

FALCON

Medium Voltage
Partial Discharge
Monitoring

TECHIMP

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Advanced testing and monitoring solutions

Medium Voltage Partial Discharge Monitoring

FALCON is representing the latest state of the art technology for partial discharge monitoring (PDM) of MV assets, combining proven and patented technology from HV asset monitoring with economic requirements. FALCON is acquiring and processing high frequency PD signals locally detected by the sensors to which it is connected, whether inductive (HFCT), capacitive (TEV).



Main Features

- Application: RMU, MV Switchgears, MV Cables and Motors
- Using proven technology from HV (patented T/F Map technology, Web Application, etc.)
- Compact and fully standalone unit with onboard computing power and data storage
- Ultra-wide bandwidth acquisition system
- Built in trend analysis with alarm warning based on T-F map
- Web browser interface
- Remotely and locally configurable
- OPC-UA IEC 62541 built in protocol
- Easy installation and commissioning
- Automatic configuration (Auto-setting) or individual settings
- Daisy chainable (LAN and Power)
- Traffic light alarm response considering Qmax and trending

APPLIED STANDARD

Standard	Description
93/68/EEC	CE Marking Directive
2014/30/EC	IEC 61326 (EMC) Electro Magnetic Compatibility
2014/35/EC	IEC 61010 (LVD) Low Voltage Directive
IEC 60068-2-6	Environmental testing - Test Fc: Vibration (sinusoidal)
IEC 60270 IEC 60034-27 IEEE 1434-2014	High-voltage test techniques - Partial discharge measurements Deviation: Magnitude of the apparent charge is measured in mV

General Characteristics

FALCON provides an economical solution for continuous monitoring of partial discharge in Medium Voltage equipment that allows to determine the deterioration of the insulation and thus, the eventual worsening of the health condition of the electrical asset before fatal breakdown.

FALCON proposes a novel approach to the continuous monitoring of the PD phenomena occurring on an integrated network of Medium Voltage equipments. Such approach is implemented by addressing the solutions to the requirements of the Medium Voltage grids in terms of non-invasive, low cost and fully automatic PD data acquisitions and elaboration, with the relevant assessment of the conditions of the Medium Voltage equipment. With onboard computing power and data storage combined with a web-browser interface, the unit can be reached from anywhere in the network allowing to analyze PD data and historic trends with very low data traffic.

Easy installation and auto-setting reduces significantly installation times.

FALCON provides automatic acquisition and elaboration of PD data, as well as automatic noise rejection and the recognition of the increasing PD trend.

FALCON incorporates patented T/F-map technology. The hardware as is provided with ultra-wide bandwidth acquisition system, which collects both PD pulse peak and phase, as well as PD pulse waveforms. The pulse waveform allows the information coming from the pulse shape to be employed. Per each acquired pulse the acquisition unit automatically calculates its time and frequency content, building the so called "T-F map". Each point of the "T-F map" corresponds to a point in the PRPD (Phase Resolved Partial Discharge) pattern and represents the equivalent time-length and the equivalent-frequency of the detected pulse. So the map shows groups of pulses ("clusters") characterized by same time and frequency content, i.e. homogenous pulses. Spotting groups of homogenous pulses results in spotting different PD sources as demonstrated by the last 30 years research in this field.

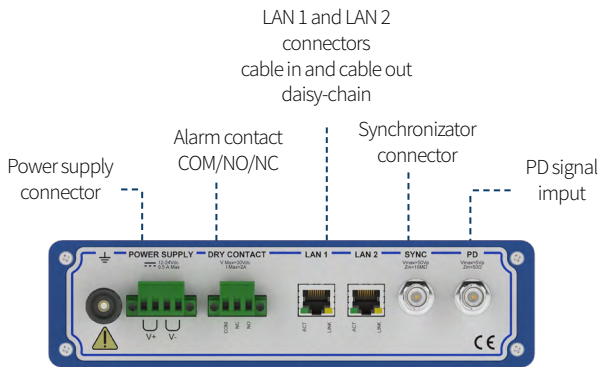
FALCON demonstrates an efficient separation of different discharge activities, including noise rejection, can be achieved through pulse shape analysis and avoids identification to be affected by different phenomena overlapping, as well as noise superposition to real PD phenomena.

Alarms

Alarms are the output of FALCON monitoring activity.

They are constantly evaluated and reported as soon as an alarm situation arises, based on the existing parameters setting. The alarm is sent to the collector, through OPC-UA protocol (IEC 62541). Filtering is made by including or excluding pulses belonging to a defined classification map area from the acquisition. Different algorithms have been defined in order to have effective alarms for various electrical assets and to pick up different partial discharge phenomena with the best accuracy possible.

Pulses per second (N/s) and maximum pulses amplitude at 95th percentile (Qmax95%) are calculated for each PD acquisition. Alarm activation algorithms are based on Qmax95% and N/s hazard simultaneously.



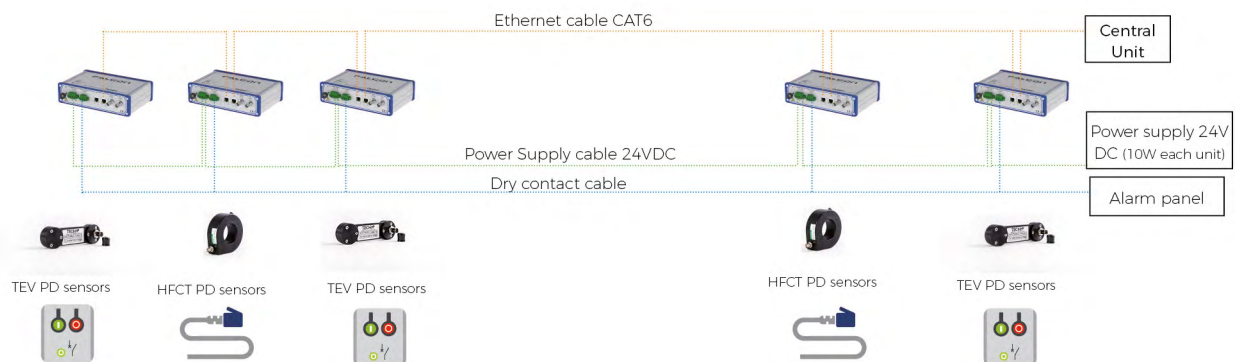
Communication Layout

FALCON allows for two ways of communication:

1. LAN connection with full remote access
2. Dry contact to connect to RTU/Scada for Alarm information

Every instrument can work as standalone device or in case of multiple installations in one site daisy chained for the LAN and power supply. The required Power Supply is 12-24VDC. The dry contacts are switched on or off in accordance with the alarm. If the alarm is present, the contact is switched. This feature can be used to convey all the alarms to a single alarm panel (or annunciator panel).

TECHNICAL SPECIFICATION		
Partial Discharge	PD channel quantity	1
	Bandwidth	16 kHz, 30 MHz
	Sampling frequency at full bandwidth	125 MS/s
	Resolution	12 bit
	Sensitivity	1,10000 mV _{peak}
	Full Scale	5 V _{peak}
	Input impedance	50 Ω
	Pre-trigger	0,100% @ 100 μs
Synchronization input	Channel quantity	1
	Frequency range	5-500Hz
	Input impedance	10 MΩ
	Sampling frequency at full bandwidth	1MS/s
	Resolution	12 bit
Communication system	Ethernet connector type	10/100/1000 Mb/s
		2 LAN ports
Communication protocol	OPCUA - IEC 62541	
	IEC 61850	
	Modbus	
	DNP3	
Power supply	12 / 24 V _{DC} , 1A	
Working temperature	-20°C ÷ +55°C	



HMI

Depending on the customers network configuration, the WEB interface of each individual FALCON unit can be reached from anywhere in the network. It provides:

- Status information of the monitoring system (whether or not there are diagnostic alerts)
- Details of the monitoring object (asset type, electrical characteristics, sensors used, etc ...)
- List of alarm events related to SP activities
- Trend-view of various statistical magnitudes (Maximum Amplitude Qmax, Nw Repeat Frequency, etc ...)
- List of system notifications (malfunction, interrupted communication, etc ...)
- Set up functions for network configuration, alarm thresholds, acquisition intervals, etc.



WEB interface: Trends



WEB interface: Home

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