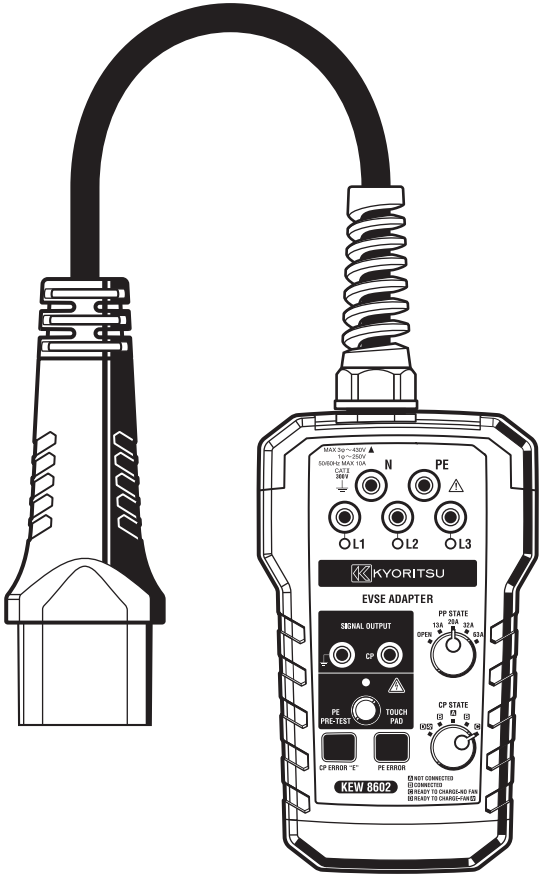
Instruction manual



EVSE ADAPTER

KEW 8602

KYORITSU ELECTRICAL
INSTRUMENTS WORKS, LTD.

Contents

1. Unpacking

Thank you for purchasing our EVSE adapter KEW 8602.
The following table is a list of the items included with the instrument.

1	Instrument	KEW 8602 x1
2	Carrying case	MODEL 9202 x1
3	Instruction manual	x1

2. Safety precautions

This instrument has been designed, manufactured, and tested according to IEC 61010: Safety requirements for electrical equipment for measurement and delivered in the best condition after passing quality control tests.
This instruction manual contains warnings and safety rules which must 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 instructions contained in this manual before starting to use 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 instructions may cause injury, instrument damage and/or damage to the equipment under test. KYORITSU is by no means liable for any damage resulting from the instrument in contradiction to these cautionary notes.

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 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.
- Never open the fuse compartment cover during a measurement.
- The instrument should be used only in its intended applications or Conditions: otherwise, safety functions equipped with the instrument don't work, and instrument damage or serious personal injury may be caused.
- Verify proper operation on a known source before use or take actions as a result of the indication of the instrument.

⚠ WARNIG

- Do not use the instrument or test leads if any abnormal conditions, such as broken cover or exposed metal parts are noted.
- Never install substitute parts or make any modifications to the instrument.
  Send the instrument to your local KYORITSU distributor for repair or recalibration.
- Stop using the test lead if the outer jacket is damaged and the inner metal or color jacket is exposed.
- Before opening the fuse compartment cover for fuse replacement, ensure that no test leads are connected to the instrument.

⚠ CAUTION

- Use a slightly damp cloth with neutral detergent or water for cleaning. Do not use abrasives or solvents.
- This instrument isn't waterproof. Do not let the instrument get wet. Otherwise, it may cause malfunction.
- If the instrument is wet, make sure to let it dry before putting it into storage.

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

Symbols

	User must refer to the explanations in the instruction manual for safety purpose.
	AC
	Double or reinforced insulation
	(Functional) Earth terminal
	Crossed-out wheel bin symbol (according to WEEE Directive: 2002/96/EC) indicating that this electrical product may not be treated as household waste, but that it must be collected and treated separately.

3. Features

This adapterKEW8602, simulating an EV (Electric Vehicle), can be used for interfacing the EV charge stations, commonly named EVSE (Electric Vehicle Service Equipment), and performs operation check and electrical safety tests of EVSE.
In combination with a Multi-Function tester (not included), this adapter also allows to carry out various electrical installation safety tests from the EVSE socket.
KEW 8602 can test EVSE with TYPE 2 plug. When you test EVSE with TYPE 1 plug, optional adapter (KEW 8603) is required.

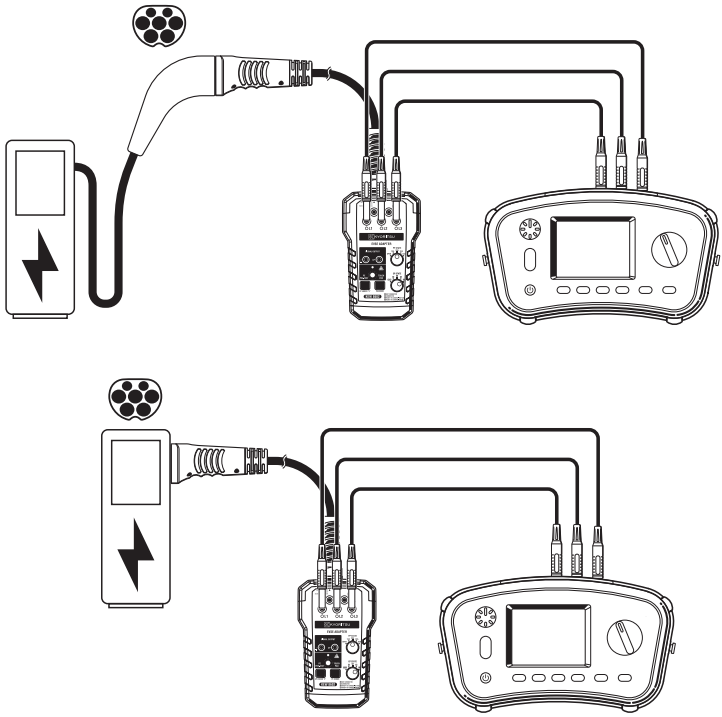


Fig.3-1

Examples of connection: to an EVSE with cable or to an EVSE without cable
Note: This adapter is designed for testing the EVSE Mode 3 for AC charging only.

Available functions:

●Pre-Test
verifies that there is no presence of dangerous voltage at the grounded PE terminal.

●CP (Control Pilot) state check
varies Control Pilot signal (resistance between CP-PE) to simulate various vehicle states (A/B/C/D) for EVSE operation check.

●PP (Proximity Pilot) state check
varies Proximity Pilot signal (resistance between PP-PE) to imitate various charge cables with different ratings for EVSE operation check.

●CP (Control Pilot) signal error simulation
simulates the state that CP signal short-circuited to PE and confirm that EVSE stops AC power flow.

●PE (Earth fault) Error simulation
simulates an interruption of PE conductor and confirm that EVSE stops AC power flow.

● Phase voltage check LED
indicates the phase voltage of charge plug of EVSE.

●CP (Control Pilot) signal output terminal
is connected to an oscilloscope to analyze Control Pilot signal.

●Measuring terminal and mains socket
are available for various installation tests.
(Mains socket is dedicated to test EVSE connected to single phase supply.)

4. Instrument layout

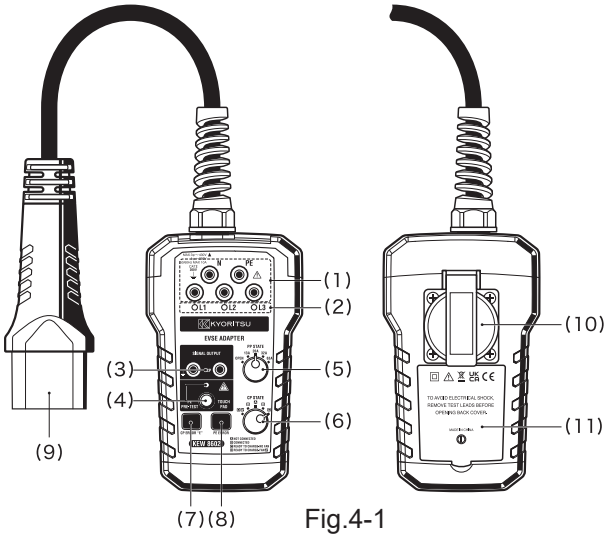


Fig.4-1

General descriptions

	Name	Description
(1)	Measuring terminals	Input terminals for measuring equipment connection (N, PE, L1, L2, and L3)
(2)	Live LED	Phase indicator LEDs for L1, L2, L3 terminals
(3)	CP signal output terminal	Output terminal (CP, PE) for CP (Control Pilot) signal check
(4)	Touch pad / Pre-Test warning LED	Touch pad for Pre-Test/ Warning LED to indicate Pre-Test result
(5)	PP state selector	PP (Proximity Pilot) state rotary switch selector (OPEN, 13A, 20A, 32A, 63A)
(6)	CP state selector	CP (Control Pilot) state rotary switch selector (A, B, C, D)
(7)	CP error simulation button	CP (Control Pilot) signal error simulation button
(8)	PE error simulation button	PE (Earth Fault) interruption error simulation button
(9)	EVSE connection plug	TYPE 2 plug connector to connect with EVSE
(10)	Mains socket	For measurement instrument and load connection (Particularly useful in case of Single phase EVSE)
(11)	Fuse compartment cover	Cover for fuse compartment

5.Test procedures

5.1Connection

Connect EVSE connection plug of KEW 8602 to an EVSE to be tested (with or without cable as the following examples).

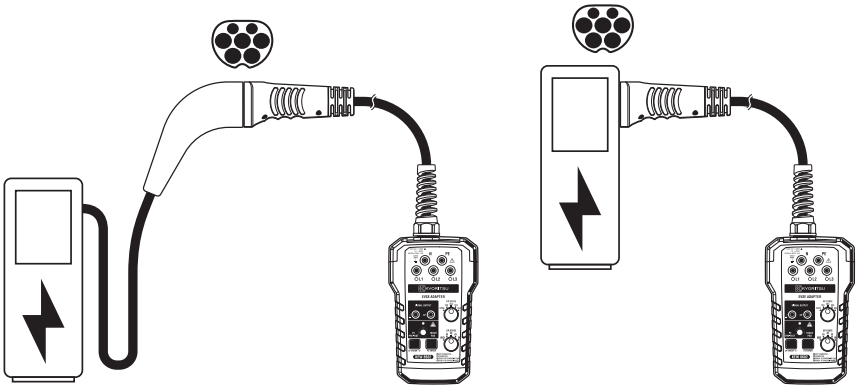


Fig.5-1

5.2 Pre-Test

After connected with the EVSE under test, touch the touch pad (4) with a bear finger. Normally the PE conductor is connected to ground and has no voltage to ground. If a dangerous high voltage is present at the PE conductor, Pre-Test warning LED (4) lights up. In such a case, stop further testing immediately and check the wiring connections. (e.g.: The PE conductor isn't connected to ground or is connected to phase by mistake.)

* Pre-Test must be conducted prior to other tests.
* Touch the touch pad with a bare finger. Do not wear insulated gloves.

Ensure a proper connection to the ground (though your shoes), otherwise, warning indication with (4) Pre-Test warning LED may not be reliable.

Fig.5-2

5.3CP (Control Pilot) state check

Switch the CP state selector (6) to simulate various vehicle state (A/B/C/D) and check the behavior of EVSE.

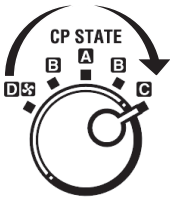


Fig.5-3

1) Set the CP state selector (6) to position “A” (car not connected) and connect KEW 8602 to EVSE.
2) Turn and set the CP state selector (6) to position “B” (car connected).
   (The EVSE under test may require payment information.)
3) Turn and set the CP state selector (6) to position “C” (car charging) or “D” (car charging with ventilation).
   Confirm that EVSE is ready for charging.
   The phase indicators are LEDs, one LED for each phase. When phase voltages are present at the EVSE, the LED indicators will light up.
   * LED L1 lights up when testing a single-phase circuit and LEDs L1/ L2/ L3 light up for a three-phase circuit.
   * In the case where the circuit under test doesn’t have a neutral wire, no LED light up.
   * If the EVSE isn’t ready for charging, turn the CP selector (6) to “A” and wait for a few minutes. Then turn the CP selector (6) to position C or D.

Vehicle states are simulated with different resistances connected between CP and PE conductors. Correlation between resistance and vehicle state is shown in Table 1.

Table 1
Resistance between CP-PE and CP terminal voltage depending on vehicle states

Vehicle State	State Description	CP-PE Resistance	CP terminal voltage
A	Electric vehicle not connected	Open	±12V (1kHz)
B	Vehicle connected, not ready to charge	2.74kΩ	+9V/-12V (1kHz)
C	Electric vehicle connected, ready to charge, ventilation not required	882Ω	+6V/-12V (1kHz)
D	Electric vehicle connected, ready to charge, ventilation required	246Ω	+3V/-12V (1kHz)

5.4PP (Proximity Pilot) state check

Switch the PP state selector (5) to check the behavior of EVSE with various cable current ratings.

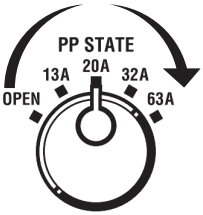


Fig.5-4

Rated currents are simulated with different resistances connected between PP and PE conductors. Correlation between resistance and rated current is shown in Table 2.

Table 2 Resistance between PP and PE depending on cable current rating

Cable current rating	Resistance between PP and PE
No cable	Open
13A	1.5kΩ
20A	680Ω
32A	220Ω
63A	100Ω

5.5CP (Control Pilot) signal error simulation

With a press of CP error simulation button (7) can simulate the behavior of EVSE where there's a short-circuit between CP and PE conductors.

1) Turn and set the CP state selector (6) to position "C" (car charging) or "D" (car charging with ventilation).
2) Turn the PP state selector (5) to any position other than OPEN.
3) Press the CP error simulation button (7) and confirm the charging process is aborted and further charging is prevented.

Fig.5-5

5.6 PE (Earth fault) error simulation

With a press of PE error simulation button (8) can simulate the interruption of the PE conductor (or unconnected state).

1) Turn and set the CP state selector (6) to position “C” (car charging) or “D” (car charging with ventilation).
2) Turn the PP state selector (5) to any position other than OPEN.
3) Press the PE error simulation button (8) and confirm the charging process is aborted and further charging is prevented.

Fig.5-6

5.7 Various tests with measuring instrument (MFT)

The following tests can be performed in combination with a Multi-Function tester (KEW 6516/6516BT, not included).

① Volt, Frequency, Phase rotation (for 3 Phase EVSE)
② Continuity of protective earthing conductor (PE)
③ Insulation resistance
④ Loop / line impedance
⑤ RCD test
⑥ Earth resistance test(3W or 2W Test)

For the details of these tests, please refer to the specification of the EVSE to be tested, instruction manual for KEW 6516/6516BT, IEC 60364-6, and IEC 60364-7-722 Standards.

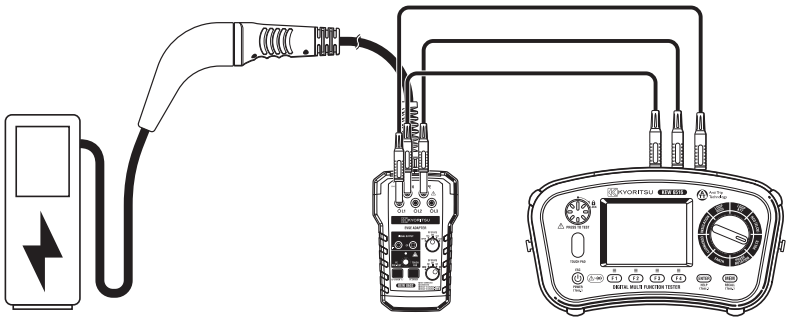


Fig.5-7

KEW 6516/6516BT

Possible example of performable tests:
① Volt, Frequency, Phase rotation (for 3 Phase EVSE)

(1) VOLT (Single-phase)

1) Turn and set the CP state selector (6) to position “C” (car charging) or “D” (car charging with ventilation).

Select VOLTS range on KEW 6516/6516BT.

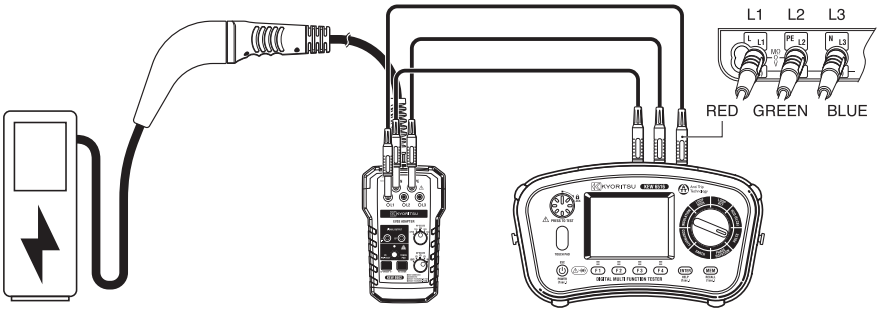


Fig.5-8 KEW 6516/6516BT

(2) VOLT (3 phase 4 wires) and phase rotation

Turn and set the CP state selector (6) to position “C” (car charging) or “D” (car charging with ventilation).

Select Phase Rotation range on KEW 6516/6516BT.

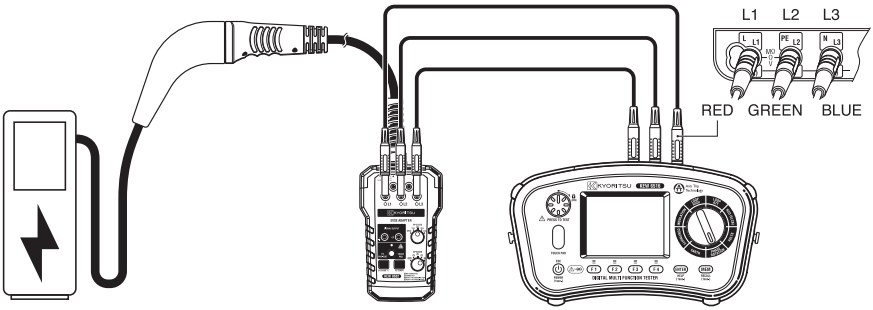


Fig.5-9 KEW 6516/6516BT

② Continuity of protective earthing conductors (PE)
Turn and set the CP state selector (6) to position “B”.

Select CONTINUITY range on KEW 6516/ 6516BT and check for continuity of the PE conductor, see a possible example of PE test:

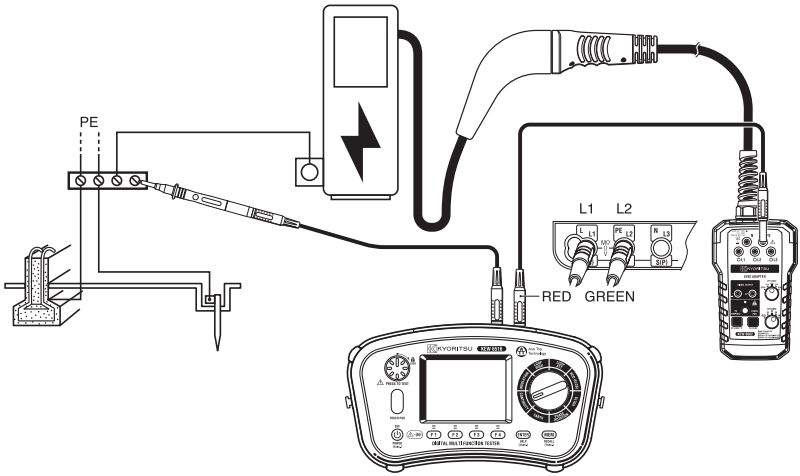


Fig.5-10

③ INSULATION RESISTANCE
Turn and set the CP state selector (6) to position “B”.

Select INSULATION range on KEW 6516/ 6516BT and ensure that EVSE isn’t energized and then measure insulation resistance between line terminal(s) and PE conductor respectively.

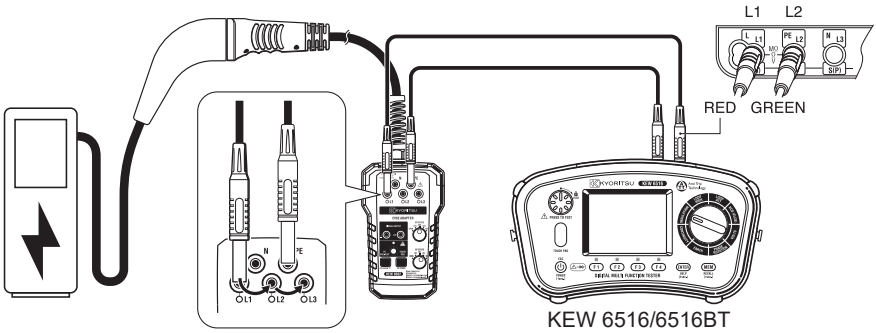


Fig.5-11

④ Loop / line impedance

Turn and set the CP state selector (6) to position “C” (car charging) or “D” (car charging with ventilation).

(1) LINE-EARTH LOOP IMPEDANCE measurement

Select LOOP ATT on KEW 6516/ 6516BT and connect to measuring terminals: L, N, and PE to conduct 3-wire LOOP impedance test.

When you test three-phase EVSE, test needs to be performed at L1, L2, and L3 terminals respectively.

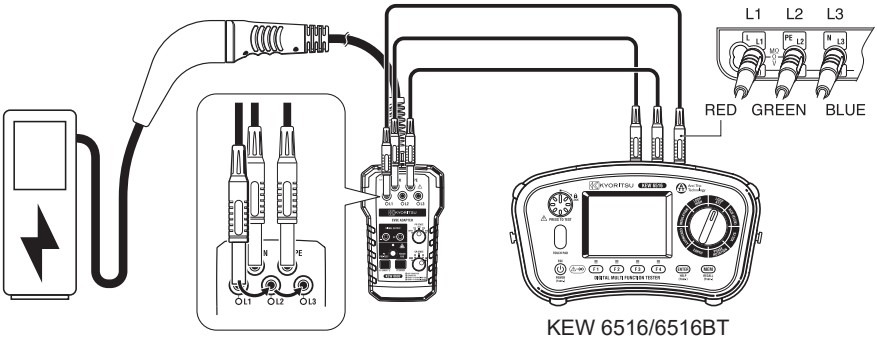


Fig.5-12

(2) LINE-NEUTRAL LINE-LINE LOOP IMPEDANCE measurement

Select LOOP HIGH on KEW 6516/ 6516BT to conduct 2-wire LOOP impedance test. Measurements of L-N LOOP and three-phase line LOOP can be performed. When you test three-phase EVSE, test needs to be performed at L1, L2, and L3 terminals respectively.

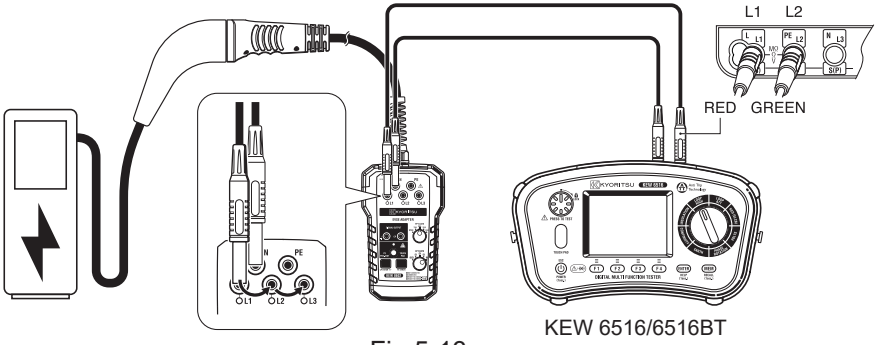


Fig.5-13

⑤ RCD test

Turn and set the CP state selector (6) to position “C” (car charging) or “D” (car charging with ventilation).

Prior to RCD test, check the type of RCD installed in the EVSE under test.
(IEC 60364-7-722 standard states that EVSE should have Type B, Type A or Type FRCDs, and a residual direct current detecting device (RDC-DD) complying with IEC 62955.)
KEW 6516/6516BT can test above RCDs: Type A, B, F and also the test on dedicated EV type RCD (30mA AC +DC 6mA), and AC type too.

Select RCD(ELCB) range on KEW 6516/ 6516BT and make settings according to the RCD to be tested and the rated sensitive current before starting a test.

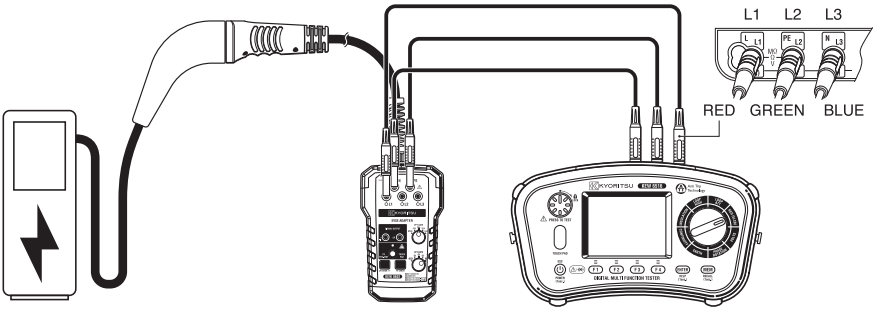


Fig.5-14

⑥ Earth resistance test (3Wire or 2Wire test)

(1) 3-wire test

In case the measuring of the earth resistance of the electrical installation which supplies the EVSE under test is needed, Select EARTH range on KEW 6516/ 6516BT and the 3-wire test.

See a possible example of Earth resistance test with 3 Wire:

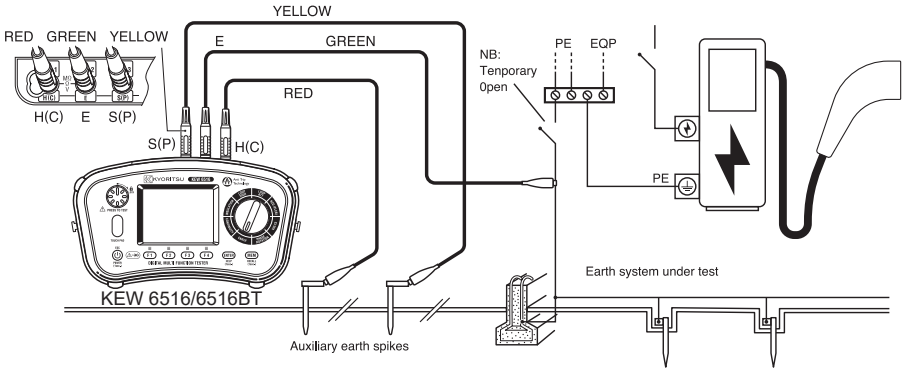


Fig.5-15

(2) 2-wire test

If sticking auxiliary earth spikes into ground is impossible, a simplified earth testing method with 2-wire can be performed by KEW 6516/ 6516BT using the neutral conductor of the power supply. Select EARTH range to perform 2-wire test. See a possible example of Earth resistance test with 2-wire method:

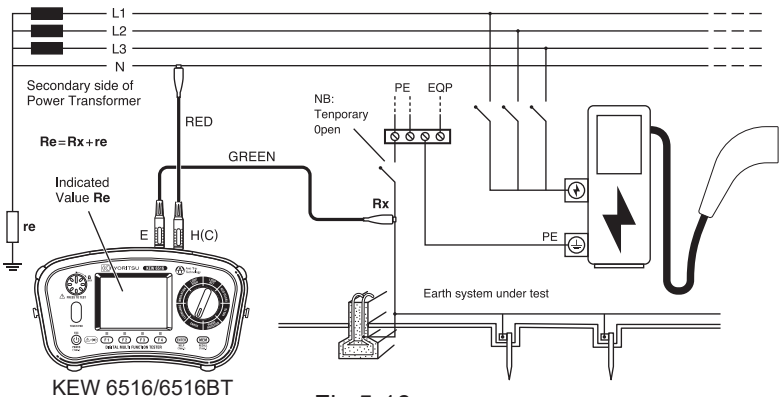


Fig.5-16

⚠ Safety Warnings for 3-wire and 2-wire Earth resistance tests.

-As the main earth conductor has to be temporarily disconnected (just for the earth test), to avoid possible risk of electric shock always use safety glows and switch OFF the power supply prior to disconnect the main earth conductor.

The power supply should only be restored after having reconnected the main earth conductor.

-Before connecting the instrument be sure there is not any dangerous voltage between the neutral conductor and the PE (for 2-wire method only).

-Please be sure such 2-wire method is accepted by your local authorities and electrical installation testing Standard.

5.8 CP (Control Pilot) signal output check

Checking the waveform and amplitude of the CP signal are possible with the connection of CP signal output terminals (3) and an oscilloscope (not included).

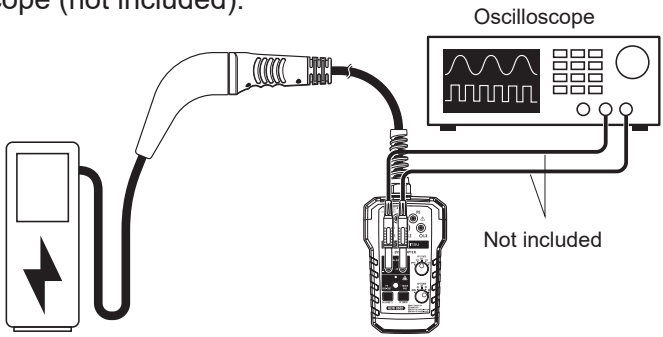


Fig.5-17

CAUTION: NEVER apply any voltage to the CP signal output terminals otherwise the KEW8602 and the EVSE may be seriously damaged!

These terminals are outputs for CP signal only, not voltage inputs!

Duty cycle of Control Pilot signal indicates the state of EVSE or allowable max. charging current. Table 3 shows correlation between duty cycle and max. charging current.

Table 3: Correlation between duty cycle and max. charging current

Nominal duty cycle interpretation by vehicle	Maximum current to be drawn by vehicle
Duty cycle < 3%	Charging not allowed
3% ≦ duty cycle ≦ 7%	Indicates that digital communication will be used to control an off-board DC charger or communicate available line current for an on-board charger. Digital communication may also be used with other duty cycles. Charging is not allowed without digital communication. 5% duty cycle shall be used if the pilot function wire is used for digital communication.
7% < duty cycle < 8%	Charging not allowed
8% ≦ duty cycle < 10%	6A
10% ≦ duty cycle ≦ 85%	Available current =(% duty cycle) x 0.6A
85% < duty cycle ≦ 96%	Available current =(% duty cycle - 64) x 2.5A
96% < duty cycle ≦ 97%	80A
Duty cycle > 97%	Charging not allowed
If the PMW signal is between 8% and 97%, the maximum current may not exceed the values indicated by the PMW even if the digital signal indicates a higher current.	

6. Fuse replacement

⚠ WARNING

- To avoid electrical shock, disconnect the adapter from the circuit under test (no cables shall be connected with).
- Always close the fuse compartment cover during measurement.
- Use the specified fuse so as not to damage the adapter.

(1) Remove all cables from KEW 8602.
(2) Loosen one fuse compartment cover-fixing screw and remove the cover.
(3) Remove the fuse (10A AC/ 250 V, time-delay type, Φ5 x 20 mm)
(4) Insert a new fuse.
(5) Attach the cover and tighten it with the screw.

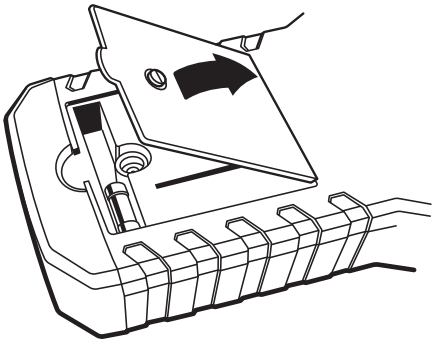


Fig.6-1

7. Specifications

- Rated voltage and : 250 V Max. (Single-phase) 430 V Max. (Three-phase)
- Rated Frequency : 50/60Hz
- Rating of mains socket : 250V/10A
- Fuse rating :10A AC /250V, Diameter 5x20mm
- Altitude : 2000 m or less
- Operating temp. & hum. range : 0 to 40ºC, RH 80 % or less (no condensation)
- Storage temp. & hum. range : -10to50ºC, RH 80 % or less (no condensation)
- Applicable standards : IEC / EN 61010-1, -2-030CATII 300V, IEC 60529 IP40
- Cable length : Approx. 250 mm
- Dimension : KEW 8602 (excluding the plug part)
  172(L)×105(W)×57(D)mm
  Plug part
  175(L)×60(W)×53(D)mm
- Weight : Approx. 840g
- Accessories : Instruction manual x 1
  Carrying case MODEL9202 x 1
  Fuse MODEL 8930 x 1
- Optional accessory : KEW 8603(TYPE 1 ->TYPE 2 CONVERSION ADAPTER)

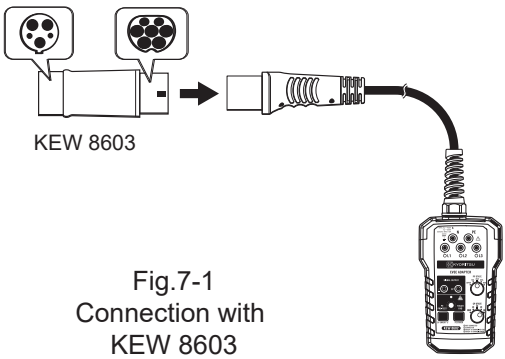


Fig.7-1
Connection with
KEW 8603

DISTRIBUTOR

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