A1515B

16/14 Channel 1-1.4kV (1 - 3 mA) Full Floating Channel Dual Range Boards for Quadruple and Triple GEM detectors

14 / 16	1000 V / 1400 V	1 / 0.1 mA or 3 / 0.3 mA selectable
No. of Channels	Max Output V	Max Output I

The A1515B is a 5 TE single-width high-voltage board for Triple, Quadruple, Cylindrical GEM and Vertex detectors, available in 14- or 16-channel variants. Its independently programmable, fully floating channels are insulated up to 5 kV and provide 0 ÷ 1 kV, 0 ÷ 1.3 kV or 0 ÷ 1.4 kV output, depending on model. Software-selectable current ranges reach 1 mA or 3 mA, with monitoring resolution down to 100 pA. Features include adjustable voltage ramping, zero-current function, protection and interlock logic; Radiall 52-pin or REDEL 51-pin connectors are available.

CAEN
Tools for Discovery

Overview

Product Highlights

- 16 independently controllable High Voltage channels
- Dual range current:
  - High Power: 1 mA or 3 mA (1 nA or 4 nA Current monitor resolution)
  - High resolution: 1 mA or 3 mA (1 nA or 4 nA Current monitor resolution)
- Floating Type: Full Floating (insulated up to 5 kV)
- Under/over-voltage alert, overcurrent and max. voltage protection
- Software Tools for easy channel management
- 1 kV/1.3 kV/1.4 kV maximum output voltage
- Radiall 52 pin or Redel 51 pin connectors (see Ordering Options)
- Zero current function
- Interlock logic for unit enable

Product Description

AT A GLANCE	
No. of Channels	**14 / 16**
Max Output V	**1000 V / 1400 V**
Max Output I	**1 / 0.1 mA or 3 / 0.3 mA selectable**
Vset/Vmon Resolution	**20 mV**
Iset/Imon Resolution	**Iset: 20 nA Imon: 1 / 0.1 nA**
Max. Ramp Up/Down Rate	**100 V/s**

The A1515B family are single width boards (5 TE wide) that house 14 or 16 (see Ordering Options) independent, Full Floating high voltage individual channels. Which are perfectly suited for GEM detectors.

The A1515B is supplied in different versions equipped with Radiall or REDEL multipin connector.

Consult our connectors reference page for technical information. As an option, it is possible to request that the REDEL connector be mounted on any version of the A1515B. The following table shows the available models:

Model	Max V	Max I	# of ch	Features
A1515BTG	1 kV	1/0.1 mA	14	For Triple GEM chambers
A1515BQG	1 kV	1/0.1 mA	16	For Quadruple GEM chambers
A1515BQGA	1 kV	1/0.02 mA	16	For Quadruple GEM chambers
A1515BCG	1.3 /1 kV	1/0.1 mA	14	For Triple Cylindrical GEM chambers
A1515BTGHP	1/0.6 kV	3/0.3 - 1/0.1 mA	14	For Triple GEM chambers (high rate)
A1515BV A1515BVR	1.4 kV	1/0.1 mA	16	For Vertex detector
A1515B	1 kV	1/0.1 mA	16	Non Stacked channels

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The channels have floating return, independent one from another, insulated up to 5 kV (Full Floating channel). The output voltage range is 0 ÷ 1 kV or 0 ÷ 1.3 kV with 20 mV set and monitor resolution.

The output channels offer dual current ranges (software selectable)**:**

For A1515BTG/A1515BQG /A1515BCG/A1515B	
High Power: 0 ÷ 1 mA	**High Resolution:** 0 ÷ 100 µA
I set resolution: 20 nA	I set resolution: 20 nA
I mon resolution: 1 nA	I mon resolution: 100 pA

For A1515BTGHP:	
High Power: 0 ÷ 3 mA	**High Resolution:** 0 ÷ 300 µA
I set resolution: 50 nA	I set resolution: 50 nA
I mon resolution: 4 nA	I mon resolution: 400 pA

For A1515BV/A1515BVR:	
High Power: 0 ÷ 1 mA	**High Resolution:** 0 ÷ 100 µA
I set resolution: 20 nA	I set resolution: 20 nA
I mon resolution: 1 nA	I mon resolution: 100 pA

Independently programmable for each channel:

Output voltage:	0 ÷ 1/1.4 kV	step: 50 mV
Current limit (Iset):	0 ÷ 1 mA/100 µA 0 ÷ 3 mA/300 µA	step: 20 nA step: 50 nA
V Ramp up/down:	1 ÷ 100 V/s	Step: 1 V/sec
TRIP parameter	0 ÷ 999.9 s; 1000 s = Infinite	Step: 0.1 s

Five special version of the board (**A1515BVTG/QG/CG/TGHP/V/VR**) have been designed specifically for Gas Electron Multiplier (GEM) detectors (Triple, Triple designed for high rate, Quadruple, Cylindrical GEM detectors and Vertex detectors). These boards have the channels internally stacked in order to power up 2 independent Triple GEM / Quadruple GEM / Triple Cylindrical GEM chambers. This configuration permits to avoid any possible issue related to the detector discharge and avalanche effects and gives the possibility to fine tune the voltage on each detector layer easily.

A CAEN SY4527 mainframe equipped with 16 boards can power 32 detectors and the high maximum current available on each channel allows managing the high segmentation of these detectors in the best way. The high max current per channel feature designed into these boards is beneficial for managing the high segmentation of GEM detectors, as it will allow discrete detector layers to perform even in the event of a short. In addition, the 2-quadrant 100 µA low current range allows a 100 pA current monitoring resolution which allows the monitoring of ion backflow currents and also to perform real-time detector diagnostics.

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In the GEM dedicated version of the A1515B in the overcurrent condition causes the following actions:

· A1515B or A1515TG/QG/CG/TGHP/V/VR (not in GEM-mode): the channel is switched off. Output voltage will drop to zero at Ramp-down rate. If TRIP is set to “constant current mode”, the channel behaves like a current generator.

· A1515BTG/QG/CG/TGHP/V/VR (in GEM-mode): all stacked channels are switched off, following a programmed sequence. Output voltages will drop to zero at Ramp-down rates. If TRIP is set to “constant current mode”, the channel behaves like a current generator. The channels can be enabled or disabled through the Interlock logic. The voltage ramp rates may be set independently for each channel.

Moreover, for board equipped with Radiall 52 pin connector the following accessories are available: Mate cable connector (Mod. A996) and relevant insertion/extraction tool (Mod. A995).

CAEN provides a complete software range to control, monitor and configure its Power Supply products.

- **GECO2020 GEneral COntrol Software**
- **CAEN HV Wrapper Library,**
- **HiVoCS web tool**
- **OPC Server for CAEN Power Supplies**
- **EPICS Service**

These tools, which support the most used operating systems, spread from low level libraries (**CAEN HV Wrapper Library**), to be used as a source for customer designed software, to the WEB interface (**HIVOCS**) available on each mainframe, up to the all-inclusive Control Software (**GECO2020**) with user friendly graphical interfaces, to meet any application need.

Advanced control via OPC Server (**CAEN OPC Server**) and EPICS (**EPICS IOC**) is supported, to easily include CAEN power supplies within existing setups featuring such standards.

- **All tools are available for free download**.

Universal Multichannel Power Supply Systems (Mainframes)

Universal Multichannel Power Supply Systems, or Mainframes, are modular systems designed to house and control High Voltage (HV) and Low Voltage (LV) boards, providing power for particle detectors and their associated electronics in standard 19” racks. CAEN offers four mainframe versions:

- **SY4527:** A large experimental system. This 19” wide / 8U high mainframe can house **up to 16 HV/LV boards**. It offers a power output from 600W up to a maximum of **4200W**, depending on installed Power Supply Units and display type. Local control is optionally available via a 10.4” or 5.7” LCD Touchscreen.
- **SY5527:** A more compact laboratory version. This 19” wide / 4U high mainframe can house **up to 6 HV/LV boards**. Its power output ranges from 600W up to a maximum of **1800W**, depending on Power Supply Units. Optional local control is available via a 5.7” LCD Touchscreen.
- **SY4527LC:** A cost-effective alternative with a shorter depth (~20cm compared to standard SYx527). This 19” wide / 8U high mainframe houses **up to 10 boards** and includes a **600W power supply**. It does not include an LCD display. It is fully compatible with SY4527 and SY5527 boards.
- **SY5527LC:** Also a cost-effective, shorter depth alternative (~20cm compared to standard SYx527). This 19” wide / 4U high mainframe houses **up to 4 boards** and includes a **400W power supply**. It does not include an LCD display. It is fully compatible with SY4527 and SY5527 boards.

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All systems offer modular design for simplified upgrades and maintenance and can be controlled remotely via Ethernet.

Technical Specifications

No. of Channels	16 or 14 (Floating Return) A1515BTG, A1515BQG, A1515BCG, A1515BTGHP: channel are grouped in two “complex” channels

Output Voltage

- 0÷1 kV
- 0÷1.3 kV (for 2 channels of A1515BCG)
- 0÷1.4 kV (x A1515BV)

Polarity	Floating 5 kV

Max. Output Current

- A1515B – A1515BTG – A1515BQG – A1515BCG: 1 mA (700 mW)
- A1515BTGHP: 3 mA on 600 V channels
- A1515BV: 1.4 kV / 1 mA / 1 W

Voltage Set Resolution	20 mV
Voltage Monitor Resolution	20 mV
Current Set Resolution	20 nA

Current Monitor Resolution

High Power:	1 nA	A1515B – A1515BTG – A1515BQG – A1515BCG – A1515BV
	4 nA	A1515BTGHP
High Resolution:	100 pA	A1515B – A1515BTG – A1515BQG – A1515BCG – A1515BV
	400 nA	A1515BTGHP

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Technical Specifications (continued)

VMAX software	0÷1 kV or 0÷1.3 kV (A1515BCG), settable for each channel or 0÷1.4 kV (x A1515BV)
VMAX software resolution	1 V
Ramp Up/Down	1÷100 Volt/sec, 1 Volt/sec step, settable for each channel
Trip	Max. time an “overcurrent” is allowed to last (seconds); common to all channels in a “complex channel”. A channel in “overcurrent” works as a current generator; output voltage varies in order to keep the output current lower than the programmed value. “Overcurrent” lasting more than set value, causes the channel to “trip”. Output voltage will drop to zero at the Ramp-down rate; in this case the channel is put in the off state. *If trip= INFINITE, “overcurrent” lasts indefinitely. TRIP range: 0 ÷ 999.9 s; 1000 s = Infinite. Step = 0.1 s*
Voltage Ripple	• Differential mode: typical < 5 mV; max 10 mV • Common mode: typical < 10 mV; max 15 mV
Voltage Monitor vs. Output Voltage Accuracy	0.2% ± 0.2V ± 50 ppm/°C
Voltage Set vs. Output Voltage Accuracy	0.2% ± 0.2V ± 50 ppm/°C
Imon det vs Output current accuracy	• 0.5% ±5 nA ±50 ppm/°C with output current from 10% to 100% f.s. and constant voltage • 2% ±5 nA ±50 ppm/°C with output current up to 10% f.s. and constant voltage
Imon real vs Current set Accuracy	2% ±100 nA
Power consumption	• 90 W full power for A1515B (16 Ch) • 80 W standby consumer

Maximum output power

- A1515BTG/A1515BQG/A1515BCG: 700 mW per channel
- A1515BTGHP: 1.5 W per 600 V channel
- A1515BV: 1W (1000 V/1 mA)

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Ordering Information

ORDERING CODE	DESCRIPTION
WA1515BCGXAA	A1515BCG – 14 Channel Floating 1.3kV/1kV, 1mA Board for Cylindrical GEM detectors
WA1515BCGXAR	A1515BCGR – 14 Channel Floating 1.3kV/1kV, 1mA Board for Cylindrical GEM detectors
WA1515BQGAXA	A1515BQGA – 16 Channel Floating 1kV,1mA Board for ALICE-TPC GEM, REDEL Conn.
WA1515BQGXAA	A1515BQG – 16 Channel Floating 1kV, 1mA Board for Quadruple GEM detectors
WA1515BQGXAR	A1515BQGR – 16 Channel Floating 1kV, 1mA Board for Quadruple GEM detectors
WA1515BTGHPR	A1515BTGHPR – 14 Channel Floating 1kV, 3mA Board (1,5W max) for Triple GEM detectors
WA1515BTGHPX	A1515BTGHP – 14 Channel Floating 1kV, 3mA Board (1,5W max) for Triple GEM detectors
WA1515BTGXAA	A1515BTG – 14 Channel Floating 1kV, 1mA Board for Triple GEM detectors
WA1515BTGXAR	A1515BTGR – 14 Channel Floating 1kV, 1mA Board for Triple GEM detectors
WA1515BVXAAA	A1515BV – 16 Channel Floating 1.4kV, 1mA Board for Vertex detectors
WA1515BVXAAR	A1515BVR – 16 Channel Floating 1.4kV, 1mA Board for Vertex detectors
WA1515BXAAAA	A1515B – 16 Channel Floating 1kV, 1mA Board
WA1515BXAAAR	A1515BR – 16 Channel Floating 1kV, 1mA Board

1. Ordering codes and descriptions are reproduced from the product record. Availability is confirmed at order entry.

Accessories

A995 — Insertion/extraction tool for A996

A996 — 52 pin cable connector

A1015 — 16 Floating Channel Multipin Radiall to SHV connector Adapter for A1515 board

A1015G — 14/16 Stacked Channel Multipin Radiall to SHV connector Adapter for A1515TG/A1515QG

Related Products

SY4527 — Universal Multichannel Power Supply System / 19”wide, 8U-high (16 slot)

SY4527LC — Universal Multichannel Power Supply System Low Cost / 19”wide, 8U-high (10 slot)

SY5527 — Universal Multichannel Power Supply System / 19”wide, 4U-high (6 slot)

SY5527LC — Universal Multichannel Power Supply System Low Cost / 19”wide, 4U-high (4 slot)

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