



Limited Liability Company Engineering Center "EnergoRazvitie"
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ЭР-451-20

Re: Reference on Instruments

**ATTN: O. N. Ekaterinina,
Deputy Director General**

Dear Olga Nikolaevna,

EnergoRazvitie Engineering Center, LLC reports that the MIKO-9A, PKR-2M, MIKO-2.3, PKV/M7 instruments operated by our organization, manufactured and delivered by your enterprise, meet the requirements for them. The equipment and functionality of the devices are provided in accordance with the order.

The MIKO-2.3 instrument and the high-voltage circuit breaker analyzer PKV/M7 are actively used by our organization in measuring the contact resistance of high-voltage circuit breakers. In particular, gas-insulated core circuit breakers of the ELF type SP7-2 at 500 kV manufactured by ABB. MIKO-2.3 is convenient to use due to its small size. The current generated by the device allows you to burn through the contact and get stable readings of contact resistance. The advantage of the device is also the combination of potential and current circuits in two terminals and taking into account the own resistance of the wires included in the kit. In general, MIKO-2.3 allows you to reduce the measurement time and get stable and reliable results. However, it is worth paying attention to the fast discharge of the battery when using a micro-ohmmeter, which determines the dependence of the instrument on the availability of the mains. Test leads for 500 kV circuit breakers must be of a minimum length of 10 meters with reliable and convenient clamps for connection, and this requires additional specification of the order.

Circuit breaker analyzer PKV/M7 is simple and convenient to operate, it allows you to control the main characteristics of high-voltage switching devices. The positive thing is that in one measurement cycle the device allows you to measure several parameters, which significantly reduces the processing time and assess the technical condition of the circuit breaker. A small number of contact cables and the use of different instrument connectors make it possible to reduce the likelihood of personnel errors when assembling the test circuit. PKV/M7 is a universal device that allows you to control the parameters of high-voltage circuit breakers, and can be safely recommended to organizations involved in the commissioning and operation of high-voltage equipment.

The MIKO-9A instrument is used to test power transformers and autotransformers. In particular, in May 2020, the device was successfully tested on the A TDCTN-250000/220/11 0 autotransformer. MIKO-9 A is equipped with a wide range of test cables (it is possible to measure three-phase circuit), which makes it possible to quickly perform a large number of measurements, reducing connection operations, with a minimum of specialists.

The presence of a built-in high-capacity battery allows measurements in the field, regardless of the availability of the mains. The device is very convenient to use (the presence of automatic mode, an important demagnetization option for the transformer, a convenient and intuitive interface), is small and lightweight.

The PKR-2M instrument is used to check the technical condition of switching devices of transformers of all types, both resistor and reactor, using the collapsible method, as well as for diagnosing on-load tap-changers with current-limiting resistors without removing the contactor tank cap. The presence of a built-in battery increases its mobility and ease of use. Equipped with long probes (optional) and a cable with crocodile clamps, it makes it easy to connect to most on-load tap-changers.

The use of these instruments allows our specialists to reduce the time of testing and measurement. These devices these devices are good to use, correspond to the declared characteristics and surpass in many aspects similar devices from other manufacturers.

Deputy General Director for
Production

A. S. Vakotov