

Model 50/12

High-Voltage Power Amplifier



- **Output Voltage**
Range 0 to ± 50 kV
DC or Peak AC
- **Output Current**
Range 0 to ± 12 mA
DC or Peak AC
- **DC Accuracy** better
than 0.1% full scale
- **Slew rate** greater
than 350 V/ μ s
- **DC offset** adjusts
from 0 to ± 50 kV
- **Adjustable current**
limit or current trip
- **Precision voltage &**
current monitors

The Model 50/12 is a DC-stable, high-voltage power amplifier designed to provide precise control of output voltages in the range of 0 to ± 50 kV DC or peak AC with an output current range of 0 to ± 12 mA DC or peak AC. The amplifier is configured as noninverting with a fixed gain of 5000 V/V. Inverting and differential input options are available. A potentiometer with a calibrated dial and polarity switch provides a DC offset over a range of 0 to ± 50 kV DC. Industrial and research applications include dielectric studies, electron beam ion traps & ion sources, electrospinning, electrostatic deflection (including ion beam steering), electrostatic flame control, electrostatic levitation, electrostatic precipitation, high-voltage cable testing, high-voltage component testing and plasma studies (including dielectric barrier discharge).

The Model 50/12 features an all solid-state design for high slew rate, wide bandwidth, and low-noise operation. The 4-quadrant, active output stage sinks or sources current to reactive or resistive loads throughout the output voltage range. This is essential to achieve the accurate output response and high slew rates demanded by reactive loads.

The Model 50/12 is protected against overvoltage and overcurrent conditions that may be generated by active loads or by output short circuits to ground. Precision voltage and current monitors provide low-voltage representations of the high-voltage output and load current for monitoring purposes or for use as feedback signals in a closed-loop system. The Remote High Voltage Enable feature provides a connection for the remote devices to turn on and off the high voltage of the instrument. This makes the



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Model 50/12 Specifications

All specifications are with no load unless otherwise noted.

Output

Output Voltage Range

0 to ± 50 kV DC or peak AC.

Output Current Range

0 to ± 12 mA DC or peak AC
(see Automatic Power Limit feature for limitations).

Amplifier Input

Input Signal Voltage Range

0 to ± 10 V DC or peak AC.
(Inverting and differential input options are available).

Input Impedance

25 k Ω , nominal
(Inverting/differential option 50 k Ω , nominal).

Features

DC Offset Voltage Adjustment

A potentiometer with a calibrated dial adjusts the level of the DC offset voltage from 0 to ± 50 kV DC. A three (3) position switch selects positive polarity, negative polarity, or DC bias voltage off.

High-Voltage Enable

Switch selectable for either local or remote control.

Local

Individual push-button switches.

Remote

A TTL compatible input. A TTL high (or open) turns off the high-voltage output. A TTL low turns on the high-voltage output.

Current Limit/Trip

A switch selectable for either current limit or current trip. A graduated one-turn panel potentiometer is used to adjust the limit/trip level from 0 to ± 12 mA.

Out of Regulation Status

An indicator will illuminate and a BNC will provide a TTL low when the Model 50/12 fails to produce the required high-voltage output such as during current limit.

Limit/Trip Status

An indicator will illuminate and a BNC will provide a TTL low when the high-voltage output is disabled due to the output current exceeding the current trip level, the detection of a high-voltage supply fault, the removal of one of the panels, or if the Model 50/12 is in an out of regulation status for greater than 500 ms.

Settling Time (to 1%)

Less than 200 μ s for a 0 to 50 kV step.

Features (cont.)

Dynamics Adjust

A graduated one-turn panel potentiometer is used to optimize the output AC response of the for various load parameters.

Voltage Monitor (VM)

A buffered output provides a low-voltage replica of the high voltage output.

VM Scale Factor

The voltage monitor output voltage scaling factor is 1/5000 V of the output voltage.

VM DC Accuracy

Better than 0.1% of full scale.

VM Offset Voltage

Less than ± 4 mV.

VM Output Noise

Less than 20 mV rms (measured using the true rms feature of the Hewlett Packard Model 34401A digital multimeter).

VM Output Impedance

47 Ω .

Current Monitor (CM)

A buffered output provides a low-voltage representation of the load current.

CM Scale Factor

0.5 V/mA.

CM DC Accuracy

Better than 2 % of full scale.

CM Offset Voltage

Less than ± 10 mV.

CM Output Noise

Less than 50 mV rms (measured using the true rms feature of the Hewlett Packard Model 34401A digital multimeter).

CM Bandwidth (-3db)

DC to greater than 5 kHz.

CM Output Impedance

47 Ω .

Amplifier Performance

DC Voltage Gain

5000 V/V.

DC Voltage Gain Accuracy

Better than 0.1% of full scale.

Offset Voltage

Less than ± 5 V.

Output Noise

Less than 10 V rms (measured using the true rms feature of the Hewlett Packard Model 34401A digital multimeter).

Slew Rate (10% to 90%, typical)

Greater than 350 V/ μ s.

Large Signal Bandwidth (2% distortion)

DC to greater than 1.4 kHz.

Small Signal Bandwidth (-3dB)

DC to greater than 20 kHz.

Performance (cont.)

Stability

Drift with Time

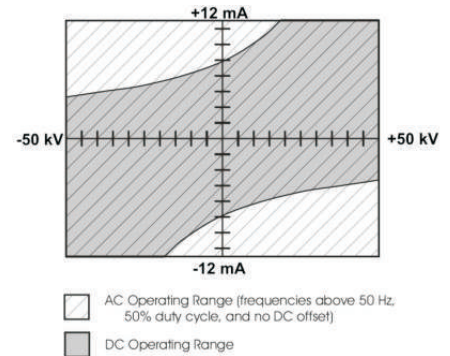
Less than 50 ppm/hr, noncumulative.

Drift with Temperature

Less than 100 ppm/ $^{\circ}$ C.

Automatic Power Limit

Automatically limits the internal power dissipation to protect the Model 50/12 from overheating. The following graph illustrates the AC and DC automatic power limit output capability.



General

Dimensions

1473 mm H x 629 mm W x 948 mm D
(58" H x 25" W x 37" D).
Depth dimension includes handles and 20 cm (8") of spacing bars on the back to insure proper airflow to the fans on the unit.

Weight

125 to 136 kg (275 to 300 lb).

High-Voltage Output Connector

High-voltage connector.

BNC Connectors

Amplifier Input
Voltage Monitor
Current Monitor
Remote High-Voltage Enable
Out of Regulation Status
Limit/Trip Status connector

Power Requirements

Line Voltage

180 to 250 V AC, at 48 to 63 Hz

Power Consumption

1800 VA, maximum.

AC Line Receptacle

Standard three-prong AC line connector.

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