

# Low Noise Voltage Amplifier

## SA-200 Series Specifications

### Single-ended Input

		DC to 800 kHz SA-200F3 LOW NOISE AMPLIFIER	1 kHz to 80 MHz SA-220F5 LOW NOISE FET AMPLIFIER	DC to 20 MHz SA-240F5 LOW NOISE FET AMPLIFIER	1 kHz to 100 MHz SA-230F5 LOW NOISE AMPLIFIER
INPUT SECTION	Input form	DC coupling, unbalanced single-ended input, SMA	AC coupling, unbalanced single-ended input, SMA	DC coupling, unbalanced single-ended input, SMA	AC coupling, unbalanced single-ended input, SMA
	Input impedance	1 k / 10 k / 100 kΩ ±5 % (DC) // 150 pF or less	1 MΩ ±5 % (5 kHz) // 57 pF typ.	1 MΩ / 100 MΩ / open // 60 pF typ.	50 Ω ±5 % (100 kHz)
	Maximum Input Voltage(Non-destructive)	±0.5 V	±1.0 V	±1.0 V	±1.0 V
	Equivalent input noise voltage density (Input terminal short circuit)	0.7 nV/√Hz or less (1 kHz)	0.7 nV/√Hz or less (100 kHz)	1.2 nV/√Hz (1 kHz)	0.35 nV/√Hz or less (100 kHz)
	Equivalent input noise current density	0.5 nA/√Hz typ. (1 kHz)	0.5 nA/√Hz typ. (10 kHz to 1 MHz)	5 fA/√Hz (100 Hz)	0.25 nA/√Hz typ. (10 kHz to 1 MHz)
	Noise figure (50Ω system)	—	—	—	0.7 dB or less, 0.6 dB typ. (10 MHz) 1.0 dB or less, 0.8 dB typ. (100 MHz)
OUTPUT SECTION	Output form	DC coupling, unbalanced single-ended output, SMA	AC coupling, unbalanced single-ended output, SMA	DC coupling, unbalanced single-ended output, SMA	AC coupling, unbalanced single-ended output, SMA
	Maximum output voltage	±10 V, 1 kΩ(1 kHz)	2.0 Vp-p, 50 Ω(1 kHz to 20 MHz)	±10 V, 1 kΩ	1.8 Vp-p, 50 Ω (1 kHz to 20 MHz)
	Output impedance	50 Ω ±5 % (DC)	50 Ω ±5 % (100 kHz)	50 Ω (1 kHz)	50 Ω ±5 % (100 kHz)
AMPLIFIER SECTION	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)
	Voltage gain frequency characteristic	DC to 800 kHz : +0.5 dB, -3 dB typ.	1 kHz to 80 MHz : +0.5 dB, -3 dB	DC to 20 MHz : +0.5 dB, -3 dB	1 kHz to 100 MHz : +0.5 dB, -3 dB
	Total harmonic distortion	0.009 % typ. (1 kHz, ±10 V)	—	0.004 % (2 Vp-p)	—
	Intercept Point	—	—	—	+30 dBm typ. (68 MHz)
GENERAL	Power input	Through feed-through capacitor	Through feed-through capacitor	HR10-7R-4P (73) (Hirose Electric)	Through feed-through capacitor
	Operating supply voltage range	±15 V ±5 %	±15 V ±5%	±15 V ±1 V	+15 V ±5 %
	Consumption current (no signal)	±50 mA or less	+65 mA typ. +75 mA or less -10 mA typ. -15 mA or less	±45 mA ±75 mA or less (Max.)	+55 mA or less
	Operating temperature ranges	0°C to 40°C	0°C to 40°C	0°C to 40°C	0°C to 40°C
	Storage temperature and humidity ranges	-10°C to 50°C 10 % RH to 80 % RH (non-condensation)	-10°C to 50°C 10 % RH to 80 % RH (non-condensation)	-10°C to 50°C 5 % RH to 95 % RH (non-condensation)	-10°C to 50°C 10 % RH to 80 % RH (non-condensation)
	Dimensions (without protrusions and bottom plate)	68(W)×43(D)×17.6(H) mm	68(W)×43(D)×28(H) mm	76(W)×50(D)×25(H) mm	68(W)×43(D)×17.6(H) mm
	Weight	Approx. 90 g	Approx. 130 g	Approx. 105 g	Approx. 90 g
	Accessory	Instruction manual, bottom plate	Instruction manual, bottom plate	Instruction manual, bottom plate	Instruction manual, bottom plate

If not specified, Supply voltage ±15 V (SA-230F5: +15 V), temperature 23°C ±5°C

• Recommended power supply: Low Noise DC Power Supply LP series  
Use a dedicated cable for power supply from LP series. See back cover.



## SA-400 Series Specifications

### Differential Input

		DC to 1 MHz SA-410F3 LOW NOISE DIFFERENTIAL AMPLIFIER	1 kHz to 70 MHz SA-420F5 LOW NOISE DIFFERENTIAL FET AMPLIFIER	30 Hz to 30 MHz SA-421F5 LOW NOISE DIFFERENTIAL FET AMPLIFIER	DC to 20 MHz SA-440F5 LOW NOISE DIFFERENTIAL FET AMPLIFIER	1 kHz to 100 MHz SA-430F5 LOW NOISE DIFFERENTIAL AMPLIFIER
INPUT SECTION	Input form	DC coupling, balanced differential input, SMA	AC coupling, balanced differential input, SMA	AC coupling, balanced differential input, SMA	DC coupling, balanced differential input, SMA	AC coupling, balanced differential input, SMA
	Input impedance	1 k/10 k/100 kΩ ±5 % // 100 pF typ.	1 MΩ ±5 % (1 kHz) // 15 pF typ.	1 MΩ ±5 % (1 kHz) // 85 pF typ.	1 MΩ / 100 MΩ / open // 60 pF typ.	50 Ω ±5 % (100 kHz)
	Maximum Input Voltage (Non-destructive)	Differential input : ±1 V Common-mode input : ±15 V	Differential input : ±10 V DC or 4 Vp-p AC Common-mode input : ±10 V DC or 6 Vp-p AC	Differential input : ±10 V DC or 4 Vp-p AC Common-mode input : ±10 V DC or 6 Vp-p AC	Differential input : ±1 V Common mode input : ±7.5 V	±2.0 V (Differential / Common-mode input)
	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 (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 (100 Hz)	7.0 pA/√Hz typ. (100 kHz)
	Noise figure (50Ω system)	—	—	—	—	1.25 dB or less, 1.10 dB typ. (10 MHz) 1.75 dB or less, 1.40 dB typ. (100 MHz)
OUTPUT SECTION	Output form	DC coupling, unbalanced single-ended output, SMA	AC coupling, unbalanced single-ended output, SMA	AC coupling, unbalanced single-ended output, SMA	DC coupling, unbalanced single-ended output, SMA	AC coupling, unbalanced single-ended output, SMA
	Maximum output voltage	±10 V, 1 kΩ (1 kHz)	2.0 Vp-p, 50 Ω (1 kHz to 20 MHz)	2.0 Vp-p, 50 Ω (100 Hz to 20 MHz)	±10 V, 1 kΩ	2.0 Vp-p, 50 Ω (1 kHz to 20 MHz)
	Output impedance	50 Ω ±5 % (100 Hz)	50 Ω ±5 % (100 kHz)	50 Ω ±5 % (100 kHz)	50 Ω (1 kHz)	50 Ω ±5 % (100 kHz)
AMPLIFIER SECTION	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 or less (1 kHz)	46 ±0.5 dB, 50 Ω (100 kHz)
	Voltage gain frequency characteristic	DC to 1 MHz : +0.5 dB, -3 dB	1 kHz to 70 MHz : +0.5 dB, -3 dB	30 Hz to 30 MHz : +0.5 dB, -3 dB	DC to 20 MHz : +0.5 dB, -3 dB	1 kHz to 100 MHz : +0.5 dB, -3 dB
	Total harmonic distortion	0.004 % typ. (1 kHz, ±10 V)	—	—	0.006 % (2Vp-p)	—
	Intercept Point	—	—	—	—	+28 dBm typ. (68 MHz)
GENERAL	Power input	HR10-7R-4P(73) (Hirose Electric)	Through feed-through capacitor	Through feed-through capacitor	HR10-7R-4P (73) (Hirose Electric)	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 %
	Consumption current (no signal)	±45 mA typ. ±75 mA or less (Max. output, load: 1 kΩ)	+54 mA typ. +70 mA or less -25 mA typ. -40 mA or less	+74 mA typ. +90 mA or less -64 mA typ. -80 mA or less	±55 mA ±75 mA or less (Max.)	+55 mA typ. +65 mA or less -30 mA typ. -45 mA or less
	Operating temperature ranges	0 °C to 40 °C	+5 °C to +35 °C	+5 °C to +35 °C	0 °C to 40 °C	0 °C to +40 °C
	Storage temperature and humidity ranges	-10 °C to 50 °C 5 % RH to 95 % RH (non-condensation)	-10 °C to 50 °C 5 % RH to 95 % RH (non-condensation)	-10 °C to 50 °C 5 % RH to 95 % RH (non-condensation)	-10 °C to 50 °C 5 % RH to 95 % RH (non-condensation)	-10 °C to 50 °C 10 % RH to 80 % RH (non-condensation)
	Dimensions (without protrusions and bottom plate)	76(W)×50(D)×21.1(H) mm	68(W)×43(D)×28(H) mm	68(W)×43(D)×28(H) mm	76(W)×50(D)×25(H) mm	68(W)×43(D)×28(H) mm
	Weight	Approx. 105 g	Approx. 100 g	Approx. 100 g	Approx. 120 g	Approx. 130 g
	Accessory	Instruction manual, bottom plate, SMA shorting plug	Instruction manual, bottom plate, SMA shorting plug	Instruction manual, bottom plate, SMA shorting plug	Instruction manual, bottom plate, SMA shorting plug	Instruction manual, bottom plate, SMA shorting plug

If not specified, Supply voltage ±15 V, temperature 23°C ±5°C

• Recommended power supply: Low Noise DC Power Supply LP series  
Use a dedicated cable for power supply from LP series. See back cover.

\*Note: The contents of this catalog are current as of September 27th, 2019.  
Product appearance and specifications are subject to change without notice.  
Before purchase, contact us to confirm the latest specifications, price and delivery date.