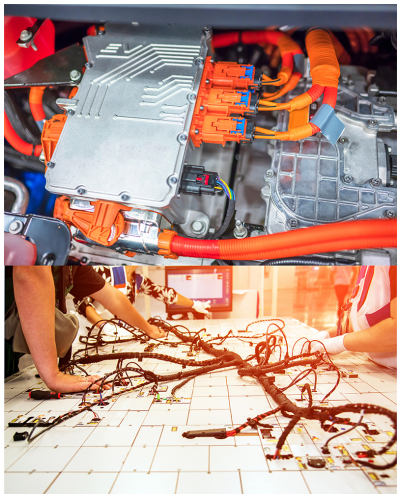
Industrial field: Electronic components  Operational category: Manufacturing and production lines

# Connector and Harness Testing System

**Key feature**

This article introduces a multichannel testing system that measures the connection state of connectors used in electric vehicles (EVs) and the state of crimped contact wires in a high-speed, high-precision manner.

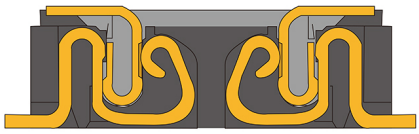



## Growing demand in EV applications

Growing adoption of power devices in EVs is leading to higher voltage and current electrical ratings for such components.

As a result, it is becoming increasingly difficult to ignore the connection resistance of connectors and contact wiring crimps in connectors and wire crimping that carry high voltages or high currents. Even if the contact resistance is low, large currents cause a voltage drop that can cause components to heat up. This prevents them from performing to specifications and accelerates connector deterioration. It is becoming increasingly important to prevent such problems.

This article introduces a testing system that can prevent latent defects through intermediate-process testing.



Contact resistance between terminals

Normal crimp

Defective crimp

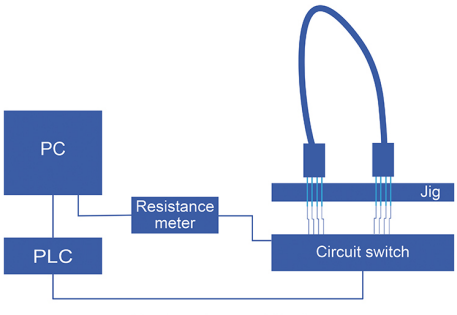
## Connector and harness testing issues

Testing checks contact resistance values of connectors either before or after they are affixed to cable assemblies.

Resistance values are measured across connector terminals using a resistance meter, and it is typical to use the 4-terminal measurement method since the resistance values are low. Consequently, four test probes are required.

In the past, this type of testing has required a jig to place the probes in contact with each connector's terminals, a relay circuit to switch between connector terminals, a resistance meter, a computer or PLC to control the instrument and relay circuit, and a program to execute the test sequence. This approach suffers from the following issues:

- Synchronized control of relay switching and the instrument is difficult, and testing is usually characterized by long takt times.
- Changes in the model being tested necessitate time-consuming setup changes.
- Significant amounts of time are required to identify issues underlying equipment failures (poor maintainability).
- The information in this article is current as of June 2018. Specifications, pricing, and other information are subject to change without notice.




Test system architecture

## Realizing high-speed testing and high maintainability

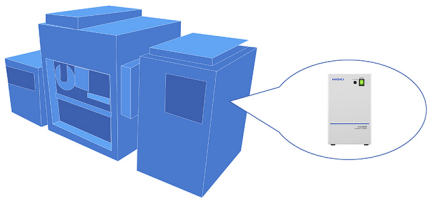
The In-Circuit FA1220 and Short-Open Tester FA1221 integrate a circuit switch (scanner) and measuring instrument into a compact enclosure in order to deliver high-speed control in connection with dedicated software running on a computer.

These general-purpose test systems make possible high-reliability testing. This solution offers the following features:

High-speed testing made possible by optimal synchronized control of the built-in scanner and instrument boards
Simple creation of test data using a computer application
Detection of test errors and prevention of shipment of defective parts by a source/sense contact check function during 4-terminal measurement
Self-test functionality that identifies issues automatically in the event of an equipment failure

The trend toward higher voltages and currents can be expected to continue as EVs enter into widespread use. Manufacturers are being called upon to further increase the quality of their connectors and harnesses and to improve mass production test takt times.
The In-Circuit FA1220 and Short-Open Tester FA1221 can address these manufacturing issues.

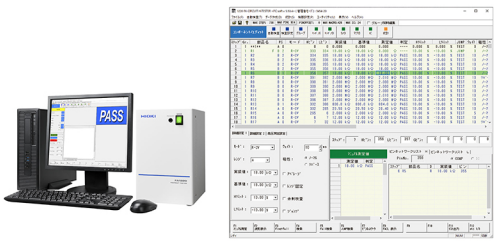
Realizing automation by embedding the system in a drive system



Realizing high-speed, high-precision testing

| Model | Maximum number of pins | Test parameters | Measurement range | Measurement speed |
|---|---|---|---|---|
| FA1221 | 128 (fixed) | Multi-pin S/O test | 4Ω to 400kΩ | From 0.8ms / pin |
| | | Resistance measurement (component test) | 400μΩ to 40MΩ | From 0.9ms /step |
| FA1220 | 1024 (Expandable in blocks of 128) | Multi-pin S/O test | 4Ω to 400kΩ | From 0.8ms / pin |
| | | Resistance measurement (component test) | 400μΩ to 40MΩ | From 0.9ms /step |

Creating test data quickly




## Functionality and concept that make it possible to embed

Despite its compact size, the In-Circuit Tester FA1220 can accommodate scanners for up to 1,024 pins.

The Short-Open Tester FA1221 provides high cost performance with a maximum of 128 pins and functionality that is limited to resistance measurement. Both products provide functionality and specifications that can be embedded in other systems.

An I/O board allows the system to be controlled from an external source, for example to start testing, and to output judgment results.

Compact size allows embedding


I/O board enables external control and communications

I/O Board E4220