



Beamline Electronic
Instrumentation

Product Catalogue



MicroTCA and FMC



CAENels
Gear For Science

Guidant

(주)가이던트

053-267-5460
guidant@guidant.co.kr



Beamline Electronic Instrumentation

AH401D²

4-channel Charge Integration Picoammeter



4
AH501D
4-channel Bipolar Picoammeter with Analog Monitors and Bias Voltage

TetrAMM⁶

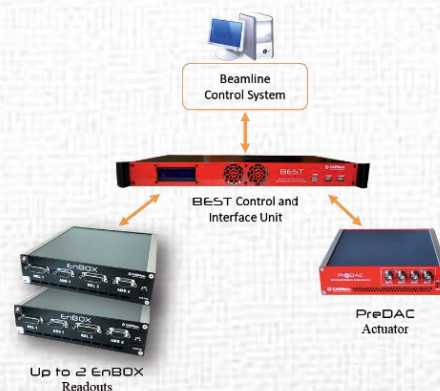
4-channel Fast Interface Bipolar Picoammeter with integrated HV source



8
BEST
Beam Enhanced Stabilization Technology

BEST-ENC¹⁰

Beam Enhanced Stabilization Technology- ENCoders



MicroTCA and FMC catalogue at Page 13

AH401D

4-channel Charge Integration Picoammeter



AH401D

- The AH401D is the new compact high-resolution charge integrating picoammeter
- Able to simultaneously sample 4-channel inputs, the AH401D has been designed to achieve an extreme sensitivity range with the best low-noise performance for this class of instruments.

FEATURES

- From 50 pA to 2 μ A current range
- 20 bit A/D converter with noise reduction digital filter
- Less than 7 ppm@200 pC full-scale range noise
- 4-channel simultaneous sampling
- Lightweight and compact design
- Ethernet 10/100 standard interface

APPLICATIONS

- Ion Chambers Reading
- pH - metering
- Ultra-Low Current Measurements
- Beam Position Monitoring
- Diamond Detectors Readout
- Radiation Monitoring

The AH401D is a compact 4-channel low noise picoammeter. It is composed of an extremely sensitive charge-integration input stage for low-current sensing, combined with a 20-bit sigma-delta AD converter with an integrated noise reduction digital filter.

This device is suited for very low current measurements, with 8 selectable input ranges spanning from 50 pA (with a 50-aA resolution) up to 2 μ A (with a 2-pA resolution). Integration time is user selectable and ranges from 1ms up to 1s. Each input channel has two integrator stages so that the current-to-voltage conversion can be performed continuously during ADC conversion, avoiding any dead time in the data output. The simultaneous sampling of the 4 independent channels make this instrument ideal for beam position monitor applications or multichannel acquisition.





The new AH401D is housed in a light and extremely compact box that can be placed close to the signal sources in order to reduce cable lengths and minimize possible noise pick-up. Low temperature drift, good linearity and very low noise allow very highprecision current measurements.

The picoammeter can be remotely controlled via a standard Ethernet 10/100 communication interface: integration time, range, data format, type of acquisition and many other parameters can be easily set and monitored.

The AH401D has an external TRIGGER input signal in order to synchronize the acquisition of the picoammeter with external events (e.g. laser triggering). Furthermore, digital samples can be transferred either using ASCII format or RAW binary data format for fast data transmission.

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com

Technical Specifications

Input Channels	4
Current Measuring Range	From 50 pA to 2μA
Current Polarity	positive
Data rate	Up to 1 ksamples/s
Integration time	From 1 ms to 1 s
Resolution Bits	20
Noise(@1ms,200pCFS)	<7ppm
Communication Interface	Ethernet 10/100 TCP-IP and UDP
I/O signal	Trigger Input, CONV output
Supply voltage	9V
Dimensions	155 x 165 x 50 mm
Weight	560g
Input Connectors	BNC



AH401D – Rear View



Ordering Options

WAH401DXAAAA	AH401D	AH401D-4-channel Charge-Integration Picoammeter with +/-9V Linear PS
--------------	--------	--

AH501D

4-channel Bipolar Picoammeter
With Analog Monitors and Bias Voltage



AH501D

- The AH501D is the high-resolution bipolar picoammeter with 4-channel simultaneous inputs, analog voltage monitors and an integrated bias voltage source. It has been especially designed as the turnkey solution for photon BPM systems as diamond detectors, ion chambers and blade gap-monitors.

FEATURES

- From ± 2.5 nA to ± 2.5 mA current range
- Up to 26 kHz sampling frequency
- 24-bit ADC conversion
- Analog voltage monitors
- Integrated Bias voltage source (up to 30V)
- Less than 200 fA full-scale range noise
- 4-channel simultaneous sampling
- Ethernet 10/100 standard interface

APPLICATIONS

- Beam Position Monitoring
- pH - metering
- Ion Chambers Readout
- Ultra-Low Current Measurements
- Quadrature Photodiode Readout
- Radiation Monitoring

The AH501D is a 4-channel low noise and fast sampling rate bipolar picoammeter with an integrated bias voltage source and voltage analog monitors. It is composed by a transimpedance input stage for current sensing combined with a buffered output voltage circuit that allows users to monitor the input current behavior and level with a simple oscilloscope or a tester.

This device performs bipolar current measurements from ± 2.5 nA (with a resolution of 300 aA) up to ± 2.5 mA (resolution of 300 pA) with a minimum sampling period of 38.4 μ A (equivalent to 26 kHz, for 1 channel and a 16-bit resolution).

The simultaneous sampling of the 4 independent channels makes this instrument ideal for beam position monitoring applications or multichannel acquisition.

The presence of an internal lownoise (0.003% of full scale) voltage

source, ranging from 0 to 30V, makes it extremely useful when using blade gap-monitors or diamond detectors needing a bias potential in order to increase the signal intensity and thus the signal-to-noise ratio. This built-in bias voltage source signal is available on a BNC connector and can also be set to a high-impedance state.

The AH501D is housed in a light and extremely compact box that can be placed close to the signal sources in order to reduce cable lengths and to minimize possible noise pick-up on the biasing and measuring signal paths. Low temperature drifts, good linearity and very low noise levels enable users to perform very high precision current measurements.

The AH501D picoammeter has an Ethernet 10/100 communication interface (TCP-IP and UDP) that allows easy instrument control with several programming languages and operating systems.



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 Electronic Instrumentation
- FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



The AH501D has an external TRIGGER/ GATE input signal on a coaxial LEMO connector in order to synchronize the acquisition of the picoammeter with external events (e.g. laser triggering). Furthermore, as for the other members

of the CAENels picoammeter family, digital samples can be transferred either using ASCII format or RAW binary data format for fast data transmission.

Technical Specifications

Input Channels	4
Current Measuring Range	From ± 2.5 nA to ± 2.5 mA
Voltage Monitors	Yes (± 5 V)
Current Polarity	bipolar
Data rate	Up to 26 ksamples/s
Resolution Bits	16 or 24
Noise (@RNG2, CIN=5pF)	150 fA (typ.)
Communication Interface	Ethernet 10/100 TCP-IP and UDP
I/O Signal	Trigger Input, CONV output
Supply Voltage	From ± 6 V to ± 15 V
Bias Voltage Output	0 to 30 V
Bias Voltage RMS Noise	0.003%
Dimensions	155 x 165 x 50 mm
Weight	500g
Input Connectors	BNC
Voltage Monitor Connectors	LEMO
Status Indicators	5 LEDs



AH501D – Rear View

Ordering Options

WAH501DXAAAA	AH501D	AH501D-4-channel Bipolar Picoammeter with Analog Monitor, Bias V and with +/- 9V Linear PS
--------------	--------	--



TetrAMM

4-channel Fast Interface Bipolar Picoammeter with integrated HV source



TetrAMM

- The TetrAMM (“Tetra AMMeter”) is the new 4-channel picoammeter designed for quad monitoring applications – e.g. photon Beam Position Monitors.
- 4-channels simultaneous sampling with a 24-bit ADC resolution and 100 kHz sampling frequency.
- Integrated High Voltage power supply source for detector biasing.

FEATURES

- 4-channel simultaneous sampling
- Up to 100 kHz sampling frequency
- 24-bit ADC conversion
- Factory calibrated
- Bipolar current ranges from ± 120 nA to ± 120 μ A (configurable upon request)
- 10/100/1000 Ethernet Connectivity
- Low-noise integrated HV source
- Firmware Remote Update
- External Trigger/Gate and Interlock
- Configurable sampling frequency
- Auto-ranging functionality
- On-board FPGA and soft-processor computations
- SFP Link
- Compact mechanical dimensions

APPLICATIONS

- Photon Beam Position Monitoring
- Diamond Detectors Readout
- Ion Chambers Readout
- Ultra-Low Current Measurements
- Quadrature Photodiode Readout

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 ± 120 μ A to ± 120 nA full-scale range 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 +500V or -500V @ 1mA outputs but it can be configured in rating (up to 6 kV - both polarities). This source, fed on a SHV connector - is perfectly suited to be used as the biasing voltage for a detector system.

As for the previous models, the TetrAMM is housed in a light and extremely compact box that can be placed close to the detector – i.e. the signal sources – 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. All measuring channels are factory calibrated.





An additional calibration can be made by the user taking into account the entire installation setup – e.g. dark currents – and can be recalled since it is stored in the device internal non-volatile memory.

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

The TetrAMM has two different TRIGGER and GATE signals on a LEMO coaxial connector; additional passive interlock

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



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 integrate the device in a closed-system. The internal firmware can be remotely

updated, please check our website www.caenels.com in order to have the last available version installed on your TetrAMM.

Technical Specifications

Input Channels	4	
Current Polarity	bipolar	
Current Measuring Range	RNG0	±120 µA
	RNG1	±120 nA
Current Resolution	RNG0	15 pA
	RNG1	15 fA
Sampling Frequency - f_s	Up to 100 kHz	
Analog Bandwidth – BW	5 kHz	
Equivalent Input Current Noise (@ 1 kHz)	RNG0	1 ppm/FS
	RNG1	6 ppm/FS
Equivalent Input Current Noise (@100 kHz)	RNG0	< 6 ppm/FS
	RNG1	< 25 ppm/FS
Temperature Coefficient - TC	RNG0	< 0.001 %/FS/K
	RNG1	< 0.002 %/FS/K
High Voltage Source	500V @ 1 mA (standard) configurable up to 6kV	
High Voltage Noise & Ripple	< 1 mV _{RMS}	
	< 3 mV _{PK-PK}	
Communication Interface	10/100/1000 Ethernet	
External Signals	Configurable Trigger/Gate Trigger Output External Interlock	
Input Connectors	BNC	
High Voltage Connector	SHV	
Extra Communication Interface	SFP – Small Form Factor Pluggable	
Additional Features	Auto-ranging	
	Firmware Remote Upgrade	
	Configurable Sampling Frequency	
	High Voltage Readback	
	High Voltage Current Readback High Voltage Overcurrent Protection	
Input Voltage	+ 12 V _{DC}	
Mechanical Dimensions	175 X 175 X 44 mm	



TetrAMM Oscilloscope Software

Ordering Options

WTETRAMMNOHV	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter without Integrated HV Source
WTETRAMM05PX	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter with Integrated +500V HV Source
WTETRAMM05NX	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter with Integrated -500V HV Source
WTETRAMM20PX	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter with Integrated +2kV HV Source
WTETRAMM20NX	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter with Integrated -2kV HV Source
WTETRAMM40PX	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter with Integrated +4kV HV Source
WTETRAMM40NX	TETRAMM	TetrAMM - 4-channel Fast Interface Bipolar Picoammeter with Integrated -4kV HV Source

BEST

Beam Enhanced
Stabilization Technology



BEST

- The BEST (Beamline Enhanced Stabilization Technology) is the first hardware system for the optimization and stabilization of the photon beam based on a distributed architecture.

System configurability and expandability – building blocks are independent and standalone.

Performs a real-time compensation of intensity and positional drifts of the beam.

FEATURES

- Readout module – i.e. TetrAMM – for photon BPM
- Actuation module – multi-channel DAC
- Control & Interface module
- X, Y correction and stabilization
- IO stabilization (optional)
- Web-server interface
- Configurability to different detector geometries and configurations
- Firmware remote update on all building blocks
- Low-latency and high-speed links between blocks allow for higher frequency beam instability correction – e.g. mechanical vibrations
- TCP-IP control
- EPICS IOC

APPLICATIONS

- Photon Beam Stabilization

The BEST (Beamline Enhanced Stabilization Technology) is a powerful instrumentation and software suite specially designed to easily provide the capabilities for simultaneously controlling position (X, Y) and intensity (I0) of the photon beam in synchrotron radiation X-ray beamlines.

The system is designed on a distributed architecture that allows installing all electronic building blocks as close as possible to the corresponding device – e.g. a piezo driver or a photon BPM.

The system is composed by three main building blocks:

- *the readout block*
- *the control and interface unit*
- *the actuator block*

The readout block is represented by the TetrAMM device: a 4-channel bipolar picoammeter with an integrated HV bias voltage source that can be connected directly to a four-quadrant phBPM detector – e.g. diamond detector,

ion chamber or quadrature diodes. This readout block has an independent 10/100/1000 Ethernet interface for standard communication and can be also used as a stand-alone readout unit. In addition to this, the TetrAMM has a high-throughput and low-latency SFP link that guarantees interface to the control unit.





The control and interface unit is the “brain” of the entire system and it is made by a 19”-1U rack that interconnects and interfaces to the other building blocks and gives access and control to the users directly via a Gigabit Ethernet interface. The control interface has a dedicated application that allows to set the parameters to configure the beamline system (detectors, piezo actuators, geometry) and control the photon beam behavior.

This central unit has four fast SFP links implemented on a board that includes a high-performance FPGA that performs the beam control tasks independently.



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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



This FPGA communicates to a higher-level layer via a PCI-e protocol. A dedicated EPICS IOC is implemented on this central unit and accessible via the Gigabit Ethernet link in order to interface to the beamline control system.

The central unit also has a video interface in order to optionally connect a monitor and USB ports to connect a mouse and a keyboard.

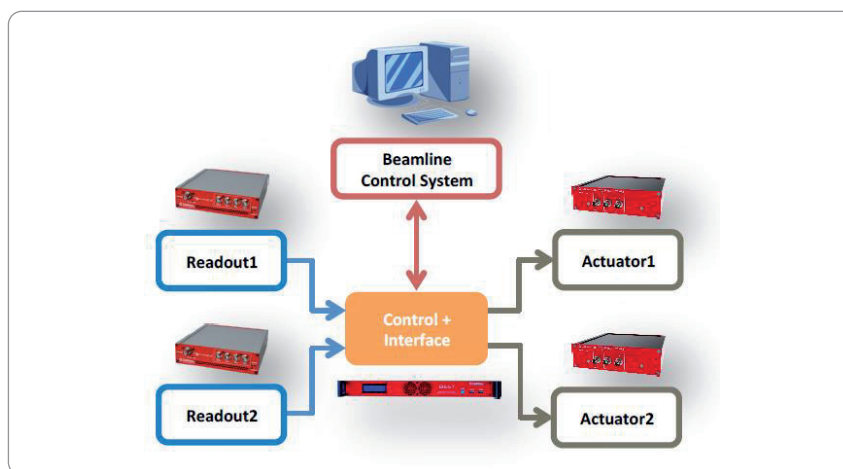
The SFP links are also dedicated to connect the system to the actuator block – i.e. PreDAC unit.

This actuation block provides two different high-resolution and high bandwidth DAC channels (X, Y controls) in its standard configuration. An additional DAC channel – I0 – can be optionally added to act on the intensity.

The BEST system basic configuration includes one TetrAMM, one control unit and one 2-channel actuator block. Up to two TetrAMMs and two actuator blocks can be handled from the control unit. Please check our website www.caenels.com for updates and further information on the BEST.

Technical Specifications

Control Interface	10/100/1000 Ethernet TCP-IP
BEST Application	Web-Server
Standard Configuration	1 TetrAMM picoammeter 1 PreDAC actuator unit (2-channels) 1 control and interface unit
Extended Configuration	2 TetrAMM picoammeter 2 PreDAC actuator unit (2-channels) 1 control and interface unit
Control and Interface Unit OS	Linux OS
Compensation Loops	Horizontal position (X) Vertical position (Y) Intensity (I0) - <i>optional</i>
Loop Communication Interface	SFP – Small Form Factor Pluggable
Additional Features	Firmware Remote Upgrade for each building block
Drivers	EPICS IOC



BEST System – block scheme

Ordering Options

WBEST2HV05PX	BEST	2-ch PreDAC, TetrAMM with +500V HV, Central Unit with embedded control system and EPICS IOC
WBEST3DACXAA	ADD-DAC	BEST PreDAC – High-Precision additional channel for Fast Actuator Unit

BEST

Beam Enhanced
Stabilization Technology

Up to 2 EnBOX
Readouts



BEST-ENC



BEST Control and
Interface Unit



PreDAC
Actuator

- The BEST-ENC (Beamline Enhanced Stabilization Technology – ENcoders) is a powerful instrumentation and software suite specially designed to provide the capabilities for real-time control of beam properties in X-ray beamlines.

FEATURES

- Readout module – i.e. TetrAMM – for photon BPM
- Actuation module – multi-channel DAC
- Control & Interface module
- X, Y correction and stabilization
- I/O stabilization (optional)
- Web-server interface
- Configurability to different detector geometries and configurations
- Firmware remote update on all building blocks
- Low-latency and high-speed links between blocks allow for higher frequency beam instability correction – e.g. mechanical vibrations
- TCP-IP control
- EPICS IOC

APPLICATIONS

- Photon Beam Stabilization

The BEST-ENC is directly derived from the BEST system architecture, as it extends the original BEST capabilities using as input not only electric currents from beam-sensing detectors but also digital signals from either incremental (quadrature) or absolute optical encoders. The BEST-ENC suite is seamlessly integrated within the BEST architecture and is fully compatible with all the original BEST features. The system is designed on a distributed architecture that allows installing all electronic building blocks as close as possible to the corresponding device – e.g. a piezo driver or a photon BPM.

The system is composed by three main building blocks:

- *the readout block*
- *the control and interface unit*
- *the actuator block*

The readout block is represented by the EnBOX (Encoder BOX), a dedicated CAEN ELS module able to read position data directly from two different types of

encoders by Renishaw: both the TONiC™ relative encoders and the absolute RESOLUTE™ types are supported by the unit.

Interfacing, as well as supplying power to the encoders is performed directly by the EnBOX which is able to provide also the RESOLUTE™ encoders with the necessary stable and clean 5V@250mA.





The BiSS® protocol is used in order to read encoder data (including error bits, CRC, etc.) when using the RESOLUTE™ type, and a different readout logic when using the TONiC™ type. Since the user selects which protocol to use, each EnBOX is able to read two TONiC™ encoders or two RESOLUTE™ ones.

The EnBOX converts the encoder data into position measurements that are shared with the BEST-ENC central unit via a fast SFP link running a proprietary protocol.

Each EnBOX unit can anyhow be controlled independently via its 10/100/1000 Mbps Ethernet TCP/IP

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



connection. Data generated by the unit and the associated encoders are integrated into the EPICS driver that each system runs on its central unit and are also accessible from the system Web Interface.

The central control and interface unit is the “core” of the entire system and acts as the data collector for all connected devices, and it is the same central unit used in the CAEN ELS BEST system.

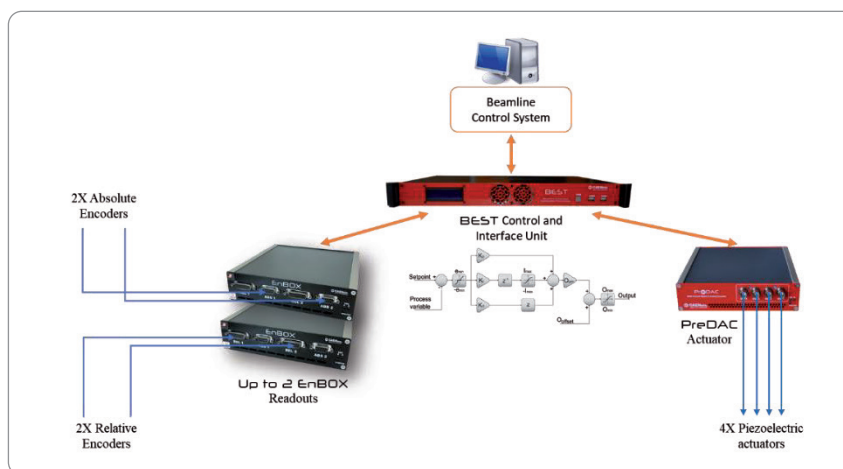
The actuator is the the PreDAC Multi-channel Digital to Analog Converter by CAEN ELS is a (up to) 4- channel, 21-bit resolution, wide-bandwidth Digital to

Analog Converter (DAC) which is especially designed for operation with the BEST and BEST-ENC systems.

The core of the PreDAC system is a high-speed 16-bit digital to analog converter that uses dithering technique and active low-pass filtering to obtain stable high accuracy (21-bit) output signal. This device is capable of outputting ± 12 V bipolar voltage with resolution of $12 \mu\text{V}$ – i.e. 21 bits of resolution on the bipolar output range.

Technical Specifications

Control Interface	10/100/1000 Ethernet TCP-IP
BEST Application	Web-Server
Standard Configuration	1 EnBOX 1 PreDAC actuator unit (2-channels) 1 control and interface unit
Extended Configuration	2 EnBOX 2 PreDAC actuator unit (2-channels) 1 control and interface unit
Control and Interface Unit OS	Linux OS
Compensation Loops	Horizontal position (X) Vertical position (Y)
Loop Communication Interface	SFP – Small Form Factor Pluggable
Additional Features	Firmware Remote Upgrade for each building block
Drivers	EPICS IOC



BEST-ENC System – block scheme

Ordering Options

WBESTENCXAAA	BEST-ENC	BEST for encoders, 2-encoder channel EnBOX, 1-channel PreDAC unit included, turnkey solution (with embedded EPICS driver)
WBEST3DACXAA	ADD-DAC	BEST PreDAC – High-Precision additional channel for Fast Actuator Unit



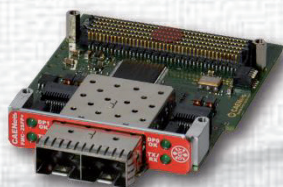
MicroTCA and FMC

FMC and μ TCA

FMC-PICO-1M4

14

4-channel 20 bit 1 MSPS FMC Floating Ammeter



16

FMC-2SFP+/ FMC-4SFP+

Dual- and Quad- Channel SFP/SFP+ FMC Adapter



FMC-MOTDRV22

18

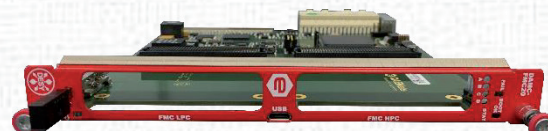
FMC Dual-Channel Stepper Motor Driver



20

DAMC-FMC25

AMC Dual High Pin Count FMC Carrier Board



DAMC-FMC20

22

AMC Dual High Pin Count FMC Carrier Board



24

AMC-PICO-8

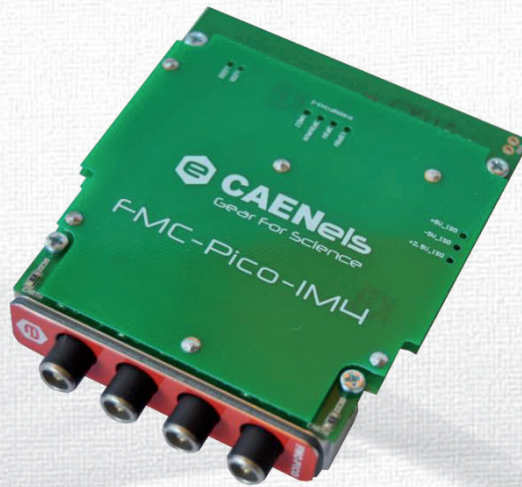
8-channel Bipolar 20-bit Picoammeter With MTCA.4 Rear I/O



HV-PANDA

26

AMC Dual High Pin Count FMC Carrier Board



FMC-PICO-1M4

4-channel 20 bit 1 MSPS
FMC Floating Ammeter



FMC-Pico-1M4

- The FMC-Pico-1M4 is a FPGA Mezzanine Card compatible with standard VITA 57.1 to be mounted on LPC and HPC carrier boards.
Four independent high-resolution bipolar current-input channels with 20 bit resolution. Input channels are capable of floating up to $\pm 300V$ respect to chassis ground.

FEATURES

- FPGA Mezzanine Card
- VITA 57.1 Standard
- High resolution Multi-Channel current measurements up to ± 1 mA (configurable upon request)
- 4 Bipolar Current-Input Channels
- Two independent full-scale ranges (± 1 mA, ± 1 μ A)
- Up to 1 MSPS simultaneous and independent sampling
- Low conversion time delay
- 20-bit resolution
- Input channels floating up to ± 300 V

APPLICATIONS

- Photon Beam Position Monitors
- Multi-Channel Fast Current Acquisition
- Detector Readout

The FMC-Pico-1M4 is a standard FPGA Mezzanine Card (FMC - VITA 57.1) Low Pin Count (LPC) board that allows to monitor bipolar currents up to 1 mA with high sampling rate and high resolution.

The board resolution is 20-bit, obtained from independent, simultaneous sampling and low-delay Analog to Digital Converters (ADCs).

Each channel has two full-scale measuring ranges, up to ± 1 mA and ± 1 μ A respectively and the current source can be floating up to ± 300 V respect to the FMC ground. The floating capability of the inputs is perfectly suitable for applications where the detector or current source needs to be biased.

The analog front-end is designed in





order to achieve low noise, low temperature dependence and very little unbalance between channels. The analog characteristics can be further improved by requesting a factory calibration of the channels - calibration data are stored in the on-board EEPROM memory that can be read via an I2C bus on the FMC connector.

A metallic shield has the dual function of shielding the analog front end from external noise sources and also isolates the internal electronics that could be capable of floating up to ± 300 V potential respect to the chassis ground.

A trigger signal can be fed on the FMC connector in order to start the conversion of data samples: this feature allows to synchronize the board acquisition to an external event - e.g. machine revolution frequency in storage rings.

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



Data readout can be performed via separate SPI links – i.e. one for each channel, sharing the same clock signal – or can be daisy-chained thus requiring less signals to be handled.

Please check the MTCA.4 section on the website www.caenels.com in order to check for news, updates and additional information on the FMC-Pico-1M4 cards and other MTCA.4 products.

Technical Specifications

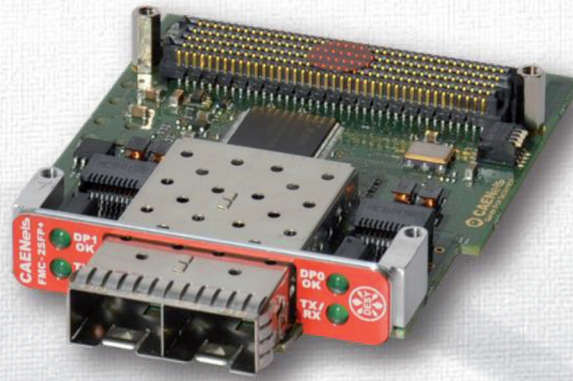
Board Type	FPGA Mezzanine Card – FMC VITA 57.1	
FMC Connector Type	High Pin Count – HPC	
Number of Channels	4	
Current Polarity	Bipolar	
Full-Scale Current	RNG0 RNG1	±1 mA ±1 μ A
Sampling Rate – F_s	1 MSPS	
Resolution	20 bit	
Conversion Time – T_{CONV}	650 ns	
Equivalent Input Current Noise @ 1MSPS	RNG0 RNG1	< 10 nA _{RMS} < 20 pA _{RMS}
Input Connectors	Triaxial – LEMO 00.650 Series	
Bandwidth (-3dB)	> 10 kHz	
Temperature Coefficient – TC	10 ppm/°C	
Unbalance of Input Channels	< 0.05% without calibration	
Differential TC	< 25 ppm/°C	
Additional Features	Signal ground floating up to ±500V Trigger / SoC signal on FMC connector Range selection on FMC connector Daisy-chain data readout capability Factory calibration (on internal EEPROM) <i>upon request</i>	



FMC-Pico-1M4 – top view

Ordering Options

FMCPICO1M4XA	FMC-PICO-1M4	4-channel 20-bit 1 MSPS FMC Dual-Range Floating Ammeter
FMCPICO1M4C1	FMC-PICO-1M4-C1	4-channel 20-bit 1 MSPS FMC Dual-Range Floating Ammeter with additional filtering
FMCPICOCUSTX	FMC-PICO-CUST	Range customization for FMC-Pico-1M4 and FMC-Pico-1M4-C1
FMCPICO1M4CL	FMC-PICO-CALIB	Offset and Gain calibration service of FMC-Pico-1M4 and FMC-Pico-1M4-C1 input channels (EEPROM storage)



FMC-2SFP+ FMC-4SFP+

Dual- and Quad- Channel SFP/SFP+
FMC Adapter



FMC-SFP+

- These FPGA Mezzanine Cards are compatible with standard VITA 57.1 and can be mounted on carrier boards – e.g. DAMC-FMC25 – for high speed communication.
- The FMC-2SFP+ and FMC-4SFP+ boards have a configurable oscillator and a wide I/O operating range (1.5V to 3.3V on V_{ADJ}).
- Available in 2-channel or 4-channel SFP/SFP+ versions.

FEATURES

- FPGA Mezzanine Card
- High-Pin-Count FMC Module (Vita 57.1 compliant) with LPC compatibility for SFP/SFP+ applications
- Wide I/O operating voltage range: V_{ADJ} can vary from 1.2V to 3.3V
- True level conversion of all SFP+ module pins including I2C bus lines
- I2C-Controlled oscillator (10-280MHz)
- Available as 4-channel or 2-channel version
- Fits on any FMC carrier without front panel modification
- Individual module status via LEDs
- Compatibility with the DAMC-FMC25 Board
- Autonomous Mode: Clock speed setting and transmitter activation via DIP switches

APPLICATIONS

- Photon Beam Position Monitors
- Multi-Channel Fast Current Acquisition
- Detector Readout

The FMC-SFP4 is a cost-efficient FPGA mezzanine card (FMC) designed according to ANSI/VITA 57.1.

It offers four SFP/SFP+ module slots. All module pins are translated to the FMC Carrier Voltage (V_{ADJ}) that can be in the range of 1.2V to 3.3V.

With this low operating voltage it can be used on almost all carriers. The module is designed as an HPC module but can also be operated on an LPC carrier (one channel + clock).

The components are placed to be compatible with carriers that have components under the FMC module.

The SFP+ cage is placed to fit to all carriers without front panel modification (card is only 16mm longer than described by FMC standard).

The module features an I2C-controlled LVDS oscillator chip that operates in the range from 10 to 280 MHz.





Automatic configuration of clock oscillator and module pins for standalone operation is selectable via onboard jumpers.

Commercially available versions are the dual channel FMC-2SFP+ with standard VITA 57.1 bezel and the quad-channel FMC-4SFP+.

Please check the MTCA.4 section on the website www.caenels.com in order to check for news, updates and additional information on the FMC-Pico-1M4 cards and other MTCA.4 products.

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetraia, 11
 55049 - Viareggio (LU)
 Italy

Phone +386 (0)5 7313 585
 Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com

Technical Specifications

Board Type	FPGA Mezzanine Card – FMC VITA 57.1
FMC Connector Type	High Pin Count – HPC
Number of SFP+ channels	2 on FMC-2SFP+ 4 on FMC-4SFP+
Sampling Rate – F_s	1 MSPS
V_{ADJ} Range	1.5V – 3.3V
On-board Oscillator Range	10 MHz – 280 MHz
On-board Oscillator Configuration Protocol	12C
Additional Features	Link Status indication via front panel or bottom-emitting LEDs
	Autonomous Mode: Clock speed setting and transmitter activation via DIP switches



FMC-4SFP+ – top view



Designed & Licensed
by DESY

Deutsches Elektronen-Synchrotron
 Ein Forschungszentrum der Helmholtz-Gemeinschaft

Ordering Options

FMC4SFP2XAAA	FMC-2SFP+	Dual-channel SFP/SFP+ Adapter FMC
FMC4SFP4XAAA	FMC-4SFP+	Quad-channel SFP/SFP+ Adapter FMC

FMC-MOTDRV22

FMC Dual-Channel
Stepper Motor Driver



FMC-MOTDRV22

- The FMC-MOTDRV22 is a two-channel stepper motor driver series compliant with the ANSI/VITA 57.1 standard
- Each channel can provide up to 12 V/1.8 A and 24 V/1.8 A per coil with a programmable chopper slope
- Internal and external power supply (connector on the FMC front bezel) versions available rated at 12 V and 24 V

FEATURES

- ANSI/VITA 57.1 LPC compliant
- Supports up to 1.8A motor coil current at 12V or 24V
- Supports up to 256 micro-steps per full step
- Real-time support
- Programmable current slopes
- Power monitor for each channel
- Each channel supports switchable EnDat2.2 or ABN-encoder readout
- 12 V internal, 12 V external or 24 V external power versions
- RoHS compliant

APPLICATIONS

- Machine Diagnostics and Control
- Laboratory Equipment

The FMC-MOTDRV22 is a cost-efficient two-channel stepper motor driver series compliant with the ANSI/VITA 57.1 specifications.

Each channel can provide up to 12V/1.8A and 24V/1.8A per coil for bipolar stepper motors depending on the model. The chopper slope is programmable within three different modes.

Each driver provides a motor load detection without external sensors and a load dependent current control. The board also offers diagnostics and protection against overcurrent, short-to-ground, undervoltage and over temperature.

- FMC-MOTDRV22-INT12V
- FMC-MOTDRV22-EXT12V
- FMC-MOTDRV22-EXT24V





These models differ from the voltage rating (12 V or 24 V) and the available power since two of them have an additional connector for external power.

The dedicated cablings are also commercially available in its standard version of 1 meter (FMC-MOTDRV22-CABLE) and in customer defined lengths. Please ask us for a quotation for non-standard cable lengths.

These FPGA Mezzanine Card boards are available in three different versions:

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia 11
55049 – Viareggio (LU)
Italy

info@caenels.com
www.caenels.com

 www.caenels.com



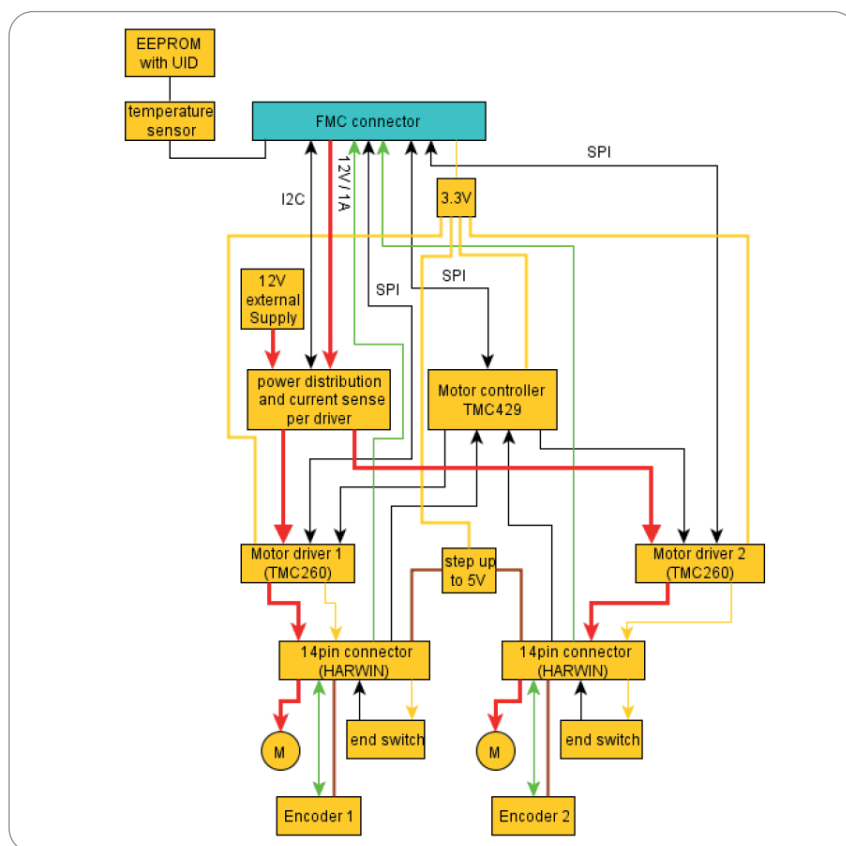
Designed & Licensed
by DESY

Deutsches Elektronen-Synchrotron
Ein Forschungszentrum der Helmholtz-Gemeinschaft

Technical Specifications

FMC-MOTDRV22

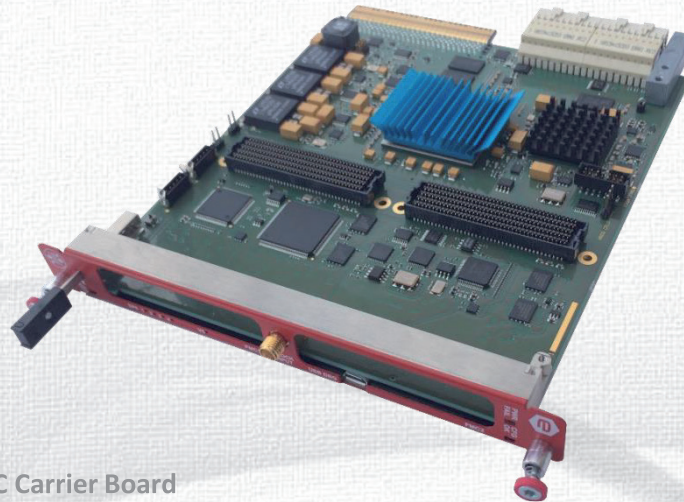
Standards	ANSI/VITA 57.1 LPC IPMI Version 2.0
I/O voltage (V_{ADJ})	1.8 V – 3.3 V
Number of Channels	2
Power Consumption	12 W (over FMC connector) 60 W (external supply)
Motor Type	2-phase Bipolar Stepper Motor
Motor Supply - maximum	12 V / 1.8 A per coil 12 V / 0.4 A per coil (via standard AMC board)
End Switch	Hall Sensor or Mechanical Sensor
Encoder	EnDat2.2 or Incremental
Connector Type	Harwin M80-5L11442MD
Operating Temperature	0 ... 70 °C
Weight – typical	300 g



FMC-MOTDRV22 – block diagram

Ordering Options

MOTDRV22IN12	FMC-MOTDRV22-INT12V	2-Channel Stepper Motor Driver with 12V Internal Power
MOTDRV22EX12	FMC-MOTDRV22-EXT 12V	2-Channel Stepper Motor Driver with 12V External Power
MOTDRV22EX24	FMC-MOTDRV22-EXT 24V	2-Channel Stepper Motor Driver with 24V External Power
CABL-FMT0001	FMC-MOTDRV22-CABLE	Cable for FMC-MOTDRV 1m



DAMC-FMC25

AMC Dual High Pin Count FMC Carrier Board



DAMC-FMC25

- The DAMC-FMC25 is a full-size standard AMC board designed to host up to two High Pin Count (HPC) FMC mezzanine cards.
- On-board Virtex-5 FPGA and Spartan-6 FPGA provided with DDR2 RAM memories.
- Designed as MTCA.4 carrier, the DAMC-FMC25 provides management of Rear Transition Module (RTM) boards via fast links.

FEATURES

- Double-width AMC board
- MTCA.4 carrier
- Two HPC FMC Mezzanine slots
- Data processing on Virtex-5 FPGA
- Board Management on Spartan-6 FPGA
- uRTM D1.1 connectivity
- PCI-e (x4) communication on AMC
- Four low-latency links on AMC
- RocketIO channels to FMCs and to RTM
- 256 MB (on Virtex-5) and 128 MB (on Spartan-6) DDR2 Memories
- MicroSD Card Slot
- Dual SPI memories for each FPGA and I2C EEPROM
- External Clock input on front panel

APPLICATIONS

- AMC carrier board for HPC FMC
- Research & Development
- Accelerator Controls
- Automation Industry
- Telecommunications

The DAMC-FMC25 is a general purpose carrier board with the ability to host two FPGA Mezzanine Cards (FMC) with High Pin Count (HPC) connectors. The AMC board is designed as a double-width mid-size MTCA.4 carrier.

A Virtex-5 FPGA allows to perform high demanding computations with a high data throughput between FMCs, uRTM and PCI express on the MTCA backplane.

Standard version of the board mounts a Virtex-5 XC5VFX70T (1136-pin) and a Spartan XC6SLX45T (484-pin) FPGAs provided respectively with 256 MB and 128 MB DDR2 memories.

The local DDR2 memories can be used in order to store data that cannot or does not need to be sent via PCI-e during acquisition.

The module management is performed

by a ATxmega128A1_AU controller directly interfaced to the AMC backplane with an I2C bus connection.

Fast links to both FMC slots – i.e. 77 differential pairs and 2 GTX @ 6.5 Gbps on each one – allow to install high performance and high density FPGA Mezzanine Cards – e.g. fast and/or high resolution digitizers or fast links.

Fast links are also dedicated to the MTCA.4 standard use of the board with 42 differential pairs and 2 GTX @ 6.5 Gbps to the uRTM Zone-3 connector.

AMC backplane connections available are Low-Latency Links (4 lanes), PCI-e 1.0 (4 lanes) and MLVDS (4 lanes).

Commercially available versions of the DAMC-FMC25 board mount “-2” or “-1” speed grade Virtex-5 (transceiver speed is limited to 4.25 Gbps on “-1” devices). Visit our website www.caenels.com for up to date information on the product.

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 Electronic Instrumentation
- FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com

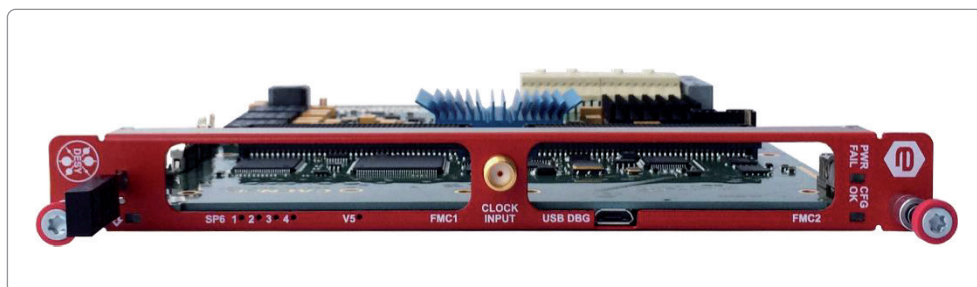
Technical Specifications

Board Size	Double-Width – Mid-Size	
Standard	MicroTCA.4 Module Management	AMC.0, AMC.1 IPMI Version 1.5, MMC V1.0
Compatibility	Zone 3 Classification AMC – Backplane Support	Class D1.1 Full
FMC Carrier	2 High Pin Count (HPC) – VITA 57.1	
FPGAs	Xilinx Virtex-5 Xilinx Spartan-6	XC5VFX70T-1FFG1136C(“-1” version) XC5VFX70T-2FFG1136C(“-2” version) XC6SLX45T-3FPG484C
RAM Memories	256MB DDR2 for Virtex-5 128MB for Spartan-6	
Storage	Virtex-5 Firmware Spartan-6 Firmware Identification Data Mass Storage	2 x SPI Flash 2 x SPI Flash 1 x 12C EEPROM 1 x MicroSD Card Slot
MMC Device	ATmega128A1-AU	
FMC Connections	FMC1 FMC2	77 diff. pairs, 2 GTX (up to 6.5 Gbps) 77 diff. pairs, 2 GTX (up to 6.5 Gbps)
RTM Connections	42 diff. Pairs, 2 GTX (up to 6.5 Gbps)	
Clock	External Input (SMA connector) FMC1, FMC2 RTM AMC (TCLKA, TCLKB) On-board generator (10-280 MHz)	
Backplane Links	Low Latency Links PCI-e MLVDS	4 lanes, AMC ports 12-15, up to 6.5 Gbps 4 lanes, AMC ports 4-7, PCIe gen. 2* 4 lanes, AMC ports 17-20
Front Panel	2 x HPC 1 x SMA, single-ended, 50 Ω, AC Micro USB (FPGA and MMC) for Debug	
FPGAs	Xilinx Virtex-5 Xilinx Spartan-6	XC5VFX70T-1FFG1136C(“-1” version) XC5VFX70T-2FFG1136C(“-2” version) XC6SLX45T-3FPG484C
Other Features	2 on-board temperature sensors Standard LEDs managed by IPMI 4 user configurable LEDs	
Operating Temperature	0 ... 50 °C	



Designed & Licensed
by DESY

Deutsches Elektronen-Synchrotron
Ein Forschungszentrum der Helmholtz-Gemeinschaft



DAMC-FMC25– front view

Ordering Options

DAMCFMC252XA	DAMC-FMC25	Dual HPC (High Pin Count) AMC Carrier Board – MTCA.4 – “-2” Speed Grade Virtex-5, 6.5 Gbps Transceivers
DAMCFMC25C1A	DAMC-FMC25-C1	Dual HPC (High Pin Count) AMC Carrier Board -MTCA.4 - XC5VFX100T-2FF1136C - Virtex-5



CAENels
Gear For Science

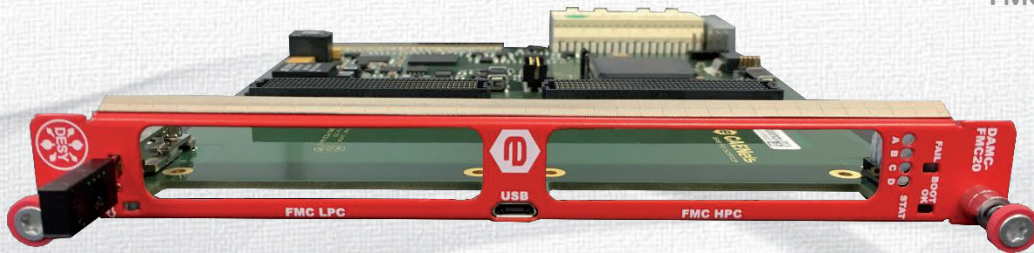
Copyright © CAEN ELS s.r.l. – 2018

All rights reserved. Information in this publication supersedes all earlier versions.
Specifications subject to change without notice.

Rev 1.1 – Printed in July 2018.

DAMC-FMC20

AMC Dual High Pin Count
FMC Carrier Board



DAMC-FMC20

- The DAMC-FMC20 is a full-size standard AMC board designed to host up to one High Pin Count (HPC) and one Low Pin Count (LPC) FMC mezzanine cards.
- On-board Spartan-6 FPGAs provided with DDR2 RAM memories.
- Designed as MTCA.4 carrier, the DAMC-FMC20 provides management of Rear Transition Module (RTM) boards via fast links.

FEATURES

- Double-width AMC board
- MTCA.4 carrier
- One HPC and one LPC FMC Mezzanine slots
- Data processing on Spartan-6 FPGA
- Board Management on Spartan-6 FPGA
- uRTM D1.1 connectivity
- PCI-e (x4) communication on AMC
- Four low-latency links on AMC
- 128 MB DDR2 Memories
- Dual SPI memories for each FPGA and I2C EEPROM

APPLICATIONS

- AMC carrier board for HPC/LPC FMC
- Research & Development
- Accelerator Controls
- Automation Industry
- Telecommunications

The DAMC-FMC20 is designed as a double-width mid-size MTCA.4 carrier. This carrier board is a general purpose One with the ability to host two FPGA Mezzanine Cards (FMC), one with High Pin Count (HPC) connectors and one with Low Pin Count (LPC) connectors .

The DAMC-FMC20 is a cost-efficient FPGA mezzanine card (FMC) carrier designed according to MTCA.4 and equipped with two Spartan-6 FPGAs.

One FPGA allows serial high-speed communication (PCIe, RTM, Backplane, FMCs) while the other one allows the implementation of large signal processing algorithms.

In addition to providing one PCIe link AMC.1 type 1 compliant, the DAMC-FMC20 is reconfigurable over PCIe and MMC.





Fast links to both FMC slots (the board supports one serial GTP link for the HPC FMC and up to two serial communication links for the LPC FMC) allow to install high performance and high density FPGA Mezzanine Cards – e.g. fast and/or high resolution digitizers or fast links.

A micro USB port is accessible from the front of the board for debugging purposes while an extra 12V power connector for high current FMC applications is also present on the board.

Backplane is reached via the AMC ports 12-15 that are connected via a dedicated cross-point switch directly to the FPGA exploiting GTP links (that also allow the communication to the LPC FMC from this cross point).

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com

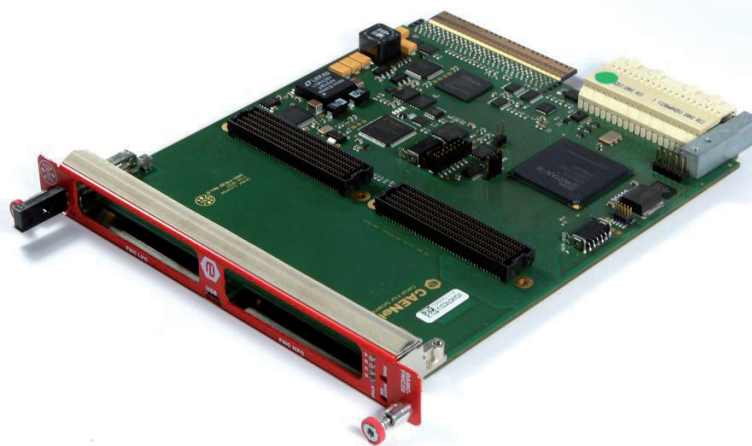
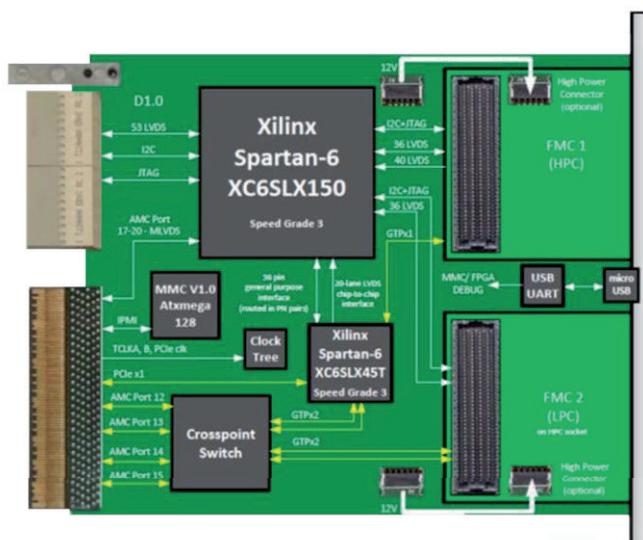


Designed & Licensed
by DESY

Deutsches Elektronen-Synchrotron
Ein Forschungszentrum der Helmholtz-Gemeinschaft

Technical Specifications

Board Size	Double-Width – Mid-Size	
Standard	MicroTCA.4 Module Management	AMC.0, AMC.1, AMC.2 IPMI Version 2.0, MMC V1.0
Compatibility	Zone 3 Classification	Class D1.0
FMC Carrier	1 High Pin Count (HPC) 1 Low Pin Count (LPC)	
FPGAs	Xilinx Spartan-6 Xilinx Spartan-6	XC6SLX150-Speed grade 3 XC6SLX45T-Speed grade 3
RAM Memories	128 MB	
MMC Device	ATxmega128A1-AU	
FMC Connections	FMC1 HPC FMC2 LPC	36+40 diff. pairs, 1x GTP 36 diff. pairs, 2x GTP
RTM Connections	53 diff. pairs, LVDS	
Backplane Links	Low Latency Links PCI-e MLVDS	4 lanes, AMC ports 12-15, up to 3.2 Gbps 1 lane, PCIe gen. 1.0, up to 2.5 Gbps 4 lanes, AMC ports 17-20
Front Panel	2 x FMC Micro USB (FPGA and MMC) for Debug	
Operating Temperature	0 ... 50 °C	



DAMC-FMC20 – block diagram (upper image) – top view (lower image)

Ordering Options

DAMCFMC20XAA	DAMC-FMC20	Dual FMC Carrier Board - MTCA.4 - Dual-FPGA Processing
--------------	-------------------	--



AMC-PICO-8

8-channel Bipolar 20-bit Picoammeter
With MTCA.4 Rear I/O



AMC-PICO-8

- The CAEN ELS AMC-PICO-8 is a full-size standard AMC board with 8 Bipolar 20-bit current-input electrometer channels
- Input channels are capable of floating up to $\pm 300V$ respect to chassis ground
- Two independent full-scale ranges for each channel

FEATURES

- Double-width AMC board
- MTCA.4 standard
- High resolution Multi-Channel current measurements up to ± 1 mA (configurable upon request)
- 8 Bipolar Current-Input Channels
- Two independent full-scale ranges (± 1 mA, ± 1 μ A)
- Up to 1 MSPS simultaneous and independent sampling
- Low conversion time delay
- 20-bit resolution
- Input channels floating up to ± 300 V
- Data processing on Virtex-5 FPGA
- Board Management on Spartan-6 FPGA
- uRTM D1.1 connectivity
- External Clock input on front panel

APPLICATIONS

- Photon Beam Position Monitors
- Multi-Channel Fast Current Acquisition
- Detector Readout
- Accelerator Controls

The AMC-PICO-8 is an eight channel picoammeter double-width AMC board in MTCA.4 format. The analog front-end allows measuring bipolar currents up to 1 mA (customizable upon request) with maximum sampling rate of 1MSPS.

The analog front-end is composed of a specially designed transimpedance input stage for current sensing combined with analog signal conditioning and filtering stages making use of state-of-the-art electronics. The 20-bit resolution is obtained from independent, simultaneous sampling and low-delay SAR (Successive Approximation Register) Analog to Digital Converters (ADCs).

Each channel has two full-scale measuring ranges, up to ± 1 mA and ± 1 μ A respectively (standard ranges - customizable upon request) and the current source can be floating up to ± 300 V respect to the chassis ground.





The floating capability of the inputs is perfectly suitable for applications where the detector or current source needs to be biased.

The analog front end is designed in order to achieve low noise, low temperature dependence and very small unbalance between channels. The analog characteristics are further improved with calibration. Calibration data are stored in the on-board EEPROM memory and are loaded in the signalprocessing logic on power-up.

The on board Virtex-5 FPGA performs the conversion from "raw" values acquired from ADCs to a single-precision floating point numbers, representing the measured current in amperes. The floating point format is highly suitable for additional post-processing. The signal-processing logic can also be configured to capture the signal on

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



Designed & Licensed
by DESY

Deutsches Elektronen-Synchrotron
Ein Forschungszentrum der Helmholtz-Gemeinschaft

certain trigger condition. Additionally, the internal memory can also be programmed to store data before trigger condition happens, providing a valuable data to user.

The communication with Virtex-5 FPGA is performed with the PCI express bus. All system parameters (e.g. analog

front-end range, sampling frequency) can be achieved by writing to appropriate registers from PCI express. The FPGA also embeds a Scatter-Gather DMA which can be used to transfer data to PCI express root port (e.g. CPU).

Visit our website www.caenels.com for up to date information on the product.

Technical Specifications

Board Size	Double-Width – Mid-Size
Input Channels	8
Input Connector Type	Triaxial – LEMO 00.650 Series (EPL.00.650)
Current Input Full-Scale Ranges	± 1 mA ± 1 μ A (configurable upon request)
Maximum Sampling Frequency	1 MSPS (per channel)
Equivalent Signal-to-Noise	RNG0: >100 dB RNG1: >90 dB
Current Resolution	2 nA 2 pA (20-bit)
Bandwidth (-3dB)	> 10 kHz
Temperature Coefficient – TC	10 ppm/°C
Differential TC	< 25 ppm/°C
Front End Isolation Voltage	± 300 V
Standard	MicroTCA.4: AMC.0, AMC.1 Module Management: IPMI Version 1.5, MMC V1.0
Compatibility	Zone3 Classification: Class D1.1 AMC Backplane Support: Full
Trigger Inputs	Internal, AMC port #17 RX AMC port #18 RX AMC port #19 RX AMC port #20 RX
Operating Temperature	0 ... 50 °C



AMC-PICO-8 – front view

Ordering Options

AMCPICO8XAAA	AMC-PICO-8	8-channel AMC – MTCA.4 Bipolar Floating Picoammeter Board
AMCPICO8C1XA	AMC-PICO-8-C1	8-channel AMC – MTCA.4 Bipolar Floating Picoammeter Board with additional analog filtering



HV-PANDA

High Voltage Positive And Negative
Double-Width AMC



HV-PANDA

- The HV-PANDA is a full-size standard AMC board that houses 4 High Voltage channels as a MTCA.4 carrier.
- High Voltage channels with different output ratings – i.e. 6kV, 4kV and 500V – and factory-selectable polarity.
- Infrastructure for management of Rear Transition Module (RTM) boards.

FEATURES

- Double-width AMC board
- MTCA.4 carrier
- 4 High Voltage (HV) channels per board
- Output Ratings up to 6kV@1mA
- Different output voltage ratings available
- Polarity factory-selectable
- Provides interconnections between CPU unit and HV channels
- Communication through FAT PIPE using PCI-e 1x standard
- Provides infrastructure for management of Rear Transition Module (RTM) boards

APPLICATIONS

- Semiconductor Detectors
- Gaseous Detectors
- Vacuum Photomultipliers
- Micro Channel Plates (MCP)
- Drift Chambers

The HV-PANDA (High Voltage Positive And Negative Double-width AMC) is an AMC board designed as MTCA.4 carrier. The board houses four different High Voltage (HV) channels that are inherited from the widespread and well-known CAEN VME technology.

The HV modules can be configured with different output ratings and polarity, ranging from 500V to 6kV and from 1.5W to 7W.

The HV channels have a floating return per pair of channels, rated up to $\pm 20V$ with respect to Protective Earth (PE).

Semiconductor detectors, gaseous detectors, vacuum photomultipliers, MCPs, silicon and germanium detectors as well as drift chambers are typical fields of application of such rated HV channels.

Each HV channel has a nominal voltage

accuracy better than 0.5 per mil of Full-Scale (FS) and a ppm-level peak-to-peak output voltage ripple.

The current and voltage limits can be changed real-time by the user as well as the behavior of the channels when the current limit threshold is exceeded; the module can switch off or can continue to operate in current-source mode.





The ramp speed can be configured with a 1 V/s resolution and can range from 1 V/s to 500 V/s.

Output voltage and current digital readbacks are also accessible by the user with a resolution of 0.01% of the FS value.

The module communication is performed through FAT PIPE using the PCI-e 1x standard and provides interconnection between the CPU unit and the High Voltage channels.

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 Electronic Instrumentation
-  FMC & MTCA.4 – MicroTCA for Physics

CAEN ELS s.r.l.

via Vetràia, 11
55049 - Viareggio (LU)
Italy

Phone +386 (0)5 7313 585
Fax +386 (0)5 7313 587

info@caenels.com
www.caenels.com



www.caenels.com



Bring the widespread and well-known CAEN VME High Voltage module technology to the MTCA platform

The HV-PANDA provides also the infrastructure for management of optional Rear Transition Module (RTM) board. Zone 3 connections are carried according to DESY guidelines for Digital uRTM – Class D1.1

Please check the MTCA.4 section on the website www.caenels.com in order to check for news, updates and additional information on the HV-PANDA modules and other MTCA.4 products.

Technical Specifications	HV-PANDA	
Board Size	Full-Size	
Number of HV Channels	4	
AMC Board Type	PICMG - AMC.0 R.2	
Output Voltage Rating	6kV@6W 4kV@7W 500V@1.5W	
Polarity	Positive or Negative (Factory-selectable)	
RTM Support	Yes	
High-Voltage Return	Floating (per pair of channels) ±20V to PE	
Nominal Voltage Accuracy	< 0.05 %	
Output Voltage Ripple @ max P _{OUT}	up to 4 kV up to 6 kV	< 3 ppm _{PK-PK} /FS < 4 ppm _{PK-PK} /FS
Voltage/Current Readback Accuracy	< 0.05 %	
Voltage/Current Readback Resolution	0.01 %	
Ramp Slew Rate	from 1 to 500 V/s	
Ramp Slew Rate Step Size	1 V/s	
Stand-by Voltage Set Resolution	1 % of FS	
Current Limit Value Accuracy	< 4 % of FS	
Output Current Threshold Behaviour	Switch-off Current-source mode	
Output Voltage Connectors	SHV-type	



HV-PANDA – side view

Ordering Options

HVPANDA6KPXA	HVPANDA6KP	HV-PANDA - 4-channel HV Full-size AMC Board (6kV@6W channel) - Positive polarity
HVPANDA6KNXA	HVPANDA6KN	HV-PANDA - 4-channel HV Full-size AMC Board (-6kV@6W channel) - Negative polarity
HVPANDA4KPXA	HVPANDA4KP	HV-PANDA - 4-channel HV Full-size AMC Board (4kV@7W channel) - Positive polarity
HVPANDA4KNXA	HVPANDA4KN	HV-PANDA - 4-channel HV Full-size AMC Board (-4kV@7W channel) - Negative polarity
HVPANDA05PXA	HVPANDA05P	HV-PANDA - 4-channel HV Full-size AMC Board (500V@1.5W channel) - Positive polarity
HVPANDA05NXA	HVPANDA05N	HV-PANDA - 4-channel HV Full-size AMC Board (-500V@1.5W channel) - Negative polarity

Beamline Electronic Instrumentation

MicroTCA and FMC



CAEN EL S.r.l.
via Vetràia 11
55049 – Viareggio (LU)
Italy
www.caenels.com
info@caenels.com





Beamline Electronic Instrumentation

MicroTCA FMC



CAENels
Gear For Science

GUIDANT
#604 DNEX,
160, Alphacity 1-ro,
Suseong-gu, Daegu,
42250 KOREA
www.guidant.co.kr
guidant@guidant.co.kr