NoiseKen

Electrostatic Discharge Simulator

ESS-S3011A

GT-30RB (Discharge Gun)

Make EMC Test Easier!

www.noiseken.com

ESD Simulator

ESS-S3011A & GT-30RB

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.

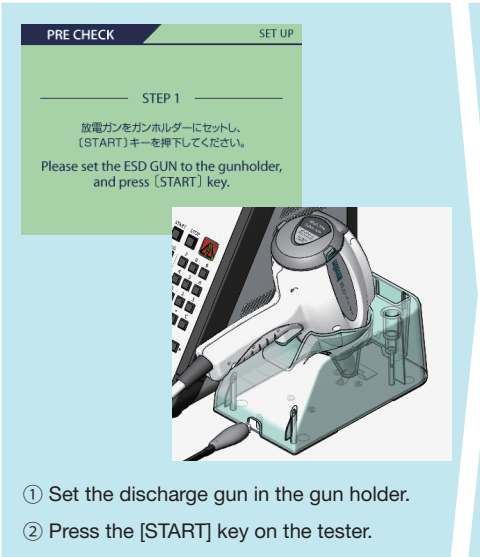
- **“3 pre-check functions” to ensure more reliable testing**
- **“CR constant indicator” to prevent incorrect unit attachment**
- **One-touch exchange of gun head and CR unit realized**
- **“Ten-key & Rotary knob” to ease the setting.**
- **“Infra-red Remote Controller” allowing setting remotely from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

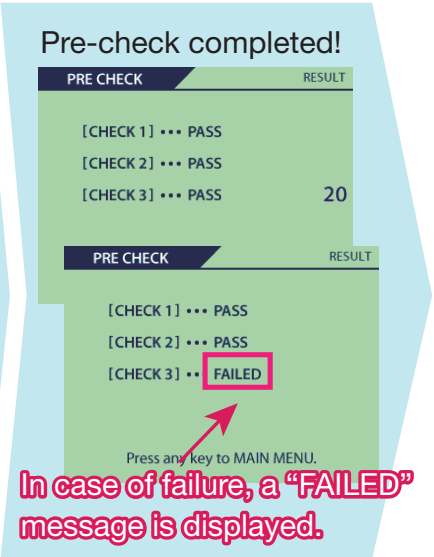
Achieve more reliable test!
Equipped with "3 Pre-check Functions"

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.



In case of failure, a “FAILED” message is displayed.

[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.

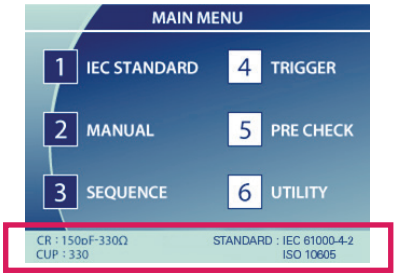
ESS-S3011A & GT-30RB

"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.

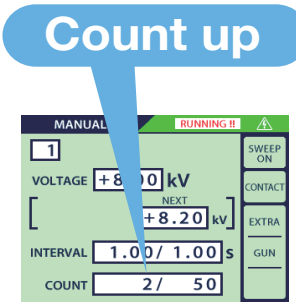
CR unit [CR]	Discharge cup [CUP]	Compliant standard table
150pF-330Ω	330	IEC 61000-4-2 Ed.2 & Ed.3、10605 2nd Ed. & 3rd Ed.
330pF-330Ω	330	ISO 10605 2nd Ed & 3rd Ed.
150pF-2kΩ	2k	ISO 10605 1st Ed., 2nd Ed . & 3rd Ed.
330pF-2kΩ	2k	ISO 10605 1st Ed., 2nd Ed . & 3rd Ed.

Easy to Check for Discharge Equipped with discharge detection function

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

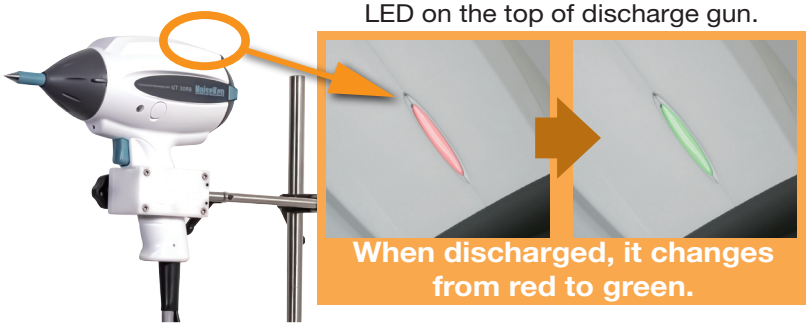
Buzzer sound of the tester

Count up the number of applications



Discharge gun LED color change

LED on the top of discharge gun.



When discharged, it changes from red to green.

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

Since you can operate the tester with the remote control without returning to the tester during the test, the test can proceed smoothly.
Infrared Remote Controller MODEL: 13-00004A

- 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-30RB

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%

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

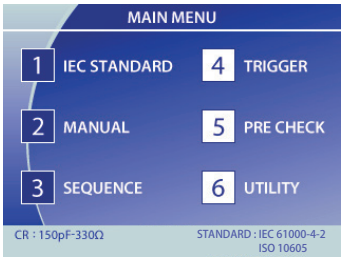

CR unit

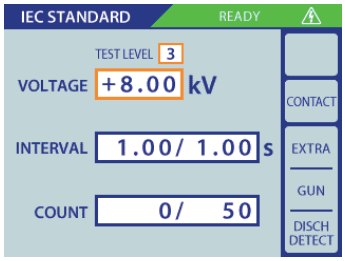

Discharge tip
(Spherical 30 mm)

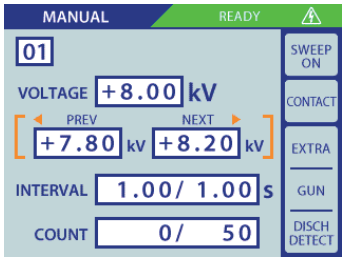
ESS-S3011A & GT-30RB

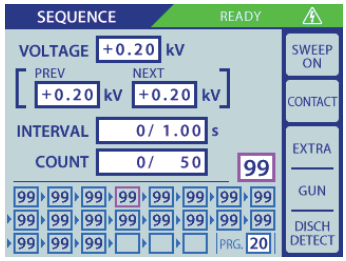
High visibility LCD panel and operatability

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 (30.5 kV max) *0.20kV～1.99kV ±10%　2.00kV～30.0kV ±5% 0.20 ～ 10.0 kV : 0.01 kV step 10.0～ 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-30RB)
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-30RB
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. 1300 g (cable and connector excluded)

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

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

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

ESS-801 / 801GL

Feature

ESD test environment in conformance with EN/IEC61000-4-2 Ed.2, 3 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)

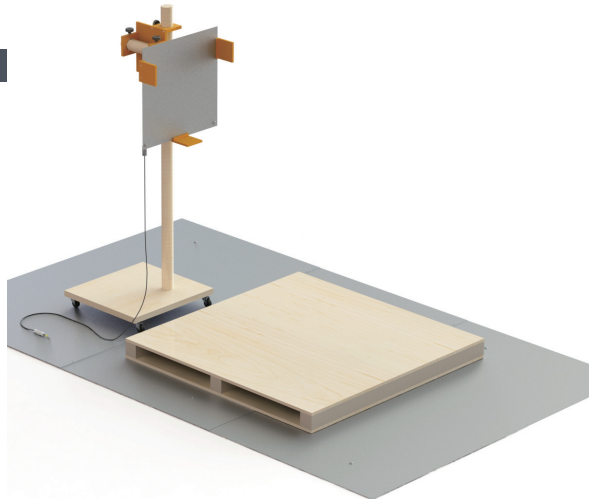
Item	Model	Dimensions	Q'ty
Test table	03-00039A	(W) 1600 × (H)800 × (D) 800 mm	1 set
Vertical coupling plane	03-00005A	(W) 500 × (H)500 × (t) 1.5 mm	1 set
Ground plane	03-00007A	(W) 1800 × (D)1000 × (t) 1.5 mm *	3 pcs.
Insulating sheet	03-00004A	(W) 1450 × (D)650 × (t) 0.5 mm	1 pc.
Horizontal coupling plane	03-00020A	(W) 1600 × (D)800 × (t) 1.5 mm	1 pc.
Discharge resistance cable	05-00182A	1.5 m cable equipped with 470 kΩ × 2 pcs.	1 pc.
Discharge resistance cable	05-00183A	3 m cable equipped with 470 kΩ × 2 pcs.	1 pc.

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

ESS-801GL (Floor-standing type)

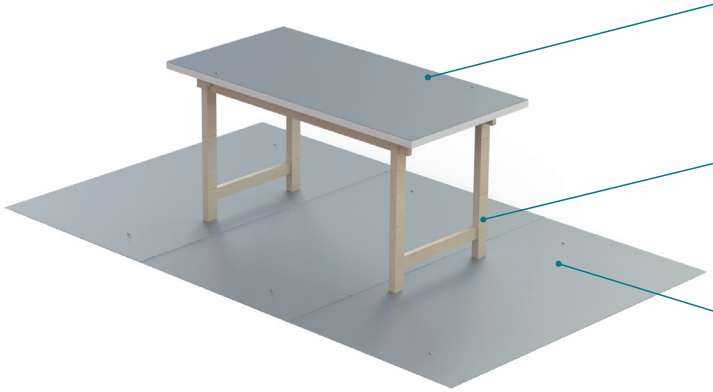
Item	Model	Dimensions	Q'ty
Insulating support	03-00024A	(W) 1200 × (H)1200 × (t) 100mm	1 pc.
Floor-standing vertical coupling plane	03-00034A	(W) 540 × (H)1540 × (D) 500mm	1 pc.
Ground plane	03-00007A	(W) 1800 × (H)1000 × (t) 1.5mm *	3 pcs.
Discharge resistance cable	05-00183A	3 m cable equipped with 470 kΩ × 2 pcs	1 pc.

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



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

Optional Accessories



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 aluminium)

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

Discharge resistance cables MODEL : 05-00182A / 05-00183A

MODEL : 05-00182A
Discharge resistor cable connecting between the horizontal coupling plane and the ground plane.
Length: 1.5m ** Includes 2pcs of 470kΩ resistors.*

MODEL : 05-00183A
Discharge resistor cable connecting between the vertical coupling plane and the ground plane.
Length: 3m ** Includes 2 x 470kΩ resistors.*

**as per the latest ed.3 of IEC 61000-4-2 Standard.*

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

Optional Accessories

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

Automatic 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

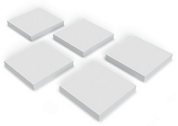
Probe Stand MODEL : 03-00108A

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

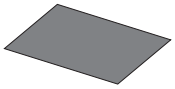
Insulating Block MODEL : 03-00054A



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

** ISO 10605 ed.3 compliant*

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



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

ESD Elimination Brush MODEL : 05-00125A

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

Free Arm Gun Stand MODEL : 03-00022B

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

- Compatible discharge gun : GT-30R series

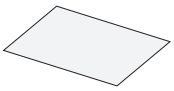
** Conversion adaptor model 03-00074A is necessary in addition for the attachment to GT-30R series*

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

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

- Compatible discharge gun : GT-30R series

Insulating Support MODEL : 03-00066A



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

** ISO 10605 ed.2 comliant*

Aluminium Plate for Test MODEL : 03-00053A

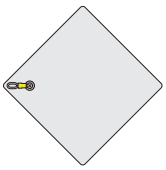


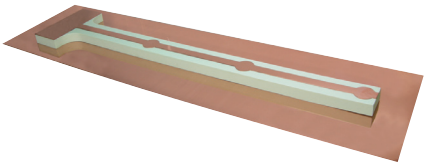
Plate to be laid out under tires for the vehicle test
W500 × D500 × t1.5 mm

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)*

Field Coupling Plane MODEL : 03-00065A



Field Coupling plane mentioned in ISO 10605 Ed.3 (2023).
Consists of a coupling plane (made of copper) and an insulation block.

** Ground reference plane is not included.*

Optional Accessories

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-30R3302KB package contents

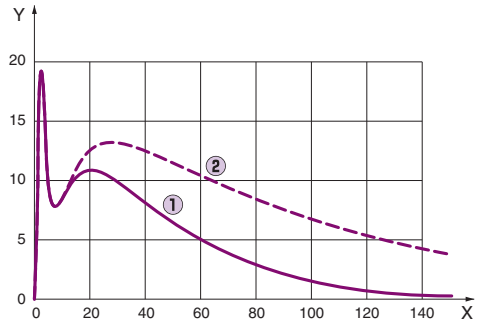
GT-30R series	gun body
03-00071A	gun head
03-00072A	gun head
06-00073B	150 pF - 330 Ω CR unit ①
06-00074B	150 pF - 2 kΩ CR unit ③
06-00075B	330 pF - 330 Ω CR unit ②
06-00076B	330 pF - 2 kΩ CR unit ④
12-00007A	conical tip
12-00008A	round tip
12-00009A	spherical tip

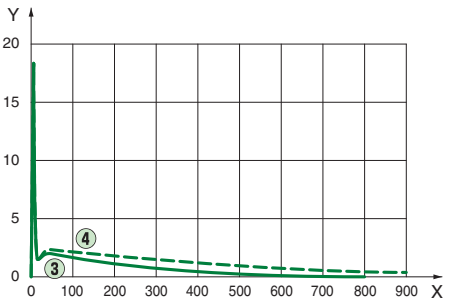
2 kΩ gun head

Spherical (φ30 mm) discharge tip

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

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





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

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

● Compatible discharge gun : GT-30R series

Fast Rise Time Adaptor MODEL : 03-00073A

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

● Compatible discharge gun : GT-30R series

Impulsive Electric Field Adaptor MODEL : 03-00068A

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

● Compatible discharge gun :GT-30R series

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

Gun discharge tips
ESD tips for contact/air discharge testing.
7A/8A conical/round tips are included in GT-30RB package.
9A spherical tip is included only in GT-30R3302KB ISO package.

● Compatible discharge gun : GT-30R series, GT-31S

Optional Accessories

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

** ESD waveform not guaranteed when using this cable*

- 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.

**included in the ESS-S3011A/GT-30R(3302K)B package.*

- 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 accessories.

- 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, automatic ESD eliminator and external trigger simultaneously

- Compatible models : ESS-S3011A, ESS-PS1

Optical Interface Box 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, ESS-PS1

Optional 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.

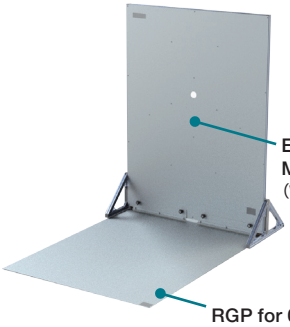
Parameter	Specification
Dimensions	(W)848×(D)765×(H)1757mm
Mass	Approx. 75kg
Power supply	AC100V 50Hz/60Hz±10%*

** 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).

ESD current target mounting board 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

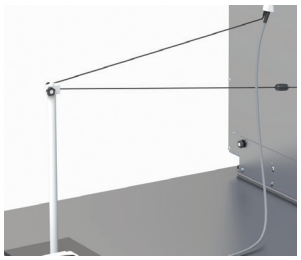
RGP for 03-00118A MODEL: 03-00119A
(W)1210×(D)1660×(T)1.5mm(Excluding positioning block)

Discharge Gun Mount MODEL : 03-00061B

Fixture to load and fix the discharge gun to the Faraday cage (FC-300) or current target mounting board (03-00052B)

- Compatible discharge gun : GT-30R series

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

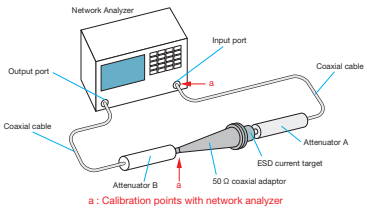
Load resistor to measure, verify and calibrate ESD current waveform defined in IEC61000-4-2 Standard and ISO 10605 Standard

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

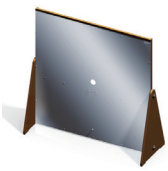
Included items: 20dB Attenuator MODEL: 00-00022A 2 pcs.
Coaxial cable MODEL: 02-00157A 1 pc.
**Conversion connector MODEL: 02-00133A is not included.*

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.*



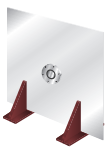
Current Target Mounting Board MODEL : 03-00052B



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 Ed.2 and ISO 10605 Ed.2 Standard

Dimensions : 1.2 m × 1.2 m

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 Standard. (*not conforming to the standard*)

Dimensions : 0.6 m × 0.6 m

Optional Accessories

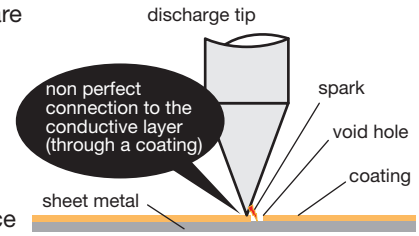
Micro-gap Discharge Tip MODEL : 12-00010A

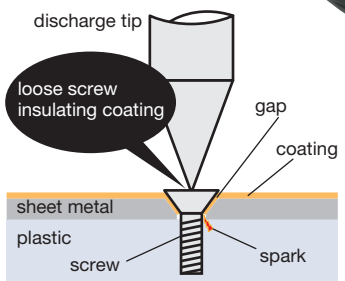
Enabling a more stringent evaluation for the real world ESD immunity

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

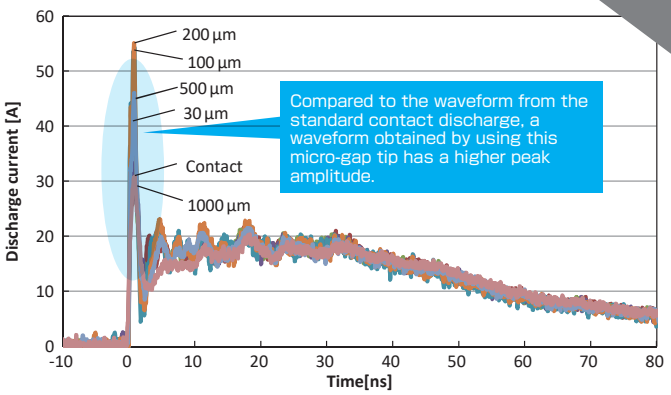




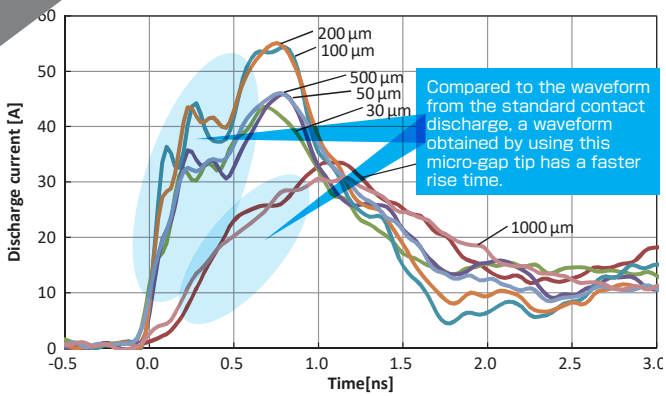
enlarged photo of the micro-gap

Simulated field events

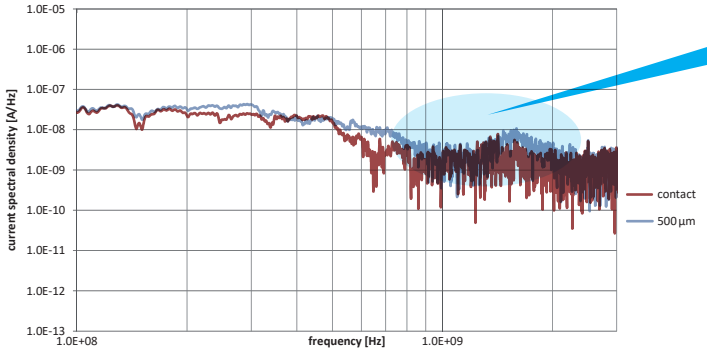
■ Output waveform (reference)



entire waveform

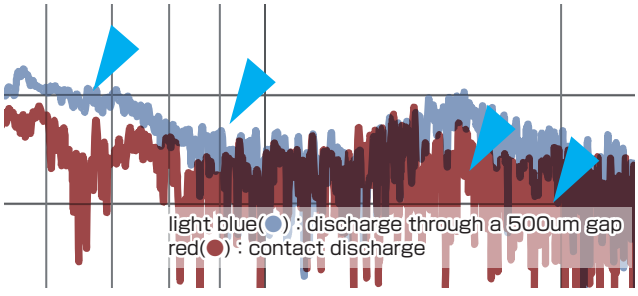


waveform leading edge



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

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.

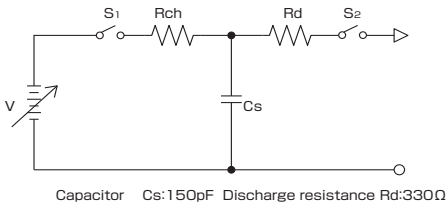
Level	Test voltage	
	Contact Discharge	Air discharge
1	2kV	2kV
2	4kV	4kV
3	6kV	8kV
4	8kV	15kV

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

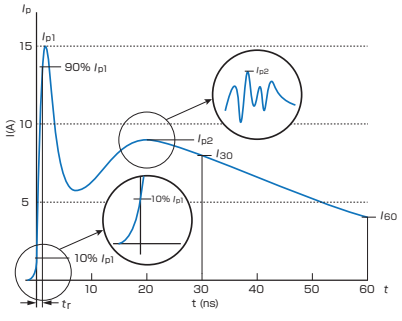
Generator characteristics

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



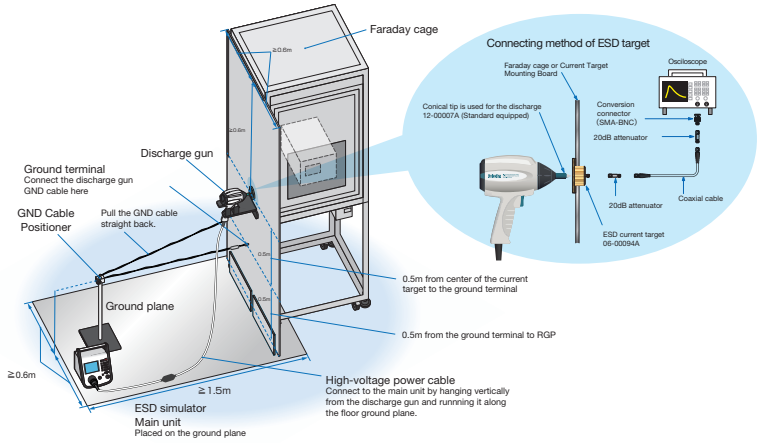
Discharge current waveform of contact discharge at 4kV

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.

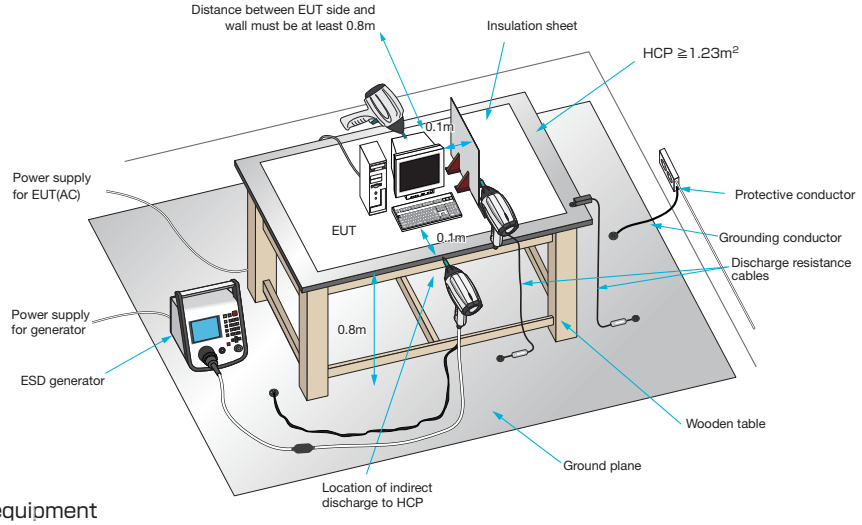
【Indirect discharge test】

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 kΩ 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.



For table-top equipment

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.

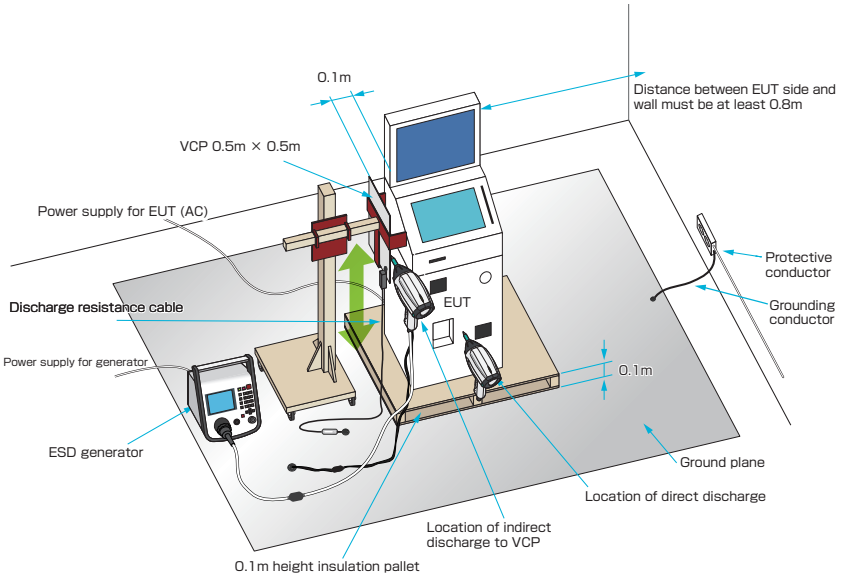
【Indirect discharge test】

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 kΩ 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.



For floor-standing equipment

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.

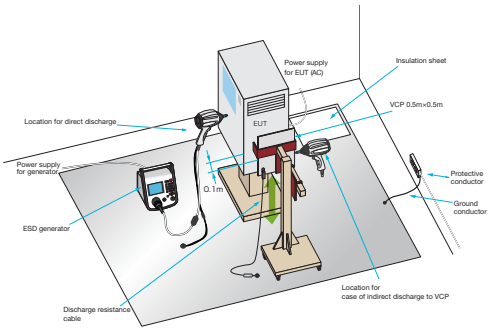
If the test results differ due to the connection of the discharge resistance cable to the EUT, disconnect the discharge resistance cable, apply ESD, then reconnect the cable and perform static elimination. The distance to the 470 kΩ resistance of the discharge resistance cable is within 0.1 m.

IEC 61000-4-2 Ed.3 Standard Summary

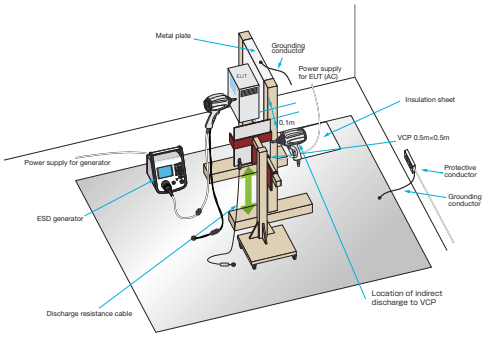
Test setup for wall-mounted equipment

[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

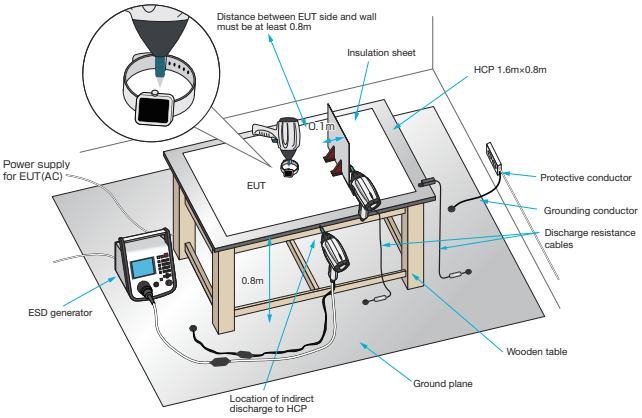


If the mounting surface is a conductive wall



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℃～35℃
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.

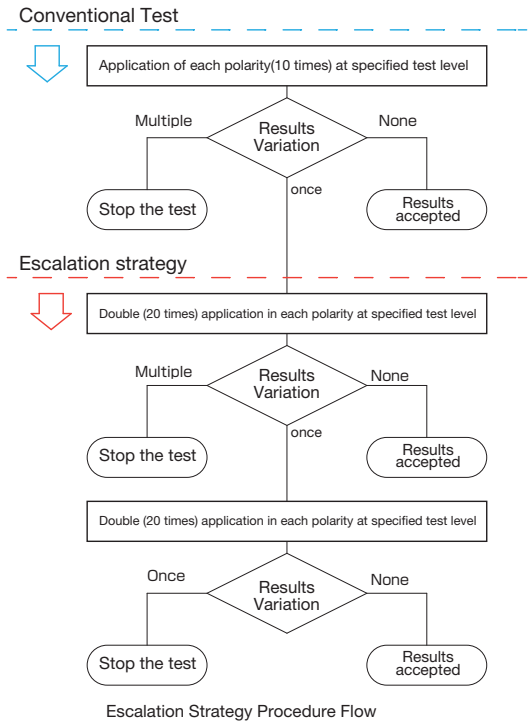
The number of discharges is at least 10 discharges at 1 second intervals, both polarities.

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.



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 Test Standard Overview

1. General

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

2. Test levels

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

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

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

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

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

Component test — Packaging and handling — Example severity levels —

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

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

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

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

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

ISO 10605 Ed.3 Test Standard Overview

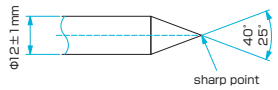
3. Specification of generator and verification of output waveform

Specification of ESD simulator

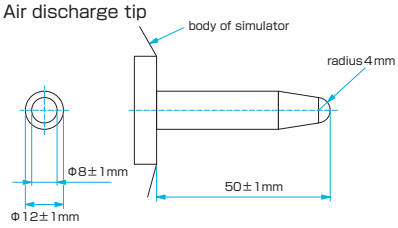
A simulator satisfying the following specifications must be used for the ESD Testing.

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

Contact discharge tip



Air discharge tip

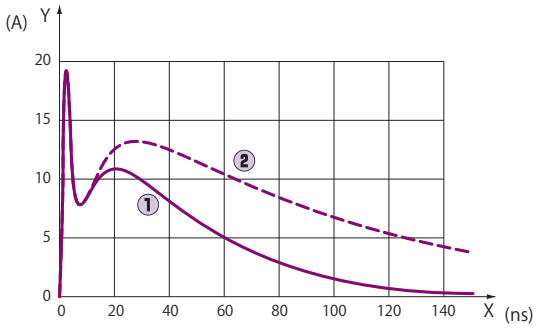


For air discharge at test voltages higher than 15 kV, a larger tip can be used to avoid pre-discharge.

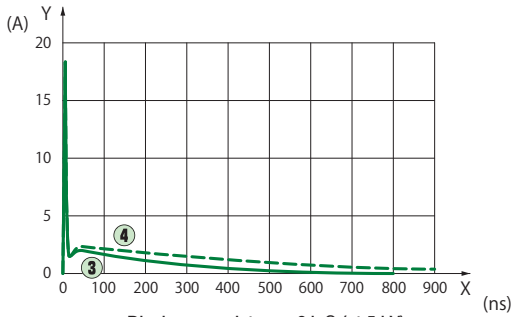
ESD Simulator Characteristics (Contact discharge mode current specifications)

The following discharge characteristics must be verified.

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



Discharge resistance 330 Ω (at 5 kV)



Discharge resistance 2 k Ω (at 5 kV)

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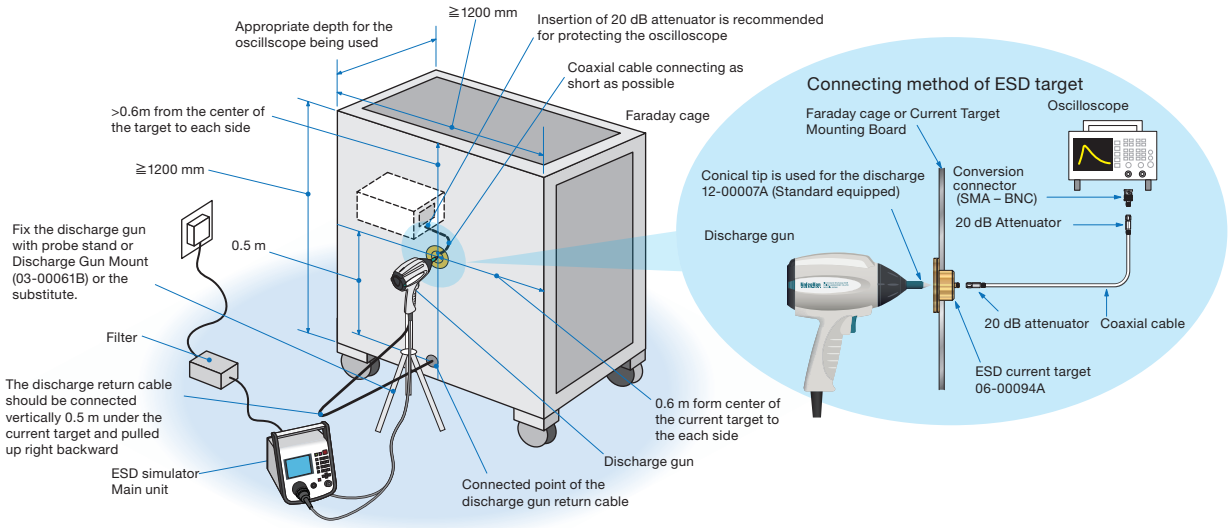
Verification of output current waveform

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

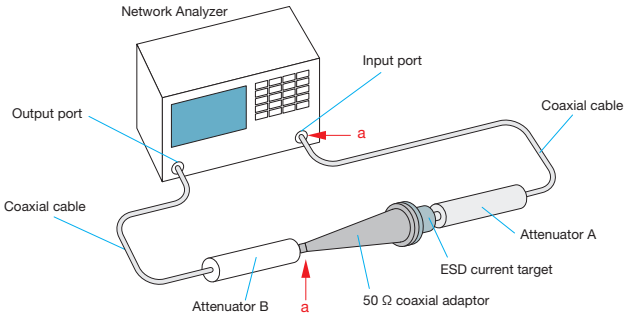


Current Target calibration

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

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

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



a : Calibration points with network analyzer

4. Test setup and test procedure

Common Points:

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

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

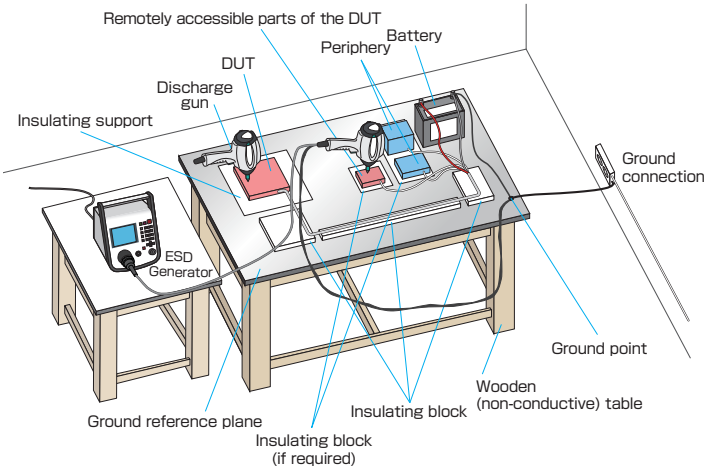
- Test at least 3 times with positive and negative polarity, separated by at least 1 second.
- Apply to every location available for human touch.
- Insulating block should be used for electronic equipment that are not directly chassis-mounted.

【 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.

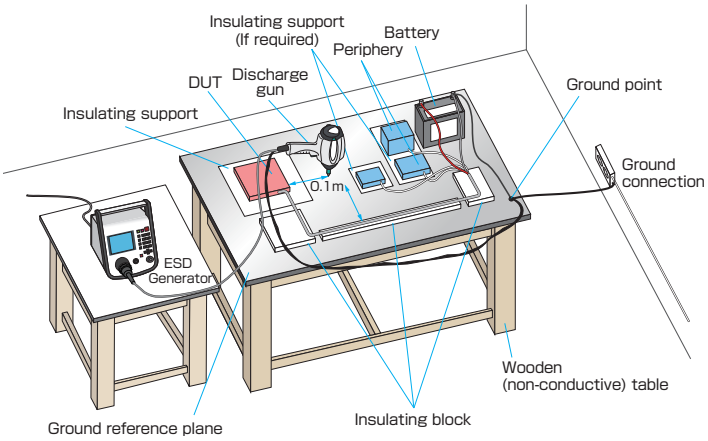
【 Air Discharge 】

- 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.



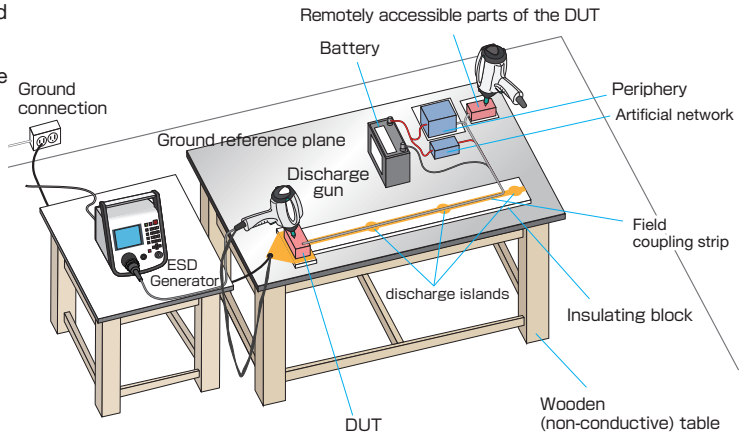
■ Component immunity test method (powered-up test) - Indirect Discharge -

- 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 330Ω.



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

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



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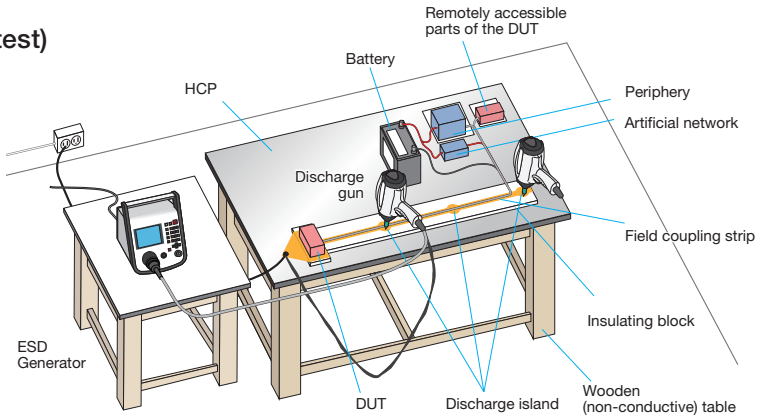
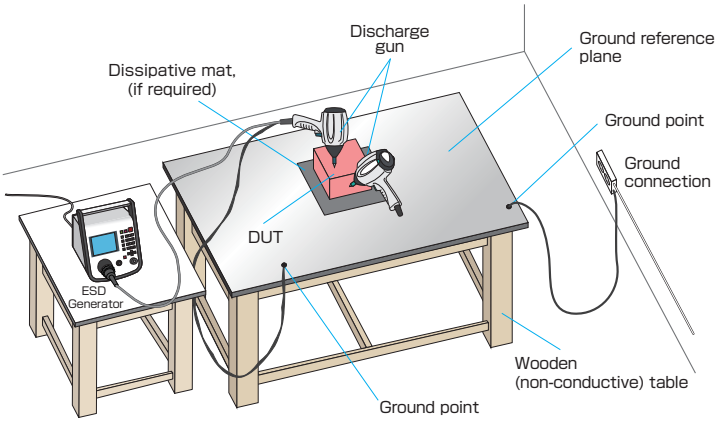
Component immunity test method (powered-up test) - Indirect Discharge using FCP -

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



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

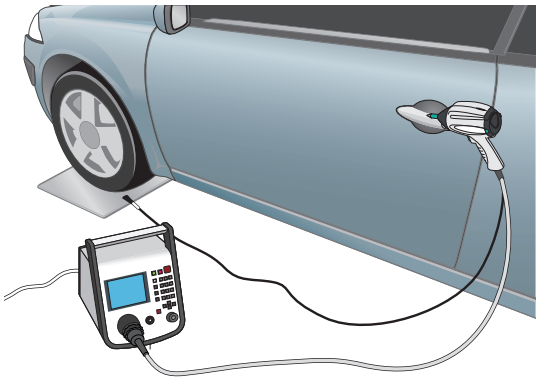
- Use 150pF capacitance and test with resistances that simulate direct contact with the human body (2kΩ) and touch with a metal object (330Ω).
- Conduct tests of two or more levels.
- At least 3 discharges shall be applied both to the positive and negative polarities with the interval not less than 1s.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



Vehicle test – Internal and external points –

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

Internal test



External test

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

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