



### System 4x System Brief

#### Introduction



Devices tested include: Transistors · IGBT · SCR · Optocouplers MOSFETs · JFets · Diodes

#### Hardware

The 4x is self-contained and is approximately 19 inches wide by 12 inches deep and 6 inches high (483mm x 305mm x 152mm). Within this small footprint, the 4x can produce a test stimulus to 3000V and 200A under program control. Robust in design, there are two Stimulus/Measurement Units (SMU)s which are independently controlled and each can withstand long ON times. The system is designed to automatically detect when the programmed source stimulus (voltage or current) is reached to sense the desired characteristic (voltage or current) to measure and perform the test.

FORCE VOLTAGE RANGE	Measure to	Max Ton*	Trise	Tfall
3000V	2.5mA	8	200us	200us
50V				
5V				
500mV	200A	300us	60us	60us
50mV				
5mV				

\*Max Ton is software limited for safety.

SemiTek

FORCE CURRENT RANGE	Measure to	Max Ton*	Trise	Tfall
200A				
20A	50V		60us	60us
2A		300us		
200mA	2000V			
20mA				
2mA				
200uA				
20uA	20001/		200us	200us
2uA	5000V	∞		
200nA				
20nA				
2nA				

As of August 1, 2020. Subject to change without notice.







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Both SMUs include a voltage and current source originating from the raw power supply within and individual meters to make measurements.

- The SOURCE lead of the DUT is typically connected to RETURN (RtnX) or a low current meter as specified by the specific test.
- The In SMU typically connects to the GATE (InX) lead of the DUT.
- The Out SMU typically connects to the DRAIN (OutX) lead of the DUT.
- All DUT circuit paths are 4-wire Kelvin and guarded to the front panel.



The power source and sense can be applied in the NEGATIVE as well as the POSITIVE. Each SMU source has its own Digital to Analog Converter (DAC) for controlling the amount of current and voltage specified for the DUT. Using proprietary circuitry, voltage and current can be held tightly to the programmed value.

Notes:

- 1. All force voltage is available across all current ranges unless otherwise noted.
- 2. All current flow is available across all voltage ranges unless otherwise noted.

		RESOLUTION			
			Source Measure		ACCURACY
	-AGE	5V	75uV	150uV	(7)
3E	LIOV	50V	750uV	1.5mV	he value
AN		200pA	3aA	6aA	oft
E R		2nA	30fA	60fA	%
UR		20nA	300fA	600fA	0.0
EAS		200nA	ЗрА	6pA	+
Ψ.	E	2uA	30pA	60pA	nge
CE/	REN	20uA	300pA	600pA	2
UR	URF	200uA	3nA	6nA	the
SO	Ū	2mA	30nA	60nA	of of
		20mA	300nA	600nA	.5%
		200mA	3uA	6uA	∓(0
		2A	30uA	60uA	
		20A	300uA	600uA	

			RESOLUTION			
			Source	Measure	ACCORACT	
		5mV	75nV	150nV		
		50mV	750nV	1.5uV		
	<b>IGE</b>	500mV	7.5uV	1.5mV		
	LTA	5V	75uV	150uV	(ən	
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Щ		300V*	5mV	10mV	he	
AN		3000V*	50mV	100mV	oft	
E R.		2nA	30fA	60fA	%9	
UR		20nA	300fA	600fA	0	
EAS		200nA	ЗрА	6pA	+ 0	
Ϋ́		2uA	30pA	60pA	в Ц	
CE/	E	20uA	300pA	600pA	0 0	
UR	SEN	200uA	3nA	6nA	th	
sc	URI	2mA	30nA	60nA	° of	
	Ū	20mA	300nA	600nA	.5%	
		200mA	3uA	6uA	0)+	
		2A**	30uA	60uA		
		20A**	300uA	600uA		
		200A**	3mA	6mA		

\*200mA max. \*\*50V max

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# Software

Test operations are controlled from the 4x Dashboard at the PC. The dashboard provides access to basically three system applications.

- **BUILD** The Build Editor is used to create and edit a test procedure to verify the electrical characteristics of your DUTs. Following the published specification, you simply complete each test module from a list of fill-in-theblank templates adding them in a spreadsheet format to *build* a procedure. A test procedure includes all of the test modules as specified by the DUT specification and operator prompts.
- **RUN** Run executes the test procedure built in Build. The test procedure is run sequentially with programmable branches based on the PASS or FAIL condition of a module (test).
- TOOLS System Tools includes:
  - Auto-Cal sets compensation values for all stimulus and measurement ranges for the SMUs. The 4x has no hardware adjustments for calibration.
  - Debug allows you to verify every source and measurement range of each SMU. This is useful for troubleshooting and general maintenance of the system.

# Screen Shots

In this view, a list of tests for Bipolar devices is presented in the pane to the left. When selected, the test is added to the routine to the pane on the right where each of the test arguments are set according to the DUT specification. Arguments may be ordered in the routine for best fit.

Typically all tests must pass for the device to PASS, but Categories allows you to sort devices based on their ability to pass or fail specific tests. This is also known as Binning.

Operator prompts may also be added to the routine providing hook up instructions, etc.

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#### RUN

Test routines are run by clicking Run or by using a hotkey from the PC or from a remote controller. In prober/handler applications, automatic SOT and EOT signals are used. In this view, a test procedure has been run 12 times and the DUTs all passed. The results of the last DUT tested are displayed in the Results pane and all of the DUT results are displayed in the Log File pane. Bin and Category panes are also displayed. To the far right, a pane showing the communication between the PC and embedded computer is shown. Any pane may be hidden as desired.

#### TOOLS

In this Debug/Maintenance view each SMU can be addressed and set independently for troubleshooting. Auto Cal is initiated from the pane and the output from the raw power supplies can also be viewed.

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	ter Gerligen Mit		
	Pass an 1	category Pass	
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#### Setup

The 4x is powered by an external power unit equipped with a standard IEC320-C14 inlet and adopting the input range from 85VAC to 264VAC. The unit outputs 24VDC which plugs directly into the 4x main station. The power unit measures approximately 8.5"L by 3.75"W by 2'H (220mm x 95mm x 46mm).

The processor within the main station operates its own private Local Area Network (LAN) via an isolated Ethernet connection to the Windows-based PC for all system and instrument functions. The PC provides all user-interface functions such as building and executing test routines. The PC may be connected to another LAN via a separate Ethernet connection.

