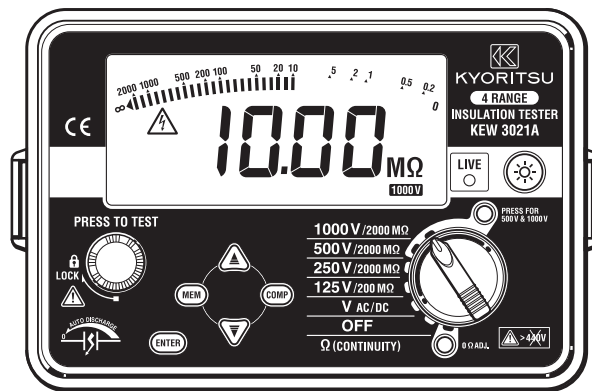


Instruction manual



INSULATION - CONTINUITY TESTER

KEW 3021A • 3022A • 3023A



**KYORITSU ELECTRICAL
INSTRUMENTS WORKS, LTD.**

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1. Safety warnings

- This instrument has been designed, manufactured and tested according to IEC 61010-1: Safety requirements for Electronic Measuring apparatus, and delivered in the best condition after passed the inspection. This instruction manual contains warnings and safety rules which must be observed by the user to ensure safe operation of the instrument and retain it in safe condition. Therefore, read through these operating instructions before using the instrument.

⚠ WARNING

- Read through and understand instructions contained in this manual before starting using the instrument.
- Save and keep the manual handy to enable quick reference whenever necessary.
- The instrument is to be used only in its intended applications.
- Understand and follow all the safety instructions contained in the manual.
- Failure to follow the instructions may cause injury, instrument damage and/or damage to equipment under test. Kyoritsu is by no means liable for any damage resulting from the instrument in contradiction to this cautionary note.

- The symbol ⚠ indicated on the instrument, means that the user must refer to the related parts in the manual for safe operation of the instrument. It is essential to read the instructions wherever the ⚠ symbol appears in the manual.

- ⚠ **DANGER** : is reserved for conditions and actions that are likely to cause serious or fatal injury.
- ⚠ **WARNING** : is reserved for conditions and actions that can cause serious or fatal injury.
- ⚠ **CAUTION** : is reserved for conditions and actions that can cause injury or instrument damage.

⚠ DANGER

- Never make measurement on a circuit in which the electrical potential exceeds AC/DC600V(Measurement CAT III 600V).
- Do not attempt to make measurement in the presence of flammable gasses. Otherwise, the use of the instrument may cause sparking, which can lead to an explosion.
- Never attempt to use the instrument if it's surface or your hand are wet.
- Be careful not to short-circuit the power line with the metal part of the test leads when measuring a voltage. It may cause personal injury.
- Do not exceed the maximum allowable input of any measuring range.
- Never open the Battery cover during a measurement.

- The instrument should be used only in its intended applications or conditions. Otherwise, safety functions equipped with the instrument do not work, and instrument damage or serious personal injury may be caused.
- Verify proper operation on a known source before use or taking action as a result indication of the instrument.
- Keep your fingers and hands behind the protective fingerguard during measurement.

⚠ WARNING

- Never attempt to make any measurement if any abnormal conditions, such as a broken case or exposed metal parts are present on the instrument and test leads.
- Never press the Test button when connecting the test leads to the instrument.
- Never rotate the Range selector switch with the test leads connected to the equipment under test.
- Do not install substitute parts or make any modification to the instrument. Return the instrument to your local KYORITSU distributor for repair or re-calibration in case of suspected faulty operation.
- Never touch the circuit under test during/immediately after the insulation resistance measurement. The test voltage may cause electrical shock.
- Do not replace batteries if the instrument is wet.
- Ensure that the test leads are firmly inserted into the terminal.
- Set the Range selector switch to OFF position when opening the Battery cover for battery replacement.
- Stop using the test lead if the outer jacket is damaged and the inner metal or color jacket is exposed.

⚠ CAUTION

- Always set the Range selector switch to the appropriate position before making measurement.
- Set the Range selector switch to "OFF" position after use and remove the test leads. The instrument consume small current at any range other than OFF, and it shortens the battery life. Remove the batteries if the instrument is to be stored and will not be in use for a long period.
- Do not expose the instrument to direct sunlight, high temperatures, humidity or dew.
- Use a damp cloth with neutral detergent for cleaning the instrument. Do not use abrasives or solvents.
- Do not store the instrument if it is wet. Store it after it dries.

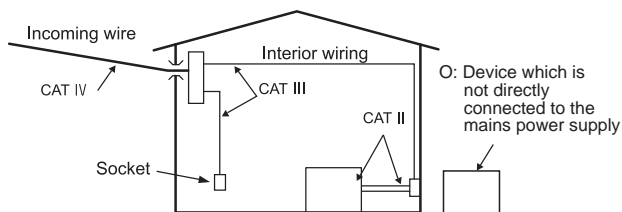
Symbols

	Danger of possible electric shock
	Instrument with double or reinforced insulation
	AC
	Earth terminal
	Refer to the instructions in the manual to protect the user and instrument.
	This instrument satisfies the marking requirement defined in the WEEE Directive. This symbol indicates separate collection for electrical and electronic equipment.
	Protection against wrong connection is up to 440V.

○ Measurement Category

To ensure safe operation of measuring instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as O to CAT IV, and called measurement categories. Higher-numbered categories correspond to electrical environments with greater momentary energy, so a measuring instrument designed for CAT III environments can endure greater momentary energy than one designed for CAT II.

- O : Circuits which are not directly connected to the mains power supply.
- CAT II : Electrical circuits of equipment connected to an AC electrical outlet by a power cord.
- CAT III : Primary electrical circuits of the equipment connected directly to the distribution panel, and feeders from the distribution panel to outlets.
- CAT IV : The circuit from the service drop to the service entrance, and to the power meter and primary over-current protection device (distribution panel).



2. Features

KEW3021A/3022A/3023A are four-range digital insulation resistance testers for testing low-voltage installation below 600V. Resistance measurement with audible Continuity check function is also available.

- Designed to following safety standards:
 - IEC61010-1(CAT III 600V Pollution degree 2)
 - IEC61010-031 (Requirements for hand-held probes)
- Small and light weight.
- Auto-discharge function
When insulation resistance like a capacitive load is measured, electric charges stored in capacitive circuits are automatically discharged after measuring. Discharge can be checked with the LED & Δ mark on LCD.
- Two resistance ranges: 40 Ω and 400 Ω (2-range auto) are also available. Buzzer sounds when a measured current exceeds 200mA.
- This instrument has 0 Ω ADJ. function to null the resistance of test lead or fuse at resistance measurement.
- Measured value is held for about 5 sec. after insulation/ resistance measurement of the Test button is released.
- Backlight function to facilitate work at night or dimly lit locations.
- Bar-graph to indicate measured results
- Max. 99 data can be saved to the internal memory at the insulation resistance range.
- Visible and audible warning (**FAIL** or **PASS** is indicated and buzzer sounds) when the measured insulation resistance exceeds the pre-set value.
- Live circuit warning indication, LED and buzzer.
- The Safety key must be kept pressed down to select 500V or 1000V range. Otherwise, neither 500V or 1000V range can be selected.
- Auto-power off function
To prevent the instrument being left powered on and conserve battery power, the instrument automatically turns off approx. 15 min. after the last switch operation.
- The **BATT** mark flickers when the battery voltage drops to the lower limit.
- Test leads with remote control switch (voltage won't be outputted when the test lead is not connected.)
- Robust housing case
- Neck strap for both hand's operation
- User-changeable test prod

3. Specification

- Applicable standards
IEC 61557-1,2,4
IEC 61010-1, -2-030 Measurement CAT III 600V Pollution degree2
(Location for use: altitude 2000m or less, indoor use)
IEC 61010-031
IEC 60529 IP40
EN 61326-1 (EMC)
EN 50581 (RoHS)

- Measuring range and accuracy
<Insulation resistance range>

KEW3021A				
Nominal voltage	1000V	500V	250V	125V
Auto Range	0~4/40/400/2000MΩ			0~4/40/200MΩ
Open circuit voltage	Nominal test voltage 100%~120%			
Short circuit current	Within 1.5mA			
Nominal test current	1MΩ	0.5MΩ	0.25MΩ	0.125MΩ
	1mA 0%~+20%			
1st effective measurement range	0.200~1000MΩ	0.200~200.0MΩ	0.200~40.00MΩ	0.200~20.00MΩ
Center scale range	50MΩ	50MΩ	5MΩ	5MΩ
Accuracy	±(2%rdg+6dgt)			
2nd effective measurement range	0.110~0.199MΩ			
	1001~2000MΩ	200.1~2000MΩ	40.01~2000MΩ	20.01~200.0MΩ
Accuracy	±(5%rdg+6dgt)			
Accuracy at 0	Within 6dgt			
KEW3022A				
Nominal voltage	500V	250V	100V	50V
Auto Range	0~4/40/400/2000MΩ		0~4/40/200MΩ	
Open circuit voltage	Nominal test voltage 100%~120%			
Short circuit current	Within 1.5mA			
Nominal test current	0.5MΩ	0.25MΩ	0.1MΩ	0.05MΩ
	1mA 0%~+20%			
1st effective measurement range	0.200~200.0MΩ	0.200~40.00MΩ	0.200~20.00MΩ	0.200~20.00MΩ
Center scale range	50MΩ	5MΩ	5MΩ	5MΩ
Accuracy	±(2%rdg+6dgt)			
2nd effective measurement range	0.110~0.199MΩ			
	200.1~2000MΩ	40.01~2000MΩ	20.01~200.0MΩ	20.01~200.0MΩ
Accuracy	±(5%rdg+6dgt)			
Accuracy at 0	Within 6dgt			

KEW3023A				
Nominal voltage	1000V	500V	250V	100V
Auto Range	0~4/40/400/2000MΩ			0~4/40/200MΩ
Open circuit voltage	Nominal test voltage 100%~120%			
Short circuit current	Within 1.5mA			
Nominal test current	1MΩ	0.5MΩ	0.25MΩ	0.1MΩ
	1mA 0%~+20%			
1st effective measurement range	0.200~1000MΩ	0.200~200.0MΩ	0.200~40.00MΩ	0.200~20.00MΩ
Center scale range	50MΩ	50MΩ	5MΩ	5MΩ
Accuracy	±(2%rdg+6dgt)			
2nd effective measurement range	0.110~0.199MΩ			
	1001~2000MΩ	200.1~2000MΩ	40.01~2000MΩ	20.01~200.0MΩ
Accuracy	±(5%rdg+6dgt)			
Accuracy at 0	Within 6dgt			

<Operating uncertainty>

Operating uncertainty (B) is an error obtained under the nominal operating conditions, and calculated with the intrinsic error (A), which is an error of the instrument used, and the error (En) due to variations. According to IEC61557, the maximum operating error should be within +/-30%.

$$B = | A | + 1.15 \times \sqrt{(E_1^2 + E_2^2 + E_3^2)}$$

- A : Intrinsic error (%)
- B : Operating uncertainty (%)
- E 1 : Variation due to changing the position (%)
- E 2 : Variation due to changing the Supply voltage (%)
- E 3 : Variation due to changing the temperature (%)

Nominal operating conditions

Ambient temperature : 0~40°C
 Relative humidity : 90% or less
 Position : Horizontal~±90°
 Battery voltage : within the battery effective range

<Resistance range>

Auto-range	0~40.00/ 400.0Ω
Open-circuit voltage(DC)	5V±20%
Short-circuit current	DC200mA or more
Measuring range to keep operating error/ tolerance	0.2~400Ω/ ±(2%rdg + 8dgt)
Outside of the measuring range to keep operating error/ tolerance	0~0.19/Ω0.1Ω

<Voltage range>

Measured voltage	20 ~ 600V
Accuracy	± (3%rdg+6dgt)
Accuracy at 0	Within 6dgt

<Number of measurement >

Possible number of measurement within the "BATTERY.GOOD" range.
(Measure 5 sec., and take pause for 25 sec.)

Range	Resistor for test	Possible number of measurement
50V	0.05MΩ	at least 1300 times
100V	0.1MΩ	at least 1300 times
125V	0.125MΩ	at least 1200 times
250V	0.25MΩ	at least 1000 times
500V	0.5MΩ	at least 1000 times
1000V	1MΩ	at least 400 times
Continuity	1Ω	at least 1300 times

Temperature & humidity range : 0°C ~ 40°C (RH: 90% or less)
(no condensation)

Storage temperature & humidity range : -20°C ~ 60°C (RH: 75% or less)
(no condensation)

Location for use : Altitude 2000m or less, Indoor use

Response time : Indicated value at each insulation resistance range comes within accuracy within approx. 1 sec. after a resistance corresponding to the mid-value and 0Ω is suddenly applied across the measuring terminals. (It may take time when measuring a capacitive load.)

Withstand voltage : AC5,160V(50/60Hz) for 5s. between the electrical circuit and the enclosure.

Overload protection : The instrument operates properly after each of the voltage shown in the table below is applied.

MODEL	KEW3021A / 3023A	KEW3022A
Continuity range	AC 440V / 1min.	AC 440V / 1min.
Insulation resistance	All ranges:AC1200V / 10sec.	All ranges : AC600V / 10sec.
AC voltage	AC720V / 10sec.	AC720V / 10sec.

Auto-ranging:

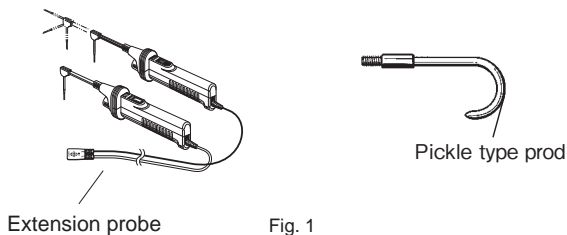
Range shifts to upper range : when a reading go over 4200
 Range shifts to lower range : when a reading go to less than 320
 Dimension : approx. 105(L)×158(W)×70(D)mm
 Weight : approx. 600g (including batteries)
 Power source : R6P or LR6 size AA x 6pcs
 Nominal power : 2.7VA

Accessories

MODEL7103A Test lead with remote control switch 1 set
 MODEL7161A test bar 1 pce
 MODEL7131B Safety alligator clip 1 pce
 MODEL8017 Extension prod 1 pce
 Neck strap 1 pce
 Cord case 1 pce
 R6P (SUM-3), size AA 6 pcs
 Instruction manual 1 pce

Optional

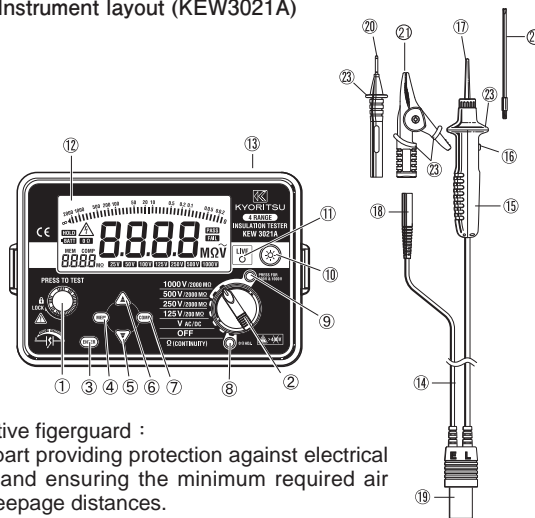
MODEL7115 Extension probe
 MODEL8016 Pickle type prod



When the instrument and the test lead are combined and used together, whichever lower category either of them belongs to will be applied.

4. Instrument layout

Fig. 2 Instrument layout (KEW3021A)



Protective figerguard :

It is a part providing protection against electrical shock and ensuring the minimum required air and creepage distances.

① Test button	② Range selector switch
③ ENTER key	④ MEM key
⑤ DOWN key	⑥ UP key
⑦ Comp key	⑧ 0 Ω ADJ. key
⑨ Safety key	⑩ Backlight key
⑪ LIVE LED	⑫ Display
⑬ Probe socket	⑭ Test lead with remote control switch MODEL7103A
⑮ Line probe	⑯ Remote control switch
⑰ Standard prod (MODEL8072)	⑱ Earth code
⑲ Probe connector	⑳ Test bar (MODEL7161A)
㉑ Safety alligator clip (MODEL7131B)	㉒ Extension prod (MODEL8017)
㉓ Protective fingeguard	

5. Preparation for measurement

5-1 Test lead connection

Insert the Probe connector into the Probe socket on the instrument correctly as shown below.

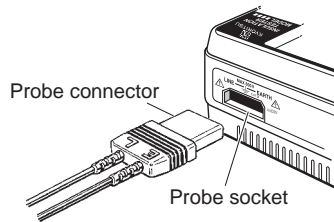


Fig. 3

5-2 Checks on Test lead and Fuse

- (1) Set the Range selector switch on the instrument to the Ω (CONTINUITY) position.
- (2) Break in test lead or fuse is suspected if "OL" is displayed on the LCD when shorting the LINE(red) and EARTH(black).
- (3) Test lead or instrument itself may have troubles when "OL" is displayed on the LCD after replacing the fuse. In this case, send the instrument to your local KYORITSU distributor for repair.

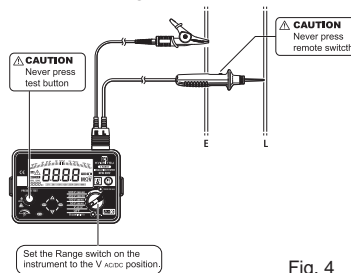
⚠ DANGER

- When the Test button or the Remote control switch is pressed while the Range selector switch set to an insulation resistance range, take care not to touch the tip of the Test probe where a high voltage is present in order to avoid possible shock hazard.
- Test lead and fuse must be inspected prior to measurement according to Clause 5-2 indicated in this manual in order to avoid possible electrical shock hazard. Voltage cannot be measured if a break is present on the fuse.

6. Measurement

6-1 Voltage measurement (Mains disconnection check)

- (1) Connect the Earth probe to the earth of the circuit under test and Line probe to the other side. If the circuit is not earthed, connect Earth probe to any appropriate conductor.
- (2) Take the reading on the LCD without pressing the Test button or Remote control switch. The mark " ~ " is displayed when measuring AC voltage. The mark " - (minus)" is displayed when the LINE probe is connected to the negative side of the conductor under test to measure DC voltage. "Lo" is displayed on the LCD when the measured voltage is under 20V.



⚠ DANGER

- Test lead and fuse must be inspected prior to measurement according to Clause 5-2 indicated in this manual in order to avoid possible electrical shock hazard. Voltage cannot be measured if a break is present on the fuse.
- Never make measurement on a circuit in which the electrical potential exceeds AC/DC600V in order to avoid possible shock hazard. (Refer to "3.Specification, AC voltage measurement.")
- When testing installation that has a large current capacity, such as a power line, be sure to make measurement on the secondary side of a circuit breaker in order to avoid personal injury.
- Do not press the Test button or Remote control switch during voltage measurement.
- Never short live conductors with the tip of a probe to avoid personal injury.
- Do not make measurement with the Battery cover removed.
- Keep your fingers and hands behind the protective fingerguard during measurement.

6-2 Insulation resistance measurement

Before performing any insulation test, check the maximum voltage that may be applied to the circuit under test.

Note:

- Some circuits have an unstable insulation resistance, which causes the reading to vary during measurement.
- The instrument may generate a high pitch tone during measurement. This is not a failure.
- If the circuit under test has a large capacitive load, it may take some time before the final reading can be obtained.
- On insulation resistance range, DC voltage is supplied through earth and Line probes, with earth probe having positive polarity. Earth probe should be connected to the earth conductor in the circuit under test. Such connection is known to be more suitable for insulation tests since an insulation resistance value measured with the positive side connected to earth is typically less than that taken through the reversed connection.

⚠ DANGER

- When the Test button or Remote control switch is pressed with the Range selector switch set to an insulation resistance range position, take care not to touch the tip of the test probe or the circuit under test where a high voltage is present in order to avoid possible shock hazard.
- Do not make measurement with the Battery cover removed.

⚠ CAUTION

- Ensure that the circuit under test is de-energized prior to any insulation testing.

- (1) Check the maximum voltage that may be applied to the circuit under test. Set the Range selector switch to a desired insulation resistance range. Keep the Safety key pressed down when turning the Range selector switch to 500V and 1000V position. (Only the 500V range is available on KEW3022A.) The message "no" is displayed on the LCD when turning the Range selector switch without pressing the Safety key.
- Buzzer sounds when the Safety key is pressed down. Keep the Safety key pressed down when switching 500V and 1000V



Fig. 5

- (2) Connect the Earth probe to the earth terminal of the circuit under test. If the circuit is not earthed, connect the Earth probe to any appropriate conductor.
- (3) Connect the Line probe to the circuit under test and press the Test button or Remote control switch.
- (4) Take the reading on the LCD.

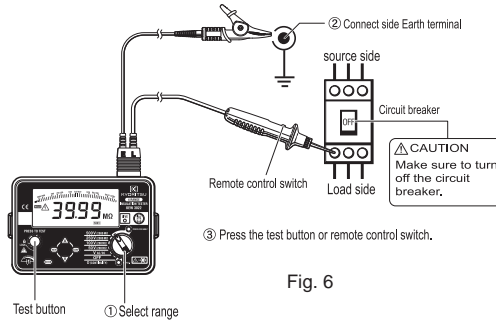
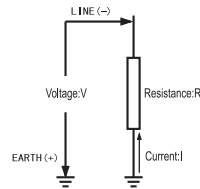


Fig. 6

Test button ① Select range

Fig. 7



Principle of operation:
Resistance = Voltage/ Current
 $R_X = V / I$



- (5) Set the Range selector switch to the OFF position and disconnect the test leads from the instrument after measurement.

<Auto discharge function>

This function allows electric charges stored in the capacitance of the circuit under test to be automatically discharged after testing. Set the Range selector switch to the OFF position or turn the Remote control switch off with the test lead connected.

Discharge can be monitored by the LIVE LED  and  mark.

Flickering while discharging.

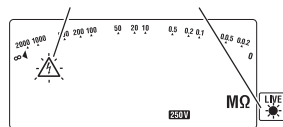


Fig. 8

(6) Set the Range selector switch to the OFF position, and disconnect the probes from the instrument.

⚠ DANGER

- Never touch the circuit under test immediately after testing. Capacitance stored in the circuit may cause electric shock. Leave the test leads connected to the circuit until the LIVE LED and LIVE circuit warning stop flickering.

6-3 Continuous measurement

For continuous measurement, a lock-down feature is incorporated on the Test button. Pressing and turning clockwise locks the button in the operating position, the button is released by turning it counterclockwise.

⚠ DANGER

- While the Test button is locked down, a high voltage is present at the tip of a probe. Attention should be paid to avoid possible shock hazard.

6-4 Output voltage characteristics

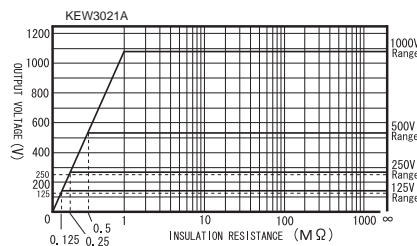
This instrument conforms to IEC61557. This standard defines that the nominal current shall be at least 1mA, and the lower limit of the insulation resistance maintaining the nominal voltage at the measurement terminal. (See the graph below.)

This value is calculated by dividing the nominal voltage by nominal current. i.e., in case that the nominal voltage is 500V, the lower limit of the insulation resistance is found as follows.

Divide 500V by 1mA equals 0.5MΩ.

That is, insulation resistance of 0.5MΩ or more is required to provide the nominal voltage to the instrument.

Nominal voltage	50V	100V	125V	250V	500V	1000V
Lower limit of insulation resistance to supply nominal current 1mA	50k Ω	0.100M Ω	0.125M Ω	0.25M Ω	0.5M Ω	1M Ω



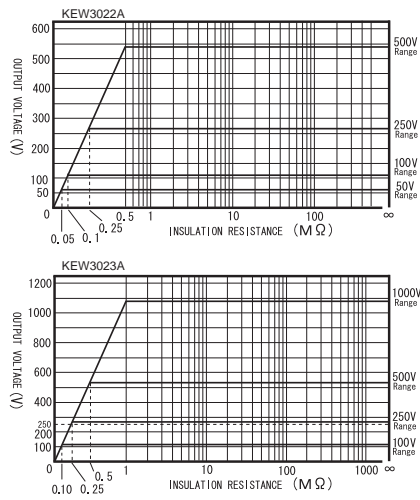


Fig. 9

6-5 Measurement of resistance (Continuity check)

⚠ DANGER

- Do not apply voltage to the resistance range. Always test the circuit or equipment to ensure it is surely de-energized before measurement.

Zero Ω ADJ. function

This is a function to null the resistance of the test lead or fuse in order to display the resistance of the equipment under test only.

Setting:

- (1) Set the Range selector switch to the Ω (Continuity) position.
- (2) Short the test leads: LINE (red) and EARTH (black).
- (3) Press the Zero Ω ADJ. key with the Test button locked or with the Remote control switch pressed. Then **0Ω** mark is lit up and a value of 0.00 Ω is displayed on the LCD. This value is saved in the memory of the instrument and won't be cleared after turning off the instrument.

Releasing:

- (1) Set the Range selector switch to the Ω (Continuity) position.
- (2) Open the test leads: LINE (red) and EARTH (black).
- (3) Press the Zero Ω ADJ. key to release this function when "OL" is displayed on the LCD while the Test button is locked or the Remote control switch is pressed down .

Measurement:

- (1) Set the Range selector switch to the Ω (Continuity) position.
- (2) Connect the test leads to the equipment under test, and press the Test button or Remote control switch.

Principle of operation:
Resistance = Voltage/ Current
 $RX = V / I$

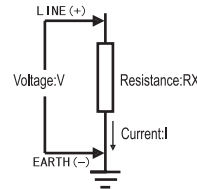


Fig. 10

Note:

- The zero Ω ADJ. function is available when the indicated value is under 9 Ω .
- A beak in Test lead or fuse is suspected when "OL" is displayed on the LED even if LINE (red) and EARTH (black) are shorted.
- Change the connection of LINE (red) and EARTH (black) when measuring the voltage with the switched polarities.
- The measurement result at the resistance function may be effected by the impedance or transient current in the operating circuit, which is connected in parallel to the instrument.

6-6 Backlight function

To facilitate working in dimly lit situations, a backlight function is provided which illuminates the display. Press the backlight key to operate this function. The backlight will light up for about 30 sec., and then turns off automatically.

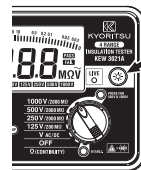


Fig. 11

6-7 Auto-power-off

To prevent the instrument being left powered on and conserve battery power, the instrument automatically turns off approx. 15 min. after the last switch operation.
To turn on the instrument again, turn the Range selector switch to OFF position once.
Then set it to the desired range.

7. Functions keys

7-1 Comparator function

Set a reference resistance value at the insulation resistance range. The measured value is compared to the pre-set reference value, and the mark of **PASS** or **FAIL** is displayed on the LCD and buzzer

Settable reference value:

0.1/0.2/0.25/0.4/0.5/1/2/3/5/10/20/30/50/100/Any : Unit [M Ω]

The upper limit of "Any" varies depending on output voltage.

50/100/125 V : 0.000 to 199.9 : Unit [M Ω]

250/500/1000 V : 0.000 to 999.9 : Unit [M Ω]

This function can be set at each range.

Setting procedure

- (1) Set the range selector switch to OFF.
- (2) While pressed down **COMP** key, turn the range selector switch to any desired insulation resistance range. In this case, there is no need to press the Safety Key to select 500V/1000V range.
- (3) Press the UP or DOWN key to select **PASS** or **FAIL** and then press the **ENTER** key. Select **PASS** to sound the when the measured value exceeds the pre-set value. Select **FAIL** to sound the when the measured value is under the pre-set value.
- (4) The number displayed at the lower left on the LCD starts flickering. Press the UP or DOWN key to select the reference value, and press the **ENTER** key.
- (5) The message **COMP** and the set value are displayed on the LCD once the setting completes.
- (6) Press the **COMP** key to release this function.

Setting for Any

- (1) The decimal point displayed at the lower left on the LCD starts flickering when "Any" is selected. Press the UP or DOWN key to select the desired decimal position, and then press the **ENTER** key.
- (2) The four-digit start flickering from the left. Press the UP or DOWN key and set it to the desired value, and press the **ENTER** key.

e.g.: in case 0.5M Ω is set.

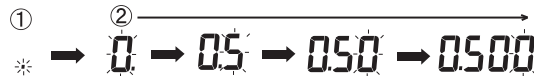


Fig. 12. Change of sub-indication

7-2 Memory (save) function

Measured insulation resistance can be saved to the internal memory up to 99 data.

Saving method:

- (1) Measure the insulation resistance, and press the MEM key while the message **HOLD** is displayed on the LCD. Then a memory

- number displayed at the lower left flickers. Select any memory number with the UP or DOWN key, and press the **ENTER** key.
- (2) Then, the measurement result displayed at the middle on the LCD flickers. Press the **ENTER** key to save the result. It will be saved to the internal memory, and the memory number is increased by 1. Press the **MEM** key to delete the result.

Recalling the memory data

- (1) Set the Range selector switch to any desired Insulation resistance range, and press the **MEM** key.
- (2) Press the UP or DOWN key to switch the memory number. The measured voltage and value are displayed on the LCD.

Deleting all memory data

- (1) To delete all memory, rotate the Range selector switch from OFF to Ω (CONTINUITY) position with the **MEM** key pressed down. Then release the **MEM** key.
- (2) The message "clr" is displayed on the LCD. It flickers and buzzer sounds when the **MEM** key is being pressed down again. The deletion is completed once " Ω " is displayed on the LCD.

Note:

- The mark "---" is displayed on the LCD when no data is saved with the selected memory No.
- Resistance value is displayed on the LCD when data is saved with the selected memory No.
- Old data is overwritten with new when a new data is saved with the same memory No.

8. Fuse & Battery replacement

DANGER

- Never open the Battery cover during a measurement. Dispose the used batteries according to the rules, which is defined by each community.

WARNING

- To avoid possible electric shock, remove test leads before opening the Battery cover. After replacing batteries, be sure to tighten up the screws for Battery cover.

CAUTION

- Do not mix new and old batteries.
Install batteries in correct polarity as marked inside the Battery compartment.

8-1 Battery Replacement

- (1) Disconnect the test probe from the instrument.
- (2) Open the battery compartment cover by unscrewing the metal captive screw to reveal battery compartment.

- (3) Always replace all six batteries with new ones at the same time.
- (4) Screw the battery compartment lid back on before using the instrument.

8-2 Fuse Replacement

- (1) Disconnect the test probe from the instrument.
- (2) Open the battery compartment cover by unscrewing the metal captive screw to reveal battery compartment and replace the fuse.
Fuse type: 500mA/600V(F) quick acting ceramic fuse 6.35 x 32mm.
- (3) Screw the battery compartment lid back on before using the instrument.

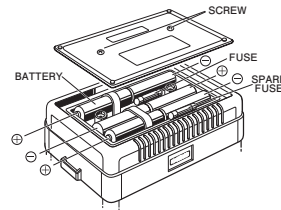


Fig. 13

9. Notes on Housing case and accessories

9-1 Case lid

Case lid can be fit under the Housing case while making measurement.

- (1) Unhook and open the Case lid.
- (2) Turn it 180 degrees.
Put the Case lid under the Housing case.
- (3) Hook it on to the Housing case.

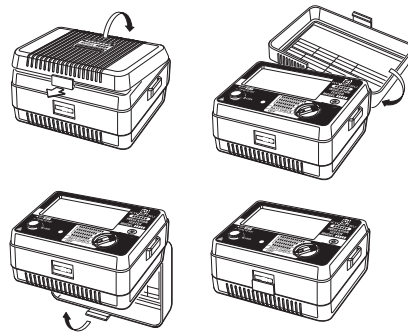


Fig. 14

9-2 Neck strap and Cord case

This instrument is equipped with a strap to suspend from the neck to allow both hands to be used freely for easy and safe operation.

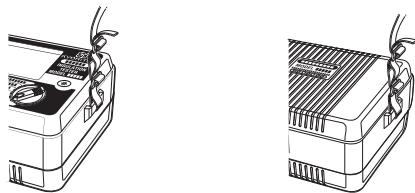


Fig. 15

9-3 Test prods and replacement

1. Types of Test prods

- MODEL8072: Standard Test prod
Used for ordinary measurement.
(Attached to the Line probe at the time of purchase.)
- MODEL8017: Extension probe
Used in difficult-to-reach situations.
- MODEL8016: Pickle prod (Optional)
Used to hook the probe on a conductor.

2. How to replace Test prod

To remove the Test prod, turn the cap of LINE probe counterclockwise. Insert the threaded end of another prod into the hexagonal hole on the probe cap as shown. Then, turn the probe cap clockwise to secure it on the body of the probe.

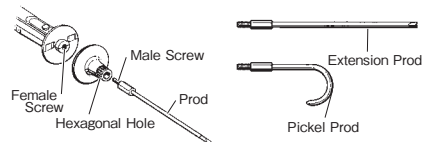


Fig. 16

9-4 Adaptors for the Earth cord and replacement

1. Adaptors

- MODEL7131B: Safety alligator clip
Connected to the Earth terminal of the Earth terminal board.
- MODEL7161A: Test bar
Connected to the earth side of the outlet.

2. How to replace Adaptors

To remove the adaptors, pull them out. Then firmly attach the adaptor as desired to the tip of the Earth cord.

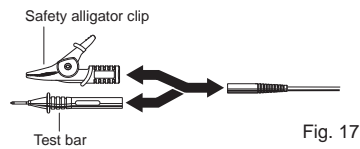


Fig. 17

⚠ DANGER

- Disconnect the test leads from the instrument before replacing the test prods of the Line probe or the adaptors of the Earth cord in order to avoid a possible electric hazard.

10. Cleaning of the instrument

Cleaning Meter cover

- When cleaning the instrument, wipe it with a silicon cloth or soft cloth to remove dust or dirt.
- When it is hard to remove the dirt, wipe it with a cloth wet with water and dry the instrument completely after cleaning.

⚠ CAUTION

- Never use any solvent which may transmute plastics, for example, organic solvent such as benzene, acetone, etc.

11. Servicing

If this tester should fail to operate correctly, return it to your nearest distributors stating the exact nature of the fault.

Before returning the instrument, make sure that:

- a) Operating instructions have been followed.
- b) Test Leads have been inspected.
- c) Fuse has been checked.
- d) Battery has been checked.
- e) The unit is returned with all accessory leads.

Remember, the more information written about the fault, the quicker it will be serviced.