

LSS-F02

Conforming to IEC61000-4-5 ed2 Standard

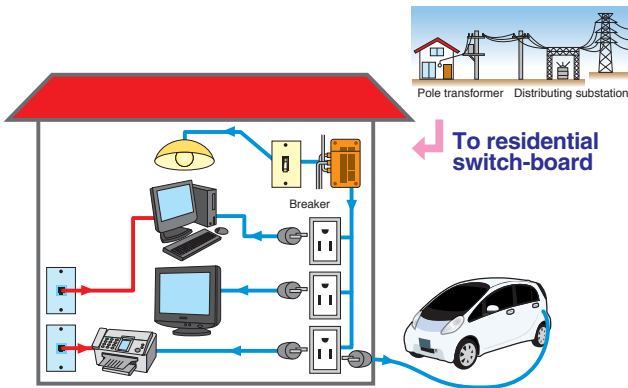


Lightning Surge Simulator

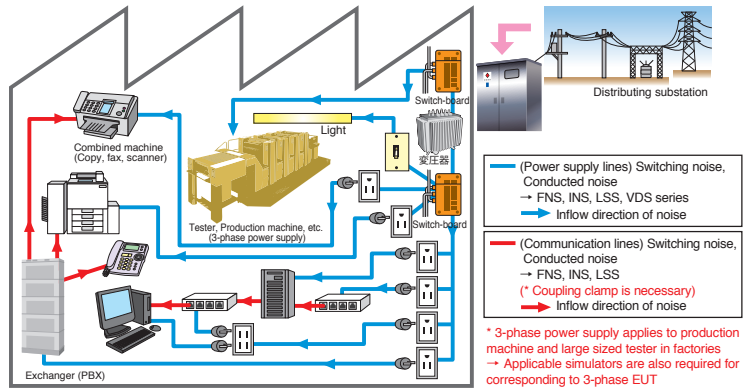
Conforming to IEC61000-4-5 ed2 Standard

LSS-F02 series

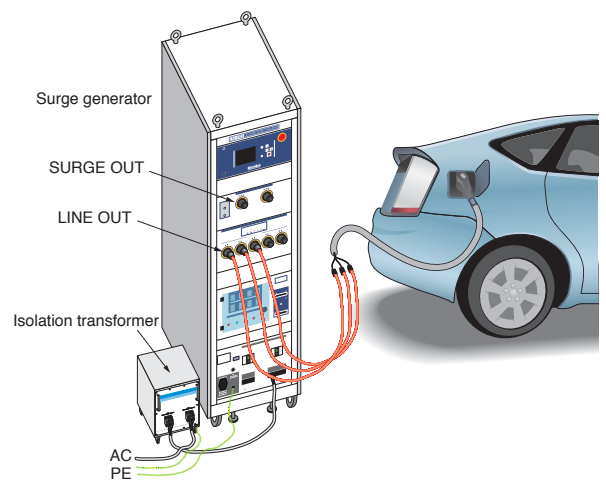
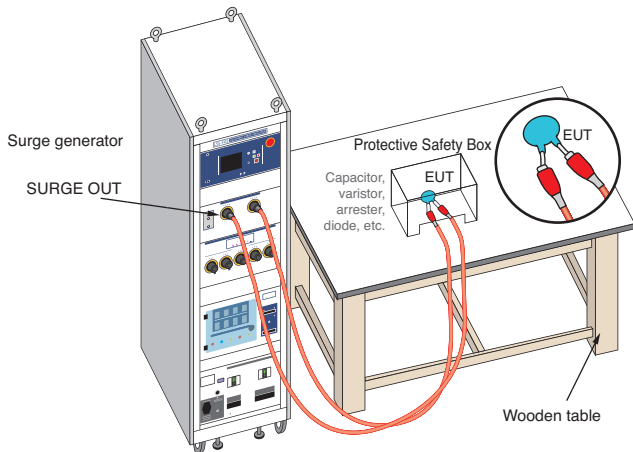
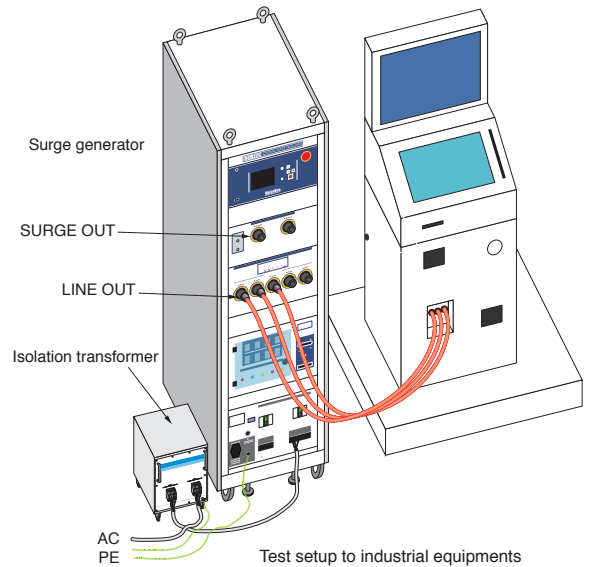
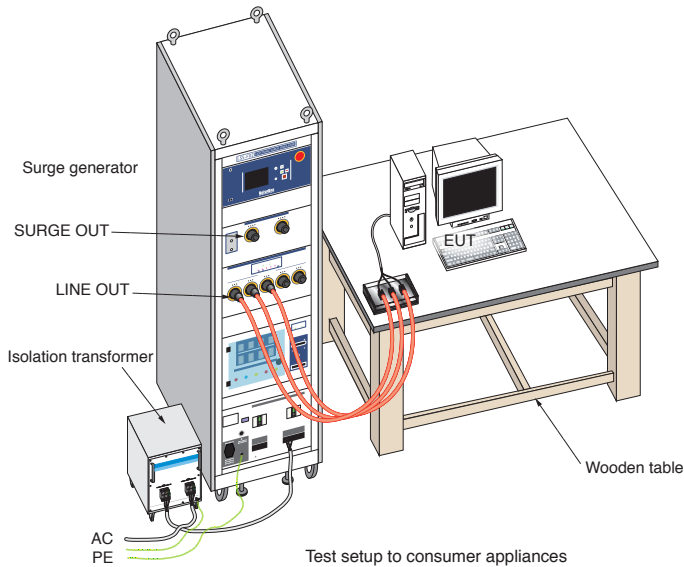
- A simulator to reproduce “High energy induced lightning noise” which is induced by potential change on the ground, or done to power lines or telephone lines as result of lightning current. Dedicated to evaluate performance of electronic equipments which are connected to power lines and telephone lines come from the outdoors or interconnection lines between buildings and the others or the floors and the other floors whether the equipments may be malfunctioned, deteriorated or resistible.



Noise inflow image into a residence



Noise inflow image into a factory



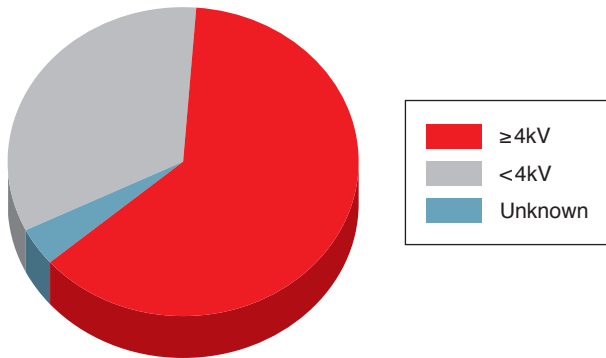
●Feature of LSS-F02 : "More safety, reliable and easy test realized"●

**"Output voltage 15kV, current 7500A"
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

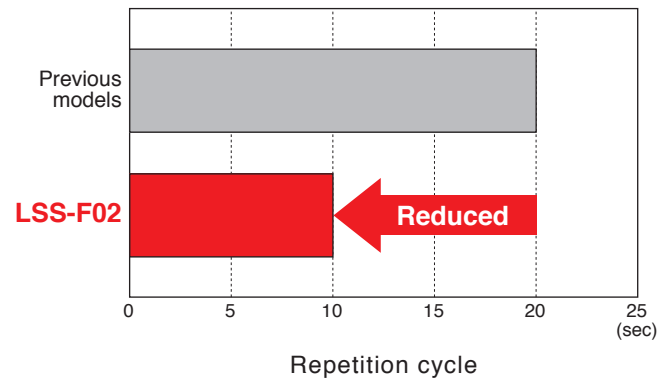


Quoted from the market investigation by NoiseKen on 2010

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

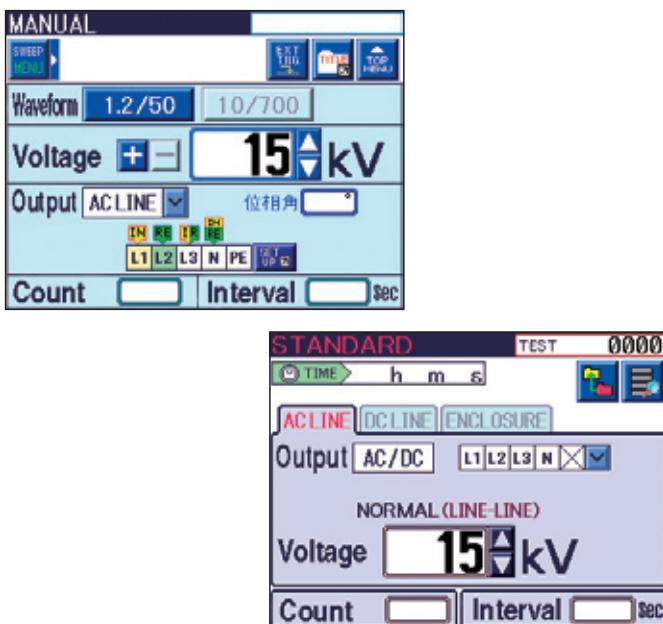
Realize 1/2 of the interval time comparing to our previous models so as to contribute to reduction of the man-hour for the test.

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



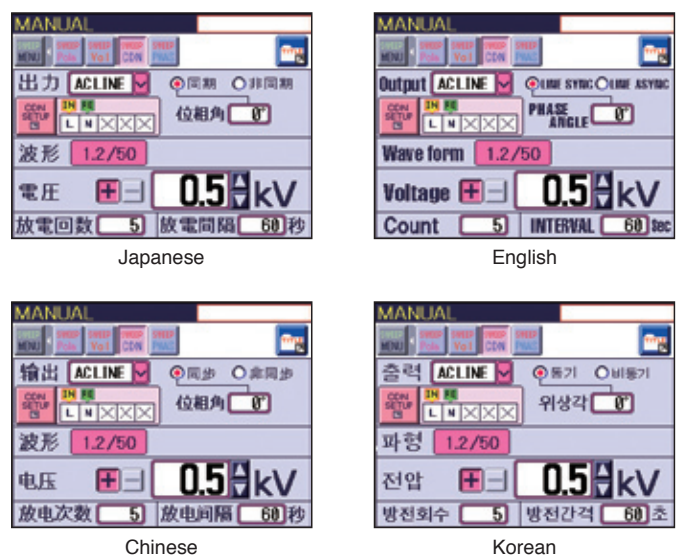
**"Touch-panel"
adopted for the easy test setting**

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.



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

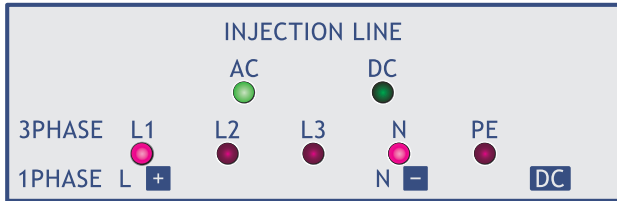
Not only Japanese and English but also Chinese and Korean available for the easy operation processing.



●Feature of LSS-F02 : "More safety, reliable and easy test realized"●

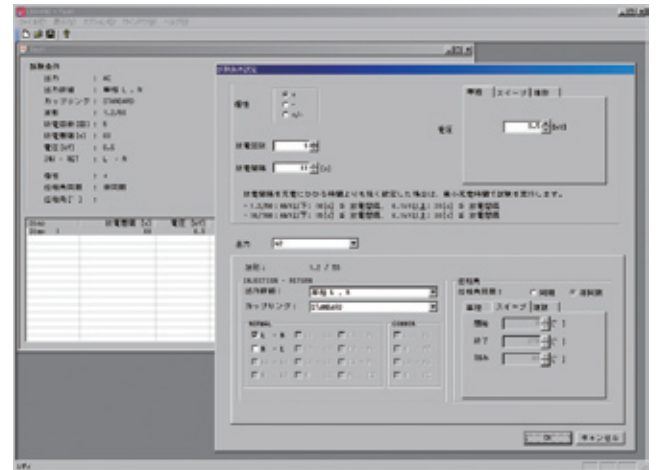
"Indicator"
which is linked with the test setting equipped

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.

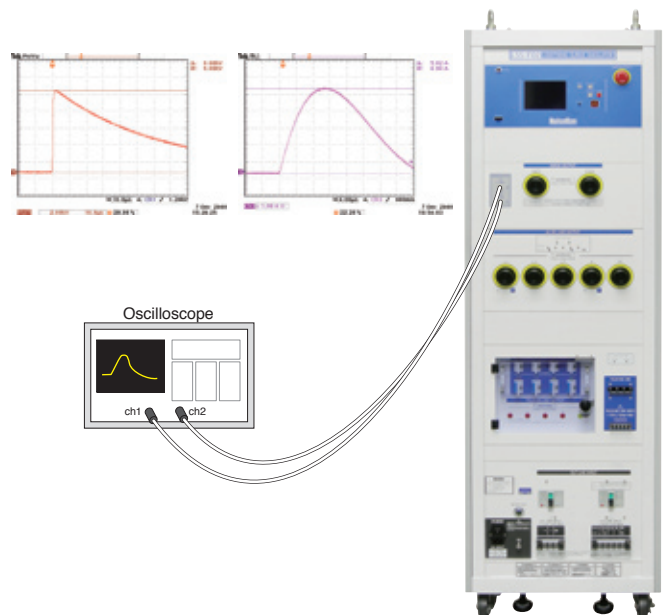
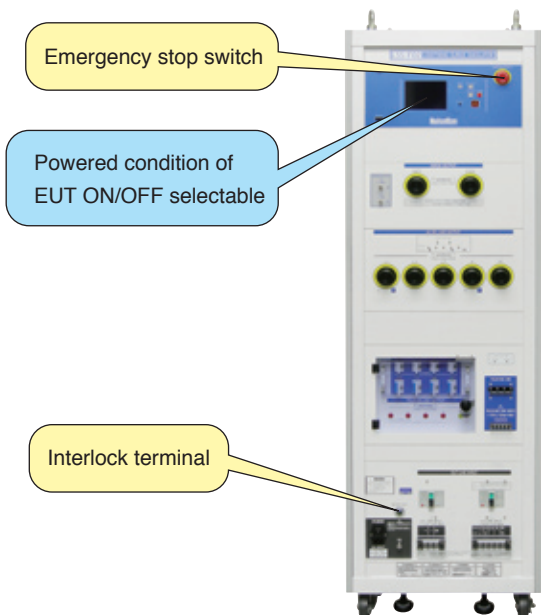
Emergency stop function which takes safety of the test operator into the account equipped both in the main body and the software. Also, the interlock setting and output voltage control function equipped.

If the protective safety fence and protective safety box are adopted as the options, more safety test can be realized.

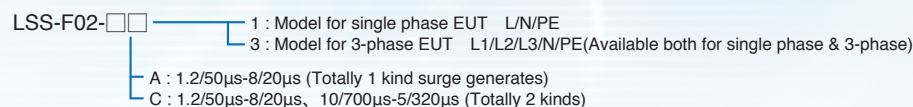
"Output waveform monitor terminal"
which can ease pre-checking of the waveforms prior to the actual test

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-F02 series specification ●

Specification

| Parameter | Specification | Note | | |
|---|---|---|-------------------------------------|-----------------|
| Surge generating unit | | | | |
| 1.2/50μs-8/20μs | Output voltage 0.5kV ~ 15kV ±10% | | | |
| Combination waveforms | Front time 1.2μs ±30% | Common for the all models Voltage step : 0.1kV step The setting can be from 0kV | | |
| | Duration 50μs ±20% | | | |
| | Output current 250A ~ 7500A ±10% | | | |
| | Front time 8μs ±20% | | | |
| | Duration 20μs ±20% | | | |
| 10/700μs-5/320μs | Output voltage 0.5kV ~ 15kV ±10% | | | |
| Combination waveforms | Front time 10μs ±30% | Models : C1/C3 Voltage step : 0.1kV step The setting can be from 0kV | | |
| | Duration 700μs ±20% | | | |
| | Output current 12.5A ~ 375A ±10% | | | |
| | Front time 5μs ±20% | | | |
| | Duration 320μs ±20% | | | |
| Output polarity | Positive / Negative | | | |
| Interval | 10 sec.~989 sec., depending on the set voltage 10 sec. (< 6kV) | 15 sec.~ in 10/700μs waveform | | |
| Output impedance | 2Ω ±10% | 1.2/50μs waveform | | |
| | 40Ω ±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 | 18μF | Between LINE - LINE (10Ω +9μF selectable) | | |
| Correspondent to IEC61000-4-5 | 10Ω ±9μF | Between LINE - PE (18μF selectable) | | |
| Injection mode | Between LINE - LINE, Between LINE - PE | | | |
| Power supply lines structure for EUT | Single phase AC | : L/N/PE | Model : A1 / C1 | |
| | DC | : +/-PE | | |
| | 3-phase AC | : L1/L2/L3/N/PE (Common for single phase and 3-phase) | | Model : A3 / C3 |
| | DC | : +/-PE | | |
| EUT power capacity | AC240V/20A MAX | 50/60Hz, DC125V/20A MAX | Model : A1 / C1 | |
| | AC500V/50A MAX | 50/60Hz, DC125V/50A MAX | Model : A3 / C3 | |
| Decoupling coil | 1.5mH | | | |
| Phase angle control | 0 ~ 360° ±10° | | | |
| CDN for Telecom lines (Only in model C1 and C3) | | | | |
| Coupling surge waveform | 1.2/50μs-8/20μs combination waveforms 10/700μs-5/320μs combination waveforms | | | |
| Max. coupling surge voltage / current | Up to the values which can be set | | | |
| Impedance matching resistors | 40Ω | 80Ωper 1 line at 2 lines 160Ωper 1 line at 4 lines | 1.2/50 μs waveform | |
| | 25Ω | 50Ωper 1 line at 2 lines 100Ωper 1 line at 4 lines | 10/700 μs waveform | |
| | | | | |
| Coupling mode | Common mode / Normal mode | | | |
| Coupling network | Gas arrester : 90V | | | |
| Line for EUT | 2 lines / 4 lines | DC50V/100mA MAX | Selectable | |
| Decoupling coil | 20mH | | | |
| Others | | | | |
| Voltage monitor | BNC output, 1/2000±10% | In open-circuit for SURGE OUT | | |
| Current monitor | BNC output, 1mV/A±10% | In short-circuit for SURGE OUT | | |
| External communication | RS-232C optical communication | | | |
| Power supply | AC100V ~ AC240V ±10% 50Hz / 60Hz | | | |
| Dimension | W555×H1800×D790 mm | | Projection excluded (in all models) | |
| Mass | Approx. 300kg | | Model : A1 / A3 | |
| | Approx. 340kg | | Model : C1 / C3 | |

Standard accessory

| Item | Specification / Function | Qty | Correspondent model |
|------------------------------------|--|----------|---------------------|
| Surge output cable | HOT / COM | 2 pcs. | Common |
| Output cable to power supply lines | For single phase : L / N / PE | 3 pcs. | A1/C1 |
| | For 3-phase : L1 / L2 / L3 / N / PE | 5 pcs. | A3/C3 |
| Output cable to telecom lines | For 1~4 lines and GND | 5 pcs. | C1/C3 |
| Arrester unit | For coupling : Equipped to main unit panel | 4 pcs. | C1/C3 |
| | 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 AC100V, 3P equipped with G connector cable | 1 pc. | Common |
| High voltage connector cap | Equipped to main unit panel | 5 pcs. | A1/C1 |
| | | 7 pcs. | A3/C3 |
| 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. 0.5kV and 1kV) for the test series according to IEC61000-4-5)

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

Option

CDN for Interconnection Lines MODEL : LSS-INJ6400SIG



Used for the surge test to interconnection lines defined in IEC61000-4-5 Standard. The EUT power capacity is DC50V/1A and enable to inject the surge to interconnection lines up to 6,600V. Possible to bypass inductor (20mH) 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-H1784)cable is needed additionally.

| Parameter | Specification |
|-----------------------------|-------------------------------------|
| Surge input voltage | 500V~6,600V (Combination wave) |
| EUT power capacity | DC50V/1A |
| Max. line number | 4 lines |
| Decoupling coil | 20mH each line |
| Impedance matching resistor | 40Ω ±10% |
| Dimension / Mass | (W)488×(H)456×(D)550mm Approx. 45kg |

* Both capacitor coupling and arrester coupling are possible in LSS-INJ6400SIG. Diode coupling which is defined in IEC61000-4-5 ed.2 (2005) newly is a test method which assumes the injection of dozens of voltage level surge to interconnection lines. Please contact us if low voltage surge injection is required since the surge injection in LSS-INJ6400SIG can be more than 90V.

Isolation Transformer MODEL : TF-2302P



Maximum capacity is single phase AC240V / 30A and the dielectric strength is 4kV Available for AC lines power supply in LSS-F02 series and widely usable for the other various noise generators or measurement equipments.

| Parameter | Specification |
|-----------------------|--|
| Max. input voltage | Single phase 240V MAX (50 / 60Hz) |
| Max. output voltage | 30A MAX |
| Dielectric strength | Primary to core : AC4kV (1 minute) Secondary to core : AC4kV (1 minute) Primary - Secondary : AC4kV (1 minute) |
| Insulation resistance | ≥ 100MΩ at DC500V |
| Dimension / Mass | (W)350×(H)475×(D)400mm (Eye bolts and handles excluded) Approx. 60 kg |

Isolation Transformer MODEL : TF-6503P



Maximum capacity is 3-phase AC600V / 50A and the dielectric strength is 4kV Available for AC lines power supply in LSS-F02 series and widely usable for the other various noise generators or measurement

| Parameter | Specification |
|------------------------|--|
| Max. input voltage | Single phase / 3-phase 240V MAX (50 / 60Hz) |
| Transformer connection | Y-connection |
| Max. output voltage | 50A MAX |
| Dielectric strength | Primary to core : AC4kV (1 minute) Secondary to core : AC4kV (1 minute) Primary - Secondary : AC4kV (1 minute) |
| Insulation resistance | ≥ 100MΩ at DC500V |
| Dimension / Mass | (W)500×(H)640×(D)700mm (Eye bolts and handles excluded) Approx. 350 kg |

Warning Lamp MODEL : 11-00008A



Usable together with LSS-F02 series. The blinking makes the operators or neighbors pay attention to the test processing.

Protective Safety Fence MODEL : 11-00010A

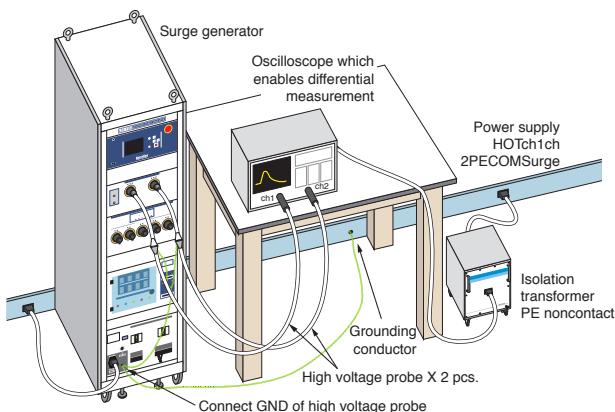
Enable to materialize the safe test environment with connection to interlock function equipped in LSS-F02 series. The safety measure can be sure together with the EUT protective safety box.

Waveform Pre-Checking Cables Set MODEL : 05-00099A

Fixtures for checking voltage waveforms and current waveforms of LSS-F02 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)



Optical USB module MODEL : 07-00022A



Optical conversion adaptor Used for remote control with PC. 5m of optical fiber cable with USB interface attached.

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

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



Relay terminal board to connect output of LSS-F02 series to EUT. Enable to connect any outlet figure in the world when wiring to the attached multi-outlet. For single phase 3 lines (Voltage resistible capacity 4.5kV)

* The same option for 3-phase 5 lines also available (18-00058B)

Reference

Summary of IEC61000-4-5 ed2.0 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 1.2/50µs and current waveform as 8/20µs) and the other is doing the injection to telecommunications lines (The voltage waveform as 10/700µs and current waveform as 5/320µs).

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.

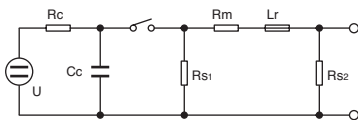
2. Test Level

| Level | Open-circuit test voltage±10% (kV) |
|-------|------------------------------------|
| 1 | 0.5 |
| 2 | 1.0 |
| 3 | 2.0 |
| 4 | 4.0 |
| x | special |

* X can be any level determined by consent between the EUT manufacturer and the simulator supplier

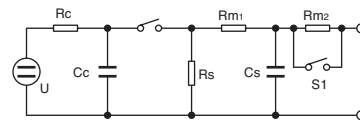
3. Waveforms Generator and Waveforms verification

1.2 / 50 Combination Waveform (1.2/50 - 8/20µs) Generation Circuit



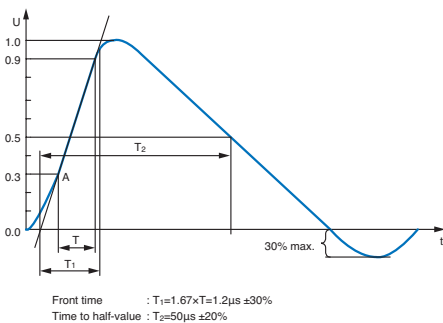
- U High-voltage source
- Rc Charging resistor
- Cc Energy storage capacitor (20µF)
- Rs Pulse duration shaping resistors
- Rm Impedance matching resistor
- Lr Rise time shaping inductor

10 / 700 Combination Waveform (10/700 - 5/320µs) Generation Circuit

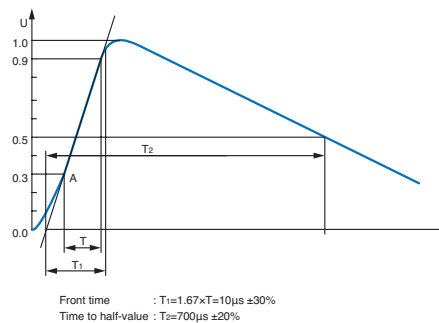


- U High-voltage source
- Rc Charging resistor
- Cc Energy storage capacitor (20µF)
- Rs Pulse duration shaping resistor
- Rm Impedance matching resistors (Rm1=15Ω;Rm2=25Ω)
- Cs Rise time shaping capacitor (0.2µF)
- S1 Switch closed when using external matching resistors

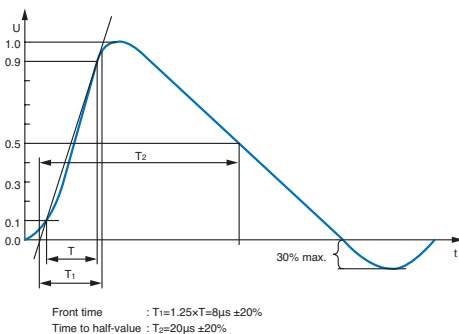
Voltage Surge (1.2/50µs)



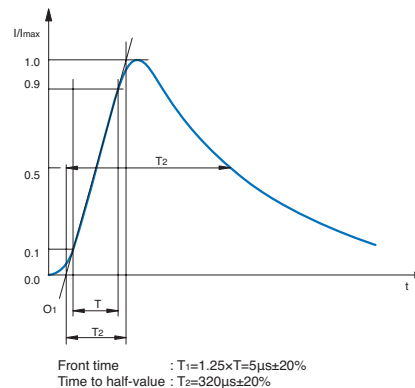
Voltage Surge (10/700µs)



Current Surge (8/20µs)



Current Surge (5/320µs)



Voltage waveform specification at the EUT port of the coupling/decoupling network

| | Coupling impedance | |
|--|-----------------------------------|-----------------------------------|
| | 18 μ F | 9 μ F+10 Ω |
| Surge voltage parameters under open circuit conditions | 18 μ F | 9 μ F+10 Ω |
| Front time | 1.2 μ s \pm 30% | 1.2 μ s \pm 30% |
| Time to half value | | |
| Current rating < 25 A | 50 μ s+10 μ s/-10 μ s | 50 μ s+10 μ s/-25 μ s |
| Current rating 25 A – 60 A | 50 μ s+10 μ s/-15 μ s | 50 μ s+10 μ s/-30 μ s |
| Current rating 60 A – 100 A | 50 μ s+10 μ s/-20 μ s | 50 μ s+10 μ s/-35 μ s |

NOTE The measurement of the surge voltage parameters should be done with the power supply input port of the coupling/decoupling network open-circuit.

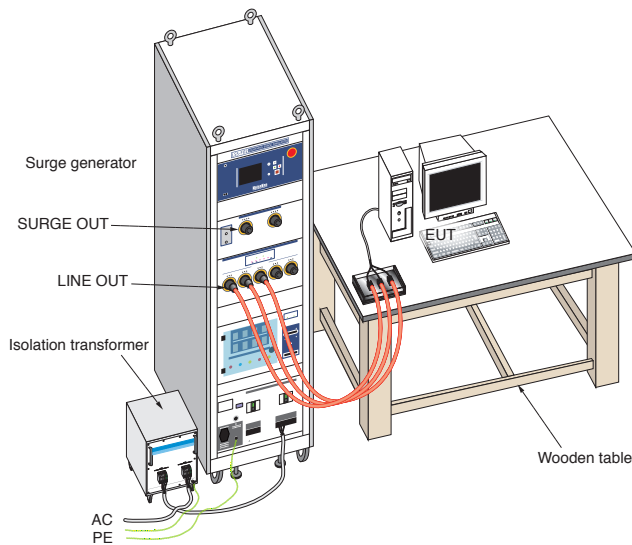
Current waveform specification at the EUT port of the coupling/decoupling network

| | Coupling impedance | |
|---|----------------------|-----------------------|
| | 18 μ F | 9 μ F+10 Ω |
| Surge current parameters under short circuit conditions | 18 μ F | 9 μ F+10 Ω |
| Front time | 8 μ s \pm 20% | 2.5 μ s \pm 30% |
| Time to half value | 20 μ s \pm 20% | 25 μ s \pm 30% |

NOTE The measurement of the surge current parameters should be done with the power supply input port of the coupling/decoupling network open-circuit.

4. Test Setup

Injection to power supply lines

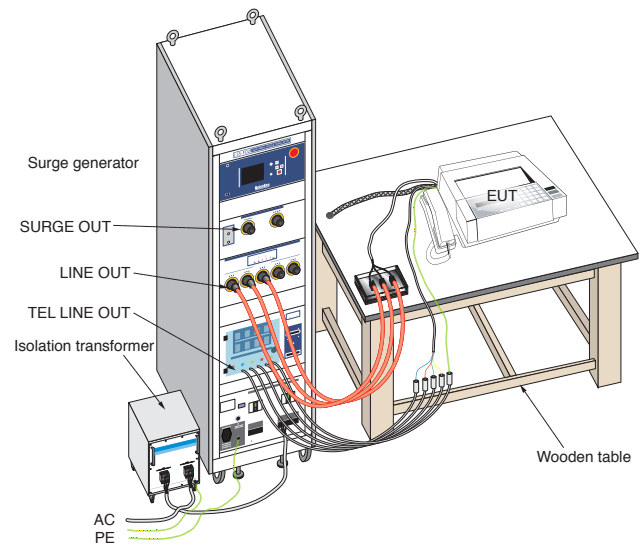


Injecting 1.2/50 combination wave put out from CDN of LSS-F02 to battery drive of a PC.

Floating circuit is adapted according to the Standard for the output.

In LSS-F02 series, enable the automated operation with the program function along the above figure.

Injection to telecom lines and power supply lines



Injecting 1.2/50 combination wave and telecom surge (10/700 combination wave) put out from CDN of LSS-F02 to power supply lines and telecom lines of a fax machine.

In LSS-F02 series, enable the automated operation with the program function along the above figure.

* The above setup figure is one example of the test setup our lightning surge simulator. There is no specification on the Standard.

* Designs and specifications are subject to be changed without notice.

URL : <http://www.noiseken.com>

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