pico Technology PicoScope 4×23/4×25 Automotive Scopes User Guide

PicoScope® 4×23 and 4×25 Automotive Scopes
Safety Guide

To prevent possible electrical shock, fire, personal injury, or damage to the product, carefully read this safety information before attempting to install or use the product. In addition, follow all generally accepted safety practices and procedures for working with and near electricity.
The product has been designed and tested in accordance with the harmonized standard publication EN 61010-1, EN 61010-2-030, EN 61010-031 and EN 61010-2-032 as defined on the Declaration of Conformity. The product left the factory in a safe condition.
Your Automotive PicoScope is intended for use as a diagnostic tool for analyzing vehicle electric systems.
The following safety descriptions are found throughout this guide:
A WARNING identifies conditions or practices that could result in injury or death.
A CAUTION identifies conditions or practices that could result in damage to the product or equipment to which it is connected.

Contents

SYMBOLS

#	Symbol	Description
1		Direct current.
2		Alternating current.
5		Earth (ground) terminal*
7		Chassis terminal.
11		Double insulated
101		Do not apply around or remove from uninsulated hazardous live conductors, which may ca use electric shock, electric burn or arc flash.
102		Application around and removal from uninsulated hazardous live conductors is permitted
12		Possibility of electric shock.
14		Caution**
		Static awareness. Static discharge can damage parts.
	CAT II	Measurement Category II is applicable to test and measuring circuits connected directly to socket outlets and similar points of the low-voltage mains installation.
	CAT III	Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage mains installation.
	CAT IV	Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage mains installation.
		Do not dispose of this product as unsorted municipal waste.

*The ground terminal can be used to make a measurement ground connection. The terminal is NOT a safety or protective earth.
**Appearance on the product of this symbol indicates a need to read this safety document or the product operating instructions or both.

 **WARNING**
This product is for professional use by trained and qualified technicians only.
To prevent injury or death use the product only as instructed and use only accessories supplied or recommended by Pico Technology. Protection provided by the product may be impaired if used in a manner not specified by the manufacturer.

MAXIMUM TERMINAL RATINGS

Model number	Maximum input voltage range	Maximum allowed common mode (USB ground to channel ground)	Overvoltage protection DC +AC peak	
			Signal inputs	Signal generator output BNC
4223	±100 V	0 V	±200 V	
4423	±100 V	0 V	±200 V	
4823	±50 V*	0 V	±100 V	±10 V
4225	±200 V	30 V	±250 V	
4425	±200 V	30 V	±250 V	
* ±50V DC and ±42.4V pk max AC				

Observe all terminal ratings and warnings marked on the product. The marked voltage is the maximum overvoltage that may be applied across that terminal without risk of personal injury or damage to the instrument. The maximum common-mode voltage is the maximum that can be present between the BNC ground of the measurement input and the USB connector ground to achieve a valid measurement.

 **WARNING**

To prevent electric shock, do not attempt to connect to or measure voltages outside of the maximum terminal rating or with an applied common mode voltage that is outside specification.
Signals exceeding the voltage limits in the table below are defined as “hazardous live” by EN 61010.

Safe voltage limits of EN 61010		
±60 V DC	30 V AC RMS	±42.4 V pk max.

The PicoScope 4225 and PicoScope 4425 can measure hazardous live voltages up to the maximum full-scale measurement voltage of ±200 V DC.
The PicoScope 4223 and PicoScope 4423 can measure hazardous live voltages up to the maximum full-scale measurement voltage of ±100 V DC.
The PicoScope 4823 is not suitable for the direct measurement of hazardous live voltages.
Accessories suited for use with, or connection to, higher voltages are all clearly marked with their maximum allowable voltage and, where applicable, their CAT rating.
To prevent electric shock, take all necessary safety precautions when working on equipment where hazardous live voltages may be present.

 **WARNING**

To prevent injury or death, do not directly connect the oscilloscope to the mains (line power) or a vehicle traction battery pack and associated power converters. To measure these voltages, use only a differential isolating probe that is specifically CAT-rated to the appropriate level for mains or high-energy use, such as those listed on the Pico website.
Always follow relevant industry standard safety procedures and use appropriate Personal Protective Equipment (PPE) where applicable. Safety training is recommended in these cases and should be separately gained.
Do not use attenuators with a direct ground-to-ground connection, such as the Pico TA010 and TA197 attenuators, for measuring AC hazardous voltages such as mains or those of a vehicle traction battery pack.

 **WARNING**

To prevent injury or death, do not use the scope or accessories if they appear to be damaged in any way, and

stop use immediately if you are concerned by any abnormal operations.

WARNING

If a signal voltage exceeding the selected full-scale measurement range is detected, it is indicated on the measurement display. A red warning icon will appear in the upper left corner and next to the relevant channel's vertical axis.

Select a larger voltage range to achieve a within-range measurement and if the condition persists, to prevent injury or death, disable or otherwise safely disconnect from the source of overvoltage.

Similarly, if the selected maximum common mode voltage on a 4425 or 4225 is exceeded, a yellow warning icon will appear in the upper left corner of the display and next to the relevant channel's vertical axis. In these conditions, displayed waveforms and measurements may be incorrect and the condition may be hazardous.

ACCESSORIES

WARNING

Do not exceed the voltage rating marked on any accessory. If an accessory is not marked with a voltage rating on either the connector, cable or body, or if a protective finger guard is removed, do not exceed the safe voltage limits listed above.

Never exceed the maximum voltage marked on a CAT-rated accessory, whether or not the accessory is being used for mains or high-energy measurements.

When connecting one or multiple accessories and an instrument channel together, the lowest voltage rating in an interconnected set of accessories applies to that channel.

CAUTION

To avoid causing permanent damage to the instrument and other connected equipment, do not exceed the voltage protection range on any cable, connector or accessory.

WARNING

Uninsulated HT pickups are designed to clip around double-insulated HT leads only – they are not designed for direct connection to a hazardous live voltage. To prevent injury or death, switch off the engine and secure against restart. Clean and inspect the HT lead for damage to insulation and fit only to undamaged double-insulated leads. Ensure that test leads are safely clear of hot or rotating parts. You can now restart the engine for the test duration.

CAUTION

Pico accessories for measuring physical properties such as resistance, pressure, temperature and ultrasonic signals are not designed to be connected to any voltage source.

To prevent fire, burning or possible damage, do not connect any temperature, ultrasonic, resistance or pressure sensors to an electrical node unless you have first confirmed that the node is de-energized.

CURRENT PROBES

WARNING

Most current probes have a tactile barrier provide for user safety.

To prevent injury or death, do not hold any current probe with a tactile barrier anywhere beyond the barrier when in use.

WARNING

Current probes are marked with their maximum voltage rating, which applies when clamped over an uninsulated conductor.

To prevent injury or death, do not use any current probe on an uninsulated conductor operating outside the

probe's marked voltage protection levels.

WARNING

To prevent injury or death, do not fit a current probe over an energized, uninsulated hazardous live conductor unless the probe is expressly marked as safe to do so by using the symbol.

Always de-energize uninsulated circuits before fitting probes marked with the symbol.

WARNING

When measuring currents in uninsulated circuits connected directly to the mains supply, always use probes with the appropriate CAT ratings.

To prevent injury or death, always follow the CAT rating of the probe and do not use a non CATrated current probe to measure mains current.

Always use extreme caution when working around bare conductors or bus bars. Contact with the conductor could result in electric shock. Always follow relevant industry-standard safety procedures and use appropriate Personal Protective Equipment (PPE) where applicable. Safety training is essential in these cases and should be separately gained.

All current probes have a maximum RMS current rating which may be derated depending on the measurement frequency in accordance with the table below.

Probe maximum RMS current by frequency								
Probe	< 400 Hz	400 Hz 1 kHz to 1 kHz to 10 kHz		10 kHz to 20 kHz	20 kHz to 60 kHz	Auto power-off	Power supply/ battery	Connection
TA018	60 A	60 A	40 A			no	1604A	BNC
TA019	600 A	–	–	–	–	no	1604A	BNC
TA167	2000 A	200 A	40 A	–	–	yes	1604A	BNC
TA189	30 A	30 A	30 A	30 A	30 A	yes	1604A	BNC
TA234	30 A	30 A	30 A	30 A	–	no	1604A	BNC

CAUTION

To avoid damage to the probe and inaccurate readings, do not use a current probe on a circuit that exceeds the probe's maximum rated frequency or the maximum rated RMS current at the measurement frequency

WARNING

Failure to observe the above safety precautions may cause damage to the current probe leading to an effective reduction in its safe voltage rating and CAT rating.

GROUNDING THE INSTRUMENT AND ITS ACCESSORIES

WARNING

The oscilloscope's ground connection through the USB cable is for measurement purposes only. It does not have a protective safety ground.

Never connect the ground input (chassis) to any electrical power source. To prevent personal injury or death, use a voltmeter to check that there is no significant AC or DC voltage between the oscilloscope ground and the point to which you intend to connect it.

CAUTION

Applying a voltage to the ground input is likely to cause permanent damage to the oscilloscope, the attached computer and other equipment.

CAUTION

To prevent measurement errors caused by poor grounding, always use the high-quality blue USB cable supplied with the oscilloscope.

Note: The oscilloscope is powered through the USB connector. No additional power supply unit is required.

Note: Maximum power requirement from the 5 V USB supply is 5 W.

WARNING

To prevent injury or death and to avoid potential damage to the oscilloscope, only connect the unit's USB connector to a certified non-hazardous PC USB output socket that has previously been approved to an appropriate standard.

ENVIRONMENT

This product is for indoor or outdoor use, in dry locations only. The products external mains power supply (if required) is for indoor use only.

Please contact Pico technical support if you would like any advice on integrating a PicoScope into your own product or application.

WARNING

To prevent injury or death, do not use in wet or damp conditions, or near explosive gas or vapor.

CAUTION

To prevent damage, always use and store your oscilloscope in appropriate environments.

	Storage	Operation	Quoted accuracy
Temperature	—20 to +60 °C	0 to 45 °C	15 to 30 °C
Humidity (non-condensing)	5 to 90 %RH	5 to 80 %RH	
Altitude	Up to 15 000 m	Up to 2000 m	
Pollution degree	2		

CARE OF THE OSCILLOSCOPE AND ACCESSORIES

The product and accessories contain no user-serviceable parts. Repair, servicing and adjustment require specialized test equipment and must only be performed by Pico Technology or an approved service provider. There may be a charge for these services unless covered by the Pico warranty.

Inspect the instrument and all probes, connectors, cables and accessories before use for signs of damage.

WARNING

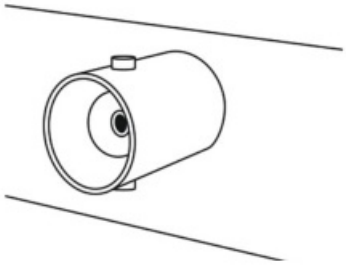
To prevent electric shock, do not tamper with or disassemble the oscilloscope, case parts, connectors or accessories.

WARNING

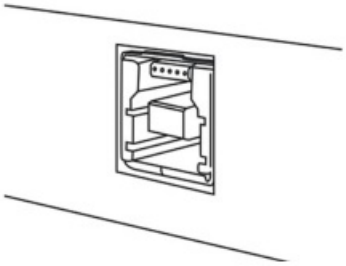
When cleaning the product, use a soft cloth and a solution of mild soap or detergent in water.

To prevent electric shock, do not allow liquids to enter the oscilloscope casing, as this will compromise the electronics or insulation inside.

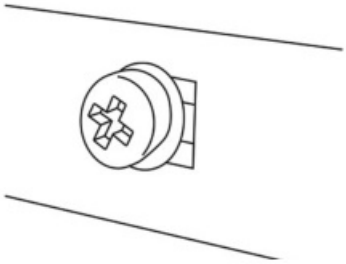
CONNECTORS AND INDICATORS



Input signal BNC connector on front of unit



USB port



Ground terminal

Note: The input signal BNCs can be identified by their channel letter. On some scopes (the 4225 and 4425) the BNC connectors also have a surround colour individual to each channel.
Specifically for PicoScope 4225 and 4425: Each channel has its own respective channel LED on the lower right of the connector. The channel LEDs remain off until the channel goes out of common mode range when they will illuminate red. When ConnectDetect is enabled, all channel LEDs show ConnectDetect status. All oscilloscopes have one sampling LED on the front panel.

FCC notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference which the user will be required to correct at their own expense.

CE & UKCA notices

These PicoScope oscilloscope models 4225, 4425 and 4823 meet the intent of the CE EMC directive 2014/30/EU and UKCA SI 2016/1091 EMC Regulations.
They also meet the intent of the CE Low Voltage Directive 2014/35/EU and UKCA SI 2016/1101 Electrical Equipment (Safety) Regulations.
For more information, please refer to your product's EU Declaration of conformity and UKCA Declaration of Conformity available for download from **picotech.com**.
PicoScope models 4223 and 4423 are obsolete products and the current directives do not apply.
Please contact Pico technical support for copies of their Declarations of Conformity.

DISPOSAL

Your help and efforts are required to protect and keep our environment clean. Therefore, either return this product at the end of life to the manufacturer or ensure WEEE compliant collection and treatment yourself.

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Documents / Resources

	pico Technology PicoScope 4x23/4x25 Automotive Scopes [pdf] User Guide 4225, 4425, PicoScope 4x23 4x25 Automotive Scopes, PicoScope 4x23 4x25, Automotive Scopes, Scopes

References

- pico.asia
- PC Oscilloscope, Data Logger & RF Products | Pico Technology
- PicoScope oscilloscope software and PicoLog data logging software