

FDM - monitoring system for technical condition of asynchronous electric motors

The **FDM** monitoring system (**F**ourier **D**iagnostics **M**onitor) is designed to monitor the technical condition of AC motors according to the spectrum of the current consumed.

Distinctive features of the FDM system

- The FDM system is implemented in a compact insulated enclosure, to which no wires are connected.

- The FDM device does not require external power supply. The device is mounted directly on one of the three phase conductors, by which the motor is connected to the mains. The device is powered by the current in the conductor, which controls the motor current.

- The FDM device will be automatically turned on when the electric motor is switched on.

- The FDM device includes two processors to record and calculate the spectrum of current signal. It also has internal expert algorithm to diagnose the defect inside the motor.

- The transmission of diagnosis result information from the FDM system to the SCADA system is carried out via Bluetooth wireless interface. The receiver can be a smartphone, a tablet or a stationary WDM signal receiver connected to the SCADA system.

Algorithm of the monitoring system

After increasing the supply voltage over the built-in internal storage to a predetermined level, the device is automatically switched to the mode of recording and analyzing the load current of the motor.

The data acquisition is performed using an internal 16-bit ADC to obtain high-resolution spectrum up to 0.01 Hz. Such a resolution is necessary for the work of the built-in spectrum analysis expert system.

By means of the analysis of the obtained spectrum, the following types of defects in motor are diagnosed:

- Defects of the squirrel cage of the rotor.
- Eccentricity of the air gap.
- Interturn closures in the stator winding.
- Defects of supporting bearings.

The obtained diagnostic information is compared with the previous results of analysis in order to identify the trend of development of defects. When detecting defects in the electric motor, a red LED will be turn on.



The final results of the FDM expert system for evaluating the state of the electric motor are transmitted via the radio channel to the higher-level SCADA system.

The information receiver is a WDM monitor that collects information from FDM systems with a total of up to 200 pieces located at a maximum distance of no more than 50-100 meters away from the WDM monitor.

Reading information from FDM is possible with a nearby Bluetooth device such as smartphone, tablet, laptop, etc.

Constructional design

The FDM device is sealed in a silicone body which has an annular shape. This is to ensure reliable isolation and convenience of installation of the device on the phase conductor of the connection of the controlled motor.

A silicone rubber housing is designed to mount the FDM device directly on the motor phase conductor. The insulated FDM enclosure is designed for operation with voltages up to 1000 V.

FDM are produced in two versions depending on the rated current of the motor load. All versions have different colors.

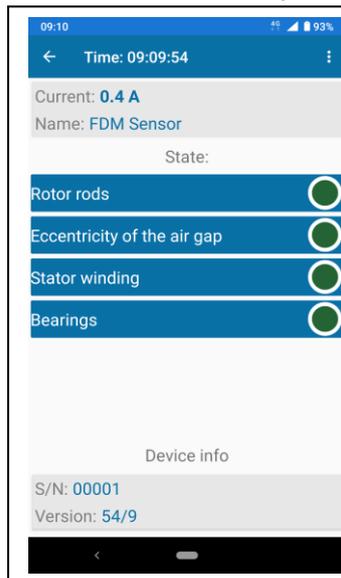
The FDM device in green color can monitor electric motors with rated current up to 30A, and red color monitors up to 150A.

This corresponds to the following capacities of three-phase electric motors 0.4 and 10 kV:

Modification	Current	0,4 kV	10 kV
FDM-30A	5-30A	20 kW	400 kW
FDM-150A	30-150A	100 kW	2500 kW

When using the FDM system to monitor electric motors with a working voltage of 10kV, for safety reasons, it is necessary to ensure that the device does not contact the motor housing with a necessary insulation gap.

The installation of the FDM system is to install it on the power wire of the motor in such a way that it does not allow the transmission antenna to be shielded: the antenna icon on the label must be visible.



Technical parameters

Parameter	Value
Lines in the spectrum	up to 12800
Operating temperature range, °C	-40 ÷ +70
Dimensions FDM-30A (D1*D2*L), mm	56 * 13 * 41
Weight, kg	0,2
Dimensions FDM-150A (D1*D2*L), mm	74 * 18 * 49
Weight, kg	0,4