KEITHLEY
A Tektronix Company

Model DMM6500

Keithley Instruments
28775 Aurora Road
Cleveland, Ohio 44139
1-800-935-5595
tek.com/keithley

6½ Digit Bench/System Multimeter Specifications

SPECIFICATION CONDITIONS

This document contains specifications and supplemental information for the DMM6500. Specifications are the standards against which the DMM6500 is tested. Upon leaving the factory, the DMM6500 meets these specifications. Supplemental and typical values are nonwarranted, apply at 23 °C, and are provided solely as useful information. Measurement accuracies are specified for DMM6500 front or rear input terminals and include conversion error for thermocouple, thermistor, and RTD measurements.

Measurement conditions include:

- After a 30-minute warmup period
- 1 PLC or 5 PLC measurement rate; for NPLC settings less than 1 PLC, add appropriate noise error from Measurement Noise table under each function
- Autozero enabled
- Calibration period: one year (recommended) or two years. Calibration period may vary depending on customer requirements
- 24-hour accuracy specification is relative to calibrator accuracy
- Communication accessory card slot cover or an optional KTTI interface card is properly installed on the rear of the unit

Definitions:

- **T_{CAL}:** The temperature at which the instrument was calibrated (23 °C for factory calibration)
- **Temperature coefficient:** Additional uncertainty added for each °C outside T_{CAL} ±5 °C
- **Power Line Cycle (PLC):** 16.67 ms at 60 Hz and 20 ms at 50 Hz or 400 Hz line frequency; frequency automatically sensed at power up

DC VOLTAGE

DC VOLTAGE ACCURACY ±(% OF READING + % OF RANGE)

Range	Resolution	Input impedance	24 hours T_{CAL} ±1 °C	90 days T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 years T_{CAL} ±5 °C	Temperature coefficient
100 mV	100 nV	> 10 GΩ or 10 MΩ ±1%	0.0015 + 0.0030	0.0025 + 0.0035	0.0030 + 0.0035	0.0035 + 0.0035	0.0001 + 0.0005
1 V	1 µV	> 10 GΩ or 10 MΩ ±1%	0.0015 + 0.0006	0.0020 + 0.0006	0.0025 + 0.0006	0.0030 + 0.0006	0.0001 + 0.0001
10 V	10 µV	> 10 GΩ or 10 MΩ ±1%	0.0010 + 0.0004	0.0020 + 0.0005	0.0025 + 0.0005	0.0030 + 0.0005	0.0001 + 0.0001
100 V	100 µV	10 MΩ ±1%	0.0015 + 0.0006	0.0035 + 0.0006	0.0040 + 0.0006	0.0050 + 0.0006	0.0006 + 0.0001
1000 V[1]	1 mV	10 MΩ ±1%	0.0020 + 0.0006	0.0035 + 0.0006	0.0040 + 0.0006	0.0050 + 0.0006	0.0006 + 0.0001

MEASUREMENT NOISE CHARACTERISTICS AND REJECTION RATIOS

Measurement rate in NPLCs	Digits	DCV RMS noise uncertainty (in % of range + fixed base)[2]	NMRR[3]	CMRR[3]
5[4]	6.5	0	100 dB	140 dB
5		0	60 dB	140 dB
1[4]		0	90 dB	140 dB
1		0	60 dB	140 dB
0.1[4]		0.00015 + 1 µV	40 dB	120 dB
0.1	5.5	0.00015 + 4 µV	--	120 dB
0.01		0.00030 + 6 µV	--	80 dB
0.0005	4.5	0.00500 + 40 µV	--	80 dB

DC VOLTAGE CHARACTERISTICS

Overrange	20% on 100 mV, 1 V, 10 V, and 100 V ranges	1% on 1000 V range	
ADC linearity (10 V range)	0.0001% of 10 V range		
Input impedance	**100 mV to 10 V ranges:** Selectable, > 10 GΩ or 10 MΩ ±1% in parallel with < 400 pF **100 V to 1000 V ranges:** 10 MΩ ±1% in parallel with < 400 pF		
Input bias current	< 50 pA at 23 °C		
Common mode current	< 600 nA peak-peak at 50 Hz or 60 Hz		
Earth isolation	500 V_{PEAK} > 10 GΩ and < 300 pF any terminal to chassis		
Common mode voltage	500 V_{PEAK} LO terminal to chassis maximum		
Autozero off error	Add ±(0.0002% of range + 3 µV) within ±1 °C and ≤ 10 minutes since last autozero Add ±(0.0010% of range + 10 µV) within ±5 °C and ≤ 60 minutes since last autozero		
Input protection	Input HI 1100 V, Sense HI (SHI) and Sense LO (SLO) 350 V referenced to LO		
Scanner card additional uncertainties and maximum input signal levels	**Scanner card**	**Add the following uncertainty**	**Maximum input signal level**
	2000-SCAN	1 µV	110 V
	2001-TCSCAN	1 µV	110 V

[1] For each additional volt over ±500 V, add 0.02 mV of uncertainty.
[2] Applies for 100 mV through 10 V ranges. Noise values apply to terminals using a low-thermal short for 50 Hz and 60 Hz operation only. Measurements through a card may introduce additional noise.
[3] NMRR for line frequency is ±0.1%. For DC common mode and 1 kΩ, unbalance on LO terminal, rejection of AC common mode signals is > 80 dB for a line frequency of ±0.1%.
[4] Line sync on.

RESISTANCE

RESISTANCE ACCURACY ±(% OF READING + % OF RANGE)[5]

Range	Resolution	Test current (±5%)	Open circuit voltage (±5%)	24 hours T_{CAL} ±1 °C	90 days T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 years T_{CAL} ±5 °C	Temperature coefficient
1 Ω[6]	1 µΩ	10 mA	12.5 V	0.0080 + 0.0200	0.0080 + 0.0200	0.0085 + 0.0200	0.0100 + 0.0200	0.0006 + 0.0010
10 Ω[6]	10 µΩ	10 mA	12.5 V	0.0020 + 0.0020	0.0080 + 0.0020	0.0085 + 0.0020	0.0100 + 0.0020	0.0006 + 0.0001
100 Ω	100 µΩ	1 mA	9.2 V	0.0020 + 0.0020	0.0075 + 0.0020	0.0085 + 0.0020	0.0100 + 0.0020	0.0006 + 0.0001
1 kΩ	1 mΩ	1 mA	9.2 V	0.0020 + 0.0006	0.0065 + 0.0006	0.0075 + 0.0006	0.0090 + 0.0006	0.0006 + 0.0001
10 kΩ	10 mΩ	100 µA	12.7 V	0.0020 + 0.0006	0.0065 + 0.0006	0.0075 + 0.0006	0.0090 + 0.0006	0.0006 + 0.0001
100 kΩ	100 mΩ	10 µA	12.5 V	0.0020 + 0.0006	0.0070 + 0.0010	0.0075 + 0.0010	0.0100 + 0.0010	0.0006 + 0.0001
1 MΩ	1 Ω	10 µA	12.5 V	0.0020 + 0.0006	0.0075 + 0.0006	0.0100 + 0.0006	0.0120 + 0.0006	0.0006 + 0.0001
10 MΩ[7]	10 Ω	0.7 µA ‖ 10 MΩ	7.1 V	0.0150 + 0.0006	0.0200 + 0.0010	0.0400 + 0.0010	0.0450 + 0.0010	0.0070 + 0.0001
100 MΩ[7]	100 Ω	0.7 µA ‖ 10 MΩ	7.1 V	0.0800 + 0.0030	0.2000 + 0.0030	0.2000 + 0.0030	0.2500 + 0.0030	0.0385 + 0.0001

RESISTANCE MEASUREMENT NOISE CHARACTERISTICS[8]

Measurement rate in NPLCs	Digits	2-wire RMS noise uncertainty (in % of range + fixed base)	4-wire RMS noise uncertainty, offset compensation OFF (in % of range + fixed base)[9]	4-wire RMS noise uncertainty, offset compensation ON (in % of range + fixed base)[9]
5	6.5	0	0	0
1		0	0	0
0.1[10]		0.00015 + 0.10 mΩ	0.00020 + 0.20 mΩ	0.00030 + 0.25 mΩ
0.1	5.5	0.00050 + 0.35 mΩ	0.00180 + 2.00 mΩ	0.00350 + 3.50 mΩ
0.01		0.00070 + 0.50 mΩ	0.00260 + 2.50 mΩ	0.00500 + 4.00 mΩ
0.0005	4.5	0.00650 + 3.50 mΩ	0.01000 + 7.00 mΩ	0.01500 + 10.00 mΩ

RESISTANCE CHARACTERISTICS

Overrange	20% on all ranges	
Autozero off error	Add ±(0.0005% of range + 5 mΩ) within ±1 °C and ≤ 10 minutes since last autozero Add ±(0.0020% of range + 10 mΩ) within ±5 °C and ≤ 60 minutes since last autozero	
Offset compensation	Selectable on 1 Ω, 10 Ω, 100 Ω, 1 kΩ, and 10 kΩ ranges, 4-wire mode only	
Maximum 4-wire lead-resistance	5 Ω per lead for 1 Ω range 10% of range per lead for 10 Ω, 100 Ω, 1 kΩ, and 10 kΩ ranges 1 kΩ per lead for 100 kΩ, 1 MΩ, 10 MΩ, and 100 MΩ ranges	
Open lead detector	Selectable on all ranges, 4-wire mode only; default is off	
Input protection	Input HI 1100 V, Sense HI (SHI) and Sense LO (SLO) 350 V referenced to LO	
Scanner card additional contact resistance	**Scanner card**	**Contact resistance**
	2000-SCAN	1 Ω at end of life
	2001-TCSCAN	1 Ω at end of life

[5] Specifications are for 2- and 4-wire resistance. For 2-wire, use relative offset and add 100 mΩ of additional uncertainty. For 4-wire, turn offset compensation on for ≤ 10 kΩ and off for > 10 kΩ. The 1 Ω range is for 4-wire only.
[6] Requires a 10-reading digital filter at 1 PLC or 2-reading digital filter at 5 PLC.
[7] Specified for < 10% lead-resistance mismatch at HI and LO.
[8] Applies for 1 Ω through 1 MΩ ranges. For 100 Ω range, multiply the listed values by five. Noise values apply to terminals using a low-thermal short for 50 Hz and 60 Hz operation only. Measurements through a card may introduce additional noise.
[9] Open lead detection off.
[10] Line sync on.

DC CURRENT

DC CURRENT ACCURACY ±(% OF READING + % OF RANGE)

Range	Resolution	Burden voltage	24 hours T_{CAL} ±1 °C	90 days T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 years T_{CAL} ±5 °C	Temperature coefficient
10 µA	10 pA	< 0.13 V	0.007 + 0.002	0.035 + 0.005	0.045 + 0.005	0.055 + 0.005	0.0030 + 0.0006
100 µA	100 pA	< 0.14 V	0.010 + 0.002	0.035 + 0.005	0.045 + 0.005	0.055 + 0.005	0.0020 + 0.0005
1 mA	1 nA	< 0.17 V	0.007 + 0.006	0.035 + 0.005	0.045 + 0.005	0.055 + 0.005	0.0020 + 0.0005
10 mA	10 nA	< 0.17 V	0.006 + 0.003	0.018 + 0.005	0.020 + 0.005	0.025 + 0.005	0.0015 + 0.0005
100 mA	100 nA	< 0.20 V[11]	0.010 + 0.003	0.015 + 0.005	0.020 + 0.005	0.025 + 0.005	0.0015 + 0.0005
1 A	1 µA	< 0.55 V[11]	0.020 + 0.004	0.030 + 0.005	0.040 + 0.005	0.050 + 0.005	0.0030 + 0.0005
3 A	1 µA	< 1.70 V[11]	0.030 + 0.004	0.040 + 0.004	0.050 + 0.004	0.060 + 0.004	0.0030 + 0.0005
10 A[12]	10 µA	< 0.50 V	0.140 + 0.025	0.190 + 0.025	0.220 + 0.025	0.250 + 0.025	0.0060 + 0.0005

DC CURRENT CHARACTERISTICS

Overrange	20% on 10 µA, 100 µA, 1 mA, 10 mA, 100 mA, and 1 A ranges 1% on 3 A and 10 A ranges
Terminal input protection	Externally accessible 3 A, 250 V fast-acting fuse, 5 × 20 mm: Keithley replacement part number FU-99-1 Externally accessible 11 A and 1000 V fuse: Keithley replacement part number (11A) 159-0583-00
Autozero off error	Add ±0.004% of range within ±1 °C and ≤ 10 minutes since last autozero Add ±0.015% of range within ±5 °C and ≤ 60 minutes since last autozero
Nominal shunt resistance[13]	10 µA: 10 kΩ; 100 µA: 1 kΩ; 1 mA: 100 Ω; 10 mA: 10 Ω; 100 mA: 1 Ω; 1 A: 100 mΩ; 3 A: 100 mΩ; 10 A: 5 mΩ

DC CURRENT MEASUREMENT NOISE CHARACTERISTICS[14]

Measurement rate in NPLCs	Digits	DCI RMS noise uncertainty (in % of range + fixed base)
5	6.5	0
1		0
0.1[15]		0.0009 + 10.0 pA
0.1	5.5	0.0015 + 5.0 nA
0.01		0.0030 + 5.0 nA
0.0005	4.5	0.0200 + 5.0 nA

[11] When using the rear terminals, add 0.1 V to the 100 mA range and 0.5 V to the 1 A and 3 A ranges.
[12] For each additional ampere over ±6 A, add 2 mA of uncertainty. Operation for > 1000 hours with a signal level of > 7 A, add 0.05% of reading uncertainty for every 1000 hours.
[13] Guaranteed by design.
[14] Applies for 10 µA through 3 A ranges. Noise values apply to open terminals. Measurements through a card may introduce additional noise.
[15] Line sync on.

TEMPERATURE

THERMOCOUPLE ACCURACY ±°C[16]

Type	Resolution	Range	2-year accuracy T_{CAL} ±5 °C; all uncertainties in °C			Temperature coefficient in °C / °C
			Simulated or external CJC		Internal CJC (on module)	
			Front/rear terminals	2001-TCSCAN	2001-TCSCAN	
J	0.001 °C	0 °C to 760 °C	0.20	0.20	0.65	0.03
		-200 °C to < 0 °C	0.20	0.20	0.65	0.03
K	0.001 °C	0 °C to 1372 °C	0.20	0.20	0.70	0.03
		-200 °C to < 0 °C	0.30	0.30	0.70	0.03
N	0.001 °C	0 °C to 1300 °C	0.20	0.20	0.70	0.03
		-200 °C to < 0 °C	0.50	0.60	1.50	0.03
T	0.001 °C	0 °C to 400 °C	0.20	0.20	0.70	0.03
		-200 °C to < 0 °C	0.30	0.30	0.70	0.03
E	0.001 °C	0 °C to 1000 °C	0.20	0.20	0.70	0.03
		-200 °C to < 0 °C	0.20	0.30	0.70	0.03
R	0.010 °C	600 °C to 1768 °C	0.40	0.50	1.30	0.03
		0 °C to < 600 °C	0.80	1.00	1.30	0.03
S	0.010 °C	600 °C to 1768 °C	0.40	0.50	1.30	0.03
		0 °C to < 600 °C	0.80	1.00	1.30	0.03
B	0.010 °C	1100 °C to 1820 °C	0.40	0.50	1.65	0.03
		350 °C to < 1100 °C	1.20	1.50	1.65	0.03

RESISTANCE TEMPERATURE DETECTOR (RTD) ACCURACY ±°C

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

Measurement method	Resolution	Range	2-year accuracy T_{CAL} ±5 °C	Temperature coefficient in °C / °C
2-wire[17]	0.01 °C	-200 °C to 850 °C	0.80	0.003
3-wire[18]	0.01 °C	-200 °C to 600 °C	0.35	0.003
		> 600 °C to 850 °C	0.37	0.003
4-wire	0.01 °C	-200 °C to 600 °C	0.06	0.003
		> 600 °C to 850 °C	0.12	0.003

THERMISTOR ACCURACY ±°C

Types: 2.2 kΩ, 5 kΩ, and 10 kΩ

Measurement method	Resolution	Range	2-years T_{CAL} ±5 °C	Temperature coefficient in °C / °C
2-wire	0.01 °C	-80 °C to 150 °C	0.08	0.002

For readings > 70 °C, add this additional uncertainty per Ω of lead, channel, and contact resistance

Thermistor type	Common model number	70 °C to 100 °C	> 100 °C to 150 °C
2.2 kΩ	44004	0.22 °C per Ω	1.11 °C per Ω
5 kΩ	44007	0.10 °C per Ω	0.46 °C per Ω
10 kΩ	44006	0.04 °C per Ω	0.19 °C per Ω

TEMPERATURE CHARACTERISTICS

Thermocouple conversion	ITS-90
Thermocouple reference junction	External (CJC on 2001-TCSCAN or user-provided with 2000-SCAN) or simulated (fixed)
Open thermocouple detection	Selectable per channel (open > 130 kΩ); default on
Earth isolation	500 V_{PEAK} > 10 GΩ and < 300 pF any terminal to chassis

[16] Accuracy excludes probe errors.
[17] Specifications do not include errors that may arise from the user's cable or terminal resistance.
[18] 3-wire RTD accuracy is for < 0.1 Ω lead-resistance mismatch for input HI and LO. Add 0.25 °C per 0.1 Ω of HI-LO resistance mismatch.

AC VOLTAGE

AC VOLTAGE ACCURACY ±(% OF READING + % OF RANGE)[19]

Range	Resolution	Calibration cycle	3 Hz to 5 Hz	5 Hz to 10 Hz	10 Hz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	100 kHz to 300 kHz
100 mV	100 nV	24 hours	1.00 + 0.02	0.35 + 0.02	0.04 + 0.02	0.10 + 0.04	0.55 + 0.08	4.00 + 0.50
1 V	1 µV	90 days	1.00 + 0.03	0.35 + 0.03	0.05 + 0.03	0.11 + 0.05	0.60 + 0.08	4.00 + 0.50
10 V	10 µV	1 year	1.00 + 0.03	0.35 + 0.03	0.06 + 0.03	0.12 + 0.05	0.60 + 0.08	4.00 + 0.50
100 V	100 µV	2 years	1.00 + 0.03	0.35 + 0.03	0.07 + 0.03	0.13 + 0.05	0.60 + 0.08	4.00 + 0.50
750 V	100 µV							
Temperature coefficient			0.100 + 0.003	0.035 + 0.003	0.005 + 0.003	0.011 + 0.005	0.060 + 0.008	0.200 + 0.020

AC VOLTAGE CHARACTERISTICS

Overrange (voltages in V_{RMS})	20% on 100 mV, 1 V, 10 V, and 100 V ranges	0% for 750 V range
AC measurement method	AC-coupled digital sampling with anti-alias filter	
Crest factor (excludes sine wave)	Crest factors of up to 3:1 at full-scale input or 10:1 maximum, whichever is greater Autorange selects optimum range for crest factor up to 10:1 Accuracy specifications apply to all crest factors and are limited to a product of (crest factor) × (fundamental frequency) ≤ 3 kHz	
Volt*Hertz product	≤ 8×10^7 V*Hz[20]	
Common-mode rejection ratio	> 70 dB, for 1 kΩ unbalance in LO lead	
Detector bandwidth	Setting of 3 Hz, 30 Hz, or 300 Hz sets maximum measurement aperture of 200 ms, 20 ms, or 2 ms, respectively; only signals with frequency greater than the detector bandwidth are measured	
Input impedance	1.1 MΩ ±2%, in parallel with < 100 pF	
Input protection	1100 V_{PEAK}	
Maximum DCV	400 V on any ACV range	
ACV frequency	Frequency reading is automatically returned in the reading buffer when in full buffer mode Frequency readings are specified in the frequency and period table	
Scanner card maximum input signal levels	**Module**	**Maximum input signal level**
	2000-SCAN	125 V_{RMS} or 175 V_{PEAK}
	2001-TCSCAN	125 V_{RMS} or 175 V_{PEAK}

[19] Specifications are for sine wave inputs > 5% of range.
[20] Guaranteed by design.

AC CURRENT

AC CURRENT ACCURACY ±(% OF READING + % OF RANGE)[21]

Range	Resolution	Burden voltage	Frequency	24 hours T_{CAL} ±1 °C	90 days T_{CAL} ±5 °C	1 year T_{CAL} ±5 °C	2 years T_{CAL} ±5 °C	Temperature coefficient
100 µA	100 pA	< 0.14 V	3 Hz to 1 kHz	0.10 + 0.07	0.10 + 0.07	0.10 + 0.07	0.10 + 0.07	0.015 + 0.010
			> 1 kHz to 10 kHz[22]	0.15 + 0.07	0.15 + 0.07	0.15 + 0.07	0.15 + 0.07	0.030 + 0.010
1 mA	1 nA	< 0.17 V	3 Hz to 5 kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
			> 5 kHz to 10 kHz[22]	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.030 + 0.006
10 mA	10 nA	< 0.17 V	3 Hz to 5 kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10+ 0.04	0.015 + 0.006
			> 5 kHz to 10 kHz[22]	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.030 + 0.006
100 mA	100 nA	< 0.20 V[23]	3 Hz to 5 kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
			> 5 kHz to 10 kHz[22]	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.030 + 0.006
1 A	1 µA	< 0.75 V[23]	3 Hz to 5 kHz [24]	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
			> 5 kHz to 10 kHz[22]	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.030 + 0.006
3 A	1 µA	< 1.70 V[23]	3 Hz to 5 kHz[24]	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
			> 5 kHz to 10 kHz[22]	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.030 + 0.006
10 A	10 µA	< 0.50 V	3 Hz to 1 kHz[24]	0.40 + 0.06	0.40 + 0.06	0.40 + 0.06	0.40 + 0.06	0.015 + 0.006
			> 1 kHz to 5 kHz	1.00 + 0.07	1.00 + 0.07	1.00 + 0.07	1.00 + 0.07	0.030 + 0.012
			> 5 kHz to 10 kHz[22]	1.00 + 0.07	1.00 + 0.07	1.00 + 0.07	1.00 + 0.07	0.030 + 0.012

AC CURRENT CHARACTERISTICS

Overrange	20% on 100 µA, 1 mA, 10 mA, 100 mA, and 1 A ranges 1% on 3 A and 10 A range
AC measurement type	AC-coupled true RMS; measures the AC component of the input Digital sampling with anti-alias filter
Input protection	See DC CURRENT CHARACTERISTICS
Crest factor[25] **(excludes sine wave)**	10:1 maximum crest factor (1.75:1 at full-scale) Autorange selects optimum range for crest factor up to 10:1 Accuracy specifications apply to all crest factors less than 5 and are limited to the product of (crest factor) × (fundamental frequency) ≤ 200 Hz
ACI frequency	Frequency readings are automatically returned in the reading buffer when in full buffer mode Frequency values are typical
Nominal shunt resistance[26]	100 µA: 1 kΩ; 1 mA: 100 Ω; 10 mA: 10 Ω; 100 mA: 1 Ω; 1 A: 100 mΩ; 3 A: 100 mΩ; 10 A: 5 mΩ

FREQUENCY AND PERIOD

FREQUENCY AND PERIOD ACCURACY ±(% OF READING)[27]

Range	Resolution	Frequency	Period	2-year accuracy T_{CAL} ±5 °C	Temperature coefficient
100 mV to 750 V (for signals > 5% of range and > 10 mV_{RMS})	0.0001% of reading	3 Hz to 10 Hz	333 ms to 100 ms	0.100	0.0002
		> 10 Hz to 100 Hz	< 100 ms to 10 ms	0.030	0.0002
		> 100 Hz to 1 kHz	< 10 ms to 1 ms	0.010	0.0002
		> 1 kHz to 300 kHz	< 1 ms to 3.3 µs	0.009	0.0002
		Square wave[28]		0.008	0.0002

[21] Specifications are for sine wave inputs > 5% of range and > 10 $µA_{RMS}$.
[22] Typical performance for the indicated frequency ranges.
[23] When using the rear terminals, add 0.1 V to the 100 mA range and 0.5 V to the 1 A and 3 A ranges.
[24] For signals of < 5 Hz, add 0.2% of reading uncertainty.
[25] 100 µA range is specified only for crest factors < 3.
[26] Guaranteed by design.
[27] Specifications apply for sine wave input; detector bandwidth of 3 Hz. For detector bandwidth 30 Hz, add 100 mHz uncertainty. For detector bandwidth 300 Hz, add 1 Hz uncertainty.
[28] Used for square waves with amplitude > 10% of range and 10 Hz to 300 kHz.

FREQUENCY AND PERIOD CHARACTERISTICS

Measurement method	Reciprocal-counting technique; measurement is AC-coupled using AC measurement functions
Voltage ranges	100 mV_{RMS} full scale to 750 V_{RMS}; auto or manual ranging
Aperture	User-definable from 2 ms to 273 ms (default 200 ms)

CONTINUITY

CONTINUITY ACCURACY 2-WIRE ±(% OF READING + % OF RANGE)[29]

Range	Resolution	Test current	Open circuit voltage (±5%)	2-year accuracy T_{CAL} ±5 °C	Temperature coefficient
1 kΩ	100 mΩ	1 mA	9.2 V	0.010 + 0.010	0.0006 + 0.0001

CAPACITANCE

CAPACITANCE ACCURACY ±(% OF READING + % OF RANGE)[30]

Range	Resolution	Charge current (±5%)[31]	2-year accuracy T_{CAL} ±5 °C	Temperature coefficient
1 nF	0.1 pF	1 µA	0.80 + 0.50	0.05 + 0.05
10 nF	1 pF	10 µA	0.40 + 0.10	0.01 + 0.01
100 nF	10 pF	100 µA	0.40 + 0.10	0.01 + 0.01
1 µF	0.1 nF	100 µA	0.40 + 0.10	0.01 + 0.01
10 µF	1 nF	1 mA	0.40 + 0.10	0.01 + 0.01
100 µF	10 nF	1 mA	0.40 + 0.10	0.01 + 0.01

CAPACITANCE CHARACTERISTICS

Overrange	20% on all ranges
Measurement method	Constant-current slope measurement
Maximum voltage and voltage clamp	**For all devices:** Clamped by hardware to < 3 V

DIODE

DIODE VOLTAGE ACCURACY ±(% OF READING + ADDITIONAL UNCERTAINTY)[32]

Voltage measure range	Resolution	Maximum voltage measurement	Test current (±5%)	2-year accuracy T_{CAL} ±5 °C	Temperature coefficient
10 V	10 µV	12 V	10 µA	0.0045 + 60.0 µV	0.0008 + 10 µV
		10 V	100 µA	0.0045 + 80.0 µV	0.0008 + 10 µV
		7 V	1 mA	0.0045 + 170.0 µV	0.0010 + 10 µV
		7 V	10 mA	0.0045 + 1.1 mV	0.0010 + 10 µV

[29] Does not include the user's lead-resistance.
[30] Accuracies are specified for cable, channel, and other stray connector capacitance properly zeroed with the REL function.
[31] Discharge current limited to < 10 mA.
[32] Specifications do not include errors that may arise from user's cable or connection resistance.

DIGITIZE

DIGITIZE DC VOLTAGE ACCURACY ±(% OF READING + % OF RANGE)[33]

Range	Resolution	Input impedance	2 Years T_{CAL} ±5 °C	Temperature coefficient
100 mV	10 µV	> 10 GΩ or 10 MΩ ±1%	0.040 + 0.020	0.0025 + 0.0030
1 V	100 µV	> 10 GΩ or 10 MΩ ±1%	0.030 + 0.010	0.0025 + 0.0010
10 V	1 mV	> 10 GΩ or 10 MΩ ±1%	0.030 + 0.010	0.0025 + 0.0010
100 V	10 mV	10 MΩ ±1%	0.030 + 0.010	0.0025 + 0.0010
1000 V	100 mV	10 MΩ ±1%	0.030 + 0.010	0.0025 + 0.0010

DIGITIZE DC CURRENT ACCURACY ±(% OF READING + % OF RANGE)[33]

Range	Resolution	Burden voltage	2 years T_{CAL} ±5 °C	Temperature coefficient
100 µA	10 nA	< 0.14 V	0.07 + 0.05	0.0030 + 0.0035
1 mA	100 nA	< 0.17 V	0.07 + 0.03	0.0030 + 0.0035
10 mA	1 µA	< 0.17 V	0.05 + 0.03	0.0030 + 0.0035
100 mA	10 µA	< 0.20 V[34]	0.05 + 0.03	0.0020 + 0.0035
1 A	100 µA	< 0.55 V[34]	0.07 + 0.03	0.0040 + 0.0035
3 A	100 µA	< 1.70 V[34]	0.09 + 0.04	0.0040 + 0.0035
10 A	1 mA	< 0.50 V	0.25 + 0.08	0.0060 + 0.0100

TYPICAL DIGITIZE SIGNAL CHARACTERISTICS

Typical performance for these conditions: Sample rate 1 MS per s; sine wave input V_{PEAK} = -1 dB full-scale of range

Function: Range	Spur-free range SFDR (1 kHz / 10 kHz / 50 kHz)	THD + noise SNDR (1 kHz / 10 kHz / 50 kHz)	Bandwidth (-3 dB, 5%)	Effective number of bits (1 kHz / 10 kHz / 50 kHz)
DCV: 100 mV	75 / 70 / 50	65 / 60 / 50	210 kHz	9 / 9 / 7
DCV: 1 V	95 / 90 / 75	80 / 80 / 75	210 kHz	12 / 12 / 11
DCV: 10 V	95 / 80 / 70	90 / 80 / 70	440 kHz	13 / 12 / 10
DCV: 100 V	50 / 35 / 25	50 / 40 / 30	17 kHz	10 / 8 / 7
DCV: 1000 V	50 / 35 / 25	50 / 40 / 30	17 kHz	13 / 11 / 10
DCI: 100 µA	80 / 65 / 45	70 / 65 / 45	430 kHz	12 / 10 / 8
DCI: 1 mA	80 / 65 / 45	70 / 65 / 45	570 kHz	12 / 10 / 8
DCI: 10 mA	80 / 65 / 45	70 / 65 / 45	230 kHz	12 / 10 / 8
DCI: 100 mA	80 / 65 / 45	70 / 65 / 45	340 kHz	12 / 10 / 8
DCI: 1 A	70 / 50 / 40	65 / 50 / 40	25 kHz	11 / 8 / 7
DCI: 3 A	70 / 50 / 40	65 / 50 / 40	25 kHz	11 / 8 / 7
DCI: 10 A	45 / 25 / 20	43 / 30 / 30	40 kHz	7 / 5 / 5

DIGITIZING ADDITIONAL CHARACTERISTICS

Maximum resolution	16 bits
Measurement input coupling	DC coupled
Sampling rate	Programmable 1 k through 1 MS per second
Minimum record time	1 µs
Maximum record length (volatile)	Up to 7 million with standard buffer (includes channel and formatting information)

[33] DC accuracy specified with 1000 samples per second, 100-reading digital filter.
[34] When using the rear terminals, add 0.1 V to the 100 mA range and 0.5 V to the 1 A and 3 A ranges.

DC VOLTAGE RATIO

DC VOLTAGE RATIO CALCULATION[35]

Method	Measurement
Channel ratio (through rear-input scanner card)	$\text{Channel ratio} = \frac{\text{channel A}}{\text{channel B}}$ Accuracy = (accuracy of channel A measure range + accuracy of channel B measure range) × channel ratio
Channel average (through rear-input scanner card)	$\text{channel average} = \frac{\text{channel A + channel B}}{2}$ Accuracy = accuracy of channel A measure range + accuracy of paired channel B measure range
DCV Input ratio (HI-LO / SHI-SLO)[36]	$\text{ratio} = \frac{\text{HI signal}}{\text{SHI signal - SLO signal}}$ $\text{Accuracy} = \left(\frac{\text{HI range}}{\text{HI signal}} \times \text{DCV \% of range accuracy} + \frac{10\text{ V}}{\text{SHI signal - SLO signal}} \times 0.0008\%\right) \times \text{ratio}$

SYSTEM SPECIFICATIONS

TYPICAL READING RATES, DC FUNCTIONS[37, 38]

60 Hz (50 Hz) operation

NPLCs	Functions: DCV (10 V) 2-wire Ω (≤ 10 kΩ), DCI (1 mA)		Functions: 4-wire Ω (≤ 1 kΩ) 4-wire and 3-wire RTD		Function: Thermistor or thermocouple	
	Measurements (readings per second)[39]					
	Buffer	Computer	Buffer	Computer	Buffer	Computer
5	12 (10)	11 (9)	5 (4)	5 (4)	12 (10)	11 (9)
1	59 (48)	58 (48)	28 (23)	28 (23)	59 (49)	57 (48)
0.1	584 (490)	440 (380)	180 (160)	170 (150)	580 (480)	440 (380)
0.01	4900 (4100)	4800 (4100)	400 (390)	400 (390)	4800 (4100)	4700 (4000)
0.0005	20600 (20600)	19800 (19800)	460 (460)	460 (460)	21000 (21000)	20300 (20300)

TYPICAL READING RATES, AC FUNCTIONS[37]

60 Hz (50 Hz) operation

Functions: ACV, ACI	Functions: Frequency, period	Measurements (readings per second)
Detector bandwidth	**Aperture**	**Buffer or computer**
3 Hz	200 ms	1
30 Hz	20 ms	10
300 Hz	2 ms	100

[35] See DC VOLTAGE ACCURACY. SHI and SLO: 10 V range only. SHI and SLO (sense) terminals referenced to LO input. Maximum voltage referenced to LO 12 V.
[36] Sense terminals on inputs are limited to 10 V range during ratio measurement. Add 0.0015% + 0.0005% per °C temperature coefficient to DCV percent of range accuracy when using the 100 V or 1000 V range on the input terminals.
[37] Reading speeds for autozero off, fixed range, autodelay off, offset compensation off, and open lead detector off where applicable.
[38] Buffer measurements: For < 0.1 PLC, multisample, and single buffer transfer binary readings only.
[39] Computer measurements: For 5 PLC, 1 PLC, and 0.1 PLC single reading and single transfer to computer (USB).

SCANNING / MULTIPLE CHANNELS (WITH OPTIONAL SCAN CARDS)[40]

Typical scanning measurement rates	Measurements into buffer or computer (channels per second)
Scanning DCV or 2-wire Ω	> 90 with 2000-SCAN card > 90 with 2001-TCSCAN card
Scanning thermocouple, thermistor, or 2-wire RTD	> 85 with 2000-SCAN card > 85 with 2001-TCSCAN card
Scanning 4-wire Ω and 3- or 4-wire RTD	> 80 with 2000-SCAN card > 80 with 2001-TCSCAN
Scanning ACV[41]	> 60 with 2000-SCAN card > 60 with 2001-TCSCAN card
Scanning alternating DCV and 2-wire Ω	> 85 with 2000-SCAN card > 85 with 2001-TCSCAN card

TYPICAL FUNCTION AND RANGE CHANGE SPEED

Function	Function change time[42]	Range change time[43]	Autorange time[42]
DCV, DCI, or 2-wire Ω[44]	< 4 ms	< 1.3 ms	< 3.2 ms
4-wire Ω[45] or 3-wire RTD			< 5.5 ms
Thermistor			—
Frequency or period (2 ms aperture)	< 1800 ms	< 50 ms[46]	< 50 ms[46]
ACV (300 Hz bandwidth)			
ACI (300 Hz bandwidth)	< 100 ms	< 4 ms	< 5 ms
Capacitance	< 4 ms	< 3 ms	< 30 ms
Digitize	< 4 ms	< 5 ms	—
Diode	< 11 ms	—	—
Continuity	< 11 ms	—	—
Thermocouple	< 4 ms	—	—

BUS TRANSFER SPEED[47]

	Peak measurements into computer (per second)			
	USB	**LAN**	**GPIB**	**RS232 (baud 115200)**
Average for 1000 readings (binary)	441,000	268,000	201,000	10,000
Average for 1000 readings with relative timestamp (binary)	272,000	150,000	105,000	2,900
Average for 1000 readings with formatted elements[48]	46,000	29,000	17,000	290

[40] Set-up conditions of the factory default setting with the following exceptions: 3.5 digits (0.0005 PLC), autorange off, autozero off, autodelay off, and open lead detection off.
[41] Assume the signal is 10 kHz or above.
[42] 3.5 digits, autozero off, 0.0005 PLC, excludes measurement time.
[43] DCV = 10 V; 2-wire or 4-wire = 1 kΩ; DCI = 1 mA; ACI = 1 mA; ACV = 1 V; Capacitance = 10 µF.
[44] 2-wire function for 100 Ω range and up. For the 10 Ω range, add 2.7 ms.
[45] 4-wire function for 100 Ω range and up. For the 1 Ω and 10 Ω ranges, add 2.7 ms.
[46] When ranging to 10 V and above, add 1.8 s.
[47] SCPI programmed using 4-byte binary format.
[48] Format elements: Reading, relative timestamp, channel, and unit.

TYPICAL DIGITIZE VOLTAGE OR CURRENT[49]

Sampling rate	Measurements over USB to computer
10 kS per s	Up to 10,000 readings per s
50 kS per s	Up to 50,000 readings per s
100 kS per s	Up to 100,000 readings per s
1 MS per s up to 7 s maximum duration	At least 90,000 readings per s

TRIGGERING

Trigger sources	Front-panel trigger key, timer, command interface, LAN/LXI, trigger in (BNC rear panel), digital I/O (optional accessory card), and TSP-Link® (optional accessory card)
External trigger delay	< 1 µs when triggering from accessory card or rear BNC input
External trigger jitter	< 1 µs when triggering from accessory card or rear BNC input
External trigger in and trigger out	0 V to 5 V logic signal input and output, TTL-compatible, programmable edge pulse Minimum pulse width: 1 µs
External trigger out, maximum rate	Up to 90 kHz, measurement dependent
External trigger in, maximum rate	Up to 150 kHz, measurement dependent

SCANNING (WITH OPTIONAL SCAN CARDS)

Scan count	1 to continuous
Scan interval	0 s to 27.7 hours
Channel delay	0 s to 60 s
Measure interval	0 s to 27.7 hours

INTERNAL MEMORY

Maximum reading memory (volatile)	Up to 7 million readings with a standard buffer (includes channel and formatting information)
Internal (nonvolatile) memory for saved scripts and scan configurations	6 MB, enables hundreds of scan configurations or TSP scripts to be saved in nonvolatile memory

[49] SCPI programmed using 4-byte binary format.

GENERAL SPECIFICATIONS

LINE POWER	
Power supply	100 V, 120 V, 220 V, and 240 V (±10%)
Power line frequency	50 Hz to 60 Hz and 400 Hz, automatically sensed at power-up
Maximum power consumption	50 VA
Typical power consumption	30 VA
Mains input fuse	250 V, 1.25 A slow-blow fuse: Keithley replacement part number FU-106-1.25
ENVIRONMENT AND REGULATORY	
Operating environment	Specified for 0 °C to 50 °C, ≤ 80% relative humidity at 35 °C, altitude up to 2000 meters
Storage environment	-40 °C to 70 °C
Vibration	MIL-PRF-28800F Class 3, random
Warm-up	30 minutes to rated accuracy
Safety	NRTL listed to UL61010-1 and CSA C22.2 No 61010-1; conforms to European Union Low Voltage Directive
EMC	Conforms to European Union EMC Directive
MECHANICAL	
Display	12.7 cm (5 in.) capacitive touch, color TFT WVGA (800 × 480) with LED backlight
Rack dimensions (W × H × D)	213.8 mm (8.42 in.) × 88.4 mm (3.48 in.) × 356.6 mm (14.04 in.)
Bench dimensions (W × H × D)	224.0 mm (8.82 in.) × 107.2 mm (4.22 in) × 387.4 mm (15.25 in.)
Shipping weight	4.54 kg (10.0 lb) instrument only
Input signal connections	Front and rear safety banana jacks or scanner cards
Plug-in scanner slot	One slot on rear panel; see OPTIONAL MULTI-CHANNEL AND SCANNER ACCESSORIES
Communication slot	One slot on rear panel; see OPTIONAL INTERFACES AND PROGRAMMABLE DIGITAL I/O
Cooling	Forced air, fixed speed
REMOTE INTERFACE: STANDARD	
LAN/LXI compliance	RJ-45 connector, 10/100BT; IP configuration; static or DHCP (manual or automatic) Web interface: virtual front panel; LXI compliance: LXI version 1.5 core 2016
USB device (rear panel, type B)	2.0 full speed, USBTMC compliant
USB host (front panel, type A)	USB 2.0, support for flash drives, FAT32; Capability: Import and export instrument configuration files, reading buffers, screen captures, and scripts
LANGUAGE	
SCPI (default)	Default command set: Standard Commands for Programmable Instruments, SCPI-1999
TSP	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, and math); able to execute test scripts stored in memory without host intervention
Emulation modes	Keithley Model 2000 and 34401A
MATH FUNCTIONS	
REL, minimum, maximum, average, standard deviation, peak-peak, dB, limit test, percent, 1/x, and mX+b with user-defined units displayed	
MISCELLANEOUS	
Real-time clock	Lithium battery backup, CR2032 coin-type, factory replaceable (3+ years of battery life); set and read year, month, day, hour, minute, and seconds (note that seconds are not adjustable)
Timestamp resolution	15 ns with standard or full buffer style
Password protection	30 characters
Alarms	Up to six: see OPTIONAL INTERFACES AND PROGRAMMABLE DIGITAL I/O
Power failure recovery mode	User selectable, resumes scanning once power is restored

OPTIONAL MULTI-CHANNEL AND SCANNER ACCESSORIES	
Scanner card module	
2000-SCAN card	10-channel, 2-pole or 5-channel, 4-pole
2001-TCSCAN card	9-channel, 2-pole or 4-channel, 4-pole with CJC sensor
Limited compatibility with 2001-SCAN and 2000-SCAN-20; see the DMM6500 Firmware Release Notes for additional information	
OPTIONAL INTERFACES AND PROGRAMMABLE DIGITAL I/O	
KTTI-RS232	RS232, 9-pin d-sub female connector; standard baud rates from 300 to 115,200 bps are supported
KTTI-GPIB	GPIB IEEE-488.1 compliant; supports IEEE-488.2 common commands and status model topology
KTTI-TSP	RJ-45 (quantity 2); TSP-Link® expansion interface allows TSP-enabled instruments to trigger and communicate with each other
Digital I/O	For KTTI-RS232, KTTI-GPIB, and KTTI-TSP Connector: 9 pin d-sub female 5 V power supply pin: Limited to 500 mA > 4 V (solid-state fuse protected) Lines: Six input / output, user-defined for control, alarms (limits), 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 fused)