

«CDR» - Monitoring System of High-Voltage Cables Technical Condition

Using monitoring systems is necessary in the operation of high-voltage cables. These systems should monitor insulation condition of cables, especially in joints.



«CDR» monitoring system (Cables Diagnostics Relay) is used for monitoring high-voltage cables condition.

«CDR» system monitors:

- Technical condition of cables insulation by PD level and distribution.
- Condition of coupling and terminal joints by temperature and PD.
- Value of compensating currents on cables shield.
- Locates the place of the defect origin in joints or cables.

«CDR-S» sensors.

«CDR-S» sensors are installed on the surface of cables. Sensors are like flexible rings with width of 200 mm. The external surface of cables near terminal or coupling joints is wrapped with this sensor. Cables temperature sensor and power frequency current sensor are supplementary installed into the «CDR-S» sensor case. The sensor of sensor is very simple.



Measuring devices.

The «DIM-PD1» and the «DIM-PD3» devices (one- or three-channel) are used in «CDR» monitoring system for measuring and analyzing cables parameters.

These devices are of the most modern equipment used in PD measuring. The features of the «DIM-PD» device:

- PD pulses measurements in every measuring channel are made in two frequency ranges – HF and UHF. Pulses from the cables insulation are measured in HF range and the pulses from the joints insulation are measured in UHF range.
- PD measurements in three-channel device are made synchronically by all the channels.

- If several measuring devices are installed in one monitoring system, then their operation is absolutely synchronic. Optical line between devices is used for synchronization, or the devices can be synchronized by GPS/GLONASS signals (for very long cables).

- Defect place origin location function is built in the monitoring system. It operates independently by two methods: by analysis of reflectogramm from PD pulses and by difference in time of high-frequency pulse arrival from one defect to the several sensors.

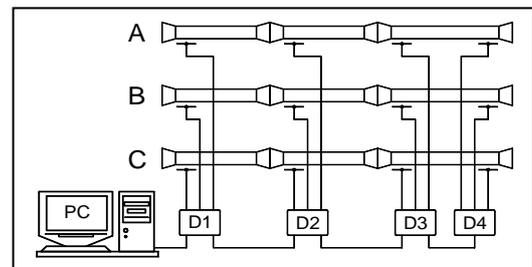
- The «CDR» system has build-in expert diagnostics system «PD-Expert» which allows to automatically define the type of defect in the insulation and the level of its development.

- The «DIM-PD» devices additionally measure and analyze cable parameters (temperature, current), which allows to arise the diagnostics accuracy.

The example of 110 kV separate phase cables monitoring.

Four «DIM-PD3» measuring devices (D1 – D4) are used for the monitoring of the cable with two coupling joints in each phase. Optical line is used for data communication and pulse measurement synchronization.

The one-channel «DIM-PD1» device can be used for single joints condition monitoring.



The «CDR» system connecting to SCADA system can be made as follows:

- By optical line and standard interface.
- By RS-485 interface.

The ModBus RTU protocol or IEC 61850 can be used for data communication from monitoring system to SCADA system.

Specifications of «CDR» system

Parameter	
Rated voltage of monitored cables, kV	10 ÷ 500
SCADA connection RS-485	Optical fiber
PC connection	USB
Temperature range, without heating, °C	-40 ÷ +60
System supply voltage, V	AC/DC 120 ÷ 260