



NF PRODUCTS CATALOG

MEASUREMENT INSTRUMENTS

POWER SUPPLIES AND POWER TEST INSTRUMENTS

CUSTOMIZED PRODUCTS

<http://www.nfcorp.co.jp/english/>

NF Corporation

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NOTES

- **Power Line Voltage**
NF products are basically designed to operate on AC100V, 50Hz/60Hz. The AC input can be modified to suit the requirements in your area. You are requested to specify the voltage required when you place the order.
 - **Dimensions and Weights**
The dimensions of all the instruments shown herein are given in approximate value in order of Width, Height, and Depth. The weights are also approximate values. Handles, rubber legs and the like are not included in the dimensions and weights given in this catalog.
 - **Prices and Quotations**
No prices are given in this catalog. For quotations please contact us or our distributors in your area.
 - **For Further Information**
More detailed specifications are available based upon your request.
- Specifications are subject to change without notice.**

WARRANTY

All NF products are warranted against defect in materials and workmanship for one year from the date of delivery to the original purchaser.
For repair or service under warranty, instruments must be returned to a distributor in your area.

FUNCTION GENERATORS

MULTIFUNCTION GENERATOR

WF1973/WF1974

Generate the waveforms you need—effortlessly!

Wide array of functions for a broad range of applications

While the WF1973 and WF1974 can generate standard waveforms such as sine and square waves, application-specific waveforms such as Gaussian pulse and chattering, and arbitrary waveforms, these generators also have a wide array of functions, including sequence, modulation, and sweep. These are up-and-coming general-purpose signal sources that are a must for engineers and should be kept on hand for a wide variety of applications.



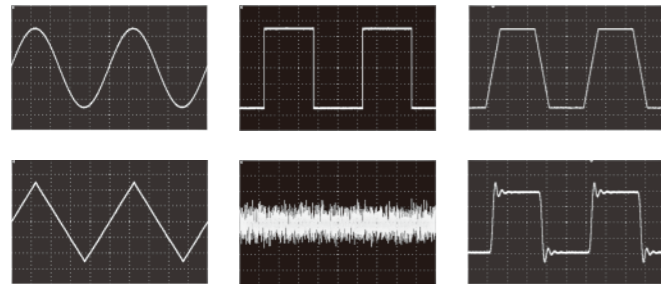
1CH 30MHz
WF1973
CE



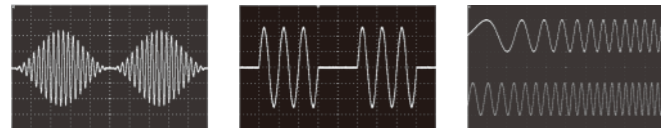
2CH 30MHz
WF1974
CE

WAVE FACTORY

Standard Waveforms

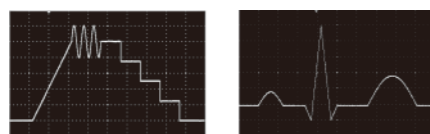


Oscillation Mode & 2 Channel Mode



Waveform Examples by Sequence Function

Parameter such as waveform, frequency and amplitude can be programmed and sequential output can be realized. Creating and editing of complex program can be easily done by sequence editing software.



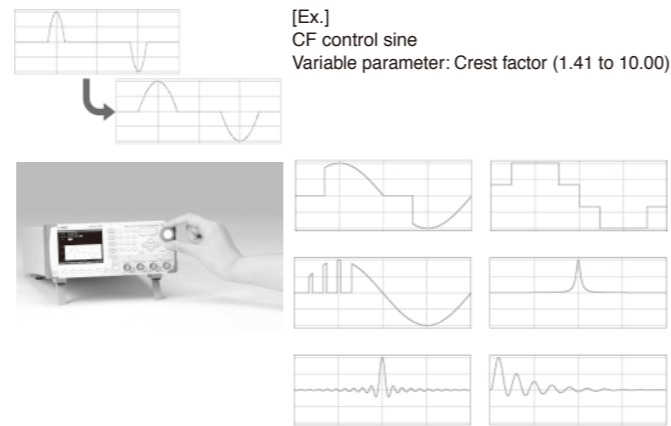
FEATURES

- **Wide Frequency Range**
0.01 μ Hz to 30 MHz
- **Various Types of Output Waveforms**
Equipped with standard, arbitrary and "parameter-variable" waveforms
- **Useful Programming Function**
The sequence function enables you to easily program output patterns.
- **Wide Array of Oscillation Modes**
Continuous, burst/trigger/gate, internal/external modulation, sweep, and sequence oscillation
- **2-channel Mode**
Two independent channels, two phases, constant frequency difference, constant frequency ratio, and differential output
- **Functions**
Synchronous operation of multiple units, usable as a pulse generator, external addition input, user-defined units and more
- **Pursuit of Usability**
Flat and lightweight (88 mm high, 2.1 kg), each channel insulated from the housing, USB/GPIB interface, and more

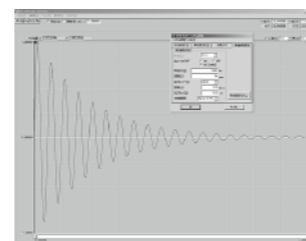
*Please refer the selection Guide in the next page

Parameter Variable Waveforms

Specific 25 kinds of waveforms for each application are installed. Necessary waveforms can be edited by setting variable parameter



Sequence Editor



Arbitrary Waveform Editor

MULTIFUNCTION SYNTHESIZER

WF1943B/WF1946B/WF1965/WF1966/WF1956

WAVE FACTORY

2CH 15MHz



WF1946B CE

2CH 50MHz



WF1966 CE

2CH 100MHz



WF1956

FEATURES

- **DDS system provides high accuracy and high resolution**
0.01 μ Hz to 15MHz / 50MHz / 100MHz
Frequency accuracy : ± 5 ppm
Resolution of frequency settings : 0.01 μ Hz
- **A variety of high-quality waveform output**
Generates sine waves, square waves, triangular waves, saw tooth waves, arbitrary waveforms, noise, and DC. Arbitrary Waveform editor is bundled.
- **A wealth of oscillation functions**
Including burst, gate, trigger, and triggered gate oscillations
- **A wide array of sweep and modulation functions**
- **Channel or 2-channel output**
Up to 6 units can be operated in sync, with a configuration of signal generators for 3 to 12 channels
- **16-bit waveform with high vertical resolution (WF1946B only)**
- **Superb user-friendliness**
Key Navigation, User unit Function, Load Function, Channel to channel isolation, Input/output floating
- **Equipped with USB and GPIB interfaces**

SELECTION GUIDE WAVE FACTORY

The following list summarizes the features of each model. For detailed specifications, refer to their respective catalogs, Web pages, or other documents.

Model name	30 MHz		15 MHz		50 MHz		100 MHz	
	WF1973	WF1974	WF1943B	WF1946B	WF1965	WF1966	WF1956	
Product name	Multifunction generator		15 MHz synthesizer	2CH 15 MHz professional synthesizer	50 MHz super synthesizer	2CH 50 MHz super synthesizer	100 MHz super synthesizer	
Oscillation frequency	0.01 μ Hz to 30 MHz		0.01 μ Hz to 15 MHz		0.01 μ Hz to 50 MHz		0.01 μ Hz to 100 MHz	
Number of channels	1	2	1	2	1	2	2	
Vertical resolution for waveform	14 bits		14 bits	16 bits	14 bits		12 bits	
Waveform and frequency range	~	0.01 μ Hz to 30 MHz		0.01 μ Hz to 15 MHz		0.01 μ Hz to 50 MHz		0.01 μ Hz to 15 MHz/100 kHz to 100 MHz ⁻¹
	□ (duty fixed)	0.01 μ Hz to 15 MHz		0.01 μ Hz to 15 MHz		0.01 μ Hz to 50 MHz		0.01 μ Hz to 15 MHz
	□ (duty variable)	0.01 μ Hz to 15 MHz		0.01 μ Hz to 500 kHz		0.01 μ Hz to 2 MHz		0.01 μ Hz to 500 kHz
	~ (symmetry variable)	0.01 μ Hz to 5 MHz		—		—		—
	~ (symmetry variable)	0.01 μ Hz to 5 MHz		—		—		—
	~ (symmetry variable)	0.01 μ Hz to 5 MHz		—		—		—
	~ (symmetry variable)	0.01 μ Hz to 5 MHz		—		—		—
	Parameter-variable waveforms (25 types)	0.01 μ Hz to 5 MHz		—		—		—
	Arbitrary waveform	0.01 μ Hz to 5 MHz		0.01 μ Hz to 500 kHz		0.01 μ Hz to 2 MHz		0.01 μ Hz to 500 kHz
	Noise	Bandwidth: 26 MHz		Bandwidth: 500 kHz		Bandwidth: 2 MHz		Bandwidth: 500 kHz
Frequency setting resolution	0.01 μ Hz (0.1 μ Hz in the HF mode for WF1956 (100 kHz to 100 MHz))							
Rising/falling variable	Pulse: 15 ns to 58.8 Ms			—		Square: 7 ns to 1 ms		—
Arbitrary waveform data length/number of waves	512 K words/128 waves, 4 M words		8 K words/12 waves, 16 K words/6 waves, 32 K words/3 waves, 64 K words/wave (64 K words are not for the WF1965, WF1966 and WF1956.)		—			
Maximum output voltage/resolution	20 Vp-p/open, 10 Vp-p/50 Ω , Resolution: 0.1 mVp-p or 1 mVp-p (depending on conditions) ⁻¹ These do not apply to CH2 of the WF1956. ⁻¹							
Oscillation mode	Continuous oscillation	○	○	○	○	○	○	
	Burst/trigger/gate/triggered gate	○	○	○	○	○	○	
	Sweep	Frequency, phase, amplitude, DC offset and duty ratio		Frequency and phase for WF1943B. Frequency, phase, amplitude, DC offset and duty ratio for WF1946B.		Frequency, phase, amplitude, DC offset and duty ratio		
	Internal modulation	FM, FSK, PM, PSK, AM, DC offset and PWM		FM and PM for WF1943B. FM, PM, AM, DC offset and PWM for WF1946B.		FM, PM, AM, DC offset and PWM		
	External modulation	—		—		AM only		
	Sequence	○	○	—	—	—	—	—
	Two channel mode	—	○	—	○	—	○	○
User-defined unit	○	○	○	○	○	○	○	
Synchronous operation	○	○	—	○ (option)	○ (option)	○ (option)	○ (option)	
Digital output	—	—	—	○ (option)	—	—	○ (option)	
Input/output floating	○	○	○	○	○	○	○	
Isolation between channels	—	○	—	○	—	○	○	
External addition	○	○	—	○	○	○	○	
Setting storage	○	○	○	○	○	○	○	
GPIB interface	○	○	○	○	○	○	○	
USB interface	○	○	○	○	○	○	○	
Color LCD display	○	○	—	—	—	—	—	
Arbitrary Waveform Editor	○	○	○	○	○	○	○	
Sequence Editor	○	○	—	—	—	—	—	
Power supply	90 V to 250 V AC		100 V/115 V/230 V AC selectable				100 V AC	
Power consumption	50 VA or less 75 VA or less		65 VA or less	100 VA or less	65 VA or less	100 VA or less	125 VA or less	
External dimensions (mm) ⁻²	216 (W) x 88 (H) x 332 (D)		216 (W) x 132.5 (H) x 290 (D)					
Weight	approx. 2.1 kg		approx. 4.2 kg	approx. 4.6 kg	approx. 4.4 kg	approx. 4.7 kg	approx. 5.4 kg	

⁻¹ The WF1956 can output 100 kHz to 100 MHz in the CH2 HF mode (PLL) (continuous oscillation of ~ wave only). The maximum output voltage for CH2 is 4 Vp-p/open, 2 Vp-p/50 Ω . The minimum resolution is 1 μ Vp-p/open (20 mV range).

⁻² Not including projections

High Resolution and Multifunction

DF1906 is a function generator of 0.1 mHz to 2 MHz. It has realized high resolution and high performance by adopting the DDS (Digital Direct Synthesis) method.



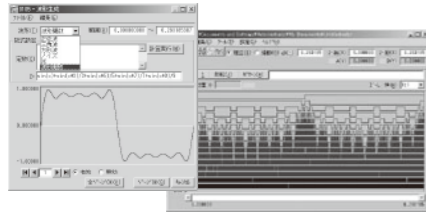
FEATURES

- High accuracy: $\pm 25\text{ppm}$
- Wide frequency range: 0.1mHz to 2MHz, resolution: 0.1mHz
- Various Output waveforms: sine, square (variable duty factor 0 to 100%), triangle (variable symmetry 0 to 100%), arbitrary waveform, DC
- Arbitrary waveform editor which facilitates generation of complex waveforms (standard equipment) *
- Oscillation modes: continuous, trigger, gate and burst
- Output on/off function, setting memory (20 sets), Load function etc.
- Equipped with USB interface
- The power input is available for worldwide applications (AC100 to 240V)
- Compact and lightweight (1.2kg, 93.5mm depth)

SPECIFICATIONS

Oscillation frequency range	0.1 mHz to 2 MHz
Output waveform	Sine, triangle (variable symmetry) square (variable duty factor), arbitrary (ARB), DC
Vertical resolution of waveform	12 bits
Waveform and frequency	sine, square (duty 50%): 0.1 mHz to 2 MHz Triangle, square (other than duty 50%) : 0.1 mHz to 50 kHz ARB: 0.1 mHz to 50 kHz
Frequency setting resolution	0.1 mHz
Frequency accuracy	$\pm 25\text{ppm}$
Triangle wave variable symmetry	Setting range: 0% to 100% Resolution of settings: 0.1%
Square wave variable duty range	Setting range: 0% to 100% Resolution of settings: 0.1%
Arbitrary waveform size and number	4 K words, 4 waves
Max. output voltage	10 Vp-p/open
Output voltage resolution	0.001 Vp-p
DC offset	$\pm 5.000\text{ V/open}$, resolution 0.001 V
Output impedance	50 Ω unbalanced
Oscillation mode	Continuous, burst, gate, trigger
Other functions	Load function (sets and displays actual output voltage when load is open or 50 Ω), Output on/off function, Setting memory (save/call 20 sets of setting items), Battery backup, Initializing function, input/output ground
Arbitrary waveform editor	Standard equipped
Interface	USB interface, USBTMC
Power requirements	AC 90 V to 250 V
Power consumption	20 VA or less
Dimensions (mm)	216(W) \times 132.2(H) \times 93.5(D)
Weight	Approx. 1.2kg

0105 ARBITRARY WAVEFORM EDITOR



You can easily create arbitrary waveforms on your PC by using separately-sold 0105, the software to create arbitrary waveforms. The waveforms you created can be transferred to DF1906 via GPIB or USB interfaces.

- Waveform Creation Function
- Waveform Editing Function
- Transferring Function
- Displaying Function
- File Operations

Compatible OS: Windows 2000, XP

CLOCK SYNTHESIZER

CK1615/CK1620



FEATURES

- High speed and high resolution
- High accuracy
- External clock input
- Variable output voltage
- Low jitter output

APPLICATIONS

- Read and write test of Hard Disk Drive, DVD, Mini Disk
- Aging test of computer peripherals
- Operation Test of next generation mobile communication system
- Operation test of LSI
- Test of polygon mirror

CLOCK SYNTHESIZER is high speed digital signal (square wave) generator. Output level is possible to apply various devices which are TTL, CMOS, ECL and GaAs. It is possible to use for testing trial digital boards.

SPECIFICATIONS

Frequency range	CK1615 : 1 kHz to 100 MHz CK1620 : 1 kHz to 500 MHz
Frequency resolution	1 mHz (maximum 12 digits)
Internal time-base frequency	accuracy : $\pm 5\text{ppm}$ aging : $\pm 2\text{ppm/year}$
High stability time-base frequency (option)	accuracy : 0.1ppm (at shipment) aging : $\pm 0.5\text{ppm/year}$
External time-base frequency	10 MHz $\pm 20\text{ppm}$
Frequency switching time	5 ms or less
Output voltage	-2.00 V to + 7.00 V/open
Rise and fall time	10% to 90%, 50 Ω terminal (amplitude setting [V/open] $\div 2.5 + 0.6$) [ns] (typ.), approx.
Interface	GPIB (option : 1911)
Power requirements	AC100 V, 115 V or 230 V $\pm 10\%$, switchable
Dimensions (mm)	216(W) \times 132.5(H) \times 290(D)
Weight	Approx. 4.2 kg

IMPEDANCE/GAIN-PHASE ANALYZER

IMPEDANCE /GAIN-PHASE ANALYZER

ZGA5905

More than just a measurement instrument



The impedance/gain-phase analyzer ZGA5905 supplies characteristics and parameters specific to electronic materials, components and circuits, and simulation data. ZGA5905 is an indispensable unit for reducing evaluation and test times and for improving performance and reliability.

FEATURES

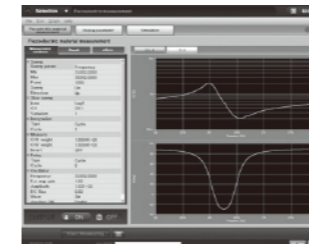
- Displays results for the DUT as characteristics graphs and parameters.
- Capable of analyses such as equivalent circuit estimation and transfer function identification as well as simulations using those analysis results.
- Generates and prints reports, and saves data.

Highly reliable measurements for a wide range of measurement object

- Capable of measuring from ultra-low frequency ranges
- Measurement frequency: 0.1 mHz to 15 MHz
- Supports measurement of power devices and high-voltage circuits
- Maximum input voltage: 250 Vrms; Dynamic range: 140 dB
- Extensive range of measurement sweep parameters and high densitysweeping of the frequency axis
- Sweep parameters: Frequency, AC amplitude, DC bias, time
- Isolation between all inputs and outputs
- Isolation voltage: 250 Vrms
- Functions available to provide improved measurement data reliability
Open/short correction, integration and equalization, etc.
- Can be combined with a power amplifier to measure according to the operating range of the DUT

MEASUREMENT & ANALYSIS

■ Piezoelectric material



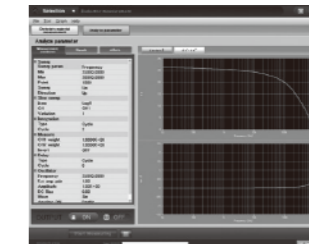
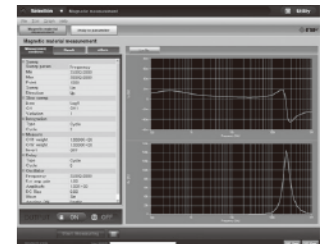
Piezoelectric material measurement

■ Dielectric material



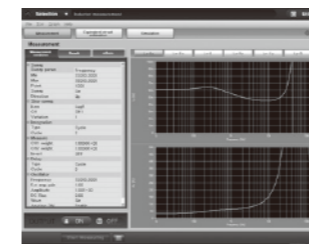
Parameter display

■ Magnetic material

Dielectric permittivity derivation $\epsilon_s - \tan \delta$ 

Magnetic material measurement

■ Inductor



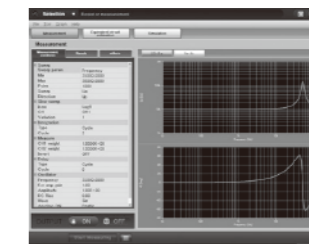
Inductor measurement

■ Capacitor



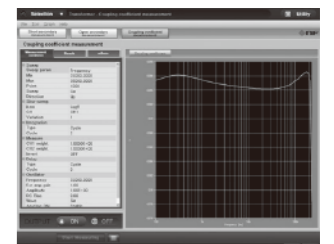
Equivalent circuit estimation

■ Resistor



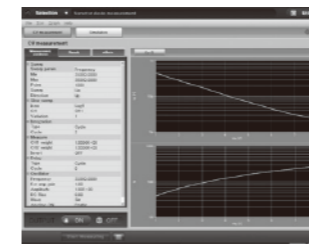
Resistor measurement

■ Transformer



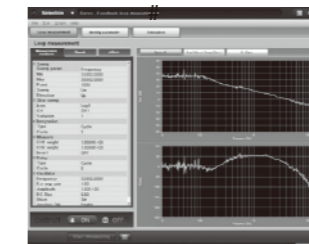
Coupling coefficient measurement

■ Diode



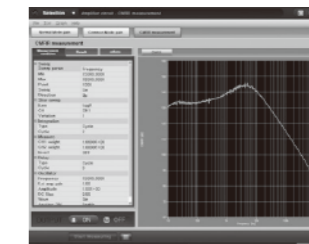
CV measurement

■ Servo



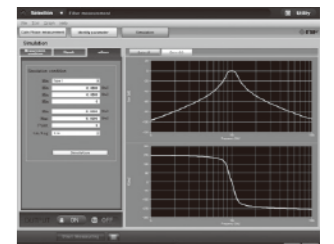
Gain-phase

■ Amplifier Circuit



CMRR

■ Filter Circuit



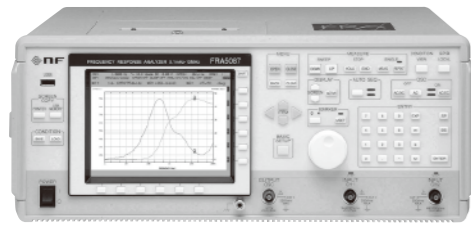
Transfer function simulation

FREQUENCY RESPONSE ANALYZERS

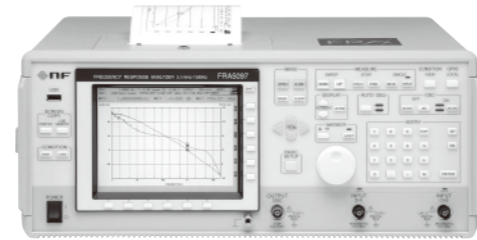
FREQUENCY RESPONSE ANALYZER

FRA5087/FRA5087

CE



FRA5087



FRA5097

A frequency response analyzer measures the gain and phase response characteristics with respect to frequency of the device or system under test, by applying a frequency swept sine-wave to it and examining its response signal.

Featured wide dynamic range realizes high precise measurement, and also ultra low frequency measurement.

APPLICATIONS

- Servo response measurement for magnetic disk and photo disk
- Loop characteristics measurement for switching power supply
- Impedance measurement for piezo-electric element
- Internal resistor measurement for electric double layer capacitor

SPECIFICATIONS

Oscillator	
Output waveform	~ , □ , ~
Frequency range	~ FRA5087 : 0.1 mHz to 10 MHz FRA5097 : 0.1 mHz to 15 MHz resolution: 0.1 mHz
Amplitude	□ , ~ 0.1 mHz to 100 kHz AC : 0 V to 10.0 V peak (no load) DC : -10.0 V to 10.0 V
Frequency sweep	Logarithmic sweep : 3 to 20,000 steps/sweep or 1 to 20,000 steps/decade Linear sweep : 3 to 20,000 steps/sweep or 0.1 mHz to 10 MHz/steps (FRA5087) 0.1 mHz to 15 MHz/steps (FRA5097) Automatic high density sweep is available.
Isolation voltage	250 Vrms (input to chassis, to analysis section)
Analyzer	
Number of input channels	2 channels (CH-1, CH-2)
Isolation voltage	250 Vrms (input to chassis, to oscillating output, and to analysis section)
Amplitude range	Auto-ranging, Max. 250 Vrms
Max. input voltage	AC + DC 350 Vpeak
DC bias elimination	Automatically eliminate up to value without error
Dynamic range	more than 140 dB (10 Hz to 1 MHz)
Delay function	0 to 9,999 s, 0 to 9,999 cycle
Integration function	0 to 9,999 s, 1 to 9,999 cycle Automatic integration is available.
Amplitude compression function	Automatically control the amplitude of oscillator for making the input level of analysis constant.
Other functions	Equalize function, harmonic analysis function
Analysis mode	Ratio : CH1/CH2, CH2/CH1 Level : CH1, CH2

FEATURES

- Gain accuracy ± 0.05 dB, Phase accuracy $\pm 0.3^\circ$
- Dynamic range more than 140dB
- Measurement frequency FRA5087 : 0.1 mHz to 10 MHz
FRA5097 : 0.1 mHz to 15 MHz
- Isolation Voltage 250 Vrms
- Bode plot, Nyquist plot, Nichols plot and Cole-Cole plot output are available
- Auto integration, amplitude condensation, arithmetic function
- Color LCD display & USB
- Built-in printer
- Software for reading data files

Arithmetic function	Arithmetic operation, differentiation, second-differentiation, Integration, double integration, open loop to closed loop change, closed loop to open loop change				
Measurement error	CH1/CH2 mode	≤ 20 kHz	≤ 500 kHz	≤ 2.2 MHz	> 2.2 MHz*
	a, b, R	$\pm 0.5\%$	$\pm 1\%$	$\pm 10\%$	$\pm 25\%$
	dBR	± 0.05 dB	± 0.1 dB	± 1 dB	± 2 dB
	Phase	$\pm 0.3^\circ$	$\pm 0.5^\circ$	$\pm 2^\circ$	$\pm 5^\circ$

*applies only to FRA5096.

Others	
Thermal printer	LCD screen hardcopy
Display device	6.5 inch, color LCD
Graph display	Bode plot/Nyquist plot/Nichols plot/Cole-Cole plot (reading and auto-scale are realized with use of the cursor.)
External memory	USB memory (USB1.1 or USB2.0) Front panel, USB-A connector
Interface	GPIB, USB
DC source output	connector for 5055, ± 24 V, Max.100 mA
Power requirements	AC100 V/120 V/230 V $\pm 10\%$, 48 Hz to 62 Hz, Max. 100VA
Dimensions (mm)	434(W) \times 177(H) \times 453(D)
Weight	approx. 12 kg

FREQUENCY RESPONSE ANALYZER

FRA5022

CE



FEATURES

- Gain accuracy: ± 0.05 dB, Phase accuracy: $\pm 0.3^\circ$
- Frequency range: 0.1 mHz to 100 kHz
- Dynamic range : 120dB
- Isolation
- Shortened measurement time of ultra-low frequencies
- Quick switching of settings
- Slim case (2U) optimal for a rack system
- Equipped with color display
- Data display software

FREQUENCY RESPONSE ANALYZER

5010A



SPECIFICATIONS

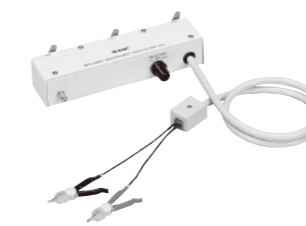
Frequency range	10mHz to 20kHz
Oscillator	
Frequency resolution	4 digits
Output waveform	~
Output voltage	10mV to 5Vrms
Analyzer	
No. of input channel	2
Input voltage range selection	Auto ranging
Isolation voltage	± 14.2 V (floating)
Analysis mode	CH1/OSC, CH1/CH2
DC bias elimination	Automatically eliminated over the entire frequency range
Integration cycles	1 to 100
Judgement function	UNDER, GO and OVER
Display device	Indicator tube
Display mode	log R, θ , numerical
Miscellaneous	
Memory	10 spots
Interface	GPIB
Power requirements	AC100, 120, 220 or 240V switchable
Dimensions (mm)	432(W) \times 132.5(H) \times 400(D)
Weight	approx. 9.5kg

OPTION & PERIPHERALS

For Frequency Response Analyzer and Impedance/Gain-phase Analyzer



High-power Impedance Measurement Adapter
PA-001-1840/ PA-001-1841



Impedance Measuring Adapter
PA-001-0368



Loop Gain Measuring Adapter
PA-001-0369



Shunt Resistor PA-001-0370



Signal Injector Probe 5055

- High withstand voltage clip set (3 per set) PA-001-0419
- High withstand voltage alligator clip cable set (small) (3 per set) PA-001-0420
- High withstand voltage alligator clip cable set (large) (3 per set) PA-001-0421
- Alligator clip cable set (3 per set) PA-001-0422
- High withstand voltage BNC adapter (T-branch) PC-001-4503
- High withstand voltage BNC cable PC-002-3347
- High withstand voltage extension BNC cable PC-007-0364
- Replacement printer paper (ten rolls) PC-007-0382
- Loop gain measuring adapter clip cable (for replacement) PC-007-1922

LCR METERS

LCR METER

ZM2371/ZM2372

CE



ZM2371

FEATURES

- Basic accuracy: 0.08 %, display resolution of 6 digits (max.)
- Measurement speed: Max. 2 ms at 1 kHz
- Measurement frequency: 1 mHz to 100 kHz, 5-digit resolution
- Measurement signal level: Max. 5 Vrms, 3-digit resolution
- Measurements parameters: Lp, Ls, Cp, Cs, Rp, Rs, |Z|, |Y|, G, Q, D, θ , X, B, Rdc
- Constant-voltage/constant-current drive (ALC:Auto Level Control)
- Internal DC bias: 0 V to +2.50 V
- DC resistance measurement
- 4-terminal contact check function and a handler interface for production lines (ZM2372)
- Application software

SPECIFICATIONS

Measurement frequencies	1 mHz to 100kHz (setting for 5-digit resolution)	Deviation display	Display deviation and deviation % from a preset reference value
Measurement parameters	Primary parameters: Lp, Ls, Cp, Cs, Rp, Rs, Z , Y and G (Automatically selectable) Secondary parameters: Q, D, θ , X, B, Rp, Rs, G, Lp and Rdc	Comparator	Primary parameters: 9 bins max. (ZM2371)/14 bins max. (ZM2372) Original measured value / deviation / deviation % can be sorted. Secondary parameter: Upper limit and lower limit comparison Original measured value / deviation / deviation % can be sorted.
Basic accuracy	0.08%	Handler interface (ZM2372)	Signal isolation Input signals: trigger, key lock, setting / correction value memory designation Output signals: comparator results (BIN1 to BIN14)
Measurement signal levels	10mVrms to 5.00Vrms (setting for 3-digit resolution)	Interface	USB, RS-232, GPIB (ZM2372)
Internal DC bias	0 V to +2.50 V	Power requirements	AC100V to 230V $\pm 10\%$, 250 V max.
Trigger	INT (automatic continuous trigger), MAN (manual), Signal	Dimensions (mm)	260 (W) \times 88 (H) \times 220 (D)
Delay time	0.000 s to 999.999 s	Weight	ZM2371: approx. 2.0 kg, ZM2372: approx. 2.1 kg
Triggered drive	Drive only at measurement/continuous drive selectable		
Measurement speed	RAP (rapid)/FAST/MED (medium)/SLOW/VSLO (very slow) Switchable between 5 levels from 2 ms to 501 ms		

TEST FIXTURES & TEST LEADS for LCR METERS

An assortment of test fixtures and test leads are available as jigs and tools for measuring components and materials with the LCR meter. Select the type that suits the target components.

ZM2324 Four-terminal alligator-clip test leads

Use these test leads with low-impedance four-terminal components, including those which have separate current supply terminals and voltage test terminals.



ZM2325A (L/M) Kelvin-clip test leads

The two test lead clips enable four-terminal connections. The ZM2325A can be used to test large or unusually shaped components that cannot be easily inserted into the direct test fixture. Select between two types: the standard L type or the M type with smaller clips.



ZM2326A Test lead for chip components

Features tweezer-type test leads for easy measurement of surface-mounted chip components, etc. The tip's measurement contact is removable.



ZM2323A Direct test fixture

This test fixture is for measuring directly connected lead-ended components. The ZM2323A enables bend-free measurement of both parallel-lead type and opposing-lead type components.



ZM232391 Three-terminal alligator-clip test leads

A three-terminal type is also available for simpler measurements.



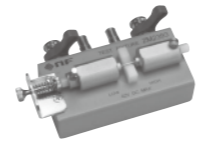
ZM232392 Kelvin-clip test leads

The ZM232392 provides test leads for simpler measurements.



ZM232393/ZM232394 Chip test fixture

This test fixture for SMD and chip elements is directly connected to the panel surface for measuring. Its small floating capacitance makes for easier zero-point correction.



ZM232328 DC voltage bias adapter

AC VOLTMETERS

TRUE R.M.S. AC VOLTMETER

M2170



SPECIFICATIONS

Voltage measurement range	1 mV to 100 Vrms/F.S.
Frequency range	5 Hz to 20 MHz
Input impedance	approx. 1 M Ω 25 pF max.
Max. input voltage	1 V to 100 V range : AC \pm DC peak value ± 250 V Frequency[Hz] \times Voltage[V] = 10 ⁸ 1mV to 300mV range : AC ± 10 Vpeak, AC \pm DC peak value ± 250 V
Indication accuracy (reference to F.S.)	30 Hz to 1 MHz : $\pm 3\%$ 10 Hz to 10 MHz : $\pm 5\%$ 5 Hz to 20 MHz : $\pm 10\%$
AC output	1V (F.S., no load), output impedance : approx. 50 Ω typ.
DC output	1V (F.S., no load), output impedance : approx. 50 Ω typ.
Meter	Taut-band with mirror type
Power requirements	AC100 V, 120 V, 230 V switchable
Dimensions (mm)	140(W) \times 177(H) \times 300(D)
Weight	approx. 3.5 kg

FEATURES

- Wide frequency range 5Hz to 20MHz
- Indication of true rms values
- AC and DC output
- Sensitivity adjustment (useful in dB and S/N ratio measurements)
- dB linear scale (option)

AC VOLTMETER / NOISE METER

M2174 / M2177



SPECIFICATIONS

Voltage measurement range	M2174 : 10 μ V to 100 Vrms/F.S. M2177 : 30 μ V to 100 Vrms/F.S.
Frequency range	5 Hz to 500 kHz
Input impedance	approx. 1 M Ω 20pF max.
Max. input voltage	30 mV to 100 V range : AC+DC peak value ± 250 V 10 μ V to 10 mV range : AC+5 Vpeak, AC+DC peak value ± 250 V
Indication accuracy (average response, reference to F.S.)	10 μ V range : 10 Hz to 30 kHz $\pm 10\%$ (M2174 only) 30 μ V range : 10 Hz to 30 kHz $\pm 5\%$ 100 μ V range : 10 Hz to 100 kHz $\pm 5\%$ 300 μ V to 100 V range : 5 Hz to 500 kHz $\pm 10\%$
AC output	1 V (F.S., no load), output impedance : approx. 50 Ω typ.
DC output	1 V (F.S., no load), output impedance : approx. 50 Ω typ.
Meter	Taut-band with mirror type
Weighting network	Built-in 4 types filter : JIS-A (JIS C 1502A), JIS-C (JIS C 1502C), DIN-45405 (AUDIO), CCIR-ARM Possible to add another 2 filters as option
Power requirements	AC100 V, 120 V, 230 V, switchable
Dimensions (mm)	140(W) \times 177(H) \times 300(D)
Weight	approx. 3.5kg

FEATURES

- 10 μ Vrms fullscale (M2174) 30 μ Vrms fullscale (M2177)
- Automatic range selection (M2177)
- Maximum six types of filters can be built-in (for auditory weighting and other functions)
- Indication response : true rms response, average response and quasi peak response
- AC and DC output
- Sensitivity adjustment (useful in dB and S/N ratio measurements)
- dB linear scale (option)

LOCK-IN AMPLIFIERS / PREAMPLIFIERS

DIGITAL LOCK-IN AMPLIFIER

LI5630/LI5640



LI5630



LI5640

NF's experienced technique utilizes fully a high speed computing function of digital signal processor, and designs DSP Lock-in Amplifiers for easier operation and cost performance, also with improving high speed and output stability of setting or measurement response.

FEATURES

- High stability based on digital processing
Phase stability 0.01°/°C, Gain stability ±100ppm/°C
- Measurement from 1mHz
Low speed signal analysis is available like infrared spectrum, temperature response etc.
- High speed and smooth response
Minimum time constant 10μs, synchronized filter provided and quick response to setting change.
- Simple and assured operation to sophisticated measurement
Auto function, key allocation, large indicating window, analog meters, and modify dial are provided.
- Two models lined up
Fulfilled multi-function digital lock-in amplifier : LI5640
Simplified and cost-performance : LI5630

SPECIFICATIONS

Model	LI5630	LI5640
Sensitivity	2nV to 1V, full-scale	
Frequency range	0.001Hz to 100kHz	
Dynamic reserve	100dB or greater	
Input impedance	10MΩ ± 1.5%, differential, floating	
Input referred noise (voltage)	6nV/√Hz (max.), 4.5nV/√Hz (typ.) (at 1kHz)	
Input referred noise (current)	—	130fA/√Hz (typ.) (10 ⁶ V/A, at 1kHz) 13fA/√Hz (typ.) (10 ⁸ V/A, at 125Hz)
Filter	50/60Hz, 100/120Hz, notch filter	
Time constant	10μs to 30ks, 24dB/oct fixed, SYNC*1	10μs to 30ks, 6, 12, 18, 24dB/oct, SYNC*1
Phase measurement	−180.00° to +179.99° resolution : 0.01°	
Reference signal mode	REF IN / INT OSC, 2F	REF IN / INT OSC / SIGNAL*2, nF (n ≤ 19999)
Internal oscillator	—	0.0005Hz to 105kHz (4 1/2-digits)
Measurement display*3	X, Y, R, θ Reference frequency, Ratio	DATA1 : X, R, NOISE, AUX IN1, X(dB), X(%) DATA2 : Y, θ, AUX IN1, AUX IN2 Reference frequency, Ratio, DC
Data memory	16 bit × 64K data sampling interval : 1/16ms to 20s	
Interface	GPIB, RS-232C	
Power requirements	AC100V, 120V or 230V switchable 50/60Hz ± 2Hz 50VA max.	
Dimensions (mm)	434(W) × 132.5(H) × 400(D)	
Weight	approx. 10kg	
Remarks	*1 Output ripple is reduced by synchronous filter which is performed moving average with integer multiples of reference signal period *2 Synchronized with measuring signal without reference signal *3 X : Rcosθ, Y : Rsinθ, θ : phase, R : amplitude	

LOCK-IN AMPLIFIER

5610B



FEATURES

- Computer interface(GPIB, RS232C)
- Automatic functions : AUTO SET, AUTO RANGE, AUTO NORMALIZE, PHASE SET
- High dynamic reserve(110dB Max.)

FEATURES

- Sensitivity 100nV to 1V fullscale, in 1-3 steps (10nV at the METER MAG operation)
- Frequency range 0.5Hz to 200kHz
- Input type Differential
- Input impedance 10M // 40pF
- Common-mode rejection ratio 110dB or greater(at 1 kHz)
- Input referred noise 5nV or lower(at 1 kHz)
- Filter LPF, HPF, BPF, automatic tuning is available.
- Reference signal mode EXT F/2F, INT F/2F
- Internal oscillator 0.5Hz to 120kHz
- Measurement display DATA 1: One of either A, A(dB), A%, X(Acosφ), X(dB), X(%)
DATA 2: One of either φ or Y (Asinφ)
DATA 3: One of either ratio, reference frequency, EXT DC Acosφ or Asinφ
- Monitoring meter Acosφ or Asinφ
- Time constant 1ms to 30s 6dB/oct or 12dB/oct
- Averaging functions Linear or exponential averaging mode No. of averages: 2¹ to 2⁹
- Interface GPIB, RS-232C
- Power requirements AC100, 120, 220 or 240V switchable
- Dimensions(mm) 432(W) × 132.5(H) × 500(D)
- Weight approx.13.5kg

SYNCHROTRACK LOCK-IN AMPLIFIER

LI-575



SPECIFICATIONS

- Sensitivity 100nV to 500mV
- Frequency range 0.5Hz to 200kHz
- Input mode Ground line may be switch-floated.
- Input impedance 100MΩ // 40pF
- Input referred noise Less than 5nV/√Hz (at 1kHz)
- Reference mode AUTO, INT, EXT, EXT2F
- Phase adjustment Not required
- Time constant 1.25ms to 125s, 6dB/oct or 12dB/oct
- Dynamic reserve Maximum 100dB
- DC output Acosφ, Asinφ, A, φ, NOISE
- Power requirements AC100, 120, 220 or 240V switchable
- Dimensions (mm) 480(W) × 149(H) × 500(D)
- Weight approx. 20kg

FEATURES

- Completely free from harmonic influences
- Wide band frequencies between 0.5Hz and 200kHz can be continuously set.
- Dynamic reserve 100dB
- Phase measurements easily performed.
- Built-in noise measuring mode; equivalent of 0.1Hz to 100Hz

LOCK-IN AMPLIFIER FREQUENCY EXTENDER

5571



A frequency converter, which can extend upper limited frequency of Lock-in Amplifier up to max. 5MHz.

FEATURES

- Input impedance: 50Ω
- Input sensitivity range: +40dB to -10dB
- Input frequency: 10kHz to 5MHz
- Input noise 10nV/√Hz (typ.)
- GPIB interface

DIFFERENTIAL AMPLIFIER

5307



The 5307 is a general-purpose low-noise differential amplifier featuring a bandwidth of DC to 10MHz, a maximum gain of 1000 and a noise level of 4nV/√Hz.

FEATURES

- Wide bandwidth : DC to 10MHz
- High gain : 10 to 1000
- Differential input (single-ended configuration also selectable)
- High CMRR : 120dB or higher
- High common mode voltage : ±10V
- Low noise : 4nV/√Hz typ. (1kHz)

SPECIFICATIONS

- Input configuration Balanced differential input (2 BNC connectors)
- Input impedance 1MΩ ± 2% (100MΩ impedance is available.)
- Gain 10 to 1000(With 50Ω load) in 1, 2, 5 sequence
- Power requirements AC100, 120, 220 or 240V switchable
- Dimensions(mm) 215(W) × 88(H) × 350(D)
- Weight Approx. 3.2kg

LOW NOISE PREAMPLIFIER

LI-75A



LI-75A



PS-70A

SPECIFICATIONS

- Input terminal Balanced
- Input impedance 100MΩ/50pF
- CMRR 120dB (DC to 100Hz)
- Input referred noise 2nV/√Hz (at 1kHz)
- Voltage gain 40dB
- Frequency response DC to 1MHz (DC), 0.2Hz to 1MHz (AC)
- Maximum output voltage ±10V/2kΩ (DC to 200kHz)
- Power requirements Provided by the Lock-in amplifier or PS-70A
- Dimensions (mm) 120(W) × 55(H) × 200(D)
- Weight 1.15kg

PS-70A DC Power Supply: Dedicated power supply for LI-75A and LI-76



The LI-76 is a current-input preamplifier which covers signals from photo-multipliers, PIN diodes and similar sources into voltage signals.

SPECIFICATIONS

Gain	10 ⁸ (V/A)	10 ⁶ (V/A)	10 ⁴ (V/A)
Input impedance	100 kΩ	1 kΩ	10 kΩ
Gain frequency response	DC to 2 kHz	DC to 20 kHz	DC to 100 kHz

Maximum output voltage ±2V (10kΩ load)
 Power requirements provided by the Lock-in amplifier, PS-70A or a built-in battery (S-006P)
 Dimensions (mm) 45(W)×40(H)×105(D)
 Weight 0.31kg
PS-70A DC Power Supply (P.12)
 Dedicated power supply for LI-75A and LI-76



The 5325 is an isolation amplifier with features of high with-standing voltage, low noise and wide frequency band. This instrument is suitable for detecting signal which is super-imposed on the high voltage line.

FEATURES

- High withstanding voltage
- Low noise
- Wide frequency range
- Small size

SPECIFICATIONS

Isolation voltage AC 7000Vpeak, 48Hz to 62Hz, 1 min.
 AC 2800Vpeak, 48Hz to 62Hz, continuous
 DC ±2000V, continuous
 IMRR 180dB or greater (DC and 60Hz, gain = ×1000)
 Gain ×1 to ×1000, 1-2-5 step
 Gain accuracy ±0.2%/F.S. or less (1kHz, no load)
 Frequency range DC to 1MHz
 Noise 15nV/√Hz typ., 20nV/√Hz or less (1kHz)
 Low pass filter 1k, 10k, 100kHz and THRU, 12dB/oct. PL (Phase Linear)
 Power requirements AC100V, 120V, 220V or 240V switchable
 48Hz to 62Hz, approx. 15VA
 Dimensions (mm) 215(W)×88(H)×350(D)
 Weight Approx. 3.2kg



The 5584A is used in conjunction with lock-in amplifiers in optical measurements.

FEATURES

- Chopping frequency : 4Hz to 400Hz or 40Hz to 4kHz
- Beam aperture :
 29mm × 10mm (4Hz to 400Hz)
 5mm × 10mm (40Hz to 4kHz)
- Equipped with reference signal output for lock-in amplifiers (TTL)



SA-200F3

SA-220F5

SA-230F5



SA-400F3

SA-420F5

SA-421F5

SA-430F5

The SA series is an amplifier with a wideband frequency range and high gain, realizing super low noise characteristics which can not be obtained with conventional amplifier.

APPLICATIONS

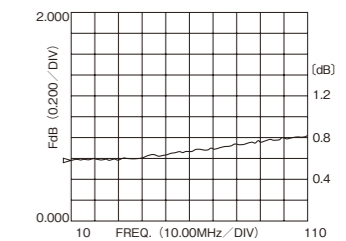
- "MCT <Mercury Cadmium Tellurium> sensor" for infrared detection
- "Superconducting SQUID sensor" for micro-magnet detection
- "High-temperature superconducting Josephson device" for microwave detection
- "Electromagnetic sensor" for MRI systems
- Photodetector such as a photomultiplier and phototransistor

SPECIFICATIONS

	SA-200F3	SA-200F3	SA-200F3
Frequency range	DC to 700 kHz	1 kHz to 80 MHz	1 kHz to 100 MHz
Input type	Single-ended DC coupled	Single-ended AC coupled	Single-ended AC coupled
Input impedance	1k/10k/100kΩ ±5% (DC)	1MΩ ±5% (5kHz)	50Ω ±5% (100kHz)
CMRR	—	—	—
Voltage noise	0.7nV/√Hz max. (1kHz) 0.5nV/√Hz typ (1kHz)	0.7nV/√Hz max. (100kHz) 0.5nV/√Hz typ (10k to 1MHz)	0.35nV/√Hz max. (100kHz) 0.25nV/√Hz typ (10k to 1MHz)
Current noise	2.2pA/√Hz typ (10kHz)	200fA/√Hz typ (100kHz)	5.0pA/√Hz typ (100kHz)
Noise figure	—	—	0.7dB max. 0.6dB typ (10MHz) 1.0dB max. 0.8dB typ (100MHz)
Maximum output	±10V/1kΩ (1kHz)	2.0V _{p-p} /50Ω (1k to 20MHz)	2.0V _{p-p} /50Ω (1k to 20MHz)
Output impedance	50Ω ±5% (DC)	50Ω ±5% (100kHz)	50Ω ±5% (100kHz)
Gain	40±0.5dB/1MΩ (1kHz)	46±0.5dB/50Ω (1MHz)	46±0.5dB/50Ω (1MHz)
Harmonics distortion	0.009% typ (1kHz±10V)	—	—
Intercept point	—	—	+30dBm typ (68MHz)
Dimensions (mm)-Weight	68×43×17.6 Approx. 90g	68×43×28 Approx. 130g	68×43×17.6 Approx. 90g

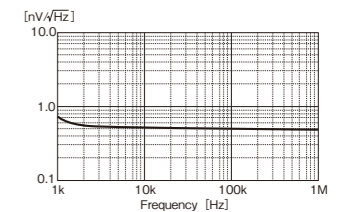
● SA-230F5

■ Noise figure



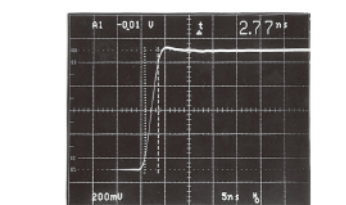
● SA-220F5

■ Input noise voltage density



● SA-230F5

■ Transient response (rise)



	SA-400F3	SA-420F5	SA-421F5	SA-430F5
Frequency range	DC to 600 kHz	1 kHz to 70 MHz	30 Hz to 30 MHz	1 kHz to 100 MHz
Input type	Differential DC coupled	Differential AC coupled	Differential AC coupled	Differential AC coupled
Input impedance	1k/10k/100kΩ ±5% (DC)	1MΩ ±5% (1kHz)	1MΩ ±5% (1kHz)	50Ω ±5% (100kHz)
CMRR	110dB以上 120dB typ (50Hz)	55dB以上 1kHz to 10MHz	46dB以上 1kHz to 10MHz	80dB以上 90dB typ (100kHz)
Voltage noise	0.9nV/√Hz max. (1kHz) 0.75nV/√Hz typ (1kHz)	1.2nV/√Hz max. (100kHz) 0.9nV/√Hz (100kHz to 10MHz)	0.7nV/√Hz max. (100kHz) 0.5nV/√Hz (100kHz to 10MHz)	0.45nV/√Hz max. (100kHz) 0.35nV/√Hz typ (10k to 1MHz)
Current noise	3.0pA/√Hz typ (10kHz)	100fA/√Hz typ (1kHz)	100fA/√Hz typ (100Hz)	7.0pA/√Hz typ (100kHz)
Noise figure	—	—	—	1.25dB max. 1.10dB typ (10MHz) 1.75dB max. 1.40dB typ (100MHz)
Maximum output	±10V/1kΩ (1kHz)	2V _{p-p} /50Ω (1kHz to 20MHz)	2V _{p-p} /50Ω (1kHz to 20MHz)	2.0V _{p-p} /50Ω (1k to 20MHz)
Output impedance	50Ω ±5% (DC)	50Ω ±5% (100kHz)	50Ω ±5% (100kHz)	50Ω ±5% (100kHz)
Gain	40±0.5dB/1MΩ (1kHz)	46±0.5dB/50Ω (1MHz)	46±0.5dB/50Ω (1MHz)	46±0.5dB/50Ω (1MHz)
Harmonics distortion	0.008% typ (1kHz±10V)	—	—	—
Intercept point	—	—	—	+28dBm typ (68MHz)
Dimensions (mm)-Weight	68×67×28 Approx. 180g*	68×43×28 Approx. 100g	68×43×28 Approx. 100g	68×43×28 Approx. 130g

* Power requirement SA-230F5: +15V±5% Others: ±15V±5% Using
 * Using SA-915D1 as a power supply

* Including heat sink

■ DC POWER SUPPLY SA-915D1

SA-915D1 is a dedicated power supply for the SA series amplifier

Output form	Mini DIN, 4-pin connector
Output voltage	±15V±3%
Maximum output current	±100mA
Output voltage noise/ripple	Max. 300μVrms (BW: 10Hz to 20MHz)
Power supply	AC100V±10%, Approx. 10VA
Dimensions (mm)/Weight	12 × 55 × 202 Approx. 1.4kg

■ DC BIAS SUPPLY SA-912S1

SA-912S1 is DC bias power supply which can be used for a sensor e.g. MCT sensor which treats a very low level signal.

Output form	Mini DIN, 4-pin connector
Output voltage noise/ ripple	+12V±3% (no load)
Maximum output current	+100mA
Output voltage ripple noise	Max. 3μVrms (BW: 10Hz to 1MHz)
Power supply	AC100V±10%, Approx. 5VA
Dimensions (mm)/Weight	120 × 55 × 202 Approx. 1.4kg

FILTERS

DUAL CHANNEL PROGRAMMABLE FILTER

3624 / 3625 / 3627 / 3628



3624



3627

FEATURES

- Wide cutoff frequency
- Various filter modes
- Cutoff frequency selectable (3-1/2 digit resolution)
- ×1, ×2, ×5 selectable passband gain at both input and output
- Single-ended or floating input (selectable)
- Low distortion about 0.02% *1 and low noise about 100 μVrms *2

*1 typ. value for 5kHz or lower of input frequency for 3624/3625
*2 for 3624 and 3625 (BW = 100kHz)

SELECTION GUIDE

Model	3624	3625	3627	3628
Cutoff frequency	0.01Hz to 159.9kHz		1Hz to 1.59MHz	
No. of channels	2	2	2	2
Roll off	24dB/oct	48dB/oct	24dB/oct	48dB/oct

SPECIFICATIONS

Model	3624	3625	3627	3628
No. of channel	2(CH-A and CH-B)			
Function	THRU (vai only input and output amplifiers), LP-MF (max. flat<Butterworth>), LP-PL (phase linear <Bessel>), HPE, BPF and BEF			
Mode	SEPARATE (independent operating CH-A and CH-B), CASCADE (cassaded CH-A and CH-B)			
Passband gain	×1, ×2, ×5 selectable respectively on input and output amplifiers			
Frequency response in THRU mode	DC to 1 MHz (+0.5, -3 dB) typ. *1		DC to 2 MHz (+0.5, -3 dB) typ. *1	
Input type	Single-ended or floating, selectable			
Input impedance	1MΩ ±2%			
Output impedance	50Ω ±2%(1 kHz), single-ended			
Max. output voltage	±10 V/no load, ±5V/50 Ω load*3		±10 V/no load, ±5V/50 Ω load*4	
Max. output current	±100 mA			
Max. attenuation	100 dB or greater (up to 100 kHz) 80 dB or greater (up to 1MHz)		90 dB or greater (up to 100 kHz), 70 dB or greater (up to 2 MHz)	
GPIB	All settings and inquiries of panel setting other than POWER, FLOAT and ZERO			
Memory	The panel settings at power off are memorized.			
Power requirements	AC100, 120, 200 or 240 V ± 10%, selectable (Max. 250 V)			
Dimensions	434(W)×132.5(H)×400(D) mm excluding protusions A Mountable into a JIS/EIA stanbard rack cabinet with an exclusive rack mounting kit			
Weight	Approx. 10.0 kg	Approx. 10.5 kg	Approx. 10.0 kg	Approx. 10.5 kg

*1 Input and output gains : ×1, input voltage : 1 Vrms

MULTIFUNCTION FILTER

3611



FEATURES

- 2-digit setting of cutoff frequency
- Selectable frequency response
- 0 or 20dB selectable passband gain
- Low cost

SPECIFICATIONS

Cutoff frequency	0.1Hz to 21.8kHz 2-digit setting with five ranges
Rolloff	24dB/oct (lowpass and highpass) 1/3 oct bandwidth(Bandpass)
No. of channel	1
Filter mode	Lowpass, Highpass, Bandpass, Bandelimination or THRU
Filter type	Highpass: Maximum flatness Lowpass: Maximum flatness or phase-linear, selectable
Gain setting	0 to 20dB (±0.5dB)
Power requirements	AC100, 120, 220 or 240V ±10%, switchable
Dimensions (mm)	216(W)×132.5(H)×290(D)
Weight	Approx. 2.6kg

HF PROGRAMMABLE LOWPASS FILTER

3660A



FEATURES

- Highest cut-off frequency of 100MHz
- Variable cut-off frequency
- Group delay ripple : 5nsp-p or less
- LP-MF and LP-PL, selectable

SPECIFICATIONS

Cutoff frequency	1MHz to 100MHz
Filter mode	LP-MF(maximum flat), LP-PL(phase linear), HPF-MF, THRU
Pass band gain	× 1, × 2, × 5 and × 10
Rolloff	48dB/oct
Input impedance	50Ω or 75Ω*
Input equivalent noise	500 μ Vrms or less at BW=1GHz
Output impedance	50Ω or 75Ω*
GPIB	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0
Power requirements	AC100, 120, 220 or 240V ±10% (max. 250V) approx. 60VA
Dimensions(mm)	432(W)×132.5(H)×400(D)
Weight	approx. 11.5kg

*specify when you order

WIDE RANGE DECADE FILTER

FV-628B



FEATURES

- Wide cutoff frequency range: LPF 1Hz to 10MHz, HPF 1Hz to 3MHz, and BPF combination of LPF and HPF
- LPF can be switched over maximum flatness and phase linear responses.

SPECIFICATIONS

Filter modes	LPF, HPF, BPF or THRU
Filter types	LPF: Maximum flatness or phase linear, selectable HPF: Maximum flatness
Cutoff frequency	LPF: 1Hz to 10MHz HPF: 1Hz to 3MHz
Rolloff	24dB/oct
No. of channel	1
Input impedance	1MΩ or 50 Ω // 50pF, selectable
Pass band gain	0±0.7dB*
Harmonic distortion	0.3% or less (at 100kHz or less)
S/N ratio	60dB or greater (at 100MHz or less)
DC offset	Adjustable to zero
Power requirements	AC100, 120, 220 or 240V± 10%, switchable
Dimensions & Weight	429(W) × 99(H) × 350(D)(mm), approx. 8kg

*0dB±1.5dB when the multiplier range for frequency setting is selected.

MIX TAPE BANDPASS FILTER

DV-12



The DV-12 is a bandpass filter with a center frequency which is selectable over eight points. Combined with a mix-tape where several frequencies' sinewave are multi-recorded, this model enables adjustment and inspection of cassette tape recorder.

SPECIFICATIONS

No. of channels	Stereo 2ch
Center frequency	63, 125, 315, 1k, 6.3k, 8k, 10k, 12.5k, THRU
Frequency selection	via front panel: by push buttons external: by remote controller (option)
Attenuation	Approx. 35dB (at $f_c \times 2$ and $\times 0.5$)
Constant output for wow-flutter measurement	3kHz at R-CH (modifiable to 3.15kHz and L-CH)
Input impedance	1MΩ typ., single-ended
Harmonic distortion	0.05 % or less (at 1kHz and ±5V output)
Crosstalk between channel	70dB (at 1kHz and ±5V output)
Power requirements	AC100V, 120 or 230V switchable
Dimensions (mm)	225(W)×67(H)×250(D)
Weight	Approx. 2.4kg

Option Frequency remote controller, Adaptor for BTL (the max. input voltage ±14V)
Modification of frequency

CD PLAYER EVALUATING FILTER

3346A



The 3346A enables an effective measuring of signal/noise ratio, dynamic range, harmonic distortion ratio, channel separation and cross modulation distortion ratio prescribed by the standard.

SPECIFICATIONS

No. of input channel	1 (L/R selectable)
Input impedance	1MΩ / 10k Ω (unbalanced, selectable)
Output impedance	100 Ω or less (unbalanced)
Input voltage	2mVrms in MON mode, 2Vrms in other modes
Cutoff frequency of lowpass filter	20kHz (14.5kHz, 22kHz or 44kHz is also possible to change as option)
S/N ratio	111dB (2Vrms output)
Channel separation	100dB or greater
Power requirements	AC100V, 120 or 230V switchable
Dimensions(mm)	215(W)×88(H)×300(D)

MEASUREMENT SYSTEM

MEASUREMENT SYSTEM

MS-500 SERIES



The MS series is suitable for pre-processing analog signals. The plug-in units of filters, differential amplifiers, isolation amplifiers, etc. can be installed into their frames. (16 channels at maximum/the JIS rack size)

24dB/oct FILTER · 48dB/oct FILTER

P-81/P-82/P-83/P-84



FEATURES

- Four modes : Lowpass (Maximum Flatness and Phase-Linear), Highpass and THRU
- 16 selectable points for high-resolution control of cutoff frequency
- Cascade mode enables simple cascade connection to neighboring units
- Input ground line is floatable, enabling the elimination of induced noise caused by ground loops

P-81 P-82 P-83 P-84

SPECIFICATIONS

Model	P-81	P-82	P-83	P-84
Cutoff frequency range	0.1Hz to 1.6kHz	1Hz to 16kHz	0.1Hz to 1.6kHz	1Hz to 16kHz
Rolloff		24dB/oct		48dB/oct

Mode Lowpass (MF, PL), Highpass and THRU
 Cutoff frequency setting 1, 215, 16 (16 points), plus multipliers
 Input method CASCADE (The output of left-side unit is connected.), FLOAT, GND (single-ended input)
 Input impedance 100kΩ // 40pF
 CMRR 60dB or greater (DC to 1kHz)
 Output voltage ± 10V
 Phase matching between the same type units
 P-81: ±1° typ., P-82: ±1.2° typ.,
 P-83: ±1° typ., P-84: ±2.2° typ.
 (LP, DC to 2fc, purchased together)

48dB/oct FILTER

P-85



FEATURES

- Wide cutoff frequency range : 0.1Hz to 119.9kHz
- High resolution : 3-digits
- Four filter modes

SPECIFICATIONS

Cutting frequency range 0.1 to 119.9kHz
 Rolloff 48dB
 Modes Lowpass (ML, PL), Highpass and THRU
 Cutting frequency setting 0.1, 0.2, 0.3, ...119.9 (1199 points) plus multipliers
 Input method CASCADE (The output of left-side unit is connected.), FLOAT, GND (single-ended input)
 Input impedance 100k Ω //40pF
 CMRR 60dB or greater (DC to 1kHz)
 Output voltage ± 10V
 Phase matching between the same type units
 ± 5.5° typ. (LP, DC to fc, purchased together)

135dB/oct FILTER

P-86/P-87



P-86 P-87

FEATURES

- Sharp rolloff equivalent to 135dB/oct
- The combination of P-86 and P-87 configures a bandpass filter

SPECIFICATIONS

Cutting frequency range P-86 : 1Hz to 119kHz
 P-87 : 1Hz to 20kHz
 Equivalent to 135dB/oct (8-pole Elliptic)
 Modes P-86 : Lowpass / P-87 : Highpass
 Cutting frequency setting 1, 2, 3, ...119 (119 points) plus multipliers
 Input method CASCADE (The output of left-side unit is connected.), FLOAT, GND (single-ended input)
 Input impedance 100k Ω //40pF
 CMRR 60dB or greater (DC to 1kHz)
 Output voltage ± 10V
 Phase matching between the same type units
 ± 2° typ. (P-86)
 (DC to 0.7fc, fc ≤ 100kHz, purchased together)

DIFFERENTIAL AMPLIFIER

P-61



FEATURES

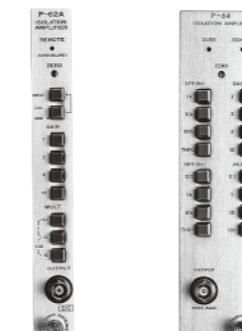
- Wide bandwidth
- High gain
- High CMRR

SPECIFICATIONS

Input type	Balanced differential input
Input impedance	100M Ω
Gain	1 to 1000, 1-2-5 steps
Gain accuracy	± 0.2% at 400Hz (no load, 25°C)
Non-linearity	± 0.02 % or better (DC, no load)
CMRR	120dB or greater (at DC to 120Hz)
DC offset	± 2μV/°C (input-referred value)
Frequency response	± 0.1dB (at DC to 10kHz) +0.5 to -3dB (at DC to 100kHz)

ISOLATION AMPLIFIER

P-62/P-64



P-62A P-64

FEATURES

- High withstanding voltage
- Wide bandwidth enabling excellent waveform transfer characteristics

SPECIFICATIONS

Model	P-62A	P-64
Isolation voltage	±1000VDC continuous, 1500Vrms (1minute, 48 to 62Hz)	±1000VDC continuous, 2000Vrms (1minute, 48 to 62Hz)
IMRR	150dB or more (DC to 60Hz)	150dB or more (DC to 60Hz)
Gain	0.1 to 1000, 1-2-5 sequence	0.1 to 1000, 1-2-5 sequence
Input type	Single-ended	
Input impedance	1MΩ // 50pF	1MΩ // 60pF
Frequency response	DC to 100kHz (-3dB)	DC to 1MHz (+1dB, -3dB)
Filter	no	Lowpass and Highpass
Output voltage	±10V	

GPIB UNIT

P-42A



FEATURES

- A maximum of 16 channels may be controlled by using this units
- Built-in multiplexer

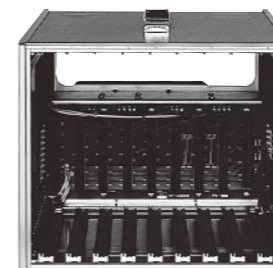
SPECIFICATIONS

GPIB function	SH1, AH1, T6, L4, SR1, RL2, PP0, DC1, DT1, C0
Other function	Multiplexer output, Status monitor

* This unit is not usable with the MS-521.

MAIN FRAME

MS-521 / MS-523 / MS-525



MS-523

The MS-521/MS-523/MS-525 is the main frame unit with built-in power supply used to house the MS-500 series plug-in units.

SPECIFICATIONS

Model	MS-521	MS-523 *2	MS-525
No. of amplifier and filter units	Maximum of 4 channels	Maximum of 8 channels	Maximum of 16 channels
Power supply	AC100, 120, 200, 220, 240V	DC11 to 15V, or AC100V	AC100, 120, 220, 240V
Control or GPIB unit	Not applicable	Applicable by P-42A	Applicable by P-42A
Dimensions(mm) and Weight *1	119.5(W)×199(H)×400(D) 5.0kg	283.5(W)×199(H)×400(D) 6.1kg	480(W)×199(H)×400(D) 12.2kg

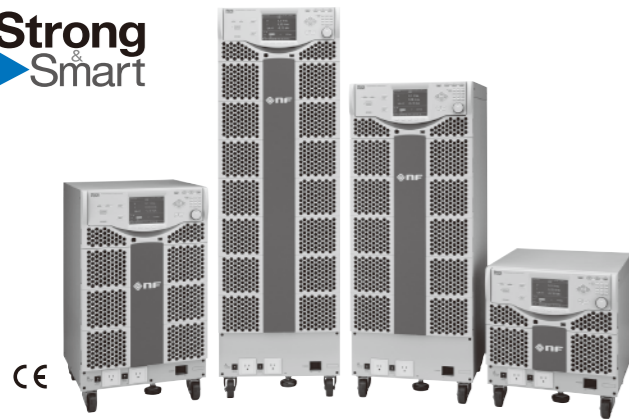
*1 Weight of mainframe only

*2 Can combine P-85, P-86 or P-87 up to max. 7 units.
Max. 6 units in conjunction with P-42A

AC POWER SOURCES

PROGRAMMABLE AC/DC POWER SOURCE

DP SERIES



A powerful and reliable AC power source for customers

NF has knowledge and skill about AC power sources, and our DP series incorporates new ideas while pursuing the high-quality, stable supply of power that is the fundamental role of any AC power source.

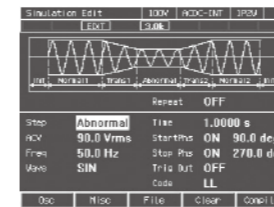
- Output control employing our unique hybrid power control technology
- User interface designed to take into account how each customer uses the equipment
- Energy-saving design to efficiently supply power and improve equipment operability

SPECIFICATIONS

		Single-phase							
		DP015S	DP030S	DP045S	DP060S	DP075S	DP090S	DP105S	DP120S
Output Power *1		1.5 kVA	3 kVA	4.5 kVA	6 kVA	7.5 kVA	9 kVA	10.5 kVA	12 kVA
Polyphase System	A polyphase system can be configured by connecting multiple units of the same single-phase model. Single-phase three-wire system: 3 kVA, 6 kVA, 9 kVA, 12 kVA, 15 kVA, 18 kVA, 21kVA, 24 kVA Three-phase system: 4.5 kVA, 9 kVA, 13.5 kVA, 18 kVA, 22.5 kVA, 27 kVA, 31.5 kVA, 36 kVA								
AC/DC Mode	AC, AC+DC, DC								
AC Output *2	Phase Voltage	0.0 V to 155.0 V/0.0 V to 310.0 V, 0.0 Vp-p to 440.0 Vp-p/0.0 Vp-p to 880.0 Vp-p (Arbitrary waveform)							
	Line to Line Voltage	—							
	Resolution	0.1 V							
	Max. Current *3 *4	15 A/7.5 A	30 A/15 A	45 A/22.5 A	60 A/30 A	75A/37.5 A	90 A/45 A	105 A/52.5 A	120 A/60 A
Max. Peak Current *3 *4	4 times value of maximum current.								
Load Power Factor Range	0 to 1 (lead or lag, at 45 Hz to 65 Hz)								
Frequency Setting Range, Output Waveform	AC mode: 40 Hz to 550 Hz, AC+DC mode: 1 Hz to 550 Hz, Resolution:0.1 Hz, Waveform: Sine, Arbitrary (16 types), Clipped Sine (3 types)								
Output Voltage Stability	Line regulation *16 : within ±0.15%, Load regulation *17 : within ±0.15 V/±0.3 V (45 Hz to 65 Hz), within ±0.5 V/±1.0 V (40 Hz to 550 Hz)								
Output Voltage Distortion Factor	0.5% or less (40 Hz to 550 Hz, 50% or more of rated output voltage, maximum output current or below, AC mode or AC+DC mode)								
DC Output	Output Power *1	1.5 kW	3 kW	4.5 kW	6 kW	7.5 kW	9 kW	10.5 kW	12 kW
	Voltage Setting Range	-220 V to +220 V/-440 V to +440 V, Resolution : 0.1 V							
	Max. Current *4	15 A/7.5 A	30 A/15 A	45 A/22.5 A	60 A/30 A	75A/37.5 A	90 A/45 A	105 A/52.5 A	120 A/60 A
Measurement Function	Voltage	RMS Value (rms), DC Average (avg) (only single phase), Peak Value (pk)							
	Current	RMS Value (rms), DC Average (avg) (only single phase), Peak Value (pk), Peak Hold Value							
	Power	Effective (W), Apparent (VA), Reactive (var) (option)							
	Others	Load Power Factor (option), Load Crest Factor (option), Synchronization Frequency, Harmonic Current (option), CO ₂ Emissions							
Current Limiter	Setting: Peak Limiter (positive current and negative current), RMS Limiter, Limit Operations: Automatic recovery or output turn off								
Power Unit Energization Setting	The power section is modularized in 1.5 kVA units. Power units can be set ON or OFF to suit the load capacity.								
Sequence Function	Number of Steps: 255 max (for 1 sequence), Step Time Setting Range: 0.0010 s to 999.9999 s jump count(1 to 9999 or ∞), jump-to, step code(2 bit),branch 1, branch 2, trigger output.Number of Memories:								
AC Line Simulation	Number of Steps: 6 (initial, normal 1, transition 1, abnormal, transition 2, normal 2), Step Time Setting Range: 0.0010 s to 999.9999 s, Parameters: Output range, mode of AC or DC, ACV (phase voltage), frequency, waveform, DCV, start phase, stop phase, phase angle,								
Other Functions	Protections, Setting Limitation: Voltage and Frequency, Remote Sensing, AGC (option), Auto Cal., Memory Function, External Signal Input,								
Control Software	Remote Control, Sequence/AC Line Simulation: data creation, edit, save, transfer, preview and execution control. Arbitrary Waveform:								
Power Input	AC100 V to 230 V±10% (Maximum voltage 250 V)single-phase *1, 50 Hz±2 Hz or 60 Hz±2 Hz, 0.95 or more (typ., at AC100 V input) *6,								
Efficiency	77% or more (typ., at AC200 V input)								
Power Consumption (Maximum)	2.25 kVA	4.5 kVA	6.75 kVA	9 kVA	11.25 kVA	13.5 kVA	15.8 kVA	18 kVA	
Weight (approx.)	38 kg	50 kg	70 kg	82 kg	110 kg	125 kg	140 kg	155 kg	
Types of Casings	Type 1		Type 2		Type 3		Type 4		
Options	Factory Option	AGC and Measurement Extensions: PA-001-1722, Sequence and Simulation: PA-001-1723, External Signal Input: PA-001-1724,							
	After purchase	Remote Controller :DP008, System Cable:PA-001-1720 (for single-phase three-wire) , PA-001-1721(for 3-phase), Rack Mount Adapter							
Reference	Note: When two values are indicated with a slash [/], the value before the slash is specification for 100 V range , the value after the slash is specification for 200 V range. *1 With models of 6 kW or more, output capacity is limited to 4.5 kW, if input voltage is AC170 V or less. *2 When [V] = Vrms, [A] = Arms, and power input voltage is 200 V, unless otherwise specified. *3 Values for single-phase 3-wire and three-phase are for phase current. *4 If at or above the rated output voltage, this is limited (reduced) to be at or below the power capacity. For single-phase, if there is DC superimposition, the RMS current value of AC+DC *5 For capacitor input type rectifier load (crest factor=4), rated output voltage, 45 Hz to 65 Hz. *6 For AC-INT, rated output voltage, resistive load yielding maximum current, and output frequency is between 45 Hz to 65 Hz.								

FEATURES

- Low distortion, low output noise
- High stability for a variety of loads, including capacitive and inductive types
- Power unit modularization for a wide range of capacity settings
- High-performance current limiter (set with peak value and RMS value)
- Measurement functions : Voltage, current, power, crest factor, power factor, frequency, harmonic current* etc.
- Sequence* and AC line simulation*
- Power unit energization settings
- Control Software for testing and complex testing
- Various interfaces
- Remote controller*



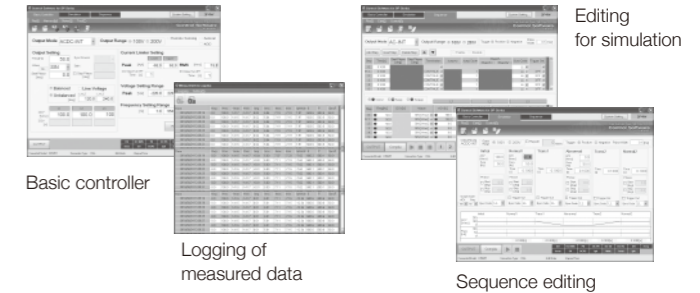
AC line simulation

LINEUP

	1.5kVA	3kVA	4.5kVA	6kVA	7.5kVA	9kVA	10.5kVA	12kVA	Polyphase system
Single-phase	●	●	●	●	●	●	●	●	—
Single-phase three-wire	—	●	—	●	—	●	—	●	Max. 24 kVA
Three-phase	—	—	●	—	—	●	—	—	Max. 36 kVA
Multi-phase	—	—	●	—	—	●	—	—	—

A polyphase system (single-phase three-wire/ three-phase) can be configured by connecting multiple units of the same single-phase model.

Control Software



Basic controller

Logging of measured data

Sequence editing

*Option

	Single-phase Three-wire				Three-phase		Multi-phase		
	DP030D	DP060D	DP090D	DP120D	DP045T	DP090T	DP045M	DP090M	
	3 kVA	6 kVA	9 kVA	12 kVA	4.5 kVA	9 kVA	4.5 kVA	9 kVA	
AC, AC+DC, DC	0.0 V to 155.0 V/0.0 V to 310.0 V, 0.0 Vp-p to 440.0 Vp-p/0.0 Vp-p to 880.0 Vp-p (Arbitrary waveform)				0.0 V to 268.4 V/ 0.0 V to 536.8 V		AC, AC+DC, DC		
Output Voltage Stability	All-phase common setting for balanced mode. Each phase setting for unbalanced mode.				0.0 V to 310.0 V/0.0 V to 620.0 V		The change to single-phase, single-phase three-wire, or three-phase is possible.		
Resolution	0.1 V				0.1 V		Single-phase Mode Same as DP045S or DP090S		
Phase Voltage	0.1 V, Line to Line: 0.2 V				0.1 V		Single-phase Three-wire Mode Same as DP030D or DP060D		
Max. Current	15 A/7.5 A	30 A/15 A	45 A/22.5 A	60 A/30 A	15 A/7.5 A	30 A/15 A	4.5 kVA	9 kVA	
Max. Peak Current	4 times value of maximum current.								
Load Power Factor Range	0 to 1 (lead or lag, at 45 Hz to 65 Hz)								
Frequency Setting Range, Output Waveform	AC mode: 40 Hz to 550 Hz, AC+DC mode: 1 Hz to 550 Hz, Resolution:0.1 Hz, Waveform: Sine, Arbitrary (16 types), Clipped Sine (3 types)								
Output Voltage Stability	Line regulation *16 : within ±0.15%, Load regulation *17 : within ±0.15 V/±0.3 V (45 Hz to 65 Hz), within ±0.5 V/±1.0 V (40 Hz to 550 Hz)								
Output Voltage Distortion Factor	0.5% or less (40 Hz to 550 Hz, 50% or more of rated output voltage, maximum output current or below, AC mode or AC+DC mode)								
DC Output	Output Power *1	1.5 kW	3 kW	4.5 kW	6 kW	7.5 kW	9 kW	10.5 kW	
	Voltage Setting Range	-220 V to +220 V/-440 V to +440 V, Resolution : 0.1 V							
	Max. Current *4	15 A/7.5 A	30 A/15 A	45 A/22.5 A	60 A/30 A	75A/37.5 A	90 A/45 A	105 A/52.5 A	120 A/60 A
Measurement Function	Voltage	RMS Value (rms), DC Average (avg) (only single phase), Peak Value (pk)							
	Current	RMS Value (rms), DC Average (avg) (only single phase), Peak Value (pk), Peak Hold Value							
	Power	Effective (W), Apparent (VA), Reactive (var) (option)							
	Others	Load Power Factor (option), Load Crest Factor (option), Synchronization Frequency, Harmonic Current (option), CO ₂ Emissions							
Current Limiter	Setting: Peak Limiter (positive current and negative current), RMS Limiter, Limit Operations: Automatic recovery or output turn off								
Power Unit Energization Setting	The power section is modularized in 1.5 kVA units. Power units can be set ON or OFF to suit the load capacity.								
Sequence Function	Number of Steps: 255 max (for 1 sequence), Step Time Setting Range: 0.0010 s to 999.9999 s jump count(1 to 9999 or ∞), jump-to, step code(2 bit),branch 1, branch 2, trigger output.Number of Memories:								
AC Line Simulation	Number of Steps: 6 (initial, normal 1, transition 1, abnormal, transition 2, normal 2), Step Time Setting Range: 0.0010 s to 999.9999 s, Parameters: Output range, mode of AC or DC, ACV (phase voltage), frequency, waveform, DCV, start phase, stop phase, phase angle,								
Other Functions	Protections, Setting Limitation: Voltage and Frequency, Remote Sensing, AGC (option), Auto Cal., Memory Function, External Signal Input,								
Control Software	Remote Control, Sequence/AC Line Simulation: data creation, edit, save, transfer, preview and execution control. Arbitrary Waveform:								
Power Input	AC100 V to 230 V±10% (Maximum voltage 250 V)single-phase *1, 50 Hz±2 Hz or 60 Hz±2 Hz, 0.95 or more (typ., at AC100 V input) *6,								
Efficiency	77% or more (typ., at AC200 V input)								
Power Consumption (Maximum)	2.25 kVA	4.5 kVA	6.75 kVA	9 kVA	11.25 kVA	13.5 kVA	15.8 kVA	18 kVA	
Weight (approx.)	38 kg	50 kg	70 kg	82 kg	110 kg	125 kg	140 kg	155 kg	
Types of Casings	Type 1		Type 2		Type 3		Type 4		
Options	Factory Option	AGC and Measurement Extensions: PA-001-1722, Sequence and Simulation: PA-001-1723, External Signal Input: PA-001-1724,							
	After purchase	Remote Controller :DP008, System Cable:PA-001-1720 (for single-phase three-wire) , PA-001-1721(for 3-phase), Rack Mount Adapter							
Reference	Note: When two values are indicated with a slash [/], the value before the slash is specification for 100 V range , the value after the slash is specification for 200 V range. *1 With models of 6 kW or more, output capacity is limited to 4.5 kW, if input voltage is AC170 V or less. *2 When [V] = Vrms, [A] = Arms, and power input voltage is 200 V, unless otherwise specified. *3 Values for single-phase 3-wire and three-phase are for phase current. *4 If at or above the rated output voltage, this is limited (reduced) to be at or below the power capacity. For single-phase, if there is DC superimposition, the RMS current value of AC+DC *5 For capacitor input type rectifier load (crest factor=4), rated output voltage, 45 Hz to 65 Hz. *6 For AC-INT, rated output voltage, resistive load yielding maximum current, and output frequency is between 45 Hz to 65 Hz.								

DP-G Series

DP-G Series is equipped with the option of AGC and Measurement Extensions (PA-001-1722) as standard. This series doesn't have the function of arbitrary waveform. Also the option of External Signal Input (PA-001-1724) cannot be added.

Options

AGC and Measurement Extensions

PA-001-1722

Sequence and Simulation

PA-001-1723

External Signal Input (for single-phase and multi-phase model)

PA-001-1724

GPIO

PA-001-1725

Remote Controller

DP008

System Cable (For single phase 3-wire)

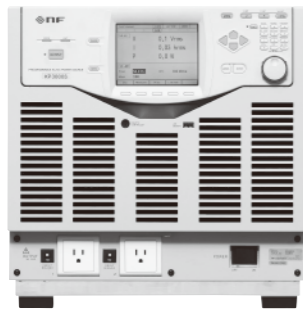
PA-001-1720

System Cable (For 3-phase)

PA-001-1721



DP008



KP3000S (Foot type, Optional outlets are equipped.)

For production lines manufacturing household electrical appliances in ever larger sizes, for mixed lines composed of both AC and DC equipment, and for testing of DC-DC converters, this unit provides 3 kVA/3 kW power.

SPECIFICATIONS

Power Output				
		100 V range	200 V range	Resolution
AC	Output voltage	0 V to 155 V	0 V to 310 V	0.1 V
	Maximum current	30 A	15 A	—
	Frequency	AC: 40 Hz to 550 Hz, AC+DC: 1 Hz to 550 Hz		0.1 Hz
DC	Output voltage	-220 V to +220 V	-440 V to +440 V	0.1 V
	Maximum current	30 A	15 A	—
Peak current		4 times		
Output waveform		Sine, arbitrary, clipped sine		

FEATURES

- AC Single-phase 3 kVA, DC 3 kW
- KP3000S : Configuration of Polyphase System
Single-phase three-wire 6 kVA (2 cabinets)
Three-phase 9 kVA (3 cabinets)
- KP3000GS : Multifunctional Single-phase Model
Includes sequence and simulation function, GPIB interface, and external signal inputs (EXT and ADD) as standard.
- Measurement functions
Voltage (rms value, average DC value, peak value), Current (rms value, average DC value, peak value, peak hold value), Power (active power, apparent power, reactive power), Load power factor, Crest factor, Sync frequency, Harmonic current (up to 40th order), CO₂ emissions
- Current limiter : peak value and RMS value
- Remote sensing, AGC, Auto Cal
- Sequence function* and simulation function*
- RS-232, USB, GPIB*, external control I/O

*Option for KP3000S
Standard equipment for KP3000GS

3-phase 9 kVA System
(A rack cabinet is sold separately.)



SPECIFICATIONS

ES2000S Single phase master

The following conditions apply unless otherwise specified.
 • The units of voltage and current are rms with rated load (pure resistance load) that obtains rated power at rated output voltage.
 • AGC : Off, Remote sensing : Internal

AC Output

- Output type Single-phase two-wire system
- Output voltage setting range 100V range : 0V to 150V
200V range : 0V to 300V (resolution of 0.1V)
- Maximum output current *1 100V range : 20A 200V range : 10A
- Maximum output current (peak) *2 Precision mode : 3.5 times of maximum output current (rms value)
High stability mode : 2.7 times of maximum output current (rms value)
- Load regulation *3 Precision mode : Within ± 0.5%
High stability mode : Within ± 1.0%
- Line regulation Within ± 0.2% to the change in power input voltage of 170V to 250V
- Load power factor range 0 to 1 (lead or lag)
- Output frequency 5Hz to 1100Hz (resolution of 0.01Hz)
- Line synchronization Outputs AC synchronized with power line frequency (range: 48Hz to 62Hz)
- Output voltage stability ± 100 ppm/°C (typ.) (rated output voltage, no load, more than one hour after turning on power)
- Output noise level 300mVrms or lower (Output voltage setting : 0V, 20Hz to 100kHz)
- Output offset voltage Within ± 15mV (DC)
- DC output *4
- Voltage setting range 100V range : 0V to +203V
200V range : 0V to +406V (resolution of 0.1V)
- Maximum output current *5 100V range : 9A 200V range : 4.5A

- Output voltage stability ± 500 ppm/°C (typ.) (rated output voltage, no load, more than one hour after turning on power)
- Power capacity 1.27kVA
- Output offset voltage Within ± 500mV (DC), adjustable
- Power Input
- Voltage, Frequency, Number of phases 170V to 250V, 48Hz to 62Hz, Single phase approx. 3.8kVA
- Power consumption approx. 3.8kVA
- Power factor 0.90 or higher (0.97 typ., at rated output)
- Functions
- Measurement functions Voltage, Current, Effective power, Reactive power, Power factor
- Simulation Function Abrupt voltage change and frequency and/or voltage sweep functions
External signal input (option), Protective function, AGC, Remote sensing, Auto Cal, Memory function, Limit value setting and Key lock
- Other Functions
- Environment and Weight
- Withstanding voltage AC 1500V rms /min. (50/60 Hz)
- Insulation resistance (DC500V) 10MΩ or higher
- Performance temperature/humidity range Performance guarantee : +5°C to +35°C, 5% to 80% RH
Operation guarantee : +0°C to +40°C, 5% to 80% RH (with absolute humidity of 1 to 25g/ m³ and no condensation)
- Dimensions (mm) 220(W) × 649(H) × 680(D)
- Weight approx. 48kg

*1 Maximum output current lowers depending on output voltage and output frequency.
 *2 45Hz to 70Hz. The ratio of rms value to the peak value of the current that runs through the capacitor-input type rectifier load.
 *3 Output voltage change for the load change of 0 to 100% at the rated output voltage. 45Hz to 100Hz.
 *4 Effective only in single-phase operations. High stability mode operation.
 *5 Maximum output current lowers depending on the output voltage.



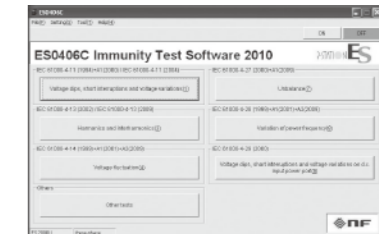
ES series is a multifunction programmable AC/DC power source you can use in EMC tests such as low frequency immunity test and harmonic current measurement.

FEATURES

- Single-phase 2kVA to 20kVA, Three-phase 6kVA to 60kVA. Single-/Three-phase switchable.
- AC output voltage: 0V to 150V/0V to 300V, Frequency: 5Hz to 1100Hz, DC output voltage: 0V to +203V/0V to +406V
- Component style allows expansion after being introduced. Cabinet style is compact and requires small installation space.
- Voltage dips, voltage variations, simultaneous sweeping of frequency and voltage.
- Equipped with measurement function, protective circuit, remote sensing, and AGC function. External input* available and peak current of 3.5 times of maximum rms value can be supplied.
- Software (ES0406C*) that performs low frequency immunity test of IEC standard is available.
- Performs power source harmonic measurement and various simulations. Furthermore, it can be used as CVF for anechoic chamber or production line.

*optional products or products sold separately

- Option ES0406C Immunity Test Software 2010
ES4439 Distribution Unit
ES4473 Interface Board
ES4474A Remote Terminal
ES4493 External Signal Input
4481 Power Inlet Unit
4482 Outlet Unit
- Peripherals ES4152 Reference Impedance Network (single phase)
ES4153 Reference Impedance Network (three-/single-phase)
As-517A/As-537 Voltage Dips Simulator



REFERENCE IMPEDANCE NETWORK

ES4152/ES4153



ES4152

ES4153

For Harmonic current measurement or flicker test (IEC 61000-3-3, IEC 61000-3-2)

This is a circuit network of resistance and inductance to make the output impedance of AC power source come near the impedance of actual commercial line.

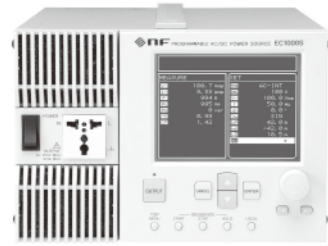
Use this in combination with Programmable AC/DC Power Source ES series in harmonic current measurement or flicker test.

- The impedance value is guaranteed at the value given by the combination of ES series and this unit.
- The errors caused by impedance switching relays or current detecting resistor are corrected with feedback.
- Equipped with voltage/current monitoring terminal for connecting analyzer
- ES4152 : Single phase 2 wires
ES4153 : Single phase 2 wires / 3 wires
Three phase 3 wires/ 4 wires

APPLICATIONS

- Voltage Dips, Short Interruptions and Voltage Variations Tests (for IEC 61000-4-11)
- Harmonic Current Measurement and Flicker Measurement (for IEC 61000-3-2 / IEC 61000-3-3)
- Simulation with Arbitrary Waveforms
- For node connection tests in photovoltaic power generation systems
- As CVCF for anechoic chambers and for production lines

CE



The EC1000S not only supplies AC and DC power as the ordinary power supply, it also allows free programming of outputs such as instantaneous interruption, voltage sweep, and voltage variation patterns. The EC1000S also has essential functions for power tests, including a variety of output measurements and measurements related to the load power supply input. In addition, while the EC1000S can output as much as 1kVA*, it is desktop-size small and light, and affordable.

* The power supply outputs 1 kVA when the input is AC 200 V and 750 VA when the input is AC 100 V.

FEATURES

- Compact (desktop size), light (approx. 9.5 kg) and portable etc.
- Output capacity: 1 kVA (for AC 200 V input)
- AC output: 0 to 135 V / 0 to 270 V, Frequency: DC to 550 Hz
DC output: -190 V to +190 V / -380 V to +380 V
AC can be superimposed over DC (AC + DC) to be output.
- Measurement Functions: Voltage, current, electrical power, frequency, power factor, CF, harmonic current
- Control Software: Measurement value logging, sequence editing, and creation of arbitrary waveforms
- Usability: Universal outlet and worldwide power supply input (AC 90V to AC 250V)

SPECIFICATIONS

● Output

Maximum output	AC 750VA (When the input is form AC100V to AC180V) 1,000VA (When the input is form AC180V to AC250V) DC 750W (When the input is form AC100V to AC180V) 1,000W (When the input is form AC180V to AC250V)
Output voltages *1,*2	AC 100V range:0.0V to 135.0V(resolution : 0.1V) 200V range:0.0V to 270.0V(resolution : 0.1V) DC 100V range:-190.0V to +190.0V(resolution : 0.1V) 200V range:-380.0V to +380.0V(resolution : 0.1V)
Maximum output currents *3,*4	AC 100V range:10A, 200V range:5A DC 100V range:10A, 200V range:5A
Frequency setting range *5	1.0Hz to 550.0Hz (resolution : 0.1Hz) Setting accuracy : ±100ppm
Output voltage waveform *5	Sine wave, square wave, arbitrary wave
Output voltage distortion rate	0.5% max. (50Hz/60Hz)
Load regulation	0.5% max.
Line regulation	0.2% max.

● Other Functions

Limiters, Setting range limits *5, External signal in outs, External synchronization, Arbitrary waveform memory, Protection functions, Miscellaneous functions

● Power Input

Input voltage range	AC 100V to AC 230V ± 10%(250V max.)
Power consumption/ power factor	50Hz/60Hz ± 2Hz(signal phase) 1.4kVA max./0.95min.(AC 100V), 0.9min.(AC 200V)

● General Information

Interface	USB interface (USBTMC)
Dimensions	258(W) × 176(H) × 440(D) (not including protrusions)
Weight	Approx. 9.5kg

● Cool Software

Functions : Remote controls, Logging, Arbitrary waveform data creation, Sequence editing

*1 Signal source modes internal mode or internal/external mode, within the voltage setting limit.
*2 When 100V power supply is used for input, the maximum output range is limited to 130V AC (±183V for DC) and 260V AC (±366V for DC) in the 100V range and 200V range, respectively.
*3 When the voltage exceeds the rated output voltage (100V,200V), the maximum output current and the maximum output peak current are limited due to the maximum output power capacities.
*4 If the output frequency is less than 40Hz or more than 400Hz, the maximum output current is limited.
*5 Only when the signal source mode is internal or internal/external. Only voltage setting limits when the signal source mode is external synchronization.



FEATURES

- A built-in crystal controlled oscillator for 50, 60 or 400Hz, switchable.(TA-120)
- Constant voltage or current mode, selectable
- Can also be used as DC amplifier

SPECIFICATIONS

Rated output	120VA
Rated output voltage	100, 120, 200 or 240V, switchable
Line regulation	Within 0.2% for ± 10%, variation of power supply voltage
Load regulation	Adjustable to zero
Frequency response	45Hz to 10kHz (± 3dB)
Harmonic distortion	1% (45Hz to 1kHz), 3% (40Hz to 10kHz)
Power requirements	AC100V (120, 200, 220 or 240V is also available.)
Dimensions	215(W) × 149(H) × 451(D)
Weight	approx. 18.7kg



This series consists of power supplies that provide an output of up to ± 200V from DC to 20kHz. Four type are available, range from 250VA to 2kVA in output power. In addition, by combining boosters with the 2kVA amplifier, power output of up to 10kVA (in 2kVA/booster) is possible.

FEATURES

- Wide range : DC to 20kHz
- High output voltage : ± 200V
- Four modes of DC (CC/CV) and AC (CV/CC)
- Output voltage can be boosted up by serial connection.
- The 4521A Power Booster combined with the 4520A enable power expansion.

SPECIFICATIONS

Model	4502	4505	4510	4520A
Rated output power	250VA	500VA	1kVA	2kVA
Maximum output power with respect to products *1	313VA	625VA	1.25kVA	2.5kVA
Rated output current	DC mode	±1.9A	±3.8A	±7.5A
	AC mode(rms)*2	2.1Arms	4.2Arms	8.3Arms
Peak current	2.5 × rated value (rms)			
Rated output voltage	120Vrms (±170V) sinewave			
Maximum output voltage	141Vrms (±200V) sinewave			
Gain	CV	100V/V		
	CC	1.5A/V	3A/V	6A/V
Gain stability	±100ppm (typ.), ±100ppm/8h (typ.) (CV, DC to 1kHz)			
Output mode	CV, CC, DC and AC			
Load regulation (DC mode)	CV mode : Within ±0.1% (DC to 1kHz), ±2% max. (1kHz to 20kHz) CC mode : Within ±2% (DC to 1kHz), ±20% max. (1kHz to 20kHz)			
Line regulation (DC mode)	CV mode : Within ±0.1% (DC to 1kHz), ±1% max. (1kHz to 20kHz)			
Frequency response	+0.2, -0.5dB : DC to 5kHz (45Hz to 5kHz for AC mode), +0, -3dB : 5kHz to 20kHz			
Harmonic distortion (DC mode)	CV mode : 0.05% or less (10Hz to 1kHz), 1% or less (10kHz), 2.5% or less (20kHz) CC mode : 0.5% or less (10Hz to 1kHz), 2.5% or less (20kHz)			
Output offset voltage/current	Adjustable to zero			
Remote sensing	Possible in the CV and DC mode (DC to 1kHz)			
Output type	Balanced, single-ended possibly, isolated between input and output			
Power requirements	1 φ 100V±10% (120, 200, 220 or 240V is available as option.) 48Hz to 62Hz	1 φ 200V±10% (220 or 240V is available as option.) 48Hz to 62Hz		
Dimensions(mm)	430(W)×176(H)×598(D)	430(W)×265(H)×598(D)	430(W)×353.5(H)×600(D)	430(W)×442.5(H)×600(D)
Weight	approx. 27kg	approx. 40kg	approx. 70kg	approx. 93kg
Remarks	*1 with respect to a capacitor-input rectifier circuit having a crest factor (I peak/I rms) of 2, in the CV mode *2 rms value for a sinewave current (at the rated output voltage, with Vcc=100% in AUTO mode)			

● POWER BOOSTER 4521A

The 4521A boosts the output power (current) of the 4520A. Up to four 4521A units can be connected to a single 4520A.

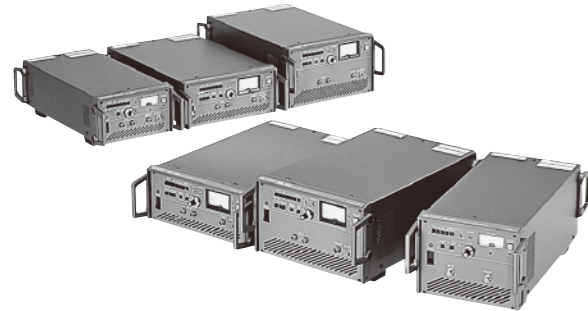
SPECIFICATIONS

Power requirement	1 φ 200V ± 10% (220 or 240V is optionally available.) 48Hz to 62Hz
Dimensions(mm)	430(W) × 442.5(H) × 600(D)
Weight	approx. 92kg



HIGH SPEED BIPOLAR AMPLIFIER

HSA SERIES



FEATURES

- High speed, broad band and high slew rate
Frequency range : DC to max.10MHz, Slew rate : max. 5000V/μs
- High voltage output (Max. 300Vp-p)
- 4 dimensions output (bipolar output)
- Excellent step response
- Two inputs are provided
- DC bias
- Low output impedance
- Function of output range shift

SPECIFICATIONS

Model	HSA4011	HSA4012	HSA4014
Frequency range	150Vp-p (±75V)	DC to 1MHz	150Vp-p (±75V)
Maximum voltage	RL=50Ω 50Vrms (40Hz to 500kHz) 45Vrms (20Hz to 1MHz) RL=100Ω ±75V (DC to 100kHz) ±70V (DC to 500kHz) ±65V (DC to 1MHz)	150Vp-p (±75V) ● ±75V range RL=25Ω 50Vrms (40Hz to 500kHz) 40Vrms (20Hz to 1MHz) RL=75Ω ±75V (DC to 100kHz) ±55V (DC to 1MHz) ● -25 to +125V range RL=125Ω -25 to +125V (DC to 100kHz) -5 to +105V (DC to 1MHz) ● -125 to +25V range RL=125Ω -125 to +25V (DC to 100kHz) -105 to +5V (DC to 1MHz)	150Vp-p (±75V) ● ±75V range RL=12.5Ω 50Vrms (40Hz to 500kHz) 40Vrms (20Hz to 1MHz) RL=37.5Ω ±75V (DC to 100kHz) ±55V (DC to 1MHz) ● -25 to +125V range RL=62.5Ω -25 to +125V (DC to 100kHz) -5 to +105V (DC to 1MHz) ● -125 to +25V range RL=62.5Ω -125 to +25V (DC to 100kHz) -105 to +5V (DC to 1MHz)
Maximum current	1A rms, 2.82Ap-p (40Hz to 1MHz) ±0.75A (DC to 40Hz)	2A rms, 5.66Ap-p (40Hz to 500kHz) ±1.0A (DC to 40Hz)	4A rms, 11.3Ap-p (40Hz to 500kHz) ±2.0A (DC to 40Hz)
Slew rate	600V/μs typ.	400V/μs typ.	400V/μs typ.
Impedance	0.5Ω + 1.5μH max.	0.25Ω + 0.8μH max.	0.125Ω + 0.4μH max.
Pre-amplifier output	Inverted phase of input. (Available for 2 units BTL connection), Connector BNC- R on rear panel		
DC bias	±50V (by 10 turns potentiometer) ±100V (by 10 turns potentiometer)		
Other functions	Monitor meter*1, Monitor output, DC offset adjustment, Output ON/OFF switch		
Input Type	2 inputs of A and B (Enable to add), Same phase both of A and B input against output		
Input Impedance	50Ω/600Ω selectable		
Gain	×10, ×20, ×50, ×100 and ×(1 to 3) variable continuously		
Frequency response	1MHz (+0.5 to -1dB, 10Vrms) 1MHz (+0.5 to -3dB, 10Vrms, ±75V range)		
Input voltage	AC100V (One of 120V/200V/220V/240V can be modified by factory option), 48Hz to 62Hz		
Power consumption	200W/300VA	400W/550VA	700W/900VA
Dimensions (mm)/Weight	220(W)×132.5(H)×450(D)/approx.10kg	290(W)×132.5(H)×450(D)/approx.13kg	290(W)×177(H)×450(D)/approx.18kg
Reference	*1 Average value indication of DC+AC		

Model	HSA4051	HSA4052	HSA4101
Frequency range	DC to 500kHz	DC to 500kHz	DC to 10MHz
Maximum voltage	300Vp-p (±150V) ● ±150V range RL=100Ω 100Vrms (40Hz to 200kHz) 40Vrms (20Hz to 500kHz) RL=300Ω ±150V (DC to 50kHz) ±55V (DC to 500kHz) ● -50 to +250V range RL=500Ω -50 to +250V (DC to 50kHz) +45 to +155V (DC to 500kHz) ● -250 to +50V range RL=500Ω -250 to +50V (DC to 50kHz) -155 to -45V (DC to 500kHz)	300Vp-p (±150V) ● ±150V range RL=50Ω 100Vrms (40Hz to 200kHz) 40Vrms (20Hz to 500kHz) RL=150Ω ±150V (DC to 50kHz) ±55V (DC to 500kHz) ● -50 to +250V range RL=250Ω -50 to +250V (DC to 50kHz) +45 to +155V (DC to 500kHz) ● -250 to +50V range RL=250Ω -250 to +50V (DC to 50kHz) -155 to -45V (DC to 500kHz)	142Vp-p (±71V) RL=50Ω 50Vrms (40Hz to 100kHz) 46Vrms (100kHz to 1MHz) 35Vrms (1MHz to 10MHz) 17Vrms (10MHz to 20MHz) RL=71Ω ±71V (DC to 40Hz)
Maximum current	1A rms, 2.83Ap-p (40Hz to 200kHz) ±0.5A (DC to 40Hz)	2A rms, 5.66Ap-p (40Hz to 200kHz) ±1.0A (DC to 40Hz)	±1.4A (40Hz to 100kHz), ±1.3A (100kHz to 1MHz) ±1.0A (1MHz to 10MHz), ±1A (DC to 40Hz) 5000V/μs typ.
Slew rate	450V/μs typ.	450V/μs typ.	5000V/μs typ.
Impedance	1Ω + 3.2μH max.	0.5Ω + 1.6μH max.	1.5Ω + 0.5μH typ.
Pre-amplifier output	Opposite phase of input. (Available for 2 units BTL connection), Connector BNC-R on rear panel		
DC bias	±200V (by 10 turns potentiometer) ±70V (by 10 turns potentiometer)		
Other functions	Monitor meter*1, Monitor output, DC offset adjustment, Output ON/OFF switch		
Input Type	2 inputs of A and B (Enable to add), Same phase both of A and B input against output		
Input Impedance	50Ω/600Ω selectable		
Gain	×20, ×40, ×100, ×200 and ×(1 to 3) variable continuously		
Frequency response	500kHz (+0.5 to -3dB, 20Vrms, ±150V range) 10MHz (+0.5 to -3dB, 10Vrms)*2		
Input voltage	AC100V (One of 120V/200V/220V/240V can be modified by factory option), 48Hz to 62Hz		
Power consumption	400W/600VA	700W/950VA	400W/700VA
Dimensions (mm)/Weight	290(W)×132.5(H)×450(D)/approx.13kg	290(W)×177(H)×450(D)/approx.18kg	220(W)×177(H)×450(D)/approx.7.8kg
Reference	*1 Average value indication of DC+AC *2 DC mode :DC to 100kHz(±0.3dB), AC mode :40Hz cutoff frequency HPF is inserted.		



BA4825



BA4850

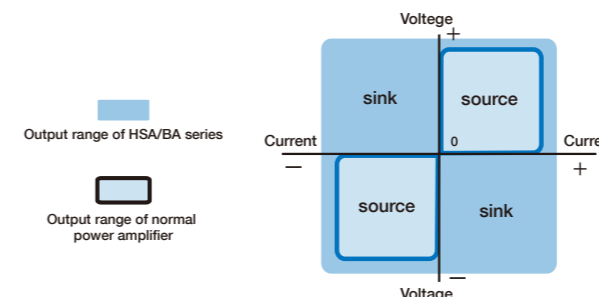
FEATURES

- Broadband: BA4825 DC to 2MHz, BA4850 DC to 50MHz
- High-power output voltage: BA4825 100Vrms (300Vp-p), 0.5Arms
BA4850 ±20V, ±1A
- High slew rate
- Low output impedance
- Bipolar output
Four-quadrant operation that enables positive and negative voltage and current to be supplied (source) and absorbed (sink).
- Multiple functions
Output polarity switching, output range shift*, output monitoring*, external output on/off control, DC bias addition*, and DC offset adjustment

SPECIFICATIONS

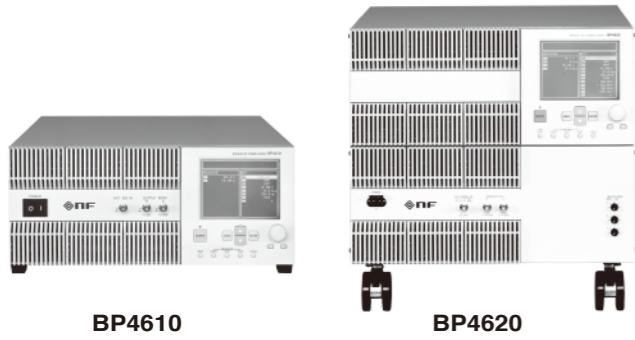
FREQUENCY	BA4825	BA4850
Frequency band	DC to 2MHz	DC to 50MHz
OUTPUT	BA4825	BA4850
Maximum output voltage	±150V range (rated resistance load 200Ω) 100Vrms or greater 40Hz to 500kHz 70Vrms or greater 500kHz to 1MHz 40Vrms or greater 1MHz to 2MHz ±150V range (rated resistance load 450Ω) ±150V (300Vp-p) DC to 500kHz ±100V (200Vp-p) 500kHz to 1MHz ±56V (112Vp-p) 1MHz to 2MHz +250V range (rated resistance load 1,250Ω) -50V to +250V DC to 500kHz +40V to +240V 500kHz to 1MHz +80V to +200V 1MHz to 2MHz -250V range (rated resistance load 1,250Ω) -250V to +50V DC to 500kHz -240V to -40V 500kHz to 1MHz -200V to -80V 1MHz to 2MHz	±20V (rated resistance load 50Ω) : DC to 20MHz ±14.2V (rated resistance load 50Ω) : 20MHz to 50MHz
Rated output current	0.5Arms(±150V range, rated resistance load 200Ω)	±1A, DC
Output power	50W(in rated condition), 150W max.	Approx. 8W max.
Characteristics of small amplitude frequency	DC to 100kHz, ±0.5 dB 100kHz to 2MHz, +1, -3 dB Conditions: Output amplitude 20 Vrms, reference 1 kHz	DC to 100kHz, ±0.5dB 10 kHz to 5 MHz, +1, -3dB Conditions: Output amplitude ±4V, reference 1kHz
Gain setting	Fixed: ×1, ×10, ×20, ×50 Variable: ×1 (CAL) to ×3, consecutive The set gain equals to (Fixed × Variable).	Fixed: ×1, ×2, ×5, ×10 Variable: ×1 (CAL) to ×3, consecutive The set gain equals to (Fixed × Variable).
Slew rate	500V/μs	6000V/μs
Output DC offset	Adjustment range: ±0.5V or more (input terminal short circuit)	
Output impedance	0.5Ω + 1.5μH or less (typ.)	3.3Ω + 0.01μH or less (typ.)
INPUT	BA4825	BA4850
Maximum input voltage	±10V	
Number of terminals	2 (A input: Front panel, B input: Rear panel) (Input type may be A input, B input, or both A input and B input.)	1 (Front Panel)
Input impedance	5Ω and 10kΩ, switchable	50Ω
MISCELLANEOUS	BA4825	BA4850
Power input	AC100V to 230V ±10% (at 250V or less), 50Hz/60Hz ±2Hz	
Power consumption	350VA or less	200VA or less
Dimensions (mm)/ Weight	258(W) × 132.5(H) × 390(D) (not including protrusions)/ Approx.7kg	

Operation region of 4 dimensions output



APPLICATIONS

- Driving and evaluation of piezoelectric elements
- Test and evaluation of display devices
- Power amplifier for signal or pulse generators
- Measurement of magnetizing characteristics (B-H curves)
- Driving of elastic surface wave ultrasonic motors and comb tooth-shaped electrodes in the field of nanotechnology and MEMS
- High-frequency ripple tests of capacitors



FEATURES

- Built-in 255-step sequential signal source
- Voltage/Current output for four quadrants
- High power : ±60V (Can be shifted)
BP4610 ±10 A (30Ap-p) BP4620 ±20 A (60Ap-p)
- High speed: DC to 150kHz
- Constant voltage (CV) / Constant current (CC) operation selectable
- Response calibration function
- Voltage/Current limiter, measurement display function
- USB interface and external analogue input
- Available for Sequence Editing Software

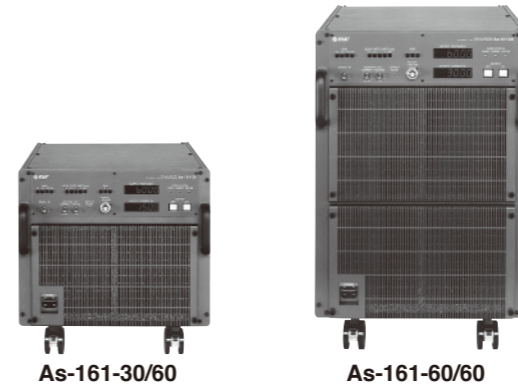
APPLICATIONS

- For power supply voltage fluctuation test on 12V/24V/42V vehicle electrical and electronic component
- As a constant current power supply for generating magnetic field
- As a constant current power supply for capacitor
- As a constant current power supply for plating etc.

SPECIFICATIONS

Output		Sequence Function	
Output Voltage Range	Any 120Vp-p between -115V and +115V	Number of Sequences	1 sequence each for CV and CC mode
Maximum Output Voltage (CV Mode)*1	DC to 0.5 kHz: ±60V (Rl 6Ω ² /3Ω ³) 0.5 kHz to 70 kHz: ±60V (Rl 4Ω ² /2Ω ³) 70 kHz to 150 kHz: ±50V (Rl 6Ω ² /3Ω ³)	Number of Steps	1 to 255 (in one sequence)
Maximum Output Current (CC Mode)*1	DC to 0.5 kHz: ±10 A (Rl6Ω) ² /±20 A (Rl3Ω) ² 0.5 kHz to 30 kHz: ±15 A (Rl4Ω) ² /±30 A (Rl2Ω) ³ 30 kHz to 70 kHz: ±8.3 A (Rl6Ω) ² /±16.6 A (Rl3Ω) ³	Step Time	0.1 ms to 999.9999s (Resolution of 0.1 ms)
Response Calibration Function	Response characteristic of the amplifier can be adjusted with adjusting knobs on the front panel (time constant : T, voltage : V, current : I)	In-Step Operation	Constant or linear sweep
Rise/Fall Time*1	CV Mode : 2.5 μs (Square wave ±60V) CC Mode : 4 μs (Square wave ±10A ² /±20A ³)	Parameters	DC voltage/current, superposed AC voltage/current, frequency, waveform, synchronous 2-bit step output
Output Impedance*1	CV mode : 7mΩ + 1.3 μH ² /3.5mΩ + 0.65 μH ³ CC mode : 10kΩ / 0.45 μF ² /5kΩ // 0.90 μF ³	Number of Sequence Repetition	1 to 999 or continuous
Internal Signal Source DC		Sequence Control	Start, Stop, Hold and Branch (Jumps to a specified step by the external trigger input)
Amplitude setting range	CC mode : ±115V (Resolution of 0.01V) CV mode : ±10A ² (Resolution of 0.001A) ±20A ³ (Resolution of 0.001A)	Others	
Superposed AC Waveform	Sine wave, Square wave, Arbitrary wave (16 types)	Measurement Function	DC/AC output voltage measurement, DC/AC output current measurement
Frequency setting range	1 Hz to 100 kHz (Resolution of 0.1Hz)	Other functions	Monitor output, Protection function, Output ON/OFF function, Store/recall/memory
Amplitude setting range	CV mode : 0 to 120Vp-p (Resolution: 0.1Vp-p) CC mode : 0 to 30Ap-p ² (Resolution: 0.01Ap-p) 0 to 60Ap-p ³ (Resolution: 0.01Ap-p)	Interface	USB
External Signal Input	Frequency range : DC to 200kHz Gain: CV mode: 100 times (100V / 1V) CC mode: 10 times (10A / 1V) ² 20 times (20A / 1V) ³	Power Requirements	BP4610 : 90 V to 250 V, 48 Hz to 62 Hz BP4620 : 180 V to 250 V, 48 Hz to 62 Hz BP4610 : Maximum of 1200 VA BP4620 : Maximum of 2400 VA
		Dimensions (mm)	BP4610 : 430(W)×176(H)×551(D) BP4620 : 430(W)×354(H)×551(D) (Not including projections)
		Weight	BP4610 : Approx. 26kg BP4620 : Approx. 53kg

*1 Typical values given. These vary depending on the adjustment with the response calibration function.
*2 BP4610
*3 BP4620



SPECIFICATIONS

Model	Output Voltage	Output Current		Frequency range
		Peak	DC	
As-161-30/60	-15V to +60V	±30A	15A	DC to 150kHz
As-161-60/60		±60A	30A	
As-161-120/60	-10V to +30V	±120A	60A	DC to 100kHz
As-161-60/30		±60A	30A	DC to 150kHz
As-161-120/30		±120A	60A	
As-161-240/30		±240A	120A	DC to 100kHz

Whithstanding capacitance	100 μ For less
Output Impedance	(100m Ω + 4 μ H) or less
Output DC bias addition	-15V to +60V (with 10-turn potentiometer)
Output offset voltage	Can be adjusted to zero using offset trimmer
Slew Rate Limit	5-point switching among 0.1V/μs, 0.3V/μs, 1V/μs, 3V/μs, and OFF.
Input Impedance	100kΩ ±10%
Input voltage	1.5V to +6V
Gain	4-point switching among 2, 5, 10, and 20 times
Voltage gain-frequency response	±3dB(With pure resistance load and at DC to 150kHz)
Voltage monitor	Output gain: 1/10 of output voltage
Current monitor	Output gain: 0.1V/A
Power requirements	Automatic switching, AC 90V to 132V and AC 180V to 230V, 48Hz to 62Hz (As-161-120/60: AC 180V to 230V 48Hz to 62Hz)
Power consumption	As-161-30/60 : 1500VA As-161-60/60 : 3000VA As-161-120/60 : 6000VA
Dimensions (mm)	As-161-30/60 : 430(W)×354.5(H)×599(D) As-161-60/60 : 430(W)×577(H)×599(D) As-161-120/60 : 580(W)×1310(H)×900(D)
Weight	As-161-30/60 : approx. 36 kg As-161-60/60 : approx. 64 kg As-161-120/60 : approx. 250 kg

As-161 conducts various EMC tests and power simulation tests on vehicle electrical and electronic components when connected to a testing waveform generator.

FEATURES

- High speed and broadband : DC to 150 kHz
- High output voltage : -15V to +60V / -10V to +30V
- High current: 30Apeak / 60Apeak / 120Apeak / 240Apeak
- Low output impedance
- Strong capacitance-withstanding design allows the amplifier to function at constant voltage even to the capacitors located at the power input of the electrical and electronic components.
- Adjustable slew rate of 5 levels.



FEATURES

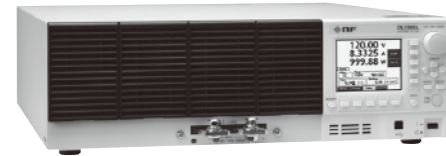
- Constant voltage mode
Large amplitude characteristic DC to 7kHz
Small amplitude characteristic DC to 45kHz (-3dB)
Slew rate 500V/μs
- Constant current mode
Large amplitude characteristic DC to 4kHz
Small amplitude characteristic DC to 10kHz (-3dB)
Slew rate 1mA/μs
- High precision voltage/current monitor output
- Small output residual noise
- Protection function
Alarm lamp contact output
High voltage output indicator
Output voltage, current limiter
Power source for lighting discharge tube

APPLICATIONS

- Research & Development and manufacturing of Photo conductor process
- static electricity application test and research
- Piezo actuator drive
- Application test and research of corona discharge
- Lighting power source for discharge tube

ELECTRONIC DC LOAD

DL SERIES



DL1000L



DL300H

FEATURES

- Load current characteristics equivalent to actual resistance loads in low-voltage range
- High-speed current control with minimal rush, overshoot and ringing
- High-speed response 30 A/μs* (max./variable slew rate) *DL1000L
- Six load modes (CC, CR, CV, CP, EXT, SHORT)
- Load current control with external analog voltage (EXT mode)
- Dynamic mode enables programmable load conditions.
- Sweep mode enables overcurrent test, overload test, and V-I characteristic measurement.
- Parallel operation for capacity expansion and multichannel synchronous operation
- Ripple noise measurement (option)

SPECIFICATIONS

Load Section	DL300L	DL300H	DL1000L	DL1000H
Voltage	120 V	500 V	120 V	500 V
Current	60 A	12 A	180 A	36 A
Power*1	300W		1000W	
Internal minimum resistance*2	17 mΩ or under	250 mΩ or under	5.6 mΩ or under	83.3 mΩ or under

Load Mode						
Constant Current (CC) mode	Current setting range	Current range: H	0 to 60 A	0 to 12 A	0 to 180 A	0 to 36 A
		Current range: M	0 to 6 A	0 to 1.2 A	0 to 18 A	0 to 3.6 A
		Current range: L	0 to 0.6 A	0 to 0.12 A	0 to 1.8 A	0 to 0.36 A
	Slew rate*2*3 (Current range)	Current range: H	0.2 A/μs to 20 A/μs	0.01 A/μs to 1 A/μs	0.3 A/μs to 30 A/μs	0.03 A/μs to 3 A/μs
Current range: M		0.02 A/μs to 2 A/μs	0.001 A/μs to 0.1 A/μs	0.03 A/μs to 3 A/μs	0.003 A/μs to 0.3 A/μs	
Current range: L		0.005 A/μs to 0.5 A/μs	0.00025 A/μs to 0.025 A/μs	0.0075 A/μs to 0.75 A/μs	0.00075 A/μs to 0.075 A/μs	
Constant Resistance (CR) mode	Voltage range	20 V				
		85 V				
	Resistance setting range	Voltage range: H	40.000 S to 0.005 S (0.025 Ω to 200 Ω)	3.3333 S to 0.004 S (0.3 Ω to 2.5 kΩ)	120.00 S to 0.01 S (0.0083 Ω to 66.667)	10.000 S to 0.001 S (0.1 Ω to 833.33 Ω)
		Voltage range: M	4.000 S to 0.0005 S (0.25 Ω to 2 kΩ)	0.33333 S to 0.00004 S (3 Ω to 25 kΩ)	12.000 S to 0.001 S (0.0833 Ω to 666.67 Ω)	1.0000 S to 0.0001 S (1 Ω to 8333.3 Ω)
	Resistance setting range	Current range: H	13.333 S to 0.0016 S (0.075 Ω to 600 Ω)	1.1111 S to 0.0001 S (0.9 Ω to 7 kΩ)	40.000 S to 0.005 S (0.025 Ω to 200 kΩ)	3.3333 S to 0.0004 S (0.3 Ω to 2.3333 kΩ)
		Current range: M	1.3333 S to 0.00016 S (0.75 Ω to 6 kΩ)	0.11111 S to 0.00001 S (9 Ω to 70 kΩ)	4.0000 S to 0.0005 S (0.25 Ω to 2 kΩ)	0.33330 S to 0.00004 S (3 Ω to 23.333 kΩ)
Voltage Measurement	Voltage setting range	Voltage range: H	0 V to 120 V	0 V to 500 V	0 V to 120 V	0 V to 500 V
		Voltage range: L	0 V to 20 V	0 V to 85 V	0 V to 20 V	0 V to 85 V
Constant Power (CP) mode	Power setting range	Current range: H	0 W to 300 W		0 W to 1000W	
		Current range: M	0 W to 40 W		0 W to 120W	
External Control (EXT) mode	Current Measurement	Current range: H	0 A to 60 A	0 A to 12 A	0 A to 180 A	0 A to 36 A
		Current range: M	0 A to 6 A	0 A to 1.2 A	0 A to 18 A	0 A to 3.6 A
Short (SHORT) mode	Short current (Maximum value)	60 A	12 A	180 A	36 A	

Operating Mode			
Normal mode	Available load mode	CC / CR / CV / CP / EXT / SHORT mode	
Dynamic mode	Available load mode	CC / CR / CV / CP mode	
	Setting period	Up to 20ms / 200ms / 2s / 20s / 60s (Resolution : 1μs / 10μs / 100μs / 1ms / 10ms)	
Sweep mode	Available load mode	CR : Sweep R, CC : Sweep C, CP : Sweep P mode	
Sequence operation (Only by remote control)	Available load mode	CC / CR / CV / CP mode	
	Step duration	1 ms to 10 min (Common in all the steps) (Resolution : 1 ms (1ms to 100ms) / 100ms (100 ms to 10min))	

Measuring Section						
DC Voltage Measurement	Voltage measurement range*4	Voltage range: H	0 V to 120 V	0 V to 500 V	0 V to 120 V	0 V to 500 V
		Voltage range: L	0 V to 20 V	0 V to 85 V	0 V to 20 V	0 V to 85 V
	Current measurement range*4	Current range: H	0 A to 60 A	0 A to 12 A	0 A to 180 A	0 A to 36 A
		Current range: M	0 A to 6 A	0 A to 1.2 A	0 A to 18 A	0 A to 3.6 A
	Current range: L	0 A to 0.6 A	0 A to 0.12 A	0 A to 1.8 A	0 A to 0.36 A	
Measuring method*5		By calculation [Voltage × Current]				

General Requirement			
Interface		USB1.1 compatible, USBTMC IEEE488.1 compatible	
Power input	Voltage / Frequency	AC100 V to 240 V ±10% 50 Hz ±2 Hz / 60 Hz ±2 Hz	
	Power consumption	60 VA or under	65 VA or under
Dimensions (W×H×D) (mm)		215(W)×128.6(H)×420(D) (Excluding projections)	430(W)×128.6(H)×450(D) (Excluding projections)
Weight		Approx. 6.5 kg	Approx. 13 kg

*1 It may vary in accordance with the internal temperature or operating time. *2 At rear loading terminals. *3 Setting can be changed only at CC mode or EXT mode. This item becomes response time setting at CV mode. Setting cannot be changed at CR, CP or SHORT modes. *4 Voltage measurement range changes in accordance with selected voltage setting range. *5 Measured results are displayed in absolute values.



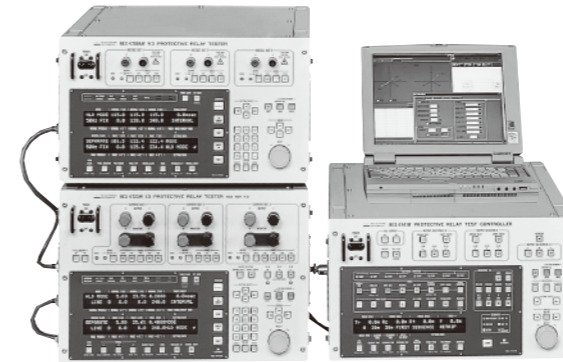
This device can also be used as an electronic load device for load testing of AC power supplies and power equipment (instead of resistors, inductors, capacitors, or dummy networks).

FEATURES

- Two operation modes: resistance mode and constant current mode
- Current waveforms can be freely set to simulate non-linear load in harmonic current, etc.
- Current phase setting is enabled
- Operates using AC or DC power
- Reduces energy consumption via power recovery
- Three-phase testing enabled in master and slave operation modes
- Can be connected to booster for higher power (As-514)

POWER TEST INSTRUMENTS

PROTECTIVE RELAY TESTERS



Protective relay testers are devices used to test protective relays installed in installed in power systems.

Various models are provided for different output elements and unctons, fenabling support for a wide range of relays (boards) and tests.

In addition to enabling combination with various other equipment to suit various kinds of tests, computer-based automation is also supported for highly efficient testing.

FEATURES

- Supports automated testing (local testing, counter testing, or stand-alone testing) of various digital relays and mechanical relays. Of course, test operations can also be set manually.
- Abundant product line includes everything from stand-alone testers to computer-based automated test systems. Various equipment can be freely combined.
- Multi-function, compact, light weight, and easy to use

SINGLE-PHASE VOLTAGE, SINGLE-PHASE CURRENT PROTECTIVE RELAY TESTER

RX4717K



FEATURES

- Outputs 100 VA single-phase voltage and 180 VA single-phase current
- Equipped with counter function, output selector, auto sweep function, memory function, DC output for testing, master/slave function, etc.
- Output frequencies of 50 Hz, 60 Hz, and 10 Hz to 200 Hz; using external synchronization or line synchronization (selectable)
- Equipped with GPIB/RS-232C interfaces
- Weight: 19.5 kg

THREE-PHASE VOLTAGE PROTECTIVE RELAY TESTER

RX4718

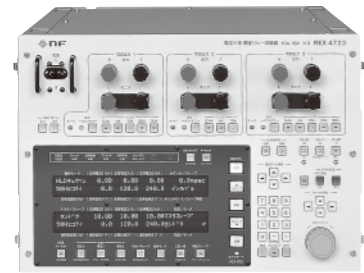


FEATURES

- Outputs 100-VA three-phase voltage
- Equipped with counter function, output selector, auto sweep function, memory function, DC output for testing, master/slave function, etc.
- Auto setting of 1LG, 2LS, three-phase batch, three-phase balanced, and phase switching functions
- Output frequencies of 50 Hz, 60 Hz, and 10 Hz to 200 Hz; using external synchronization or line synchronization (selectable)
- Equipped with GPIB/RS-232C interfaces
- Weight: 19.5 kg

THREE-PHASE CURRENT PROTECTIVE RELAY TESTER

RX4723

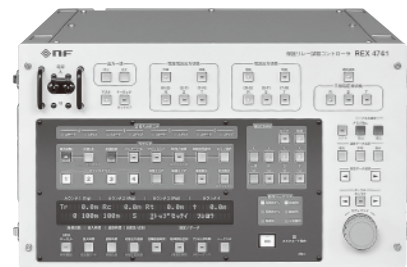


FEATURES

- Output capacity modes include three-phase current (180 VA per phase), two-phase current (360 VA for first phase, 180 VA for second phase), and single-phase current (540VA)
- Can be easily combined with RX4718 for local testing
- Equipped with counter function, output selector, auto sweep function, memory function, DC output for testing, master/slave function, GPIB/RS-232C interfaces, etc.
- Output frequencies of 50 Hz, 60 Hz, and 10 Hz to 200 Hz; using external synchronization or line synchronization (selectable)

PROTECTIVE RELAY TEST CONTROLLER

REX4741



REX4741

FEATURES

- External controller for NF's protective relay testers
- Main unit includes control functions for local tests, output selector, time counter, dummy circuit breaker, and response input selector
- Easily configurable with computer-based local and stand-alone relay test systems
- Equipped with GPIB interface
- Weight: 17 kg



REX4731

CURRENT OUTPUT AMPLIFIER REX4731

Current booster increasing capacity for supporting mechanical relay test (Maximum 450VA output)

3-PHASE VOLTAGE CURRENT STANDARDS

RX4763

For calibration of various meters, CT, PT, and power transducers



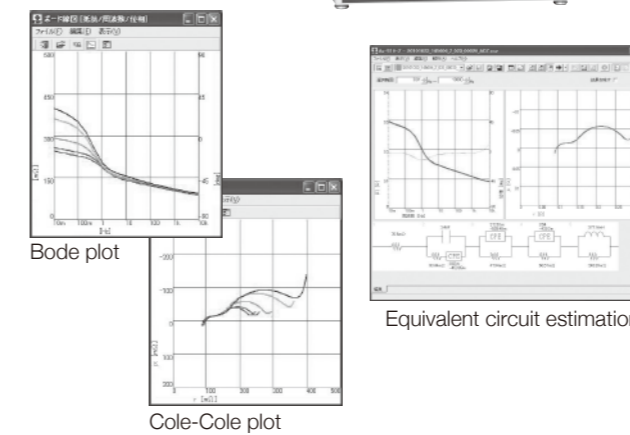
FEATURES

- Output : Three-phase voltage, three-phase current, DC
- Frequency: 1.000Hz to 5000.000Hz, setting resolution 1mHz
- Frequency accuracy: ± 30 ppm
- Waveform: Sine, harmonics, arbitrary, DC
- Output mode:
Balanced, unbalanced, three-phase three-wire, single-phase three-wire

CUSTOMIZED PRODUCTS

Li-ion BATTERY TEST SYSTEM

Suitable for research to improve the storage performance, safety, and durability

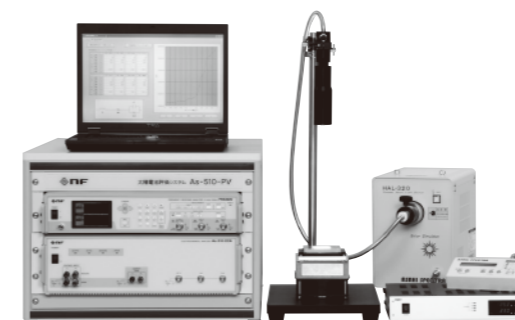


FEATURES

- 300 mA, 4 A and 60 A
300 mA model supports high-resolution measurements. (available for 240 A max.)
- Supports measurement of AC impedance during charging or discharging (measurement of dynamic characteristics).
- Constant-current measurement enables measurement over long periods without changing the state of the battery.
- Reference electrodes enable separation of positive and negative electrodes for detailed measurements.
- Equivalent circuit estimation allows quantitative evaluation of the battery's internal polarization characteristics.
- Supports a variety of tests
 - Charge/discharge
 - Constant-current charge/discharge
 - Constant-current, constant-voltage charge
 - Constant-power discharge
 - Constant-resistance discharge
 - AC impedance measurement
 - Charge/discharge cycle deterioration test
 - Cyclic, potential step, and trapezoidal step cycle deterioration tests
 - Electrochemical measurements
 - Cyclic voltammetry
 - Linear sweep voltammetry
 - Electrochemical impedance spectroscopy
 - Potential step and trapezoidal step chronoamperometry
 - Sequence program function
For increasing the reproducibility of measurements
 - Support for electrode deterioration evaluation testing
Maximum potential cycle count: 1,000,000

SOLAR CELL TEST SYSTEM

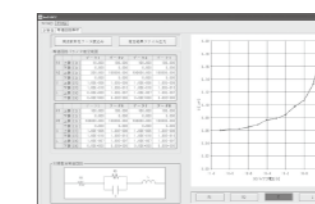
Suitable for research to improve the conversion efficiency and for research on new materials.



Peltier temperature control equipment (Option)

FEATURES

- Automatically measures and collects data for estimating the concentration of impurities (shallow level) and defects (deep level) within solar cells.
- Supports separation research on the concentration of impurities and defects in combination with temperature control equipment.
- Small Current (300 mA), high-resolution model available that can test even small cells in the R&D stage.
- Measurement items
IV characteristics, CV characteristics, CVT characteristics



CV characteristics

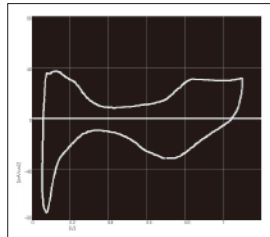
FUEL CELL ELECTROCHEMICAL MEASUREMENT SYSTEM

Measures a variety of electrochemical characteristics and impedance characteristics.

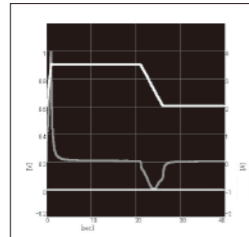


FEATURES

- Possible to make detailed measurements of micro fuel cells using a high resolution bipolar power supply. ($\pm 4\text{ A}/\pm 0.4\text{ A}$ range, min. 0.1 mA resolution)
- Possible to measure characteristics of solid-oxide fuel cells, which sometimes have problems related to voltage drop. ($\pm 5\text{ V}/\pm 4\text{ A}$ bipolar output)
- Support for FCCJ-recommended electrochemical deterioration speed tests.
- Support for a variety of tests
 - Constant-current operation test/constant-voltage operation test
 - Measurement of current-voltage characteristics (Tafel plot)
 - Measurement of electrode characteristics using cyclic voltammetry, linear-sweep voltammetry, etc.
 - Impedance measurement using AC method and Cole-Cole plot rendering
 - Measurement of electrochemical impedance spectrum of MEA
- Possible to perform sequential testing combining tests specified by the user
- Support for automatic equivalent circuit estimation



Cyclic voltammogram



Potential step cycling test (FCCJ-recommended)

GRID CONNECTION TESTING SYSTEM

For grid connection test of distributed power (solar panels, fuel cells, etc.)

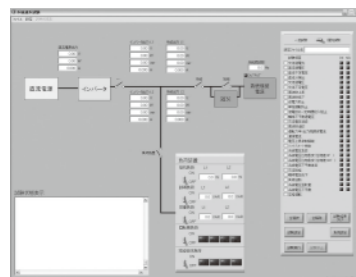


AC Power Source and Impedance Network

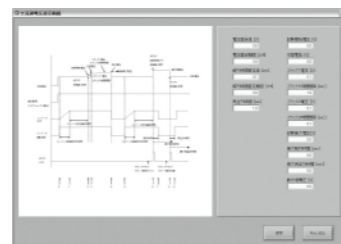
Measuring instruments

FEATURES

- Supports power generation systems with output capacities ranging from 1kW to 36kW
- Supports configuration of systems that include a DC power supply, system simulation power supply, line impedance, load devices, measuring instruments, and system software
- Enables reverse current testing
- Enables testing of single-phase two wire, single-phase three wire, three-phase three wire/four wire
- Impedance network for system simulation (various capacities are supported)



Test parameter setting



Load setting



LED TEST SYSTEM

Measures and analyzes the characteristics of LEDs.



FEATURES

- Drives the LED elements by using the constant current power supply that amplifies the PWM waveform.
- Measures the forward current (I_f) and forward voltage (V_f)
- Estimates the differential resistance characteristics from I_f - V_f characteristics.

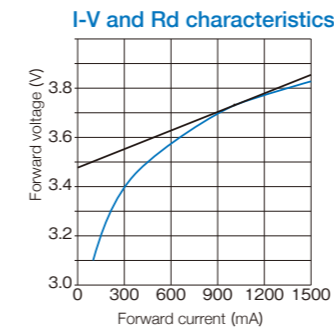
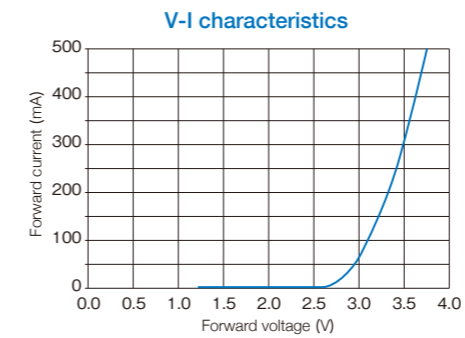
SPECIFICATIONS

Drive	As-630-LE4	As-630-LE8
Output current	-4 A to +4 A/ $\pm 5\text{ V}$	-8 A to +8 A/ $\pm 5\text{ V}$
Frequency	DC to 1 kHz	
Drive waveform	PWM waveform and DC	
PWM duty ratio	0 to 100%	
Rise/fall time settings	Min. 7 μs	Min. 5 μs
Monitor output	Current	1W/0.1A (0.4A range) 1W/1A (4A range)
	Voltage	1:1 1:100

Measurement	As-630-LE4	As-630-LE8
Forward current (I_f)	0 to 4 A	0 to 8 A
Forward voltage (V_f)	0 to 5 V	0 to 50 V
Display of characteristics	V-I, I-V, differential resistance	

Software

Parameter setting, display of characteristics (V-I, I-V, differential resistance characteristics), display of current and voltage waveform



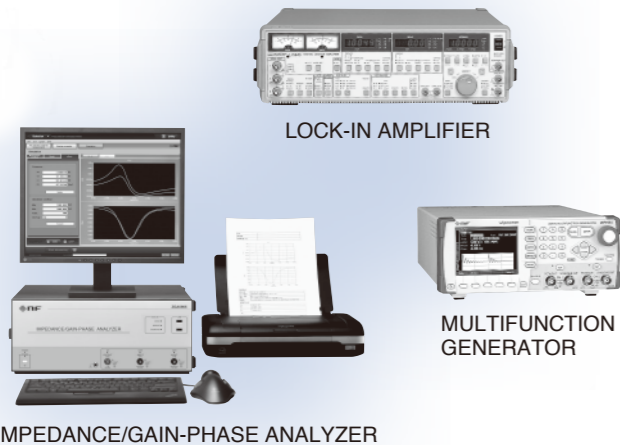
Driving the Future of Technology : Original Solutions for Measurement and Control

Leveraging Our Core Technologies to Develop New Products

Our market-leading, and unique and customized products deliver the functionality and reliability necessary for technology development. With our lineup of unique products, NF can satisfy a variety of needs in a wide array of technical fields.

MEASUREMENT INSTRUMENTS

Delivers advanced measurement solutions from R&D to production lines,

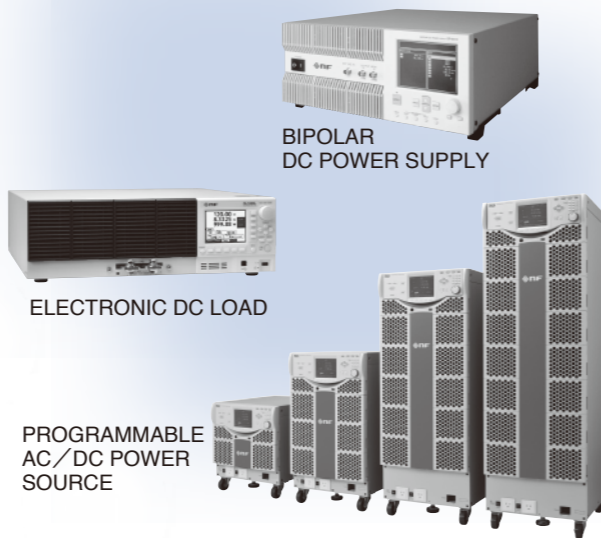


PRODUCTS LINEUP

- Function Generator
- LCR Meter
- AC Voltmeter
- Impedance / Gain-phase Analyzer
- Frequency Response Analyzer
- Lock-in Amplifier / Preamplifier
- Filter

POWER SUPPLIES AND POWER CONTROL PRODUCTS

Creates the optimum environment for the testing and evaluation of advanced electronic devices and components.

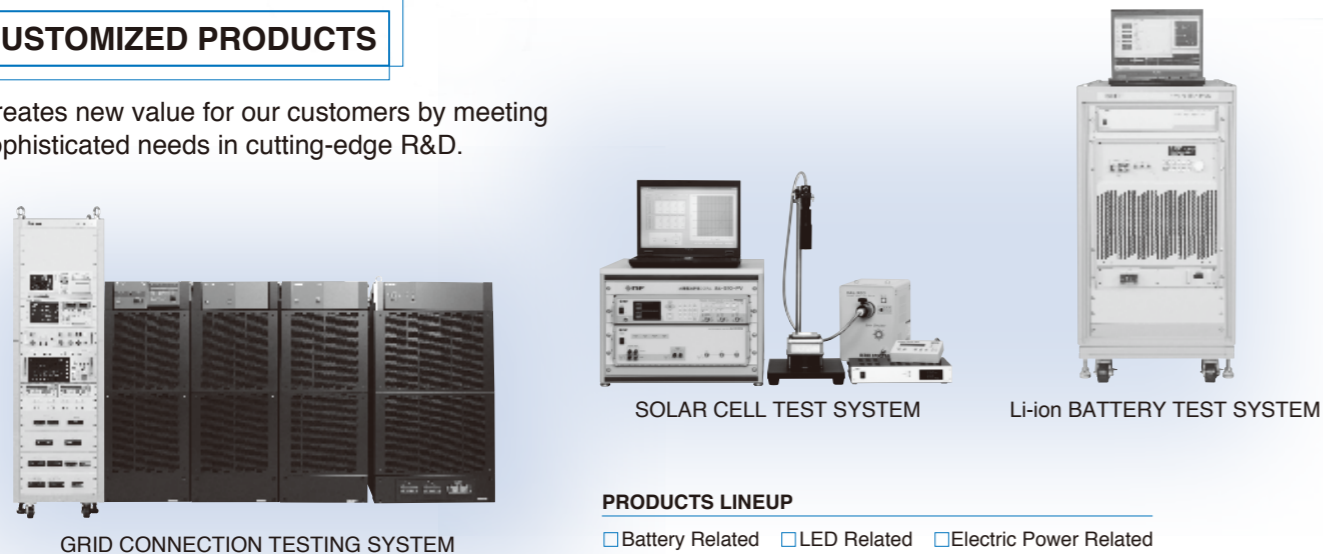


PRODUCTS LINEUP

- AC Power Source
- Bipolar Amplifier
- Electronic Load
- Power Test Instrument

CUSTOMIZED PRODUCTS

Creates new value for our customers by meeting sophisticated needs in cutting-edge R&D.



PRODUCTS LINEUP

- Battery Related
 - LED Related
 - Electric Power Related
- Including electronic components and materials, digital devices, and nanotechnology and so on.

Corporate Profile

Since its foundation, NF Corporation has constantly endeavored to develop cutting edge technology. Analog technology such as negative feedback (from which the company's name derives) has formed the basis for this process. One thing that remained unchanged since the beginning is the spirit epitomized by the motto we adopted at the time of NF's establishment: Unique and Original. It expresses our confidence and pride in advancing the field of analog technology, a field that has become the focus of renewed attention as the electronics industry continues to grow and develop without pause. In the years ahead, NF will continue to create products and services that combine innovation and high added value through a fusion of the analog technology we are known for and digital technology. In this way we hope to continue to advance, together with our customers.



Head Office

- Company Name
- Address of Head Office
- Corporate Brand Logo

NF Corporation
6-3-20 Tsunashima Higashi, Kohoku-ku, Yokohama, Kanagawa, Japan



- Date Founded
- Capital
- President
- Number of Employees
- Stock
- Domestic Sales Branches
- Overseas Offices
- Group Companies

April 27, 1959
¥910 million yen
Tsuneo Takahashi
252 (as of March 31, 2011)
Listed in Osaka Securities Exchange (Jasdaq)
Sendai, Saitama, Yokohama, Nagoya, Osaka, Fukuoka
Shanghai
NF Engineering Co., Ltd.
Yamaguchi NF Electronics Co., Ltd.
NF Fieldtec Inc.
NF Technology (Shanghai) Co., Ltd.

NF Corporation

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