

**Keithley Instruments**

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**High Power Interface Panel  
Instrument Specifications**

**SPECIFICATION CONDITIONS**

The Model 8020 High Power Interface Panel provides a highly accurate, flexible, and easy to use interface between the Keithley Instruments high power Parametric Curve Tracer (PCT) and SourceMeter® instruments and a variety of probe stations, test fixtures, and handlers. It has six measurement channels that accommodate 3 kV, low-current, and high-current measurements. You can configure the first five channels with a variety of output connector types to match your probe station. You can configure the first four channels with optional capacitance voltage (C-V) bias tees (AC + DC couplers), which provides high voltage C-V measurements on up to 4 pins of the device under test. The Model 8020 also comes with a selection of resistors that can be installed to provide stability and extra protection to the device.

**CONDITIONS**

This document contains typical performance characteristics and supplemental information for the Model 8020 High Power Interface Panel. These specifications are for the interface panel only and do not include external cables. Characteristics, supplemental characteristics, and typical values are non-warranted, apply at 23 °C ± 5 °C, < 60 percent relative humidity, and are provided solely as useful information.

**MODEL 8020 TYPICAL PERFORMANCE CHARACTERISTICS**

Characteristic		Path	High voltage (HV) channel	200 V channels 1-3	Common LO channel	High current channel
<b>Maximum DCV</b>		Both	3030 V	202 V	40 V	42 V
<b>Maximum DCI<sup>1</sup></b>	<b>C-V mode</b>	DC	122 mA	1.515 A	4.5 A triaxial <sup>2</sup> 5 A banana	40.4 A
		AC + DC	100 µA	100 µA		
	<b>I-V mode</b>	DC	122 mA	1.515 A		
		AC + DC	122 mA	1.0 A <sup>3</sup>		
	<b>C-V Hi I mode</b>	DC	122 mA	1.515 A		
		AC + DC	122 mA	1.0 A <sup>3</sup>		
<b>Maximum pulsed current</b>	<b>C-V mode</b>	DC	122 mA	10 A	10 A triaxial 40 A banana	100 A
		AC + DC	100 µA	100 µA		
	<b>I-V mode</b>	DC	122 mA	10 A		
		AC + DC	122 mA	1 A <sup>3</sup>		
	<b>C-V Hi I mode</b>	DC	122 mA	10 A		
		AC + DC	122 mA	1 A <sup>3</sup>		

<sup>1</sup> C-V mode and C-V Hi I modes are available only with the Model 8020-CVU bias tee option.

<sup>2</sup> With inner shield of triaxial cable shield connected to common LO.

<sup>3</sup> When sourcing current, add 2 mA / 1 A of offset to the instrument specification.

Characteristic		Path	High voltage channel	200 V channels 1-3	Common LO channel	High current channel
Minimum pulse width <sup>4</sup>	C-V mode	DC	20 ms	150 $\mu$ s	N/A	100 $\mu$ s
		AC + DC	675 ms	20 ms		
	I-V mode	DC	20 ms	150 $\mu$ s		
		AC + DC	20 ms	20 ms		
	C-V Hi I mode	DC	20 ms	150 $\mu$ s		
		AC + DC	20 ms	20 ms		
Leakage current <sup>5</sup>	C-V mode	DC	N/A	N/A	N/A	5 nA
		AC + DC	N/A	N/A		
	I-V mode	DC	5 pA + 10 fA/V	5 pA + 10 fA/V		
		AC + DC	5 pA + 10 fA/V	5 pA + 10 fA/V		
	C-V Hi I mode	DC	N/A	N/A		
		AC + DC	N/A	N/A		
Offset voltage (non-Kelvin)	C-V mode	DC	< 100 mV/A	< 100 mV/A	< 120 mV/A	< 6 mV/A
		AC + DC	< 5 V/100 $\mu$ A	< 5 V/100 $\mu$ A		
	I-V mode	DC	< 100 mV/A	< 100 mV/A		
		AC + DC	< 2 V/A	< 2 V/A		
	C-V Hi I mode	DC	< 100 mV/A	< 100 mV/A		
		AC + DC	< 2 V/A	< 2 V/A		
Voltage limit protection			N/A	240 V signal or guard to common LO <sup>6</sup>	42 V signal or sense to common	N/A
Current protection			10 A fuse	10 A fuse or 1 A clamp <sup>7</sup>	10 A fuse or 1 A clamp <sup>7</sup>	N/A
Series resistor capable			Yes	Yes	No	No
Model 8020-CVU optional bias tee (AC + DC coupler)			Yes	Yes	No	No
C-V bandwidth			10 kHz to 2 MHz	10 kHz to 2 MHz	N/A	N/A

<sup>4</sup> Minimum pulse widths are with no load. See instrument specifications for additional limits. With the 10 A fuse installed only.

<sup>5</sup> Performance with a 10 V step and 3 s of settling time. Safe high voltage (SHV) connector cards and coaxial cables will add significant additional leakage and offset.

<sup>6</sup> High current LO is not conducted through common LO channel.

<sup>7</sup> The 1 A clamp prevents transient current spikes over 1 A. Published results are with triaxial connector cards and cables only.

Characteristic		Typical accuracy using a bias tee per device terminal <sup>8</sup>		
Typical C-V 2-terminal accuracy <sup>9</sup>	20 pF < C < 100 nF @ 100 kHz	3 % + 2 pF		
	10 pF < C < 10 nF @ 1 MHz	3 % + 0.5 pF		
Typical C-V 3-terminal accuracy				
	C <sub>GD</sub> = 100 pF C <sub>DS</sub> = 1 nF C <sub>GS</sub> = 10 nF @ 20 kHz	C <sub>GD</sub>	42 % + 2 pF	
		C <sub>DS</sub>	11 % + 2 pF	
		C <sub>GS</sub>	5 % + 2 pF	
	C <sub>GD</sub> = 100 pF C <sub>DS</sub> = 1 nF C <sub>GS</sub> = 10 nF @ 100 kHz	C <sub>GD</sub>	7 % + 2 pF	
		C <sub>DS</sub>	11 % + 2 pF	
		C <sub>GS</sub>	5 % + 2 pF	
	C <sub>GD</sub> = 100 pF C <sub>DS</sub> = 1 nF C <sub>GS</sub> = 10 nF @ 1 MHz	C <sub>GD</sub>	5 % + 2 pF	
		C <sub>DS</sub>	5 % + 2 pF	
		C <sub>GS</sub>	5 % + 2 pF	
	C <sub>GD</sub> = 100 pF C <sub>DS</sub> = 430 pF C <sub>GS</sub> = 1 nF @ 20 kHz	C <sub>GD</sub>	5 % + 2 pF	
		C <sub>DS</sub>	5 % + 2 pF	
		C <sub>GS</sub>	5 % + 2 pF	
	C <sub>GD</sub> = 100 pF C <sub>DS</sub> = 430 pF C <sub>GS</sub> = 1 nF @ 100 kHz	C <sub>GD</sub>	5 % + 2 pF	
C <sub>DS</sub>		5 % + 2 pF		
C <sub>GS</sub>		5 % + 2 pF		
C <sub>GD</sub> = 100 pF C <sub>DS</sub> = 430 pF C <sub>GS</sub> = 1 nF @ 1 MHz	C <sub>GD</sub>	5 % + 2 pF		
	C <sub>DS</sub>	5 % + 2 pF		
	C <sub>GS</sub>	5 % + 2 pF		

<sup>8</sup> High voltage channel. Additional error above 1 nF of (1 ppm/nFV × VDC × CDUT(nF)). Measured @ 100 kHz.

<sup>9</sup> C-V mode is available only with the Model 8020-CVU bias tee option.

**SPECIFICATIONS**

Channel / connector	Instrument connections	Device connections
<b>High voltage</b>	Input connectors: <ul style="list-style-type: none"> <li>▪ Force/Sense HI: Keithley HV triaxial</li> <li>▪ Force/Sense LO: Keithley HV triaxial</li> </ul> Recommended instruments: <ul style="list-style-type: none"> <li>▪ Model 2657A</li> </ul>	Must select one output connector: <ul style="list-style-type: none"> <li>▪ 8020-KHV Keithley HV triaxial Kelvin</li> <li>▪ 8020-AHV Agilent HV triaxial Kelvin</li> <li>▪ 8020-SHV SHV coaxial Kelvin</li> <li>▪ 8020-BLK Blank panel</li> </ul>
<b>200 V, 1-3</b>	Input connectors: <ul style="list-style-type: none"> <li>▪ Force/Sense HI: Standard 3-lug triaxial</li> <li>▪ Force/Sense LO: Standard 3-lug triaxial</li> </ul> Recommended instruments: <ul style="list-style-type: none"> <li>▪ Model 4200-SCS</li> <li>▪ Model 2635A/B</li> <li>▪ Model 2636A/B</li> <li>▪ Model 2611A/B</li> <li>▪ Model 2612A/B</li> </ul>	Must select one output connector per channel: <ul style="list-style-type: none"> <li>▪ 8020-KHV Keithley HV triaxial Kelvin</li> <li>▪ 8020-AHV Agilent HV triaxial Kelvin</li> <li>▪ 8020-SHV SHV coaxial Kelvin</li> <li>▪ 8020-STC Standard triaxial Kelvin</li> <li>▪ 8020-BLK Blank panel</li> </ul>
<b>Instrument common LO</b>	The input connectors for the Force/Sense LO for each instrument are included with the particular channel that instrument is connected to.	Included output connectors: <ul style="list-style-type: none"> <li>▪ Force LO: 4 mm banana</li> <li>▪ Chassis: 4 mm banana</li> <li>▪ Force/Sense LO: Standard triaxial</li> </ul> Must select one output connector: <ul style="list-style-type: none"> <li>▪ 8020-KHV Keithley HV triaxial Kelvin</li> <li>▪ 8020-AHV Agilent HV triaxial Kelvin</li> <li>▪ 8020-SHV SHV coaxial Kelvin</li> <li>▪ 8020-STC Standard triaxial Kelvin</li> <li>▪ 8020-BLK Blank panel</li> </ul>
<b>High current</b>	Input connectors: <ul style="list-style-type: none"> <li>▪ Force HI/LO 1: 2-pin 4 mm Phoenix</li> <li>▪ Force HI/LO 2: 2-pin 4 mm Phoenix</li> <li>▪ Sense HI/LO 1: 2-pin 1 mm Phoenix</li> <li>▪ Sense HI/LO 2: 2-pin 1 mm Phoenix</li> </ul> Recommended instruments: <ul style="list-style-type: none"> <li>▪ Model 2651A</li> </ul>	Included output connectors: <ul style="list-style-type: none"> <li>▪ Force HI/LO: 2-pin 4 mm Phoenix screw terminal block</li> <li>▪ Sense HI/LO: 2-pin 1 mm Phoenix screw terminal block</li> <li>▪ Chassis: 4 mm banana</li> </ul>
<b>Interlock</b>	Input connectors: <ul style="list-style-type: none"> <li>▪ 3-pin circular (4200-SCS)</li> <li>▪ 6 each, 3-pin inline (26xxB)</li> </ul>	Output connectors: <ul style="list-style-type: none"> <li>▪ OUT: 4-pin circular (to device under test access point)</li> <li>▪ EXPANSION: 4-pin circular (to another Model 8020)</li> </ul>
<b>Bias tee (AC+DC couplers)</b>	Input connectors: <ul style="list-style-type: none"> <li>▪ Kelvin SMA on first 4 channels</li> <li>▪ SMA AC guard port</li> </ul> Recommended instruments: <ul style="list-style-type: none"> <li>▪ Model 4200-SCS</li> <li>▪ Model PCT-CVU</li> </ul>	The output connectors are defined by user-selected output connector card.

**GENERAL**

<b>Warranty</b>	1 year
<b>EMC</b>	Conforms to European Union EMC Directive
<b>Safety</b>	NRTL listed to UL61010-1:2008 and CSA C22.2 No. 61010-1 Conforms to European Union Low Voltage Directive
<b>Environment</b>	For indoor use only <b>Altitude:</b> Maximum 2000 m (6562 ft) above sea level <b>Operating:</b> 0 °C to 50 °C, 60 % relative humidity up to 35 °C <b>Storage:</b> -25 °C to 65 °C
<b>Dimensions</b>	118 mm high x 438 mm wide x 328 mm deep (4.6 in. x 17.2 in. x 12.9 in.)
<b>Weight</b>	<b>Model 8020 (no output cards installed):</b> 4.7 kg (10.4 lb.) <b>Model 8020-CVU:</b> 0.4 kg (0.9 lb) <b>Model 8020-KHV:</b> 0.2 kg (0.4 lb) <b>Model 8020-SHV:</b> 0.2 kg (0.4 lb) <b>Model 8020-AHV:</b> 0.25 kg (0.5 lb) <b>Model 8020-STC:</b> 0.2 kg (0.4 lb) <b>Model 8020-BLK:</b> 0.05 kg (0.1 lb)

**ACCESSORIES**

Model Number	Supplied	Optional	Description
131936100	X <sup>12</sup>	X	SMA (M) to SMB (M) Adapter
131936200	X <sup>12</sup>	X	SMA (F) to SMB (F) Adapter
2290-5-SHV		X	5 kV SHV Female-SHV Cable, 3 m (10 ft)
236-ILC-3		X	Interlock Cable for the Model 4200-SCS
2651A-KIT-x		X	2 Pin High Current Cable Assembly
7078-TRX-x		X	M-M Standard Low Noise Triaxial Cable
8020-AHV <sup>10</sup>		X	Kelvin Agilent HV Triaxial Connector Card
8020-BLK <sup>10</sup>	X	X	Blank Panel Connector Card
8020-CVU <sup>11</sup>		X	Integrated 3 kV and 200 V Bias Tees for Model 8020
8020-DP	X <sup>12</sup>	X	High Voltage Discharge Probe
8020-ILC-1		X	Interlock Expansion Cable
8020-ILC-S	X	X	Interlock Expansion Termination Plug
8020-ILC-UNT	X	X	Unterminated Interlock Cable
8020-KHV <sup>10</sup>		X	Kelvin Keithley HV Triaxial Connector Card
8020-RES-KIT	X	X	HV-Rated Resistors
8020-SHI-BNC-2		X	2 Pin Phoenix to BNC Cable for Sense HI, 2 m
8020-SHV <sup>10</sup>		X	Kelvin SHV Connector Card
8020-SNS-x	X	X	8 Pin to 2 Pin Phoenix Cables

<sup>10</sup> Field installation.<sup>11</sup> Factory installation only.<sup>12</sup> Supplied with Model 8020-CVU option.

Model 8020 High Power Interface Panel Instrument Specifications

Model Number	Supplied	Optional	Description
8020-STC		X	Kelvin Standard Triaxial Connector Card
8020-TLV <sup>13</sup>		X	Low Voltage Safety Triaxial Connector Cover
CA-404B		X	50 $\Omega$ M-M SMA Cable, 2 m
CA-405B		X	50 $\Omega$ M-M SMA Cable, 15 cm
CA-406B <sup>14</sup>	X	X	50 $\Omega$ M-M SMA Cable, 33 cm
CA-446A		X (qty. 4)	100 $\Omega$ M-M SMA Cable, 3 m
CA-447A		X (qty. 4)	100 $\Omega$ M-M SMA Cable, 1.5 m
CA-451A		X	50 $\Omega$ M-M SMA Cable, 11 cm
CA-452A		X	50 $\Omega$ M-M SMA Cable, 20 cm
CA-558-x		X	25 Pin to 3 Pin Interlock Cable for Model 26xx
CA-568-120	X	X	Green-Yellow Ground Cable, 304.8 cm
CS-1195-2	X	X	2-Pin Phoenix Connector for 2651A Sense
CS-1391 <sup>14</sup>	X	X	SMA Tee Adapter, F-M-F
CS-1592-2	X	X	2-Pin Female Phoenix (Receptacle Housing) Termination Block
CS-1626-2		X	2-Pin Receptacle Phoenix Panel Mount
HV-CA-554-x		X	M-M 3 kV-Rated Triaxial Cable
HV-CA-571-3		X	Male to Unterminated 3 kV-Rated Triaxial Cable, 3 m
HV-CS-1613		X	3 kV HI-V-Rated Triaxial Feedthrough Connector
SC-206		X	Raw, High-Current, Low-Inductance Coaxial Cable, Sold Per Inch
SHV-CA-553-x		X	M-M 3 kV-Rated Triaxial to SHV Coaxial Cable

<sup>13</sup> Supplied with 8020-STC connector card.

<sup>14</sup> Supplied with Model 8020-CVU option.