HIOKI

BYPASS DIODE TESTER FT4310

World's first

Inspect solar panel bypass diodes for opens and shorts in broad daylight without covering panels

Quickly identify faulty bypass diodes during operation and maintenance

Efficiently test strings without covering panels

Simultaneously measure all parameters

Automatically transfer data wirelessly

Did you know? A failed bypass diode can cause a fire.

CE

3 year Warranty

Bluetooth®

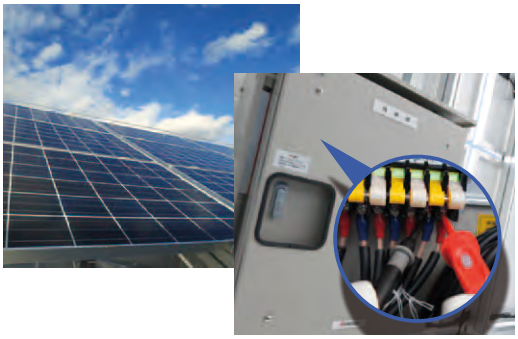
Please see www.hioki.com for list of supported regions.

Easily inspect bypass diodes for open and short-circuit faults even in broad daylight

Bypass diodes protect solar cells from overheating when partial shading occurs. However, they only jump into action when a panel is shaded, so defective diodes can go undiscovered until it is too late. When a defective bypass diode is unable to prevent a shaded cell from receiving more and more negative voltage, the cells can overheat and cause eventual damage.

World's first! Conduct open fault testing easily during any time of day

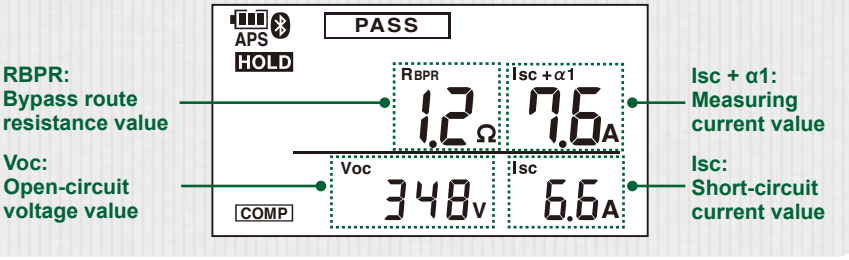
- Traditionally, bypass diodes can only be inspected for good working condition at night or when power is not being generated by the solar panels in order to verify that any applied current is guided past the solar cells. With the FT4310, you can detect for open faults even when the sun is out without covering the panels. Testing can also be performed at night.
  **Testing for short-circuit faults can only be performed during the day.*
- Easily test using the strings in the junction boxes, eliminating the need to climb onto the roof and dramatically improving work efficiency.
  **Disconnect the string being measured from the interconnect prior to measurement.*

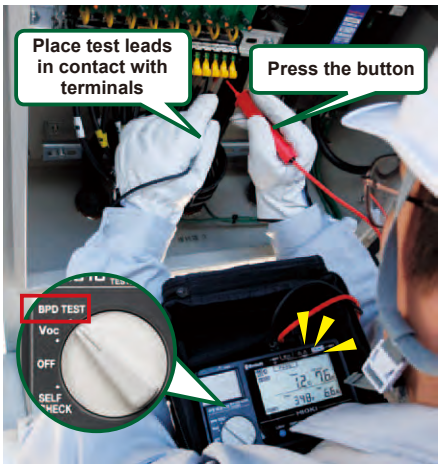


Save time - simultaneously measure all electrical parameters

- Simply set the rotary knob to “BPD TEST” and press the “Measure” button to measure and display all parameters necessary for fault identification (open-circuit voltage, short-circuit current, and bypass route resistance).

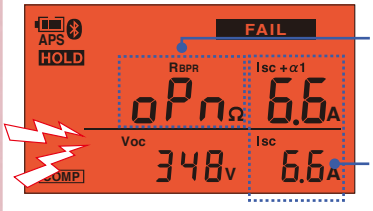
Normal reading — Measurement takes **2 sec.** or less per string





Red backlight and audible warning alert the user to possible faults

Open fault — Using BPD TEST mode



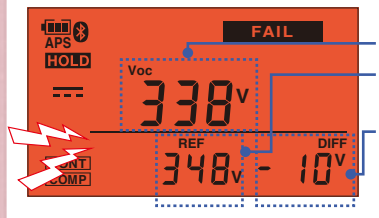
The instrument indicates the open state (“opn”).

The measurement current and short-circuit current are approximately equal.

Principle

If the bypass diode is functioning normally, the measured current value should be close to 1 A larger than the short-circuit current value.
*Visit the Hioki website for a more detailed explanation of the underlying principles.

Short-circuit fault — Using Voc mode



Voc: Measured value

REF: Reference value (initial measured value)

DIFF: Difference between measured value and reference value

The diode is determined to have failed since the values differ by -10 V.

Principle

When a bypass diode experiences a short-circuit fault, the output voltage decreases (by about 10 V) because the corresponding solar panels are not contributing to the array’s generated power.
By detecting this difference, it is possible to detect bypass diode short-circuit faults and cell string losses.

Ease of use and functionality in a powerful instrument that fits in the palm of your hand

Improve work efficiency by continuing to measure and record without interruptions

Automatically transfer data with Bluetooth® wireless technology

Available for Android and iOS devices

Save date in CSV or PDF format

Measured values held on the display are sent immediately to a smartphone or tablet via Bluetooth® wireless technology.
Eliminate the need to take notes - particularly useful at sites with a large number of test points.
(Use with the dedicated Hioki GENNECT Cross app.)

Discover anomalies before they develop into failures

Detect component degradation using the FT4310's comparator function

Since the FT4310 can measure the resistance of the bypass route, including the wiring resistance of solar panel strings, you can detect degradation of bypass diodes (which manifests itself in the form of increased resistance) and increased contact resistance in the connections between modules (defective connections).
The instrument's comparator function can be used to compare measured values to a previously set value to generate PASS and FAIL judgments, making it easier to discover anomalies.

Simultaneously measure all parameters
BPD TEST mode

Batch measurement of open-circuit voltage, short-circuit current, and bypass route resistance
Easily discover open faults

Specialized for open-circuit voltage measurement
Voc mode

Measure open-circuit voltage in **1 sec. or less**
Easily discover short-circuit faults since the FT4310 can display the difference between the measured value and the reference value

Enhanced safety
SELF CHECK mode

Detect anomalies in the instrument's internal circuitry before measurement

Backlight (White LED)

Bright backlight lets you work in dark or poorly lit locations.

Integrated "hold" button right on test leads

A button right at your fingertip on the test leads lets you hold measured values easily, eliminating the need to operate a control on the instrument itself. They also incorporate a handy light.

DROP PROOF

Testers are built tough to withstand a 1-meter drop onto a concrete floor.

Energy-saving design

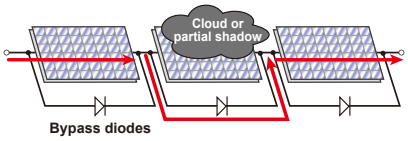
Six AA batteries provide enough power for 3000 measurements.

Bundled case with neck strap

Leave both hands free so you can precisely position test probes without worrying about dropping the instrument.

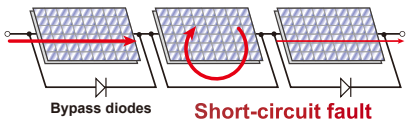
Reference Issues caused by faulty bypass diodes

Normal reading: Current is routed around panels that are covered by shadows



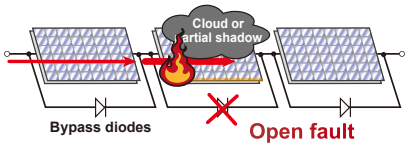
When a solar panel is obscured by a partial shadow (or when it fails), the current bypasses the panel in order prevent any drop-off in generating efficiency.

Short-circuit fault: Generating capacity falls



When a short-circuit fault occurs, **the generated current flows in a loop, making it impossible to capture the generated power, resulting in lowered efficiency.**

Open fault: Potential fire



When an open fault occurs, **current is forced to flow to the defective cell when it's covered by a shadow, causing the panel to heat up and posing the risk of fire.**

Specifications

Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year, Product warranty period for 3 years

Caution: The FT4310 cannot measure strings installed in parallel. Please contact Hioki for more information.

■ General Specifications

Measurement items	Open-circuit voltage, Short-circuit current, Bypass route resistor
Functions	Displays the number of bypass diode measurements, Automatic polarity judgment function, Comparison display, Auto hold, Live circuit indicator, Buzzer sounds, Backlight, Comparator, Battery indicator, Auto power off, Bluetooth® wireless technology
Operating temperature and humidity	-10 to 65°C, 80% RH or less *(no condensation) *Less than 40°C*
Storage temperature and humidity	-20 to 65°C, 80% RH or less (no condensation)
Maximum input voltage	1000 V DC
Dustproof and waterproof	IP40 (EN60529)
Standards	Safety: EN61010, EMC: EN61326
Drop proof	On concrete: 1 m
Power supply	LR6 (AA) alkaline battery×6, Maximum rated power 18 VA
Continuous operating time	Approx. 45 hours (Comparator, backlight, Bluetooth® OFF) Approx. 18 hours (Comparator, backlight, Bluetooth® ON)
Dimensions	152W×92H×69D mm (5.98 W × 3.62 H × 2.72 D in)
Mass	650 g (22.9 oz) (including batteries, excluding test leads)

Description of functionality

Displays the number of bypass diode measurements	: Indicates the number of bypass diode measurements that have been made from the time the instrument was turned on until it is turned off (COUNT mode).
Automatic polarity judgment function	: Warns the user with an audio tone and red backlight that the measured voltage has exceeded the threshold.
Live circuit indicator	: Warns the user that no voltage exists across the measurement terminals.
Comparator	: Compares measured values to a set reference value to generate a PASS or FAIL judgment. **Resistance** (set in BPD TEST mode) **Voltage** (set in Voc mode)

■ Measurement Specifications

BPD TEST mode

Measurement items	Bypass diode comparator judgment, Bypass route resistor, Open-circuit voltage, Short-circuit current, Measurement (applied) current
Measurement object	Crystal system string Open-circuit voltage: 1000 V DC or less, Rated current: 2 A to 12 A DC
Measurement method	Short-circuit and pulse voltage application
Duration of shorting between terminals	10 ms or less
Output pulse	Voltage: 100 V DC or less, Pulse width: 5 ms or less Limiting current: Measured short-circuit current + 1 A or less Maximum: 13 A
Measurement time	2 s or less (3 s or less when measurement voltage is 10 V or less)
Possible number of measurements	3000 times (Comparator, backlight, Bluetooth® OFF) LR6 Alkaline battery × 6

Voc mode

Measurement items	Open-circuit voltage
Measurement range	0 V to 1000 V DC (Displayed up to 1200 V DC)
Response time	Within 1 sec.

■ Accuracy specifications

	Range (displayed range)	Accuracy range	Accuracy	Input impedance
Open-circuit voltage	1000 V (0 to ±1200 V)	0 to ±1000 V	±0.2% rdg. ±3 dgt.	1 MΩ or higher
Short-circuit current	15.0 A (0.0 to 15.0 A)	0.0 to 15.0 A	±3% rdg. ±3 dgt.	0.5 Ω or lower
Bypass route resistance	15Ω (0.0 to 15.0 Ω)	0.0 to 15.0 Ω	*±5% rdg. ±5 dgt.	-

During pure resistance measurement

■ Software specifications

GENNECT Cross (Freeware)

Interface	Bluetooth® 4.0LE
Communication distance	5 m (line of sight)
Supported Android™ devices	Android™ 4.3 or later (Bluetooth® low energy enabled devices)
Supported iOS devices	iOS 10 or later (Bluetooth® low energy enabled devices)

Search for "GENNECT Cross" in Google Play or on the App Store.

ANDROID APP ON Google play

Download on the App Store

Android iPhone

Order code/ Options

Model : BYPASS DIODE TESTER FT4310

Model No. (Order Code) (Note)

FT4310 (Built-in Bluetooth® wireless technology)

Caution: The FT4310 cannot measure strings installed in parallel. Please contact Hioki for more information.

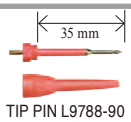
[Accessories]
TEST LEAD SET WITH REMOTE SWITCH L9788-11×1
CARRYING CASE C0206×1
Instruction manual×1
LR6 alkaline battery×6

Test leads

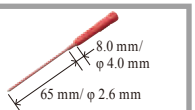
The L9788-11 is bundled, others are exclusive options for L9788-11

TEST LEAD SET WITH REMOTE SWITCH L9788-11
Bundled with Test Lead with Remote Switch L9788-10/ Earth lead, alligator clip, 1.2 m (3.94 ft) length

TEST LEAD WITH REMOTE SWITCH (RED) L9788-10
Lighting LED lamp & comparator indicator (Operate only when main unit provides a comparator function), 1.2 m (3.94 ft) length



TIP PIN L9788-90
Spare parts for tip of the L9788/ L9788-10, Tip length 35 mm (1.38 in)/φ 3.2 mm (0.13 in)



BREAKER PIN L9788-92
For checking breaker terminal, Detachable for tip of the L9788-10, 65 mm (2.56 in) length, φ 2.6 mm (0.10 in)

Other option

*The C0206 is bundled

CARRYING CASE C0206

Software

Free smartphone / tablet app GENNECT Cross

GENNECT Cross SF4000
Application for Android, iOS, and Windows

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