

# Lightning Surge Simulator

## LSS-6330 series



**Make EMC Test Easier !**

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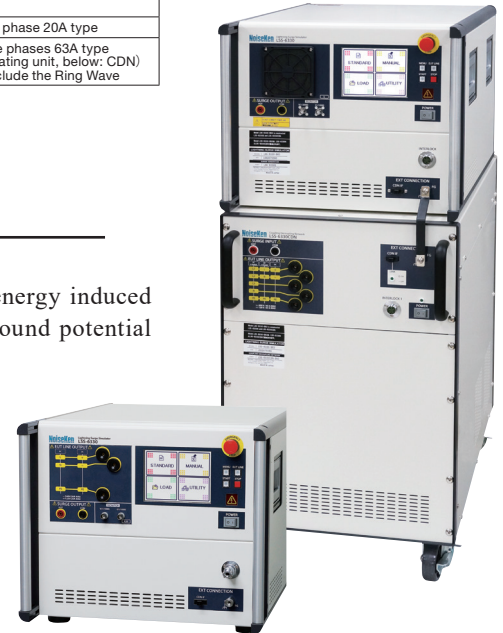
Model	Specifications
LSS-6330-A20A	left picture: single phase 20A type
LSS-6330-B63A	right picture: three phases 63A type
LSS-6330-C63A	(up: surge generating unit, below: CDN) * C63 does not include the Ring Wave

Lightning Surge Simulator

# LSS-6330 series

This simulator for evaluation of the resistance of electronic devices simulates "high-energy induced lightning noise" induced in distribution lines and communication lines due to the ground potential fluctuations caused by lightning strikes.

- Compliant to IEC 61000-4-5 Ed.3, IEC61000-4-12 Ed.3 (RINGWAVE 100kHz) and ANSI IEEE62-45 (2002)\*
- Equipped with pre-check function for a simple pre-start inspection of the simulator (not calibration)
- Equipped with output waveform monitor terminal: waveform applied to EUT during testing can be observed on oscilloscope.
- Equipped with 2 test modes. Standard Test mode with IEC 61000-4-5 standard preset test conditions and Manual Test mode allowing arbitrary test conditions setting for easy settings according to the application.
- Optional PC remote control software is available for supporting lengthy lightning surge testing.
- Employs MPU control that simplifies continuous testing: surge output, waveform switching, polarity switching, etc. can be performed automatically.



\* For Ring Wave coupling, simultaneous application is possible only for the Basic test type with PE as surge COM.

## Simple pre-start inspection with the equipped pre-check function

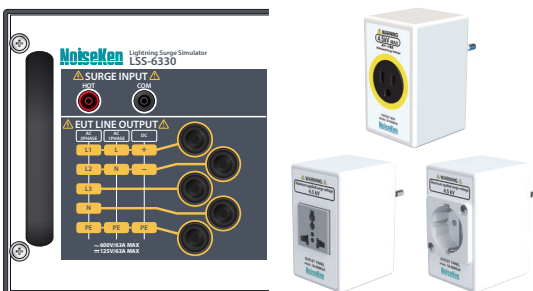
Before, pre-start inspection required using two high-voltage probes and an oscilloscope capable of differential measurement for the output waveform verification. Now, with the LSS-6330 you can pre-check the presence of output simply by connecting a dedicated cable to the main body of the simulator.

( Check available at SURGE OUTPUT / EUT LINE OUTPUT )

## Intuitive connection panel Applied phase displayed on the front panel

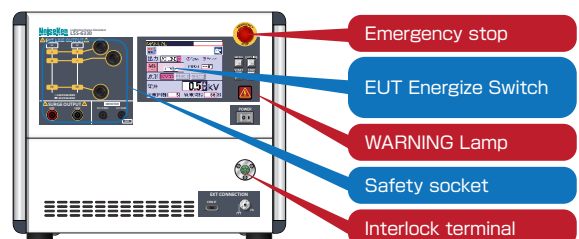
Equipped with an intuitive connection front panel helping prevent misconnection of power cables during the test.

Optional Outlet boxes are also available for easier connection.



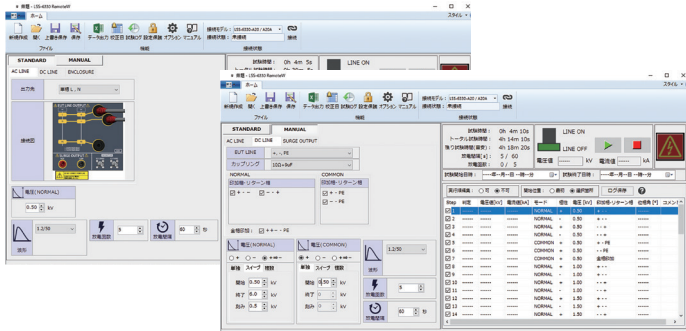
## Emergency stop button and interlock terminal ensuring safety

Equipped with operation safety functions in both hardware and software. Safety connection sockets as well as emergency stop switch and interlock terminal secure high operation safety regarding EUT connection. Using optional "safety fence" and "EUT protection box" allows ensuring further safety.



### PC Software available (option) For Remote Test Control (14-00053B)

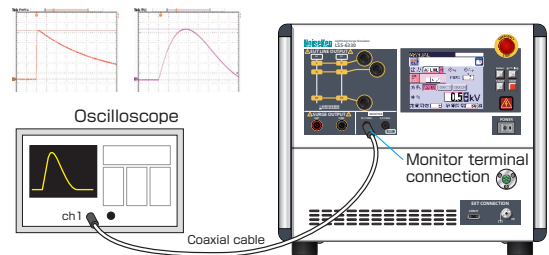
Allows setting test conditions, saving test results and test history, exporting test reports, etc.



\* Software English version available

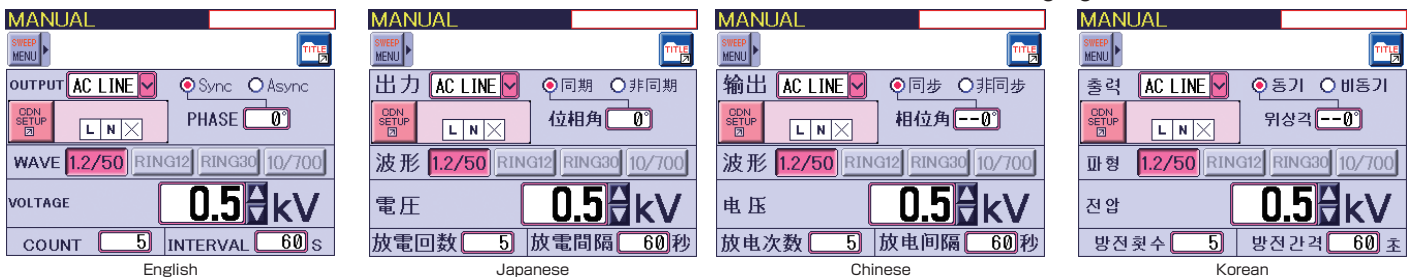
### Waveform verification through "output waveform monitor terminal"

In response to multiple requests from our customers, we equipped the monitor terminal allowing to verify the injected waveform on an oscilloscope. Even without the oscilloscope, the test panel displays applied voltage and current parameters.



### Multilingual localization

Multilingual touch panel display supports easy and sure test setting. English, Chinese, Korean and Japanese languages available.



### Specifications

■ Surge generator unit LSS-6330-A20A / B63A / C63A common

Parameter	Specifications	Notes
Surge Waveform	1.2/50 $\mu$ s-8/20 $\mu$ s combination 10/700 $\mu$ s-5/320 $\mu$ s combination RING WAVE	※RING WAVE only for A20A and B63A
1.2/50 $\mu$ s-8/20 $\mu$ s combination	Open voltage	0.5kV ~ 6.7kV $\pm$ 10%
	Front time	1.2 $\mu$ s $\pm$ 30%
	Time to half-value	50 $\mu$ s $\pm$ 20%
	Short-circuited current	250A ~ 3350A $\pm$ 10%
	Front time	8 $\mu$ s $\pm$ 20%
10/700 $\mu$ s-5/320 $\mu$ s combination	Open voltage	0.5kV ~ 6.7kV $\pm$ 10%
	Front time	10 $\mu$ s $\pm$ 30%
	Time to half-value	700 $\mu$ s $\pm$ 20%
	Short-circuited current	12.5A ~ 167.5A $\pm$ 10%
	Front time	5 $\mu$ s $\pm$ 20%
RING WAVE ※for A20A and B63A only	Open voltage	0.25kV ~ 6.6kV $\pm$ 10%
	Front time	0.5 $\mu$ s $\pm$ 30%
	Frequency	100kHz $\pm$ 10%
	Waveform envelop	Pk2 = 40% < Pk1 < 110% Pk3 = 40% < Pk2 < 80% Pk4 = 40% < Pk3 < 80%
	Short-circuited current	8.3 ~ 220A $\pm$ 10% (30 $\Omega$ ) 20.8 ~ 550A $\pm$ 10% (12 $\Omega$ )
Polarity	+/-	
Output impedance	2 $\Omega$ $\pm$ 10%	1.2/50 $\mu$ s waveform
	40 $\Omega$ $\pm$ 10%	10/700 $\mu$ s waveform
	12 $\Omega$ $\pm$ 20%、30 $\Omega$ $\pm$ 20%	RING (selectable)

**LSS-6330 series**

Parameter	Specifications	Notes
Surge generation circuit	Floating	
Minimum charging time	0.0kV ~ 4.0kV : 5 sec 4.1kV ~ 6.7kV : 10 sec	1.2/50 $\mu$ s waveform
	0.0kV ~ 4.0kV : 10 sec 4.1kV ~ 6.7kV : 15 sec	10/700 $\mu$ s waveform
	0.0kV ~ 4.0kV : 1 sec 4.1kV ~ 6.6kV : 3 sec	RING WAVE
Communication fuction	RS-232C compliant Optical connector	Optional
	External CDN control	※only for B63A and C63A
Emergency stop	Push-lock button switch (Test STOP, High voltage OFF, EUT Line switch SHUT OFF)	
Interlock function	External connection status detection	
Emergency lamp	Red LED blinking after start the tests	
Emergency lamp connector	Equiped with emergency lamp connector. Emergency lamp turns on after the test start.	
EUT Fail	3 ports	
Voltage monitor	BNC output、2000V/V $\pm$ 10% Accuracy : $\pm$ 10% vs. actual output	Waveform not guaranteed
Current monitor	BNC output、1000A/V $\pm$ 10% Accuracy : $\pm$ 10% vs. actual output	Waveform not guaranteed
Phase angle control	0° ~360° $\pm$ 10°	EUT power AC90V Min. 50Hz/60Hz $\pm$ 10%
Trigger input	asynchronous , synchronized to AC line 0° ~360° / 1° step, external input	
Power supply	AC100V ~ AC240V $\pm$ 10% 50Hz / 60Hz $\pm$ 10%	
Operational environment	Temperature : 15 ~ 35°C Humidity : 25 ~ 75%RH	
Dimensions	LSS-6330-A20A : (W)430 × (H)349 × (D)530 mm	protrusions excluded
	LSS-6330-B63A / LSS-6330-C63A surge generating unit : (W)430 × (H)349 × (D)530 mm	
Weight	LSS-6330-A20A : approx 50kgs	
	LSS-6330-B63A surge generating unit : approx 40kgs	
	LSS-6330-C63A surge generating unit : approx 35kgs	

■ CDN Output Unit LSS-6330-A20A

Parameter	Specifications	Notes
Surge Waveform	1.2/50 $\mu$ s-8/20 $\mu$ s combination,RING WAVE	
1.2/50 $\mu$ s-8/20 $\mu$ s combination	Open voltage	0.5kV ~ 6.7kV $\pm$ 10%
	Front time	1.2 $\mu$ s $\pm$ 30%
	Time to half-value	50 $\mu$ s $\pm$ 20%
	Short-circuited current	250A ~ 3350A $\pm$ 10%
	Front time	8 $\mu$ s $\pm$ 20%
	Time to half-value	20 $\mu$ s $\pm$ 20%
	Open voltage	0.5kV ~ 6.7kV $\pm$ 10%
	Front time	1.2 $\mu$ s $\pm$ 30%
	Time to half-value	50 $\mu$ s +10 $\mu$ s /-25 $\mu$ s
	Short-circuited current	41.7A ~ 558A $\pm$ 10%
	Front time	2.5 $\mu$ s $\pm$ 30%
	Time to half-value	25 $\mu$ s $\pm$ 30%
RING WAVE	Open voltage	0.25kV ~ 6.6kV $\pm$ 10%
	Front time	0.5 $\mu$ s $\pm$ 30%
	Frequency	100kHz $\pm$ 10%
	Waveform envelop	Pk2 = 40% < Pk1 < 110% Pk3 = 40% < Pk2 < 80% Pk4 = 40% < Pk3 < 80%
	Short-circuited current	20.8 ~ 550A $\pm$ 10%
	Front time	0.2 ~ 1 $\mu$ s
Power Capacity for EUT line	AC240V/20A MAX 50/60Hz、DC125V/20A MAX	
Decoupling coil	1.5mH	
Voltage dip	Less than 10% of the rated voltage when the rated current is energized	at the AC CDN unit output terminal
Residual voltage	Less than 15% of the max injected voltage or less than double of the power line rated voltage (peak value)	



LSS-6330 series

■ CDN Output Unit LSS-6330-B63A / LSS-6330-C63A

Parameter	Specifications	Notes	
Surge Waveform	1.2/50 $\mu$ s-8/20 $\mu$ s combination, RING WAVE	※RING WAVE only for B63A	
1.2/50 $\mu$ s-8/20 $\mu$ s combination	Open voltage	0.5kV $\sim$ 6.7kV $\pm$ 10%	
	Front time	1.2 $\mu$ s $\pm$ 30%	
	Time to half-value	50 $\mu$ s $\pm$ 20%	
	Short-circuited current	250A $\sim$ 3350A $\pm$ 10%	
	Front time	8 $\mu$ s $\pm$ 20%	
	Time to half-value	20 $\mu$ s $\pm$ 20%	
	Open voltage	0.5kV $\sim$ 6.7kV $\pm$ 10%	
	Front time	1.2 $\mu$ s $\pm$ 30%	
	Time to half-value	50 $\mu$ s +10 $\mu$ s /-25 $\mu$ s	
	Short-circuited current	41.7A $\sim$ 558A $\pm$ 10%	
	Front time	2.5 $\mu$ s $\pm$ 30%	
	Time to half-value	25 $\mu$ s $\pm$ 30%	
	RING WAVE	Open voltage	0.25kV $\sim$ 6.6kV $\pm$ 10%
		Front time	0.5 $\mu$ s $\pm$ 30%
Frequency		100kHz $\pm$ 10%	
Waveform envelop		Pk2 = 40% < Pk1 < 110% Pk3 = 40% < Pk2 < 80% Pk4 = 40% < Pk3 < 80%	
Short-circuited current		20.8 $\sim$ 550A $\pm$ 10%(12 $\Omega$ )	
Front time		0.2 $\sim$ 1 $\mu$ s	
Power Capacity for EUT line	AC600V/63A MAX 50/60Hz、DC125V/63A MAX		
Decoupling coil	1.5mH		
Voltage dip	Less than 10% of the rated voltage when the rated current is energized	at the AC CDN unit output terminal	
Residual voltage	Less than 15% of the max injected voltage or less than double of the power line rated voltage (peak value)		
Phase angle control	0° $\sim$ 360° $\pm$ 10° EUT power supply AC90V min. 50Hz / 60Hz $\pm$ 10%		
Power supply	AC100V $\sim$ AC240V $\pm$ 10% 50Hz / 60Hz $\pm$ 10%		
Operational environment	Temperature : 15 $\sim$ 35°C Humidity : 25 $\sim$ 75%RH		
Dimensions	(W)430 $\times$ (H)695 $\times$ (D)686 mm / approx 135kgs	protrusions excluded	

■ Included Accessories (LSS-6330-A20A)

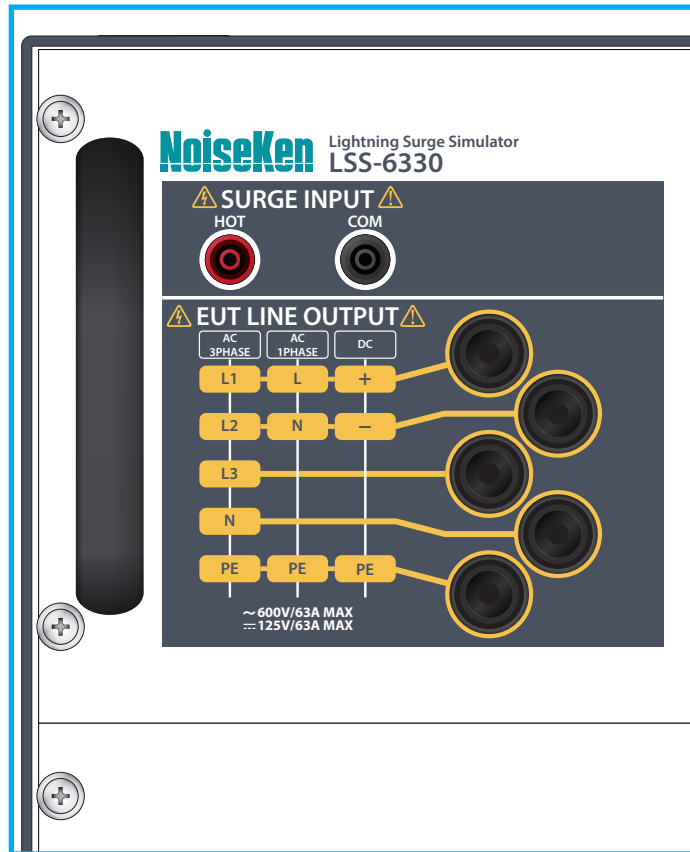
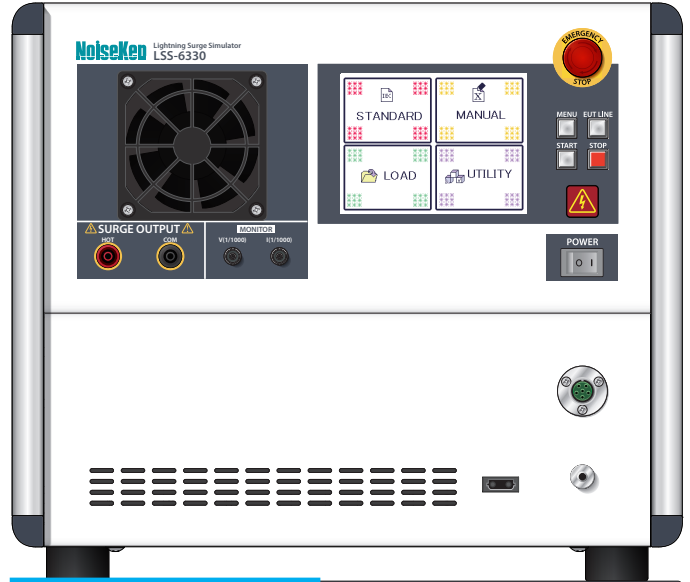
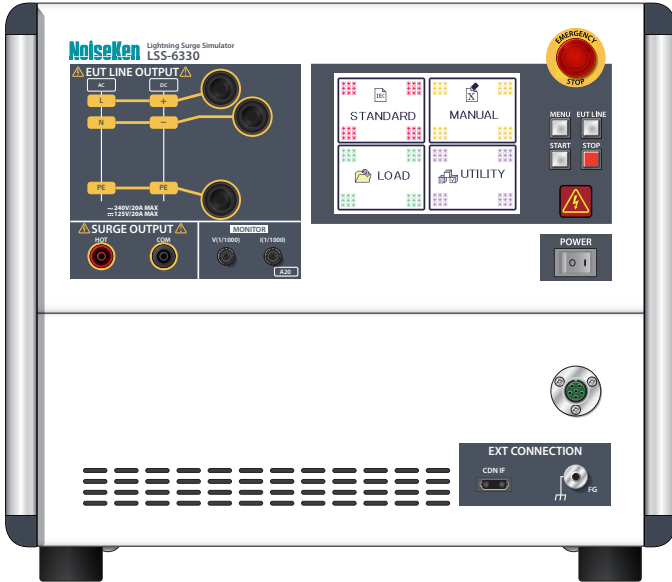
Item	Quantity	Notes
AC cable	1	
Line output cable	3	1.5m, Plug - M6
FG cable (05-00070A)	1	2m, M6 - M6
Coaxial cable for monitoring (02-00128A)	1	1m, BNC - BNC
Interlock connector	1	
Precheck cable for Surge output terminal	1	1m, plug - plug
Precheck cable for Line output terminal	1	1m, plug - plug
Line input cable	1set	1red, 1black, 1green/yellow
Surge output cable	2	1.5m, Plug - Alligator clip
Instruction manual	1	
Accessory bag	1	

■ Included Accessories (LSS-6330-B63A / LSS-6330-C63A)

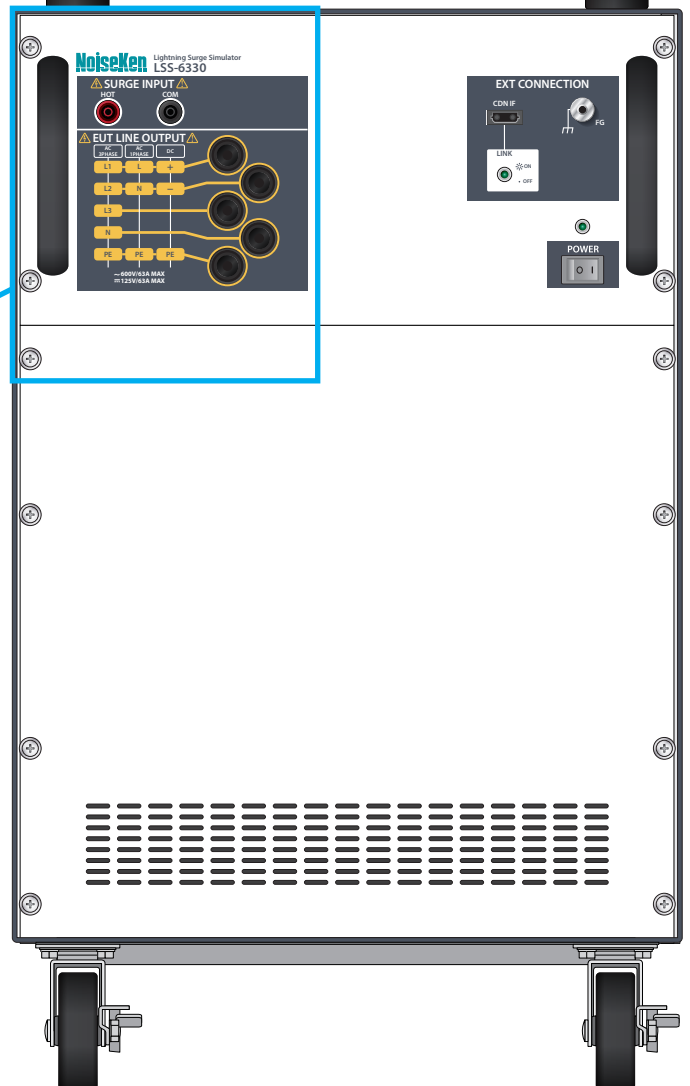
Item	Quantity	Notes
AC cable	2	
Line output cable	5	1.5m, Plug - M6
Surge input cable	1	connector cover red & black
FG cable (05-00070A)	2	2m, M6 - M6
Coaxial cable for monitoring (02-00128A)	1	1m, BNC - BNC
Interlock connector	1	
Precheck cable for surge output terminal	1	1m, plug - plug
Precheck cable for line output terminal	1	1m, plug - plug
Interlock cable	1	
FG connection short bar	1	
Optical cable	1	
Line input cable	1set	3red, 1black, 1green/yellow
Surge output cable	2	1.5m, Plug - Alligator clip
Instruction manual	1	
Accessories bag	1	

LSS-6330 series

Front panel



SURGE IN / EUT LINE OUT

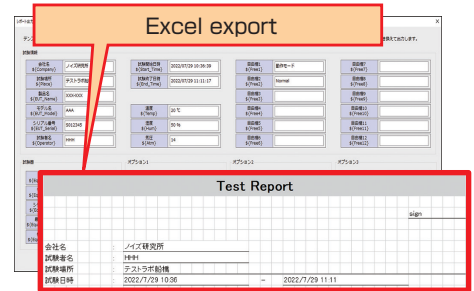


LSS-6330 PC Remote Control Software

# LSS-6330 RemoteW Model:14-00053B

LSS-6330 RemoteW (model: 14-00053B) is a PC Software for LSS-6330 series Lightning Surge Simulators remote control. This software allows setting of test parameters such as output voltage, polarity, phase angle and application mode. It greatly supports lengthy lightning surge tests, contributing to shorter test time and man-hours reduction.

- Standard Test mode allows testing based on IEC 61000-4-5 standard preset test conditions.
- Manual Test mode allows arbitrary setting of test parameters such as output voltage, polarity, phase angle and application mode.
- Test Report including test conditions, test lists and other test information can be exported in Excel format.
- Compatible with Windows 10 and 11 64 bit versions, supports English and Japanese languages.

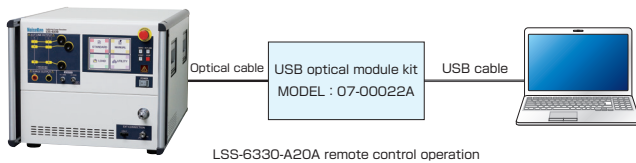


Report Export function

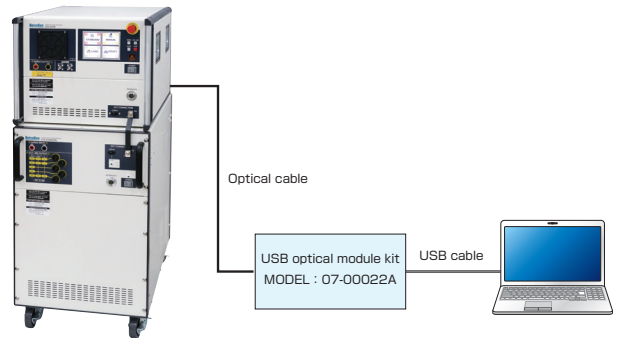
## Hardware Configuration

### 【 Remote Control operation image 】

Perform the lightning surge test by controlling the output voltage, polarity, phase angle and application mode of the simulator's Main Unit.



LSS-6330-A20A remote control operation



LSS-6330-B63A / LSS-6330-C63A remote control operation

## Software system requirements

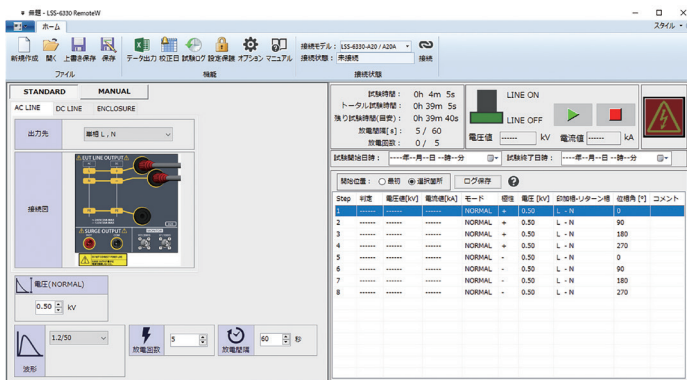
Parameter	Specifications
OS	Windows 10,64bit (English or Japanese ver.) Windows 11,64bit (English or Japanese ver.)
CPU	Dual-Core over 2.4GHz or better recommended
RAM	8GB or more recommended
Storage	5GB or more available free space
Display	WXGA resolution (1366×768) minimum WXGA ++resolution (1600×900) or better recommended

### 【Attention】

- Operation is not guaranteed when using software on cloud services or using online storages.
- For correct "Report Export" function, be sure to have installed Microsoft Excel compatible with the OS and within the support period.  
\*Please use the Desktop version, not the Store App version.
- USB Optical Module Kit (model 07-00022A) is required.
- 2 (two) available USB ports required.
- CD-ROM or DVD-ROM drive required for installing drivers for the USB Optical module.

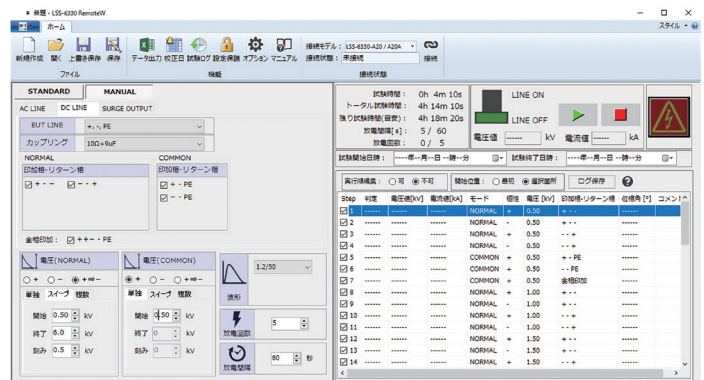
## PC remote control software

### Standard Test mode



Perform IEC Standard test easily

### Manual Test mode



Perform testing at arbitrary test parameters settings

Options

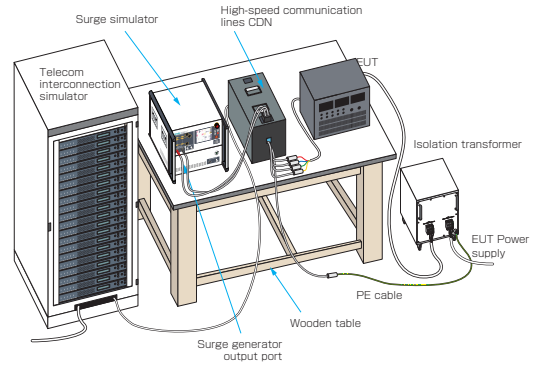
High-speed communication lines CDN **MODEL: F-130814-1004**



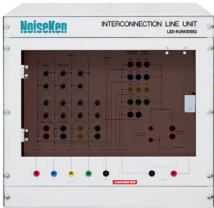
This CDN product is used to apply surges to unshielded symmetrical high-speed communication lines with speed up to 1000Mbit/s, as defined in the IEC 61000-4-5 Standard.

Conversion cables (05-00147A) are required for the CDN connection to the LSS-F03 simulator.  
 Conversion cables (05-00164A) are required for the CDN connection to the LSS-6330 simulator.

Parameter	F-130814-1004-2	F-130814-1004-4
Maximum input voltage	2kV	4kV
EUT power capacity	DC65V/1A	
Maximum line Number	8 lines	
EUT/AE connector	RJ-45	
Dimensions	(W) 400 × (H) 230 × (D) 240mm	



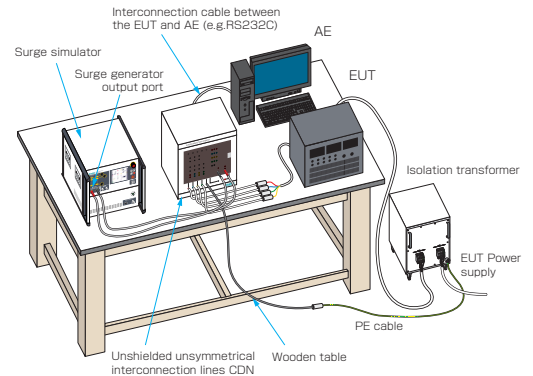
CDN for Interconnection Lines **MODEL : LSS-INJ6401SIG**



This CDN product is used to apply surges to interconnection lines as defined in the IEC61000-4-5 Standard. With The EUT power capacity of DC50V / 1A it is possible to inject surges to interconnection lines up to 6,600V. Possible to bypass inductor (20 mH) with connecting the attached connection plug to inductor bypass terminal in DC output. Possible to equip the attached surge protective arrester between each line and ground.

Conversion cables (05-T1578) are required for the CDN connection to the LSS-F03 simulator.  
 Conversion cables (05-00165A) are required for the CDN connection to the LSS-6330 simulator.

Parameter	Specifications
Surge input voltage	500V-6,600V (1.2/50 $\mu$ s-8/20 $\mu$ s Combination wave)
EUT power capacity	DC50V / 1A
Max. line number	4 lines
Decoupling coil	20mH each line
Matching resistor	40 $\Omega$ ±10%
Dimensions / Weight	(W) 488 x (H) 456 x (D) 550mm Approx. 45kgs



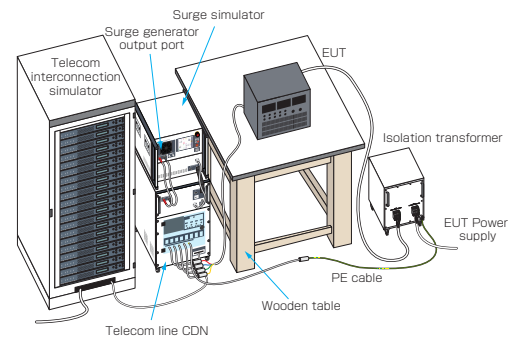
Telecom CDN for LSS-6330 **MODEL : LSS-6330TEL**



This CDN product is used to apply surges to unshielded symmetrical interconnection or telecom lines, as defined in the IEC61000-4-5 Standard.

\* Please inquire us for more details.

Parameter	Specifications
Surge Input Voltage	6kV
EUT Power Supply Capacity	DC50V /100mA MAX
Maximum line Number	4 Lines
Decoupling Coil	20 mH each line
Coupling Resistor	40 $\Omega$ (1.2/50 $\mu$ s - 8/20 $\mu$ s Combination wave) 25 $\Omega$ (10/700 $\mu$ s - 5/320 $\mu$ s Combination wave)
Dimensions / Weight	(W) 430 x (H) 695 x (D) 686mm Approx. 75kgs





Options

Isolation Transformer **MODEL : TF-2302P**



Model TF-2302P is a single-phase isolation transformer rated AC240V/30A with dielectric strength of 4kV. For safety reasons, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	Specifications
Maximum input voltage	Single phase AC240V Max (50/60Hz)
Maximum output current	30A Max
Dielectric strength	Primary winding to core AC4kV (1 minute) Secondary winding to core AC4kV (1 minute) Primary to secondary windings AC4kV (1 minute)
Insulation resistance	100MΩ or more at DC500V
Dimensions / Weight	(W)350×(H)475×(D)400mm (Except for eye bolt and handle) / Approx. 60kg
Accessories	AC single phase line input cable (5.5sq 3-line 3m, One end: with a stick-type soldering terminal, The other end: without terminal): 1pc., PE/FG cable (3.5sq 3m Both ends: with a φ6 ring-type soldering terminal) : 1pc. Instruction Manual: 1pc. AC single phase line output cable (3.5sq 3-line 2m, One end: with stick-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc.

Isolation Transformer **MODEL : TF-6503P, TF-6633P**



Model TF-6503P, TF-6633P are three-phase isolation transformers rated AC 600 V / 50 A (TF-6633P 63A) and dielectric strength of 4 kV. For safety reasons, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	TF-6503P Specifications	TF-6633P Specifications
Maximum input voltage	Single / Three phase AC 600 V Max (50/60 Hz)	
Transformer wiring method	Star wiring	
Maximum output current	50 A Max	63 A Max
Dielectric strength	Primary winding to core AC 4 kV (1 minute) Secondary winding to core AC 4 kV (1 minute) Primary to secondary windings AC 4 kV (1 minute)	
Insulation resistance	100 MΩ or more at DC 500 V	
Dimensions / Weight	TF-6503P: (W)500×(H)640×(D)700mm (Eye bolts and handles excluded) approx. 350kg TF-6633P: (W)500×(H)661×(D)700mm (Eye bolts and handles excluded) approx. 400kg	
Accessories	AC three-phase line input cable (14sq (22sq for TF-6633P) 4-line 3m, One end: with a stick-type soldering terminal, the other end: without terminal):1 pc. PE cable (8sq 3m, One end: with a φ6 ring-type soldering terminal, The other end: without terminal): 1 pc. PE/FG cable (8sq 3m Both ends: with a φ6 ring-type soldering terminal): 1 pc. Instruction Manual: 1 pc. AC three phase line output cable (14sq (22sq for TF-6633P) 4-line 2m, One end: with stick-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc. PE cable (8sq 2m, One end: with a φ6 ring-type soldering terminal, The other end: with a φ5 ring-type soldering terminal): 1pc.	

Noise Canceller Transformers **NCT series**



It has superb attenuation characteristics against impulse noises. It can also be used for insulation during impulse noise test. \*Connection cable requires modification. Please inquire us for more details.

MODEL	Primary / Secondary Voltage	Rated current	Frequency
NCT-160	120V	5A	50/60Hz
NCT-1240		20A	
NCT-2240	240V	10A	

Circuit Breaker Box **MODEL : 18-00072A (20A) / 18-00073A (50A)**



A breaker box that can cut off the line between the tester and the power supply side when used in combination with the LSS-6330 series.\* Connection cable requires modification. Please inquire us for more details.

Parameter	Specifications (18-00072A)	Specifications (18-00073A)
Rated Voltage	AC250V 50/60Hz DC65V	AC240/415V 3 phase 4 wire Y-connection, 50/60Hz AC240V : Line-N (neutral) AC415V : Line-Line
Rated Current	20A	50A
Switching durability	over 10,000 times (rated open/close 6,000 times, no load open/close 4,000 times, frequency 6 times/minute)	
Neutral pole (N pole)	N/A	The neutral pole does not trip by itself.The neutral pole does not open before the other poles and does not close after the other poles.
Operating temperature, humidity	15 ~ 35°C 25 ~ 75% (no condensation)	
Dimensions	(W)180×(H)92×(D)100mm (excluding protrusions)	(W)180×(H)92×(D)120mm (excluding protrusions)
Weight	0.75 kg	1.2kg

## Options

### OUTLET BOX



This product is an outlet box for converting a line output socket to a terminal block type.

18-00081A	Outlet box 125V 15A 2P+PE	Btype (3Ptype, JP/USAtype) AC125V 15A MAX
18-00082A	multi-outlet box	Japan (JIS), America (UL), Canada (CSA), Australia (CSA), Swiss (SEV), Italy (CEI), Europe (CEE, DIN), England (BS) Input up to 4.5kV
18-00083A	Outlet box	Europe CEE DIN 250V 16A MAX
18-T2300	3P Terminal Block Conversion Box	3P terminal block M6 with protective cover Input up to 5kV <i>* This is a custom product. Please contact us for details.</i>
18-N2494	5P Terminal Block Conversion Box	5P terminal block M6 with protective cover Input up to 5kV <i>* This is a custom product. Please contact us for details.</i>

#### Terminal Connection Board with Multi-Outlet(3P) **MODEL : 18-00048B**



A relay terminal board for connecting the output of the LSS-6330 series to the EUT. By wiring to the included multi-outlet, you can directly connect a power plug that supports the standards of each country.

single phase 3 lines (withstand voltage 4.5kV)  
*\*Conversion cable (model: 05-00166A) is required for connection with LSS-6330.*

#### Terminal Connection Board with Multi-Outlet(5P) **MODEL : 18-00058B**

A relay terminal board for connecting the output of the LSS-6330 series to the EUT. By wiring to the included multi-outlet, you can directly connect a power plug that supports the standards of each country.

three phase 5 lines (withstand voltage 4.5kV)  
*\*Multi-outlet is for single phase.  
\*Conversion cable (model: 05-00167A) is required for connection with LSS-6330.*

#### Terminal Block for 3P **MODEL : 18-00047A**

Terminal block board for CDN to connect EUT. 3 pins  
*\*Conversion cable (model: 05-00166A) is required.*

#### Terminal Block for 5P **MODEL : 18-00044A**

Terminal block board for CDN to connect EUT. 5 pins  
*\*Conversion cable (model: 05-00167A) is required.*

#### EUT Protective Safety Box **MODEL : 11-00006A**



Protection box to prevent access to EUT during the test. Further safety can be achieved by combining with the protective safety fence

(W) 600 × (D) 400 × (H) 350mm *\*protrusions excluded*

#### Protective Safety Fence **MODEL : 11-00010A**

Allows construction of a safe test environment by connecting with the lightning surge simulator's interlock function. Combined use with the EUT protection box ensures a completely safe test environment.

#### Warning Lamp **MODEL : 11-00008A**



Alarm lamp for LSS series. Allows to alert and call for attention by blinking during the test.

#### Tri-Color Pilot Light **MODEL : 11-00015A**



Tri-color pilot light for LSS-6330 models. Allows to alert and call for attention by blinking during the test. The lights change in three colors in accordance with the test status.

#### USB Optical Module Kit **MODEL : 07-00022A**



Connection adapter used for remotely controlling the simulator from a PC. Equipped with USB-Optical conversion fiber optic cable (5m).

# IEC61000-4-5 Ed.3 Test Standard

## 1. General

The task of the described laboratory test is to evaluate malfunctions of EUT under specified operational conditions to unipolar one-way surges caused by switching and lightning induction effects at certain threat levels. This standard specifies 2 kinds of the combination waveforms. One is simulating injection to power supply lines and interconnections lines (1.2/50µs voltage waveform and 8/20µs current waveform) and the other simulates injection to telecommunication equipment connect to outdoor telephone lines (10/700µs voltage waveform and 5/320µs current waveform).

It is not intended to test the capability of EUT's insulation to withstand high-voltage stress or direct injections of lightning currents, i.e., direct lightning strikes.

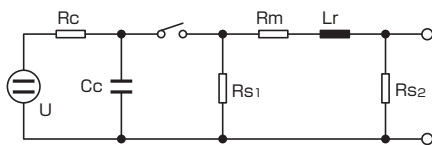
## 2. Test Levels

Level	Open-circuit test voltage kV	
	Normal mode	Common mode
1	-	0.5
2	0.5	1.0
3	1.0	2.0
4	2.0	4.0
x	special	special

x: Can be any level, above, below or in between the others. The level shall be agreed upon between the manufacturers and users.

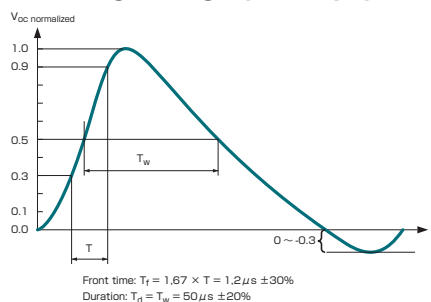
## 3. Waveforms Generator and Waveforms specifications

### Generation Circuit

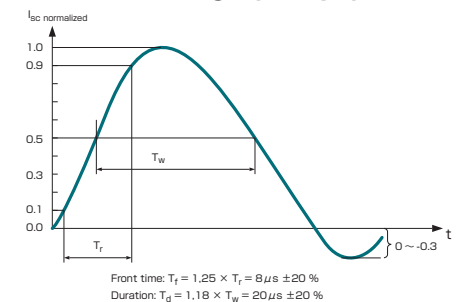


- U High-voltage source
- Rc Charging resistor
- Cc Energy storage capacitor
- Rs Pulse duration shaping resistors
- Rm Impedance matching resistor
- Lr Rise time shaping inductor

### Voltage Surge (1.2/50µs)



### Current Surge (8/20µs)



### 1.2/50µs Combination Waveform specification

	Front time Tf µs	Duration Td µs
Open-circuit voltage	Tf = 1,67 × T = 1,2 ± 30 %	Td = Tw = 50 ± 20 %
Short-circuit current	Tf = 1,25 × Tr = 8 ± 20 %	Td = 1,18 × Tw = 20 ± 20 %

## 4. Voltage waveform specification at the EUT port of power line CDN

### 1.2/50µs Voltage waveform specification at the EUT port of the power line CDN (open-circuit voltage)

Open-circuit voltage *	Coupling impedance	
	18 µF (line to line)	9 µF + 10 Ω (line to ground)
Peak voltage Current rating ≤ 16 A 16 A < current rating ≤ 32 A 32 A < current rating ≤ 63 A 63 A < current rating ≤ 125 A 125 A < current rating ≤ 200 A	Set voltage +10 %/-10 % Set voltage +10 %/-10 % Set voltage +10 %/-10 % Set voltage +10 %/-10 % Set voltage +10 %/-10 %	Set voltage +10 %/-10 % Set voltage +10 %/-10 % Set voltage +10 %/-15 % Set voltage +10 %/-20 % Set voltage +10 %/-25 %
Front time Duration	1,2 µs ± 30 %	1,2 µs ± 30 %
Current rating ≤ 16 A 16 A < current rating ≤ 32 A 32 A < current rating ≤ 63 A 63 A < current rating ≤ 125 A 125 A < current rating ≤ 200 A	50 µs + 10 µs/ -10 µs 50 µs + 10 µs/ -15 µs 50 µs + 10 µs/ -20 µs 50 µs + 10 µs/ -25 µs 50 µs + 10 µs/ -30 µs	50 µs + 10 µs/ -25 µs 50 µs + 10 µs/ -30 µs 50 µs + 10 µs/ -35 µs 50 µs + 10 µs/ -40 µs 50 µs + 10 µs/ -45 µs

\* A CDN meeting the current rating of the EUT and its relevant waveform specification from this table shall be used.

IEC61000-4-5 Ed.3 Test Standard

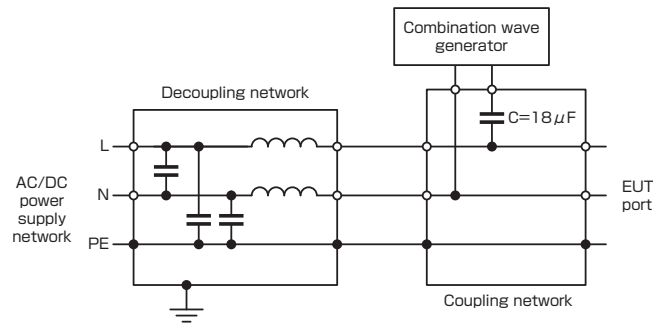
■ Current waveform specification at the EUT port of the power line CDN (short-circuit current)

Surge current parameters under short-circuit conditions	Coupling impedance	
	18 $\mu$ F (line to line)	9 $\mu$ F + 10 $\Omega$ (line to ground)
Front time	$T_f = 1,25 \times T_r = 8\mu s \pm 20 \%$	$T_f = 1,25 \times T_r = 2,5 \mu s \pm 30 \%$
Duration	$T_d = 1,18 \times T_w = 20\mu s \pm 20\%$	$T_d = 1,04 \times T_w = 25 \mu s \pm 30 \%$

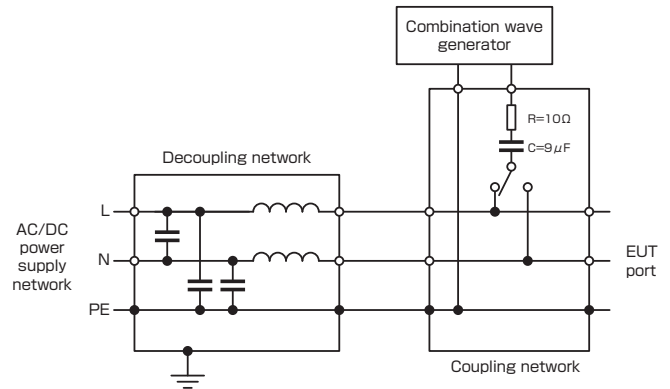
■ Relationship between peak open-circuit voltage and peak short-circuit current at the EUT port of the power line CDN

Open-circuit peak voltage +/-10% at EUT port of the CDN	Short-circuit peak current +/-10% at EUT port of the CDN (18 $\mu$ F)	Short-circuit peak current +/-10% at EUT port of the CDN (9 $\mu$ F + 10 $\Omega$ )
0,5 kV	0,25 kA	41,7 A
1,0 kV	0,5 kA	83,3 A
2,0 kV	1,0 kA	166,7 A
4,0 kV	2,0 kA	333,3 A

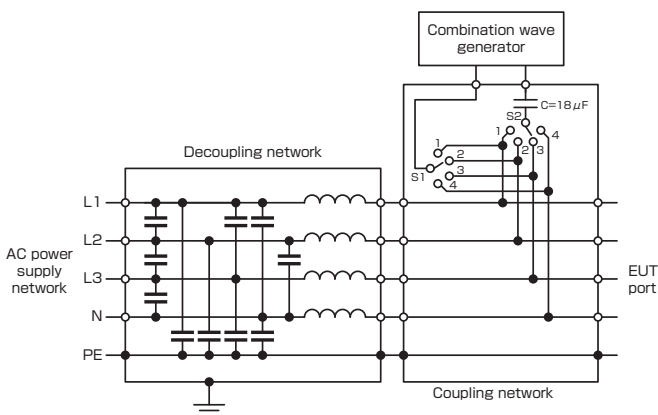
■ Single phase power line CDN (line-to-line mode)



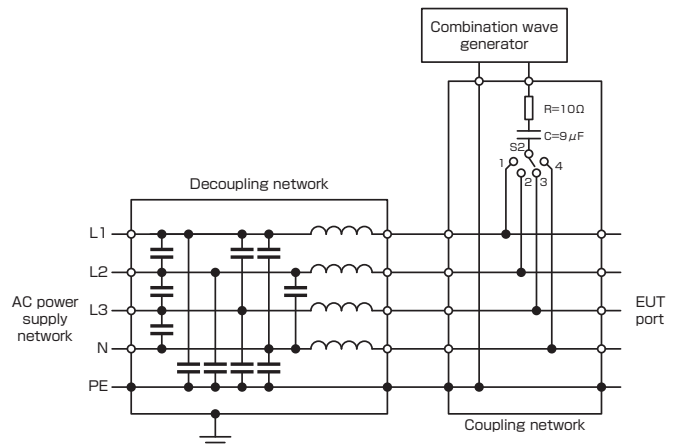
■ Single phase power line CDN (line-to-ground mode)



■ Three-phase power line CDN (line-to-line mode)



■ Three-phase power line CDN (line-to-ground mode)

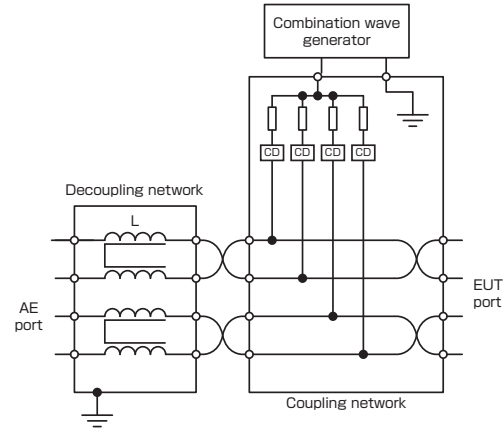
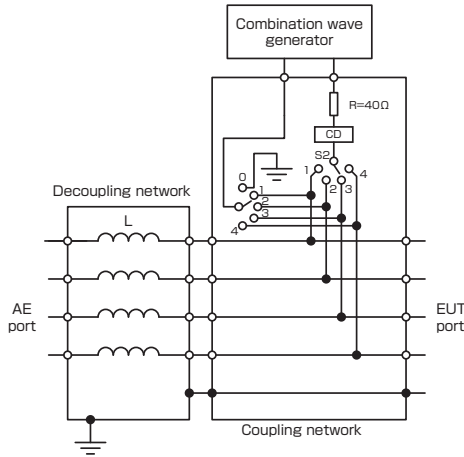




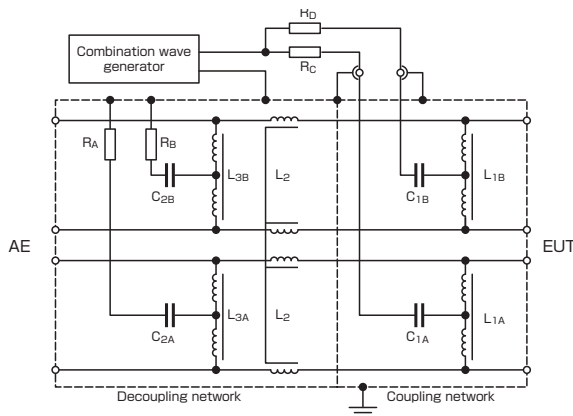
IEC61000-4-5 Ed.3 Test Standard

■ CDN for unshielded unsymmetrical interconnection lines

■ CDN for unshielded symmetrical interconnection lines



■ CDN for unshielded symmetrical high speed communication lines up to 1000Mbit/s



■ Surge waveform specifications at the EUT port of the CDN for unshielded unsymmetrical interconnection lines

Coupling method	Output voltage from the generator	Open-circuit Voltage at the EUT port of the CDN Voc ±10 %	Voltage front time Tf = 1,67 xTr ±30 %	Voltage duration Td = Tw ±30 %	Short-circuit current at the EUT port of the CDN Isc ±20 %	Current front time Tf=1,25xTr ±30 %	Current Duration Td=1,18xTw ±30 %
Line to PE R = 40Ω, CD = 0,5 μF	4 kV	4 kV	1,2 μs	38 μs	87 A	1,3 μs	13 μs
Line to PE R = 40Ω, CD = GDT	4 kV	4 kV	1,2 μs	42 μs	95 A	1,5 μs	48 μs
Line-to-line R = 40Ω, CD = 0,5 μF	4 kV	4 kV	1,2 μs	42 μs	87 A	1,3 μs	13 μs
Line-to-line R = 40 Ω, CD = GDT	4 kV	4 kV	1,2 μs	47 μs	95 A	1,5 μs	48 μs

■ Surge waveform specifications at the EUT port of the CDN for unshielded symmetrical interconnection lines

Coupling method	Output voltage	Open-circuit Voltage at the EUT port of the CDN Voc ±10 %	Voltage front time Tf = 1,67 xTr ±30 %	Voltage duration Td = Tw ±30 %	Short-circuit current at the EUT port of the CDN Isc ±20 %	Current front time Tf=1,25xTr ±30 %	Current Duration Td=1,18xTw ±30 %
Line to PE R = 40Ω Coupling devices*	2 kV	2 kV	1,2 μs	45 μs	48 A	1,5 μs	45 μs

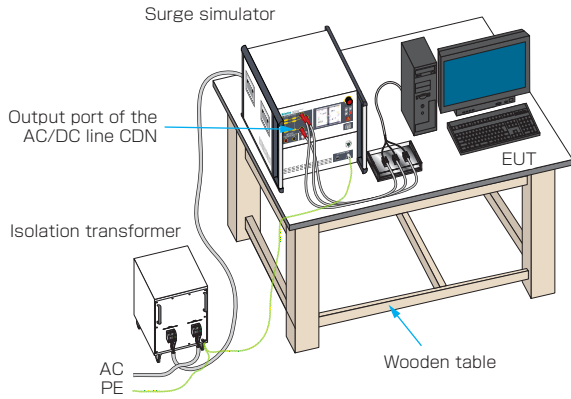
\* GDT, Clamping device, Avalanche devices

It is recommended that the CDN calibrated at the highest rated voltage. The values shown in the table are for a set value of 4 kV. If the CDN is rated for another maximum voltage, the calibration shall be performed at that maximum voltage. (In case the maximum voltage is 6kV, multiply the short circuit current value shown in this table by 1.5.)

IEC61000-4-5 Ed.3 Test Standard

**5. Test Setup**

**Application of surges to power supply lines**



The 1.2/50 combination wave specified in the IEC61000-4-5 standard is applied from Lightning Surge simulator's CDN to power supply of the EUT. Compliant with the standard requirements, the simulator is equipped with a floating output. The simulator can conduct a series of automated tests based on preprogrammed settings.

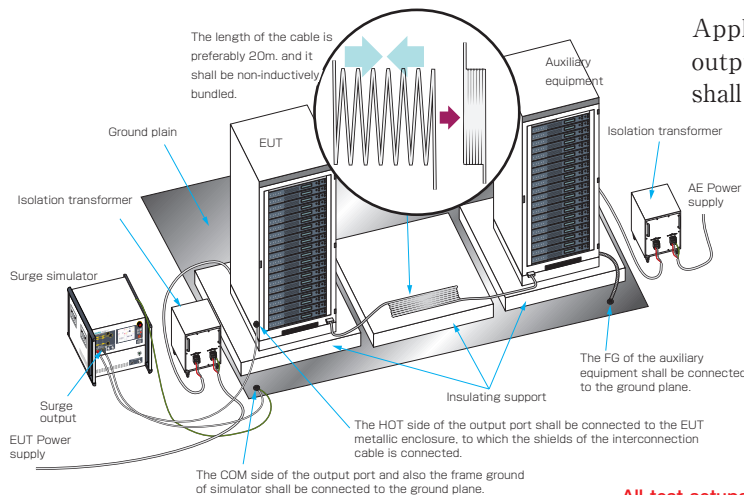
**Application of surges through unshielded unsymmetrical interconnection lines CDN**

The 1.2/50  $\mu$ s surge generator of the LSS-6330 simulator shall be used in combination with an optional external CDN. This CDN is connected between the EUT and AE (auxiliary equipment).

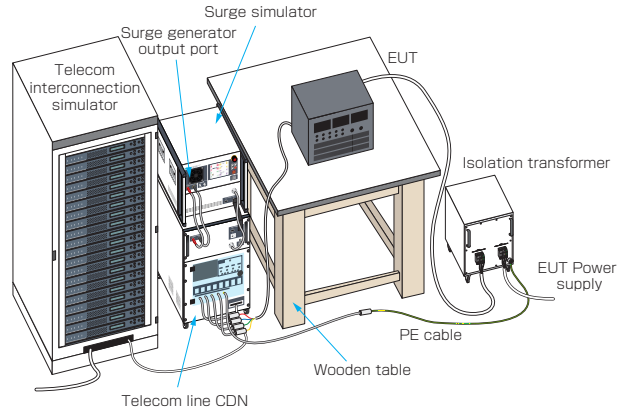
For all tests shown here, if it is not otherwise specified, the length of cable between the EUT and CDN should not exceed 2m.

**Application of surges to shielded lines**

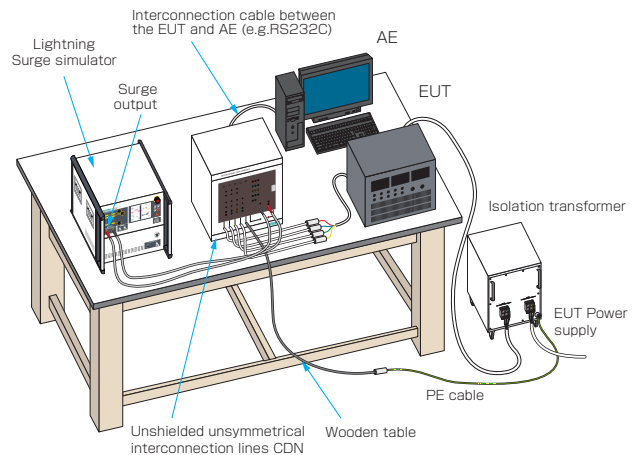
In case of shielded lines, the surge shall be applied to the metallic enclosure of the EUT (for the EUT without a metallic enclosure, the surge shall be applied to the shields of the cable).



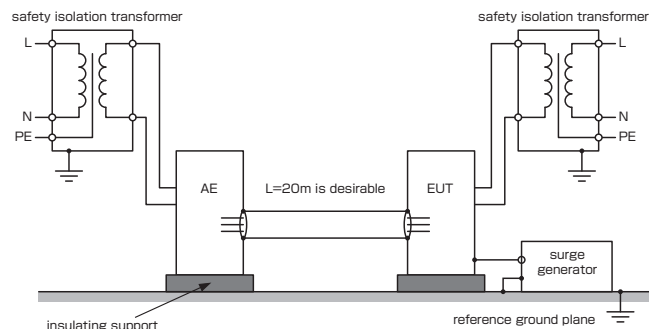
**Application of surges to telecom lines**



The 1.2/50 combination wave surge specified in IEC 61000-4-5 Standard is applied to the telephone line of an EUT (such as a facsimile machine) through a high-speed telecom CDN connected to Lightning Surge simulator.



Application of the surges shall be done from the generator output port via a 18  $\mu$ F capacitor. The auxiliary equipment shall be connected to the ground plane while the EUT shall not.



All test setups shown here are examples for performing tests by using the LSS-6330 series simulators. Some parts are not requirements of the relevant IEC standard.

6. Test procedure

Execution of the test

- Number of surges  
For DC power ports and interconnection lines five positive and five negative surge pulses.  
For AC power ports five positive and five negative pulses each at 0°, 90°, 180° and at 270°;
- Time between successive pulses: 1 min or less

7. Evaluation of Test Results and Test Report

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product. The recommended classification is as follows:

- 1) Normal performance within limits specified by the manufacturer, requestor or purchaser;
- 2) Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention;
- 3) Temporary loss of function or degradation of performance, the correction of which requires operator intervention;
- 4) Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

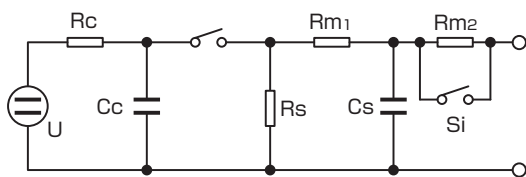
Generally, as far as the EUT can be immune to the surges injected during all injection period and it satisfies the functional requirements according to the product specification, the test result can be judged as “Good”.  
The test report shall contain the test conditions and the result.

Note: These test setups and procedures are quoted from IEC61000-4-5 Ed.3 (2014) Standard. Please refer to the standard if more details are required.

8. Surge testing for unshielded outdoor symmetrical communication lines

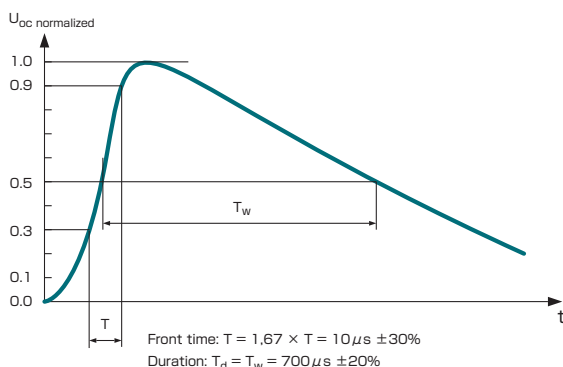
The 3rd edition of the standard requires the 10/700 us combination wave to be applied to ports connected to outdoor telecommunication lines only and the Annex A (Normative) dedicatedly address this test. Outdoor telecommunication lines are typically greater than 300m in length, as the result of this length 10/700µs wave is more representative. Telecommunication lines are usually protected by a primary protector installed at the cable entry to building. Testing shall be performed including the intended primary protector.

10/700 combination waveform (10/700 · 5/320µs) generation circuit

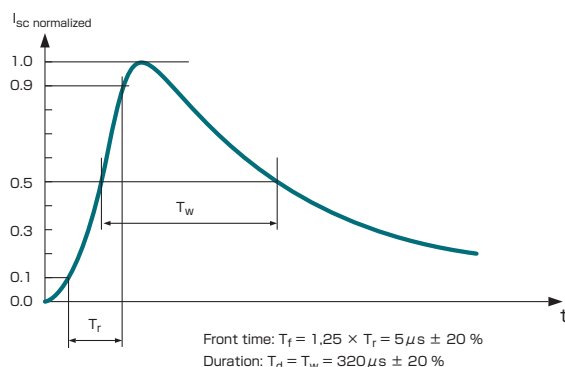


- U High-voltage source
- Rc Charging resistor
- Cc Energy storage capacitor
- Rs Pulse duration shaping resistor
- Rm Impedance matching resistors
- Cs Rise time shaping capacitor
- Si Switch closed when using external matching resistors

Open circuit voltage waveform



Short circuit current waveform



IEC61000-4-5 Ed.3 Test Standard

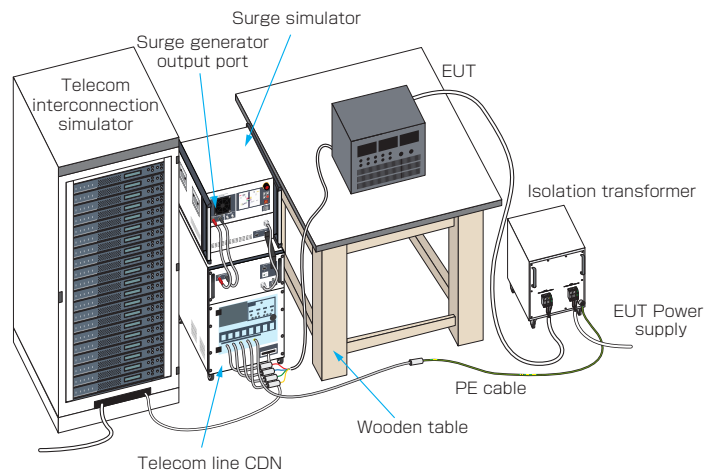
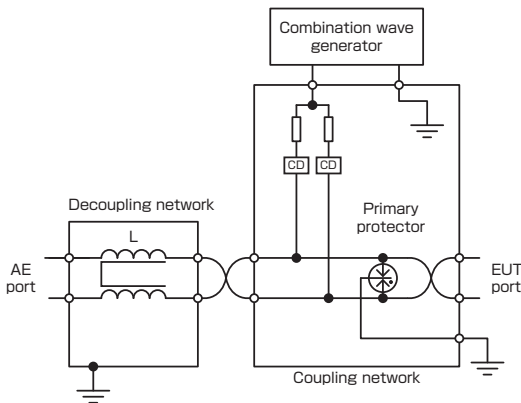
■ Definitions of the waveform parameters of 10/700 μs combination waveform

	Front time μs	Duration μs
Open-circuit voltage	10 ± 30 %	700 ± 20 %
Short-circuit current	5 ± 20 %	320 ± 20 %

■ Relationship between peak open-circuit voltage and peak short-circuit current of the 10/700μs combination waveform

Peak open-circuit voltage at generator output ± 10 %	Peak short-circuit current at generator output ± 10 %
0,5 kV	12,5 A
1,0 kV	25A
2,0 kV	50A
4,0 kV	100A

■ Test setup example for 10/700 μs generator and CDN for outdoor unshielded symmetrical communications lines



■ Surge waveform specifications at the EUT port of the CDN for unshielded outdoor symmetrical communication lines

Coupling method	Output voltage from the generator	Open-circuit voltage at the EUT port of the CDN Voc ± 10 %	Voltage front time Tf = 1,67 xTr ± 30 %	Voltage duration Td = Tw ± 30 %	Short-circuit current at the EUT port of the CDN Isc ± 20 %	Current front time Tf ± 30 %	Current duration Td ± 30 %
Common mode Coupling devices 1 pair 27,5 Ω	4 kV	4 kV	8 μs	250 μs	145 A	3,2 μs	250μs

Note: These test setups and procedures are quoted from IEC61000-4-5 Ed.3 (2014) Standard. Please refer to the standard if the more details are required.

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