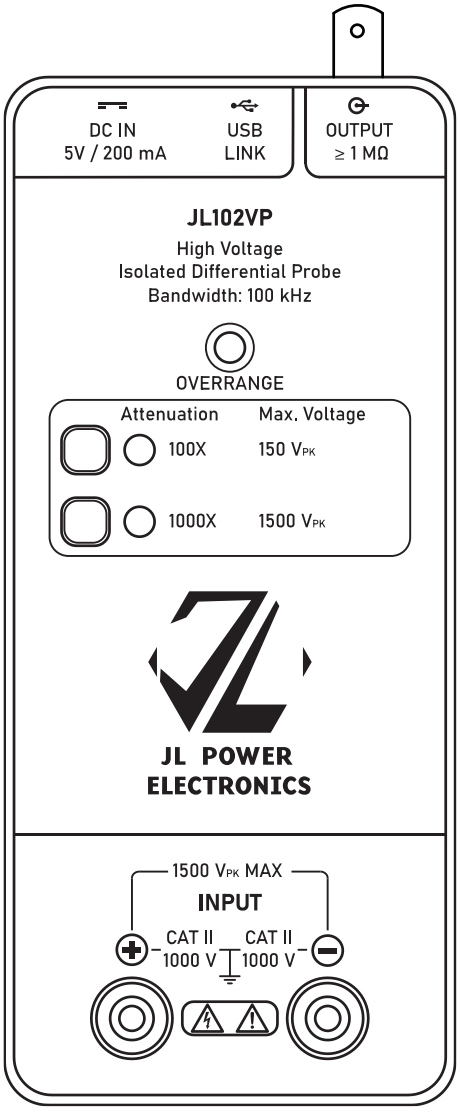
# JL102VP

## High Voltage Isolated Differential Probe

# User Manual




English

JL POWER ELECTRONICS

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# Overview

The JL102VP differential voltage probe is electrically isolated and allows for safe and accurate floating voltage measurements, with the capability to measure voltages up to ±1.5 kV (DC or peak) with selectable attenuation of 100X and 1000X. The input terminals are protected against transient overvoltages of up to 6 kV between terminals or from each terminal to ground/probe output, ensuring safety for peripheral equipment and users. Visual and audible alarm indicates when the input voltage exceeds the linear measurement range of the probe.

For added convenience, the probe is powered via a USB input and provides an additional USB port of the passthrough or link type, enabling data connection between a storage device (e.g., pen drive) and the host (e.g., oscilloscope) used to power the probe.

This product does not use batteries.

## Standard accessories

- USB-B to USB-A power and data cable
- Coaxial RG58C output cable with BNC connectors
- Red and black test leads
- Alligator clip adapters
- Carrying case
- User manual

## Optional accessories

- USB 5V power supply, 100-240VAC ~50/60 Hz

# Safety Compliance

## Terms and symbols

### Terms in this manual

These terms may appear in this manual:

⚠ WARNING

**Warning statements identify conditions or practices that could result in:**

- **Injuries or deaths;**
- **Damage to this product;**
- **Damage to other equipment.**

### Symbols on the product



**CAUTION**
Refer to the user manual.



**WARNING**
Electric shock hazard.

## Measurement categories

Measurement categories classify instruments by their ability to resist short transient overvoltages that occur in addition to the instrument's working voltage.

**CAT I**

Circuits not directly connected to the mains, such as protected electronic equipment and battery-powered circuits.

**CAT II**

Circuits directly connected to the low-voltage installation by a standard socket outlet, such as portable tools, household appliances, and similar loads.

**CAT III**

Building electrical installations, such as junction boxes, distribution boards, buses, and equipment permanently connected to the fixed installation.

**CAT IV**

Source of the low-voltage installation, such as electricity meters and primary overcurrent protection devices.

## Pollution degrees

The pollution degree classifies the levels of dry pollution and condensation that can occur in the environment.

**Pollution degree 1**

Environments where there is no pollution or only dry, non-conducting pollution occurs. There is no significant risk of accumulation of dust, humidity, or foreign substances in electrical equipment. Products of this category are generally encapsulated, hermetically sealed, or used only in clean rooms.

**Pollution degree 2**

Environments where normally dry and non-conductive pollution occurs, with moderate exposure to humidity and dust, which may temporarily degrade the instrument's insulation due to condensation. Typical locations are offices, laboratories, or light industrial environments. Temporary condensation only occurs when the product is out of service.

**Pollution degree 3**

Environments that contain conductive pollutants or dry, non-conductive pollution that becomes conductive due to condensation, which may affect the insulation of the instrument. Typically applies to sheltered locations where neither temperature nor humidity are controlled and generally protected from direct sunlight, rain and direct wind, such as industrial production areas.

**Pollution degree 4**

Environments that contain conductive pollutants, rain or snow, which generate persistent conductivity and may affect the insulation of the instrument. Typically applies to outdoor locations.

## Product classification

This instrument is developed in accordance with IEC61010 standards, pollution degree 2, overvoltage category CAT II 1000 $V_{RMS}$.

⚠ WARNING **Do not use this instrument in other overvoltage categories and outside the environment for which it is specified.**

## Precautions

⚠ WARNING **To ensure safety and avoid electrical shock, personal injury, and damage to the probe or other devices connected to it, observe the following instructions:**

- Never use the probe in environments with a measurement category higher than that specified. Do not use the probe in wet, humid, or explosive environments. Make sure the probe surface is completely dry before making connections.
- Do not apply effective voltages greater than the specified maximum voltages between any probe input and ground, or between inputs.

- Make sure that the probe and measuring instrument (e.g. oscilloscope) are properly grounded. The probe is grounded via the BNC connector through the grounding of the measuring instrument.
- Ensure that all accessories comply with the specified measurement category. The measurement category with the lowest value between the accessories and the probe defines the category of the entire measurement chain.
- Do not touch exposed connections and components when the power is on. Remove jewelry, watches, and other metallic objects.
- Due to the risk of electric shock, special care must be taken when the instruments are operating at effective voltages greater than 60 VDC or 30 VAC RMS.
- Do not use the probe if any part is damaged or with suspected failures. In these cases, have it inspected by qualified service personnel.

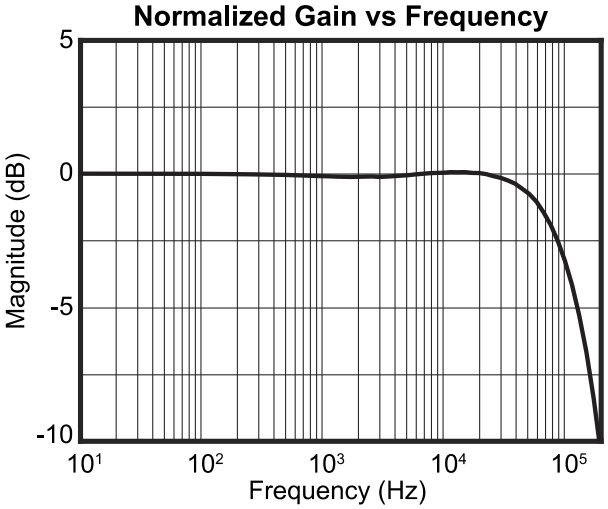
# Specifications

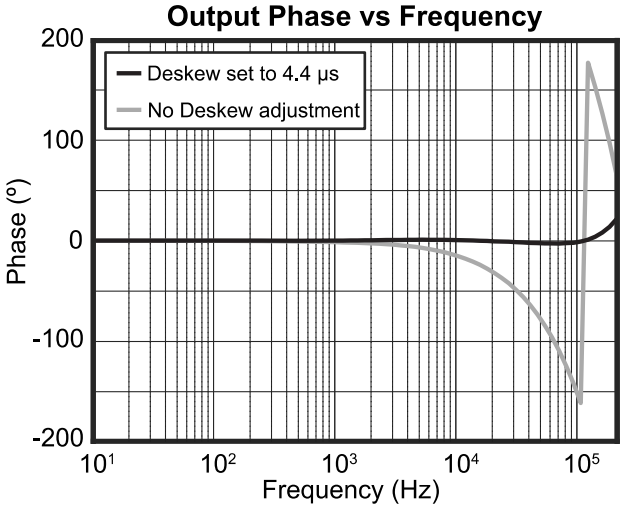
| | | |
|---|---|---|
| **Model** | | **JL102VP** |
| **Attenuation** | | 100X<br>1000X |
| **Maximum Differential Voltage** | Linear Range (DC + AC peak)<br>Continuous<br>Transient (1 s) | 150 V (100X); 1500 V (1000X)<br>3200 V (100X e 1000X)<br>6000 V (100X e 1000X) |
| **Maximum Common Mode Voltage** | Continuous<br>Transient (60 s) | 1700 V (100X e 1000X)<br>6000 V (100X e 1000X) |
| **Maximum Input Voltage to Earth** | | 1000 $V_{RMS}$ CAT II |
| **Gain Accuracy** | | ±1% (DC – 500 Hz)<br>±2% (500 Hz – 25kHz) |
| **Bandwidth (Typical)** | | 100 kHz (-3dB) |
| **Rise Time** | | 3.5 µs |
| **Skew delay** (1) | | 4.4 µs |
| **Initial delay** (2) | | 1.5 µs |
| **Differential Input Impedance** | | 5.3 MΩ  \|\| < 7 pF |
| **Input to output Impedance** | | > 5 GΩ  \|\| < 6 pF (each input to ground) |
| **Input Coupling** | | DC |
| **Oscilloscope Input Coupling** | | 1 MΩ, AC or DC |
| **Noise referred to input (Typical)** | | 0.12 $V_{RMS}$ (100X)<br>1.20 $V_{RMS}$ (1000X) |
| **CMRR (Typical)** | | DC–100 Hz: 76 dB (100X),  52 dB (1000X)<br>100 Hz–1 kHz: 54 dB (100X),  45 dB (1000X)<br>1 kHz–25 kHz: 45 dB (100X),  36 dB (1000X) |
| **Temperature Range** | Operating<br>Storage | 0 ºC to 40 ºC<br>-10 ºC to 60 ºC |
| **Humidity Range** | Operating<br>Storage | < 20% to 85% RH<br><  5% to 90% RH |
| **Power Supply / Energy Consumption** | | 5 V / 200 mA |
| **Weight** | | 200 g |
| **Dimensions (Maximum)** | | 184 x 75 x 33 mm (7.25 x 2.96 x 1.30 in) |

**Notes:**

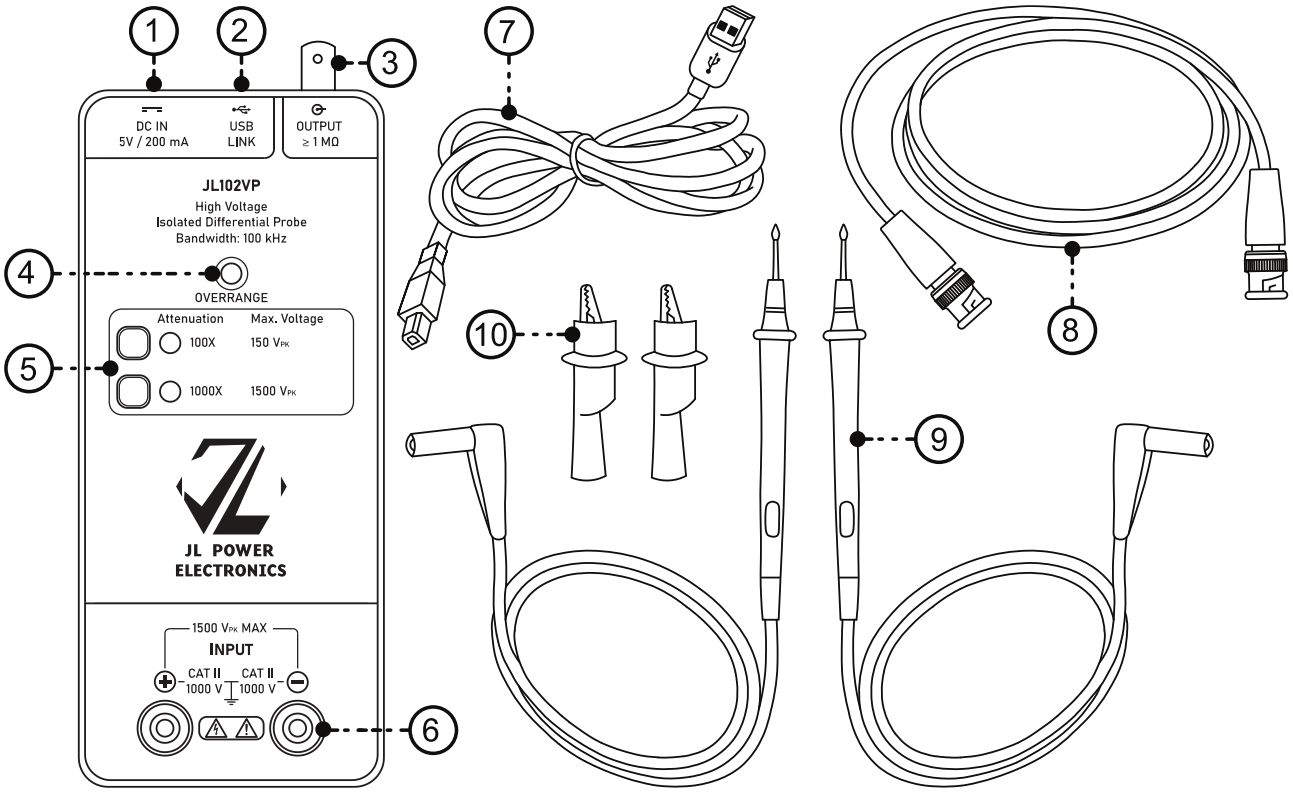
(1) Propagation delay. This parameter is generally used to compensate for the response using the oscilloscope's Deskew function.
(2) Delay time for the start of the response to a voltage step.

## Typical characteristics



# Description of the Probe and Accessories




**1)** USB-B input port for probe power (5 V / 200 mA)

**2)** USB-A port with a direct link to the input port

**3)** Measured signal output

**4)** Overrange LED Indicator

**5)** Buttons and attenuation LED indicators (100X or 1000X)

**6)** Isolated high voltage signal input

**7)** USB-B to USB-A power and data cable

**8)** Coaxial RG58C output cable with BNC connectors

**9)** Test lead

**10)** Alligator clip adapter

# Operation

## Functional description

### Initialization

When powering on the probe, the OVERRANGE LED indicator will blink once and a beep will sound.

### Overrange

When the input signal exceeds the linear measuring range limits, the OVERRANGE LED indicator will light up, and a beep will sound until the attenuation range is correctly set or the measured signal is reduced within the specified measurement range.

### Attenuation range

The attenuation must be set according to the attenuation indicator LEDs using the adjustment buttons on the probe and manually in the oscilloscope settings.

### Power supply and USB LINK

The probe must be powered through certificated power supplies or USB ports on equipment that complies with USB standards. To use a communication device at the USB LINK input (pen drive), the cable between the probe and the host must be shielded and capable of data communication. The cable included in the accessories meets these requirements.

The probe's USB ports are not electrically interconnected with the OUTPUT connector. This feature prevents the formation of ground loops with the measuring instrument's connections and allows the probe to be powered either by the instrument itself, by other equipment or a dedicated power supply, without changing its performance.

When cascading devices through the USB LINK port, make sure the power supply is capable of supplying the required current. It is not recommended to cascade more than two devices (e.g. two probes or a probe and a storage device).

## Handling the probe

Handle and store the probe with care. Always handle the probe by the body. Avoid applying excessive traction or subjecting the probe cables to sharp bends.

⚠ WARNING

**Avoid placing or storing the probe on very hot surfaces. Product durability and measurement reliability are greater at mild temperatures.**

**Do not place magnets close to the probe and do not place it on equipment that produces an intense magnetic field, especially during use. If necessary, use appropriate extenders for the input and output cables and test leads.**

## Connecting the probe to the test instrument

1) Connect the coaxial cable to the OUTPUT connector on the probe and to the oscilloscope's channel input.
2) Set the oscilloscope channel input impedance to 1 MΩ.
3) Connect the power cable to the DC IN input on the probe and to the power supply (oscilloscope USB port or external supply). The OVERRANGE LED indicator should blink once and a beep will sound.
4) Select the appropriate attenuation using the buttons on the probe.
5) Set the oscilloscope to the same selected attenuation.
6) Make coupling settings and offset adjustments manually on the oscilloscope.

## Connecting the probe to the test circuit

⚠ WARNING

**Before connecting the probe to the circuit under test, make sure that the measuring instrument and the equipment under test are properly grounded.**

**Turn off the circuit under test before connecting or disconnecting the test leads.**

**Make sure the test leads are in good condition and keep your fingers behind the insulation cover.**

The probe is connected to the circuit under test through the test leads, connected to the (+) and (-) inputs of the probe. Both inputs must be connected to the circuit under test.

Increasing parasitic capacitance or inductance in the input paths can introduce unwanted effects or slow the rise time of fast signals. If there is a large loop area between the input terminals, noise may be induced, which the probe's common mode rejection may not be able to remove. This effect can be reduced by twisting the input cables to minimize the loop area. Furthermore, to avoid a decrease in CMRR, the cables connected to both inputs should be the same type and have the same length.

# Maintenance

## Cleaning

The external surfaces of the device should be cleaned only using a soft cloth or swab lightly moistened with water or ethyl alcohol. Use only the amount necessary to moisten the cloth or swab. Dry the probe and accessories thoroughly before using them.

⚠ WARNING

**Do not use harsh chemicals or abrasive cleansers and protect the probe from adverse weather conditions. The probe is not waterproof.**

## Calibration interval

This probe has no user-accessible adjustments. The recommended calibration interval is two years. For calibration, follow the service instructions.

## Service strategy

If your probe requires repair or calibration service, contact your service representative or JL Power Electronics for instructions on how to return your probe. There are no user-serviceable or user-adjustable internal parts in this product.

⚠ WARNING

**Do not remove product covers. If the probe is defective within the warranty period and conditions, it will be replaced with a factory refurbished probe. If the probe is not under warranty, a quote will be passed on to the customer, with a discount being offered for probes that have not had their warranty seals broken.**

**Replacement probes are factory repaired, inspected, and calibrated to the same standards as a new product.**

# Troubleshooting

| | |
|---|---|
| **No LED lights up and no signal is measured** | • Check if the probe is powered though the DC IN input. |
| **Overrange alarm is triggering in the 100X scale** | • If the alarm is continuous, check if the measured signal amplitude is greater than 150 $V_{PK}$.<br>• If the alarm is intermittent, inspect the waveform for the presence of voltage spikes significantly higher than the normal amplitude of the signal.<br>• To address the above issues, switch the attenuation to the 1000X scale using the probe button and also in the oscilloscope settings.<br>• Check for the presence of intense magnetic fields near the probe.(1) |
| **Overrange alarm is triggering in the 1000X scale** | • Check if the occurrence is simultaneous with load switching or turning the tested equipment on/off.(2)<br>• Check for the presence of intense magnetic fields near the probe.(1)<br>• The amplitude of the measured signal exceeds the probe's capacity. Reduce the input signal amplitude or use a probe model compatible with the voltage levels to be measured. |
| **The measurements on the oscilloscope screen indicate incorrect amplitudes** | • Check the oscilloscope settings for attenuation on the channel used with the probe.<br>• Check the oscilloscope settings for the channel input impedance. It should be configured to 1 MΩ. Do not connect any line termination device between the probe output cable and the oscilloscope input.<br>• Check for the presence of intense magnetic fields near the probe.(1) |
| **The waveform is inverted** | • Check and correct the polarity of the signal connection at the probe input relative to the (+) and (-) inputs.<br>• Check if the oscilloscope has a waveform polarity inversion setting on the channel used by the probe and keep this function turned off. |
| **The device connected to the USB Link port is not recognized by the oscilloscope, or data transfer failure occurs** | • Ensure that the probe's DC IN input is connected to a USB port on the oscilloscope with data function.<br>• Check if the cable used is shielded and compliant with the USB standard for data communication. Preferably, use the USB cable provided with the probe. |
| **Noisy signal** | • Check if the source of interference originates outside the JL102VP probe. To do this, disconnect all cables from the probe without changing any oscilloscope settings, keeping the channel that was being used by this probe enabled.(3)<br>• Check for the presence of intense electric fields near the probe.(4)<br>• For a better signal-to-noise ratio when measuring signals with amplitudes below 150 $V_{PK}$, set the attenuation to 100X on the probe and in the oscilloscope settings. |

| | |
|---|---|
| | • If already using the 100X scale, increase the input signal amplitude or use a probe model more suitable for the voltage levels to be measured. |
| **Unlisted or unresolved issue** | • Please contact JL Power Electronics. Contact information can be found at the end of this manual. |

**Notes:**

(1) Keep the probe body away from possible sources of magnetic fields such as power transformers, motors, magnets, and high-current cables. If necessary, extend the length of the probe's input and/or output cables using appropriate extenders to allow for greater distance between the probe body and these elements.

(2) Abrupt current switching in circuits with inductors, coils, transformers, motors, or long cables, performed through switches, breakers, contactors, relays, or any other type of mechanical contact, can cause short-duration voltage spikes that exceed the configured scale. In these cases, sporadic alarm activation may be disregarded when occurring in sync with these events, provided that the voltage spike produced by the circuit does not surpass the maximum transient voltage supported by the probe (see the specifications table), to prevent damage to the probe.

(3) Verify whether the oscilloscope manufacturer requires it to be grounded and ensure that such grounding is properly connected. Do not use passive voltage probes with the grounding clip (alligator clip) connected to oscillating electrical potentials relative to earth on other channels, as it may cause internal interferences in the oscilloscope and pose risks to the operator. When working with circuits that generate high voltages and frequencies, prefer the use of isolated probes on all measurement channels.

(4) Arrange the positions of the input (INPUT), output (OUTPUT), and power (DC IN) cables of the probe, as well as any interconnecting cables between instruments. Avoid high-voltage cables being close to signal cables, and also prevent them from being too close to the probe body beyond what is necessary for connection to the isolated signal input (INPUT).

# Warranty

All instruments are carefully inspected, tested, and calibrated. This product is warranted against manufacturing defects under normal conditions of use, conservation, and maintenance, and will be repaired upon presentation of an invoice if it exhibits defects and complies with the warranty terms described below.

**1)** The warranty period is 12 (twelve) months from the date of invoice issuance.
**2)** The warranty is no longer valid in the following cases:
  **A)** Damages caused by natural wear and tear, heavy use, or exposure to unforeseen adverse conditions (weather, humidity, salt air, extreme cold, and heat).
  **B)** Breaking the warranty seal performed by an unauthorized professional or company.
  **C)** Misuse, improper handling, and use contrary to the specifications in this document, such as usage beyond specified technical limits and the use of power supplies not compliant with the USB standard.
  **D)** Damages caused by accidents, drops, and/or mishaps.
**3)** This warranty does not cover accessories such as test leads and adapters, USB power cable, and coaxial cable.
**4)** Shipping and return freight expenses are the responsibility of the customer or contracting company.

www.jlpowerelectronics.com

+55 (48) 98841-8794

jlconversores@gmail.com

jlpowerelectronics

@jlpowerelectronics

R. Cônego Bernardo, 101 – Sala 204
Florianópolis - SC

If you have any questions, please contact our support.

JL POWER ELECTRONICS