

**EKF****EXPERT**

TECHNICAL AND OPERATION MANUAL

DIGITAL MULTIMETER MAS830B, MAS830L, MAS838






EKF EXPERT

SAFETY INFORMATION


Digital multimeters MAS830B, MAS830L, MAS838 EKF series Expert comply with the requirements of GOST 12.2.091-2012 (IEC 61010-1:2001) in terms of device safety and GOST R 51522.2.1-2011 (IEC 61326-2-1:2005), GOST R 51522.2.2-2011 (IEC 61326-2-2:2005) in terms of electromagnetic compatibility. To ensure safe operation of the device, follow the recommendations in the operation manual.

The safety icons are shown in Table 1.

Table 1

	Important safety information
	High voltage may be present
	Grounding
	Double insulation
	The fuse can be replaced with a similar one with the parameters given in the operation manual

- Use the sockets, functions and measuring ranges as described in the operation manual.
- Do not use the multimeter if it has a damaged housing. Pay particular attention to the connection sockets.
- Use original probes from this model of multimeter. Do not use defective probes. Check the insulation of the probes on the regular basis. When measuring, keep your fingers behind the barrier edge of the probes.
- Do not use the multimeter if the back cover is open or the housing is not completely closed.
- Never exceed the overload capacity value specified for each measuring range.
- Do not touch any unused sockets when the device is connected to the circuit to be tested.
- If the order of the measured value is not known beforehand, set the range switch to the maximum value.
- Before changing the position of the range switch, disconnect the probe from the circuit to be measured.
- When measuring in TV sets and static power supply unit, always remember that high voltage impulses may be present at the measured points, which can damage the device.

- Disconnect power and discharge high voltage capacitors when measuring electrical resistance, checking circuit continuity, diodes.
- Never measure resistances in the closed circuit.
- Do not use the product in an explosive atmosphere or in the rooms with high humidity.
- Replace the battery as soon as the symbol appears .
- Always be careful at work when voltage is over 60V DC or 30V AC.



If the producer's operating rules are not followed, the protection applied to the device may be degraded.

If a fault or malfunction occurs, it is necessary to stop using the multimeter immediately. The multimeter shall be only diagnosed and repaired in an authorized workshop.

When maintaining the product, use a soft cloth for cleaning; do not use abrasives or solvents.

1 FUNCTION

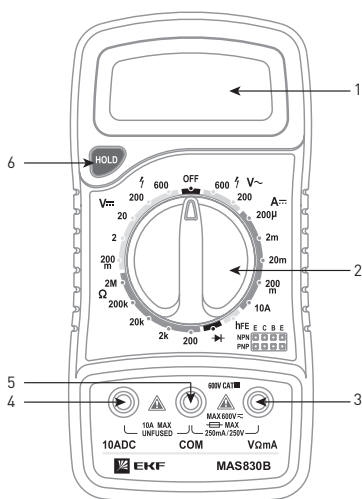
Digital multimeters MAS830B, MAS830L, MAS838 EKF series Expert are quality measuring instruments with a wide range of functions for everyday use (table 2 has functions for each model):

- DC voltage measurement DCV (V_{DC})
- AC voltage measurement ACV (V_{AC})
- DC current measurement DCA (A_{DC})
- electrical resistance measurement (Ω)
- diode checking (\rightarrow)
- transistor testing (hFE)
- circuit continuity checking / audio checking (\bullet)
- temperature measurement ($^{\circ}\text{C}$)
- data hold (**HOLD**)
- display backlit (**BACKLIGHT**)

Table 2

Model	V_{DC}	V_{AC}	A_{DC}	Ω	\rightarrow	hFE	\bullet	$^{\circ}\text{C}$	HOLD	BACKLIGHT
MAS830B	+	+	+	+	+	+			+	
MAS830L	+	+	+	+	+	+	+		+	+
MAS838	+	+	+	+	+	+	+	+	+	

2 ELEMENTS OF FRONT PANEL



1. LCD display 3 1/2 digits, symbol height 15 mm
- Rotary switch: for selecting function and measuring range and activation and deactivation of the device **[OFF]**
2. Socket «**VΩmA**» to connect the probe of positive polarity (red probe)
3. Socket «**10A**» to connect the probe of positive polarity (red probe)
4. Socket «**COM**» to connect the probe of negative polarity (black probe)
5. Button «**HOLD**»


Fig. 1 - Elements of front panel elements, example of MAS830B

Table 3

Button	Function
HOLD	Current value hold (indicator appears « HOLD »). If you press again, the function of current value hold will be deactivated and the device returns to normal measurement mode
BACKLIGHT	If you press, the function of the display backlit will be activated. The backlight goes out after 5 seconds. Press the button again to reactivate the backlight

3 TECHNICAL DATA

Table 4

Parameter	Value
Maximum display value	1999
Measurement method	Double-integrated ADC
Measuring rate	3 measurements per second
Overload indicator	"1" on LCD display
Battery discharge indicator	symbol on LCD display 
Polarity indicator	symbol " - " for negative polarity
Safety category	600V CATIII
Housing insulation	double, class II
Protection class according to GOST 14254	IP20
Operating temperature	0 to 40 °C, at relative humidity of no more than 80%
Altitude above sea level, m	Up to 2000
Supply voltage	9 V Battery type 6F22, 1604
Dimensions, mm	69x138x31
Weight, g	170 (with battery)
Service life, years	10

DC VOLTAGE

Table 5

Range	Resolution	Accuracy
200 mV	0,1 mV	$\pm 0,5\% \pm 3D$
2 V	0,001 V	
20 V	0,01 V	
200 V	0,1 V	
600 V	1 V	$\pm 0,8\% \pm 5D$

*D - least significant digit value
 Overload protection: 250 V DC
 or root-mean-square value (RMS)
 for range 200 mV or 600 V DC or (RMS)
 for other ranges.

AC VOLTAGE

Table 6

Range	Resolution	Accuracy
200 V	0,1 V	$\pm 1,2\% \pm 10D$
600 V	1 V	

Overload protection: 1000 B DC
 or 750 V AC (RMS).
 Frequency range:
 40 Hz - 1 kHz True RMS.

TEMPERATURE TEMPERATURE

Table 7

Range	Resolution	Accuracy
from -20°C to 0°C	1°C	$\pm 10\% \pm 2D$
from 0°C to 400°C		$\pm 1,0\% \pm 3D$
from 400°C to 1000°C		$\pm 2,0\% \pm 3D$

DIRECT CURRENT

Table 8

Range	Resolution	Accuracy	Model
200 mK A	0,1 mK A	$\pm 1,0\% \pm 3D$	MAS830B, MAS830L
2 mA	0,001 mA		MAS830B MAS830L MAS838
20 mA	0,01 mA	$\pm 1,0\% \pm 5D$	
200 mA	0,1 mA	$\pm 1,5\% \pm 5D$	
10 A	0,01 A	$\pm 3,0\% \pm 10D$	

Overload protection: 250 mA/250 V fuse.
10 A range is not protected against overload.

RESISTANCE

Table 9

Range	Resolution	Accuracy
200 Ohm	0,1 Ohm	$\pm 0,8\% \pm 5D$
2 kOhm	0,001 kOhm	$\pm 0,8\% \pm 2D$
20 kOhm	0,01 kOhm	
200 kOhm	0,1 kOhm	
2 Mohm	0,001 Mohm	$\pm 1,0 \pm 5D$

Maximum open circuit voltage: 3,2 V. Overload protection: 250 V DC or RMS.

4 MEASUREMENT PERFORMANCE



Never exceed the overload capacity value given for each measuring range.

DC AND AC VOLTAGE MEASUREMENT (V_{DC} and V_{AC})

1. Connect the red probe to the «**VΩmA**» socket and the black probe to the «**COM**» socket. The polarity of the red probe is considered positive.
2. Use the rotary switch to select the desired DCV (V_{DC}) or ACV (V_{AC}) voltage measuring range. If the voltage is not known, set the range switch to the maximum voltage and then set it to the lower voltage until the desired measuring accuracy is obtained.
3. Connect the probes to the circuit under test.
4. Read the value and polarity of the tested voltage on the display.
5. If the display shows only "1" in the left digit, it indicates that an overload has occurred and the range switch shall be set to a higher value.
6. When the work is completed, put the rotary switch to the position «**OFF**».

DIRECT CURRENT MEASUREMENT (A $\overline{\cdot}$)

1. Connect the red probe to the «**V Ω mA**» socket and the black probe to the «**COM**» socket. The polarity of the red probe is considered positive. (For current measurements from 200 mA to 10 A, move the red probe to the «**10ADC**» socket).
2. Use the rotary switch to select the desired DCA current measurement range (A $\overline{\cdot}$). If the current is not known, set the range switch to «**200 mA**» and then set the desired accuracy by switching to lower limits.
3. Open the circuit to be measured and connect the probes in series with the load to be measured.
4. Read the current value and polarity on the display.
5. If the display only shows "1" on the left digit, it indicates that an overload has occurred and the range switch shall be set to a higher value.
6. When the work is completed, put the rotary switch to the position «**OFF**».

RESISTANCE MEASUREMENT (Ω)

1. Connect the red probe to the «**V Ω mA**» socket and the black probe to the «**COM**» socket. The polarity of the red probe is considered positive.
2. Use the rotary switch to select the required resistance measuring range (Ω).
3. Connect the probes to the resistance to be measured and read the values on the display.
4. If the measured resistance value exceeds the maximum value of the selected measurement range, the number "1" will appear in the left digit, it means, that the overload occurred and the range switch shall be set to a higher value.
5. When the work is completed, put the rotary switch to the «**OFF**» position.



If the resistance to be measured is set in the circuit, switch off the power supply and discharge all capacitances in the circuit before carrying out the measurements.

DIODE CHECKING ($\overrightarrow{\cdot}$)

1. Connect the red probe to the «**V Ω mA**» socket and the black probe to the «**COM**» socket. The polarity of the red probe is considered positive.
2. Set the rotary switch to « $\overrightarrow{\cdot}$ ».
3. Connect the red probe to the anode and the black probe to the cathode of the diode to be tested. The display will show the approximate voltage drop in the diode when direct current is flowing through it. When the probes are connected back to the diode, the display will show "1".
4. When the work is completed, put the rotary switch to the «**OFF**» position.

CIRCUIT CONTINUITY CHECKING / AUDIO CHECKING ($\overrightarrow{\cdot}$) for models MAS838, MAS830L

1. Connect the red probe to the «**V Ω mA**» socket and the black probe to the «**COM**» socket.
2. Put the rotary switch to « $\overrightarrow{\cdot}$ ».
3. Connect the probes to two points of the circuit to be tested. If there is electrical contact between the two points (less than 70 ± 30 ohms resistance), an audio signal will issue.
4. When the work is completed, put the rotary switch to the «**OFF**» position.

TRANSISTOR TESTING (hFE)

1. Put the rotary switch to the «**hFE**» position.
2. Determine the type of NPN or PNP transistor and identify the emitter terminals, bases and collector. Insert the transistor into the corresponding holes on the front panel connector: "E" – emitter, "B" – base, "C" – collector of the transistor.
3. Read the hFE value on the display at a base current of 10 μ A and a collector-emitter voltage Vce of 3 V.
4. When the work is completed, put the rotary switch to the «**OFF**» position.



Remove the probes from the multimeter sockets before testing the transistor.

TEMPERATURE MEASUREMENT (°C) for model MAS838

1. Set the rotary switch to °C. The ambient temperature is shown on the display.
2. Connect the thermocouple, type "K" to the appropriate sockets (connect the red thermocouple wire to the «**VΩmA**» socket and the black thermocouple wire to the «**COM**» socket) on the front panel and attach the thermocouple to the object to be tested.
3. Read the temperature on the display.
4. When the work is completed, put the rotary switch to the «**OFF**» position.




Before carrying out any other actions, remove the thermocouple, type "K" from the sockets to avoid electric shock.



Maximum operating temperature, thermocouple type "K" is 250 °C (300 °C in short-time operating mode).

REPLACEMENT OF BATTERY AND FUSE

If the symbol  is displayed, it indicates that the battery needs to be replaced. The fuse rarely needs to be replaced and almost always blows due to user's error. To replace the battery and fuse (250 mA/250 V), unscrew 2 screws on the back cover. Remove the old battery and replace with the new one. Observe the polarity of the battery. Close the housing and tighten the screws.



Before replacing the battery, ensure that the probes and thermocouple are disconnected from the devices to be tested and the rotary switch is in the «**OFF**» position.

5 SCOPE OF DELIVERY

1. Multimeter – 1 pc;
2. Measuring probe set (red/black) – 1 pc.
3. Battery 9 V – 1 pc;
4. Thermocouple, type "K" – 1 pc. (only for MAS838);
5. Technical and operation manual – 1 pc.

6 TRANSPORTATION AND STORAGE

The device shall be transported in accordance with the transport regulations applicable to each mode of transport. During storage and transportation the device shall be protected from any mechanical damage. Conditions of transportation and storage of these products in terms of climatic factors of environment are according to group 1 of GOST 16962-71.

7 DISPOSAL



After the device has been decommissioned, it shall be packed for disposal in accordance with the procedures specified by the consumer, or in accordance with federal or regional law in Russia or the member states of the Customs Union.

**EKF****EXPERT****8 PRODUCER'S WARRANTY**

The producer guarantees that the product is in compliance with the requirements of the normative documentation, provided the user observes the conditions of use, transportation and storage. Service life: 10 years.

Warranty period of storage starting from the production date: 10 years.

Warranty period of operation, starting from the date of sale: 12 months.

9 CERTIFICATE OF ACCEPTANCE

The multimeter has been produced in accordance with current normative documentation and is recognized as suitable for use.

Stamp of technical supervision:

Production date _____

10 NOTE OF SALE

Date of sale _____

Seller's signature _____

Stamp of selling company:



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