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DC Power Supply Fluctuation Test System for Automotive Electrical Equipment

NEW

Compliant with ISO16750-2:2023, ISO21780:2020, ISO7637-2:2004, 2011 standards (individual OEM standards can also be accommodated ^{*1})
Application software control (LAN) enables easy and reliable creation and editing of various power supply fluctuation waveforms in addition to ISO standards

Switch box OT12-PBZ (5 ch): enables power line momentary interruption (positive pole, negative pole, both poles) and communication line momentary interruption (16 ch)

Intelligent bipolar power supply PBZ series (with LAN): 20 V / 40 V / 60 V / 80 V, 4 models in total

Low ripple noise, low impedance, high speed response, built-in function generator, etc.

Synchronization deviation between channels of 1 μ s or less achieved (using both trigger synchronization and clock synchronization)

Test automation is possible with a view to reducing test man hours ^{*2}

^{*1} For individual OEM standards, please contact our sales office.

^{*2} Test automation is a custom order. Please contact our sales office.

DC Power Supply Fluctuation Test System for Automotive Electrical Equipment

System constructed by combining switch box and software

- Intelligent bipolar power supply: PBZ series (with LAN)



- Switch box: OT12-PBZ

- Integrated software for power supply fluctuation testing of automotive electrical equipment: SD037-PBZ
- ISO standard license: OP10-SD037-PBZ (option)



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This test system is designed to simulate power supply voltage fluctuations, momentary voltage drops, and momentary interruptions for electronic equipment installed in vehicles, and evaluate the immunity of the electronic equipment.

For power supply fluctuation test compliance standards, in addition to the international standards ISO16750-2, ISO21780, and ISO7637-2, the system also accommodates regional standards and industry association standards in various countries, as well as power supply fluctuation test standards required by individual OEMs.

The key feature of this system is that it provides a switch box necessary for power supply fluctuation tests, momentary voltage drop tests, and momentary interruption tests, as well as an application software that controls the sequence operation of the intelligent bipolar power supply PBZ series, thereby building a power supply fluctuation test system compliant with various standards.

- **Compliant with ISO16750-2.2023, ISO21780.2020, ISO7637-2.2004, 2011 standards**
(individual OEM standards can also be accommodated ^{*1})
- **Application software control (LAN) enables easy and reliable creation and editing of various power supply fluctuation waveforms in addition to ISO standards**
- **Switch box**
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(using both trigger synchronization and clock synchronization)
- **Test automation is achieved with a view to reducing testing man hours ^{*2}**

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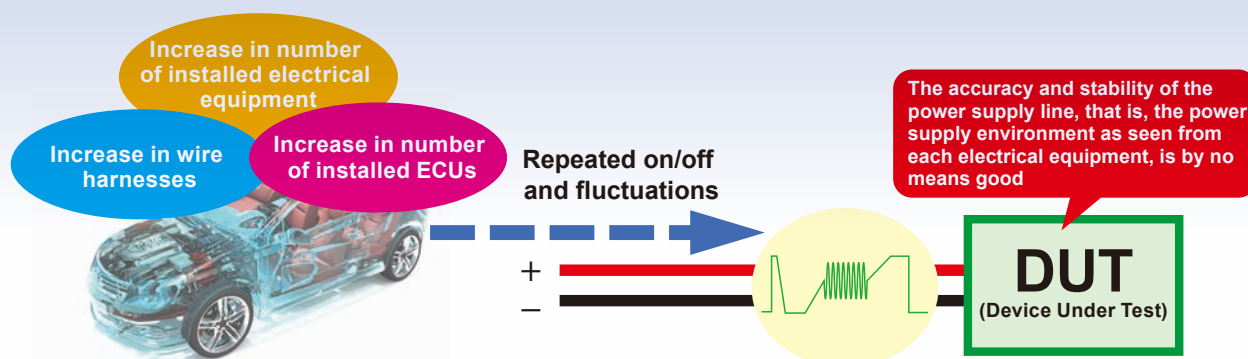
What is power supply fluctuation test for automotive electrical equipment?

● Necessity of power supply fluctuation test

For automobiles, the primary source of energy is the battery, but factors such as engine start-up as well as electronic circuit chattering can be cause for concern. Therefore, power supply fluctuation waveforms are arbitrarily programmed and evaluated assuming momentary interruptions of the power supply caused by these factors. Power supply fluctuation tests are conducted to simulate these conditions.

● Power supply fluctuation is “stress” for the DUT

Since automobiles carry human lives, they must always operate reliably and be safe. Therefore, it is necessary to conduct power supply fluctuation immunity tests to confirm that each electrical equipment is not affected by the stress of power supply fluctuations.



Power supply used for power supply fluctuation test

● Bipolar power supply with high speed response and high current

In automotive electronic equipment, wire harnesses are long, and inductive loads such as motors, as well as large capacitance capacitors connected between the input and ground, are often present, exhibiting capacitive characteristics as loads. In such cases, a general DC power supply may exceed its linear operating range, making it impossible to obtain the waveform output as set. Considering these factors, it is common to use a bipolar power supply with high speed response and high current for power supply fluctuation testing of automotive electronic equipment.

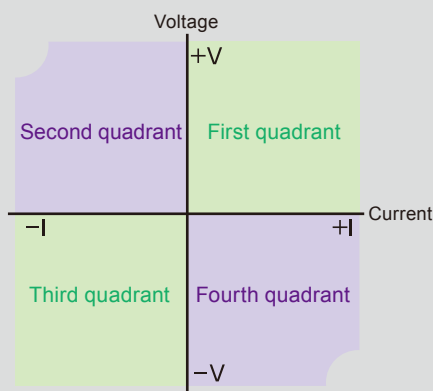
The intelligent bipolar power supply PBZ series is a bipolar DC stabilized power supply that can continuously pass through 0 and vary in either direction without switching + and - polarities for output terminals. The PBZ is capable of 4-quadrant operation, meaning that it is capable of both sourcing and sinking power, ideal for driving both inductive and capacitive loads.

This power supply comes equipped with a built-in function generator (signal generation function), allowing for easy waveform generation and sequence setting. It is also equipped with a synchronous operation function essential for power supply fluctuation test and a parallel operation function for expanding the output current. The “switching” + “linear” design of the PBZ has allowed for a 40% reduction in weight (approx. 22 kg) compared to our conventional models, while achieving low ripple noise and high-speed operation (CV mode: 100 kHz).

What is a bipolar power supply?

A bipolar power supply is a power supply device having a four quadrant operating region, with output voltage and current both bipolar.

Four quadrant (bipolar) operation conceptual diagram



- Green box: Voltage and current in the same direction (source)
- Purple box: Voltage and current in opposite directions (sink)

PBZ series
Intelligent Bipolar DC power supply



Intelligent Bipolar Power Supply PBZ Series

● Model with LAN

- PBZ20-20 (± 20 V / ± 20 A)
- PBZ60-6.7 (± 60 V / ± 6.7 A)
- PBZ40-10 (± 40 V / ± 10 A)
- PBZ80-5 (± 80 V / ± 5 A)

Reasons for choosing the PBZ series

Power supply fluctuation test system for automotive electrical equipment

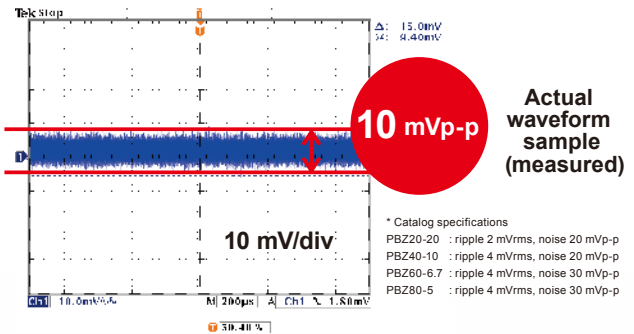
How to select a power supply without failure

6 points

Realizing power supply fluctuation test for automotive electrical equipment

① Low ripple noise

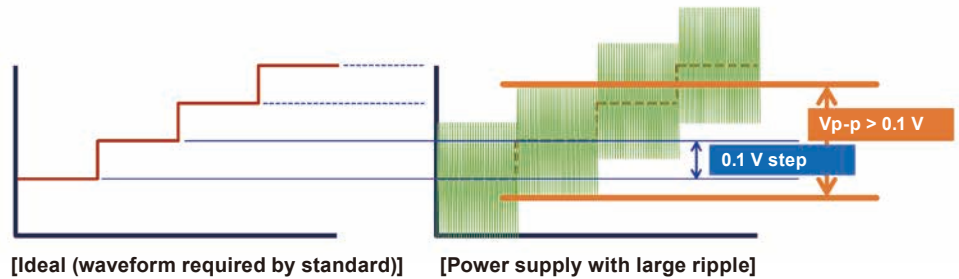
In the ISO7637-2 standard, the ripple noise of the power supply used for testing is specified as " $V_{p-p} < 200 \text{ mV}$ ". Also, some OEM standards require " $V_{p-p} < 100 \text{ mV}$ ".



[Explanation]

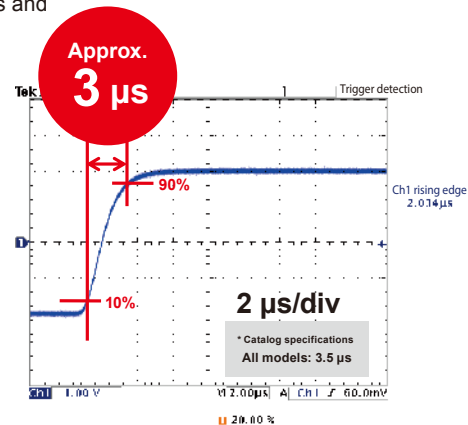
Low power supply ripple noise

Depending on the private standards of automotive manufacturers, some manufacturers require fluctuation voltage variable in 0.1 V steps. In other words, if the power supply itself has a ripple noise of 100 mV or more, even if the test voltage is varied in 0.1 V steps, it will be buried in this ripple noise baseline, making it unclear what test is being performed.



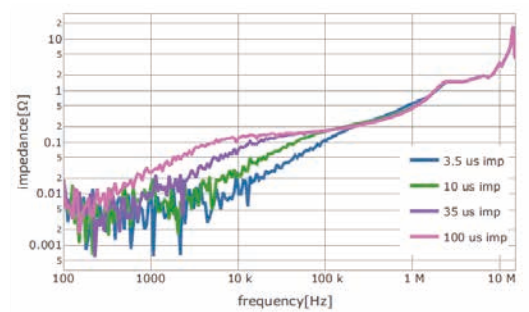
② Fast tr/tf (rise/fall time)

The response speed of rise/fall time accommodates the relay operation tests and momentary voltage drop tests required by individual OEMs.



③ Low internal impedance

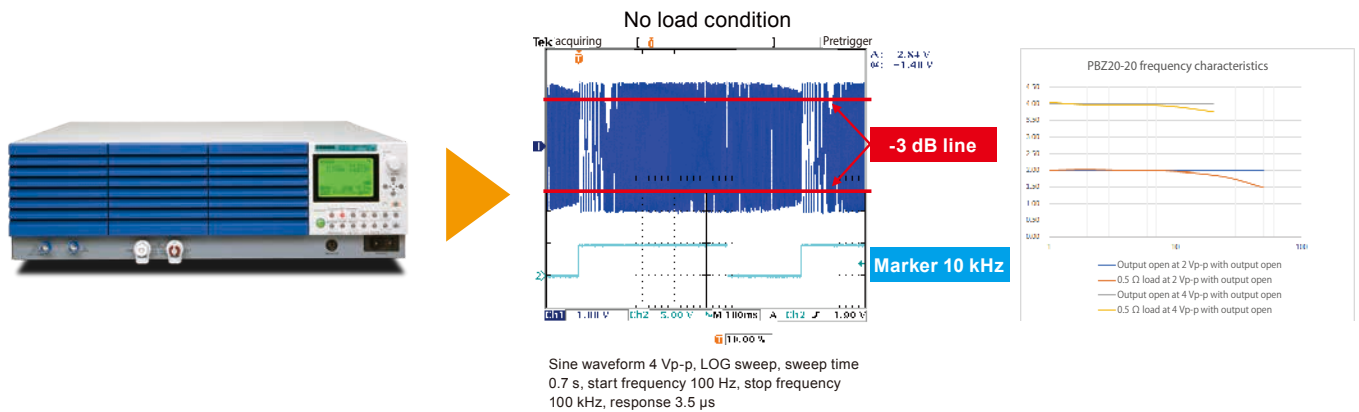
In the ISO7637-2 standard, the internal impedance of the power supply used for testing is specified as "10 mΩ or less" within the range of DC to 400 Hz. In the same standard, it is specified as "0 Ω to 0.05 Ω" in Pulse2b.



* Impedance characteristics vary by model. For details, refer to the Instruction Manual.

④ Excellent gain characteristics (frequency characteristics)

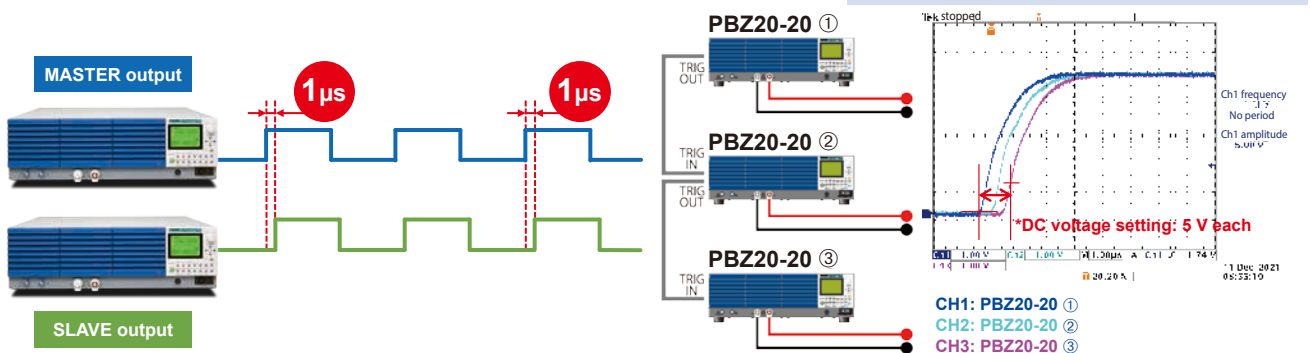
By employing our original high speed amplifier technology, frequency characteristics of DC to 100 kHz (-3 dB) are achieved.
Target models (PBZ20-20, PBZ40-10, PBZ60-6.7, PBZ80-5)



⑤ Synchronous operation possible

Depending on the electrical equipment, some equipment receive power from multiple power input ports for the power supply output supplied from the battery. In such cases, different voltage waveforms are supplied at different timings for each power input port, so power supply fluctuation test must be performed in synchronization with each power input port. With PBZ, by using both trigger synchronization and clock synchronization (10 MHz), synchronization deviation (synchronization delay specification: 1 μs or less) does not occur even during long time operation.

[Trigger synchronization and clock synchronization combined
(image & measured values)]

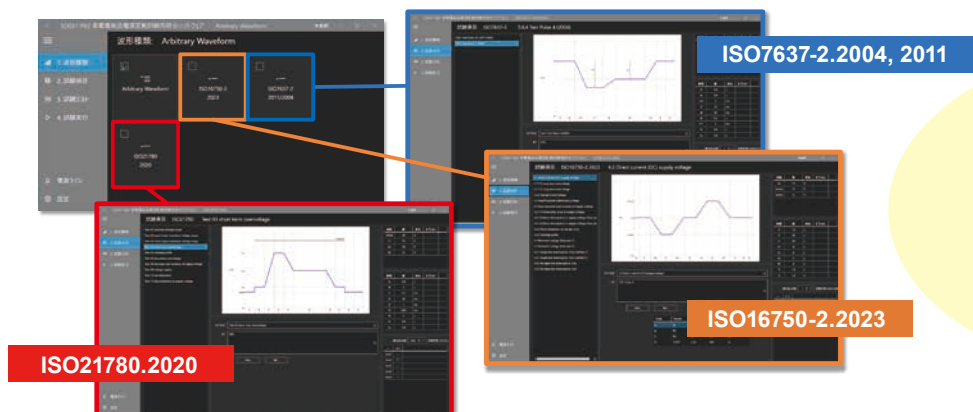


⑥ Flexible support for international standards and individual OEM standards

The power supply fluctuation test system is operated using dedicated application software. By activating the optional standard enablement license required for the integrated software for power supply fluctuation testing of automotive electrical equipment (SD037-PBZ), tests based on standards can be executed easily.

● Example of activating OP10-SD037-PBZ (ISO license) on

SD037-PBZ (Integrated software for power supply fluctuation testing of automotive electrical equipment)



With OP10-SD037-PBZ (ISO license),
the standard tests of

► ISO7637-2.2004, 2011

► ISO16750-2.2023

► ISO21780.2020

are preset, so you can easily execute a test
simply by selecting your desired test item.

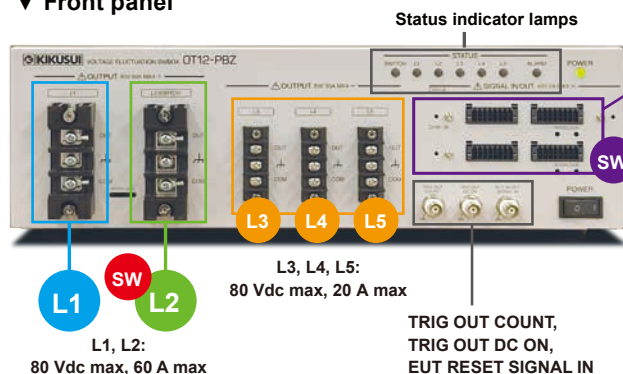
Although this is a test standard for assuming specific power supply fluctuation patterns and checking the operation of each electrical equipment, in reality the test patterns defined in international standards are few, and it is mostly the case that each OEM * defines its own test patterns and requests its suppliers to perform tests accordingly. With PBZ, flexible response is possible by using optional switch box and application software.

* For individual OEM standards, please contact our sales office.

OT12-PBZ: Switch box with external device coordination / momentary interruption function

The switch box with external device coordination / momentary interruption function OT12-PBZ is a unit for configuring a power supply fluctuation test system for automotive electrical equipment using our bipolar power supply PBZ series. It can mechanically turn the PBZ power supply output on and off.

▼ Front panel



SIGNAL IN/OUT (CH1 to CH16)
Signal line input/output connector
*Signal I/O: 40 Vdc max, 2 A max

● Operation via dedicated application software

The power supply fluctuation test system is operated by:
▶ Integrated software for power supply fluctuation testing of automotive electrical equipment: SD037-PBZ
▶ ISO standard license: OP10-SD037-PBZ (option)

● Supports momentary interruption test

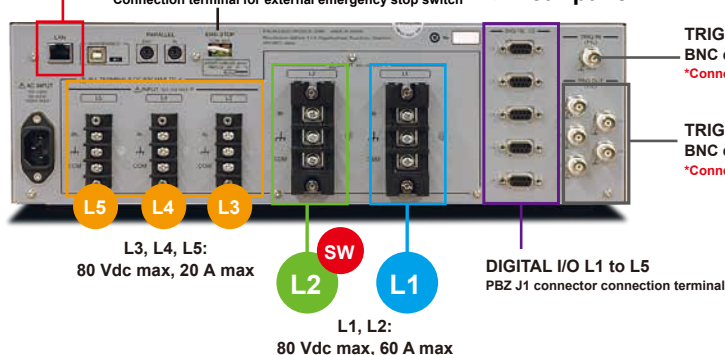
Built-in momentary interruption switch capable of handling momentary interruption tests required for standard-compliant tests
(1 system for power **SW**, 16 systems for signals **SW**)

LAN port

Communication I/O is via LAN connection only

Connection terminal for external emergency stop switch

▼ Rear panel

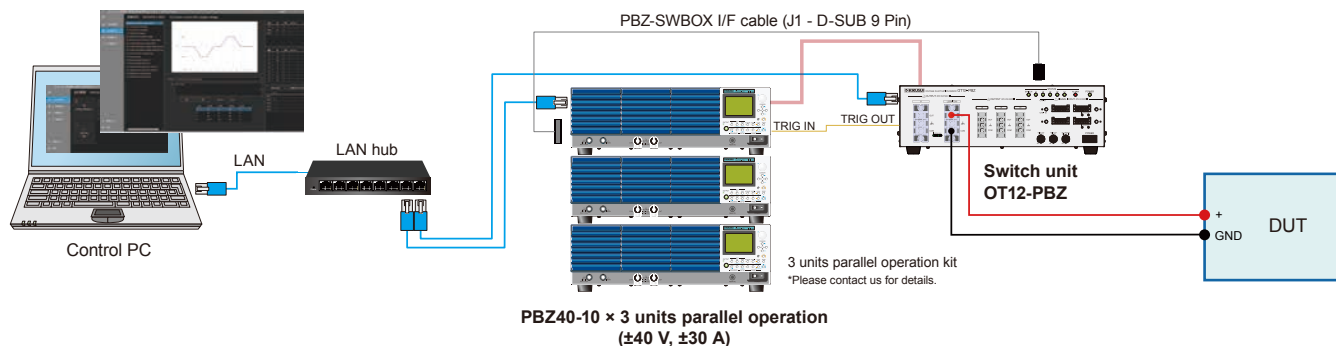


TRIG IN
BNC connector for trigger signal input
*Connect to the TRIG OUT terminal of the PBZ set as the battery line [constant supply line].

TRIG OUT
BNC connector for trigger signal output
*Connect to the TRIG IN terminal of the PBZ connected to L1 to L5 lines.

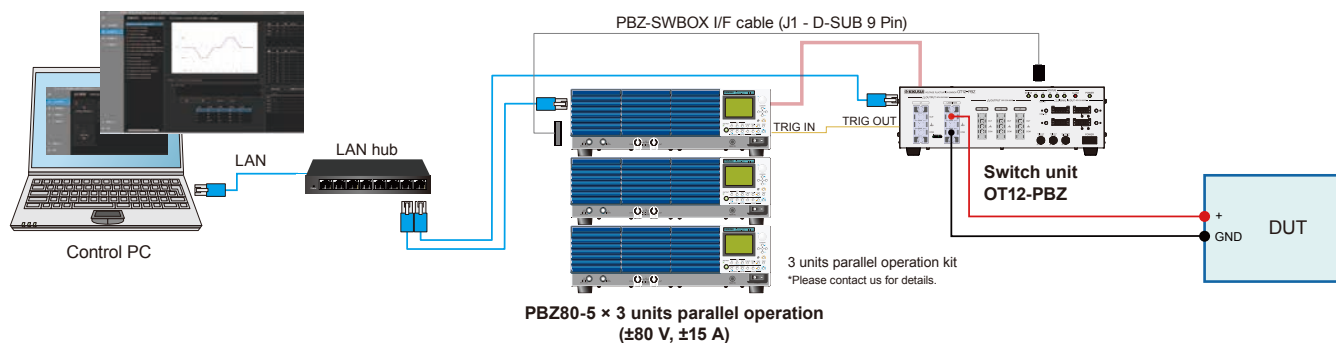
System configuration example ①

SD037-PBZ (Integrated software for power supply fluctuation testing of automotive electrical equipment)
OP10-SD037-PBZ <ISO standard compatible, 1 ch (12 V, 24 V systems)>



System configuration example ②

SD037-PBZ (Integrated software for power supply fluctuation testing of automotive electrical equipment)
OP10-SD037-PBZ <ISO standard compatible, 1 ch (48 V systems)>



Application software

Model name	Product name	Remarks
SD037-PBZ	Integrated software for power supply fluctuation testing of automotive electrical equipment	Integrated application, arbitrary waveform creation function

Option

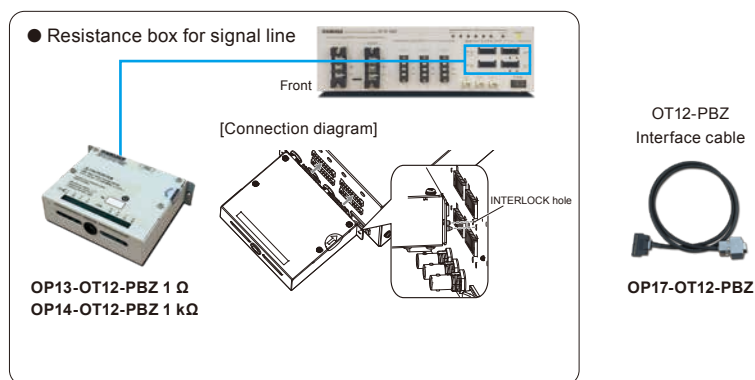
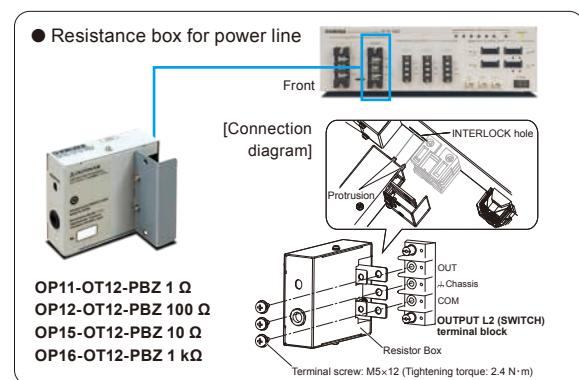
Standard enablement license

Model name	Product name	Remarks
OP10-SD037-PBZ	ISO standard license	Compliant with ISO16750-2:2023, ISO21780:2020, ISO7637-2:2004, 2011 standards
OP20-SD037-PBZ	OEM standard license	
OP30-SD037-PBZ	OEM standard license	
OP40-SD037-PBZ	OEM standard license	
OP50-SD037-PBZ	LV standard license	Compliant with LV124, LV148 standards

* For individual OEM standards, please contact our sales office.

Resistance box for waveform confirmation and others

Model name	Product name	Remarks
OP11-OT12-PBZ	Resistance box for power supply fluctuation test (for power line) 1 Ω	Before performing a momentary interruption test for the power line or signal line, connect the optional resistance box in place of the EUT to confirm the waveform on the power line or signal line. An oscilloscope is used for waveform confirmation.
OP12-OT12-PBZ	Resistance box for power supply fluctuation test (for power line) 100 Ω	
OP13-OT12-PBZ	Resistance box for power supply fluctuation test (for signal lines) 1 Ω	
OP14-OT12-PBZ	Resistance box for power supply fluctuation test (for signal lines) 1 k Ω	
OP15-OT12-PBZ	Resistance box for power supply fluctuation test (for power line) 10 Ω	* With interlock function. Test execution is not possible when the resistance box is connected.
OP16-OT12-PBZ	Resistance box for power supply fluctuation test (for power line) 1 k Ω	
OP17-OT12-PBZ	OT12-PBZ interface cable	MIL connector - DSUB connector conversion cable, length 1 m



External coordination function (connection with user controlled equipment)

● Equipped with auxiliary signals for test automation

<When installing a host monitoring device>

OT12-PBZ is equipped with auxiliary signal terminals for automating tests using a host monitoring device.

The availability of this function differs depending on the standard and test item.



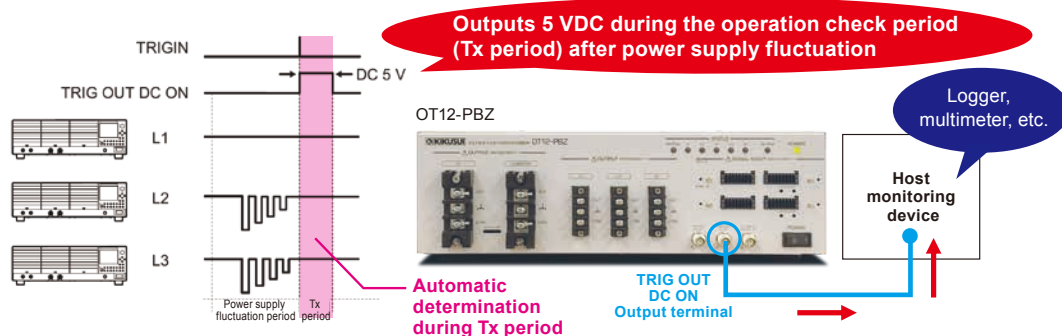
*Please prepare commercially available coaxial cables and LAN cables.

- ③ EUT RESET SIGNAL IN input terminal
- ① TRIG OUT DC ON output terminal
- ② TRIG OUT COUNT output terminal

① TRIG OUT DC ON output terminal

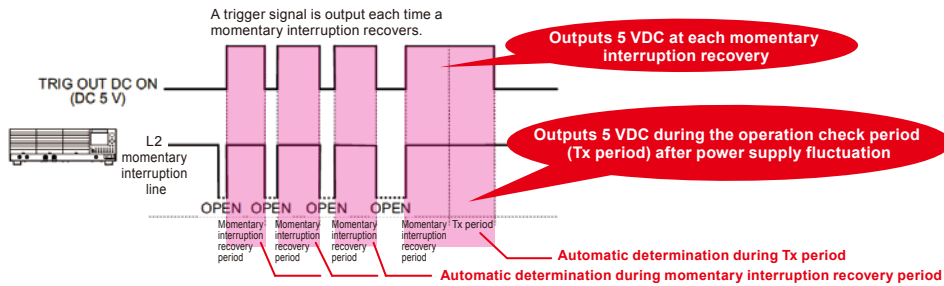
OT12-PBZ outputs 5 VDC during the operation check period (Tx period) after power supply fluctuation*, or during the momentary interruption recovery period. The operation check period or the momentary interruption recovery period can be detected by the host monitoring device.

*Only when operating settings are made for specific OEM standards.



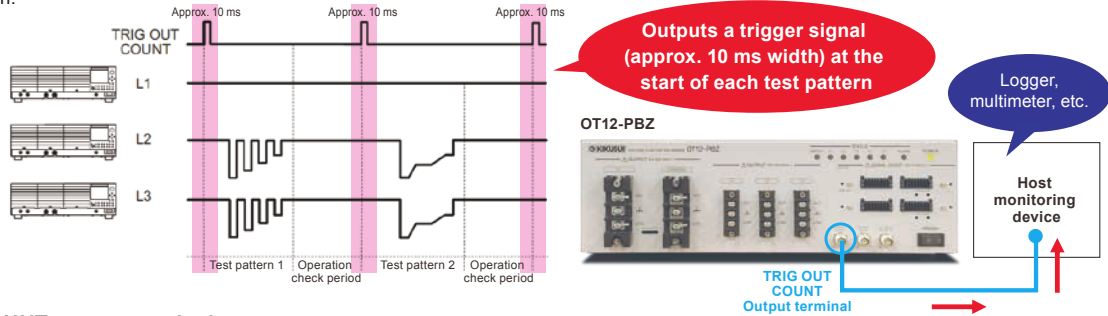
① TRIG OUT DC ON output terminal

When the "Trigger output for each momentary interruption" check box is selected in the application software.



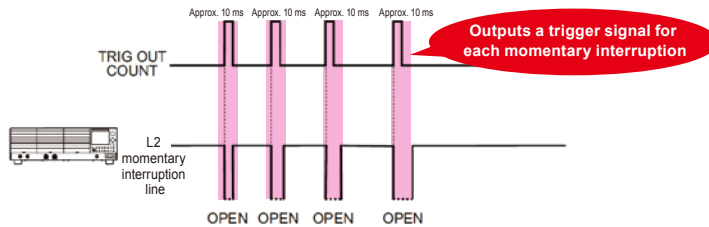
② TRIG OUT COUNT output terminal

A trigger signal (approx. 10 ms width) is output at the start of each test pattern. By comparing the count number of this trigger output with the test pattern, the test execution status and the test pattern in which an error occurred can be identified. In momentary interruption test, it can be changed to trigger output for each momentary interruption.



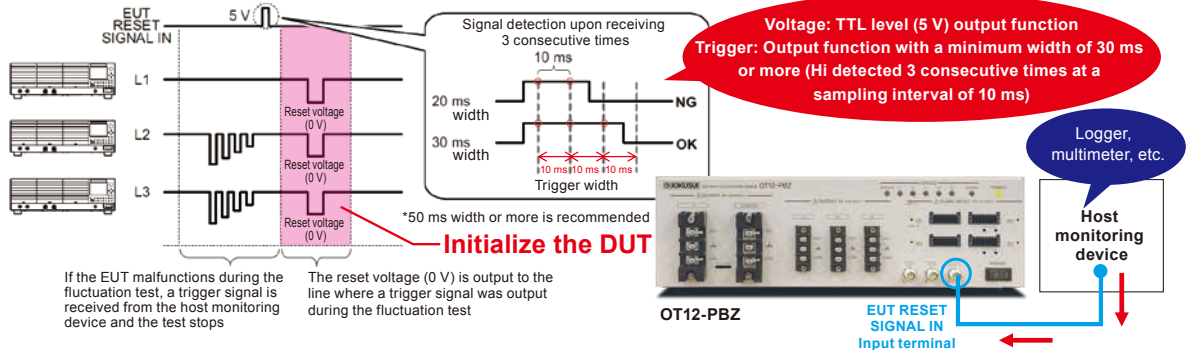
② TRIG OUT COUNT output terminal

When the "Trigger output for each momentary interruption" check box is selected in the application software.



③ EUT RESET SIGNAL IN input terminal

If the EUT malfunctions during a test, when a trigger input is applied from the host monitoring device to the EUT RESET SIGNAL IN terminal, OT12-PBZ outputs a reset voltage (0 V) to the EUT to initialize the EUT.



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