



M O D E L K E S 4 0 2 1



Electrostatic Discharge Simulator KES4021

Complies with the EN/IEC61000-4-2 standard
Maximum testing voltage of ± 30 kV exceeds required test levels.
Easy-to-use panel design



IEC61000-4 Series

Electrostatic Discharge Simulator

MODEL KES4021

Compliant with the ISO 10605 Standard

[Overview]

An electrostatic discharge is a common phenomenon. Entry of an arc current or electromagnetic wave deriving from this discharge into the circuit network of an electric or electronic device may lead to malfunctioning or destruction of the device. This matter has long been discussed at the IEC and other standardization bodies, resulting in electrostatic discharge immunity testing methodology and other related standards being established. Over the recent years, there has been a growing demand for electrostatic discharge simulation capability in the field of automotive electronics, as well as in the field of home electronics. The KES4021 simulator is used for immunity tests intended to simulate a direct or indirect discharge from a charged human operator to an electric or electronic device.

[Features]

- **Electrostatic discharge simulator compliant with EN/IEC 61000-4-2**

KES4021 is a slim, lightweight electrostatic discharge simulator that is compliant with the EN/IEC 61000-4-2 standard.

- **Maximum test voltage of ± 30 kV that is more than sufficient for required testing levels**

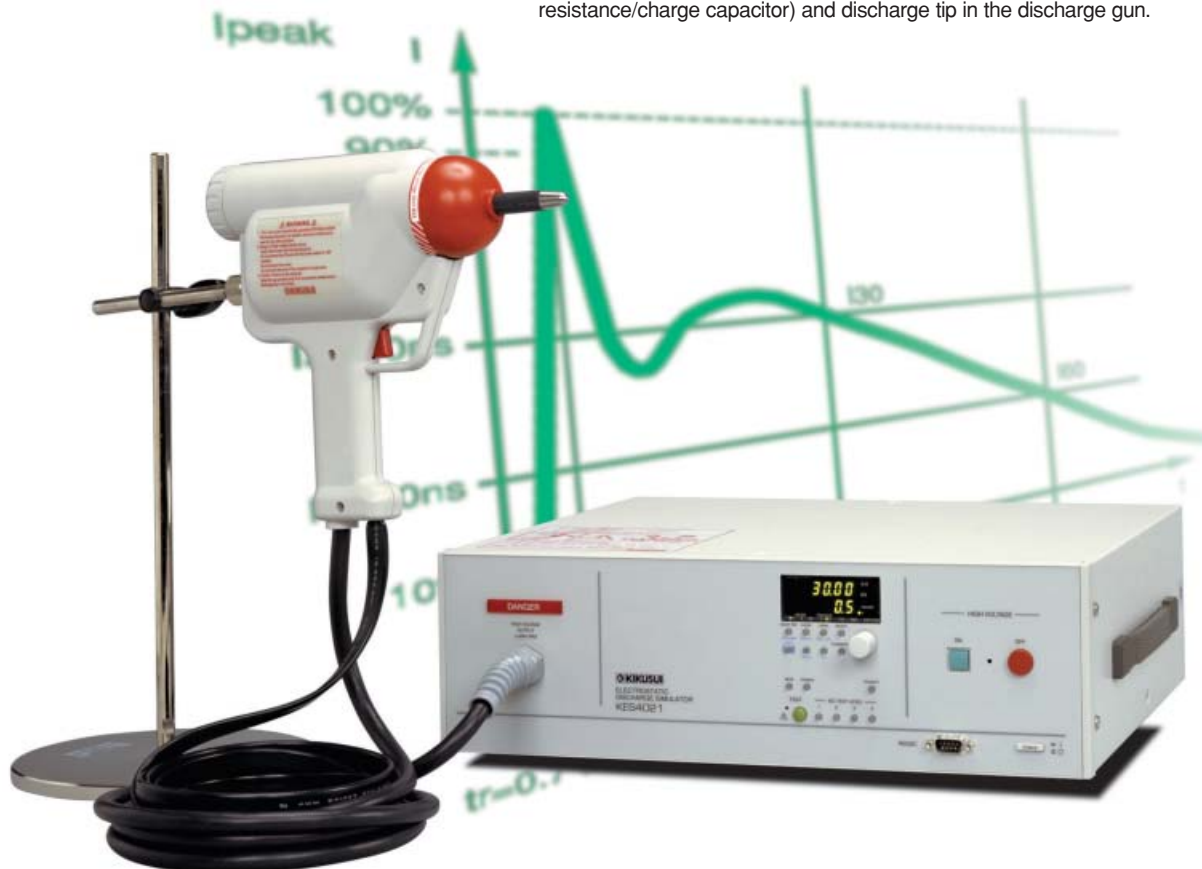
KES4021 supports a maximum test voltage of ± 30 kV, enabling tests to be conducted at levels far exceeding the IEC standard level 4 (± 15 kV). It allows you to identify the conditions where your product begins to malfunction or breaks down (limit value).

- **New panel design focusing on ease of operation**

The operation panel has keys and rotary knob which allow to directly set test levels specified by the IEC standard. These controls facilitate adjustment for standard-compliance tests and other various settings.

- **Support for the ISO 10605 standard**

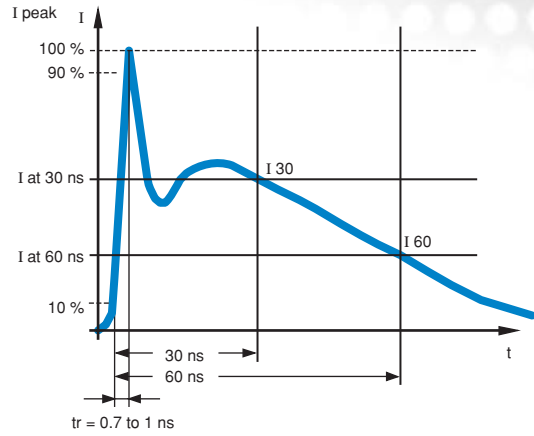
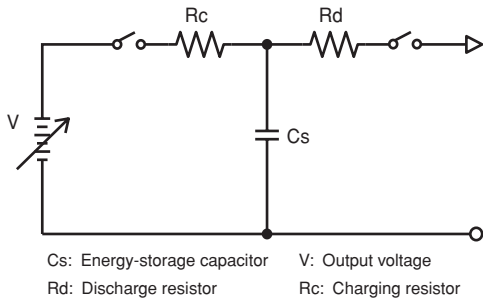
Testing to the ISO 10605 standard, which specifies test methods for electrical disturbances from electrostatic discharge with relation to automotive electronics, can be performed easily by replacing the CR unit (discharge resistance/charge capacitor) and discharge tip in the discharge gun.



The gun stand is optional.

IEC61000-4-2-specified waveforms and test levels and KES4021's output waveforms

■ Simplified diagram of the ESD generator ■ Typical waveform of the output current of the ESD generator



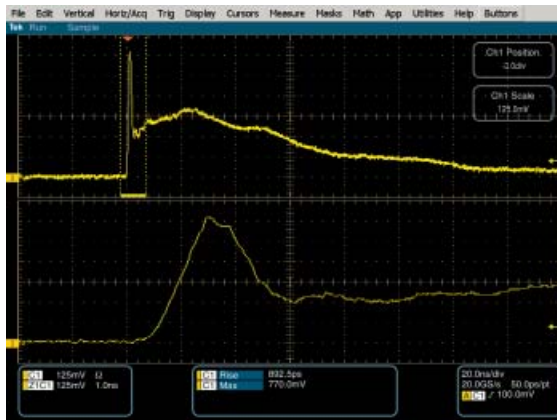
■ Waveform parameters

Level	Indicated voltage	First peak current of discharge $\pm 10\%$	Rise time t_r with discharge switch	Current ($\pm 30\%$) at 30 ns	Current ($\pm 30\%$) at 60 ns
1	2 kV	7.5 A	0.7 to 1 ns	4 A	2 A
2	4 kV	15 A	0.7 to 1 ns	8 A	4 A
3	6 kV	22.5 A	0.7 to 1 ns	12 A	6 A
4	8 kV	30 A	0.7 to 1 ns	16 A	8 A

■ Test levels

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

■ KES4021 output current waveform (Level 1)



◀ Entire waveform
20ns/div
1.25A/div

◀ Enlarged view of the rising part
1.0ns/div
1.25A/div

■ Specifications

Item	Specification
Discharge method	Contact discharge and Air discharge
Set voltage	0.50kV to 30kV
Polarity	Positive and Negative
Energy storage capacitor	150 pF $\pm 10\%$ (replaceable)
Discharge resistor	330 $\Omega \pm 10\%$ (replaceable)
Charge resistor	50M Ω
Discharge interval	0.05 / 0.1s to 99.9s
Number of discharges	1 to 999 / Continuous
Trigger	Main panel trigger and Discharge gun trigger
Discharge current waveform	Compliant with the IEC61000-4-2 standard
Interface	RS-232C (Option)
Power supply	100 V to 240 V AC (50 Hz to 60 Hz)
Dimensions	430 W \times 132 H \times 370 Dmm Main unit: Approx. 8.0 kg
Weight	Discharge gun: Approx. 1.5 kg (including the 2.5 m high voltage cable)

Discharge Gun



- **Easy-to-replace energy storage capacitor and discharge resistor**
In addition to the standard 150 pF capacitor unit and 330 Ω discharge resistor, a variety of optional components are available including a 330 pF capacitor unit and 2 k Ω discharge resistor.
- **Faithful reproduction of IEC61000-4-2-specified waveforms**
KES4021 also supports the discharge current waveforms prescribed for the waveform calibration method laid down in a target compliant with IEC61000-4-2 Editions 1. In addition, it was designed to suppress waveform ringing to improve waveform quality.

Item	Specification
Output voltage	0.50 kV to 30 kV
Energy storage capacitor	150 pF $\pm 10\%$ (replaceable)
Discharge resistor	330 $\Omega \pm 10\%$ (replaceable)
Charge resistor	50 M Ω (with the main unit connected)
Dimensions	65 W \times 235 H \times 220 Dmm (excluding the discharge chip)
Weight	Approx. 1.5 kg (including the 2.5 m high voltage cable)

Standard Accessories

Product name	Model name	Quantity
CR unit (150 pF/330 Ω) for EN/IEC61000-4-2	CR21-KES	1
Air discharge tip for EN/IEC61000-4-2	AT21-KES	1
Contact discharge tip for EN/IEC61000-4-2	CT21-KES	1
Operation manual		1

Optional components

Option parts for ISO 10605 standard test

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

Product name	Model name
CR unit (330 pF/2 kΩ) for ISO 10605	CR22-KES
CR unit (150 pF/2 kΩ) for ISO 10605	CR23-KES
Air discharge tip for ISO 10605	AT22-KES
Contact discharge tip for ISO 10605	CT22-KES



▲CR22-KES



▲CR23-KES



▲AT22-KES



▲CT22-KES

C Unit/Discharge Resistor*

IEC61000-4-2 specifies the combination of the energy storage capacitor and the discharge resistor. Different 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 in the discharge gun.

[C Unit]

This unit is inserted into a discharge gun. It consists only of an energy storing capacitor. A separately sold discharge resistor must be connected to it during use.

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

This is the stand used to fix the discharge gun. It is convenient to discharge electricity at the same point (vertical joint plate in particular).

Product name	Model name
Discharge gun stand	GS21-KES

Testing Environment Fixtures

IEC61000-4-2 specifies the testing environment based on equipment type. The following equipment is required to conduct an electrostatic discharge immunity test meeting the EUT requirements.

[For Desktop Equipment]

Fixtures to test desktop equipment such as 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

[For Floor-Standing Equipment]

Fixtures to test floor-standing equipment such as rack mounted equipment.

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

Waveform Measuring Instrument

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

Product name	Model name
Current-sensing transducer	CS21-KES
Faraday cage	FC21-KES



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