

VT1005

AC/DC HIGH VOLTAGE DIVIDER

Instruction Manual

EN

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VT1005A961-00 22-10H



HIOKI

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Warranty

Warranty malfunctions occurring under conditions of normal use in conformity with the Instruction Manual and Product Precautionary Markings will be repaired free of charge. This warranty is valid for a period of three (3) years from the date of purchase. Please contact the distributor from which you purchased the product for further information on warranty provisions.

Introduction

Thank you for choosing the Hioki VT1005 AC/DC High Voltage Divider. To ensure your ability to get the most out of this device over the long term, please read this manual carefully and keep it available for future reference. Please review the separate "Operating Precautions" before using the device.

The latest edition of the instruction manual

The contents of this manual are subject to change, for example as a result of product improvements or changes to specifications.

The latest edition can be downloaded from Hioki's website.
<https://www.hioki.com/global/support/download/>



Overview

The VT1005 is an AC/DC voltage divider that converts an input voltage of up to 5 kV (no measurement category) into a one-thousandth for output with high accuracy. The device has good flatness in frequency characteristics and stable temperature characteristics. It can be used not only for voltage measurement but also for high-precision power measurement by combining it with a wattmeter.

Precautions for Use

Be sure to follow the precautions listed below in order to use the device safely and in a manner that allows it to function effectively.

⚠ DANGER

- **Never touch the metal areas at the tips of voltage cords during measurement.**
Doing so could cause serious bodily injury or a short-circuit.
- ⊘ ■ **Do not use the device to measure circuits that exceed its ratings or specifications.**
Doing so could cause damage to the device or overheating, resulting in serious bodily injury.

⚠ WARNING

- **Do not use any cables whose insulation is damaged or whose metal portion is exposed.**
Doing so could cause serious bodily injury.
- ⊘ ■ **Do not touch the voltage cords after turning on the line under measurement.**
- ⊘ ■ **Do not disconnect the voltage cords from the device while the voltage cords are connected to the line under measurement.**
Failure to do so could cause bodily injury.

- ⓘ ■ **If you notice smoke, an unusual sound, or a strange odor, immediately turn off the device and the line under measurement, unplug the power cord from the outlet, and disconnect the wiring.**
Failure to do so could cause serious bodily injury or fire.
- ⓘ ■ **Turn off the line under measurement before connecting the voltage cords.**
Failure to do so could cause bodily injury.
- **When using the device, use only Hioki-specified voltage cords and power cord.**
Using a cord other than those specified could result in bodily injury or a short-circuit.

⚠ CAUTION

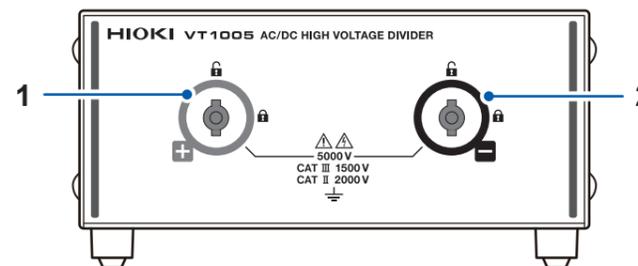
- ⊘ ■ **Do not bend, pull on, or twist cords, including where they connect, with excessive force.**
Doing so could cause the cords to break.
- **Do not step on cords or allow them to become caught between other objects.**
Doing so may damage insulation, resulting in bodily injury.
- ⊘ ■ **Do not bend cords at temperatures of 0°C or lower. Do not pull on cables.**
The cords are hardened. Doing so could damage the insulation or cause a wire break, resulting in an electric shock.
- **Do not input a voltage to input terminals while the device has been turned off.**
Doing so could cause damage to the device.

- **Securely connect the included power cord to the device and a grounded-type power outlet before measurement.**
Failure to ground the device with the power cord could cause the operator to experience an electric shock.
- ⓘ ■ **When disconnecting cords, disengage the lock and then pull out the connector while gripping it at the connection (do not pull on the cord).**
Doing so could damage the connector or junction.
- **Use the L9217 Connection Cord (which is made of resin) with insulated BNC connectors.**
Connecting a metal BNC cable to an insulated BNC connector could damage the insulated BNC connector or connected equipment.

- The device is not designed to insulate an measuring instrument electrically from lines under measurement.
- The device is classified as a Class A device under the EN 61326 standard. Use of the device in a residential setting such as a neighborhood could interfere with reception of radio and television broadcasts. If you encounter this issue, take steps as appropriate to address it.
- If the device seems to be malfunctioning, contact your authorized Hioki distributor or reseller.

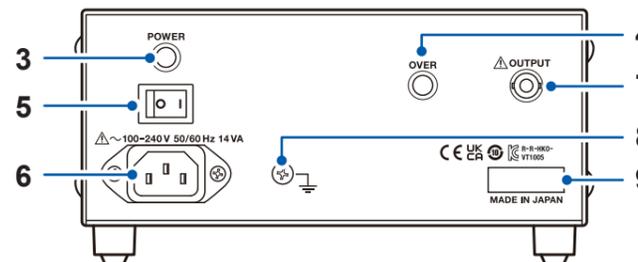
Parts Names

Front



1	Voltage input terminal (positive)	Connect the L1050 Voltage Cord (red) here.
2	Voltage input terminal (negative)	Connect the L1050 Voltage Cord (black) here.

Back



3	POWER indicator (power supply)	Indicates the power status. Light off: the device is off. Green light: the device is on.
4	OVER indicator (excessive input)	Indicates the input status. Light off: within the input range Red light: out of the input range
5	Power switch	Can be used to turn the device on and off. (I: on, O: off)
6	Power inlet	Connect the accompanying power cord here.
7	BNC output connector	Connect the L9217 Connection Cord (insulated BNC cable) here.
8	Functional grounding terminal	In locations with excessive noise, connecting the functional grounding terminal of this device to that of a power analyzer may enhance noise immunity.
9	Serial number	The serial number consists of nine digits. The first two digits indicate the year of manufacture, while the second two digits indicate the month of manufacture. Do not remove this sticker as the number is important.

Measurement Method

1 Prepare for measurement.

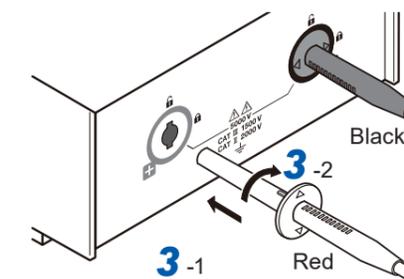
Crimp solderless terminals to the L1050 Voltage Cord to connect it to a line to be measured.

2 Connect the power cord.

1. Make sure that the device's power switch is set to the OFF position.
2. Connect the accompanying power cord to the power inlet of the device.

3 Connect the voltage cords.

1. Connect the L1050 Voltage Cord (black, red) to each voltage input terminal while aligning the protrusions with the grooves of the voltage input terminal.
2. Turn the connector clockwise to lock it (until ▷ points to 🔒). Before removing it, turn the connector counterclockwise to unlock it (until △ points to 🔓).



4 Connect the BNC cable.

1. Connect the L9217 Connection Cord (insulated BNC) to the BNC connector of the device.
2. Attach the 9704 Conversion Adapter to the L9217 cable, and then connect the Conversion Adapter to the Power Analyzer's voltage input terminals.

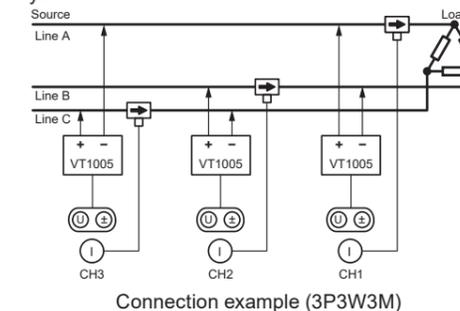
The Conversion Adapter has a polarity. Connect the 9704's red terminal to the U voltage input terminal and the black one to the ± voltage input terminal.

5 Use the power switch to turn the device on.

Make sure that the POWER indicator lights green. The device may malfunction if the indicator does not light green even when the switch has been set to ON. If you encounter this issue, unplug the power cord not to allow the device to be used.

6 Make connections to a line to be measured.

Shut off the power supplied to the line to be measured and exercise safety precautions when making connections. Make connections referring to the connection screen of the Power Analyzer.



7 Configure the Power Analyzer settings.

Please refer to the "Power Analyzer Setup Guide" provided with the device for configuring the PW8001, PW6001, or PW3390 Power Analyzer settings.

8 Perform measurement.

1. Turn on the line under measurement and confirm that the measured values displayed on the Power Analyzer are within the rated range.
2. Make sure that the device's OVER indicator (excessive input) does not light red. Shut off the power supplied to the line under measurement when the indicator lights red.

Specifications

Accuracy labeling

Reading (display value)

Indicates the value displayed by the instrument. Limit values for reading errors are expressed as a percentage of the reading ("% of reading" or "% rdg").

Full scale (rated voltage)

Indicates the rated voltage. Limit values for full-scale errors are expressed as a percentage of full scale ("% of full scale" or "% f.s.").

Operating environment	Indoor use, pollution degree 2, altitude up to 2000 m (6562 ft.)
Operating temperature and humidity range	-10°C to 50°C (14°F to 122°F) 80% RH or less (non-condensing)
Storage temperature and humidity range	-20°C to 60°C (-4°F to 140°F) 80% RH or less (non-condensing)
Dust resistance and water resistance	IP20 (EN 60529)

The protection rating for the enclosure of this device (based on EN60529) is *IP20.
*IP20

This indicates the degree of protection provided by the enclosure of the device for use in hazardous locations, entry of solid foreign objects, and the ingress of water.
2: Protected against access to hazardous parts with fingers. The equipment inside the enclosure is protected against entry by solid foreign objects larger than 12.5 mm in diameter.
0: The equipment inside the enclosure is not protected against the harmful effects of water.

Standards	Safety: EN 61010 EMC: EN 61326 Class A
Power supply	Rated supply voltage: 100 V to 240 V AC (assuming voltage fluctuation of ±10%) Rated power-supply frequency: 50 Hz, 60 Hz Anticipated transient overvoltage: 2500 V Maximum rated power: 14 VA
Indicator (power)	When turned off: light off; when turned on: green light
Indicator (excessive input)	Judgment is made based on the peak voltage between the input terminals. Within the range: light off, Out of the range: red light
Dimensions	Approx. 195.0W × 83.2H × 346.0D mm (7.68"W × 3.28"D × 13.62"H)
Weight	Approx. 2.2 kg (77.6 oz.)
Product warranty duration	3 years
Included accessories	<ul style="list-style-type: none"> L1050-01 Voltage Cord (1.6 m) L9217 Connection Cord (insulated BNC, 1.6 m) 9704 Conversion Adapter (insulated-female BNC-to-banana plug) Power cord Instruction Manual (this document) Power Analyzer Setup Guide Operating Precautions (0990A903)

Options
The options listed below are available for the device. To order an option, please contact your authorized Hioki distributor or reseller. Options are subject to change. Check Hioki's website for the latest information.

- L1050-01 Voltage Cord (1.6 m)
- L1050-03 Voltage Cord (3.0 m)
- L9217 Connection Cord (insulated BNC, 1.6 m)
- L9217-01 Connection Cord (insulated BNC, 3.0 m)
- L9217-02 Connection Cord (insulated BNC, 10 m)
- 9704 Conversion Adapter (insulated-female BNC-to-banana plug)

Differential maximum rated voltage	5000 V rms, ±7100 V peak Provided this falls within the frequency derating curve illustrated in Fig. 1.
Maximum rated common-mode voltage	5000 V rms, ±7100 V peak Provided this falls within the frequency derating curve illustrated in Fig. 1.
Maximum rated line-to-ground voltage	No measurement category: 5000 V AC/DC, ±7100 V peak Anticipated transient overvoltage: 0 V Measurement category II: 2000 V AC/DC, anticipated transient overvoltage: 12000 V Measurement category III: 1500 V AC/DC, anticipated transient overvoltage: 10000 V

Definition of measurement categories	
No measurement category (O)	Applicable to the measurement of circuits that are not directly connected to the main power supply. EXAMPLE: Measurement on the secondary-side equipment from the socket outlet of fixed installation through a transformer, etc.
Measurement category II (CAT II)	Applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage mains installation.
Measurement category III (CAT III)	Applicable to test and measuring circuits connected to the distribution part of the building's low-voltage mains installation.

Voltage dividing ratio	1000:1
Maximum output voltage	Approx. ±12 V
Output resistance	50 Ω ±10 Ω
Input resistance (DC)	Between input terminals: 52.8 MΩ (typical) Line-to-ground: 26.4 MΩ (typical)

Input capacity (100 kHz)	Between input terminals: 5.5 pF (typical) Line-to-ground: 11 pF (typical)
Frequency flatness	Band where amplitude falls within ±0.1% range: 200 kHz (typical) Band where phase falls within ±0.1° range: 500 kHz (typical, after phase delay corrected)
Accuracy guarantee conditions	Accuracy guarantee duration: 1 year Accuracy guarantee temperature and humidity range: 23°C ±5°C (73°F ±9°F), 80% RH or less (non-condensing) Warm-up time: 30 minutes or more Sine-wave input, measuring instrument with an input resistance of 1 MΩ or more, differential maximum rated voltage or less, common-mode input voltage of 0 V, no external magnetic field

Measurement accuracy		
Frequency	Amplitude ±(% of reading + % of full scale)	Phase
DC	0.03% + 0.05%	-
DC < f < 30 Hz	0.2% + 0.1%	±0.1°
30 Hz ≤ f < 45 Hz	0.1% + 0.1%	±0.1°
45 Hz ≤ f ≤ 66 Hz	0.02% + 0.02%	±0.06°
66 Hz < f ≤ 100 Hz	0.1% + 0.02%	±0.12°
100 Hz < f ≤ 1 kHz	0.1% + 0.02%	±0.2°
1 kHz < f ≤ 5 kHz	0.15% + 0.02%	±0.4°
5 kHz < f ≤ 50 kHz	0.15% + 0.02%	±(0.08 × f)°
50 kHz < f ≤ 100 kHz	0.5% + 0.02%	±(0.08 × f)°
100 kHz < f ≤ 300 kHz	1.5% + 0.5%	±(0.08 × f)°
300 kHz < f ≤ 1 MHz	5.0% + 0.5%	±(0.08 × f)°
Frequency band	4 MHz (-3 dB typical)	-

- The unit of f in the accuracy formula is kilohertz (kHz). Full scale corresponds to 5000 V.
- Phase accuracy values are merely designed values when the input has a frequency other than 50 Hz and 60 Hz and a voltage exceeding 600 V.
- Amplitude and phase accuracy values are merely designed values when the input frequency is within DC < f < 10 Hz.
- Amplitude and phase accuracy values are merely designed values when the input has a frequency within 10 Hz ≤ f < 16 Hz and a voltage exceeding 220 V.
- Amplitude accuracy values are merely designed values when the input has a frequency within 16 Hz ≤ f < 40 Hz and a voltage exceeding 1000 V.
- Amplitude accuracy values are merely designed values when the input has a frequency within 2 kHz < f ≤ 10 kHz and a voltage exceeding 3000 V.
- Amplitude accuracy values are merely designed values when the input has a frequency within 10 kHz < f ≤ 30 kHz and a voltage exceeding 1000 V.
- Amplitude accuracy values are merely designed values when the input has a frequency within 30 kHz < f ≤ 100 kHz and a voltage exceeding 750 V.
- Amplitude and phase accuracy values are merely designed values when the input frequency is in 100 kHz < f ≤ 1 MHz and a voltage exceeding (22000 / f [kHz]) volts.

Output noise	300 μV rms or less
Common-mode voltage rejection ratio (CMRR)	50 Hz/60 Hz: 90 dB (typical) 100 kHz: 80 dB (typical) The maximum rated voltage is specified by the CMRR when applied between the voltage input terminals and the enclosure.

Effects of temperature
Within the range of -10°C to 18°C or 28°C to 50°C
Add ±20 ppm of reading per degree Celsius.
Add further ±2 ppm of full scale per degree Celsius for direct current.

Effects of conducted radio-frequency electromagnetic field
0.2% of full scale or less at 10 V/m

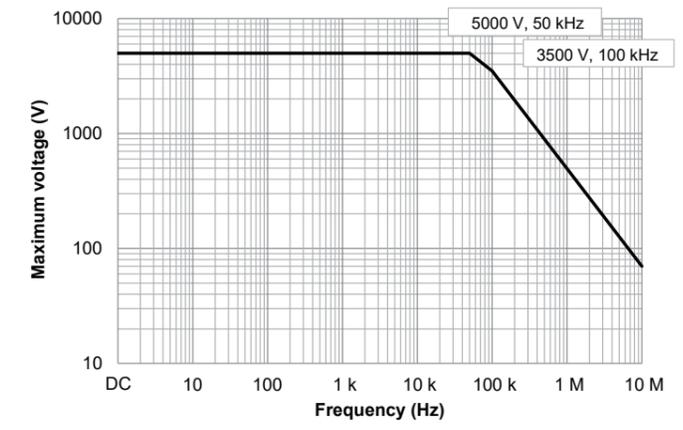


Fig. 1. Frequency derating curve

Combination Accuracy with Power Analyzer

Combination accuracy with the PW8001, PW6001, PW3390 Power Analyzers are as follows:
(power analyzer accuracy) + (divider accuracy)
Accuracy additions based on the various conditions of the Power Analyzer and Voltage Divider specifications also apply.

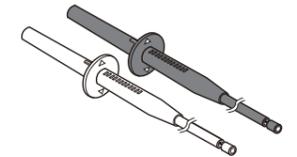
L1050 Voltage Cord

WARNING

- Inspect the L1050 Voltage Cord before use, and if you find the sheath is damaged or internal sheath or conductors are exposed, do not use the Voltage Cord.
- Use of an abnormal Voltage Cord could cause an electric shock to the operator. Replace it with a new one.
- Do not damage the insulation when processing cables. Doing so could cause serious bodily injury or a short-circuit.

The L1050 consist of a red cord and a black cord and each cord is cut off on one side (half-stripped).
Crimp solderless terminals to the L1050 Voltage Cord according to the circuit to be measured.

- The sizes and dimensions of the L1050's wires are as described below:
- Size: 22 AWG (0.326 mm²)
 - Outer dimension: 5.2 mm (including insulator)

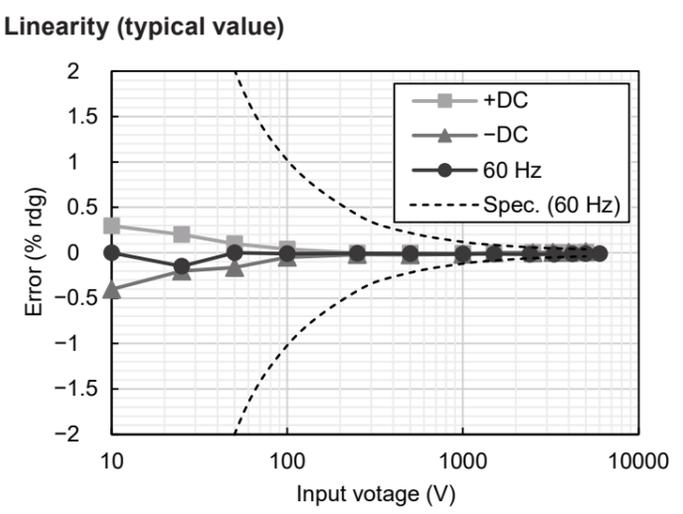
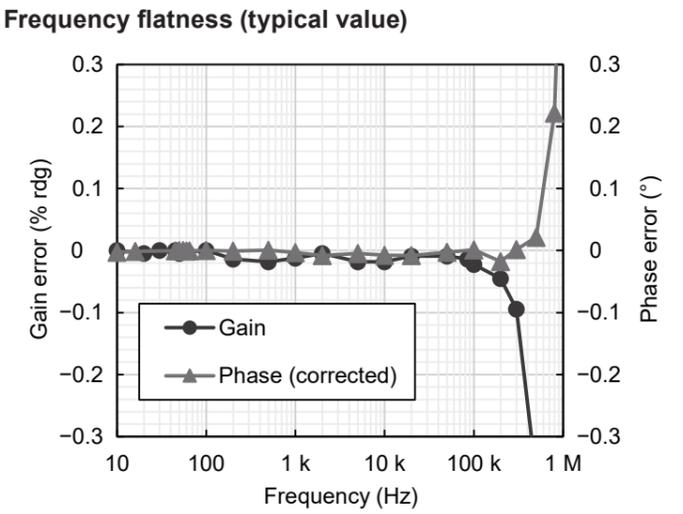
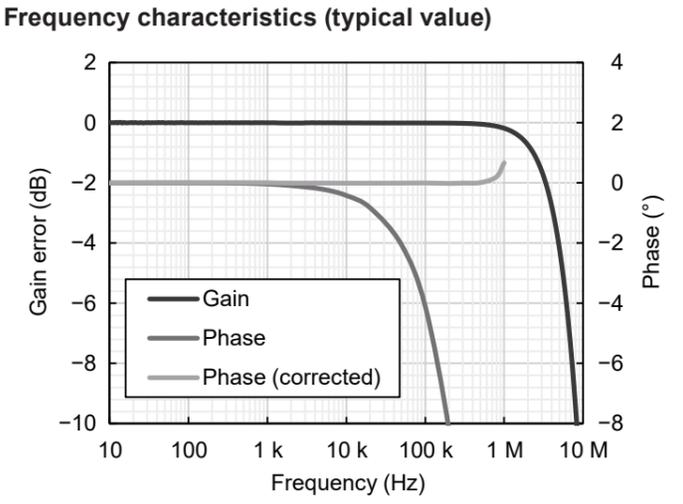


If you need to strip any insulation, use a wire stripper that supports 22 AWG twisted wires.
Crimp solderless terminals compatible with the wire listed above.
Put heat-shrinkable tubes on crimped parts to secure the solderless terminals to wires. Otherwise, the wires could be subjected to mechanical stress, such as tensile, torsion, and bending stress, resulting in wire breaks.

Specifications

	L1050-01	L1050-03
Model		
Operating environment	Indoor use, pollution degree 2, altitude up to 2000 m (6562 ft.)	
Operating temperature and humidity range	Connection cord -10°C to 100°C (14°F to 212°F) 80% RH or less (non-condensing) Banana plug -10°C to 50°C (14°F to 122°F) 80% RH or less (non-condensing)	
Storage temperature and humidity range	-20°C to 60°C (-4°F to 140°F) 80% RH or less (non-condensing)	
Terminal shape	Banana plug-to-not terminated (half-stripped)	
Cord length	Approx. 1.6 m (63") (including banana plug)	Approx. 3.0 m (118.1") (including banana plug)
Weight	Approx. 55 g (1.9 oz.)	Approx. 95 g (3.4 oz.)
Maximum rated voltage	5000 V AC/DC, ±7100 V peak	
Maximum rated current	100 mA	
Supported model	VT1005 AC/DC High Voltage Divider	

Characteristics



Dimensions

