

# kaise


## DIGITAL MULTIMETER

### INSTRUCTION MANUAL


# SK-6500


## KAISE CORPORATION


## FOR SAFETY MEASUREMENTS!!

Prior to use, to avoid an electrical shock hazard to the operator and/or damage to the instruments, read carefully the WARNINGS with the symbol  listed in 「4. SAFETY PRECAUTIONS」, 「5. MEASUREMENT PROCEDURES」 and 「6. MAINTENANCE」 of this instruction manual.

### Important Symbols

 The symbol listed in IEC 61010-1 and ISO 3864 means "Caution (refer to instruction manual)".

 **WARNING** : The symbol in this manual advises the user of an electrical shock hazard that could result in serious injury or even death.

 **CAUTION** : The symbol in this manual advises the user of an electrical shock hazard that could cause injury or material damages.

## WARNING

Do not measure High Power Line of more than 6kVA with this instrument. High Power Line is very dangerous and/or lethal to measure. High Power Line sometimes includes High Surge Voltage that could possibly induce dangerous arcs of explosive short in the instrument and could result in serious injury to the operator. Even if it is Low Power Line (Low Energy Circuit), when measuring high voltage, use extreme care to avoid electrical shock hazard and/or damage to the instrument.

## 1. INTRODUCTION

Thank you for purchasing KAISE "SK-6500 DIGITAL MULTIMETER". To obtain the maximum performance of this instrument, read this Instruction Manual carefully, and take safe measurement.

### 1-1. UNPACKING AND INSPECTION

Before unpacking, examine the shipping cartons for any sign of damage. Unpack and inspect the instrument and accessories for any damage from mechanical shock, water leakage, or other causes. If any damage or missing item is found, consult the local dealer for replacement.

Make certain that following items are contained.

1. Digital Multimeter with Test Leads
2. Note-book type Carrying Case
3. Instruction Manual

## 2. SPECIFICATIONS

### 2-1. GENERAL SPECIFICATIONS

#### 1. DISPLAY (LCD)

a. **Numerical Display** : 3.5 digit LCD, Maximum reading 1999, 12mm high.

b. **Units and Symbols** :  $\bar{=}$ ,  $-$ ,  $\sim$ , mV, V, M $\Omega$ , k $\Omega$ ,  $\Omega$ ,  $\leftarrow$ ,  $\bullet$ , DH, BAT, AUTO and decimal point.

#### 2. OPERATING PRINCIPLE

3. **RANGE SELECTION** : Auto-Ranging

4. **OVERLOAD INDICATION** : "OL" symbol appears.

5. **POLARITY** : Auto-Polarity ("—" symbol appears in minus)

6. **BATTERY WARNING** : "BAT" symbol appears when battery voltage becomes at approx. 2.4V or less.

7. **SAMPLING RATE** : 3 times / second
8. **DISPLAY HOLD** : Press DH key to hold display values.
9. **CONTINUITY TEST** : Buzzer sounds and  $\bullet$  symbol appears on LCD.
  - a. **Buzzer Sounds** : at approx. 50 $\Omega$  or less
  - b. **Open Circuit Voltage** : approx. 0.45V
10. **OVERLOAD PROTECTION** :
  - a. V : 900V DC/AC maximum for 1 minute
  - b.  $\Omega$  /  $\leftarrow$  /  $\bullet$  : 300V DC/AC rms maximum for 1 minute
11. **DIELECTRIC STRENGTH** : 3.52kV AC (50Hz) for 1 minute (between input terminal and case)
12. **OPERATABLE TEMPERATURE & HUMIDITY** : 0°C to 40°C, 80%RH or lower in non-condensing.
13. **STORAGE TEMPERATURE & HUMIDITY** : -20°C to 60°C, 70%RH or lower in non-condensing.
14. **TEMPERATURE COEFFICIENT** : Accuracy in 23°C  $\pm$  5°C  $\times$  0.1 / °C
15. **POWER SUPPLY** : 3V CR2032 Battery  $\times$  1
16. **POWER CONSUMPTION** : Approx. 2mA
17. **CONTINUOUS OPERATING TIME** : 150 hours or more (in DC Voltage range, 0mV input)
18. **AUTO POWER OFF** : Power turns off automatically after 15 minutes of any operation.
19. **SAFETY LEVEL** : CE Marking approved (IEC-61010-1, CAT II 600V, CAT III 300V and EMC Test passed.)
20. **DIMENSION & WEIGHT** : 109(H)  $\times$  55(W)  $\times$  9(D)mm, Approx. 60g
21. **ACCESSORIES** : 3V CR2032 Battery (installed)  $\times$  1, Note-book type Carrying Case, Instruction Manual
22. **OPTIONAL ACCESSORY** : 940 Alligator Clips

### 2-2. MEASUREMENT SPECIFICATIONS

(23°C  $\pm$  5°C, < 80%RH in non-condensing)

#### 1. DC VOLTAGE ( $\bar{=}$ V)

Range	Accuracy	Resolution	Input Resistance	Max. Input Voltage
200.0mV	$\pm$ 1.3%rdg $\pm$ 5dgt	100 $\mu$ V	$\geq$ 100M $\Omega$	600V DC
2.000V	$\pm$ 1.3%rdg $\pm$ 3dgt	1mV	$\approx$ 12M $\Omega$	
20.00V		10mV	$\approx$ 10M $\Omega$	
200.0V		100mV		
600V		1V		

Overload Protection : 900V DC for 1 minute

#### 2. AC VOLTAGE ( $\sim$ V)

Range	Accuracy	Resolution	Input Resistance	Max. Input Voltage	Overload Protection
2.000V	$\pm$ 2.0%rdg $\pm$ 8dgt	1mV	$\approx$ 12M $\Omega$	600V AC	900V AC for 1 minute
20.00V		10mV			
200.0V		100mV	$\approx$ 10M $\Omega$		
600V		1V			

#### 3. RESISTANCE ( $\Omega$ )

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage
200.0 $\Omega$	$\pm$ 2.0%rdg $\pm$ 4dgt	0.1 $\Omega$	$\leq$ 1mA	$\leq$ 0.45V
2.000k $\Omega$		1 $\Omega$	$\leq$ 0.3mA	
20.00k $\Omega$		10 $\Omega$	$\leq$ 40 $\mu$ A	
200.0k $\Omega$		100 $\Omega$	$\leq$ 4 $\mu$ A	
2.000M $\Omega$		1k $\Omega$	$\leq$ 0.4 $\mu$ A	
20.00M $\Omega$		$\pm$ 5.0%rdg $\pm$ 4dgt	10k $\Omega$	

Overload Protection : 300V DC/AC rms for 1 minute

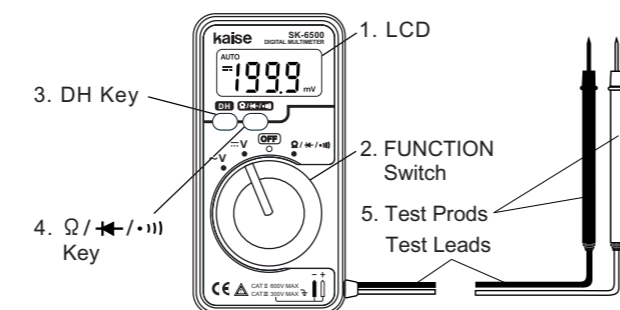
#### 4. DIODE TEST ( $\leftarrow$ )

Range	Accuracy	Open Circuit Voltage	Test Current	Overload Protection
2.000V	$\pm$ 5.0%rdg $\pm$ 4dgt	$\leq$ 1.7V	$\leq$ 0.7mA	300V DC/AC rms for 1 minute

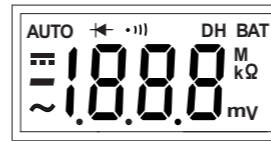
#### 5. CONTINUITY TEST ( $\bullet$ )

Range	Buzzer Sound	Resolution	Open Circuit Voltage	Overload Protection
200.0 $\Omega$	Approx. 50 $\Omega$ or less	100m $\Omega$	$\approx$ 0.45V	300V DC/AC rms for 1 minute

## 3. NAME ILLUSTRATION



### 3-1. LCD



- AUTO : Auto-Ranging
- $\bar{=}$  : Direct Current (DC)
- : Minus symbol (automatically appears when polarity is minus.)
- $\sim$  : Alternating Current (AC)
- $\leftarrow$  : Diode Test
- $\bullet$  : Continuity Test
- DH : Display Hold
- BAT : Battery Warning
- M $\Omega$ , k $\Omega$ ,  $\Omega$  : Units of Resistance
- mV, V : Units of Voltage

### 3-2. Function Switch

Set FUNCTION Switch to measurement position.

- OFF position : Power turns off at this position
- $\bar{=}$  V position : 0 to 600V DC measurements
- $\sim$  V position : 0 to 600V AC measurements
- $\Omega$  position : 0 to 20M $\Omega$  measurements
- $\leftarrow$  position : Diode tests
- $\bullet$  position : Continuity tests

### 3-3. DH Key

Enables to hold display values by pressing DH key once and "DH" symbol appears on LCD. To cancel display hold, press DH key again and "DH" symbol disappears.

### 3-4. $\Omega$ / $\leftarrow$ / $\bullet$ Key

Enables to select resistance measurements, diode tests and continuity tests.

### 3-5. Test Prods (Test Leads)

Connect red and black test prods to the circuit to be measured.

Generally, Black Test Prod is connected to negative (-) side, and Red Test Prod is connected to positive (+) side.

## 4. SAFETY PRECAUTIONS

Correct knowledge about electric measurements is required because electric measurement is sometimes a very dangerous work. To eliminate possibility of injury to the operator and damage to the instrument, the following precautions and measurement procedures must be taken. Mis-use, abuse and carelessness cannot be prevented by any written word and is fully the operator's responsibility. Observing the following warnings and cautions, take safe measurements.

### 4-1. WARNINGS

#### WARNING 1. Checks of Body and Test Leads

Before every measurement, do not fail to confirm that the body of this instrument and handle insulators of the attached Test Leads have no cracks nor any other damage on them. Make sure that the body and the handle insulators are free of dust, grease and moisture.

#### WARNING 2. Measurements of High Power Line (more than 6kVA) are Prohibited

Do not measure with this instrument High Power Line (High Energy Circuits more than 6kVA) such as Distribution Transformers, Bus Bars, Power Line for Big Motors, etc. High Power Line is very dangerous as it sometimes includes High Surge Voltage that will induce short circuit in the instrument and results in shock hazard. Use the special instrument designed to measure High Power Line of more than 6kVA.

#### WARNING 3. Warning for High Voltage Measurements

Even if to measure Low Energy Circuits (more than 100V) of electric/electronics appliances, heating elements, small motors, line cords and plugs, etc., High Voltage Measurements are very dangerous. Do not touch the Live Part of Multimeter, its Test Leads and the Circuit while it is on.

Generally, shock hazard shall be exist at any part involving a potential in excess of 30V rms or 42.4V DC or peak and where a leakage current from that part to ground exceeds 0.5mA.

#### WARNING 4. Dangerous Voltage Measurement Procedure

Always observe strictly the following measurement procedure when measuring dangerous voltage.

1. Before measurement, turn off power to the circuit to be measured.
2. Set FUNCTION Switch to  $\bar{=}$  V or  $\sim$  V position.

3. Attach - (Black) and + (Red) Alligator Clips (optional) to Test Prods of Test Leads.
4. Confirm that the power of the circuit to be measured is OFF. Then, connect Black Alligator Clip to - (earth) side and Red Alligator Clip to + (positive) side of the circuit to be measured.
5. Place the instrument away from your body, and do not touch it with your hands. Also, take safety distance from the power source or the circuit to prevent any part of your body from touching dangerous voltage.
6. Turn on power to the circuit to be measured and read the voltage on the Multimeter. Refer to the figure 1.

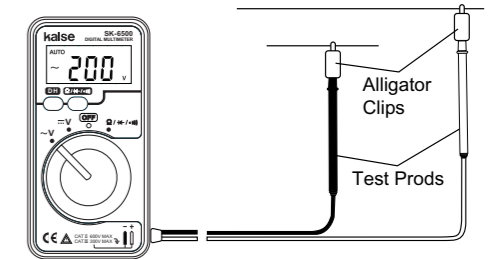


Fig. 1

7. Turn off power to the circuit to be measured and discharge all capacitors in the circuit.
8. Disconnect Alligator Clips of Test Prods from the circuit.

### In case you want to measure live line, observe the following procedure.

1. Place the instrument away from your body.
2. Set FUNCTION Switch to  $\bar{=}$  V or  $\sim$  V position.
3. Take safety distance for the power or the circuit to be measured to prevent any part of your body from touching dangerous voltage.
4. Attach Black Alligator Clip to Black Test Prod. Then, connect Black Alligator Clip to - (earth) side of the circuit to be measured.
5. Hold Red Test Prod with one hand and connect it to + (positive) side of the circuit to be measured.
6. Read the voltage on LCD. Refer to the figure 2.

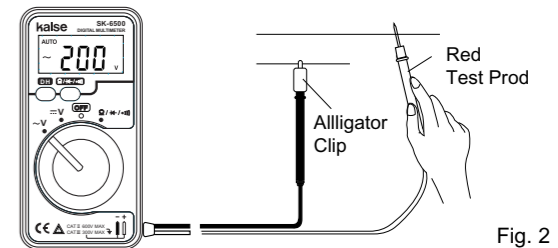


Fig. 2

7. Disconnect Red Test Prod from the circuit and then disconnect Black Alligator Clip from the circuit.

#### WARNING 5. Maximum Input Observance

Do not attempt to measure voltage that might exceed 600V AC or DC, the specified maximum input of this instrument.

#### WARNING 6. Correct Selection of FUNCTION Switch

When taking measurement, always confirm that FUNCTION Switch is set to correct position. Do not measure voltage on  $\Omega$  /  $\leftarrow$  /  $\bullet$  position.

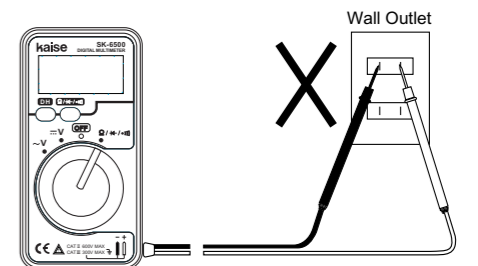




Fig. 3

#### WARNING 7. Test Leads Disconnection

Prior to change FUNCTION Switch to another position when measuring, or opening Rear Case for replacement of battery, always disconnect Test Leads from the circuit being measured.

### 4-2. GENERAL WARNINGS AND CAUTIONS

 **WARNING 1.** Do not let the children use the instrument or those people who are unable to recognize the dangers of electric measurements.

 **WARNING 2.** Do not make electric measurements in a naked or barefooted state. This will give electric shock hazard to the operator.

