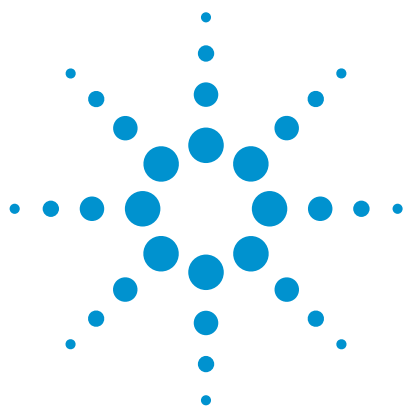




# Agilent U1250 Series Handheld Digital Multimeters

## Data Sheet

### Test more – more safely



The Agilent U1250 Series handheld digital multimeters (DMMs) exceed your expectations by delivering powerful features and performance that meet your toughest requirements and applications. The series latest multimeters, the offering capabilities and functions you need.

#### Key features

- Superior contrast from organic LED (OLED) display<sup>1</sup>
- 50,000-count dual display
- Up to 0.025% basic DCV accuracy
- True-RMS AC and AC+DC<sup>2</sup> measurements
- K-type and J-type<sup>2</sup> temperature measurements
- Manual and automated (interval) data logging; internally to DMM and externally to PC
- CAT III 1000 V and CAT IV 600 V safety protection
- Built-in 20-MHz frequency counter<sup>2</sup>
- Built-in programmable square-wave generator<sup>2</sup>

#### Do more with just one instrument

The basic model, U1251B, expands your capabilities beyond typical DMM measurements to include data logging. The U1252B starts with the same foundation, and then adds a 20-MHz frequency counter and programmable square-wave generator — so you'd be able to perform more tests conveniently with one tool. What's more: both models come bundled with a complete set of accessories to equip you right from the start at no extra cost.

Offering the same functionality as the U1252B, the U1253B is the world's first OLED handheld DMM. You won't have to squint to be sure you're reading it right: On the go or on the bench, you'll get crystal-clear viewing indoors, even in dark, off-angle situations.

#### Find problems quickly

Troubleshooting can be tricky, especially when you're dealing with elusive problems. With the U1250 Series' data logging capability, you can ensure that every reading gets recorded manually or at intervals you specify. Better yet: you can have virtually unlimited data logging saves when you connect any of the U1250 Series DMM to a PC with the optional IR-to-USB cable.

In addition, the U1250 Series lets you achieve greater confidence in your measurements with accurate true-RMS AC measurements, low DCV error rate of up to 0.025% and high-resolution display of 50,000 counts.

#### Uncompromising ruggedness and safety

The U1250 Series DMMs are housed in robust overmold enclosures, rated at CAT III 1000 V and CAT IV 600 V and operate over a wide temperature range of -20 °C to +55 °C. Each DMM also include a 30 kA high energy fuse to further protect you against violent fuse failures during high-current measurements. Built tough and certified to stringent industrial standards, the U1250 DMM is what you need to face the demands of everyday tasks.

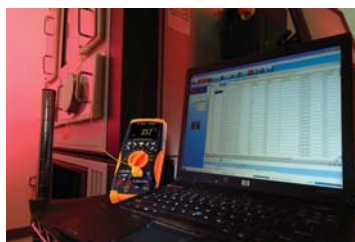


**Figure 1:** Automate recording of measurements with bundled GUI data-logging software.

[1] U1253B model  
[2] U1252B/U1253B models



**Agilent Technologies**

## Take a closer look



OLED display with approximately 160° viewing angle, and high contrast ratio of 2000:1 for crystal-clear viewing <sup>1</sup>



50,000 count dual display with true-RMS reading capability



Figure 2: U1253B front view

[1] U1253B only

[2] U1252B/U1253B only

## DC SPECIFICATIONS

| FUNCTION                  | RANGE                            | RESOLUTION        | TEST CURRENT/<br>BURDEN VOLTAGE | ACCURACY $\pm$ (% of reading + No. of Least Significant Digit) |                                               |
|---------------------------|----------------------------------|-------------------|---------------------------------|----------------------------------------------------------------|-----------------------------------------------|
|                           |                                  |                   |                                 | U1251B                                                         | U1252B/U1253B                                 |
| VOLTAGE <sup>(1)</sup>    | 50.000 mV                        | 0.001 mV          | -                               | 0.05 + 50 <sup>[2]</sup>                                       | 0.05 + 50 <sup>[2]</sup>                      |
|                           | 500.00 mV                        | 0.01 mV           | -                               | 0.03 + 5                                                       | 0.025 + 5                                     |
|                           | 1000.0 mV                        | 0.1 mV            | -                               |                                                                |                                               |
|                           | 5.0000 V                         | 0.0001 V          | -                               |                                                                |                                               |
|                           | 50.000 V                         | 0.001 V           | -                               |                                                                | 0.03 + 5                                      |
|                           | 500.00 V                         | 0.01 V            | -                               |                                                                |                                               |
|                           | 1000.0 V                         | 0.1 V             | -                               |                                                                |                                               |
| RESISTANCE <sup>(8)</sup> | 500.00 $\Omega$ <sup>[3]</sup>   | 0.01 $\Omega$     | 1.04 mA                         | 0.08 + 10                                                      | 0.05 + 10                                     |
|                           | 5.0000 k $\Omega$ <sup>[3]</sup> | 0.0001 k $\Omega$ | 416 $\mu$ A                     | 0.08 + 5                                                       | 0.05 + 5                                      |
|                           | 50.000 k $\Omega$                | 0.001 k $\Omega$  | 41.2 $\mu$ A                    |                                                                |                                               |
|                           | 500.00 k $\Omega$                | 0.01 k $\Omega$   | 4.12 $\mu$ A                    |                                                                |                                               |
|                           | 5.0000 M $\Omega$                | 0.0001 M $\Omega$ | 375 nA                          | 0.2 + 5                                                        | 0.15 + 5                                      |
|                           | 50.000 M $\Omega$ <sup>[4]</sup> | 0.001 M $\Omega$  | 187 nA                          | 1 + 10                                                         | 1 + 5                                         |
|                           | 500.00 M $\Omega$ <sup>[4]</sup> | 0.01 M $\Omega$   | 187 nA                          | N/A                                                            | 3+10 < 200 M $\Omega$ / 8+10 > 200 M $\Omega$ |
|                           | 500.00 nS <sup>[5]</sup>         | 0.01 nS           | 187 nA                          | 1 + 20                                                         | 1 + 10                                        |
| CURRENT                   | 500.00 $\mu$ A                   | 0.01 $\mu$ A      | 0.06 V (100 $\Omega$ )          | 0.1 + 5 <sup>[6]</sup>                                         | 0.05 + 5 <sup>[6]</sup>                       |
|                           | 5000.0 $\mu$ A                   | 0.1 $\mu$ A       | 0.6 V (100 $\Omega$ )           |                                                                |                                               |
|                           | 50.000 mA                        | 0.001 mA          | 0.09 V (1 $\Omega$ )            | 0.2 + 5 <sup>[6]</sup>                                         | 0.15 + 5 <sup>[6]</sup>                       |
|                           | 440.00 mA                        | 0.01 mA           | 0.9 V (1 $\Omega$ )             |                                                                |                                               |
|                           | 5.0000 A                         | 0.0001 A          | 0.2 V (0.01 $\Omega$ )          | 0.3 + 10                                                       | 0.3 + 10                                      |
|                           | 10.000 A <sup>[7]</sup>          | 0.001 A           | 0.4 V (0.01 $\Omega$ )          |                                                                | 0.3 + 5                                       |
| DIODE TEST <sup>(8)</sup> | -                                | 0.1 mV            | 1.04 mA                         | 0.05 + 5                                                       |                                               |

[1] Input impedance: Refer to Table A on page 9.

[3] The accuracy of 500  $\Omega$  and 5 k $\Omega$  is specified after NULL function, which is used to subtract the test lead resistance and the thermal effect.

[4] For the range of 50 M $\Omega$  and 500 M $\Omega$ , the R.H. is specified for <60%.

[5] The accuracy is specified for <50 nS and after NULL function with open test lead.

[6] Always use the NULL function to zero out thermal effect with open test lead before measuring the signal. If the NULL function is not used, an additional 20 counts needs to be added to the DC current accuracy. Thermal effect could occur due to the following:

- Wrong operation to measure the high voltage of 50 V ~ 1000 V for resistance, diode, and mV measurements.
- After battery-charging has completed.
- After measuring a current greater than 440 mA, it is suggested that the meter be left to cool down for twice the measuring time used.

[7] Current can be measured up to 10 A continuously. An additional 0.5% needs to be added to the specified accuracy if the signal measured is in the range of 10 A~20 A for 30 seconds maximum. After measuring a current of > 10 A, leave the meter to cool down for twice the measuring time used before application of low current measurement.

[8] Maximum open voltage: <+ 4.2 V.

## U1251B AC VOLTAGE SPECIFICATIONS

| FUNCTION                               | RANGE     | RESOLUTION | ACCURACY ± (% of reading + No. of Least Significant Digit) |               |               |                |
|----------------------------------------|-----------|------------|------------------------------------------------------------|---------------|---------------|----------------|
|                                        |           |            | FREQUENCY                                                  |               |               |                |
|                                        |           |            | 30 Hz ~ 45 Hz                                              | 45 Hz ~ 1 kHz | 1 kHz ~ 5 kHz | 5 kHz ~ 30 kHz |
| TRUE RMS AC VOLTAGE <sup>[1] [2]</sup> | 50.000 mV | 0.001 mV   | 1.0+60                                                     | 0.6+40        | 1.0+40        | 1.6+60         |
|                                        | 500.00 mV | 0.01 mV    |                                                            | 0.6+25        |               |                |
|                                        | 1000.0 mV | 0.1 mV     |                                                            |               | 1.0+25        | 3.5+120        |
|                                        | 5.0000 V  | 0.0001 V   |                                                            |               |               |                |
|                                        | 50.000 V  | 0.001 V    |                                                            |               |               |                |
|                                        | 500.00 V  | 0.01 V     |                                                            |               |               |                |
|                                        | 1000.0 V  | 0.1 V      |                                                            | 0.6+40        | 1.0+40        | N/A            |

## U1251B AC CURRENT SPECIFICATIONS

| FUNCTION                  | RANGE                    | RESOLUTION | ACCURACY ± (% of reading + No. of Least Significant Digit) |               |                     |
|---------------------------|--------------------------|------------|------------------------------------------------------------|---------------|---------------------|
|                           |                          |            | FREQUENCY                                                  |               |                     |
|                           |                          |            | 30 Hz ~ 45 Hz                                              | 45 Hz ~ 2 kHz | 2 kHz ~ 20 kHz      |
| AC CURRENT <sup>[2]</sup> | 500.00 µA <sup>[4]</sup> | 0.01 µA    | 1.5+50                                                     | 0.8+20        | 3.0+80              |
|                           | 5000.0 µA                | 0.1 µA     | 1.5+40                                                     |               | 3.0+60              |
|                           | 50.000 mA                | 0.001 mA   |                                                            |               |                     |
|                           | 440.00 mA                | 0.01 mA    |                                                            |               |                     |
|                           | 5.0000 A                 | 0.0001 A   | 2.0+40 <sup>[6]</sup>                                      |               | 3+60,<br><3 A/5 kHz |
|                           | 10.000 A <sup>[5]</sup>  | 0.001 A    |                                                            |               |                     |

## U1252B/U1253B AC VOLTAGE SPECIFICATIONS

| FUNCTION                                   | RANGE     | RESOLUTION | ACCURACY ± (% of reading + No. of Least Significant Digit) |               |               |                |                               |
|--------------------------------------------|-----------|------------|------------------------------------------------------------|---------------|---------------|----------------|-------------------------------|
|                                            |           |            | FREQUENCY                                                  |               |               |                |                               |
|                                            |           |            | 20 Hz ~ 45 Hz                                              | 45 Hz ~ 1 kHz | 1 kHz ~ 5 kHz | 5 kHz ~ 15 kHz | 15 kHz~100 kHz <sup>(8)</sup> |
| TRUE RMS AC VOLTAGE <sup>(1) (2) (9)</sup> | 50.000 mV | 0.001 mV   | 1.5+60                                                     | 0.4+40        | 0.7+40        | 0.75+40        | 3.5+120                       |
|                                            | 500.00 mV | 0.01 mV    |                                                            | 0.4+25        | 0.4+25        |                |                               |
|                                            | 1000.0 mV | 0.1 mV     |                                                            |               | 0.6+25        | 1.5+40         |                               |
|                                            | 5.0000 V  | 0.0001 V   |                                                            |               | 0.4+25        |                |                               |
|                                            | 50.000 V  | 0.001 V    |                                                            |               | N/A           | N/A            | N/A                           |
|                                            | 500.00 V  | 0.01 V     |                                                            |               |               |                |                               |
|                                            | 1000.0 V  | 0.1 V      |                                                            | 0.4+40        | 0.4+40        | N/A            | N/A                           |

## U1252B/U1253B AC CURRENT SPECIFICATIONS

| FUNCTION                               | RANGE                    | RESOLUTION | ACCURACY ± (% of reading + No. of Least Significant Digit) |               |                |                               |     |
|----------------------------------------|--------------------------|------------|------------------------------------------------------------|---------------|----------------|-------------------------------|-----|
|                                        |                          |            | FREQUENCY                                                  |               |                |                               |     |
|                                        |                          |            | 20 Hz ~ 45 Hz                                              | 45 Hz ~ 1 kHz | 1 kHz ~ 20 kHz | 20 kHz~100 kHz <sup>[7]</sup> |     |
| TRUE RMS AC CURRENT <sup>[2] [9]</sup> | 500.00 µA <sup>[4]</sup> | 0.01 µA    | 1.0+20                                                     | 0.7+20        | 0.75+20        | 5.0+80                        |     |
|                                        | 5000.0 µA                | 0.1 µA     |                                                            |               |                |                               |     |
|                                        | 50.000 mA                | 0.001 mA   |                                                            |               |                |                               |     |
|                                        | 440.00 mA                | 0.01 mA    | 1.5+20 <sup>[6]</sup>                                      |               | 1.5+20         |                               |     |
|                                        | 5.0000 A                 | 0.0001 A   |                                                            |               |                |                               |     |
|                                        | 10.000 A <sup>[5]</sup>  | 0.001 A    |                                                            |               |                | 3+60,<br><3 A/5 kHz           | N/A |

[1] Input impedance: Refer to Table A on page 9.

[2] AC mV/V and AC  $\mu$ A/mA/A specifications are true RMS AC coupled, valid from 5% to 100% of range. The crest factor may be up to 3 at full scale, up to 5 at half- scale, except for 1000 mV and 1000 V ranges, where the crest factor is 1.5 at full scale and 3 at half scale.

[4] Input current >35  $\mu$ Arms.

[5] Current can be measured from 2.5 A up to 10 A continuously. An additional 0.5% needs to be added to the specified accuracy if the signal measured is in the range of 10 A ~ 20 A for 30 seconds maximum. After measuring a current of >10 A, leave the meter to cool down for twice the measuring time used before application of low current measurement.

[6] Input current < 3 Arms.

[7] The additional error to be added as frequency >20 kHz and signal input <10% of range: 3 counts of LSD per kHz.

[8] The additional error to be added as frequency >15 kHz and signal input <10% of range: 3 counts of LSD per kHz.

[9] Crest factor  $\leq$  3.0 at full scale, 5.0 at half scale except the 1000 mV and 1000 V ranges where it is 1.5 at full scale, 3.0 at half scale. For non-sinusoidal waveform, add 0.1% of reading  $\pm$  0.3% of range.

## U1252B/U1253B AC+DC VOLTAGE SPECIFICATIONS

| FUNCTION                                    | RANGE     | RESOLUTION | ACCURACY $\pm$ (% of reading + No. of Least Significant Digit) |               |               |                |                               |
|---------------------------------------------|-----------|------------|----------------------------------------------------------------|---------------|---------------|----------------|-------------------------------|
|                                             |           |            | FREQUENCY                                                      |               |               |                |                               |
|                                             |           |            | 30 Hz ~ 45 Hz                                                  | 45 Hz ~ 1 kHz | 1 kHz ~ 5 kHz | 5 kHz ~ 15 kHz | 15 kHz~100 kHz <sup>[4]</sup> |
| TRUE RMS AC VOLTAGE <sup>[1] [2] [10]</sup> | 50.000 mV | 0.001 mV   | 1.5+80                                                         | 0.4+60        | 0.7+60        | 0.8+60         | 3.5+220                       |
|                                             | 500.00 mV | 0.01 mV    | 1.5+65                                                         | 0.4+30        | 0.4+30        | 0.8+45         | 3.5+125                       |
|                                             | 1000.0 mV | 0.1 mV     |                                                                |               | 0.6+30        |                |                               |
|                                             | 5.0000 V  | 0.0001 V   |                                                                |               |               | 1.5+45         |                               |
|                                             | 50.000 V  | 0.001 V    |                                                                |               | 0.4+30        |                |                               |
|                                             | 500.00 V  | 0.01 V     |                                                                |               |               | N/A            | N/A                           |
|                                             | 1000.00 V | 0.1 V      |                                                                | 0.4+45        | 0.4+45        | N/A            | N/A                           |

## U1252B/U1253B AC+DC CURRENT SPECIFICATIONS

| FUNCTION                            | RANGE                         | RESOLUTION   | ACCURACY $\pm$ (% of reading + No. of Least Significant Digit) |               |                       |
|-------------------------------------|-------------------------------|--------------|----------------------------------------------------------------|---------------|-----------------------|
|                                     |                               |              | FREQUENCY                                                      |               |                       |
|                                     |                               |              | 30 Hz ~ 45 Hz                                                  | 45 Hz ~ 1 kHz | 1 kHz ~ 20 kHz        |
| TRUE RMS AC CURRENT <sup>[10]</sup> | 500.00 $\mu$ A <sup>[6]</sup> | 0.01 $\mu$ A | 1.1+25                                                         | 0.8+25        | 0.8+25                |
|                                     | 5000.0 $\mu$ A                | 0.1 $\mu$ A  |                                                                |               |                       |
|                                     | 50.000 mA                     | 0.001 mA     | 1.2+25                                                         | 0.9+25        | 0.9+25                |
|                                     | 440.00 mA                     | 0.01 mA      |                                                                |               |                       |
|                                     | 5.0000 A                      | 0.0001 A     | 1.8+30 <sup>[8]</sup>                                          | 0.9+30        | 3.3+70,<br><3 A/5 kHz |
|                                     | 10.000 A <sup>[7]</sup>       | 0.001 A      |                                                                | 0.9+25        |                       |

## U1251B/U1252B TEMPERATURE SPECIFICATIONS

| THERMOCOUPLE TYPE        | RANGE                    |                          | RESOLUTION                        | ACCURACY              |                       |
|--------------------------|--------------------------|--------------------------|-----------------------------------|-----------------------|-----------------------|
|                          | $^{\circ}$ C             | $^{\circ}$ F             |                                   | $^{\circ}$ C          | $^{\circ}$ F          |
| K                        | -200 ~ 1372 $^{\circ}$ C | -328 ~ 2502 $^{\circ}$ F | 0.1 $^{\circ}$ C/0.1 $^{\circ}$ F | 0.3% + 3 $^{\circ}$ C | 0.3% + 6 $^{\circ}$ F |
| J<br>(for U1252A/U1252B) | -210 ~ 1200 $^{\circ}$ C | -346 ~ 2192 $^{\circ}$ F | 0.1 $^{\circ}$ C/0.1 $^{\circ}$ F | 0.3% + 3 $^{\circ}$ C | 0.3% + 6 $^{\circ}$ F |

## U1253B TEMPERATURE SPECIFICATIONS

| THERMOCOUPLE TYPE | RANGE                   |                         | RESOLUTION                          | ACCURACY            |                       |
|-------------------|-------------------------|-------------------------|-------------------------------------|---------------------|-----------------------|
|                   | $^{\circ}$ C            | $^{\circ}$ F            |                                     | $^{\circ}$ C        | $^{\circ}$ F          |
| K                 | -200 ~ -40 $^{\circ}$ C | -104 ~ -40 $^{\circ}$ F | 0.1 $^{\circ}$ C/0.1 $^{\circ}$ F   | 1% + 3 $^{\circ}$ C | 1% + 5.4 $^{\circ}$ F |
|                   | -40 ~ 1372 $^{\circ}$ C | -40 ~ 2502 $^{\circ}$ F | 0.1 $^{\circ}$ C / 0.1 $^{\circ}$ F | 1% + 1 $^{\circ}$ C | 1% + 1.8 $^{\circ}$ F |
| J                 | -210 ~ -40 $^{\circ}$ C | -346 ~ -40 $^{\circ}$ F | 0.1 $^{\circ}$ C / 0.1 $^{\circ}$ F | 1% + 3 $^{\circ}$ C | 1% + 5.4 $^{\circ}$ F |
|                   | -40 ~ 1200 $^{\circ}$ C | -40 ~ 2192 $^{\circ}$ F | 0.1 $^{\circ}$ C / 0.1 $^{\circ}$ F | 1% + 1 $^{\circ}$ C | 1% + 1.8 $^{\circ}$ F |

## CAPACITANCE SPECIFICATIONS

| RANGE     | RESOLUTION | ACCURACY | MEASURING RATE AT FULL SCALE                                  | MAX. DISPLAY |
|-----------|------------|----------|---------------------------------------------------------------|--------------|
| 10.000 nF | 0.001 nF   | 1% + 8   | 4 times/sec.<br><br><br><br><br>1 time/sec.<br>0.1 times/sec. | 11000 counts |
| 100.00 nF | 0.01 nF    | 1% + 5   |                                                               |              |
| 1000.0 nF | 0.1 nF     |          |                                                               |              |
| 10.000 μF | 0.001 μF   |          |                                                               |              |
| 100.00 μF | 0.01 μF    |          |                                                               |              |
| 1000.0 μF | 0.1 μF     |          |                                                               |              |
| 10.000 mF | 0.001 mF   |          |                                                               |              |
| 100.00 mF | 0.01 mF    | 3% + 10  | 0.01 times/sec                                                |              |

## FREQUENCY SPECIFICATIONS<sup>[5]</sup>

| RANGE      | RESOLUTION | ACCURACY               |                        | MIN. INPUT FREQUENCY |
|------------|------------|------------------------|------------------------|----------------------|
|            |            | U1251B/2B              | U1253B                 |                      |
| 99.999 Hz  | 0.001 Hz   | 0.02%+3 <sup>[9]</sup> | 0.02%+3 <sup>[9]</sup> | 1 Hz                 |
| 999.99 Hz  | 0.01 Hz    | 0.02%+3, <600 kHz      | 0.02%+3, <600 kHz      |                      |
| 9.9999 kHz | 0.0001 kHz |                        |                        |                      |
| 99.999 kHz | 0.001 kHz  |                        |                        |                      |
| 999.99 kHz | 0.01 kHz   |                        |                        |                      |

- [1] Input impedance: Refer to Table A on page 9.
- [2] Crest factor  $\leq 3.0$  at full scale, 5.0 at half scale except the 1000 mV and 1000 V ranges where it is 1.5 at full scale, 3.0 at half scale.  
For non-sinusoidal waveform, add 0.1% of reading  $\pm 0.3\%$  of range.
- [3] The additional error to be added as frequency  $>20$  kHz and signal input  $<10\%$  of range: 3 counts of LSD per kHz.
- [4] The additional error to be added as frequency  $>15$  kHz and signal input  $<10\%$  of range: 3 counts of LSD per kHz.
- [6] Input current  $>35$   $\mu$ Arms.
- [7] Current can be measured from 2.5 A up to 10 A continuously. An additional 0.5% needs to be added to the specified accuracy if the signal measured is in the range of 10 A ~ 20 A for 30 seconds maximum. After measuring a current of  $>10$  A, leave the meter to cool down for twice the measuring time used before application of low current measurement.
- [8] Input current  $< 3$  Arms.
- [9] For non-square wave signals, add 5 counts.
- [10] AC voltage and AC current specifications are true RMS AC coupled, valid from 5% to 100% of range.

## U1251B FREQUENCY SENSITIVITY DURING VOLTAGE MEASUREMENT

| FREQUENCY SENSITIVITY AND TRIGGER LEVEL                       |                                           |                      |                               |                      |
|---------------------------------------------------------------|-------------------------------------------|----------------------|-------------------------------|----------------------|
| INPUT RANGE                                                   | MINIMUM SENSITIVITY<br>(R.M.S. Sine Wave) |                      | TRIGGER LEVEL FOR DC COUPLING |                      |
| (Maximum input for specified accuracy = 10 x Range or 1000 V) | 20 Hz - 100 kHz                           | $>100$ kHz ~ 200 kHz | $< 100$ kHz                   | $>100$ kHz ~ 200 kHz |
| 50.000 mV                                                     | 10 mV                                     | 15 mV                | 10 mV                         | 15 mV                |
| 500.00 mV                                                     | 25 mV                                     | 35 mV                | 60 mV                         | 70 mV                |
| 1000.0 mV                                                     | 40 mV                                     | 50 mV                | 100 mV                        | 150 mV               |
| 5.0000 V                                                      | 0.25 V                                    | 0.5 V                | 0.5 V / 1.25 V ( $< 100$ Hz)  | 0.6 V                |
| 50.000 V                                                      | 2.5 V                                     | 5 V                  | 5 V                           | 6 V                  |
| 500.00 V                                                      | 25 V                                      | N/A                  | 50 V                          | N/A                  |
| 1000.0 V                                                      | 50 V                                      | N/A                  | 300 V                         | N/A                  |

## U1252B/U1253B FREQUENCY SENSITIVITY DURING VOLTAGE MEASUREMENT

| FREQUENCY SENSITIVITY AND TRIGGER LEVEL                       |                                           |                      |                               |                      |
|---------------------------------------------------------------|-------------------------------------------|----------------------|-------------------------------|----------------------|
| INPUT RANGE                                                   | MINIMUM SENSITIVITY<br>(R.M.S. Sine Wave) |                      | TRIGGER LEVEL FOR DC COUPLING |                      |
| (Maximum input for specified accuracy = 10 x Range or 1000 V) | 20 Hz ~ 200 kHz                           | $>200$ kHz ~ 500 kHz | $< 100$ kHz                   | $>100$ kHz ~ 500 kHz |
| 50.000 mV                                                     | 10 mV                                     | 25 mV                | 10 mV                         | 25 mV                |
| 500.00 mV                                                     | 70 mV                                     | 150 mV               | 70 mV                         | 150 mV               |
| 1000.0 mV                                                     | 120 mV                                    | 300 mV               | 120 mV                        | 300 mV               |
| 5.0000 V                                                      | 0.3 V                                     | 1.2 V                | 0.6 V                         | 1.5 V                |
| 50.000 V                                                      | 3 V                                       | 5 V                  | 6 V                           | 15 V                 |
| 500.00 V                                                      | 30 V $< 100$ kHz                          | N/A                  | 60 V                          | N/A                  |
| 1000.0 V                                                      | 50 V $< 100$ kHz                          | N/A                  | 120 V                         | N/A                  |

## FREQUENCY SENSITIVITY DURING CURRENT MEASUREMENT

| INPUT RANGE    | MINIMUM SENSITIVITY (R.M.S. Sine Wave)<br>20 Hz ~ 20 kHz |
|----------------|----------------------------------------------------------|
| 500.00 $\mu$ A | 100 $\mu$ A                                              |
| 5000.0 $\mu$ A | 250 $\mu$ A                                              |
| 50.000 mA      | 10 mA                                                    |
| 440.00 mA      | 25 mA                                                    |
| 5.0000 A       | 1 A                                                      |
| 10.000 A       | 2.5 A                                                    |

## PEAK HOLD

| SIGNAL WIDTH             | ACCURACY FOR DC mV/VOLTAGE/CURRENT |
|--------------------------|------------------------------------|
| Single event > 1 ms      | 2% + 400 for all ranges            |
| Repetitive > 250 $\mu$ s | 2% + 1000 for all ranges           |

## DUTY CYCLE AND PULSE WIDTH <sup>[1]</sup>

| FUNCTION    | MODE        | RANGE          | ACCURACY AT FULL SCALE |
|-------------|-------------|----------------|------------------------|
| DUTY CYCLE  | DC Coupling | 0.01% ~ 99.99% | 0.3% per kHz + 0.3%    |
| PULSE WIDTH | 500 ms      | 0.01 ms        | 0.2% + 3               |
|             | 2000 ms     | 0.1 ms         | 0.2% + 3               |

[1] The positive or negative pulse width must be greater than 10  $\mu$ s, and the duty cycle range should be considered. The pulse width range is determined by the frequency of the signal.

## U1252B/U1253B FREQUENCY COUNTER SPECIFICATIONS

| DIVISION                           | RANGE      | RESOLUTION | ACCURACY $\pm$ (% of reading + No. of Least Significant Digit) |                          | SENSITIVITY   | MIN. INPUT FREQUENCY | MAXIMUM MEASUREMENT LEVEL |
|------------------------------------|------------|------------|----------------------------------------------------------------|--------------------------|---------------|----------------------|---------------------------|
|                                    |            |            | U1252B                                                         | U1253B                   |               |                      |                           |
| 1<br>(secondary display “-1-”)     | 99.999 Hz  | 0.001 Hz   | 0.02% + 3 <sup>[1]</sup>                                       | 0.02% + 3 <sup>[1]</sup> | 100 mV R.M.S. | 0.5 Hz               | < 30 Vpp                  |
|                                    | 999.99 Hz  | 0.01 Hz    | 0.002% + 5,<br><985 kHz                                        | 0.002% + 5,<br>< 985 kHz |               |                      |                           |
|                                    | 9.9999 kHz | 0.0001 kHz |                                                                |                          |               |                      |                           |
|                                    | 99.999 kHz | 0.001 kHz  |                                                                |                          |               |                      |                           |
|                                    | 999.99 kHz | 0.01 kHz   |                                                                |                          |               |                      |                           |
|                                    | 9.9999 MHz | 0.0001 MHz | 0.002% + 5,<br>< 1 MHz                                         | 200 mV R.M.S.            |               |                      |                           |
| 100<br>(secondary display “-100-”) | 9.9999 MHz | 0.0001 MHz | 0.002% + 5,<br>< 20 MHz                                        | 0.002% + 5,<br>< 20 MHz  | 400 mV R.M.S. | 1 MHz                |                           |
|                                    | 99.999 MHz | 0.001 MHz  |                                                                |                          | 600 mV R.M.S. |                      |                           |

## U1252B/U1253B SQUARE WAVE OUTPUT

| OUTPUT <sup>[2]</sup>      | RANGE                                                                                                                                                | RESOLUTION | ACCURACY                          |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------|
| FREQUENCY                  | 0.5, 1, 2, 5, 6 <sup>[6]</sup> , 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 120, 150, 200, 240, 300, 400, 480, 600, 800, 1200, 1600, 2400, 4800 Hz | 0.01 Hz    | 0.005% + 2                        |
| DUTY CYCLE <sup>[3]</sup>  | 0.39% ~ 99.60%                                                                                                                                       | 0.390625%  | 0.4% of full scale <sup>[4]</sup> |
| PULSE WIDTH <sup>[4]</sup> | 1/Frequency                                                                                                                                          | Range/256  | 0.2 ms + Range/256                |
| AMPLITUDE                  | Fixed 0 ~ +2.8 V                                                                                                                                     | 0.1 V      | 0.2 V                             |

## DISPLAY RATE

| FUNCTION               | TIMES/SECOND      |
|------------------------|-------------------|
| ACV                    | 7                 |
| ACV + dB               | 7                 |
| DCV                    | 7                 |
| AC + DC V              | 2                 |
| $\Omega$ /nS           | 14                |
| Diode                  | 14                |
| Capacitance            | 4 (< 100 $\mu$ F) |
| DCI                    | 7                 |
| ACI                    | 7                 |
| AC + DC I              | 2                 |
| Temperature            | 6                 |
| Frequency              | 1 (>10 Hz)        |
| Duty cycle/Pulse width | 0.5 (>10 Hz)      |

## MANUAL AND INTERVAL DATA LOGGING

| LOGGING TYPE | MAXIMUM DATA POINTS <sup>[5]</sup> |        |        |
|--------------|------------------------------------|--------|--------|
|              | U1251B                             | U1252B | U1253B |
| MANUAL       | 100                                | 100    | 100    |
| INTERVAL     | 200                                | 200    | 1000   |

## DECIBEL (dB) CALCULATION

| dB BASE            | REFERENCE       | DEFAULT REFERENCE |
|--------------------|-----------------|-------------------|
| 1 m $\Omega$ (dBm) | 1-9999 $\Omega$ | 50 $\Omega$       |
| 1 V (dBV)          | 1 V             | 1 V               |

[1] All frequency counters are susceptible to errors. Shielding inputs from external noise pickup is critical to minimize measurement errors. For non-square wave signals, add 5 counts.

[2] Output impedance: 3.5 k $\Omega$  maximum.

[3] The positive or negative pulse width must be greater than 50  $\mu$ s for adjustment of the duty cycle or pulse width under different frequencies. Otherwise, the accuracy and range will be different from the specifications defined.

[4] For signal frequencies greater than 1 kHz, an addition of 0.1% per kHz is added to the accuracy.

[5] For data logging to PC, maximum number of data points is dependent on available hard disk space.

[6] For the U1253B model.

## INPUT IMPEDANCE

Table A

| FUNCTION        | RANGE            | U1251B                                                                     | U1252B/U1253B                                                              |
|-----------------|------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| DC Voltage      | 50 mV to 1000 mV | 10 M $\Omega$                                                              | 10 M $\Omega$                                                              |
|                 | 5 V to 1000 V    | 10 M $\Omega$ (nominal),<br>with 10 M $\Omega$ in parallel at dual display | 10 M $\Omega$ (nominal),<br>with 10 M $\Omega$ in parallel at dual display |
| AC Voltage      | 50 mV to 1000 mV | 10 M $\Omega$ in parallel with<br>< 100 pF                                 | 10 M $\Omega$ in parallel with < 100 pF                                    |
|                 | 5 V to 1000 V    |                                                                            |                                                                            |
| AC + DC Voltage | 50 mV to 1000 mV | N/A                                                                        | 10 M $\Omega$                                                              |
|                 | 5 V to 1000 V    |                                                                            | 10 M $\Omega$ (nominal)<br>in parallel with 10 M $\Omega$ , < 100 pF       |

## GENERAL SPECIFICATIONS

### DISPLAY

Both primary and secondary displays are 5-digit on the LCD display.  
Both the primary and secondary displays offer a maximum resolution of 50,000 counts. Automatic polarity indication.

### CONNECTIVITY

IR to USB

### POWER CONSUMPTION

105 mVA / 420 mVA (with backlight) maximum (U1251B)  
165 mVA / 480 mVA (with backlight) maximum (U1252B)  
420 mVA maximum (U1253B)

### BATTERY TYPE

9 V Alkaline battery (ANSI/NEDA 1604A or IEC 6LR61)  
9 V Carbon-zinc battery (ANSI/NEDA 1604D or IEC6F22)  
7.2 V or 8.4 V Ni-MH Rechargeable battery

### BATTERY LIFE

**U1251B:** 72 hours typical  
**U1252B:** 36 hours typical  
**U1253B:** 8 hours typical

### OPERATING ENVIRONMENT

- Full accuracy at  $-20^{\circ}\text{C}$  to  $55^{\circ}\text{C}$  ; and to 80% RH for temperatures up to  $35^{\circ}\text{C}$ , decreasing linearly to 50% RH at  $55^{\circ}\text{C}$
- 0 to 2000 m altitude per IEC 61010-1 2nd Edition CAT III, 1000 V / CAT IV, 600 V

### STORAGE COMPLIANCE

$-40^{\circ}\text{C}$  to  $70^{\circ}\text{C}$  with battery removed

### SAFETY COMPLIANCE

- IEC 61010-1:2001 / EN610101-1:2001
- Canada: CSA C22.2 No. 61010-1:2004

### MEASUREMENT CATEGORY

CAT III 1000 V / CAT IV 600 V

### EMC COMPLIANCE

Certified to IEC/EN 61326: 2002, CISPR 11, and equivalents for Group 1, Class A

### COMMON MODE REJECTION RATIO (CMRR)

**U1251B/U1252B:**  $>90\text{ dB}$  at DC, 50/60 Hz  $\pm 0.1\%$   
(1 k $\Omega$  unbalanced)  
**U1253B:**  $>100\text{ dB}$  at DC, 50/60 Hz  $\pm 0.1\%$  (1 k $\Omega$  unbalanced)

### NORMAL MODE REJECTION RATIO (NMRR)

**U1251B/U1252B:**  $>60\text{ dB}$  at DC, 50/60 Hz  $\pm 0.1\%$   
**U1253B:**  $>90\text{ dB}$  at DC, 50/60 Hz  $\pm 0.1\%$

### TEMPERATURE COEFFICIENT

0.15 \* (specified accuracy)/  $^{\circ}\text{C}$  (from  $20^{\circ}\text{C}$  to  $18^{\circ}\text{C}$  or  $28^{\circ}\text{C}$  to  $55^{\circ}\text{C}$ )

### SHOCK and VIBRATION

Tested to IEC/EN 60068-2

### DIMENSIONS (HxWxD)

203.5 mm x 94.4 mm x 59.0 mm

### WEIGHT

**U1251B:** 504 $\pm$ 5 g with battery  
**U1252B/U1253B:** 527 $\pm$ 5 g with battery

### WARRANTY

3 years for main unit  
3 months for standard accessories unless otherwise specified.

ORDERING INFORMATION



STANDARD SHIPPED ACCESSORIES

| DESCRIPTION                                   | APPLICABLE MODELS |        |        |
|-----------------------------------------------|-------------------|--------|--------|
|                                               | U1251B            | U1252B | U1253B |
| Alligator clips                               | •                 | •      | •      |
| SMT grabbers                                  | —                 | —      | —      |
| Fine-tip test probes                          | —                 | —      | —      |
| Test probe leads (4-mm)                       | •                 | •      | •      |
| Mini grabber                                  | —                 | —      | —      |
| Alkaline 9 V battery                          | •                 | —      | —      |
| Rechargeable Ni-MH battery with power adapter | —                 | •      | •      |
| Soft carrying case                            | —                 | —      | —      |
| Certificate of Calibration                    | •                 | •      | •      |
| Test Report                                   | •                 | •      | •      |
| Quick Start Guide                             | •                 | •      | •      |

OPTIONAL ACCESSORIES

MEASURING ACCESSORIES (NON-TEMPERATURE)



U1161A Extended test lead kit

- Includes two test leads (red and black), two test probes, medium-sized alligator clips and 4-mm banana plugs.
- Test leads: CAT III 1000 V, CAT IV 600 V, 15 A
  - Test probes: CAT III 1000 V, CAT IV 600 V, 15 A
  - Medium Sized Alligator Clips: CAT III 1000 V, CAT IV 600 V, 15 A
  - 4-mm banana plugs: CAT II 600 V, 10 A



U1162A Alligator clips

- One pair of insulated alligator clips (red and black). Recommended for use with Agilent standard test leads.
- Rated CAT III 1000 V, CAT IV 600 V, 15 A.



#### U1163A SMT grabbers

- One pair of SMT grabbers (red and black).  
Recommended for use with Agilent standard test leads.
- Rated CAT II 300 V, 3 A.



#### U1164A Fine-tip test probes

- One pair of fine-tip test probes (red and black).  
Recommended for use with Agilent standard test leads.
- Rated CAT II 300 V, 3 A.

### MEASURING ACCESSORIES (NON-TEMPERATURE)



#### U1168A Standard test lead kit

Includes two test leads (red and black), 19-mm and 4-mm test probes, alligator clips, fine-tip test probes, SMT grabbers and mini grabber (black).

- Test leads: CAT III 1000 V, CAT IV 600 V, 15 A
- Test probes (19mm tip): CAT II 1000 V, 15 A
- Test probes (4-mm tip): CAT III 1000 V, CAT IV 600 V, 15 A  
(highly recommended for CAT IV environment)
- Alligator clips: CAT III 1000V, CAT IV 600 V, 15 A
- Fine-tip test probes: CAT II 300 V, 3 A
- SMT grabber: CAT II 300 V, 3 A
- Mini grabber: CAT II 300 V, 3 A



#### U1169A Test probe leads

Includes two test leads (red and black), and a pair each of 19-mm and 4-mm test probes.

- Test leads: CAT III 1000 V, CAT IV 600 V, 15 A
- Test probe (19-mm tip): CAT II 1000 V, 15 A
- Test probes (4-mm tip): CAT III 1000 V, CAT IV 600 V, 15 A  
(highly recommended for CAT IV environment)



#### U1583B AC current clamp

- Dual range: 40 A and 400 A
- Rated CAT III 600 V
- BNC-to-banana-plug adapter provided for use with DMMs

### MEASURING ACCESSORIES (TEMPERATURE)



#### U1180A Thermocouple adapter+lead kit, J and K types

Includes thermocouple adapter, thermocouple bead J-type and thermocouple bead K-type.

- T/C adapter J/K-type
- T/C bead J-type: -20 °C to 200 °C
- T/C bead K-type: -20 °C to 200 °C



#### U1181A Immersion temperature probe

- Type-K T/C for use in oil and other liquids
- Measurement range: -50 °C to 700 °C
- Includes adapter U1184A for connection to DMM



#### U1182A Industrial surface temperature probe

- Type-K T/C for use on still surfaces
- Measurement range: -50 °C to 400 °C
- Includes adapter U1184A for connection to DMM



#### U1183A Air temperature probe

- Type-K T/C for use in air and non-caustic gas
- Measurement range: -50 °C to 800 °C
- Includes adapter U1184A for connection to DMM



#### U1184A Temperature probe adapter

- Mini-connector-to-banana-plug adapter for use with DMM



#### U1185A J-type thermocouple and adapter

- T/C adapter J/K-type
- T/C bead J-type: -20 °C to 200 °C

## MEASURING ACCESSORIES (TEMPERATURE)



### U1186A K-type thermocouple and adapter

- T/C adapter J/K-type
- T/C bead J-type: -20 °C to 200 °C

## CABLE



### U1173A IR-to-USB cable

- For remote control and data logging to PC
- Max. baud rate: 19,200 bits per second

## CARRYING CASE



### U1172A Transit case (aluminium-clad)

The robust casing to transport your DMM and accessories

- Aluminum-clad, black panel construction
- Dimension: 18" (H) x 13" (W) x 6" (D)
- Weight: 4 kg



### U1174A Soft carrying case

The convenient way to carry your DMM and essential accessories

- Dimension: 9" (H) x 5" (W) x 3" (D)

## HANGING KIT



### U1171A Magnetic hanging kit

For fastening of DMM to a steel surface so both hands are free.

## AC ADAPTOR



### U1170A AC adaptor

Includes AC power cord based on country



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