



# Instruction Manual of BM890


## I Overview

The complete machine circuit design of BM890 series takes large-scale integrated circuit and A/D converter as the core, provided with global function overloading protection to measure direct current voltage and current, A.C. voltage and current, resistor and current, resistor, capacitor, frequency temperature, diode forward voltage drop, transistor hFE parameters and circuit on and off and etc.

## II Safety rules and attentions

- The instrument of model BM890 is in line with IEC1010-1 CATII 600V standard. Before use, please read the instruction manual carefully.
- It is not allowed to use with the rear cover not ready; otherwise, it may cause danger.
- Before use, check insulation layer of the pen-shape meter shall be perfect and free of damage and broke wires.
- The range switch shall be set at the correct range position.
- The input signal can not be beyond the specified limits to avoid electric shock and damaging the instrument.
- Shift of the range switch can not be changed during measuring.
- Measure potential difference of the public terminal COM and the ground “” can not exceed 600V to avoid electric shock.
- For testing voltage higher than DC50V and AC36Vrms, be careful to avoid electric shock.
- When the LCD displays “”, electric quantity of the battery is not sufficient, and the battery shall be replaced to ensure normal operation of the instrument.
- Replacement of fuse in the instrument shall employ the same specifications.
- The instrument shall be calibrated once a year at least.

## III Performance

1. Insufficient electric quantity indication: “

## IV Technical indexes

Precision  $\pm$  (a % reading + figures) Warranty period: 1 year  
Guaranteed temperature precision:  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  RH<70 %

### 1. Direct current voltage

Range	Resolution	Measurement error
200mV	0.1mV	$\pm (0.5\%+5d)$
2V	1mV	
20V	10mV	
200V	100mV	
600V	1V	$\pm (0.8\%+5d)$

Input impedance: 200mV and 2V shift is  $1\text{M}\Omega$ , and others are  $10\text{M}\Omega$ .  
Overloading protection: 200mV and 2V range is 250V, and others are direct current or A.C. peak value 600V.


### 2. A.C. voltage

Range	Resolution	Measurement error	
		BM890D	BM890C+
200mV	0.1mV	$\pm (1.2\%+5d)$	—
2V	1mV	$\pm (0.8\%+5d)$	—
20V	10mV		$\pm (0.8\%+5d)$
200V	100mV		
600V	1V	$\pm (1.2\%+7d)$	

Input impedance: 200mV and 2V range is  $1\text{M}\Omega$ , and others are  $10\text{M}\Omega$ .  
Frequency scope: 40Hz~400Hz (200V and 600V ranges are 40Hz~100Hz).  
Overloading protection: 200mV and 2V ranges are 250V, and others are direct current or alternative current peak value 600V.  
Display: average value (sine wave valid value calibration).

### 3. Direct current

Range	Resolution	Measurement error
20mA	10 $\mu\text{A}$	$\pm (0.8\%+5d)$
200mA	100 $\mu\text{A}$	$\pm (1.2\%+5d)$
10A	10mA	$\pm (2\%+5d)$

Overloading protection: 0.2A/250V fuse and 10A range without fuse.  
 Maximum input current: 10A (input time no more than 10 seconds).  
Measuring voltage drop: the full range is DC200mV.

## 4. Alternative current

Range	Resolution	Measurement error	
		BM890D	BM890C+
20mA	10 $\mu\text{A}$	$\pm (1.2\%+5d)$	—
200mA	100 $\mu\text{A}$	$\pm (1.8\%+5d)$	
10A	10mA	$\pm (3\%+7d)$	

Overloading protection: 0.2A/250V with fuse, and 10A range without fuse  
Maximum input current: 10A (input time no more than 10 seconds)  
Measuring voltage drop: the full range is 200mV.  
Frequency scope: 40Hz~400Hz.

Display: average value (sine wave valid value calibration)

## 5. Resistance

Range	Resolution	Measurement error
200 $\Omega$	0.1 $\Omega$	$\pm (0.8\%+5d)$
2K $\Omega$	1 $\Omega$	
20K $\Omega$	10 $\Omega$	
200K $\Omega$	100 $\Omega$	
2M $\Omega$	1K $\Omega$	$\pm (1\%+5d)$
20M $\Omega$	10K $\Omega$	
200M $\Omega$	100K $\Omega$	

Overloading protection: 220V valid value  
Open circuit voltage: < 1V (200M $\Omega$  range is 2.8V)  
About 10 displayed in case of short circuit for 200M $\Omega$  range: actual measurement value = display value -10  
For example: the measured standard resistance is 100M $\Omega$ , the instrument display is 101.0 and the real value is 101.0 - 10 = 100.0

## 6. Capacitance Cx

Range	Resolution	Measurement error
2nF	1pF	$\pm (3\%+5d)$
20nF	10pF	
200nF	100pF	
2 $\mu\text{F}$	1nF	
200 $\mu\text{F}$	100nF	$\pm (5\%+5d)$

Notes: when measuring the capacitor, the capacitor shall be fully discharged.

## 7. Frequency F

Range	Resolution	Measurement error
		BM890C+
2KHz	1Hz	$\pm (1.5\%+5d)$
20KHz	10Hz	

Notes: valid value of the tested frequency signal: 200mV~10V  
Overloading protection: 220V valid value

## 8. Temperature $^{\circ}\text{C}$



Range	Resolution	Measurement error
		BM890C+
-20~400 $^{\circ}\text{C}$	1 $^{\circ}\text{C}$	$\pm (0.75\%+4d)$
401 $^{\circ}\text{C}$ ~1000 $^{\circ}\text{C}$	1 $^{\circ}\text{C}$	$\pm (1.5\%+15d)$

Notes: model K thermal coupler is used (temperature probe).

## 9. Crystal triode hFE testing


Range	Notes	Testing conditions
hFE	Displayed scope 0~1000 $\beta$	I <sub>bc</sub> ≈10 $\mu\text{A}$ , V <sub>ce</sub> ≈2.8V

## 10. Diode and buzzing continuous conductance testing

Range	Notes	Testing conditions
	Display forward conductance round value of diode	Forward direct current about 1mA Backward direct current voltage about 2.8V
	When the conductance resistance is < about 50 $\Omega$ , buzzer in the machine works, and round value of the resistance is displayed.	Open circuit voltage about 2.8V

Overloading protection: 220V valid value

## V Operation instructions

Before use, pay attention to the symbol beside the jacket of the testing pen “”, which reminds you the tested voltage or current not beyond this value. In addition, before use, the range switch shall be set at the switch which you want to set.

### 1. D.C. voltage measurement

- 1) The black pen is inserted into COM jacket, and the red pen is inserted into V/ $\Omega$  jacket.
- 2) Estimate maximum value of the tested signal voltage, select proper range, and connect the pen to the tested load or signal source to read the value.

In addition: polarity of the red pen will be simultaneously displayed on the screen.

Notes:

- a. Before measurement, if range of the tested voltage can not be estimated, the range switch shall be set at the maximum range shift (600V shift), and select proper shift according to the displayed value.
- b. If the screen only displays 1, it means that the tested voltage is beyond the range and voltage higher than 600V can not be input. Although reading can be acquired, there is danger of damaging internal wires and causing safety accidents.
- c. Avoid electric shock when measuring high voltage.

#### 2. A.C voltage measurement

- 1) The black pen is inserted into COM jacket, and the red pen is inserted into V/Ω jacket.
- 2) Estimate maximum value of the tested signal voltage, select a proper range and connect the pen to the tested load or signal source to read the value.

Notes:

Please refer to the D.C. voltage notes a, b and c.

#### 3. D.C. current measurement

- 1) The black pen is inserted into COM jacket. When the tested current is less than 200mA, the red pen is inserted into mA jacket; when the tested current is 200mA~10A, the red pen is inserted into 10A jacket.
- 2) Set the range switch at the range of the D.C. current range, and the pen meter is connected with the circuit in series connection. When the instrument displays the current reading, polarity of the red pen will be displayed.

Notes:

- a. Before measurement, if the range of the tested current can not be estimated, set the range switch at the maximum range switch (10A shift), and select a proper shift according to the displayed value.
- b. If the screen only displays 1, it means that the tested current is beyond the range, and the range switch shall be shifted higher.
- c. Maximum input current of mA jacket is 200mA, and input overloading may cause permanent damage of the fuse, which will be immediately replaced to ensure that the current measurement is under normal conditions.
- d. 10A jacket is not provided with fuse, the measurement time shall be less than 10 seconds to avoid precision affected by heating of wires.

#### 4. A.C. current measurement

- 1) The black pen is inserted into COM jacket. When the tested current is less than 200mA, the red pen is inserted into mA jacket; if the tested current is 200mA~10A, the red pen is inserted into 10A jacket.
- 2) Set the range switch at the A.C. current range scope, and the pen is connected with the tested circuit in series connection.

Notes:

Refer to the D.C. current measurement notes a, b, c and d.

#### 5. Resistance measurement

- 1) The black pen is inserted into COM jacket, and the red pen is inserted into V/Ω jacket.
- 2) Set the range switch at Ω range scope, and the pen is connected with the tested circuit in bridge connection.

Notes:

- a. When the tested resistance >1MΩ, reading of the instrument can be stabilized after several seconds, which is normal for measuring high resistance.
- b. When measuring high resistance, the resistor shall be inserted into V/Ω and COM jackets to avoid interference.
- c. When testing online resistors, please confirm that the tested circuit is powered off and the capacitor is fully discharged, and the measurement can be carried out.
- d. In case of short circuit, the range 200MΩ has about indicated value 10, which will be subtracted when measuring. For example, when measuring 100 MΩ resistance, and the displayed value is 101.0, and the results are 101.0 - 10=100.0

#### 6. Capacitance measurement

The tested capacitor is inserted into "Cx" jacket.

Notes:

- a. Before connecting the capacitor, the instrument can be calibrated at zero; however, several indicated value can not affect the testing precision.
- b. Do not connect external voltage or the charge capacitor to the input jacket. When electric quantity of the capacitor is large enough, it will discharge to the internal instrument, and the measurement precision is affected, and even the instrument may be burnt down.

#### 7. Frequency measurement (Only available for BM890C+)

- 1) The black pen is inserted into COM jacket, and the red pen is inserted into V/Ω jacket.
- 2) Select a proper range, and the pen meter is parallelly connected to the tested signal to read the value.

Notes:

- a. Valid value of input voltage value of the frequency shift is 200mV to 10V.
- b. Maximum value of the input protection voltage is 220V.

#### 8. Temperature measurement (Only available for BM890C+)

1) Red end of model K temperature probe is inserted into V/Ω jacket and the black end is inserted into mA jacket.

2) The probing end (also called thermal end) is placed at the forecast environment to observe the instrument reading.


Notes:

- a. When the temperature shift is suspended at the input end, it displays a random value, and temperature of the tested environment can be displayed after the temperature probe is inserted.
- b. When the temperature probe is not inserted into the instrument, the displayed value is meaningless. Limit temperature of the accompanied model K WRNM-010 exposed contact thermal coupler is 250°C (300°C for a short while).

#### 9. Crystal triode hFE parameters measurement

- 1) Set the range switch at hFE shift.
- 2) Confirm the crystal triode is PNP or NPN, and pins E, B and C of the tested tube is inserted into the testing holes of the instrument.
- 3) The instrument displays hFE round value, and the testing conditions are base current 10μA and Vce about 2.8V.



#### 10. Diode measurement

- 1) The black pen inserted into COM jacket, and the red pen is inserted into V/Ω jacket (polarity of the red pen is "+").
- 2) Set the range switch at , and the testing pen is connected with the tested diode in bridge connection.

Notes:

- a. When the input end is open circuit, the instrument displays 1, which is beyond the range.
- b. The displayed value is forward voltage drop value. When the diode is connected in a reverse direction, it is beyond the range.

#### 11. Buzzing continuity conductance testing

- 1) The black pen is inserted into COM jacket, and the red pen is inserted into V/Ω jacket.
- 2) Set the range switch at  range (the same shift with diode  testing), and the pen is connected with both ends of the circuit to be tested in bridge connection.
- 3) If resistance between the tested points is less than 50Ω, the buzzer will work.

Notes:

Conductance of the tested circuit must be checked with power off. For any loading signal will make the buzzer make sound which causes error judgment.

#### 12. Data holding

When pressing DH key, the data is held on the screen; when the DH key is released, it enters normal measurement conditions again.

### VI Accessories

1. 1 Instruction manual
2. 1 couple of pen meters
3. 1 piece of PVC protection sleeve
4. Temperature probe of model K (Only available for BM890C+)