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 case 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** : ⎓ , ⎓ , ～, mV, V, MΩ, kΩ, Ω, ⊣◀, •))) , DH, BAT, AUTO and decimal point.
2. **OPERATING PRINCIPLE** : ∑⊿ conversion
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 •))) symbol appears on LCD.
   - **a. Buzzer Sounds :** at approx. 50Ω or less
   - **b. Open Circuit Voltage :** approx. 0.45V
10. **OVERLOAD PROTECTION :**
    - **a.** V : 900V DC/AC maximum for 1 minute
    - **b.** Ω/⊣◀/•))) : 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℃ to 40℃, 80%RH or lower in non-condensing.
13. **STORAGE TEMPERATURE & HUMIDITY** : -20℃ to 60℃, 70%RH or lower in non-condensing.
14. **TEMPERATURE COEFFICIENT :** Accuracy in 23℃±5℃×0.1 / ℃
15. **POWER SUPPLY** : 3V CR2032 Battery × 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 automaticaly 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. **DIMEMSION & WEIGHT :** 109(H)×55(W)×9(D)mm, Approx. 60g
21. **ACCESSORIES :** 3V CR2032 Battery (installed)×1, Note-book type Carrying Case, Instruction Manual
22. **OPTIONAL ACCESSORY** : 940 Alligator Clips

2-2. MEASUREMENT SPECIFICATIONS

(23℃±5℃、＜80%RH in non-condensing)

1. DC VOLTAGE（⎓V）

Range	Accuracy	Resolution	Input Resistance	Max. Input Voltage
200.0mV	±1.3%rdg±5dgt	100μV	≧100MΩ	600V DC
2.000V	±1.3%rdg±3dgt	1mV	≒12MΩ	
20.00V		10mV	≒10MΩ	
200.0V		100mV		
600V		1V		

Overload Protection：900V DC for 1 minute

2. AC VOLTAGE（～V）

Range	Accuracy	Resolution	Input Resistance	Max. Input Voltage	Overload Protection
2.000V	±2.0%rdg ±8dgt	1mV	≒12MΩ	600V AC	900V AC for 1 minute
20.00V		10mV	≒10MΩ		
200.0V		100mV			
600V		1V			

3. RESISTANCE（Ω）

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage
200.0Ω	±2.0%rdg±4dgt	0.1Ω	≦1mA	≦0.45V
2.000kΩ		1Ω	≦0.3mA	
20.00kΩ		10Ω	≦40μA	
200.0kΩ		100Ω	≦4μA	
2.000MΩ		1kΩ	≦0.4μA	
20.00MΩ	±5.0%rdg±4dgt	10kΩ	≦0.04μA	

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

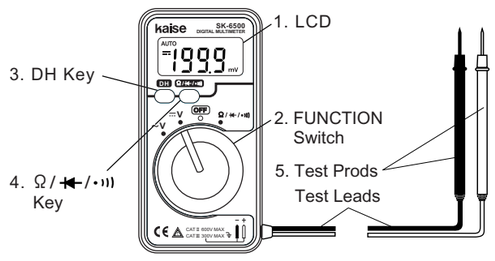
4. DIODE TEST（⊣◀）

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

5. CONTINUITY TEST（•)))）

Range	Buzzer Sound	Resolution	Open Circuit Voltage	Overload Protection
200.0Ω	Approx. 50Ω or less	100mΩ	≒0.45V	300V DC/AC rms for 1 minute

3. NAME ILLUSTRATION



3-1. LCD

AUTO	:	Auto-Ranging
⎓	:	Direct Current (DC)
—	:	Minus symbol (automatically appears when polarity is minus.)
～	:	Alternating Current (AC)
⊣◀	:	Diode Test
•)))	:	Continuity Test
DH	:	Display Hold
BAT	:	Battery Warning
MΩ、kΩ、Ω	:	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
⎓V position	: 0 to 600V DC measurements
～V position	: 0 to 600V AC measurements
Ω position	: 0 to 20MΩ measurements
⊣◀ position	: Diode tests
•))) 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. Ω /⊣◀/•))) 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 ⎓V or ～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.

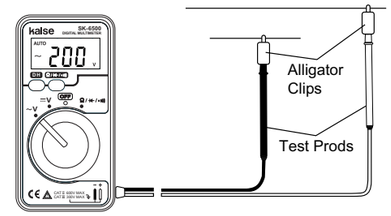


Fig. 1

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 ⎓V or ～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.

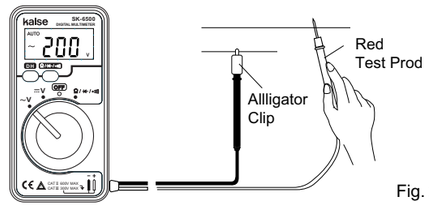


Fig. 2

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 Ω / ⊣◀ / •))) position.

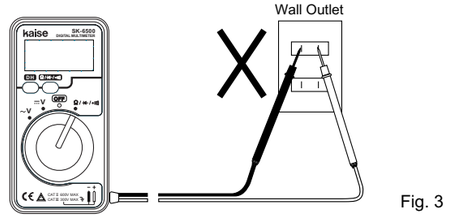


Fig. 3

⚠ WARNING 7. Test Leads Disconnection

Prior to change FUNCTION Switch to another position when measuring, or opening Rear Case for replacement of battery, always dieconnect 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.

⚠ **WARNING 3.** The points of Test Prods are sharp and dangerous. Do not get hurt with them.

⚠ **CAUTION 4.** Do not polish the meter case, or attempt to clean it with any cleaning fluid, gasoline, benzine, etc. If necessary, use silicon oil or antistatic fluid.

⚠ **CAUTION 5.** Avoid severe mechanical shock or vibration, extreme temperature or very strong magnetic field.

⚠ **CAUTION 6.** Remove the batteries when not in use for an extended time since the exhausted batteries might leak electrolyte and corrode the internal components.

5. MEASUREMENT PROCEDURES

5-1. PREPARATION FOR USE

1. INSTRUCTION MANUAL ⚠

Prior to use, read INSTRUCTION MANUAL carefully and acquaint yourself with the specifications and functions of the instrument. Especially, read and observe strictly 「4. SAFETY PRECAUTIONS」.

2. BATTERY

One 3V CR2032 battery is installed in this instrument. When the battery is consumed and "BAT" symbol appears on LCD, replace the battery referring to 「6-2. BATTERY REPLACEMENT」.

3. OVERLOAD INDICATION

If input value exceeds 1999 counts which is the maximum value of the measurement range being used, "OL" symbol appears on LCD. However, it does not appear in 600V DC/AC measurement range.

4. AUTO POWER OFF

After 15 minutes of last operation of FUNCTION Switch, DH Key, or Ω / ⊣◀/•)) Key, power turns off automatically to conserve battery life (goes down in sleep condition and 10 μA consumption).

Canceling Auto Power Off function : Turn the power on pressing DH Key.

5. SYMBOL MARK

The following symbols shown on instrument and in the instruction manual are listed in IEC 61010-1 and ISO 3864.

⚠	Caution (refer to instruction manual.)		
~	Alternating Current (AC)	⏚	Earth (Ground)
⎓	Direct Current (DC)	⧈	Double Insulation

5-2. AC VOLTAGE (~V) MEASUREMENTS

⚠ WARNING

- Maximum measureable voltage of AC Voltage line is 600V AC. Do not measure voltage that might exceed 600V to avoid electric shock hazard to the operator or serious damage to the instrument.
- Do not measure High Power Line at 6kVA or more.
- Before measurements, read carefully 「4. SAFETY PRECAUTIONS」 for safety measurements.

1. Set FUNCTION Switch to "~V" position.
   NOTE : Random numerals appeared on LCD without any inputs are caused by high internal resistance of the instrument and not the trouble.
2. Connect Black Test Prod to the negative (earth) side of the circuit to be measured and Red Test Prod to the positive (high potential) side.
   NOTE : In Voltage Measurements, connect the instrument **IN PARALLEL** to the circuit to be measured.
   NOTE : When measuring a dangerous circuit, connect Alligator Clips (optional) on Test Prods for safety measurement.
3. Read the voltage on LCD
4. After the measurements, set FUNCTION Switch to OFF position.

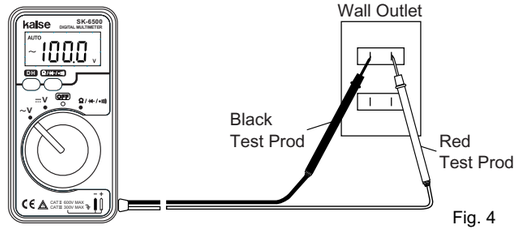


Fig. 4

5-3. DC VOLTAGE (⎓V) MEASUREMENTS

⚠ WARNING

- Maximum measureable voltage of DC Voltage line is 600V DC. Do not measure voltage that might exceed 600V to avoid electric shock hazard to the operator or serious damage to the instrument.
- Do not measure High Power Line at 6kVA or more.
- Before measurements, read carefully 「4. SAFETY PRECAUTIONS」 for safety measurements.

1. Set FUNCTION Switch to "⎓V" position.
   NOTE : Random numerals appeared on LCD without any inputs are caused by high internal resistance of the instrument and not the trouble.
2. Connect Black Test Prod to the negative (earth) side of the circuit to be measured and Red Test Prod to the positive (high potential) side.
   NOTE : In Voltage Measurements, connect the instrument **IN PARALLEL** to the circuit to be measured.
   NOTE : When measuring a dangerous circuit, connect Alligator Clips (optional) on Test Prods for safety measurement.
3. Read the voltage on LCD.
4. After the measurements, set FUNCTION Switch to OFF position.

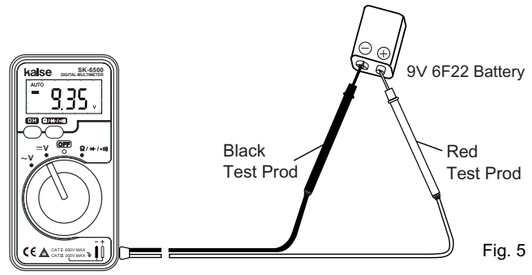


Fig. 5

5-4. RESISTANCE (Ω) MEASUREMENTS

⚠ WARNING

- Do not measure voltage at Ω position to avoid electric shock hazard to the operator or serious damage to the instrument.
- When measuring in-circuit resistance, turn off the power of the circuit to be measured and discharge all capacitors.
- Before measurements, read carefully 「4. SAFETY PRECAUTIONS」 for safety measurements.

1. Set FUNCTION Switch to Ω / ⊣◀/•)) position.
2. If the resistor to be measured is connected in a circuit, turn the circuit power off and discharge all capacitors. Open one side of the resistor.
3. Connect Test Prods to the resistor (or circuit) to be measured.
4. Read the resistance on LCD.
5. After the measurements, set FUNCTION Switch to OFF position.

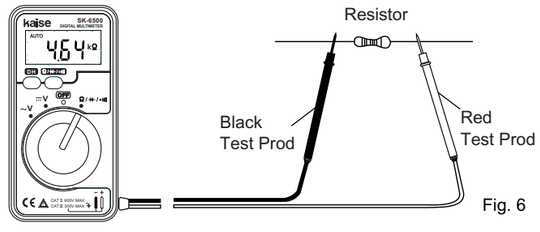


Fig. 6

5-5. DIODE (⊣◀) TESTS

⚠ WARNING

- Do not measure voltage at ⊣◀ position to avoid electric shock hazard to the operator or serious damage to the instrument.
- When testing in-circuit diode, turn off the power of the circuit to be tested and discharge all capacitors.
- Before measurements, read carefully 「4. SAFETY PRECAUTIONS」 for safety measurements.

1. Set FUNCTION Switch to "Ω / ⊣◀/•)) " position.
2. Press "Ω / ⊣◀/•)) " Key once. " ⊣◀ " symbol appears on LCD.
3. If the diode to be tested is connected in a circuit, turn the circuit power off and discharge all capacitors. Disconnect one side of the diode from the circuit.
4. Connect Black Test Prod to Anode and Red Test Prod to Cathode of the diode (Reverse Connection). Confirm "OL" symbol is displayed on LCD.
5. Connect Test Prods to the opposite side of 4. (Foward Connection). The tested diodes are judged good if the following voltages are displayed on LCD.
   Silicon diodes・・・・・・・0.4V～0.7V
   Germanium diodes・・・・0.1V～0.4V
6. After the Diode Tests, set FUNCTION Switch to OFF position.

   NOTE : Light-emitting diode is not testable.

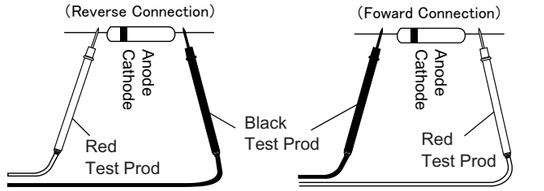


Fig. 7

5-6. CONTINUITY (•))) TESTS

⚠ WARNING

- Do not measure voltage at •)) position to avoid electric shock hazard to the operator or serious damage to the instrument.
- When testing in-circuit continuity, turn off the power of the circuit to be tested and discharge all capacitors.
- Before measurements, read carefully 「4. SAFETY PRECAUTIONS」 for safety measurements.

1. Set FUNCTION Switch to "Ω / ⊣◀/•)) " position.
2. Press "Ω / ⊣◀/•)) " Key twice. " •)) " symbol appears on LCD.
3. When testing in-circuit continuity, turn the circuit power off and discharge all capacitors.
4. Connect Test Prods to the circuit to be tested. Buzzer sounds when the resistance value displayed on LCD is approx. 50Ω or less.
5. After the Continuity Tests, set FUNCTION Switch to OFF position.

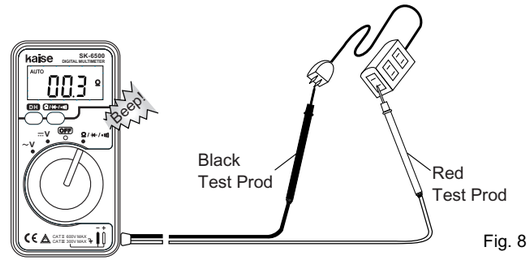


Fig. 8

6. MAINTENANCE

6-1. WARRANTY STATEMENT

The warranty statement for the Digital Multimeter is printed on the last page of this instruction manual. Read it carefully before requesting a warranty repair.

6-2. BATTERY REPLACEMENT

⚠ WARNING

To avoid electric shock hazard on battery replacement, stop measurement and turn the power OFF before opening Rear Case. Disconnect Test Prods from the circuit.

Replace the battery when "BAT" symbol appears on LCD.

1. Stop measurement and turn the power off. Disconnect Test Prods from the circuit.
2. Remove the screw on the Rear Case
3. Open Rear Case and remove it.
4. Remove the used battery.
5. Insert a new 3V CR2032 battery in correct polarity, "+" side up.
6. Replace the Rear Case and tighten the screw.

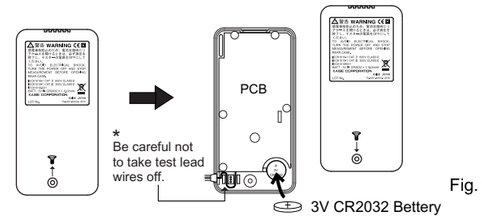


Fig. 9

6-3. PERIODICAL CHECK AND CALIBRATION

Periodical check and calibration are necessary to make safety measurements as well as to maintain the specifications.
It is recommended that the instrument may be checked and calibrated once each year and/or after it is repaired. Periodical Check and Calibration services are available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer at a cost basis charge.
Pack the instrument securely in its original carton together with descriptions of your name, address, telephone number and the service required, and ship prepaid to your local dealer.

6-4. REPAIR

Repair service, warranty or non-warranty, is available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer. Warranty repair is executed free of charge, but, non-warranty repair is charged on the cost basis.
Pack the instrument securely in its original package together with descriptions of your name, address, telephone number, problem encountered and the service required, and ship prepaid to your local dealer.

When the instrument does not operate properly, the following steps should be taken before returning the instrument for repair, warranty or non-warranty.

1. Check the battery connection.
2. Check the battery if it is installed in the correct polarity.
3. Check the battery if it is alive and usable.
4. Make sure that FUNCTION Switch is set to correct position.
5. Make sure that the body of this instrument and the handle insulators of the Test Prods have no cracks nor any other damage on them.
6. Be careful of noise from the equipment under test or the ambient environment in which the instrument is being used. The instrument is fully shielded against noise, but may read error due to very strong noise.

WARRANTY

The Digital Multimeter SK-6500 is warranted in its entirety against any defects of material or workmanship under normal use and service within a period of one year after the date of purchase of the instrument by the original purchaser. This warranty is extended by **KAISE AUTHORIZED DEALER** only to original purchaser or original user of the instrument on condition that the Warranty Registration Card is completed and returned to the authorized dealer within two weeks after the purchase of the instrument new from the dealer. The obligation under this warranty to be executed by **KAISE AUTHORIZED DEALER** is limited to repairing or replacing the Digital Multimeter SK-6500 returned intact to it, with transportation charge prepaid, and which to its satisfaction is judged by it to have been thus defective. **KAISE AUTHORIZED DEALER** and **KAISE CORPORATION**, the manufacturer shall not otherwise be liable for any damages or loss, consequential 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 **KAISE AUTHORIZED SERVICE AGENCY**, nor which has been subject to misuse, negligence or accident, incorrect repair by users, or installation or use not in accord with instructions furnished by the manufacturer.

KAISE AUTHORIZED DEALER

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