

EMC Test Equipment Catalog



- Electrostatic Discharge Simulator
- Impulse Noise Simulator
- Fast Transient / Burst Simulator
- Lightning Surge Simulator
- Voltage Dip & Swell Simulator
- Damped Oscillatory Wave Simulator
- Emission Measurement System
- Broadband Sleeve Antenna
- TEM Horn Antenna
- EMC Test Systems for Automotive Electronics

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www.noiseken.com

Lightning Surge Simulator

LSS-F03 series

For a stricter test with a maximum voltage of 15 kV.

A tester simulatively generates "High energy induced lightning noise" which induced to distribution lines or communication lines by ground potential fluctuation caused by lightning strikes.

- Lightning surge simulator compliant with the IEC61000-4-5 Edition 3 requirements
- Maximum output voltage 15 kV (maximum coupling of 15 kV to AC / DC CDN and 6 kV to Telecom CDN)
Enable to conduct the more extended reliability test including the destructive test
- Large size LCD for the operation is adopted for realizing better visibility and operatability
- Easy operation for the sequential tests with adoption of MPU control Surge output / Waveform switching / Polarity switching / Sequence can be automated sequentially
- Selectable either MANUAL or PROGRAM mode MANUAL mode is used for the test according to the Standard or performing single conditioned test and PROGRAM mode can perform different conditioned tests sequentially so that the tests can be performed easily along purposes.
- Excellent safety with equipment of interlock
- Standard equipment of terminal for checking the waveforms : Enable to check the waveforms in connection to an oscilloscope on hand with BNC cable
- Isolation transformers in line-up (Option)
- In order to avoid resonance with the power supply, possible to vary the constant of the decoupling network (1.5, 1.3, 1.0, 0.8 mH)(Customized production). When some products like a power conditioner for photovoltaic application are connected to a lightning surge simulator, the resonant phenomena may be happened and the products may not work well. In LSS-F03 series (with customization), possible to change constants of the inductances so as to avoid such trouble.



Unit to switch constant of the inductance



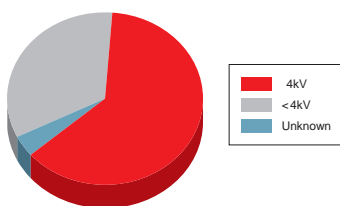
Lightning Surge LSS

"Output voltage 15 kV, current 7500 A" which can conduct breakdown resistibility test.

Approx. 60% of the users are carrying on the test with voltage more than IEC Standard.

Requirement in IEC Standard < To keep up with quality in the market

Test voltage of lightning surge immunity test

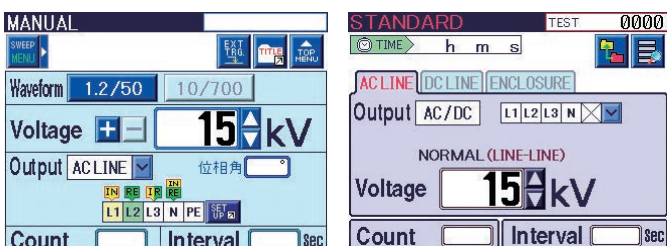


Quoted from the market investigation by NoiseKen on 2010

"Touch-panel" adopted for the easy test setting.

Adopt LCD touch panel for pursuing high visibility and realizing user-friendly operation with affluent icons.

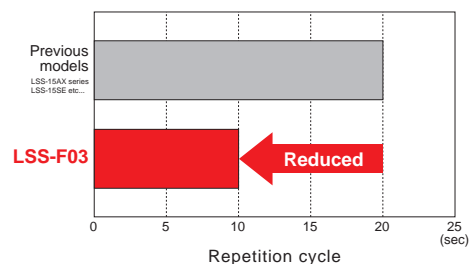
Also, easy operation is realized not only for the test according to IEC Standard but also for the sequential tests with the parameter sweep function.



"50% reduction of the output interval" which can drastically reduce the test time.

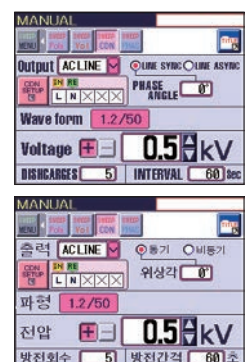
Realize 1/2 of the interval time comparing to our previous models so as to contribute to reduction of the man-hour for the test.

(* in case of the test less than 6 kV output)



"Multi-languages" for the easy operation processing available.

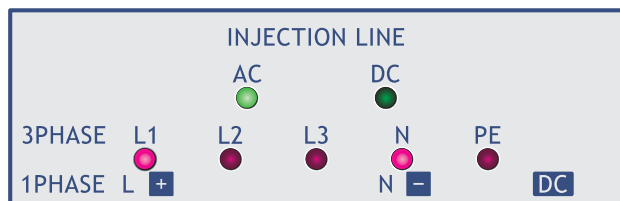
Not only Japanese and English but also Chinese and Korean available for the easy operation processing.



LSS-F03 series

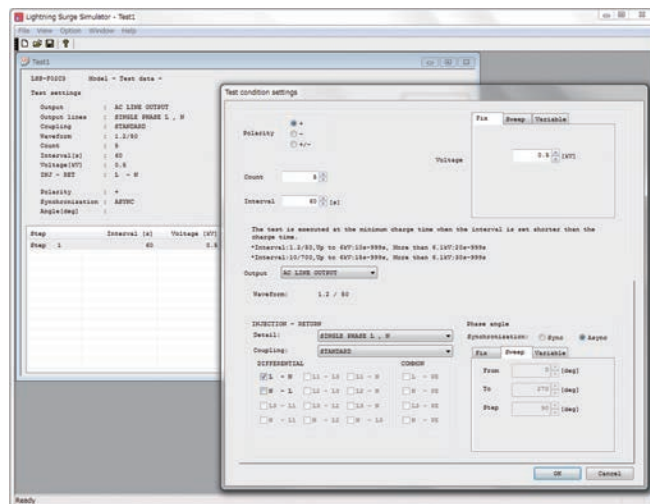
"Indicator" which is linked with the test setting equipped.

Indicators which visualize the cables connections in the test equipped.



PC control available with the optional software.

Enable to control from external Windows® PC. Also, enable to put the report of the test result in record out.



"Emergency stop" & "Interlock terminal" which secure the test operator equipped.

Emergency stop function which takes safety of the test operator into the account equipped both in the main body and the software. Also, the interlock setting and output voltage control function equipped. If the protective safety fence and protective safety box are adopted as the options, more safety test can be realized.

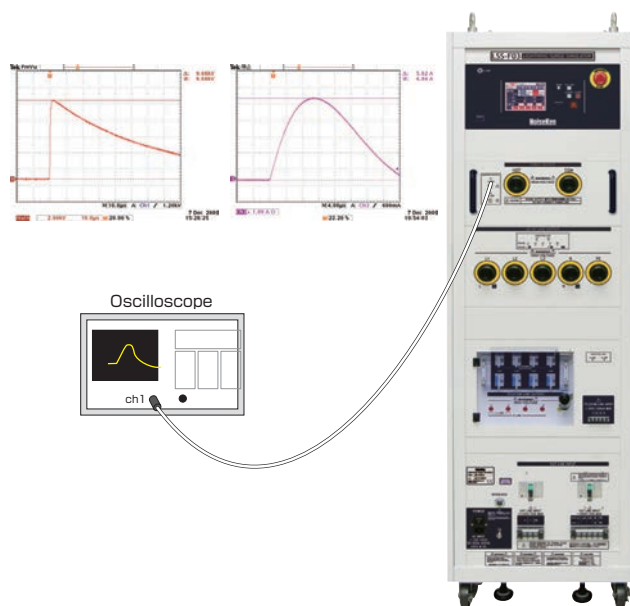
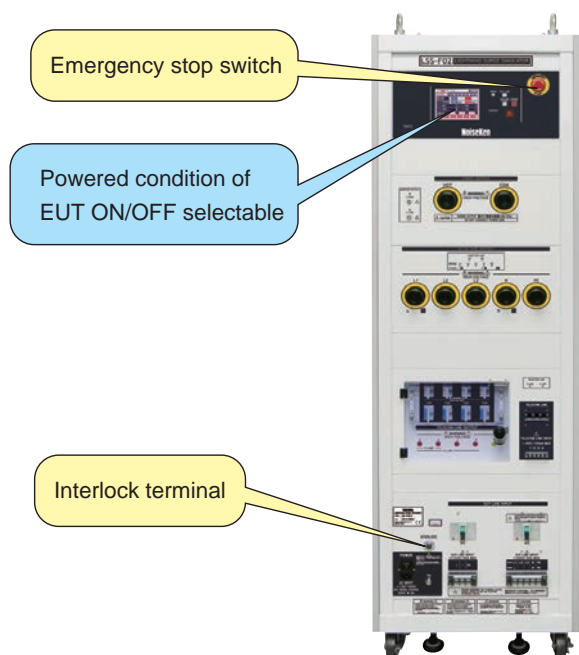
"Output waveform monitor terminal" which can ease pre-checking of the waveforms prior to the actual test.

In order to respond to the request "The simple waveform checking is desired before the test", equip the monitor terminal.

*The terminal is just for the simple checking.

If the accurate measurement is required, the specialized equipments are necessary.

Please contact us for the more details.



How to understand the model numbers

LSS-F03-□□

- 1 : Model for single phase EUT L/N/PE
- 3 : Model for 3-phase EUT L1/L2/L3/N/PE (Available both for single phase & 3-phase)
- A : 1.2/50 μ s-8/20 μ s (Totally 1 kind surge generates)
- C : 1.2/50 μ s-8/20 μ s, 10/700 μ s-5/320 μ s (Totally 2 kinds)

Specification

Parameter	Specification	Note
Surge generating unit		
1.2/50 μ s - 8/20 μ s	Output voltage 0.5 kV ~ 15 kV \pm 10%	Common for the all models Voltage step : 0.1 kV step The setting can be from 0 kV
Combination waveforms	Front time 1.2 μ s \pm 30%	
	Duration 50 μ s \pm 20%	
	Output current 250 A ~ 7500 A \pm 10%	
	Front time 8 μ s \pm 20%	
	Duration 20 μ s \pm 20%	
10/700 μ s-5/320 μ s	Output voltage 0.5 kV ~ 15kV \pm 10%	Models : C1A / C3A Voltage step : 0.1 kV step The setting can be from 0 kV
Combination waveforms	Front time 10 μ s \pm 30%	
	Duration 700 μ s \pm 20%	
	Output current 12.5 A ~ 375 A \pm 10%	
	Front time 5 μ s \pm 20%	
	Duration 320 μ s \pm 20%	
Output polarity	Positive / Negative	
Interval	10 sec. ~ 989 sec., depending on the set voltage 10 sec. (< 6 kV)	15 sec. ~ in 10/700 μ s waveform
Output impedance	2 Ω \pm 10%	1.2/50 μ s waveform
	40 Ω \pm 10%	10/700 μ s waveform
■AC/DC CDN		
Coupling surge waveform	1.2/50 μ s - 8/20 μ s combination waveforms	
Max. coupling surge voltage / current	Up to the values which can be set	
Coupling network	18 μ F Between LINE - LINE (10 Ω + 9 μ F selectable)	
Correspondent to IEC61000-4-5	10 Ω \pm 9 μ F Between LINE - PE (18 μ F selectable)	
Injection mode	Between LINE - LINE, Between LINE - PE	
Power supply lines structure for EUT	Single phase AC : L / N / PE	Model : A1A / C1A
	DC : + / - / PE	
	3-phase AC : L1 / L2 / L3 / N / PE (Common for single phase and 3-phase)	Model : A3A / C3A
	DC : + / - / PE	
EUT power capacity	AC 240 V / 20 A MAX 50/60 Hz DC 125 V / 20 A MAX	Model : A1A / C1A
	AC 500 V / 50 A MAX 50/60 Hz DC 125 V / 50 A MAX	Model : A3A / C3A
Decoupling coil	1.5 mH	
Phase angle control	0 ~ 360° \pm 10°	
■CDN for Telecom lines (Only in model C1 and C3)		
Coupling surge waveform	1.2/50 μ s - 8/20 μ s combination waveforms	
	10/700 μ s - 5/320 μ s combination waveforms	
Max. coupling surge voltage / current	6 kV (waveform specifications can be met at 2 kV for 1.2/50 μ s waveform and 4 kV for 10/700 waveform)	
Impedance matching resistors	40 Ω	1.2/50 μ s waveform
	80 Ω per 1 line at 2 lines	
	160 Ω per 1 line at 4 lines	
	25 Ω per line	10/700 μ s waveform
Coupling mode	Common mode	
Coupling network	Gas arrester : 90 V	
Line for EUT	2 lines / 4 lines DC 50 V / 100 mA MAX	Selectable
Decoupling coil	20 mH	
■Others		
Voltage monitor	BNC output, 1 / 2000 \pm 10%	In open-circuit for SURGE OUT
Current monitor	BNC output, 1 mV / A \pm 10%	In short-circuit for SURGE OUT
External communication	RS-232C optical communication	
Power supply	AC 100 V ~ AC 240V \pm 10% 50/60Hz	
Dimensions	(W)555 \times (H)1450 \times (D)790 mm (A1A / A3A), (W)555 \times (H)1800 \times (D)790 mm (C1A / C3A)	Projection excluded (in all models)
Weight	A1A : approx. 290 kg A3A : approx. 300 kg C1A : approx. 325 kg C3A : approx. 340 kg	

Standard accessory

Item	Specification / Function	Q'ty	Correspondent model
Surge output cable	HOT / COM	2 pcs.	Common
Output cable to power supply lines	For single phase : L / N / PE	3 pcs.	A1A / C1A
	For 3-phase : L1 / L2 / L3 / N / PE	5 pcs.	A3A / C3A
Output cable to telecom lines	For 1 ~ 4 lines and GND	5 pcs.	C1A / C3A
Arrester unit	For coupling : Equipped to main unit panel	4 pcs.	C1A / C3A
	For input protection : Equipped to main unit panel	4 pcs.	
Cable for monitor	BNC - BNC cable	1 pc.	Common
External interlock connector	5P plug (Short between #1 - #3)	1 pc.	Common
Power supply cable	For AC 100 V, 3P equipped with G connector cable	1 pc.	Common
High voltage connector cap	Equipped to main unit panel	5 pcs.	A1A / C1A
		7 pcs.	A3A / C3A
FG cable	For grounding the body	1 pc.	Common
Instruction manual	-	1 volume	Common

● These products use parts containing mercury. Please comply with laws or regulation in countries or states the products are used for the disposal.

● Certain periodical inspection shall be recommended since consumable parts are contained in the products.

In the test to 3-phase 5 lines (with PE) power supply lines, a message which alert the inspection per around 200 sets (in the test to single phase (with PE) power supply lines, it is done per around 800 sets).

(1 set in this case means that the test shall be done with 2 levels (eg. 0.5 kV and 1 kV) for the test series according to IEC 61000-4-5)

* Exchange timing of the parts may differed depending on the operative conditions and environment. Please contact us for the more details.

Option

High-speed communication lines CDN for LSS-F03 series



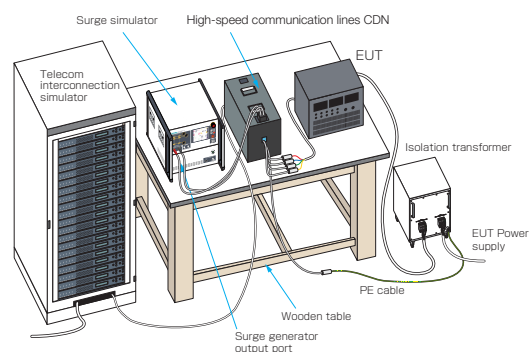
Defined in the IEC 61000-4-5, this CDN product is used to apply surges to unshielded symmetrical interconnection lines with speed up to 1000 Mbit/s.

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	2 kV	4 kV
EUT power capacity	DC 65V / 1 A	
Maximum line Number	8 lines	
EUT/AE connector	RJ-45	
Dimensions	(W)400 × (H)230 × (D)240 mm	

● Available model : LSS-F03 series, LSS-6330 series



CDN for Interconnection Lines for LSS-F03 series MODEL : LSS-INJ6401SIG



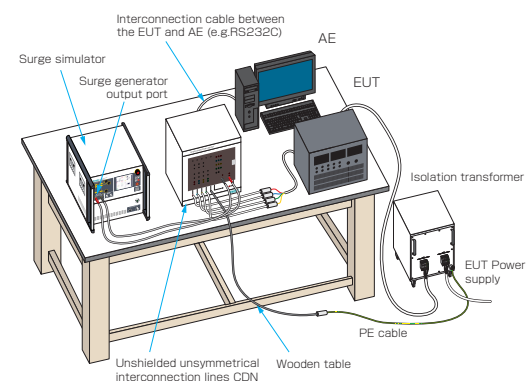
Used for the surge test to interconnection lines defined in IEC61000-4-5 Standard. The EUT power capacity is DC 50 V / 1 A and enable to inject the surge to interconnection lines up to 6,600 V. Possible to bypass inductor (20 mH) with connecting the attached connection plug to inductor bypass terminal in DC output. Possible to equip the attached surge protective arrester between each line and ground.

* The conversion (05-T1578)cable is needed additionally.

* The conversion (05-00165)cable is needed additionally.

Parameter	Specification
Surge input voltage	500 V ~ 6,600 V (Combination wave)
EUT power capacity	DC 50 V / 1 A
Max. line number	4 lines
Decoupling coil	20 mH each line
Matching resistor	40Ω ± 10%
Dimensions / Weight	(W) 488 × (H)456 × (D) 550 mm approx. 45 kg

● Available model : LSS-F03 series, LSS-6330 series



Telecom line CDN



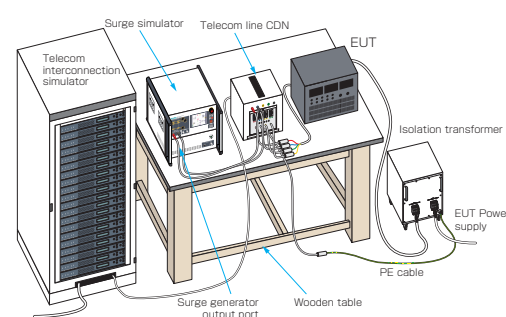
* The product in the photo is under development.

Defined in IEC61000-4-5, this CDN product is used to apply surges to interconnection lines for unshielded subject or telecom lines.

*Please inquire to us for details.

Item	Specificaion / Performance
Surge Input Volatage	6.6 kV
EUT Power Supply Capacity	DC 50 V 100 mA
Max. Line Number	4 Lines
Decoupling Coil	20 mH each line
Matching Resistor	40 Ω (1.2/50μs - 8/20μs Combination wave)
	25Ω (10/700μs - 5/320μs Combination wave)
Dimensions / Weight	(W)297 × (H)262 × (D) 250 mm / approx. 10 kg

● Available model : LSS-6330 series



AC Line Input Cable (Single phase) MODEL : 05-00134A

AC line input cable (3-phase) MODEL : 15-00135A

DC line input cable MODEL : 05-00136A

Option

OUTLET BOX



OUTLET BOX converts LINE output socket.

18-00081A	Outlet box 125V 15A 2P+PE	Btype(3Ptype、JP/USAtype) AC 125 V 15 A 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 4.55 kV
18-00083A	Outlet box	Europe CEE DIN 250 V 16 A MAX
18-T2300	3P terminal block conversion box	3P terminal block M6 with protective cover & Input up to 5 kV. * This is a custom product. Please contact us for details.
18-N2494	5P terminal block conversion box	5P terminal block M6 with protective cover & Input up to 5 kV. * This is a custom product. Please contact us for details.

● Available model : LSS-6330 series

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



Terminal connection board for the output of LSS-6230-A20 to connect EUT. By wiring with multi-outlet, plug compliant to each country's standard can be inserted directly.

single phase 3 lines (withstand vlotage 4.5 kV)
*Conversion cable (model: 05-00166A) is re-
quired.

● Available model : LSS-F03 series, LSS-6330 series

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



Terminal connection board for the output of LSS-6230-A20 to connect EUT. By wiring with multi-outlet, plug compliant to each country's standard can be inserted directly.

three phases 5 lines (withstand vlotage 4.5 kV)
*Multi-outlet is for single phase.

● Available model : LSS-F03 series, LSS-6330 series

Terminal Block for 3P MODEL : 18-00047A

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

● Available model : LSS-F03 series, LSS-6330 series

Terminal Block for 5P MODEL : 18-00044A

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

● Available model : LSS-F03 series, LSS-6330 series

EUT Protective Safety Box MODEL : 11-00005A/11-00006A



Protection box to prevent access to EUT during the test.
Further safety is secured together with the safety protective fence

MODEL	Dimensions
11-00005A	(W)400 × (D)300 × (H)300 mm
11-00006A	(W)600 × (D)400 × (H)350 mm

Protective Safety Fence MODEL : 11-00010A

Enable to materialize the safe test environment with connection to interlock function equipped in LSS-F03 series. The safety measure can be sure together with the EUT protective safety box.

Warning Lamp MODEL : 11-00008A



Alarm lamp for LSS series. Alarm lamp illuminated when high voltage is generated at the time of test

● Available model : LSS-F03 series, LSS-6330 series

Tri-color pilot light MODEL : 11-00015A



Usable together with LSS-6330-A20. The blinking makes the operators or neighbors pay attention to the test processing. Three colors indicate corresponding simulator's test status change.

● Available model : LSS-F03 series, LSS-6330 series

Optical USB module MODEL : 07-00022A



Conversion adapter to interface with PC for the remote control of LSS
USB to optical interface. Fiber cable 5 m included.

● Available model : LSS-F03 series, LSS-6330 series

Option

Isolation Transformer MODEL : TF-2302P



Model TF-2302P is a single-phase isolation transformer rated AC 240 V / 30 A and dielectric strength of 4 kV. For safety reason, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	Specification
Maximum input voltage	Single phase AC 240 V Max (50/60 Hz)
Maximum output current	30 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	(W)350 × (H)475 × (D)400 mm (Eye bolts and handles excluded) / approx. 60 kg

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



Model TF-6503P is a three-phase isolation transformer rated AC 600 V / 50 A and dielectric strength of 4 kV. For safety reason, an isolation transformer is indispensable for AC powered testing for equipment.

Parameter	TF-6503P Specification	TF-6633P Specification
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	(W)500 × (H)640 × (D)700 mm (Eye bolts and handles excluded) / approx. 300 kg	

Noise Canceller Transformer NCT series

It has superb attenuation characteristics against impulse noises. It can be used for insulate in the impulse noise test.
*Connection cable is needed to be modified when it is connected with the transformer. Please inquire us for details.



MODEL	Primary Voltage / Secondary Voltage	Rated current	Frequency
NCT-160	120 V	5 A	50/60Hz
NCT-1120		10 A	
NCT-1240		20 A	
NCT-260	240 V	2.5 A	
NCT-2120		5 A	
NCT-2240		10 A	

Circuit Breaker Box MODEL : 18-00072A/73A



Model TF-6503P is a three-phase isolation transformer rated AC600 V / 50A and dielectric strength of 4 kV. For safety reason, an isolation transformer is indispensable for AC powered testing for equipment.

Item	Specification (18-00072A)	Specification(18-00073A)
Rated Voltage	AC 250 V 50/60 Hz DC 65 V	AC 240 / 415 V 3-phase 4-line Y-connection 50/60 Hz AC 240 V: Line - Neutral pole (N pole) AC 415 V: Line - Line
Rated Current	20 A	50 A
Switching life	≥ 10000 times (test conditions: rated switching 6000 times, switching without load 4000 times, switching frequency 6 times/min.)	
Neutral pole(N pole)	-	No trip alone Neither open-circuit before pther poles nor closed-circuit after the other poles
Operating Temperature / Operating Humidity	15 - 35°C / 25-75% (without dew)	
Dimensions	(W)180 × (H)92 × (D)100 mm (protrusion excluded)	(W)180 × (H)92 × (D)120 mm (protrusion excluded)
Weight	0.75 kg	1.2 kg

● Available model : LSS-6330 series

Option

Arrester capacitor unit MODEL : 08-00012A

Arrester unit for surge decoupling.

● Available model : LSS-F03 series

Arrester capacitor unit MODEL : 08-00016A

Arrester unit for surge coupling

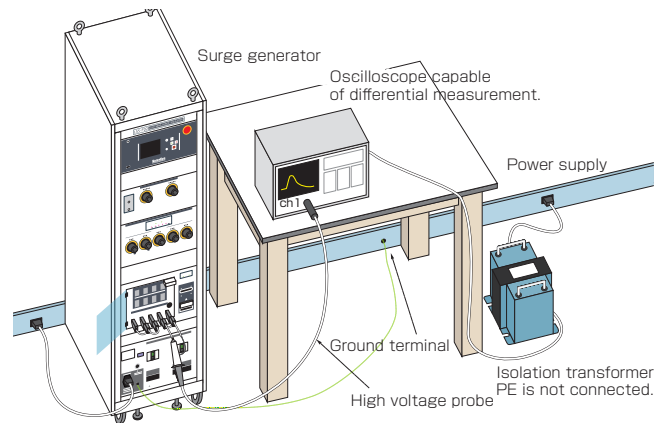
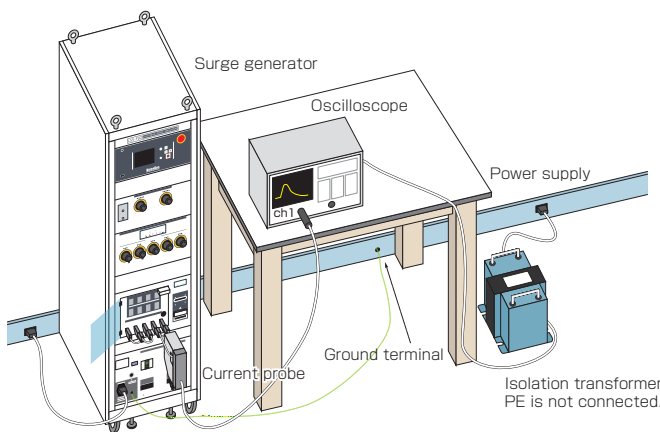
● Available model : LSS-F03 series

Telecom waveform check cable set MODEL : 05-00150A

The Jig used when measure the output waveform from the CDN for telecom line.

The following equipment is required additionally.

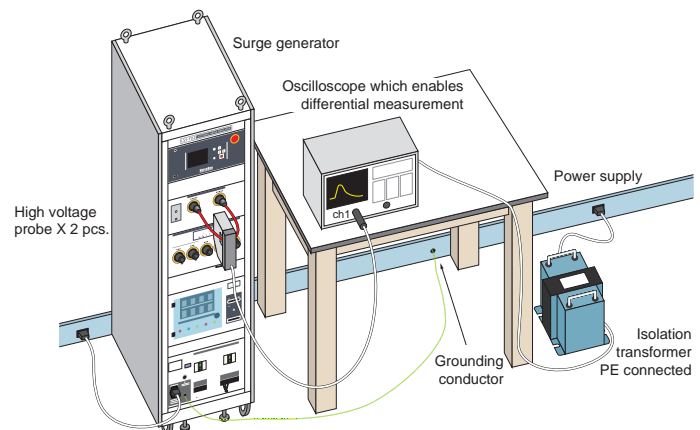
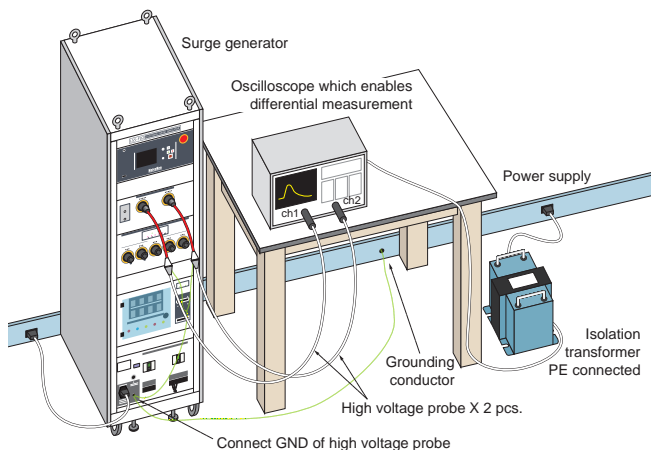
- Oscilloscope (with differential operation function)
- High voltage probe (when measuring surge voltage / withstand voltage required)
- Current probe (when measuring surge short-circuit current)
- Insulation transformer (for oscilloscope)

■ Surge waveform measurement (measurement example at the telecom line CDN terminal at 05-00150A)**Waveform Pre-Checking Cables Set MODEL : 05-00099A**

Fixtures for checking voltage waveforms and current waveforms of LSS-F03 series.

Followings are necessary for the checking additionally.

- Oscilloscope (Differential operation function built-in)
- High voltage probes (for surge voltage measurement / Voltage resistibility necessary)
- Current probe (For surge short current measurement)
- Isolation transformer (for oscilloscope)
- Earth cable (for PE connection)

■ Surge Waveform Measurement (Setup of measurement from SURGE OUT with 05-00099A)

* Measurement of short current waveform from AC /DC CDN is not possible with the waveform pre-checking cables set (05-00099A)

IEC61000-4-5 Ed.3 Test Standard

1. General

The task of the described laboratory test is to find the reaction of the EUT under specified operational conditions, to surge voltages caused by switching and lightning effects at certain threat levels. This standard specifies 2 kinds of the combination waveforms. One is simulating the injection to power supply lines and interconnections lines (The voltage waveform as 1.2/50 μ s and current waveform as 8/20 μ s) and the other is doing the injection to telecommunications lines (The voltage waveform as 10/700 μ s and current waveform as 5/320 μ s). It is not intended to test the capability of the EUT's insulation to withstand high-voltage stress, direct injections of lightning currents, i.e., direct lightning strikes, are not considered in this standard.

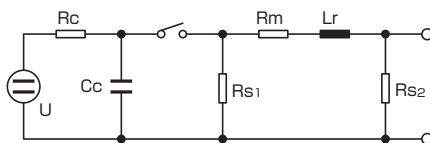
2. Test Level

Level	Open-circuit test voltage kV	
	Normal model	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.

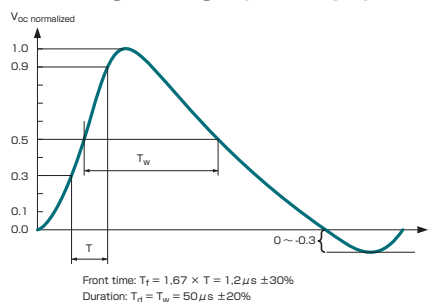
3. Waveforms Generator and Waveforms verification

Generation Circuit

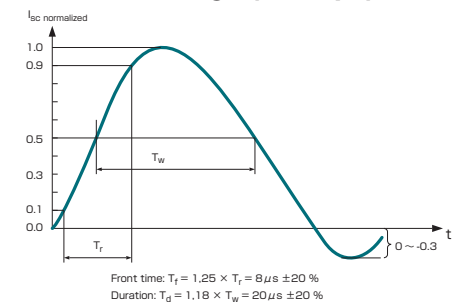


U High-voltage source
Rc Charging resistor
Cc Energy storage capacitor
Rs Pulse duration shaping resistors
Rm Impedance matching resistor
Lr Rise time shaping inductor

Voltage Surge (1.2/50 μ s)



Current Surge (8 / 20 μ s)



1.2/50 μ s Combination Waveform specification

	Front time $T_f \mu s$	Duration $T_d \mu s$
Open-circuit voltage	$T_f = 1.67 \times T = 1.2 \pm 30\%$	$T_d = T_w = 50 \pm 20\%$
Short-circuit current	$T_f = 1.25 \times T_r = 8 \pm 20\%$	$T_d = 1.18 \times T_w = 20 \pm 20\%$

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

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

Open circuit voltage *	Coupling impedance	
	18 μ F (line to line)	9 μ F + 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	1.2 $\mu s \pm 30\%$	1.2 $\mu s \pm 30\%$
Duration	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

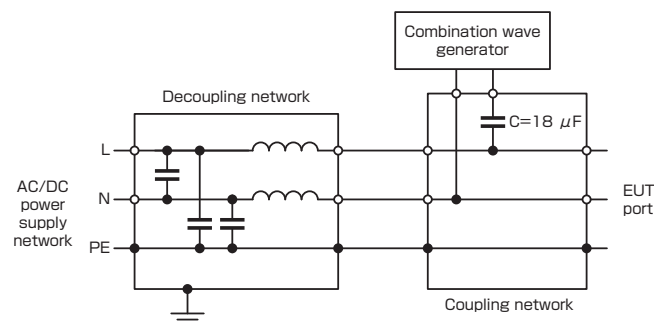
■ Current waveform specification at the EUT port of the power line CDN (short-circuit current)

Surge current parameters under short-circuit conditions	Coupling impedance	
	18 μF (line to line)	9 μF + 10 Ω (line to ground)
Front time	$T_f = 1,25 \times T_r = 8\mu\text{s} \pm 20\%$	$T_f = 1,25 \times T_r = 2,5\mu\text{s} \pm 30\%$
Duration	$T_d = 1.18 \times T_w = 20\mu\text{s} \pm 20\%$	$T_d = 1,04 \times T_w = 25\mu\text{s} \pm 30\%$

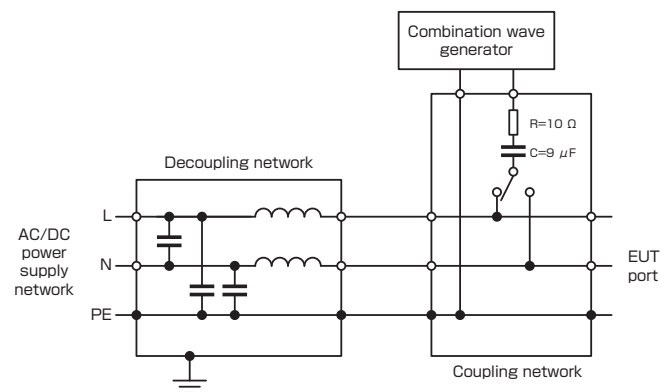
■ Relationship between peak open-circuit voltage and peak short-circuit current at the EUT port of the power line CDN

Open-circuit peak voltage $\pm 10\%$ at EUT port of the CDN	Short-circuit peak current $\pm 10\%$ at EUT port of the CDN (18 μF)	Short-circuit peak current $\pm 10\%$ at EUT port of the CDN (9 μF + 10 Ω)
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

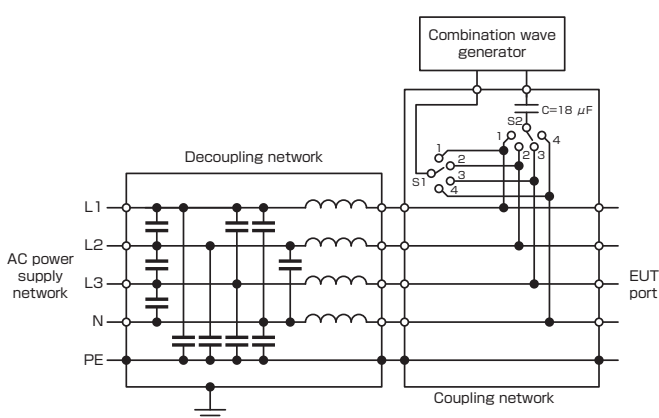
■ Single phase power line CDN (line to line mode)



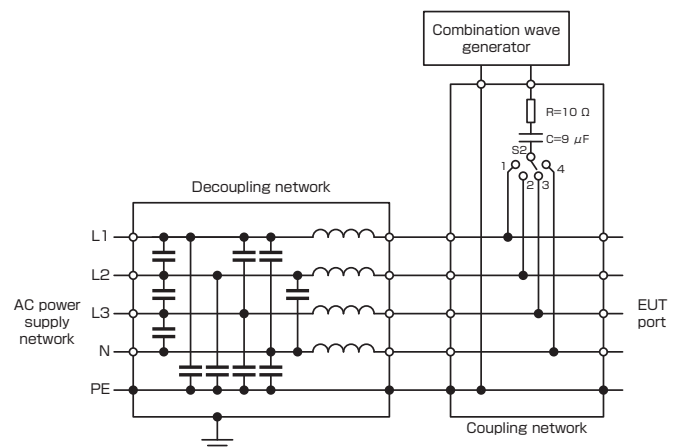
■ Single phase power line CDN (line to ground mode)



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

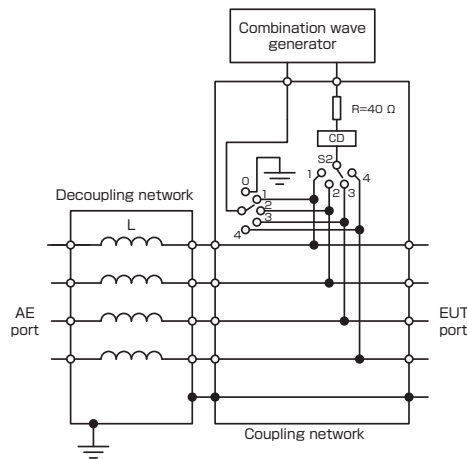


■ Three-phase power line CDN (line to ground mode)

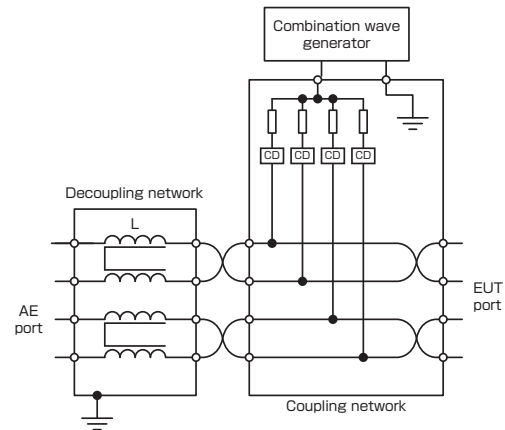


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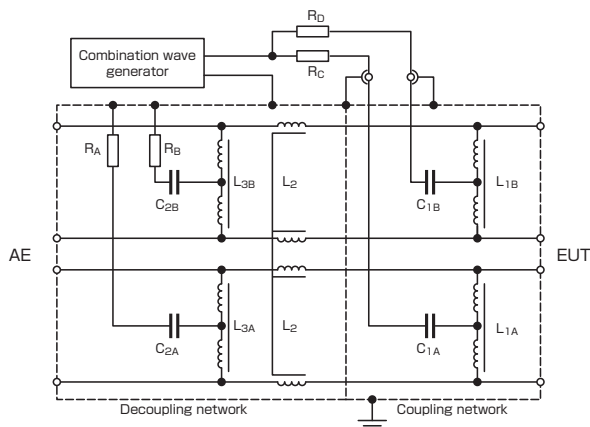
■ CDN for unshielded unsymmetrical interconnection lines



■ 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	Voltage at the EUT port of the CDN $V_{oc} \pm 10\%$	Voltage front time $T_f = 1,67 \times T_r \pm 30\%$	Voltage duration $T_d = T_w \pm 30\%$	Short-circuit current at the EUT port of the CDN $I_{sc} \pm 20\%$	Current front time $T_f = 1,25 \times T_r \pm 30\%$	Current Duration $T_d = 1,18 \times T_w \pm 30\%$
Line to PE $R = 40\ \Omega$, $CD = 0,5\ \mu F$	4 kV	4 kV	1,2μs	38μs	87 A	1,3μs	13μs
Line to PE $R = 40\ \Omega$, $CD = GDT$	4 kV	4 kV	1,2μs	42μs	95 A	1,5μs	48μs
Line to line $R = 40\ \Omega$, $CD = 0,5\ \mu F$	4 kV	4 kV	1,2μs	42μs	87 A	1,3μs	13μs
Line to line $R = 40\ \Omega$, $CD = GDT$	4 kV	4 kV	1,2μs	47μs	95 A	1,5μs	48μs

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

Coupling method	Output voltage from the generator	Voltage at the EUT port of the CDN $V_{oc} \pm 10\%$	Voltage front time $T_f = 1,67 \times T_r \pm 30\%$	Voltage duration $T_d = T_w \pm 30\%$	Short-circuit current at the EUT port of the CDN $I_{sc} \pm 20\%$	Current front time $T_f = 1,25 \times T_r \pm 30\%$	Current Duration $T_d = 1,18 \times T_w \pm 30\%$
Line to PE $R = 40\ \Omega$ Coupling devices*	2 kV	2 kV	1,2μs	45μs	48 A	1,5μs	45μs

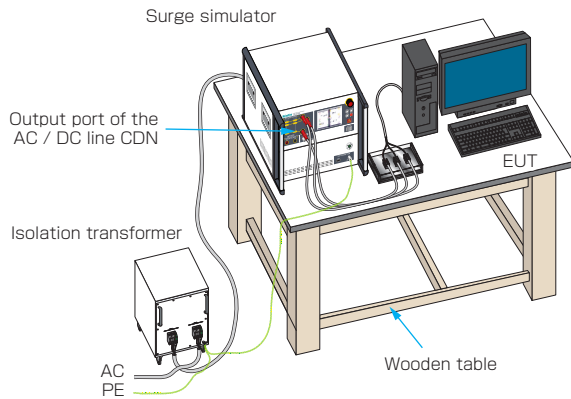
* GDT, Clamping device, Avalanche devices

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, calibration shall perform at that maximum voltage. (In the case of the maximum voltage is 6 kV, multiply the short circuit current value shown in this table by 1.5.)

IEC61000-4-5 Ed.3 Test Standard

5. Test Set-ups

■ Application of surges to power supply lines



The 1.2/50 combination wave (C/W) specified in the IEC 61000-4-5 standard is applied through the power lines CDN of the LSS-6330 simulator. Compliant with the standard requirements, the simulator is of floating output. The simulator can conduct a series of tests to preprogrammed settings.

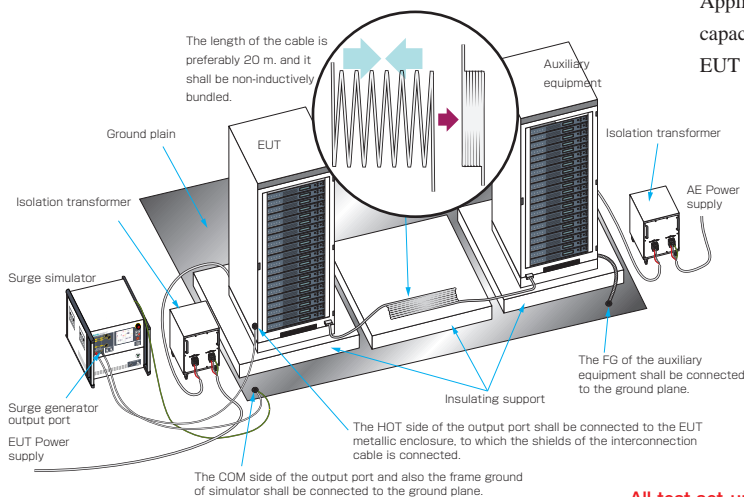
■ Application of surges through unshielded unsymmetrical interconnection lines CDN

The 1.2/50 μ 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)

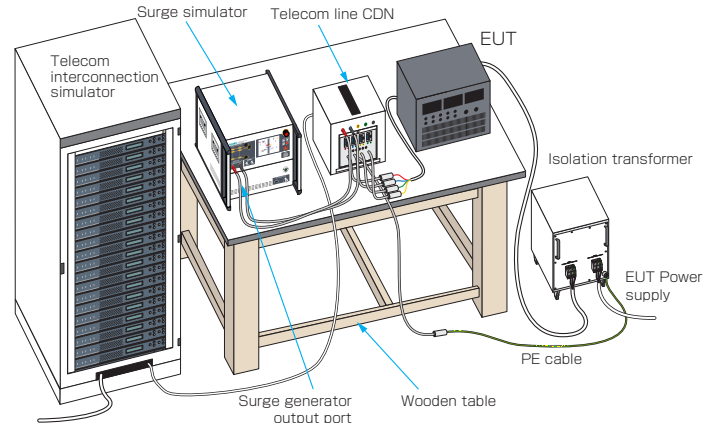
For all tests shown here, if it is not otherwise specified, the length of cable between the EUT and CDN should be 2m or shorter.

■ Test set-up for surges applied to shielded lines

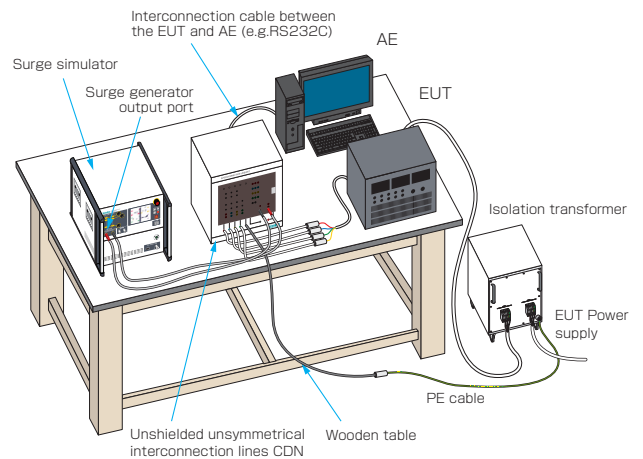
In case of shield lines, surge shall be applied to the metal enclosure of the EUT (for the EUT without a metallic enclosure, surges shall be applied to the shields of the cable)



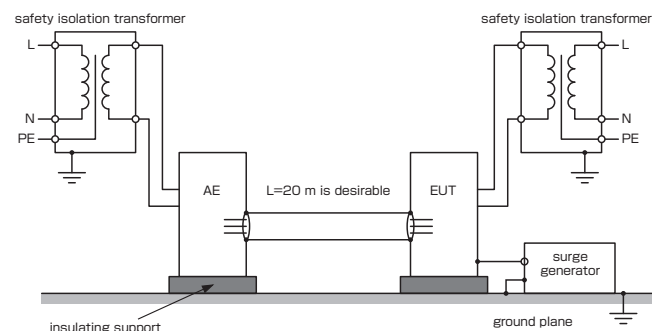
■ Application of surges to telecom lines



The 1.2/50 combination wave (C/W) specified in the IEC 61000-4-5 standard is applied through the telecom lines CDN of the LSS-6330 simulator.



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



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

IEC61000-4-5 Ed.3 Test 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.

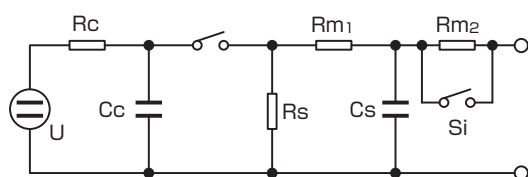
Generally speaking, as far as the EUT can be immune to the surges which is injected in the all specified period and it satisfy the functional requirements according to the product specification, the test result can be judged as “Good”.

The test report shall contain the test conditions and the result.

8. Surge testing for unshielded outdoor symmetrical communication lines

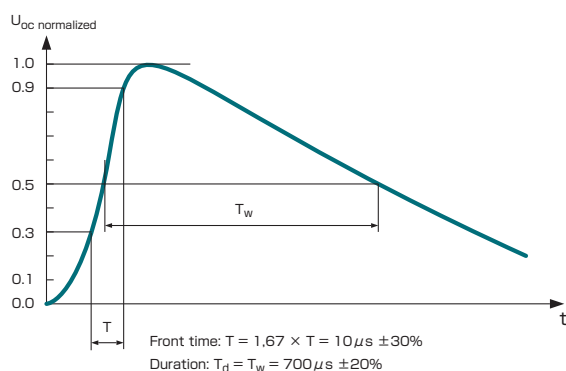
The 3rd edition of the standard requires the 10 / 700 μ s combination wave is applied to ports connected to outdoor telecommunication lines only and the Annex A (Normative) dedicatedly address this test. Outdoor telecommunication lines are typically greater than 300 in length, as the result of this length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

■ 10 / 700 combination waveform (10 / 700 · 5 / 320 μ s) generation circuit

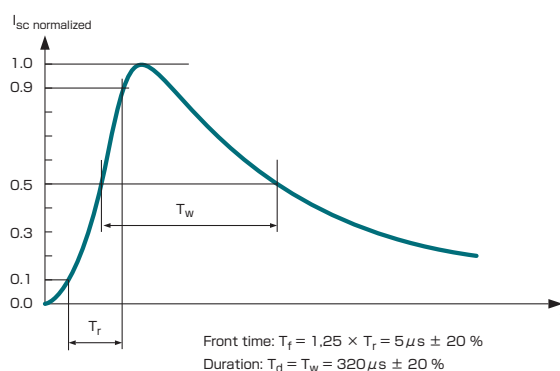


U	High-voltage source
Rc	Charging resistor
Cc	Energy storage capacitor
Rs	Pulse duration shaping resistor
Rm	Impedance matching resistors
Cs	Rise time shaping capacitor
Si	Switch closed when using external matching resistors

■ Open circuit voltage waveform



■ Short circuit current waveform



IEC61000-4-5 Ed.3 Test Standard

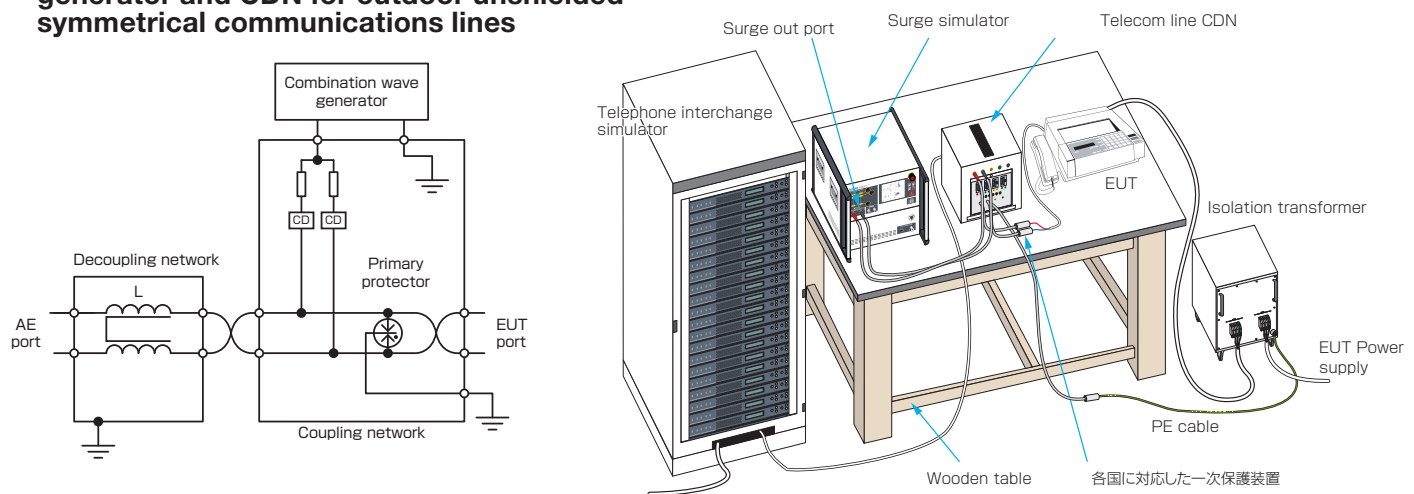
Definitions of the waveform parameters of 10/700 μ s combination waveform

	Front time μ s	Duration μ s
Open-circuit voltage	$10 \pm 30 \%$	$700 \pm 20 \%$
Short-circuit current	$5 \pm 20 \%$	$320 \pm 20 \%$

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

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

Test set-up example by using the 10/700 μ s 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 V_{oc} $\pm 10 \%$	Voltage front time $T_f = 1,67 \times T_r$ $\pm 30 \%$	Voltage duration $T_d = T_w$ $\pm 30 \%$	Short-circuit current at the EUT port of the CDN I_{sc} $\pm 20 \%$	Current front time T_f $\pm 30 \%$	Current duration T_d $\pm 30 \%$
Common mode Coupling devices 1 pair 27,5 Ω	4 kV	4 kV	8 μ s	250 μ s	145 A	3,2 μ s	250 μ s

Note: These test set-ups and procedures are quoted from IEC61000-4-5 Ed.3 (2014) Standard. Please go through the standard if the more details are required.

Lightning Surge Simulator

LSS-720B2

Feature

- Lightning surge simulator (Generator) conforming to JEC 210 / 212 Standard
- 20 kV as the maximum output voltage
Enable to verify dielectric strength against induced lightning surge whose level cannot be available with the combination surge simulators
- 4000 A as the maximum output current
Enable to conduct testing for surge absorbers for their current handling capability
- Enable to observe the output waveform only with an oscilloscope on hand and 1 / 10 voltage probes since 1 / 100 waveform check terminal is standard equipped
- Isolation transformer built-in so that the primary power input and EUT can be easily connected



Specification

Parameter	LSS-720B	
Voltage surge	Output waveform	1.2/50 μ s
	Max. output voltage	20 kV
	Polarity	Positive or negative
	Output impedance	6 $\Omega \pm 10 \%$
	Built-in load resistance	50 $\Omega \pm 10 \%$ (Current limit resistance 100 Ω)
	Short current at max. output	3300 A
Current surge	Output waveform	8 / 20 μ s
	Max. output current	4000 A
	Polarity	Positive or negative
	Output impedance	5 $\Omega \pm 10 \%$
	Built-in load resistance	3 k $\Omega \pm 10 \%$
Surge repetitive cycle single output		Single output
EUT power capacity		Single phase 240 V / 20 A
Dimensions		(W) 555 × (H) 1860 × (D) 840 mm
Weight		Approx. 450 kg

Accessory

Item	Model number	Q'ty
Bag for accessories		1 pc.
Power cable		1 pc.
Surge ground cable		1 pc.
Switch for external trigger	04-00003A	1 pc.
Surge output cable		1 pc.
Single phase input cable	05-00003A	1 pc.
Check terminal	02-00023A	1 pc.
Residual voltage discharge probe		1 pc.
Warning lamp		1 pc.
Fuse		2 pcs.
Output cable	05-00015A	2 pcs.
Interlock connector		1 pc.
Instruction manual		1 volume
Switch key		2 pcs.
Waveform switching connection bar		6 pcs.