MSense® BM
ETOS® Bushing Monitoring
Online Monitoring for High-Voltage Bushings.

www.reinhausen.com
MSENSE® BM & ETOS® BUSHING MONITORING.

MSENSE® BM & ETOS® – the solution for all conditions

Hardware/software building block in the control cabinet
- MSENSE® BM as the single solution based on ETOS® technology
- Bushing monitoring as a modular function of ETOS®

Bushing adapter
- Detection of the measured voltage at the test tap of the bushings
- Adapters available for all common bushing manufacturers and types
- Protection class IP66

Bushing coupling unit
- Adjustment of the measured voltage (measurement capacitor)
- Protection class IP66
- Elimination of vibration problems in operation

Simple and secure system integration

MSENSE® BM & ETOS®
Data aggregation and interpretation, limit values, events, recommendations for action

Secure communication to the control center via standard protocols, e.g. IEC 61850

Access via standard browser
 Detect errors in good time

According to CIGRÉ, 17% of all transformer failures and approximately 50% of all transformer fires can be traced back to defective bushings. In the worst case, this results in total breakdown.

Offline measurement procedures check the state of the bushing during shutdown and with long intervals between checks.* Any damages and accelerated aging processes arising in the meantime remain undetected and can cause severe damage to the assembly.

Online monitoring: Reliable and continuous

MSENSE® BM & ETOS® provide protection against transformer failures without incorrect tripping events. The system monitors the state of the bushings using the so-called double-reference method. This consists of the patented MR 2/3 reference algorithm in combination with the reference voltage method.

The innovative and field-tested algorithm from MR always compares the values of the bushings in pairs. Deviations from the reference value are therefore highlighted very quickly. Environmental influences (sun, rain, snow and wind) and operational management influences (grid asymmetries, overload and overvoltages) are eliminated. This is because only those changes that truly indicate aging of or damage to the bushings are recorded.

The MSENSE® BM & ETOS® system ensures efficiency, operational reliability and plannable maintenance.

* The CIGRÉ Working Group A2.34 recommends an offline inspection of the bushings just once every six to eight years.
**MSENSE® BM-C**

**ETOS® BUSHING MONITORING.**

**CAPACITANCE.**

Condition evaluation based on capacitance changes

**MSENSE® BM-C & ETOS® bushing monitoring Basic** evaluates the state of the bushings based on capacitance changes. Sparkovers at the partial capacitances or damage to and aging of the internal insulation lead to a change to the capacitance. The system issues these changes as a warning or alarm to the control center.

**Recommendation:** This method is suitable for grid structures that are generally stable.

- Comparison of capacitance $C_i$ of the bushing with a precision capacitance $C_M$ through highly accurate voltage measurement
- $C_M$ is defined specifically for each application

Changes to the capacitance indicate:

- Sparkovers at the partial capacitances
- Damage to the internal insulation (aging, partial discharge)

Online monitoring guarantees high-level operational reliability, efficiency and plannable maintenance
MSENSE® BM-T
ETOS® BUSHING MONITORING.
CAPACITANCE and TAN δ.

Condition evaluation based on changes to the capacitance and dissipation factor

MSENSE® BM-T & ETOS® bushing monitoring Pro monitors the condition based on the capacitance and the dissipation factor (tan δ). Changes to both values indicate partial breakdowns and damage to the internal insulation. Here too the superordinate system receives a warning or alarm.

Recommendation: This method is suitable for critical applications in combination with expected grid asymmetries. The evaluation of the reference voltage eliminates additional influencing factors.

- Comparison of capacitance $C_1$ of the bushing with a precision capacitance $C_0$ through highly accurate voltage measurement
- Additional analysis of the dissipation factor (tan δ)
- Based on the calculated current vector from the reference voltage ($U_{ref}$)

Changes to the capacitance and dissipation factor indicate:

- Sparkovers at the partial capacitances
- Damage to the internal insulation (aging, partial discharge)
- Damage to the conductor and the mechanical structure
- Heavy surface soiling

The patented MR algorithm eliminates operational and environmental influences

The 2/3 reference algorithm from MR compares each of the bushings in pairs. In this way, only those changes that truly indicate aging and damage are recorded.
MSENSE® BM
ETOS® BUSHING MONITORING.

Highlights at a glance

- Reliable early detection of errors, aging and risks of failure
- Reduced operating costs, plannable maintenance and investment security
- Grid stability thanks to permanent monitoring
- Recommendations for action through targeted analysis of information
- 24/7 MR service