NoiseKen®
Total Coordinator for EMC

NEW PRODUCT

Full compliance with the IEC 61000-4-11 standard
One unit solution for dip, swell, interruption and variation tests

VOLTAGE DIP AND UP SIMULATOR

VDS-2002

Voltage dips, also called sags, are brief reductions in AC mains voltage, typically between half a cycle to a few seconds. The best-known sources of voltage dips and interruptions are listed below:

- The starting of a large load such as a motor or resistive heater.
- Loose or defective wiring such as insufficiently tightened box screws on mains conductors leading to the increase of your system impedance, thus, making itself vulnerable to the effect of current increase.
- Faults or short circuits draw excessive currents until the protective devices such as a fuse or circuit breaker operates.
- Faults on distant circuit typically which can be automatically switched and removed by reclosers. This type of event is sometimes a series of voltage dips caused by continuous operation of reclosers.
- Loads that have continuously varying power levels cause voltage variations rather than an abrupt change.

Clearly from the above, voltage dips, interruptions, and variations are everywhere and unavoidable.

Voltage dips and short interruptions are not always abrupt because of the reaction time of rotating machines and protection elements- the rotating machines will operate as generators sending power into the network. Some equipment, typically containing a power-fail detection circuit, is more vulnerable to gradual variations than to abrupt change.

In any case, these voltage changes can degrade the performance of electronic equipment in many different ways: digital circuit upset, data-loss or distortion and so on. Therefore, immunity testing for these types of events should be performed to ensure your product's safe and reliable operation.

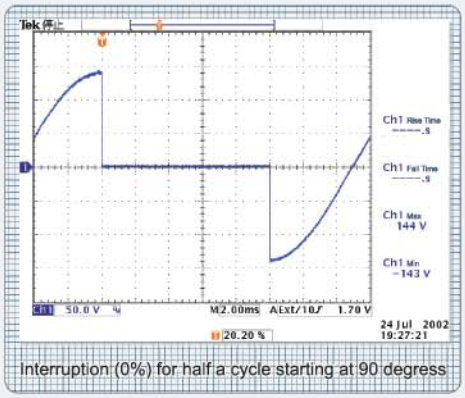
In fact, in the scheme of international compliance, the IEC 61000-4-11 compliance voltage dip test is a must for all products having a rated input current not exceeding 16A per phase.

The NoiseKen VDS-2002 Voltage Dip and Up Simulator, uncompromising on and fully compliant with all the test generator requirements in the standard including fast rise and fall times, peak inrush current drive capability, overshoot/undershoot and others, fulfills accurate testing needs.

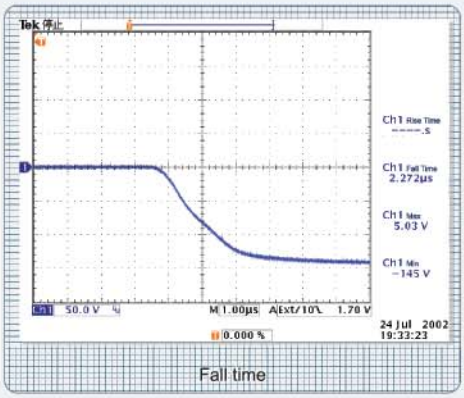
FEATURES

- Fully compliant with all the test generator requirements of IEC standard
- One unit solution for dip, swell, interruption, and variation tests up to 16A 290V single phase AC
- Interruption test up to 16A 125V DC*
- Two motor-driven transformers approach enables switching between any voltages*
- Preset IEC test levels 0%/40%/70% additional 120%
- Two modes for 0% (interruption) test: open & short*
- Optional Windows Application Software available to more extensively control the unit
- Accurate waveforms

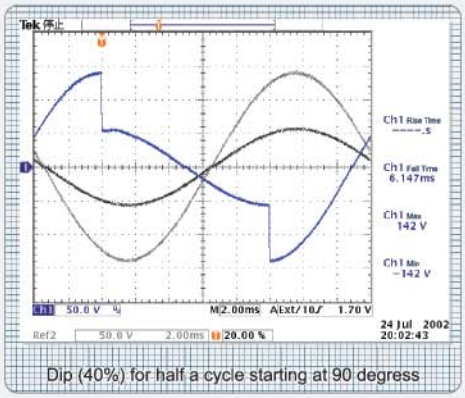
* Optional software required



Interruption (0%) for half a cycle starting at 90 degress

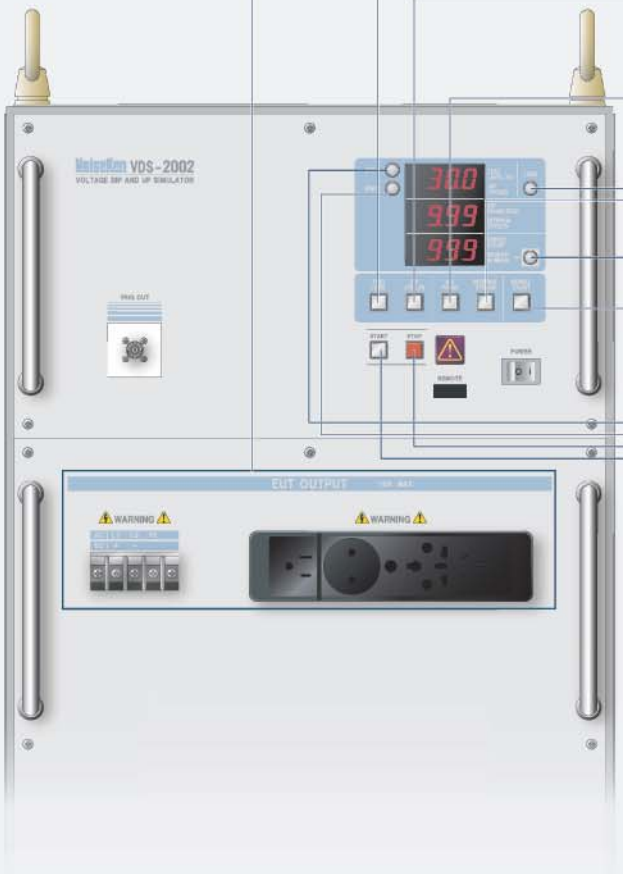


Fall time



Dip (40%) for half a cycle starting at 90 degress

CONTROL PANEL



EUT OUTPUT:
receptacles (Multi-type) +Terminal Blocks for AC/DC.

TEST LEVEL:
selects a test level among 0, 40, 70 and 120%.

DIP CYCLES:
selects the duration of a dip among 0.5, 1, 5, 10, 25 and 50 cycles.

DIP PHASE:
selects the phase angle at which a dip starts among 0, 45, 90, 135, 180, 225, 270 and 315 degrees.

INTERVAL CYCLES:
selects the time interval between each dip among 1, 3, 5, 10, 30, 50, 100, 300, 500 cycles and 10s.

REPEAT COUNT:
selects the number of dips among 1, 3, 5, 10, 30, 50, 100 and infinite.

MEMORY NUMBER:
used to save or call up the selected test setting among preset 5 settings

LINE: turns on and off power to the EUT

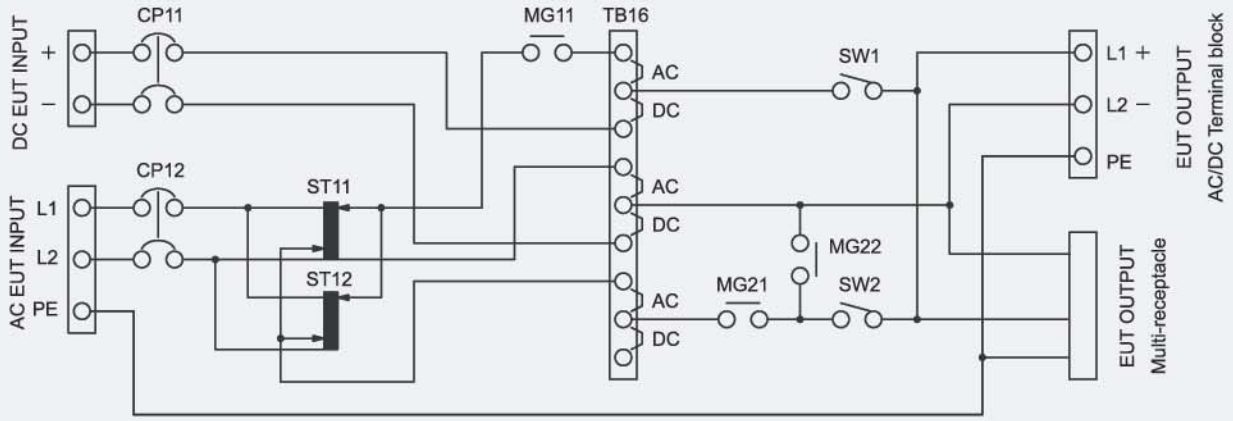
SW1:
for output verification, the unit outputs the normal voltage adjusted by the slide transformer 1.

SW2:
for output verification, the unit outputs the dip/swell voltages adjusted by the slider transformer 2.

START: starts the test.

STOP: stops the test.

ELECTRICAL SCHEMATIC



OPERATING PRINCIPLE

As shown in the above schematic, the VDS employs two independent motor-driven slide transformers and two IGBT switches. Under complete control by the unit control circuitry, it generates voltages dips, interruptions and variations with much wider parameter settings than those originally required in the IEC 61000-4-11 standard.

Since the unit employs two slide transformers, it can generate two variable voltage levels, which are independently preset, corresponding to dip (or variation) and normal voltage (voltage in interval cycles). The two IGBT switches enable to fulfill the fast rise and fall time requirements called for in the relevant standard.

AC/DC selection terminals are provided to insert the two transformers for an AC test and to bypass them for the DC test. DC interruption test, therefore, can be done by utilizing the same IGBT switches.

To offer short and open mode selection in AC interruption test, two magnet relays, MG22 and MG21, work to realize low impedance and high impedance as seen from the load side.

SPECIFICATIONS

Parameters				Specifications			Remarks
Compliant standard				IEC 61000-4-11			
Number of lines				Single phase			
Test mode	Interruption AC/DC			Synchronous	PC/local	Short circuit	
				Asynchronous	PC		
				Synchronous/Asynchronous	PC	Open circuit	
	Dip and swell			Synchronous	PC/local		
				Asynchronous	PC		
	Variation			Asynchronous	PC/Local Only 2s-1s-2s standard defined test available in local mode		
Input voltage range				AC90~264V, 50/60 Hz DC0~125V			
Output voltage range				AC0V~120% of input voltage DC0V~input voltage			AC290V max
Output VA				4.224kVA			Continuous
Output current capability	AC	100% of input voltage		16A rms			Continuous
		70% of input voltage		23A rms			<5S
		40% of input voltage		40A rms			<5S
	DC			16A			Continuous
Peak inrush current drive capability	AC100~120V			>250A			at 100% output, <10ms
	AC220~240V			>500A			
Load regulation	100% of input voltage 0~16A rms			<5%			
	70% of input voltage 0~23A rms			<7%			
	100% of input voltage 0~40A rms			<10%			
Overshoot/undershoot				<5%			100 ohm loaded
Rise time/fall time				1~5μS			100 ohm loaded
Normal voltage setting	Setting by percent		PC	~120%			10V minimum
			Local	100%			
	Setting by voltage		PC	10V~290V			5V step
	Accuracy			±5V			0V~16A output
Dip/Swell level	Setting by percent		PC	Short/Open selectable for 0% (interruption)		0~120%	
			Local	Short circuit for 0% (interruption) setting		0/40/70/120%	4 steps
	Setting by voltage		PC	Short/Open selectable for 0V (interruption)		0~290V (0~120%)	5V step
	Accuracy			±5V			
Repetition of events	No. of events		PC	1~1000 or continuous			1 event step
			Local	1, 3, 5, 10, 30, 50, 100 or continuous			8 steps
Interval cycle	Setting by cycle		Synchronous	PC		0.5~5000.5 cycles	0.5 cycle step
				Local		1,3,5,10,30,50,100,300,500 cycles, 10s	10 steps
	Setting by time		Setting for short duration	Synchronous	PC	1~100s	1s step
				Asynchronous		10ms~100s (50Hz) 8.3ms~100s (60Hz)	0.1 ms step
			Setting for long duration	Asynchronous		1s~10h	1s step
Dip cycle	Setting by cycle			Synchronous	PC	0.01~5000 cycles	0.01 cycle step
					Local	0.5, 1, 5, 10, 25, 50 cycles	6 steps
	Setting by time		Setting for short duration	Synchronous	PC	0.1 ms~100s	0.1ms step
				Asynchronous		0.1 ms~100s	0.1ms step
			Setting for long duration	Asynchronous		1s~10h	1s step
Dip phase (Starting phase angle of events)	Setting by phase angle			Synchronous	PC	0~359°	1° step
					Local	0, 45, 90, 135, 180, 225, 270, 315	8 steps (45 degrees step)
	Setting by time				PC	0~19.9 ms for 50Hz	0.1ms step
						0~16.6 ms for 60Hz	
Voltage variation test	Setting by time		Changing time	Asynchronous	PC	0.1s~10 s at least 0.1s required for 10% change of input	0.1s step
			Changed time			0~10s	0.1s step
			Interval			0~100s	0.1s step
	Test level				PC	0~120%	
Memory					Local	5 tests	Test sequence stored up to 10 steps when controlled by PC
					PC	10 steps	
Equipment input	AC100~115V/200~240V±10%, 50/60Hz, 120VA						
External interface	optical RS-232						
Operating temperature	15~35°C						
Operating humidity	25~75%R.H. (No dewing)						
Dimensions	(W)430×(H)745×(D)600mm(projection excluded)						
Weight	Approx.150 kgs.						

IEC 61000-4-11 Standard/Voltage Dips, Short Interruptions and Variations

Test levels

Test Level %U_T	Voltage dip and short interruptions %U_T	Duration (in perriod)
0	100	0.5 1 5 10 25 50 x
40	60	
70	30	

Test Level %U_T	Time for decreasing voltage	Time at reduced voltage	Time for increasing voltage
40%U_T	2s±20%	1s±20%	2s±20%
0%U_T	2s±20%	1s±20%	2s±20%
	x	x	x

The voltages in this standard use the rated voltage for the equipment (U_T) as a basis for voltage test level specifications. If the equipment has a specified input voltage range, then testing should be performed at the lower and upper limits of the voltage range specified. However, in practice it is only necessary to perform the tests at the lowest specified input voltage, since all the tests concern a reduction or interruption of supply voltages. "X" is an open duration. One or more of the above test levels and durations may be chosen.

IEC61000-4-11 is a basic EMC standard defining test generator, methods and others and does not specify particular test levels and durations, but it is the Generic Immunity standards, as well as the Product family standards, that specify the test revel and pass/fail performance criteria applied to a particular class of equipment.

For an open set of duration, the IEC standard says other values may be taken in a justified case and shall be specified in product specifications. *For possible future requirements, VDS-2002 has provisions of a variable slew rate from 1s to 10s (0~100% output)*

Characteristics of the test generator
Peak inrush current drive capability (not required for voltage variation tests)
500A for 220V-240V mains
250A for 100V-120V mains

The test generator has to simulate the very low output impedance characteristics of the real world mains. In other words, the generator must be able to provide inrush currents of a similar level to the actual power mains.

Most electronic products such as those using switching power supplies exhibit high start up currents needed to charge capacitive input circuitry in their input section. *Conventional AC amplifiers cannot meet this requirement, and worse yet, they perform as external soft-start circuits for the EUT.* For verifications, the generator shall be switched from 0% to 100% of full output, when driving a load consisting of an uncharged capacitor whose value is 1700μF in series with a suitable rectifier. A bleeder resistor in a range of 100 ohm to 10k ohm shall be connected in parallel with the capacitor. Several time constants must be allowed between tests. The standard specifies the current monitor's characteristics used to measure peak inrush current capability.

Overshoot/Undershoot (loaded with 100 ohms) : <5%
Voltage rise/fall time (for abrupt change, generator loaded with 100 ohms): 1 to 5μs. *Conventional AC amplifiers cannot meet this requirement*
Phase shifting: 0 to 360°

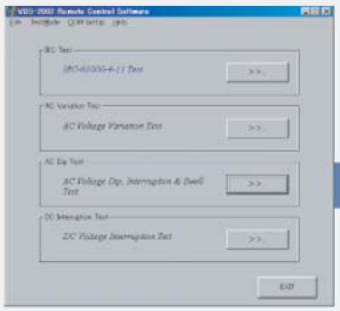
Execution of test
3 dips/interruptions/variations with interval of 10s minimum
Abrupt change in supply voltage shall occur at zero crossing of the voltage.Additional angles (45, 90, 135, 180, 225, 270, 315°)are specified for use by product committees or individual product specifications.
The IEC standard requires the monitoring of EUT line voltage within a accuracy of 2%.*ALM-21 is suitable for this purpose with its logging capability. This power Line Monitor also can monitor the VDS output voltages.*
ALM-21 accuracy: ±(0.5% rdg+0.8V)

OPTIONAL ACCESSORIES

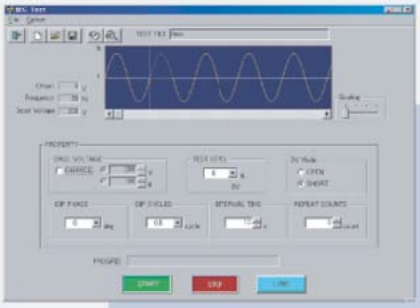
Control Software
Model 14-00029A

- Wider parameter settings than locally allowed
- Setting to IEC 61000-4-11 are preprogrammed
- Intuitive setting for all test parameters
- GUI (graphical user interface)
- Sequential operation up to 10 steps
- Test report generation

RS232C Optlink set
Model 07-00017A

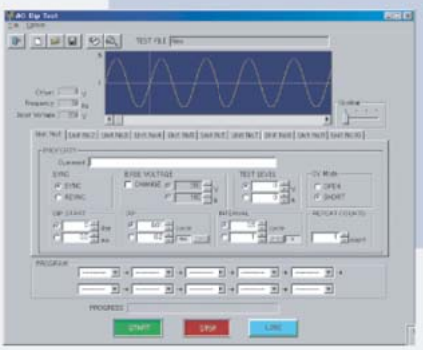


Main Window

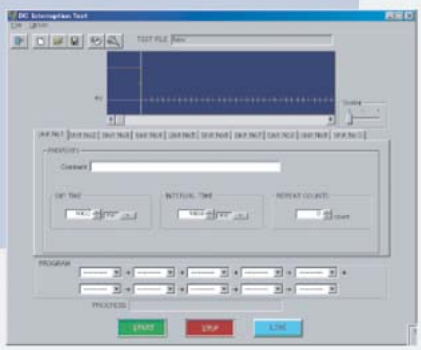


IEC Test

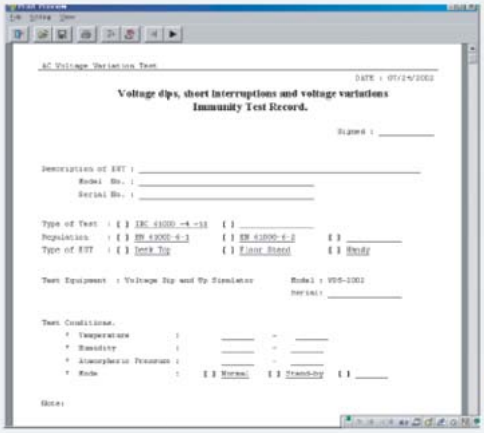
AC Variation Test



AC Dip Test



DC Interruption Test



Report

AC Line Monitor
Model ALM-21

The IEC 61000-4-11 requires monitoring of the main voltage for testing (voltage to AC EUT INPUT) within an accuracy of 2%. A compact, portable AC Line Monitor ALM-21, originally intended for site surveys, is suitable for this purpose with its data logging capability. It also can monitor the output from the VDS-2002.