



# EKF



## TECHNICAL MANUAL






Digital multimeter  
MS18C EKF EXPERT

## SAFETY INFORMATION


The digital multimeter MS18C EKF EXPERT 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 with 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 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 with the back lid open or the housing loosely 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 measured circuit.
- If you do not know the measured value order before measuring, 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 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.
- Never measure resistance in a closed circuit.
- Do not use the product in explosive or high-humid environment.
- Replace the battery as soon as the symbol  appears.
- Be careful whenever dealing with voltage over 60 V DC or 30 V 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 multimeter MS18C EKF EXPERT is a high-quality measuring instrument with a wide range of functions for everyday use:

- DC voltage measurement DCV ( $V_{\text{DC}}$ )
- AC voltage measurement ACV ( $V_{\text{AC}}$ )
- DC measurement DCA ( $A_{\text{DC}}$ )
- AC measurement ACA ( $A_{\text{AC}}$ )
- electrical resistance measurement ( $\Omega$ )
- capacitance measurement ( $\mu\text{F}$ )
- frequency measurement ( $\text{Hz}$ )
- temperature measurement ( $^{\circ}\text{C}/^{\circ}\text{F}$ )
- diode test ( $\rightarrow|$ )
- transistor test ( $h_{\text{FE}}$ )
- data hold (**HOLD**).

Press the «H / » button to record the measurement result and the current reading will be held on the display.

- non-contact voltage detection (**NCV**)
- live circuit test (**Live**)
- continuity test / buzzer ( $\bullet||$ )
- display backlight/work space backlight («H / »). Press the button «H / » for 5 seconds to backlight the display. Press the button again to switch on the backlight. 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, the device beeps, and turns into standby mode. The device can be restarted by pressing any button.

## 2 FRONT PANEL ELEMENTS

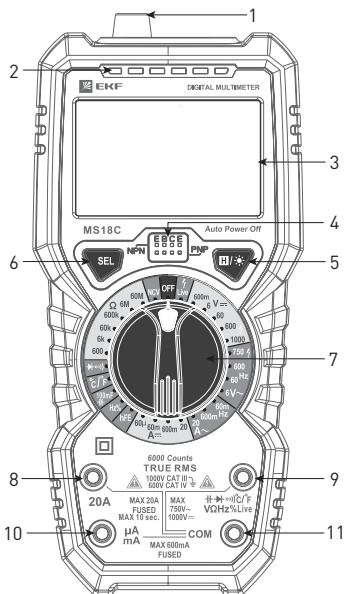


Fig. 1 - Front panel elements

1. Non-contact voltage (NCV) tester
2. NCV LED
3. LCD display
4. Socket for testing transistors
5. Button for data hold / backlight activation («H / ☀»)
6. Selection button (**SEL**). For temperature measurement: °C or °F. For frequency measurement: Hz or relative pulse duration (%). For alternating current (**ACA**) and voltage (**ACV**) measurement: press the button to select voltage/frequency mode or current/frequency mode in ACV or ACA measurement mode
7. Rotary switch: for selecting function and measurement range and switching on/off of the device (**OFF**)
8. «20A» socket to connect a probe of positive polarity (red probe)
9. Socket (H) (H) °C/°F VΩHz%Live) 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)

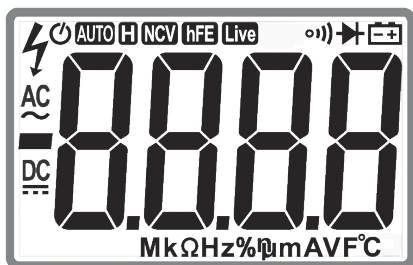


Fig. 2

Table 2

Icon	Description
	Low battery
	Auto power-off
	High voltage
	Negative polarity
	AC voltage
	DC voltage
	Circuit continuity test (buzzer)
	Diode test
<b>AUTO</b>	Automatic measurement range detection
H	Data hold
°C, °F	Temperature measurement unit (°C: Celsius; °F: Fahrenheit)
%	Relative pulse duration
<b>NCV</b>	Non-contact voltage detection
<b>Live</b>	Live circuit test

### 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
Low battery 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
Degree of protection by IEC 60529	IP20
Operating temperature, °C	from 0 to +40 at relative humidity of max. 80%
Sampling frequency, Hz	~ 3 Hz
Altitude above sea level, m	max. 2000
Power supply	4x1,5 V battery AA
Dimensions, mm	89x190x50
Weight, g	380 (with battery)
Service life, years	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 V DC or 750 V AC  
 AC root-mean-square value (RMS).

## RESISTANCE

Table 6

Range	Resolution	Accuracy
600 Ohm	0,1 Ohm	± 0,8% ± 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	± 1,2% ± 30D


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

## DIRECT CURRENT

Table 8

Range	Resolution	Accuracy
60 µA	0,01 µA	± 0,8% ± 3D
60 mA	0,01 mA	
600 mA	0,1 mA	
20 A	0,01 A	± 1,2% ± 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 over 5 A, the duration of continuous measurement should not exceed 10 seconds. Current measurements can be repeated 1 minute after the previous measurement.

## 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 V DC or 750 V AC (RMS).  
 Frequency range:  
 40 Hz - 1 kHz True RMS.

## FREQUENCY

Table 7

Range	Resolution	Accuracy
9,999 Hz	0,001 Hz	± 1,0% ± 3D
99,99 Hz	0,01 Hz	
999,9 Hz	0,1 Hz	
9,999 kHz	0,001 kHz	
99,99 kHz	0,01 kHz	
999,9 kHz	0,1 kHz	
9,999 kHz	0,001 MHz	


Overload protection: 600 V DC/AC

## ALTERNATING CURRENT

Table 9

Range	Resolution	Accuracy
60 mA	0,01 mA	± 1,0% ± 3D
600 mA	0,1 mA	
20 A	0,01 A	± 1,5% ± 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 over 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% ± 30D
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 mF	0,01 mF	

Overload protection: 600 V DC/AC

## 4 MEASUREMENTS



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

### DC AND AC VOLTAGE MEASUREMENT (V $\overline{\text{---}}$ and V $\sim$ )

1. Connect the red probe to the socket (⚡)C/°FVΩHz%Live) 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 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 circuit under test.
4. Read the value and polarity of the tested voltage.
5. If «OL» appears on the display, 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.



Within the 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 this case, short-circuit the probes connected to the terminals (⚡)C/°FVΩHz%Live) and (COM) to reset the values of the device. When AC voltage is measured, press the button «SEL» to measure the frequency of the AC voltage source.

## DIRECT CURRENT AND ALTERNATING CURRENT MEASUREMENT (A $\overline{\text{~}}$ and A $\sim$ )

1. Connect the black probe to the socket **(COM)**. Connect the red probe to the socket **( $\mu\text{A mA}$ )** 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 you do not know the measured value before measuring, 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, 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 ( $\Omega$ )

1. Connect the red probe to the socket «**( $\overline{\text{~}}$   $\rightarrow$   $\bullet$ ) $\circ/\circ\text{FV}\Omega\text{Hz}\%\text{Live}$ » 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 symbol «**OL**» is displayed, overload has occurred. 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 the probes to each other and write down the obtained resistance value before measuring. Then subtract the above value from the measured resistance.
6. When measuring in the 60 MOhm range, 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 «**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.

## CIRCUIT CONTINUITY TEST / BUZZER ( $\bullet$ )

1. Connect the red probe to the socket **( $\overline{\text{~}}$   $\rightarrow$   $\bullet$ ) $\circ/\circ\text{FV}\Omega\text{Hz}\%\text{Live}$ )** 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 two points of the circuit to be tested. In case of contact between the points (resistance is less than 40 Ohm), the green LED will light up and the buzzer will sound. If the measured resistance value is between 40 and 60 Ohm, the red LED will light up.
4. When the work is completed, put the rotary switch to the «**OFF**» position.



## DIODE TEST (→)

1. Connect the red probe to the socket (→) °C/°F VΩHz %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 (→).
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 reverse connected to the diode the display will show «OL» .
4. When the work is completed, put the rotary switch to the «OFF» position.

## TRANSISTOR TEST (hFE)

1. Put the rotary switch to the «hFE» position.
2. Determine whether the transistor is NPN or PNP 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 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.



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, «K» type to the appropriate sockets on the front panel (red thermocouple plug to (→) °C/°F VΩHz %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 «OFF» position. 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 «OFF» position.



To avoid electric shock or damage to the device, do not measure frequency signals with voltage over 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 «OFF» position.



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 the capacitor voltage before capacitance measuring.

## NON-CONTACT VOLTAGE DETECTION (NCV)

1. Put the rotary switch to the (NCV) position.
2. Bring the tester (at the top of the device) within 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 the buzzer will sound at different frequencies depending on the signal strength.
4. When the work is completed, put the rotary switch to the «OFF» position.



Voltage may be present even if the indicators do not light up. 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 effect on the detection result.




When voltage is present at the terminals of the multimeter, the non-contact voltage LEDs may light up due to the induced voltage. External sources of interferences (flash light, electric motor, etc.) can cause the NCV LEDs light up.

## LIVE CIRCUIT TEST (Live).

1. Connect the red test lead to the socket (H $\rightarrow$ H $\rightarrow$ °C/°FV $\Omega$ 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, and 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 «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, remove the 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, 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. DELIVERY SCOPE

1. Multimeter – 1 pc.;
2. Set of probes (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 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 «Energoresheniya Kazakhstan», Kazakhstan, Almaty, Bostandyk district, Turgut Ozal st., 247, apt 4.

## 9 CERTIFICATE OF ACCEPTANCE

The digital multimeter MS18C EKF EXPERT 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



[www.ekfgroup.com](http://www.ekfgroup.com)