

BUSHINGIQ™

BUSHING & LIGHTNING ARRESTER MONITORING

The BushingIQ™ is a continuous monitoring system for transformer bushings and lightning arresters

APPLICATIONS

- PF/Tan δ Monitoring of HV & LV Bushings
- Lightning Arrester Condition Monitoring
- Pollution Monitoring
- Complete Transformer Monitor when Integrated with the TransformerIQ

BENEFITS

- Condition Based Maintenance
- Reduced Risk of Catastrophic Failure
- Scalable Smart Grid Solution
- Safety for Personnel & Assets

The BushingIQ™ performs continuous online bushing monitoring to provide early warning protection and to reduce unnecessary time based maintenance

BUSHING FAILURE MODES

The most common type of bushing failure occurs in the internal capacitive layers. These failures occur slowly over time with one layer failing and burning through the insulation. The BushingIQ™ advanced warning of bushing failure through sensors that detect early changes in the voltage amplitude and phase angle.



MONITORING TECHNIQUE

The BushingIQ™ monitors Power Factor/Tan δ from the bushing C1 Test Tap using algorithms that simulate the Schering Bridge technique, a standard industry method of offline testing. This standard based method provides early warning of a problem bushing. Online tests are performed at rated voltage, under load, and in all weather conditions, as opposed to offline testing which is performed at 10KV when weather conditions permit.



This online test detects internal insulation failures or external issues such as surface contamination due to pollution. The condition of the bushing is displayed on a 0-100% scale indicating changes in the Power Factor/Tan δ .

COMMUNICATIONS & DATA INTERFACE OPTIONS

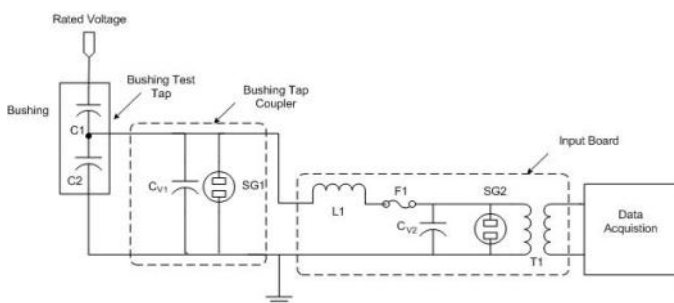
Access to the BushingIQ™ may be obtained on-site or remotely. The system can also interface to an existing SCADA system.

Communication options include:

- LCD Touch Panel Display
- Hardwired or Wireless
- IEC 61850
- DNP3
- pcAnywhere™
- Windows RDP
- RJ45 Ethernet Interface
- Serial Interface (ASCII)

BUSHING TAP SENSOR

The Bushing Tap Sensor forms a capacitive voltage divider between the operating voltage and the capacitance of the bushing. This sensor protects the test tap with quad redundant protection by using the voltage divider capacitors and two spark gaps. The sensor measures the condition of the bushing's insulation by using Phasor Values to compute Power Factor.

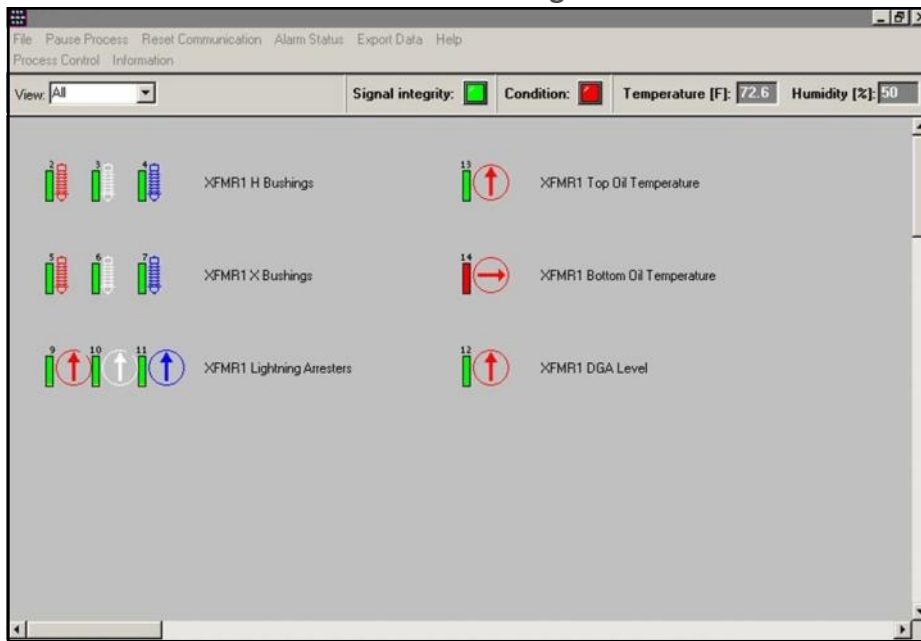


With over 14 years of field experience and thousands of installations, the BushingIQ™'s sensors and predictive algorithms have been tested and proven worldwide

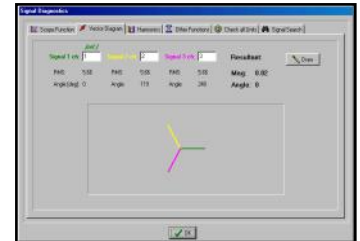
UNIQUE ALGORITHMS

The system's trending algorithms provide early warning of changes to bushing insulation quality. The Condition Value of each bushing is calculated by trending the Power Factor/Tan δ measurements in combination with comparative changes from the sampled set of bushings. The condition value is displayed in an intuitive Green, Yellow, or Red status indicating the level of risk for each monitored bushing. When compared to other methods of bushing monitoring, such as the current sum method, The BushingIQ™'s algorithms provide the most accurate and earliest indication of the condition of the bushing's insulation integrity under all weather and environmental conditions.

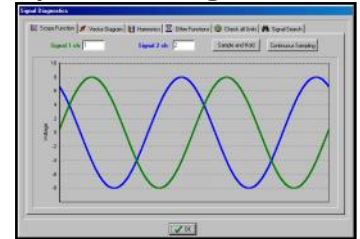
Condition Monitoring Screen



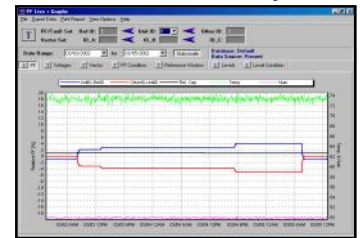
Vector Diagram Diagnostic Tool



Scope Mode Diagnostic Tool



Power Factor/Tan δ Graph Screen



Technical Specifications

Input Power	85—240 AC 50/60 Hz or 85 - 240V DC
Signal Inputs	
Bushing Monitoring Channels	9 AC Max (3 per AC Inputs Board)
Input Impedance	50 Ω (< 1 kHz)
Signal Input Mode	Differential
Maximum Full Voltage	\pm 60V rms
Isolation Between Inputs	3000 V
Surge Withstand	ANSI/IEE C37.90.1—1989 IEC 254
Analog Input Channels	8 (with Optional Sensor Board)
Signal Outputs	
Isolated Alarm Contact	6 Contacts, Max DC 200V, Max Current DC 1 Amp.
Digital to Analog Channels	2 (12 Bit Channels), \pm 5, 0-5V or 0-10V Range
Enclosure	NEMA 4 (optional NEMA 4X)
Dimensions	20" x 16" x 8" (49cm x 40.64cm x 20.32cm)
Weight	45lbs (10.45Kg)

Power Supply	Isolated Supply to Cabinet 110/220 V AC, 50/60 Hz, 40W
Environment	
BTC & Interface Cabinet	-55° C to +65° C
Humidity	0-95% non-condensing
Pollution	1°
Interface	Serial Port; 4 RS232/RS 485; 1 RJ45 Ethernet
Optional Interface	IEC 61850 ; DNP3
	Wireless 2.4GHz, Spread Spectrum, Freq. Hopping Comms
	Touch Panel Display
Sensor Cable	Single STP to Overall Bundles
Rated	2kV AC insulation Levels (Belden 1039A)
Min. Shield/Drain Gauge	>0.7 mm ² (Single) ; >1.0 mm ² (Overall)
Min. Core Gauge	>0.7 mm ²

SMART GRID SOLUTIONS SINCE 1974

Innovative and Practical Technology

From our early history of implementing novel features such as continuous sampling and adaptive sensing to countering industry conventions of hard-wiring equipment with wireless solutions instead, GridSense™ has always provided unique answers to utility problems.

Tested and Proven Offerings

GridSense™ has thousands of devices embedded within the networks of hundreds of utilities worldwide. Through rugged design and construction the company has developed reliable products that meet the rigors of utility requirements and the environment.

Cost-effective Solutions

The total ownership cost of a monitoring system with respect to the underlying asset being monitored is always important. By embedding superior functionality relative to price and by reducing the cost of implementations which includes support, installation and service time, GridSense™ is able to bring distribution automation to the smallest utility assets.

Rapidly Deployable and Scalable Systems

GridSense™ products are designed for quick, safe and easy deployment typically without the need for planned outages. Modular solutions can be implemented over widespread areas as monitoring needs expand over time and assets age.

Intelligent Solutions for the Grid

LineIQ™

Intuitive system providing wireless monitoring, analysis, and display of overhead circuits to 138kV



TransformerIQ™

Comprehensive Monitoring system for vault, distribution, and substation applications



PowerMonic™

All-weather and rugged power quality disturbance analyzer for enabling safe and high resolution inspection of energized equipment



BushingIQ™

High voltage on-line bushing, CT and lightning arrester monitor



LiveLine™

High Voltage Inspection Camera which wirelessly streams high resolution images or video of energized equipment



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