NoiseKen

EMC TEST EQUIPMENT PRODUCT CATALOGUE

Make EMC Test Easier!

|2|0|2|5|

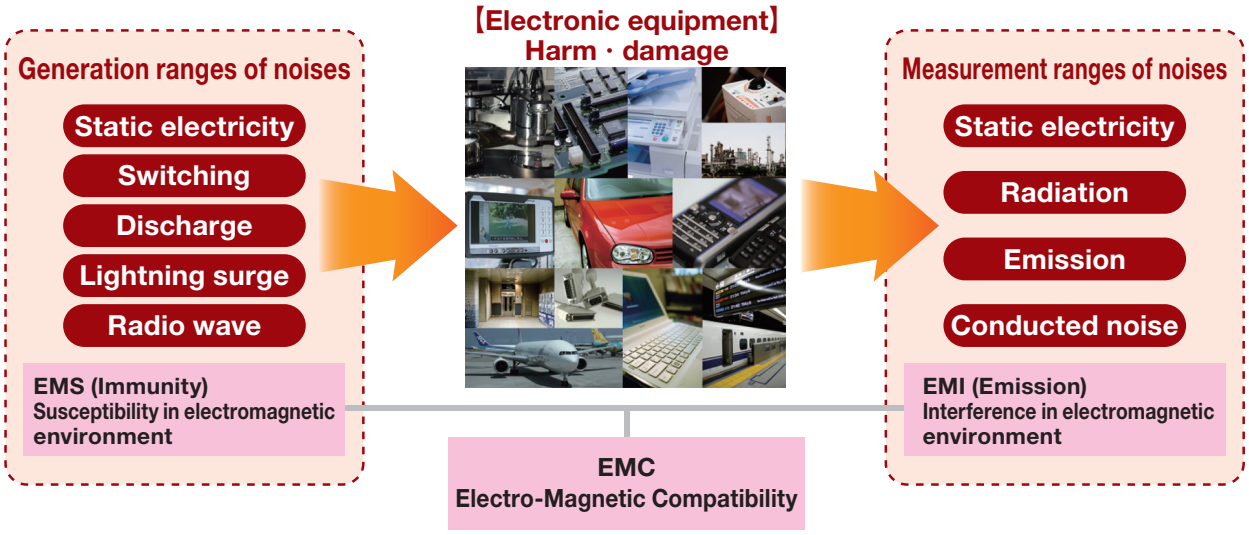
www.noiseken.com

Mission statement from NoiseKen

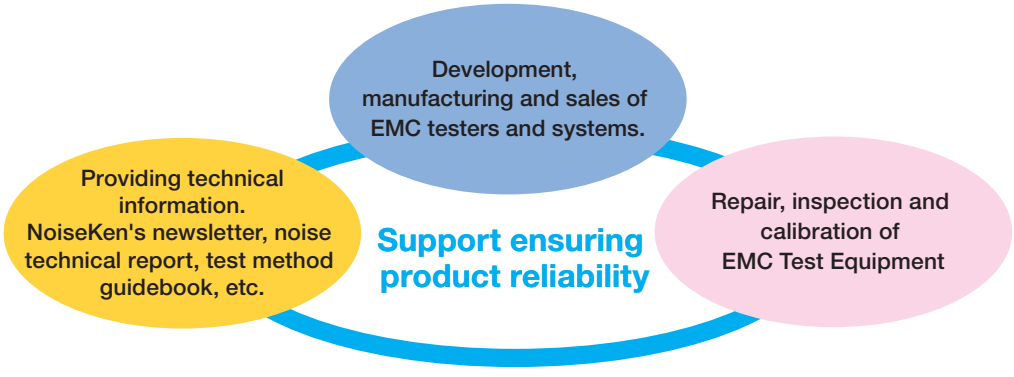
"To challenge the reproduction of electrical noise continuously and aim to be a company that makes customer EMC tests easier."

Our company was founded in 1975, when the term "EMC" began to be used as the phenomenon of malfunctions became a social problem with the spread of computers, as "a company that manufactures noise testers for reproducing malfunctions of electronic devices."
Since then, in order to contribute to the quality of products that customers make, we have provided EMC testers reproducing (output / measure) electrical noise such as electrostatic discharge phenomenon, high current phenomenon at the time of lightning strike, transient phenomenon in car, contracted EMC test services (contracted test site "Test Lab Funabashi"), and provided technical materials such as "NoiseKen News" (former Technical Report) and "Test Method Guidebook". Our brand "NoiseKen" has been adopted by more than 5,000 customers in Japan.
Based on the history and achievements so far, in addition to "continuing to challenge the reproduction of electrical noise" which is the starting point of our founding, we will continue to improve not only quality, cost and delivery time, but also automation and simulation function of our testers / measuring instruments. "NoiseKen" contributes to EMC and noise countermeasures by aiming to be a "company that makes customer's EMC tests easier" while responding to changes in the way of life.

Variety of Electrical Noises and EMC



Products & Services of "NoiseKen"

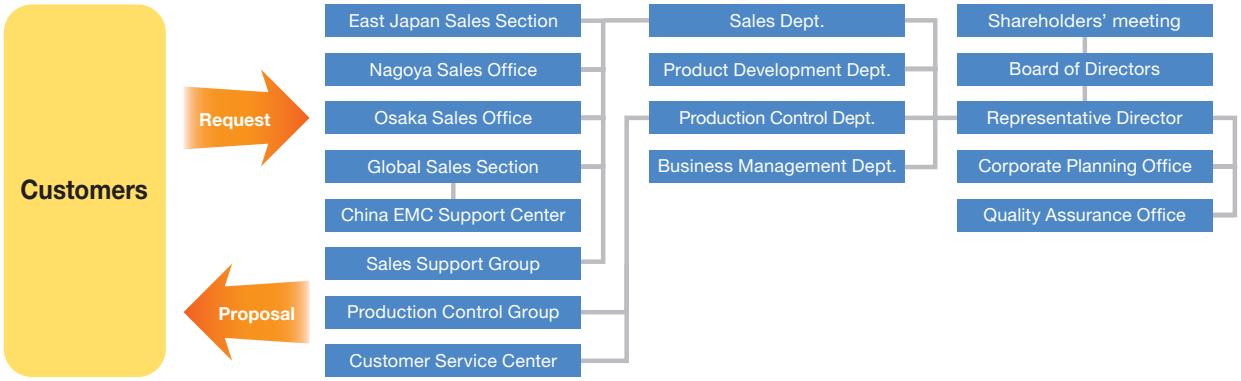


Historical Highlights of Noise Laboratory Co., Ltd.

1975 Adachi Noise Laboratory Co., Ltd. establishment / Location of the Head Office : Iguchi,Mitaka-shi, Tokyo.
1976 Company name was changed to Noise Laboratory Co., Ltd.
1984 Head Office was relocated to Noborito, Tama-ku, Kawasaki-shi.
1990 Head Office was relocated to Kami-asao, Asao-ku, Kawasaki-shi.
1995 Start contract testing and measurement services in Funabashi, Chiba Pref.
Selected as "New business model company" by Kanto Trade & Industry Bureau.
1996 Head Office was relocated to Mampukuji, Asao-ku, Kawasaki City,
Commercialization of "electromagnetic wave interference source exploration device (ESV system)" through industry-academia collaboration with Industrial Technology Center of Tochigi prefecture.
1997 Equipped an anechoic chamber in Test Laboratory Funabashi.
2000 Head Office and Kakio Work were relocated to Chiyoda, Sagamihara City.
2004 Acquired IEC17025 accredition.
2009 Acquired test site certification in ISO/IEC17025 to Test Laboratory Funabashi by VLAC.
2011 China after-sales service office was established.
2012 Launched Space-electric/magnetic visualization systems (EPS-02 series) in collaboration with Kanazawa University
2015 Launched thin-plate broad band antenna in partnership with Toyota Motor Corp.
2016 The 32rd Kanagawa Industrial Technology Development Grand Prize incentive-awarded to NKU07M32G Broadband Sleeve Antenna.
2018 Received "IEC 1906 Award" from IEC (International Electrotechnical Commission).
2019 Received the "Excellent paper award" from Environmental Electromagnetic Engineering Study Group, the Institute of Electronics, Information and Communication Engineers.
2020 Commercialization of "TEM horn antenna" through industry-academia collaboration with the National Institute of Information and Communications Technology (NICT).
Completion of new building (office building) due to business expansion.
2023 End of contract testing service business (Test Lab Funabashi).
2024 Opened new EMC Solution Center at Head Office (Sagamihara).

Outline of Noise Laboratory Co., Ltd.

【Company name】	NOISE LABORATORY CO., LTD.
【Location】	Head office : 1-4-4 Chiyoda, Chuo-ku, Sagamihara City, Kanagawa Pref. 252-0237 Japan TEL : +81-42-712-2051 FAX: +81-042-712-2050
【Establishment】	28th March, 1975
【Representative Director】	Junichi Fujigaki
【Accounting period】	May
【Dealings banks】	Mizuho bank Machida Branch Bank of Yokohama Sagamihara Ekimae Branch Bank of Mitsubishi UFJ Sagamihara Branch Sumitomo Mitsui Banking Corporation Machida Branch



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●The printed products in this catalog are as of March, 2025. They may be changed without a preliminary announcement.

Electrostatic Discharge Simulator

ESS-PS1 & GT-31S (ESD Gun)

Make your electrostatic testing easier!

This tester simulates the electrostatic discharge phenomenon from a charged human body and evaluates the resistance of electronic devices to electrostatic discharge.

Electrostatic discharge occurs when a charged human body approaches an operation panel, button switches, or housing of electronic devices. It generates a high-voltage, high-frequency noise which can cause malfunctions in the electronic devices.
Electrostatic testing reproducing noise caused by electrostatic discharge is one of the essential immunity tests to prevent troubles caused by noise in the market.

- IEC 61000-4-2 / ISO 10605 Standards compliance.
- Touch panel operation discharge gun improves operability.
- Portable battery unit offer convenient testing for large equipment.
- Pre-check function for simple pre-start inspection to ensure correct testing.
- One-touch replacement of CR unit.

*Probe stand for the discharge gun is an option.

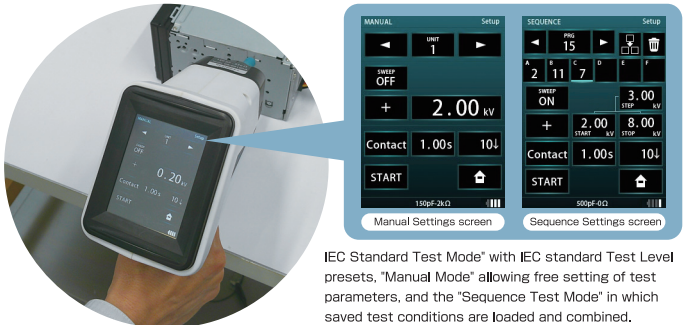
Greater freedom in testing!
Touch panel and portable battery for easier testing

The discharge gun is equipped with a touch panel and is battery-powered for improved portability. This is effective when testing mobility devices, large medical devices, office equipment, etc.

**Product image is for illustration purpose only.*

Easy setting of test conditions
Intuitive Operation Screen

Easy setting of test conditions using the touch panel on the discharge gun. User-friendly intuitive design with English/Japanese multilanguage support.

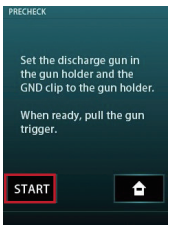


IEC Standard Test Mode" with IEC standard Test Level presets, "Manual Mode" allowing free setting of test parameters, and the "Sequence Test Mode" in which saved test conditions are loaded and combined.

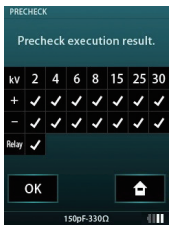
More reliable testing
Pre-check Function

Three pre-check functions to ensure more reliable testing: "High voltage power supply output check," "Insulation failure check," and "Discharge relay operation check." Three pre-check functions allow early detection of abnormalities in the testing equipment. Does not require a dedicated measuring device, anyone can easily operate this function.

Set the discharge gun in the gun holder



Start the Pre-Check



Pre-Check Complete

※Image during development

ESS-PS1 & GT-31S

ESS-PS1 & GT-31S Specifications

Parameter	Features / Specifications
Output voltage	0.2kV ～ 30.0kV
Polarity	Positive / negative
Repetition cycle	0.05s ～ 600s
Discharge number of times	1 - 60,000 times, continuous
Discharge mode	Contact discharge / Air discharge
Test mode	IEC standard test mode Manual test mode Sequence test mode
Trigger mode	Gun trigger / External trigger
Discharge detection	present
Pre-check function	present

Parameter	Features / Specifications
CR-cup check	IEC & ISO detection
Operation panel	Color LCD touch panel (resistive film type)
Language	English / Japanese
External Control	Optical connector connection for PC communication
Power Supply	AC100V ～ 240V / battery
Dimensions	Power Supply Unit: (W)180×(H)124×(D)292mm Gun: (W)90×(H)236.2×(D)285.4mm ** protrusions excluded*
Weight	Power Supply Unit: 3kg (excluding AC adapter) Gun: 1.2kg (cables included/connector excluded)
Gun Holder	Included in the package

ESS-PS1 & GT-31S Options

CR for GT-31S (discharge module)

CR (discharge module) for use with the GT-31S series discharge guns.

Conventional discharge guns have separate discharge cups and CR units.

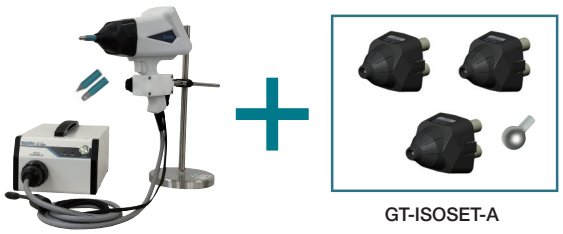
CR (discharge module) for GT-31S integrates the discharge cup and CR unit.

MODEL	Product Name
06-00100A	CR for GT-31S (150pF-330Ω)
06-00101A	CR for GT-31S (150pF-2kΩ)
06-00102A	CR for GT-31S (330pF-330Ω)
06-00103A	CR for GT-31S (330pF-2kΩ)
06-00105A	CR for GT-31S (500pF-0Ω)
06-00106A	CR for GT-31S (150pF-500Ω)
06-00107A	CR for GT-31S (100pF-1.5kΩ)
06-00108A	CR for GT-31S (200pF-0Ω)
06-00109A	CR for GT-31S (150pF-150Ω)
GT-ISOSET-A	ISO Accessory Set for GT-31S Set includes: CR for GT-31S 06-00101A / 06-00102A / 06-00103A, discharge tip (sphere type) 12-00009A

***Please inquire separately for CRs other than those listed.**

For ISO 10605 testing

ISO 10605 testing can be performed by using the optional ISO accessory set for the GT-31S with the ESS-PS1&GT-31S.



ESS-PS1&GT-31S

GT-ISOSET-A

※ CR is for illustrative purposes only.

Discharge Tips MODEL: 12-00007A / 8A / 9A

Discharge gun tips

Discharge tip (conical): 12-00007A
Discharge tip (round): 12-00008A
Discharge tip (sphere type): 12-00009A

Probe stand MODEL: 03-00130A

Probe stand used to secure a discharge gun for electrostatic testing equipment. (Not regulated by IEC standard)
The articulated type allows the discharge gun to be oriented and fixed in any desired direction.

Parameter	Specification
Dimensions	Height (H): 380mm Base diameter: 160mm
Mass	Approx. 4.1kg
Range of motion	Vertical: 150mm Pivot angle: 130°

ESD Simulator

ESS-S3011A & GT-30RA (ESD Gun)

Free you from the hassle of testing by the pre-check function and the weight reduction of the discharge gun

EMC test equipment to evaluate the resistibility of electronic equipment when energy charged on a human body or object is discharged to the electronic equipment.
This can be available for evaluating malfunctions or functions declines of electronic equipment against the ESD. Programmable simulator to ease some complicated tests. The output voltage is up to 30kV allowing to perform testing compliant to IEC61000-4-2 & ISO 10605 Standards.

*Probe stand for the discharge gun is an option.

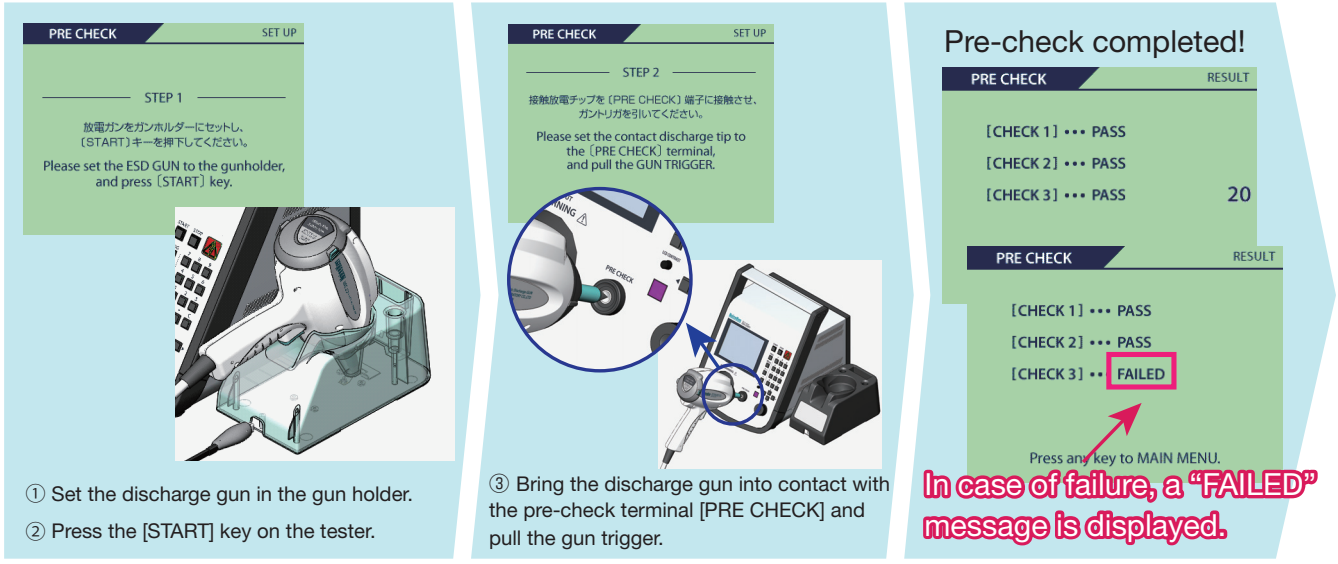
- “3 pre-checking function” to ensure more reliable testing.
- “CR constant indicator” to prevent incorrect unit attachment.
- One-touch exchange of gun head and CR unit realized.
- “Ten-key & Rotary knob” to ease the setting.
- “Infra-red Remote Controller” allowing setting remotely from the generator (Option).
- “Discharge Detecting Function” to realize the air-discharge confirmation.
- “Lightest discharge gun in the market” to lighten the continuous operation (Excluding the cable and connector).
- “White LED Irradiator” to facilitate the visualization of the discharging areas.
- “ Control Software” to enable the test result reporting and control with PC.

* The software is available for a free of charge download from our web-site. (The connection cable is necessary in addition).
* C (Capacitor) and R (Resistor) for the discharge gun is one-body unit.
* ISO 10605 compliant test can be realized with the optional parts in addition.

Feature

Achieve more reliable test!
Equipped with "3 Pre-check Functions"

The new ESD simulator is equipped with 3 pre-check functions; "high voltage power output check", "insulation failure check", and "discharge relay operation check" on the main body and discharge gun.You can prevent troubles such as failing to perform the test properly; if you did not notice the failure of the tester body or the relay inside the discharge gun has reached the end of its life.



① Set the discharge gun in the gun holder.
② Press the [START] key on the tester.

③ Bring the discharge gun into contact with the pre-check terminal [PRE CHECK] and pull the gun trigger.

[Check 1] High-voltage power output check: Check the error from the set value.
[Check 2] Insulation defect check: Checks for defective insulation withstand voltage.
When the discharge gun is placed in the attached gun holder, you can check the output of the high-voltage power supply and check for insulation defects.

[Check 3] Discharge relay operation check: Check the relay for wear.
Check the wear of the discharge relay by bringing the discharge gun into contact with the check terminal and discharging.

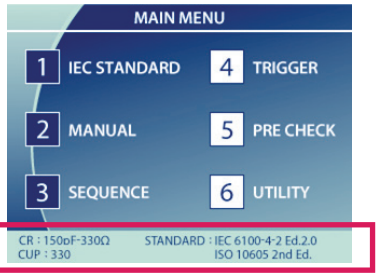
ESS-S3011A & GT-30RA

"CR constant indicator" to make sure the correct unit attachment

The constants of the discharge resistance and discharge capacitor, which were previously disassembled and checked, are now displayed on the main unit screen. When the CR unit or discharge cup of the discharge gun is replaced, it is automatically recognized and the type of CR unit is determined. The CR unit and the discharge cup are identified separately, and if the combination complies with the standard, the conforming standard is displayed at the bottom of the main menu.

Whether the gun head corresponds to IEC or ISO ?

What values are the charge capacitor and discharge resistor ?



Indicated on the display of the generator

*There are restrictions on the display pattern.

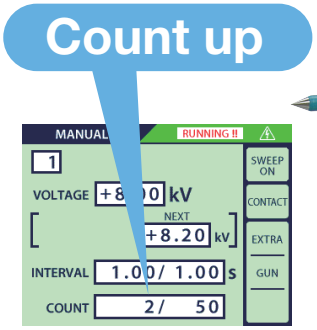
CR unit [CR]	Discharge cup [CUP]	Compliant standard table
150pF-330Ω	330	IEC 61000-4-2 Ed.2、ISO 10605 2nd Ed.
330pF-330Ω	330	ISO 10605 2nd Ed.
150pF-2kΩ	2k	ISO 10605 1st Ed. & 2nd Ed.
330pF-2kΩ	2k	ISO 10605 1st Ed. & 2nd Ed

Easy to Check for Discharge Equipped with discharge detection function

It is possible to check the presence or absence of discharge during an air discharge test, which was difficult until now, by checking the buzzer sound from the tester and the LED display on the top of the discharge gun.

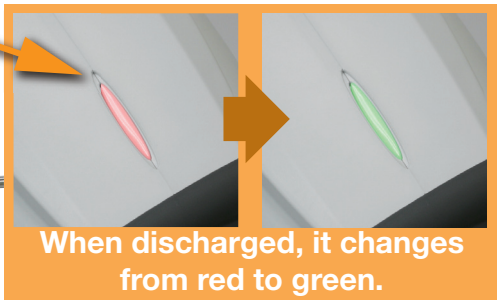
Buzzer sound of the tester

Count up the number of applications



Discharge gun LED color change

LED on the top of discharge gun.

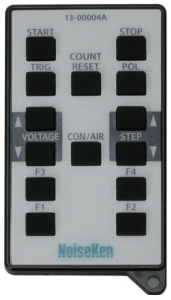


When discharged, it changes from red to green.

"Infrared Remote Control" allows controlling the test from distance *optional accessory*

Since you can operate the tester with the remote control without returning to the tester during the test, the test can proceed smoothly.

- Start/Stop
- Polarity change
- Voltage Up / Down
- Air/Contact discharge change
- Gun trigger function
  Count reset
  Sequence change
  F key assignment
  etc.



Most of the operations can be controlled by the remote controller.

ESS-S3011A & GT-30RA

The discharge gun became lighter and easier to use

The discharge gun itself has been reviewed from scratch to achieve weight reduction and the best balance of the center of gravity.
The weight is lighter than previous one and the balance of the center of gravity has been improved, making it extremely easy to hold and reducing the burden on the arm during long-term tests. Please pick it up and try it.
In addition, it is now to easy to confirm the performing of air discharge by the LED indicator on the top of the discharge gun,
which was possible only by visual check before, making it difficult to confirm at times. Also, it is a discharge gun with a full range of functions and operations, such as easy replacement of the CR units and discharge cup, which used to take time and effort, and the installation of an "LED light" that brightly illuminates the application.

Equipped with an LED light that illuminates the application location.

A light and easy-to-hold discharge gun! Improved balance of the center of gravity and weight reduction of over 20%

Light and soft!
High voltage cable and ground return cable.

One-touch replacement of CR unit.

Easy to replace the discharge cup.

ISO 10605 standard compliant discharge gun package available

By adding the optional discharge cup and CR units, it performs tests that comply with the ISO 10605 standard.
Since it is easily replaced the discharge cups and CR units, various CR constants can be tested with a single discharge gun.

Options for ISO 10605 Standard compliant test

Model	Name
12-00009A	Discharge tip (GT-30R series Spherical 30 mm)
03-00072A	Gun head to GT-30R series for constant 2 kΩ test
06-00074B	CR unit (150 pF - 2 kΩ) to GT-30R series
06-00076B	CR unit (330 pF - 2 kΩ) to GT-30R series
06-00075B	CR unit (330 pF - 330 Ω) to GT-30R series

Gun head
for constant 2 kΩ test

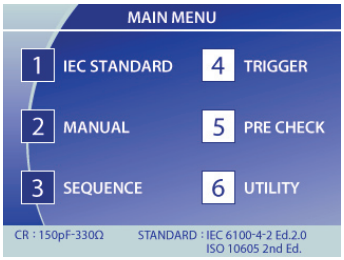
CR unit

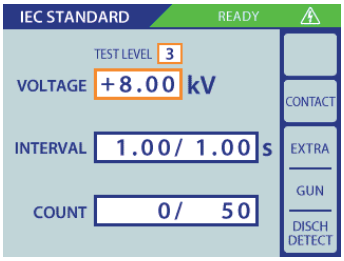
Discharge tip
(Spherical 30 mm)

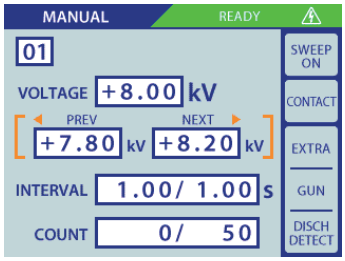
ESS-S3011A & GT-30RA

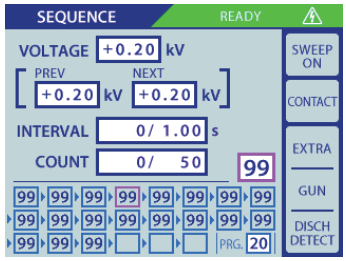
High visibility LCD panel and operatability

Reviewed the past operatability, adding Ten-key and Rotary knob realizing an easier and more comfortable operation can be realized.
In " 1 IEC STANDARD" in MAIN MENU, since the test levels are preset, the test parameters can be set easily only with selection of the test level. In " 2 MANUAL", voltage, number of times interval and sweep settings of the test can be selected and also the set conditions can be saved. In " 3 SEQUENCE", the set conditions in MANUAL can be recalled for combining them so as to realize the arbitrary sequential tests. In addition, varied functions like setting for gun trigger, automated ESD eliminator, etc. are equipped.









Specifications

Parameter	Specification
Polarity	Positive / Negative
Output voltage	0.20 kV ～ 30.0 kV ± 5% (30.5 kV max) *0.20kV～1.99kV ±10%　2.00kV～30.0kV ±5% ～ 10.0 kV : 0.01 kV step　～ 30.0 kV : 0.1 kV step
Repetition cycle	0.05s ～ 600s ±10% / Manual Set step : 0.01s (0.05 ～ 9.99s), 0.10s (10.0 ～ 600.0s)
Discharge number of times	1 ～ 60,000 times, Preset 1 time step or continuous preset
Discharge mode	Contact discharge / Air discharge
Radiation level mode	NORMAL mode / EXTRA mode
Trigger mode	Gun trigger / Main trigger / External trigger
Operation panel	Color LCD / Push-buttons (Partially lighting)
Gun holder	Standard attached (to hold the discharge gun Model GT-30RA)
Radiation mode select switch	Extra / Normal switching function built-in
Discharge detection	Discharge detection function in air-discharge equipped
Pre-checking function	Following 3 steps function equipped (by user operation. Not the calibration but just checking) STEP1 : High voltage output checking STEP2 : Withstanding voltage checking STEP3 : Discharge relay operation checking
CR & Gun head checking	CR constant and gun head recognizable (indication to prevent a wrong combination)
"IEC STANDARD" test mode	Contact discharge mode : 2.0 kV, 4.0 kV, 6.0 kV and 8.0 kV steps Air discharge mode : 2.0 kV, 4.0 kV, 8.0 kV and 15.0 kV steps
"MANUAL" test mode	Contact / Air discharge mode, Arbitrary setting 0.2 kV ～ 30.0 kV Sweeping function built-in, Recordable up to 99 units
"SEQUENCE" test mode	Enables to operate units set in MANUAL mode continuously. Max. 22 steps / 1 program and the programs recordable up to 20.
Warning lamp	Lighting at voltage output from the generator. Blinking at electro-static discharging
Charge capacitor / resistor	150 pF ± 10%, 330 Ω ± 10% (Built-in CR unit for discharge gun GT-30RA)
Charge resistor in generator	10 M Ω (Totally 53 Ω in combination with 43 M Ω in discharge gun)*
AUX connector	D-SUB 15 pins female connector (for connecting to patolight, automated ESD eliminator, external interlock input, external trigger input terminal)
Optical communication	Optical connector (serial interface) for connecting to PC connector
Power supply / consumption	AC100 V ～ AC240 V　50 Hz / 60 Hz　± 10%　75VA
Dimensions	Generator : (W)392 mm × (H)312 mm × (D)295.3 mm (gun holder included) Discharge gun : (W)83.3 mm × (H)217.2 mm × (D)229.3 mm
Weight	Generator : approx. 7.5 kg (with Gun Holder) Discharge gun : approx. 800 g (cable and connector excluded)

* The constant depends on combination with CR unit for the discharge gun

■ Details of GT-30RA discharge gun: Discharge gun (with discharge cup 330 Ω test), CR unit 06-00073B (150 pF - 330 Ω), discharge tips (conical / round)

Test environment (Table-top type / Floor-standing type)

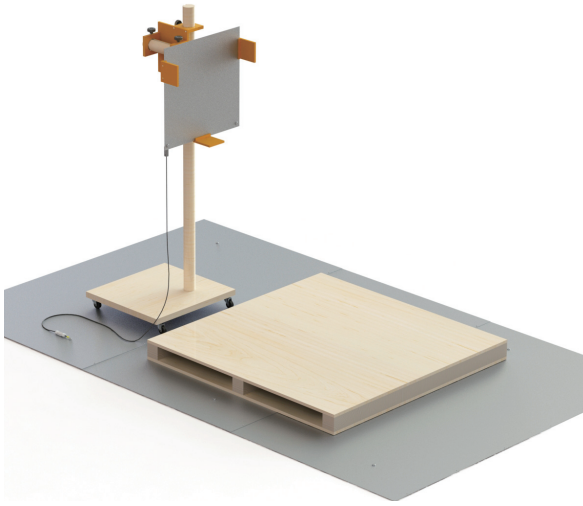
ESS-801 / 801GL

Feature

ESD test environment in conformance with EN/IEC61000-4-2 Standard.
Two types for EUT are available, table-top type and floor-standing type so that the environments can support the tests along EUT figures. Since the table is made of wood, influence to the test result should be small (quantitable test result can be expected since the discharge can be realized in state high frequency electromagnetic field is less lost) and the high reproducibility can be expected and realized. Also, can be versatilely utilized for another tests like impulse noise immunity test, etc.

- **ESD test environments in conformance with EN/IEC61000-4-2 standard**
- **Highly reproducible tests can be performed**
- **Can be verstatilely utilized for other tests**

Test setup example with ESS-801
* Contents of the set are as per the specification



Test setup example with ESS-801GL
* Contents of the set are as per the specification

Specifications

ESS-801 (Table-top type)

Item	Model	Dimensions	Q'ty
Test table	03-00039A	(W) 1600 × (H)800 × (D) 800 mm	1 set
Vertical coupling plane	03-00005A	(W) 500 × (H)500 × (t) 1.5 mm	1 set
Ground plane	03-00007A	(W) 1800 × (D)1000 × (t) 1.5 mm ※	3 pcs.
Insulating sheet	03-00004A	(W) 1450 × (D)650 × (t) 0.5 mm	1 pc.
Discharge resistance cable	05-00054B	2 m cable equipped with 470 kΩ × 2 pcs.	2 pcs.
Horizontal coupling plane	03-00020A	(W) 1600 × (D)800 × (t) 1.5 mm	1 pc.

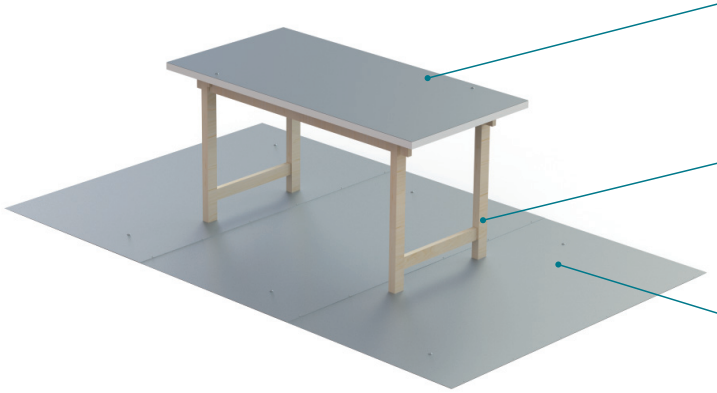
** size of 1 sheet (1 set = 3 sheets)*

ESS-801GL (Floor-standing type)

Item	Model	Dimensions	Q'ty
Insulating support	03-00024A	(W) 1200 × (H)1200 × (t) 100mm	1 pc.
Floor-standing vertical coupling plane	03-00034A	(W) 540 × (H)1540 × (D) 500mm	1 pc.
Ground plane	03-00007A	(W) 1800 × (H)1000 × (t) 1.5mm ※	3 pcs.
Discharge resistance cable	05-00054B	2 m cable equipped with 470 kΩ × 2 pcs	1 pc.

** size of 1 sheet (1 set = 3 sheets)*

Options



Horizontal Coupling Plane (HCP) MODEL : 03-00020A

Metal plane to be placed onto the table in case of the testing to table top devices.
W1600 × D800 × t1.5mm × 1 pc. (Made of aluminum)

Test Table MODEL : 03-00039A

Wooden table to be used for the test to devices under test (DUT).
W1600 × × H800 × D800 mm

Ground Reference Plane (GRP) MODEL : 03-00007A

Ground plane to be placed just under the wooden table.
W1800 × D1000 × t1.5 mm × 3 pcs. in 1 set (Made of aluminum)

Discharge resistance cable MODEL : 05-00054B

Cable to be used for eliminating the ESD on DUT and connect between HCP and GRP
470 kΩ × 2 pcs./1 set.

Insulating support MODEL : 03-00024A

When doing the electrostatic discharge test to floor-standing equipment, to be used for floating the equipment 10cm higher than the ground reference plane.
Size : W 1200 × D 1200 × H 100 mm
Material : Wooden
Withstanding load : 500 kg

Options

Cubic Insulating Block100 MODEL : 03-00029A

Used for floating EUT 10cm upper than the ground plane in case of testing to floor-standing EUT
Size : W100 × D100 × H100 mm
Material : Wood
Withstanding load: 500 kg

Automated ESD Eliminator MODEL : 01-00013B

Enable to eliminate electric charge which has been charged to EUT automatically with connection to ESS-S3011A. (Not standardized in the IEC Standard)

● Compatible model : ESS-S3011A

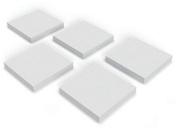
Probe Stand MODEL : 03-00108A

A probe stand used to fix the discharge gun for ESD Simulator. (Not standardized in the IEC Standard) Because of the articulated type, the discharge gun fixes in any direction.

Parameter	Specification
Dimensions	(H)380 mm, Pedestal diameter 160 mm
Weight	approx. 4.1 kg
Range of movement	Vertical: 150 mm, Swing angle: 130°

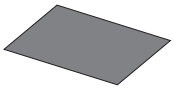
● Compatible discharge gun : GT-30R series

Insulating Block MODEL : 03-00054A



Blocks to float (isolate) wirings of DUT from GRP.
W300 × D300 × H50 mm, 5 pcs. in 1 set

Conductive Mat (for ISO Standard) MODEL : 03-00055A



Mat to be laid out in between DUT and GRP for the ESD susceptibility test in the packaging and handling.
Surface resistance $10^7 \times 10^9\ \Omega$
W1000 × D500 × t2 mm

ESD Elimination Brush MODEL : 05-00125A

Brush to eliminate the electrification on EUT / DUT before starting the test.

Free Arm Gun Stand MODEL : 03-00022B

Enables to move discharge gun vertically and horizontally to arbitrary desirable discharging point.
(Not standardized in the IEC/ISO Standard)

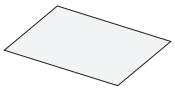
● Compatible discharge gun : GT-30R series
* Conversion adaptor model 03-00074A is necessary in addition for the attachment to GT-30R series

Conversion Adaptor for Free Arm Gun Stand MODEL : 03-00074A

Adaptor for connecting between Free Arm Gun Stand 03-00022B and discharge gun GT-30R series.

● Compatible discharge gun : GT-30R series

Insulating Support MODEL : 03-00066A



Sheet to be laid out in between DUT and GRP for the test to automotive electronics devices.
W1450 × D650 × t2 mm
Material: PVC (vinyl chloride) transparent

Aluminum Plate for Test MODEL : 03-00053A

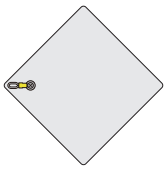
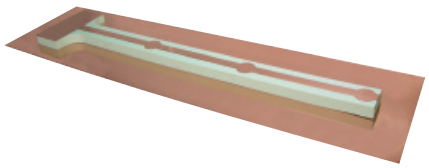


Plate to be laid out under tires for the vehicle test
W500 × D500 × t1.5 mm

Ground Cable (for ISO Standard) MODEL : 05-00104A

Cable to be used for grounding connection required in ISO 10605 (2001). L2000 × W50 mm
* Not required in ISO 10605 Ed.2 (2008)

Coupling Plane for ISO 10605 Annex F MODEL : 03-00065A



Coupling plane used for the optional test in ISO 10605 Ed.2 (2008). It consists of a coupling plane (made of copper) and an insulation block.
* Ground reference plane is not included.

Options

CR Units

CR units for GT-30R series ESD Guns

- Compatible discharge gun : GT-30R series

* Please contact us if you require a CR constant other than listed on this page.
* The unit size depends on the capacitor constant.

Model	CR constant
06-00077B	500pF-0Ω
06-00078B	150pF-500Ω
06-00079B	100pF-1.5kΩ
06-00080B	200pF-0Ω
06-00081B	150pF-150Ω
06-00082B	500pF-500Ω
06-00083B	500pF-5kΩ
06-00084B	250pF-100Ω
06-00085B	200pF-100Ω
06-00086B	250pF-0Ω
06-G896	330pF-0Ω
06-G897	150pF-0Ω
06-K1936	200pF-250Ω
06-K1964	330pF-100Ω
06-N2270	500pF-100Ω

For ISO 10605 compliant test

●GT-30R3302KA package contents

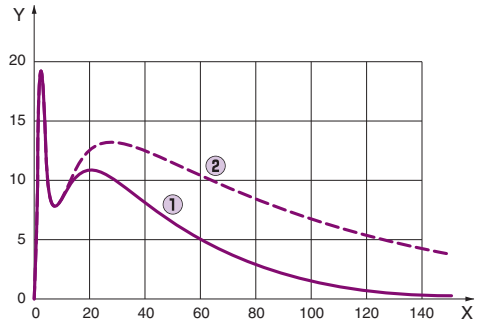
GT-30R series	gun body
03-00071A	gun head
03-00072A	gun head
06-00073B	150 pF - 330 Ω CR unit ①
06-00074B	150 pF - 2 kΩ CR unit ③
06-00075B	330 pF - 330 Ω CR unit ②
06-00076B	330 pF - 2 kΩ CR unit ④
12-00007A	conical tip
12-00008A	round tip
12-00009A	spherical tip

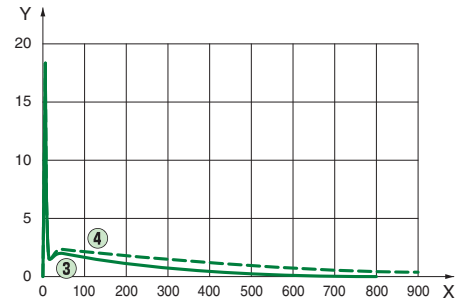
2 kΩ gun head

Spherical (φ30 mm) discharge tip

Energy storage capacitor / Discharge resistor values	1st discharge peak current	t_1 Current	t_2 Current
150 pF / 330 Ω ①	3.75 A / kV ±10%	2A / kV ± 30% (t_1 = 30 ns)	1 A / kV ± 30% (t_2 = 60ns)
330 pF / 330 Ω ②	3.75 A / kV ±10%	2 A / kV ± 30% (t_1 = 65 ns)	1A / kV ± 30% (t_2 = 130 ns)

Energy storage capacitor / Discharge resistor values	1st discharge peak current	t_1 Current	t_2 Current
150 pF / 2 kΩ ③	3.75 A / kV +30% -0%	0.275 A / kV ±30% (t_1 = 180 ns)	0.15 A / kV ± 50% (t_2 = 360 ns)
330 pF / 2 kΩ ④	3.75 A / kV + 30%-0%	0.275 A / kV ±30% (t_1 = 400 ns)	0.15 A / kV ± 50% (t_2 = 800 ns)





Gun Head MODEL : 03-00071A / 03-00072A

Gun head to be changed according to Standard compliant test. 2 kinds for the test with 330 Ω (03-00071A) and 2 kΩ (03-00072) are available.

- **Compatible discharge gun : GT-30R series**

Fast Rise Time Adaptor MODEL : 03-00073A

Realize a faster rise time of the discharge current than IEC 61000-4-2 standard value (0.6 ~ 1.0 ns) around 0.2 × 0.3 ns with attachment to the discharge gun.
(Not standardized in the IEC Standard)

- **Compatible discharge gun : GT-30R series**

Impulsive Electric Field Adaptor MODEL : 03-00068A

Adaptor for simulating static induction as one of noise inductive mode with attachment to the discharge gun (Not standardized in the IEC Standard)

- **Compatible discharge gun :GT-30R series**

Discharge Tips MODELS : 12-00007A / 8A / 9A

12-00007A Conical discharge tip (for contact test)
12-00008A Round discharge tip (for air test)
12-00009A Spherical (φ30mm) discharge tip (for air test 15 kV and higher)

Options

Impulsive Magnetic Field Adaptor MODEL : 03-00069A

Adaptor for simulating electromagnetic induction as one of noise inductive mode with attachment to the discharge gun (Not standardized in the IEC Standard)

- Compatible discharge gun : GT-30R series

Magnetic Field Adaptor MODEL : 03-00070A

Magnetic field adaptor for Ford standard. Connected to GT-30R series discharge gun, it generates transient magnetic fields. (Not standardized in the IEC Standard)

- Compatible discharge gun : GT-30R series

Parameter	Specification
Loop coil diameter	155 mm
Dimensions	168 mm (loop outer diameter) 300 mm (length) 12.7 mm (thickness of the loop)

Extension cable for GT-30R MODEL : 05-00047B

Extension cable in connection between ESD simulator main unit and its discharge gun. The length is 3 m
* not compliant with the IEC standard

- Compatible discharge gun :GT-30R series

Gun Holder MODEL : 03-00075A

Holder for discharge gun during the test.
Also, can be the pre-checking fixture in combination between ESS-S3011A and GT-30R series.

- Compatible discharge gun : GT-30R series

Specialized Case for Discharge Gun MODEL : 09-00006A

Specialized Case for storing and carrying the discharge gun, CR units and the other related fixtures.

- Compatible discharge gun : GT-30R series

Warning Lamp MODEL : 11-00014B

Warning light used for alerting and calling for attention during the test.

- Compatible model : ESS-S3011A

* The connection is done with DSUB connector.

AUX Connector Junction Box MODEL : 05-00052A

Enable to connect warning lamp, automated ESD eliminator and external trigger simultaneously

- Compatible model : ESS-S3011A

USB Optical Module Kit MODEL : 07-00022A

Optical conversion adaptor Used for remote control with PC. 5 m of optical fiber cable with USB interface attached.

- Compatible model : ESS-S3011A

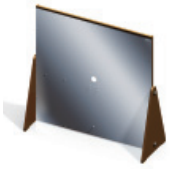
Options

Faraday cage MODEL : FC-200

Faraday cage which is defined in IIEC61000-4-2 Standard and ISO 10605 Ed.2 Standard
to verify the discharge current waveform. Easy to move with casters equipped to the bottom.

Parameter	Specification
Power supply	AC100 V 50 Hz / 60 Hz 3 P inlet Equipped with over-current protective breaker
Opening Dimensions on door	(W) 410 mm × (H) 618 mm
Dimensions / Weight	(W)670 mm × (H)1612 mm × (D) 1509 mm Approx. 65 kg. 3p outlet × 2 15 A MAX

Current Target Mounting Board MODEL : 03-00052B



The board to fix the load resistor (MODEL NO. 06-00094A ESD current target) for measuring the discharge current waveform defined in IEC61000-4-2 Standard and ISO 10605 Ed.2 Standard
Dimensions : 1.2 m × 1.2 m

Coaxial Cable MODEL : 02-00157A

High frequency responsible cable to connect ESD target and oscilloscope.
BNC-SMA connector (02-00133A) is also available as an option
*included in the 06-00094A package

GND Cable Positioner MODEL : 03-00060A

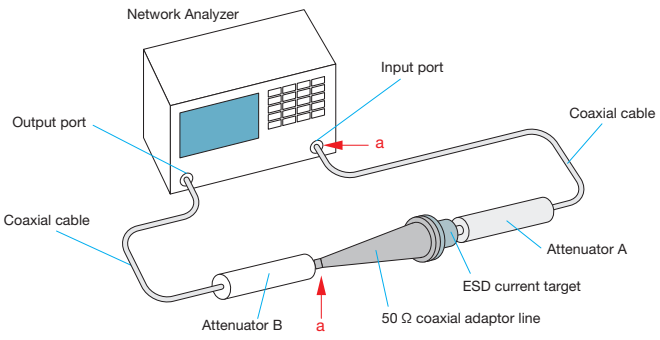
Stand to pull and fix the ground cable of discharge gun 0.5 m backwards at the middle of the cable when calibrating the ESD current.

ESD Current Target Calibration Set MODEL : 06-00068B

Set to calibrate the ESD target (06-00094A) in conformance with IEC61000-4-2 Ed.2.0 (2008).

Adaptor (06-00068B)

A photo of 06-00094A ESD target and 06-00068B adaptor connected faced to face



a : Calibration points with networks analyzer

Current Target Mounting Board MODEL : 03-00027A

The board to fix the load resistor (MODEL NO. 06-00094A ESD current target) for simple measuring the discharge current waveform defined in IEC61000-4-2 Standard and ISO 10605 Ed.2 Standard. (not conforming to the standard)
Dimensions : 0.6 m × 0.6 m

ESD Current Target MODEL : 06-00094A

Load resistor to measure, verify and calibrate ESD current waveform defined in IEC61000-4-2 Standard and ISO 10605 Ed.2 Standard

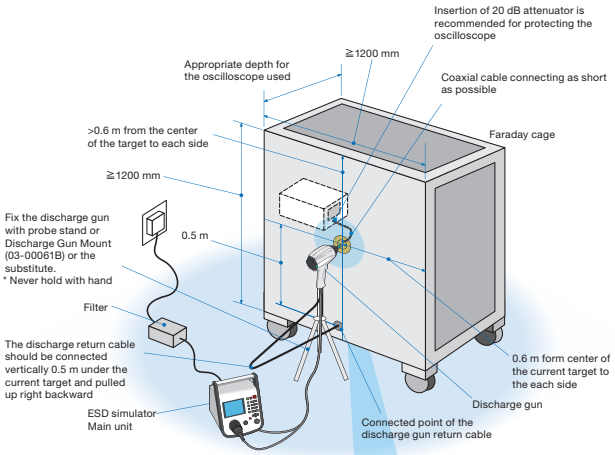
Parameter	Specification
Injection voltage (pulse)	30 kV MAX
Input resistance	2.04 Ω
Output impedance	2.04Ω
Insertion loss (S21)	≦1GHz : Within ±0.5dB 1GHz～4GHz : Within ±1.2dB
Output connector	SMA type
Dimensions／Weight	70 φ×35 mm／Approx. 480g

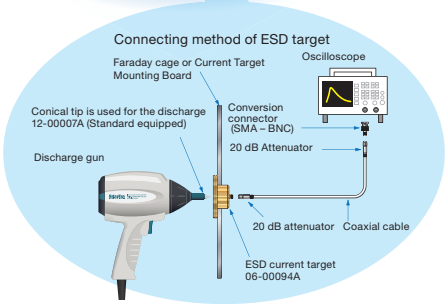
Discharge Gun Mount MODEL : 03-00061B

Fixture to load and fix the discharge gun to the Faraday cage (FC-200) or current target mounting board (03-00052B)

Attenuator MODEL : 00-00022A

Attenuator to protect measurement equipment for ESD current waveform.Attenuation ratio 20 dB
*included in the 06-00094A package





Options

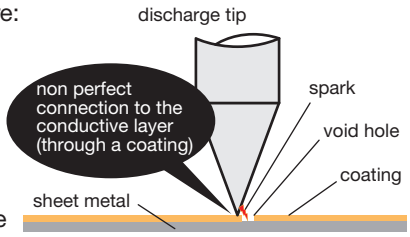
Micro-gap Discharge Tip MODEL : 12-00010A

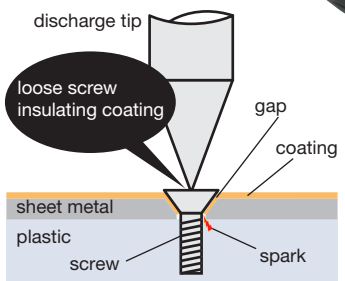
Enabling a more stringent evaluation for the real world ESD immunity

Gun Head
Model : 03-00103A

Connected to the NoiseKen ESD gun, this tip allows for a waveform with higher peak amplitude and a faster rise time. It is a common view that ESD immunity testing is the most challenging and passing the standard test does not always assure real world immunity. This tip is helpful for more extensive testing against non-standard-ized field events.

■ Events you can simulate are:
- Loose screws
- Poor insulation coating
- Poor electrical connection between components and others which cause secondary discharges within a very close distance

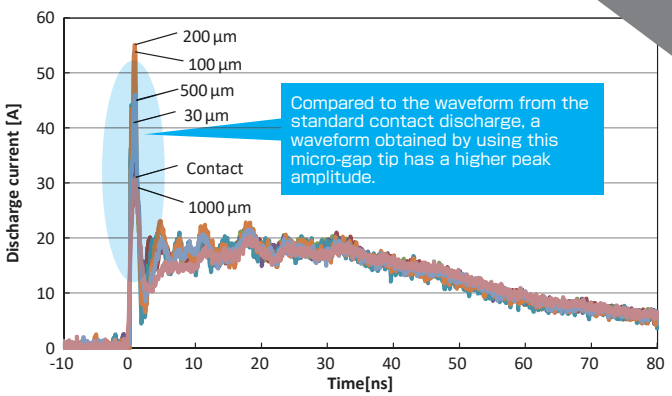




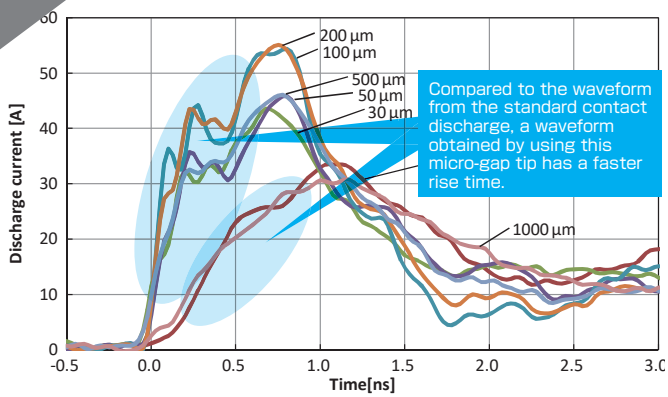
enlarged photo of the micro-gap

Simulated field events

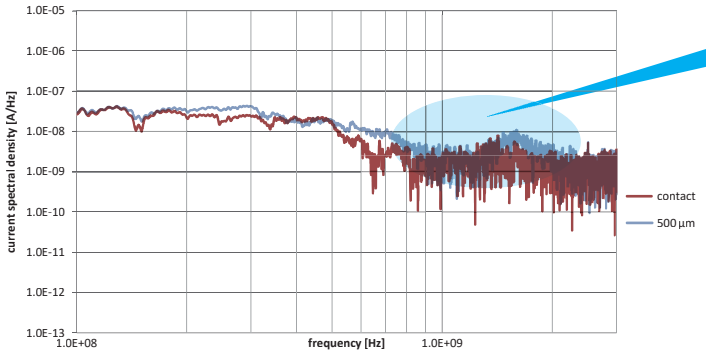
■ Output waveform (reference)



entire waveform

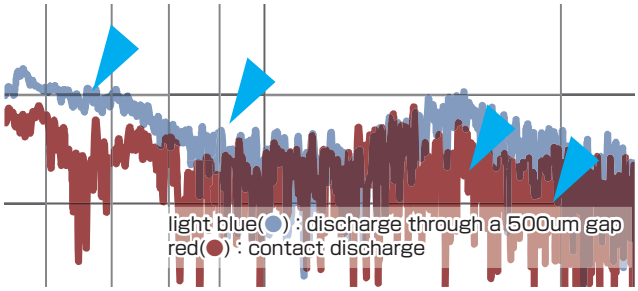


waveform leading edge



discharge current energy spectral density

Compared to the contact discharge, discharge through a micro-gap contains a higher level of noises over the higher side of the spectrum



Testing with energy rich pulses for the GHz band

■ Compatible discharge guns

TC-815S, 815R, 815ISO, 815-330, 815-2K, 815S-330, GT-30R series (the Gun Head 03-00103A required)

*This product cannot be used for the air discharge testing

IEC61000-4-2 Ed.2 Test Standard Overview

1. General

The international immunity test standard which applies to electronic equipment against ESD generated directly from a human body or near metal objects in condition chemical fibers carpets or clothings are used in low humidity relatively. This standard assumes cases when charged human body discharges to electronic equipment and testing with the circuit to simulate current waveform generated in such conditions.

2. Test Levels

Test level range for the ESD

The levels as below.

Level	Test voltage (contact discharge)	Test voltage (air discharge)
1	2 kV	2 kV
2	4 kV	4 kV
3	6 kV	8 kV
4	8 kV	15 kV
X	Special	Special

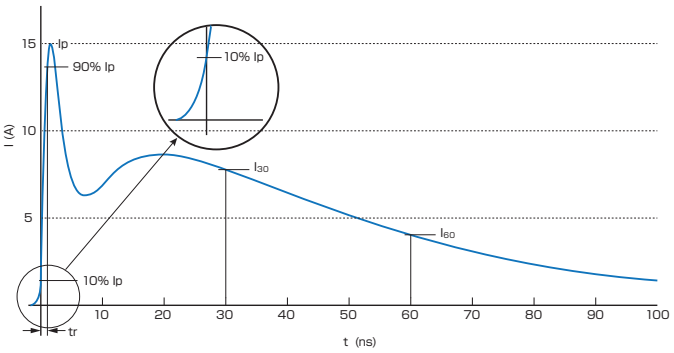
*** × can be any level determined by consent between the manufacturer and the user**

3. Test Generator and Waveform Verification

Generator specification

The generator must satisfy following specification.

Energy accumulation capacity	150 pF (typical)
Discharge resistance	330 Ω (typical)
Output voltage	8 kV / Contact discharge, 15 kV / Air discharge
Tolerance of output voltage	± 5%
Polarity of output voltage	Positive and negative (Switching available)
Hold time	> = 5 sec.
Discharge mode of operation	Single discharges (Discharge interval > = 1 sec)
Waveform of discharge current	See right figure

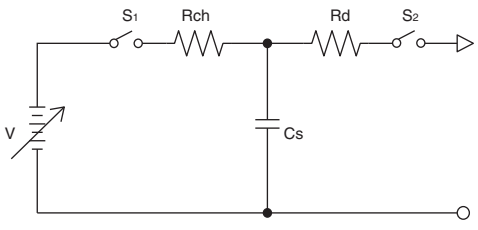


Discharge current waveform and its characteristics

Generator characteristics

The characteristics in the following table must be verified in order to compare the tests results among different generators

Level	Indicated voltage	1st peak current of discharge (± 15%) Ip	Rise time (± 25%)	Current (± 30%) at 30 ns	Current (± 30%) at 60 ns
1	2 kV	7.5 A	0.8 ns	4 A	2 A
2	4 kV	15 A	0.8 ns	8 A	4 A
3	6 kV	22.5 A	0.8 ns	12 A	6 A
4	8 kV	30 A	0.8 ns	16 A	8 A



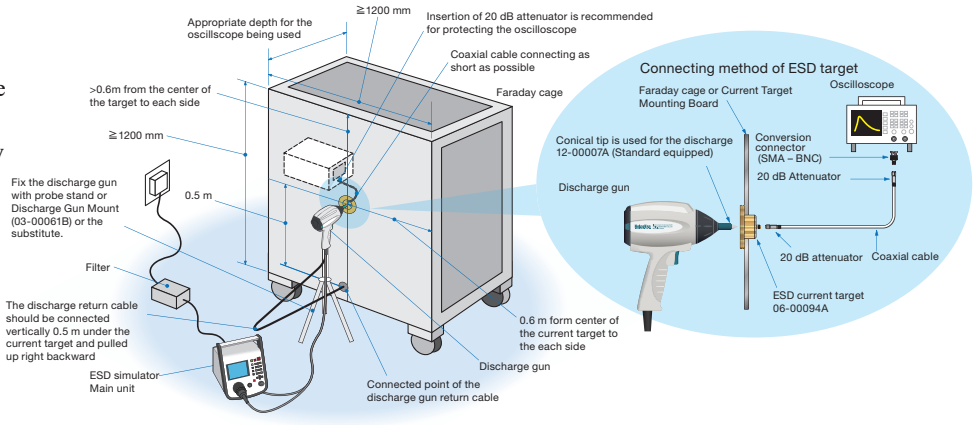
Capacitance Cs : 150 pF
Discharge resistance Rd : 330 Ω

Simplified diagram of the ESD generator

IEC61000-4-2 Ed.2 Test Standard Overview

Waveform verification of ESD Generator

Measure the waveform with an oscilloscope with bandwidth of 2 GHz or more upon use of Faraday cage and the current target.
Attach the discharge electrode directly to the current target and operate the generator with the contact discharge mode.

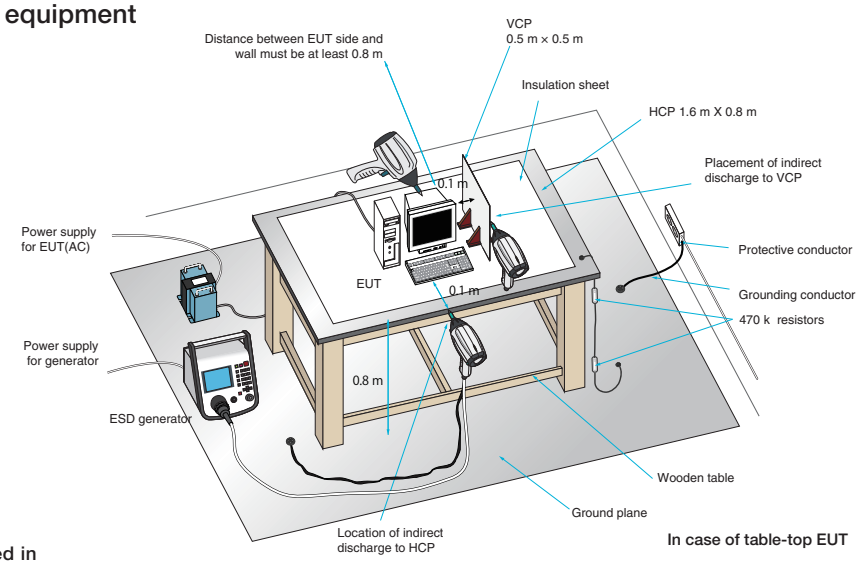


* Insertion use of approx. 20 dB attenuator for protecting the measurement equipment is recommended, although it is not specified in the IEC Standard.

4. Test setup

Example of test set-up for table-top equipment

The direct discharge test is an electrostatic direct discharge to EUT for examining its influence to the EUT.
Put a wooden table which height is 0.8 m on the ground plane and place horizontal coupling plane (HCP 1.6 m × 0.8 m).
Connect the HCP with resistor 470 kΩ × 2 to the ground plane and lay an insulation sheet between the HCP and the EUT.
The indirect discharge test is an electrostatic discharge to the HCP and vertical coupling plane (VCP 0.5 m × 0.5 m) for examining its influence to the EUT. Connect the VCP with resistor 470 kΩ × 2 to the ground plane as well.

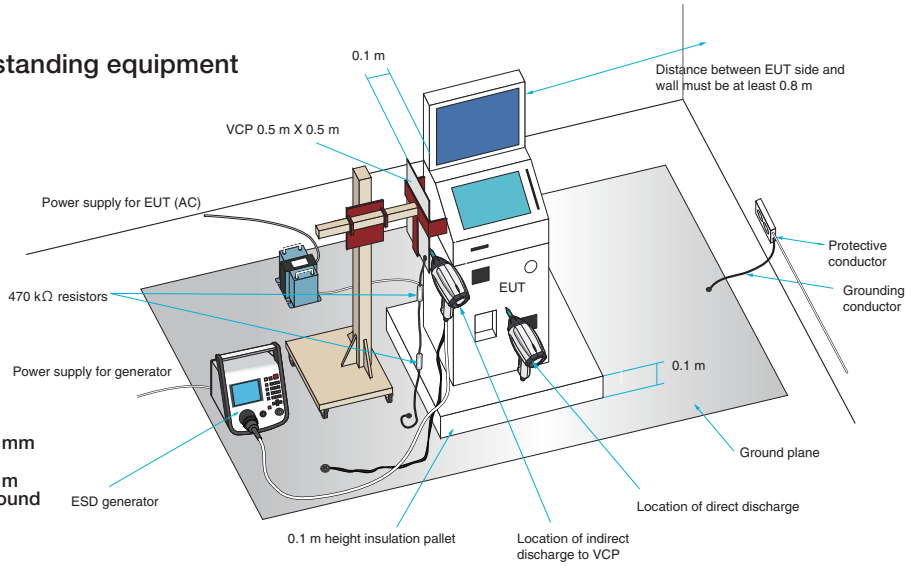


In case of table-top EUT

* The isolation transformer for EUT is not specified in IEC Standard.

Example of test set-up for floor-standing equipment

Put an insulation pallet which height is 0.1 m onto the ground plane and place EUT on the pallet for the direct discharge test.
The indirect discharge test is an electrostatic discharge to the VCP for examining its influence to the EUT.
Connect the VCP with resistor 470 kΩ × 2 to the ground plane as well.



In case of floor-standing EUT

* Float cables from the ground plane with 0.5 mm thickness insulation sheet.
* Keep GND cable of the discharge gun ≧ 0.2 m from any conductive parts other than the ground plane
* The isolation transformer for EUT is not specified in IEC Standard.

IEC61000-4-2 Ed.2 Test Standard Overview

5. Test Procedure

Climatic and Other Environmental Conditions

It is necessary to let the equipment brought in from different climatic conditions to fully adjust to testing environment before performing the test. Also, in order to stabilize the discharging condition certainly, it is necessary to fix the climatic conditions in the test room. Fulfillment of the conditions listed in following table must be required to perform testing in conformance with IEC61000-4-2.

Ambient temperature	15ºC to 35ºC
Relative humidity	30% to 60%
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1060 mbar)
Electromagnetic conditions	Level not to affecting test result

Test Procedure

Direct discharge test : Contact discharge (at 1 second interval) and air discharge (at max. 5 sec. cycle)
Indirect discharge test : Discharge to VCP and HCP
At least 10 single discharges shall be applied at 1 second or longer interval in both positive and negative polarities.
*** A preliminary test with discharges 20 times or more per second may be done in order to select the points to which single discharges should be applied.**

6. Evaluation of Test Results and Test Report

The tests results are classified into following 4 patterns according to specifications of EUT and operating conditions.

1) **Normal operation within the tolerance of the specification**
2) **Temporary degradation or loss in the operation or the function which is able to be recovered by a self-recovery function**
3) **Temporary degradation or loss in the operation or the function which needs to be recovered by user intervention or reset in the system.**
4) **Damage of the system (parts) or software, and unrecoverable degradation in the function due to loss of the data.**

Generally, as far as the EUT is immune to the ESD during testing and it satisfies the functional requirements according to the product specification after testing, the test result can be perceived as "Pass"
The test report shall contain the test conditions and the result.

Notes: This test procedure and test set-up are extracted from IEC 61000-4-2 Ed.2 (2008) and JIS C 61000-4-2 ed.2.0 (2012) Standards for applying to our products.
Please refer to the Standards for more details.

ISO 10605 Ed.3 Test Standard Overview

1. General

Electrostatic discharges which are generated both in vehicles and while we get on and off there can be factors to cause malfunction of the electrical devices and components. Nowadays, more attention has been paid, as vehicles install more and more electronic devices and components. This Standard regulates that static electricity is discharged to the electronic devices or equipment from the charged human body and tests are simulated by electrical circuit to reproduce the electric current waveform at the discharge.
In addition to procedures for the immunity tests and evaluations in state that the electronic devices or equipment work while the vehicle is driving, the Standard also regulates tests procedures to evaluate the immunity of the each module against simulated human discharges during the assembly process or in servicing.

2. Test levels

The following tests levels are for reference. The categories are classified according to functional importance of the electronics devices/ components.

Component test – Example severity levels for direct contact discharge and direct air discharge (Function performance status)

Test severity level	Direct contact discharge			Direct air discharge		
	Category 1	Category 2	Category 3	Category 1	Category 2	Category 3
Level 4	±8kV	±8kV	±15kV	±15kV	±15kV	±25kV
Level 3	±6kV	±8kV	±8kV	±8kV	±8kV	±15kV
Level 2	±4kV	±4kV	±6kV	±4kV	±6kV	±8kV
Level 1	±2kV	±2kV	±4kV	±2kV	±4kV	±6kV

Component test – Example severity levels for indirect contact discharge (Function performance status)

Test severity level	Indirect contact discharge		
	Category 1	Category 2	Category 3
Level 4	±8kV	±15kV	±20kV
Level 3	±6kV	±8kV	±15kV
Level 2	±4kV	±4kV	±8kV
Level 1	±2kV	±2kV	±4kV

Component test — Packaging and handling — Example severity levels —

Test severity level	Direct contact discharge			Direct air discharge		
	Category 1	Category 2	Category 3	Category 1	Category 2	Category 3
Full function after test	±1kV	±2kV	±4kV	±8kV	±15kV	±25kV

Vehicle test — Example severity levels for contact discharge and air discharge (Test points accessible only from inside vehicle)

Test severity level	Contact discharge			Air discharge		
	Category 1	Category 2	Category 3	Category 1	Category 2	Category 3
Level 4	±6kV	±8kV	±8kV	±8kV	±15kV	±15kV
Level 3	±4kV	±4kV	±6kV	±6kV	±8kV	±8kV
Level 2	±2kV	±2kV	±2kV	±4kV	±4kV	±6kV
Level 1	—	—	—	±2kV	±2kV	±4kV

Vehicle test — Example severity levels for contact discharge and air discharge (Test points accessible only from outside vehicle)

Test severity level	Contact discharge			Air discharge		
	Category 1	Category 2	Category 3	Category 1	Category 2	Category 3
Level 4	±6kV	±8kV	±8kV	±15kV	±15kV	±25kV
Level 3	±4kV	±6kV	±6kV	±8kV	±8kV	±15kV
Level 2	±2kV	±2kV	±4kV	±4kV	±6kV	±8kV
Level 1	—	—	±2kV	±2kV	±4kV	±6kV

ISO 10605 Ed.3 Test Standard Overview

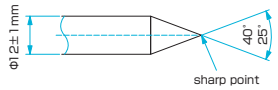
3. Specification of generator and verification of output waveform

Specification of ESD simulator

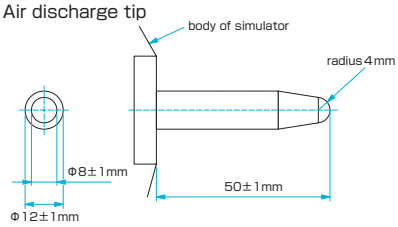
A simulator satisfying the following specifications must be used for the ESD Testing.

Parameter	Specification
Output voltage - Contact discharge- (kV)	2kV ～ 15kV
Output voltages - Air discharge- (kV)	2kV ～ 25kV
Output voltage accuracy (%)	≦ 5%
Polarity	Positive and negative
Rise time of short circuit current in contact discharge mode (10% to 90%)	0.7ns ～ 1ns
Holding time	≧ 5 s
Storage capacitances (pF)	150pF, 330pF
Discharge resistances (Ω)	2kΩ, 330Ω

Contact discharge tip



Air discharge tip

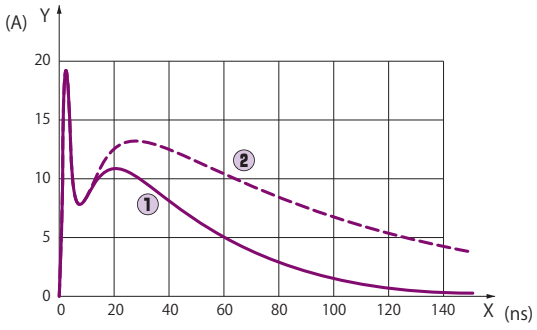


For air discharge at test voltages higher than 15 kV, a larger tip can be used to avoid pre-discharge.

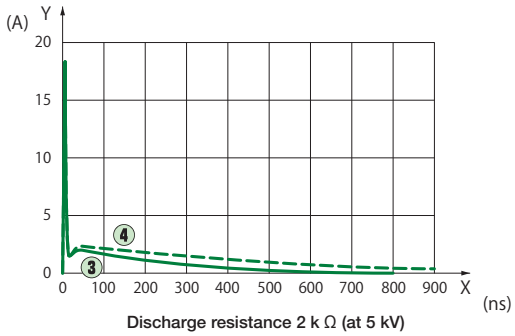
ESD Simulator Characteristics (Contact discharge mode current specifications)

The following discharge characteristics must be verified.

Capacitance / resistance	1st peak current	Current at t_1	Current at t_2	Below Figure indication
150pF/330Ω	3.75A/kV ±10%	2A/kV±30% (t_1=30ns)	1A/kV ±30% (t_2=60ns)	①
330pF/330Ω		2A/kV±30% (t_1=65ns)	1A/kV ±30% (t_2=130ns)	②
150pF/2kΩ	3.75A/kV +30% − 0%	0.275A/kV±30% (t_1=180ns)	0.15A/kV±50% (t_2=360ns)	③
330pF/2kΩ		0.275A/kV±30% (t_1=400ns)	0.15A/kV±50% (t_2=800ns)	④



Discharge resistance 330 Ω (at 5 kV)

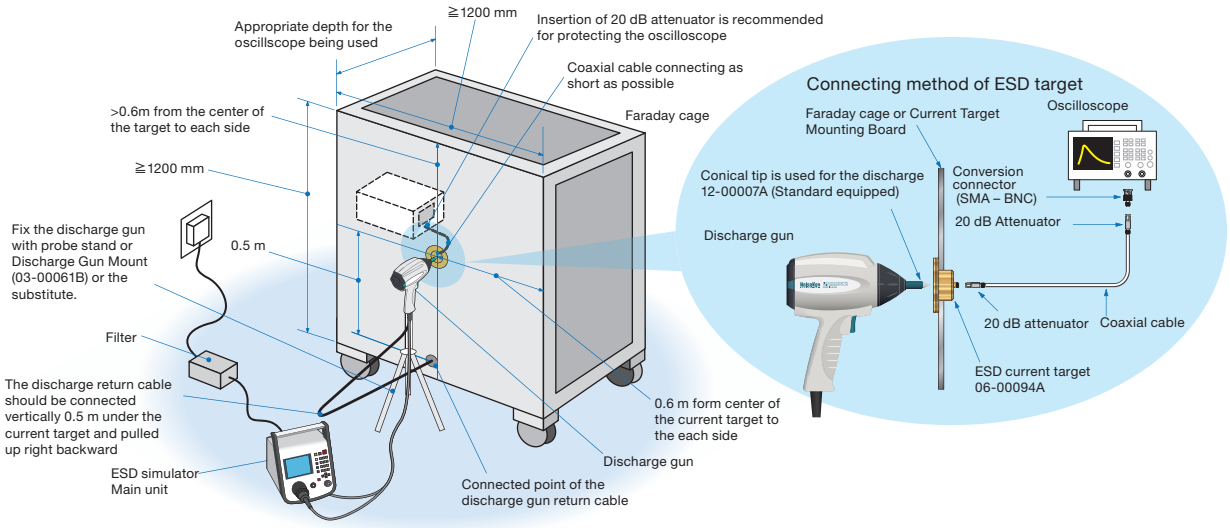


Discharge resistance 2 k Ω (at 5 kV)

ISO 10605 Ed.3 Test Standard Overview

Verification of output current waveform

The waveform shall be verified with an oscilloscope which bandwidth is 1 GHz or more in a Faraday cage or with a 1.2 m × 1.2 m metallic board mounting an ESD current target in the center of the cage or the board. The discharge electrode (Discharge tip of the gun) shall be touched onto the target and the discharge mode shall be set at the contact discharge mode.
The discharge return cable shall be turned up the center of the length and connected to vertically 0.5 m under the target on surface of the Faraday cage or board.

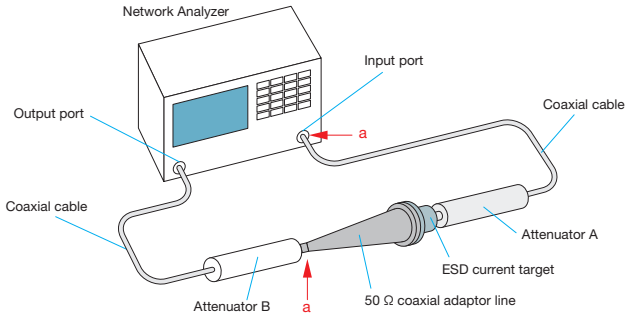


Current Target calibration

The frequency characteristics of current waveform observation targets must be verified using a dedicated measurement jig.

Adaptor for calibrating ESD current target
(Model:06-00068A)

Figure of attaching ESD current target and the calibration adaptor
(Left : Target Right : Adaptor)



a : Calibration points with networks analyzer

4. Test setup and test procedure

Common Points:

- Ground plane: at least 1.6 x 0.8m in size, at least 0.2m larger than the DUT or peripherals during setup, and with a connection resistance of 2.5mΩ or less.
- Insulating block: height 50±5mm. Extend 20mm beyond the test configuration on all sides.
- The DUT shall be connected to all peripheral devices required for functional testing of the DUT with the wire harness length of 1.7m (+0.3m - 0).
- All components should be at least 0.2 m apart from each other.
- Bundle the wire harness 0.1m away from the edge of the ground plane and secure it to the insulating block.
- The supply battery shall be on the test table, with the negative terminal of the battery directly connected to the GP.
- The test stand should be at least 0.1m away from other dielectric structures.
- For direct discharge, connect the electrostatic simulator's discharge return cable to the ground plane.
- Use discharge network of 150pF or 330pF depending on the EUT device location, and use 330Ω or 2kΩ.
- The test should be conducted for two or more test levels.
- Isolating block should be used for electronic equipment that are not directly chassis-mounted.

ISO 10605 Ed.3 Test Standard Overview

Component immunity test method (powered-up test) - Direct contact and air discharge -

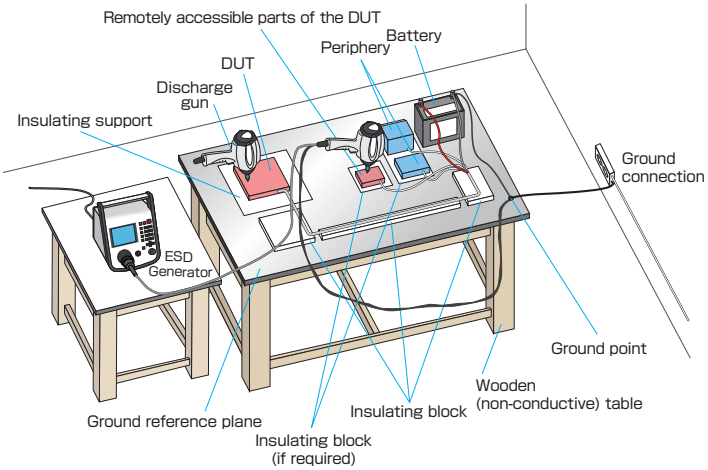
- Test at least 3 times with positive and negative polarity, separated by at least 1 second.
- Apply to every location available for human touch.
- Isolating block should be used for electronic equipment that are not directly chassis-mounted.

【Contact Discharge】

- The discharge electrode is brought into contact with the discharge point of the DUT before activating the discharge switch.
- For painted surfaces, if the coating is not an insulating coating, the pointed tip of the generator should penetrate the coating so as to make contact with the conducting substrate.
- The ESD discharge tip is held perpendicular to the surface of the DUT.

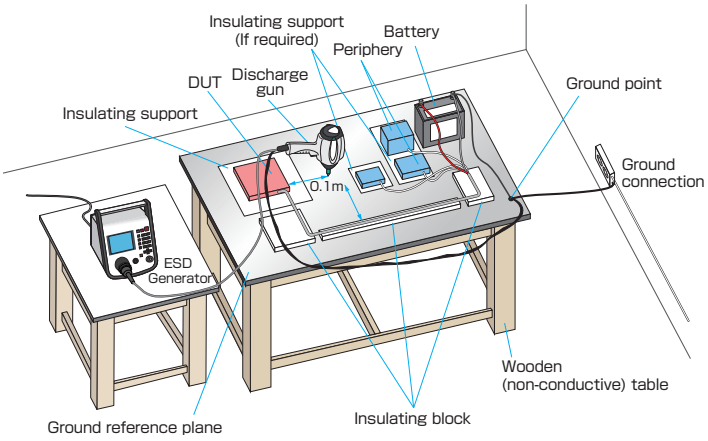
【Air Discharge】

- After operating the discharge switch, move the discharge electrode tip to the DUT as quickly as possible (0.1m/s to 0.5m/s) until it contacts the discharge point and apply voltage.
- If the conductive material is declared to be an insulating coating, perform air discharge.



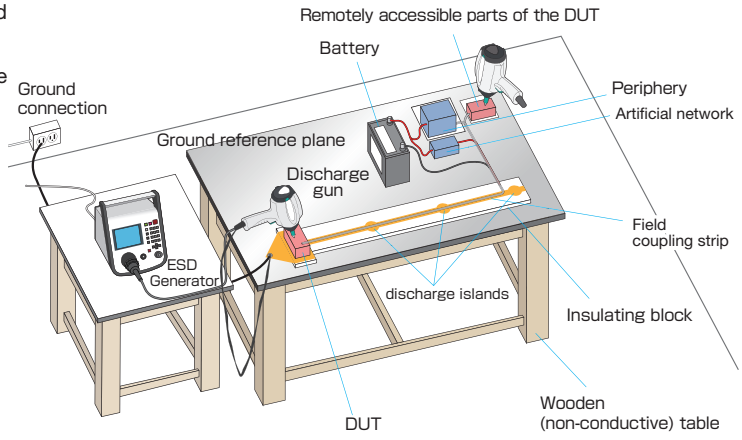
Component immunity test method (powered-up test) - Indirect Discharge -

- Apply discharge to the ground plane with contact discharge.
- Test 10 times or more at intervals of 1s or more.
- Apply to the ground plane at points on each side of the DUT.
- Position the DUT so that the nearest surface is 0.1 m away from the edge of the ground plane that receives the discharge.
- Apply at a position 0.1m from the DUT and harness.
- Select 330pF as the CR constant depending on the mounting position of the device, and use 330Ω.



Component immunity test method (powered-up test) - Direct Discharge using FCP -

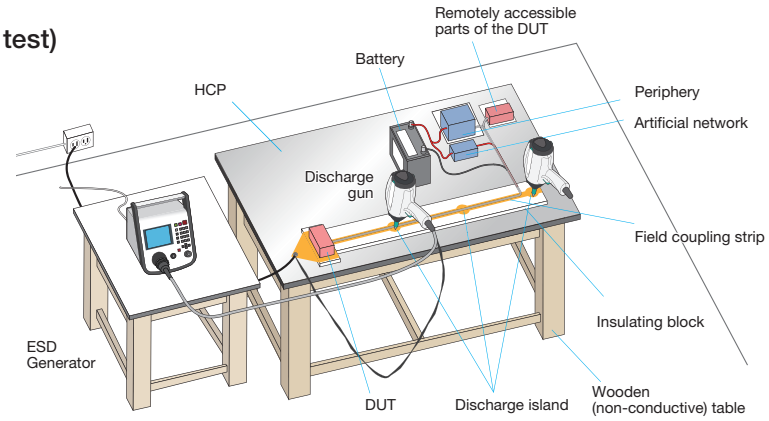
- At least 3 discharges shall be applied both to the positive and negative polarities with the interval not less than 1s.
- Select 150pF or 330pF as the CR constant depending on the mounting location of the device, and use 330Ω.



ISO 10605 Ed.3 Test Standard Overview

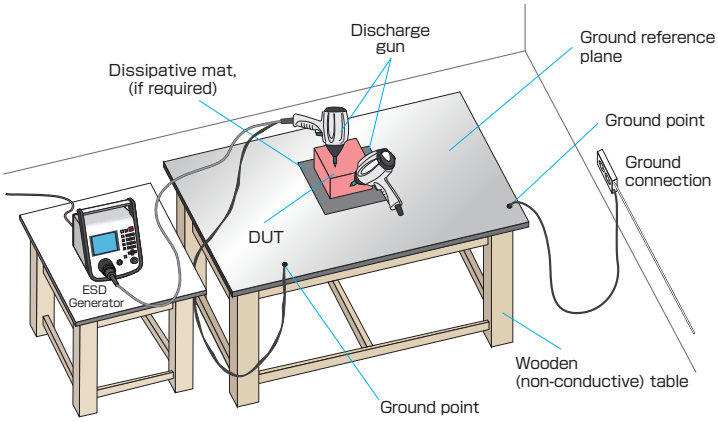
Component immunity test method (powered-up test) - Indirect Discharge using FCP -

- Apply at least 10 contact discharges for each polarity to each discharge island with the time interval 1 s or longer.
- The CR constant is selected to be 330pF depending on the mounting position of the device, and 330Ω is used.



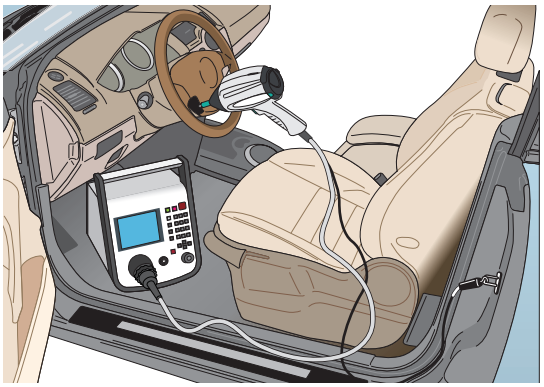
Component immunity test method (unpowered) - Packaging and Handling - ESD Sensitivity Test

- Use 150pF capacitance and test with resistances that simulate direct contact with the human body (2kΩ) and touch with a metal object (330Ω).
- Conduct tests of two or more levels.
- At least 3 discharges shall be applied both to the positive and negative polarities with the interval not less than 1s.
- Contact discharge shall be applied to all locations human finger may touch.
- After applying the voltage, remove the static electricity from the DUT with a static elimination resistor of 1MΩ±20%, then energize it and confirm that it operates normally.

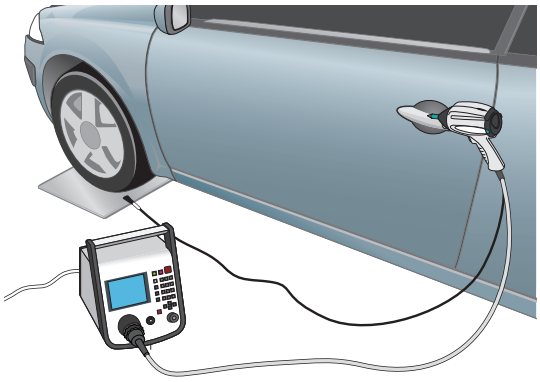


Vehicle test – Internal and external points –

- Areas that can be easily touched by people inside the vehicle are tested with 330pF/330Ω or 2kΩ.
- Areas that can be easily touched by people from outside the vehicle are tested with 150pF/330Ω or 2kΩ.
- The ground wire connects to the chassis, such as the seat rail. During external testing connect to a nearby chassis or metal plate under the tire.
- Both the contact discharge and air discharge tests shall be done both for the internal and external tests.



Internal test



External test

Note: This test outline is based on the ISO10605 Ed.3 2023 Standard. Please refer to the original text of the Standard for detailed test methods, etc.

18-00086B

ESD Voltage Meter

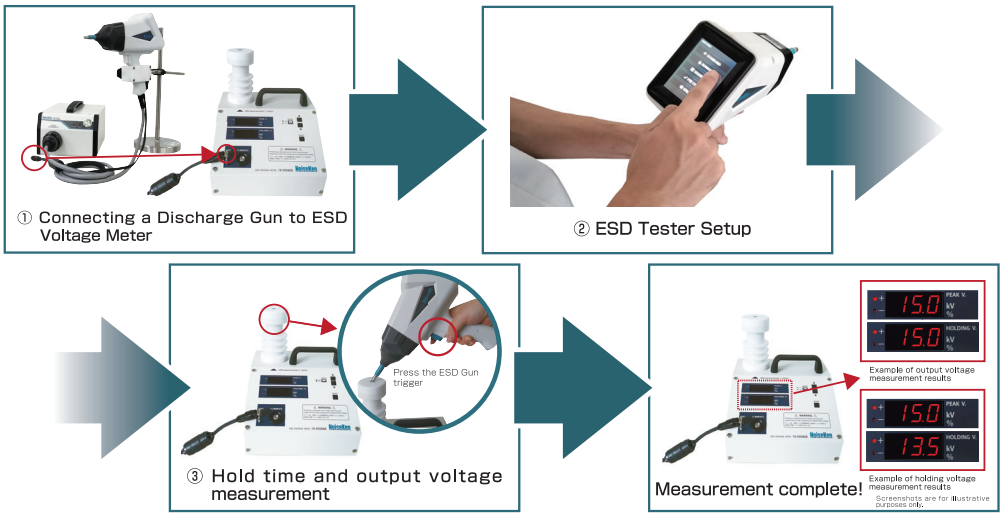
For measuring the hold time and output voltage of electrostatic testers

The ESD voltage meter MODEL: 18-00086B is a device that can measure the voltage holding time (holding voltage after 5 seconds) and output voltage, which are the tester specifications during the air discharge test in IEC 61000-4-2.
The measured voltage is displayed on a 7-segment LED with peak and holding voltage values.

- Easily measure the Hold Time, the tester specification for air-discharge testing.
- Measure the output voltage from ±2kV to 30kV.
- Monitor the measured voltage waveform by connecting to an oscilloscope.
- Compact, lightweight and easy to carry.

Easy measurement of tester specifications for the Air Discharge testing ! Hold time measurement function

IEC 61000-4-2 standard specifies the voltage "Hold Time" as a tester specification related to the Air discharge testing. The Hold Time is defined as "the time interval during which the output voltage decreases by 10% or less due to leakage before the discharge" and is required to be "at least 5 seconds". By using this product, the voltage "hold time" can be easily measured. Also, the output voltage specified in the IEC 61000-4-2 Standard can be easily measured without using a high-voltage probe or voltmeter.



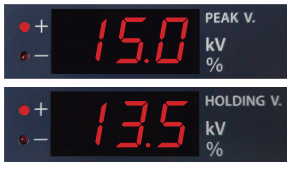
■ Measuring Holding Voltage

① Connect the alligator clip on the end of the GND cable of the discharge gun to the GND terminal of the ESD voltage meter .

② Set the electrostatic tester to Air Discharge mode and the output voltage: set to the voltage set a the ESD voltage meter.

③ Press the【START】switch on the electrostatic tester to charge the discharge gun, then make contact of the discharge tip of the ESD GUN to the GND terminal of the ESD voltage meter. After eliminating the high voltage, press the trigger switch on the discharge gun while keeping the discharge tip in contact with the ESD input terminal of the ESD voltage meter.

【Example of measurement results】
When the holding voltage value is displayed in【HOLDING V.】in kV display mode. *Percentage (%) display mode is also available.



* for illustrative purposes only.

【PEAK V.】displays the Peak Voltage using the peak hold function.
【HOLDING V.】displays the holding voltage value and the reduction rate every second.

18-00086B ESD Voltage Meter

■ Measuring output voltage

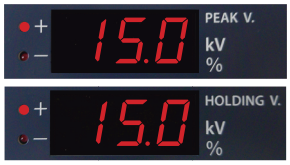
① Connect the alligator clip on the end of the GND cable of the discharge gun to the GND terminal of the ESD voltage meter .

② Set the electrostatic tester to Contact Discharge mode and the output voltage: set to the voltage set at the ESD voltage meter, the discharge interval: 0.05s, discharge count: 100 times or more.

③ Press the【START】switch on the electrostatic tester to charge the discharge gun, then make contact of the discharge tip of the ESD GUN to the GND terminal of the ESD voltage meter. After eliminating the high voltage, press the trigger switch on the discharge gun while keeping the discharge tip in contact with the ESD input terminal of the ESD voltage meter.

【Example of measurement results】

When the Holding Voltage value is displayed in [HOLDING V.] *kV display mode only.



* for illustrative purposes only.

【PEAK V.】displays the Peak Voltage using the peak hold function.
【HOLDING V.】displays the holding voltage value and the reduction rate every second.

Specifications

Parameter	Functions / Performance
Input polarity	Positive/Negative
Input voltage	±2kV - 30kV *Voltage value set at the electrostatic tester
Voltage display accuracy (voltage display mode)	Within ±5% *for DC input
Display	Voltage value: 7-segment LED 4 digits. Polarity: LED
Buzzer	built-in
Monitor output	BNC connector Approx. 1/10,000 (Approx. 3V output at 30kV input). Output accuracy: ±20% of indicated voltage value
GND Terminal	Conductive to the GND of the product housing
Elimination terminal	Conductive to the GND of the product housing
Input resistance	1TΩ±20%
Voltage divider ratio	Approx. 1/3,333
Check voltage setting range	2.0kV, 4.0kV, 8.0kV, 15.0kV, 20.0kV, 25.0kV, 30.0kV * Input voltage threshold is 1/2 of the set check voltage value
Hold time setting range	5.0 - 30.0 sec.
Power supply	AC100V ～240V±10% 50Hz ／60Hz
Power consumption	13VA
Operating temperature range	+15℃ - +35℃
Operating humidity range	30%RH to 60%RH (no condensation)
External dimensions	(W)220mm x (H)256.5mm x (D)230mm (excluding protrusions)
Mass	Approx. 2kg

Impulse Noise Simulator (semi-conductor type)

INS-S220 / S420

To solve the real trouble in the market

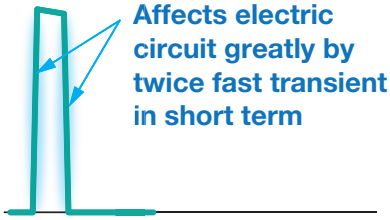
This Noise simulator simulates high frequency noises generated by ON/OFF switching at contact points of switches or relays, and arcs caused by electric motor, allowing to evaluate the resistibility of electric devices.
The Pulse contains wide range of frequency components and energy volume is changeable by adjusting pulse width. This allows conducting of highly-reproducible noise tests for noise troubles in the market.

- Button touch instead of coaxial cable replacing reduces pulse width setting time.
- Pulse waveform stability has improved, allowing highly-reproducible testing.
- Consumable parts reduction cut down running cost.
- Common mode/normal modes are easily switched between by a short plug.
- “Test time setting” new function simplifies test time setting.
- Wiring became easier thanks to a built-in 50Ω terminator resistor design.
- Repetition cycle became faster. Due to high repetition, malfunction occurrence rate is up and test time is shortened.(only INS-S220)
- Outlet Panel allows direct connection of EUT AC plug.(option)
- Various tests are available by using different probes and coupling clamps.(option)
- Using of external CDN allows testing to 3-phase EUTs.(option)
- Dedicated software simplifies testing with various test conditions (option, applicable to INS-S420 only)

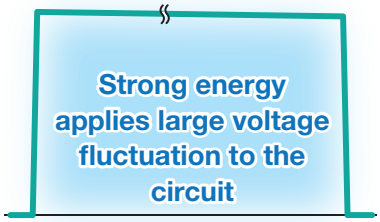
Features

To solve the trouble in the market
Test pulse with adjustable high frequencies and energy volume

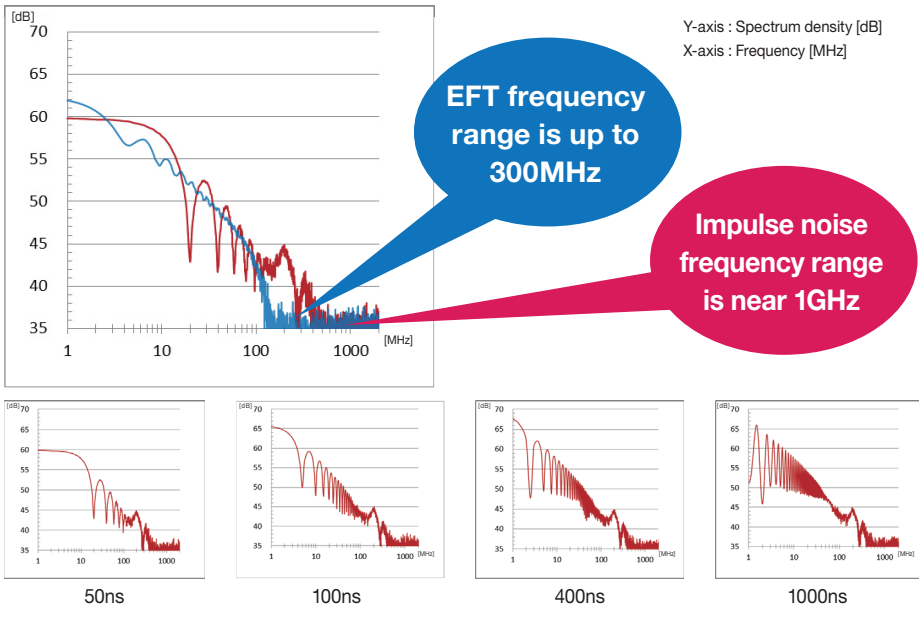
Narrow pulse of 50-100ns width although contains small energy, greatly affects electric circuits due to two transient fluctuations of short-time rise and fall and inductive coupling by steeply generated electromagnetic field.Wide pulse of 800ns-1000ns contains more energy, making it easy to apply large voltage fluctuations to the circuit.The rise time of impulse simulator is faster than IEC61000-4-4 fast transient/burst test and contains high frequency components up to 1GHz. Therefore, when noise is applied to the EUT, it is easier to penetrate and affect the electronic circuit.In addition, since the included frequency spectrum components and intensity differ depending on the pulse width of the impulse, it is recommended to conduct tests with several types of pulse widths.



【 50ns pulse image 】



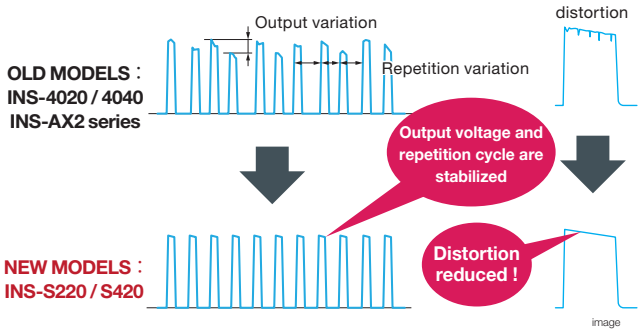
【 1000ns pulse image 】



INS-S220 / S420

Improved reproducibility of test results Allows for more quantitative testing

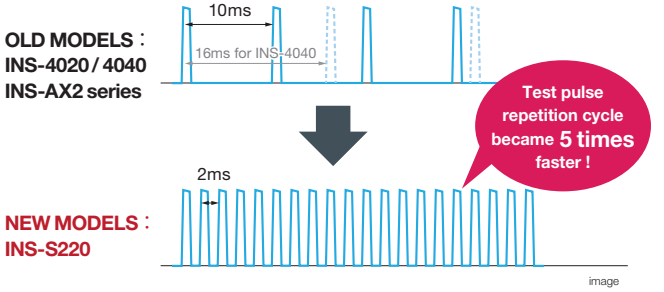
By changing from the conventional mercury relay to the semiconductor relay, the stability of the test pulse waveform has been improved, enabling tests with more quantitative and highly reproducible test results than before. In addition, the output waveform defect occurring with the mercury relay deterioration has been eliminated.



Improved malfunction occurrence rate Contributes to testing time reduction

By speeding up the test pulse repetition period compared to old models,product malfunction occurrence rate should increase contributing to overall test time reduction.

Example : In case the repetition cycle is 2ms



*** There are restrictions on the pulse repetition period.**

Pulse Width setting simplified Setting time reduced

Pulse width setting in old models (INS-4020/4040) required troublesome manual cable connection switching. New Impulse Noise Simulator models INS-S220/S420 setting is simple by pushing buttons, reducing setting time and helping avoid connection errors.

Complicate cable connection setting becomes…

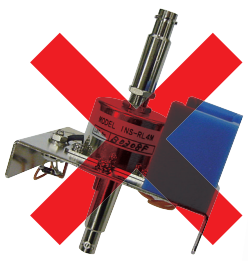
SIMPLE with button operations.

Connection simplified Connection time reduced

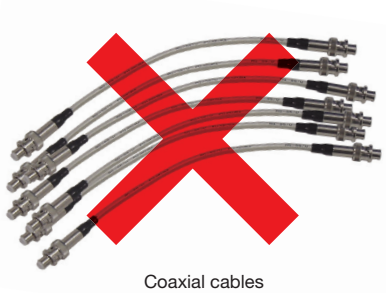
Outlet panel was adopted for easy EUT connection. By using an outlet panel (optional) matching the shape of each country, you can easily connect EUT for the test.

Operating Cost reduction Consumable parts reduced

Adopted semiconductor type relay instead of old mercury type relay (consumable).
Consumables such as pulse width setting cables and mercury relays are no longer required, reducing replacement costs.



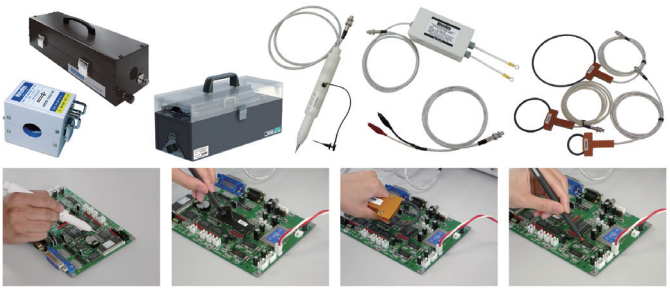
Mercury relay



Coaxial cables

Easy Noise countermeasurement Identify the malfunction location

A large number of noise application options are available for power lines, communication lines, harnesses, housings, and board levels, making it easy to identify malfunction locations.



INS-S220 / S420

Specifications

Parameter		INS-S220	INS-S420
Pulse settings-1	Pulse output voltage	0.50kV ～ 0.99kV ±10%　0.01kV step	—
	Pulse width	100ns ～ 1000ns ±10%　50ns step	
	Repetition cycle	1ms ～ 999 ms ±10%　1ms step	
Pulse settings-2	Pulse output voltage	1.00kV ～ 2.00 kV ±10%　0.01kV step	0.50kV ～ 4.00kV ±10%　0.01kV step
	Pulse width	50ns ～ 1000 ns ±10%　50ns step	50ns ±15%, 100ns ～ 1000ns ±10%　50ns step
	Repetition cycle	10ms ～ 999 ms ±10%　1ms step	
Output voltage		0.5 ～ 2.00kV±10%　（10V step）	0.5 ～ 4.00kV±10%　（10V step）
Polarity		+ / −	
Rise time		＜3ns	
Output impedance		50Ω	
Terminal resistance		50Ω	
Pulse repetition modes	LINE PHASE	50Hz/60Hz injection phase angle 0 ～ 360°　±10°（1°step） synchronized with L-N of EUT supply or external CDN	
	VARIABLE	1ms ～ 999ms ±10 %（～ 1kV） *pulse settings-1 10ms ～ 999ms ±10 %（1kV ～ 2kV） *pulse settings-2	10ms ～ 999ms ±10 %
	EXT TRIG	Period：>10ms Input signal level：TTL/open collector negative logic Pulse width：>1ms When LINE PHASE mode is selected and there is an input with a period of 16 to 20 ms, it is recognized as a zero-cross sync signal for external CDN.	
	1 SHOT	Single pulse generation each time the 1 SHOT button is pressed. Synchronized (phase angle set on the PHASE control) or asynchronized pulse period.	
Memory storage		5 tests	
Test time		1s ～ 999s ±10%　1s step	
Coupling switch		L(+), N(−), PE ／ PULSE OUT　*manual switch by coaxial cable	
Coupling mode		common-mode / normal-mode　*manual switch by short plug	
EUT power capacity		Single phase AC240V / DC125V 16A　(L(+), N(−), PE)	
External control		N/A	RS-232C compliant optical communication
Power supply		AC100 ～ 240V 50Hz/60Hz	
Operating temperature / humidity		15 ～ 35℃ / 25 ～ 75%	
Dimensions / weight		（W）430×（H）249×（D）540mm (protrusions excluded) / approx. 20kg	（W）430×（H）349×（D）540mm (protrusions excluded) / approx. 23kg
HV coaxial cable connector		NMHV Noiseken custom type	
Accessories		coaxial cable 30cm (02-00155A): 2pcs, SG short plug (02-00106A): 1pc, SG cable (05-00103A): 1pc, outlet panel: 1pc, AC cable: 1pc, Instruction Manual: 1 volume, accessories bag: 1pc	

Impulse Noise Simulator (semi-conductor type)

INS-S100

Pulse output settings from 50V

Test noise resistance of circuit boards and low voltage components

NEW

※ illustration image only

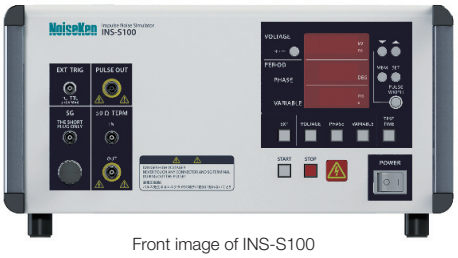
The impulse noise simulator tests the resistance of electronic equipment by simulating quick rise-time high-frequency noise due to discharge between the contacts of switching devices and arc discharge generated from electronic motors.
The impulse noise simulator INS-S100 can output pulses from 50V, allowing to evaluate the noise resistance of circuit boards and low voltage components during product development, and during analysis of malfunctions occurred in the market.

- **Easy testing of circuit boards' noise resistance due to the pulse output voltage from 50V.**
- **Easy noise immunity assessment due to possibility to change the output voltage during pulse output.**
- **"TEST TIME" setting available.**
- **Lightweight and compact due to no decoupling network (CDN) included.**
- **Test the noise resistance of signal lines using optional coupling adapters.**
- **Test the noise resistance of circuit boards using optional radiation probes.**

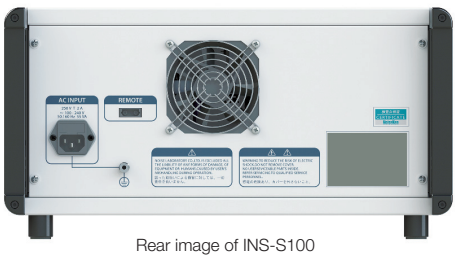
Impulse noise simulators - Specifications Table -			
Parameter	INS-S100	INS-S220	INS-S420
Pulse output voltage	0.05kV ～ 1.00kV	0.50kV ～ 2.00kV	0.50kV ～ 4.00kV
Pulse width	50ns ～ 1000ns	100ns ～ 1000ns ※output voltage：～ 0.99kV 50ns ～ 1000ns ※output voltage：1.00kV ～	50ns ～ 1000ns
Repetition cycle	10ms ～ 999ms	1ms ～ 999ms ※output voltage：～ 0.99kV 10ms ～ 999ms ※output voltage：1.00kV ～	10ms ～ 999ms
Rise time	＜ 3ns ※ when 50Ω terminated		
Decoupling network (CDN)	none	equipped	

Specifications

Parameter		Specifications
Pulse output voltage		0.05kV ～ 1.00kV ±10%　0.01kV step ※1 Parameters can be changed during pulse output
Pulse width		50ns ～ 1000ns ±10%　50ns step（only 50ns is ±15%）
Repetition cycle		10ms ～ 999ms ±10%　1ms step
Rise time		＜ 3ns ※1
Polarity		＋ / －
Output impedance		50Ω ※2
Terminal resistance		50Ω
Pulse repetition modes	VARIABLE	10ms ～ 999ms
	EXT TRIG	Input connector：BNC Operating cycle：＞ 10ms Input signal level：TTL / open collector negative logic Pulse width：＞ 1ms
	1 SHOT	Single pulse generation each time the 1 SHOT button is pressed. In PHASE mode, output is synchronized to the set phase angle
Test time		1s ～ 999s ±10%　1s step
HV coaxial cable connector		NMHV ※3
Communication function		RS-232C compliant optical communication
Power supply		AC100V ～ 240V ±10%　50Hz / 60Hz ±10%
Dimensions / weight		（W）430×（H）199×（D）370mm (protrusions excluded) / approx. 11kg
Accessories		coaxial cable 30cm（02-00155A）：2pcs, SG short plug（02-00106A）：1pc, SG cable（05-00103A）：1pc, outlet panel：1pc, AC cable：1pc, Instruction Manual：1 volume, accessories bag：1pc
Notes ※1 when 50Ω terminated ※2 Impedance matching using a 50Ω series resistor ※3 NoiseKen custom product		



Front image of INS-S100



Rear image of INS-S100

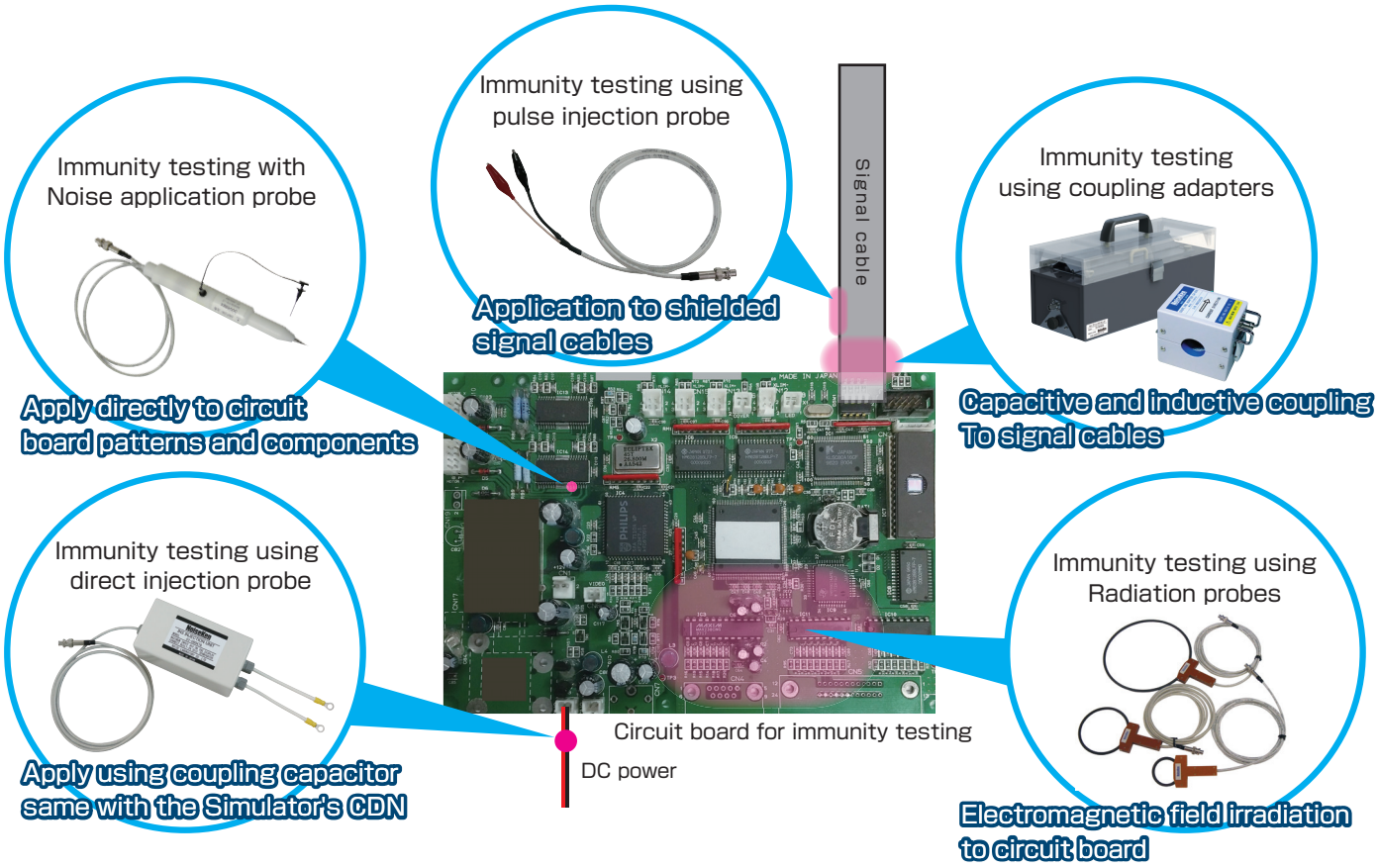
※ illustration image only

INS-S100

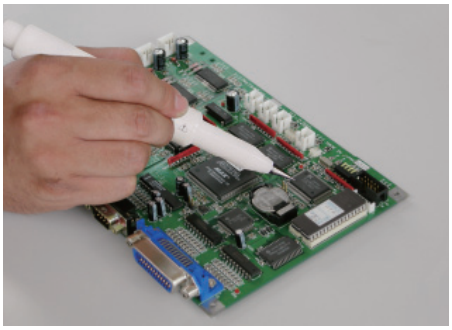
Features

Improve the Product Quality !
Choose the application method best suiting your testing purpose

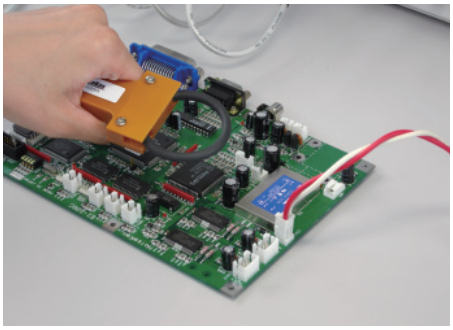
The purpose of noise resistance testing is to ensure a certain level of social safety by clearing the limits of international and industry standards, and to improve product quality by confirming and reproducing malfunctions occurring in the market. Generally, impulse noise testing is performed by injecting noise into the power supply system to check the product's noise resistance, but resistance can also be tested on circuit boards by the application method according to the purpose. You can easily test the noise immunity by clamping the coupling adapter to the signal cable and applying the voltage, or by using a radiation probe to identify the malfunction location due to the near magnetic field on the circuit board.



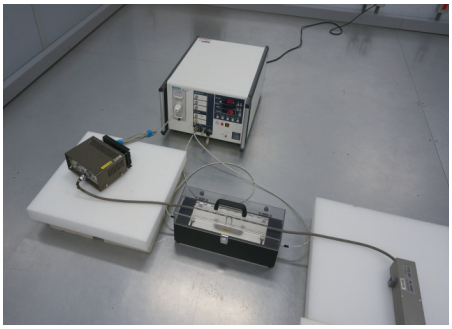
Noise immunity testing with Impulse Noise Simulator



Noise immunity testing using noise application probe



Noise immunity testing using radiation probe



Noise immunity testing using coupling adapter

For testing using radiation probes/coupling adapters, please see the Impulse Noise Simulator page of Noise Laboratory Co., Ltd. (noiseken.com).

Automatic CDN for Impulse Noise Simulator

IJ-AT450

Automatic CDN for Impulse Noise Simulator (Model:IJ-AT450) is a superposition unit allowing testing to 3-phase AC lines and high-voltage DC lines by combining with the Impulse Noise Simulator. By performing remote control from Windows PC using dedicated software, the tester can automatically perform the test such as setting of voltages and applied phase, as well as sequence control.

- **Tests can be performed on three-phase four-wire lines up to AC500V/50A.**
- **Testing to DC-lines up to DC250V/50A is also possible.**
- **EUT line switch allows the AC/DC line to be shut off.**
- **Emergency stop switch to stop the test in case of emergency.**

Parameter	Specifications
Input pulse voltage	4kV terminating resistance 50 Ω is connected
EUT power capacity	AC: 3-phase, 4-wire (L1, L2, L3, N) 500V / 50A DC:250V / 50A
Input and output terminals	Input terminal: Terminal block Output terminal: Terminal block panel
High voltage coaxial connector	NMHV type *NoiseKen custom
Superimposed phase switching	Switching by selection operation *Switching by the front switch of the main unit or remote software.
Zero Cross Detection	Detected from between L1-L2
Line protection circuit	Mounted with shut-off circuit device *Connectable/releasable input and output
Emergency stop	Built-in mushroom-type switch for push-lock and rotation-release
External control	Remote control from PC with optical I/F circuit
Power supply	AC100 ～ 240V 50Hz/60Hz
Operating temperature /humidity	Temperature: 15 to 35° Humidity: 25 to 75%
Dimensions/weight	(W)430×(H)199×(D)540mm (protrusions excluded) / Approx. 24kg
Accessories	BNC coaxial cable (02-00159A): 1pc, high-voltage coaxial cable (02-00160A): 1pc, AC cable: 1pc, SG cable (05-00172A): 1pc, outlet panel (18-00074A): 1pc, instruction manual: 1 volume, accessories bag: 1pc.

IJ-AT450 in connection with INS-S420

Easy switching of application phase Setting time reduced

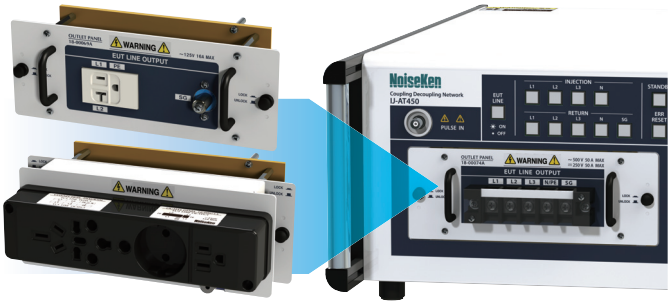
In the old model, setting the applied phase was troublesome requiring manual switching using the dedicated coaxial cables and short-plug. IJ-AT450 simplifies switching and reduces setting time and helps avoid connection errors.

Complicate cable connection setting becomes…

SIMPLE with button operations.

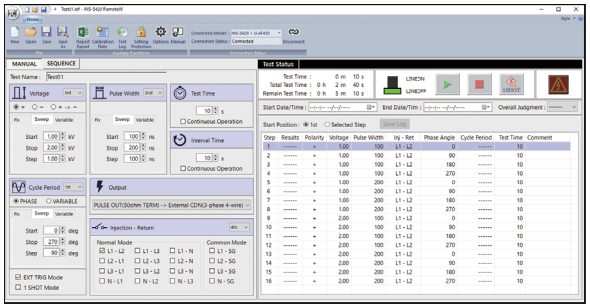
Connection simplified Connection time reduced

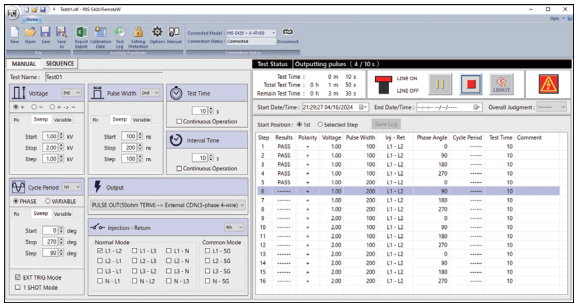
Outlet panel was adopted for easier EUT connection and conducting the test.



PC Software（※ optional） Testing automation reduces testing time and man-hours

Using remote control software, in addition to test parameters such as pulse output voltage, pulse width, polarity, and repetition period, the application mode (common/normal) and applied phase can be set, and the test conditions can be controlled in sequence. This reduces the time and effort required to change the wiring during testing and contributes to shortening the testing time and reducing the number of man-hours.





Remote Control Software

INS-S series RemoteW Model:14-00069A

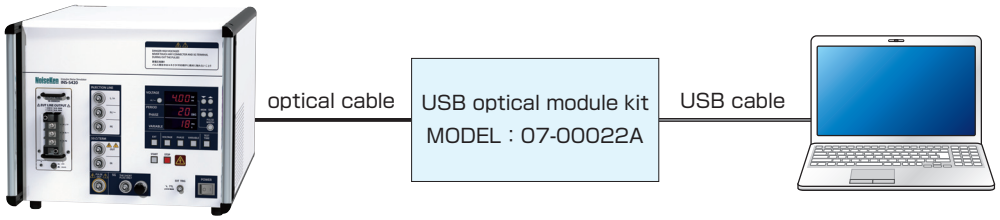
INS-S series RemoteW (Model：14-00069A) is the dedicated software for remote control of INS-S series simulators.
Using this software, you can set the application mode as well as test parameters such as pulse output voltage, pulse width, phase angle and repetition period. Test conditions can be controlled in sequences, which contributes to reducing the test time and man-hours.

- **Manual tests can be performed by setting test parameters such as pulse output voltage, pulse width, phase angle, repetition period, and test time.**
- **Sequence tests can be performed by arbitrarily combining manual test data.**
- **Test information such as test conditions, test list, etc, can be generated into a Test Report and exported in Excel format.**
- **EUT FAIL signal detected using digital I/O.**
- **Compatible with Windows 10,11 64 bit versions with English and Japanese supported languages.**
- **Various settings data can be protected by the "Settings Protection" function.**

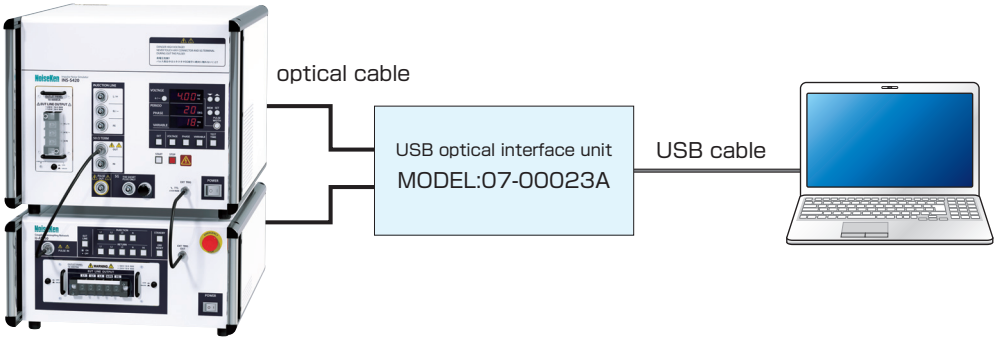
※ Phase angle setting with INS-S100 requires combination with an external CDN.
※ For INS-S220, only compatible with Custom model equipped with optical interface.

Hardware Configuration

【PC Remote control of INS-S420】
Allows controlling the pulse output voltage, pulse width, phase angle and repetition period of the Simulator's main unit, however application phase and return phase switch control is not available.



【PC Remote control of INS-S420 & IJ-AT450】
Allows controlling the pulse output voltage, pulse width, phase angle and repetition period of the Simulator's main unit, and also application phase and return phase switching and EUT LINE ON/OFF control is available.



Software System Requirements

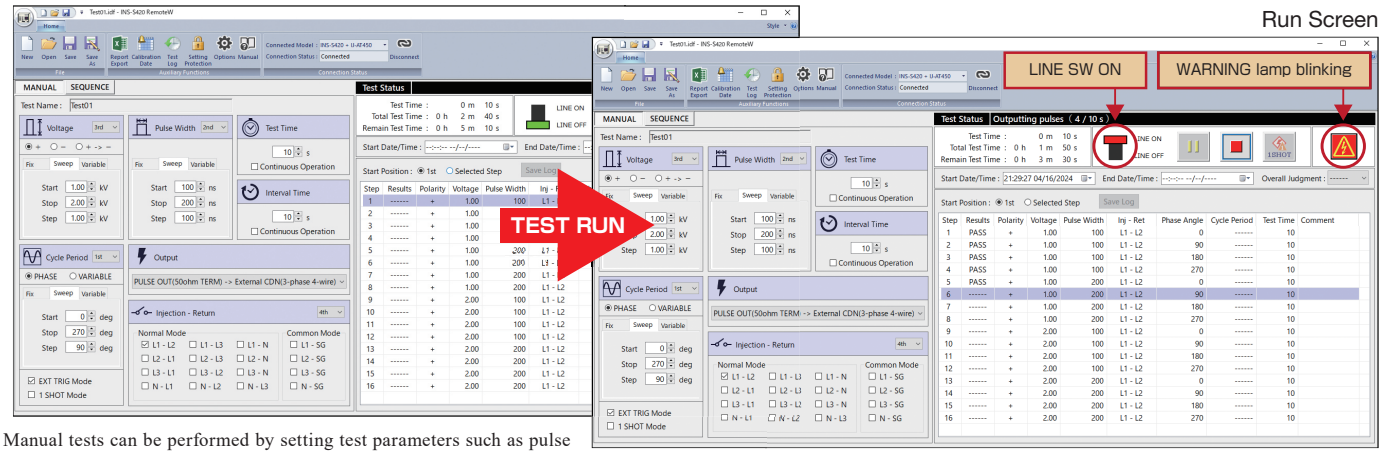
Parameter	Specifications
OS	Windows 10, 64bit (English or Japanese ver.) Windows 11, 64bit (English or Japanese ver.)
CPU	Dual-Core over 2.4GHz or better recommended
RAM	8GB or more recommended
Storage	5GB available free space
Display	1920×1080 pixels (FullHD) or more recommended

【Attention】
○ Operation is not guaranteed when using software on cloud services or using online storages.
○ For correct "Report Export" function, be sure to have installed Microsoft Excel compatible with the OS and within the support period. (Please use the Desktop version, not the Store App version.)
○ Optical USB Interface unit is required (models 07-00022A or 07-00023A).
○ Available USB ports required.
(2 USB ports required. In case of using Digital I/O - 3 USB ports required.)
○ CD-ROM or DVD-ROM drive required for installing drivers for the Optical USB Interface.

14-00069A

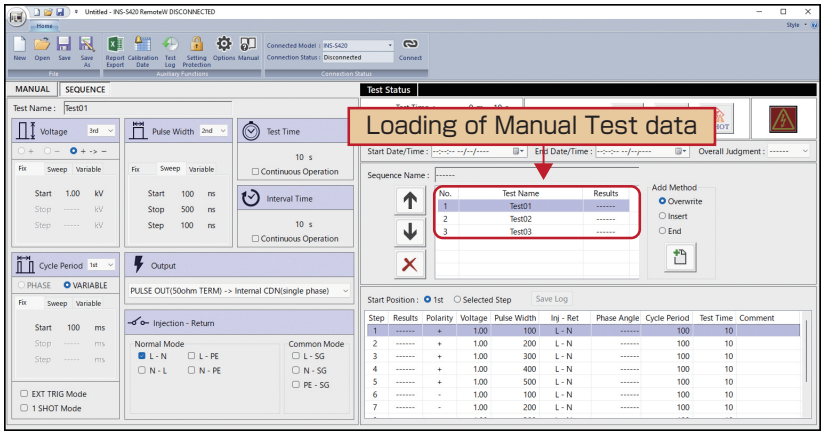
Remote Control Software

Manual Test



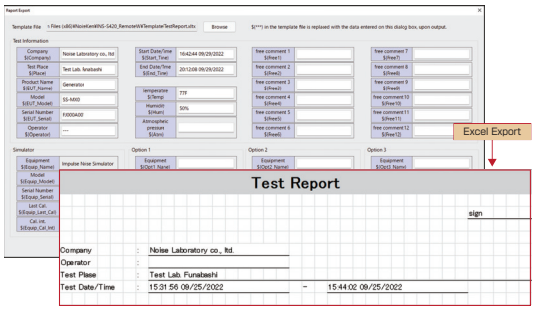
Manual tests can be performed by setting test parameters such as pulse output voltage, pulse width, phase angle, repetition period, and test time.

Sequence Test



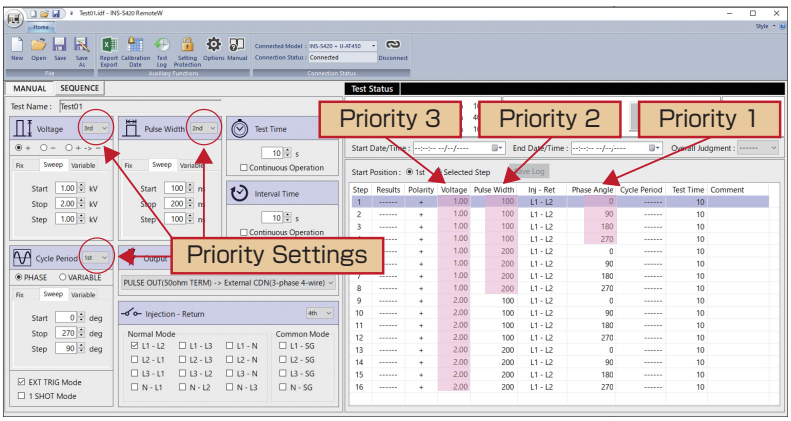
Sequence tests can be performed by arbitrarily combining manual test data.

Report Generation



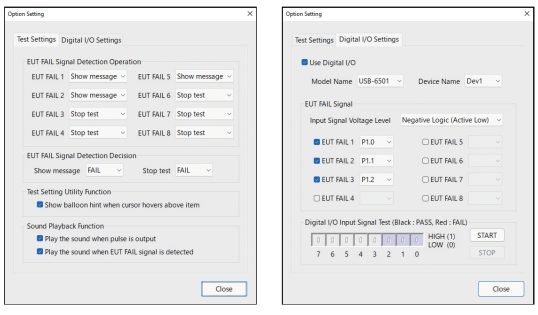
Test information such as test conditions,test list, etc, can be generated into a Test Report and exported in Excel format.
Test Report can be set to a desired format by loading a template file.

Sweep Function

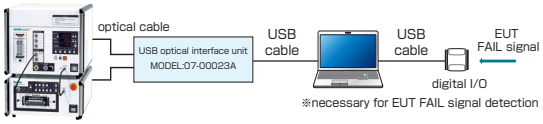


Sweep test with priorities set for test parameters is available.

EUT FAIL signal detection function



By using a digital I/O by National Instruments, you can detect up to 8 EUT FAIL signals and you can set the operation and judgment when EUT FAIL signals are detected. Please contact us for more details.



Options

Attenuator for waveform check MODEL：00-00017A

Attenuator for measuring high voltage pulse.

Parameter	Specifications
Attenuation rate	DC～2GHz：40dB（100：1）
Input pulse peak voltage	4000V MAX
Tolerable continuous pulse examples	Pulse width : 50ns~1000ns Pulse repetition frequency : Max. 60Hz at 4000V output; Max. 100Hz at 2000V 1 hour continuous use
Input impedance	50Ω (50Ω±1% at DC)
Output impedance	50Ω (50Ω±1% at DC) *If using an oscilloscope with high input impedance (1 MΩ), a 50 Ω termination is required.
Interface connectors	INPUT：HN(F)　OUTPUT：N(F)
Dimensions/ Weight	(W)154.5mm×(D)105mm×(H)37mm / Approx 1350g
Accessories	Input cable (HN(P)-NMHV(P) 0.5m) 1pc., Output cable (N(P)-BNC(P) 1m) 1pc., Instruction Manual 1pc.

Attenuator MODEL：00-00011A

Attenuator for protecting measuring instruments.
It is recommend to use this attenuator when using the waveform checking attenuator (00-00017A) to protect measuring instrument.

Attenuating rate 20dB, N type connector　INS-S220/S420 → coaxial cable → 00-00017A → 0000011A → coaxial cable → oscilloscope

PULSE DIVIDER for INS MODEL：00-00021A

Voltage divider enabling low voltage test by dividing and outputting high voltage pulses at a ratio of 4:1.

Parameter	Specifications
Attenuation rate	DC～2GHz：12dB（4：1）
Input pulse peak voltage	2000V MAX
Tolerable continuous pulse examples	Pulse width : 10ns~1000ns Pulse repetition frequency :2000V output ≤ 62.5Hz (continuous output)
Input / Output impedance	50Ω (50Ω±1% at DC)
Interface connectors	HN(F)
Dimensions / Weight	(W)169mm×(D)119mm×(H)37mm / Approx 1490g
Accessories	I/O cables (HN(P)-NMHV(P) 0.5m) 2pcs., Output cable (HN(P)-HN(P) 0.3m) 1pc., Instruction Manual 1pc.

Outlet Panel MODEL：18-00059C/60B/84A

Outlet panel to be available for different types of connectors in line output of INS-S220 / S420.

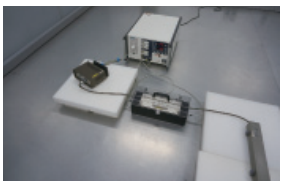
Model	Specifications
18-00059C	JP/USA Type　AC125V 16A MAX
18-00060B	CEE Type　AC240V 16A MAX
18-00084A	multi outlet type　AC250V 16A MAX

Outlet Panel MODEL：18-00069A/71A

Outlet panel for converting the line output connector IJ-AT450

Model	Specification
18-000069A	JP/USA Type　AC125V 16A MAX
18-00071A	multi outlet type　AC240V 15A MAX

Coupling Adaptor MODEL：15-00014A



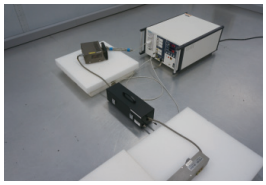
Allows noise application combined with an Impulse Noise Simulator by simply inserting a cable of an electronic device. Calibration fixture (15-00015A) for this clamp is also available.

- ○ **Allows to injecting the noise without cutting signal, DC, AC, GND, etc.**
- ○ **Allows to test noise immunity of electric devices separately.**
- ○ **Allows highly-effective noise immunity testing since the noise can be injected directly to signal lines.**

Parameter	Specifications
Input voltage	4000V Max
Input pulse width	50~1000ns
Coupling method	Capacitive coupling
Dimensions / Weight	(W)386×(H)155×(D)140mm (protrusions excluded) / Approx 4kg
Adequate cable dimensions	maximum diameter 20mm
Terminal resistor	N/A
Coaxial connectors	Coaxial cable NMHV(P)-NMHV(P)-1.5M 2pcs

Options

Coupling Adaptor MODEL : CA-805B (Capacitive coupling)

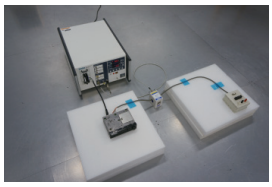


Allows noise application combined with an Impulse Noise Simulator by simply inserting a cable of an electronic device.

- ○ Allows injecting the noise without cutting signal, DC, AC, GND, etc.
- ○ Allows to test noise immunity of electric devices separately.
- ○ Allows highly-effective noise immunity testing since the noise can be injected directly to signal lines.
- ○ Allows to clamp bundle of lines whose of maximum diameter up to 26mm.

Parameter	Specifications
Input voltage	4000V MAX
Input pulse width	50~1000ns
Coupling method	Capacitive coupling
Dimensions / Weight	(W)350×(H)105×(D)110mm (protrusions excluded) / Approx 3kg
Adequate cable dimensions	maximum diameter 26mm
Terminal resistor	N/A
Coaxial connectors	Coaxial cable NMHV(P)-NMHV(P)-1.5M 2pcs (MODEL 02-00025A)

Coupling Adaptor MODEL : 15-00007A (CA-806 / Magnetic field coupling)



Allows noise application combined with an Impulse Noise Simulator by simply inserting a cable of an electronic device.

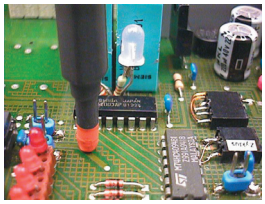
- ○ Allows injecting the noise without cutting signal, DC, AC, GND, etc.
- ○ Allows to test noise tolerance of electric devices separately.
- ○ Termination resistance built-in.

Parameter	Specifications
Structure	Magnetic field coupling noise injection clamp
Input voltage	2000V Max.
Input pulse width	50~1000ns
Coupling ratio	1/10±10% of input voltage
Termination resistance	50Ω built-in(54Ω)
Max. diameter of ground cable	27mm
Dimensions / Weight	(W)89×(H)64X(D)120mm / Approx 1000g
Coaxial connector	NMHV(P)-NMHV(P) 1m: 1pc. (MODEL: 02-00053A)

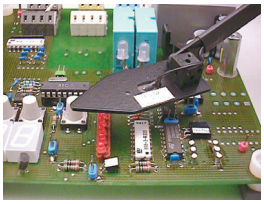
EMS Probe Kit MODEL : H2-B

Probes for noise injection onto PCB patterns and flat cables using the Impulse Noise Simulator.
By choosing different probes, it is possible to separate the electric field/magnetic field and perform near field irradiation.
* Max. pulse voltage: 1kV, max. pulse width: 50ns, fastest repetition period: 10 ms)

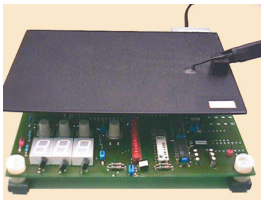
- ○ Noise can be applied to any part of a PCB or harness.
- ○ Allows to detect noise immunity weak points by separating and combining use of electric/magnetic field probes.
- ○ A set of 3 electric field probes and 3 magnetic field probes with different shapes and sizes.
- ○ Noise can be applied in the range of several millimeters, allowing to easily identify weak points.
- ○ Allows to identify weak points for specific frequencies by using a signal generator as a wave source.
- ○ Suited for locating noise sensitive spots by using with the INS or FNS equipment



BS05DB



ES02



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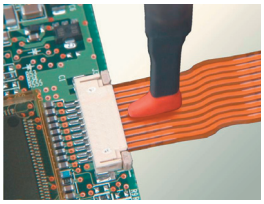

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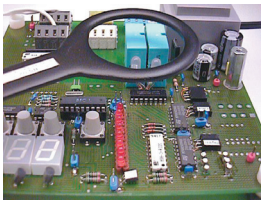

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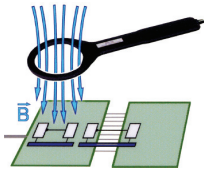

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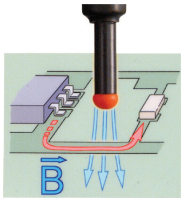
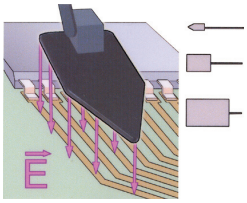
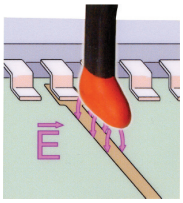


BS04DB
BS05DB



ES02
ES00



ES05D

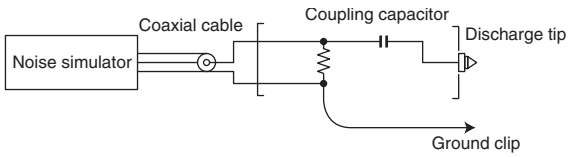
Options

Noise Injection Probe MODEL : 01-00034A

A probe for injecting noise directly into the pattern and parts of the printed circuit board.
*Input pulse repetition period: 10 ms or more

- ○ Noise immunity can be tested at the board level because noise can be injected directly into each pin of the LSI.
- ○ Up to 500V noise injection is possible utilizing INS or FNS simulator.
- ○ Possible to exchange the coupling capacitor (Option)
- ○ 50 ohm termination resistor built-in

[Options]
Coupling capacitors: 06-00039A 220pF. 06-00040A 330pF. 06-00041A 3pF. 06-00042A 500pF.
* 01-00034A does not include the coupling capacitors

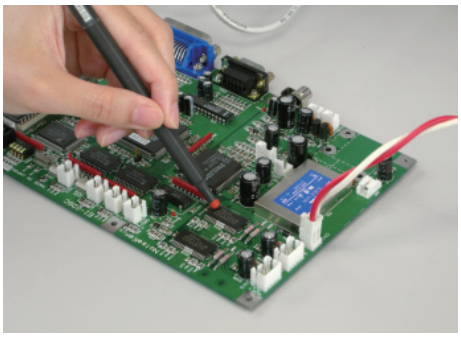


Radiation Probes MODEL : 01-00006A / 7A / 8A / 9A / 10A / 31A / 50A

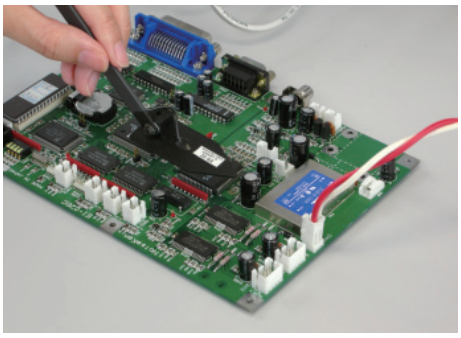
These probes, in combination with Impulse Noise Simulator allow to emit electromagnetic field radiation noise to the wiring of PCB inside electronic equipment, and is used to search for areas vulnerable to radiation noise.

Parameter	Specifications
Input voltage	4000V Max
Input pulse width	50~1000ns (1μs)
Loop diameter	01-00006A : φ50mm, 01-00007A : φ75mm, 01-00008A : φ100mm, 01-00009A : φ150mm, 01-00010A : φ200mm, 01-00031A : 250mm, 01-00050A : 30mm
Cable length	Approx.2m
Weight	Approx.180g~220g
Termination Resistance	N/A

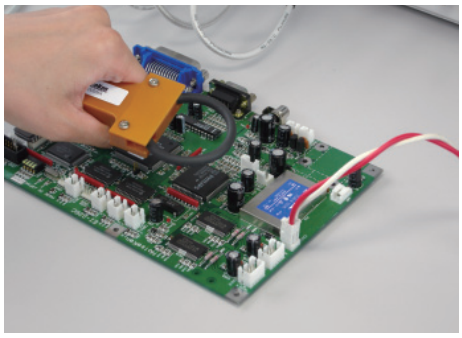
Probes application examples



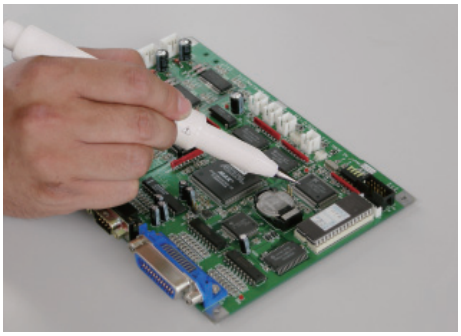
H2-B



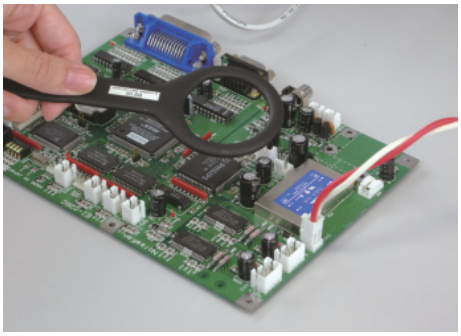
H2-B



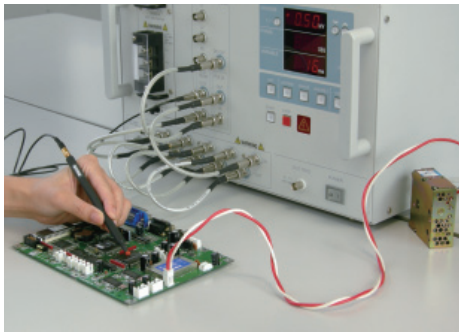
Radiation probe



Noise injection probe



H2-B



H2-B

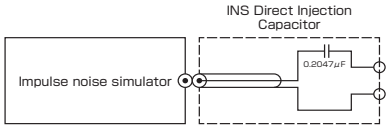
Pulse Injection Cable MODEL : 02-H1834

This cable is used for direct noise injection in combination with an Impulse Noise Simulator.
* It cannot be used for applying current to places where current flows, such as power lines.

Options

INS Direct Injection Capacitor MODEL : 01-00047A

A unit for directly applying the pulse output of the Impulse Noise Simulator without passing through the simulator's internal CDN. A coupling capacitor same with the CDN is built-in.
It can be used when the power supply capacity of the test product is a weak current such as a DC5V line, and when it cannot be energized when passing through the simulator's CDN.



Item	Specifications
Coaxial connector	NMHV
Connector	M6 ring crimp terminals
Dimensions / weight	80×80×150 mm（protrusions excluded）／ 400g

Injection Unit MODEL : IJ-4050

Unit allowing noise injection to power supply lines of EUT up to 3-phase 5 lines (L1, L2, L3, N, PE) in combination with main units of INS series. Setting for Normal mode and Common mode is simple and easy with change of the connectors configurations.
In case of the combination with INS-4020 / 4040 / S220, test synchronized with EUT lines can be conducted.

Parameter	Specifications
Input impulse voltage	Max. 8kV without 50Ω termination　Max. 4kV with 50Ω termination
EUT power capacity	3-phase 5 lines (L1, L2, L3, N, PE)　AC415V 50A (Unavailable for DC) AC415V between L1-L2, L2-L3, L3-L1　AC240V between L1, L2, L3 – N
Injection phase switching	By coaxial connectors L1, L2, L3, N, PE
Coupling modes	Normal / Common (Setting with short plug connection)
Zero cross detection	Detects between L1 – L2 and outputs the synchronization signal from SYNC OUT terminal
EUT line protection circuit	Detects current in L1, L2 and L3 lines and breakes L1, L2, L3 and N lines
EUT line input terminal	Terminal block, screw connection
EUT line output terminal	Exclusive contact for φ6
Coupling Attenuation characteristics	≦-10db　10kHz~1GHz　without load
Residual voltage at input	≦450V　Residual voltage without load when 4000V impulse is injected with 50Ω termination
Termination resistance	N/A (Termination resistance in Impulse Noise Simulator is applied)
Power supply	AC100V~240V±10%　50 / 60Hz　20VA Max
Operating temperature / humidity range	15~35℃　25~75%
Dimensions / Weight	(W)430×(H)199×(D)535mm (Protrusions excluded) / Approx 25kg

Injection Unit MODEL : IJ-5100Z

Unit allowing noise injection to power supply lines of EUT up to AC480V / 100A 3-phase 5 lines (L1, L2, L3, N, PE) in combination with main units of INS series. In case of the combination with INS-4020 / 4040 / S220, test synchronized with EUT lines can be conducted.

Parameter	Specifications
Input impulse voltage	Max. 8kV without 50Ω termination　Max. 4kV with 50Ω termination
EUT Line	3-phase 5 lines (L1, L2, L3, N, PE)
Maxium voltage of EUT line	AC 480V
Maxium current of EUT line	100A
Line synchronlzation output	1/2 of EUT line input voltage
Through characteristics	within －10db in 10kHz~1GHz
CDN power supply	AC 100～240V ±10% 50 / 60Hz
Dimensions / Weight	(W)488×(H)520×(D)825mm (Protrusions included) / Approx 115kg

Circuit Breaker Box MODEL : 18-00072A (20A) / 18-00073A (50A)

A breaker box allowing to cut off the line between the Simulator and the power supply side by using it in combination with the INS-S220/S420/IJ-4050/AT450.* Connection requires processing of the connection cable. Contact us for more details.

Parameter	Specifications（18-00072A）	Specifications（18-00073A）
Rated Voltage	AC250V 50/60Hz DC65V	AC240/415V　3 phase 4 wire　Y-connection,　50/60Hz AC240V：Line-N (neutral)　AC415V：Line-Line
Rated Current	20A	50A
Switching durability	over 10,000 times (rated open/close 6,000 times, no load open/close 4,000 times, frequency 6 times/minute)	
Neutral pole (N pole)	N/A	The neutral pole does not trip by itself.The neutral pole does not open before the other poles and does not close after the other poles.
Operating temperature, humidity	15 ～ 35℃　25 ～ 75%（no condensation）	
Dimensions	(W)180×(H)92×(D)100mm（excluding protrusions）	(W)180×(H)92×(D)120mm（excluding protrusions）
Weight	0.75 kg	1.2kg

Options

Isolation Transformer MODEL : TF-2302P

Model TF-2302P is a single-phase isolation transformer rated AC240V/30A with dielectric strength of 4kV.
For safety reasons, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	Specifications
Maximum input voltage	Single phase AC240V Max (50/60Hz)
Maximum output current	30A Max
Dielectric strength	Primary winding to core AC4kV (1 minute) Secondary winding to core AC4kV (1 minute) Primary to secondary windings AC4kV (1 minute)
Insulation resistance	100MΩ or more at DC500V
Dimensions / Weight	(W)350×(H)475×(D)400mm (Except for eye bolt and handle) / Approx. 60kg
Accessories	AC single phase line input cable (5.5sq 3-line 3m, One end: with a stick-type soldering terminal, The other end: without terminal): 1pc., PE/FG cable (3.5sq 3m Both ends: with a φ6 ring-type soldering terminal) : 1pc. Instruction Manual: 1pc. AC single phase line output cable (3.5sq 3-line 2m, One end: with stick-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc.

Isolation Transformer MODEL : TF-6503P, TF-6633P

Model TF-6503P, TF-6633P are three-phase isolation transformers rated AC 600 V / 50 A (TF-6633P 63A) and dielectric strength of 4 kV. For safety reasons, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	TF-6503P Specifications	TF-6633P Specifications
Maximum input voltage	Single / Three phase AC 600 V Max (50/60 Hz)	
Transformer wiring method	Star wiring	
Maximum output current	50 A Max	63 A Max
Dielectric strength	Primary winding to core AC 4 kV (1 minute) Secondary winding to core AC 4 kV (1 minute) Primary to secondary windings AC 4 kV (1 minute)	
Insulation resistance	100 MΩ or more at DC 500 V	
Dimensions / Weight	TF-6503P: (W)500×(H)640×(D)700mm (Eye bolts and handles excluded) approx. 350kg TF-6633P: (W)500×(H)661×(D)700mm (Eye bolts and handles excluded) approx. 400kg	
Accessories	AC three-phase line input cable (14sq (22sq for TF-6633P) 4-line 3m, One end: with a stick-type soldering terminal, the other end: without terminal):1 pc. PE cable (8sq 3m, One end: with a φ6 ring-type soldering terminal, The other end: without terminal): 1 pc. PE/FG cable (8sq 3m Both ends: with a φ6 ring-type soldering terminal): 1 pc. Instruction Manual: 1 pc. AC three phase line output cable (14sq (22sq for TF-6633P) 4-line 2m, One end: with stick-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc. PE cable (8sq 2m, One end: with a φ6 ring-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc.	

Noise Canceller Transformers NCT series

These series have excellent attenuation characteristics for impulse noises.
Used for line input insulation during impulse noise testing.

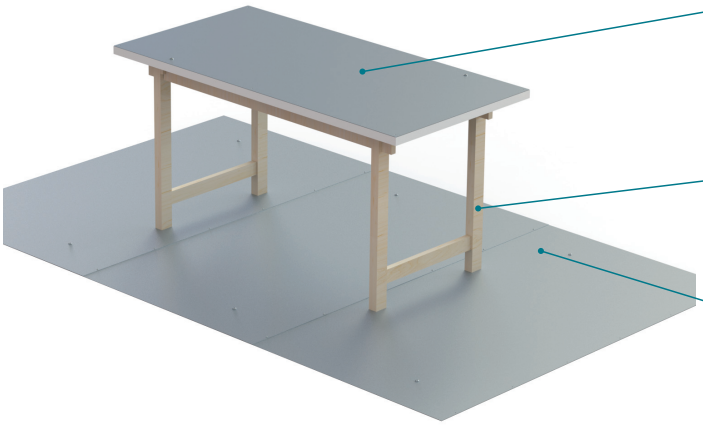
MODEL	Primary / Secondary Voltage	Rated current	Frequency
NCT-160	120V	5A	50/60Hz
NCT-1240		20A	
NCT-2240	240V	10A	

Line input cable MODEL：05-00160A Line output cable MODEL：05-00161A

The connection cable between noise impulse simulator and noise canceller transformer on primary winding.
Please inquiry us for details.

Description	MODEL	Specifications
Line input cable	05-00160A	Single phase 20A, 3m Cabtyre cable, Ring terminal end - Stripped end (termination at the customer`s side)
Line output cable	05-00161A	Single phase 20A, 2m Cabtyre cable, Ring terminal end - Ring terminal end

Options



Horizontal Coupling Plane (HCP) MODEL : 03-00020A

Metal plate placed on the table for the testing of tabletop EUT.
(W)1600 ×(D)800 × (t)1.5 mm × 1 sheet (made of Aluminum)
* Used as a horizontal coupling plane in ESD testing and also can be used as a ground plane

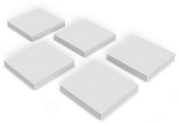
Test Table MODEL : 03-00039A

Wooden table to be used for the test to equipment (EUT) and devices under test (DUT).
(W)1600 × (H)800 × (D)800 mm

Ground Reference Plane (GRP) MODEL : 03-00007A

Ground plane to be placed under the wooden table.
(W)1800 × (D)1000 × (t)1.5 mm × 3 pcs. in 1 set (made of aluminum)

Insulating Block MODEL : 03-00054A



Blocks to float (isolate) wirings of EUT from GRP.
(W)300 × (D)300 × (H)50mm, 5 pcs. in 1 set

Material: Polyethylene foam

Insulating support MODEL : 03-00024A

Used for floating EUT 10cm above the ground plane in case of testing to floor-standing EUTs.

Size : (W)1200 × (D)1200 × (H)100mm
Material : Wooden
Withstanding load : 500kg

Cubic Insulating Block100 MODEL : 03-00029A

Used for floating EUT 10cm above the ground plane in case of testing to floor-standing EUTs.

Size : (W)100 × (D)100 × (H)100mm
Material : Wood
Withstanding load: 500kg
4 pcs per set

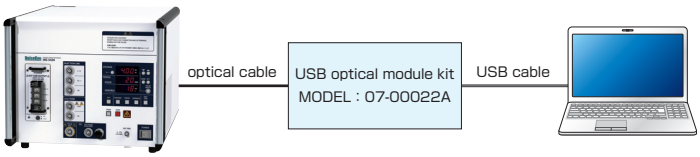
SG Cable MODEL : 05-00103A

Braided wire cable to connect between SG terminal of the main unit and the ground reference plane.

Length : 0.1m

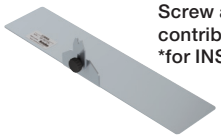
USB Optical Module Kit MODEL : 07-00022A

Connection adapter used for remotely controlling the simulator from a PC.
Equipped with USB-Optical conversion fiber optic cable (5m)



【PC control image of INS-S420 only】
Allows controlling the pulse output voltage, pulse width, phase angle and repetition period of the Simulator's main unit, however application phase and return phase switch control is not available.

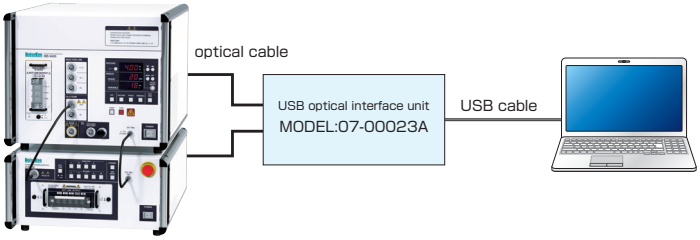
SG Connection Plate MODEL : 03-00112A



Metal plate connecting simulator's SG and ground plane.
Screw attaching to the Ground Plane is not required contributing to simulator's mobility.
*for INS-S220/S420

USB optical interface unit MODEL : 07-00023A

Connection adapter used for remotely controlling the simulator from a PC.Equipped with USB-Optical conversion fiber cables 5m x 4 (ch)



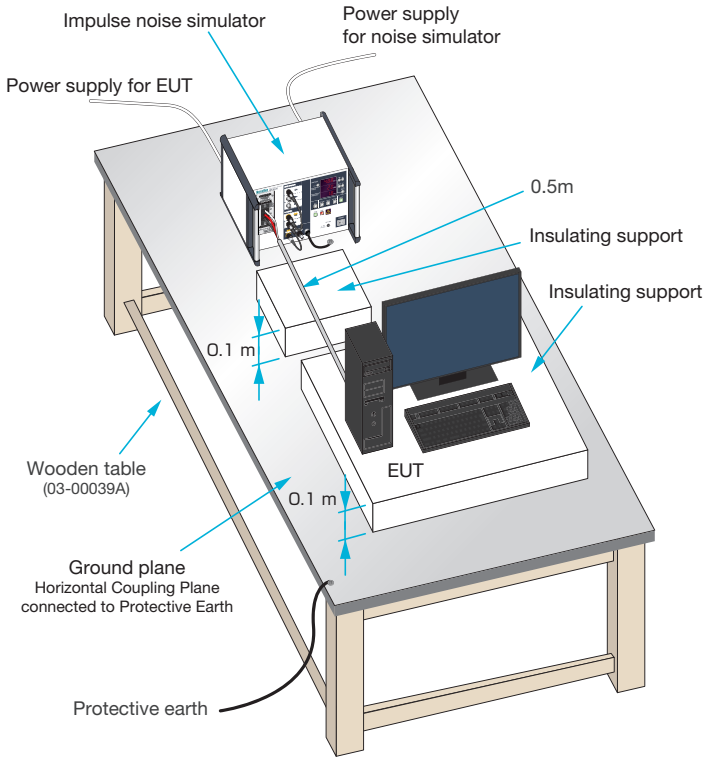
【PC control image of both INS-S420 and IJ-AT450】
Allows controlling the pulse output voltage, pulse width, phase angle and repetition period of the Simulator's main unit, and also application phase and return phase switching is available.

Impulse Noise Test Overview

(Square Wave) Impulse Noise Test Method

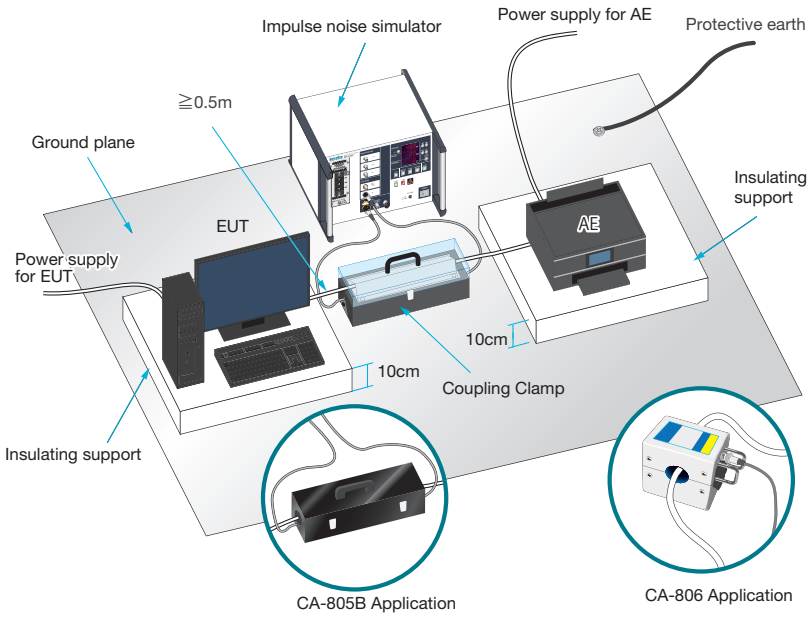
Power supply lines test method

① Connect the power supply line for EUT to EUT LINE INPUT on the simulator main unit (hereafter referred to as the Main Unit) through an isolation transformer.
② Lay a ground plane and insulation sheet under the main unit and the EUT, and ground the ground plane for safety.
③ Connect the power supply cable of EUT to the main unit (fold and bind the cable to shorten it if too long)
④ In the common mode test, connect the SG short plug, and connect the SG terminal of the main unit and the ground plane as well as the FG terminal of the EUT (if there is a terminal) and the ground plane with a short and reliable braided wire with low impedance for high frequencies.
⑤ Connect 50Ω TERM OUT connector to connector of phase (L1 or L2, PE if necessary) the noise is intended to be injected with coaxial cable.



Interconnection lines test method

① Lay a ground plane and insulation sheet under the main unit and the EUT, and ground the ground plane for safety.
② Open the coupling adaptor 15-00014A (option) and clamp interface cable with the adaptor. Connect co-nector of the adaptor to PULSE OUT of the main unit. Connect the other connector of the adaptor to 50Ω TERM IN of the main unit.
③ Connect power supply cable of EUT to any power source since no high voltage pulse is injected in this test.
④ Connect the Main Unit's SG terminal and FG terminal of EUT to the ground plane.



Impulse Noise Test Overview

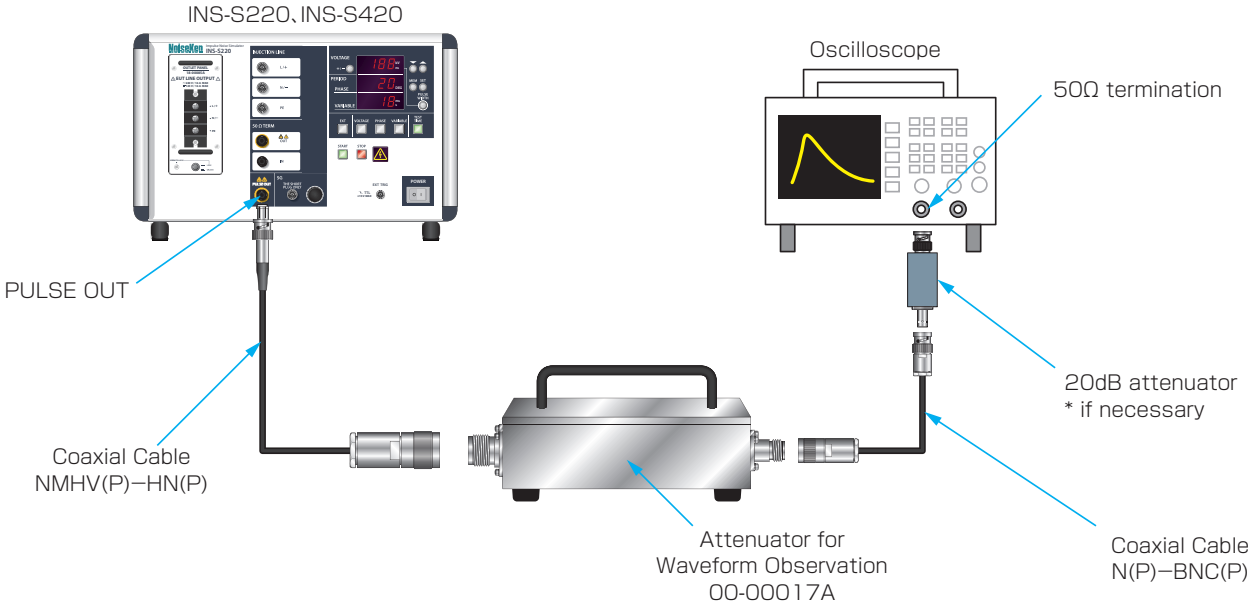
Waveform Observation

Waveform observation using the 00-00017A attenuator for waveform observation.

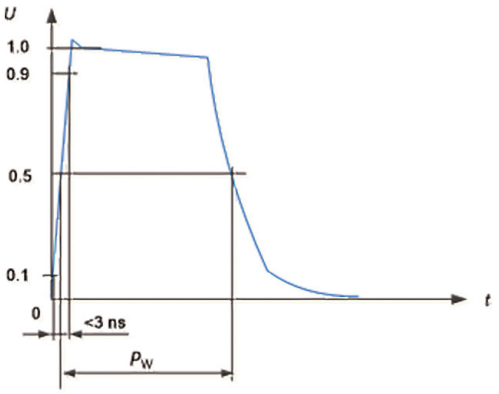
① Connect the PULSE OUT of the Main Unit and the input connector of the 00-00017A waveform observation attenuator with the (HN(P)-NMHV(P)) coaxial cable included with the 00-00017A waveform observation attenuator. Connect the output connector of 00-00017A and the included coaxial cable (N(P)-BNCP)) to the input of the oscilloscope. If necessary, insert an attenuator between them.
② The output impedance of 00-00017A is 50Ω, so set the oscilloscope input to 50Ω termination.
③ Start the Main Unit.

-Reference- The reason to use an attenuator if necessary

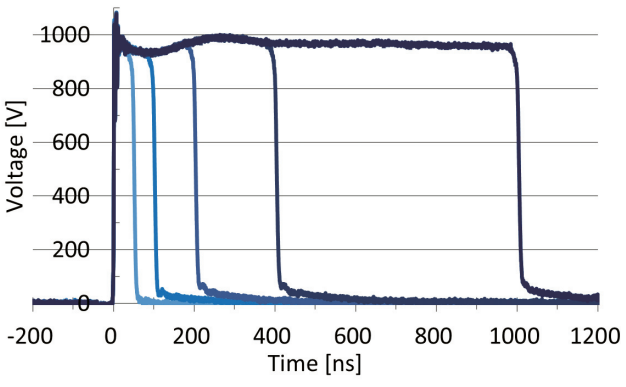
The impedance of the Main Unit is 50Ω. Since the load resistance of 00-00017A is also 50Ω, if the voltage is set to 4,000V, then 4000V × (50Ω/50Ω+50Ω) = 2000V output can be confirmed, and the attenuated by 00-00017A voltage of 20V is input to the oscilloscope. Some oscilloscopes cannot accept 20V input when measuring with 50Ω termination, so it is necessary to insert a 20dB attenuator for further attenuation. (In this case, the input is 20V → 2V due to the attenuation ratio of 10:1)



Output waveform image



Output waveform (rise time and PW specification)



Output waveform（50ns、100ns、200ns、400ns、1000ns）

Fast transient / burst simulator

FNS-AX4-A20/B63

It is compact and equipped with new functions to make EMC testing easier

It is a tester that evaluates the resistance of electronic devices by simulating high-frequency noise that rises quickly due to discharge between contacts of switching devices and arc discharge generated from electronic motors.

- IEC 61000-4-4 Ed.3 standard compliance.
- Pre-check function equipped, making inspection before testing easier.
- Normal mode test support for testing for real field troubles. (option)
- Utilize an outlet box that simplifies EUT connection. (option)
- Compared with conventional products, the size has become compact. (Approximately 67% by volume)
- Easy to understand Panel display reduces mistakes in connecting power cables.
- Windows compatible software control. (option)
- Next calibration date notification. (Windows software only)
- LCD screen with multi-language support and enhanced operability.
- Maximum output voltage of 5 kV and maximum pulse frequency of 2 MHz allowing to test above the standard test level.
- CDN capacity is increased to single phase type AC 240 V 20 A, single and three phase type to AC 600 V 63 A, supporting a wider range of EUTs.
- Large capacity CDN (100 A or 150 A) option available for Injection test on various EUTs.
- Using coupling clamps and EMS probe kit allows to test signal lines and evaluate noise immunity on PCBs. (option)

Specifications

■ Generator specifications

Parameter	Specification / Function
Output voltage	200 to 5000 V 10 V Step
Polarity	Positive or negative, polarity alternation possible per burst
Repetition frequency	0.1 kHz to 2000 kHz 0.1 kHz to 1 kHz / 0.01 kHz step Tolerance ± 5%, 1.0 kHz to 10 kHz / 0.1 kHz step Tolerance ± 5% 10 kHz to 100 kHz / 1 kHz step Tolerance ± 5%, 100 kHz to 1000 kHz / 10 kHz step Tolerance ± 5% 1000 kHz to 2000 kHz / 100 kHz step Tolerance ± 10%, (Limitation per voltage levels when continuous output)
Number of pulses	1 to 1000 at a step of 1 pulse , Setting limit: 1 pulse per ms in a burst (repetition frequency 1 kHz or more)
Burst duration	Formula for Burst duration = Pulse number / Repetition Frequency Scope of manually setting value for burst duration: 0.01 to 999 ms
Burst period	10 to 1000ms ± 10% 10ms steps (500ms or more for polarity alternate mode)
Polarity alternate function	Output polarity alternated between positive and negative at each burst period Setting condition: the burst period is 500ms or more and the burst pause period [(burst period) - (burst duration)] is 100ms or more Maximum test time: 10 minutes
Continuous Pulse output	Up to 1000 V -10 kHz or less, to 2000 V -4 kHz or less, to 5000 V -1 kHz or less. Maximum test time for each case: 10 min
Frequency modulation	Frequency is shifted continuously between set frequency and approximately -10% from the set frequency. The modulating wave is triangular wave of approximately 20Hz
External trigger	External trigger input invokes 1 burst output in synchronization with the trigger input. Trigger specification: Hi (+ 5V) → Lo (0 V) triggers one burst period.
Pulse waveform (at 50 Ω load)	Pulse peak voltage: (set voltage / 2) ± 10% Rise time: 5 ns ± 30% Pulse width: 50 ns ± 30%
Pulse waveform (at 1 kΩ load)	Pulse peak voltage: (set voltage × 0.95) ± 20% Rise time: 5 ns ± 30% Pulse width: 35 to 150 ns
DC blocking capacitor	10nF ± 20%

■ CDN specifications

Parameter	Specification / Function
Power capacity	A 20 model: single phase AC 240 V / 20 A, DC 125 V / 20 A (10 A for PE) B 63 model: three-phase AC 600 V / 63 A, DC 125 V / 63 A (10 A for N / PE)
Applied phase	A20 model: L / N / PE B63 model: L1 / L2 / L3 / N / PE Single line or all lines can be specified individually for each phase
Injection mode	Common mode (Normal mode available using option)
EUT Line input/output	φ6 mm safety socket
Coupling capacitor	33 nF
Output waveform specification	Pulse peak voltage: (set voltage) / 2 ± 10% Rise time: 5.5 ns ± 1.5 ns Pulse width: 45 ns ± 15 ns Set voltage ± 4000 V, frequency specified from 5 kHz to 100 kHz
Input residual voltage	10% or less of setting pulse voltage EUT line input is 50 Ω termination, line output is defined as open
AC Line Sync	Synchronous and asynchronous setting available. Setting phase angle: 0 to 360 ° ± 10 ° 1 ° Step Synchronizable voltage: AC 85 V to rated voltage Reference phase: between L-N (A20 model), L1-L2 (B63 model)

■ Other specifications

Parameter	Specification / Function
Emergency stop	Push lock type switch (Test stop, EUT line OFF)
EUT FAIL function	FAIL signal from external (Hi → Lo) detected during test FAIL signal specifications VLO: 0 V, VHI: + 5 V Choose operation from test stop / pause when triggered 3 channels available for the FAIL input
External interface	REMOTE (For external PC control), CDN I/F (For external CDN), INDICATOR (For Warning Lamp or indicator lamp) EUT FAIL INPUT (For temporary pause at EUT failure event)
Accessories	Power Cable, SG Cable, Line Input Cable, Output Cable, Waveform Check Connector, Coaxial Cable, Operation Manual, Accessories bag
Operating environment	Temperature 15 to 35 °C Relative humidity 25 to 75%
External Dimensions / Weight	(W)430 × (H)199 × (D)370 mm (excluding protrusions) / Approximately 14 kg (A20 model) and 22 kg (B63 model)
Power supply	AC 100 to 240 V ± 10% 50/60 Hz approx. 120 VA

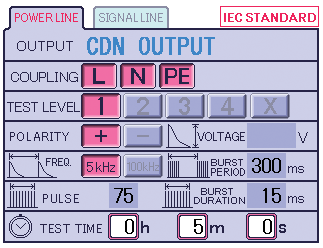
FNS-AX4-A20/B63

Operation Screen

Operation Screen

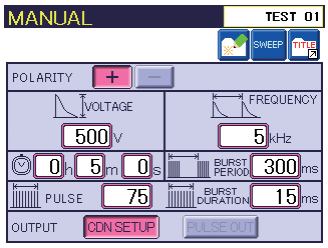
In each test mode screen, you can simply push button on/off and simply enter numerical parameters with the numeric keypad. In addition, all test conditions can be set within 1 to 2 screens.

STANDARD mode



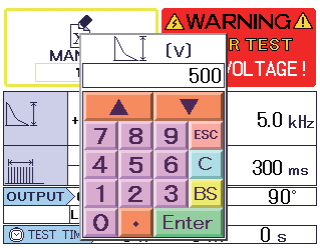
The test conditions defined in IEC 61000-4-4 are pre-set. When injected on the power supply, test pulse frequencies are 5 kHz or 100 kHz and voltage selections are 0.5 kV, 1.0 kV, 2.0 kV, 4.0 kV.

MANUAL mode



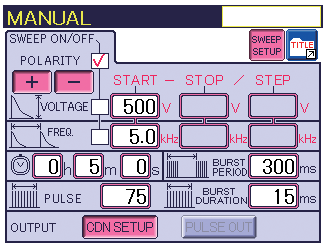
In the MANUAL mode, detailed test conditions can be set. The pictograms are shown to intuitively understand the setting of the test conditions. From this screen you can switch to the setting screen for conducting the sweep test.

MANUAL mode (Test condition setting)



Polarity and injection phase setting can be easily set by turning the button on/off. Numerical parameters, such as test voltage, etc. can be entered with numeric keypad which appears when necessary for easy number entering.

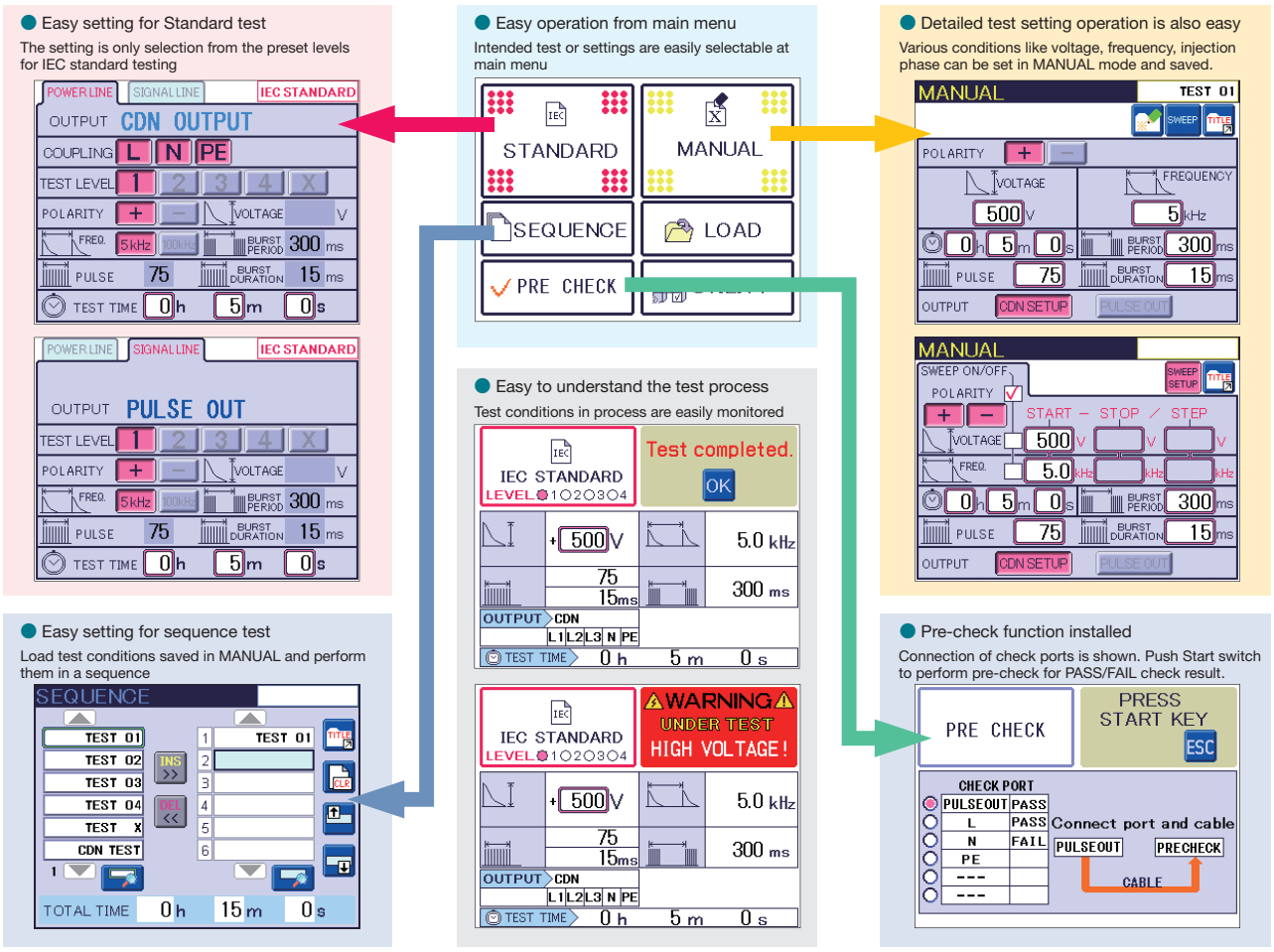
MANUAL mode (sweep test setting)



It is a test mode in which the condition of output voltage and repetition frequency change can be set to be executed automatically. In the setting example, shows burst voltage change in 100V step from 500V to 1000V. A convenient function for judging the malfunction point of EUT by setting the condition change of output voltage, repetition frequency, polarity, power injection phase, injection phase angle.

Screen Configuration

Set either "STANDARD" or "MANUAL" from the menu screen, and make various settings such as test voltage, polarity, frequency, injection phase and so on. "MANUAL" also allows you to set the sweep mode injection. You can save up to 30 test conditions. In "SEQUENCE", you can load the test conditions set in "MANUAL" and combine the test conditions of maximum 18 steps, and create up to 15 programs. You can also pre-check before starting test.

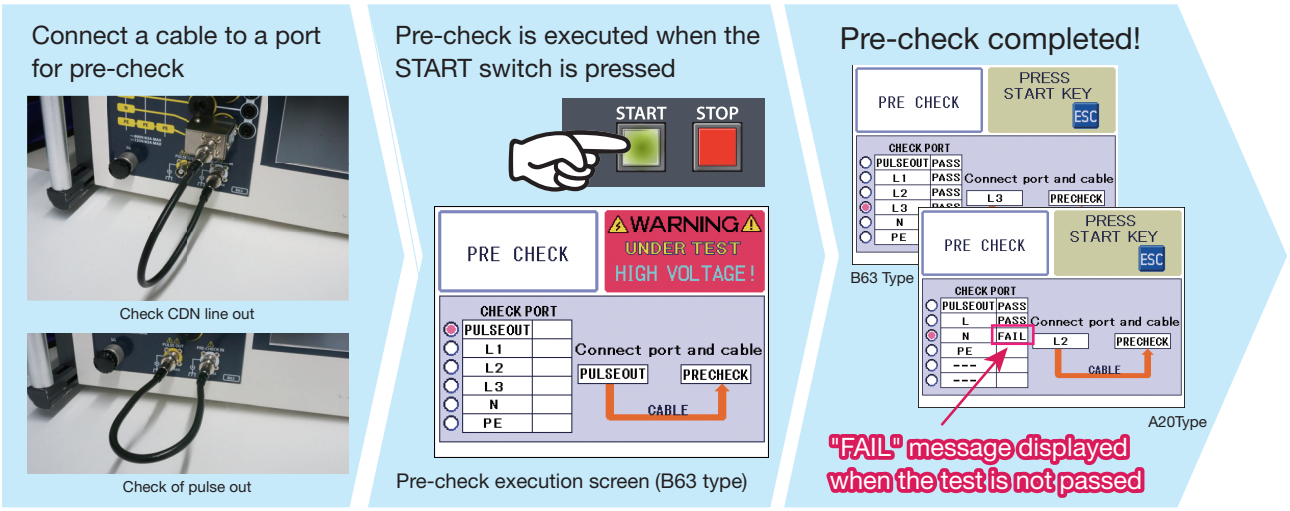


FNS-AX4-A20/B63

Features

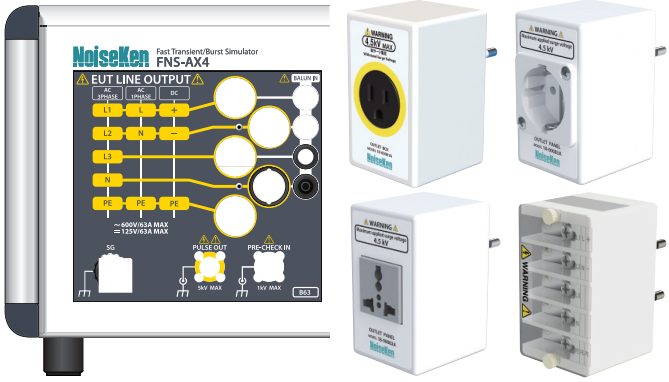
Easy to perform pre-test inspection with pre-check function

Built-in monitor circuit for pre-check in the tester body. By simply connecting the waveform observation connector and the attached coaxial cable to the CDN OUT or PULSE OUT of the tester, you can easily check whether the pulse is output normally. You can easily perform pre-start inspection without using a dedicated attenuator or oscilloscope.
* Note: this is not a calibration of the tester.



Simple and Easy EUT power line connection Injection phase indicator on front panel

In order to prevent mistakes in the connection of the power cable during the test, front panel shows the connection destination at a glance. Also an outlet box (option) is available for the simple power connection.

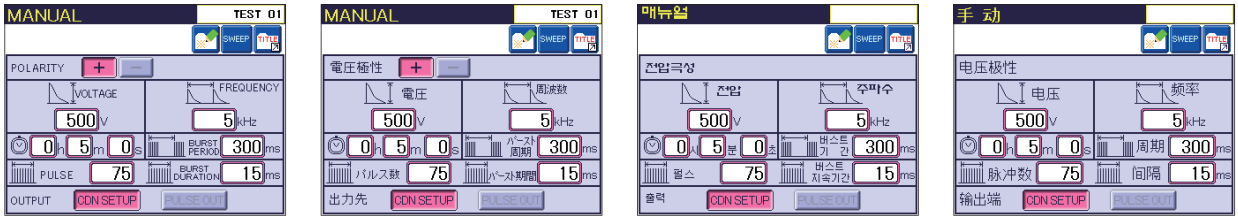


Coupling Balun available for normal mode test

IEC 61000-4-4 standard has the provision of the common mode test only, but noise may enter the equipment in the normal mode in the field and malfunction may occur. ANSI C37.90.1 standard specifies for corresponding normal mode noise testing. FNS-AX4 can now perform the normal mode test complying with ANSI C 37.90.1 standard with an optional dedicated normal mode coupling balun.

Easy to understand "multi-language" test settings

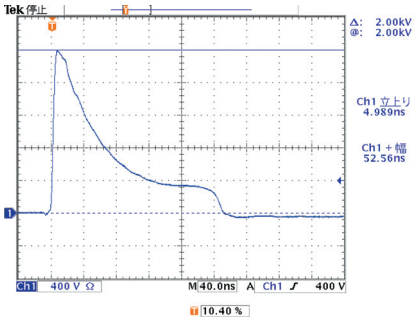
Operation settings are available in English and Japanese languages.
*English/Chinese, English/Korean languages available for Custom Models per User's request.



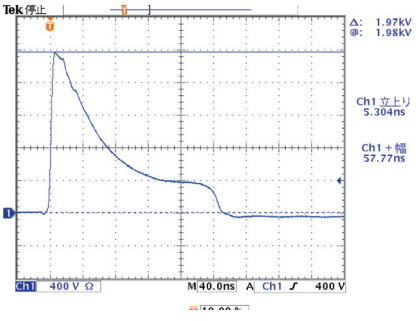
FNS-AX4-A20/B63

OUTPUT Waveform

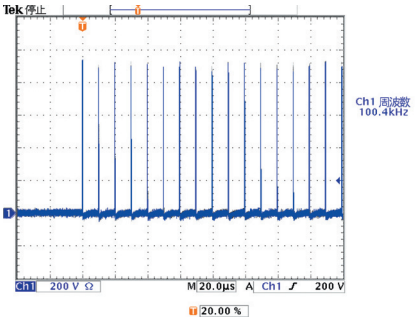
PULSE OUT connector waveform: 50 Ω



EUT LINE OUTPUT waveform :1k Ω

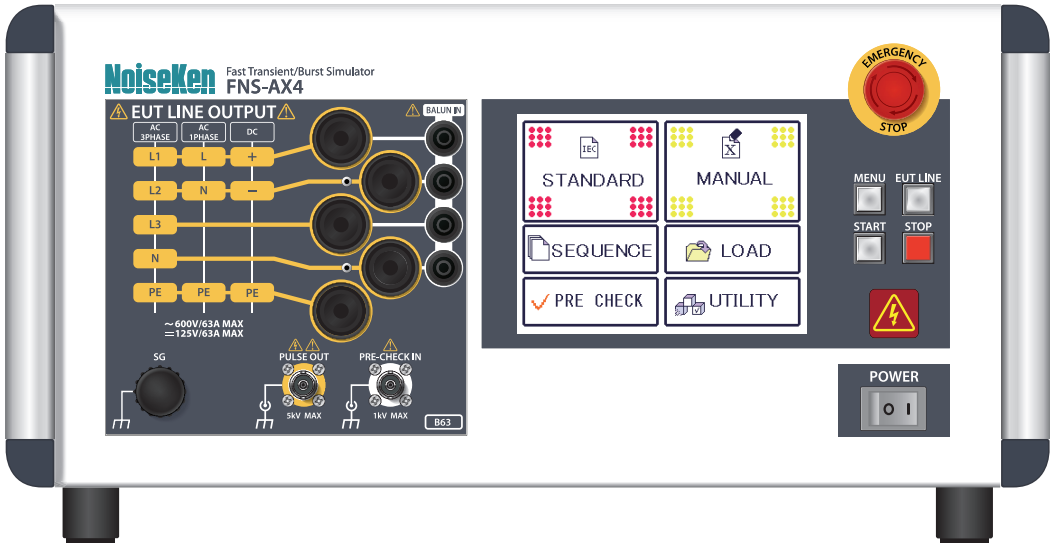


Repetitive pulses output as burst

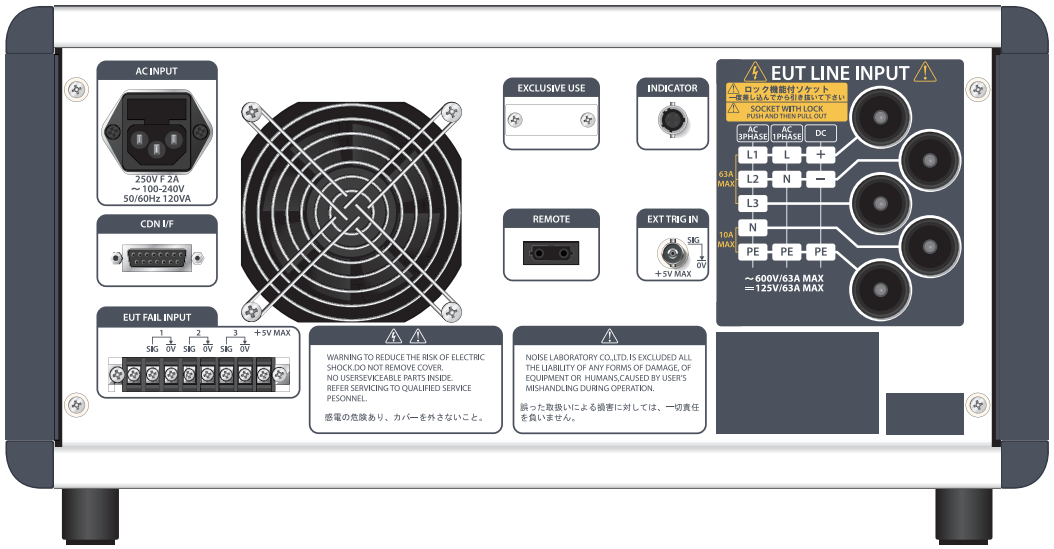


Front Panel / Rear Panel

Front Panel



Rear Panel



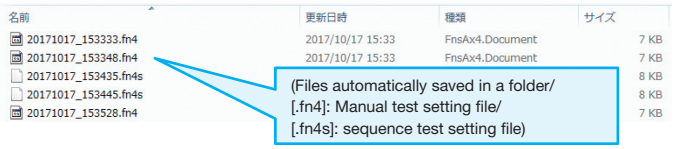
FNS-AX4-A20/B63

Windows software

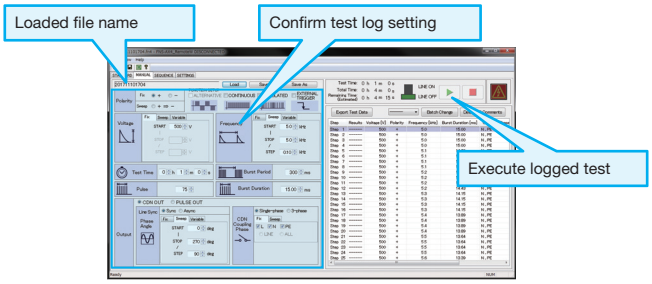
Remote control from Windows PC is possible using optional Optical USB module (MODEL：07-00022A). Windows software is available for customer environment for setting test conditions, saving test results, recording test logs, report generation, etc.

Test Log

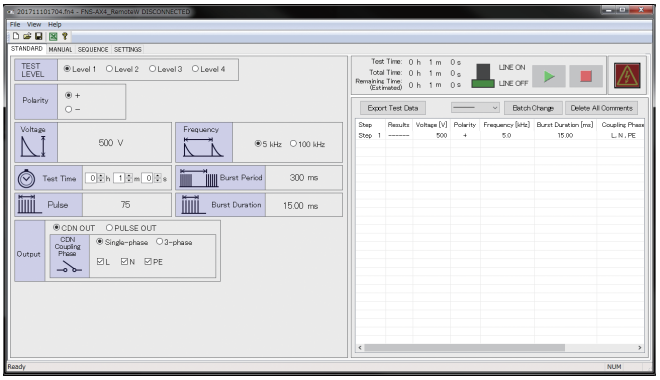
Manual Test/ Sequential test will create test log and setting file and saved automatically. Setting file is named automatically from the tested year/month/date/time.



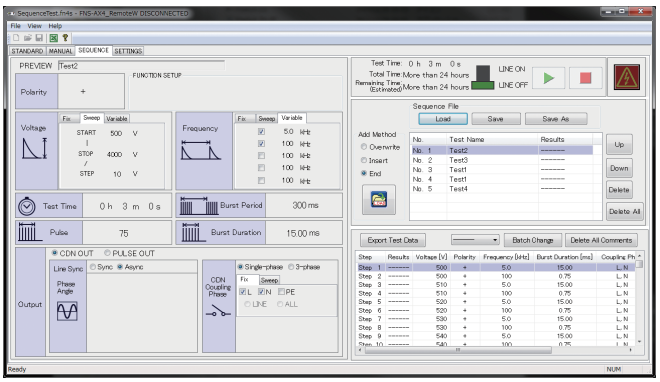
With software setting, you can enable or disable test log saving and also set folder location of the setting files saved. You can load the testing condition saved in the test log to re-test with the previously saved condition.



Standard mode test screen (For IEC standard testing)

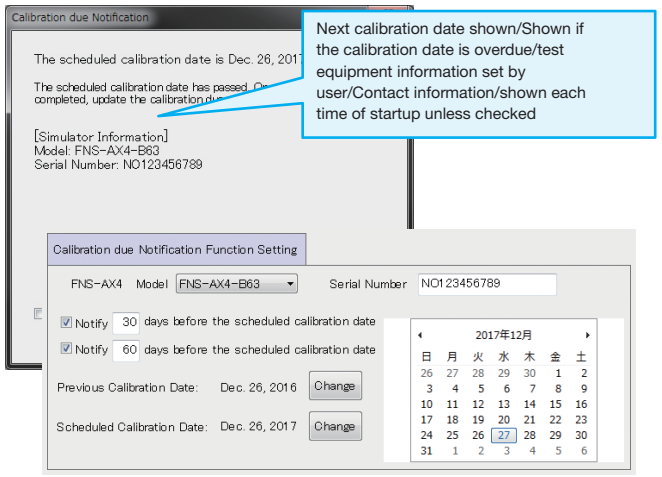


Sequence mode test screen (For sequence test)

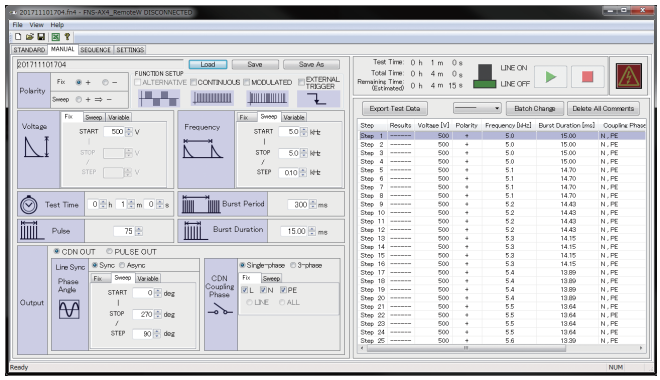


Next calibration date notification

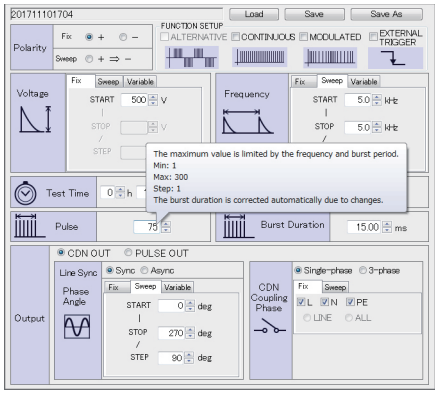
Following notification will be shown when the date set as notified date comes. It is simply set by the pop-up calendar.



Manual mode test screen (For Manual setting)



In Manual mode, a balloon shows up to indicate setting limitation by just placing mouse pointer. Balloon display can be enabled or disabled.



Options

Coupling Clamp MODEL: 15-00018A

Clamp calibration fixture (15-00010A)

Coupling clamp for capacitive coupling test on interconnection lines complying to IEC61000-4-4 Ed.3. In addition, calibration fixture for coupling clamp is available.

- ○ Size: W1110 × D210 × H189 mm (protrusions excluded)
- ○ Visibility of the tested cable is improved by the transparent plastic upper lid
- ○ Clamp bar allows you to easily fix coupling plate to signal or control lines

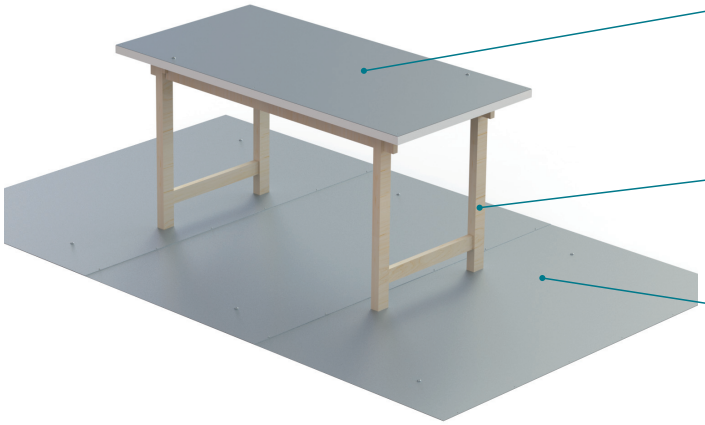
OUTLET BOX

OUTLET BOX converts LINE output socket.

18-00081A	Outlet box 125 V 15 A 2P+PE	Btype (3Ptype、JP/USAtype) AC 125 V 15 A MAX
18-00082A	multi-outlet box	Japan (JIS), America (UL), Canada (CSA), Australia (CSA), Swiss (SEV), Italy (CEI), Europe (CEE, DIN), England (BS) Input up to 4.55 kV
18-00083A	Outlet box	Europe CEE DIN 250 V 16 A MAX
18-T2300	3P terminal block conversion box	3P terminal block M6 with protective cover & Input up to 5 kV. * This is a custom product. Please contact us for details.
18-N2494	5P terminal block conversion box	5P terminal block M6 with protective cover & Input up to 5 kV. * This is a custom product. Please contact us for details.

Normal mode coupling balun Model: 15-00013A

The product allows injection of test voltage on EUT with Normal mode. 5 kV Max.



Horizontal Coupling Plane (HCP) MODEL : 03-00020A

Metal plate plane on the table for the testing of tabletop EUT.
W1600 × D800 × t1.5 mm × 1 sheet (Made of Aluminum)
* Used as a horizontal coupling plane in ESD testing and also can be used as a ground plane

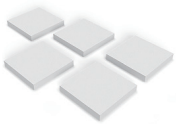
Test Table MODEL : 03-00039A

Wooden table to be used for the test to devices under test (DUT).
W1600 × H800 × D800 mm

Ground Reference Plane (GRP) MODEL : 03-00007A

Ground plane to be placed just under the wooden table.
W1800 × D1000 × t1.5 mm × 3 pcs. in 1 set (Made of aluminum)

Insulating block MODEL：03-00054A



Keep the EUT and its wirings afloat above the ground plane
Size: W300 × D300 × H50 mm
Material: foamed polyethylene
5 pcs per set

Insulating support MODEL：03-00024A

Keep the EUT and its wirings 10cm afloat above the ground plane
Size: W1200 × D1200 × H100 mm
Material: Wood
Withstanding load: 500 kg

Cubic insulator block MODEL：03-00029A

Keep the EUT and its wirings 10cm afloat above the ground plane
Size: W100 × D100 × H100 mm
Material: Wood
Withstanding load: 500kg
4 pcs per set

SG cable MODEL：05-00103A

Braided wire cable to connect between SG terminal of the main unit and the ground reference plane.
Length: 0.1 m

Options

Warning Lamp　MODEL：11-00008B

Alarm lamp for FNS-AX4 series. Alarm lamp illuminated when high voltage is generated at the time of test.

※ The model number of this model will change to MODEL: 11-00017A as soon as current stock runs out, due to the discontinuation of production of the connector used.

Tri-color pilot light　MODEL：11-00016A

The light is for FNS-AX4 series. Three colors indicate corresponding simulator's test status change.

Attenuator for waveform check　MODEL：00-00017A

Attenuator for measuring high voltage pulse.

Parameter	Specification
Attenuation rate	DC ～ 2 GHz：40 dB (100：1)
Input pulse peak voltage	4000 V MAX
Tolerable continuous pulse examples	Repetition Frequency：≦ 5 kHz Burst duration：≦ 15ms Burst period：≧ 300ms, (Assuming IEC 61000-4-4 pulse waves)
Input impedance	50 Ω　(50 Ω ± 1% at DC)
Output impedance	50 Ω　(50Ω ± 1% at DC)
Interface connectors	INPUT：HN (F)　OUTPUT：N (F)
Dimensions/ Weight	(W)154.5 mm × (D)105 mm × (H)37 mm approx. 1350 g

Attenuator for waveform check　MODEL：00-00018A

Attenuator for measuring high voltage pulse.

Parameter	Specification
Attenuation ratio	DC ～ 400 MHz：60 dB (1000：1)
Input pulse peak voltage	5000 V MAX
Tolerable continuous pulse examples	Repetition frequency：≦ 5 kHz Burst duration：≦ 15ms Burst period：≧ 300ms, (Assuming IEC 61000-4-4 pulse waves)
Input impedance	1000 Ω ± 2%
Output impedance	50 Ω (± 2% at DC ～ 400 MHz)
Interface connectors	INPUT：NMHV (F)　OUTPUT：N (F)
Dimensions / Weight	(W)133 mm × (D)25.4 mm × (H)25.4 mm approx. 150 g

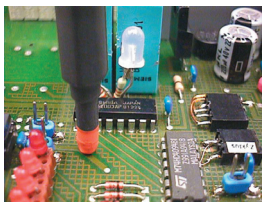
USB Optical Module Kit MODEL：07-00022A

Conversion adapter to interface with PC for the remote control of FNS
USB to optical interface. Fiber cable 5m included.

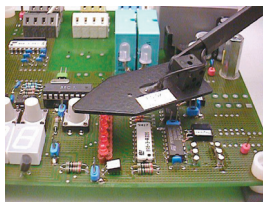
EMS Probe Kit　MODEL : H2-B

Probes for noise injection onto PCB patterns and flat cables using the Impulse Noise Simulator.
By choosing different probes, it is possible to separate the electric field/magnetic field and perform near field irradiation.
* Max. pulse voltage: 1kV, max. pulse width: 50ns, fastest repetition period: 10 ms)

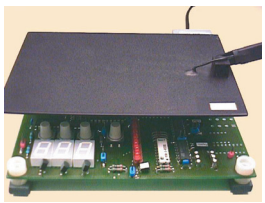
- ○ Noise can be applied to any part of a PCB or harness.
- ○ Allows to detect noise immunity weak points by separating and combining use of electric/magnetic field probes.
- ○ A set of 3 electric field probes and 3 magnetic field probes with different shapes and sizes.
- ○ Noise can be applied in the range of several millimeters, allowing to easily identify weak points.
- ○ Allows to identify weak points for specific frequencies by using a signal generator as a wave source.
- ○ Suited for locating noise sensitive spots by using with the INS or FNS equipment



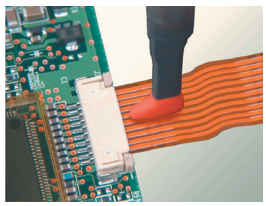
BS05DB



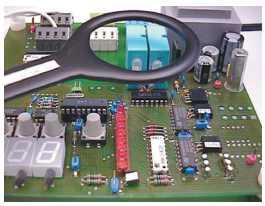
ES02



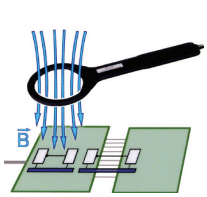
ES00



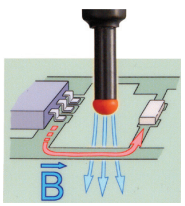
ES05D



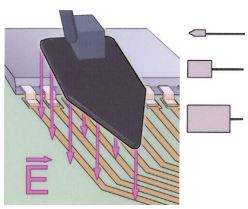
BS02



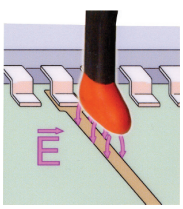
BS02



BS04DB
BS05DB



ES02
ES00



ES05D

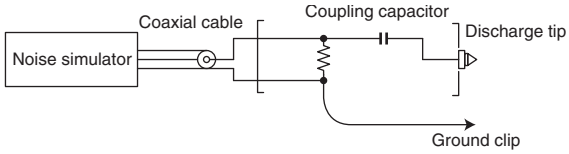
Options

Noise Injection Probe MODEL : 01-00034A

A probe for injecting noise directly into the pattern and parts of the printed circuit board.
*Input pulse repetition period: 10 ms or more

- ○ Noise immunity can be tested at the board level because noise can be injected directly into each pin of the LSI.
- ○ Up to 500V noise injection is possible utilizing INS or FNS simulator.
- ○ Possible to exchange the coupling capacitor (Option)
- ○ 50 ohm termination resistor built-in

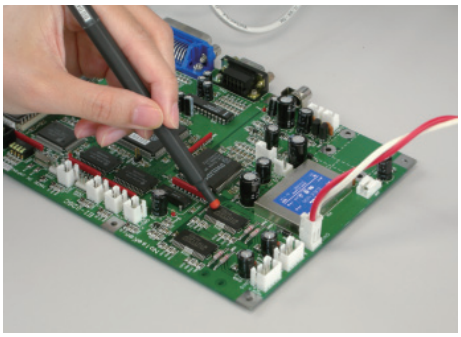
[Options]
Coupling capacitors: 06-00039A 220pF. 06-00040A 330pF. 06-00041A 3pF. 06-00042A 500pF.
* 01-00034A does not include the coupling capacitors



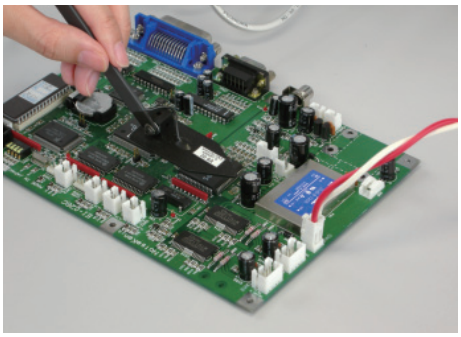
Radiation Probes MODEL : 01-00006A / 7A / 8A / 9A / 10A / 31A / 50A

These probes, in combination with Impulse Noise Simulator allow to emit electromagnetic field radiation noise to the wiring of PCB inside electronic equipment, and is used to search for areas vulnerable to radiation noise.

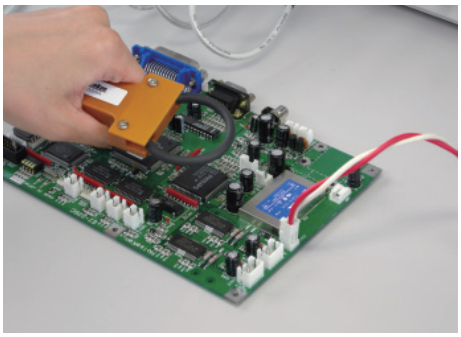
Parameter	Specifications
Input voltage	4000V Max
Input pulse width	50~1000ns (1μs)
Loop diameter	01-00006A : φ50mm, 01-00007A : φ75mm, 01-00008A : φ100mm, 01-00009A : φ150mm, 01-00010A : φ200mm, 01-00031A : 250mm, 01-00050A : 30mm
Cable length	Approx.2m
Weight	Approx.180g~220g
Termination Resistance	N/A



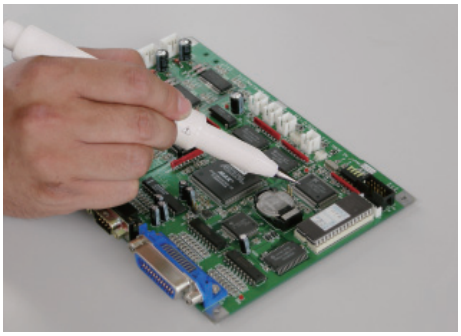
H2-B



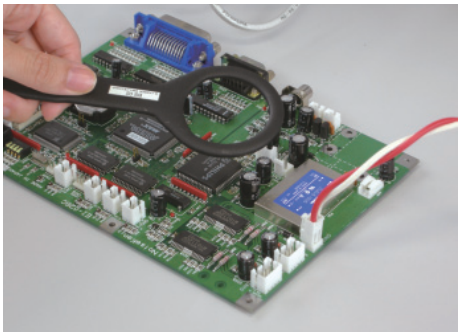
H2-B



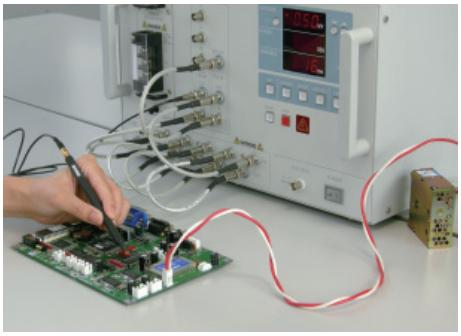
Radiation probe



Noise injection probe



H2-B



H2-B

Options

Coupling Adaptor MODEL: CA-805B

CA-805B makes testing for noise tolerance possible by just clamping interconnection cable of electrical equipment in combination with FNS series.

- ○ Inject noise without cutting cables
- ○ Able to test individual noise tolerance of electrical equipment
- ○ Able to clamp bundle lines up to 26 mm max diameter

Parameter	Specification
Input voltage	4000 V Max
Dimensions	(W) 350 × (H) 120 × (D) 130 mm
Clamp interim	26mm
Weight	approx. 3 kg

Coupling Adaptor MODEL: 15-00007A (CA-806)

15-00007A (CA-806) makes testing for noise tolerance possible by just clamping interconnection cable of electrical equipment in combination with FNS series.

- ○ Inject noise without cutting cables
- ○ Able to test individual noise tolerance of electrical equipment
- ○ Able to clamp bundle lines up to 27 mm max diameter

Parameter Structure	Specification
Input voltage	2000 V Max.
Coupling ratio	1/10 of input voltage ± 10%
Termination resistance	50 Ω system built-in
Max. diameter of cable clamped	27 mm
Dimensions	(W) 89 × (H) 64 × (D) 120 mm (protrusion excluded)
Weight	approx. 1000 g

Clamp Model	Coupling method	Maximum Input voltage	Coupling ratio	Interim diameter of clamp
CA-805B	Capacitive (Electrostatic)	±4000 V	1:1	26 mm
CA-806	Inductive (Magnetic)	±2000 V	10:1	27 mm

High power Coupling Decoupling Network

High power Coupling Decoupling Network (CDN) can be provided for customers' requirements. Please consult with us for details.

Coupling Fixture for High Frequency Surge Test

Coupling fixture provided to inject noise to harness in combination with Fast Transient Burst simulator.
The varieties of coupling capacity are lined up. Please contact us for details.

Fast transient / burst simulator

CDN Unit (DC 600V 200A)

This equipment can be combined with the Fast transient/Burst Simulator's main unit to perform noise superimposition tests on 3 wires (+ / - / PE) up to DC600V/200A.
In combination with the FNS-AX4 Simulator main unit, tests can be performed by setting the applied phase switching and applied phase sweep.
Allows to evaluate burst noise immunity during charging of EV/PHV vehicles, which is required by ECE R10-05/05. (EV Fast Charging applicable)

Target models: FNS-AX4 series

* For using this CDN unit, modification of the Simulator's main body is required. Please contact us for details.

※ This product is a custom product. Please contact us for details.

Customization up to DC1000V is available.

Specifications

Parameter	Specification
Maximum pulse applied voltage	4500V
Number of power lines	3 phase（+ / - / PE）
Power supply capacity	DC 600V 50 ／ 60Hz 200A max
Coupling mode	common mode
Applied Phase	Single line, all lines, each phase can be set individually
Coupling capacitor	33nF
CDN power supply	AC 100 ～ 240V ± 10% 50/60Hz
Dimensions / Weight	(W)555 mm × (D)790 mm × (H)1250mm（excluding protrusions） ／ approx.150kg

IEC61000-4-4 Ed.3 Test Standard Overview

1. General

The Test Standard for evaluating immunity of electric / electronic equipment when they are interfered by fast transient repetitive bursts which are generated by break of inductive load equipment or bounds of relay contact point.

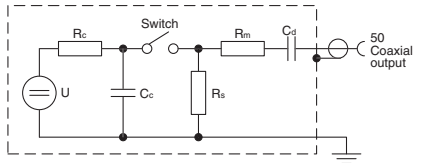
2. Test Levels

Open circuit output test voltage and repetition rate of the impulses

	On power port, PE		On I/O (input/output) signal, data and control ports	
Level	Voltage peak (kV)	Repetition rate (kHz)	Voltage peak (kV)	Repetition rate (kHz)
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X	Special	Special	Special	Special

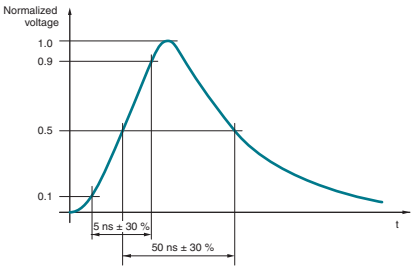
3. Burst Generator and Waveform Verification

Circuit diagram of a fast transient/burst generator

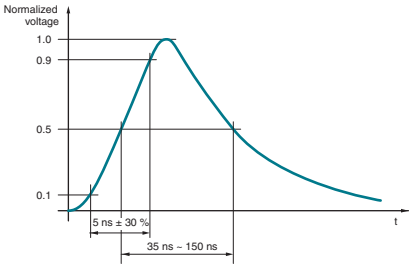


U High-voltage source
Rc Charging resistor
Cc Energy storage capacitor
Rs Impulse duration shaping resistor
Rm Impedance matching resistor Cd
DC-blocking capacitor

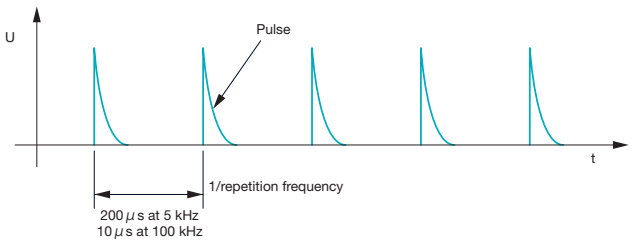
Waveshape of a single pulse into a 50 Ω load

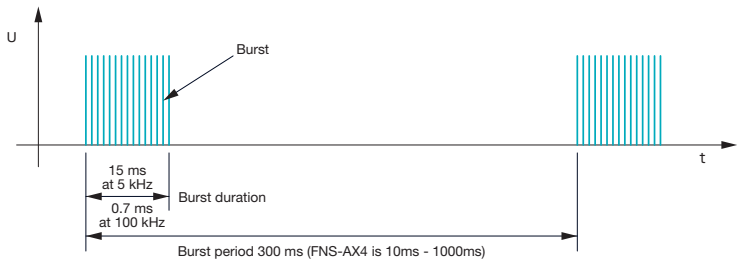


Waveshape of a single pulse into a 1 kΩ load

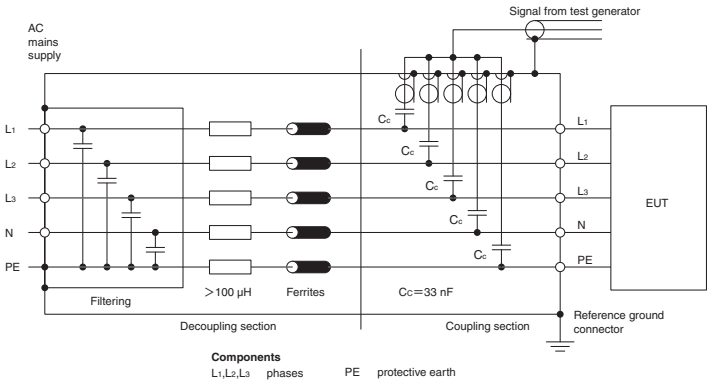


Pulse waveshape into a 50Ω load and general graph of a fast transient/burst



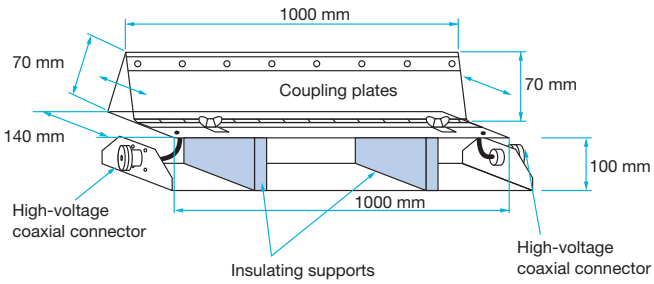


CDN for AC/DC power mains supply ports/terminals FNS-AX4 allows injection to All Phases and to an arbitrary phase



Components
L1,L2,L3 phases
N neutral
PE protective earth
Cc coupling capacitor

Structure and dimensions of Capacitive coupling clamp for signal and control lines



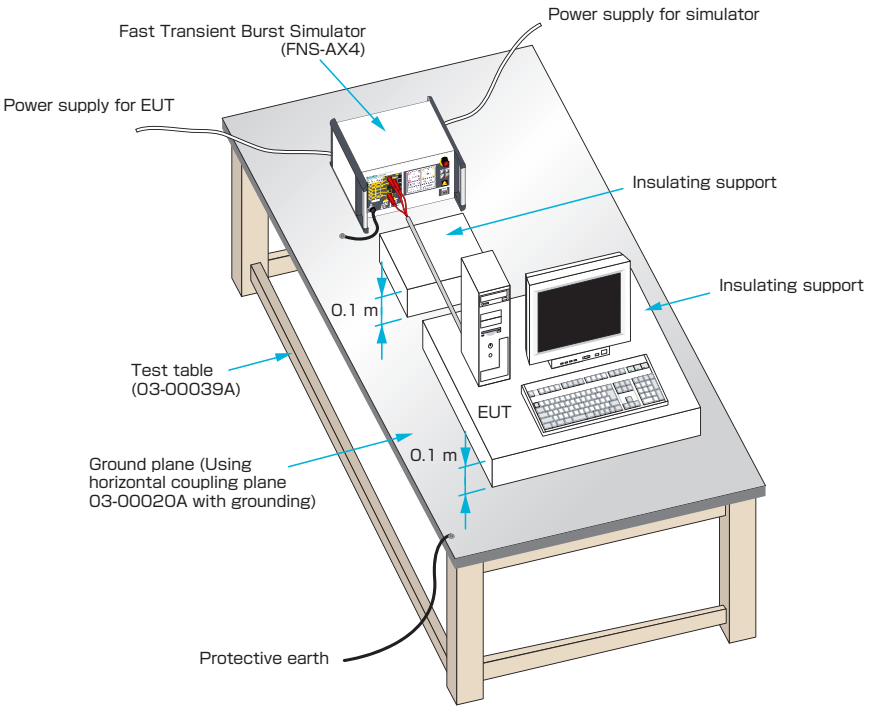
IEC61000-4-4 Ed.3 Test Standard Overview

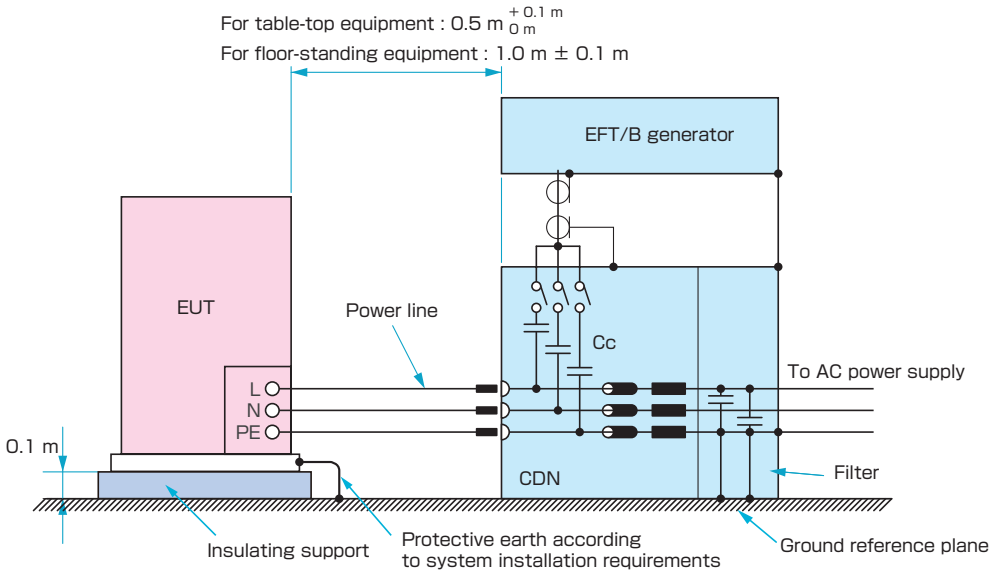
4. Test Setup

Test Method to Power Supply Lines

① Put the simulator onto ground reference plane which is connected to the protective ground and connect SG terminal on the front panel to the ground reference plane.
② Place an insulating support (10cm thick) onto the ground reference plane and put EUT on the support (so that the EUT can be isolated from the ground reference plane).
③ Connect LINE OUTPUT on the front panel of the simulator to EUT with a cable (keep distance of 50 cm for Table-Top EUT, and 1m for Floor-Standing EUT) and start operation of EUT.
④ Set the required test conditions (like the burst voltage, etc.) and start the test.

In case of table top EUT

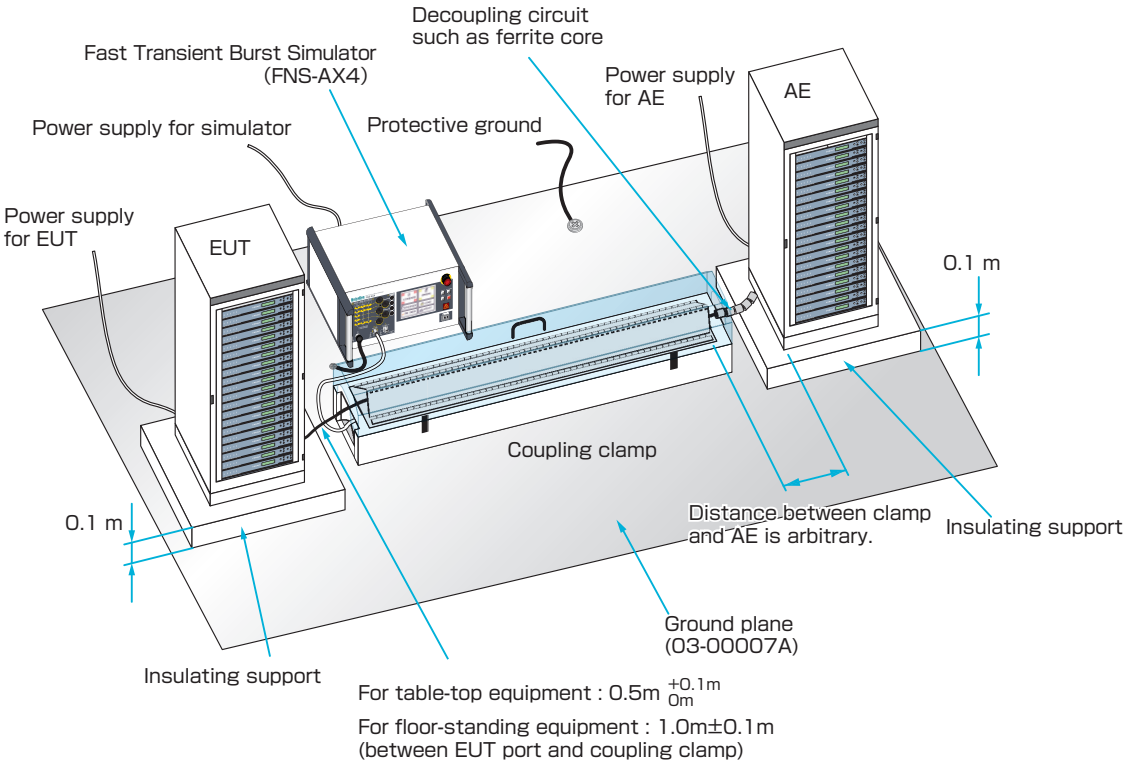


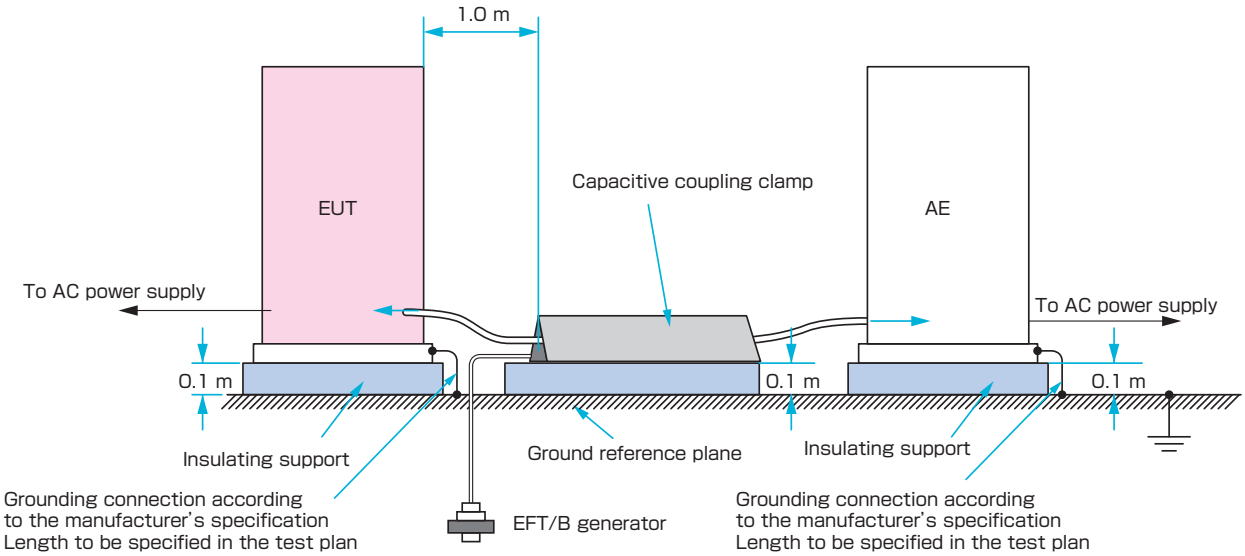


IEC61000-4-4 Ed.3 Test Standard Overview

Test Method to Signal or Control Lines

① Put the simulator onto ground reference plane which is connected to the protective ground and connect SG terminal on the front panel to the ground reference plane.
② Place the coupling clamp (Option) onto the ground reference plane.
③ Connect PULSE OUT port to connector of the coupling clamp.
④ Pass the line cable through the coupling clamp. Adjust the clamping part so that the coupling capacity can be largest (space between the cable and clamp can be minimum).
⑤ Cover the coupling clamp for preventing the electrical shock, set the required test conditions (like the burst voltage, etc.)





IEC61000-4-4 Ed.3 Test Standard Overview

5. Test Procedure

The test shall be carried out on the basis of a test plan that shall include the verification of the performances of the EUT as defined in the technical specification.

- Type of test that will be carried out;
- Test level;
- Polarity of the test voltage (both polarities are mandatory);
- Internal or external generator;
- Duration of the test (not less than 1 min);
- Number of applications of the test voltage;
- EUT's ports to be tested;
- Representative operating conditions of the EUT;
- Sequence of application of the test voltage to the EUT's ports;
- Auxiliary equipment;

6. Evaluation of Test Results and Test Report

Classify tests results as below in terms of specifications and operating conditions of EUT.

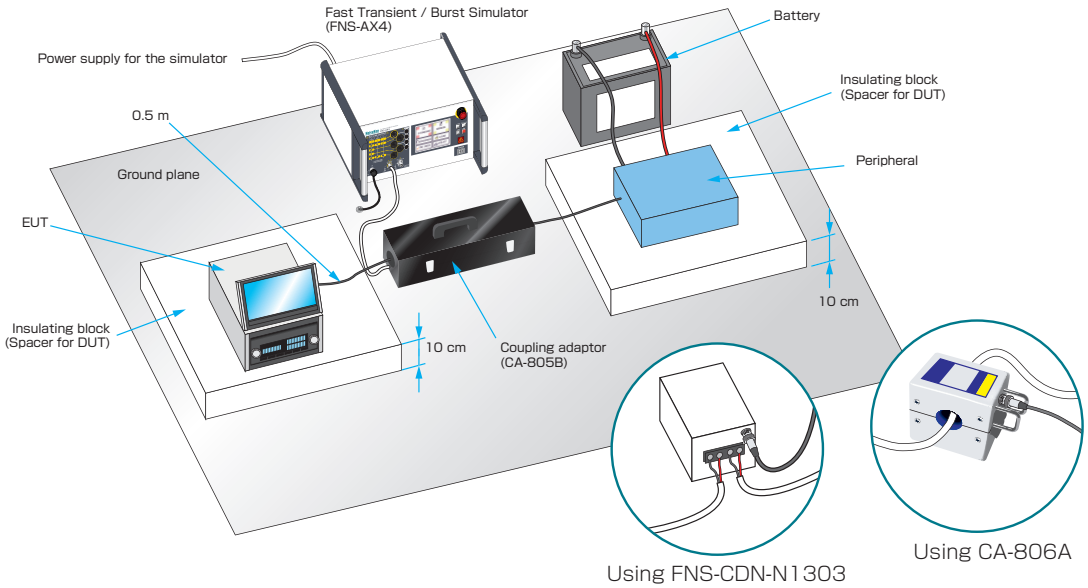
1) Normal performance within limits specified by the manufacturer, requestor or purchaser;
2) Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention;
3) Temporary loss of function or degradation of performance, the correction of which requires operator intervention;
4) Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

Notes: This test procedure and test set-up are extracted from IEC61000-4-4 Ed.3 (2012) and JIS C 61000-4-4 standards for applying to our products.
Please refer to the Standards if more details are required.

■ Test Method using various clamps (outside of IEC 61000-4-4 compliance testing)

Test Method using Fast Transient / Burst Simulator

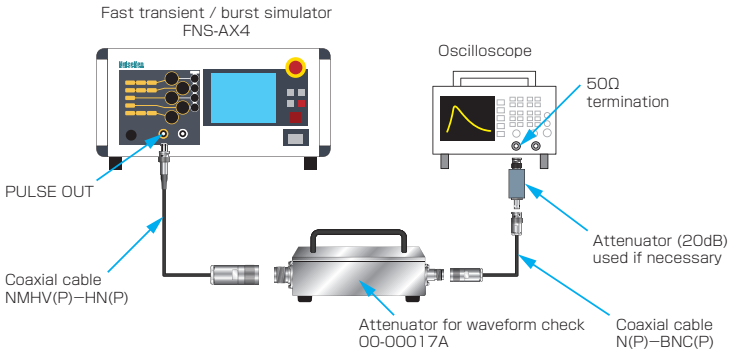
① Place the simulator onto the ground plane which is connected to the protective earth and connect SG terminal on the front panel to the ground plane.
② Connect power cable (Standard accessory) to AC IN on the back of the simulator.
③ Place coupling adaptor CA-805B (Option) onto the ground plane and connect G terminal on side connector part of the clamp to the ground plane.
④ Connect PULSE OUT connector on the front of the simulator to connector of the adaptor.
(Pay due attention so that no high voltage is being output during the connection)
⑤ Clamp the interconnection lines to be tested with the adaptor.
⑥ Set the test conditions like the coupling voltage, etc. , by the touch-panel on the simulator and start the test.



IEC61000-4-4 Ed.3 Test Standard Overview

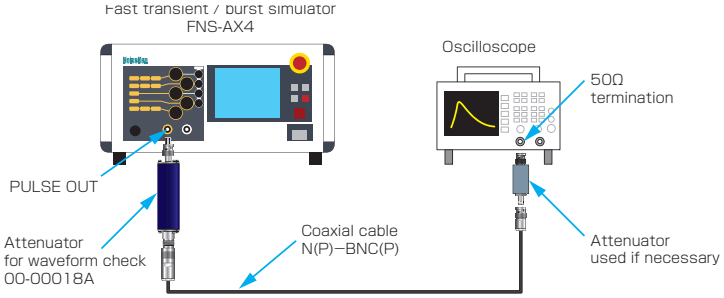
Waveform Verification on 50Ω load (Using waveform verification attenuator 00-00017A)

① Connect between input of waveform verification attenuator 00-00017A and PULSE OUT of the test equipment using coaxial cable comes with the attenuator (HN(P)-NMHV(P)).
Also connect between oscilloscope input and output connector of the attenuator using coaxial cable comes with the test equipment (N(P)-BNC(P)).
Add an attenuator to oscilloscope if necessary.
② Input impedance of oscilloscope shall be set to 50 ohm because output impedance of 00-00017A is 50 ohm.
③ START the test equipment generator.



Waveform Verification on 1kΩ load (Using Waveform verification attenuator 00-00018A)

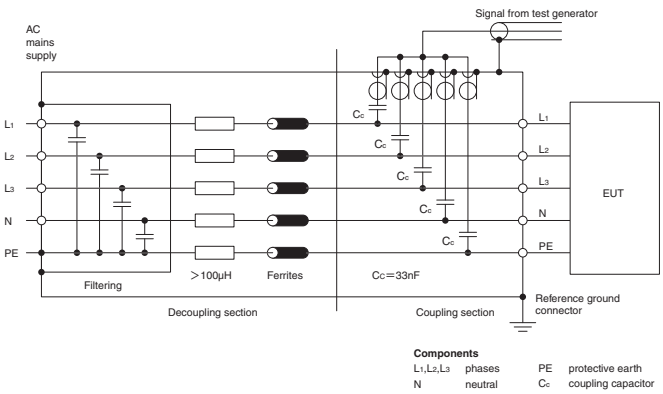
①Directly connect the input of waveform verification attenuator 00-00018A and PULSE OUT of the test equipment.
Also connect between oscilloscope input and output connector of the attenuator using coaxial cable comes with the test equipment (N(P)-BNC(P)).
Add an attenuator to the oscilloscope if necessary.
② Input impedance of oscilloscope shall be set to 50 ohm because output impedance of 00-00017A is 50 ohm.
③ START the test equipment generator.

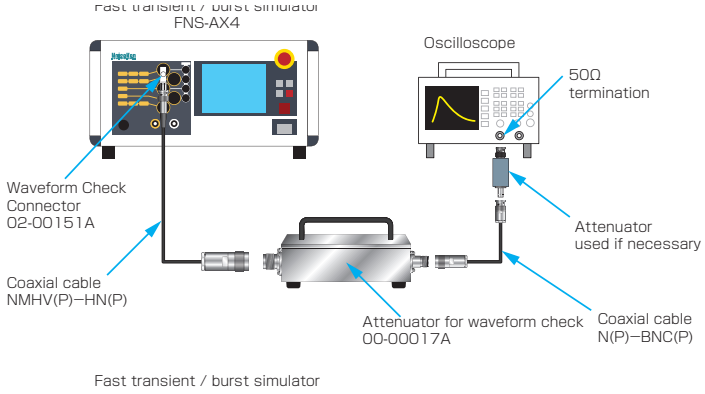


Waveform verification at EUT LINE OUT (Using 02-00151A and 00-00017A)

① Use the waveform verification connector(02-00151A) included with the FNS-AX4 onto EUT LINE OUTPUT and ground reference socket.
② Set the simulator to inject all phases and verify waveform of each OUTPUT LINE.
③ Insert the waveform verification connector straight onto EUT LINE OUTPUT connector and ground reference socket next to the connector. Be sure to insert deep and secure.
④ Connect between input connectors of waveform verification attenuator 00-00017A and the waveform verification adapter using the coaxial cable included with the attenuator (HN(P)-NMHV(P)).
Also connect between oscilloscope input and output connector of the attenuator using the coaxial cable included with the test equipment (N(P)-BNC(P)).
Add an attenuator to the oscilloscope if necessary.
⑤ Input impedance of oscilloscope shall be set to 50 ohm because output impedance of 00-00017A is 50 ohm.
⑥ START the test equipment generator.

02-00151A adapter mounted onto L2(N,-) port of EUT LINE OUTPUT





Fast transient / burst simulator

Lightning Surge Simulator

LSS-F03 series

For a stricter test with a maximum voltage of 15 kV

A tester simulatively generates "High energy induced lightning noise" which induced to distribution lines or communication lines by ground potential fluctuation caused by lightning strikes.

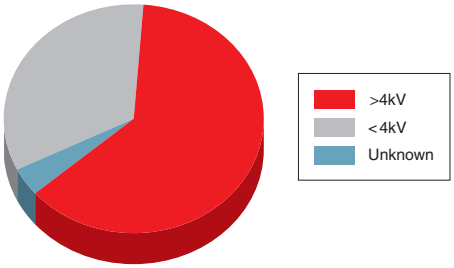
- Lightning surge simulator compliant with the IEC61000-4-5 Edition 3 requirements.
- Maximum output voltage 15 kV (maximum coupling of 15 kV to AC / DC CDN and 6 kV to Telecom CDN). Enables to conduct the more extended reliability test including the destructive test.
- Large size LCD for the operation is adopted for realizing better visibility and operatability.
- Easy operation for the sequential tests with adoption of MPU control. Surge output / Waveform switching / Polarity switching / Sequence can be automated sequentially
- Selectable either MANUAL or PROGRAM modes. MANUAL mode is used for the test according to the Standard or performing single conditioned test and PROGRAM mode can perform different conditioned tests sequentially so that the tests can be performed easily along purposes.
- Excellent safety with equipment of interlock.
- Standard equipment of terminal for checking the waveforms : Enable to check the waveforms in connection to an oscilloscope with a BNC cable
- Isolation transformers available (Option)
- In order to avoid resonance with the power supply, possible to vary the constant of the decoupling network (1.5, 1.3 , 1.0, 0.8 mH) (Customized production).

15kV Output Voltage, 7500A Current Enable EUT destruction resistance test

Approx. 60% of the users are conducting the test with voltage more than the IEC standard regulated voltage.

IEC Standard Requirement < To keep up with quality in the market

Test voltage of lightning surge immunity test



Based on the market research by NoiseKen in 2010

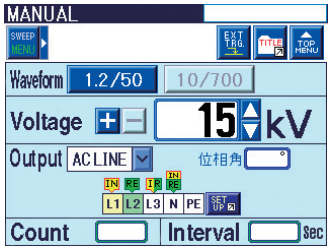
Prevent the Resonance with the Power supply! Inductance constant switching function

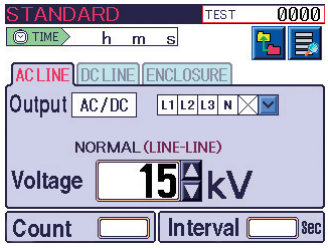
Resonance phenomenon may occur in some EUTs when connected to the lightning surge simulator, causing malfunctions. By switching the inductance constant, it is possible to shift the resonance phenomenon and operate the EUT normally. Even when this function is used, the output waveform satisfies the IEC Standard regulations.
(Inductance constant values: 0.8 mH/ 1.0 mH/ 1.3 mH/ 1.5 mH)
* This function is available as a custom order. Please contact us for details.

Inductance Constant switch section

"Touch-panel" adopted for easy test setting

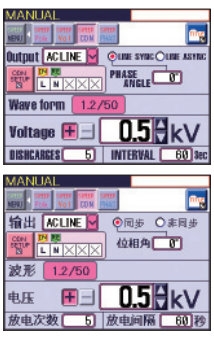
Adopted LCD touch panel for pursuing high visibility and realizing user-friendly operation with intuitive icons.
Also, easy operation is realized not only for the test according to IEC Standard but also for the sequential tests with the parameter sweep function.

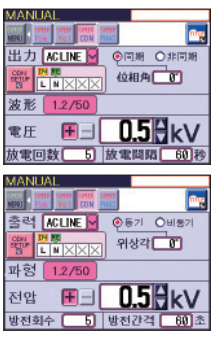




"Multi-languages" for easy operation processing available

English and Japanese languages available.
*English/Chinese, English/Korean languages available for Custom Models per User's request.

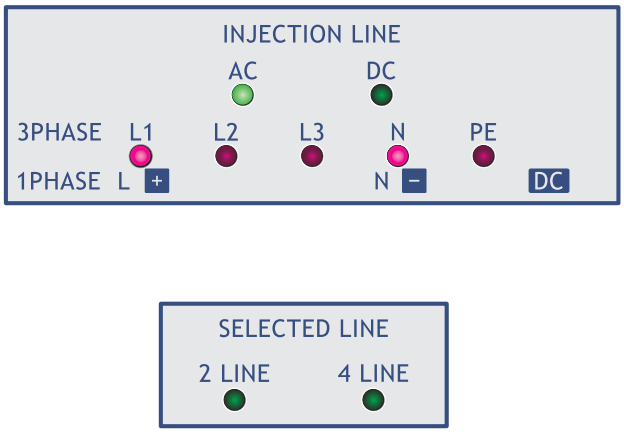




LSS-F03 series

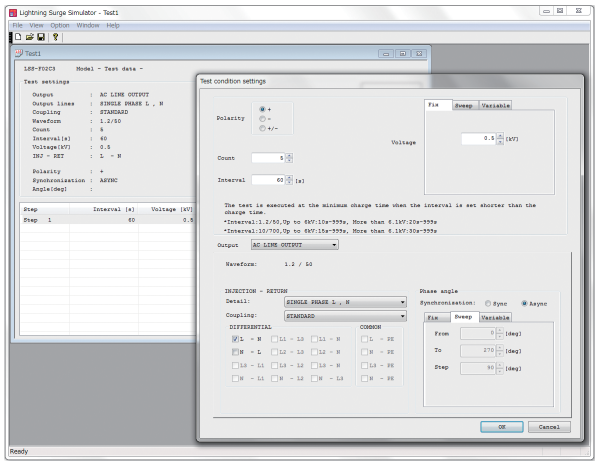
"Indicator" which is linked with the test setting equipped

Indicators which visualize the cables connections in the test equipped.



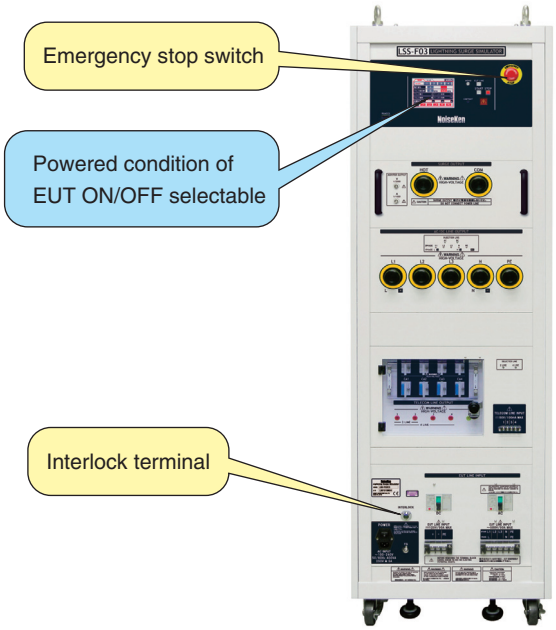
PC control available with the optional software

Dedicated software allows control from an external Windows® PC. enabling to output the test result report as a record.
* Software is available for download from our website.



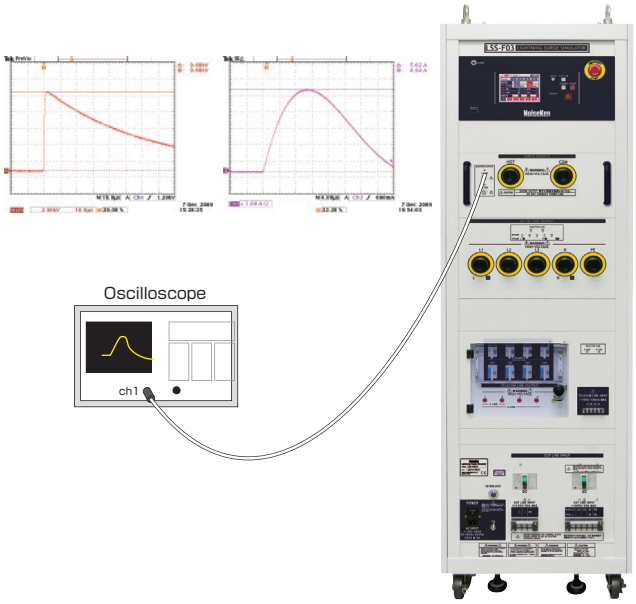
"Emergency stop" & "Interlock terminal" to ensure the test operator's safety

Emergency stop function esuring safety of the test operator equipped both in the main body and the software. Also, the interlock setting and output voltage limit function equipped.
Protective safety fence and protective safety box are available as options for a more safe test.



"Output waveform monitor terminal" which can ease pre-checking of the waveforms prior to the actual test

Monitor terminal adopted to allow a simple waveform check before the test.
*The terminal is just for simple checking.
If an accurate measurement is required, the specialized equipment is necessary.
Please contact us for more details.



Model numbers meaning:

LSS-F03-□□A
- 1 : Model for single phase EUT L/N/PE
- 3 : Model for 3-phase EUT L1/L2/L3/N/PE(Available both for single phase & 3-phase)
- A : 1.2/50μs-8/20μs (generates 1 surge type)
- C : 1.2/50μs-8/20μs、10/700μs-5/320μs (2 types)

Specifications

■Parameter	Specification		Note
Surge generating unit			
1.2/50μs - 8/20μs Combination waveforms	Output voltage	0.5 kV ～ 15 kV ± 10%	Common for all models Voltage step : 0.1 kV step The setting can be from 0 kV
	Front time	1.2μs ± 30%	
	Duration	50μs ± 20%	
	Output current	250 A ～ 7500 A ± 10%	
	Front time	8μs ± 20%	
	Duration	20μs ± 20%	
10/700μs-5/320μs Combination waveforms	Output voltage	0.5 kV ～ 15kV ± 10%	Models : C1A / C3A Voltage step : 0.1 kV step The setting can be from 0 kV
	Front time	10μs ± 30%	
	Duration	700μs ± 20%	
	Output current	12.5 A ～ 375 A ± 10%	
	Front time	5μs ± 20%	
	Duration	320μs ± 20%	
Output polarity	Positive / Negative		
Interval	10 sec. ～ 999 sec., depending on the set voltage 10 sec. (< 6 kV)		15 sec. ～ in 10/700μs waveform
Output impedance	2 Ω ± 10%		1.2/50μs waveform
	40 Ω ± 10%		10/700μs waveform

■AC/DC CDN			
Coupling surge waveform	1.2/50μs - 8/20μs combination waveforms		
Max. coupling surge voltage / current	Up to the values which can be set		
Coupling network	18 μF	Between LINE - LINE (10 Ω + 9 μF selectable)	
Correspondent to IEC61000-4-5	10 Ω ± 9 μF	Between LINE - PE (18 μF selectable)	
Injection mode	Between LINE - LINE, Between LINE - PE		
Power supply lines structure for EUT	Single phase AC	: L / N / PE	Model : A1A / C1A
	DC	: + / - / PE	
	3-phase AC	: L1 / L2 / L3 / N / PE (Common for single phase and 3-phase)	Model : A3A / C3A
	DC	: + / - / PE	
EUT power capacity	AC 240 V / 20 A MAX 50/60 Hz DC 125 V / 20 A MAX		Model : A1A / C1A
	AC 500 V / 50 A MAX 50/60 Hz DC 125 V / 50 A MAX		Model : A3A / C3A
Decoupling coil	1.5 mH		
Phase angle control	0 ～ 360° ± 10°		

■CDN for Telecom lines (Only in models C1 and C3)			
Coupling surge waveform	1.2/50μs - 8/20μs combination waveforms		
	10/700μs - 5/320μs combination waveforms		
Max. coupling surge voltage / current	6 kV (waveform guaranteed up to 2 kV for 1.2/50μs waveform and up to 4 kV for 10/700 waveform)		
Impedance matching resistors	40 Ω	80 Ω per 1 line at 2 lines	1.2/50μs waveform
		160 Ω per 1 line at 4 lines	
	25 Ω per line		10/700μs waveform
Coupling mode	Common mode		
Coupling network	Gas arrestor : 90 V		
Line for EUT	2 lines / 4 lines DC 50 V / 100 mA MAX		Selectable
Decoupling coil	20 mH		

■Others		
Voltage monitor	BNC output, 1 / 2000 ± 10%	In open-circuit for SURGE OUT
Current monitor	BNC output, 1 mV / A ± 10%	In short-circuit for SURGE OUT
External communication	RS-232C optical communication	
Power supply	AC 100 V ～ AC 240V ± 10% 50/60Hz	
Power Consumption	400 VA	
Dimensions	(W)555 × (H)1450 × (D)790 mm (A1A / A3A), (W)555 × (H)1800 × (D)790 mm (C1A / C3A)	Protrusions excluded (in all models)
Weight	A1A : approx. 290 kg A3A : approx. 300 kg C1A : approx. 325 kg C3A : approx. 340 kg	

Standard accessories

Parameter	Specification / Function	Q'ty	Correspondent model
Surge output cable	HOT / COM	2 pcs.	Common
Output cable to power supply lines	For single phase : L / N / PE	3 pcs.	A1A / C1A
	For 3-phase : L1 / L2 / L3 / N / PE	5 pcs.	A3A / C3A
Output cable to telecom lines	For 1 ～ 4 lines and GND	5 pcs.	C1A / C3A
Arrestor unit	For coupling : Equipped to main unit panel	4 pcs.	C1A / C3A
	For input protection : Equipped to main unit panel	4 pcs.	
Monitor cable	BNC - BNC cable	1 pc.	Common
External interlock connector	5P plug (Short between #1 - #3)	1 pc.	Common
Power supply cable	For AC 100 V, 3P equipped with G connector cable	1 pc.	Common
High voltage connector cap	Equipped to main unit panel	5 pcs.	A1A / C1A
		7 pcs.	A3A / C3A
FG cable	For grounding the body	1 pc.	Common
Instruction manual	-	1 volume	Common

● Certain periodical inspection shall be recommended since consumable parts are contained in the products.
In the test to 3-phase 5 lines (with PE) power supply lines, a message which alert the inspection per around 200 sets (in the test to single phase (with PE) power supply lines, it is done per around 800 sets).
(1 set in this case means that the test shall be done with 2 levels (eg. 0.5 kV and 1 kV) for the test series according to IEC 61000-4-5)
* Exchange timing of the parts may differ depending on the operative conditions and environment. Please contact us for more details.

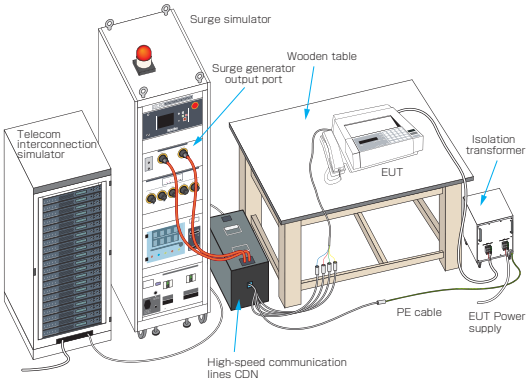
Options

High-speed communication lines CDN　MODEL: F-130814-1004

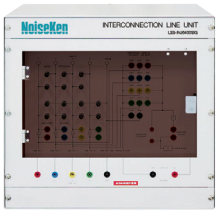
This CDN product is used to apply surges to unshielded symmetrical high-speed communication lines with speed up to 1000Mbit/s, as defined in the IEC 61000-4-5 Standard.

Conversion cables (05-00147A) are required for the CDN connection to the LSS-F03 simulator.

Parameter	F-130814-1004-2	F-130814-1004-4
Maximum input voltage	2kV	4kV
EUT power capacity	DC65V/1A	
Maximum line Number	8 lines	
EUT/AE connector	RJ-45	
Dimensions	(W) 400 ×(H) 230 × (D) 240mm	



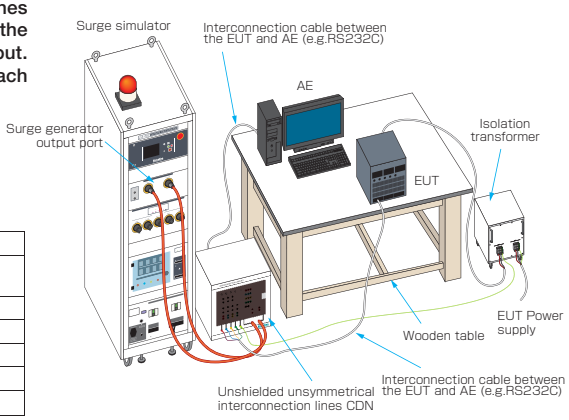
CDN for Interconnection Lines　MODEL : LSS-INJ6401SIG



This CDN product is used to apply surges to interconnection lines as defined in the IEC61000-4-5 Standard. With The EUT power capacity of DC50V / 1A it is possible to inject surges to interconnection lines up to 6,600V. Possible to bypass inductor (20 mH) with connecting the attached connection plug to inductor bypass terminal in DC output. Possible to equip the attached surge protective arrestor between each line and ground.

Conversion cables (05-T1578) are required for the CDN connection to the LSS-F03 simulator.

Parameter	Specifications
Surge input voltage	500V~6,600V (1.2/50μs-8/20μs Combination wave)
EUT power capacity	DC50V / 1A
Max. line number	4 lines
Decoupling coil	20mH each line
Matching resistor	40Ω±10%
Dimensions / Weight	(W) 488 x (H) 456 x (D) 550mm Approx. 45kgs



Options

Isolation Transformer MODEL : TF-2302P

Model TF-2302P is a single-phase isolation transformer rated AC240V/30A with dielectric strength of 4kV.
For safety reasons, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	Specifications
Maximum input voltage	Single phase AC240V Max (50/60Hz)
Maximum output current	30A Max
Dielectric strength	Primary winding to core AC4kV (1 minute) Secondary winding to core AC4kV (1 minute) Primary to secondary windings AC4kV (1 minute)
Insulation resistance	100MΩ or more at DC500V
Dimensions / Weight	(W)350×(H)475×(D)400mm (Except for eye bolt and handle) / Approx. 60kg
Accessories	AC single phase line input cable (5.5sq 3-line 3m, One end: with a stick-type soldering terminal, The other end: without terminal): 1pc., PE/FG cable (3.5sq 3m Both ends: with a φ6 ring-type soldering terminal) : 1pc. Instruction Manual: 1pc. AC single phase line output cable (3.5sq 3-line 2m, One end: with stick-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc.

Isolation Transformer MODEL : TF-6503P, TF-6633P

Model TF-6503P, TF-6633P are three-phase isolation transformers rated AC 600 V / 50 A(TF-6633P 63A) and dielectric strength of 4 kV. For safety reasons, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	TF-6503P Specifications	TF-6633P Specifications
Maximum input voltage	Single / Three phase AC 600 V Max (50/60 Hz)	
Transformer wiring method	Star wiring	
Maximum output current	50 A Max	63 A Max
Dielectric strength	Primary winding to core AC 4 kV (1 minute) Secondary winding to core AC 4 kV (1 minute) Primary to secondary windings AC 4 kV (1 minute)	
Insulation resistance	100 MΩ or more at DC 500 V	
Dimensions / Weight	TF-6503P: (W)500×(H)640×(D)700mm (Eye bolts and handles excluded) approx. 350kg TF-6633P: (W)500×(H)661×(D)700mm (Eye bolts and handles excluded) approx. 400kg	
Accessories	AC three-phase line input cable (14sq (22sq for TF-6633P) 4-line 3m, One end: with a stick-type soldering terminal, the other end: without terminal):1 pc. PE cable (8sq 3m, One end: with a φ6 ring-type soldering terminal, The other end: without terminal): 1 pc. PE/FG cable (8sq 3m Both ends: with a φ6 ring-type soldering terminal): 1 pc. Instruction Manual: 1 pc. AC three phase line output cable (14sq (22sq for TF-6633P) 4-line 2m, One end: with stick-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc. PE cable (8sq 2m, One end: with a φ6 ring-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc.	

Noise Canceller Transformers NCT series

It has superb attenuation characteristics against impulse noises. It can also be used for insulation during impulse noise test.
***Connection cable requires modification. Please inquire us for more details.**

MODEL	Primary / Secondary Voltage	Rated current	Frequency
NCT-160	120V	5A	50/60Hz
NCT-1240		20A	
NCT-2240	240V	10A	

Options

Terminal Connection Board with Multi-Outlet(3P) MODEL : 18-00048B

A relay terminal board for connecting the output of the LSS-F03 series to the EUT.
By wiring to the included multi-outlet, you can directly connect a power plug that supports the standards of each country.

single phase 2 lines with PE (withstand voltage 4.5kV) ※ 20A Max

Terminal Connection Board with Multi-Outlet(5P) MODEL : 18-00058B

A relay terminal board for connecting the output of the LSS-F03 series to the EUT.
By wiring to the included multi-outlet, you can directly connect a power plug that supports the standards of each country.

three phase 5 lines (withstand voltage 4.5kV)
*Multi-outlet is for single phase. ※ 50A Max

Terminal Block for 3P MODEL：18-00047B

Terminal block board for CDN to connect EUT. 3 pins

Terminal Block for 5P MODEL：18-00044A

Terminal block board for CDN to connect EUT. 5 pins

EUT Protective Safety Box MODEL：11-00006A

Protection box to prevent access to EUT during the test.
Further safety can be achieved by combining with the protective safety is fence

（W) 600 × (D) 400 × (H) 350mm *protrusions excluded*

Protective Safety Fence MODEL : 11-00010A

Allows construction of a safe test environment by connecting with the lightning surge simulator's interlock function.
Combined use with the EUT protection box ensures a completely safe test environment.

Warning Lamp MODEL：11-00008B

Alarm lamp for LSS series. Allows to alert and call for attention by blinking during the test.

※ The model number of this model will change to MODEL: 11-00017A as soon as current stock runs out, due to the discontinuation of production of the connector used.

● Compatible models : LSS-F03 series

AC Line Input Cable (Single phase) MODEL : 05-00134A

DC line input cable MODEL : 05-00136A

AC line input cable (3-phase) MODEL : 15-00135A

USB Optical Module Kit MODEL：07-00022A

Connection adapter used for remotely controlling the simulator from a PC.
Equipped with USB-Optical conversion fiber optic cable (5m).

● Compatible models : LSS-F03 series

Options

Arrester unit MODEL : 08-00012A

Arrester unit for surge decoupling.

Coupling arrester unit MODEL : 08-00016A

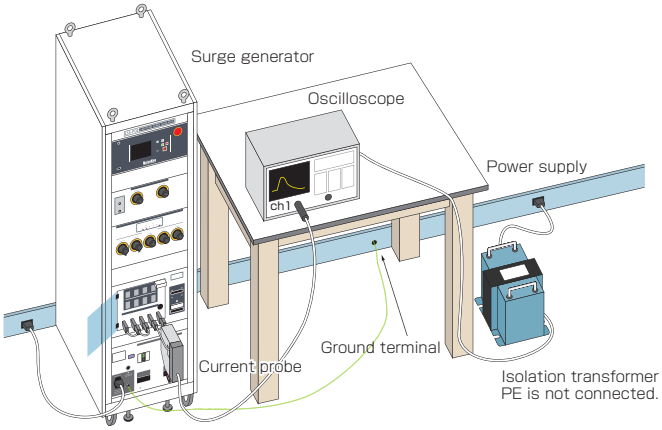
Arrester unit for surge coupling

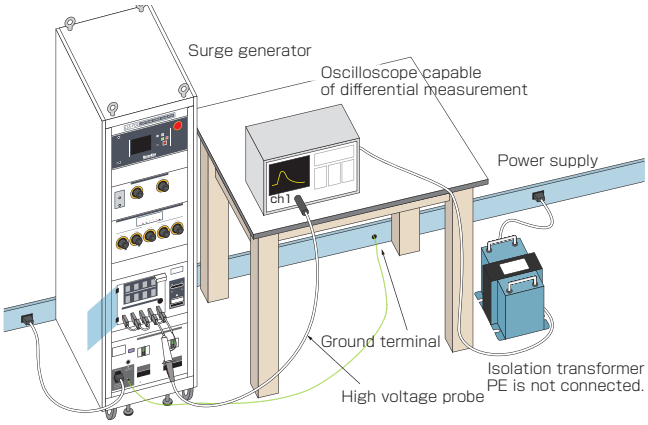
Telecom waveform check cable set MODEL : 05-00150A

Jig used for measuring the output waveform from the CDN for telecom line.
The following equipment is required additionally.
- Oscilloscope (with differential operation function)
- High voltage probe (when measuring surge voltage / withstand voltage required)
- Current probe (when measuring surge short-circuit current)
- Isolation transformer (for oscilloscope)

● **Compatible models : LSS-F03 series**

■Surge waveform measurement (measurement example at the telecom line CDN terminal at 05-00150A)

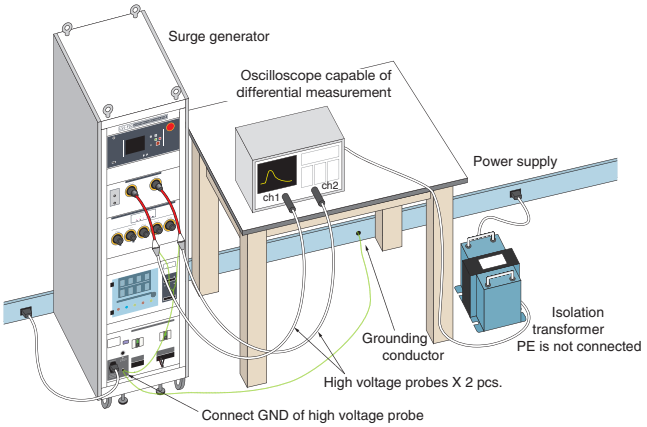


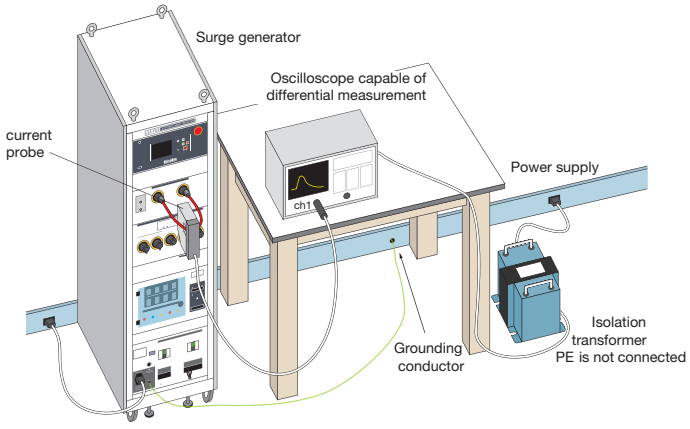


Waveform Checking Cables Set MODEL : 05-00099A

Jig for checking voltage waveforms and current waveforms of LSS-F03 series.
Followings are necessary for the checking additionally.
- **Oscilloscope (Differential operation function built-in)**
- **High voltage probes (for surge voltage measurement / Voltage resistibility necessary)**
- **Current probe (For surge short current measurement)**
- **Isolation transformer (for oscilloscope)**
- **Earth cable (for PE connection)**

■ Surge Waveform Measurement (Setup of measurement from SURGE OUT with 05-00099A)





* Measurement of short current waveform from AC /DC CDN is not possible with the waveform pre-checking cables set (05-00099A)

IEC61000-4-5 Ed.3 Test Standard Overview

1. General

The task of the described laboratory test is to evaluate malfunctions of EUT under specified operational conditions to unipolar one-way surges caused by switching and lightning induction effects at certain threat levels. This standard specifies 2 kinds of the combination waveforms. One is simulating injection to power supply lines and interconnections lines (1.2/50μs voltage waveform and 8/20μs current waveform) and the other simulates injection to telecommunication equipment connect to outdoor telephone lines (10/700μs voltage waveform and 5/320μs current waveform).
It is not intended to test the capability of EUT's insulation to withstand high-voltage stress or direct injections of lightning currents, i.e., direct lightning strikes.

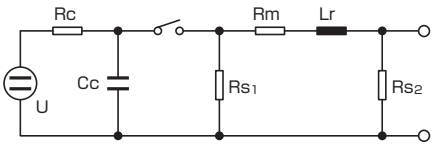
2. Test Levels

Level	Open-circuit test voltage kV	
	Normal mode	Common mode
1	-	0.5
2	0.5	1.0
3	1.0	2.0
4	2.0	4.0
x	special	special

x: Can be any level, above, below or in between the others. The level shall be agreed upon between the manufacturers and users.

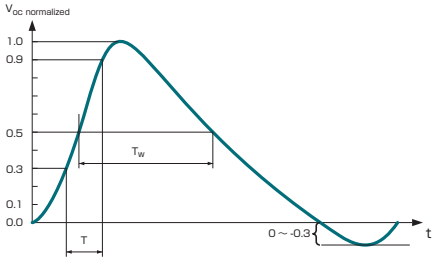
3. Waveforms Generator and Waveforms specifications

Generation Circuit



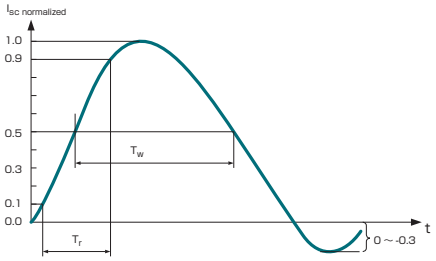
U High-voltage source
Rc Charging resistor
Cc Energy storage capacitor
Rs Pulse duration shaping resistors
Rm Impedance matching resistor
Lr Rise time shaping inductor

Voltage Surge (1.2/50μs)



Front time: $T_f = 1{,}67 \times T = 1{,}2\mu s \pm 30\%$
Duration: $T_d = T_w = 50\mu s \pm 20\%$

Current Surge (8/20μs)



Front time: $T_f = 1{,}25 \times T_r = 8\mu s \pm 20\%$
Duration: $T_d = 1{,}18 \times T_w = 20\mu s \pm 20\%$

1.2/50μs Combination Waveform specification

	Front time Tf μs	Duration Td μs
Open-circuit voltage	Tf = 1,67 × T = 1,2 ± 30 %	Td = Tw = 50 ± 20 %
Short-circuit current	Tf = 1,25 × Tr = 8 ± 20 %	Td = 1,18 × Tw = 20 ± 20 %

4. Voltage waveform specification at the EUT port of power line CDN

1.2/50μs Voltage waveform specification at the EUT port of the power line CDN (open-circuit voltage)

Open-circuit voltage *	Coupling impedance	
	18 μF (line to line)	9 μF + 10 Ω (line to ground)
Peak voltage		
Current rating ≦ 16 A	Set voltage +10 %/-10 %	Set voltage +10 %/-10 %
16 A < current rating ≦ 32 A	Set voltage +10 %/-10 %	Set voltage +10 %/-10 %
32 A < current rating ≦ 63 A	Set voltage +10 %/-10 %	Set voltage +10 %/-15 %
63 A < current rating ≦ 125 A	Set voltage +10 %/-10 %	Set voltage +10 %/-20 %
125 A < current rating ≦ 200 A	Set voltage +10 %/-10 %	Set voltage +10 %/-25 %
Front time	1,2 μs ± 30 %	1,2 μs ± 30 %
Duration		
Current rating ≦ 16 A	50 μs + 10 μs/ -10 μs	50 μs + 10 μs/ -25 μs
16 A < current rating ≦ 32 A	50 μs + 10 μs/ -15 μs	50 μs + 10 μs/ -30 μs
32 A < current rating ≦ 63 A	50 μs + 10 μs/ -20 μs	50 μs + 10 μs/ -35 μs
63 A < current rating ≦ 125 A	50 μs + 10 μs/ -25 μs	50 μs + 10 μs/ -40 μs
125 A < current rating ≦ 200 A	50 μs + 10 μs/ -30 μs	50 μs + 10 μs/ -45 μs

* A CDN meeting the current rating of the EUT and its relevant waveform specification from this table shall be used.

IEC61000-4-5 Ed.3 Test Standard Overview

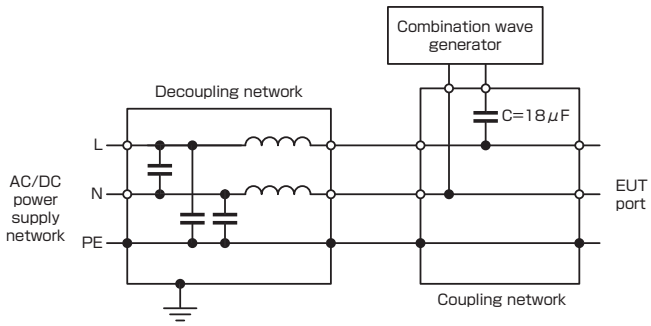
Current waveform specification at the EUT port of the power line CDN (short-circuit current)

Surge current parameters under short-circuit conditions	Coupling impedance	
	18 μF (line to line)	9 μF + 10 Ω (line to ground)
Front time	Tf = 1,25 × Tr = 8μs ± 20 %	Tf = 1,25 × Tr = 2,5 μs ± 30 %
Duration	Td=1,18×Tw=20μs±20%	Td = 1,04 × Tw = 25 μs ± 30 %

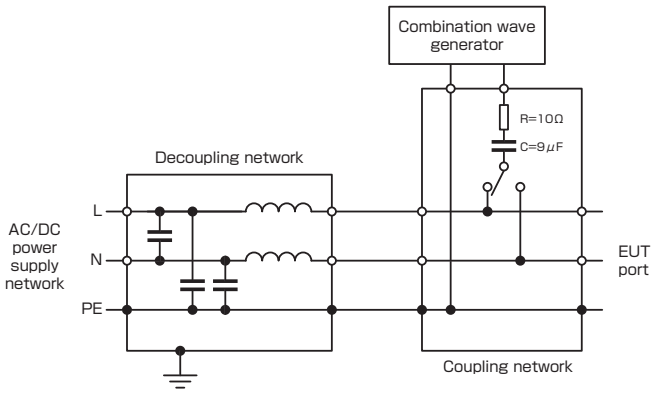
Relationship between peak open-circuit voltage and peak short-circuit current at the EUT port of the power line CDN

Open-circuit peak voltage +/-10% at EUT port of the CDN	Short-circuit peak current +/-10% at EUT port of the CDN (18μF)	Short-circuit peak current +/-10% at EUT port of the CDN (9 μF + 10 Ω)
0,5 kV	0,25 kA	41,7 A
1,0 kV	0,5 kA	83,3 A
2,0 kV	1,0 kA	166,7 A
4,0 kV	2,0 kA	333,3 A

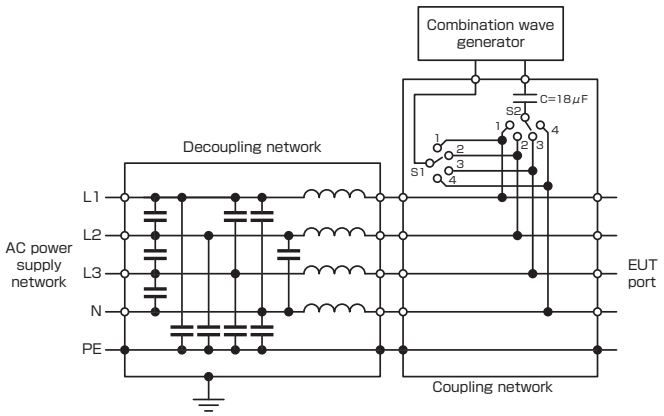
Single phase power line CDN (line-to-line mode)



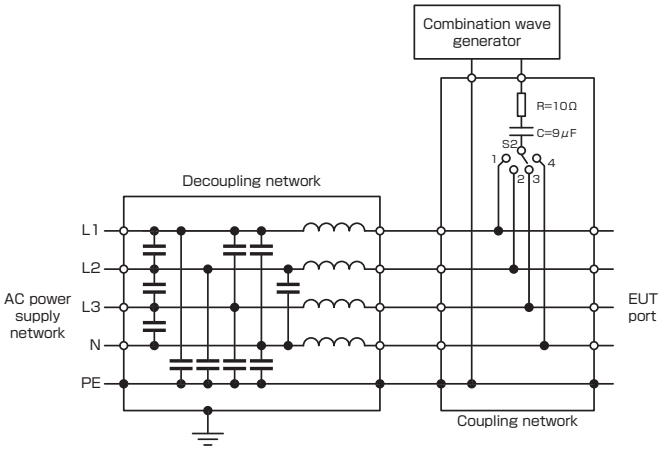
Single phase power line CDN (line-to-ground mode)



Three-phase power line CDN (line-to-line mode)

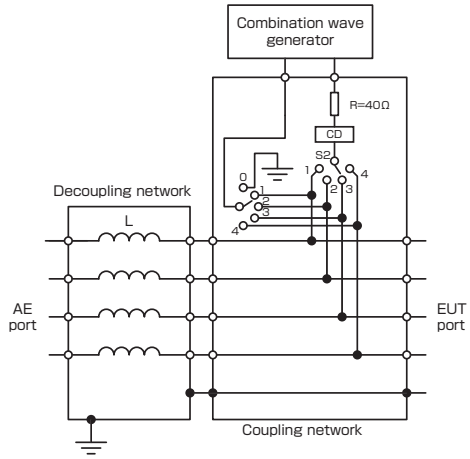


Three-phase power line CDN (line-to-ground mode)

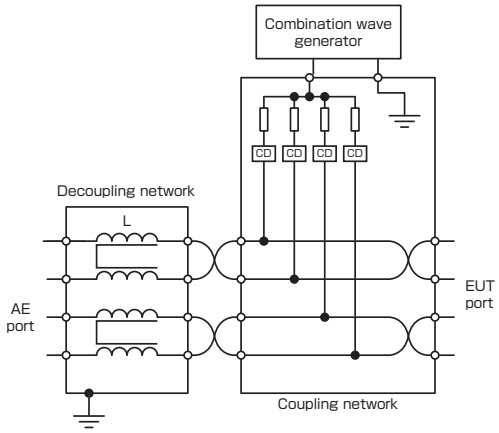


IEC61000-4-5 Ed.3 Test Standard Overview

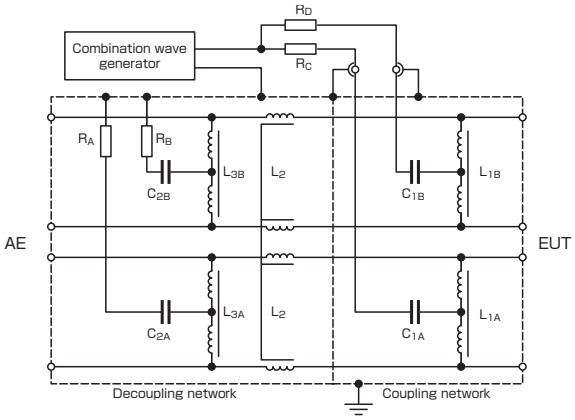
CDN for unshielded unsymmetrical interconnection lines



CDN for unshielded symmetrical interconnection lines



CDN for unshielded symmetrical high speed communication lines up to 1000Mbit/s



Surge waveform specifications at the EUT port of the CDN for unshielded unsymmetrical interconnection lines

Coupling method	Output voltage from the generator	Open-circuit Voltage at the EUT port of the CDN Voc ± 10 %	Voltage front time Tf = 1,67 × Tr ± 30 %	Voltage duration Td = Tw ± 30 %	Short-circuit current at the EUT port of the CDN Isc ± 20 %	Current front time Tf=1,25xTr ± 30 %	Current Duration Td=1,18xTw ± 30 %
Line to PE R = 40 Ω , CD = 0,5 µF	4 kV	4 kV	1,2 µs	38 µs	87 A	1,3 µs	13 µs
Line to PE R = 40 Ω , CD = GDT	4 kV	4 kV	1,2 µs	42 µs	95 A	1,5 µs	48 µs
Line-to-line R = 40 Ω , CD = 0,5 µF	4 kV	4 kV	1,2 µs	42 µs	87 A	1,3 µs	13 µs
Line-to-line R = 40 Ω , CD = GDT	4 kV	4 kV	1,2 µs	47 µs	95 A	1,5 µs	48 µs

Surge waveform specifications at the EUT port of the CDN for unshielded symmetrical interconnection lines

Coupling method	Output voltage	Open-circuit Voltage at the EUT port of the CDN Voc ± 10 %	Voltage front time Tf = 1,67 xTr ± 30 %	Voltage duration Td = Tw ± 30 %	Short-circuit current at the EUT port of the CDN Isc ± 20 %	Current front time Tf=1,25xTr ± 30 %	Current Duration Td=1,18xTw ± 30 %
Line to PE R = 40 Ω Coupling devices*	2 kV	2 kV	1,2 µs	45 µs	48 A	1,5 µs	45 µs

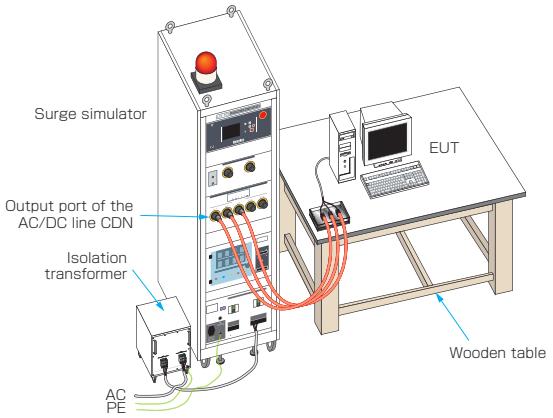
*** GDT, Clamping device, Avalanche devices**

It is recommended that the CDN calibrated at the highest rated voltage. The values shown in the table are for a set value of 4 kV. If the CDN is rated for another maximum voltage, the calibration shall be performed at that maximum voltage. (In case the maximum voltage is 6kV, multiply the short circuit current value shown in this table by 1.5.)

IEC61000-4-5 Ed.3 Test Standard Overview

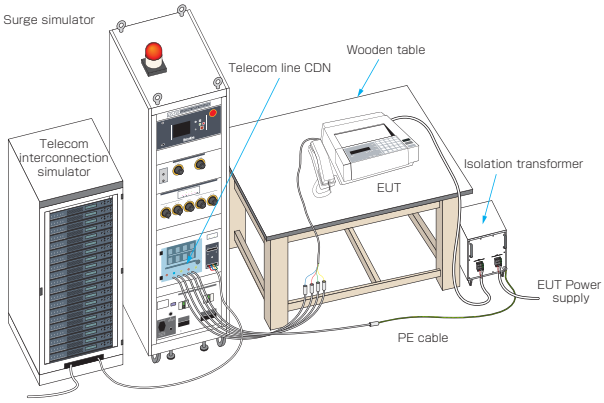
5. Test Setup

Application of surges to power supply lines



The 1.2/50 combination wave specified in the IEC61000-4-5 standard is applied from Lightning Surge simulator's CDN to power supply of the EUT. Compliant with the standard requirements, the simulator is equipped with a floating output. The simulator can conduct a series of automated tests based on preprogrammed settings.

Application of surges to telecom lines

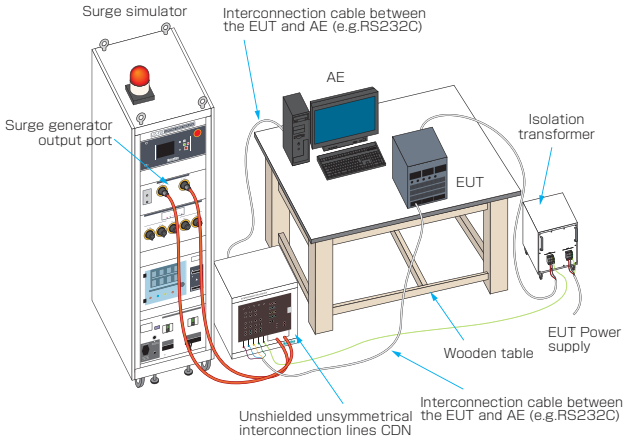


The 1.2/50 combination wave surge specified in IEC 61000-4-5 Standard is applied to the telephone line of an EUT (such as a facsimile machine) through a high-speed telecom CDN connected to Lightning Surge simulator.

Application of surges through unshielded unsymmetrical interconnection lines CDN

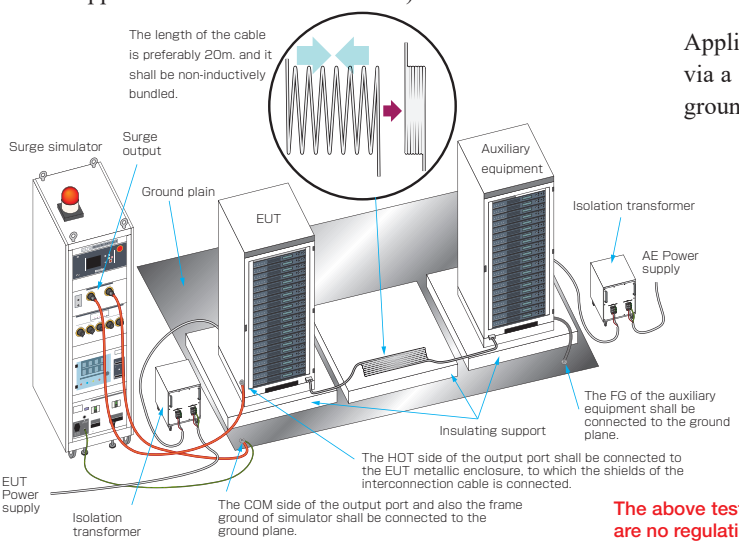
The 1.2/50μs surge generator of the LSS-6330A simulator shall be used in combination with an optional external CDN. This CDN is connected between the EUT and AE (auxiliary equipment).

For all tests shown here, if it is not otherwise specified, the length of cable between the EUT and CDN should not exceed 2m.

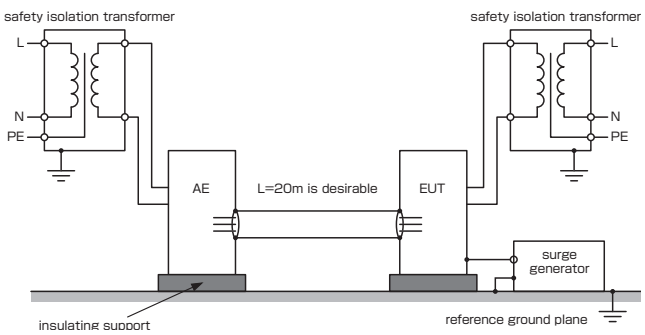


Application of surges to shielded lines

In case of shielded lines, the surge shall be applied to the metallic enclosure of the EUT (for the EUT without a metallic enclosure, the surge shall be applied to the shields of the cable).



Application of the surges shall be done from the generator output port via a 18μF capacitor. The auxiliary equipment shall be connected to the ground plane while the EUT shall not.



The above test layouts is an example of a setup using our lightning surge tester. There are no regulations regarding test layout in the IEC Standard.

IEC61000-4-5 Ed.3 Test Standard Overview

6. Test procedure

Execution of the test

・Number of surges
For DC power ports and interconnection lines five positive and five negative surge pulses.
For AC power ports five positive and five negative pulses each at 0º, 90º, 180º and at 270º;
・Time between successive pulses: 1 min or less

7. Evaluation of Test Results and Test Report

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product. The recommended classification is as follows:

1) Normal performance within limits specified by the manufacturer, requestor or purchaser;
2) Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention;
3) Temporary loss of function or degradation of performance, the correction of which requires operator intervention;
4) Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

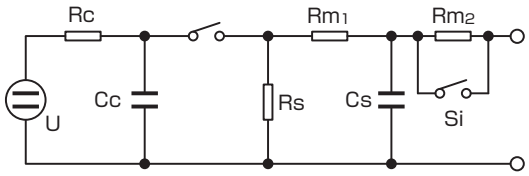
Generally, as far as the EUT can be immune to the surges injected during all injection period and it satisfies the functional requirements according to the product specification, the test result can be judged as “Good”.
The test report shall contain the test conditions and the result.

Note: These test setups and procedures are quoted from IEC61000-4-5 Ed.3 (2014) Standard. Please refer to the standard if more details are required.

8. Surge testing for unshielded outdoor symmetrical communication lines

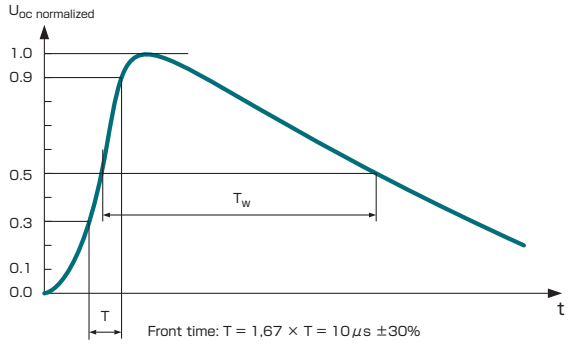
The 3rd edition of the standard requires the 10/700 us combination wave to be applied to ports connected to outdoor telecommunication lines only and the Annex A (Normative) dedicatedly address this test. Outdoor telecommunication lines are typically greater than 300m in length, as the result of this length 10/700μs wave is more representative. Telecommunication lines are usually protected by a primary protector installed at the cable entry to building. Testing shall be performed including the intended primary protector.

10/700 combination waveform (10/700 · 5/320μs) generation circuit



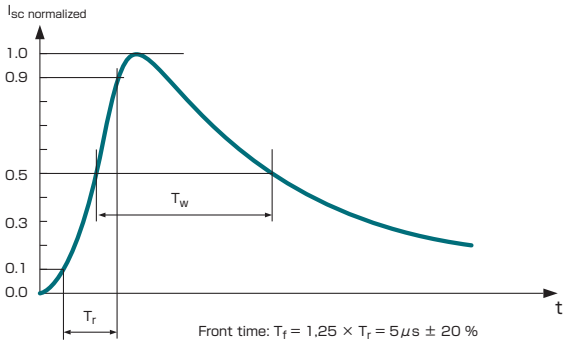
U	High-voltage source
Rc	Charging resistor
Cc	Energy storage capacitor
Rs	Pulse duration shaping resistor
Rm	Impedance matching resistors
Cs	Rise time shaping capacitor
S_1	Switch closed when using external matching resistors

Open circuit voltage waveform



Front time: T = 1,67 × T = 10μs ±30%
Duration: $T_d = T_w$ = 700μs ±20%

Short circuit current waveform



Front time: T_f = 1,25 × T_r = 5μs ± 20 %
Duration: $T_d = T_w$ = 320μs ± 20 %

IEC61000-4-5 Ed.3 Test Standard Overview

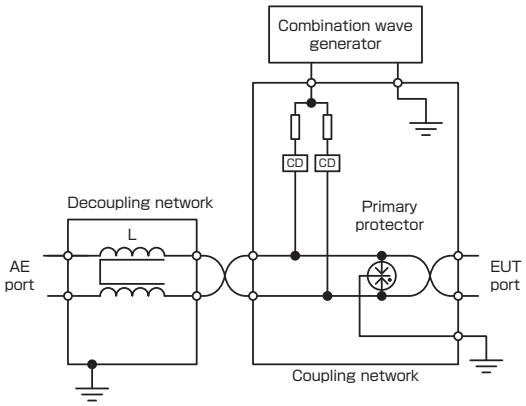
Definitions of the waveform parameters of 10/700 μs combination waveform

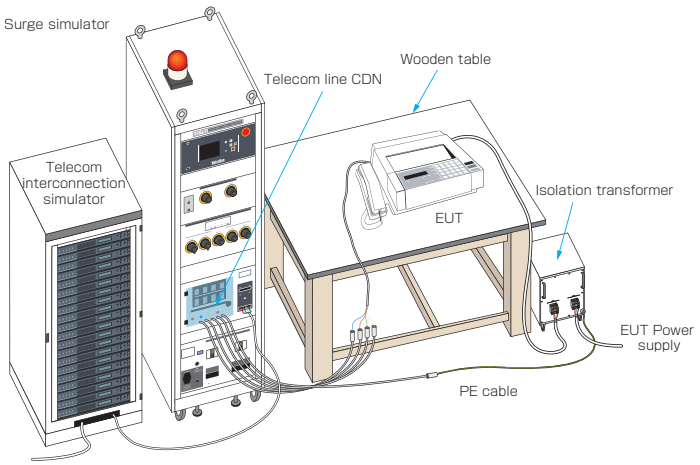
	Front time μs	Duration μs
Open-circuit voltage	10 ± 30 %	700 ± 20 %
Short-circuit current	5 ± 20 %	320 ± 20 %

Relationship between peak open-circuit voltage and peak short-circuit current of the 10/700μs combination waveform

Peak open-circuit voltage at generator output ± 10 %	Peak short-circuit current at generator output ± 10 %
0,5 kV	12,5 A
1,0 kV	25A
2,0 kV	50A
4,0 kV	100A

Test setup example for 10/700 μs generator and CDN for outdoor unshielded symmetrical communications lines





Surge waveform specifications at the EUT port of the CDN for unshielded outdoor symmetrical communication lines

Coupling method	Output voltage from the generator	Open-circuit voltage at the EUT port of the CDN Voc ± 10 %	Voltage front time Tf = 1,67 xTr ± 30 %	Voltage duration Td = Tw ± 30 %	Short-circuit current at the EUT port of the CDN Isc ± 20 %	Current front time Tf ± 30 %	Current duration Td ± 30 %
Common mode Coupling devices 1 pair 27,5 Ω	4 kV	4 kV	8 μs	250 μs	145 A	3,2 μs	250μs

Note: These test setups and procedures are quoted from IEC61000-4-5 Ed.3 (2014) Standard. Please refer to the standard if the more details are required.

For Lightning Surge Simulator

CDN UNIT (AC600V / 300A)

This equipment can be combined with the LSS-F03 series lightning surge simulators to perform noise superimposition tests on three-phase four-wire (L1, L2, L3, N) lines up to AC600V / 300A.

* This product is a custom product. Please contact us for details.

Parameter	Function / performance	Note
Allowable input surge waveform	1.2/50 μ s-8/20 μ sCombination waveform	
Allowable input surge waveform	Up to the max value that can be set	
Coupling circuit IEC 61000-4-5 compliant	18 μ F ± 10% 10 Ω +9 μ F ± 10%	Line-to-line Line-PE
AC superimposition part Output waveform	Open circuit voltage：0.5kV ～ 15kV ± 10% Wave crest length：1.2 μ s ± 30% Wave tail length：50 μ s+10 μ s/-25 μ s Short-circuit current：250A ～ 7500A ± 10% Wave crest length：8 μ s ± 20% Wave tail length：20 μ s ± 20%	Coupling circuit：18 μ F Decoupling coil：1.5mH Cable length：0.5m on one side Setting is possible from 0kV Line input side open
	Open circuit voltage：0.5kV ～ 15kV ＋ 10/-20% Wave crest length：1.2 μ s ± 30% Wave tail length：50 μ s+10 μ s/-40 μ s Short-circuit current：41.7A ～ 1250A ± 10% Wave crest length：2.5 μ s ± 30% Wave tail length：25 μ s ± 30%	Coupling circuit：18 μ F（10 Ω +9 μ F selectable） Decoupling coil：1.5mH Cable length：0.5m on one side Setting is possible from 0kV Line input side open
Apply mode	Line-to-line	Coupling circuit： 18 μ F（10 Ω +9 μ F selectable）
	Line-PE	Coupling circuit： 10 Ω +9 μ F（18 μ F selectable）
EUT power line configuration	Three-phase AC：L1/L2/L3/N/PE	
EUT power line power capacity	AC600V/300A MAX 50/60Hz	
Decoupling coil	1.5mH	
External dimensions	W555 × H1800 × D790 mm	

For Lightning Surge Simulator

DC power supply CDN (DC500V 60A)

This equipment can be combined with the Lightning Surge Simulator to perform noise superimposition tests up to DC 500 V / 60 A. In combination with the Lightning Surge Simulator main unit, tests can be performed by setting the applied phase switching and applied phase sweep.

- **By using EV Fast Charger connectors for the EUT line INPUT/OUTPUT, DC power supply superimposition tests can be easily performed in combination with a lightning surge tester.**
- **This equipment can be controlled by operating the Surge Simulator.**

Customization up to DC1000V is available.

Parameter	Function / performance	Notes
Superimposed surge waveform	1.2/50 μ s - 8/20 μ s combination waveform	
Max. superimposed surge voltage/ current	4.5kV	
Coupling circuit	18 μ F ± 10%	Line - Line
DC CDN output waveform	Open circuit voltage：0.5kV ～ 4.5kV ± 10% Wave crest length：1.2 μ s ± 30% Wave tail length：50 μ s+10 μ s/-10 μ s Short-circuit current：250A ～ 2250A ± 10% Wave crest length：8 μ s ± 20% Wave tail length：20 μ s ± 20%	Coupling circuit：18 μ F Decoupling coil：1.5mH Cable length：0.5m on one side Line input side open
Applied mode	Line - Line	Coupling circuit：18 μ F
EUT power line configuration	DC：＋/－	
EUT power line power capacity	DC500V/60A	
Decoupling coil	1.5mH (default)/1.3mH/1.0mH/0.8mH	

* This is a custom product.
It may be necessary to modify the Simulator's main unit. Prior technical discussion is advised.
Please contact our sales representative for more details.

Lightning Surge Simulator(AC500V/200A DC600V/200A)

- Compliant with IEC 61000-4-5 Ed.3 standard：ECE R10 is regulated at Ed.2, possible to switch to Ed.2
- AC500V/200A DC600V/200A built-in coupling decoupling network.
- Built-in EV relay welding protection diode in DC line.
  You can evaluate the lightning surge resistance when charging EV / PHV vehicles, which is required by ECE R10-04 / 05. (EV Fast Charging applicable)
- Maximum output voltage 15kV: In the reliability evaluation test of the lightning surge test, the evaluation including the destructive test can be performed.
- Adopt a large LCD screen operation panel: A large LCD panel screen has been adopted for the operation unit to improve visibility and operability.
- Employs MPU control that simplifies continuous testing: Surge output / waveform switching / polarity switching / sequence operation can be performed automatically.
- Equipped with manual and program modes. Manual mode for standard tests and single condition tests, and Program mode for continuous tests under different conditions. You can easily set test conditions according to your application.
- Excellent safety functions including interlock.
- Equipped with waveform check terminal as standard.
- You can check the output waveform with your oscilloscope and BNC cable.
- Isolation transformer required to protect the power supply for EUT is available. (option)
- Possible to switch the constant of the decoupling circuit in order to prevent resonance with the power supply.
- Possible to switch to a circuit not including 18uF in the surge output of IEC61000-4-5 (Edition 2.0 2005 version).

* This product is a custom product. Please contact us for details.

Customization up to DC1000V is available.

■ Surge generating unit (1.2/50 μ s-8/20 μ s Combination waveform)

Parameter	Function / performance
Open-circuit voltage	0.5kV ～ 15kV ± 10%
Open circuit voltage	Wave crest length：1.2 μ s ± 30%　Wave tail length：50 μ s ± 20%
Short circuit current	250A ～ 7500A ± 10%
Current waveform	Wave crest length：8 μ s ± 20%　Wave tail length：20 μ s ± 20%
Output polarity	Positive / negative
Output impedance	2 Ω± 10%
Surge generation circuit method	Floating
Minimum charging time	0.0kV -6.0kV：10 s 6.1kV -15.0kV：20 s

■ AC/DC CDN

Parameter	Function / performance
CDN Surge waveform	1.2/50 μ s-8/20 μ s combination waveform
Max CDN surge voltage / current	Up to the max value that can be set
Coupling circuit IEC 61000-4-5 compliant	18 μ F :Line-to-line (10 Ω +9 μ Fselectable) 10 Ω± 9 μ F :Line-PE (18 μ Fselectable)
Apply mode	Line-to-line, Line-PE
EUT power line configuration	Three-phase AC/DC :L1/L2/L3/N/PE（Single / three-phase） +/-/PE
EUT power line configuration	AC500V/200A MAX 50/60Hz、DC600V/200A MAX
Decoupling coil	1.5mH (standard)/ 1.3mH/1.0mH/0.8mH
Phase angle control	0 ～ 360° ± 10°

■ Other

Parameter	Function / performance
Voltage monitor	BNC output、1/2000 ± 10% (when the surge out setting output is open-circuit)
Current monitor	BNC output、1mV/A ± 10%　(when the surge out setting output is short-circuit)
Driving power supply	AC100V ～ AC240V ± 10%　50Hz / 60Hz
External dimensions	W1034 × H1640 × D918 mm

Lightning Surge Simulator

LSS-720B2

Features

This simulator simulates "high-energy induced lightning noise" induced in distribution lines and communication lines due to ground potential fluctuations caused by lightning strikes, and evaluates the resistance of electronic devices.
It is possible to check the dielectric strength due to induced lightning at a level that cannot be confirmed with the combination waveform required by the IEC standard.

- **Lightning surge simulator (Generator) conforming to JEC 210 / 212 Standard.**
- **Maximum output voltage : 20 kV.**
  Enables verifying dielectric strength against induced lightning surge which level cannot be available with the combination surge simulators.
- **Maximum output current : 4000 A.**
  Enables conducting testing for surge absorbers for their current handling capability.
- **Enables observing the output waveform only with an oscilloscope at hand and 1 / 10 voltage probes since 1 / 100 waveform check terminal is standard equipped.**
- **Isolation transformer built-in so that the primary power input and EUT can be easily connected.**

Specifications

Parameter		Specification
Voltage surge	Output waveform	1.2/50μs
	Max. output voltage	20 kV
	Polarity	Positive or negative
	Output impedance	6 Ω ± 10 %
	Built-in load resistance	50 Ω ± 10% (Current limit resistance 100 Ω)
	Short current at max. output	3300 A
Current surge	Output waveform	8 / 20μs
	Max. output current	4000 A
	Polarity	Positive or negative
	Output impedance	5 Ω ± 10%
	Built-in load resistance	3 kΩ ± 10%
Surge repetitive cycle single output		Single output
EUT power capacity		Single phase 240 V / 20 A
Dimensions		(W) 555 × (H) 1860 × (D) 840 mm
Weight		Approx. 450 kg

Accessories

Parameter	Model number	Q'ty
Bag for accessories		1 pc.
Power cable		1 pc.
Surge ground cable		1 pc.
Switch for external trigger	04-00003A	1 pc.
Surge output cable		1 pc.
Single phase input cable	05-00003A	1 pc.
Check terminal	02-00023A	1 pc.
Residual voltage discharge probe		1 pc.
Warning lamp		1 pc.
Fuse		2 pcs.
Output cable	05-00015A	2 pcs.
Interlock connector		1 pc.
Instruction manual		1 volume
Switch key		2 pcs.
Waveform switching connection bar		6 pcs.

JEC Standard Overview

Standard

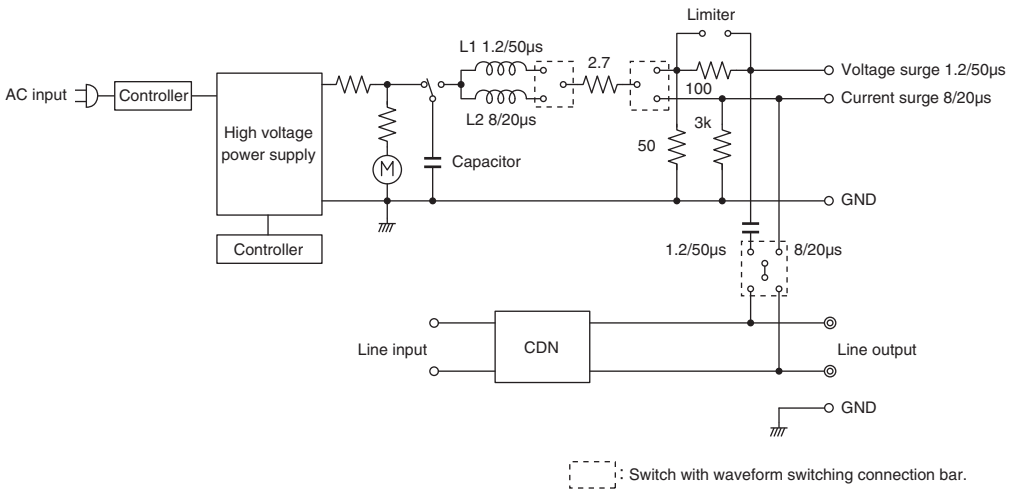
Provides dielectric strength test for electronic equipment connected to electric power systems, and specifies test voltage and object circuits for purpose of protection of electric facilities.

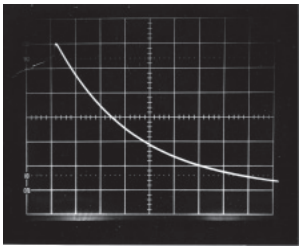
■ Examples of Surge Injection to Power Lines

In low voltage control dielectric test method, test voltage induction and voltage resistibility test against lightning surge impulse specified in JEC-210 (The Institute of Electrical Engineers of Japan / Japanese Electrotechnical Committee), verify whether EUT can be resistible against the lightning impulses (Standardized 1.2/50μs) which test conditions are specified in the Standard and which are injected both to the positive and negative each 3 times.

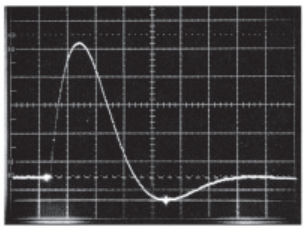
Circuit class NO.	Lightning impulse test voltage (V)				Object circuit
	To ground	Between inter electric circuit	Between contact points and between coil terminals: Instrument transformer	Between contact points and between coil terminals: DC/AC circuits	
1	7	4.5	4.5		Secondary and third circuits in instrument transformer which is used for main circuit (main unit side)
2A	7	3		3	Operation / Control circuits in breaker of disconnector used for main circuit
2B	5	3		3	
3	3	3		3	DC100-200V/AC100-400V circuits auxiliary equipment in main unit attached
4	4	4.5	3		Secondary and third circuits in instrument transformer of observation / protective relay / remote observation control board, etc.
5	4	3		3	DC100-200V/AC100-400V circuits in direct / protective relay / observation control board, etc.

Block Diagram and Waveforms





Voltage surge waveform 1.2/50μs
Voltage : 3 kV
V : 500 V / Div.
H : 20μs / Div.



Current surge waveform 8 / 20μs
Current : 2400 A
I : 500 A / Div.
H : 10μs / Div.

Voltage Dip & Swell Simulator

VDS-2002

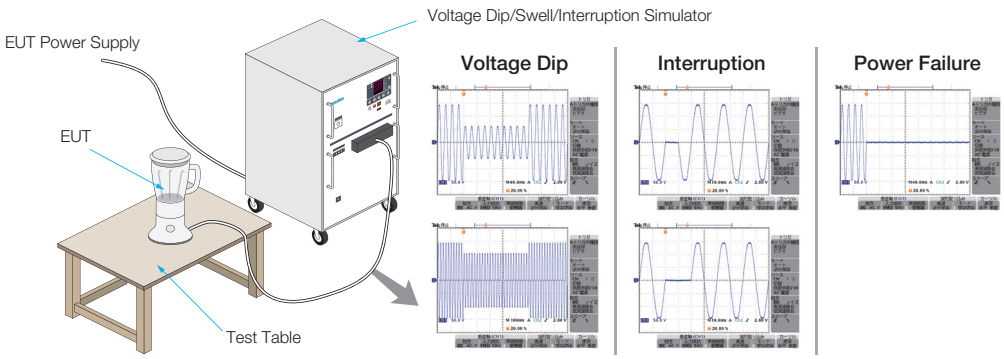
Features

Used to evaluate performance such as malfunctions and functional deterioration due to power supply voltage fluctuations in electronic and electrical equipment.
Simulates the phenomenon of voltage variations and momentary power failures in commercial power supplies (AC100/200V) and evaluates the resistance of electronic equipment.
In addition to the requirements of the international standard IEC61000-4-11, it is tested in all industries as a tolerance evaluation against voltage variations and instantaneous interruptions for electronic equipment.

- **Voltage dip & swell simulator conforming to EN/IEC61000-4-11 Ed.3 (2020) Standard.**
- **Multiple types AC plug receptacle on the front panel for easy connection of the EUT.**
- **Easy settings for the test parameters on the front panel (Voltage variations test is performed by software.).**
- **Realize flexible test conditions setting beyond the Standard with a PC remote control.**
- **Allows to conduct the interruption test in DC (DC 125 V / 16 A max).**

Specifications

Parameter			Specification		
Compliant Standard			IEC 61000-4-11 (1994)、IEC 61000-4-11 (2004)　at Output voltage 0 to 100%		
Number of Phases			Single Phase		
Test Modes	AC/DC Voltage Interruption test Sensing, direct mode		Cycle synchronous/asynchronous setting	PC setting	Short/Open modes selection during interruption
			Cycle synchronous setting	Main Unit setting	Short mode during interruption
	AC voltage dip and swell test Cycle synchronous/asynchronous setting		Cycle synchronous/asynchronous setting	PC setting	
			Cycle synchronous setting	Main Unit setting	
	AC voltage variations test Sensing mode		Cycle asynchronous setting	PC setting Main Unit setting (2s, 1s, 2s setting only)	
EUT	Input voltage range		AC90～264V 50/60Hz, DC0～125V　※3		
	Output voltage range		AC0V～input voltage+20%, DC0V～input voltage　AC290Vmax ※2		
Output VA rating			4.224kVA　(continuous)		
Output current capability	AC	100% of input voltage	16Arms　(continuous)		
		80% of input voltage	20Arms　(<5s)		
		70% of input voltage	23Arms　(<5s)		
		40% of input voltage	40Arms　(<5s)		
	DC		16A　(continuous)		
MAX Output current capability		AC100～120V	250A peak Output voltage 100%, <10ms in direct mode		
		AC220～240V	500A peak Output voltage 100%, <10ms in direct mode		
Load regulated Output voltage variation		100% of input voltage 0 –16 Arms	<5%		
		70% of input voltage 0 –23 Arms	<5%		
		70% of input voltage 0 –23 Arms	<5%		
		100% of input voltage 0 –40 Arms	<5%		
Overshoot / undershoot			<5%　100 ohm loaded in the Sensing Mode		
Rise time / fall time			1～5μs　100 ohm loaded		



VDS-2002

Parameter				Specification
BASE VOLTAGE	Percent Setting	PC setting		(4%)～120% percentage with a minimum value of 10V ※1 ※2
		main unit setting		100% ※1
	Voltage Setting	PC setting		10～290V (0V～input voltage+20%) 5Vstep ※2 arbitrary setting 1V step
	Accuracy			±5V Output current 0 to 16A
TEST LEVEL (Interruption, dip, swell)	Percent Setting	PC setting	Short/Open selectable for 0%	0～120% ※1
		main unit setting	Short/Open selectable for 0%	0, 40, 70, 80, 120% 5V step ※1
	Voltage Setting	PC setting	Short/Open selectable for 0%	0～290V (0V～5V step+20%) 5V step ※2 arbitrary setting 1V step
	Accuracy			±5V Output current 0 to 16A
REPEAT COUNT	No. of Events setting	PC setting		1-1000 or continuous (0) 1 event step
		main unit setting		1, 3, 5, 10, 30, 50, 100、or continuous(Cnt) 8 steps
INTERVAL CYCLES	CYCLE Setting	Synchronous	PC setting	0.5～5000.5 CYCLE 0.5 CYCLE steps
			main unit setting	1, 3, 5, 10, 30, 50, 100, 300, 500 CYCLE、and 10s 10 steps
	s Setting	Synchronous	PC setting	1～100s 1s steps
	m s Setting	Asynchronous		8.3～100000.0ms(100s) 0.1ms steps
	s Setting	Asynchronous		1～36000s(10h) 1s steps
DIP CYCLES (voltage interruptions, dip cycles)	CYCLE Setting	Synchronous	PC setting	0.01～5000 CYCLE 0.01 CYCLE steps
			main unit setting	0.5, 1, 5, 10, 12, 25, 30, 50, 250, 300 CYCLE 10steps
	m s Setting	Synchronous	PC setting	0.1～100000.0ms (100s) 0.1ms steps
	m s Setting	Asynchronous		0.1～100000.0ms (100s) 0.1ms steps
	s Setting	Asynchronous		1～36000s(10h) 1s steps

Parameter				Specification
DIP PHASE (voltage interruptions, dip starting phase)	Phase Angle setting	Synchronous	PC setting	0～360° 1° steps
			main unit setting	0, 45, 90, 135, 180, 225, 270, 315, 360° 9 steps (45° steps)
	Time Setting		PC setting	0～19.9ms 0.1ms steps 50Hz
				0～16.6ms 0.1ms steps 60Hz
Voltage Variations Test	PC setting	Asynchronous	PC setting	0.1s～10s 0.1s steps output voltage 0～120%
Memory capacity			PC setting	Up to 10 tests can be programmed and stored as long as the recording media such as PC HD, FD, etc. allow.
			main unit setting	5 tests
Input voltage from EUT				AC100～240V±10% 50/60Hz
Interface				Optical interface Optional optical converter RS-232 or USB selection
Operating temperature				15～35℃
Operating humidity				25～75%R.H. (no condensation)
External dimensions / Weight				(W)430×(H)745×(D)600mm (excluding protrusions) / approx.150kg
Power consumption				120VA (AC100～240V 50/60Hz)

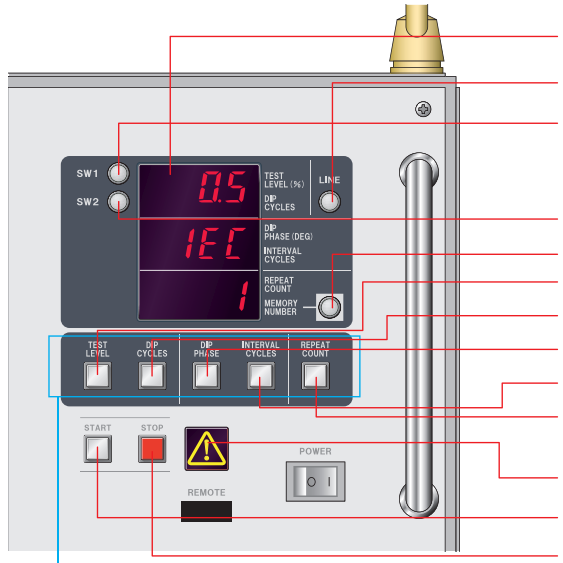
※1：percent against input voltage

※2：not compliant to IEC 61000-4-11(1994) and IEC 61000-4-11 Ed2 (2004) , ed.3 (2020) Standards when voltage output is >100%

※3：The input voltage must be free of distortion and voltage variations.

VDS-2002

Front Panel



Digital indicator : Indicates test level / Dip cycle / Dip phase / Interval / Number of tests

LINE switch : ON / OFF of power supply to EUT

SW1 monitor switch : Output the input voltage (base voltage) in LINE ON state. Switching between Sensing mode (Correction of voltage fall due to load variation) and Direct Mode (Outputs the input voltage constantly) by press-and-hold operation

SW2 monitor switch : Indicates test level (Set % value for input voltage) in LINE ON state

Memory number switch : Memorizes up to 5 test patterns

Test level switch : Sets test level

Dip cycle switch : Sets time from start of dip or swell and its finish

Dip phase switch : Sets phase angle from start of dip or swell and its finish

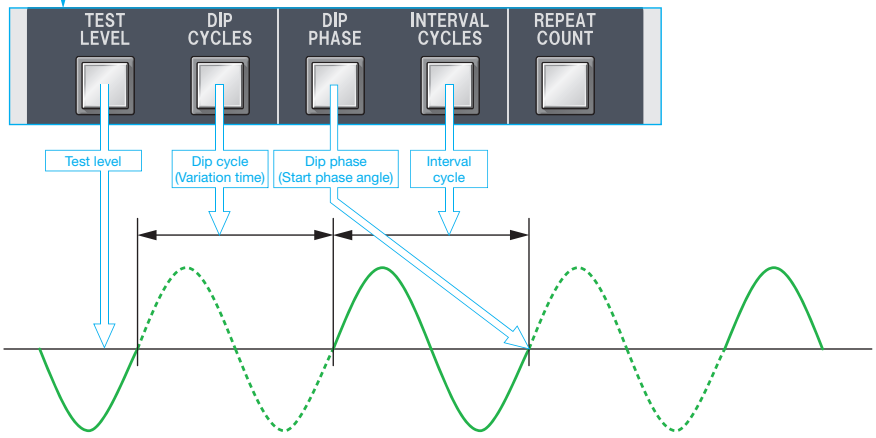
Interval cycle switch : Sets repetition cycle

Repeat switch : Sets the number of tests

Warning lamp : Turns on in LINE on state. Blinking in START of tests

START switch : Starts the test. Impossible to do without LINE ON.

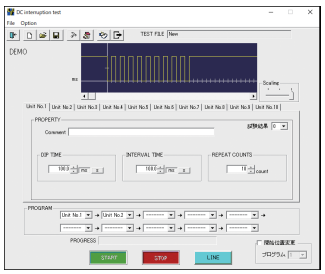
STOP switch : Stops the test. Does not LINE OFF.

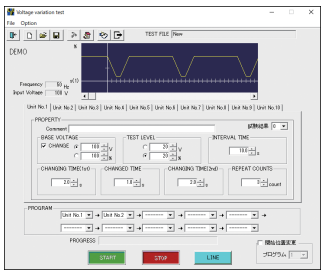


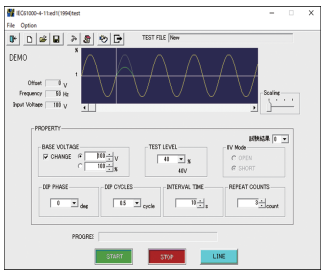
■Options

Software (VDS-2002-PC) MODEL : 14-00036A

Allows standardized test settings and user-defined test settings.
In addition to the IEC test level, there are various setting items such as dip-up cycle, repetition cycle, interval cycle, etc., which greatly supports voltage fluctuation testing.







USB Optical Module Kit MODEL : 07-00022A

Connection adaptor used for PC remote control of the simulator.
USB optical conversion, equipped with 5m optical fiber cable

IEC61000-4-11 Ed.3 Test Standard Overview

1. General

Immunity test standard for electrical / electronic equipment which are connected to low voltage power supplies networks whether they are malfunctioned or resistible against voltage dips, short interruptions or voltage variations.
Power capacity of equipment under the test (EUT) shall be 16A per phase. This standard applies to equipment connected to 50/60 Hz AC supply network and does not apply to equipment operating on 400Hz AC.

2. Test Level

- The voltages in this standard use the rated voltage for the equipment (UT) as a basis for voltage test level specification.
- if the voltage range does not exceed 20 % of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for the test level specification (U_T).

1. Voltage dips and short interruptions

Table 1 – Preferred test level and durations for voltage dips

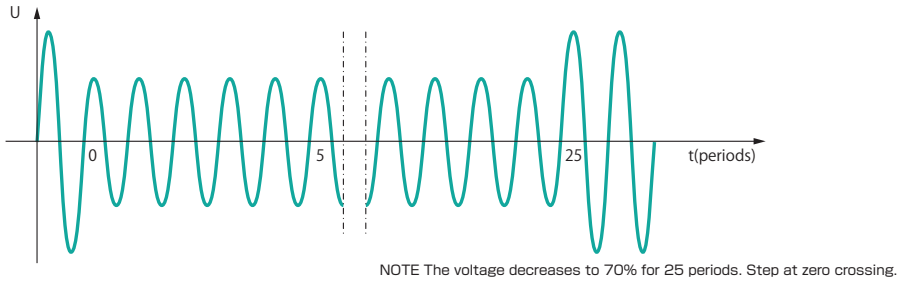
Class[a]	test level and durations for voltage dips (ts) (50 Hz / 60 Hz)				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0% during 1 / 2 cycle	0% during 1 cycle	70% during 25 / 30[c] cycles		
Class 3	0% during 1 / 2 cycle	0% during 1 cycle	40% during 10 / 12[c] cycle	70% during 25 / 30[c] cycle	80% during 250 / 300[c] cycle
Class X[b]	Special	Special	Special	Special	Special

a. Classes as per IEC 61000-2-4 ; see Annex B
b. Class x can be any level determined by consent between the EUT manufacturer and the simulator supplier
c. “25 / 30 cycle” means “25 cycles for 50 Hz test” and “30 cycles for 60 Hz test”
* Each dip% shall be voltages against the rated voltages

Table 2 – Preferred test level and durations for short interruptions

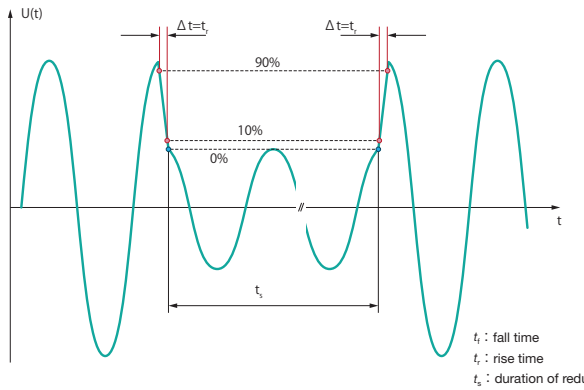
Class	Test level and durations for short interruptions (ts) (50 Hz / 60 Hz)
Class 1	Case-by-case according to the equipment requirements
Class 2	0% during 250 / 300* cycle
Class 3	0% during 250 / 300* cycle
Class X	Special

a. Classes as per IEC61000-2-4 ; see Annex B
b. Class x can be any level determined by consent between the EUT manufacturer and the user
c. “250/300 cycle” means “250 cycles for 50 Hz test” and “300 cycles for 60Hz test”

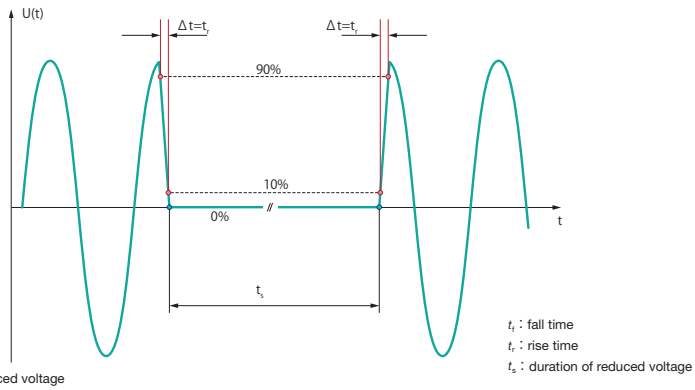


NOTE The voltage decreases to 70% for 25 periods. Step at zero crossing.

Voltage dip - Example: 70% voltage dip sine wave graph



Voltage dip - Example: 40% voltage dip sine wave graph at 90°



Short interruption

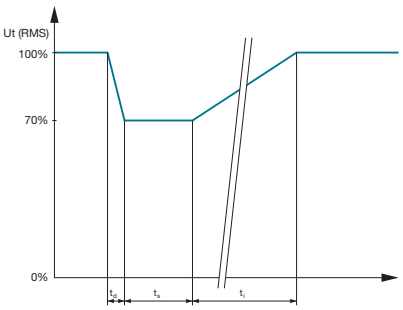
IEC61000-4-11 Ed.3 Test Standard Overview

2. Voltage variations (Optional)

Table 3 – Timing of short-term voltage variations

Voltage test level	Time for decreasing voltage (td)	Time at reduced voltage (ts)	Time for increasing voltage (ti)
7 0 %	Abrupt	1 cycle	25/30 cycles
X	Special	Special	Special

*** Class × can be any level determined by consent between the EUT manufacturer and the simulator supplier**
*** "25/30 cycle" means "25 cycles for 50Hz test" and "30 cycles for 60Hz test"**

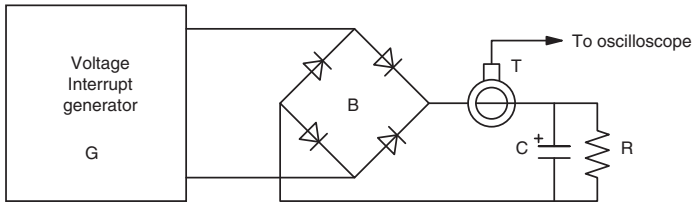


t_d : Time for decreasing voltage
t_s : time at reduced voltage
t_i : time for increasing voltage

3. Characteristics and performance of the generator

Output voltage at no load	As required in Table 1, ±5% of residual voltage value
Voltage change with load at the output of the generator	
100% output, 0 A to 16 A	Less than 5 of U_T
80% output, 0 A to 20 A	Less than 5 of U_T
70% output, 0 A to 23 A	Less than 5 of U_T
40% output, 0 A to 40 A	Less than 5 of U_T
Output current capability	16A r.m.s per phase at rated voltage. The generator shall be capable of carrying 20A at 80% of rated value for a duration of 5s. It shall be capable for carrying 23A at 70% of raged voltage and 40A at 40% rated voltage for a duration of 3s. (This requirement may be reduced according to the EUT rated steady-state supply current. See Clause A. 3).
Peak inrush current capability (no requrement for voltage variation tests)	Not to be limited by the generator. However, the maximum peak capability of the generator need not exceed 1000 A for 250 V to 600 V mains, 500 A for 200 V to 240 V mains, or 250 A for 100 V to 120 V mains.
Instantaneous peak overshoot / undershoot of the actual voltage, generator loaded with 100 Ω resistive load	Less than 5% of U_T
Voltage rise (and fall) time tr (and tf) see Figures 1b) and 2, during abrupt change, generator loaded with 100 Ω resistive load	Between 1μs and 5μs
Phase shifting (if necessary)	0° to 360°
Phase relationship of voltage dips and interruptions with the power frequency	Less than ± 10°
Zero crossing control of the generators	± 10°

EUT Peak Inrush Current requirement



Circuit for determining the inrush current drive capability of the short interruptions generator

Components

G	**voltage interrupt generator, switched on at 90° and 270°**
T	**current probe, with monitoring output to oscilloscope**
B	**rectifier bridge**
R	**bleeder resistor, not over 10000 Ω or less than 100 Ω**
C	**1700 μF ± 20% electrolytic capacitor**

In order to be able to use a low-inrush drive current capability generator to test a particular EUT, that EUT's measured inrush current shall be less than 70% of the measured inrush current drive capability of the generator.

IEC61000-4-11 Ed.3 Test Standard Overview

4. Test Setup

The test shall be performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer. If no cable length is specified, it shall be the shortest possible length suitable to the application of the EUT.

5. Test Procedure

Execution of the test

- The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips / interruptions with intervals of 10s minimum (between each test event).
- Each representative mode of operation shall be tested.
- For voltage dips, changes in supply voltage shall occur at zero crossings of the voltage, and at additional angles considered critical by product committees or individual product specifications preferably selected from 45°, 90°, 135°, 180°, 225°, 270° and 315°on each phase. For short interruptions, the angle shall be defined by the product committee as the worst case. In the absence of definition, it is recommended to use 0°for one of the phases.
- For voltage variations (Optional), the EUT is tested to each of the specified voltage variations, three times at 10s interval for the most representative modes of operations.

Climatic and Electromagnetic Conditions

Ambient temperature	15℃ ～ 35℃
Relative humidity	25% ～ 75%
Atmosopherical pressure	86 kPa ～ 106 kPa (860 hPa (mbr) ～ 1060 hPa (mbr))
Electromagnetic environment	Level which does not affect the test result

6. Evaluation of Test Results and Test Report

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product. The recommended classification is as follows:

1) Normal performance within limits specified by the manufacturer, requestor or purchaser;
2) Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention;
3) Temporary loss of function or degradation of performance, the correction of which requires operator intervention;
4) Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

Generally, as far as the EUT can be immune to the surges which is injected in the all specified period and it satisfy the functional requirements according to the product specification, the test result can be judged as “Good”.
The test report shall contain the test conditions and the result.

Notes: This test set-up is quoted from IEC61000-4-11 Ed.3.0 (2020) Standard.
Please refer to the Standard if more details are required.

Damped oscillatory wave simulator

SWCS-931SD

The damped oscillatory wave simulator simulates the fast-repeating, high-frequency noise that occurs when switches turn on and off, and evaluates the resistance of electronic and electrical equipment.
Higher reliability and accuracy have been realized comparing to the previous model with adaption of the semiconductor switch.

- **A maximum output voltage of 1.5 kV.**
- **Repetition frequency variable from 0.4 Hz to 400 Hz.**
- **Output resistance variable from 50 to 200 Ω (10Ω step).**

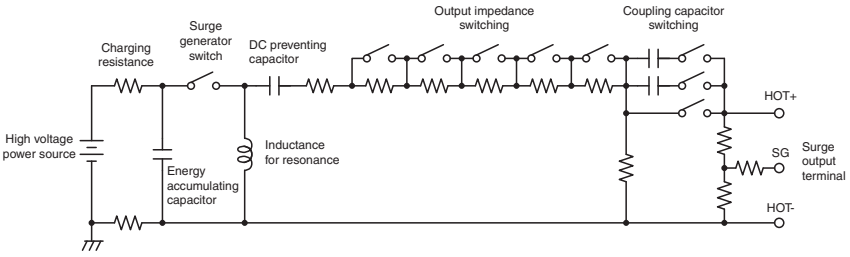
Specification

Parameter	Specification
Output waveform	Damped oscillatory wave
Output voltage	100 V ～ 1500 V
Polarity	Positive (1st wave) or negative (short bar switching)
Oscillatory frequency	1.5 MHz ± 0.2 MHz
Time to half-value peak	10μs ± 20 % (0.1 kV ～ 1.0 kV) 10μs ± 40 % (1.0 kV ～ 1.5 kV)
Output impedance	50 ～ 200 Ω (10 Ω pitch set possible)
Repetition cycle	0.4 ～ 400 Hz (3-stage switching, continuously variable)
Injection time	1s ～ 10min. or continuous
Coupling capacitor	100 pF / 470 pF
EUT power capacity	–
Power supply	AC 100 ～ 240 V 50 / 60Hz
Dimensions	(W) 430 x (H)200 x (D)400 mm
Weight	Approx. 7 kg

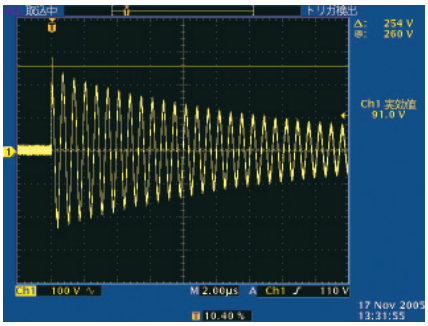
Accessories

Item	Q'ty
Accessories bag	1 pc.
Instruction manual	1 volume
Power cable	1 pc.
Short bar	1 pc.

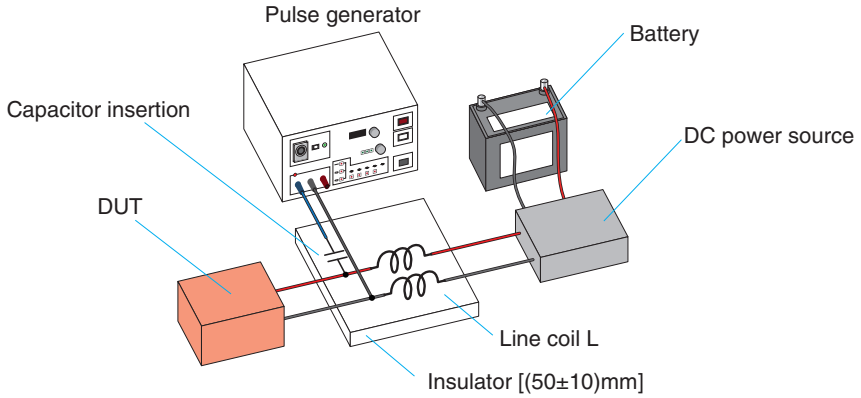
Internal Circuit



Output Waveform



Test Setup

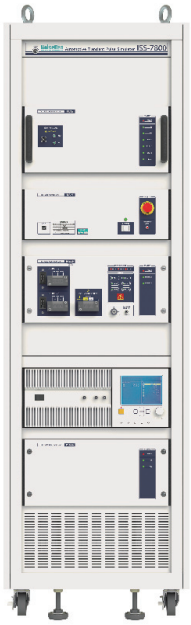


Test procedure example using the damped oscillatory wave simulator

① Place the main simulator unit (hereinafter referred to as the Main unit) onto the outside of the ground reference plane.
② Connect the included power supply cable to AC IN on the backside of the Main unit.
③ Connect the DUT connection cables to HOT and GND terminals of the Main unit (insert a capacitor to HOT side), and connect the other side of the cables are to the testing harnesses. * The connection cables to be prepared by the user.
④ Set the injection voltage and other parameters of the controller part of the Main unit's front panel and start the test.

ISO Standard Automotive Transient Surge Simulator

ISS-7800 series



For a secure and safe mobility society

The ISS-7800 series simulators output transient surges required by the International Standard ISO-7637 for verifying the noise immunity tolerance of automotive electronic devices.

- Perform testing in compliance with ISO 7637-2 and ISO 7637-3 Standards.
- Perform tests for 12V / 24V systems.
- Pulses 2b and 4 can be output by incorporating BP4610.
- Compatible with ISO 16750-2 2012 Ed. Load dump Test A/B (ISS-7820/7821).
- Compatible with many individual manufacturer standards.
- Mounted on a space-saving vertical rack.
- A wide range of optional accessories such as coupling clamps and waveform verification equipment is available.
- PC control software (included) allows setting of individual test sequences.
- Integrated PC Software with an intuitive user-friendly interface.

Contact our sales representative for more details.

Product image for illustration purpose only.

System overview

The ISS-7800 series is a test system with different pulse units mounted on a single rack. Additional pulse units (such as 5a/5b and slow pulse +/-) can be added to the rack if necessary. Sequence testing and report creation is available by controlling the entire system with the PC Software.

MODEL	ISO 7637-2					ISO 7637-3			
	2011 edition			2004 edition		2007 edition			
	Pulse 1/2a	Pulse 2b ※1	Pulse 3a/3b	Pulse 4 ※1	Pulse 5a/5b	Fast Pulse a	Fast Pulse b	Slow Pulse +	Slow Pulse −
ISS-7810	○	○	○	○	—	○	○	—	
ISS-7820	○	○	○	○	○	○	○	—	
ISS-7821 ※2	○	○	○	○	○	○	○	○	

※1: BP4610 is required to output 2b and 4 Pulse waveforms.

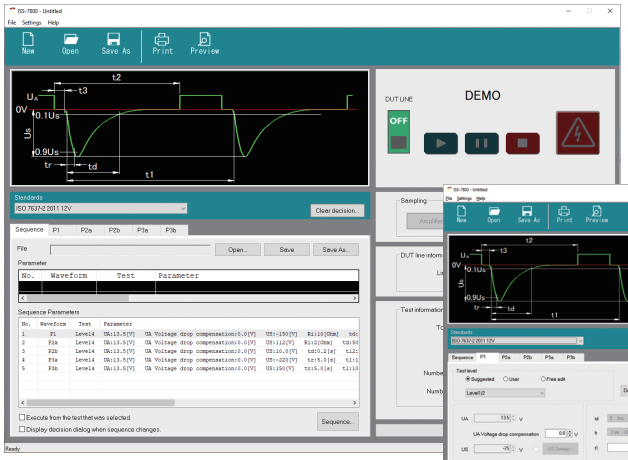
※2: ISS-7821 also has Pulse 1bis equipped.

USB Cable

Windows PC

Automotive Transient Surge Simulator
MODEL : ISS-7821

Remote control software



Sequence testing

Sweep function

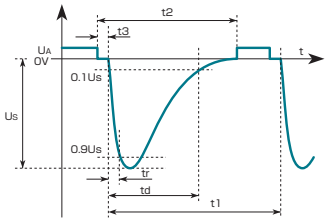
ISS-7800 Series System Image

ISS-7800 series

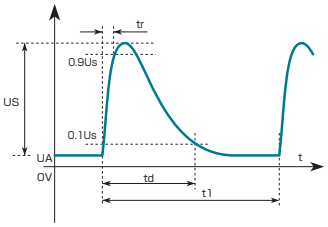
Specifications

Test Pulse Generator Unit P1/2a

Parameter	Specifications		
	Pulse 1 (12V)	Pulse 1 (24V)	Pulse 2a (12V / 24V)
Output voltage (Us)	−10V ～ −330V Step −1V	−20V ～ −600V Step −1V	20V ～ 330V Step 1V *setting available from 12V
Output impedance (Ri)	4、10、20、30、50、90Ω	10、20、30、50、90Ω	2、4、10、20、50、90Ω
Pulse width (td)	1、1.75、2、6ms		0.05、1、2ms
Rise time (tr)	1(+0/-0.5)、2(+0/-1.0)、3(+0/-1.5)μs		1(+0/−0.5)μs
Pulse repetition time (t1)	0.5s ～ 99s Step 0.1s		0.2s ～ 99s Step 0.1s



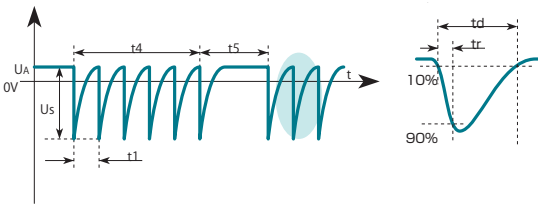
pulse 1



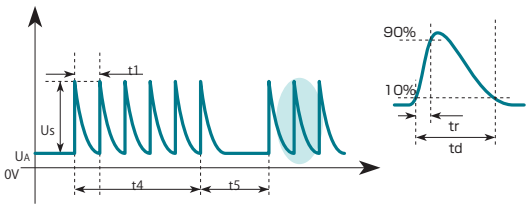
pulse 2a

Test Pulse Generator Unit P3a/3b & CDN

Parameter	Specifications	
	Pulse 3a (12V・24V)	Pulse 3b (12V / 24V)
Output voltage (Us)	−10V ～ −350V Step −1V	10V ～ 350V Step 1V
Output impedance (Ri)	50Ω	
Pulse width (td)	0.15 (±0.045) μs	
Rise time (tr)	5 (±1.5) ns、3.5ns max	
Pulse repetition time (t1)	10μs ～ 1000μs Step 1μs	
DUT power capacity	DC60V / 50A	



pulse 3a

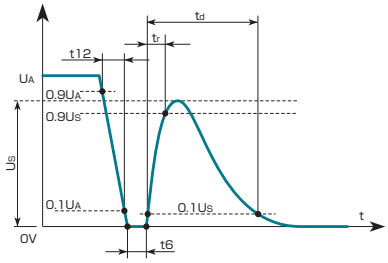


pulse 3b

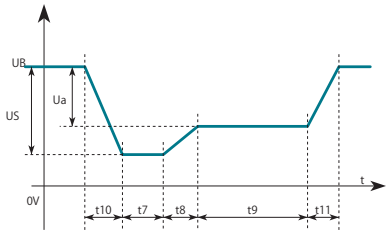
Bipolar Power Supply BP4610 P2b/4

Parameter	Specifications
	Pulse 2b (12V・24V)
UA、US	0V ～ 60V Step 1V
Ri	0Ω ～ 0.05Ω
td	0.1s、0.2s、0.5s、1s、2s、4s
t12、tr、t6	1ms、2ms、5ms

Parameter	Specifications
	Pulse 4 (12V・24V)
UB	0V ～ 60V Step 1V
Us、Ua	0V ～ 60V Step 1V (less than UB)
Ri	0Ω ～ 0.02Ω
t7、t8、t10、t11	1ms ～ 999ms Step 1ms
t9	0.1s ～ 99.9s Step 1ms



pulse 2b

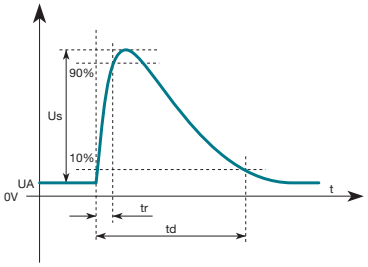


pulse 4

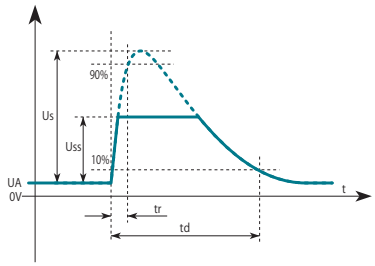
ISS-7800 Series

Test Pulse Generator Unit 5a/5b ※ Tentative Specifications

Parameter	Specifications		
	Pulse 5a (12V)	Pulse 5a (24V)	Pulse 5b (12V / 24V)
Output voltage (Us)	30V ～ 200V		
Output voltage (Uss)	—		15V ～ 100V
Output impedance (Ri)	0.5Ω ～ 40Ω		
Pulse width (td)	40ms ～ 400ms		
Rise time (tr)	5ms ～ 10ms		



pulse 5a

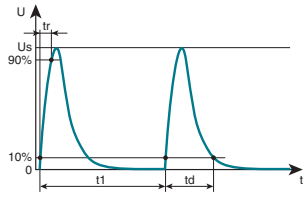


pulse 5b

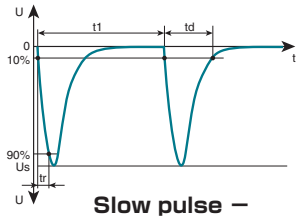
Test Pulse Generator Unit Slow pulse +/- ※ Tentative Specifications

Parameter	Specifications	
	Slow Pulse +	Slow Pulse -
Output voltage (Us)	5V ～ 100V	−5V ～ −100V
Output impedance (Ri)	2Ω	
Pulse width (td)	50μs	
Rise time (tr)	1(+0/−0.5)μs	

**Contact our sales representative for more details.*



Slow pulse +

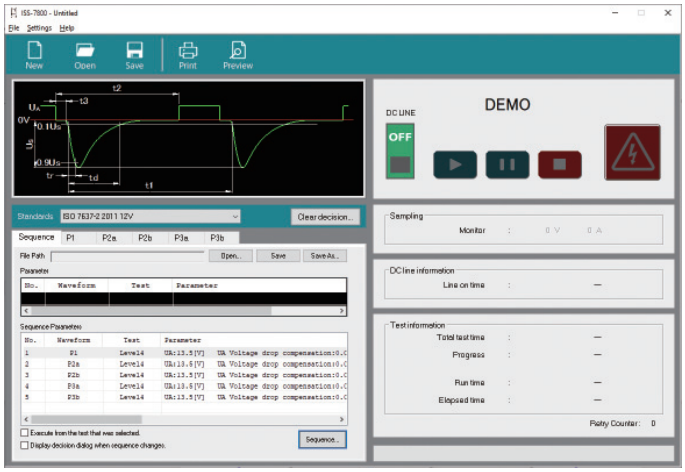


Slow pulse −

Remote control software

PC Control Software for ISS-7800 series allows testing for each test pulse required by the Standard. Sequence testing that combines different test pulses and test levels in any order is available. Sweep test setting for surge voltage, internal impedance and pulse width parameters is available.

Sequence testing



Combine test pulses and test levels in any order.

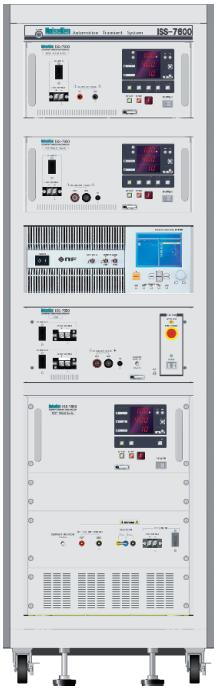
Sweep function

Sweep settings for surge voltage and internal impedance available.

ISO Standard Compliant Automotive Transient Surge Simulator

ISS-7600 Series

This tester simulates various transient surge phenomenon noise in vehicles required by the international standard ISO 7637-2 (2011 version) and evaluates the resistance of on-board electronic devices.



- Highly accurate output waveforms.
- Waveforms guaranteed not only at the output terminal of each generator but also at the output terminal of the Coupling Network.
- Capable of running either as a system or as individual generators.
- PC Remote Control Software can control ISS-7600 through USB interface connection.
- Supports 12 V / 24 V / 42 V systems.
- 60 V / 50 A big volume Coupling Networks available.
- Up to 200 A Power supply available.
- Electric shock-free safety plugs are used for every output terminal.
- Load resistors meeting the loading conditions (specified in Annex D of the standard) for the verification of the output characteristics optionally available.
- Equipped with a high accuracy current monitor. An oscilloscope allows measurement of the current waveform flowing into the DUT. Current and voltage waveforms can be examined at the same time with an oscilloscope because the current monitor output circuit is floating with respect to the SG and FG. The monitor's frequency response characteristic is from DC to 150 kHz.
- Japanese software is also available.

* Private standards or specifications by manufactures can be responded upon request.

Pulse 1 / 2a Generator

ISS-7610

Pulse 1 : Simulation of transients due to supply disconnection from inductive loads. It is applicable to DUTs which, as used in the vehicle, remain connected directly in parallel with an inductive load.

Pulse 2a : Simulates transients due to sudden interruption of currents in a device connected in parallel with the DUT due to the inductance of the wiring harness.

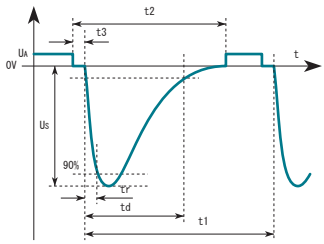
- Compliant tests to ISO 7637-2 (2011) Standard (Pulse1/Pulse2a generator)
- Stand-alone usage possible with 60V 30A CDN built-in.

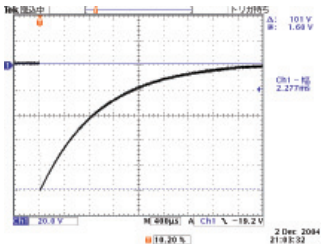
Parameter	Specification (Pulse 1)	Specification (Pulse 2a)
Output voltage (Us)	-5 V ～ -720 V (-1 V step)	5 V ～ 300 V (1V step)
Output impedance (Ri)	10 Ω, 30 Ω, 50 Ω	2 Ω, 4 Ω, 10 Ω, 30 Ω, 50 Ω
Pulse width (td)	50μs, 200μs, 300μs, 500μs, 1ms, 2ms	50μs, 200μs, 300μs, 500μs
Rise time (tr)	1μs : -0.5μs /+0μs 3μs : -1.5μs /+0μs	1μs : -0.5μs /+0μs
Pulse repetition period (t1)	0.5s ～ 99.9s (0.1s step), P2a : 0.1s ～ 99.9s (0.1s step)	
DUT power capacity	DC 60 V / 30A	
Dimensions	(W)430 × (H)200 × (D)522 mm	
Weight	Approx. 20 kg	Power consumption 260 VA

Parameter	Q'ty
Output cable (2 m)	Each 1 pc. of red & black color one
DC input cable (2 m)	1 pc.
Short lead for waveform verification	1 pc.
Interlock plug	1 pc.
Fuse (3.15 A)	2 pcs.
AC cable	1 pc.
Instruction manual	1 volume

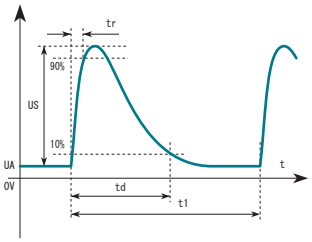
Output waveform

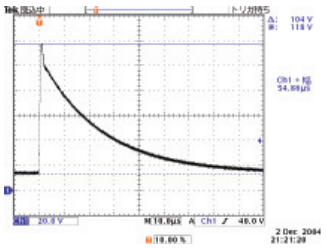
pulse1





pulse2a





ISS-7600 Series

Pulse 3a / 3b Generator
ISS-7630

Simulation of transients which occur as a result of the switching processes. The characteristics of these transients are influenced by distributed capacitance and inductance of the wiring harness.

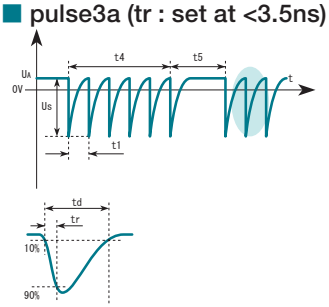
- **Compliant tests to ISO 7637-2 (2011) Standard (Pulse 3a/Pulse 3b generator).**
- **Stand-alone usage possible with 60V 30A CDN built-in.**
- **Frequency sweep (10 kHz - 100 kHz - 10 kHz) test possible (Option).**
- **Faster than 3.5ns rise time realized so as to conduct more severe test than the Standard.**

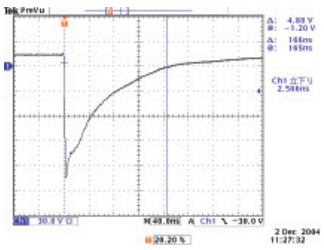
Parameter	Specification
Output voltage (Us)	-20 V ～ -350 V (-1 Vstep) 20 V ～ 350 V (1 Vstep)
Output impedance (Ri)	50 Ω
Pulse width (td)	150ns ± 45ns
Rise time (tr)	5ns ± 1.5ns, <3.5ns
Pulse repetition period (t1)	10μs ～ 999μs (1μs step) *1 kHz ～ 100 kHz Frequency sweep possible (option necessary)
DUT power capacity	DC60V/30A
Dimensions	(W)430 × (H)200 × (D)522 mm
Weight	Approx. 17 kg　Power consumption 110 VA

Parameter	Q'ty
Output cable (0.5m)	Each 1 pc. of red & black color one
DC input cable (2m)	1 pc.
BNC conversion adaptor	1 pc.
50Ω coaxial cable (BNC equipped)	1 pc.
G cable	1 pc.
Waveform verification lead	1 pc.
Interlock plug	1 pc.
Fuse (3.15A)	2 pcs.
AC cable	1 pc.
Instruction manual	1 volume

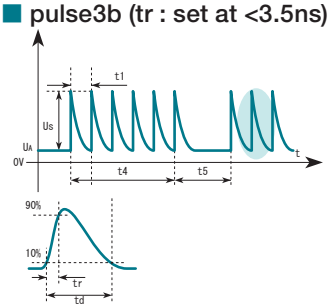
Output waveform

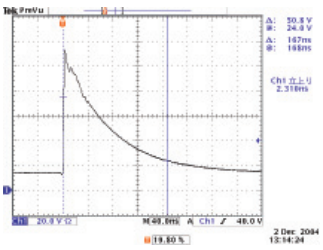
pulse3a (tr : set at <3.5ns)





pulse3b (tr : set at <3.5ns)



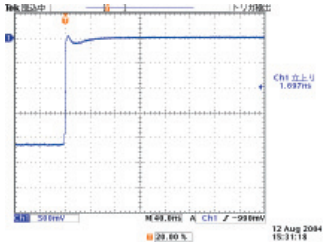


Difference of the impulse response among measurement probes

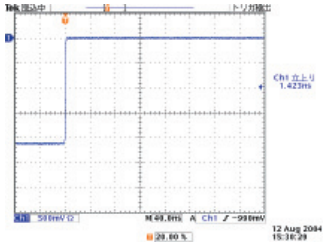
Since Pulse 3a / 3b contain high frequency components, the waveform measurement should be paid attention.
It can be done easily with the optional attenuator.

BNC conversion adaptor for the measurement

Attenuator in No-load (Option)



Measurement with a 100:1



Measurement with the NoiseKen no-load attenuator

Pulse 2b / 4 Generator

BP4610

Pulse 2b : Simulates transients from DC motors acting as generators after the ignition is switched off.
Pulse 4 : Simulates supply voltage reduction caused by energizing the starter-motor circuits of internal combustion engines.

- **Compliant tests to ISO 7637-2 (2011) Standard (Pulse 2b generator).**
- **Compliant to ISO 7637-2 (2004) Standard pulse 4 generator.**
- **± 60 V 10 A DC - 150 kHz bipolar amplifier built-in.**
- **Works as a power source replacing an external battery for testing with the other pulses.**
- **Expandable to be 15 A or 30 A upon addition of an optional external power supply.**

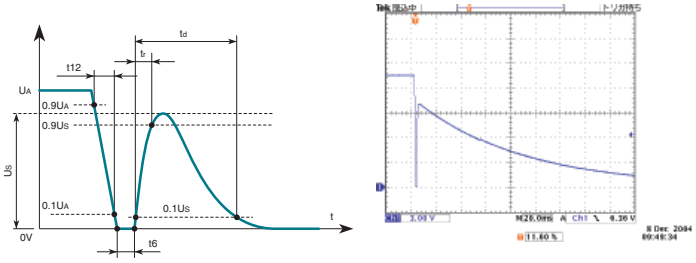
*** Requirement of 100 A / 200 A can be responded upon request.**
*** Optional software shall be necessary for putting Pulse 2b / 4 out.**

Parameter		Specification
Pulse 2b	UA, Us*	0 V ～ 60.0V ± 10% ± 0.5 V 0.1 V step
	Ri	0 Ω ～ 0.05 Ω
	Td	0.1s, 0.2s ,0.5s ,1s ,2s ,4s ±20%
	t12, tr, t6*	1ms ,2ms ,5ms ±50%
Pulse 4	UB	0 V ～ 60.0 V ± 10% ± 0.5 V 0.1 V step
	Us, Ua	0 V ～ -UB ± 10% ± 0.5 V -0.1 V step
	Ri	0Ω ～ 0.02 Ω (at shipment)
	t7, t8 ,t10 ,t11*	1ms ～ 999ms ± 10% 1ms step
	t9	0.1s ～ 99.9s ±1 0% 0.1s step
Dimensions		(W)430 × (H) 177 × (D)550 mm
Weight		Approx. 26 kg Power consumption 1200 VA

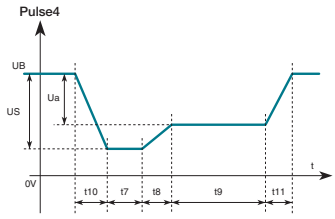
***Each parameter can be set individually.**

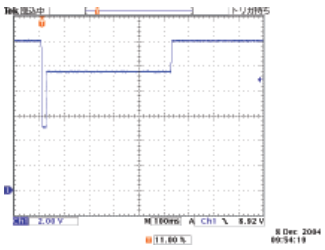
Output Waveform

pulse2b



pulse4





Pulse 5a / 5b Generator

ISS-7650

Pulse 5a : Simulation of load dump transient, occurring in the event of a discharged battery being disconnected while the alternator is generating charging current and with other loads remaining on the alternator circuit at this moment.
Pulse 5b : Simulation of the above load dump transient when a Zener diode is inserted to the battery route.

- **ISO 7637-2 (2004) compliant pulse 5a.**
- **Pulse 5a and Pulse 5b generating unit.**
- **A built-in 60 V / 30 A Coupling Network allows independent operation.**
- **Equipped with a programmable clip circuit that can produce Pulse 5b clipped waveform in steps of 0.1 V without externally attaching a zener diode.**

***The ISO standard requires pulse 5a and 5b have the same value for their td. Due to the effects of the integrated clip circuit, pulse 5b width is different from that of pulse 5a. Pulse 5b non-compliant to ISO 16750 (2012) Test B.**

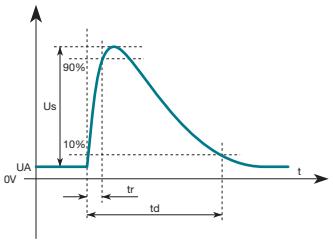
ISS-7600 Series

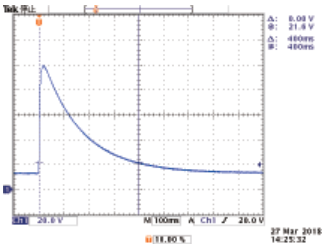
Parameter	Specification	
Pulse5a	12 V system	24 V system
Output voltage (Us)	20 V ～ 100 V (0.5 V step)	20 V ～ 200 V (0.5 V step)
Output impedance (Ri)	0.5 Ω ～ 8 Ω (0.5 Ω step)	1 Ω ～ 8 Ω (0.5 Ω step)
Pulse width (td)	40ms, 100ms ,200ms, 350ms ,400ms	100ms ,200ms ,350ms ,400ms
Rise time (tr)	10ms (+0, -5ms)	10ms (+0, -5ms)
Pulse5b	12 V system	24V system
Output voltage (Uss)	10 V ～ 40 V (0.1 V step)	
Pulse width (td)	Td of pulse 5b is dependent on Us, Uss and Ri settings, the same value as pulse 5a td not available	
DUT power capacity	DC 60 V / 30 A	
Dimensions	(W)488 × (H)670 × (D)660 mm	
Weight	Approx. 100 kg	Power consumption150 VA (in stand-by) / 600 VA (in charging)

Parameter	Q'ty
Output cable (2 m)	Each 1 pc. of red & black color one
DC input cable (2 m)	1 pc.
Coaxial cable for current monitoring	1 pc.
DC coupling switching plug	1 pc.
Short lead for waveform verification	1 pc.
Interlock plug	1 pc.
Fuse (6.3 A)	2 pcs.
AC cable	1 pc.
Instruction manual	1 volume

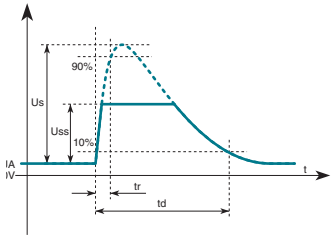
Output Waveform

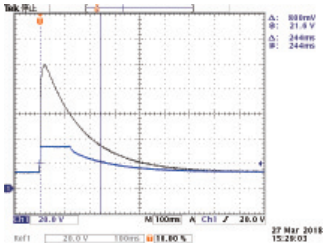
pulse5a





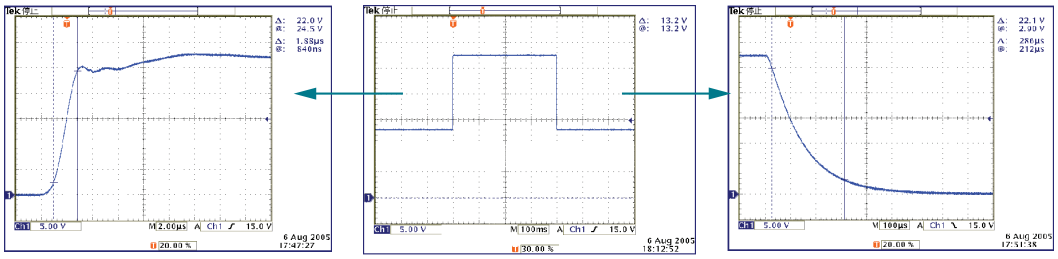
pulse5b





pulse5c (Customized waveform)

* Responded upon the particular request. If required, please contact us.



*1ms - 500ms (1ms)

Coupling Network & System Rack

ISS-7690 / ISS-7602

System rack that all pulse generating units can be mounted on (ISS-7602).
ISS-7690 Coupling Network unit centralizes all pulse outputs of the system-configured generators in the single output port.

- **Software selectable pulse generators and DC supplies.**
- **In addition to the built-in DC power supply (BP4610), two external power supplies (battery) connections are available.**
- **Switches three independent power supplies (BP4610 (LINE 1), LINE 2, LINE 3).**
- **A high speed DC interruption switch with < 1μs fall time capability is standard built-in.**
- **Equipped with a high accuracy current monitor.**
- **The pulse 3a and 3b waveforms meet the ISO standard specifications at the output ports of the Coupling Network Unit.**

Insure high frequency Pulse 3a / 3b waveforms which may be dulled due to the wiring length with the centralized CDN output port.

Parameter	Specification
DUT power capacity	60 V / 50 A
DC input	2 channels (Amplifier power supply & battery) *Including Pulse 2b, Pulse 4 and arbitrary waveform.
Pulse input	Pulse1, Pulse2a/2b ,Pulse3a/3b ,Pulse4, Pulse5a, Pulse5b
Interruption test	≦ 1μs (in DC interruption), Not switched in fluctuation of the interruption
Current monitor	Monitoring terminal (BNC)output 10m V/A (DC)150 kHz
System rack	(W)555 × (H)1800 × (D)790 mm

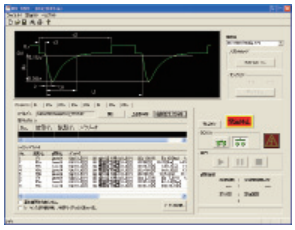
Control software

ISS-7601

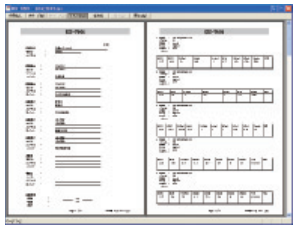
Comprehensive control software for the all pulse generators.

- Comprehensive control software for the all pulse generators.
- Enables to control the each pulse generator comprehensively.
- One touch output possible even in Pulse 2b and Pulse 4 whose waveforms assembly may be troublesome.
- Easy setting of the test conditions with its programming function.
- Reporting function available to realize the test conditions, comments as well as the result (Preview and print-out also possible).

Sequence setting screen



Preview screen for printing the test result out



Fast Pulse /Slow Pulse Generators

ISS-7630 / ISS-7610-N1229

The ISO 7637-3 2007 standard provides evaluation of the immunity of devices under test (DUTs) to transient transmission by coupling via lines other than supply lines. The test transient pulses simulate both fast and slow transient disturbances, such as those caused by the switching of inductive loads and relay contact bounce. Also it provides 3 kinds of the coupling methods.

ISS-7630 (Fast Pulse)

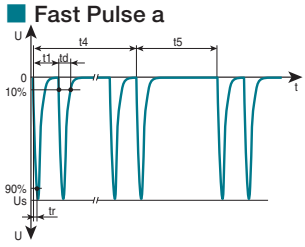
Parameter	Specification
Output voltage (Us)	-20 V ～ -350 V (-1 V step) 20 V ～ 350 V (1 V step)
Output impedance (Ri)	50 Ω
Pulse width (td)	150ns ± 45ns
Rise time (tr)	5ns ± 1.5ns, < 3.5ns
Pulse repetition period (t1)	10μs ～ 999μs (1μs step)
DUT power capacity	DC 60V / 30 A
Dimensions	(W)430 × (H)200 × (D)522 mm
Weight	Approx. 17 kg　Power consumption 110VA

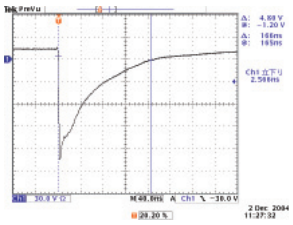
ISS-7610-N1229 (SLOW Pulse)

Parameter	Specification
Output voltage (Us)	5 ～ 50 V (0.1 V step) -5 ～ -50 V (-0.1 V step)
Output impedance (Ri)	2 Ω
Pulse width (td)	50μs ± 10μs
Rise time (tr)	1μs
Pulse repetition period (t1)	0.1 ～ 99.9s (0.1s step)
DUT power capacity	–
Dimensions	(W)430 × (H)200 × (D)522 mm
Weight	Approx. 20 kg　Power consumption 50VA

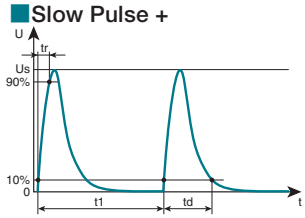
Output Waveform

Fast Pulse a

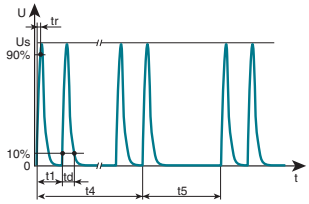


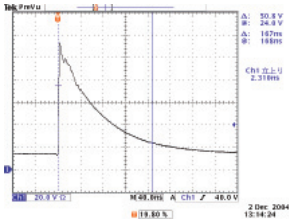


Slow Pulse +

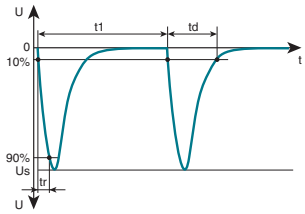


Fast Pulse b





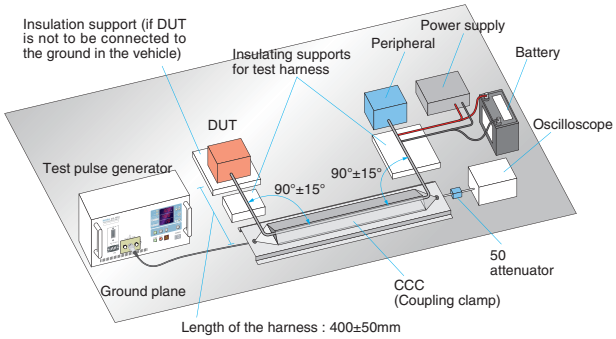
Slow Pulse –



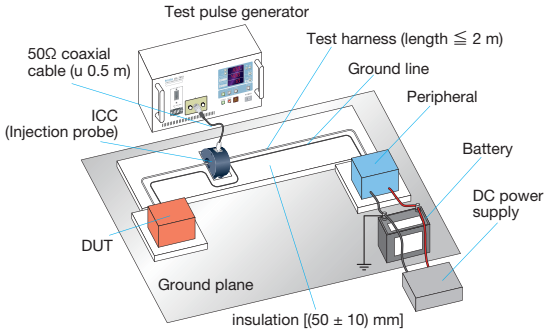
ISS-7600 Series

Test Setup (ISO 7637-3)

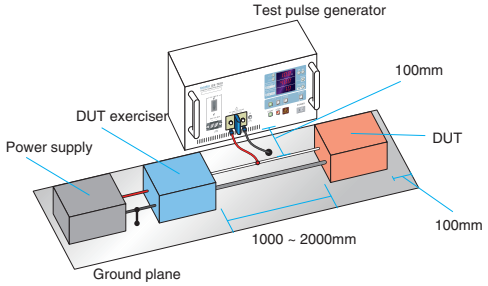
· Capacitive coupling clamp (CCC) method (Only for Fast Pulse)

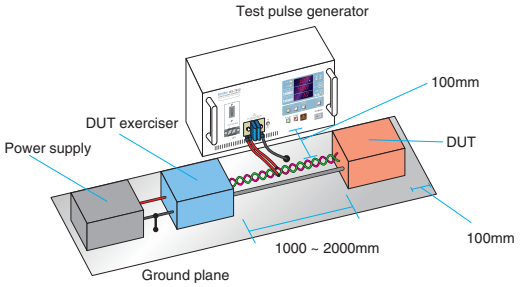


· Inductive coupling clamp (ICC) method (Only for Slow Pulse)



Direct capacitor coupling (DCC) method (For Fast Pulse and Slow Pulse)

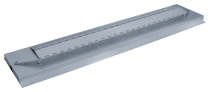




* DCC test setup for CAN bus.

Options

Coupling Clamp MODEL : ISS-7630-Cup



Coupling clamp for testing for lines other than supply lines. Capacitively couples 3a and 3b pulses into the lines under test.
Contents: Coupling clamp, BNC Coaxial cable 0.5m, BNC coaxial cable 0.1 m, 50Ω 5W terminator, Metal fasteners

● Compatible models : ISS-7630、ISS-7800 series

Injection Probe

Clamp used for the Inductive coupling clamp (ICC) test method provided in ISO 7637-3 Standard. Calibration fixture is also available.

Waveform Verification Set Model : 06-00059B

A set of resistor and attenuator for observing the pulse of Test Pulse 1 / Test Pulse 2a / Test Pulse 2b / Test Pulse 3a / Test Pulse 3b / Test Pulse 5a of ISS-7610, BP4610, ISS-7630, & ISS-7650.
1 Ω resistor, 2 Ω resistor, 10 Ω resistor, 50 Ω resistor, 2.5 k Ω 40 dB ATT, 50 Ω 20 dB ATT × 2

● Compatible models: ISS-7610, ISS-7630, ISS-7650

** resistors can be purchased separately*

Waveform Verification Set Model : 06-00095A

A set of resistor and attenuator for observing the pulse of Test Pulse 1 / Test Pulse 2a / Test Pulse 2b / Test Pulse 3a / Test Pulse 3b / Test Pulse 5a of ISS-7800 series.
1 Ω resistor, 2 Ω resistor, 10 Ω resistor, 50 Ω resistor, 2.5 k Ω 40 dB ATT, 50 Ω 20 dB ATT × 2

● Compatible models: ISS-7800 series

Waveform Verification Attenuator under No Load Conditions Model : 00-00007A

The attenuator for observing high frequency and high voltage pulses of Test Pulse 3a / Test Pulse3b of ISS-7630.
2.5 k Ω 40 dB ATT (Pulse 3a / Pulse 3b)

● Compatible models: ISS-7630、ISS-7800 series

50Ω Load Waveform Verification Attenuator Model : 00-00006B

The attenuator for observing high frequency and high voltage pulses of Test Pulse 3a / Test Pulse 3b of ISS-7630.
50 Ω 20 dB ATT × 2 (Pulse 3a / Pulse 3b)

● Compatible models: ISS-7630、ISS-7800 series

DCC BOX

- Inject pulse noise into the I / O signal line through a 100pF coupling capacitor regulated by ISO 7637-3.
- With a check terminal to check the pulse
- The pulse decoupling inductor can be attached to and detached from the sample (hereinafter referred to as EUT1 and EUT2).
- Since the pulse generator to the DCC BOX is a balanced transmission line and the DCC BOX to EUT 1 and EUT 2 is an unbalanced transmission line, a balanced / unbalanced balun is built in to suppress disturbance of the pulse waveform.

Warning Lamp MODEL : 11-00017A

Warning Lamp that can be used with the ISS-7800 series.
Allows to alert and call for attention by blinking during the test.

● Compatible models: ISS-7800 series

Tri-color pilot light MODEL : 11-00016A

Three-color indicator light that can be used with the ISS-7800 series.
Allows to alert and call for attention by blinking during the test.
The lights change in three colors in accordance with the test status.

● Compatible models: ISS-7800 series

JASO Standard Compliant Automotive Transient Surge Simulator

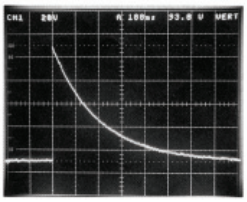
JSS series

Simulator to reproduce various transient surge phenomena which are generated in a vehicle and required in JASO D001-94 General Rules of Environmental Testing Methods for Automotive Electronic Equipment established by The Society of Automotive Engineers of Japan Standard, and evaluate the immune resistibility of the equipped electronics devices against the surge.

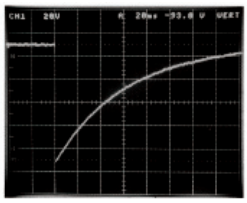
JSS-001

- **JASO D001-94 Standard compliant simulator.**
- **Applicable for 12 V / 24 V systems.**
- **One touch selection possible for the output surge waveform.**

Output Waveforms



A-1 Waveform
τ :200ms
V:20V/Div
H:100ms/Div



B-1 Waveform
τ :60ms
V:20V/Div
H:20ms/Div

Specifications

Parameter		Specification (JSS-001)	Specification (JSS-003-N2921)
Output voltage / RC Time constant / Output impedance / DC cut time			
	Type A-1	100V/200ms/0.8Ω / —	100V/200ms/0.8Ω / —
	Type A-2	150V/2.5μs/0.4Ω / —	150V/2.5μs/0.4Ω / —
	Type B-1	— 100V/60ms/8Ω /300ms	—100V/60ms/8Ω /300ms
	Type B-2	— 320V/2ms/80Ω /10ms	—320V/2ms/80Ω /10ms
	Type D-1		150V/400ms/1.5Ω / —
	Type D-2		200V/2.5μs/0.9Ω / —
	Type E		—400V/26ms/210Ω /120ms
Repetition frequency /number of pulses		30s/1 ～ 999999	30s/1 ～ 999999 ※ Type A-2,B-1,B-2,D-2 30s/2sec selectable
DUT power capacity		Max. DC50V/10A	Max.DC50V/10A
Dimensions		(W) 555 × (H) 1500 × (D) 790mm	(W) 555 × (H) 1800 × (D) 790mm
Weight		Approx.160kg	Approx.200kg

JASO D001-94

1.Conditions of Transient Voltage Test

Class	Type of test		Test conditions Vp (V)	τ (μs)	f (Hz)	R3 (Ω)	Number of pulses	Location of transient voltage impression
12V system	Type A	A-1	70	200000	–	0.8	1	Power supply terminal
		A-2	110	2.5		0.4	10	
	Type B	B-1	-80	60000	1/30	8	100	
		B-2	-260	2000		80		
	Type C		As agreed between the parties concerned				via agreement	Related Terminal
24V system	Type D	D-1	110	400000	–	1.5	1	Power supply terminal
		D-2	170	2.5	1/30	0.9	10	
	Type E		-320	26000		210	100	
	Type F		As agreed between the parties concerned				via agreement	Related Terminal

2.Constants in the Generating Circuits for Type A and Type D Transient Voltage Tests

Type of test		Capacitor voltage (V)	ResistorR1	ResistorR2 (Ω)	ResistorR3 (Ω)	ResistorR4 (Ω)	Capacitor C (μF)	Remarks
Type A	A-1	88	To be determined along power supply capacity for the charging	5 (100)	1 (100)	4 (100)	80000	Select the either combination
		70		2 (100)	0.8 (100)	∞	110000	
	A-2	110		0.6 (200)	0.4 (150)	∞	4.7	–
Type D	D-1	130		22 (100)	2 (100)	11 (100)	50000	Select the either combination
		110		5.5 (100)	1.5 (100)	∞	73000	
	D-2	170		1.2 (100)	0.9 (100)	∞	2.2	–

Remarks 1. Numbers in parenthesis are reference figures for resistor power rating. Unit: W 2 The specified values for resistors and capacitors shall be true values not designated values.

3.Constants in the Generating Circuits for Type B and Type E Transient Voltage Tests

Type of test		Capacitor voltage (V)	ResistorR1	ResistorR2 (Ω)	ResistorR3 (Ω)	ResistorR4 (Ω)	Capacitor C (μF)	Remarks
Type B	B-1	-100	To be determined along power supply capacity for the charging	50 (10)	10 (10)	40 (10)	2400	Select the either combination
		-80		20 (10)	8 (10)	∞	3000	
	B-2	-260		60 (5)	80 (5)	∞	33	–
Type E		-457		27 (100)	300 (10)	700 (10)	1000	Select the either combination
		-320		13 (100)	210 (10)	∞	2000	

Remarks 1. Numbers in parenthesis are reference figures for resistor power rating. Unit: W 2 The specified values for resistors and capacitors shall be true values not designated values.
* See the original document for the Figures.

FORD Standard Transient Pulse Generator

ISS-T1321

Simulator to generate Transient Pulse as required in FORD's EMC standard (EMC-CS-2009) for surge test onto automotive electronic devices. The generation waveforms are Pulse A1 / A2-1 / A2-2 / C1 / C2 surges standardized as RI130 & CI220, and Waveform F fluctuation standardized as CI260.

Basic specifications

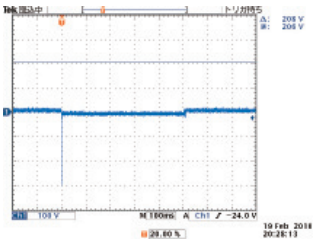
Parameter	Specification
DC Max Input Voltage	DC 13.5 V
DC Max Output Current	10 A・50 A (depends on waveform selection)
DC Input Breaker	50 A
Test Timer	1 ～ 999S (memorizes last test settings for up to 3 months)
Switching Relay	KUP-1415-12 (by Potter & Brumfield) displays the relaying accumulation * replacement recommended after 100 hours.
Emergency Stop	Red colored mushroom shape type. (push-lock-turn-reset type) Pulse output stop / DC output stop.
Power supply	AC 100 V–AC 240 V ± 10 %　50 VA
Dimensions	Approx. W430 mm × D322 mm × H 200 mm (protrusion excluded)
Weight	Approx. 12 kg

Output waveform and Current value

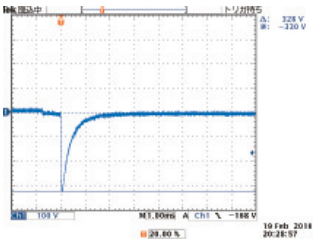
Test item	Output waveform	Mode	Required injection time *1	Max output current	Output terminal
RI130	A2-1	2	60s	*2	C, D terminals(BNC terminals)
		3			
	A2-2	2			
		3			
CI220	A1	1	120s	10	DC LINE OUT (C, D terminals are short circuited)
		2	20s		
	A2-1	1	20s		
		2			
		3			
	A2-2	2			
		3			
	C-1	2		50	
		3			
	C-2	2			
		3			
CI260	Waveform F	-	60s	10	DC LINE OUT (C, D terminals are open)

*1 : Injection times are variable.　*2: Direct connection to 15-N1583 coupling test fixture.

CI220 A1 MODE1

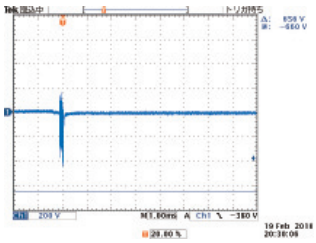


100V/div　100ms/div

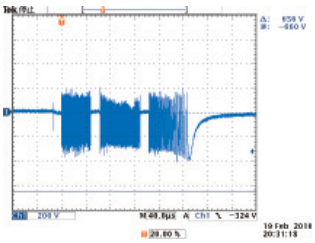


100V/div　1ms/div

CI220 A2-1 MODE1

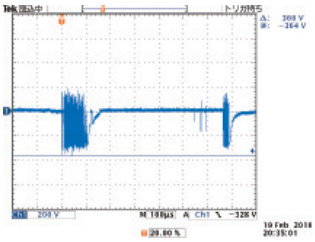


200V/div　1ms/div

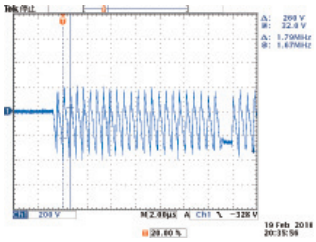


200V/div　40ms/div

CI220 A2-1 MODE2

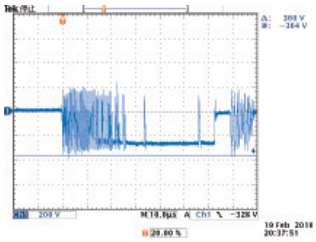


200V/div　100 μs/div

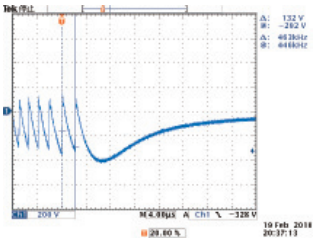


200V/div　2 μs/div

CI220 A2-1 MODE3



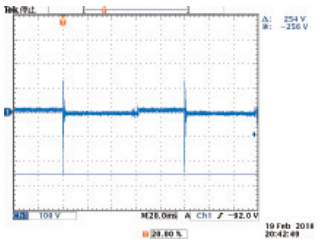
200V/div　10 μs/div



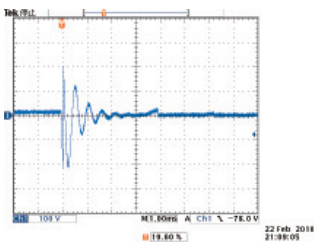
200V/div　4 μs/div

ISS-T1321

CI220 A2-2 MODE2

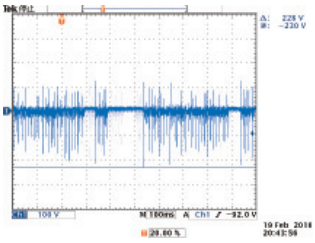


100V/div 20ms/div

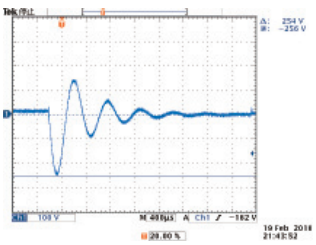


100V/div 1ms/div

CI220 A2-2 MODE3

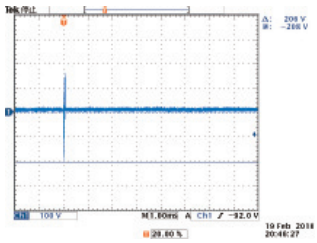


100V/div 20ms/div

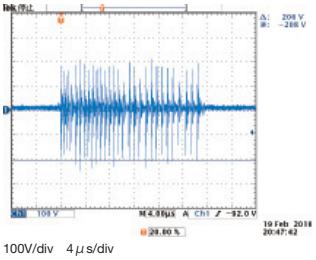


100V/div 1ms/div

CI220 C1 MODE2

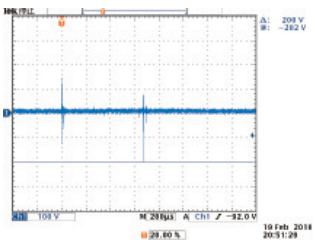


100V/div 1ms/div

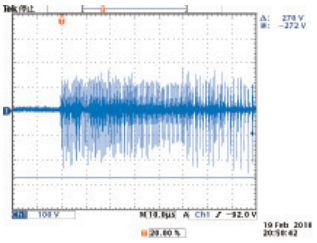


100V/div 4 μs/div

CI220 C1 MODE3

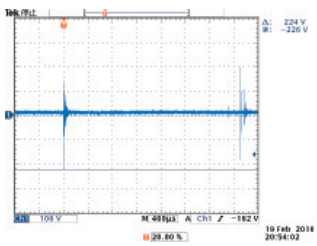


100V/div 200 μs/div

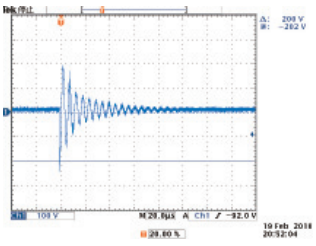


100V/div 10 μs/div

CI220 C2 MODE2

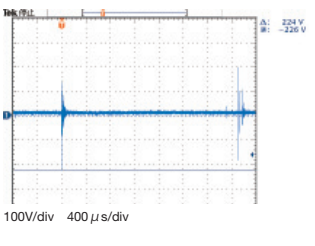


100V/div 400 μs/div

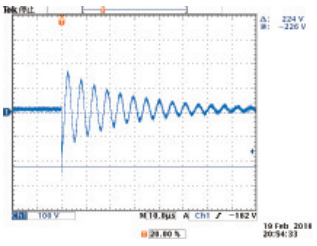


100V/div 20 μs/div

CI220 C2 MODE3

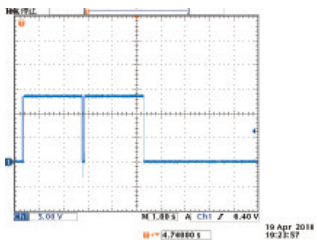


100V/div 400 μs/div

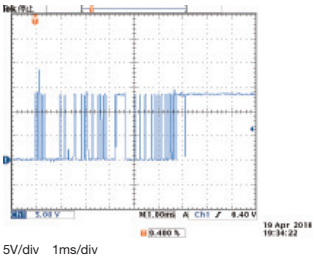


100V/div 10 μs/div

CI260 Waveform F



5V/div 1s/div



5V/div 1ms/div

ISS-T1321

Test Fixture for FORD standard RI130/RI150
15-N1583

Harness injection fixture to perform RI130 / RI150 test required in FORD Standard EMC-CS-2009
(Allows to perform RI130 test in combination with ISS-T1321).

Test fixture overall appearance

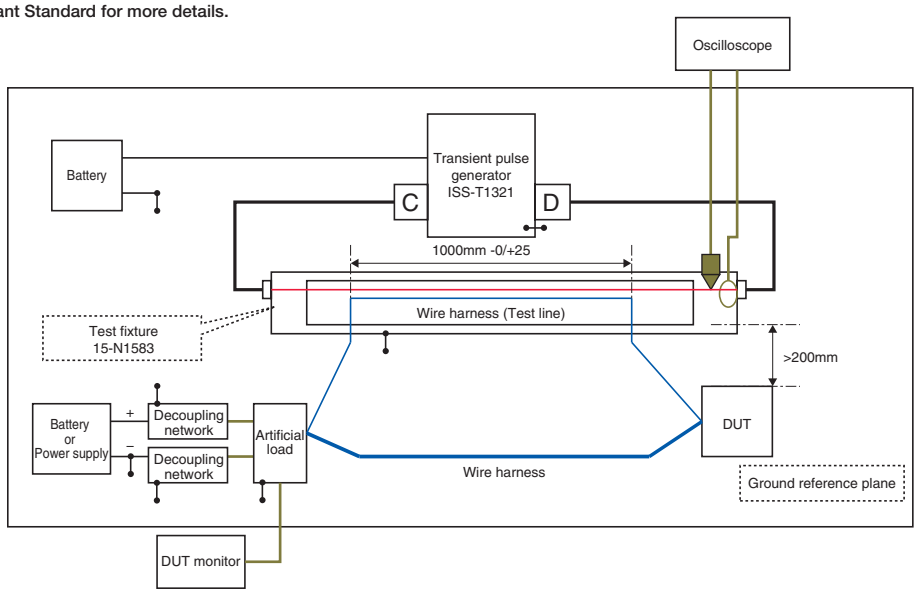
Basic specifications

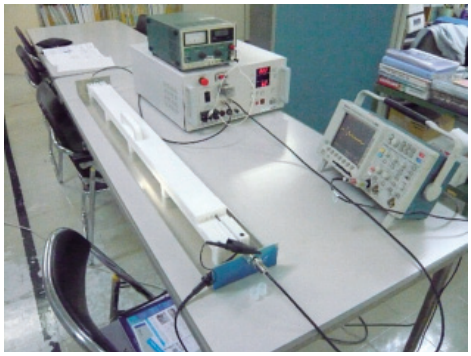
Connector	N Type (Female contact)
Source wire	AWG 14 copper wire (with cover)
Dimensions	(W)1306 × (H)72 × (D)152 mm (protrusions excluded)
Weight	Approx. 7.5 kg
Equipped cable	Connection cable to ISS-T1321 × 2 pcs.

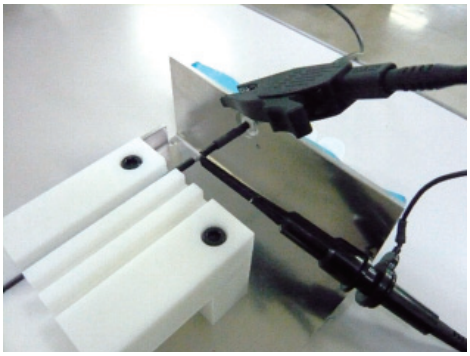
Connection setup

【Test setup】RI130

* Please refer to the relevant Standard for more details.



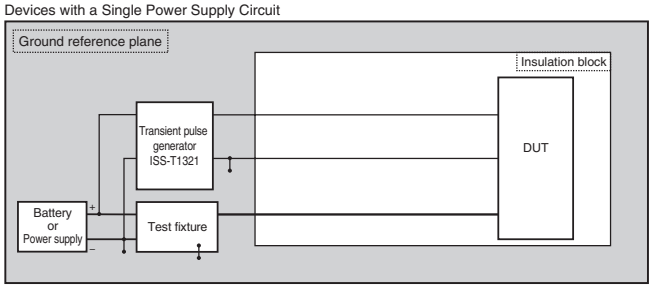




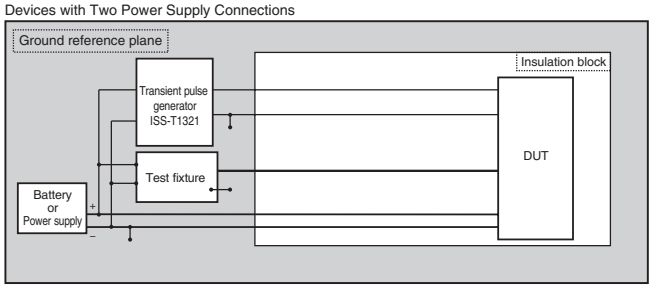
ISS-T1321

【Test setup】CI220

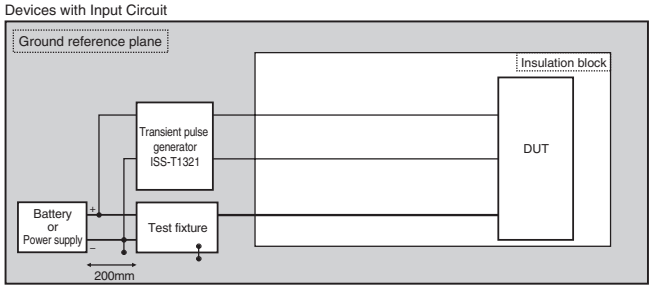
・Devices with a Single Power Supply Circuit



・Devices with Two Power Supply Connections



・Devices with Input Circuit



*** Please refer to the relevant Standard for more details.**

FORD Standard CI250 Transformer Unit

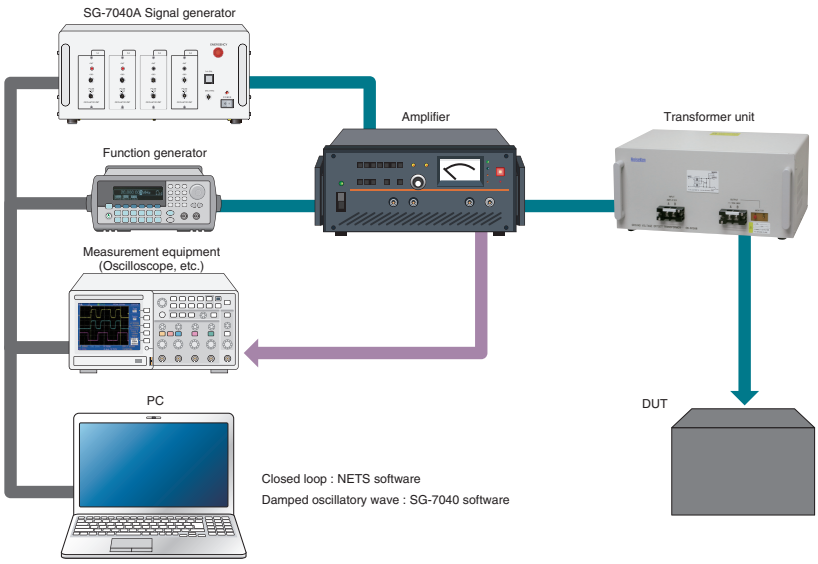
06-N1588

Ground offset transformer for conducting the CI250 test specified in the FORD standard "EMC-CS-2009".
The test is performed in combination with the DC voltage fluctuation test system (SG-7040A System).

Overall appearance

Basic specifications

Frequency Characteristics	30 Hz ～ 250 kHz
Input Signal	200 W max
Output Current	DC 50 A max
Coupling Ratio	4 : 1 (Input : Output)
Dimensions	Approx. (W)430 × (D)322 × (H)200 mm (protrusion excluded)

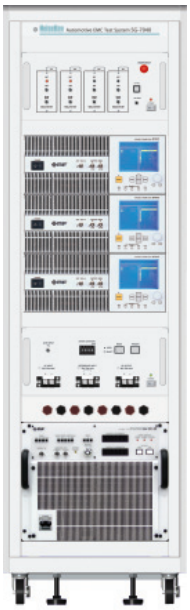


We can also offer testing and measuring instruments complying with other standards.

DC Power Supply Voltage Fluctuation Simulators

SG-7040A System

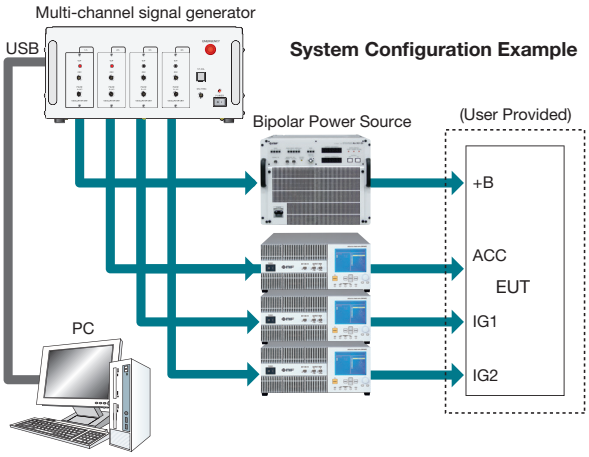
Simulator to reproduce power supply voltage fluctuation to electronics devices in a vehicle and evaluate the immune resistibility against the fluctuation.
Max. 4 channels not only +B connection but also ACC, IG (and IG2), etc. can be synchronized for the reproduction.



- ISO 16750 Standard compliant test (Possible to respond to private standards of the manufacturers).
- High resolution and high accuracy for the waveforms output realized with waveforms operation circuits built in the each channel.
- Easy and precise reproduction of the fluctuation phenomena not only in the Standard but also arbitrarily enabled with the software control (USB).
- Insures less than 1μs for the synchronizing variation among the channels.
- Enable to reproduce waveforms by using CSV data collected from real vehicle oscilloscope measurements.
- Automated testing operation can be customized for reducing the man-hour.

*Please contact us for the specification details.
*Load dump test A and B pulses not available

Specifications



The system is primarily comprised of the following three elements: multi-channel signal generator, bipolar power source(s), and arbitrary waveform creation software.
Appropriate bipolar power sources shall be selected and the multi-channel signal generator shall be configured according to test requirements.

1. Multi-channel signal generator

・Modular construction for a maximum of four channels
・Arbitrary waveform creation (DC, ramp wave, sine wave, exponential wave, frequency modulation, amplitude modulation)
・Waveform sequence creation

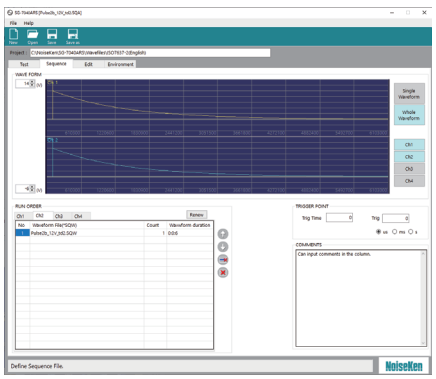
2. Arbitrary Waveform Creation Software

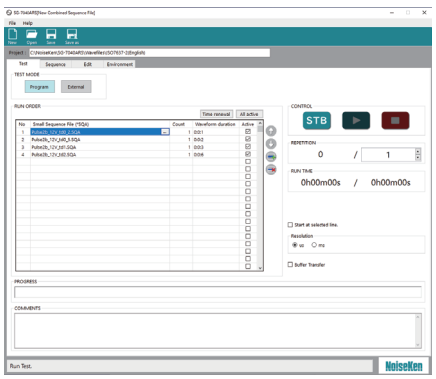
The arbitrary waveform creation software easily creates complicated waveforms with repeated voltage and time ramping with its superb GUI.

3. Bipolar Power Source

High-speed bipolar power source is selected according to the DUT power rating.

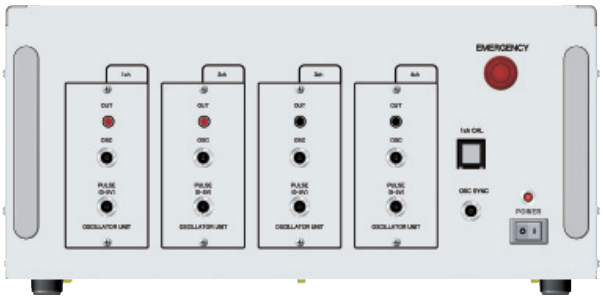
Software





SG-7040A System

Multi-channel signal generator SG-7040A



Specifications

Parameter	Specifications / Functions
Channel Number	1 ch ～ 4 ch
Oscilloscope Trigger Output	BNC Connector 0 ～ 5 V Set the desired point as the trigger point with the waveform creation software and monitor waveform generation with the external trigger function of the oscilloscope.
Waveform Generator Method	Sampling waveform output based on partial waveform memory and DSP circuit output CSV data
Output Voltage	0.00 ～ ± 6.00 V
Output Current	5 mA Max.
Output Impedance	50 Ω
Setting Resolution	0.01 V
Output Resolution	1.221 mV
Offset Voltage	± 6.0 V
Frequency Response	150 kHz Max. (± 6.00 V Amplitude Sine Wave)
Characteristics	150 kHz Max. (± 6.00 V Square Sine Wave)
Frequency Precision	± 20ns + 50 ppm (over the entire frequency rang)
Waveform Rise / Fall Time	Less than 100ns (0±1.00V Swing)
Slew Rate	20 V /μs
Synchronization accuracy	Adjustable at a step of 1.0uS up to 10uS, to compensate differences in response time of the amplifiers connected. Synchronization with <1.0uS accuracy at the outputs of the bipolar power amplifiers connected.
Calibration Output	1 kHz 1V (Test Use)
PC Interface	USB 1.1
Operating Temperature	25℃ ±10℃
Operating Humidity	20 ～ 90% RH
Drive Power Source	Local AC supply voltage ±10% 50 / 60Hz 15 VA
External Dimensions	approx. (W)430 × (D)400 × (H)200 mm
Weight	approx. 10 kg

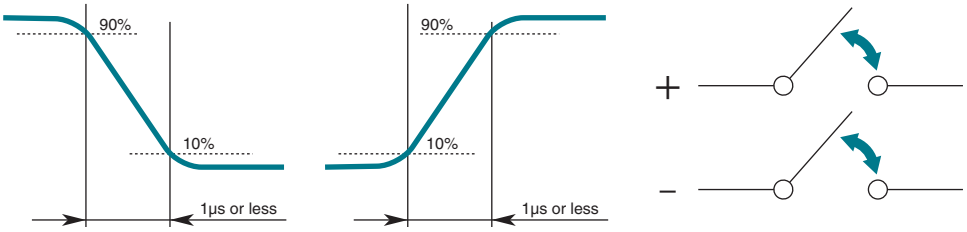
Accessories

Item	Q'ty
Coaxial cable (BNC-BNC/2m)	For number of channel
Output cable (1m)	For number of channel
Crimping terminal (M4)	For number of channel × 2 pcs.
Crimping terminal (M6)	For number of channel × 2 pcs.
Crimping terminal (M8)	For number of channel × 2 pcs.
Fuse (3.15A)	1 pc.
Application software	1 pc.
AC cable	1 pc.
USB cable	1 pc.
Instruction manuals (for main unit and software operation)	Each 1 volume
Accessories bag	1 pc.

DC Cut Module MODEL : SG-7044

- **Disconnects DC supply circuits**
- **Open and Sink Modes**
- **Rise and fall time < 1μs**
- **Controllable from SG-7040A**
- **Sink currents up to -30 V**
- **DC 50 A**

Optional equipment for the SG-7040A Series to carry out supply interruption test with <1μs rise/fall time requirement.



Specifications

Parameter	Specification
Output voltage	0 ～ DC 60 V
Steady-state current	Max. 50 A
Short mode	Open / Short (Current intake)
Cut off mode	Only + / Only - / Both polarities
Cut time	Open : Input terminal or trigger switch
	Short : Set at short duration or set at 2 - 9999μs
Rise / Fall time	≦ 1μs (10 % - 90 % short mode output open at DC 12V)
Dimensions / Weight	(W)430 × (D)400 × (H)200 mm / approx. 10 kg

Accessories

Item	Q'ty
Coaxial cable (BNC-BNC / 2 m)	1 pc.
Output cable (1m)	1 pc.
Crimping terminal (M4)	4 pcs.
Crimping terminal (M8)	4 pcs.
Fuse (2 A)	2 pcs.
AC cable	1 pc.
Instruction manuals	1 volume
Accessories bag	1 pc.

* In case the units are cabined in the rack, AC cable shall be connected inside of the rack.

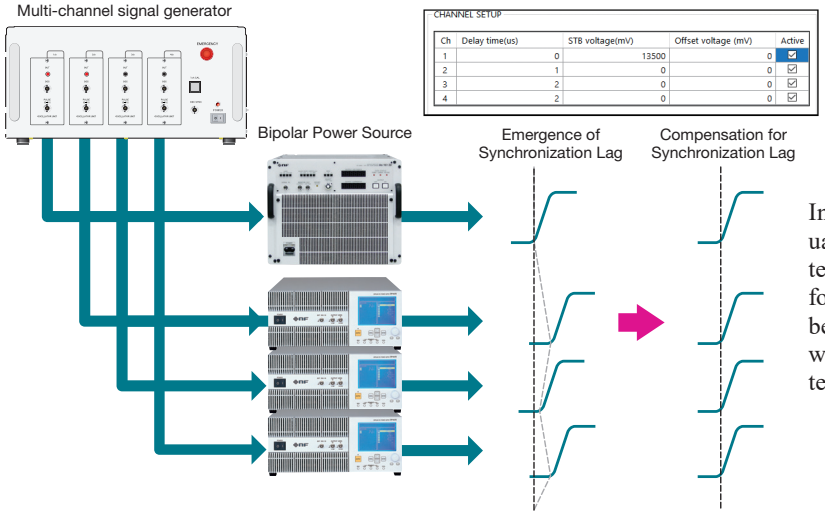
SG-7040A System

Sweep Setting Function

Easily and reliably creates a loop waveform using the sweep function detailed at left for a long test duration requiring varying T (times) and V (voltages).

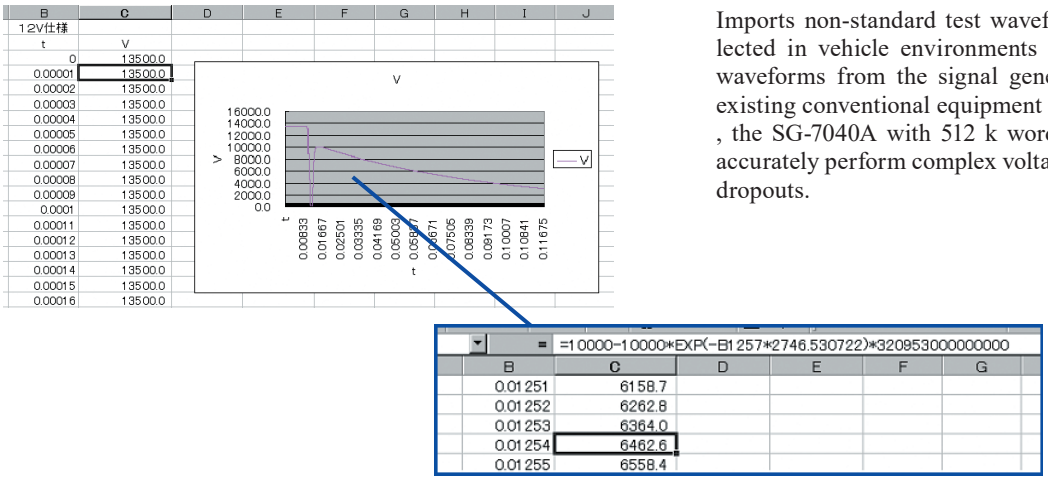
T (ε) = Start
Te (ε) = Stop
Ut (ε) = Step
N = Loop Number
LP = Loop Setting

Delay Set Function



In multichannel tests it is important to ensure each individual channel is precisely synchronized. This system guarantees a synchronization delay of 1μs or less by compensating for output timing differences from the power amplifiers being connected, whereas other systems are not equipped with similar capability, which often leads to a erroneous test.

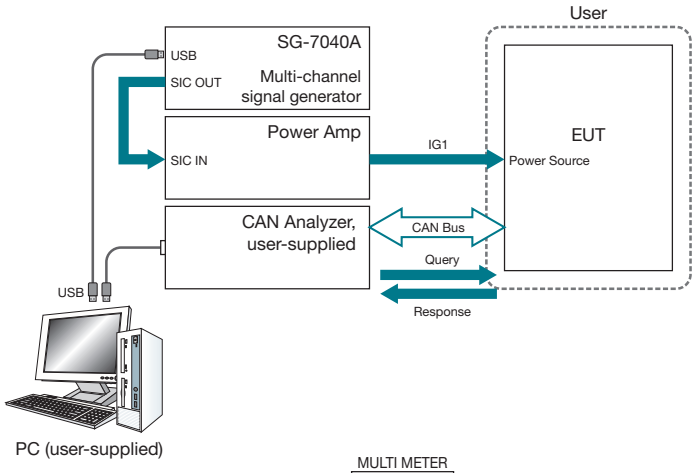
CSV Waveform EXCEL Operation Example



Imports non-standard test waveforms such as waveforms data collected in vehicle environments as CSV files, and generates these waveforms from the signal generator. Not available thus far with existing conventional equipment due to the limited memory capacity , the SG-7040A with 512 k words memory is a perfect solution to accurately perform complex voltage variations, fluctuations, dips and dropouts.

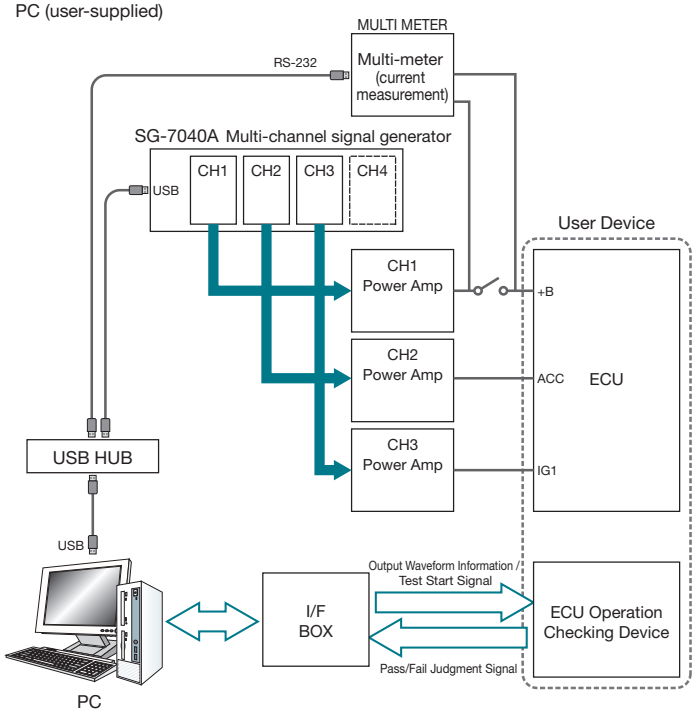
SG-7040A System

Automated Simulations



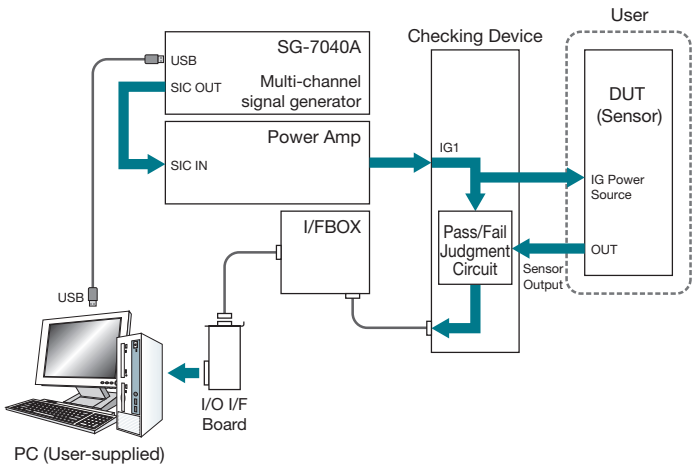
Example 1: CAN Communication Control

CAN is one of the most widely adopted system bus in automotive technology. Automated testing can be done by reading CAN communication protocols into the software and defining malfunction of the DUT.



Example 2: "Dark Current" Measurement

Some automobile manufacturers implement "Dark Current" measurements. This system allows dark current measurements in conjunction with voltage fluctuation simulations.



Example 3: Check Device

Automated testing by incorporating Pass/Fail judgment circuit with received signals from the DUT such as voltage, current, and frequency.

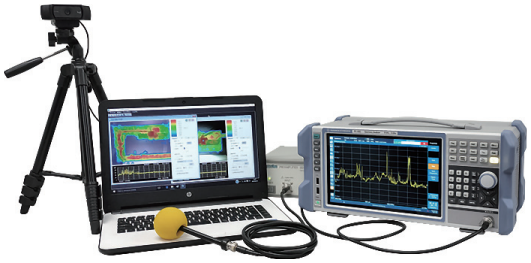
EPS-02Ev3

Electromagnetic Field Visualization System

For effective EMI debugging

EPS is an EMC/EMI debugging tool enabling designers to rapidly perform pre-measurement, failure point identification, and improvement efficiency confirmation in EMC/EMI countermeasure process of product design.
The software detects location of the probe by color detection* through the camera image, performs real-time frequency analysis of the measured signal and displays the electromagnetic field strength superimposed on the actual image of the measured object in form of a heat map.

* Proprietary position detection method to patent application No. 2007-223275 by Kanazawa University and patent No. 5205547 by Noise Laboratory Co., Ltd.



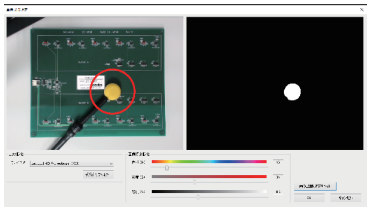
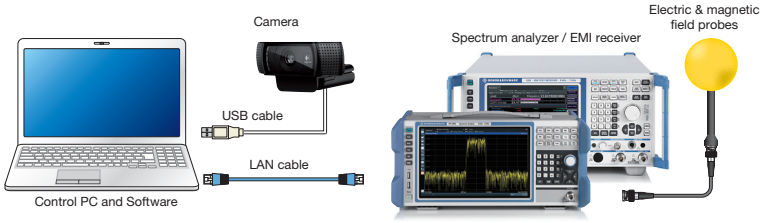


Image recognition (probe tip yellow color recognition)

- A real-time diagnostic tool supporting EMC/EMI debugging.
- Swift visualization and analysis of EMC/EMI problems.
- Easy comparison of countermeasures before and after.
- Capable of measurement from entire products to single components.
- User-friendly compact design.
- A system can be constructed using the customer's spectrum analyzer and electromagnetic field probe. (consultation required)



Easy to carry at a lower price!

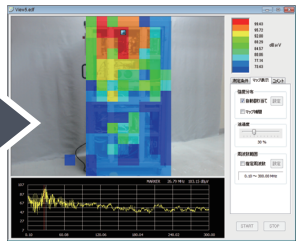
Tektronix

RSA306B spectrum analyzer is convenient to carry around for on-site measurements.
In addition, the system can be constructed at a lower cost.

Various product sizes measurement

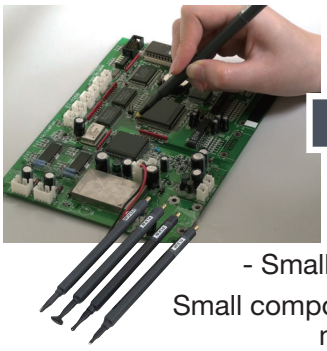
Various probes applicable

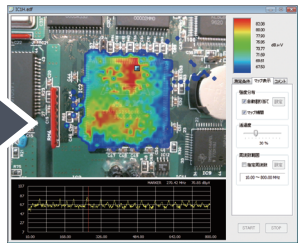
Various types of electromagnetic field probes can be used regardless of the manufacturer.Therefore, by interchanging electromagnetic field probes, it is possible to measure various sizes, from small items such as parts and circuit boards to large equipment such as stationary equipment.In addition, objects with complicated shapes can also be measured by positioning the camera.



- Big-size probes -

Large equipment EM field measurement





- Small precision probes -

Small components and PCB EM field measurement

A wide variety of standard-compliant spectrum analyzer drivers

Added additional spectrum analyzers possible to use, making it easier to use your current spectrum analyzer.

Rohde & Schwarz	Spectrum analyzer	FSV series, FSV3000 series, FPL series
	EMI receiver	ESR series, ESRP series
Keysight Technologies	Signal analyzer	N9010A, N9010B
Tektronix	Oscilloscope	MDO4000 series
	Spectrum analyzer	RSA306B

Please inquire about other spectrum analyzers.

Tektronix MDO4000 series

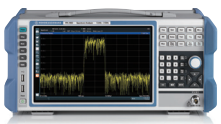
Tektronix RSA306B

Keysight Technologies N9010A

Keysight Technologies N9010B

Rohde & Schwarz FSV

Rohde & Schwarz FPL



Rohde & Schwarz ESR

EPS-02Ev3

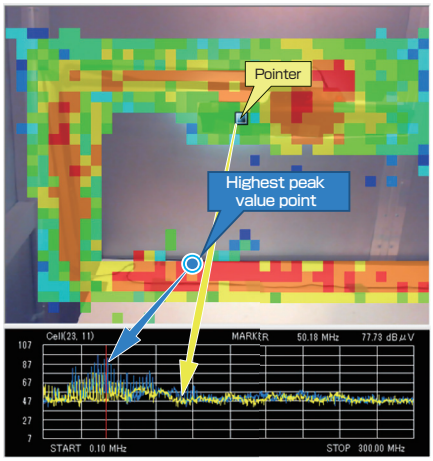
Superimosed Display function newly added !

NEW Function !

Enhanced data analysis function

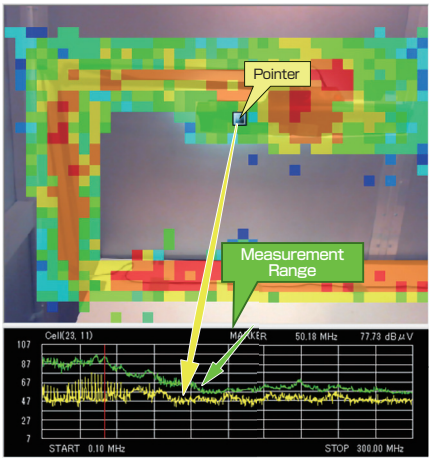
A superimposed display function has been added to display the spectrum at the point with the highest peak value, the spectrum at the maximum value in the measurement range, and the spectrum at a designated pointer. By dragging the spectrum graph when displayed superimposed, you can check the frequency and level values of each data.

Highest Peak Value point
spectrum superimposition display



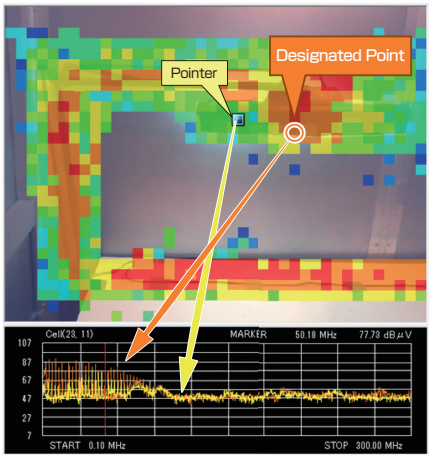
Highest peak value point spectrum
Spectrum directly below the pointer

Measurement Range Highest Value
spectrum superimposition display

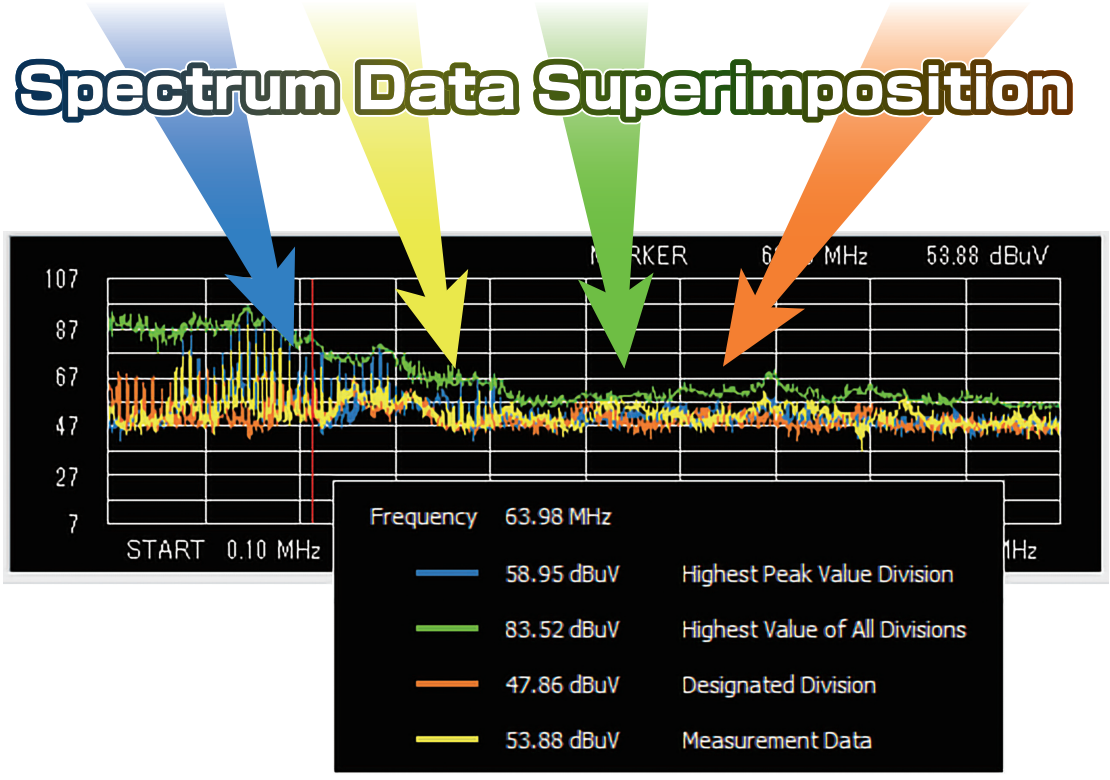


Spectrum with highest value for each frequency in the spectrum of all measurement points
Spectrum directly below the pointer

Designated Point
spectrum superimposition display



Spectrum at the Designated Point
Spectrum directly below the pointer



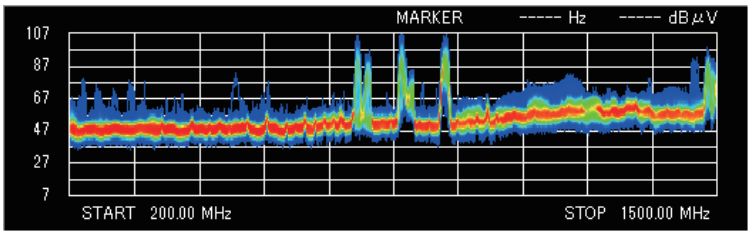
Up to 3 data can be displayed superimposed

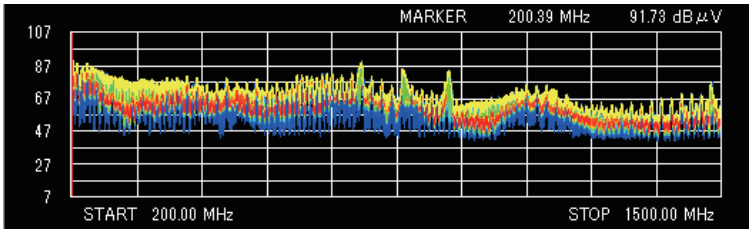
EPS-02Ev3

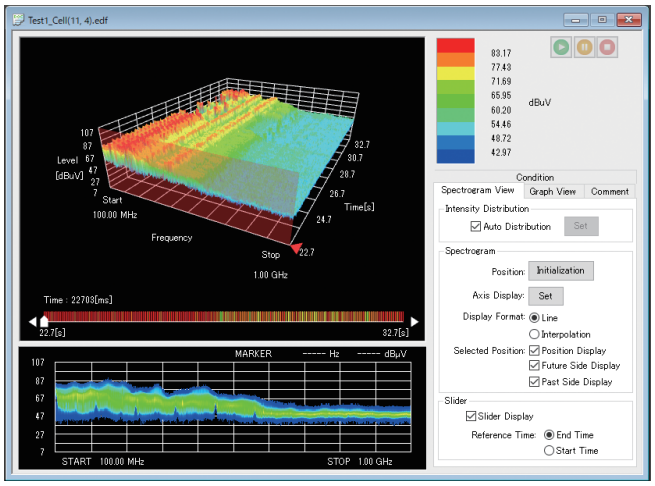
Easily Check the Noise Occurrence Frequency

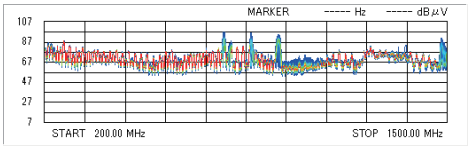
The density display function expands the range of analysis

Added a function to display colors according to the frequency of occurrence (density display function) to the conventional spectrum display function. This makes it possible to easily check the noise occurrence frequency and the amplitude at the measurement frequency. A wide range of analysis is available, from checking the noise amplitude in regular measurements (using the density display function), to checking the details of areas of concern (noise with large amplitude, intermittent noise, etc.) by spectrogram measurement.

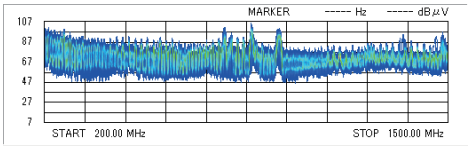




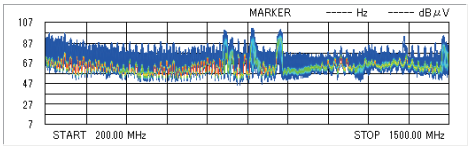




Example of noise with little change



Example of noise with large fluctuation

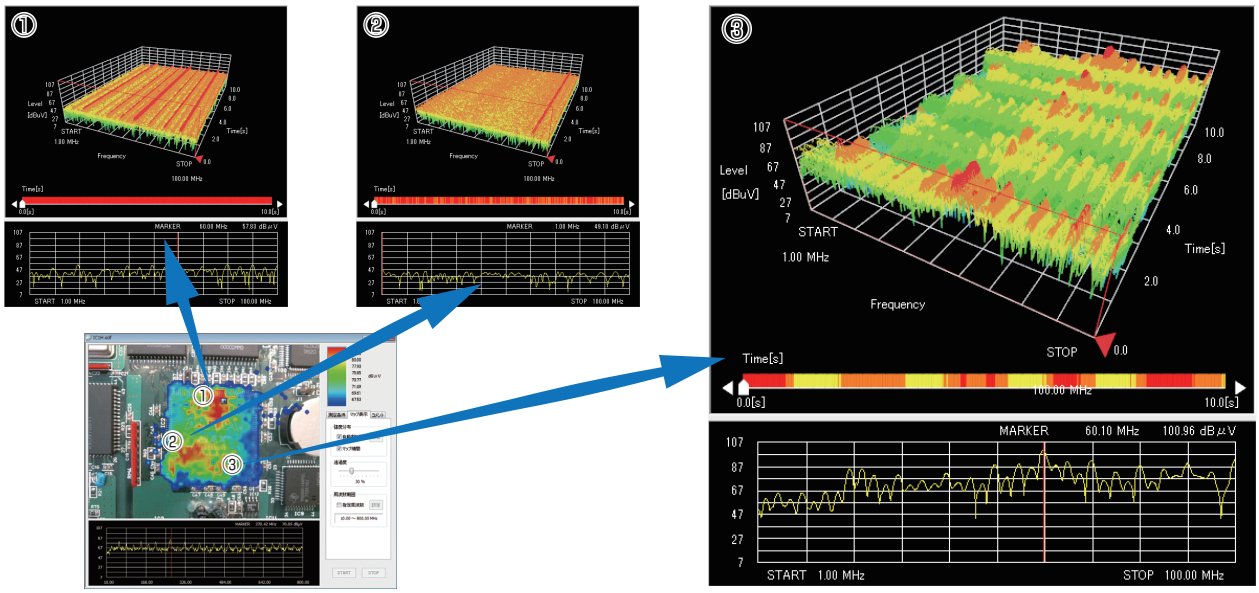


Example of intermittent noise

Simplified EMC/EMI Debugging

Three-Dimensional Indication (Time, Frequency, Amplitude)

In addition to conventional two-dimensional (frequency and level) measurement, three-dimensional (frequency, level, time) measurement is now possible for the space electromagnetic field visualization system that has been well received. This makes it possible to visually confirm changes in noise over time, and analyze noise causing factors such as discovering discontinuous noise.

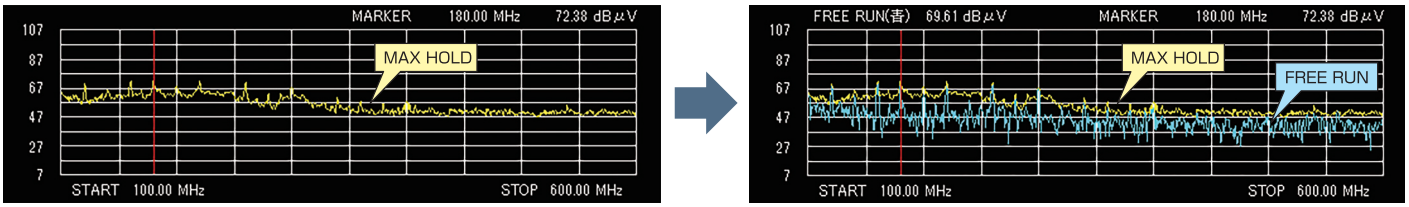


EPS-02Ev3

Simultaneous waveform display function newly added

Real-time spectrum data can be checked at the same time

It is now possible to display FREE RUN waveforms simultaneously when displaying MAX HOLD or MAX PEAK DATA waveforms.



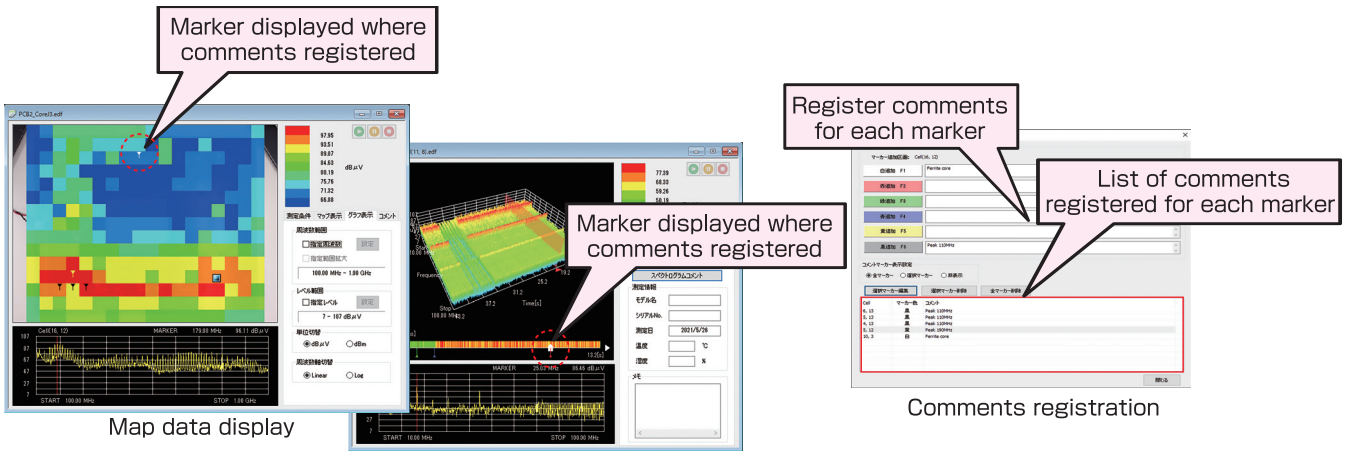
Before

Simultaneous display with the new function !

Enhanced comment functionality

Check the records of countermeasures locations

A function has been added that allows you to display a marker at the position where you want to register a comment such as countermeasure location or notes, and to register comments on the time axis of map data and spectrograms. By registering comments for countermeasure locations in each colored marker, you can trace the countermeasure record.



Map data display

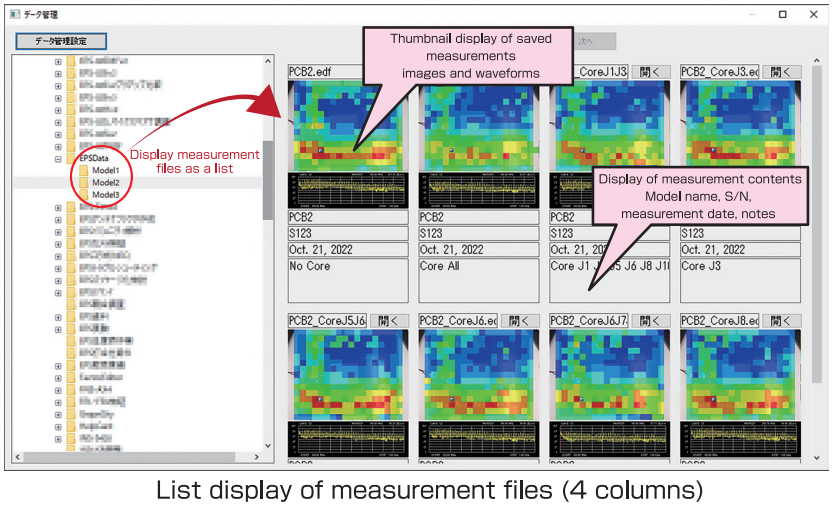
Spectrogram display

Comments registration

"Measurement files List Display" new function added

Accumulated measurement files displayed to check countermeasures history

A function to display a list of measurement files has been added, making it possible to display a list of saved measurement files. By displaying the accumulated measurement files as a list, you can comprehensively compare the countermeasures history.



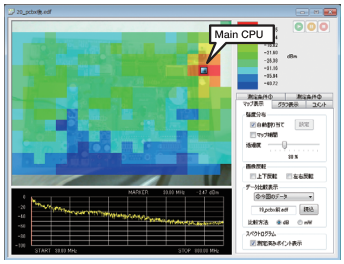
List display of measurement files (4 columns)

EPS-02Ev3

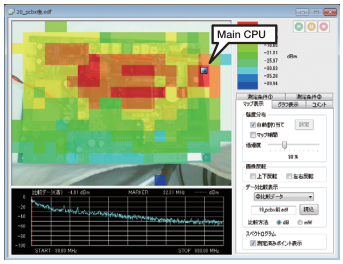
Easy comparison before and after countermeasures

Equipped with a difference display function

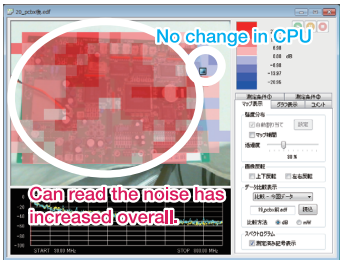
In addition to the conventional method of comparing measured data side by side, it is now possible to compare in the same range by loading a comparison target file into the same file. Also, the data difference display function allows to compare differences in measurement data by color.



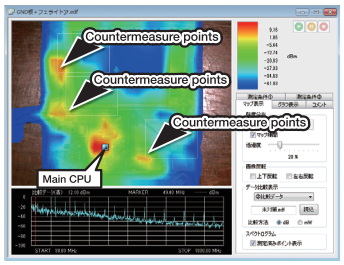
Operation Mode 1 (During standby)



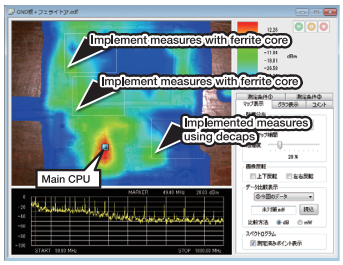
Operation Mode 2 (During operation)



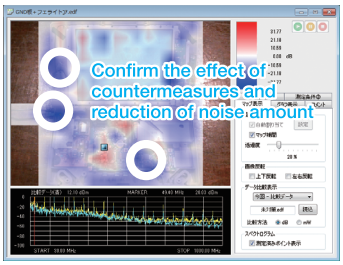
Differences display



Before countermeasures



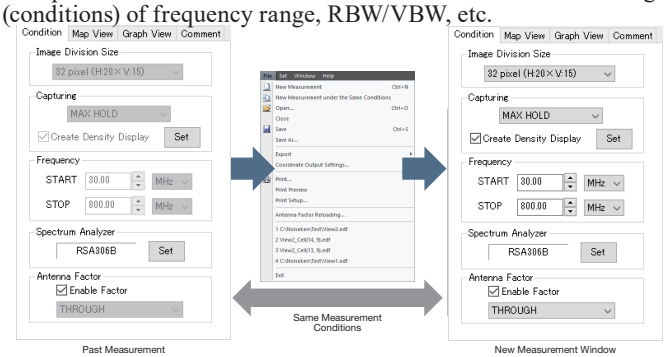
After countermeasures



Differences display

Easy measurement under the same conditions as past data

Added a new function, so that a new measurement can be performed under the same measurement conditions as the previous measurement. By loading the past measurement data, it is possible to conduct measurement under the same settings (conditions) of frequency range, RBW/VBW, etc.



Past Measurement

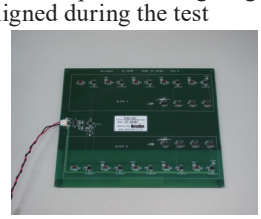
New Measurement Window

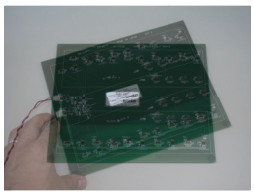
Camera image ghost function

Previously taken images can be displayed overlaid for position alignment.

Usage example 1: aligning the camera position with the previously taken image before the test

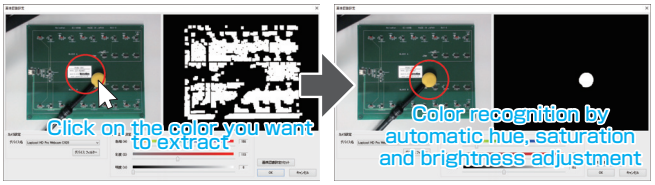
Usage example 2: realigning the camera position when it got misaligned during the test





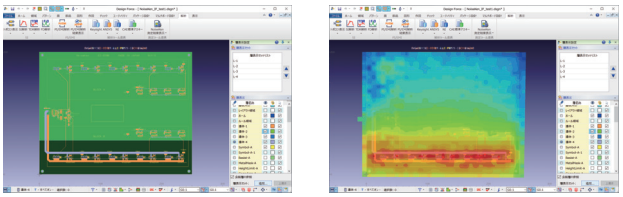
Simplified image recognition settings

By clicking on the part of the screen where you want to recognize the color (tip of the probe), the software automatically adjusts the hue, saturation, and brightness optimal for color recognition.



Specified coordinate output function

Measurement results can be imported to external CAD software and CAD drawings and actual measurement data can be superimposed and displayed.



Example of actual measurement results displayed on Zuken CR-8000 Design Force

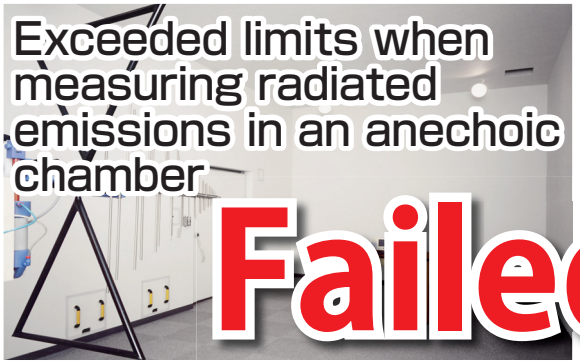
Others

Highlighting unmeasured points: unmeasured areas highlighted by flashing black and white, preventing measurement leaks.

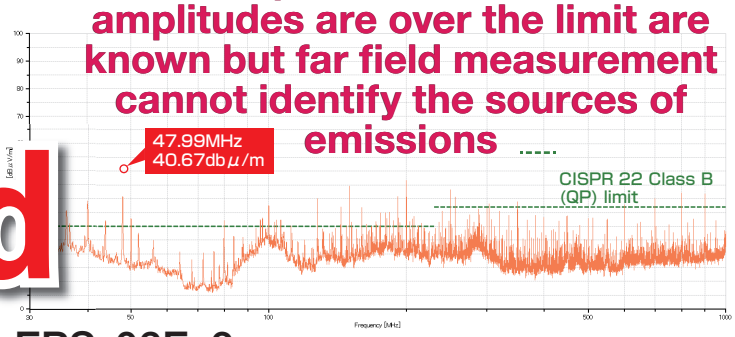
EPS-02Ev3

Locates possible interference sources for pre- and post-compliance measurements

① Conducting radiated emission measurements in an anechoic chamber



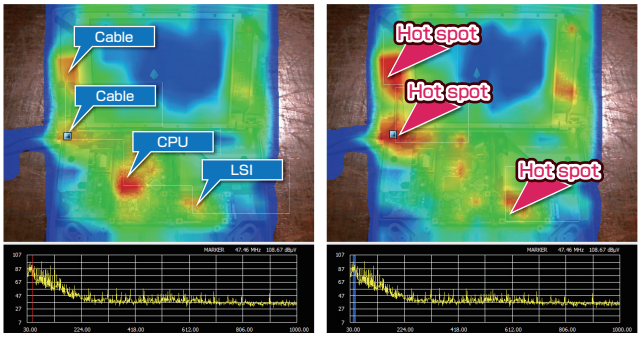
The frequencies at which the amplitudes are over the limit are known but far field measurement cannot identify the sources of emissions



② Near-field measurement by EPS-02Ev3

A intensity distribution map shows red "hot spots", which are the countermeasures target areas. Furthermore, narrowing down to the desired range of frequencies lets you know the relevant spots of the frequencies in interest.

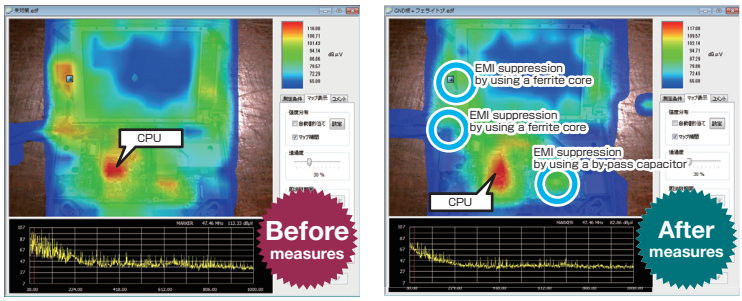
- Identify the "hot spots" locations for countermeasures
- Identify the root cause



③ Incorporating suppression measures and verifying their effectiveness

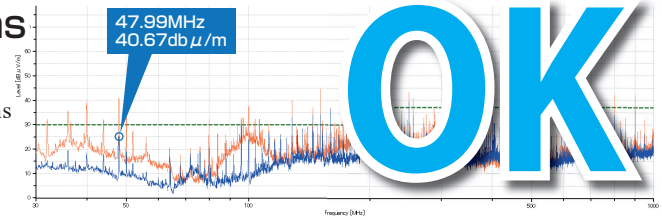
Measurement after the noise countermeasures indicated that the emission level lowered. This makes it easier to establish the countermeasure strategy for problem areas such as circuit traces, components, cables and housing.

- Evaluate different countermeasures techniques
- Verify the effectiveness of the selected countermeasure technique



④ Re-measure radiated emissions in an anechoic chamber

After the noise countermeasures, measured the radiated emissions again in the anechoic chamber, verifying that the noise level was kept below the limit. The data can be saved as a reference for the next countermeasures, allowing the know-how to be shared and accumulated.



Accumulated measurement data can be the basis of optimized design and debugging method rules, and improving and sharing know-hows, which contributes to engineering time and cost reduction, and reliability and safety improvements.

EPS-02Ev3

Specifications

Frequency range	Depends on electromagnetic field probe, preamplifier and spectrum analyzer specifications
Measurement unit	dBμV、dBm
Data recording method	Single ／ Free Run ／ Max Hold ／ Max Peak Data*
Auxiliary functions	Save / load / export / comment input / factor reload / camera image retake / up-down & right-left inversion of camera image / ghost display of camera image / screen enlargement-reduction
Compatible operating system	Microsoft® Windows® 10 / 11 (English or Japanese ver.)

*Max Peak Data: Displays the trace data with the largest peak value from the trace data measured at each measurement point.

System

System configuration example	Electromagnetic field probes(EM-6992)*, BNC(P)-N(P) connector coaxial cable (02-00150A), 3-color probe head covers, RF preamplifier (00-00019A), spectrum analyzer, control PC
Accessories	Web camera, camera tripod, USB extension cable for camera (2m), extension pole, LAN cable (2m), setup media (software), USB protection key, quick start guide

Electromagnetic field probes (EM-6992) *Frequency Characteristics

Model	Type	Electric / Magnetic fields	Structure
EM-6993	6cm Loop	magnetic field antenna	shielded loop
EM-6994	3cm Loop		shielded loop
EM-6995	1cm Loop		shielded loop
EM-6996	3.6cm Ball	electric field antenna	spherical dipole
EM-6997	Stub		short monopole

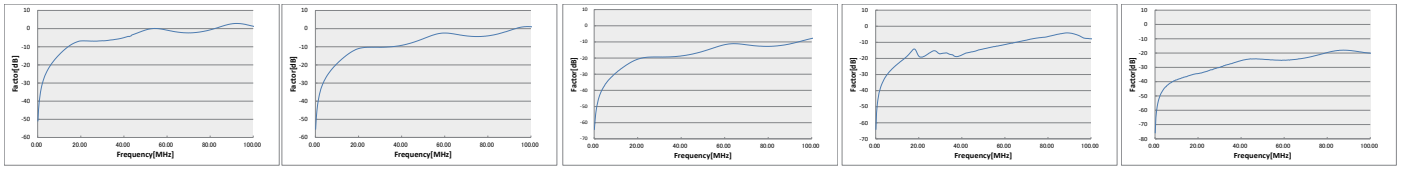
■ Magnetic field probes *by Electro-Metrics Corporation

EM-6993 (6cm Loop) EM-6994 (3cm Loop) EM-6995 (1cm Loop)

■ Electric field probes

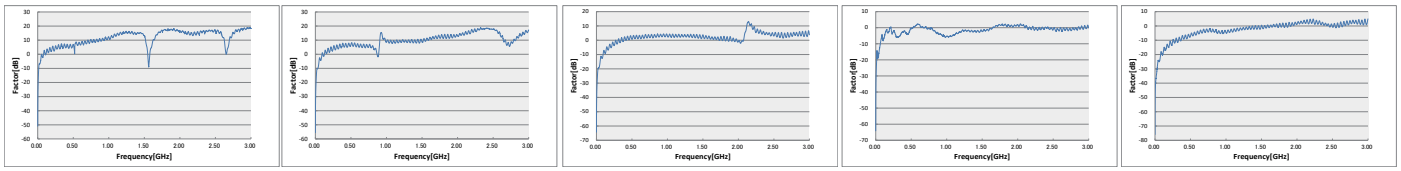
EM-6996 (3.6cm Ball) EM-6997 (Stub)

■100 kHz ～ 100 MHz



EM-6993 (6cm Loop) EM-6994 (3cm Loop) EM-6995 (1cm Loop) EM-6996 (3.6cm Ball) EM-6997 (Stub)

■100 kHz ～ 3 GHz



EM-6993 (6cm Loop) EM-6994 (3cm Loop) EM-6995 (1cm Loop) EM-6996 (3.6cm Ball) EM-6997 (Stub)

*The frequency characteristics of the above probes are data taken using a microstrip line.

System requirements

Parameter	EPS-02Ev3
OS	Microsoft® Windows® 10 / 11 (English or Japanese versions)
CPU	Intel Core™ i5 or higher (i7 or higher recommended)
RAM	8 GB or more recommended
HDD	min. 10 GB of free space
Display	WXGA resolution (1366 x 768) or higher required Full HD resolution (1920 x 1080) recommended

In addition to the conditions on the left, the following conditions apply.

- Operation cannot be guaranteed when using software that uses cloud services or online storage.
- A DVD drive is required to install the upgraded version and minor upgraded version.
- Make sure there is a free USB port. (Occupies 2 or 3 ports, not including mouse)

EPS-02Ev3 Options

Pre-amplifier MODELS：00-00012A/14A/16A/19A

High-performance preamplifiers that can be used for various purposes including for the EPS-02 series.

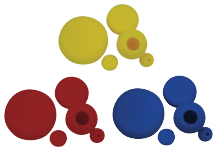
Parameter	Specifications / Performance
Operating Frequency Range	00-00012A：9kHz ～ 1GHz 00-00014A：500MHz ～ 8GHz 00-00016A：9kHz ～ 1GHz 00-00019A：10kHz ～ 3GHz
GAIN	00-00012A：36dB (typ) 00-00014A：47dB (typ) 00-00016A：46dB (typ) 00-00019A：43dB (typ)
Input / Output Connector	N-Female
Dimensions / Weight	W160 × D230 × H88mm ／approx. 3kg *protrusions excluded*
Accessories	N(P)-N(P) connector coaxial cable 1 m (00-00019A only)

EPS-02Ev3 Options

Three Color Probe Cover Set　MODEL：03-00122A

A set of head covers for various probe tips. Attaching to the tip of the probe facilitates image recognition of the EPS-02 series camera.The electromagnetic field probes can be stored in the case with the probe head covers attached, and unused probe cover heads can also be stored.
* Storage Case is included

Replacement Three Color Probe Cover Set　MODEL:03-00123A



Replacement probe head covers for the 3-color probe head cover set.

Software upgrade　MODEL：EPS-02Ev3-UG

Version upgrade to EPS-02Ev3 software. Accessories: disk media (software), USB protection key, quick start guide

EPS-02Ev3 Software minor version upgrade　MODEL：EPS-02Ev3-MUG

Minor version upgrade of EPS-02Ev3 software. Accessories: disk media (software), quick start guide

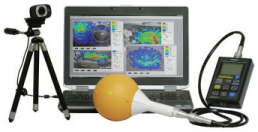
EPS-02EMFv2 / EPS-02Hv2　(low frequency magnetic field)

Spatial Magnetic Field Visualization System

EPS-02EMFv2 can save the frequency data of the measured magnetic field, so you can easily identify the countermeasure points.
EPS-02Hv2 can directly read and visualize the data from the magnetic field sensor measurement part. It is very compact and easy to carry, and is convenient for on-site measurement.

EPS-02EMFv2

- **The direction of the magnetic field can be determined by acquiring data on the X, Y, Z axes and the combined effective values of the three axes.**
- **Measurements required by ICNIRP 2010, IEC 62233 and JIS TS C 0044 can be performed.**



EPS-02Hv2

Specifications

Model	EPS-02EMFv2	EPS-02Hv2
Frequency Range	10Hz～400kHz	10Hz～400kHz、 10Hz～2kHz、 2kHz～400kHz
Frequency selection	available	not available
Measurement mode	magnetic field	Magnetic field (magnetic flux density) / exposure level
Measurement unit	dBμV、dBm	T、G、A/m、%
Measured axis	X、Y、Z	X、Y、Z、combined effective values
Data recording method	Single／Free Run／Max Hold／Peak Hold※	Peak Hold
Auxiliary functions	Save / load / export / comment input	
Compatible OS	Microsoft® Windows® 10 / 11 (English or Japanese ver.)	

*Max Peak Data: Displays the trace data with the largest peak value from the trace data measured at each measurement point.

System

Model	EPS-02EMFv2	EPS-02Hv2
System configuration	Magnetic field measuring instrument (FT3470-91/92: manufactured by Hioki Electric Co., Ltd.), oscilloscope (RTO2004-NSL or RTO6: manufactured by Rohde & Schwarz Japan Ltd.), control PC, probe extension cable 5m (dedicated cable)	Magnetic field measuring instrument (FT3470-91/92): manufactured by Hioki Electric Co., Ltd.), control PC, 5m probe extension cable (dedicated cable)
	* FT3470-91 / 92 and RTO2004-NSL are specifically adjusted for this system, and their specifications differ from that of general products.	
Accessories	Web camera, camera tripod, USB extension cable for camera (2m), extension pole, LAN cable (2m) *EPS-02EMFv2, setup media (software)* EPS-02EMFv2 includes EPS-02Hv2, USB protection key and the quick start guide	

* Please contact us for the recommended PC system requirements.

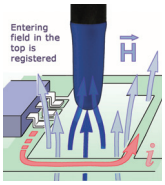
Software upgrade　MODELS：EPS-02EMFv2-UG / EPS-02Hv2-UG

Software upgrade to EPS-02EMFv2 and EPS-02Hv2. Accessories: Web camera, disk media (software), quick start guide

Introduction of LANGER's Near-Field Probes

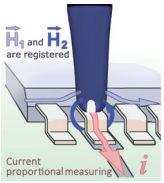
The EPS-02Ev3 system can be used in combination with various types of electromagnetic field probes.
The electromagnetic field probes introduced below are near-field probes manufactured by LANGER, Germany, with various probes available for measurements ranging from a single pin level of parts to large components and assemblies.
We also offer probes for low frequencies and for measurements in higher frequency bands to use in combination with our EPS-02Ev3.
Please contact our sales representatives for detailed specifications of various near-field probes and combination with EPS-02Ev3.

Near-Field Probes Model: LF1 set — 100 kHz - 50 MHz Magnetic Field

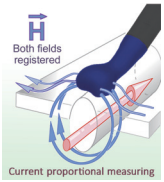


LF-B3

LF-R400



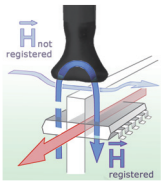
LF-U2.5



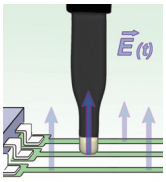
LF-U5

The LF1 set is a set of 4 types of shielded near-field probes for measuring magnetic fields from 100kHz to 50MHz on electronic assemblies.
The probe heads are designed for detection of electromagnetic interference sources at single pins, larger components and on assemblies. First, identify the large-scale sources with the LF-R 400 probe, and then use high-resolution probes such as LF-B 3, LF-U 5 and LF-U 2. 5 These magnetic field probes have a structure suppressing electric field components (electrically shielded).
** A conversion connector (MODEL: 02-00050A) is required to connect these probes to EPS-02Ev3.*

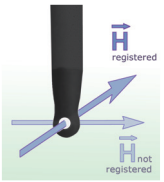
Near-Field Probes Model : RF1 set — 30 MHz - 3 GHz Electric / Magnetic Fields



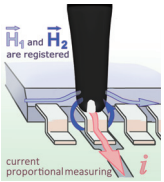
RF-K 7-4



RF-E10



RF-R 3-2

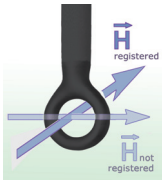


RF-U 2.5-2

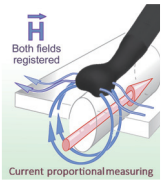
RF1 set is a set of 4 passive near-field probes for measuring electric and magnetic fields from 30 MHz to 3 GHz on electronic assemblies. Each probe is suitable for measurements very close to the electronic assembly, e.g. on single IC pins, conductive paths, components and connectors to identify electromagnetic interference sources. By using these probes one can detect the orientation of the magnetic field and the electric field distribution. These near-field probes have a structure suppressing electric field components (electrically shielded).
** A conversion connector (MODEL: 02-00050A) is required to connect these probes to EPS-02Ev3.*

Near-Field Probes Model : RF2 set — 30 MHz - 3 GHz Magnetic Fields

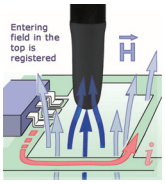
RF-R 400-1



RF-R 50-1



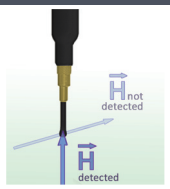
RF-U 5-2



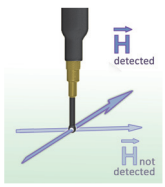
RF-B 3-2

RF2 set is a set of 4 passive near-field probes for measuring magnetic fields from 30 MHz to 3 GHz on electronic assemblies. These probe heads allow for the step by step localization of the sources of interference from the RF magnetic-field on the assembly. Initially, RF-R 400-1 and RF-R 50-1 probes can be used to detect far-field electromagnetic interference. Next, the higher resolution RF-B 3-2 and RF-U 5-2 probes allow for more accurate detection of interference sources. By using these probe one can detect the orientation of the magnetic field and the electric field distribution. These near-field probes have a structure suppressing electric field components (electrically shielded).
** A conversion connector (MODEL: 02-00050A) is required to connect these probes to EPS-02Ev3.*

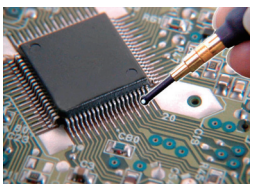
Near-Field Probes Model : RF3 mini set — 30 MHz - 3 GHz Magnetic Field



RF-B 0.3-3



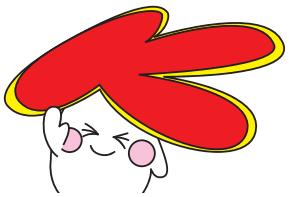
RF-R 0.3-3



The RF3 mini set consists of two passive near-field probes with a resolution under 1 mm to measure magnetic field of 30 MHz to 3 GHz on electronic assemblies at the development stage. These probes have special miniature heads which are designed for detailed measurements of magnetic field and disturbance currents and can be used to detect the orientation and distribution of the magnetic field on the electronic assembly. These probes have a sheath structure and are electrically shielded. It is recommended to use a 20 dB or 30 dB pre-amplifier when measuring with these probes.
** A conversion connector (MODEL: 02-00050A) is required to connect these probes to EPS-02Ev3.*

Sound source visualization system "KANON"

EPS-02Sv2

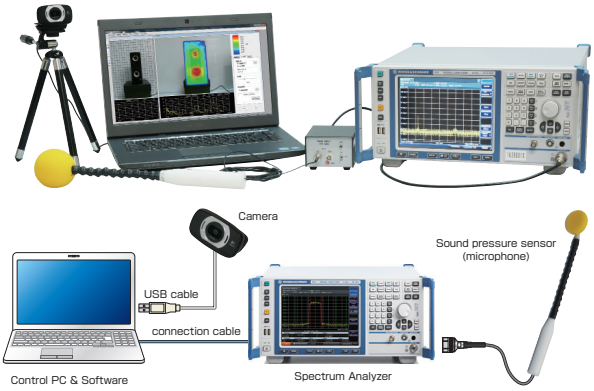


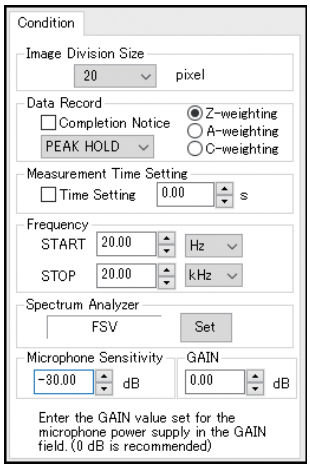
EPS-02Sv2 is a system that detects the position of the sound pressure sensor from the image of the camera by color recognition and analyzes the frequency of the signal measured by the sensor in real time. The intensity level of the measured sound pressure can be superimposed on the actual image of the object to be measured and displayed in color on a computer monitor in the form of a heat map. Measurements for sound countermeasures are usually performed using sound source detection equipment in a soundproof facility, but the facility and the equipment itself are very expensive.

In addition, since most sound source detectors pick up various sounds over a wide range, it is difficult to use and measure them on-site in the field.

The Sound Source Visualization System "KANON" makes it possible to easily measure the sound which is usually done in a soundproof facility on-site, by using an omnidirectional microphone with a structure giving it directivity.

Allows to easily identify the sound source and take countermeasures on site before the final check at a soundproof facility. Contributes to soundproofing cost and man-hours reduction by reducing the frequency of using of the soundproof facilities and equipment.





- **Improved microphone directivity allows for easy sound measurement even in non-soundproof sites.**
- **Measurement is conducted by simply tracing the space with the sensor, so anyone can easily operate it.**
- **The intensity level of the measured sound can be superimposed on the actual image of the object to be measured and displayed in color on a heat map on a computer monitor.**
- **Easily identify the sound source by visualizing the measurement results.**
- **Recognition settings can be made according to the color of the sensor, enabling image tracking supporting a variety of colors.**
- **Simple noise measurement is available.**

EPS-02Sv2　Specific Functions; Software Specifications

EPS-02Sv2 can perform simple noise measurement by digital frequency weighting (Z/A/C) of the measured sound pressure level.

Frequency weighting sound pressure level display	Z-weighting	Flat frequency weighting
	A-weighting	Frequency weighting that approximates the audibility of small sounds
	C-weighting	Frequency weighting that approximates the audibility of loud sounds
Color coding of map diagrams by overall level (also possible to color-code the map diagram by peak level)	Overall level	Sound pressure levels composite value
Microphone sensitivity input function	Microphone sensitivity	Microphone-specific sensitivity calibration value
GAIN input function	GAIN	Microphone power supply amplification (GAIN) setting value

Specifications

Model	EPS-02Sv2
Frequency Range	20Hz ～ 20kHz
Frequency Selection	available
Measurement Mode	sound pressure level
Measurement Unit	dB
Measurement Axes	N/A
Sensor	1/2 inch microphone
Microphone cable	BNC coaxial cable
Data recording method	Single / Free Run / Max Hold / Peak Hold
Auxiliary functions	Save / Load / Print / Export / Comments Input
Supported OS	Windows 10 ／ 11
Accessories	USB camera, USB extension cable for camera (2m), tripod for camera, Software, USB protection key, quick start guide, microphone head covers (yellow, red, blue - 1pc each color), microphone arm, microphone + preamp, microphone power supply, AC adapter, BNC-P ⇔ BNC-P 50 Ω coaxial cable (3m), BNC-P ⇔ N-P 50 Ω coaxial cable (1.5m), LAN cable.

Options

Microphone head covers (yellow, red, blue)　MODEL：03-00100A

Probe tip head covers set.
Makes EPS-02Sv2 camera image recognition easier by attaching to the probe tip.
***Yellow, red, blue - 1pc each color.**

Microphone check kit　MODEL：19-00147A

Check kit outputting 1kHz 94dB sound for diagnosing microphone malfunctions.

Patent No.: 6258045
by Noise Laboratory Co., Ltd. and Toyota Motor Corporation.

Models: NKU07M32G / NKU2460G / NKU5080G

Broadband Sleeve Antenna

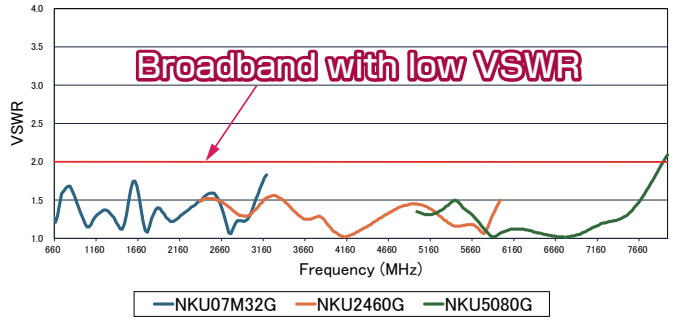
Broadband sleeve antenna has been developed for efficient immunity testing against hand-held transmitters and cellular phones. In the conventional strong electromagnetic field immunity test in the near field, it was necessary to replace the antenna according to each frequency, which required a lot of labor and time. These Broadband sleeve antennas is a single antenna solution eliminating the need for antenna changes and dramatically reducing the test time. Furthermore, these antennas with their small-size and lightweight properties and a flexible handle are suitable for testing in narrow spaces.

- **Compliant with ISO 11452-9 (2021) and ISO 11451-3 (2024).**
- **Tests can also be conducted for the 6GHz band (5.925GHz to 7.125GHz) expanded by Wi-Fi 6E and 7.**
- **A wide frequency range eliminating the need for antenna changes.**
- **With a power handling capacity of 20W (10W for NKU2460G/NKU5080G), it is capable of testing strong electromagnetic fields.**
- **High efficiency due to a low VSWR and high gain.**
- **Suitable for broadband digital modulation thanks to a good VSWR flatness.**
- **Small, light-weight and flat antennas easy to use in narrow spaces.**
- **The flexible antenna handle makes it easy to handle and maneuver during testing.**
- **Since there is little variation in the near-field distribution for each frequency, it is possible to radiate an electromagnetic field to the EUT without changing the position of the antenna.**

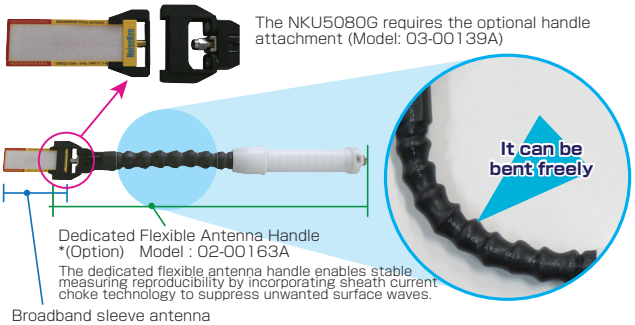
Specifications

Parameter	Specifications /Performance		
	NKU07M32G	NKU2460G	NEW NKU5080G
Frequency range	(660) 700 MHz ~ 3.2 GHz	2.4 GHz ~ 6 GHz	5 GHz ~ 8 GHz
VSWR	≦ 2.0		~ 7.5GHz : ≦ 2.0 7.5GHz ~ : ≦ 2.5
Maximum power input	20 W (continuous)	10 W (continuous)	
Input impedance	50Ω		
Connector	SMA (J) ※ antenna part only		
Dimensions ※protrusions excluded	W 50mm × H 186mm× D 8mm	W 35mm × H 108mm × D 10mm	W 33mm × H 90mm × D 9.5mm The handle attachment 03-00139A is required.
Weight	Approx. 73.5g	Approx. 20g	Approx. 14g

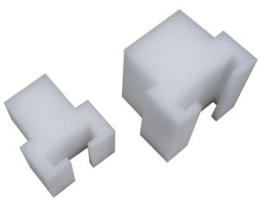
VSWR



Antenna Configuration



Antenna Spacer MODEL : 03-00113A / 114A / 140A

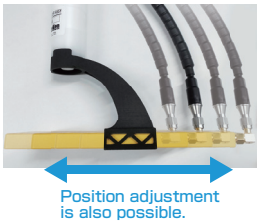


Antenna Spacer for the Broadband Sleeve Antenna. Equipping it allows the irradiation distance from the EUT to be kept at 50 mm.

Image of the equipped Antenna Spacer

Dedicated Antenna Adapter for NKU2460G MODEL : 03-00126A

A dedicated antenna adapter for broadband sleeve antennas. By using this adapter, antennas can be attached using Φ22 antenna holders and similar equipment. It is shape-compatible with the Schwarzbeck 420NJ antenna, making antenna changing easy.



NKU07M32G / NKU2460G / NKU5080G

CALIBRATION SERVICE AVAILABLE

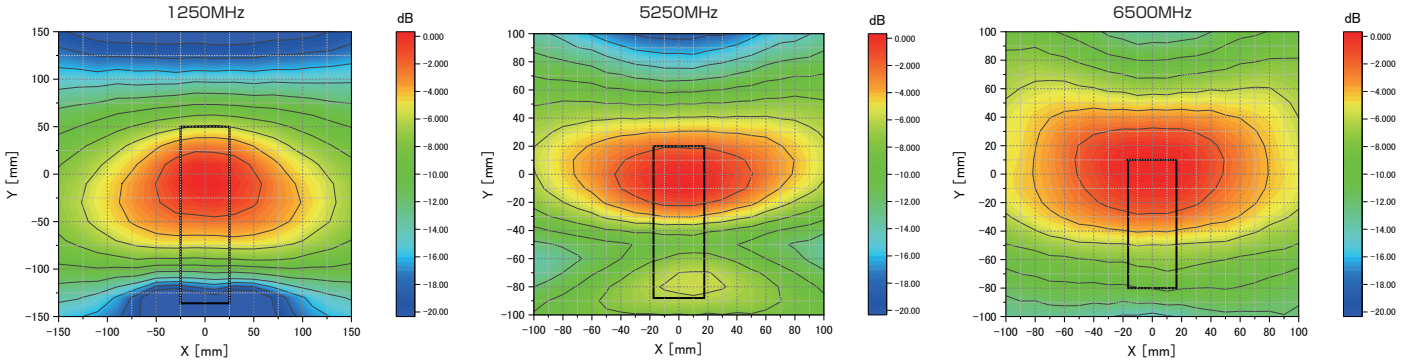
Calibration services are available for VSWR, electric field distribution and proximity gain characteristics of the Broadband Sleeve Antenna (NKU07M32G, NKU2460G,NKU5080G). In ISO 11452-9 standard the calibration of electric field is not specified, and testing level is set in accordance with input power to the transmitting antenna. The calibration allows to confirm proper functions of the transmitting antenna, which is necessary to ensure the quality of the testing. In addition, the electric field distribution and proximity gain characteristics allow to confirm the position and strength of strong radiation from the Antenna.

NKU07M32G

NKU2460G

NEW NKU5080G

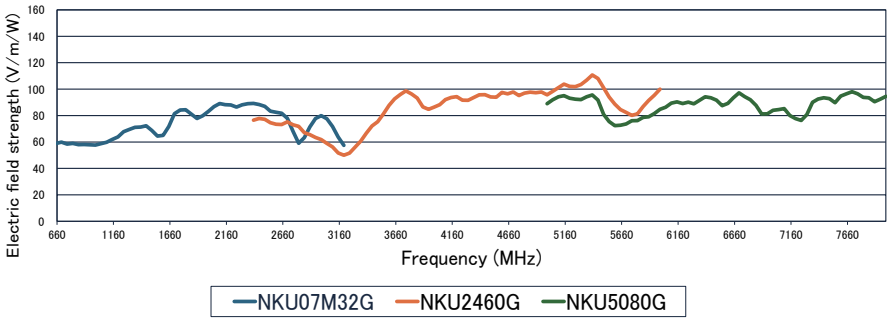
Image of Electric Field Distribution Characteristics



【Distribution map conditions】

● 1-axis electric field ●Measurement distance: 50 mm from the antenna ● Contour line interval : 2dB / Line

Image of Electric Field Strength Characteristics



【Conditions for Acquiring Electric Field Strength】

● 1-axis electric field ● Measurement distance: 50 mm from the antenna

● Measurement position coordinates (X : Y): NKU07M32G (0 : 10), NKU2460G (0 : 0),NKU5080G (0 : 0) ● Antenna input: 1W

TEM Horn Antenna

THA-380M60G / THA-380M70G

EMC Testing in the 5G/IoT Era!

The TEM horn antenna is an antenna for conducting a close proximity radiation immunity evaluation test (near electromagnetic field immunity test) of electromagnetic waves radiated from various wireless transmitters such as mobile phones and Wi-Fi equipment.
In the future, the close proximity radiation immunity evaluation test using the TEM horn antenna is expected to expand to various product standards such as medical equipment (IEC 60601-1-2) and multimedia equipment (CISPR 35).
NoiseKen's TEM horn antenna has a wide band, low VSWR, and wide electric field uniformity, offering an ideal solution for an efficient close proximity radiation immunity test.

THA-380M60G

THA-380M70G

** prototype image*

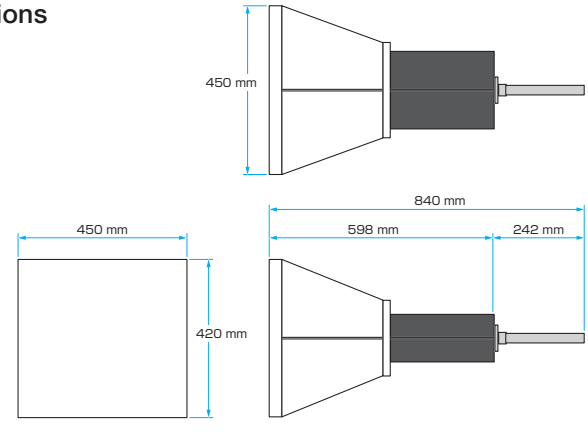
** This product is based on research results of the National Institute of Information and Communications Technology (NICT), Japan and joint-research with Noise Laboratory Co., Ltd.*

- **TEM horn antenna compliant with IEC 61000-4-39 Ed.1 standard.**
- **Allows testing to the entire frequency range of 380 MHz - 6 GHz with one antenna.**
- **Also supports 6 GHz band Wi-Fi "Wi-Fi 6E" (5.925 - 7.125 GHz).**
- **Low VSWR and high GAIN enable efficient electromagnetic wave radiation.**
- **Wide field uniformity reduces the number of times of movement of the antenna when radiating the EUT.**
- **Can be used for IEC 61000-4-3 preliminary testing in combination with a low-cost/low-output power amplifier by utilizing the proximity characteristics of the antenna.**

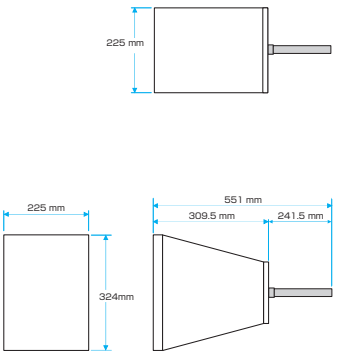
Specifications

	THA-380M60G	THA-380M70G
Parameter	Specifications	
Compliant standard	IEC 61000-4-39	
Frequency range	380 MHz - 6 GHz（8 GHz）** over 6 GHz not guaranteed*	380 MHz - 7.125 GHz
VSWR	below 3 (refer to Figure "VSWR")	below 3 (refer to Figure "VSWR") ** over 6 GHz not guaranteed*
Input power	380 MHz - 750 MHz：180 W MAX 750 MHz - 1.7 GHz：100 W MAX 1.7 GHz - 6 GHz：65 W MAX	380 MHz - 7.125 GHz：100 W MAX
Electric field uniform area	refer to figure "Electric field distribution characteristics"	
Required power	refer to figure "Power required for generating 300 V/m (typ) (at 0.1 m)"	
Impedance (typ)	50 Ω	
Connector	N (J)	
Dimensions	W450 mm × H420 mm × D598 mm **excluding protrusions, excluding φ 22 antenna support pole* **refer to the below figure "Dimensions" for the details*	W225 mm × H324 mm × D309.5 mm **excluding protrusions, excluding φ 22 antenna support pole* **refer to the below figure "Dimensions" for the details*
Weight	approx.3.2 kg	approx.1.6 kg

Dimensions



THA-380M60G

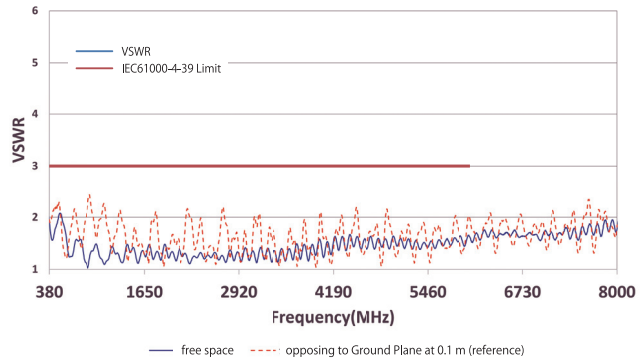


THA-380M70G

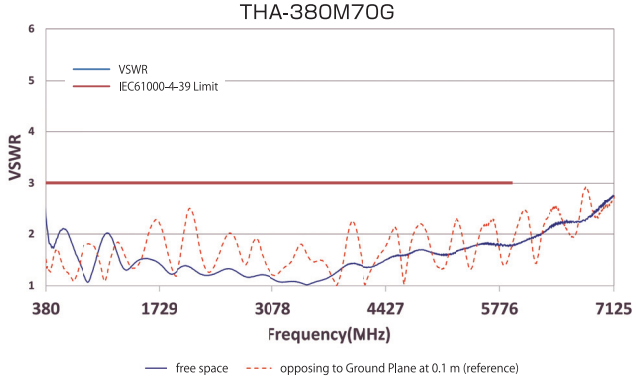
THA-380M60G / THA-380M70G

VSWR

THA-380M60G

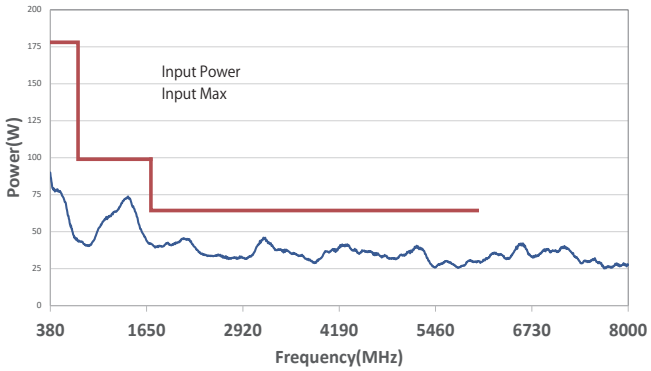


THA-380M70G

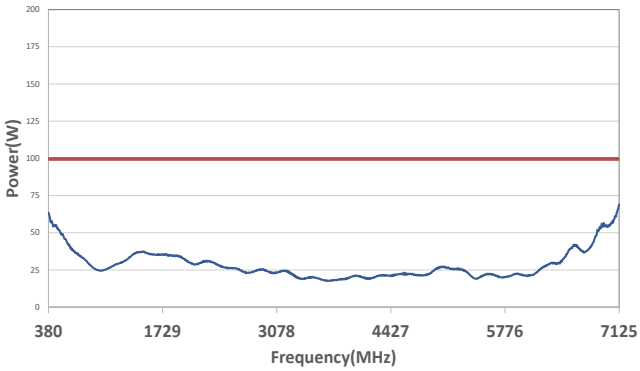


Power required for generating 300 V/m (typ) (at 0.1 m)

THA-380M60G



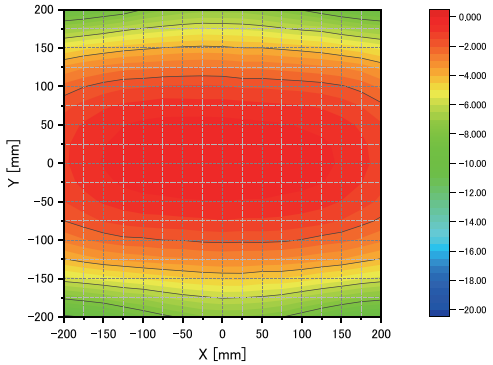
THA-380M70G



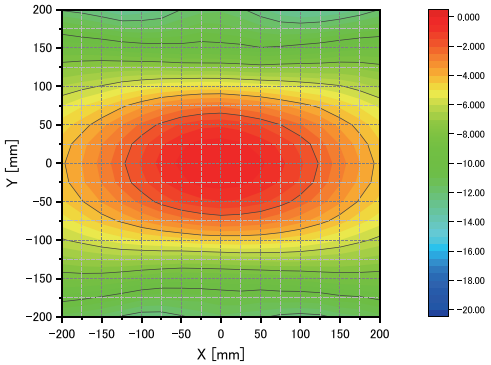
Electric field distribution characteristics

THA-380M60G

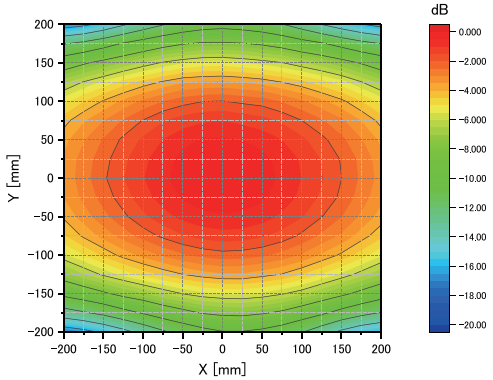
【385MHz】

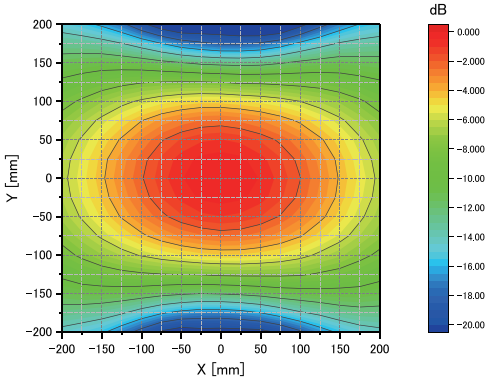


THA-380M70G

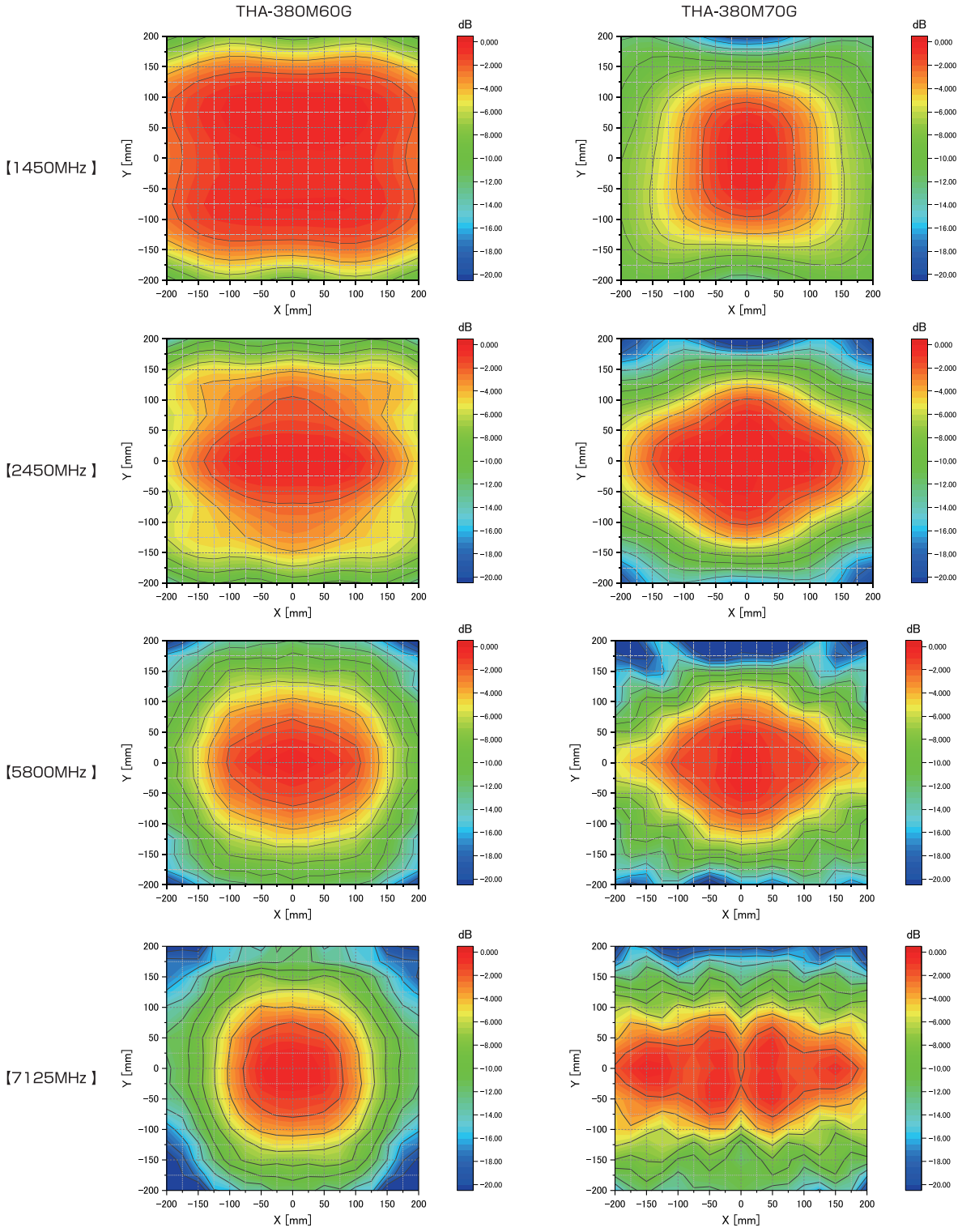


【870MHz】





THA-380M60G / THA-380M70G



Antenna distance: 0.1 m

2 dB / Line: The second contour line from the inside is the electric field uniform area.

The electric field distribution is vertically and horizontally symmetrical

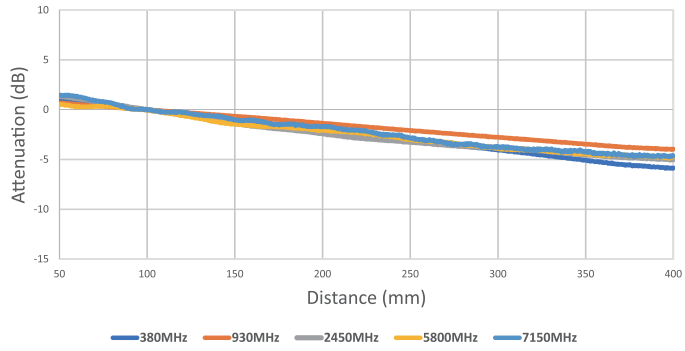
THA-380M60G / THA-380M70G

Close proximity distance characteristics

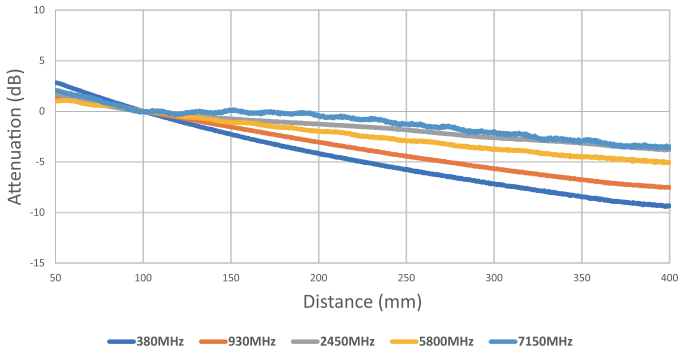
Distance attenuation characteristics

* Distance attenuation characteristics on axes with 100 mm from the antenna as the reference point

THA-380M60G



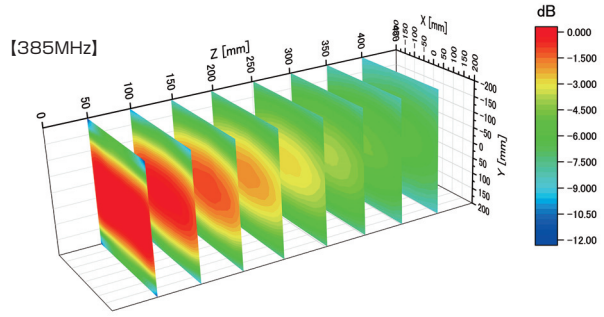
THA-380M70G

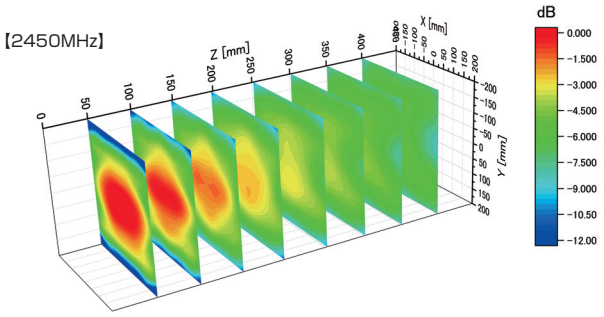


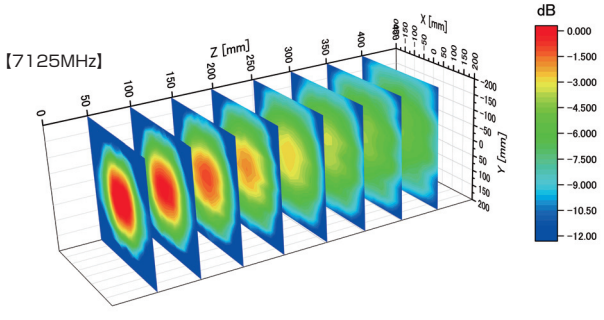
Electric field distribution distance characteristics

* Reference point: maximum of 100mm

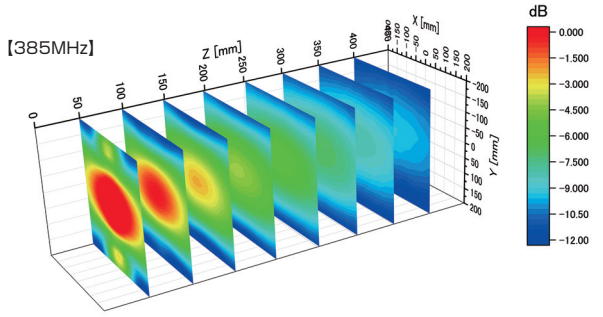
THA-380M60G

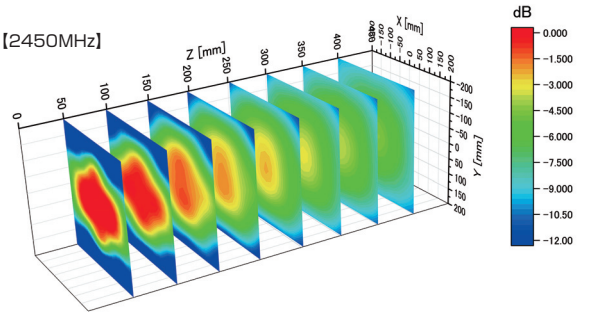


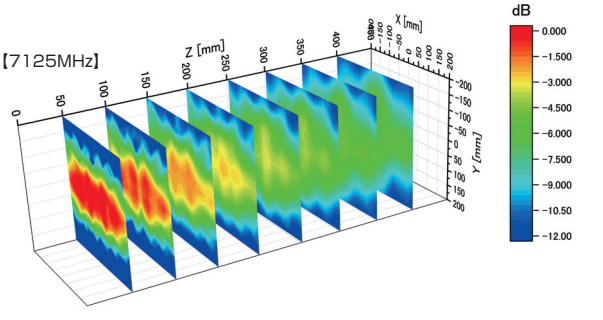




THA-380M70G



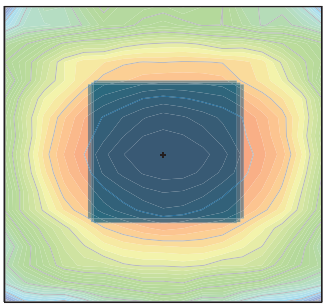




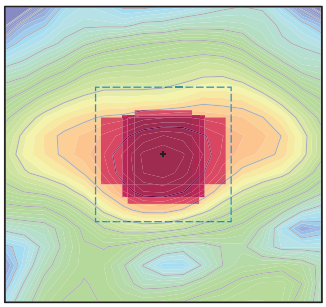
THA-380M60G / THA-380M70G

Securing Uniform Field Area

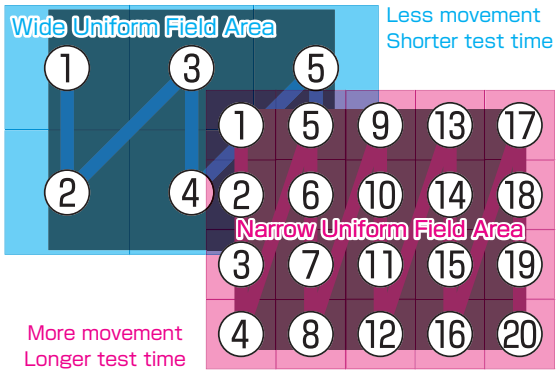
In the actual test, a quadrangle inscribed in the uniform electric field area is created to control the irradiation position. Therefore, a symmetrical electric field distribution characteristic that can create a large square with the maximum point in the center is required.



【Symmetrical Uniform Field Area】
Since the uniform electric field area is symmetrical vertically and horizontally, a wide uniform electric field area can be obtained with reference to the central axis of the antenna.



【Distorted Uniform Field Area】
If the uniform electric field area is distorted, it is difficult to secure a wide uniform field area with reference to the central axis of the antenna (the uniform field area becomes narrow).

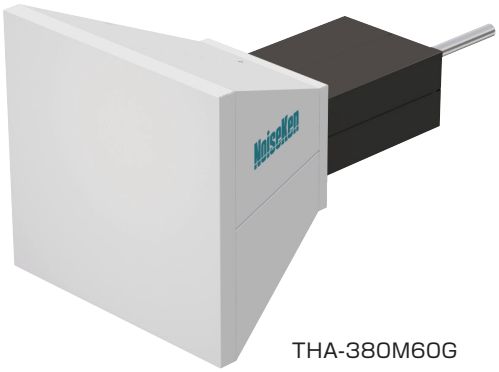


Difference in the number of antenna movements

The wide and symmetrical electric field distribution characteristics contribute to shorter test time!

THA-380M60G and THA-380M70G Comparison Table

	THA-380M60G	THA-380M70G
Dimensions, Weight	Good	Excellent
Frequency range	Excellent	Excellent
	8 GHz max (*guaranteed up to 6 GHz)	7.125 GHz max
VSWR	Excellent	Excellent
	Good VSWR even when facing metallic surfaces	
Required Power (for generating 300 V/m (typ) (at 0.1 m)	Good	Excellent
Electric field distribution	Excellent	Good
Distance attenuation characteristics	Excellent	Good
	Attenuation after the reference point is low, being effective even for products with depth.	Relatively large difference in attenuation characteristics depending on the frequency.
Electric field distribution distance characteristics	Excellent	Good
Use in far-field test methods	Excellent	N/A Specifically designed as an antenna for close proximity radiation immunity testing



THA-380M60G

NEW !

THA-380M70G

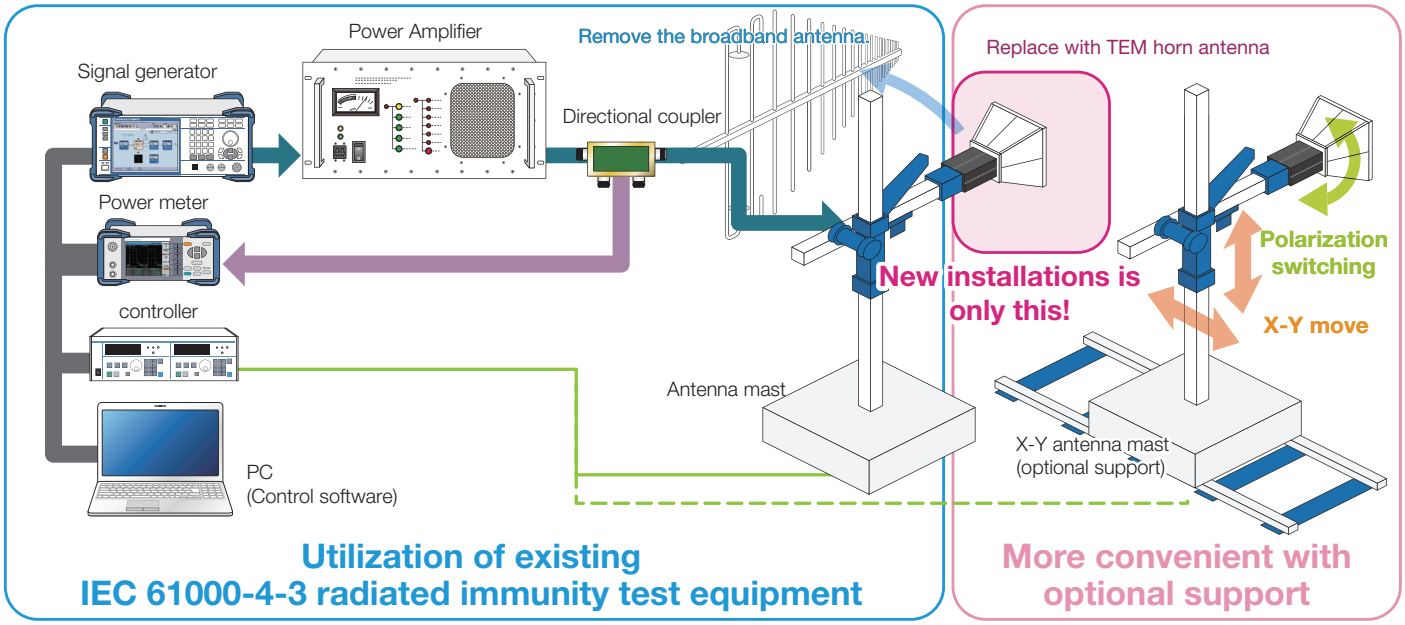
THA-380M60G / THA-380M70G

System configuration image

The system consists of a signal generator serving as a signal source for noise, a power amplifier that amplifies the signal, a TEM horn antenna that emits radio waves, a power meter to check the power supplied to the TEM horn antenna and a software to control these devices.

The basic system configuration is almost the same with the IEC 61000-4-3 radiated immunity test. System setup for the proximity irradiation test can be achieved by simply switching the antennas from the broadband antenna to the TEM horn antenna.

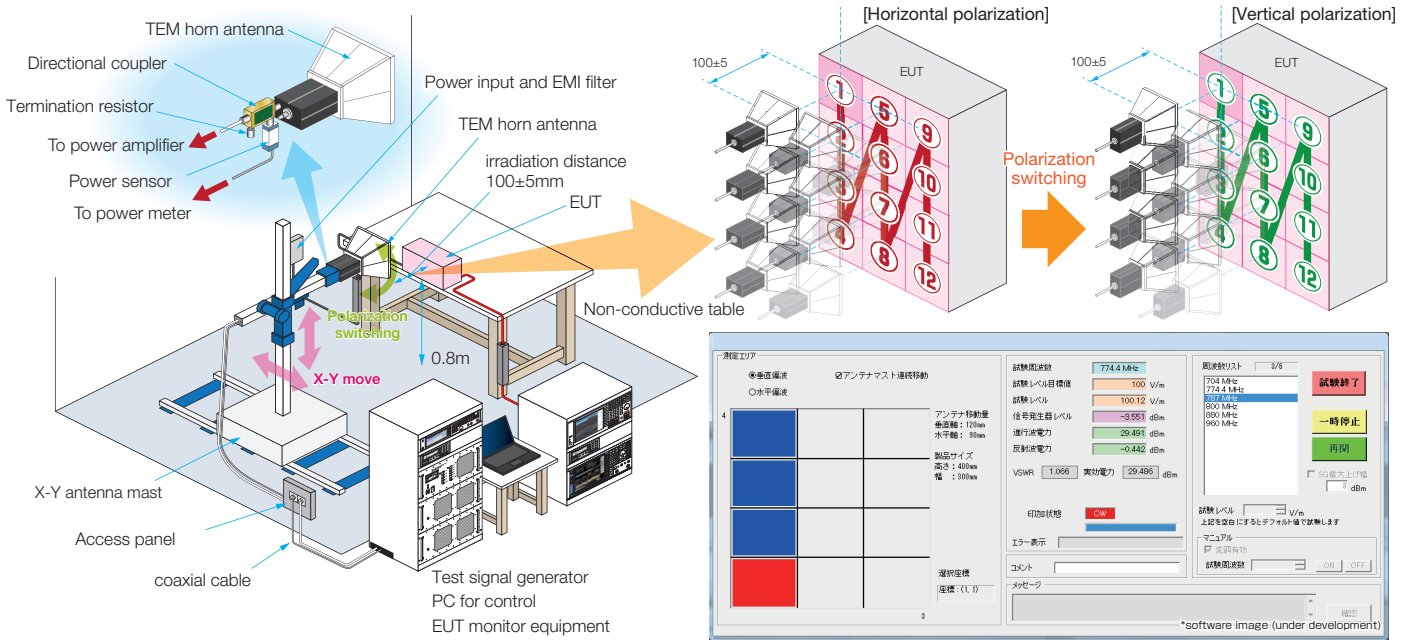
**antenna position control (X-Y control) is available as an option*



System configuration using the dedicated software

Test image using dedicated software (X-Y position movement and polarization switching control)

In the test, the distance between the DUT and the antenna is set to 100 mm, and all surfaces of the DUT are radiated with vertically polarized waves and horizontally polarized waves. By using the dedicated software to automate the antenna movement and radio wave radiation, you can further reduce test time and labor.



Simplified Radiated Immunity Test System

This system can easily perform Radiated Immunity tests by using a small power amplifier for proximity tests, a signal generator, and a highly efficient antenna for proximity tests according to the test frequency and application. This system is recommended for customers who want to perform simple evaluations at low cost, and who want to take measures against electromagnetic interference from wireless transmitters. The Simplified Radiated Immunity Test System can be used for various tests and verifications related to electromagnetic interference including from wireless transmitters.

Features & Benefits

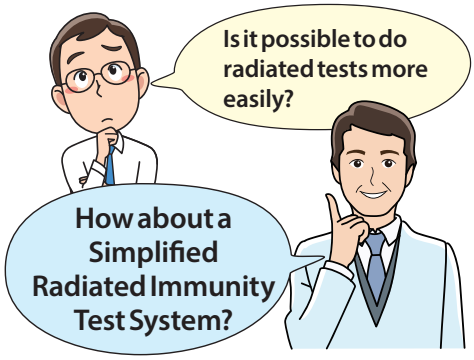
● Features

- Wideband support up to 7 GHz
- Strong E-field strength (up to 90V/m)
- Free modulation settings (AM, PM, Continued Wave)
- Low cost (minimum equipment, anechoic chamber use is not mandatory)

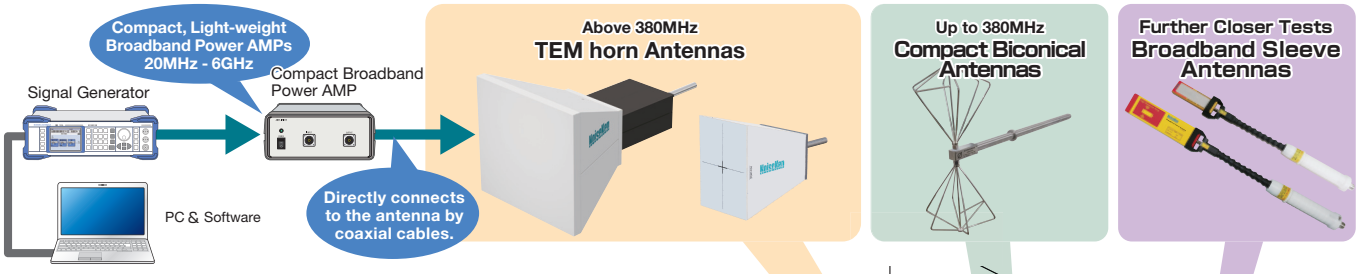
● Benefits

- Various electromagnetic interference verification at a low cost
- Reference standards: IEC 61000-4-3, IEC 61000-4-39, ISO 11452-9
- Find weak locations

Low Cost Easy

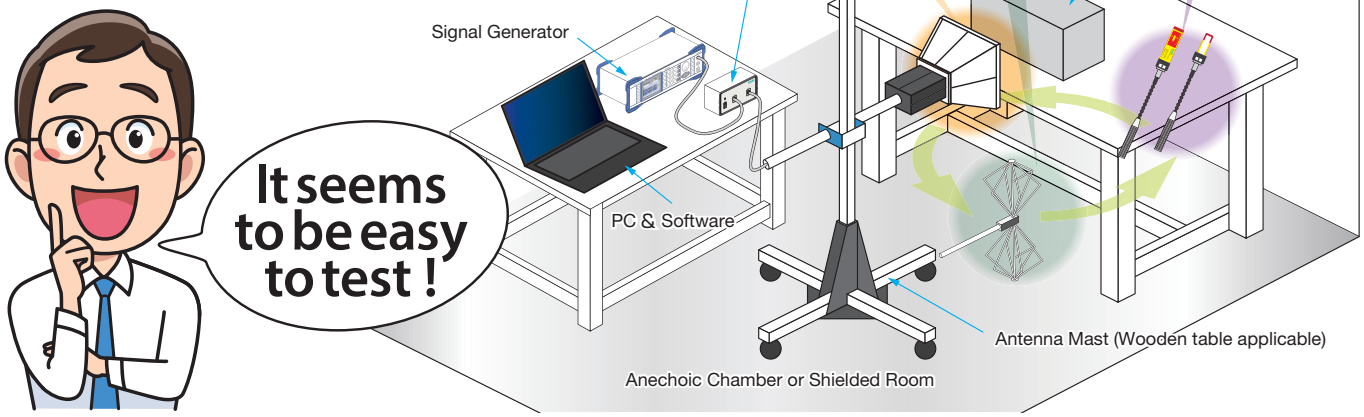


Build a system with the minimum necessary equipment



Simply select the test distance and set the test level.

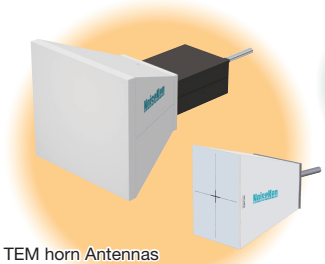
Test distance : 100mm / 200mm / 300mm / 400mm
Field strength : 10V/m etc.
SG automatically adjusts required antenna input power.



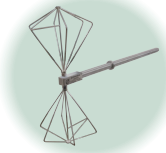
High-performance Proximity Antennas

Select Antennas According to the Test Purpose

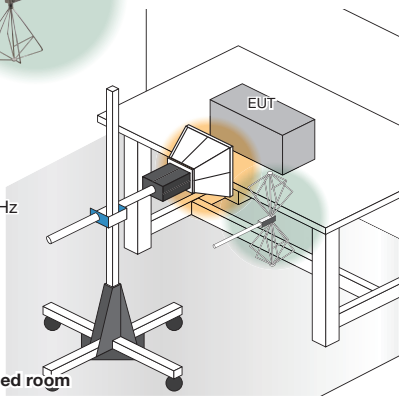
Testing related to IEC 61000-4-3



TEM horn Antennas
THA-380M60G ／ THA-380M70G
380MHz ～ 6GHz(8GHz) ／ 380MHz ～ 7.125GHz



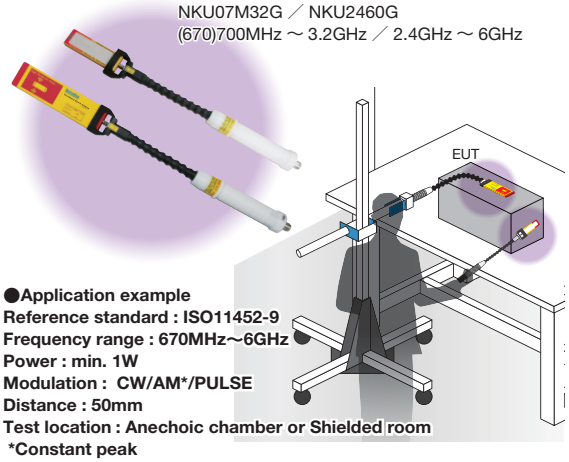
Compact Biconical Antennas
BBVU 9135 + UBAA 9114
80MHz ～ 380MHz



●Application example
Frequency ranges : 80MHz～6GHz
Field strength : 18V/m
Modulation : AM 1kHz 80%*
Distance : 200mm
Test locations : Anechoic chamber or Shielded room
***Constant peak**

Verify Electromagnetic Interference from other RF Transmitters.

Broadband Sleeve Antennas
NKU07M32G ／ NKU2460G
(670)700MHz ～ 3.2GHz ／ 2.4GHz ～ 6GHz



●Application example
Reference standard : ISO11452-9
Frequency range : 670MHz～6GHz
Power : min. 1W
Modulation : CW/AM*/PULSE
Distance : 50mm
Test location : Anechoic chamber or Shielded room
***Constant peak**

Although Simple, this test allows evaluation at a Low-Cost!

We have been performing the Conducted Immunity (IEC 61000-4-6) test in a shielded room, and we are very satisfied with the system because it is simple, low-cost, and easy to perform the Radiated Immunity test.

- Industrial equipment manufacturer -

An effective test system to reproduce failures!

A failure occurred during the Radiated Immunity test at the EMC test lab, and we had a hard time locating the problem. We could reproduce the failure with the help of the Simplified Radiated Immunity test system.
It is very effective in locating the defective location by bringing the antenna closer.

- Multi-media equipment manufacturer -

Customers Feedback

★★★

Can be used for evaluation of wireless transmitter bands!

Although the Radiated Immunity Test (IEC 61000-4-3) has the requirement only up to 1GHz , We appreciate that this system also allows for simple evaluation beyond that level, Up to 2 GHz and 5 GHz wireless communication bands.

- Industrial equipment manufacturer -

More than enough for our needs at this cost !

Our needs for Radiated Immunity Testing (IEC 61000-4-3) are not so big to make a huge capital investment (Anechoic chamber & system), so a Simplified Low-Cost Test system like this is more than enough for our needs!

- Factory Automation equipment manufacturer -

Measures against electromagnetic interference from wireless transmitters.

There are increasing cases of electromagnetic interference from other wireless transmitters such as Wi-Fi and smartphones, it is nice to be able to test as a countermeasure against electromagnetic interference from wireless transmitters.

- Semiconductor device manufacturer -

Reproduce communication loss due to electromagnetic interference.

We have a communication loss issue occuring due to electromagnetic interference from other wireless transmitters in products with communication functions. We want to use this system to reproduce the issue.

- Communication equipment manufacturer -

NOTE

NOTE

NoiseKen
NOISE LABORATORY

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