

IX256-F2 - 256+2 CHANNEL INTEGRATING ELECTROMETER

Key Features

- 256 fully parallel charge integrators.
- Dynamic range up to 1.5 μA or 350 pC for 256 channels.
- Two auxiliary multirange I-V converter inputs with ranges from 1 μA to 1 mA full-scale range.
- Dose delivery controller with high-speed interlocking.
- Configurable general-purpose digital I/O.
- Fiber optic digital and communication ports.
- Two software configurable solid state relay outputs.
- Ethernet interface with web server UI and JSON API.
- Optional high voltage bias output with loopback verification.



IX256-F2

Typical Applications

- Multi-strip and pixelated detector readout.
- Beam current, position and width measurements readout.
- Dose delivery control using ionization chambers.

PURCHASE OPTIONS

The following options must be specified by the customer at the time of order. Option code suffixes are appended to the part number in the order shown.

OPTION CODE	DESCRIPTION
-X***	Auxiliary high voltage (HV) supply. Positive or negative polarity; 500 V, 1000 V, or 2000 V. Suffix format: -X(P/N)(VV) where P = positive, N = negative, and VV = 05 (500 V), 10 (1000 V), or 20 (2000 V).
-FLT	Flat front panel for use in the Pyramid Nozzle Rack. If not specified, the default bent metal front panel is used.

Examples:

- IX256-F2 – Standard configuration (no HV)
- IX256-F2-XN10 – Includes -1000 V HV supply
- IX256-F2-XP20-FLT – Includes +2000 V HV supply and flat front panel

PRODUCT SPECIFICATION

MECHANICAL

Weight	1.04 kg (2.3 lbs)
Dimensions	197 x 137 x 50 mm (overall approximate; see figures)
Chassis Material	1 mm stainless steel
IP Rating	IP20 (protection against solid objects larger than 12.5 mm; no protection against water ingress)

MICROPROCESSOR

Processor	AM3358 ARM Cortex A8, 1 GHz
Memory	512 MB DDR3 RAM
Storage	32 GB micro-SD card
Operating System	Blackberry QNX real-time OS
Control System	Pyramid IGX modular real-time control system
Software API	Supports HTTP (JSON), WebSockets (JSON), EPICS, and more. See Programmer manual for full details.

256 ANALOG TO DIGITAL CONVERTER

Type	Simultaneous sampling unipolar charge integrator
Resolution	20-bit raw conversion, 32-bit sample averaging
Full-scale Current Ranges	Selectable from 75, 300, 600, 900, 1200, 1500, 1800, and 2100 nA
Full-scale Charge Ranges	Selectable from 12, 50, 100, 150, 200, 250, 300, and 350 pC
Negative Full-scale	-0.4% of the positive full-scale range.
Integration Frequency	Programmable from 1 Hz to 6,000 Hz
Conversion Frequency	Programmable from 1 Hz to 6,000 Hz
Sample Frequency	Programmable from 0.1 Hz to 6,000 Hz
Sample Filter	Block averaging, each conversion into sub-samples
ADC Channels	256 channels divided into four 68-pin VHDCI connectors.

DUAL AUXILIARY ANALOG TO DIGITAL CONVERTER

Type	Bipolar transimpedance amplifier with a simultaneous sampling delta-sigma analog to digital converter
Resolution	18-bit raw conversion, 32-bit sample averaging
Full-scale Current Ranges	Selectable from 1 μ A, 10 μ A, 100 μ A, and 1 mA
Negative Full-scale	Fully bipolar

Analog Bandwidth	15 kHz
Conversion Frequency	Programmable from 1 Hz to 50 kHz
Sample Frequency	Programmable from 0.1 Hz to 50 kHz
Sample Filter	Block averaging, each conversion into sub-samples
ADC Channels	Two separate channels with independent range selection

OPERATING ENVIRONMENT

Temperature	10 to 45°C (optimal range: 15 to 25°C)
Humidity	Less than 70%, non-condensing
Vibration	Less than 0.1g across all axes (0.1 to 100 Hz)
Environment	Clean and dust-free environment

SHIPPING AND STORAGE ENVIRONMENT

Temperature	-10 to 50°C
Humidity	Less than 80%, non-condensing
Vibration	Less than 1g across all axes (0.1 to 100 Hz)

PHYSICAL INTERFACE SPECIFICATION

POWER INPUT (REAR PANEL)

Device Connector	Switchcraft 2.1 mm threaded jack L721
Mating Connector	Switchcraft S761K
Nominal Voltage	24 VDC
Voltage Range	9 - 36 VDC
Maximum Power	25 Watts
Grounding	M3 threaded stud

ETHERNET (REAR PANEL)

Device Connector	Shielded RJ45 Jack
Isolation	Magnetics, HIPOT test up to 1500 Vrms
Speed Rating	10/100 Base-T (IEEE 802.3)

DIGITAL EXPANSION CONNECTOR (REAR PANEL)

Connector	Female 9-pin D-sub connector.
Pin 1	D1, 3.3V bidirectional GPIO, with 20 mA driving capability.
Pin 2	D2, 3.3V bidirectional GPIO, with 20 mA driving capability.
Pin 3	D3, 3.3V bidirectional GPIO, with 20 mA driving capability.
Pin 4	D4, 3.3V bidirectional GPIO, with 20 mA driving capability.
Pin 5	5 VDC power supply output, capable of delivering up to 200 mA.
Pin 6	3.3V I ² C SCL clock output for communication with I ² C devices.
Pin 7	3.3V I ² C SDA data line for bidirectional data transmission.
Pin 8	3.3 VDC power supply output, capable of providing up to 200 mA.
Pin 9	Ground reference for both 3.3V and 5V power supplies.
Shell	Connected to chassis ground.

RELAY CONNECTORS (REAR PANEL)

Two solid-state relays are provided with flexible software-controlled operation. The relays are guaranteed to be commanded open if the device loses power or if the software encounters a fault. However, hardware damage to the relays may still occur, which could prevent them from opening or closing as expected.

Connector	COMBICON style two-row, 8-position terminal block header with male pins.
Fuse	Combined rating of 200 mA at 24 Volts.



Load Voltage	80 V maximum
On Resistance	0.15 Ω typical
Off Resistance	10 ⁹ Ω typical
Open Time	0.06 ms typical, 0.5 ms maximum
Close Time	0.6 ms typical, 5 ms maximum
Pins 1 and 5	24 VDC (fused)
Pins 2 and 6	Ground return for 24 VDC
Pin 3	Relay 1 contact A
Pin 4	Relay 1 contact B
Pin 7	Relay 2 contact A
Pin 8	Relay 2 contact B

FIBER OPTICS (REAR PANEL)

Connector	ST bayonet fiber optic port
Wavelength	820 nm (850 nm compatible)
Baud Rate	DC to 50 MHz
Fiber Compatibility	50/125 μm , 62.5/125 μm , 100/140 μm , and 200 μm Plastic-Clad Silica
Maximum Distance	At least 2000 meters and further at lower data rates
Channel Count	3 transmitters and 3 receivers

OPTIONAL HIGH VOLTAGE BIAS CONNECTORS (REAR PANEL)

These connectors are included only when the IX256 is purchased with the high voltage option.

Two connectors are provided: one for the high voltage output and one optional readback line. The readback allows the IX256 to confirm that the correct voltage is present after the detector load is connected and can also be used to detect whether the cables are properly connected to the detector.

Connector	SHV (coaxial)
Compliance	1-Watt maximum power output
Monitoring	12-bit ADC under software control
Channel Count	One output and one input

AUXILIARY ENVIRONMENTAL SENSOR CONNECTORS (FRONT PANEL)

These two connectors provide the same functionality as the rear 9-pin digital expansion connector but are duplicated and relocated to the front panel for user convenience. They are intended for connecting multiple environmental sensors simultaneously.

Note: general-purpose digital I/O is not available on these connectors.



Connector	Female 9-pin D-sub connector.
Pin 1	No connection.
Pin 2	No connection.
Pin 3	No connection.
Pin 4	No connection.
Pin 5	5 VDC power supply output, capable of delivering up to 200 mA.
Pin 6	3.3V I ² C SCL clock output for communication with I ² C devices.
Pin 7	3.3V I ² C SDA data line for bidirectional data transmission.
Pin 8	3.3 VDC power supply output, capable of providing up to 200 mA.
Pin 9	Ground reference for both 3.3V and 5V power supplies.
Shell	Connected to chassis ground.

AUXILIARY BIPOLAR CURRENT INPUT CONNECTORS (FRONT PANEL)

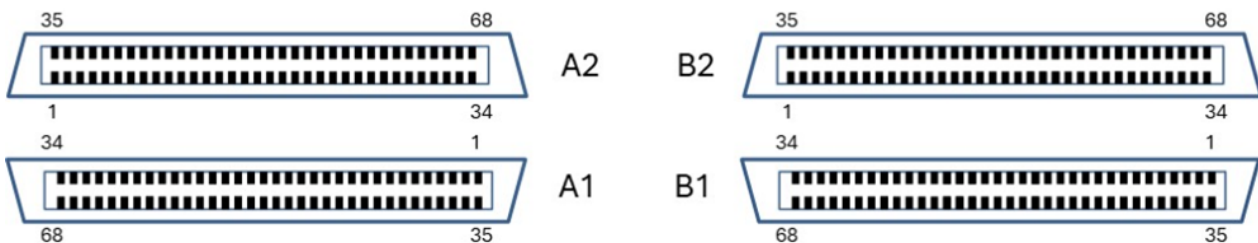
These inputs are suitable for connecting to Pyramid ionization chamber dose planes or other detectors that require bipolar or high current readout.

Connector	BNC (isolated coaxial)
Maximum Current	±1 milliamp
Channel Count	2 BNC inputs

HIGH DENSITY INTEGRATING VHDCI CONNECTORS (FRONT PANEL)

These inputs are suitable for direct pin-to-pin connection to Pyramid ionization chambers with VHDCI connectors and Pyramid MLFC devices using VHDCI screened male to male cables.

Connectors	Four 68-pin VHDCI (Sometimes called SCSI 5)
Contact Material	Gold Plated
Channel Count	64 channels and 4 ground pins per connector



Layout of the Four VHDCI Connectors



MECHANICAL DRAWINGS

