

## **The OLM®**

### **A third generation Circuit Breaker On Line Monitoring system**

#### **Overview**

The OLM2 monitoring device may, at a first glance, look as an ordinary circuit breaker monitor but certainly it isn't. In fact it is more than that. It is both a conventional "circuit breaker watch dog" and a specialized high performance acquisition system in one and the same unit.

The OLM monitors with their sensors, cluster server as well as the field bus connecting them together, are all essential parts in a high reliability monitoring equipment. As all external communication, with OLM equipments, also by design is routed through a cluster server there is no need for switch yard activities of this reason any more. Just connect and get status for the monitored circuit breakers directly from the station building and even from other locations on the globe.

Expensive and complicated one may think. Not at all, pc computers and data communication is probably the most developed technology of today and the cheapest as well. As the field bus can make use of twisted copper cable, daisy chained between the units, also that cost is very low.

In the head office and any other locales concerned, data from connected station equipments, can be accessed, treated and put in a database. The necessary software is included in each equipment delivery. Routing of alarm information, pc computer object analysis, remote maintenance, everything is included in the software. The communication can for example make use of local or wide area networks as well as the Internet and most wired and wireless telephone networks.

The OLM2 monitoring device has resources to monitor: SF6 gas density (3), coil current (3), motor current (1), coil circuit conductivity (3), power voltage (3), power line current (3), temperature (2), mechanical travel (2), status (8), pressure (1) and has two programmable alarm signal outputs as well as an optically isolated high voltage protected RS485 serial communication port. It is intended as part of station equipments with continuous communication but has a data buffer for a number of events in case of interruptions. The device also monitors it self and all connected sensors continuously and immediately reports any malfunctions detected.

The field bus (OLM bus) uses a failsafe protocol combined with a low level command structure for fast and safe transmission of internal data. The physical connection between the monitors and the cluster server are usually done through daisy-chained electrical wiring. Each bus, consisting of a good quality twisted pair screened copper cable, can chain up to 30 units to a server with a total length of up to 1200 meter (at maximum speed). And the number of busses that can be used, in the equipment, is only limited by the number of communication ports that can be attached to the server computer. Optical fiber as well as radio and power line links can also be useful here especially to and between distant object groups.

The cluster server is the heart in OLM circuit breaker monitoring equipments and is in essence a router with built-in full backup for supervision data. Data for monitored objects is scanned continuously and are saved as compressed files. The server also monitors it self, the

field busses and all connected monitors continuously and immediately creates reports for any system malfunctions detected. The necessary software is included in the equipment delivery.

Usually an ordinary pc computer is all that's needed. Of course for large stations the disk memory space should be considered and for unattended distant stations eventually UPS and watchdog expansions can be valuable. Some USB to RS485 converters, for field busses, may also be required. The server computer also doesn't necessarily need a keypad, mouse and monitor but can be managed through, for example, a separate laptop and why not through a wireless network. Additionally system maintenance for any part of equipments can be done remotely from the office, service shop, sub contractor etc.

Optionally the object supervision and exploration software (OLM explorer) can be used on the server. With this option a database is created on the server and the automatic supervision engine continuously can calculate and report every detected object and system malfunction directly on site.

Usually also the OLM explorer software is running on computers located in the office, service department and eventually, at least temporary, at the system suppliers site; creating databases, distributing status and alarm reports etc. The number of possible simultaneous users is only limited by the owner's permission. Of course selected objects from any number of reachable station equipments may be handled and collected in both general and specialized databases.

Very extensive object analysis can be done whenever necessary as well as do optimizing of supervision algorithms. Status reports can be routed to other software entities as well as physical persons. Real time alarm reports can be sent as e-mail and eventually received in a cellular phone to alert a plant responsible. Auto messages can also be sent to a SCADA system for the same reason.

Status and trends for such wearing parts as coils, contacts, SF6, motor, heater, lubrication, sealing etc, even external equipment like battery condition as well as extreme ambient temperatures, are monitored. Condition and alarm messages are created and distributed each time specified levels are exceeded. Safety critical parameters are calculated in the monitoring device directly; make possible instant automatic measures through programmable alarm outputs.

Interfacing external equipment is as simple as reading data from a common database (SQL). Even external administrative and supervision software entities may use this simple solution as OLM object databases can be created, automatically updated and reached anywhere.

And the best of all no expensive, limiting and preliminary for ever industry standards to adopt just prevailing well-proven world standard of today's computer technology and about current competition how to compare a Mercedes with rickshaws?

**Benefits by points**

- Almost any important part of any high voltage circuit breaker today still in service, from any manufacturer and based on any technology can be monitored with the OLM concept.
- Station OLM equipments can easily be expanded with more monitored circuit breakers, new and already in service.
- Circuit breaker manufacturer independent producer ensures further development and full support even for mixed brand switchgear solutions.
- OLM provided new circuit breakers can be delivered from world leading manufacturers like ABB and Siemens.
- The foremost task of any circuit breaker monitoring system is to increase the lifecycle and resulting power transmission safety as well as lowering maintenance needs and resulting operating costs. After five years in service, around the world, the post calculated MTBF, for OLM monitoring devices, is higher than 500 years!
- The included software is the “OLM Installer” application which is mainly used for monitor installation tasks, the “OLM Server” which runs the cluster server computer and the “OLM Explorer” application which run the entire system. No more software is necessary for the full function and this basic software is free for all users.
- Benefits obviously are a common point, in the station, for all external data communication and a standard pc computer with a common software platform (Microsoft Windows operating systems) directly supporting any data communication standard of importance.
- Data is compressed for fastest possible data transfer in slow speed communications such as with wireless and wired telephone modem links for example. As it is both expensive and difficult to establish high speed data links in desolated areas this feature is important.
- Complete history of original as well as calculated data, for any OLM equipped circuit breaker, is organized in databases. “Normalized parameters and trends” from this data matrix are continuously compared against manufacturer recommended fault tolerances and condition and alarm reports are created and distributed whenever exceeded.
- The OLM concept is layered in structure that makes possible simple and safe self supervision of whole systems. The first layer consists of the monitoring device with its attached sensors. The second layer consists of the cluster server, the field buses and the attached monitoring devices. The third layer consists of, for example, a computer in the office network attached through Internet to a number of station equipments. The fourth layer is eventually a cellular phone attached to the office computer through a cellular network connected to a mail server connected to.. etc. Each layer adds information necessary, for object as well as for self supervision, until it reaches its end destination. In this way any malfunction in the equipment, system and the message distribution can be secured.
- The very high reliability and self supervision of all data communication makes separate alarm wiring redundant. Automatized alarm measures can be performed from any layer.