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EN



**Probing Solutions.
Made in Germany.**



PHV **X**^(kV) – Series

**High Voltage Probes
with Universal BNC Interface**

4000 V, >600 MHz

PRELIMINARY

Datasheet



About PHVX Series Probes

The state-of-the-art high voltage probe series PHVX establishes itself with its first 4kV model PHVX4kV as the best-in-class solution for the growing demands of power electronics design, e.g. low side VDS measurements in double pulse testing of high-speed high-voltage switching devices of SiC technology, and IGBTs, thyristors, fast-switching HV diodes, and more.

All PHVX series models are engineered to deliver precise and consistent results, allowing designers to optimize the efficiency and performance of their power electronic systems with confidence.

With <3pF low input capacitance and a bandwidth exceeding 600MHz, the PHVX series ensures accurate and reliable measurements for fast-switching devices and power electronics, making it an essential tool for engineers working on advanced designs having a protected test environment.

The PHVX series probes have a universal BNC output connector and are compatible with any oscilloscope in the lab with 1 M Ω input impedance.

PMK's PHVX series probes are not for handheld use and for integration into full-automated or manual test stations for high-voltage safety reasons. All PHVX probes are therefore used as a voltage-measuring component (permanently attached device) of a test system.

The probe series impresses with its innovative and compact form factor. Individual contacting with high signal fidelity in different applications is ensured with the replaceable spring tip and a variety of contacting accessories for high voltages. Particularly the unique ground rings which can be rotated through 360° and thus enables direct contacting to 5.08mm (2.5kV) or 7.62mm (4kV) pitch square pin headers without adding any additional capacitive loading to the DUT for highest signal fidelity. In addition, there is a wide range of soldering adapters, BNC adapters, and other accessories for easy and save connectivity for this non-handheld probe.

Each voltage model is available in different cable lengths and configurations, w/o intelligent read-out function, and w/o additional Silicon insulation (S) for high power measurements. The optional read-out (RO) features intelligent communication with automatic scaling on the oscilloscope display. The fully equipped model with intelligent read-out and extra Silicon insulation end with nomenclature -S-RO.

Please review the ordering information for the full list of available accessories and options.

Factory Calibration

All probes are calibrated at end of production. A factory calibration certificate is optional. Annual factory re-calibration is recommended. ISO17025 calibration upon delivery or as re-calibration is possible on request.

Specifications

Do not exceed the specifications. Allow the probe to warm up for 20 minutes. This probe comes with 1 year warranty. Each specification is determined at +23 °C ambient temperature. This probe series is not for hand-held use, and not rated for CAT II, III or IV.

Electrical Specifications

Electrical Specifications¹ that are not marked with (*) as guaranteed are typical.

| Models ² | PHVX4kV models |
|--|------------------------------------|
| Attenuation* ($\leq \pm 1$ % guaranteed) | 100:1 |
| Maximum Rated Input Voltages ¹ | |
| No Measurement Category | 4000 V rms / 4000 V pk / 4000 V DC |
| CAT Rating | not applicable |
| Pollution Degree | 2 |
| DC Gain Accuracy ³ | ± 0.5 % (preliminary) |
| Input Impedance | 50 M Ω < 3 pF |
| Compensation Range | 10 pF – 25 pF |
| Input Coupling of the Measuring Instrument | 1 M Ω |



The electrical specifications are valid for use in a controlled environment, like a semiconductor tester or test setup with protective cover.

| Models | PHVX4kV type | | |
|---|--|--|--|
| Article numbers ² | PHVX4kV-2-0 PHVX4kV-2-0-RO PHVX4kV-2-S PHVX4kV-2-S-RO | PHVX4kV-3-0 PHVX4kV-3-0-RO PHVX4kV-3-S PHVX4kV-3-S-RO | PHVX4kV-5-0 PHVX4kV-5-0-RO PHVX4kV-5-S PHVX4kV-5-S-RO |
| Cable Length | 2m | 3m | 5m |
| Bandwidth* (-3 dB) Small Signal (guaranteed) | > 600 MHz | TBD | TBD |
| Rise time (10 % - 90 %) Large Signal | < 800 ps | TBD | TBD |

Mechanical Specifications

| Parameter | Specification |
|-------------------------------|--|
| Weight (Probe only) | TBD |
| Length ⁴ | Model dependent |
| Probe Input | To position on 0.64mm(0.025") square pin header(s) |
| Output Connector ⁵ | BNC (Male) |

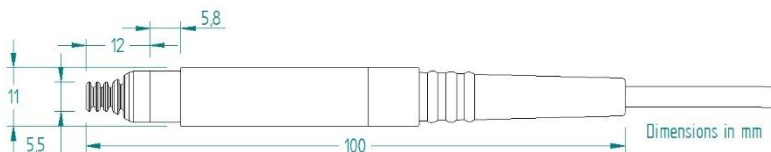
Notes:

- ¹ The rating is based on basic insulation in a controlled environment in accordance with IEC 61010-1. Also observe the definitions in the probe series' instruction manual. See voltage derating graph in the referring manual section.
- ² Each model is available with different cable lengths, w/o read-out, and w/o extra silicon cable insulation for measurements in high power applications. See "Ordering Information".
- ³ Input voltage >25%
- ⁴ Depending on model, available in different length
- ⁵ Depending on model, available with or without read-out

Environmental Specifications

| Parameter | | Specification |
|---------------------------|---------------|--|
| Temperature Range | Operating | 0 °C to +50 °C |
| | Non-Operating | -40 °C to +71 °C |
| Maximum Relative Humidity | Operating | 80 % relative humidity for temperatures up to +31 °C, decreasing linearly to 40 % at +45 °C, non-condensing humidity |
| | Non-Operating | 95 % relative humidity for temperatures up to +40 °C |
| Altitude | Operating | up to 2000 m |
| | Non-Operating | up to 15000 m |

Dimensions



Scope of Delivery

See chapter “Ordering Information” to review the selection of accessories.

- 1x PHVX series probe
- 1x **890-440-005** PHVX-GND ring for 2500V DC or AC peak, 5.08mm pitch, >360° angle of rotation
- 1x **890-440-008** PHVX-GND ring with GND lead to 2mm banana, with clamp
- 1x Instruction manual
- 1x **890-010-912** Set cable coding rings (3x4 colors)
- 1x Read-out for use with Keysight oscilloscopes

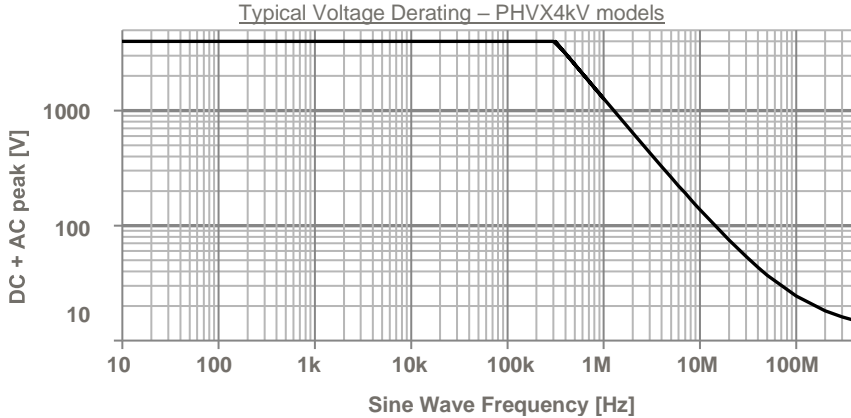


Typical Voltage Derating



Note that the maximum input voltage rating of the probe decreases as the frequency of the applied signal increases.

The charts given here are valid for no measurement category, not in CAT II, III, IV (1).



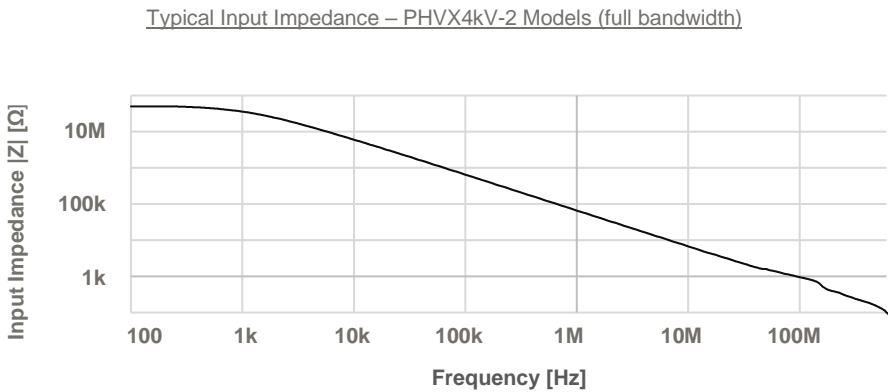
As defined in IEC 61010-1. See definitions explained in the instruction manual.

Typical Input Impedance



The input impedance of the probe decreases as the frequency of the applied signal increases.

The charts given here are valid for no measurement category, not in CAT II, III, IV (1).



(1) As defined in IEC 61010-1. See definitions explained in the instruction manual.

Ordering Information

Step 1: Select Base Probe

Each voltage model is available in different cable lengths and configurations, w/o intelligent read-out function, and w/o additional Silicon insulation (S) for high power measurements. The optional read-out (RO) features intelligent communication with automatic scaling on the oscilloscope display. The fully equipped model with intelligent read-out and extra Silicon insulation end with nomenclature -S-RO.

| | |
|-----------------------|--|
| PHVX4kV-2-0 | PHVX4kV, passive HV probe, >600MHz, 4000V DC / 4000V pk, 2.0m, 100:1 |
| PHVX4kV-2-0-RO | PHVX4kV, passive HV probe, >600MHz, 4000V DC / 4000V pk, 2.0m, 100:1, with readout |
| PHVX4kV-2-S | PHVX4kV, passive HV probe, >600MHz, 4000V DC / 4000V pk, 2.0m, 100:1, additional Silicon insulation for high current applications, without readout |
| PHVX4kV-2-S-RO | PHVX4kV, passive HV probe, >600MHz, 4000V DC / 4000V pk, 2.0m, 100:1, additional Silicon insulation for high current applications, with readout |
| PHVX4kV-3-0 | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 3.0m, 100:1, without readout |
| PHVX4kV-3-0-RO | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 3.0m, 100:1, with readout |
| PHVX4kV-3-S | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 3.0m, 100:1, additional Silicon insulation for high current applications, without readout |
| PHVX4kV-3-S-RO | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 3.0m, 100:1, additional Silicon insulation for high current applications, with readout |
| PHVX4kV-5-0 | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 5.0m, 100:1, without readout |
| PHVX4kV-5-0-RO | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 5.0m, 100:1, with readout |
| PHVX4kV-5-S | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 5.0m, 100:1, additional Silicon insulation for high current applications, without readout |
| PHVX4kV-5-S-RO | PHVX4kV, passive HV probe, TBD MHz, 4000V DC / 4000V pk, 5.0m, 100:1, additional Silicon insulation for high current applications, with readout |

Step 2: Select Additional Accessories

More PHVX-series connectivity options are in planning. If no fitting solution is shown below, please reach out to sales@pmk.de with your specific needs and application information.

Accessory ratings will be shown in the manual.

| | |
|--------------------|--|
| 890-440-001 | PHVX-PCB Adapter 2500V same footprint as PMK's high voltage PCB-Adapter 5.0-L (890-700-006) for PMK's PHV1000/2000 series max 2500V DC or AC peak |
| 890-440-011 | PHVX-PCB Adapter 4000V max 4000V DC or AC peak |

| | |
|--------------------|--|
| 890-440-002 | PHVX-BNC Adapter, max V TBD |
| 890-440-003 | PHVX-Dual adapter to 2mm banana, max V TBD |
| 890-440-004 | PHVX-Sprung Hook (red), max V TBD |
| 890-440-005 | PHVX-GND ring for 2500V DC or AC peak with 5.08mm pitch, for >360° rotational angle <i>included in scope of delivery</i> |
| 890-440-015 | PHVX-GND ring for 4000V DC or AC peak with 7.62mm pitch, for >360° rotational angle |
| 890-440-006 | PHVX-dualGND ring for 2500V DC or AC peak with 2x 5.08mm pitch, >360° rotational angle |
| 890-440-016 | PHVX-dualGND ring for 4000V DC or AC peak with 2x 7.62 mm pitch, >360° rotational angle |
| 890-440-007 | PHVX-GND ring with GND lead to 2mm banana, without clamp |
| 890-440-008 | PHVX-GND ring with GND lead to 2mm banana, with clamp <i>included in scope of delivery</i> |
| 890-800-001 | Spring tips, gold-plated, 5x |
| 890-800-000 | Solid tips, gold-plated, 5x |
| 890-440-009 | PHVX-Dual adapter to 2mm banana, with pair of clamps (red/black), max V TBD |
| 890-440-010 | Set 2 clamps, for use with 2mm banana plugs (red/black), max V TBD |



Observe the accessory ratings. Do not exceed the accessory ratings.
The accessories for this probe series have been safety tested.
Do not use any other accessories than recommended for this probe series.

Step 3: Select optional Calibration Certificate

| | |
|-------------------|--|
| On request | factory calibration certificate |
| On request | ISO 17025 (re-)calibration certificate |

The logo for dataTec, featuring the word "dataTec" in a white, italicized, sans-serif font. The "a" is lowercase and has a dot, while "T" is uppercase. The logo is centered within a solid red rectangular background.

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