GMS600 monitoring system for generator circuit-breaker
State-of-the-art monitoring
The ABB group is a leader in power and automation technologies. The company operates in approximately 100 countries and employs 145,000 people.

ABB is the leader in design and manufacturing of generator circuit-breakers (GCBs) since 1954 with more than 8,000 deliveries in over 100 countries. We offer the widest and most modern portfolio of GCBs in SF₆ technology across a range of short circuit ratings, from 63 kA to 300 kA and nominal currents from 6,300 A to over 50,000 A to meet the demand of all types of power plants around the globe.

ABB’s next generation monitoring systems GMS600-G and GMS600-GT provide full control of GCB operational parameters enabling preventive and predictive maintenance. It supports the overall increase of power plant safety and reliability whilst enabling cost-effective lifetime management by the innovative Value Based Customer Care (VBCC) concept of ABB.

GMS600-G and GMS600-GT are state-of-the-art monitoring systems that enable simplified and efficient lifetime management in order to optimize the use of GCB in power plants. Built on the already established GMS600 technology, the updated version offers unique features such as SF₆ gas monitoring and trending [GMS600-G], temperature monitoring of primary conductors [GMS600-GT] and enhanced operating drive supervision.

Independent from the control and protection system used in the power plant, GMS600 can be integrated in new GCBs or retrofitted into existing GCB applications.

Intelligent electronic device based on ABB common platform
Based on ABB’s well-proven Relion® Series 650, it provides precise indications of the GCB’s remaining time to service with an efficient data logging system. An intuitive network interface via webserver and web client application and connection with the most modern communication protocols such as IEC 61850 and DNP3. GMS600 supports power plant operators and maintenance engineers for a proactive and cost efficient maintenance program, while improving diagnostic capability through the recorded data and threshold levels. This contributes to the overall increase of reliability and availability of power plants.

Available versions:
- GMS600-G  all functions except temperature monitoring
- GMS600-GT  all functions including temperature monitoring.
How does it work

GMS600 turns raw data acquired from GCB operations into diagnostic and prognostic information. Key operational parameters such as close and open operations during normal operation of power plant (as well as during exceptional events such as load rejections and short-circuit faults) are recorded and properly evaluated to determine the impact on the expected time to service.

The GMS600-G and GMS600-GT are the updated versions of GMS600, optimized by powerful processors with unique additional features. All information is displayed locally by local human machine interface as well as remotely by webserver and web client application. Data can be transmitted over the power plant network by the modern communication protocols IEC 61850 and DNP3.
Main functionalities

∑ Time to maintenance

The analysis for time to maintenance provides information of the remaining time to service based on the evaluation of the actual close-open operations.

Computation is performed considering the following three criteria:
- Electrical lifetime
- Number of operations
- Time period

This information allows power plant operators and maintenance engineers for earlier planning of service activities in combination with planned shut-downs of the power plant units.

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SF₆ gas monitoring & trending

In line with the highest standards in terms of environment protection, ABB GCBs have the lowest SF₆ leakage rate and the monitoring system GMS600-G keeps it under control. GMS600-G is equipped with a transducer for online measurement of the SF₆ gas density and an algorithm calculates the actual leakage rate and relevant trending over time. Unexpected gas leakages can be detected earliest possible and the estimated remaining time until warning/alarm levels is calculated and shown to the user in real time.

Temperature monitoring

GMS600-GT provides monitoring of the actual temperature of the primary conductors, with relevant logging over time to enable a real time analysis of the thermal status of the GCB. This monitoring function assures that the GCB cannot accidentally be loaded above the limits in accordance with the applicable standards, achieving 100 percent control of the current flow through the GCB even during unplanned increase of ambient temperature.

As the thermal behavior of the GCB is influenced by the resistance of the primary conductors, including relevant moving contacts of line disconnectors and breaking chambers, online measurements assure that the resistance between the GCB terminals is under control. Thus providing additional diagnostic capability.
Warnings and alarms are displayed locally on the GMS600 via LEDs. Availability of centralized data provides remote access via webserver or other available communication protocols. The recording to the data log of the device allows comprehensive and in-depth offline analysis.

Data logging

Data logging is a powerful feature of GMS600 for quick and easy analysis of any event involving the GCB which provides the following features:

**Event log**
- Logs all important events into the GMS600, including warnings and alarms, change of settings, etc.

**Disturbance recorder**
- Triggers when a certain limit of interrupted current is exceeded - logs current waveforms and binary input signals in Comtrade format (*.csv)

**Operations log**
- Logs with time stamps, close and open operations, root mean square (rms) values of interrupted current, sum of ablation factor and other events
- Logs temperature and gas density values over time
- Logs operating mechanism pump starts

Webserver functionality

Webserver functionality allows access from remote to the actual and logged values of GMS600 via Ethernet by any internet browsers with following benefits:

- All relevant information is available at first view
- Possibility to download and export logged data in Comtrade format for analysis and archiving

Operating mechanism supervision

ABB hydro-mechanical spring charged operating mechanisms type HMB are the most reliable for GCB.\(^1\)

Supervision of certain parameters of the circuit-breaker operating mechanism will detect any change in performance characteristics for early and preventive planning of correction actions.

\(^1\) Cigré’ paper A2-206 published in 2012

Warnings and alarms indication
ABB’s Value Based Customer Care (VBCC) with GMS600

ABB experts at your fingertips

The innovative concept of VBCC enables ABB to support power plant operators and maintenance engineers to facilitate the highest operational availability of their GCB’s over the entire lifecycle. ABB experts will provide valuable service recommendations according to customers’ requirements. The newly developed analysis tool will be used to extrapolate measured GMS600 data by applying sophisticated prognostics algorithms. The result are trending charts including calculated service due dates.
What is VBCC

Gather
Periodical download and export of the log file from the GMS600 in accordance with the agreements and user's profile.

Analysis
ABB extrapolates measured data and reviews results.

Recommendations
ABB experts provide recommendations to customers based on the analysis results.

Decision support
The result will be a comprehensive and customized GCB status report including trending charts of measured and extrapolated data, service due dates and recommendations.

What are the benefits

Customized report
The report provides two different views:
- An overall summary of the GCB fleet condition, which clearly addresses the management of the operators with highly aggregated information
- Detailed technical analysis for every single GCB

Reduced maintenance costs
Going along with the change from time based to condition based maintenance approach, ABB provides recommendations and service due dates considering the breaker condition and the usage of the GCB.
This results in customized service intervals for individual customers.

Harmonized maintenance planning
Based on the predicted service due dates in the condition report, power plant operators are able to better align and coordinate GCB maintenance activities within the scheduled plant shutdowns.

Prolongs lifetime of GCB
The overall goal is to avoid unplanned outages of the GCB and strive to prolong the lifetime of the breaker for the best cost-effective lifetime management of the equipment.
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