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Side-By-Side Comparison of the Agilent 34405A and Fluke 45 Digital Multimeters

Application Note



Agilent Technologies

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Introduction

The Agilent 34405A 5.5-digit digital multimeter is the latest member of Agilent's digital multimeter (DMM), expanding Agilent's offerings in electronics measurement tools. It provides a broad range of measurement functions. Features such as DC voltage, DC current, true-RMS AC voltage and AC current, 2-wire resistance, frequency measurement, diode test, and continuity measurement functions are designed to meet general industrial needs. It is rich in features, fast, accurate, reliable, and easy to use.

This application note explains the differences between Agilent 34405A and Fluke 45 digital multimeters. Agilent has verified and tested all of the features and specifications discussed in this document.

The points of comparison include:

- Feature comparison
- SCPI capabilities
- Programming interfacing differences
- Mechanical compatibility

For more detailed product information, see Page 5 for other relevant product literature.

Throughout this document, we use the following shorthand terms when referring to the various products and product families:

- "**34405A**" refers to the Agilent 34405A 5.5-digit digital multimeter
- "**Fluke 45**" refers to the Fluke 45 5-digit digital multimeter

Compare Key Features

The resolution, digits, and counts of a DMM are the key factors that determine its compatibility with any applications and uses. If the basic features match your needs, then it will be worthwhile to evaluate other features the DMM offers.

Resolution, Digits, Counts, and Speed

Resolution refers to how good a measurement a DMM can make. The terms *digits* and *counts* are used to describe a DMM's resolution. Table 1 shows that the 34405A has higher resolution, digits, and counts when compared to Fluke 45. The 34405A is a 5.5-digit DMM with 120000-count resolution whereas Fluke 45 is a 5-digit DMM with 99999-count resolution. The 34405A can achieve a reading speed at 4.5 digit DMM of 70 readings/sec while Fluke 45 can achieve 20 readings/sec.

Measurement Functions, Math Operations, and Ranges

As shown in Table 2, the 34405A offers two additional measurement functions – temperature and capacitance.

As for the math operations, Fluke 45 provides eight math operations and 34405A offers six math operations.

Table 3 shows the different ranges for the DC and AC functions of both the 34405A and Fluke 45.

Table 1 Comparison of digits, resolution, and reading speed

	34405A	Fluke 45
Digits	5.5	5
Resolution	120000	99999
Reading speed	70 readings/s	20 readings/s

Table 2 Comparison of measurement functions and math operations

	34405A	Fluke 45
Measurement functions	DC voltage	DC voltage
	DC current	DC current
	AC voltage	AC voltage
	AC current	AC current
	2 W resistance	2 W resistance
	Frequency	Frequency
	Diode	Diode
	Continuity	Continuity
	Temperature	
	Capacitance	
Math operations	Min/Max	Min/Max
	dB	dB
	dBm	Hold
	Null	REL
	Limit	Comp (compare)
	Hold	REF#
		REFΩ
		THRESH

Table 3 Comparison of ranges

		34405A	Fluke 45
DC functions and ranges	DC voltage	100 mV to 1000 V	300 mV to 1000 V
	DC accuracy	250 ppm	250 ppm
	DC current	10 mA to 10 A	30 mA to 10 A
	2 W resistance	100 Ω to 100 MΩ	300 Ω to 100 MΩ
	Diode test	1 V 0.83 mA	3.2 V 0.75 mA
	Capacitance	1 nF to 10000 μF	none
	Temperature	-80 °C to 150 °C	none
AC functions and ranges	True RMS AC Voltage	100 mV to 750 V	300 mV to 750 V
		20 Hz to 100 kHz	20 Hz to 100 kHz
	True RMS AC Current	10 mA to 10 A	10 mA to 10 A
		20 Hz to 10 kHz	20 Hz to 2 kHz
Frequency	20 Hz to 300 kHz	5 Hz to 1 MHz	

Evaluate Programming Capabilities

In this section, some aspects of instrument programming will be considered and they are connectivity, software, and SCPI compatibility.

Connectivity

General Purpose Interface Bus (GPIB) has been the de facto standard for test system input/output (I/O) for many years. In the computer world, cost-effective, easy-to-use LAN and USB interfaces have become pervasive, and most current-generation personal computers (PCs) include both types of ports. LAN and USB ports are becoming more and more common in test equipment and they offer test-system developers distinct advantages.

Fluke 45 DMM provides RS-232 and GPIB (Option) interfaces, whereas the 34405A offers a USB 2.0 interface. USB 2.0 provides an inexpensive, auto-detect, robust, and easy-to-use connection to your PC, and no extra GPIB card is needed.

Software

Both the 34405A and Fluke 45 can be programmed with the IVI-COM and VISA drivers provided. The 34405A is compliant with the TMC-488.2 standard, while the USB interface works seamlessly with Agilent connectivity software and can be controlled remotely with industry standard SCPI commands or through DMM Intuilink connectivity software.

SCPI Compatibility

Standard Commands for Programmable Instruments (SCPI) is an ASCII-based instrument command language designed for test and measurement instruments. Both the 34405A and Fluke 45 can be programmed using the SCPI command set. However, they have different hierarchical structures (tree systems), and the SCPI command sets for the two DMMs are almost entirely incompatible. Figure 1 shows that the 34405A and Fluke 45 have entirely different SCPI commands hierarchical structures (tree systems) except for one subsystem, which is the IEEE-488 Common commands set.

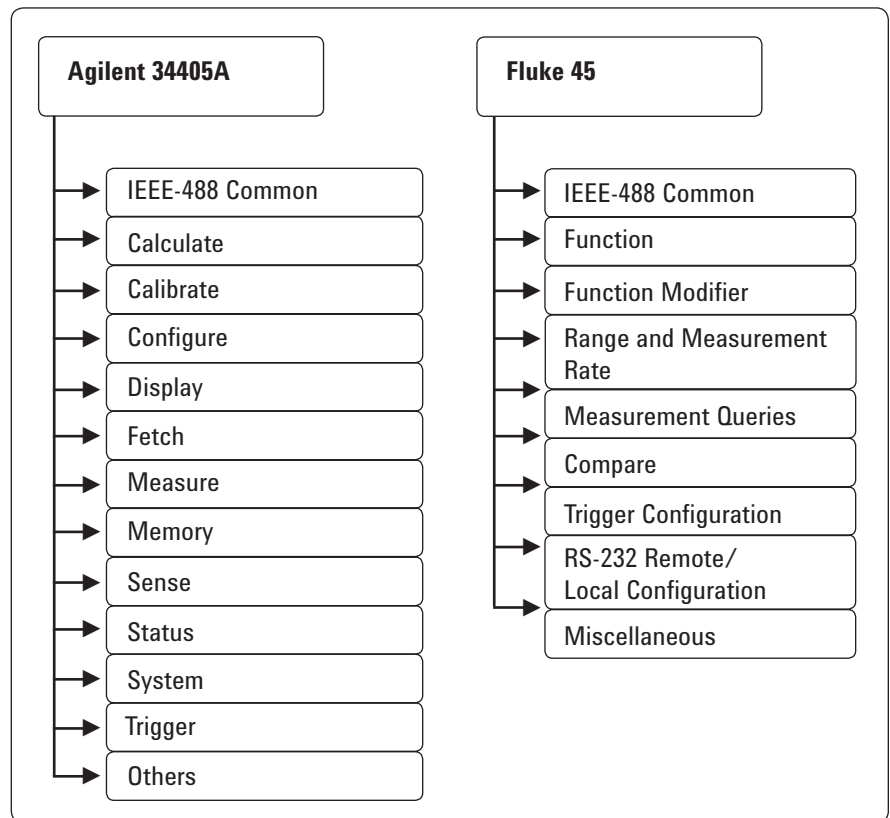


Figure 1. Hierarchical structures (tree systems) of the 34405A and Fluke 45 DMMs

Mechanical Differences

The 34405A and Fluke 45 have approximately the same dimensions. The 34405A measures 212.6 mm wide, 88.5 mm deep, and 272.3 mm high, whereas Fluke 45's dimensions are 216 mm by 93 mm by 286 mm. This means the Fluke 45 is slightly bigger than 34405A. Although these two DMMs have approximately the same dimensions, their designs for both front and rear panels are completely different. Both DMMs' front panels also have their own function buttons with dual displays. The main difference on the rear panel is that, the 34405A has only one USB interface while Fluke 45 has an RS-232 interface with an optional GPIB (IEEE 488) interface.

Conclusion

This application note has listed many points of comparison between the 34405A and Fluke 45. The results of these comparisons are summarized as follows:

- The 34405A is rich in features, fast, accurate, reliable, and easy to use.
- The 34405A provides a broad range of measurement functions.
- Most SCPI commands for the two DMMs are not compatible due to the differences in hierarchical structure.
- The USB interface of the 34405A provides a robust, fast and easy connection.
- There are not many mechanical differences between the 34405A and Fluke 45.

Related Literature

The following Agilent product literatures can help you select the best digital multimeter for your application:

- The 34405A Digital Multimeter Data Sheet, 5989-4906EN <http://cp.literature.agilent.com/litweb/pdf/5989-4906EN.pdf>
- The 34405A Digital Multimeter User's and Service Guide, 34405-91000 <http://cp.literature.agilent.com/litweb/pdf/34405-91000.pdf>



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Revised: July 17, 2008

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Printed in USA, July 17, 2008

5989-5979EN



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