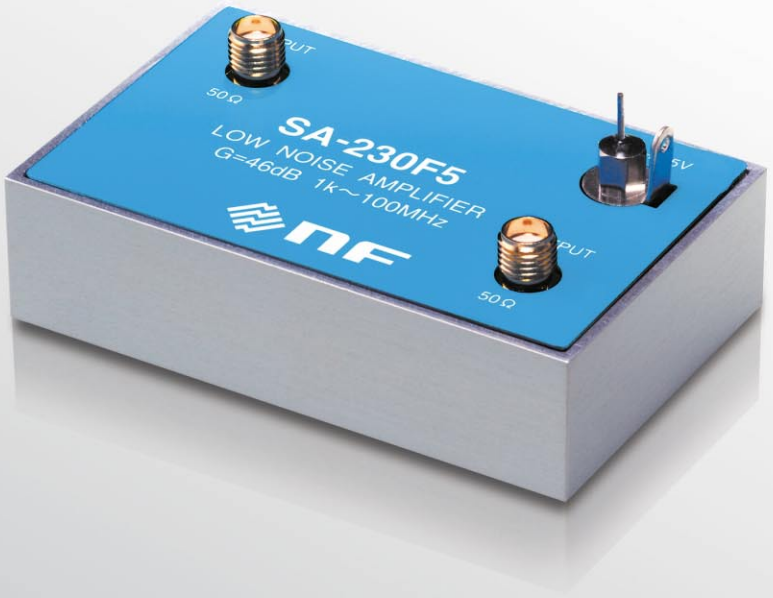
Low Noise Preamplifier SA series

Extremely low noise.

The preamplifiers achieve previously unattainable ultra-low noise levels.



NF Corporation

Cutting-edge R&D makes detection of submicro-signals possible

Our SA series preamplifiers for detection of submicro-signals employ a proprietary circuit configuration using negative feedback technology to achieve ultralow noise levels that were previously not possible. The SA-230F5 can amplify extremely small signals (with which noise from the amplifier itself could cause problems) and achieves world-class ultralow noise performance: an input voltage noise density of 0.25 nV/$\sqrt{\text{Hz}}$ and noise figure of 0.6 dB. Seven models are available to match differing requirements for frequency range, input format, and input impedance. SA series preamplifiers are suitable as head amplifiers for sensors of various types, and they are ideal for enhancing sensitivity or reducing noise level in analyzers or measuring instruments.

Applications

SA series are used to foster versatility as sensor head amplifiers or preamplifier for sensitivity improvement and noise reduction in analyzers and measurement instruments.

- Superconducting device in quantum computers
- MCT (Mercury Cadmium Tellurium) sensor for infrared detection
- Squid sensor for micro-magnet detection
- High-temperature superconducting Josephson device for microwave detection
- Electromagnetic sensor for MRI systems
- Photodetector such as a photo-multiplier and photo-transistor
- Improving sensitivity of lock-in amplifiers

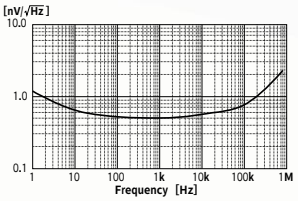
Specifications

	 **SA-200F3** Low Noise Amplifier	 **SA-220F5** Low Noise FET Amplifier	 **SA-230F5** Low Noise Amplifier
Input			
Frequency range (typ.)	DC to 700kHz	1kHz to 80MHz	1kHz to 100MHz
Input form	DC coupling, unbalanced single-ended input	AC coupling, unbalanced single-ended input	AC coupling, unbalanced single-ended input
Input impedance	1k/10k/100kΩ±5% (DC) // 150pF max.	1MΩ±5% (5kHz) // 57pF typ.	50Ω±5% (100kHz)
Max. input voltage (burnout voltage)	±0.5V	±1.0V	±0.5V
CMRR	—	—	—
Input voltage noise density	0.7nV/$\sqrt{\text{Hz}}$ max. (1kHz) 0.5nV/$\sqrt{\text{Hz}}$ typ. (1kHz)	0.7nV/$\sqrt{\text{Hz}}$ max. (100kHz) 0.5nV/$\sqrt{\text{Hz}}$ typ. (10kHz to 1MHz)	0.35nV/$\sqrt{\text{Hz}}$ max. (100kHz) 0.25nV/$\sqrt{\text{Hz}}$ typ. (10kHz to 1MHz)
Input noise current density	2.2pA/$\sqrt{\text{Hz}}$ typ. (10kHz)	200fA/$\sqrt{\text{Hz}}$ typ. (100kHz)	5.0pA/$\sqrt{\text{Hz}}$ typ. (100kHz)
Noise figure	—	—	0.7dB max. 0.6dB typ. (10MHz) 1.0dB max. 0.8dB typ. (100MHz)
Output			
Max. output voltage	±10V/1kΩ (1kHz)	2.0$V_{p\text{-}p}$/50Ω (1kHz to 20MHz)	2.0$V_{p\text{-}p}$/50Ω (1kHz to 20MHz)
Output impedance	50Ω±5% (DC)	50Ω±5% (100kHz)	50Ω±5% (100kHz)
Amplifier			
Voltage gain	40±0.5dB/1MΩ (1kHz)	46±0.5dB/50Ω (1MHz)	46±0.5dB/50Ω (1MHz)
Voltage gain frequency characteristics	DC to 700kHz : +0.5dB, −3dB	1kHz to 80MHz : +0.5dB, −3dB	1kHz to 100MHz : +0.5dB, −3dB
Harmonics distortion	0.009% typ. (1kHz±10V)	—	—
Intercept point	—	—	+30dBm typ. (68MHz)
Others			
Recommended power supply voltage range*1	±15V±5%	±15V±5%	+15V±5%
Quenscent current	±50mA max.	+65mA typ. +75mA max. −10mA typ. −15mA max.	+55mA max.
Operating temperature range	0℃ to 40℃	0℃ to 40℃	0℃ to 40℃
Storage temperature / humidity range	−10℃ to 50℃, 10% to 80% RH (no condensation)	−10℃ to 50℃, 10% to 80% RH (no condensation)	−10℃ to 50℃, 10% to 80% RH (no condensation)
Dimension (mm)*2	68×43×17.6	68×43×28	68×43×17.6
Weight	Approx. 90g	Approx. 130g	Approx. 90g

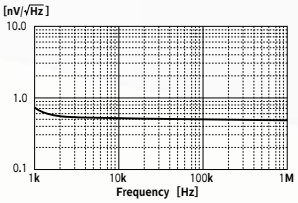
 **SA-400F3** Low Noise Differential Amplifier	 **SA-420F5** Low Noise Differential FET Amplifier	 **SA-421F5** Low Noise Differential FET Amplifier	 **SA-430F5** Low Noise Differential Amplifier
DC to 600kHz	1kHz to 70MHz	30Hz to 30MHz	1kHz to 100MHz
DC coupling, balanced differential input	AC coupling, balanced differential input	AC coupling, balanced differential input	AC coupling, balanced differential input
1k/10k/100kΩ±5% (DC) // 80pF typ.	1MΩ±5% (1kHz) // 15pF typ.	1MΩ±5% (1kHz) // 85pF typ.	50Ω±5% (100kHz)
Differential input : ±0.5V Common mode input : ±10V	Differential input : DC±10V or AC4$V_{p\text{-}p}$ Common mode input : DC±10V or AC6$V_{p\text{-}p}$	Differential input : DC±10V or AC4$V_{p\text{-}p}$ Common mode input : DC±10V or AC6$V_{p\text{-}p}$	±2.0V (differential input /common input mode)
110dB min. (50Hz), 120dB typ. (50Hz), 80dB typ. (100kHz)	55dB min. 1kHz to 10MHz	46dB min. 1kHz to 10MHz	80dB min. (100kHz), 90dB typ. (100kHz), 80dB typ. (10MHz)
0.9nV/$\sqrt{\text{Hz}}$ max. (1kHz) 0.75nV/$\sqrt{\text{Hz}}$ typ. (1kHz)	1.2nV/$\sqrt{\text{Hz}}$ max. (100kHz) 0.9nV/$\sqrt{\text{Hz}}$ typ. (100kHz to 10MHz)	0.7nV/$\sqrt{\text{Hz}}$ max. (100kHz) 0.5nV/$\sqrt{\text{Hz}}$ typ. (100kHz to 10MHz)	0.45nV/$\sqrt{\text{Hz}}$ max. (100kHz) 0.35nV/$\sqrt{\text{Hz}}$ typ.(10k to 1MHz)
3.0pA/$\sqrt{\text{Hz}}$ typ. (10kHz)	100fA/$\sqrt{\text{Hz}}$ typ.(1kHz)	100fA/$\sqrt{\text{Hz}}$ typ.(100Hz)	7.0pA/$\sqrt{\text{Hz}}$ typ.(100kHz)
—	—	—	1.25dB max. 1.10dB typ. (10MHz) 1.75dB max. 1.40dB typ (100MHz)
±10V/1kΩ (1kHz)	2.0$V_{p\text{-}p}$/50Ω (1kHz to 20MHz)	2.0$V_{p\text{-}p}$/50Ω (1kHz to 20MHz)	2.0$V_{p\text{-}p}$/50Ω (1kHz to 20MHz)
50Ω±5% (DC)	50Ω±5% (100kHz)	50Ω±5% (100kHz)	50Ω±5% (100kHz)
40±0.5dB/1MΩ (1kHz)	46±0.5dB/50Ω (1MHz)	46±0.5dB/50Ω (1MHz)	46±0.5dB/50Ω (1MHz)
DC to 500kHz : +0.5dB, −3dB	1kHz to 70MHz : +0.5dB, −3dB	30Hz to 30MHz : +0.5dB, −3dB	1kHz to 100MHz : +0.5dB, −3dB
0.008% typ. (1kHz±10V)	—	—	—
—	—	—	+28dBm typ. (68MHz)
±15V±5%	±15V±5%	±15V±5%	±15V±5%
±92mA typ. ±100mA max.	+54mA typ. +70mA max. −25mA typ. −40mA max.	+74mA typ. +90mA max. −64mA typ. −80mA max.	+55mA typ. +65mA max. −30mA typ. −45mA max.
0℃ to 40℃	0℃ to 40℃	0℃ to 40℃	0℃ to 40℃
−10℃ to 50℃, 10% to 80% RH (no condensation)	−10℃ to 50℃, 10% to 80% RH (no condensation)	−10℃ to 50℃, 10% to 80% RH (no condensation)	−10℃ to 50℃, 10% to 80% RH (no condensation)
68×67×28	68×43×28	68×43×28	68×43×28
Approx. 180g*3	Approx. 100g	Approx. 100g	Approx. 130g

*1 Using SA-915 as a power supply *2 Not including protrusion *3 Including heat sink

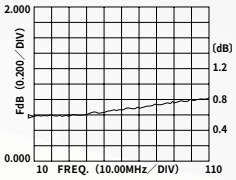
Characteristics



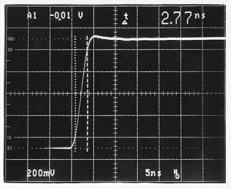
■ **SA-200F3**
Input voltage noise density



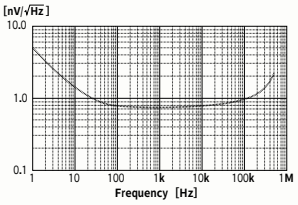
■ **SA-220F5**
Input voltage noise density



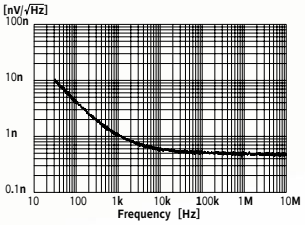
■ **SA-230F5**
Noise figure



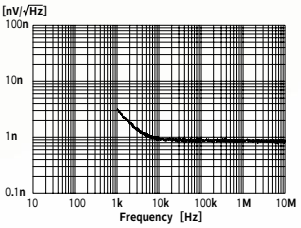
■ **SA-230F5**
Transient response (rise)



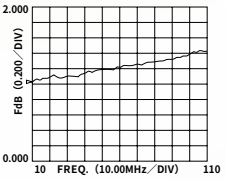
■ **SA-400F3**
Input voltage noise density



■ **SA-421F5**
Input voltage noise density



■ **SA-420F5**
Input voltage noise density



■ **SA-430F5**
Noise figure

Power Supplies

DC Power Supply **SA-915D1**

SA-915D1 is to supply DC power, which is intended for SA series amplifiers, for reductions in noise and ripple. The innovative way to fight the noise has been taken in this power supply. The combination use of an SA series amplifier and SA-915D1 is suggested to assure outstanding performance.

Specifications

Output form	Mini DIN, 4-pin connector
Output voltage	±15V ±3%
Max. output current	±100mA
Output voltage noise / ripple	Max. 300μVrms (BW : 10Hz to 20MHz)
Output voltage temperature coefficient	50ppm/℃ typ.
Power requirements	AC100V ±10%, 48Hz to 62Hz, approx. 10VA
Dimensions (mm)	120×55×200 (protrusion not included)
Weight	Approx. 1.4kg
Operating temperature / humidity range	0℃ to 40℃, 10 to 90% RH (no condensation)
Storage temperature / humidity range	−10℃ to 50℃, 10 to 80% RH (no condensation)

Note:
The above specifications are applied unless otherwise specified : 23℃±5℃, AC100V, Load resistance : 150Ω

DC Bias Supply **SA-912S1**

SA-912S1 is a bias power supply for sensors that process micro-signals.This power supply is composed of a dual-redundant regulator, special noise filter circuit, and dual shield chassis, which offers excellent noise reduction.

Specifications

Output form	Mini DIN, 4-pin connector
Output voltage	±12V ±3% (no load)
Max. output current	±100mA
Output voltage noise / ripple	Max. 3μVrms (BW : 10Hz to 1MHz)
Output voltage temperature coefficient	30ppm/℃ typ.
Power requirements	AC100V ±10%, 48Hz to 62Hz, approx. 5VA
Dimensions (mm)	120×55×200 (protrusion not included)
Weight	Approx. 1.4kg
Operating temperature / humidity range	0℃ to 40℃, 10 to 90% RH (no condensation)
Storage temperature / humidity range	−10℃ to 50℃, 10 to 80% RH (no condensation)

Note:
The above specifications are applied unless otherwise specified : 23℃±5℃, AC100V, Load resistance : 70Ω

- The contents in this catalog are current as of Nov.1.2007.
- Appearances and specifications are subject to change without notice.
- Check the latest product information (including the delivery date, price and specifications) before purchase.

NF Corporation

Head Office
6-3-20 Tsunashima Higashi, Kohoku-ku, Yokohama 223-8508, Japan
Phone : +81-45-545-8128 Fax : +81-45-545-8187

Shanghai Representative Office
Room 22G, Huamin Empire Plaza, No.726 Yan An West Road, Changning District, Shanghai 200050, China
Phone : +86-21-6473-5735 Fax : +86-21-6415-6576

Shenzhen Representative Office
Room1701, East, Aidi Building, No.5003 Binhe Road, Futian District, Shenzhen 518045, China
Phone : +86-755-8355-1866 Fax : +86-755-8355-1214

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

Printed in Japan, Nov.2007
DN07Y-D39-1A2