NSG 200
Line Interference Simulation System

The Classic Line

Introduction

Electrical supply networks are, unfortunately, not free from interference. Influences on the supply system such as lightning strikes, defects and switching operations necessitated for operational reasons are just a few of the effects that ultimately affect the cleanliness of the electrical supply. Added to this, all loads are also sources of interference to some extent or another. The same loads are, however, usually also victims of the interference inasmuch as problem-free operation can be intermittently or permanently disrupted. Modern items of electronic apparatus in the home, the office and in industry are particularly sensitive to uncleanliness in the power supplied to them.

Interference on the mains and the effects caused, i.e. the incorrect behaviour of the electronic apparatus, occur only sporadically and are therefore correspondingly difficult to identify. Manufacturers of equipment hence have to take concerted measures, such as filtering, screening, etc., during both the development and manufacture of their products to ensure immunity against the known interference factors.

These effects are simulated by interference generators in a concentrated and exactly reproducible manner. They provide a means for analysing the interference immunity of equipment and systems during development, for examining the effectiveness of improvement measures as well as for assuring electromagnetic compatibility (EMC) during manufacture and quality control.

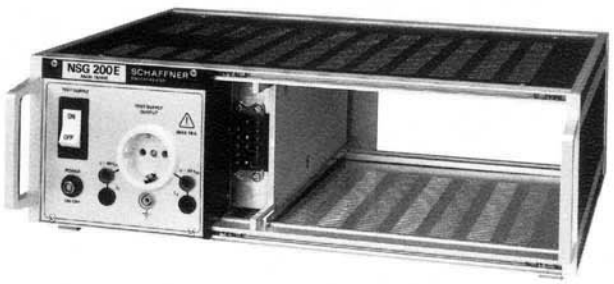
SCHAFFNER Generators in the NSG 200 series includes a complete range of instruments for the simulation of the most important line-borne types of interference. Through the use of the concept of a mainframe and a selection of plug-in generator modules, application-oriented test sets can be assembled with the possibility of subsequent extentions.

Many test procedures have been set down as Standards by international and national committees such as ANSI-IEEE, IEC, ECMA, CENELEC, NAMUR, etc. The generators in the NSG 200 series conform to these specifications and are furnished with additional features to provide the user with extended analysis possibilities.

SCHAFFNER instruments have had a considerable influence on the practical side of testing in the EMC field.

Configuration and operation of the NSG 200 generator system has been engineered for simple handling under practical working conditions. A wide range of accessories is available to help the user arrange his test set-up in a safe and rational manner.

NSG 200E Main-frame



- ***Main-frame in a table-top housing***
- ***Country-specific versions***
- ***Switchable EUT supply***
- ***Phase monitoring***

The NSG 200E main-frame serves as an enclosure for the 6 different types of plug-in generators. The main-frame provides common facilities for the generator modules such as the mains input connection, connector for the EUT supply, overload trip, filtering, phase indicator, EUT connector with interference pulse injection, etc.
Although built as a table-top housing, the main-frame can also be installed in a 19" rack by adding a pair of mounting flanges.

Technical specifications

Instrument power supply	
Mains voltage	100 ... 120 V / 220 ... 240 V
Frequency	50 / 60 Hz
Power consumption	<300 VA
EUT power supply	
AC 50/60 Hz	12 ... 250 V, 16A_{rms} max.
AC 400 Hz	24 ... 250 V, 6A_{rms} max.
DC	5 ... 50 V (250 V), 16 A max.
Impedance	Z = 0.4 Ω + jw 0.001 Ω
Voltage drop	AC 50/60 Hz, 16 A: approx. 9 V AC 400 Hz, 6 A: approx.15 V DC 16 A: approx. 7 V
Signal lamps	For phase indication
Power input	3-pin 16 A apparatus connector (IEC 320, VDE 0626/78)
Protection	Thermal cut-out 2-pole/16 A
Earth leakage current	Up to 10 mA at 220 V 50 Hz
EUT connector	SCHUKO or UL 498/13, country-specific adapters and laboratory safety sockets

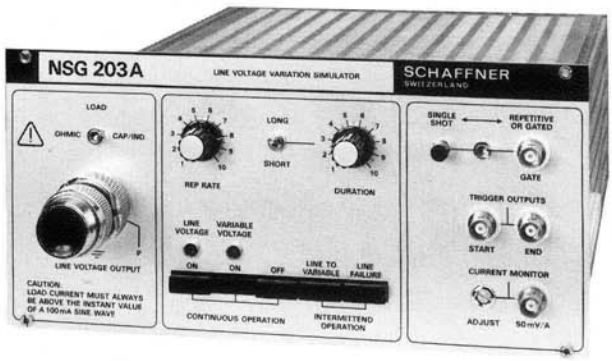
Dimensions	
Width:	437 mm or 17.2" (19" chassis)
Height:	150 mm or 5.9"
Depth:	345 mm or 13.6"
Weight:	10.5 kg or 23 lbs

Accessories (included)
Mains cable
Cable for power to EUT
Socket for EUT (country specific)

Optional accessories

402-227	Universal safety connectors (set of 3 pieces)
402-251	Measurement adapter

NSG 203A
Mains Dropout and Variation



- ***Simulates mains drop-outs in the ms range***
- ***Under/over-voltage test***
- ***Single triggering or Repetitive operation***

The NSG 203A module generates brief supply interruptions to the EUT such as those that frequently occur in supply networks through switching operations. The drop-out period and the repetition interval can both be varied over wide ranges.
Electronic equipment with semiconductor memories have to be subjected to such tests in order to determine their "holding time" and to be able to guarantee their reliable operation.

Further, by means of an additional regulating transformer, sudden voltage changes can be simulated typical of those that are caused on supply lines when heavy loads are switched on or off. Direct jumps from over-voltage to under-voltage or vice-versa can be achieved through the use of two variable transformers.

Standards

IEC204-1 (1981)	IEC TC 77 A&B
NAMUR Part 1 (1988)	NW&M Lab 0320 (1981)
etc.	

Technical specifications

Mains input voltage	250 Vac max. 50/60 Hz
Output voltage	600 Vac max. (after the regulating transformer)
Current to EUT	0.1 ... 16 A_{rms}
Mains drop-out,short	1.5 ms ... 30 ms
long	25 ms ... 500 ms
Repetition interval	0.6 s ... 25 s
Line voltage variation	
short	10 ms ... 300 ms
long	0.25 s ... 5 s
Repetition interval	0.6 s ... 25 s
Monitor output	50 mV/A current converter
Drop-out triggering	single pulse or continuous
Gate	ext. gate/inhibit
Trigger output	start/end, for oscilloscope or MD 203
Dimensions	265 x 130 x 340 mm (10.43 x 5.12 x 13.39")
Weight	5.2 kg or 11.45 lbs approx.

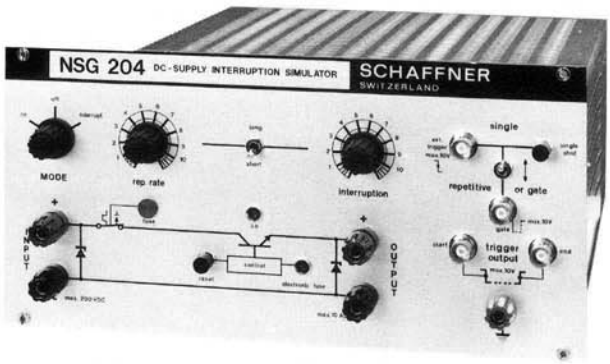
Accessories (included)

431-818	Dummy connector

Optional accessories

431-828	Connecting cable for 1 regulating transformer
431-829	Connecting cable for 2 regulating transformers
MD 203	Interval counter
402-737	Pair of BNC cable, 0.5 m for MD 203

NSG 204
DC Dropout



- ***Simulates ms drop-outs in DC supplies***
- ***Fast load-change tests***
- ***Test circuit is opto-isolated***
- ***Test range from 5 to 220V DC/ 10A***

The NSG 204 module simulates interruptions in DC power supplies such as those that can occur in the operation of electronic equipment through switching over to emergency power supplies, buffer batteries, etc. Drop-outs caused originally by interruptions in the mains supply can thus be simulated on the dc side of systems using decentralized DC/DC converters. The period and repetition interval of the drop-outs can be varied over wide ranges.

Voltage variation tests can also be carried out by connecting two suitable supply voltages. The module can also be used to test the behaviour of parts of a circuit under abrupt load change conditions.
Electronic fuses protect the instrument and the test circuit against overloads. The test circuit is insulated from the instrument supply by an opto-isolator.

Standards
NAMUR Part 1 (1988) etc.

Technical specifications

Test voltage	5 ... 220 Vdc
Test current	10 A max.
Drop-out time, short	1 ... 60 ms
long	30 ... 2000 ms
Cycle time, short	0.2 ... 2 s
long	0.8 ... 10 s
Switching time	
at 100 V/2 A	On -> Off < 2 µs
	Off -> On < 1 µs
at 15 V/10 A	On -> Off < 2 µs
	Off -> On < 1 µs
Max. voltage drop at 10 A	2 V
Drop-out triggering	Single pulse or repetitive
Gate	ext. gate/inhibit
Trigger output	Start/End, for oscilloscope or MD 203
Overload cut-out	
magnetic	Switch off time
	at 20 A < 1 min
	at 30 A < 20 ms
electronic	at 40 A < 10 µs

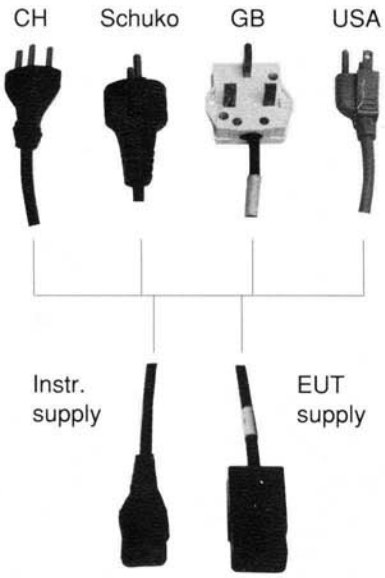
Dimensions:	265 x 130 x 340 mm (10.43 x 5.12 x 13.39")
Weight	6.8 kg or 15 lbs approx.

Optional accessories

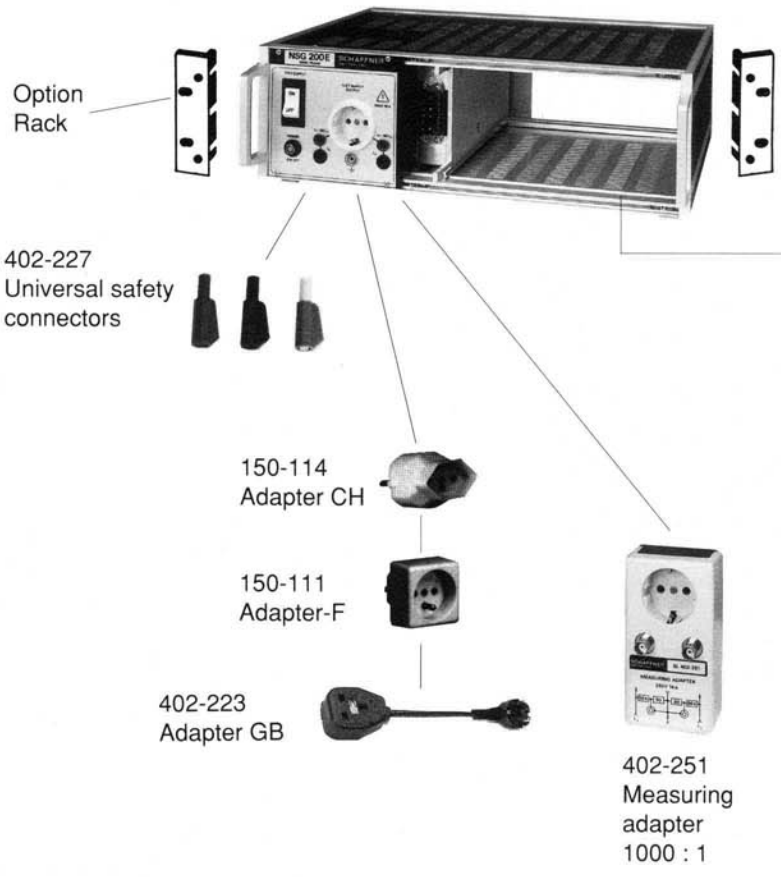
MD 203	Interval counter
402-737	Pair of BNC cable, 0.5 m for MD 203

Accessories

Plugs for mains and test cables



NSG 200E



Ordering Information

NSG 200E

In accordance with the order number, the instrument is set to the appropriate line voltage before leaving the factory and is fitted with the country- specific outlet sockets (or adapters) as well as mains cables for the instrument supply and the power feed to the EUT.

Order No.	Country	Plug type	Mains
NSG 200E - 01	D/S/NL/I/E/ N/SF/etc.	Schuko	220 ... 240 V; 50/60 Hz
NSG 200E - 02	CH	Typ 13	220 ... 240 V; 50/60 Hz
NSG 200E - 03	F/B	Typ 530 19	220 ... 240 V; 50/60 Hz
NSG 200E - 04	USA/CAN/FE	UL 498/13	100 ... 120 V; 50/60 Hz
NSG 200E - 05	GB	BS 1363	220 ... 240 V; 50/60 Hz

Please add the designation RACK for the flanged version intended for installation in a 19" cabinet.
Example: NSG 200E - 01/RACK

Generators

The plug-ins are set to the correct line voltage and frequency at the factory.The appropriate mains socket (or adapter must also be stated for the NSG 222A and NSG 225A.
The full ordering information is as follows:

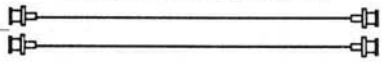
Type	Voltage	Frequency	Plug type
NSG 203A	100 V or		Schuko or
NSG 204	110 V or		CH or
NSG 222A	120 V or	50 Hz or	F or
NSG 223A	220 V or	60 Hz	USAor
NSG 224A	230 V or		GB
NSG 225A	240 V		

Example: NSG 225A/220V/50Hz/F

NSG 203 A

431-828 Connecting cable for 1 regulating tr.
431-829 Connecting cable for 2 regulating tr.

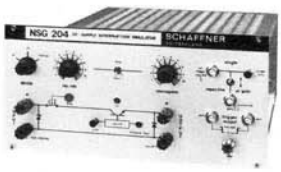
402-737 BNC cable (pair)



MD 203

Interval counter

NSG 204

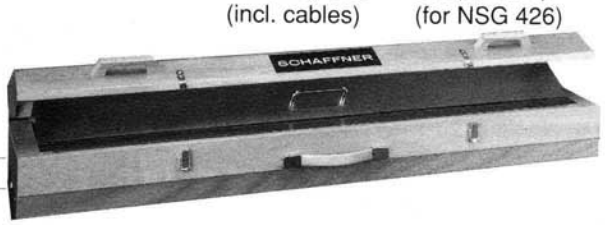


NSG 426

Data lines Coupling unit (incl. cables)

400–063 Coupl. clamp (for NSG 426)

NSG 222A



CDN 125 Coupling clamp IEC 801-4 (incl. cable)

402-379

Attenuator 6 dB

NSG 225A

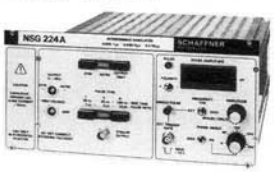
CDN 300

3-phase FT/Burst coupling network (incl. cables)

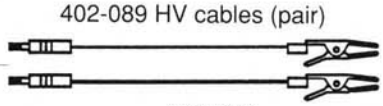
NSG 223A

400-070 Additional impedance (IEC255-4)

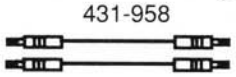
NSG 224A



402-089 HV cables (pair)



431-958



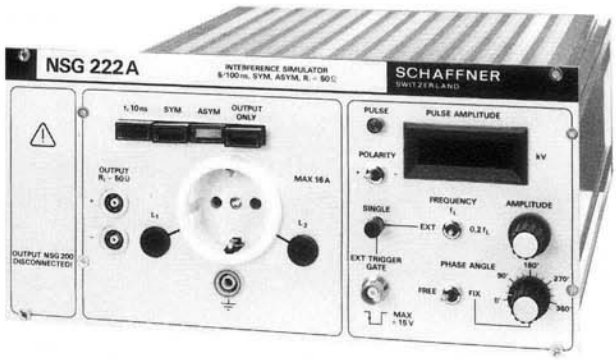
HV cables (Pair)

NSG 523

402-139 Distribution box

3-phase coupling network

NSG 222A
Fast Transients



- ***Fast interference pulses in the ns range***
- ***Built-in coupling network***
- ***Accessories enable extended applications***
- ***Suitable for detailed analyses***

Switches, relays and other contacting devices produce fast interference pulses through contact bouncing and sparking. These pulses spread throughout supply networks and linking cables, and can find their way into neighboring equipment. The pulses have steep rising edges and hence generate a wide interference spectrum to which fast logic circuits are particularly susceptible.
The NSG 222A generator simulates these sources of interference with pulses in the form 5 ns/100 ns.
A built-in coupling network designed for both symmetrical and asymmetrical pulse injection enables apparatus to be tested on the mains side. Through the use of accessories, the pulse output can be utilised to carry out various tests on data lines, 3-phase supplies, at the sub-assembly level, etc.
The continuously setting of the pulse amplitude, the choice of two different pulse rise times, the phase-related coupling and the single pulse function make the generator eminently suitable for detailed analyses of the interference susceptibility of electronic devices.

Standards
EEC 4517/79 COM (78) 766 Final
NW&M Lab 0320 (1981)
Loyd's Register's Type Approval Scheme (1985)
etc.

Technical specifications

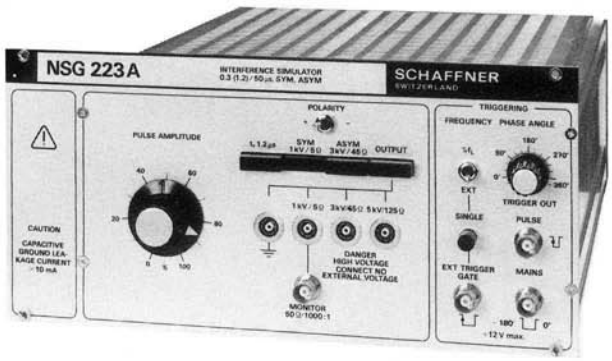
Pulse amplitude	50V ... 2500V (unloaded)
Rise time	5 ns ± 20% and 10 ns ± 20%
Pulse duration	100 ns + 20% (unloaded) 80 ns ± 15% (into 50 Ω)
Polarity	pos./neg.
Digital display	3-digit ± 5%, ± 1 Digit
Internal impedance	50 Ω ± 10%
Repetition frequency	Mains freq., $^1/_5$ mains freq.
Single triggering	Manual or ext. trigger
Phase angle	0 ... 360°adjust. ± 20% or free running
Coupling	symmetrical, asymmetrical
Dimensions	265 x 130 x 340mm (10.43 x 5.12 x 13.39")
Weight	3.2kg or 7 lbs

Optional accessories

NSG 426	Coupling unit for signal lines
400-063	Coupling clamp for signal cables
CDN 125	Coupling clamp according to IEC 801-4
CDN 300	FT/Burst coupling unit, 3-phase
156-154	HV coaxial plug
402-227	Universal safety connectors (set of 3 pieces)

NSG 223A
High energy pulses

- ***High energy standard pulses 1.2/50 µs***
- ***Symmetrical and asymmetrical mains coupling***
- ***Component tests up to 5 kV***



The NSG 223A module generates high energy pulses typical of those produced by switching inductive and capacitive loads, lightning strikes, etc. The pulses can be symmetrically or asymmetrically superimposed on the mains supply by means of the coupler in the main-frame as well as being available via separate sockets for component testing purposes. Because of their relatively high energy of about 2 Joules, the pulses can result in damage to unprotected or unsuitably arranged elements in input circuits.

This type of pulse is defined by various standards, IEC 801-5 among them. Compared to this specification, the NSG 223A generator has a somewhat higher internal impedance of 45 Ω in keeping with the wishes of many instrument manufacturers and test departments to overcome the danger of stressing components too much.
Clearly arranged operating elements enable the various test parameters such as the pulse amplitude, phase angle, polarity, repetition mode, etc. to be readily adjusted as desired.

Standards

IEC 801-5 (limited)
IEC 60-2
VDE 0432, Part 22
NAMUR, Part 1
VDE 0433, Part 3

Technical specifications

Pulse data

Operating mode	SYM	ASYM	OUTPUT	Tol.
Amplitude max. unloaded	1000 V	3000 V	1/3/5 kV	± 10 %
Rise time t_r	1,2 µs	1,2 µs	1,2 µs	± 30 %
switchable t_r	150 ns	500 ns	500 ns	± 30 %
Pulse durat. t_w	50 µs 1)	50 µs 1)	50 µs 1)	± 20 %
Impedance R_i	5 Ω	45 Ω	5/45/125 Ω	± 10 %

1) at 100 % amplitude

Pulse energy	2 Joules approx.
Polarity	pos./neg.
Phase angle	0 ... 360°
Repetition rate	1/8 mains frequency
Single pulse	manual triggering or ext. trigger
Trigger input	ext. trigger/gate
Monitor output	1000 : 1
Trigger output	pulse and phase zero crossing for oscilloscope triggering

Dimensions:	265 x 130 x 340 mm (10.43 x 5.12 x 13.39")
Weight:	5.4kg or 11.9 lbs

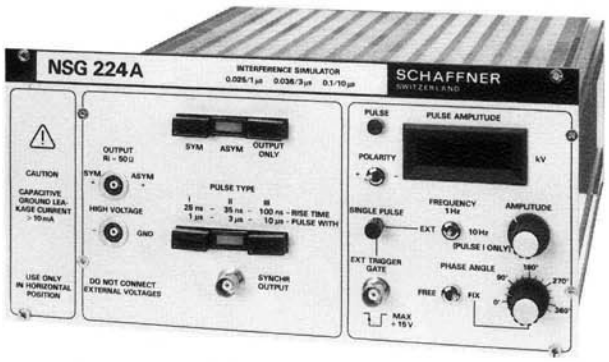
Accessories (included)

156-154	HV coaxial plug

Optional accessories

402-089	HV cable set with universal connectors for EUT connection
400-070	Additional impedance for insulation testing (IEC 255-4)
NSG 523	3-phase coupling network
431-958	HV cable, 0.4 m (pair)
402-139	Distribution box

NSG 224A
Medium Energy Pulses



- ***Interference pulses of up to 120mJ***
- ***Pulse voltage display via DVM***

Interference susceptibility testing with medium energy pulses is called for in various Standards as well as by calibration centres for automatic weighing and measuring systems.
The NSG 224A generator produces three types of interference pulses with fixed relationships between the rise time, pulse duration and repetition rate in each case. The pulse amplitude, and hence the pulse energy, is infinitely adjustable.

The interference pulses can be superimposed symmetrically or asymmetrically on the mains supply in either an in-phase or free running manner. The pulses are available in their pure form at HV sockets for use with external couplers.

Standards

NW&M Lab 0320 (1981)
BS 6491 Part 1 (1984)
etc.
OIML No. 11 (1986)
DS 5103 (1986)

Technical specifications

Pulse type

Pulse type	I	II	III	Tol.
Pulse duration	1 µs	3 µs	10 µs	±20%
Rise time	25 ns	35 ns	100 ns	±20%
Amplitude	50... 2500 V	50...2500 V	50...2500 V	±10%
Repetition rate	1 or 10 Hz	1 Hz	1 Hz	
Energy [1]	12,5 mJ	38 mJ	120 mJ	

([1] at 2500V into R_L = 50 Ω)

Polarity	pos./neg.
Generator impedance	50 Ω
Pulse output	HV coaxial connector
Mains coupling	symmetrical/asymmetrical
Phase angle	synchronous, 0 ... 360 ° asynchronous
Single pulses	Push-button operation or external
Trigger input	Ext. Trigger / Gate
Trigger output	to synchronize oscilloscope

Dimensions:	265x130x340mm (10.43 x 5.12 x 13.39")
Weight:	3.5kg or 7.7 lbs approx.

Accessories (included)

156-154	HV coaxial plug

Optional accessories

402-089	HV cable set with universal connectors for EUT connection
NSG 523	3-phase coupling network
431-958	HV-cable, 0.4m (Pair)
402-139	Distribution box

NSG 225A
Burst simulator

- ***Test in conformity with IEC 801-4***
- ***Test classes I to IV***
- ***Built-in coupler***

Inductively loaded mechanical switches, relays, etc. produce interference signals in the form of pulse bursts. The pulses have a fast rise time and hence generate a wide interference spectrum extending to over 200MHz to which digital and analogue electronic circuits are particularly sensitive. The summing effect of a burst of pulses serve to increase the demand for interference immunity for analogue circuitry.
Important Standards, such as the IEC 801-4, VDE 0843/4 and CENELEC HD 481/4 define the necessary interference immunity for various categories of instrument. The burst test are relevant not just to the mains connections but also to data and control lines.

The NSG 225A generator simulates these pulse bursts for the specified test classes. The pulse is superimposed on the EUT supply via an incorporated single phase coupler so that the EUT can be connected directly to the built-in mains socket.
The pulses are also available at a HV output for connection to auxiliary devices for coupling into 3-phase supplies, data lines, etc.

Standards

IEC 801-4	CENELEC HD 481/4
NAMUR (1988)	VDE 0843/4
etc.	

Technical specifications

Pulse data (unloaded)"

Test level	I	II	III	IV	Tol.
Amplitude	500 V	1000 V	2000 V	4000 V	±10%
Burst frequecy	5 kHz	5 kHz	5 kHz	2,5 kHz	±20%

Rise time t_r	5 ns ± 30 % into 50 Ω
Pulse duration t_p	50 ns ± 30 % into 50 Ω
Burst duration t_{Burst}	15 ms ± 20 %
Repetition t_{Rep}	300 ms ± 20 %
Polarity	pos / neg
Generator impedance	50 Ω ± 20 % (dynamic)
Pulse output	HV coaxial connector
Coupling	1-phase mains coupling L1 => Reference earth L2 => Reference earth SL => Reference earth L1 und L2 => Ref. earth L1 und L2 und SL => R. earth
Cross talk attenuation	> 30 dB (between lines)
Monitor	for pulse rate measurement
Gate	pulse inhibit

Dimensions	270x130x340mm (10.62 x 5.12 x 13.39")
Weight	3.9kg or 8.6 lbs approx.

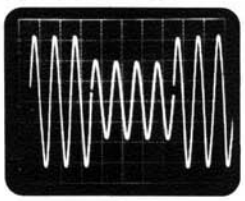
Optional accessories

CDN 125	Coupling clamp conforming to IEC 801-4
402-379	Attenuator 6dB, for coupling clamp
CDN 300	3-phase FT/burst coupler
NSG 426	Coupler unit for data lines
400-063	Coupling clamp, small, for use with NSG 426
402-378	Attenuator 100:1, for pulse measurements
156-154	HV coaxial plug
402-227	Universal safety connectors (set of 3 items)

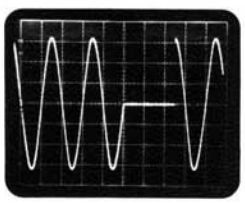
Instruments
SCHAFFNER

Typical pulse shapes

NSG 203A



Under-voltage test

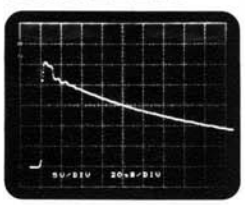


Short dropout

NSG 204

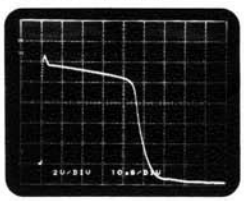
(as NSG 203A but for DC-Supplies)

NSG 222A



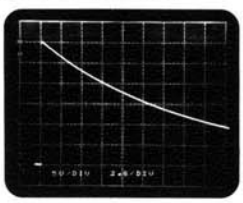
Pulse shape 5/100 ns

NSG 223A



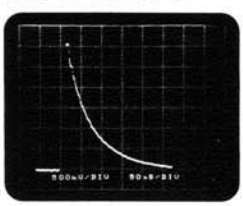
Pulse shape 1,2/50 µs

NSG 224A



Pulse shape 100 ns/10 µs

NSG 225A



Bursts - single pulse shape 5/50 ns

Change without notice

International sales and production subsidiaries

Switzerland:
SCHAFFNER ELEKTRONIK AG
Distribution Switzerland
Mühlehaldenstr.6
CH-8953 **Dietikon**
Tel. (01) 741 46 44
Fax (01) 741 19 60

Switzerland:
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Mühlehaldenstr.6
CH-8953 **Dietikon**
Tel. (01) 741 46 44
Fax (01) 741 19 60

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5, rue Michel Carré
F-95100 **Argenteuil**
Tél. (1) 39 47 86 36
Tlx. 608 723 schafra f
Fax (1) 39 47 02 28
Subsidiary:
F-38450 **Notre Dame de Commiers**
Tél. (76) 72 46 16
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