

Trek Model 609E-6

High-Voltage Power Amplifier



The Model 609E-6 is a DC-stable, high-voltage power amplifier used in industrial and research applications. It features an all-solid-state design for high slew rate, wide bandwidth and low-noise operation. The four-quadrant, active output stage sinks or sources current into reactive or resistive loads throughout the output voltage range. This type of output is essential to achieve an accurate output response and high slew rate demanded by a variety of loads such as highly capacitive or reactive loads. It is configured as a non-inverting amplifier, an inverting amplifier or as a differential amplifier. Different input configurations can be wired into the unit.

Key Specifications

- Output Voltage Range: 0 to ± 4 kV DC or peak AC
- Output Current Range: 0 to ± 20 mA DC or peak AC
- Slew Rate: Greater than 150 V/ μ s
- Large Signal Bandwidth (-3 dB): DC to greater than 13 kHz
- DC Voltage Gain: 1000 V/V

Typical Applications Include

- AC or DC biasing
- Atmospheric plasma
- Dielectric barrier discharge
- Electroactive polymers (EAP)
- Electrophoresis, electrophotography
- Electrorheological fluids
- Electrostatic deflection
- Electro-optic modulation
- Ferroelectric material characterization
- Ion beam steering
- Mass spectrometers
- Material poling and particle accelerators

Features and Benefits

- Four-quadrant output for driving capacitive loads
- Closed loop system for high accuracy
- Short-circuit protected for equipment protection
- DC-stable for programmable supply applications
- Low output noise for ultra-accurate outputs
- NIST-traceable Certificate of Calibration provided with each unit



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Model 609E-6 Specifications

Performance

| | |
|---|--|
| Output Voltage | 0 to ± 4 kV DC or peak AC |
| Output Current | 0 to ± 20 mA DC or peak AC |
| Input Voltage Range | 0 to ± 4 V DC or peak AC |
| Input Impedance | |
| <i>Noninverting</i> | 25 k Ω , nominal |
| <i>Inverting</i> | 50 k Ω , nominal |
| <i>Differential</i> | 50 k Ω , nominal |
| DC Voltage Gain | 1000 V/V |
| <i>Noninverting (V_A) Configuration</i> | 1000 V/V |
| <i>Inverting (V_B) Configuration</i> | -1000 V/V |
| <i>Differential Configuration</i> | Function of the difference between two input signals. Represented by the equation: $V_{OUT} = 1000 (V_A - V_B)$ |
| DC Voltage Gain Accuracy | Better than 0.1% of full scale |
| DC Offset Voltage | Less than ± 2 V |
| Output Noise | Less than 50 mV rms* |
| Slew Rate (10% to 90%, typical) | Greater than 150 V/ μ s |
| Settling Time (to 1%) | Less than 150 μ s for a 0-4 kV step |
| Large Signal Bandwidth | DC to greater 6 kHz (1% Distortion) DC to greater 13 kHz (-3 dB) |
| Small Signal Bandwidth (-3dB) | DC to greater than 35 kHz |
| Stability | |
| <i>Drift with Time</i> | Less than 100 ppm/hr, noncumulative |
| <i>Drift with Temp</i> | Less than 200 ppm/ $^{\circ}$ C |

Voltage Monitor

| | |
|-------------------|--|
| Ratio | 1/1000th of the high-voltage output signal |
| DC Accuracy | Better than 0.1% of full scale |
| DC Offset Voltage | Less than ± 2.5 mV |
| Output Noise | Less than 2 mV rms* |
| Output Impedance | 47 Ω |

Current Monitor

| | |
|------------------|--------------------------------|
| Ratio | 0.5 V/mA |
| DC Accuracy | Better than 0.5% of full scale |
| Offset Voltage | Less than ± 5 mV |
| Output Noise | Less than 10 mV* |
| Output Impedance | 47 Ω |

Features

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|----------------------|---|
| High Voltage On/Off | |
| <i>Local</i> | Individual push-button switches |
| <i>Remote</i> | TTL high turns OFF the high voltage; TTL low turns on the high voltage |
| Dynamics Adjustments | Graduated 1-turn potentiometer used to optimize the AC response for various load parameters |
| Current Limit/Trip | Switch selectable for limit or trip. Graduated 1-turn potentiometer adjusts from 0 to 20 mA |
| Out of Regulation | LED illuminates and BNC provides a TTL low when Model 609E-6 fails to produce HV output such as during a current limit |
| Trip Status | LED illuminates and BNC provides a TTL low when HV is disabled due to the output current exceeding the current trip level, a high voltage fault is detected or the top cover is removed |

Mechanical

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|-----------------|--|
| Dimensions | 140 mm H x 432 mm W x 439 mm D (5.5" H x 17" W x 17.25" D) |
| Weight | 13.2 kg (29 lb) |
| HV Connector | Alden High Voltage Connector |
| BNC Connectors | Voltage monitor, current monitor, remote HV ON/OFF, out of regulation, fault/trip status |
| Amplifier Input | Amphenol panel mount |

Operating Conditions

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|-------------------|---|
| Temperature | 0 $^{\circ}$ C to 40 $^{\circ}$ C (32 $^{\circ}$ F to 104 $^{\circ}$ F) |
| Relative Humidity | To 85%, noncondensing |
| Altitude | To 2000 meters (6561.68 ft.) |

Electrical

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|-------------------|---|
| Line Voltage | Factory Set for one of two ranges: 90 to 127 V AC or 180 to 250 V AC, either at 48 to 63 Hz |
| Power Consumption | 220 VA, maximum |

Supplied Accessories

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|-------------------------------------|-----------------|
| Operator's Manual | PN: 23163 |
| HV Output Cable | PN: 43406 |
| Input Cable Connector Assembly | PN: 43418 |
| Line Cord (90 V to 127 V operation) | PN: N5011 |
| Line Cord 230 V AC | Contact factory |

Optional Accessories

| | |
|--------------------|---|
| HV Output Cable | PN: 43406 |
| 19" Rack Mount Kit | Model 607RA (with EIA hole spacing) Model 607RAJ (with JIS hole spacing) |

*Measured using the true rms feature of the HP Model 34401A digital multimeter
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