



- **Integrated Accelerator and Ion Source Chassis**
- **High Performance Ground Reference Lens Chassis**
- **Very Low Ripple and Ultra Stable Outputs**
- **Robust Arc and Short Circuit Protection**
- **Designed to Minimize Micro-discharge Events**
- **Optically Isolated Digital Interface**
- **CE Marked & Designed to Meet SEMI S2**

Spellman's FIB Series is an integrated multiple output high voltage power supply specifically designed for focused ion beam applications. It incorporates a high stability accelerator voltage with the floating outputs to drive traditional Ga Ion and Plasma Sources.

An additional Lens Chassis is available, providing the high performance fixed or reversible polarity high voltage lenses required to focus the Ion Beam. Focused Ion Beam is typically used in the semiconductor industry, materials science and in the biological field for imaging, etching and deposition of materials.

The Main Chassis provides an Acceleration voltage up to 35kV, with floating Filament, Extractor and Suppressor outputs, all designed to the exacting performance requirements for FIB applications. The Lens Chassis offers Lens voltages up to 30kV, with fixed or reversible polarity.

All outputs are offered with ultra-low ripple, excellent regulation, stability, temperature coefficient, drift and accuracy specifications.

Customer control of this integrated FIB power supply system is accomplished via a fiber optic or Ethernet interface. All high voltage safety interlocks are of a failsafe hardware based design.

TYPICAL APPLICATIONS

Focused Ion Beam (FIB)
Ion Gun Controller

SPECIFICATIONS

Input Voltage:

+24Vdc, ±5% @ 5.5 amps maximum.
Inrush is <6 amps for 1 second.

Environmental:

Operating Temperature:
+10°C to +45°C ambient for normal operation.
The unit will operate from 0°C but will require an extended warm up period.

Storage Temperature:
-20°C to +60°C

Humidity:
0 to 80% RH, non-condensing

Altitude:
2000 meters ASL at full power. For altitudes above 2000 meters the maximum ambient operating temperature is linearly derated by 1.1°C per 300 meter interval.

FIB Input Power Connector:

2 pin Mate-n-Lok (TE 1-350942-0)

FIB Communication:

Fiber Optics dual channel Avago HFBR- 2524z/1524z. RS-232. Ethernet RJ-45 socket which supports 100BaseTX. When Ethernet port is connected, RS-232 will not work. A Spellman Fiber Optic to RS-232 converter can be ordered, as well as a complete Fiber Optic to USB communication kit.

FIB Vacuum Interlock Connector:

Dual channel Avago HFBR- 2524z (receiver) /1524z (transmitter)

FIB to Lens Modules Interconnection:

The modules are supplied with interconnecting cables for the power and communications. The same kit is used to connect the FIB to the lens module, and, if required, between a lens module and the next.

FIB HV Output Connector:

The main high voltage output is fitted with a custom 4 pole receptacle. A Spellman HV cable assembly, available in different lengths, can be ordered with the unit.

Lenses HV Output Connectors:

The lenses are fitted with Lemo ERA3Y430CTL receptacles. A Spellman 5 meters mating HV cable assembly can be ordered with the units. (See the product manual for additional cables and connectors information)

FIB and LGM Operation:

When the modules are switched on / enabled, all output voltages are automatically set to 0V.

Safety Interlocks:

The vacuum interlock is an optical interlock. When it opens, the power supply is deactivated via relay contacts and will not reactivate until it is enabled through the computer control, even though the interlock may close. The FIB communication remains operational.

The interlock plate is situated around the FIB HV Output connector, and if removed will also disable all outputs.

The individual modules of the HVPS can be enabled and disabled through computer control, provided the appropriate hardware interlocks are enabled.

Weight:

Main chassis: 67.46 lbs. (30.6 kg)
Lens chassis: 27.56 lbs. (12.5 kg)

Regulatory Approvals:

Compliant to EEC Low Voltage Directive. UK Conformity Assessed. RoHS Compliant.

OUTPUTS SPECIFICATIONS

MODULE	FIB				LGM
	Accelerator	Filament	Suppressor	Extractor	Lens
Output Voltage	0 to 35kV, referenced to ground	0 to 5V referenced to Accelerator, current controlled	-2kV to +2kV referenced to Accelerator	0 to -15kV referenced to Accelerator	30kV max, referenced to ground, positive, negative or bipolar. (see Lens Module options table)
Output current - max	30µA	5A	30µA	400µA	30µA or 50µA (see config. table)
Output current limit	30µA	current controlled	30µA	programmable 8 bit, 0 to 400µA	30µA or 50µA (see config. table)
Output Absolute Accuracy	100V	5mA	20V	100V	100V
Load Regulation	±0.01% of max for 0 to 30µA change	±0.1% of max for 0 to 5V change	±0.01% of max for 0 to 30µA change	±0.01% of max for 0 to 400µA change	±0.005% of max for 0 to max rated current change
Line Regulation	100mV for a 5% line change	5mA for a 5% line change	100mV for a 5% line change	100mV for a 5% line change	100mV for a 5% line change
Ripple p-p from 0.1Hz to 1MHz	200mV at max output	10mA	150mV	100mV at 30µA and below	200mV for 30kV bipolar outputs. 150mV for all other output ratings
Temperature Coefficient	25 ppm/°C	200 ppm/°C	25 ppm/°C	25 ppm/°C	25 ppm/°C
Stability (after 2h warm up)	1.5V / 10h	5mA/10min	0.5V / 10h	0.5V / 10h	1V / 10h
Programming	16 bit, 0 to 35kV	16 bit, 0 to 5A	16 bit, -2kV to +2kV	16 bit, 0 to -15kV	16 bit, min to max Vout
Voltage Monitoring	16 bit, 0 to 35kV ±1% accuracy ±50V offset	16 bit, 0 to 5V ±4% accuracy ±0.1V offset	16 bit, -2kV to +2kV ±1% accuracy ±8V offset	16 bit, 0 to -15kV ±1% accuracy ±15V offset	18 bit, min to max Vout, ±1% accuracy ±15V offset
Current Monitoring	16 bit, 0 to 30µA ±1% accuracy ±0.3µA offset	16 bit, 0 to 5A ± 4% accuracy ±50mA offset	N/A	16 bit 0 to 10µA: ±0.05µA accuracy ±0.05µA offset 16 bit 10µA to 400µA: ±3% accuracy ±5µA offset	18 bit, min to max Iout ±3% accuracy ±1µA offset
Response (see note 1)	<1.0 s	<0.1 s	<0.25 s	<0.25 s	<0.1 s, <4 sec to reach <2V away from steady state for 20kV to 18kV and 18kV to 20kV change
Additional info				see note 2	see notes 3 and 4

Note 1:
This is the time taken for the output signal of a module to settle (to 0.2% of the step size, or 1 V (20 mA for the filament), whichever is greater) in response to a ±2% or less (of full scale) step in its output, as measured from when the output first starts to change.

Note 2:
Hard trip at 400µA in < 0.25s programmable trip delay (for when current at I limit) 0 to 255s, 8 bit res., (5s min, 20s default)

Note 3:
The above specifications do not apply in the range -500V to +500V.

Note 4:
Wobble range: 2V to 2.5kV p-p, sinusoidal. If wobbling occurs near zero, the wobble waveform will be clipped so as to prevent crossing zero.
Wobble Period: 1s to 4s

LENS MODULES

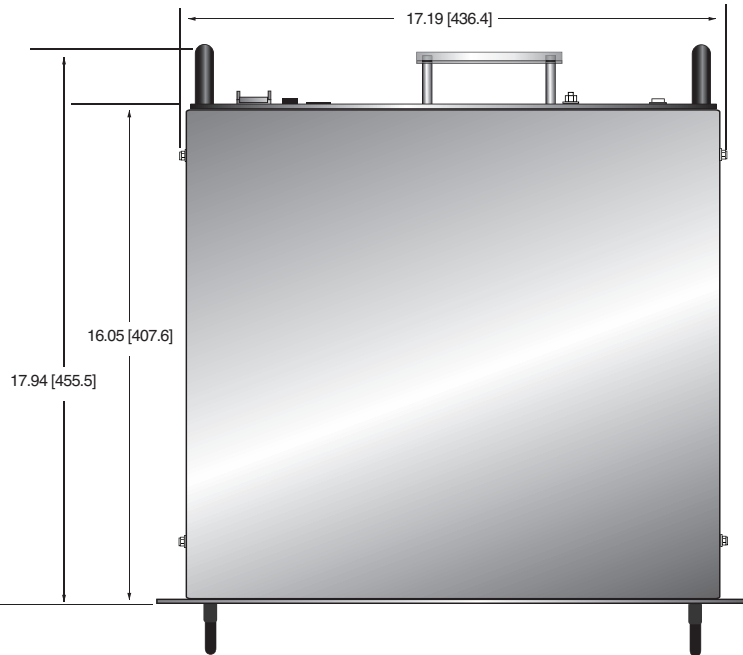
Available as Standard		Lens 1 Output		Lens 2 Output	
Part number	Voltage	Current	Voltage	Current	Current
LGM30P/25PN	0V to +30kV	30uA	-25kV to +25kV	30uA	30uA
LGM30P/30P	0V to +30kV	30uA	0V to +30kV	30uA	30uA
LGM30P/25N	0V to +30kV	30uA	0V to -25kV	30uA	30uA
Available on Request		Lens 1 Output		Lens 2 Output	
LGM20PN/30PN	-20kV to 20kV	30uA	-30kV to +30kV	30uA	30uA
LGM30N/25PN	0V to -30kV	30uA	-25kV to +25kV	30uA	30uA
LGM20N/10N	0V to -20kV	50uA	0 to -10kV	50uA	50uA

Please consult with factory for availability and custom configuration requests.

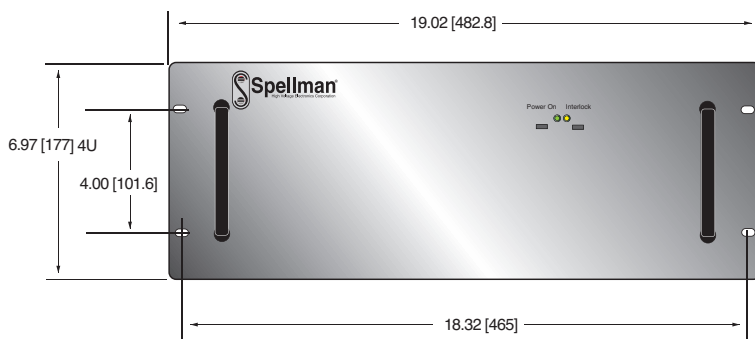
Main Chassis

DIMENSIONS: in.[mm]

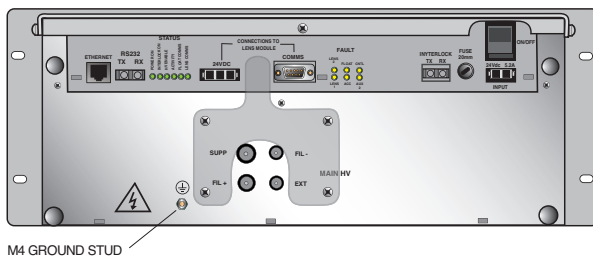
TOP VIEW



FRONT VIEW



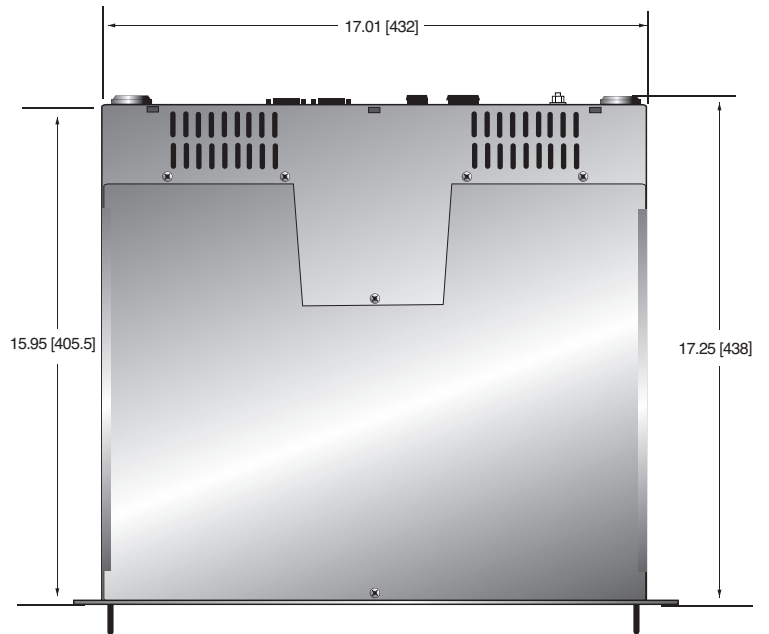
REAR VIEW



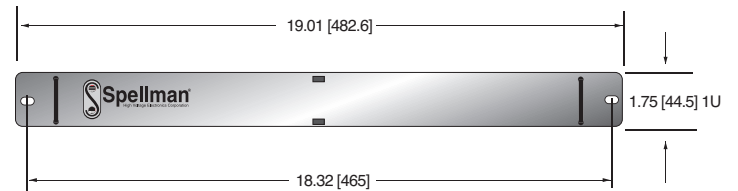
Lens Chassis

DIMENSIONS: in.[mm]

TOP VIEW



FRONT VIEW



REAR VIEW



HOW TO ORDER

Description	Part number
FIB - Main Chassis	FIB35
LGM - Lens Chassis	See part number in the Lens Modules Table
FIB to Lens Modules Interconnection kit	FIBK826
FIB HV Output cable	2.8 meters: HVC30/4ISO/1209 5 meters: HVC30/4ISO/1297
Lens HV Output cable	5 meters: HVC30/1S/1253
FIB communication kit	FIBK100
Optical to RS-232 converter	21777

