

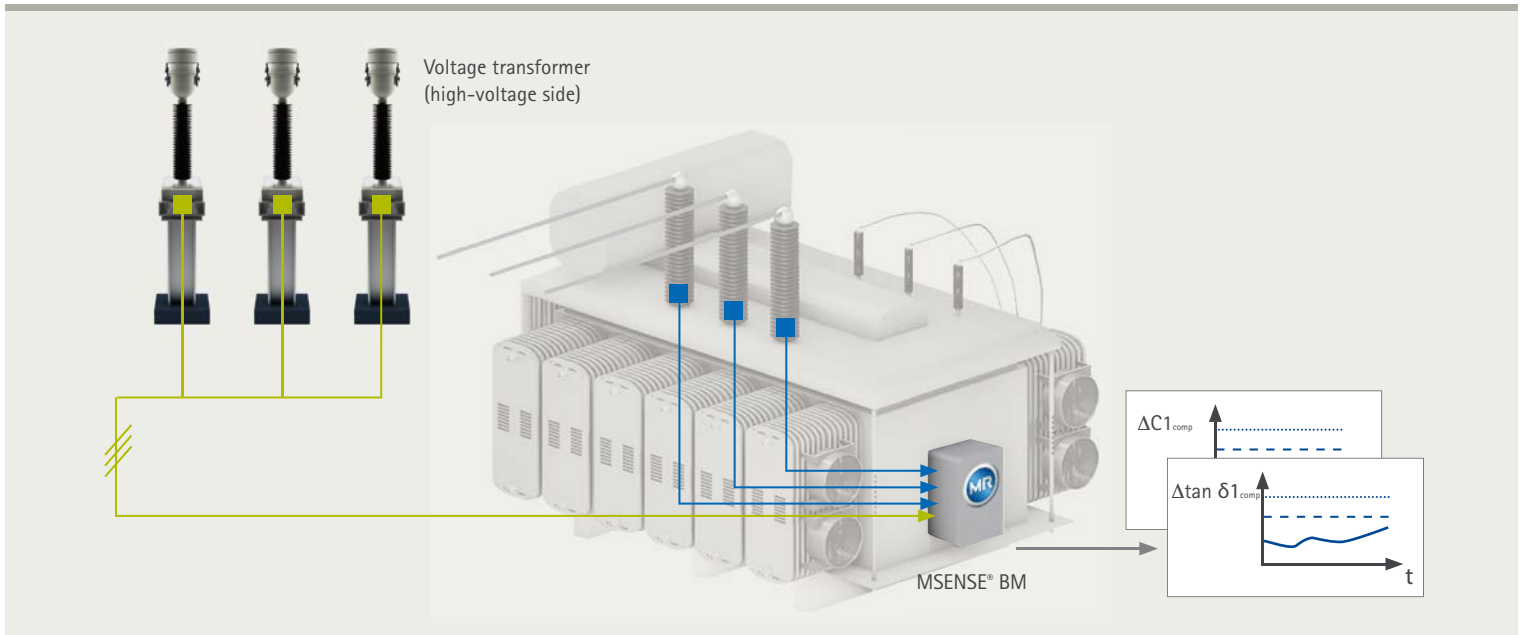


MSENSE[®] BM MONITORING FOR BUSHINGS.

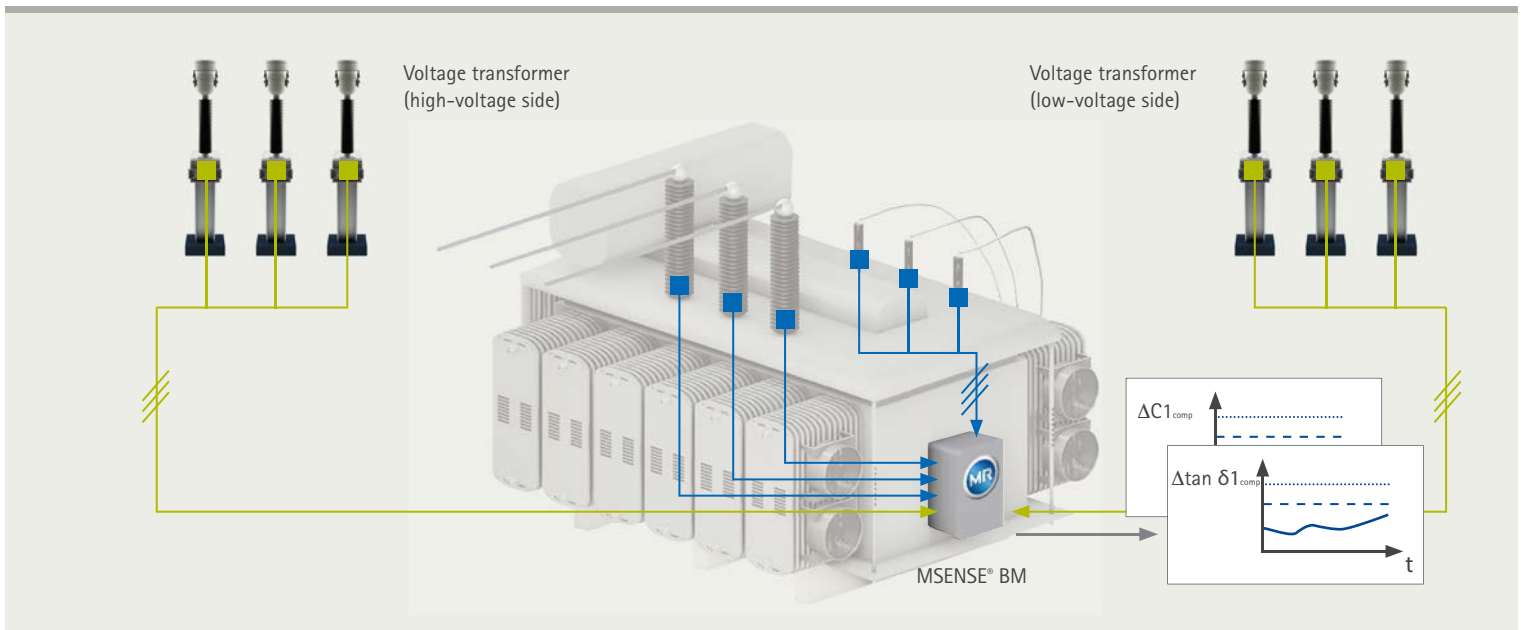
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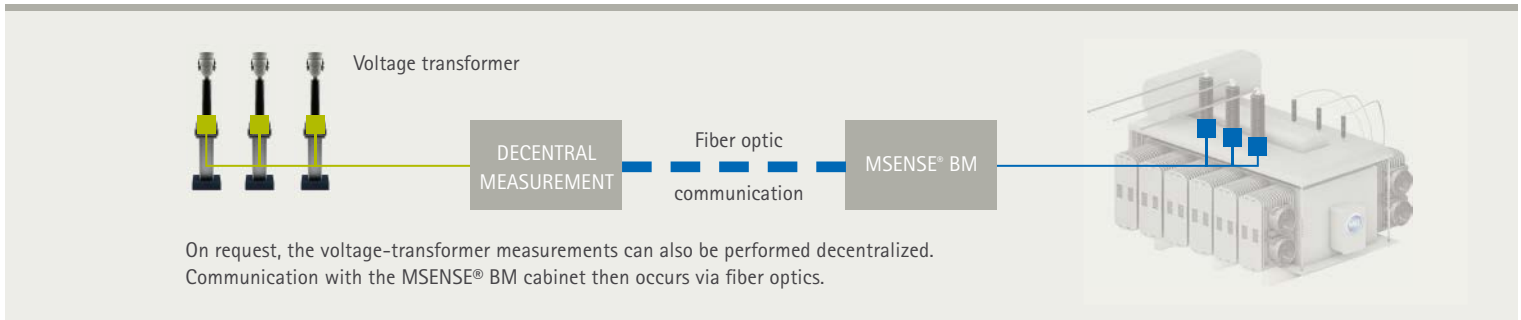
Monitoring of three high-voltage bushings with reference system



Monitoring of three high-voltage and three low-voltage bushings with reference system



Special option



- Voltages at bushings
- Voltages at reference system

RELIABILITY FOR BUSHINGS.

17%* of all transformer failures can be traced back to bushing defects, and are also the main cause for transformer fires. At the same time, the network requirements for availability and reliability of transformers is increasing. Continuous condition monitoring and evaluation of the bushings is therefore imperative. MSENSE® BM enables early detection of bushing errors and therefore allows action to be taken before the transformer is damaged.

*Quelle: Cigre A2.37

For electrical field grading, high-voltage bushings above a certain voltage level are almost exclusively equipped with capacitive grading layers. These are exposed to high electrical, thermal and mechanical loads during operation. Bushing failures can be caused by transient overvoltages, increased temperatures or temperature fluctuations, as well as by the ingress of moisture, which can quickly lead to a failure of the bushing insulation or even to a major transformer failure.

The condition of bushings can be determined through regular time-based diagnostics. Since bushing failures tend to develop rapidly, immediate action - from additional measurements to bushing replacement - must be taken. Continuous status monitoring is possible with an online monitoring system. MSENSE® BM continually measures the relevant factors directly at the RIP (Resin Impregnated Paper), OIP (Oil Impregnated Paper) or RIS (Resin Impregnated Synthetic) bushings in the voltage ranges of 10 kV to 800 kV. Variants are available for monitoring 3 or 6 bushings on three-phase transformers.

Reliable and field-tested

The MSENSE® BM uses an innovative and field-tested Double-Reference Method (2/3-reference method) which monitors the condition of the bushing insulation in regard to changes in capacitance (C1) and dissipation factor ($\tan\delta$) in a three-phase system. The key aspect of this process is that, since the algorithm continuously incorporates all three bushings into the mutual monitoring, the temperature dependence of other processes is eliminated. Furthermore, the signals of the respective voltage transformers are used as a reference for detecting the symmetry of the three-phase mains voltage. The operating condition of the grid is checked for validity and if the grid symmetry is within a defined bandwidth, the measurements are taken into account. The Double-Reference Method ensures that the influence of temperature and voltage fluctuations on a bushing monitoring system is effectively limited by the cross checking of values.

Changes in capacitance and dissipation factor of the bushings are compared with limit values, thereby enabling a fast and reliable evaluation of the condition of the high-voltage bushings. If the values (C1 or $\tan\delta$) of one phase deviate from the original values, the user is alerted via a two-stage limit-value process consisting of a warning and an alarm. This means that faults in the insulation system can be effectively detected at an early stage and the user can react before a fatal failure occurs.

EXTRA RELIABLE. EXTRA SECURE.

MSENSE® BM consists of three components: a coupling unit, a bushing adapter and the evaluation unit.

RIP, RIS or OIP

Bushings from 10 kV to 800 kV



Bushing adapter

- Detection of the measured voltage at the measuring connection of the bushings
- Protection class IP 66
- Three or six depending on variant

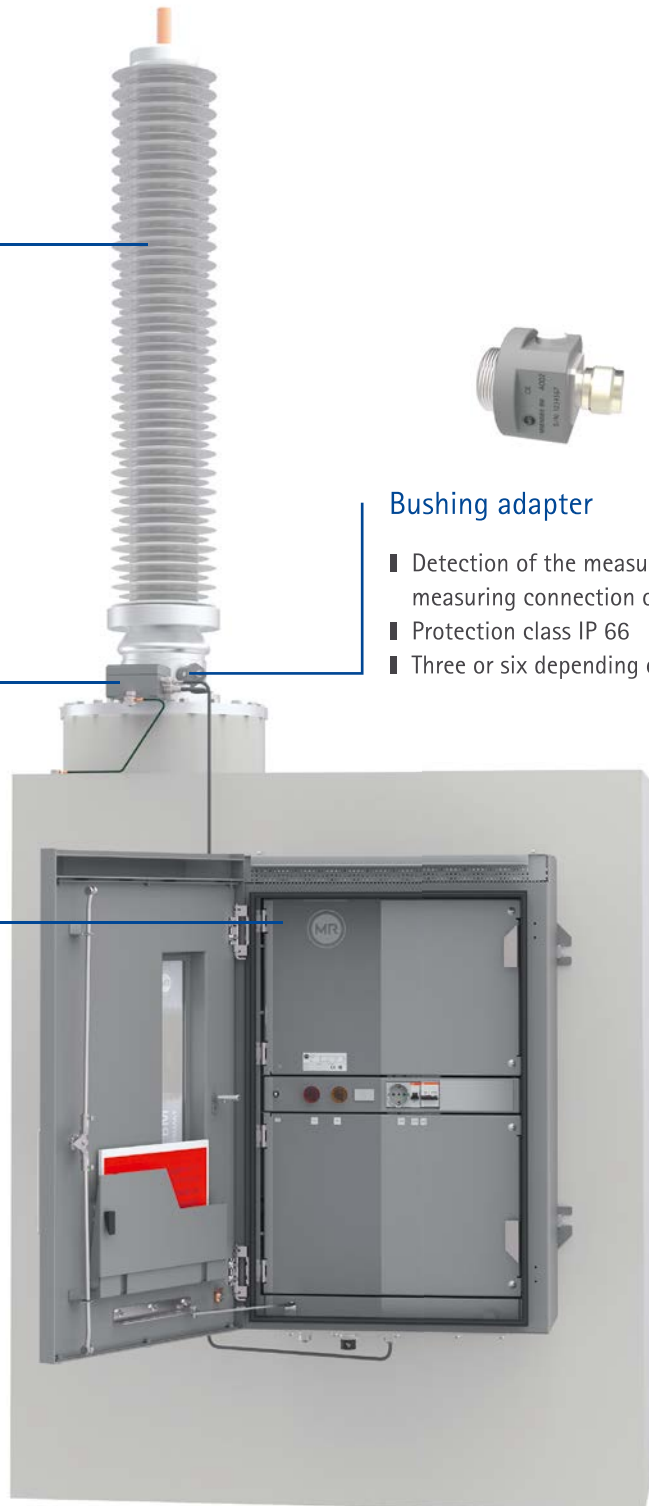


Coupling unit

- Adjustment of the measured voltage
- Protection class IP 66
- Three or six depending on variant

Control cabinet incl. ISM® Technology

- Housing of aluminum sheet (protection class IP 66)
- Passive cooling thanks to double-walled design
- Monitoring of the bushings
- Display and operation
- LED strips for interior lighting
- Integrated laptop holder
- Thermostat-controlled anti-condensation heating
- Key information also visible from outside/ UV-resistant inspection window
- Integrated data interface and socket



FUTURE-PROOFED. THE ISM[®] TECHNOLOGY.

MSENSE[®] BM is based on the MR ISM[®] Technology automation platform, which has been used successfully in the field since 2013.

ISM[®] Technology is the standardized hardware and software basis that is being used for all MR automation solutions.

The hardware components and the universal software architecture are distinguished by their user-friendliness and flexibility. The system is, of course, designed to meet the special requirements of energy technology with regard to reliability, robustness, and durability.

ISM[®] Technology is also open and flexible, supporting both the use of standard products as well as the integration of individual requirements in transformer substation automation. Regardless of the application, users benefit from standardized components, tools, and operating interfaces – in short: the ISM[®] Intuitive Control Interface (IICI).

Software

- Robust operating system as the basis for all system and application functions
- Database of current and historical operating data as well as status and log information
- Web-based visualization in accordance with HTML 5 standard with SVG (Scalable Vector Graphics)
- All necessary SCADA protocols are available in client or server functionality

Hardware

- Modular and efficient hardware design
- Integrated, flexible functions
- Specific modules for various tasks, such as measurement or communication
- Supports all common interface standards
- 19" design or housing for installation on a cap rail in a control cabinet or in a motor-drive unit



TECHNICAL DATA.

Bushing adapter (more upon request)		A001	A002
Bushing type		Micafil	HSP
		RTKF	SETFt 1550/420-1800
		RTKG	SETFt 600/123-2000
Dimensions		Ø 50 x 64 mm	Ø 50 x 60 mm
Input	Measuring connection	Ø 54 mm (female)	Ø 54 mm (female)
	Thread	internal, G3/4"	external, M30 x 1.5
Output		N connector	N connector
Permissible ambient temperature during operation		-40 ... +90°C	-40 ... +90°C
Protection class (DIN EN 60529)		IP 66	IP 66
Weight		approx. 170 g	approx. 180 g
Coupling unit		C001, C002	
Dimensions (width x height x depth)		117 x 100 x 60 mm	
Input		N connector	
Output		Voltage measurement (U)	
Capacity		Order-specific	
Output voltage		typical (RMS): 75 VAC	
		max. (RMS): 100 VAC	
Permissible ambient temperature during operation		-40 ... +80°C	
Protection class (DIN EN 60529)		IP 66	
Weight		approx. 1.2 kg	
Control cabinet		MSENSE® BM	
Dimensions (width x height x depth)		616 x 848 x 420 mm	
Current draw		max. 11.3 A	
Voltage supply		220...240 VAC (other supply voltages on request)	
Frequency		50 Hz	
Heat output		130 W (regulated)	
Socket		220...240 VAC, max. 10 A	
Permissible ambient temperature during operation		-25 ... +50°C	
Protection class (DIN EN 60529)		IP 66	
Weight		approx. 53 kg	
ISM [®] Technology			
Measurements	High-voltage	3-phase U measurement of bushings 3-phase U measurement of voltage transformer (reference system)	
	Low-voltage*	3-phase U measurement of bushings 3-phase U measurement of voltage transformer (reference system)	
Digital inputs/outputs		Electrically isolated inputs; signal voltage 18-265 V AC/DC Potential-free relay outputs; signal voltage up to 265 V AC/DC	
Communication interfaces		Ethernet, RJ45 for communication* (IEC 61850, DNP3, Modbus TCP, IEC 60870-5-104) RJ45 for remote visualization*, RJ45 for HMI connection*, FO 1310 nm single port* Serial RS 232/422/485 for SCADA communication* (DNP3, Modbus RTU, IEC 60870-5-101, -103) FO FST or FSMA connector, Wave length 660 nm or 850 nm*	
Standards		IEC 61010-1, IEC 61010-2-030, IEC 61000-6-2/-4, IEC 60255-21-1/-2/-3 Class 1	

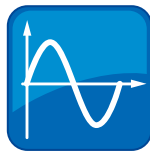
* optional

MORE POWER, MORE VALUE.



Reliable monitoring of high-voltage bushings

- Robust and reliable online monitoring
- Innovative algorithm with compensation of grid symmetry or temperature influences
- Reliable messages and recommendations for action
- Detecting, saving and evaluating condition-relevant variables at the high-voltage bushing
- For new transformers or for retrofitting



Simple operation and state-of-the-art graphic display

- Intuitive user interface with simple operating concept
- Web-based visualization makes software installation unnecessary
- Interface for remote access included in standard scope of delivery
- Communication in common control system standards
- Simple connection of the optionally available touch display



Additional services

- Performance of measurements on high-voltage bushings (C, $\tan\delta$, partial discharges) including interpretation of the measurement results and development and implementation of recommendations for action
- Commissioning of the MSENSE® BM
- If necessary, replacement of bushings
- Performance of and support during factory/site acceptance tests (FAT/SAT)
- Modernization of facilities – including system consultations and wiring modifications
- General product training
- Technical training at our Regensburg training center or at local MR subsidiaries
- On-site practical training

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THE POWER BEHIND POWER.

