Extremely, low noise measurements with high accuracy for very small signals

SA-251F6

SA-440F5

SA-200/SA-400 series pre-amplifiers are used for detecting sub micro-Volt signals, and can achieve a ultra low noise level. Eleven models are available for meeting various requirements, such as frequency range, input type, and input impedance. SA-200/SA-400 series pre-amplifiers are best for various types of sensors.

*CE certified: SA-240F5, SA-250F6, SA-251F6, SA-410F3, SA-440F5

APPLICATIONS

- Electromagnetic sensor for NMR/MRI systems
- High speed temperature sensor
- High precision strain gauge sensor
- Superconducting SQUID sensor for micro-magnetic detection
- High-temperature superconducting Josephson device for microwave detection
- Superconducting device in quantum computers

SPECIFICATIONS

Single-end

	SA-200F3	SA-220F5	SA-240F5	SA-230F5	SA-250F6	SA-251F6
Bandwidth	DC to 800 kHz	1 kHz to 80 MHz	DC to 20 MHz	1 kHz to 100 MHz	100 Hz to 250 MHz	1 kHz to 500 MHz
Input type	DC coupling	AC coupling	DC coupling	AC coupling	AC coupling	AC coupling
Input impedance	1 k/10 k/100 kΩ ±5% //150 pF or less typ.	1 MΩ ±5% //57 pF typ.	1 MΩ/100 MΩ/open //60 pF typ.	50 Ω ±5%	50 Ω	50 Ω
Equivalent input noise voltage density (Input terminal short circuit)	0.7 nV/√Hz or less (1 kHz) 0.5 nV/√Hz typ. (1 kHz)	0.7 nV/√Hz or less (100 kHz) 0.5 nV/√Hz typ. (10 kHz to 1 MHz)	1.2 nV/√Hz (1 kHz)	0.35 nV/√Hz or less (100 kHz) 0.25 nV/√Hz typ. (10 kHz to 1 MHz)	0.25 nV/√Hz or less (1 MHz)	0.25 nV/√Hz or less (1 MHz)
Equivalent input noise current density	2.2 pA/√Hz typ. (10 kHz)	200 fA/√Hz typ. (100 kHz)	5 fA/√Hz typ. (10 Hz)	5.0 pA/√Hz typ. (100 kHz)	5 pA/√Hz typ. (1 MHz)	8 pA/√Hz typ. (1 MHz)
Noise figure (50 Ω system)	—	—	—	0.6 dB typ. (10 MHz) 0.8 dB typ. (100 MHz)	0.6 dB (10 MHz) 1.0 dB (250 MHz)	0.9 dB (10 MHz) 1.2 dB (250 MHz) 1.8 dB (500 MHz)
Maximum output voltage	±10 V, 1 kΩ	2.0 Vp-p, 50 Ω	±10 V, 1 kΩ	1.8 Vp-p, 50 Ω	2.0 Vp-p	2.0 Vp-p
Output impedance	50 Ω ±5%	50 Ω ±5%	50 Ω	50 Ω ±5%	50 Ω	50 Ω
Voltage gain	40±0.5 dB, 1 MΩ (1 kHz)	46 ±0.5 dB, 50 Ω (1 MHz)	40 dB ±0.1 dB or less (1 kHz)	46 ±0.5 dB, 50 Ω (20 MHz)	40 ±0.5 dB (1 MHz)	40 ±0.5 dB (1 MHz)
Total harmonic distortion	0.009% typ.	—	0.004% typ.	—	—	—
Power Supply	Through feed-through capacitor	Through feed-through capacitor	HR10-7R-4P (73) connector	Through feed-through capacitor	HR10-7R-4P (73) connector	HR10-7R-4P (73) connector
Operating supply voltage range	±15 V ±5%	±15 V ±5%	±15 V ±1 V	+15 V ±5%	+15 V ±1 V	+15 V ±1 V
Dimensions (W×D×H)	68 × 43 × 17.6 mm	68 × 43 × 28 mm	76 × 50 × 25 mm	68 × 43 × 17.6 mm	76 × 50 × 25 mm	76 × 50 × 25 mm
Weight (approx.)	90 g	130 g	105 g	90 g	140 g	140 g

Differential

	SA-410F3	SA-420F5	SA-421F5	SA-440F5	SA-430F5
Bandwidth	DC to 1 MHz	1 kHz to 70 MHz	30 Hz to 30 MHz	DC to 20 MHz	1 kHz to 100 MHz
Input type	DC coupling	AC coupling	AC coupling	DC coupling	AC coupling
Input impedance	1 k/10 k/100 kΩ ±5% or less //100 pF typ.	1 MΩ ±5% //15 pF typ.	1 MΩ ±5% //85 pF typ.	1 MΩ/100 MΩ/open //60 pF typ.	50 Ω ±5%
CMRR (Equivalent input)	110 dB or more (55 Hz) 80 dB typ. (100 kHz)	55 dB or more (1 kHz to 10 MHz)	46 dB or more (1 kHz to 10 MHz)	90 dB or more (10 Hz to 10 kHz) 60 dB (1 MHz)	80 dB or more (100 kHz), 90 dB typ. (100 kHz) 80 dB typ. (10 MHz)
Equivalent input noise voltage density (Input terminal short circuit)	0.75 nV/√Hz typ. (1 kHz)	1.2 nV/√Hz or less (100 kHz) 0.9 nV/√Hz typ. (100 kHz to 10 MHz)	0.7 nV/√Hz or less (100 kHz) 0.5 nV/√Hz typ. (100 kHz to 10 MHz)	1.8 nV/√Hz (1 kHz)	0.45 nV/√Hz or less (100 kHz) 0.35 nV/√Hz typ. (10 kHz to 1 MHz)
Equivalent input noise current density	4.5 pA/√Hz typ. (10 kHz)	100 fA/√Hz typ. (1 kHz)	100 fA/√Hz typ. (100 Hz)	25 fA/√Hz typ. (100 Hz)	7.0 pA/√Hz typ. (100 Hz)
Noise figure (50 Ω system)	—	—	—	—	1.25 dB or less, 1.10 dB typ. (10 MHz) 1.75 dB or less, 1.40 dB typ. (100 MHz)
Maximum output voltage	±10 V, 1 kΩ	2.0 Vp-p, 50 Ω	2.0 Vp-p, 50 Ω	±10 V, 1 kΩ	2.0 Vp-p, 50 Ω
Output impedance	50 Ω ±5%	50 Ω ±5%	50 Ω ±5%	50 Ω	50 Ω ±5%
Voltage gain	40±0.2 dB, 1 MΩ (1 kHz)	46±0.5 dB, 50 Ω (1 MHz)	46±0.5 dB, 50 Ω (1 MHz)	40 dB ±0.1 dB (1 kHz)	46±0.5 dB, 50 Ω (100 kHz)
Total harmonic distortion	0.004% typ.	—	—	0.006% typ.	—
Power Supply	HR10-7R-4P (73) connector	Through feed-through capacitor	Through feed-through capacitor	HR10-7R-4P (73) connector	Through feed-through capacitor
Operating supply voltage range	±15 V ±1 V	±15 V ±5%	±15 V ±5%	±15 V ±1 V	±15 V ±5%
Dimensions (W×D×H)	76 × 50 × 21.1 mm	68 × 43 × 28 mm	68 × 43 × 28 mm	76 × 50 × 25 mm	68 × 43 × 28 mm
Weight (approx.)	105 g	100 g	100 g	120 g	130 g

High gain and wide bandwidth

NEW

CURRENT INPUT

CE

*All model CE certified

SA-600 series are used for detecting small signals to achieve high gain and wide bandwidth.

APPLICATIONS

- Photomultiplier tube, photodiode and other photodetectors
- Monitor of particle accelerator beam
- Scanning tunneling microscope
- Ion detector

SPECIFICATIONS

	SA-604F2	SA-605F2	SA-606F2	SA-607F2	SA-608F2	New SA-609F2
	DC to 500 kHz, 10 M (V/A)	DC to 250 kHz, 100 M (V/A)	DC to 100 kHz, 1 G (V/A)	DC to 20 kHz, 10 G (V/A)	DC to 2 kHz, 100 G (V/A)	DC to 300 Hz, 1 T (V/A)
Maximum input current	±1 μA	±100 nA	±10 nA	±1 nA	±100 pA	±10 pA
Equivalent input current noise density(typ.)	45 fA/$\sqrt{Hz}$	15 fA/$\sqrt{Hz}$	6 fA/$\sqrt{Hz}$	2.5 fA/$\sqrt{Hz}$	0.6 fA/$\sqrt{Hz}$	0.4 fA/$\sqrt{Hz}$
Gain	1×10^{7} (10 M) V/A ±1%	1×10^{8} (100 M) V/A ±1%	1×10^{9} (1 G) V/A ±1%	1×10^{10} (10 G) V/A ±1%	1×10^{11} (100 G) ±3%	1×10^{12} (1 T) ±1%
LPF output (Cut-off frequency setting)	30 kHz/100 kHz/ 300 kHz/ THRU, selectable	10 kHz/30 kHz/ 100 kHz/ THRU, selectable	3 kHz/10 kHz/ 30 kHz/ THRU, selectable	1 kHz/3 kHz/ 10 kHz/ THRU, selectable	100 Hz/300 Hz/ 1 kHz/ THRU, selectable	30 Hz/3 Hz/0.3 Hz/ THRU, selectable
Operating power supply voltage	±15 V ±1 V					
External dimensions / Weight	76 (W) × 50 (D) × 21.1 (H) mm / approx. 135 g					100 (W) × 50 (D) × 25 (H) mm / approx. 140 g