

**K E S 4 0 2 1 A / 4 0 2 2 A**



## **Electrostatic Discharge Simulator KES4021A/4022A**

- Complies with the EN/IEC61000-4-2 standard
- Maximum testing voltage of  $\pm 30$  kV exceeds required test levels.
- Easy-to-use panel design
- Equipped with the programming feature(KES4022A)
- Applied to various standards of the electrostatic testing

# Compliant with the IEC61000-4-2 Ed2.0:2008 Standard

## Electrostatic Discharge Simulator

# KES4021A/4022A

NEW

An electrostatic discharge is a common phenomenon. The electric shock by the electrostatic discharge occurs such as when touching the door knob, walking on the carpet in dry condition, or getting on and off from the automobile. When the ark current or the electromagnetic wave were generated by those electrostatic discharge flows into the electric circuit, it may cause a significant adverse effect such as malfunction of the electronic device or destruction of the electric circuit. These issues are deeply concerned under the present circumstances because of the semiconductors have been widely adopted and used in the most electric devices or electronics equipments. Therefore, the related standard of the electrostatic discharge immunity test has become established. We offer the product which complies to the standard of the immunity test that can simulate the direct or indirect discharge to the electrical device and the electronic equipment from the charged human body.

### • IEC61000-4-2 Ed2.0: 2008 Complied to the standard

[Applied to the automated test operation]

■ KES4022A

[For the manual operation]

■ KES4021A

### • IEC61000-4-2 Ed2.0:2008 / ISO10605 Ed2.0:2008 Complied to the standard

[Applied to the automated test operation]

■ KES4022A FOR ISO.STD.ED2

[For the manual operation]

■ KES4021A FOR ISO.STD.ED2

Make the setting of complex test condition easier !  
Equipped with the convenient program feature !  
(KES4022A)



Model KES4022A. The gun stand is option. PC is not included.

### [Features]

- ▶ **Electrostatic discharge simulator compliant with EN/IEC 61000-4-2**
- ▶ **Maximum test voltage of  $\pm 30$  kV is more than sufficient for required testing levels**
- ▶ **Applied to the ISO 10605 Ed2.0:2008 standard\***

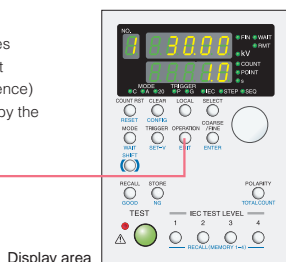
\*The ISO10605 Ed2.0 stipulates the combination of the capacitor with an accumulated energy (150pF/330pF) and the discharge resistor (330 $\Omega$ /2k $\Omega$ ). The unit applied to the edition of IEC61000-4-2 Ed2.0:2008/ISO10605 Ed2.0:2008 includes the optional CR unit (CR32-KES, CR33-KES, CR34-KES) and the discharge tip (AT32-KES, CT32-KES, ST31-KES, ST32-KES) besides the standard accessory of the CR unit (CR31-KES) and the discharge tip (AT31-KES, CT31-KES).

\* If the optional standard ISO10605 Ed2.0:2008 is purchased at later date, the extra cost will be charged for the calibration combined with main unit.

### Exclusive features of the KES4022A

- ▶ **Test condition settings, the programming feature by the main unit or using the application software**
- ▶ **Selective 4 test modes depending on the application**

4 operation modes  
(Manual, IEC test level, step, sequence)  
can be selected by the  
OPERATION key



Display area

#### Manual operation

Tests using the specified test conditions

single operation

#### Auto operation

Test consisting of several test condition combinations

IEC test level operation

step operation

sequence operation

OPERATION key

#### ● Manual operation (single operation)

When the test is performed, the test conditions remain the same unless you change the conditions. You can also select the IEC61000-4-2 test level.

#### ● IEC test level operation

Auto operation that you set for the IEC test levels and polarities.

Testing is performed in order from the lowest IEC61000-4-2 test level to the selected test level.

#### ● Step operation

Auto operation that you set for the step voltage and polarities.

Testing is performed in sequence according to the set starting, ending, and step voltage.

#### ● Sequence operation

Auto operation that you set for arbitrary test conditions.

Testing is performed in sequence from step when the number of test conditions were set.

### [Specifications of the main unit]

Item	KES4022A	KES4021A
Discharge method	Contact discharge and Air discharge	
Set voltage	0.00kV to 30.5kV(Guaranteed specifications: 0.50kV to 30.0kV)	
Polarity	Positive and Negative	
Polarity setting	PoS: for the positive polarity only	-
	nEG:for the negative polarity only	
	P-n: Start with a positive voltage and switch the polarity for each step	
	n-P: Start with a negative voltage and switch the polarity for each step	
	PA-nA: Test all positive steps then all negative steps	
	nA-PA: Test all negative steps then all positive steps	
Charge resistor	50M $\Omega$ (combined with the discharge gun)	
Discharge interval	0.05 / 0.1s to 99.9s	
Discharge cycle	1 to 99999/Continuous	1 to 999/Continuous
Trigger	Main panel trigger and Discharge gun trigger	
Type of test	Manual operation	
	IEC test level operation: level 1,2,3,4*	
	step operation: in step voltage 0.01 to 30.0kV	-
	sequence operation*	
Discharge points	1 point to 10 points	-
Memory operation	Stores 20 sets of testing conditions for each operation (a total of 80 sets)	
Wait feature	ON or OFF	
Discharge Current Waveform	IEC61000-4-2 Ed2.0: 2008, ISO10605 Ed2.0: 2008	
Interface	RS232C interface, External connection I/F (Option)	RS232C(Optional)
Application Software	CD-ROM	-
Power supply	AC100V to 240V 50/60Hz	
Dimensions	430Wx132Hx370Dmm	
Weight	approx. 8.0kg(17.6 lb)	

\*The KES4021A applies only for the setting level

\*Up to 20 steps of configuration with different test conditions in a single sequence test.

### [Specifications of the discharge gun]

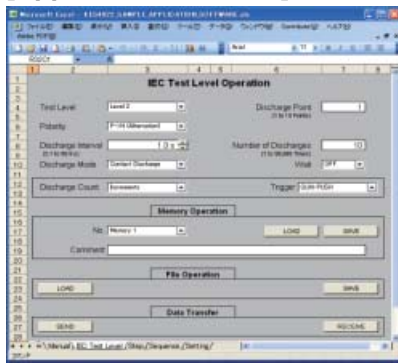
Item	Common specifications for KES4021A / KES4022A
Output voltage	0.00kV to 30.5kV
Energy storage capacitor	150pF $\pm$ 10% (replaceable)*
Discharge resistor	330 $\Omega$ $\pm$ 10% (replaceable)*
Charge resistor	50M $\Omega$ (with the main unit connected)
Dimensions	218W (excluding the discharge chip) x 232.5H x 63Dmm
Weight	Approx. 1.5Kg (including the 2.5 m high voltage cable)
Discharge chip	Air discharge tip (AT31-KES), Contact discharge tip (CT31-KES)

\*The IEC61000-4-2 stipulates the combination of the energy storage capacitor (150pF) and the discharge resistor (330 $\Omega$ ). The CR unit (CR31-KES), included as a standard accessory, is the type of fixed component value. For other combinations, the optional combination with different component values are available.

### [Accessories]

• Power cord: 1 pc., • CR unit (CR31-KES), • Air discharge tip (AT31-KES): 1 pc., • Contact discharge tip (CT31-KES): 1 pc., • CD-ROM: 1 pc. (KES4022A), • Operation Manual: 1 copy

## [Application Software]



**The complex setting of test condition can be easily made by entering the specified parameters.**

(Remarks) The execution or aborting the test can not be controlled remotely from the PC. This software can not be used for the KES4021A.

The KES4022A includes a dedicated application software as a standard accessory. The test conditions can be set either from the front panel or through by the PC. Moreover, the specified condition of the parameter can be easily entered in the excel format as it activates as macro program.

[System requirement]

- Interface : RS232C
- OS : Windows XP Professional (SP2 or later, 32 bit version)
- Application software : Microsoft Excel 2003 VBA

## [Optional components]

### ● Option parts for IEC61000-4-2 standard test

CR unit and discharge tip are available for the IEC61000-4-2 standard test.

Product name	Model name
CR unit (150 pF/330Ω) for IEC61000-4-2	CR31-KES
Air discharge tip(Resistance value 330Ω)	AT31-KES
Contact discharge tip(Resistance value 330Ω)	CT31-KES

### ● Option parts for ISO 10605 standard test

CR unit and discharge tip are available for the ISO 10605 standard test.

Product name	Model name
CR unit(330pF/330Ω)for ISO10605 Ed.2.0	CR32-KES
CR unit(150pF/2kΩ)for ISO10605 Ed.2.0	CR33-KES
CR unit(330pF/2kΩ)for ISO10605 Ed.2.0	CR34-KES
Air discharge tip(Resistance value 2kΩ)	AT32-KES
Contact discharge tip(Resistance value 2kΩ)	CT32-KES
Sphere discharge tip(Resistance value 330Ω)	ST31-KES
Sphere discharge tip(Resistance value 2kΩ)	ST32-KES

### ● C Unit/Discharge Resistor\*

IEC61000-4-2 specifies the combination of the energy storage capacitor and the discharge resistor. Changing the combinations of the C unit and the discharge resistor can simulate various conditions.

\*Some combinations of the energy storage capacitor and the discharge resistor may shorten the life of the discharge-generating high-voltage switch of the discharge gun.

#### [C Unit]

This unit is inserted into a discharge gun. It consists of the energy storing capacitor. The discharge resistor(sold separately) must be connected for the operation.

Capacity	Model name
150pF	EC21-KES
100pF	EC22-KES
200pF	EC23-KES
250pF	EC24-KES
300pF	EC25-KES
330pF	EC26-KES
400pF	EC27-KES
500pF	EC28-KES

#### [Discharge Resistor]

Equipped inside the option C Unit to limit discharge current.

Resistance value	Model name
330Ω	DR21-KES
100Ω	DR22-KES
150Ω	DR23-KES
200Ω	DR24-KES
300Ω	DR25-KES
400Ω	DR26-KES
500Ω	DR27-KES
1kΩ	DR28-KES
1.5kΩ	DR29-KES
2kΩ	DR30-KES
5kΩ	DR31-KES
10kΩ	DR32-KES
10Ω	DR33-KES

### ● Discharge Gun Stand

The stand used to hold the discharge gun. It is convenient for discharging electricity at the same point (vertical joint plate in particular).

Product name	Model name
Discharge gun stand	GS21-KES

### ● Testing Environment Fixtures

EC61000-4-2 specifies the testing environment based on equipment type. Required equipments for performing the electrostatic discharge immunity test applied to the EUT

#### [ For Desktop Equipments ]

Fixtures for the test desktop equipment such as a PC.

Product name	Model name
Test table	TT21-KES
Ground reference plane*	GP21-KES
Horizontal coupling plane	ZC21-KES
Insulation sheet	IS21-KES
Vertical coupling plane (table-top)*	VC21-KES
Resistor cable	CL21-KES

\*Optional resistance cable (model : CL21-KES) is required

#### [ For Floor-Standing Equipments ]

Fixtures for the test floor-standing equipment such as a rack mounted equipment.

Product name	Model name
Ground reference plane	GP21-KES
Vertical coupling plane (floor-standing)*	VC22-KES
Insulating support	IP21-KES

\*Optional resistance cable (model : CL21-KES) is required

### ● Waveform Measuring Instrument

The instrument used to measure the discharge current waveform defined in IEC61000-4-2.

Product name	Model name
Current target (For Ed2.0)	Made-to-order production
Target adapter line (For Ed2.0)	
20dB Attenuator	
Coaxial cable for high frequency (SMA-SMA)	
Conversion Connector (SMA-BNC)	





# Electrostatic discharge immunity test

## Outline of the IEC61000-4-2 Ed 2.0

This standard stipulates the immunity requirements and test methods for electrical and electronic equipment subjected to static electricity discharges, from operators directly, and from personnel to adjacent objects. It additionally defines ranges of test levels which relates to different environmental and installation conditions and establishes test procedures.

### ● Test method

The contact discharge testing is preferred.  
The air discharge testing should be applied only when the contact discharge testing can not be performed.

### ESD test instruments

Specification of the ESD generator	
Energy storage capacitor	150pF
Discharge resistor	330Ω
Output voltage	Contact discharge 8kV and Air discharge 15kV
Tolerance of the output voltage display	±5%
Polarity of the output voltage	Positive and Negative
Holding time	At least 5 seconds
Discharge operation mode	Single discharge (discharge interval must be at least 1 second)
Discharge current waveform	Refer to the figure as shown on the right

### The range of the preferred test level for the ESD testing

Level	Contact discharge	Air discharge
1	2kV	2kV
2	4kV	4kV
3	6kV	8kV
4	8kV	15kV
X	special	special

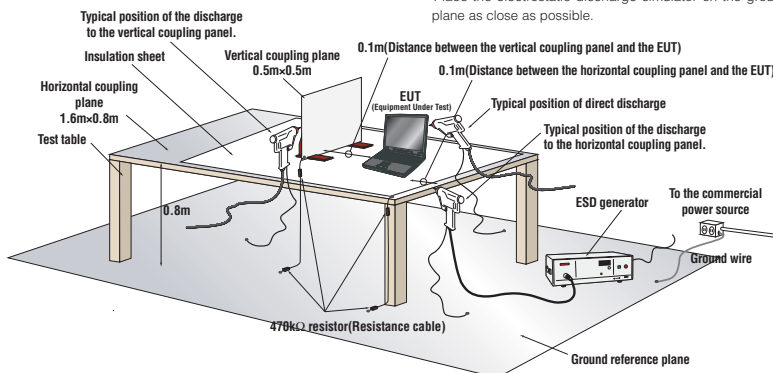
\* X can be set at any level specified by the manufacturer and the user.

### The definition of the output current waveform of the ESD generator

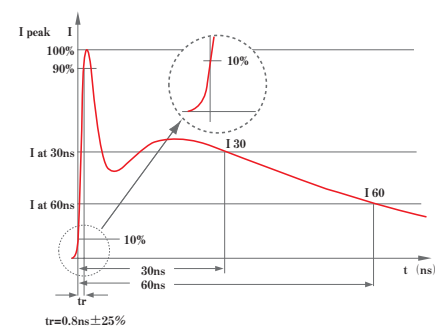
Level	Indicated voltage	First peak current of discharge (±15%)Ip	Rise time tr with discharge switch(±25%)	Current (±30%) at 30 ns	Current (±30%) at 60 ns
1	2kV	7.5A	0.8ns	4A	2A
2	4kV	15A	0.8ns	8A	4A
3	6kV	22.5A	0.8ns	12A	6A
4	8kV	30A	0.8ns	16A	8A

### ● Sample layout of the test instruments for the Table-top equipment

- Put a 0.8 meter high test table (made of wood) on the ground reference plane, then place the horizontal coupling plane on the test table.
- Connect two 470k resistors between the horizontal coupling plane and the ground reference plane as shown in the figure.
- In the testing method of indirect discharge, it observes the effect of EUT when discharging to the vertical or horizontal coupling plane.
- Use a horizontal coupling plane (1.6m×0.8m) and a vertical coupling plane (0.5m×0.5m)
- Connect two 470k resistors between the vertical coupling plane and the ground reference plane.
- Distance between the horizontal coupling plane and the EUT
- Place the EUT about 0.1m from the edge of the horizontal coupling plane.
- Place the electrostatic discharge simulator on the ground reference plane as close as possible.

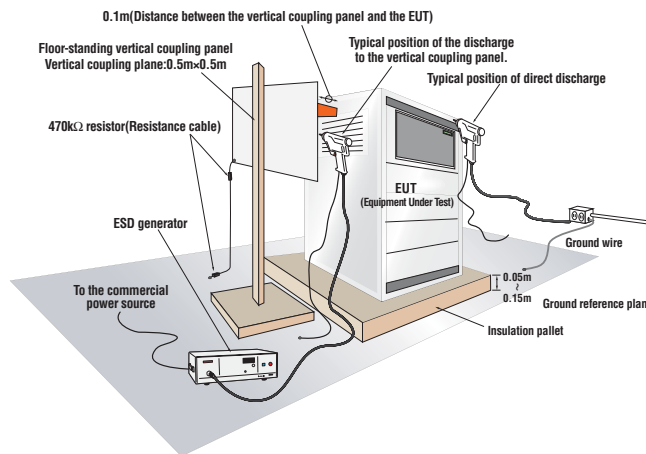


### ● Typical waveform of the discharge output current of the ESD generator

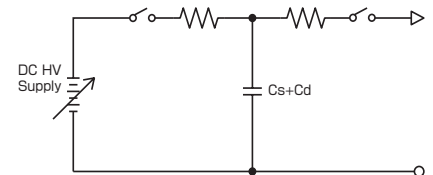


### ● Sample layout of the test instruments for the Floor-standing equipment

- Put a 0.1 meter high of insulation pallet on the ground reference plate, then place the EUT on it.
- The indirect discharge testing is the test method to observe the effect to the EUT while discharging to the vertical coupling plane.
- Connect two 470k resistors between the vertical coupling plane and the ground reference plane.
- Place the electrostatic discharge simulator on the ground reference plane as close as possible.



### ● Simplified diagram of the ESD generator



Cs+Cd: 150pF (typical value)

Cd: Distribution volume existed between the generator and peripheral devices

Rd : 330Ω (typical value)



## KIKUSUI ELECTRONICS CORPORATION

1-1-3, Higashiyamata, Tsuzuki-ku, Yokohama, 224-0023, Japan

Phone: (+81) 45-593-7570, Facsimile: (+81) 45-593-7571, www.kikusui.co.jp

KIKUSUI AMERICA, INC. 1-877-876-2807 [www.kikusuiamerica.com](http://www.kikusuiamerica.com)



1633 Bayshore Highway, Suite 331, Burlingame, CA 94010  
Phone : 650-259-5900 Facsimile : 650-259-5904

KIKUSUI TRADING (SHANGHAI) Co., Ltd. [www.kikusui.cn](http://www.kikusui.cn)



Room, D-01, 11F, Majesty Bld, No.138, Pudong Ave, Shanghai City  
Phone : 021-5887-9067 Facsimile : 021-5887-9069

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