HIGH VOLT
Test with the best.®

LOSS MEASURING SYSTEM LiMOS

- Measurement of no-load loss and current
- Measurement of load loss and impedance voltage
- Loss measurement during temperature rise test
- Voltage measurement during induced voltage test
- Zero-sequence measurement

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Fig. 1 **LiMOS 2000/100 consisting of three sensors with Measuring and Transmitting Units (MTU) and the remote screen**

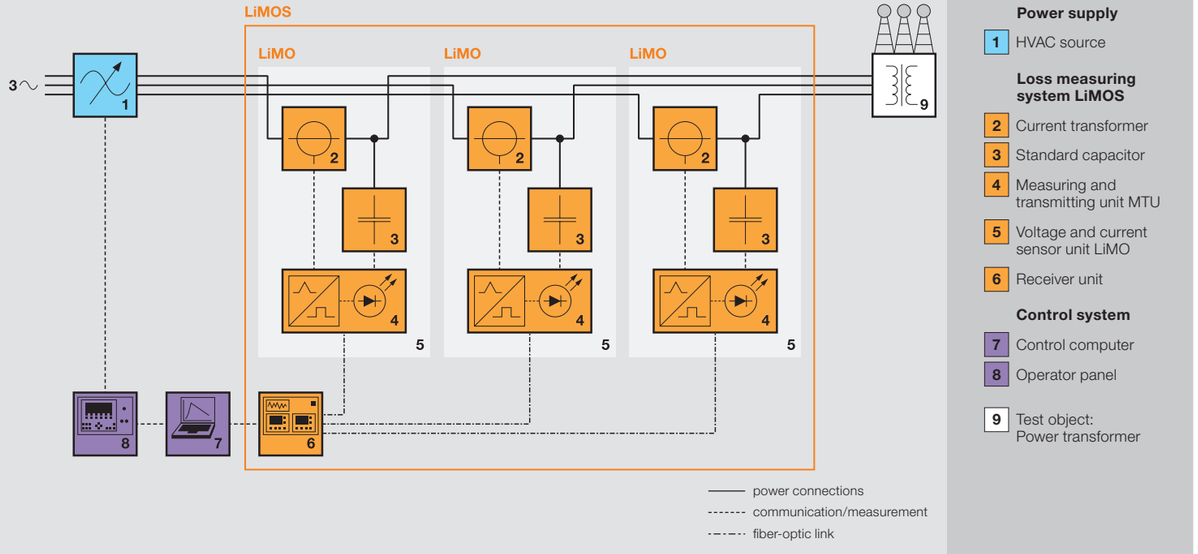

Fig. 2 **Block diagram of transformer test system, type WV, with measuring system, type LiMOS**

FACTS IN BRIEF

Losses in power transformers cause running costs during the complete lifetime of the device. Certain electrical losses are inevitable, and therefore operators of power transformers attach great importance to precise measurement of no-load and load losses.

LiMOS is a high-precision loss measuring system consisting of one high voltage unit per phase including voltage and current acquisition, which helps minimize the required space in the test bay. The acquired voltage and current are digitized within the same device and then transmitted as optical signals to the receiver unit placed outside the high-voltage area, e.g., in the control room. As a result, disturbances by EMI coupling into communication cables are negligible. The measuring ranges are set at the receiver unit or on a computer, without rewiring or even entering the high-voltage area, in manual or in auto-range mode.

APPLICATION

LiMOS is a versatile power measuring system increasing the operator's comfort and safety during:

- Type tests
- Routine tests
- Tests for research and development

And suitable for measurement of:

- No-load losses and current
- Load losses and impedance voltage
- Losses during heat run tests
- Power consumption during induced voltage test
- Voltage and current for determination of the zero-sequence impedance

LiMOS can be used in combination with the static frequency converter based transformer test system, type WV, or as a stand-alone system when the test power is supplied by another source. There is no need to remove LiMOS from the system when frequencies between 40 and 200 Hz are used.

SYSTEM AND COMPONENTS

The transformer loss measuring system LiMOS consists of up to three combined voltage and current sensor units LiMO (5) [see *fig. 2*] and one receiver unit LiMO-MCSU (6).

Each voltage and current sensor unit LiMO contains a high accuracy current transducer (2) and a compressed-gas standard capacitor (3). The digitalization of the sensor signals is performed by the LiMO-MTU (4) located at the bottom of the LiMO sensor unit. The digitalized and preprocessed signals are transmitted to the common receiver unit LiMO-MCSU (6) via fiber-optic cable.

The evaluation of transformer losses and other readings is executed in the receiver unit LiMO-MCSU. Optionally, the transmitted signals can be converted into analog values for further evaluation with third-party power analyzers (analog monitor output). No separate wattmeter is necessary.

The system software iMOS is provided to:

- Operate the entire measuring system
- Change measuring ranges of voltage and current remotely
- Read out, process, and visualize the measured data
- Integrate the loss measuring system into the HIGHVOLT control for automated evaluation and recording of measured values

If used with multi-phase systems the software is capable of multi-channel data processing, making relations between the measured values of the several phases additionally available.

BENEFITS

- COMPACT DESIGN: ONLY ONE HV DEVICE PER PHASE
- REMOTE CONTROL OF MEASURING RANGES IN MANUAL AND AUTOMATIC MODE
- FULLY DIGITAL SIGNAL PROCESSING – RESULTS IN HIGHEST ACCURACY
- NO SEPARATE WATTMETER NECESSARY – RESULTS IN HIGHEST ACCURACY
- HIGH PRECISION DUE TO DATA ACQUISITION AND DIGITIZATION DIRECTLY AT SIGNAL SOURCE
- DATA TRANSMISSION OVER LONG DISTANCES WITHOUT INTERFERENCES
- GALVANICALLY INSULATED AND INTERFERENCE-FREE SIGNAL TRANSMISSION FROM HV AREA TO THE CONTROL ROOM
- NO NEED TO REMOVE LiMOS FROM TEST CIRCUIT WHEN USING OTHER FREQUENCIES FROM 40 TO 200 HZ

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TECHNICAL PARAMETERS

Table 1 **Standard loss measuring systems**

Parameter		LiMOS 2000/100	LiMOS 2000/200	LiMOS 4000/100	LiMOS 4000/200
Measurement Ranges	Voltage	100 V – 200 V – 500 V – 1 kV – 2 kV – 5 kV – 10 kV – 20 kV – 50 kV – 100 kV			
		add. 200 kV			add. 200 kV
	Current	1 A – 2 A – 5 A – 10 A – 20 A – 50 A – 100 A – 200 A – 500 A – 1000 A – 2000 A			
				add. 4000 A	add. 4000 A
Analog monitor output (opt.)	Voltage	100 V at 100 %			
	Current	1 A at 100 %			
Accuracy	Voltage	0.08 %[1]			
	Current	0.08 %[1]			
	Power	0.11 %[2] to 0.90 %[2]			
Measuring frequency		50 and 60 Hz			
Operating frequency		40 to 200 Hz			

1) at 40 % to 110 % range utilization
2) at ≥ 100 V and ≥ 1 A, depending on the power factor

INTERFERENCES: CONVENTIONAL LOSS MEASUREMENT AND MEASUREMENT BY LiMOS

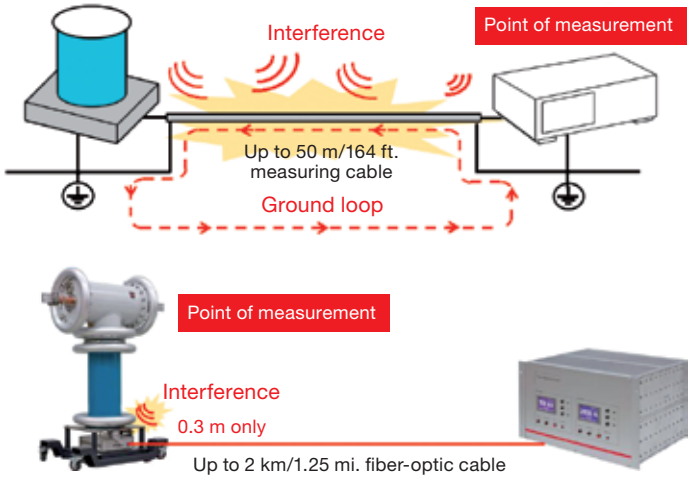

Figure above:
Conventional loss measuring circuit
- Point of measurement: wattmeter in operator room
- Analog signal transmission, up to 50 m/164 ft.
- Disturbances by interference and ground loops

Figure below:
Loss measurement with HIGHVOLT LiMOS
- Point of measurement close to signal source
- Digital data transmission
- Very low interference level
- Distances up to 2 km/1.25 mi between signal source and operator room

Fig. 3 **Comparison of conventional loss measurement (fig. above) and measurement by LiMOS (fig. below)**

APPLICABLE STANDARDS FOR TRANSFORMER LOSS MEASUREMENT

IEC
- IEC 60076-1
- IEC 60076-8

IEEE
- C57.12.90-2010
- C57.123-2010

GOST
- GOST 3484.1-88

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