### Specifications

#### PROGAMMABLE CURRENT AMPLIFIER CA5350

**Input section**
- DC coupling unbalanced input
- Input connectors: BNC receptacle input, input impedance: 50 Ω.

**Gain**
<table>
<thead>
<tr>
<th>Setting (V/A)</th>
<th>Input resistance (Ω)</th>
<th>Setting range (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 M</td>
<td>10 Ω</td>
<td>±100 μA to ±100 mA</td>
</tr>
<tr>
<td>1 k</td>
<td>100 Ω</td>
<td>±100 μA to ±100 mA</td>
</tr>
<tr>
<td>100 μ</td>
<td>1 kΩ</td>
<td>±100 μA to ±100 mA</td>
</tr>
<tr>
<td>10 μ</td>
<td>10 kΩ</td>
<td>±100 μA to ±100 mA</td>
</tr>
<tr>
<td>1 μ</td>
<td>100 kΩ</td>
<td>±100 μA to ±100 mA</td>
</tr>
<tr>
<td>1 n</td>
<td>1 MΩ</td>
<td>±100 μA to ±100 mA</td>
</tr>
<tr>
<td>1 pA</td>
<td>10 MΩ</td>
<td>±100 μA to ±100 mA</td>
</tr>
</tbody>
</table>

**Output section**
- DC coupling unbalanced output
- Output connectors: BNC receptacle output, output impedance: 50 Ω.

**Gain and accuracy (DC)**
- ±0.1% of setting ±20 mV (When no load)
- ±1.0% of setting ±100 mV (When no load)

**Input and output offset voltage**
- −8.000 V to +8.000 V, setting resolution: 0.001 V

**Output impedance**
- 50 Ω (Supplementary value)

**Setting memory**
- 10 sets (1 set is fixed for use by factory default settings)

**External control**
- GPIB: IEEE488.1
- USB: USB 1.1 full speed, device class CDC

**Power supply**
- 100, 120, 220, 240 VAC ±10% (250 V or less)
- 50 Hz/60 Hz ±2 Hz, Power consumption: 40 VA or less

**Storage**
- −10°C to +50°C, 5% to 95% RH

**Applications**
- Photodetection with PMTs and Photodiodes
- Scanning Tunneling Microscopy
- Using Various Optical Sensors (PD, APD, PMT)
- Quantum Electronics
- MEMS
- And more...

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### Option
- Rack mount brackets (Single-unit, inch, metric)
- Rack mount brackets (Double-unit, inch, metric)
- Rack mount brackets (Double-unit, metric)

### Notes
- The contents of this catalog are current as of April 1, 2014.
- Product appearance and specifications are subject to change without notice.
- Before purchase, contact us to confirm the latest specifications, price and delivery date.

### NF Corporation
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- http://www.nfccorp.co.jp/eng/index/
With its unique circuitry, high gain and broad bandwidth, as well as stable operation with additional input capacitance.

The CA5350 programmable current amplifier is a variable gain type, current-input, voltage-output amplifier. Gain can be set from $10^4$ V/A to a maximum of $10^7$ V/A. In addition, the included current suppression function enables the canceling of the dark current that cannot be avoided with photoelectric conversion elements such as photodiodes. BNC connectors are used for input and output, so special cables or an external power supply are not required. The various settings, including gain, are easy to perform using the dial and keys on the front panel, and the set values are displayed on the screen. Since the GPIB and USB interfaces make remote control also possible, gain and other settings can be performed from a personal computer, making it easy to configure an automatic measurement system.

With its performance, functions and operability, this programmable current amplifier supports the current amplification of signals from computer, making it easy to configure an automatic measurement system. BNC connectors are used for input and output, so special cables or an external power supply are not required. The various settings, including gain, are easy to perform using the dial and keys on the front panel, and the set values are displayed on the screen. Including gain, cannot be avoided with photoelectric conversion elements such as photodiodes.

Gain can be set in seven ranges of $10^4$, $10^5$, $10^6$, $10^7$, $10^8$, $10^9$, $10^{10}$ (V/A), in x10 increments. This enables the optimal gain setting to match the current and sensor values that vary depending on the measurement conditions. In addition, if an output amplifier gain of x10 is used, a maximum gain setting of $10^5$ V/A is possible.

**Fast Response and Stable Operation**

The fast response of 0.7 μs at $10^6$ V/A gain enables support for fast pulse response signal processing in optical systems. Our unique circuit design technology enables stable operations even with the capacitance of the connecting cables and sensors, eliminating any concerns about oscillation. In addition, overshoot and ringing do not occur even for pulse responses. By achieving both fast response and broad bandwidth, as well as stable operation even with additional capacitance on the input side, the CA5350 supports a variety of sensor types.

**Low Noise**

Built-in filters and DC power supply

The CA5350 achieves an ultra-low noise with an input-referred noise of 2.5 fA/√Hz (at $10^{10}$ V/A, 55 Hz). In addition, in order to remove noise components and to improve the signal-to-noise ratio (SN ratio), the built-in filter can be set to a response speed in the range of 1 μs to 300 ms to optimize the SN ratio and response speed depending on the application. And furthermore, in our pursuit of the low noise operation that is essential to the amplification of a weak current, we have adopted a low noise DC power supply in the power supply section using our own unique technology.

**Current Suppression**

For photoelectric conversion elements such as photodiodes and photo transistors, in the absence of incident light, a weak current called a dark current will flow. In a current amplifier with high gain, a small DC current input becomes a large voltage when output, and the amplifier is saturated and measurement becomes impossible. The built-in suppression current source is adjustable to cancel the input of such dark current. The current suppression setting can be selected in six ranges from ±8 nA to ±800 μA. In addition, the auto-suppression function can be used to automatically set the range and current value required to suppress the dark current.

**APPLICATIONS**

- Beam position monitoring for storage rings and synchrotrons
- I-V characteristic measurement of organic thin film devices
- Gate leakage current measurement of devices such as field-effect transistors (FET) and insulated-gate bipolar transistors (IGBT)
- Detection of tunneling current of scanning tunneling microscopes (STM)
- Detection of conductive probe current for atomic force microscope (AFM) current measurement
- As a preamplifier for a lock-in amplifier

**Built-in System Features**

Interfaces, input and output terminals

The standard-equipped USB and GPIB interfaces support remote control and integration of the CA5350 into an automatic measurement system. Since input and output terminals are provided on both the front and rear panels, you can choose the terminals depending on how you are connecting to sensors or other equipment. In addition, the half-rack size makes the integration of multiple units easy.

**For system measurements that combine a variety of measurements.**

The CA5350 programmable current amplifier can be combined with various other devices such as a lock-in amplifier, digital oscilloscope, and data acquisition system to support system measurements.

**Depend on sensors and applications — Supporting research with a variety of functions**

- Bias power supply −8 V to +8 V
- Bias power supply for applying a bias voltage to a variety of sensors
- Display backlight brightness setting
- 3-level setting, including OFF
- Enables use in light-sensitive experiments.
- Setting memory: 10 sets
**Specifications**

### PROGRAMMABLE CURRENT AMPLIFIER CA5350

**Display**
monic LCD with 3-level backlight brightness setting (including OFF)

**Input section**
- DC coupling, unbalanced input

- Input connectors:
  - MONO-POLE, Input facilities between front panel and rear panel

**Output section**
- DC coupling, unbalanced output

- Output connectors:
  - Front and rear panels. Same signal output to analog BNC receptacle connection on front and rear panels.

<table>
<thead>
<tr>
<th>Maximum input current</th>
<th>±30 mA (Without load)</th>
</tr>
</thead>
</table>

**Gain and accuracy (DC)**

<table>
<thead>
<tr>
<th>Setting</th>
<th>±0.1% of setting + 20 mV (when no load)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 μA</td>
<td>±0.0% of setting + 0.01% of range</td>
</tr>
<tr>
<td>80 μA</td>
<td>±0.05% of setting + 0.1% of range</td>
</tr>
<tr>
<td>500 μA</td>
<td>±0.08% of setting + 0.1% of range</td>
</tr>
<tr>
<td>5 mA</td>
<td>±0.1% of setting + 0.1% of range</td>
</tr>
<tr>
<td>50 mA</td>
<td>±0.2% of setting + 0.2% of range</td>
</tr>
<tr>
<td>500 mA</td>
<td>±0.25% of setting + 0.3% of range</td>
</tr>
</tbody>
</table>

**Output amplifier gain**

- Setting range:
  - 1×1 to 1×10

- Setting accuracy:
  - ±0.25%

**Input impedance**

- DC to 70 kHz: 100 kΩ
- DC to 500 kHz: 10 MΩ

**Output impedance**

- DC to 500 kHz: 0.7 Ω

**Output connectors**

- Front and rear panels. Same signal output to analog BNC receptacle connection on front and rear panels.

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<table>
<thead>
<tr>
<th>Maximum output voltage</th>
<th>±10 V (When no load)</th>
</tr>
</thead>
</table>

**Maximum current**

- DC to 500 kHz: 0.7 Ω

**Non-destructive maximum input current**

- ±30 mA

**Rack mount brackets**

- (Single-unit, metric)
- (Single-unit, inch)
- (Double-unit, metric)

**Applications**

- Photodetection with PMTs and Photodiodes
- Scanning Tunneling Microscopy
- Spectroscopy
- Quantum Electronics
- Semiconductors
- MEMS

**New**

- High Gain
  - 10^6 V/A to 10^12 V/A (7 ranges, x10 increments)
  - 10^27 V/A maximum

- Broad Bandwidth
  - DC to 500 kHz (10^6 V/A), DC to 70 kHz (10^9 V/A)

- Fast Response
  - 0.7 μs (10^6 V/A)

- Low Noise
  - 2.5 fA/√Hz (10^10 V/A, at 55 Hz)

- Current Suppression
  - ±28 mV to ±2800 μA (6 ranges)

**Programmable Current Amplifier CA5350**

**Note 2:** Rise time of the square wave output waveform (10% to 90%)

**Option**

- Rack mount brackets (Single-unit, inch)
- Rack mount brackets (Double-unit, metric)
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