U2722A/U2723A USB Modular Source Measure Unit

Put a Bench in Your Bag

The next time you're called out to solve tough problems in electronic products or processes, leave the bulky transit cases behind. With Keysight Technologies, Inc.'s USB modular instrument (MI) family, you can easily carry powerful test gear in your bag along with your laptop PC.

Our line of MIs includes two oscilloscopes, a DMM, a function generator with arbitrary waveform capability, a source/measure unit and a 4x8 switch matrix. All provide USB 2.0 connectivity (with USBTMC-USB488) standard and plug-and-play simplicity for easy use on the go or on the bench.

Notice: The U2722A/U2723A will be discontinued on June 1, 2024. The last day to place order for this product is May 31, 2024. Keysight will continue to provide world-class support for this product for the standard period of 5 years.

KEYSIGHT

Features

- Four-quadrant operation (± 20 V, ± 120 mA)
- 100 pA measurement sensitivity with 16-bit resolution
- 0.1% basic accuracy
- Embedded test script (for U2723A, details on Page 3)
- IV Curve application support (for U2723A, on KMM and BenchVue)
- Hi-Speed USB 2.0 connectivity
- Dual-play operation: standalone and modular capability
- **NEW!** Control, automate and simplify with Keysight BenchVue software. Now included.
- Compatible with a wide range of Keysight Development Environments (KDEs)

Keysight U2722A/U2723A USB Modular Source Measure Unit (SMU)

The U2722A and U2723A are 3-channel SMUs, the size of a typical novel, and flexibly operate as standalone units or as modular units in the U2781A USB modular product chassis. Each SMU provides voltage and current programming/readback with

high-accuracy measurement capabilities. Each of the three channels may be configured separately or in a matrix – in series or parallel. These versatile SMUs allow you to perform sweep and measurement with just a single device, without extra configurations.

Figure 1. U2722/3A used as a standalone instrument

Figure 2. U2722/3A used as a modular instrument

Control, Automate and Simplify with BenchVue — No Programming Needed (Now Included)

Keysight BenchVue software for the PC eliminates many of the issues around bench testing. By making it simple to connect, control instruments, and automate test sequences, you can quickly move past the test development phase and access results faster than ever before with just a few clicks. BenchVue supports hundreds of Keysight instrument types and models all from one easy to use application. Control, Automate, Simplify with BenchVue.

Keysight U2700A series USB Modular Instruments won Design News' Golden Mousetrap Award in the 2009 Best Products Category.

Keysight U2723A USB SourceMeasure Unit won the 20th Annual Electronic Design, Strategy, News (EDN) Innovation Award in the DC and Low-Frequency Test category.

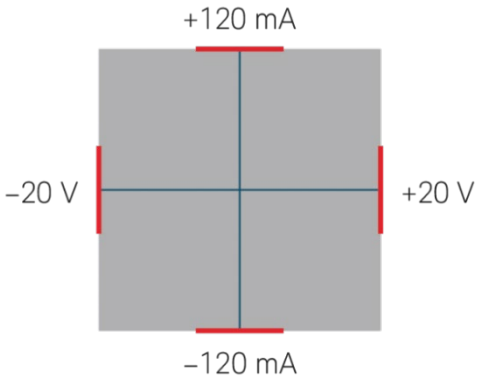
Increase the efficiency of your tests

With a high measurement sensitivity of 100 pA at 16-bit resolution for pico-level measurement and 0.1% accuracy, the U2722A/U2723A USB Modular Source Measure Unit provides detailed and accurate analysis and measurement results. The U2722A/U2723A supports SCPI and IVI-COM, and is compatible with a wide range of Keysight Development Environments. Both choices of application software, the Keysight Measurement Manager (KMM) software and BenchVue USB Modular SMU App, help kickstart and simplify your SMU measurements.

Pre-define test configurations and execute commands automatically

The U2723A USB Modular SMU provides an embedded test script to help you pre-define test configurations or duplicate tests easily without spending too much time on programming. Each channel in the U2723A is allocated two memory lists, each capable of storing up to 200 commands and results individually. Stored commands in active memory will be executed accordingly while the measurement results obtained are automatically stored in the result buffer.

Four-quadrant operations with high measurement sensitivity and accuracy



The U2722A/U2723A SMU is a versatile device that allows you to perform sweep and measurement from different operating regions without needing extra configurations. The four-quadrant operation

(± 20 V, ± 120 mA) makes the U2722A/U2723A SMU well suited for a wide range of test applications, including leakage measurement, solar cell measurement, forward/reverse voltage and curve tracer transistors. The U2722A/U2723A SMU also offers high measurement sensitivity with 16-bit resolution and accuracy that allows you to obtain more accurate analysis and measurement results.

Fixture and upgraded software for semiconductor testing

The Keysight U2941A Parametric Test Fixture is designed to complement usage of the Keysight U2722A/U2723A USB Modular SMU in the testing of pin-through-hole semiconductor components, including SMT and DIP ICs. The U2941A comes with three input channels, a common ground, and five types of socket modules of various pin configurations.

The included Parametric Measurement Manager software allows easy set-up of the U2722A/U2723A and U2941A for parametric test, simplifies testing and enables recording of data. The software also supports the U2751A USB Modular Switch Matrix when used with the U2722A/U2723A SMU.

A purchasable upgraded software, the Keysight Parametric Measurement Manager Pro (U2942A), analyzes discrete semiconductor and plots the results in an IV curve. See page 9 for more information on the PMM Pro software.

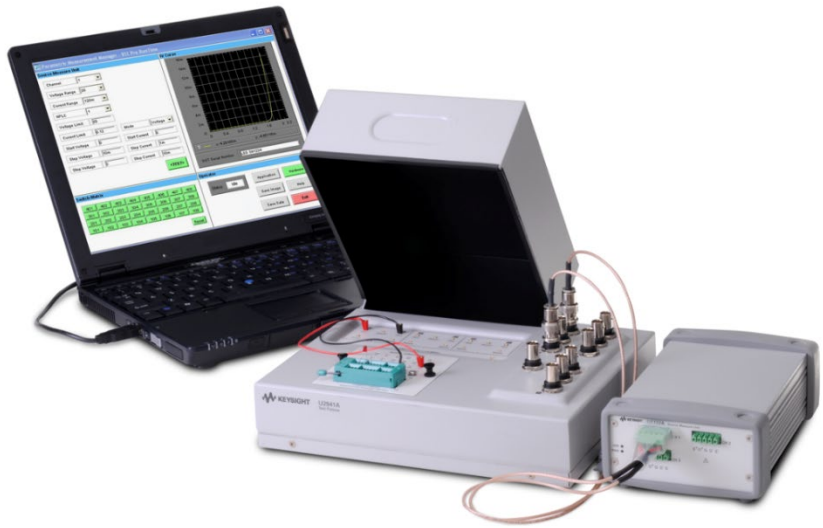


Figure 3. Download specifications for the U2941A parametric test fixture from www.keysight.com/find/U2941A

U2722A/U2723A USB Modular Source Measure Unit

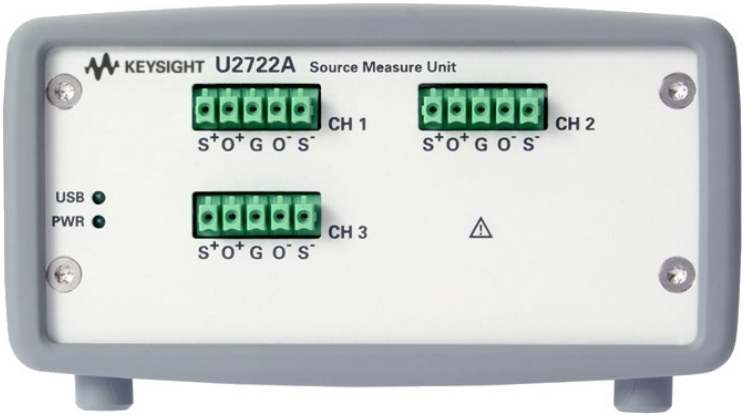
Product characteristics and general specifications

Remote interface	• Hi-Speed USB 2.0 • USBTMC-USB4881
Power consumption	• +12 VDC, 3 A maximum • Isolated ELV supply source
Operating environment	• Operating temperature from 0 °C to +50 °C • Relative humidity at 20% to 85% RH (non-condensing) • Altitude up to 2000 meters • Pollution Degree 2 • For indoor use only
Storage compliance	–20 °C to 70 °C
Safety & EMC compliance	Refer to Declaration of Conformity for the latest revisions of regulatory compliance at: www.keysight.com/go/conformity
Shock and vibration	Tested to IEC/EN 60068-2
IO connector	Output connectors
Dimension (W × D × H)	Module dimension: • 120.00 mm x 183.00 mm x 66.00 mm (with bumpers) • 105.00 mm x 175.00 mm x 50.00 mm (without bumpers)
Weight	Module dimension: • 700 g (with bumpers) • 650 g (without bumpers)

1. Compatible with Microsoft Windows operating systems only. Requires a direct USB connection to the PC so the appropriate driver can be installed in the USB modular instrument.

Product outlook and dimensions

Front view



Top view

Rear view

Specifications

Model	U2722A/U2723A
Number of outputs	3

Output ratings (at 0 °C to 50 °C)

Voltage	–20 V to 20 V
Current	–120 mA to 120 mA

Performance specification

U2722A/U2723A	Range	Accuracy[1]	Resolution
Voltage programming 12 months (at 25 °C ± 3 °C), ± (% of output + offset)	± 2 V	0.075% + 1.5 mV	0.1 mV
	± 20 V	0.05% + 10 mV	1 mV
Current programming 12 months (at 25 °C ± 3 °C), ± (% of output + offset)	± 1 µA	0.085% + 0.85 nA	100 pA
	± 10 µA	0.085% + 8.5 nA	1 nA
	± 100 µA	0.075% + 75 nA	10 nA
	± 1 mA	0.075% + 750 nA	100 nA
	± 10 mA	0.075% + 7.5 µA	1 µA
	± 120 mA	0.1% + 100 µA	20 µA
Voltage readback 12 months (over USB with respect to the actual output at 25 °C ± 3 °C), ± (% of output + offset)	± 2 V	0.075% + 1.5 mV	0.1 mV
	± 20 V	0.05% + 10 mV	1 mV
Current readback 12 months (over USB with respect to the actual output at 25 °C ± 3 °C), ± (% of output + offset)	± 1 µA	0.085% + 0.85 nA	100 pA
	± 10 µA	0.085% + 8.5 nA	1 nA
	± 100 µA	0.075% + 75 nA	10 nA
	± 1 mA	0.075% + 750 nA	100 nA
	± 10 mA	0.075% + 7.5 µA	1 µA
	± 120 mA	0.1% + 100 µA	20 µA

1. Accuracy measurements are based on NPLC 10.

Product Characteristics

Performance characteristics

Rise/fall time (ms)[1]		U2722A	U2723A
For resistive measurement[2]	± 1 µA	170.0	15.0
	± 10 µA	18.0	5.0
	± 100 µA	6.0	1.0
	± 1 mA	1.0	1.0
	± 10 mA	1.0	1.0
	± 120 mA	1.0	1.0

Remote sense operating range	**Ensure that the maximum voltage between the OUTPUT+ and SENSE+, OUTPUT–, wand SENSE– does not exceed 3 V**
Temperature coefficient	Maximum change in output/readback per °C after a 30-minute warm-up is 0.15
Guard output resistance	0.2 kΩ
Noise 10 Hz to 20 MHz (peak-peak)	100 mV typical into a resistive load (floating mode)
Output voltage overshoot, ±(% of output + offset)[2]	During turn-on or turn-off, the output plus overshoot < 0.1% + 10 mV
Programming language	SCPI (Standard Commands for Programmable Instruments)
Maximum sense lead resistance	1 MΩ for rated accuracy
Voltage line regulation	0.01% of range
Voltage load regulation	0.01% + 100 µV
Current line regulation	0.04% of range
Current load regulation	0.04% + 100 µA
Recommended calibration interval	One year
Maximum input capacitance load	10 nF

1. Drive 50% of 1 V or 10 V output with a resistive load. Rise time is from 10% to 90% of program voltage change at maximum current. Fall time is from 90% to 10% of program voltage change at maximum current.
2. Measurements obtained are per default bandwidth setting.

NOTE:

- All channels are isolated from the ground and from each other. Isolation is +60 VDC, Category 1.
- All specifications are based on a three-hour warm-up time.
- The measurement accuracy value is x (1 + a * y), where,
  - x = accuracy specification at room temperature,
  - a = temperature coefficient, and
  - y = temperature change from room temperature in °C

Noise 10 Hz to 20 MHz (Peak-peak)

Voltage range	**Current range**					
	1 µA	10 µA	100 µA	1 mA	10 mA	120 mA
2 V	50 mV	50 mV	50 mV	50 mV	30 mV	30 mV
20 V	50 mV	50 mV	50 mV	50 mV	30 mV	30 mV

USB Modular SMU App within BenchVue

BenchVue software for the PC makes it simple to connect, control, capture and view multiple Keysight instruments simultaneously with no additional programming. You can derive answers faster than ever by easily viewing, logging and exporting measurement data and screen images with a few clicks from a single environment.

Figure 4. Download specifications for the U2941A parametric test fixture from www.keysight.com/find/U2941A

- Visualize multiple measurements simultaneously
- Easily log data, screen shots and system state
- Rapidly prototype custom test sequences
- Recall past states of your USB Modular to replicate results
- Export measurement data in the desired format fast
- Quickly access manuals, drivers, FAQs and videos

The USB Modular SMU App within BenchVue allows you to quickly control the U2722A/U2723A SMU to visualize measurements, perform data logging and annotate captured data. With BenchVue, you can visualize multiple SMU channels simultaneously, in addition to performing the following:

- Configure SMU channels – in serial or parallel – to achieve higher throughput
- Configure voltage and current source, range and limit for each channel
- Display source and measure concurrently for each channel
- Plot IV Curve (with U2723A)

In just a few clicks, you can also record measurements and export results to popular PC-friendly applications such as Microsoft Excel and Microsoft Word for further analysis. Get started with BenchVue, downloadable at no cost at www.keysight.com/find/benchvue

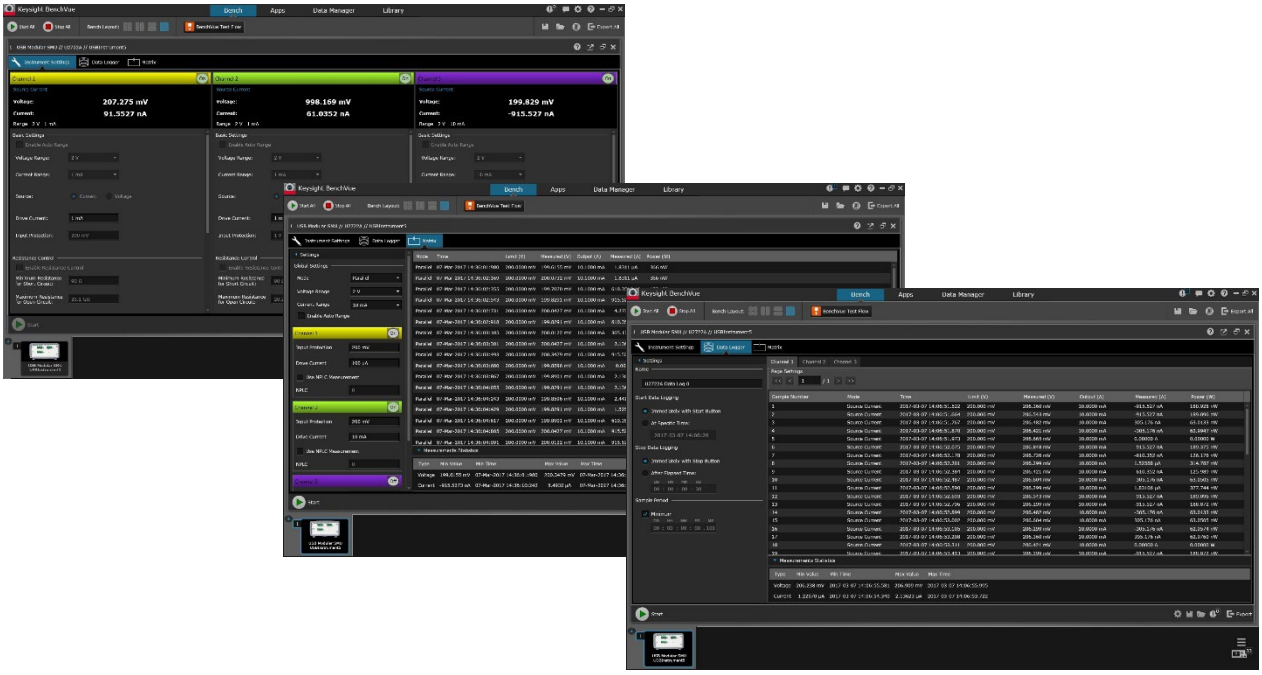


Figure 5. Visualize all 3 channels simultaneously and configure your SMU easily on BenchVue's modern interface.

U2941A Parametric Test Fixture

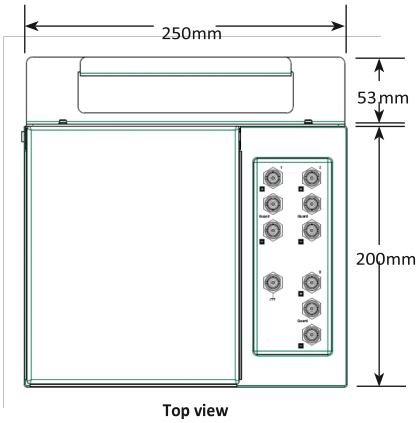
Specifications and system requirements

Specifications	
The following specifications are valid for 23 °C ±5 °C and <70% relative humidity.	
Electrical specifications	
Voltage rating	60 VDC
Current rating	1 A
Environmental specifications	
Operating temperature	0 °C to 50 °C
Storage temperature	–20 °C to 70 °C
Operating humidity	20% to 85% RH non-condensing
Storage humidity	5% to 90% RH non-condensing
Altitude	Up to 2000 m
Physical specifications	
Dimensions (WxDxH)	250 mm × 200 mm × 120 mm
Weight	1.33 kg (approx.)

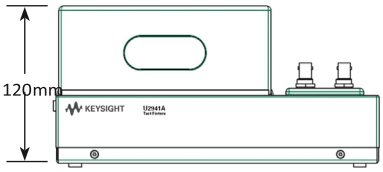
Minimum System Requirement

Hardware	
Processor	1.6 GHz Pentium IV or higher
RAM	512 MB (1.0 GB or higher recommended)
Hard disk space	1.0 GB free disk space at runtime
Display resolution	1024 × 768 recommended
Operating system and browser	
Operating system	Windows XP Professional or Home Edition, Service Pack 1 or later; or Windows 2000 Professional, Service Pack 4 or later
Browser	Microsoft Internet Explorer 5.01 (6.0 or higher recommended)
Software	
Keysight IO Libraries Suite	Version 15.0 or higher
Keysight VEE	Runtime version 8.5, patch 8.5.1
Keysight Measurement Manager	Version 1.6 or higher
Microsoft .NET Framework	Version 1.1 and 2.0

Dimensions



Top view



Front view

Ordering Information

U2722A	USB modular source measure unit
U2723A	USB modular source measure unit with embedded test scripts
U2941A	Parametric test fixture, shipped with: • Assembly PTFE plate • 28-pin dual-in-line package (DIP) socket module • 0.1-inch universal socket module • 0.075-inch universal socket module • 0.05-inch universal socket module • Pin plug-to-pin plug cables, black (4 pcs) • Pin plug-to-pin plug cables, red (4 pcs) • Pin plug-to-pin plug cables, blue (4 pcs) • Pin plug-to-miniature clip cables, black (4 pcs) • Pin plug-to-miniature clip cables, blue (4 pcs) • PCB jumper pin • BNC to two-wire cable, 1 m (3 pcs)

Optional Accessories for the U2700 Series

U2921A-101	USB secure cable, 2 m

Optional Accessories for the U2941A Parametric Test Fixture

U2941A-101	Pin plug-to-pin plug cable, black
U2941A-102	Pin plug-to-pin plug cable, red
U2941A-103	Pin plug-to-pin plug cable, blue
U2941A-104	Pin plug-to-miniature clip cables, black
U2941A-106	Pin plug-to-miniature clip cables, blue
U2941A-107	BNC to two-wire, 1 m
U2941A-201	Assembly PTFE plate • Insulation board with minimal leakage current; suitable for extremely low-current measurement
U2941A-202	28-pin dual-in-line package (DIP) socket module Lever actuated zero insertion force (ZIF) socket
U2941A-203	0.1-inch universal socket module • 0.1-inch pitch; suitable for virtually any device such as components, DIP IC or small scale circuit
U2941A-204	0.075-inch universal socket module • 0.075-inch pitch; suitable for virtually any device such as components, DIP IC or small scale circuit
U2941A-205	0.05-inch universal socket module • 0.05-inch pitch; suitable for any device such as components, DIP IC or small scale circuit

Other Products in the Keysight USB Modular Test Instruments Family

U2701A/U27012A USB modular oscilloscope

Features

- High sampling rate up to 500 MSa/s, enabling accurate measurement analysis
- Up to 32 MB large memory
- Fast Fourier transfer (FFT) and waveform math functions enables easy waveform calculation

For more information: www.keysight.com/find/usbscope

U2741A USB modular digital multimeter (DMM)

Features

- Fast reading speed (up to 100 Sa/s)
- Wide range of basic measurement functions, including frequency and temperature measurements

For more information: www.keysight.com/find/U2741A

U2751A USB modular switch matrix

Features

- Minimal cross-talk of -30 dB at 45 MHz wide bandwidth
- High bandwidth at 45 MHz without terminal block
- Capability to test up to four devices-under-test (DUTs)
- Works with other Keysight instruments for multi-point testing

For more information: www.keysight.com/find/U2751A

U2761A USB modular function/arbitrary waveform generator

Features

- Direct digital synthesis (DDS) waveform generator
- Pulse generator that can generate pulse signal as stimulus
- Easy customization with Arbitrary Waveform Editor
- Internal modulation capability simplifies test setup

For more information: www.keysight.com/find/U2761A

U2781A USB modular product chassis

Features

- Expansion of channels for each modular product
- Multiple instrument synchronization
- Internal and external 10 MHz reference clock
- High-speed USB 2.0
- SSI/Star trigger bus synchronization between external trigger source and modules

For more information: www.keysight.com/find/U2781A

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.

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