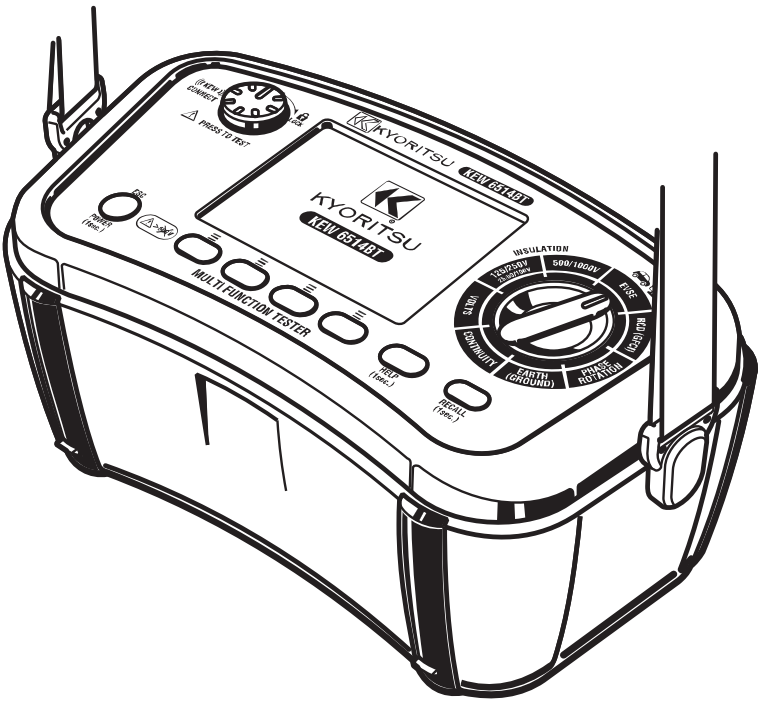
Instruction manual



Multifunction Tester

KEW 6514BT

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 passing quality control tests.
This instruction manual contains warnings and safety procedures which have to be observed by the user to ensure safe operation of the instrument and to maintain it in safe condition. Therefore, read through these operating instructions before starting to use the instrument.

⚠ DANGER

- Read through and understand the instructions contained in this manual before using the instrument.
- Keep the manual at hand 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.

It is essential that the above instructions are adhered to.
Failure to follow the above instructions may cause injury, instrument damage and/or damage to equipment under test. Kyoritsu assumes no responsibility for damage and injury caused by misuse or not following the instructions in the manual.

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

- Do not apply voltages above 600 V, including voltage to earth, across the terminals of this instrument.
- This instrument is rated to CAT III 600 V/ CAT IV 300 V. Do not make measurements under the circumstances exceeding the designed measurement categories (such as CAT IV 600 V).
- Do not attempt to make measurements 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 its surface or your hand is wet.
- Be careful not to short-circuit a power line with the metal part of the test lead during a measurement. It may cause personal injury.
- Never open the battery compartment cover during a measurement.
- Keep your hand and fingers behind the protective fingerguard during a measurement.
- Verify proper operation on a known source before use or take actions as a result of the indication of the instrument.

⚠ WARNING

- Do not use the instrument or test leads if any abnormal conditions, such as broken cover or exposed metal parts are noted.
- First, firmly connect the test leads to the instrument, and then press the test switch.
- Never install substitute parts or make any modifications to the instrument. Send the instrument to your local KYORITSU distributor for repair or re-calibration.
- Do not try to replace batteries if the surface of the instrument is wet.
- Connect each test lead firmly into the corresponding terminals.
- Before opening the battery compartment cover for battery or fuse replacement, ensure that no test leads are connected to the instrument and the instrument is off.
- Stop using the test lead if the outer jacket is damaged and the inner metal or color jacket is exposed.
- Never turn the rotary switch while the test leads are connected to the equipment under test.

⚠ CAUTION

- Power off the instrument and disconnect all test leads after use. Remove batteries if the instrument is to be stored and won't be used for a long period.
- Do not expose the instrument to direct sunlight, high temperature, humidity, or dew.
- Use a slightly damp cloth with neutral detergent or water for cleaning. Do not use abrasives or solvents.
- If the instrument is wet, make sure to let it dry before putting it into storage.
- This instrument isn't waterproof. Do not let the instrument get wet. Otherwise, it may cause malfunction.
- Always make sure to set the rotary switch to the appropriate position before making a measurement.
- Do not apply voltage to the instrument while it is powered off.

Symbols

The following symbols are used and marked on the instrument and in this instruction manual. Please carefully check before starting to use the instrument.

	Double or reinforced insulation
	User must refer to the explanations in the instruction manual.
	Earth
	Danger of possible electrical shock
	Do not use on AC electric systems exceeding 600 V.
	Complies with WEEE Directive (2002/ 96/ EC) marking requirements. (valid in each EU country)

Measurement (overvoltage) category

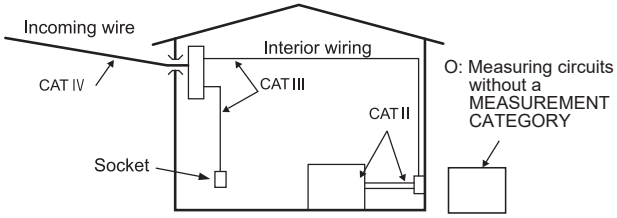
To ensure safe operation of measuring instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as O to CAT IV, and called measurement categories. Higher- numbered categories correspond to electrical environments with greater momentary energy, so a measuring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

O : Measuring circuits without a MEASUREMENT CATEGORY

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 overcurrent protection device (distribution panel).



2. Features

KEW 6514BT is a versatile multifunction tester offering the following electrical measurements.

1. Insulation resistance measurement
2. Voltage measurement
3. Continuity measurement
4. Earth resistance measurement
5. Phase rotation check
6. RCD test (measures RCD trip time and Ramp)
7. EVSE (EV charger) test

• Each function has the following features.

Insulation resistance measurement

Auto discharge	Electric charges stored in capacitive loads during measurement are automatically discharged after the measurement.
Elapsed time display	Elapsed time of measurement is displayed when starting insulation resistance measurement. The LCD shows 1-min value as well.
DAR/PI measurement	DAR (Dielectric Absorption Ratio) value and PI (Polarization Index) values are automatically calculated and displayed during insulation resistance measurement.
SPD	Operating voltage of SPD (Surge Protection Device) can be measured.
Safety lock	Stops voltage output to prevent a risk of danger: unintentional measurement by pressing the test switch by mistake won't be performed.

Continuity measurement

Protection against live circuit	The internal circuit is protected against electrical hazards even if the instrument is connected to the live circuit during resistance or continuity measurement by mistake.
0Ω adjustment	It is possible to cancel the resistance of test leads and measure the resistance of the measured object only.

Earth resistance measurement

Precision/ Simplified measurement	Both of precision measurement (using 3-wire) and simplified measurement (using 2-wire) are available.
LOOP 2-Wire	Impedance between LINE-EARTH can be measured even if the circuit under test is live.

Phase rotation check

Supporting low voltage	Phase rotation check can be started from the low voltage due to the wide measurement range: 3 V - 600 V.
Motor rotation	Phase rotation check for the wiring of motor is possible by measuring voltage generated at operating the motor manually.

RCD test

Auto test	×1/2, ×1, and Ramp test are automatically performed in sequence.

EV charger check

CP signal measurement	Max charging current and CP STATE (connection state between EV charger and EV) are displayed by measuring CP signal (communication signal between EV charger and EV).
Latch locking test	Measures the resistance of built-in monitoring resistor for checking the latch switch of the charging cable for EV charger is locked or unlocked state.
EVSE programmable autotest	It is possible to select and arrange the test items and sequence freely by using our special application and perform tests in the programmed sequence.

• Comparator function
The LCD shows whether the values measured at insulation resistance, continuity, or earth resistance are within or out of the allowable range.

• Memory function
Measured data can be saved in the internal memory and recalled and deleted from the memory.

• Auto memory function
Measured data is automatically saved in the internal memory after measurement.
(As for the functions on which measurement is being performed continuously, e.g., voltage function, a press of test button is required to save the data.)

• Bluetooth communication function
Remote monitoring and data transfer are possible by pairing with tablet devices via Bluetooth. Data in the internal memory can be transferred to a PC via Bluetooth.

• IR communication function
Data in the internal memory can be transferred to a PC via IR communication by using USB adapter MODEL 8212USB (optional accessory).

• Clock function
Measured date and time are saved together with the measured results.

• Auto power off
The instrument turns off automatically when the instrument is inactive for about 10 minutes.

• Help function
Correct wiring for each measurement can be checked on the LCD.

3. Specifications

3.1 Measuring range and accuracy
(23℃±5℃ , 45%-75%RH)

(1) Insulation resistance measurement

Rated measurement voltage	25V	50V	100V	125V	250V	500V	1000V
Range (Auto-ranging)	2/20 MΩ		2/20/200 MΩ			2/20/200/1000 MΩ	2/20/200/2000 MΩ
Display range	2 MΩ: 0.000-2.099 MΩ						
	20 MΩ:1.60-20.00 MΩ		20 MΩ: 1.60-20.99 MΩ				
	-		200 MΩ: 16.0-200.0 MΩ			200 MΩ: 16.0-209.9 MΩ	
	-					1000 MΩ: 160-1000 MΩ	2000 MΩ: 160-2000 MΩ
Over-range display	>20.00 MΩ		>200.0 MΩ			>1000 MΩ	>2000 MΩ
Open circuit voltage	100-120% of the rated measurement voltage						
Short circuit current	Within 1.5 mA						
Rated measurement current	1.0-1.2 mA (at the following resistances)						
	0.025 MΩ	0.05 MΩ	0.1 MΩ	0.125 MΩ	0.25 MΩ	0.5 MΩ	1 MΩ
First effective measurement range	0.100-10.00 MΩ		0.100-25.0 MΩ		0.100-50.0 MΩ	0.100-100.0 MΩ	0.100-1000 MΩ
	±2%rdg±2dgt						
Second effective measurement range	0.050-0.099 MΩ: ±2%rdg±4dgt						
	10.01-18.00 MΩ		25.1-180.0 MΩ		50.1-180.0 MΩ	100.1-900 MΩ	1001-1800 MΩ
	±5%rdg						
Other measurement range	0.000-0.049 MΩ: ±2%rdg±6dgt						
	18.01-20.00 MΩ		180.1-200.0 MΩ			901-1000 MΩ	1801-2000 MΩ
	±5%rdg						

- Positive measurement voltage is outputted from the PE terminal and negative voltage from the L terminal.
- Max capacitive load: The maximum value of capacitive load which can be discharged within the defined time (10 sec.) after measuring 1 uF (IEC 61010-2-034).
- Inductive load: 2 uF, capacitive load of which variations at the output voltage test defined in IEC 61557-2 are within ±10%.
- Buzzer sounds during a measurement on 1000 V range.

(2) SPD

Range	1000 V
Display range and measuring range	0-1000 V
Over-range indication	>1000V
Accuracy	±5%rdg±5dgt
Voltage increase ratio	100 V/ sec.
Voltage increase step	By 1 V
Threshold value for current detection	1 mA

(3) Voltage

Range (Auto-ranging)	300.0/ 600 V
Display range	Voltage: 2.0-314.9 V, 240-600 V Frequency: 40.0-70.0 Hz (2 V or higher)
Measuring range (guaranteed accuracy)	Voltage: 2-600 V Frequency: 45-65 Hz
Over-range indication	Voltage: <2.0 V, >600 V Frequency: <40.0 Hz, >70.0 Hz
Accuracy	Voltage: ±2%rdg±4dgt Frequency: ±0.5%rdg±2dgt

* Measurement method: RMS detection
  Add ±1%rdg to the specified accuracy for the sine wave other than CF <2.5.
  (850 Vpeak or less)

(4) Continuity

Range (Auto-ranging)	20.00/ 200.0/ 2000 Ω
Display range	20.00Ω:0.00-20.99 Ω 200.0Ω:16.0-209.9 Ω 2000Ω:160-2000 Ω
Measuring range (guaranteed accuracy)	0-2000 Ω
Over-range indication	>2000 Ω
Accuracy (NULL enabled)	±2.0%rdg±8dgt
Open circuit voltage	7-14 V DC
Measurement current	200 mA or more (2 Ω or less)

* 0 Ω adjustment function is available when the displayed value is 9 Ω or less.

(5) Earth resistance measurement
1. 3W (Precision measurement) and 2W (Simplified measurement) tests

	3W (Precision measurement)	2W (Simplified measurement)
Range (Auto-ranging)	20.00/ 200.0/ 2000 Ω	
Display range	20.00 Ω: 0.00-20.99 Ω 200.0 Ω: 16.0-209.9 Ω 2000 Ω: 160-2000 Ω	
Measuring range (guaranteed accuracy)	0-2000 Ω	
Over-range indication	>2000 Ω	
Accuracy	20Ω range：±2%rdg±0.08 Ω Other ranges：±2%rdg±3dgt (Aux. earth resistance：100 Ω)	20Ω range：±2%rdg±0.08Ω Other ranges：±2%rdg±3dgt
Output current	20Ω range: Approx. 3 mA 200Ω range: Approx. 1.7 mA 2000Ω range: Approx. 0.7 mA Frequency: 825 Hz±5 Hz	

(6) Loop 2W (2-Wire loop impedance test)

Input voltage range	85-260 V (50/ 60 Hz) (Frequency display range: 45-65 Hz)
Range (Auto-ranging)	200.0/ 2000 Ω
Display range	200.0Ω: 0.0-209.9 Ω 2000Ω: 210-2000 Ω
Measuring range (guaranteed accuracy)	0-2000 Ω
Over-range indication	>2000 Ω
Accuracy	±(3%rdg+10dgt)
Measurement current	L-PE: 7 mA

* If a reading is unstable, one upper range digit might be used instead of the display range to be used.

(7) Phase rotation

	Phase rotation	Motor rotation
Display range	2 V-600 V/45-65 Hz	No voltage indication. *The LCD shows “>2.0V” when the reading exceeds the upper limit of voltage.
Measuring range (guaranteed accuracy)	3 V-600 V/ 45-65 Hz	0.1-2 V/ 1-10 Hz
Indication	Clockwise direction: “1.2.3” and clockwise phase sequence icon Counterclockwise direction: “3.2.1” and counterclockwise phase sequence icon	

(8) RCD test

• Nominal system voltage: 100 V/ 230 V/ 400 V, 50/ 60 Hz
(operating uncertainty is maintained in the range of -15%+10%)
• Input voltage range: 85 V-440 V, 50/ 60 Hz (Frequency display range: 45-65 Hz)
Measurable voltage is limited to 190 - 440 V when the rated residual current I△n is 100 mA or 200 mA and to 190 - 260 V when the current is 500 mA.

Mode	Rated residual current(mA) I△n	Test current		Energizing time	
		Current value (mA) RMS	Accuracy @230 V	Energizing time	Accuracy
×1/2	15/30/ 50/100/ 200/500	I△n×1/2	-8% to -2%	2000 ms (default setting)	Trip time ±1%rdg±2 ms Energizing time FS±3%
×1		I△n	+2% to +8%	550 ms	
Ramp (▟)		I△n×1.1	-4% to +4%	20%-110% of rated residual current. Current increases every 10%, 10 steps in total. 300 ms/ step	Energizing time FS±3%

・Test current：Sine wave
・Energizing time for ×1/2 can be changed by using the app.

(9) EV charger check

1. CP signal measurement

Voltage Vtop Vbase Frequency Duty	Range	15.0V
	Display range	Voltage Vtop:2.0 V to 15.0 V Voltage Vbase：-15.0 V to -2.0 V, ---, -V*1 Frequency：DC*2, 10 to 1100 Hz Duty：10.0% to 96.0% *1: In case of DC, “---,-V” is displayed for Vbase. *2: The LCD shows “DC” when frequency is 0 Hz or higher and less than 10 Hz.
	Measuring range (guaranteed accuracy)	Voltage Vtop:2.0 V to 15.0 V Voltage Vbase: -15.0 V to -2.0 V Frequency: 980 to 1020 Hz Duty: 10.0% to 96.0%
	Indications out of display range	Voltage Vtop: <2.0 V, >15.0 V Voltage Vbase: <-15.0 V, >-2.0 V Frequency: >1100 Hz Duty: <10.0%, >96.0%, ---%* * Displayed when the frequency is less than 980 Hz or over 1020 Hz.
	Accuracy	Voltage: ±4dgt Frequency: ±0.5%rdg±4dgt Duty: ±10dgt
Max. charging current	Range	80.0 A
	Display range	6.0 A-80.0 A
	Indications out of display range	---A* (* Displayed when Duty is “---%”.)
	Accuracy	Varies depending on the accuracy of duty measurement.
	Formula	Where: 10%≦Duty [%]≦85%, Duty [%] × 0.6 A, and 85%<Duty [%]≦96%, (Duty [%] - 64) × 2.5 A
CP STATE	Criteria of judgement	When Vtop is within the following range and meets the following conditions 1. and 2., CP STATE is judged and displayed based on the voltage value of Vtop. If condition 1. or 2. is unsatisfied, the LCD shows “---”. • A(Not connected):11 V≦Vtop≦13 V • B(Connected):8 V≦Vtop≦10 V • C(Ready to charge):5 V≦Vtop≦ 7 V • D(Ready to charge, ventilation required): 2 V≦Vtop≦4 V Conditions: 1. Frequency is DC and CP STATE is A. 2. In any of CP STATE B/C/D, frequency is between 995 and 1005 Hz, and Vbase is within -13.0 V to -11.0 V.

2. EV/ Latch locking
Measuring range and accuracy are the same as for continuity measurement.
Lock/ unlock state is judged by the measured resistance and the result is displayed on the LCD as follows.

Status	Resistance range	Judgement
Lock	135 Ω-165 Ω	The LCD shows "✓" symbol when the resistances measured at latch switch is locked and unlocked state are within the allowable range respectively. When both measured resistances are within the allowable range, "✓" symbol is displayed at the middle right area of the LCD. In other cases, the LCD shows "×" symbol.
Unlock	432 Ω-528 Ω	

3.2 Possible number of measurements within the effective battery voltage
Measurement: 5 sec., Pause: 25 sec. (Measures RCD once every 30 sec.)

Function		Test resistance	Possible number of measurements within the effective battery voltage
Continuity		1 Ω	2000 times or more
Insulation resistance	25V	0.025 MΩ	2000 times or more
	50V	0.05 MΩ	2000 times or more
	100V	0.1 MΩ	2000 times or more
	125V	0.125 MΩ	2000 times or more
	250V	0.25 MΩ	2000 times or more
	500V	0.5 MΩ	1500 times or more
	1000V	1 MΩ	1500 times or more
RCD ×1 30 mA		-	3500 times or more
Earth resistance		10 Ω	3000 times or more
Voltage/ Phase rotation		-	Approx. 35 hours

3.3 Others

Applicable standards	• IEC 61010-1, -2-030 CAT III 600 V / CAT IV 300 V Pollution degree 2 • IEC 61010-2-034 • IEC 61557-1, -2, -3, -4, -5, -6, -7, -10 • IEC 60529 (IP40) • IEC 61010-031 MODEL 7281…CAT III 600 V/ CAT IV 300 V (Use of cap is required in CAT III or higher environment.) MODEL 7247…CAT III 600 V/ CAT IV 300 V * When test leads are connected to and used with the instrument, the lower category either of them belongs to is applied. • IEC 63000 (Environmental standard: RoHS)
Location for use	Altitude 2000 m or less, In-door use

Nominal system voltage	100 V/ 230 V/ 400 V 50 Hz/ 60 Hz
Operating temp. & humidity range	-10℃ to +50℃ 80% RH or less (no condensation)
Storage temp. & humidity range	-20℃ to +60℃ 75% RH or less (no condensation)
External communication	Bluetooth Ver 5.0
Withstand voltage	5160 V AC (50/ 60 Hz)/ 5 sec. (between electrical circuit and enclosure)
Insulation resistance	50 MΩ or more/ 1000 V DC (between electrical circuit and enclosure)
Auto-power-off function	Turns off the instrument automatically if there is no function change, range change or switch press for about 10 min. In case of the following cases, auto power off function doesn't work. - While voltage of 30 V or higher is being applied to the instrument, (in case of CP signal measurement, a square wave of 2 V or higher or DC voltage is being applied to) - measurement is being performed, or - during Bluetooth communication.
Backlight	Automatically turns off if there is no activity for about 2 min. (Auto off is disabled during a measurement.)
Dimension	136(D)×235(W)×114(H) mm
Weight	Approx. 1300 g (including batteries)
LCD	Color TFT LCD (320×240 dots)
Power supply	AA battery × 8 (Use of AA Alkaline battery is recommended.)

3.4 Operating uncertainty

Operating uncertainty (B) is an uncertainty obtained under the rated operating conditions, and calculated with the intrinsic uncertainty (A), which is an error of the instrument used, and the error (En) due to variations.
According to IEC 61557, the maximum operating uncertainty should be within ± 30%.

(1) Operating uncertainty at insulation resistance measurement (IEC 61557-2)

IEC 61557-2

$$B = \pm\sqrt{A^2 + \frac{4}{3}(E_2{}^2 + E_3{}^2)}$$

A	Intrinsic uncertainty
E_1	Influence of position (N/A since this is a digital tester.)
E_2	Influence of supply voltage (until battery status indicator becomes empty ▭)
E_3	Influence of temperature (IEC 61557-2, 0℃ -35℃)

* The measuring range to keep the max. operating uncertainty is the same as the 1st effective measuring range.

(2) Operating uncertainty at continuity measurement (IEC 61557-4)

$$B = \pm\sqrt{A^2 + \frac{4}{3}(E_2{}^2 + E_3{}^2)}$$

A	Intrinsic uncertainty
E_1	Influence of position (N/A since this is a digital tester.)
E_2	Influence of supply voltage (until battery status indicator becomes empty ▭)
E_3	Influence of temperature (0℃ -35℃)

* Measuring range to keep the max. operating uncertainty (within ±30%) is 0.2 to 2000 Ω.

(3) Operating uncertainty at earth resistance measurement (IEC 61557-5)

$$B = \pm\sqrt{A^2 + \frac{4}{3}(E_2{}^2 + E_3{}^2 + E_4{}^2 + E_5{}^2)}$$

A	Intrinsic uncertainty
E_1	Influence of position (N/A since this is a digital tester.)
E_2	Influence of supply voltage (until battery status indicator becomes empty ▭)
E_3	Influence of temperature (0℃ -35℃)
E_4	Influence of series interference voltage (True RMS value 3 V)
E_5	Influence of prove and aux. earth electrode (100×RA≦50 kΩ)

* Measuring range to keep the max. operating uncertainty (within ±30%) is 5.0 Ω to 2000 Ω.

(4) Operating uncertainty at LOOP 2W measurement (IEC 61557-3)

$$B = \pm\sqrt{A^2 + \frac{4}{3}(E_2{}^2 + E_3{}^2 + E_{6.2}{}^2 + E_7{}^2 + E_8{}^2 + E_9{}^2 + E_{10}{}^2)}$$

A	Intrinsic uncertainty
E_1	Influence of position (N/A since this is a digital tester.)
E_2	Influence of supply voltage (until battery status indicator becomes empty ▭)
E_3	Influence of temperature (0℃ to 35℃)
$E_{6.2}$	Influence of phase angle (0° to 30°)
E_7	Influence of system frequency (-1% to +1%)
E_8	Influence of system voltage (85% to 110%)
E_9	Influence of harmonics 3th 5%, 7th 5% (Phase angle 0°), 5th 6% (Phase angle 180°)
E_{10}	Influence of series interference voltage (0.5% of nominal voltage)

* Measuring range to keep the max. operating uncertainty (within ±30%) is 10.0 Ω to 2000 Ω.

(5) Operating uncertainty at RCD measurement (IEC 61557-6)

$$B = \pm\sqrt{A^2 + \frac{4}{3}({E_2}^2 + {E_3}^2 + {E_5}^2 + {E_8}^2)}$$

A	Intrinsic uncertainty
E_1	Influence of position (N/A since this is a digital tester.)
E_2	Influence of supply voltage (until battery status indicator becomes empty)
E_3	Influence of temperature (0℃ -35℃)
E_5	Influence of probe resistance
E_8	Influence of system voltage

* Probe: An additional earth electrode used as a probe for sampling potentials during measurement

Rated residual current (I△n)	Probe resistance
15 mA	300 Ω
30 mA	100 Ω
50 mA	40 Ω
100 mA	
200 mA	
500 mA	

Each operating uncertainty shall not exceed the following values.

Range	Test current
×1/2	-10% to 0%
×1	0% to +10%
Ramp ( )	-10% to +10%

4. Instrument layout

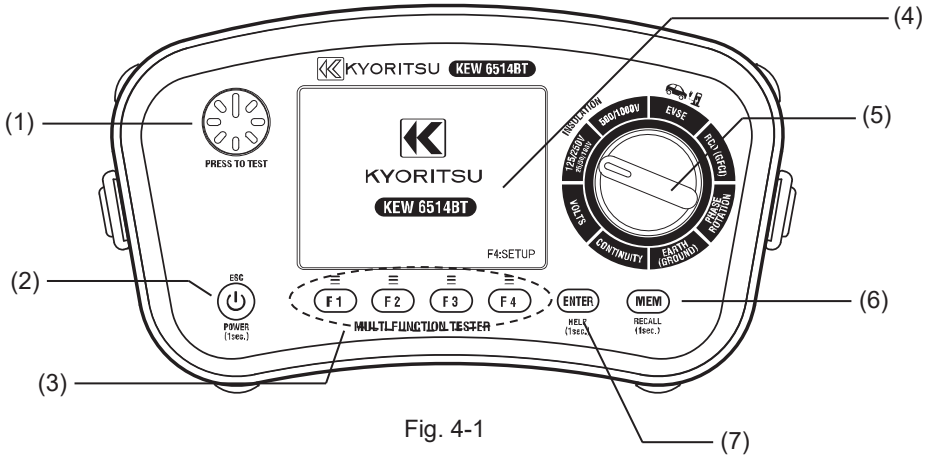


Fig. 4-1

Name	Description
(1) Test switch	Press to start a measurement. Hold down and turn the switch clockwise to lock it in the operating position.
(2) POWER switch/ ESC switch	A long press (1 sec. or longer) turns on/ off the instrument. A short press (less than 1 sec.) works as an ESC switch and return to the previous screen.
(3) Function switch	Settings for each measurement are available.
(4) LCD	Color LCD
(5) Rotary switch	Select a measurement function.
(6) MEM (Memory) switch	Short press (less than 1 sec.) while the measured value is being displayed and held on the LCD saves the measured value, and long press (1 sec. or longer) recalls or deletes the saved data.
(7) ENTER switch	Confirms operations or settings. A long press (1 sec. or longer) can display the HELP screen for the currently selected function.

Input terminal

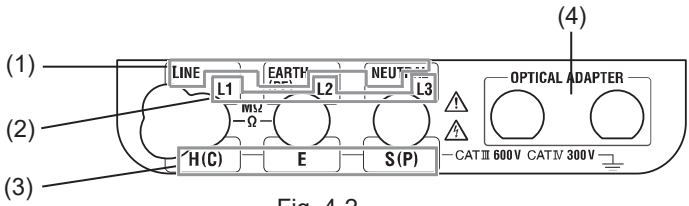


Fig. 4-2

Function	Terminal
(1) Measurement terminal for Insulation, Continuity, RCD, and Voltage	LINE: Line terminal
	EARTH(PE): Protective earth terminal
	NEUTRAL: Neutral (Neutral line) terminal
(2) Terminal for phase rotation	L1: Line 1 (R) terminal
	L2: Line 2 (S) terminal
	L3: Line 3 (T) terminal
(3) Terminal for earth	H(C): Auxiliary earth electrode (current pole) terminal
	E: Terminal for the earth under test
	S(P): Auxiliary earth electrode (potential pole) terminal
(4) Communication adapter	MODEL 8212USB adapter

5. Accessories

● Test lead

(1) Test leads with remote-control switch MODEL 7281
Extension prod long MODEL 8017B

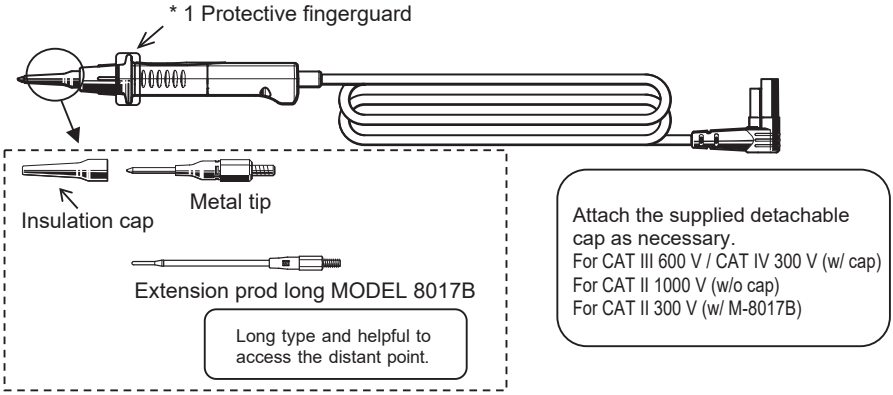


Fig. 5-1

(2) Distribution board test lead MODEL 7247

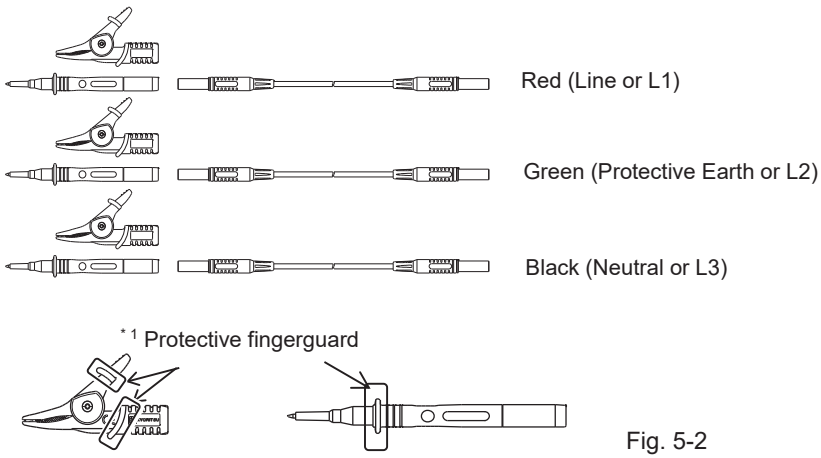


Fig. 5-2

*1 Protective fingerguard is a part providing protection against electrical shock and ensuring the minimum required clearance and creepage distances.

(3) Earth resistance test leads MODEL 7228A (for precision measurement)

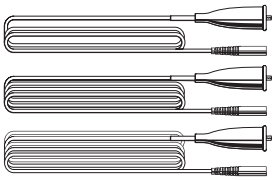


Fig. 5-3

(4) Auxiliary earth spikes MODEL 8041

Fig. 5-4

• The other accessories
(1) Soft case MODEL 9084 × 1
(2) Carrying case MODEL 9142 × 1
(3) Instruction manual × 1
(4) Shoulder strap with buckle MODEL 9151 × 1
(5) Shoulder pad MODEL 9199 × 1
(6) Size AA Alkaline battery × 8
(7) Spare fuse F 500 mA/ 600 V Φ6.3 × 32 mm (SIBA 7009463.0,5)
* Stored in the battery compartment area.

• Optional accessories
(1) USB adapter MODEL 8212USB

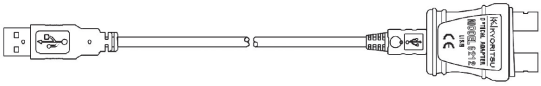
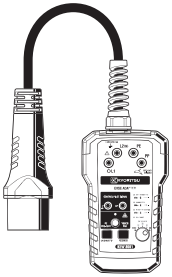


Fig. 5-5

(2) Adapter for measurement terminal MODEL 8259
(3) Precision measurement cord set MODEL 7272
(4) Precision measurement cord set MODEL 7245A
(5) EVSE adapter KEW 8601 (TYPE 1 plug)
(6) EVSE adapter KEW 8602 (TYPE 2 plug)



Connect with EV charging point/ station.

Fig. 5-6

Symbols

	Battery status indicator
	Indicates that a measurement is in progress.
	Live circuit warning displayed when 30 V or higher is applied to the instrument. (Resistance, Continuity/ Insulation / Earth resistance Function) * Except for LOOP 2W function.
	Indicates total judgment result on EVSE or latch locking tests. ☑ : Measured values at latch locking/ unlocking are both within the criteria of judgement. ☒ : Either of the measured values at latch locking/ unlocking is out of the criteria of judgement.
	Displayed when a voltage value exceeding the measuring range for EVSE function, CP signal measurement or motor rotation.
	Comparator function Displayed when the displayed value is within the judgment criteria when measuring insulation resistance, earth resistance, and continuity function.
	Indicates auto memory function is enabled.
	Indicates the data is saved by manual operation. It is possible to flag the desired data on the recall screen. The data with this mark won't be overwritten even while data are automatically saved by auto memory function.
	Safety lock for insulation resistance measurement The instrument doesn't start measurement, even though the test switch is pressed, while the safety lock is enabled.
R_H Hi, Rs Hi	Indicates the probe resistance (R_H, R_S) of H(C) or S(P) terminal exceeds the measuring range at earth resistance in precision measurement.
No 3Phase system	Indicates the incorrect wiring on Phase rotation function (Voltage isn't Three-phase voltage).
	Wiring check for RCD, earth resistance, and Loop 2W functions
	During the measurement on RCD, earth resistance, or Loop 2W function, the symbol appears to indicate the internal temperature is high. Further measurements are suspended until the symbol disappears.
Uc > UL	Indicates that Uc measured on RCD function is higher than UL value (50 V).

no	Appears at any of the following cases: ● On RCD function, the RCD to be tested tripped before starting a measurement. The preset I Δ n value might be incorrect. ● On Phase rotation function, voltage/ frequency of the input voltage exceeds the measuring range. ● RCD tripped during Loop 2W measurement.
	Indicates the necessity to reset the RCD tripped at the auto test on RCD function.
	Indicates the necessity to press the test switch at the measurement on EVSE function.
	Indicates the necessity to press the trigger on the EV charging cable at the measurement on EVSE function.

6. Setup

● Settings of the following items can be made on the SETUP MENU.
(1) LANGUAGE .....: Language selection
(2) TIME.....: Clock (time and date) adjustment
(3) LCD CONTRAST ....: LCD contrast adjustment
(4) LCD BACKLIGHT....: LCD backlight brightness adjustment
(5) AUTO MEMORY .....: Set the auto memory function to ON or OFF.
(6) SYSTEM RESET ....: Restore the instrument settings to default.

● Setting method:
(1) Press the POWER switch at least 1 sec. to turn on the instrument.
(2) Press the F4 switch while the start-up screen is displayed (Approx. 2 sec.) after powering on the instrument.
(3) SETUP screen appears. It is possible to display this screen by pressing the F4 switch on the wiring diagram screen available on Help function.

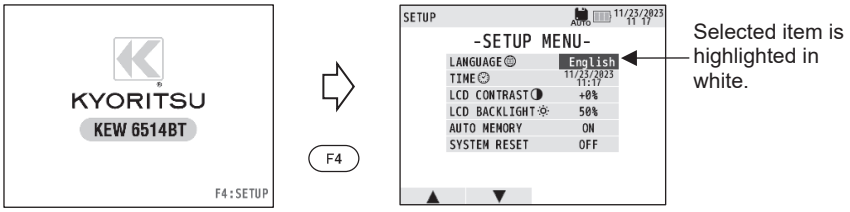


Fig. 6-1 Fig. 6-2

(4) Press the F1(▲) or F2(▼) switch to select the item you wish to change and confirm it with the ENTER switch.
(5) Then press the F1(▲) or F2(▼) switch to change the setting.

Items	Settings
LANGUAGE	ENGLISH, 日本語
TIME	Month/ Day/ Year Hour: Minute
LCD CONTRAST	-45% to +45% (by 1%)
LCD BACKLIGHT	10% to 100% (by 10%)
AUTO MEMORY	ON or OFF (Default setting: “ON”)
SYSTEM RESET	Restore the instrument settings to default.

(6) Changed settings are saved by pressing the ENTER switch and the screen returns to the SETUP screen. Press the ESC switch to cancel changes.
(7) The instrument enters stand-by mode by pressing the ESC switch on SETUP screen.

7. Getting started

7.1 Attachment of metal tip/ adapter to test leads

The following metal tips and adapters are user-changeable depending on measurement purposes.

(1) MODEL 7281

The following metal tips are available.

1. Standard metal tip: installed at a shipment and supplied with a detachable insulation cap.
2. MODEL 8017B: long type and helpful to access the distant point.

[How to replace the parts]

Turn the tip of MODEL 7281 counterclockwise and remove the metal tip.

Insert the metal tip you wish to use into the hexagon hole and turn the tip part of the probe clockwise to tighten firmly.

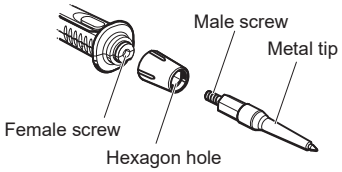


Fig. 7-1

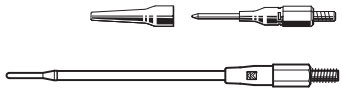


Fig. 7-2

(2) MODEL 7247

Attach either of the following adapters to MODEL 7247.

[Adapters for MODEL 7247]

1. Alligator clip
2. Test probe

[How to replace the parts]

Firmly attach the adapter you wish to use to the end of banana cable.

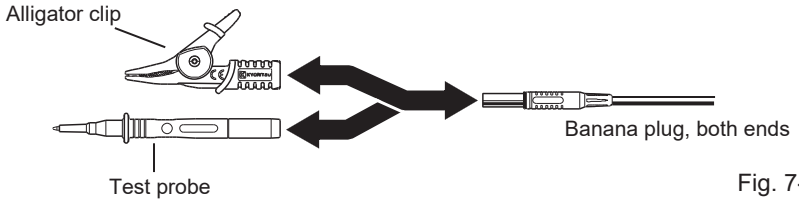


Fig. 7-3

⚠ DANGER

To avoid getting electrical shocks, disconnect the test leads from the instrument before replacing the metal tip for test lead with remote-control switch or adapter for banana cable.

7.2 Battery voltage check

(1) Please refer to "18.1 Battery replacement" in this manual and insert batteries in the instrument.
(2) Hold down the POWER switch (at least 1 sec.) to turn on the instrument.
(3) Check the battery status indicator displayed at the upper right corner of the LCD.

	Normal. Battery voltage is enough.
	Low battery voltage: For continuous measurement, please refer to "18.1 Battery replacement" and replace the batteries with new ones.
	Battery voltage is below the lower limit of the operating voltage. In such a condition, accuracy of the measured result isn't guaranteed. Replace batteries with new ones immediately.

- Battery status indicator might rapidly change from "▮▮▮" to "▭" during a measurement depending on the measured objects; for example, resistance of the object is low.
- Use of size AA Alkaline battery is recommended. Use of other batteries may cause improper indication of battery level.

7.3 Time adjustment

This instrument has clock function. Time and date are displayed at the upper right corner of the LCD.
Time display format: Month/ Day/ Year Hour: Min.

(1) Enter the SETUP mode to adjust clock. Refer to "6. SETUP" how to enter setup mode.
(2) Press the F1(▲) or F2(▼) switch and select "TIME" and then press the ENTER switch.
(3) Press the F3(◀) or F4(▶) switch to select the parameter to be changed.
(4) Press the F1(▲) or F2(▼) switch and alter the value and then confirm the change with the ENTER switch. Pressing the ESC switch during the adjustment can return to the previous step.

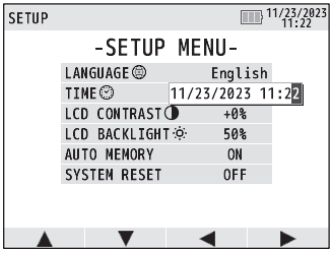


Fig. 7-4 Time and date adjustment

7.4 Help function

With this function, correct connection for each measurement can be checked on the LCD.

To check connection diagrams:
(1) Select the function and range on which measurement is to be performed and hold down the ENTER(HELP) switch 1 sec. or longer.
(2) Then the LCD shows the corresponding connection diagram.

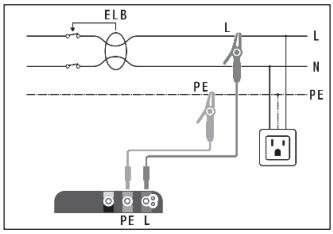


Fig. 7-5 Example of connection

(3) If multiple connections are available, press the F1 switch to toggle the connection diagrams.
(4) Press the ESC switch to close the currently displayed connection diagram and return to the measurement screen.

- The instrument enters setup mode by pressing the F4 (SETUP) switch while the LCD is showing a connection diagram.

8. Insulation resistance

To inspect the insulation performance of electrical equipment or circuit, use this instrument and measure the insulation resistance of them. Check the voltage rating of the circuit to be measured before making measurement and select the voltage applied to.

- Depending on the circuit to be measured, displayed insulation resistance value may not stabilize.
- The instrument may give beep sound during an insulation resistance measurement; however, this is not a malfunction.
- Measurement time may be longer when measuring a capacitive load.
- At an insulation resistance measurement, the output voltage of PE terminal is positive and of L terminal is negative.
- Connect the PE terminal and the earth (ground) terminal at measurement. It is recommended to connect the positive side to the earth side when measuring insulation resistance against ground or when a part of the object under measurement is earthed. Such connection is known to be more suitable for insulation testing since insulation resistance values measured with the positive side connected to the earth are typically lower than those taken through the reversed connection.

⚠ CAUTION

Always disconnect power to the circuit under test before starting insulation resistance measurement. Do not attempt to make measurements on a live circuit. Otherwise, it may damage the instrument.

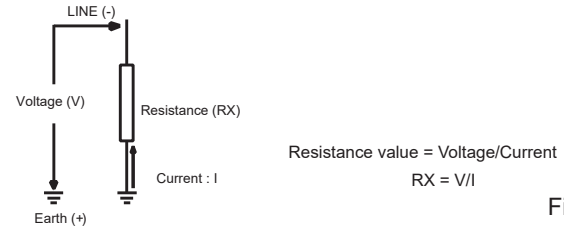
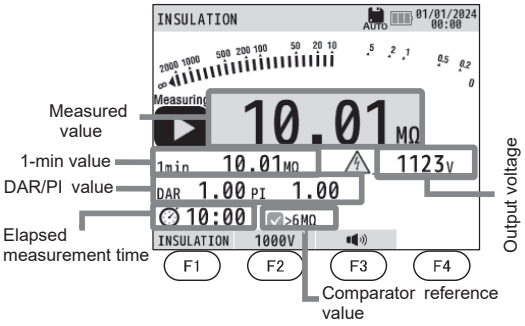


Fig. 8-1

8.1 Measurement method

Not only normal insulation resistance but also operating voltage of the Surge Protection Device (SPD) can be measured on the insulation resistance function.

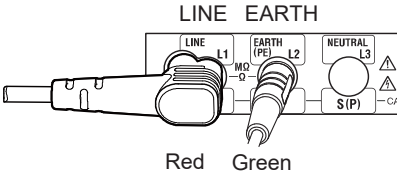


F1	Insulation resistance measurement or SPD * For SPD, only 500/1000 V functions are available.
F2	Rated measurement voltage (25 V,50 V,100 V,125 V,250 V) (500 V, 1000 V)
F3	Buzzer function
F4	Safety lock (enabled for 500/1000 V with default setting)

Fig. 8-2

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to insulation resistance function position.
The insulation resistance function of this instrument is divided into the following two functions according to the output voltages.
- 25V / 50V / 100V / 125V / 250V ... Low voltage function
- 500V/1000V…High voltage function

(2) Press the F1 switch and select insulation resistance or SPD.
SPD is selectable only when the rotary switch is set to High voltage function (500V/1000V).
(3) Check the voltage value which is possible to apply to the circuit under test and press the F2 switch to select the desired voltage.
(In case of SPD, the apply voltage is fixed to 1000 V.)
(4) Connect the test leads and instrument as follows.



LINE terminal Distribution Board test lead, Red (MODEL 7247) or Test leads with remote-control switch (MODEL 7281)
EARTH terminal Distribution Board test lead, Green (MODEL 7247)

Fig. 8-3

(5) Measure the voltage to confirm that the circuit under test is not energized.
(6) Connect the EARTH terminal of the instrument and the earth terminal of the circuit under test with the test lead.
(7) Place the tip of test lead to the LINE terminal to the circuit under test and press the test switch or remote-control switch. (Fig. 8-4, Fig. 8-5, Fig. 8-6)
- The live warning LED blinks and buzzer sounds if a voltage of 30 V or higher exists in the circuit. While the live warning is being provided, no measurement can be performed even if the test switch is pressed.
- The LCD shows insulation resistance value at insulation resistance measurement and breakdown voltage at SPD.
- If the measured value exceeds the limit value of the display range, the symbol “>” is displayed on the LCD.
- The LCD shows elapsed measurement time by 1 sec. during insulation resistance measurement. When the elapsed time exceeds 100 min, the time counter stops and freezes at 99 min. 59 sec.

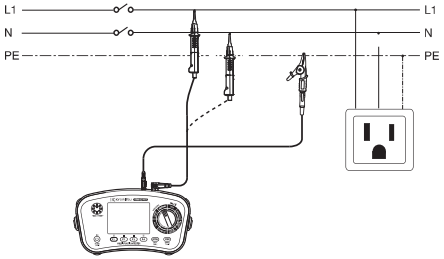


Fig. 8-4

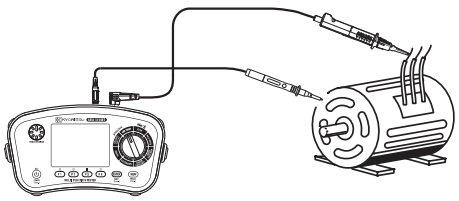


Fig. 8-5

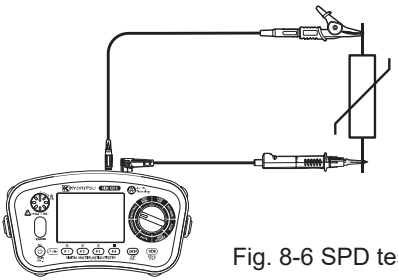


Fig. 8-6 SPD test Connection diagram

(8) Auto discharge

This function allows electric charges stored in the capacitance of the circuit under test to be automatically discharged after measurement. Set the test switch or remote-control switch to OFF with the test leads connected. Discharge status can be checked with the blinking "LIVE" symbol and buzzer.

⚠ DANGER

Never touch the circuit under test right after measurement. Capacitances stored in the circuit may cause electric shock. Leave the test leads connected to the circuit, and do not touch the circuit until blinking "LIVE " goes off.

8.2 Continuous measurement

For continuous measurement, use the lock-down feature incorporated on the test switch. Pressing and turning the test switch clockwise locks the switch in the operating position. Turn the switch counterclockwise and unlock it after measurement.

⚠ DANGER

High voltage is present at the tip of a probe while the test switch is locked down. Attention should be paid to avoid possible shock hazard.

8.3 Voltage characteristics of measurement terminals

This instrument conforms to IEC 61557. This standard defines that the rated measurement current shall be at least 1 mA, and the lower limit of the insulation resistance maintaining the rated measurement voltage at measurement terminals. (See the table below.)

This value is calculated by dividing the rated voltage by rated current. ie., in case that the rated voltage is 500 V, the lower limit of the insulation resistance is found as follows. Divide 500 V by 1 mA equals 0.5 MΩ. That is, insulation resistance of 0.5 MΩ or more is required to provide the rated voltage to the instrument.

Rated voltage	25V	50V	100V	125V	250V	500V	1000V
Lower limit of insulation resistance to supply rated measurement current (1 mA)	0.025 MΩ	0.05 MΩ	0.1 MΩ	0.125 MΩ	0.25 MΩ	0.5 MΩ	1 MΩ

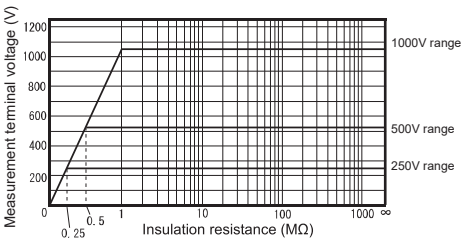


Fig. 8-7

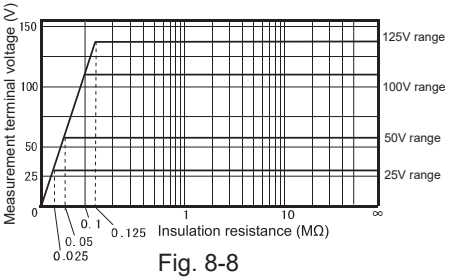


Fig. 8-8

8.4 DAR/ PI measurement, 1-min value display

The instrument can measure and calculate DAR (Dielectric Absorption Ratio) and PI (Polarization Index) values automatically during an insulation resistance measurement. The measured value one minute after the start of measurement can also be displayed.

- The DAR value is displayed in 1 minute and the PI value in 10 minutes after starting a measurement.
- The following table shows the formula and display range.

Formula	DAR = Resistance value (1 min after a start of test)/Resistance value (15 sec after a start of test) PI = Resistance value (10 min after a start of test)/Resistance value (1 min after a start of test)
Display range	0.00-9.99

* If a denominator, the measured resistance, used in the above formula is 0 MΩ or out of display range; the LCD shows "no" as DAR/ PI value. When the calculated DAR/ PI values exceed the display range, the LCD shows ">9.99".

8.5 Comparator function

The comparator function is a judgment function that compares the measured value with the reference value and informs the user by the buzzer (when it is enabled) and "✓" symbol when the measured value is below the reference value.

The following table shows the default setting of insulation resistance function. These values are changeable via the special application. Please refer to "17.2 KEW Smart Advanced".

Rated measurement voltage	25V	50V	100V	125V	250V	500V	1000V
Criteria of judgement	0.1 MΩ	0.1 MΩ	0.1 MΩ	0.1 MΩ	0.2 MΩ	0.4 MΩ	6 MΩ

8.6 SPD

The SPD can measure the voltage (breakdown voltage) at which the surge protection device operates. Press the test switch or remote-control switch to start a measurement. The voltage between the L-PE terminal is increased from 0 V to 1000 V. The voltage, when current of 1 mA or more is detected between the L-PE terminal, is judged as a breakdown voltage. Then voltage output is stopped, and the measured result is displayed on the LCD.

⚠ DANGER

High voltage is generated at the tips of the test leads during SPD measurement. Attention should be paid to avoid possible shock hazard.

- Press the test switch or remote-control switch to start a measurement. Press the F4 switch or ESC switch (short press of less than 1 sec.) to stop the measurement.
- The screen shows the breakdown voltage (DC voltage display) and the assumed AC voltage. The AC voltage is calculated by the following formula.
  AC voltage = breakdown voltage/1.4
- If a current of 1 mA or more is not detected during measurement (over-range), the display shows “>1000V” .

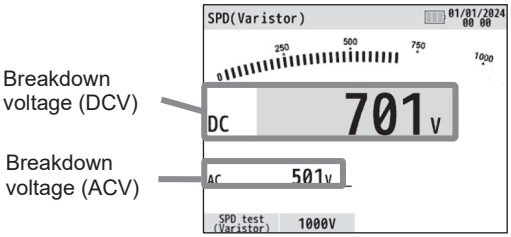


Fig. 8-9 SPD measurement screen

8.7 Safety lock function

The instrument doesn't start a measurement when 🔒 symbol is displayed in the LCD above F4 switch. Another press of the F4 switch unlock the safety lock and clears 🔓 symbol. When the rated measurement voltage or functions are changed, or the power is turned off, the safety lock function is turned on again.

9. Voltage

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to the "VOLTS" position.
(2) Connect the test leads to the instrument as illustrated below.

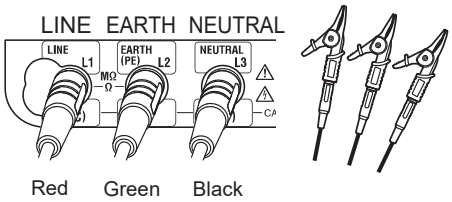


Fig. 9-1

LINE terminal Distribution Board test lead, Red (MODEL 7247)
EARTH terminal Distribution Board test lead, Green (MODEL 7247)
NEUTRAL terminal Distribution Board test lead, Black (MODEL 7247)

(3) Connect the test leads to the circuit under test.
Voltage and frequency values are displayed. (Frequency is displayed for inputs of 2 V or more.)

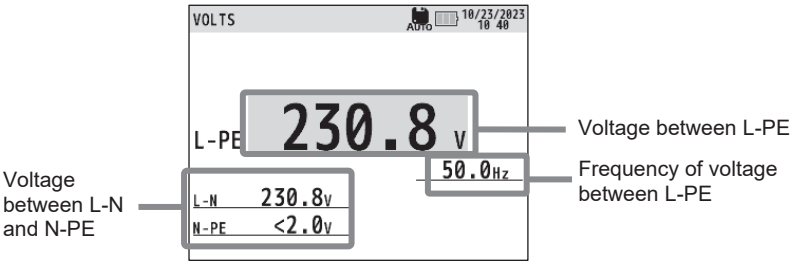


Fig. 9-2

10. Continuity

⚠ DANGER

Do not apply external voltage to the instrument while performing measurements on continuity function. Always check the circuit under test is surely de-energized before starting a measurement.

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

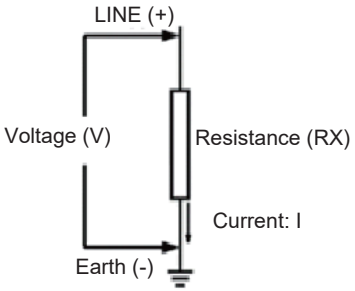


Fig. 10-1

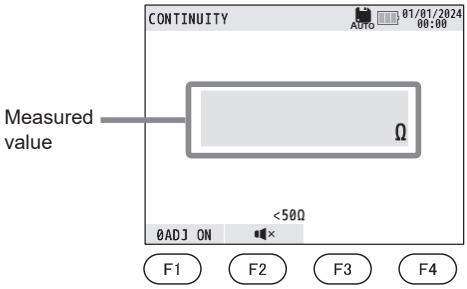
10.1 0 Ω ADJ. function

The 0 Ω adjustment function cancels the resistances of the test leads and internal circuit and displays the resistance of the DUT only. The maximum resistance which can be cancelled is 9 Ω.

(1) Press the F1 switch, while "0ADJ OFF" is displayed on the LCD above the F1 switch, during a measurement (displayed value is 9.00 Ω or less).
(2) Confirm that the LCD shows "0.00Ω" and "0ADJ ON" is displayed on the LCD above F1 switch.

- This 0 ADJ. function doesn't work if the reading is 9 Ω or higher, even if 0Ω ADJ button is pressed. The warning buzzer also sounds.
- The 0Ω ADJ function can be set to OFF by the following procedure.
  - Keep the test leads open with "0ADJ ON" enabled and press the F1 switch while the test switch is being held down.

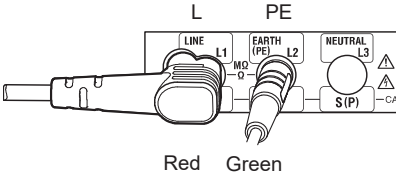
10.2 Measurement method



F1	Turns on/ off 0Ω ADJ function.
F2	Turns on/ off buzzer function.
F3	-
F4	-

Fig. 10-2

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to the CONTINUITY position.
(2) Connect the test leads to the instrument as illustrated below.



L terminal Distribution Board test lead, Red (MODEL 7247) or Test lead with remote-control switch (MODEL 7281)
PE terminal Distribution Board test lead, Green (MODEL 7247)

Fig. 10-3

(3) Firmly contact the ends of test leads (see Fig. 10.4) and then press and lock the test switch. The LCD shows the resistance value of the test leads.

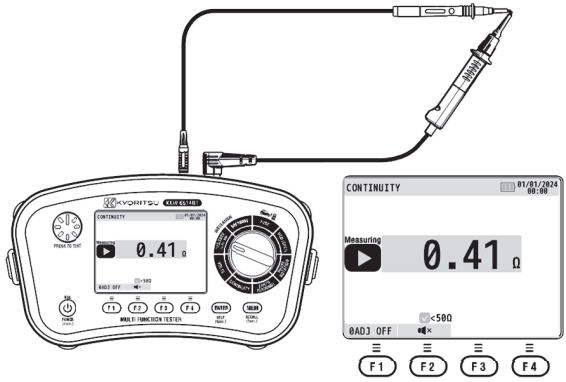


Fig. 10-4

(4) Unlock the test switch and confirm the LCD shows 0.00 Ω.
(5) Confirm that the circuit isn't live and then connect the test leads. (See Fig. 10-5.)

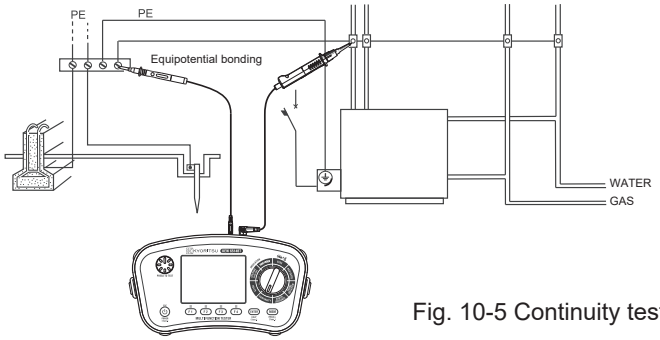


Fig. 10-5 Continuity test example

(6) Press the test switch and check the resistance value displayed on the LCD.
If the measured value is greater than 2000 Ω, the symbol “>” (indicating exceeding the measuring range) will be displayed.

⚠ DANGER

The measured results may be adversely affected by the impedance and transient current of the additional operating circuits connected in parallel.

• Protection against live circuit
This instrument is equipped with a protection function to prevent damage even if the instrument is connected to a live circuit by mistake during resistance and continuity measurement. That is, the instrument is protected and not be damaged if the measurement terminal is connected to a live circuit while the terminal is open circuit state.

10.3 Comparator function

The comparator function is a judgment function that compares the measured value with the reference value and informs the user by the buzzer (when it is enabled) and “✓” symbol when the measured value is below the reference value.

The default value (factory setting) of the continuity function is 50 Ω.

11. Earth resistance

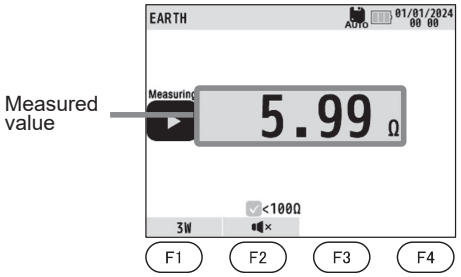
With the earth resistance measurement function of this instrument, earth resistance of power distribution lines, in-house wiring system and electrical appliances can be measured.

⚠ DANGER

• Be extremely careful when measuring earth resistance since high voltage, 50 V max is generated across H(C) – E terminals.

This instrument can perform the following three types of earth resistance measurements.

(1) 3W (Precision measurement)
Accurately measures earth resistance by using earth spikes.
(2) 2W (Simplified measurement)
Uses an existing low earth resistor as an auxiliary electrode and measures the resistance between neutral line and earth electrode.
(3) Loop 2W (2W (LIVE): 2-Wire loop impedance test)
Measures loop impedance between LINE and EARTH of live circuit.
(Normally, this measurement is called as "Loop impedance measurement".)



F1	Switches between 3W, 2W, and 2W (LIVE)
F2	Turns on/ off the buzzer function. (Not available on LOOP 2W function)
F3	-
F4	-

Fig. 11-1

11.1 Measurement principle

(1) Measurement Principle of 3W test (Precision measurement)
This instrument makes earth resistance measurements with fall-of-potential method, which is a method to obtain earth resistance value "Rx" by applying AC constant current "I" between the measurement object "E" (earth electrode) and "H(C)" (current electrode) and finding out the potential difference "V" between "E" (earth electrode) and "S(P)" (potential electrode).

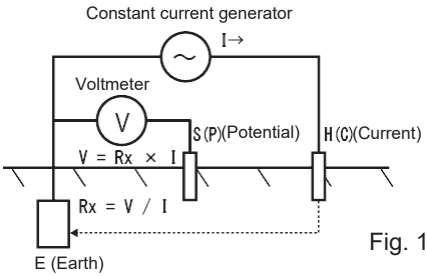


Fig. 11-2

(2) Measurement Principle of 2W (Simplified measurement)
The measurement principle is basically the same as the precision measurement (3W), but the S(P) terminal is short-circuited with H(C) inside the instrument. This allows measurement to be made via the two poles: E and the H (C) terminals.

(3) LOOP 2W (2-Wire loop impedance test)
Make connection as the following figure shows so that current I1 flows between LINE-EARTH in the live circuit.
Here, frequency of current I1 is different from the one of the commercial power supply voltage.
Measure voltage V2: between LINE-EARTH.
Since the voltages of the commercial power supply voltage V1 and the voltage applied to Rx (Rx x I1) are mixed in V2, the difference of frequencies can be used to remove V1 to calculate Rx.
The following formula is used.
Rx = (V2–V1)/I1

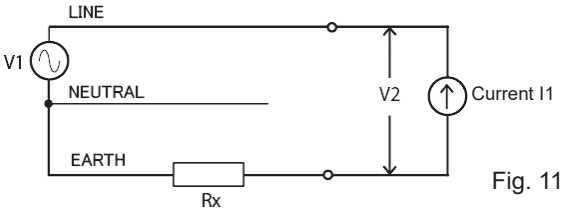
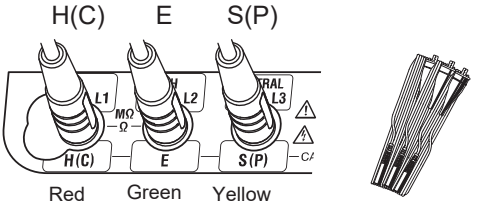


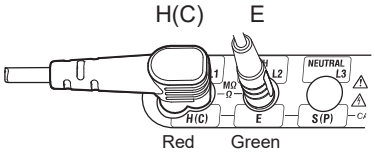
Fig. 11-3

11.2 3W (Precision measurement) and 2W (Simplified measurement) method
(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to the EARTH (GROUND) position.
(2) Press the F1 switch and select “3W” or “2W”.
(3) Connect the test leads to the instrument illustrated below. (Fig. 11-4, Fig. 11-5)



H(C) terminal Red cable (MODEL 7228A)
E terminal Green cable (MODEL 7228A)
S(P) terminal Yellow cable (MODEL 7228A)

Fig. 11-4 Precision measurement (3W method)



H(C) terminal Distribution Board test lead, Red (MODEL 7247) or Test leads with remote-control switch (MODEL 7281)
E terminal Distribution Board test lead, Green (MODEL 7247)

Fig. 11-5 Simplified measurement (2W method)

Ensure that the test leads are firmly connected to each terminal. Loose connection may cause contact failure and lead to inaccurate readings.

(4) Connection

3W test (Precision measurement)

Stick the auxiliary earth spikes S(P) and H(C) into the ground deeply. They should be aligned at an interval of 5 to 10 m from the earthed electrode under test.
Connect the precision measurement test leads to the E, S(P) and H(C) terminals on the instrument respectively as shown in Fig. 11-6, and then connect the test leads (green, yellow, and red) to the earthed electrode under test (E) and auxiliary earth spike S(P) and H(C) in order.

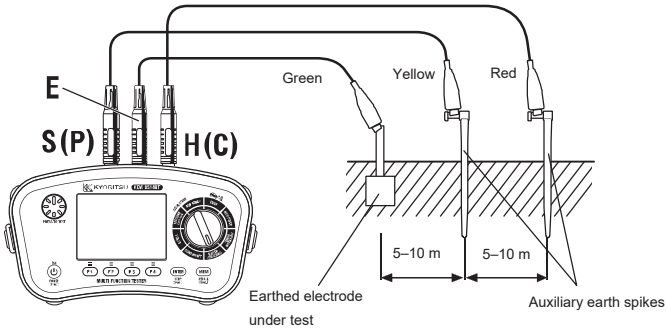
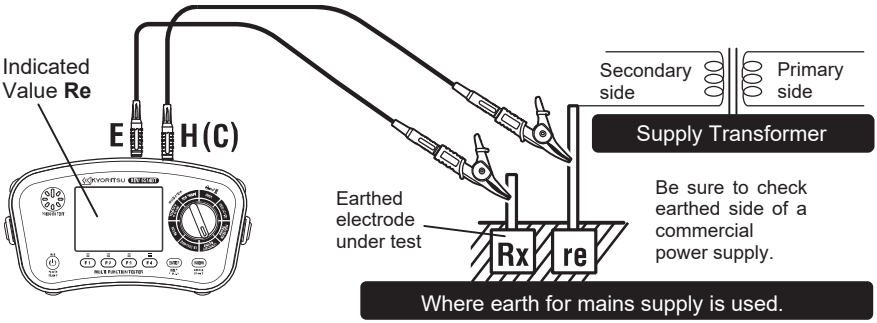


Fig. 11-6

Make sure to stick the auxiliary earth spikes in the moist part of the soil.
Give enough water where the spikes have to be stuck into the dry, stony or sandy part of the earth so that it may become moist.
In case of concrete, lay the auxiliary earth spike down and water it, or put a wet cloth etc. on the spike when making measurement. Aux. earth electrodes cannot be used on the ground such as asphalt where water will not permeate.

2W test (Simplified measurement)

This method is useful when the auxiliary earth spike cannot be stuck.
As an auxiliary earth electrode, use an existing earth electrode (possibly the lowest earth resistance) and perform measurement using the two-terminal method. A common earth for a commercial power supply or a lightning rod for a building can be used as an earth electrode. Make connection as shown in the following figure.



Rx = Re – re
Rx: True resistance
Re: Indicated value
re: Earth resistance of earth electrode

Fig. 11-7

⚠ DANGER

- Use a voltage detector to check a common earth of commercial power supply.
- Do not use this instrument to check a common earth of commercial power supply. There's a risk of danger since voltage value may not be displayed even though the instrument is connected to a live circuit, when the connection of the earthed electrode under test comes off or when the connection of the test leads is incorrect etc.

(5) Earth voltage check

Measure the voltage on the voltage function: the LCD shows earth voltage.
The displayed voltages: L-PE, L-N, and N-PE are the voltages across the terminals H(C)-E, H(C)-S(P), and S(P)-E, respectively.
Confirm that the displayed voltage is less than 10 V. If the voltage is 10 V or higher (3 V or higher in case of 400 Hz), excessive errors in earth resistance measurement may be caused. To avoid this, make measurement after reducing the earth voltage; for example, by powering off the equipment which is connected to the earth electrode under test.

(6) When the LIVE warning is displayed on the LCD, disconnect the instrument from the circuit under test without pressing the test switch.

(7) Press the test switch or remote-control switch to start a measurement.

⚠ CAUTION

- If measurement is made with the test leads twisted or in touch with each other, the reading of the instrument may be affected by induction. For accurate measurement, test leads should be arranged so as not to be contacted with each other.
- If earth resistance of auxiliary earth spikes is too large, it may result in inaccurate measurement. Make sure to stick the auxiliary earth spikes H(C) and S(P) into the moist part of the earth carefully and ensure sufficient connections between the respective connections.

11.3 LOOP 2W measurement method (2-Wire loop impedance test)
This instrument can measure loop impedance between LINE-EARTH of live circuit.
This measurement is suitable for circuits which don't have neutral wires and cannot be measured with simplified measurement since this measurement uses just LINE and EARTH terminals.

Measure the impedance Zx indicated by the dotted line shown in the following figure.
In the example below, impedance Zx contains the resistance of L1 cable, impedance of transformer, and earth resistance. Thus, this method can be used as a simple earth check by measuring the total impedance from LINE to EARTH.

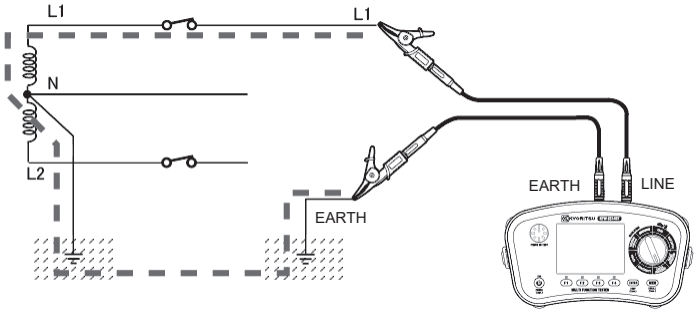
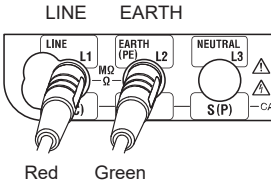


Fig. 11-8

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to EARTH (GROUND) position.

(2) Press the F1 switch and select “2W(LIVE)” .

(3) Connect the test leads to the instrument as illustrated below. (Fig. 11-9)



LINE terminal Distribution test leads, Red (MODEL 7247)
EARTH terminal Distribution test leads, Green (MODEL 7247)

Fig. 11-9

Ensure that the test leads are firmly connected to each terminal. Loose connection may cause contact failure and lead to inaccurate readings.

(4) Connect the test leads to the circuit under test as illustrated below.
Connect the LINE terminal to either L1 or L2 of the circuit under test, whichever is ok.

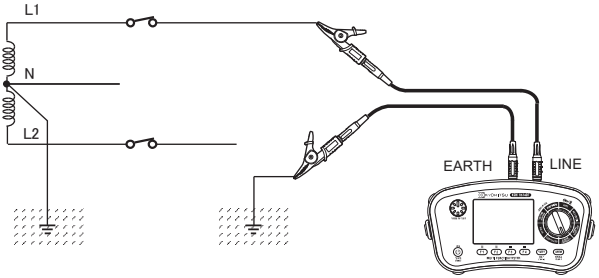


Fig. 11-10

(5) When connection completes, check the wiring check symbol on the LCD.
If the symbol indications don't match Fig. 11-11 or the LCD shows ⚠ symbol, the connection is not correct and needs to be corrected.
- The voltage between L and PE is always displayed on the LCD. Stop the measurement if the voltage displayed after making connection isn't normal value.

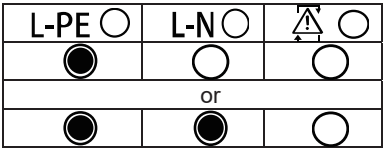


Fig. 11-11

(6) Press the test switch and check the resistance value displayed on the LCD.
Measurement takes approx. 10 sec.
If the measured value is greater than 2000 Ω, the symbol “>” (indicating exceeding the measuring range) will be displayed.

⚠ CAUTION

During Loop 2W measurement, test current flows through the earth. This test current is a low current so as not to trip RCDs rated to 15 mA; however, if leakage current already generated in the circuit under test, the RCDs may trip. When RCD trips during a measurement, the LCD shows “no”.

11.4 Comparator function

The comparator function is a judgment function that compares the measured value with the reference value and informs the user by the buzzer (when it is enabled) and “✓” symbol when the measured value is below the reference value. (Except for Loop 2W measurement)

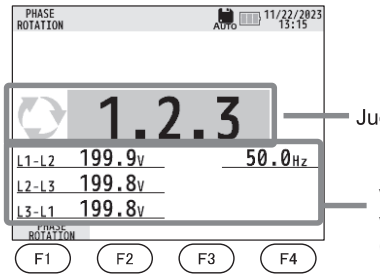
The default value (factory setting) of the continuity function is 100 Ω.

12. Phase rotation

⚠ DANGER
When performing motor rotation test, confirm that no voltage is applied to the measured object (motor) before starting measurement.

KEW 6514BT can check phase rotation of live circuit; in addition, it has motor rotation test function to judge the phase rotation by the voltage, which is generated by turning the motor manually.

- Measurements if the live circuit can be made if voltage value is at least 3 V. This is a kind of precheck to confirm the phase rotation while the voltage of the secondary side is low, for example, when 200 V is applied to the primary side of the transformer.
- At the motor rotation test, it is possible to perform phase rotation test at lower voltage and frequency than the standard phase rotation test.



Voltage across terminals and frequency of L1-L2 voltage
(These values won't be displayed at motor rotation.)

F1	Setting of measurement mode (Phase rotation, Motor rotation)
F2	-
F3	-
F4	-

Fig. 12-1

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to PHASE ROTATION position.
(2) Press the F1 switch and select "PHASE ROTATION" or "-Ⓜ- ROTATION".
(3) Connect the test leads to the instrument as illustrated below. (Fig. 12-2)

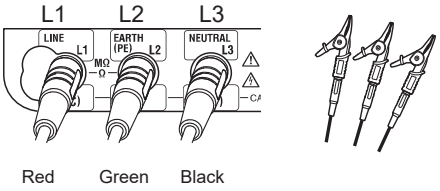


Fig. 12-2

L1 terminal Distribution Board test lead, Red (MODEL 7247)
L2 terminal Distribution Board test lead, Green (MODEL 7247)
L3 terminal Distribution Board test lead, Black (MODEL 7247)

(4) Connect the test leads to the circuit under test. (Fig. 12-3, Fig. 12-4)
For motor rotation check, run the motor by hands when connection is properly done.

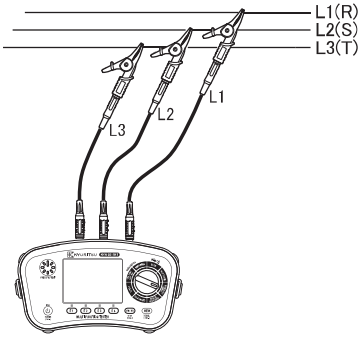


Fig. 12-3 Phase rotation check

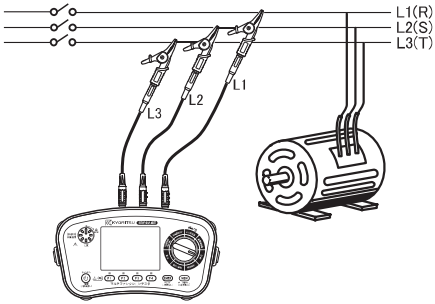


Fig. 12-4 Motor rotation check

(5) Check result is displayed as follows.

Fig. 12-5

- When the LCD shows “No 3Phase system” or “---” , the circuit under test may not be Three-phase system or connection may not be correct. Check the circuit under test and the connections.
- If the message “no” is displayed on the LCD, voltage out of the measuring range may be applied to the circuit under test. Check the rated voltage and frequency of the circuit under test.
- If measurement voltage contains harmonics, such as invertor power supply, it may affect the measurement result.

13. RCD

13.1 Measurement principle

This instrument uses a constant current circuit to allow leakage current to flow between LINE-NEUTRAL and trip RCDs. It is also possible to use earth to pass the leakage current to the earth.

- At the operating time measurement, the instrument measures the time from the start of leakage current flowing to RCD trip and display the result on the LCD.
- At Ramp test, gradually increase the leakage current from 20% of the rated residual current till the RCD trips. The LCD shows the current value when the RCD tripped.

Since this instrument uses a constant current circuit, influence of the fluctuations in system voltages is less on this instrument.

When the leakage current flows to the earth, voltage (contact voltage Uc) is generated depending on the magnitude of the earth resistance of the circuit under test. KEW 6514BT monitors the magnitude of this Uc value and stops RCD test when the Uc value exceeds the limit value (Limit voltage UL 50 V).

13.2 Measurement method

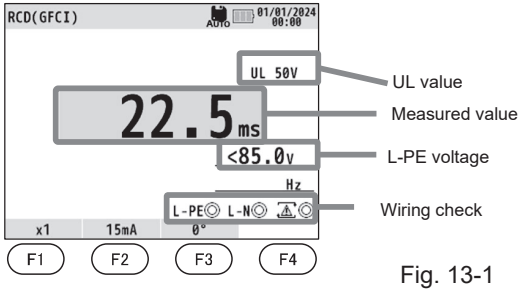


Fig. 13-1

F1	Setting of measurement mode (×1/2, ×1, sensitive current, AUTO)
F2	IΔn Rated residual current setting
F3	Phase rotation (0° or 180°) 0°/180° * AUTO only

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to RCD (GFCI) position.
(2) Press the F1 switch to select the desired measurement mode.

×1/2	Applies a half of rated earth and test RCD doesn't trip.
×1	Applies rated residual current and measures RCD tripping time.
Ramp (▟)	Varies test current from 20% to 110% of rated residual current and measure the trip current of RCD.
AUTO	Automatically and continuously performs ×1/2, ×1, and Ramp test.

(3) Press the F2 switch to set the rated residual current I△n.
(4) Press the F3 switch to select the phase to apply measurement current.
(5) Connect the test leads and instrument as follows.

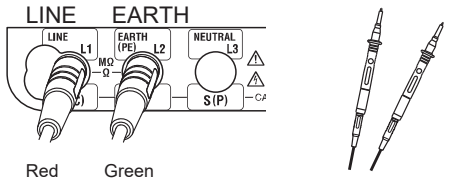


Fig. 13-2

LINE terminal Distribution Board test lead, Red (MODEL 7247)
EARTH terminal Distribution Board test lead, Green (MODEL 7247)

(6) Connect the test leads to the circuit under test.

Connection for Three-phase 3-Wire

Measurement is performed on the power supply side and load side of different phases.
In the case of three-phase RCDs, measurement can be made in any combination of R-S', S-T' and T-R'. However, depending on the combination, the operating time may be slightly different from other combinations due to the structure of the RCDs.
Connect the LINE terminal of the instrument and the load side of the RCD and EARTH terminal and the power supply side of the RCD with the supplied test leads. (Fig. 13-3)

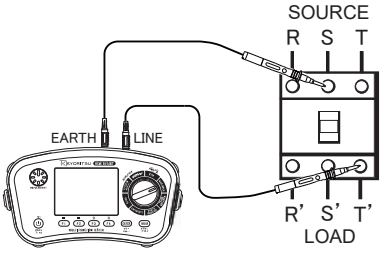


Fig. 13-3
Connection for Three-phase 3-Wire

Connection for Single-phase

Connect the LINE terminal of the instrument and the LINE of the load side of the RCD and EARTH terminal and the NEUTRAL of power supply side of the RCD with the supplied test leads.
(Fig. 13-4)

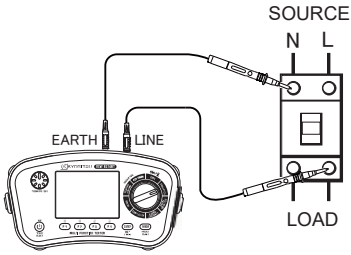


Fig. 13-4
Connection for Single-phase

When measuring RCD for Single-phase 3-Wire, connect the EARTH terminal of the instrument to the NEUTRAL of the power supply side of the RCD and the LINE terminal to the LINE (either is ok) of the load side of the RCD with the supplied test leads. (Fig. 13-5)

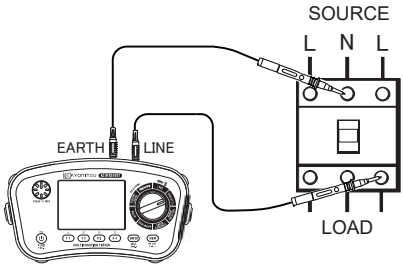


Fig. 13-5
Connection for Single-phase 3-Wire

Connection using EARTH
(earth electrode or protective conductor)

Connect the EARTH terminal of the instrument to the EARTH (earth electrode or protective conductor) and LINE terminal to the LINE of the load side of RCD.

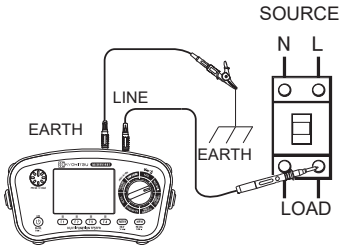


Fig. 13-6
Connection using EARTH

⚠ DANGER

Extra caution should be taken when applying current to EARTH for tests since the other RCDs (Fig. 13-7) may trip and damage the connected devices and cause accidents.

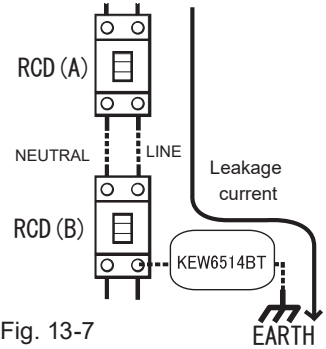


Fig. 13-7

(7) When connection completes, check the wiring check symbol on the LCD.
If the symbol indications don't match Fig. 13-8 or the LCD shows ⚠ symbol, the connection is not correct and needs to be corrected.
- The voltage between L and PE is always displayed on the LCD. Stop the measurement if the voltage displayed after making connection isn't normal value.

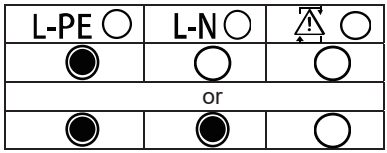


Fig. 13-8

(8) Press the test switch to start measurement.
- For ×1/2, ×1…Trip time of the RCD is displayed on the LCD respectively.
When the RCD doesn't trip, the LCD shows “>” symbol (out of range indication) and full-scale time.

Trip time varied depending on the type of RCDs and the time shall complies with the following table. The standard values of tripping time defined by IEC 61009 and IEC 61008 are listed in the table below for I△n and 5I△n.

Type of RCD	I△n(×1)	5I△n(×5)
General(G)	300 ms max allowed value	40 ms max allowed value
Selective(S)	500 ms max allowed value	150 ms max allowed value
	130 ms min allowed value	50 ms min allowed value

- At ×1/2 (rated residual non-operating current) test, RCD shall not trip.
- Ramp (▟)…The tripping current is displayed on the LCD.

(9) Press the F3 (0° /180°) switch to change phases and repeat step (8).

⚠ CAUTION

- If symbol appears on the LCD, it indicates that the test resistor has become hot, and the automatic cutoff circuit has been activated. Cool down the instrument before starting further measurements. The overheat protection circuit is to protect the test resistor from thermal damage.
- When the Uc voltage rises to UL value or greater, the measurement is automatically ceased and "Uc > UL" is displayed on the LCD.
- If the "I△n" setting is greater than the rated residual current of the RCD, the RCD may trip and "no" may be displayed on the LCD.
- If voltage exists between the protective conductor and earth, it may influence the measurements.
- If voltage exists between the neutral point and the earth, it may affect the measurement; therefore, the connection between the neutral point and the earth of the distribution system must be checked before starting a measurement.
- If leakage current flows into the circuit connected to the RCD, it may affect the measurement.
- The potential fields of other earth installations may influence the measurement.
- Special conditions of RCDs of a particular design, for example S-type, should be taken into consideration.
- When making measurement by using EARTH, the resistance of the probe (earth electrode) shall not exceed the resistance value specified in the column related to RCD described in 3.4 Operating uncertainty.
- Use of devices (e.g., capacitors or rotating machinery) connected to the RCD may significantly delay the trip time.
- Always reset the RCD to its original state after a test.

13.3 Auto test

Auto test is a function to perform ×1/2, ×1, and Ramp test automatically.

Follow the following procedure to perform the auto test.
(1) Press the F1 switch and select “AUTO” .
(2) Press the F2 switch and select “I△n” (rated residual current).
(3) Press the F3 switch and select the phase to apply measurement current first.
(When selecting “0° /180°” , measurement is performed for both phases.)
(4) Press the test switch to start auto test.
If the RCD tripped at the test, reset the tripped RCD (turn it back ON).
When a live circuit is detected, the following test starts automatically.
(5) The LCD show the result as follows.

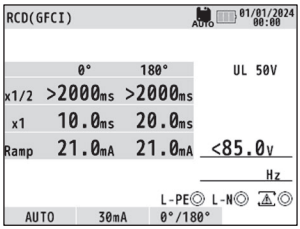


Fig. 13-9 Example of result display with 0° /180° setting

Test sequence differs according to the selected phase to be tested.

Phase setting (F3 switch)	Test sequence
0°	×1/2(0°)→×1(0°)→Ramp(0°)
180°	×1/2(180°)→×1(180°)→Ramp(180°)
0° /180°	×1/2(0°)→×1/2(180°)→×1(0°)→×1(180°)→Ramp(0°)→Ramp(180°)

14. EV charger (EVSE function)

Various tests required for electric installation can be performed on only one function (EVSE function). The performable measurements are not only insulation resistance, voltage, earth resistance, and RCD but also CP signal and latch lock measurement specially required for EV chargers.
This instrument can test normal EV charger only.
EVSE adapter KEW 8601 or KEW 8602 is required to connect with EV charger.

Press the F1 switch to toggle the test items in order: ①→②…→⑥→①.
① INSULATION (125V/250V)
② VOLTS
③ EARTH
④ CP
⑤ LATCH LOCKING
⑥ RCD

For the detail of ①, ②, ③, and ⑥, see clause 8, 9,11, and 13 in this manual.
As for the connection, refer to the instruction manual for KEW 8601 or KEW 8602.

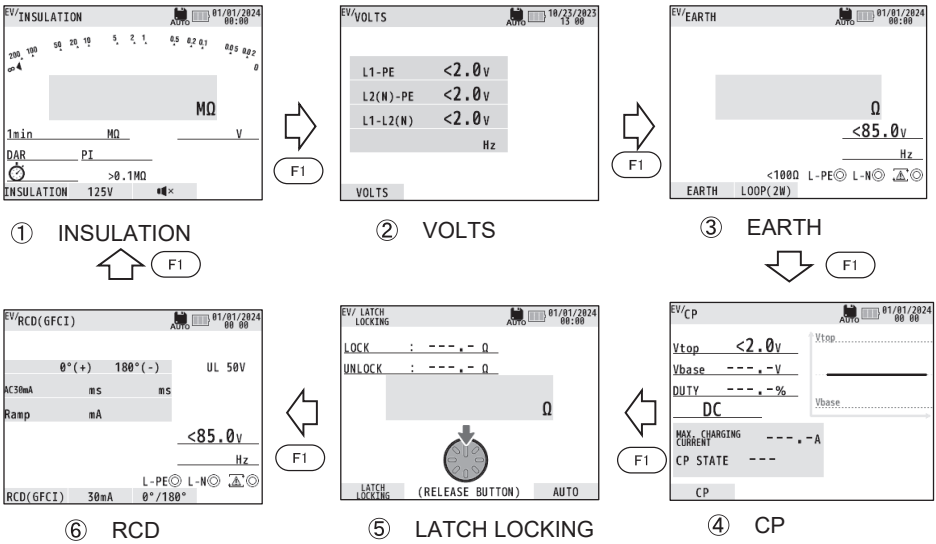


Fig. 14-1

14.1 CP signal (CP)

CP is the control pilot signal (or called as CP signal) for bi-directional communication between EV and EV charger. This signal is a square wave or pure sine waveform with frequency of 1 kHz. This instrument judges and indicates the max. charging current and CP STATE (EV state) according to the amplitude (max. Vtop and min. Vbase) of CP signal and Duty ratio.

• Measurement method

(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to "EVSE" position.

(2) Press the F1 switch and select "CP".

(3) Connect the test leads to the instrument as illustrated below.

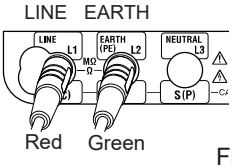


Fig. 14-2

LINE terminal Distribution Board test lead, Red (MODEL 7247)
EARTH terminal Distribution Board test lead, Green (MODEL 7247)

(4) Connect the test leads to CP and GND terminals of KEW 8601 or KEW 8602 respectively.
(For details, refer to the instruction manual for KEW 8601or KEW 8602.)

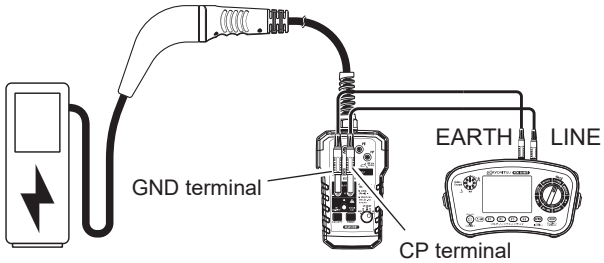


Fig. 14-3

(5) The LCD shows voltage, frequency, Duty ratio, max. charging current, and CP STATE.
When the voltage is DC, "DC" is displayed next to the frequency value.

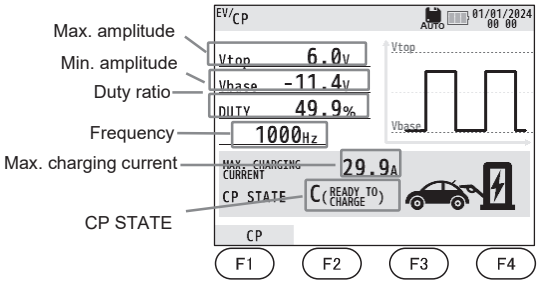


Fig. 14-4

• CP STATE is categorized in four states.
If Vtop and Vbase voltage values don't fall within any of the CP STATE range, the LCD shows ” --- “ instead of CP STATE.

MAX. CHARGING CURRENT A CP STATE A(NOT CONNECTED)	Electric vehicle not connected
MAX. CHARGING CURRENT 30.0A CP STATE B(CONNECTED)	Electric vehicle connected
MAX. CHARGING CURRENT 29.8A CP STATE C(READY TO CHARGE)	Electric vehicle connected, ready to charge (ventilation not required)
MAX. CHARGING CURRENT 29.7A CP STATE D(READY TO CHARGE)	Electric vehicle connected, ready to charge (ventilation required)

14.2 Latch locking test

EV chargers have features to monitor the connection and disconnection of the charging cable to prevent accidental disconnection of cable during charging and to prevent theft. To monitor the connection and disconnection of charging cable, the instrument measures circuit resistance of the latch switch of the charging cable. According to the measured circuit resistance, it is possible to confirm that the latch switch is in lock or unlock state.

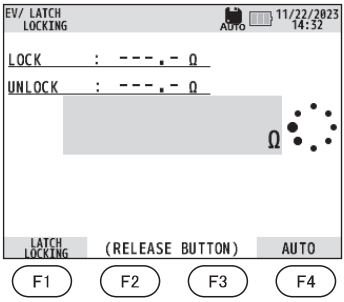


Fig. 14-5

F1	-
F2	-
F3	-
F4	Switches “AUTO” and “MANUAL”.

• Measurement method
(1) Press the POWER switch and turn on the instrument. Turn the rotary switch and set to EVSE position.
(2) Press the F1 switch and select “LATCH LOCKING”.
(3) Connect the test leads to the instrument illustrated below.

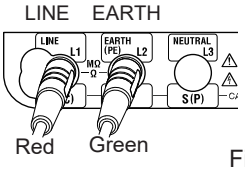


Fig. 14-6

LINE terminal Distribution Board test lead, Red (MODEL 7247)
EARTH terminal Distribution Board test lead, Green (MODEL 7247)

(4) Press the F4 switch and select “AUTO” or “MANUAL”.
At the latch locking test, resistance of the circuit under test is measured in order: when the latch switch is locked and then unlocked.
- When selecting “AUTO” , the instrument starts measurement automatically: there's no need to press the test switch.
- When selecting “MANUAL” , a press of test switch is required to start a measurement.

(5) Connect the test leads to PP and PE terminals of KEW 8601 respectively.

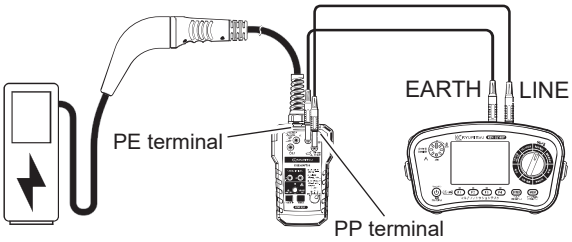


Fig. 14-7

(6) Press the test switch.
The instrument starts measurement and displays the circuit resistance of the locked latch switch.

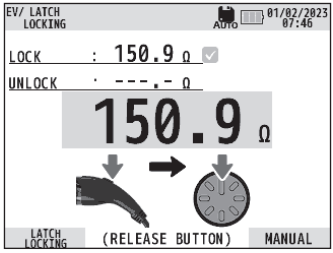


Fig. 14-8

If you wish to stop and redo the latch locking test, press the ESC switch. A press of ESC switch can stop the measurement and re-start the measurement.

(7) Unlock the latch switch and press the test switch. When selecting “AUTO” , there's no need to press the test switch. (Measurement automatically resumes when the latch switch is unlocked.) The displayed value is the resistance measured when the latch switch is unlocked.

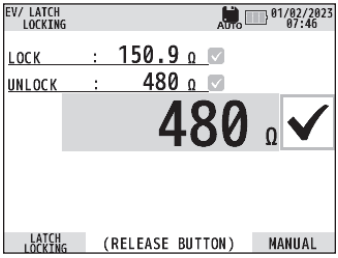


Fig. 14-9

• Auto test starts when the following conditions are satisfied.
  * when the resistance varies ±50 Ω or more from the resistance value measured at the lock of latch switch, or
  * when there's no variation of ±50 Ω or more for 10 seconds.

14.3 EVSE programmable autotest

It is possible to program the combination and sequence of six types of measurements which are available on EVSE function and perform a series of tests as programmed.

• Test is performed according to the program: in the programmed sequence.
  The LCD shows Help screen for the first measurement -> The first measurement is performed. -> Help screen for the second measurement -> Second measurement -> …
  Display of Help screen can be set to ON/ OFF via the application.

• Program can be set up by using the special application for tablet devices.
  The number of programmable measurements is up to 10. (Repeating the same measurement multiple times is also possible.)

15. Memory function

Measured results on each function can be saved in the internal memory. (1000 results max.)

Data can be saved by either of the following two methods.
(1) Manual data save : Press the MEM switch after a measurement and save the data.
(2) Auto memory function : No need to press the MEM switch. Measured data is saved automatically after a measurement.

Auto memory function can be set to ON or OFF on the SETUP screen.

|⚑ symbol

(1) Flag symbol |⚑ is attached and displayed for the manually saved data.
Data with |⚑ symbol aren't overwritten even if auto memory function is set to ON.
Data No. is assigned to new save data automatically in ascending order but the Data No. with |⚑ symbol is skipped.
(2) The flag symbol |⚑ isn't attached to the data saved by using auto memory function.
Data without |⚑ symbol is overwritten by the new save data with the same Data No.
(3) It is possible to set the |⚑ symbol to the data after saving respectively.
Pressing the F4 switch on the data recall screen can put on or off this flag symbol.

15.1 Manual data save

Measured data can be saved by the following method.
(Press the ESC switch to back to the previous screen.)

(1) Start with the screen on which the measured value is held after measurement. (Fig. 15-1)
(Voltage measurement is being performed in the background.)
(2) Press the MEM switch (less than 1 sec.) and switch the screen to memory screen. (Fig. 15-2)
(3) Set the DATA No. if necessary. (Fig. 15-2)
DATA No. is automatically assigned in ascending order.
If you wish to assign specific DATA No., another setting is required.
• In this case, if the existing DATA No. is entered and saved, the data with the same DATA No. previously saved is overwritten.
When there's no need to change the automatically assigned DATA No., go to step (4).

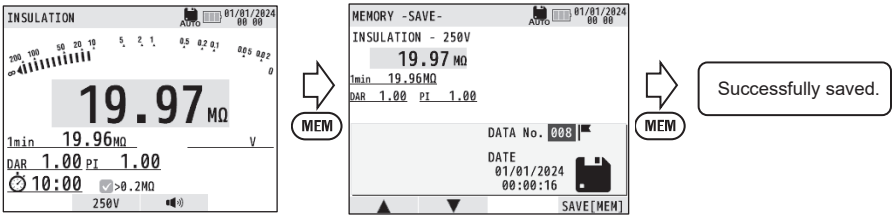


Fig. 15-1 Fig. 15-2

Press the ENTER switch and highlight the DATA No., and then press the F1(▲) or F2(▼) switch to change the DATA No. and confirm it with the ENTER switch.
The selectable DATA No. is from 000 to 999.

(4) Press the F4 or MEM switch to save the data.

15.2 Auto memory function

With this function, measured results are automatically saved in the internal memory. While this function is set to ON, “AUTO” mark is displayed at the upper area of the LCD.

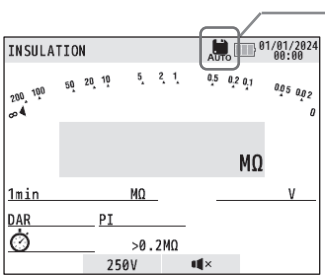


Fig. 15-3

Data is saved at the timing as listed below.

Function		Condition
CONTINUITY		End of measurement.
INSULATION/ SPD		
EARTH		
RCD		
EVSE	INSULATION	
	VOLTS	A short press of the test switch.
	EARTH	End of measurement.
	CP	A short press of the test switch.
	LATCH LOCKING	End of measurement.
	RCD	
VOLTS		A short press of the test switch.
PHASE ROTATION/ MOTOR ROTATION		

- At Latch locking test on EVSE function, data is saved only after completion of the latch locking test - from the start of latch lock measurement to the end of unlock measurement.

15.3 How to recall save data

Measured data can be recalled according to the following procedures.
(Press the ESC switch to return to the previous screen.)

(1) Hold down (1 sec. or longer) the MEM switch in the stand-by mode. (Fig. 15-4)
The LCD shows the list of the save data. (Fig. 15-5)
(2) Press the F1(▲) or F2(▼) switch and select the data you wish to check and press the ENTER switch.
(3) The selected data is displayed. (Fig. 15-6)
(4) Press the ESC switch twice to return to the measurement screen.

Pressing the F4 switch on the data recall screen (Fig. 15-6) can put on or off the flag symbol.

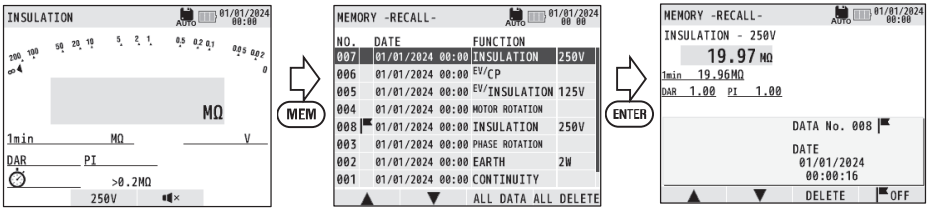


Fig. 15-4 Fig. 15-5 Fig. 15-6

15.4 How to delete data

Save data can be deleted according to the following procedures.
(1) Follow the steps from (1) to (3) described in "How to recall save data" to display the data you wish to delete.
(2) Press the F3 switch. Then the following confirmation message is displayed on the LCD. Another press of the F3 switch deletes the selected data.
To cancel the deletion, press the ESC switch while the confirmation message is being displayed and return to the previous screen.

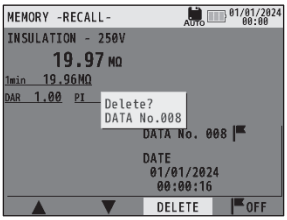


Fig. 15-7

(3) To delete all data, follow the step (1) described in "How to recall save data" and display the list of save data on the LCD.
Press the F4 switch. Then the following confirmation message is displayed on the LCD. Another press of the F4 switch deletes all data.
To cancel the deletion, press the ESC switch while the confirmation message is being displayed and return to the previous screen.

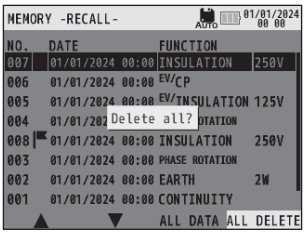


Fig. 15-8

16. How to transfer the save data

The internal memory data can be transferred to PC by using USB adapter MODEL 8212USB or via Bluetooth communication.

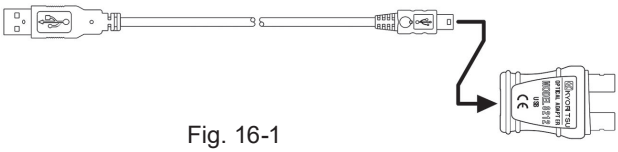


Fig. 16-1

MODEL 8212USB

The saved data can be transferred by either of the following methods.

1. Data transfer by using MODEL 8212USB
   (1) Download "KEW Report2" and the driver for MODEL 8212USB from our website and install them in your PC before starting data transfer.
   (2) Disconnect the test leads from the instrument.
   (3) Insert the plug of MODEL 8212USB into the USB terminal into the USB terminal of your PC.
   (4) Connect MODEL 8212USB to the instrument as shown in Fig. 16-2.
   (5) Turn on the instrument. (Any function is ok.)
   (6) Run "KEW Report2" and click "Download". The save data will be downloaded from the internal memory to the PC. For further details, refer to HELP of "KEW Report2".

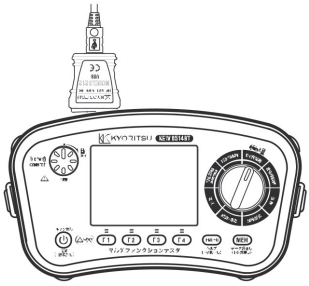


Fig. 16-2

2. Data transfer via Bluetooth
   (1) Download and install "KEW Report2" in your PC before starting data transfer.
   (2) Turn on the Bluetooth connection on your PC.
   (3) Disconnect the test leads from the instrument.
   (4) Power on the instrument. There's no need for concern about the position of the rotary switch: any function is ok.
   (5) Run "KEW Report2" and click "Download". The save data will be downloaded from the internal memory to the PC. For further details, refer to HELP of "KEW Report2".

17. Bluetooth communication function

17.1 Bluetooth communication

This instrument has a Bluetooth communication function and can perform data communicate with Android/ iOS tablet devices.
Before starting to use this function, install the special application "KEW Smart Advanced" in your tablet device. Then you can check the measurement result not only on site but also in a remote place.

To use this function, connect the tablet device to the internet and download the application "KEW Smart Advanced". Some functions are available only while connected to the internet. For further detail, please refer to "17.2 KEW Smart Advanced".

⚠ WARNING

Radio waves at Bluetooth communication may affect the operations of medical electronic devices. Special care should be taken when using Bluetooth connection in the areas where such devices are present.

Cautions:

- Using the instrument or tablet devices near wireless LAN devices (IEEE802.11.b/ g) may cause radio interferences, lowering of communication speed, resulting in significant time lag in the display update rate between the instrument and tablet device. In this case, keep the instrument and the tablet device away from the wireless LAN devices, or turn off the wireless LAN devices, or shorten the distance between the instrument and the tablet device.
- It may be difficult to establish communication connection if either the instrument or tablet device is in a metal box. In such a case, change the measurement location or remove the metal obstacle between the instrument and the tablet device.
- If any leaking of data or information occurs while making a communication using Bluetooth function, we assume no responsibility for any released content.
- Some tablet devices, even if the application runs properly, may fail to establish communication with the instrument. Please use another tablet device and try to communicate with. If you still cannot confirm the connection, there may be some problem with the instrument unit. Please contact your local KYORITSU distributor.
- The Bluetooth word mark and logos are owned by Bluetooth SIG, Inc. and we, KYORITSU, are licensed by them for use.
- Android, Google Play Store, and Google Maps are the trademark or registered trademark of Google Inc.
- iOS is the trademark or registered trademark of Cisco.
- Apple Store is the service mark of Apple Inc.
- In this manual, the "TM" and " ® " marks are omitted.

Contain FCC ID: SH6MDBT42Q
Contain IC ID : 8017A-MDBT42Q
CCAM16LP1180T2
R 201-160496

17.2 Feature of KEW Smart Advanced

It is possible to check the measurement result from a distant place with your tablet devices by installing the special application "KEW Smart Advanced" in your tablet device.

The special application "KEW Smart Advanced" is available on download site for free: Google Play Store for Android device and App Store for iOS devices. (An Internet access is required.) Please note that communication charge is incurred separately for downloading applications and using special features of them. For your information, "KEW Smart Advanced" is provided on-line only.

Features of "KEW Smart Advanced":

- Remote monitoring/ checking
- Data save/ recall function
- Map display
  Measured locations can be checked on the Google Maps if the saved data includes GPS location info.
- Comment editing
  Measured result can be saved with comments.
  The latest information about "KEW Smart Advanced" can be checked with the site on Google Play Store or App Store.
- Settings of KEW 6514BT
  It is possible to change various settings: ON/ OFF of each function, limitation of measurement function, and reference value of comparator function.

The following setting items are available.

(1) Date and Time setting (changeable from the setup menu)
(2) Download of internal memory data
(3) Measurement restriction on each function
(4) Safety lock setting (Insulation resistance)
(5) Change of over-range limit value (Insulation resistance)
(6) Change of reference value on comparator function (Continuity/ Earth/ Insulation resistance)
(7) Testing duration setting (RCD test) * ×1/2 range only
(8) Number of test items/ sequence/ Help display settings (EVSE test)

Please note that the above listed items may be changed according to the version upgrade of application.

18. Battery and fuse replacement

⚠ DANGER

- Do not open the battery compartment cover if the instrument is wet.
- Do not replace batteries during a measurement. To avoid getting electrical shock, power off the instrument and disconnect all test leads before replacing batteries or fuse.
- The battery compartment cover must be closed and screwed before making measurement.
- Fuse for replacement shall be the one rated to 500 mA/ 600 V.

18.1 Battery replacement

Replace batteries with new ones when the battery indicator is "▭": battery level is almost empty.

⚠ CAUTION

- Do not mix new and old batteries nor different types of batteries.
- Install batteries in correct polarity as marked inside.

(1) Power off the instrument and disconnect all test leads from the terminals.
(2) Unscrew two screws and remove the battery compartment cover. (Fig. 18-1)
(3) Replace all eight batteries with new ones at once. Observe correct polarity when inserting new batteries. Use of size AA Alkaline battery (LR6) is recommended.
(4) Attach the battery compartment cover and secure it with two screws.

Date and time setting will be cleared if no batteries were inserted in the instrument 10 min. or longer. When battery replacement is required, be careful not to exceed this period. If the date and time setting is cleared and restored to the default, please do the setting again.

18.2 Fuse replacement

The continuity measurement circuit is protected by the HRC ceramic type fuse situated in the battery compartment.
Fuse: F 500 mA, 600 V (Φ6.3 × 32 mm)
SIBA 7009463.0,5

- Procedures
  (1) Power off the instrument and disconnect all test leads from the terminals.
  (2) Unscrew two screws and remove the battery compartment cover. (Fig. 18-1)
  (3) Replace the fuse with new one and check for continuity with another tester. If the fuse has been blown, replace it with the spare fuse.
  (4) Attach the battery compartment cover and secure it with two screws.

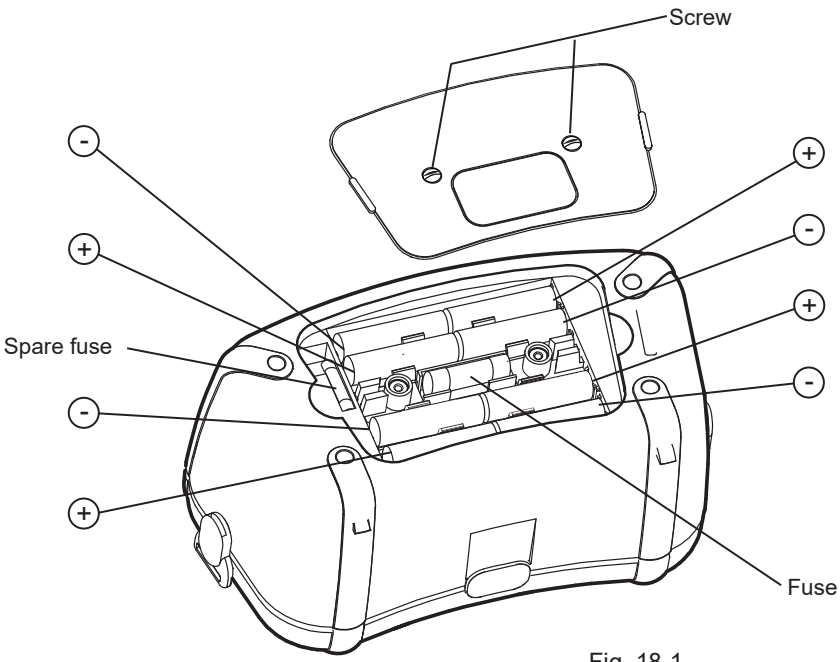
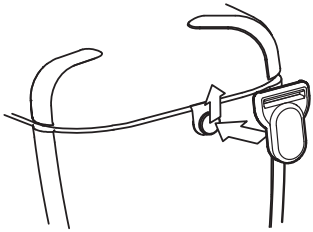


Fig. 18-1

19. Strap belt assembly

Attach the strap belt according to the following procedures. By hanging the instrument around the neck, both hands will be left free for testing.

(1) Attach the Buckle to KEW 6514BT as shown in Fig. 19-1.



Match the hole of the Buckle and the protrusion at the side face of KEW 6514BT and slide it upwards.

Fig. 19-1

(2) Let the shoulder pad through the strap belt.

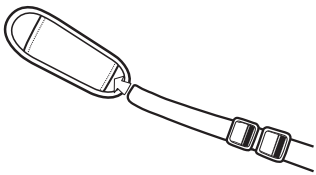


Fig. 19-2

(3) Pass the strap belt down through the buckle from the top, and up.

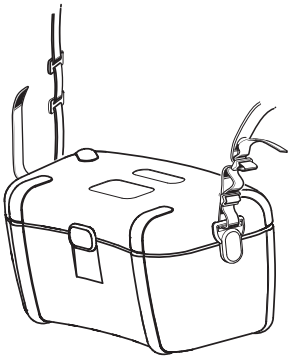


Fig. 19-3

(4) Pass the strap through the buckle, adjust the strap for length and secure.

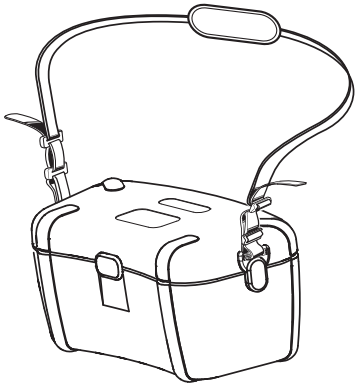


Fig. 19-4

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KYORITSU ELECTRICAL INSTRUMENTS WORKS, LTD.

2-5-20,Nakane, Meguro-ku,
Tokyo, 152-0031 Japan
Phone: +81-3-3723-0131
Fax: +81-3-3723-0152
Factory: Ehime,Japan

www.kew-ltd.co.jp