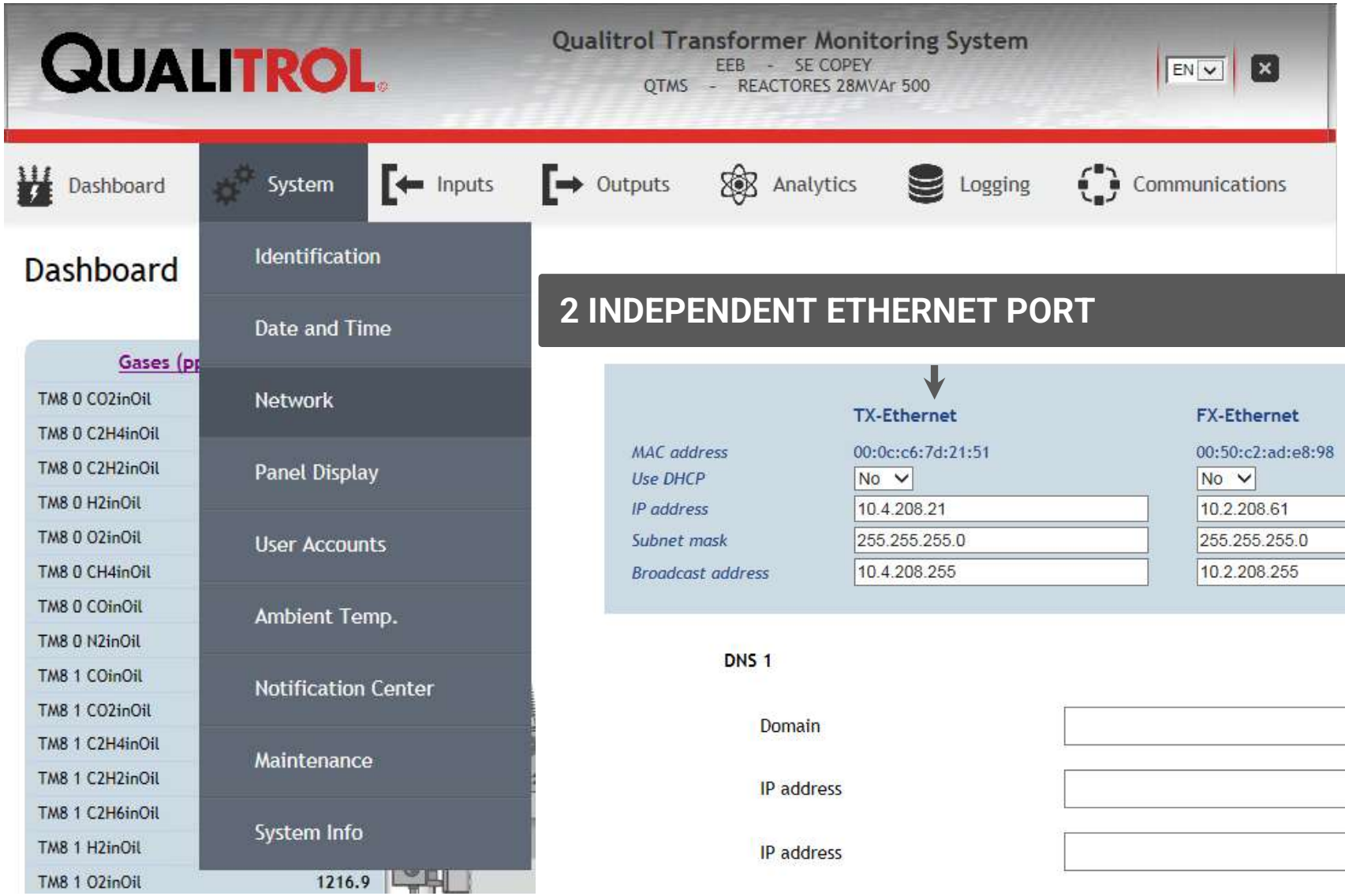
Gases (ppm)	
TM8 0 CO2inOil	148.7
TM8 0 C2H4inOil	0
TM8 0 C2H2inOil	0
TM8 0 C2H6inOil	0
TM8 0 H2inOil	0
TM8 0 O2inOil	1989
TM8 0 CH4inOil	0
TM8 0 COinOil	46
TM8 0 Moisture	2.5 ppm

Cooling Systems	
VENTILADOR ETP1	0
VENTILADOR ETP2	0

Temperature
Empty

Transformer Power	HV	LV
Empty		

DASHBOARD



2 INDEPENDENT ETHERNET PORT

	TX-Ethernet	FX-Ethernet
MAC address	00:0c:c6:7d:21:51	00:50:c2:ad:e8:98
Use DHCP	No	No
IP address	10.4.208.21	10.2.208.61
Subnet mask	255.255.255.0	255.255.255.0
Broadcast address	10.4.208.255	10.2.208.255

DNS 1

Domain	
IP address	
IP address	

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THANK YOU

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