



# EKF



## TECHNICAL MANUAL

Digital multimeter






M830B / M832 / M838 EKF MASTER

## SAFETY INFORMATION


The digital multimeter M830B / M832 / M838 EKF MASTER complies with IEC 61010-1:2001 in terms of safety requirements, and IEC 61326-2-1:2005 and IEC 61326-2-2:2005 in terms of electromagnetic compatibility. To ensure safe operation of the device, follow the instructions herein.

The safety symbols used herein are listed in Table 1.

Table 1

	Important safety information
	High voltage may be present
	Grounding
	Double insulation
	The fuse can be replaced by a similar one with the parameters specified herein.

## SAFETY INSTRUCTIONS:

- Use sockets, functions and measuring ranges as described herein.
- Do not use the multimeter if its housing is damaged. Pay particular attention to the connection sockets.
- Use original probes from this model of the multimeter. Do not use defective probes. Check the insulation of the probes regularly. When measuring, keep your fingers behind the barrier edge of the probes.
- Do not use the device with the back lid open or the housing loosely closed.
- Never exceed the overload capacity values of the device specified for each measuring range.
- Do not touch any unused sockets when the device is connected to the measured circuit.
- If you do not know the measured value order before measuring, set the range switch to the maximum value.
- Before changing the position of the range switch, disconnect the probes from the circuit to be measured.
- When measuring in TV sets and static power supplies, be aware that high voltage pulses may be present at the measured points, which can damage the device.
- Disconnect power and discharge high voltage capacitors when measuring electrical resistance, testing circuit continuity and diodes.
- Before installing the transistor for testing, make sure that the probes are not connected to electrical circuits.
- Never measure resistance in a closed circuit.
- Replace the battery as soon as the symbol appears 

- Be careful whenever dealing with voltage over 60V DC or 30V AC.



If you fail to observe the manufacturer's operating instructions, the protection of the device may be degraded.

Stop using the device immediately if any malfunctions or faults occur. The device shall be serviced and repaired only by authorized service companies.

For cleaning of the product, use a soft cloth, do not use abrasives or solvents.

## 1 DESCRIPTION

The digital multimeters M830B, M832, M838 EKF MASTER are compact devices with functions as follows (for details, refer to Table 2):

- DC voltage measurement (DCV)
- AC voltage measurement (ACV)
- DC measurement (DCA)
- electrical resistance measurement
- temperature measurement
- diode test
- transistor test
- circuit continuity test (buzzer)
- signal generation with 50 Hz frequency (square signal)

Table 2

Model									
M830B	+	+	+	+	+		+		
M832	+	+	+	+	+	+	+	+	
M838	+	+	+	+	+	+	+		+

## 2 FRONT PANEL ELEMENTS

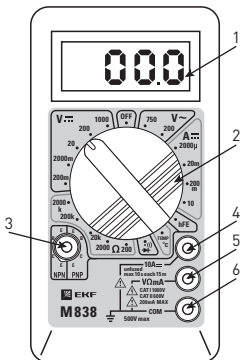



Figure 1. Front panel elements

1. LCD-display 3 1/2 digits, character height 12,7 mm.
2. Rotary switch for selecting functions and measurement range, and switching on/off the device. The device is switched off when the switch is in the «OFF» position.
3. Socket «hFE» for measuring transistor gain.
4. Input socket «10 A» for connecting a probe of positive polarity for measurement of current up to 10A.
5. Input socket «VΩmA» for connecting a probe of positive polarity for measurement of voltage, electrical resistance, and current up to 200 mA.
6. Input socket «COM» for connecting a probe of negative polarity.

## 3 TECHNICAL DATA

Table 3

Parameter	Value
Maximum display value	1999 with automatic polarity detection
Measurement method	Double-integrated ADC
Measurement rate	2 measurements per second
Overload indicator	«1» on LCD display
Low battery indicator	symbol  on LCD display
Polarity indicator	sign « - » at negative polarity
Safety category	CATI 1000V / CAT II 600V
Housing insulation	double, class II
Degree of protection by IEC 60529	IP20
Operating temperature, °C	from 0 to + 40, at relative humidity of max. 80%
Altitude above sea level, m	max. 2000
Power supply	9 V Battery (NEDA 1604, 6F22)
Dimensions, mm	126x70x26
Weight, g	108 (with battery)
Service life, years	10

## DC VOLTAGE

Range	Resolution	Accuracy
200 mV	0,1 mV	$\pm 0,5\% \pm 3D$
2000 mV	1 mV	$\pm 0,8\% \pm 5D$
20 V	10 mV	
200 V	0,1 V	
1000 V	1 V	$\pm 1,0\% \pm 5D$

\*D - least significant digit value

Overload protection: 220 V

Root-mean-square value (RMS)

for 200 mV and 1000 V DC range or 750 V (RMS) for all other ranges.

## AC VOLTAGE

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

Overload protection:

1000V DC or 750 V DC/AC (RMS)

Frequency: 45 - 450 Hz.

Measurement of the mean value equal to the RMS value (RMS) for sinusoidal signals.

## TEMPERATURE

Range	Resolution	Accuracy
from -40°C to +150°C	1°C	$\pm 1,0\% \pm 4D$
from +150°C to +1370°C		$\pm 1,5\% \pm 15D$

## OTHER FUNCTIONS

Function	Description
Diode test	Indicates the direct voltage drop in the diode
Transistor test	Range: 0 - 1000; Test current $I_{base} = 10 \mu A$ ; Test voltage $V_{ce} = 2,8 V$
Circuit continuity test (buzzer)	If the resistance of the tested circuit is less than $30 \pm 20 \text{ Ohm}$ , the buzzer sounds. Overload protection: 15 s, 220 V DC/AC (RMS)
Signal generation with 50 Hz frequency (square signal)	Input voltage 5 V, 50 kOhm

## DIRECT CURRENT

Range	Resolution	Accuracy	Model
200 $\mu A$	0,1 $\mu A$	$\pm 1,8\% \pm 2D$	M830B
2000 $\mu A$	1 $\mu A$		M830B, M832, M838
20 mA	10 $\mu A$		M830B, M832, M838
200 mA	0,1 mA	$\pm 2\% \pm 2D$	M830B, M832, M838
10 A	10 mA	$\pm 2\% \pm 10D$	M832, M838

Overload protection: fuse 500 mA/250 V. (The range 10 A is not protected against overloading).

## RESISTANCE

Range	Resolution	Accuracy
200 Ohm	0,1 Ohm	$\pm 1,0\% \pm 10D$
2000 Ohm	1 Ohm	$\pm 1,0\% \pm 4D$
20 kOhm	10 Ohm	
200 kOhm	0,1 kOhm	
2000 kOhm	1 kOhm	

Maximum open circuit voltage: 3,2 V.

Overload protection: 15 s, 220 V DC/ AC (RMS)

## 4 MEASUREMENTS

### DC AND AC VOLTAGE MEASUREMENT

1. Connect the red probe to the socket «**VΩ**», and the black probe to the socket «**COM**». The polarity of the red probe is considered positive.
2. Use the rotary switch to select the desired DCV or ACV voltage measurement range. If you do not know the measured voltage before measuring, set the range switch to the maximum voltage position and switch to lower values to achieve the required measurement accuracy.
3. Connect the probes to the tested circuit.
4. Read the value and polarity of the tested voltage on the display.
5. If the display shows only «1» in the left digit, overload has occurred. Set the range switch to a higher value.
6. When the work is finished, put the rotary switch to the «**OFF**» position.



When the range switch is set to «**750 V**» the display will show a «**HV**» sign to warn of high voltage operation. Caution is required.

### DIRECT CURRENT MEASUREMENT

1. Connect the red probe to the socket «**VΩmA**», and the black probe to the socket «**COM**». The polarity of the red probe is considered positive.
2. Use the rotary switch to select the desired direct current DCA measurement range. If you do not know the measured current before measuring, set the range switch to «**200 mA**» and then switch to the lower values to achieve the desired measurement accuracy. If you assume that the measured current is in the range from 200 mA to 10 A, move the red probe to the socket «**10 A**».
3. Open the tested circuit and connect the probes of the device in series with the load where the current is measured.
4. Read the current value and its polarity on the display.
5. If the display shows only «1» in the left digit, overload has occurred. Set the range switch to a higher value.
6. When the work is completed, put the rotary switch to the «**OFF**» position.



Range 10 A is not protected against overload.  
Maximum measurement time is 15 s.

### RESISTANCE MEASUREMENT

1. Connect the red probe to the socket «**VΩmA**», and the black probe to the socket «**COM**». The polarity of the red probe is considered positive.
2. Use the rotary switch to select the desired resistance measurement range  $\Omega$ .
3. Connect the probes to the tested resistance and read the values on the display.
4. If the value of the measured resistance exceeds the maximum value of the selected measurement range, the display will show «1» in the left digit.
5. When the work is finished, put the rotary switch to the «**OFF**» position.



If the measured resistance is set in the circuit, disconnect the power and discharge all capacitances of the circuit before performing measurements.

## TEMPERATURE MEASUREMENT (for model M838)


1. Put the range switch to the «**TEMP**» position. The display will show the ambient temperature.
2. Connect the thermocouple, type «K» to the appropriate sockets on the front panel and place the thermocouple against the object to be tested. Read the temperature on the indicator.
3. When the work is finished, put the rotary switch to the «**OFF**» position.




To avoid electric shock, make sure that the thermocouple is disconnected before performing other work.

Maximum operating temperature of the thermocouple, type «K» is 250 °C [300 °C for short-term operating mode].


## DIODE TEST

1. Connect the red probe to the socket «**VΩmA**», and the black probe to the socket «**COM**». The polarity of the red probe is considered positive.
2. Put the rotary switch to the position 
3. Connect the red probe to the anode and the black probe to the cathode of the tested diode. The display will show the approximate voltage drop in the diode when the direct current is flowing through it. When the probes are reverse connected to the diode, the display will show «1».
4. When the work is finished, put the rotary switch to the «**OFF**» position.


## TRANSISTOR TEST

1. Set the rotary switch to the position .
  2. Determine whether the transistor is NPN or PNP and identify the emitter, base, and collector contacts. Insert the transistor into the corresponding holes of the connector on the front panel: «E» – emitter, «B» – base, «C» – collector of the transistor.
  3. Read the hFE value on the display at the base current of 10 μA and collector-emitter voltage Vce of 2,8 V.
  4. When the work is finished, put the rotary switch to the «**OFF**» position.
- Before testing the transistor, remove the probes from the sockets of the multimeter.

#### CIRCUIT CONTINUITY TEST (BUZZER)

1. Connect the red probe to the socket «**VΩmA**», and the black probe to the socket «**COM**».
2. Put the rotary switch to the position .
3. Connect the probes to the points of the measured circuit. In case of electrical contact between the points (resistance is less than  $30 \pm 20$  Ohm), the buzzer sounds.
4. When the work is finished, put the rotary switch to the «**OFF**» position.


#### SIGNAL GENERATOR (for model M832)

1. Connect the red probe to the socket «**VΩmA**», and the black probe to the socket «**COM**». The polarity of the red probe is considered positive.
2. Set the rotary switch to the position .
3. The square signal of rectangular shape with 50 Hz frequency appears between sockets «**VΩmA**» and «**COM**». The output voltage is approximately 5 V and contains a DC voltage component, so an isolation capacitor should be used.
4. When the work is finished, put the rotary switch to the «**OFF**» position.



The output signal is used. The circuit is not protected against short circuit. Do not apply more than 40 V voltage to the probes in this mode.

#### BATTERY AND FUSE REPLACEMENT

If the symbol  is displayed, the battery needs to be replaced. The fuse rarely needs to be replaced and frequently blows due to user's error. To replace the battery and fuse (500 mA/250 V), unscrew 2 screws on the back lid of the device. Remove the failed element and replace it with a new one. Observe the polarity of the battery. Close the housing, tighten the screws.



Before replacing the battery, make sure that the probes are disconnected from the tested devices and the rotary switch is in the «**OFF**» position.



## 5 DELIVERY SCOPE

1. Multimeter - 1 pc.
2. Set of probes (red/black) - 1 pc.
3. Battery 9 V - 1 pc.
4. Thermocouple, type K (only for model M838) - 1 pc.
5. Technical and operation manual - 1 pc.

## 6 TRANSPORTATION AND STORAGE



The product shall be transported in compliance with the transportation regulations applicable to each means of transport. The product shall be protected against mechanical impact during storage and transportation. The product shall be stored in heated and ventilated space at the ambient temperature from -25 to +35 °C and relative humidity of max. 70%. Do not expose to direct sunlight and precipitations. Do not store near acid and alkali.

## 7 DISPOSAL



Life-expired and failed products shall be disposed of in compliance with the national and local laws and regulations in force. To dispose of the product, send it to an authorized company for recycling in compliance with the national and local laws and regulations in force.

## 8 MANUFACTURER'S WARRANTY

The manufacturer guarantees the products comply with the declared characteristics, provided that the consumer follows the operation, transportation and storage conditions.

**Service life:** 10 years.

**Shelf life:** 10 years from the date of manufacture.

**Warranty period:** 12 months from the date of sale.

**Manufacturer:** for information, refer to the product package.

**Importer and EKF trademark service representative:**

EKF ELECTRICAL SOLUTION – FZCO, Dubai Silicon Oasis, DDP, Building A2, Dubai, United Arab Emirates.

**Importer and EKF trademark service representative on the territory of the Russian Federation:** OOO «Electroresheniya», Otradnaya st., 2b bld. 9, 5th floor, 127273, Moscow, Russia. Tel.: +7 (495) 788-88-15.

**Importer and EKF trademark service representative on the territory of the Republic of Kazakhstan:** TOO «Energosheniya Kazakhstan», Kazakhstan, Almaty, Bostandyk district, Turgut Ozal st., 247, apt 4.

## 9 CERTIFICATE OF ACCEPTANCE

The digital multimeter M182 EKF MASTER has been manufactured in compliance with laws and regulations in force and has been approved for operation.

Quality control stamp

**Date of manufacture:**

For information, refer to the product package.

## 10 NOTE OF SALE

Date of sale

Seller's signature

Seller's seal



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