RIGOL

PVA9000 Series

Active Probe

User Guide

Oct. 2025

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

E-mail: service@rigol.com

Website: *http://www.rigol.com*

Section	Description	Page

1 Safety Requirement

1.1 General Safety Summary

Read the following safety precautions before using the product to avoid personal injury and to prevent damage to this product or any equipment connected to this product.

To prevent possible hazards, be sure to use this product in accordance with the regulations.

- **Connect or Disconnect the Equipment Properly.**

  Connect the probe output terminal to the measuring instrument before the probe is connected to the circuit under test. Disconnect the probe input terminal from the circuit under test before disconnecting the probe from the instrument.

- **Observe All Terminal Ratings.**

  To avoid fire or electric shock, please observe all ratings and markings on the product. Before making any connections to the product, consult the User Guide of the product for more details about ratings.

- **Use the Product only in Specified Measurement Category.**

  The probe only applies to circuits not directly connected to the mains (CAT I). It is not applicable to CAT II, CAT III, or CAT IV measurement.

- **Check the Equipment Status Periodically.**

  Check the physical status of the probe and its accessories, including the cables, interfaces, or any visible damage or wear. Do not use the probe with damaged, cracked, or defective cable. Stop using it with suspected failures.

- **Do Not Operate with Suspected Failures.**

  If you suspect that there is damage to the product, have it inspected by RIGOL authorized personnel before further operations. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by RIGOL authorized personnel.

- **Avoid Exposed Circuitry.**

  Do not touch exposed circuits and components after the power is connected.

- **ESD Protection.**

  Electrostatic Discharge (ESD) may cause damage to the instrument. Therefore, perform tests in an ESD Protected Area (EPA) whenever possible. Before connecting a cable to the instrument, briefly ground its inner and outer conductors to release static electricity.

- **Do Not Operate in Wet Conditions.**

  For indoor use only. To avoid short circuit inside the instrument or electric shock, never use the product in a humid environment.

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

  To avoid personal injuries or damage to the instrument, never operate the instrument in an explosive atmosphere.

- **Keep Product Surfaces Dry and Clean.**

1.2 Safety Notices and Symbols

Safety Notices in this Manual:

WARNING

Indicates a potentially hazardous situation or practice which, if not avoided, will result in serious injury or death.

CAUTION

Indicates a potentially hazardous situation or practice which, if not avoided, could result in damage to the product or loss of important data.

Safety Notices 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**

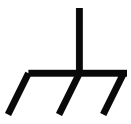
  It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

Safety Symbols on the Product:

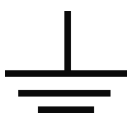
Hazardous Voltage

Safety Warning

Protective Earth Terminal



Chassis Ground



Test Ground

1.3 Environmental Considerations

The following symbol indicates that this product complies with the WEEE Directive 2012/19/EU.

The equipment may contain substances that could be harmful to the environment or human health. To avoid the release of such substances into the environment and avoid harm to human health, we recommend you to recycle this product appropriately to ensure that most materials are reused or recycled properly. Please contact your local authorities for disposal or recycling information.

You can click on the following link *https://www.rigol.com/intl/services/environmental-protection-statement.html* to download the latest version of the RoHS&WEEE certification file.

2 Document Overview

This manual gives you a quick overview of the technical specifications and basic operation methods of the PVA9000 Series Active Probe.

TIP

For the latest version of this manual, download it from RIGOL official website (*http://www.rigol.com*).

Publication Number

UGE41100-1110

Content Conventions in this Manual

The PVA9000 Series Active Probe includes the following model. Unless otherwise specified, this manual takes PVA9130 as an example to illustrate the basic operations of the PVA9000 series.

Model	Bandwidth
PVA9130	13 GHz (-3 dB)
PVA9100	10 GHz (-3 dB)

3 General Inspection

1. **Inspect the packaging**

   If the packaging has been damaged, do not dispose the damaged packaging or cushioning materials until the shipment has been checked for completeness and has passed both electrical and mechanical tests.

   The consigner or carrier shall be liable for the damage to the instrument resulting from shipment. RIGOL would not be responsible for free maintenance/rework or replacement of the instrument.

2. **Check the probe**

   In case of any mechanical damage, missing parts, or failure in passing the electrical and mechanical tests, contact your RIGOL sales representative.

3. **Check the accessories**

   Please check the accessories according to the packing lists. If the accessories are damaged or incomplete, please contact your RIGOL sales representative.

4 Product Overview

4.1 Introduction

PVA9000 is an active probe with up to 13 GHz bandwidth designed for high frequency test applications. It can measure differential and single-ended signals effectively with better common mode rejection. The PVA9000 series supports hand-held probe head and solder-in probe head to enhance adaptability and usability. Meanwhile, the probe tip spacing can be fine-adjusted to accommodate different test point spacings.

The PVA9000 series is compatible with the auto-recognized interface of RIGOL DS80000 series oscilloscope and can be recognized and configured automatically. It simplifies the operation and improves the user experience with immediate test.

Besides, PVA9000 offers various accessories and options and most of them are replaceable, enabling versatile use in different test and measurement scenarios.

4.2 Probe Size

The figure below shows the main body of the PVA9000 Series Active Probe.

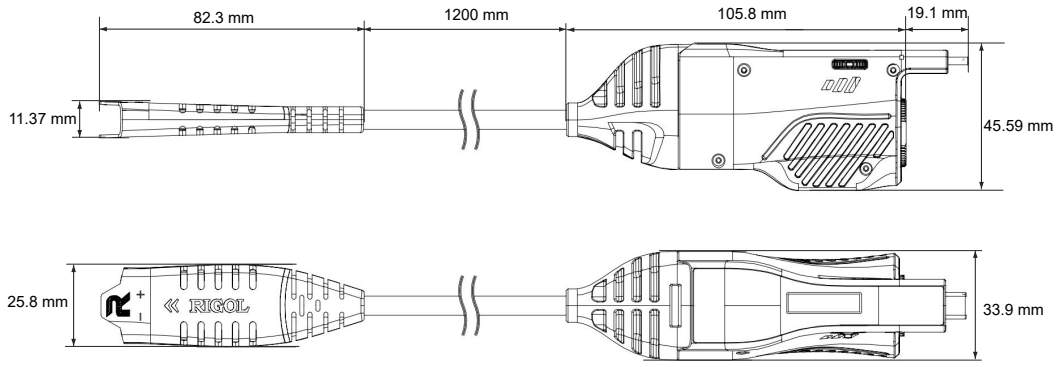


Figure 4.1 Probe Size

4.3 Probe Overview

The PVA9000 is as shown in the figure below.

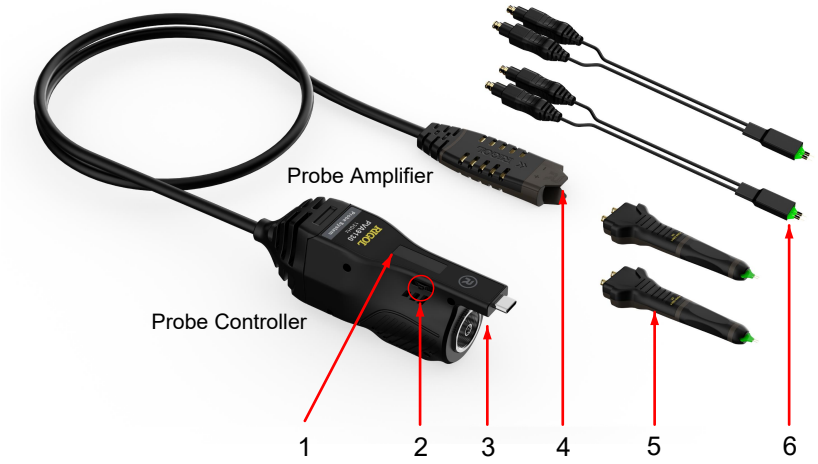


Figure 4.2 PVA9000

NOTE

The probe controller shown in the figure above integrates a power supply. When connected to the oscilloscope via the output connector and the oscilloscope is powered on, it automatically powers the PVA9000.

1. Probe display. When the probe is powered on, it displays the probe information.
2. Thumbwheel switch.
3. Probe output interface, used to connect the oscilloscope to power the probe and transmit signals. The interface consists of a 3.5 mm coaxial connector and a Type-C connector.
4. Probe head connector, used to connect different probe heads as required.
5. Hand-held probe head, used to connect the probe head connector. You can select 3× or 6× hand-held probe head as needed.
6. Solder-in probe head, used to connect the probe head connector. You can select 3× or 6× solder-in probe head as needed.

4.4 Probe Head

PVA9000 supports hand-held differential probe head and solder-in differential probe head.

Hand-held Differential Probe Head

Similar to using normal passive probes, you can use this probe head to measure signals. Besides, the probe spacing can be adjusted to cater to different measurement requirements.

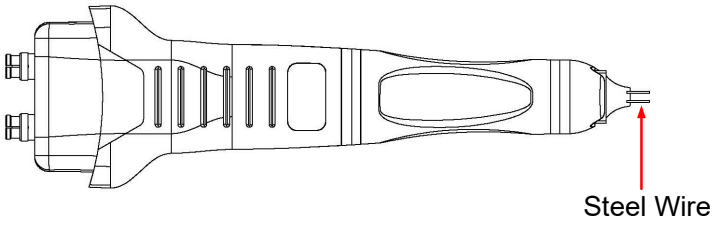


Figure 4.3 Hand-held Differential Probe Head

For hand-held differential probe head, the spring-steel probe tips make it easy to adjust the spacings, as shown in *Figure 4.3* .

Solder-in Differential Probe Head

The solder-in differential probe head is well-suited for measuring signals on high-density IC pins.

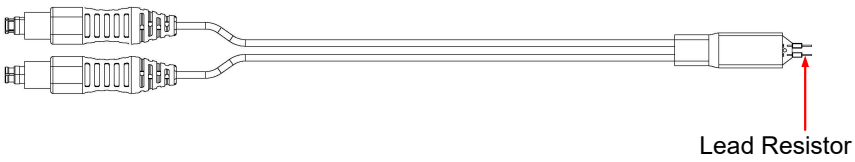


Figure 4.4 Solder-in Differential Probe Head

Use an auxiliary device to stabilize the probe head when using it to make measurements. Note: Never hold the probe head by hand during use. This may cause the resistor lead soldered onto the probe head to break or detach. The hand contact may also affect the probe performance.

The lead resistor of the solder-in probe head is a standard accessory. If it is damaged during use, you can replace it with a new one by referring to *To Replace Probe Accessories*.

4.5 Standard Accessories

The table below lists the probe kits and standard accessories of the PVA9000 Series Active Probe. All of them can be ordered from RIGOL.

Description	Order No.	Quantity
Active Probe	PVA9130/PVA9100	1
450 Ω Solder-in Probe Head	PVA9-DS01-6X	1
200 Ω Solder-in Probe Head	PVA9-DS01-3X	1

Description	Order No.	Quantity
450 Ω Hand-held Probe Head	PVA9-DB01-6X	1
200 Ω Hand-held Probe Head	PVA9-DB01-3X	1
Solder-in Probe Head Lead Resistor (150 Ω)	PVA9-R-150	4
Hand-held Probe Head Tin-plated Steel Wire (Length: 30 cm, Diameter: 0.15 mm)	PVA9-SteelWire-015	1
Hand-held Probe Head Tin-plated Steel Wire (Length: 30 cm, Diameter: 0.17 mm)	PVA9-SteelWire-017	1
Probe Bag	-	1

4.6 Option

The option can be ordered from RIGOL.

Description	Order No.
Probe Performance Verification and Offset Calibration Kit	CF-PV&Deskew Kit-P-16GHz

5 To Use the Probe

When using the PVA9000 Series Active Probe, correct operation methods can guarantee the probe performance, prolong the service life of the probe, and ensure valid signal measurement results. This chapter elaborates on how to use the PVA9000 series properly.

CAUTION

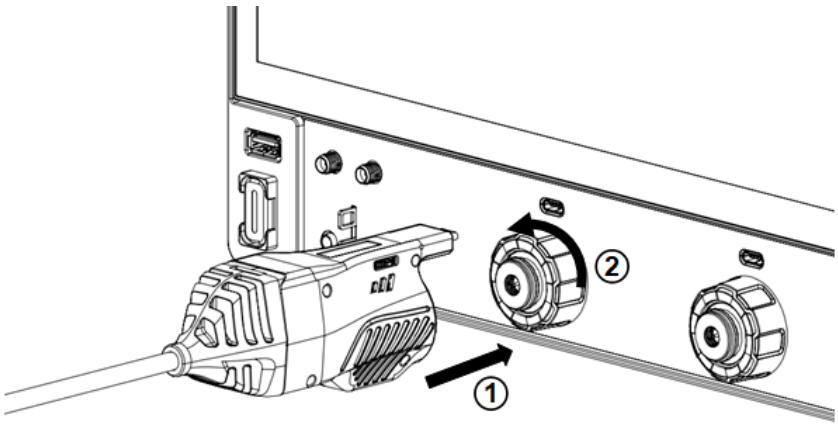
Do not bend or pull the probe cable to avoid any mechanical shocks to the probe in order to guarantee the product performance.

5.1 To Connect the Oscilloscope

After the PVA9000 Series Active Probe is properly connected to RIGOL DS80000 series oscilloscope, the oscilloscope recognizes the probe automatically and provides power and offset voltage for the probe via the front panel. At this point, you can adjust the offset voltage (see *To Adjust Offset Voltage*) and calibrate the probe (see *To Calibrate the Probe*) via the oscilloscope front panel. For details, refer to the manual of your oscilloscope.

Follow the steps below to connect the probe to the oscilloscope and make measurements:

1. Connect the probe output interface to an input connector of the oscilloscope. Rotate the front-panel coaxial connector of the oscilloscope to lock the probe.



2. Connect the probe head to the active probe amplifier.
3. Use any probe auxiliary device to connect the probe to the circuit under test. Make sure that the circuit under test is grounded properly before connection.
4. If you want to disconnect the probe from the oscilloscope, first rotate the coaxial connector to unlock their connection and then pull the connector straight out of the oscilloscope.

CAUTION

Never attempt to pull the probe from the connector of the oscilloscope when the probe is locked, or it may cause damage to the probe.

5.2 To Use the Probe Head

The PVA9000 Series Active Probe supports solder-in differential probe head and hand-held differential probe head. This section introduces how to use the two differential probe heads.

CAUTION

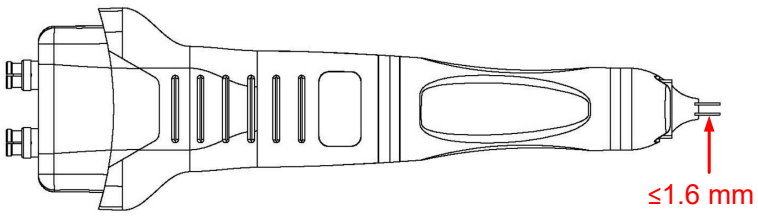
Never connect the probe amplifier directly to the circuit. A probe head must be attached before use.

Use the Hand-held Differential Probe Head

The hand-held differential probe head allows you to easily measure both differential and single-ended signals. To meet different testing scenarios, the PVA9000 series provides two types of probe head steel wires with diameters of 0.15 mm and 0.17 mm.

- **0.15 mm Diameter Steel Wire:** It has better elasticity for requirements of different test spacings. When using 0.15 mm diameter steel wire, it is recommended that the test spacing range from 0.3 mm to 2.5 mm.
- **0.17 mm Diameter Steel Wire:** It has better rigidity to provide a more direct and stable physical connection. When using 0.17 mm diameter steel wire, it is recommended that the test spacing range from 0.4 mm to 1.8 mm.

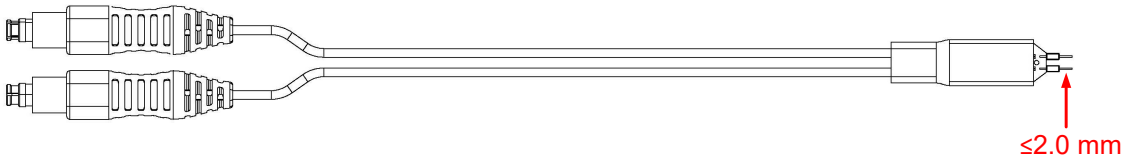
As shown in the figure below, the recommended length of the steel wire should not exceed 1.6 mm (the distance from the probe head plate edge to the end of the steel wire). When the length of the steel wire exceeds 1.6 mm, it will reduce the bandwidth of the probe head and the amplifier system. You can use the trim gauge provided in the accessories to trim the steel wire.



Use the Solder-in Differential Probe Head

The solder-in differential probe head allows users to replace the lead resistor, enhancing usability and extending the service life of the probe.

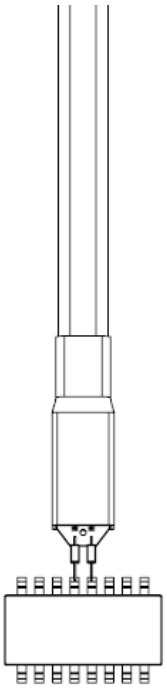
As shown in the figure below, the cutting length of the lead resistor is recommended not to exceed 2 mm (the reserved soldering lead length). When the length exceeds 2 mm, it will reduce the probe head and the bandwidth of the amplifier system.



For test points with greater spacings, longer lead may introduce signal overshoot and ringing, leading to changes in high-frequency response.

To obtain the best measurement results and avoid damaging the probe, note the following when using the solder-in differential probe head:

- Keep the lead as short as possible for best performance when measuring.
- Always disconnect the probe head from the probe amplifier before soldering or desoldering.
- Before soldering the lead, it is recommended to use appropriate tools (such as a probe holder) to stabilize the probe. This helps prevent excessive mechanical stress at the solder joints and ensures soldering quality and connection stability.



5.3 To Replace Probe Accessories

Replace the Probe Head

Take care not to break the connection to avoid affecting the probe performance when replacing the probe head.

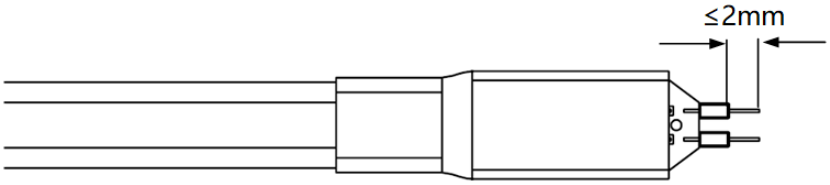
1. Disconnect the probe head from the probe amplifier.
2. Push the new probe head straight into the active probe amplifier.

CAUTION

When removing the probe head module, do not wiggle the probe head up and down or twist it to avoid damaging the connection pins.

Replace the Lead Resistor

During use, if the lead resistor of the solder-in probe head is damaged or breaks off, you can replace it with a new one. The length of the new lead should be less than or equal to 2 mm (recommended).



CAUTION

When the lead is longer than 2 mm, the bandwidth of the probe will be affected. You can use a trim gauge to trim the length of the lead.

5.4 To Adjust Offset Voltage

RIGOL DS80000 series oscilloscope provides offset voltage for the PVA9000 Series Active Probe. The offset voltage is used to adjust the signal under test that is out of the input dynamic range of the active probe amplifier to ensure the signal integrity.

You can adjust the offset voltage via the oscilloscope. The method is as follows:

1. Refer to *To Connect the Oscilloscope* to connect the PVA9000 series probe to the channel (e.g. CH1) input terminal of the oscilloscope.
2. Open the probe setting menu of the oscilloscope to adjust the offset voltage.

TIP

For how to open the menu and set the parameter, please refer to the manual of your oscilloscope.

5.5 To Calibrate the Probe

Before using the PVA9000 Series Active Probe, you need to calibrate the probe. The method is as follows:

1. Connect the probe to the analog channel and the Type-C interface of the oscilloscope (taking the CH1 of DS80000 as an example).
2. Click or tap the channel status label at the bottom of the screen to open the Vertical menu. Then click or tap **Probe** > **CH1** > **Calibration** and the oscilloscope will calibrate the probe automatically. The calibration takes about 80 to 90 seconds. After the calibration is completed, the prompt message "Probe calibrated successfully" or "Probe calibration failure" will be displayed on the oscilloscope based on the calibration result.

TIP

During the calibration process, please disconnect the probe head and ensure there is no signal input.

TIP

The calibration operation may differ for different oscilloscope models. For details, refer to the User Guide of your oscilloscope.

NOTE

The specification of the PVA9000 series depends on the calibration of the probe. After the calibration is completed, the offset voltage zero point and the offset gain are calibrated. After the probe is connected, you can check the probe information including the vendor, model, serial number, and the last calibration time on the probe setting menu. After power-on, the PVA9000 only requires one manual calibration at most. No more calibration is required to ensure measurement accuracy.

6 Specifications

Technical specifications are valid when:

- The probe is calibrated at 23°C ± 5°C ambient temperature
- The probe is powered by normal power supply
- The temperature, altitude, and humidity of the environment in which the probe is located cannot exceed the limits of the stated environmental requirements.

Table 6.1 PVA9000 Probe Head Specifications

PVA9130 Probe Head (13 GHz)					
Technical Specifications		PVA9-DB01-3X	PVA9-DS01-3X	PVA9-DB01-6X	PVA9-DS01-6X
Frequency Response					
Bandwidth		13 GHz	13 GHz	13 GHz	13 GHz
Step Response					
Rise Time[1] (10%～90%)		26.9 ps	26.9 ps	26.9 ps	26.9 ps
Input Impedance					
Input Capacitance (Typ.)	Diff	324 fF	125 fF	331 fF	201 fF
	SE	466 fF	152 fF	481 fF	248 fF
Input Resistance	Diff	51 kΩ	51 kΩ	100 kΩ	100 kΩ
	SE	25.5 kΩ	25.5 kΩ	50 kΩ	50 kΩ
AC Input Impedance (>10 kHz)	Diff	500 Ω	500 Ω	1 kΩ	1 kΩ
	SE	250 Ω	250 Ω	500 Ω	500 Ω

Table 6.2 PVA9000 Probe Amplifier Specifications

Specifications	PVA9100		PVA9130	
Probe Head Type	450 Ω Probe Head	200 Ω Probe Head	450 Ω Probe Head	200 Ω Probe Head
System Bandwidth[1]	10 GHz	10 GHz	13 GHz	13 GHz
DC Input Impedance	100kΩ±2% (Diff) 50kΩ±2% (SE) 25kΩ±2% (CM)	51kΩ±2% (Diff) 25.5kΩ±2% (SE) 12.5kΩ±2% (CM)	100kΩ±2% (Diff) 50kΩ±2% (SE) 25kΩ±2% (CM)	51kΩ±2% (Diff) 25.5kΩ±2% (SE) 12.5kΩ±2% (CM)
AC Input Impedance (10 kHz)	1 kΩ (Diff) 500 Ω (SE) 250 Ω (CM)	500 Ω (Diff) 250 Ω (SE) 125 Ω (CM)	1 kΩ (Diff) 500 Ω (SE) 250 Ω (CM)	500 Ω (Diff) 250 Ω (SE) 125 Ω (CM)
Input Voltage Range	2.5 Vpp	1.25 Vpp	2.5 Vpp	1.25 Vpp
Input CM Voltage	±12 V DC to 750 Hz ±1.25 V > 750 Hz	±6 V DC to 750 Hz ±0.65 V > 750 Hz	±12 V DC to 750 Hz ±1.25 V > 750 Hz	±6 V DC to 750 Hz ±0.65 V > 750 Hz
CMRR	DC-10kHz 50dB 10kHz-1MHz 40dB 1MHz-1GHz 30dB ＞1GHz 20 dB	DC-10kHz 50dB 10kHz-1MHz 40dB 1MHz-1GHz 30dB ＞1GHz 20 dB	DC-10kHz 50dB 10kHz-1MHz 40dB 1MHz-1GHz 30dB ＞1 GHz 20 dB	DC-10kHz 50dB 10kHz-1MHz 40dB 1MHz-1GHz 30dB ＞1 GHz 20 dB
DC Atten. Ratio	6.96:1	3.55:1	6.96:1	3.55:1
Offset Voltage Range	±16 V	±8 V	±16 V	±8 V

Specifications	PVA9100		PVA9130	
Offset Voltage Error	±2% of setting ±3mV	±2% of setting ±3mV	±2% of setting ±3mV	±2% of setting ±3mV
Input Reference Noise	5 mVrms	3 mVrms	5 mVrms	3 mVrms
Max. Input Voltage	±30 V	±15 V	±30 V	±15 V

Table 6.3 Environmental Characteristics

Environmental Characteristics	Specification
Operating Temperature	0℃ to 40℃
Storage Temperature	-40℃ to +60℃
Operating Humidity	0 to 80% RH
Storage Humidity	0 to 90% RH
Operating Altitude	4600 m
Storage Altitude	15300 m

Table 6.4 Mechanical Characteristics

Mechanical Characteristics	PVA9130/PVA9100
Size	Refer to *Figure 4.1*
Cable Length	1200 mm
Weight	Probe Net Weight: 96 g ± 10 g Probe Kit (package included): 1180 g ± 50 g

NOTE

[1]: Measured value when cascaded with the DS80000 series.

7 Care and Cleaning

Care

Do not leave the probe and its accessories where it may be exposed to sunlight for long periods of time.

CAUTION

Do not expose the probe and its accessories to caustic liquids.

Cleaning

Clean the probe and its accessories according to the operating conditions.

1. Disconnect the probe from the oscilloscope or the power source.
2. Wipe the exterior surfaces of the probe and its accessories with a soft cloth dampened with a mild detergent or water solution.

WARNING

To avoid short circuits or personal injury caused by moisture, make sure that the probe is completely dry before use.

8 Warranty

RIGOL TECHNOLOGIES CO., LTD. (hereinafter referred to as RIGOL) warrants that the product mainframe and product accessories will be free from defects in materials and workmanship within the warranty period. If a product proves defective within the warranty period, RIGOL guarantees free replacement or repair for the defective product.

To get repair service, please contact your nearest RIGOL sales or service office.

There is no other warranty, expressed or implied, except such as is expressly set forth herein or other applicable warranty card. There is no implied warranty of merchantability or fitness for a particular purpose. Under no circumstances shall RIGOL be liable for any consequential, indirect, ensuing, or special damages for any breach of warranty in any case.

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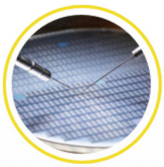

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