NoiseKen

Electrostatic Discharge Simulator

ESS-S3011A
ESS-B3011A
GT-30RA (Discharge Gun)

www.noiseken.com

ESD Simulator

ESS-S3011A & GT-30RA

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.

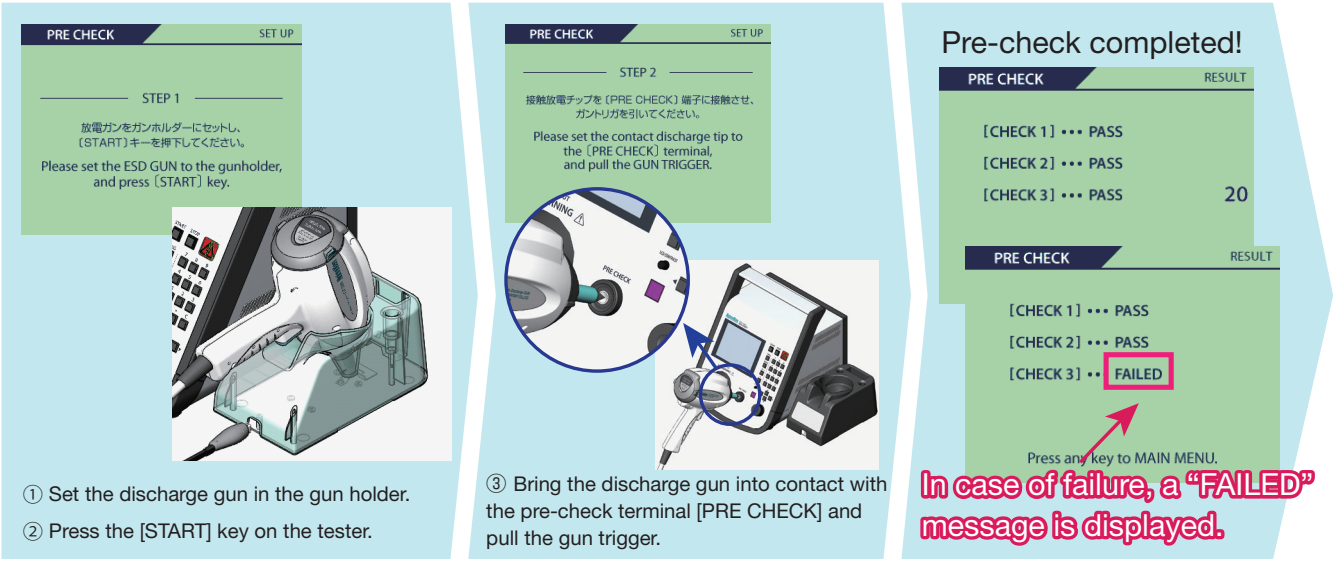
- “3 pre-checking function” to ensure more reliable testing
- “CR constant indicator” to prevent incorrect unit attachment
- One-touch exchange of gun head and CR unit realized
- “Ten-key & Rotary knob” to ease the setting.
- “Infra-red Remote Controller” allowing setting remotely from the generator (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.

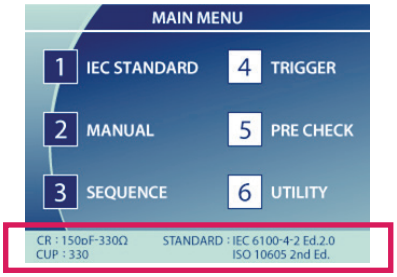
ESS-S3011A & GT-30RA

"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.

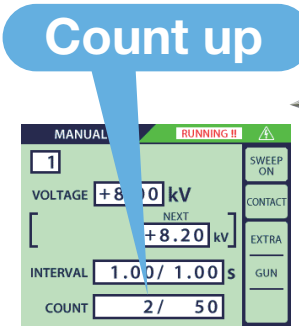
CR unit [CR]	Discharge cup [CUP]	Compliant standard table
150pF-330Ω	330	IEC 61000-4-2 Ed.2、10605 2nd Ed.
330pF-330Ω	330	ISO 10605 2nd Ed.
150pF-2kΩ	2k	ISO 10605 1st Ed. & 2nd Ed.
330pF-2kΩ	2k	ISO 10605 1st Ed. & 2nd Ed

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.

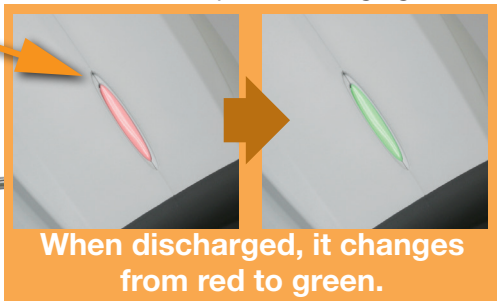
Buzzer sound of the tester

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.

"Infra-red Remote Controller" available as an option to realize the setting remotely from the generator

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

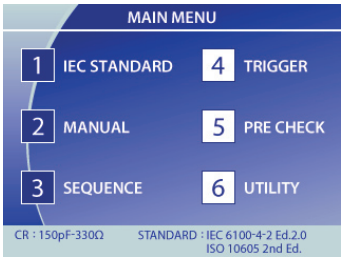
CR unit

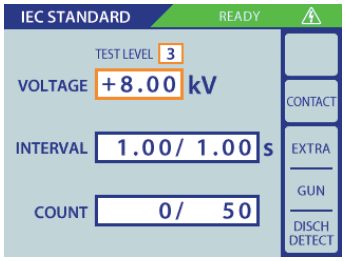
Discharge tip
(Spherical 30 mm)

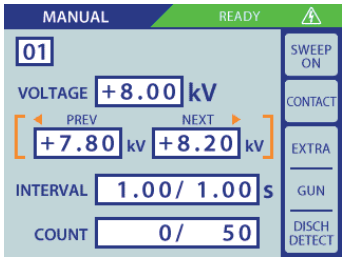
ESS-S3011A & GT-30RA

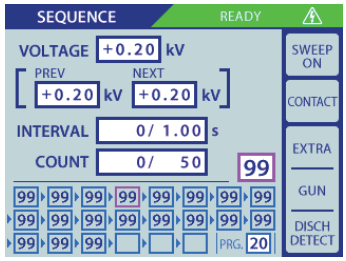
High visibility LCD panel and operatability

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)

ESD Simulator

ESS-B3011A & GT-30RA

Cost-oriented Basic model

Cost-oriented basic model ESD Simulator equipped with the light weight discharge gun. The output voltage can be selected up to max. 30 kV and compliant to both EN / IEC 61000-4-2 Standard and ISO 10605 Standard.

- **"Pre-checking function" for performing a more reliable testing**
- **"CR constant checking function" (no indicator) to prevent incorrect unit attachment"**
- **"Discharge Detecting Function" to realize the air-discharge confirmation.**
- **"Lightest Discharge Gun in the market" to lighten the continuous operation.**
- **"White LED Irradiator" to facilitate the visualization of the discharging area.**
- **One-touch exchange of gun head and CR unit realized**

*** ISO 10605 compliant test performable with addition of the gun head and CR units**

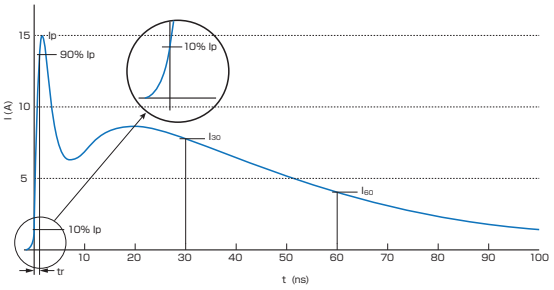
*Probe stand for the discharge gun is an option.

Specifications

Parameter	Specification
Modell	ESS-B3011A
Output voltage	0.20 kV ～ 30.0 kV ± 5% (30.5 kV max) *0.20kV ～ 1.99kV ±10%　2.00kV ～ 30.0kV ±5% ～ 10.0kV ： 0.01kV step 10.0 ～ 30.0kV ： 0.1kV step
Polarity	Positive / Negative
Repetition cycle	0.05s ～ 9.99s ± 10%, 0.01s step / Manual
Discharge No. of times	1 ～ 999 times, Preset 1 time step or continuous preset
Discharge mode	Contact discharge / Air discharge
Trigger mode	Gun trigger / Main trigger
Operation panel	Indicator : 5 × 7 Dot matrix LED / Operation : Push buttons (Partially lighting)
Radiation mode select switch	Extra / Normal switching function built-in
Discharge detection	Discharge detection function in air-discharge equipped.
Pre-checking function	High voltage output checking function (by user operation. Not the calibration but just checking)
CR & Gun head checking	CR constant and gun head recognizable (to prevent the wrong combination without indicator)
IEC LEVEL	Contact discharge mode : 2.0 kV, 4.0 kV, 6.0 kV and 8.0 kV step
Switching function	Air discharge mode : 2.0 kV, 4.0 kV, 8.0 kV and 15.0 kV step
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 MΩ (Totally 53 Ω in combination with 43 MΩ in discharge gun)*
Power supply / consumption	AC 100 V ～ AC 240 V ± 10%　50 Hz / 60 Hz　75 VA
Dimensions	Generator : (W)270 mm × (H)263 mm × (D)200 mm Discharge gun : (W)83.3 mm × (H)217.2 mm × (D)229.3 mm
Weight	Generator : Approx. 4.6 kg Discharge gun : Approx. 800 g (excluding cable and connector)

* Remote control function not built-in.
* The constant depends on combination with CR unit for the discharge gun

Discharge output waveform (IEC Standard)



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

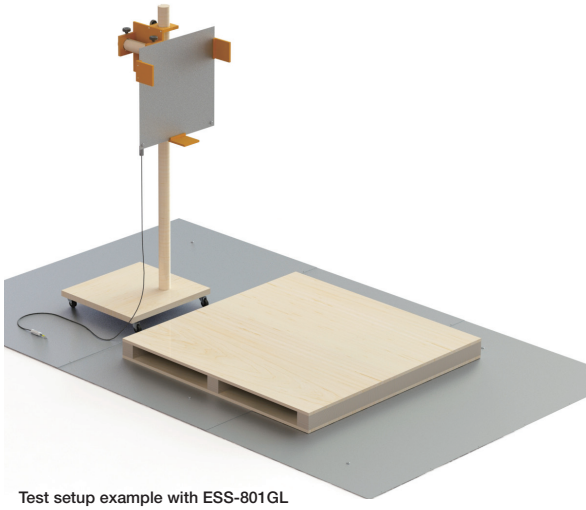
Specifications

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.

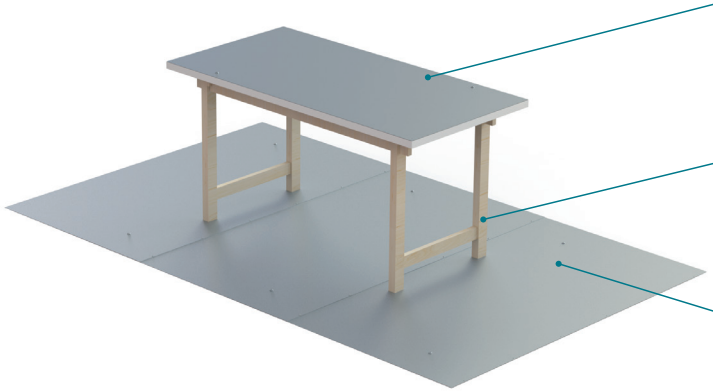
ESS-801GL (Floor-standing type)

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.



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

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

Option

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

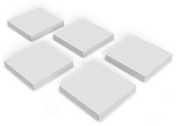
Probe Stand MODEL : 03-00108A

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°

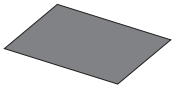
● Compatible discharge gun : GT-30R series

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 × 10^9 Ω
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)

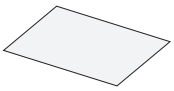
● Compatible discharge gun : GT-30R series
* Conversion adaptor model 03-00074A is necessary in addition for the attachment to GT-30R series

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

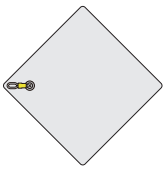
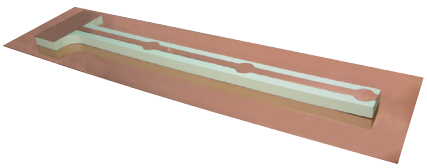


Plate to be laid out under tires for the vehicle test
W500 × D500 × t1.5 mm

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.

Option

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

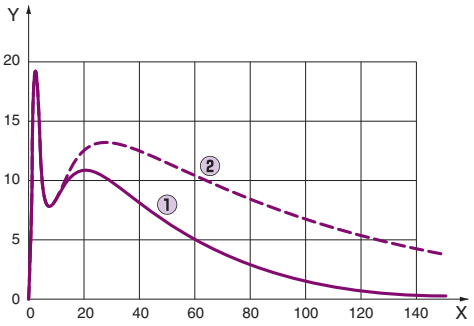
GT-30R series	gun body
03-00071A	gun head
03-00072A	gun head
06-00073B	150 pF - 330 Ω CR unit ①
06-00074B	150 pF - 2 kΩ CR unit ③
06-00075B	330 pF - 330 Ω CR unit ②
06-00076B	330 pF - 2 kΩ CR unit ④
12-00007A	conical tip
12-00008A	round tip
12-00009A	spherical tip

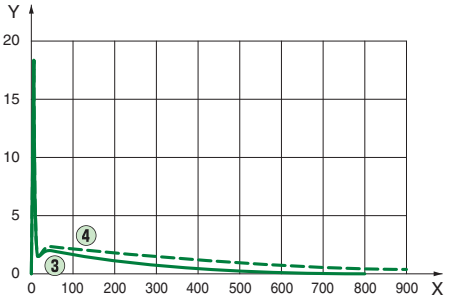
2 kΩ gun head

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

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

Gun discharge tips
The all 3 tips are standard equipped with GT-30R series.

● 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

Option

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 m
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

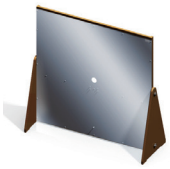
Option

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

GND Cable Positioner MODEL : 03-00060A

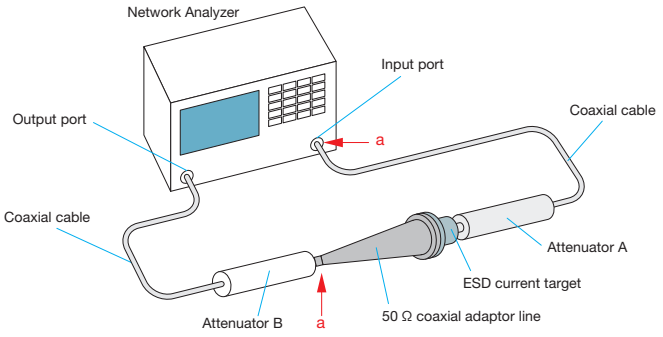
Stand to pull and fix the ground cable of discharge gun 0.5 m backwards at the middle of the cable when calibrating the ESD current.

ESD Current Target Calibration Set MODEL : 06-00068A

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

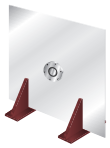
Adaptor (06-00068A)

A photo of 06-00094A ESD target and 06-00068A 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

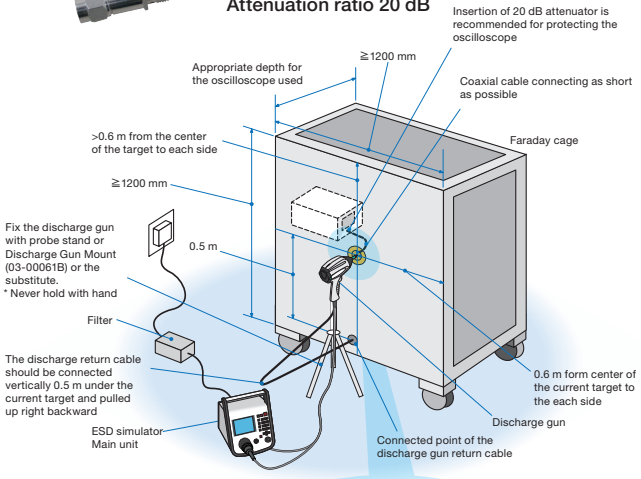
Parameter	Specification
Injection voltage (pulse)	30 kV MAX
Input resistance	2.04 Ω
Output impedance	2.04Ω
Insertion loss (S21)	≦1GHz : Within ±0.5dB 1GHz～4GHz : Within ±1.2dB
Output connector	SMA type
Dimensions／Weight	70 φ×35 mm／Approx. 480g

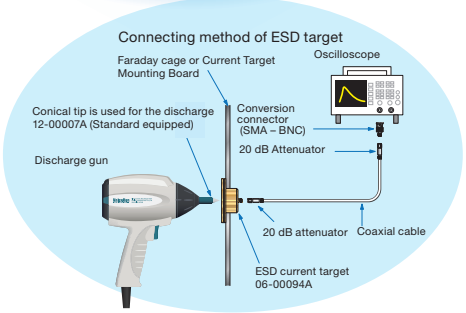
Discharge Gun Mount MODEL : 03-00061B

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





Option

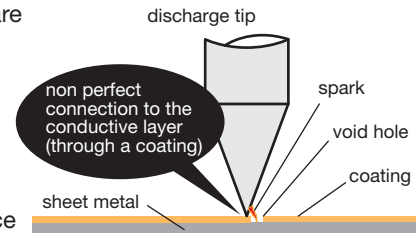
Micro-gap Discharge Tip MODEL : 12-00010A

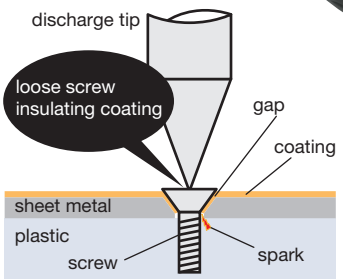
Enabling a more stringent evaluation for the real world ESD immunity

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

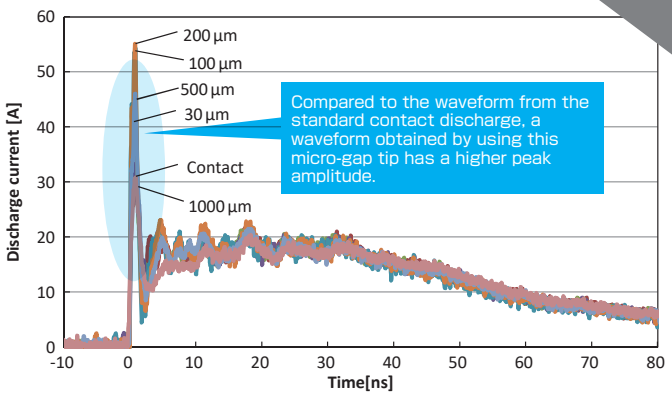




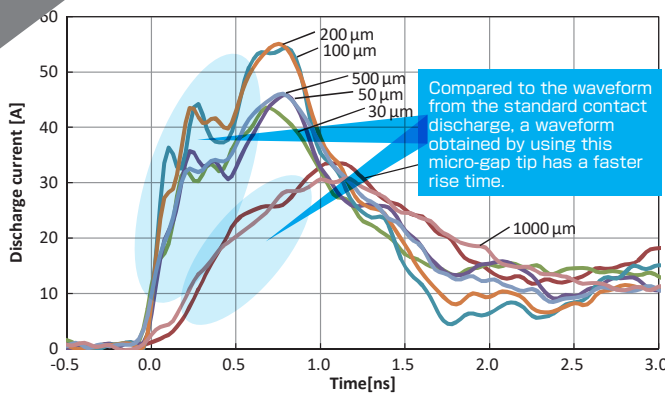
enlarged photo of the micro-gap

Simulated field events

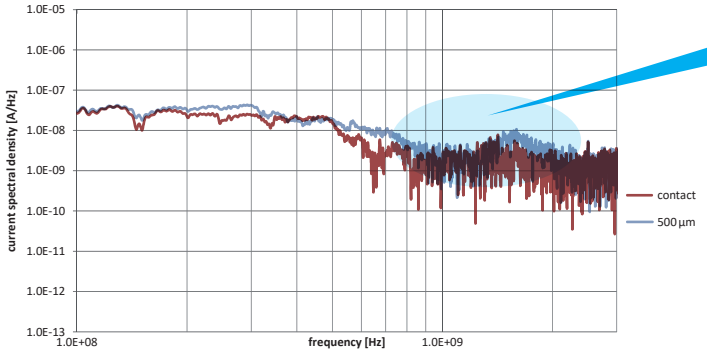
■ Output waveform (reference)



entire waveform

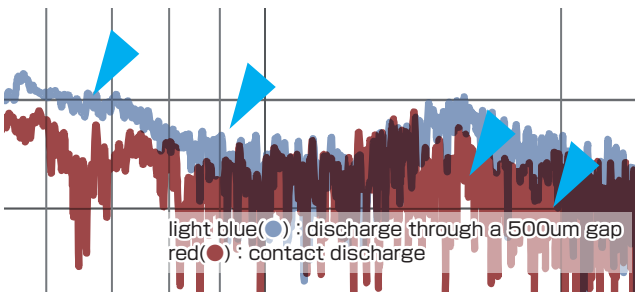


waveform leading edge



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

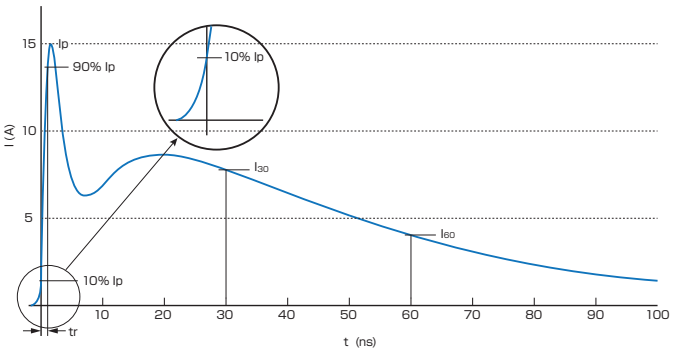
*** × can be any level determined by consent between the manufacturer and the user**

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

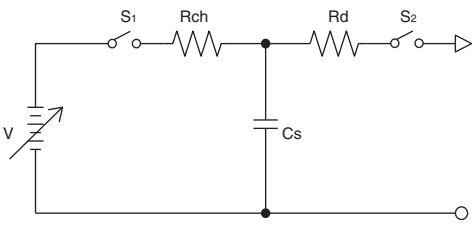


Discharge current waveform and its characteristics

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



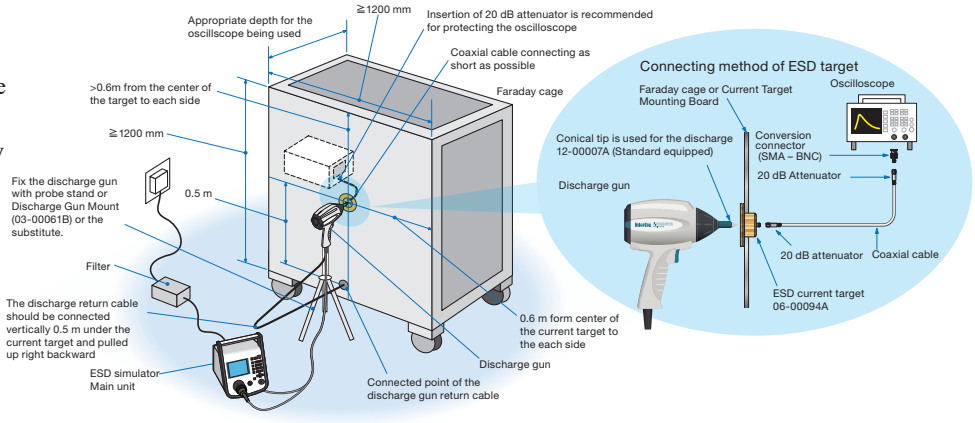
Capacitance Cs : 150 pF
Discharge resistance Rd : 330 Ω

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.

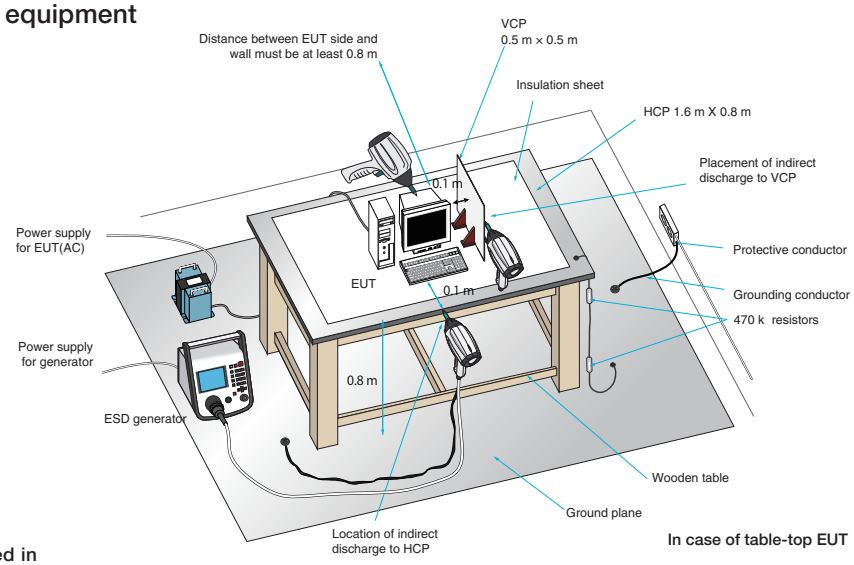


* Insertion use of approx. 20 dB attenuator for protecting the measurement equipment is recommended, although it is not specified in the IEC Standard.

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.

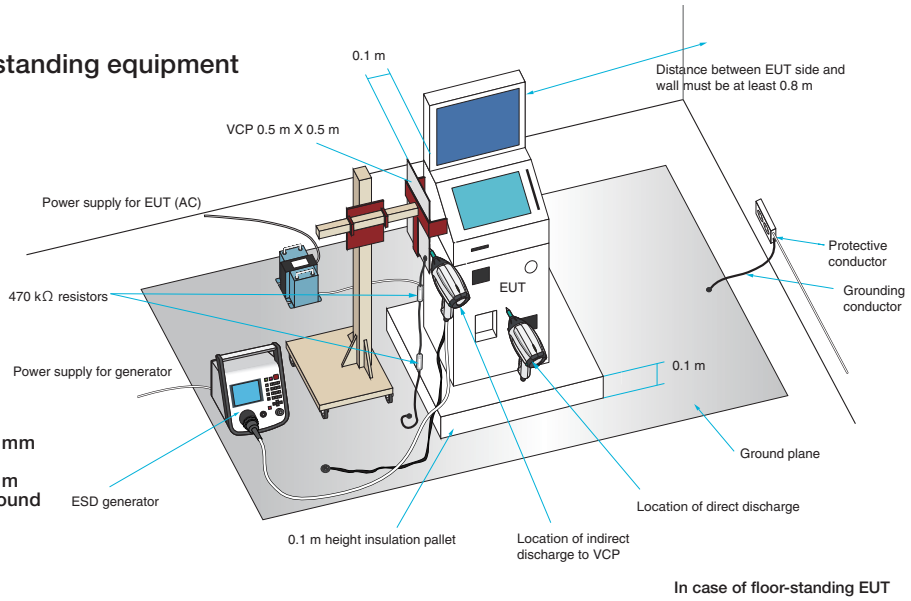


In case of table-top EUT

* 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.2 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)

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

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

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

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

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

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

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

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.

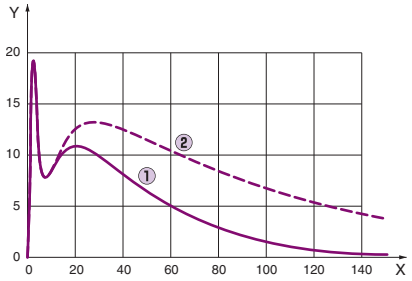
Parameter	Specification
Output voltage - Contact discharge- (kV)	2 kV ～ 15 kV
Output voltages - Air discharge- (kV)	2 kV ～ 25 kV
Output voltage accuracy (%)	≦ 5%
Polarity	Positive and negative
Rise time of short circuit current in contact discharge mode (10% to 90%)	0.7 ns ～ 1 ns
Holding time	≧ 5 s
Storage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

ISO 10605 Ed.2 Test Standard Overview

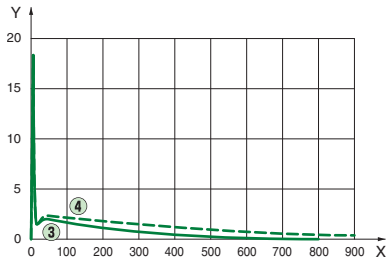
Contact discharge mode current specifications

Following discharge characteristics must be verified.

Typical capacitance / resistance values	Peak current / charge voltage	Current at T1 / Charge voltage	Current at T2 / Charge voltage
① 150 pF / 330 Ω	3.75 A / kV ± 10%	2 A / kV ± 30% (t1 = 30 ns)	1 A / kV ± 30 % (t2 = 60 ns)
② 330 pF / 330 Ω		2A / kV ± 30% (t1 = 65 ns)	1 A / kV ± 30 % (t2 = 130 ns)
③ 150 pF / 2 kΩ	3.75 A / kV + 30% -0%	0.275 A / kV ± 30% (t1 = 180 ns)	0.15 A / kV ± 50 % (t2 = 360 ns)
④ 330 pF / 2 kΩ		0.275 A / kV ± 30% (t1 = 400 ns)	0.15 A / kV ± 50 % (t2 = 800 ns)



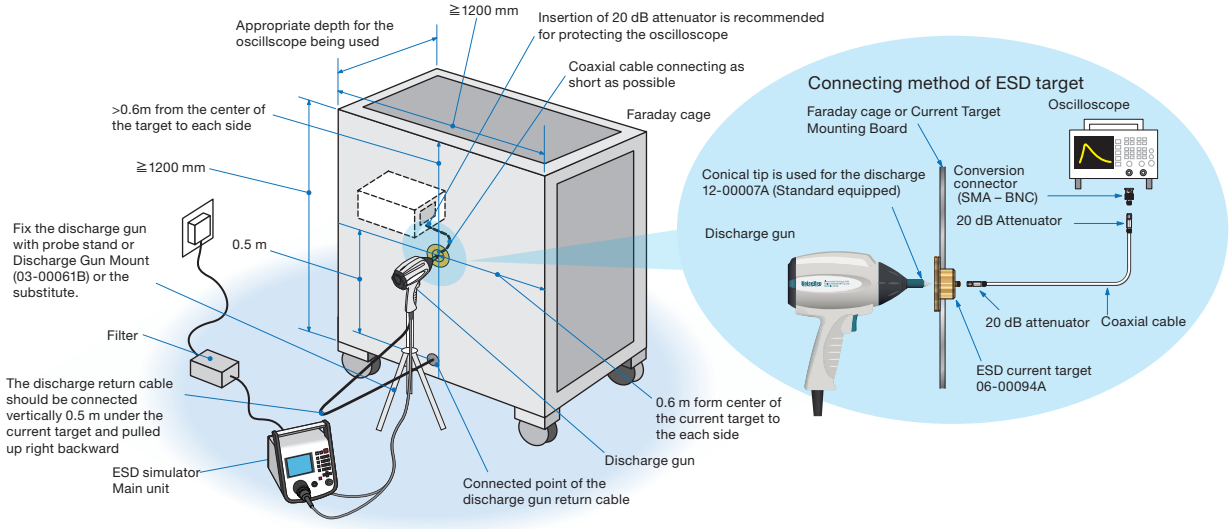
Discharge resistance 330 Ω (at 5 kV)



Discharge resistance 2 k Ω (at 5 kV)

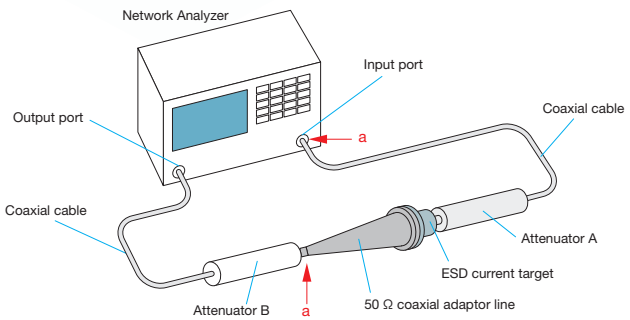
Verification of output current waveform

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.



Target Calibration

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



a : Calibration points with networks analyzer

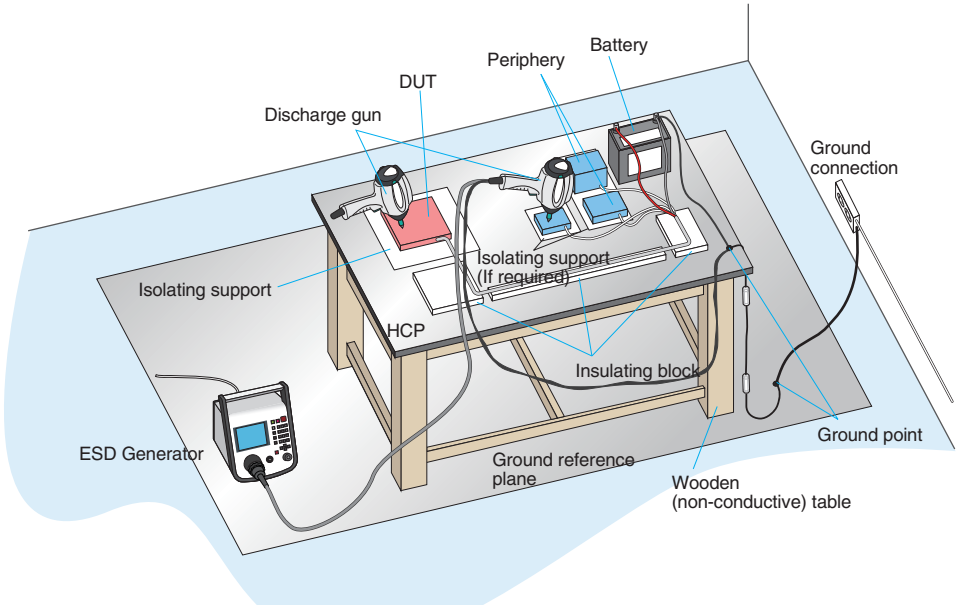
Figure of attaching ESD current target and the calibration adaptor (Left : Target Right : Adaptor)

ISO 10605 Ed.2 Test Standard Overview

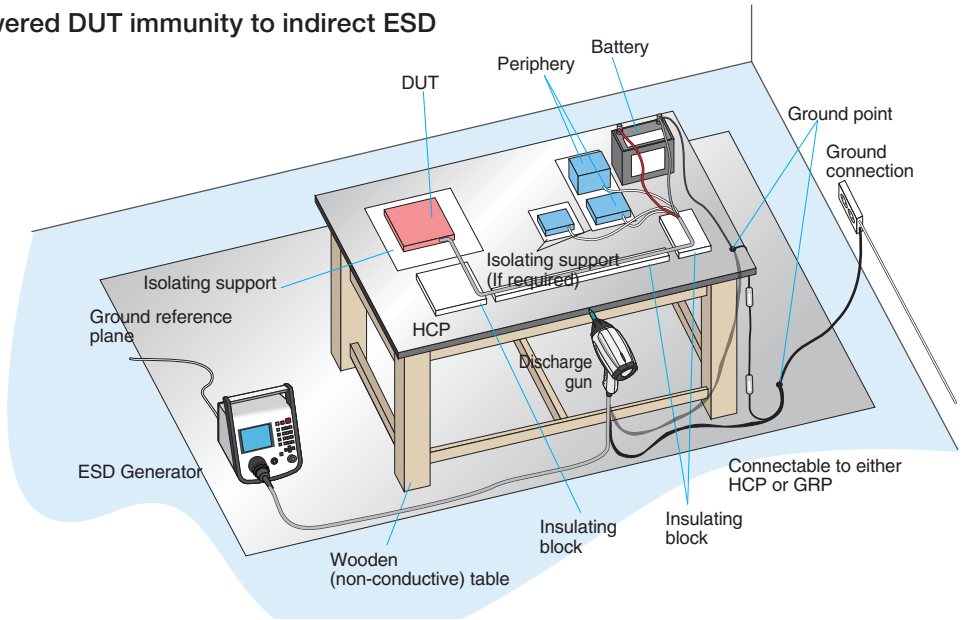
4. Test setup and test procedure

For testing powered DUT immunity to direct ESD - Contact discharge and air discharge

- Capacitance shall be selected to 150 pF (In case for components accessible from outside vehicle) or 330 pF (In case for components accessible from inside vehicle) and resistance shall be 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 5s. The time intervals between successive single discharges in the indirect discharge shall be longer than 50 ms and the number of the test shall be > 50 times. (Discharge interval 1s or more during contact discharge)
- In the contact discharge, it shall be done to wherever human finger may touch.
- In the air discharge, the speed of approach should be between 0.1 m / s and 0.5 m / s and the discharge tip is held perpendicular to the surface of the DUT when possible; if not possible, an angle of at least 45° to the surface of the DUT is preferred.
- Insulating blocks shall be used for DUT which is not grounded to the chassis directly.



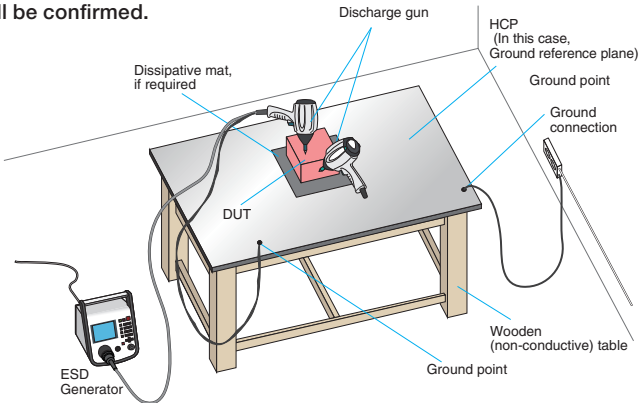
For testing powered DUT immunity to indirect ESD



ISO 10605 Ed.2 Test Standard Overview

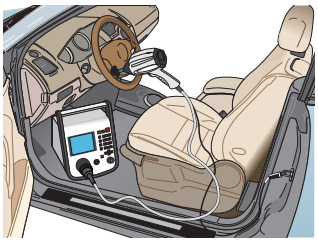
For testing (unpowered) packaging and handling ESD sensitivity

- Capacitance shall be selected to 150 pF (Although the resistance value is not regulated, it is recommended to perform the tests supposing both resistance when the DUT may be directly accessible by human body (2 kΩ) and it may be accessible by a metal object a human holds (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.
- In the contact discharge, it shall be done to wherever human finger may touch.
- Charge build-up should be eliminated by briefly connecting a bleeder wire with high resistance (> 1 MΩ) after the discharge and the DUT shall be turned on. Afterwards, normal operation of it shall be confirmed.

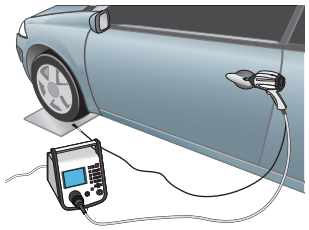


Vehicle test – Internal and external points

- Choose a generator capacitance of 330 pF for areas that can easily be accessed only from the inside of the vehicle and resistance of 330 Ω or 2 kΩ
- Choose a capacitance of 150 pF for points that can easily be touched only from the outside of the vehicle and resistance of 330 Ω or 2 kΩ.
- The ESD generator ground shall be connected to chassis like the seat-rail in case of the interior test or connected to a metallic plate under the wheel closest to the application point in case of the exterior test.
- Both the contact discharge and air discharge shall be done both for the internal and external tests.

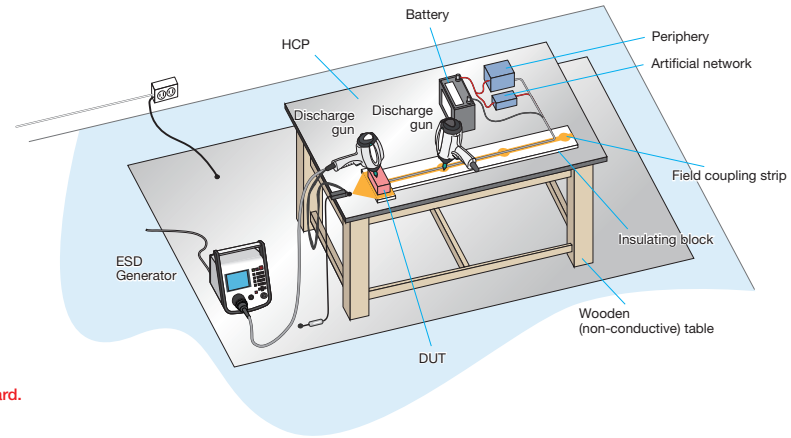


Internal test



External test

Optional test set-up and procedure for electronic modules (powered-up test) – Direct and indirect discharge



Notes: This test set-up is quoted from ISO10605 ed2.0 (2008) Standard.
Please refer to the Standard if more details are required.

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