



EMC TEST SYSTEM
for AUTOMOTIVE ELECTRONICS

KES SERIES

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Transient Immunity Tester : **KES7700 Series**
Voltage Variation Simulator : **KES7400A Series**
Application Software for KES 7000 System : **KES7100**

KES7700 Series - Transient Immunity Tester



Transient Immunity Tester KES7700 Series are transient surge tester that utilizes a compact unit system. A surge generator circuit is installed for each pulse unit as the tester meets the requirement of ISO7637-2, ISO7637-3, ISO16750-2, JASO D001, SAE J1113, and other standards. The KES7700 Series meets a broad range of independent automobile manufacturer standards as well. The ISO7637 standard specifies Pulse 1, Pulse 2a, and Pulse 3a/3b, while the ISO16750-2 standard specifies Pulse 5a/5b. Each pulse simulates the following: electromagnetic phenomena produced by electronic equipment joined by wire harnesses during an automobile's normal operation, electromagnetic coupling during switch opening and closing, and load dump surges produced by the alternator when the battery is disconnected. Each pulse also tests the tolerance of on-board electronic equipment. In this testing, malfunctions and breakdowns involving on-board electronic equipment are evaluated.

- **Full compliance with ISO 7637-2.2004, ISO 7637-2.2011, ISO 7637-3.2007, ISO 16750-2.2010**

- **Load dump suppressor for pulse 5b**

The use of an amplifier circuit and a dedicated suppressor allows the system to generate waveforms that faithfully comply with the pertinent standards not only for pulse 5a required by ISO 7637 but also for pulse 5b.

- **Compact modular cabinet**

The modular cabinet allows surge waveforms to be added with ease.

- **Output terminals provided at a height of 50mm above the floor level as specified in the ISO 7637-2 standard**

Enhanced reproducibility

- **Two types of CDNs available (60 V/50 A and 60 V/100 A)**

The main frame contains a built-in CDN module supporting up to 100 A, thereby allowing a large-capacity test to be conducted in a single cabinet without using any external CDN.

- **Dedicated software for condition setting and tester control**

- **JASO D001-94 pulse unit offered as an optional module**

For other details such as compliance with test requirements of individual auto makers, please contact us.

KES7702, KES7703 : Main Frame		
Item	Specification	
Model	KES7702	KES7703
CDN capacity	60 VDCmax 50 Amax	60 VDCmax 100 Amax
Input voltage	100 to 240 VAC (factory-set default*) 50/60 Hz 500 VA or less	
Dimensions	440(17.32")W × 405(15.94")H × 605(23.81")Dmm	440(17.32")W × 405(15.94")H × 620(24.40")Dmm
Weight	Approx. 45 kg(99.20 lbs)	Approx.48 kg(105.82 lbs)
PC interface	RS-232C	
Pulse module	Plug-in type: 5 modules (250 mm wide max.) External-connect type: 2 modules	
Others	Analog control terminal for the DC power supply for EUT, Monitor terminal (100:1), External stop terminal, Warning lamp terminal (24VDC, 500mA max), Emergency stop switch	

*Input voltage, 100, 110, 115, 120, 200, 220, 230, and 240 VAC available as factory option.

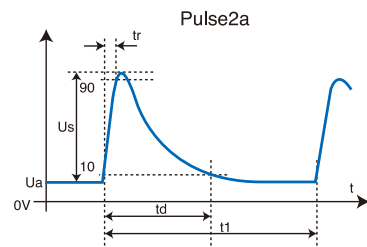
KES7721- Pulse2a



The KES7721 generate test pulses 2a required by the ISO and SAE standards. Test pulse 2a is used to simulate the transient phenomenon where induction occurs in the wire harness when the current flowing in the device connected in parallel to the tested device is suddenly cut off.

KES7721 : ISO7637-2 Pulse2a, ISO7637-3 Slow Pulses

Item	Specification
Model	KES7721
Pulse module 2a	Plug-in type
Peak voltage (Us)	±20 V to ± 300 V, in steps of 0.1 V
Output impedance (Ri)	2 Ω, 4 Ω, 10 Ω
Rise time (tr)	1 μs (+0 μs, -0.5 μs)
Pulse width (td)	50 μs ±10 μs at No Load, 40 μs ± 8.0 μs at 4 Ω Load, 12 μs ± 2.4 μs at 2 Ω Load
Repetition interval (t1)	0.2 s to 99 s, in steps of 0.1 s
DC cut time (t2)	1 ms to 100 ms, in steps of 0.1 ms
Surge delay time (t3)	Less than 100 μs
Driving power	Supplied from the main frame
Power consumption	-
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 2.5 kg(5.51 lbs)



- Output impedance : Since 2 Ω, 4 Ω, and 10 Ω can be selected, it supports ISO7637-2.2004SO standards and independent standards of automobile manufacturers.
- Since it also outputs negative polarity waveforms whose polarity has been reversed, it supports ISO7637-3.2007 standards and independent standards of automobile manufacturers.

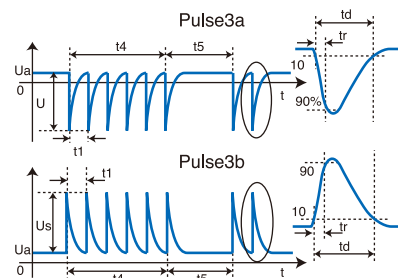
KES7731- Pulse3a/3b



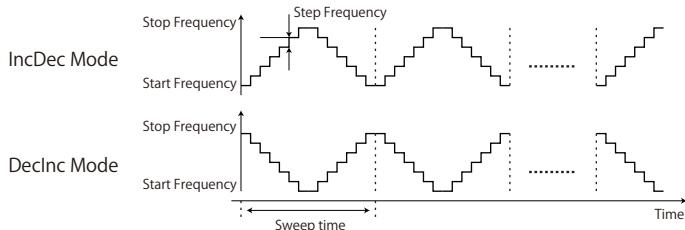
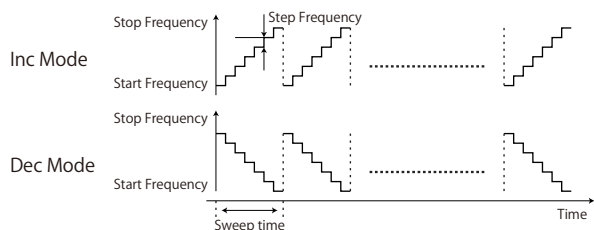
The KES7731 generate test pulses 3a/3b required by the ISO and SAE standards. Test pulses 3a/3b are used to simulate the transient phenomenon that occurs during the switching process.

KES7731 : ISO7637-2 Pulse3a/3b, ISO7637-3 Fast Pulses a & b

Item	Specification
Model	KES7731
Pulse module 3a/3b	Plug-in type
Peak voltage (Us)	±20 V to ± 300 V, in steps of 0.1 V
Output impedance (Ri)	50 Ω
Rise time (tr)	5 ns ±1.5 ns
Pulse width (td)	150 ns ±45 ns at No Load / 50 Ω Load
Repetition interval (t1) (Frequency)	1 to 100 kHz, in steps of 1 kHz
Generation time (t4)	10 ms
Pulse train interval (t5)	90 ms to 9.99 s, in steps of 0.1 ms
Driving power	Supplied from the main frame
Power consumption	-
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 2.1 kg(4.62 lbs)



- Recurrence interval frequency sweeps (1 kHz to 100 kHz) can be performed. Four modes are available for sweeps.



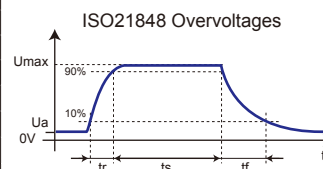
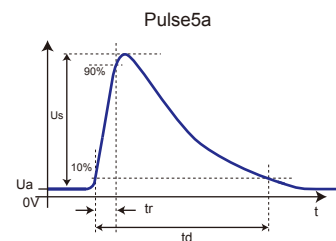
KES7750/7751- Pulse5a/5b



The KES7750, KES7751 generates test pulses 5a/5b required by the ISO and SAE standards. Test pulses 5a/5b are used to simulate the transient voltage that is produced when the battery is cut off from the operating alternator. An alternator having a transient voltage suppressor is tested with test pulse 5b, while test pulse 5a is used to test one that does not have such a suppressor.

KES7750, KES7751 : ISO7637-2.2004, ISO16750-2.2010 Pulse5a/5b

Item	Specification	
Model	KES7750	KES7751
Pulse module 5a/5b	External-connect type	
Peak voltage (Us)	+40.0 V to +200.0 V (0.1 V step), +40.0 V to +150.0 V (Output impedance (Ri)=0.5 Ω)	
Output impedance (Ri)	0.5 Ω, 1 Ω, 2 Ω, 4 Ω, 6 Ω, 8 Ω	
Rise time (tr)	10 ms (+0 ms, -5 ms)	
Pulse width (td)	Choose from 40 ms, 50 ms, 100 ms, 150 ms, 200 ms, 250 ms, 300 ms, 350 ms, 400 ms, 450 ms, 500 ms, 550 ms, 600 ms, 650 ms, 700 ms	
Repetition interval (t1)	30.0 s to 99.0 s (0.1 s step) *Ua+Us ≥ 100 V : 60.0 s to 99.0 s (0.1 s step)	
CDN capacity	60 VDC max 50 A max	60 VDC max 100 A max
Driving power	Supplied from the main frame	
Power consumption	-	
Dimensions	440(17.32")W×280(11.02")H×595(23.42")D mm	440(17.32")W×280(11.02")H×610(24.01")D mm
Weight	Approx. 32 kg(70.54 lbs)	Approx. 35 kg(77.16 lbs)
ISO21848 Overvoltages(DC-10615 Load Dump)mode		
Peak voltage(Umax)	+40.0 V to +120.0 V(0.1 V step)	
Output impedance (Ri)	0.5 Ω, 1 Ω, 2 Ω, 4 Ω, 6 Ω, 8 Ω	
Rise time (tr)	10 ms	
Control time(ts)	400 ms	
Fall time (tr)	20 ms	



SPEC80677/80678- Pulse 5b Load Dump Suppressor

Complied with
ISO7637-2.2004
ISO16750-2.2010
Pulse5a/5b

The SPEC80677/80678 are suppressors that generates pulse 5b required by ISO 7637-2.2004, ISO16750-2.2010 standard. When connected with the pulse 5a/5b module (KES7750), it lets you set a suppressed voltage of up to 100 V in steps of 0.1 V.



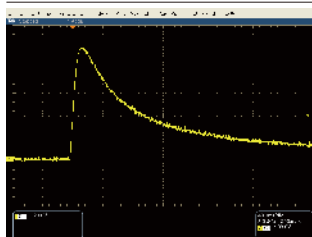
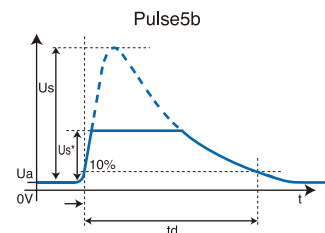
Features

- Suppressed voltage: 100 V max. (settable in steps of 0.1 V)
- The waveform required by the standard can be output accurately without changing the pulse width (td) that is set for pulse 5a.

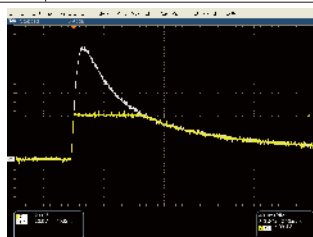
*The above applies only when Kikusui's pulse 5a/5b module (KES7750) or an amplifier circuit-based pulse 5a generator is used.

SPEC80677/80678 : ISO7637-2.2004, ISO16750-2.2010 Pulse5a/5b

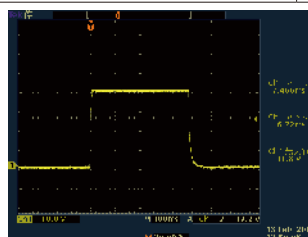
Item	Specification	
Model	SPEC80677	SPEC80678
Load dump suppressor for generating pulse 5b	External-connect type	
CDN capacity	60 VDCmax 50 Amax	60 VDCmax 100 Amax
Maximum input surge voltage (Us)	200 V Max	
Settable suppressed voltage range (Us*)	10 to 100 V, in steps of 0.1 V / accuracy:3.0 V	
Maximum suction surge current	300 A Max	
Maximum suction surge interval	30 s or more	
Driving power	100 VAC to 240 VAC 50/60 Hz	
Power consumption	90 VA or less	
Dimensions	440(17.32")W×133(5.23")H×550(21.65")D mm	
Weight	Approx. 17 kg(37.47 lbs)	



Pulse5a



Pulse5b

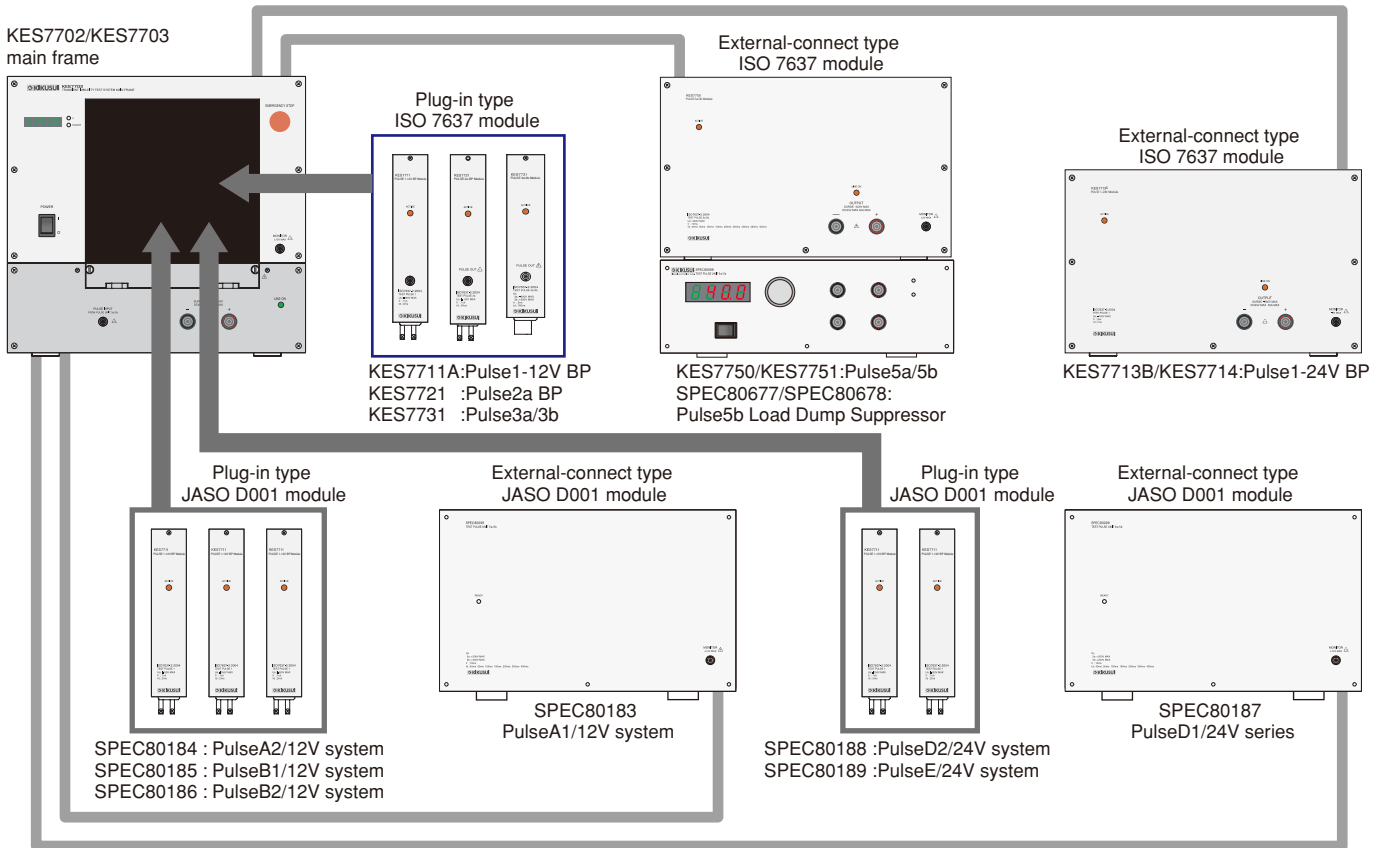


ISO21848 Overvoltages

Application Notes KES7700 Series

1. System components

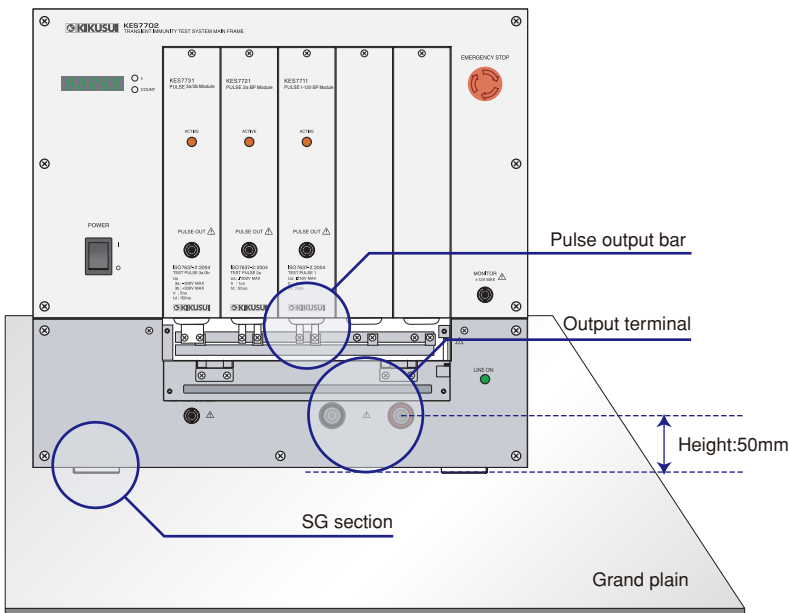
The KES7702/KES7703 main frame can be connected with up to 7 pulse modules (5 plug-in type modules + 2 external-connect type modules). By replacing pulse modules, it is possible to comply with various automotive manufacturer's requirements, such as the ISO 7637-2 and JASO D001 standards.



*In the KES7700 series, each pulse module supports a specific surge waveform. If the related international standard is revised, the system can be upgraded simply by replacing pulse modules. This system architecture also makes it easy to meet individual auto makers' test requirements.

2. Test reproducibility improvement

The KES7702/KES7703 mainframe are designed to simplify the setup of the test environment prescribed in the ISO7637-2 standards. Preparation of the test environment can lead to test reproducibility.



Output waveform stability

Placing the output system on the front surface and the power supply system and signal system on the rear surface made it possible to achieve stable transient surge output and communication control. Also, a bus bar was utilized for the output end. Since the input and communication control systems of each unit are separated from the output lines, malfunction of the tester itself due to transient surges being output is less likely to occur.

Test reproducibility

Since the lower part of mainframe KES7702/KES7703 testers is an SG unit, braided wire and other ground cables are unnecessary as a connection with a ground plane can be made. Also, the output terminal is set at a height of 50 mm from the ground plane (reference ground surface) as prescribed in the ISO7637-2 standards.

Options

SPEC80265A : R-UNIT for KES7721/KES7750/KES7751



Specification	
Waveform observation resistor	2 Ω (for Pulse2a, Pulse5a) Input voltage: Maximum 200 V

SPEC80266A : R-UNIT for KES7711A



Specification	
Waveform observation resistor	10 Ω (for Pulse1-12V) Input voltage: Maximum -100 V

SPEC80267A : R-UNIT for KES7713B/KES7714



Specification	
Waveform observation resistor	50 Ω (for Pulse1-24V) Input voltage: Maximum -400 V

SPEC80268A : Pulse Monitor UNIT for KES7700



Specification	
Waveform observation adapter	No-load observation adapter Input voltage: Maximum -900 V to +400 V

SPEC80488 : R-UNIT for KES7713B/KES7714



Specification	
Waveform observation resistor	20 Ω (for SAE J1113-11 Pulse1b) Input voltage: Maximum -400 V

SPEC80617 : R-UNIT for KES7721



Specification	
Waveform observation resistor	4 Ω (for Pulse 2a) Input voltage: Maximum 200 V

KES7300 : Capacitive Coupling Clamp



Specification	
Compatible International Standard	ISO7637-3:2007(Second Edition)
Characteristic impedance	50 Ω ±10 %
Coupling capacitance	200 pF or smaller
Maximum input voltage	±300 V
Diameter that can be clamped	φ40 mm max.
Connector shape	BNC connector
Weight	Approx. 5.5 kg (12.12 lbs)
Accessories	20dB attenuator (30 W)×1 [44-70-0010] 20dB attenuator (5 W)×1 [97-03-0020] Coaxial cable (500 mm)×1 [89-04-1360]

SPEC80637 : DCC & ICC Cable Set



Specification	
Compatible International Standard	ISO7637-3:2007(Second Edition)
Capacitor Box for DCC test	100 pF/220 pF/470 pF/0.1 μF *Maximum input voltage: 150 V
Joint Cable for DCC test	30 cm×2, 100 cm×2
Ground Cable for DCC test	50 cm×1, 100 cm×1
Cable for DCC test	BNC(P)-BNC(P)cable×1(40 cm)
Connector for DCC test	BNC(P)-BNC(P)Connector×1
for ICC test	BNC(P)-N(P)cable×2(45 cm)

JASO D001-94

List of JASO D001-94 standard-compliant pulse unit

JASO standards are automotive standards established by the Society of Automotive Engineers of Japan. For environment tests, "D001: General Rules of Environmental Testing Methods for Automotive Electronic Equipment" is most generally utilized. Pulse units for performing "transient voltage characteristics tests" in this standard are available as an option. This pulse unit can perform tests conforming to JASO D001 standards by connecting to mainframe KES7702/KES7703 testers.



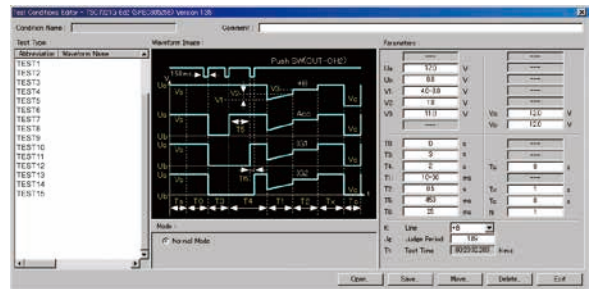
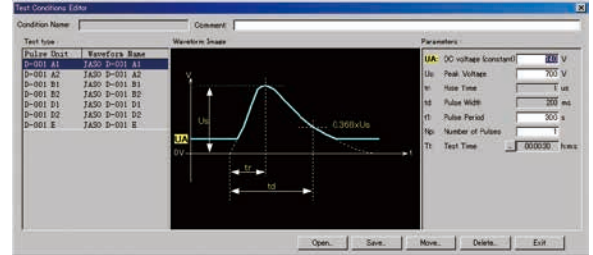
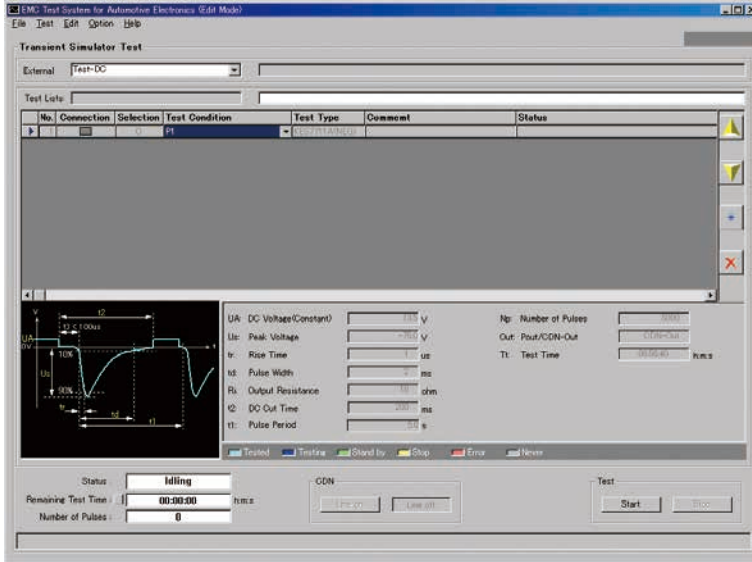
■ Replacing a pulse unit makes it easy to comply with JASO standards. ■ Recurrence interval: Settings from a minimum of 5.0 s are possible.
*Varies by pulse unit. Refer to the specifications shown below.

SPEC80183 : JASO D001-94 Pulse A1/12V	
Specification	
Pulse module A1	External-connect type
Peak voltage(Us)/Damping constant/output resistance(R3)	+100 V, in steps of 0.1 V/200 mS/0.8 Ω
Rise time (tr)	1 μs or less
Repetition interval (t1)	30.0 s to 99 s, in steps of 0.1 s
Dimensions	440(17.32")W × 280(11.02")H × 580(22.83")D mm
Weight	Approx. 30 kg(66.13 lbs)
SPEC80184 : JASO D001-94 Pulse A2/12V	
Specification	
Pulse module A2	Plug-in type
Peak voltage(Us)/Damping constant/output resistance(R3)	+150 V, in steps of 0.1 V/2.5 μs/0.4 Ω
Rise time (tr)	1 μs or less
Repetition interval (t1)	5.0 s to 99 s, in steps of 0.1 s
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 3 kg(6.61 lbs)
SPEC80185 : JASO D001-94 Pulse B1/B12V	
Specification	
Pulse module B1	Plug-in type
Peak voltage(Us)/Damping constant/output resistance(R3)/DC cut time	-100 V, in steps of 0.1 V/60 ms/8 Ω/300 ms
Rise time (tr)	1 μs or less
Repetition interval (t1)	10.0 s to 99 s, in steps of 0.1 s
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 3.5 kg(7.71 lbs)
SPEC80186 : JASO D001-94 Pulse B2/B12V	
Specification	
Pulse module B2	Plug-in type
Peak voltage(Us)/Damping constant/output resistance(R3)/DC cut time	-290 V, in steps of 0.1 V/2 ms/80 Ω/10 ms
Rise time (tr)	1 μs or less
Repetition interval (t1)	5.0 s to 99 s, in steps of 0.1 s
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 2.5 kg(5.51 lbs)
SPEC80187 : JASO D001-94 Pulse D1/24V	
Specification	
Pulse module D1	External-connect type
Peak voltage(Us)/Damping constant/output resistance(R3)	+150 V, in steps of 0.1 V/400 ms/1.5 Ω
Rise time (tr)	1 μs or less
Repetition interval (t1)	30.0 s to 99 s, in steps of 0.1 s
Dimensions	440(17.32")W × 280(11.02")H × 580(22.83")D mm
Weight	Approx. 30 kg(66.13 lbs)
SPEC80188 : JASO D001-94 Pulse D2/24V	
Specification	
Pulse module D2	Plug-in type
Peak voltage(Us)/Damping constant/output resistance(R3)	+200 V, in steps of 0.1 V/2.5 μs/0.9 Ω
Rise time (tr)	1 μs or less
Repetition interval (t1)	5.0 s to 99 s, in steps of 0.1 s
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 2.5 kg(5.51 lbs)
SPEC80189 : JASO D001-94 Pulse E/24V	
Specification	
Pulse module E	Plug-in type
Peak voltage(Us)/Damping constant/output resistance(R3)/DC cut time	-340 V, in steps of 0.1 V/26 ms/210 Ω/130 ms
Rise time (tr)	1 μs or less
Repetition interval (t1)	30.0 s to 99 s, in steps of 0.1 s
Dimensions	50(1.96")W × 260(10.23")H × 330(12.99")D mm
Weight	Approx. 3.5 kg(7.71 lbs)

KES7100 - Application Software for KES7000 system

The application software KES7100 for the KES7000 system enables to control the KES7700 series and KES7400A series on the same platform. Test conditions for transient surge tests, voltage variations tests, and tests catering to individual automotive manufacturer's test requirements can be edited

easily by using waveform libraries. Also, the arbitrary waveform generation function makes it possible to create various voltage variation waveforms. Furthermore, KES7100 enables to save user-created reports in CSV files.



Features

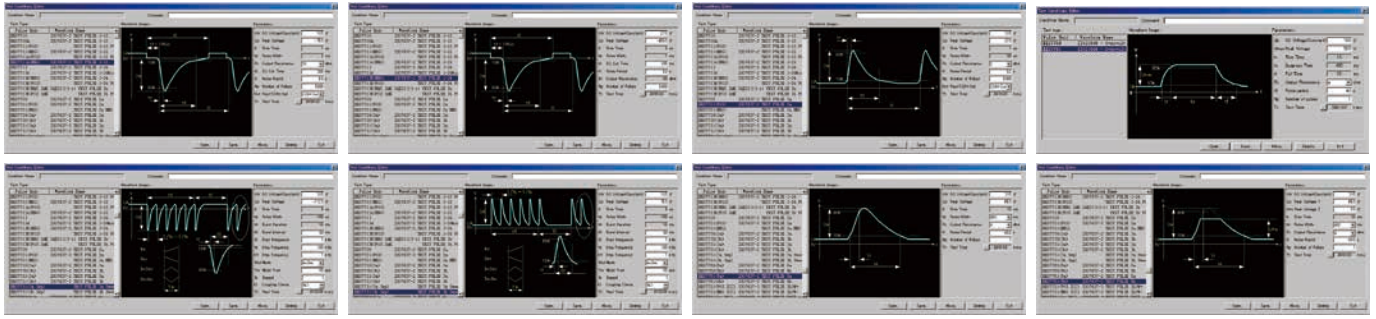
- **Up to 50 test conditions can be registered in a test execution list, and tests are carried out in accordance with the list.**
The test editing window allows user-defined test conditions to be registered in a database in advance.
- **For transient surge testing, up to seven types of pulse modules can be controlled.**
- **For voltage variations testing, up to four testers can be controlled for synchronous operation by communicating with a single tester.**
- **In addition to those compliant with the ISO 7637-2.2004 standard, a variety of waveforms can be generated easily (for voltage variations testing).**
Besides the tests using ISO 7637-2.2004-compliant waveform libraries, tests catering to individual auto makers' test requirements can be conducted with ease by using the arbitrary waveform generation function and adding necessary waveform libraries. For information about the supported standards, please contact us.
- **The created test execution list can be saved in a file along with comments.**
A separate test execution list can be created for each type of device to be tested.
- **The result of the OK/NG judgment that the user makes at the end of each test can be saved in the execution list.**
A test record report (CSV-format file) can be created for each test registered in the execution list. (These reports can be viewed and edited using spreadsheet software.)
- **The RS-232C interface is supported for communication.**

KES7100 : Application Software	
Item	Specification
Test settings	Transient surge test: ISO 7637-2 Pulse 1-12V, Pulse 1-24V, Pulse 2a, Pulse 3a/3b, Pulse 5a/5b
	Transient surge test: JASO D001 Pulse A1, Pulse A2, Pulse B1, Pulse B2, Pulse D1, Pulse D2, Pulse E
	Voltage variations test: ISO 7637-2 Pulse 2b, Pulse 4, arbitrary waveform generation, waveform libraries catering to individual auto makers' test requirements * Option
Others	Test report creation function (CSV file format), external trigger input/output function (TTL signal level) * Special order only
PC specs	
OS	Microsoft Windows, XP
CPU	Pentium II 400 MHz or faster
RAM	64 MB or more
HDD	100 MB or more of free space
Display	SVGA 1024 × 768 or more
Communication port	RS232C*

*2 ports are required when both transient immunity tester and voltage variation simulator are performed. The communication cable for RS232C is required for each port. It can not be controlled simultaneously. The RS232C communication cable (1pc.) is included as a standard accessory.

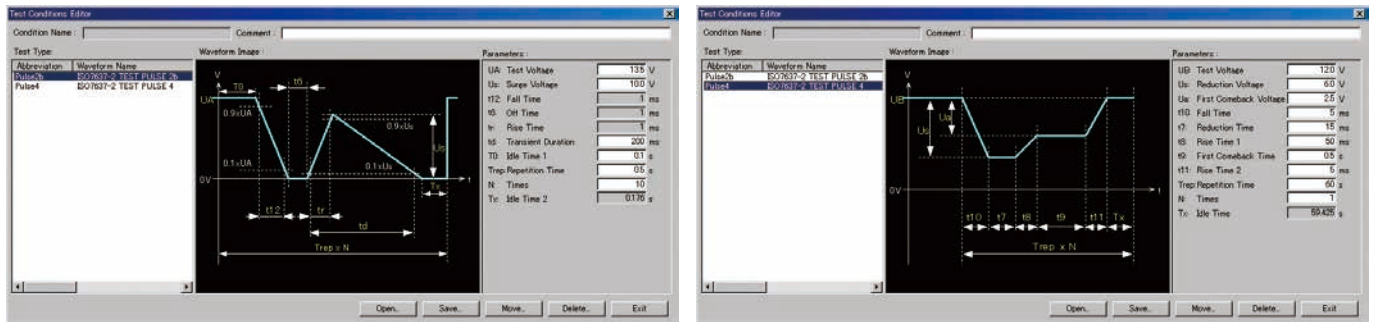
■ KES7100 Transient Surge Test

This waveform library is for transient surge testing. By default, it contains the waveforms specified by the ISO 7637-2 and JASO D001 standards.



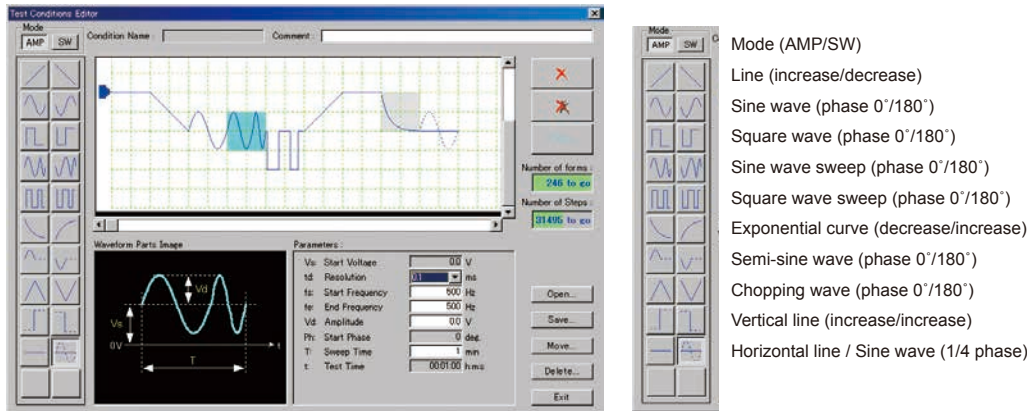
■ KES7100 Voltage Variations Test

This waveform library is for voltage variations testing. By default, it contains the Pulse 2b and Pulse 4 waveforms specified by the ISO 7637-2 standard.

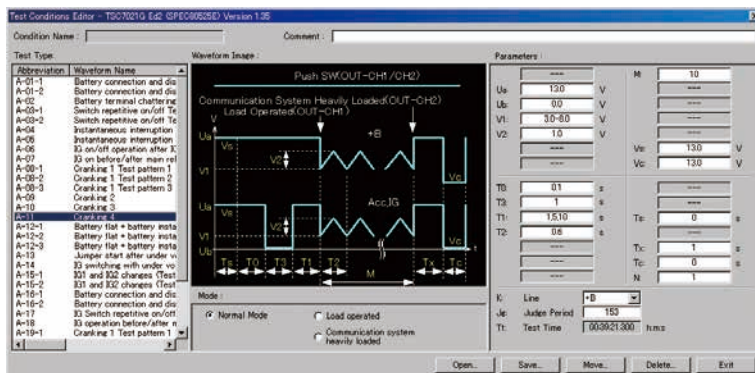


■ KES7100 Arbitrary Waveform Generation Function

A variety of waveforms can be generated by combining waveform parts.



■ KES7100 Auto Maker-Specific Waveform Library (Example)



For voltage variation waveforms required by auto makers, pattern libraries are available (charged). Complex requirements like the values of V (voltage) and T (variable time) are varied in steps can be optionally added. (An estimate is to be made through consultation.)



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