

EV Charging Tester

The EV charging tester is an equipment that determines the status of quick/normal charges, high-voltage relay, and the presence of any abnormality in quick and high-voltage charging path of the electric vehicle.



Precautions Before Use

Precautions when handling high-voltage parts



The user is responsible for all damages that are caused by not understanding the contents of this EV charging tester Manual thoroughly or by controlling it differently from the contents of the User Manual.

- Before inspecting or repairing high-voltage system, make sure to separate the safety plug to cut off the high voltage.
- Make sure to remove metal objects substances (watch, ring, and other metal products, etc.) from your body as they may cause high-voltage short circuit, which causes human and vehicle damages.
- Before starting any operation related to high voltage, please wear personal protective equipment for safety accident prevention.
- Please make sure that persons other than the operator wearing the protective equipment are prohibited from touching any part related to high-voltage parts.

Precautions when utilizing the product



Personal injuries or material damages can occur if the user does not pay attention for handling, and more serious results may occur under certain conditions. Please comply with all safety rules and instructions.

- Remove foreign materials from the component and keep its cleanliness before and after using the equipment.
- Make sure you familiarize yourself with contents of the manual before use, and follow the procedures and instructions.
- Before using the equipment, please familiarize yourself with safety instructions for vehicle management.
- Use the equipment only in a well-ventilated space, and make sure to wear protective equipment (protective glasses and gloves, etc.).
- If the equipment is damaged by external shock, immediately stop using the equipment. If the equipment needs to be repaired, make sure to request the equipment manufacturer to perform the repair work. (Abnormal repair may become the cause of equipment damage)
- Make sure to use a grounded circuit.
- Use only with the power source (AC 110~220V, 50/60Hz) intended by the manufacturer.
- The equipment must not be exposed to rain or snow.
- The equipment must not be used for purposes other than the purpose of its manufacture.
- Do not leave the equipment being installed in the vehicle.
- If you do not use the equipment within its operating temperature range (0 - 104°F/40 °C).

 **Warning**

These connectors are used for *CP/*PD voltage check and only trained professionals should use (or access).

Measuring voltage:

CP: 12V \pm 0.3V, PD: 3V \pm 0.3V

*CP: Control Pilot

*PD: Proximity Detection



Hardware

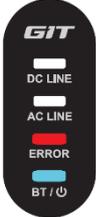
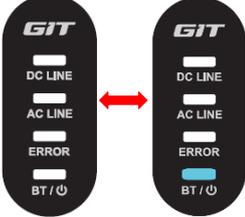
Specification

Item	Specification
LED Status	4 Color LEDs(DC LINE/ AC LINE/ ERROR/ Power, BT)
Wireless communication	Bluetooth V5.0(BLE)
High voltage range	DC 800V MAX
Current range	12A MAX
Operating power(±10%)	AC 110~220V/50~60Hz/1A
Operating temperature	0°C ~ +40°C
Operating humidity/altitude	Up to 20~80 % R.H/ 2000m
Operating place	Indoor place
Overvoltage category	II
Size and weight	CCS2-Type(Europe):70mm x 361mm x 240mm / 1.7kg

EV charging test components

Name	Component	Major function
EV charging tester		<ol style="list-style-type: none"> 1. Controls the conditions for the charging test. 2. Measures high voltage/current.
KDS 2.0		<ol style="list-style-type: none"> 1. Performs the test sequence. 2. Indicates the test measured values.
VCI II		<ol style="list-style-type: none"> 1. Performs the vehicle diagnostic communication. <p>(Connects the OBD terminal of the vehicle.)</p>

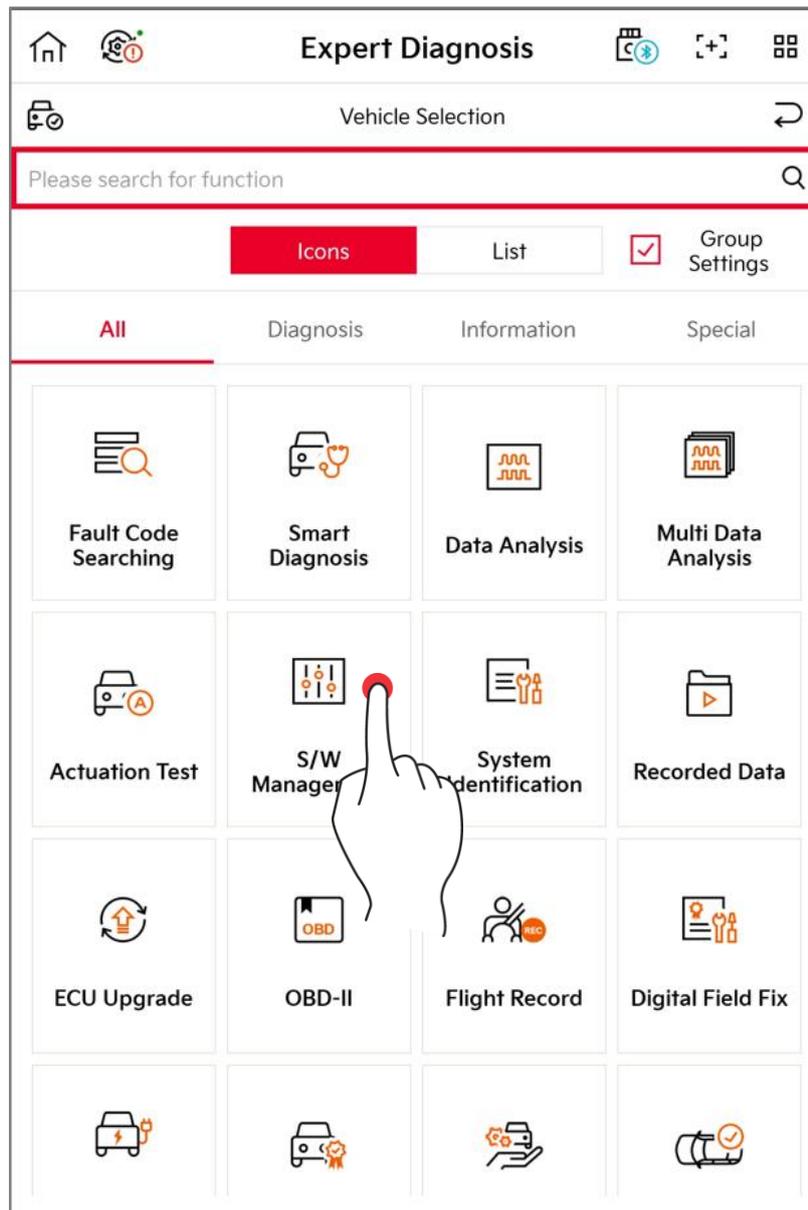
Detailed description of the EV Charging Tester LED

Name	Major function	LED status	
DC LINE	Indicates the test results on rapid charging line.	 OK	 NG
AC LINE	Indicates the test results on standard charging line.	 OK	 NG
ERROR	Indicates the occurrence of system error.	 OK	 NG
BT/Power	<ul style="list-style-type: none"> - Indicates the power. - Indicates the connection status between the diagnostic apparatus and the test equipment. 	 Connected	 Not connected (the light flickers once a second)

Advanced Preparation – Entering into the function screen

Phase1

Tab [Expert Diagnosis] –[S/W Management].

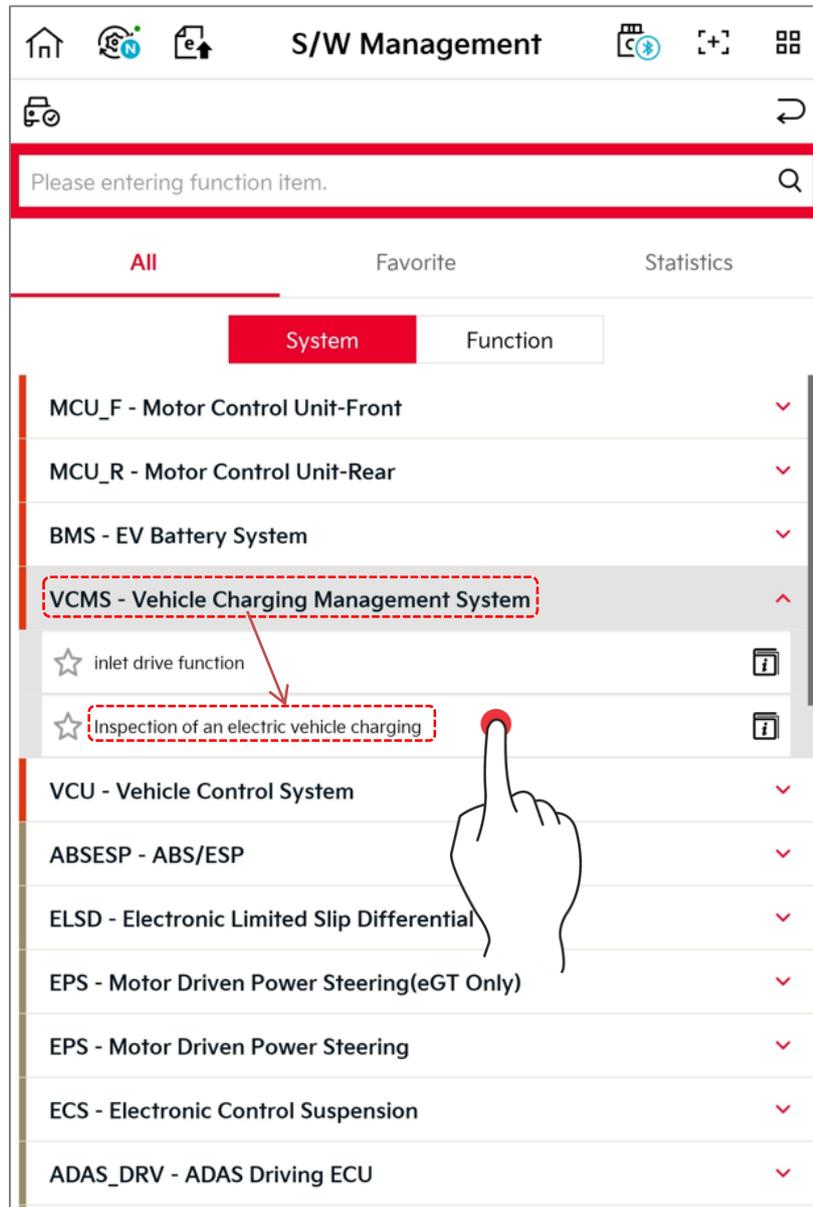


Reference

Before performing the function, VCI II must be connected to OBD connector on the vehicle.

Phase2

Tab [Vehicle Charging Management system] -> [Inspection of an electric vehicle charging] menu.

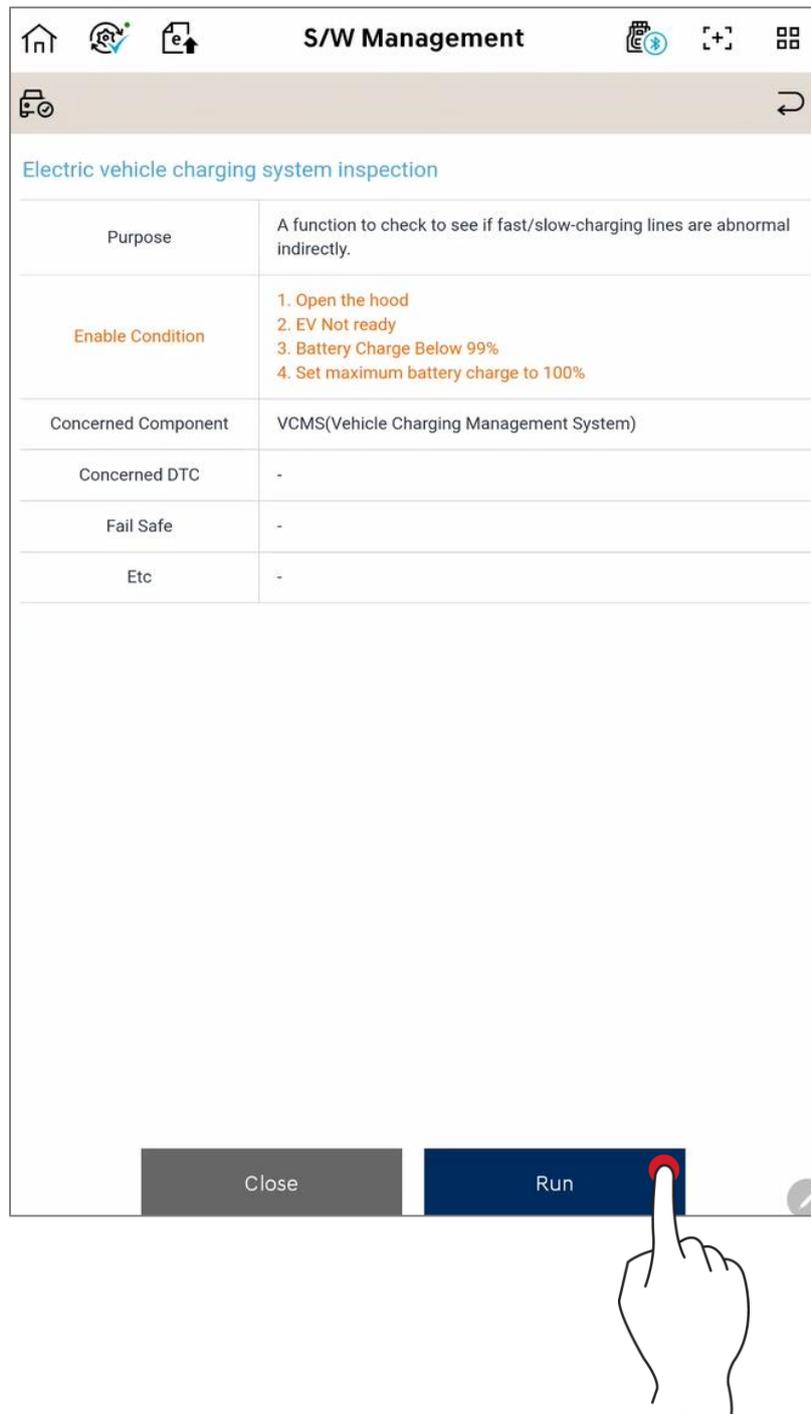


Advanced Preparation – Connection of the equipment

Phase1

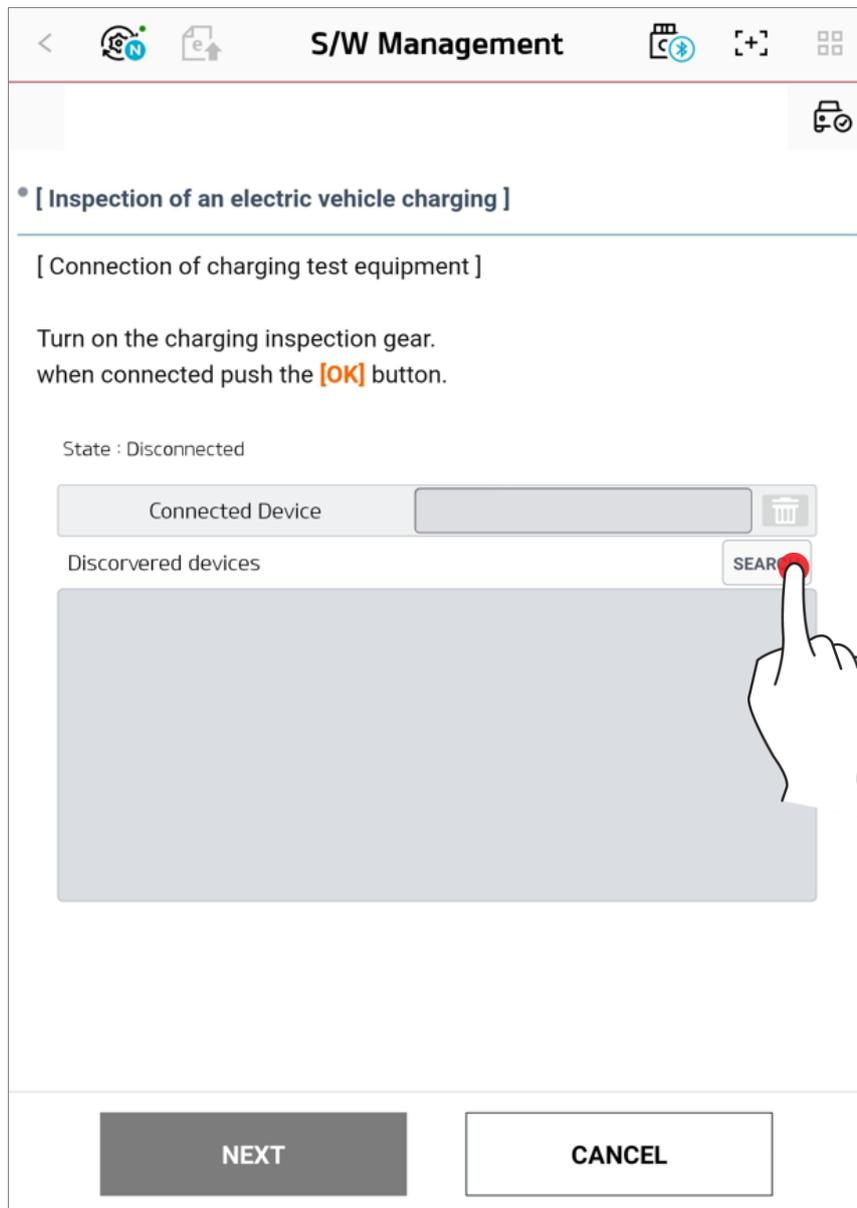
After checking the purpose and condition of the EV charging test, tab

 button at the bottom of the screen.



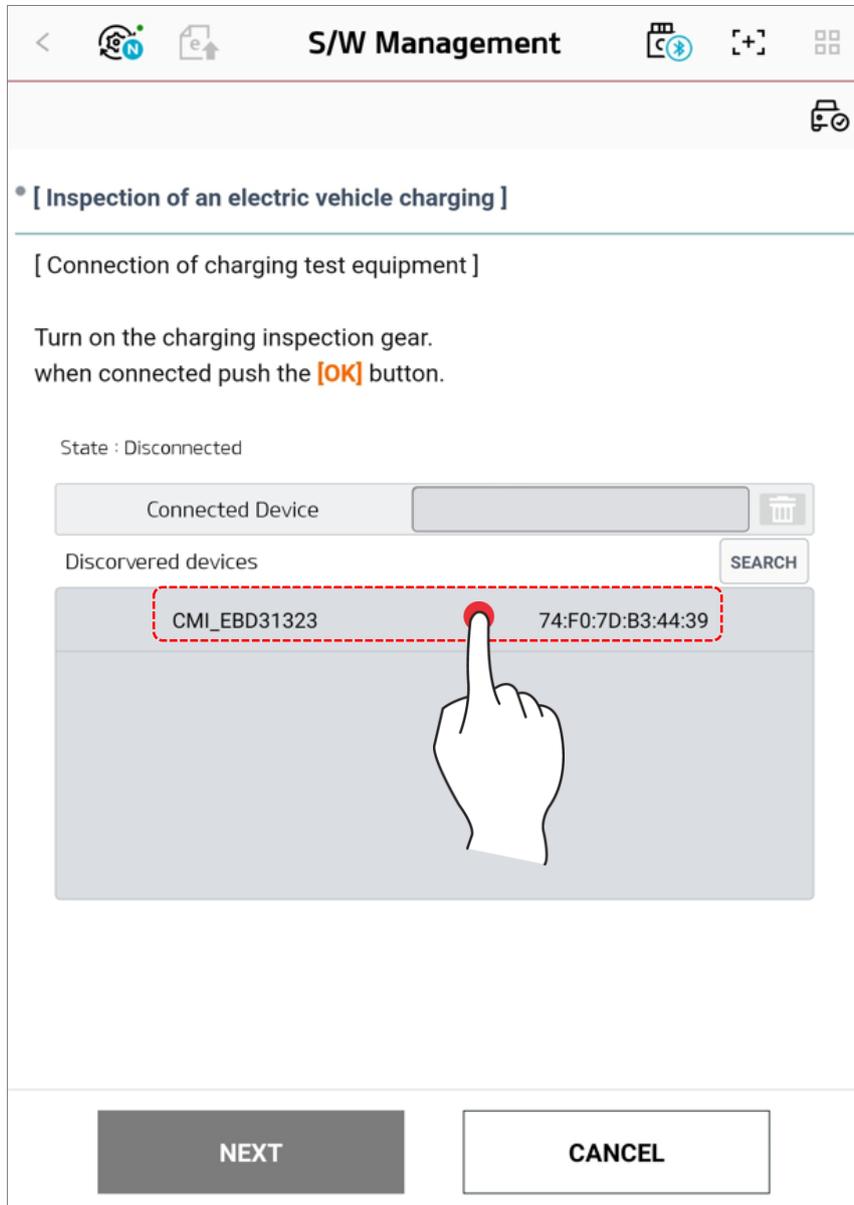
Phase2

Tab  button to connect the charging test equipment.



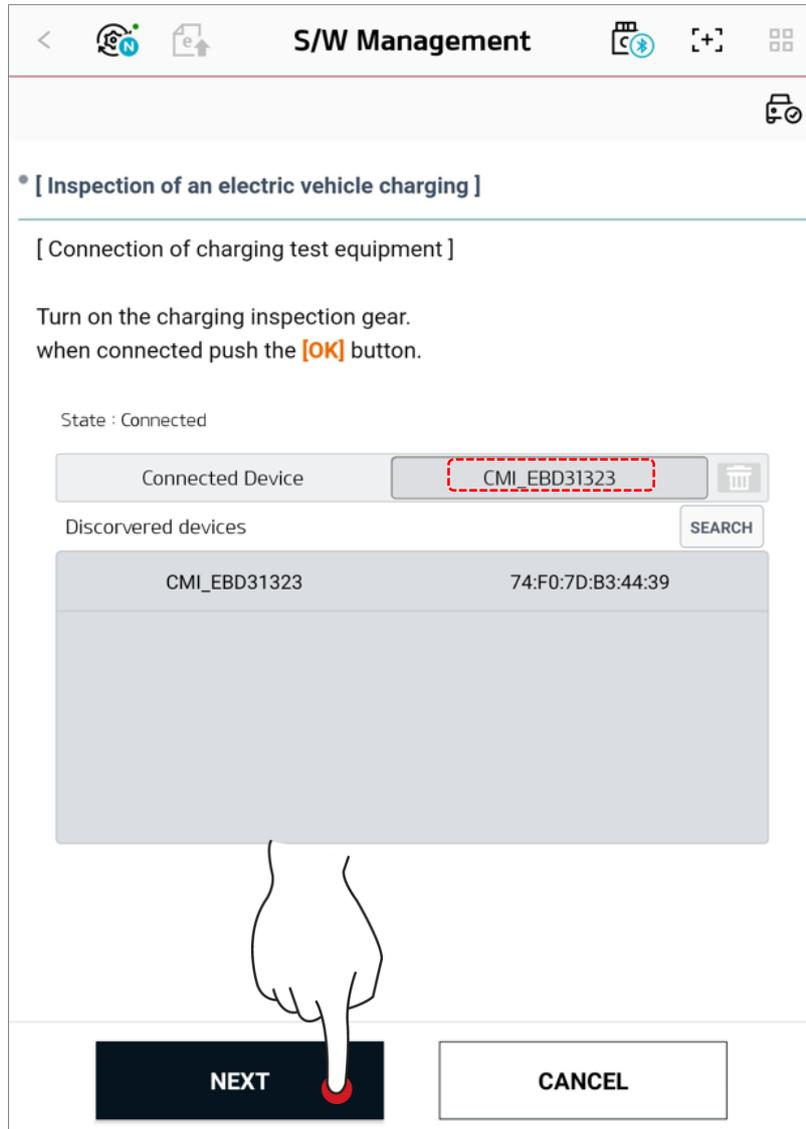
Phase3

Tab the equipment in the research result.



Phase4

After the selected, the equipment is registered in "Connected Device" list, tab **NEXT** button at the bottom of the screen.



Phase5

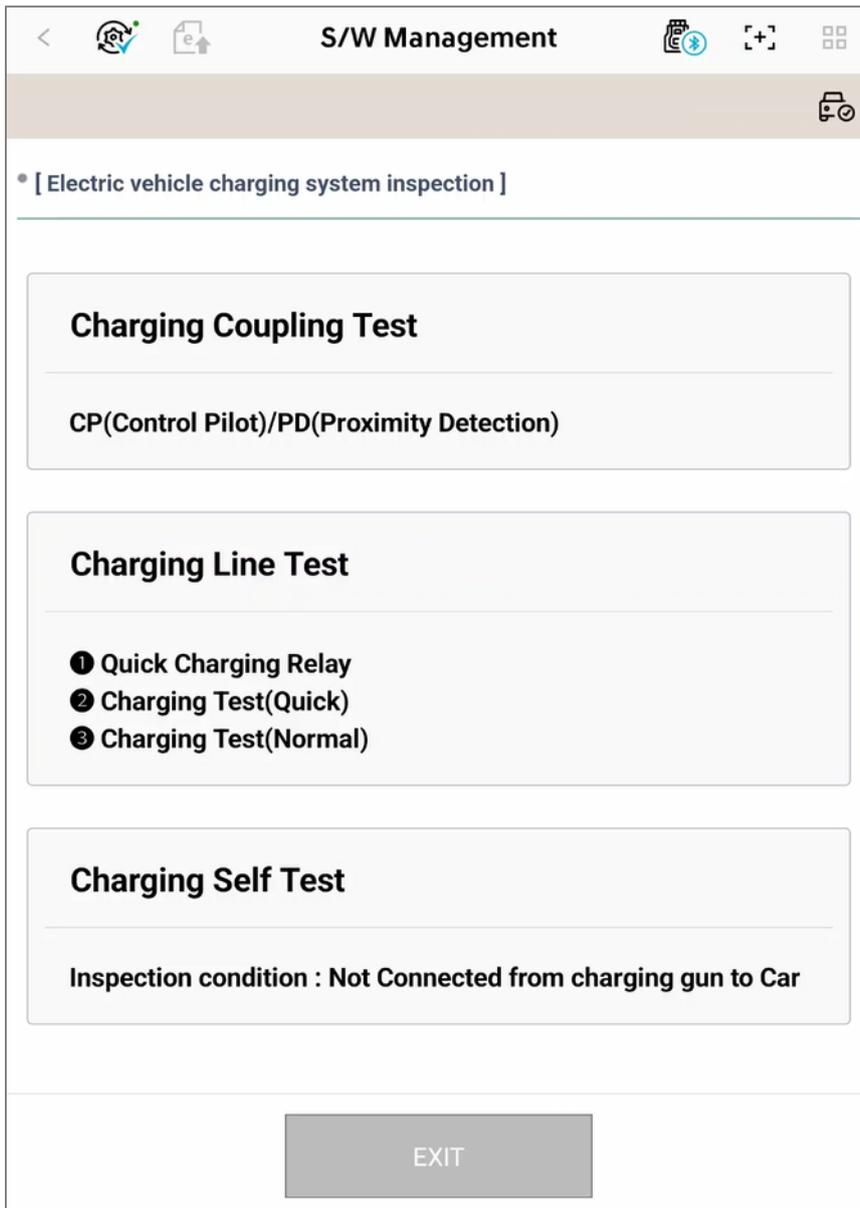
Once the BT signal of the equipment is connected normally, "BT/Power" LED of the equipment main body will be turned on with blue light.



Major Function

Main screen

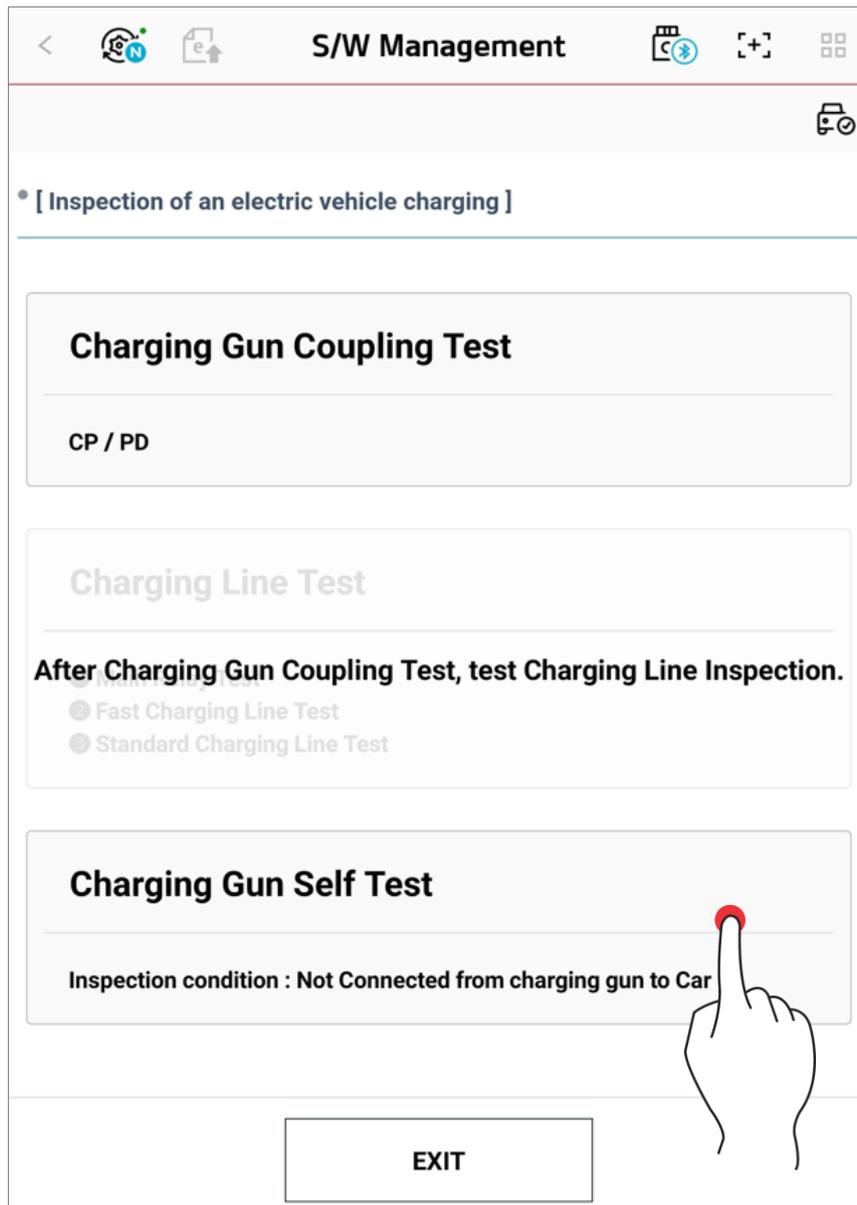
It shows major functions of the EV charging line test, and the users can run a desired function by touching it.



Self-test on the test equipment

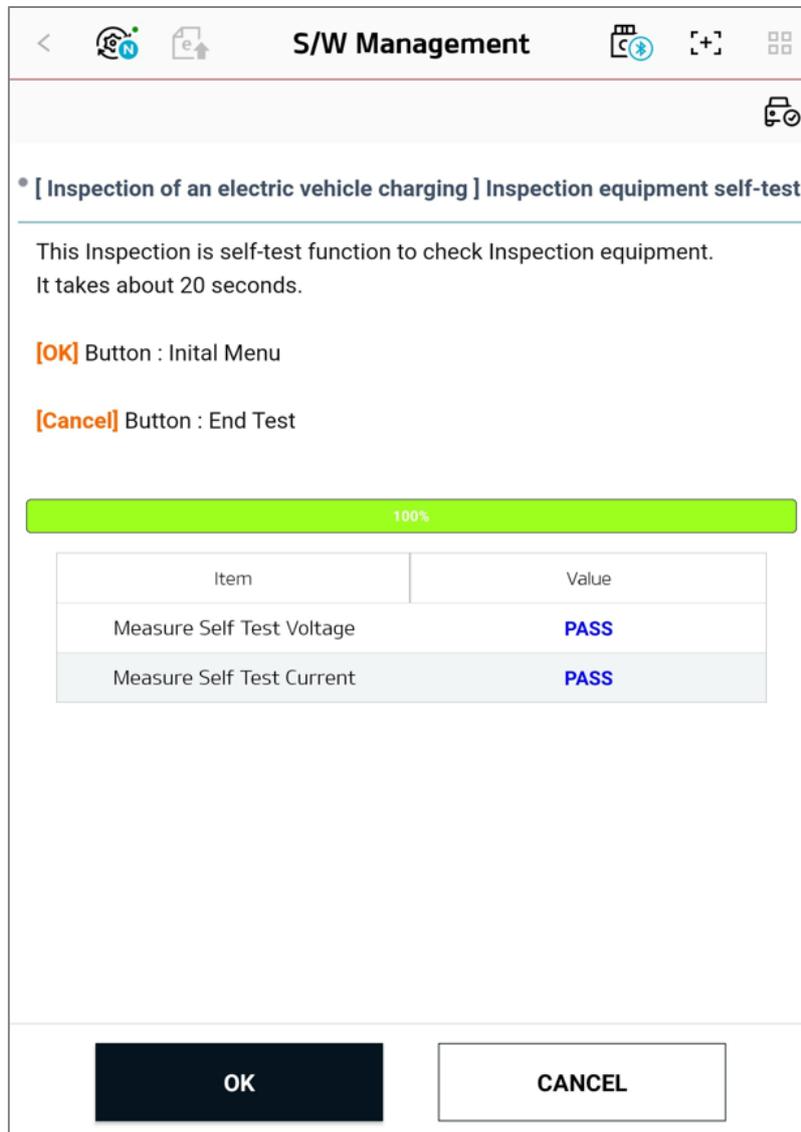
Phase 1

This is a function is for checking the status of EV Charging tester whether there is abnormality in charging when an error occurs while the main test function is being operated, or if there is no change in voltage in connection test. Tab [Charging Gun Self-test]



Phase 2

Once you enter into the function screen, the self-test will begin, and the results will be shown on the screen after approximately 20 seconds.



The screenshot displays the 'S/W Management' interface. At the top, there is a navigation bar with a back arrow, a refresh icon, a document icon, the title 'S/W Management', a Bluetooth icon, a zoom icon, and a grid icon. Below the navigation bar is a header area with a truck icon and the text: '• [Inspection of an electric vehicle charging] Inspection equipment self-test'. The main content area contains the following text: 'This Inspection is self-test function to check Inspection equipment. It takes about 20 seconds.' Below this, there are two instructions: '[OK] Button : Inital Menu' and '[Cancel] Button : End Test'. A green progress bar is shown at 100%. Below the progress bar is a table with two columns: 'Item' and 'Value'. The table contains two rows: 'Measure Self Test Voltage' with a value of 'PASS' and 'Measure Self Test Current' with a value of 'PASS'. At the bottom of the screen, there are two buttons: a dark blue 'OK' button and a white 'CANCEL' button.

[OK] Button : Inital Menu

[Cancel] Button : End Test

100%

Item	Value
Measure Self Test Voltage	PASS
Measure Self Test Current	PASS

OK **CANCEL**



Notification

Please run the corresponding function **only after removing the charging test** from the inlet.



Notification

The message below will appear when failure occurs.

The screenshot displays a mobile application interface. At the top, there is a navigation bar with a back arrow, a refresh icon, a document icon, the title "S/W Management", a calendar icon, a plus icon, and a grid icon. Below the navigation bar, the screen shows the following information:

- Vehicle ID: KNAC381BFNA009074
- Vehicle Model: EV6(CV)/2022/160kW (2WD) / 70+160kW (AWD)
- Vehicle Icon: A small car icon with a checkmark.

The main content area contains a notification titled "[Inspection of an electric vehicle charging] Inspection equipment self-test". Below the title, it states: "This Inspection is self-test function to check Inspection equipment. It takes about 20 seconds." Two instructions are provided: "[OK] Button : Inital Menu" and "[Cancel] Button : End Test".

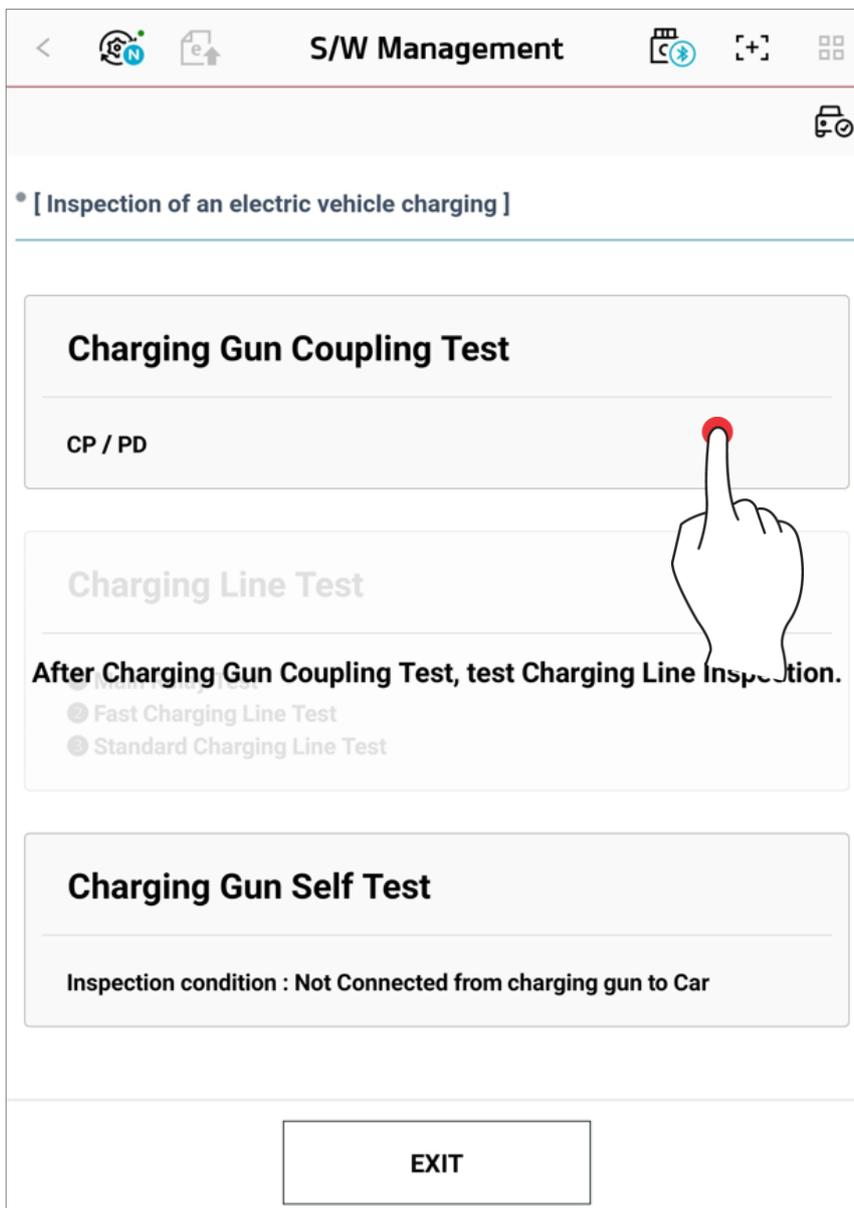
Below the notification, a "Notice" section is displayed with the text: "The self test failed. your device failed continuously please contact administrator." A dark blue "OK" button is centered below the notice.

At the bottom of the screen, there are two buttons: a dark blue "OK" button and a light gray "CANCEL" button.

Charging Coupling test

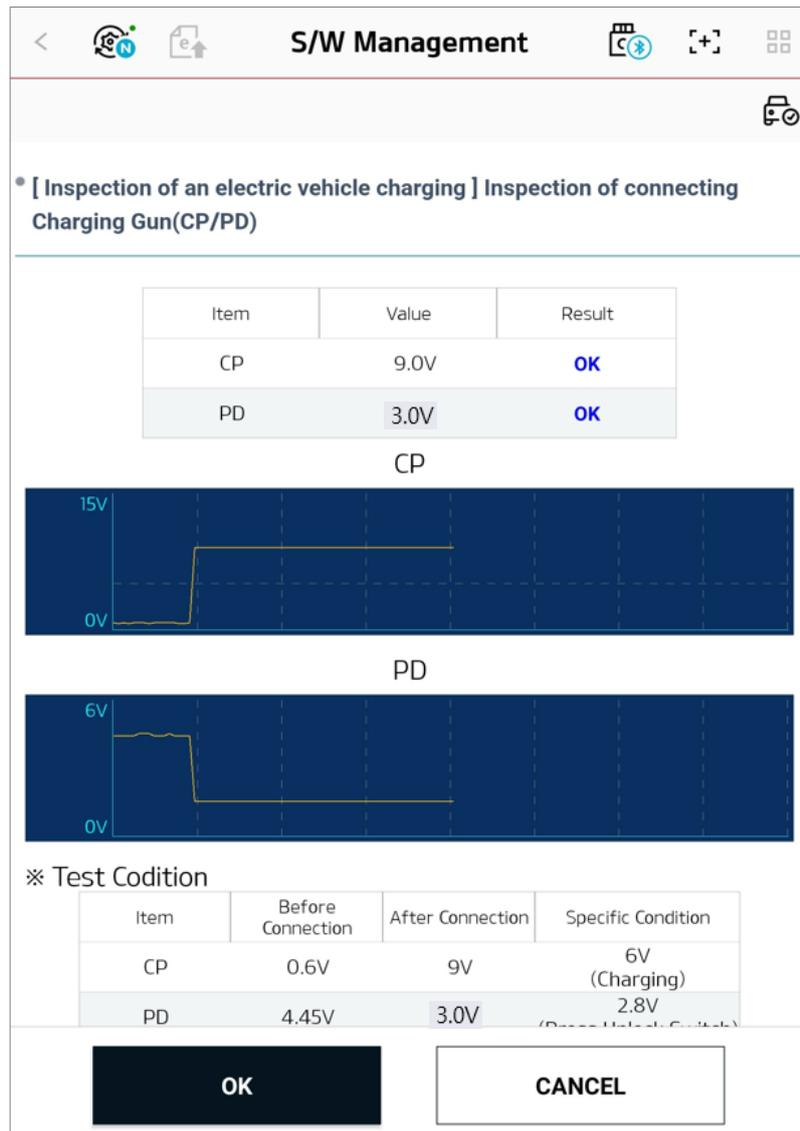
Phase 1

This is a function that measures CP/PD voltage value to check whether the charging test equipment is normally connected to the inlet.



Phase 2

The table at the top of the screen shows voltage value per operation and test results. The graph in the middle of the screen shows change in CP/PD voltage values of the controller, which are measured in real time through the diagnostic communication.



Determination condition

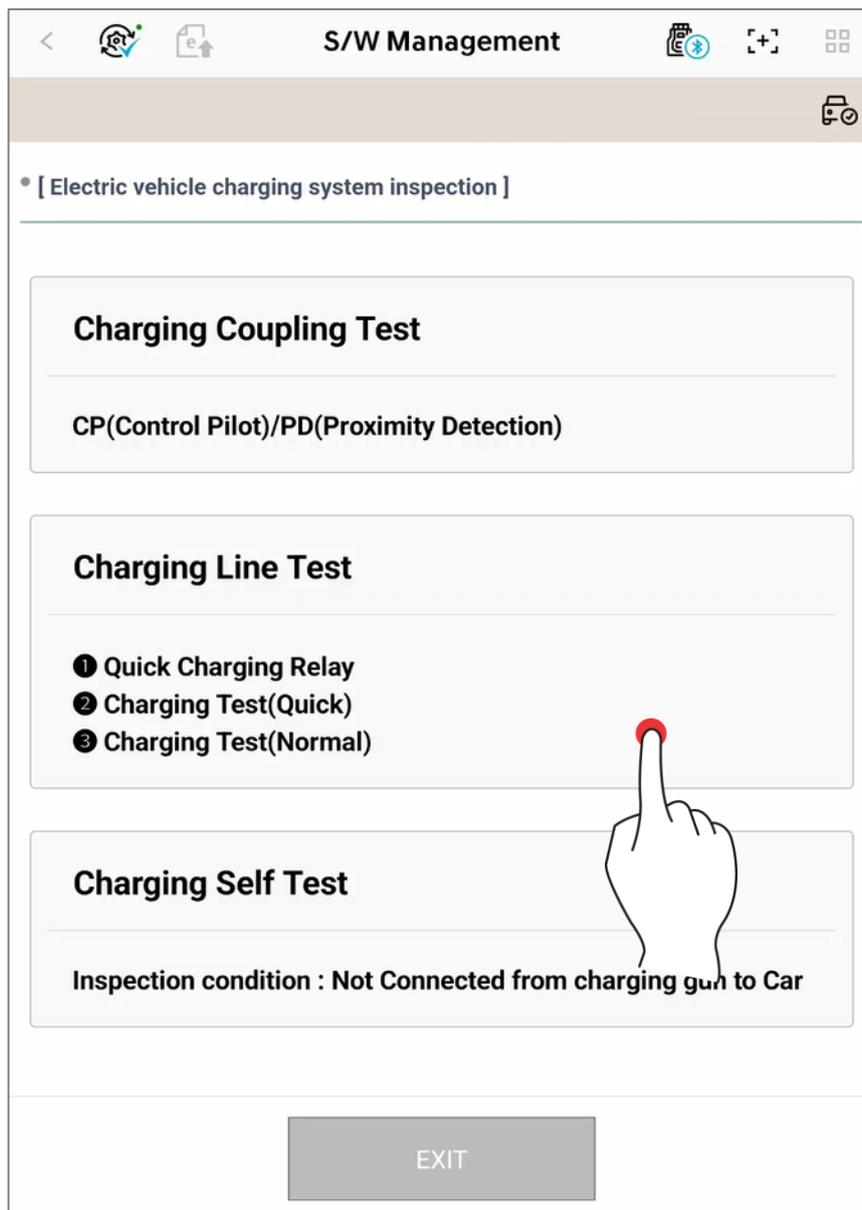
Europe (CCS2)	Measured Value	Determination
CP	9V±0.3	OK
PD	3V±0.3	NG

Charging line test

Description

The following 3 different functions will be performed as the main test functions:

1. Quick charge relay test
2. Quick charging line test
3. Standard charging line test



Quick charge relay test

This is a test that checks if there is abnormality in the quick charge relay operation through a high-voltage quick charge port.

The screenshot displays the 'S/W Management' interface. At the top, there are navigation icons and the title 'S/W Management'. Below the title, there are three buttons: 'Quick Charging Relay' (highlighted in green), 'Charging Line(Quick)', and 'Charging Line(Normal)'. A sub-header reads: '* [Inspection of an electric vehicle charging] Quick Charge Relay Test'. Below this is a table with the following data:

Item	Value	Result
Fast Charging Relay Test	0V	OK

Below the table is a schematic diagram of an electric vehicle's powertrain and charging system. The diagram shows the 'Charging Port Inlet' at the top right, with 'AC(Normal)' and 'DC(Quick)' lines. The 'DC(Quick)' line connects to a 'Quick Charging Relay' located between the 'H/V Battery' and the 'Multi Inverter (RR)'. Other components shown include the 'H/V Battery', 'VCMS', 'ICCU', 'H/V Junction Block (FRT)', 'Inverter (FRT)', 'FRT Motor', 'Gear Differential Unit', 'VCM', 'RR Motor', 'Gear Differential Unit', 'Multi Inverter (RR)', 'BMU', and 'PRA'. At the bottom of the interface are two buttons: 'NEXT' and 'CANCEL'.



Determination condition

Measured Value	Determination
0V	OK
exceeds 0V	NG

Quick charging line test

This is a test that checks whether there is abnormality in the quick charging line that goes through [high-voltage battery -> inverter -> charge port] through the path of the high-voltage quick charge port.

The screenshot displays the 'S/W Management' interface. At the top, there are navigation icons and the title 'S/W Management'. Below this, three buttons are visible: 'Quick Charging Relay', 'Charging Line(Quick)' (highlighted in green), and 'Charging Line(Normal)'. A sub-header reads: '• [Inspection of an electric vehicle charging] Quick Charge Line Test'. Below the sub-header is a table with the following data:

Item	Value	Result
Fast Charging Line Test	458V	OK

Below the table is a schematic diagram of an electric vehicle's powertrain and charging system. The diagram shows the 'Charging Port Inlet' at the top right, with 'AC(Normal)' and 'DC(Quick)' lines. The 'DC(Quick)' line connects to an 'H/V Junction Block (RR)' and a 'Multi Inverter (RR)'. The 'AC(Normal)' line connects to an 'H/V Junction Block (FRT)' and an 'Inverter (FRT)'. The 'H/V Battery' is connected to a 'PRA' (Power Relay Assembly) and a 'BMU' (Battery Management Unit). Other components shown include 'VCMS', 'ICCU', 'VCU', 'FRT Motor', 'Gear Differential Unit', and 'RR Motor'. At the bottom of the interface are two buttons: 'NEXT' and 'CANCEL'.



Determination condition

Comparison between *the charging equipment measured values and *diagnostic communication values

Deviation	Determination
Less than 20%	OK
0V or 20% or more	NG

- * Charging equipment measured value: BMU controller's diagnosis communication voltage value
- * Diagnostic communication value: actually measured voltage value of the high-voltage quick charge port



Notification

If the test result is NG, it will receive the breakdown status from the vehicle to indicate the problematic part as red light on the screen, and display the AS response method. (Only the vehicle models after EV9 can operate this function)

Normal charging line test

This is a test that checks whether there is abnormality in the normal charging line, which goes through [high-voltage battery -> *ICCU -> charge port] through the path of normal charge port.

* ICCU : Integrated Charging Control Unit

S/W Management

Quick Charging Relay Charging Line(Quick) **Charging Line(Normal)**

• [Inspection of an electric vehicle charging] Standard Charge Line Test

6A **8A** 10A 12A

Item	Value	Result
Standard Charging Line Test	8.5A	OK

Charging Port Inlet

VCMS ICCU AC(Normal) DC(Quick)

AWD ONLY
FRT Motor
Gear Differential Unit
Inverter (FRT)
VCU

H/V Junction Block (FRT)

H/V Battery

BMU
PRA

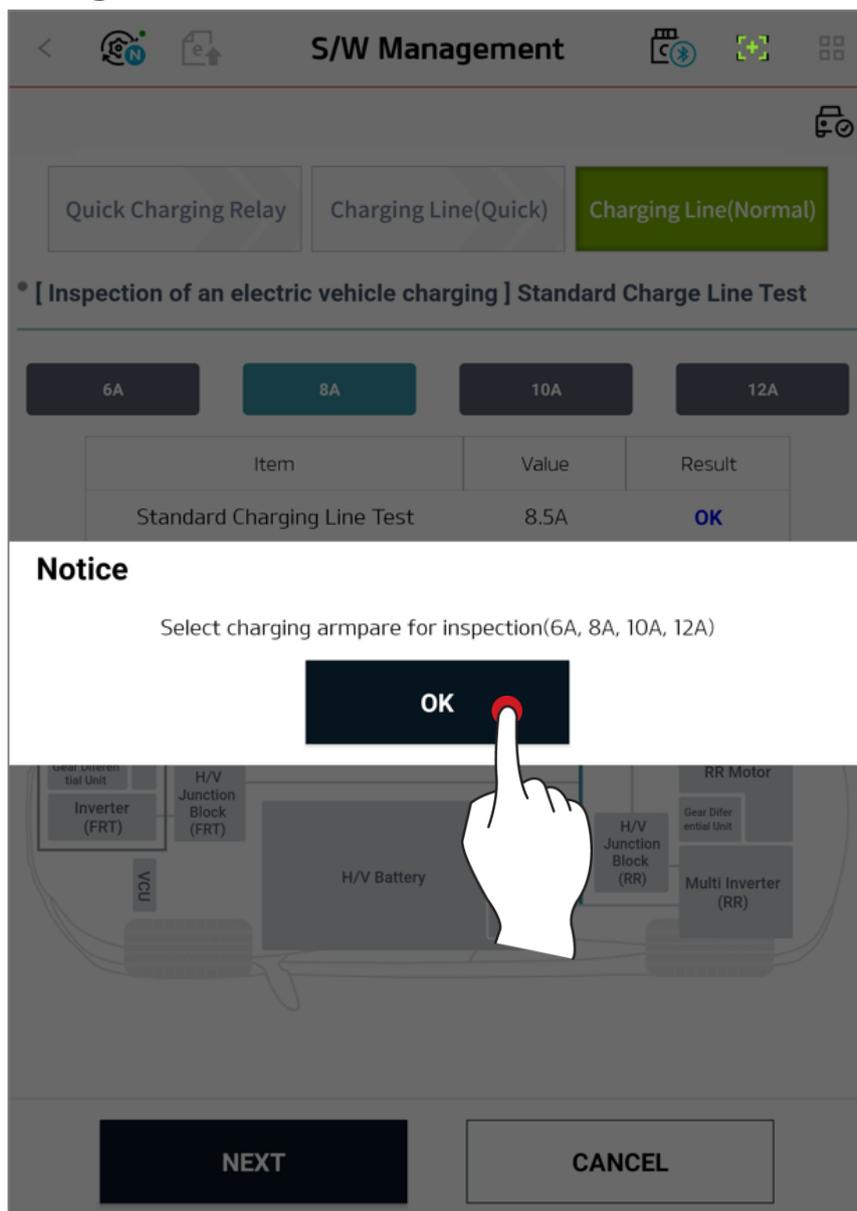
H/V Junction Block (RR)

RR Motor
Gear Differential Unit
Multi Inverter (RR)

NEXT **CANCEL**

● step 1

When you enter into the function screen, the test will be run with a fixed default value of 8A. Then, the user can change the current value to be measured by touching a desired current value (6, 8, 10, or 12 A) to proceed the measurement. Tab **OK** button, then select a current value (6, 8, 10, or 12 A) that you want to check.





Determination condition

The standard charging will be initiated and the running current value (A) will be measured.

(Error range 15%)

Measured Value	Determination
6A or more	OK
Less than 6A	NG



Notification

In the case of 12 A, using a thin extension cable may lead to causing a safety accident. Thus, the following notification will be shown, and the test will be conducted only when the user approves it.

Notice

Do not use extension cables or adapters when using 12A. Beware of using 12A due to it may cause safety accidents such as power interruption and fire

OK **CANCEL**



Notification

Battery charging current is adjusted to 90% - 60% depending on the user's charging environment and battery life. (The current values between 3 and 5 A can also be charged)

● step 2

Once the measurement is completed, tap **NEXT** button to close the test.

The screenshot displays the 'S/W Management' interface. At the top, there are navigation icons and a 'NEXT' button. Below this, three buttons are visible: 'Quick Charging Relay', 'Charging Line(Quick)', and 'Charging Line(Normal)' (highlighted in green). The main section is titled '[Inspection of an electric vehicle charging] Standard Charge Line Test'. Below the title, there are four buttons for current values: 6A, 8A, 10A, and 12A (highlighted in teal). A table shows the test results:

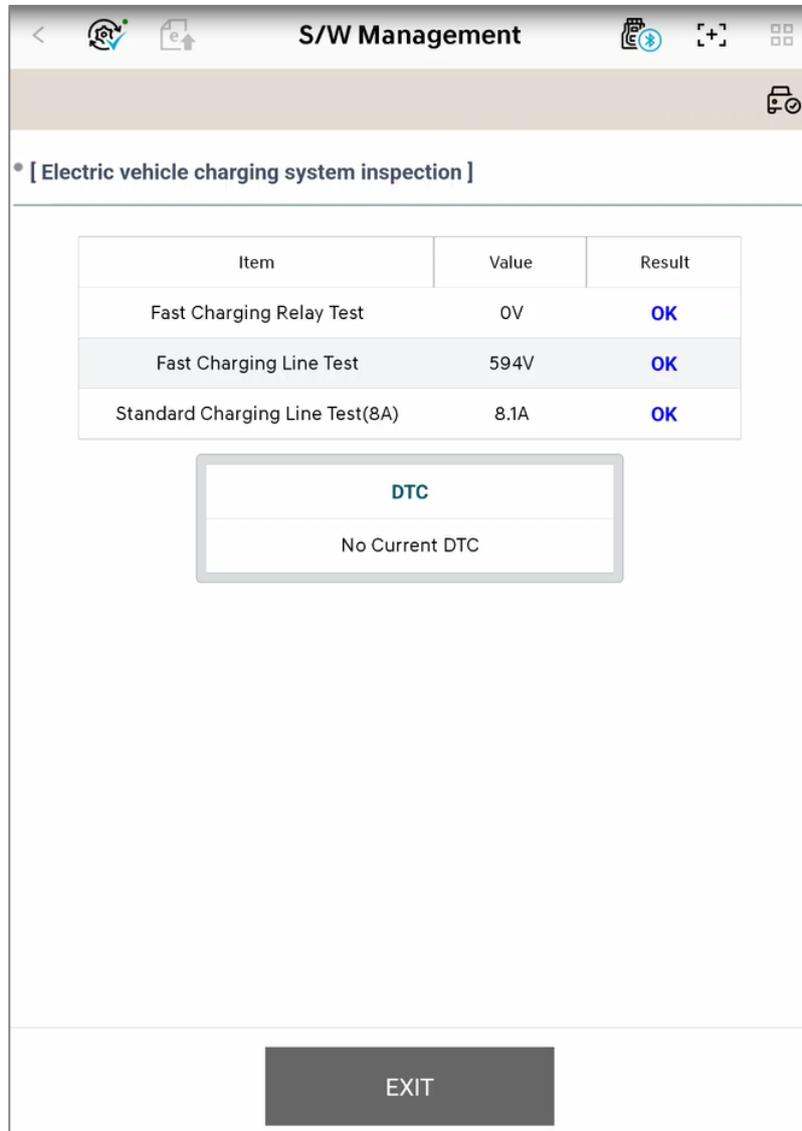
Item	Value	Result
Standard Charging Line Test	12.8A	OK

Below the table is a schematic diagram of an electric vehicle's powertrain. It shows the 'Charging Port Inlet' connected to 'AC(Normal)' and 'DC(Quick)'. The 'DC(Quick)' line goes through an 'ICCU' and 'VCMS' to the 'H/V Battery'. The battery is connected to a 'PRA' and 'BMU'. The 'AC(Normal)' line goes through an 'H/V Junction Block (RR)' to a 'Multi Inverter (RR)', which is connected to an 'RR Motor' and 'Gear Differential Unit'. On the left side, there is an 'AWD ONLY' section with an 'FRT Motor', 'Gear Differential Unit', and 'Inverter (FRT)', connected to an 'H/V Junction Block (FRT)' and 'VCU'.

At the bottom of the interface, there are two buttons: 'NEXT' (highlighted in black) and 'CANCEL'.

Test result

After the test has completed, test results are displayed.



The screenshot displays the 'S/W Management' interface. At the top, there is a navigation bar with a back arrow, a home icon, the title 'S/W Management', and several utility icons. Below the navigation bar is a header section with a car icon and the text '* [Electric vehicle charging system inspection]'. The main content area features a table with three columns: 'Item', 'Value', and 'Result'. The table contains three rows of test results. Below the table is a box labeled 'DTC' with the text 'No Current DTC'. At the bottom of the screen is a dark grey button labeled 'EXIT'.

Item	Value	Result
Fast Charging Relay Test	0V	OK
Fast Charging Line Test	594V	OK
Standard Charging Line Test(8A)	8.1A	OK

DTC
No Current DTC

EXIT