HV-PANDA

HV Positive And Negative Double-width AMC

CAENels
Gear for Science

AMC - ADVANCED MEZZANINE CARD

User's Manual

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Document Revisions

Document Revision	Date	Comment
0.1	January 28th 2015	First Release
1.0	September 20th 2015	Sections added and modifications
1.1	May 3rd 2018	Typo errors fixing
1.2	November 23rd 2022	Added UKCA compliance logo
2	August 8th 2024	Updated address and revision numbering

Safety information - Warnings

CAEN ELS will repair or replace any product within the guarantee period if the Guarantor declares that the product is defective due to workmanship or materials and has not been caused by mishandling, negligence on behalf of the User, accident or any abnormal conditions or operations.

Please read carefully the manual before operating any part of the instrument

WARNING

Do NOT open the boxes

CAEN ELS s.r.l. declines all responsibility for damages or injuries caused by an improper use of the Modules due to negligence on behalf of the User. It is strongly recommended to read thoroughly this User's Manual before any kind of operation.

CAEN ELS s.r.l. reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.

Disposal of the Product

The product must never be dumped in the Municipal Waste. Please check your local regulations for disposal of electronics products.

Read over the instruction manual carefully before using the instrument.
The following precautions should be strictly observed before using the device:

WARNING

- Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in this manual.
- Do not use the device if it is damaged. Before you use the device, inspect the instrument for possible cracks or breaks before each use.
- Do not operate the device around explosives gas, vapor or dust.
- Always use the device with the cables provided.
- Turn off the device before establishing any connection.
- Do not operate the device with the cover removed or loosened.
- Do not install substitute parts or perform any unauthorized modification to the product.
- Return the product to the manufacturer for service and repair to ensure that safety features are maintained

CAUTION

- This instrument is designed for indoor use and in area with low condensation.

The following table shows the general environmental requirements for a correct operation of the instrument:

Environmental Conditions	Requirements
Operating Temperature	0°C to 50°C
Operating Humidity	30% to 85% RH (non-condensing)
Storage Temperature	-10°C to 60°C
Storage Humidity	5% to 90% RH (non-condensing)

1. Introduction

This chapter describes the general characteristics and main features of AMC HV-PANDA Advanced Mezzanine Card.

1.1 AMC HV-PANDA Overview

The CAEN ELS AMC HV-PANDA is a standard Double-Width Full-Size (Height) Advanced Mezzanine Card (AMC) board that hosts 4 High Voltage power supply modules with paired floating ground returns. It is mechanically and electrically compliant to the AMC.0 R2.0 standard with the modifications required by MTCA.4 Revision 1.0 (PICMG AMC.0 R2.0 "Advanced Mezzanine Card Base Specification" and PICMG Specification MTCA.4 Revision 1.0 "MicroTCA Enhancements for Rear I/O and Precision Timing") and follows DESY (Deutsches Elektronen-Synchrotron) recommendations for Rear Transition Modules (RTM) connections version D1.1.

The board hosts up to four (4) CAEN High Voltage (HV) modules which are available in ranges from 500V up to 6kV, both positive and negative polarity, and currents up to 3mA for a maximum output power of 7 Watts. Every pair of channels shares a common ground return that is allowed to float up to ±120 V (factory limited to ±15 V for safety reasons).

Each channel has an independent dry interlock available through a connector on the AMC front panel. The individual interlock inputs are referred to the AMC board ground and can be factory configured to work with OC pins or active controllers that are 5V TTL compatible. On the AMC front panel is also available a global dry interlock, whose ground is allowed to float up to ±24 V, that acts on all 4 high voltage channels simultaneously.

An auxiliary +12V power input connector is available on the front panel to provide the required current to the HV channels when the AMC card is used in conjunction with a power demanding RTM board.

Front panel LEDs provide information on board operational conditions and HV channels status: voltage polarity, over-current , channel ON/OFF.

A metallic shield on Component Side 1 and two plastic covers on Component Side 2 have the function of protect the user from inadvertent contact with the internal electronics that could be floating up to ±120 V.

The AMC board transfers data on the MTCA backplane by means of a PCI Express 1.0 x1 communication link on port 4 and a Gigabit Ethernet connection on port

0. Ports 17 to 20 are fully populated with MLVDS transceivers to allow the user to provide triggering signals for HV channels or RTM synchronization.

The micro-USB port on the front panel provides a means to slowly communicate with both FPGA and AMC Module Management Controller (MMC) and can be used for debugging and monitoring purposes.

1.2 Device Description

Both sides and the front view of the AMC HV-PANDA can be seen on the following **Figure 1**, **Figure 2** and **Figure 3**.

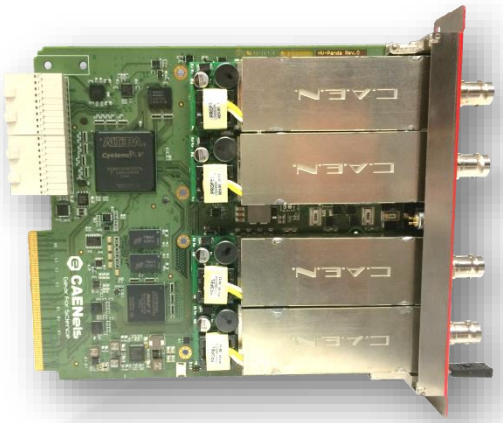

Figure 1: AMC HV-PANDA
Component side 1

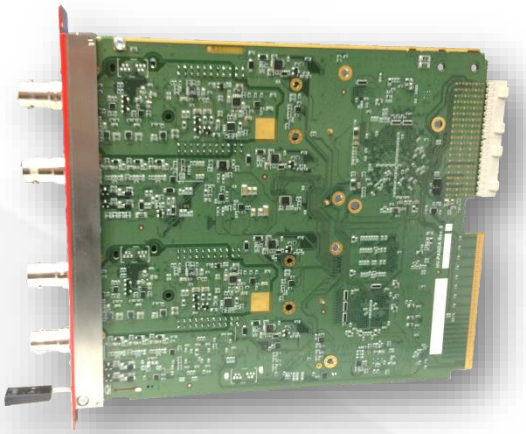

Figure 2: AMC HV-PANDA
Component side 2

Figure 3: AMC HV-PANDA front view

The AMC HV-PANDA can be subdivided into the following building blocks:

- the HV channel;
- the HV digital and analog control logic and isolation section;
- the interlock management section;
- the digital section that communicates on the MTCA backplane;
- the Module Management section as required by AMC.0 R2.0 specification;
- the power supply part.

The block diagram of the whole device can be seen on the **Figure 4**.

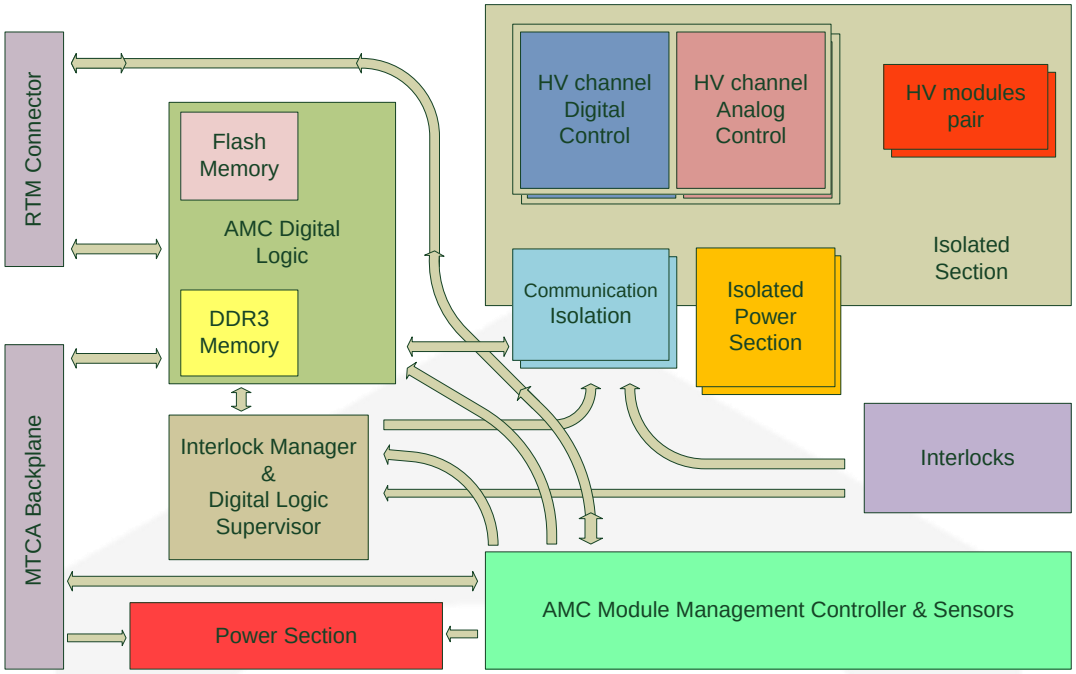

Figure 4: AMC HV-PANDA block diagram

The HV modules are treated as mezzanine modules, they host the voltage multiplication section and are responsible for providing all monitoring and control signals to the analog and digital control electronics that resides on the AMC board. The HV control logic reads relevant informations from the modules and takes immediate actions according to informations provided by the AMC digital logic.

Different HV modules can be mounted on the AMC HV-PANDA board according to the following table. Both positive and negative polarity are available.

Voltage / Current rating	*Typical application example*
6 kV / 1 mA	*Micro-channel Plates, Drift Chambers*
4 kV / 3 mA (9 W MAX)	*Photomultipliers, Drift Chambers, Silicon & Germanium Detectors*
500 V / 3 mA	*Semiconductor devices, Diamond Detectors*

Interlock signals act on the HV control logic as well as on the HV channel itself to provide additional security. The same interlock information is provided to the Interlock manager that informs the AMC Digital logic of the anomalous operational state.

AMC Digital logic interfaces the board to the MTCA backplane. It communicates with a CPU board inside the MTCA chassis using a PCI-e gen.1 x1

interface and optionally a Gigabit Ethernet link. This sections conveys the user instructions to the HV digital section and provides a feedback about the channels status. The AMC board includes a Flash memory module that can also be used to store user defined informations and a DDR3 memory (up to 4Gb) to accomodate a computation demanding RTM board. The RTM is linked to the AMC Digital logic by means of two multi-gigabit links and LVDS lines according to DESY D1.1 RTM connection recommendations.

The Module Management Controller (MMC) is fully compliant with *"PICMG AMC.0 R2.0"* specification with the additional requirements as per *"PICMG Specification MTCA.4 Rev.1.0"* and all other relevant PICMG specifications. The HV-PANDA board relies on DESY MMC code that is proven to provide excellent interoperability capabilities when boards from different vendors are mixed in the same MTCA chassis.

The Power Supply section converts the Payload Power coming from the MTCA backplane (+12V) to the voltage levels required by the AMC ground referred digital section (+3.3V, +2.5V, +1.8V, +1.5V and +1.1V), by the HV bulk power section (±12V) and by the floating electronics (+5V, +7.5V and -5.5V).

2. Quick Introduction to the MTCA Environment

The following will be a brief introduction to the MTCA environment to provide the user with the basic knowledge and terminology that will be used throughout the following sections. If the user is already familiar with the MTCA system he can proceed to the following chapter.

2.1 Glossary

AMC	Advanced Mezzanine Card, if not specified may refer to both AMC.0 or AMC.4 boards.
CU	Cooling Unit, a separate entity in the MTCA system responsible for cooling the boards in the chassis.
MCH	MicroTCA Carrier Hub. Is the board responsible for : - managing the system boards by means of the MCMC controller on the IPMB-x busses; - providing connectivity options between AMCs on multiple Ports; - providing clock distribution.
PM	Power Module. Board responsible for providing Payload and Management power to the other modules.
Slot	The location reserved for a module, whether it is an AMC, MCH, PM or CU, that comprises the Connector and the Card Guides.
MCMC	MicroTCA Carrier Management Controller is the required management to interface to AMC MMC via IPMB-L bus and to CU and PM EMMCs via IPMB-0.
MMC	Module Management Controller is the required management to communicate with the MCMC and provides information about operational status and requirements of the AMC on which it resides.
IPMB	Intelligent Platform Management Bus, according to IPMI specification and PICMG extensions.

Hot-Swap Handle	Hand grip that provides user interface that initiates the hot-swap sequence and allows module removal from the chassis.
Module LEDs	Leds required by AMC.0 R2.0 standard. 3 Leds are required: - BLUE LED: indication of hot-swap and communication status; - LED 1: red color, provides indication of faults; - LED 2: green color, indicates *"in service"* status.
Logic GND	The reference potential for logic signals and power levels
Shelf GND	The electrical potential of the MTCA chassis metal frame
Payload Power	12V power provided by the PM
Management Power	3.3V power for board management section

Additional terms are available in the *"Glossary"* section of the relevant PICMG specification.

3. Safety and Installation

Please read carefully this general safety and installation information before using the product.

3.1 General Safety Information

This section contains the fundamental safety rules for the installation and operation of the system. Read thoroughly this section before starting any procedure of installation or operation of the product.

Safety Terms and Symbols on the Product

These terms may appear on the product:

- **DANGER** indicates an injury hazard immediately accessible as you read the marking;
- **WARNING** indicates an injury hazard not immediately accessible as you read the marking;
- **CAUTION** indicates a hazard to property including the product.

3.2 Initial Inspection

Prior to shipment this system was inspected and found free of mechanical or electrical defects. Upon unpacking of the system, inspect for any damage, which may have occurred in transit. The inspection should confirm that there is no exterior damage to the system such as broken knobs or connectors and that the front panels are not scratched or cracked.

Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify CAEN ELS d.o.o. service personnel.

3.3 Injury Precautions

This section contains the fundamental safety rules for the installation and operation of the system in order to avoid injuries.

3.3.1 Caution

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture and intended use of this equipment and may impair the built-in protections within.

CAEN ELS d.o.o. shall not be liable for user's failure to comply with these requirements.

To avoid electrical shock or fire hazard, do not apply a voltage to a load that is outside the range specified for that load.

Do Not Operate Without Covers.

To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Do Not Operate in Wet/Damp Conditions.

To avoid electrical shock, do not operate this product in wet or damp conditions.

Do Not Operate in an Explosive Atmosphere.

To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Do Not Operate With Suspected Failures.

If you suspect there is damage to this product, have it inspected by qualified service personnel.

3.4 Input Ratings

Do not use DC supply which exceeds the input voltage rating of this instrument. MTCA standards requires a fixed DC voltage source of +12V for bulk power and +3.3V for management power, refer to the relevant standard for further informations.

For safety reasons, the supply voltage fluctuations should not exceed above voltage range.

3.5 Output Connectors

Do not plug or unplug output SHV connectors when HV power modules are on and the power units are regulating current on the electrical load.

3.6 Live Circuits

Operating personnel must not remove the AMC HV-PANDA front and rear covers nor the HV modules. No internal adjustment or component replacement is allowed to non-CAEN ELS d.o.o. personnel.
In order to avoid injuries, always disconnect power plugs, discharge circuits and remove external voltage source before touching components (wait 5 minutes at least).

3.7 Part Replacement and Modifications

Parts substitutions and modifications are allowed by authorized CAENels d.o.o. service personnel only.

3.8 Installation Instructions

The AMC HV-PANDA board shall be installed in a MTCA.4 compliant chassis capable of housing an AMC double-width full-height module, it is possible to provide a MTCA.0 compatible board if needed. The MicroTCA Carrier Hub (MCH) used shall be able to support the PCI-e link on port 4 and optionally a Gigabit Ethernet link on port 0.

Follow these instructions in order to correctly install the AMC HV-PANDA board in a Double-width capable MTCA chassis or ATCA carrier board.

3.8.1 Installation in a MTCA.4 chassis

The HV-PANDA is an AMC (Advanced Mezzanine Card) specifically designed to comply with all MTCA.4 (MicroTCA for physics) requirements and as such shall be installed in a MTCA.4 compliant chassis. Many chassis variants are available from different vendors with possibly different backplane arrangements for connections on ports 2 and 3. CAEN ELS HV-PANDA does not rely on vendor specific implementations of the backplane allowing the board to be mounted on a broad range of chassis, the only mandatory requirement is the ability of the crate to host Double-Width Full-Size AMC boards.

Locate an available free AMC slot in the MTCA sub-rack. Remove any Card Guide Support Plate (CGSP) located on the immediate right of the AMC slot, if the slot is designed to host Mid-size AMCs remove also any CGSP that might be placed at the left of the slot to be used.
Make sure that the ESD contact on the card guide of the MTCA chassis sub-rack

is in properly working conditions and that the AMC HV-PANDA ESD Strip is not covered and that provides a clean surface for contact.

Pull the AMC module Hot-Swap Handle until it is in the unlocked position.

Insert the HV-PANDA board in the top and bottom card guides of the AMC slot and slide the card fully in until the edge connector is fully mated to the MTCA backplane connector (see **Figures 2.1** and **2.2**). If the board is correctly inserted into the MTCA chassis the extended face plate of the AMC front panel shall be almost in contact with the sub-rack retention interface and allow the front panel screws to be locked to the chassis.

Do not force the AMC card in the chassis as this may result in damage to the board. If difficulty arises in fully inserting the board into the chassis make sure it is correctly inserted in both the card guides of the sub-rack, if so remove it from the slot and check for any possible obstruction coming from the card guides or nearby struts.

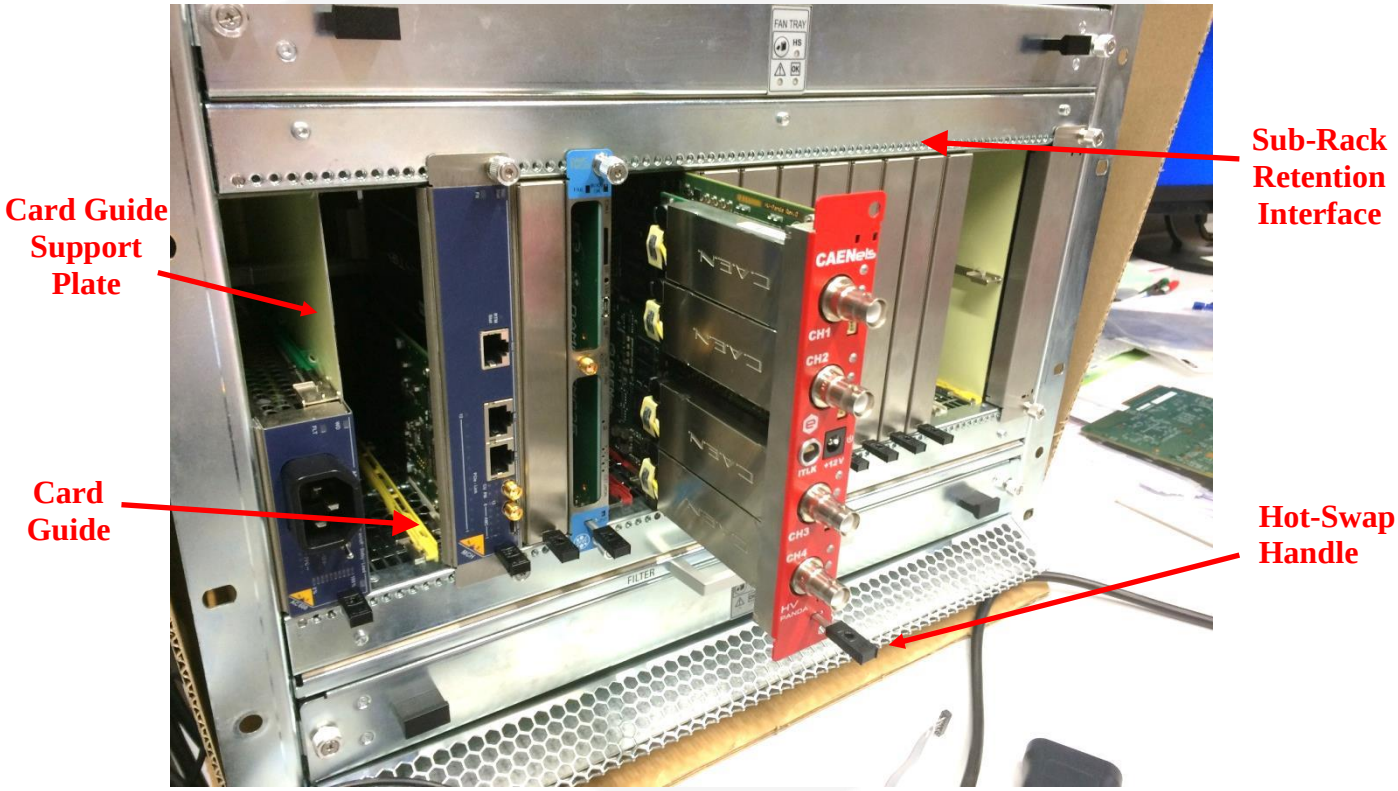

Figure 2.1 : Insertion of the AMC card in the MTCA chassis

Figure 2.2 : AMC fully inserted in the MTCA chassis

3.8.2 Installation in a MTCA.0 chassis or ATCA carrier

Please note that the AMC HV-PANDA has been designed to be fully compatible with AMC.0 R2.0 specification and following modifications stated in MTCA.4 Rev. 1.0 specification. The addition of the RTM connector does not allow the AMC HV-PANDA to fit in a MTCA.0 chassis or ATCA carrier board without removing the connector itself. The ATCA carrier board shall support Double Cutaway Bays.

If the board needs to be used in a MTCA.0 chassis or ATCA carrier please contact CAEN ELS d.o.o. personnel for further advices.

3.9 Ground Connections

For safety and performance reasons the MTCA standard requires the presence of two separate ground connections, a Logic GND that is the reference potential for the Payload Power and the Management Power and a Chassis GND that is connected to the MTCA chassis and all the AMCs front panels. The AMC HV-PANDA board adds two other reference voltage levels to this set, one for every pair of HV modules, that represent the zero potential for the measurement of the high voltage output.

The two HV ground potentials are directly accessible on the outer shield of the SHV and for safety reasons are not allowed to float more than ±15V (insulation guaranteed by design can reach up to ±120V) respect to Logic GND by means of a voltage suppressing electronic. Do not actively drive the ground level of the HV channels as this may result in damage to the HV-PANDA board. A detailed sketch of the grounding connections is depicted in **Figure 5**.

The return current path is always established through the cable shield.

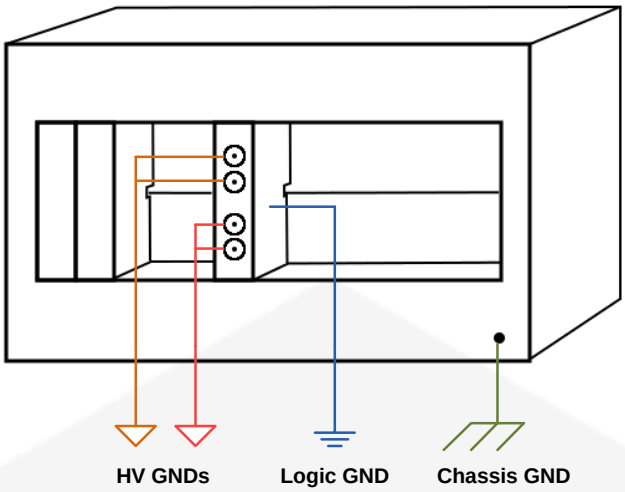

Figure 5: Grounding Connections

4. Controlling the HV-PANDA

4.1 Digital Interface

The HV-Panda communicates through the backplane using PCI-express gen. 1 x1 on the Fat Pipe first lane (AMC port 4 Fabric D to MCH 1).

The board is controlled using a proprietary user space driver provided in the User's CD. The HV-Panda can also be operated using the DESY "pcieuni" driver in conjunction with the 'panda.map' file that is provided in appendix and also in the User's CD.

4.2 Graphical User Interface

The HV-Panda GUI requires superuser privileges to be operated.

The Graphical interface provides easy access to all HV-Panda functionalities and presents itself as depicted in Figure 7.

Figure 7: HV-PANDA GUI

The 'Enable/Disable' button allow the user to enable or shut down the HV channel, while the 'V set' text field defines the desired output voltage.
The 'V rdbk' gives information about the output voltage measured by the channel providing readback informations.
'Current' field provides information regarding the output current provided by the channel to the load.
'Ramp down and ramp up' allow the user to slow down or speed up the time necessary to reach the defined set-point or to shut down the channel.
The "Leds" on the bottom of the GUI provide visual indication of the status of the channel and, in the case of the overcurrent, are redundant to what is provided by the actual leds located on the front panel of the module.
If one of the interlocks is active the according led will turn red and the module will be shut down and not allowed to ramp up again until the interlock condition is removed.

Figure 8: HV-PANDA GUI with channel 3 interlock active

4.3 HV-Panda Console

The HV Panda can also be operated by a command line console.
By launching the panda-console.py executable the user can have access to all the functionalities of the board already described in the Graphical interface section.

5. Ordering Options

The ordering codes of the **AMC HV-PANDA** are the following:

Ordering Code	Product Description
HVPANDA6KPXA	HV-PANDA - 4-channel HV Full-size AMC Board (6kV@6W per channel) - Positive polarity
HVPANDA6KNXA	HV-PANDA - 4-channel HV Full-size AMC Board (-6kV@6W per channel) - Negative polarity
HVPANDA4KPXA	HV-PANDA - 4-channel HV Full-size AMC Board (4kV@7W per channel) - Positive polarity
HVPANDA4KNXA	HV-PANDA - 4-channel HV Full-size AMC Board (-4kV@7W per channel) - Negative polarity
HVPANDA05PXA	HV-PANDA - 4-channel HV Full-size AMC Board (500V@1.5W per channel) - Positive polarity
HVPANDA05NXA	HV-PANDA - 4-channel HV Full-size AMC Board (-500V@1.5W per channel) - Negative polarity

6. Technical Specifications

Technical Specifications for the AMC HV-PANDA cards are hereafter presented:

General Technical Specifications	
Board Type	PICMG - AMC.0 R.2 with RTM connector according to PICMG specifications "AMC.0 R2.0 – Advanced Mezzanine Card Base Specification" and "MTCA.4 Revision 1.0 – MicroTCA Enhancement for Rear IO and Precision Timing"
Board Size	Double-Width Full-Size
RTM Supported Type	According to DESY D1.1 specification
Number of HV Channels	4
HV Channels Connectors	SHV

Table 1: General information for the AMC HV-PANDA

6.1 Electrical Specifications

Electrical Specifications	
Output Voltage Rating	6 kV @ 6W 4 kV @ 7W 500 V @ 1.5W
Voltage Polarity	Positive or Negative (factory-selectable)
HV Return	Floating (per pair of channels) ±20V to PE
RTM Support	Yes - Class D1.1
Nominal Voltage Accuracy	<0.05%
Output Voltage Ripple @ max P_{OUT}	<3 ppm_{pk-pk}/FS (up to 4kV) <4 ppm_{pk-pk}/FS (up to 6kV)
Voltage/Current Read-back Accuracy	<0.05%

Voltage/Current Read-back Resolution	0.01%
Ramp Speed	From 1 to 500 V/s
Ramp Speed 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

Table 2: Electrical specifications for AMC HV-PANDA

7. Mechanical Dimensions

The AMC HV-PANDA board complies with the PICMG AMC.0 R2.0 "Advanced Mezzanine Card Base Specification" standard and extension MTCA.4 Revision 1.0 "MicroTCA Enhancement for Rear I/O and Precision Timing". The board is a double-width, full-size AMC card with front panel SHV connectors.

The mechanical dimensions of the AMC board can be found in the following table.

Dimension	*Value*
AMC Form Factor	Double-width, Full-size
Physical Width	148.5 mm
Physical Depth (including SHV)	180.6 mm (199 mm)
Physical Height (with front panel)	28.95 mm

Table 3: Mechanical dimensions

8. Appendix A

HV-Panda MAP file:

```
# name          number of elements      address         size            bar     width   fracbits  signed
VERSION         0x00000001          0x00000000      0x00000004      0x00000000      32        0         0
WATCHDOG        0x00000001          0x00000004      0x00000004      0x00000000      32        0         0
STATUS          0x00000001          0x00000008      0x00000004      0x00000000      32        0         0
CONTROL         0x00000001          0x00000010      0x00000004      0x00000000      32        0         0

CH_POLARITY     0x00000001          0x00000020      0x00000004      0x00000000      32        0         0

CH1_CTRL        0x00000001          0x00000100      0x00000004      0x00000000      32        0         0
CH1_V_SET       0x00000001          0x00000104      0x00000004      0x00000000      32        0         1
CH1_V_MON       0x00000001          0x00000108      0x00000004      0x00000000      32        0         1
CH1_I_MON       0x00000001          0x0000010C      0x00000004      0x00000000      32        0         1
CH1_STATUS      0x00000001          0x00000110      0x00000004      0x00000000      32        0         0
CH1_RAMP_UP     0x00000001          0x00000114      0x00000004      0x00000000      32        0         0
CH1_RAMP_DOWN   0x00000001          0x00000118      0x00000004      0x00000000      32        0         0

CH2_CTRL        0x00000001          0x00000120      0x00000004      0x00000000      32        0         0
CH2_V_SET       0x00000001          0x00000124      0x00000004      0x00000000      32        0         1
CH2_V_MON       0x00000001          0x00000128      0x00000004      0x00000000      32        0         1
CH2_I_MON       0x00000001          0x0000012C      0x00000004      0x00000000      32        0         1
CH2_STATUS      0x00000001          0x00000130      0x00000004      0x00000000      32        0         0
CH2_RAMP_UP     0x00000001          0x00000134      0x00000004      0x00000000      32        0         0
CH2_RAMP_DOWN   0x00000001          0x00000138      0x00000004      0x00000000      32        0         0

CH3_CTRL        0x00000001          0x00000140      0x00000004      0x00000000      32        0         0
CH3_V_SET       0x00000001          0x00000144      0x00000004      0x00000000      32        0         1
CH3_V_MON       0x00000001          0x00000148      0x00000004      0x00000000      32        0         1
CH3_I_MON       0x00000001          0x0000014C      0x00000004      0x00000000      32        0         1
CH3_STATUS      0x00000001          0x00000150      0x00000004      0x00000000      32        0         0
CH3_RAMP_UP     0x00000001          0x00000154      0x00000004      0x00000000      32        0         0
CH3_RAMP_DOWN   0x00000001          0x00000158      0x00000004      0x00000000      32        0         0

CH4_CTRL        0x00000001          0x00000160      0x00000004      0x00000000      32        0         0
CH4_V_SET       0x00000001          0x00000164      0x00000004      0x00000000      32        0         1
CH4_V_MON       0x00000001          0x00000168      0x00000004      0x00000000      32        0         1
CH4_I_MON       0x00000001          0x0000016C      0x00000004      0x00000000      32        0         1
CH4_STATUS      0x00000001          0x00000170      0x00000004      0x00000000      32        0         0
CH4_RAMP_UP     0x00000001          0x00000174      0x00000004      0x00000000      32        0         0
CH4_RAMP_DOWN   0x00000001          0x00000178      0x00000004      0x00000000      32        0         0


SPI_CONTROL         0x00000001      0x00002900      0x00000004      0x00000000      32        0         0
SPI_STATUS          0x00000001      0x00002904      0x00000004      0x00000000      32        0         0
SPI_STATUS_CLEAR    0x00000001      0x00002908      0x00000004      0x00000000      32        0         0
SPI_DATA_0          0x00000001      0x00003000      0x00000004      0x00000000      32        0         0
SPI_DATA_1          0x00000001      0x00003004      0x00000004      0x00000000      32        0         0
SPI_DATA_2          0x00000001      0x00003008      0x00000004      0x00000000      32        0         0
SPI_DATA_3          0x00000001      0x0000300C      0x00000004      0x00000000      32        0         0
SPI_DATA_4          0x00000001      0x00003010      0x00000004      0x00000000      32        0         0
SPI_DATA_5          0x00000001      0x00003014      0x00000004      0x00000000      32        0         0
SPI_DATA_6          0x00000001      0x00003018      0x00000004      0x00000000      32        0         0
SPI_DATA_7          0x00000001      0x0000301C      0x00000004      0x00000000      32        0         0
SPI_DATA_8          0x00000001      0x00003020      0x00000004      0x00000000      32        0         0
SPI_DATA_9          0x00000001      0x00003024      0x00000004      0x00000000      32        0         0
```