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.

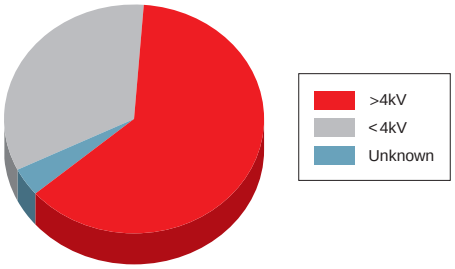
- Lightning surge simulator compliant with the IEC61000-4-5 Edition 3 requirements
- Maximum output voltage 15 kV (maximum coupling of 15 kV to AC / DC CDN and 6 kV to Telecom CDN) Enables to conduct the more extended reliability test including the destructive test
- Large size LCD for the operation 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 modes. 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 with a BNC cable
- Isolation transformers available (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).

15kV Output Voltage, 7500A Current Enable EUT destruction resistance test

Approx. 60% of the users are conducting the test with voltage more than the IEC standard regulated voltage.

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

Test voltage of lightning surge immunity test



Based on the market research by NoiseKen in 2010

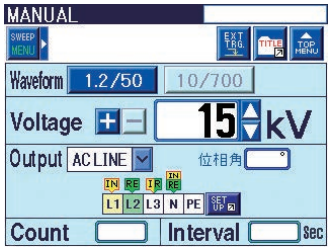
Prevent the Resonance with the Power supply! Inductance constant switching function

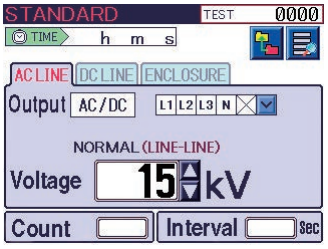
Resonance phenomenon may occur in some EUTs when connected to the lightning surge simulator, causing malfunctions. By switching the inductance constant, it is possible to shift the resonance phenomenon and operate the EUT normally. Even when this function is used, the output waveform satisfies the IEC Standard regulations.
(Inductance constant values: 0.8 mH/ 1.0 mH/ 1.3 mH/ 1.5 mH)
* This function is available as a custom order. Please contact us for details.

Inductance Constant switch section

"Touch-panel" adopted for easy test setting

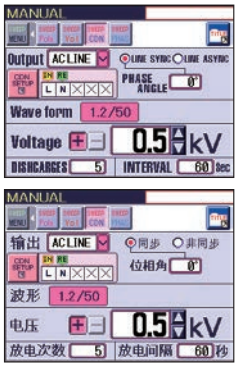
Adopted LCD touch panel for pursuing high visibility and realizing user-friendly operation with affluent icons.
Also, easy operation is realized not only for the test according to IEC Standard but also for the sequential tests with the parameter sweep function.





"Multi-languages" for easy operation processing available

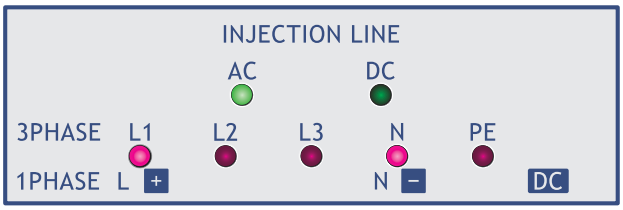
English, Japanese, Chinese and Korean languages available for easy operation processing.

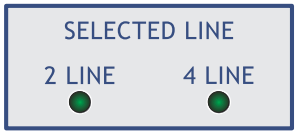


LSS-F03 series

"Indicator" which is linked with the test setting equipped

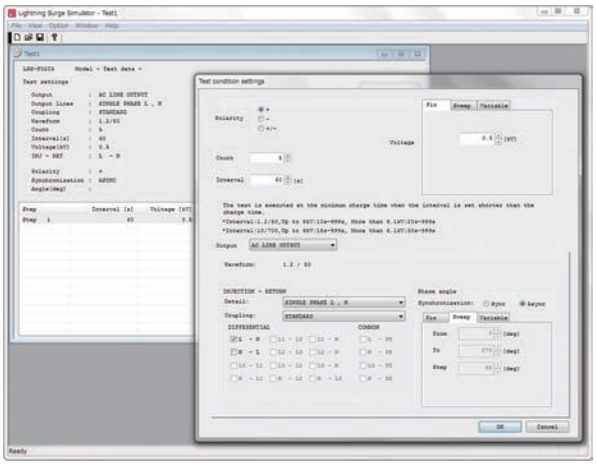
Indicators which visualize the cables connections in the test equipped.





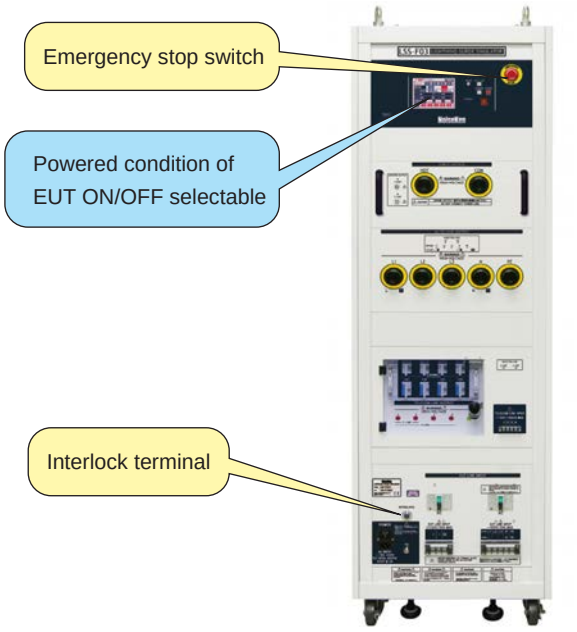
PC control available with the optional software

Dedicated software allows control from an external Windows® PC. enabling to output the test result report as a record.
* Software is available for download from our website.



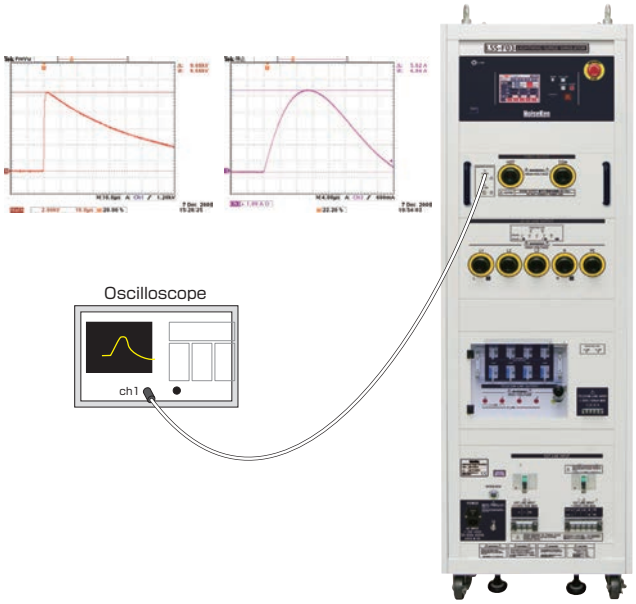
"Emergency stop" & "Interlock terminal" to ensure the test operator's safety

Emergency stop function esuring safety of the test operator equipped both in the main body and the software. Also, the interlock setting and output voltage limit function equipped.
Protective safety fence and protective safety box are available as options for a more safe test.



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

Monitor terminal adopted to allow a simple waveform check before the test.
*The terminal is just for simple checking.
If an accurate measurement is required, the specialized equipment is necessary.
Please contact us for more details.



Model numbers meaning:

LSS-F03-□□A
- 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 : 1.2/50μs-8/20μs (generates 1 surge type)
- C : 1.2/50μs-8/20μs、10/700μs-5/320μs (2 types)

Specifications

■Parameter	Specification		Note
Surge generating unit			
1.2/50μs - 8/20μs Combination waveforms	Output voltage	0.5 kV ～ 15 kV ± 10%	
	Front time	1.2μs ± 30%	Common for all models
	Duration	50μs ± 20%	Voltage step : 0.1 kV step
	Output current	250 A ～ 7500 A ± 10%	The setting can be from 0 kV
	Front time	8μs ± 20%	
	Duration	20μs ± 20%	
10/700μs-5/320μs Combination waveforms	Output voltage	0.5 kV ～ 15kV ± 10%	
	Front time	10μs ± 30%	Models : C1A / C3A
	Duration	700μs ± 20%	Voltage step : 0.1 kV step
	Output current	12.5 A ～ 375 A ± 10%	The setting can be from 0 kV
	Front time	5μs ± 20%	
	Duration	320μs ± 20%	
Output polarity	Positive / Negative		
Interval	10 sec. ～ 999 sec., depending on the set voltage 10 sec. (< 6 kV)		15 sec. ～ in 10/700μs waveform
Output impedance	2 Ω ± 10%		1.2/50μs waveform
	40 Ω ± 10%		10/700μs waveform

■AC/DC CDN			
Coupling surge waveform	1.2/50μs - 8/20μs combination waveforms		
Max. coupling surge voltage / current	Up to the values which can be set		
Coupling network	18 μF	Between LINE - LINE (10 Ω + 9 μF selectable)	
Correspondent to IEC61000-4-5	10 Ω ± 9 μF	Between LINE - PE (18 μF 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° ± 10°		

■CDN for Telecom lines (Only in models C1 and C3)			
Coupling surge waveform	1.2/50μs - 8/20μs combination waveforms		
	10/700μs - 5/320μs combination waveforms		
Max. coupling surge voltage / current	6 kV (waveform guaranteed up to 2 kV for 1.2/50μs waveform and up to 4 kV for 10/700 waveform)		
Impedance matching resistors	40 Ω	80 Ω per 1 line at 2 lines	1.2/50μs waveform
		160 Ω per 1 line at 4 lines	
	25 Ω per line		10/700μs waveform
Coupling mode	Common mode		
Coupling network	Gas arrestor : 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 ± 10%	In open-circuit for SURGE OUT
Current monitor	BNC output, 1 mV / A ± 10%	In short-circuit for SURGE OUT
External communication	RS-232C optical communication	
Power supply	AC 100 V ～ AC 240V ± 10% 50/60Hz	
Power Consumption	400 VA	
Dimensions	(W)555 × (H)1450 × (D)790 mm (A1A / A3A), (W)555 × (H)1800 × (D)790 mm (C1A / C3A)	Protrusions excluded (in all models)
Weight	A1A : approx. 290 kg A3A : approx. 300 kg C1A : approx. 325 kg C3A : approx. 340 kg	

Standard accessories

Parameter	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
Arrestor unit	For coupling : Equipped to main unit panel	4 pcs.	C1A / C3A
	For input protection : Equipped to main unit panel	4 pcs.	
Monitor cable	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

● 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 differ depending on the operative conditions and environment. Please contact us for more details.

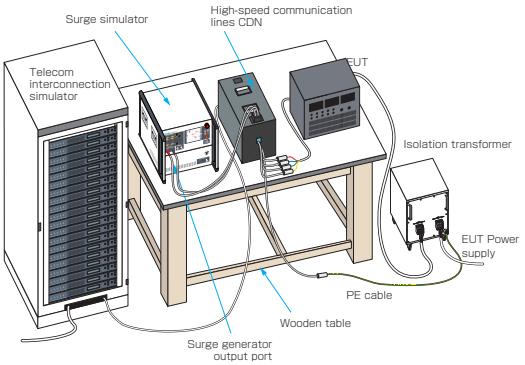
Options

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-6330A 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	

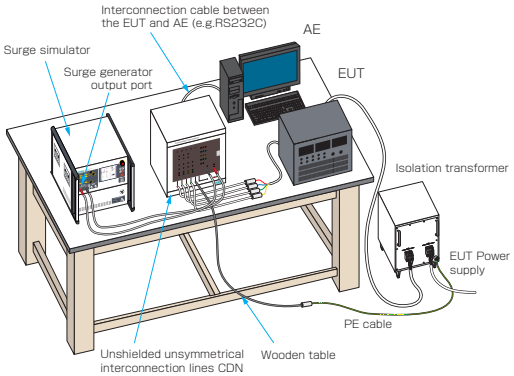


CDN for Interconnection Lines MODEL : LSS-INJ6401SIG

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 arrestor 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-6330A simulator.

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

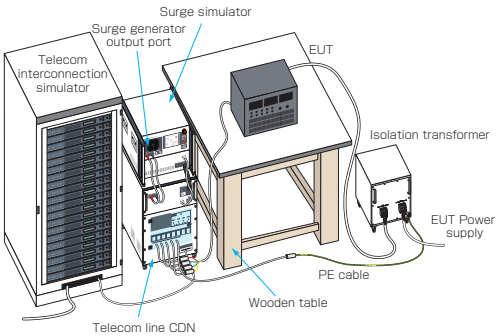


Telecom CDN for LSS-6330A MODEL : LSS-6330ATEL

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 Ω (1.2/50μs - 8/20μs Combination wave) 25Ω (10/700μs - 5/320μs Combination wave)
Dimensions / Weight	(W) 430 x (H) 695 x (D) 686mm Approx. 75kgs

● **Compatible models : LSS-6330A series**



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-6330A 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℃　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 ** 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 5kV ** This is a custom product. Please contact us for details.*

● Compatible models : LSS-6330A series

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

A relay terminal board for connecting the output of the LSS-6330A 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. Not required for LSS-6330A series.

● Compatible models : LSS-F03 series, LSS-6330A series

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

A relay terminal board for connecting the output of the LSS-6330A 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. Not required for LSS-6330A series.

● Compatible models : LSS-F03 series, LSS-6330A series

Terminal Block for 3P MODEL：18-00047B

Terminal block board for CDN to connect EUT. 3 pins
*Conversion cable (model: 05-00166A) is required. Not required for LSS-6330A series.

● Compatible models : LSS-F03 series, LSS-6330A 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. Not required for LSS-6330A series.

● Compatible models : LSS-F03 series, LSS-6330A series

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 is 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：11-00008B

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

● Compatible models : LSS-F03 series, LSS-6330A series

Tri-Color Pilot Light MODEL：11-00015A

Tri-color pilot light for LSS-6330A 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.

● Compatible models : LSS-6330A series

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).

● Compatible models : LSS-F03 series, LSS-6330A series

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

DC line input cable MODEL : 05-00136A

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

Options

Arrester capacitor unit　MODEL : 08-00012A

Arrester unit for surge decoupling.

● **Compatible models : LSS-F03 series**

Arrester capacitor unit　MODEL : 08-00016A

Arrester unit for surge coupling

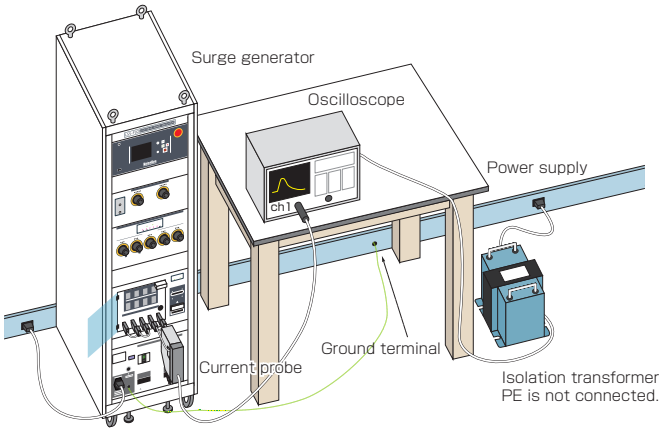
● **Compatible models : LSS-F03 series**

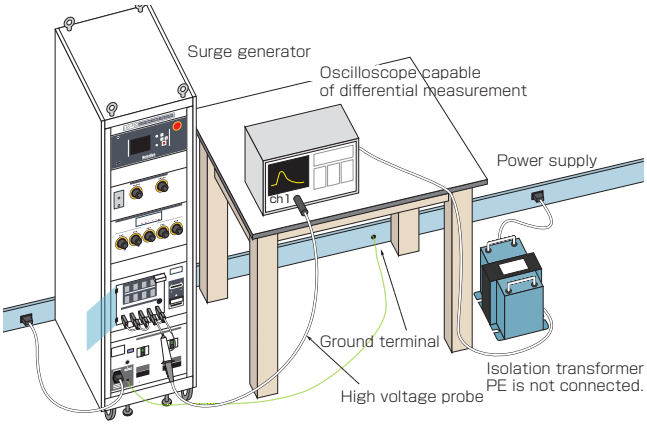
Telecom waveform check cable set　MODEL：05-00150A

Jig used for measuring 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)
- Isolation transformer (for oscilloscope)

● **Compatible models : LSS-F03 series**

■Surge waveform measurement (measurement example at the telecom line CDN terminal at 05-00150A)

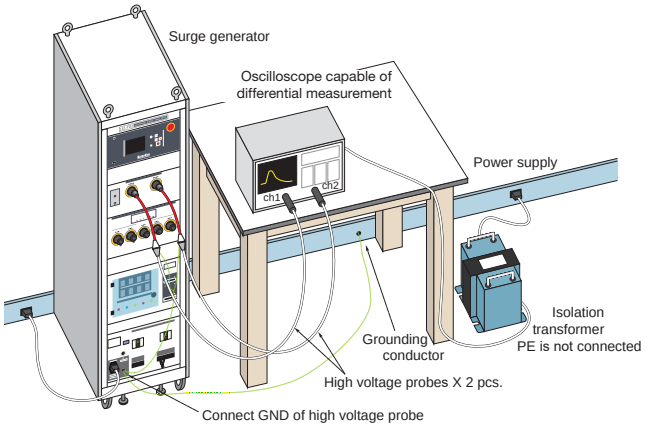


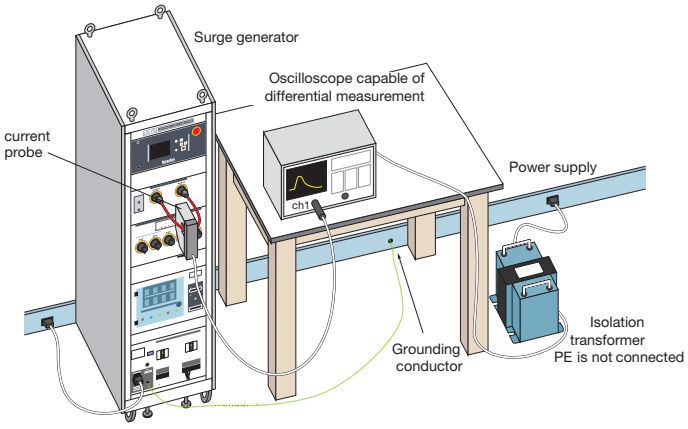


Waveform Checking Cables Set　MODEL : 05-00099A

Jig 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)