

PHVS 1000

High Voltage Passive Probe

Instruction Manual



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Warranty

PMK GmbH warrants this oscilloscope accessory for normal use and operation within specifications for a period of two (2) years from date of shipment and will repair or replace any defective product which was not damaged by negligence, misuse, improper installation, accident or unauthorized repair or modification by the buyer. This warranty is applicable only to defects due to material or workmanship. PMK GmbH disclaim any other implied warranties of merchantability or fitness for a particular purpose. PMK GmbH will not be liable for any indirect, special, incidental, or consequential damages (including damages for loss of profits, loss of business, loss of use or data, interruption of business and the like), even if PMK GmbH has been advised of the possibility of such damages arising from any defect or error in this manual or product.



(EC conformity marking)

The manufacturer declares the conformity of this product with the actual required safety standards in accordance with the Low Voltage Directive (LVD) 2006/95/EC:

CEI/IEC 61010-031:2008

Safety requirements for electrical equipment
for measurement, control and laboratory use -

Part 031:

Safety requirements for hand-held probe
assemblies for electrical measurement and test

WEEE/ RoHS Directives



(EC conformity marking)

This electronic product is classified within the WEEE/ RoHS* category list as monitoring and control equipment (category 9). Category 9 products are exempted from the restrictions under the scope of the RoHS directive.

Your help and efforts are required to protect and keep clean our environment. Therefore return this electronic product at the end of its life either to the manufacturer or take care of separate WEEE collection and professional WEEE treatment yourself. Do not dispose as unsorted municipal waste!

* EC Directives:

WEEE Directive 2002/96/EC

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Waste Electrical and Electronic Equipment

RoHS Directive 2002/95/EC

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Restriction of the use of certain Hazardous Substances
in Electrical and Electronic Equipment

Definitions and Examples (Clause 6.5.2)

Measurement Category I	Definition:	Measurement category I is for measurements performed on circuits not directly connected to a mains supply.
	Examples:	Measurements in circuits not derived from a mains supply and specially protected (internal) circuits derived from a mains supply. In the latter case, transient stresses are variable; for that reason requires that the transient withstand capability of the equipment is made known to the user.
Measurement Category II CAT II	Definition:	Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.
	Examples:	Household appliances, portable tools and similar equipment.
Measurement Category III CAT III	Definition:	Measurement category III is for measurements performed in the building installation.
	Examples:	Measurements on distribution boards, circuit breakers, wiring including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation and equipment for industrial use like for example stationary motors with permanent connection to the fixed installation.
Measurement Category IV CAT IV	Definition:	Measurement category IV is for measurements performed at the source of the low-voltage installation.
	Examples:	Electricity meters and measurements on primary over current protection devices and and ripple control units.

Definitions (Clause 3.5.6)

- Pollution Degree 1** No POLLUTION or only dry, non conductive POLLUTION.
NOTE The POLLUTION has no influence.
- Pollution Degree 2** Only- non conductive POLLUTION. Occasionally, however, a temporary conductivity caused by condensation must be accepted.
- Pollution Degree 3** Conductive POLLUTION occurs or dry, non-conductive POLLUTION occurs which becomes conductive due to condensation which is to be expected.

IEC Safety Symbols

The following symbols may appear on the product or in this instruction manual:



Caution, risk of danger. Refer to manual.



Caution, risk of electric shock.



Earth (ground) TERMINAL.

To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Be aware that if you use this probe assembly in a manner not specified the protection this product provides may be impaired.

Only qualified personnel should use this probe assembly.

Use only grounded instruments.

Do not connect the probe ground lead to a potential other than earth ground. Always make sure the probe and the measurement instrument are grounded properly.

Connect and disconnect properly.

Connect the probe output to the measurement instrument and connect the ground lead to earth ground before connecting the probe to the circuit under test. Disconnect the probe input and the probe ground lead from the circuit under test before disconnecting the probe from the measurement instrument.

Observe probe and probe accessory ratings.

Do not apply any electrical potential to the probe input which exceeds the maximum ratings of the probe or the accessories connected to it. In a combination always the *lower* rating / measurement category applies to both probe and accessories connected to it.

Make sure to comply with the voltage versus frequency derating curve on page 8.

Keep away from live circuits.

Avoid open circuitry. Do not touch connections or components when power is present.

Do not operate with suspected failures.

Refer to qualified service personnel.

Indoor use only.

Do not operate in wet/damp environment. Keep product surfaces dry and clean.

Do not operate the product in an explosive atmosphere.

The PHVS1000 is rated for 1000V AC rms or DC CAT II.



Note that the max. input voltage rating of the probe decreases as the frequency of the applied signal increases (see Derating section).

Refer to the relevant section of this instructions manual for the maximum input voltages, derating information and definitions of relevant IEC Measurement Categories (CAT).

Grounding the Probe

Connect the probe to the oscilloscope input and connect the ground lead to earth ground before performing any measurements. Note that all accessible metal parts are connected to the BNC instrument connector (GND), except for the probe tip and the BNC centre-conductors.



The PHVS1000 is designed for ground-referenced measurements only.

About the PHVS Probe Series

The PHVS1000A is the PMK general purpose high voltage probe with a 1000:1 attenuation. Its fast rise time and accurate frequency response make it suitable for a variety of measurement applications. The very sharp probe tip is spring loaded and minimizes the pressure to the dut (device under test). It also prevents the probe from slipping on the board surface. Especially when probing at an angle. The probe tips are changeable. Replacement tips are provided within the accessory pack. Refer to the maintenance section to learn how to change the probe tip.

Specifications that are not defined to be guaranteed are typical and are published as general information to the user. The instrument should have warmed-up for at least 20 minutes and the environmental conditions do not exceed the probe 's specified limits.

Electrical Specifications

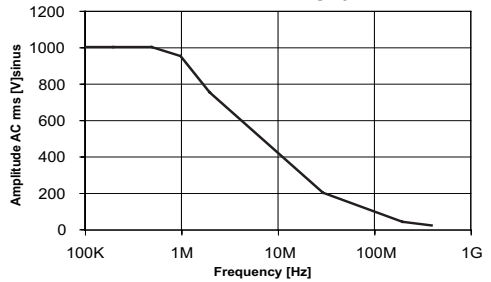
Attenuation Ratio ⁽¹⁾	1000:1	± 2 % at DC
Voltage Coefficient	0.0005 %/V	(typical)
System Bandwidth	400 MHz	(-3 dB)
Probe Risetime	900 ps	(10 % - 90 %) (typical)
Maximum Rated Input Voltage ⁽²⁾	1000 V rms	
Measurement category I:	4000 V transient overvoltage	
Measurement category II:	1000 V rms CAT II	
Pollution Degree	2	

Voltage Derating



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

Typical voltage derating PHVS1000
Measurement category I

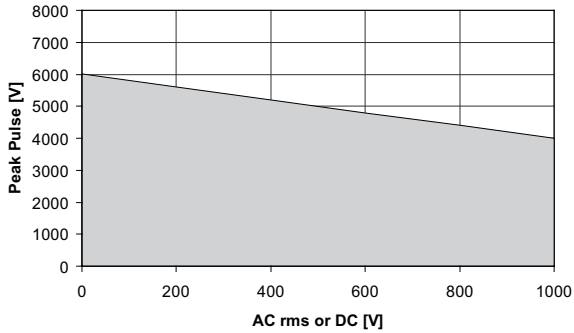


- (1) Connected to oscilloscope with an input impedance of 1 MΩ ± 1 %.
- (2) As defined in IEC 61010-031. Also see definitions explained on page 4 and 5.

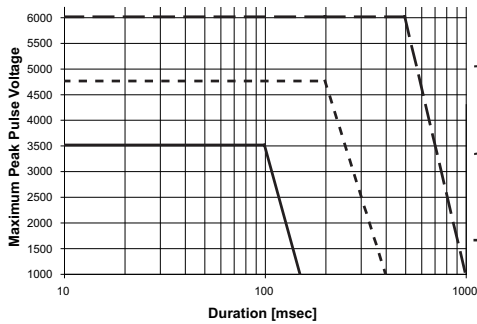
Maximum Pulse Ratings

For pulse measurements make sure to comply with the ratings as shown on this page.

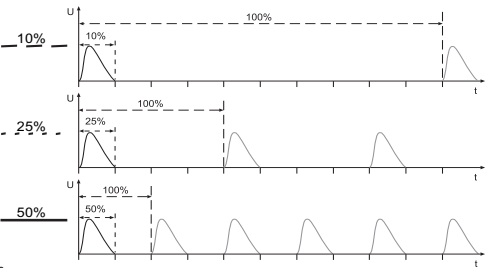
PHVS1000 RMS vs. Peak Pulse Voltage
Measurement Category I



Maximum Pulse Derating PHVS1000
Measurement Category I



Duty Cycle



* Values at 10 ms also apply to all Pulse Durations smaller than 10 ms.

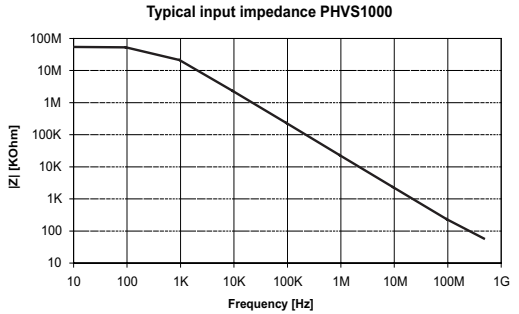
Electrical Characteristics

Input Resistance (System)	50 MΩ	± 1 %
Input Capacitance (System)	7.5 pF	(typical)
Compensation Range	10 pF - 50 pF	(typical)
Input Coupling of the Measuring Instrument	1 MΩ AC / DC	

Input Impedance



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



Mechanical Characteristics

Weight (probe)	67 g
Cable Length	2 m
Probe Tip Diameter	5 mm

Environmental specifications

Altitude	operating	up to 2000 m
	non-operating	up to 15000 m
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 +50° C



Handle with care especially when fitted with the extra thin and sharp spring contact tip to avoid any injury. Note that the probe cable is a sensitive part of the probe. Do not damage through excessive bending or pulling. Avoid mechanical shock to this product in general to guarantee accurate performance and protection.

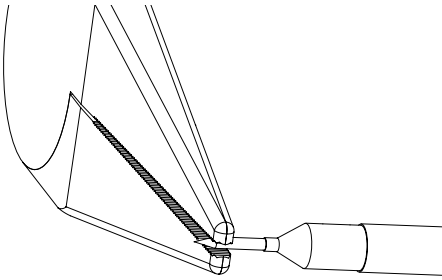
Maintenance**Cleaning**

To clean the exterior of the probe use a soft cloth moistened with either distilled water or isopropyl alcohol. Before use allow the probe to dry completely.

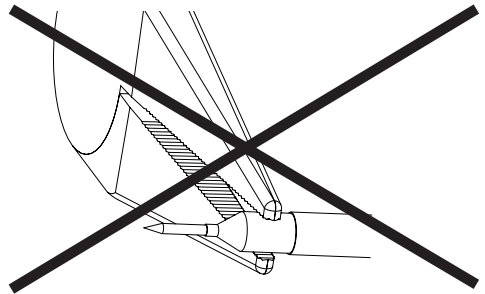
Changing the Probe Tip

To change the probe tip use pliers to grip and pull it carefully straight out of its contact socket, along the axis of the probe. Do not grip the white plastic insulator or the housing with pliers, because the tip could be squeezed and cannot be removed and respectively the probe could be damaged.

If the probe tip is removed, the new tip can be inserted with pliers into the contact socket, along the axis of the probe. In order to insert the probe tip completely into the housing, press the probe tip against a hard surface carefully.



Use pliers to grip and pull the probe tip carefully out of its contact socket.



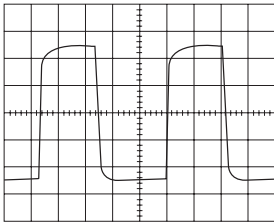
Do not grip the white plastic insulator or the probe housing with pliers.

The probe can be adjusted for low frequency (LF) compensation and for high frequency (HF) compensation and DC dividing ratio.

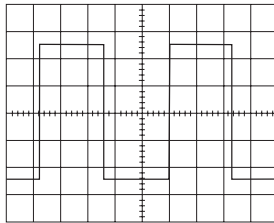
LF Compensation

LF needs to be adjusted when the probe is connected to the scope input the first time. LF compensation matches the probes cable capacitance to the oscilloscope input capacitance. This matching assures good amplitude accuracy from DC to upper bandwidth limit frequencies. A poorly compensated probe clearly influences the overall system performance (probe + scope) and introduces measurement errors resulting in inaccurate readings and distorted waveforms.

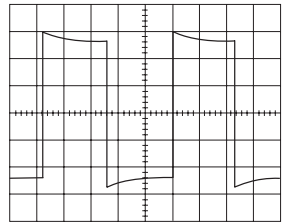
LF compensation is performed by connecting the probe to the CAL – output on the oscilloscope front panel and adjusting the LF compensation trimmer to optimum square wave response. For clarification see below figures.



undercompensated

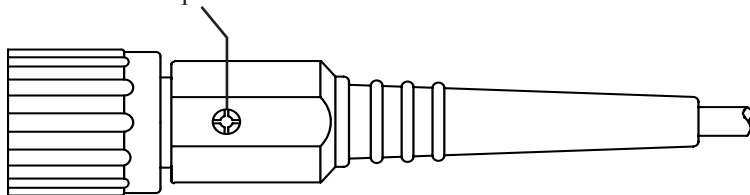


optimum



overcompensated

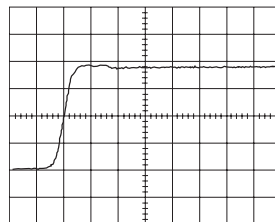
LF Compensation



HF Compensation

HF needs to be adjusted when the probe is connected to the scope input the first time.

HF adjustment is performed by connecting the probe to the rectangular wave generator with a fast rise time. Adjust trimmers for optimum square wave response.

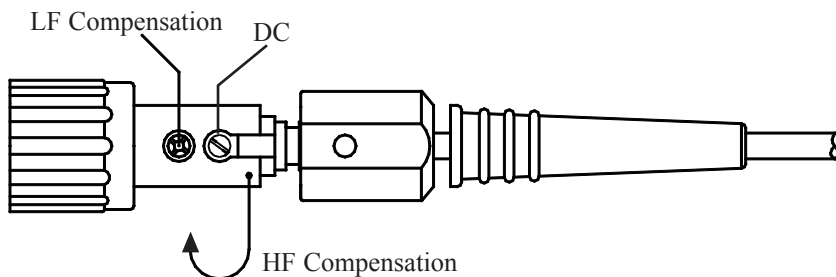


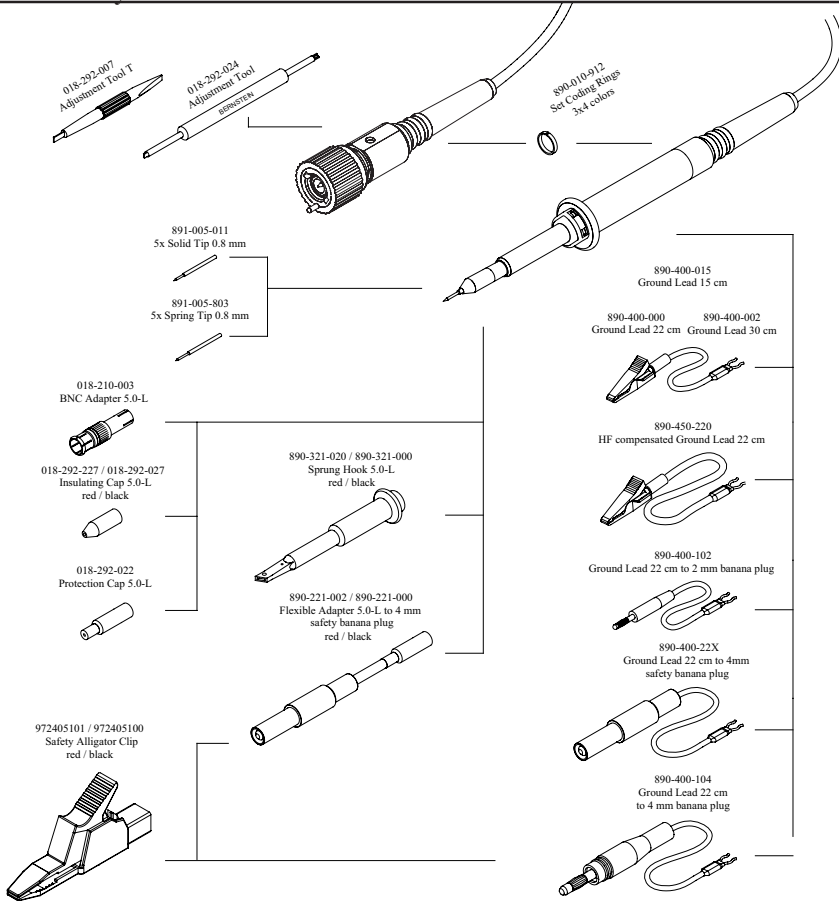
optimum

DC Adjustment

In order to provide highest accuracy over the voltage range this probes dividing ratio is factory adjusted using 500 VDC source and a measuring device with a precision input impedance of $1M\Omega \pm 0.01\%$.

Factory calibration traceable to DKD is available on request.





The following items are included in the scope of delivery. Please check the delivery for completeness. If any item is missing, send a message to our service department and we will send you this item immediately.

Item	Qty
Adjustment Tool T	1
Ground Lead 22 cm	1
Instruction Manual	1
Insulating Cap 5.0-L	1
Probe	1
Protection Cap 5.0-L	1 (1)
Solid Tip 0.8 mm	1
Spring Tip 0.8 mm	1 (2)
Sprung Hook 5.0-L	1

Additionally when delivered in case:

BNC Adapter 5.0-L	1
Coding Rings (set) 3x4 Colors	1
Flexible Adapter 5.0-L	1
Ground Lead 22 cm to 4 mm Bananaplug	1
Safety Alligator Clip red	1

(1) plugged on probe

(2) installed in probe



Use ground lead only for connections to earth ground.



The BNC Adapter is rated: 100 V rms CAT II, Pollution Degree 1



The accessories provided with the probe have been safety tested. Do not use any other accessories than those “originally” provided.

M60-722-A02

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