EKF

TECHNICAL MANUAL

Digital multimeter
M182 EKF MASTER

SAFETY INFORMATION

The digital multimeter M182 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 device if its housing is damaged. Pay particular attention to the connection sockets.
- Use only original probes from this device model. Do not use defective probes. Check 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 overload capacity values of the device specified for each measuring range.

• Do not touch any open 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 turning the range switch, disconnect the probes from the measured circuit.
• When measuring in TV sets and static power supply units, 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, disconnect the probes from electrical circuits.
• Never measure resistance in a closed circuit.
• Replace the battery as soon as the battery symbol  appears.
• Be careful whenever dealing with voltage over 60VDC or 30VAC.


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

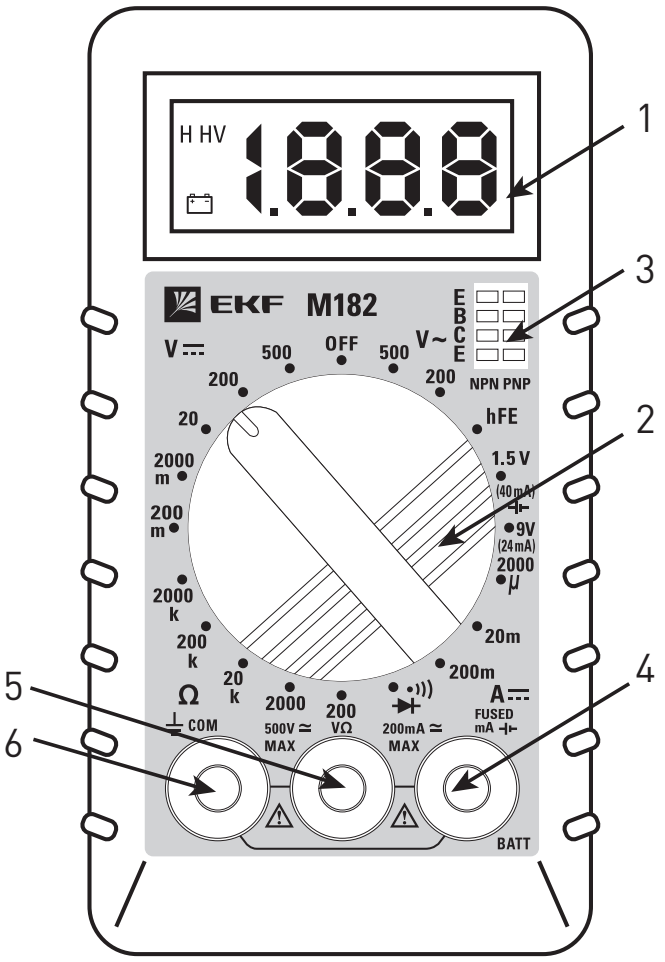
Stop using the device immediately if any malfunctions or faults occur. The device shall be serviced and repaired only by authorized service companies.
For cleaning of the product, use a soft cloth, do not use abrasives or solvents.

1 DESCRIPTION

The digital multimeter M182 EKF MASTER is a small-size device with functions as follows:

- DC voltage (DCV) measurement V⎓
- AC voltage (ACV) measurement V~
- Direct current measurement A⎓
- Electrical resistance measurement Ω
- Diode test
- Transistor test hFE
- Circuit continuity test (buzzer)
- Batteries 1,5V/9V test TEST

2 FRONT PANEL ELEMENTS



1. LCD-display with 3 1/2 digits, character height is 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 «mA» for connecting a probe of positive polarity for current measurement.
5. Input socket «VΩ» for connecting a probe of positive polarity for voltage and resistance measurement.
6. Input socket «COM» for connecting a probe of negative polarity.

Figure 1. Front panel elements

3 TECHNICAL DATA

Table 2

Characteristics	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 « - » for negative polarity
Safety category	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	12 V Battery A23 (NEDA 1811A, Energizer AG23)
Dimensions, mm	100x50x23
Weight, g	53 (with battery)
Service life, years	10

DC VOLTAGE

Range	Resolution	Accuracy
200 mV	0,1 mV	± 0,5% ± 3D
2000 mV	1 mV	±0,8%±5D
20 V	10 mV	
200 V	0,1 V	
500 V	1 V	± 1,0% ± 5D

* D - least significant digit value
Overload protection: 220 V root-mean-square value (RMS) for 200 mV AC range and 500 V DC/AC RMS for all other ranges.

AC VOLTAGE

Range	Resolution	Accuracy
200 V	0,1 V	± 2,0% ± 10D
500 V	1 V	

Overload protection: 500 V DC/AC (RMS).
Frequency: 45 - 450 Hz.
Measurement of the mean value equal to the RMS value for sinusoidal signals.

DIRECT CURRENT

Range	Resolution	Accuracy
2000 µA	1 µA	±1,8% ± 2D
20 mA	10 µA	
200 mA	0,1 mA	±2% ± 2D

Overload protection:
fuse 500 mA/250 V.

RESISTANCE

Range	Resolution	Accuracy
200 Ohm	0,1 Ohm	±1,0% ± 10D
2000 Ohm	1 Ohm	±1,0% ± 4D
20 kOhm	10 Ohm	
200 kOhm	0,1 kOhm	
2000 kOhm	1 kOhm	

Maximum open circuit voltage: 3 V.
Overload protection:
15 s, 220 V DC/ AC (RMS).

OTHER FUNCTIONS

Function	Description
Diode test	Indicates the direct voltage drop in the diode
Transistor test	Range: 0 - 1000 Test current Ibase = 10 µA Test voltage Vce = 2,8 V
Circuit continuity test (buzzer)	If the resistance of the tested circuit is less than 30 ± 20 Ohm, the buzzer sounds
Battery test	Displays the battery operating current of 1.5 V / 9 V. Approximate current values: 40 mA / 24 mA.

4 MEASUREMENTS

DC AND AC VOLTAGE MEASUREMENT (**V⎓** and **V~**)

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 (**V⎓**) or ACV (**V~**) measurement range. If you do not know the measured value 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 «**500 V**», the display will show a «**HV**» sign to warn of high voltage operation. Caution is required.

DIRECT CURRENT MEASUREMENT (**A⎓**)

1. Connect the red probe to the socket «**mA**», 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 DCA measurement range. If you do not know the measured value before measuring, set the range switch to the «**200 mA**» position and switch to lower values to achieve the required measurement accuracy.

3. Open the tested circuit and connect the probes in series with the load where the current is measured.
4. Read the value and 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 finished, put the rotary switch to the «**OFF**» position.

RESISTANCE MEASUREMENT (**Ω**)

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 resistance measurement range.
3. Connect the probes to the measured resistance and read the value 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 measuring.

DIODE TEST (⭲|)

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. Turn the rotary switch to 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 (**hFE**)

1. Turn the rotary switch to the «**hFE**» 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 multimeter sockets.

CIRCUIT CONTINUITY TEST / BUZZER (•))))

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

BATTERY TEST (TEST)

1. Connect the red probe to the socket «**mA**», and the black probe to the socket «**COM**». The polarity of the red probe is considered positive.
2. Turn the rotary switch to position «9V» or «1,5V».
3. Connect the test probes to the battery poles and read the value on the display.
4. When the work is finished, put the rotary switch to the «**OFF**» position.

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 two screws on the back lid of the device. Remove the failed element and replace it with a new one. Observe polarity of the battery. Close the housing, and 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 12 V - 1 pc.
4. 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: ООО «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: ТОО «Energoresheniya 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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v2