

# 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](http://www.noiseken.com)

## Voltage Dip & Swell Simulator

# VDS-2002

### Feature

- Voltage dip & swell simulator conforming to EN/IEC61000-4-11 Ed.3 (2020) Standard
- Multiple types AC plug receptacle on the front panel for easy connection of the EUT
- Easy setting for the test parameters on the front panel
- Realize flexible test conditions setting beyond the Standard with a PC remote control
- Enable to conduct the interruption test in DC (DC 125 V / 16 A max)



### Specification

Parameter			Specification	Note
Input voltage range			AC 90 ~ 240 V $\pm$ 10% 50/60 Hz $\pm$ 10% DC 0 ~ 125 V	
Output voltage range			AC 0 ~ Input voltage + 20% DC 0 or Input voltage	AC 290 V Max
Output current capability	AC	100% of input voltage	16 A rms	Continuous
		80% of input voltage 20 A rms	for a duration of < 5s	
		70% of input voltage 23 A rms	for a duration of < 5s	
		40% of input voltage 40 A rms	for a duration of < 5s	
	DC		16 A	Continuous
Peak inrush current drive capability			AC 100 ~ 120 V AC 220 ~ 240 V	250 A peak (< 10ms) 500 A peak (< 10ms)
Load regulation			100% of input voltage at 0 ~ 16 A rms 80% of input voltage < 5% at 0 ~ 20 A rms 70% of input voltage < 5% at 0 ~ 23 A rms 40% of input voltage < 5% at 0 ~ 40 A rms	<5%
Over shoot / Under shoot				<5% At 100 $\Omega$ load
Rise and fall time				1 ~ 5 $\mu$ s At 100 $\Omega$ load
Dip / Swell level	Percent setting		0 ~ 120%	
	Voltage setting		0 ~ 290 V	5 V step
Number of repetition	Number setting		1 ~ 1000 times or unlimited repetition	1 time step
Interval cycle	Cycle setting	Synchronous	0.5 ~ 5000 cycles	0.5 cycle step
		Asynchronous	1s ~ 100s	1s step
	Time setting		10ms ~ 10h	0.1ms step
Dip cycle	Cycle setting	Synchronous	0.01 ~ 5000 cycles	0.01 cycle step
		Asynchronous	0.1ms ~ 10h	1s step at setting > 100s
	Time setting		0.1ms ~ 100s	0.1ms step
Dip phase	Phse angle setting	Synchronous	0 ~ 360°	1° step
		Asynchronous	0 ~ 16.6 ms (60Hz)	0.1ms step
	Time setting		0 ~ 19.9 ms (50Hz)	
Voltage variation test	Time setting		Synchronous	0.3 ~ 10 s for time for increasing voltage
Memory capacity				5 tests
Input voltage from EUT				AC100 ~ 115V / AC200 ~ 240 V $\pm$ 10% 50/60 Hz $\pm$ 5%
Interface				Optical interface (RS232C or USB)
Operating temperature range				15 ~ 35°C
Operating humidity range				25 ~ 75%RH (without dew)
Dimensions				(W) 430 x (H) 650 x (D) 600 mm
Weight				Approx. 130 kg

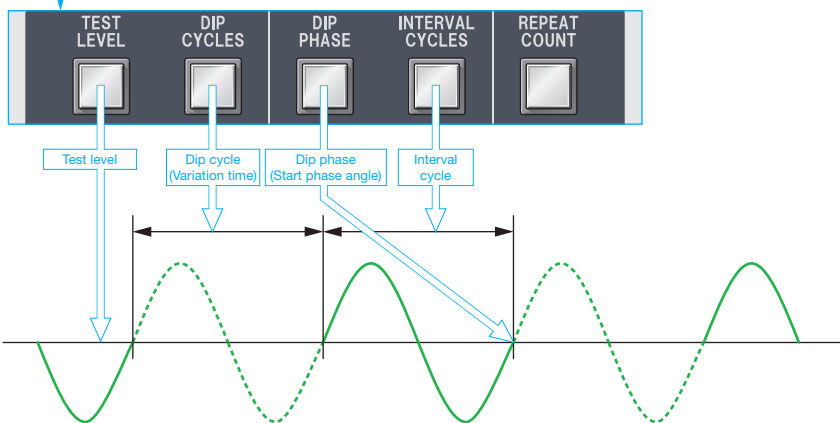
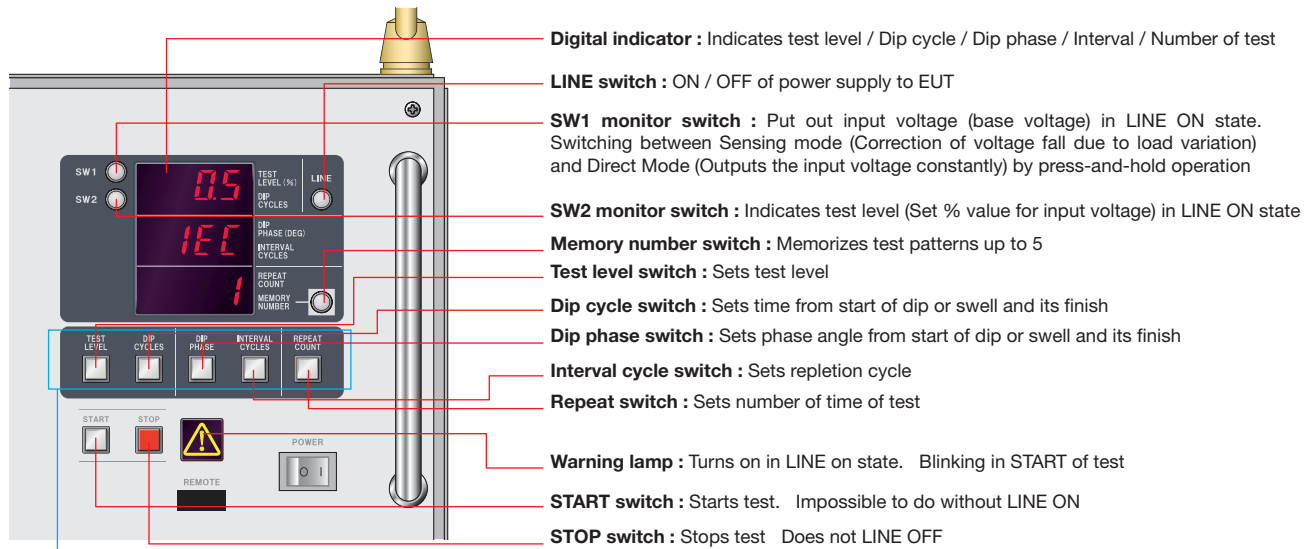
\* The above specifications are based on the use of the optional Windows remote control software.

### Accessory

Item	Q'ty
Power cable	1 pc.
Instruction manual	1 volume

## VDS-2000

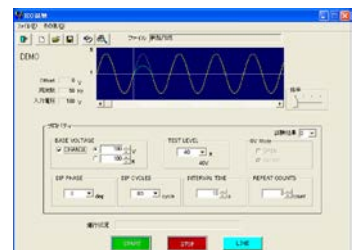
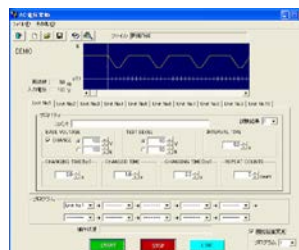
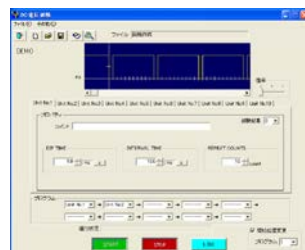
## Front Panel



## Option

Software (VDS-2002-PC) **MODEL : 14-00036A**

Enables to set the test parameters along users' preference or determination in addition to the Standard. The set available parameters are dip & swell cycle, repetition cycle, interval cycle, etc. as well as IEC test levels. Very efficient tools for the operation.

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

Connection adaptor used for PC remote control of the simulator.  
USB optical conversion, equipped with 5m optical fiber cable

Optical RS232 Module **MODEL : 07-00017A**

Connection adaptor used for PC remote control of the simulator.  
RS232C optical conversion, equipped with 5m optical fiber cable

# IEC61000-4-11 Ed.3 Test Standard

## 1. General

Immunity test standard for electrical / electronic equipment which are connected to low voltage power supplies networks whether they are malfunctioned or resistible against voltage dips, short interruptions or voltage variations.

Power capacity of equipments under the test (EUT) shall be 16A per phase. This standard applies to equipment connected to 50/60 Hz AC supply network and does not apply to equipment operating on 400Hz AC.

## 2. Test Level

- A basis for the voltage test level use the rated voltage for the equipment ( $U_T$ ).
- if the voltage range does not exceed 20 % of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for the test level specification ( $U_T$ ).

### 1. Voltage dips and short interruption

Table 1 – Preferred test level and durations for voltage dips

Calss <sup>a</sup>	test level and durations for voltage dips (ts) (50 Hz / 60 Hz)				
Class 1	Case-by-case according to the equipments requirements				
Class 2	0% during 1 / 2 cycle	0% during 1 cycle	70% during 25 / 30 <sup>c</sup> cycles		
Class 3	0% during 1 / 2 cycle	0% during 1 cycle	40% during 10 / 12 <sup>c</sup> cycle	70% during 25 / 30 <sup>c</sup> cycle	80% during 250 / 300 <sup>c</sup> cycle
Class X <sup>b</sup>	Special	Special	Special	Special	Special

a. Classes as per IEC 61000-2-4 ; see Annex B

b. Class x can be any level determined by consent between the EUT manufacturer and the simulator supplier

c. "25 / 30 cycle" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test"

\* Each dip% shall be voltages against the rated voltages

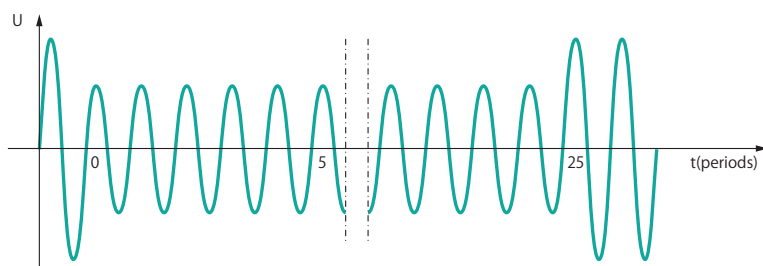
Table 2 – Preferred test level and durations for short interruptions

Calss	Test level and durations for short interruptions (ts) (50 Hz / 60 Hz)
Class 1	Case-by-case according to the equipments requirements
Class 2	0% during 250 / 300* cycle
Class 3	0% during 250 / 300* cycle
Class X	Special

a. Classes as per IEC61000-2-4 ; see Annex B

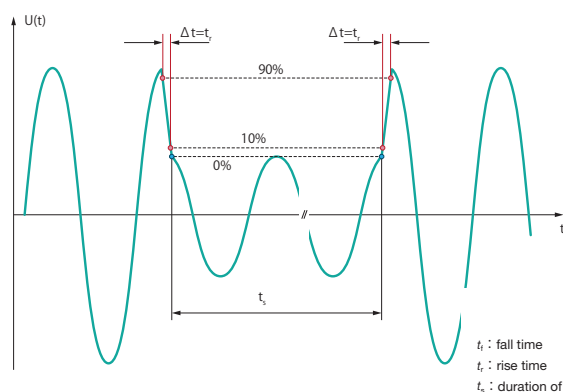
b. Class x can be any level determined by consent between the EUT manufacturer and the simulator supplier

c. "250/300 cycle" means "250 cycles for 50 Hz test" and "300 cycles for 60Hz test"

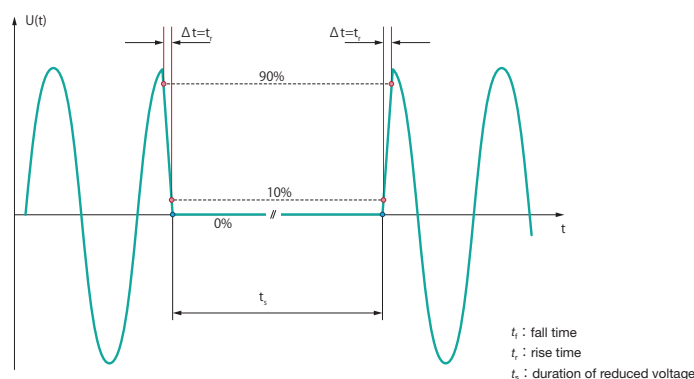


NOTE The voltage decreases to 70% for 25 periods. Step at zero crossing.

Voltage dip - Example: 70% voltage dip sine wave graph at 0°



Voltage dip - Example: 40% voltage dip sine wave graph at 90°



Short interruption

## IEC61000-4-11 Ed.3 Test Standard

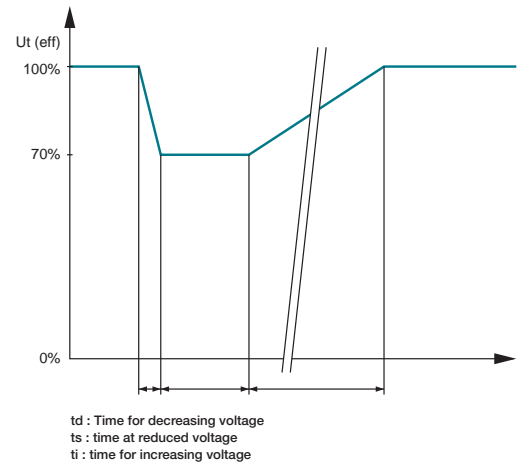
## 2. Voltage variations (Optional)

Table 3 – Timing of short-term voltage variations

Voltage test level	Time for decreasing voltage (td)	Time at reduced voltage (ts)	Time for increasing voltage (ti)
70%	Abrupt	1 cycle	25/30 cycles
X*	Special	Special	Special

\* Class x can be any level determined by consent between the EUT manufacturer and the simulator supplier

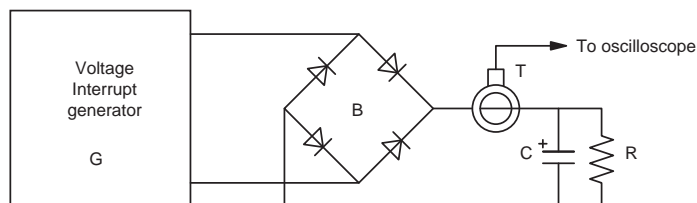
\* "25/30 cycle" means "25 cycles for 50Hz test" and "30 cycles for 60Hz test"



## 3. Characteristics and performance of the generator

Output voltage at no load	As required in Table 1, $\pm 5\%$ of residual voltage value
Voltage change with load at the output of the generator	
100% output, 0 A to 16 A	Less than 5 of $U_T$
80% output, 0 A to 20 A	Less than 5 of $U_T$
70% output, 0 A to 23 A	Less than 5 of $U_T$
40% output, 0 A to 40 A	Less than 5 of $U_T$
Output current capability	16A r.m.s per phase at rated voltage. The generator shall be capable of carrying 20A at 80% of rated value for a duration of 5s. It shall be capable for carrying 23A at 70% of rated voltage and 40A at 40% rated voltage for a duration of 3s. (This requirement may be reduced according to the EUT rated steady-state supply current. See Clause A. 3).
Peak inrush current capability (no requirement for voltage variation tests)	Not be limited by the generator. However, the maximum peak capability of the generator need not exceed 1000 A for 250 V to 600 V mains, 500 A for 200 V to 240 V mains, or 250 A for 100 V to 120 V mains.
Instantaneous peak overshoot / undershoot of the actual voltage, generator loaded with 100 $\Omega$ resistive load	Less than 5% of $U_T$
Voltage rise (and fall) time $t_r$ (and $t_f$ ) see Figures 1b) and 2, during abrupt change, generator loaded with 100 $\Omega$ resistive load	Between 1 $\mu$ s and 5 $\mu$ s
Phase shifting (if necessary)	0° to 360°
Phase relationship of voltage dips and interruptions with the power frequency	Less than $\pm 10^\circ$
Zero crossing control of the generators	$\pm 10^\circ$

## ■ EUT Peak Inrush Current requirement



## Components

- G voltage interrupt generator, switched on at 90° and 270°
- T current probe, with monitoring output to oscilloscope
- B rectifier bridge
- R bleeder resistor, not over 10000  $\Omega$  or less than 100  $\Omega$
- C 1700  $\mu$ F  $\pm 20\%$  electrolytic capacitor

Circuit for determining the inrush current drive capability of the short interruptions generator

In order to be able to use a low-inrush drive current capability generator to test a particular EUT, that EUT's measured inrush current shall be less than 70% of the measured inrush current drive capability of the generator.

## IEC61000-4-11 Ed.3 Test Standard

### 4. Test Setup

The test shall be performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer. If no cable length is specified, it shall be the shortest possible length suitable to the application of the EUT.

### 5. Test Procedure

#### ■ Climatic and Electromagnetic Conditions

Ambient temperature	15°C ~ 35°C
Relative humidity	25% ~ 75%
Atmospherical pressure	86 kPa ~ 106 kPa (860 hPa (mbr) ~ 1060 hPa (mbr))
Electromagnetic environment	Level which does not affect the test result

#### ■ Execution of the test

- The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips / interruptions with intervals of 10s minimum (between each test event).
- Each representative mode of operation shall be tested.
- For voltage dips, changes in supply voltage shall occur at zero crossings of the voltage, and at additional angles considered critical by product committees or individual product specifications preferably selected from 45°, 90°, 135°, 180°, 225°, 270° and 315° on each phase. For short interruptions, the angle shall be defined by the product committee as the worst case. In the absence of definition, it is recommended to use 0° for one of the phases.
- For voltage variations (Optional), the EUT is tested to each of the specified voltage variations, three times at 10s interval for the most representative modes of operations.

### 6. 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.

**Notes:** This test set-up is quoted from IEC61000-4-11 Ed.3.0 (2020) Standard.  
Please go through the Standard if the more details are required.