

# Transformer Bushings Leakage , tan delta, imbalance and capacitance Monitoring

Substation Digital



integrated



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*Pioneering the future of power testing and monitoring*





## Advanced reporting

Most advanced reporting and communication protocols



## Proven BMC technology

The same Bushing sensors and components are used in the SIEMENS Bushing monitoring system, over 5000 units are now in-service.



## Key advantages

- Simultaneous measurement of up to six bushing leakage currents, providing following data:
- Relative capacitance in percentage to the start-up value
- Relative power factor (%PF) for each bushing
- Magnitude of imbalance currents for two three phase sets of bushings
- Phase angles of the imbalance currents
- Alarm in case the measured values exceed the threshold
- Complete on-line transformer monitoring and bushing monitoring system in conjunction with other POWER VIEW products

## Description

Bushing are relatively cheap (comparing to transformer value). Unfortunately, bushings breakdown failure often leads to catastrophic transformer failure like windings deformations. Due to materials imperfection weather conditions and stress bushings are prone to failure. Unfortunately, sometimes that failure escalates very quickly. Historically bushings were tested off-line to measure the capacitance and the dissipation / power factor.

The Bushing BMC Monitor is a permanently installed on-line bushing monitoring system. It continuously measures up to six leakage currents, tests the power factor and capacitance values and monitors the condition of bushings, CCVT's 1) and free-standing CT's. The bushing monitoring system incorporates three measurement modes for standard and two for optional configurations. Standard configuration with 6 current inputs:

- Sum of three current test
- Adjacent phase reference test
- Phase comparison

Optional configuration with 3 voltage and 3 current inputs:

- Reference test (3 bushings and 3 CCVT's 1))

Optional configuration with 6 voltage inputs:

- CCVT 1) Reference test (6 CCVT's 1))

The bushing sensors / adapters are connected to the capacitor taps designed for all types of bushings to allow measurement of the leakage current up to 140 mA AC.



## Bushing monitoring setup

The Bushing Monitoring system POWER VIEW BLC Monitor can be ordered in different versions with 3, 6, 9, 12 or 15 ) bushing sensors according to the specification.

The system contains following parts:

- Bushing sensors with connection cable
- Bushing Monitor Power View BLC including cabinet, power supply, circuit breaker, terminals and wiring
- Communication cable

The adapters are designed for bushings with grounded and un- grounded capacitor taps. The adapter is designed to prevent a voltage developing on the equipment, in case that the sensor becomes disconnected from the bushing monitoring system.



## Technical Specification

Measurements		Accuracy
Measuring quantity	Range	
Leakage current	0 ... 140 mA AC	± 1.5 % of reading
Power factor / Dissipation factor	0 ... 100 %	± 0.045 % absolute
Capacitance	100 ... 5000 pF	± 1.0 % of reading
Phase angle of imbalance current	0 ... 360	± 1.0 % of reading

## Digital outputs

- Bushing sensor - Resistive bridge / capacitive bridge

## Communication

- Standard : Wireless and RS 232 – Screw terminals and RJ45 (Proprietary protocol) Communication interface**

- DNP3 serial or MODBUS® RTU Controller (Option)

- Optional : 4-20mA analog outputs and parallel Scada substation Digital

## Operation principle

- Bushing sensor - Resistive bridge / capacitive bridge

<b>Voltage range: (Bushing primary)</b>	<b>69 ... 765 kV AC</b>
60 Hz voltage: (on the tap at monitoring)	max. 2.5 kV AC
60 Hz voltage: (on the tap at opened or mistakenly cut coax cable)	max. .5 kV AC
Dimensions:	Size is different depending on the voltage
Weight:	approx. no more than 1 kg
Operating temperature:	-55°C ... +90°C, 95 % relative humidity (non condensing)
Storage temperature:	-50 °C ... +55 °C
Installation environment:	Outdoor, no corrosive agents in the air
Type of capacitor tap:	Any manufacturer
Connector to test tap:	¾" / 1 ¼" / 2 ¼" others on request

<b>Supply voltage</b>	<b>85 ... 264 V AC / 47 ... 63 Hz or 120 ... 370 V DC</b>
Power consumption:	Max. 24 VA
Dimensions:	
Cabinet:	Stainless steel 304
3 and 6 channels	W 420 x H 595 x D 153 mm
9 and 12 channels	W 610 x H 686 x D 229 mm
Weight:	
3 and 6 channels	approx. 15 kg
9 and 12 channels	approx. 23 kg
Operation temperature:	-40 °C ... +65 °C
Storage temperature:	-40 °C ... +85 °C
AD converter	16 Bit
Sampling rate	10 kHz
Safety	
Electrostatic discharge:	IEC 801-2



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