

Transformer OLTC Fault gas Detection & Monitoring



The OLTC Fault Gas Monitoring unit provides early detection of faults in natural breathing on-load tap changers by continuously monitoring hydrogen, methane, ethane, ethylene, moisture, and gas pressure to support timely maintenance and asset evaluation



www.powerview-energy.com

OLTC Fault Gas Monitoring

🕒 Multi Fault gas detection

Detection of Hydrogen ,Methane, Acetylene Ethane, Ethylene for fault detection and classification plus moisture

✅ Easy installation and powerful software for data analysis

Less than 1 hour installation, ultra long-range wireless communication and most advanced software

📄 Description

The OLTC Fault gas monitoring is an early fault detection and monitoring unit which is designed for natural breathing On load tap changer to prevent serious faults in the earlier stage , plan outage and repair and evaluate asset condition It is capable of monitoring hydrogen gas generation, methane generation, ethane and ethylene moisture and complete gas pressure

🔍 Gasses formation

Gases in oil are created by breaking the molecular bonds of oil molecules caused by electrical stress, partial discharges, hot spots, oxidation, decomposition of insulation, etc.). Molecules of insulating oil in high voltage equipment break down under the influence of the thermal and electrical stresses to produce gases

In OLTC Hydrogen (H₂) is generated by partial discharges, arcing and in normal service caused by stress from electrical field,

Acetylene (C₂ H₂) is generated by arcing. Methane (CH₄) is generated at higher temperatures though generation starts at relatively low temperature (approx. 150 °C). Ethylene, (C₂ H₄) is generated by higher temperatures (300 °C and higher). Ethane (C₂ H₆) is also generated by higher temperatures (300 °C and higher).

In non vacuum type Acetylene and hydrogen are normally generated between switching operations but Methane , ethane and Ethylene are generally indicating thermal fault . In the arching spot the center temperature can reach thousand degrees Celsius. The oil molecules on this spot are totally degraded. After finishing of the arching molecules are regrouped and hydrogen and acetylene are the bypass product. Few millimeters from the plasma arch the temperature reduces. This relation between the gases is constant if the gases are generated by the arcs only. If there is another source of thermal fault gases, such as an overheated contact, the relation will change, and a fault can be detected in an early stage before any severe faults occur.

Gas generation in Vacuum types is extremely small compared to non-vacuum types since the main gassing source, the arc, is isolated in the vacuum interrupters. Only sparking from commutating contacts and heating from transition resistors and, for some types, also change-over selectors produces gases. This makes also faults such as arcing and high PD-levels possible to detect. Overheating will also be possible to detect at an earlier stage.

📶 Ultra long wireless communication And low power consumption

Wireless communication at ultra long range of several tenths of kilometers



📊 Measurement Technology

Generally, fault gases are normally present in some levels in OLTC (due to arching). Increased gas generation above limit thresholds is generally related to oil is imposed to excessive electrical and thermal stress (due to evolving fault). As the fault generation accelerates more gasses are released. Some small portion of the gases gets dissolved in the oil (depending on the oil solubility coefficient).

There complete installation can be completed in couple of hours without any permanent modifications of the OLTC tank.

After the mechanical installation, the system can be easily integrated in a central monitoring. The sensor can be powered form network or batteries which should be replaced every 5 years, The monitoring is completely wireless, and no cable installations are necessary for power supply or data communication .

The system was designed to operate at extremely cold and warm environments and is shock and vibration resistant.

Fault Gas Early Detection & Monitoring



Alarms, notifications and reporting

Fully customizable alarms , email and SMS notification and trending



Technical specification



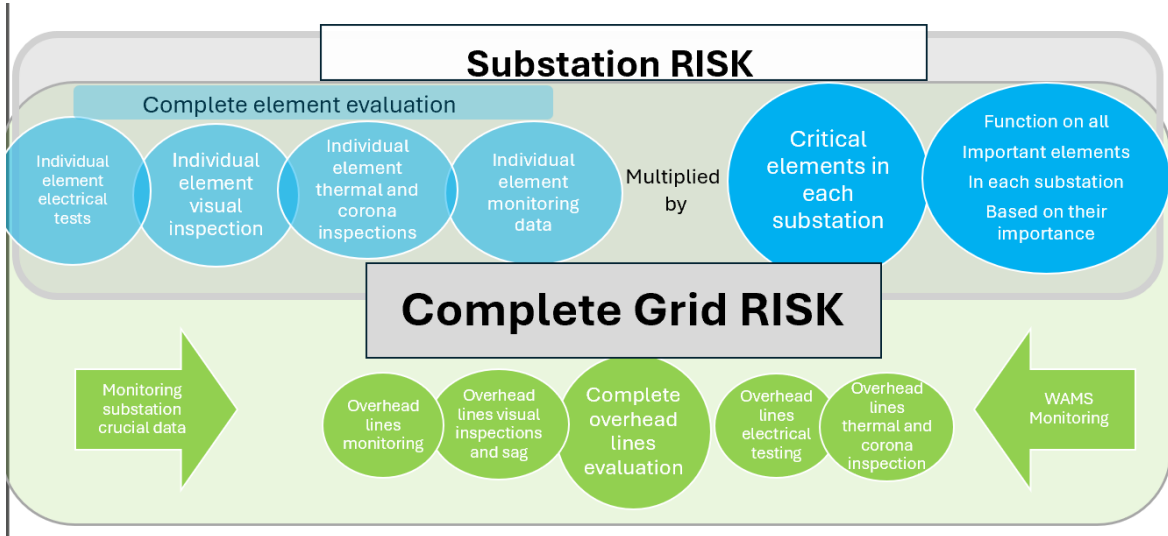
Low ownership smart substation integration

Cheapest ownership cost and installation due to ultra low power consumption and wireless communication.

Most advanced reporting and communication protocols

Detection and measurement range H2	Up to 40000 ppm
Detection and measurement range Methane	Up to 50.000 ppm
Measurement range Ethane and Ethylene	Up to 30.000 ppm
Accuracy	±5 % of range for H2 and methane and , ±10 % of range for Ethane / Ethylene
Min resolution	±50ppm
Minimum detection limit	50 ppm _v
Cross sensitivity	No cross sensitivity to T, P and RH
Response time	20 sec
Warm-up time	5 sec
Total gas pressure monitoring range	gas Sensor with moisture and pressure analyzer
Operating temperature (electronics)	-40 ... +70 °C
Storage temperature	-50 ... +80 °C
Operating humidity	0 ... 100 %RH, condensing
Pressure tolerance	80-120 HPa
Power supply	Batteries 3.5 V
Batteries lifetime with factory settings (1 sample/h)	5 years
IECEX Quality Assessment Report	IEC 80079-34:2018
ATEX Quality Assurance Notification	2014/34/EU
RoHS (2 & 3) Compliant	2011/65/EU & 2015/863
China RoHS Compliant	SJT/T 11363 & 11364
REACH Compliant	EC 1907/2006 (33 & 67)

Software for monitoring asset management , risk assessment , complete inspections analysis and grid digitalization

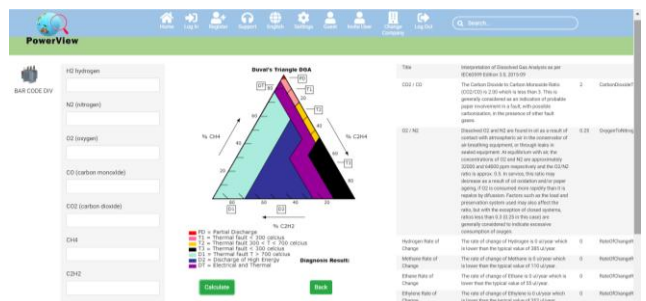


Comprehensive risk = \int all elements (electrical test + visual + thermal + monitoring) + corona inspection + overhead lines \int (electrical test + visual + thermal + monitoring) + WAMS + other substation monitoring data

Risk assessment and automated asset Diagnostics

Risk assessment and digitalization of all data includes analysis and manages all substation data such as electrical tests, monitoring, visual and thermal inspections for the most comprehensive asset assessment. It includes trending each individual parameter of the Electrical tests and analyzing the results of electrical tests performed on each element (comparing them with preset editable limits) depending on the element characteristics (like voltage level, type of insulation media etc.). It also includes managing of all other types of inspections and analyzes all the possible monitoring values (and compares to preset editable limits). Predictive maintenance stands for knowing your high voltage assets condition while it is still in service. Smart substation maintenance is based on smart decisions. Smart decisions are based on individual elements condition holistic evaluation (monitoring electrical tests and other inspections such as thermal and corona). This kind of evaluation of your substation results in asset performance at its optimal maximum with minimum downtime. Comprehensive risk assessment means analyzing all important parameters in advance so actions can be taken at the optimal timing with minimal. repair and downtime costs .

The test reports and inspections data are processed and automatic results analysis is performed with recommendations using artificial intelligence for further tests (if needed) or course actions





Build your digital substation



QR codes containing all the relevant data for all electrical elements



True Digital Electrical Substation with all existing substation element real electrical test, visual inspection, thermal and corona inspection and monitoring.



Substation Digital is integrated smart substation maintenance web application for digital HV asset management , risk assessment, inspections management , electrical tests management, processing and automated analysis according international standards and records keeping. A wireless maintenance Scada is also integrated in the app capable of connecting more than 1000 existing monitoring devices with alarms distribution . The app also features notification and access management for all elements. Everything can be arranged digitally as existing originally in HV substations. The features are also available as IOS and Android mobile app . The application functionalities are being divided as electrical tests, monitoring , visual, thermal and corona inspection on a cloud platform or on premises installation . This application allows power and big industrial companies to set up a virtual substation, assign authorizations within the company (staff can have different authorizations similar to the ones they have in maintenance such as: upload electrical tests, analyze tests, change limits, connect monitoring devices, analyze monitoring data, upload visual , thermal or corona status, comments and pictures, arrange meetings, edit inspection lists,

SMART decision making

Access for all the relevant information to the relevant people anytime anywhere. This app makes all information related to substation maintenance, inspections and monitoring available on web and mobile app from server access. This helps decision making , records keeping , information availability and ease of access .

Costs reduction

Cost reduction in monitoring installations, and HV assets life extension.

Down time reduction

The system evaluates all the data in a matter of seconds and does the most advanced artificial intelligence analysis and limits comparison to international standards.

The Smart affordable wireless monitoring enables commercially viable monitoring on all relevant parameters on one platform irrelevant of the equipment manufacturer with integrated alarms and notifications with single click and virtual intelligence data evaluation



Cloud digital substation



True Digital Electrical Substation with all existing substation element real electrical test, visual inspection, thermal and corona inspection and monitoring and asset monitoring Issues history



The first system offering one click specific element data upload, the first system which integrates different parameters (electrical, monitoring, visual ,thermal and corona inspections).

Electrical tests

This software can directly import test reports from existing manufacturers, process the test reports and analyze test results and compare to preset limits against international standards. For each element there is a complete list for all possible electrical tests created according nameplate information (example voltage category , vector group and connections type etc) . All tests are divided depending on importance and the system only trends ones that user actually tests.

Special algorithms do most accurate temperature correction of the results and on import results from test reports. The software automatically compares all test results against international standards recommendations , rate of change limits , testing intervals performs risk assessment and automatically suggests further tests (if necessary)

Results upload permissions are arranged in the most natural way and are editable by account administrator.



Integrated diagnostic tools



Integrated automatic element analysis And data evaluation



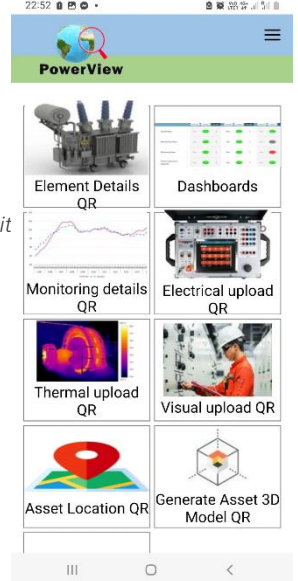
Preset editable lists for visual, thermal and corona and electrical tests



Integrated 3rd party limited or unlimited substation data analysis

Mobile app

Complete substation maintenance application software with all electrical tests with diagnosis , all inspections and wireless monitoring cloud SCADA with diagnosis for complete reliable HV asset risk assessment





PowerView Electrical Tests - Transformer TR1

PowerPlan electric tests	Temp	Test Results	Test Field 2	Test Conditions	Value with Temp correction	Trend	Test Files	Alarm Status	Percent in Relation to ROC Alarm	Percent in Relation to Limit Alarm	Test Field 2 Alarm Status	Percent in Relation to ROC Alarm	Percent in Relation to Limit Alarm
Insulation resistance test	C												
HV to LV	1.5	Gi		5000V	1.5GΩ			LIMIT 1	89%	65%	N/A	0%	0%
HV to E	2.3	Gi		5000V	2.3GΩ			LIMIT 1	0%	42%	N/A	0%	0%
LV to E	1.9	Gi		2000V	1.9GΩ			LIMIT 1	53%	51%	N/A	0%	0%
HV + LV to E	1.7	Gi		5000V	1.7GΩ			LIMIT 1	20%	57%	N/A	0%	0%

Tan delta test	Temp correction	Temp Value	Test Results	Test Field 2	Test Conditions	Value with Temp correction	Trend	Test Files	Alarm Status	Percent in Relation to ROC Alarm	Percent in Relation to Limit Alarm
CHG + CHL		20	0.54	%	10000V	0.6%			LIMIT 2	33%	20%
CHL		20	0.33	%	2000V	0.3%			LIMIT 1	33%	66%

 **Combined monitoring view on all existing elements**

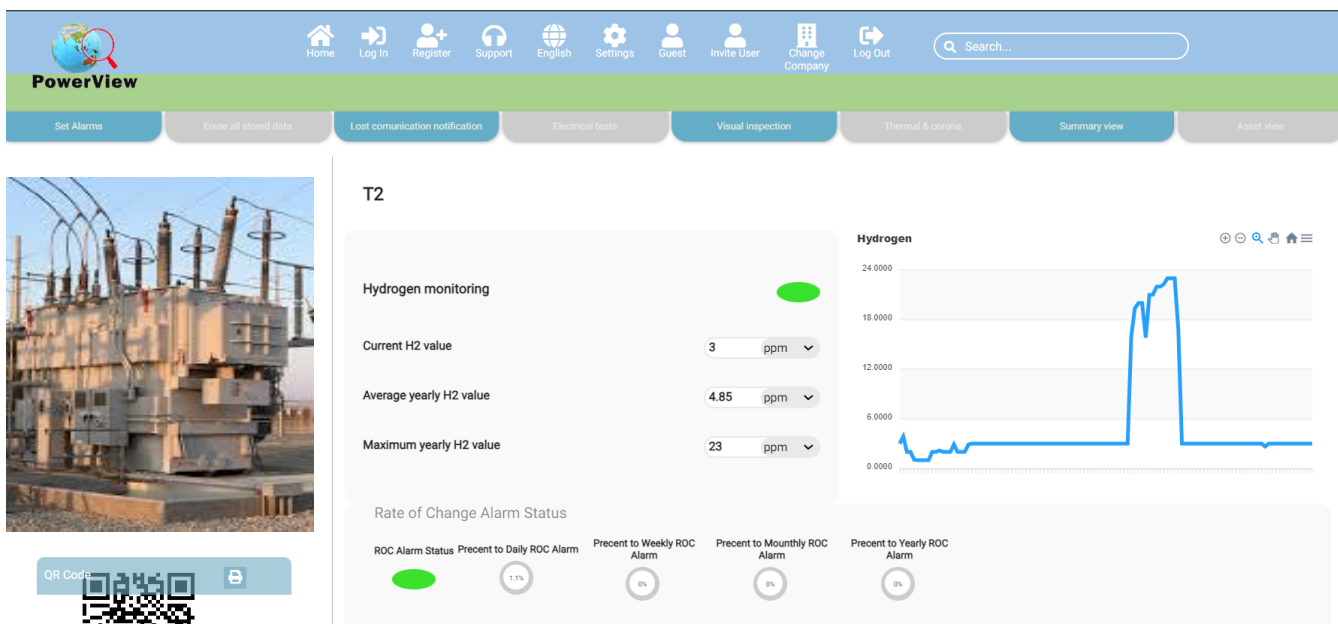
 **Simple 3 step monitoring connection in less than 10 minutes**

 **Monitoring integration of more than 1000 existing monitoring devices from various manufacturers such as ABB, Siemens, Iris POWER, Doble, POWER VIEW with alarms integrated**

 **Simple notification divided by elements**

 **Types, type of inspection, Editable, access list and online monitoring meeting platform**

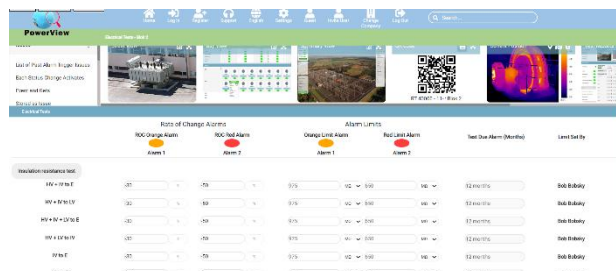
 **Most advanced integrated power grids evaluation monitoring reporting, management and remote support solution**



The screenshot shows the PowerView software interface. At the top is a navigation bar with icons for Home, Log In, Register, Support, English, Settings, Guest, Invite User, Change Company, and Log Out. Below this is a search bar. The main dashboard area has several tabs: Set Alarms, Erase all stored data, Lost communication notification, Electrical tests, Visual inspection, Thermal & corona, Summary view, and Asset view. The 'Visual inspection' tab is active, showing a large image of a power transformer. To the right of the image is a 'Hydrogen monitoring' section with a green status indicator and three input fields for 'Current H2 value' (3 ppm), 'Average yearly H2 value' (4.85 ppm), and 'Maximum yearly H2 value' (23 ppm). Below this is a 'Rate of Change Alarm Status' section with four circular indicators for 'ROC Alarm Status', 'Precent to Daily ROC Alarm', 'Precent to Weekly ROC Alarm', and 'Precent to Monthly ROC Alarm', all showing 0%.

Limits

Preset limits are assigned in the software for each element type according International standards (having in mind elements nominal characteristics such as operating voltage, type of insulation, connection type etc.) These limits are automatically assigned to each new element. Users with adequate permissions can edit these limits. There are several million different models (with different limits which can be assigned to an element.



The screenshot shows a table of alarm limits in the PowerView software. The table has columns for 'ROC Change Alarm', 'ROC Red Alarm', 'Change Limit Alarm', 'ROC Limit Alarm', 'Test Due Alarm (Months)', and 'Limit Set By'. The table contains several rows of data for different equipment types and their associated alarm limits.

	ROC Change Alarm	ROC Red Alarm	Change Limit Alarm	ROC Limit Alarm	Test Due Alarm (Months)	Limit Set By
Insulation resistance test						
IR > 10 MΩ	0.01	0.05	0.05	0.05	12 months	Bob B.obby
IR > 10 MΩ	0.01	0.05	0.05	0.05	12 months	Bob B.obby
IR > 10 MΩ	0.01	0.05	0.05	0.05	12 months	Bob B.obby
IR > 10 MΩ	0.01	0.05	0.05	0.05	12 months	Bob B.obby
IR > 10 MΩ	0.01	0.05	0.05	0.05	12 months	Bob B.obby
IR > 10 MΩ	0.01	0.05	0.05	0.05	12 months	Bob B.obby

This software can also integrate and communicate with big number of existing monitoring devices. This was particularly important for users that already have monitoring equipment from different manufacturers. The software was developed in a way which made it possible for them to continue using the equipment that they already use .

SUBSTATION DIGITAL

Complete substation maintenance application software with all electrical tests with diagnosis , all inspections and wireless monitoring cloud SCADA with diagnosis for complete reliable HV asset risk assessment



Thermal and corona inspection
With history, comparison, meeting options, comments, predefined inspection lists and recommendations
due, alarming and meeting options .



Mobile application for IOS and Android



Direct thermal pictures upload from existing thermal and corona cameras .



Visual inspection

A smart visual inspection app (integrated into the web app and mobile app) offers users the ability to keep track of visual inspection , and integrate the data into the asset records. With simple QR code scan user can directly upload a picture , change status and report an issue for visual inspection directly from the field . This application has dynamic preset editable list of visual inspections for each particular HV element in relation to it's nameplate (such as voltage level insulation type etc) . There is also help for each inspection which guides operators with suggestions and recommendations.

Monitoring

Centralized wireless monitoring, data management alarms and notifications. This feature currently integrates over 1000 different commercially available monitoring units from different manufacturers into the software. The wireless electronic devices communication includes one router which covers the entire substation and reads data from up to 1000 devices installed in the substation (area of several square kilometers).

This dramatically reduces expensive installations from several thousand EUR per unit to several hundred of thousand EUR per unit in terms of shielded cabling, expensive SCADA RTU's, and installation costs and reduces waist.

Thermal and corona inspection

A smart thermal and corona inspection app (integrated into the web and mobile app) offers users the ability to keep track of thermal and corona inspection and integrate the data into the asset records. With simple QR code scan user can directly upload a picture, change status and report an issue for thermal and corona inspection directly from the field.

This application has dynamic preset editable list of visual inspections with help for each particular HV element in relation to it's nameplate (such as voltage level insulation type etc) . There is also help for each inspection which guides operators with suggestions and recommendations.

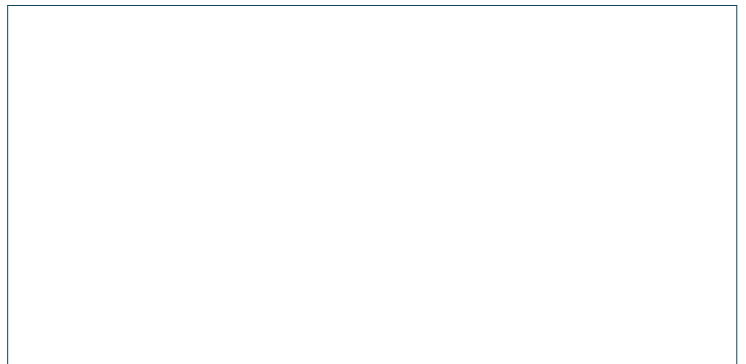




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