

**New development**  
**Milliohmmeter MIKO-9**

Warranty: 36 months  
 Service life: 10 years

Planned period early release – II quarter of 2018.  
 We accept applications for purchase.



**DC current resistance measurement in inductive and noninductive circuits in the range from 10  $\mu\text{Ohm}$   $\div$  30 k $\text{Ohm}$  for the currents of up to 10A:**

- Windings of power transformers, instrument current transformers, electromagnets and electric motors;
- Compensatory, current-limiting and other resistors of high-voltage circuit breakers;
- Contacts and contact connections of power and signal circuits;
- Cables.

Measurement ranges and currents are specified both for automatic and manual modes. The analyzer ensures fully automated measurement of highly inductive load resistance and balancing the thermal EMF in the external circuit.

Distinctive features:

- **Automatic measurement of three-phase transformers.**
- **There is also a mode for resistance measurement across two windings simultaneously** - this mode guarantees fast and accurate measurement of DC electric resistance of power transformers, particularly, by triangular-form connection of the secondary winding, should conventional methods do not produce reliable results.
- **Demagnetization mode of transformer's magnetic circuit** - for eliminating the residual magnetization of transformer's magnetic conduit after DC tests prior to other tests.
- **OLTC in-place check mode (DRM-test method)** - allows carrying out of in-place check and diagnostics of OLTC with current-limiting resistors without removing the contactor tank covers. A graph of current variance at contacts switching is drawn up and the time of switching as well as the general technical condition of the instrument is checked on its basis. Analysis of the

acquired graphs provides not only for sorting out of elements by fault-free/faulty criteria but also for defining the nature of the defect allowing eliminating of fault-free OLTCs opening.

- **"Heat test" mode (cooling test)** - The testing procedure and results interpretation technique follow the requirements set forth in Item 2 of GOST 3484.2-88 "Power Transformers. Heat Tests".
- **Automation of measurement process:**
  - Automatic calculation of relative deviations of winding resistance at three phases against each other;
  - Automatic recalculation of linear resistance of windings connected with delta or star connection to the phase winding resistance;
  - Automatic recalculation of winding resistance measured at current temperature to resistance at the certified temperature (with due regard to winding material);
  - Automatic calculation of deviations measured and normalized to the certified temperature of winding resistance in relation to the certified values of resistance;
  - Automatic calculation of winding temperature based on its measured and certified value of resistance and certified temperature.
- **Personal computer connection through USB or Bluetooth.**
- **Sensor display and independent power supply.**







### Specifications

Specifications	Value
Resistance range,	10 $\mu$ Ohm $\div$ 30 kOhm
Maximum permissible intrinsic error of resistance measurement	$\pm$ (0.1%+0.5 $\mu$ Ohm)
Best resolution	0.1 $\mu$ Ohm
Measuring current intensity, A	0.0005 $\div$ 10
Relative drift of measuring current intensity, %/s	$\pm$ 0.002
Maximum output voltage, V	22
Set output power limits, W	0.3; 1; 5; 20; 62
Maximum output capacity: when powered from the battery, W when powered from the mains, W	20 60
Mains voltage: AC (valid value), V DC, V	90 $\div$ 253 127 $\div$ 354
Maximum consumed power, W	120
Type of data transmission channel	USB, Bluetooth
Dimensions, mm	270x250x130
Operation temperature range, $^{\circ}$ C	-20 $\div$ +50
IP for transportation	IP64
IP rating in operating state	IP40
Maximum measuring unit weight, kg	4.0
Interface language	English
User manuals language	English
Calibration interval, year	3

## Recommended package of the Instrument

Photo	Item, Index	Application	Recommended complete set (pcs.)
<b>Standard complete set:</b>			
	MIKO-9 measuring unit	Instrument with the basic software and accompanying documents, Mains cable, Ground wire, Cable USB 2.0, Zero resistance equivalent, Shunt and Attachment devices set kit.	1
<b>Additional complete set (on order):</b>			
<b>Select at least one measuring cable:</b>			
	Measuring cable (set of 2 pcs.) CKБ041.18.00.000 CKБ041.18.00.000-01	Cable for connection to transformer leads. Alligator type clamps with the jaw of up to 80 mm. Length – 8.5 m	1
	Measuring cable CKБ041.19.00.000	Cable for measuring the transient resistance of contacts; measurement of CT and VT windings resistance. Length: 3 m.  Clamps: current and potential contacts: 'crocodile' clamps with 25mm jaws (2 pcs.), and removable probes with a 3mm diameter plug 70mm long (2 pcs.).	1
	Measuring cable (set of 2 pcs.) CKБ041.26.00.000 CKБ041.26.00.000-01	Cable for connection to transformer leads as an alternative to cables available CKБ041.18.00.000 and CKБ041.18.00.000-01.  Clamp jaw of up to 103 mm. Length - 8.5 m.	-
	Test cables for CT and VT CKБ041.21.00.000	For measuring the resistance of CT and VT windings of both in-built and stand-alone transformers / circuit-breakers.  Alligator type clamps with the jaw of 25 mm. Length – 4 m.	-
	Measuring cable extension (set of 2 pcs.) CKБ031.20.00.000	Recommended for application together with measuring cables CKБ041.18.00.000/CKБ041.18.00.000-01 (throat of up to 80 mm) and CKБ041.26.00.000/CKБ041.26.00.000-01 (throat of up to 103 mm).  Length - 6.5 m.	1

**For applying the DRM-test one of the short-circuiting cable sets for closing secondary circuits and additional resistor shall be ordered:**

	<p>Short-circuiting cable (set of 3 pcs.) СКБ041.23.00.000</p>	<p>This set consists of three short-circuiting wires 3m long each. Both ends of the wire are furnished with welded 'crocodile' clamps with 80 mm jaws.</p> <p>This cable is for OLTC devices of power transformers.</p> <p>Furthermore, this cable is needed for <b>connecting the high-voltage and low-voltage windings</b> when performing measurements in the 'two consecutive windings' mode.</p>	<p style="text-align: center;">-</p>
	<p>Short-circuiting cable (set of 3 pcs.) СКБ035.31.00.000</p>	<p>This set consists of three short-circuiting wires 12m long each. Both ends of the wire are furnished with welded 'crocodile' clamps with 80 mm jaws.</p> <p>This cable is for OLTC devices of auto transformers.</p>	<p style="text-align: center;">1</p>
	<p>Additional resistor СКБ032.25.00.000</p>	<p>For in-place OLTCs monitoring at apparent resistance of the winding of no more than 0.5 Ohm</p>	<p style="text-align: center;">1</p>
	<p>Cable and documentation bag СКБ126.06.00.000</p>	<p>Handy, sturdy and wear-resistant bag for carrying cables, documents and other additional component parts.</p>	<p style="text-align: center;">1</p>
	<p>KMDLAX-6P plug</p>	<p>An adapter for the RS-485 cable for the analyzer communication with the SCADA-controlled measurement system.</p>	<p style="text-align: center;">-</p>
	<p>Reference inductor adaptor СКБ023.12.00.000</p>	<p>For verification laboratories: inspection / calibration of the instrument.</p>	<p style="text-align: center;">-</p>
<p style="text-align: center;">-</p>	<p>Manipulating rod for equipment of up to 35kV (2.2 m) СКБ010.41.00.000</p> <p>Manipulating rod for equipment of up to 110kV (3.7 m) СКБ010.41.00.000-01</p> <p>Manipulating rod for equipment of up to 220kV (5.1 m) СКБ010.41.00.000-02</p>	<p>The rod is designed to ensure convenient connection to contacts of a transformer inputs.</p> <p>The rod is completed with a clamp with current and potential contacts connected by wires with the measurement platform. Test cables are connected to the measurement platform from the ground.</p>	<p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p style="text-align: center;">-</p>

## Area of the Instrument application

Test methods	Recommended Instrument
<b>Power cable lines</b>	
Monitoring of cable lines	<b>MIKO-9</b> , MIKO-8M, MIKO-7, MIKO-2.3
<b>Current transformers</b>	
Measuring of secondary resistance	<b>MIKO-9</b> , MIKO-8M, MIKO-7, MIKO-2.3
Operates in the range of 10 m $\Omega$ ÷ 10 k $\Omega$ on the current of up to 10A, therefore, when measuring the resistance of the secondary current transformer windings the minimum output power shall be set as low as 0.3W, that will reduce the current amperage.	
<b>Voltage transformers (electromagnetic and capacitive)</b>	
Measuring of secondary resistance	<b>MIKO-9</b> , MIKO-8M, MIKO-7, MIKO-2.3
Operates in the range of 10 m $\Omega$ ÷ 10 k $\Omega$ on the current of up to 10A, therefore, when measuring the resistance of the secondary current transformer windings the minimum output power shall be set as low as 0.3W, that will reduce the current amperage.	
<b>Power transformers, autotransformers and oil-immersed reactors</b>	
Measuring of transformer winding resistance	<b>MIKO-9</b> , MIKO-8M, MIKO-7, MIKO-2.3
In-place estimation of the state of OLTC contactors (DRM-test)	<b>MIKO-9</b> , MIKO-8M, PKR-2M
Contactors operation oscillography	<b>MIKO-9</b> , MIKO-8M, PKR-2M
<b>Synchronous generators, compensators and AC/DC motors</b>	
Measuring of winding resistance of the facility	<b>MIKO-9</b> , MIKO-8M, MIKO-7, MIKO-2.3