

#### Keithley Instruments

28775 Aurora Road  
Cleveland, Ohio 44139  
1-800-935-5595  
[tek.com/keithley](http://tek.com/keithley)

### SPECIFICATION CONDITIONS

This document contains specifications for the Series 2230 Triple-Channel Power Supplies. Specifications are the standards against which the Models 2230-30-3, 2230-30-6, and 2230-60-3 are tested. Upon leaving the factory, the Models 2230-30-3, 2230-30-6, and 2230-60-3 meet these specifications. Typical values are not warranted, apply at 23 °C ± 5 °C, and are provided solely as useful information. Specifications apply under these conditions:

- Temperature 0 °C to 40 °C and relative humidity 10% to 80% unless defined differently in this document.
- After a 30-minute warmup period.
- Within one year of the calibration period.

### MODEL-SPECIFIC SPECIFICATIONS

	2230-30-3		2230-30-6		2230-60-3	
	CH1 and CH2	CH3	CH1 and CH2	CH3	CH1 and CH2	CH3
<b>DC output rating</b>						
Voltage	0 V to 30 V	0 V to 5 V	0 V to 30 V	0 V to 5 V	0 V to 60 V	0 V to 5 V
Voltage Limit	30.1 V	5.1 V	30.1 V	5.1 V	60.1 V	5.1 V
Current	0 A to 3 A	0 A to 3 A	0 A to 6 A	0 A to 3 A	0 A to 3 A	0 A to 3 A
Maximum power	195 W		375 W		375 W	
<b>Load regulation (23 °C ± 5 °C)</b>						
Voltage	±(0.01% + 3 mV)		±(0.01% + 3 mV)		±(0.01% + 3 mV)	
Current	±(0.01% + 3 mA)		±(0.01% + 3 mA)		±(0.01% + 3 mA)	
<b>Line regulation (23 °C ± 5 °C)</b>						
Voltage	±(0.01% + 3 mV)		±(0.01% + 3 mV)		±(0.01% + 3 mV)	
Current	±(0.01% + 3 mA)		±(0.01% + 3 mA)		±(0.01% + 3 mA)	
<b>Ripple and noise (20 Hz to 20 MHz, 23 °C ± 5 °C)</b>						
Voltage ( $V_{\text{peak-peak}}$ )	<3 mV <sub>peak-peak</sub>		<4 mV <sub>peak-peak</sub>	<3 mV <sub>peak-peak</sub>	<4 mV <sub>peak-peak</sub>	
Voltage ( $V_{\text{RMS}}$ )	<1 mV <sub>RMS</sub>		<1 mV <sub>RMS</sub>	<1 mV <sub>RMS</sub>	<1 mV <sub>RMS</sub>	
Current ( $I_{\text{RMS}}$ )	<4 mA		<5 mA	<4 mA	<4 mA	
<b>Setting resolution</b>						
Voltage	1 mV		1 mV		1 mV	
Current	1 mA		1 mA		1 mA	

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	2230-30-3		2230-30-6		2230-60-3	
	CH1 and CH2	CH3	CH1 and CH2	CH3	CH1 and CH2	CH3
<b>Setting accuracy (using remote sense, 23 °C ± 5 °C, ±(% of reading + offset))</b>						
Voltage	±(0.03% + 10 mV)		±(0.03% + 10 mV)		±(0.03% + 10 mV)	
Current	±(0.1% + 5 mA)		±(0.1% + 8 mA)	±(0.1% + 5 mA)	±(0.1% + 5 mA)	
<b>Readback resolution</b>						
Voltage	1 mV		1 mV		1 mV	
Current	1 mA		1 mA		1 mA	
<b>Readback accuracy (23 °C ± 5 °C ±(% of reading + offset))</b>						
Voltage	±(0.03% + 10 mV)		±(0.03% + 10 mV)		±(0.03% + 10 mV)	
Current	±(0.1% + 5 mA)		±(0.1% + 8 mA)	±(0.1% + 5 mA)	±(0.1% + 5 mA)	
<b>Temperature coefficient ±(% of output + offset) / °C (between 0 °C to 18 °C and 28 °C to 40 °C)</b>						
Voltage	±(0.01% + 1 mV)		±(0.01% + 1 mV)		±(0.01% + 1 mV)	
Current	±(0.02% + 1 mA)		±(0.02% + 1 mA)		±(0.02% + 1 mA)	
<b>Series setting resolution</b>						
Voltage	1 mV	—	1 mV	—	—	—
Current	1 mA	—	1 mA	—	—	—
<b>Series readback resolution</b>						
Voltage	1 mV	—	1 mV	—	—	—
Current	1 mA	—	1 mA	—	—	—
<b>Parallel setting resolution</b>						
Voltage	1 mV	—	1 mV	—	1 mV	—
Current	1 mA	—	0 A to 9.999 A: 1 mA 10 A to 12 A: 10 mA	—	1 mA	—
<b>Parallel readback resolution</b>						
Voltage	1 mV	—	1 mV	—	1 mV	—
Current	1 mA	—	0 A to 9.999A: 1 mA 10 A to 12A: 10 mA	—	1 mA	—
<b>Rise time (10% to 90%)</b>	≤100 ms		≤100 ms		≤100 ms	
<b>Fall time (90% to 10%)</b>	≤0.5 s	≤0.1 s	≤0.5 s	≤0.1 s	≤1.5 s	≤0.1 s
<b>Load transient recovery time</b>						
Voltage setting band 50 mV, 50% to 100%, 1 kHz, rise and fall rate 5 A per μs: ≤50 μs (typical)						
<b>Transition time</b>						
CC mode to CV mode, V-set = 5 V, I-limit = 0.5 A, resistive load change from 2.5 Ω to 25 Ω: ≤10 ms						
CV mode to CC mode, V-set = 5 V, I-limit = 0.5 A, resistive load change from 25 Ω to 2.5 Ω: ≤5 ms						
<b>Output timer</b>						
Setting range	0.1 s to 99999.9 s		0.1 s to 99999.9 s		0.1 s to 99999.9 s	
Resolution	0.1 s		0.1 s		0.1 s	

Specifications are subject to change without notice

## GENERAL SPECIFICATIONS

<b>Communications</b>	<ul style="list-style-type: none"> <li>▪ <b>USB:</b> Type B connector, USB 2.0, USBTMC compatible</li> <li>▪ <b>RS232:</b> Baud rates: 4800/9600/19,200/38,400/57,600/115,200</li> </ul>
<b>Rear-panel connectors</b>	<ul style="list-style-type: none"> <li>▪ <b>Output:</b> 15-pin terminal block socket</li> <li>▪ <b>RS-232:</b> DB-9 connector</li> <li>▪ <b>USB device:</b> Type B connector</li> <li>▪ <b>AC power input:</b> 3-prong socket assembly with fuse</li> </ul>
<b>Display</b>	Vacuum fluorescent display
<b>Memory</b>	36 setup memories
<b>Output and Remote Sense</b>	Removable 15-pin screw-terminal block carries the following signals: <ul style="list-style-type: none"> <li>▪ <b>Output channels:</b> Duplicates the front-panel outputs</li> <li>▪ <b>Remote sense lines:</b> Connections for remote sense for each channel</li> <li>▪ <b>Control input:</b> Multifunction TTL input, which can function as a trigger input, output control line, or digital input</li> <li>▪ <b>Status output:</b> Multifunction TTL output, which can function as a fault indication or digital output</li> </ul>
<b>Floating voltage rating</b>	Up to 400 V (DC + peak AC) between protective earth (safety ground) and any output terminal
<b>Power source</b>	<ul style="list-style-type: none"> <li>▪ <b>110 V ac setting:</b> 2230-30-3: 99 V<sub>RMS</sub> to 132 V<sub>RMS</sub> 2230-30-6 and 2230-60-3: 108 V<sub>RMS</sub> to 132 V<sub>RMS</sub> with 2230-HRM installed</li> <li>▪ <b>220 V ac setting:</b> 198 V<sub>RMS</sub> to 264 V<sub>RMS</sub></li> <li>▪ <b>Frequency:</b> 50/60 Hz</li> <li>▪ <b>Power consumption:</b> 2230-30-3: 700 VAC; 2230-30-6 and 2230-60-3: 1000 VAC</li> </ul>
<b>EMC</b>	<ul style="list-style-type: none"> <li>▪ <b>European Union:</b> Conforms to European Union EMC directive</li> <li>▪ <b>USA:</b> FCC, CFR Title 47, Part 15, Subpart B, Class A</li> <li>▪ <b>Australia:</b> EMC Framework, demonstrated per Emission Standard AS/NZS 2064 (industrial, scientific, and medical equipment)</li> </ul>
<b>Safety</b>	<ul style="list-style-type: none"> <li>▪ <b>European Union:</b> Conforms to Low Voltage Directive</li> <li>▪ <b>USA:</b> NRTL listed to UL61010-1-2004</li> <li>▪ <b>Canada:</b> CAN/CSA C22.2 No. 61010-1 2004</li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>▪ <b>With boot:</b> 104.2 mm high × 225.3 mm wide × 481.1 mm deep (4.10 in. × 8.87 in. × 18.94 in.)</li> <li>▪ <b>Without boot:</b> 88.2 mm high × 214.5 mm wide × 456.6 mm deep (3.47 in. × 8.44 in. × 17.98 in.)</li> </ul>
<b>Shipping weight</b>	<ul style="list-style-type: none"> <li>▪ <b>2230-30-3:</b> 12.3 kg (27 lb)</li> <li>▪ <b>2230-30-6 and 2230-60-3:</b> 13.8 kg (30 lb)</li> </ul>
<b>Net weight</b>	<ul style="list-style-type: none"> <li>▪ <b>2230-30-3:</b> 9.6 kg (21 lb)</li> <li>▪ <b>2230-30-6 and 2230-60-3:</b> 11.1 kg (24 lb)</li> </ul>
<b>Environment</b>	<ul style="list-style-type: none"> <li>▪ <b>Altitude:</b> <ul style="list-style-type: none"> <li>▪ <b>Operating:</b> Up to 2000 meters (6562 ft) above sea level</li> <li>▪ <b>Storage:</b> Up to 4000 meters (13,124 ft) above sea level</li> </ul> </li> <li>▪ <b>Operating:</b> 0 °C to 40 °C, 10% to 80% relative humidity up to 40 °C</li> <li>▪ <b>Storage:</b> <ul style="list-style-type: none"> <li>▪ -20 °C to 70 °C, 10% to 80% relative humidity up to 40 °C</li> <li>▪ -20 °C to 70 °C, 5% to 60% relative humidity above 40 °C up to 70 °C</li> </ul> </li> </ul>

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