

Keysight E5250A

Low Leakage Switch Mainframe

Technical Overview



Introduction

Basic Functions

Keysight Technologies, Inc. E5250A Low Leakage Switch Mainframe functions:

- Switches DC current, DC voltage, capacitance and pulse with DC instruments and LCR meters
- Controls switching through builtin GPIB
- Performs self test using Option 301 relay function test adapter

Configurations

- Option 001 10 x 12 matrix switch: From 10 x 12 to 10 x 48 matrix per frame. (Option 001 x 1 to 4)
- Option 501 24-channel (8 x 3) multiplexer: From 24 to 96 channels per frame (Option 501 x 1 to 4)
- Required cables and connector plates are available.

Furnished Program Disk

- The E5250A includes a program disk (3.5-inch LIF format) that contains two utility and three sample programs.
- Utility programs: Virtual front panel, self test (IBASIC)
- Sample programs and routines: C compensation using Keysight 4284A application samples for this matrix switch and multiplexer. (HP BASIC) VFP setup data upload (HP BASIC)

Specification Disk

The Supplemental Information and Typical Data entries in the following specifications are not warranted but they provide useful information about the functions and performance of the instruments. Specifications, typical data, and supplemental information are defined at $23^{\circ}\text{C} \pm 5^{\circ}$ < 60% relative humidity (RH).

General Specifications

Temperature Range	
Operating:	5° C to 40° C
Storage:	-40° C to 70° C
Humidity Range	
Operating:	5% to 80% (no condensation)
Storage:	5% to 90% RH at 65° C
Altitude	
Operating:	0 to 2000 m (6500 ft)
Storage:	0 to 15,240 m (50,000 ft)
Regulatory Compliance	
Safety:	CSA C22.2 No. 1010.1/IEC 1010-1
EMC:	CISPR 11 Group 1 class A&EN50082-1
Power Requirements:	100/120/220/240 V ± 10%, 47 Hz to 63 Hz
Maximum VA:	100 VA
No. of Slots:	4 slots for 30-mm height switch cards
Size	
Mainframe:	230 mm H x 430 mm W x 600 mm D
Option 001:	30 mm H x 395 mm W x 424 mm D
Option 501:	30 mm H x 395 mm W x 424 mm D
Weight (approx.)	
Mainframe:	11.2 kg
Option 001:	2.0 kg
Option 501:	2.1 kg
No. of Ports (with option 001)	
Low Leakage I-V Port:	2
General I-V Port:	4
C-V Port:	2
HF Port:	2
Output Channels:	12
No. of Ports (with option 501)	
Low Leakage I-V port:	3
Bias Port:	3
Output Channels:	24 (8 x 3)

Option 001 10 x 12 Matrix Switch

Switch Secification*

Condition	A	B	C
Max. Current rating (A):	1.0	-	-
Max. Voltage rating (V)			
Channel to Ground:	200	-	-
Channel to Channel:	300	-	-
Close Ch Residual R (Ω)			
Low Leakage I-V Port:	0.6	-	-
General I-V Port:	1.0	-	-
C-V, HF Port:	1.0	-	-
Ch Isolation R (Ω)	1		
Low Leakage I-V Port:	0 ¹³	5 x 10 ¹²	2 x 10 ¹²
General I-V Port:	10 ¹²	5 x 10 ¹¹	2 x 10 ¹¹
C-V, HF Port:	10 ⁹	5 x 10 ⁸	2 x 10 ⁸
Condition A:	23° C ± 5° C, 5% to 60% RH		
Condition B:	5° C to 18° C, 28° C to 40° C, 5% to 60% RH		
Condition C:	28° C to 40° C, 60% to 80% RH		

*This specification is defined with the module plugged into the mainframe.

Typical Data

Offset current:	< 0.1 pA ¹ < 1000 pA ¹	(Low Leakage I-V Port) (General I-V Port)
Channel Crosstalk Capacitance:	< 0.3 pF/ch	
Offset voltage, Electro Motive Force (EMF) at 5 min.:	< 80 μV < 110 μV < 110 μV	(Low Leakage I-V Port) (General I-V Port) (C-V, HF Port)
Guard Capacitance:	< 145 pF ² < 123 pF ²	(Low Leakage I-V Port) (General I-V Port)
Additional C measurement Error	< ±1% ±0.5 pF ³	(C-V Port)

Supplemental Information

Bandwidth (at -3 dB)	< 10 MHz	(C-V, HF Port)
Relay Contact Life:	> 10 ⁸ times	(Dry Switching Mode)
Settling Time:	< 3.5 sec to < 0.4 pA after 10 V applied	(Low Leakage I-V Port)

1. The offset current when zero volts are applied to all input and output channels
2. The guard capacitance of the closed port on input and output ports when one module per frame is installed
3. The additional error using the C-Compensation program at 1 kHz ~ 1 MHz, < 1000 pF

E5250A Option 501 24-Channel (8x3) Multiplexer

Switch Specification*

Condition	A	B	C
Max. Current rating (A):	1.0	-	-
Max. Voltage rating (V)			
Channel to Ground:	200	-	-
Channel to Channel:	300	-	-
Close Ch Residual R (Ω)			
Low Leakage I-V Port:	0.6	-	-
Bias Port:	1.0	-	-
Ch Isolation R (Ω)			
Low Leakage I-V Port:	10 ¹³	5 x 10 ¹²	2 x 10 ¹²
Bias Port:	10 ⁹	5 x 10 ⁸	2 x 10 ⁸
Condition A:	23° C ± 5° C, 5% to 60% RH		
Condition B:	5° C to 18° C, 28° C to 40° C, 5% to 60% RH		
Condition C:	28° C to 40° C, 60% to 80% RH		

*This specification is defined with the module plugged into the mainframe.

Typical Data

Offset current:	< 0.1 pA ¹	(Low Leakage I-V Port)
Channel Crosstalk Capacitance:	< 0.4 pF/ch < 5 pF/ch	(Low Leakage I-V Port) (Bias Port)
Offset voltage (EMF) at 5 min.:	< 80 μV	(Low Leakage I-V Port)
Guard Capacitance:	< 180 pF ² < 60 pF	(Low Leakage I-V Port) (Low Leakage I-V Port, when the port is open)

Supplemental Information

Relay Contact Life:	> 108 times	(Dry Switching Mode)
Settling Time:	< 3.5 sec to < 0.4 pA after 10 V applied	(Low Leakage I-V Port)

- 1. When zero volts are applied to all input and output channels
- 2. The guard capacitance of the closed port on input and output ports when one module per frame is installed

Accessory Specifications

16494A	Triaxial Cable
16494B	Kelvin Triaxial Cable
16494C	Kelvin Triaxial Cable for 4142
16494D	8 ch Shielded Coaxial Cable
16495A	Connector Plate w/12 Triax. Intlk/GNDU
16495B	Connector Plate w/24 Triax. Intlk/GNDU
16495C	Connector Plate w/6 8 ch SHLD conn
16495D	Connector Plate w/12 8 ch SHLD conn
16495E	Half Size Blank Plate

General Specifications

Temperature Range	
Operating:	5° C to 40° C
Storage:	-40° C to 70° C
Humidity Range	
Operating:	5% to 80% (no condensation)
Storage:	5% to 90% RH at 65° C

16494E Wide Temperature 8 ch shielded Coaxial Cable

General Specifications

Temperature Range	
Operating:	5° C to 40° C
	-50° C to 200° C (for cable only)
Storage:	-40° C to 70° C
Humidity Range	
Operating:	5% to 80% (no condensation)
Storage:	5% to 90% RH at 65° C

4155C and 4156C Supplemental Information

4155C Supplemental Information

Data shows the degradation when using the 4155C with Low Leakage I-V Port.

Voltage Range and Offset Accuracy (with MPSMU)		
Range	Setting	Measurement
2 V	960 μ V + (0.5 x Iout) V	780 μ V + (0.5 x Iout) V
Current Range and Offset Accuracy (with MPSMU)		
Range	Setting	Measurement
1 nA	3 pA + (0.2 x Vout) pA	3 pA + (0.2 x Vout) pA
10 nA	7 pA + (0.2 x Vout) pA	5 pA + (0.2 x Vout) pA
100 nA	50 pA + (0.4 x Vout) pA	30 pA + (0.4 x Vout) pA

4156C Supplemental Information

Data shows the degradation when using the 4156C with Low Leakage I-V Port with non-kelvin connection.

Voltage Range and Offset Accuracy (with HRSMU)		
Range	Setting	Measurement
2 V	500 μ V + (0.5 x Iout) V	280 μ V + (0.5 x Iout) V
Current Range and Offset Accuracy (with HRSMU)		
Range	Setting	Measurement
10 pA	0.4 pA + (0.2 x Vout) pA	0.1 pA + (0.2 x Vout) pA
100 pA	0.4 pA + (0.2 x Vout) pA	0.1 pA + (0.2 x Vout) pA
1 nA	0.7 pA + (0.2 x Vout) pA	0.5 pA + (0.2 x Vout) pA
10 nA	4 pA + (0.2 x Vout) pA	2 pA + (0.2 x Vout) pA
100 nA	40 pA + (0.3 x Vout) pA	20 pA + (0.3 x Vout) pA

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