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# kaise

CE

## INSTRUCTION MANUAL

## INSULATION TESTER


SK-3010 / 3011 / 3012

SK-3013 / 3016 / 3310


SK-3315 / 3320 / 3322


## 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 [5. SAFETY PRECAUTIONS], [6. MEASUREMENT PROCEDURES] and [7. MAINTENANCE] of this instruction manual.

### Important Symbol

 : The symbol listed in IEC 1010 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**

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. When measuring dangerous voltages of High Power Line or High Voltage Circuit, always place the instrument away from your body without holding it with your hands.

Do not touch the Insulation Tester, its Test Leads, or any part of the circuit while it is on.

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## 1. FEATURES

- EASY OPERATION** : This battery operated multi-purpose Insulation Tester presents quite an easy operation by a smart arrangement of FUNCTION Switch and Pushbutton Switch with TIMER.
- DOUBLE/TRIPLE RATING and 300V/600V AC** : Model SK-3000 Series features Double/triple Rating and 300V/600V AC Range that enabled the instrument to play the roles of two/three insulation testers differently rated. 300V/600V AC Ranges are used to measure AC Voltage Line and checks if the line is live or not.
- VOLTAGE CHARACTERISTIC** : This series provides a high voltage characteristic for lower measurement points of rated resistance to meet VDE and JIS (C-1302-1994) specifications.
- TIMER SWITCH** : This series provides TIMER Switch that enables continuous 3 minute measurements when necessary.
- LOW OHM MEASUREMENTS and CONTINUITY TESTS** : SK-3016 can measure Low Ohms of 0 to 20 $\Omega$  to check circuits to earth, Switches and Fuses. SK-3016 is also provided with Continuity Test Buzzer.
- PHASE TESTS** : SK-3322 is provided with PHASE TEST FUNCTION. Phase sequence is easily checked and indicated by LED display.
- TAUT BAND METER MOVEMENT** : of Drop-proof, Internal Core Magnet type minimizes outside magnetic influence and assures trouble-free performance.
- DROP-PROOF and WATER-RESISTANT CASES** : Cases are designed to be Dust-proof and Water-resistant, and One Packaging Carrying Case style.

## 2. UNPACKING AND INSPECTION

Before unpacking, examine the shipping carton 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 included in the box.

- Insulation Tester
- 100-40 Lead Wires
- 766 Red Test Prod (with 767 Test Pin)
- 942 Black Alligator Clip
- Six 1.5V R6P Batteries
- One Phase Test Lead (SK-3322 only)
- Instruction Manual

## 3. SPECIFICATIONS

### 1. RATING AND RANGES

Model	SK-3010	SK-3011	SK-3012
Rated Voltage/ Resistance	50V/10M $\Omega$ 125V/20M $\Omega$	125V/20M $\Omega$ 250V/50M $\Omega$	250V/ 50M $\Omega$ 500V/100M $\Omega$
Effective Measuring Range	0.005~10M $\Omega$ 0.01~20M $\Omega$	0.01~20M $\Omega$ 0.01~50M $\Omega$	0.01~ 50M $\Omega$ 0.05~100M $\Omega$
Center Scale	0.2M $\Omega$ 0.5M $\Omega$	0.5M $\Omega$ 1M $\Omega$	1M $\Omega$ 2M $\Omega$
Allowable Voltage at no load	less than 1.3 times of Rated Voltage		
Rated Measuring Current	1mA~1.2mA		
Shorted Current	less than 2mA		
AC Voltage	0~300V	0~300V	0~600V
Low Ohms	—	—	—
Continuity Test	—	—	—
Phase Test	—	—	—

Model	SK-3013	SK-3016
Rated Voltage/ Resistance	500V/1000M $\Omega$ 1000V/2000M $\Omega$	500V/100M $\Omega$ 1000V/200M $\Omega$
Effective Measuring Range	0.5~1000M $\Omega$ 1~2000M $\Omega$	0.05~100M $\Omega$ 0.1~200M $\Omega$
Center Scale	20M $\Omega$ 50M $\Omega$	2M $\Omega$ 5M $\Omega$
Allowable Voltage at no load	less than 1.3 times of Rated Voltage	
Rated Measuring Current	1mA~1.2mA	
Shorted Current	less than 2mA	
AC Voltage	0~600V	0~600V
Low Ohms	—	2 $\Omega$ /20 $\Omega$ OpenV. $\geq$ 5V, M.C. 200mA
Continuity Test	—	Buzzer sounds less than 1 $\Omega$ /10 $\Omega$
Phase Test	—	—

Model	SK-3310	SK-3315
Rated Voltage/ Resistance	25V/ 5M $\Omega$ 50V/ 10M $\Omega$ 125V/200M $\Omega$	125V/ 20M $\Omega$ 250V/ 50M $\Omega$ 500V/1000M $\Omega$
Effective Measuring Range	0.001~ 5M $\Omega$ 0.005~ 10M $\Omega$ 0.1~200M $\Omega$	0.01~ 20M $\Omega$ 0.01~ 50M $\Omega$ 0.5~1000M $\Omega$
Center Scale	0.1M $\Omega$ 0.2M $\Omega$ 5M $\Omega$	0.5M $\Omega$ 1M $\Omega$ 20M $\Omega$
Allowable Voltage at no load	less than 1.3 times of Rated Voltage	
Rated Measuring Current	1mA~1.2mA	
Shorted Current	less than 2mA	
AC Voltage	0~300V	0~600V
Low Ohms	—	—
Continuity Test	—	—
Phase Test	—	—

Model	SK-3320	SK-3322
Rated Voltage/ Resistance	250V/ 50M $\Omega$ 500V/ 100M $\Omega$ 1000V/2000M $\Omega$	250V/ 50M $\Omega$ 500V/ 100M $\Omega$ 1000V/2000M $\Omega$
Effective Measuring Range	0.01~ 50M $\Omega$ 0.05~ 100M $\Omega$ 1~2000M $\Omega$	0.01~ 50M $\Omega$ 0.05~ 100M $\Omega$ 1~2000M $\Omega$
Center Scale	1M $\Omega$ 2M $\Omega$ 50M $\Omega$	1M $\Omega$ 2M $\Omega$ 50M $\Omega$
Allowable Voltage at no load	less than 1.3 times of Rated Voltage	
Rated Measuring Current	1mA~1.2mA	
Shorted Current	less than 2mA	
AC Voltage	0~600V	0~600V
Low Ohms	—	—
Continuity Test	—	—
Phase Test	—	Normal Phase : Green Reverse Phase : Red Voltage Range : AC 50V~500V Frequency Range : 50Hz/60Hz

## 2. GENERAL SPECIFICATIONS

### 1. STANDARD MEASUREMENT CONDITION

Environment Temperature & Humidity : 23°C $\pm$ 3°C 45%~75%

Posture : Horizontal (Inclination Angle is less than 5 degrees).

Outside Magnetic Field : None.

Battery Voltage :  $\pm$ 0.1V (within the battery effective range).

### 2. ACCURACY (under above condition)

1. Meg Ohm Resistance :

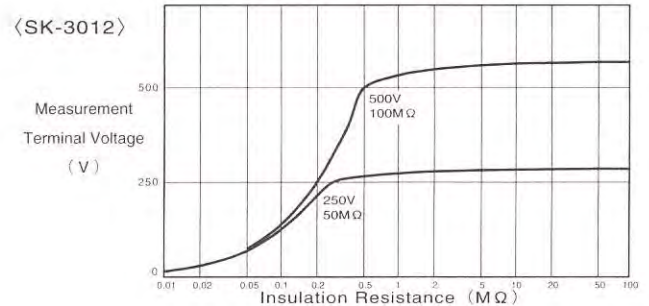
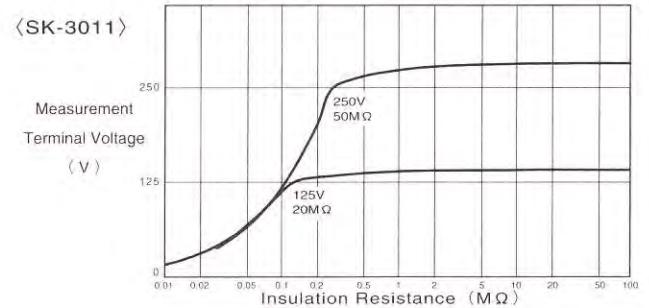
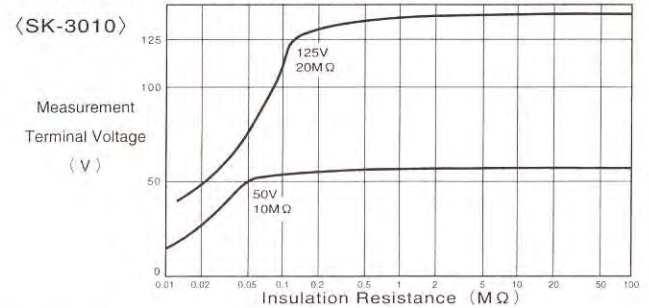
- First effective range (between 1/1000 and 1/2 of rated resistance) : less than 5% of reading value.
- Second effective range (over 1/2 of rated resistance) : less than 10% of reading value.
- The other area of scale (includes Zero and Infinite) : less than 0.5mm of full scale length.

2. AC Voltage :  $\pm 3\%$  of full scale value.
3. Low Ohms :  $\pm 3\%$  of full scale length.
4. Voltage at no load : less than 1.3 times of Rated Voltage.
5. Rated Measuring Current : 1mA $\sim$ 1.2mA.
6. Shorted Current : less than 2mA.

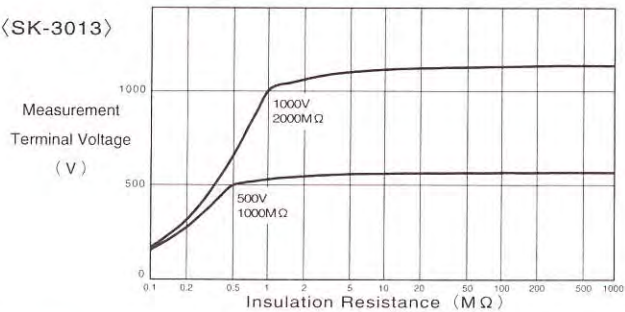
### 3. OVERLOAD PROTECTION

1. M $\Omega$  Ranges : 1.2 times of Rated Voltage (50Hz or 60Hz) for 10 seconds.
  2. 300V AC Range (SK-3010/3011/3310) : 450V AC for one minute.  
600V AC Range (the other models) : 800V AC for one minute.
  3. Low Ohms Range (SK-3016 only) : by 1A 600V Fuse.
  4. Phase Test Range (SK-3322 only) : 600V AC for one minute.
- 4. DIELECTRIC STRENGTH** : 5.55kV (Sine Wave) for one minute between Case and Input Terminals.
- 5. OPERATING TEMPERATURE & HUMIDITY** : 0°C $\sim$ 40°C, less than 75%RH in non-condensing.
- 6. STORAGE TEMPERATURE & HUMIDITY** : -10°C $\sim$ 50°C, less than 70%RH in non-condensing.
- 7. BATTERIES** : Six 1.5V R6P Batteries.
- 8. CURRENT CONSUMPTION** :  
SK-3010/3310 : 2.5VA, SK-3011 : 3VA,  
SK-3012/3315 : 3.5VA, SK-3013/3016/3320/3322 : 4VA.
- 9. FUSE** : One F 1A 600V,  $\phi$  6.2 $\times$ 32mm, approved to IEC spec.
- 10. DIMENSIONS & WEIGHT** : 169 (H) $\times$ 148 (W) $\times$ 47.5 (D),  
570g (580g for SK-3322).
- 11. ACCESSORIES** :  
100-40 Lead Wires, 766 Red Test Prod (with 767 Test Pin),  
942 Black Alligator Clip, Six 1.5V R6P Batteries, One Phase Test Lead (SK-3322 only), Instruction Manual.
- 12. OPTIONAL ACCESSORIES** :  
766 Black Test Prod (with 767 Test Pin),  
942 Red Alligator Clip.

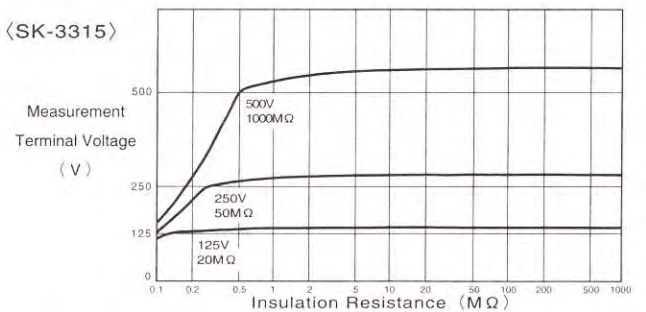
### 3. VOLTAGE CHARACTERISTICS



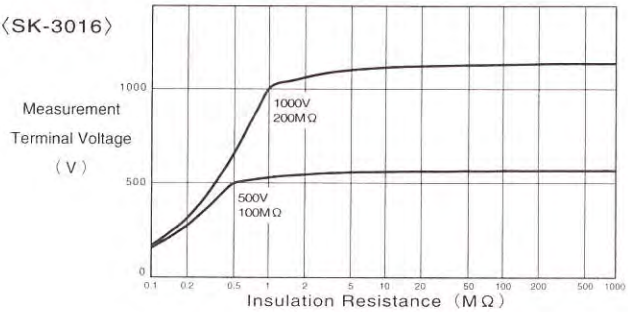
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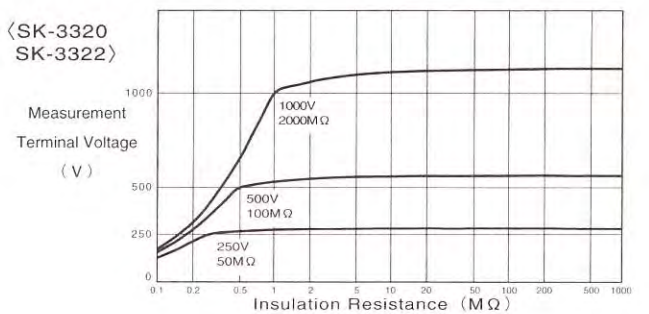
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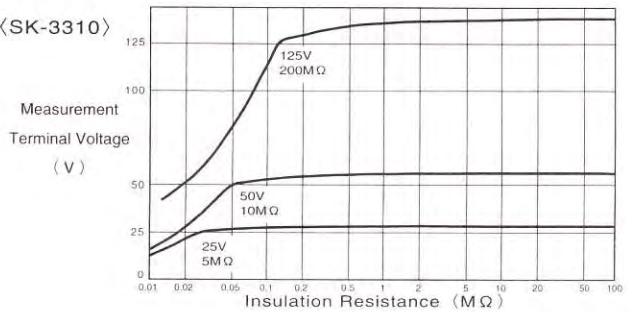
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<SK-3320  
SK-3322>



<SK-3310>



## 4. NAME ILLUSTRATION

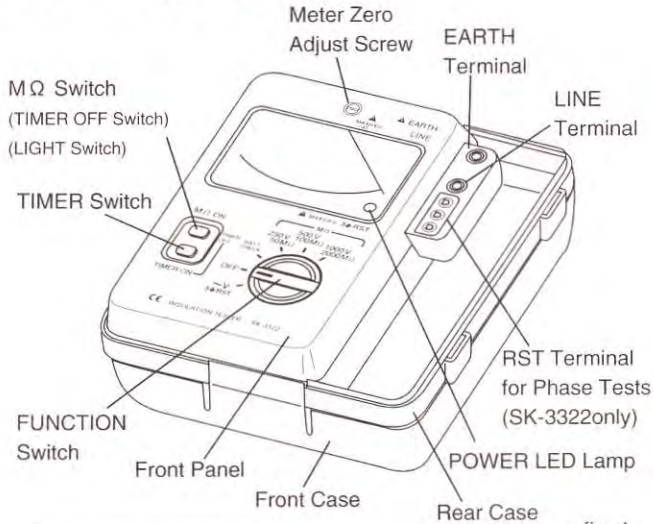


fig. 1

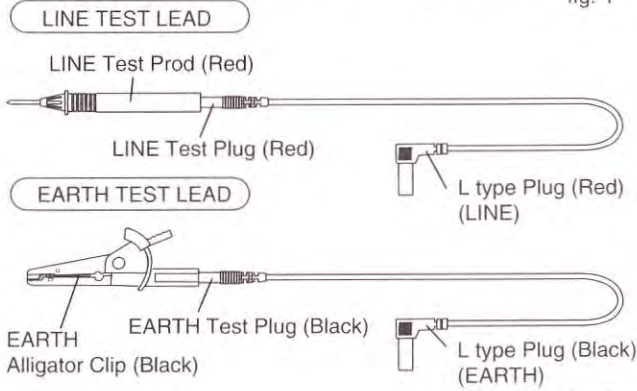


fig. 2

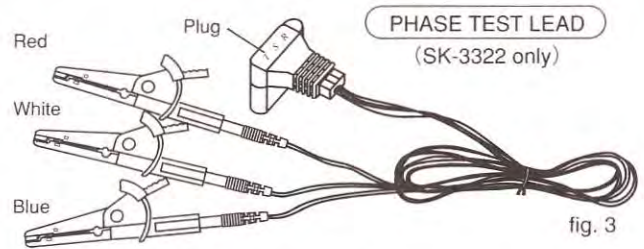


fig. 3

## 5. SAFETY PRECAUTIONS

Correct knowledge about electric measurements is necessary 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. Misuse, abuse and carelessness cannot be prevented by any written word and is fully the operator's responsibility. Observing the following precautions, take safe measurements.

### 5-1. WARNINGS

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

Before every measurement, do not fail to confirm that 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.

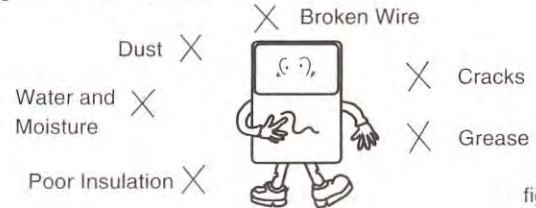


fig. 4

**⚠ WARNING 2. Warning for High Power Line Measurements**

High Power Lines (High Energy Circuits) such as Distribution Transformers, Bus Bars, Large Motors, etc. are very dangerous. High Power Line sometimes includes High Surge Voltage that could induce explosive short in the instrument and could result in shock hazard. When measuring voltage of High Power Line, do not touch the Insulation Tester, its Test Leads or any part of the Circuit while it is on.

**⚠ WARNING 3. Warning for High Voltage Measurements**

Even if with Low Energy Circuits of electric/electronic appliances, heating elements, small motors, line cords and plugs, etc., High Voltage Measurements are very dangerous. Do not touch the Insulation Tester, its Test Leads or any part of the Circuit while it is on. Generally, shock hazard shall be considered to 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. Insert Black L type Plug of EARTH Test Lead into EARTH Terminal and Red L type Plug of LINE Test Lead into LINE Terminal.
3. Connect Black Alligator Clip to EARTH Test Plug and Red Alligator Clip (optional) to LINE Test Plug.
4. Set FUNCTION Switch to  $\sim V$  position.
5. 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  $+$  (line) side of the circuit to be measured.

**NOTE :** Reverse connection is possible in AC Voltage measurements.

6. 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.
7. Turn on power to the circuit to be measured and read the voltage on the meter. Refer to the figure 5.

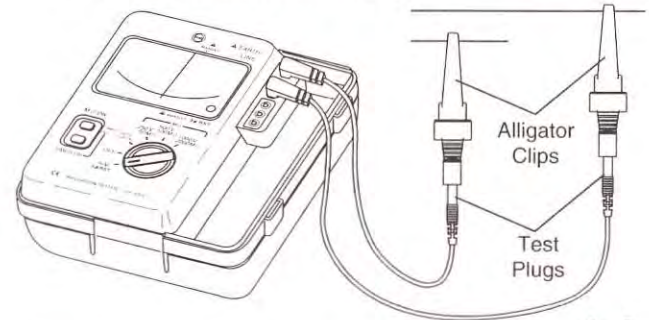


fig. 5

8. When the measurement is finished, turn off power to the circuit to be measured and discharge all capacitors in the circuit.
9. Disconnect Alligator Clips of Test Leads from the circuit.

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

1. Insert Black L type Plug of EARTH Test Lead into EARTH Terminal and Red L type Plug of LINE Test Lead into LINE Terminal.
2. Connect Black Alligator Clip to EARTH Test Plug and Red Test Prod to LINE Test Plug.
3. Set FUNCTION Switch to  $\sim V$  position.



4. Take safety distance from the power or the circuit to be measured to prevent any part of your body from touching dangerous voltage.
  5. Connect Black Alligator Clip to — (earth) side of the circuit to be measured.
  6. Hold Red Test Prod with one hand and connect it to + (positive) side of the circuit to be measured.
- NOTE:** Reverse connection is possible in AC Voltage measurements.
7. Read the voltage on the meter. Refer to the figure 6.

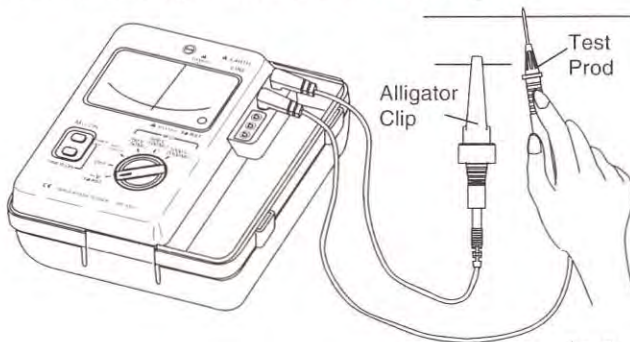


fig. 6

8. When the measurement is finished, disconnect Red Test Prod from the circuit and then disconnect Black Alligator Clip from the circuit.

**! WARNING 5. Correct Selection of FUNCTION Switch**

When taking measurements, always confirm that FUNCTION Switch is set to correct position. Do not measure voltage on M  $\Omega$  position or Low Ohm position (SK-3016).

Refer to the figure 7.

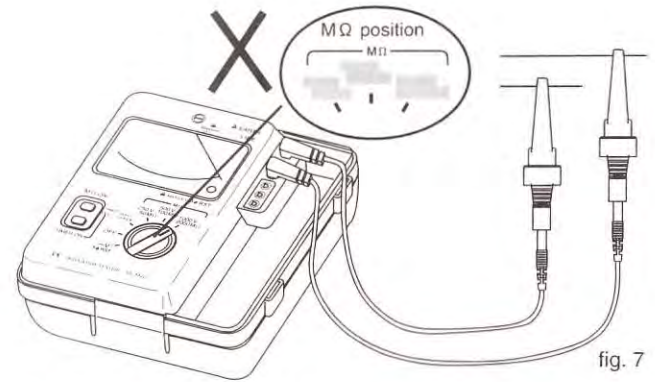


fig. 7

**! WARNING 6. Maximum Input Observance**

Do not attempt to measure AC voltage that exceeds the maximum rated voltage, 300V or 600V AC.

**! WARNING 7. Test Leads Disconnection**

Prior to changing FUNCTION Switch to another position when measuring, or opening Battery Case Cover for replacement of batteries and fuse, always disconnect Test Leads from the circuit being measured.

**! WARNING 8. Test Leads Disconnection before PHASE TEST**

Prior to taking PHASE TEST, always disconnect Test Leads from the circuit being measured and Terminals for safety (SK-3322 only).

**! WARNING 9. Turn off power before Lo  $\Omega$  Measurements and Continuity Tests.**

Prior to taking Low Ohm Measurements and Continuity Tests, turn off power of the circuit to be measured for safety.

## 5-2. CAUTIONS IN HANDLING

- ⚠ **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, benzene, 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.

## 6. MEASUREMENT PROCEDURES

### 6-1. 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 the 「5. SAFETY PRECAUTIONS」.

#### 2. FRONT CASE

Open Front Case outside when taking measurements. Also, the Front Case can be detached from Rear Case by pulling it toward A as shown in the figure 8. Then turn it horizontally in 180 degrees and put it under Rear Case.

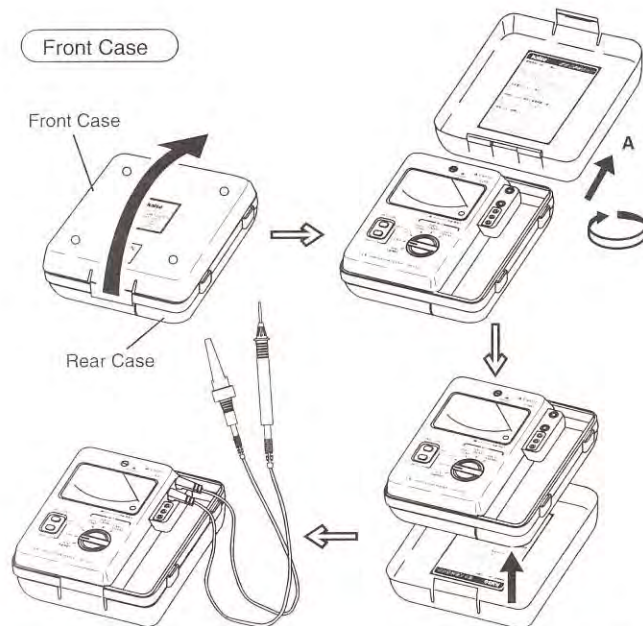


fig. 8

#### 3. BATTERIES

Six 1.5V R6P batteries are furnished with this instrument. Before placing the Insulation Tester into use, open Battery Case Cover and install the batteries making sure of the polarity. Refer to 「7-2. BATTERY AND FUSE REPLACEMENT」 on page 25.

#### 4. FUSE

**Always use Fuse that complies with IEC specifications (SIBA, L Nr. 70 094 63, F1A 600V).**

One 1A 600V  $\phi$  6.2×32mm fuse is installed in this instrument to protect the circuit. Do not apply voltage greater than the

maximum value specified. When replacing fuse, use the specified one. For replacement, refer to 「7-2. BATTERY AND FUSE REPLACEMENT」 on page 25.

## 5. ZERO ADJUSTMENT OF METER MOVEMENT

1. Before use, for best accuracy, make certain that the pointer is set exactly on the Zero Position ( $\infty M\Omega$  Line), at the right extremity of the arc.
2. If not on Zero, turn right or left the Zero Adjust Screw at middle top of Front Panel so that the pointer should exactly indicate the Zero Position.
3. Zero adjustment is not necessary to be repeated at every measurement, but the pointer is out of the Zero Position due to change of mechanical condition.

## 6. TEST LEADS

**Always use Test Leads that complies with IEC specifications (IEC-1010-2-31 and 600V~) for safety.**

1. One set of test leads, consisting of a Black Lead for EARTH Terminal (EARTH Test Lead) and Red Test Lead for LINE Terminal (LINE Test Lead), is furnished with this instrument. It is good practice to use the Black Test Lead for EARTH Terminal and the Red Test Lead for LINE Terminal.
2. EARTH Test Lead consists of one L type Plug, EARTH Test Plug and one Black Alligator Clip.  
LINE Test Lead consists of one L type Plug, LINE Test Plug and one Red Test Prod with a Test Pin.
3. The L type Plugs of Test Leads are inserted in the EARTH and LINE Terminals, and the Alligator Clip and the Test Prod are used to make contact with the circuit.

**NOTE :** If necessary, use Red Alligator Clip (optional) and Black Test Prod (optional).

## 7. PHASE TEST LEAD (SK-3322 only)

**Always use PHASE Test Lead that complies with IEC specifications (IEC-1010-2-31 and 600V~) for safety.**

1. One PHASE Test Lead, consisting of one molded Plug and Red Alligator Clip (R), White Alligator Clip (S) and Blue Alligator Clip (T) is furnished with this instrument.
2. The Plug of PHASE Test Lead is inserted into the RST Terminals. Red, White and Blue Alligator Clips are connected to the first, second and third lines respectively.

**NOTE :** If necessary, use Black and Red Test Prods (optional).

## 8. M $\Omega$ SWITCH (TIMER OFF SWITCH) (TEST ON Switch on SK-3016)

When measuring insulation resistance (M $\Omega$ ), press M $\Omega$  Switch. (TEST ON Switch on SK-3016). POWER LED lamp lights.

## 9. TIMER SWITCH

For continuous M $\Omega$  measurements, press TIMER Switch. POWER LED Lamp lights. TIMER Switch and POWER LED Lamp turn off automatically after 3 minutes. To set TIMER Switch OFF, press TIMER OFF Switch (M $\Omega$  Switch).

## 10. FUNCTION SWITCH

Set FUNCTION Switch to desired position,  $\sim V$  ( $\sim V$  3 $\phi$  RST for SK-3322), BATT. CHECK, Low $\Omega$ /  $\rightarrow$ ) or M $\Omega$  position, and set it back to POWER OFF position when measurements are finished.

## 11. BATTERY CHECK

1. Set FUNCTION Switch to BATT. CHECK position.
2. If the pointer indicates within BATT. OK. zone, the batteries are judged to be good.






**NOTE :** In this case, make it as quickly as possible since the power consumption becomes maximum. Replace FUNCTION Switch to OFF position after batteries are checked.

## 12. ZERO CHECK

1. Set FUNCTION Switch to  $M\Omega$  position.
2. Short EARTH Test Lead and LINE Test Lead together, then press  $M\Omega$  Switch. (TEST ON Switch on SK-3016).
3. If the pointer indicates ZERO  $M\Omega$  at the left extremity of  $M\Omega$  scale, the instrument proves to be accurately regulated.

## 13. SYMBOL MARK

The following symbols shown on the instrument and in the instruction manual are listed in IEC 1010 and ISO 3864.

-  : Caution (refer to instruction manual).
-  : Alternating Current (AC)
-  : Fuse
-  : Double Insulation
-  : High Voltage (This indicate that this terminal carries voltage at dangerous levels.)


## 6-2. INSULATION RESISTANCE ( $M\Omega$ ) MEASUREMENTS

### WARNING

To avoid electrical shock hazard and/or damage to the instrument, always confirm before measurement that the circuit (or object) to be tested is not live.

1. Insert Black L type Plug of EARTH Test Lead into EARTH Terminal and Red L type Plug of LINE Test Lead into LINE Terminal.
2. Set FUNCTION Switch to desired  $M\Omega$  position.

3. Connect Black Alligator Clip of EARTH Test Lead and Red Test Prod of LINE Test Lead to the circuit (or object) to be tested.


 **WARNING** : If the circuit (or object) to be tested is live, voltage is shown on the meter. In this case, turn off power to the circuit (or object) to be tested.


4. Press  $M\Omega$  Switch. (TEST ON Switch on SK-3016). If the measurement is to be taken continuously for a certain time, press Timer Switch.


**NOTE** : Timer Switch is regulated to turn off power automatically after 3 minutes to prevent the battery consumption.

5. Read the insulation resistance on the rated  $M\Omega$  scale, marked  $M\Omega$ .
6. When measurements are finished, disconnect Red Test Prod from the circuit and then disconnect Black Alligator Clip from the circuit.
7. Set FUNCTION Switch to OFF position.

## 8. CAUTIONS AND INSTRUCTIONS

 **CAUTION 1** : Before measurement, make sure that the circuit or object to be tested is not live. If voltage is supposed to exist in the circuit or object, it is checked on AC. V range.

 **CAUTION 2** : When one end of the circuit (or object) under test is grounded, connect the grounded side to the EARTH Terminal (plus polarity) in the measurement. Measurement should be taken in this way from safety point of view, since the measurement value normally shows small in this method. Especially, in testing cables, this procedure is commonly followed. In such a test, take care not to make the lead wire connected with the LINE Terminal (minus polarity) touch the ground or any other object.

 **CAUTION 3** : If the circuit (or object) under test is not grounded, the above connections to LINE and EARTH Terminals are optional.

### 6-3. AC VOLTAGE ( $\sim$ V) MEASUREMENTS

#### WARNING

Do not attempt to measure voltage that might exceed Maximum Rated Voltage, 300V or 600V AC. Prior to measurements, read carefully [5. SAFETY PRECAUTIONS] to avoid electrical shock hazard and/or damage to the instruments.

1. Insert Black L type Plug of EARTH Test Lead into EARTH Terminal and Red L type Plug of LINE Test Lead into LINE Terminal.
2. Set FUNCTION Switch to  $\sim$ V position.
3. Connect Black Alligator Clip of EARTH Test Lead to  $-$ (earth) side, and Red Test Prod of LINE Test Lead to  $+$ (line) side of the circuit.

**NOTE** : The connection should be **IN PARALLEL** with the circuit being measured.

**NOTE** : Reverse connection is possible in AC Voltage Measurements.

4. Read the voltage on the first arc down, marked  $\sim$ V.
5. When measurements are finished, disconnect Red Test Prod from the circuit and then disconnect Black Alligator Clip from the circuit.
6. Set FUNCTION Switch to OFF position.

### 6-4. LOW OHM MEASUREMENTS (SK-3016 only)

#### WARNING

Before making Low Ohm Measurements, remove power to the circuit being tested and discharge all capacitors in the circuit.

1. Insert Black L type Plug of EARTH Test Lead into EARTH Terminal and Red L type Plug of LINE Test Lead into LINE Terminal.
2. Set FUNCTION Switch to Low  $\Omega \times 1/(\cdot\cdot)$  or  $\times 10/(\cdot\cdot)$  position.
3. Connect Black Alligator Clip of EARTH Test Lead and Red Test Prod of LINE Test Lead to the circuit to be measured.
4. Press TEST ON Switch.
5. Read the resistance on the second arc down, marked  $\Omega$ .
6. In case of using Long Test Leads (includes Standard Test Leads) :
  - ① To make accurate measurements adjusting small resistance of Test Leads, make use of TIMER (Low  $\Omega$  : 0ADJ) Switch. In this case, always short Test Leads together and press TIMER Switch. This procedure is called [Zero Ohm Adjustment] .
  - ② Connect Test Leads to the circuit being measured and read the resistance. Measurements can be performed for approx. 3 minutes continuously. The [Zero Ohm Adjustment] must be made every time before pressing TIMER Switch.
  - ③ In case of using Standard Test Leads, also always make [Zero Ohm Adjustment] before pressing TIMER Switch.
7. When measurements are finished, disconnect Red Test Prod from the circuit and then disconnect Black Alligator Clip from the circuit.
8. Set FUNCTION Switch to OFF position.

### 6-5. CONTINUITY TESTS (SK-3016 only)

#### WARNING

Before making Continuity Tests, remove power to the circuit being tested and discharge all capacitors in the circuit.

1. Perform Continuity Tests in the same procedure as [6-4. LOW OHM MEASUREMENTS] . Buzzer sounds when the resistance is less than approx. 20  $\Omega$ .

- In case of using Long Test Leads and using TEST ON Switch, Buzzer sounds when the resistance is less the value that is approx.  $20\Omega$  reduced by the small resistance value of the Long Test Leads.

## 6-6. PHASE TESTS (SK-3322 only)

### WARNING

Do not attempt to measure voltage that might exceed 600V AC. Prior to measurements, read carefully [5. SAFETY PRECAUTIONS] to avoid electrical shock hazard and/or damage to the instruments.

- Insert Plugs of PHASE Test Lead into RST Terminals.
- Set FUNCTION Switch to 3  $\phi$  RST ( $\sim V$ ) position
- Connect Red Alligator Clip of PHASE Test Lead to the first line of the power line to be tested, White Alligator Clip to the second line, and Blue Alligator Clip to the third line.  
**NOTE :** Cords ; Red (R), White (S) and Blue (T).
- Phase sequence is checked by LED display as follows.
  - When Green Lamp lights, the power line proves normal phase sequence (R. S. T).
  - When Red Lamp lights, the power line proves reverse phase sequence (T. S. R).
  - When neither lamp lights, the power line proves open.**NOTE :** In phase Tests, Line Voltage to be tested must be 50V to 500V.
- When measurements are finished, disconnect Alligator Clips from the circuit.
- Set FUNCTION Switch to OFF position.

## 7. MAINTENANCE

### 7-1. WARRANTY STATEMENT

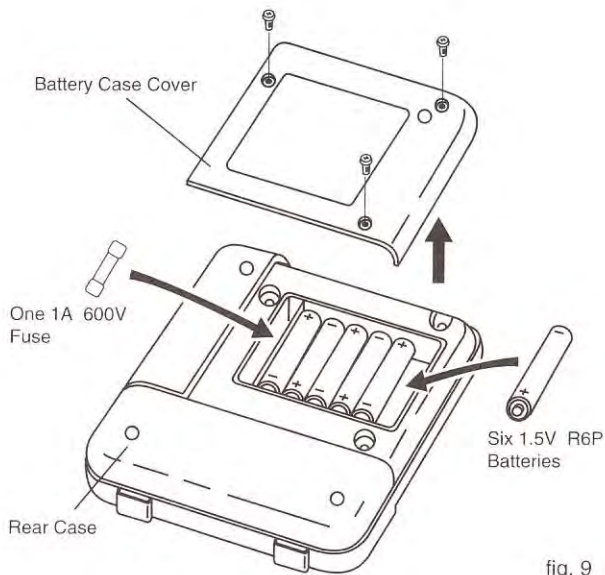
The warranty statement for the Insulation Testers is printed on the last page of the manual. Read it carefully before requesting a warranty repair.

### 7-2. BATTERY AND FUSE REPLACEMENT

### WARNING

Remove both Test Leads from external circuit connections and from the Input Terminals before removing Battery Case Cover to replace the batteries or fuse.

- If the pointer indicates beyond BATT. OK. zone when Battery Check is made, replace the batteries.
- Remove both Test Leads from the circuit and from the Input Terminals. Remove Phase Test Lead with SK-3322.
- Set FUNCTION Switch to OFF position.
- Unscrew the 3 screws on Battery Case Cover and remove Battery Case Cover.
- Replace the consumed batteries with fresh ones, 1.5V R6P type.  
**NOTE :** Place the batteries in the correct polarity.
- If the fuse is blown, replace the fuse with fresh one 1A 600V,  $\phi 6.2 \times 32\text{mm}$ .  
**Always use Fuse that complies with IEC specifications (SIBA, L Nr. 70 094 63, F1A 600V) .**
- Replace Battery Case Cover and screw.



### 7-3. PERIODICAL CHECK AND CALIBRATION

Periodical check and calibration are necessary to make safety measurements as well as to maintain the specifications described on page 3 to 9.

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.

### 7-4. 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 carton 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 and fuse connections.
2. Check the batteries if they are installed in the correct polarity.
3. Check the batteries if they are alive and usable.
4. Check the fuse if it is not blown.
5. Make sure that FUNCTION Switch and the other switches are selected correctly.
6. Make sure that the body of this instrument and the handle insulators of the test leads have no cracks nor any other damage on them.
7. 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 Insulation Tester, SK-3010/3011/3012/3013/3016/3310/3315/3320/3322, is warranted in its entirety against any defects of material or workmanship under normal use and service within a period of six months 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 Insulation Tester, SK-3010/3011/3012/3013/3016/3310/3315/3320/3322, 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 wiring by users, or installation or use not in accord with instructions furnished by the manufacturer.

**KAISE AUTHORIZED DEALER**