# Agilent U1401A/U1401B Handheld Multi-function Calibrator/Meter

## Data Sheet

### Calibrate *while* you measure with just one tool


Agilent handheld multi-function calibrator/meter has all you need for quick validation, servicing or troubleshooting of process control devices on the go. Travel and test easily with one rugged, feature-packed tool. Agilent now offers its latest handheld calibrator/meter, the U1401B in all-new orange, providing capabilities and functions equivalent to the U1401A.

**Features**

- Dual display with bright LCD backlight
- Simultaneous source and measure
- Bipolar voltage and current, square-wave, auto scan and ramp outputs
- Full-span DMM capability, including temperature and frequency measurements
- Hold and Min/Max/Average recordings
- Data logging to PC with optional IR-to-USB cable
- Built-in charging capability

#### The 2-in-1 that helps you travel light

More often than not, the calibration of process control parts requires simultaneous measurements with a DMM. With the U1401A/U1401B, you can carry two tools in one—and calibrate while you measure. Slip the U1401A/U1401B in its sturdy carrying case and you're ready to go.

#### Full-featured DMM functions

The U1401A/U1401B is packed with a full span of DMM measurement functions, including AC+DC voltage and current, resistance, temperature, frequency, diode and continuity tests. It also equips you with recording functions such as Hold, Min/Max/Average and data logging to PC.

#### Rugged and tested to stringent standards

The U1401A/U1401B comes with a robust protective holster and tested to stringent industrial standards. Each U1401A/U1401B is also sealed with a three-year warranty and the assurance that you can perform your calibration tasks with confidence.

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## Take a closer look


Robust protective holster

Hold and Min/Max/Avg recordings

Built-in battery-charging capability

Bipolar voltage and current, square-wave, auto scan and ramp

Dual display with backlight

4-20 mA and 0-20 mA percentage scale readout

Easy function access through intuitive buttons and rotary switch

Voltage, current, resistance, temperature, frequency, pulse width, duty cycle, diode and continuity

**Simultaneous source and measure**

# Input Specifications

The accuracy is given as ± (% of reading + counts of least significant digit (LSD)) at 23 °C ± 5 °C, with relative humidity less than 80% R.H., and after a warm-up period of at least five minutes. Without warm-up, an additional five counts of LSD need to be considered.

## Voltage specifications

| Function | Range | Resolution | Accuracy | Overload protection |
|---|---|---|---|---|
| **DC voltage** [1] | 50 mV | 1 µV | 0.05% + 50 [2] | 250 Vrms |
| | 500 mV | 10 µV | 0.03% + 5 | |
| | 5 V | 0.1 mV | | |
| | 50 V | 1 mV | | |
| | 250 V | 10 mV | | |
| **AC voltage** [3] **(True-rms: From 5% to 100% of range)** | 50 mV | 1 µV | **45 Hz to 5 kHz:** 0.7% + 40<br>**5 kHz to 20 kHz:** 1.5% + 40 | |
| | 500 mV | 10 µV | **45 Hz to 5 kHz:** 0.7% + 20<br>**5 kHz to 20 kHz:** 1.5% + 20 | |
| | 5 V | 0.1 mV | | |
| | 50 V | 1 mV | | |
| | 250 V | 10 mV | | |
| **AC+DC voltage** [3] **(True-rms: From 5% to 100% of range)** | 50 mV | 1 µV | **45 Hz to 5 kHz:** 0.8% + 70<br>**5 kHz to 20 kHz:** 1.6% + 70 | |
| | 500 mV | 10 µV | **45 Hz to 5 kHz:** 0.8% + 25<br>**5 kHz to 20 kHz:** 1.6% + 25 | |
| | 5 V | 0.1 mV | | |
| | 50 V | 1 mV | | |
| | 250 V | 10 mV | | |

[1] Input impedance: 10 MΩ (nominal) for the range of 5 V and above, and 1 GΩ (nominal) for the 50/500 mV range.

[2] Accuracy can be improved to 0.05% + 5. Always use the Relative function to offset thermal effects before measuring the signal.

[3] Input impedance: 1.1 MΩ in parallel with <100 pF (nominal) for the range of 5 V and above, and 1 GΩ (nominal) for the 50/500 mV range. Crest factor ≤ 3.

# Current specifications

| Function | Range | Resolution | Accuracy | Burden voltage/shunt | Overload protection |
|---|---|---|---|---|---|
| DC current | 50 mA | 1 µA | 0.03% + 5 [1] | 0.06 V (1 Ω) | 250 V, 630 mA Quick acting fuse |
| | 500 mA | 10 µA | | 0.6 V (1 Ω) | |
| AC current [2] (True-rms: From 5% to 100% of range) | 50 mA | 1 µA | **45 Hz to 5 kHz:** 0.6% + 20 | 0.06 V (1 Ω) | |
| | 500 mA | 10 µA | | 0.6 V (1 Ω) | |
| AC+DC current [2] (True-rms: From 5% to 100% of range) | 50 mA | 1 µA | **45 Hz to 5 kHz:** 0.7% + 25 | 0.06 V (1 Ω) | |
| | 500 mA | 10 µA | | 0.6 V (1 Ω) | |

[1] Always use the Relative function to offset thermal effects before measuring the signal. If this function is not used, accuracy could go down to 0.03% + 25. Thermal effects may be present due to:

- Constant current, constant voltage, or square wave output.
- Wrong operation. For example, resistance, diode, or mV measurement function is used to measure high voltage signals exceeding 250 V.
- After battery charging has completed.
- After measuring current greater than 50 mA.

[2] Crest factor ≤ 3

## Temperature specifications

| Thermocouple type | Range | Resolution | Accuracy [1] | Overload protection |
|---|---|---|---|---|
| K | –40 °C to 1372 °C | 0.1 °C | 0.3% + 3 °C | 250 Vrms |
| | –40 °F to 2502 °F | 0.1 °F | 0.3% + 6 °F | |

## Resistance specifications

The following resistance specifications are valid if the maximum open voltage is less than +4.8 V.

| Range | Resolution | Accuracy | Minimum input current | Overload protection |
|---|---|---|---|---|
| 500 Ω | 0.01 Ω | 0.15% + 8 [2] | 0.45 mA | 250 Vrms |
| 5 kΩ | 0.1 Ω | 0.15% + 5 [2] | 0.45 mA | |
| 50 kΩ | 1 Ω | | 45 µA | |
| 500 kΩ | 10 Ω | | 4.5 µA | |
| 5 MΩ | 0.1 kΩ | | 450 nA | |
| 50 MΩ | 1 kΩ | 1% + 8 [3] | 45 nA | |

## Diode and continuity specifications

For diode test, the overload protection is 250 Vrms and the instrument will beep when the reading is below 50 mV (approx). For continuity test, the instrument will beep when the resistance is less than 10.00 Ω.

| Resolution | Accuracy | Test current | Open voltage |
|---|---|---|---|
| 0.1 mV | 0.05% + 5 | Approximately 0.45 mA | < +4.8 VDC |

## 1 ms peak hold specifications

| Signal width | Accuracy for DC mV/voltage/current |
|---|---|
| Single event >1 ms | 2% + 400 for all ranges |

[1] Accuracy is specified for meter operation only, excludes thermocouple probe tolerance and with the instrument placed in the operating area for at least one hour.
[2] Accuracy is specified after applying the Relative function to offset any test lead resistance and thermal effect.
[3] Accuracy is specified for <60% R.H.

# Frequency specifications

| Range | Resolution | Accuracy | Minimum input frequency | Overload protection |
|---|---|---|---|---|
| 100 Hz | 0.001 Hz | 0.02% + 3 | 1 Hz | 250 Vrms |
| 1 kHz | 0.01 Hz | | | |
| 10 kHz | 0.1 Hz | | | |
| 100 kHz | 1 Hz | | | |
| 200 kHz | 10 kHz | | | |

## Frequency sensitivity and trigger level for voltage measurement

| Input range | Minimum sensitivity (rms sine wave) | | Trigger level for DC coupling | |
|---|---|---|---|---|
| | 1 Hz to 100 kHz | >100 kHz | <20 kHz | 20 kHz to 200 kHz |
| 50 mV | 15 mV | 25 mV | 20 mV | 30 mV |
| 500 mV | 35 mV | 50 mV | 60 mV | 80 mV |
| 5 V | 0.3 V | 0.5 V | 0.6 V | 0.8 V |
| 50 V | 3V | 5 V | 6 V | 8 V |
| 250 V | 30 V | – | 60 V | – |

## Frequency sensitivity for current measurement

| Input range | Minimum sensitivity (rms sine wave) |
|---|---|
| | 30 Hz to 20 kHz |
| 50 mA | 2.5 mA |
| 500 mA | 25 mA |

## Duty cycle and pulse width

| Function | Mode | Range | Accuracy at full scale [1] |
|---|---|---|---|
| Duty cycle | DC coupling | 0.1% to 99.9% | 0.3% per kHz + 0.3% |
| | AC coupling | 5% to 95% | |
| Pulse width [2] | – | 0.01 ms to 1999.9 ms | 0.2% + 3 |

[1] Accuracy is based on a 5-V square-wave input to the 5 VDC range.
[2] Pulse width must be greater than 10 µs and its range is determined by the frequency of the signal.

# Output Specifications

Accuracy is given as ± (% of output + counts of least significant digit (LSD)) at 23 °C ± 5 °C, with relative humidity less than 80% R.H., and after a warm-up period of at least five minutes. The maximum input voltage protection is 30 VDC.

## Constant voltage and current outputs

| Function | Range | Resolution | Accuracy | Minimum output |
|---|---|---|---|---|
| Constant voltage (CV) | ± 1.500 V | 0.1 mV | 0.03% + 3 | 25 mA or above [1] |
| | ± 15.000 V | 1 mV | | |
| Constant current (CC) | ± 25.000 mA | 1 µA | 0.03% + 5 | 12 V or above [2][3] |

## Square wave output

| Output | Range | Resolution | Accuracy |
|---|---|---|---|
| Frequency (Hz) | 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 120, 150, 200, 240, 300, 400, 480, 600, 800, 1200, 1600, 2400, 4800 | 0.01 | 0.005% + 1 |
| Duty Cycle (%) [4] | 0.39% to 99.60% | 0.390625% | 0.01% + 0.2% [5] |
| Pulse Width (ms) [4] | 1/Frequency | Range/256 | 0.01% + 0.3 ms |
| Amplitude (V) | 5 V, 12 V | 0.1 V | 2% + 0.2 V |
| | ±5 V, ±12 V | | 2% + 0.4 V |

[1] Loading coefficient: 0.012 mV/mA for 1.5 V output.

[2] Loading coefficient: 1 µA/ V. The minimum output voltage is based on 20 mA into a 600 Ω load.

[3] If the current loop has a 24-V power, a minimum output voltage of 24 V is achievable with a 20 mA current into a 1200-Ω load (using the yellow test lead).

[4] The positive or negative pulse width must be greater than 50 µs to enable adjustment of duty cycle or pulse width under different frequencies. Otherwise, the accuracy and range will be different from the specifications defined.

[5] For signal frequencies greater than 1 kHz, add an addition of 0.1% per kHz.

# General Specifications

| | |
|---|---|
| **Display** | Both primary and secondary displays are 5-digit on the liquid crystal display (LCD) with a maximum resolution of 51,000 counts and automatic polarity indication. Backlight available. |
| **Power supply** | • **9.6 V Ni-MH rechargeable batteries:** 1.2 V x 8 pieces. *No cadmium, lead or mercury.*<br>• **External switching adapter:** AC 100 V to 240 V, 50/60 Hz input and DC 24 V/2.5 A output |
| **Power consumption** | • **Battery charging:** 9.3 VA typical<br>• **Sourcing of constant current at 25 mA, maximum load:** 5.5 VA typical on 24 V DC adapter, 2.4 VA typical on 9.6 V batteries<br>• **Meter only:** 1.8 VA typical on 24 V DC adapter, 0.6 VA typical on 9.6 V batteries |
| **Battery life** | Assuming fully-charged Ni-MH batteries:<br>**Meter only:** 20 hours (approx.)<br>**Source/Meter:** 4 hours (approx.)<br>[+ −] will appear when voltage drops below 9 V (approx.) |
| **Charging time** | 3 hours (approx.) in 10 °C to 30 °C environment<br>NOTE: Prolonged charging is required if battery is fully discharged. |
| **Measurement rate** | 3 readings/second, except for:<br>• **AC+DC:** 1 reading/second<br>• **Frequency and duty cycle (> 1 Hz):** 1 reading/second<br>• **Pulse width (> 1 Hz):** 0.25 to 1 reading/second |
| **Common Mode Rejection Ratio (CMRR)** | > 90 dB at DC, 50/60 Hz ± 0.1% (1 kΩ unbalanced) |
| **Normal Mode Rejection Ratio (NMRR)** | > 60 dB at DC, 50/60 Hz ± 0.1% |
| **Operating environment** | 0 °C to 40 °C; up to 80% relative humidity (R.H.) for temperatures up to 31 °C, decreasing linearly to 50% R.H. at 40 °C |
| **Storage environment** | –20 °C to 60 °C with batteries removed; 5% to 80% R.H. non-condensing |
| **Altitude** | 0 to 2000 m |
| **Safety compliance** | IEC 61010-1:2001/EN61010-1:2001 (2nd Edition), CAN/CSA-C22.2 No. 61010-1-04, ANSI/UL 61010-1:2004, CAT II 150 V Overvoltage Protection, Pollution Degree 2 |
| **EMC compliance** | IEC61326-2-1:2005/EN61326-2-1:2006, ICES-001:2004, AS/NZS CISPR11:2004 |
| **Temperature coefficient** | • **Input:** 0.15 x (specified accuracy)/°C (from 0 °C to 18 °C or 28 °C to 40 °C)<br>• **Output:** ±(50 ppm output + 0.5 digit)/°C |
| **Dimensions (H x W x D)** | 192 mm x 90 mm x 54 mm |
| **Weight** | 0.98 kg with holster and batteries |
| **Calibration** | One-year calibration cycle recommended |
| **Warranty** | • 3 years for main unit<br>• 3 months for standard accessories unless otherwise specified |

# Ordering Information

U1401A

U1401B

## Standard shipped items

- Quick Start Guide
- Certificate of Calibration (CoC)
- Calibrator/Meter standard test lead kit
- Yellow test lead for mA simulation
- Protective holster
- Rechargeable battery pack
- AC power adapter and cord (according to country)

** Soft carrying case is included for U1401A*

## Optional accessories

**U5481A** IR-to-USB cable

**U1186A** K-type thermocouple and adapter

**U1181A** Immersion temperature probe
**U1182A** Industrial surface temperature probe
**U1183A** Air temperature probe

**U1168A** Standard test lead kit

**U5491A** Soft carrying case

**U5402A** Yellow test lead for mA simulation

More accessories at: **www.agilent.com/find/handheld-calibrator-meter**

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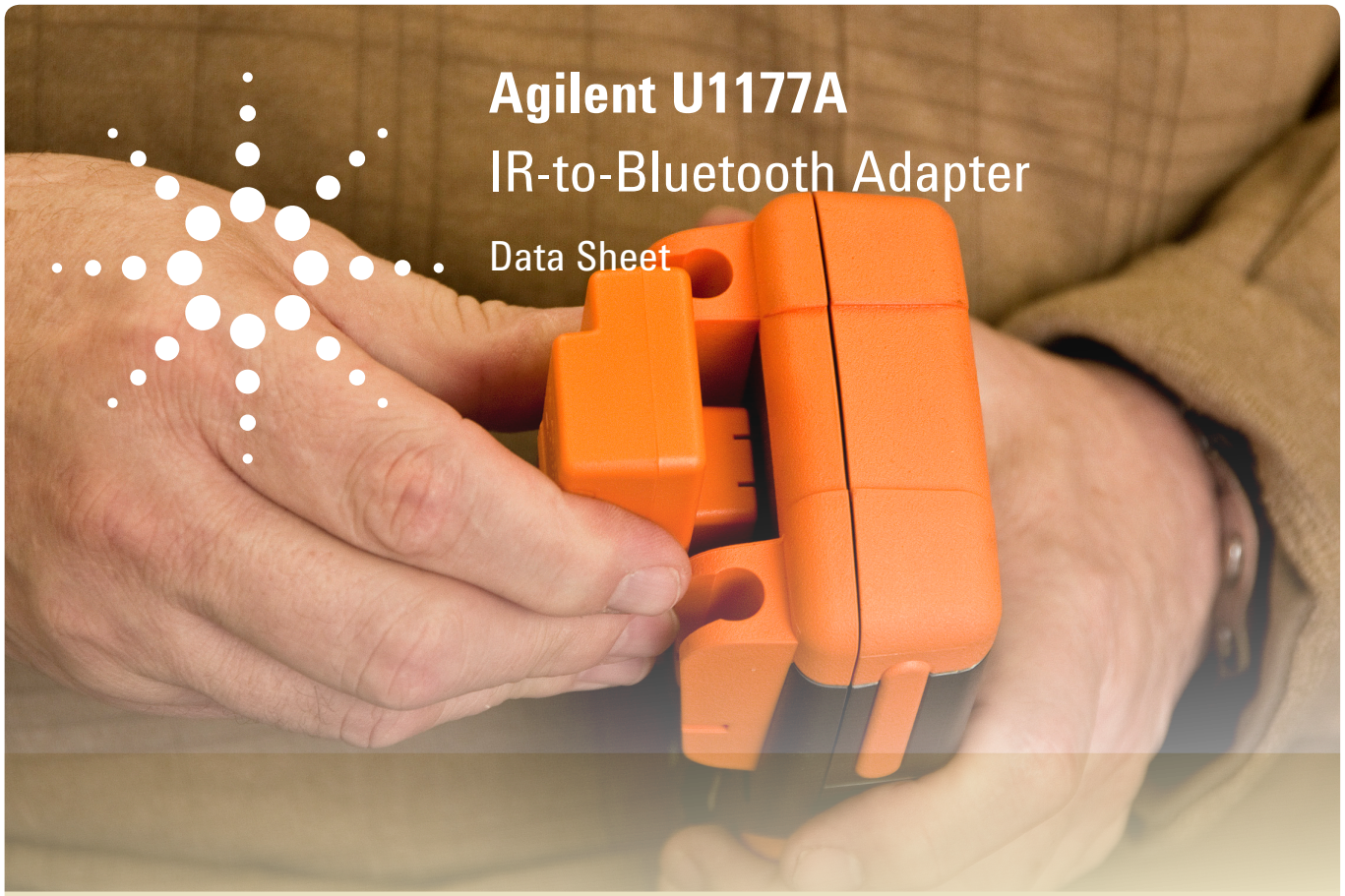

# Agilent U1177A
## IR-to-Bluetooth Adapter
### Data Sheet

## Features

- Enables Bluetooth® connection to Agilent handheld digital multimeters
- Easy to install by attaching to Infrared (IR) port located at the back of Agilent handheld digital multimeters
- Compatible with Agilent U1230 series, U1240 series, U1250 series and U1270 series handheld digital multimeters
- Operated by two 1.5 V AAA batteries



Agilent U1177A Infrared (IR)-to-Bluetooth® adapter offers wireless remote connectivity solution via Bluetooth® connection simply by attaching the adapter to the IR port of an Agilent handheld digital multimeter. The wireless remote connectivity is set up when an Agilent handheld digital multimeter is connected to U1177A and an Android device (tablet or smart phone) with the installed software. Every U1177A also has a unique Media Access Control (MAC) address. User can quickly and easily scan for the right U1177A using their Android device and pair up with the U1177A.

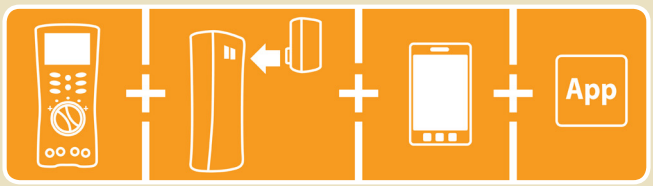


*Figure 1. Agilent wireless remote connectivity solution*

# Take a closer look


*Figure 2. The U1177A as illustrated*

## Perform data logging with multimeters – wirelessly!

*Figure 3. Data logging with Agilent Mobile Logger software.*

Data logging is an important function for industrial users to capture data streams or plotting trending graphs. These data and graphs are used for analysis to identify intermittent behavior or detect drifts. Agilent Mobile Logger is the free Android application software that logs data and provides trending graphs from Agilent handheld digital multimeters. Agilent Mobile Logger offers an array of extended functions such as sending e-mail or Short Message Service (SMS) automatically, and pan and zoom function via the Android device's touch screen. Alternatively, data logging and monitoring activities can also be performed at the comfort of one's Personal Computer (PC) via a downloadable Agilent GUI data logger software.

*Notes:*

1. *Agilent Mobile Meter and Agilent Mobile Logger can be downloaded from www.agilent.com/find/hh-Android or from Android Market (https://market.android.com/)*
2. *Agilent GUI Data Logger Software can be www.agilent.com/find/hh-logger*

## Perform up to three multimeter measurements at the same time with Agilent Mobile Meter

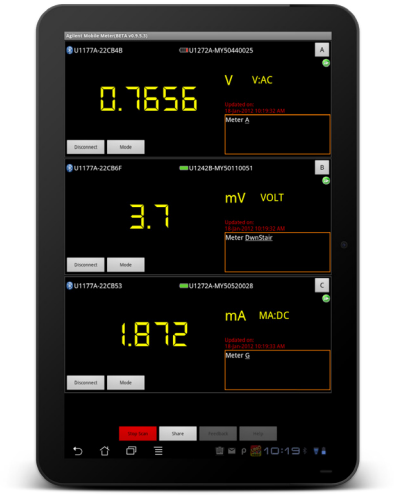


*Figure 4. Up to three multimeters measurements with the Agilent Mobile Meter*

Agilent Mobile Meter is a free Android application software that allows an Android device to connect, control and perform up to 3 multimeter measurements. Without the need to be physically present at various points, users can now extend their reach to two or three places. This solution allows you to make measurements from a safe distance, eliminates the need to walk back-and-forth between measure target and control points, and monitors multiple measurements simultaneously. Achieve higher work productivity when you use the U1177A with your Agilent handheld digital multimeters.

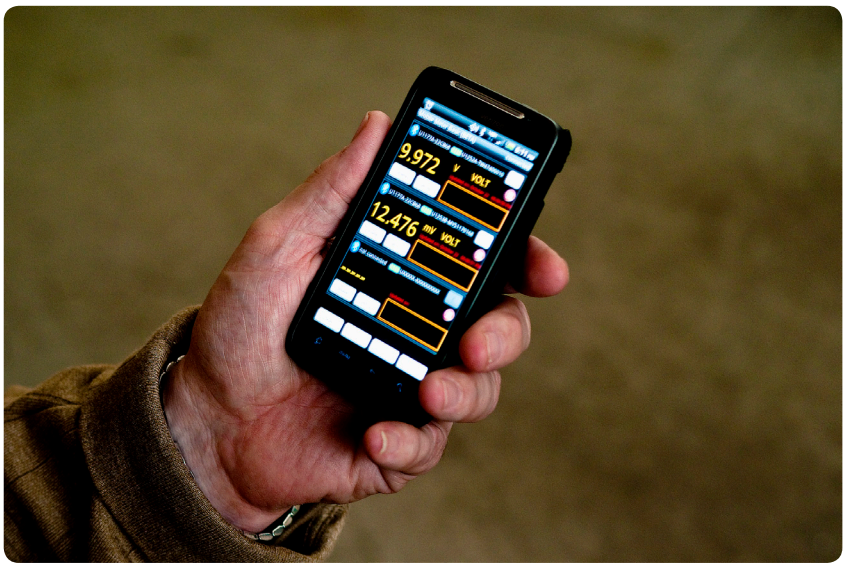


*Figure 5. Make measurements with the Agilent Mobile Meter via an Android smart phone*

# Specifications

| Product characteristics | Description |
|---|---|
| Radio specification | • Frequency: 2402 MHz ~ 2480 MHz<br>• Antenna Power: 1 mW or less<br>• Number of Channels: 79<br>• Modulation: GFSK / PSK |
| Operating environment | Operating temperature from –20 to 55 °C |
| Storage environment | Storage temperature from –40 to 70 °C |
| Relative humidity (R.H.) | Relative humidity up to 95% at 40 °C (non-condensing) |
| Power consumption | Maximum 130 mVA for two 1.5 V AAA batteries |
| Battery life | 30 hours typical (based on continuous data transfer) |
| Battery type | Alkaline 24 A (ANSI/NEDA) and LR03 (IEC), or Zinc Chloride 24 D (ANSI/NEDA) and R03 (IEC) |
| Dimension (W x H x L) | 39.0 × 71.0 × 37.0 mm |
| Weight | 60 g with batteries |
| Warranty | Three months |
| Bluetooth | "**Bluetooth**" Version 2.1 + EDR compliant, SPP profile, Class 2 device (with 10 metres connection range) |
| Safety | The U1177A complies with the requirements of the following safety and regulation standards:<br>• FCC Part15C (Certification) (15.209, 15.247) FCC ID: ZKMAGILENT-U1177A<br>• FCC Part15B (DoC) (15.109)<br>• RSS–210 Issue 8:2010 IC: 6310A–U1177A<br>• ICES–003 Issue 4:2004<br>• EN 300 328 V1.7.1:2008<br>• EN 301 489–1V1.8.1:2008/–17 V2.11:2009<br>• EN 55022:2006+A1:2007/EN55024:1998+A1:2001+A2:2003<br>• EN 50371:2002<br>• EN 60950–1:2006/A11:2009/A1:2010<br>• Complies with IDA Standards (DB 102425)<br>• India Equipment Type Approval (ETA) Certificate No: 1424/2011/WRLO<br>• COFETEL Certificate No: RCPAGU111-1066, registered under Agilent Technologies Mexico S de RL de CV<br><br>"This telecommunication equipment conforms NTC technical requirement" |

**Standard shipped items:**

- Two 1.5 V AAA batteries
- Operating instructions

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