

# **RIGOL**

## **用户手册**

### **RP1000D 系列高压差分探头**

**2017 年 04 月**  
**RIGOL TECHNOLOGIES, INC.**



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## 文档编号

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了解下列安全性预防措施，以避免受伤，并防止损坏本产品或与本产品连接的任何产品。为避免可能的危险，请务必按照规定使用本产品。

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本产品通过电源电缆的保护接地线接地。为避免电击，在连接本产品的任何输入或输出端子之前，请确保本产品电源电缆的接地端子与保护接地端可靠连接。

### 查看所有终端额定值。

为避免起火和过大电压的冲击，请查看产品上所有的额定值和标记说明，请在连接产品前查阅产品手册以了解额定值的详细信息。

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### 保持适当的通风。

通风不良会引起仪器温度升高，进而引起仪器损坏。使用时应保持良好的通风，定期检查通风口和风扇。

### 请勿在潮湿环境下操作。

为避免仪器内部电路短路或发生电击的危险，请勿在潮湿环境下操作

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仪器。

**请勿在易燃易爆的环境下操作。**

为避免仪器损坏或人身伤害，请勿在易燃易爆的环境下操作仪器。

**请保持产品表面的清洁和干燥。**

为避免灰尘或空气中的水分影响仪器性能，请保持产品表面的清洁和干燥。

**防静电保护。**

静电会造成仪器损坏，应尽可能在防静电区进行测试。在连接电缆到仪器前，应将其内外导体短暂接地以释放静电。

# 安全术语和符号

本手册中的术语。以下术语可能出现在本手册中：



**警告**

警告性声明指出可能会危害操作人员生命安全的条件和行为。



**注意**

注意性声明指出可能导致本产品损坏或数据丢失的条件和行为。

产品上的术语。以下术语可能出现在产品上：

**DANGER** 表示您如果不进行此操作，可能会立即对您造成危害。

**WARNING** 表示您如果不进行此操作，可能会对您造成潜在的危害。

**CAUTION** 表示您如果不进行此操作，可能会对本产品或连接到本产品的其他设备造成损坏。

产品上的符号。以下符号可能出现在产品上：



双层绝缘  
符号



高电压



安全警告



保护性  
接地端



壳体  
接地端



测量  
接地端

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## RP1000D 系列高压差分探头简介

RP1000D 系列高压差分探头可以将输入的高差分电压转换为低电压，并将波形显示在示波器上。其使用频率可分别高达 25MHz（RP1025D）、50MHz（RP1050D）、100MHz（RP1100D），非常适合大电力测试和研发使用。

RP1000D 系列高压差分探头适用于通用示波器，其标识的衰减比是在示波器的输入阻抗为  $1\text{M}\Omega$  时的衰减量，当示波器的输入阻抗设置为  $50\Omega$  时，衰减量变为输入阻抗为  $1\text{M}\Omega$  时的 2 倍。



图 1 RP1025D 高压差分探头



图 2 RP1050D 高压差分探头



图 3 RP1100D 高压差分探头

## 基本操作

1. 将附件提供的红色安规 IC 夹与红色双香蕉插头硅胶线的一端连接，将黑色安规 IC 夹与黑色双香蕉插头硅胶线的一端连接。然后将红色双香蕉插头硅胶线与高压探头的红色 (+) 输入端口连接，将黑色双香蕉插头硅胶线与高压探头的黑色 (-) 输入端口连接。

注意：

- a) 安规 IC 夹可替换为高压专用 IC 夹、安规鳄鱼夹或安规接触探头棒。
  - b) 双香蕉插头硅胶线可替换为高压专用双香蕉插头硅胶线。
2. 将双端 BNC 同轴线缆的一端与高压差分探头的 BNC 接口连接，另一端连接至示波器输入端。
  3. 打开示波器上的通道开关，调节高压探头和示波器使二者的衰减比匹配。若示波器的衰减比与高压探头不匹配，则实际的垂直档位等于高压探头的衰减比除以示波器的衰减比再乘以示波器上的垂直档位。

例如：示波器的衰减比设置为 1X，高压探头的衰减比设置为 X200，示波器上的垂直档位为 0.5V/div，则实际的垂直档位为  $200 \times 0.5V/div = 100V/div$ 。当示波器的输入阻抗是  $50\Omega$  时，实际垂直档位为  $2 \times 200 \times 0.5V/div = 200V/div$ 。

注意：当示波器的衰减比与高压探头的衰减比设置一致时，示波器上显示的垂直档位即为实际档位。

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## 清洁与保养

### 清洁:

本产品不需要任何特定的清洁, 如有需要, 请使用轻软干净的布, 沾上微量的清洁液轻轻地在产品外擦拭。

### 保养:

本产品如果超过 60 天以上不使用, 请将本产品放在防潮箱中存储。

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## 规格

## 技术参数

## RP1025D:

带宽	衰减比为 X50 和 X200: DC - 25MHz (-3dB) 衰减比为 X20: DC - 15MHz
衰减比	X20、X50、X200
精度	±2%
输入电压范围 (DC + AC 峰峰值)	衰减比为 X20: ≤ 140Vpp, 约 50Vrms 或 DC 衰减比为 X50: ≤ 350Vpp, 约 125Vrms 或 DC 衰减比为 X200: ≤ 1400Vpp, 约 500Vrms 或 DC
最大输入电压	最大差分电压: 1400V (DC+AC 峰峰值) 或 500Vrms 输入端对地电压: 600Vrms
输入阻抗	差分: 4MΩ/1.2pF 单端对地: 2MΩ/2.3pF
输出电压	≤ ±6.5V
输出阻抗	50Ω
上升时间	衰减比为 X50 和 X200: 14ns 衰减比为 X20: 23.4ns
共模抑制	60Hz: > 50dB 100Hz: > 50dB 1MHz: > 50dB
电源	指定外接 9V DC 电源 (必须为 <b>RIGOL</b> 承认的指定品)
功耗	0.4 瓦特

**RP1050D:**

带宽	衰减比为 X200、X500、X1000: DC - 50MHz (-3dB) 衰减比为 X100: DC - 25MHz
衰减比	X100、X200、X500、X1000
精度	±2%
输入电压范围 (DC + AC 峰峰值)	衰减比为 X100: ≤ 700Vpp, 约 230Vrms 或 DC 衰减比为 X200: ≤ 1400Vpp, 约 460Vrms 或 DC 衰减比为 X500: ≤ 3500Vpp, 约 1140Vrms 或 DC 衰减比为 X1000: ≤ 7000Vpp, 约 2300Vrms 或 DC
最大输入电压	最大差分电压: 7000V (DC+AC 峰峰值) 或 2300Vrms 输入端对地电压: 6500Vrms
输入阻抗	差分: 100MΩ/1.2pF 单端对地: 50MΩ/2.3pF
输出电压	≤ ±7.0V
输出阻抗	50Ω
上升时间	衰减比为 X200、X500 和 X1000: 7ns 衰减比为 X100: 14ns
共模抑制	60Hz: > 50dB 100Hz: > 50dB 1MHz: > 50dB
电源	指定外接 9V DC 电源 (必须为 <b>RIGOL</b> 承认的指定品)
功耗	0.4 瓦特

## RP1100D:

带宽	衰减比为 X200、X500、X1000: DC - 100MHz (-3dB) 衰减比为 X100: DC - 50MHz
衰减比	X100、X200、X500、X1000
精度	±2%
输入电压范围 (DC + AC 峰峰值)	衰减比为 X100: ≤ 700Vpp, 约 230Vrms 或 DC 衰减比为 X200: ≤ 1400Vpp, 约 460Vrms 或 DC 衰减比为 X500: ≤ 3500Vpp, 约 1140Vrms 或 DC 衰减比为 X1000: ≤ 7000Vpp, 约 2300Vrms 或 DC
最大输入电压	最大差分电压: 7000V (DC+AC 峰峰值) 或 2300Vrms 输入端对地电压: 6500Vrms
输入阻抗	差分: 100MΩ/1.2pF 单端对地: 50MΩ/2.3pF
输出电压	≤ ±8.0V
输出阻抗	50Ω
上升时间	衰减比为 X200、X500 和 X1000: 3.5ns 衰减比为 X100: 7ns
共模抑制	60Hz: > 50dB 100Hz: > 50dB 1MHz: > 50dB
电源	指定外接 9V DC 电源 (必须为 RIGOL 承认的指定品)
功耗	0.4 瓦特



## 操作环境

	一般状态	操作状态	存储状态
温度	+20℃至+30℃	0℃至+50℃	-30℃至+70℃
湿度	≤ 70%RH	10%至 85%RH	10%至 90%RH

## 一般技术规格

探头尺寸	RP1025D: 214mm x 60mm x 35mm
	RP1050D: 240mm x 85mm x 36mm
	RP1100D: 240mm x 85mm x 36mm
重量	RP1025D: 280g
	RP1050D: 280g
	RP1100D: 280g
安全性	IEC 1010-1, CAT III, 污染等级 2
电磁兼容性	符合 EN50081-1 及 50082-1 标准
最大对地电压	RP1025D: 600Vrms
	RP1050D: 6500Vrms
	RP1100D: 6500Vrms
使用环境	室内环境
绝缘类别	双重绝缘

## 附件

## RP1025D:

	附件	说明	数量
1.	用户手册	中英文	1
2.	符合所在国家标准的 AC 电源适配器	——	1
3.	双端 BNC 同轴电缆线	50Ω 阻抗 RG58C UL 长度 100cm	1
4.	双香蕉插头硅胶线	UL 6KV 18AWG 长度 60cm	红色: 1; 黑色: 1
5.	安规 IC 夹	UL 1000V CAT III	红色: 1; 黑色: 1
6.	安规鳄鱼夹	UL 1000V CAT II, 10A	红色: 1; 黑色: 1

## RP1050D:

	附件	说明	数量
1.	用户手册	中英文	1
2.	符合所在国家标准的 AC 电源适配器	——	1
3.	双端 BNC 同轴电缆线	50Ω 阻抗 RG58C UL 长度 100cm	1
4.	高压专用双香蕉插头 硅胶线	UL 20KV 16AWG 长度 60cm	红色: 1; 黑色: 1
5.	高压专用 IC 夹	最大 6500V(DC+ACp-p)	红色: 1; 黑色: 1
6.	安规鳄鱼夹	UL 1000V CAT II, 10A	红色: 1; 黑色: 1

**RP1100D:**

	附件	说明	数量
1.	用户手册	中英文	1
2.	符合所在国家标准的 AC 电源适配器	——	1
3.	双端 BNC 同轴电缆线	50Ω 阻抗 RG58C UL 长度 100cm	1
4.	高压专用双香蕉插头 硅胶线	UL 20KV 16AWG 长度 60cm	红色: 1; 黑色: 1
5.	高压专用 IC 夹	最大 6500V(DC+ACp-p)	红色: 1; 黑色: 1
6.	安规鳄鱼夹	UL 1000V CAT II, 10A	红色: 1; 黑色: 1
7.	安规接触探头棒	UL 1000V, CAT III	红色: 1; 黑色: 1



# **RIGOL**

## **User's Guide**

### **RP1000D Series High Voltage Differential Probe**

**Apr. 2017**

**RIGOL TECHNOLOGIES, INC.**



# Guaranty and Declaration

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**RIGOL** guarantees this product conforms to the national and industrial standards in China as well as the ISO9001:2008 standard and the ISO14001:2004 standard. Other international standard conformance certification is in progress.

## Contact Us

If you have any problem or requirement when using our products or this manual, please contact **RIGOL**.

E-mail: [service@rigol.com](mailto:service@rigol.com)

Website: [www.rigol.com](http://www.rigol.com)

## General Safety Summary

Please review the following safety precautions carefully before putting the instrument into operation so as to avoid any personal injuries or damages to the instrument and any product connected to it. To prevent potential hazards, please use the instrument only specified by this manual.

### **Ground The Instrument.**

The instrument is grounded through the Protective Earth lead of the power cord. To avoid electric shock, it is essential to connect the earth terminal of power cord to the Protective Earth terminal before any inputs or outputs.

### **Observe All Terminal Ratings.**

To avoid fire or shock hazard, observe all ratings and markers on the instrument and check your manual for more information about ratings before connecting.

### **Do Not Operate Without Covers.**

Do not operate the instrument with covers or panels removed.

### **Avoid Circuit or Wire Exposure.**

Do not touch exposed junctions and components when the unit is powered.

### **Do Not Operate With Suspected Failures.**

If you suspect damage occurs to the instrument, have it inspected by qualified service personnel before further operations. Any maintenance, adjustment or replacement especially to circuits or



accessories must be performed by **RIGOL** authorized personnel.

**Keep Well Ventilation.**

Inadequate ventilation may cause increasing of temperature or damages to the device. So please keep well ventilated and inspect the intake and fan regularly.

**Do Not Operate in Wet Conditions.**

In order to avoid short circuiting to the interior of the device or electric shock, please do not operate in a humid environment.

**Do Not Operate in an Explosive Atmosphere.**

In order to avoid damages to the device or personal injuries, it is important to operate the device away from an explosive atmosphere.

**Keep Product Surfaces Clean and Dry.**

To avoid the influence of dust and/or moisture in air, please keep the surface of device clean and dry.

**Electrostatic Prevention.**

Operate in an electrostatic discharge protective area environment to avoid damages induced by static discharges. Always ground both the internal and external conductors of the cable to release static before connecting.

# Safety Terms and Symbols

**Terms Used in this Manual.** These terms may appear in this manual:



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**WARNING**

Warning statements indicate conditions or practices that could result in injury or loss of life.

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**CAUTION**

Caution statements indicate conditions or practices that could result in damage to this product or other property.

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**Terms Used on the Product.** These terms may appear on the product:

- DANGER** It calls attention to an operation, if not correctly performed, could result in injury or hazard immediately.
- WARNING** It calls attention to an operation, if not correctly performed, could result in potential injury or hazard.
- CAUTION** It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

**Symbols Used on the Product.** These symbols may appear on the product:



**Double Insulation**



**Hazardous Voltage**



**Safety Warning**



**Protective Earth Terminal**



**Chassis Ground**



**Test Ground**

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## RP1000D Overview

RP1000D series high voltage differential probe can convert high differential input voltage to low voltage and display the waveform on oscilloscope. Its working frequency is up to 25MHz (RP1025D), 50MHz (RP1050D) and 100MHz (RP1100D) and it is rather suitable for large electricity test and R&D.

RP1000D series high voltage differential probe is applicable to general purpose oscilloscope and the labeled attenuation ratios are those when the input impedance of the oscilloscope is  $1M\Omega$ . The attenuation ratios will double when the input impedance of the oscilloscope is  $50\Omega$ .



Figure 1 RP1025D High Voltage Differential Probe



Figure 2 RP1050D High Voltage Differential Probe



Figure 3 RP1100D High Voltage Differential Probe



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## Basic Operations

1. Connect the red safety IC clip with one end of the red dual-banana plug silicon cable and the black safety IC clip with one end of the black dual-banana plug silicon cable provided in the accessories. Then, connect the red dual-banana plug silicon cable with the red (+) input terminal of the high voltage probe and the black dual-banana plug silicon cable with the black (-) input terminal of the high voltage probe.

Note:

- a) The safety IC clip can be replaced by the high voltage dedicated IC clip, safety alligator clip or safety contact probe prod;
  - b) The dual-banana plug silicon cable can be replaced by high voltage dedicated dual-banana plug silicon cable.
2. Connect one end of the dual-BNC coaxial cable to the BNC interface of the high voltage differential probe and the other end to input terminal of the oscilloscope.
  3. Turn on the channel switch on the oscilloscope and adjust the high voltage probe and oscilloscope to make the attenuation ratios of the two match. If the attenuation ratio of the oscilloscope does not match that of the high voltage probe, the actual vertical scale equals the attenuation ratio of the high voltage probe divided by the attenuation ratio of the oscilloscope and then times the vertical scale of the oscilloscope.

For example, when the attenuation ratio of the oscilloscope is set to 1X, the attenuation ratio of the high voltage probe is set to X200 and the vertical scale of the oscilloscope is 0.5V/div, the actual vertical scale is  $200 \times 0.5\text{V/div} = 100\text{V/div}$ . When the input impedance of the oscilloscope is  $50\Omega$ , the actual vertical scale is  $2 \times 200 \times 0.5\text{V/div} = 200\text{V/div}$ .

Note: When the attenuation ratio of the oscilloscope matches the attenuation ratio of the high voltage probe, the vertical scale displayed on the oscilloscope is the actual scale.

## **Cleaning and General Care**

### **Cleaning:**

This product has no particular requirement for cleaning. To clean the probe, please wipe the probe surface using soft and clean cloth dampened with detergent.

### **General Care:**

Please store this product in anti-humidity case if the product will not be used for more than 60 days.

## **Warranty**

**RIGOL** warrants that its products mainframe and accessories will be free from defects in materials and workmanship within the warranty period.

If a product is proven to be defective within the respective period, **RIGOL** guarantees the free replacement or repair of products which are approved defective. To get repair service, please contact with your nearest **RIGOL** sales or service office.

**RIGOL** does not provide other warranty items except the one being provided by this warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

# Specifications

## Technical Specifications

### RP1025D:

<b>Bandwidth</b>	X50 or X200 attenuation ratio: DC - 25MHz (-3dB) X20 attenuation ratio: DC - 15MHz
<b>Attenuation Ratio</b>	X20, X50, X200
<b>Accuracy</b>	±2%
<b>Input Voltage Range (DC + AC peak-peak value)</b>	X20 attenuation ratio: ≤ 140Vpp, about 50Vrms or DC X50 attenuation ratio: ≤ 350Vpp, about 125Vrms or DC X200 attenuation ratio: ≤ 1400Vpp, about 500Vrms or DC
<b>Maximum Input Voltage</b>	Maximum differential voltage: 1400V (DC+AC peak-peak value) or 500Vrms Voltage to ground at the input terminal: 600Vrms
<b>Input Impedance</b>	Differential: 4MΩ/1.2pF Single-ended and to ground: 2MΩ/2.3pF
<b>Output Voltage</b>	≤ ±6.5V
<b>Output Impedance</b>	50Ω
<b>Rise Time</b>	X50 or X200 attenuation ratio: 14ns X20 attenuation ratio: 23.4ns
<b>Common-mode Rejection</b>	60Hz: > 50dB 100Hz: > 50dB 1MHz: > 50dB
<b>Power Supply</b>	Specified external 9V DC power supply (must be specified products acknowledged by <b>RIGOL</b> )
<b>Power Consumption</b>	0.4 watt

**RP1050D:**

<b>Bandwidth</b>	X200, X500 or X1000 attenuation ratio: DC - 50MHz (-3dB) X100 attenuation ratio: DC - 25MHz
<b>Attenuation Ratio</b>	X100, X200, X500, X1000
<b>Accuracy</b>	±2%
<b>Input Voltage Range (DC + AC peak-peak value)</b>	X100 attenuation ratio: ≤ 700Vpp, about 230Vrms or DC X200 attenuation ratio: ≤ 1400Vpp, about 460Vrms or DC X500 attenuation ratio: ≤ 3500Vpp, about 1140Vrms or DC X1000 attenuation ratio: ≤ 7000Vpp, 2300Vrms or DC
<b>Maximum Input Voltage</b>	Maximum differential voltage: 7000V (DC+AC peak-peak value) or 2300Vrms Voltage to ground at the input terminal: 6500Vrms
<b>Input Impedance</b>	Differential: 100MΩ/1.2pF Single-ended and to ground: 50MΩ/2.3pF
<b>Output Voltage</b>	≤ ±7.0V
<b>Output Impedance</b>	50Ω
<b>Rise Time</b>	X200, X500 or X1000 attenuation ratio: 7ns X100 attenuation ratio: 14ns
<b>Common-mode Rejection</b>	60Hz: > 50dB 100Hz: > 50dB 1MHz: > 50dB
<b>Power Supply</b>	Specified external 9V DC power supply (must be specified products acknowledged by <b>RIGOL</b> )
<b>Power Consumption</b>	0.4 watt

**RP1100D:**

<b>Bandwidth</b>	X200, X500 or X1000 attenuation ratio: DC - 100MHz (-3dB) X100 attenuation ratio: DC - 50MHz
<b>Attenuation Ratio</b>	X100, X200, X500, X1000
<b>Accuracy</b>	±2%
<b>Input Voltage Range (DC + AC peak-peak value)</b>	X100 attenuation ratio: ≤ 700Vpp, about 230Vrms or DC X200 attenuation ratio: ≤ 1400Vpp, about 460Vrms or DC X500 attenuation ratio: ≤ 3500Vpp, about 1140Vrms or DC X1000 attenuation ratio: ≤ 7000Vpp, about 2300Vrms or DC
<b>Maximum Input Voltage</b>	Maximum differential voltage: 7000V (DC+AC peak-peak value) or 2300Vrms Voltage to ground at the input terminal: 6500Vrms
<b>Input Impedance</b>	Differential: 100MΩ/1.2pF Single-ended and to ground: 50MΩ/2.3pF
<b>Output Voltage</b>	≤ ±8.0V
<b>Output Impedance</b>	50Ω
<b>Rise Time</b>	X200, X500 or X1000 attenuation ratio: 3.5ns X100 attenuation ratio: 7ns
<b>Common-mode Rejection</b>	60Hz: > 50dB 100Hz: > 50dB 1MHz: > 50dB
<b>Power Supply</b>	Specified external 9V DC power supply (must be specified products acknowledged by <b>RIGOL</b> )
<b>Power Consumption</b>	0.4 watt

## Operation Environment

	General	Operation	Storage
Temperature	+20°C to +30°C	0°C to +50°C	-30°C to +70°C
Humidity	≤ 70%RH	10% to 85%RH	10% to 90%RH

## General Specifications

<b>Probe Dimensions</b>	RP1025D: about 214mm x 60mm x 35mm
	RP1050D: about 240mm x 85mm x 36mm
	RP1100D: about 240mm x 85mm x 36mm
<b>Weight</b>	RP1025D: 280g
	RP1050D: 280g
	RP1100D: 280g
<b>Safety</b>	IEC 1010-1, CAT III, pollution degree 2
<b>Electromagnetic Compatibility</b>	Conform to EN50081-1 and 50082-1 standards
<b>Maximum Voltage to Ground</b>	RP1025D: 600Vrms
	RP1050D: 6500Vrms
	RP1100D: 6500Vrms
<b>Using Environment</b>	Indoor environment
<b>Insulation Category</b>	Double insulation

# Accessories

**RP1025D:**

	<b>Accessories</b>	<b>Explanation</b>	<b>Quantity</b>
1.	User's Guide	Chinese & English	1
2.	AC power adaptor that accords with the standard of the destination country	--	1
3.	Dual-BNC coaxial cable	50Ω impedance RG58C UL 100cm length	1
4.	Dual-banana plug silicon cable	UL 6KV 18AWG 60cm length	Red: 1; Black: 1
5.	Safety IC clip	UL 1000V CAT III	Red: 1; Black: 1
6.	Safety alligator clip	UL 1000V CAT II, 10A	Red: 1; Black: 1



**RP1050D:**

	<b>Accessories</b>	<b>Explanation</b>	<b>Quantity</b>
1.	User's Guide	Chinese & English	1
2.	AC power adaptor that accords with the standard of the destination country	--	1
3.	Dual-BNC coaxial cable	50Ω impedance RG58C UL 100cm length	1
4.	High voltage dedicated dual-banana plug silicon cable	UL 20KV 16AWG 60cm length	Red: 1; Black: 1
5.	High voltage dedicated IC clip	maximum 6500V (DC+AC p-p)	Red: 1; Black: 1
6.	Safety alligator clip	UL 1000V CAT II, 10A	Red: 1; Black: 1

**RP1100D:**

	<b>Accessories</b>	<b>Explanation</b>	<b>Quantity</b>
1.	User's Guide	Chinese & English	1
2.	AC power adaptor that accords with the standard of the destination country	--	1
3.	Dual-BNC coaxial cable	50Ω impedance RG58C UL 100cm length	1
4.	High voltage dedicated dual-banana plug silicon cable	UL 20KV 16AWG 60cm length	Red: 1; Black: 1
5.	High voltage dedicated IC clip	maximum 6500V (DC+AC p-p)	Red: 1; Black: 1
6.	Safety alligator clip	UL 1000V CAT II, 10A	Red: 1; Black: 1
7.	Safety contact probe prod	UL 1000V, CAT III	Red: 1; Black: 1