Electrostatic Discharge Simulator

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

w w w . n o i s e k e n . c o m
ESD Simulator

ESS-S3011A & GT-30RA

Smart model equipped high function & extendibility

EMC test equipment to evaluate the resistibility of electronic equipments 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 and performable IEC61000-4-2 & ISO 10605 Standardscompliant tests.

- “3 pre-checking function” to make sure the more confirmable test
- “CR constant indicator” to make sure the correct unit attachment
- One-touch exchange of gun head and CR unit realized
- “Ten-key & Rotary knob” to ease the setting.
- “Infra-red Remote Controller” to realize the setting remotely from the generator (Standard attached).
- “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 scheduled to be downloaded freely from our website (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

More insurable test realized ! “3 pre-checking function” built-in

[Check 1] Check high voltage output Confirm error to the set value.
[Check 2] Check withstanding voltage Confirm whether withstanding voltage is normal or defective
The output and defectiveness are checked upon insertion of the discharge gun to the attached gun holder.
[Check 3] Check discharge relay operation Confirm whether the relay is exhausted or still available.
Confirmable by touch of the discharge gun to the check terminal on the generator and discharge.

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

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
Lighter and more user-friendly discharge gun

The discharge gun has been renewed completely to materialize a considerable weight reduction and best gravity balance. Human load in the operation can be remarkably reduced comparing to the previous model. Please realize it on-hand actually. Also, an event of air discharge can be visualized with LED light on the body in this new discharge gun although the previous one has to be confirmed only with human eyes. In addition, various functions are added like one-touch exchange of CR unit, LED irradiator to shine the discharging points, etc.

“Infra-red Remote Controller” standard attached to realize the setting remotely from the generator

Most of the operation can be controlled by the remote controller.
**ISO 10605 standard compliant discharge gun package available**

Options for ISO 10605 Standard compliant test

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

**High visibility LCD panel and operatability**

Reviewed the past operatability so that more easy and optimal 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 and number of times of the test can be selected and also the set conditions can be recorded. Sweeping discharges can be set as well. 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.

### Specification

**Parameter** | **Specification**
---|---
Polarity | Positive / Negative
Output voltage | 0.20kV ~ 30.0kV (5% (30.5kVmax))
| ~10.0kV / 0.01kV step ~30.0kV / 0.1kV step
Repetition cycle | 0.05s ~ 600s / Manual
| Set step : 0.01s (0.05 ~ 9.99s), 0.10s (10.0 ~ 600.0s)
No. of time of discharge | 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)
| SETP1 : High voltage output checking
| SETP2 : Withstanding voltage checking
| SETP3 : Discharge relay operation checking
CR & Gun head checking | CR constant and gun head recognizable (with an indicator to prevent the wrong combination)

**Parameter** | **Specification**
---|---
"IEC STANDARD" test mode | Contact / Air discharge mode, Arbitrary setting during 0.0kV ~ 30.0kV
"MANUAL" test mode | 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 | 150pF (Totally 330pF) (Built-in CR unit for discharge gun GT-30RA)
Change resistor in generator | 10MΩ (Totally 50MΩ in combination with 43MΩ in discharge gun)*
AUX connector | D-SUB 15pins female connector
(For connecting to patolight, automated ESD eliminator, external interlock input, external trigger input terminal)
Optical communication | Optical connector (parallel interface) for connecting to PC connector
Power supply / consumption | AC100V ~ AC240V / 50Hz / 60Hz ±10% 75VA
Dimensions | Generator : (W)83.3mm X (H)217.2mm X (D)229.3mm
| Discharge gun : (W)83.3mm X (H)217.2mm X (D)229.3mm
Weight | Generator : approx. 7.5kg
| Discharge gun : approx. 800g (cable and connector excluded)
* The constant depends on combination with CR unit for the discharge gun
ESD Simulator
ESS-B3011A & GT-30RA

Cost-oriented Basic models

Cost-oriented basic model ESD Simulator the light Weight discharge gun attachable. The output voltage can be selected max. 30kV. And compliant to both EN/IEC61000-4-2 Standard and ISO10605 Standard.

- “Pre-checking function” taking the confirmable test into the account
- “CR constant checking function” (No indicator) to make the correct unit attachment sure
- “Discharge Detecting Function” to realize the air-discharge confirmation.
- “Lightest Discharge Gun in the market” to lighten the continual 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 (only with ESS-B3011A)

### Specification

<table>
<thead>
<tr>
<th>Parameter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>ESS-B3011A</td>
</tr>
<tr>
<td>Output voltage</td>
<td>0.20kV~30.0kV±5% (30.5kV max)</td>
</tr>
<tr>
<td>Polarity</td>
<td>Positive / Negative</td>
</tr>
<tr>
<td>Repetition cycle</td>
<td>0.05s~9.99s±10%, 0.01s step / Manual</td>
</tr>
<tr>
<td>No. of time of discharge</td>
<td>1~999 times, Preset 1 time step or continuous preset</td>
</tr>
<tr>
<td>Discharge mode</td>
<td>Contact discharge / Air discharge</td>
</tr>
<tr>
<td>Trigger mode</td>
<td>Gun trigger / Main trigger</td>
</tr>
<tr>
<td>Operation panel</td>
<td>Indicator : 5x7 Dot matrix LED / Operation : Push buttons (Partially lighting)</td>
</tr>
<tr>
<td>Radiator mode select switch</td>
<td>Extra / Normal switching function built-in</td>
</tr>
<tr>
<td>Discharge detection</td>
<td>Discharge detection function in air-discharge equipped.</td>
</tr>
<tr>
<td>Pre-checking function</td>
<td>High voltage output checking function</td>
</tr>
<tr>
<td></td>
<td>(by user operation. Not the calibration but just checking)</td>
</tr>
<tr>
<td>CR &amp; Gun head checking</td>
<td>CR constant and gun head recognizable</td>
</tr>
<tr>
<td></td>
<td>(to prevent the wrong combination without indicator)</td>
</tr>
<tr>
<td>IEC LEVEL</td>
<td>Contact discharge mode : 2.0kV, 4.0kV, 6.0kV and 8.0kV step</td>
</tr>
<tr>
<td>Switching function</td>
<td>Air discharge mode : 2.0kV, 4.0kV, 8.0kV and 15.0kV step</td>
</tr>
<tr>
<td>Warning lamp</td>
<td>Lighting at voltage output from the generator. Blinking at electro-static discharging</td>
</tr>
<tr>
<td>Charge capacitor / resistor</td>
<td>150pF ±10% / 330pF ±10% (Built-in CR unit for discharge gun GT-30RA)</td>
</tr>
<tr>
<td>Charge resistor in generator</td>
<td>10MΩ ±10% in combination with 43MΩ in discharge gun</td>
</tr>
<tr>
<td>Power supply / consumption</td>
<td>AC100V~AC240V ±10% 50Hz / 60Hz 62VA</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Generator : (W)270mm X (H)283mm X (D)200mm</td>
</tr>
<tr>
<td></td>
<td>Discharge gun : (W)83.3mm X (H)217.2mm X (D)229.3mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Generator : Approx. 4.8kg</td>
</tr>
<tr>
<td></td>
<td>Discharge gun : Approx. 800g (excluding cable and connector)</td>
</tr>
</tbody>
</table>

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

Discharge output waveform (IEC Standard)

Probe stand for the discharge gun is option.
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 (quantifiable 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, versatility utilized for another tests like impulse noise immunity test, etc.

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

**Specification**

ESS-801 (Table-top type)

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Dimensions</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test table</td>
<td>03-00003A</td>
<td>(W) 1600x(H)800x(D)800mm</td>
<td>1 set</td>
</tr>
<tr>
<td>Vertical coupling plate</td>
<td>03-00005A</td>
<td>(W) 500x(H)500x(t) 1.5mm</td>
<td>1 set</td>
</tr>
<tr>
<td>Ground plane</td>
<td>03-00007A</td>
<td>(W) 1800x(D)1000x(t) 1.5mm</td>
<td>3 pcs.</td>
</tr>
<tr>
<td>Insulating sheet</td>
<td>03-00004A</td>
<td>(W) 1450x(H)650x(t) 0.5mm</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Discharge resistance cable</td>
<td>05-00054B</td>
<td>2m cable equipped with 470kΩ 2 pcs.</td>
<td>2 pcs.</td>
</tr>
<tr>
<td>Horizontal coupling plate</td>
<td>03-00020A</td>
<td>(W) 1600x(D)800x(t) 1.5mm</td>
<td>1 pc.</td>
</tr>
</tbody>
</table>

ESS-801GL (Floor-standing type)

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Dimensions</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulating support</td>
<td>03-00024A</td>
<td>(W) 1200x(H)1200x(D) 100mm</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Floor-standing coupling plate</td>
<td>03-00034A</td>
<td>(W) 540x(H)1540x(D) 500mm</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Ground plane</td>
<td>03-00007A</td>
<td>(W) 1800x(D)1000x(t) 1.5mm</td>
<td>3 pcs.</td>
</tr>
<tr>
<td>Discharge resistance cable</td>
<td>05-00054B</td>
<td>2m cable equipped with 470kΩ 2 pcs.</td>
<td>1 pc.</td>
</tr>
</tbody>
</table>

**Option**

- **Horizontal Coupling Plate (HCP) MODEL : 03-00020A**
  Metal plate to be placed onto the table in case of the testing to table top devices. W1600 x D800 x 11.5mm x 1 pc.(Made of aluminum)

- **Test Table MODEL : 03-00039A**
  Wooden table to be used for the test to devices under test (DUT). W1600 x H800 x D800mm

- **Ground Reference Plane (GRP) MODEL : 03-00007A**
  Ground plane to be placed just under the wooden table. W1800 x D1000 x 11.5mm x 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 470kΩ × 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 x D 1200 x H 100mm Material : Wooden Withstanding loads : 500kg
**ELECTROSTATIC DISCHARGE SIMULATOR**

**Cubic Insulating Block**
MODEL: 03-00029A

Used for floating EUT 10cm upper than the ground plane in case of testing to floor-standing EUT
Size: W100 × D100 × H100mm
Material: Wood
Withstanding loads: 500kg

**Probe Stand**
MODEL: 03-00108A

A probe stand used to fix the discharge gun for ESD Simulator. (Excluded from IEC standard) Because of the articulated type, the discharge gun fixes in any direction.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>H380mm, Pedestal diameter 160mm</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 4.1 kg</td>
</tr>
<tr>
<td>Range of movement</td>
<td>Vertical: 150mm; Swing angle: 130°</td>
</tr>
</tbody>
</table>

**Insulating Block**
MODEL: 03-00054A

Blocks to float (isolate) wirings of DUT from GRP.
W300 × D300 × H50mm, 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 10⁷~10⁹Ω
W1000 × D500 × t2mm

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

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

**Automated ESD Eliminator**
MODEL: 01-0013B

Enable to eliminate electric charge which has been charged to EUT automatically with connection to ESS-S3011A

**Conversion Adaptor for Probe Stand**
MODEL: 03-00074A

Adaptor for connecting between probe stand PS-806 or 03-00022B and discharge gun GT-30R series.

**Free Arm Gun Stand**
MODEL: 03-00022B

Enable to move discharge gun vertically and horizontally to arbitrary desirable discharging point. (Out of ISO Standard)

**Insulating Support**
MODEL: 03-00066A

Sheet to be laid out in between DUT and GRP for the test to automotive electronics devices.
W1450 × D650 × t2mm

**Aluminum Plate for Test**
MODEL: 03-00053A

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

**Automated ESD Eliminator**
MODEL: 01-0013B

Enable to eliminate electric charge which has been charged to EUT automatically with connection to ESS-S3011A

**Conversion Adaptor for Probe Stand**
MODEL: 03-00074A

Adaptor for connecting between probe stand PS-806 or 03-00022B and discharge gun GT-30R series.

**Free Arm Gun Stand**
MODEL: 03-00022B

Enable to move discharge gun vertically and horizontally to arbitrary desirable discharging point. (Out of ISO Standard)

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

Cable to be used for grounding connection required in ISO 10605 (2001). L2000 × W50mm

* Not required in ISO 10605 Ed.2 (2008)

**Probe Stand**
MODEL: 03-00108A

A probe stand used to fix the discharge gun for ESD Simulator. (Excluded from IEC standard) Because of the articulated type, the discharge gun fixes in any direction.

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**Conversion Adaptor for Probe Stand**
MODEL: 03-00074A

Adaptor for connecting between probe stand PS-806 or 03-00022B and discharge gun GT-30R series.

**Free Arm Gun Stand**
MODEL: 03-00022B

Enable to move discharge gun vertically and horizontally to arbitrary desirable discharging point. (Out of ISO Standard)

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

Cable to be used for grounding connection required in ISO 10605 (2001). L2000 × W50mm

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**Conversion Adaptor for Probe Stand**
MODEL: 03-00074A

Adaptor for connecting between probe stand PS-806 or 03-00022B and discharge gun GT-30R series.

**Free Arm Gun Stand**
MODEL: 03-00022B

Enable to move discharge gun vertically and horizontally to arbitrary desirable discharging point. (Out of ISO Standard)

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

Cable to be used for grounding connection required in ISO 10605 (2001). L2000 × W50mm

* Not required in ISO 10605 Ed.2 (2008)
For ISO10605 compliant test

<table>
<thead>
<tr>
<th>CR Unit M</th>
<th>CR unit for ESD gun GT-30R series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Available discharge gun : GT-30R series</td>
</tr>
<tr>
<td></td>
<td>• Please contact us when the other CR constant is required than the right description.</td>
</tr>
<tr>
<td></td>
<td>• The unit size depends on the capacitor constant.</td>
</tr>
</tbody>
</table>

Gun Head MODEL : 03-00071A / 03-00072A
Gun head to be changed according to Standard compliant test. 2 kinds for the test with 330Ω (03-00071A) and 2kΩ (03-00072) are lined up.
• Available discharge gun : GT-30R series

Discharge Tip MODEL : 12-00007A / 8A / 9A
Discharge tips on the gun. Conical (12-00007A) and Round (12-00008A) are standard equipped with GT-30R series. The all 3 tips are standard equipped with GT-30R series.
• Available discharge gun : GT-30R series

Fast Rise Time Adaptor MODEL : 03-00073A
Fast Rise Time Adaptor MODEL : 03-00073A
Realize faster rise time of the discharge current than IEC61000-4-2 standard value (0.6-1.0ns) around 0.2-0.3ns with attachment to the discharge gun.
• Available discharge gun : GT-30R series

Impulsive Electric Field Adoptor MODEL : 03-00068A
Adaptor for simulating static induction as one of noise inductive mode with attachment to the discharge gun (Not standardized in IEC)
• Available discharge gun : GT-30R series

CR Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>CR constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-00073B</td>
<td>150pF-330Ω</td>
</tr>
<tr>
<td>06-00074B</td>
<td>150pF-2kΩ</td>
</tr>
<tr>
<td>06-00075B</td>
<td>330pF-330Ω</td>
</tr>
<tr>
<td>06-00076B</td>
<td>330pF-2kΩ</td>
</tr>
<tr>
<td>12-00070A</td>
<td>conical tip</td>
</tr>
<tr>
<td>12-00076A</td>
<td>round tip</td>
</tr>
<tr>
<td>12-00075A</td>
<td>spherical tip</td>
</tr>
</tbody>
</table>

* Please contact us when the other CR constant is required than the right description.
* The unit size depends on the capacitor constant.
## Magnetic Field Adapter
**MODEL : 03-00070A**
Magnetic field adapter for Ford standard. Connected to GT-30R series discharge gun, it generates transient magnetic fields.
- **Available discharge gun**: GT-30R series

### Item | Specification
---|---
Loop coil diameter | 155mm
Dimensions | 168mm (loop outer diameter) 300mm (length) 12.7mm (thickness of the loop)

## 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 IEC)
- **Available discharge gun**: GT-30R series

## Extension cable for GT-30R
**MODEL : 05-00047B**
Extension cable in connection between ESD simulator main unit and its discharge gun. The length is 3m. *not compliant with the IEC standard*
- **Available 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.
- **Available discharge gun**: GT-30R series

## Specialized Case for Discharge Gun
**MODEL : 09-00006A**
Specialized Case for putting the discharge gun, CR units and the other related fixtures and carrying them out.
- **Available discharge gun**: GT-30R series

## Aux Connector Junction Box
**MODEL : 05-00052A**
Enable to connect warning lamp, automated ESD eliminator and external trigger simultaneously
- **Available model**: ESS-S3011A

## Warning Lamp
**MODEL : 11-00014A**
Caution is alerted with its blinking while the HV circuit is on.
- **Available model**: ESS-S3011A
  * The connection is done with D5USB connector.

## Optical RS232 Module
**MODEL : 07-00017A**
Optical conversion adaptor used for remote control with PC. 5m of optical fiber cable with RS232 interface attached.
- **Available model**: ESS-S3011A

## Optical USB Module
**MODEL : 07-00022A**
Optical conversion adaptor Used for remote control with PC. 5m of optical fiber cable with USB interface attached.
- **Available model**: ESS-S3011A

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[www.noiseken.com](http://www.noiseken.com)
Load Resistor Mounting Board  MODEL : 03-00027A

The board to fix the load resistor (MODEL NO. 06-00067A ESD current target) for measuring the discharge current waveform defined in IEC61000-4-2 Standard and ISO 10605 Ed.2 Standard. (not conforming to the standard strictly but simply)
Dimensions : 0.6m X 0.6m

ESD Current Target  MODEL : 06-00067A

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

Parameter Specification
300kHz-4GHz  ±0.5dB
1GHz-4GHz  ±1.2dB
Maximum applied voltage 15kV
Conversion ratio 2V/1A (50Ω termination)
Weight Approx. 400g

Coaxial Cable  MODEL : 02-00132A
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 0.5m backward 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 (06-00067A) in conformance with IEC61000-4-2 Ed.2.0 (2008).

Attenuator  MODEL : 00-00010A / 00-00011A
Attenuator to protect measurement equipment for ESD current waveform.
00-00010A : Attenuation ratio 6dB / SMA connector
00-00011A : Attenuation ratio 20dB / N connector

Discharge Gun Mount  MODEL : 03-00061B
Fixture to load and fix the discharge gun to be Faraday cage (FC-200) or load resistor mounting board (03-00052B)

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.

Power supply AC100V 50Hz/60Hz 3P inlet
Equipped with over-current protective breaker
Opening Dimensions (W) 410mm X (H) 618mm
Dimensions / Weight (W)670mm x (H)1612mm x (D) 1509mm Approx. 65kg. 3p outlet X 2 15A MAX

Load Resistor Mounting Board  MODEL : 03-00052B

The board to fix the load resistor (MODEL NO. 06-00067A ESD current target) for measuring the discharge current waveform defined in IEC61000-4-2 Standard and ISO 10605 Ed.2 Standard. (not conforming to the standard strictly but simply)
Dimensions : 1.2m X 1.2m

Option

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.

Item Specification
Power supply AC100V 50Hz/60Hz 3P inlet
Equipped with over-current protective breaker
Opening Dimensions (W) 410mm X (H) 618mm
Dimensions / Weight (W)670mm x (H)1612mm x (D) 1509mm Approx. 65kg. 3p outlet X 2 15A MAX
Enabling a more stringent evaluation for the real world ESD immunity

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

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

Simulated field events

- Output waveform (reference)

Compared to the waveform from the standard contact discharge, a waveform obtained by using this micro-gap tip has a higher peak amplitude.

Testing with energy rich pulses for the GHz region

- Compatible discharge gun
  TC-815S, 815R, 815ISO, 815-300, 815-2K, 815S-330, GT-30Rseries (the dedicated cup 03-00103A required)

*This product cannot be used for the air discharge testing
IEC61000-4-2 Ed.2 Test Standard

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 an charged human body discharges to electronic equipment and testing with the circuit to simulate current waveform generated in such conditions.

2. Test Level

- **Test level range for the ESD**

  The levels as below.

<table>
<thead>
<tr>
<th>Level</th>
<th>Test voltage (contact discharge)</th>
<th>Test voltage (air discharge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2kV</td>
<td>2kV</td>
</tr>
<tr>
<td>2</td>
<td>4kV</td>
<td>4kV</td>
</tr>
<tr>
<td>3</td>
<td>6kV</td>
<td>8kV</td>
</tr>
<tr>
<td>4</td>
<td>8kV</td>
<td>15kV</td>
</tr>
<tr>
<td>X</td>
<td>Special</td>
<td>Special</td>
</tr>
</tbody>
</table>

  * X can be any level determined by consent between the EUT manuracturer and the simulator supplier

3. Test Generator and Waveform Verification

- **Generator specification**

  The generator must satisfy following specification.

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

- **Generator characteristics**

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

<table>
<thead>
<tr>
<th>Level</th>
<th>Indicated voltage</th>
<th>1st peak current of discharge (±15%) Ip</th>
<th>Rise time (±25%) at 30ns</th>
<th>Current (±30%) at 30ns</th>
<th>Current (±30%) at 60ns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2kV</td>
<td>7.5A</td>
<td>0.8ns</td>
<td>4A</td>
<td>2A</td>
</tr>
<tr>
<td>2</td>
<td>4kV</td>
<td>15A</td>
<td>0.8ns</td>
<td>8A</td>
<td>4A</td>
</tr>
<tr>
<td>3</td>
<td>6kV</td>
<td>22.5A</td>
<td>0.8ns</td>
<td>12A</td>
<td>6A</td>
</tr>
<tr>
<td>4</td>
<td>8kV</td>
<td>30A</td>
<td>0.8ns</td>
<td>16A</td>
<td>8A</td>
</tr>
</tbody>
</table>

- Discharge current waveform and its characteristics

  Capacitance Cs : 150pF
  Discharge resistance Rd : 330Ω
  Simplified diagram of the ESD generator
Waveform verification of ESD Generator

Measure the waveform with an oscilloscope whose band width is 2GHz 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.

* It is recommended that insertion of approx. 20dB attenuator for protecting the measurement equipment although it is not specified in IEC Standard.

4. Test setup

Example of test set-up for table-top equipment

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

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

Example of test set-up for floor-standing equipment

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

* Float cables from the ground plane with 0.5mm thickness insulation sheet.

* Keep GND cable of the discharge gun 0.2m from any conductive parts other than the ground plane.

* The isolation transformer for EUT is not specified in IEC Standard.
Climatic and Other Environmental Conditions

It is necessary to leave equipment which are brought in from different climatic conditions fully 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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>15°C to 35°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>30% to 60%</td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>86 kPa (860 mbar) to 106 kPa (1060 mbar)</td>
</tr>
<tr>
<td>Electromagnetic conditions</td>
<td>Level not to affect the test result</td>
</tr>
</tbody>
</table>

Test Procedure

Direct discharge test: Contact discharge (at 1 second interval) and air discharge
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 which 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 IEC61000-4-2 (2009) and JIS C 61000-4-2 standardised2.0 (2005) Standard for applying to our products.
Please go through the Standards if the more details are required.
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 provides 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, also, the Standard provides tests procedures to evaluate the immunity of the each module against simulated human discharges during the assembly process or in servicing.

2. Test level

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

<table>
<thead>
<tr>
<th>Component test</th>
<th>Example severity levels for direct contact discharge and direct air discharge (Function performance status)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test severity level</td>
<td>Category 1</td>
</tr>
<tr>
<td>Level 4</td>
<td>±8kV</td>
</tr>
<tr>
<td>Level 3</td>
<td>±6kV</td>
</tr>
<tr>
<td>Level 2</td>
<td>±4kV</td>
</tr>
<tr>
<td>Level 1</td>
<td>±2kV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component test</th>
<th>Example severity levels for indirect contact discharge (Function performance status)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test severity level</td>
<td>Category 1</td>
</tr>
<tr>
<td>Level 4</td>
<td>±8kV</td>
</tr>
<tr>
<td>Level 3</td>
<td>±6kV</td>
</tr>
<tr>
<td>Level 2</td>
<td>±4kV</td>
</tr>
<tr>
<td>Level 1</td>
<td>±2kV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicle test</th>
<th>Example severity levels for contact discharge and air discharge (Test points accessible only from inside vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test severity level</td>
<td>Contacts discharge</td>
</tr>
<tr>
<td>Category 1</td>
<td>Category 2</td>
</tr>
<tr>
<td>Level 4</td>
<td>±6kV</td>
</tr>
<tr>
<td>Level 3</td>
<td>±4kV</td>
</tr>
<tr>
<td>Level 2</td>
<td>±2kV</td>
</tr>
<tr>
<td>Level 1</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vehicle test</th>
<th>Example severity levels for contact discharge and air discharge (Test points accessible only from outside vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test severity level</td>
<td>Contacts discharge</td>
</tr>
<tr>
<td>Category 1</td>
<td>Category 2</td>
</tr>
<tr>
<td>Level 4</td>
<td>±6kV</td>
</tr>
<tr>
<td>Level 3</td>
<td>±4kV</td>
</tr>
<tr>
<td>Level 2</td>
<td>±2kV</td>
</tr>
<tr>
<td>Level 1</td>
<td>–</td>
</tr>
</tbody>
</table>

3. Specification of generator and verification of output waveform

- **Specification of ESD simulator**

Following specification must be satisfied with the simulator for the test.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage, Contact discharge (kV)</td>
<td>2kV/15kV</td>
</tr>
<tr>
<td>Output voltages - Air discharge (kV)</td>
<td>2kV/25kV</td>
</tr>
<tr>
<td>Output voltages accuracy (%)</td>
<td>±5%</td>
</tr>
<tr>
<td>Polarity</td>
<td>Positive and negative</td>
</tr>
<tr>
<td>Rise time of short circuit current in contact discharge mode (10% to 90%):</td>
<td>0.7ns/1ns</td>
</tr>
<tr>
<td>Holding time</td>
<td>≤5s</td>
</tr>
<tr>
<td>Storage capacitances (pF)</td>
<td>150pF, 330pF</td>
</tr>
<tr>
<td>Discharge resistances (Ω)</td>
<td>2kΩ, 330Ω</td>
</tr>
</tbody>
</table>
Testing Summary according to ISO 10605 Ed.2 Standard

Contact discharge mode current specifications

Following discharges characteristics should be verified.

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

The waveform shall be verified with an oscilloscope whose bandwidth is 1GHz or more in a Faraday cage or with a 1.2m x 1.2m 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 0.5m under the target on surface of the Faraday cage or board.

Verification of output current waveform

The waveform shall be verified with an oscilloscope whose bandwidth is 1GHz or more in a Faraday cage or with a 1.2m x 1.2m 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 0.5m under the target on surface of the Faraday cage or board.

Calibration of target

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

Figure of attaching ESD current target and the calibration adaptor (Left: Target Right: Adaptor)
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 330Ω.
- The test level shall be two or more.
- At least 3 discharges shall be applied both to the positive and negative polarities with the interval not less than 1s. 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.
- 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
For testing (unpowered) packaging and handling ESD sensitivity

- Capacitance shall be selected to 150 pF (Although the resistance value is not provided, it is recommended to perform the tests supposing both resistance when the DUT may be directly accessible by human body (2kΩ) and it may be accessible by a metal object a human hold (330Ω))
- The test level shall be two or more.
- 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 (>1MΩ) 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 330pF for areas that can easily be accessed only from the inside of the vehicle and resistance of 330Ω 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 330Ω 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.
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 go through the Standard if the more details are required.