

# E5260A/E5262A/E5263A/E5270B Precision IV Analyzers



# Introduction

The high performance IV analyzer with current measurement capability as low as 0.1 fA, offers the industry the best current-voltage characterization solution

Keysight's Precision IV analyzer offers very accurate IV characterization solution. Using the powerful characterization software, EasyEXPERT group+ and integrated source and measurement units (SMUs), Precision IV analyzer can quickly enable highly accurate current-voltage measurement. This high performance IV analyzer with current measurement capability as low as 0.1 fA, along with SMU scalability, meets the requirements of advanced IV characterization, with the lowest pricing range.

With its intuitive graphical user interface, Keysight's EasyEXPERT group+ software which is included in the Precision IV analyzer, supports all of the characterization tasks from measurement setup through to data analysis and protection.

This complete device characterization platform, tailored for the Precision IV analyzer, can be installed on any PC and can quickly and efficiently accelerate the IV characterization of various materials and devices without the need for configuring instruments and programming. The EasyEXPERT group+ also offers robust analysis capabilities, reporting functions, and can be installed on multiple PCs to allow for cross-departmental group work.

The Precision IV analyzer series offers four product models. Two channel models offer fixed configuration at an affordable price. Eight slot models provide scalability and flexibility of configurable SMU modules.



Figure 1. E5270B Precision IV Analyzer with optional ASU.

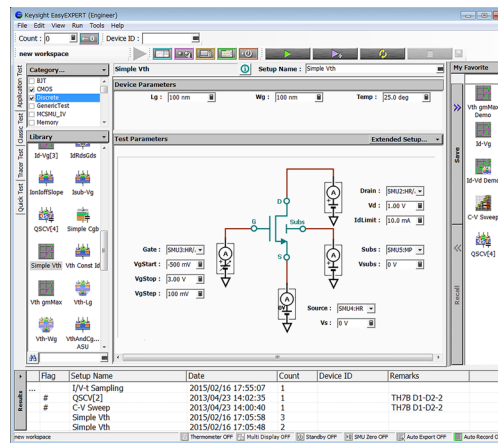


Figure 2. Intuitive software enables you to get the IV curve simply on the PC without programming.

# The Complete IV Characterization Solution

## SMU provides easy and accurate IV measurement

A source/monitor unit (SMU) is a core measurement resource of an IV analyzer and integrates 4-quadrant voltage/current source and voltage/current meter into a single unit. The tight integration of these capabilities allows SMU performance to achieve pA or fA current measurement resolution. In addition, SMUs have internal feedback mechanisms that enable them to maintain an accurate and stable output along with a compliance (limit) feature that protects devices from damage due to excessive voltage or current. High Power SMUs, Medium Power SMUs and High Resolution SMUs also support triaxial connections with active guarding for low current measurement and 4-wire (Kelvin) force and sense connections for low resistance measurement.

## Multiple functions enhance SMU capabilities

The SMU in the Precision IV analyzer integrates many different source and measurement capabilities into one compact form. It can operate as a seamless 4-quadrant precision voltage/current source or measurement device. Its versatile all-in-one integrated source and measurement capabilities allow it to perform a wide variety of I-V measurements without the need to change connections or use additional equipment.

## ASU provides 0.1 fA measurement capability

The HRSMU provides unique measurement resolution of 1 fA. However, if you need more low current performance, you can achieve 0.1 fA measurement resolution by combining the HRSMU module with the atto-sense and switch unit (ASU). The ASU provides impressive ultra low current measurement capabilities on IV characterization.

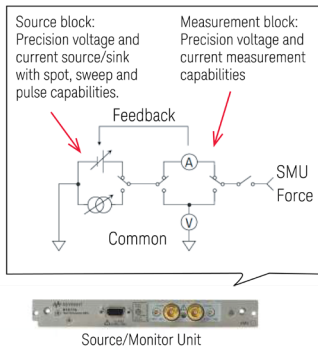


Figure 3. SMU circuit design.



Figure 4. E5270B with optional ASU.

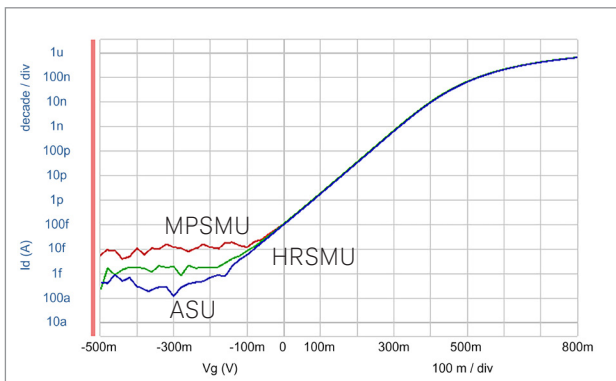


Figure 5. Ultra low current measurement with ASU.

# EasyEXPERT group+ Makes it Easy to Measure and Analyze Your Devices

## Application test mode provides extensive libraries of pre-defined tests

Using the pre-defined sample application tests installed in the EasyEXPERT group+, you can make parametric measurements with just a few simple mouse clicks. The application test libraries, furnished with the EasyEXPERT group+ software, can help you accelerate the characterization of not only semiconductor devices but also electronic materials, active/passive components, and many other types of electronic devices.

## Classic test mode provides full hardware control using mouse operation

When you perform a measurement other than the ready-to-use applications in the library, the classic test mode provides direct access to the analyzers hardware capabilities. By taking full advantage of windows-based features, you can set the various parameters such as output voltage/current, number of sweep steps, range etc. for the hardware available features.

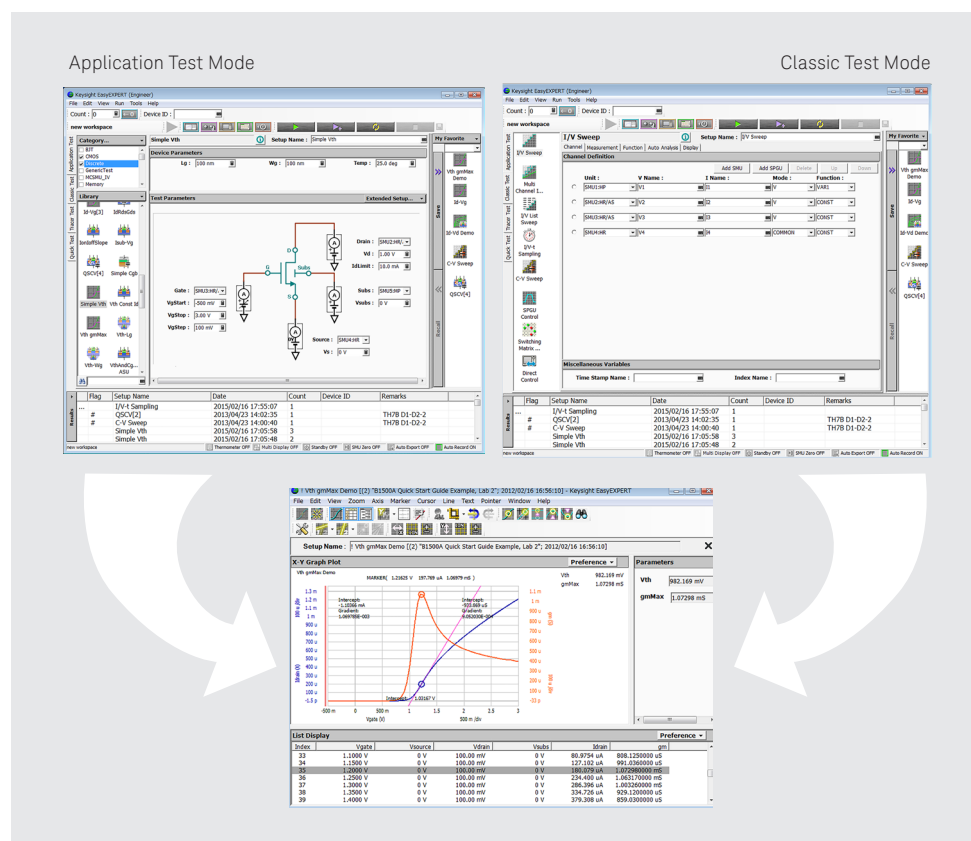


Figure 6. Application test mode and Classic test mode. Measurement result is stored, then the display result is displayed automatically.

# Accelerated Graphical Analysis and Data Exporting to Your PC for Further Data Processing

## Auto-analysis and enhanced graphical display features accelerate your analysis

The data display window accelerates the analysis of the measurement results. It provides detailed graphical display and analysis features. It can be automatically opened when the measurement is complete. It is also available to analyze the measurement result in the data store.

This provides many analysis tools such as auto scaling, marker and line operations, multiple Y axes capabilities etc. For example, the data display and intuitive GUI operation allows you to quickly extract the threshold voltage by finding the max position on the gm curve in Y2, drawing the tangent line on the Id curve in Y1, and reading out its intercept to X axis, as shown in the following figure.

In conjunction with the auto-analysis capability of the measurement setup, you can perform the operation automatically after the measurement without manual operation.

## Direct Excel export for quick post measurement analysis on a PC

The data display is enhanced to allow you to export data directly to Excel without needing to save it as a CVS file. This helps to accelerate the post measurement analysis on any PC. It is also possible to export graphs as image files. The preference menu provides a range of options for you to choose from such as color and your choice of information to be placed in the graph pane.

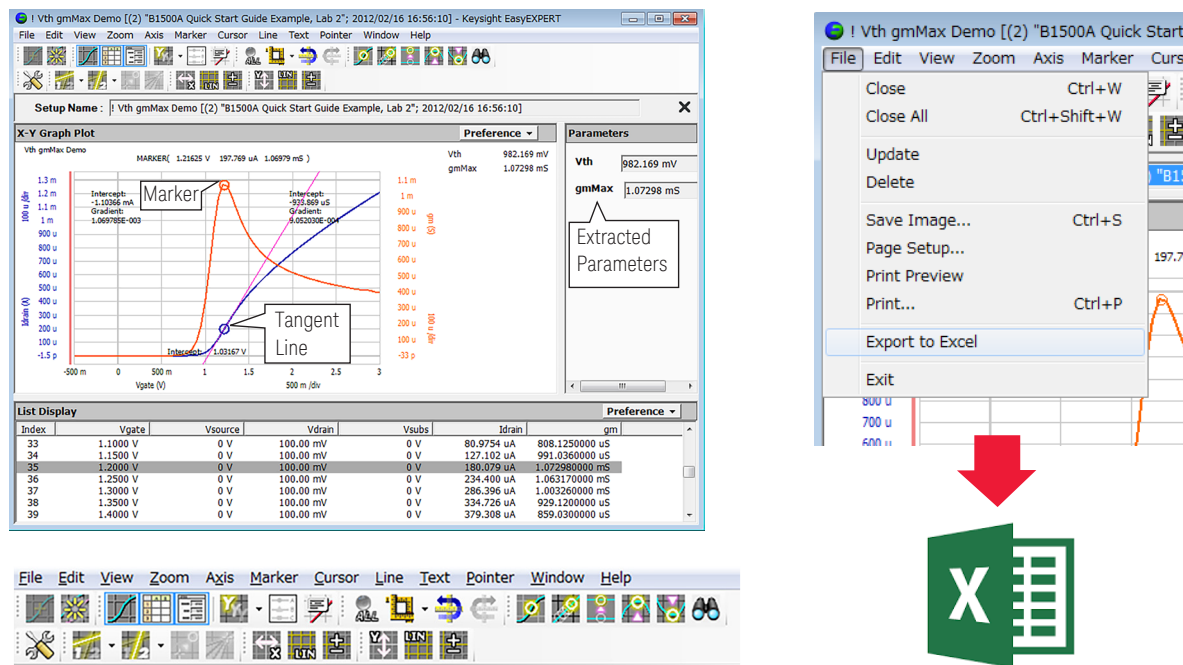
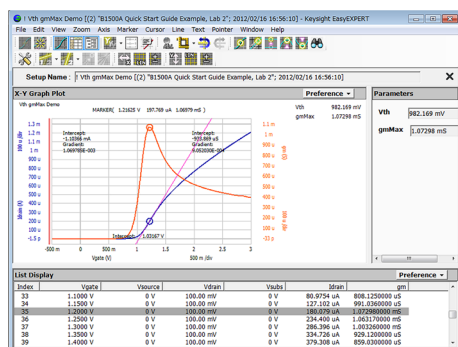


Figure 7. Powerful analysis capabilities.

## Quickly Perform the Measurement by Using Appropriate User Interface

### Measurement data is stored automatically

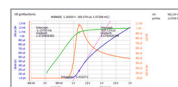
After executing the measurement, the measurement data is automatically stored in the built-in data base. This system also allows you to recall the measurement setup or view the measurement result graphically as well as allowing you to export the data files such as TXT/CSV, EasyEXPERT data, Graph image or Excel format.



TXT/  
CSV



EasyEXPERT  
data



Image



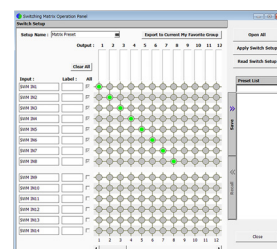
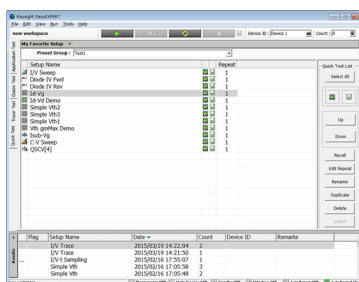
Excel

### Intuitive GUI is used to control an optional switching matrix

The EasyEXPERT group+ also supports a switching matrix control. This allows you to create a switching matrix setup on GUI using mouse point and click operations. You can also use the EasyEXPERT group+ for the test system by integrating the analyzer and switching matrix to test multiple points with limited resources.

### Make a quick automated test sequence without the need for programming

The EasyEXPERT group+ has a GUI-based quick test mode that supports automated test sequencing. Quick test mode provides a convenient means to execute a sequence of tests created in application test, classic test or tracer test mode without the need for any programming. You can also combine wafer prober control with quick test mode to perform multiple tests automatically across a wafer.





## EasyEXPERT group+ Allows Flexible Characterization Tasks to be Performed that Significantly Improve Productivity

Take full advantage of the analyzer's powerful capabilities from the lab to the office

The powerful capabilities of EasyEXPERT group+ do not limit it to use as an instrument controller. It can be installed in your PC as your personal analyzer environment. Because it can be connected to the instrument via USB-GPIB interface, it is portable and can be used either for offline tasks in the office or online measurement execution in the lab. It does not need to be within range of the instrument to operate correctly and most tasks can be operated in the office with the PC peripherals such as wide display, USB, HDD and software such as Excel to improve the productivity.

In addition, the EasyEXPERT group+ can be installed on multiple PCs at no additional cost so that every team member can have their own personal analyzer environment. It will ensure speed, accuracy and efficiency within group work. EasyEXPERT group+ also provides options to protect important data when sharing it with multiple users.

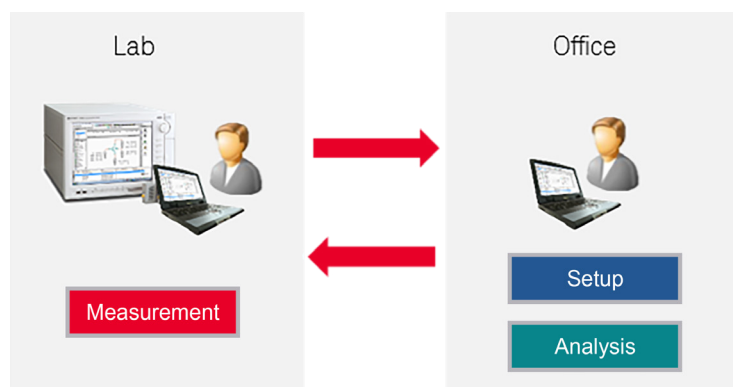


Figure 8. Your PC becomes your portable personal characterization environment.

## Offering support across the Keysight analyzer series for more flexibility and scalability according to your needs

The EasyEXPERT group+ is a unified characterization platform across the Keysight precision current-voltage analyzer series. Although available applications are adaptive for configured resources, it supports the interoperation of measurement resources. Its flexibility and scalability provides many options for the lab operation and future expansion.

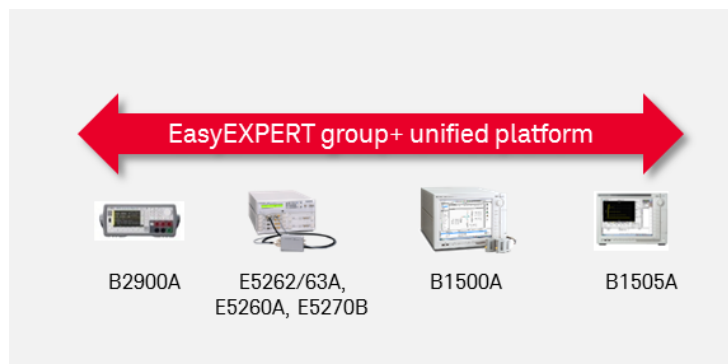


Figure 9. EasyEXPERT group+ provides unified platform.

## The Highest IV Performance with the Lowest Price Range

The Keysight Precision IV Analyzers have four models with several different types of SMU modules. For the E5260A and E5270B models, you can configure up to eight slots for the SMU modules.

### Two-channel models can handle simple test needs

Many component measurements, such as diode and resistor characterization, only demand one or two source/monitor units (SMUs). In these situations the Keysight E5262A or E5263A is ideal choices, providing sufficient test capability. Because both SMUs reside in the same mainframe, synchronization of these two measurement resources is automatic. You do not have to worry about synchronizing the SMUs as you would if you were using single SMU units. The availability of two-channel models also supports the testing of devices with up to three terminals as long as one terminal can be tied to the GNDU.

### Eight-slot mainframe providing flexibility and expandability

When you require more than two SMUs, or where flexibility and future expandability are key concerns, either the user-configurable Keysight E5260A IV Analyzer or the E5270B Precision IV analyzer is the ideal choice. The mainframe of E5260A/E5270B can hold up to eight single-slot modules or up to four dual-slot modules. If you install four HPSMUs into the mainframe, you can output 1 Amp of current from each of these units simultaneously. There is also a 4-Amp ground unit in the E5260A /E5270B mainframe to enable you to sink all of the current without having to worry about any resistive ground rise issues.

### Unique low current measurement hardware configuration

The E5270B can accommodate three different source monitor unit (SMU) modules: a medium power SMU (MPSMU), a high power SMU (HPSMU), and a high resolution SMU (HRSMU). In addition, the HRSMU accepts an optional atto-sense and switch unit (ASU) which increases the low-current measurement resolution of the HRSMU to 100 atto amps (0.1 femto amp). All SMU terminals have active guard technology which can prevent current leakage in low current measurements.



E5262A/E5263A 2 Channel IV Analyzer



E5260A IV Analyzer



E5270B Precision IV Analyzer with optional ASU



# Keysight's Parametric Test Solutions Meet Your Measurement Needs

## Comparison table

The Keysight Parametric test solutions with EasyEXPERT group+ provides both traditional and task-oriented approaches to device characterization to meet the complex challenges. The following table help you select the best solution to meet your measurement need.

		Precision IV Analyzer (2ch model)		Precision IV Analyzer (8ch model)		Advanced Device analyzer
		E5262A	E5263A	E5260A	E5270B	B1500A
Maximum output		100 V / 0.2 A	200 V / 1 A	200 V / 1 A	200 V / 1 A	200 V / 1 A
Minimum measurement resolution		5 pA / 100 $\mu$ V	5 pA / 100 $\mu$ V	5 pA / 100 $\mu$ V	0.1 fA / 0.5 $\mu$ V	0.1 fA / 0.5 $\mu$ V
Numbers of SMU channels		2	2	1 to 8	1 to 8	1 to 10
Output connector type		Active Guard Triaxial (Force / Sense)	Active Guard Triaxial (Force / Sense)	Active Guard Triaxial (Force / Sense)	Active Guard Triaxial (Force / Sense)	Active Guard Triaxial (Force / Sense)
SMU features	Source operation	Voltage or current source with 4-quadrant operation (source and sink)	Voltage or current source with 4-quadrant operation (source and sink)	Voltage or current source with 4-quadrant operation (source and sink)	Voltage or current source with 4-quadrant operation (source and sink)	Voltage or current source with 4-quadrant operation (source and sink)
	Auto-ranging	Yes	Yes	Yes	Yes	Yes
	Compliance (limit)	Yes	Yes	Yes	Yes	Yes
Current-voltage measurement capability	Spot	Yes	Yes	Yes	Yes	Yes
	Sweep	Yes	Yes	Yes	Yes	Yes
	Time sampling	No	No	No	No	Yes
Advanced measurement capability	Capacitance	No <sup>1</sup>	No <sup>1</sup>	No <sup>1</sup>	No <sup>1</sup>	Yes
	Ultra-fast pulsed IV / Transient IV	No	No	No	No	Yes
Measurement setup and control	Mouse & keyboard operation	Yes	Yes	Yes	Yes	Yes
	Classic test	Yes	Yes	Yes	Yes	Yes
	Application test	Yes	Yes	Yes	Yes	Yes
	Tracer test	Yes	Yes	Yes	Yes	Yes
	Test sequence	Yes	Yes	Yes	Yes	Yes
	Switch and prober control	Yes	Yes	Yes	Yes	Yes

1. QSCV measurement by SMU is not supported.

## Keysight's Parametric Test Solutions Meet Your Measurement Needs (continued)

### Comparison table (continued)

		Precision IV Analyzer (2ch model)		Precision IV Analyzer (8ch model)		Advanced Device analyzer
		E5262A	E5263A	E5260A	E5270B	B1500A
Data analysis and management	Data management by workspace	Yes	Yes	Yes	Yes	Yes
	Graphical display with auto analysis	Yes	Yes	Yes	Yes	Yes
	Automated data store	Yes (Measurement setup and result)	Yes (Measurement setup and result)	Yes (Measurement setup and result)	Yes (Measurement setup and result)	Yes (Measurement setup and result)
	Automated data export	Yes (Excel dynamic link, Excel files, CSV files, images, text, EasyEXPERT file)	Yes (Excel dynamic link, Excel files, CSV files, images, text, EasyEXPERT file)	Yes (Excel dynamic link, Excel files, CSV files, images, text, EasyEXPERT file)	Yes (Excel dynamic link, Excel files, CSV files, images, text, EasyEXPERT file)	Yes (Excel dynamic link, Excel files, CSV files, images, text, EasyEXPERT file)
EasyEXPERT and analyzer controller	Built-in PC	No	No	No	No	Yes
	External PC	Yes	Yes	Yes	Yes	Yes
Group usage support	Personal analyzer environment	Yes	Yes	Yes	Yes	Yes
	Interoperability across the Keysight analyzer series	Yes	Yes	Yes	Yes	Yes
	Data protection	Yes	Yes	Yes	Yes	Yes

## Key Specification & Ordering Information

### Key specification of each SMU modules

		Precision IV Analyzer series			
		E5262A	E5263A	E5260A	E5270B
MPSMU (Medium Power SMU)	Max. output	100 V / 200 mA	100 V / 200 mA	100 V / 200 mA	100 V / 100 mA
	Min. resolution	5 pA / 100 $\mu$ V	5 pA / 100 $\mu$ V	5 pA / 100 $\mu$ V	10 fA / 0.5 $\mu$ V
HPSMU (High Power SMU)	Max. output	N/A	200 V / 1 A	200 V / 1 A	200 V / 1 A
	Min. resolution	N/A	5 pA / 100 $\mu$ V	5 pA / 100 $\mu$ V	10 fA / 2 $\mu$ V
HRSMU (High Resolution SMU)	Max. output	N/A	N/A	N/A	100 V / 100 mA
	Min. resolution	N/A	N/A	N/A	1 fA / 0.5 $\mu$ V
ASU <sup>1</sup> (Atto-sense Switch Unit)	Max. output	N/A	N/A	N/A	100 V / 100 mA
	Min. resolution	N/A	N/A	N/A	0.1 fA / 0.5 $\mu$ V

1. One ASU requires one HRSMU module to connect it.

## Ordering Information

### Ordering information of Precision IV Analyzer

The GNDU (ground unit) is furnished with the mainframe of any model. It can force 0V and sink current up to 4 A (2.2A for 2ch model). Any model contains triaxial cables for GNDU and SMU, GNDU to Kelvin adapter, USB-GPIB interface and EasyEXPERT group+ install media.

<b>Precision IV Analyzer (2ch fixed configuration)</b>			
<b>Model</b>		<b>E5262A</b>	<b>E5263A</b>
Pre-configured SMU		Two MPSMU	One MPSMU and one HPSMU
<b>Cable Length options</b>			
015	1.5m cable length	Available	Available
030	3.0m cable length	Available	Available
<b>Precision IV Analyzer (configurable up to 8 channels)</b>			
<b>Model</b>		<b>E5260A</b>	<b>E5270B</b>
Pre-configured SMU		None	None
<b>Cable Length options</b>			
015	1.5m cable length	Available	Available
030	3.0m cable length	Available	Available
<b>Quick configuration options</b>			
A01	Four MPSMU package	Available	Available
A02	Two MPSMU and two HRSMU package	Not available	Available
A03	Four HRSMU package	Not available	Available
<b>Add-on module options</b>			
A10	Add one HPSMU (2 slots)	Available	Available
A11	Add one MPSMU (1 slot)	Available	Available
A17	Add one HRSMU (1 slot)	Not available	Available
A28	Add Atto-sense and Switch Unit (ASU) <sup>1</sup>	Not available	Available

1. Option A28 requires HRSMU modules by option A02, A03 or A17.

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