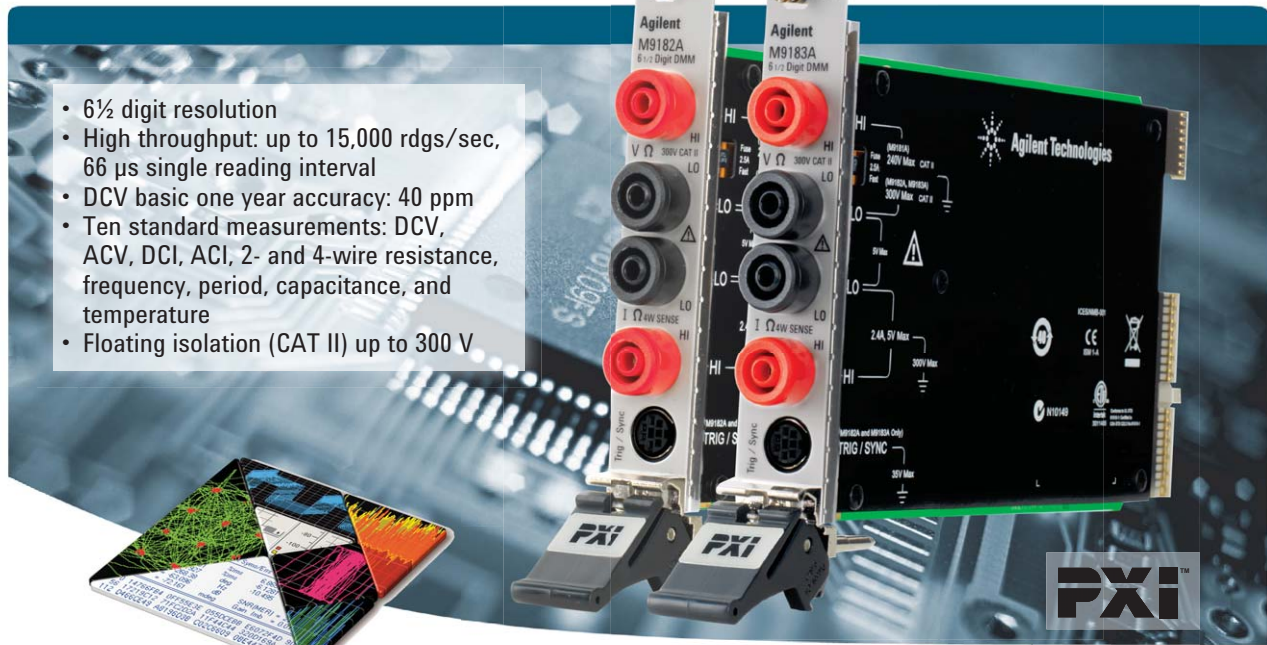


Agilent PXI Digital Multimeters



Data Sheet

6½ Digit, High Performance
M9182A
M9183A



Discover the Alternatives...

... Agilent **Modular** Products



Agilent Technologies

OVERVIEW

Agilent's M9182A and M9183A 6½ digit high performance PXI digital multimeters (DMMs) offer fast throughput, flexible measurements, and trustworthy results. The M9182A provides ten built-in measurement types with all the accuracy and stability you would expect from an Agilent 6½ digit DMM. The M9183A provides the same capabilities as the M9182A, with market-leading measurement speed of up to 15,000 readings per second, additional ranges, and a DC source.

Industries and Applications

- Aerospace and defense
- Automotive electronics test
- Industrial electronics test
- Medical device test
- Semiconductor and component test



Features

- 6½ digit resolution
- Up to 15,000 readings per second, 66 µs single reading interval time (M9183A)
- Up to 4,500 readings per second, 222 µs single reading interval time (M9182A)
- Basic 1 year DCV accuracy of 40 ppm
- DCV, ACV, DCI, ACI, 2- and 4-wire resistance, frequency, period, capacitance, and temperature
- Pulse width, duty cycle, and totalizer/event counter (M9183A)
- DC voltage and current source (M9183A)
- External trigger in and DMM out, to synchronize with external multiplexers and instruments
- Analog threshold trigger with pre- and post- levels for measuring the correct signal
- Floating isolation (CAT II) to 300 V
- Software drivers to support most common programming environments
- Chassis connector compatibility: PXI-1 (J-1 only), PXIe hybrid slot

Customer Values

- Measurements you can trust
- Higher test throughput due to the lowest latency
- Application development in the environment of your choice reduces development time
- Customer supportable calibration procedures as well as calibration services available from Agilent

PXI-DMM M918xA Feature Summary

All three products are 6½ digit PXI DMMs that take DCV, ACV, DCI, ACI, 2- and 4-wire resistance measurements.

DMM	Description	DCV basic 1 year accuracy	Maximum reading rate at 4½ digits	Other measurements	Triggering	DC source
M9181A*	Basic features PXI DMM	90 ppm	150 rdgs/sec	None	Immediate	n/a
M9182A	High performance PXI DMM	40 ppm	4,500 rdgs/sec	Temperature, capacitance, frequency, period	Immediate, analog threshold, PXI trigger bus, external	n/a
M9183A	Enhanced performance PXI DMM	40 ppm	15,000 rdgs/sec	Temperature, capacitance, frequency, period, offset compensated Ω, pulse width, duty cycle, totalizer/ event counter	Immediate, analog threshold, PXI trigger bus, external	± 10 V ± (1.2 µA to 12 mA)

*This table and more information about the M9181A can be found in the M9181A data sheet, literature number 5990-9035EN.

EASY SETUP... TEST... AND MAINTENANCE

Hardware Platform

Compliance

The M9182A and M9183A 6½ digit DMMs are PXI compliant, using either a cPCI (J1), PXI-1 (J1) or PXIe Hybrid slot. Designed to benefit from fast data interfaces, an M9182A or M9183A DMM can be integrated with other test and automation modules in a PXI, CompactPCI, or Hybrid chassis. The PXI format offers high performance in a small, rugged package. It is an ideal deployment platform for many automated test systems. A wide array of complementary PXI products are currently available. Products from Agilent include switches, multiplexers, digitizers, waveform generators, and local oscillators.

Software Platform

IO Libraries Suite

Agilent IO Libraries Suite offers fast and easy instrument connections. IO Libraries Suite 16.1 supports PXI, helping you display all of the modules in your system, view information about installed software and allows you to more easily find the right driver and start module soft front panels directly with Agilent Connection Expert.

National Instruments IO libraries are also supported, and may be used along with Agilent IO libraries.

Drivers

Agilent's digital multimeters come complete with software drivers for Windows® XP, Windows Vista, and Windows 7 (32 and 64 bit). These software drivers work in the most popular test and measurement development environments including: LabVIEW, Visual Studio® (C, C++, C#, Visual Basic), MATLAB, and VEE.

Easy software integration

Application code examples are included for LabVIEW, Visual Basic, C/C++, C#, and MATLAB – demonstrating DMM set up and basic functionality. These application code examples can be used to help you integrate the DMM module into your measurement system.

Soft front panel

The soft front panel provides easy to use instrument control. The M9182A and M9183A graphical user interface guides developers through module setup so users can quickly configure the DMM.

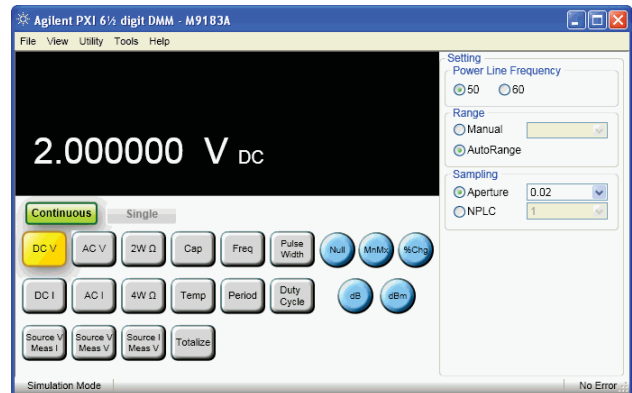


Figure 1. M9183A soft front panel

One notable feature of the soft front panel is the Driver Call Log which allows the user to see the driver calls for each button pushed. The user can then incorporate the driver calls into their application program – enabling fast and easy program development.

Calibration

Each M9182A and M9183A DMM is factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate.

Calibration is required once per year. A documented calibration process allows you to do in-rack calibration using standard calibration sources. Alternatively, Agilent and 3rd party calibration labs offer calibration services for the M9182A and M9183A DMMs.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

M9182A and M9183A: Accuracy specifications \pm (% of reading + % of range) ^{1,2}					
Function	Range ³	Frequency	24 hour 23 °C \pm 1 °C	90 day 23 °C \pm 5 °C	1 year 23 °C \pm 5 °C
DC voltage	200.0000 mV		0.0030 + 0.0005	0.0040 + 0.0008	0.0050 + 0.0010
	2.000000 V		0.0020 + 0.0002	0.0030 + 0.0002	0.0040 + 0.0003
	20.00000 V		0.0040 + 0.0006	0.0050 + 0.0007	0.0070 + 0.0008
	200.0000 V		0.0030 + 0.0002	0.0040 + 0.0001	0.0050 + 0.0003
	300.0000 V		0.0130 + 0.0002	0.0230 + 0.0003	0.0250 + 0.0003
True RMS, AC voltage ^{4,5} (Fast RMS off)	200.0000 mV ⁶	10 Hz - 20 Hz	3.00 + 0.18	3.10 + 0.19	3.20 + 0.22
		20 Hz - 47 Hz	0.37 + 0.08	0.38 + 0.09	0.40 + 0.10
		47 Hz - 10 kHz	0.13 + 0.05	0.14 + 0.06	0.15 + 0.06
		10 kHz - 50 kHz	0.25 + 0.08	0.26 + 0.10	0.27 + 0.12
		50 kHz - 100 kHz	1.90 + 0.18	1.95 + 0.19	2.00 + 0.20
	2.000000 V	10 Hz - 20 Hz	3.00 + 0.10	3.10 + 0.11	3.20 + 0.13
		20 Hz - 47 Hz	0.37 + 0.07	0.38 + 0.08	0.40 + 0.09
		47 Hz - 10 kHz	0.05 + 0.05	0.06 + 0.06	0.07 + 0.06
		10 kHz - 50 kHz	0.32 + 0.06	0.33 + 0.07	0.35 + 0.08
		50 kHz - 100 kHz	1.90 + 0.08	2.00 + 0.09	2.10 + 0.10
	20.00000 V	10 Hz - 20 Hz	3.00 + 0.07	3.10 + 0.08	3.30 + 0.10
		20 Hz - 47 Hz	0.37 + 0.06	0.38 + 0.07	0.40 + 0.08
		47 Hz - 10 kHz	0.06 + 0.05	0.07 + 0.06	0.07 + 0.07
		10 kHz - 50 kHz	0.18 + 0.09	0.20 + 0.11	0.22 + 0.13
		50 kHz - 100 kHz	1.30 + 0.15	1.40 + 0.18	1.50 + 0.20
	200.0000 V & 300.0000 V	10 Hz - 20 Hz	3.00 + 0.07	3.10 + 0.08	3.30 + 0.08
		20 Hz - 47 Hz	0.43 + 0.06	0.44 + 0.07	0.45 + 0.08
		47 Hz - 10 kHz	0.07 + 0.05	0.08 + 0.07	0.09 + 0.08
		10 kHz - 50 kHz	0.28 + 0.07	0.30 + 0.08	0.32 + 0.10
		50 kHz - 100 kHz	1.30 + 0.09	1.60 + 0.12	2.40 + 0.13
True RMS, AC voltage ^{4,5} (Fast RMS on)	200.0000 mV ⁶	350 Hz - 800 Hz	0.60 + 0.08	0.65 + 0.09	0.70 + 0.10
		800 Hz - 10 kHz	0.13 + 0.05	0.14 + 0.06	0.15 + 0.06
		10 kHz - 50 kHz	0.55 + 0.08	0.60 + 0.10	0.63 + 0.12
		50 kHz - 100 kHz	5.30 + 0.18	5.40 + 0.19	5.60 + 0.20
		2.000000 V	350 Hz - 800 Hz	0.93 + 0.07	0.96 + 0.08
	800 Hz - 10 kHz		0.07 + 0.05	0.08 + 0.06	0.08 + 0.06
	10 kHz - 50 kHz		0.62 + 0.06	0.65 + 0.07	0.70 + 0.08
	50 kHz - 100 kHz		5.10 + 0.08	5.20 + 0.09	5.30 + 0.10
	20.00000 V		350 Hz - 800 Hz	0.93 + 0.06	0.96 + 0.07
		800 Hz - 10 kHz	0.07 + 0.05	0.07 + 0.06	0.07 + 0.07
		10 kHz - 50 kHz	0.31 + 0.09	0.33 + 0.11	0.35 + 0.13
		50 kHz - 100 kHz	2.00 + 0.15	2.20 + 0.18	2.40 + 0.20
		200.0000 V & 300.0000 V	350 Hz - 800 Hz	1.00 + 0.06	1.10 + 0.07
	800 Hz - 10 kHz		0.07 + 0.05	0.07 + 0.07	0.08 + 0.08
	10 kHz - 50 kHz		0.34 + 0.07	0.45 + 0.08	0.50 + 0.10
	50 kHz - 100 kHz		2.50 + 0.09	2.80 + 0.12	3.20 + 0.13

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

M9182A and M9183A: Accuracy specifications \pm (% of reading + % of range) ^{1,2}					
Function	Range ³	Frequency, test current or burden voltage	24 hour 23 °C \pm 1 °C	90 day 23 °C \pm 5 °C	1 year 23 °C \pm 5 °C
Resistance ⁷	20.00000 Ω (M9183A only)	10 mA	0.004 + 0.004	0.009 + 0.004	0.014 + 0.005
	200.0000 Ω	1 mA	0.004 + 0.002	0.010 + 0.002	0.013 + 0.003
	2.000000 k Ω	1 mA	0.003 + 0.002	0.008 + 0.002	0.012 + 0.002
	20.00000 k Ω	100 μ A	0.003 + 0.002	0.008 + 0.002	0.012 + 0.002
	200.0000 k Ω	10 μ A	0.006 + 0.002	0.010 + 0.002	0.016 + 0.003
	2.000000 M Ω	1 μ A	0.018 + 0.002	0.030 + 0.003	0.040 + 0.004
	20.00000 M Ω	100 nA	0.120 + 0.002	0.130 + 0.003	0.200 + 0.003
	200.0000 M Ω (M9183A, 2-wire only)	4 nA	0.800 + 0.013	1.000 + 0.015	1.300 + 0.025
DC current	200.0000 nA (M9183A only)	< 100 μ V	0.130 + 0.020	0.160 + 0.023	0.170 + 0.030
	2.000000 μ A (M9183A only)	< 100 μ V	0.050 + 0.004	0.080 + 0.003	0.210 + 0.008
	20.00000 μ A (M9183A only)	< 100 μ V	0.050 + 0.002	0.080 + 0.003	0.130 + 0.004
	200.0000 μ A (M9183A only)	< 2.5 mV	0.052 + 0.100	0.070 + 0.150	0.100 + 0.200
	2.000000 mA	< 25 mV	0.020 + 0.015	0.030 + 0.020	0.040 + 0.028
	20.00000 mA	< 250 mV	0.020 + 0.002	0.035 + 0.003	0.045 + 0.003
	200.0000 mA	< 55 mV	0.020 + 0.025	0.030 + 0.030	0.040 + 0.040
	2.000000 A	< 520 mV	0.100 + 0.003	0.150 + 0.004	0.200 + 0.005
True RMS, AC current ⁸	2.000000 mA ⁹	10 Hz - 20 Hz	2.70 + 0.20	2.90 + 0.20	2.90 + 0.20
		20 Hz - 47 Hz	0.90 + 0.20	0.90 + 0.20	1.00 + 0.20
		47 Hz - 1 kHz	0.04 + 0.08	0.08 + 0.15	0.12 + 0.20
		1 kHz - 10 kHz	0.12 + 0.20	0.14 + 0.20	0.22 + 0.20
	20.00000 mA	10 Hz - 20 Hz	1.80 + 0.15	2.60 + 0.15	2.80 + 0.15
		20 Hz - 47 Hz	0.60 + 0.15	0.90 + 0.15	1.00 + 0.15
		47 Hz - 1 kHz	0.07 + 0.05	0.15 + 0.10	0.16 + 0.15
		1 kHz - 10 kHz	0.21 + 0.15	0.30 + 0.20	0.40 + 0.20
	200.0000 mA	10 Hz - 20 Hz	1.80 + 0.20	2.70 + 0.20	2.80 + 0.20
		20 Hz - 47 Hz	0.60 + 0.20	0.90 + 0.20	1.00 + 0.20
		47 Hz - 1 kHz	0.15 + 0.08	0.17 + 0.09	0.20 + 0.11
		1 kHz - 10 kHz	0.30 + 0.15	0.35 + 0.18	0.40 + 0.20
	2.000000 A	10 Hz - 20 Hz	1.80 + 0.20	2.50 + 0.23	2.70 + 0.25
		20 Hz - 47 Hz	0.66 + 0.30	0.80 + 0.30	0.90 + 0.30
		47 Hz - 1 kHz	0.30 + 0.19	0.33 + 0.19	0.35 + 0.20
		1 kHz - 10 kHz	0.40 + 0.20	0.45 + 0.23	0.50 + 0.25
Frequency or period ^{10, 14}	200 mV to 300 V	1 Hz - 20 Hz	0.08 + 0.01	0.08 + 0.01	0.08 + 0.01
		20 Hz - 130 Hz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		130 Hz - 640 Hz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		640 Hz - 2.5 kHz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		2.5 kHz - 40 kHz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		40 kHz - 200 kHz	0.05 + 0.01	0.05 + 0.01	0.05 + 0.01
		200 kHz - 300 kHz	0.07 + 0.01	0.07 + 0.01	0.07 + 0.01

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

M9182A and M9183A: Accuracy specifications \pm (% of reading + % of range) ^{1,2}					
Function	Range	Full scale reading or resolution	24 hour 23 °C \pm 1 °C	90 day 23 °C \pm 5 °C	1 year 23 °C \pm 5 °C
Single shot duty cycle ¹¹ [M9183A only]	2 - 100 Hz	0.02 %	0.03 \pm 0.03	0.03 \pm 0.03	0.03 \pm 0.03
	100 Hz - 1 kHz	0.20 %	0.03 \pm 0.30	0.03 \pm 0.30	0.03 \pm 0.30
	1 - 10 kHz	2.00 %	0.03 \pm 3.00	0.03 \pm 3.00	0.03 \pm 3.00
Single shot pulse width ^{12, 14} [M9183A only]	14 μ s - 62.5 ms	1 μ s	.01 \pm 4 μ s	01 \pm 4 μ s	01 \pm 4 μ s
Capacitance ¹³ [M9183A and M9182A]	1000.0 pF	1199.9 pF	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	10.000 nF	11.999 nF	1.20 + 0.05	1.20 + 0.05	1.20 + 0.05
	100.00 nF	119.99 nF	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	1.0000 μ F	1.1999 μ F	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	10.000 μ F	11.999 μ F	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	100.00 μ F	119.99 μ F	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	1.0000 mF	1.1999 mF	1.20 + 0.10	1.20 + 0.10	1.20 + 0.10
	10.000 mF	11.999 mF	2.00 + 0.10	2.00 + 0.10	2.00 + 0.10

1. Specifications are for 1 hour warm up, within 1 hour self-cal, aperture \geq 0.5 sec. Slow AC filter for AC measurements only.
2. For temperatures outside the range of 23 °C \pm 5 °C, but within 0 °C to 50 °C, add 0.1 \times accuracy specification per °C.
3. 20% over range on all ranges except 300 V range, 10% over range for 300 V range.
4. Minimum input specified: 5 mV or 1% of range, whichever is larger.
5. Signal is limited to 8×10^6 Volt Hz product. For example, at 32 kHz, the highest input is 250 V.
6. For inputs from 5 mV to 15 mV, add 100 μ V to the specification.
7. Specifications are for 4-wire resistance measurements, for 2-wire, add 1 m Ω additional error to the specification; for offset compensated ohms (M9183A only), add 0.02% of range.
8. Minimum input specified: 60 μ A or 1.5% of range, whichever is larger; for inputs $<$ 5% of full scale, add 0.02% of range.
9. For inputs from 60 to 120 μ A, add 10 μ A to the specification; for inputs $<$ 5% of full scale, add 0.1% of range.
10. Minimum amplitude greater of: 100 mV, or 5 % of range for 1 Hz to 2.5 kHz, or 25 % of range for 2.5 kHz to 200 kHz, or 40% of range for 200 kHz to 300 kHz.
11. Specifications are % of reading (0.03) \pm adder.
12. Specifications are % of reading + time.
13. Specifications apply to input signals \geq 5% of range.
14. Maximum wait time for duty cycle and period is 5 seconds.

Definitions for specifications

Specification (spec): Represents warranted performance of a calibrated instrument that has been stored for a minimum of two hours within the operating temperature range of 0 to 55 °C, unless otherwise stated, and after a one hour warm-up period. The specifications include measurement uncertainty. Data represented in this document are specifications unless otherwise noted.

Typical (typ): Represents characteristic performance, which 80% of the instruments manufactured will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 25 °C).

Nominal (nom): The expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

Measured (meas): An attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

Note: All graphs contain measured data from several units at room temperature unless otherwise noted.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

M9182A and M9183A Sensitivity (nom)		
Function	Lowest Range	Sensitivity
DCV	200.0000 mV	0.1 μ V
ACV	200.0000 mV	0.1 μ V
Resistance (M9183A)	20.00000 Ω	10 $\mu\Omega$
Resistance (M9182A)	200.0000 Ω	100 $\mu\Omega$
DCI (M9183A)	200.0000 nA	0.1 pA
DCI (M9182A)	2.000000 mA	10 nA
ACI	2.000000 mA	1 nA
Capacitance	1000.0 pF	0.1 pF

M9182A and M9183A temperature accuracy (spec) ¹					
Temperature function	Type	R ₀ (Ω)	Sensitivity	Range/max temperature	1 year 23 °C \pm 5 °C
RTD temperature measurement ^{2,3}	pt385	100 Ω , 200 Ω	0.01 °C	-150 to 650 °C	\pm 0.06 °C
		500 Ω , 1 k Ω	0.01 °C	-150 to 650 °C	\pm 0.03 °C
	Cu (Copper)	Less than 12 Ω	0.01 °C	-100 to 200 °C	\pm 0.18 °C at \leq 20 °C \pm 0.05 °C otherwise
		Higher than 90 Ω	0.01 °C	-100 to 200 °C	\pm 0.10 °C at \leq 20 °C \pm 0.05 °C otherwise
Thermocouple temperature measurement ^{4,5}	B	NA	0.01 °C	2200 °C	\pm 0.38 °C
	E	NA	0.01 °C	1200 °C	\pm 0.035 °C
	J	NA	0.01 °C	2000 °C	\pm 0.06 °C
	K	NA	0.01 °C	3000 °C	\pm 0.07 °C
	N	NA	0.01 °C	3000 °C	\pm 0.10 °C
	R	NA	0.01 °C	2700 °C	\pm 0.25 °C
	S	NA	0.01 °C	3500 °C	\pm 0.35 °C
	T	NA	0.01 °C	550 °C	\pm 0.06 °C
Thermistor ³	2.25 k Ω	NA	0.01 °C	-80 to 150 °C	\pm 0.1 °C
	5 k Ω	NA	0.01 °C	-80 to 150 °C	\pm 0.1 °C
	10 k Ω	NA	0.01 °C	-80 to 150 °C	\pm 0.1 °C

1. Specifications are for one hour warm up, within one hour self-cal, aperture \geq 0.5 sec.

2. 4-wire RTD measurement, R₀ variable 1 Ω to 7 k Ω .

3. For total measurement accuracy, add temperature probe error.

4. For total measurement accuracy, add thermocouple error and cold junction compensation.

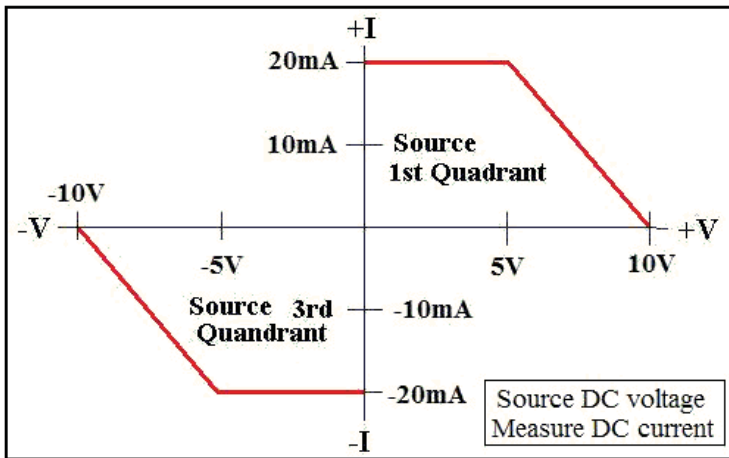
5. DMM linearization temperature range may be greater than that of the thermocouple device.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Source-Measure [(spec) unless otherwise stated)]

M9183A source DC voltage, measure DC voltage		
Parameter	Closed Loop	Open Loop
DC voltage source (output) range	+10 to -10 V	+10 to -10 V
DC source sink current at 5 V output	5 mA	5 mA
DAC resolution (nom)	18 bits /12 bits	12 bits
DC voltage source accuracy 1 Year, 23°± 5° C	0.01% ± 0.001%	0.5% ± 0.2%
Settling time (typ)	100 ms/1 ms	1 ms
Source resistance (nom)	200 ohms	200 ohms

M9183A source DC voltage, measure DC current	
DC voltage source (output) range	-10.000 to +10.000 V
DC current measurement range	0 to ± 20 mA
Voltage resolution (nom)	5 mV
Voltage source accuracy 1 Year, (23 °C ± 5 °C) ^{1,2,3,4}	2.0% ± 0.4%
Settling time (typ)	100 ms
DC current measurement accuracy	0.1% + 0.005%



M9183A source DC current, measure DC voltage			
DC voltage measurement range	0 to ± 2.0 V		
Current output	Compliance voltage	Minimum Level	Source Accuracy 1 year, (23 °C ± 5 °C) ^{1,2,3}
< 1.25 µA	4.2 V	10 nA	1% + 1%
< 12.5 µA	4.2 V	50 nA	1% + 1%
< 125 µA	4.2 V	100 nA	1% + 0.5%
< 1.25 mA	4.2 V	1 µA	1% + 0.5%
< 12.5 mA	1.2 V	10 µA	1% + 0.5%

1. Specifications are for one hour warm up, within one hour self-cal, slow AC filter.
2. For temperatures outside the range of 23 °C ± 5 °C, but within 0 °C to 50 °C, add 0.1 × accuracy specification per °C.
3. Repetitive reading at an aperture of 133 ms or higher.
4. If DCV source > 6 V, then add current * 4 ohms; if DCV source > 8 V, then add current * 30 ohms.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Triggering Characteristics

The M9182A and M9183A have advanced triggering capabilities that exceed those found on other digital multimeters. Advanced triggering enables you to obtain the signal you need and accurately measure it, in a variety of applications.

External hardware trigger

Trigger input voltage level range (at DIN 7 connector)	+3 to +15 V activates the trigger
Minimum trigger pulse width	Aperture + 50 μ s
Trigger input impedance	3 k Ω
Edge	Selectable positive or negative edge

PXI bus trigger inputs

Trigger input voltage level range (via PXI backplane)	CMOS level (see PXI standard)
Minimum trigger pulse width	Aperture + 50 μ s
Edge	Selectable positive or negative edge

Trigger features

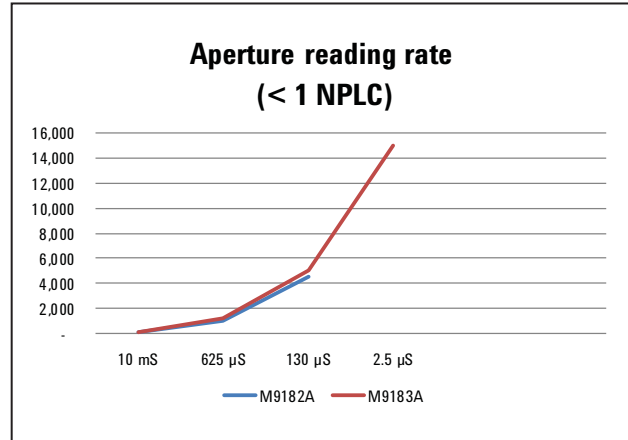
Trigger sources		Immediate, PXI trigger , external DIN connector, analog threshold trigger source
Trigger delay	Measurement delay	50 μ s to 15 s
[Auto delay (default delay) ensures 1st reading accuracy in most configurations)	Resolution	1 μ s to 65 ms and 16 μ s above 65 ms
Reading storage		Circular buffer - 80 readings
Multi Sample Mode (DCV and DCI functions only)	Aperture range	2.5 μ s to 160 ms (M9183A) 130 μ s to 160 ms (M9182A)
	Maximum read interval range	1sec for apertures \geq 625 μ s, else 65 ms
	Reading per trigger	Up to 80 readings (maximum of 78 pre-triggers or a maximum of 80 post triggers)
	Trigger sources	PXI trigger, external DIN connector, and analog threshold (accuracy within 5% of range)

MEASUREMENT CHARACTERISTICS

Resolution vs. Aperture and Reading Rate for DCV, DCI, Ω

Measurement aperture	Maximum readings per second	Resolution
10 ms	98	6½ digits (22 bits)
625 μ s	1,200	5½ digits (18 bits)
130 μ s	4,500	4½ digits (14 bits)
2.5 μ s	15,000 (M9183A only) ¹	4½ digits (14 bits)

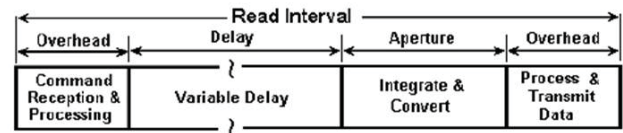
1. 15,000 readings/second represent a typical maximum with a measurement aperture of 2.5 μ s. Results will vary, depending on what PC hardware, PXI hardware, and driver are used.



Transaction Speed

Transactional I/O speed is a single reading measurement. This is important when you are taking many single measurements with the DMM. The M9183A delivers the highest transactional measurement speed in its class. These fast readings, up to 15,000 readings per second with a read interval rate of 66 μ s, provides the lowest latency, translating into higher test-system throughput and lower cost of test per unit tested.

Variable delay can be programmed to allow fully settled readings in most configurations.



Time frame of a single measurement
 Minimum read interval = 66 μ s (M9183A)
 Minimum read interval = 222 μ s (M9182A)

System Reading and Throughput Rates

Switching ranges within a function	Aperture (A)	Range change time (ms)
DCV	$A \leq 20$ ms	$(A \times 0.2) + 15$
	$A > 20$ ms	$A + 15.6$
Resistance (2-wire or 4-wire)	$A < 33$ ms	$(A \times 0.05) + 15.5$
	$A \geq 33$ ms	$A + 13$
DCI (200 mA or 2 A to any other range)	$A \leq 40$ ms	4.2
	$A > 40$ ms	15.7
DCI (all other ranges)	All apertures	1
Capacitance	All apertures	12

Switch between functions	Aperture (A)	Function change time (ms)
DCV	$A < 16$ ms	15.6
	$A \geq 16$ ms	$A + 25$
Resistance to DCI	$A < 16.66$ ms	7.8
	$16.66 \text{ ms} \leq A < 40$ ms	$A \times 0.65$
	$A \geq 66.66$ ms	$(A \times 0.51) + 45$
DCV to capacitance	$A < 33.33$ ms	23.4
	$A \geq 33.33$ ms	$(A \times 0.65) + 50$
Resistance to capacitance	$A \leq 33.33$ ms	23.4
	$33.33 \text{ ms} < A < 80$ ms	$(A \times 2) + 35$
	$80 \text{ ms} \leq A < 160$ ms	23.4
	$A \geq 160$ ms	160

MEASUREMENT CHARACTERISTICS

DC voltage	
Measurement method	Delta-sigma A/D conversion
Input resistance	200 mV, 2.0 V ranges: >10 G Ω with typical leakage of < 50 pA; 20 V, 200 V, 300 V ranges: 10.0 M Ω
Input isolation	330 VDC, 250 VAC from Earth ground
Input overvoltage protection	330 VDC all ranges
DCV noise rejection	Normal mode rejection at 50, 60, or 400 Hz \pm 0.5%; > 95 dB (apertures \geq 0.160 s); CMRR (1 k Ω lead imbalance) \geq 120 dB
True RMS AC voltage	
Measurement method	AC coupled (10 Hz to 100 kHz) true RMS — measures the AC component of an input waveform that consists of AC and DC components.
Crest factor	Maximum crest factor of 4 at full scale, 7 at 10% of range
Input impedance	1 M Ω , in parallel with < 300 pF
Settling time	< 0.5 sec to within 0.1% of final value Fast RMS: < 0.05 sec to within 0.1% of final value
Peak input	8 x 10 ⁶ volt Hz product (example: 250 V @ 32 kHz)
Input overvoltage protection	330 VAC all ranges
ACV noise rejection	Common mode rejection at 50 Hz or 60 Hz; 1 k Ω imbalance in either lead > 60 dB
Resistance	
Measurement method	Selectable 2-wire or 4-wire. Current source referenced to LO output
Offset compensation (M9183A only)	All ranges, use with apertures > 5 ms Voffset + (I*R) < 2.2 V for ranges \geq 2 k Ω Voffset + (I*R) < 0.22 V for ranges < 2 k Ω
Maximum test voltage	240 mV for 20 Ω and 200 Ω ranges; 2.4 V for 20 k Ω to 20 M Ω ranges; 1.0 V for 200 M Ω range (M9183A only)
Maximum lead resistance (4-wire)	50 k Ω for 200 k Ω , 2.0 M Ω , and 20 M Ω ranges; 5 k Ω for 20 k Ω range 500 Ω for 200 Ω and 2 k Ω ranges; 50 Ω for 20 Ω range
Input protection	330 V on all ranges
DC current	
Shunt resistance	10 Ω for 2 mA and 20 mA, 0.1 Ω for 200 mA and 2 A; Virtual zero shunt for 200 μ A, 20 μ A, 2 μ A, and 200 nA range (M9183A only)
Input protection	Protected with 2.5 A, 250 V fast blow fuse
True RMS AC current	
Measurement method	AC coupled true RMS measurement (measures the AC component only.) analog RMS DC converter.
Shunt resistance	10 Ω for 2 mA and 20 mA, 0.1 Ω for 200 mA and 2 A
Input protection	Protected with 2.5 A, 250 V fast blow fuse

MEASUREMENT CHARACTERISTICS

Frequency and period	
Measurement method	Direct (conventional) counting
Input impedance	1 M Ω with < 300 pF
Sensitivity (130 Hz)	.001 Hz

Totalizer (M9183A only)	
Active edge polarity	Positive or negative transition
Maximum count	10,000,000,000
Allowed rate	1 to 30,000 events per second
Threshold	Set threshold DAC
Accuracy	± 2 counts

Capacitance	
Measurement method	Differential charge balance: variable currents used to stimulate dV/dt response.
Connection type	2-wire

Environmental and physical characteristics	
Temperature range	Operating -10° to 55 °C Non-operating -40 ° to +85 °C
Relative humidity	Operating to 80% at 40 °C Storage to 95% at 40 °C
Connectors	V HI*, 2-wire Ω IN, DCV OUT Sheathed banana jack V LO*, 2-wire Ω IN, DCV OUT Sheathed banana jack I HI*, 4-wire Ω IN Sheathed banana jack I LO*, 4-wire Ω IN Sheathed banana jack Sync OUT DIN 7, pin 2 External Trigger IN DIN 7, pin 7 Trigger and Sync common DIN 7, pin 4
Safety	Complies with IEC 61010-1, CAT II 300 V, pollution degree 2
EMC	Complies with EN61326-1 Industrial Environment
Warm-up time	1 hour

* Do not connect the V HI and V LO or I HI and I LO connectors to anything when the measurement function does not utilize those connectors.

Physical characteristics	
Dimensions	3U/1-slot PXI/CompactPCI standard
Weight	0.5 kg (1 lb.)

Power dissipation:	
+5 V	Total power
300 mA	1.5 W max

CONFIGURATION

Hardware

Model	Description
M9182A	PXI 6½ digit multimeter, high performance
M9183A	PXI 6½ digit multimeter, enhanced performance
DMM units include:	Getting started guide, software drivers, user and service documentation (on CD ROM), Agilent I/O libraries

Software

Model	Description
Supported Operating Systems	Microsoft Windows XP (32-bit), Microsoft Windows Vista (32/64-bit), Microsoft Windows 7 (32/64-bit)
Standard Compliant Drivers	IVI-C, IVI-COM, LabVIEW
Supported Application Development Environments (ADE)	VisualStudio (VB.NET, C#, C/C++)®, LabVIEW, MATLAB, VEE
Agilent IO Libraries	Includes: VISA Libraries, Agilent Connection Expert, IO Monitor

Calibration and Warranty

Advantage services: calibration and warranty

Agilent Advantage Services is committed to your success throughout your equipment's lifetime.

Calibration

R-50C-011-3	Yearly calibration, for 3 years
R-50C-011-5	Yearly calibration, for 5 years
R-50C-021-3	Yearly ANSI Z540-1-1994 calibration, for 3 years
R-50C-021-5	Yearly ANSI Z540-1-1994 calibration, for 5 years

Warranty

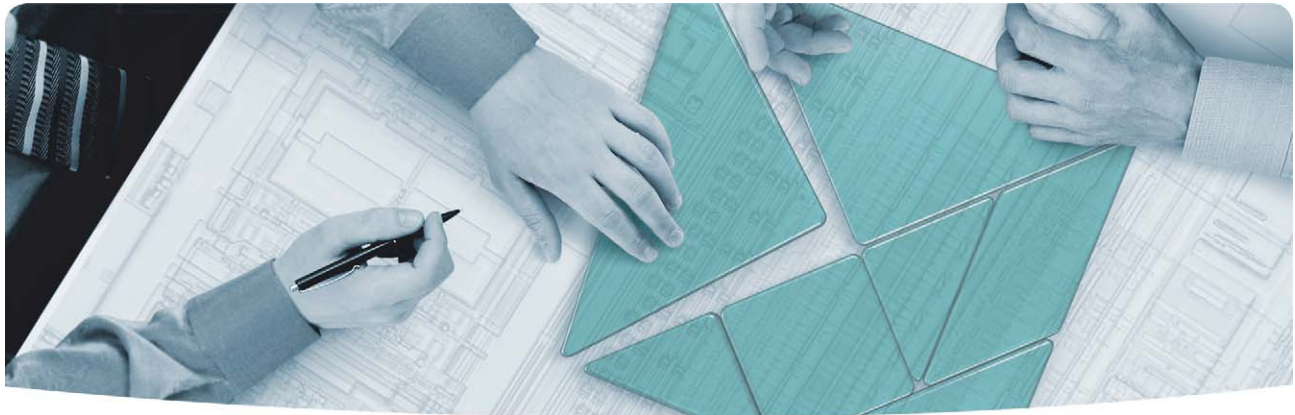
	Standard warranty is 1 year
R-51B-001-3C	1 year return-to-Agilent warranty extended to 3 years
R-51B-001-5C	1 year return-to-Agilent warranty extended to 5 years

Accessories

Model	Description
34138A	Test lead set

Related products

Model	Description
M9018A	18-slot PXIe chassis
M9021A	PCIe cable interface to an external system controller
M9036A	Embedded controller
M9101A	PXI high-density multiplexer, 64 channels, reed relays
M9103A	PXI high-density multiplexer, 99 channels, armature relays
M9120A	PXI high-density matrix switch, 4x32, armature relays
M9121A	PXI high-density matrix switch, 4x64, reed relays
M9181A	PXI digital multimeter, 6½ digit, basic features



The Modular Tangram

The four-sided geometric symbol that appears throughout this document is called a tangram. This seven-piece puzzle originated in China a few centuries ago. The goal is to create shapes—from simple to complex—that form an identifiable silhouette. As with a tangram, the possibilities may seem infinite as you begin to create a new test system. With a set of clearly defined elements—architecture, hardware, software—Agilent can help you create the system you need, from simple to complex.



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