# 5402A

## Low-Noise Current Amplifier

## Overview

The 5402A is a low-noise current input preamplifier designed for use whenever the signal source is a current source—for example, an electron multiplier, ion collector, photo multiplier or photodiode, or when measuring sample impedances. The gain (transimpedance) is switch selectable with six settings enabling the amplifier, on its most sensitive range, to detect fractions of a picoamp without noise degradation.

The unit has a bandwidth of 100 kHz on its highest gain (1 GV/A) and greater than 4 MHz on its lowest gain (10 kV/A), while still maintaining low-input current noise ranging from 25 fA /√Hz on the 1 GV/A range to 5 pA/√Hz on the 10 kV/A range. The gain setting is changed by simply pressing a pushbutton, with the present setting being indicated by an LED. The setting is retained when the power switch is turned off and restored when it is turned on again.

Switch-selectable output filters allow AC or DC output coupling, and three choices of low-pass filtering that can reduce overall noise, especially when working at high gains if the full bandwidth is not required. The 5402A is powered by two internal lithium-ion rechargeable batteries that allow operation for up to 48 hours on a single charge. This method of powering delivers the lowest possible noise as well as allowing isolated operation, preventing problems that might be caused by ground loops. A plug-in power adapter is provided, which typically recharges the 5402A within three hours.




## Features

- Low-input impedance
- Low noise
- Single-ended virtual ground input
- Six gain settings
- DC to > 4 MHz frequency response
- Internal rechargeable batteries

## Applications

- Photodiode amplification
- Photomultiplier amplification
- Ion collector amplification
- Electron multiplier amplification
- Impedance measurements

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# 5402A Low-Noise Current Amplifier

## Specifications

| Input | |
|---|---|
| **Mode** | Single-ended |
| **Coupling** | DC |
| **Connector** | BNC socket |
| **Max. Safe Input Voltage** | ±20 Vdc |
| **Input Bias Current** | 1 pA typical |
| **Input Referred Voltage Noise** | 2.5 nV/√Hz typical |
| **Input Referred Current Noise** | See Table 1 |

| Gain and Frequency Response | |
|---|---|
| **Gain** | Switch selectable (6 settings) to 1 G, 100 M, 10 M, 1 M, 100 K, 10 K V/A |
| **Accuracy** | ± 0.5 dB |
| **Flatness in Pass-Band** | ± 0.5 dB |
| **Frequency Response** | See Table 1 |

| Output Filters | |
|---|---|
| **Output Coupling (High-Pass)** | When set to DC, amplifier is DC coupled<br>When set to AC, low-frequency cut off is 0.1 Hz |
| **Output Filter (Low-Pass)** | Low-pass Butterworth filter with 18 dB/octave roll-off filter reduces overall noise, especially when working at high gains, if full bandwidth is not required |
| **Cut-Off Frequency Settings** | |
| 10 MHz | Full bandwidth |
| 1 MHz | 1 MHz ± 150 kHz |
| 100 kHz | 100 kHz ± 15 kHz |

**Table 1. Typical Frequency Response**

| Gain | Bandwidth (–3 dB) with $C_{in}$ = 10 pF | Bandwidth (–3 dB) with $C_{in}$ = 1 nF | Input Referred Current Noise (typical) |
|---|---|---|---|
| 10 K | > 5 MHz | > 500 kHz | 5 pA/√Hz |
| 100 K | > 2 MHz | > 200 kHz | 1 pA/√Hz |
| 1 M | > 800 kHz | > 100 kHz | 500 fA/√Hz |
| 10 M | > 450 kHz | > 80 kHz | 100 fA/√Hz |
| 100 M | > 250 kHz | > 25 kHz | 50 fA/√Hz |
| 1 G | > 100 kHz | > 20 kHz | 25 fA/√Hz |

| Output | |
|---|---|
| **Impedance** | 50 Ω |
| **Connector** | BNC jack |
| **Max. Voltage Swing** | > 5 V pk-pk |
| **Polarity** | Current flowing into the input produces a positive output voltage |
| **Protection** | Output is short-circuit protected |

| Power | |
|---|---|
| **Internal** | Rechargeable lithium-ion batteries provide up to 48 hours of use. Batteries recharge automatically when DC power is connected. Recharge time is maximum of 3 hours. |
| **External** | 9 Vdc @ 350 mA maximum |
| **Connector** | 1.3 mm DC power socket, inner pin positive, outer barrel negative |

| General | |
|---|---|
| **Dimensions** | |
| Excluding Connectors | 3½" W x 1¼" D x 2¾" H<br>(85 mm x 31 mm x 71 mm) |
| Including Connectors | 4½" W x 1¼" D x 2¾" H<br>(114 mm x 31 mm x 71 mm) |
| **Weight** | 7.5 oz (210 g) excluding optional power supply |
| **Operating Temperature** | 5 °C to 40 °C |
| **Storage Temperature** | –25 °C to 70 °C |

## Ordering Information

**5402A**

Low-noise current amplifier complete with line power supply.

For more information, please visit our website at **www.ameteksi.com**

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AMETEK®

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