


kaise

**DIGITAL MULTIMETER
INSTRUCTION MANUAL**


KU-2602

KAISE CORPORATION

FOR SAFETY MEASUREMENTS!!

To prevent an electrical shock hazard to the operator and/or damage to the instruments, read this instruction manual carefully before using the instrument. **WARNING** with the symbol  on the instrument and this instruction manual are highly important.

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 (High Energy Circuits). High Power Line is very dangerous and sometimes includes High Surge Voltage that could cause explosive short in the instrument and could result in serious injury to the operator. This instrument is for Low Power Line measurement. Even in the Low Power Line, pay careful attention when measuring high voltage line.

INTRODUCTION

Thank you for purchasing KAISE "KU-2602 DIGITAL MULTIMETER". To obtain the maximum performance of this instrument, read this Instruction Manual carefully, and take safe measurement.


1. UNPACKING AND INSPECTIONS

Confirm if the following items are contained in the package in good condition. If there is any damage or missing items, ask your local dealer for replacement.

- Digital Multimeter with Holster 1 pce.
- Test Lead (100-50) 1 set
- Temperature Sensor (818-02) 1 pce.
- Spare Batteries (1.5V R6P,AA) 2 pcs.
- Spare Fuses (0.5A/250V, 10A/250V) 1 pce. each
- Instruction Manual 1 pce.

2. SPECIFICATIONS

2-1. GENERAL SPECIFICATIONS

- DISPLAY (LCD)**
 - Numerical Display : 3 · 3/4 digit, 4000 count, 12mm high
 - Units and Symbols : mV, V, Hz, %, Ω, kΩ, MΩ, nF, μF, °C, μA, mA, A, \Rightarrow , ∇ , REL Δ , \square , OL, AUTO, AC, DC, — and decimal point
- OPERATING PRINCIPLE** : Σ Δ conversion
- RANGE SELECTION** : Auto/Manual
- POLARITY** : Auto polarity ("—" sign when minus)
- OVERLOAD INDICATION** : "OL" is displayed on LCD except for AC/DC600V
- BATTERY WARNING** :  indication at approx. 2.4V or less
- SAMPLING RATE** : 2 times/second
- DISPLAY HOLD** : Hold indicating values by HOLD Key
- DIFFERENCE MEASUREMENT** : Measurable by REL Δ Key
- DIELECTRIC STRENGTH** : 3.7kV for 1 minute (between input terminals and case)
- OPERATING TEMPERATURE & HUMIDITY** : 0°C to 40°C, less than 85%RH in non-condensing
- STORAGE TEMPERATURE & HUMIDITY** : -20°C to 60°C, less than 95%RH in non-condensing
- POWER SUPPLY** : 1.5V R6P or LR6 (AA) batteries x 2

- POWER CONSUMPTION** : approx. 9mW typ
- CONTINUOUS OPERATING TIME** : 70 hours or more
- AUTO POWER OFF** : Power turns off automatically after approx. 15 minutes (cancelable)
- FUSE** : μA, mA function : Fast-acting 0.5A/250V, φ5×20mm
A function : Fast-acting 10A/250V, φ6×30mm
- SAFETY LEVEL** : CE marking approved (EN61010-1 CAT II 600V, CAT III 300V)
- DIMENSIONS & WEIGHT** : 155(H)×75(W)×29(D)mm, Approx. 180g
- ACCESSORIES** :
100-50 Test Leads, 818-02 Temperature Probe, 1.5V R6P (AA) Batteries × 2 (Installed & Spare), F14 Spare Fuse (0.5A/250V), F17 Spare Fuse (10A/250V), Holster, Instruction Manual
- OPTIONAL ACCESSORIES** :
660 AC/DC Clamp Adapter, 821 AC Clamp Adapter, 100-41 Test Lead Kit, 100-62 Test Lead Set, 940 Alligator Clip, 995 Carrying Case, 817-01 to 817-25 Temperature Probe, 732 Miniature Connector Conversion Plug

2-2. MEASUREMENT SPECIFICATION

(23°C±5°C、<75%RH in non-condensing)

Average Rectification						
Range	Accuracy (40 to 400Hz)	Resolution	Input Impedance	Maximum Input	Range Selection	Overload Protection
400.0mV	±1.2%rdg±5dgt	0.1mV	≧11MΩ	600V rms	Auto/ Manual	600V rms
4.000V	±0.8%rdg±5dgt	1mV				
40.00V		10mV	≧10MΩ	600V DC	Auto/ Manual	600V DC
400.0V	100mV					
600V	±1.2%rdg±5dgt	1V				

Measurement range of 400.0mV range : 5.0mV to 400.0mV
Accuracy is not applicable to Hz or Duty measurements entered from AC Voltage range

2. DC Voltage (—V)

Range	Accuracy	Resolution	Input Impedance	Maximum Input	Range Selection	Overload Protection
400.0mV	±0.5%rdg±5dgt	0.1mV	>100MΩ	600V DC	Auto/ Manual	600V DC
4.000V		1mV	≧11MΩ			
40.00V	±0.8%rdg±5dgt	10mV	≧10MΩ	600V DC	Auto/ Manual	600V DC
400.0V		100mV				
600V	±0.8%rdg±5dgt	1V				

Accuracy is not applicable to Hz or Duty measurements entered from DC Voltage range

3. RESISTANCE (Ω)

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage	Range Selection	Overload Protection
400.0Ω	±1.0%rdg±5dgt	0.1Ω	≦0.3mA	≧0.44V	Auto/ Manual	250V rms 10 seconds
4.000kΩ		1Ω	≦40μA			
40.00kΩ	±2.0%rdg±5dgt	10Ω	≦4μA	600V DC	Auto/ Manual	600V DC
400.0kΩ		100Ω	≦0.4μA			
4.000MΩ	±2.0%rdg±5dgt	1kΩ	≦40nA	600V DC	Auto/ Manual	600V DC
40.00MΩ		10kΩ	≦40nA			

4. DIODE TEST (—▶)

Range	Accuracy	Test Current	Open Circuit Voltage	Overload Protection
4.000V	±5%rdg±3dgt	≦0.5mA	≦1.5V	250V rms 10 seconds

5. CONTINUITY TEST (—•)

Range	Buzzer Sound	Response Time	Open Circuit Voltage	Overload Protection
400.0Ω	less than 60Ω	1m sec.	≧0.44V	250V rms 10 seconds

6. CAPACITANCE (—▶)

Range	Accuracy	Resolution	Range Selection	Overload Protection
4.000nF	±5.0%rdg±10dgt	1pF	Auto	250V rms 10 seconds
40.00nF		10pF		
400.0nF	±2.0%rdg±5dgt	0.1nF	Auto	250V rms 10 seconds
4.000μF		1nF		
40.00μF	±4.0%rdg±5dgt	10nF	Auto	250V rms 10 seconds
200.0μF		0.1μF		

7. TEMPERATURE (°C)

Range	Accuracy	Resolution	Sensor
0°C to 40°C	±3°C	1°C	Built-in
-20°C to 200°C	±0.75%rdg±3°C		External
200°C to 500°C	±1.5%rdg±3°C		External

K-type thermocouple / Sensor accuracy is not included
Specification of supplied temperature sensor (818-02) :
Measurement range : -50°C to 100°C (Accuracy : ±2.5°C)

8. FREQUENCY (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Maximum Input	Range Selection
9.999Hz to 9.999MHz	±0.02%rdg±5dgt	0.01Hz to 1.0kHz	3V rms	250V rms	Auto

9. DUTY CYCLE (%)

Range	Accuracy (1Hz to 10kHz)	Resolution	Input Sensitivity	Maximum Input
0.1% to 99.9%	±2%rdg±5dgt	0.1%	3V rms	250V rms

10. DC/AC CURRENT

AC : Average Rectification						
Range	Accuracy (AC:40 to 400Hz)	Resolution	Voltage Drop	Maximum Input	Range Selection	Overload Protection
400.0μA	DC : ±1.5%rdg±5dgt AC : ±2.0%rdg±5dgt	0.1μA	40mV	4000μA	Auto/ Manual	0.5A/250V fuse
4000μA		1μA	400mV			

Accuracy is not applicable to Hz or Duty measurements entered from μA range

AC : Average Rectification						
Range	Accuracy (AC:40 to 400Hz)	Resolution	Voltage Drop	Maximum Input	Range Selection	Overload Protection
40.00mA	DC : ±1.5%rdg±5dgt AC : ±2.0%rdg±5dgt	10μA	70mV	400mA	Auto/ Manual	0.5A/250V fuse
400.0mA		100μA	700mV			

Accuracy is not applicable to Hz or Duty measurements entered from mA range

AC : Average Rectification						
Range	Accuracy (AC:40 to 400Hz)	Resolution	Voltage Drop	Maximum Input	Range Selection	Overload Protection
4.000A	DC : ±2.0%rdg±5dgt AC : ±2.5%rdg±5dgt	1mA	500mV	10A (less than 15 seconds)	Auto/ Manual	10A/250V fuse
10.00A		10mA	1.4V			

Accuracy is not applicable to Hz or Duty measurements entered from A range

3. SAFETY PRECAUTIONS

3-1. WARNINGS

Correct knowledge of electric measurements is essential to avoid unexpected danger such as operator's injury or damage to the instrument. Read carefully and observe the following precautions for safety measurements.

WARNING 1. Checks of Body and Test Lead

Before measurement, confirm the body of this instrument and handle insulators of the Test Lead have no cracks or any other damages. Dust, grease and moisture must be removed.

WARNING 2. High Power Line Measurements is Prohibited

Do not measure High Power Line (High Energy Circuits) such as Distribution Transformers, Bus Bars and Large Motors. High Power Line sometimes includes High Surge Voltage that could cause explosive short in the instrument and could result in shock hazard. Generally, shock hazard could occur when the current between the circuit, that involves more than 33V rms or 46.7V DC or peak, and ground goes up to 0.5mA or more.

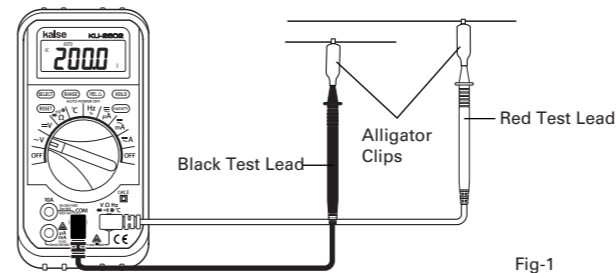
WARNING 3. Warning for High Voltage Measurements

Even for Low Energy Circuits of electric/electronic appliances, such as heating elements, small motors, line cords and plugs, High Voltage Measurements are very dangerous. Do not touch any part of the circuit.

WARNING 4. Dangerous Voltage Measurement Procedure

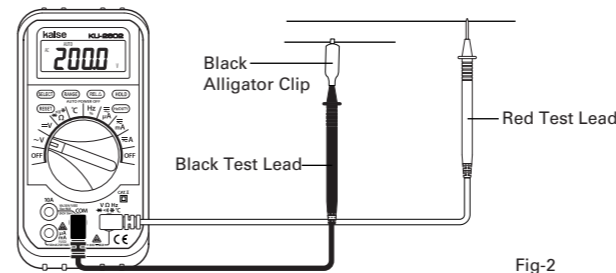
For dangerous voltage measurement, strictly observe the warnings below.

- Do not hold the instrument in your hands.
- Keep safety distance from power source or circuit to be measured not to touch the dangerous voltage.
- Attach black and red alligator clips to test lead pins.
- Turn off the circuit to be measured when connecting the test leads.
- After finishing the measurement, turn off the circuit to be measured again and discharge the all capacitors. Then, detach alligator clips (test leads) from the circuit.



In case of live-line measurement, strictly observe the warnings below.

- Do not hold the instrument in your hands.
- Keep safety distance from power source or circuit to be measured not to touch the dangerous voltage.
- Black test lead : Attach black alligator clip and connect to — (earth) side of the circuit.
- Red test lead : Connect to + (positive) side of the circuit.



3-2. PREVENTION OF FAILURE

WARNING 1. Correct Selection of Function Switch

Always confirm that **FUNCTION Switch** is set to the correct position. Do not measure voltage except at Voltage measurement function.

WARNING 2. Maximum Input Observance

Do not measure anything that might exceed the specified maximum input values.

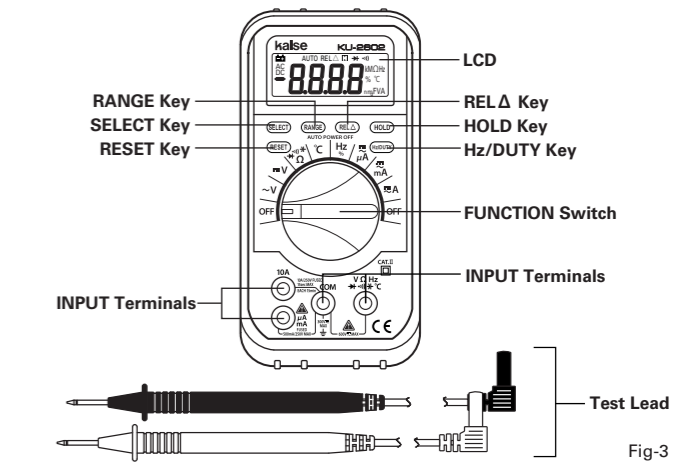
WARNING 3. Test Lead Detachment

Detach test leads from the measuring circuit when changing measurement functions or removing rear case for battery or fuse replacement.

3-3. GENERAL WARNINGS AND CAUTIONS


- WARNING 1.** Children and the persons who do not have enough knowledge about electric measurements must not use this instrument.
- WARNING 2.** Do not measure the electricity in naked or barefooted to protect yourself from electrical shock hazard.
- WARNING 3.** Be careful not to get hurt with the sharp test lead pins.
- CAUTION 1.** Keep away the instrument from hot and humid conditions like in the car. Do not apply hard mechanical shock or vibration.
- CAUTION 2.** Do not polish the case or attempt to clean it with any cleaning fluid like gasoline or benzene. If necessary, use silicon oil or antistatic fluid.
- CAUTION 3.** Remove the batteries when the instrument is out of use for a long time. The exhausted battery might leak electrolyte and corrode the inside.

4. NAME ILLUSTRATION



4-1. LCD



-  : Low battery warning
- AC : Alternative Current
- DC : Direct Current
- : Minus
- AUTO : Auto-ranging
- REL Δ : Difference measurement
- \square : Lights up in Display Hold function
- ∇ : Diode test
- \Rightarrow : Continuity test
- Ω, kΩ, MΩ : Resistance measurement
- Hz : Frequency measurement
- % : Duty cycle measurement
- °C : Temperature measurement
- nF, μF : Capacitance measurement
- mV, V : Voltage measurement
- μA, mA, A : Current measurement

4-2. FUNCTION SWITCH

The switch to turn on the instrument and to select measurement functions. After finishing the measurement, turn it to "OFF".

WARNING

- Always confirm that **FUNCTION Switch** is set to the correct position. Do not measure voltage except at Voltage measurement function.
- To prevent electric shock or damage of this unit, detach test leads from measuring circuit before changing measurement functions.

4-3. SELECT Key

Use this Key to select sub-measurement functions in resistance or current measurements. Functions are changed as follows each time when the **SELECT Key** is pressed.

- Resistance measurement : Ω → ∇ → \Rightarrow → ∇ → Ω
- Current measurement (μA / mA / A) : DC A → AC A → DC A

4-4. RANGE Key

Manual-range measurement is possible by pressing this key during the auto-range measurement ("AUTO" disappears from LCD). To change the measurement range in manual-range, press **RANGE Key**. Check decimal point and select the suitable ranges. **To return to Auto-range** : Press **RANGE Key** for 1 second or more. ("AUTO" lights up). **NOTE** : **RANGE Key** is available for DC/AC Voltage, resistance and DC/AC current measurements.

4-5. REL Δ Key

Press **REL Δ Key** to start difference measurement ("REL Δ " lights up). Measurement value displayed on LCD is converted into 0±1 digit, and the relative value is displayed. **To release it** : Press **REL Δ Key** again. Difference measurement is finished and returns to the normal measurement mode ("REL Δ " disappears). **NOTE** : **REL Δ Key** is not available in Frequency and Duty Cycle measurements.

4-6. HOLD Key : Display Hold

Press this key to hold displayed value on LCD. ("H" lights up).

To release it : Press HOLD Key again.

NOTE : HOLD Key is not available in Frequency measurement.

4-7. Hz/DUTY Key : select Frequency or Duty

Hz/DUTY Key is available in Frequency or Duty measurement ranges. Press this key to select Hz or Duty cycle measurement function.

NOTE : Accuracy is not applicable to Hz or Duty measurements that are entered from AC/DC voltage or AC/DC current functions.

4-8. RESET Key

Press RESET Key to reset the setting of each measurement function to the initial setting when powered on.

4-9. Input terminals • Test lead

Insert black test lead to COM terminal and red test read to the other terminals.

1. Insert black test lead to COM terminal and insert red test lead to Ω terminal.
2. Set FUNCTION Switch to " Ω ".
3. If the resistor to be measured is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Then, disconnect one side of the resistor.
4. Connect test leads to the resistor (or circuit) to be measured.
5. Read the measurement value on LCD.
6. After finishing the measurement, set FUNCTION Switch to "OFF".

Available functions : Range hold, Display hold, Difference measurement and Reset function

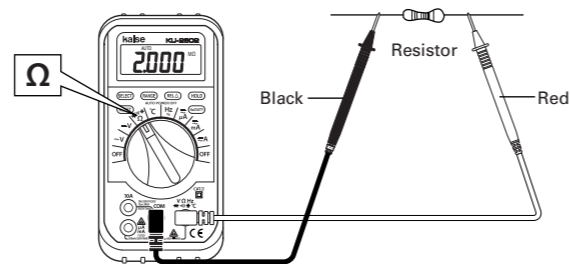


Fig-6

5-4. DIODE TEST (\rightarrow)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- If the diode is connected in a circuit, turn off the power to the circuit and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to \rightarrow terminal.
2. Set FUNCTION Switch to " Ω ".
3. Press SELECT Key once to display " \rightarrow " on LCD.
4. If the diode is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Disconnect one side of the diode.
5. Connect black test lead to Anode side and red test lead to Cathode side of the diode (Reverse connection). Confirm "OL" is displayed on LCD.
6. Connect test leads to the opposite side of "5" (Forward Connection). Test results are good if the following voltage values are displayed on LCD.
 - Silicon diodes : 0.4V to 0.7V
 - Germanium diodes : 0.1V to 0.4V
7. After finishing the measurement, set FUNCTION Switch to "OFF".

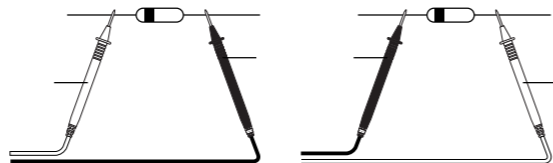


Fig-7

5-5. CONTINUITY TEST (\rightarrow)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- When measuring in-circuit continuity, turn off power to the circuit to be measured and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM Terminal and insert red test lead to \rightarrow terminal.
2. Set FUNCTION Switch to " Ω ".
3. Press SELECT Key twice to display " \rightarrow " on LCD.
4. If testing continuity in a circuit, turn off the power to the circuit and discharge the all capacitors.
5. Connect test lead to both side of the circuit to be measured. Buzzer sounds when the circuit resistance is approx. 60 Ω or lower.
6. After finishing the measurement, set FUNCTION Switch to "OFF".

5-6. CAPACITANCE MEASUREMENT (\rightarrow)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- If the capacitor is connected in a circuit, turn off the power to the circuit and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to \rightarrow terminal.
2. Set FUNCTION Switch to " Ω ".
3. Press SELECT Key three times to display the unit of "nF" on LCD.
4. Press REL Δ Key to reset the display into 0.000nF \pm 3dgt.
5. If the capacitor is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Then, disconnect one side of the capacitor.

6. Connect test lead to both side of the capacitor to be measured. Read the measurement value on LCD.
- NOTE : High capacitance capacitor should be taken longer to get a measurement value.
7. After finishing the measurement, set FUNCTION Switch to "OFF".

Available functions : Display hold and Reset function

5-7. TEMPERATURE MEASUREMENT ($^{\circ}$ C)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in $^{\circ}$ C position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Set FUNCTION Switch to " $^{\circ}$ C". The ambient temperature can be measured by built-in temperature sensor.
2. Insert "-" side of provided temperature probe to COM terminal and insert "+" side to $^{\circ}$ C terminal.
3. Put the tip of temperature probe to the object to be measured, and read the measurement value on LCD.
4. After finishing the measurement, set FUNCTION Switch to "OFF".

Available functions : Display hold, Difference measurement and Reset function

5-8. FREQUENCY / DUTY CYCLE MEASUREMENT (Hz / %)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in Hz position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

Frequency and duty cycle for AC voltage or DC voltage of pulse waveform can be measured.

1. Insert black test lead to COM terminal and insert red test lead to Hz terminal.
2. Set FUNCTION Switch to "Hz".
3. Connect test lead to the circuit to be measured. Read the measurement value on LCD.
- NOTE : Connect the instrument IN PARALLEL to the circuit.
4. After finishing the measurement, set FUNCTION Switch to "OFF".

Duty Cycle Measurement (%) : Duty cycle can be measured by pressing Hz/DUTY Key during frequency measurement. To return to the frequency measurement mode, press Hz/DUTY Key again.

Available functions : Display hold (only for Duty Cycle) and Reset function

5-9. CURRENT MEASUREMENT (\rightarrow A / \rightarrow mA / \rightarrow μ A)

WARNING

- Do not measure High Power Line or high power circuit.
- Do not measure the current that exceeds the maximum input value.
- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow A / \rightarrow mA / \rightarrow μ A positions. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.
- Be sure to connect RED test lead to 10A terminal in \rightarrow A measurement.
- Continuous loading time of 10A (maximum input value) in \rightarrow A measurement is within 15 seconds.

1. Insert black test lead to COM terminal and insert red test lead μ A, mA or 10A terminal.
- NOTE : RED test lead must be connected to 10A terminal in \rightarrow A measurement function.
2. Set FUNCTION Switch to " μ A", "mA" or "10A". Select the suitable position depending on the amount of the measurement current.
3. Press SELECT Key once to measure AC current.
4. Turn off the power of the circuit to be measured. Open the circuit after discharging the capacitors.
5. Connect black test lead to - (earth) side and connect red test lead to + (positive) side of the circuit to be measured.
- NOTE : Connect the instrument IN SERIES to the circuit.
- NOTE : Use alligator clips (option) for dangerous current measurement.
6. Turn on the power of the circuit to be measured. Read the measurement value on LCD.
7. Turn off the power of the circuit to be measured and discharge the all capacitors. Set FUNCTION Switch to "OFF".

NOTE : Accuracy is not applicable to Hz or Duty measurements that are entered from \rightarrow μ A / \rightarrow mA / \rightarrow A measurement functions.

Available functions : Range hold, Display hold, Difference measurement and Reset function

6. MAINTENANCE

6-1. BATTERY AND FUSE REPLACEMENT

WARNING

- To avoid electrical shock, replace batteries and fuses after finishing measurement.
- Detach test leads from circuit and input terminals and set FUNCTION Switch to "OFF".
- Always use the specified fuse. Do not use this instrument shorting fuse holder or without using the fuse.

FUSE SPECIFICATION : 0.5A/250V (ϕ 5 \times 20mm) and 10A/250V (ϕ 6 \times 30mm)

BATTERY REPLACEMENT

1. Detach test leads from input terminals and set FUNCTION Switch to "OFF".
2. Loosen a screw of battery cover and open it.
3. Remove the exhausted batteries and insert 2 pcs of new 1.5V R6P (AA) batteries in the correct polarity.
4. Fix battery cover and tighten the screw.

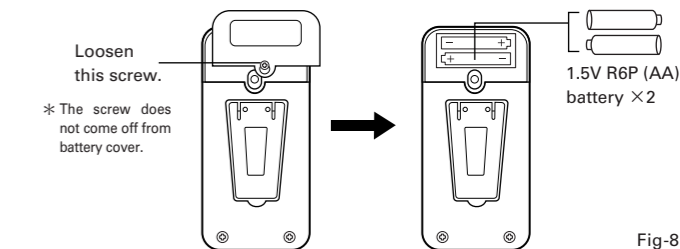


Fig-8

NOTE : Remove the battery when the instrument is out of use for a long time. The exhausted battery might leak electrolyte and corrode the inside.

FUSE REPLACEMENT

1. Detach test leads from input terminals and set FUNCTION Switch to "OFF".
2. Loosen 2-screws on the lower side of rear case and remove rear case.
3. Remove blown fuse from fuse holder and insert new one.
4. Fix rear case onto the front case and tighten the screws.

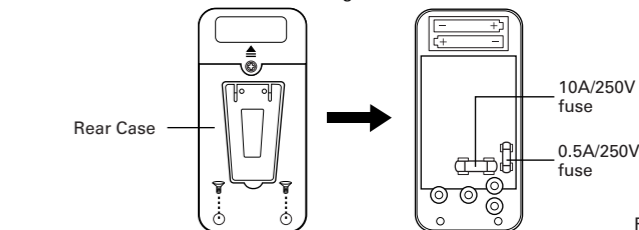


Fig-9

6-2. PERIODICAL CHECK AND CALIBRATION

Periodical check and calibration is necessary to make safety measurements and to maintain the specified accuracy. The recommended check and calibration term is once a year and after the repair service. This service is available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer.

6-3. REPAIR

Repair service is available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer. Pack the instrument securely with your name, address, telephone number and problem details, and ship prepaid to your local dealer.

Check the following items before asking repair service.

1. Check the battery connection, polarity, and capacity.
2. Check if the fuse does not blow out or not drop off from the fuse holder.
3. Confirm that the FUNCTION Switch is set correctly.
4. Confirm if the over input, exceeding the specified range value, is not applied.
5. Confirm that measured accuracy is adopted in the operating environment.
6. Confirm that the body of this instrument and test leads have no cracks or any other damages.
7. Check if the instrument is not affected by the strong noise generated from the equipment to be measured or measuring surroundings.

WARRANTY

KU-2602 is warranted in its entirety against any defects of material or workmanship under normal use and service within a period of one year from the date of purchase of the original purchaser. Warranty service is available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer. Their obligation under this warranty is limited to repairing or replacing KU-2602 returned intact or in warrantable defect with proof of purchase and transport charges prepaid. KAISE AUTHORIZED DEALER and the manufacturer, KAISE CORPORATION, shall not be liable for any consequential damages, loss or otherwise. The foregoing warranty is exclusive and in lieu of all other warranties including any warranty of merchantability, whether expressed or implied. This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside of KAISE AUTHORIZED SERVICE AGENCY, nor which have been subject to misuse, negligence, accident, incorrect repair by users, or any installation or use not in accordance with instructions provided by the manufacturer.

KAISE AUTHORIZED DEALER



KAISE CORPORATION

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 TEL : +81-268-35-1601 / FAX : +81-268-35-1603
 E-mail : sales@kaise.com http://www.kaise.com

Product specifications and appearance are subject to change without notice due to continual improvements.

5. MEASUREMENT PROCEDURES

5-1. PREPARATION FOR USE

1. INSTRUCTION MANUAL Δ

Read INSTRUCTION MANUAL carefully to understand the specification and functions correctly. "3. SAFETY PRECAUTIONS" is very important for safety measurement.

2. BATTERY

Two 1.5V R6P (AA) batteries are installed in this instrument. When "H" lights up on LCD, replace them into the new ones in reference to "6-1. BATTERY AND FUSE REPLACEMENT".

3. FUSE

0.5A/250V and 10A/250V fuses are installed to protect the current measurement function. Replace them in reference to "6-1. BATTERY AND FUSE REPLACEMENT" when blown out.

4. OVERLOAD INDICATION

LCD displays "OL" when measurement value exceeds the maximum value of each measurement range.

5. AUTO POWER OFF

Power turns off automatically after approx. 15 minutes of last operation.

NOTE : Small current consumption remains even in the auto power off condition.

Be sure to set FUNCTION Switch to "OFF" after finishing the measurement.

To cancel it : Turn on the instrument holding down SELECT Key.

5-2. VOLTAGE MEASUREMENT (\sim V / \Rightarrow V)

WARNING

- Do not measure High Power Line or high power circuit.
- Do not measure any voltage that might exceed maximum input value (600V AC/DC).
- Confirm the FUNCTION Switch is set to the correct position.
- Read "3. SAFETY PRECAUTIONS" carefully to avoid electric shock hazard and serious damage to the instrument.

1. Insert black test lead to COM terminal, and insert red test lead to V terminal.
2. Set FUNCTION Switch to " \sim V" or " \Rightarrow V".
- NOTE : LCD display might be drifting at this time due to the high input impedance of this instrument, but does not affect the measurement.
3. Connect black test lead to - (earth) side of the circuit being measured and connect red test lead to + (positive) side.
- NOTE : Connect the instrument IN PARALLEL to the circuit.
- NOTE : Use alligator clips (option) for dangerous voltage measurement.
4. Read the measurement value on LCD.
5. After finishing the measurement, set FUNCTION Switch to "OFF".

NOTE : Accuracy is not applicable to Hz or Duty measurements that are entered from \sim V / \Rightarrow V measurement functions.

Available functions : Range hold, Display hold, Difference measurement and Reset function

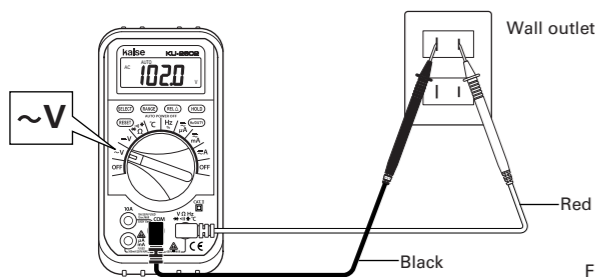


Fig-5

5-3. RESISTANCE MEASUREMENT (Ω)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in Ω position. This will cause electrical shock hazard to the operator and/or serious damage to the instrument.
- In case in-circuit resistance is measured, turn off the power to the circuit being measured and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to Ω terminal.
2. Set FUNCTION Switch to " Ω ".
3. If the resistor to be measured is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Then, disconnect one side of the resistor.
4. Connect test leads to the resistor (or circuit) to be measured.
5. Read the measurement value on LCD.
6. After finishing the measurement, set FUNCTION Switch to "OFF".

Available functions : Range hold, Display hold, Difference measurement and Reset function

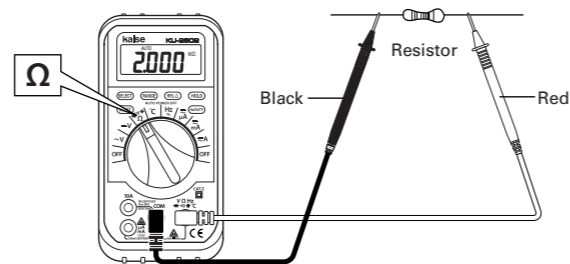


Fig-6

5-4. DIODE TEST (\rightarrow)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- If the diode is connected in a circuit, turn off the power to the circuit and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to \rightarrow terminal.
2. Set FUNCTION Switch to " Ω ".
3. Press SELECT Key once to display " \rightarrow " on LCD.
4. If the diode is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Disconnect one side of the diode.
5. Connect black test lead to Anode side and red test lead to Cathode side of the diode (Reverse connection). Confirm "OL" is displayed on LCD.
6. Connect test leads to the opposite side of "5" (Forward Connection). Test results are good if the following voltage values are displayed on LCD.
 - Silicon diodes : 0.4V to 0.7V
 - Germanium diodes : 0.1V to 0.4V
7. After finishing the measurement, set FUNCTION Switch to "OFF".

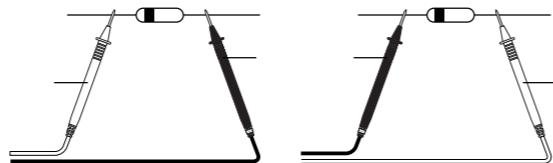


Fig-7

5-5. CONTINUITY TEST (\rightarrow)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- When measuring in-circuit continuity, turn off power to the circuit to be measured and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM Terminal and insert red test lead to \rightarrow terminal.
2. Set FUNCTION Switch to " Ω ".
3. Press SELECT Key twice to display " \rightarrow " on LCD.
4. If testing continuity in a circuit, turn off the power to the circuit and discharge the all capacitors.
5. Connect test lead to both side of the circuit to be measured. Buzzer sounds when the circuit resistance is approx. 60 Ω or lower.
6. After finishing the measurement, set FUNCTION Switch to "OFF".

5-6. CAPACITANCE MEASUREMENT (\rightarrow)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- If the capacitor is connected in a circuit, turn off the power to the circuit and discharge the all capacitors.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to \rightarrow terminal.
2. Set FUNCTION Switch to " Ω ".
3. Press SELECT Key three times to display the unit of "nF" on LCD.
4. Press REL Δ Key to reset the display into 0.000nF \pm 3dgt.
5. If the capacitor is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Then, disconnect one side of the capacitor.

6. Connect test lead to both side of the capacitor to be measured. Read the measurement value on LCD.
- NOTE : High capacitance capacitor should be taken longer to get a measurement value.
7. After finishing the measurement, set FUNCTION Switch to "OFF".

Available functions : Display hold and Reset function

5-7. TEMPERATURE MEASUREMENT ($^{\circ}$ C)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in $^{\circ}$ C position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

1. Set FUNCTION Switch to " $^{\circ}$ C". The ambient temperature can be measured by built-in temperature sensor.
2. Insert "-" side of provided temperature probe to COM terminal and insert "+" side to $^{\circ}$ C terminal.
3. Put the tip of temperature probe to the object to be measured, and read the measurement value on LCD.
4. After finishing the measurement, set FUNCTION Switch to "OFF".

Available functions : Display hold, Difference measurement and Reset function

5-8. FREQUENCY / DUTY CYCLE MEASUREMENT (Hz / %)

WARNING

- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in Hz position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.

Frequency and duty cycle for AC voltage or DC voltage of pulse waveform can be measured.

1. Insert black test lead to COM terminal and insert red test lead to Hz terminal.
2. Set FUNCTION Switch to "Hz".
3. Connect test lead to the circuit to be measured. Read the measurement value on LCD.
- NOTE : Connect the instrument IN PARALLEL to the circuit.
4. After finishing the measurement, set FUNCTION Switch to "OFF".

Duty Cycle Measurement (%) : Duty cycle can be measured by pressing Hz/DUTY Key during frequency measurement. To return to the frequency measurement mode, press Hz/DUTY Key again.

Available functions : Display hold (only for Duty Cycle) and Reset function

5-9. CURRENT MEASUREMENT (\rightarrow A / \rightarrow mA / \rightarrow μ A)

WARNING

- Do not measure High Power Line or high power circuit.
- Do not measure the current that exceeds the maximum input value.
- Confirm the FUNCTION Switch is set to the correct position.
- Do not measure voltage in \rightarrow A / \rightarrow mA / \rightarrow μ A positions. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "3. SAFETY PRECAUTIONS" carefully before measurement.
- Be sure to connect RED test lead to 10A terminal in \rightarrow A measurement.
- Continuous loading time of 10A (maximum input value) in \rightarrow A measurement is within 15 seconds.

1. Insert black test lead to COM terminal and insert red test lead μ A, mA or 10A terminal.
- NOTE : RED test lead must be connected to 10A terminal in \rightarrow A measurement function.
2. Set FUNCTION Switch to " μ A", "mA" or "10A". Select the suitable position depending on the amount of the measurement current.
3. Press SELECT Key once to measure AC current.
4. Turn off the power of the circuit to be measured. Open the circuit after discharging the capacitors.
5. Connect black test lead to - (earth) side and connect red test lead to + (positive) side of the circuit to be measured.
- NOTE : Connect the instrument IN SERIES to the circuit.
- NOTE : Use alligator clips (option) for dangerous current measurement.
6. Turn on the power of the circuit to be measured. Read the measurement value on LCD.
7. Turn off the power of the circuit to be measured and discharge the all capacitors. Set FUNCTION Switch to "OFF".

NOTE : Accuracy is not applicable to Hz or Duty measurements that are entered from \rightarrow μ A / \rightarrow mA / \rightarrow A measurement functions.

Available functions : Range hold, Display hold, Difference measurement and Reset function

6. MAINTENANCE

6-1. BATTERY AND FUSE REPLACEMENT

WARNING

- To avoid electrical shock, replace batteries and fuses after finishing measurement.
- Detach test leads from circuit and input terminals and set FUNCTION Switch to "OFF".
- Always use the specified fuse. Do not use this instrument shorting fuse holder or without using the fuse.

FUSE SPECIFICATION : 0.5A/250V (ϕ 5 \times 20mm) and 10A/250V (ϕ 6 \times 30mm)