

«VMD-10» - Device for Dissipation Factor and PD Monitoring in the Insulation of High-voltage Transformers, Cables, Gas-Insulated Equipment

«VMD 10» multipurpose device (Vector Measurement Device) is used for measuring insulation parameters of different types of high-voltage equipment, such as power and measuring transformers, cables, motors.

«VMD-10» has unique functions and features. It organically combines several instruments used for insulation parameter measurements in on-line and off-line modes.

«VMD-10» has the following functions:

- Measuring of high-voltage insulation dielectric parameters (dissipation factor and insulation capacity).
- PD measuring and analyzing in transformer and cable insulation by three channels in HF frequency range – from 0.5 up to 20.0 MHz.
- PD measuring in gas-insulated equipment (GIS) and inside the tanks of oil-filled equipment by three channels in UHF frequency range – from 100 up to 1000 MHz.
- Effective PD source location in high-voltage outdoor and indoor switchgears and cables.
- High-frequency lightning and switching pulse measuring.
- Digital measuring of three-phase currents, voltages, powers.

«VMD-10» is mostly used for one-time and periodical measurements of insulation parameters; however large inbuilt memory allows using «VMD-10» as a stationary device for continuous on-line monitoring.

1. High-Voltage Insulation Parameter Measurement.

For dissipation factor measurement in high-voltage insulation, in «VMD-10» there is an instrument for measuring absolute and relative parameters of the insulation leakage current vector and the applied voltage vector.

The specific feature of «VMD-10» is that the parameters of the 6 current (voltage) vectors are being measured synchronically. The operator can



configure the measuring circuit by himself, the following 3 variants are used most often:

- One-phase (three-phase) measuring of insulation parameters by using the external source of AC voltage of power frequency.
- One-phase (three-phase) measuring of insulation parameters by using voltage vectors of the operating voltage.
- Relative measuring of the insulation parameters of three phases in one object by using comparative circuit of parameters monitoring.

A measuring circuit can include a calibrating capacitor for creating reference signal.

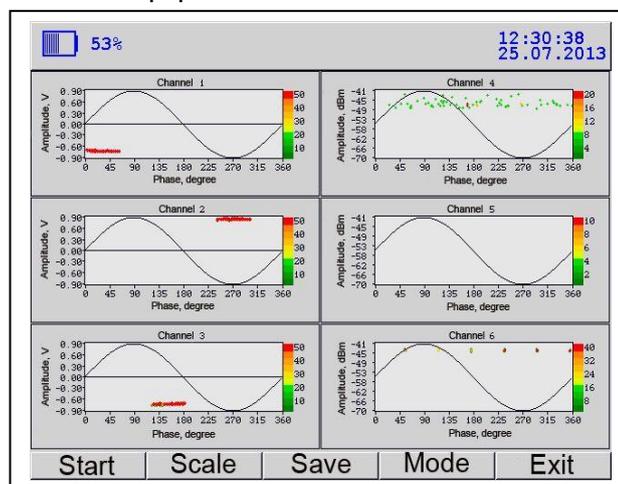
2. PD Measurement and Analysis in the Insulation of Power and Measuring Transformers, Cables, Switchgears.

«VMD-10» has 6 inputs for connecting PD sensors: 3 inputs are used for connecting HF sensors with the frequency from 0.5 up to 20.0 MHz. This is the frequency range suitable for PD measuring in most types of high-voltage equipment.

«VMD-10» sensors synchronically measure PD pulses by three HF channels, the measurement results are saved in the device

memory for viewing and analyzing. If additional software is used then «PD-Expert» build-in expert system is available. «PD-Expert» defines the defect type and accesses its danger by using PRPD (Phase Resolved PD) and frequency pulse parameters (PD-Cloud).

The three HF PD measuring channels are united with the three channels for measuring conduction currents in the insulation, so they use the same input slots on the device side panel. It is convenient, for example, for integrated monitoring of transformer high-voltage bushings when both the insulation conduction currents and PD can be measured by one and the same sensors installed on the test taps.



3. PD Measuring in the Insulation of GIS, Inside Power Transformers, in Motors and Cable Joints.

In some high-voltage objects where PD sensors are installed close to the possible zones of defect formation in the insulation, PD should be measured in UHF frequency range, from 100 up to 1000 MHz. PD measurements in the UHF frequency range are most often made in the Gas-Insulated switch gears.

For that purpose in addition to the three HF measuring channels in «VMD-10» device there are three UHF measuring channels for connecting UHF-antennas and sensors adapted to measurements in GIS, inside power transformers and other types of high-voltage equipment.

4. Contactless Defects Location in the Insulation of Outdoor and Indoor Switchgears

The presence of UHF PD measuring channels allows on-line diagnostics of insulation condition in high-voltage equipment of outdoor and indoor switchgears. This method is effective for mass inspection of high-voltage equipment.

Express diagnostics is done using log-periodic antenna of «VMD-10». In consecutive order the antenna is directed onto different equipment and then the electromagnetic radiation intensity from different objects of outdoor switchgears is compared.

5. Measurement and Analysis of HF Lighting and Switching Surge Pulses in the Power System.

High-frequency switching pulses influence not only the automatics and protection relays, but the high-voltage equipment in the whole, thereby

emergency shutdowns of transformers and other gas-insulated and vacuum switching equipment has become more often.

«VMD-10» can also be used for measuring and temporal monitoring (up to several days) of lighting and switching surge pulses in three-phase high-voltage cables.

6. High-Voltage Equipment Electric Parameters Measurement.

«VMD-10» can make all the standard electrical measurements.

The function of one-phase and three-phase measuring of active and total power allows effective measuring of no-load running loss of transformers as well as other important parameters of high-voltage equipment.

«VMD-10» Design and Delivery Set.

«VMD-10» is a compact portable device in the metal case; the device has combined power supply – both from supply net and from battery. Device has special protective case for carrying and transporting.

«VMD-10» can have options, such as some additional diagnostic facilities, a set of sensors and antennas.

Given the specificity of the HV insulation parameters measuring circuits, when the device body is often under high voltage (usually when using inverted measuring circuits) «VMD-10» can be operated by remote control at a distance of several tens of meters.

The device is connected to PC by WI-FI – for that special software is supplied together with the device.

«VMD-10» Input Circuits Parameters

The number of insulation leakage current measurement channels	3
Insulation leakage currents range, mA	0.002 ÷ 200.0
Dissipation factor measurement accuracy	0.01*tgδ + 0.0001
PD measuring channels (HF + UHF)	6 (3 + 3)
PD measuring range, pC	5 - 100000
Voltage measuring range in three channels, V	0.1 ÷ 220
Current measuring range in three channels, A	0.05 ÷ 5.0

«VMD-10» Parameters

Color screen resolution, pixels	640 * 480
Memory volume RAM, data, Mb	64 / 256
PC connection	USB, Wi-Fi
Operating from battery, hour	4
Temperature range, C°	-20 ÷ 45
Device dimensions, mm	240 * 240 * 140
Device weight, kg	5