

**EKF****EXPERT**






# TECHNICAL AND OPERATION MANUAL

## DIGITAL MULTIMETER MS18C EKF EXPERT

### SAFETY INFORMATION

Digital multimeter MS18C EKF series Expert meets 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 electro-magnetic compatibility. To ensure safe use of the device, follow the recommendations in the operating 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

### SAFE OPERATION RULES:

- 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 when the back cover is open or the housing is not completely closed.
- Never exceed the overload capacity value specified in the data sheet for each measuring range.
- Do not touch any unused sockets when the device is connected to the circuit being measured.
- If the order of the measured value is not known beforehand, set the range switch to the maximum value.
- Before changing the range switch position, 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 a 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 60 V DC or 30 V 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 multimeter MS18C EKF series Expert is a quality measuring instrument with a wide range of functions for everyday use:

- DC voltage measurement DCV ()
- AC voltage measurement ACV ()
- DC current measurement DCA ()
- AC current measurement ACA ()
- electrical resistance measurement ()
- capacitance measurement ()
- frequency measurement ()
- temperature measurement ()
- diode checking ()
- transistor testing ()
- data hold (**HOLD**).

Press the button to record the measurement result

«**H** / » and the current reading will be hold on the display. If you press briefly the button again, it will deactivate the value hold, and the device returns to the normal measuring mode.

- non-contact voltage detection (**NCV**)
- live circuit testing (**Live**)
- continuity checking / audio checking ()
- display backlight/work space backlight («**H** / »). If you hold down the button «**H** / » for more than 5 seconds, the backlit will turn on. If you press it again, the backlit will turn off. If the button is not pressed again, the display backlight is automatically switched off after 15 seconds.
- automatic power off (**Apo**). If you do not operate the device for 15 minutes after starting it, the device will issue an audible signal and go into standby mode. The device can be restarted by pressing any button.

## 2 ELEMENTS OF FRONT PANEL

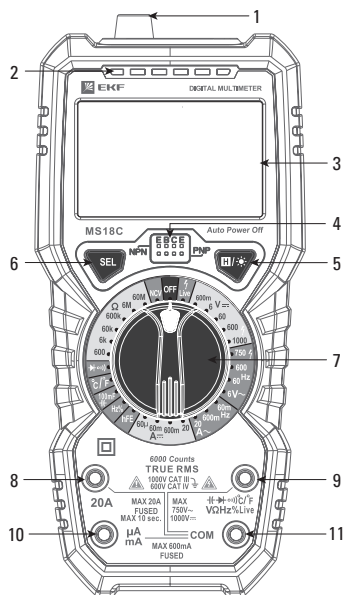


Fig. 1 - Front panel elements

1. Non-contact voltage detection sensor
2. Non-contact voltage detection indicator
3. LCD display
4. Socket for testing transistors
5. Button for data hold / backlight activation («H / ⚡»)
6. Button **[SEL]**. When measuring temperature: mode °C 3 or °F. When measuring frequency: Hz measuring mode or mode of relative pulse duration (%). When measuring alternating current or voltage: press the button to select voltage/frequency mode or current/frequency mode in AC voltage measurement mode or AC current measurement mode
7. Rotary switch: for selecting function and measurement range and activation/deactivation of the device **[OFF]**
8. «20A» socket to connect a probe of positive polarity (red probe)
9. Socket **[C/°F]** to connect a probe of positive polarity (red probe)
10. Socket **(μA mA)** to connect a probe of positive polarity (red probe)
11. Socket **(COM)** to connect a probe of negative polarity (black probe)

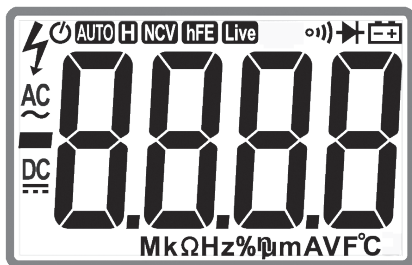



Fig. 2

Table 2

Icon	Description
	Battery discharge indicator
	Auto power-off indicator
	High voltage indicator
	Negative polarity indicator
<b>AC</b>	AC voltage indicator
<b>DC</b>	DC voltage indicator
	Indicator for circuit continuity checking mode r (audio checking)
	Indicator for diode checking mode
<b>AUTO</b>	Indicator for the automatic measurement range detection mode
<b>H</b>	Indicator for data hold mode
<b>°C, °F</b>	Indicator for temperature measurement unit [°C: Celsius; °F: Fahrenheit]
<b>%</b>	Indicator of relative pulse duration
<b>NCV</b>	Indicator for non-contact voltage detection mode
<b>Live</b>	Indicator for live circuit testing mode

### 3 TECHNICAL DATA

Table 3

Parameter	Value
Maximum display value	6000
Measurement method	Double-integrated ADC
Measuring rate	3 measurements per second
Overload indicator	«OL» on LCD display
Battery discharge indicator	symbol on LCD display 
Polarity indicator	symbol « - » for negative polarity
Safety category	600V CATIV / 1000V CATIII
Housing insulation	double, class II
Fuses	for mA input socket: 630 mA/250 V for A input socket: 20 A/250 V
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	about 3 Hz
Supply voltage	Up to 2000
Dimensions, mm	4x1,5 V battery of AA type
Weight, g	89x190x50
Service life, years	380 (with battery)
Protection class according to GOST 14254	10

#### DC VOLTAGE

Table 4

Range	Resolution	Accuracy
600 mV	0,1 mV	± 0,5% ± 3D
6 V	0,001 V	
60 V	0,01 V	
600 V	0,1 V	
1000 V	1 V	

\*D - least significant digit value  
 Overload protection: 1000 B DC or 750 V  
 AC root-mean-square value (RMS).

#### AC VOLTAGE

Table 5

Range	Resolution	Accuracy
6 V	0,001 V	± 0,8% ± 3D
60 V	0,01 V	
600 V	0,1 V	
750 V	1 V	± 1,0% ± 10D

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

## ACCURACY

Table 6

Range	Resolution	Accuracy
600 Ohm	0,1 Ohm	$\pm 0,8\% \pm 3D$
6 kOhm	0,001 kOhm	
60 kOhm	0,01 kOhm	
600 kOhm	0,1 kOhm	
6 MOhm	0,001 MOhm	
60 MOhm	0,01 MOhm	$\pm 1,2\% \pm 30D$

Overload protection: 600 B DC/AC  
Open circuit voltage: 1 V.

## FREQUENCY

Table 7

Range	Resolution	Accuracy
9,999 Гц	0,001 Гц	$\pm 1,0\% \pm 3D$
99,99 Гц	0,01 Гц	
999,9 Гц	0,1 Гц	
9,999 кГц	0,001 кГц	
99,99 кГц	0,01 кГц	
999,9 kHz	0,1 kHz	
9,999 MHz	0,001 MHz	

Overload protection: 600 V DC/AC

## DIRECT CURRENT

Table 8

Range	Resolution	Accuracy
60 $\mu$ A	0,01 $\mu$ A	$\pm 0,8\% \pm 3D$
60 mA	0,01 mA	
600 mA	0,1 mA	
20 A	0,01 A	$\pm 1,2\% \pm 3D$

Overload protection:  
Range up to 600 mA: fuse 630 mA/250 V.  
Range up to 20 A: 20 A/250 V.



When measuring the current of more than 5 A, the duration of continuous measurement should not exceed 10 seconds. Current measurements can be repeated 1 minute after the previous measurement.

## ALTERNATING CURRENT

Table 9

Range	Resolution	Accuracy
60 mA	0,01 mA	$\pm 1,0\% \pm 3D$
600 mA	0,1 mA	
20 A	0,01 A	$\pm 1,5\% \pm 3D$

Overload protection:  
Range up to 600 mA: fuse 630 mA/250 V  
Range up to 20 A: 20 A/250 V.



When measuring the current of more than 5 A, the duration of continuous measurement should not exceed 15 seconds. Current measurements can be repeated 1 minute after the previous measurement.

## TEMPERATURE

Table 10

Range	Resolution	Accuracy
from -20 to 1000°C	1°C	±1,0% ± 3D
from -4 to 1832°F	1°F	

## CAPACITANCE

Table 11

Range	Resolution	Accuracy
6 nF	0,001 nF	±4,0% ± 3D
60 nF	0,01 nF	±4,0% ± 3D
600 nF	0,1 nF	
6 µF	0,001 µF	
60 µF	0,01 µF	
600 µF	0,1 µF	
6 mF	0,001 mF	±5,0% ± 3D
100 µF	0,01 mF	

Overload protection: 600 B DC/AC

## 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 socket (**VΩHz**) 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 voltage measurement range. If the voltage is not known, set the limit switch to the maximum voltage and then set it to a 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.
5. If «**OL**» appears on the display, it means that there is an overload and the range switch needs to be set to a higher value.
6. When the work is completed, put the rotary switch to the «**OFF**» position.



Within a measurement range of 600 mV DC and 6 V AC voltage, the readings of the multimeter may be different from zero before the measuring probes are connected. In such a situation, short-circuit the probes connected to the terminals (**VΩHz**) and (**COM**) in order to zero the values of the device. When AC voltage is measured, if you press the button «**SEL**», you can measure the frequency of the AC voltage source.

### DIRECT CURRENT AND ALTERNATING CURRENT MEASUREMENT ( $I_{DC}$ and $I_{AC}$ )

1. Connect the black probe to the socket (**COM**). Connect the red probe to the socket (**µA mA**) if you measure the current of less than 600 mA; connect the red probe to the socket (**20A**) when you measure the current in the range between 600 mA and 20 A.
2. Use the rotary switch to select the desired current measurement range. If the current is not known beforehand, set the limit switch to «600 mA» and then switch to lower limits to achieve the desired measurement accuracy.
3. Open the circuit to be measured and connect the probes in series with the load in

which the current is measured.

4. Read the current value and polarity on the display.
5. If the symbol «**OL**» appears on the display, it means that an overload has occurred and the range switch needs to be set to a higher value.
6. When the work is completed, put the rotary switch to the position «**OFF**».

#### RESISTANCE MEASUREMENT ( $\Omega$ )

1. Connect the red probe to the socket «**(H  $\rightarrow$   $\bullet$ )**» **C/FV $\Omega$ Hz%Live**» and the black probe to the socket «**COM**» socket. The polarity of the red probe is considered positive.
2. Use the rotary switch to select the required resistance measuring range.
3. Connect the probes to the resistance to be measured 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 the symbol «**OL**», it means that an overload occurred and it is necessary to set the range switch to a higher value.
5. In order to guarantee the accuracy of measurements when measuring small values of electrical resistance, short-circuit beforehand the test probes to each other and write down the obtained resistance value. Then subtract the above value from the measured resistance.
6. When measuring in the 60 M $\Omega$ m range, you need to wait for a few seconds before the measurement results reach a constant value. This is normal when measuring large resistances.
7. When the work is completed, put the rotary switch to the position «**OFF**».



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.

#### CIRCUIT CONTINUITY CHECKING / AUDIO CHECKING ( $\bullet \rightarrow \bullet$ )

1. Connect the red probe to the socket «**(H  $\rightarrow$   $\bullet$ )**» **C/FV $\Omega$ Hz%Live**» 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 «**( $\rightarrow$   $\bullet$ )**».
3. Connect the probes to the two points of the circuit to be tested. If there is an electrical contact between the two points (resistance is less than 40 ohms), the green LED will light up and the audible signal will issue. If the measured resistance value is between 40 and 60 ohms, the red LED will light up.
4. When the work is completed, put the rotary switch to the position «**OFF**».

#### DIODE CHECKING ( $\rightarrow$ )

1. Connect the red probe to the socket «**(H  $\rightarrow$   $\bullet$ )**» **C/FV $\Omega$ Hz%Live**» 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 «**( $\rightarrow$   $\bullet$ )**».
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 the direct current is flowing through it. When the probes are connected back to the diode the display will show «**OL**».
4. When the work is completed, put the rotary switch to the position «**OFF**».



## 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 of 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  $\mu$ A and a collector-emitter voltage Vce of 2,8 V.
4. When the work is completed, put the rotary switch to the position «OFF».



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

## TEMPERATURE MEASUREMENT (°C/°F)

1. Set the rotary switch to °C. The ambient temperature is shown on the display.
  2. Connect the thermocouple of «K» type to the appropriate sockets on the front panel (red thermocouple plug to (H- $\rightarrow$ -))°C/°FVΩHz%Live) and black thermocouple plug to (COM) and put the thermocouple to the object to be tested. Read the temperature on the display.
  3. When the work is completed, put the rotary switch to the position «OFF».
- Before carrying out any other actions, remove the thermocouple, type «K» from the sockets to avoid electric shock.
- Maximum operating temperature of the thermocouple, type «K» is 250 °C (300 °C in short-time operating mode)

## FREQUENCY MEASUREMENT (Hz%)

1. Connect the black and red probes to the (COM) and (H- $\rightarrow$ -))°C/°FVΩHz%Live) sockets respectively.
2. Set the rotary switch to the (Hz%) position.
3. Connect the probes to the circuit to be tested.
4. Read the frequency value on the display.
5. When the work is completed, put the rotary switch to the position «OFF».



To avoid electric shock or damage to the device, do not measure frequency signals with voltages higher than 250 V DC or AC (RMS).

## CAPACITANCE MEASUREMENT (H)

1. Connect the black probe and the red probe to the (COM) and (H- $\rightarrow$ -))°C/°FVΩHz%Live) sockets, respectively.
2. Set the rotary switch to the position (H).
3. Measure the capacitance value of the circuit to be tested and read the measured value on the display.
4. When the work is completed, put the rotary switch to the position «OFF».



To avoid possible damage to the multimeter or the equipment to be tested, disconnect the current in the circuit under test and discharge all high voltage capacitors before measuring the capacitance. To make sure that the capacitor is discharged, measure first the capacitor voltage.

## NON-CONTACT VOLTAGE DETECTION (NCV)

1. Put the rotary switch to the (NCV) position.
2. Bring the sensor (at the top of the device) closer than 5 mm to the tested conductor.

3. If current is flowing through the conductor, the indicators of signal strength (high, medium or low) will light up and an audible signal will issue at different frequencies depending on the signal strength.

4. When the work is completed, put the rotary switch to the position «OFF».



Voltage may be present even if the indicators are not turned on. Do not rely solely on the non-contact voltage detection function to detect the presence of voltage. The design of the socket, insulation thickness and other external factors can have an effect on the detection result.



When voltage is present at the terminals of the multimeter, the non-contact voltage detection indicators may trigger due to the induced voltage.

External sources of interferences (flash light, electric motor, etc.) can cause the tripping of non-contact voltage detection indicators.

#### LIVE CIRCUIT TESTING (Live).


1. Connect the red test lead to the socket (H $\rightarrow$ •) °C/°F V $\Omega$ Hz%Live).

2. Put the rotary switch to the position (Live).

3. When the probe is inserted into the phase contact socket or approaches a live wire, when the device detects AC voltage, the voltage intensity indicator lights up and an audible signal of varying intensity issues.

4. When the work is completed, put the rotary switch to the position «OFF».

#### 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, remove the screws on the back cover of the device. Remove the old battery and replace with the new one. Observe the polarity of the battery. Close the housing, tighten the screws.



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

#### 5. SCOPE OF DELIVERY

1. Multimeter – 1 pc.;
2. Set of measuring probe set (red/black) – 1 pc.;
3. Battery 1,5 V – 4 pcs.;
4. Thermocouple, type «K» – 1 pc.;
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.

## 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:



**EKF**

**EXPERT**



Importer and EKF trademark service representative  
on the territory of the Russian Federation:  
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