

230



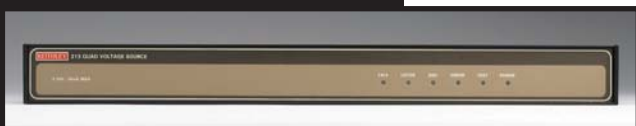
- $\pm 2\text{mA}$ ,  $\pm 20\text{mA}$ ,  $\pm 100\text{mA}$  programmable I-LIMIT
- Remote sensing
- 100-point source memory
- Programmable Digital I/O

### Ordering Information

230 Programmable Voltage Source

Extended warranty, service, and calibration contracts are available.

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- GPIB controlled
- Autoranging or programmable  $\pm 1\text{V}$ ,  $\pm 5\text{V}$ , or  $\pm 10\text{V}$  ranges
- 10mA output current per channel
- Fast waveform buffers

### Ordering Information

213 Quad Voltage Source

Extended warranty, service, and calibration contracts are available.

## Programmable Voltage Source

The Model 230 Voltage Source is a programmable solution for precision sourcing of low-level DC voltage.

RANGE	MAXIMUM OUTPUT	ACCURACY (1 Year) 18°–28°C	STEP SIZE	TEMPERATURE COEFFICIENT/°C 0°–18°C & 28°–50°C
100 V	$\pm 101.00$ V	0.05 % + 50mV	50 mV	0.005% + 0.5 mV
10 V	$\pm 19.995$ V	0.05 % + 10mV	5 mV	0.005% + 100 $\mu\text{V}$
1 V	$\pm 1.9995$ V	0.05 % + 1mV	500 $\mu\text{V}$	0.005% + 25 $\mu\text{V}$
100 mV	$\pm 199.9$ mV	0.075% + 300 $\mu\text{V}$	50 $\mu\text{V}$	0.01 % + 25 $\mu\text{V}$

SELECTABLE CURRENT LIMIT:  $\pm 100\text{mA}$ ,  $\pm 20\text{mA}$ ,  $\pm 2\text{mA}$  (–0, +20%).

NOISE: (150 $\mu\text{V}$  + 50ppm range) p-p, 0.1Hz to 300Hz; 5mV p-p, 0.1Hz to 300kHz. Specification applies for local sensing only, typical.

RESPONSE TIME, TRANSIENT RECOVERY TIME: <3ms.

OUTPUT IMPEDANCE: 1m $\Omega$ .

EXTERNAL TRIGGER: TTL-compatible.

OUTPUT CONNECTIONS: Five-way binding posts for OUTPUT, OUTPUT SENSE, COMMON, COMMON SENSE, and CHASSIS GROUND; BNC for EXTERNAL TRIGGER INPUT and OUTPUT.

### ACCESSORIES AVAILABLE

7008-*	IEEE-488 Digital Cable
1019A-*	Single or Dual Fixed Rack Kit
4288-4	Rack Mount Kit

### GENERAL

SYSTEMS COMPATIBILITY: IEEE-488-1978.

MAXIMUM COMMON MODE VOLTAGE: 250V rms, DC to 60Hz.

EMC: Conforms to European Union Directive 89/336/EEC.

SAFETY: Conforms to European Union Directive 73/23/EEC (meets EN61010-1/IEC 1010).

POWER: 105–125 or 210–250VAC, 50 or 60Hz (80VA). 90–105 or 180–210V AC operation available.

DIMENSIONS, WEIGHT: 127mm high  $\times$  216mm wide  $\times$  359mm deep (5 in  $\times$  8½ in  $\times$  14½ in). Net weight 4.4kg (9 lb 11 oz).

## Quad Voltage Source

The Model 213 Quad Voltage Source (QVS) is a convenient and cost-effective instrument for sourcing voltage. Each of four fully independent and stackable channels provides up to  $\pm 10\text{V}$  of bias at 10mA.

### Digital I/O with 100mA Drive Current

The Model 213 QVS also provides 8 bits each of TTL compatible digital input and output on a DB25 female connector for driving relays and similar applications.

### VOLTAGE

RANGE	MAXIMUM OUTPUT	STEP SIZE	ACCURACY 18°–28°C $I_{\text{OUT}} = 1\text{mA}$	NOISE (p-p, typical) 0.1–10Hz
1 V	$\pm 1.02375$ V	250 $\mu\text{V}$	$\pm(0.05\% + 1\text{mV})$	<5ppm of range
5 V	$\pm 5.11875$ V	1.25 mV	$\pm(0.05\% + 3\text{mV})$	<3ppm of range
10 V	$\pm 10.2375$ V	2.5 mV	$\pm(0.05\% + 10\text{mV})$	<3ppm of range

TEMPERATURE COEFFICIENT OF ACCURACY (0°–18°C & 28°–50°C):  $\pm(0.002\%$  of setting + 100 $\mu\text{V})/^{\circ}\text{C}$ .

INTERNAL BUFFER: An 8192-location internal buffer is used to store values for waveform generation as fast as 1ms per point.

DIGITAL I/O: 8 TTL compatible level sensitive inputs, 8 outputs, internally selectable TTL compatible or open collector with 100mA drive and capable of withstanding 50V (for driving relays or other devices from an external voltage supply).

### ACCESSORIES AVAILABLE

213-CON	Analog Output Connector (supplied)
C126-1	DB25 Male to DB25 Female with 1.5m (5 ft) Cable
CS-400	DB25 Male Solder Cup

RANGING: Autorange or select one of three fixed ranges.

OUTPUT RESISTANCE: <500m $\Omega$ , typical.

WIDEBAND NOISE (p-p, typical): 0.1 to 20MHz, 8mV

### GENERAL

CHANNEL-TO-CHANNEL, CHANNEL TO DIGITAL LOW ISOLATION: 500V or 105V-Hz, whichever is less.

POWER: 90–125 or 180–250V AC (internally switch selectable); 50–60Hz, 70VA max.

DIMENSIONS, WEIGHT: 425mm wide  $\times$  45mm high  $\times$  309mm deep (16½ in  $\times$  1¾ in  $\times$  12 in). Net weight 3.52kg (7.75 lb).

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# 213 Quad Voltage Source

## SPECIFICATIONS

**QUAD VOLTAGE SOURCE:** Sources voltage from four independent, isolated ports. Includes 8-bit digital I/O port.

**FUNCTION:** Can be used as a constant DC source or as a voltage waveform generator.

**INTERNAL BUFFER:** An 8192-location internal buffer is used to store values for waveform generation.

**CONTROL MODES:** Four control modes may be chosen by the user:

**Direct:** Output changes upon execution of the “V” device dependent command.

**Indirect:** Output changes after receiving an external trigger.

**Stepped:** Step through internal buffer, under control of external triggers.

**Waveform:** Output voltage waveform from buffer, under control of an internal time base.

**NUMBER OF WAVEFORM CYCLES:** The number of cycles through the buffer in the Waveform Control Mode is user selectable, 1 to 65535 or continuous.

**SYNCHRONIZATION OF PORTS:** The ports can be forced to execute their voltage waveforms in a synchronized manner.

**WAVEFORM STEP INTERVAL:** 1ms to 65535ms.

**TRIGGER AND SRQ:** IEEE-488 bus or rear panel DB-25.

**DIGITAL I/O:** 8 TTL compatible level sensitive inputs. 8 outputs, internally selectable TTL compatible or open collector with 100mA drive and capable of withstanding 50V (for driving relays or other devices from an external voltage supply).

VOLTAGE			ACCURACY 18°- 28°C I <sub>OUT</sub> = 1mA
RANGE	MAXIMUM OUTPUT	STEP SIZE	
1 V	±1.02375 V	250 µV	±(0.05% + 1 mV)
5 V	±5.11875 V	1.25 mV	±(0.05% + 3 mV)
10 V	±10.2375 V	2.5 mV	±(0.05% + 10 mV)
TEMPERATURE COEFFICIENT OF ACCURACY (0°-18°C & 28°-50°C): ±(0.002% of setting + 100µV)/°C.			
RANGING: Autorange or select one of three fixed ranges.			
DC OUTPUT CURRENT: 10mA maximum.			
OUTPUT RESISTANCE: <500mΩ, typical.			
NOISE (p-p, typical):	RANGE	0.1-10Hz	
	1 V	<5ppm of range	
	5 V	<3ppm of range	
	10 V	<3ppm of range	

**WIDEBAND NOISE (p-p, typical):** 0.1 to 20MHz, 8mV.

**SETTLING TIME (typical):** 750µs to rated accuracy into a 1kΩ load.

## EXECUTION SPEED

**RESPONSE TO IEEE-488 COMMAND:** <10ms typical.

**TRIGGER LATENCY:** 1-2ms typical (all three types of external triggering), trigger to output voltage change.

## IEEE-488 BUS IMPLEMENTATION

**MULTILINE COMMANDS:** SDC, DCL, GET, UNL, UNT, SPE, SPD, MTA, MLA.

**UNILINE COMMANDS:** IFC, REN, EOI, SRQ, ATN.

**INTERFACE FUNCTIONS:** SH1, AH1, T4, TE0, L4, LE0, SR1, RL0, PP0, DC1, DT1, C0 (C28 during calibration), E1.

**PROGRAMMABLE FUNCTIONS:** Port select, output voltage, control mode, autorange enable, range select, waveform step interval, number of cycles, offset calibration, gain calibration, buffer allocation, buffer data, buffer location pointers, command trigger, trigger masking, SRQ masking, system defaults, digital output, EOI, IEEE-488 output terminator, IEEE-488 output format, system status output, system test, error query.

IEEE-488 address is set manually from the rear panel.

## GENERAL

**CHANNEL-TO-CHANNEL ISOLATION:** 500V or 10<sup>5</sup>V-Hz, whichever is less.

**CHANNEL TO DIGITAL LOW ISOLATION:** 500V or 10<sup>5</sup>V-Hz, whichever is less.

**CONNECTORS:** **Outputs:** 12-pin quick disconnect.  
**Digital I/O:** DB-25 female.

**ENVIRONMENT:**

**Operating:** 0°–50°C; 0–70% relative humidity to 35°C. Linearly derate relative humidity 3%/°C, 35°–50°C.

**Storage:** –25° to 65°C.

**WARM-UP:** One hour to rated accuracy.

**POWER:** 90–125 or 180–250V AC (internally switch selectable); 50–60Hz, 70VA max.

**DIMENSIONS, WEIGHT:** 425mm wide × 45mm high × 309mm deep (16¼ in × 1¾ in × 12 in). Net weight 3.52kg (7.75 lb).

**ACCESSORIES SUPPLIED:**

Instruction manual  
213-CON Analog Output Connector

**ACCESSORIES AVAILABLE:**

213-CON Analog Output Connector  
213-RBN-2 Card Edge Connector with 2m (6.2 ft) ribbon cable

Specifications are subject to change without notice.