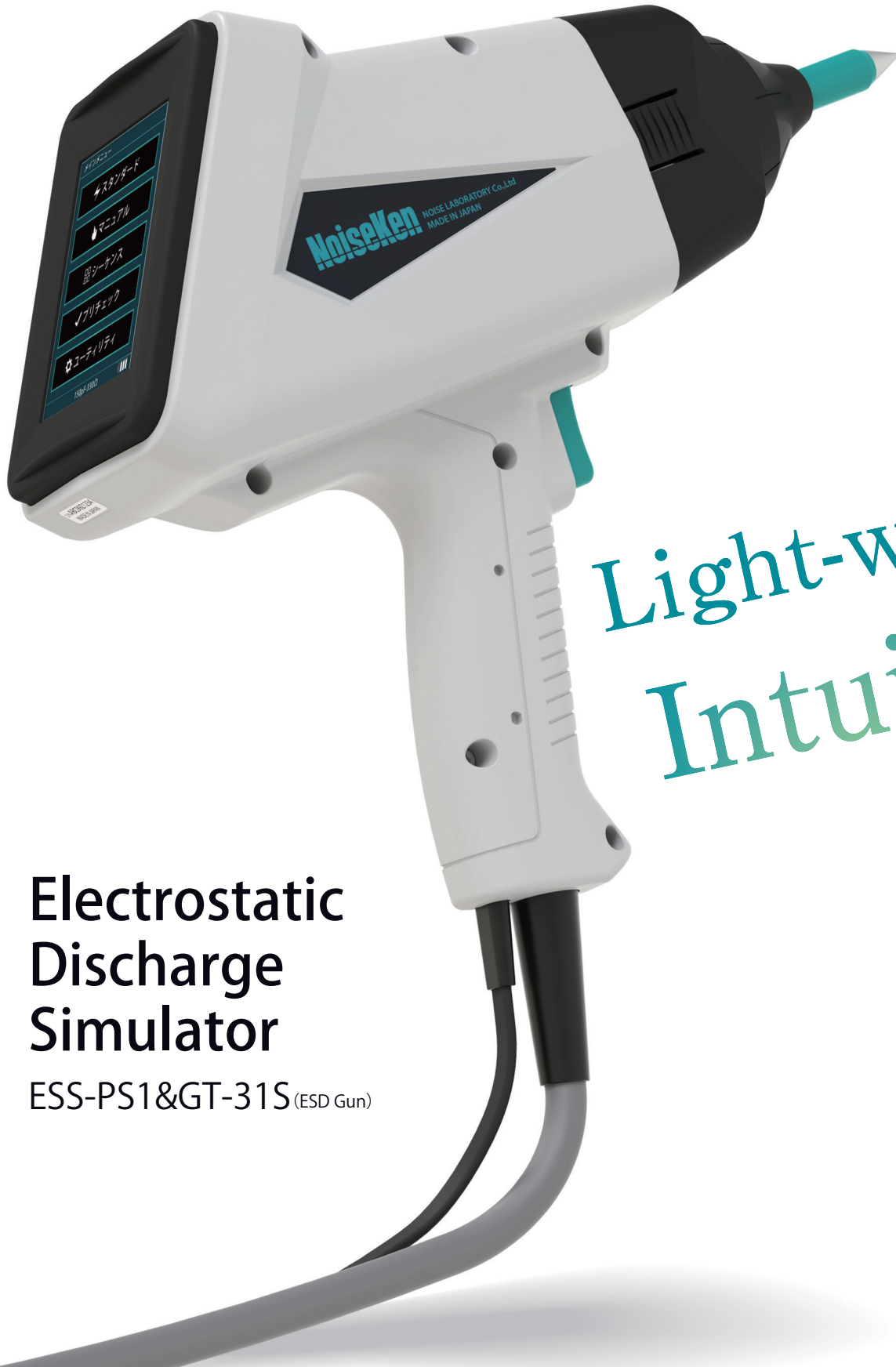




Light-weight
Intuitive

Electrostatic Discharge Simulator

ESS-PS1>-31S (ESD Gun)

Electrostatic Discharge Simulator

ESS-PS1 & GT-31S

Make electrostatic discharge testing easier !

Electrostatic discharges caused by a charged human body approaching an electronic device's operation panel, button switches, or enclosure generate high-voltage, high-frequency noise that can cause electronic devices to malfunction. Electrostatic discharge simulator is used to simulate such electrostatic discharge phenomena and evaluate the resistance of electronic equipment to electrostatic discharge.

IEC 61000-4-2 / ISO 10605
Standards compliant testing

Touch panel on discharge gun Intuitive operation menu

Easy-to-understand intuitive design. The display language can be switched between English and Japanese, and in "Standard Mode," test conditions for IEC and ISO standards can be easily set.

Big screen
25% bigger
than other ESD Guns

Light-weight
13% lighter
than other ESD Guns



Manual mode "allows free setting of test voltage, application frequency, etc.



Sequence test mode - load the saved test conditions in sequence and combine for automatic testing

The main unit is battery powered Convenient to carry!

Superior portability makes it effective for testing mobility equipment, large medical equipment, office equipment, etc.



Light-weight
51% lighter
than other ESD Guns

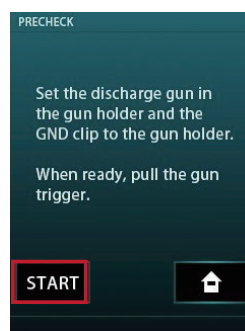
More reliable and secure testing!

When performing electrostatic discharge testing, do you ever feel unsure as to whether the test is being carried out correctly? With the three pre-check functions (high voltage power supply output check / insulation failure check / discharge relay operation check) provided in our simulator, such concerns can be eliminated. Before starting a test, the simulator can easily check for any abnormalities, making the test more reliable and secure.

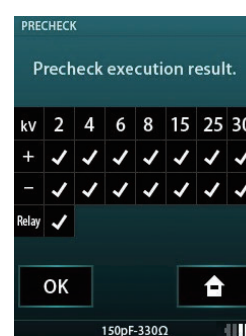
**NoiseKen
Original
Function**



Set the discharge gun in the gun holder



Start the Pre-Check



Pre-Check Complete

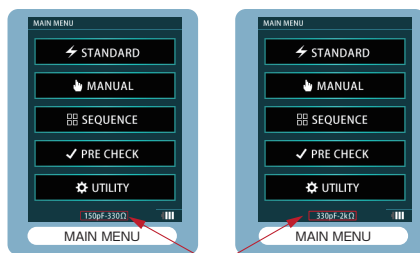
Eliminate mis-attachment

Equipped with discharge module identification function

Equipped with an automatic recognition function to identify the type of discharge module installed in the discharge gun. Automatic recognition of installed discharge modules reduces installation errors.



discharge gun GT-31S



Discharge module (capacitor and discharge resistor) recognition display

Discharge Module	Display	Operational restriction
Not attached	Not attached	START is not possible
150pF-330Ω	150pF-330Ω	None
330pF-330Ω	330pF-330Ω	None
150pF-2kΩ	150pF-2kΩ	None
330pF-2kΩ	330pF-2kΩ	None
C value disregarded-0 Ω	0Ω	None
Others (30kV enabled unit)	Other	None
Other (20kV MAX unit)	Other (20kV MAX)	MAX 20 kV

Features

- Complies with IEC 61000-4-2 / ISO 10605 standards.
- The discharge gun is equipped with a touch panel for improved operability.
- Battery operation improves portability and makes testing of large equipment more convenient.
- Equipped with a pre-check function (pre-start inspection) to ensure testing is carried out properly.
- Uses a discharge module in which the discharge cup and CR unit are integrated.
- Equipped with automatic discharge module recognition function helping to reduce mis-attachment.
- Equipped with a discharge detection function that notifies the user of discharge detection.

*Air discharge mode only.

- Remote control from PC via optical communication is also possible.

* Please consult with our sales representative.



The ISO 10605 test can be performed by using the accessory set for GT-31S (MODEL: GT-ISOSET-A).

ESS-PS1 & GT-31S

Specifications

● Main Unit ESS-PS1

Parameter	Specification
Output voltage	0.20kV - 30.0kV (30.5kV max), 0.20kV - 10.00kV: 0.01kV step setting, 10.0kV - 30.0kV: 0.1kV step setting
Output polarity	Positive/Negative
Repetition cycle	0.05s - 600.0s ± 10%, 0.05s - 9.99s: 0.01s step setting, 10.0s - 600.0s: 0.1s step setting
Discharge number of times	1 - 60000 times, 1 time step setting, or continuous
Discharge mode	Contact discharge, air discharge
Test mode	IEC test mode - Contact discharge: 2.0kV, 4.0kV, 6.0kV, 8.0kV Air discharge: 2.0kV, 4.0kV, 8.0kV, 15.0kV
	ISO test mode - Test voltage: 2.0kV, 4.0kV, 6.0kV, 8.0kV, 15kV, 20kV, 25kV
	Manual test mode - Contact and air discharge mode 0.20kV - 30.5kV, Arbitrary setting, Sweep function available. *99 test units memory
	Sequence test mode - Max. 6 steps per sequence program. *20 sequence programs memory
Trigger settings	Trigger switch or external trigger
Gun stand	Gun stand for the GT-31S discharge gun *included as standard equipment
Discharge detection	Detects discharges in air discharge mode
Pre-check function (pre-start inspection)	Check 1: Check the output voltage of the built-in high-voltage power supply and the dielectric strength of the simulator Check 2: High voltage output and dielectric strength check Check 3: Discharge relay operation check
Discharge Module detection	Recognition and display of various discharge modules
AUX connector	D-SUB 15-pin female connector Connection of warning light (MODEL: 11-00014B) and automatic ESD Elimination probe (MODEL: 01-00013B) External trigger input and external interlock input
Optical Communication Connectors	PC-communication optical connector (serial interface)
Power Supply and Power Consumption	AC100V - 240V ± 10%, 50Hz to 60Hz / Battery
Operating temperature	+15°C - +35°C
Operating humidity	20%RH - 60%RH * No condensation
Dimensions	Main unit: (W)1800 x (D)270 x (H)124mm * Protrusions not included
Mass	Main unit: 3.0 kg *excluding AC adapter for charging

● Discharge Gun GT-31S

Parameter	Specification
Output voltage	0.20kV - 30.5kV
Output polarity	Positive/Negative
Holding time	5 seconds or more
Control panel	Color LCD touch panel (resistive film type)
Operating temperature	+15°C - +35°C
Operating humidity	20%RH - 60%RH * No condensation
Dimensions	(W)90 x (D)236.2 x (H)246mm * Excluding discharge tip
Mass	1.5 kg * including cables, excluding connectors

● Battery

Parameter	Specification
Battery type	Rechargeable lithium-ion battery
Rated voltage	DC 14.4V
Rated capacity	3.40 Ah
Charging time (reference value)	3 hours (ambient temperature 25° C)
Continuous use time (reference value)	Approx. 7 hours *Depends on usage conditions

● AC Adapter

Parameter	Specification
Input Rating	AC100V ~ AC240V ± 10% 50Hz ~ 60Hz / 1.7A
Rated voltage	DC19.0V / 3.42A
Dimensions	(W)95 x (D)25.4 x (H)50mm * Cable and connector not included
Mass	270g

Accessories

Discharge module (CR for GT-31S)

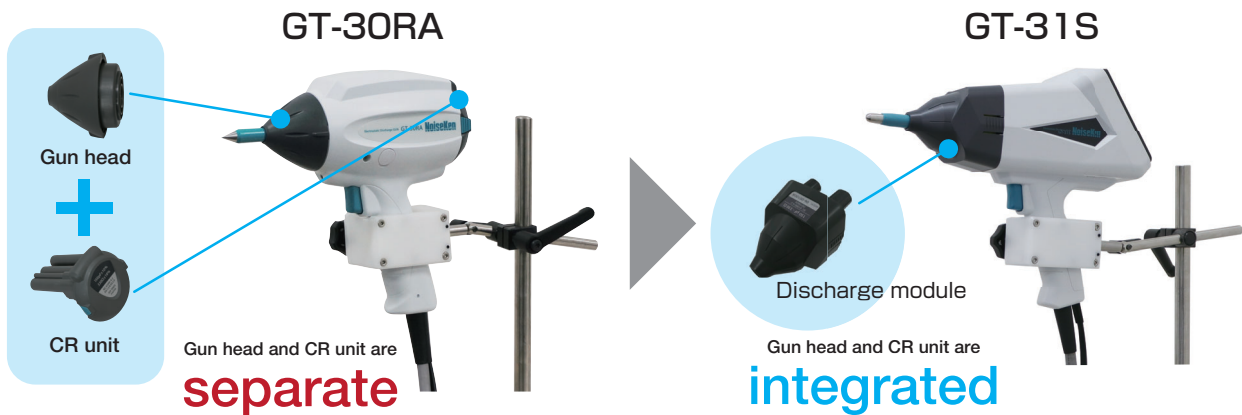


Conventional discharge guns had a CR unit and a discharge cup attached, but in the GT-31S discharge gun, the CR unit and the discharge cup are integrated in 1 piece as a discharge module.
By replacing the discharge module, testing to IEC 61000-4-2 and ISO 10605 standards is possible.

MODEL	Product Name	Constant	Remarks
06-00100A	CR for GT-31S (150pF-330)	150pF-330Ω	IEC 61000-4-2 Ed.2 & Ed.3 ISO 10605 Ed.2 & Ed.3
06-00101A	CR for GT-31S (150pF-2k)	150pF-2kΩ	ISO 10605 Ed.1/2/3
06-00102A	CR for GT-31S (330pF-330)	330pF-330Ω	ISO 10605 Ed.2 & Ed.3
06-00103A	CR for GT-31S (330pF-2)	330pF-2kΩ	ISO 10605 Ed.1/2/3
06-00104A	CR for 12-00010A and GT-31S (150pF-330)	150pF-330Ω	CR for Micro-gap Discharge Tip 12-00010A
06-00105A	CR for GT-31S (500pF-0)	500pF-0Ω	
06-00106A	CR for GT-31S (150pF-500)	150pF-500Ω	
06-00107A	CR for GT-31S (100pF-1.5k)	100pF-1.5kΩ	
06-00108A	CR for GT-31S (200pF-0)	200pF-0Ω	
06-00109A	CR for GT-31S (150pF-150)	150pF-150Ω	
06-00115A	Fast Rise Time CR for GT-31S (150pF-330)	150pF-330Ω	
06-G1262	CR for GT-31S (200pF-50Ω)	200pF-50Ω	Discharge module for wearable devices

06-00100A is included in the discharge gun GT-31S package

Please inquire separately for discharge modules (CR for GT-31S) other than the listed constants.



● For ISO 10605 testing

The ISO 10605 test can be conducted using the accessory set for the GT-31S.

MODEL	Product Name	Set Contents
GT-ISOSET-A	Accessory set for GT-31S	06-00101A / 06-00102A / 06-00103A / 12-00009A Quantity: 1 each 12-00009A is a discharge tip (sphere type)



ESS-PS1 & GT-31S



GT-ISOSET-A

Accessories

Micro gap discharge tip MODEL: 12-00010A

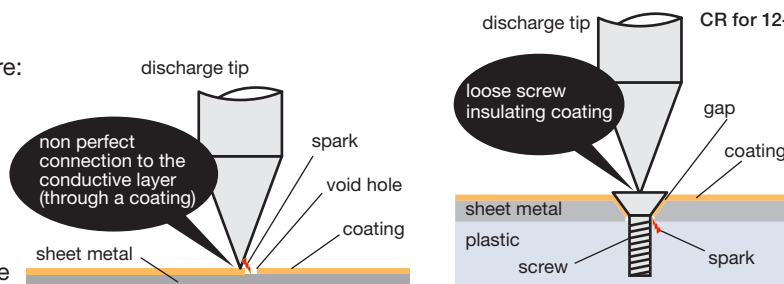
Enabling a more stringent evaluation for the real world ESD immunity

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-standardized field events.



Events you can simulate are:

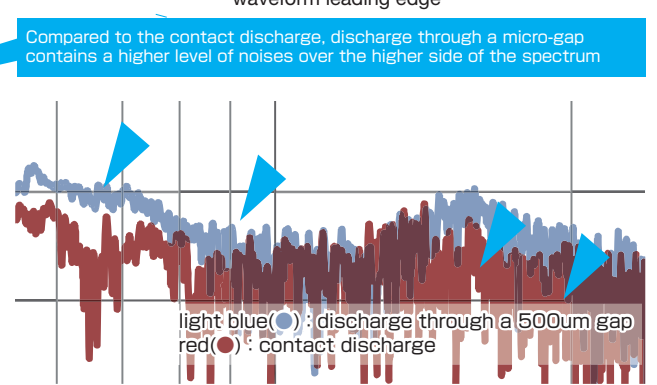
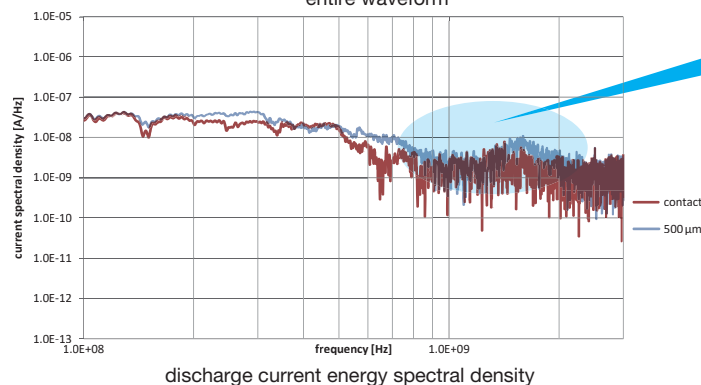
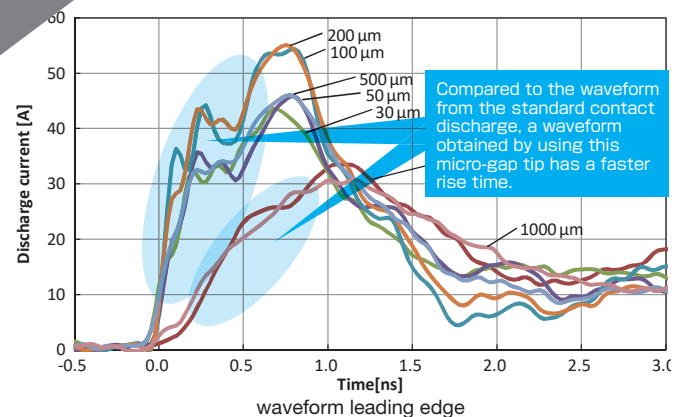
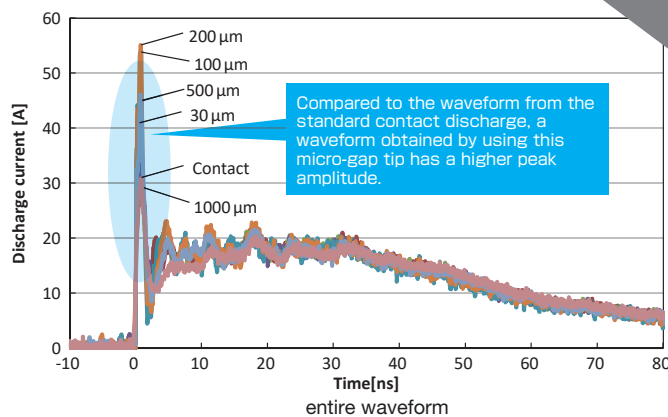
- Loose screws
- Poor insulation coating
- Poor electrical connection between components and others which cause secondary discharges within a very close distance



enlarged photo of the micro-gap

Simulated field events

Output waveform (reference)



Testing with energy rich pulses for the GHz band

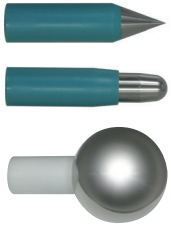
Other compatible discharge guns

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

Accessories

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



Tip of discharge gun.
 Discharge tip (conical): 12-00007A
 Discharge tip (round): 12-00008A
 Discharge tip (sphere type 30mm): 12-00009A

Discharge gun stand MODEL: 03-00127A



A stand to fix the discharge gun for testing.
 Also used during the pre-check (pre-start inspection).
 03-00127A is included in the main unit ESS-PS1 package.

ESD elimination brush MODEL: 05-00125A



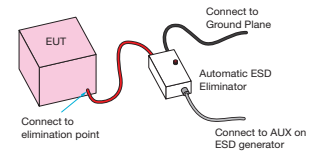
This brush is used to remove electrical charges accumulated on equipment when conducting ESD tests.
 Dimensions: (W)250 x (D)15 x (H)60mm
 Weight: Approx. 160g *Cable not included



Automatic ESD Eliminator MODEL: 01-00013B



Connected to ESS-PS1 ESD Simulator to automatically perform static elimination to remove charges from equipment charged by the application of static electricity.
 Dimensions: (W)85 x (D)150 x (H)60mm
 Mass: 1.1 kg



Free Arm Probe Stand MODEL: 03-00022B



Probe stand to move and fix the discharge gun of ESD Simulator to a desired position, up and down, left or right.

*Not standardized in the Standard
 When using discharge gun GT-31S, stand conversion adapter MODEL: 03-00131A is separately required.

Parameter	Specification
Dimensions	(W)200 x (D)68 x (H)750mm * When stored
Mass	5kg

Probe stand for GT Guns MODEL: 03-00130A



Used to fix a discharge gun during ESD testing. The articulated type allows the discharge gun to be oriented and fixed in any desired direction.

*Not standardized in the Standard
 Probe stand exclusively for use with the GT-31S discharge gun.

Parameter	Specification
Dimensions	Height: 380mm Base diameter: 160mm
Mass	4.1kg
Motion range	Vertical: 150mm Pivot angle: 130°

Stand conversion adapter MODEL: 03-00131A



Adapter for mounting the discharge gun GT-31S on a free arm probe stand.

OPTICAL INTERFACE BOX MODEL : 07-00022A



Used to operate the ESD Simulator remotely from a PC.
 Includes 5m USB-to-optical conversion fiber-optic cable.

AUX Connector Junction Box MODEL: 05-00052A



Used for connection of multiple auxiliary accessories such as warning light, automatic ESD eliminator, external triggers and others.

Warning light MODEL: 11-00014B



This warning light can be used with the ESS-PS1 static tester. Flashes during the test alerting the surrounding people.

AC adapter MODEL: 17-00007A



AC adapter for the ESS-PS1 ESD Simulator.
 17-00007A is included in the ESS-PS1 package.

Accessories

Faraday cage MODEL: FC-300



Faraday cage for checking current waveforms as defined in the IEC 61000-4-2 / ISO 10605 standards. Easy to move with the attached casters.

Parameter	Specification
Dimensions	(W)848×(D)765×(H)1757mm
Mass	Approx. 75kg
Power supply	AC100V 50Hz/60Hz±10%*

* Other power supply voltages (220V, etc.) available per request.

RGP for FC-300 MODEL: 03-00138A
(W)1225×(D)1680×(T)1.5mm

* FC-300 is a Faraday cage compliant with IEC 61000-4-2 Ed.3. FC-300 does not include RGP for FC-300 (03-00138A), GND cable holding stand (03-00129A), or discharge gun fixing base (03-000128A).

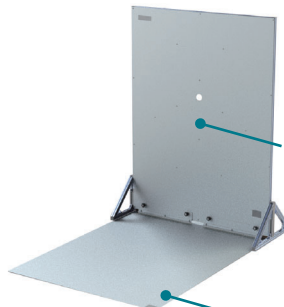
Discharge gun mount MODEL: 03-00128A



Jig for fixing the discharge gun during waveform verification using a Faraday cage and ESD current target mounting board (03-00052B/03-00118A).

Compatible guns: GT-31S, GT-30R(A), TC-815R, TC-815S

ESD current target mounting plate MODEL: 03-00118A

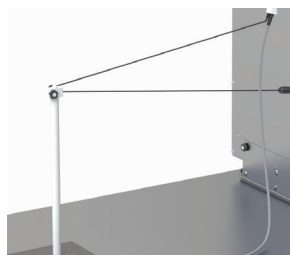


A board and dedicated ground plane for mounting current target in a discharge current waveform measurement environment.

ESD current target mounting board
MODEL: 03-00118A
(W) 1275×(D)560×(H) 1636mm

RGP for 03-00118A MODEL: 03-00119A
(W) 1210×(D)1660×(T) 1.5mm(Excluding positioning block)

GND cable positioner MODEL: 03-00129A



A stand for pulling the ground cable of a discharge gun when observing the ESD discharge current waveform.

(H)700mm

ESD current target MODEL: 06-00094A



Load resistor required by the IEC 61000-4-2 standard. Used for measurement of the electrostatic discharge current waveform.

Parameter	Specification
Max. applied voltage (pulse)	30kV MAX
Input Resistance	2.04 Ω
Output impedance	2.04 Ω
Insertion loss (S21)	300kHz - 1GHz: within ±0.5dB 1 GHz - 4 GHz: within ±1.2 dB
Output connector	SMA type
Dimensions	70φ×35mm
Mass	480g

Included items: Attenuator MODEL: 00-00022A 2 pcs.

Coaxial cable MODEL: 02-00157A 1 pc.

*Conversion connector MODEL: 02-00133A is not included.

Target mounting board (1.2m x 1.2m) MODEL: 03-00052B



Mounting board for fixing the ESD current target 06-00094A for measuring discharge current waveform.
Dimensions: 1200mm x 1200mm

Attenuator MODEL: 00-00022A



20dB SMA type attenuator for protection of measurement equipment.
*Included in the 06-00094A package.

Conversion connector MODEL: 02-00133A

SMA to BNC conversion connector.

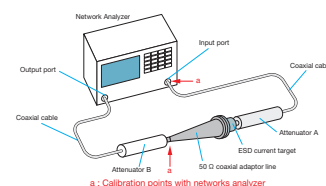
ESD Current Target Calibration Set MODEL: 06-00068B



Adapter for calibrating ESD current target 06-00094A/06-00067A.

Not compatible with 06-00001A.

* Current target MODEL: 06-00094A is not included.



Load resistor mounting board MODEL: 03-00027A



Mounting board for fixing the ESD current target 06-00094A for measuring discharge current waveform.
Dimensions: 600mm x 600mm

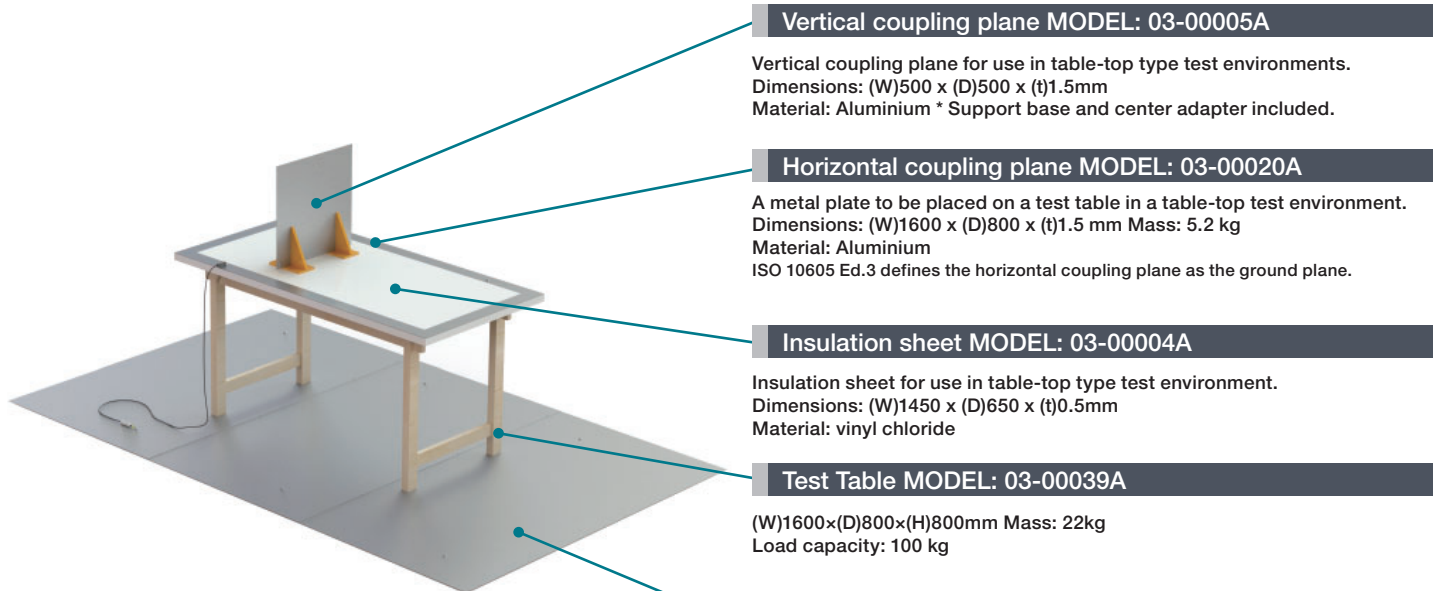
Coaxial cable MODEL: 02-000157A



Coaxial cable for high frequency. Used to connect ESD current target to oscilloscope.
Length: 1m

*Included in the 06-00094A package.

Accessories

**Vertical coupling plane MODEL: 03-00005A**

Vertical coupling plane for use in table-top type test environments.
 Dimensions: (W)500 x (D)500 x (t)1.5mm
 Material: Aluminium * Support base and center adapter included.

Horizontal coupling plane MODEL: 03-00020A

A metal plate to be placed on a test table in a table-top test environment.
 Dimensions: (W)1600 x (D)800 x (t)1.5 mm Mass: 5.2 kg
 Material: Aluminium
 ISO 10605 Ed.3 defines the horizontal coupling plane as the ground plane.

Insulation sheet MODEL: 03-00004A

Insulation sheet for use in table-top type test environment.
 Dimensions: (W)1450 x (D)650 x (t)0.5mm
 Material: vinyl chloride

Test Table MODEL: 03-00039A

(W)1600x(D)800x(H)800mm Mass: 22kg
 Load capacity: 100 kg

Ground plane MODEL: 03-00007A

Metal plate to be placed under wooden table.
 Dimensions of 1 sheet: (W)1800 x (D)1000 x (t)1.5mm Mass: 7.2 kg (1 sheet)
 Quantity: 3 sheet/set Material: Aluminium
 In ISO 10605 Ed.3, the horizontal coupling plane is used as a ground plane, so it is not required.

Floor-standing vertical coupling plane MODEL: 03-00034A

Vertical coupling plane for use in floor-standing test environment.
 Dimensions: (W)540 x (D)500 x (H)1538mm
 Material: Aluminium * Support base and center adapter included.

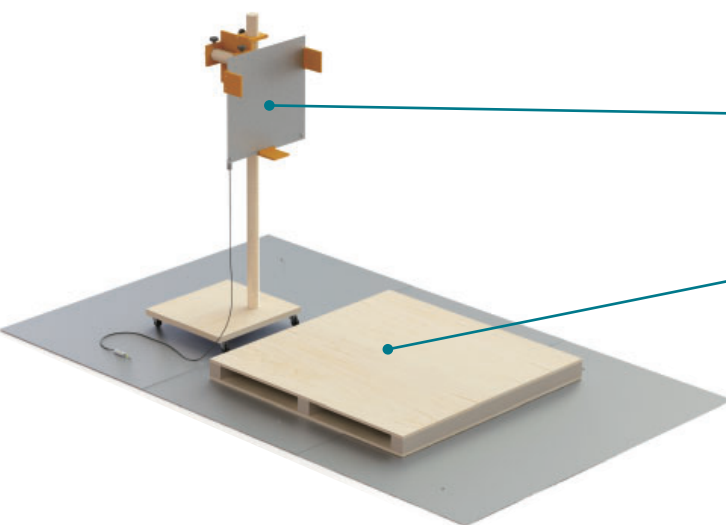
Insulation support MODEL: 03-00024A

Insulating support for use in floor-standing test environment. Used to float equipment 10 cm when conducting ESD testing.
 Dimensions: (W)1200 x (D)1200 x (H)10 mm Mass: 22 kg
 Load capacity: 500 kg

Cubic insulating block 100 MODEL: 03-00029A

A cubic insulating block for use in a floor-standing test environment. Used to float equipment 10 cm when conducting ESD testing.
 Dimensions: (W)100 x (D)100 x (H)100mm
 Quantity: 4 pcs/1 set

*Set products are also available. For details, please refer to p.13: Test Environment (Table-top type and floor-standing type) ESS-801 / 801GL.



*Set products are also available. For details, please refer to p.13: Test Environment (Table-top type and floor-standing type) ESS-801 / 801GL.

Discharge resistance cable (1.5m) MODEL: 05-00182A

Discharge resistor cable connecting between the horizontal coupling plane and the ground plane.
 Length: 1.5m * Includes 2pcs of 470kΩ resistors.
 * IEC 61000-4-2 Ed.2/Ed.3, ISO 10605 Ed.2/Ed.3 compliant

The photo is for illustrative purposes only.

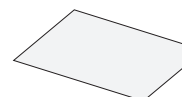
Insulation block MODEL: 03-00054A

Insulation blocks are used to raise (insulate) wiring from equipment above the ground plane.
 Dimensions: (W)300 x (D)300 x (H)50mm
 Quantity: 5 sheets/set
 ISO 10605 ed.3 compliant

Discharge resistance cable (3m) MODEL: 05-00183A

Discharge resistor cable connecting between the vertical coupling plane and the ground plane.
 Length: 3m * Includes 2 x 470kΩ.
 * IEC 61000-4-2 Ed.2/Ed.3, ISO 10605 Ed.2/Ed.3 compliant

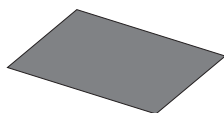
The photo is for illustrative purposes only.

Insulation support MODEL: 03-00066A

This sheet is placed between the equipment and the ground plane when performing electrostatic testing of in-vehicle electronic equipment.
 Dimensions: (W)1450 x (D)650 x (t)2mm
 Material: PVC (polyvinyl chloride) transparent
 ISO 10605 ed.2 compliant

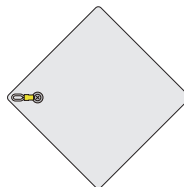
Accessories

Static dissipative mat for ISO 10605 MODEL: 03-00055A



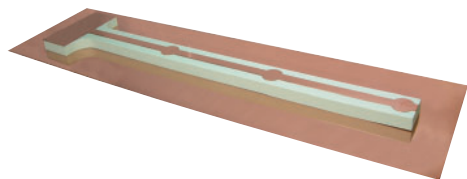
A mat placed between the equipment and the ground plane during packaging and handling ESD susceptibility testing.
Dimensions : (W)1000 x (D)1000 x (t)2mm

Aluminium plate for testing MODEL: 03-00053A



A metal plate that is placed under the tire when performing ESD testing on an actual vehicle.
Dimensions: (W)500 x (D)500 x (t)1.5mm

Field Coupling Plane MODEL: 03-00065A



A set of coupling part (made of copper) and insulating block as specified in ISO 10605.
The dimensions of the electric field coupling surface vary depending on the size of the EUT.
**Customization available, please consult our sales representative.*
**Ground plane not included.*

Impulsive Electric Field Adaptor for GT-31S MODEL: 03-00135A



Adaptor for simulating electrostatic induction, an inductive mode of noise, and is used in combination with an ESD Simulator and a discharge gun.

Impulsive Magnetic Field Adaptor for GT-31S MODEL: 03-00136A



Adaptor for simulating magnetic field induction, an inductive mode of noise, and is used in combination with an electrostatic tester and a discharge gun.

Magnetic field loop adaptor for GT-31S MODEL: 03-00137A



A magnetic field loop adaptor, in accordance with U.S. Ford standard, used in combination with an electrostatic tester and a discharge gun.

Storage case for GT-31S MODEL: 09-00011A



Case for storing the GT-31S discharge gun. Can also store the GT-31S accessory set (GT-ISOSSET-A) for performing testing complying with ISO Standard.

ESS-PS1/GT-31S storage case MODEL: CASE-ESSPS1



This case can store the ESS-PS1 static tester and the GT-31S discharge gun. Can also store the GT-31S accessory set (GT-ISOSSET-A) for performing testing complying with ISO Standard.

ESD voltage meter MODEL: 18-00086B

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.

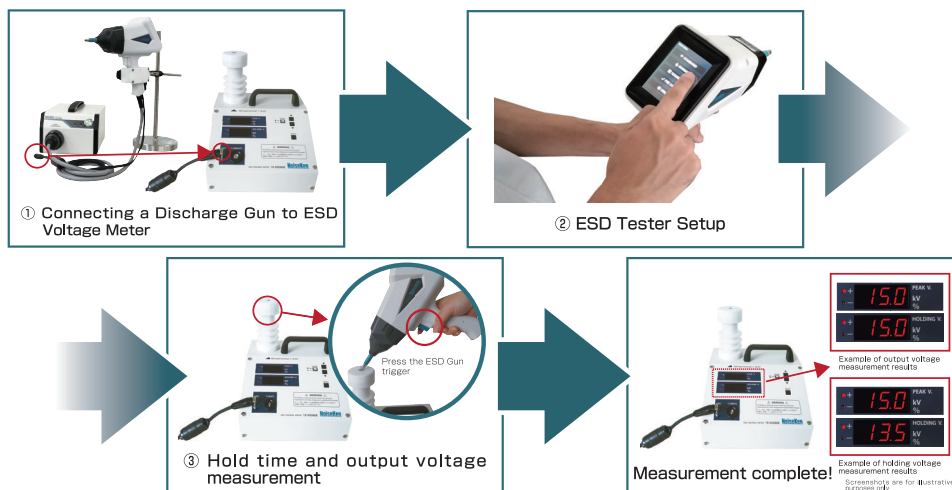
The measured voltage is displayed on a 7-segment LED with peak and holding voltage values.



- Easily measure the Hold Time, the tester specification for air-discharge testing.
- Measure the output voltage from $\pm 2\text{kV}$ 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.



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

Accessories

■ 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°C - +35°C
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

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

ESS-801 / 801GL

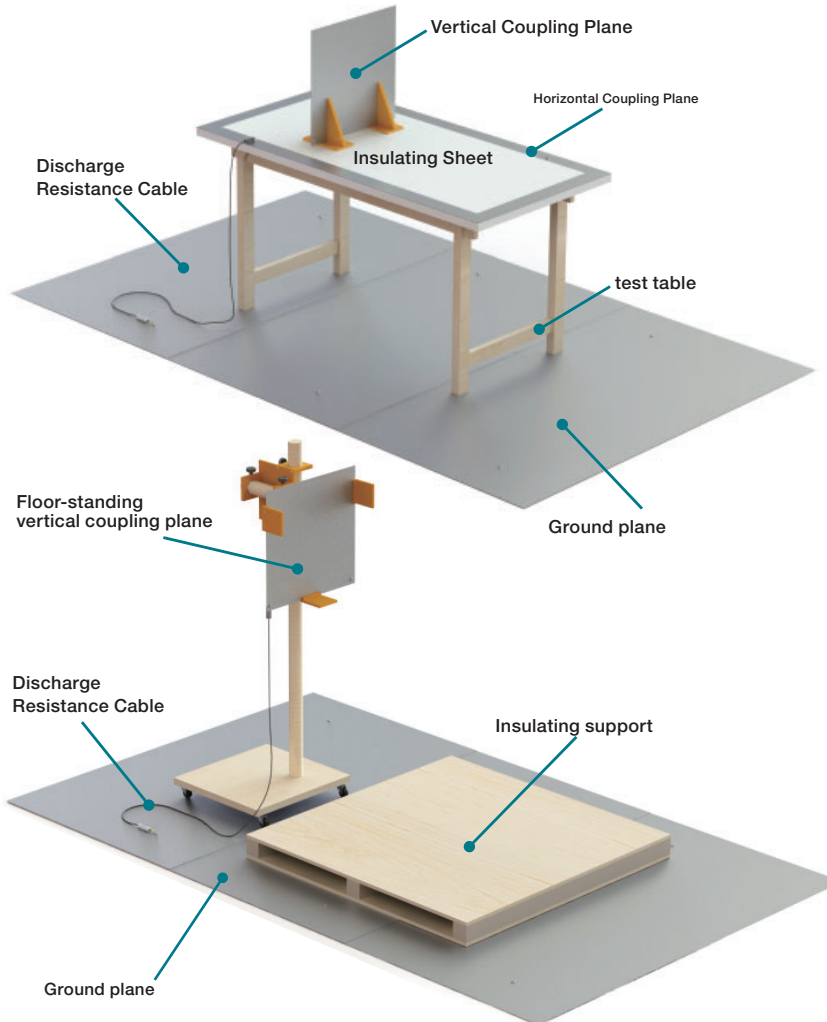
Features

The electrostatic test environment conforms to the IEC 61000-4-2 standard, and two types, table type and floor-standing type, support a wide range of testing environments.

The test table is made of wood, which minimizes the influence on the test (high-frequency electromagnetic fields can be applied to the specimen without loss, resulting in excellent quantitativity) and allows for highly reproducible testing.

It is also versatile for other tests such as impulse noise testing.

- This is an electrostatic discharge immunity test environment that complies with the IEC 61000-4-2 standard.
- There are two types of test environments: one for tabletop equipment and the other for floor-standing equipment.
- It can be used not only for EN/IEC 61000-4-2, but also for other EMC tests such as impulse tests.



Specifications

Test Environment Set (Table-top type) MODEL: ESS-801

Product Name	Model	Dimensions	Remarks
Test table	03-00039A	(W)1600×(D)800×(H)800mm	Mass:22 kg Load capacity:100 kg
Insulating Sheet	03-00004A	(W)1450×(D)650×(t)0.5mm	Material: Vinyl chloride
Vertical Coupling Plane	03-00005A	(W)500×(D)500×(t)1.5mm	Material: Aluminium *Supporting base and center adapter included
Ground plane	03-00007A	(W)1800×(D)1000×(t)1.5mm	Material: Aluminium * size of 1 sheet (1 set = 3 sheets)
Horizontal coupling plane	03-00020A	(W)1600×(D)800×(t)1.5mm	Material: Aluminium
Discharge Resistance Cable	05-00182A	Length: 1.5m	470kΩ×2 *for Horizontal Coupling Plane
Discharge Resistance Cable	05-00183A	Length: 3m	470kΩ×2 *for Vertical Coupling Plane

Test Environment Set (Floor-standing type) MODEL: ESS-801GL

Product Name	Model	Dimensions	Remarks
Insulating support	03-00024A	(W)1200×(D)1200×(H)10mm	Mass: 22 kg Load capacity: 500 kg
Ground plane	03-00007A	(W)1800×(D)1000×(t)1.5mm	Material: Aluminium * size of 1 sheet (1 set = 3 sheets)
Floor-standing vertical coupling plane	03-00034A	(W)540×(D)500×(H)1538mm	Material: Aluminium *Supporting base and center adapter included
Discharge Resistance Cable	05-00183A	Length: 3 m	470kΩ×2

IEC 61000-4-2 Ed.3 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 values for ESD

The test levels for ESD are shown below. Air discharge is tested at all test levels up to the specified test level, and contact discharge and indirect discharge tests are tested at the specified test level.

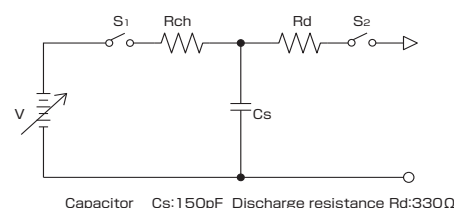
Level	Test voltage	
	Contact Discharge	Air discharge
1	2kV	2kV
2	4kV	4kV
3	6kV	8kV
4	8kV	15kV

3. Verification of test generators and waveforms

Generator specification

The generator must satisfy following specification.

Parameter	Values
Output voltage	Contact discharge: 2kV to 8kV Air discharge: 2kV to 15kV
Output voltage tolerance	±5%
Output voltage polarity	Positive and negative
Holding time	5 seconds or more
Discharge Mode	single-shot discharge



Simplified diagram of the ESD generator

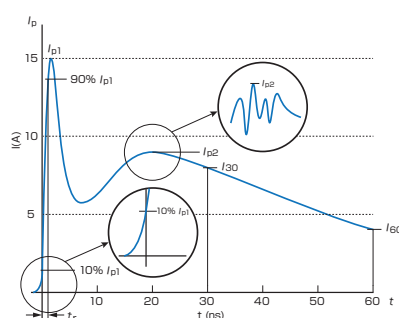
Generator characteristics

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 I_{p1} (±15%)	Rise time t_r (±25%)	Second peak current I_{p2} (−20%/+40%)*	Current value at 30ns I_{30} (±30%)	Current value at 60ns I_{60} (±30%)
Contact Discharge	Air discharge						
1	1	2 kV	7.5 A	0.8 ns	4.5 A	4.0 A	2.0 A
2	2	4 kV	15.0 A	0.8 ns	9.0 A	8.0 A	4.0 A
3	---	6 kV	22.5 A	0.8 ns	13.5 A	12.0 A	6.0 A
4	3	8 kV	30.0 A	0.8 ns	18.0 A	16.0 A	8.0 A
---	4	15 kV	56.3 A	0.8 ns	33.8 A	30.0 A	15.0 A

Discharge current waveform and its characteristics

* I_{p2} is the maximum value in the 10ns to 40ns interval



Discharge current waveform of contact discharge at 4kV

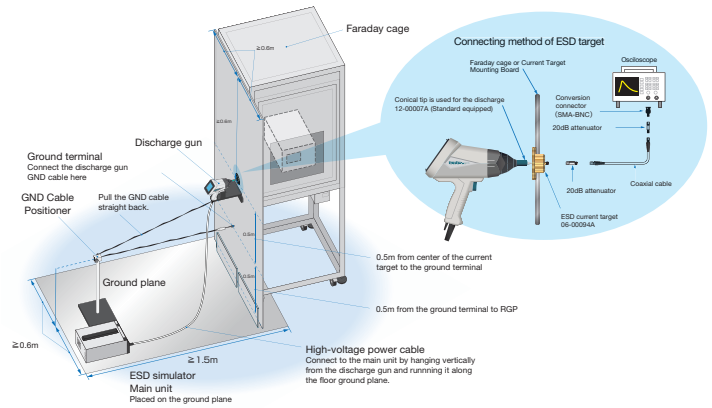
Contact discharge and air discharge are shown in the level column of the discharge current waveform parameter, and the discharge current waveform regulations apply to contact discharge as well as air discharge.

IEC 61000-4-2 Ed.3 Standard Summary

■ Waveform verification of ESD Generator

There are no changes to the regulations for current targets and oscilloscope bandwidths, etc. However, the setup for discharge current calibration has been changed, with the height of the current target fixed at 1 m and a floor ground plane required. To improve reproducibility, the high-voltage cable of the electrostatic tester should hang vertically from the discharge gun and be connected to the body of the tester along the floor ground plane, and the main unit of the electrostatic tester should also be installed on the ground plane.

* 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 test setup for table-top equipment

【Direct discharge test】

The direct discharge test is a test in which the EUT is directly discharged to verify the effect to the device. A wooden table 0.8 m high is placed on the ground plane and a horizontal coupling plane is placed on top of it. The horizontal coupling plane is connected to the ground plane with a discharge resistor cable. Place an insulating sheet between the horizontal coupling plane and the device.

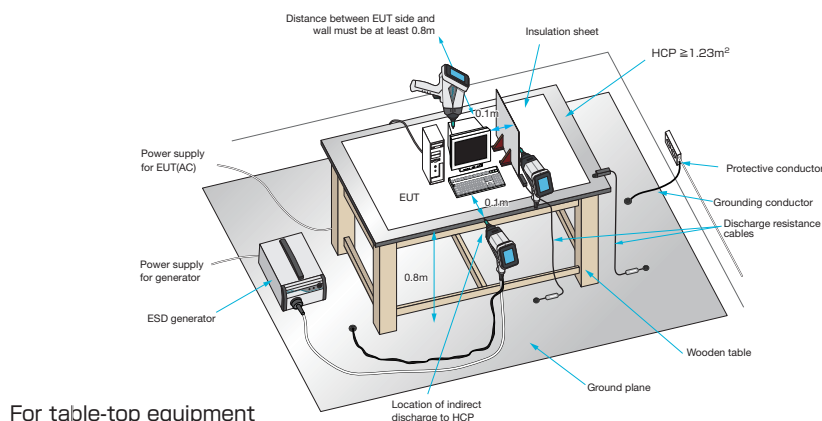
【Indirect discharge test】

The indirect discharge test is a test in which the horizontal and vertical coupling planes are discharged to verify the effect to the EUT. In addition to the test environment for direct discharge testing, a vertical coupling plane (0.5 m x 0.5 m) is used. The vertical coupling plane is also connected to the ground plane with a discharge resistor cable.

The cables of the equipment are floated off the horizontal coupling plane with 0.5 mm insulation sheet.

<Basic test setup>

- (1) The distance between the 470 k Ω resistance of the discharge resistance cable and the terminals shall be within 0.1 m at both ends.
- (2) The total length of the discharge resistance cable to the horizontal coupling plane shall not exceed 1.5 m.
- (3) The total length of the discharge resistance cable to the vertical coupling plane shall not exceed 3 m.
- (4) Auxiliary equipment can be installed inside or outside the test environment, and the connection cables of auxiliary equipment can be decoupled.
- (5) Horizontal coupling plane regulations were changed from dimensional rules to area rules. Not only rectangular shape, but also square, round and other shapes are acceptable.



IEC 61000-4-2 Ed.3 Standard Summary

■ Example test setup for floor-standing equipment

【Direct discharge test】

Place an insulating support 0.1 m high on the ground plane and place the EUT on top of it.

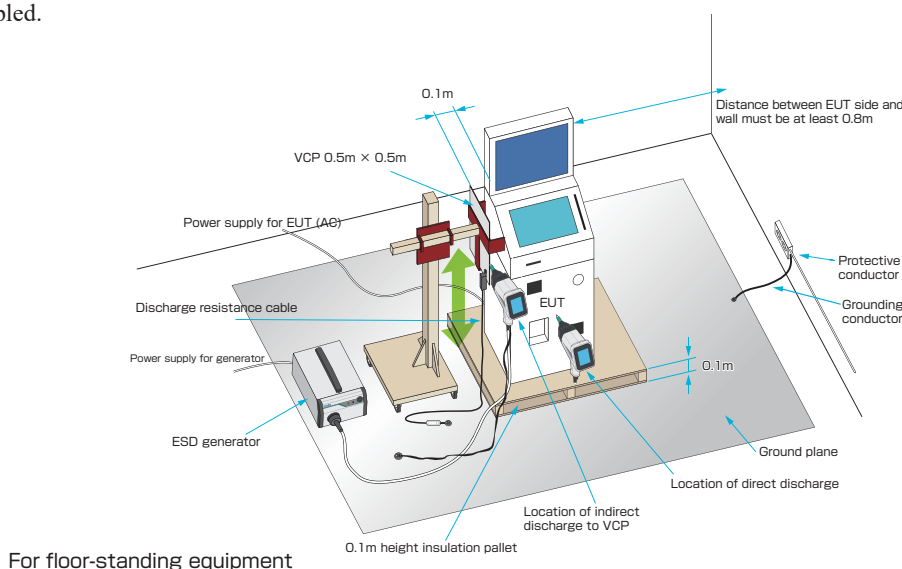
【Indirect discharge test】

A test to verify the effect to the EUT by application of the discharge to a vertical coupling plane. The vertical coupling plane is connected to the ground plane with a discharge resistor cable.

Equipment cables are floated off the ground plane with 0.5 mm insulation sheet.

<Basic test setup>

- (1) The distance between the 470 k Ω resistance of the discharge resistance cable and the terminals shall be within 0.1 m at both ends.
- (2) The total length of the discharge resistance cable to the vertical coupling plane shall not exceed 3 m.
- (3) Auxiliary equipment can be installed inside or outside the test environment, and the connection cables of auxiliary equipment can be decoupled.



■ Test Setup for table-top and floor-standing equipment *For Ungrounded Equipment

There are no changes to the basic test setup for testing ungrounded table-top and floor-standing devices, but ungrounded devices are defined as Class II devices as defined in IEC 62368-1.

If the test results differ due to the connection of the discharge resistance cable to the EUT, disconnect the discharge resistance cable, apply ESD, then reconnect the cable and perform static elimination. The distance to the 470 k Ω resistance of the discharge resistance cable is within 0.1 m.

IEC 61000-4-2 Ed.3 Standard Summary

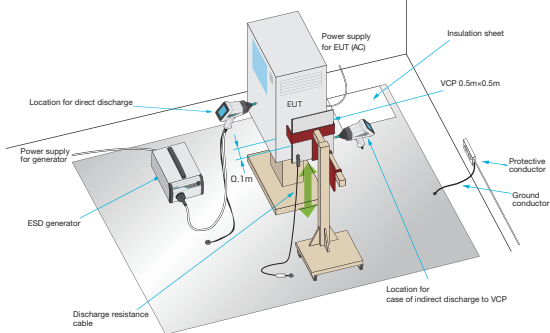
■ Test setup for wall-mounted equipment

[For non-conductive surfaces] Place a 0.8 m high non-conductive support on top of the ground plane and place the device on top of it for testing.

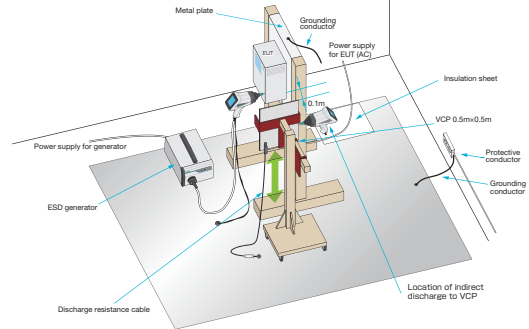
[For conductive surfaces] The test is performed by mounting the device on a grounded metal wall with a distance of 0.8 m from the ground plane to the bottom of the device.

Other regulations are not significantly different from the test for floor-standing equipment.

If the mounting surface is a non-conductive wall



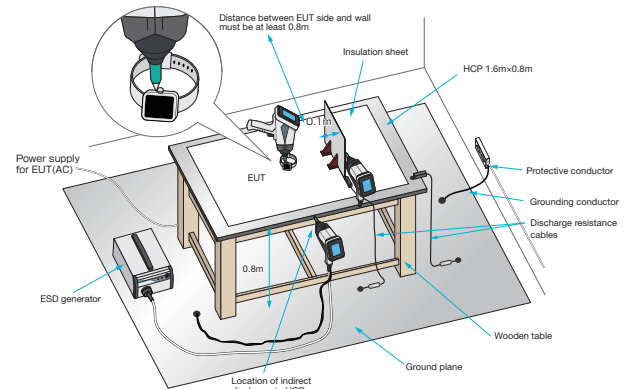
If the mounting surface is a conductive wall



■ Test Setup for Wearable Devices

Test is conducted at the test setup of table-top equipment for ungrounded devices.

For additional experimental testing, the recommended charging capacitor and discharge resistor are 200 pF and 50 Ω , respectively, to reproduce the most severe discharge current conditions from a wearable device worn on the waist.



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, it is necessary to control 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.

Climatic conditions	
Parameter	official regulations
Ambient temperature	15°C ~ 35°C
Relative humidity	30% ~ 60%
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1060 mbar) * Values published by a meteorological observatory may be used.
Tests may be performed at relative humidity of 30% or less, but no further action is required if the EUT meets the specified performance criteria within these conditions, otherwise the test shall be performed within the relative humidity range described above.	
The electromagnetic conditions shall be such that the correct operation of the EUT is guaranteed in order not to affect the test results.	

■ Test Procedure

Direct discharge test: contact discharge (discharge at 1 second intervals) and air discharge (approach the EUT as quickly as possible).

Indirect discharge test: Applied to vertical and horizontal coupling planes.

Indirect discharge testing to the horizontal coupling plane targets the surface on which the EUT is normally installed, and testing of metal housings, especially EUTs with PE connections, is no longer necessary. Indirect discharge testing using a vertical coupling plane is performed on an accessible surface of the EUT.

The number of discharges is at least 10 discharges at 1 second intervals, both polarities.

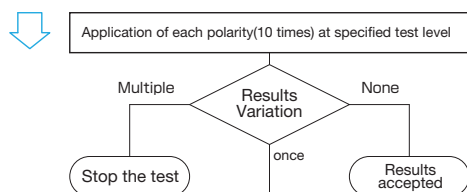
A preliminary test can be performed by discharging 20 times per second or more repeatedly in order to determine the discharge points.

IEC 61000-4-2 Ed.3 Standard Summary

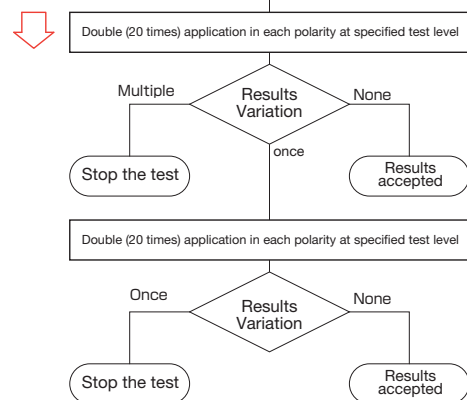
6. Escalation strategy

If there are variations in the performance of the equipment during a direct discharge and it cannot be determined if the variations are due to the application of the discharge, an escalation strategy is applied.

Conventional Test



Escalation strategy



Escalation Strategy Procedure Flow

If the device experiences a variation in performance during the application of a discharge and it is impossible to determine whether the variation is due to the application of the discharge, use the flowchart on the left as a guide. (Regulation)

Note: Not applicable if the application of the discharge allows the device to consistently perform the same operation and the test result can be determined.

If one variation occurs during 10 applications in the actual test, the result is accepted if 20 applications are made again and no variation occurs.

If one more variation occurs during the additional test, it will be accepted if no malfunction occurs after another 20 applications, and if multiple variations occur, it will be inapplicable.

7. Evaluation of Test Results and Test Report

■ Test Results (Reference)

Test results are classified according to EUT specifications and operating conditions as follows:

Performance Criterion A: Normal operation within specifications

Performance Criterion B: Temporary degradation of function or performance that can self-recover.

Performance Criterion C: Temporary degradation of functionality or performance requiring operator intervention or system reboot.

■ Test report

The following items are newly stipulated

- ☐ Test level
- ☐ The length of the discharge return cable
- ☐ Performance criteria specified in the generic, product or product-family standard
- ☐ Test setup
- ☐ Diagram or photograph indicating the discharge points
- ☐ Number of discharges per discharge point
- ☐ HCP dimensions and shape, if used
- ☐ Escalation strategy, if used

Note: This test method and connection method are excerpted from the IEC 61000-4-2 Ed.3 standard, and an example is shown using our product.

Please refer to the original Standard for detailed test methods.

ISO 10605 Ed.3 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 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 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 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 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 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 Standard Overview

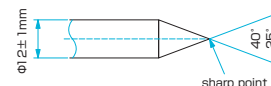
3. Specification of generator and verification of output waveform

■ Specification of ESD simulator

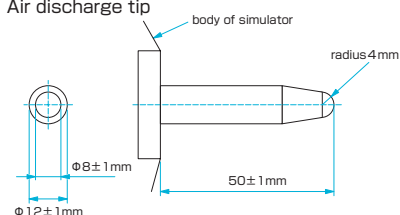
A simulator satisfying the following specifications must be used for the ESD Testing.

Parameter	Specification
Output voltage - Contact discharge- (kV)	2kV ~ 15kV
Output voltages - Air discharge- (kV)	2kV ~ 25kV
Output voltage accuracy (%)	$\leq 5\%$
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)	2k Ω , 330 Ω

Contact discharge tip



Air discharge tip

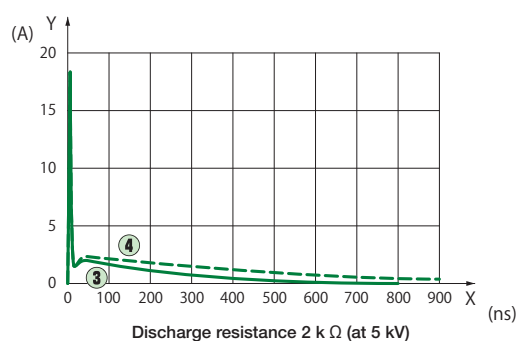
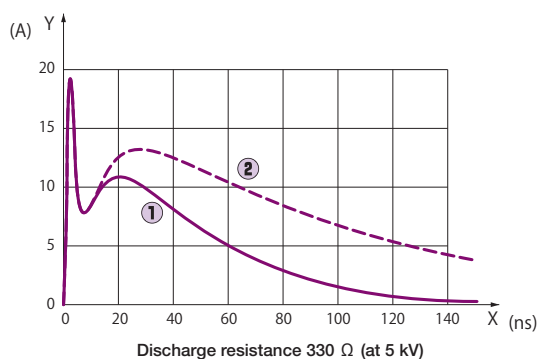


For air discharge at test voltages higher than 15 kV, a larger tip can be used to avoid pre-discharge.

■ 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/330 Ω	3.75A/kV $\pm 10\%$	2A/kV $\pm 30\%$ ($t_1=30$ ns)	1A/kV $\pm 30\%$ ($t_2=60$ ns)	①
330pF/330 Ω		2A/kV $\pm 30\%$ ($t_1=65$ ns)	1A/kV $\pm 30\%$ ($t_2=130$ ns)	②
150pF/2k Ω	3.75A/kV +30% - 0%	0.275A/kV $\pm 30\%$ ($t_1=180$ ns)	0.15A/kV $\pm 50\%$ ($t_2=360$ ns)	③
330pF/2k Ω		0.275A/kV $\pm 30\%$ ($t_1=400$ ns)	0.15A/kV $\pm 50\%$ ($t_2=800$ ns)	④



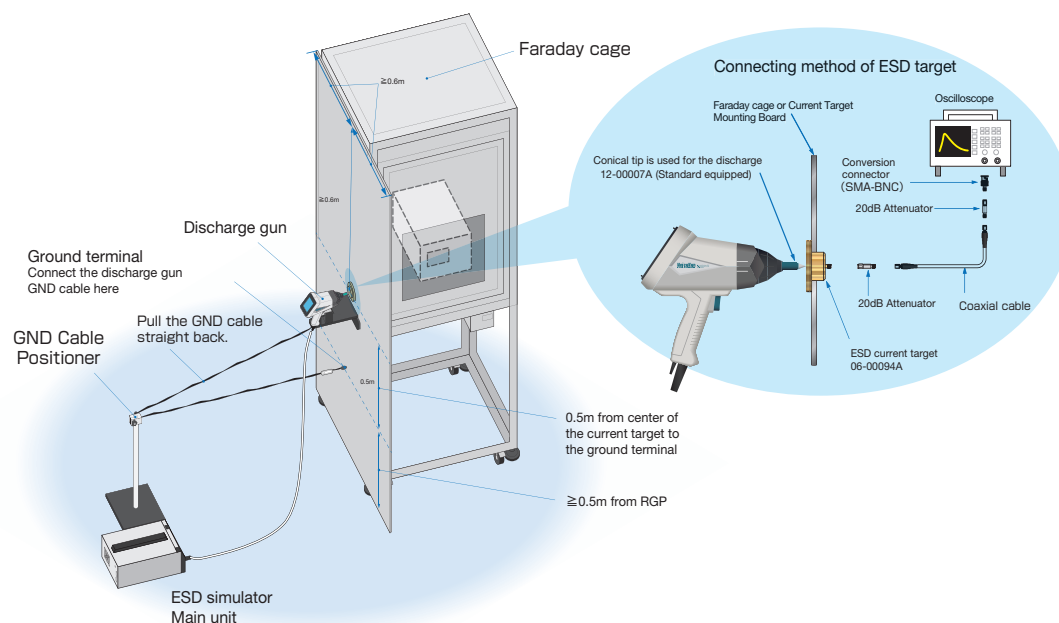
ISO 10605 Ed.3 Standard Overview

4. Verification of test generators and waveforms

- Check output current waveform

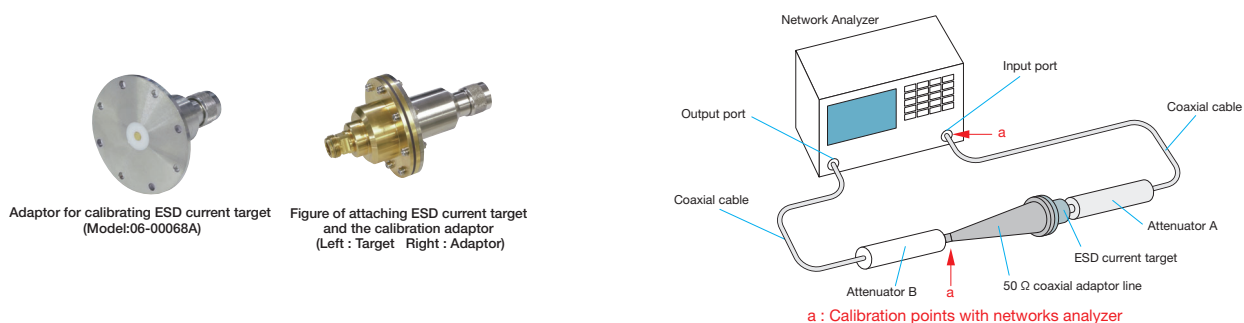
The waveform shall be verified with an oscilloscope which bandwidth is 1 GHz or more in a Faraday cage or with a $1.2\text{ m} \times 1.2\text{ m}$ metallic board mounting an ESD current target in the center of the cage or the board. The discharge electrode (Discharge tip of the gun) shall be touched 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.



4. Test Setup

■ 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 2.5m Ω or less.
- Insulating block: height 50 $\pm$ 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 330 Ω or 2k Ω .
- The test should be conducted for two or more test levels.
- Insulating block should be used for electronic equipment that are not directly chassis-mounted.

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

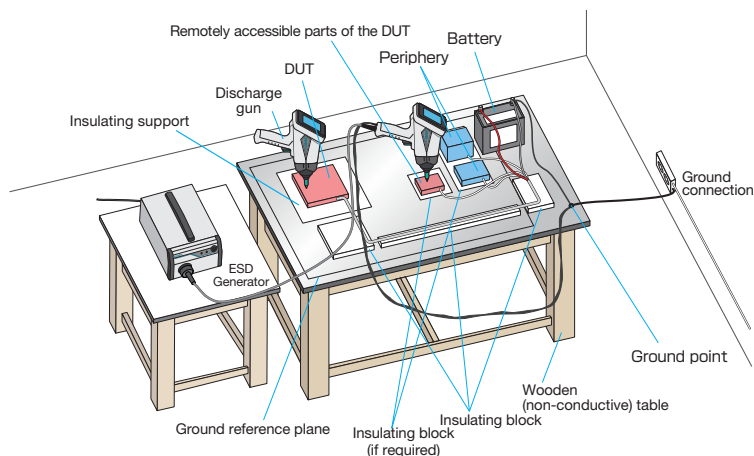
- Test at least 3 times with positive and negative polarity, separated by at least 1 second.
- Apply to every location available for human touch.
- Insulating block should be used for electronic equipment that are not directly chassis-mounted.

【 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.

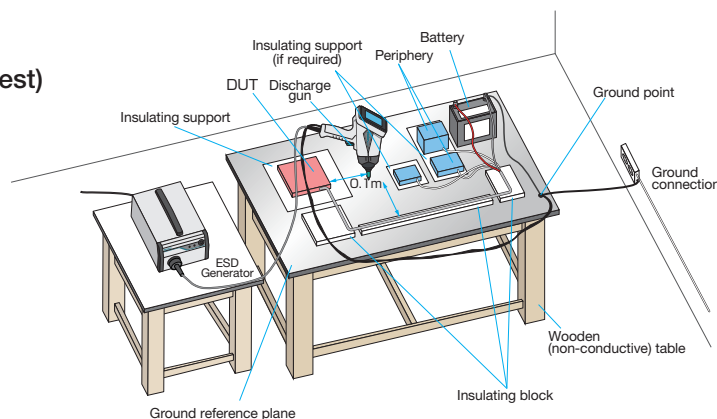
【 Air Discharge 】

- 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 330 Ω .

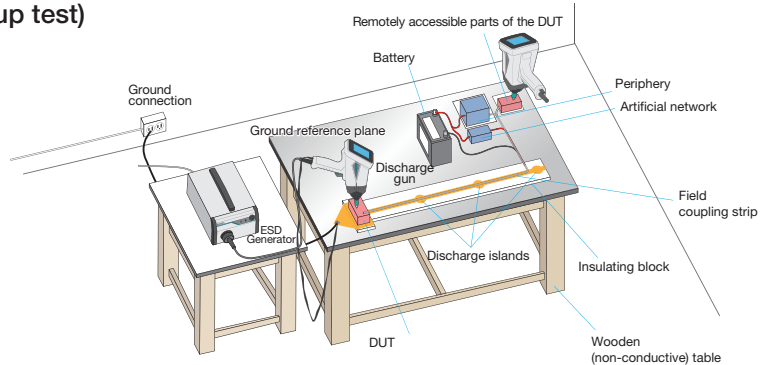


ISO 10605 Ed.3 Standard Overview

■ Component immunity test method (powered-up test)

- Indirect Discharge using FCP -

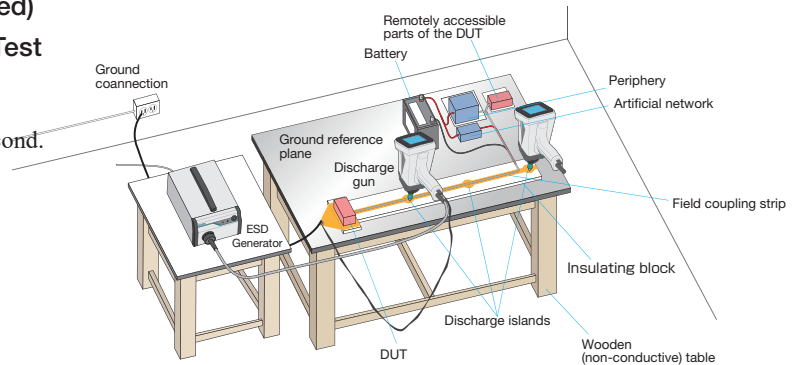
- Test at least 10 times with positive and negative polarity at intervals of for at least 1 second.
- The CR constant is selected to be 150pF or 330pF depending on the mounting position of the device, and 330 Ω is used.



■ Component immunity test method (unpowered)

- Packaging and Handling - ESD Sensitivity Test

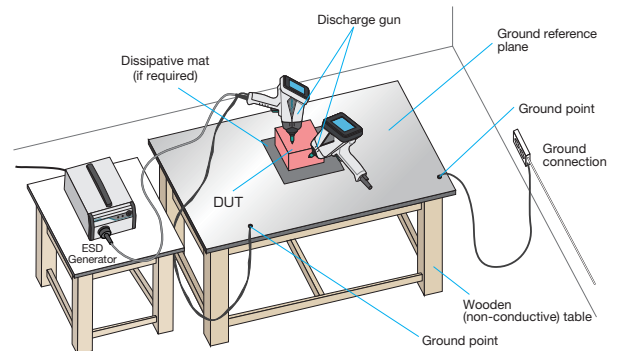
- Test at least 10 times with positive and negative polarity to each island, at intervals of for at least 1second.
- CR constant is 330 pF depending on the mounting position of the device, and 330 Ω is used.



■ Component immunity test method (unpowered)

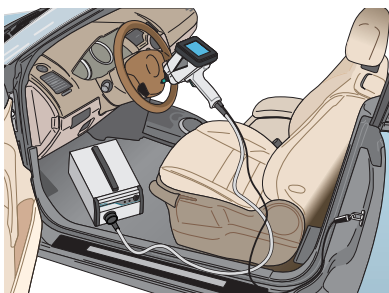
- Packaging and Handling - ESD Sensitivity Test

- We recommend using a CR constant of 150 pF and conducting tests with resistances that simulate both direct human contact (2 k Ω) and contact with a metallic object being held (330 Ω).
- 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 is applied to all areas touched by the hand.
- After applying the voltage, remove the static electricity from the DUT with a static elimination resistor of 1M $\Omega \pm 20\%$, then energize it and confirm that it operates normally.

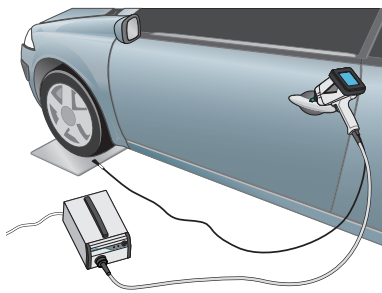


■ Vehicle test – Internal and external points –

- Areas that can be easily touched by people inside the vehicle are tested with 330pF/330 Ω or 2k Ω .
- Areas that can be easily touched by people from outside the vehicle are tested with 150pF/330 Ω or 2k Ω .
- 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 testing



External Testing

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.

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