

Chapter 3

Characteristics

3.1 SPECIFICATIONS

The following specifications apply at the nominal line voltage $\pm 10\%$ and at a temperature of 25°C (77°F) unless otherwise stated.

3.1A Power Amplifier

1. Compliance Voltage: $> \pm 100\text{ V}$
2. Maximum Output Current: $> \pm 1.0\text{ A}$
3. Slew Rate: $10\text{ V}/\mu\text{s}$ (high speed)
4. Bandwidth, Open Loop, Unity Gain: $> 2.5\text{ MHz}$
5. Voltage Temperature Stability: $< 50\text{ }\mu\text{V}/^{\circ}\text{C}$

3.1B Differential Electrometer

1. Input Impedance: $> 10^{10}\Omega$ in parallel with $< 50\text{ pF}$
2. Input Bias Current: $< 20\text{ pA}$ at 25°C
3. Maximum Input Voltage
Differential: $\pm 10\text{ V}$
Reference Input: $\pm 11\text{ V}$
4. Common Mode Rejection
 $> 80\text{ dB}$ from dc to 1 kHz
 $> 40\text{ dB}$ at 100 kHz
5. Bandwidth
Small Signal: $> 4\text{ MHz}$
Full Signal: $> 400\text{ kHz}$
6. Offset Voltage: $< 10\text{ }\mu\text{V}$
7. Offset Temperature Stability: $< 10\text{ }\mu\text{V}/^{\circ}\text{C}$

3.1C Current Measurement

1. Ranges: 8 decades, 1 A to 100 nA
2. Accuracy (dc) at Monitor
 $10\text{ }\mu\text{A}$ to 1 A : Better than 0.2% of range
 100 nA and $1\text{ }\mu\text{A}$ Ranges: Better than 0.5% of range $\pm 5\text{ nA}$ max ($\pm 1\text{ nA}$ typical)
3. Frequency Response (small signal)
 1 mA Range: -3 dB at $> 1\text{ MHz}$, $1\text{ k}\Omega$ source impedance
 $10\text{ }\mu\text{A}$ Range: -3 dB at $> 75\text{ kHz}$, $100\text{ k}\Omega$ source impedance

3.1D Potential/Current

1. Digital/Analog Converters (DAC's)

Bias DAC

Resolution: 14 bits
Range: $\pm 8\text{ V}$ (potentiostat)
 $\pm 200\%$ of full-scale current (galvanostat)

Modulation DAC

Resolution: 14 bits
Range (Poten.): $\pm 2\text{ V}$, $\pm 0.2\text{ V}$, and $\pm 0.02\text{ V}$
Range (Galvan.): $\pm 200\%$, $\pm 20.00\%$, and $\pm 2.000\%$ of full-scale current.

2. Accuracy

Applied Potential: 0.2% of reading $\pm 2\text{ mV}$
Applied Current: 0.2% of full-scale current

3.1E IR Compensation

1. Positive Feedback

Digitally Controlled Range: $1/\text{Current Range}$ (0 to 2 times the Current Range Resistor)
Resolution: 0.05% of Current Range Resistor

2. Current Interrupt

Digital Potential Error Correction: 12 bit DAC
Total Interruption Time: $< 200\text{ }\mu\text{s}$
Switching Time, ON/OFF: $< 1\text{ }\mu\text{s}$ ($1\text{ k}\Omega$ resistive cell)

3.1F System

1. Rise Time (10% to 90% on high-speed setting)
No Load: $< 750\text{ ns}$
 $1\text{ }\Omega$, 1 A : $< 3\text{ }\mu\text{s}$
 $10\text{ k}\Omega$, $100\text{ }\mu\text{A}$: $< 2\text{ }\mu\text{s}$

2. Noise and Ripple: typically $< 25\text{ }\mu\text{V}$ rms referred to external input

3.1G Computer interfaces

1. RS-232C
2. IEEE-488 (GPIB)

The instrument recognizes more than 100 different commands for control from a remote computer via the IEEE-488 or RS-232C interface. The *Model 273A Remote-Programming Command Handbook* describes these commands and provides detailed explanations of GPIB and RS-232C communications, including rear-panel switch settings and communications protocols.