On Line Monitoring system OLM®

Switch monitor OLM2
On Line Monitoring System

ELCON AB, Sweden

ELCON
INTERNATIONAL

No. 1 in testing your breakers
www.elcon.se

Why do continuous on-line condition monitoring on your Circuit Breakers?

There are several reasons:

1. To assist network providers in meeting new industry demands, since the deregulation of electricity markets has imposed operational demands on the electricity networks in an environment of cost reduction, coupled with increased risks and liabilities.

2. High voltage circuit breakers are subject to ageing and wear during their service life. To balance this effect ,and to assure levels of dependability, different types of maintenance and refurbishment policies are applied during the lifetime of the circuit breakers. Lifetime of switching equipment is difficult to estimate in advance, because it depends on many factors such as manufacturing technology and temperature, electrical stress, ambient conditions and mechanical stress.

By using an on line monitoring system like the OLM2, it will help the asset owner to enhance his maintenance programs in a more reliable cost effective way:

• Implement a Reliability Centered Maintenance (RCM) program by using historical intelligence gathered continuously in real time.

• Perform Just-In-Time (JIT) Maintenance when problems are detected, acting only on indication of breaker impending misoperation or failure.

• Postpone scheduled maintenance and be confident that the breaker is operating satisfactorily and has not exceeded its wear limits

SOME FEATURES WITH THE ONLINE MONITORING SYSTEM OLM2 FOR CIRCUIT BREAKERS

» The OLM can be used on any voltage level,type and brand of Circuit breakers,such as conventional air-insulated switchgear (AIS) and gas-insulated switchgear (GIS).

» Circuit breakers from several of the worlds leading manufactures can directly be delivered with OLM monitoring as well as any circuit breaker in service afterwards can be completed with it.

» Around the clock, OLM measures all relevant breaker parameters e.g. open-close-time, motion, coil- and motor-current, operating voltage, temperature in the switchgear cabinet, pressure and density of SF6-Gas etc..... and calculates I 2 t.

» Automatically, data will be stored ,and it provides a trend analysis and evaluates historical data. The measurement data can be acquired via Internet or SCADA-Systems and can be evaluated with the OLM Explorer.

- You are informed about the condition of your circuit breakers at any time and anywhere.

- You get an small device, easy to fit.

- You get the complete OLM2 hardware, no extra modules needed, only chose external senors.

- You will have free updates of new improvements of the software.

- You save time and money through optimization of the maintenance intervals.

- You get an SF6 level detection,possible leak is indicated an a "last date to refill" is calculated.

- You get a well tested system, today over 2000 installations in many different locations and tough environments, such as for instead in South America, Canada, Australia, China, and many more places....

OLM2 switch monitors

An OLM2-switch monitor is a small measure and data acquisition unit designed for use in switchgear environments. It is adapted to be mounted and connected in the cabinet of the host object. All communication with the world around is done through an electrical bus.

A switch monitor continuously is waiting for events. Possible events are operations, status alarms and commands. As soon as an operation occurs an acquisition and evaluation is performed. The operation record then is saved in memory to be forwarded on command. A status alarm record, which occurs at specified conditions, is saved in the same way.
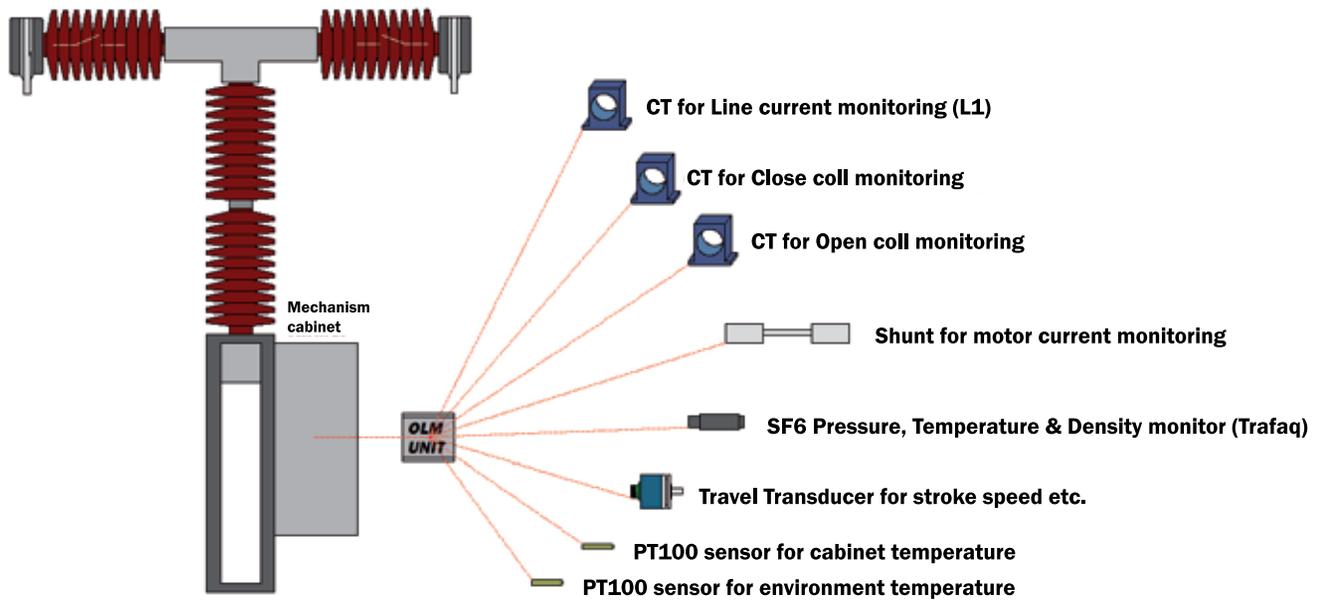
Communications always are initiated on command from an external computer. All information necessary for external use is fetched in this way. A two level alarm output also is signaling under specified conditions.

A switch monitor unit can be mounted in the cabinet of the host object without any special brackets. It can withstand the intense vibrations that occur for more than 10 000 operations.

Except for the emission and immunity requirements stated for CE-marking an OLM-switch monitor can manage all those special electrical disturbances that occurs in switchgear environments. Connections also are protected for faulty connections possibly done at installations.

Various measuring sensors can be connected to the OLM2

CT for Line current monitoring (L1)

CT for Close coil monitoring

CT for Open coil monitoring

Mechanism cabinet

OLM UNIT

Shunt for motor current monitoring

SF6 Pressure, Temperature & Density monitor (Trafaq)

Travel Transducer for stroke speed etc.

PT100 sensor for cabinet temperature

PT100 sensor for environment temperature

Trafag

Travel transducer

AHMA ABB travel transducer

OLM2 continuously monitors circuit breaker condition. It signals in real time any malfunction to maintenance services. Therefore, OLM2 facilitates reduced maintenance cost and failure risk.

SF6

» For measuring of SF6 gas density a special sensor is used. This sensor also can measure the temperature of the gas. The temperature-normalized and the real pressure then can be calculated from this density. Up to three such sensors can be used on each OLM2

» Monitors the SF6 leak rate and calculates last date to refill.
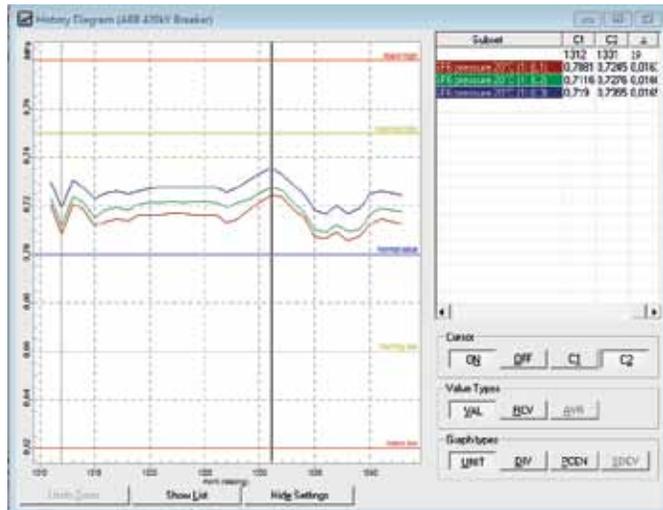
Mechanical operation

» Monitors close and open operating times.
» Allows the use of conventional auxiliary switches or primary contact travel sensors.
» Monitors primary contacts separation speed, damping and over travel.
» Detects deterioration in mechanical performance (friction, corrosion, breakage, spring fatigue, wearness of linking and rods, and damping defects).
» Monitors auxiliary and image contact timing
» Spring operating mechanism

Monitors recharging motor operating time.

» Monitors motor supply voltage, current and energy
» Detects motor or limit switch defects.
» Monitors spring travel

Hydraulic operating mechansim

» Monitors pump motor operating time.
» Detects internal and external leackage.
» Detects threshold pressure on hydraulic system

Switching

» Monitors current during breaking.
» Estimates primary contact wear(i^2dt)
» Monitors arc time

Auxiliary and control circuits

» Monitors operating coil continuity
» Monitors coil current, voltage, resistance, armature time and energy.
» Monitors auxiliary supply voltage.
» Monitors heater integrity.
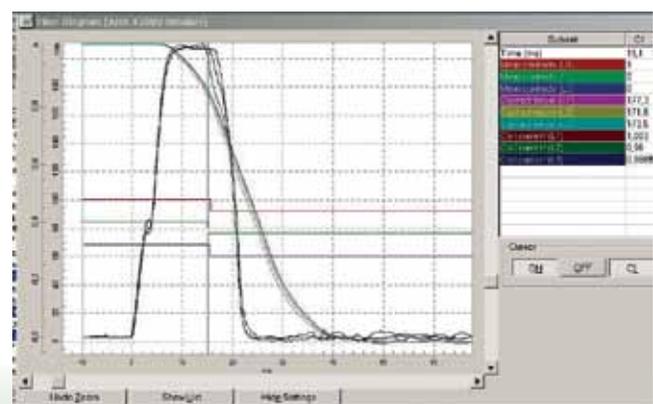
The OLM software suite

The specialized software necessary to build and maintain high performance OLM monitoring systems for whole corporations consists of three separate programs the OLM explorer, the OLM server and the OLM installer. Included is also a standard version of the downloadable OLM monitor firmware.

OLM Explorer

The OLM (object) explorer is the main program used both on servers and personal workstations. It works against an internal database (Access) or an internal/external database (SQL). The OLM explorer supports different languages such as English, German, Chinese and Portuguese, but other languages can on request easily be supported.

The OLM explorer is also used by anyone related on a company on their personal computers. It is used for object analysis as well as for system maintenance. Also here a common SQL or the internal database is used. When internal access/SQL databases are used object data can be fetched either as raw data or be copied from an external database. Wherever the corporate network can be connected any OLM monitored object (circuit breaker) can be assessed and analyzed. And if connected to a terminal server the OLM explorer didn't even need to be available on the client computer.

OLM Server

The OLM server software is the station equipment coordinator, data backup and router. It runs as system service routine thus can automatically restart after power failures and other interruptions.

The OLM server has a special built in function that can automatically synchronize its data on an external server. This feature can be useful in stations without Ethernet communication. With use of some sort of data modem (telephone, ISDN, GSM etc.) a link to Internet is established. The synchronization process (read write data until both are equal) is performed with the FTP protocol. The external server then is connected via the corporate network (Ethernet) and used as an ordinary OLM server.

OLM Installer

The OLM installer is used for installation and maintenance works only.

Necessary system software is Microsoft Windows operating system from 2000 and later on all workstations and servers. For medium to large systems it is recommended that at least one server running Microsoft SQL server software is available. Optionally Microsoft terminal server operating systems can be used.

An OLM standard software license for unlimited number of users is included with OLM equipment. Software updates are free, and can be downloaded from www.elcon.se.

SOME SOFTWARE FEATURES

» Easy configuration of the OLM with the installation wizard
» Open database structure,data can be exported in different protocols, for instead IEC 61850.
» Different languages for the OLM explorer, English, German, Chinese, Portuguese. Easy to update new languages.
» OLM explorer can be used in terminal server environments.
» The information and graphs are presented in a easy way, no special education needed

Trend calculation

Automatic trend calculation, in OLM, is based on the presumption that if the average of a parameter value deviates so much that it passes a certain level (attention level) it indicates the start of a development worth attention. When this happen the current parameter average is compared with its average a number of points back in history and the point in future where a straight line passes a critical level (alarm level) is calculated

Gas leakage supervision

Leakage is the most common and almost the only problem with use of SF6 gas as isolation and arc extinguish media for circuit breaker contacts. In the OLM software there is two parameters indicating aspects on this subject the "SF6 leak rate" and the "SF6 last date to refill ".

Contact wear supervision

Wear or deterioration of high voltage circuit breaker contacts can be divided in two groups. Current dependent (erosion) and pure mechanical wear.

Relation correction technique

"Relation correction" is our designation for a technique to adjust parameter values to correspond the values it should have in a reference environment. Available parameters as temperature, voltage, time from last operation, contact erosion sum etc. are used.

The main reason is to enhance the detection of deviations due to malfunctions as well as create a base for more stable and safe trend prognosis.

Examples

We know that the ambient temperature have some influence on the reaction time of coil devices. The viscosity of lubricants we know will decrease on lowering component temperatures, and slow down the reaction time.

Even the voltage level has some influence on the "Coil armature time" (reaction time). If we have variations in the power supply voltage we can assume the inverse variations in the coil armature time. Low voltage will give a longer reacting time.

Condition messaging

Automatic condition reporting is the ultimate result of any object supervision task. The OLM explorer software has built in functions not to just generate such messages but even distribute them to SCADA systems, or to E-mail account. The message can include actions to be taken.
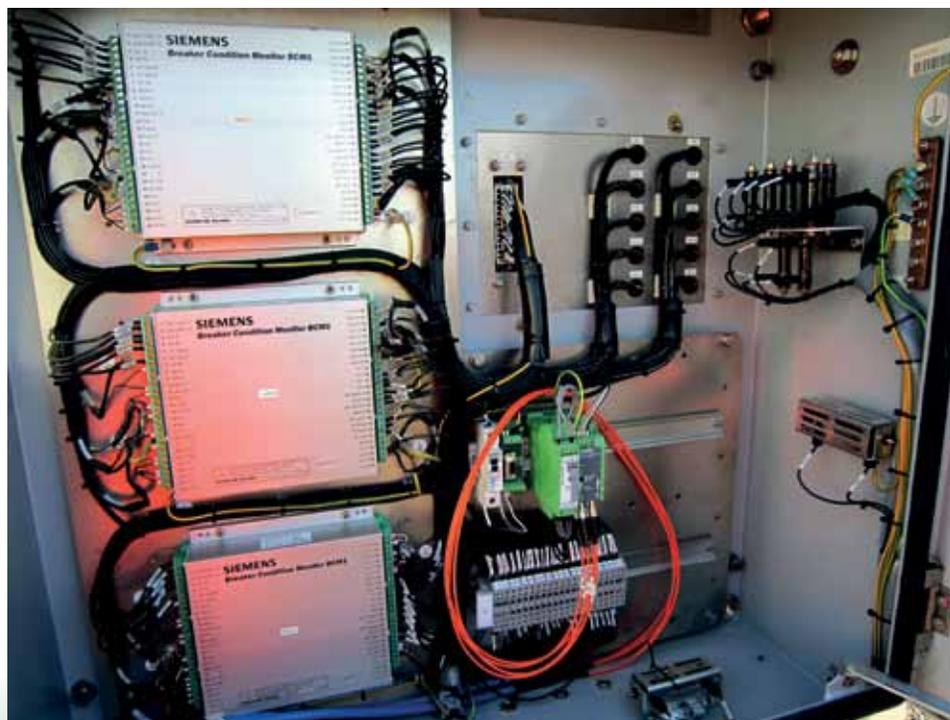
Automatic condition messaging is done whenever a parameter alarm or warning limit is exceeded and at system malfunctions. Evaluation is done each time new data is fetched as well as when manual recalculation is performed.

Installation examples
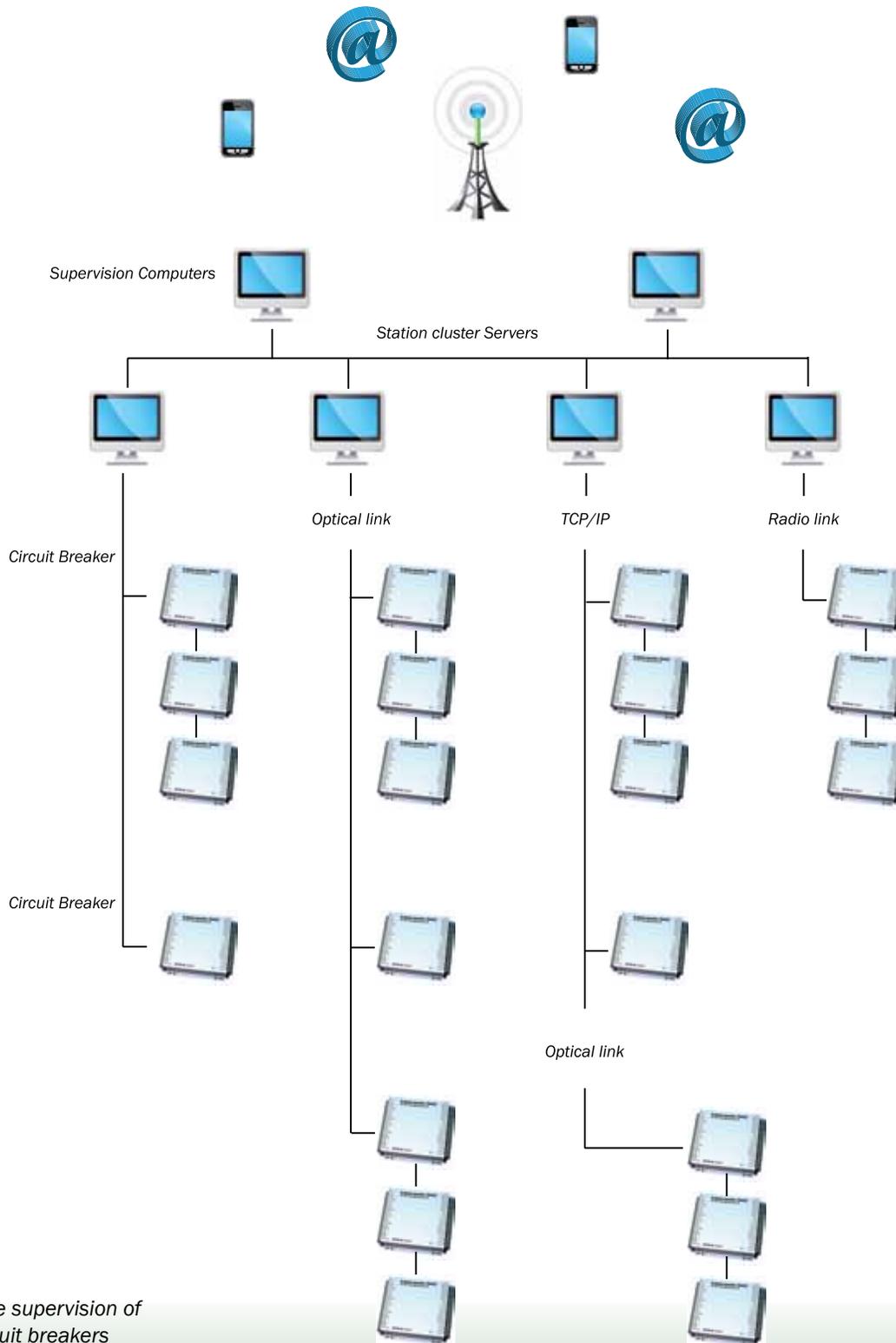
Mitsubishi 120 sfmt 145 KV

Siemens 3AP2 F1 550KV

The OLM field bus

Communication between OLM monitors and the server is usually by twisted par screened copper cables, optical fiber, radio links or GSM can also replace parts of the electrical bus if required. The field bus is connected directly to the OLM monitor. With transfer rates up to 115 kbps totally 1 200 meter of cable can be used in a bus. According to spec, for standard drivers, up to 32 units can be daisy chained in each bus. Data is secured, with error correction, against electrical disturbances and interruptions that can occur at transmissions. With optical fiber the total number of units on the bus can be extended to 63 if none of the electrical parts exceed 32 units.

Supervision Computers

Station cluster Servers

Optical link   TCP/IP   Radio link

Circuit Breaker

Circuit Breaker

Optical link

Complete remote supervision of high voltage circuit breakers

Order information

Fill in the form below and we will send you a quote for the items you selected.

OLM On-line Monitor	Description		Art. no.
OLM unit	The main unit. The OLM/BCM system can today be ordered directly from the breaker manufacturer: ABB, Siemens, Mitsubishi.		B001
Motor current sensor	Connected in series in the motor circuit to monitor the motor current during spring charge.		B010
Coil current sensor	Clip on current transformer used to monitor the trip and close coil currents and line currents.		B011-A
Cabinet temperature sensor	PT100 sensor to measure the cabinet temperature.		B012
Travel parameter sensor	Fastened in order to get travel parameters such as speed, stroke, etc. Also used for contact timing.		S108-B
Density sensor	Used monitor gas density, pressure and temperature.		B014
RS232-RS485 converter	This converter is used to connect the OLM Bus to the OLM server computer.		B013-A
Hall-element current transducers	Two DIN rail mount modules, one with three and one with two hall-element based current transducers. The modules are intended for coil and motor monitoring together with OLM.		B049 (two pole) B050 (three pole)

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OLM2 HARDWARE SPECIFICATION SUMMARY

Number of status and timing inputs (a, b, spring, press, alarm, block, res1, res2)	8
Recommended source voltage	(24 – 250) VDC
Contact voltage level (mean)	15 V
Hysteresis voltage	± 1 V
Voltage level accuracy	± 1,5 V
Contact input reaction time	< 100 µs
Number of voltage supervisory inputs (pow, u1, u2)	3
Measuring range FS (extensible with external resistor)	(0–280) VAC/±390 VDC
Accuracy	0,5 % of FS
Number of coil supervisory inputs (close, trip1, trip2)	3
Working range trig input	(24 – 250) VDC
Trig voltage level	15 V
Trig voltage level accuracy	± 1,5 V
Trig input reaction time	< 100 µs
Coil current input working range FS (shunt or ct)	±100 mV
Coil current input accuracy	0,5 % of FS

Operation coil supervisory input trip2 can be used for motor current

Number of travel transducer inputs (trvl)	1
Digital input for digital position encoder, receiver type	RS422
Analog input for position encoder measuring range FS	(0 – 5) V
Analog input accuracy	0,5 % of FS
Analog input impedance	1 Mohm // 45 pF
Power source for both	5 V, ≤ 100 mA

Analog input can be used for 4 – 20 mA sensor trough an external 250-ohm resistor

Number of temperature sensor inputs (Tint, Tamb)	2
Sensor type	PT100 class B
Measuring range FS	(-55-+85)°C, (-67-+185)°F
Measuring accuracy	± 1°C, ± 2°F
Number of line current inputs (ct1, ct2, ct3)	3
Measuring range FS	(0 – 100) mV AC
Measuring accuracy	1 % of FS

Inputs for ct2 and ct3 can be used for heater1 and heater2

Number of Trafag 8774 SF6 density and temperature sensor inputs	3
Measuring range density FS (dens1, dens2, dens3)	(0 – 50) kg/m3 SF6
Accuracy density	± 2% of FS
Measuring range temperature FS (T1, T2, T3)	(-40-+85)°C, (-40-+185)°F
Accuracy temperature	± 3% of FS
Power output total for all three	17 V DC, ≤ 100 mA
Number of communication ports (com)	1
Hardware interface type	RS 485
Communication rate	≤ 115 kbps
Communication protocol	OLM-bus
Alarm out contacts (alarm1 (no), alarm2 (nc))	2
Contact data	230 VAC, 1 A
Power supply input AC (pow)	(85 – 265) V
Power supply input DC (pow)	(100 – 300) V
Power consumption	< 12 VA

Voltage supervisory channel pow is internally connected to power input

Ambient temperature operating	(-20-+60)°C, (-4-+140)°F
Ambient temperature storage	(-40-+70)°C, (-40-+158)°F
Relative humidity, non-condensing	(0 – 95)%
Encapsulation class	IP20
Dimension l*w*h	(220 *210 *50) mm (8.66 *8.27 *1.97) in
Weight	1,6 kg, 3.53 lbs.
Sampling frequency	2 kHz
Internal memory	128 kbyte
Calendar clock	< ± 1 h per year

Rechargeable lithium battery, backup time	> 60 days
Expected battery lifetime	> 15 year

Complied standards

This unit complies with the following international standards

LVD
EN61010-1: 1993-09-30
EN61010-1/A2: 1996-01-12

EMC
EN50081-1, EN55011 class B
EN50082-2, EN61000-4-2, -3, -4, -5, -6, -8, -9, -11

Basic tests performed and passed according to the following

Electrical isolation tests

Power impulse, (1,2/50 µs, 4kV)	IEC60

Electrical disturbance immunity tests

Electrostatic discharge, ESD	IEC1000-4-2 L4
Electromagnetic field (80 -1000 MHz)	IEC1000-4-3 L3
Burst, 6 kV coupling network, 4 kV capacitive clamp	IEC1000-4-4 L5
Surge, 2 kV symmetrical-, 4 kV asymmetrical pulse	IEC1000-4-5 L4
Induced radio-frequency field, (0.15 – 80 MHz)	IEC1000-4-6 L3
Power frequency magnetic field, (160 A/m)	IEC1000-4-8 Spec
Pulse magnetic field	IEC1000-4-9 L5
Voltage dips, variations and short interruptions	IEC1000-4-11 L3

Electrical emission tests

RFI Voltage/Field	EN55011B

Declaration of conformity

According to the EMC Directive 89/336/EEG, 92/31/EEG & the Low Voltage Directive 73/23/EEG and 93/68/EEG including amendments by the CE-marking Directive 93/68/EEG

Type of equipment	Switch monitor
Brand name or trademark	OLM
Type designation(s)/Model no(s)	OLM2

Manufacturer: Elcon AB, Box 44, SE-770 14 Nyhammar, SWEDEN, Tel: +46-240-64 11 10, Fax: +46-240-13 19

The following standards and/or technical specifications, which comply with good engineering practice in safety matters in force within the EEA, have been applied:

Standard, EMC

Test report/technical construction file/normative document

EN50081-1, EN55011 Class B — Ref. No: 00182/Issued by: Elcon AB

EN50082-2, EN61000-4-3, -6, -11, Level 3
EN50082-2, EN61000-4-2, -5, Level 4
EN50082-2, EN61000-4-4, -8, -9, Level 5

Standard, LVD

Test report/technical construction file/normative document

SS-EN 61 010-1: 1993-09-30 — Ref. No: 0011-001/Issued by: Elcon AB

SS-EN 61 010-1/A2: 1996-01-12

Additional information
The product is CE-marked in 2000

As manufacturer/ the manufacturer's authorized representative established within EEA, we declare under our sole responsibility that the equipment follows the provisions of the Directives stated above.

Contact

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