KEITHLEY
A Tektronix Company

Model DMM7512

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7-1/2 Digit Sampling Multimeter Specifications

SPECIFICATION CONDITIONS

This document contains specifications and supplemental information for the Model DMM7512 7½ Digit Sampling Multimeter instrument. Specifications are the standards against which the DMM7512 is tested. Upon leaving the factory, the DMM7512 meets these specifications. Supplemental and typical values are nonwarranted, apply at 23 °C, and are provided solely as useful information. Measurement accuracies are specified at the DMM7512 terminals under these conditions:

- Temperature 23 °C ±5 °C, 5% to 60% relative humidity, noncondensing
- After a 4-hour warmup period
- 1 PLC or 5 PLC; for NPLC settings less than 1 PLC, add appropriate ppm of range for peak noise uncertainty from the RMS noise table
- Autozero enabled unless otherwise noted
- Remote sense operation or properly zeroed local operation
- Calibration period: One year or two years (calibration period may vary depending on customer requirements)
- T_{ACAL} = Ambient temperature of last automatic calibration
- T_{CAL} = Ambient temperature of last external calibration; factory calibration performed at 23 °C ±1 °C

DC VOLTAGE

Accuracy (input impedance auto)

Range[1]	Resolution	Input impedance	Accuracy ±[ppm of reading + ppm of range]				
			24 hour T_{CAL} ±1 °C[2]	90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[3]
100.00000 mV[4]	10 nV	> 10 GΩ or 10 MΩ ±1%	6 + 30	12 + 30	18 + 30	29 + 30	0.1 + 2.5
1.0000000 V[4]	100 nV	> 10 GΩ or 10 MΩ ±1%	4 + 2	9 + 5	15 + 5	26 + 5	0.1 + 0.5
10.000000 V[4]	1 µV	> 10 GΩ or 10 MΩ ±1%	2 + 0.7	9 + 1.2	14 + 1.2	22 + 1.2	0.1 + 0.05
100.00000 V[4]	10 µV	10 MΩ ±1%	8 + 6	[18 + 15][5]	[22 + 15][5]	[30 + 15][5]	[0.15 + 0.1][5]
				35 + 15	40 + 15	45 + 15	2.0 + 1
1000.0000 V[4,6]	100 µV	10 MΩ ±1%	8 + 6	[19 + 10][5]	[23 + 10][5]	[31 + 10][5]	[0.15 + 0.1][5]
				35 + 10	40 + 10	45 + 8	2.0 + 1

[1] 20% overrange on all ranges except 1% for 1000 V range.
[2] Relative to calibration accuracy.
[3] Add per degree from T_{CAL} ±5 °C.
[4] When properly zeroed using the Rel function with external cables.
[5] Specified within 30 days of autocalibration, T_{OPER} ±5 °C from T_{ACAL}.
[6] For signal levels greater than 500 V, add 0.02 ppm/V to the ppm of the readings specification for measurements exceeding 500 V.

RMS NOISE (ADDITIONAL PEAK NOISE UNCERTAINTY)[7]

- Applies to ± ppm of range
- Peak noise uncertainty is included in DC specifications for ≥ 1 PLC
- Add peak noise uncertainty to measurements for < 1 PLC
- Input impedance set to auto

Examples:

- 10 V at 0.006 PLC: 1.2 (from Accuracy table) + 11 (additional peak noise uncertainty) = 12.2 ppm of range
- 10 V at 1 PLC: 1.2 + 0 = 1.2 ppm of range

NPLC	Digits	100 mV	1 V	10 V	100 V	1000 V
5	7½	0.5	0.08	0.06	0.3	0.06
1	7½	0.5	0.09	0.07	0.4	0.07
0.2[8]	6½	2 (10)	0.2 (1.6)	0.1 (1.1)	1.1 (9.4)	0.1 (1)
0.2	6½	2 (12)	0.2 (1.6)	0.1 (1)	1.1 (8.9)	0.2 (1.1)
0.06	5½	3 (17)	0.4 (2.7)	0.3 (2.1)	3 (17)	0.3 (2.4)
0.006	4½	19 (95)	3 (18)	3 (15)	34 (125)	3 (18)
0.0005	3½	95 (480)	48 (215)	36 (170)	173 (800)	40 (205)

DC voltage characteristics

ADC linearity	1.0 ppm of reading + 1.0 ppm of range
Input impedance	100 mV to 10 V ranges: Selectable > 10 GΩ ‖ < 400 pF (auto) or 10 MΩ ±1% (10 MΩ) 100 V to 1000 V ranges: 10 MΩ ±1%
Input bias current	< 50 pA at 23 °C under the following conditions: Autozero off or input impedance 10 MΩ
Common mode current	< 2.1 µA peak-peak in 1 MHz bandwidth < 100 nA peak-peak in 1 kHz bandwidth
Common mode voltage	500 V_{PEAK} LO terminal to chassis maximum
DC voltage autozero off error	For ±1 °C and ≤ 10 minutes, add ± (8 ppm of reading + 15 µV)

[7] Noise values are based on 1000 readings with autozero on and using low thermal 4-wire short. V_{RMS} noise is typical. Additional peak noise is guaranteed.
[8] With line sync on.

Normal mode rejection

For DC voltage, line frequency ±0.1%

	5 PLC	1 PLC	≤ 0.2 PLC	≤ 0.01 PLC
Line sync on	110 dB	90 dB	45 dB	—
Line sync off	60 dB	60 dB	—	—

Common mode rejection

For DC voltage and 100 Ω unbalanced in LO terminal

NPLC	5	1	0.2	≤ 0.2
Line sync	On	On	On	Off
CMRR	140 dB	140 dB	120 dB	80 dB

RESISTANCE

Enhanced accuracy (within 30 days of autocalibration, T_{OPER} ±5 °C from T_{ACAL})[9]

Range[10]	Resolution	Test current[11] (±5%)	Accuracy ±[ppm of reading + ppm of range]				
			24 hour T_{CAL} ±1 °C[12]	90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[13]
1.0000000 Ω	0.1 µΩ	10 mA	15 + 60	30 + 60	30 + 60	30 + 60	0.15 + 0.1
10.000000 Ω	1 µΩ	10 mA	15 + 6	30 + 6	30 + 6	30 + 6	0.15 + 0.1
100.00000 Ω	10 µΩ	1 mA	12 + 4	27 + 4	27 + 4	27 + 4	0.15 + 0.1
1.0000000 kΩ	100 µΩ	1 mA	12 + 3	24 + 3	24 + 3	24 + 3	0.15 + 0.1
10.000000 kΩ[14]	1 mΩ	100 µA	13 + 3	30 + 3	30 + 3	30 + 3	0.15 + 0.1
100.00000 kΩ[14,15]	10 mΩ	10 µA	13 + 3	30 + 3	30 + 3	30 + 3	0.3 + 0.1
1.0000000 MΩ[14,16]	100 mΩ	10 µA	14 + 3	30 + 4	30 + 4	30 + 4	0.7 + 0.1
10.000000 MΩ[17]	1 Ω	0.69 µA ‖ 10 MΩ	150 + 6	200 + 10	200 + 10	200 + 10	70 + 1
100.00000 MΩ[17]	10 Ω	0.69 µA ‖ 10 MΩ	800 + 30	2000 + 30	2000 + 30	2000 + 30	385 + 1
1.0000000 GΩ[17]	100 Ω	0.69 µA ‖ 10 MΩ	9000 + 100	9000 + 100	9000 + 100	9000 + 100	3000 + 1

[9] Specifications are for 4-wire resistance, offset compensation on for ≤10 kΩ measurements, and offset compensation off for ≥10 kΩ measurements. 1 Ω range is 4-wire only. For 2-wire, with Rel, add 50 mΩ to ppm of range uncertainty. Without Rel and with Model 1756 test leads, add 100 mΩ to ppm of range uncertainty.

[10] 20% overrange on all ranges.
[11] Test current with offset compensation off.
[12] Relative to calibration accuracy.
[13] Add per degree from T_{CAL} ±5 °C.
[14] Specifications are for external cable and load capacitance < 1 nF.
[15] For offset compensation on, add 10 ppm uncertainty to ppm of reading.
[16] For 4-wire 1 MΩ, open lead detector on, add 10 ppm uncertainty to ppm of reading.
[17] Specified for < 10% lead resistance mismatch in HI and LO.

Accuracy[18]

Range[19]	Resolution	Test current[20] (±5%)	Accuracy ±[ppm of reading + ppm of range]				
			24 hour T_{CAL} ±1 °C[21]	90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[22]
1 Ω	0.1 µΩ	10 mA	15 + 60	40 + 60	50 + 60	70 + 60	2.5 + 5
10 Ω	1 µΩ	10 mA	15 + 6	40 + 6	50 + 6	70 + 6	2.5 + 0.5
100 Ω	10 µΩ	1 mA	12 + 4	35 + 4	47 + 4	65 + 4	5 + 0.25
1 kΩ	100 µΩ	1 mA	12 + 3	30 + 3	41 + 3	65 + 3	5 + 0.25
10 kΩ[23]	1 mΩ	100 µA	10 + 3	30 + 3	42 + 3	65 + 3	2.5 + 0.25
100 kΩ[23,24]	10 mΩ	10 µA	13 + 3	38 + 3	50 + 3	65 + 3	5 + 1
1 MΩ[23,25]	100 mΩ	10 µA	14 + 3	38 + 5	50 + 5	65 + 5	5 + 1
10 MΩ[26]	1 Ω	0.69 µA ‖ 10 MΩ	150 + 6	200 + 10	400 + 10	600 + 12	70 + 1
100 MΩ[26]	10 Ω	0.69 µA ‖ 10 MΩ	800 + 30	2000 + 30	2000 + 30	2600 + 30	385 + 1
1 GΩ[26]	100 Ω	0.69 µA ‖ 10 MΩ	9000 + 200	9000 + 200	13000 + 200	14000 + 200	3000 + 1

Resistance open circuit DC voltage[27]

Range[19]	2-wire	Offset compensation off	Offset compensation on
		4-wire	4-wire
1 Ω	–	9.2 V	9.5 V
10 Ω	9.2 V	9.2 V	9.5 V
100 Ω, 1 kΩ	14.0 V	14.2 V	14.3 V
10 kΩ	9.5 V	9.5 V	9.5 V
100 kΩ, 1 MΩ	12.7 V	14.3 V	14.3 V (100 kΩ range only)
10 MΩ to 1 GΩ	6.9 V	6.9 V	–

[18] Specifications are for 4-wire resistance, offset compensation on for ≤10 kΩ measurements, and offset compensation off for ≥10 kΩ measurements. 1 Ω range is 4-wire only. For 2-wire, with Rel, add 50 mΩ to ppm of range uncertainty. Without Rel and with Model 1756 test leads, add 100 mΩ to ppm of range uncertainty.

[19] 20% overrange on all ranges.

[20] Test current with offset compensation off.

[21] Relative to calibration accuracy.

[22] Add per degree from T_{CAL} ±5 °C.

[23] Specifications are for external cable and load capacitance < 1 nF.

[24] For offset compensation on, add 10 ppm of uncertainty to ppm of reading.

[25] For 4-wire, 1 MΩ, open lead detection on, add 10 ppm uncertainty to ppm of reading.

[26] Specified for < 10% lead resistance mismatch in HI and LO.

[27] Open circuit voltage is typical, measured from input HI to LO, SHI and SLO open. For 1 Ω to 1 MΩ ranges using an external digital multimeter (DMM) set to 10 MΩ input impedance; for 10 MΩ to 1 GΩ ranges, set external DMM to >10 GΩ input impedance.

4-wire ohms (≤ 10 kΩ) offset compensation on

RMS NOISE (ADDITIONAL PEAK NOISE UNCERTAINTY)[28]

- Applies to ± ppm of range
- Peak noise uncertainty is included in DC specifications for ≥ 1 PLC
- Add peak noise uncertainty to measurements for < 1 PLC

Examples:

- 1 kΩ at 0.006 PLC: 3 (from Accuracy table) + 26 (additional peak noise uncertainty) = 29 ppm of range
- 1 kΩ at 1 PLC: 3 + 0 = 3 ppm of range

NPLC	Digits	1 Ω	10 Ω	100 Ω	1 kΩ	10 kΩ
5	7½	2.8	0.3	0.3	0.07	0.3
1	7½	4.2	0.4	0.4	0.12	0.5 (2)
0.2[29]	6½	30 (160)	3 (13)	3 (13)	0.4 (2.6)	1.2 (8.2)
0.2	6½	50 (250)	5 (22)	5 (22)	0.6 (3.2)	1.2 (8.3)
0.06	5½	115 (546)	11 (54)	12 (56)	1.1 (6.6)	3 (18)
0.006	4½	397 (2144)	40 (215)	38 (216)	6 (34)	15 (78)
0.0005	3½	1767 (9333)	177 (933)	183 (954)	85 (406)	89 (456)

2-wire ohms

RMS NOISE (ADDITIONAL PEAK NOISE UNCERTAINTY)[28]

- Applies to ± ppm of range
- Peak noise uncertainty is included in DC specifications for ≥ 1 PLC
- Add peak noise uncertainty to measurements for < 1 PLC

Examples:

- 10 kΩ at 0.006 PLC: 3 (from Accuracy table) + 5 (50 mΩ with Rel) + 43 (additional peak noise uncertainty) = 51 ppm of range
- 10 kΩ at 1 PLC: 3 + 5 + 0 = 8 ppm of range

NPLC	Digits	10 Ω	100 Ω	1 kΩ	10 kΩ
5	7½	1.1	0.8 (0.4)	0.1	0.2
1	7½	0.6	0.6 (0.4)	0.09	0.4 (0.45)
0.2[29]	6½	2 (17)	2 (10)	0.2 (1.5)	0.8 (6.3)
0.2	6½	2 (17)	2 (14)	0.3 (1.6)	0.8 (6.4)
0.06	5½	5 (29)	6 (32)	0.4 (3.7)	2 (12)
0.006	4½	25 (114)	21 (119)	3 (21)	9 (50)
0.0005	3½	103 (517)	109 (536)	56 (219)	55 (283)

[28] Noise values are based on 1000 readings with autozero on and using low thermal 4-wire short. RMS noise is typical. Additional peak noise is guaranteed.
[29] With line sync on.

Resistance characteristics

Maximum 4-wire ohms lead resistance	5 Ω per lead for 1 Ω range, 10% of range per lead for 10 Ω to 1 kΩ ranges; 1 kΩ per lead for all other ranges
Offset compensation	Selectable on 4-wire, 1 Ω to 100 kΩ ranges
Open lead detector	Default is off
Autozero off error	For 2-wire ohms, ±1 °C and ≤ 10 minutes, add ±(8 ppm of reading) and 1.5 mΩ for 10 Ω range, 15 mΩ for 100 Ω and 1 kΩ ranges, 150 mΩ for 10 kΩ range, 1.5 Ω for 100 kΩ range, and 15 Ω for all other ranges For 4-wire ohms, ±1 °C and ≤ 10 minutes, add ±(8 ppm of reading)
Input current limit	For signals with a magnitude of +12 V to +40 V or -12 V to -40 V: ±13 mA source or sink, typical For signals with a magnitude of greater than +40 V or -40 V: ±1.3 mA source or sink, typical

DC CURRENT

Enhanced accuracy (within 30 days of autocalibration, T_{OPER} ±5 °C from T_{ACAL})

Range[30]	Resolution	Maximum burden voltage	Accuracy ±[ppm of reading + ppm of range]				
			24 hour T_{CAL} ±1 °C[31]	90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[32]
10.000000 µA	1 pA	15 mV	30 + 30	75 + 30	75 + 30	75 + 30	0.15 + 0.1
100.00000 µA	10 pA	15 mV	20 + 5	60 + 9	60 + 9	60 + 9	0.15 + 0.1
1.0000000 mA	100 pA	15 mV	30 + 5	60 + 9	60 + 9	60 + 9	0.15 + 0.1
10.000000 mA	1 nA	20 mV	40 + 5	60 + 9	60 + 9	60 + 9	0.15 + 0.1
100.00000 mA	10 nA	200 mV	50 + 18	150 + 30	150 + 30	150 + 30	0.15 + 0.1
1.0000000 A	100 nA	400 mV	150 + 50	400 + 50	400 + 50	400 + 50	0.15 + 0.1
3.000000 A	1 µA	1300 mV	200 + 40	400 + 40	400 + 40	400 + 40	0.15 + 0.1

Accuracy

Range[30]	Resolution	Maximum burden voltage	Accuracy ±[ppm of reading + ppm of range]				
			24 hour T_{CAL} ±1 °C[31]	90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[32]
10.000000 µA	1 pA	15 mV	30 + 30	100 + 30	125 + 40	175 + 50	10 + 8
100.00000 µA	10 pA	15 mV	20 + 5	75 + 12	100 + 15	150 + 20	10 + 3
1.0000000 mA	100 pA	15 mV	30 + 5	75 + 12	100 + 15	150 + 20	10 + 3
10.000000 mA	1 nA	20 mV	40 + 5	75 + 12	100 + 15	150 + 20	10 + 3
100.00000 mA	10 nA	200 mV	50 + 18	300 + 30	400 + 30	500 + 30	50 + 5
1.0000000 A	100 nA	400 mV	150 + 50	400 + 50	450 + 50	500 + 50	10 + 10
3.000000 A	1 µA	1300 mV	200 + 40	400 + 40	450 + 40	500 + 40	10 + 10

[30] 20% overrange supported for all ranges except for 3 A, which is 1% supported.
[31] Relative to calibration accuracy.
[32] Add per degree from T_{CAL} ±5 °C.

RMS NOISE (ADDITIONAL PEAK NOISE UNCERTAINTY)[33]

- Applies to ± ppm of range
- Peak noise uncertainty is included in DC Specifications for PLC ≥ 1
- Add peak noise uncertainty to measurements for PLC < 1

Examples:

- 1 mA at 0.006 PLC: 9 (from Accuracy table) + 20 (additional peak noise uncertainty) = 29 ppm of range
- 1 mA at 1 PLC: 9 + 0 = 9 ppm of range

NPLC	Digits	10 µA	100 µA	1 mA	10 mA	100 mA	1 A	3 A
5	7½	0.15	0.14	0.09	0.1	0.3	0.3	0.2
1	7½	0.4	0.13	0.1	0.1	0.5	0.5	0.3
0.2[34]	6½	0 (220)	0 (23)	0.2 (3.4)	0.2 (1.6)	2 (10)	2 (11)	0.7 (4.6)
0.2	6½	120 (260)	12 (26)	1.2 (3.8)	0.3 (1.8)	1.9 (9.8)	2 (10)	0.8 (5)
0.06	5½	130 (280)	12 (29)	1.3 (5.6)	0.4 (3.9)	2 (14)	2 (14)	1.2 (7.7)
0.006	4½	130 (350)	14 (42)	3 (20)	2 (20)	4 (30)	4 (31)	7 (51)
0.0005	3½	260 (2110)	30 (300)	20 (150)	20 (160)	30 (190)	30 (190)	70 (510)

DC current characteristics

Range	10 µA	100 µA	1 mA	10 mA	100 mA	1 A	3 A
Effective internal shunt value[35]	1 kΩ	100 Ω	10 Ω	1 Ω	0.1 Ω	0.1 Ω	0.1 Ω
Autozero off error: For ±1 °C and ≤ 10 minutes, add ±(8 ppm of reading + range error)	150 pA	1.5 nA	15 nA	150 nA	15 µA	150 µA	150 µA
Overload recovery: For each additional sustained amp beyond ±1.5 A, add the following initial ppm of range error until thermally settled after overload recovery	15,500	1800	150	150	6500	200	—

TEMPERATURE

4-wire RTD or 3-wire RTD

Types: 100 Ω platinum PT100, D100, F100, PT385, PT3916; or user-configurable 0 Ω to 10 kΩ

Type	Range	Resolution	Accuracy ± °C	
			2 year T_{CAL} ±5 °C	Temperature coefficient[36]
4-wire RTD	-200 °C to 400 °C	0.01 °C	0.09 °C	0.003 °C /°C
3-wire RTD[37]	-200 °C to 400 °C	0.01 °C	0.75 °C	0.003 °C /°C

[33] Noise values are based on 1000 readings with autozero on and AMPS terminal open. RMS noise is typical. Additional peak noise is guaranteed.
[34] With line sync on.
[35] Values are typical and guaranteed by design.
[36] Add per degree from T_{CAL} ±5 °C; specifications without autocalibration.
[37] For 3-wire RTD, accuracy is for < 0.1 Ω lead resistance mismatch for input HI and LO. Add 0.25 °C/ 0.1 Ω of HI-LO lead resistance mismatch.

Thermistor

Types: 2.252 kΩ, 5 kΩ, and 10 kΩ

Type	Range	Resolution	Accuracy ± °C	
			2 year T_{CAL} ±5 °C	Temperature coefficient[36]
Thermistor	-80 °C to +150 °C	0.01 °C	0.08 °C	0.002 °C /°C

Thermocouple

Types: B, E, J, K, N, R, S, T

Type	Range	Resolution	Accuracy ± °C	
			2 year T_{CAL} ±5 °C[38] Simulated reference junction	Temperature coefficient[36]
B	350 °C to +1820 °C	0.1 °C	0.9 °C	0.03 °C/°C
E	−200 °C to +1000 °C	0.001 °C	0.4 °C	0.03 °C/°C
J	−200 °C to +760 °C	0.001 °C	0.4 °C	0.03 °C/°C
K	−200 °C to +1372 °C	0.001 °C	0.4 °C	0.03 °C/°C
N	−200 °C to +1300 °C	0.001 °C	0.4 °C	0.03 °C/°C
R	0 °C to +1768 °C	0.1 °C	0.9 °C	0.03 °C/°C
S	0 °C to +1768 °C	0.1 °C	0.9 °C	0.03 °C/°C
T	−100 °C to +400 °C	0.001 °C	0.4 °C	0.03 °C/°C

CONTINUITY

Range[39]	Resolution	Test current	Open circuit voltage	Accuracy ±[ppm of reading + ppm of range]	
				2 year T_{CAL} ±5 °C	Temperature coefficient[40]
1.0000 kΩ	100 mΩ	1 mA	14.0 V	100 + 100	2.5 + 1

Continuity characteristics

Continuity high limit	User-selectable; default 10 Ω

[38] Exclusive of cold-junction errors.
[39] Specifications exclude lead resistance.
[40] Add per degree from T_{CAL} ±5 °C; specifications without autocalibration.

Diode

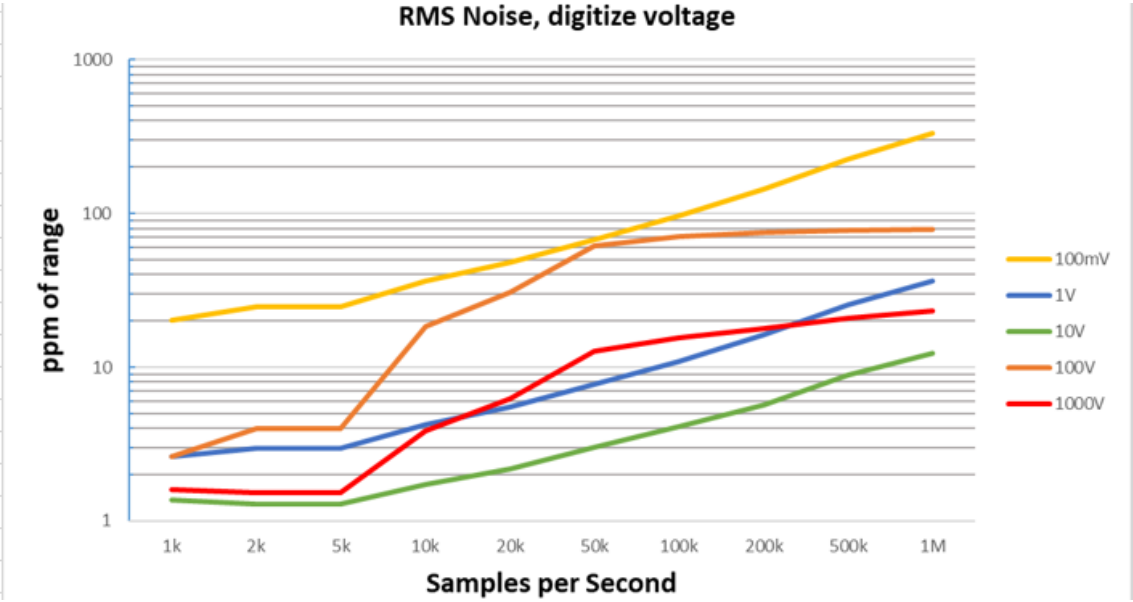
Voltage measure range[41]	Resolution	Bias level (selectable)	Accuracy ±[ppm of reading + ppm of range]			
			90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[40]
10.000000 V	1 µV	10 µA / 100 µA / 1 mA	20 + 5	30 + 5	45 + 5	2.5 + 1

DIGITIZE VOLTAGE

Accuracy (input impedance auto)

Range[42,43]	Resolution[44]	Input impedance[45]	Accuracy ±[ppm of reading + ppm of range]			
			90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[46]
100.000 mV	1 µV	> 10 GΩ or 10 MΩ ±1%	210 + 100	220 + 100	230 + 100	15 + 20
1.00000 V	10 µV	> 10 GΩ or 10 MΩ ±1%	110 + 75	120 + 75	130 + 75	15 + 20
10.0000 V	0.1 mV	> 10 GΩ or 10 MΩ ±1%	110 + 75	120 + 75	130 + 75	10 + 20
100.000 V[47]	1 mV	10 MΩ ±1%	110 + 75	120 + 75	130 + 75	15 + 20
1000.00 V[48]	10 mV	10 MΩ ±1%	110 + 75	120 + 75	130 + 75	10 + 20

DC-coupled additional noise uncertainty, typical[49]



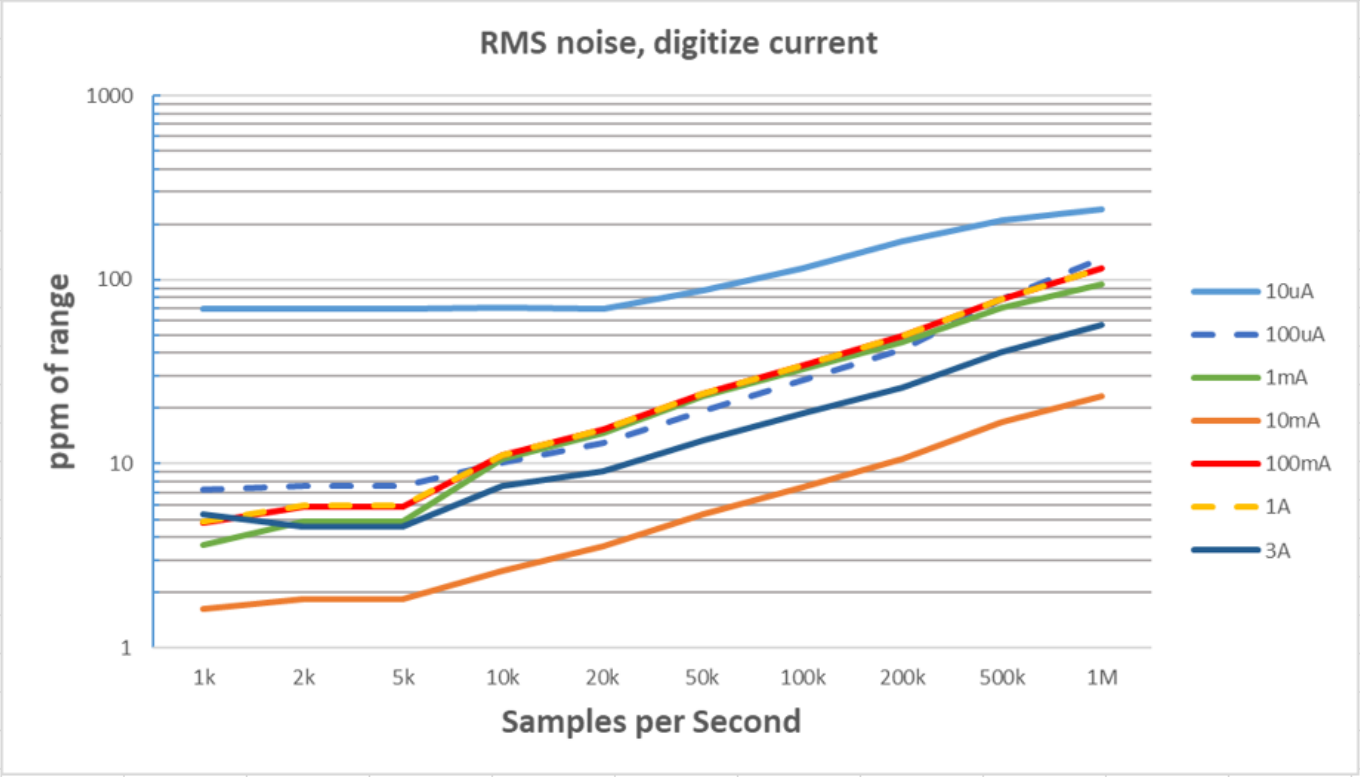
[41] 20% overrange on all ranges.
[42] For DC coupling, 20% overrange for 100 mV to 100 V. For AC coupling, 500% overrange 100 mV to 100 V. 1% for 1000 V range DC coupling.
[43] Accuracy with sample rate 1 k per second, aperture auto, and 100 reading buffer average.
[44] Power up default is 4½ digits.
[45] User-selectable.
[46] Add per degree from T_{CAL} ±5%.
[47] For 100 V range, input impedance auto and without A_{CAL}, add 100 ppm of range additional uncertainty and 15 ppm/°C additional uncertainty for "of range" temperature coefficient for operation outside of T_{CAL} ±5 °C.
[48] For signal levels greater than 500 V, add 0.02 ppm/V to the ppm of the readings specification for measurements exceeding 500 V.
[49] Specified with aperture Auto and 4-wire short on input terminals. For 100 V range, input impedance 10 MΩ, multiply by 2.5. For all ranges and sample rate > 1 k, add an additional 3× RMS noise uncertainty to ppm of range.

DIGITIZE CURRENT

DC accuracy[50]

Range[51]	Resolution[52]	Burden voltage	Accuracy ± [ppm of reading + ppm of range]			
			90 day T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 year T_{CAL} ±5 °C	Temperature coefficient[53]
10.0000 µA	0.1 nA	15 mV	150 + 75	160 + 75	170 + 75	30 + 15
100.000 µA	1 nA	15 mV	150 + 75	160 + 75	170 + 75	30 + 15
1.00000 mA	10 nA	15 mV	150 + 75	160 + 75	170 + 75	30 + 15
10.0000 mA	100 nA	20 mV	150 + 75	160 + 75	170 + 75	30 + 15
100.000 mA	1 µA	200 mV	340 + 100	450 + 100	560 + 100	50 + 20
1.00000 A	10 µA	400 mV	400 + 110	500 + 110	600 + 110	50 + 25
3.00000 A	100 µA	1300 mV	650 + 150	900 + 150	900 + 150	50 + 25

Additional noise uncertainty, typical[54]



[50] Accuracy with sample rate 1 k per second, aperture auto, and 100 reading buffer average.
[51] 20% overrange on all ranges except 3.3% for 3 A range.
[52] Power up default is 4½ digits.
[53] Add per degree from T_{CAL} ±5 °C.
[54] Specified with aperture Auto and open input terminals. For all ranges and for ≥1 k sample rate, add an additional 3× RMS noise uncertainty to ppm of range.

DIGITIZER CHARACTERISTICS

Maximum resolution	18 bits
Measurement input coupling	DC (voltage only)
Sampling rate[55]	Programmable 1 k through 1 million
Volatile sample memory with timestamp	27.5 million
Minimum record time	1 µs
Timestamp resolution	1 ns with standard or full buffer style 1 µs with compact buffer style
Timestamp accuracy	With standard or full buffer style, 20 ns between adjacent readings, with total buffer time < 2 s With compact buffer style, 2 µs adjacent readings, with total buffer time < 2 s
Maximum record length	8 million

Typical reading rates, 60 Hz (50 Hz) operation[56,57,58,59]

		Functions: DC voltage (10 V) 2-wire ohms (≤ 10 kΩ), DC current (1 mA)		**Functions: 4-wire ohms (≤ 1 kΩ) 4-wire / 3-wire RTD**		**Functions: Thermistor**		**Functions: Dry circuit (≤ 1 kΩ)**	
NPLC	**Digits**	**Measure-ments into buffer**	**Measure-ments into computer**	**Measure-ments into buffer**	**Measure-ments into computer**	**Measure-ments into buffer**	**Measure-ments into computer**	**Measure-ments into buffer**	**Measure-ments into computer**
1	7½	59.8 (49.8)	58 (48)	29 (24)	28 (24)	57 (48)	57 (48)	27 (23)	26 (22)
0.2	6½	295 (240)	250 (210)	128 (109)	119 (100)	230 (200)	230 (200)	100 (89)	96 (85)
0.06	5½	965 (810)	950 (800)	310 (280)	315 (280)	900 (750)	900 (750)	190 (180)	190 (180)
0.006	4½	7500 (6700)	7300 (6500)	750 (730)	740 (720)	6800 (6000)	6800 (6000)	295 (290)	295 (290)
0.0005	3½	26000 (26000)	24000 (24000)	860 (860)	860 (860)	18000 (18000)	18000 (18000)	310 (310)	310 (310)

Digitize, typical

Sampling rate	**Digits**	**Resolution**	**Measurements into computer**[59]
10 kS/s	5½	18	9700
20 kS/s	4½	16	19000
50 kS/s	4½	16	44400
100 kS/s	4½	15	80000
1 MS/s	3½	12	108000

[55] Sample rate is not continuously adjustable. For valid discrete settings, see the *Model DMM7512 Reference Manual*.
[56] Reading speeds for autozero off, fixed range, autodelay off. Offset compensation off and open lead detector off where applicable.
[57] Buffer measurements: For < 0.2 PLC, multisample, single buffer transfer binary reading only.
[58] PC measurements: For 1 and 0.2 PLC single reading and single transfer to computer (USB).
[59] Reading rates using factory default operating conditions and autorange off, autodelay off. Speeds include measurement and data transfer out of the USB. ≥1000 readings with binary transfer over USB.

SYSTEM PERFORMANCE, TYPICAL

- Mode: 3½ digit, autozero off, 0.0005 PLC, excludes measurement time
- Time includes function change from DC voltage or 2-wire ohms to listed function

Function	Function change (ms)	Range change (ms)
DC voltage or 2-wire ohms (< 10 kΩ)	6	1.3
4-wire ohms (< 10 kΩ)	7	1.3
DC current	7	1.3
Digitize voltage or current	7	1.3

Ranges for function change times

Function change times apply to the ranges listed in the table below.

Function	Range
DC voltage	10 V
2-wire or 4-wire ohms	1 kΩ
DC current	1 mA
Thermocouple	Use DC voltage rates
Thermistor	Use 2-wire ohms rates

Buffer transfer speed (binary)	Measurements into computer (per second)	
	USB	LAN
Average for 1000 readings	280000	270000
Average for 1000 readings with timestamp	170000	140000

TRIGGERING

Time base accuracy	25 ppm
Trigger source	Analog DC voltage, DC current, or any system trigger
Trigger coupling	DC
Input trigger latency[60,61,62]	< 225 ns
Input trigger jitter[60,61]	< 50 ns
Sample period jitter[60,61]	< 1 ns

DMM triggers

EXT TRIG IN and OUT	0 V to 5 V logic signal input and output, TTL-compatible
EXT trigger latency (IN and OUT)	< 400 ns
EXT trigger latency (IN or OUT)	< 200 ns (guaranteed by design)

[60] Guaranteed by design; for digital I/O only.
[61] Stimulus command required to meet specifications.
[62] If using trigger model, add 200 ns uncertainty.

Analog triggering[63]

Analog level, edge, or window trigger types[64]

Trigger characteristics	Voltage input	Current input
Input range	100 mV to 1000 V	10 µA to 3 A
Resolution	0.05%	0.05%
Basic accuracy (T_{ACAL} ±5 °C)[65,66]	1%	1%

Analog trigger latencies

	Digital I/O	External
Positive logic	800 ns + 40 ns jitter	930 ns + 40 ns jitter
Negative logic	800 ns + 40 ns jitter	840 ns + 40 ns jitter

Window filter and memory (buffer)

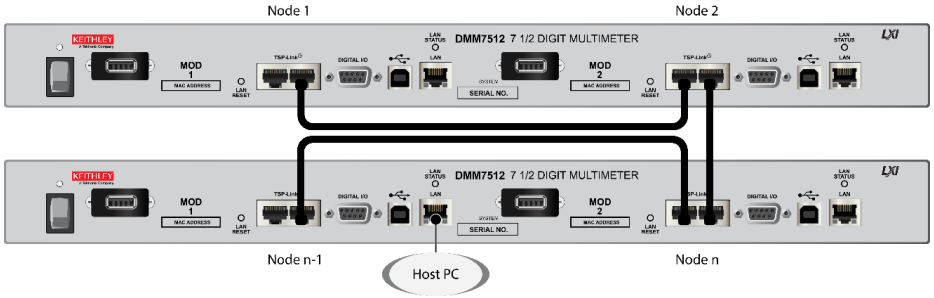
Window filter size	0 to 10% of reading, where 0 averages all readings
Memory	Up to 27.5 million timestamped readings with the compact buffer style, with additional memory available using an external USB flash drive
Maximum Internal memory (buffer)	27.5 million readings with the compact buffer style (6½-digit without formatting); 11 million readings with the standard or full buffer styles

[63] For DC coupled, the trigger level can be set up to 100% of measure range.
[64] Rising or falling edge triggering supported. Window trigger requires setting two independent levels.
[65] Trigger event occurs after the threshold crossing at a time determined by total trigger latencies.
[66] Accuracy specifications require user ACAL and are verified with level trigger amplitude set to 50% of range with a 100 Hz sine wave at 100% full scale of range. High frequency rejection is off. NPLC 0.0005 (DC voltage/DC current) or aperture 1 µs for digitize voltage or digitize current. Specified for fixed range, autozero off. For DC current and digitized DC current 3 A range, add an additional 2%.

GENERAL INSTRUMENT SPECIFICATIONS

Input protection	1010 V DC all ranges and functions on HI and LO terminals; 350 V all ranges and functions on sense HI, sense LO terminals; 250 V rated current input terminal; fused 3 A range; current input terminals protected to 1 kV
3 A input fuse protection	3.5 A, 1 kV fast blow type; Keithley part number DMM7510-FUSE-3A
Common mode isolation	500 V DC or AC V_{PEAK} LO to chassis All terminals > 10 GΩ, < 1000 pF any terminal to chassis
Power line	Universal input, 100 V to 240 V
Line frequency	50 Hz or 60 Hz, automatically sensed at power-up
Power consumption	165 VA
Operating environment	Specified for 0 °C to 50 °C, 70% relative humidity up to 35 °C; derate 3% relative humidity per °C, 35 °C to 50 °C
Storage environment	-25 °C to 65 °C
Environment	For indoor use only
Altitude	Maximum 2000 m (6562 ft) above sea level
Pollution degree	2
Real time clock	Lithium battery backup (3+ years battery life)
EMC	Conforms to European Union EMC Directive
Safety	NRTL listed to UL61010-1 and CSA C22.2 No 61010-1; conforms with European Union Low Voltage Directive
Vibration	MIL-PRF-28800F Class 3, Random
Warm-up	4 hours to rated accuracy
Input signal connections	Rear safety banana jacks
Cooling	Forced air, side intake, and rear exhaust
Dimensions	**Rack Mount:** 44 mm high × 483 mm wide × 696 mm deep (1.7 in. × 19 in. × 27.41 in.)
Shipping weight	11.3 kg (25.0 lb)

Digital I/O	**Connector**	9-pin female D
	5 V power supply pin	Limited to 500 mA at > 4 V (solid-state fuse protected)
	Lines	Six input/output, user-defined, for digital I/O or triggering
	Input signal levels	0.7 V (maximum logic low) 3.7 V (minimum logic high)
	Input voltage limits	-0.25 V (absolute minimum) +5.25 V (absolute maximum)
	Maximum source current	+2.0 mA at > 2.7 V (per pin)
	Maximum sink current	-50 mA at 0.7 V (per pin, solid-state fuse protected)
	Handler	User-defined start of test, end of test, four category bits
Math functions	Rel, dB, Limit Test, Percentage, 1/x, and mX + b	

Remote interface	LAN: RJ-45 connector, 10/100BT; Virtual Front Panel USB device (front panel, type B): 2.0 full speed, USBTMC compliant USB host (front panel, type A): USB 2.0, support for flash drives, FAT 32
LXI compliance	LXI version 1.4 Core 2011
Language	Embedded Test Script Processor (TSP) accessible from any host interface; responds to high-speed test scripts comprised of remote commands and statements (for example, branching, looping, math); able to execute high-speed test scripts stored in memory without host intervention; also SCPI (default command set)
Expansion interface	The TSP-Link expansion interface allows TSP-enabled instruments to trigger and communicate with each other. See the figure below.  The DMM7512 has four TSP-Link connectors (two on each module) to make it easier to connect instruments in a sequence. ▪ Once instruments are interconnected through the TSP-Link expansion interface, a computer can access all of the resources of each instrument through the host interface of any TSP-Link instrument. ▪ A maximum of 32 TSP-Link nodes can be interconnected. Each module uses one TSP-Link node.
IP configuration	Static or DHCP (manual or automatic)