

# PMS 221A

High Impedance passive Probe

Instruction Manual



Information in this publication supersedes that in all previously published material.  
Specifications are subject to change without notice.

## **Manufacturer**

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PMK GmbH

Mess- und Kommunikationstechnik

Industriestr. 17

63150 Heusenstamm, Germany

Internet: [www.pmk-gmbh.com](http://www.pmk-gmbh.com)

Phone: +49 (0) 6104 6453

E-Mail: [sales@pmk-gmbh.com](mailto:sales@pmk-gmbh.com)

Fax: +49 (0) 6104 6457

[service@pmk-gmbh.com](mailto:service@pmk-gmbh.com)

## **Warranty**

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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 61010-031:2002

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**

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(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)

<b>Measurement Category I</b>	<b>Definition:</b>	Measurement category I is for measurements performed on circuits not directly connected to a mains supply.
	<b>Examples:</b>	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 it is required that the transient withstand capability of the equipment is made known to the user.
<b>Measurement Category II</b> CAT II	<b>Definition:</b>	Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.
	<b>Examples:</b>	Household appliances, portable tools and similar equipment.

**IEC Pollution Degrees**

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Definitions (Clause 3.5.6)

<b>Pollution Degree 2</b>	Only- non conductive POLLUTION. Occasionally, however, a temporary conductivity caused by condensation must be accepted.
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**IEC Safety Symbols**

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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 Ratings.**

Do not apply any electrical potential to the probe input which exceeds the maximum ratings of the probe. Make sure to comply with the voltage versus frequency derating curve on page 6.

**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.**

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**

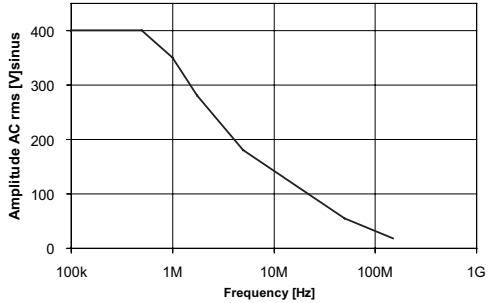
Attenuation Ratio (switchable) <sup>(1)</sup>	1:1	10:1	± 2 % at DC (at 10:1)
Voltage Coefficient	-	0.0025 %/V	(typical)
Probe Bandwidth	20 MHz <sup>(2)</sup>	150 MHz	(-3 dB)
Probe Risetime	18 nsec	2.4 nsec	(10 % - 90 %) (typical)
Maximum Rated Input Voltage <sup>(3)</sup>			
Measurement category I:	-	400V rms	1250 V transient overvoltage
Measurement category II:	55 V rms CAT II	300V rms CAT II	
Pollution Degree <sup>(3)</sup>	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 PMS221A (switched to 10:1)  
Measurement category I**



- (1) Connect to oscilloscope with a input impedance of 1 MΩ ± 1 %.
- (2) at 15 pF input capacitance of measuring instrument.
- (3) As defined in IEC 61010-031. See definitions explained on page 4.

**Electrical Characteristics**

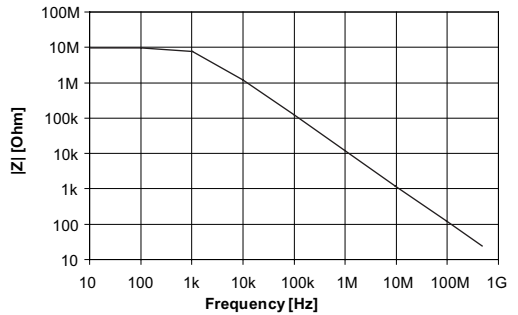
Attenuation Ratio	1:1	10:1	
Input Resistance (System)	-	10 MΩ	± 1 %
Input Capacitance (System)	78 pF incl. Oszi	13 pF	(typical)
Compensation Range	-	15 pF - 40 pF	(typical)
Input coupling of the measuring instrument	1 MΩ AC / DC	1 MΩ AC / DC	

**Input Impedance**



*Note that the Input Impedance of the probe decreases as the frequency of the applied signal increases.*

**Typical input impedance PMS221A**  
(switched to 10:1)



**Mechanical Characteristics**

Weight (probe only )	49 g
Cable Length	1.2 m
Probe Tip Diameter	5 mm

**Environmental Specifications**

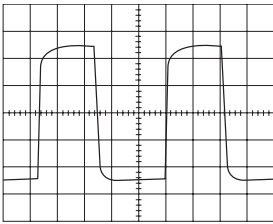
Altitude	operating	up to 2000 m
	non-operating	up to 15000 m
Temperature Range	operating	0° C to +50° C
	non-operating	-40° C to +71° C
Maximum Relative Humidity	operating	80 % relative humidity for temperatures up to +31° C, decreasing linearly to 40 % at +50° C

The probe can be adjusted for low frequency (LF) compensation.

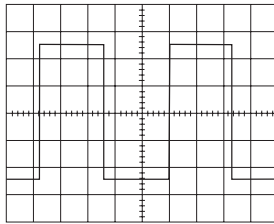
**LF Compensation**

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.

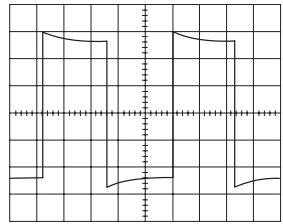
LF compensation is performed by connecting the probe to the CAL - output on the oscilloscope front panel and adjusting the LF compensation trimmer to optimum square wave response. For clarification see below figures.



undercompensated

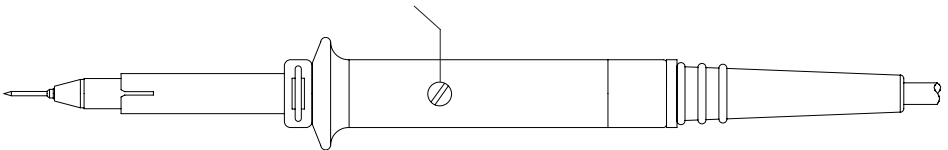


optimum



overcompensated

**LF Compensation**





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.

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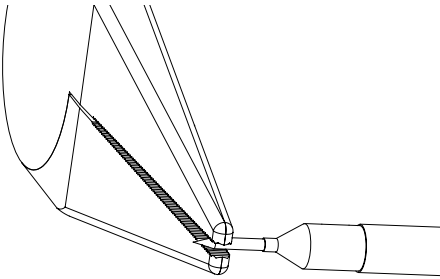
**Maintenance****Cleaning**

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.

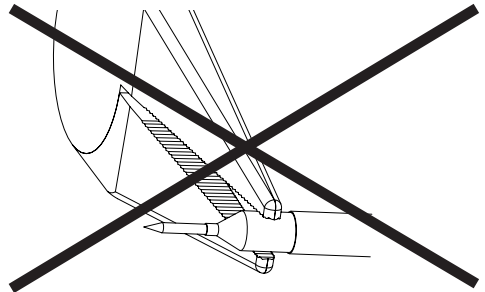
**Changing the probe tip**

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.

018-292-063  
IC-Cap 5.0  
0.8 mm pitch; gray



018-292-064  
IC-Cap 5.0  
1.0 mm pitch; brown



018-292-065  
IC-Cap 5.0  
1.27 mm pitch; black



018-292-017  
Insulating Cap 5.0  
black



018-292-027  
Protection Cap 5.0  
black



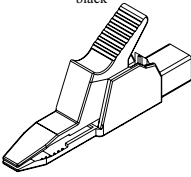
018-210-001  
BNC Adapter 5.0



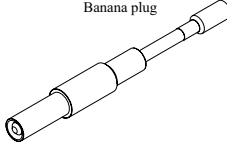
890-7000-000  
PCB Adapter 5.0



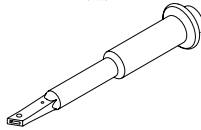
972405100  
Safety Alligator Clip  
black



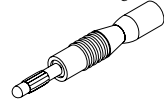
890-220-000  
Flexible Adapter 5.0 to 4 mm safety  
Banana plug



890-320-000  
Sprung Hook 5.0  
black



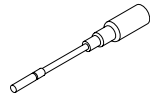
890-210-000  
Flexible Adapter 5.0 to 4 mm  
Banana Plug



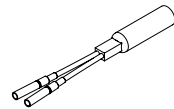
890-202-000  
Flexible Adapter 5.0 to 2 mm  
Banana Plug



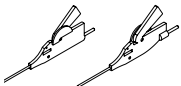
890-510-700  
Adapter 5.0 to 0.8 mm socket



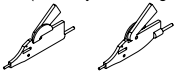
890-520-701  
Dual Adapter 5.0 to 0.8 mm socket



890-500-13X  
QFP IC-Clip 13 mm long  
down to 0.5 mm pitch  
( X : 4 = yellow; 5 = green )

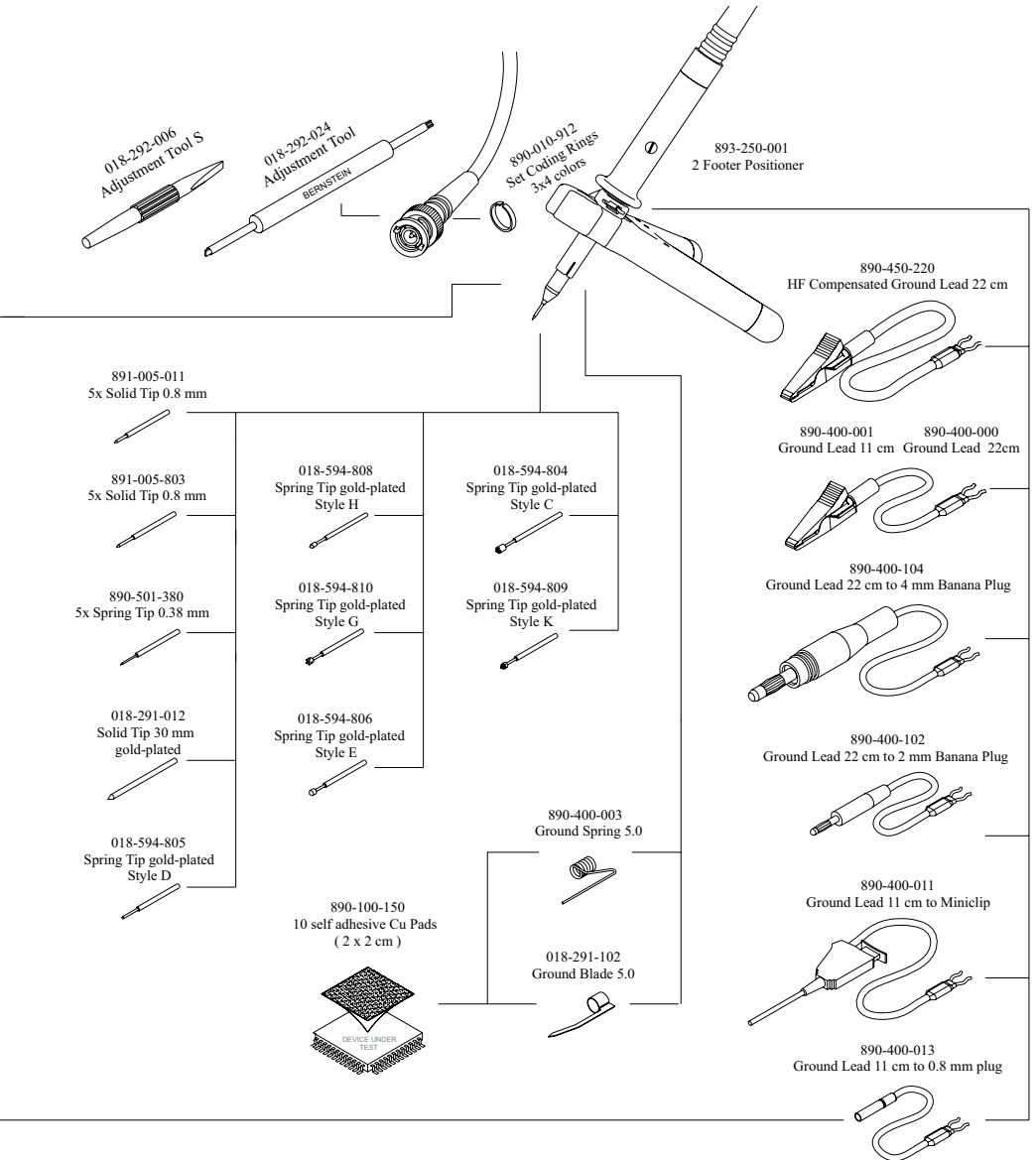


890-500-00X  
QFP IC-Clip short  
down to 0.5 mm pitch  
( X : 4 = yellow; 5 = green )



P25SCHWARZ  
Pico hook™





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.

<b>Item</b>	<b>Qty</b>
Adjustment Tool S	1
Ground Blade 5.0	1
Ground Lead 22 cm	1
IC-Cap 5.0 0.8 mm pitch; grey	1
IC-Cap 5.0 1.0 mm pitch; brown	1
IC-Cap 5.0 1.27 mm pitch; black	1
Instruction Manual	1
Insulating Cap 5.0	1
Probe	1
Protection Cap 5.0	1 <sup>(1)</sup>
self adhesive Cu Pads (2 x 2 cm)	2
Solid Tip 0.8 mm	1
Spring Tip 0.8 mm	1 <sup>(2)</sup>
Sprung Hook 5.0	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 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.*