



**4-channel Fast Interface  
Bipolar Picoammeter with  
Integrated High-Voltage Source**



**T e t r A M M**

- The TetrAMM ("Tetra AMMeter") is a 4-channel picoammeter designed for quadrature monitoring applications - e.g. photon Beam Position Monitors
- 4-channel simultaneous sampling with a 24-bit Analog-to-Digital conversion resolution and 100 kHz sampling frequency
- Integrated High Voltage power supply with factory-selectable polarity source for detector biasing

## FEATURES

- 4-channel simultaneous sampling
- Up to 100 kHz sampling frequency
- 24-bit ADC conversion
- Bipolar current ranges from  $\pm 120$  nA to  $\pm 120$   $\mu$ A - different ranges available
- 10/100/1000 Ethernet Connectivity
- Low-noise integrated HV source
- Firmware Remote Update
- External Trigger/Gate and Interlock
- Auto-ranging functionality
- On-board FPGA and soft-processor computations
- SFP Link
- Compact mechanical dimensions
- Oscilloscope software available
- Ready to be integrated into the  
**BEST** stabilization system

## APPLICATIONS

- Beam Position Monitoring
- Ion Chambers Readout
- Ultra-low Current Measurements
- Diamond Detector Readout
- Radiation Monitoring

**T**etrAMM. The TetrAMM ("Tetra AMMeter") is the new 4-channel picoammeter designed for quadrature monitoring applications - e.g. photon Beam Position Monitors - that expands CAEN ELS picoammeter family.

The device is composed by a carrier board and by two plugins: these are the Front-End board and the High Voltage source.

The Front End board performs the analog signal conditioning and the digital data conversion: input currents range from  $\pm 120$   $\mu$ A to  $\pm 120$  nA full-scale range in the standard configuration and are simultaneously converted with a 24-bit resolution at a maximum 100 kHz frequency.

The High Voltage plugin board is rated at a standard +500 V or -500 V @ 1 mA output but it can





be configured in its rating and polarity (up to 4 kV). This source, fed on a SHV connector - is perfectly suited to be used as the biasing voltage for a detector system.

The TetrAMM is housed in a light and extremely compact box that can be placed close to the detector - i.e. the signal source - in order to reduce cable lengths and to limit noise pick-up from external sources or from parasitic effects. Low-noise, high stability and excellent linearity enable users to perform very high precision current measurements.

A 10/100/1000 Mbit Ethernet connection allows for very fast data transmission and easy instrument control with several operating systems and programming languages.

#### About Us

CAEN ELS is a leading company in the design of power supplies and state-of-the-art complete electronic systems for the Physics research world, having its main focus on dedicated solutions for the particle accelerator community and high-end industrial applications.

-  Power Supply Systems
-  Precision Current Measurements
-  Beamline Electronics Instrumentation
-  FMC and MicroTCA

#### CAEN ELS s.r.l.

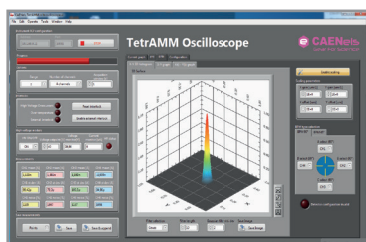
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**TetrAMM - Rear View**



**Oscilloscope Software**



The TetrAMM has two different TRIGGER and GATE signals on a LEMO coaxial connector; additional passive interlock contacts are present on the 10-pin I/O connector on the rear panel.

An SFP link is also present and

it will be used to integrated the device in a closed-system.

The internal firmware can be remotely updated, please check our website [www.caenels.com](http://www.caenels.com) in order to have the last available version installed on your TetrAMM.

#### Technical Specifications

TetrAMM	
<b>Input Channels</b>	4
<b>Current Polarity</b>	Bipolar
<b>Current Measuring Range</b>	RNG0: $\pm 120 \mu\text{A}$ RNG1: $\pm 120 \text{nA}$
<b>Current Resolution</b>	RNG0: $15 \text{ pA}$ RNG1: $15 \text{ fA}$
<b>Analog Bandwidth</b>	5 kHz
<b>Data rate</b>	up to 100 ksamples/s
<b>Equivalent Input Noise (@ 1 ksps)</b>	RNG0: 1 ppm/FS RNG1: 6 ppm/FS
<b>Equivalent Input Noise (@ 100 ksps)</b>	RNG0: 6 ppm/FS RNG1: 25 ppm/FS
<b>Communication Interface</b>	Ethernet 10/100/1000 TCP-IP or UDP SFP - Small Form-factor Pluggable
<b>Temperature Coefficient</b>	RNG0: $< 0.001 \text{ \%}/\text{FS}/\text{K}$ RNG1: $< 0.002 \text{ \%}/\text{FS}/\text{K}$
<b>I/O Signals</b>	Configurable Trigger/Gate - input Trigger - output External Interlock - output
<b>Additional Features</b>	Auto-Ranging Firmware Remote Upgrade Configurable Sampling Frequency High Voltage Output Current/Voltage Readback High Voltage Overcurrent Protection
<b>Protections</b>	External Interlock Internal Over-Temperature High Voltage Over-Current
<b>High Voltage Output</b>	High Voltage Source 500 V @ 1 mA - standard configurable up to 4 kV with different ordering options
<b>Connectors</b>	BNC for current inputs SHV for High-Voltage output
<b>Weight</b>	850 g
<b>Supply Voltage</b>	+12 V
<b>Status Indicators</b>	5 LEDs

Ordering code	Range	HV	BW	Description
WTETRAMMNOHV	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	n.a.	5 KHz	4-channel Fast Interface Bipolar Picoammeter without Integrated HV Source
WTETRAMM05PX	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	+500V	5 KHz	4-channel Fast Interface Bipolar Picoammeter with Integrated +500V HV Source
WTETRAMM05NX	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	-500V	5 KHz	4-channel Fast Interface Bipolar Picoammeter with Integrated -500V HV Source
WTETRAMM20PX	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	+2KV	5 KHz	4-channel Fast Interface Bipolar Picoammeter with Integrated +2KV HV Source
WTETRAMM20NX	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	-2 KV	5 KHz	4-channel Fast Interface Bipolar Picoammeter with Integrated -2KV HV Source
WTETRAMM40PX	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	+4KV	5 KHz	4-channel Fast Interface Bipolar Picoammeter with Integrated +4KV HV Source
WTETRAMM40NX	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	-4KV	5 KHz	4-channel Fast Interface Bipolar Picoammeter with Integrated -4KV HV Source
WTETRAMMC001	$\pm 1.2 \mu\text{A}, \pm 1.2 \text{nA}$	-500V	100 KHz	4-channel Fast Interface Picoammeter with Integrated -500V HV (RNG: $\pm 1.2 \mu\text{A}, \pm 1.2 \text{nA}$ )
WTETRAMMC002	$\pm 1.2 \text{mA}, \pm 1.2 \mu\text{A}$	+500V	5 KHz	4-channel Fast Interface Picoammeter with Integrated +500V HV (RNG: $\pm 1.2 \text{mA}, \pm 1.2 \mu\text{A}$ )
WTETRAMMC003	$\pm 25 \mu\text{A}, \pm 250 \text{nA}$	n.a.	5 KHz	4-channel Fast Interface Picoammeter without Integrated HV (RNG: $\pm 25 \mu\text{A}, \pm 250 \text{nA}$ )
WTETRAMMC004	$\pm 120 \mu\text{A}, \pm 120 \text{nA}$	+500V	20 KHz	4-channel Fast Interface Picoammeter with Integrated +500V HV (RNG: $\pm 120 \mu\text{A}, \pm 120 \text{nA}$ )
WTETRAMMC005	$\pm 10 \mu\text{A}, \pm 125 \text{nA}$	-500V	5 KHz	4-channel Fast Interface Picoammeter with Integrated -500V HV (RNG: $\pm 10 \mu\text{A}, \pm 125 \text{nA}$ )
WTETRAMMC006	$\pm 10 \mu\text{A}, \pm 2 \mu\text{A}$	n.a.	5 KHz	4-channel Fast Interface Picoammeter without Integrated HV (RNG: $\pm 10 \mu\text{A}, \pm 2 \mu\text{A}$ )