

# HIGH VOLTAGE

POWER SUPPLIES

X-RAY GENERATORS

MONOBLOCK® X-RAY SOURCES



# 2025



[spellmanhv.com](http://spellmanhv.com)

07.08.2025



Plastics Sorting

Mineral Analysis

Crystal Inspection

X-Ray Fluorescence

Plating Measurement

X-Ray Diffraction

Thickness Gauging

Cargo Screening

Food Inspection

NDT Analysis

Undersea Telecom

Security Applications

Radiography

Fluoroscopy

Extraoral Dental X-Ray

Bone Densitometry

Mammography

Mass Spectrometry

Capillary Electrophoresis

Electrostatic Printing

Ion Beam Implantation

Semiconductor Processing

Electron Beam Welding

Capacitor Charging

High Power RF Transmitters

## Spellman High Voltage. Powering the Future of Advanced Technologies



For over 75 years, Spellman has been helping technology companies grow by providing standard and custom high voltage power converters, X-Ray generators and Monoblock® X-Ray sources of exceptional value and

performance and by aligning our procedures, processes and infrastructure to support our customers' goals – a process we call homologation. At Spellman, homologation is in everything we do. From initial product concept through final delivery, we dedicate a team of experts to work with each customer.

### Your Vision is Our Mission

Spellman advances medical care, industrial processes, quality control, scientific research, security and telecommunications by providing innovative high voltage power conversion solutions that enable equipment manufacturers to improve their systems' performance, reliability, cost and bottom line.

### Innovation & Quality

With over 75 years of high voltage innovation, world-class ISO certified production facilities and global support network, Spellman can meet the needs of discriminating global OEM's system manufacturers

### Compliance and Safety

Safety and Regulatory Agency approvals such as: UL, CSA, and IEC can be provided. In addition, Spellman is authorized to conduct UL sanctioned testing

### Risk Management

Consistent processes across multiple facilities ensures a secure supply chain. Products can be manufactured at multiple Spellman sites. With standardized manufacturing, training and equipment, you can be assured of quality products and service for years to come

### Support and Service

Our globally situated technical support centers are strategically located to provide rapid local response to customer needs. Support Centers are linked through a common ERP system and real-time data reporting so information is always available about your product and delivery status

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## MODULAR SUPPLIES

MODEL	MAX. VOLTAGE	MAX. POWER	PAGE
MSA	1–3kV	0.9W	4-5
MS	300V–3kV	3W	6-7
PMT	500V–7.5kV	1.9–4W	8-9
UM	62.5V–6kV	4W–30W	10-15
UM8–40	8kV–40kV	4W–30W	16-21
MPS	1kV–30kV	10W	22-24
MPD	1kV–30kV	10W	25-27
MPS20W	1kV–20kV	20W	28-29
SMS	1kV–60kV	60W	30-31
UMW	8kV–20kV	60W, 125W	32-35
SLM	1kV–160kV	300W–1.2kW	36-39

## RACK MOUNT SUPPLIES

MODEL	MAX. VOLTAGE	MAX. POWER	PAGE
SL	1kV–130kV	10W–1.2kW	40-44
SL150KV	150kV	1.2kW	45-46
SL2KW	500V–50kV	2kW	47-50
SLS	160kV–360kV	2kW	51-54
STA	1kV–70kV	4kW	55-57
STR	1kV–150kV	6kW	58-60
ST	1kV–225kV	12kW–180kW	61-65

## X-RAY GENERATORS

MODEL	MAX. VOLTAGE	MAX. POWER	PAGE
XLG	30kV–130kV	3W–260W	66-67
XMPG	10kV	10W	68-69
MNX	50kV, 65kV	50W, 65W, 75W	70-72
uX	50kV, 65kV	50W, 65W, 75W	73-77
MFx	50kV, 65kV	50W, 65W, 75W	78-80
XRF	160kV	80W, 320W, 640W	81-82
uXHP	50kV–80kV	100W	83-86
DXM	20kV–160kV	300W–1.2kW	87-91
DXB	40kV–320kV	300W–1.2kW	92-94
DXM100	100kV	300W–1.2kW	95-97
XLF	60kV	600W–1.2kW	98-99
XRV	160kV–450kV	1.8kW–6kW	100-103
XRV Controller			282
XRV I/O Box			283-286
DF/FF	60kV	3kW–4kW	104-105
VMX	40kV	5kW	106-108
PMX	49kV	5kW	109-111
PMX70	70kV	12kW	112-114
CCT	60kV–140kV	32kW, 42kW, 50kW	115-116
CT	60kV–140kV	32kW–110kW	117

## PORTABLE X-RAY IMAGING

MODEL	MAX. VOLTAGE	MAX. POWER	PAGE
SPX	160kV–300kV	800W–900W	118-124
Tube Stand			125-126
SPX Laser Pointer			127

## MONOBLOCK® X-RAY SOURCE

MODEL	MAX. VOLTAGE	MAX. POWER	PAGE
XRB011	80kV	20W, 50W	128-131
uXRB130P65	130kV	65W	132-136
XRB80N100	80kV	100W	137-140
XRB80PN100HR	80kV	100W	141-146
XRB100N100	100kV	100W	147-149
XRBHR	80kV–100kV	100W–500W	150-157
XRBD	160kV	100W–500W	158-165
XRB180PN200	180kV	200W	166-168
XRB80PN300	80kV	300W	169-173
XRB80PN320	80kV	320W	174-176
XRB200PN400/CT	200kV	400W	177-179
XRB160PN480/1	160kV	480W	180-182
XRB160PN480/2	160kV	480W	183-185
XRB160PN480/CT	160kV	480W	186-188
XRB200PN500	200kV	500W	189-191
XRB150PN600	150kV	600W	192-194
XRB160PN688/CT	160kV	688W	195-197
PDM90PN900	90kV	900W	198-200
MMB125PN3.5	125kV	3.5kW	201-203

## APPLICATION SPECIFIC

MODEL	MAX. VOLTAGE	MAX. CURRENT	PAGE
<b>Mass Spectrometry</b>			
MI1.5PN24	1.5kV	6.5mA	204-205
ML430	430V	12mA–25mA	206-207
ML1350	245V–1350V	15mA	208-209
MX2.5	2.5kV	60µA	210-211
MX8 PLUS	8kV	100µA	212-213
MX10	10kV	100µA	214-215
MX20	20kV	100µA	216-217
MXE	2.5kV–10kV	200µA	218-219
MX10 PLUS	2.3kV–10kV	10µA–230µA	220-221
MXR	20kV, 30kV	300µA	222-223
MCP	3kV	330µA	224-225
TOF3000	30kV	400µA	226-227
MCP4	4kV	600µA	228-229
<b>E Beam/I Beam</b>			
FIB	35kV	30µA	230-232
EBM20N5/24	20kV	250µA	233-235
EBM-TEG	30kV	170µA	236-237
EBM-TEGR	30kV	400µA	238-239
EBM-FEG	30kV	200µA	240-242
EBM60-FEG	60kV	300µA	243-245
<b>Power Feed Equipment</b>			
PFE-P	6kV	1.0A	246-248
PFE-LV	6kV	1.2A	249-250
PFE-HV	6kV–15kV	1.5A	251-252
PFE-SB	6kV–20kV	2A–2.5A	253-256
<b>Image Intensifiers</b>			
DGM935	30kV	30µA	257-258
DGM945	30kV	50µA	259-260
<b>Electrophoresis/Electrospinning</b>			
CZE1000R	30kV	300µA	261-262
CZE2000	5kV–30kV	0.3mA–2mA	263-264
<b>Capacitor Charging</b>			
CCM1KW	1kV–4kV	500J/s– 1000J/s	265-267
CCM	4kV	3100J/s	268-269
<b>e-Beam Evaporation</b>			
EVA	5kV–10kV	3kW, 6kW, 12kW	270-276
<b>Electrostatic Chuck</b>			
MSC2.5PN7.5	2.5kV	3mA	277-278
ECHUCK	2kV–5kV	5mA	279
<b>Injector Control</b>			
ICA	15kV	5.5mA	280-281

## ACCESSORIES

MODEL	PAGE
XRV Controller	282
XRV I/O Box	283-286
HVD	287



- **Compact High Performance Module**
- **Variable Voltage Programming**
- **0.9 Watts Output Power**
- **Voltage Monitor**
- **Arc and Short Circuit Protected**

The MSA Series are compact printed circuit board mountable (PCB) high voltage power supply module available from 1kV to 3kV with either a positive or negative output polarity. The MSA Series feature 0-10Vdc variable voltage programming that equals 0-100% of rated output voltage. A voltage monitor is provided where 0-10Vdc equals 0-100% of rated output voltage. Additionally a status signal and enable signal provides simple control of the power supply. All units have in-built protection against fault conditions.

The MSA Series are intended for general use where a compact high performance PCB mountable power supply is required, like driving an electron multiplier in a mass spectrometer. The aluminium enclosure helps shield the unit reducing radiated noise.

#### TYPICAL APPLICATIONS

Photomultiplier Tubes  
Electron Multiplier  
Mass Spectrometry  
Electrostatic Lenses  
Nuclear Instruments

#### SPECIFICATIONS

##### Input Voltage:

+24 Vdc,  $\pm 2$ Vdc

##### Input Current:

150mA maximum input current  
30mA pk-pk maximum input current ripple

##### Output Polarity:

Positive or negative, specify at time of order

##### Output Power:

0.9 watts, maximum

##### Output Voltage Accuracy:

$\pm 1\%$

##### Voltage Regulation:

Line: 21.6Vdc to 26.4Vdc,  $\pm 0.02\%$

Load: 0-100% rated load,  $\pm 0.02\%$

##### Stability:

50ppm/8hrs after one hour warm up period

##### Temperature Coefficient:

25ppm per degree C

##### Settling Time:

After Power On or Enable:

100 milliseconds, typical

When power is removed the unit will decay to  $\pm 60$  volts within 2 seconds

##### Protection:

Arc and short circuit protected.

Not designed to withstand continuous arcing

##### Environmental:

Temperature Range:

Operating: 0°C to 60°C

Storage: -20°C to 70°C

Humidity:

95% RH, non-condensing

##### Cooling:

Convection cooled

##### Dimensions:

2.73" L x 2.21" W x 1.21" D (69.4mm x 56.2mm x 30.7mm)

##### Weight:

7.0 oz. (200g)

##### Regulatory Approvals:

Designed to meet EN 61010-1, UL 61010A-1 and CAN/CSA-22.2 No. 61010.1

As the unit is intended for incorporation into end users equipment it will not be tested as a standalone unit to meet the EMC directive. The user will need to follow sensible EMC precautions in using the unit.

The unit is compliant with the EU RoHS directive.

### MSA SELECTION TABLE

Model	Output Voltage	Output Current	Ripple (Vpp)
MSA1*24	0-1kV	0-900μA	30mV
MSA2*24	0-2kV	0-450μA	40mV
MSA3*24	0-3kV	0-300μA	50mV

- 1) Replace the \* with "P" for positive output polarity and "N" for negative output polarity.
- 2) The ripple figure includes random non switch related noise, noise related to the oscillator, switching and feedback control circuitry and noise associated with the rectified primary switching frequency.

### LOW VOLTAGE SIGNAL PINS FOR POWER AND CONTROL

PIN	SIGNAL	LEVEL	SIGNAL PARAMETERS
1	Enable	TTL	Enable = Low ( $\leq 1.2V$ ). Disable = High ( $\geq 2.4V$ ), when Enable pin is NC, 10kΩ pull up to +5V $\pm 10\%$
2	Status	0V/5V	OK = 11kΩ pull up to +5.1V $\pm 10\%$ . Fault = $\leq 0.1V$ , Zout = 1kΩ
3	Voltage Program	0-10V	0 to +10Vdc = 0 to 100% rated output voltage, Accuracy = $\pm 1\%$ . Zin = 10kΩ
4	Voltage Monitor	0-10V	0 to +10Vdc = 0 to 100% rated output voltage, Accuracy = $\pm 2\%$ . Zout = 20kΩ
5	Input Voltage	24Vdc	Power Input
6*	Signal Ground	0V	Ground reference for control and monitoring signals
7*	Power Ground	0V	Power Return

To reset the unit after a fault condition, Pin1 (Enable) must be set high for at least 10 seconds

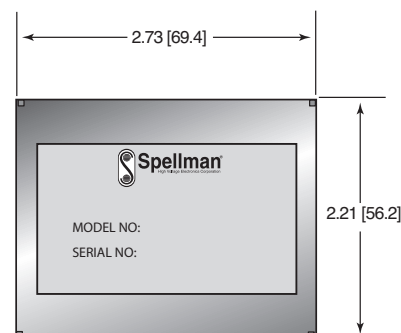
\* pins 6 & 7 are linked internally

### HIGH VOLTAGE CONNECTION DETAIL

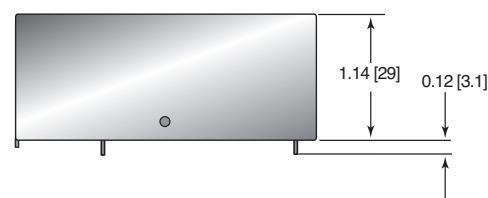
PIN	SIGNAL	SIGNAL PARAMETERS
8	High Voltage Output	0-100% Rated Output. !!Danger: High Voltage!!

DIMENSIONS: in.[mm]

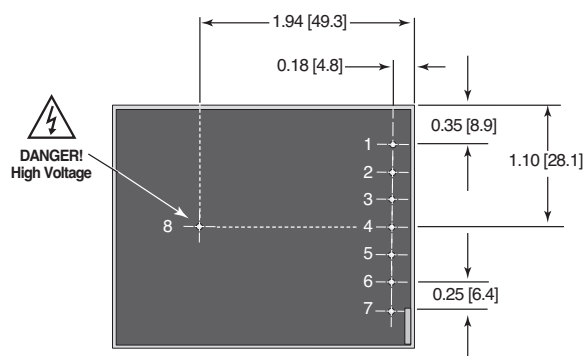
#### TOP VIEW



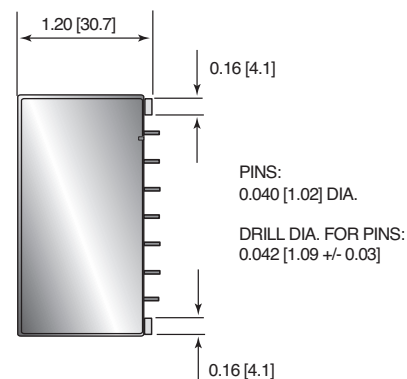
#### FRONT VIEW



#### BOTTOM VIEW



#### SIDE VIEW





Spellman's MS Modules have been designed for printed circuit board mounting with high reliability, small size and light weight. The MS 3W modules provide well regulated, low ripple, high stability output voltages ranging from 300V to 3kV in a versatile, compact and cost-effective design. The modules incorporate remote control and arc & short-circuit protection. Radiated pickup is eliminated by sealing each module in an aluminum enclosure.

#### TYPICAL APPLICATIONS

Photomultiplier Tubes  
Precision Lenses  
Image Intensifiers  
Nuclear Instruments  
Spectroscopy

#### OPTIONS

- I Isolated Input to Output  
Maximum Isolation Voltage:  
40V for units  $\leq 1\text{kV}$   
100V for units  $> 1\text{kV}$

Note: this option is only available for certain models, please consult Spellman for availability.

#### SPECIFICATIONS

##### Input Voltage:

+12Vdc  $\pm 1\text{V}$ .

##### Input Current:

$< 0.65\text{A}$  at full output.

##### Output Voltage:

Continuously adjustable over each entire range  
Models available in either positive or negative polarity.  
See table for voltage ranges.

- **Low Cost**
- **Output Voltages up to 3kV**
- **3 Watts Power Rating**
- **Positive or Negative Polarity**
- **Arc and Continuous Short Circuit Protected**
- **Low Stored Energy**
- **High Reliability**
- **Internal 5V Reference**
- **OEM Customization Available**

##### Output Voltage Control:

Remote voltage programming such that 0-5Vdc gives 0 to full rated output

##### Output Power: 3W continuous.

##### Voltage Regulation:

Line: 0.005% for input change of 1V.  
( $< 0.01\%$  for MS0.3 units)  
Load: 0.05% for 100 $\mu\text{A}$  to full load change at maximum voltage. ( $< 0.1\%$  for MS0.3 units)

##### Ripple: See MS selection table

##### 5Vdc Reference: +5.0V ( $\pm 0.2\text{V}$ )

A maximum of 1mA can be drawn from this output.

##### Temperature:

Operating:  $0^\circ\text{C}$  to  $+50^\circ\text{C}$ .  
Storage:  $-35^\circ\text{C}$  to  $+85^\circ\text{C}$ .

##### Temperature Coefficient: 50ppm/ $^\circ\text{C}$ typical.

##### Stability:

$< 0.05\%/8$  hrs at constant operating conditions  
after one hour warm-up.

##### Humidity: 0 to 90% non-condensing.

##### Dimensions:

Units  $\leq 1\text{kV}$ :  
.87"H x 2.1"W x 3.1"D (23mm x 53mm x 78mm).  
Units  $> 1\text{kV}$ :  
1.1"H x 2.36"W x 4.2"D (28mm x 60mm x 106mm).

##### Weight:

Units  $\leq 1\text{kV}$ : 0.2lb (80g).  
Units  $> 1\text{kV}$ : 0.4lb (160g).

##### Regulatory Approvals:

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

## MS SELECTION TABLE

OUTPUT VOLTAGE (V)	OUTPUT CURRENT (mA)	RIPPLE V (p-p)	MODEL
300	10	0.05	MS0.3*12/C
500	6	0.05	MS0.5*12/C
750	4	0.075	MS0.75*12/C
1000	3	0.10	MS1*12/C
1500	2	0.15	MS1.5*12/C
2000	1.5	0.20	MS2*12/C
2500	1.2	0.25	MS2.5*12/C
3000	1	0.30	MS3*12/C

## How To Order:

MSXX\*12/C/I

where:

XX is the Output voltage (see selection table)

\* is the polarity: P for positive / N for negative

/I is the floating output option, if required

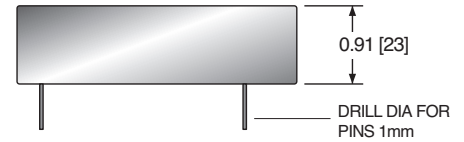
Note: For specific model and option availability across the range, please consult Spellman Sales

Examples: MS2N12/C

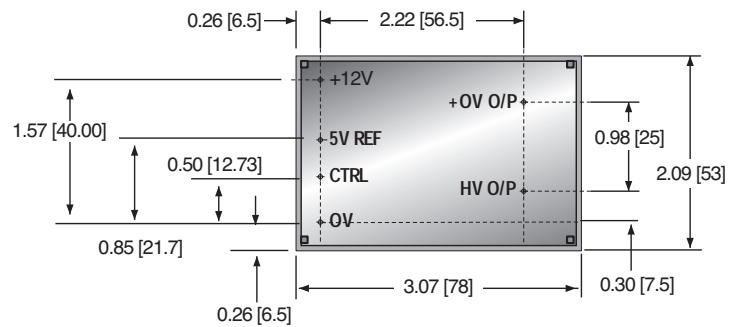
MS0.3P12/C/I

DIMENSIONS: in.[mm]

## SIDE VIEW



## BOTTOM VIEW

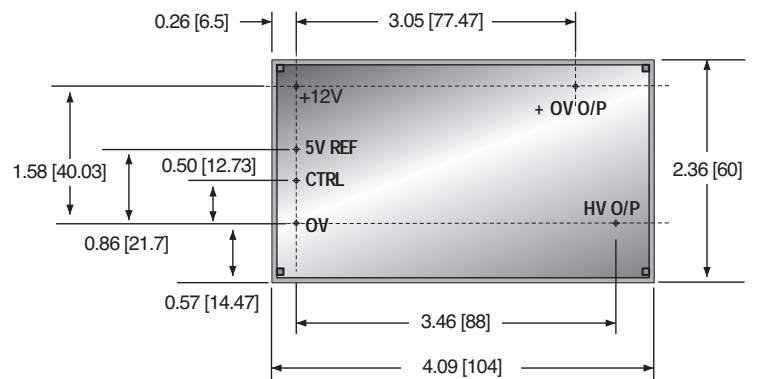


UNIT > 1000V UP TO 3000V

## SIDE VIEW



## BOTTOM VIEW



View on pins.  
Recommended hole size  
for terminals 1mm.





Spellman's Bertan brand of PMT modular high voltage power supplies offer well regulated, fixed polarity outputs up to 7.5kV, which operate off a low voltage DC input voltage. These fully enclosed modules are specifically designed with proprietary linear power conversion techniques to provide exceptionally low ripple and noise. The PMT is ideal for precision applications including: photomultiplier tubes, solid state detectors and ultrasonic transducers.

The output voltage can be controlled by either a local internal potentiometer or by a customer provided ground referenced signal for remote operation. Additionally a ground referenced output voltage monitor signal is provided. The PMT can be powered from either a single positive voltage source or a split  $\pm$  voltage source, providing application flexibility.

### TYPICAL APPLICATIONS

Photomultiplier tubes  
Ultrasonic transducers  
Solid state detectors

### SPECIFICATIONS

#### Input Voltage:

Option 1: +24Vdc to +30Vdc @ 400mA  
Option 3:  $\pm$ 12Vdc to  $\pm$ 18Vdc @ 400mA  
specify "-1" (option 1) or "-3" (option 3) when ordering

#### Efficiency:

$\approx$ 50%, typical

#### Output Polarity:

Positive or negative, specify at time of order

#### Output Voltage:

See "model selection" table

#### Output Current:

See "model selection" table

#### Output Power:

1.875W, 2W, 2.5W, 3W, 4W

#### Voltage Regulation:

Line:  $\pm$ 0.001% of rated output voltage for a  
+1% input line change

Load:  $\pm$ 0.001% of rated output voltage for a  
full load change

- 500V to 7.5kV @ 1.9 to 4 Watts
- Low Cost Modular Design
- Excellent Stability & Regulation
- Low Noise & Ripple
- Arc & Short Circuit Protected
- UL Recognized and RoHS Compliant

#### Ripple:

See "model selection" table

#### Stability:

$\leq$ 0.005% per hour, 0.02% per 8 hours, after a 1/2  
hour warm up

#### Accuracy:

Remote Programming  $\pm$ (2% of setting, +0.5% of maximum)  
Voltage Monitor  $\pm$ 2%

#### Temperature Coefficient:

$\leq$ 50ppm/ $^{\circ}$ C

#### Arc/Short Circuit:

All units are fully arc and short circuit protected and will  
limit continuous short circuit output current to less than  
150% of maximum rated output current.

#### Operating Temperature

0 $^{\circ}$ C to +50 $^{\circ}$ C

#### Storage Temperature:

-40 $^{\circ}$ C to +85 $^{\circ}$ C

#### Humidity:

20% to 85% RH, non-condensing

#### Interface Connector:

12 position card edge connector, mate provided with unit

#### Output Connector:

A captive 24" (610mm) of RG-59B/U shielded cable,  
unterminated is provided

#### Cooling:

Convection cooled.

#### Dimensions:

3.875"W X 1.25"H X 6.3125"D (98mm x 32mm x 160mm)

#### Weight:

$\leq$ 2.0 pounds (0.9kg)

#### Regulatory Approvals:

Designed to meet EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. UL/CUL recognized File E148969.  
RoHS compliant.

#### MODEL SELECTION TABLE

Model	Output Voltage	Output Current	Ripple (Vpp)
PMT-05C-P,N	0 to 500V	0 to 8mA	5mV
PMT-10C-P,N	0 to 1kV	0 to 4mA	4mV
PMT-20C-P,N	0 to 2kV	0 to 2mA	2mV
PMT-30C-P,N	0 to 3kV	0 to 1mA	6mV
PMT-50C-P,N	0 to 5kV	0 to 0.5mA	10mV
PMT-75C-P,N	0 to 7.5kV	0 to 0.25mA	100mV

Specify "P" for positive polarity or "N" for negative polarity

#### INTERFACE CONNECTOR

Signal	Parameters	Option 1 Pin Number	Option 3 Pin Number
+ Power Input	+24Vdc to +30Vdc or +12Vdc to +18Vdc	3&4	3 & 4 & 5
- Power Input	-12Vdc to -18Vdc	n/a	2 & 6
Ground	Ground	1 & 12	1 & 12
Voltage Monitor	See Voltage Monitor Table	11	11
+9Vdc Reference	+9.0Vdc, 10mA maximum	10	10
Voltage Program Input	0 to 9Vdc = 0 to 100% rated output, 100kΩ Zin	8	8
Local Voltage Program	Internal program potentiometer wiper, 0 to 9Vdc	9	9

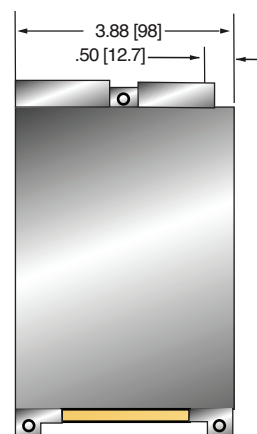
#### VOLTAGE MONITOR TABLE

Model	Signal Voltage	Signal Impedance
PMT-05C-P,N	0 to 5 volts	50k ohms
PMT-10C-P,N	0 to 1 volts	10k ohms
PMT-20C-P,N	0 to 2 volts	25k ohms
PMT-30C-P,N	0 to 3 volts	30k ohms
PMT-50C-P,N	0 to 5 volts	100k ohms
PMT-75C-P,N	0 to 7.5 volts	200k ohms

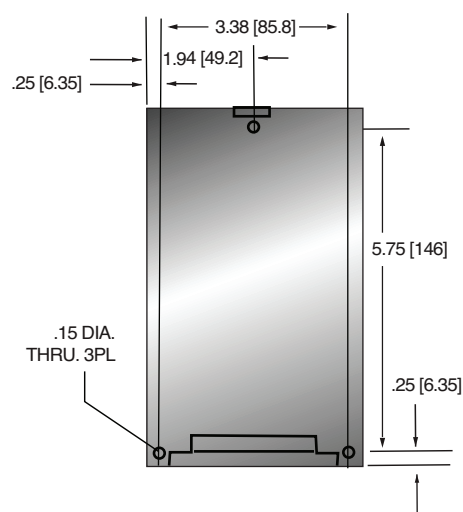
Note: The Voltage Monitor polarity matches the high voltage output polarity

DIMENSIONS: in.[mm]

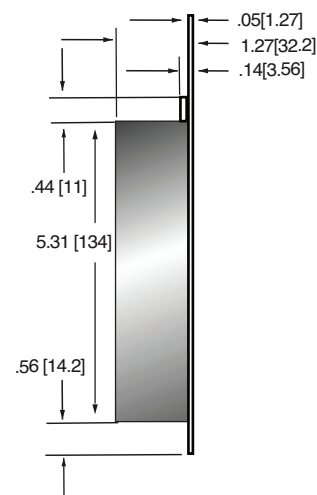
#### TOP VIEW



#### BOTTOM VIEW



#### FRONT VIEW





- **8 Voltage Ranges from 62.5V to 6kV, Fixed Negative or Positive Polarity**
- **Available Output Power Increments of 4, 20 and 30 Watts**
- **Voltage/Current Regulation with Automatic Crossover Control**
- **Voltage and Current Monitor Signals**
- **Fully Arc and Short Circuit Protected**
- **Precision +5V Reference Output**
- **Comprehensive Standard Interface**
- **CE Listed, UL Recognized and RoHS Compliant**

## Form, Fit and Function Design:

Spellman's UM Series of printed circuit board mountable, high voltage modules offer a form, fit and function replacement for presently available commercially made units, while providing additional features and benefits at competitive pricing. Utilizing proprietary power conversion technology and Spellman's six decades of high voltage experience, these SMT based high voltage modules provide improved performance/reliability and easier system integration at a lower cost when compared to the competition.

## Advanced Power Conversion Topology:

UM converters use a proprietary zero voltage switching power conversion topology providing exceptional efficiency and inherent low noise and ripple. Radiated emissions are reduced compared to conventional switching topologies, minimizing or even eliminating the need to shield the unit from adjacent circuitry.

The high voltage output is generated using a ferrite core high voltage step up transformer which feeds the output circuitry. Units at 1kV or higher utilize an arrangement of half wave Cockcroft-Walton voltage multiplier stages to obtain the specified high voltage output, while lower voltage units use a robust rectification and filter circuit.

Due to the fixed, high frequency conversion rate the output capacitance is small resulting in minimal stored energy. Through the use of generously rated surge limiting resistors and a fast acting current loop, all units are fully arc and short circuit protected.

## Control and Regulation:

The actual output voltage generated is sampled via a high impedance divider to create a voltage feedback signal. A current feedback signal is created via a current sense resistor in the low end return of the high voltage output circuitry. These two accurate ground referenced feedback signals are used to precisely regulate and control the units in addition to external monitoring purposes.

Due to the UM's unique converter topology it can provide full current into low impedance loads or even a short circuit. Standard units limit at 103% of maximum rated output current.

## Standard Interface:

The Spellman UM Series interface provides current programming capability and positive polarity, buffered, low output impedance voltage and current monitor signals (zero to +4.64Vdc equals zero to full scale rated). A voltage programming input is provided where 0 to +4.64Vdc equals 0 to 100% of rated voltage.

Current programmability allows the user to set where the unit will current limit, anywhere from 0 to 100% of maximum rated current. This feature is beneficial where less than full output current is desired, like in the case of protecting a sensitive load.

The buffered low impedance voltage and current monitor signals can drive external circuitry directly, while minimizing loading and pickup effects. These features save the user the expense and implementation of external interface buffering circuitry while improving overall signal integrity.

This standard interface is made available via a row of 13 pins with 0.1" pin spacing. A legacy interface (7 pins on a 0.2" spacing) that is compatible with presently available commercially made units can be provided by ordering the "L" option.

## Mechanical and Environmental Considerations:

The UM Series are solid encapsulated, printed circuit board mountable, plastic cased converters measuring only 2.97" X 1.5" X 0.83" (75.4mm X 38.1mm X 21.1mm). All units are encapsulated using a silicon based potting material which is considerably lighter in weight than epoxy. Two isolated, non grounded 2-56 machine screws thread into the module to securely mount it to the printed circuit board, relieving any stress on the interface pins. Mounting plates, brackets and flanged mounting options are also available

## Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588. RoHS Compliant.

### SPECIFICATIONS

#### Input Voltage:

12Vdc for 4W, 24Vdc for 20W and 30W

#### Nominal Voltage Range:

11Vdc to 30Vdc for 4W, 23Vdc to 30Vdc for 20W and 30W

#### Input Current: (typical)

Disabled: 30mA  
No load: 90mA  
Full load:  
4 watt units: 0.5A  
20 watt units: 1.0A  
30 watt units: 1.5A

#### Efficiency:

80-85%, typical

#### Voltage Regulation:

Line: <0.01%  
Load: <0.01%

#### Current Regulation:

Line: <0.01%  
Load: <0.01%

#### Stability:

0.01% per 8 hours, 0.02% per day after 30 min. warmup

#### Accuracy:

2% on all programming and monitoring, except I Sense 10%

#### Temperature Coefficient: (typical)

Standard: 100ppm/°C  
Optional: 25ppm/°C (T Option)

#### Environmental:

Temperature Range:  
Operating: 0°C to 65°C case temperature  
Storage: -55°C to 85°C, non operational  
Humidity:  
10% to 90%, non-condensing.

#### Cooling:

Convection cooled, typical. 30 watt units operating at full power might require additional cooling to maintain case temperature below 65°C. Methods may include: forced air cooling, use of heat sink or metal case, etc. It is the user's responsibility to maintain the case temperature below 65°C. Damage to the power supply due to inadequate cooling is considered misuse and repairs will not be covered under warranty.

#### Dimensions:

2.97" L X 1.49" W X 0.81" H  
(75.4mm X 37.9mm X 20.6mm)

#### Weight:

4 oz. (113g), typical

### UM 4W SELECTION TABLE

Model Number	Output V	Output Current	Low Freq. Ripple %Vp-p @ 1Hz-1kHz	High Freq. Ripple %Vp-p @ 1kHz-1MHz	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal	High Voltage Divider Resistance
UM0.062*4	0 to 62.5V	64mA	0.030	0.028	8.8µF	1Ω	1.5V	0.5MΩ
UM0.125*4	0 to 125V	32mA	0.045	0.014	8.8µF	4.4Ω	2.75V	0.88MΩ
UM0.25*4	0 to 250V	16mA	0.034	0.017	2.2µF	20Ω	4.9V	1.50MΩ
UM0.5*4	0 to 500V	8mA	0.036	0.040	0.8µF	94Ω	10.1V	2.65MΩ
UM1*4	0 to 1KV	4mA	0.025	0.015	0.2µF	470Ω	10.75V	20MΩ
UM2*4	0 to 2kV	2mA	0.022	0.015	0.097µF	1.0KΩ	10.4V	30MΩ
UM4*4	0 to 4kV	1mA	0.019	0.017	0.012µF	9.4KΩ	11.1V	100MΩ
UM6*4	0 to 6kV	0.67mA	0.016	0.015	0.007µF	20KΩ	9.9V	150MΩ

### UM 20W SELECTION TABLE

Model Number	Output V	Output Current	Low Freq. Ripple %Vp-p @ 1Hz-1kHz	High Freq. Ripple %Vp-p @ 1kHz-1MHz	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal	High Voltage Divider Resistance
UM0.062*20	0 to 62.5V	320mA	0.060	0.088	8.8µF	1Ω	330mV	0.5MΩ
UM0.125*20	0 to 125V	160mA	0.067	0.044	8.8µF	4.4Ω	675mV	0.88MΩ
UM0.25*20	0 to 250V	80mA	0.035	0.019	2.2µF	20Ω	1.135V	1.50MΩ
UM0.5*20	0 to 500V	40mA	0.041	0.040	0.8µF	94Ω	2.25V	2.65MΩ
UM1*20	0 to 1KV	20mA	0.039	0.095	0.2µF	470Ω	4.35V	20MΩ
UM2*20	0 to 2kV	10mA	0.026	0.016	0.097µF	1.0KΩ	6.6V	30MΩ
UM4*20	0 to 4kV	5mA	0.023	0.028	0.012µF	9.4KΩ	6.65V	100MΩ
UM6*20	0 to 6kV	3.3mA	0.017	0.018	0.007µF	20KΩ	6.74V	150MΩ

### UM 30W SELECTION TABLE

Model Number	Output V	Output Current	Low Freq. Ripple %Vp-p @ 1Hz-1kHz	High Freq. Ripple %Vp-p @ 1kHz-1MHz	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal	High Voltage Divider Resistance
UM0.062*30	0 to 62.5V	480mA	0.075	0.112	8.8µF	1Ω	500mV	0.5MΩ
UM0.125*30	0 to 125V	240mA	0.075	0.056	8.8µF	4.4Ω	930mV	0.88MΩ
UM0.25*30	0 to 250V	120mA	0.055	0.031	2.2µF	20Ω	1.65V	1.50MΩ
UM0.5*30	0 to 500V	60mA	0.085	0.041	0.8µF	94Ω	3.4V	2.65MΩ
UM1*30	0 to 1KV	30mA	0.032	0.171	0.2µF	220Ω	6.5V	20MΩ
UM2*30	0 to 2kV	15mA	0.031	0.112	0.097µF	470Ω	9.85V	30MΩ
UM4*30	0 to 4kV	7.5mA	0.028	0.071	0.012µF	4.4KΩ	9.85V	100MΩ
UM6*30	0 to 6kV	5mA	0.020	0.051	0.007µF	9.4KΩ	10.0V	150MΩ

Note: Total ripple is the sum of the low frequency and high frequency ripple. Grayed text indicates Legacy interface signals.

## STANDARD INTERFACE

PIN	SIGNAL	PARAMETERS
1	Power Ground Return	+12Vdc or +24Vdc power return/HV return
1A	Signature Resistor	Unique Identifying resistor connected to ground
2	+ Power Input	+12Vdc or +24Vdc power input
2A	N/C	
3	I Sense	See I Sense text and tables
3A	I Mon	0 to 4.64Vdc = 0 to 100% rated output. Zout < 10kΩ
4	Enable Input	Low (<0.7V, Isink@1mA)=HV OFF, High (open or >2V)=HV ON
4A	V Mon	0 to 4.64Vdc = 0 to 100% rated output. Zout < 10kΩ
5	Signal Ground	Signal Ground
5A	I Pgm	0 to 4.64Vdc = 0 to 100% rated output. Zin > 47kΩ Leave open for preset current limit @103% of rated output current
6	Remote Adjust	Positive Polarity Unit: 0 to +4.64VDC = 0 to 100% rated voltage, Zin > 1MΩ Negative Polarity Unit: +5VDC to 0.36V = 0 to 100% rated voltage, Zin > 100kΩ Leave open if pin 6A (VPgm) is used for programming
6A	V Pgm	0 to 4.64Vdc = 0 to 100% rated voltage. Zin > 100kΩ Leave open if pin 6 (remote adjust) is used for programming
7	+5V Reference Output	+5Vdc ±0.5%, 50ppm/°C. Zout =475Ω
8	HV Ground Return	HV Ground Return
9	E Out Monitor	10:1 ratio for models below 1kV, 100:1 ratio for models 1kV and above. Polarity of Voltage Monitor signal equals polarity of unit. Accuracy is ±2%, 100ppm/°C. Calibrated with DVM with 10MΩ input impedance
10	HV Output	HV Output
11	HV Output	HV Output

Grayed out signals are provided for backward legacy compatability and their use is not required

Power Ground Return, Signal Ground and HV Ground Return are connected internally. For best performance they should not be connected externally.

## LEGACY INTERFACE (L OPTION)

PIN	SIGNAL	PARAMETERS
1	Power Ground Return	+12Vdc or +24Vdc power return/HV return
2	+ Power Input	+12Vdc or +24Vdc power input
3	I Sense	See I Sense text and tables for details
4	Enable Input	Low (<0.7V, Isink@1mA)=HV OFF, High (open or >2V)=HV ON
5	Signal Ground	Signal Ground
6	Remote Adjust	Positive Polarity Unit: 0 to +4.64VDC = 0 to 100% rated voltage, Zin > 1MΩ Negative Polarity Unit: +5VDC to 0.36V = 0 to 100% rated voltage, Zin > 100kΩ
7	+5V Reference Output	+5Vdc ±0.5%, 50ppm/°C. Zout =475Ω
8	HV Ground Return	HV Ground Return
9	E Out Monitor	10:1 ratio for models below 1kV, 100:1 ratio for models 1kV and above. Polarity of Voltage Monitor signal equals polarity of unit. Accuracy is ±2%, 100ppm/°C. Calibrated with DVM with 10MΩ input impedance
10	HV Output	HV Output
11	HV Output	HV Output

Power Ground Return, Signal Ground and HV Ground Return are connected internally. For best performance they should not be connected externally.

### Standard Interface Connections

Seventeen (17) gold plated 0.025" (0.64mm) square pins suitable for direct PCB mounting. See mechanical drawing for location and spacing details.

### Programming and Monitor Signals

Voltage and current programming is done via positive polarity, high input impedance, 0 to 4.64Vdc signals. Voltage and current monitors are positive polarity, buffered low output impedance 0 to 4.64Vdc signals.

### I Mon

The I Mon signal is a true output current monitoring signal. All internal offsets due to feedback divider currents have been compensated for.

### Signature Resistor

A unique identifying signature resistor for each type of unit is connected from Pin 1A to ground. Details if desired are available upon request.

### Legacy Interface Connections

Eleven (11) gold plated 0.025" (0.64mm) square pins suitable for direct PCB mounting. See mechanical drawing for location and spacing details.

### I Sense Signal

The I Sense signal polarity is opposite of the output polarity of the module. This signal is protected via a transorb and provided via a series connected 47k isolation resistor. Internal HV dividers create a small, linear offset voltage on the I sense signal that can be compensated for.

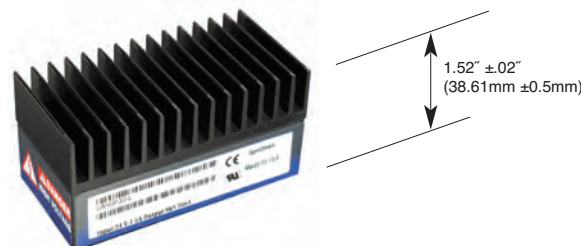
### Adhesive Backed Heat Sink

UM modules are provided with an uninstalled top mounted adhesive backed heat sink. Label removal is not required if the customer elects to install and use the provided heat sink.

The UM's internal power dissipation causes a case temperature rise. If the case exceeds 65°C, the unit needs external cooling (fan or heat sink). Even if the case is below 65°C, it is prudent to keep it much lower. Like a semiconductor device; the hotter it is, the shorter the life. For every 10°C reduction of temperature the lifetime will be increased by a factor of ~2.35. The thermal resistance from internal circuitry to ambient is 8°C/watt without a heat sink (still air). This reduces to 6°C/watt with the heat sink.

Example:

Assuming ~80% efficiency for a 20 watt UM module, the 5 watts of internal power dissipation would create a 40°C rise. Using the heat sink there would be only a 30°C rise. Ultimately it is up to the user to determine what cooling method is applicable for their application, but the general recommendation is to keep the module as cool as possible.



## UM OPTIONS

### T Option

#### Low Temperature Coefficient-

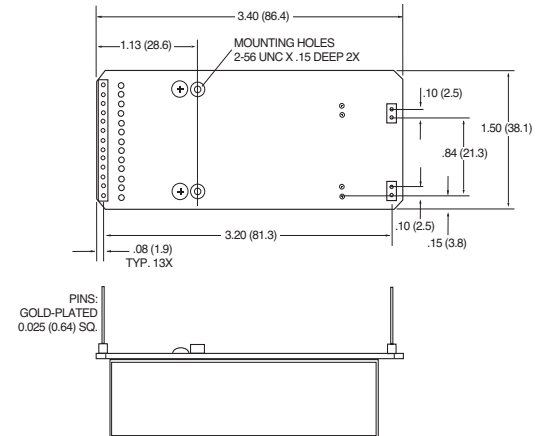
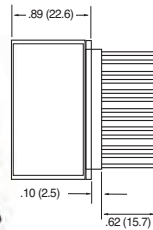
The T Option offers the UM with an improved temperature coefficient. The standard voltage feedback divider is replaced with one having a superior temperature coefficient, resulting in a unit with 25ppm/C° (typical) temperature coefficient.

## PHYSICAL INTERFACING

### A Option

#### Adapter Board-

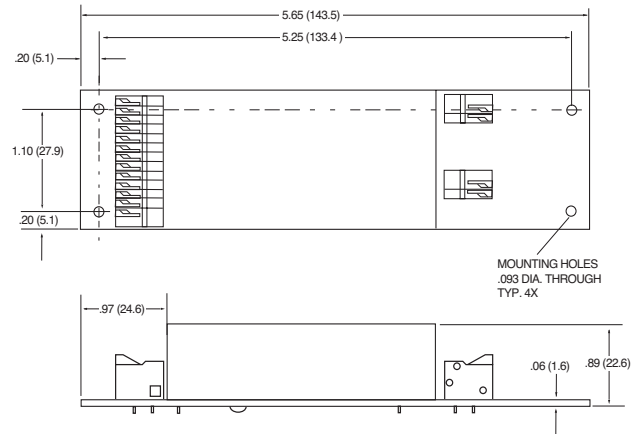
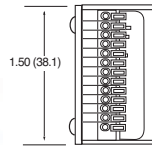
Spellman's UM module can be fitted with an adapter board that will allow a drop in replacement for other commercially available modules of a physically larger size, while providing identical functionality with superior performance.



### B Option

#### Terminal Block-

The B Option provides terminal block connections for both the customer interface and high voltage output/return. This feature can be helpful in situations where frequent wiring changes are anticipated, as in a testing or prototype environment.



## SHIELDING

### M Option

#### Mu Metal Shield-

UM modules can be fitted with an adhesive backed Mu Metal foil shield to help protect sensitive adjacent circuitry.



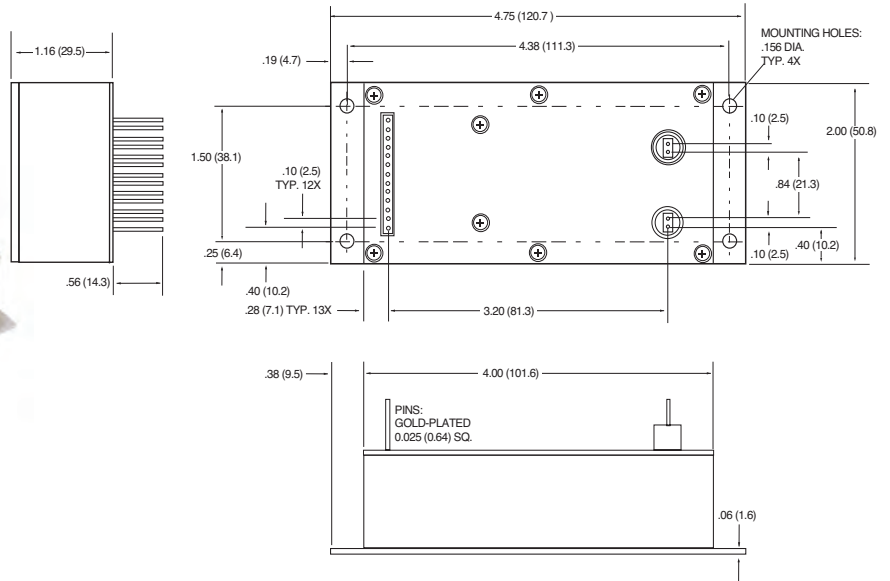
Same as standard unit.  
See page 6 of 6 for dimensional drawings

### SHIELDING continued

#### S Option

##### RF Tight Shielded Can-

The S Option mounts the UM module inside of a flanged RF tight aluminum can.

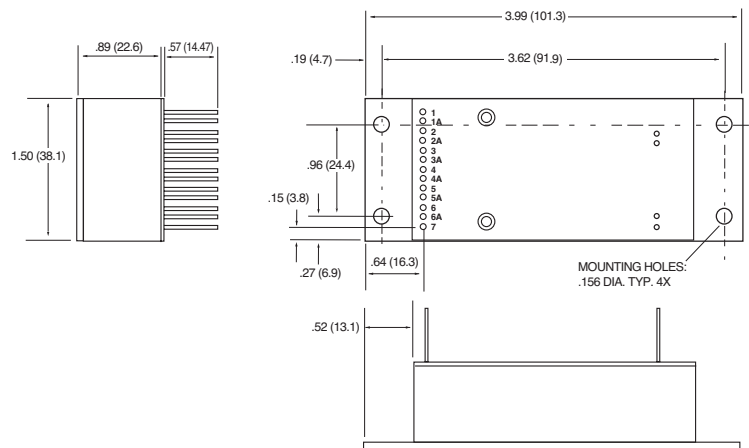


### CHASSIS MOUNTING

#### E Option

##### Eared Mounting Plate-

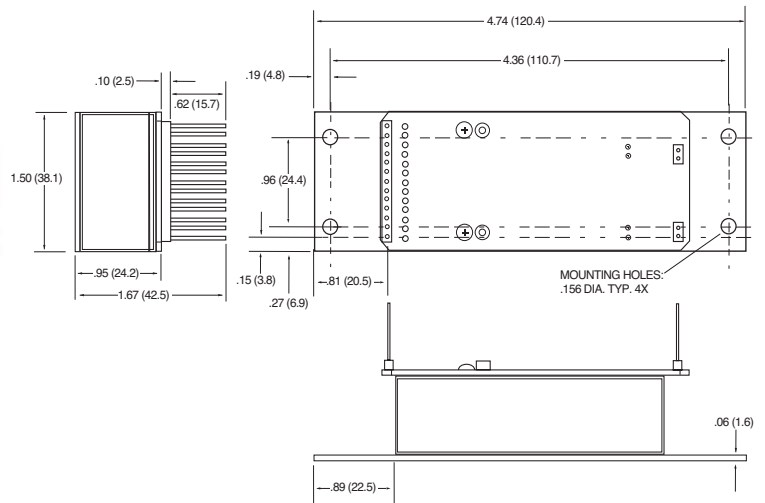
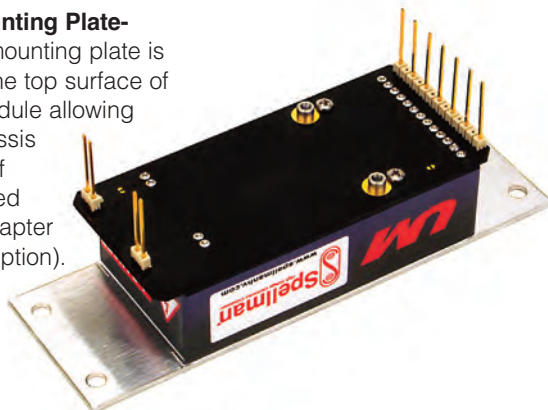
An eared mounting plate is affixed to the top surface of the UM module allowing simple chassis mounting of unit.



#### E2 Option

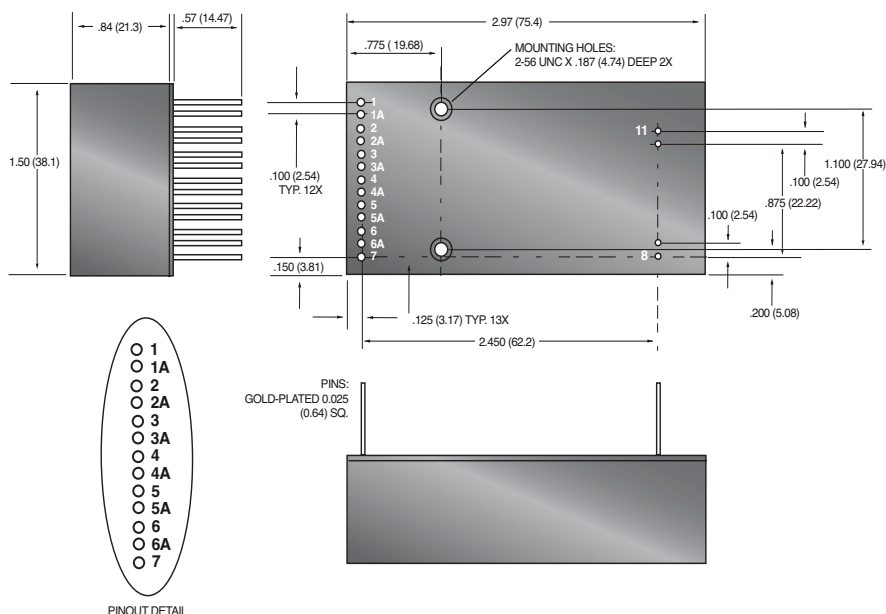
##### Eared Mounting Plate-

An eared mounting plate is affixed to the top surface of the UM module allowing simple chassis mounting of units ordered with the Adapter Board (A Option).

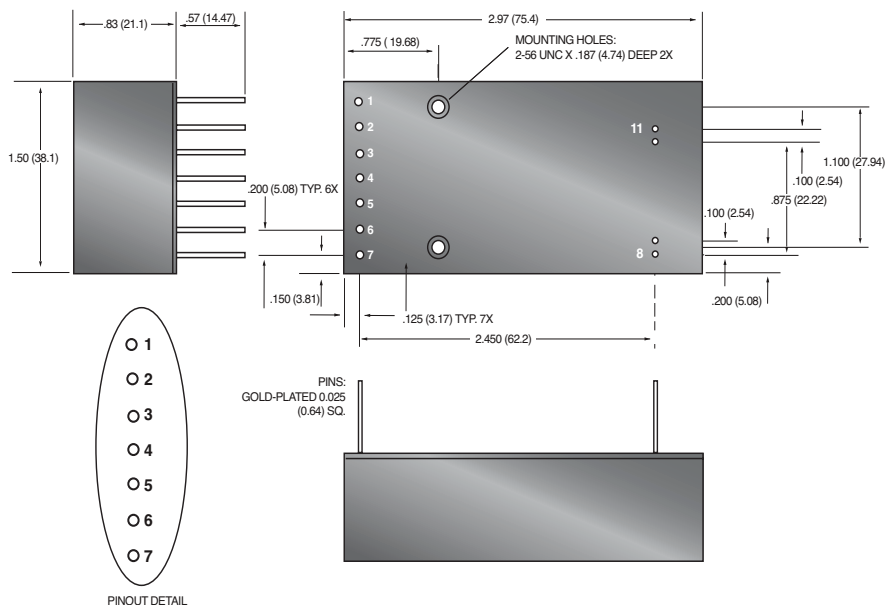


DIMENSIONS: in.[mm]

## 17 PIN - Standard Interface



## 11 PIN - Legacy Interface



Note: There may be some restrictions on multiple option combinations. Please contact our sales department for more details.

## ORDERING INFORMATION

Voltage	0 to 62.5Vdc	0.062
	0 to 125Vdc	0.125
	0 to 250Vdc	0.25
	0 to 500Vdc	0.5
	0 to 1000Vdc	1
	0 to 2000Vdc	2
	0 to 4000Vdc	4
	0 to 6000Vdc	6
Polarity	Positive	P
	Negative	N
Power	Watts Output	4
	Watts Output	20
	Watts Output	30

## STANDARD UNIT ORDERING EXAMPLE

UM1N20

Model | Voltage | Polarity | Power

## OPTION ORDERING INFORMATION

OPTION	OPTION CODE
Legacy Interface	L
Low Temperature Coefficient	T
Adapter Board	A
Terminal Block	B
Mu Metal Shield	M
RF Tight Shielded Can	S
Eared Mounting Plate	E
Eared Mounting Plate/Adapter Board	E2

## OPTION ORDERING EXAMPLE

UM4P30/L/E

Model | Voltage | Polarity | Power | Option | Option





- **9 Voltage Ranges from 8kV to 40kV, Fixed Negative or Positive Polarity**
- **Available Output Power Increments of 4, 15 and 30 Watts**
- **Voltage/Current Regulation with Automatic Crossover Control**
- **Voltage and Current Monitor Signals**
- **Fully Arc and Short Circuit Protected**
- **Precision +5V Reference Output**
- **Comprehensive Standard Interface**
- **CE listed and RoHS compliant**

### Form, Fit and Function Design:

Spellman's UM Series of printed circuit board mountable, high voltage modules offer a form, fit and function replacement for presently available commercially made units, while providing additional features and benefits at competitive pricing. Utilizing proprietary power conversion technology and Spellman's six decades of high voltage experience, these SMT based high voltage modules provide improved performance/reliability and easier system integration at a lower cost when compared to the competition.

### Advanced Power Conversion Topology:

UM converters use a proprietary zero voltage switching power conversion topology providing exceptional efficiency and inherent low noise and ripple. Radiated emissions are reduced compared to conventional switching topologies, minimizing or even eliminating the need to shield the unit from adjacent circuitry.

The high voltage output is generated using a ferrite core high voltage step up transformer which feeds a half wave Cockcroft-Walton voltage multiplier to obtain the specified high voltage output.

Due to the fixed, high frequency conversion rate the output capacitance is small resulting in minimal stored energy. Through the use of generously rated surge limiting resistors and a fast acting current loop, all units are fully arc and short circuit protected.

### Control and Regulation:

The actual output voltage generated is sampled via a high impedance divider to create a voltage feedback signal. A current feedback signal is created via a current sense resistor in the low end return of the high voltage output circuitry. These two accurate ground referenced feedback signals are used to precisely regulate and control the units in addition to external monitoring purposes.

Due to the UM's unique converter topology it can provide full current into low impedance loads or even a short circuit. Standard units limit at 103% of maximum rated output current.

### Standard Interface:

The Spellman UM Series interface provides current programming capability and positive polarity, buffered, low output impedance voltage and current monitor signals (zero to +4.64Vdc equals zero to full scale rated). A voltage programming input is provided where 0 to +4.64Vdc equals 0 to 100% of rated voltage.

Current programmability allows the user to set where the unit will current limit, anywhere from 0 to 100% of maximum rated current. This feature is beneficial where less than full output current is desired, like in the case of protecting a sensitive load.

The buffered low impedance voltage and current monitor signals can drive external circuitry directly, while minimizing loading and pickup effects. These features save the user the expense and implementation of external interface buffering circuitry while improving overall signal integrity.

This standard interface is made available via a row of 13 pins with 0.1" pin spacing. A legacy interface (7 pins on a 0.2" spacing) that is compatible with presently available commercially made units can be provided by ordering the "L" option.

### Mechanical and Environmental Considerations:

The UM Series are solid encapsulated, printed circuit board mountable, plastic cased converters. All units are encapsulated using a silicon based potting material which is considerably lighter in weight than epoxy. Isolated, non grounded 2-56 machine screws thread into the module to securely mount it to the printed circuit board, relieving any stress on the interface pins. Mounting plates, brackets and flanged mounting options are also available. High voltage output is provided via a 36" (914.4mm) minimum length of appropriately rated high voltage wire.

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588. RoHS Compliant.

### SPECIFICATIONS

#### Input Voltage:

12Vdc for 4W, 24Vdc for 15W and 30W

#### Nominal Voltage Range:

11Vdc to 30Vdc for 4W, 23Vdc to 30Vdc for 15W and 30W  
4W units can operate at 24Vdc input with no deratings or damage to unit

#### Input Current: (typical)

Disabled: 10mA @ 24Vdc  
Full output, no load: 160mA @ 24Vdc, 300mA @ 12Vdc  
Full output, full load:  
4 watt units: 330mA @ 24Vdc, 640mA @ 12Vdc  
15 watt units: 850mA @ 24Vdc  
30 watt units: 1590mA @ 24Vdc

#### Voltage Regulation:

Line: <0.01% Load: <0.01%

#### Current Regulation:

Line: <0.01% Load: <0.01%

#### Stability:

0.01% per 8 hours, 0.02% per day after 30 min. warmup

#### Accuracy:

2% on all programming and monitoring, except I Sense 10%

#### Temperature Coefficient: (typical)

Standard: 100ppm/°C  
Optional: 25ppm/°C (T Option)

#### Environmental:

Temperature Range:

Operating: -40°C to 65°C case temperature

Storage: -55°C to 105°C, non operational

Humidity:

10% to 90%, non-condensing.

#### Cooling:

Convection cooled, typical. 30 watt units operating at full power might require additional cooling to maintain case temperature below 65°C. Methods may include: forced air cooling, use of heat sink or metal case, etc. It is the user's responsibility to maintain the case temperature below 65°C. Damage to the power supply due to inadequate cooling is considered misuse and repairs will not be covered under warranty.

#### Dimensions:

8kV-12kV:

3.700" L X 1.500" W X 0.990" H (93.98mm X 38.10mm X 25.03mm)

15kV-20kV:

4.700" L X 1.500" W X 0.990" H (119.38mm X 38.10mm X 25.03mm)

25kV-40kV:

6.960" L X 1.600" W X 1.14" H (176.78mm X 40.64mm X 28.87mm)

#### Weight:

8kV-12kV: 5.7 ounces (162 grams), typical

15kV-20kV: 7.2 ounces (204 grams), typical

25kV-40kV: 13.1 ounces (371 grams), typical

#### Output Cable:

UM8, UM10, UM12, UM15: TV20 (min. length, 36" (914.4mm)

UM20, UM25: TV30 (min. length, 36" (914.4mm)

UM30, UM35, UM40: TV40 (min. length, 36" (914.4mm)

### UM 4W, 8kV TO 40kV SELECTION TABLE

Model Number	Output V	Output Current	Ripple(max) %Vp-p	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal	High Voltage Divider Resistance
UM8*4	0 to 8kV	0.5mA	0.10	6830pF	50kΩ	5V	200MΩ
UM10*4	0 to 10kV	0.4mA	0.05	4380pF	50kΩ	2.4V	300MΩ
UM12*4	0 to 12kV	0.333mA	0.05	4380pF	50kΩ	3.33V	300MΩ
UM15*4	0 to 15kV	0.266mA	0.05	3220pF	100kΩ	1.69V	400MΩ
UM20*4	0 to 20kV	0.2mA	0.05	2310pF	100kΩ	1.316V	550MΩ
UM25*4	0 to 25kV	0.16mA	0.05	1540pF	100kΩ	1.1V	800MΩ
UM30*4	0 to 30kV	0.133mA	0.05	1370pF	120kΩ	0.95V	900MΩ
UM35*4	0 to 35kV	0.115mA	0.05	1370pF	140kΩ	0.72V	900MΩ
UM40*4	0 to 40kV	0.1mA	0.05	1370pF	140kΩ	1.3V	900MΩ

### UM 15W, 8kV TO 40kV SELECTION TABLE

Model Number	Output V	Output Current	Ripple(max) %Vp-p	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal	High Voltage Divider Resistance
UM8*15	0 to 8kV	1.875mA	0.10	6830pF	50kΩ	3.75V	200MΩ
UM10*15	0 to 10kV	1.5mA	0.05	4380pF	50kΩ	8.152V	300MΩ
UM12*15	0 to 12kV	1.25mA	0.05	4380pF	50kΩ	5V	300MΩ
UM15*15	0 to 15kV	1mA	0.05	3220pF	100kΩ	5.53V	400MΩ
UM20*15	0 to 20kV	0.75mA	0.05	2310pF	100kΩ	4.21V	550MΩ
UM25*15	0 to 25kV	0.6mA	0.05	1540pF	100kΩ	3.42V	800MΩ
UM30*15	0 to 30kV	0.5mA	0.05	1370pF	120kΩ	2.89V	900MΩ
UM35*15	0 to 35kV	0.429mA	0.05	1370pF	140kΩ	2.39V	900MΩ
UM40*15	0 to 40kV	0.375mA	0.05	1370pF	140kΩ	4.21V	900MΩ

### UM 30W, 8kV TO 40kV SELECTION TABLE

Model Number	Output V	Output Current	Ripple(max) %Vp-p	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal	High Voltage Divider Resistance
UM8*30	0 to 8kV	3.75mA	0.10	6830pF	50kΩ	5.36V	200MΩ
UM10*30	0 to 10kV	3mA	0.05	4380pF	50kΩ	7.87V	300MΩ
UM12*30	0 to 12kV	2.5mA	0.05	4380pF	50kΩ	5V	300MΩ
UM15*30	0 to 15kV	2mA	0.06	3220pF	100kΩ	5.29V	400MΩ
UM20*30	0 to 20kV	1.5mA	0.06	2310pF	100kΩ	8.15V	550MΩ
UM25*30	0 to 25kV	1.2mA	0.06	1540pF	100kΩ	6.56V	800MΩ
UM30*30	0 to 30kV	1mA	0.06	1370pF	120kΩ	5.52V	900MΩ
UM35*30	0 to 35kV	0.857mA	0.05	1370pF	140kΩ	4.66V	900MΩ
UM40*30	0 to 40kV	0.75mA	0.05	1370pF	140kΩ	8.15V	900MΩ

Grayed text indicates Legacy interface signals.

### STANDARD INTERFACE

PIN	SIGNAL	PARAMETERS
1	Power Ground Return	+12Vdc or +24Vdc power return/HV return
1A	Signature Resistor	Unique Identifying resistor connected to ground
2	+ Power Input	+12Vdc or +24Vdc power input
2A	OT Output	+5Vdc @ 1mA = Over Temp fault
3	I Sense	See I Sense text and tables for details
3A	I Mon	0 to 4.64Vdc = 0 to 100% rated output. Zout < 10kΩ
4	Enable Input	Low (<0.7V, Isink@1mA)=HV OFF, High (open or >2V)=HV ON
4A	V Mon	0 to 4.64Vdc = 0 to 100% rated output. Zout < 10kΩ
5	Signal Ground	Signal Ground
5A	I Pgm	0 to 4.64Vdc = 0 to 100% rated output. Zin > 47kΩ Leave open for preset current limit @103% of rated output current
6	Remote Adjust	Positive Polarity Unit: 0 to +4.64VDC = 0 to 100% rated voltage, Zin > 1MΩ Negative Polarity Unit: +5VDC to 0.36V = 0 to 100% rated voltage, Zin > 100kΩ Leave open if pin 6A (VPgm) is used for programming
6A	V Pgm	0 to 4.64Vdc = 0 to 100% rated voltage. Zin > 100kΩ Leave open if pin 6 (remote adjust) is used for programming
7	+5V Reference Output	+5Vdc ±1%, 25ppm/°C. Zout =475Ω
8	HV Ground Return	HV Ground Return
9	E Out Monitor	1000:1 ratio. Polarity of Voltage Monitor signal equals polarity of unit. Accuracy is ±2%, 100ppm/°C. Calibrated with DVM with 10MΩ input impedance

Grayed out signals are provided for backward legacy compatibility and their use is not required.

Power Ground Return, Signal Ground and HV Ground Return are connected internally. For best performance they should not be connected externally.

### LEGACY INTERFACE (L OPTION)

PIN	SIGNAL	PARAMETERS
1	Power Ground Return	+12Vdc or +24Vdc power return
2	+ Power Input	+12Vdc or +24Vdc power input
3	I Sense	See I Sense text and tables for details
4	Enable Input	Low (<0.7V, Isink@1mA)=HV OFF, High (open or >2V)=HV ON
5	Signal Ground	Signal Ground
6	Remote Adjust	Positive Polarity Unit: 0 to +4.64VDC = 0 to 100% rated voltage, Zin > 1MΩ Negative Polarity Unit: +5VDC to 0.36V = 0 to 100% rated voltage, Zin > 100kΩ
7	+5V Reference Output	+5Vdc ±1%, 25ppm/°C. Zout =475Ω
8	HV Ground Return	HV Ground Return
9	E Out Monitor	1000:1 ratio. Polarity of Voltage Monitor signal equals polarity of unit. Accuracy is ±2%, 100ppm/°C. Calibrated with DVM with 10MΩ input impedance

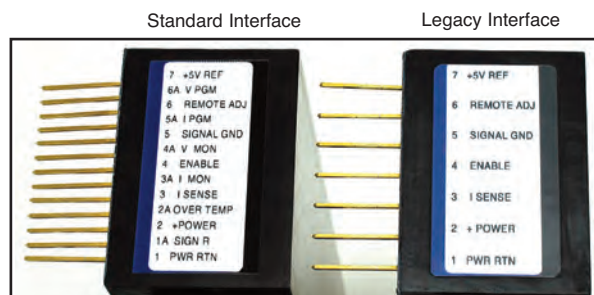
Power Ground Return, Signal Ground and HV Ground Return are connected internally. For best performance they should not be connected externally.

### Standard Interface Connections

Fifteen (15) gold plated 0.025" (0.64mm) square pins suitable for direct PCB mounting.

### Legacy Interface Connections

Nine (9) gold plated 0.025" (0.64mm) square pins suitable for direct PCB mounting.



See mechanical drawing for location and spacing details

### Programming and Monitor Signals

Voltage and current programming is done via positive polarity, high input impedance, 0 to 4.64Vdc signals. Voltage and current monitors are positive polarity, buffered low output impedance 0 to 4.64Vdc signals.

### I Mon

The I Mon signal is a true output current monitoring signal. All internal offsets due to feedback divider currents have been compensated for.

### Signature Resistor

A unique identifying signature resistor for each type of unit is connected from Pin 1A to ground. Details if desired are available upon request.

### I Sense Signal

The polarity of the I Sense signal is opposite of the polarity of the output voltage of the unit that generated it. So a positive output polarity unit creates a negative polarity current monitor signal; while a negative output polarity unit creates a positive polarity current monitoring signal. This signal is clamped to ground internally via a bidirectional transient protection device and the signal is made available via a series connected 47kΩ isolation resistor. Internal HV dividers create a small, linear offset voltage on this current monitor signal that can be compensated for.

### OT Output

The unit is protected by an internal thermostat that will shut the unit off if the case temperature exceeds 65°C. The OT Output signal will change states indicating an over temperature fault has occurred. In order to clear the OT signal and re-enable the unit, the temperature has to drop below 55 degrees C and input power needs to be recycled. For details on unit cooling requirements and the OT Output signal please see the operator's manual.

## UM8-40 OPTIONS

### T Option

#### Low Temperature Coefficient-

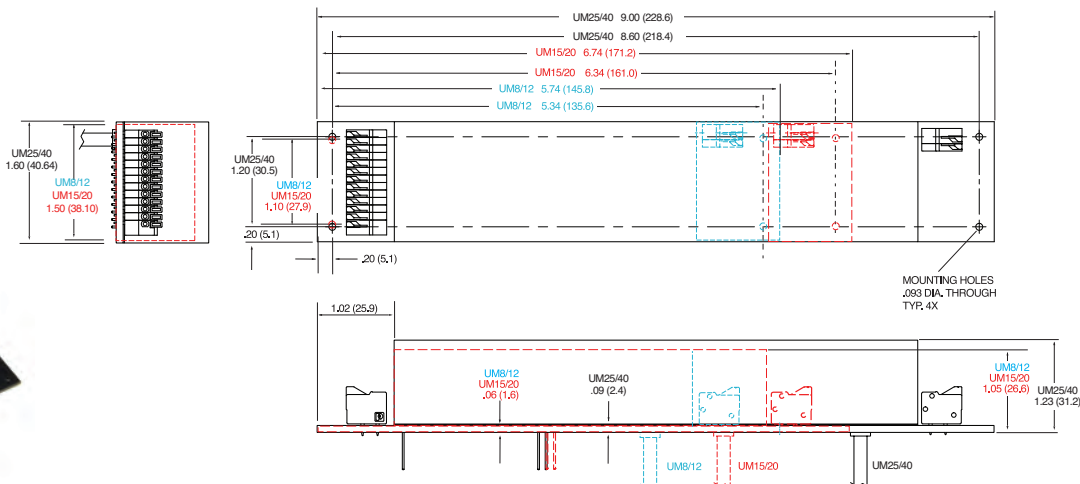
The T Option offers the UM with an improved temperature coefficient. The standard voltage feedback divider is replaced with one having a superior temperature coefficient, resulting in a unit with 25ppm/C° (typical) temperature coefficient.

## PHYSICAL INTERFACING

### B Option

#### Terminal Block-

The B Option provides terminal block connections for both the customer interface and high voltage output/return. This feature can be helpful in situations where frequent wiring changes are anticipated, as in a testing or prototype environment.

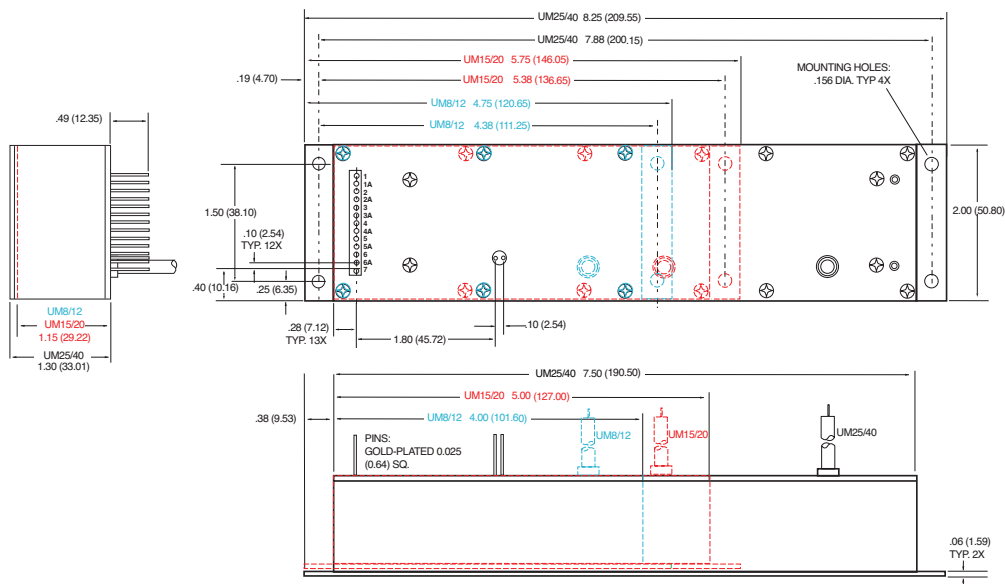


## SHIELDING OPTIONS

### S Option

#### RF Tight Shielded Can-

The S Option mounts the UM module inside of a flanged RF tight aluminum can.



### SHIELDING OPTIONS (CONT)

#### M Option

##### Mu Metal Shield-

UM modules can be fitted with an adhesive backed Mu Metal foil shield to help protect sensitive adjacent circuitry.



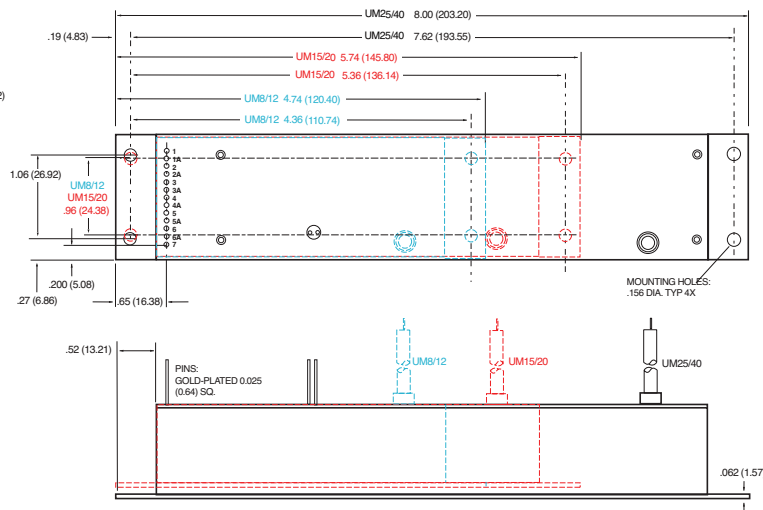
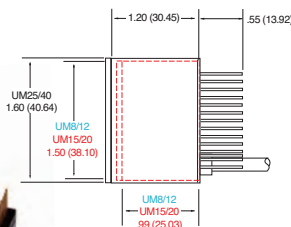
Same as standard unit.  
See page 6 of 6 for dimensional drawings

### CHASSIS MOUNTING OPTION

#### E Option

##### Eared Mounting Plate-

An eared mounting plate is affixed to the top surface of the UM module allowing simple chassis mounting of unit.



### ORDERING INFORMATION

Voltage	0 to 8kV	8
	0 to 10kV	10
	0 to 12kV	12
	0 to 15kV	15
	0 to 20kV	20
	0 to 25kV	25
	0 to 30kV	30
	0 to 35kV	35
	0 to 40kV	40
Polarity	Positive	P
	Negative	N
Power	Watts Output	4
	Watts Output	15
	Watts Output	30

### STANDARD UNIT ORDERING EXAMPLE

UM30N30  
Model | Voltage | Polarity | Power

### OPTION ORDERING INFORMATION

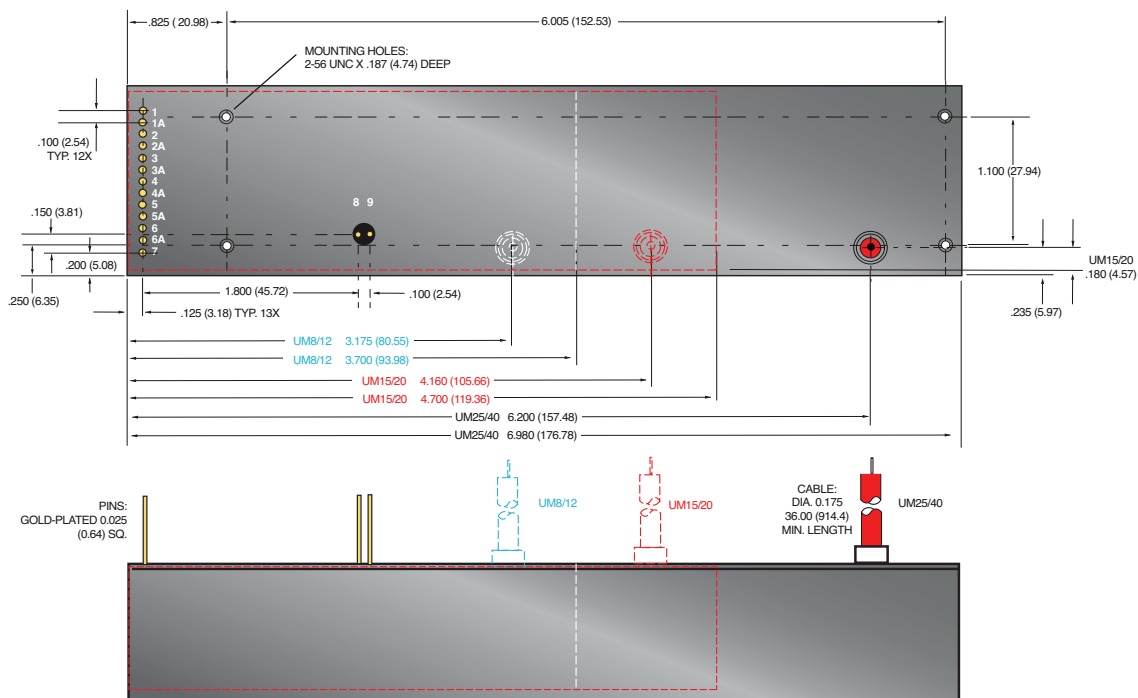
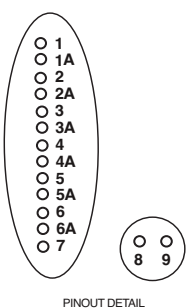
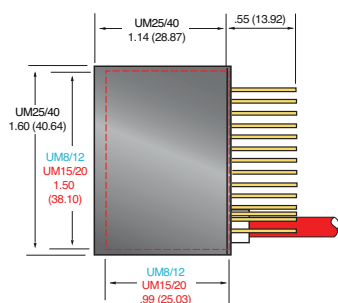
OPTION	OPTION CODE
Legacy Interface	L
Low Temperature Coefficient	T
Mu Metal Shield	M
RF Tight Shielded Can	S
Eared Mounting Plate	E
Terminal Block	B

### OPTION ORDERING EXAMPLE

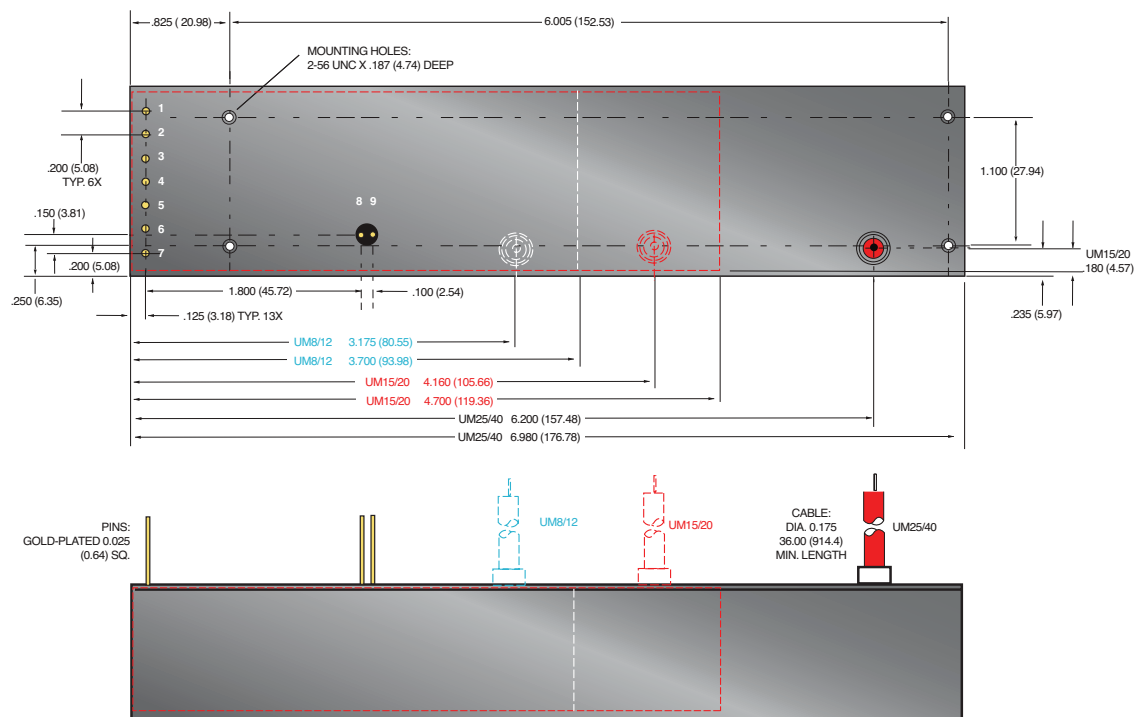
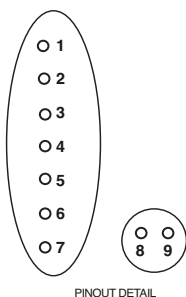
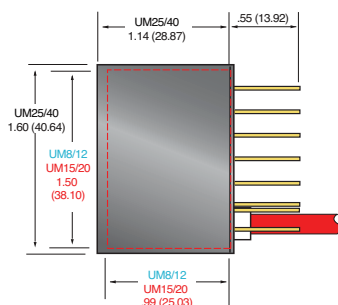
UM25P15/L/E  
Model | Voltage | Polarity | Power | Option | Option

DIMENSIONS: in.[mm]

## 15 PIN - Standard Interface



## 9 PIN - Legacy Interface





- **Differential Input for Voltage Program**
- **Optional RS-232/RS-485 Control**
- **10 Watts Output Power**
- **Voltage and Current Monitors and Controls**
- **High Stability**
- **Ultra Low Ripple and Noise**
- **CE Marked and UL61010-1 Certified**

Spellman's new MPS series are a family of high voltage 10 Watt modules that provide output voltages ranging from 1kV to 30kV.

The MPS series are high performance products designed with Spellman's hybrid topology of linear and switch mode power conversion techniques delivering lower noise with higher efficiency. The MPS series produces excellent ripple and stability performance specifications from a compact footprint. Additionally the MPS series features, as standard, a differential amplifier input for the voltage programming signal to improve immunity from external system noise and addressing any offset issues. Alternatively the output voltage may be pre-set by an internal potentiometer.

RS-232 or RS-485 digital interfaces are also available as optional; both the standard analog and the optional digital controls are provided via a 15-pin D-type connector.

Spellman's proprietary HV technology coupled with SMT circuitry results in an ultra compact and lightweight module that is available as either a positive or negative supply that is ideal for OEM applications.

## TYPICAL APPLICATIONS

Photomultiplier Tubes	Electrostatic Printing
Electron and Ion Beams	Scintillators
Electronmultiplier Detectors	Mass Spectrometry
Microchannel Plate Detectors	Electrostatic Lenses
Nuclear Instruments	

## OPTIONS

<b>VCC</b>	Variable Current Control
<b>HS</b>	High Stability
<b>DCC 2</b>	RS-232
<b>DCC 4</b>	RS-485

Note: It is not possible to supply the unit with both HS and DCC options

## SPECIFICATIONS

### Input Voltage:

+24 Vdc,  $\pm 2$ Vdc

### Input Current:

$\leq 1$  amp maximum

### Output Voltage:

9 models available from 1kV to 30kV

### Output Polarity:

Positive or negative, specify at time of order

### Power:

10 watts, maximum

### Voltage Regulation:

Line:  $\leq 0.001\%$  of rated output voltage over specified input voltage

Load:  $\leq 0.001\%$  of rated output voltage for full load change

### Current Regulation (VCC Option):

Line:  $\leq 0.01\%$  for 1V input voltage change under any load conditions

Load:  $\leq 0.01\%$  for full load to short circuit

### Ripple:

See "model selection" table

### Stability:

$\leq 0.007\%$  per hour, 0.02% per 8 hours after 1.0 hour warm up period.  
 $\leq 0.05\%$  per 1000 hours after 1.0 hour warm up period (HS option)

### Temperature Coefficient:

$\leq 25$ ppm per degree C  
 $\leq 10$ ppm per degree C (HS option)

### Environmental:

Temperature Range:  
 Operating: 0°C to 50°C  
 Storage: -35°C to 85°C

### Humidity:

20% to 85% RH, non-condensing

### Cooling:

Convection cooled

### Interface Connector:

15 pin male D connector

### Output Connector:

A captive 39.4" (1 meter) long shielded HV cable is provided

### Dimensions:

1-10kV:	1.18" H X 2.75" W X 5.12" D (30mm x 70mm x 130mm)
15-20kV:	1.18" H X 2.75" W X 6.49" D (30mm x 70mm x 165mm)
30kV:	1.37" H X 2.95" W X 8.47" D (65mm x 75mm x 215mm)

### Weight:

1-3kV:	9.88 oz. (280g)
5-10kV:	14.82 oz. (420g)
15-20kV:	22.92 oz. (650g)
30kV:	35.51 oz. (950g)

### Regulatory Approvals:

UL recognized component (RC), File E354595. Compliant to IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1. UKAS marked to BS EN 61010-1. RoHS compliant.

As the unit is designed for incorporation within the users system it is not tested against any specific EMC standards. The user will need to take sensible EMC precautions when designing the unit in and verify the overall system EMC performance against any relevant standards.

### MPS ANALOG INTERFACE— 15 PIN D CONNECTOR (NON-DCC UNITS)

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power/Signal Ground	Ground (also used as analog signal ground on 1kV to 10kV units)
2	+24Vdc Input	+24Vdc @ 1 amp maximum
3	Voltage Monitor Output	0 to 10Vdc=0 to 100% Rated Output $\pm 2\%$ , $Z_{out}=10k\Omega$
4	Local Programming Potentiometer Wiper Output	Potentiometer connected to +10Vdc (accuracy: 0.2%) and Ground, 0 to 10Vdc adjustable wiper output provided
5	Voltage Program Input	0 to 10Vdc=0 to 100% Rated Output $\pm 2\%$ , $Z_{in}=10M\Omega$
6	Voltage Program Differential Amplifier Output	0 to 10Vdc=0 to 100% Rated Output, $Z_{out}=10k\Omega$
7	Voltage Program Differential Amplifier Input—Positive	0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of rated output, diode clamped to ground, $Z_{in}=38k\Omega$
8	Current Monitor Output	0 to 10Vdc = 0 to 100% Rated Output $\pm 2\%$ , $Z_{out}=10k\Omega$
9	Voltage Program Differential Amplifier Input—Negative	0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of Rated Output, diode clamped to ground, $Z_{in}=38k\Omega$
10	No Connection	No Connection
11	Current Program Input	Standard: Internally connected to provide 110% fixed current limit VCC Option: 0 to 10Vdc=0 to 100% Rated Output $\pm 2\%$ , $Z_{in}=1M\Omega$
12	Enable Input	Low = Enable, TTL, CMOS, Open Collector Compliant
13	Internal Connection	No Connection
14	Vref (/HS unit only)	+10V ultra high stability reference output. Accuracy: 0.05%, temperature coeff. <5ppm/°C On standard units the reference voltage is available on pin 4
15	Analog Signal Ground (15kV to 20kV units)	Analog Signal Ground (No connection for (1kV to 10kV units)

### MPS DIGITAL INTERFACE— 15 PIN D CONNECTOR (DCC UNITS)

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power/Signal Ground	Ground
2	+24Vdc Input	+24Vdc @ 1 amp maximum
3	No Connection	No Connection
4	Local Programming Potentiometer Wiper Output	Potentiometer connected to +10Vdc and Ground, 0 to 10Vdc adjustable wiper output provided
5	No Connection	No Connection
6	No Connection	No Connection
7	No Connection	No Connection
8	No Connection	No Connection
9	No Connection	No Connection
10	No Connection	No Connection
11	No Connection	No Connection
12	Enable Input	Low = Enable, TTL, CMOS, open collector compliant
13	No Connection	No Connection
14	TxD	Transmit data (output) with respect to ground (pin 1)
15	RxD	Receive data (input) with respect to ground (pin 1)

Notes: 1.) The DCC option operated via a simple ASCII protocol. Contact us for more information.  
2.) The HS and DCC option cannot be offered together

### MPS SELECTION TABLE

Model	Output Voltage	Output Current	Ripple (Vpp)
MPS1*10/24	1kV	10mA	<10mV
MPS2*10/24	2kV	5.00 mA	<20mV
MPS2.5*10/24	2.5kV	4.00 mA	<25mV
MPS3*10/24	3kV	3.3mA	<25mV
MPS5*10/24	5kV	2mA	<30mV
MPS10*10/24	10kV	1mA	<50mV
MPS15*10/24	15kV	0.66mA	<100mV
MPS20*10/24	20kV	0.5mA	<150mV
MPS30*10/24	30kV	0.33mA	<250mV

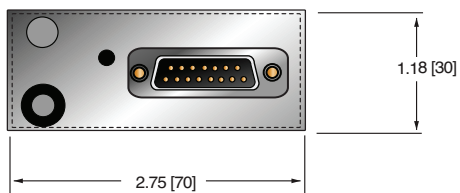
\*Specify "P" for positive polarity or "N" for negative polarity.  
Custom units available.

### How To Order:

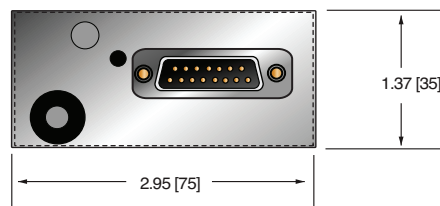
MPSXX\*10/24/YYY  
where:  
XX is the Output voltage (see selection table)  
\* is the polarity: P for positive / N for negative  
YYY is the option: VCC / HS / DCC2 / DCC4

DIMENSIONS: in.[mm]

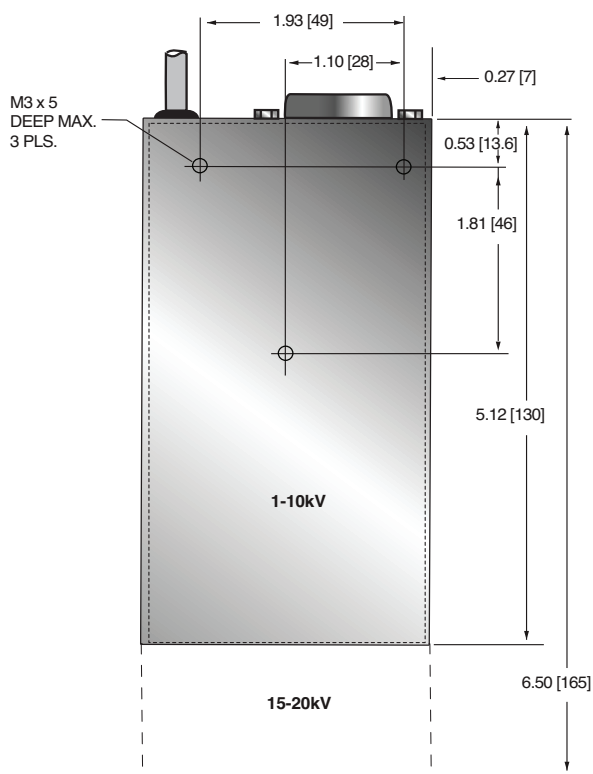
**1-20kV  
FRONT VIEW**



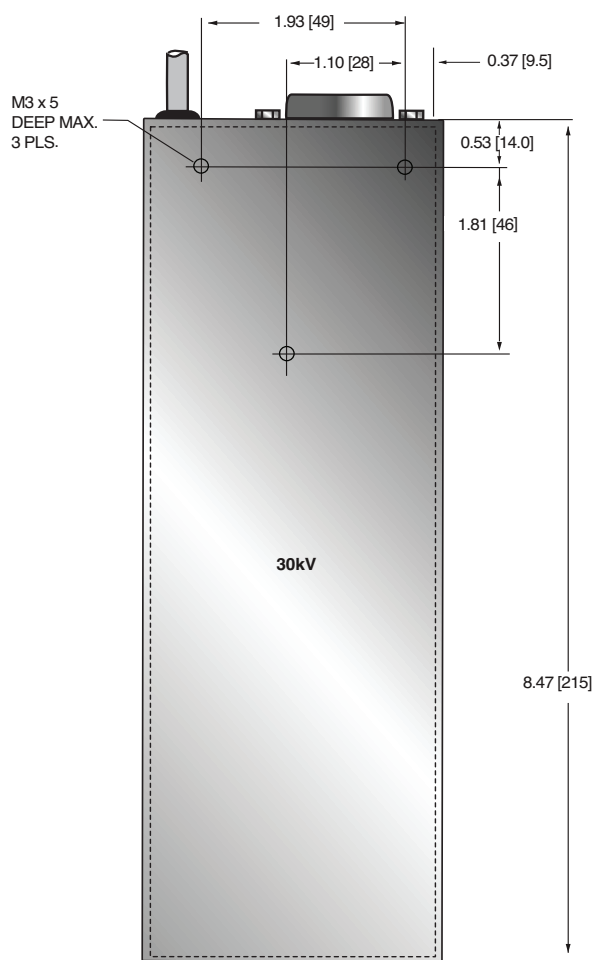
**30kV  
FRONT VIEW**



**BOTTOM VIEW**



**BOTTOM VIEW**



**SIDE VIEW**



**SIDE VIEW**





- **Extremely Compact 10W High Performance Module**
- **Multiple Control Interfaces: Differential Analog, RS-232 and RS-485**
- **Voltage and Current Monitors**
- **High Stability, Low TC**
- **Ultra Low Ripple and Noise, Down to 1/f Band**
- **Free GUI for Testing and Development Work**
- **Digital Control Features: Multiple Units Operation, Current Control, Status Flags and Wobbler Function**

Spellman's MPD series is a family of high voltage, high performance 10 Watt modules with output voltages ranging from 1kV to 30kV.

Spellman's hybrid topology of linear and switch mode power conversion techniques delivers ultra-low noise, excellent ripple and stability performance all within its compact footprint.

The MPD series can be controlled via analog or digital interfaces, both provided via a standard 15-pin D-type connector.

In analog mode, the unit features a differential amplifier input for the voltage programming signal to improve immunity from external system noise and address any offset issues. In digital mode, RS-232 and RS-485 interfaces provide additional features: current control, status flags, multiple units operation (RS-485 only), and wobbler function.

Spellman's proprietary HV technology coupled with SMT circuitry results in an ultra-compact and lightweight module, available as either a positive or negative supply, that is ideal for OEM applications.

## TYPICAL APPLICATIONS

Mass Spectrometry	Electrostatic Printing
Electrostatic Lenses	Scintillators
Automatic test equipment	Electron Multipliers
Capillary Electrophoresis	Electrospinning
Electron and Ion Beams	Electrostatic Chucks
Microchannel Plate Detectors	Photomultiplier Tubes

## SPECIFICATIONS

### Input Voltage:

+24 Vdc,  $\pm 2$ Vdc

### Input Current:

$\leq 1$  amp maximum

### Output Voltage:

7 models available from 1kV to 30kV

### Output Polarity:

Positive or negative, specify at time of order

### Power:

10 watts, maximum

### Voltage Regulation:

Line: For a 1V line change 10ppm

Load: 0-100% load 10ppm

### Current Limit:

110% of rated output current. In digital control mode, the current limit is settable from 0 to 110% of the rated output current.

### Ripple:

See "drift, ripple and noise" table

### Stability:

After one hour warm up period.

10ppm/hour

25ppm/8 hours

100ppm/1000 hours

### Temperature Coefficient:

10ppm per degree C

### Protection:

Arc and short circuit protected.

Not designed to withstand continuous arcing.

The unit monitors and reports faults through status flags (digital com). When a trip occurs, the output is disabled and the unit can be reset through enable, fault reset or power cycle.

### Control Software:

A free GUI can be provided for customer testing and development work.

### Main Features:

- Voltage control and enable inputs
- Voltage and current monitor outputs
- 10V voltage reference output

### Digital Features:

The following features are available when operating in digital control mode.

- Multiple units operation (RS-485 only)
- Current control
- Wobbler function: sine wave superimposed to voltage output (programmable amplitude 0-300V, period 0.1 to 2s)

### Environmental:

Temperature Range:

Operating: 0°C to 50°C

Storage: -35°C to 85°C

Humidity:

20% to 85% RH, non-condensing

### Cooling:

Convection cooled

**Dimensions:**

1kV-10kV:  
1.18" H X 2.75" W X 5.12" D (30mm x 70mm x 130mm)  
15kV-20kV:  
1.18" H X 2.75" W X 6.50" D (30mm x 70mm x 165mm)  
30kV-20kV:  
1.38" H X 2.95" W X 8.46" D (35mm x 75mm x 215mm)

**Weight:**

1kV-10kV: 14.82 oz. (420g)  
15kV-20kV: 22.93 oz. (650g)  
30kV: 33.51 oz. (950g)

**Interface Connector:**

15 pin male D connector

**Output Connector:**

Captive 39.4" (1 meter) long un-terminated and shielded HV cable:

1kV to 20kV units: HRG58

30kV units: LEMO 130666

**Regulatory Approvals:**

Compliant to EEC Low Voltage Directive. UK Conformity Assessed. UL/CUL recognized, File E354595. RoHS Compliant.

Note: for 1kV and 30kV units approvals, please inquire.

**MPD SELECTION TABLE**

Model	Output Voltage	Output Current
MPD1*10/24	1kV	10mA
MPD2.5*10/24	2.5kV	4.00mA
MPD5*10/24	5kV	2mA
MPD10*10/24	10kV	1mA
MPD15*10/24	15kV	0.66mA
MPD20*10/24	20kV	0.5mA
MPD30*10/24	30kV	0.33mA

\*Specify "P" for positive polarity or "N" for negative polarity.  
Custom units available.

**MPD DRIFT, RIPPLE and NOISE**

Model	3mHz-30mHz	30mHz-3Hz	3Hz-30Hz	30Hz-300Hz	300Hz-30kHz	30kHz-3MHz
MPD1	7mV	7mV	7mV	4mV	4mV	4mV
MPD2.5	10mV	10mV	10mV	5mV	5mV	5mV
MPD5	10mV	10mV	10mV	10mV	10mV	10mV
MPD10	20mV	20mV	20mV	20mV	20mV	20mV
MPD15	30mV	30mV	30mV	30mV	30mV	30mV
MPD20	40mV	40mV	40mV	40mV	40mV	40mV
MPD30	60mV	60mV	60mV	60mV	60mV	60mV

**MPD EXTERNAL INTERFACE—  
15 PIN MALE D CONNECTOR**

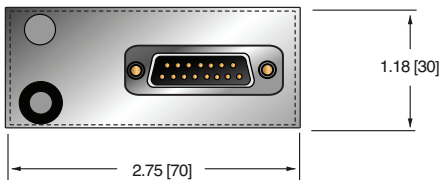
PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Ground	Ground
2	+24Vdc Input	+24Vdc @ 1 amp maximum
3	Voltage Monitor Output	Voltage monitor 0 to 10Vdc for 0 to full scale output $\pm 1\%$ (wrt signal ground) $Z_{out}=10k\Omega$
4	Voltage Reference Output	10Vdc @ 10mA maximum
5	Voltage Program Input	0 to 10Vdc=0 to 100% rated output $\pm 1\%$ , $Z_{in}=10M\Omega$
6	Voltage Program Differential Amplifier Output	0 to 10Vdc=0 to 100% rated output, $Z_{out}=10k\Omega$
7	Voltage Program Differential Amplifier Input—Positive	0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of rated output, diode clamped to ground, $Z_{in}=38k\Omega$
8	Current Monitor Output	Voltage monitor 0 to 10Vdc for 0 to full scale output $\pm 1\%$ (wrt signal ground) $Z_{out}=10k\Omega$
9	Voltage Program Differential Amplifier Input—Negative	0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of rated output, diode clamped to ground, $Z_{in}=38k\Omega$
10	Voltage Program Digital Output	0 to 10Vdc = 0 to 100% rated output, $Z_{out}=10k\Omega$
11	Signal Ground	Signal ground for control and monitoring
12	Enable Input	Low = Enable, TTL, CMOS, open collector compliant
13	Digital Mode	RS-232 or RS-485 configuration Low = RS-485, Open circuit = RS-232
14	RS-232 Tx/RS-485 (-)	Transmit data (output) wrt pin 1 or RS-485 inverting
15	RS-232 Rx/RS-485 (+)	Receive data (input) wrt pin 1 or RS-485 non inverting

Digital Control – Connect pin 5 to pin 10

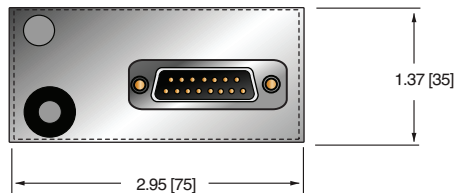
Analog Control – Connect pin 5 to pin 6

DIMENSIONS: in.[mm]

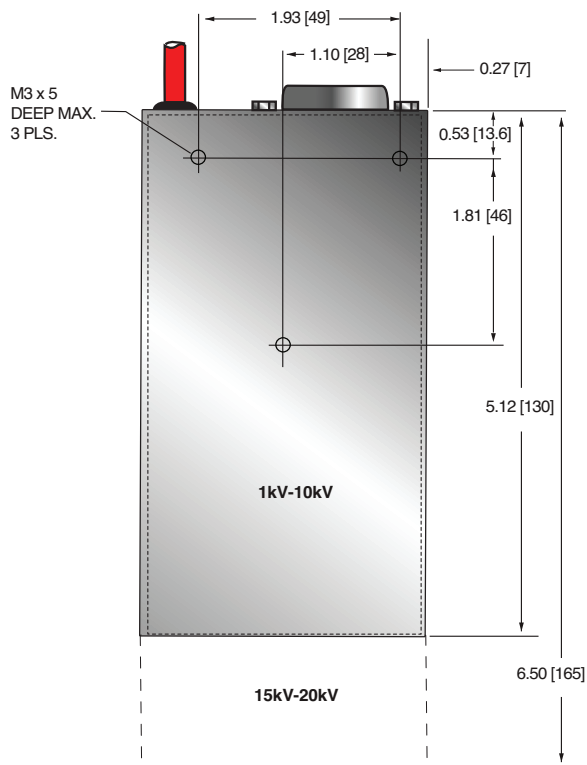
**1kV-20kV  
FRONT VIEW**



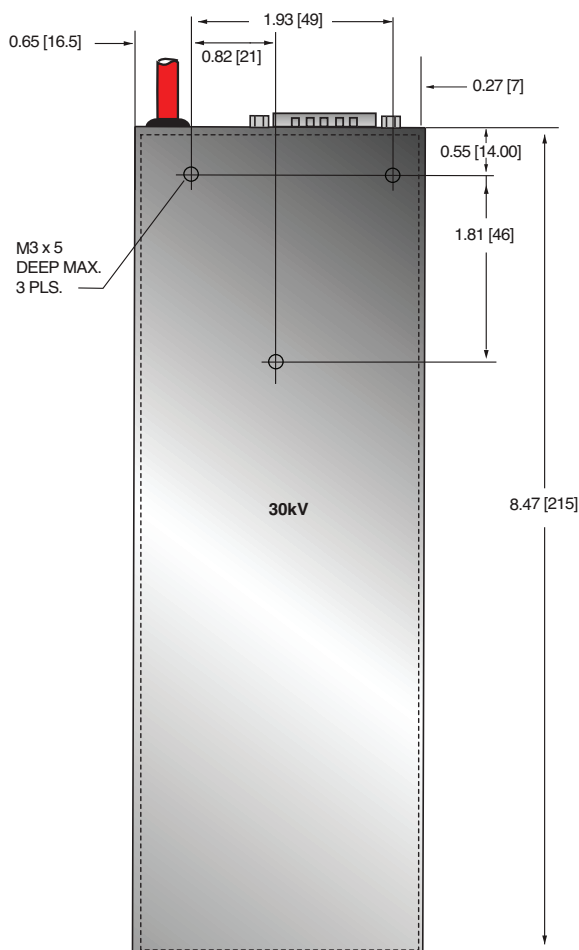
**30kV  
FRONT VIEW**



**BOTTOM VIEW**



**BOTTOM VIEW**



**SIDE VIEW**



**SIDE VIEW**





- **Differential Input for Voltage Program**
- **20 Watts Output Power**
- **Voltage and Current Controls**
- **Voltage and Current Monitors**
- **High Stability**
- **Ultra Low Ripple and Noise**
- **High Voltage Enable Control**

Spellman's new MPS20W series are a family of high voltage 20 Watt modules that provide output voltages ranging from 1kV to 20kV.

The MPS20W series are high performance products designed with Spellman's hybrid topology of linear and switch mode power conversion techniques delivering lower noise with higher efficiency. The MPS20W series produces excellent ripple and stability performance specifications from a compact footprint. Additionally the MPS20W series features, as standard, a differential amplifier input for the voltage programming signal to improve immunity from external system noise and addressing any offset issues. Alternatively the output voltage may be pre-set by an internal potentiometer. A fully featured remote user interface is provided via 15-pin D-type connector as standard. The output voltage is arc and short circuit protected and the power input has a current limiter fitted.

Spellman's proprietary HV technology coupled with SMT circuitry results in an ultra compact and lightweight module that is available as either a positive or negative supply that is ideal for OEM applications.

## TYPICAL APPLICATIONS

Photomultiplier Tubes  
Microchannel Plate Detectors  
Scintillators  
Mass Spectrometry  
Electron and Ion Beams  
Electrostatic Lenses  
Nuclear Instruments  
Electrostatic Printing

## OPTIONS

**VCC** Variable Current Control

## SPECIFICATIONS

### Input Voltage:

+24 Vdc,  $\pm 2$ Vdc

### Input Current:

$\leq 1.5$  amps

### Output Voltage:

7 models available from 1kV to 20kV

### Output Polarity:

Positive or negative, specify at time of order

### Power:

$\leq 20$  watts

### Voltage Regulation:

Line:  $\leq 0.001\%$  of rated output voltage over specified input voltage

Load:  $\leq 0.001\%$  of rated output voltage for full load change

### Current Regulation (Vcc Option):

Line:  $\leq 0.01\%$  for 1V input voltage change under any load conditions

Load:  $\leq 0.001\%$  for 0 to full load

### Ripple:

See "model selection" table

### Stability:

$\leq 0.01\%$  per hour, 0.02% per 8 hours after 1.0 hour warm up period.

### Temperature Coefficient:

$\leq 25$ ppm per degree C

### Environmental:

Temperature Range:

Operating: 0°C to 50°C

Storage: -35°C to 85°C

Humidity:

20% to 85% RH, non-condensing

### Cooling:

Convection cooled

### Dimensions:

1-10kV 1.31" H x 3.74" W x 5.91" D (33.5mm x 95mm x 150mm)

15-20kV 1.31" H x 3.74" W x 7.28" D (33.5mm x 95mm x 185mm)

### Weight:

1-2kV: 15.17 oz. (430g)

3-10kV: 25.76 oz. (730g)

15-20kV: 35.30 oz. (1000g)

### Interface Connector:

15 pin male D connector

### Output Connector:

A captive 39.4" (1 meter) long shielded HV cable is provided

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588. RoHS compliant.

## MPS20W SELECTION TABLE

Model	Output Voltage	Output Current	Ripple (Vpp)
MPS1*20/24	0-1kV	20mA	<25mV
MPS2*20/24	0-2kV	10 mA	<50mV
MPS3*20/24	0-3kV	6.67mA	<75mV
MPS5*20/24	0-5kV	4mA	<125mV
MPS10*20/24	0-10kV	2mA	<250mV
MPS15*20/24	0-15kV	1.33mA	<375mV
MPS20*20/24	0-20kV	1mA	<500mV

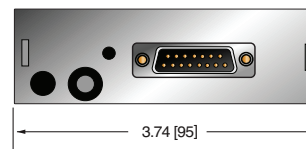
\*Specify "P" for positive polarity or "N" for negative polarity.  
Custom units available.

## MPS20W ANALOG INTERFACE — 15 PIN D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power/Signal Ground	Ground
2	+24Vdc Input	+24Vdc @ 1.5 amp maximum
3	Voltage Monitor Output	0 to 10Vdc=0 to 100% Rated Output, Zout =2.2kΩ
4	Local Programming Potentiometer Wiper Output	Potentiometer connected to +10Vdc and Ground, 0 to 10Vdc adjustable wiper output provided
5	Voltage Program Input	0 to 10Vdc=0 to 100% Rated Output, Zin=10MΩ
6	Voltage Program Differential Amplifier Output	0 to 10Vdc=0 to 100% Rated Output, Zout =2.2kΩ
7	Voltage Program Differential Amplifier Input—Positive	0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of rated output, diode clamped to ground, Zin =38kΩ
8	Current Monitor Output	0 to 10Vdc = 0 to 100% Rated Output, Zout =2.2kΩ
9	Voltage Program Differential Amplifier Input—Negative	0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of Rated Output, diode clamped to ground, Zin =38kΩ
10	No Connection	No Connection
11	Current Program Input	Standard: Internally connected to provide 110% fixed current limit VCC Option: 0 to 10Vdc=0 to 100% Rated Output, Zin=1MΩ
12	Enable Input	Low = Enable, TTL, CMOS, Open Collector Compliant
13	Internal Connection	No Connection
14	No Connection	No Connection
15	Analog Signal Ground	Analog Signal Ground

DIMENSIONS: in.[mm]

### FRONT VIEW

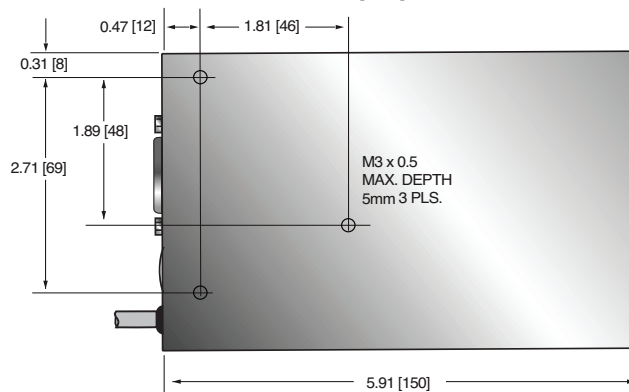


1-10kV Unit

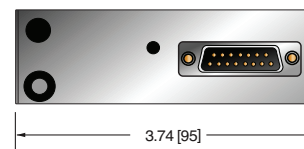
### SIDE VIEW



### BOTTOM VIEW



### FRONT VIEW

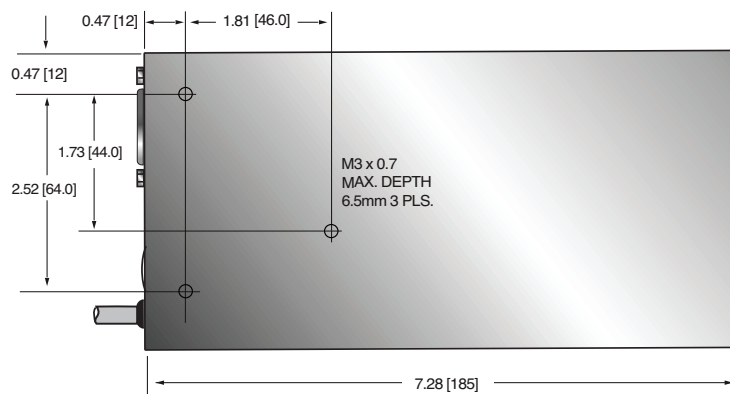


15-20kV Unit

### SIDE VIEW



### BOTTOM VIEW





- **Output Voltages from 1kV to 60kV**
- **Arc and Short Circuit Protected**
- **Low Stored Energy**
- **Test Points for Output Current and Voltage**
- **Enable/Inhibit Control of Output**
- **OEM Customization Available**

Spellman's SMS Series of 60 watt high voltage power supplies are based on a proprietary resonant fly back power conversion topology that provides over 80% efficiency. These fixed polarity modules (specify positive or negative at time of order) feature both voltage and current regulation with automatic crossover, making them ideal for sensitive load applications. The robust design of SMS Series along with comprehensive arc and short circuit protection allow operation in the most demanding environments.

#### TYPICAL APPLICATIONS

Electrospinning  
Hipot Testing  
Detector Arrays  
Electrophoresis  
Cable Testing

#### SPECIFICATIONS

##### Input:

+24Vdc  $\pm 10\%$  @ 4.0A

##### Output:

10 models from 1kV to 60kV. Positive or negative polarity outputs.

##### Efficiency:

80 to 85%, typical

##### Voltage Regulation:

Load: 0.01% of output voltage no load to full load.  
Line:  $\pm 0.01\%$  for  $\pm 10\%$  change in input voltage.

##### Current Regulation:

Load: 0.1% of output current from 0 to rated voltage.  
Line: 0.05% of rated current over specified input range.

##### Stability:

0.02% per 8 hours.

##### Temperature Coefficient:

0.01% per  $^{\circ}\text{C}$ , voltage or current regulated.

##### Ripple:

0.1% p-p of maximum output voltage.

##### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$   
Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
Humidity:  
0 to 90%, non-condensing

##### Dimensions:

3"H x 5"W x 9"D (7.6cm x 12.7cm x 23.0cm).

##### Weight:

5.25 pounds (2.38kg)

##### Input Connector:

12 pin AMP Metri-Mate (mating connector and pins provided)

##### Output Cable:

18"  $\pm 1$ " (45.7cm) of UL<sup>®</sup> approved high voltage wire

##### Front Panel Ground Connection:

Threaded 8-32 ground stud, nut provided

##### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

### SMS SELECTION TABLE

Maximum Rating kV	Maximum Rating mA	Model Number
1	60	SMS 1*60
3	20	SMS 3*60
5	12	SMS 5*60
10	6	SMS 10*60
15	4	SMS 15*60
20	3	SMS 20*60
30	2	SMS 30*60
40	1.5	SMS 40*60
50	1.2	SMS 50*60
60	1.0	SMS 60*60

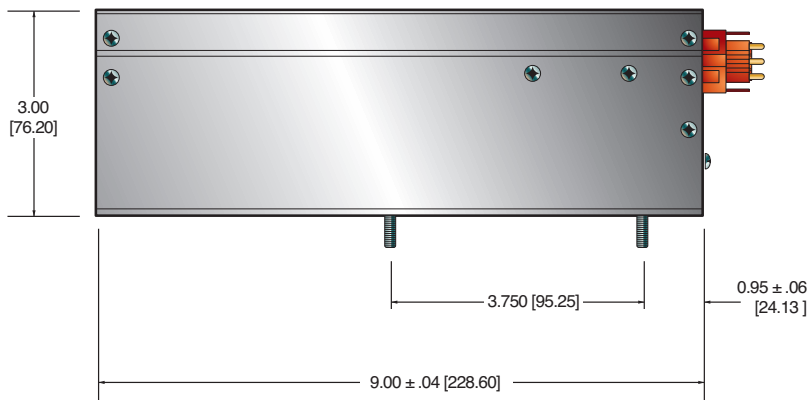
\*Specify "P" for positive polarity or "N" for negative polarity.

### CONNECTOR 12 PIN

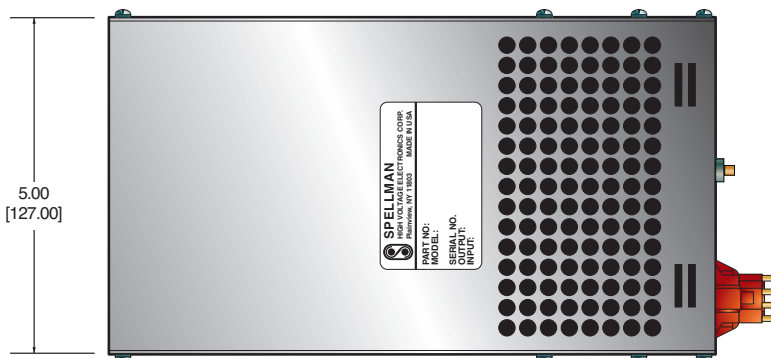
PIN	SIGNAL	PARAMETERS
1	Power Ground	+24Vdc Return
2	+24Vdc Input	+24Vdc @ 3.5 amps, maximum
3	High Voltage Enable/Inhibit	Open = HV OFF, Ground = HV ON
4	Voltage Test Point	0 to 10Vdc = 0 to 100% of rated output
5	Current Test Point	0 to 10Vdc = 0 to 100% of rated output
6	Voltage Programming	0 to 10Vdc = 0 to 100% of rated output
7	Current Programming	0 to 10Vdc = 0 to 100% of rated output
8	+10Vdc Reference	+10Vdc @ 1mA maximum
9	Signal Ground	Signal Ground
10	Spare	No Connection
11	Spare	No Connection
12	Spare	No Connection

DIMENSIONS: in.[mm]

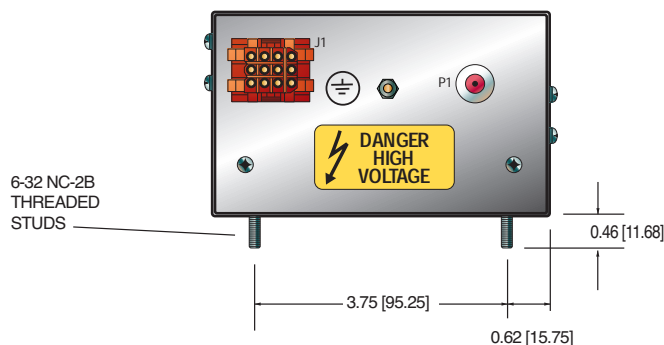
#### SIDE VIEW



#### TOP VIEW



#### BACK VIEW





- **5 Voltage Ranges from 8kV to 20kV, Fixed Negative or Positive Polarity**
- **Available Output Power Increments of 60 and 125 Watts**
- **Voltage/Current Regulation with Automatic Crossover Control**
- **Voltage and Current Monitor Signals**
- **Fully Arc and Short Circuit Protected**
- **UL Recognized**
- **CE Listed and RoHS Compliant**

## Form, Fit and Function Usability:

Spellman's UMW Series of high voltage modules provides users with a form, fit and function replacement for presently available commercially made units, while providing superior features and benefits at competitive pricing. Utilizing proprietary power conversion technology, unique high voltage packaging, and Spellman's unmatched encapsulation techniques, these SMT based high voltage modules provide improved performance and easier system integration at a lower cost when compared to the competition.

## Advanced Power Conversion Topology:

UMW converters use a proprietary resonant power conversion topology providing exceptional efficiency and inherent low noise and ripple outputs. Radiated emissions are dramatically reduced compared to conventional switching topologies, effectively minimizing or even eliminating the need to shield the unit from adjacent circuitry.

The high voltage output is generated through the use of a ferrite core high voltage step up transformer which feeds the high voltage output circuitry. Units utilize an appropriate arrangement of low capacitance Cockcroft-Walton voltage multiplier stages to obtain the specified high voltage output.

Due to the fixed, high frequency conversion rate of the converter, the output capacitance is small resulting in minimal stored energy and fast rise times. Through the use of generously rated surge limiting resistors and a fast acting current loop, all units are fully arc and short circuit protected.

## Control and Regulation:

The actual output voltage generated is sampled via a high impedance divider to create a voltage feedback signal. A current feedback signal is created via a current sense resistor being placed in the low end return of the high voltage output circuitry. These two accurate ground referenced feedback signals are used to precisely regulate and control the units output. These accurate and calibrated signals are also used for external monitoring purposes.

Due to the UMW's unique converter topology it can provide full current into low impedance loads or even a short circuit. Standard units limit at 103% of maximum rated output current.

## Standard User Interface:

The Spellman UMW Series offers a standard customer interface that provides current programming capability and positive polarity, buffered, low output impedance voltage and current monitor signals (0 to +4.64Vdc equals 0 to full scale rated). A voltage programming input is provided where 0 to +4.64Vdc equals 0 to 100% of rated voltage.

Current programmability allows the user to set where the unit will current limit, anywhere from 0 to 100% of maximum rated current. This feature is beneficial where less than full output current is desired, like in the case of protecting a sensitive load.

The buffered low impedance voltage and current monitor signals can drive external circuitry directly, while minimizing loading and pickup effects. These feature save the user the expense and implementation of external interface buffering circuitry while improving overall signal integrity.

## Mechanical and Environmental Considerations:

The UMW Series are modular sheet metal enclosed converters measuring 8.00" X 4.50" X 1.075" (203mm X 114mm X 27mm). All units are encapsulated using a propriety silicon based potting material which is considerably lighter in weight than epoxy encapsulation techniques. Physical mounting of the unit is accomplished via the use of bottom mounted studs or threaded blind inserts, dependent upon model ordered.

### SPECIFICATIONS

#### Input Voltage:

24Vdc

#### Normal Voltage Range:

23Vdc to 30Vdc

#### Derated Voltage Range:

11Vdc to 30Vdc

#### Input Current: (typical)

Disabled: <40mA  
No load: <600mA  
Full load:  
60 watt units: 3 amps  
125 watt units: 6.2 amps

#### Voltage Regulation:

Line: <0.01%  
Load: <0.01%

#### Current Regulation:

Line: <0.01%  
Load: <0.01%

#### Stability:

0.01% per 8 hours, 0.02% per day  
after 30 min. warmup

#### Accuracy:

2% on all programming and monitoring,  
except I Sense 10%

#### Temperature Coefficient: (typical)

100ppm/°C

#### Overshoot:

<0.1% Vp

#### Environmental:

Temperature Range:  
Operating: 0°C to 65°C case temperature  
Storage: -55°C to 85°C, non operational  
Humidity:  
10% to 90%, non-condensing

#### Dimensions:

8.00" L X 4.50" W X 1.075" H  
(203mm X 114mm X 27mm)

#### Weight:

1.75 lbs. (0.79kg)

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. UL/CUL recognized, File  
E227588. RoHS Compliant.

### UMW 60W SELECTION TABLE

Model Number	Output V	Output Current	Ripple(max) %Vp-p	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal
UMW8*60	0 to 8kV	7.5mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	3553pF	14.1k $\Omega$	1.6V
UMW10*60	0 to 10kV	6mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	3553pF	14.1k $\Omega$	1.47V
UMW12*60	0 to 12kV	5mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	2870pF	30k $\Omega$	1.24V
UMW15*60	0 to 15kV	4mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	2460pF	30k $\Omega$	1.0V
UMW20*60	0 to 20kV	3mA	<1.0 (C load $\geq 0.01\mu\text{F}$ )	2460pF	45k $\Omega$	4.61V

### UMW 125W SELECTION TABLE

Model Number	Output V	Output Current	Ripple(max) %Vp-p	Output Capacitance	Arc Limiting Resistance	I Sense Scaling Full Scale Signal
UMW8*125	0 to 8kV	15.5mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	7106pF	3k $\Omega$	1.1V
UMW10*125	0 to 10kV	12.5mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	7106pF	3k $\Omega$	1.15V
UMW12*125	0 to 12kV	10.5mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	5740pF	6.6k $\Omega$	1.40V
UMW15*125	0 to 15kV	8.3mA	<1.0 (C load $\geq 0.05\mu\text{F}$ )	4920pF	6.6k $\Omega$	1.1V
UMW20*125	0 to 20kV	6.25mA	<1.0 (C load $\geq 0.01\mu\text{F}$ )	4920pF	14.1k $\Omega$	9.57V

Grayed text indicates Legacy interface signals.

### ORDERING INFORMATION

Voltage	0 to 8kV	8
	0 to 10kV	10
	0 to 12kV	12
	0 to 15kV	15
	0 to 20kV	20
Polarity	Positive	P
	Negative	N
Power	60Watts	60
	125Watts	125
Legacy Interface	Legacy Interface	L

If a high voltage mating connector is required it should be included at time of order. See page 3 for details

### ORDERING EXAMPLE

UMW15P125/L

Model | Voltage | Polarity | Power | Option

### STANDARD INTERFACE

PIN	SIGNAL	PARAMETERS
1	Power Ground Return	+24Vdc power ground return
2	+ Power Input	+24Vdc power input
3	I Sense	See I Sense text and tables for details
4	Enable Input	Low (<0.7V, Isink@1mA)=HV OFF, High (open or >2V)=HV ON
5	Signal Ground	Signal Ground
6	Remote V Adjust	0 to +4.64Vdc = 0 to 100%, Zin >1MΩ
7	+5V Reference Output	+5Vdc ±2%. Zout = 475Ω
8	Power Ground Return	+24Vdc Power Ground Return
9	+ Power Input	+24Vdc Power Input
10	Signature Resistor	Unique identifying resistor connected to ground
11	Remote I Adjust	0 to +4.64Vdc = 0 to 100%, Zin >1MΩ Leave open for preset current limit @103% of rated output current
12	I Monitor	0 to +5Vdc = 0 to 107.5%, Zout <10kΩ
13	V Monitor	0 to +5Vdc = 0 to 107.5%, Zout <10kΩ
14	E Out Monitor	1.00 Volt, 1GΩ/1.1MΩ divider with 10MΩ meter

### Interface Connections

Fourteen (14) gold plated 0.025" (0.63mm) square pins that will mate with AMP Mod-U connectors. See mechanical drawing for location and spacing details.

### Programming and Monitor Signals

Voltage and current programming is done via positive polarity, high input impedance, 0 to 4.64Vdc signals. Voltage and current monitors are positive polarity, buffered low output impedance 0 to 4.64Vdc signals.

### Signature Resistor

A unique identifying signature resistor for each type of unit is connected from Pin 10 to Ground. Details if desired are available upon request.

### LEGACY INTERFACE (L OPTION)

PIN	SIGNAL	PARAMETERS
1	Power Ground Return	+24Vdc power ground return
2	+ Power Input	+24Vdc power input
3	I Sense	See I Sense text and tables for details
4	Enable Input	Low (<0.7V, Isink@1mA)=HV OFF, High (open or >2V)=HV ON
5	Signal Ground	Signal Ground
6	Remote Adjust	Positive Polarity Unit: 0 to +4.64Vdc = 0 to 100% rated voltage Zin>1MΩ Negative Polarity Unit: +5Vdc to 0.36Vdc = 0 to 100% rated voltage Zin>1MΩ
7	+5V Reference Output	+5Vdc ±2%. Zout = 475Ω
8	Power Ground Return	+24Vdc Power Ground Return
9	+ Power Input	+24Vdc Power Input
10	Signature Resistor	Unique identifying resistor connected to ground
11	N/C	
12	N/C	
13	N/C	
14	E Out Monitor	1.00 volt/kV, 1GΩ/1.1MΩ divider with 10MΩ meter

### I Sense Signal

The polarity of the current monitor signal is opposite of the polarity of the output voltage of the unit that generated it. So a positive output polarity unit creates a negative polarity current monitor signal; while a negative output polarity unit creates a positive polarity current monitoring signal. This signal is clamped to ground internally via a bidirectional 18 volt transient protection device and the signal is made available via a series connected 47kΩ isolation resistor. Internal HV dividers create a small, linear offset voltage on this current monitor signal that can be compensated for.

### HIGH VOLTAGE MATING CONNECTOR

KV	CONNECTOR
8	LGH1 SHV P.N. 304781-001
10	
12	
15	
20	LGH1L SHV P.N. 304781-101

### Low Voltage Interface Connector

A mating AMP Mod-U interface connector will be provided.

### High Voltage Output Mating Connector

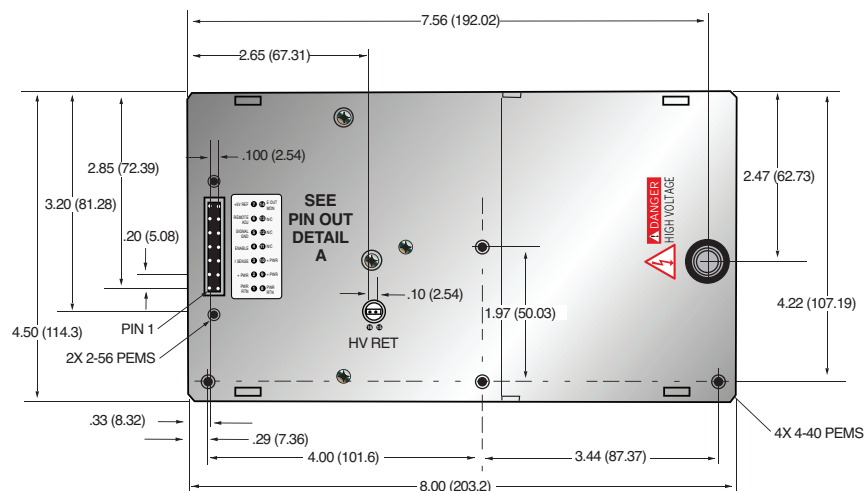
An appropriate mating LGH high voltage connector (36" long) will be required. Please see table to left for specific part number.

### High Voltage Return

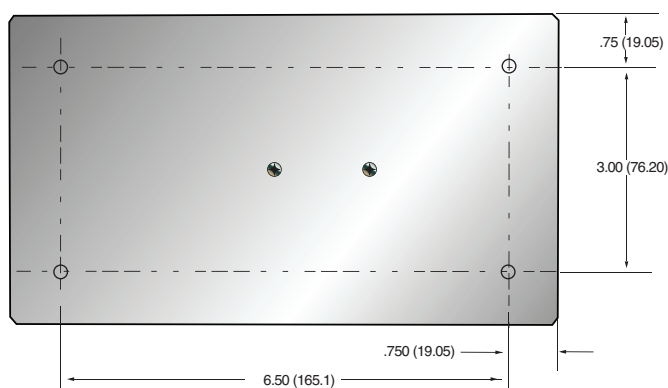
Two gold plated 0.025" (0.63mm) square pins (15 and 16) are provided. These are connected to Power Ground Return.

DIMENSIONS: in.[mm]

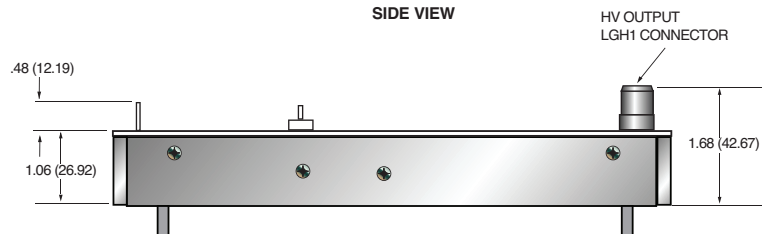
TOP VIEW  
UMW UP TO 15KV



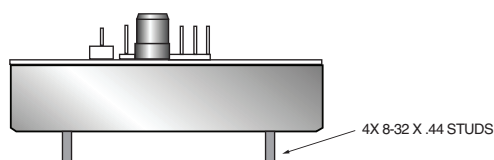
**BOTTOM VIEW**



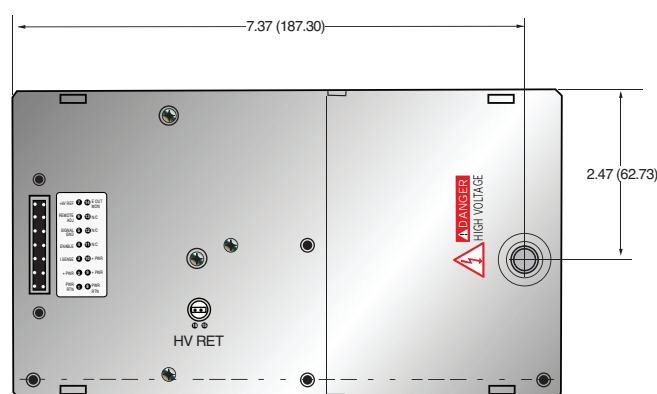
**SIDE VIEW**



**FRONT VIEW**

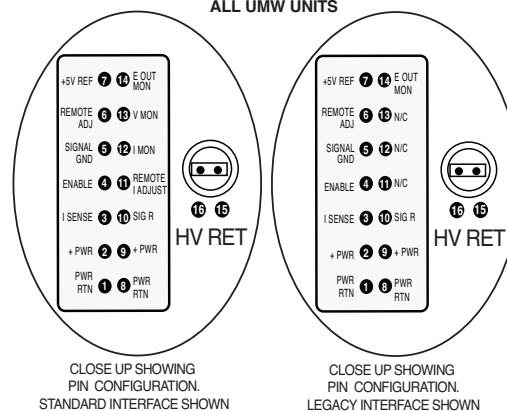


TOP VIEW  
UMW 20KV

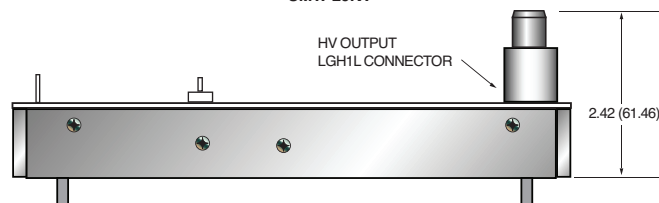


### PIN OUT DETAIL A

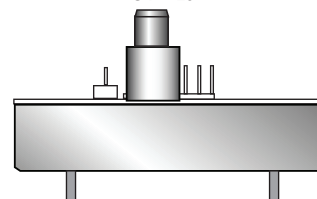
**ALL UMW UNITS**



SIDE VIEW  
UMW 20KV



FRONT VIEW  
UMW 20KV





- **Compact & Lightweight**
- **Models from 1kV-160kV, 300W, 600W AND 1200W**
- **Universal Input, Power Factor Corrected**
- **Low Cost Modular Design**
- **Standard Digital Interfaces: USB, Ethernet and RS-232**
- **CE Compliant, UL Recognized**

Spellman's SLM Series of high voltage modules are designed for OEM applications up to 160kV at 1200 watts. Its universal input, small package size and choice of three standard digital interfaces simplifies integrating the SLM into your system design. Models are available in either positive or negative polarity. The SLM is fully arc and short protected. Excellent regulation specifications are provided along with outstanding stability performance.

### TYPICAL APPLICATIONS

Capacitor Charging	Electrostatics
HiPot Testing	E Beam Systems
CRT Testing	CW Lasers

### FIRMWARE CONFIGURATIONS

#### STANDARD BASED FEATURES

<b>AOL</b>	Adjustable Overload Trip
<b>AT</b>	Arc Trip
<b>NAD</b>	No Arc Detect
<b>NSS</b>	No Slow Start
<b>PSS</b>	Programmable Slow Start
<b>RFR</b>	Remote Fault Reset
<b>RMI</b>	Remote Mode Indicators
<b>ROV</b>	Remote Overvoltage Adjust

### SPECIFICATIONS

#### Input Voltage:

Power factor corrected input,  $\geq 0.98$   
 100-240Vac,  $\pm 10\%$  (90-264Vac):  
     47-63Hz @ 4.0A for 300 watt units  
 200-240Vac,  $\pm 10\%$  (180-264Vac):  
     47-63Hz @ 4.0A for 600 watt units  
     47-63Hz @ 8.0A for 1200 watt units

#### Output Voltage:

12 models—1kV to 160kV

#### Output Polarity:

Negative or positive, specify at time of order

#### Local Indicators:

Arc, HV On, Temp Error, OVP, I Mode  
 Power On, OC, Reg Error

#### Power:

3 power ranges available—300, 600 and 1200 watts.  
 Other power levels available on special order.

#### Voltage Regulation:

$\leq 0.01\%$  of rated output voltage over specified input voltage range  
 $\leq 0.01\%$  of rated output voltage for a full load change

#### Current Regulation:

$\leq 0.01\%$  of rated output current over specified input voltage range  
 $\leq 0.01\%$  of rated output current for a  $\pm 100\mu A$   
 for a full voltage change

#### Ripple:

$\leq 0.2\%$  rms of maximum rated voltage,  
 measured with a 10 foot long HV cable

#### Stability:

$\leq 50\text{ppm/hr}$  after a 2 hour warm up

#### Temperature Coefficient:

$\leq 100\text{ppm}$  per degree C

#### Environmental:

Temperature Range:  
     Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$   
     Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
 Humidity:  
     20% to 85% RH, non-condensing.

#### Control Interface

##### Local Interface:

Potentiometers are provided to adjust voltage and current.

**Remote Interface:** USB, Ethernet and RS-232 are standard,  
 implemented with 12 bits of resolution.

All digital monitors have an accuracy specification of 2%.

**Control Software:** A Windows graphical user interface  
 example is provided.

#### HV Control Enable/Interlock:

A dry contact, hardware based interlock is provided for  
 remote mode. In local mode this I/O is the enable.

#### Monitor Signals:

Voltage and current monitor signals are scaled 0-10Vdc  
 equals 0-100% of full scale, accuracy is 1%.

#### Dimensions:

300/600 watts:	4.75" H X 6" W X 12" D (120.65mm x 152.4mm x 304.8mm)
1200 watts:	4.75" H X 12" W X 12" D (120.65mm x 304.8mm x 304.8mm)
160kV:	10.5" H X 19" W X 21.5" D (266.7mm x 482.6mm x 546.1mm)

#### Weight:

300/600 watts:	14 pounds (6.35kg)
1200 watts:	26 pounds (11.8kg)
160kV:	142 pounds (64.4kg)

## Cooling:

Forced air

## Input Line Connector:

IEC320 cord set with integrated EMI filter

## Output Cable:

1-70kV units:

A detachable 10' (3.3m) long shielded HV cable is provided.

160kV units:

R24 connector. Mating HV cable not provided

## Regulatory Approvals:

Compliant to 204/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. UL/CUL recognized, File 227588. RoHS compliant. SLM160\*1200 is not UL recognized.

## SLM SELECTION TABLE- 300W

300 Watt		
kV	mA	Model
1	300	SLM1*300
3	100	SLM3*300
5	60	SLM5*300
10	30	SLM10*300
15	20	SLM15*300
20	15	SLM20*300
30	10	SLM30*300
40	7.5	SLM40*300
50	6	SLM50*300
60	5	SLM60*300
70	4.28	SLM70*300

\*Specify "P" for positive polarity or "N" for negative polarity

## SLM SELECTION TABLE- 600W

600 Watt		
kV	mA	Model
1	600	SLM1*600
3	200	SLM3*600
5	120	SLM5*600
10	60	SLM10*600
15	40	SLM15*600
20	30	SLM20*600
30	20	SLM30*600
40	15	SLM40*600
50	12	SLM50*600
60	10	SLM60*600
70	8.56	SLM70*600

\*Specify "P" for positive polarity or "N" for negative polarity

## SLM SELECTION TABLE- 1200W

1200 Watt		
kV	mA	Model
1	1200	SLM1*1200
3	400	SLM3*1200
5	240	SLM5*1200
10	120	SLM10*1200
15	80	SLM15*1200
20	60	SLM20*1200
30	40	SLM30*1200
40	30	SLM40*1200
50	24	SLM50*1200
60	20	SLM60*1200
70	17.14	SLM70*1200
160	7.5	SLM160*1200

\*Specify "P" for positive polarity or "N" for negative polarity

## SLM ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Fault	Open Collector, 35V @ 10mA Maximum
2	Current Program In	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
3	Voltage Program In	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
4	NC	No Connection
5	Local Voltage Prog.	Multi-turn front panel potentiometer
6	NC	No Connection
7	Local Current Prog.	Multi-turn front panel potentiometer
8	Voltage Monitor	0 to 10V=0 to 100% Rated Output, Zout=4.99k, 1%
9	Signal Ground	Ground
10	Current Monitor	0 to 10V=0 to 100% Rated Output, Zout=4.99k, 1%
11	HV Enable Input	Connect to Pin 12 to HV Enable Supply
12	HV Enable Output	+15V @ Open, ≤15mA @ Closed
13	NC	No Connection
14	HV On Output Signal	Open Collector, 35V @10mA Maximum
15	Spare	No Connection

## RS-232 DIGITAL INTERFACE— J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	NC	No Connection
2	TX out	Transmit Data
3	RX in	Receive Data
4	NC	No Connection
5	SGND	Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

## USB DIGITAL INTERFACE— J4 4 PIN USB "B" CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	VBUS	+5 Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

## ETHERNET DIGITAL INTERFACE— J5 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX-	Receive Data -
7	NC	No Connection
8	NC	No Connection

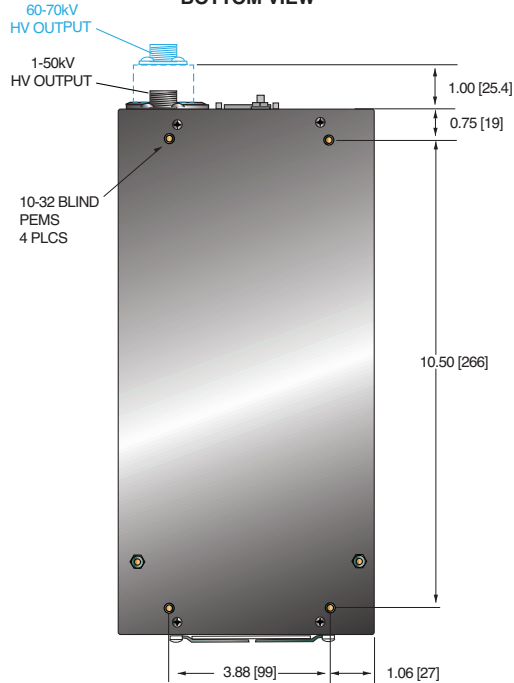
## R24 HV CONNECTOR PINOUT J6 HIGH VOLTAGE OUTPUT (160kV)

PIN	OUTPUT CONNECTION
C (common)	High Voltage Output
S (small)	High Voltage Output
L (large)	High Voltage Output

DIMENSIONS: in.[mm]

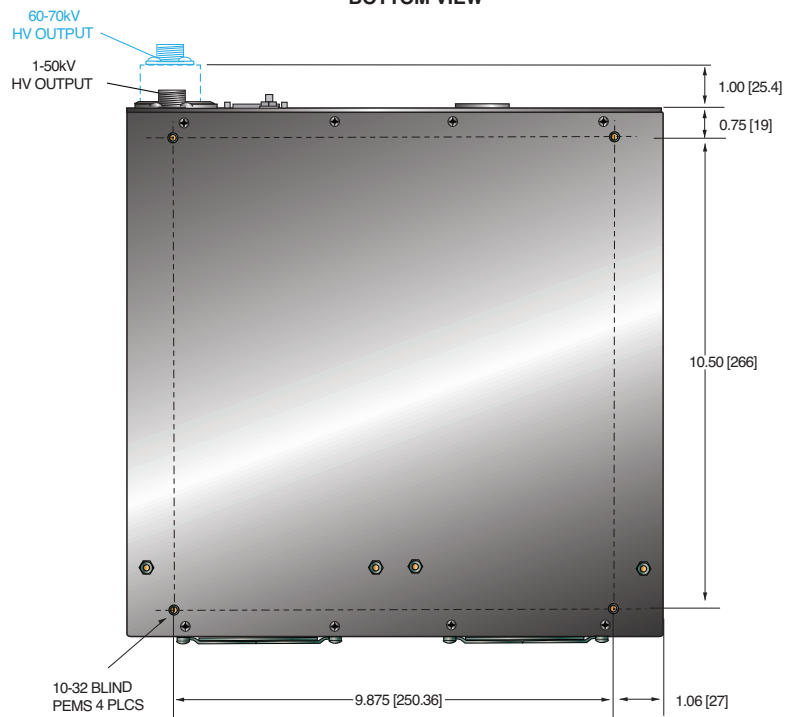
300/600 Watt

BOTTOM VIEW

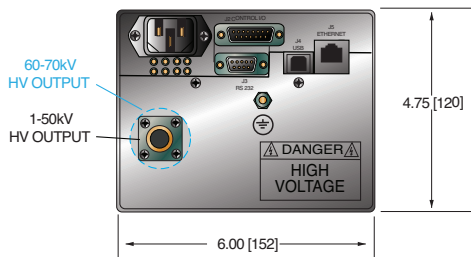


1200 Watt

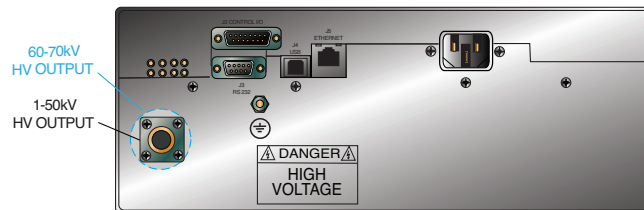
BOTTOM VIEW



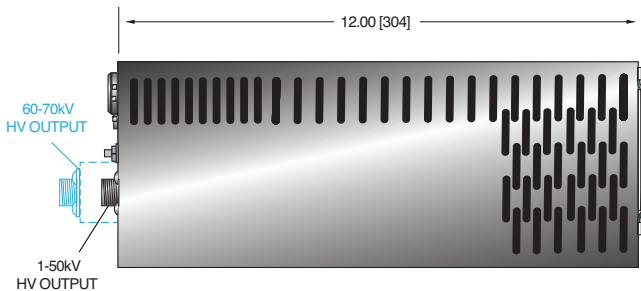
FRONT VIEW



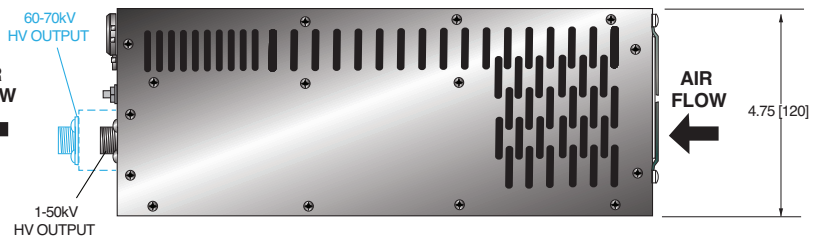
FRONT VIEW



SIDE VIEW



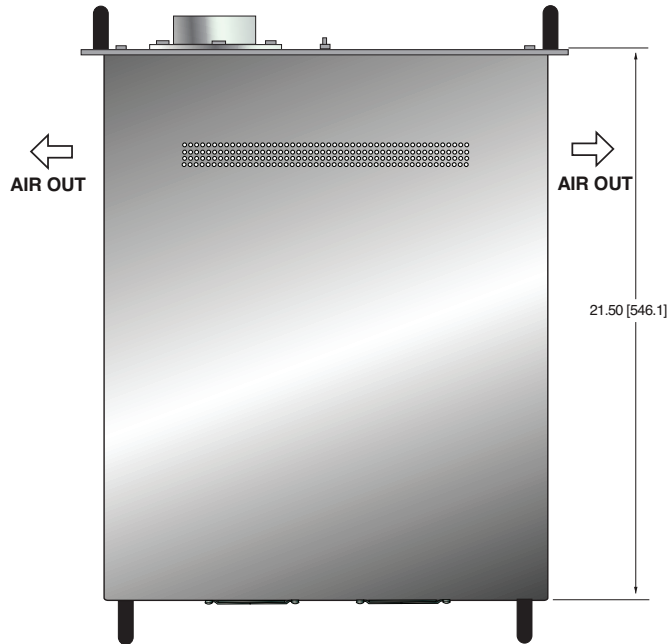
SIDE VIEW



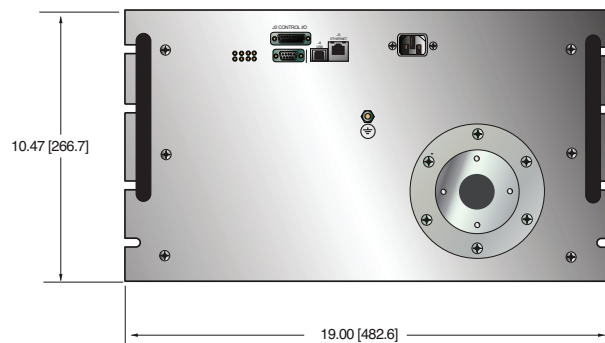
DIMENSIONS: in.[mm]

160kV

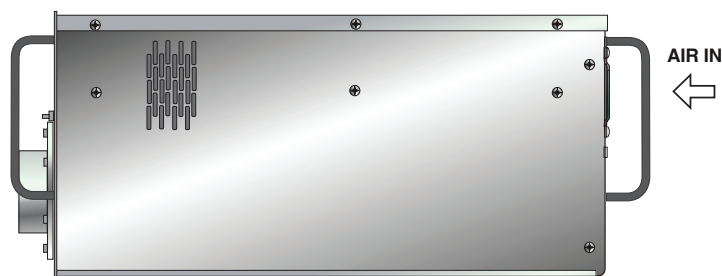
TOP VIEW



FRONT VIEW



SIDE VIEW



SL 10W-300W

SL 600W-1200W



Spellman's SL Series of high voltage power supplies are designed to meet uncompromising performance standards in a minimum of space. Their circuitry includes a resonant high frequency inverter with proprietary control which provides fault-free operation in extreme transient and arcing environments with greater than 85% efficiency. These full featured supplies are available in a wide range of outputs with many options.

## TYPICAL APPLICATIONS

Analytical X-ray	Capacitor Charging
Electrostatics	Hipot Testing
E-Beam Systems	General Laboratory

## OPTIONS

See page 5 for options and descriptions

## SPECIFICATIONS

### Status Indicators:

Voltage and Current Control Mode, Interlock Open/Closed, High Voltage Inhibit, Overcurrent and Overvoltage, Arc, Regulation Error, Overtemperature, Over Power (optional).

### Input:

115Vac or 220Vac $\pm$ 10%, 50/60Hz. Specify with order. 1200W model available in 200/220Vac only. For input current see table on page 2.

### Output:

Models available from 1kV to 130kV. Each model is available in positive, negative or reversible polarity output.

### Front Panel Controls:

Voltage and current are continuously adjustable by ten-turn potentiometers with lockable counting dials, ON/OFF circuit breaker/lamp, high voltage ON switch/indicator and high voltage OFF switch/indicator.

### Voltage Regulation:

Load: 0.005% of maximum voltage +500mV for full load change.  
Line:  $\pm$ 0.005% of full voltage +500mV over specified input range

### Current Regulation:

Load: 0.01% of maximum current  $\pm$ 100 $\mu$ A for full voltage change.  
Line:  $\pm$ 0.005% of maximum current for a  $\pm$ 10% input line change.

- **Very Compact and Lightweight**
- **Voltage Range from 1kV to 130kV**
- **Reversible Polarity Standard up to 8kV**
- **Extensive Analog and Digital Interface**
- **Optional VFD Front Panel/Ethernet Interface**
- **Arc Quench/Arc Count/Arc Trip**
- **OEM Customization Available**

### Ripple:

0.1% p-p +1Vrms.

### Temperature Coefficient:

100ppm/ $^{\circ}$ C voltage or current regulated. Higher stability is available on special order.

### Environmental:

Temperature Range:

Operating: 0 $^{\circ}$ C to 50 $^{\circ}$ C.

Storage: -40 $^{\circ}$ C to 85 $^{\circ}$ C.

Humidity:

10 to 90% relative humidity, non-condensing

### Stability:

100ppm/hour after 1/2 hour warm-up for both voltage and current regulation.

### Metering:

Digital voltage and current meters, 3 1/2 digit  $\pm$ 1 least significant digit.

### Output Cable:

10' (3.05m) of shielded high voltage cable removable at the rear panel.

### AC Line Input Cable:

10 to 300W: IEC320 Cord Set, 6' (1.83m)  
600 to 1200W: 3-conductor, 12AWG, 6' (1.83m) cable permanently attached to unit.

### Dimensions:

10W – 300W: 1 3/4" H(1U) x 19"W x 19"D\*\*  
(4.45cm x 48.3cm x 48.3cm).

600W – 1200W: 3 1/2" H(2U) x 19"W x 19"D\*\*  
(8.9cm x 48.3cm x 48.3cm).

\*\*Depth becomes 24" (60.7cm) for 80 to 130kV ranges.

### Weight:

17 to 30lbs (7.7 to 14kg) depending on model.

### Regulatory Approvals:

Compliant to EEC EMC Directive and EEC Low Voltage Directive. RoHS Compliant.

## Electronic Component (Power Source)

**SL series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The SL series is not intended to be operated by end users as a stand-alone device. The SL series power supply can only be fully assessed when installed within a system, and as a component part within that system.

**SL SELECTION TABLE- 10W, 30W, 60W 1.75" (1U)**

kV	10 Watt mA	Model	30 Watt mA	Model	60 Watt mA	Model
1	10	SL1PN10	30	SL1PN30	60	SL1PN60
2	5	SL2PN10	15	SL2PN30	30	SL2PN60
3	3.3	SL3PN10	10	SL3PN30	20	SL3PN60
6	1.7	SL6PN10	5	SL6PN30	10	SL6PN60
8	1.25	SL8PN10	3.75	SL8PN30	7.5	SL8PN60
10	1.0	SL10*10	3	SL10*30	6	SL10*60
15	0.67	SL15*10	2	SL15*30	4	SL15*60
20	0.50	SL20*10	1.5	SL20*30	3	SL20*60
30	0.33	SL30*10	1.0	SL30*30	2	SL30*60
40	0.25	SL40*10	0.75	SL40*30	1.5	SL40*60
50	0.20	SL50*10	0.60	SL50*30	1.2	SL50*60
60	0.17	SL60*10	0.50	SL60*30	1.0	SL60*60
70	0.14	SL70*10	0.43	SL70*30	0.85	SL70*60
80	0.13	SL80*10	0.38	SL80*30	0.75	SL80*60
100	0.10	SL100*10	0.30	SL100*30	0.60	SL100*60
120	0.10	SL120*10	0.25	SL120*30	0.50	SL120*60
130	0.10	SL130*10	0.25	SL130*30	0.46	SL130*60

**SL SELECTION TABLE- 150W, 300W 1.75" (1U)**

kV	150 Watt mA	Model	300 Watt mA	Model
1	150	SL1PN150	300	SL1PN300
2	75	SL2PN150	150	SL2PN300
3	50	SL3PN150	100	SL3PN300
6	25	SL6PN150	50	SL6PN300
8	18.75	SL8PN150	37.5	SL8PN300
10	15	SL10*150	30	SL10*300
15	10	SL15*150	20	SL15*300
20	7.5	SL20*150	15	SL20*300
30	5.0	SL30*150	10	SL30*300
40	3.75	SL40*150	7.5	SL40*300
50	3.00	SL50*150	6.0	SL50*300
60	2.50	SL60*150	5.0	SL60*300
70	2.1	SL70*150	4.28	SL70*300
80	1.90	SL80*150	3.75	SL80*300
100	1.50	SL100*150	3.00	SL100*300
120	1.25	SL120*150	2.50	SL120*300
130	1.15	SL130*150	2.30	SL130*300

**SL SELECTION TABLE- 600W, 1200W 3.50" (2U)**

kV	600 Watt mA	Model	1200 Watt mA	Model
1	600	SL1PN600	1200	SL1PN1200
2	300	SL2PN600	600	SL2PN1200
3	200	SL3PN600	400	SL3PN1200
6	100	SL6PN600	200	SL6PN1200
8	75	SL8PN600	150	SL8PN1200
10	60	SL10*600	120	SL10*1200
15	40	SL15*600	80	SL15*1200
20	30	SL20*600	60	SL20*1200
30	20	SL30*600	40	SL30*1200
40	15	SL40*600	30	SL40*1200
50	12	SL50*600	24	SL50*1200
60	10	SL60*600	20	SL60*1200
70	8.6	SL70*600	17	SL70*1200
80	7.5	SL80*600	15	SL80*1200
100	6.0	SL100*600	12	SL100*1200
120	5.0	SL120*600	10	SL120*1200
130	4.6	SL130*600	9.2	SL130*1200

**SL INPUT CURRENT**

MODEL	115Vac	220Vac
10 watt	<1A	<1A
30 watt	<1A	<1A
60 watt	1.1A	<1A
150 watt	2.8A	1.5A
300 watt	5.6A	3A
600 watt	11.1A	6A
1200 watt	n/a	12A

The input current numbers above are worse case assuming the power supply is being operated at maximum power and low line conditions, taking efficiency and power factor into account.

**SL TERMINAL BLOCK 26 PIN**

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Common	Signal Ground
2	External Inhibit	Ground=Inhibit, Open=HV On
3	External Interlock	+15V at Open, <15mA at Closed
4	External Interlock Return	Return for Interlock
5	Current Monitor	0 to 10V=0 to 100% Rated Output
6	kV Test Point	0 to 10V=0 to 100% Rated Output
7	+10Vdc Reference	+10Vdc, 1mA Max
8	Remote Current Program In	0 to 10V=0 to 100% Rated Output
9	Local Current Program Out	Front Panel Program Voltage
10	Remote Voltage Program In	0 to 10V=0 to 100% Rated Output
11	Local Voltage Program Out	Front Panel Program Voltage
12	Power Monitor	0 to 10V=0 to 100% Rated Output
13	Remote Power Program In	(Optional)
14	Local HV Off Out	+15V at Open, <25mA at Closed
15	HV Off	Connect to HV OFF for FP Operation
16	Remote HV On	+15V, 10mA Max=HV Off
17	Remote HV Off Indicator	0=HV On, +15V, 10mA Max=HV Off
18	Remote HV On Indicator	0=HV Off, +15V, 10mA Max=HV On
19	Remote Voltage Mode	Open Collector 35V Max, 10mA Max On=Active
20	Remote Current Mode	
21	Remote Power Mode	
22	Remote PS Fault	0=Fault, +15V, 0.1mA Max=No Fault
23	+15V Output	+15V, 100mA Max
24	Power Supply Common	Signal Ground
25	Spare	Spare
26	Shield Return	Chassis Ground

**How To Order:**

Sample model number: SL80PN1200/NSS/DPM4

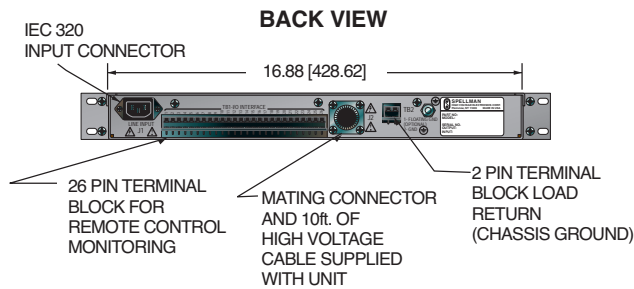
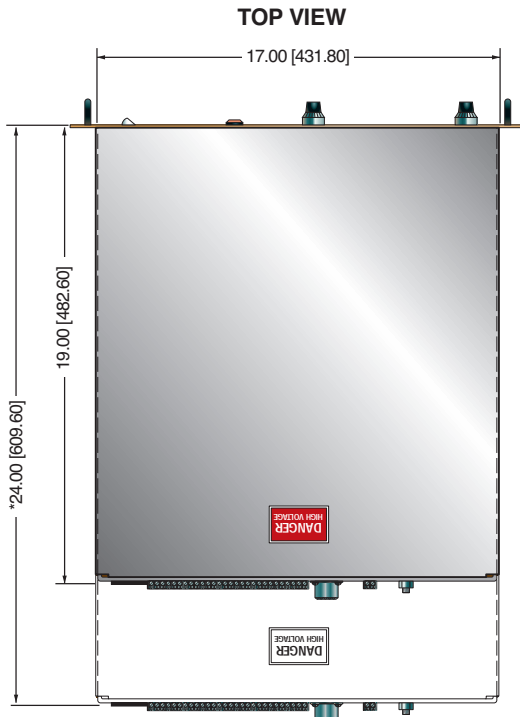
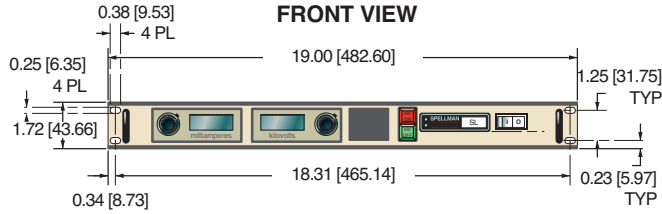
SL series unit, 80kV maximum output voltage, reversible polarity output, 1200 watts, no slow start, 4.5 digit panel meters

There may be some restrictions on multiple option combinations. Please contact our sales department for more details.

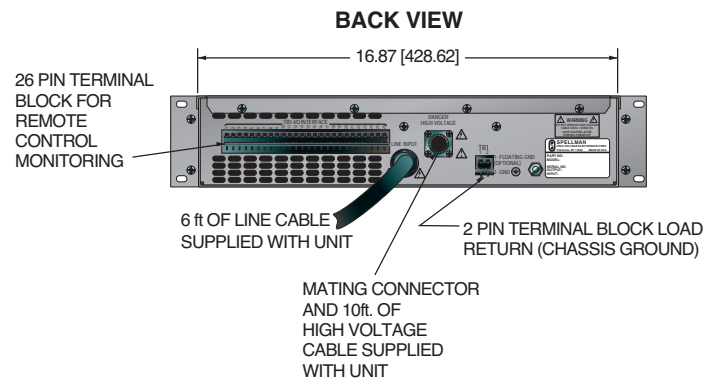
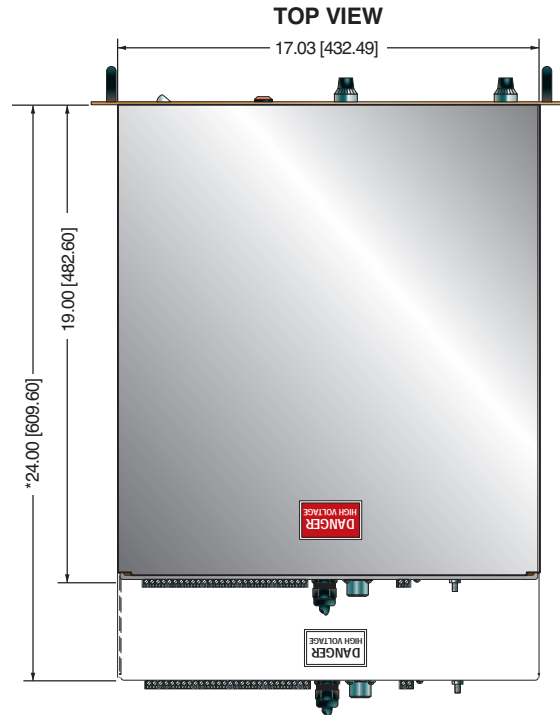
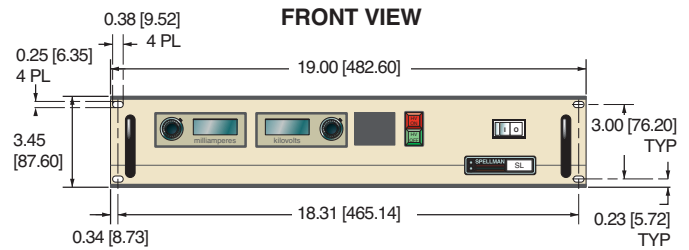
\*Specify "P" for positive, "N" for negative, or "PN" for reversible polarity. Higher voltage models available on special order.

DIMENSIONS: in.[mm]

#### 10W-300W



#### 600W-1200W



\* Depth becomes 24" [609.60] for 80kV to 130kV range.



## eSL OPTION



The eSL Option provides a vacuum fluorescent front panel display and Ethernet connectivity. Both the 1U (1.75") and 2U (3.5") SL product offerings are available with the eSL Option. Using the front panel local controls the main menu has the following features:

**Local/Remote Control**

Allows operation from either the local front panel or remotely via the Ethernet Category 5 connector.

**Features Menu**

Allows control over Adjustable Overload Trip and Slow Start features.

**Tutorial Menu**

Provides information on how to use the local front panel interface.

**Diagnostics Menu**

Provides information on the revisions of the hardware, firmware and IP address. Additionally the Diagnostics Menu provides information on the status of the internal low voltage housekeeping power supply voltages.

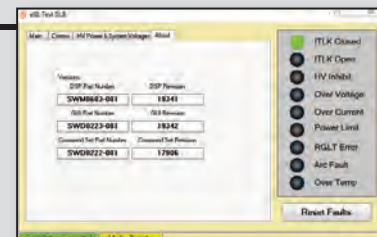
eSL Option power supplies can still be fully controlled via the SL's comprehensive remote analog interface, so these units are fully backwards compatible with standard SL power supplies.

**Typical Front Panel Screens****Model Number****Standby****HV ON****Digital Interface**

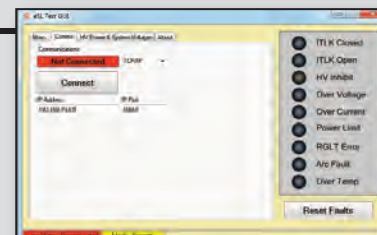
A front panel accessible Category 5 connector provides Ethernet connectivity. Spellman provides a basic demo GUI for convenience of the user, but most customers implement their own software.

**About Screen**

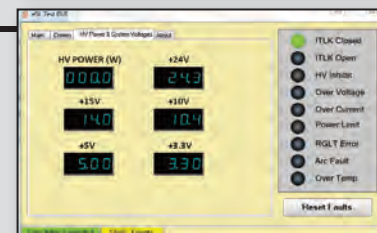
DSP part number, DSP revision, GUI part number, GUI revision, Command set part number, Command set revision

**Coms Screen**

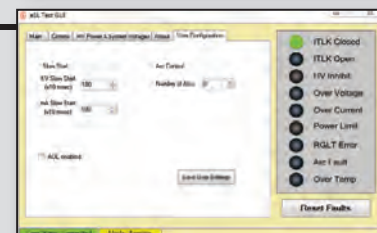
Communications, IP address, IP port

**HV Power and System Voltages Screen**

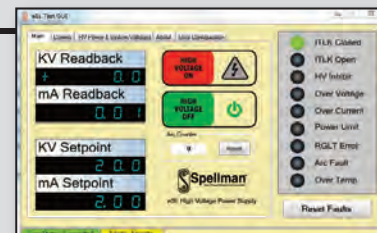
HV power (watts) +24V, +15V, +10V, +5V, +3.3V

**User Configuration Screen**

Slow Start – kV, Slow Start – mA, Adjustable Over Load (AOL), Arc Control, Fault Indicators

**Main Screen**

kV Setpoint, kV Readback, mA Setpoint, mA Readback, HV OFF Button, HV ON Button, Arc Counter, System Diagnostics, Reset Faults Button



## SL SERIES OPTIONS

- AOL** *Adjustable Overload Trip*  
A control board jumper is moved to make the power supply shut down if it ever operates in current mode. This allows the user to set the current programming level as a trip point that will turn the power supply off with an Over Current fault if it ever tries to operate in Current Mode.
- APT** *Adjustable Power Trip*  
A third control loop is installed in the power supply, a power loop. This power loop uses an analog multiplier chip to multiply the voltage and current feedback signals to create a power feedback signal. Programming and feedback scaling is 0-10Vdc = 0-100% of rated power. The circuit is configured to trip the power supply off with an Over Power fault if the power loop ever tries to regulate.
- AT** *Arc Trip*  
A control board jumper is moved such that the first arc sensed will shut the power supply off with an ARC fault.
- CMS** *Current Mode Select*  
A front panel switch is provided to allow the power supply to either regulate in current mode or create an over current fault when operated in current mode, which will shut down the supply. This is basically a switch selectable AOL option.
- CPC** *Constant Power Control*  
Identical to the APT Option with the exception the power supply will run and regulate when the power loop becomes active.
- DPM4** *Digital Panel Meter, 4.5 digits*  
The standard 3.5 digit front panel meters are replaced with 4.5 digit panel meters.
- EFR** *External Fault Relay*  
A set of relay contacts are provided via the rear panel interface that will change state if the power supply shuts down due to a fault condition.
- eSL** *Ethernet Connectivity/VFD Front Panel*  
The eSL Option provides a vacuum fluorescent front panel display, Ethernet connectivity and comprehensive front panel controls.
- FCV** *Fine Control Voltage*  
This option adds a second potentiometer to the front panel of the unit. This allows for a finer local adjustment of the output voltage setting.
- FG** *Floating Ground*  
All the analog returns inside the power supply are isolated from chassis and brought to one point on the rear panel. Any current that flows out of the power supply via the HV cable/connector on the high side must return back to the multiplier via the load return on the low side. With only one path to flow through on the low side, a current meter can be inserted in series and a safe ground referenced measurement can be made of the actual high voltage output current.
- FGLL** *Floating Ground Low Leakage*  
Identical functionality as the FG Option but a shield is placed around the high voltage multiplier to capture any leakage current inside the power supply and return it to the top of the current sense resistor. This negates any internal leakage currents from effecting measurements being made.
- IO** *Instant On*  
A jumper is placed between TB1-15 and TB1-16 on the rear panel, causing the power supply to automatically toggle into HV ON when ever the line voltage is applied.
- LL(X)** *Lead Length*  
Extra long high voltage output cable. 20, 40, 60 and 100 feet are standard lengths.
- LR** *Low Ripple*  
Done on a case by case basis, the standard unit is evaluated and modifications are done to improve the output ripple to 0.05% peak to peak. The operating frequency might be increased, or additional filtering may be added to the HV multiplier.
- NAD** *No Arc Detect*  
This option removes the arc intervention circuitry from the power supply. Care must be exercised when using this option as damage to the HV multiplier could occur.
- NSS** *No Slow Start*  
The standard 6 second long linear ramp of output voltage is removed allowing the high voltage to "step" to its set point when enabled.
- PN** *Positive/Negative*  
Reversible polarity option. Units that are not inherently reversible by design (10kV to 130kV) can have their output polarity reversed by the process of exchanging the high voltage multiplier section.
- RFR** *Remote Fault Reset*  
This option provides the ability to reset any power supply faults that might occur via toggling a signal on the rear panel interface.
- ROV** *Remote Over Voltage*  
The programming signal for the over voltage comparator circuit is made available to the customer remotely, allowing the power supply to be set to trip the OVP circuit anywhere from 0 -110% of rated output voltage.
- SL** *Slides*  
Industry standard rack mounted slides are installed on the power supply.
- SS(X)** *Slow Start(X)*  
The standard slow start is modified to provide a time of (X) seconds. Time frames of 0.1 seconds to 120 seconds can be accommodated.

There may be some restrictions on multiple option combinations. Please contact our Sales department for more details.



- **Cable Connected 150kV @ 1200W Power Supply**
- **Requires Only 8.75" (5U) Panel Height**
- **Extensive Analog Interface**
- **Arc Quench/Arc Count/Arc Trip**
- **Comprehensive Digital Fault Diagnostics**

Spellman's SL150kV rack mount high voltage power supply is designed for scientific and industrial OEM applications requiring 150kV at 1200 watts in a compact cable connected standard sized rack. Models are available in positive, negative or reversible polarity. The SL150kV is fully arc and short circuit protected. Excellent regulation specifications are provided along with outstanding stability performance. The vacuum encapsulated high voltage output section assures reliable corona free operation by eliminating any concerns due to environmental factors.

## TYPICAL APPLICATIONS

Electrostatics  
HiPot Testing  
Semiconductor Processing  
Capacitor Charging

## OPTIONS

<b>200</b>	200Vac Input Voltage
<b>AOL</b>	Adjustable Overload Trip
<b>APT</b>	Adjustable Power Trip
<b>AT</b>	Arc Trip
<b>BFP</b>	Blank Front Panel
<b>CPC</b>	Constant Power Control
<b>DPM4</b>	4.5 Digit Panel Meters
<b>EFR</b>	External Fault Relay
<b>LL(X)</b>	Non-Standard HV Cable Length (10 standard)
<b>NAD</b>	No Arc Detect
<b>NSS</b>	No Slow Start
<b>RFR</b>	Remote Fault Reset
<b>SS(X)</b>	Non-Standard Slow Start (6 seconds standard)

## SPECIFICATIONS

### Front Panel Controls:

Power ON/OFF switch, HV ON Switch, HV OFF Switch with preset feature, 3.5 digit backlight digital meters for display of output voltage and output current, 10 turn locking potentiometers with counting dials for adjustment of both output voltage and output current.

### Front Panel Indicators:

HV ON	High Voltage Inhibit
HV OFF	Over Current
Voltage Control Mode	Over Voltage
Current Control Mode	Arc
Interlock Open	Regulation Error
Interlock Closed	Overtemperature

### Input:

220Vac  $\pm 10\%$ , 50/60Hz @ 12A  
200Vac  $\pm 10\%$ , 50/60Hz @ 13.2A

### Output Voltage:

0 to 150kV

### Output Polarity:

Positive, negative or reversible specify at time of order

### Output Current:

8mA

### Output Power:

1200W

### Voltage Regulation:

Load: 0.01% of rated voltage for a full load change  
Line:  $\pm 0.01\%$  of rated voltage over specified input voltage range

### Current Regulation:

Load: 0.01% of rated current  $\pm 100\mu\text{A}$  for full voltage change.  
Line:  $\pm 0.01\%$  of rated current over specified input voltage range

### Ripple:

0.1% peak to peak of maximum output

### Temperature Coefficient:

100ppm/ $^{\circ}\text{C}$ .

### Stability:

100ppm/hr after a 2 hour warm up, for both voltage and current regulation

### Operating Temperature:

0 to  $40^{\circ}\text{C}$  operating

### Storage Temperature:

$-40$  to  $+85^{\circ}\text{C}$  storage

### Humidity:

20% to 85%, non-condensing

### Input Line Connector:

3 conductor 12 AWG 6 ft (1.83m) cable, permanently attached

### Output Connector:

A detachable 10 ft (3.05m) shielded HV cable is provided

### Cooling:

Forced Air

### Dimensions:

8.75"H x 19"W x 22"D rack mount.  
(22.23cm x 48.26cm x 55.88cm)

### Weight:

89 pounds (40.4kg)

### Regulatory Approvals:

Designed to meet EEC EMC Directive. Designed to meet to EEC Low Voltage Directive. RoHS Compliant.

## Electronic Component (Power Source)

**SL150kV series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The SL150kV series is not intended to be operated by end users as a stand-alone device. The SL150kV series power supply can only be fully assessed when installed within a system, and as a component part within that system.

## SL150KV ANALOG INTERFACE— JB4 25 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Common	Signal Ground
2	External Inhibit	Ground = Inhibit, Open = HV ON
3	External Interlock	+15Vdc @ open, ≤ 5mA @ closed
4	External Interlock Return	Connect to pin 3 to enable supply
5	Current Monitor	0 to 10Vdc = 0 to 100% rated voltage, Zout = 10kΩ
6	Voltage Monitor	0 to 10Vdc = 0 to 100% rated voltage, Zout = 10kΩ
7	+10Vdc Reference	+10Vdc @ 1mA, maximum
8	Remote Current Program Input	0 to 10Vdc = 0 to 100% rated voltage, Zout = 10kΩ
9	Local Current Program Output	Multi-turn front panel pot for local control capability
10	Remote Voltage Program Input	0 to 10Vdc = 0 to 100% rated voltage, Zout = 10kΩ
11	Local Voltage Program Output	Multi-turn front panel pot for local control capability
12	EFR (Common)	External Fault Relay (Optional)
13	EFR (Normally Open)	External Fault Relay (Optional)
14	Local HV OFF OUT	+15Vdc @ open, <25mA @ closed, connect to HV OFF for front panel operation
15	HV OFF	Connect to HV OFF OUT for front panel operation
16	Remote HV ON	+15Vdc @ 10mA maximum = HV OFF
17	Remote HV OFF Indicator	0 = HV ON, +15Vdc @ 10mA maximum = HV OFF
18	Remote HV ON Indicator	0 = HV OFF, +15Vdc @ 10mA maximum = HV ON
19	Remote Voltage Mode	Open collector 50Vdc @ 10mA maximum, ON = Active
20	Remote Current Mode	Open collector 50Vdc @ 10mA maximum, ON = Active
21	Remote Power Mode	Open collector 50Vdc @ 10mA maximum, ON = Active
22	Power Supply Fault	Open collector, 50Vdc @ 10mA maximum
23	+15Vdc Output	+15Vdc @ 100mA, maximum
24	Power Supply Ground	Signal Ground
25	Shield Return	Chassis Ground

Specify "P" for positive polarity or "N" for negative polarity, and PN = reversible as illustrated below.

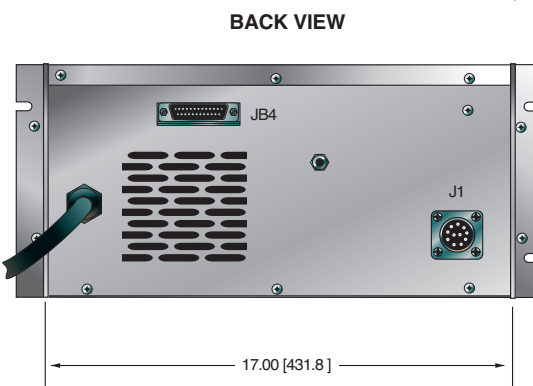
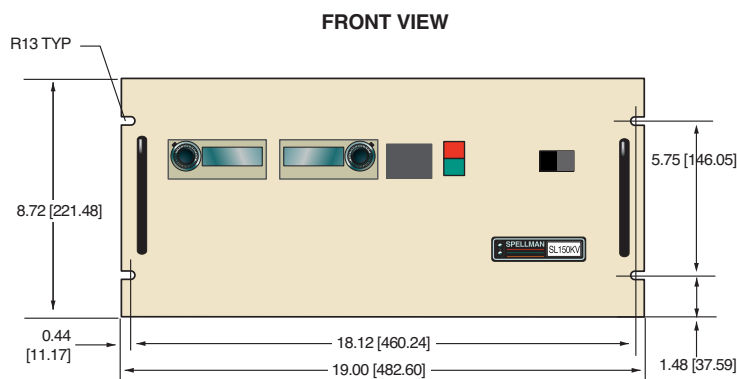
Sample Model Number: SL150P1200/BFP/LL(20)

Where SL = power supply series, 150 = maximum output voltage in kV,

P = positive output polarity, 1200 = maximum output power (watts), BFP = Blank

Front Panel, LL(20) = 20 foot HV cable.

DIMENSIONS: in.[mm]





- **Very Compact and Lightweight**
- **Low EMI and RFI**
- **Voltage Range from 500V to 50kV**
- **Reversible Polarity Standard up to 8kV**
- **Optional VFD Front Panel/Ethernet Interface**
- **Extensive Analog and Digital Interface**
- **Arc Quench/Arc Count/Arc Trip**
- **OEM Customization Available**

Spellman's SL2KW Series of 2kW high voltage power supplies are designed to meet uncompromising performance standards in a minimum of space. Their circuitry includes a resonant high frequency inverter with proprietary control which provides fault-free operation in extreme transient and arcing environments with greater than 85% efficiency. These full featured supplies are available in a wide range of outputs with many options.

### TYPICAL APPLICATIONS

Semiconductor Manufacturing	CPT/CRT Testing
Electrostatics	Hipot Testing
E-Beam Systems	General Laboratory
Capacitor Charging	CW Lasers

### OPTIONS

See page 4 for options and descriptions

### SPECIFICATIONS

#### Status Indicators:

Voltage and Current Control Mode, Interlock Open and Closed, High Voltage Inhibit, Overcurrent and Overvoltage, Arc, Regulation Error, Overtemperature.

#### Input:

Standard: 208Vac  $\pm 10\%$ , 50/60Hz @ 8.5A/phase, three phase  
Optional: 220Vac  $\pm 10\%$ , 50/60Hz @ 19.75A, single phase

#### Output:

Models available from 0.5kV to 50kV. Each model is available in positive, negative or reversible polarity output.

#### Front Panel Controls:

Voltage and current are continuously adjustable by ten-turn potentiometers with lockable counting dials, ON/OFF circuit breaker/lamp, high voltage ON switch/indicator and high voltage OFF switch/indicator.

#### Voltage Regulation:

Load: 0.005% of maximum voltage +500mV for full load change.  
Line:  $\pm 0.005\%$  of full voltage +500mV over specified input range

#### Current Regulation:

Load: 0.01% of maximum current  $\pm 100\mu\text{A}$  for full voltage change.  
Line:  $\pm 0.005\%$  of maximum current for a  $\pm 10\%$  input line change.

#### Ripple:

0.1% p-p +1Vrms, three phase line input  
0.3% p-p +1Vrms, single phase line input

#### Temperature Coefficient:

100ppm/ $^{\circ}\text{C}$  voltage or current regulated.  
Higher stability is available on special order.

#### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ .  
Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .  
Humidity:  
10 to 90% relative humidity, non-condensing

#### Stability:

100ppm/hour after 1/2 hour warm-up for both voltage and current regulation.

#### Metering:

Digital voltage and current meters,  $3\frac{1}{2}$  digit  $\pm 1$  least significant digit.

#### Interface Connector:

25 pin male D connector

#### Output Cable:

10' (3.3m) of shielded high voltage cable removable at the rear panel.

#### AC Line Input Cable:

A 6 foot (1.83m) cable is permanently attached to the unit. Single phase units use 3 conductor 12AWG cable, three phase units use 4 conductor 16AWG cable.

#### Dimensions:

3.5" H(2U) x 19" W x 19" D  
(8.9cm x 48.3cm x 48.3cm)

#### Weight:

17 to 26lbs (7.7 to 11.8kg) depending on model.

#### Regulatory Approvals:

Compliant to EEC EMC Directive for 3 phase units, conducted and radiated emission only for single phase units. Compliant to EEC Low Voltage Directive. RoHS Compliant.

### Electronic Component (Power Source)

**SL2KW series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The SL2KW series is not intended to be operated by end users as a stand-alone device. The SL2KW series power supply can only be fully assessed when installed within a system, and as a component part within that system.

## eSL OPTION



The eSL Option provides a vacuum fluorescent front panel display and Ethernet connectivity. Using the front panel local controls the main menu has the following features:

### Local/Remote Control

Allows operation from either the local front panel or remotely via the Ethernet Category 5 connector.

### Features Menu

Allows control over Adjustable Overload Trip and Slow Start features.

### Tutorial Menu

Provides information on how to use the local front panel interface.

### Diagnostics Menu

Provides information on the revisions of the hardware, firmware and IP address. Additionally the Diagnostics Menu provides information on the status of the internal low voltage housekeeping power supply voltages.

eSL Option power supplies can still be fully controlled via the SL2KW's comprehensive remote analog interface, so these units are fully backwards compatible with standard SL2KW power supplies.

## Typical Front Panel Screens

### Model Number



### Standby



### HV ON

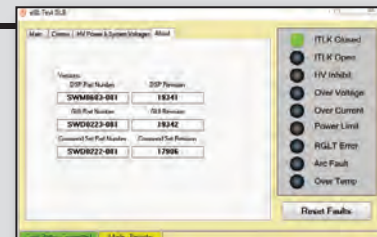


## Digital Interface

A front panel accessible Category 5 connector provides Ethernet connectivity. Spellman provides a basic demo GUI for convenience of the user, but most customers implement their own software.

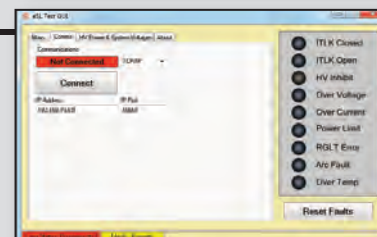
### About Screen

DSP part number, DSP revision, GUI part number, GUI revision, Command set part number, Command set revision



### Coms Screen

Communications, IP address, IP port



### HV Power and System Voltages Screen

HV power (watts) +24V, +15V, +10V, +5V, +3.3V



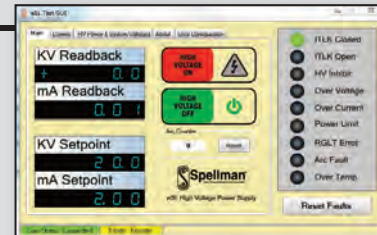
### User Configuration Screen

Slow Start – kV, Slow Start – mA, Adjustable Over Load (AOL), Arc Control, Fault Indicators



### Main Screen

kV Setpoint, kV Readback, mA Setpoint, mA Readback, HV OFF Button, HV ON Button, Arc Counter, System Diagnostics, Reset Faults Button



### SL2KW SELECTION TABLE

MAXIMUM RATING		MODEL NUMBER
kV	mA	
0.5	4000	SL0.5PN2000
1	2000	SL1PN2000
2	1000	SL2PN2000
3	666	SL3PN2000
6	333	SL6PN2000
8	250	SL8PN2000
10	200	SL10*2000
15	133	SL15*2000
20	100	SL20*2000
30	66.6	SL30*2000
40	50	SL40*2000
50	40	SL50*2000

\*Specify "P" for positive polarity or "N" for negative polarity or "PN" for reversible polarity

### SL2KW 25 PIN D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Common	Signal Ground
2	External Inhibit	Ground=Inhibit, Open=HV On
3	External Interlock	+15V at Open, <15mA at Closed
4	External Interlock Return	Return for Interlock
5	Current Monitor	0 to 10V=0 to 100% Rated Output
6	kV Test Point	0 to 10V=0 to 100% Rated Output
7	+10Vdc Reference	+10Vdc, 1mA Max
8	Remote Current Program In	0 to 10V=0 to 100% Rated Output
9	Local Current Program Out	Front Panel Program Voltage
10	Remote Voltage Program In	0 to 10V=0 to 100% Rated Output
11	Local Voltage Program Out	Front Panel Program Voltage
12	EFR Common	Optional External Fault Relay 30V @ 2A Maximum
13	EFR-NC/EFR-NO	
14	Local HV Off Out	+15V at Open, <25mA at Closed
15	HV Off	Connect to HV OFF for FP Operation
16	Remote HV On	+15V, 10mA Max=HV Off
17	Remote HV Off Indicator	0=HV On, +15V, 10mA Max=HV Off
18	Remote HV On Indicator	0=HV Off, +15V, 10mA Max=HV On
19	Remote Voltage Mode	Open Collector 35V Max, 10mA Max, On=Active
20	Remote Current Mode	
21	Remote Power Mode	
22	Remote PS Fault	0=Fault, +15V, 0.1mA Max=No Fault
23	+15V Output	+15V, 100mA Max
24	Power Supply Common	Signal Ground
25	Shield Return	Chassis Ground

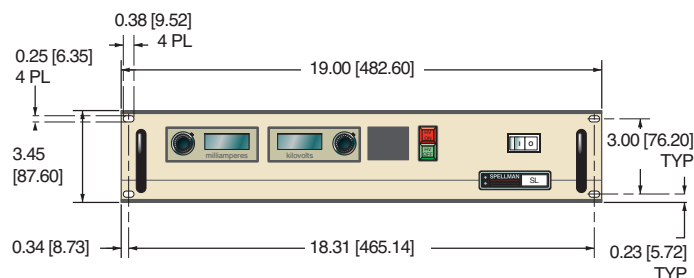
#### How To Order:

Sample model number: SL20PN2000/NSS/DPM4  
SL2KW Series unit, 20kV maximum output voltage, reversible polarity output, 2000 watts, no slow start, 4.5 digit panel meters

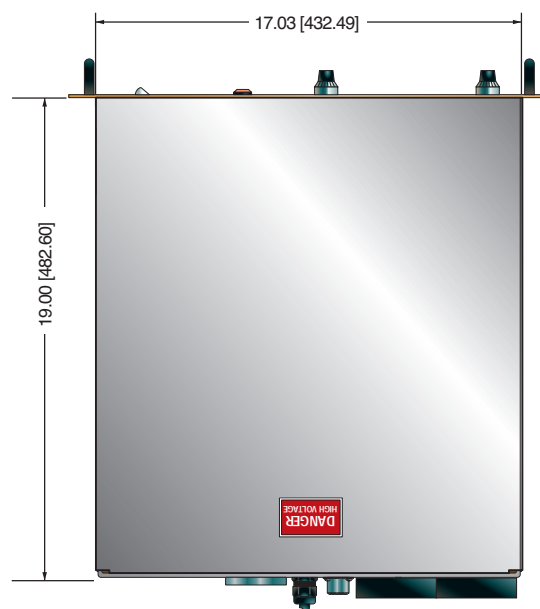
There may be some restrictions on multiple option combinations. Please contact our Sales department for more details.

DIMENSIONS: in.[mm]

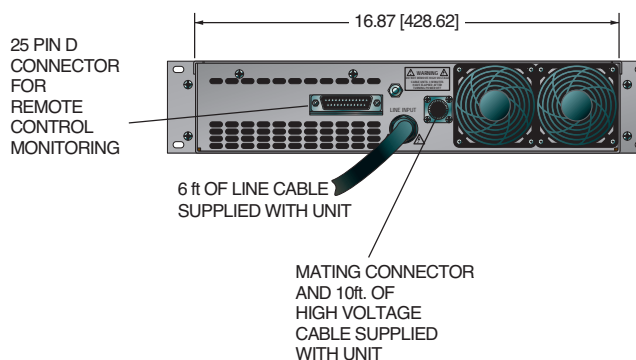
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW



## SL2KW SERIES OPTIONS

### **AOL** *Adjustable Overload Trip*

A control board jumper is moved to make the power supply shut down if it ever operates in current mode. This allows the user to set the current programming level as a trip point that will turn the power supply off with an Over Current fault if it ever tries to operate in Current Mode.

### **APT** *Adjustable Power Trip*

A third control loop is installed in the power supply, a power loop. This power loop uses an analog multiplier chip to multiply the voltage and current feedback signals to create a power feedback signal. Programming and feedback scaling is 0-10Vdc = 0-100% of rated power. The circuit is configured to trip the power supply off with an Over Power fault if the power loop ever tries to regulate.

### **ARC** *Arc Sense*

A signal is provided on a spare pin (TB1-21) that changes state whenever the power supply detects an arc.

### **AT** *Arc Trip*

A control board jumper is moved such that the first arc sensed will shut the power supply off with an ARC fault.

### **CMS** *Current Mode Select*

A front panel switch is provided to allow the power supply to either regulate in current mode or create an over current fault when operated in current mode, which will shut down the supply. This is basically a switch selectable AOL option.

### **CPC** *Constant Power Control*

Identical to the APT Option with the exception the power supply will run and regulate when the power loop becomes active.

### **DPM4** *Digital Panel Meter, 4.5 digits*

The standard 3.5 digit front panel meters are replaced with 4.5 digit panel meters.

### **EFR** *External Fault Relay*

A set of relay contacts are provided via the rear panel interface that will change state if the power supply shuts down due to a fault condition.

### **eSL** *Ethernet Connectivity/VFD Front Panel*

The eSL Option provides a vacuum fluorescent front panel display, Ethernet connectivity and comprehensive front panel controls.

### **FCV** *Fine Control Voltage*

This option adds a second potentiometer to the front panel of the unit. This allows for a finer local adjustment of the output voltage setting.

### **IO** *Instant On*

A jumper is placed between TB1-15 and TB1-16 on the rear panel, causing the power supply to automatically toggle into HV ON when ever the line voltage is applied.

### **LL(X)** *Lead Length*

Extra long high voltage output cable. 20, 40, 60 and 100 feet are standard lengths. Non standard lengths can be custom ordered.

### **NAD** *No Arc Detect*

This option removes the arc intervention circuitry from the power supply. Care must be exercised when using this option as damage to the HV multiplier could occur.

### **NSS** *No Slow Start*

The standard 6 second long linear ramp of output voltage is removed allowing the high voltage to "step" to its set point when enabled.

### **PN** *Positive/Negative*

Reversible polarity option. Units that are not inherently reversible by design (10kV to 50kV) can have their output polarity reversed by the process of exchanging the high voltage multiplier section.

### **RFR** *Remote Fault Reset*

This option provides the ability to reset any power supply faults that might occur via toggling a signal on the rear panel interface.

### **ROV** *Remote Over Voltage*

The programming signal for the over voltage comparator circuit is made available to the customer remotely, allowing the power supply to be set to trip the OVP circuit anywhere from 0 -110% of rated output voltage.

### **SL** *Slides*

Industry standard rack mounted slides are installed on the power supply.

### **SS(X)** *Slow Start(X)*

The standard slow start is modified to provide a time of (X) seconds. Time frames of 0.1 seconds to 120 seconds can be accommodated.

There may be some restrictions on multiple option combinations. Please contact our Sales department for more details.



- **160kV - 360kV Outputs**
- **Low Ripple**
- **High Stability**
- **Overcurrent, Overvoltage and Arc Protection**
- **Arc Detect**
- **Lightweight, Compact Size**
- **OEM Customization Available**

The SLS series of high voltage power supplies provide up to 2000 watts of power with voltage outputs ranging from 160kV to 360kV. These power supplies utilize high frequency resonant inverters with proprietary controls for reliable operation in extreme environments. The high voltage multiplier unit is built with a hybrid design of solid encapsulation and air, thus reducing its overall size. Comprised of 20kV interlocking wafers, the multiplier unit offers flexible building blocks for many different output configurations.

### TYPICAL APPLICATIONS

Ion Implantation  
Particle Accelerators  
Electron Guns

### OPTIONS

**eSL** Ethernet Connectivity/VFD Front Panel

### SPECIFICATIONS

#### Input Voltage:

Standard: 220Vac  $\pm 10\%$ , 50/60Hz @ 8A/phase, three phase  
Optional: 200Vac  $\pm 10\%$ , 50/60Hz @ 8.9A/phase, three phase

#### Output Voltage Range:

Models available from 160kV to 360kV and up to 2000W. Each model is available with positive or negative polarity outputs.

#### Voltage Regulation:

Better than 0.05% for specified line variations and load variations.

#### Ripple:

0.1% p-p of maximum output voltage.

#### Remote Voltage Control:

0 to +10V for 0 to maximum voltage. Accuracy and repeatability: 1% of maximum rating.

#### Remote Current Control:

0 to +10V for 0 to maximum voltage. Accuracy and repeatability: 1% of maximum rating.

#### Voltage Monitor:

0 to 10V equivalent to rated voltage. Accuracy, 1% reading.

#### Current Monitor:

0 to 10V equivalent to rated current. Accuracy, 1% reading.

#### Stability:

0.05% per hour after 1/2 hour warm-up.  
0.05% per 8 hours.

#### Slow Start:

Slow start times: 6 seconds standard.

#### Temperature Coefficient:

0.01% per degrees C.

#### Protection:

Overcurrent, Overvoltage, Arc protection, Overtemperature.

#### Arc Detect:

If 8 arcs occur in a 10 second, non-synchronous time window, the supply reverts to the Power Down Mode with an ARC fault displayed on the front panel default diagnostic display.

#### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -20°C to 85°C

#### Humidity:

10% to 70%, non-condensing.

#### Dimensions:

Inverter Driver Chassis:  
3.50" (2U) H x 19.0" W x 19.0" D  
(8.9cm x 48.3cm x 48.3cm)

#### Multiplier Unit:

See page 3.

#### Distance from Stack to Driver:

2.5 meters  $\pm 0.1$  meter maximum.

#### Signal Connector:

25 pin, male D connector, J3.

#### Metering:

Front panel, 3.5 digit, digital voltage and current meters.

#### Front Panel Controls:

Voltage and current are continuously adjustable by ten-turn potentiometers with lockable counting dials, ON/OFF circuit breaker/lamp, high voltage ON switch/indicator and high voltage OFF switch/indicator.

## Front Panel Status Indicators:

Voltage Control Mode	Overtemperature
Current Control Mode	Overpower (optional)
Interlock Open	Overcurrent
Interlock Closed	Overvoltage
High Voltage Inhibit	Arc
Regulation Error	

## Regulatory Approvals:

RoHS compliant

## Electronic Component (Power Source)

### SLS series is intended for installation as a component of a system.

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The SLS series is not intended to be operated by end users as a stand-alone device. The SLS series power supply can only be fully assessed when installed within a system, and as a component part within that system.

## Corona Dome Terminations:

The SLS Series of "stack" configured high voltage power supplies come in a various output voltages and different physical configurations. Appropriate corona relief is required for these units to operate at maximum output voltage. Frequently users will provide the corona relief needed so Spellman will provide stack assemblies that by themselves will not be able to operate at maximum output voltage corona free. Please be certain to discuss your requirements with Spellman to be assured you get a stack assembly in the physical configuration you require for your application. The optional K941 Toroid (5" x 20") should be considered if customer corona relief will not be provided.



360kV Stack  
shown with  
optional  
K941 Toroid

## SLS SELECTION TABLE

MAXIMUM RATING kV	mA	MODEL NUMBER
160	12.5	SLS160*2000
200	10.0	SLS200*2000
260	7.7	SLS260*2000
300	6.6	SLS300*2000
360	5.5	SLS360*2000

\*Specify "P" for positive polarity or "N" for negative polarity  
Other combinations of voltage and current are available.

## SLS I/O INTERFACE CONNECTOR 25 PIN

PIN	SIGNAL
1	Power Supply Common
2	External Inhibit
3	External Interlock
4	External Interlock Return
5	Current Monitor
6	Voltage Monitor
7	+10V Reference
8	Remote Current Program In
9	Local Current Program Out
10	Remote Voltage Program In
11	Local Voltage Program Out
12	Optional EFR (common)
13	Optional EFR (normally closed)
14	Local HV OFF Out
15	HV OFF
16	Remote HV ON
17	Remote HV OFF Indicator
18	Remote HV ON Indicator
19	Remote Voltage Mode
20	Remote Current Mode
21	Spare
22	Remote PS Fault
23	+15V Output
24	Power Supply Common
25	Shield Return

### eSL OPTION



The eSL Option provides a vacuum fluorescent front panel display and Ethernet connectivity. Using the front panel local controls the main menu has the following features:

#### Local/Remote Control

Allows operation from either the local front panel or remotely via the Ethernet Category 5 connector.

#### Features Menu

Allows control over Adjustable Overload Trip and Slow Start features.

#### Tutorial Menu

Provides information on how to use the local front panel interface.

#### Diagnostics Menu

Provides information on the revisions of the hardware, firmware and IP address. Additionally the Diagnostics Menu provides information on the status of the internal low voltage housekeeping power supply voltages.

eSL Option power supplies can still be fully controlled via the SL2KW's comprehensive remote analog interface, so these units are fully backwards compatible with standard SL2KW power supplies.

### Typical Front Panel Screens

#### Model Number



#### Standby



#### HV ON

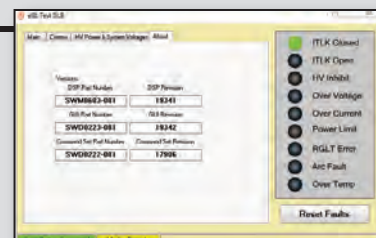


### Digital Interface

A front panel accessible Category 5 connector provides Ethernet connectivity. Spellman provides a basic demo GUI for convenience of the user, but most customers implement their own software.

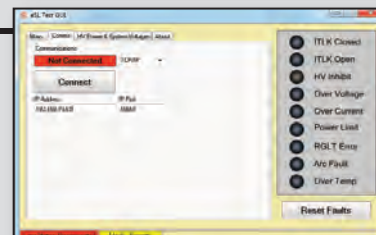
#### About Screen

DSP part number, DSP revision, GUI part number, GUI revision, Command set part number, Command set revision



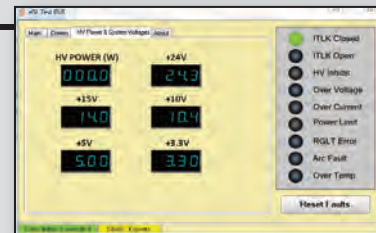
#### Coms Screen

Communications, IP address, IP port



#### HV Power and System Voltages Screen

HV power (watts) +24V, +15V, +10V, +5V, +3.3V



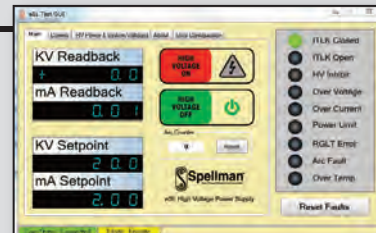
#### User Configuration Screen

Slow Start - kV, Slow Start - mA, Adjustable Over Load (AOL), Arc Control, Fault Indicators

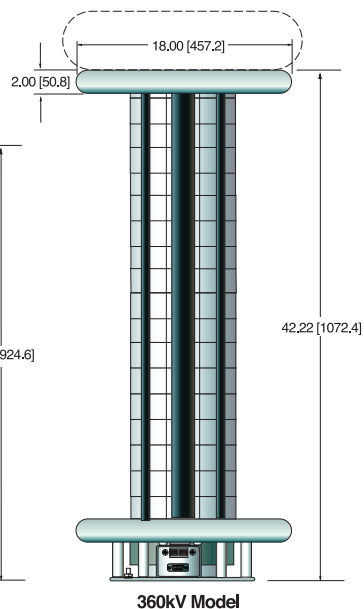
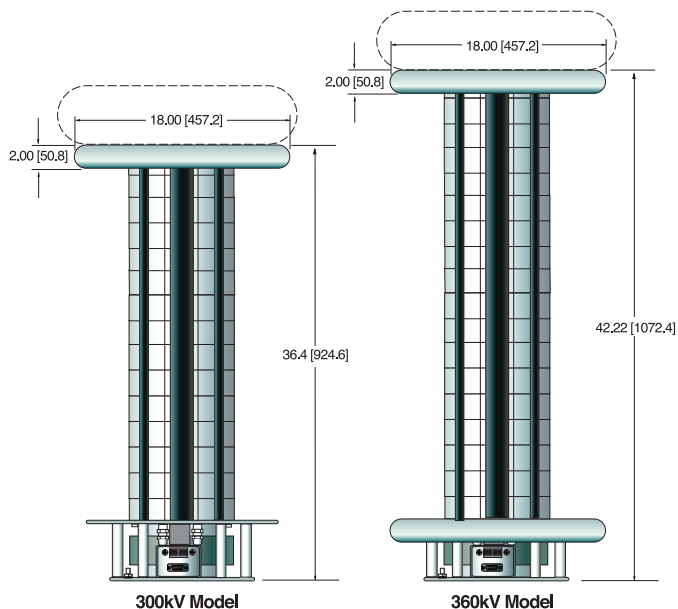
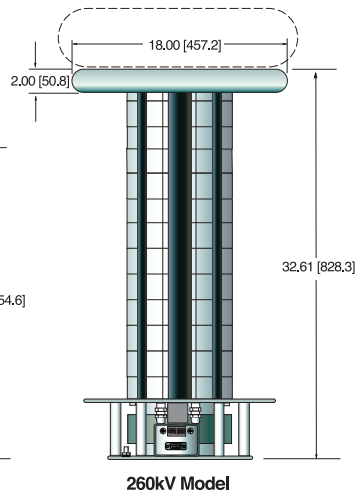
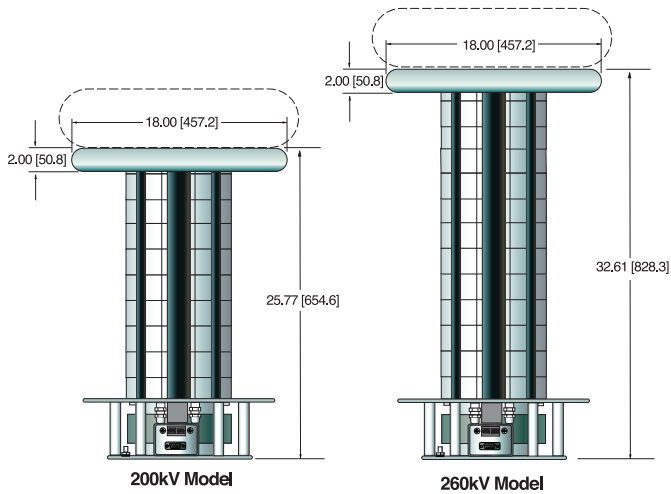
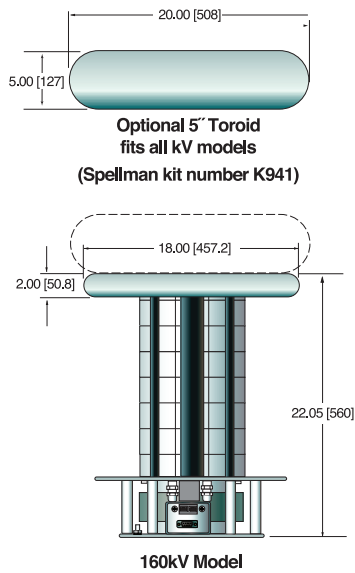


#### Main Screen

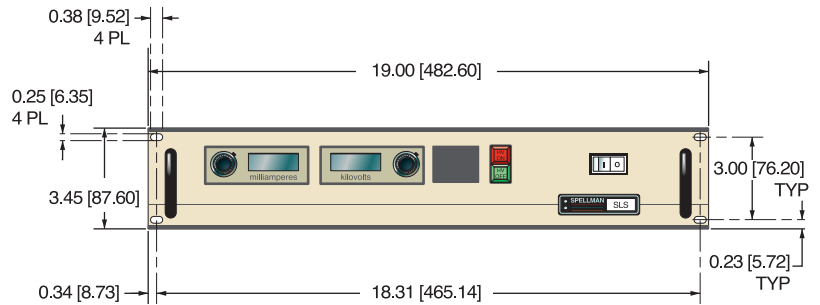
kV Setpoint, kV Readback, mA Setpoint, mA Readback, HV OFF Button, HV ON Button, Arc Counter, System Diagnostics, Reset Faults Button



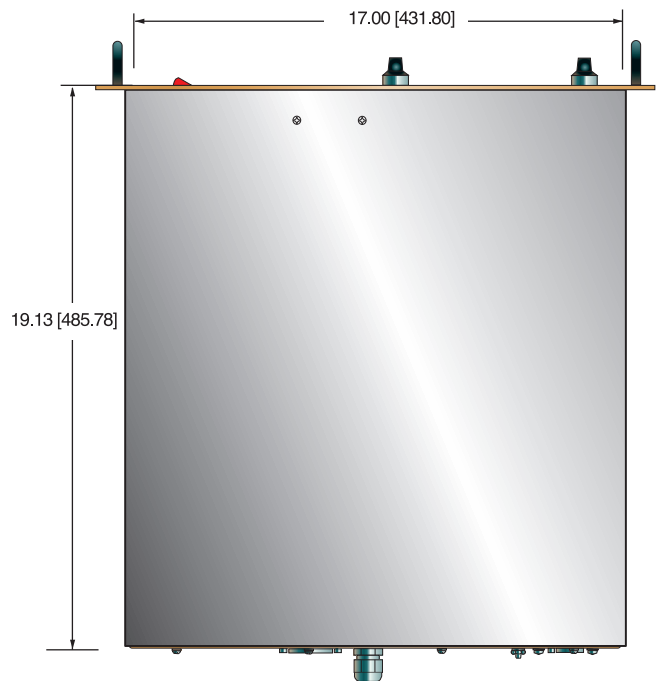
DIMENSIONS: in.[mm]



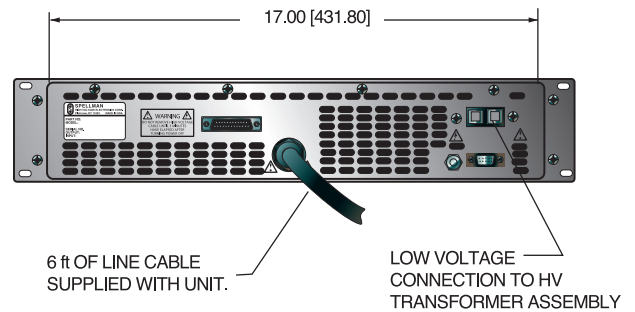
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW





- **4kW's in Single 3U (5.25") Chassis**
- **Models from 1kV to 70kV**
- **Remote Analog and Remote Ethernet Interface**
- **Arc and Short Circuit Protected**
- **Customer Configurable Features Via Ethernet Interface**
- **OEM Customization Available**

Spellman's STA Series of 4kW high voltage power supplies are available in positive or negative polarities in 15 different models with outputs ranging from 1kV to 70kV. A full featured front panel allows easy local control, while an extensive analog interface provides comprehensive remote capability. The standard Ethernet and RS-232 digital interfaces simplify integrating the STA into your system design.

The STA's robust IGBT inverter is inherently fault tolerant and is ideal for demanding applications like semiconductor processing and vacuum deposition. Many operational features can be configured by the user to suit their particular requirements.

### TYPICAL APPLICATIONS

Ion Beam Implantation  
Semiconductor Processing  
Electron Beam Welding  
Capacitor Charging  
High Power RF Transmitters  
Electrostatic Precipitators  
X-Ray Systems

### HARDWARE BASED OPTIONS

**BFP** Blank Front Panel  
**HS** High Stability  
**LL(X)** High Voltage Cable Length  
**1PH** 180-264Vac, Single Phase Input

### SOFTWARE CONFIGURABLE FEATURES

Adjustable Overload Trip  
Arc Trip Count  
Arc Quench Time  
Arc Re-Ramp Time  
Constant Power Control  
Adjustable Power Trip  
Slow Start Ramp Times

### SPECIFICATIONS

#### Input Voltage:

Standard: 180-264Vac, 50/60Hz, three phase, 90% efficiency, 0.85 power factor  
Optional: 180-264Vac 50/60Hz, single phase (1PH)

#### Input Current:

Standard: 180-264Vac, three phase 17 amps, maximum  
Optional: 180-264Vac, single phase 38 amps, maximum

#### Output Voltage:

15 models from 1kV to 70kV. Each model is available with positive or negative outputs.

#### Local Output Controls:

Voltage and current are continuously adjustable over entire range via ten-turn potentiometers with lockable counting dials.

#### Voltage Regulation:

Load: 0.05% of full voltage +500mV for full load change.  
Line: 0.05% of full voltage +500mV over specified input range.

#### Current Regulation:

Load: 0.05% of full current  $\pm 100\mu A$  for any voltage change.  
Line: 0.05% of full current over specified input range.

#### Ripple:

0.1% p-p +1Vrms

#### Stability:

0.02%hr. after 1 hour warm-up.

#### Temperature Coefficient:

100ppm/°C. Higher stability (50ppm/°C) available on special order via the HS option

#### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -40°C to 85°C  
Humidity:  
10% to 90% RH, non-condensing.

#### Cooling:

Forced air; inlet through side panels, outlet at rear panel

#### Metering:

Digital voltage and current meters, accurate to within 1%

#### System Status Display:

"Dead Front" type indicators provide status of up to 12 system operations including voltage and current regulation, fault conditions and circuit control.

**Analog Interface Connector:**

50 pin female D connector

**High Voltage Output Cable:**

A detachable 10' (3.05m) long shielded HV cable is provided

**Dimensions:**

1kV to 70kV:

5.25" (3U)H X 19" W X 21" D (133mm x 482mm x 533mm)

**Weight:**

1kV to 8kV: 46 lbs. (20.87kg)

10kV to 70kV: 58 lbs. (26.31kg)

Individual kV models may vary

**Regulatory Approvals:**

Designed to meet EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

**Electronic Component (Power Source)**

**STA series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The STA series is not intended to be operated by end users as a stand-alone device. The STA series power supply can only be fully assessed when installed within a system, and as a component part within that system.

**Digital Interface**

The STA features a standard RS-232 and Ethernet digital interface. Utilizing these standard digital interfaces can dramatically simplify power supply interfacing requirements saving the user both time and money, while enhancing functionality and overall capability. Spellman provides a GUI the STA that allows the customer to both customize operational features of the STA while also providing basic power supply operational features.

**Arc Intervention**

Spellman's STA power supplies have an arc intervention feature that senses arc currents via a fast acting current sense transformer. The purpose of the arc intervention circuitry is to prevent power supply damage from continuous, long term arcing. The factory default configuration will trip off the unit with an Arc Fault if 4 arcs occur in a 10 second time period. Customers can change basic arc intervention parameters (Arc Count, Arc Quench, Reramp Time, and Window Time) within preset limits via the digital interface; customized units can be provided for unique arc prone environments, contact Spellman for details.

**STA SELECTION TABLE**

MAXIMUM RATING		MODEL NUMBER
kV	mA	
1	4,000	STA1*4
2	2,000	STA2*4
3	1,333	STA3*4
4	1,000	STA4*4
6	667	STA6*4
8	500	STA8*4
10	400	STA10*4
12	333	STA12*4
15	267	STA15*4
20	200	STA20*4
30	133	STA30*4
40	100	STA40*4
50	80	STA50*4
60	67	STA60*4
70	57	STA70*4

\*Substitute "P" for positive polarity and "N" for negative polarity. Polarity must be specified at time of order.



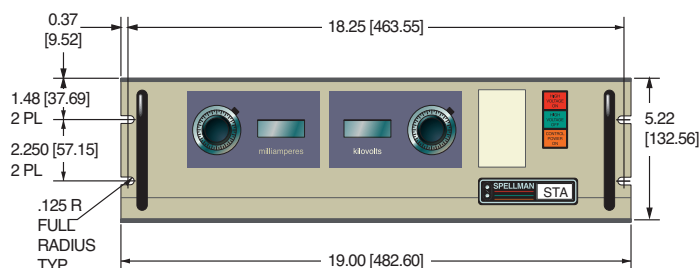
**STA rear panel shown with local operation plug installed in 50 pin D connector**

#### JB1 STA ANALOG INTERFACE— 50 PIN FEMALE D CONNECTOR

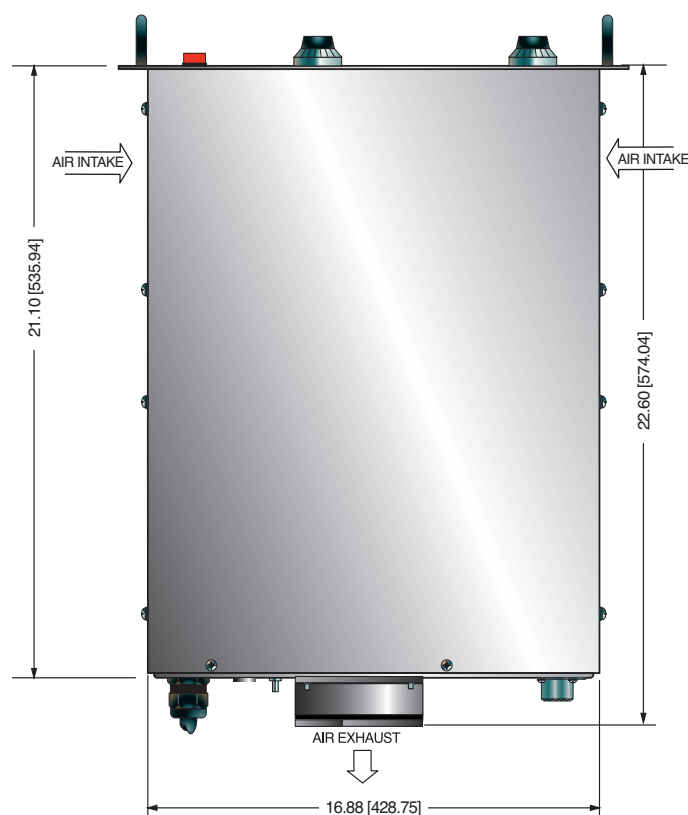
PIN	SIGNAL	PARAMETERS
1	Power Supply Common	Power Supply Ground
2	Reset/HV Inhibit	Normally open, Low = Reset/Inhibit
3	External Interlock	+24Vdc @ open, <25mA @ closed
4	External Interlock Return	Return for External Interlock
5	mA Test Point	0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%
6	kV Test Point	0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%
7	+10Vdc Reference Output	+10Vdc @ 1mA
8	mA Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
9	Local mA Program Output	0-10Vdc = 0-100% rated output, front panel pot
10	kV Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
11	Local kV Program Output	0-10Vdc = 0-100% rated output, front panel pot
12	Remote Power On Output	+24Vdc @ open, 2A peak, 1Adc @ closed
13	Remote Power On Return	Return for Remote Power On
14	Remote HV Off	+24Vdc @ open, 2A peak, 1Adc @ closed, connect to pin15 for front panel operation
15	Remote HV Off/On Common	HV On/Off Common
16	Remote HV On	+24Vdc @ open, 2A peak, 1Adc @ closed, momentarily connect to pin 15 enable high voltage
17	HV Off Indicator	+24Vdc @ 25mA = HV Off
18	HV On Indicator	+24Vdc @ 25mA = HV On
19	Power Supply Common	Supply Ground
20	+24Vdc Output	+24Vdc @ 100mA, maximum
21	Voltage Mode Status	Open Collector, Low = Active
22	Current Mode Status	Open Collector, Low = Active
23	Power Mode Status	Open Collector, Low = Active
24	Interlock Closed Status	Open Collector, Low = Active
25	Power Test Point	0-10Vdc = 0-100% rated output, Zout= 5KΩ, 1%
26	Spare	
27	Spare	
28	Remote Overvoltage Adjust	0-10Vdc = 0-100% rated output
29	Over Power Fault	Open Collector, Low = Active
30	Over Voltage Fault	Open Collector, Low = Active
31	Over Current Fault	Open Collector, Low = Active
32	System Fault	Open Collector, Low = Active
33	RGLT Error Fault	Open Collector, Low = Active
34	Arc	Open Collector, Low = Active
35	Over Temp Fault	Open Collector, Low = Active
36	AC Fault	Open Collector, Low = Active
37	Spare	
38	Spare	
39	Spare	
40	Spare	
41	Spare	
42	Remote Power Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
43	Local Power Program Output	0-10Vdc = 0-100% rated output, internal pot
44	+5Vdc Output	+5Vdc @ 100mA, maximum
45	+15Vdc Output	+15Vdc @ 100mA, maximum
46	-15Vdc Output	-15Vdc @ 10mA, maximum
47	RS232 Tx	
48	RS232 Rx	
49	RS232 GND	
50	Power Supply Common	Power Supply Ground

DIMENSIONS: in.[mm]

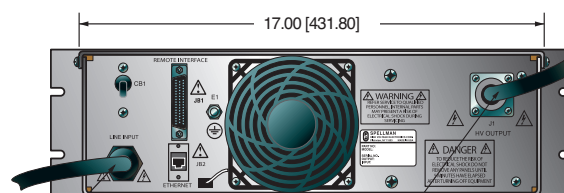
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW



6 ft OF LINE CABLE  
SUPPLIED WITH UNIT.

MATING CONNECTOR AND  
10ft OF HIGH VOLTAGE  
CABLE SUPPLIED WITH UNIT.





**Need higher power?** The ST Series provides 12kW in the same size as the STR Series



- **6kW's in Single 6U (10.5") Chassis**
- **Models from 1kV to 150kV**
- **Remote Analog and Remote Ethernet Interface**
- **Arc and Short Circuit Protected**
- **Customer Configurable Features Via Ethernet Interface**
- **OEM Customization Available**

Spellman's STR Series of 6kW high voltage power supplies are available in positive or negative polarities in 19 different models with outputs ranging from 1kV to 150kV. A full featured front panel allows easy local control, while an extensive analog interface provides comprehensive remote capability. The standard Ethernet and RS-232 digital interfaces simplify integrating the STR into your system design.

The STR's robust IGBT inverter is inherently fault tolerant and is ideal for demanding applications like semiconductor processing and vacuum deposition. Many operational features can be configured by the user to suit their particular requirements.

### TYPICAL APPLICATIONS

Ion Beam Implantation  
Semiconductor Processing  
Electron Beam Welding  
Capacitor Charging  
High Power RF Transmitters  
Electrostatic Precipitators  
X-Ray Systems

### HARDWARE BASED OPTIONS

**BFP** Blank Front Panel  
**HS** High Stability  
**LL(X)** High Voltage Cable Length  
**400VAC** 360-528Vac, Three Phase Input  
**1PH** 180-264Vac, Single Phase Input

### SOFTWARE CONFIGURABLE FEATURES

Adjustable Overload Trip  
Arc Trip Count  
Arc Quench Time  
Arc Re-Ramp Time  
Constant Power Control  
Adjustable Power Trip  
Slow Start Ramp Times

### SPECIFICATIONS

#### Input Voltage:

Standard: 180-264Vac, 50/60Hz, three phase, 90% efficiency, 0.85 power factor  
Optional: 360-528Vac 50/60Hz, three phase (400VAC)  
180-264Vac 50/60Hz, single phase (1PH)

#### Input Current:

Standard: 180-264Vac, three phase 25 amps, maximum  
Optional: 360-528Vac, three phase 12.5 amps, maximum  
180-264Vac, single phase 57 amps, maximum

#### Output Voltage:

19 models from 1kV to 150kV. Each model is available with positive or negative outputs. 1kV to 10kV units are internally reversible.

#### Local Output Controls:

Voltage and current are continuously adjustable over entire range via ten-turn potentiometers with lockable counting dials.

#### Voltage Regulation:

Load: 0.05% of full voltage +500mV for full load change.  
Line: 0.05% of full voltage +500mV over specified input range.

#### Current Regulation:

Load: 0.05% of full current  $\pm 100\mu A$  for any voltage change.  
Line: 0.05% of full current over specified input range.

#### Ripple:

0.1% p-p +1Vrms

#### Stability:

0.02%/hr. after 1 hour warm-up.

#### Temperature Coefficient:

100ppm/°C. Higher stability (50ppm/°C) available on special order via the HS option

#### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -40°C to 85°C  
Humidity:  
10% to 90% RH, non-condensing.

#### Cooling:

Forced air; inlet through side panels, outlet at rear panel

#### Metering:

Digital voltage and current meters, accurate to within 1%

#### System Status Display:

"Dead Front" type indicators provide status of up to 12 system operations including voltage and current regulation, fault conditions and circuit control.

**Analog Interface Connector:**

50 pin female D connector

**High Voltage Output Cable:**

A detachable 10' (3.05m) long shielded HV cable is provided

**Dimensions:**

1kV to 120kV:

10.5" (6U)H X 19" W X 21" D (266mm x 482mm x 533mm)

150kV:

10.5" (6U)H X 19" W X 23" D (266mm x 482mm x 584mm)

**Weight:**

1kV to 50kV: &lt;100 pounds (45.36kg)

60kV to 120kV: &lt;140 pounds (63.50kg)

150kV: &lt;150 pounds (68kg)

Individual kV models may vary

**Regulatory Approvals:**

Compliant to EEC EMC Directive. Compliant to EEC

Low Voltage Directive. RoHS Compliant.

**Electronic Component (Power Source)****STR series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The STR series is not intended to be operated by end users as a stand-alone device. The STR series power supply can only be fully assessed when installed within a system, and as a component part within that system.

**STR SELECTION TABLE**

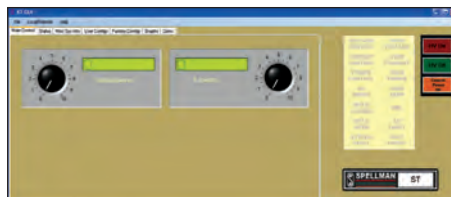
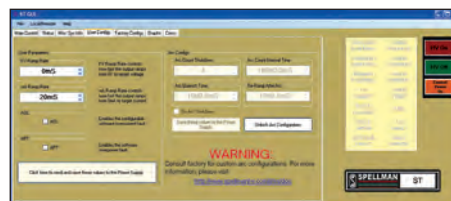
MAXIMUM RATING		MODEL NUMBER
kV	mA	
1	6,000	STR1*6
2	3,000	STR2*6
3	2,000	STR3*6
4	1,500	STR4*6
6	1,000	STR6*6
8	750	STR8*6
10	600	STR10*6
12	500	STR12*6
15	400	STR15*6
20	300	STR20*6
30	200	STR30*6
40	150	STR40*6
50	120	STR50*6
60	100	STR60*6
70	86	STR70*6
80	75	STR80*6
100	60	STR100*6
120	50	STR120*6
150	40	STR150*6

\*Substitute "P" for positive polarity and "N" for negative polarity. Polarity must be specified at time of order.

1-10kV units are inherently reversible by design requiring an internal wiring change to swap polarities. Intermediate voltage units are available by special order.

**Digital Interface**

The STR features a standard RS-232 and Ethernet digital interface. Utilizing these standard digital interfaces can dramatically simplify power supply interfacing requirements saving the user both time and money, while enhancing functionality and overall capability. Spellman provides a GUI with the STR that allows the customer to both customize operational features of the STR while also providing basic power supply operational features.

**Main control screen****Status screen****User configuration screen****Arc Intervention**

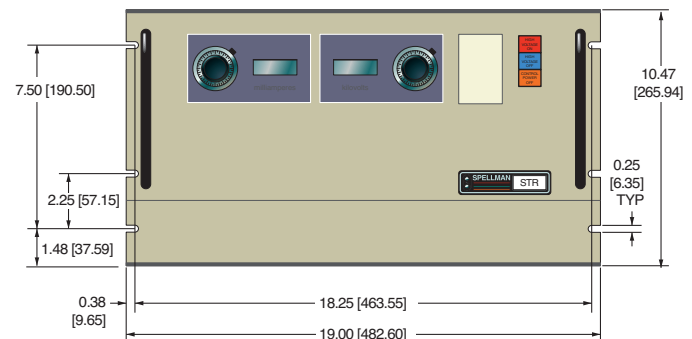
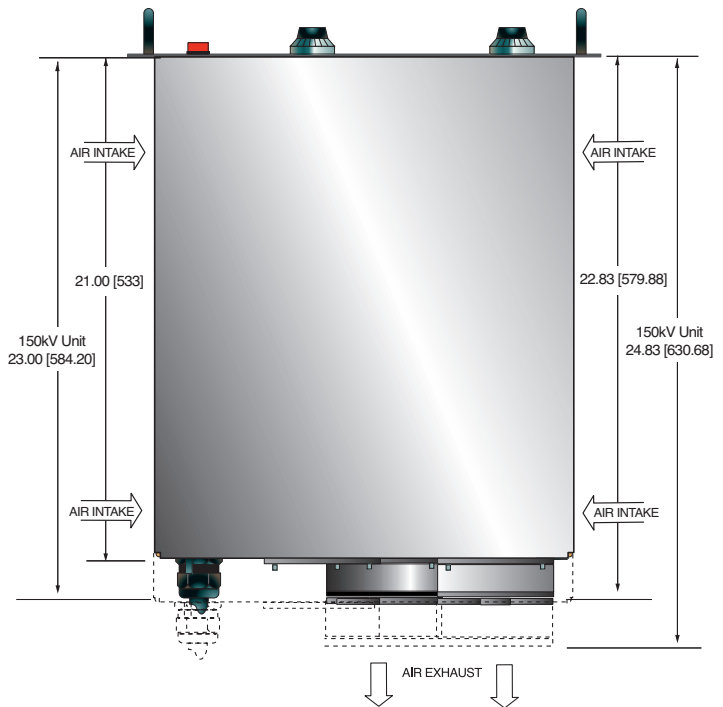
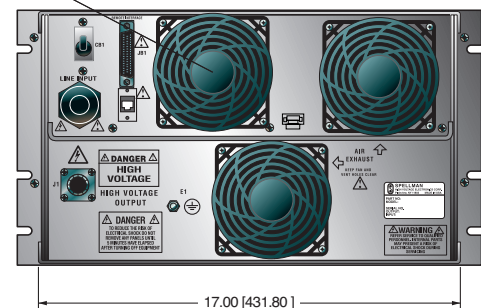
Spellman's STR power supplies have an arc intervention feature that senses arc currents via a fast acting current sense transformer. The purpose of the arc intervention circuitry is to prevent power supply damage from continuous, long term arcing. The factory default configuration will trip off the unit with an Arc Fault if 4 arcs occur in a 10 second time period. Customers can change basic arc intervention parameters (Arc Count, Arc Quench, Reramp Time, and Window Time) within preset limits via the digital interface; customized units can be provided for unique arc prone environments, contact Spellman for details.

**STR rear panel view**

**JB1 STR ANALOG INTERFACE—  
50 PIN FEMALE D CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	Power Supply Common	Power Supply Ground
2	Reset/HV Inhibit	Normally open, Low = Reset/Inhibit
3	External Interlock	+24Vdc @ open, <25mA @ closed
4	External Interlock Return	Return for External Interlock
5	mA Test Point	0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%
6	kV Test Point	0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%
7	+10Vdc Reference Output	+10Vdc @ 1mA
8	mA Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
9	Local mA Program Output	0-10Vdc = 0-100% rated output, front panel pot
10	kV Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
11	Local kV Program Output	0-10Vdc = 0-100% rated output, front panel pot
12	Remote Power On Output	+24Vdc @ open, 2A peak, 1Adc @ closed
13	Remote Power On Return	Return for Remote Power On
14	Remote HV Off	+24Vdc @ open, 2A peak, 1Adc @ closed, connect to pin 15 for front panel operation
15	Remote HV Off/On Common	HV On/Off Common
16	Remote HV On	+24Vdc @ open, 2A peak, 1Adc @ closed, momentarily connect to pin 15 enable high voltage
17	HV Off Indicator	+24Vdc @ 25mA = HV Off
18	HV On Indicator	+24Vdc @ 25mA = HV On
19	Power Supply Common	Supply Ground
20	+24Vdc Output	+24Vdc @ 100mA, maximum
21	Voltage Mode Status	Open Collector, Low = Active
22	Current Mode Status	Open Collector, Low = Active
23	Power Mode Status	Open Collector, Low = Active
24	Interlock Closed Status	Open Collector, Low = Active
25	Power Test Point	0-10Vdc = 0-100% rated output, Zout= 5KΩ, 1%
26	Spare	
27	Spare	
28	Remote Overvoltage Adjust	0-10Vdc = 0-100% rated output
29	Over Power Fault	Open Collector, Low = Active
30	Over Voltage Fault	Open Collector, Low = Active
31	Over Current Fault	Open Collector, Low = Active
32	System Fault	Open Collector, Low = Active
33	RGLT Error Fault	Open Collector, Low = Active
34	Arc	Open Collector, Low = Active
35	Over Temp Fault	Open Collector, Low = Active
36	AC Fault	Open Collector, Low = Active
37	Spare	
38	Spare	
39	Spare	
40	Spare	
41	Spare	
42	Remote Power Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
43	Local Power Program Output	0-10Vdc = 0-100% rated output, internal pot
44	+5Vdc Output	+5Vdc @ 100mA, maximum
45	+15Vdc Output	+15Vdc @ 100mA, maximum
46	-15Vdc Output	-15Vdc @ 10mA, maximum
47	RS232 Tx	
48	RS232 Rx	
49	RS232 GND	
50	Power Supply Common	Power Supply Ground

DIMENSIONS: in.[mm]

**FRONT VIEW****TOP VIEW**NON-OPERATIONAL  
(VENT COVER ONLY)**BACK VIEW**



1-150kV



225kV

Spellman's ST Series of 12kW high voltage power supplies are available in positive or negative polarities in 20 different models with outputs ranging from 1kV to 225kV. A full featured front panel allows easy local control, while an extensive analog interface provides comprehensive remote capability. The standard Ethernet and RS-232 digital interfaces simplify integrating the ST into your system design.

The ST's robust IGBT inverter is inherently fault tolerant and is ideal for demanding applications like semiconductor processing and vacuum deposition. Many operational features can be configured by the user to suit their particular requirements. Power >100kW's can be provided by configuring additional chassis in parallel.

### TYPICAL APPLICATIONS

Ion Beam Implantation  
Semiconductor Processing  
Electron Beam Welding  
Capacitor Charging  
High Power RF Transmitters  
Electrostatic Precipitators  
X-Ray Systems

### HARDWARE BASED OPTIONS

**BFP** Blank Front Panel  
**HS** High Stability  
**LL(X)** High Voltage Cable Length  
**400VAC** 360-528Vac Input

### SOFTWARE CONFIGURABLE FEATURES

Adjustable Overload Trip  
Arc Trip Count  
Arc Quench Time  
Arc Re-Ramp Time  
Constant Power Control  
Adjustable Power Trip  
Slow Start Ramp Times

- **12kW's in Single 6U (10.5") Chassis**
- **Models from 1kV to 225kV**
- **Remote Analog and Remote Ethernet Interface**
- **Parallel Units for >100kW's**
- **Arc and Short Circuit Protected**
- **Customer Configurable Features Via Ethernet Interface**
- **OEM Customization Available**

### SPECIFICATIONS

#### Input Voltage:

Standard: 180-264Vac, 50/60Hz, three phase, 90% efficiency, 0.85 power factor  
Optional: 360-528Vac 50/60Hz, three phase (400Vac)

#### Input Current:

Standard: 180-264Vac, three phase; 50 amps, maximum  
Optional: 360-528Vac, three phase; 25 amps, maximum

#### Output Voltage:

20 models from 1kV to 225kV. Each model is available with positive or negative outputs. 1kV to 10kV units are internally reversible.

#### Local Output Controls:

Voltage and current are continuously adjustable over entire range via ten-turn potentiometers with lockable counting dials.

#### Voltage Regulation:

Load: 0.05% of full voltage +500mV for full load change.  
Line: 0.05% of full voltage +500mV over specified input range.

#### Current Regulation:

Load: 0.05% of full current  $\pm 100\mu\text{A}$  for any voltage change.  
Line: 0.05% of full current over specified input range.

#### Ripple:

0.3% p-p +1Vrms. Lower ripple available via special order

#### Stability:

0.02%hr. after 1 hour warm-up.

#### Temperature Coefficient:

100ppm/°C. Higher stability (50ppm/°C) available on special order via the HS option

#### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -40°C to 85°C  
Humidity:  
10% to 90% RH, non-condensing.

#### Cooling:

Forced air; inlet through side panels, outlet at rear panel

#### Metering:

Digital voltage and current meters, accurate to within 1%

#### System Status Display:

"Dead Front" type indicators provide status of up to 12 system operations including voltage and current regulation, fault conditions and circuit control.

#### Input Line Connector:

A 6 foot (1.8 meter) long captive line cord is provided.

**Analog Interface Connector:**

50 pin female D connector

**High Voltage Output Cable:**

1-150kV: A detachable 10' (3.05m) long shielded HV cable is provided

225kV: R-28 type X-Ray connector.  
No output cable is provided**Dimensions:**

1kV to 120kV:

10.5" (6U)H X 19" W X 21" D (266mm x 482mm x 533mm)

150kV:

10.5" (6U)H X 19" W X 23" D (266mm x 482mm x 584mm)

225kV:

20.55" H X 17.01" W X 29.7" D (521mm x 432mm x 754mm)

**Weight:**

1kV to 50kV: &lt;100 pounds (45.36kg)

60kV to 120kV: &lt;140 pounds (63.50kg)

150kV: &lt;150 pounds (68.03kg)

225kV: &lt;260 pounds (117.9kg)

Individual kV models may vary

**Regulatory Approvals:**

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

**Electronic Component (Power Source)****ST series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The ST series is not intended to be operated by end users as a stand-alone device. The ST series power supply can only be fully assessed when installed within a system, and as a component part within that system.

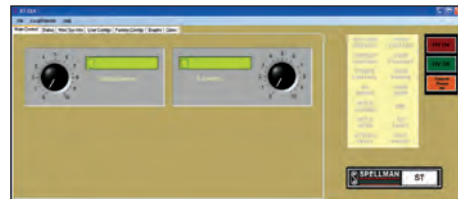
**Parallel Capability**

The ST series is designed to offer additional power capability by adding a chassis in parallel to create a main/secondary configuration providing up to and beyond 100kW's. The main chassis is the point of connection for customer interfacing; this multi-chassis system effectively functions as a single power supply. The main unit retains the full featured front panel, while secondary units have a Blank Front Panel. To configure an orderable model number, simply use Spellman's applicable base ST model number and increment the power denominator in 12kW steps as required:

**ST60P24** This would be an ST with a 60kV, positive polarity, providing 24kW's of power (2 chassis)

**Rear panel showing connections for parallel operation****Main/secondary 24kW ST****Digital Interface**

The ST features a standard RS-232 and Ethernet digital interface. Utilizing these standard digital interfaces can dramatically simplify power supply interfacing requirements saving the user both time and money, while enhancing functionality and overall capability. Spellman provides a GUI with the ST that allows the customer to both customize operational features of the ST while also providing basic power supply operational features.

**Main control screen****Status screen****User configuration screen****Arc Intervention**

Spellman's ST power supplies have an arc intervention feature that senses arc currents via a fast acting current sense transformer. The purpose of the arc intervention circuitry is to prevent power supply damage from continuous, long term arcing. The factory default configuration will trip off the unit with an Arc Fault if 4 arcs occur in a 10 second time period. Customers can change basic arc intervention parameters (Arc Count, Arc Quench, Reramp Time, and Window Time) within preset limits via the digital interface; customized units can be provided for unique arc prone environments, contact Spellman for details.

## ST SELECTION TABLE

MAXIMUM RATING		MODEL NUMBER
kV	mA	
1	12,000	ST1*12
2	6,000	ST2*12
3	4,000	ST3*12
4	3,000	ST4*12
6	2,000	ST6*12
8	1,500	ST8*12
10	1,200	ST10*12
12	1,000	ST12*12
15	800	ST15*12
20	600	ST20*12
30	400	ST30*12
40	300	ST40*12
50	240	ST50*12
60	200	ST60*12
70	171	ST70*12
80	150	ST80*12
100	120	ST100*12
120	100	ST120*12
150	67	ST150*10
225	40	ST225*10

\*Substitute "P" for positive polarity and "N" for negative polarity. Polarity must be specified at time of order.  
1-10kV units are inherently reversible by design requiring an internal wiring change to swap polarities. Intermediate voltage units are available by special order. 150kV and 225kV units are limited to a maximum output of 10kW's

**NOTE: ST225 units cannot be paralalled!****Parallel operation:**

Additional power can be provided in increments of 12kW's by connecting chassis in parallel via the use of the ST's main/secondary configuration.

Use the applicable base ST model number and increment the power denominated in 12kW steps as required.

**ST10P24** 10kV @ 24kW's

**ST10P36** 10kV @ 36kW's

**ST10P48** 10kV @ 48kW's



ST 1-150kV rear panel view



ST 225V rear panel view

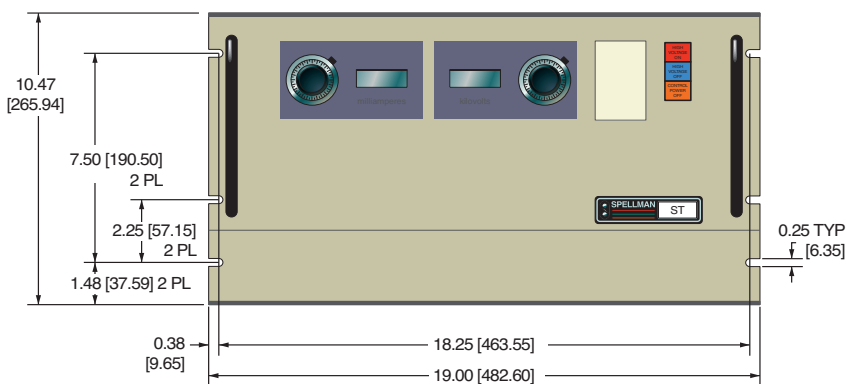
JB1 ST ANALOG INTERFACE—  
50 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Common	Power Supply Ground
2	Reset/HV Inhibit	Normally open, Low = Reset/Inhibit
3	External Interlock	+24Vdc @ open, <25mA @ closed
4	External Interlock Return	Return for External Interlock
5	mA Test Point	0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%
6	kV Test Point	0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%
7	+10Vdc Reference Output	+10Vdc @ 1mA
8	mA Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
9	Local mA Program Output	0-10Vdc = 0-100% rated output, front panel pot
10	kV Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
11	Local kV Program Output	0-10Vdc = 0-100% rated output, front panel pot
12	Remote Power On Output	+24Vdc @ open, 2A peak, 1Adc @ closed
13	Remote Power On Return	Return for Remote Power On
14	Remote HV Off	+24Vdc @ open, 2A peak, 1Adc @ closed, connect to pin15 for front panel operation
15	Remote HV Off/On Common	HV On/Off Common
16	Remote HV On	+24Vdc @ open, 2A peak, 1Adc @ closed, momentarily connect to pin 15 enable high voltage
17	HV Off Indicator	+24Vdc @ 25mA = HV Off
18	HV On Indicator	+24Vdc @ 25mA = HV On
19	Power Supply Common	Supply Ground
20	+24Vdc Output	+24Vdc @ 100mA, maximum
21	Voltage Mode Status	Open Collector, Low = Active
22	Current Mode Status	Open Collector, Low = Active
23	Power Mode Status	Open Collector, Low = Active
24	Interlock Closed Status	Open Collector, Low = Active
25	Power Test Point	0-10Vdc = 0-100% rated output, Zout= 5KΩ, 1%
26	Spare	
27	Spare	
28	Remote Overvoltage Adjust	0-10Vdc = 0-100% rated output
29	Over Power Fault	Open Collector, Low = Active
30	Over Voltage Fault	Open Collector, Low = Active
31	Over Current Fault	Open Collector, Low = Active
32	System Fault	Open Collector, Low = Active
33	RGLT Error Fault	Open Collector, Low = Active
34	Arc	Open Collector, Low = Active
35	Over Temp Fault	Open Collector, Low = Active
36	AC Fault	Open Collector, Low = Active
37	Spare	
38	Spare	
39	Spare	
40	Spare	
41	Spare	
42	Remote Power Program Input	0-10Vdc = 0-100% rated output, Zin>10MΩ
43	Local Power Program Output	0-10Vdc = 0-100% rated output, internal pot
44	+5Vdc Output	+5Vdc @ 100mA, maximum
45	+15Vdc Output	+15Vdc @ 100mA, maximum
46	-15Vdc Output	-15Vdc @ 10mA, maximum
47	RS232 Tx	
48	RS232 Rx	
49	RS232 GND	
50	Power Supply Common	Power Supply Ground

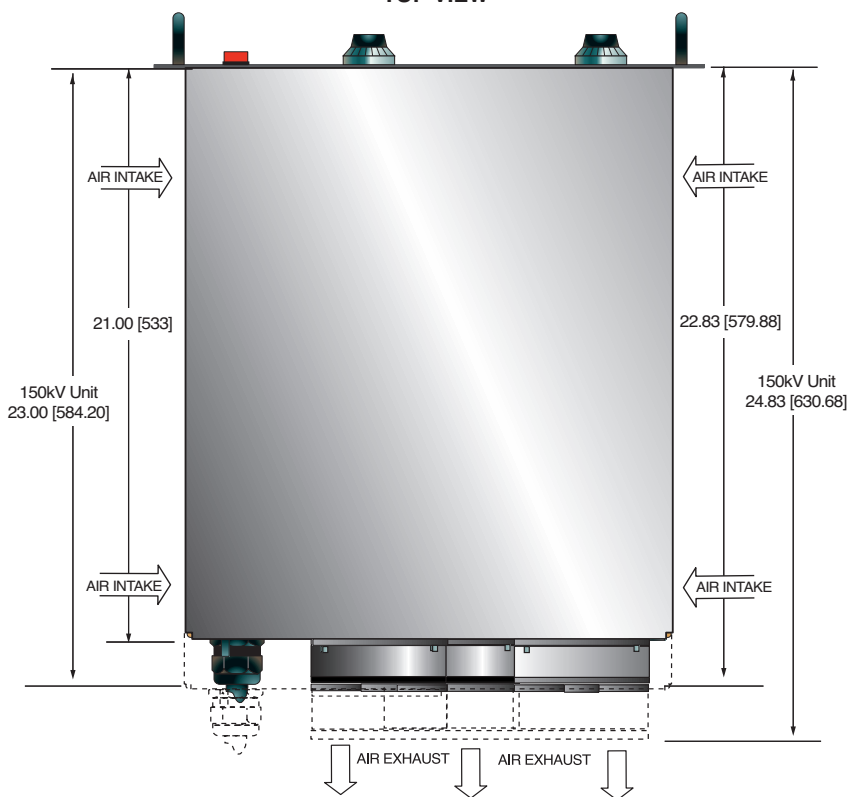
DIMENSIONS: in.[mm]

**FRONT VIEW**

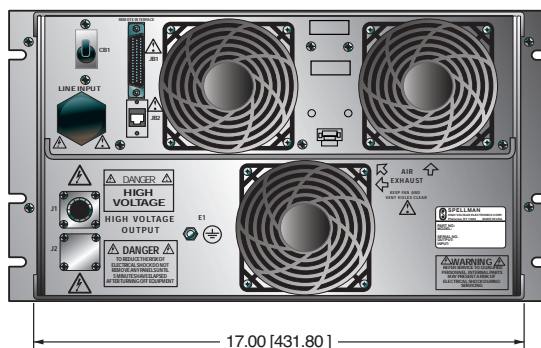
## ST 1kV-150kV



**TOP VIEW**



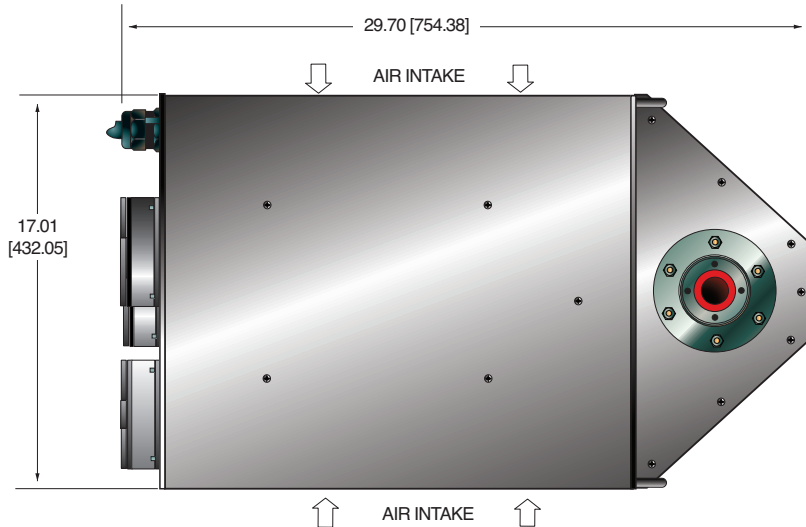
### BACK VIEW



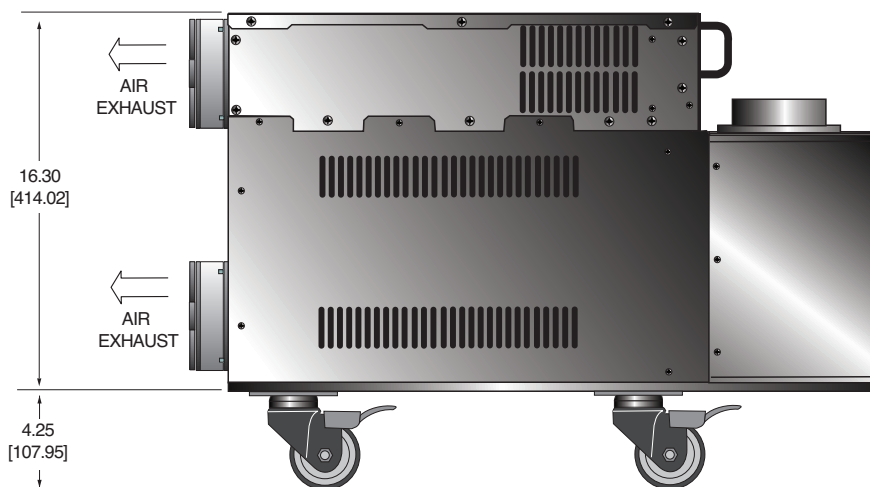
ST 225kV

DIMENSIONS: in.[mm]

**TOP VIEW**

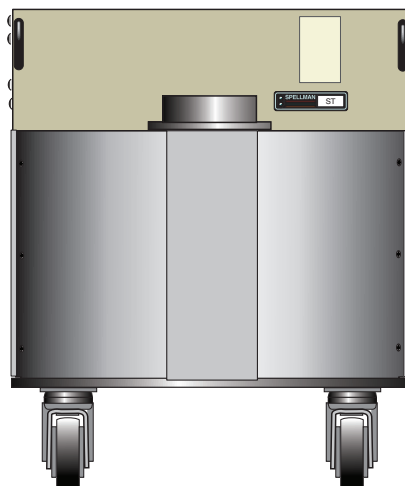


**SIDE VIEW**

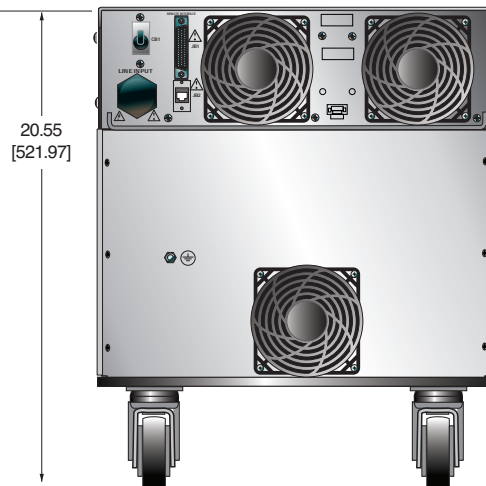


**FRONT VIEW**

NOTE:  
Blank front  
panel on  
ST 225kV units



**REAR VIEW**





Spellman's XLG Series of X-Ray generators are well regulated high voltage power supplies with output voltages to 130kV and very low ripple achieved through the use of advanced resonant conversion techniques. Extremely stable voltage and emission current outputs result in significant performance improvements over previously available technology. The XLG Series provides all the power, control and support functions required for X-Ray applications including a regulated dc filament supply. These units incorporate local and remote programming, monitoring, safety interlock, short-circuit and overload protection.

## TYPICAL APPLICATIONS

Plating Measurement  
Mineral Analysis  
X-Ray Fluorescence

## OPTIONS

<b>APT</b>	Adjustable Power Trip
<b>AT</b>	Arc Trip
<b>SS(x)</b>	Non-Standard Slow Start
<b>NSS</b>	No Slow Start
<b>IO</b>	Instant ON
<b>LL(x)</b>	Extra Length HV Cable
<b>SL</b>	Slides

## FRONT PANEL STATUS INDICATORS:

Overvoltage	Voltage Control Mode
Overtemperature	Current Control Mode
Regulation Error	Interlock Open
Arc	Interlock Closed
HV ON: Red	HV OFF: Green

## SPECIFICATIONS

### Input Voltage:

115Vac $\pm$ 10%, 50-60Hz single phase or  
220Vac $\pm$ 10%, 50-60Hz single phase.  
For input current see table on page 2.

### Voltage and Current Control:

Local: continuously adjustable from zero to maximum rating via a ten-turn potentiometer with a lockable counting dial.  
Remote: 0 to +10Vdc proportional from 0 to full output.  
Accuracy:  $\pm$ 1%. Input Impedance: 10Mohm.

- **Output Voltages to 130kV**
- **Integrated Ground Referenced Filament Supply**
- **Low Ripple**
- **"Hot Anode"**
- **Positive Polarity**
- **Local & Remote Programming**
- **OEM Customization Available**

### Filament:

Specify at time of order:

FH: 9A, 3V.

FL: 3A, 3V.

Preheat level is 0.45 amps in standby

### Voltage Regulation:

Load: 0.005% of full output voltage no load to full load.

Line: 0.005% for input voltage range change.

### Current Regulation:

Load: 0.05% of full current  $\pm$ 100 $\mu$ A from 0 to full voltage.

Line: 0.05% of rated current over specified input range.

### Ripple:

0.03% rms below 1kHz.

0.75% rms above 1kHz.

### Temperature Coefficient:

100ppm/ $^{\circ}$ C.

### Stability:

0.01%/8 hrs after 1/2 hour warm-up.

0.02% per 8 hours (typical).

### Cooling:

Free air convection.

### Metering:

Digital voltage and current meters (3.5 digits),  
1% accuracy.

### HV Output Cable:

10' (3.3m) of shielded HV cable removable at rear.

### I/O Connectors:

25 pin D-type for control interface with  
mating connector provided.

### Dimensions:

30 to 60kV:

3.5"H x 19"W x 19"D (8.9cm x 48.3cm x 48.3cm).

80 to 130kV:

3.5"H x 19"W x 24"D (8.9cm x 48.3cm x 61.0cm).

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. RoHS Compliant.

## Electronic Component (Power Source)

**XLG series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The XLG series is not intended to be operated by end users as a stand-alone device. The XLG series power supply can only be fully assessed when installed within a system, and as a component part within that system.

### XLG INPUT CURRENT

MODEL	115Vac	220Vac
3W-30W	0.6A	0.3125A
40W-60W	1.2A	0.625A
70W-150W	3.0A	1.56A
160W-260W	5.25A	2.71A

### XLG SELECTION TABLE 0.1mA, 0.2mA, 0.5mA

kV	0.1mA	0.2mA	.5mA
30	XLG30P3*	XLG30P6*	XLG30P15*
35	XLG35P3.5*	XLG35P7*	XLG35P17.5*
40	XLG40P4*	XLG40P8*	XLG40P20*
50	XLG50P5*	XLG50P10*	XLG50P25*
60	XLG60P6*	XLG60P12*	XLG60P30*
80	XLG80P8*	XLG80P16*	XLG80P40*
100	XLG100P10*	XLG100P20*	XLG100P50*
120	XLG120P12*	XLG120P24*	XLG120P60*
130	XLG130P13*	XLG130P26*	XLG130P65*

\*Specify FH for High power (27W) filament, FL for Low power (9W) filament.

### XLG SELECTION TABLE 1.0mA, 2.0mA, 3.0mA

kV	1.0mA	2.0mA	3.0mA
30	XLG30P30*	XLG30P60*	XLG30P90*
35	XLG35P35*	XLG35P70*	XLG35P105*
40	XLG40P40*	XLG40P80*	XLG40P120*
50	XLG50P50*	XLG50P100*	XLG50P150*
60	XLG60P60*	XLG60P120*	XLG60P180*
80	XLG80P80*	XLG80P160*	---
100	XLG100P100*	XLG100P200*	---
120	XLG120P120*	XLG120P240*	---
130	XLG130P130*	XLG130P260*	---

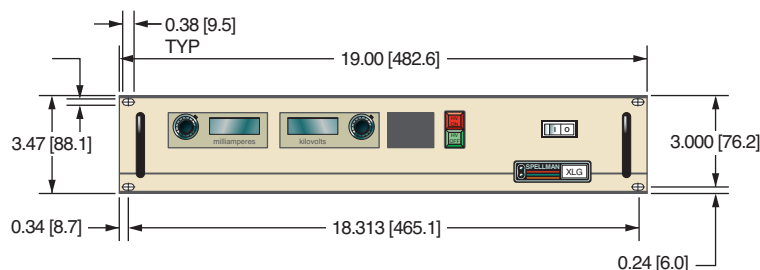
\*Specify FH for High power (27W) filament, FL for Low power (9W) filament.

### XLG CONNECTOR 25 PIN

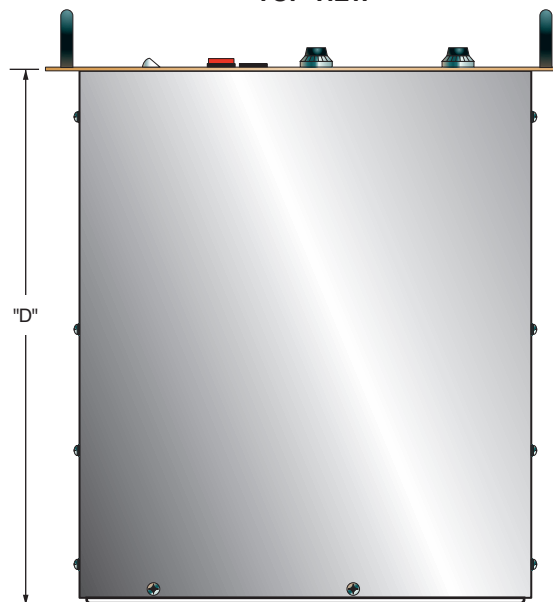
PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Common	Signal Ground
2	External Inhibit	Ground=Inhibit, Open=HV On
3	External Interlock	+15V at Open, <15mA at Closed
4	External Interlock Return	Return for Interlock
5	Current Monitor	0 to 10V=0 to 100% Rated Output
6	kV Test Point	0 to 10V=0 to 100% Rated Output
7	+10V Reference	+10V, 1mA Max
8	Remote Current Program In	0 to 10V=0 to 100% Rated Output
9	Local Current Program Out	Front Panel Program Voltage
10	Remote Voltage Program In	0 to 10V=0 to 100% Rated Output
11	Local Voltage Program Out	Front Panel Program Voltage
12	Power Monitor	0 to 10V=0 to 100% Rated Output
13	Remote Power Program In	(Optional)
14	Local HV Off Out	+15V at Open, <25mA at Closed
15	HV Off	Connect to HV OFF for Fp Operation
16	Remote HV On	+15V, 10mA Max=HV Off
17	Remote HV Off Indicator	0=HV On, +15V, 10mA Max=HV Off
18	Remote HV On Indicator	0=HV Off, +15V, 10mA Max=HV On
19	Remote Voltage Mode	Open Collector 50V Max, 10mA Max
20	Remote Current Mode	
21	Remote Power Mode	On=Active
22	Remote PS Fault	0=Fault, +15V, 0.1mA Max=No Fault
23	+15V Output	+15V, 100mA Max
24	Power Supply Common	Signal Ground
25	Shield Return	Shield Return

DIMENSIONS: in.[mm]

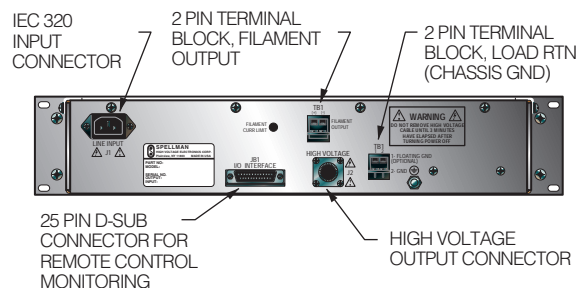
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW





- **Output Voltage 4kV to 10kV**
- **Integrated Ground Referenced Filament Supply**
- **Low Ripple**
- **Local and Remote Programming**
- **OEM Customization Available**

The XMPG is a modular 10kV @ 10W X-Ray generator designed to drive a grounded filament X-Ray tube via closed loop filamentary control of the 0 to 1mA emission current. The grounded filament supply is rated at 0-5 amps @ 3Vdc. The filament supply features an internally adjustable 0.5 to 2.5 amp filament preheat and a internally adjustable 0 to 5 amp filament limit.

The high voltage program and emission current program have internal preset capability simplify interfacing to this X-Ray generator. Or a customer provided 0 to 10Vdc signal can be used to remotely control these two signals. A high voltage monitor signal and emission current monitor signal is provided. A High Voltage Enable input provides control of the high voltage output and a Filament Stable output indicates the filament current is stable and the X-Ray tube is producing X-Rays.

## SPECIFICATIONS

### Input Voltage:

+24 Vdc,  $\pm 10\%$

### Input Current:

2 amp maximum

### Output Voltage:

10kV, controllable over the range 4kV to 10kV

### Voltage Accuracy:

<2%

### Polarity:

Positive

### Voltage Regulation:

Line: <0.01% for input voltage change of  $\pm 10\%$

Load: <0.01% for zero to full load

### Voltage Stability:

< 0.1% per 24 hours at constant operating conditions, after 30 minutes warm up

### Ripple:

< 500mV p-p of output voltage at full load

### Ramp Rate:

< 20kV/second

### Temperature Coefficient:

<250ppm per degree C

### Current Regulation:

Line:  $\leq 0.01\%$  for 10% input voltage change under any load conditions

Load:  $\leq 0.01\%$  for full load to short circuit

### Emission Current:

0-1mA

### Current Accuracy:

<1% (above 10% of maximum output current)

### Current Stability:

< 0.02%

### Environmental:

Temperature Range:

Operating: 5°C to 40°C

Storage: -40°C to 70°C

Humidity:

Operating: 20% to 80% RH, non-condensing

Storage: 5% to 95%

### Filament Supply:

Voltage: 0V to 3Vdc referenced to ground

Load Current: 5A max, preset adjustable limit

Stability: < 0.25% per 8 hours at constant operating conditions

Ripple: <50mV p-p (at maximum load current).

Temperature Coefficient: <300ppm/°C

### Filament Output:

A captive 500mm long unterminated 16 AWG twisted wire pair is provided.

### High Voltage Output:

A captive 500mm long unterminated length of URM76 shielded cable

A red High Voltage On LED is provided next to the high voltage output to indicate that high voltage is being produced by the unit

### Dimensions:

1.31"H x 4.13"W x 7.28"D (33.5mm x 105mm x 185mm)

### Weight:

4.4 lbs. (2.0kg)

### Regulatory Approvals:

Designed to meet IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1. RoHS compliant.

As the unit is designed for incorporation within the users system it is not tested against any specific EMC standards. The user will need to take sensible EMC precautions when designing the unit in and verify the overall system EMC performance against any relevant standards.

## FILAMENT OUTPUT

COLOR	NAME
Red	Filament +
Black	Filament -

## CUSTOMER INTERFACE— 15 PIN MALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	+24Vdc	+24Vdc
2	Ground	Ground
3	Preheat (set value)	0-5Vdc from internal preset
4	Test (Filament Current Direct Program)	Do not connect
5	HV Enable	Digital Input
6	Filament Stable	Digital Output
7	HV Program Output	0-10Vdc from Internal Preset
8	HV Program Input	0-10Vdc = 0-10kV, $Z_{in} = 5M\Omega$ , accuracy $\pm 2\%$ of full scale
9	High Voltage Monitor	0-10Vdc = 0-10kV, $Z_{out} = 10k\Omega$ , accuracy $\pm 2\%$ of full scale
10	Emission Current Monitor	0-10Vdc = 0-1mA, $Z_{out} = 10k\Omega$ , accuracy $\pm 3\%$ of full scale
11	Filament Current Monitor	0-10Vdc = 0-5A, $Z_{out} = 2.2k\Omega$ , accuracy $\pm 5\%$ of full scale
12	Emission Current Program Input	0-10Vdc = 0-1mA, $Z_{in} = 1M\Omega$ , accuracy $\pm 3\%$ of full scale
13	Emission Current Program Output	0-10Vdc from Internal Preset
14	Ground	Ground
15	Preset Max. Filament Current (set value)	0-10Vdc from Internal Preset

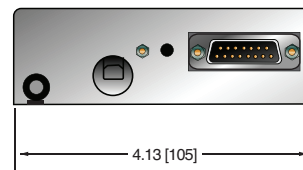
The filament Preheat level and current limit are set by internal preset potentiometers accessible through the side of the case.  
If external high voltage enable control is not required link pins 7 and 8.  
If external emission current control is not required link pins 12 and 13.

### How To Order:

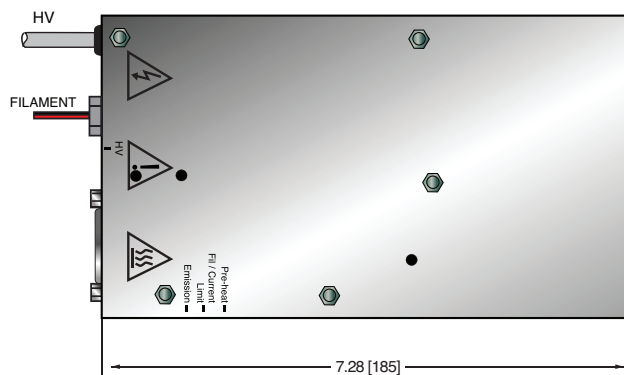
Model number: XMPG10P10/24

DIMENSIONS: in.[mm]

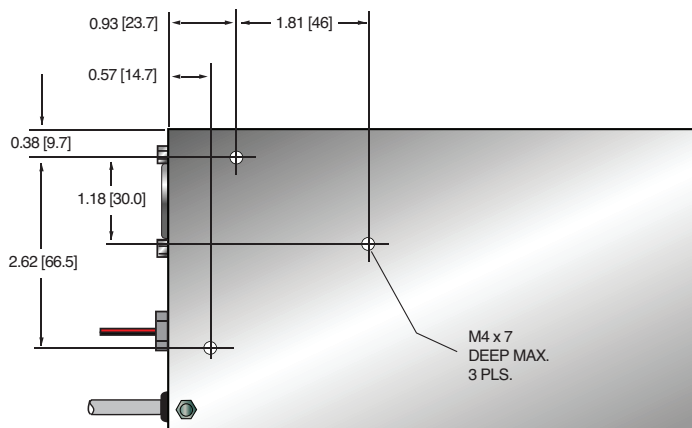
### FRONT VIEW



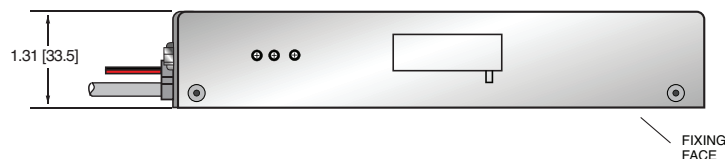
### TOP VIEW



### BOTTOM VIEW



### SIDE VIEW





#### Ask about our X-Ray subsystem capabilities

- **50kV at 2mA, 50 or 75 Watt Max**
- **65kV at 2mA, 65 Watt Max**
- **Adjustable Integrated Filament Supply**
- **Arc & Short Circuit Protection**
- **Voltage & Current Programming**
- **Local and Remote Emission Control**
- **Safety Interlock**
- **OEM Customization Available**
- **CE Marked, UL Recognized**

The MNX Series is the result of Spellman's exceptional high voltage packaging and surface mount fabrication techniques coupled with proprietary encapsulation technology producing this ultra-compact X-Ray generator module. The MNX powers grounded cathode X-Ray tubes from a variety of well-known manufacturers, featuring a 0 to 50kV/65kV high voltage output @ 2mA limited to 50, 65 or 75 Watts. The MNX uses closed loop filament control circuitry providing highly regulated beam current. The ground referenced low noise dc filament supply operates between 0.3 and 3.5 amps. Offering tight regulation, high stability and low ripple, the MNX provides users local and remote analog control to set beam voltage, emission current and filament current limit.

#### TYPICAL APPLICATIONS

The MNX is designed to run a variety of tubes from industry leading manufacturers. Contact Spellman sales to determine if the X-Ray tube of interest can be powered by the MNX.

#### OPTIONS

<b>XCC</b>	XRM Compatible HV Cable (50kV only)
<b>5VPM</b>	0 to 5 Volt Programming and Monitor Scaling
<b>5302</b>	Mammoflex HV cable for MNX
<b>2001</b>	Mammoflex HV cable for MNX w/XCC option

#### SPECIFICATIONS

##### Input Voltage:

+24Vdc  $\pm 10\%$ , for 50W or 75W units  
+24Vdc  $\pm 1V$ , for 65kV @ 65W unit

##### Input Current:

MNX50P50: 4.0 amps, maximum  
MNX50P75: 6.0 amps, maximum  
MNX65P65: 5.0 amps, maximum  
GB Option: 1.0 amp additional, maximum

##### Efficiency:

80-85%, typical

##### Output:

0 to 50kV at 0 to 2mA, limited to a maximum of 50 watts or 75 Watts. 0-65kV at 2mA limited to 65 Watts.

##### Voltage Control:

Local: Internal multi-turn potentiometer to set voltage from 0 to full output voltage.  
Remote: 0 to +10Vdc proportional from 0 to full output voltage. Accuracy:  $\pm 1\%$ .  $Z_{IN}$ : 10Mohm.

##### Emission Control:

Local: Internal potentiometer to set beam current between 0 and full output current.  
Remote: 0 to +10Vdc proportional from 0 to full output current. Accuracy:  $\pm 1\%$ .  $Z_{IN}$ : 10Mohm. Filament limit and filament preheat control capability is also provided.

##### DC Filament Supply:

Current: 3.5A, adjustable limit  
Voltage: 5.0 volt limit

##### Voltage Regulation:

Load: 0.01% of output voltage no load to full load.  
Line:  $\pm 0.01\%$  for  $\pm 10\%$  change in input voltage.

##### Current Regulation:

Load: 0.01% of output current from 0 to rated voltage.  
Line:  $\pm 0.01\%$  for  $\pm 10\%$  change in input voltage.

##### Ripple:

0.1% p-p of maximum rated output voltage, 50kV units (50/75W)  
0.1% rms maximum rated output voltage, 65kV units (65W)

##### Environmental:

Operational: 0°C to +50°C  
Storage: -40°C to +85°C  
Humidity: 0% to 90%, non-condensing

##### Temperature Coefficient:

0.01% per °C, voltage and current.

##### Stability:

0.05% per 8 hours after 1/2 hour warm-up.

##### Voltage and Current Monitors:

0 to +10Vdc proportional from 0 to rated output. Accuracy  $\pm 1\%$ .

##### Dimensions:

50kV Unit: 5.00"H x 2.87"W x 8"D  
(127.00mm x 72.90mm x 203.25mm)  
65kV Unit: 5.00"H x 2.87"W x 9"D  
(127.00mm x 72.90mm x 228.65mm)  
XCC Option: 5.00"H x 2.87"W x 9"D (50/75W units only)  
(127.00mm x 72.90mm x 228.65mm)

##### Weight:

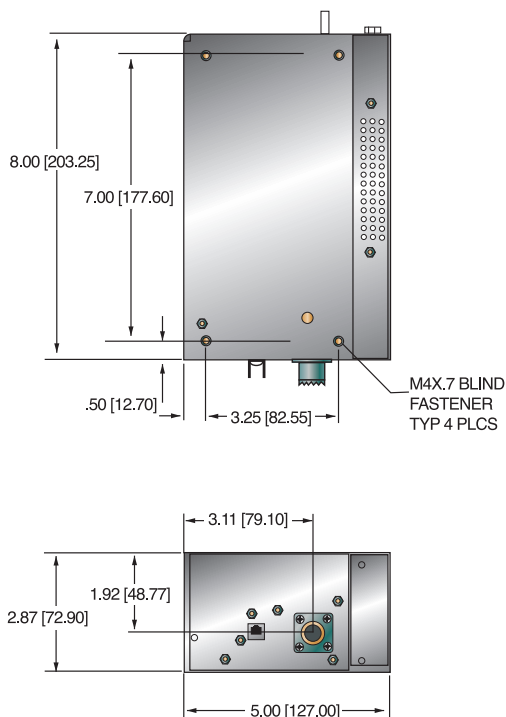
6.5 lbs. (2.9kg)

##### Regulatory Approvals:

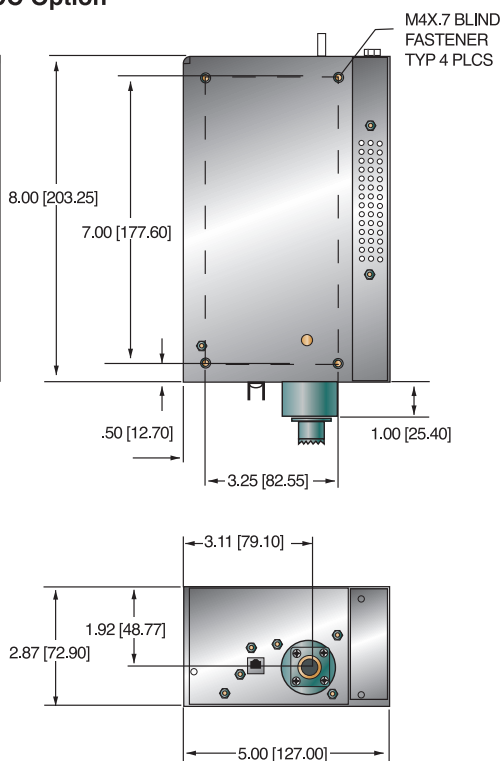
Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588; MNX65P65 is not UL/CUL recognized. RoHS Compliant.

DIMENSIONS: in.[mm]

50kV



50kV with XCC Option



### J2 POWER INPUT CONNECTOR

PIN	SIGNAL	PARAMETER
1	+24V Input	+24 volts @ 5A, max.
2	24V Return (Gnd.)	Power Ground

### J3 FILAMENT CONNECTOR

PIN	SIGNAL	PARAMETER
1	Filament Out	0.3A to 3.5A, 5 volt, max.
2	Filament Return	Filament Ground

### J4 ANALOG INTERFACE CONNECTOR MALE 15 PIN MINI "D"

PIN	SIGNAL	PARAMETER
1	Monitor Return	Signal Ground
2	Voltage Monitor	0-10 volts = 0 to full scale, Zout=1KΩ
3	Current Monitor	0-10 volts = 0 to full scale, Zout=1KΩ
4	Interlock Output	Connect 12V HVON bulb to pin 15 to enable
5	+10 Volt Reference	+10 Volts at 1mA, maximum
6	Filament Monitor	1 volt = 1 amp, Zout=1KΩ
7	Voltage Program Input	0-10 volts = 0 to full scale, Zin=10MΩ
8	Local Voltage Program*	0-10 volts, screwdriver adjust
9	Filament Limit Setpoint*	1 volt = 1 amp, screwdriver adjust
10	Current Program Input	0-10 volts = 0 to full scale, Zin=10MΩ
11	Local Current Program*	10 turn pot, screwdriver adjust
12	Not used (+24V Out for Interlock)	(Optional Interlock configuration)
13	Not used (Interlock Coil)	(Optional Interlock configuration)
14	Filament Preheat Setpoint*	1 volt = 1 amp, screwdriver adjust
15	Interlock Return	Interlock Ground

\*Denotes 10 turn potentiometer located on front panel

### J1 HIGH VOLTAGE OUTPUT CONNECTOR

Spellman drywell type detachable connector.

**Standard:** A one meter (39.4") long polyethylene mating high voltage cable is provided.

**5302:** A one meter (39.4") long Mammoflex mating high voltage cable is provided, SHV p/n 201946-007

**2001:** A one meter (39.4") long Mammoflex mating high voltage cable is provided, compatible with the XCC Option SHV p/n 201946-002

**Drywell connector depth:**

50kV: 7.25"

65kV: 8.25"

XCC Option: 8.25"

### How To Order:

Sample model number:

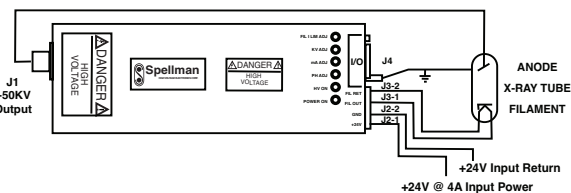
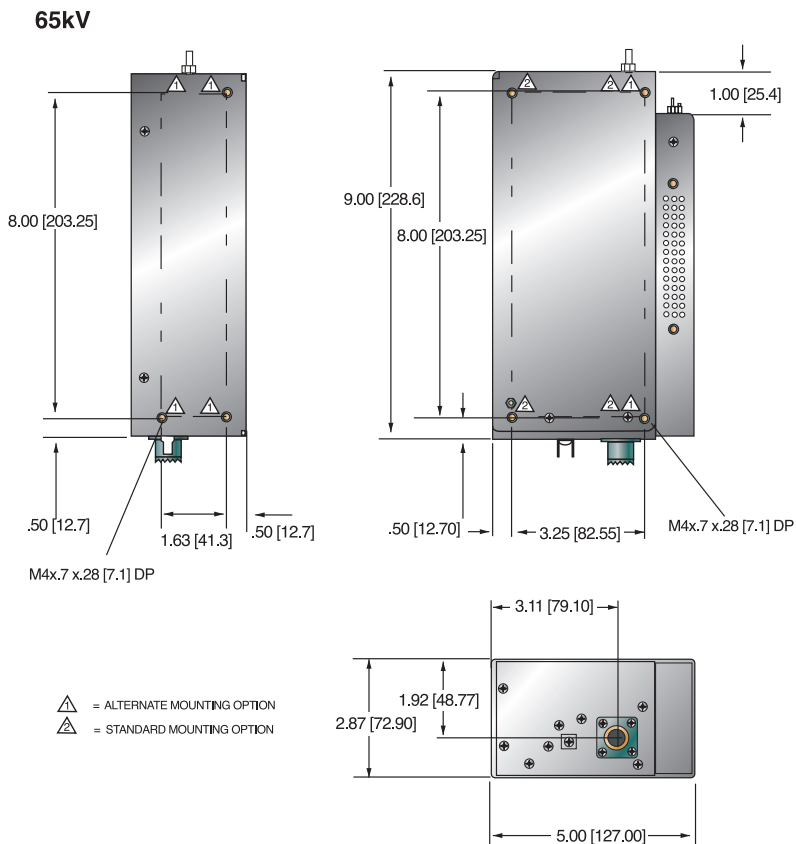
50 Watt unit: MNX50P50

65 Watt unit: MNX65P65

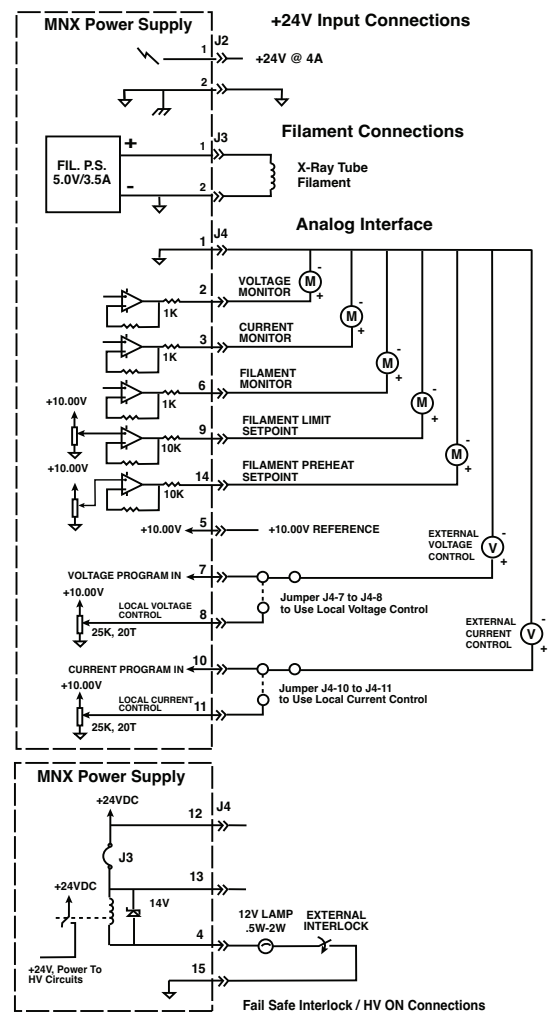
75 Watt unit: MNX50P75

Options are added to the model number as follows:  
MNX50P50/XCC

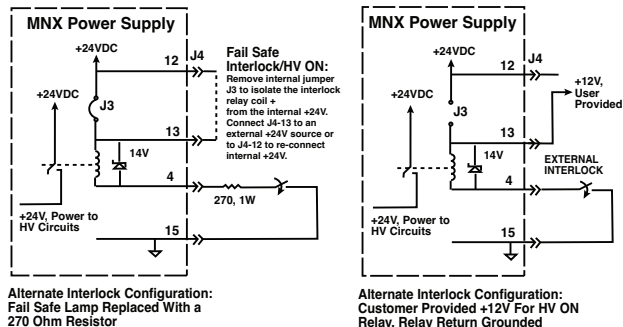
DIMENSIONS: in.[mm]



Typical MNX Operating Setup



Alternate Interlock Configurations



**Ask about our X-Ray subsystem capabilities**

- **50kV at 2 mA. 50 or 75 Watt Max.**
- **65kV at 2 mA. 65 Watt Max.**
- **Adjustable Isolated Filament Supply**
- **Overvoltage & Short Circuit Protection**
- **Voltage & Current Programming**
- **Local and Remote Emission Control**
- **Safety Interlock**
- **RS-232, Ethernet, & USB Standard**
- **Redundant HV Monitor Signal Available**
- **OEM Customization Available**

The uX Series is the result of Spellman's exceptional high voltage packaging and surface mount fabrication techniques coupled with proprietary encapsulation technology producing this ultra-compact X-Ray generator module. The uX powers grounded cathode X-Ray tubes from a variety of well-known manufacturers, featuring a 0 to 50kV/65kV high voltage output @ 2mA limited to 50, 65 or 75 Watts. The uX uses closed loop filament control circuitry providing highly regulated beam current. The low noise dc filament supply operates between 0.3 and 3.5 amps. Offering tight regulation, high stability and low ripple, the uX provides users local and remote analog control to set beam voltage, emission current and filament current limit. USB, RS-232 and Ethernet interface is standard.

**TYPICAL APPLICATIONS**

The uX is designed to run a variety of tubes from industry leading manufacturers. Contact Spellman sales to determine if the X-Ray tube of interest can be powered by the uX.

**OPTIONS**

<b>XCC</b>	XRM Compatible HV Cable (50kV only)
<b>5VPM</b>	0 to 5 Volt Programming and Monitor Scaling
<b>GB</b>	Grid Bias
<b>GF</b>	Grounded Filament
<b>5302</b>	Mammoflex HV cable for uX
<b>2001</b>	Mammoflex HV cable for uX w/XCC option

**SPECIFICATIONS****Input:**

- +24Vdc  $\pm 10\%$ , 5.0A maximum for either 50 Watts or 75 Watts.
- +24Vdc  $\pm 1V$ , 5.0A maximum for 65kV/65W units.

**Efficiency:**

75%, typical

**Output:**

0 to 50kV at 0 to 2mA, limited to a maximum of 50 watts or 75 Watts. 0-65kV at 2mA limited to 65 Watts.

**Voltage Control:**

- Local: Internal multi-turn potentiometer to set voltage from 0 to full output voltage.
- Remote: 0 to +10Vdc proportional from 0 to full output voltage. Accuracy:  $\pm 1\%$ .  $Z_{IN}$ : 10Mohm.

**Emission Control:**

Local: Internal potentiometer to set beam current between 0 and full output current.

Remote: 0 to +10Vdc proportional from 0 to full output current. Accuracy:  $\pm 1\%$ .  $Z_{IN}$ : 10Mohm. Filament limit and filament preheat control capability is also provided.

**DC Filament Supply:**

Isolated filament power supply generates emission current feedback signal for accurate low X-Ray tube current performance.

Current: 3.5A, adjustable limit

Voltage: 5.0 volt limit

**Environmental:**

Operational: 0°C to +50°C

Storage: -40°C to +85°C

Humidity: 0% to 90%, non-condensing

**Temperature Coefficient:**

0.01% per °C, voltage and current.

**Stability:**

0.05% per 8 hours after 1/2 hour warm-up.

**Voltage and Current Monitors:**

0 to +10Vdc proportional from 0 to rated output. Accuracy  $\pm 1\%$ .

**Redundant Voltage Monitor:**

A redundant high voltage feedback divider with proportional 0 to +10Vdc = 0 to 100% output voltage signal can be provided on a custom basis.

**Dimensions:**

50kV Unit: 4.00"H x 2.87"W x 8.00"D  
(101.6mm x 72.95mm x 202.20mm).

65kV Unit: 4.00"H x 2.87"W x 9.00"D  
(101.6mm x 72.95mm x 228.60mm).

XCC Option: 4.00"H x 2.87"W x 9.00"D  
(101.6mm x 72.95mm x 228.60mm).

**Weight:**

4.5 lbs. (2.1kg) typical

**Regulatory Approvals:**

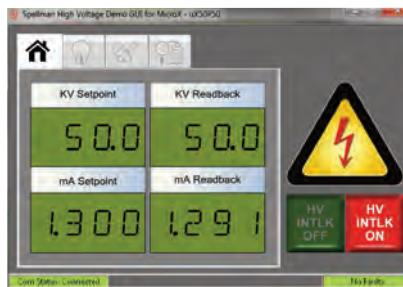
Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant. UL/CUL recognized, File E227588

### Digital Interface

The uX features a standard USB, RS-232 and Ethernet digital interface. Utilizing these standard digital interfaces can dramatically simplify power supply interfacing requirements saving the user both time and money, while enhancing functionality and overall capability. Spellman provides a GUI with the uX that allows the customer to both customize operational features of the uX while also providing basic power supply operational features. Details of the uX's digital interface capability are described in detail in the uX manual.



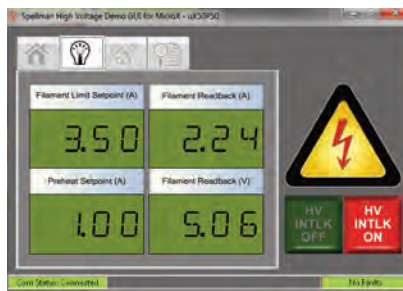
Closeup showing digital interface connectors



Main Control Screen



Communication Screen



Filament Status Screen

### Grid Bias Option (GB):

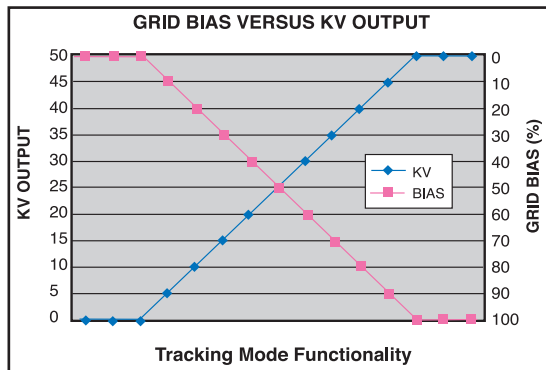
Spellman's Grid Bias Option for the uX Series is specifically designed for popular commercially available grid bias X-Ray tubes. The Grid Bias voltage is developed via the use of a separate integrated high frequency switching circuit, providing maximum flexibility and control. The Grid Bias output is a voltage regulated, current compliant topology ideally suited for Wehnelt electrode applications. Arc and short circuit protection of the Grid Bias output prevents any damage due to transient events or installation errors.

### Tracking Mode Operation

Functioning in tracking mode the voltage monitor (0-10Vdc = 0 to 50kV) of the main high voltage output is internally connected to the Grid Bias programming input (0-10Vdc = 0 to -300Vdc of Grid Bias). Connected in this manner the Grid Bias output will track in a linearly proportional fashion the setting of the main kV output.

A multiturn potentiometer limits the maximum magnitude of Grid Bias output applied to the X-Ray tube, providing unparalleled flexibility.

The output of the Grid Bias option is provided via an auxiliary two position Phoenix Contact terminal block, the mating connector is provided.



### GRID BIAS SPECIFICATIONS

- Output Voltage:** 0 to -300Vdc
- Output Current:** 0.25mA, maximum
- Load Regulation:** 1% of output voltage, no load to full load
- Line Regulation:** 1% for a  $\pm 10\%$  change in input voltage
- Ripple:** 1% of maximum rated voltage



uX with Grid Bias Option

Note: Units ordered with the GB Option will be provided with the XCC Option for proper high voltage cable compatibility.

**HIGH VOLTAGE OUTPUT CONNECTOR**

Spellman drywell type detachable connector.

**Standard:** A one meter (39.4") long polyethylene mating high voltage cable is provided.

**5302:** A one meter (39.4") long Mammoflex mating high voltage cable is provided, SHV p/n 201946-007

**2001:** A one meter (39.4") long Mammoflex mating high voltage cable is provided, compatible with the XCC Option SHV p/n 201946-002

**POWER INPUT CONNECTOR**

PIN	SIGNAL	PARAMETER
1	+24V Input	+24 volts @ 5A, max.
2	24V Return (Gnd.)	Power Ground

**FILAMENT CONNECTOR**

PIN	SIGNAL	PARAMETER
1	Filament Out	0.3A to 3.5A, 5 volt max.
2	Filament Return	Filament Return

Note: On the standard uX unit, the filament return wire cannot be grounded as this would short circuit the tube return current monitoring to the uX. If grounding of the filament is required, please select the GF (Grounded Filament) option when ordering.

**ANALOG INTERFACE CONNECTOR  
MALE 15 PIN MINI "D"**

PIN	SIGNAL	PARAMETER
1	Monitor Return	Signal Ground
2	Voltage Monitor	0-10 volts = 0 to full scale, Zout=1K $\Omega$
3	Current Monitor	0-10 volts = 0 to full scale, Zout=1K $\Omega$
4	Interlock Output	Connect 12V HVON bulb to pin 15 to enable
5	+10 Volt Reference	+10 Volts at 1mA, maximum
6	Filament Monitor	1 volt = 1 amp, Zout=1K $\Omega$
7	Voltage Program Input	0-10 volts = 0 to full scale, Zin=10M $\Omega$
8	Local Voltage Program*	0-10 volts, screwdriver adjust
9	Filament Limit Setpoint*	1 volt = 1 amp, screwdriver adjust
10	Current Program Input	0-10 volts = 0 to full scale, Zin=10M $\Omega$
11	Local Current Program*	10 turn pot, screwdriver adjust
12	Not used (+24V Out for Interlock)	(Optional Interlock configuration)
13	Not used (Interlock Coil)	(Optional Interlock configuration)
14	Filament Preheat Setpoint*	1 volt = 1 amp, screwdriver adjust
15	Interlock Return	Interlock Ground

\*Denotes 10 turn potentiometer accessible through holes in cover

**GRID BIAS CONNECTOR  
2 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETER
1	Ground	Chassis Ground
2	Grid Bias	0 to -300Vdc

**USB DIGITAL INTERFACE —  
4 PIN USB "B" CONNECTOR**

PIN	SIGNAL	PARAMETER
1	VBUS	+5 Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

**ETHERNET DIGITAL INTERFACE —  
8 PIN RJ45 CONNECTOR**

PIN	SIGNAL	PARAMETER
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX-	Receive Data -
7	NC	No Connection
8	NC	No Connection

**RS-232 DIGITAL INTERFACE —  
9 PIN FEMALE D CONNECTOR**

PIN	SIGNAL	PARAMETER
1	NC	No Connection
2	TX out	Transmit Data
3	RX in	Receive Data
4	NC	No Connection
5	SGND	Ground
6	NC	No Connection
7	NC	No Connection
8	Voltage Monitor 2	0-10V = 0 to full scale, Zout = 1K $\Omega$
9	Power Supply OK	+15V = OK, 0V = Fault, Sink/Source 3mA max

**How To Order:**

Sample model number:

50 Watt unit: uX50P50

65 Watt unit: uX65P65

75 Watt unit: uX50P75

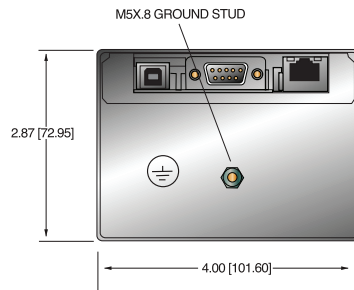
Options are added to the model number as follows:

uX50P50/XCC or uX50P75/GB

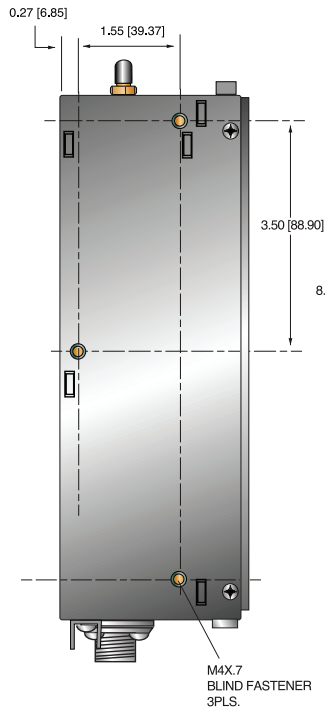
**Ask about our X-Ray subsystem capabilities**

DIMENSIONS: in.[mm]  
50kV

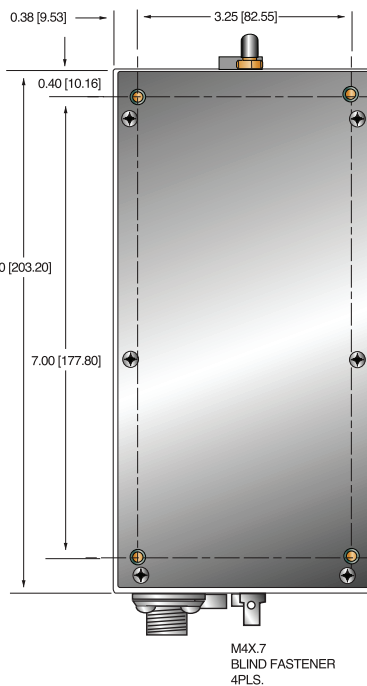
BACK VIEW



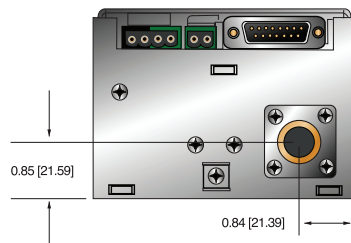
SIDE VIEW



BOTTOM VIEW

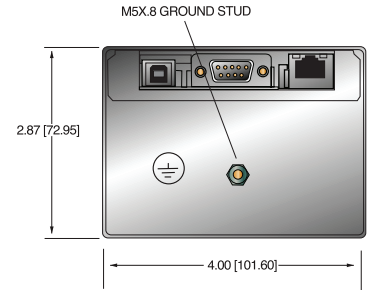


FRONT VIEW

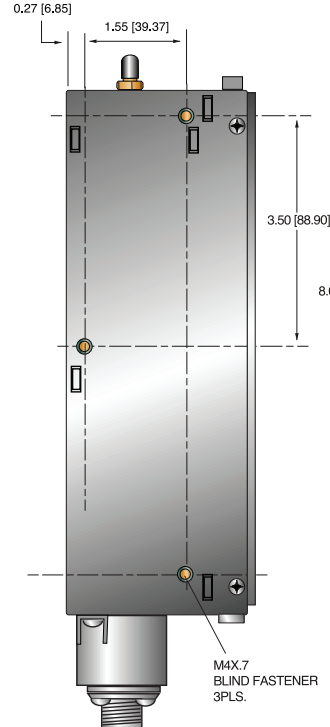


DIMENSIONS: in.[mm]  
50kV with XCC Option

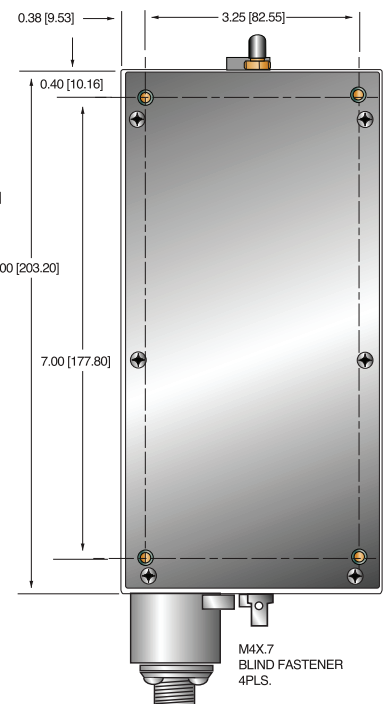
BACK VIEW



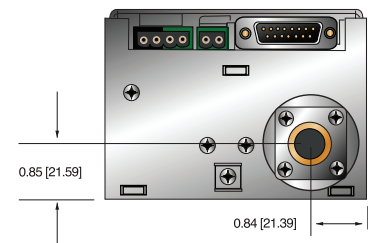
SIDE VIEW



BOTTOM VIEW



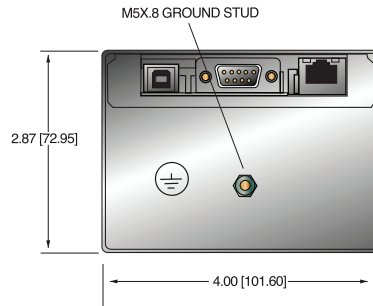
FRONT VIEW



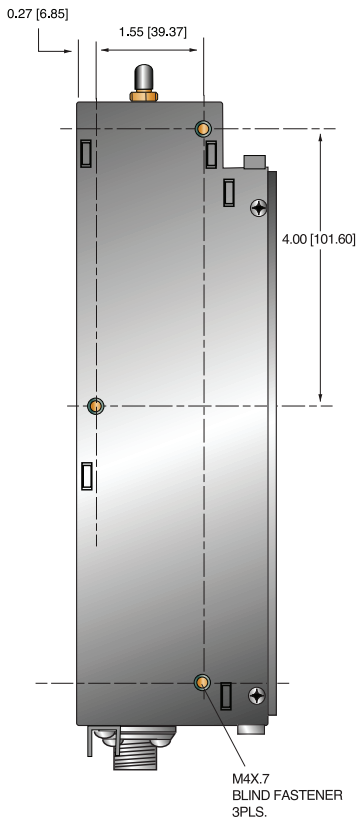
DIMENSIONS: in.[mm]

65kV

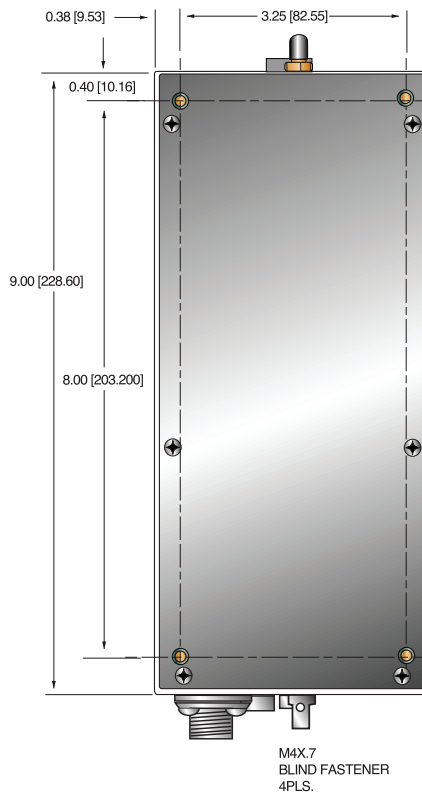
## BACK VIEW



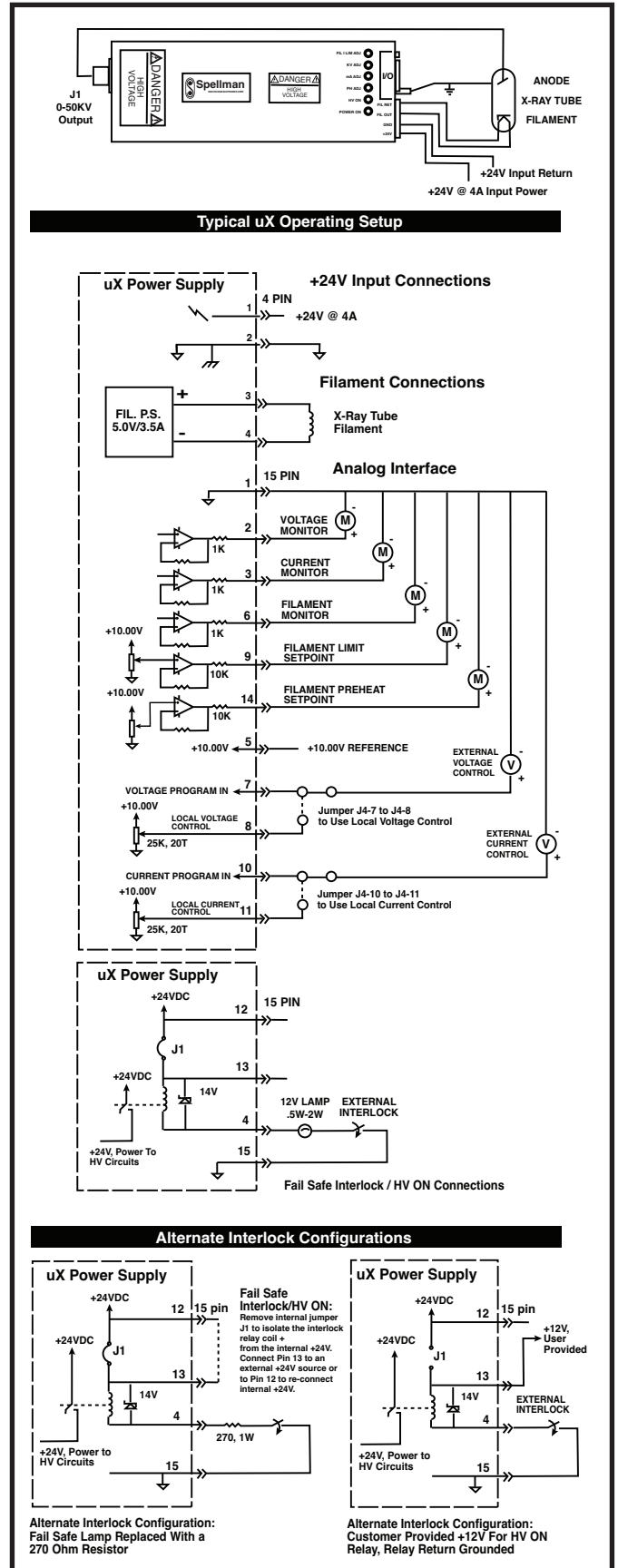
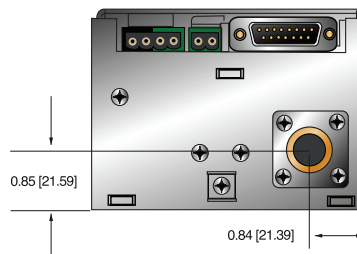
## SIDE VIEW



## BOTTOM VIEW



## FRONT VIEW





- **50kV at 2mA, 50 or 75 Watt Max**
- **65kV at 2mA, 65 Watt Max**
- **Floating Integrated Filament Supply**
- **Arc & Short Circuit Protection**
- **Voltage & Current Programming**
- **Local and Remote Emission Control**
- **Safety Interlock**
- **Optional Digital Interface**

The MFX Series is the result of Spellman's exceptional high voltage packaging and surface mount fabrication techniques, coupled with its proprietary encapsulation technology producing this ultra compact-sized OEM X-Ray generator module.

The MFX Series is designed to power floating filament X-Ray tubes from various manufacturers. It features a 0 to 50kV (or 0 to 65kV) high voltage output, and up to 2mA of emission current limited to 50, 65 or 75 Watts, operating from a +24Vdc input. The MFX utilizes a closed loop filamentary beam control circuit to provide a highly regulated beam current. The floating ac filament supply operates between 0.3 and 4 amps. Offering tight regulation, high stability and low ripple, the MFX provides users both local and remote analog control to set beam voltage, emission current and filament current limit. An optional USB, RS-232 and Ethernet interface is available.

### OPTIONS

- SIC** Standard Interface Controller (Ethernet, USB & RS-232)
- 5VPM** 0 to 5 Volt Programming and Monitor Scaling

### SPECIFICATIONS

#### Input:

- +24Vdc  $\pm 10\%$ , 5.0A maximum for either 50 Watts or 75 Watts.
- +24Vdc  $\pm 1V$ , 5.0A maximum for 65kV/65W units.

#### Efficiency:

80-85%, typical

#### Output:

0 to 50kV at 0 to 2mA, limited to a maximum of 50 watts or 75 Watts. 0-65kV at 2mA limited to 65 Watts. Negative output polarity.

#### Voltage Control:

- Local:** Internal multi-turn potentiometer to set voltage from 0 to full output voltage.
- Remote:** 0 to +10Vdc proportional from 0 to full output voltage. Accuracy:  $\pm 1\%$ .  $Z_{IN}$ : 10Mohm.

#### Emission Control:

- Local:** Internal potentiometer to set beam current between 0 and full output current.
- Remote:** 0 to +10Vdc proportional from 0 to full output current. Accuracy:  $\pm 1\%$ .  $Z_{IN}$ : 10Mohm. Filament limit and filament preheat control capability is also provided.

#### High Frequency AC Filament Supply:

- Current: 0-4A, adjustable limit
- Voltage: 5.0 volt limit

#### Voltage Regulation:

- Load: 0.01% of output voltage no load to full load.
- Line:  $\pm 0.01\%$  for  $\pm 10\%$  change in input voltage.

#### Current Regulation:

- Load: 0.01% of output current from 0 to rated voltage.
- Line:  $\pm 0.01\%$  for  $\pm 10\%$  change in input voltage.

#### Ripple:

- 0.1% p-p of maximum rated output voltage, 50kV units (50/75W)
- 0.1% rms maximum rated output voltage, 65kV units (65W)

#### Environmental:

- Operational: 0°C to +50°C
- Storage: -40°C to +85°C
- Humidity: 0% to 90%, non-condensing

#### Temperature Coefficient:

- 0.01% per °C, voltage and current.

#### Stability:

- 0.05% per 8 hours after 1/2 hour warm-up.

#### Voltage and Current Monitors:

- 0 to +10Vdc proportional from 0 to rated output. Accuracy  $\pm 1\%$ .

#### Dimensions:

- 50kV Unit: 7.00"H x 2.87"W x 8"D (177.80mm x 72.90mm x 203.25mm)
- 65kV Unit: 7.00"H x 2.87"W x 9"D (177.80mm x 72.90mm x 228.65mm)
- SIC Option: 7.75"H x 2.87"W x 8"D/9"D (196.85mm x 72.90mm x 203.25mm/228.65mm)

#### Weight:

- 7.0 lbs. (3.2kg)

#### Regulatory Approvals:

- RoHS compliant.

#### J2 POWER INPUT CONNECTOR

PIN	SIGNAL	PARAMETER
1	+24V Input	+24 volts @ 5A, max.
2	24V Return (Gnd.)	Power Ground

#### J4 ANALOG INTERFACE CONNECTOR MALE 15 PIN MINI "D"

PIN	SIGNAL	PARAMETER
1	Monitor Return	Signal Ground
2	Voltage Monitor	0-10 volts = 0 to full scale, Zout=1KΩ
3	Current Monitor	0-10 volts = 0 to full scale, Zout=1KΩ
4	Interlock Output	Connect 12V HVON bulb to pin 15 to enable
5	+10 Volt Reference	+10 Volts @ 1mA, maximum
6	Filament Monitor	1 volt = 1 amp, Zout=1KΩ
7	Voltage Program Input	0-10 volts = 0 to full scale, Zin=10MΩ
8	Local Voltage Program*	10 turn pot., screwdriver adjust
9	Filament Limit Setpoint*	1 volt = 1 amp, screwdriver adjust
10	Current Program Input	0-10 volts = 0 to full scale, Zin=10MΩ
11	Local Current Program*	10 turn pot., screwdriver adjust
12	Not used (+24V Out for Interlock)	(Optional Interlock configuration)
13	Not used (Interlock Coil)	(Optional Interlock configuration)
14	Filament Preheat Setpoint*	1 volt = 1 amp, screwdriver adjust
15	Interlock Return	Interlock Ground

\*Denotes 10 turn potentiometer located on front panel

#### J1 CATHODE OUTPUT CLAYMOUNT HV CONNECTOR

PIN	OUTPUT CONNECTION
C (common)	-High Voltage Output
S (small)	-High Voltage Output
L (large)	Filament Output
G (grid)	Filament Output

Note: No high voltage cable is provided

Recommended Cable:

Claymount part number: 11470

Cable assembly, L3 CA11, CA11, 10F, CS=Bare 10 foot,  
Mini Federal Connectors on both ends, "C" and "S" are  
both connected to the bare wire

#### How To Order:

Sample model number:

50 Watt unit: MFX50N50

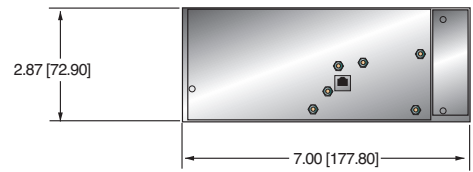
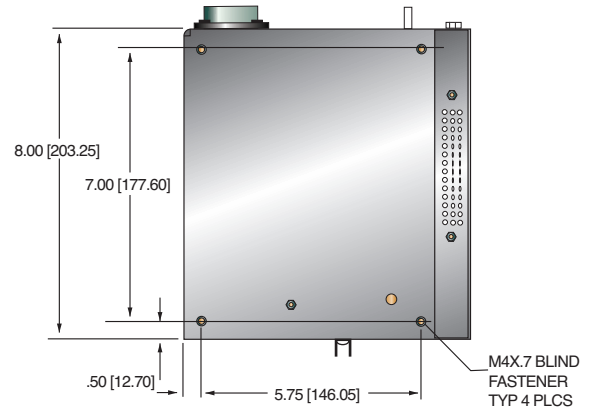
65 Watt unit: MFX65N65

75 Watt unit: MFX50N75

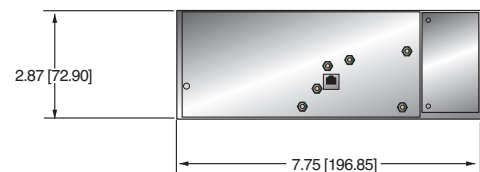
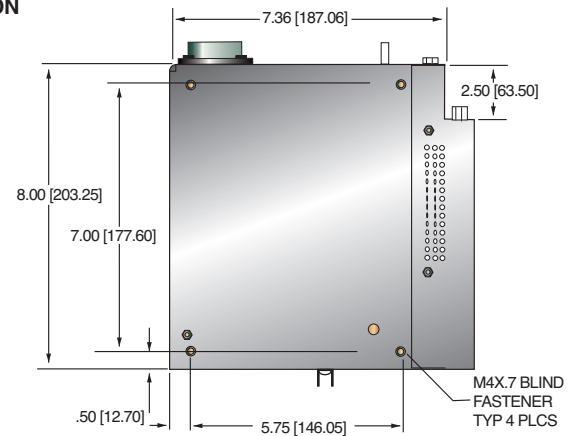
Options are added to the model number as follows:

MFX50N75/SIC

DIMENSIONS: in.[mm]



#### 50KV WITH SIC OPTION







Spellman's XRF X-Ray generator platform allows for a wide range of input voltages and supply either 80W, 320W or 640W of output power at up to 160kVdc. These lightweight rack-mountable X-Ray generators house a miniaturized high voltage system in a solid encapsulated, oil-free design. The XRF generators are designed with a power factor corrected input circuit which reduces harmonic emissions and noise normally associated with other high frequency switching power supplies. The XRF generators incorporate an internal floating filament and a closed-loop emission control circuit for precise regulation of emission current. Remote monitoring and control of voltage, current and filament current is also provided.

## TYPICAL APPLICATIONS

X-Ray Inspection, Non-Destructive Testing

## TYPICAL OPTIONS

<b>DF</b> Dual Filament	<b>AT</b> Arc Trip
<b>GS</b> Grid Supply	<b>IO</b> Instant ON
<b>SL</b> Slides	<b>SS(X)</b> Non Standard Slow Start

## SPECIFICATIONS

### Input Voltage:

80W:	90-125Vac at 48-62Hz @ 1.9A
	180-264Vac at 48-62Hz @ 0.9A
320W:	180-264Vac at 48-62Hz @ 3.5A
640W:	180-264Vac at 48-62Hz @ 7A

### Power Factor:

0.9 or better.

### High Voltage Supply:

#### Output Voltage:

0-160kV, negative polarity.

#### Output Current:

80W:	0.5mA max.
320W:	2.0mA at 160kV
640W:	4.0mA

#### Output Voltage Stability:

Within 0.1% of set value after warm-up period at full load.

#### Output Voltage Ripple:

80W & 320W:	<0.1%, or 160V p-p for high freq. and line freq. at full load.
640W:	0.03% rms <1kHz, 0.75% rms above 1kHz.

#### Beam Current Stability

80W:	Within 0.1% of set value after 1/2 hour warm-up at constant output setting of 30-160kV and line voltage of 90-125 & 180-264Vac.
320W & 640W:	Same as 80W except line voltage of 180-264Vac.

- **160kV Output Voltage**
- **Rack-Mountable**
- **Floating Filament (AC or DC)**
- **Internal Grid Power Supply (80W Model)**
- **Power Factor Correction**
- **Closed-loop Emission Control**
- **OEM Customization/X Number Required**

### Filament Supply:

Constant current DC filament supply with closed-loop current feedback.

### Filament Voltage:

7V rms (high frequency) max.

### Filament Current:

5A max., adjustable 0-5.0A by external Filament Limit Programming input.

### Floating Grid Power Supply:

**Grid Supply:** The grid supply controls tube beam current in a closed-loop regulation design.

**Grid Voltage:** 0 to 1200Vdc.

**Grid Voltage Ripple:** Less than 1.0V rms at any frequency.

**Grid Supply Response:** Less than 0.5mA in less than 10ms.

### Control and Monitoring:

**Analog Control Inputs:** Three inputs have internal load resistance greater than 330kohms.

### Voltage Programming:

80W, 320W & 640W:  
0 to +10Vdc, where 10.0Vdc = 160kV output.

### Beam Tube Current Control:

80W: 0 to +10Vdc, where 10.0Vdc = 0.5mA tube current.  
320W: 0 to +10Vdc, where 10.0Vdc = 2.0mA tube current.  
640W: 0 to +10Vdc, where 10.0Vdc = 4.0mA tube current.

### Filament Current Control:

0 to +10Vdc, where 5.0Vdc = 5.0A filament current.

**Analog Monitor Outputs:** (See tables for details)

**Digital Control Inputs:** (See tables for details)

**Digital Outputs:** (See tables for details)

### Connections:

#### Output Connector:

R24 (see owners manual for details)

#### Input Power Connector:

5-pin male MS-type, Amphenol P/N 97-3102A-18-20P

#### Control Connector:

25-pin "D" connector, male, chassis-mounted.

### Environmental:

0 to +50°C at 10-95% RH, non-condensing.  
Forced convection cooling.

### Dimensions:

7"H x 19"W x 22"D (17.8cm x 48.3cm x 55.9cm).

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

## Electronic Component (Power Source)

**XRF generators are intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The XRF series is not intended to be operated by end users as a stand-alone device. The XRF series power supply can only be fully assessed when installed within a system, and as a component part within that system.

## 160kV XRF SELECTION TABLE

OUTPUT VOLTAGE kV	OUTPUT CURRENT mA	OUTPUT POWER W	MODEL (X NUMBER REQUIRED)
160	0.5	80	X- - - - -
160	2.0	320	X- - - - -
160	4.0	640	X- - - - -

## J2 AC INPUT CONNECTOR WIRING

5 Pin MS Type	7 Pin UTG Type	CONNECTION
A	1	Auxiliary (Logic) Line
B	2	Auxiliary (Logic) Neutral
C	3	Ground
D	4	Main (Inverter) Line
E	5	Main (Inverter) Neutral

## JB1 160kV XRF 80W, 320W, 640W 25 PIN

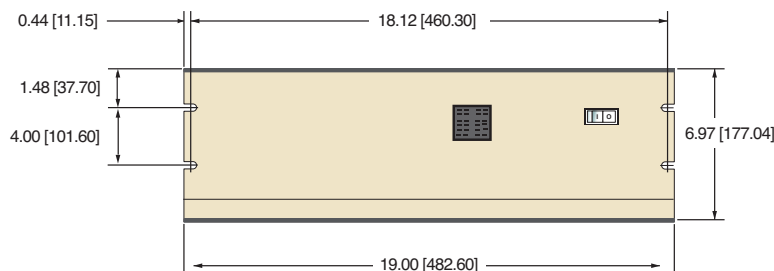
PIN	SIGNAL	SIGNAL PARAMETERS
1	Filament Limit	0-5V = 0-5A Filament Limit
2	High Voltage on Control	+12VDC IN = HV ON
3	N/C	
4	N/C	
5	High Voltage On Status	Low = HV ON
6	A-Ground	Ground
7	kV Monitor	0-10V = 0-160kV
8	Interlock Control	+12VDC IN = Interlock Closed
9	N/C	
10	mA Demand	0-10V = 0-100% Rated Output
11	N/C	
12	N/C	
13	D-Ground	Ground
14	Fil. Monitor	0-5V = 0-5A
15	N/C	
16	N/C	
17	N/C	
18	N/C	
19	mA Monitor	0-10V = 0-100% Rated Output
20	N/C	
21	+12VDC Out	
22	kV Demand	0-10V = 0-160kV
23	Grid Inhibit/Fil. Select	Low = Grid Inhibit
24	N/C	
25	Chassis Gnd (I/O Shield)	Chassis Gnd.

## 160kV XRF 80W, 320W, 640W TERMINAL BLOCK 10 PIN

PIN	SIGNAL	SIGNAL PARAMETERS
1	Interlock	Jumper to TB1-2 to close interlock
2	Interlock Return	
3	kV Monitor	0-10V=0-160kV
4	mA Monitor	0-10V = 0-100% Rated Output
5	Filament Monitor	0-5V=0-5A
6	N/C	
7	HV ON Indicator	+15V = HV ON
8	Voltage Mode Indicator	Low = Voltage Mode.
9	Current Mode Indicator	Low = Current Mode.
10	GND	Ground

DIMENSIONS: in.[mm]

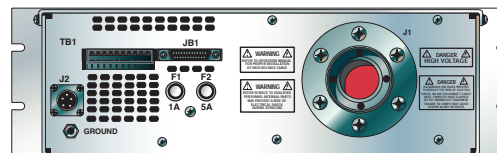
FRONT VIEW



TOP VIEW



BACK VIEW





80kV unit shown



### Ask about our X-Ray subsystem capabilities

- **50kV, 65kV and 80kV Output Voltage**
- **100W Output Power**
- **Adjustable Ground Isolated Filament Supply**
- **Overvoltage & Short Circuit Protection**
- **Voltage & Current Programming**
- **Local and Remote Emission Control**
- **Safety Interlock**
- **RS-232, Ethernet, & USB Standard**
- **Redundant HV Monitor Signal**

The uXHP Series is the result of Spellman's exceptional high voltage packaging and surface mount fabrication techniques coupled with proprietary encapsulation technology producing this ultra-compact X-Ray generator module. The uXHP powers grounded cathode X-Ray tubes from a variety of well-known manufacturers, featuring a 0 to 50kV/65kV/80kV high voltage output @ 5mA limited to 100W. The uXHP uses closed loop filament control circuitry providing highly regulated beam current. The low noise dc filament supply operates between 0.3 and 3.5A. Offering tight regulation, high stability and low ripple, the uXHP provides users local and remote analog control to set beam voltage, emission current and filament current limit. USB, RS-232 and Ethernet interface is standard.

### TYPICAL APPLICATIONS

Powering grounded cathode X-Ray tubes from Varex, Kevex, Oxford, RTW, Superior and Trufocus.

### SPECIFICATIONS

#### Input:

+24Vdc  $\pm 1V$ ; 7.75A maximum

#### Efficiency:

75%, typical

#### Output:

See model selection table on page 2

#### Voltage Control:

Local: Internal multi-turn potentiometer to set voltage from 0 to full output voltage.

Remote: 0 to 10Vdc = 0 to 100% rated output voltage. Accuracy:  $\pm 1\%$ .  $Z_{IN} = 10\text{Mohm}$ .

#### Emission Control:

Local: Internal potentiometer to set beam current from 0 to full output current.

Remote: 0 to 10Vdc = 0 to 100% rated output current. Accuracy:  $\pm 1\%$ .  $Z_{IN} = 10\text{Mohm}$ . Filament limit and filament preheat control capability is also provided.

#### Voltage and Current Monitors:

0 to 10Vdc = 0 to 100% rated output

Accuracy:  $\pm 1\%$ .  $Z_{OUT} = 1\text{kohm}$

#### Redundant Voltage Monitor:

A redundant high voltage feedback divider where 0 to 10Vdc = 0 to 100% rated output is monitored via firmware. The analog monitor signal can be provided by special order.

#### Temperature Coefficient:

0.01% per  $^{\circ}\text{C}$ , voltage and current.

#### Stability:

0.05% per 8 hours after 1/2 hour warm-up.

#### Digital Interface:

RS-232, Ethernet and USB is standard

#### DC Filament Supply:

Ground isolated filament power supply allows actual tube current feedback signal for monitoring accurate low X-Ray tube current performance.

Current: 0-3.5A, adjustable limit

Voltage: 5.0V, maximum compliance

#### Environmental:

Operational:  $0^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$

Storage:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

Humidity: 0% to 90%, non-condensing

#### Dimensions:

50/65kV Unit: 7.00"H x 3.07"W x 9.00"D  
(177.80mm x 78.00mm x 228.60mm)

80kV Unit: 7.00"H x 3.07"W x 10.50"D  
(177.80mm x 78.00mm x 266.70mm)

#### Weight:

50/65kV Unit: 8.5 lbs. (3.85kg)

80kV Unit: 10.0 lbs. (4.53kg)

#### Cooling:

User provided forced air cooling is required

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588. RoHS Compliant.

### uXHP MODEL SELECTION TABLE

OUTPUT VOLTAGE	OUTPUT CURRENT	OUTPUT POWER	MODEL NUMBER
0-50kV	0-5mA	100W	uXHP50P100
0-65kV	0-5mA	100W	uXHP65P100
0-80kV	0-5mA	100W	uXHP80P100

### CONTROL POWER INPUT CONNECTOR

PIN	SIGNAL	PARAMETER
1	+24V Control Power	+24 volts @ 1A, max.
2	+24V Control Power Return	Power Ground

### FILAMENT CONNECTOR

PIN	SIGNAL	PARAMETER
1	Filament Output	0.3A to 3.5A @ 5V, max.
2	Filament Return	Filament Return

Note: The filament return wire cannot be grounded as this would short circuit the tube return current monitoring to the uXHP. If grounding of the filament is required, please consult the factory.

### ANALOG INTERFACE CONNECTOR— MALE 15 PIN MINI “D”

PIN	SIGNAL	PARAMETER
1	Monitor Return	Signal Ground
2	Voltage Monitor	0-10V = 0 to full scale, Zout=1KΩ
3	Current Monitor	0-10V = 0 to full scale, Zout=1KΩ
4	Interlock Output	Connect 12V HV ON bulb to pin 15 to enable
5	+10V Reference	+10V at 1mA, maximum
6	Filament Monitor	1V = 1A, Zout=1KΩ
7	Voltage Program Input	0-10V = 0 to full scale, Zin=10MΩ
8	Local Voltage Program*	0-10V, screwdriver adjust
9	Filament Limit Setpoint*	1V = 1A, screwdriver adjust
10	Current Program Input	0-10V = 0 to full scale, Zin=10MΩ
11	Local Current Program*	10 turn pot, screwdriver adjust
12	Not used (+24V Out for Interlock)	(Optional Interlock configuration)
13	Not used (Interlock Coil)	(Optional Interlock configuration)
14	Filament Preheat Setpoint*	1V = 1A, screwdriver adjust
15	Interlock Return	Interlock Ground

\*Denotes 10 turn potentiometer accessible through holes in cover

### USB DIGITAL INTERFACE— 4 PIN USB “B” CONNECTOR

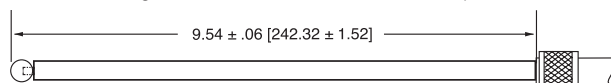
PIN	SIGNAL	PARAMETER
1	VBUS	+5Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

### HIGH VOLTAGE OUTPUT CONNECTOR

Spellman drywell type detachable connector.

**50/65kV:** A one meter (39.4”) long polyethylene mating high voltage cable with banana plug termination is provided.

**80kV:** A one meter (39.4”) long polyethylene mating high voltage cable with corona ball termination is provided.



HV Cable Options:

**5302:** (50kV unit only)  
A one meter (39.4”) long Mammoflex mating high voltage cable is provided, SHV p/n 201946-007

**2001:** (50kV with XCC option and 65kV units only)  
A one meter (39.4”) long Mammoflex mating high voltage cable is provided, compatible with the XCC Option SHV p/n 201946-002

### HIGH VOLTAGE POWER INPUT CONNECTOR 2 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETER
1	+24V High Voltage Power Input	+24V @ 7.75A max
2	+24V High Voltage Power Return	Power Ground

### ETHERNET DIGITAL INTERFACE— 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	PARAMETER
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX-	Receive Data -
7	NC	No Connection
8	NC	No Connection

### RS-232 DIGITAL INTERFACE— 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETER
1	NC	No Connection
2	TX out	Transmit Data
3	RX in	Receive Data
4	NC	No Connection
5	SGND	Ground
6	NC	No Connection
7	NC	No Connection
8	Voltage Monitor 2	0-10V = 0 to full scale, Zout = 1KΩ
9	Power Supply OK	+15V = OK, 0V = Fault, Sink/Source 3mA max

### How To Order:

Sample model number:

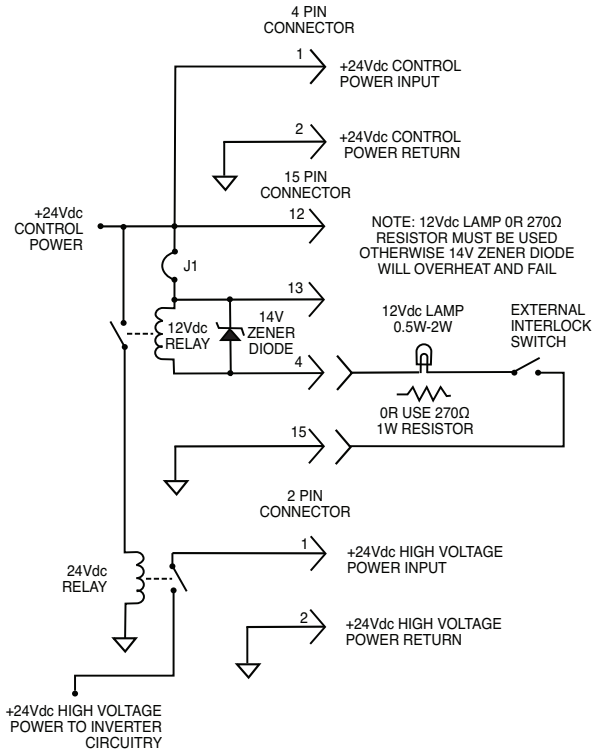
50kV unit: uXHP50P100

65kV unit: uXHP65P100

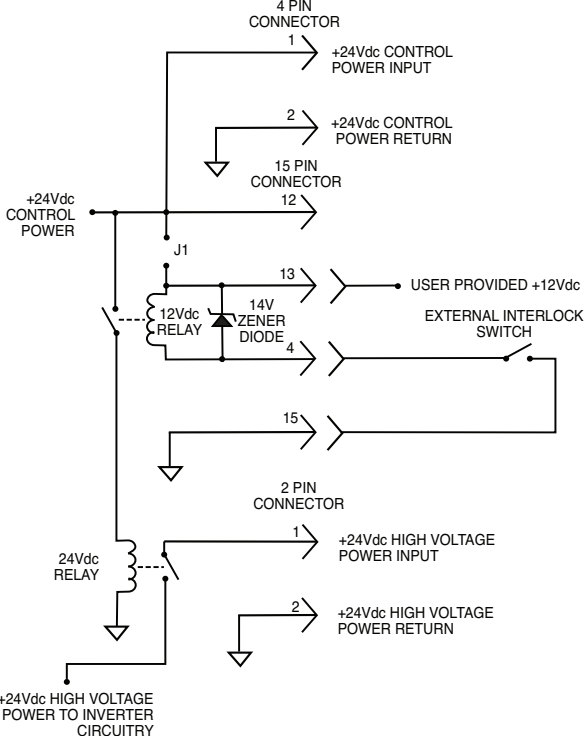
80kV unit: uXHP80P100

Ask about our X-Ray subsystem capabilities

## RECOMMENDED INTERLOCK CONFIGURATION



## ALTERNATE INTERLOCK CONFIGURATION



## Digital Interface

The uXHP features a standard USB, RS-232 and Ethernet digital interface. Utilizing these standard digital interfaces can dramatically simplify power supply interfacing requirements saving the user both time and money, while enhancing functionality and overall capability. Spellman provides a GUI with the uXHP that allows the customer to both customize operational features of the uXHP while also providing basic power supply operational features. Details of the uXHP's digital interface capability are described in detail in the uXHP manual.



Closeup showing digital interface connectors

## Filament Status Screen



## Main Control Screen



## Varex VF-80J X-Ray Tube

The uXHP was specifically designed in cooperation with Varex to power their new VF-80J X-Ray tube. This joint effort resulted in the creation of both the VF-80J X-Ray tube and the uXHP X-Ray generator. The Varex VF-80J tube is uniquely rated to run at up to 80kV @ 100 watts, 4mA maximum.

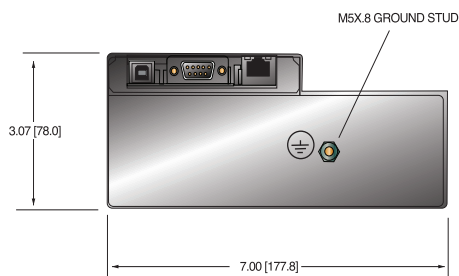
The uXHP was explicitly designed to operate at up to 80kV and provide 100 watts down to 25kV, so customers could make full use of the capabilities of the VF-80J X-Ray tube. Varex and Spellman, working together to push the boundaries of X-Ray technology.



DIMENSIONS: in.[mm]

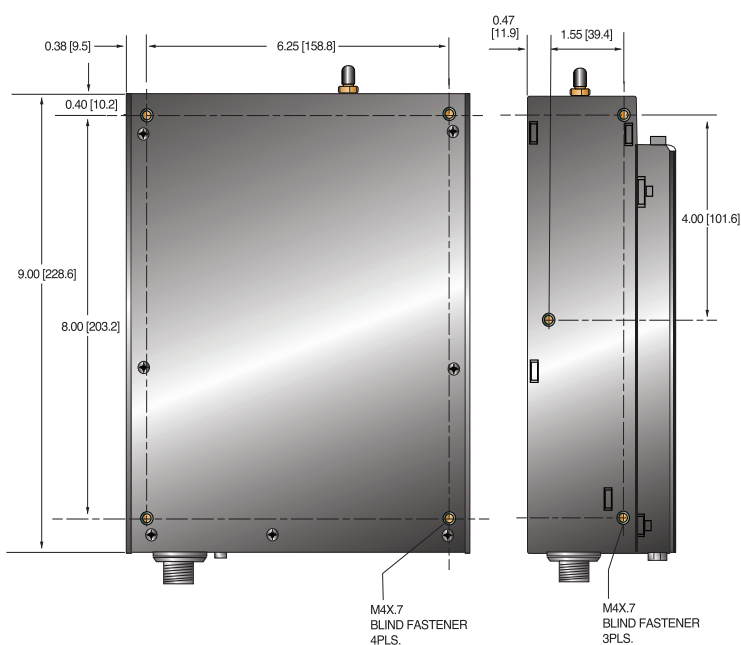
## 50kV, 50kV/XCC and 65kV

BACK VIEW

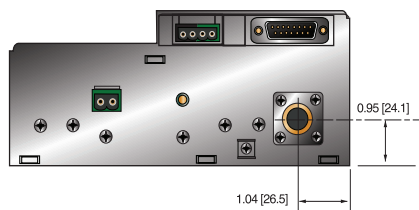


BOTTOM VIEW

SIDE VIEW

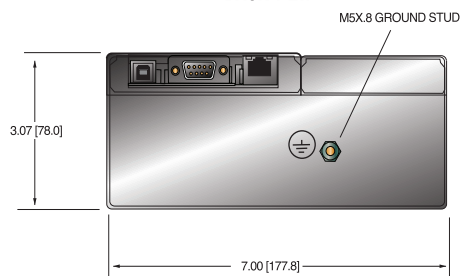


FRONT VIEW



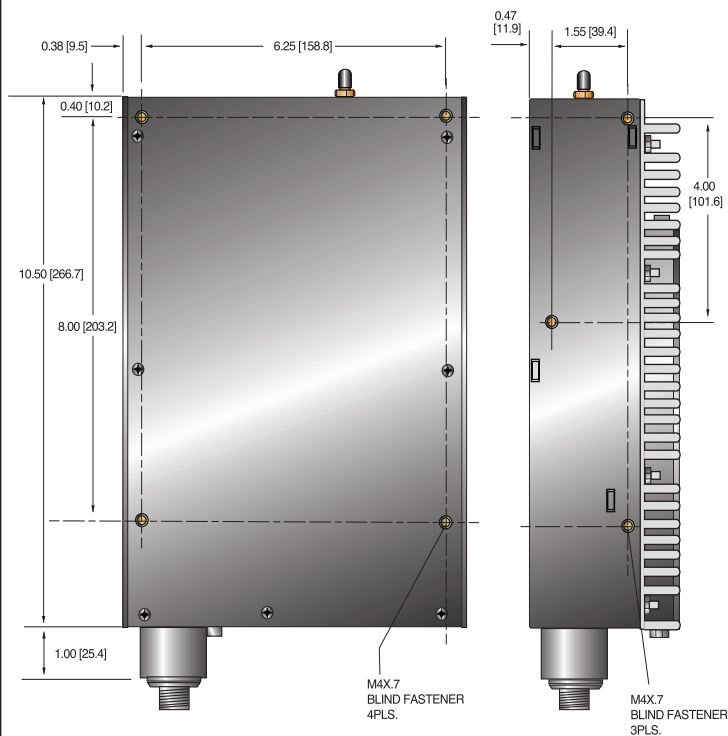
## 80kV

BACK VIEW

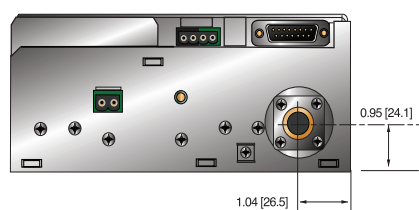


BOTTOM VIEW

SIDE VIEW



FRONT VIEW





- **Compact & Lightweight**
- **Models from 20kV-160kV, 300W, 600W and 1200W**
- **Universal Input, Power Factor Corrected**
- **Hot Anode or Hot Cathode X-Ray Tube Capable**
- **Standard Digital Interfaces: USB, Ethernet and RS-232**
- **CE Compliant, UL Recognized and RoHS Compliant**
- **User Programmable Ramping and Arc Detect Feature**

Spellman's new DXM Series of X-Ray generator modules are designed for OEM applications up to 160kV at 1200 watts. Its universal input, small package size and choice of three standard digital interfaces simplifies integrating the DXM into your X-Ray analysis system. Models are available to operate either floating filament (negative HV polarity) or ground referenced filament (positive HV polarity), X-Ray tube designs. DSP based emission control circuitry provides excellent regulation of emission current, along with outstanding stability performance.

## TYPICAL APPLICATIONS

Plastics Sorting  
Crystal Inspection  
Plating Measurement  
Diamond Inspection  
Mineral Analysis  
X-Ray Fluorescence  
X-Ray Diffraction

## SPECIFICATIONS

### Input Voltage:

Power factor corrected input  
100-240Vac  $\pm 10\%$  (90-264Vac):  
47-63Hz @ 4.6A for 300 watt units  
200-240Vac  $\pm 10\%$  (180-264Vac):  
47-63Hz @ 4.3A for 600 watt units  
47-63Hz @ 8.2A for 1200 watt units

### Output Voltage:

8 models—20kV, 30kV, 40kV, 50kV, 60kV,  
70kV, 75kV and 160kV

### Output Polarity:

Negative- for floating filament X-Ray tubes  
Positive- for ground referenced filament X-Ray tubes

### Power:

3 power ranges available:  
300 watts, 600 watts and 1200 watts.  
Other power levels available on special order.

### Output Voltage Regulation:

$\leq 0.01\%$  of rated output voltage over specified  
input voltage range  
 $\leq 0.01\%$  of rated output voltage for a full load change

### Emission Current Regulation:

$\leq 0.01\%$  of rated output current over specified  
input voltage range  
 $\leq 0.01\%$  of rated output current for a change from 30%  
to 100% of rated output voltage  
Filament is disabled when kV is  $< 30\%$  of full scale output

### Ripple:

$\leq 1\%$  rms at  $> 20\text{kHz}$ ,  $0.1\%$  rms below  $20\text{kHz}$

### Stability:

$\leq 25\text{ppm/hr}$  after a 2 hour warm up

### Temperature Coefficient:

$\leq 50\text{ppm}$  per degree C

### Environmental:

Temperature Range:  
Operating:  $0^\circ\text{C}$  to  $40^\circ\text{C}$   
Storage:  $-40^\circ\text{C}$  to  $85^\circ\text{C}$   
Humidity:  
20% to 85% RH, non-condensing.

### Filament Configuration:

Closed loop emission control regulates filament setting  
to provide desired X-Ray tube emission current.  
Two types are available: Floating Filament (ac output  
referenced to negative output voltage) and Ground  
Referenced Filament (dc output referenced to ground).

**Output:** 0-5 amps at a compliance of 10 volts, maximum.

The filament loop is disabled when the kV output is less  
than 30% of full scale output to protect the X-Ray tube.  
Standard filament Preheat adjustable 0-2.5 amps.  
Other filament levels available on special order.

### Control Interface

#### Local Interface:

Potentiometers are provided to adjust filament limit and preheat levels

#### Remote Interface:

USB, Ethernet and RS-232 are standard.  
All digital monitors have an accuracy specification of 2%

#### Control Software:

A Windows graphical user interface example is provided

#### High Voltage Enable:

A hardware based, dry contact closure will enable the power supply into the high voltage on mode

#### Monitor Signals:

Voltage and current monitor signals are scaled 0-10Vdc equals 0-100% of full scale, accuracy is 1%

### Dimensions:

300/600 Watts: 4.75" H X 6" W X 12" D  
(120.65mm x 152.4mm x 304.8mm)

1200 Watts: 4.75" H X 12" W X 12" D  
(120.65mm x 304.8mm x 304.8mm)

160kV: 10.5" H X 19" W X 21.5" D  
(266.7mm x 482.6mm x 546.1mm)

### Weight:

300/600 Watts: 14 pounds (6.35kg)

1200 Watts: 26 pounds (11.8kg)

160kV: 142 pounds (66.4kg)

### Cooling:

Forced air

### Input Line Connector:

IEC320 with EMI filter

### Output Connector:

Depends upon polarity selected.  
See table and drawing. Other connectors and pinouts available on special order.

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588. RoHS Compliant. DXM160N1200 is not UL recognized.

### DXM SELECTION TABLE – 300W, 600W, 1200W

300 Watt			600 Watt			1200 Watt		
kV	mA	Model	mA	Model	mA	Model		
20	15	DXM20*300	30	DXM20*600	60	DXM20*1200		
30	10	DXM30*300	20	DXM30*600	40	DXM30*1200		
40	7.5	DXM40*300	15	DXM40*600	30	DXM40*1200		
50	6	DXM50*300	12	DXM50*600	24	DXM50*1200		
60	5	DXM60*300	10	DXM60*600	20	DXM60*1200		
70	4.28	DXM70*300	8.56	DXM70*600	17.12	DXM70*1200		
75	4	DXM75*300	8	DXM75*600	16	DXM75*1200		
160					7.5	DXM160N1200		

\*Specify "P" for positive polarity or "N" for negative polarity

### FILAMENT TERMINAL BLOCK – TB1 TWO POSITION TERMINAL BLOCK

POSITION	SIGNAL	SIGNAL PARAMETERS
1	Filament Output	0-5 amps, 10Vdc Maximum
2	Filament Return	Filament Return

For positive polarity/ground referenced filament units

### DXM ANALOG INTERFACE – J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Fault	Open Collector, 35V @ 10mA Maximum
2	Current Program In	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
3	Voltage Program In	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
4	Filament Limit Input	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
5	Local Filament Limit	Multi-turn front panel potentiometer
6	Filament Preheat Input	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
7	Local Filament Preheat	Multi-turn front panel potentiometer
8	Voltage Monitor	0 to 10V=0 to 100% Rated Output, Zout=4.99k, 1%
9	Signal Ground	Ground
10	Current Monitor	0 to 10V=0 to 100% Rated Output, Zout=4.99k, 1%
11	X-Ray Enable Input	Connect to Pin 12 to HV Enable Supply
12	X-Ray Enable Output	+15V @ Open, ≤15mA @ Closed
13	Filament Monitor	1 Volt=1 Amp, Zout=10kΩ
14	X-Ray On Output Signal	Open Collector, 35V @10mA Maximum
15	Spare	N/C

### RS-232 DIGITAL INTERFACE – J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	N/C	No Connection
2	TX out	Transmit Data
3	RX in	Receive Data
4	N/C	No Connection
5	SGND	Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

#### USB DIGITAL INTERFACE — J4 4 PIN USB “B” CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	VBUS	+5 Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

#### ETHERNET DIGITAL INTERFACE — J5 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX-	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

#### R24 HV CONNECTOR PINOUT J6 CATHODE OUTPUT (160kV)

PIN	OUTPUT CONNECTION
C (common)	High Voltage Output
S (small)	Filament Output
L (large)	Filament Output

#### HIGH VOLTAGE OUTPUT CONNECTOR — J6 FLOATING FILAMENT

20kV-75kV Negative Polarity:  
Claymount Mini Federal standard X-Ray connector

160kV Negative Polarity:  
R24 (cable not provided)

#### HIGH VOLTAGE OUTPUT CONNECTOR — J6:GROUND FILAMENT

Positive Polarity: Spellman High Voltage  
Delrin Drywell connector.  
4 foot (1.21m) long high voltage  
cable provided

For positive polarity units a ground referenced filament output is  
provided on a two position terminal TB1. See table

#### CLAYMOUNT HV CONNECTOR

PIN	OUTPUT CONNECTION
C (common)	High Voltage Output
S (small)	High Voltage Output
L (large)	Filament Output
G (grid)	Filament Output

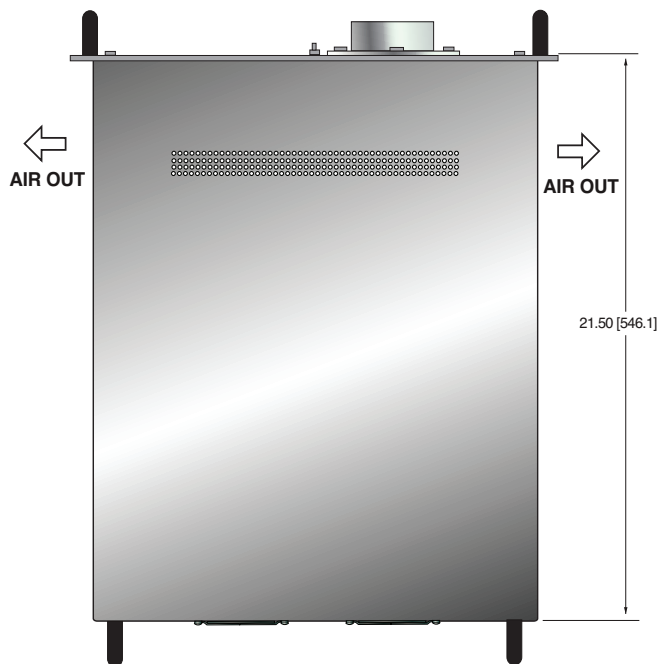
Note: No high voltage cable is provided

Recommended Cable: Claymount part number: 12096

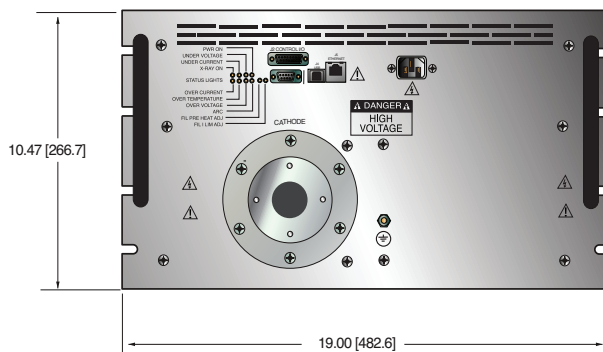
Cable assembly, L3 CA11, CA11, 10F, CS=Bare 10 foot, Mini Federal  
Connectors on both ends, "C" and "S" are both connected to the bare  
shield wire

DIMENSIONS: in.[mm]

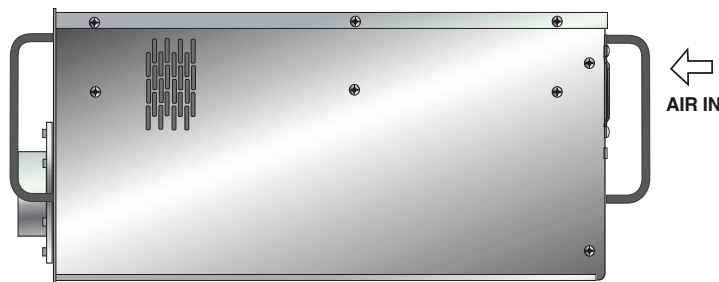
160kV



FRONT VIEW



SIDE VIEW



DIMENSIONS: in.[mm]

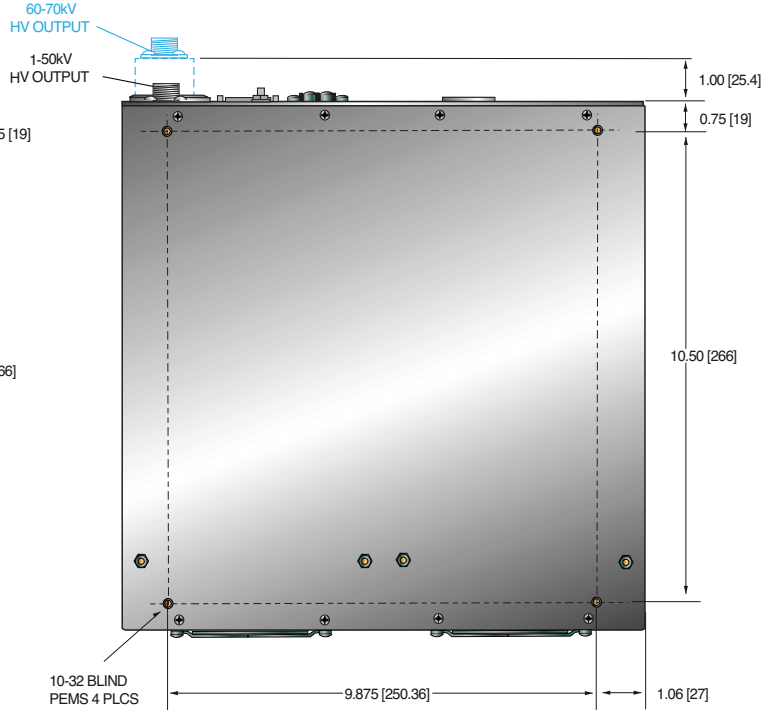
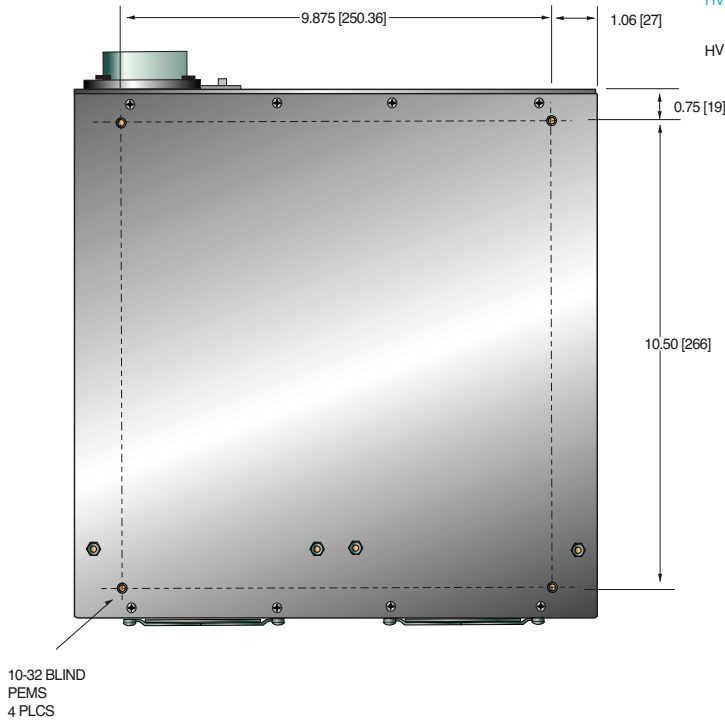
**1200 Watt**

Negative Polarity - Floating Filament

Positive Polarity - Ground Filament

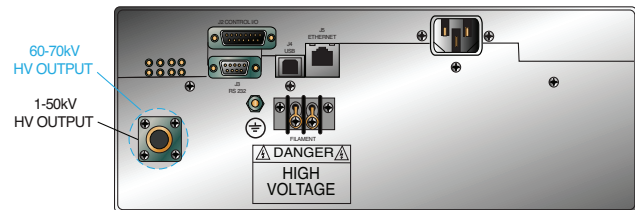
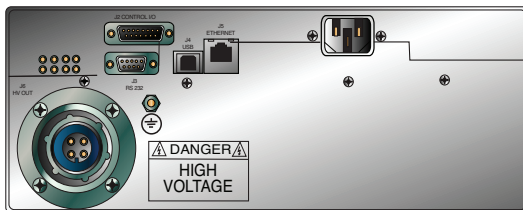
**BOTTOM VIEW**

**BOTTOM VIEW**



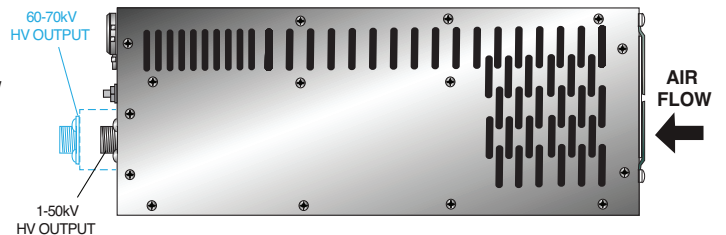
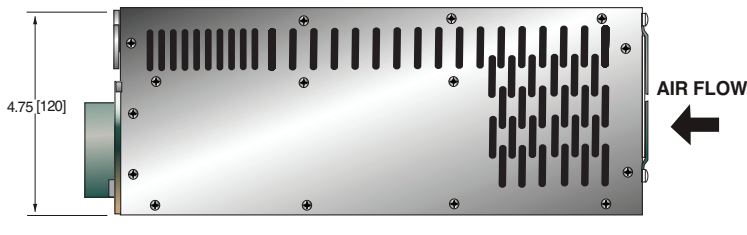
**FRONT VIEW**

**FRONT VIEW**



**SIDE VIEW**

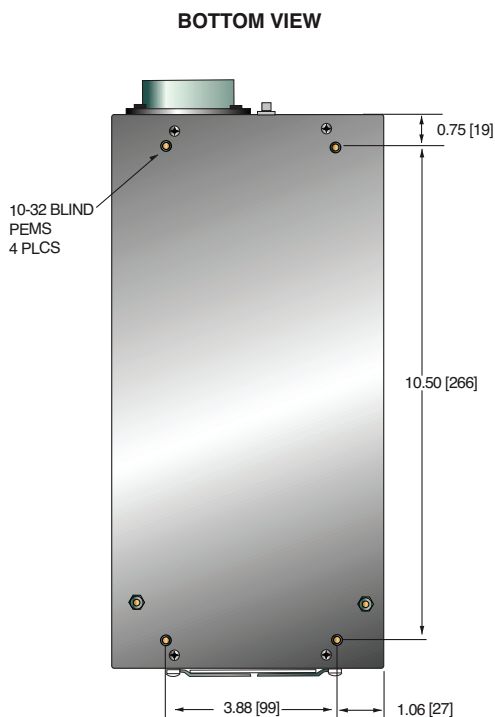
**SIDE VIEW**



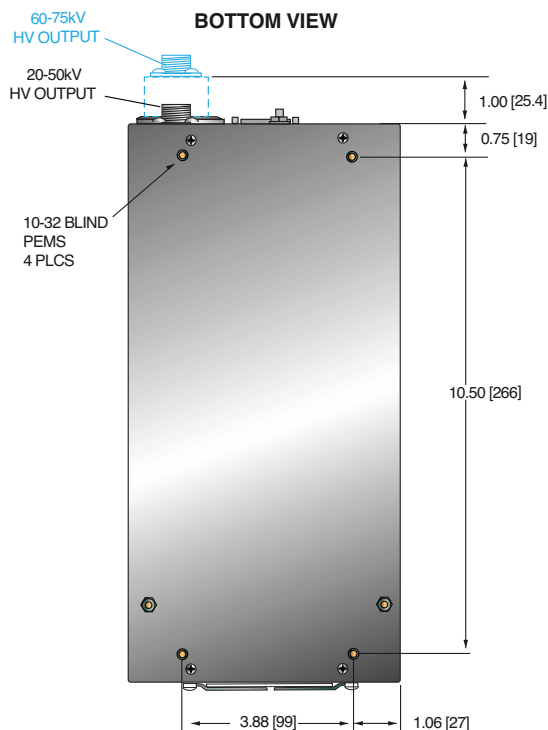
DIMENSIONS: in.[mm]

**300/600 Watt**

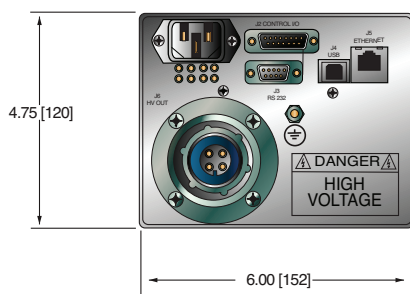
Negative Polarity - Floating Filament



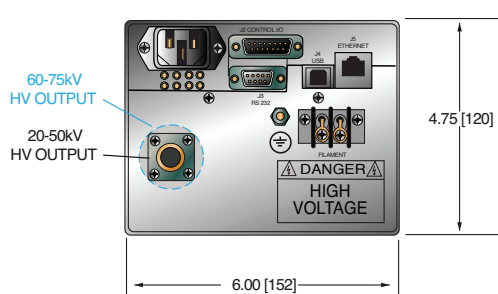
Positive Polarity - Ground Filament



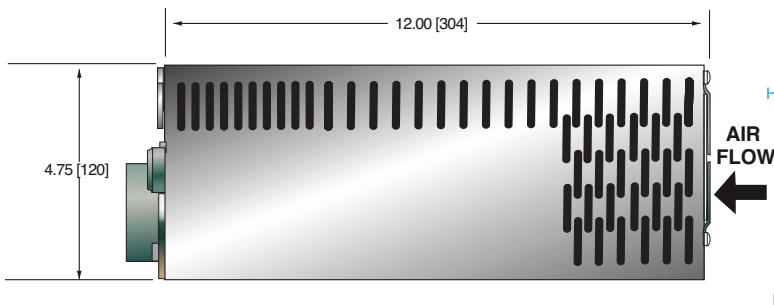
**FRONT VIEW**



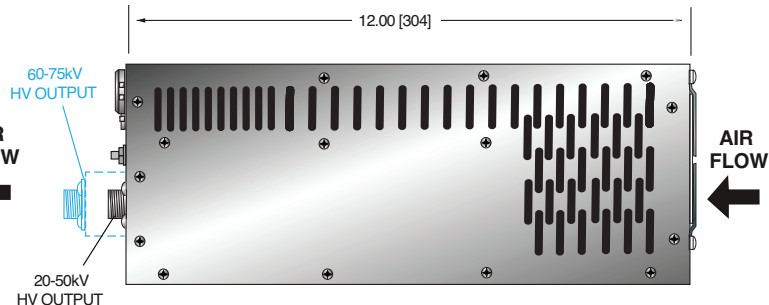
**FRONT VIEW**



**SIDE VIEW**



**SIDE VIEW**





- **Bipolar Outputs in a Single Unit**
- **Compact & Lightweight**
- **Models from 40kV to 320kV, 300W, 600W and 1200W**
- **Universal Input, Power Factor Corrected**
- **Standard Digital Interfaces:  
USB, Ethernet and RS-232**
- **CE Compliant, UL Recognized**

Spellman's new DXB Series of bipolar X-Ray generator modules are designed for OEM applications up to 320kV ( $\pm 160$ kV) at 1200 watts. Its universal input, small package size and choice of three standard digital interfaces simplifies integrating the DXB into your X-Ray analysis system. DSP based emission control circuitry provides excellent regulation of emission current, along with outstanding stability performance.

## TYPICAL APPLICATIONS

Plastics Sorting	Mineral Analysis
Crystal Inspection	X-Ray Fluorescence
Plating Measurement	X-Ray Diffraction
Thickness Gauging	Cargo Screening
Food Inspection	

## SPECIFICATIONS

### Input Voltage:

Power factor corrected input  
100-240Vac,  $\pm 10\%$  (90-264Vac):  
47-63Hz @ 5.7A for 300 watt units  
200-240Vac,  $\pm 10\%$  (180-264Vac):  
47-63Hz @ 4.8A for 600 watt units  
47-63Hz @ 8.0A for 1200 watt units

### Output Voltage:

7 models: 40kV, 60kV, 80kV, 100kV, 120kV,  
140kV and 320kV

### Output Polarity:

$\pm$  bipolar output, filament referenced to negative output

### Power:

3 power ranges available—300 watts, 600 watts  
and 1200 watts  
Other power levels available on special order.

### Output Voltage Regulation:

$\leq 0.01\%$  of rated output voltage over specified  
input voltage range  
 $\leq 0.01\%$  of rated output voltage for a full load change

### Emission Current Regulation:

$\leq 0.01\%$  of rated output current over specified  
input voltage range  
 $\leq 0.01\%$  of rated output current for a change from 30%  
to 100% of rated output voltage  
Filament is disabled when kV is  $< 30\%$  of full scale output

### Ripple:

$\leq 1\%$  rms at  $> 20$  kHz,  $0.1\%$  rms below 20 kHz

### Stability:

$\leq 25$  ppm/hr after a 2 hour warm up

### Temperature Coefficient:

$\leq 50$  ppm per degree C

### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$   
Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
Humidity:  
20% to 85% RH, non-condensing.

### Filament Configuration:

Closed loop emission control regulates filament setting  
to provide desired X-Ray tube emission current.  
Floating Filament (ac output referenced to negative  
output voltage).

**Output:** 0-5 amps at a compliance of 10 volts, maximum.

The filament loop is disabled when the kV output is less  
than 30% of full scale output to protect the X-Ray tube.  
Standard filament Preheat adjustable 0-2.5 amps.  
Other filament levels available on special order.

### Control Interface

**Local Interface:** Potentiometers are provided to adjust filament  
limit and preheat levels

**Remote Interface:** USB, Ethernet and RS-232 are standard.  
All digital monitors have an accuracy specification of 2%

**Control Software:** A Windows graphical user interface  
example is provided.

**High Voltage Enable:** A hardware based, dry contact closure  
will enable the power supply into the high voltage on mode

**Monitor Signals:** Voltage and current monitor signals are  
scaled 0-10Vdc equals 0-100% of full scale, accuracy is 1%

### Cooling:

Forced air

### Dimensions:

40-140kV:  
4.75" H X 12" W X 12" D (120.65mm x 304.8mm x 304.8mm)  
320kV:  
10.5" H X 19.0" W X 21.5" D (266.7mm x 482.6mm x 546.1mm)

### Weight:

40-140kV: 26 pounds (11.8kg)  
320kV: 150 pounds (68kg)

#### Input Line Connector:

IEC320 with EMI filter

#### Output Connectors:

40-140kV:

Claymont Mini Federal Standard X-Ray connectors.

Other connectors and pinouts available on special order.

320kV:

R24 X-Ray connectors.

Other connectors and pinouts available on special order.

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC

Low Voltage Directive. UL/CUL recognized, File E227588.

RoHS Compliant. DXB320PN1200 is not UL recognized.

#### DXB SELECTION TABLE— 300W, 600W, 1200W

kV	300 Watt		mA	600 Watt		mA	1200 Watt	
	mA	Model		mA	Model		mA	Model
40	7.50	DXB40PN300	15.0	DXB40PN600	30.0	DXB40PN1200		
60	5.00	DXB60PN300	10.0	DXB60PN600	20.0	DXB60PN1200		
80	3.75	DXB80PN300	7.50	DXB80PN600	15.0	DXB80PN1200		
100	3.00	DXB100PN300	6.00	DXB100PN600	12.0	DXB100PN1200		
120	2.50	DXB120PN300	5.00	DXB120PN600	10.0	DXB120PN1200		
140	2.14	DXB140PN300	4.28	DXB140PN600	8.57	DXB140PN1200		
320	Not Available			Not Available			3.75	DXB320PN1200

#### DXB ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Fault	Open Collector, 35V @ 10mA Maximum
2	Current Program In	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
3	Voltage Program In	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
4	Filament Limit Input	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
5	Local Filament Limit	Multi-turn front panel potentiometer
6	Filament Preheat Input	0 to 10V=0 to 100% Rated Output, Zin=10MΩ
7	Local Filament Preheat	Multi-turn front panel potentiometer
8	Voltage Monitor	0 to 10V=0 to 100% Rated Output, Zout=4.99k, 1%
9	Signal Ground	Ground
10	Current Monitor	0 to 10V=0 to 100% Rated Output, Zout=4.99k, 1%
11	X-Ray Enable Input	Connect to Pin 12 to HV Enable Supply
12	X-Ray Enable Output	+15V @ Open, ≤15mA @ Closed
13	Filament Monitor	1 Volt=1 Amp, Zout=10kΩ
14	X-Ray On Output Signal	Open Collector, 35V @10mA Maximum
15	Spare	N/C

#### RS-232 DIGITAL INTERFACE— J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	N/C	No Connection
2	TX out	Transmit Data
3	RX in	Receive Data
4	N/C	No Connection
5	SGND	Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

#### USB DIGITAL INTERFACE— J4 4 PIN USB "B" CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	VBUS	+5 Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

#### ETHERNET DIGITAL INTERFACE— J5 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX-	Receive Data -
7	NC	No Connection
8	NC	No Connection

#### CLAYMOUNT HV CONNECTOR PINOUT J6 CATHODE OUTPUT (40-140kV)

PIN	OUTPUT CONNECTION
C (common)	-High Voltage Output
S (small)	-High Voltage Output
L (large)	Filament Output
G (grid)	Filament Output

#### CLAYMOUNT HV CONNECTOR PINOUT J7 ANODE OUTPUT (40-140kV)

PIN	OUTPUT CONNECTION
C (common)	+High Voltage Output
S (small)	+High Voltage Output
L (large)	+High Voltage Output
G (grid)	+High Voltage Output

Note: No high voltage cable is provided

Recommended Cable:

Claymont part number: 12096

Cable assembly, L3 CA11, CA11, 10F, CS=Bare 10 foot,

Mini Federal Connectors on both ends, "C" and "S" are

both connected to the bare wire

#### R24 HV CONNECTOR PINOUT J6 CATHODE OUTPUT (320kV)

PIN	OUTPUT CONNECTION
C (common)	-High Voltage Output
S (small)	Filament Output
L (large)	Filament Output

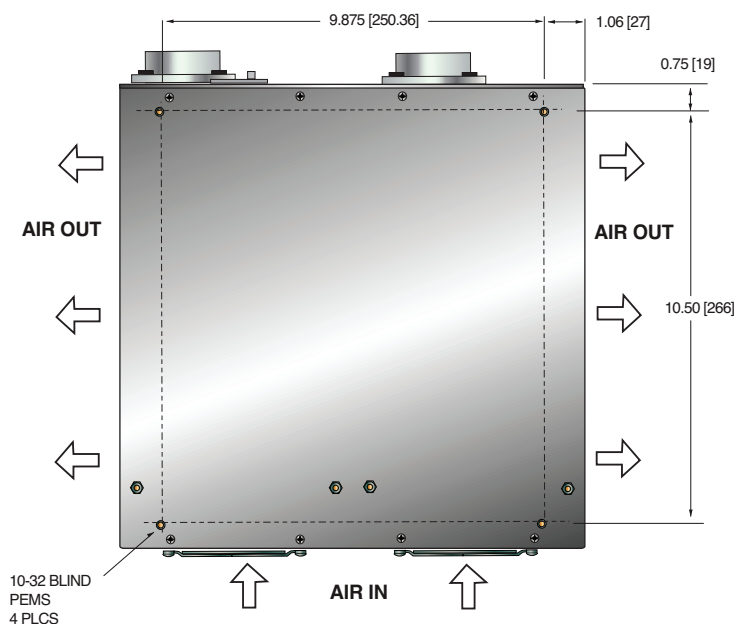
#### R24 HV CONNECTOR PINOUT J7 ANODE OUTPUT (320kV)

PIN	OUTPUT CONNECTION
C (common)	+High Voltage Output
S (small)	+High Voltage Output
L (large)	+High Voltage Output

DIMENSIONS: in.[mm]

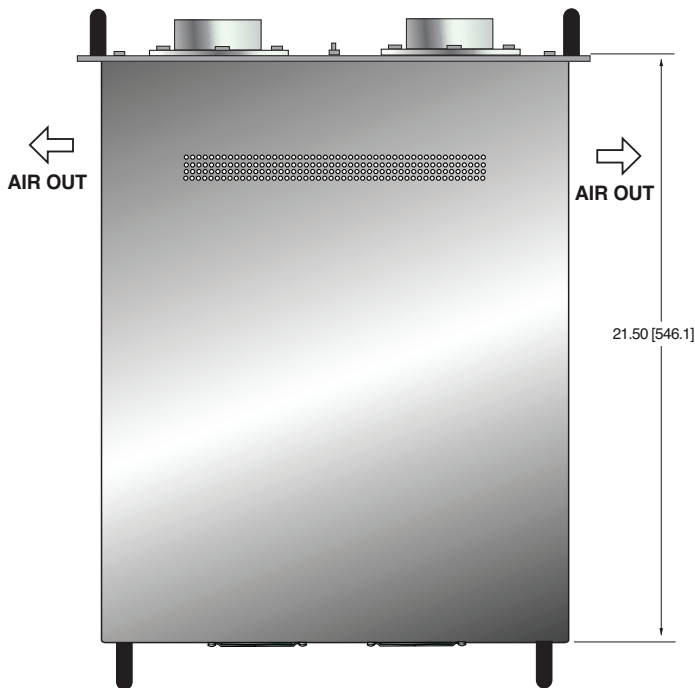
40-140kV

BOTTOM VIEW

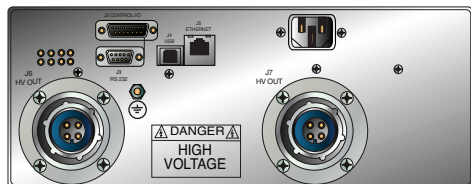


320kV

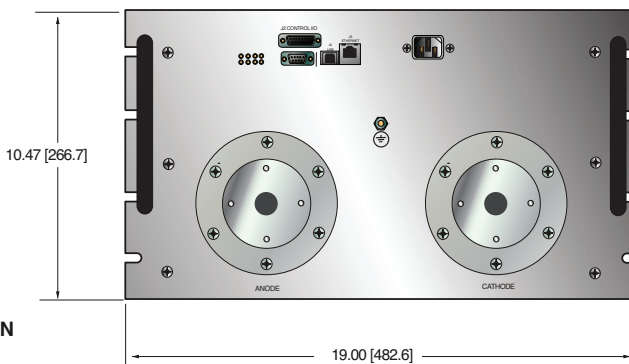
TOP VIEW



FRONT VIEW



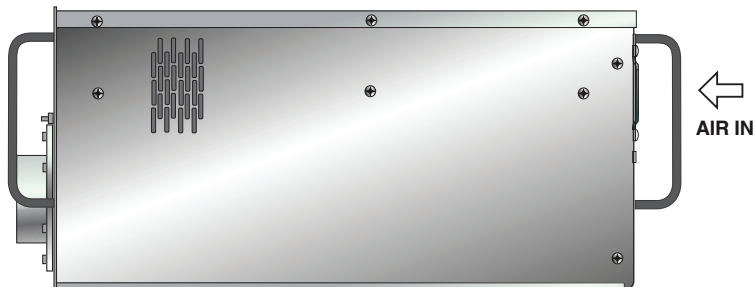
FRONT VIEW



SIDE VIEW



SIDE VIEW





- **100kV @ 1200W**
- **Compact & Lightweight Modular Unit**
- **Universal Input, Power Factor Corrected**
- **Standard Digital Interfaces: USB, Ethernet and RS-232**
- **Programmable Power Trip Feature**
- **User Programmable Ramping and Arc Detect Feature**
- **CE Compliant**

Spellman's new DXM100 X-Ray generator module is designed for OEM applications up to 100kV at 1200 watts. Its universal input, small package size and choice of three standard digital interfaces simplifies integrating the DXM100 into your X-Ray analysis system. DSP based emission control circuitry provides excellent regulation of emission current, along with outstanding stability.

### TYPICAL APPLICATIONS

NDT Analysis	Crystal Inspection
Plating Measurement	Diamond Inspection
Mineral Analysis	Food/Product Inspection

### SPECIFICATIONS

#### Input Voltage:

Power factor corrected input,  $\geq 0.98$   
180-264Vac, 47-63Hz, 8.25A maximum

#### Output Voltage:

100kV, maximum

#### Output Polarity:

Negative for floating filament X-Ray tubes

#### Output Current:

12mA maximum

#### Output Power:

1200 Watts maximum

#### Output Voltage Regulation:

$\leq 0.01\%$  of rated output voltage over specified input voltage range  
 $\leq 0.01\%$  of rated output voltage for a full load change

#### Emission Current Regulation:

$\leq 0.01\%$  of rated output current over specified input voltage range  
 $\leq 0.01\%$  of rated output current for a change from 30% to 100% of rated output voltage  
Filament is disabled when kV is  $< 30\%$  of full scale output

#### Ripple:

$\leq 1\%$  rms at  $> 20$  kHz,  $0.1\%$  rms below 20 kHz

#### Stability:

$\leq 25$  ppm/hr after a 2 hour warm up

#### Temperature Coefficient:

$\leq 50$  ppm per degree C

#### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$   
Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

Humidity:

20% to 85% RH, non-condensing.

#### Filament Configuration:

Closed loop emission control regulates filament setting to provide desired X-Ray tube emission current.

**Output:** 5.0 amps at a compliance of 10.0 volts, maximum.  
The filament loop is disabled when the kV output is less than 30% of full scale output to protect the X-Ray tube.  
Standard filament Preheat adjustable 0-2.5 amps.  
Other filament levels available on special order.

#### Control Interface:

##### Local Interface:

Potentiometers are provided to adjust filament limit and preheat levels

**Remote Interface:** USB, Ethernet and RS-232 are standard.  
All digital monitors have an accuracy specification of 2%

**Control Software:** A Windows graphical user interface example is provided.

**High Voltage Enable:** A hardware based, dry contact closure will enable the power supply into the high voltage on mode

**Monitor Signals:** Voltage and current monitor signals are scaled 0-10Vdc equals 0-100% of full scale, accuracy is 1%

**Over Power Fault:** The maximum power the unit can supply can be programmed (0-1200 watts) via the digital interface, this setting will be stored in memory. An over power fault will occur if the output power is  $\geq 105\%$  of the set point value. When an over power fault occurs the high voltage output will be disabled and the Over Power Fault indicator will be activated on the GUI/Applet. Additionally both the UV and OV fault LED's on the DXM100 will be illuminated.

#### Cooling:

Forced air

#### Dimensions:

6.25" H X 12" W X 15.5" D (158.75mm x 304.79mm x 393.7mm)

#### Weight:

43 pounds (19.5kg)

#### Input Line Connector:

IEC320 with EMI filter, 6' (1.83 meter) cord set provided

#### Output Connector:

CA10 (R10). See table for pin out information

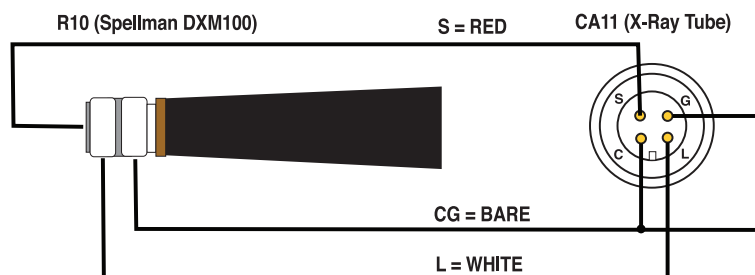
#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588.  
RoHS Compliant.

### DXM100 ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Fault	Open Collector, 35V @ 10mA Maximum
2	Current Program In	0 to 10V=0 to 100% Rated Output, $Z_{in}=10M\Omega$
3	Voltage Program In	0 to 10V=0 to 100% Rated Output, $Z_{in}=10M\Omega$
4	Filament Limit Input	0 to 10V=0 to 100% Rated Output, $Z_{in}=10M\Omega$
5	Local Filament Limit	Multi-turn front panel potentiometer
6	Filament Preheat Input	0 to 10V=0 to 100% Rated Output, $Z_{in}=10M\Omega$
7	Local Filament Preheat	Multi-turn front panel potentiometer
8	Voltage Monitor	0 to 10V=0 to 100% Rated Output, $Z_{out}=4.99k$ , 1%
9	Signal Ground	Ground
10	Current Monitor	0 to 10V=0 to 100% Rated Output, $Z_{out}=4.99k$ , 1%
11	X-ray Enable Input	Connect to Pin 12 to HV Enable Supply
12	X-ray Enable Output	+15V @ Open, $\leq 15mA$ @ Closed
13	Filament Monitor	1 Volt=1 Amp, $Z_{out}=10k\Omega$
14	X-ray On Output Signal	Open Collector, 35V @ 10mA Maximum
15	Spare	NC

### Typical DXM100 Cable Wiring



### RS-232 DIGITAL INTERFACE— J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	NC	No Connection
2	TX out	Transmit Data
3	RX in	Receive Data
4	NC	No Connection
5	SGND	Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

### USB DIGITAL INTERFACE— J4 4 PIN USB “B” CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	VBUS	+5 Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

### ETHERNET DIGITAL INTERFACE— J5 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX-	Receive Data -
7	NC	No Connection
8	NC	No Connection

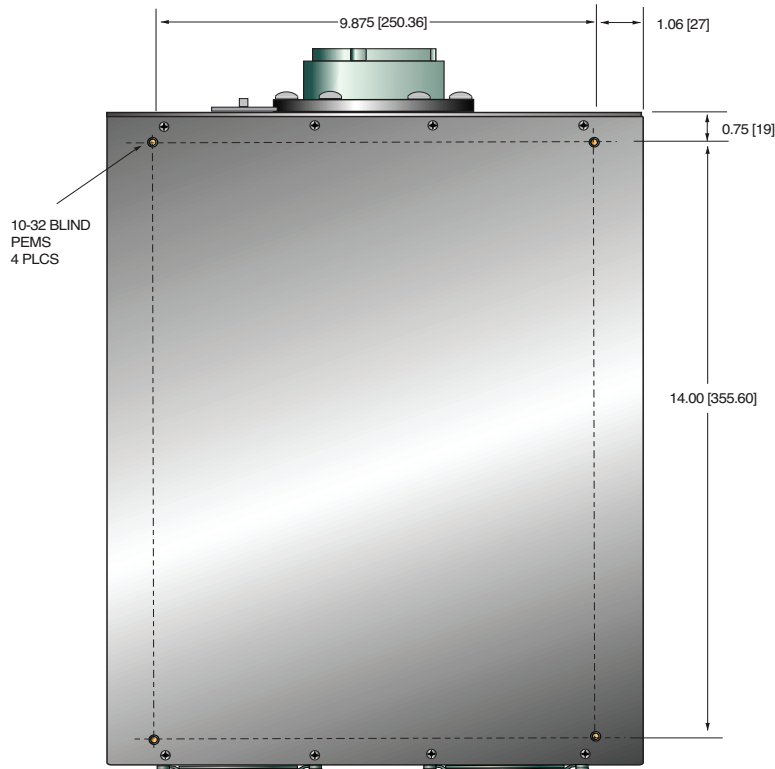
### J6 CA10 (R10) HV CONNECTOR

PIN	OUTPUT CONNECTION
C (common)	High Voltage Output
S (small)	High Voltage Output
L (large)	Filament Output

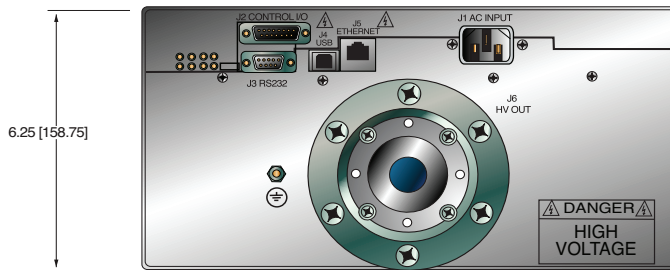
Note: No high voltage cable is provided

DIMENSIONS: in.[mm]

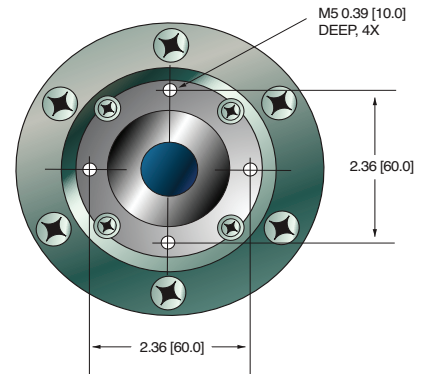
**BOTTOM VIEW**



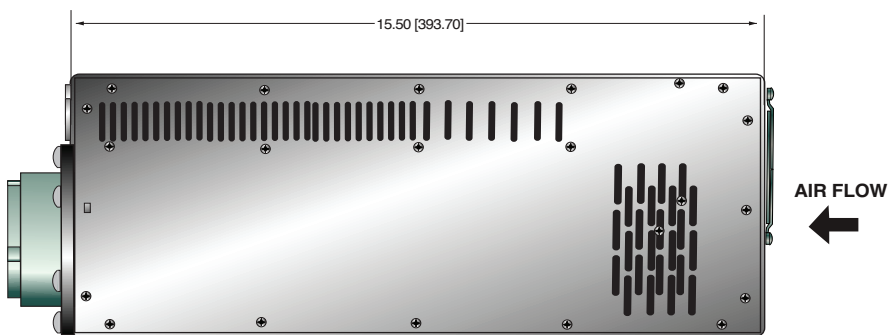
**FRONT VIEW**



**HIGH VOLTAGE  
MATING FLANGE  
BOLT CIRCLE DETAIL**



**SIDE VIEW**





Spellman's XLF Series of X-Ray generators are well regulated high voltage power supplies with output voltages to 60kV and very low ripple achieved through the use of advanced resonant conversion techniques. Extremely stable voltage and emission current outputs result in significant performance improvements over previously available technology. The XLF Series provides power, control and support functions required for X-Ray applications including a regulated ac filament supply referenced to the cathode. These units also incorporate local and remote programming, monitoring, safety interlock, short-circuit and overload protection.

## TYPICAL APPLICATIONS

Plastics Sorting  
Crystal Inspection  
Diamond Inspection

## OPTIONS

<b>APT</b>	Adjustable Power Trip
<b>AT</b>	Arc Trip
<b>SS(x)</b>	Non-Standard Slow Start
<b>NSS</b>	No Slow Start
<b>IO</b>	Instant ON
<b>SL</b>	Slides

## FRONT PANEL STATUS INDICATORS:

Overvoltage	Voltage Control Mode
Overtemperature	Current Control Mode
Regulation Error	Interlock Open
Arc	Interlock Closed
HV ON: Red	HV OFF: Green

## SPECIFICATIONS

### Input Voltage:

#### XLF 600W:

115Vac  $\pm 10\%$  @ 11.4A, 50-60Hz single phase  
220Vac  $\pm 10\%$  @ 5.9A, 50-60Hz single phase

#### XLF 1200W:

220Vac  $\pm 10\%$  @ 11.8A, 50-60Hz single phase

### Voltage and Current Control:

Local: continuously adjustable from zero to maximum rating via a ten-turn potentiometer  
Remote: 0 to +10Vdc proportional from 0 to full output  
Accuracy:  $\pm 1\%$   
Input Impedance: 10Mohm

- **Output Voltages to 60kV**
- **Integrated Floating Filament Supply**
- **Low Ripple**
- **"Hot Cathode"**
- **Negative Polarity**
- **Local & Remote Programming**
- **OEM Customization Available**

### Filament:

12 volts @ 5 amps, preheat level is 0.45 amps in standby

### Voltage Regulation:

Load: 0.005% of full output voltage no load to full load  
Line: 0.005% for input voltage range change

### Current Regulation:

Load: 0.05% of full current  $\pm 100\mu A$  from 0 to full voltage  
Line: 0.05% of rated current over specified input range

### Ripple:

0.03% rms below 1kHz  
0.75% rms above 1kHz

### Temperature Coefficient:

100ppm/ $^{\circ}C$ .

### Stability:

0.01%/8 hrs after 1/2 hour warm-up  
0.02% per 8 hours (typical)

### Cooling:

Fan cooled

### Metering:

Digital voltage and current meters (3.5 digits),  
1% accuracy

### Voltage and Current Monitors:

0 to +10Vdc proportional to rated output

### HV Output:

75kV, 3 conductor Federal Standard X-Ray connector

### I/O Connectors:

25 pin D-type for control interface with mating connector provided

### Dimensions:

3.5"H x 19"W x 20"D (8.9cm x 48.3cm x 50.8cm)

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

## Electronic Component (Power Source)

**XLF series is intended for installation as a component of a system.**

It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The XLF series is not intended to be operated by end users as a stand-alone device. The XLF series power supply can only be fully assessed when installed within a system, and as a component part within that system.

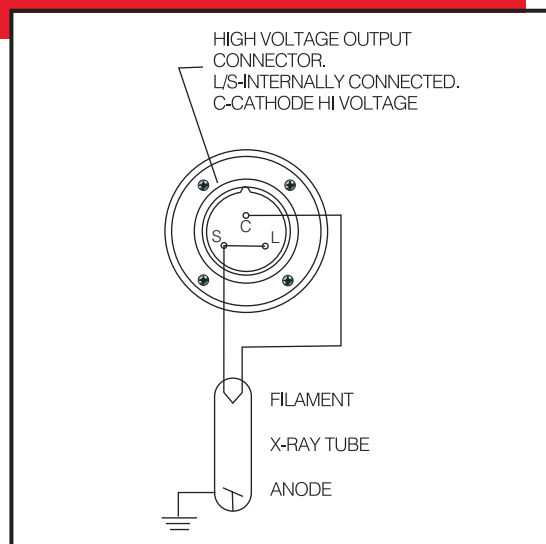
#### 600W, 1200W XLF SELECTION TABLE

600 Watt			1200 Watt		
kV	mA	Model	kV	mA	Model
30	20	XLF30N600	30	40	XLF30N1200
40	15	XLF40N600	40	30	XLF40N1200
50	12	XLF50N600	50	24	XLF50N1200
60	10	XLF60N600	60	20	XLF60N1200

#### JB1 CONNECTOR 25 PIN

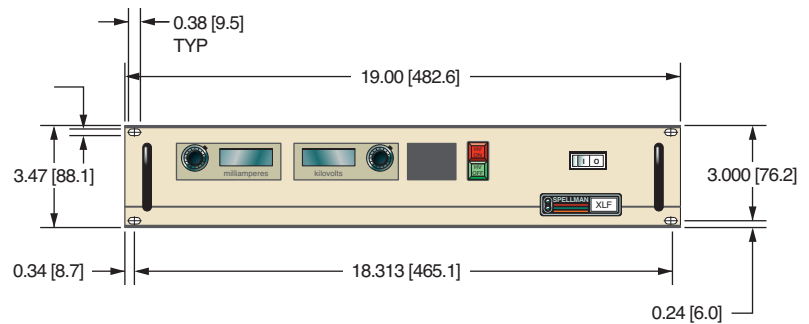
PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Common	Signal Ground
2	External Inhibit	Ground=Inhibit, Open=HV On
3	External Interlock	+15V at Open, <15mA at Closed
4	External Interlock Return	Return for Interlock
5	Current Monitor	0 to 10V=0 to 100% Rated Output
6	kV Test Point	0 to 10V=0 to 100% Rated Output
7	+10V Reference	+10Vdc @ 1mA Max
8	Remote Current Program In	0 to 10V=0 to 100% Rated Output
9	Local Current Program Out	Front Panel Program Voltage
10	Remote Voltage Program In	0 to 10V=0 to 100% Rated Output
11	Local Voltage Program Out	Front Panel Program Voltage
12	Power Monitor	0 to 10V=0 to 100% Rated Output
13	Remote Power Program In	(Optional)
14	Local HV Off Out	+15V at Open, <25mA at Closed
15	HV Off	Connect to HV OFF for Fp Operation
16	Remote HV On	+15V, 10mA Max=HV Off
17	Remote HV Off Indicator	0=HV On, +15V, 10mA Max=HV Off
18	Remote HV On Indicator	0=HV Off, +15V, 10mA Max=HV On
19	Remote Voltage Mode	Open Collector 50V Max, 10mA Max On=Active
20	Remote Current Mode	
21	Remote Power Mode	
22	Remote PS Fault	0=Fault, +15V, 0.1mA Max=No Fault
23	+15V Output	+15V, 100mA Max
24	Power Supply Common	Signal Ground
25	Shield Return	Shield Return

#### HIGH VOLTAGE CONNECTOR PINOUT

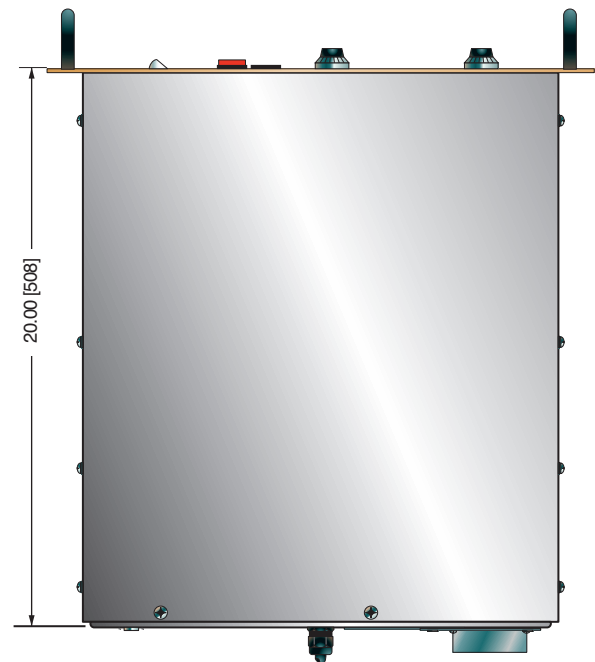


DIMENSIONS: in.[mm]

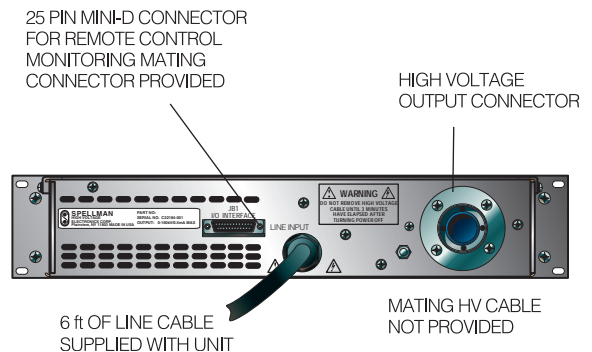
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW



**NOW AVAILABLE**

1800 Watt units specifically designed for the HP and HPX families of X-Ray tubes used in high speed digital and industrial CT applications.

- **160kV, 225kV, 320kV, 350kV and 450kV Models**
- **Complete X-Ray Generator Package**
- **Power Factor Corrected AC Input Circuitry**
- **Integrated Dual Filament Supplies**
- **Digital Interface—USB, Ethernet and RS-232**
- **Excellent Stability and Regulation**
- **Available with Black Powder Coated Finish**

Spellman's XRV series of X-Ray high voltage power supplies sets the standard for compact 1.8kW to 6.0kW, high performance X-Ray inspection generators. Spanning an output voltage range of 160kV to 450kV in negative, positive or bipolar output configurations, there's a model available for virtually every application requirement.

Active power factor correction circuitry reduces input current requirements while minimizing line related EMI. Spellman's proprietary inverter topology allows for unprecedented efficiencies and power densities. A solid encapsulated high voltage section further reduces size and weight and provides reliable, maintenance free operation.

DSP based SMT control circuitry provides your choice of USB, Ethernet and RS-232 along with analog interfacing, simplifying OEM system integration. The two DC output, current regulated filament power supplies are controlled via sophisticated emission current regulation circuitry to provide accurate and stable X-Ray tube currents. Comprehensive fault diagnostic circuitry, and Arc Sense, Arc Quench and Arc Count functionality is also incorporated into this compact, space saving X-Ray generator.

**TYPICAL APPLICATIONS**

Non Destructive Testing  
X-Ray Scanning  
Security Applications  
Medical Applications

**OPTIONS**

**400Vac  $\pm 10\%$  (6kW only)**  
**GUI Control Software for XRV**  
**XRVC (XRV Controller)**

**SPECIFICATIONS****Input Voltage:****1.8kW, 3.0kW, 4.0kW and 4.5kW models:**

180-264Vac, single phase, 47-63 Hertz, active power factor corrected input to  $\geq 0.98$

**6.0kW models:**

208 or 400Vac,  $\pm 10\%$ , three phase, 47-63 Hertz, passive power factor corrected

**Input Current:**

1.8kW, 3.0kW, 4.0kW and 4.5kW models: <30 amps

6.0kW models: <25 amps per phase for 208Vac

<15 amps per phase for 400Vac

**Output Voltage:**

Accuracy: 0.25%

Stability:  $\leq 0.1\%$  per 8 hours, after 1 hour warm up

**1.8kW, 3.0kW, 4.0kW and 4.5kW models:**

Load:  $\pm 0.05\%$  of rated output voltage for a full load change

Line:  $\pm 0.05\%$  of rated output voltage over specified input voltage range

**6.0kW models:**

Load:  $\pm 0.1\%$  of rated output voltage for a full load change

Line:  $\pm 0.1\%$  of rated output voltage over specified input voltage range

**Output Polarity:**

See "model selection" table

**Output Current:**

See "model selection" table

**Ripple:**

See "model selection" table

**Temperature Coefficient:****1.8kW, 3.0kW, 4.0kW and 4.5kW models:**

$\pm 50\text{ppm}/^\circ\text{C}$

**6.0kW models:**

$\pm 50\text{ppm}/^\circ\text{C}$

**Emission Current:**

Accuracy: 0.25%

Stability: 100ppm/ $^\circ\text{C}$

**1.8kW, 3.0kW, 4.0kW and 4.5kW models:**

Load:  $\pm 0.05\%$  of rated output current for a change from 30% to 100% of rated output voltage

Line:  $\pm 0.05\%$  of rated output current over specified input voltage range

**6.0kW models:**

Load:  $\pm 0.1\%$  of rated output current for a change from 30% to 100% of rated output voltage

Line:  $\pm 0.1\%$  of rated output current over specified input voltage range

**Filament:**

Output:

0-6 amps at a compliance of 10Vdc, maximum

Dual Focal Spot:

Small and large, selectable via interface signal

Configuration:

DC filament drive. Closed loop emission control regulates filament setting to provide desired X-Ray tube emission current

### Control Interface:

Remote Interface:

Analog, USB, Ethernet and RS-232 are standard

Control Software:

A Windows graphical user interface example is provided.

### Environmental:

Temperature Range:

Operating: 0°C to 50°C

Storage: -40°C to 85°C

Humidity:

20% to 85% RH, non-condensing.

### Mains Input Connector:

**1.8kW, 3.0kW, 4.0kW and 4.5kW models:**

Type 97-3102A-24-11P

**6.0kW models:**

Type 97-3102A-24-22P

### Interface Connectors:

Digital—Ethernet, RS-232 and USB

Analog—25 pin connector

### Output Connector:

See "model selection" table

### Cooling:

Forced air

### Regulatory Approvals:

Compliant to EEC EMC Directive/Compliant to EEC Low Voltage Directive. UL/CUL recognized, File E227588. RoHS Compliant.

### GUI Control Software for the XRV



- Automatic warm-up of the X-Ray tube
- Max watts operation
- Timed or Continuous Exposure modes
- Configuration menu for user options setting of HVPS
- Fault and status monitor

GUI is specifically designed for controlling XRV series power supplies. As an alternative to the analog control, the GUI will allow the user to control all necessary functions of the HVPS from a user-friendly windows based menu. Additionally the GUI can be used as a diagnostic tool when the HVPS is controlled via the analog interface.



## XRV160/320/350 SPECIFICATIONS

	XRV160*1800	XRV160*3000	XRV160*4000	XRV160*6000	XRV320P&N1800	XRV320P&N4500	XRV350P&N4500
DC Output Voltage	5kV to 160kV	5kV to 160kV	5kV to 160kV	5kV to 160kV	5kV to ±160kV	5kV to ±160kV	5kV to ±175kV
Polarity*	Pos or Neg	Pos or Neg	Pos or Neg	Pos or Neg	Bipolar	Bipolar	Bipolar
Output Rated Current	0-30mA	0-30mA	0-50mA	0-50mA	0-30mA	0-30mA	0-30mA
Output Power	1.8kW	3.0kW	4.0kW	6.0kW	1.8kW	4.5kW	4.5kW
Ripple/Noise (p-p)	<0.025%	<0.05%	<0.1%	<0.25%	<0.025%	<0.1%	<0.1%
Dimensions	10.09" H x 17.16" W x 24" D (256mm x 436mm x 609mm)				2X 10.09" H x 17.16" W x 24" D (256mm x 436mm x 609mm)		
Weight	150 lbs. (68kg)	150 lbs. (68kg)	150 lbs. (68kg)	155 lbs. (70.3kg)	300 lbs. (136 kg)	300 lbs. (136 kg)	300 lbs. (136 kg)
Output Connector	R24	R24	R24	R24	Two R24	Two R24	Two R24

## XRV225/450 SPECIFICATIONS

	XRV225*1800	XRV225*3000	XRV225*4000	XRV225*6000	XRV450P&N1800	XRV450P&N4500
DC Output Voltage	5kV to 225kV	5kV to 225kV	5kV to 225kV	5kV to 225kV	5kV to ±225kV	5kV to ±225kV
Polarity*	Pos or Neg	Pos or Neg	Pos or Neg	Pos or Neg	Bipolar	Bipolar
Output Rated Current	0-30mA	0-30mA	0-30mA	0-30mA	0-30mA	0-30mA
Output Power	1.8kW	3.0kW	4.0kW	6.0kW	1.8kW	4.5kW
Ripple/Noise (p-p)	<0.025%	<0.05%	<0.1%	<0.25%	<0.025%	<0.1%
Dimensions	15.90" H x 17" W x 30.72" D (404mm x 432mm x 780mm)				2X 15.90" H x 17" W x 30.72" D (404mm x 432mm x 780mm)	
Weight	240 lbs. (109kg)	240 lbs. (109kg)	240 lbs. (109kg)	240 lbs. (109kg)	480 lbs. (218 kg)	480 lbs. (218 kg)
Output Connector	R28	R28	R28	R28	Two R28	Two R28

Units are available in positive output polarity without filament, see model selection table for ordering details.

\*Specify "P" for positive or "N" for negative polarity.

### J1 HV CONNECTOR—R24/R28

PIN	SIGNAL	PARAMETERS
C	HV Output	XRV160 and XRV320—R24 Connector XRV225 and XRV450—R28 Connector
S	Small Filament Output	0 to 6 amps @ 10Vdc
L	Large Filament Output	0 to 6 amps @ 10Vdc

### J2 ANALOG INTERFACE—25 PIN D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Fault	Low, sum of faults, HVPS detected a fault, open collector, 50V @ 10mA max
2	mA Program	0 to 10V FS Z in = 10M ohms
3	kV Program	0 to 10V FS Z in = 10M ohms
4	Filament Limit L/S Ref.*	0 to 10V FS Z in = 10M ohms
5	Filament Preheat L/S Ref.*	0 to 10V FS Z in = 10M ohms
6	kV Monitor	0 to 10V FS Z out = 4.99k ohms
7	mA Monitor	0 to 10V FS Z out = 4.99k ohms
8	Filament Current Monitor*	0 to 10V FS Z out = 4.99k ohms
9	Signal Ground	Ground
10	X-Ray Enable	+24Vdc = X-Ray ON, connect to pin 14 with dry contact relay
11	Filament ON*	Filament ON status, low, filament is ON open collector 50V, @ 10mA max
12	Interlock 1	Active low, interlock is closed, safe to enable HV
13	Interlock 2	Active low, interlock is closed, safe to enable HV
14	+24Vdc	+24Vdc @ 100mA, maximum
15	Filament Enable*	Active low, turn filament ON
16	Filament Control*	Active low, filament is regulated by ECR (HV must be ON). Not active, the filament is regulated by the preheat reference
17	Filament L/S Select	Filament selection large or small, low = small spot is selected
18	Filament L/S Confirm	Open collector, 50V @ 10mA max Filament selection confirm, low = small spot is selected
19	HVPS RDY	Low = HVPS ready, open collector, 50V @ 10mA max
20	X-Ray ON	X-Ray ON status, low = X-Rays are ON open collector, 50V @ 10mA max
21	Interlock Status	Low, interlocks are closed, can enable HV open collector, 50V @ 10mA max
22	GND	Digital ground
23	X-Ray ON Pre-Warn	Pre-warning, low, before X-Ray ON open collector, 50V @ 10mA max
24	Reset	Active low, minimum 10mS transition
25	Arc fault	Low, arc fault, the HVPS has detected an arc open collector, 50V @ 10mA max

\*Not active on positive models

### MODEL SELECTION TABLE

MODEL	VOLTAGE	POWER	POLARITY
XRV160*1800	160kV	1.8kW	Pos or Neg
XRV160*3000	160kV	3.0kW	Pos or Neg
XRV160*4000	160kV	4.0kW	Pos or Neg
XRV160*6000/208V	160kV	6.0kW	Pos or Neg
XRV160*6000/400V	160kV	6.0kW	Pos or Neg
XRV225*1800	225kV	1.8kW	Pos or Neg
XRV225*3000	225kV	3.0kW	Pos or Neg
XRV225*4000	225kV	4.0kW	Pos or Neg
XRV225*6000/208V	225kV	6.0kW	Pos or Neg
XRV225*6000/400V	225kV	6.0kW	Pos or Neg
XRV320P&N1800	±160kV	1.8kW	Bipolar
XRV320P&N4500	±160kV	4.5kW	Bipolar
XRV350P&N4500	±175kV	4.5kW	Bipolar
XRV450P&N1800	±225kV	1.8kW	Bipolar
XRV450P&N4500	±225kV	4.5kW	Bipolar

\*Specify P for positive polarity and N for negative polarity. Positive polarity models do not have integrated filament power supplies. Contact Spellman for custom output voltage/power models.

### RS-232 DIGITAL INTERFACE—J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX out	Receive Data
3	RX in	Transmit Data
4	N/C	No Connection
5	SGND	Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

### ETHERNET DIGITAL INTERFACE—J4 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX-	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

### USB DIGITAL INTERFACE—J5 4 PIN USB “B” CONNECTOR

PIN	SIGNAL	PARAMETERS
1	VBUS	+5 Vdc
2	D-	Data -
3	D+	Data +
4	GND	Ground

### JB1 MAIN AND AUXILIARY INPUT POWER—TYPE 97-3102A-24-11P (Single Phase Units)

PIN	SIGNAL	PARAMETERS
A	Auxiliary AC Line Power	180-264Vac
B	Auxiliary Ground	Ground
C	Auxiliary AC Neutral	Neutral
D	Main AC Line Power	180-264Vac
E	Main Ground	Ground
F	Main AC Neutral	Neutral

### JB1 MAIN AC INPUT POWER—TYPE 97-3102A-24-22P (Three Phase Units)

PIN	SIGNAL	PARAMETERS
A	Line 1	208Vac, ±10%, 50/60Hz @ 25 amps
B	Line 2	208Vac, ±10%, 50/60Hz @ 25 amps
C	Line 3	208Vac, ±10%, 50/60Hz @ 25 amps
D	GND	Ground

Note: Use 4 conductor cable or single isolated wires rated no less than 600Vac, 30 amps (10AWG, minimum)

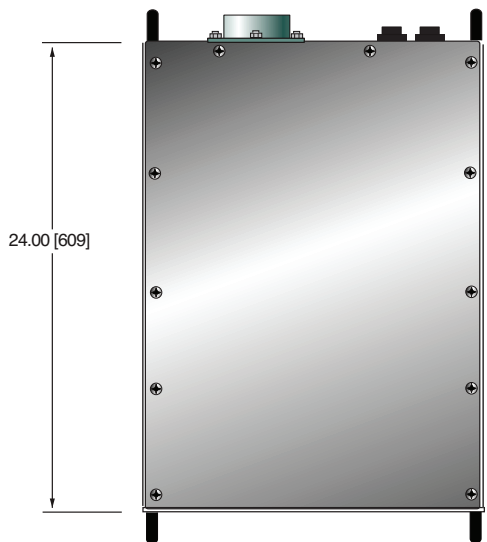
### JB2 AUXILIARY AC INPUT POWER—TYPE 97-3102A-20-3P (Three Phase Units)

PIN	SIGNAL	PARAMETERS
A	Line 1	208Vac, ±10%, 50/60Hz (source 3 phase L1, L2)
B	Line 2	208Vac, ±10%, 50/60Hz (source 3 phase L1, L2)
C	GND	Ground

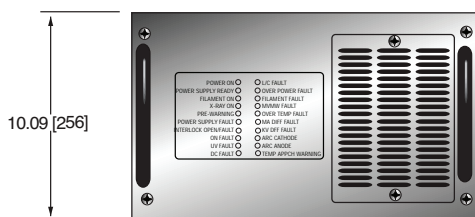
System Ground: System ground wires (10AWG minimum) to the ground terminal E1 GND to the power supply using ground stud M6 X 20MM, with M6 nut.

### XRV160

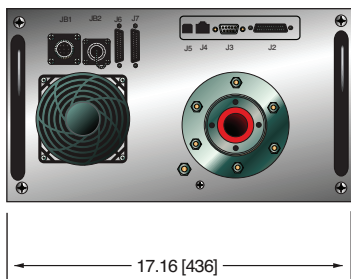
#### TOP VIEW



#### FRONT VIEW



#### REAR VIEW

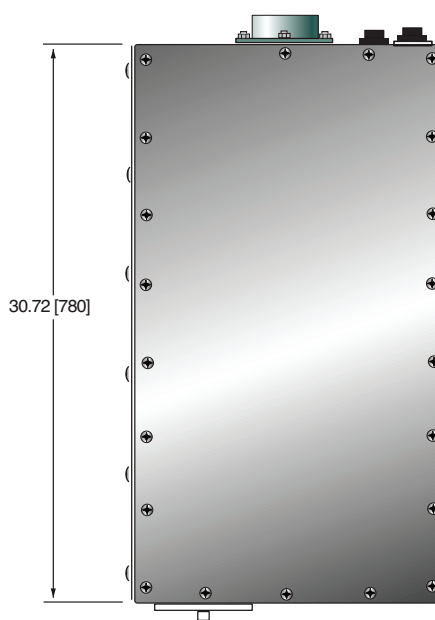


XRV320 is comprised of two XRV160 units configured in a bipolar arrangement

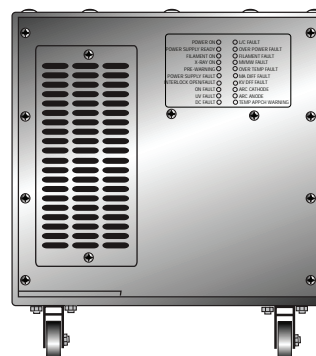
DIMENSIONS: in.[mm]

### XRV225

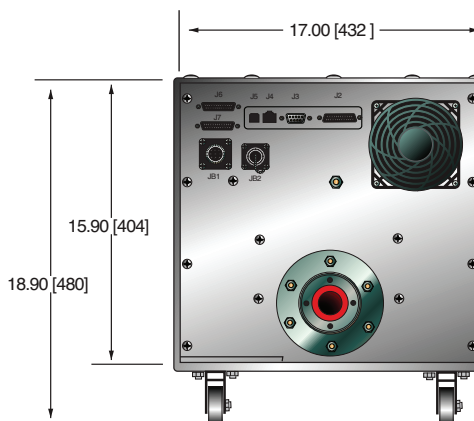
#### TOP VIEW



#### FRONT VIEW



#### REAR VIEW



XRV450 is comprised of two XRV225 units configured in a bipolar arrangement





- **Ideal for Common XRD & XRF X-Ray Tubes**
- **Compact Size, 5 1/4" (3U) High Chassis**
- **Solid Encapsulation Insures Maintenance-Free Operation**
- **Auto Ramp of the HV Emission Current to Preset Values**
- **OEM Customization Available**

Spellman's DF/FF Series of X-Ray Generators feature our new inverter design which incorporates IGBTs for power switching and provides new levels of reliability. In addition, re-engineering of the DF/FF's internal filament power supply eliminates audio noise at normal operating levels by operating at a higher frequency. The DF/FF's utilize a sine wave current source, produced by phase shifting series resonant circuits at switching frequencies greater than 20kHz to generate high voltage dc. This technique eliminates undesirable electromagnetic radiation normally associated with switching and power control regulators. The high efficiency of these units allows for air cooling in a 5.25" (3U) high chassis.

#### TYPICAL APPLICATIONS

X-Ray Diffraction (XRD)  
X-Ray Fluorescence (XRF)

#### OPTIONS

**220FSI** 220Vac Fail Safe Interlock  
**208-3P** 208Vac Three Phase Input

#### SPECIFICATIONS

##### Input Voltage:

220Vac  $\pm 10\%$ , 50-60Hz, single phase (three phase optional)

##### Input Current:

3kW: 220Vac @ 29.5A, single phase  
208Vac @ 12.8A/phase, three phase  
4kW: 220Vac @ 39.3A, single phase  
208Vac @ 17.0A/phase, three phase

##### Output Voltage:

**DF3:** 0 to 60kV negative polarity  
**FF3:** 0 to 60kV positive polarity  
Other output voltages are available

##### Output Current:

**DF3:** 0 to 80mA  
**FF3:** 0 to 100mA  
Other output currents are available

##### Maximum Output Power:

3kW (4kW optional)

##### Output Voltage Regulation:

Load: 0.005% of rated output for full load change  
Line: 0.005% of rated output over specified input range  
Temperature Coefficient: 50 ppm/ $^{\circ}\text{C}$  (20 ppm/ $^{\circ}\text{C}$  optional)  
Long Term Stability: 0.01%/8 hours.

##### Emission Current Regulation:

Load: 0.01% of rated output for a 10 to 60kV change  
Line: 0.005% of rated output over specified inputs  
Temperature Coefficient: 50 ppm/ $^{\circ}\text{C}$   
Long Term Stability: 0.01%/8 hours

##### Ripple:

0.03% rms <1kHz, 0.75% rms above 1kHz

##### Environmental:

Temperature Range:  
Operating: 0 $^{\circ}\text{C}$  to 40 $^{\circ}\text{C}$   
Storage: -20 $^{\circ}\text{C}$  to 85 $^{\circ}\text{C}$   
Humidity:  
10% to 90%, non-condensing

##### Filament Voltage:

**DF:** 12Vac  
**FF:** 12Vdc

##### Filament Current:

5A (up to 12A max available)

##### Dimensions:

5.25"(3U) H x 19" W x 22" D (13.3cm x 48.3cm x 55.9cm)

##### Weight:

90lbs (40kg)

##### Regulatory Approvals:

Compliant to EEC EMC Directive.  
Compliant to EEC Low Voltage Directive.

#### ADDITIONAL FEATURES

##### Water Flow Switch:

A 24Vdc signal is available on the rear panel to turn on the cooling water to the X-Ray tube. This signal can be enabled either when control power is on or when the high voltage is turned on. (Customer must specify)

##### Fail Safe Interlock:

A 24Vdc signal is available on the rear panel to energize an external X-Ray on lamp. This signal is energized when the high voltage is turned on. High voltage will not enable if this circuit is open. (A 220Vac signal is optional)

##### Preheat and Ramp:

Automatic preheat and ramp control circuits are provided which ramp the kV and mA slowly to set levels. kV ramps in approximately 10 seconds while mA ramps in approximately 20 seconds.

##### Output Connector:

75kV, 3 conductor Federal Standard X-Ray connector. 60kV is connected to terminal "C". Terminals "S" and "L" are jumped together. The filament output is connected between terminals "C" and "S". Other configurations are optional. (On the FF3, all output connections S, L, & C are connected together)

##### Remote Signal Connector:

Remote interface is available via a 50 pin mini D connector. Extensive remote programming and monitoring is provided.

### Electronic Component (Power Source)

**DF/FF series is intended for installation as a component of a system.**

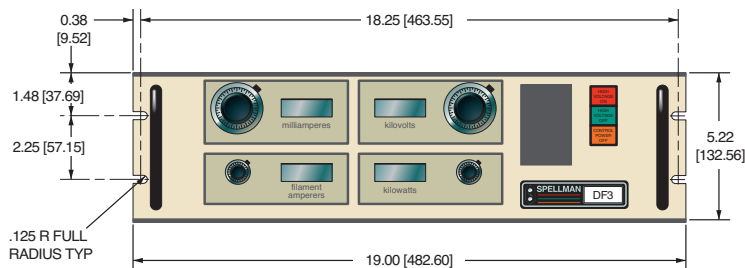
It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The DF/FF series is not intended to be operated by end users as a stand-alone device. The DF/FF series power supply can only be fully assessed when installed within a system, and as a component part within that system.

### JB1 MINI D CONNECTOR 50 PIN

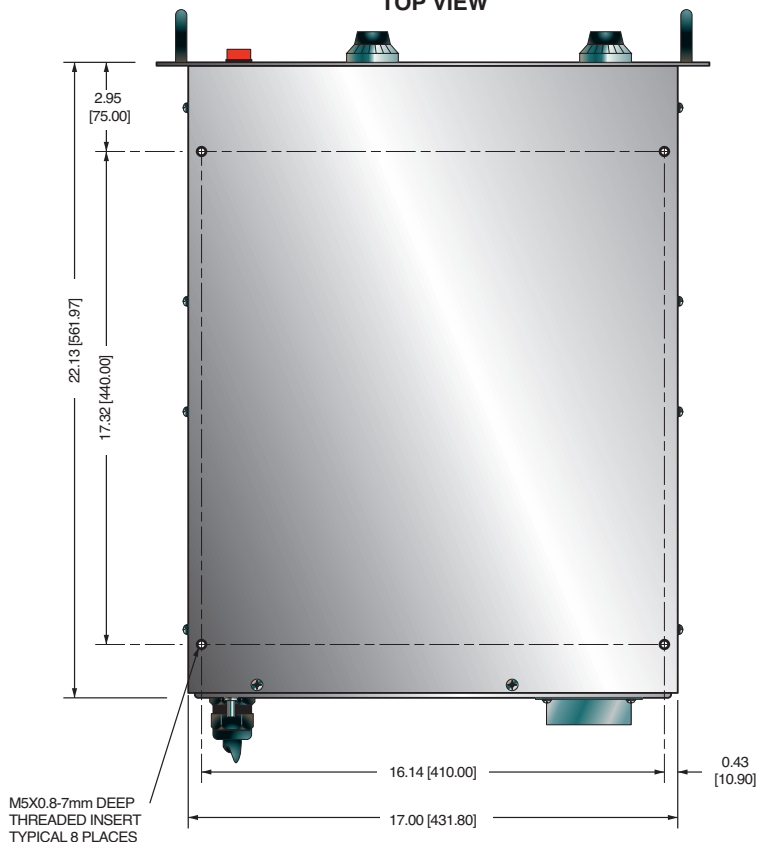
PIN	SIGNAL
1	+5Vdc (or connect to pin-11)
2	Control Power On
3	Intlk
4	X-Ray On
5	X-Ray Off
6	Spare
7	Spare
8	Reset
9	Rmt/Lcl
10	24V Switched
11	+5Vcch
12	X-Ray On Status
13	Overvoltage
14	kV Min
15	Overpower
16	Filament Current Limit
17	mA Current Limit
18	LCL Status
19	Power Supply Fault
20	Gnd
21	Spare
22	(DF) Remote X-Ray On
23	(DF) Remote X-Ray On Ret
24	Spare
25	Gnd
26	kV Ref
27	kV Com
28	mA Ref
29	mA Com
30	Spare
31	Spare
32	Spare
33	Pwr. Limit (OL Ref)
34	Pwr. Limit Com (OL Com)
35	Filament Current Limit
36	Filament Current Limit Com
37	Spare
38	kV Monitor
39	mA Monitor
40	Spare
41	Spare
42	kV Ref Mon
43	mA Ref Mon
44	Spare
45	Spare
46	Filament Monitor
47	Mon Common
48	Spare
49	Gnd
50	Spare

DIMENSIONS: in. [mm]

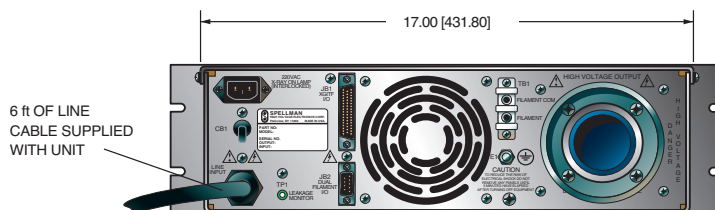
### FRONT VIEW



### TOP VIEW



### BACK VIEW



Cost reduced version for OEM quantities available, contact Sales.





Spellman's VMX redefines the standard for high performance, low cost Mammography X-Ray generators. The VMX was born from an integrated, high performance, value added design perspective so there's no need to compromise critical specifications to meet ever demanding system price targets.

The 40kV/5kW X-Ray generator integrates a dual filament power supply and a dual speed starter. A DC current source filament power supply provides fast rise times with stable and accurate X-Ray tube emission currents. The solid encapsulated high voltage output section eliminates oil concerns while reducing the effects of environmental humidity and contamination.

Flexibility in interfacing is provided via RS-232 and optional Ethernet connectivity. The VMX supports advanced mammography application features including Smart AEC Exposure, Automatic Filament Calibration, Tube Anode Heat Calculator and user configurable Tube Library. Compact, full featured, high performance, low cost. Spellman's VMX, the next generation Mammography X-Ray generator.

## SPECIFICATIONS

### Input Voltage:

200-240Vac ( $\pm 10\%$ ), single phase, 50Hz/60Hz

### Input Current:

Minimum 35A service recommended for 5kW operation  
External EMC Filter (Schaffner FN2070-36-08-36A)  
required to meet CE/EMC specifications – Not provided with the generator  
Mains Contactor – Not provided within the generator.  
Customer is responsible for mains safety disconnection.

### Output Voltage

#### Output Voltage Range:

20kV to 40kV

#### Polarity:

Positive, grounded cathode X-Ray tube

#### Accuracy:

Within 1% of programmed values

#### Reproducibility:

<0.5%

#### Settling Time:

<10ms

- **Custom Designed Specifically for Mammography Applications**
- **Compact Space Saving Modular Format**
- **Fast Settling Helps Minimize Unnecessary Patient Radiation Exposure**
- **Dual Speed Starter, Boost/Brake Capability**
- **RS-232 and Optional Ethernet Interfaces**
- **Low Cost, Value Added Design**

### Ripple:

$\leq 1\%$

### Stability:

$\leq 0.01\%$  per 8 hours

### Temperature Coefficient:

$\leq 100\text{ppm}/^\circ\text{C}$

### Output Current/Power

#### Output Current Range:

10mA to 200mA

#### Output Power:

5kW @ 0.1 second loading time  
30W maximum average power

### Maximum mAs:

600mAs

### Exposure Timer:

5ms-10 seconds

### Accuracy:

Within 2% of programmed values measured after mA rises to stable DC level

### Reproducibility:

<0.5%

### Settling Time:

<10ms

### Filament Configuration:

DC filament drive: self corrected filament preheat settings with closed loop emission control and smart learning algorithm

### Filament Output:

0-6 amps at a compliance of 5.5 volts, maximum

### Dual Speed Starter:

High speed (180Hz) and low speed (60Hz) can be configured via the serial interface.  
Boost and Brake capability provided.

### High Voltage Connector:

60kV, Claymount CA-3 type or equivalent

### Optional Communication Interface:

Ethernet (RJ45)

### Grounding Point:

M5 ground stud provided on chassis

### Environmental:

Temperature Range:  
Operating:  $10^\circ\text{C}$  to  $40^\circ\text{C}$   
Storage:  $-40^\circ\text{C}$  to  $85^\circ\text{C}$   
Humidity:  
20% to 85% RH, non-condensing.

## Cooling:

Convection cooled, no internal fans.  
Forced air cooling not required

## Dimensions:

9.38" H X 6.6" W X 12" D  
(237.5mm x 167.6mm x 304.8mm)

## Weight:

<22 pounds (10kg)

## Regulatory Approvals:

Compliant to EMC:IEC 60601-1-2. UL/CUL  
recognized file E242584. RoHS compliant.

## Application Features:

- 2 point/3 point exposure modes
- AEC/Smart AEC exposure modes
- Automatic filament current calibration
- Tube anode heat calculator
- User configurable tube library

## TB2 ROTOR INTERFACE

PIN	SIGNAL	PARAMETERS
TB2-1	PHASE	To tube auxiliary winding
TB2-2	RUN	To tube principle winding
TB2-3	COM	To tube common winding
TB2-4	GROUND	To tube housing ground

## TB3 TUBE AND INTERLOCK INTERFACE

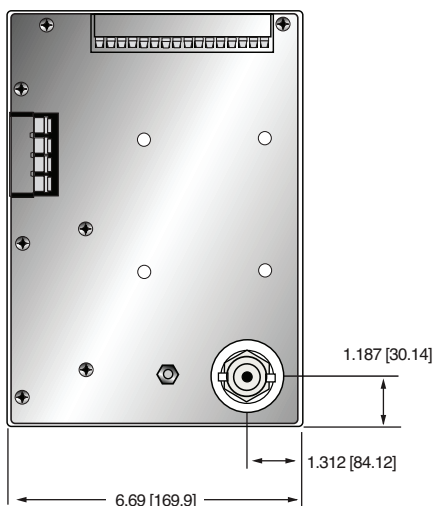
PIN	SIGNAL	PARAMETERS
TB3-1	SMALL FIL	Connection to tube small filament
TB3-2	COMMON	Connection to tube filament common
TB3-3	LARGE FIL	Connection to large filament
TB3-4	GROUND	Generator chassis for cable shield connection
TB3-5	Interlock 2+	Used if tube has separate thermostat switch.
TB3-6	Interlock 2-	Open = OVER TEMP. (short terminals if not used)
TB3-7	Interlock 3+	Used if tube has cooling circulator flow switch.
TB3-8	Interlock 3-	Open = NO FLOW. (short terminals if not used)
TB3-9	Safety Interlock+	User signal (Contact Closure) for safety interlocks such as door interlocks. Open turns HV OFF, or inhibits HV from being generated. Closed = OK 24Vdc @ <1A typical
TB3-10	Safety Interlock-	
TB3-11	Contact Coil+	Option for contactor coil control
TB3-12	Contact Coil-	
TB3-13	Spare	N/C
TB3-14	Spare	N/C
TB3-15	Tube Current+	Tube current flows out from this pin
TB3-16	Tube Current-	Tube current flows into this pin

## VMX STANDARD SYSTEM INTERFACE— JB1 25 PIN MALE D CONNECTOR

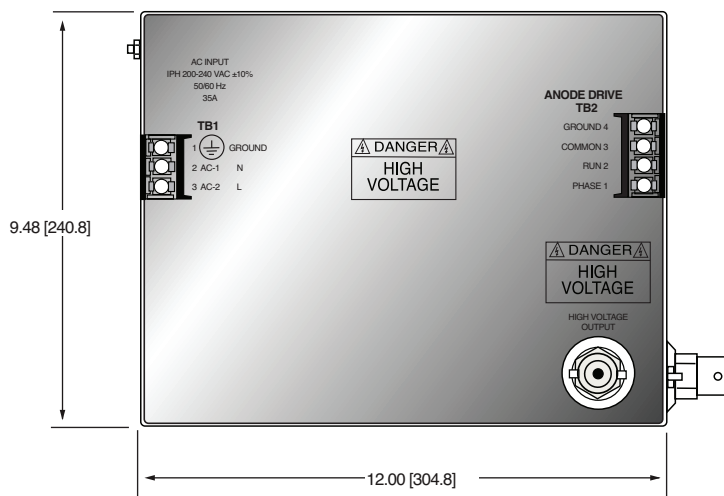
PIN	SIGNAL	PARAMETERS
1	GND	Signal Ground
2	+5Vdc Out	+5Vdc, 100mA max.
3	RS-232 Tx Out	RS-232 Transmit
4	RS-232 Rx In	RS-232 Receive
5	PREP	User signal (Contact Closure) to alert the generator that exposure sequence will begin. Once this signal is active, exposure parameters are locked in and cannot be changed. The generator enables the starter to boost the rotor. Contact connection to pin 24. Closed = PREP, the filament is placed in preheat mode
6	READY	Generator signal to user to indicate the rotor runs to speed and the generator is ready for X-Ray exposure Open Collector. Low/Active = Ready
7	ROTOR SHUTDOWN	User signal to brake the rotor drive
8	EXPOSURE	User signal (Contact Closure) to generator to generate X-Rays. Filament is boosted, and high voltage is generated after the boost time. Contact connection to pin 24. Closed = Exposure
9	X-Ray ON 75% Status	Transistor output to indicate X-Ray ON status synchronized with 75% of kVP setting point.
10	X-Ray ON Status	Transistor output to indicate X-Ray ON status synchronized with kV start up.
11	N/C	N/C
12	X-Ray SHUTDOWN/AEC	User signal to generator to rapidly turn HV OFF and ON during serial exposure sequence
13	RS-232 ISO Ground	Isolated ground from RS-232 transceiver IC
14	HVG FAULT Status	Generator signal indicating generator fault. Open collector transistor output. Low/Active = Fault
15	Status Bit 1	3 bit status lines for up to 6 status messages. See separate matrix describing functionality. Open Collector. Low/Active = Message
16	Status Bit 2	
17	Status Bit 3	
18	N/C	N/C
19	N/C	N/C
20	kV Monitor	Signal from generator. 0-10V = 0-40kV. Zout = 1kΩ
21	Emission Monitor	Signal from generator. 0-10V = 0-200mA. Zout = 1kΩ
22	Filament Current Monitor	Signal from generator. 0-10V = 0-6A. Zout = 1kΩ
23	Program/Monitor Return	Ground for reference of program and monitor signals
24	+24Vdc Out	For connection to PREP and EXPOSURE control relay coils
25	SHIELD/GND	For connection of interface cable shield to generator chassis ground

DIMENSIONS: in.[mm]

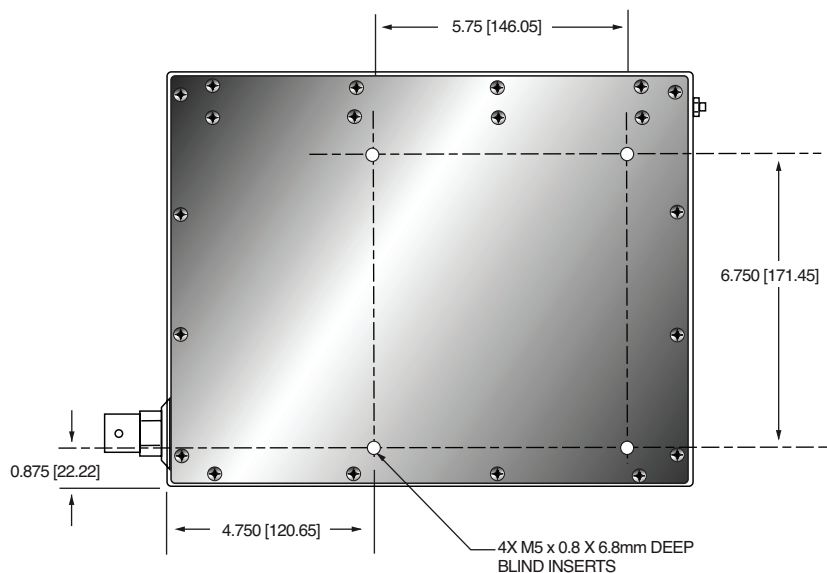
FRONT VIEW



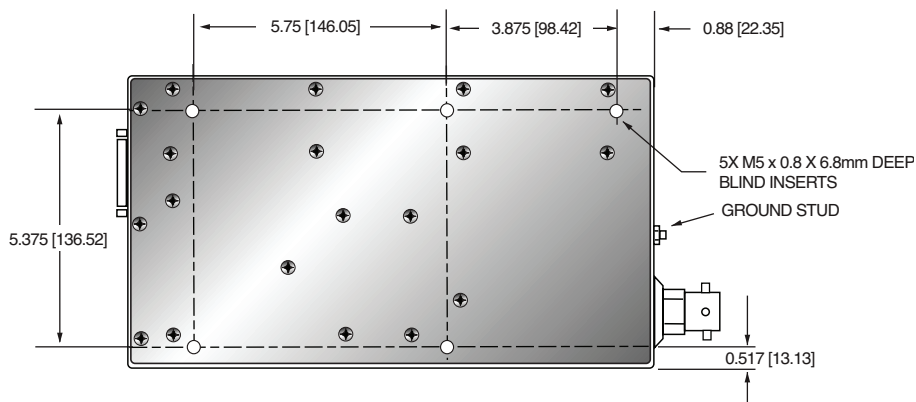
TOP VIEW



BOTTOM VIEW



SIDE VIEW





- **Custom Designed Specifically for Mammography Applications**
- **Compact Space Saving Modular Format**
- **Fast Rise and Fall Times Help Minimize Unnecessary Patient Radiation Exposure**
- **Dual Speed Starter, Boost/Brake Capability**
- **RS-232 and Optional Ethernet Interfaces**

Spellman's PMX is a high performance X-Ray generator designed specifically for mammography applications including FFDM and DBT. It features 2 and 3 point exposure modes as well as smart AEC with a pre exposure.

The PMX is a 5kW high frequency X-Ray generator integrated with a dual filament power supply, and a dual speed X-Ray tube starter. Due to the PMX's superior power conversion technology and inverter design it can provide stable and accurate X-Ray tube high voltage with fast rise and fall times.

Smooth system integration of the PMX is accomplished through the use of RS-232 and optional Ethernet digital interface, preloaded X-Ray tube parameters, easy access interlocks and I/O connections, and internal generator diagnostics. Optional GUI utility software is also offered to help with initial system integration.

## SPECIFICATIONS

### Input Voltage:

200-240Vac ( $\pm 10\%$ ), single phase, 50Hz/60Hz

### Input Current:

Minimum 35A service recommended for 5kW operation  
External EMC Filter (Schaffner FN2070-36-08-36A) required to meet CE/EMC specifications – Not provided  
Mains Contactor – Not provided  
Customer is responsible for mains safety disconnection.

### Output (Tube) Voltage

#### Output Voltage Range:

20kV to 49kV

#### Polarity:

Positive, grounded cathode X-Ray tube

#### Accuracy:

2% (measured per IEC60601-2-45)

#### Reproductibility:

<0.5%

#### Rise Time:

<1ms to within 98% of the programmed voltage

#### Fall Time:

<10ms with a max HV cable length of 8 feet (2.4 meters)

#### Ripple:

$\leq 4\%$  p-p

### Output (Tube) Current/Power:

#### Output Current Range:

10mA to 200mA

#### Output Power:

5kW @ 0.1 second loading time,  
300 Watts maximum average power

#### Accuracy:

<  $\pm 10\%$  on exposure less than 10ms  
(measured per IEC60601-2-45)

#### Rise Time:

<1ms to within 95% of the programmed mA value

#### Fall Time:

<10ms with a maximum HV cable length  
of 8 feet (2.4 meters)

### Exposure Time (Loading Time):

#### Maximum Single Exposure Time:

10 seconds

#### Shortest Single Exposure Time:

5ms

#### Loading time accuracy:

$\pm 3\% + 1\text{ms}$  (measured per IEC60601-2-45)

#### Maximum mAs:

600mAs

#### Exposure Timer:

5mS-10 seconds

#### Accuracy:

<  $\pm 10\%$  (measured per IEC60601-2-45)

#### Reproductibility:

<0.5%

### Filament Configuration:

DC filament drive: self corrected filament preheat settings with closed loop emission control and smart learning algorithm

#### Filament Output:

0-6 amps at a compliance of 5.5 volts, maximum.

#### Dual Speed Starter:

High speed (180Hz) and low speed (60Hz) can be configured via the serial interface.  
Boost and Brake capability provided.

## High Voltage Connector:

60kV, Claymount CA-3 type or equivalent

## Communication Interface:

RS-232 standard, optional Ethernet

## Grounding Point:

M5 ground stud provided on chassis

## Environmental:

Temperature Range:

Operating: 10°C to 40°C

Storage: -40°C to 85°C

Humidity:

20% to 85% RH, non-condensing.

## Cooling:

Internal fan

## Dimensions:

9.47" H X 7.19" W X 13.72" D

(240.5mm x 182.6mm x 348.5mm)

## Weight:

<23 pounds (10.5kg)

## Regulatory Approvals:

Designed to meet EMC:IEC 60601-1-2. UL/CUL recognized file E242584. RoHS compliant.

## Application Features:

- 2 point/3 point exposure modes
- AEC/Smart AEC exposure modes
- Dual Speed Starter
- X-Ray tube anode heat calculator
- Preloaded X-Ray tube parameters and expandable X-Ray tube library

## TB3 TUBE AND INTERLOCK INTERFACE

PIN	SIGNAL	PARAMETERS
TB3-1	SMALL FIL	Connection to tube small filament
TB3-2	COMMON	Connection to tube filament common
TB3-3	LARGE FIL	Connection to large filament
TB3-4	GROUND	Generator chassis for cable shield connection
TB3-5	Interlock 2+	Used if tube has separate thermostat switch.
TB3-6	Interlock 2-	Open = OVER TEMP. (short terminals if not used)
TB3-7	Interlock 3+	Used if tube has cooling circulator flow switch.
TB3-8	Interlock 3-	Open = NO FLOW. (short terminals if not used)
TB3-9	Safety Interlock+	User signal (Contact Closure) for safety interlocks such as door interlocks. Open turns HV OFF, or inhibits HV from being generated. Closed = OK 24Vdc @ <1A typical
TB3-10	Safety Interlock-	
TB3-11	Contactors Coil+	Option for contactor coil control
TB3-12	Contactors Coil-	
TB3-13	Spare	N/C
TB3-14	Spare	N/C
TB3-15	Tube Current+	Tube current flows out from this pin
TB3-16	Tube Current-	Tube current flows into this pin

## TB2 ROTOR INTERFACE

PIN	SIGNAL	PARAMETERS
TB2-1	PHASE	To tube auxiliary winding
TB2-2	RUN	To tube principle winding
TB2-3	COM	To tube common winding
TB2-4	GROUND	To tube housing ground

## PMX STANDARD SYSTEM INTERFACE— JB1 25 PIN MALE D CONNECTOR

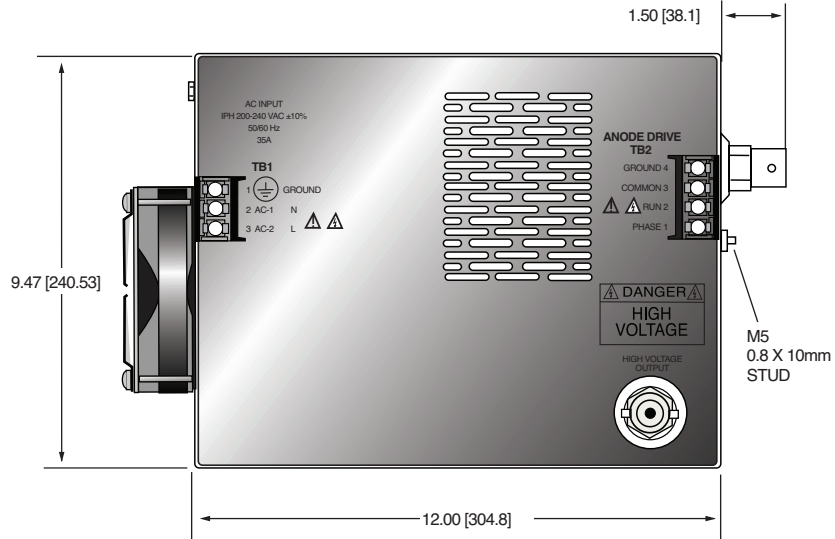
PIN	SIGNAL	PARAMETERS
1	GND	Signal Ground
2	+5Vdc Out	+5Vdc, 100mA max.
3	RS-232 Tx Out	RS-232 Transmit
4	RS-232 Rx In	RS-232 Receive
5	PREP	User signal (Contact Closure) to alert the generator that exposure sequence will begin. Once this signal is active, exposure parameters are locked in and cannot be changed. The generator enables the starter to boost the rotor. Contact connection to pin 24. Closed = PREP, the filament is placed in preheat mode
6	READY	Generator signal to user to indicate the rotor runs to speed and the generator is ready for X-Ray exposure Open Collector. Low/Active = Ready
7	ROTOR SHUTDOWN	User signal to brake the rotor drive
8	EXPOSURE	User signal (Contact Closure) to generator to generate X-Rays. Filament is boosted, and high voltage is generated after the boost time. Contact connection to pin 24. Closed = Exposure
9	X-Ray ON 75% Status	Transistor output to indicate X-Ray ON status synchronized with 75% of kVP setting point.
10	X-Ray ON Status	Transistor output to indicate X-Ray ON status synchronized with kV start up.
11	N/C	N/C
12	X-Ray SHUTDOWN/AEC	User signal to generator to rapidly turn HV OFF and ON during serial exposure sequence
13	RS-232 ISO Ground	Isolated ground from RS-232 transceiver IC
14	HVG FAULT Status	Generator signal indicating generator fault. Open collector transistor output. Low/Active = Fault
15	Status Bit 1	3 bit status lines for up to 6 status messages. See separate matrix describing functionality. Open Collector. Low/Active = Message
16	Status Bit 2	
17	Status Bit 3	
18	N/C	N/C
19	N/C	N/C
20	kV Monitor	Signal from generator. 0-10V = 0-50kV. Zout = 1kΩ
21	Emission Monitor	Signal from generator. 0-10V = 0-200mA. Zout = 1kΩ
22	Filament Current Monitor	Signal from generator. 0-10V = 0-6A. Zout = 1kΩ
23	Program/Monitor Return	Ground for reference of program and monitor signals
24	+24Vdc Out	For connection to PREP and EXPOSURE control relay coils
25	SHIELD/GND	For connection of interface cable shield to generator chassis ground

DIMENSIONS: in.[mm]

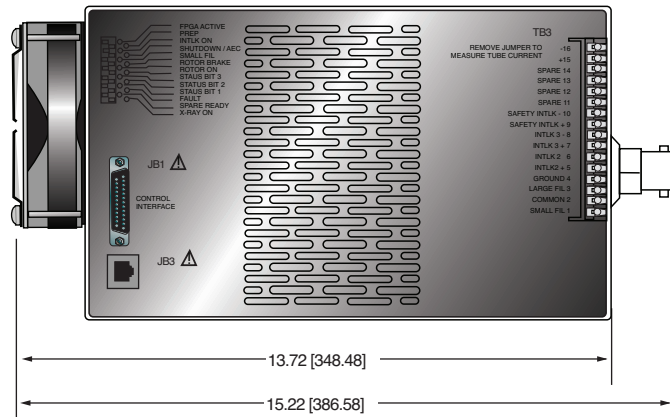
FRONT VIEW



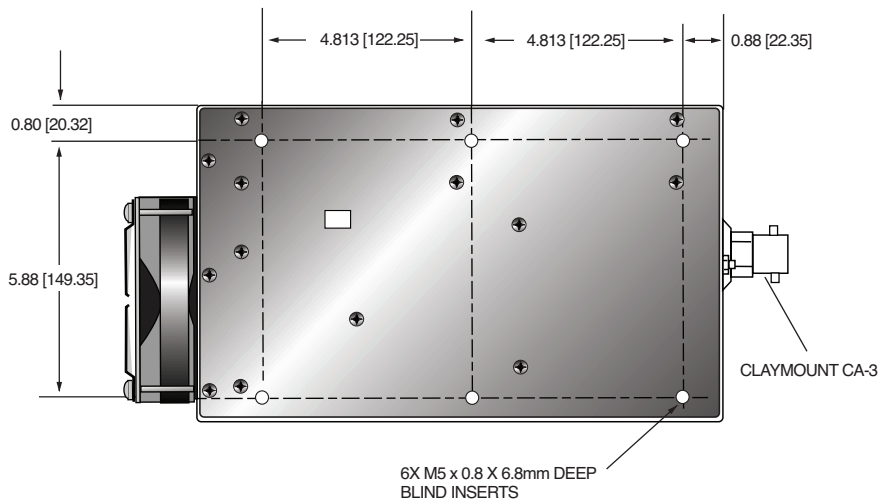
SIDE VIEW



TOP VIEW



BOTTOM VIEW





- **Compact Space Saving Modular Format**
- **Fast Rise/Fall Time Minimize Patient Exposure**
- **High Speed Starter, Boost/Brake Capability**
- **Ethernet/RS-232 Interfaces**

The PMX70 is Spellman's new high performance X-Ray generator designed to power Varex Mammography X-Ray tubes. It features a 12kW peak high frequency inverter and high voltage section complete with a smart learning filament power supply and high speed starter. State of the art power conversion technology provides stable and accurate X-Ray tube high voltage with fast rise and fall times. Ethernet and RS-232 interfacing provides easy system integration. Preloaded X-Ray tube parameters, easy access interlocks and I/O connections, and internal generator diagnostics. Optional GUI utility software is also offered to help with initial system integration.

### SPECIFICATIONS

#### Input Voltage:

230Vac  $\pm 10\%$ , single phase, 50Hz/60Hz

#### Input Current:

30 amps, customer to fuse.

Mains Contactor – not provided.

Customer is responsible for mains safety disconnection.

Less than 30 amps over a typical scan is defined as following: Due to unknown line impedance, customer supplied external inductors 100uH to 300uH in series with input connections, (200uH to 600uH total), may be required to keep rms currents below 30 amps and to avoid erroneous circuit breaker trips. Spellman can recommend appropriate inductors as required.

#### Output (Tube) Voltage

#### Output Voltage Range:

-25kV to -70kV

#### Polarity:

Negative output polarity; to drive rotating anode, floating cathode X-Ray tube (Varex M-1581).

#### Accuracy:

2% (measured per IEC60601-2-45)

#### Reproducibility:

<0.5%

#### Output (Tube) Current/Power

#### Output Current Range:

10mA to 200mA

#### Output Power:

12kW peak, 400 watt average.

#### Duty Cycle:

25%. A typical scan being at fixed settings in the range of 40kV-70kV and 16mA-200mA. Pulsed operation is supported.

#### Accuracy:

<  $\pm 10\%$  on exposure less than 10ms  
(measured per IEC60601-2-45)

#### Rise Time:

1-2 milliseconds, typical (HV cable dependent). Fall time is load dependant, and the HV cable is a significant factor. The HV cable which is not provided with the PMX70, has a maximum length of 8 feet (2.4m).

#### Fall Time:

<10ms with a HV cable length of 8 feet (2.4 meters)

#### Exposure Time (Loading Time):

#### Maximum Single Exposure Time:

20 seconds

#### Shortest Single Exposure Time:

4ms

#### Loading time accuracy:

$\pm 3\% + 1\text{ms}$  (measured per IEC60601-2-45)

#### Maximum mAs:

3200mAs

#### Exposure Timer:

4ms-20 seconds

#### Reproducibility:

<0.5%

#### Filament Configuration:

AC high frequency filament drive: self-corrected filament preheat settings with closed loop emission control and smart learning algorithm.

#### Filament Output:

0-6 amps at a compliance of 5.5 volts, maximum.

#### High Speed Starter:

High speed (360Hz) starter configured via the serial interface. Boost and Brake capability provided.

#### AC Input Connector:

Two position terminal block

#### System Interface Connector:

25 pin male D connector

#### Rotor Interface Connector:

Four position terminal block

#### Tube and Interlock Interface Connector:

16 pin terminal block

### High Voltage Connector:

Claymount CA-11 type or equivalent.

### Communication Interface Connector:

Ethernet, RJ45 jack

### Grounding Point:

M5 ground stud provided on chassis

### Environmental:

Temperature Range:

Operating: 10°C to 40°C

Storage: -40°C to 85°C

Humidity:

20% to 85% RH, non-condensing.

### Cooling:

Forced air, internal fan

### Dimensions:

10.08" H X 19.49" W X 10.75" D

(256mm x 495mm x 273mm)

### Weight:

48.5 pounds (22.0kg)

### Rotational Capability:

Capable of working on a rotating gantry with a nominal rotating speed of 0.5 Hertz.

### Regulatory Approvals:

Designed to comply with IEC 60601. RoHS Compliant.

Customer provided external EMC filter may be required to meet CE/EMC specifications.

### X-Ray Tube Compatibility:

Varex M-1581

## PMX70 STANDARD SYSTEM INTERFACE — JB1 25 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	GND	Signal Ground
2	+5Vdc Out	+5Vdc, 100mA max.
3	RS-232 Tx Out	RS-232 Transmit
4	RS-232 Rx In	RS-232 Receive
5	PREP	User signal (Contact Closure) to alert the generator that exposure sequence will begin. Once this signal is active, exposure parameters are locked in and cannot be changed. The generator enables the starter to boost the rotor. Contact connection to pin 24. Closed = PREP, the filament is placed in preheat mode
6	READY	Generator signal to user to indicate the rotor runs to speed and the generator is ready for X-Ray exposure Open Collector. Low/Active = Ready
7	ROTOR SHUTDOWN	User signal to brake the rotor drive
8	EXPOSURE	User signal (Contact Closure) to generator to generate X-Rays. Filament is boosted, and high voltage is generated after the boost time. Contact connection to pin 24. Closed = Exposure
9	X-Ray ON 75% Status	Transistor output to indicate X-Ray ON status synchronized with 75% of kVP setting point.
10	X-Ray ON Status	Transistor output to indicate X-Ray ON status synchronized with kV start up.
11	N/C	N/C
12	X-Ray SHUTDOWN/AEC	User signal to generator to rapidly turn HV OFF and ON during serial exposure sequence
13	RS-232 ISO Ground	Isolated ground from RS-232 transceiver IC
14	HVG FAULT Status	Generator signal indicating generator fault. Open collector transistor output. Low/Active = Fault
15	Status Bit 1	3 bit status lines for up to 6 status messages. See separate matrix describing functionality. Open Collector. Low/Active = Message
16	Status Bit 2	
17	Status Bit 3	
18	N/C	N/C
19	N/C	N/C
20	kV Monitor	Signal from generator. 0-10V = 0-50kV. Zout = 1kΩ
21	Emission Monitor	Signal from generator. 0-10V = 0-200mA. Zout = 1kΩ
22	Filament Current Monitor	Signal from generator. 0-10V = 0-6A. Zout = 1kΩ
23	Program/Monitor Return	Ground for reference of program and monitor signals
24	+24Vdc Out	For connection to PREP and EXPOSURE control relay coils
25	SHIELD/GND	For connection of interface cable shield to generator chassis ground

## TB2 ROTOR INTERFACE

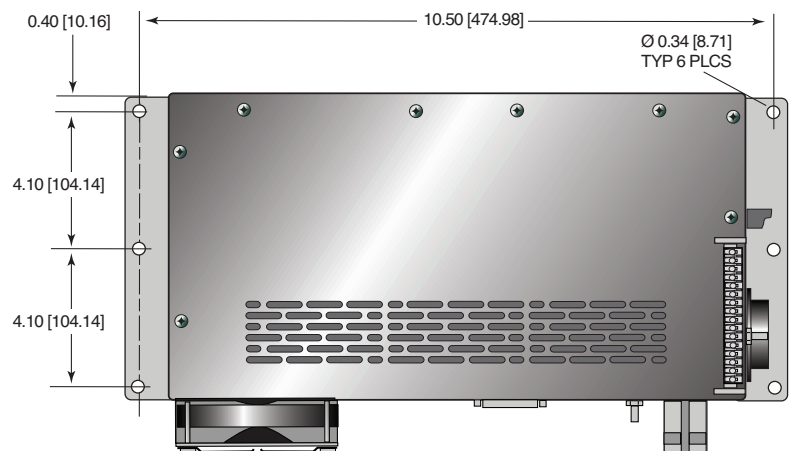
PIN	SIGNAL	PARAMETERS
TB2-1	PHASE	To tube auxiliary winding
TB2-2	RUN	To tube principle winding
TB2-3	COM	To tube common winding
TB2-4	GROUND	To tube housing ground

## TB3 TUBE AND INTERLOCK INTERFACE

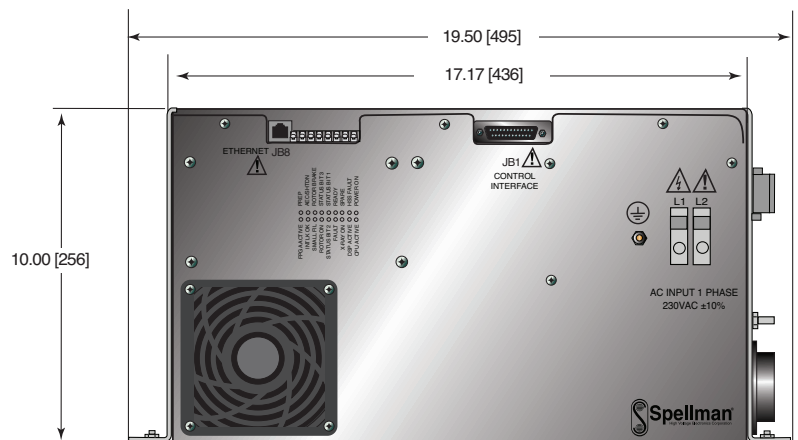
PIN	SIGNAL	PARAMETERS
TB3-1	SMALL FIL	Connection to tube small filament
TB3-2	COMMON	Connection to tube filament common
TB3-3	LARGE FIL	Connection to large filament
TB3-4	GROUND	Generator chassis for cable shield connection
TB3-5	Interlock 2+	Used if tube has separate thermostat switch.
TB3-6	Interlock 2-	Open = OVER TEMP. (short terminals if not used)
TB3-7	Interlock 3+	Used if tube has cooling circulator flow switch.
TB3-8	Interlock 3-	Open = NO FLOW. (short terminals if not used)
TB3-9	Safety Interlock+	User signal (Contact Closure) for safety interlocks such as door interlocks. Open turns HV OFF, or inhibits HV from being generated. Closed = OK 24Vdc @ <1A typical
TB3-10	Safety Interlock-	
TB3-11	Contactor Coil+	Option for contactor coil control
TB3-12	Contactor Coil-	
TB3-13	Spare	N/C
TB3-14	Spare	N/C
TB3-15	Tube Current+	Tube current flows out from this pin
TB3-16	Tube Current-	Tube current flows into this pin

DIMENSIONS: in.[mm]

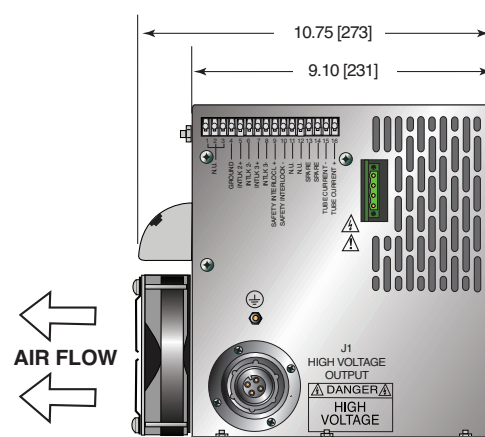
TOP VIEW



SIDE VIEW



FRONT VIEW





Spellman High Voltage has been designing, manufacturing and providing CT generators for OEM customers for over three decades. We have unrivaled experience being the first provider of a CT generator used in a commercially available continuous rotating CT scanner in 1985. Since then Spellman has enhanced performance and developed new CT generators year after year, setting the standard for CT generator technology.

Spellman's CCT series of CT generators provide a unique combination of performance and price. Ideally suited for the economy 16 slice CT scanner, this generator has the ability to be scaled from 32kW to 50kW. Its compact size and unique bend makes it suitable for small footprint gantry designs. Designed to easily pair with many off the shelf CT tubes.

## OPTIONS

- DG** Deflection Grid  
**CG** Cutoff Grid

## SPECIFICATIONS

### Input Voltage:

- Main: 400Vac, three phase, +15%/-20%, 50/60Hz  
Auxiliary: 220/230Vac, single phase, +15%/-10%, 50/60Hz

### Output Voltage:

- Range: 60kV to 140kV (bipolar, 30kV to 70KV)  
Accuracy:  $\pm 0.5\%$  of setting

### Output Current:

- Range: 10mA to 420mA, 50kW maximum.  
10mA to 350mA, 42kW maximum.  
10mA to 275mA, 32kW maximum.

### Filament Output:

- Type: Two filament outputs, large and small  
Voltage/Current: 15Vac (30kHz-40kHz) @ 0-6A  
maximum, referenced to cathode output

### Power:

- Maximum mA: 420mA, 50kW maximum  
Maximum kV: 140kV, 50kW maximum  
Peak: 50kW

- Maximum mA: 350mA, 42kW maximum  
Maximum kV: 140kV, 42kW maximum  
Peak: 42kW

- Maximum mA: 275mA, 32kW maximum  
Maximum kV: 140kV, 32kW maximum  
Peak: 32kW

**Gantry Rotation:** 0.5 seconds

### Starter:

- Type: Dual Speed Starter  
Compatibility: All industry standard X-Ray tubes

- **32, 42 and 50kW all in the same footprint and volume**
- **Utilizes Spellman's own SPI interface (compatible with other Spellman CT generators)**
- **16/32 slice with 0.5 second rotation**
- **Supports Spellman's add on Grid Box Option**
- **Integrated anode drive (supporting ball or liquid metal bearings)**

## GRID SPECIFICATIONS

Optional grid box for  
Deflection or Cutoff Grid



### Deflection Grid:

The deflection grid (also called the Flying Focal Spot) allows for dynamic movement of the focal spot providing double X sampling which increases effective resolution while decreasing unwanted artifacts.

- Type: Deflection grid, single box assembly  
Input Power: 24Vdc,  $\pm 10\%$  @ 4.2A maximum, negative input ties to chassis ground internally

### Connectors:

- High Voltage Input:  
3 pin 75kV Federal Standard (Cathode, Large, Small)  
High Voltage Output:  
4 pin 75kV CA7 (Cathode, Large, G1, G2)

Number of Grids: 2 grids, switching out of phase

Bandwidth: DC to 5kHz

Output Voltage: 0V to -4KV, from grid to cathode. User input will command the bi-level grids to switch between adjustable voltages, VLOW and VHI.  
The two grids switch out of phase: If G1 is at VLOW, G2 will be at VHI and vice versa. The VLOW and VHI levels for G1 and G2 are independently adjustable from 0 to -4KV but VLOW range is constrained by:  $|VLOW| \leq |VHI|$

### Cutoff Grid:

A cutoff grid truncates the high voltage at the end of the X-Ray exposure, reducing patient radiation dosing that does not contribute to the imaging process.

- Type: Cutoff grid, single box assembly  
Input Power: 24Vdc,  $\pm 10\%$  @ 0.75A maximum, negative input ties to chassis ground internally

### Connectors:

- High Voltage Input:  
3 pin 75kV Federal Standard  
(Cathode, Large, Small)

- High Voltage Output:  
4 pin 75kV CA7 (Cathode, Large, G1, G2)

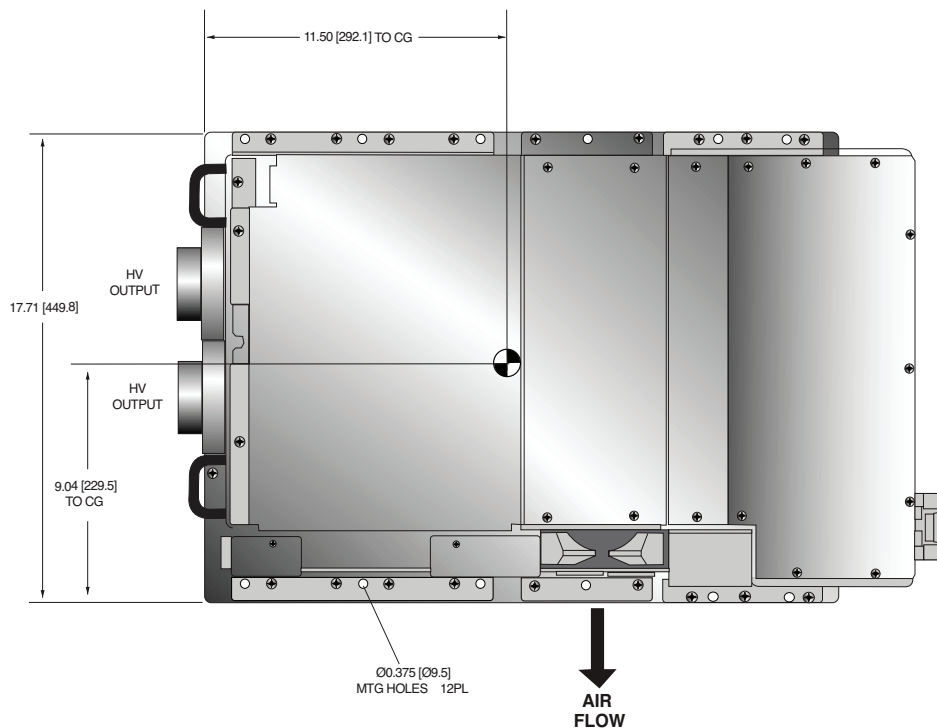
Number of Grids:

One, switched between "Zero" ( $0V \geq Vg-c \text{ ZERO} \geq -10V$ ) and "Cutoff" ( $Vg-c \text{ CUTOFF} = -4kV \pm 10\%$  @ steady state)

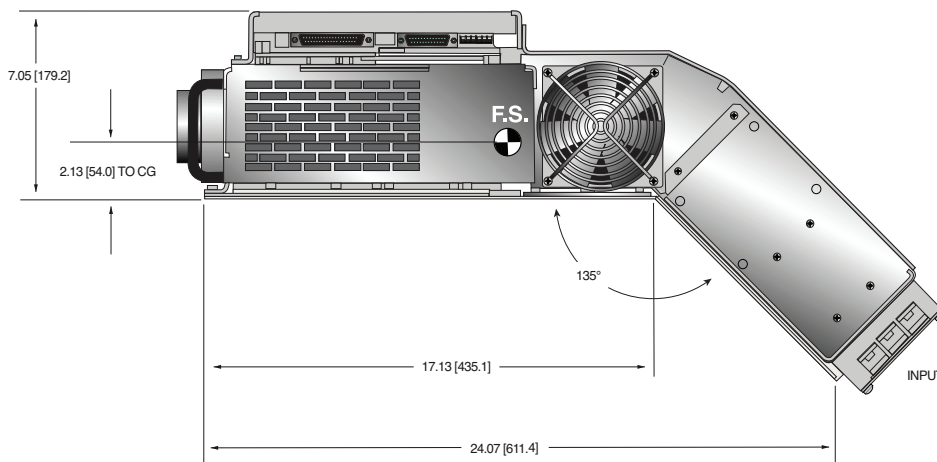
#### CCT X-RAY GENERATOR

DIMENSIONS: in.[mm]

##### TOP VIEW



##### SIDE VIEW



#### How to Order:

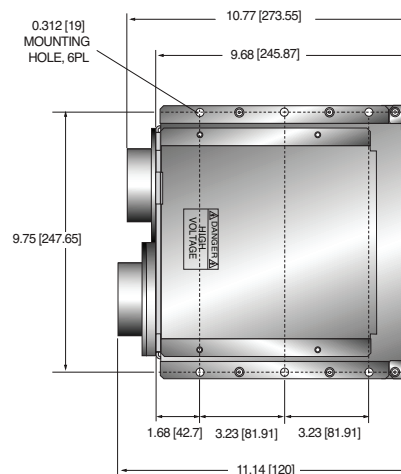
32kW maximum:	PART NO.: CCT70PN32
42kW maximum:	PART NO.: CCT70PN42
50kW maximum:	PART NO.: CCT70PN50

Consult sales for grid options

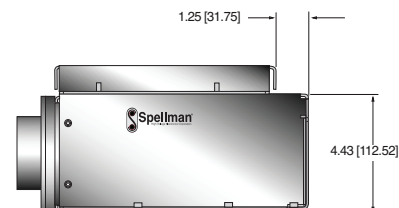
#### DEFLECTION / CUTOFF GRID

DIMENSIONS: in.[mm]

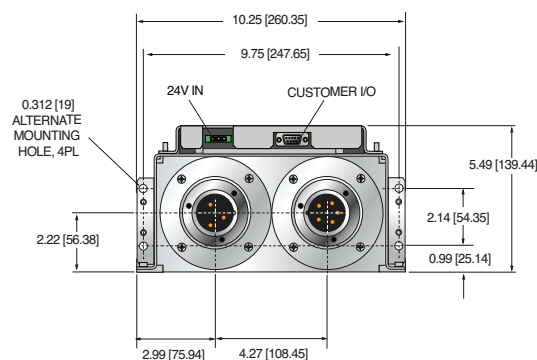
##### TOP VIEW



##### SIDE VIEW



##### FRONT VIEW



Spellman High Voltage has been designing, manufacturing and providing CT generators for OEM customers for over three decades. We have unrivaled experience being the first provider of a CT generator used in a commercially available continuous rotating CT scanner in 1985. Since then Spellman has enhanced performance and developed new CT generators year after year, setting the standard for CT generator technology.

Spellman High Voltage has manufactured over 30,000 CT generators. We have the knowledge, capability and experience to provide you with the CT generator technology you need.

**Ask about our subsystem capabilities**

- **CT Generators from 32kW to 110kW**
- **60-140kV output**
- **Rotational CT up to 240rpm**
- **Fast rise time**
- **Designed to drive industry standard CT tubes**
- **Digital interface allows for ease of integration**
- **OEM customization**



32/42/50kW 16-64 slice single chassis  
"compact" CT generator



50kW/80kW 16-128 slice "performance"  
CT generator with grid/Z deflection



110kW 64-264 slice "premier" CT generator  
for state of the art CT systems

MODEL	32/42/50kW Compact CT Generator	50/80kW CT Generator	110kW CT Generator
Model Designation	CCT70PN32 CCT70PN42 CCT70PN50	CT70PN50 CT70PN80	CT140N110
Input Power	400Vac, 3Ø, +15%/-20%, 50/60Hz		
Auxiliary Input Power	220/230Vac, 1Ø +15%/-10%, 50/60Hz	220/230Vac, 1Ø +15%/-10%, 50/60Hz	Not required
kV Output Range	60kV - 140kV (bipolar, 30kV – 70kV)	60kV - 140kV (bipolar, 30kV – 70kV)	60kV to 140kV Anode grounded
kV Output Accuracy	±0.5% of setting		
mA Output Range	10mA – 300mA / 32kW maximum 10mA – 350mA / 42kW maximum 10mA – 360mA / 50kW maximum	10mA – 420mA / 50kW maximum 10mA – 667mA / 80kW maximum	6mA to 900mA, 110kW maximum
mA Regulation/Accuracy	2% or 2mA or which is larger for 20mA -350mA	2% or 1mA or which is larger for 20mA -420mA	2% or 1mA or which is larger for 20mA -900mA
Filament Output	2 outputs: 15Vac @ 0-6A up to 8A available	1 output: 15Vac @ 0-6A, up to 15A available 2 filament/no grid configuration available	2 outputs: 10Vac @ 0-8A,
Filament Accuracy	±5% of setting	±5% of setting	±2% from 25% to 75%, 5% above
Filament Repeatability	±0.2%		
Starter	HSS configured to match X-Ray tube used		
Interface	Custom serial interface		
Rotation	Up to 120 rpm	Up to 120 rpm	Up to 240 rpm
Configuration	Single Chassis	Two chassis	Four chassis
Grid Option	Dual grid/single filament, 0-4kV @ 0-4kHz (separate assembly)	Dual grid/single filament, 0-4kV @ 0-4kHz (built-in)	n/a
Magnetic Z Deflection Option	n/a	Ground based single channel beam steering	n/a

Please consult factory regarding product configuration availability and regulatory requirements for specific markets



Spellman's SPX Series are perfectly suited for today's demanding NDT inspection requirements. SPX units are rugged, yet easy to transport and economical to maintain. They can be line or portable generator powered automatically adapting to standard input voltages to permit all day inspection under extreme conditions virtually anywhere.

The end grounded X-Ray tubes have a focal spot size of 1.5mm sq. and the exposed anode allows for easy and flexible positioning of the tube head assembly. Tube ports use a low-absorption beryllium window that allows the radiographer to utilize the full spectrum of X-Ray energy. The high radiation output of the SPX systems allow for lower kV per exposure, shorter exposure times and increased film contrast for superior radiographic imaging.



The SPX microprocessor-driven control unit provides automatic warm-up and comprehensive self-diagnostic circuitry. Memory to store and recall exposure techniques is standard and the last set of exposure parameters is retained before powering down. The SPX is adjustable in 1kV and 0.1mA increments. Exposure duration can be set from 1 second to 99 min 59 seconds in 1 second increments. There are three models to choose from: 160kV, 200kV and 300kV.

- **Constant Potential Output**
- **Excellent Stability and Regulation**
- **Power Factor Corrected AC Input Circuitry**
- **Digital Interface, Ethernet and RS-232**
- **End Grounded Exposed Anode**
- **Portable, Repeatable, Accurate**
- **100% Duty Cycle**
- **Unparalleled Resolution Imaging**
- **Liquid or Air Cooled Models**
- **Penetration of up to 76mm of Fe (300kV unit)**

### TYPICAL APPLICATIONS

- Aerospace
- Manufacturing
- Defense
- Aviation
- Energy
- Security Systems
- NDT Applications

### SPECIFICATIONS

#### Input Line Requirements:

Automatically adapts to input line voltage  
100-130Vac, 50/60Hz, 20 Amperes maximum  
200-250Vac, 50/60Hz, 10 Amperes maximum  
May also be portable-generator powered

#### X-Ray Output:

SPX160: 20 to 160kV, 0.5mA to 5.0mA (800 watts max.)  
SPX200: 10 to 200kV, 0.5mA to 10.0mA (900 watts max.)  
SPX300: 10 to 300kV, 0.5mA to 10.0mA (900 watts max.)  
Constant potential, end-grounded anode,  
air or liquid cooled versions available

#### X-Ray Tube Window:

SPX160: Beryllium 0.8mm (directional)  
Nickel 0.6mm (panoramic)  
SPX200: Beryllium 1.0mm  
SPX300: Beryllium 1.0mm

#### Radiation Coverage:

SPX160: 40° directional or 360° panoramic tube available  
SPX200: 40° directional or 360° panoramic tube available  
SPX300: 40° x 60°

#### Radiation Output:

SPX160: 14R/min at 50cm filtered with 0.5 inches (12.7mm) aluminum at 160kV, 5mA  
SPX200: 21R/min at 50cm filtered with 0.5 inches (12.7mm) aluminum at 200kV, 4.5mA  
SPX300: 30R/min at 50cm filtered with 0.5 inches (12.7mm) aluminum at 300kV, 3mA

#### Radiation Leakage:

Less than 2.0 Roentgens per hour at 1 meter from the X-Ray tube target.

## Effective Focal Spot:

### SPX160:

Standard: 0.7mm x 1.0mm (0.03in x 0.04in) EN12543  
0.5mm x 0.5mm (0.02in x 0.02in)  
nominal IEC60336

Panoramic: This tube has a flat target (0 degree) and therefore it is without dimension along the tube axis (other than panoramic tubes with conical targets). The true focal spot on the target can only be estimated by taking two focal spot film exposures in the main beam 90 degrees apart from each other. Due to this no focal spot is inferred.

### SPX200:

Standard: 3mm x 3mm (0.12in x 0.12in) EN12543  
Panoramic: 0.4mm x 4mm (0.016in x 0.16in) EN12543

### SPX300:

Standard: 3mm x 3mm (0.12in x 0.12in) EN12543

## Ambient Temp:

100% duty cycle @ 120°F (49°C)

## Duty Cycle:

100% - liquid or air cooled

## Operating Temp:

32°F to 120°F (0°C to 49°C)

## Storage Temp:

-30°F to 160°F (-35°C to 71°C)

## Anode Cooling:

Liquid coolant solution closed loop between X-Ray tube anode and cooling unit, or fan forced air cooling.

## Liquid Cooling Unit Dimensions:

Please reference dimension drawings

## Liquid Cooling Unit Weight:

54lbs. (15.4kg) approx.

## Tube Head Dimensions:

Please reference dimension drawings

## Tube Head Weight:

### SPX160:

Liquid Cooled: 29lbs. (13.15kg)  
Air Cooled: 33lbs. (14.97kg)  
Panoramic: 29lbs. (13.15kg)

### SPX200:

Liquid Cooled: 37lbs. (16.78kg)  
Air Cooled: 41lbs. (18.60kg)  
Panoramic: 37lbs. (16.78kg)

### SPX300:

Liquid Cooled: 98lbs. (44.5kg)  
Air Cooled: 105lbs. (47.61kg)

## X-Ray Control Unit:

Digital microcomputer based with local control, RS-232 and Ethernet

## X-Ray Control Unit Dimensions:

Please reference dimension drawings

## X-Ray Control Unit Weight:

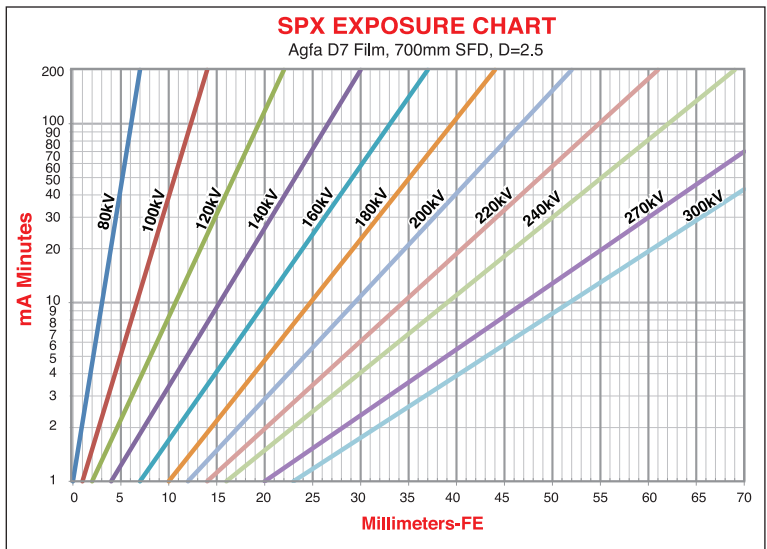
26lbs. (11.8kg) approx.

## Safety Devices:

- Tubehead Pressure Relief Valve
- Tubehead Thermal Cut-Out
- Tubehead Pressure Gauge
- Tubehead Low Pressure Cut-Out @ 25psi (1.72 Bar)
- Coolant Flow Sensor (liquid cooled only)
- Control Unit Safety Keyswitch
- Microcomputer-based Self Diagnostics
- Continuous Exposure Parameter Display

## Standard Accessories:

- Operation manual
- Tubehead carrying case
- Tubehead Cable- 100' with strain relief
- Extra key (1) for Control Unit Safety Lock
- Power cable - 25' with strain relief
- Coolant hose - twin, 50' with self-sealing terminations (liquid cooled only)
- Cooler power cable



This chart is for reference only (actual settings may vary due to SFD, material, and film type)

### SPX160 MODEL SELECTION TABLE

MODEL NUMBER	DESCRIPTION
SPX160ACDBG	Air Cooled, 40° Directional Beam, Glass insert
SPX160LCDBG	Liquid Cooled, 40° Directional Beam, Glass insert
SPX160LCPANG	Liquid Cooled, PANoramic Beam, Glass insert

### SPX200 MODEL SELECTION TABLE

MODEL NUMBER	DESCRIPTION
SPX200ACDBC	Air Cooled, 40° Directional Beam, metal Ceramic insert
SPX200LCDBG	Liquid Cooled, 40° Directional Beam, Glass insert
SPX200ACDBG	Air Cooled, 40° Directional Beam, Glass insert
SPX200LCPANC	Liquid Cooled, PANoramic beam, metal Ceramic insert
SPX200LCDBC	Liquid Cooled, 40° Directional Beam, metal Ceramic insert

### SPX300 MODEL SELECTION TABLE

MODEL NUMBER	DESCRIPTION
SPX300LCDBC	Liquid Cooled, 40° Directional Beam, metal Ceramic insert
SPX300ACDBC	Air Cooled, 40° Directional Beam, metal Ceramic insert

### SPX OPTIONS

MODEL NUMBER	DESCRIPTION
3-000-0754	SPX160/200 tubehead stand
3-000-0756	SPX300 tubehead stand
3-000-0792	Laser pointer for liquid cooled tube
K935	SPX160 Laser pointer for air cooled tube
K936	SPX200/300 Laser pointer for air cooled tube
K937	SPX200 Laser pointer for liquid cooled tube
K938	SPX300 Laser pointer for liquid cooled tube

### SPX MAIN AC INPUT

Controller Side; Male, 3 pins MS type

PIN	SIGNAL
A	LINE 1 120/220Vac
B	LINE 2 Neutral 120/220Vac
C	Ground

### SPX INTERLOCK CONNECTOR

Controller Side; Female, 8 pins MS type

Tube Side; Male, 8 pins MS type

PIN	SIGNAL
A	External Interlock
B	External Interlock
C	X-Ray ON External Light
D	External Lights Common
E	Pre-Warning External Light
F	External Light Confirm Input
G	24Vdc Outut, 1A max.
H	24Vdc Return (com.)

### SPX FAN CONNECTOR (A/C ONLY)

Controller Side; Female, 8 pins MS type

Tube Side; Male, 4 pins MS type

PIN (Control)	PIN (Tube Head)	SIGNAL
D	A	Fan 120Vac Line1
C	B	Fan 220Vac Tap
G	C	Fan 120Vac Line2/Neutral
B	D	Ground
E		N/C
F		N/C
A		Flow Interlock
H		Flow Interlock

### SPX COOLER CONNECTOR (W/C ONLY)

Controller Side; Female, 8 pins MS type

Tube Side; Male, 8 pins MS type

PIN	SIGNAL
A	Flow Interlock
B	Ground
C	120/220Vac Line1 for Motor
D	120/220Vac Line2/Neutral for Motor
E	120Vac Motor Tap
F	120/220Vac Motor Tap
G	220Vac Motor Tap
H	Flow Interlock

### SPX160 TUBE HEAD CONNECTOR

Controller Side; Female, 10 pins MS type

Tube Side; Male, 10 pins MS type

PIN	SIGNAL
A	Interlock Temperature/Pressure
B	Ground
C	Ground
D	HV Transformer
E	mA Feedback
F	Filament Transformer
G	kV Feedback
H	kV Feedback Return (GND)
I	Filament Transformer
J	HV Transformer

### SPX200/300 TUBE HEAD CONNECTOR

Controller Side; Female, 14 pins MS type

Tube Side; Male, 14 pins MS type

PIN	SIGNAL
A	Interlock Temperature/Pressure SPX200, N/C SPX300
B	Ground
C	Ground
D	HV Transformer
E	mA Feedback
F	Filament Transformer
G	kV Feedback
H	kV Feedback Return (GND)
I	Filament Transformer
J	HV Transformer
K	N/C
L	Interlock Temperature/Pressure SPX300, N/C SPX200
M	N/C
N	N/C

## OPTIONAL ACCESSORIES

### GUI Control Software for the SPX

GUI is specifically designed for controlling SPX series systems. As an alternative to the front panel control, the GUI will allow the user to control all necessary functions of the system from a user-friendly windows based menu. Additionally the GUI can be used as a diagnostic tool when the system is controlled via the front panel.

- **Automatic warm-up of the X-Ray tube**
- **Timed or Continuous Exposure modes**
- **Fault and status monitor**



### Laser Pointer

Spellman's exclusive Laser Pointer allows pinpoint image area targeting. The Laser Pointer projects a highly visible reference laser beam from the tubehead to surfaces up to 75 feet away, showing precisely where the central X-Ray beam will be located, providing unmatched accuracy for greater efficiency and reduced set-up times.



### Tubehead Stand

An optional X-Ray Tubehead Stand allows for quick set up and provides rigid support for optimal image quality with three-axis positioning of the tube head assembly. The stand incorporates telescoping legs, a hand wheel-driven variable height adjustment and lockable hand wheel controlling the tubehead tilt and horizontal rotation. The tubehead cradle is cushioned for secure mounting and vibration damping. A bubble-type indicator is included for quick and easy leveling of the tubehead. Black anodized aluminum construction. 35lbs. (16kg) approx.



### Air Cooled Tube Head Assembly

The air cooled tube head assembly uses a heat sink and high volume fan to dissipate heat from the anode and typically is used in applications that do not have limited access and are not in a volatile fuel vapor atmosphere. The air cooled tube head assembly does not require the cooler unit and the associated mixing and maintenance of liquid coolant. This unit requires less user maintenance and could be considered more environmentally friendly.



### Panoramic Tube Head Assembly

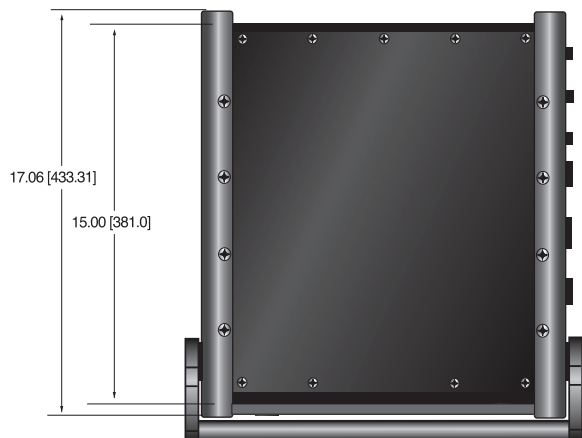
The panoramic tube head assembly comes in a liquid cooled version only and produces radiation in a 360 degree cone making it ideal for aircraft FOD inspection, inspection of tanks or pipes or any application that requires circumferential radiographic inspection.



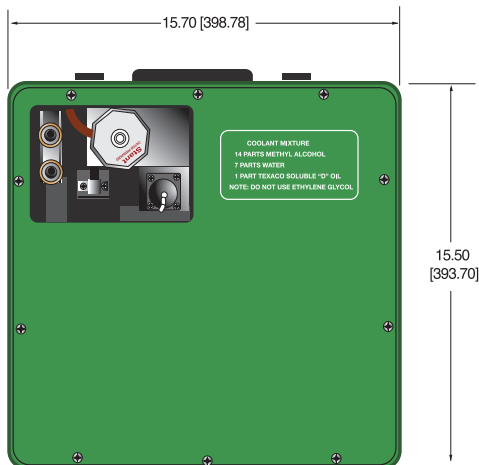
### SPX160

DIMENSIONS: in.[mm]

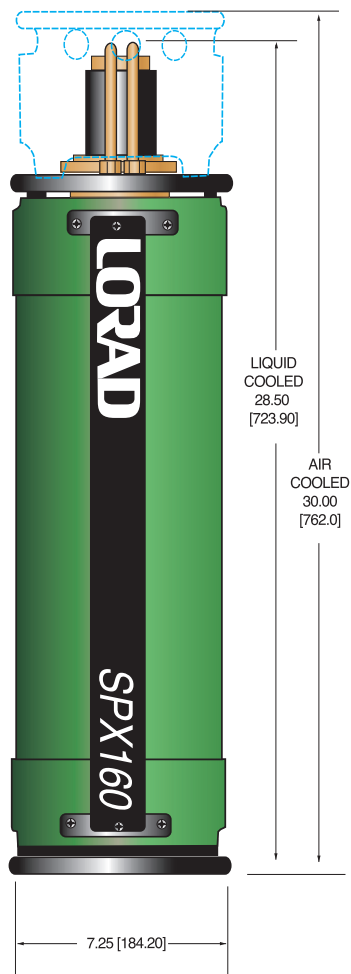
CONTROL UNIT  
TOP VIEW



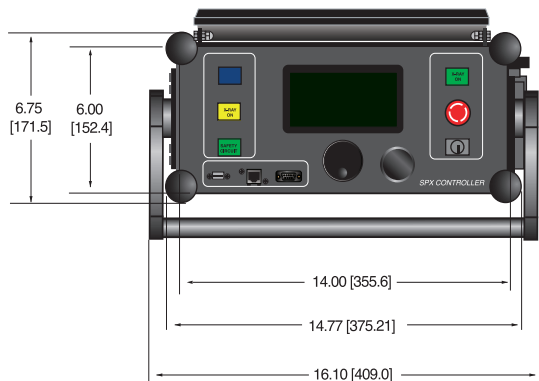
COOLER  
TOP VIEW



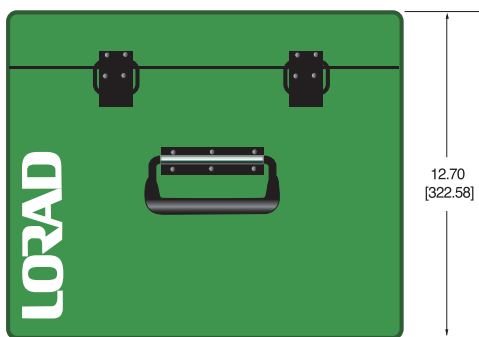
SPX160  
TUBE HEAD  
SIDE VIEW



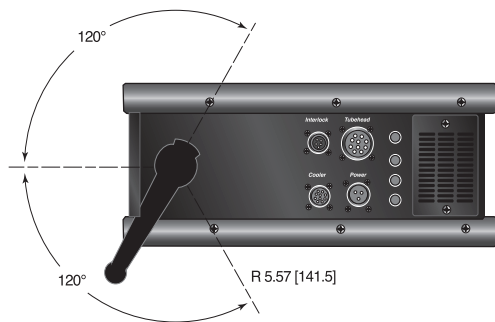
FRONT VIEW



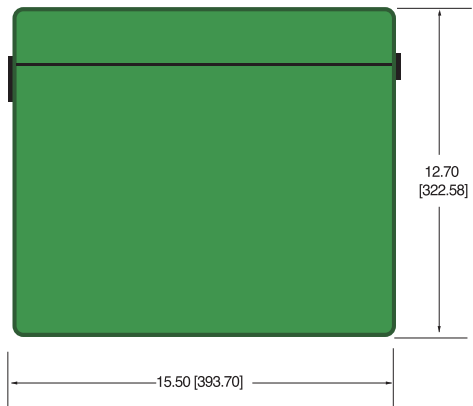
FRONT VIEW



SIDE VIEW



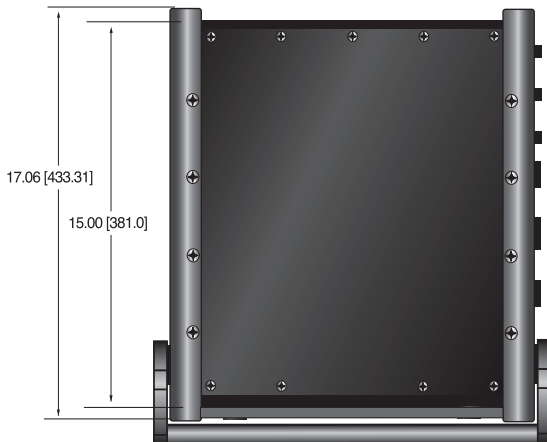
SIDE VIEW



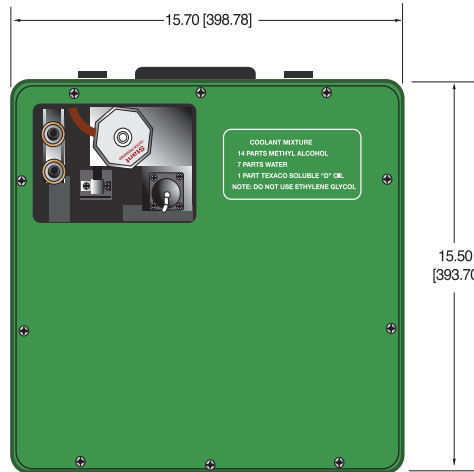
### SPX200

DIMENSIONS: in.[mm]

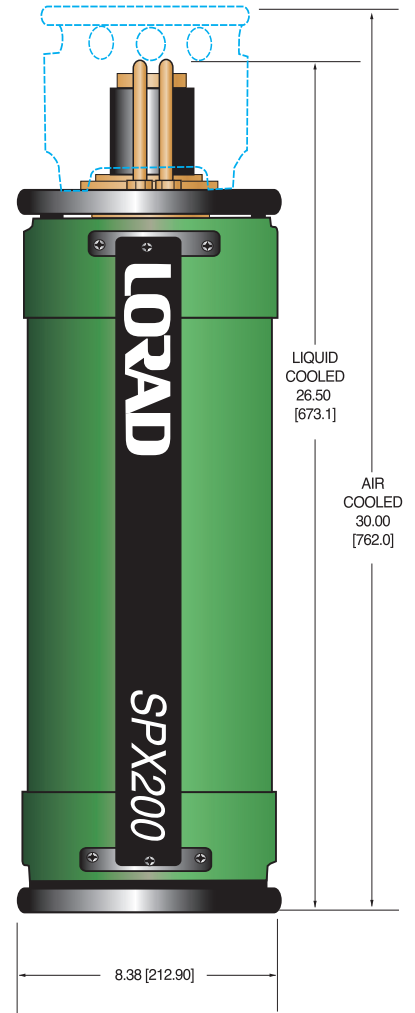
CONTROL UNIT  
TOP VIEW



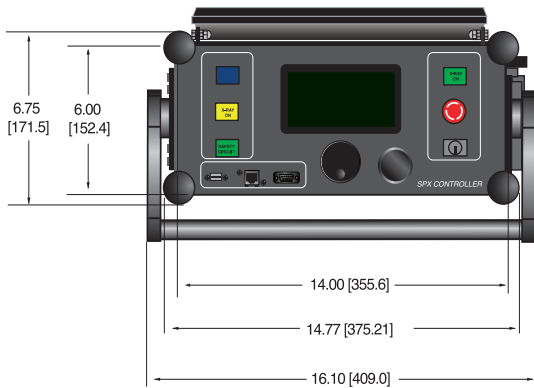
COOLER  
TOP VIEW



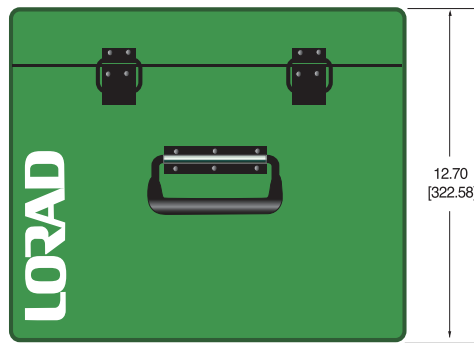
SPX200  
TUBE HEAD  
SIDE VIEW



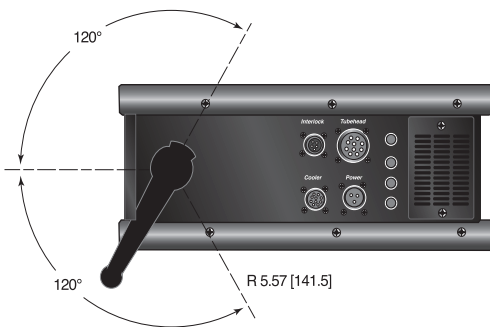
FRONT VIEW



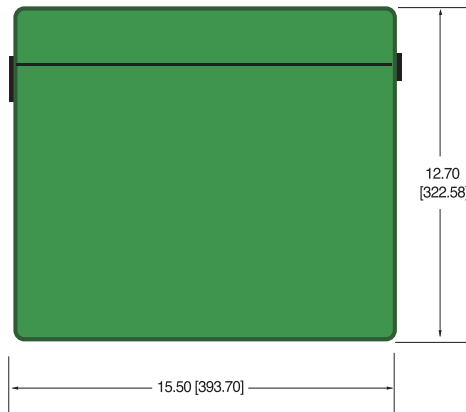
FRONT VIEW



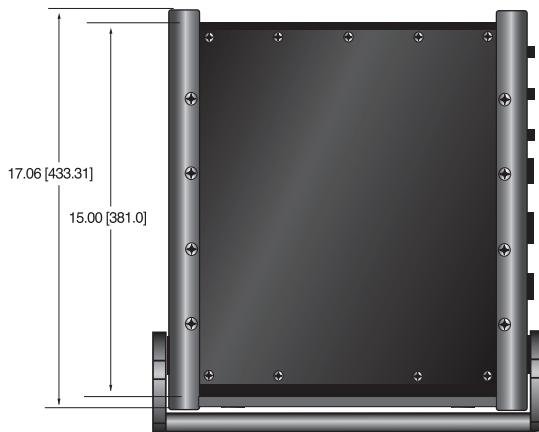
SIDE VIEW



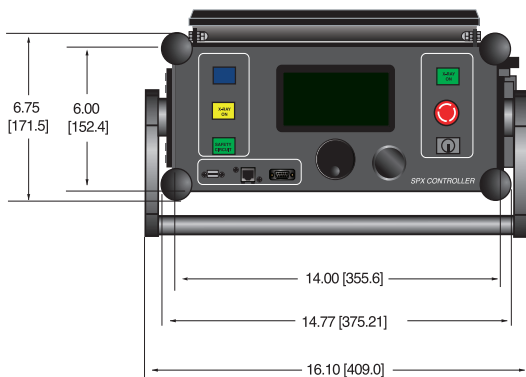
SIDE VIEW



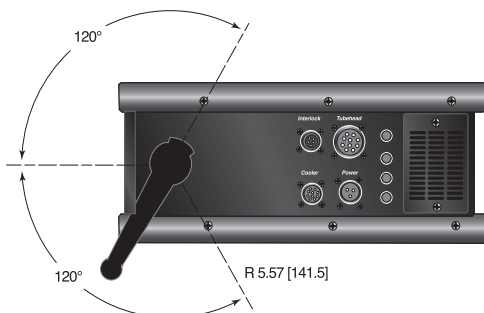
**CONTROL UNIT  
TOP VIEW**



**FRONT VIEW**



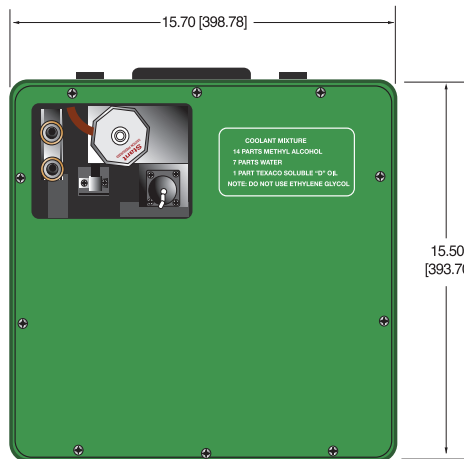
**SIDE VIEW**



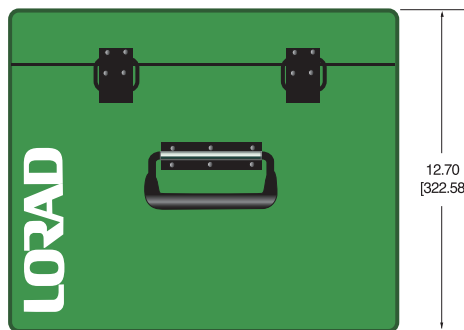
**SPX300**

DIMENSIONS: in.[mm]

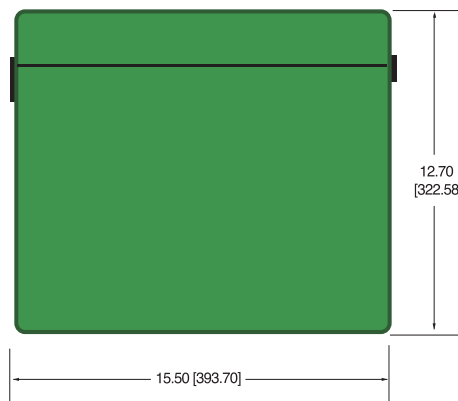
**COOLER  
TOP VIEW**



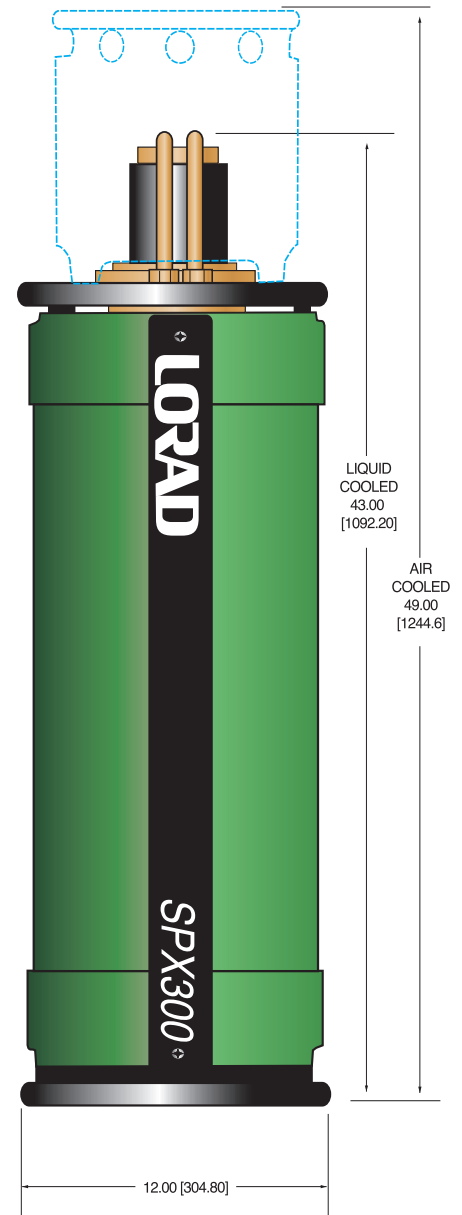
**FRONT VIEW**



**SIDE VIEW**



**SPX300  
TUBE HEAD  
SIDE VIEW**





Spellman's LPX Series are perfectly suited for today's demanding NDT inspection requirements. LPX units are rugged, easy to transport and the optional LPX1620 Tubehead Stand allows for quick set up and provides rigid support for optimal image quality. The tubehead stand incorporates telescoping legs, a hand wheel driven variable height adjustment and lockable hand wheel controlling the tubehead tilt and horizontal rotation. The tubehead cradle is cushioned for secure mounting and vibration damping. A bubble-type indicator is included for quick and easy leveling of the tubehead.

### SPECIFICATIONS

#### Horizontal Rotation:

360°

#### Tilt:

-45° to +90°

#### Dimensions:

Footprint of legs:

43" (109cm) min., 70.5" (179cm) max.

Floor to center line of tubehead ring:

45.5" (115cm) min., 83.5" (212cm) max.

#### Weight:

35lbs. (16kg)

### SET-UP

1. Extend tripod legs outward
2. Loosen height lock knob and raise gearhead mount approx. 3 inches
3. Place gearhead on tripod shaft. Align set screw hole in shaft with hole in gearhead mount. Using supplied hex key, tighten set screw to engage gear head mount.
4. Mount tubehead in cradle. Open knurled latch and outer ring to remove cradle assembly. Release the two hook latches on the cradle to open it. Fit cradle over tubehead making sure any cooling manifolds are positioned between cushioning pads. Latch the hook latches securely.
5. Mount cradle in the gear head outer ring. Close and latch the knurled knob locking mechanism.
6. Use the height, tilt, and rotation controls to position the X-Ray tubehead as needed. Lock all adjustments before making X-Ray exposures.

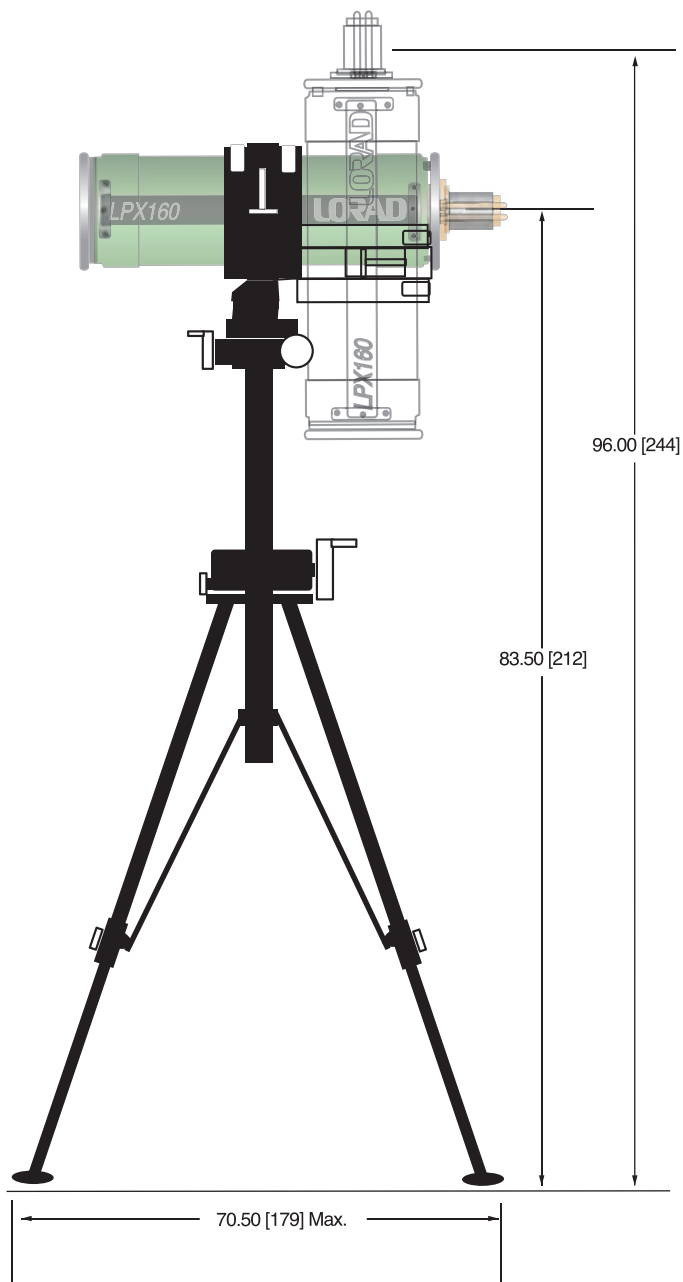
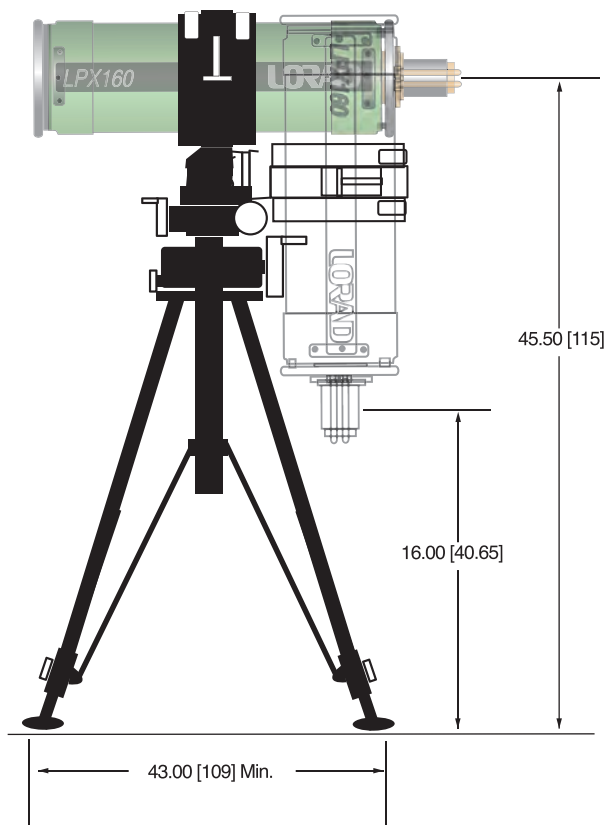
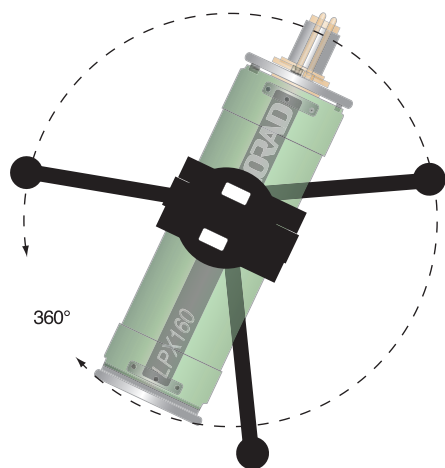


The LPX1620 Tubehead Stand is compatible with all LPX160, LPX200 and LPX300 tubehead assemblies

### LPX1620 MODEL SELECTION TABLE

PART NUMBER	DESCRIPTION
3-000-0754	Tubehead stand for LPX160 and LPX200
3-000-0756	Tubehead stand for LPX300

DIMENSIONS: in. [cm]





- **Exclusive to Lorad LPX Systems**
- **Quick Set Up**
- **Accurate up to 75 Feet Away**
- **Adaptors for Most LPX Tubeheads**

Other imaging systems may produce inconsistent results and require repeat exposures. Spellman's Laser Pointer, exclusive to Lorad's LPX Systems, locates the centerline of the X-Ray beam for unmatched accuracy and efficiency. The Laser Pointer shows precisely where the central X-Ray beam will contact the test area by projecting a highly visible reference beam from the X-Ray tube head to surfaces up to 75 feet away. The beam is activated by a push button and automatically shuts off after 30 seconds. The Laser Pointer is lightweight and powered by three (3) AAA batteries. The Laser Pointer can be used with Lorad's end-grounded exposed anode tube heads and also with air cooled tube heads with the addition of the air cooled adaptor.

## SPECIFICATIONS

### Wavelength:

670nm typical

### Output power:

4.2mW +/-5%

### Laser Class:

Class IIIa Conforming (CDRH 21CFR)  
Class 3R (IEC 60825 1)

### Operating Current:

@ 5Vdc 45mA typical, 125mA max

### Battery Lifetime:

20 hours typical (Alkaline AAA cells)

### Operating Temp:

10°C to +40°C

### Operating time w/o restart:

30 seconds

### Dimensions:

1.75" H x 2.72" W x 2.72" D  
(4.44cm x 6.90cm x 6.90cm)

### Adaptors:

LPX160 A/C Part Number 9-200-0110  
LPX160 L/C N/A  
LPX160 Panoramic N/A  
LPX200 A/C Part Number 9-200-0327  
LPX200 L/C Part number 9-200-0370  
LPX200 Panoramic N/A  
LPX300 L/C 9-200-0465



The LPX Laser Pointer is compatible with most LPX160, LPX200 and LPX300 tubehead assemblies



- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Can be Mounted in Any Physical Orientation**
- **Analog or Digital Control Interface**

Spellman's XRB011 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 80kV at 20W and 80kV at 50W. Features like 24Vdc input voltage, small package size, standard analog interface and RS-232/Ethernet digital interface simplify integrating the XRB011 into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability and performance.

### TYPICAL APPLICATIONS

Medical X-Ray: Fluoroscopy and Radiography for Extremities, Specimen Radiography.  
Pulsed Fluoroscopy (contact Spellman sales)  
Industrial X-Ray: Component inspection and Non-Destructive Testing

### SPECIFICATIONS

#### X-Ray Characteristics:

Tube Type: Micro focus tube  
Focal Spot: 33 $\mu$ m Nominal, 50 $\mu$ m max. (IEC 336)  
Beam Filter: Ultem 0.060" (1.5mm)  
Oil 0.175" (4.4mm)  
Beam Geometry: Symmetrical 40° cone

#### Input Voltage:

20W: 24Vdc  $\pm$ 1V @ 2.5A  
50W: 24Vdc  $\pm$ 1V @ 4A

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 35kV to 80kV

#### X-Ray Tube Current:

20W: 0-250 $\mu$ A over specified tube voltage range  
50W: 0-700 $\mu$ A over specified tube voltage range

#### X-Ray Tube Power:

20/50W maximum continuous

#### Voltage Regulation:

Line:  $\pm$ 0.5% for a  $\pm$ 1V change of nominal input line voltage  
Load:  $\pm$ 0.1% for a load change of 25 $\mu$ A to maximum rated current

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  $\pm$ 1% of the programmed value

#### Voltage Risettime:

Ramp time shall be  $\leq$ 250ms from 10% to 90% of maximum rated output voltage

#### Voltage Temperature Coefficient:

$\leq$ 100ppm/°C

#### Over Temperature Fault:

Indicates that the internal oil temperature has exceeded 65° C. The high voltage output will be disabled. Toggling the X-Ray ON Command OFF and ON will reset the fault.

#### Over Voltage Fault:

An overvoltage (OV) fault is detected when the output voltage exceeds 82kV. The high voltage output will be disabled. Toggling the X-Ray ON Command OFF and ON will reset the fault.

#### Voltage Ripple:

1% peak to peak

#### Current Regulation:

Line:  $\pm$ 0.5% for a  $\pm$ 1V change of nominal input line voltage  
Load:  $\pm$ 0.5% for a voltage change of 35kV to 80kV

#### Current Accuracy:

Current measured through the X-Ray tube is within  $\pm$ 2.5% of the programmed value

#### Over Current Fault:

An overcurrent (OC) fault is detected when the emission current exceeds 275 $\mu$ A (20W model) and 710 $\mu$ A (50W model). Toggling the X-Ray ON Command OFF and ON will reset the fault.

#### Arc Intervention:

One arc fault. The high voltage output will be disabled. Toggling the X-Ray ON command OFF and ON will reset the fault.

#### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

#### Analog Interface:

Ground referenced 10kV/V, 25 $\mu$ A/V (20W model) and 70 $\mu$ A/V (50W model) for programming and monitoring analog interface signals. Open collector, active low digital signal interface. Internal jumper is needed to be configured for analog interface.

#### Digital Interface:

RS-232: standard  
Ethernet: optional

#### Control Software:

A demo GUI is available for engineering evaluations

#### Interlock/Signals:

A hardware interlock functions in both analog and digital programming modes.

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

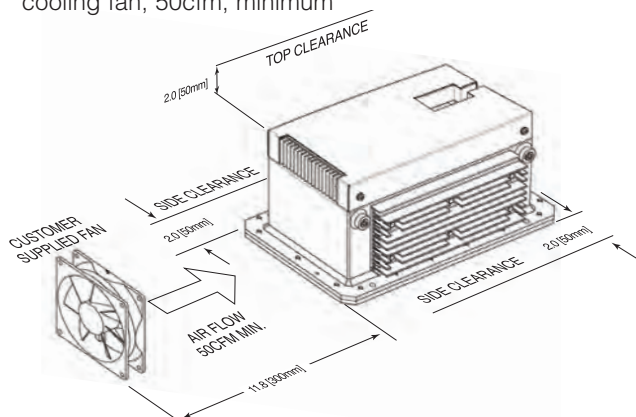
-20°C to +70°C

#### Humidity:

10% to 95% relative humidity, non-condensing

#### Cooling:

20W and 50W option: Customer provided, external cooling fan, 50cfm, minimum



#### Analog Interface and Input Line Connector:

25 pin D connector, male

#### Digital Interface Connector:

RS-232: 9 pin D connector, female  
Ethernet: RJ45 connector

#### Grounding Point:

6-32 ground stud provided on chassis

#### Dimensions:

20W: 5.81"W x 5.0"H x 10.81"D  
(147.57mm X 127mm X 274.57mm)  
50W: 6.00"W x 5.0"H x 10.81"D  
(152.4mm x 127mm x 274.57mm)

#### Weight:

20W: 18lbs (8.165kg)  
50W: 20lbs (9.072kg)

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Less than 1mR/hr at 1 meter

#### Regulatory Approvals:

Compliant to UL/CUL recognized file E242584.  
CE to EN 61010-1 for non-medical applications.

#### RS-232 DIGITAL INTERFACE— J5 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	NC	No Connection
2	TX Out	Transmit Data
3	RX In	Receive Data
4	NC	No Connection
5	SGND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

#### ETHERNET DIGITAL INTERFACE— RJ45 8 PIN CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX +	Transmit Data +
2	TX -	Transmit Data -
3	RX +	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX -	Receive Data -
7	NC	No Connection
8	NC	No Connection

#### ANALOG INTERFACE— J1 25 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	+24V	+24Vdc±1Vdc @ 4A
2	+24V	+24Vdc±1Vdc @ 4A
3	+24V	+24Vdc±1Vdc @ 4A
4	NC	No Connection
5	+24V RETURN	+24V RETURN
6	+24V RETURN	+24V RETURN
7	+24V RETURN	+24V RETURN
8	Signal Ground	Signal Ground
9	Interlock Input	Input, Active low, Interlock is low safe to enable high voltage. Connect to +24V Return
10	kV Monitor	Output, 0 to 8V = 0 to rated output voltage. Zout=100Ω
11	μA Monitor	Output, 0 to 10V = 0 to rated output current. Zout=100Ω
12	X-Ray Ready status	Output, Active Low, Open Collector, 24Vdc @ 10mA max
13	X-Ray ON status	Output, Active Low, Open Collector, 24Vdc @ 10mA max
14	Filament Standby status	Output, Active Low, Open Collector, 24Vdc @ 10mA max
15	Over Voltage Fault	Output, Active Low, Open Collector, 24Vdc @ 10mA max
16	Over Current Fault	Output, Active Low, Open Collector, 24Vdc @ 10mA max
17	ARC Fault	Output, Active Low, Open Collector, 24Vdc @ 10mA max
18	Filament Current Limit Fault	Output, Active Low, Open Collector, 24Vdc @ 10mA max
19	Signal Ground	Signal Ground
20	Interlock Output	Output, Active Low, Open Collector, 24Vdc @ 10mA max
21	μA Program	Input, 0 to 10V = 0 to rated output current. Zin=10kΩ
22	kV Program	Input, 0 to 8V = 0 to rated output voltage. Zin=10kΩ
23	X-Ray ON Command	Input, Active low Low (short) = X-Ray ON High (open) = X-Ray OFF Internal pull up resistor to +15V
24	Signal Ground	Signal Ground
25	Over Temperature	Output, Active Low, Open Collector, 24Vdc @ 10mA max

### 20W Model ORDERING INFORMATION

#### Medical Applications:

XRB011-80PN20	80kV, 250uA, 20W, Analog Interface, RS-232
XRB011-80PN20E	80kV, 250uA, 20W, Analog Interface, RS-232, Ethernet
XRB011-80PN20A	80kV, 250uA, 20W, Analog Interface

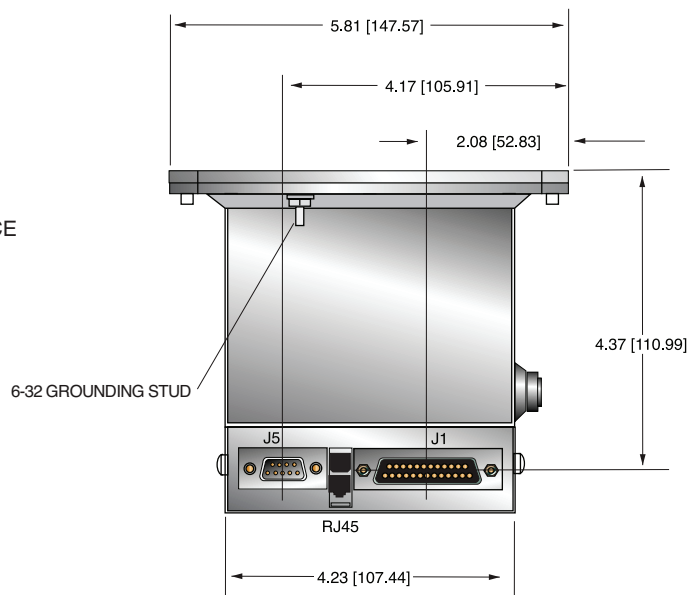
#### Non-Medical Applications:

XRB011-80PN20/CE	80kV, 250uA, 20W, Analog Interface, RS-232, CE
XRB011-80PN20E/CE	80kV, 250uA, 20W, Analog Interface, RS-232, Ethernet, CE
XRB011-80PN20A/CE	80kV, 250uA, 20W, Analog Interface, CE

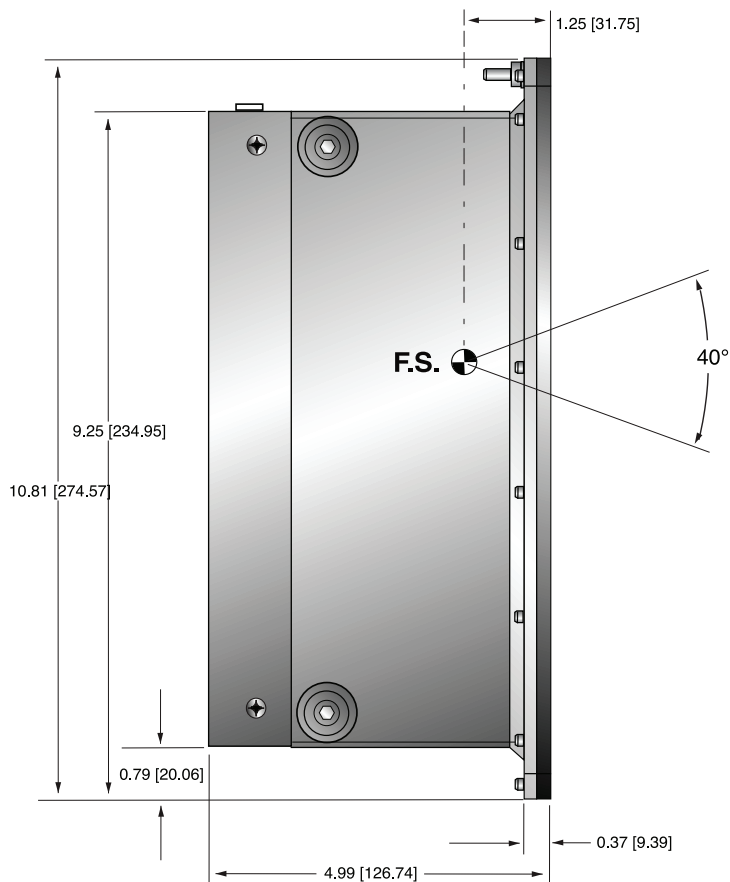
### XRB011 20W Model

DIMENSIONS: in.[mm]

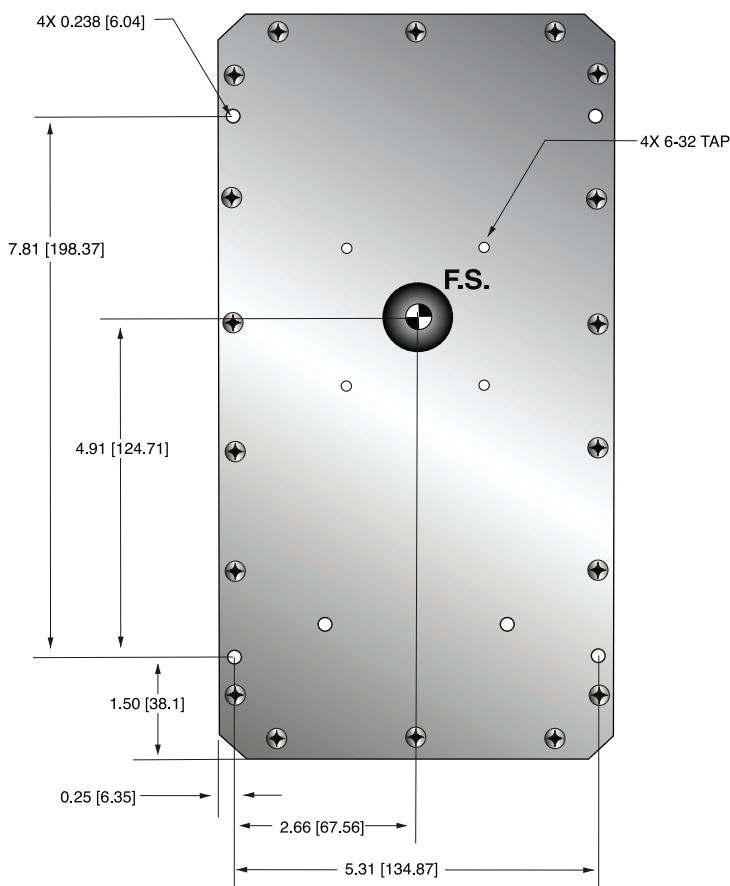
#### FRONT VIEW



#### SIDE VIEW



#### TOP VIEW



## 50W Model

## ORDERING INFORMATION

### Medical Applications:

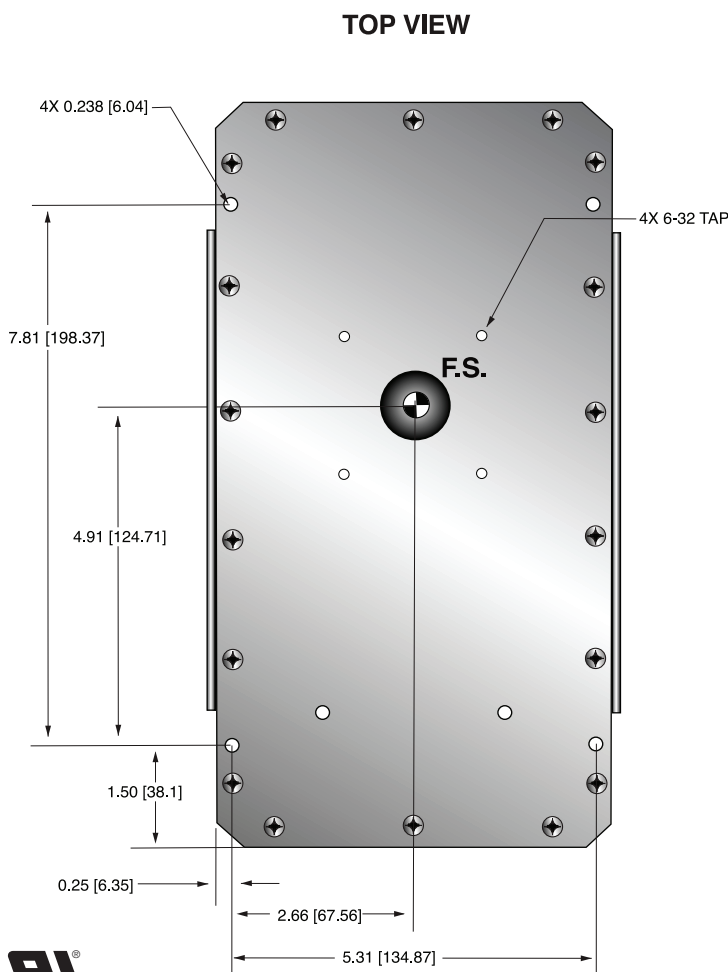
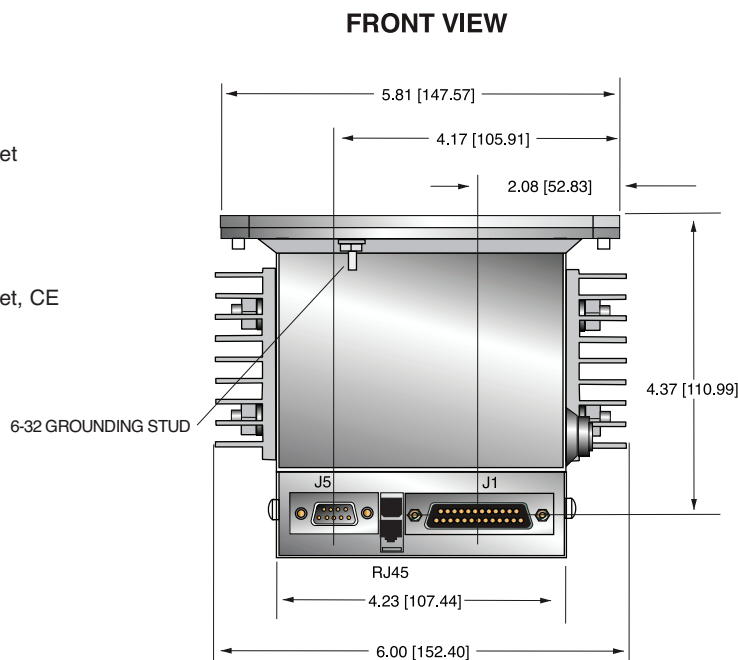
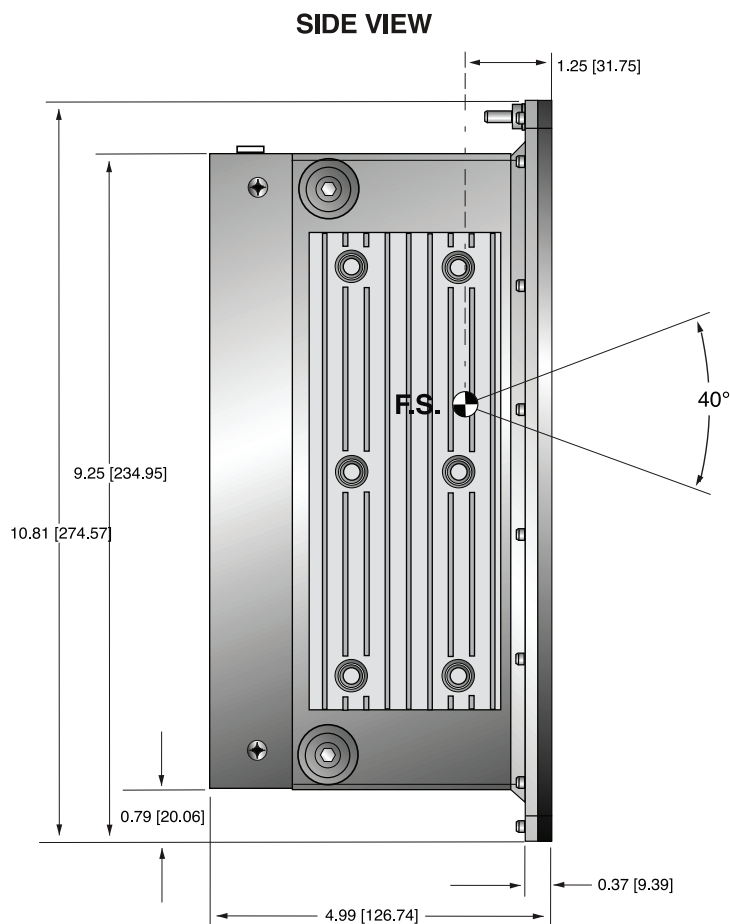
XRB011-80PN50	80kV, 700uA, 50W, Analog Interface, RS-232
XRB011-80PN50E	80kV, 700uA, 50W, Analog Interface, RS-232, Ethernet
XRB011-80PN50A	80kV, 700uA, 50W, Analog Interface

### Non-Medical Applications:

XRB011-80PN50/CE	80kV, 700uA, 50W, Analog Interface, RS-232, CE
XRB011-80PN50E/CE	80kV, 700uA, 50W, Analog Interface, RS-232, Ethernet, CE
XRB011-80PN50A/CE	80kV, 700uA, 50W, Analog Interface, CE

**XRB011**  
**50W Model**

DIMENSIONS: in.[mm]





Spellman's  $\mu$ XRB130P65 microfocus Monoblock® X-Ray sources are designed for high resolution imaging applications powering its internal microfocus X-Ray tube up to 130kV @ 65W. Features like 24Vdc input voltage, small package size and standard RS-232 digital interface simplify integrating the  $\mu$ XRB130P65 into your X-Ray system. The small, round focal spot size, optimized over the range of operating voltage, and high magnification, combined with stable high intensity output provides distortion free, superior quality 2D and 3D images.

### TYPICAL APPLICATIONS

#### Industrial X-Ray:

- Circuit board and electronic component inspection
- High resolution Non Destructive Testing of metal and plastic parts
- Micro CT for Industrial applications
- Battery inspection

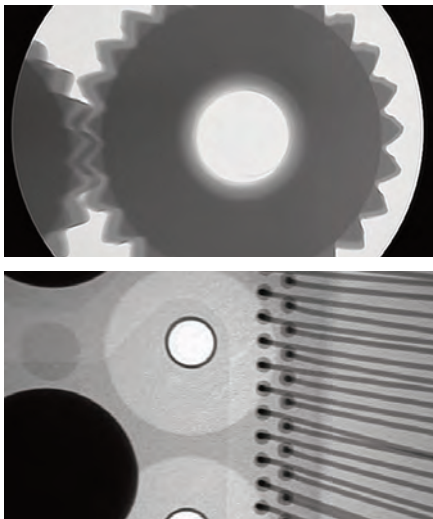
#### Medical X-Ray:

- Micro CT for life sciences applications

### OPTIONS

**WB** Wide Beam  
**ET** Extended Tube (wide beam only)  
**LW** Light Weight

The uXRB130P65 is ideal for applications such as printed circuit board inspection, battery inspection and industrial/medical micro CT.



Photos provided by ThermoFisher Scientific

- **Integrated X-Ray Tube and Control Electronics in One Compact Assembly**
- **Standard RS-232 Digital Interface Offers Access to Diagnostics and Operating Logs**
- **Standard Windows Test GUI**
- **7 Micron Focal Spot for Narrow Beam**
- **8 Micron Focal Spot for Wide Beam**
- **10mm/14mm Spot to Window Spacing Provides High Geometric Magnification**

### SPECIFICATIONS

#### Narrow Beam Benefits (Standard):

The small round spot is optimized over the range of kV and power to provide distortion free images. Operated at 4 watts yields a 6 micron spot for high resolution imaging. The 14mm spot to window spacing offers high geometric magnification.

#### Narrow Beam X-Ray Characteristics (Standard):

Spot Ellipticity:  $\pm 20\%$  @ 16 watts, 130kV  
 (either axis referred to average)  
 Beam Geometry:  $\geq 53^\circ$ , round beam, uniform beam profile in any direction  
 Spot to Window Spacing: 14mm  $\pm 0.5$ mm  
 Window Diameter (uncollimated):  $\approx 19$ mm  
 Window Material and Thickness: Beryllium, 0.25mm  
 Target Material: Tungsten

#### Wide Beam Benefits (WB Option):

The 115 degree round beam is well suited for automated inspection where a large field of view is required for maximum throughput or off angled views. The 10mm spot to window spacing provides superior high geometric magnification.

#### Wide Beam X-Ray Characteristics (WB Option):

Spot Ellipticity:  $\pm 20\%$  @ 16 watts, 130kV  
 (either axis referred to average)  
 Cone of Illumination:  $115^\circ$ , round beam, uniform beam profile in any direction  
 Spot to Window Spacing: 10mm  $\pm 0.5$ mm  
 Window Diameter (uncollimated):  $\approx 38$ mm  
 Window Material and Thickness: Beryllium, 0.51mm  
 Target Material: Tungsten  
 X-Ray Leakage: Behind X-Ray tube is  $\leq 0.5$ mR/hr at 2.55cm

**Input Voltage:**  
 +24-27Vdc

**Input Current:**  
 <6 amps

#### Anode Supply:

Output Voltage:

20kV to 130kV (referenced to Cathode Gun Supply)

Output Current:

up to 0.5mA, from 20kV to 130kV

#### Environmental:

Operating Temperature:

0°C to +32°C

Storage Temperature:

-20°C to +70°C

Humidity:

0 to 95%, non-condensing

Altitude:

Up to 5,000 feet (1524 meters)

#### Cooling:

Internal fan is incorporated. Adequate air circulation around unit must be provided.

#### Digital Interface:

RS-232

#### Mechanical:

See drawings

**Weight:** Standard: 30lbs. (13.60kg)

Standard/Extended Tube: 34lbs. (15.40kg)

Light Weight (LW option): 23lbs. (10.43kg)

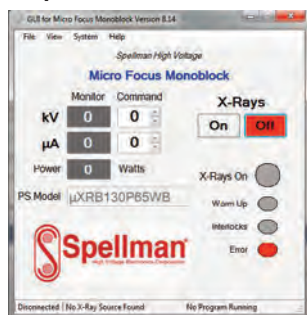
Light Weight/Extended Tube: 27lbs. (12.24kg)

#### Regulatory Approvals:

Compliant to EEC EMC Directive.

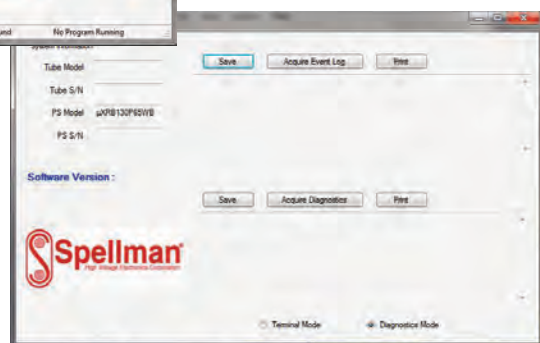
Compliant to EEC Low Voltage Directive.

#### Graphical User Interface



Spellman provides an example of a Graphical User Interface (GUI) for the convenience of the user but most customers implement their own software.

<Main System Screen



Diagnostics Screen

#### J1 INPUT/OUTPUT — 16 PIN AMP #206036-1 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Chamber Interlock Out	To close Chamber Interlock connect pin 1 to pin 2, R<2Ω
2	Chamber Interlock In	To close Chamber Interlock connect pin 2 to pin 1, R<2Ω
3	X-Ray ON Lamp Out	120Vac @ 3A/250Vac @ 1.5A rated contacts. Close at X-Ray ON
4	X-Ray ON Lamp In	120Vac @ 3A/250Vac @ 1.5A rated contacts. Close at X-Ray ON
5	N/C	N/C
6	Prime Power Interlock Out	To close Power Interlock connect pin 6, 7 to pin 8, 10, R<2Ω
7	Prime Power Interlock Out	To close Power Interlock connect pin 6, 7 to pin , R<2Ω
8	Prime Power Interlock In	To close Power Interlock connect pin 8, 10 to pin 6, 7, R<2Ω
9	N/C	N/C
10	Prime Power Interlock In	To close Power Interlock connect pin 8, 10 to pin 6, 7, R<2Ω
11	+24Vdc Input (+)	+24Vdc Input (+)
12	+24Vdc Input (+)	+24Vdc Input (+)
13	+24Vdc Return (-)	+24Vdc Return (-)
14	+24Vdc Return (-)	+24Vdc Return (-)
15	X-Ray On Indicator Out	24Vdc @ 3A rated contacts. Close at X-Ray On
16	X-Ray On Indicator In	24Vdc @ 3A rated contacts. Close at X-Ray On

#### J2 RS-232 DIGITAL INTERFACE — 9 PIN AMP #788903-1 CONNECTOR

PIN	SIGNAL	NAME
1	DCD	Data Carrier Detect
2	RD	Received Data
3	TD	Transmitted Data
4	DTR	Data Terminal Ready
5	SGNO	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to send
8	CTS	Clear to Send
9	RI	Ring Indicator

#### SPOT TABLE

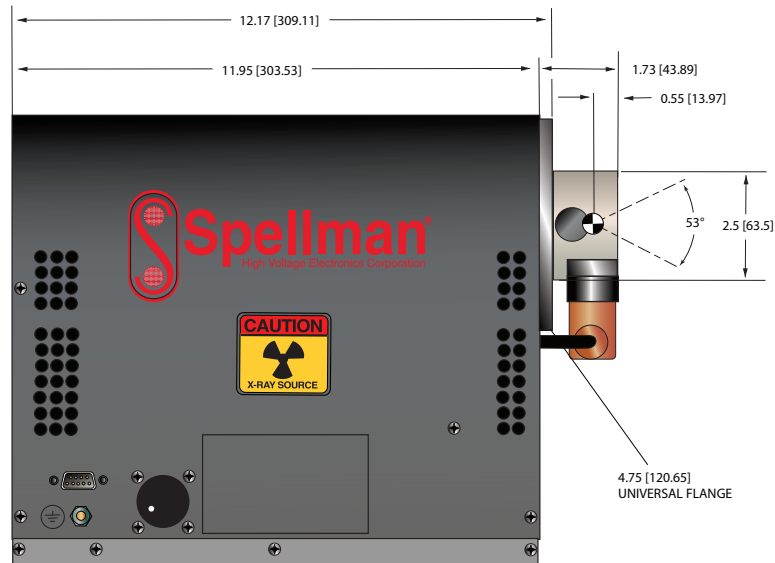
PARAMETER	NARROW BEAM	WIDE BEAM
Operating Voltage Range	45-130kV	50-130kV
Maximum Power	65W, 130kV	65W, 130kV
Maximum Beam Current	0.500mA	0.500mA
Spot Size	4 Watt	≤ 7μ, 45-130kV
	8 Watt	≤ 10μ, 45-130kV
	16 Watt	≤ 22μ, 45-130kV
	32 Watt	≤ 48μ, 70-130kV
	40 Watt	≤ 60μ, 80-130kV
	65 Watt	≤ 100μ, 130kV

#### How to Order:

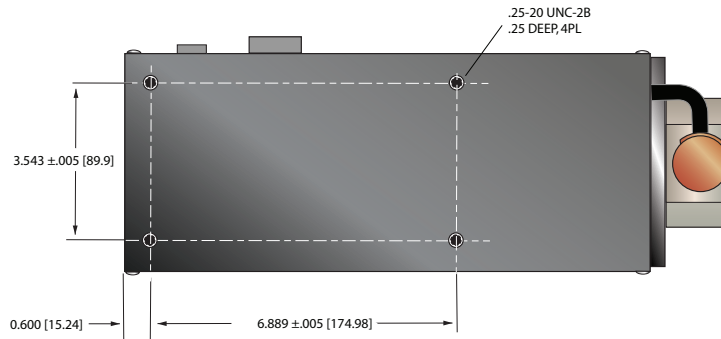
Standard (Narrow Beam)	PART NO.: μXRB130P65NB
Wide Beam Option	PART NO.: μXRB130P65WB
Wide Beam Option and Extension Tube	PART NO.: μXRB130P65WBET

DIMENSIONS: in.[mm]

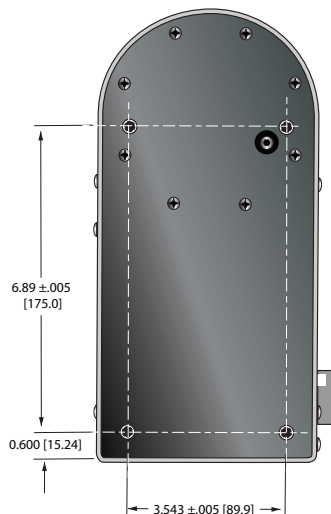
### NARROW BEAM (Standard) SIDE VIEW



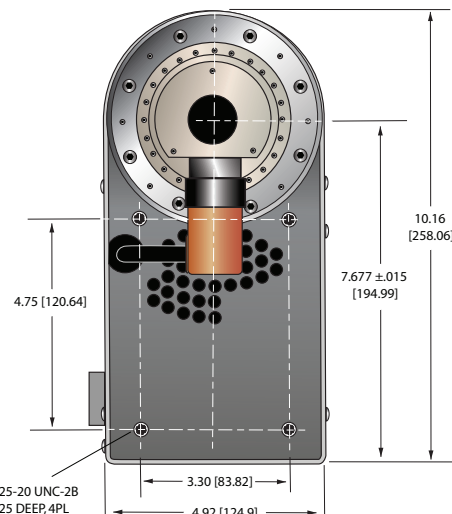
### BOTTOM VIEW



### REAR VIEW

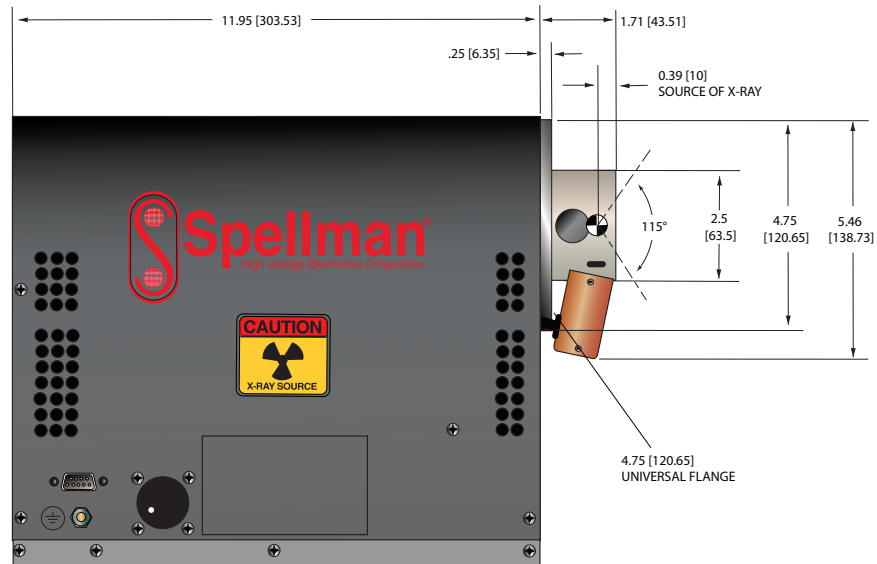


### FRONT VIEW

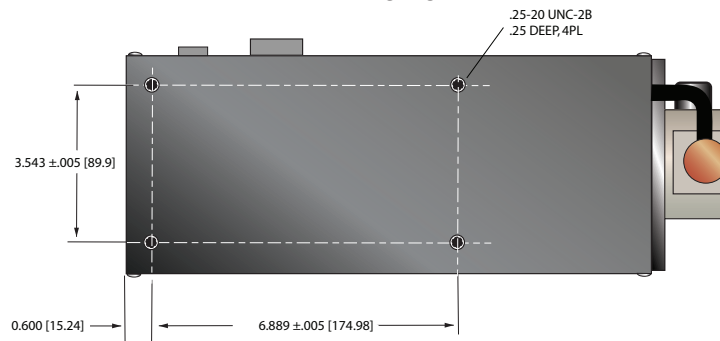


DIMENSIONS: in.[mm]

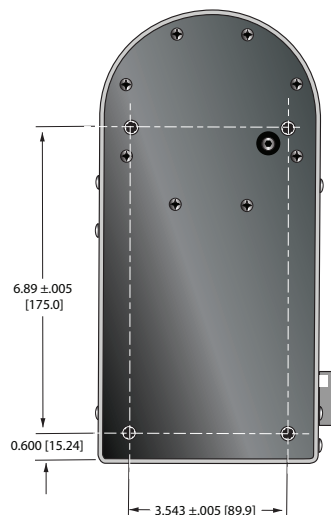
#### WIDE BEAM (WB Option) SIDE VIEW



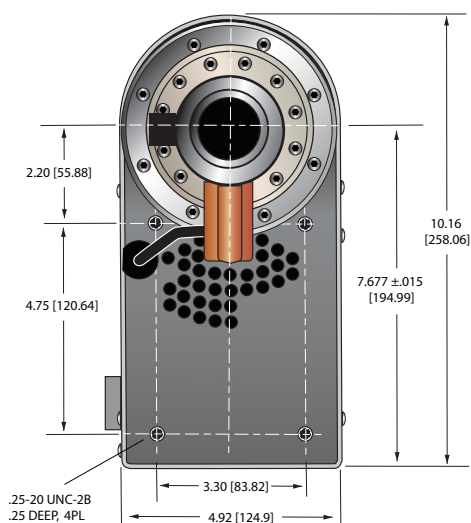
#### BOTTOM VIEW



#### REAR VIEW



#### FRONT VIEW







Spellman's XRB80N100 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 80kV at 100W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this unit into your X-Ray system. The XRB80N100 is available either with fan shaped (standard) or (optional) cone shaped beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

#### TYPICAL APPLICATIONS

X-Ray Scanning: Bone Densitometry,  
Thickness Measurement, Food Inspection,  
Fill Level Confirmation, Parcel Inspection

#### SPECIFICATIONS

##### X-Ray Characteristics:

Focal Spot: 0.5mm (IEC 336)

Beam Filter:

Ultem: 3.30mm  $\pm 0.15$ mm

Oil: 8mm  $\pm 0.1$ mm

Glass: 1.8mm  $\pm 0.25$ mm

BE: 0.8mm

Beam Geometry:

Fan: Standard. The beam angular coverage will be 75° with the beam plane perpendicular to the X-Ray tube axis and 13° wide.

Cone: Optional. 25° cone beam

##### Input Voltage:

Power factor corrected input 0.98, 100-240Vac  $\pm 10\%$   
50/60Hz, 2A, maximum

##### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable up to 80kV

##### X-Ray Tube Current:

150uA to 1.25mA over specified tube voltage range

##### X-Ray Tube Power:

100W maximum continuous

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Control Interface and Standard RS-232 Digital Interface**

##### Voltage Regulation:

Line:  $\pm 0.05\%$  of maximum output voltage over a  $\pm 10\%$  change of nominal input line voltage

Load:  $\pm 0.1\%$  of maximum rated voltage for 150uA to 1.25mA load change

##### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  $\pm 2\%$  of the programmed value

##### Voltage Risettime:

Standard: Ramp time shall be 500ms from 10% to 90% of maximum rated output voltage

Optional: 5 seconds. Specify at time of order

##### Voltage Overshoot:

5% of maximum voltage, to return within 2.5% of maximum voltage in less than 100ms

##### Voltage Ripple:

1% peak to peak of maximum voltage for frequencies  $\leq 1$ kHz

##### Emission Current Parameters

##### Current Regulation:

Line:  $\pm 0.05\%$  of rated output current over a  $\pm 10\%$  change of nominal input line voltage

Load:  $\pm 0.1\%$  of rated output current for a change from 50% to 100% of rated output voltage

##### Current Accuracy:

Current measured through the X-Ray tube is within  $\pm 2\%$  of the programmed value

##### Current Risettime:

Standard: Ramp time shall be 500ms from 10% to 90% of maximum rated current

Optional: 5 seconds. Specify at time of order

##### Arc Intervention:

3 arcs in 10 seconds with a 200ms quench = Shutdown

##### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

#### Analog Interface:

Ground referenced 0 to 9Vdc for all programming and monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

#### Digital Interface:

Jumpers are needed to be configured and the digital interface cable installed to enable the RS-232 interface.

#### Control Software:

A demo GUI is available for engineering evaluations

#### Interlock/Signals:

A hardware interlock functions in both analog and digital programming modes. The hardware X-Ray Enable signal only functions in analog programming mode.

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-40°C to +70°C

#### Humidity:

10% to 95% relative humidity, non-condensing

#### Cooling:

Customer provided 150cfm external cooling fan as required to maintain oil temperature below 55°C. (External cooling is not required if fan option is selected)

#### Input Line Connector:

3 pin, Phoenix Contact 1829167, SHV part number 105725-219. Mating connector Phoenix Contact #1805990, SHV part number 105808-475 provided with unit.

#### Analog Interface Connector:

15 pin D connector, male

#### Digital Interface Connector:

9 pin D connector, female

#### Grounding Point:

8-32 ground stud provided on chassis

#### Dimensions:

See line drawings

#### Weight:

32lbs (14.5kg)

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530.

#### AC LINE POWER CONNECTOR— J1 THREE POSITION PHOENIX CONTACT

PIN	SIGNAL
1	Earth Ground
2	Line
3	Neutral

Mating connector provided with unit

#### RS-232 DIGITAL INTERFACE— J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

#### XRB ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Fault Output	Open collector, 35V @ 10mA max. high = no fault
2	mA Program Input	0 to 9.00Vdc = 0 to 100% rated output, Zin = 10MΩ
3	kV Program Input	0 to 9.00Vdc = 0 to 100% rated output, Zin = 10MΩ
4	X-Ray On Lamp Relay Output	Common, dry contacts, 30Vdc @ 1A, max
5	X-Ray On Lamp Relay Output	Normally open, X-Ray ON = closed
6	mA Monitor Output	0 to 9Vdc = 0 to 100% rated output, Zout = 10kΩ
7	X-Ray On Lamp Relay Output	Normally closed, X-Ray ON = open
8	kV Monitor Output	0 to 9.00Vdc = 0 to 100% rated output, Zout = 10kΩ
9	Signal Ground	Ground
10	Signal Ground	Ground
11	HV Interlock Return Input	Connect to Pin 12 to close HV interlock
12	HV Interlock Output	+15Vdc @ open, 5mA when connected to pin 11
13	X-Ray Enable Output	+15Vdc @ open, 5mA when connected to pin 15
14	X-Ray Status Output	Open collector, 35V @ 10mA max high = X-Ray OFF
15	X-Ray Enable Return Input	Connect to pin 13 to enable X-Ray generation

#### LED INDICATORS

INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

#### OPTIONS

- RT** 5 second Risetime for both voltage and current
- CB** Cone Beam
- FN** Integrated Cooling Fan
- M** Elapsed Time Meter  
(measures X-Ray ON elapsed time)

#### How to Order:

Standard: PART NO.: XRB80N100

Risetime, Cone Beam, Fan and  
Elapsed Time Meter Options

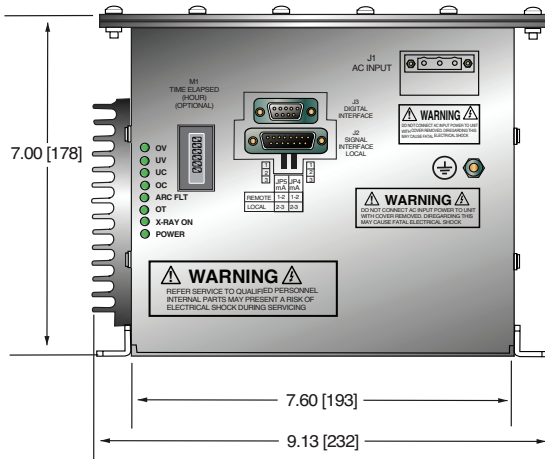
PART NO.: XRB80N100/RT/CB/FN/M

DIMENSIONS: in.[mm]

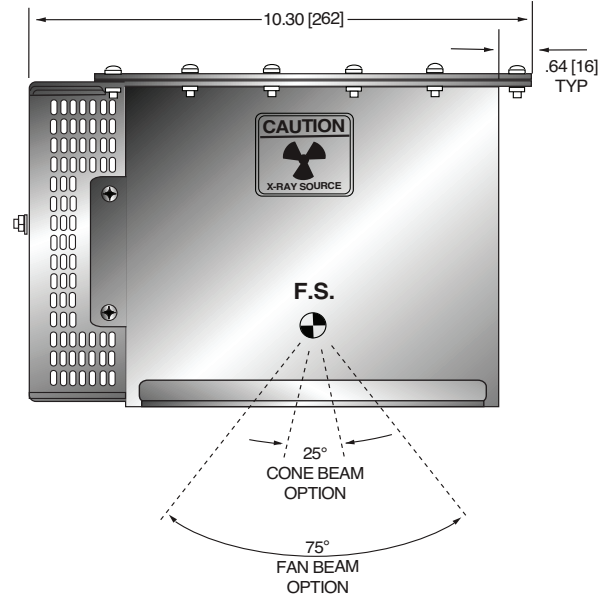
#### Standard Unit

#### FRONT VIEW

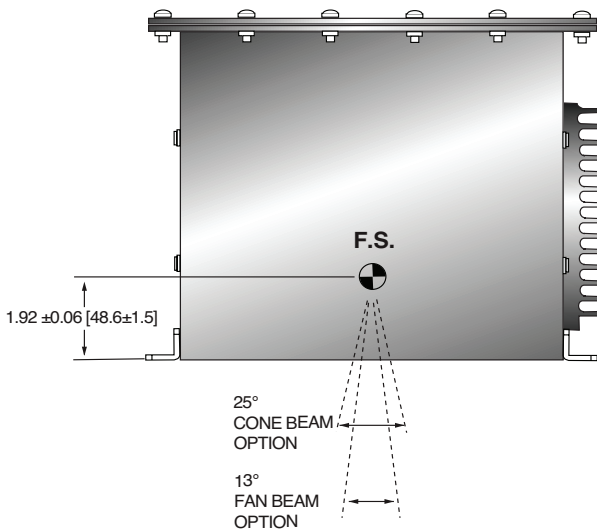
NOTE: Shown with Elapsed Time Meter option



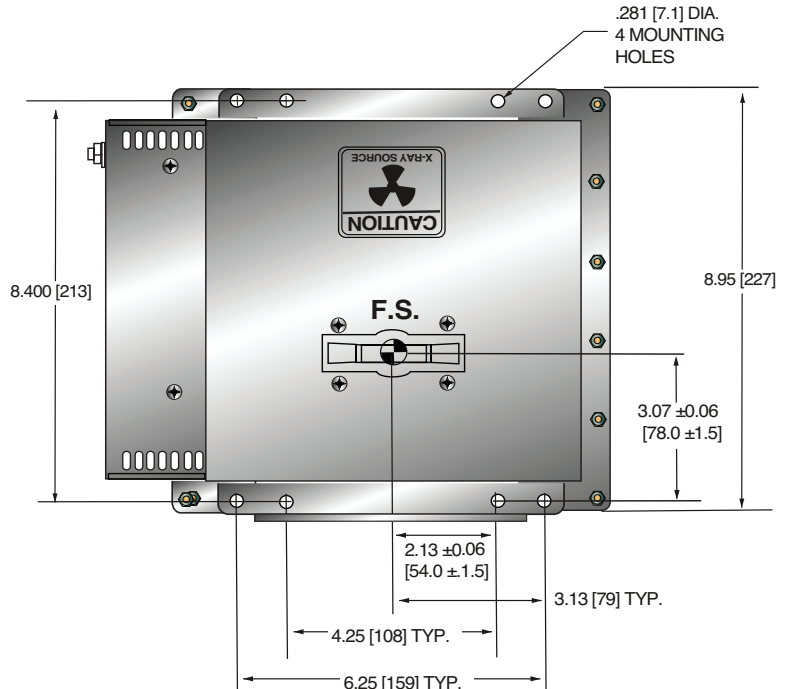
#### SIDE VIEW



#### BACK VIEW



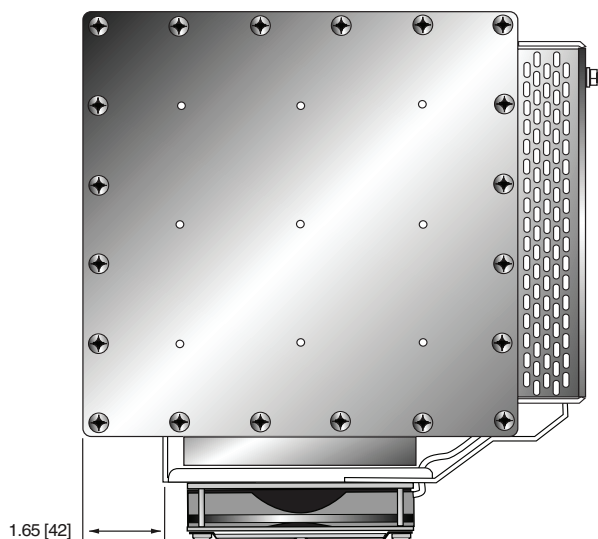
#### BOTTOM VIEW



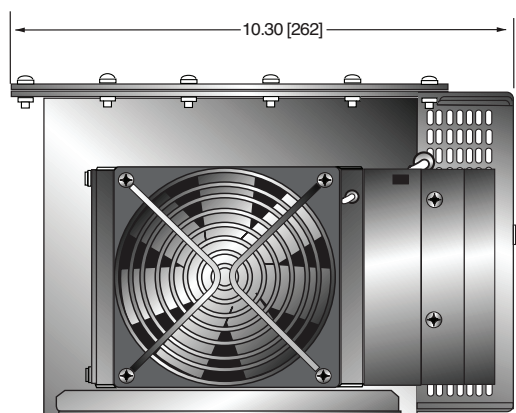
DIMENSIONS: in.[mm]

**Cooling Fan Option**

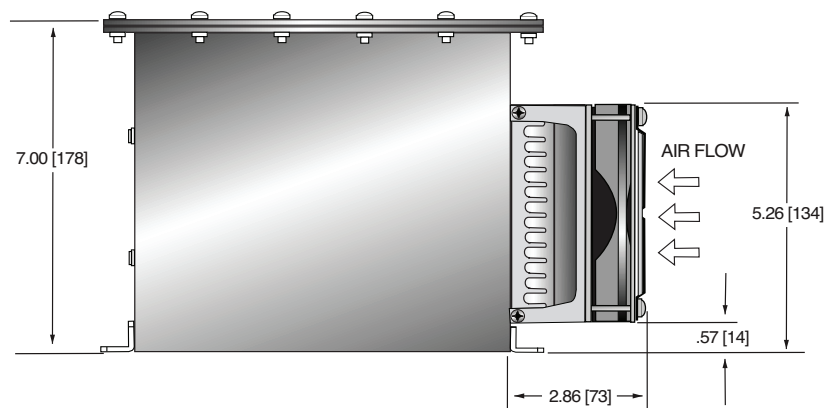
**TOP VIEW**



**SIDE VIEW**



**BACK VIEW**





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface and Standard RS-232 Digital Program and Monitor Interface**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning (Smart Controller Option Only)**

Spellman's XRB80PN100HR (high reliability) Monoblock® X-Ray source is designed for OEM applications powering its internal Bipolar X-Ray tube up to 80kV at 100W.

Features like universal input, small package size and a standard RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. The XRB80PN100HR is available either with fan shaped (standard) or (optional) cone shaped beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance. The XRB80PN100HR is designed for long field life and comes with a 3 year warranty.

### TYPICAL APPLICATIONS

X-Ray Scanning, Thickness Measurement, Food Inspection, Fill Level Confirmation, Parcel Inspection

### OPTIONS

<b>CB</b>	Cone Beam
<b>.5mm</b>	.5mm focal spot X-Ray tube
<b>NF</b>	80° x 10° Narrow Fan beam
<b>RA</b>	Right Angle cable
<b>SC</b>	Smart Controller

### SPECIFICATIONS

#### X-Ray Characteristics:

Focal Spot: 0.8mm (IEC 336) standard  
0.5mm (IEC 336) optional

#### Beam Filter:

Utem: 3.00mm ±0.15mm  
Oil: 7.5mm ±0.25mm  
Glass: 1.7mm ±0.2mm  
Be: 0.8mm

#### Beam Geometry:

Fan: The standard beam angular coverage will be 80° with the beam plane perpendicular to the X-Ray tube axis and 20° wide (with a 2° tolerance)  
An optional 80° x 10° (with a 2° tolerance) is also available  
Cone: Optional. 20° cone beam (with a 2° tolerance)

#### Input Voltage:

Power factor corrected input 0.98, 100-240Vac ±10%  
50/60Hz, 2A maximum

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable 40kV (±20kV)  
to 80kV (±40kV)

#### X-Ray Tube Current:

150uA to 2.00mA over specified tube voltage range  
(100W max.)

#### X-Ray Tube Power:

100W maximum continuous

#### Voltage Regulation:

Line: ±0.05% of maximum output voltage over a ±10%  
change of nominal input line voltage  
Load: ±0.1% of maximum rated voltage for 150uA  
to 2.00mA load change

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  
±2% of the programmed value

#### Voltage Risettime:

Ramp time shall be <500ms from 10% to  
90% of maximum rated output voltage

#### Voltage Ripple:

0.5% peak to peak of maximum voltage for frequencies ≤1kHz

#### Emission Current Parameters

##### Current Regulation:

Line: ±0.05% of rated output current over a  
±10% change of nominal input line voltage  
Load: ±0.1% of rated output current for a change  
from 50% to 100% of rated output voltage

##### Current Accuracy:

Current measured through the X-Ray tube is within  
±2% of the programmed value

##### Current Risettime:

Ramp time shall be <500ms from 10% to 90%  
of maximum rated current

##### Arc Intervention:

4 arcs in 10 seconds with a 100ms quench/100ms  
re-ramp = Shutdown

#### Filament Configuration:

Internal AC filament drive with closed loop filament emission control

#### Analog Monitoring Interface:

Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

#### Digital Programming and Monitoring Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature. Tolerance 3%. (with an additional 5µA offset at ≤10% mA programming)

#### Control Software:

A demo GUI is available for engineering evaluations

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-40°C to +70°C

#### Humidity:

10% to 95% relative humidity, non-condensing

#### Cooling:

X-Ray Tank: Customer provided 250 cfm external cooling fan as required to maintain oil temperature below 55°C.

Controller: Forced air via internal fan.

#### Input Line Connector:

3-pin Phoenix Contact 1829167. Mating connector provided with unit

#### Analog Interface Connector:

15 pin male D connector provided with unit

#### Digital Interface Connector:

9 pin female D connector provided with unit

#### Grounding Point:

M4 ground stud provided on chassis

#### Dimensions:

X-Ray Tank: 11.3"L x 9.625"W x 4.93"H  
(287.02mm x 244.4mm x 125.2mm)

Standard  
Controller: 8.5"L x 6.70"W x 2.21"H  
(215.9mm x 170.2mm x 56.1mm)

Smart  
Controller: 8.5"L x 7.14"W x 2.40"H  
(215.9mm x 181.4mm x 61.0mm)

#### Weight:

X-Ray Tank: 36lbs (16.32kg)

Standard  
Controller: 3.7lbs (1.68kg)

Smart  
Controller: 3.9lbs (1.77kg)

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530

#### SMART XRB (only available with Smart Controller option)

**The XRB80PN100HR with the Smart Controller (SC option) has two new digital features available: data logging and firmware controlled seasoning.**

#### Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

#### FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRB80PN100HR stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

#### NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Pre Heat Set point

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown alarm if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

#### Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRB80PN100HR knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

How to Order:	
Standard	PART NO.: XRB80PN100HR
Cone Beam Option	PART NO.: XRB80PN100HR/CB
0.5mm Focal Spot Option	PART NO.: XRB80PN100HR/.5mm
Narrow Fan Beam Option	PART NO.: XRB80PN100HR/NF
Cable Option	PART NO.: XRB80PN100HR/RA
Smart Controller Option	PART NO.: XRB80PN100HR/SC

#### AC LINE POWER CONNECTOR— J1 THREE POSITION PHOENIX CONTACT

PIN	SIGNAL
1	Earth Ground
2	Line
3	Neutral

Mating connector provided with unit

#### RS-232 DIGITAL INTERFACE— J3 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

#### ETHERNET DIGITAL INTERFACE\*— J4 8 PIN RJ45 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX-	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

\*Ethernet interface for Smart Controller option only

#### LED INDICATORS

INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

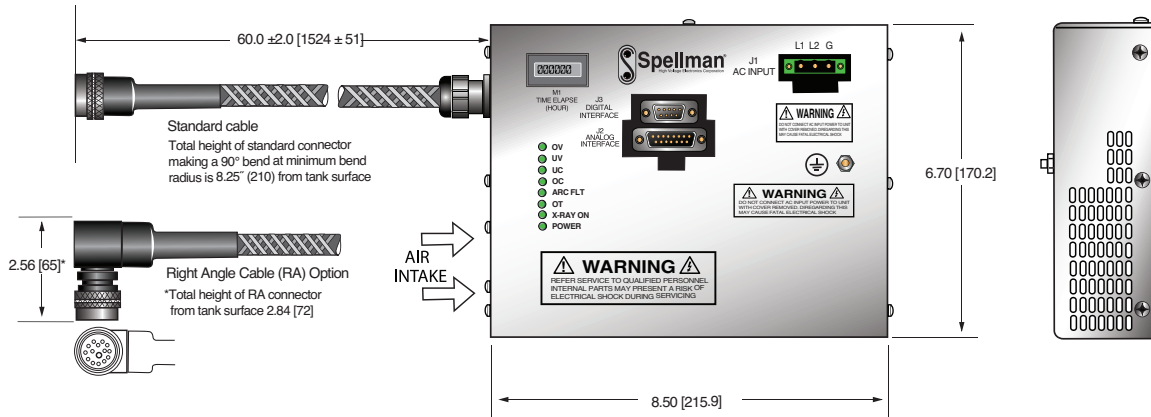
#### XRB80PN100HR ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Fault Output	Open collector, 35V @ 10mA max. high = no fault
2	N/C	No Connection
3	N/C	No Connection
4	X-Ray On Lamp Relay Output	Common, dry contacts, 30Vdc @ 1A, max
5	X-Ray On Lamp Relay Output	Normally open, X-Ray ON = closed
6	mA Monitor Output	0 to 9Vdc = 0 to 100% rated output, Zout = 10kΩ
7	X-Ray On Lamp Relay Output	Normally closed, X-Ray ON = open
8	kV Monitor Output	0 to 9.00Vdc = 0 to 100% rated output, Zout = 10kΩ
9	Signal Ground	Ground
10	Signal Ground	Ground
11	HV Interlock Return Input	Connect to Pin 12 to close HV interlock
12	HV Interlock Output	+15Vdc @ open, 5mA when connected to pin 11
13	X-Ray Enable Output	+15Vdc @ open, 5mA when connected to pin 15
14	X-Ray Status Output	Open collector, 35V @ 10mA max high = X-Ray OFF
15	X-Ray Enable Return Input	Connect to pin 13 to enable X-Ray generation (for local enable)

DIMENSIONS: in.[mm]

### STANDARD CONTROL UNIT

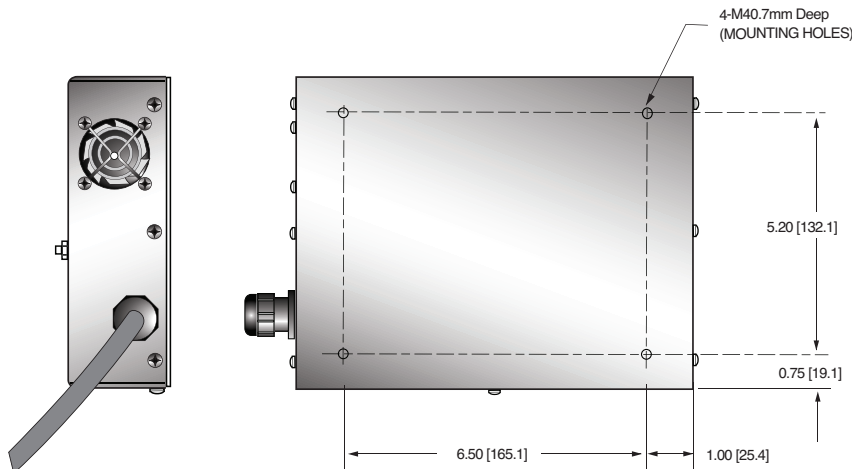
#### TOP VIEW



#### SIDE VIEW



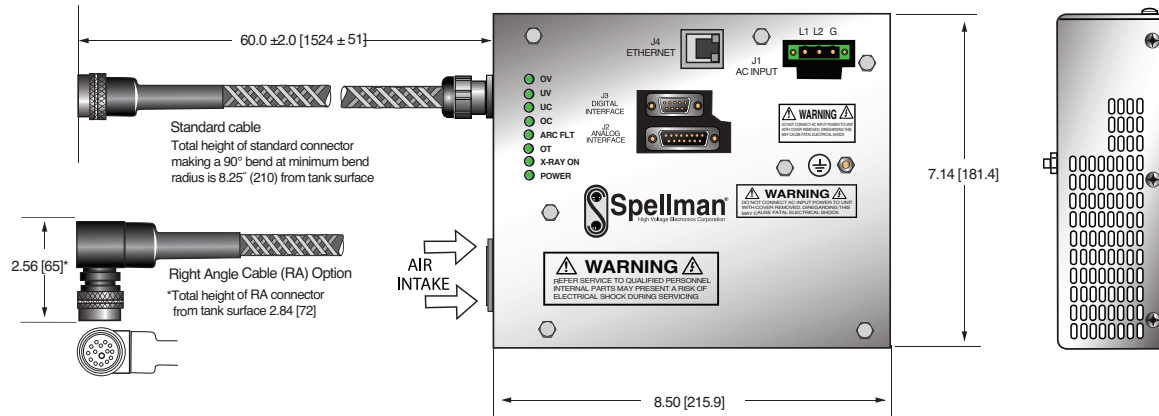
#### BOTTOM VIEW



DIMENSIONS: in.[mm]

## SMART CONTROL UNIT

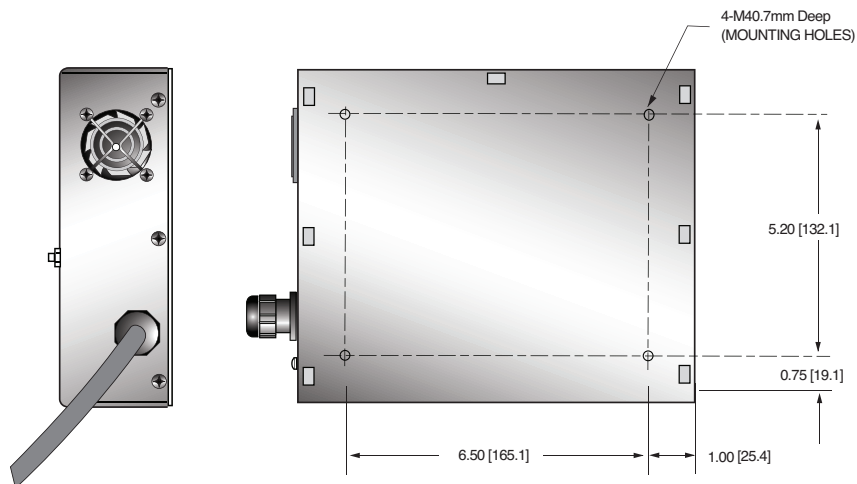
### TOP VIEW



### SIDE VIEW

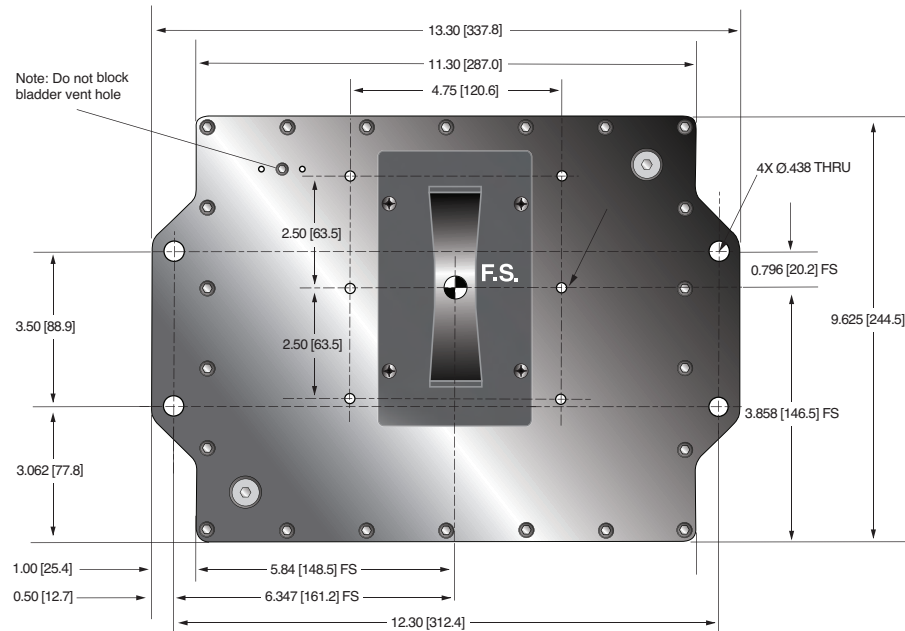


### BOTTOM VIEW

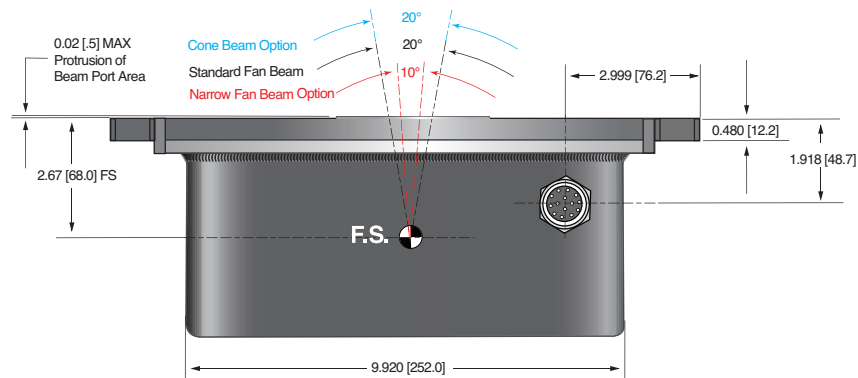


DIMENSIONS: in.[mm]

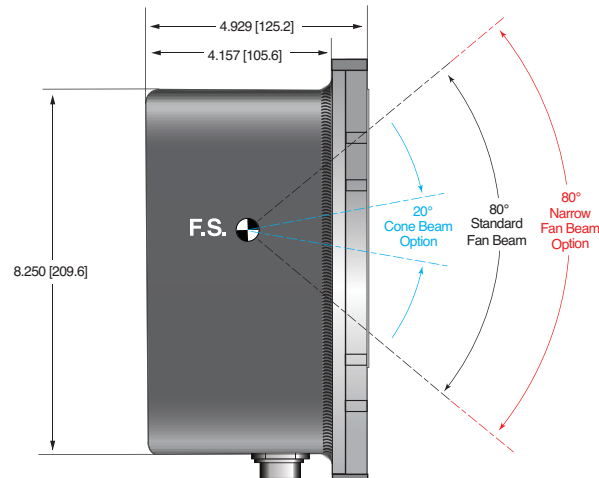
#### GENERATOR TANK TOP VIEW



#### FRONT VIEW



#### SIDE VIEW





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal input, Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Control Interface and Standard RS-232 Digital Interface**

Spellman's XRB100N100 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 100kV at 100W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

### SPECIFICATIONS

#### X-Ray Characteristics:

Tube Type:	Stationary anode, tungsten target
Focal Spot:	0.5mm (IEC 336)
Beam Filter:	Lexan: 3.2mm Oil: 10mm $\pm 0.1$ mm Glass: 1.8mm max
Beam Geometry:	Symmetrical fan 74° x 10° $\pm 1^\circ$

#### Input Voltage:

Power factor corrected input 0.98, 100-240Vac  $\pm 10\%$   
50/60Hz, 2A, maximum

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between  
40kV to 100kV

#### X-Ray Tube Current:

100uA to 1mA over specified tube voltage range

#### X-Ray Tube Power:

100W maximum continuous

#### Voltage Regulation:

Line:	$\pm 0.1\%$ of maximum output voltage over a $\pm 10\%$ change of nominal input line voltage
Load:	$\pm 0.1\%$ of maximum rated voltage for 100uA to 1mA load change

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  
 $\pm 2\%$  of the programmed value

#### Voltage Risettime:

Ramp time shall be 1 second from 10% to  
90% of maximum rated output voltage

#### Voltage Overshoot:

5% of maximum voltage, to return within 2.5% of  
maximum voltage in less than 50ms

#### Voltage Ripple:

0.5% peak to peak of maximum voltage for  
frequencies  $\leq 1$ kHz

#### Emission Current Parameters

##### Current Regulation:

Line:	$\pm 0.5\%$ of rated output current over a $\pm 10\%$ change of nominal input line voltage
Load:	$\pm 0.5\%$ of rated output current for a change from 50% to 100% of rated output voltage

##### Current Accuracy:

Current measured through the X-Ray tube is within  
 $\pm 1\%$  of the programmed value

##### Current Risettime:

Ramp time shall be 1 second from 10% to 90%  
of maximum rated current

##### Arc Intervention:

3 arcs in 10 seconds with a 200ms quench = Shutdown

##### Filament Configuration:

Internal high frequency AC filament drive with closed loop  
filament emission control

**Analog Interface:**

Ground referenced 0 to 9Vdc for all programming and monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

**Digital Interface:**

Jumpers are needed to be configured and the digital interface cable installed to enable the RS-232 interface.

**Control Software:**

A demo GUI is available for engineering evaluations.

**Interlock/Signals:**

A hardware interlock functions in both analog and digital programming modes. The hardware X-Ray Enable signal only functions in analog programming mode.

**Operating Temperature:**

0°C to +40°C

**Storage Temperature:**

-40°C to +70°C

**Humidity:**

10% to 95% relative humidity, non-condensing

**Cooling:**

Forced air and natural convection augmented by customer provided external cooling fan to maintain oil temperature below 55°C.

**Input Line Connector:**

3 pin, Phoenix Contact 1829167, SHV part number 105725-219. Mating connector Phoenix Contact #1805990, SHV part number 105808-475 provided with unit.

**Analog Interface Connector:**

15 pin D connector, male

**Digital Interface Connector:**

9 pin D connector, female

**Grounding Point:**

M4 ground stud provided on chassis

**Dimensions:**

See page 3 of 3

**Weight:**

55lbs (25kg)

**Orientation:**

Can be mounted in any orientation.

**X-Ray Leakage:**

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

**AC LINE POWER CONNECTOR—  
J1 THREE POSITION PHOENIX CONTACT**

PIN	SIGNAL
1	Earth Ground
2	Line
3	Neutral

Mating connector provided with unit

**RS-232 DIGITAL INTERFACE—  
J3 9 PIN FEMALE D CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

**XRB ANALOG INTERFACE—  
J2 15 PIN MALE D CONNECTOR**

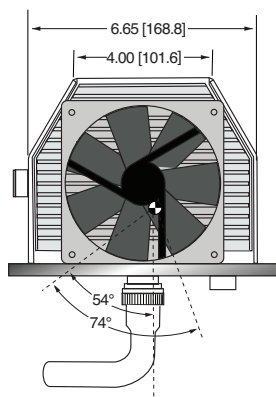
PIN	SIGNAL	PARAMETERS
1	Power Supply Fault Output	Open collector, 35V @ 10mA max. high = no fault
2	mA Program Input	0 to 9.00Vdc = 0 to 100% rated output, Z <sub>in</sub> = 10MΩ
3	kV Program Input	0 to 9.00Vdc = 0 to 100% rated output, Z <sub>in</sub> = 10MΩ
4	X-Ray On Lamp Relay Output	Common, dry contacts, 30Vdc @ 1A, max
5	X-Ray On Lamp Relay Output	Normally open, X-Ray ON = closed
6	mA Monitor Output	0 to 9Vdc = 0 to 100% rated output, Z <sub>out</sub> = 10kΩ
7	X-Ray On Lamp Relay Output	Normally closed, X-Ray ON = open
8	kV Monitor Output	0 to 9.00Vdc = 0 to 100% rated output, Z <sub>out</sub> = 10kΩ
9	Signal Ground	Ground
10	Signal Ground	Ground
11	HV Interlock Return Input	Connect to Pin 12 to close HV interlock
12	HV Interlock Output	+15Vdc @ open, 5mA when connected to pin 11
13	X-Ray Enable Output	+15Vdc @ open, 5mA when connected to pin 15
14	X-Ray Status Output	Open collector, 35V @ 10mA max high = X-Ray OFF
15	X-Ray Enable Return Input	Connect to pin 13 to enable X-Ray generation

**LED INDICATORS**

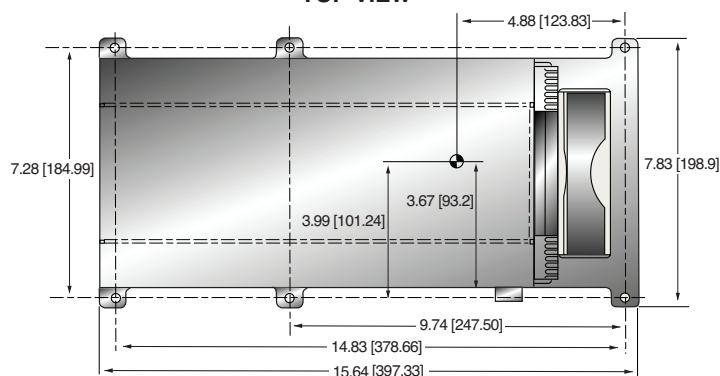
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

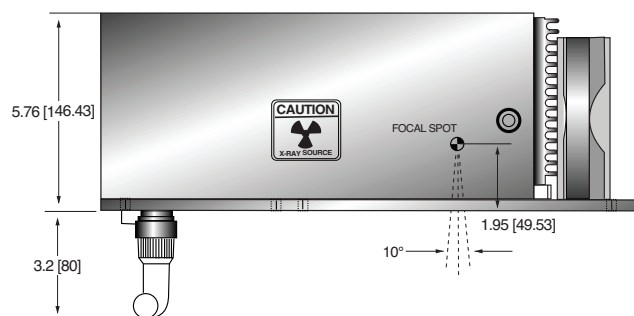
### X-RAY GENERATOR FRONT VIEW



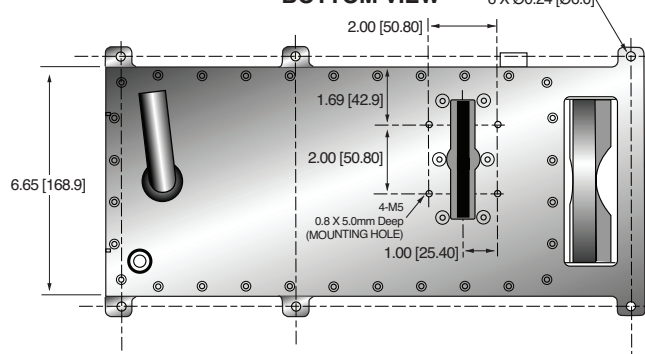
**TOP VIEW**



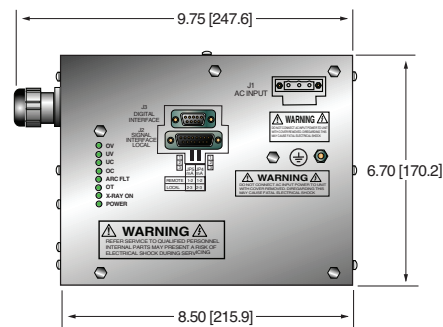
### SIDE VIEW



**BOTTOM VIEW**



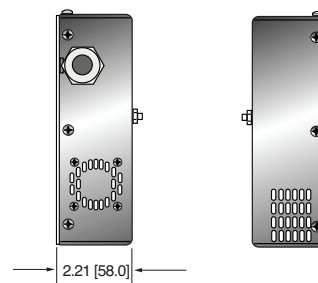
**CONTROL UNIT  
FRONT VIEW**



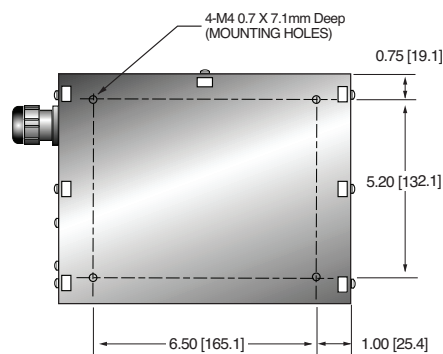
**TOP VIEW**



### SIDE VIEW



**BOTTOM VIEW**





- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface, Standard RS-232 Digital Interface and Ethernet**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning**

Spellman's XRBHR (high reliability) Series of Monoblock® X-Ray sources are designed for OEM applications powering their internal Bipolar X-Ray tube at 80kV and 100kV at power levels of 100W, 210W, 350W and 500W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of any XRBHR model into your X-Ray system. Each XRBHR model is available with fan shaped (standard) or cone shaped (optional) beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance. The XRBHR Series is designed for long field life and comes with a 3 year warranty.

### TYPICAL APPLICATIONS

Food Inspection Systems, Fill Level Confirmation Systems, Security Scanning Systems, Industrial NDT Systems, Thickness/Plating Measurement Systems

### OPTIONS

<b>CB</b>	Cone Beam
<b>.5mm</b>	.5mm focal spot X-Ray tube
<b>ST-TE</b>	
<b>RA-SE</b>	See page 4 for Cable Options
<b>RA-TE</b>	

### SPECIFICATIONS

#### X-Ray Characteristics:

Focal Spot:	0.8mm (IEC 336) standard 0.5mm (IEC 336) optional
Beam Filter:	
Ultem:	1.50mm ±0.15mm
Oil:	9.0mm ±0.25mm
Glass:	1.7mm ±0.2mm
Be:	0.8mm
Beam Geometry:	
Fan:	Standard. The beam angular coverage will be 80° with the beam plane perpendicular to the X-Ray tube axis and 12° wide (with a 2° tolerance)
Cone:	Optional. 40° cone beam (with a 2° tolerance)

#### Input Voltage:

100- 240Vac, ±10%, 50/60 Hertz, .98 power factor

#### Input Current:

100W @ 2A  
210W @ 4A  
350W @ 6A  
500W @ 8A

#### X-Ray Tube Voltage:

See table. Minimum kV for emission current 35kV

#### X-Ray Tube Current:

See table. Minimum emission current 150uA

#### X-Ray Tube Power:

See table

#### Voltage Regulation:

Line: ±0.05% of maximum output voltage over a ±10% change of nominal input line voltage  
Load: ±0.1% of maximum rated voltage for 150uA to full rated load change

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±2% of the programmed value

#### Voltage Risetime:

Standard ramp time shall be <500ms from 10% to 90% of maximum rated output voltage

#### Voltage Ripple:

0.5% peak to peak of maximum voltage for frequencies ≤1kHz

#### Emission Current Parameters

##### Current Regulation:

Line: ±0.05% of rated output current over a ±10% change of nominal input line voltage  
Load: ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

##### Current Accuracy:

Current measured through the X-Ray tube is within ±2% of the programmed value

##### Current Risetime:

Standard ramp time shall be <500ms from 10% to 90% of maximum rated current

##### Arc Intervention:

4 arcs in 10 seconds with a 100ms quench/100ms re-ramp = Shutdown

##### Filament Configuration:

Internal floating AC filament drive with closed loop filament emission control circuitry

#### Analog Interface:

Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

#### Digital Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-40°C to +70°C

#### Humidity:

10% to 95% relative humidity, non-condensing

#### Cooling:

X-Ray Tank:

- 100W: Convection/customer supplied forced air so tank is <55°C
- 210W: Externally powered forced air cooling, 24Vdc @ 2A
- 350W: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A
- 500W: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A

Controller: Forced air via internal fan.

#### Grounding Point:

- M5 ground female thread on tank
- M5 ground stud on control chassis provided

#### Dimensions:

- X-Ray Tank: see drawings
- 100W/210W Controller: see drawings
- 350W/500W Controller: see drawings

#### Weight:

X-Ray Tank:

- 100W @ 75 lbs. (34kg)
- 210W @ 75lbs. (34kg)
- 350W @ 81.5lbs. (37kg)
- 500W @ 81.5lbs. (37kgs)

Controller:

- 100W/210W: 4 pounds (1.18kg)
- 350W/500W: 7 pounds (3.18kg)

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530

#### MODEL SELECTION TABLE

MODEL	MAX. VOLTAGE	MAX. CURRENT	MAX. POWER
XRB80PN210HR	80kV	5.25mA	210 watts
XRB80PN350HR	80kV	8mA	350 watts
XRB80PN500HR	80kV	8mA	500 watts
XRB100PN100HR	100kV	2mA	100 watts
XRB100PN210HR	100kV	4.2mA	210 watts
XRB100PN350HR	100kV	7mA	350 watts
XRB100PN500HR	100kV	8mA	500 watts

#### LED INDICATORS

INDICATOR	SIGNAL	CONDITION Illuminated When...	LED COLOR
1	OV Error 6	High kV occurs	Red
2	UV Error 5	Low kV occurs	Red
3	UC Error 4	Low mA occurs	Red
4	OC Error 3	High mA occurs	Red
5	ARC Error 2	Arc fault occurs	Red
6	OT Error 1	Over temperature occurs	Red
7	X-Ray On	X-Rays are being generated	Green
8	Power On	AC input power is present	Green

#### SMART XRB

The XRBHR has two new digital features: data logging and firmware controlled seasoning.

##### Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

##### FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRBHR stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

##### NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Filament Limit Set point
Pre Heat Set point	Line Dip

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

##### Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRBHR knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

### Power and Interface Connections

#### AC INPUT—3 PIN PHOENIX CONTACT 1858772

PIN	SIGNAL	PARAMETERS
1	AC Input (high)	100-240Vac (high)
2	Ground	Ground
3	AC Input (neutral)	100-240Vac (neutral)

#### DC INPUT FOR HEAT DISSIPATION UNIT—4 PIN AMP (210/350/500W) 206060-1

PIN	SIGNAL	DESCRIPTION	PARAMETERS
1	24Vdc	Fan/Pump Power	24Vdc @ 5 amps
2	24Vdc Return		
3	N/C	No Connection	N/C
4	N/C	No Connection	N/C

It is critical to ensure that 24Vdc is supplied to pins 1 and 2

#### ANALOG INTERFACE— 10 PIN PHOENIX CONTACT 1792605

PIN	SIGNAL	PARAMETERS
1	X-Ray Interlock Enable	Apply +24Vdc to enable interlock. Open/removal of +24Vdc will cause X-Ray generation to stop.
2	X-Ray Interlock Enable Return	Ground reference for X-Ray Interlock.
3	Pin removed	N/C
4	kV Monitor	0-10Vdc = 0-100% rated output voltage. Zout = 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0-10Vdc = 0-100% rated output current. Zout = 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @ 10mA maximum
8	HV ON Lamp Relay N/O	N/O dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load
9	HV ON Lamp Relay C	Common dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load
10	HV ON Lamp Relay N/C	N/C dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load

#### RS-232 DIGITAL INTERFACE— 9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	N/C
2	Transmitted Data	Conforms to EIA RS-232-C
3	Received Data	Conforms to EIA RS-232-C
4	N/C	N/C
5	Signal Ground	Signal Ground
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	N/C	N/C

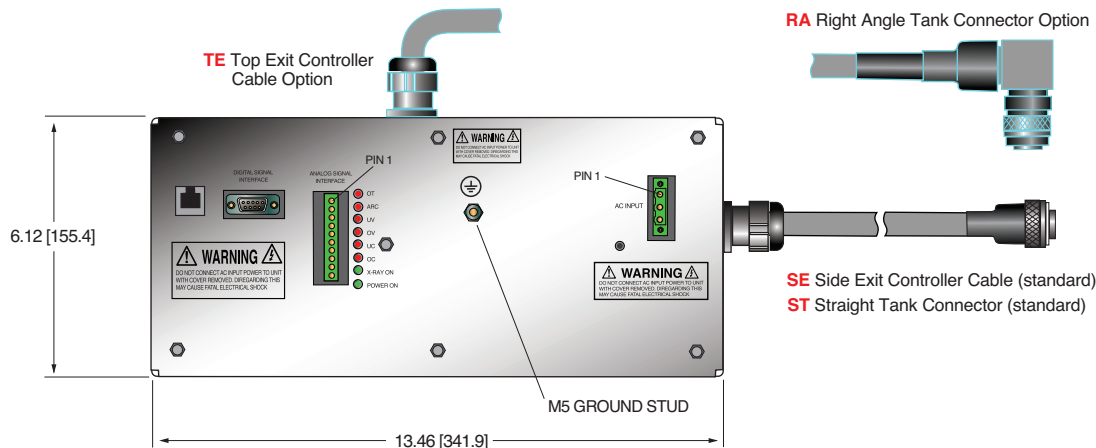
#### ETHERNET DIGITAL INTERFACE— RJ45 8 PIN FEMALE CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX +	Transmit Data +
2	TX -	Transmit Data -
3	RX +	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX -	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

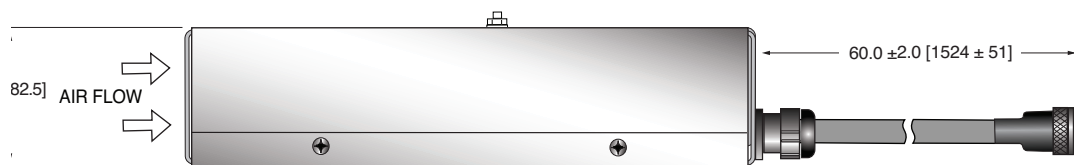
DIMENSIONS: in.[mm]

**100/210W  
CONTROL UNIT**

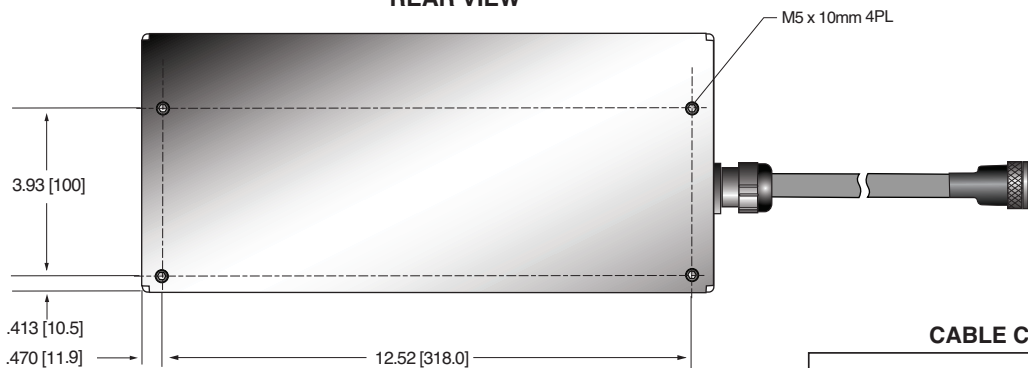
### FRONT VIEW



**BOTTOM VIEW**



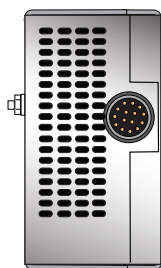
### REAR VIEW



### SIDE VIEW

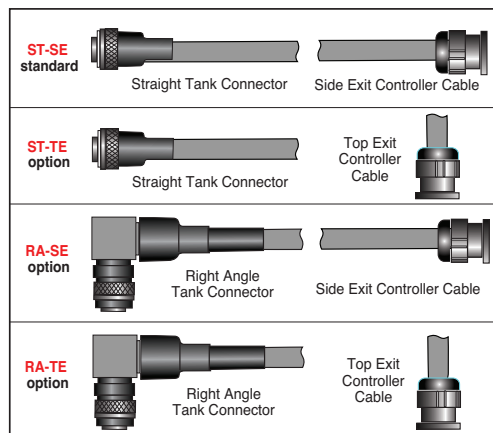


### SIDE VIEW



**Standard**  
**SE** Side Exit  
shown

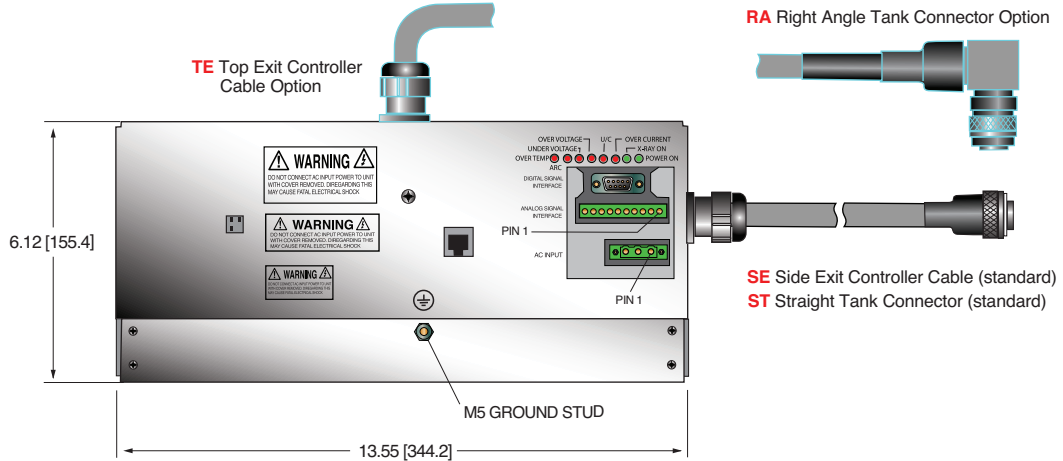
## CABLE CONFIGURATIONS



DIMENSIONS: in.[mm]

#### 350/500W CONTROL UNIT

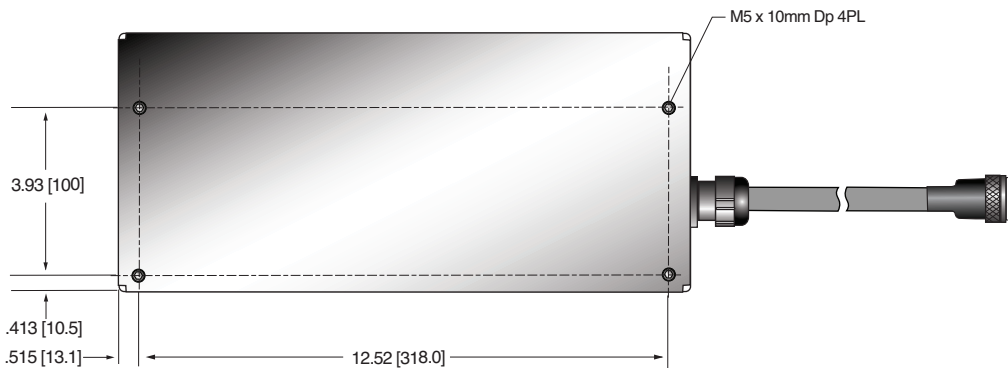
##### FRONT VIEW



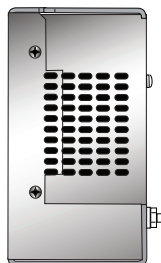
##### BOTTOM VIEW



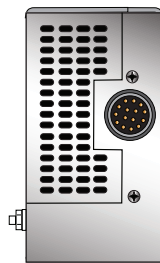
##### REAR VIEW



##### SIDE VIEW



##### SIDE VIEW

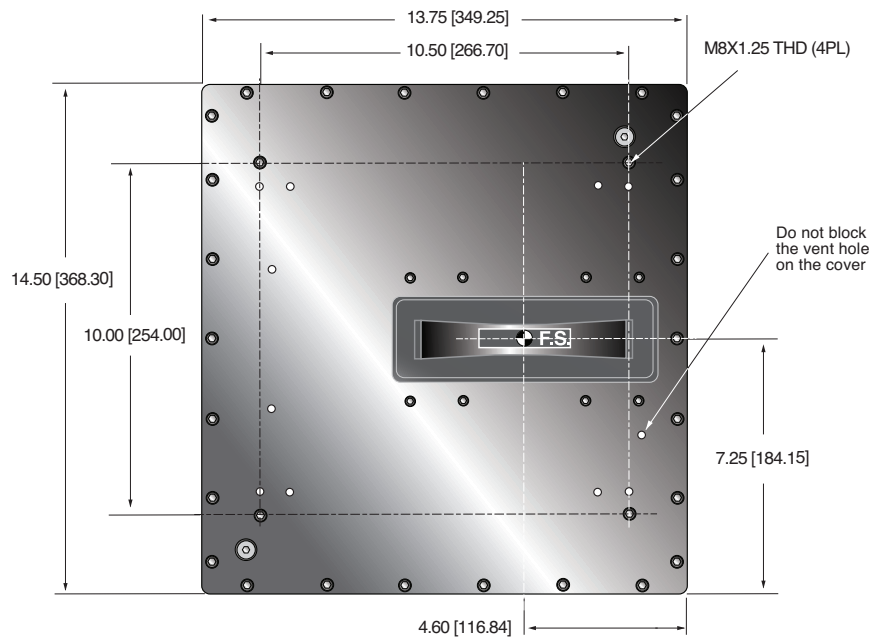


Standard  
SE Side Exit  
shown

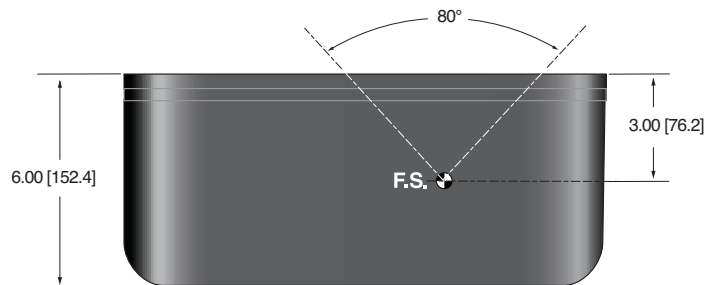
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## 100W TANK

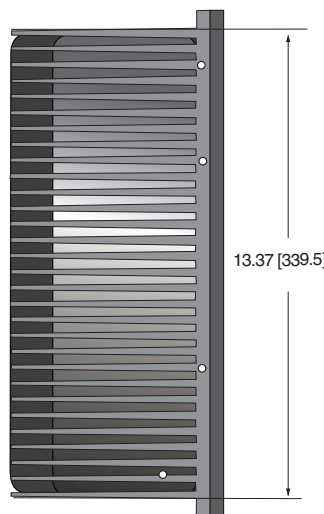
### TOP VIEW



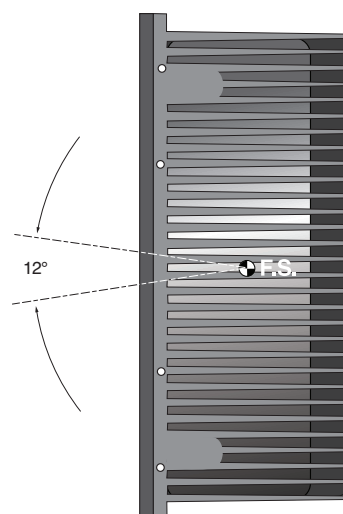
### SIDE VIEW



### BACK VIEW

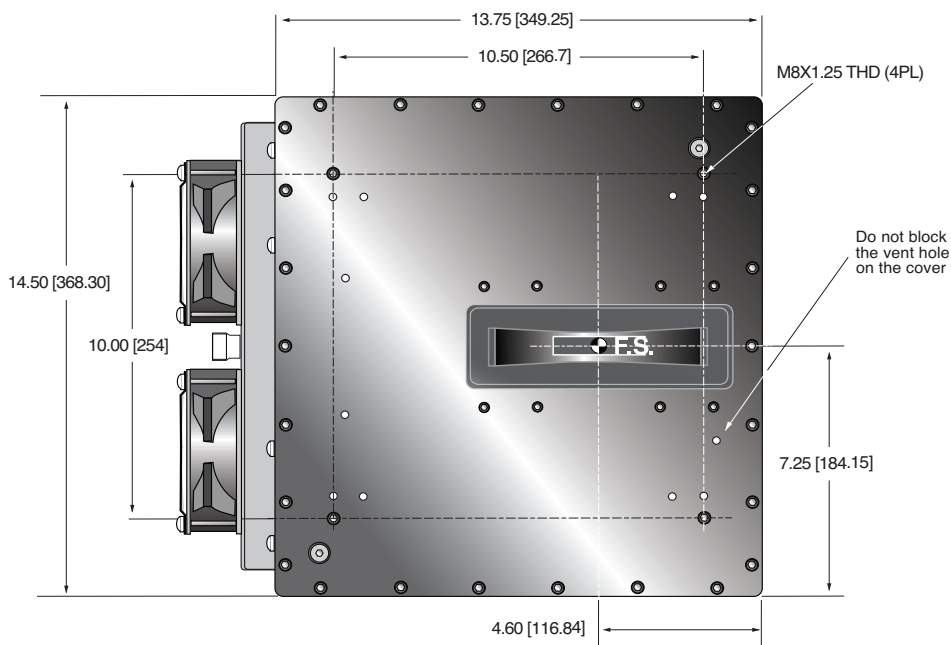


### FRONT VIEW

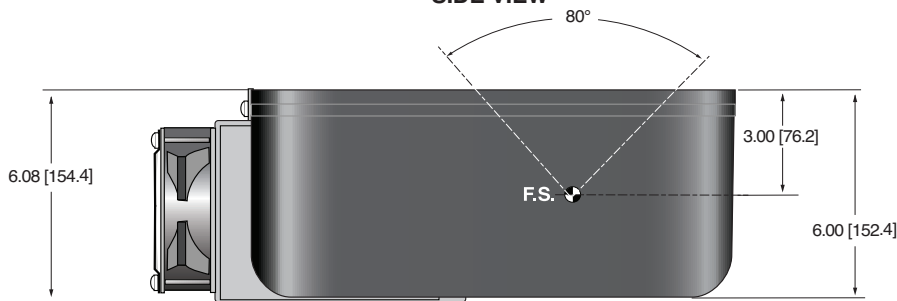


DIMENSIONS: in.[mm]

## 210W TANK TOP VIEW



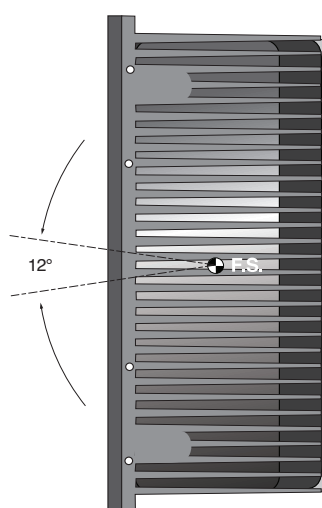
## SIDE VIEW



## BACK VIEW



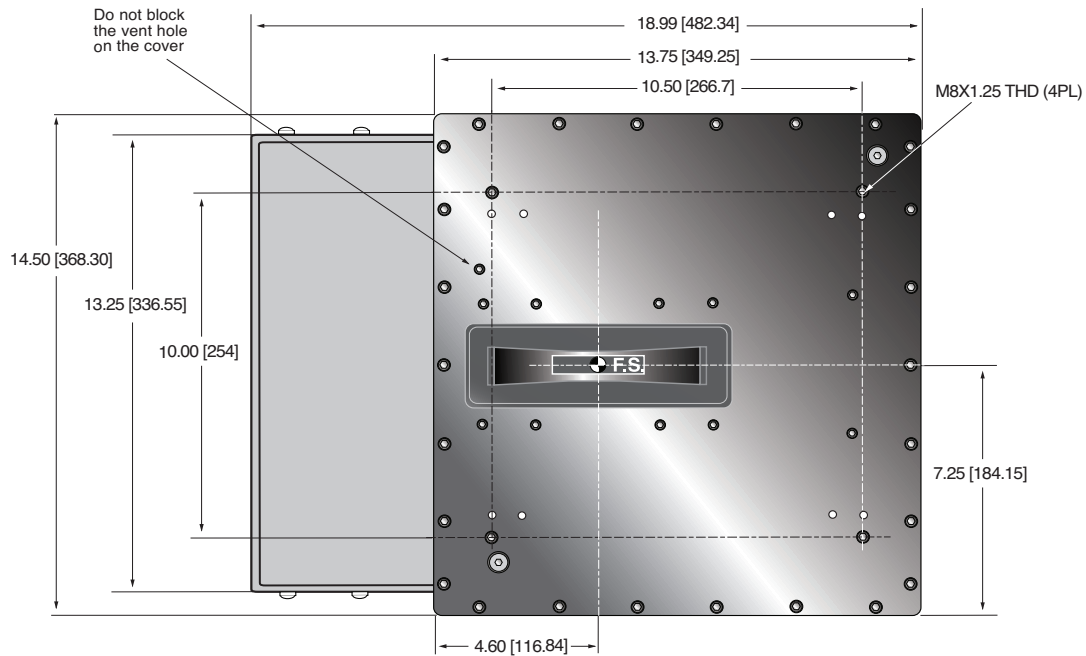
## FRONT VIEW



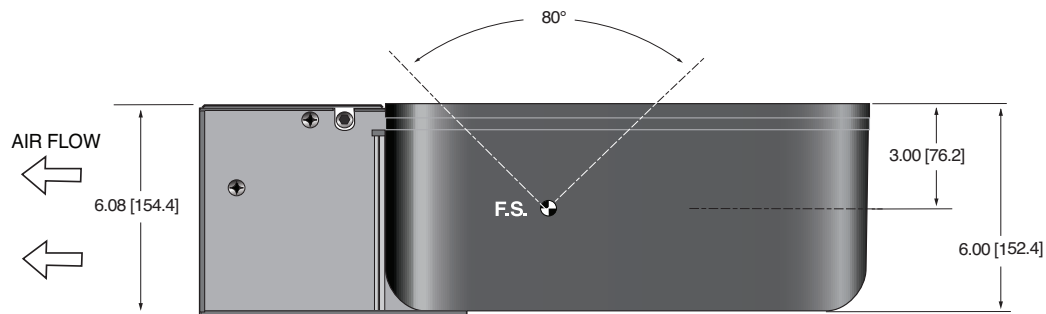
DIMENSIONS: in.[mm]

#### 350/500W TANK

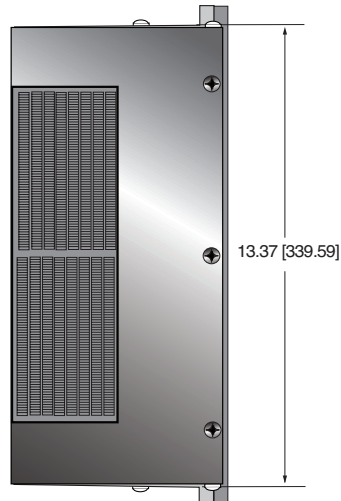
#### TOP VIEW



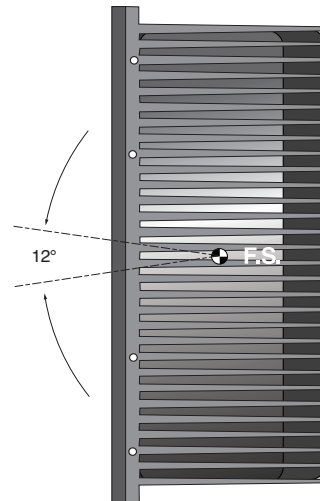
#### SIDE VIEW



#### BACK VIEW



#### FRONT VIEW





- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface, Standard RS-232 Digital Interface and Ethernet**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning**

Spellman's XRBD Series of Monoblock® X-Ray sources are designed for OEM applications powering their internal bipolar X-Ray tube at 160kV at power levels of 100W, 210W, 350W and 500W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of any XRBD model into your X-Ray system. Each XRBD model is available with fan shaped (standard) or cone shaped (optional) beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

### TYPICAL APPLICATIONS

Food Inspection Systems, Fill Level Confirmation Systems, Security Scanning Systems, Industrial NDT Systems, Thickness/Plating Measurement Systems

### OPTIONS

<b>CB</b>	Cone Beam
<b>.5mm</b>	.5mm focal spot X-Ray tube
<b>ST-TE</b>	
<b>RA-SE</b>	See page 4 for Cable Options
<b>RA-TE</b>	

### SPECIFICATIONS

#### X-Ray Characteristics:

Focal Spot:	0.8mm (IEC 336) standard 0.5mm (IEC 336) optional
Beam Filter:	
Ultem:	1.50mm ±0.15mm
Oil:	9.0mm ±0.25mm
Glass:	1.7mm ±0.2mm
Be:	0.8mm
Beam Geometry:	
Fan:	Standard. The beam angular coverage will be 80° with the beam plane perpendicular to the X-Ray tube axis and 12° wide (with a 2° tolerance)
Cone:	Optional. 40° cone beam (with a 2° tolerance)

#### Input Voltage:

100-240Vac, ±10%, 50/60 Hertz, .98 power factor

#### Input Current:

100W @	2.0A
210W @	4.0A
350W @	6.0A
500W @	8.0A

#### X-Ray Tube Voltage:

See table. Minimum kV for emission current 35kV

#### X-Ray Tube Current:

See table. Minimum emission current 150uA

#### X-Ray Tube Power:

See table

#### Voltage Regulation:

Line:	±0.05% of maximum output voltage over a ±10% change of nominal input line voltage
Load:	±0.1% of maximum rated voltage for 150uA to full rated load change

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±2% of the programmed value

#### Voltage Risetime:

Standard ramp time shall be <500ms from 10% to 90% of maximum rated output voltage

#### Voltage Ripple:

0.5% peak to peak of maximum voltage for frequencies ≤1kHz

#### Emission Current Parameters

##### Current Regulation:

Line:	±0.05% of rated output current over a ±10% change of nominal input line voltage
Load:	±0.1% of rated output current for a change from 50% to 100% of rated output voltage

##### Current Accuracy:

Current measured through the X-Ray tube is within ±2% of the programmed value

##### Current Risetime:

Standard ramp time shall be <500ms from 10% to 90% of maximum rated current

##### Arc Intervention:

4 arcs in 10 seconds with a 100ms quench/100ms re-ramp = Shutdown

##### Filament Configuration:

Internal floating AC filament drive with closed loop filament emission control circuitry

### Analog Interface:

Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

### Digital Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.

### Operating Temperature:

0°C to +40°C

### Storage Temperature:

-40°C to +70°C

### Humidity:

10% to 95% relative humidity, non-condensing

### Cooling:

X-Ray Tank:  
100W: Convection/customer supplied forced air so tank is <55°C  
210W: Externally powered forced air cooling, 24Vdc @ 2A  
350/500W: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A

Controller: Forced air via internal fan

### Grounding Point:

M5 ground female thread on tank  
M5 ground stud on control chassis provided

### Dimensions:

see drawings

### Weight:

X-Ray Tank:  
100/210W @ 78lbs. (35.4kg)  
350/500W @ 84.5lbs. (38.3kg)  
Controller:  
100W/210W: 4 pounds (1.18kg)  
350W/500W: 7 pounds (3.18kg)

### Orientation:

Can be mounted in any orientation.

### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530.

## MODEL SELECTION TABLE

MODEL	MAX. VOLTAGE	MAX. CURRENT	MAX. POWER
XRBD160PN100	160kV	1mA	100 watts
XRBD160PN210	160kV	2.1mA	210 watts
XRBD160PN350	160kV	3.5mA	350 watts
XRBD160PN500	160kV	4mA	500 watts

## LED INDICATORS

INDICATOR	SIGNAL	CONDITION	Illuminated When...	LED COLOR
1	OV Error 6	High kV occurs		Red
2	UV Error 5	Low kV occurs		Red
3	UC Error 4	Low mA occurs		Red
4	OC Error 3	High mA occurs		Red
5	ARC Error 2	Arc fault occurs		Red
6	OT Error 1	Over temperature occurs		Red
7	X-Ray On	X-Rays are being generated		Green
8	Power On	AC input power is present		Green

## SMART XRB

The XRBD has two new digital features:  
data logging and firmware controlled seasoning.

### Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

### FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRBD stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

### NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Filament Limit Set point
Pre Heat Set point	Line Dip

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

### Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRBD knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

## Power and Interface Connections

## AC INPUT—3 PIN PHOENIX CONTACT 1858772

PIN	SIGNAL	PARAMETERS
1	AC Input (high)	100-240Vac (high)
2	Ground	Ground
3	AC Input (neutral)	100-240Vac (neutral)

DC INPUT FOR HEAT DISSIPATION  
UNIT—4 PIN AMP (210/350/500W) 206060-1

PIN	SIGNAL	DESCRIPTION	PARAMETERS
1	24Vdc	Fan/Pump Power	24Vdc @ 5 amps
2	24Vdc Return		
3	N/C	No Connection	N/C
4	N/C	No Connection	N/C

It is critical to ensure that 24Vdc is supplied to pins 1 and 2

ANALOG INTERFACE—  
10 PIN PHOENIX CONTACT 1792605

PIN	SIGNAL	PARAMETERS
1	X-Ray Interlock Enable	Apply +24Vdc to enable interlock. Open/removal of +24Vdc will cause X-Ray generation to stop.
2	X-Ray Interlock Enable Return	Ground reference for X-Ray Interlock.
3	Pin removed	N/C
4	kV Monitor	0-10Vdc = 0-100% rated output voltage. Zout = 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0-10Vdc = 0-100% rated output current. Zout = 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @ 10mA maximum
8	HV ON Lamp Relay N/O	N/O dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load
9	HV ON Lamp Relay C	Common dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load
10	HV ON Lamp Relay N/C	N/C dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load

RS-232 DIGITAL INTERFACE—  
9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	N/C
2	Transmitted Data	Conforms to EIA RS-232-C
3	Received Data	Conforms to EIA RS-232-C
4	N/C	N/C
5	Signal Ground	Signal Ground
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	N/C	N/C

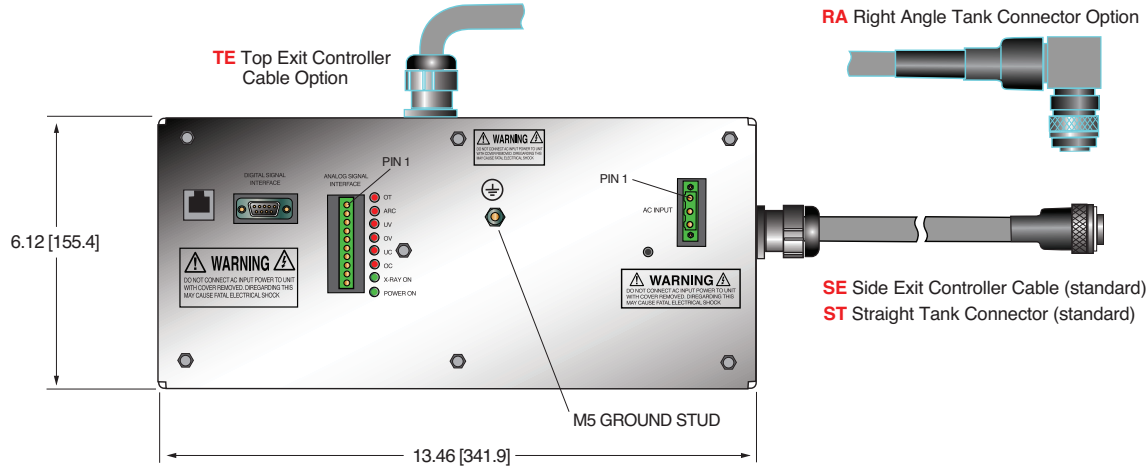
ETHERNET DIGITAL INTERFACE—  
RJ45 8 PIN FEMALE CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX +	Transmit Data +
2	TX -	Transmit Data -
3	RX +	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX -	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

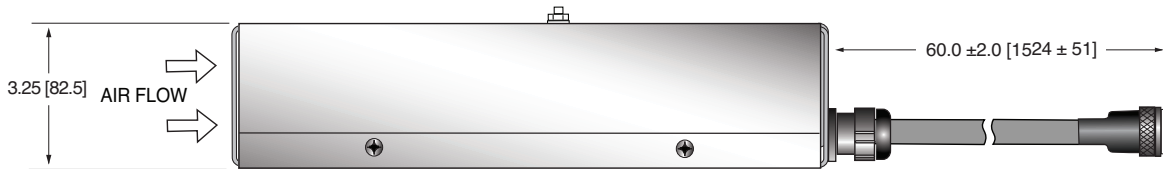
DIMENSIONS: in.[mm]

#### 100/210W CONTROL UNIT

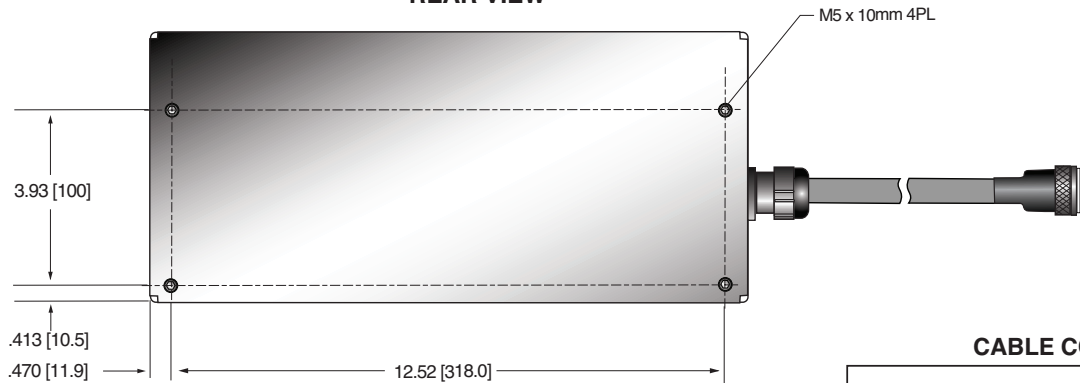
#### FRONT VIEW



#### BOTTOM VIEW



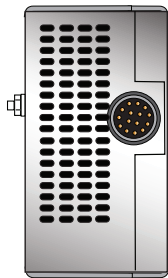
#### REAR VIEW



#### SIDE VIEW



#### SIDE VIEW



Standard  
SE Side Exit  
shown

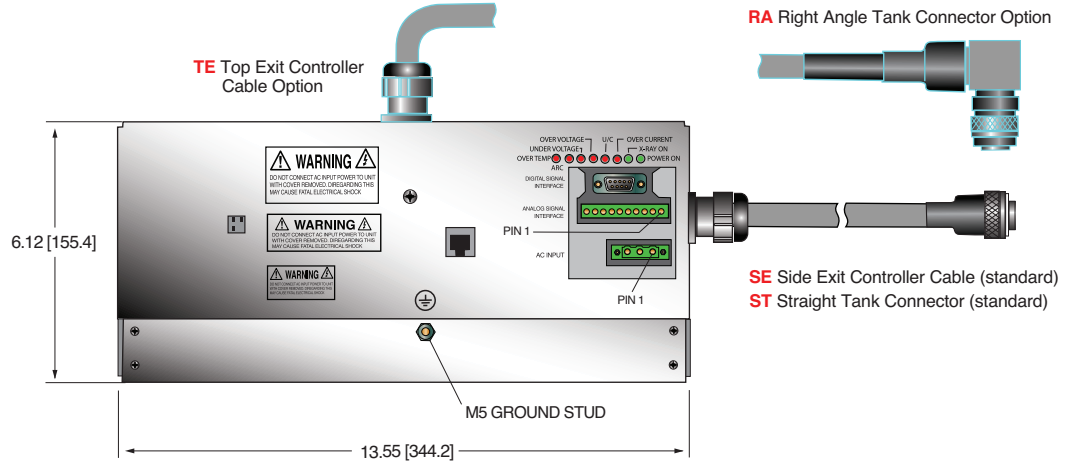
#### CABLE CONFIGURATIONS

<b>ST-SE</b> standard		
<b>ST-TE</b> option		
<b>RA-SE</b> option		
<b>RA-TE</b> option		

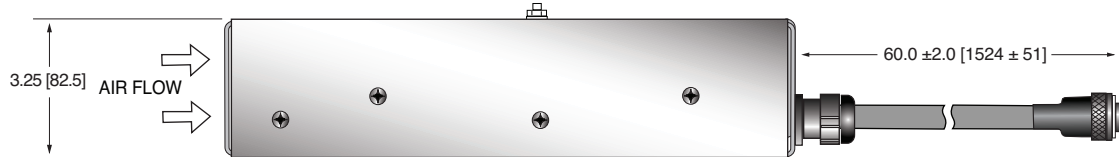
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### 350/500W CONTROL UNIT

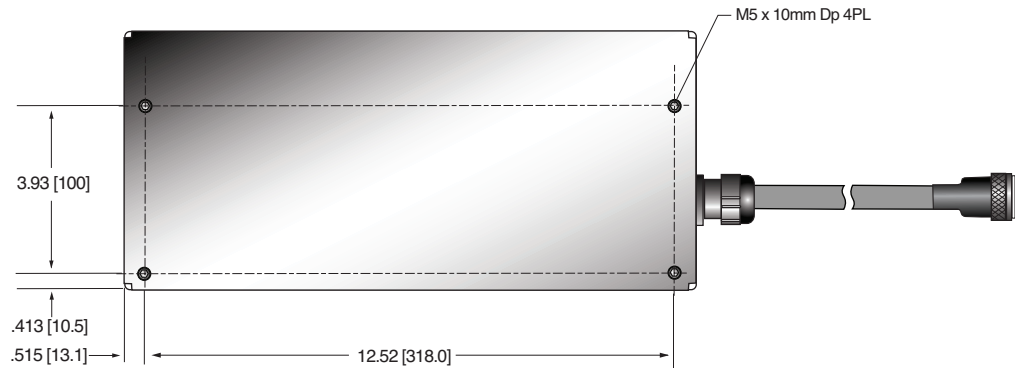
#### FRONT VIEW



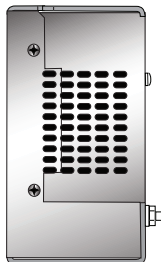
#### BOTTOM VIEW



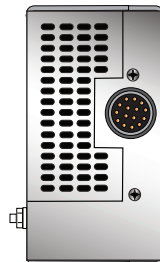
#### REAR VIEW



#### SIDE VIEW



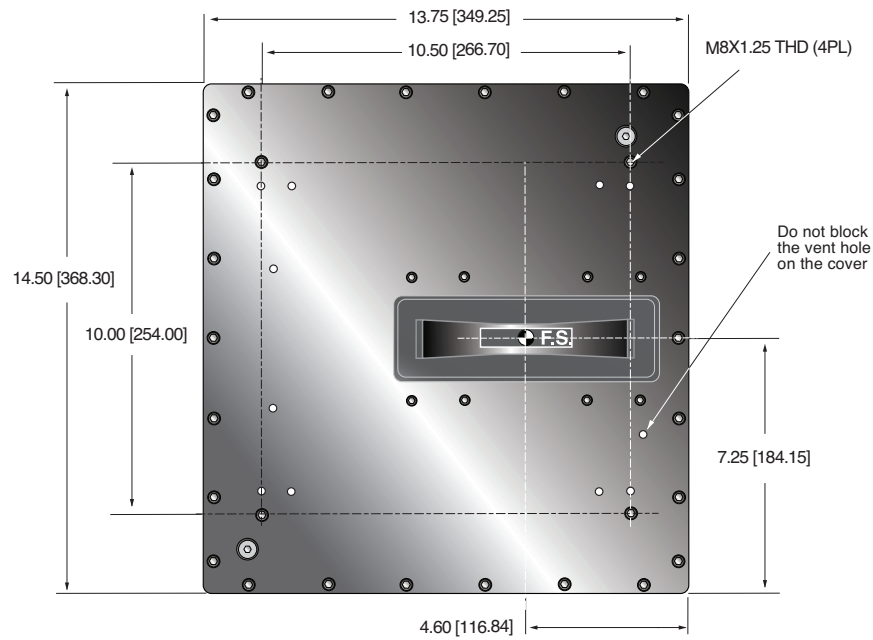
#### SIDE VIEW



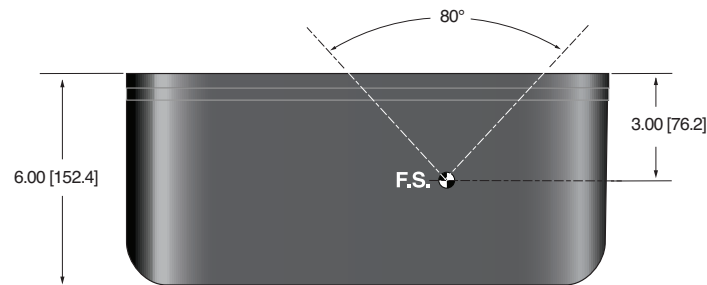
Standard  
SE Side Exit  
shown

DIMENSIONS: in.[mm]

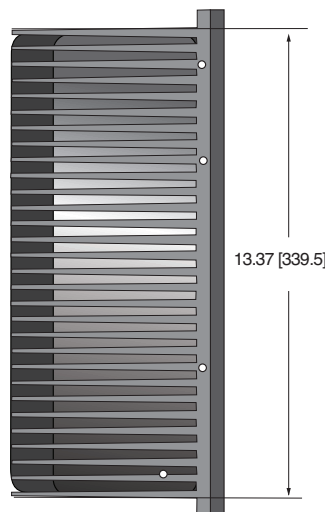
**100W TANK  
TOP VIEW**



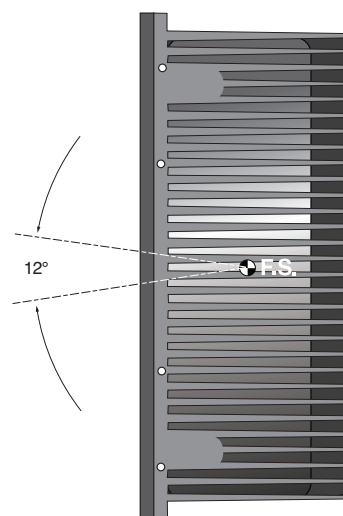
### SIDE VIEW



### BACK VIEW

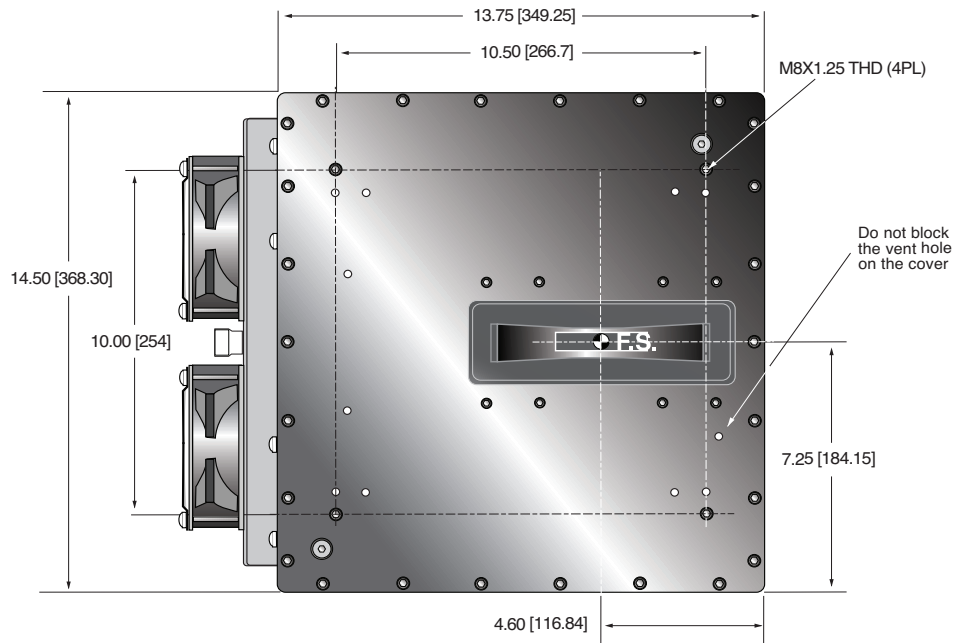


**FRONT VIEW**

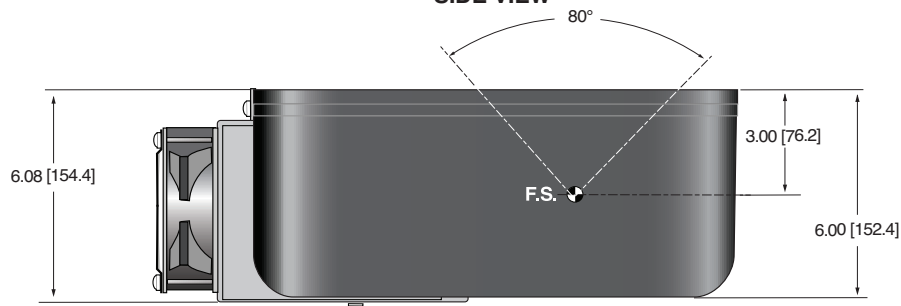


DIMENSIONS: in.[mm]

### 210W TANK TOP VIEW



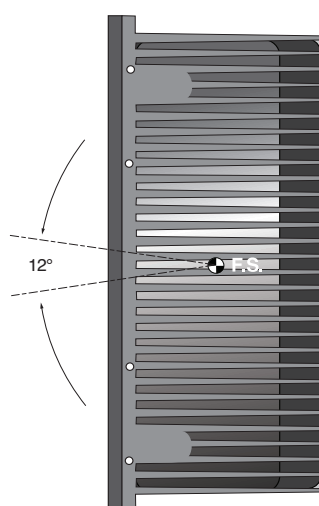
### SIDE VIEW



### BACK VIEW



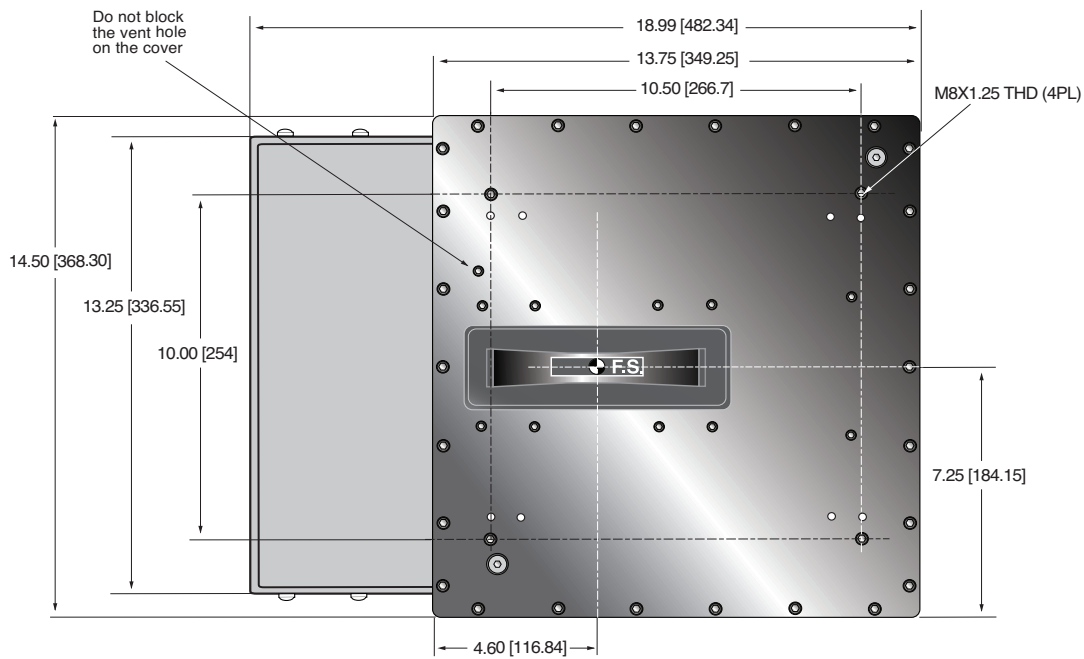
### FRONT VIEW



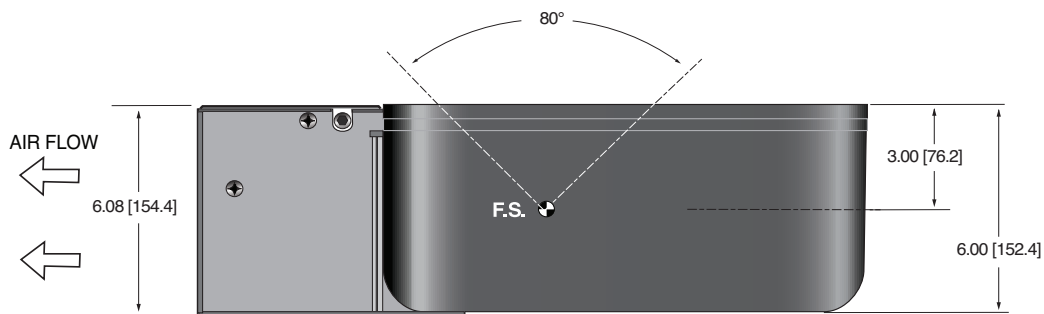
DIMENSIONS: in.[mm]

#### 350/500W TANK

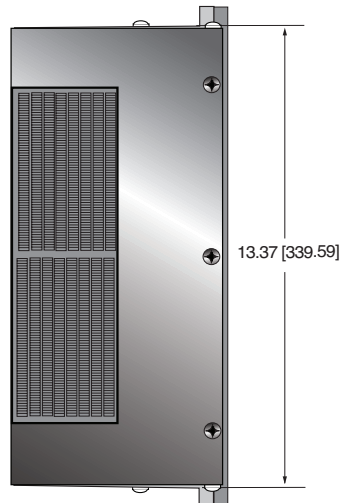
##### TOP VIEW



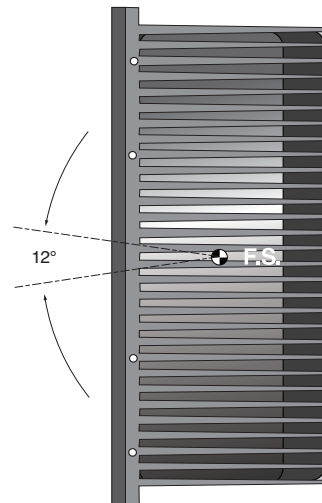
##### SIDE VIEW

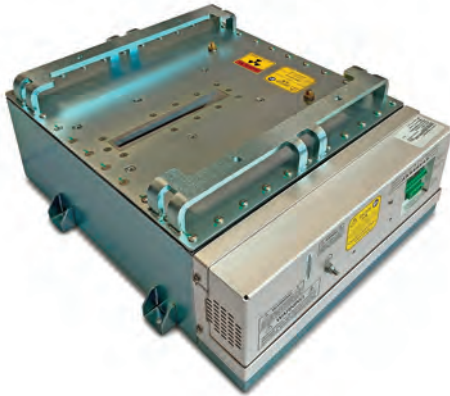


##### BACK VIEW



##### FRONT VIEW





Spellman's XRB180PN200 is an integrated X-Ray source operating up to 180kV and 200W, providing OEM users a compact plug-and-play Monoblock for critical inspection and screening applications. The unit incorporates a 25° angle stationary anode X-Ray tube offering a fan beam of 80°x 4°. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, with industry leading dose stability and image quality. This compact model comes with standard analog and RS-232 digital control. Spellman can provide customized versions of this platform for specific OEM system requirements.

## TYPICAL APPLICATIONS

Aviation Security Screening: Checked Baggage/EDS, Checkpoint. Vehicle Inspection, General NDT, Food Inspection

## SPECIFICATIONS

### X-Ray Characteristics:

Tube Type:	Stationary Anode, tungsten target
Focal Spot:	0.8 x 0.8mm nominal (IEC60336)
Beam Filter:	Consists of oil and the curved Ultem 0.079" +/-0.01". Inherent filtration in the X-Ray Tube is 1mm Be, 1.5mm +/-10% glass.
Beam Geometry:	Fan of 80° X 4°, ±1%
Anode Angle:	25°

### Input Voltage:

Power factor corrected input to 0.98. 100Vac to 240Vac, ±10%, 50/60 Hertz. 5A, maximum

### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 90kV to 180kV.

### Voltage Accuracy:

The high voltage measured at the X-ray tube will be within ±1% of the selected value.

### Voltage Ripple:

Ripple will be ≤0.2% of maximum rated voltage for frequencies ≤1kHz.

### Voltage Regulation:

< ±0.1% for ±10% of nominal input line change  
< ±0.1% for 0.5mA to 1.1mA load change

- **180kV and 200W**
- **X-Ray Tube Current: 0.5mA to 1.1mA**
- **Focal Spot 0.8 x 0.8mm nominal (IEC60336)**
- **Fan Beam of 80° X 4°, maximum**
- **Power factor corrected input to 0.98**
- **100Vac to 240Vac, ±10%**

### Voltage Overshoot:

kV overshoot will return within 5% of full voltage in less than 10ms.

### Risetime:

The voltage and current risetime is controlled by a ramping circuit. Ramp time is less than 0.5 second from 10% to 90% of output voltage and current.

### X-Ray Tube Current:

0.5mA to 1.1mA @ 180kV, 200 Watts maximum

### Current Accuracy:

<±1% of the selected value.

### Current Regulation:

<0.5% at 90-180kV, 0.5mA to 1.1mA

### Arc Intervention:

Unit will detect a single arc but HV will not shut down. If multiple arcs occur (4 in 10 seconds) then the unit will shut down.

### Filament Configuration:

Internal high frequency AC filament drive operated in current mode with closed loop filament emission control.

### Analog Interface:

Ground referenced 0 to 10Vdc for all monitoring signals. Relay contacts and open collector outputs for other signals.

### Digital Interface:

The RS-232 interface allows for programming of the voltage, current, and X-Ray Enable. Provides monitoring for voltage, current and oil temperature. Tolerance is 3% (with additional 5uA offset at ≤10%mA programming).

### Control Software:

A demo GUI is available for engineering evaluation.

### Operating Temperature:

0°C to +40°C

### Storage Temperature:

-40°C to +70°C

### Humidity:

10% to 95% relative humidity, non-condensing.

### Cooling:

Via natural convection/external cooling fans of 100CFM minimum or maintaining tank/oil temperature below 55°C.

**Input Line Connector:**

3 pin Phoenix Contact, p/n 1829167.  
Mating connector provided with unit.

**Analog Interface Connector:**

10 pin Phoenix Contact, p/n 1755503.  
Mating connector provided with unit.

**Digital Interface Connector:**

9 pin female D connector.  
Mating connector provided with unit.

**Grounding Point:**

M4 grounding stud provided on chassis.

**Dimensions:**

See outline drawing.

**Weight:**

132 pounds (60kg).

**Orientation:**

Can be mounted in any orientation.

**X-Ray Leakage:**

Not to be greater than .5mR/hr at 5cm from any surface of the Monoblock® when measured at 180kV @ 1.1mA.

**Regulatory Approvals:**

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive.

**AC INPUT POWER****3 PIN PHOENIX CONTACT P/N 1829167**

PIN	SIGNAL	PARAMETERS
1	Line	100-240Vac, ±10%, 50/60 Hertz @ 6 amps
2	GND	Ground
3	Neutral	100-240Vac, ±10%, 50/60 Hertz @ 6 amps

**ANALOG INTERFACE—****10 PIN PHOENIX CONTACT P/N 1755503**

PIN	SIGNAL	PARAMETERS
1	X-Ray On	+24Vdc = Enable X-Ray, Low or open = Disable X-Ray
2	X-Ray On Return	X-Ray on Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 200kV, Zout = 10kΩ
5	SGND	Signal Ground
6	mA Monitor	0 to 10Vdc = 0 to 1.5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @ 10mA, maximum
8	HV On Lamp N/O	Relay dry contact, normally open, 30Vdc @ <1A, nominal 50mA DC load
9	HV On Lamp Common	Relay dry contact, common, 30Vdc @ <1A, nominal 50mA DC load
10	HV On Lamp N/C	Relay dry contact, normally closed, 30Vdc @ <1A, nominal 50mA DC load

**RS-232 DIGITAL INTERFACE—****9 PIN MALE D CONNECTOR**

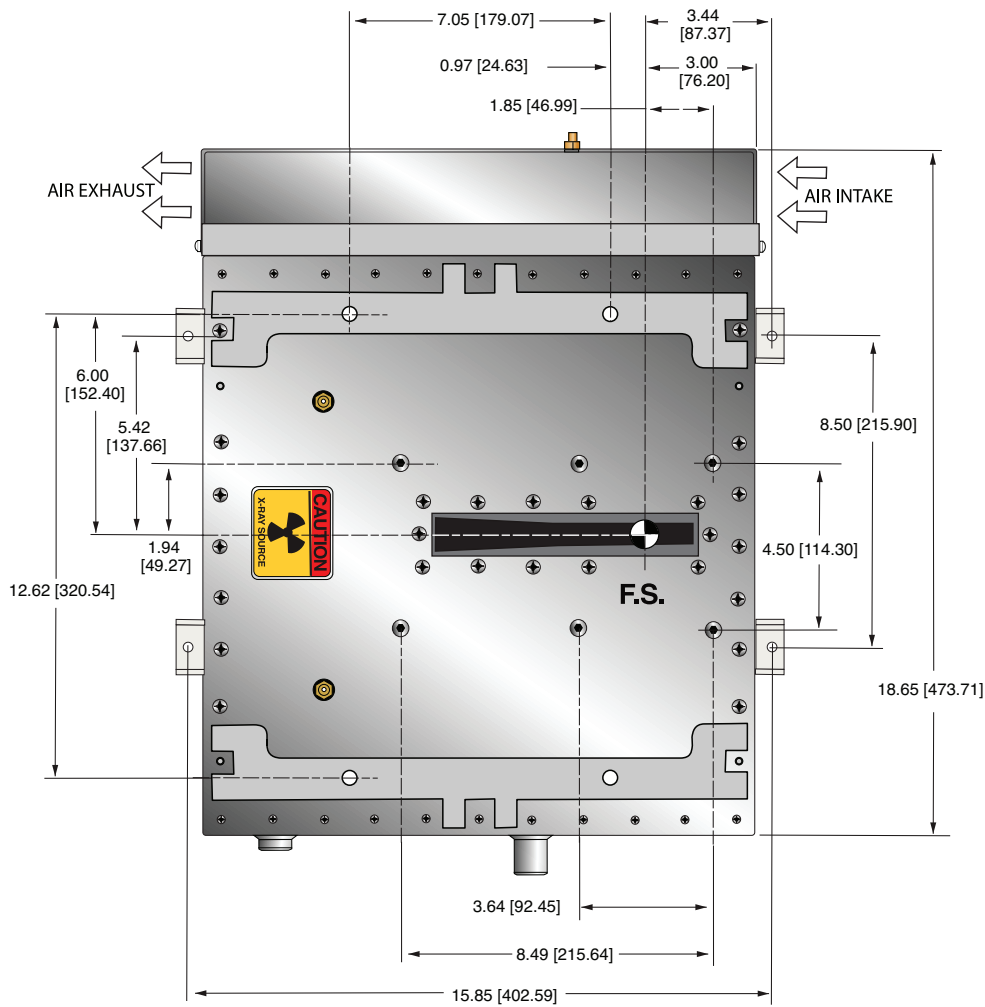
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to EAI RS-232-C
3	Receive Data	Conforms to EAI RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

**FRONT PANEL LED INDICATORS**

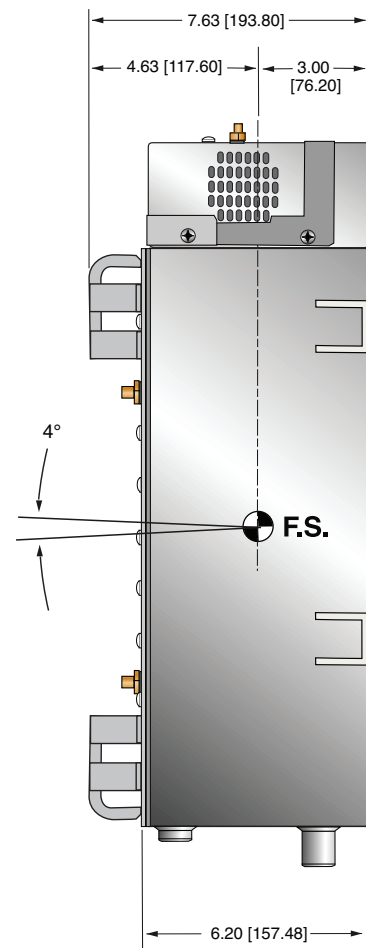
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...	LED COLOR
LED 1	OT	OverTemperature occurs	Red
LED 2	ARC	Arc fault occurs	Red
LED 3	UV	Low kV occurs	Red
LED 4	OV	High kV occurs	Red
LED 5	UC	Low mA occurs	Red
LED 6	OC	High mA occurs	Red
LED 7	X-RAY ON	X-Rays are enabled	Green
LED 8	PWR ON	Power is ON	Green

DIMENSIONS: in.[mm]

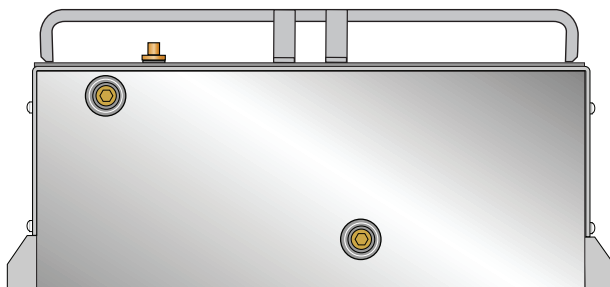
TOP VIEW



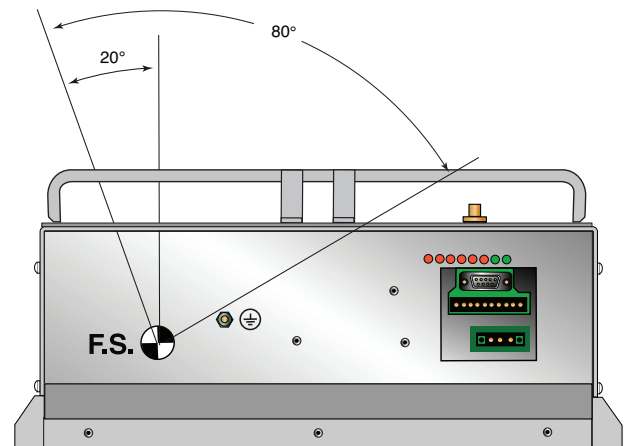
SIDE VIEW



BACK VIEW



FRONT VIEW





Spellman's XRB<sub>e</sub>80PN300 beryllium window Monoblock® X-Ray sources are designed for OEM applications powering the internal Bipolar X-Ray tube at 80kV at a power level of 300W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of the XRB<sub>e</sub>80PN300 into your X-Ray system. It is available with a cone shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

## TYPICAL APPLICATIONS

Food Inspection Systems, Fill Level Confirmation Systems, Security Scanning Systems, Industrial NDT Systems, Thickness/Plating Measurement Systems

## OPTIONS

ST-TE  
RA-SE  
RA-TE

Cable Options (see page 3)

## SPECIFICATIONS

### X-Ray Characteristics:

Focal Spot: 0.8mm (IEC 336) standard  
Beam Filter: Be 0.8mm  
Beam Geometry:  
Cone: Standard. The beam angular coverage will be 40° with the beam plane perpendicular to the X-Ray tube axis

### Input Voltage:

100- 240Vac, ±10%, 50/60 Hertz, .98 power factor

### Input Current:

300W @ 6A

- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface, Standard RS-232 Digital Interface and Ethernet**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning**

### X-Ray Tube Voltage:

Maximum 80kV

### X-Ray Tube Current:

Maximum 5mA

### X-Ray Tube Power:

300W

### Voltage Regulation:

Line: ±0.05% of maximum output voltage over a ±10% change of nominal input line voltage

Load: ±0.1% of maximum rated voltage for 150uA to full rated load change

### Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±2% of the programmed value

### Voltage Risettime:

Standard ramp time shall be <500ms from 10% to 90% of maximum rated output voltage

### Voltage Ripple:

0.5% peak to peak of maximum voltage for frequencies ≤1kHz

### Emission Current Parameters

#### Current Regulation:

Line: ±0.05% of rated output current over a ±10% change of nominal input line voltage

Load: ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

#### Current Accuracy:

Current measured through the X-Ray tube is within ±2% of the programmed value

#### Current Risettime:

Standard ramp time shall be <500ms from 10% to 90% of maximum rated current

#### Arc Intervention:

4 arcs in 10 seconds with a 100ms quench/100ms re-ramp = Shutdown

#### Filament Configuration:

Internal floating AC filament drive with closed loop filament emission control circuitry

#### Analog Interface:

Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pinout table.

#### Digital Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-40°C to +70°C

#### Humidity:

10% to 95% relative humidity, non-condensing

#### Cooling:

X-Ray Tank: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A

Controller: Forced air via internal fan.

#### Grounding Point:

M5 ground female thread on tank

M5 ground stud on control chassis provided

#### Dimensions:

X-Ray Tank: see drawings

Controller: see drawings

#### Weight:

X-Ray Tank: 81.5lbs. (37kg)

Controller: 7lbs. (3.18kg)

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC

Low Voltage Directive. UL/CUL recognized file E235530

#### AC INPUT—3 PIN PHOENIX CONTACT 1858772

PIN	SIGNAL	PARAMETERS
1	AC Input (high)	100-240Vac (high)
2	Ground	Ground
3	AC Input (neutral)	100-240Vac (neutral)

#### DC INPUT FOR HEAT DISSIPATION UNIT—4 PIN AMP (210/350/500W) 206060-1

PIN	SIGNAL	DESCRIPTION	PARAMETERS
1	24Vdc	Fan/Pump Power	24Vdc @ 5 amps
2	24Vdc Return		
3	N/C	No Connection	N/C
4	N/C	No Connection	N/C

It is critical to ensure that 24Vdc is supplied to pins 1 and 2

#### LED INDICATORS

INDICATOR	SIGNAL	CONDITION Illuminated When...	LED COLOR
1	OV Error 6	High kV occurs	Red
2	UV Error 5	Low kV occurs	Red
3	UC Error 4	Low mA occurs	Red
4	OC Error 3	High mA occurs	Red
5	ARC Error 2	Arc fault occurs	Red
6	OT Error 1	Over temperature occurs	Red
7	X-Ray On	X-Rays are being generated	Green
8	Power On	AC input power is present	Green

#### ANALOG INTERFACE— 10 PIN PHOENIX CONTACT 1792605

PIN	SIGNAL	PARAMETERS
1	X-Ray Interlock Enable	Apply +24Vdc to enable interlock. Open/removal of +24Vdc will cause X-Ray generation to stop.
2	X-Ray Interlock Enable Return	Ground reference for X-Ray Interlock.
3	Pin removed	N/C
4	kV Monitor	0-10Vdc = 0-100% rated output voltage. Zout = 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0-10Vdc = 0-100% rated output current. Zout = 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @ 10mA maximum
8	HV ON Lamp Relay N/O	N/O dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load
9	HV ON Lamp Relay C	Common dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load
10	HV ON Lamp Relay N/C	N/C dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load

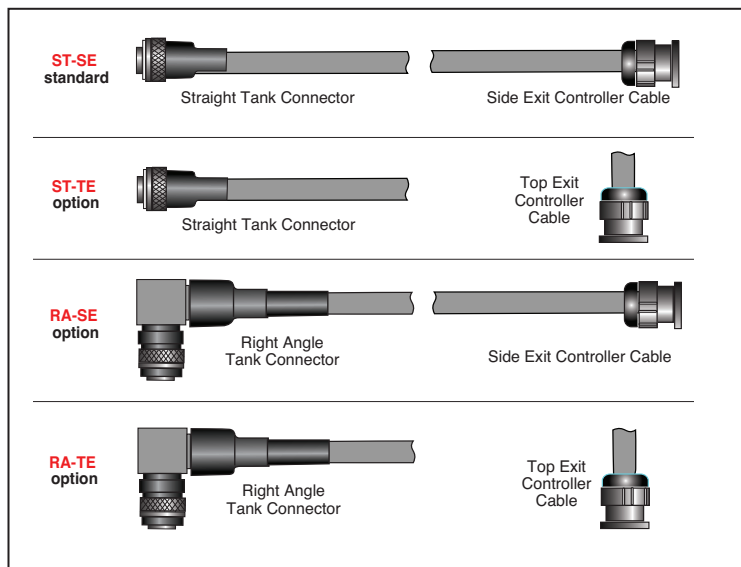
#### RS-232 DIGITAL INTERFACE— 9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	N/C
2	Transmitted Data	Conforms to EIA RS-232-C
3	Received Data	Conforms to EIA RS-232-C
4	N/C	N/C
5	Signal Ground	Signal Ground
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	N/C	N/C

#### ETHERNET DIGITAL INTERFACE— RJ45 8 PIN FEMALE CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX +	Transmit Data +
2	TX -	Transmit Data -
3	RX +	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX -	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

### CABLE CONFIGURATIONS



### SMART XRB

The XRBe80PN300 has two new digital features: data logging and firmware controlled seasoning.

#### Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

#### FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRBe80PN300 stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

#### NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Filament Limit Set point
Pre Heat Set point	Line Dip

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

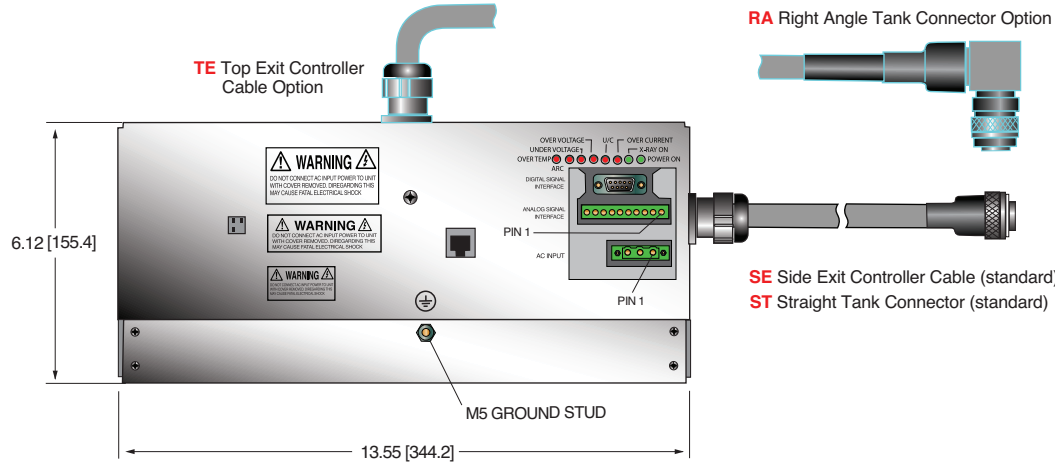
#### Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRBe80PN300 knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

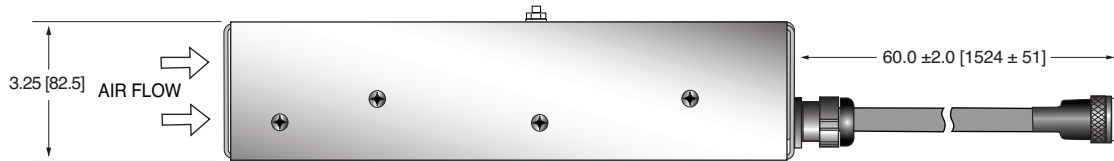
DIMENSIONS: in.[mm]

### CONTROL UNIT

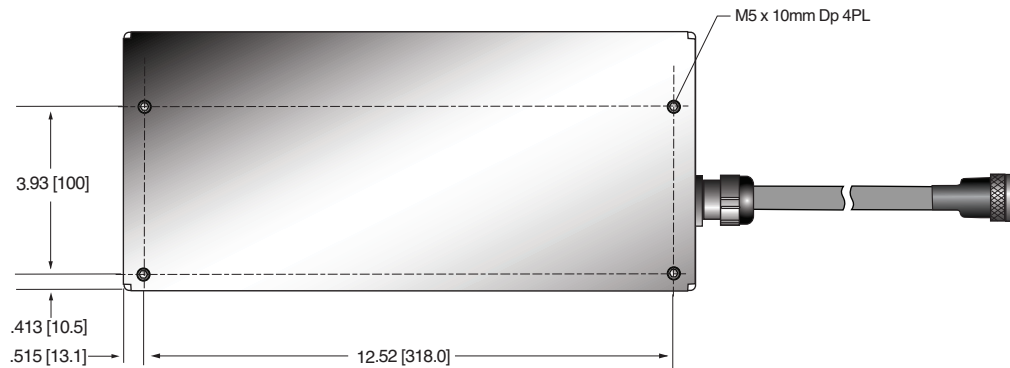
#### FRONT VIEW



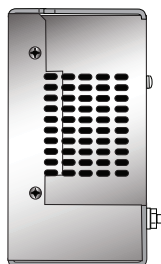
#### BOTTOM VIEW



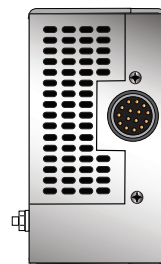
#### REAR VIEW



#### SIDE VIEW



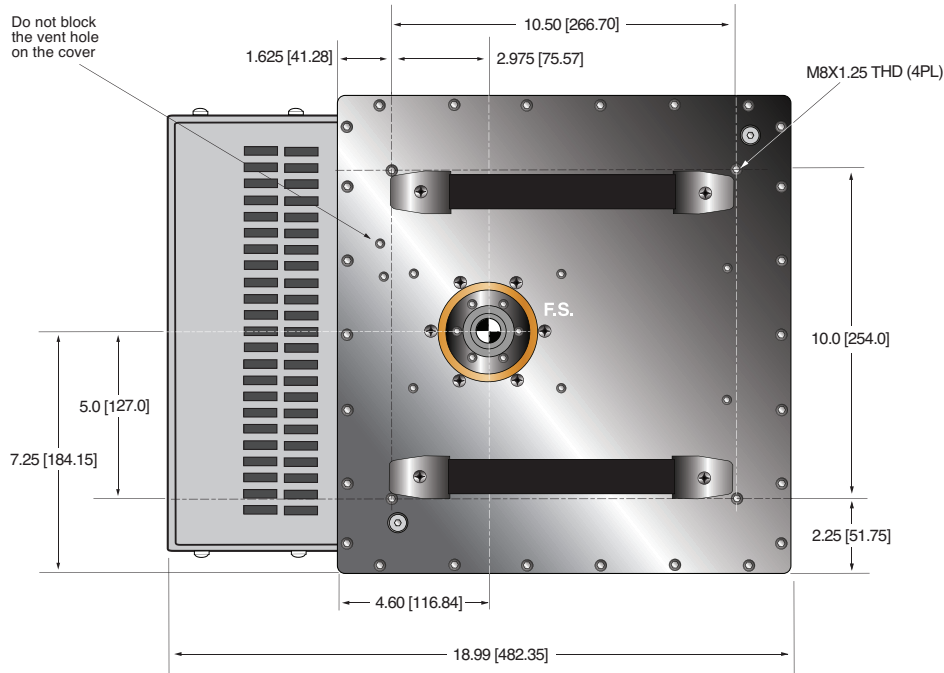
#### SIDE VIEW



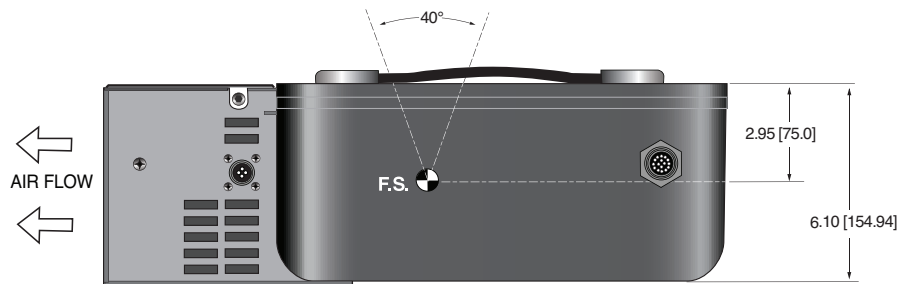
Standard  
**SE** Side Exit  
shown

DIMENSIONS: in.[mm]

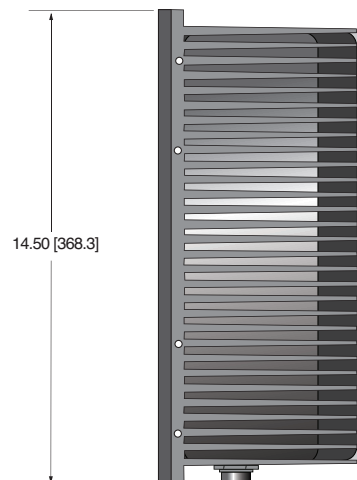
TOP VIEW



SIDE VIEW



FRONT VIEW





Spellman's XRB80PN320 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 80kV at 320W. Features like small package size and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

#### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

#### SPECIFICATIONS

##### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 0.8mm x 0.8mm (IEC 336)  
Beam Filter: 5052 Al, 0.040" ( $\pm 0.01$ ")  
Beam Geometry: Asymmetrical fan 80° x 10°  $\pm 2^\circ$

##### Input Voltage:

200-240Vac  $\pm 10\%$ , 50/60Hz, 6.5A max

##### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 40kV to 80kV

##### X-Ray Tube Current:

0.5mA to 4mA over specified tube voltage range

##### X-Ray Tube Power:

320W maximum continuous

##### Voltage Regulation:

Line:  $\pm 0.05\%$  for a  $\pm 10\%$  input line change  
Load:  $\pm 0.05\%$  for a 0.5mA to 4mA load change

##### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  $\pm 2\%$  of the programmed value

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Can be Mounted in Any Physical Orientation**
- **Standard RS-232 Digital Interface**

##### Voltage Risetime:

Ramp time shall be  $< 500\text{ms}$  from 10% to 90% of rated output

##### Voltage Overshoot:

Within 5% of rated voltage in  $< 10\text{ms}$

##### Voltage Ripple:

$\leq 1\%$  p-p of rated voltage @ 1kHz

##### Current Regulation:

Line:  $\pm 0.5\%$  @ 50-100% V nominal over specified Line range  
Load:  $\pm 0.5\%$  @ 50-100% V nominal over specified Load range

##### Current Accuracy:

Current measured through the X-Ray tube is within  $\pm 2\%$  of the programmed value

##### Current Risetime:

$< 500\text{ms}$  from 10% to 90% of rated output

##### Arc Intervention:

4 arcs in 10 seconds = shutdown

##### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

##### Analog Interface:

0 to 10Vdc ground referenced monitoring signals

##### Digital Interface:

RS-232

##### Control Software:

A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

##### Interlock Signals:

A hardware interlock functions in digital programming modes.

##### Operating Temperature:

0°C to +40°C

##### Storage Temperature:

-40°C to +70°C

##### Humidity:

10% to 90% relative humidity, non-condensing

##### Cooling:

Heat exchanger w/fan and oil pump

#### Input Line Connector:

Terminal block, Schurter, Inc. part no. 6100-33

#### Digital Interface Connector:

9 pin D, female

#### Analog Monitoring Connector:

10 pin Phoenix Contact 1755503

#### Grounding Point:

8-32 ground stud provided on chassis

#### Dimensions:

See line drawing

#### Weight:

120lbs (54.4kg) maximum

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

#### Regulatory Approvals:

Designed to be compliant to EEC EMC Directive and EEC Low Voltage Directive with an external filter.

#### AC INPUT POWER TERMINAL BLOCK

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	Line	Line
3	Line	Line
4	Neutral	Neutral
5	Neutral	Neutral
6	Neutral	Neutral

#### RS-232 DIGITAL INTERFACE JB16 9 PIN FEMALE D CONNECTOR

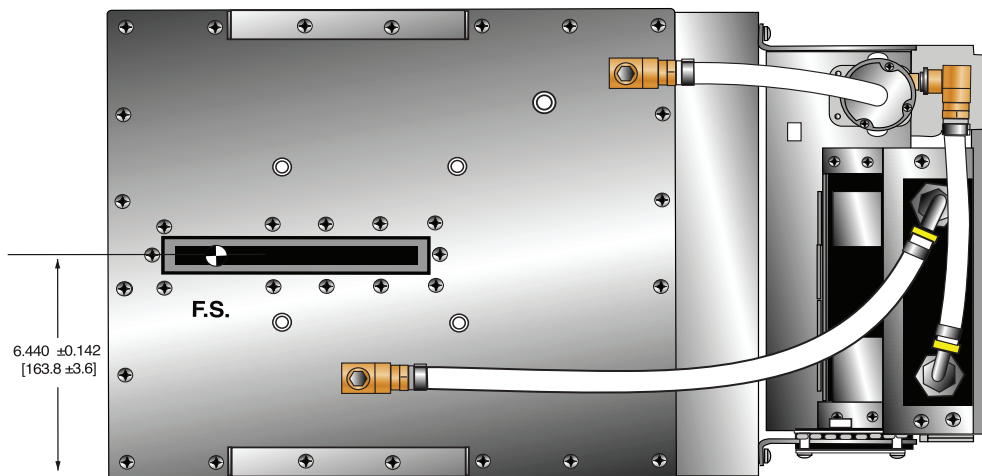
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	RS-232 Transmit
3	RX	RS-232 Receive
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

#### ANALOG MONITORING— JB11 10 PIN PHOENIX CONTACT

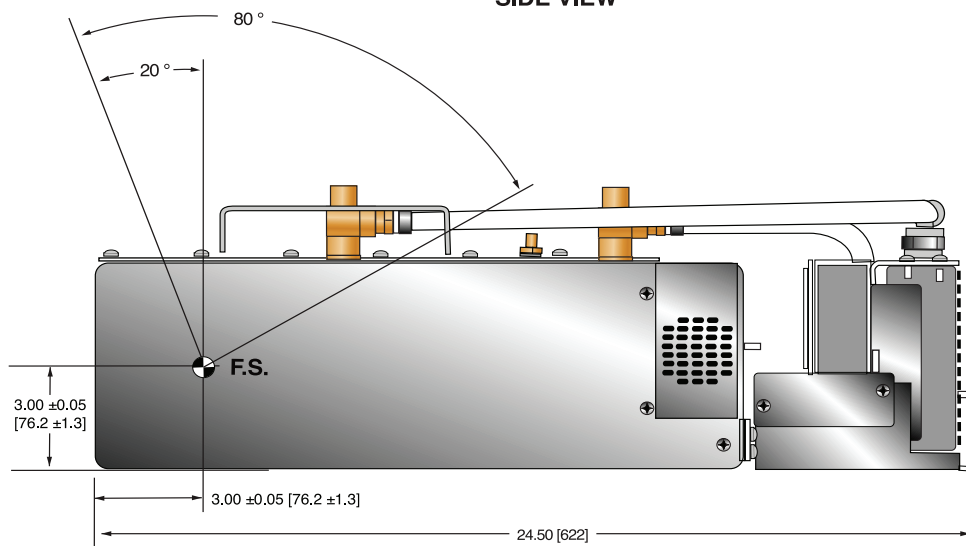
PIN	SIGNAL	PARAMETERS
1	X-Ray Enable	+24Vdc = Enable X-Ray 0Vdc/Open = Disable X-Rays
2	RTN	Signal Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 100kV, Zout = 10kΩ
5	SGND	Signal Return
6	mA Monitor	0 to 10Vdc = 0 to 5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @10mA max.
8	HV On Lamp, Relay N/O	Relay Normally Open, 50Vdc @ 1A maximum
9	HV On Lamp, Relay Common	Relay Common, 50Vdc @ 1A maximum
10	HV On Lamp, Relay N/C	Relay Normally Closed, 50Vdc @ 1A maximum

DIMENSIONS: in.[mm]

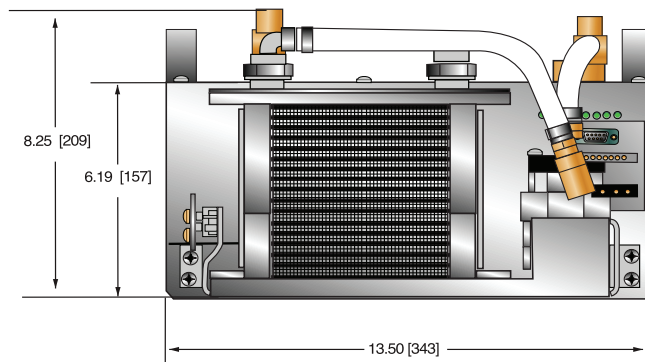
TOP VIEW



SIDE VIEW



BACK VIEW





Spellman's XRB200PN400/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 200kV at 400W. Features like universal input, small package size, standard analog monitoring and RS-232 digital interface simplify integrating this unit into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection,  
Fill Level Confirmation, Security Applications

### SPECIFICATIONS

#### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 0.8mm x 0.5mm (IEC336)  
Beam Filter: Glass 1.8mm, Oil 10mm, Al 1mm  
Beam Geometry: Symmetrical fan 85° x 10° ±1°

#### Input Voltage:

100Vac-240Vac ±10%, 50/60Hz, 6A maximum

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between  
100kV to 200kV

#### X-Ray Tube Current:

0.5mA to 2mA over specified tube voltage range

#### X-Ray Tube Power:

400W maximum continuous (350W average without  
external forced air)

#### Voltage Regulation:

Line: ±0.1% for a ±10% input line change  
Load: ±0.1% for a 0.5mA to 2mA load change

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  
±1% of the programmed value

#### Voltage Risetime:

<1 second from 10% to 90% of rated output

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

#### Voltage Overshoot:

5% in less than 100ms

#### Voltage Ripple:

≤0.2% pp of rated maximum voltage

#### Current Regulation:

Line: ±0.1% @ 100-200kV, 0.25mA to 2mA  
Load: ±0.5% @ 100-200kV, 0.25mA to 2mA

#### Current Accuracy:

Current measured through the X-Ray tube is within  
±1% of the programmed value

#### Current Risetime:

<1 second from 10% to 90% of rated output

#### Arc Intervention:

4 arcs in 10 seconds = shutdown

#### Filament Configuration:

Internal high frequency AC filament drive with closed loop  
filament emission control

#### Digital Interface:

RS-232 interface.

#### Control Software:

A demo GUI for engineering evaluations will be provided  
for the RS-232 digital interface upon request.

#### Interlock Signals:

A hardware interlock function is provided

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-40°C to +70°C

#### Humidity:

5% to 95% relative humidity, non-condensing

#### Cooling:

Heat exchanger w/fan and oil pump, powered from 24Vdc, 2A  
power supply (customer provided). External forced air cooling  
if needed to keep oil temperature below 55°C

#### Input Line Connector:

3 pin Phoenix Contact 1829167

#### Analog Interface Connector:

10 pin Phoenix Contact 1755503

#### Digital Interface Connector:

9 pin D connector, female

#### Grounding Point:

M5 ground stud provided on chassis

#### Dimensions:

See drawing

#### Weight:

148.0lbs (67.0kg)

#### Orientation:

Can be mounted in any orientation.

#### X-Ray Leakage:

Not to be greater than 5uSv/hr at 5cm outside the external surface

#### AC INPUT POWER 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

#### DC POWER FOR HEAT DISSIPATION UNIT 4 PIN AMP 206061-1 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	+24	+24Vdc
2	RTN	Return
3	+24	+24Vdc
4	RTN	Return

#### ANALOG INTERFACE— 10 PIN PHOENIX CONTACT

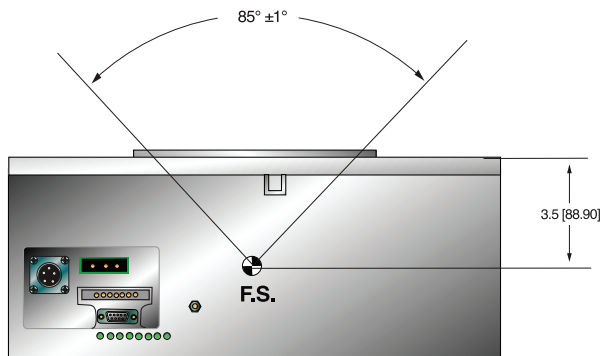
PIN	SIGNAL	PARAMETERS
1	X-Ray	+24Vdc = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	N/C
4	kV Monitor Output	0 to 9Vdc = 0 to 100% Rated Voltage
5	SGND	Signal Ground
6	mA Monitor Output	0 to 9Vdc = 0 to 100% Rated Current
7	Fault	Open Collector, Open = No Fault
8	Relay N/O	HV On, 50V @ 1A maximum
9	Relay Common	HV On, 50V @ 1A maximum
10	Relay N/C	HV On, 50V @ 1A maximum

#### RS-232 DIGITAL INTERFACE— 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to E/A RS-232-C
3	Receive Data	Conforms to E/A RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

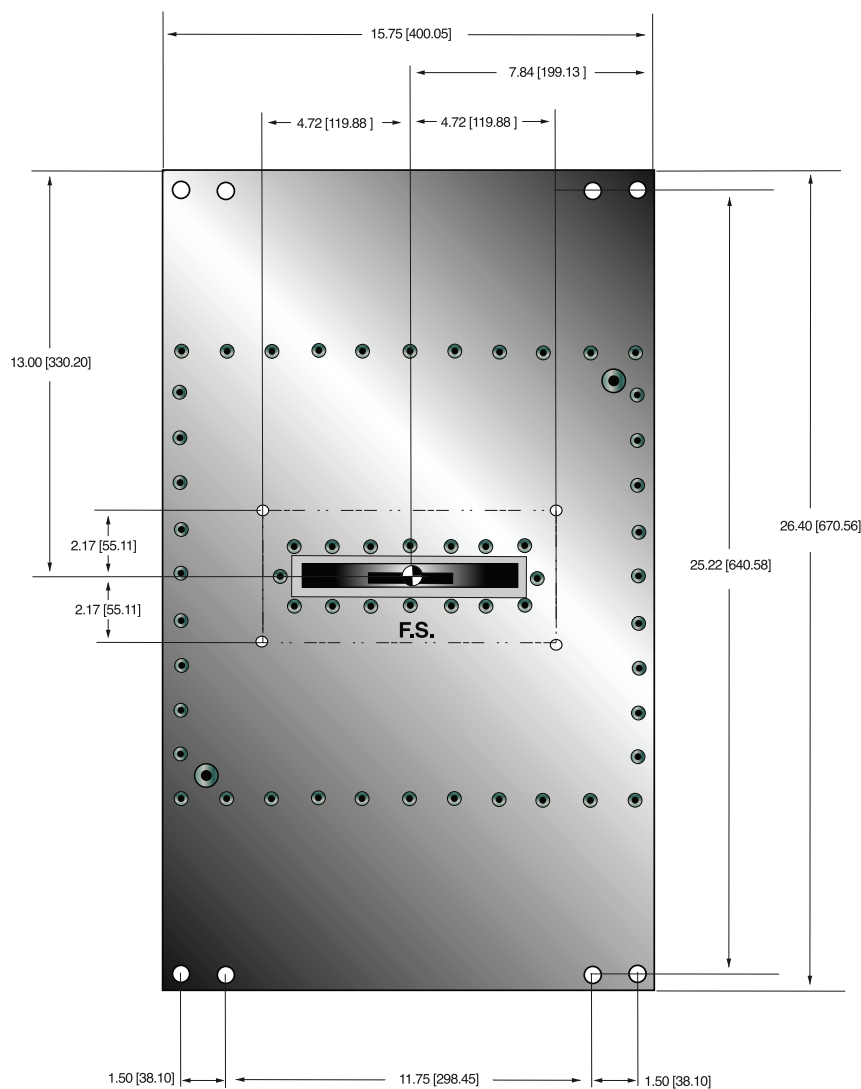
FRONT VIEW



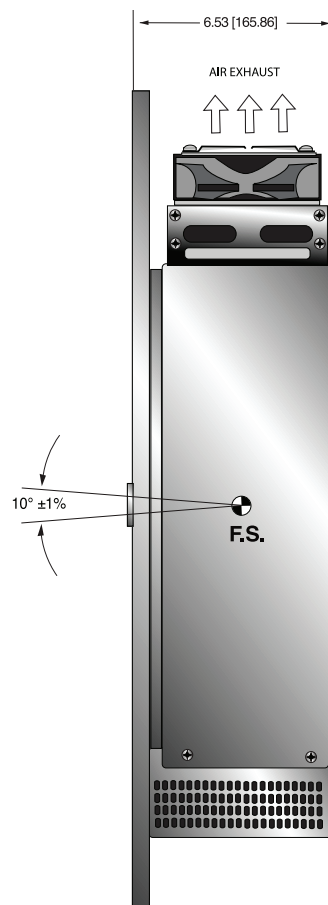
BACK VIEW

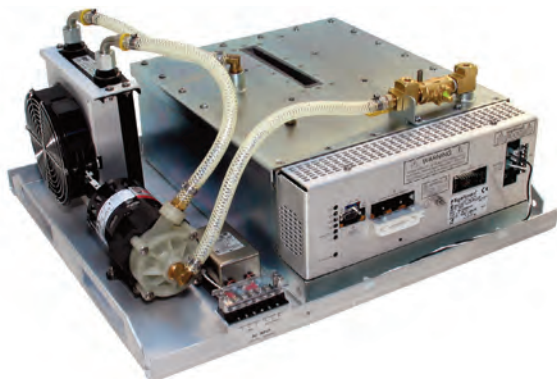


TOP VIEW



SIDE VIEW





Spellman's XRB160PN480/1 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like power factor correction, small package size, standard analog monitoring and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

### SPECIFICATIONS

#### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 0.8mm x 0.8mm (IEC336)  
Beam Filter: Curved 1mm Al  
Beam Geometry: Asymmetrical fan 80° x 10° ±2°

#### Input Voltage:

220Vac, ±10%, 50/60Hz, 6.5A max

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

#### X-Ray Tube Current:

0.25mA to 3mA over specified tube voltage range

#### X-Ray Tube Power:

480W maximum continuous

#### Voltage Regulation:

Line: ±0.1% for a ±10% input line change of nominal input line voltage  
Load: ±0.1% for a 0.25mA to 3mA load change

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±2% plus 1.785kV of the programmed value

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

#### Voltage Risetime:

Ramp time shall be ≤2 seconds from 10% to 90% of rated output

#### Voltage Overshoot:

±1% switching between 90kV to 160kV @ 0.25mA

#### Voltage Ripple:

≤0.1% of rated voltage from 10Hz to 1kHz

#### Current Regulation:

Line: ±0.5% @ 80-160kV, 0.25mA to 3mA

Load: ±0.5%, 0.25mA to 3mA

#### Current Accuracy:

Current measured through the X-Ray tube is within 2% of the programmed value

#### Current Risetime:

≤2 seconds from 10% to 90% of rated output

#### Arc Intervention:

4 arcs in 10 seconds = shutdown

#### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

#### Analog Interface:

0 to 10Vdc ground referenced signals

#### Digital Interface:

RS-232 interface

#### Control Software:

A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

#### Interlock Signals:

A hardware interlock function is provided

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-20°C to +70°C

#### Humidity:

5% to 95% relative humidity, non-condensing

**Cooling:**

Heat exchanger w/fan and oil pump,  
powered from AC

**Input Line Connector:**

6 position terminal block

**Analog Interface Connector:**

7 pin Molex 26-60-5070

**Digital Interface Connector:**

9 pin D connector, female

**Grounding Point:**

8-32 ground stud provided on chassis

**Dimensions:**

20" x 22.5" x 10.75" (508mm x 572mm x 273mm)

**Weight:**

125lbs (56.7kg)

**Orientation:**

Can be mounted in any orientation.

**X-Ray Leakage:**

Not to be greater than 0.5mR/hr at 5cm  
outside the external surface

**AC INPUT POWER  
J1 6 POSITION TERMINAL BLOCK**

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	Removed	N/C
3	Neutral	Neutral
4	Removed	N/C
5	Spare	N/C
6	Spare	N/C

**ANALOG INTERFACE CONNECTOR —  
7 PIN MOLEX, 0.156 CENTER**

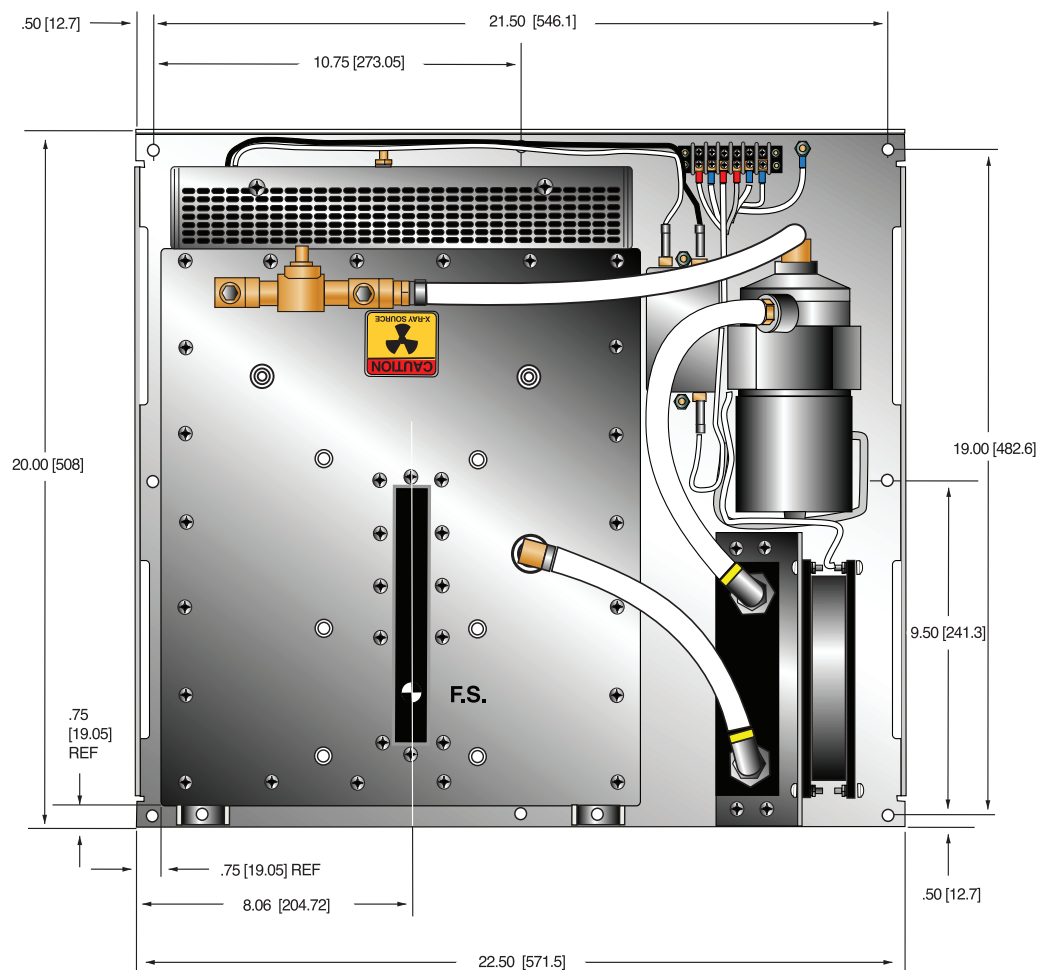
PIN	SIGNAL	PARAMETERS
1	X-Ray	+12Vdc @16mA = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	N/C
4	kV Monitor Output	0 to 1.6Vdc = 0 to 160kV
5	SGND	Signal Ground
6	mA Monitor Output	0 to 3Vdc = 0 to 3mA
7	Fault	Open Collector, Open = No Fault

**RS-232 DIGITAL INTERFACE —  
9 PIN FEMALE D CONNECTOR**

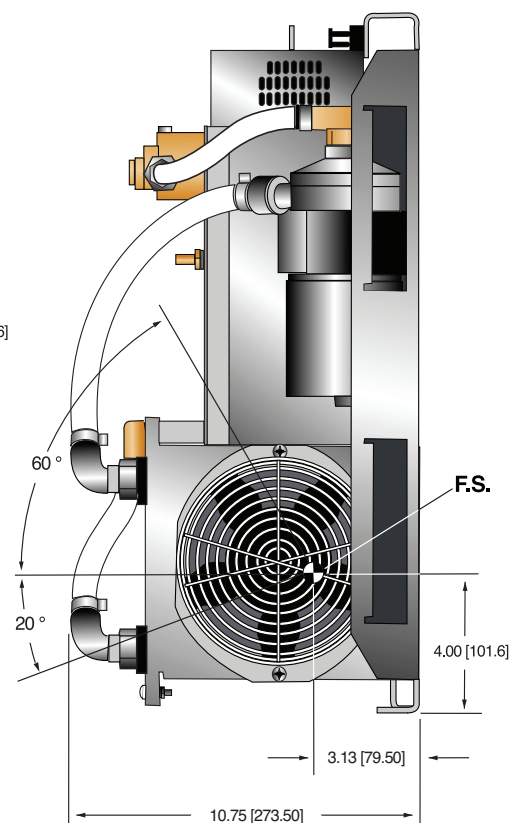
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	X-Ray Enable	+12Vdc @ 16mA = Enable
9	N/C	No Connection

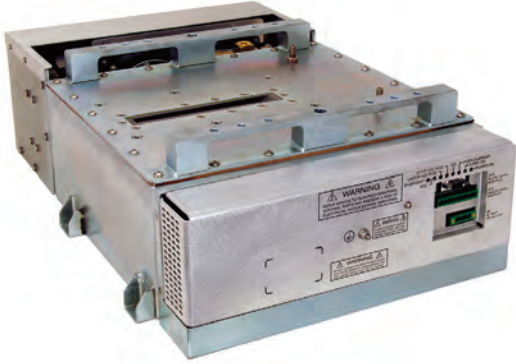
DIMENSIONS: in.[mm]

**TOP VIEW**



### SIDE VIEW





Spellman's XRB160PN480/2 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

#### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

#### SPECIFICATIONS

##### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 0.8mm x 0.8mm (IEC336)  
Beam Filter: 1mm curved window  
Beam Geometry: Asymmetrical fan 80° x 10° ±2°

##### Input Voltage:

100-240Vac ±10%, 50/60Hz, 6.5A max; 12Vdc @ 5A

##### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

##### X-Ray Tube Current:

0.25mA to 3mA over specified tube voltage range

##### X-Ray Tube Power:

480W maximum

##### Voltage Regulation:

Line: ±0.1% for a ±10% input line change of nominal input line voltage  
Load: ±0.1% for a 0.3mA to 3mA load change

##### Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±1% of the programmed value

##### Voltage Risettime:

Ramp time shall be <1 second from 10% to 90% of rated output

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Control Interface and Standard RS-232 Digital Interface**

##### Voltage Overshoot:

Within 5% of rated voltage in <10ms

##### Voltage Ripple:

0.1% pp of rated voltage @ ≤1kHz

##### Current Regulation:

Line: ±0.1% for a ±10% input line change of nominal input line voltage  
Load: ±0.5% @ 80-160kV, 0.3mA to 3mA

##### Current Accuracy:

Current measured through the X-Ray tube is within ±1% of the programmed value

##### Current Risettime:

<1 second from 10% to 90% of rated output

##### Arc Intervention:

4 arcs in 10 seconds with a 200ms quench = Shutdown

##### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

##### Analog Interface:

0 to 10Vdc ground referenced signals

##### Digital Interface:

RS-232 interface.

##### Control Software:

A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

##### Interlock Signals:

A hardware interlock functions in both analog and digital programming modes.

##### Operating Temperature:

0°C to +40°C

##### Storage Temperature:

-40°C to +70°C

##### Humidity:

95% relative humidity, non-condensing

##### Cooling:

Heat exchanger w/fan and oil pump, powered from DC input

### Input Line Connector:

3 pin, Phoenix Contact 1829167

### Analog Interface Connector:

10 pin, Phoenix Contact 1755503

### Digital Interface Connector:

9 pin D connector, female

### Heat Exchanger Power Connector:

4 pin AMP part no. 206061-1

### Grounding Point:

8-32 ground stud provided on chassis

### Dimensions:

See outline drawing

### Weight:

125lbs (56.7kg)

### Orientation:

Can be mounted in any orientation.

### X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

### AC INPUT POWER 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

### DC POWER FOR HEAT DISSIPATION UNIT 4 PIN AMP 206061-1 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	+12	+12Vdc
2	RTN	Return
3	+12	+12Vdc
4	RTN	Return

### ANALOG INTERFACE— JB15 10 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	X-Ray Signal	+24Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=2.2kΩ
2	X-Ray Signal Return	Signal Return
3	N/C	N/C
4	kV Monitor	0-10Vdc = 0 to 178kV, Zout = 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0-10Vdc = 0 to 3.4mA, Zout = 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @10mA maximum
8	HV ON Lamp Relay n/o	Relay Normally Open, 50Vdc @ 1A maximum
9	HV ON Lamp Relay common	Relay Common, 50Vdc @ 1A maximum
10	HV ON Lamp Relay n/c	Relay Normally Closed ,50Vdc @ 1A maximum

### LED INDICATORS

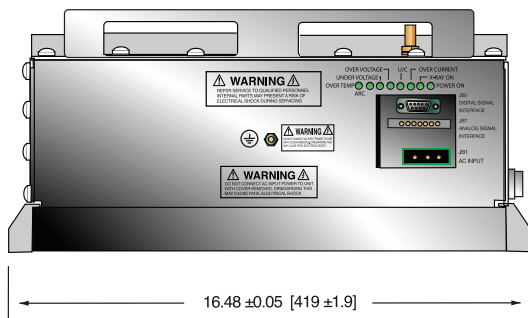
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

### RS-232 DIGITAL INTERFACE— 9 PIN FEMALE D CONNECTOR

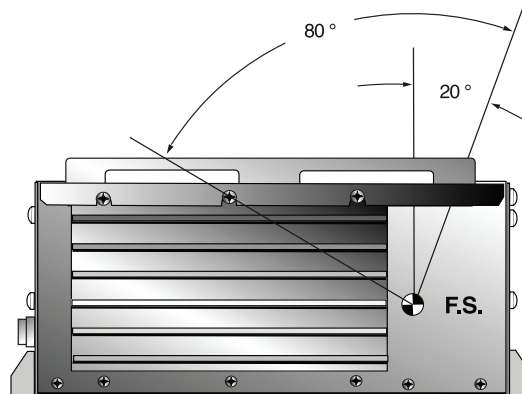
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to E/A RS-232-C
3	Receive Data	Conforms to E/A RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

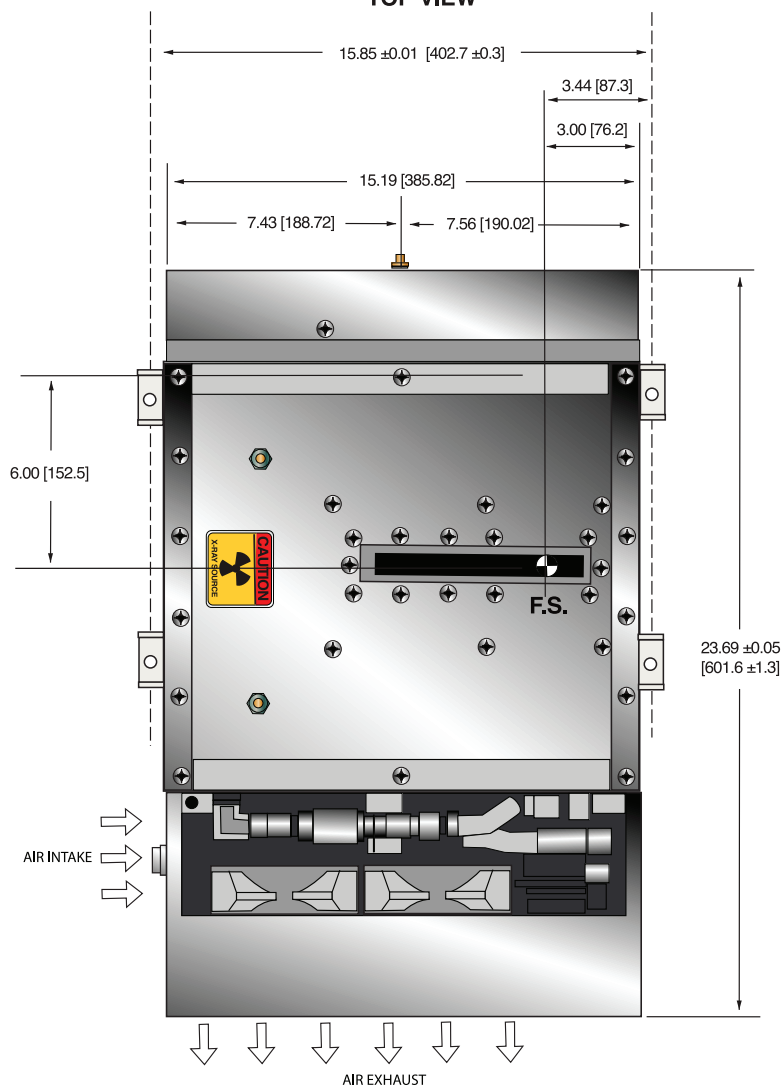
FRONT VIEW



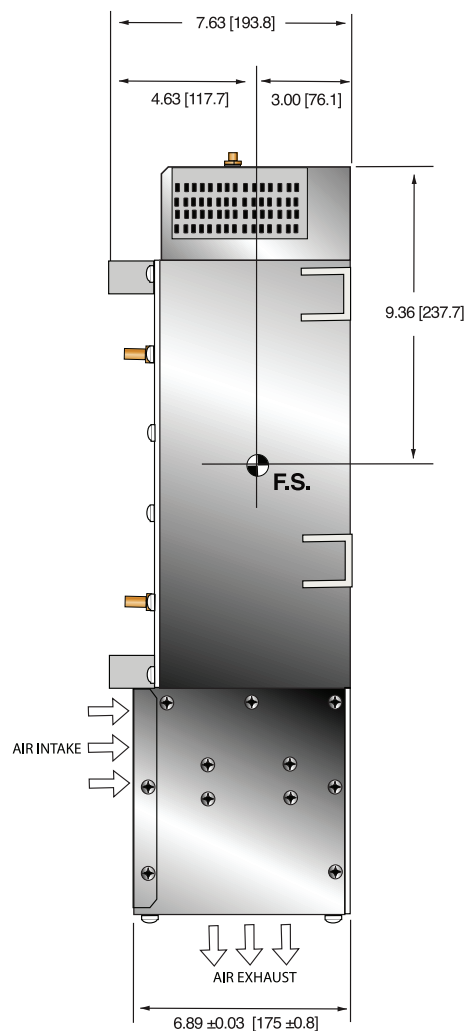
BACK VIEW



TOP VIEW



SIDE VIEW





Spellman's XRB160PN480/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like small package size and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

### SPECIFICATIONS

#### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 0.8mm x 0.8mm (IEC336)  
Beam Filter: 1.7mm of glass, 1mm of Al, and 10mm of oil  
Beam Geometry: Symmetrical fan 105° ±3° x 4° ±1°

#### Input Voltage:

Monoblock®: 100-240Vac ±10%, 50/60Hz, 6.5A max  
Heat Dissipation Unit: 24Vdc, 3A

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 20kV to 160kV

#### X-Ray Tube Current:

0.3mA to 6mA over specified tube voltage range

#### X-Ray Tube Power:

320W continuous, 480W peak

#### Voltage Regulation:

Line: ±0.1% for a ±10% input line change of nominal input line voltage  
Load: ±0.1% for a 0.3mA to 6mA load change

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Can be Mounted in Any Physical Orientation**
- **Standard RS-232 Digital Interface**

#### Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±1% of the programmed value

#### Voltage Risettime:

Ramp time shall be <1 second from 1% to 90% of rated output

#### Voltage Overshoot:

Within 5% of rated voltage

#### Voltage Ripple:

0.1% pp of rated voltage @ ≤1kHz

#### Current Regulation:

Line: ±0.5%  
Load: ±0.5%

#### Current Accuracy:

Current measured through the X-Ray tube is within ±1% of the programmed value

#### Current Risettime:

<1 second from 1% to 90% of rated output

#### Arc Intervention:

4 arcs in 10 seconds = Shutdown

#### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

#### Digital Interface:

RS-232

#### Control Software:

A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

#### Interlock Signals:

A hardware interlock functions in digital programming modes.

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-40°C to +70°C

#### Humidity:

5% to 90% relative humidity, non-condensing

#### Cooling:

Heat exchanger w/fan and oil pump, powered from customer provided 24Vdc @ 3A

**Input Line Connector:**

3 pin Phoenix Contact part no. 1829167

**Digital Interface Connector:**

9 pin D, female

**Analog Signal Connector:**

10 pin Phoenix Contact part no. 1755503

**Cooler Power Connector:**

4 pin AMP part no. 206061-1

**Grounding Point:**

8-32 ground stud provided on chassis

**Dimensions:**

24.00" x 16.00" x 6.50"  
(609.60mm x 406.40mm x 165.10mm)

**Weight:**

125lbs (49.5kg) ±10lbs (±4.5kg)

**Orientation:**

Can be mounted in any orientation.

**X-Ray Leakage:**

Not to be greater than 0.5mR/hr at 5cm  
outside the external surface

**Special Features:**

Stationary or rotating CT application up to 90rpm  
at a max. radius of 24.75" (629mm)

**AC INPUT POWER  
3 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

**ANALOG INTERFACE—  
10 PIN PHOENIX CONTACT**

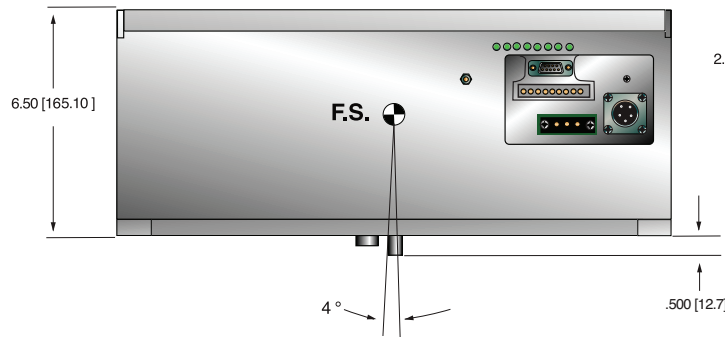
PIN	SIGNAL	PARAMETERS
1	X-Ray	+24Vdc = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	No Connection
4	kV Monitor Output	0 to 9Vdc = 0 to 100% Rated Voltage
5	SGND	Signal Ground
6	mA Monitor Output	0 to 9Vdc = 0 to 100% Rated Current
7	Fault	Open Collector, Open = No Fault
8	Relay N/C	HV On, 50V @ 1A maximum
9	Relay Common	HV On, 50V @ 1A maximum
10	Relay N/O	HV On, 50V @ 1A maximum

**RS-232 DIGITAL INTERFACE—  
9 PIN FEMALE D CONNECTOR**

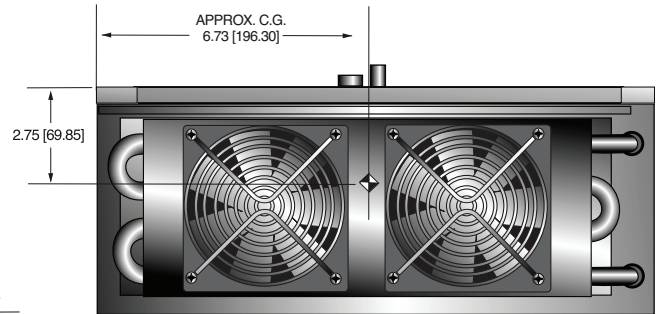
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to E/A RS-232-C
3	Receive Data	Conforms to E/A RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

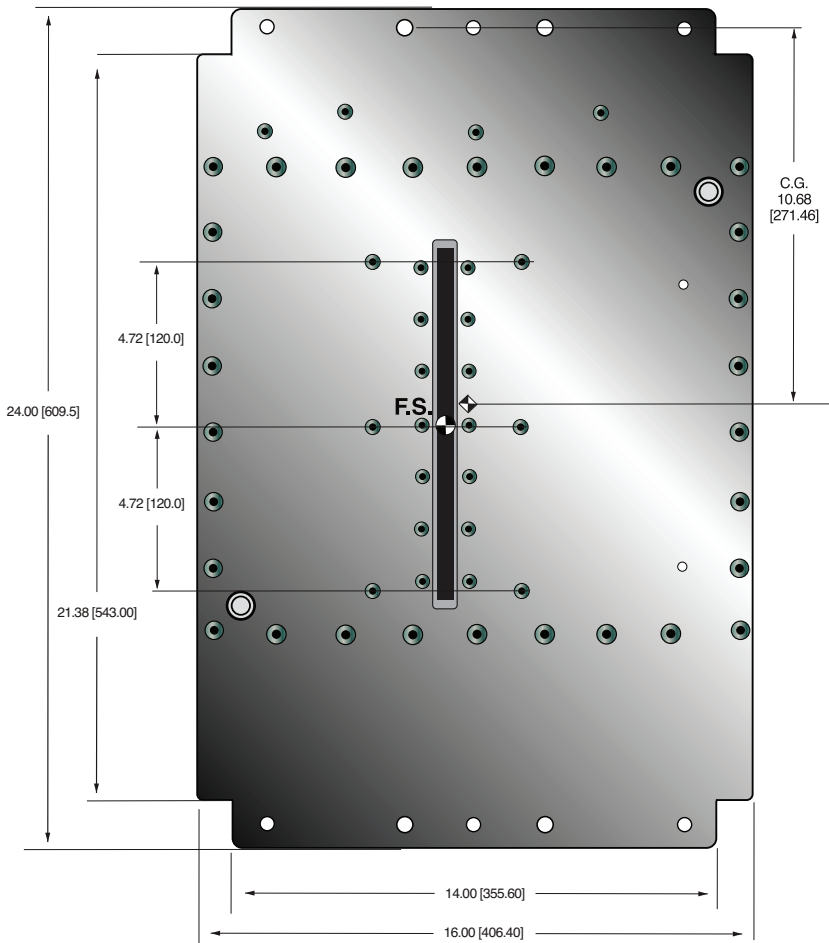
FRONT VIEW



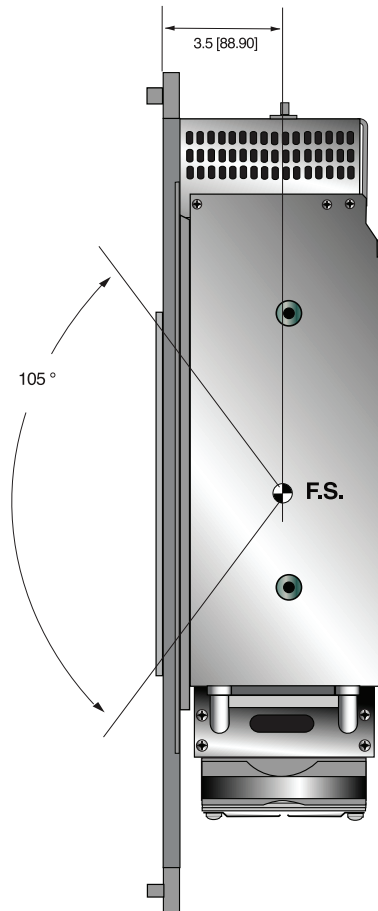
BACK VIEW

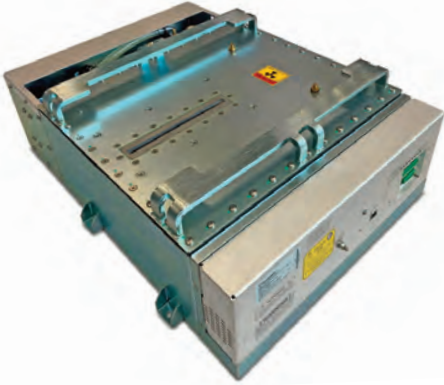


TOP VIEW



SIDE VIEW





Spellman's XRB200PN500 is an integrated X-Ray source operating up to 200kV and 500W, providing OEM users a compact plug-and-play Monoblock® for critical inspection and screening applications. The unit incorporates a 15° angle stationary anode X-Ray tube offering a symmetrical fan beam of 85° X 4°. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, with industry leading dose stability and image quality. This compact model comes with standard analog and RS-232 digital control. Spellman can provide customized versions of this platform for specific OEM system requirements.

## TYPICAL APPLICATIONS

Aviation Security Screening: Checked Baggage/EDS  
Vehicle Inspection, Cargo Inspection, General NDT

## SPECIFICATIONS

### X-Ray Characteristics:

Tube Type:	Stationary Anode, tungsten target
Focal Spot:	0.8 x 0.5mm nominal (IEC60336)
Beam Filter:	Glass 2.1mm, maximum. Oil 18mm.
Beam Geometry:	Symmetrical fan of 85° X 4°, ±1%
Anode Angle:	15°

### Input Voltage:

Power factor corrected input to 0.98. 100Vac to 240Vac, ±10%, 50/60 Hertz. 6 Amps, maximum

### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 100kV to 200kV

### Voltage Accuracy:

The high voltage measured at the X-ray tube will be within ±1% of the selected value.

### Voltage Ripple:

Ripple will be 1% of maximum rated voltage for frequencies ≤1kHz.

### Voltage Regulation:

< ±0.1% for ±10% of nominal input line change  
< ±0.1% for 0.5mA to 2.5mA load change

### Voltage Overshoot:

kV overshoot will return within 5% of full voltage in less than 100ms.

### Risetime:

The voltage and current risetime is controlled by a ramping circuit. Ramp time is less than 1.0 second from 10% to 90% of output voltage and current.

- **200kV and 500W**
- **X-Ray Tube Current: 0.5mA to 2.5mA @ 200kV**
- **Focal Spot 0.8 x 0.5mm Nominal (IEC60336)**
- **Symmetrical Fan Beam of 85° X 4°, ±1%**
- **Power Factor Corrected Input to 0.98**
- **100Vac to 240Vac, ±10%**
- **Logging and Firmware Controlled X-Ray Tube Seasoning**

### X-Ray Tube Current:

0.5mA to 2.5mA @ 200kV <±1% of the selected value.  
500 watts maximum

### Current Regulation:

<0.5% at 100 - 200 kV, 0.5mA to 2.5mA

### Arc Intervention:

Unit will detect a single arc but HV will not shut down. If multiple arcs occur (4 in 10 seconds) then the unit will shut down.

### Filament Configuration:

Isolated high frequency AC filament drive operated in current mode with closed loop thermionic filament emission control.

### Digital Interface:

The RS-232 and Ethernet interfaces allow for programming of the voltage, current and X-Ray Enable. Provides monitoring for voltage, current and oil temperature. Tolerance is 3%.

### Control Software:

A demo GUI is available for engineering evaluation.

### Operating Temperature:

0°C to +40°C

### Storage Temperature:

-40°C to +70°C

### Humidity:

10% to 95% relative humidity, non-condensing.

### Cooling:

Heat exchanger with fan and oil pump. Customer provided +24Vdc @ 3A is required. In certain situations, external cooling fans of 250CFM may be required to maintain tank/oil temperature below 55°C.

### Input Line Connector:

3 pin Phoenix Contact, p/n 1829167.  
Mating connector provided with unit.

### Analog Interface Connector:

10 pin Phoenix Contact, p/n 1755503.  
Mating connector provided with unit.

### RS-232 Connector:

9 pin female D connector. Mating connector provided with unit.

### Ethernet Connector:

8 pin RJ45 connector.

### Heat Dissipation Unit Connector:

4 pin AMP connector, TE Connectivity (206061-1)  
Mating connector provided with unit.

### Grounding Point:

M4 grounding stud provided on chassis.

### Dimensions:

See outline drawing.

### Weight:

181 pounds (80kg).

### Orientation:

Can be mounted in any orientation.

### X-Ray Leakage:

Not to be greater than .5mR/hr at 5cm from any surface of the Monoblock® when measured at 200kV @ 2.5mA.

### Regulatory Approvals:

Compliant to EEC Low Voltage Directive. Designed to meet EEC EMC Directive with customer provided external line filter, Corcom p/n 6EU1F or equivalent.

### AC INPUT POWER

#### 3 PIN PHOENIX CONTACT P/N 1829167

PIN	SIGNAL	PARAMETERS
1	Line	100-240Vac, ±10%, 50/60 Hertz @ 6 amps
2	GND	Ground
3	Neutral	100-240Vac, ±10%, 50/60 Hertz @ 6 amps

### DC POWER FOR HEAT DISSIPATION UNIT

#### 4 PIN AMP 206061-1 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	+24Vdc	+24Vdc @ 3A*
2	24Vdc Return	Return
3	+24Vdc	+24Vdc @ 3A*
4	24Vdc Return	Return

\*Both +24V supplies are required for pump and fans

### RS-232 DIGITAL INTERFACE—

#### 9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to EAI RS-232-C
3	Receive Data	Conforms to EAI RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

### ETHERNET INTERFACE—

#### 8 PIN FEMALE RJ45 CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX-	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

### ANALOG INTERFACE—

#### 10 PIN PHOENIX CONTACT P/N 1755503

PIN	SIGNAL	PARAMETERS
1	X-Ray On	+24Vdc = Enable X-Ray, Low or open = Disable X-Ray
2	X-Ray On Return	X-Ray on Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 200kV, Zout = 10kΩ
5	SGND	Signal Ground
6	mA Monitor	0 to 10Vdc = 0 to 2.5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @ 10mA, maximum
8	HV On Lamp N/O	Relay dry contact, normally open, 30Vdc @ <1A, nominal 50mA DC load
9	HV On Lamp Common	Relay dry contact, common, 30Vdc @ <1A, nominal 50mA DC load
10	HV On Lamp N/C	Relay dry contact, normally closed, 30Vdc @ <1A, nominal 50mA DC load

### FRONT PANEL LED INDICATORS

INDICATOR	SIGNAL NAME	CONDITION Illuminated When...	LED COLOR
LED 1	OT	OverTemperature occurs	Red
LED 2	ARC	Arc fault occurs	Red
LED 3	UV	Low kV occurs	Red
LED 4	OV	High kV occurs	Red
LED 5	UC	Low mA occurs	Red
LED 6	OC	High mA occurs	Red
LED 7	X-RAY ON	X-Rays are enabled	Green
LED 8	PWR ON	Power is ON	Green

### SMART XRB

The XRB200PN500 features data logging and firmware controlled seasoning.

#### Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage.

#### FAULT EVENTS

Temperature, Arc, High Current, High Voltage, Low Voltage, Watchdog, Power Fault, Interlock

The XRB200PN500 stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing: Anode kV, Cathode kV, Total kV, Total mA, Filament, Temperature

We also log non-fault events, these are changes in set points or state of the unit.

#### NON FAULT EVENTS

HV On, HV Off, kV Set point, mA Set point, Low Current, Filament Limit Set point, Pre Heat Set point, Line Dip

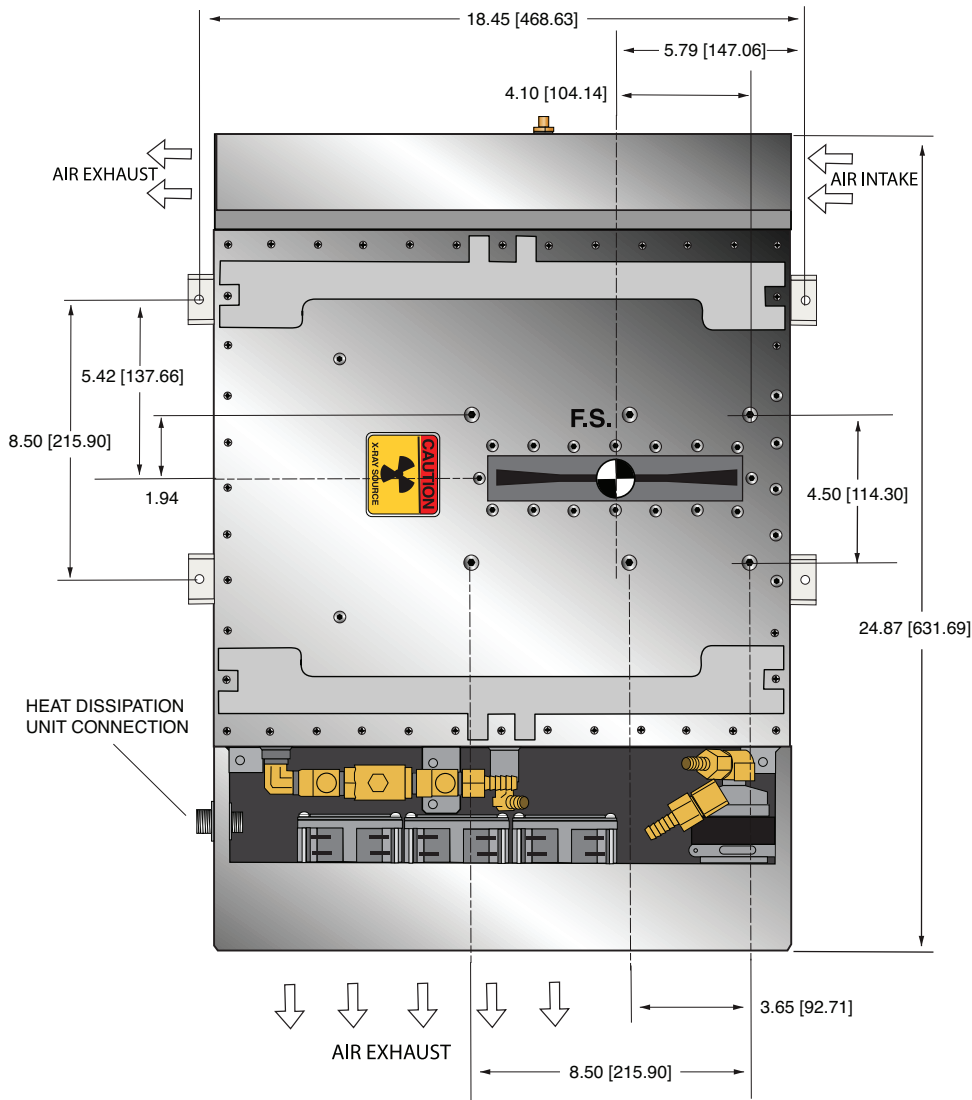
Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

#### Firmware Controlled Seasoning:

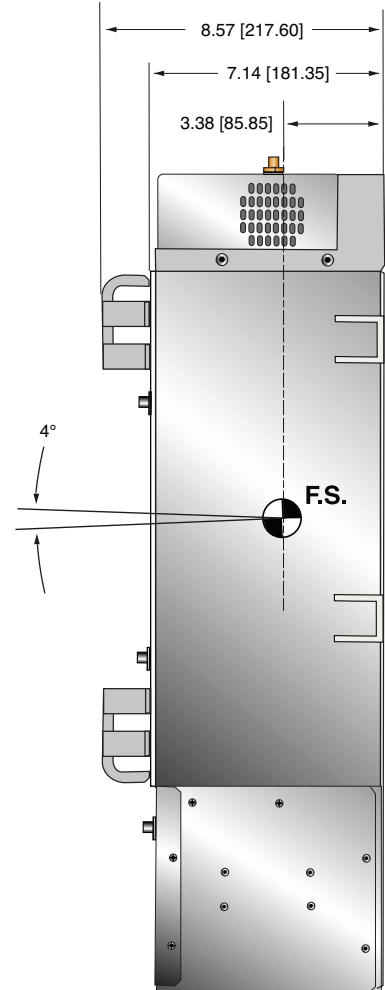
Every unit comes with an initial seasoning table, or customers can set their own. The XRB200PN500 knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

DIMENSIONS: in.[mm]

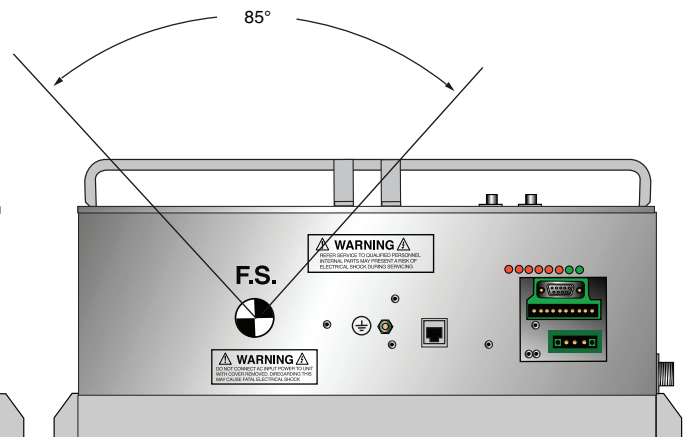
TOP VIEW



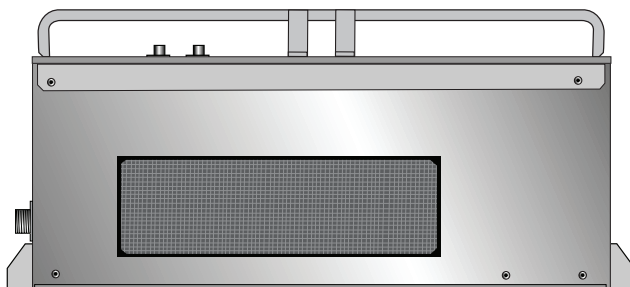
SIDE VIEW



FRONT VIEW



BACK VIEW





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

Spellman's XRB150PN600 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 150kV at 600W. Features like power factor correction, small package size and a standard analog and RS-232 digital interface simplify integrating this unit into your X-Ray system. Standard models are available with cone shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

## TYPICAL APPLICATIONS

X-Ray Scanning: Bone Densitometry,  
Food Inspection, Security

## SPECIFICATIONS

### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 0.5mm x 0.5mm (IEC 336)  
Beam Filter: 0.06" Ultem  
Beam Geometry: Cone, 18° ±1°

### Input Voltage:

200-240Vac ±10%, 50/60Hz, 6.5A maximum

### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between  
70kV to 150kV

### X-Ray Tube Current:

1.0mA to 4.0mA over specified tube voltage range

### X-Ray Tube Power:

160W continuous, 600W peak  
Duty Cycle: 30 seconds on, 300 seconds off  
@ 600W peak

### Voltage Regulation:

Line: ±0.1% for a ±10% input line change of  
180 to 264Vac  
Load: ±0.1% for a 1.0mA to 4.0mA load change.  
600W maximum

### Voltage Accuracy:

Voltage measured across the X-Ray tube is within  
±2% of the programmed value

### Voltage Risettime:

±1% in less than 300ms

### Voltage Overshoot:

±10% during 300ms risetime

### Voltage Ripple:

1% rms of rated voltage @ 10Hz to 1MHz

### Current Regulation:

Line: ±0.1% from 180-264Vac  
Load: ±0.5% @ 70kV-150kV, 1.0mA to 4.0mA

### Current Accuracy:

Current measured through the X-Ray tube is within  
±2% of the programmed value

### Current Risettime:

±1% in less than 300ms

### Arc Intervention:

4 arcs in 10 seconds with a 200ms quench = Shutdown

### Filament Configuration:

Internal high frequency AC filament drive with closed loop  
filament emission control

### Analog Interface:

0 to 5Vdc ground referenced signals

### Digital Interface:

RS-232 interface.

### Control Software:

A demo GUI for engineering evaluations will be provided  
for the RS-232 digital interface upon request.

### Interlock/Signals:

A hardware interlock function is provided

### Operating Temperature:

0°C to +40°C

### Storage Temperature:

-40°C to +70°C

### Humidity:

10% to 95% relative humidity, non-condensing

### Cooling:

External fan required. 250cfm minimum to maintain  
an oil temperature of 55° C

## Input Line Connector:

3 pin Phoenix Contact P/N 1829167

## Analog Interface Connector:

10 pin Phoenix Contact P/N 1755503

## Digital Interface Connector:

9 pin D connector, female

## Grounding Point:

8-32 ground stud provided on chassis

## Dimensions:

13.46" x 13.38" x 6.24"

(341.89mm x 339.85mm x 158.50mm)

## Weight:

66lbs (30kg)

## Orientation:

Can be mounted in any orientation.

## X-Ray Leakage:

Less than 100mR/hr at 1m distance,  
measured at 140kV, 3mA

## AC INPUT POWER JB1 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Chassis Ground
3	Neutral	Neutral

## RS-232 DIGITAL INTERFACE— JB16 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Spare	N/C
2	Transmit	RS-232
3	Receive	RS-232
4	Spare	N/C
5	Signal Ground	Ground
6	Spare	N/C
7	Spare	N/C
8	Spare	N/C
9	Spare	N/C

## ANALOG INTERFACE— JB15 10 PIN PHOENIX CONTACT

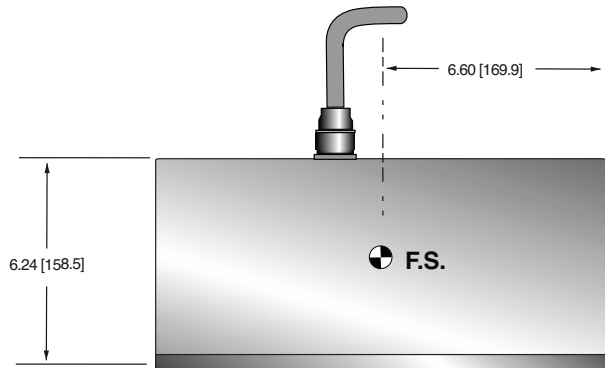
PIN	SIGNAL	PARAMETERS
1	X-Ray Signal	+12Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=1kΩ
2	X-Ray Signal Return	Signal Return
3	N/C	N/C
4	kV Monitor	0 to 5Vdc = 0 to 175kV, Zout= 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0 to 5Vdc = 0 to 4.5mA, Zout= 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @10mA maximum
8	HV ON Lamp Relay n/o	Relay Normally Open, 50Vdc @ 1A maximum
9	HV ON Lamp Relay common	Relay Common, 50Vdc @ 1A maximum
10	HV ON Lamp Relay n/c	Relay Normally Closed, 50Vdc @ 1A maximum

## LED INDICATORS

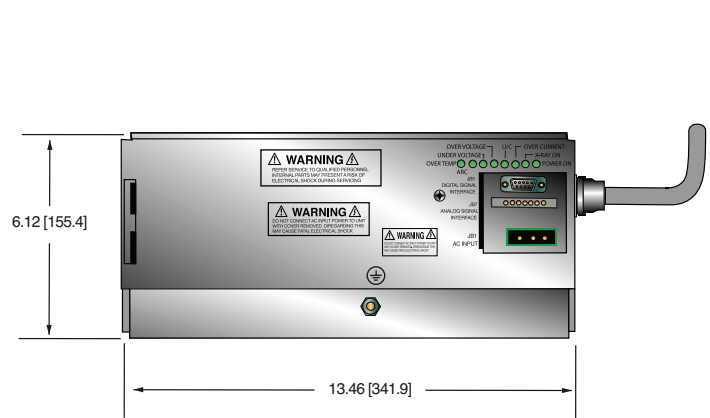
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

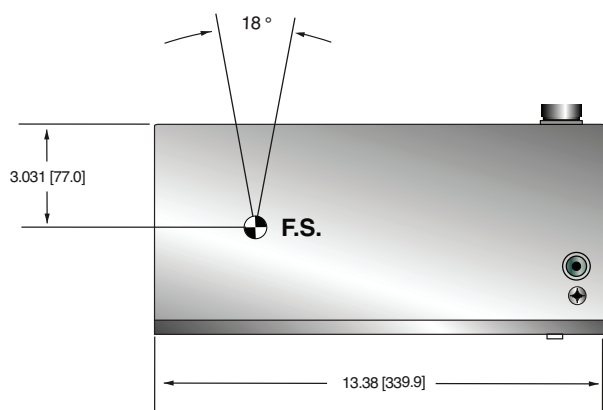
FRONT VIEW TANK



FRONT VIEW CONTROL ASSEMBLY

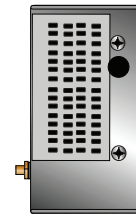


SIDE VIEW TANK

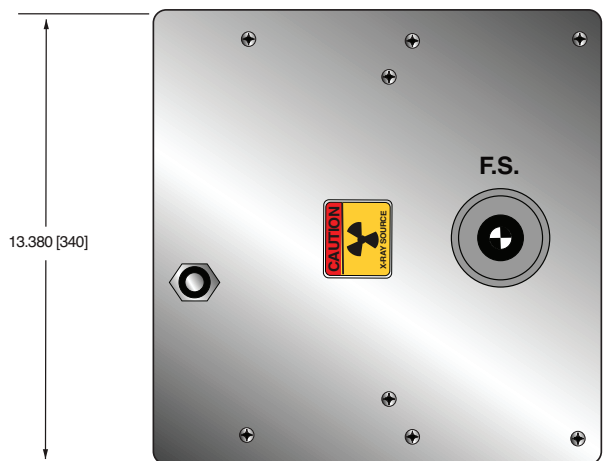


SIDE VIEW CONTROL ASSEMBLY

AIR EXHAUST

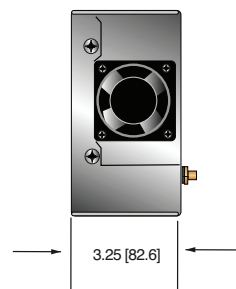


TOP VIEW TANK



SIDE VIEW CONTROL ASSEMBLY

AIR INTAKE





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Standard RS-232 Digital Interface**

Spellman's XRB160PN688/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 688W. Features like small package size and RS-232 digital interface simplify integrating this unit into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

#### TYPICAL APPLICATIONS

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

#### SPECIFICATIONS

##### X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter  
Focal Spot: 2.5mm x 2.5mm (IEC 60336)  
Beam Filter: 1.5mm glass, 9-26mm oil, 0.4mm Al  
Beam Geometry: Asymmetrical fan 93° x 15° ±2°

##### Input Voltage:

230Vac, ±15%, 50/60Hz, 5A max

##### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 50kV to 160kV

##### X-Ray Tube Current:

0.25mA to 4.3mA over specified tube voltage range

##### X-Ray Tube Power:

688W maximum continuous

##### Voltage Regulation:

Line: ±0.1% ±10%  
Load: ±0.1% 0.25 to 4.3mA

##### Voltage Accuracy:

Voltage measured across the X-Ray tube is within 1% of the programmed value

##### Voltage Risetime:

Ramp time shall be 500ms nominal, 1 second maximum from 10% to 90% of rated output

##### Voltage Overshoot:

Within 5% of rated voltage

##### Voltage Ripple:

1% p-p of rated voltage

##### Current Regulation:

Line: ±0.5% ±10%  
Load: ±0.5% 0.25 to 4.3mA

##### Current Accuracy:

Current measured through the X-Ray tube is within 5% of the programmed value

##### Current Risetime:

500ms nominal, 1 second maximum

##### Arc Intervention:

4 arcs in 10 seconds = shutdown

##### Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

##### Digital Interface:

RS-232 interface.

##### Control Software:

A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

##### Interlock Signals:

A hardware interlock function is provided

##### Operating Temperature:

5°C to +40°C

##### Storage Temperature:

-25°C to +65°C

##### Humidity:

10% to 90% relative humidity, non-condensing

##### Cooling:

Heat exchanger w/fan and oil pump, powered from AC

**Input Line Connector:**

5 pin Molex 26-60-4050

**Heat Exchanger Power Connector:**

4 pin AMP part no. 206061-1

**Digital Interface Connector:**

9 pin D connector, female

**Grounding Point:**

M5 ground stud provided on chassis

**Dimensions:**

See drawing

**Weight:**

140lbs ±10lbs (64kg ±4.5kg)

**Orientation:**

Can be mounted in any orientation.

**X-Ray Leakage:**Less than 300uR/hr at a distance of  
10cm from all surfaces**Special Features:**Stationary or rotating CT application up to 100rpm  
at a maximum radius 20.25" (514mm)**AC INPUT POWER****J1 5 PIN MOLEX 26-60-4050 CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	Line	230Vac Input
2	Line	230Vac Input
3	N/C	No Connection
4	Neutral	230Vac Neutral
5	Neutral	230Vac Neutral

**AC POWER FOR HEAT DISSIPATION UNIT****4 PIN AMP 206061-1 CONNECTOR**

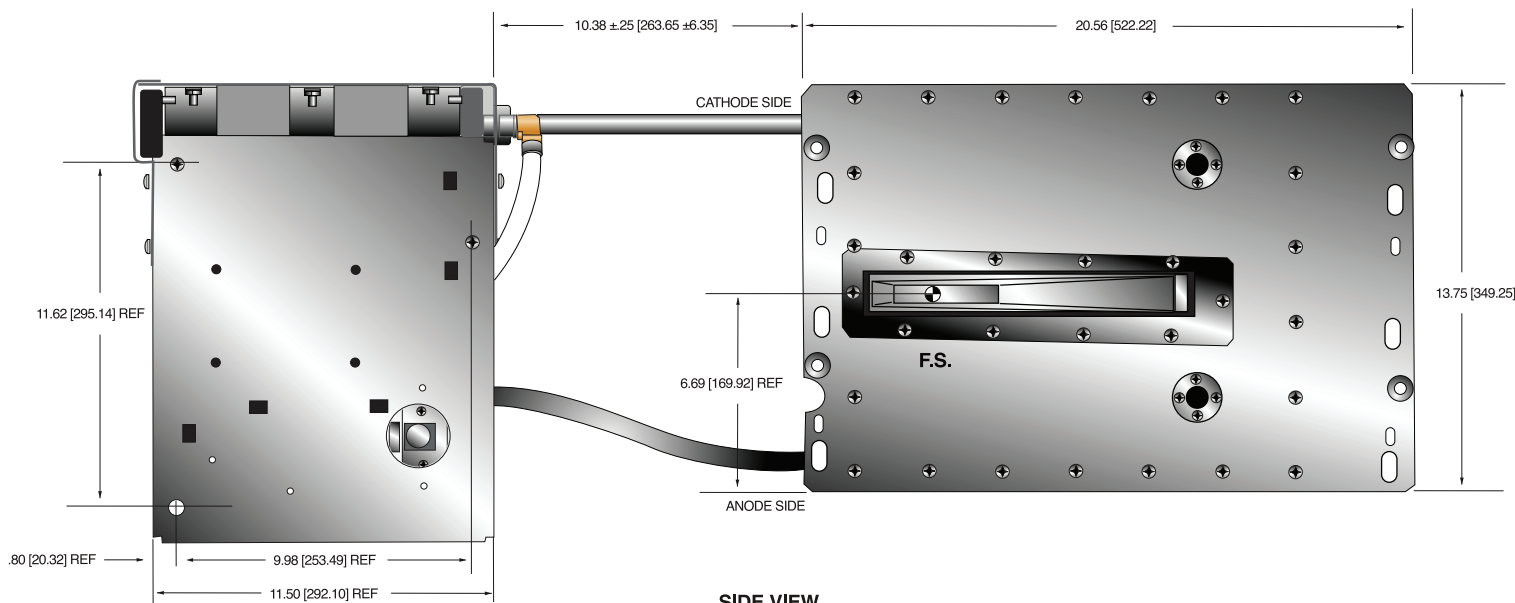
PIN	SIGNAL	PARAMETERS
1	Line	230Vac Input
2	N/C	No Connection
3	Neutral	230Vac Neutral
4	GND	Chassis Ground

**RS-232 DIGITAL INTERFACE—****J5 9 PIN FEMALE D CONNECTOR**

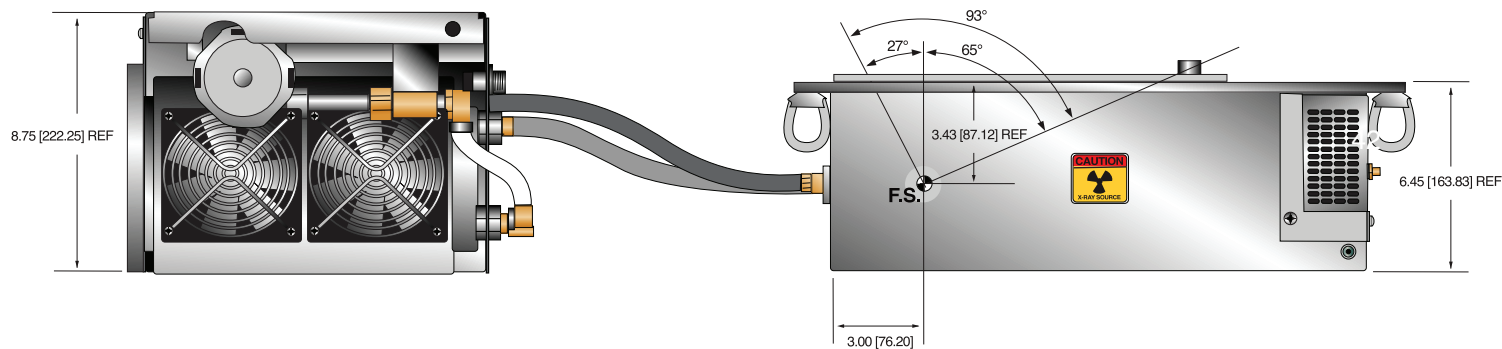
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

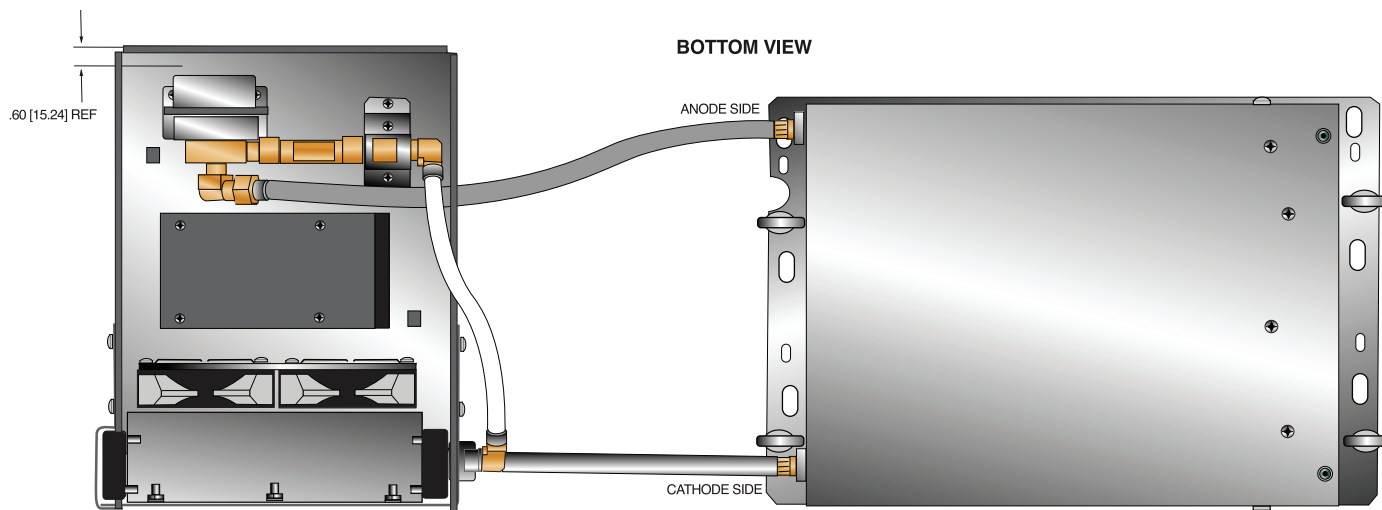
TOP VIEW



SIDE VIEW



BOTTOM VIEW





Spellman's new Panoramic Dental Monoblock® consists of an integrated X-Ray tube, dual-output high voltage power supply, and filament supply with control circuitry. The PDM90PN900 is designed for extra oral dental X-Ray applications including CT and Panoramic X-Ray. Features like small package size, standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability and performance.

### TYPICAL APPLICATIONS

Dental X-Ray: Panoramic and CT Imaging

### SPECIFICATIONS

#### X-Ray Tube Characteristics:

Target Angle: 5 degrees  
Focal Spot: 0.5mm nominal  
Beam Filtration: 3.0mm of Al equivalent  
Beam Geometry: see page 3

#### X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 50kV to 90kV

#### Voltage Regulation:

Line:  $\pm 0.5\%$  for a  $\pm 1V$  change of nominal input line voltage  
Load:  $\pm 0.1\%$  for a load change of 25 $\mu A$  to maximum rated current

#### X-Ray Tube Current:

1mA to 10mA over specified tube voltage range

#### Current Regulation:

Line:  $\pm 0.5\%$  for a  $\pm 1V$  change of nominal input line voltage  
Load:  $\pm 0.5\%$  for a voltage change of 35kV to 80kV

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Analog or Digital Control Interface**

#### X-Ray Tube Power:

900W peak power

#### Duty Cycle:

CT (Pulsed):  $\leq 45$  seconds scan time cycle at up to 40 pulses per second available

Panoramic (Continuous): Maximum scan time = 30s, with 60s off-time. Five consecutive scans

#### Input Voltage:

100-240Vac  $\pm 10\%$  50/60 Hz, 10 amps RMS maximum

#### Interface:

The RS-232 serial communications interface will be used to program and monitor output voltage and current, control various functions and report status and faults.

#### Digital Interface Connector:

RS-232: 9 pin D connector, male

#### Operating Temperature:

0°C to +40°C

#### Storage Temperature:

-20°C to +70°C

#### Humidity:

5% to 95% relative humidity, non-condensing

#### Cooling:

Tank: Convection  
Controller: Forced air via provided fan

#### Dimensions:

X-Ray Tank: 9.7"W x 7.7"H x 4.7"D  
(247mm x 195mm x 119mm)  
Inverter/Controller: 7.10"W x 9.80"H x 3.60"D  
(180mm x 250mm x 92mm)

#### Weight:

X-Ray Tank: 17lbs (7.7kg)  
Inverter/Controller: 6.5lbs (3kg)

#### X-Ray Leakage:

Less than 100mR/hour (or  $< 1mGy/hr$ ) @ 1meter from the Monoblock® surface.

#### Regulatory Approvals:

Compliant to EMC 60601-1-2 (external EMC filter and shielding required). UL/CUL recognized file E242584.

## AC INPUT POWER 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

## ANALOG INTERFACE — J2 10 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	X-Ray Ready/Sync	+5 V Logic
2	X-Ray Enable	+5 V Logic
3	+ X-ray Signal (Exgate)	+5VDC = Enable X-Ray, Low (or Open) = Disable X-Ray
4	Signal Ground	Signal Ground
5	VMTR Signal (KV monitor)	Voltage: 0 to +5.00 V max, Scale Factor: 0 – 5.00 Vdc = 0 to 100 kV
6	Signal Ground	Signal Ground
7	IMTR Signal (mA monitor)	Voltage: 0 to +5.00 V max, Scale Factor: 0 – 5.00 Vdc = 0 – 12.1mA
8	Fault Signal	Output signal: Open Collector, High (Open) = No Fault
9	HV ON Lamp, Relay N/O	Relay Normally Open, Dry contacts rated 1A or less will handle a nominal 50mA DC load.
10	HV ON Lamp, Common	Common

## RS-232 DIGITAL INTERFACE — J5 9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX In	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

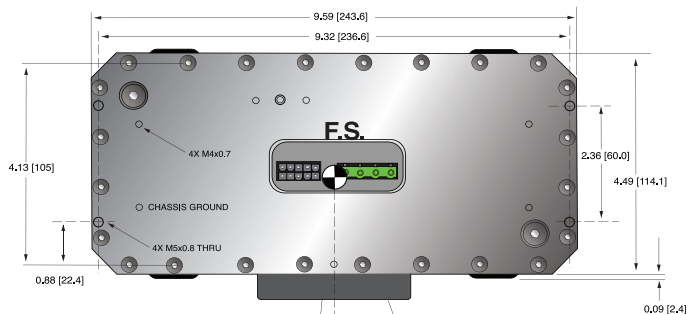
## LED INDICATORS

INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	PW (Pulse mode)	Pulse mode selected
LED 8	CW (CW mode)	CW mode selected
LED 9	CW (CW mode)	X-Ray is ON

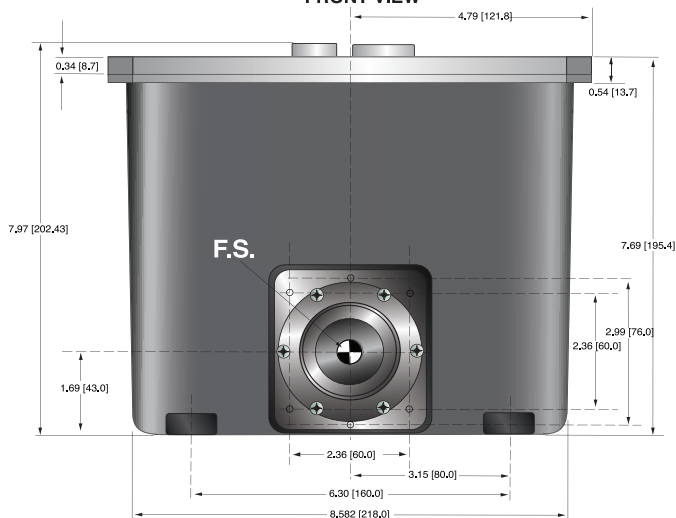
#### PDM Generator Tank

DIMENSIONS: in.[mm]

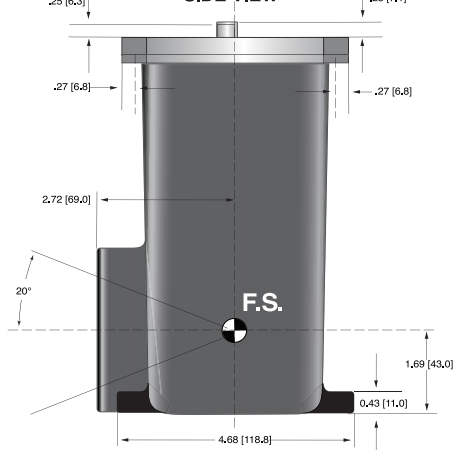
##### TOP VIEW



##### FRONT VIEW



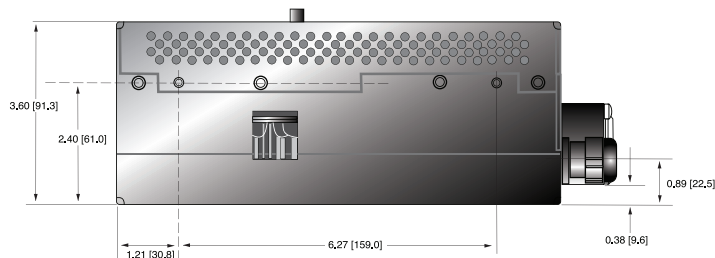
##### SIDE VIEW



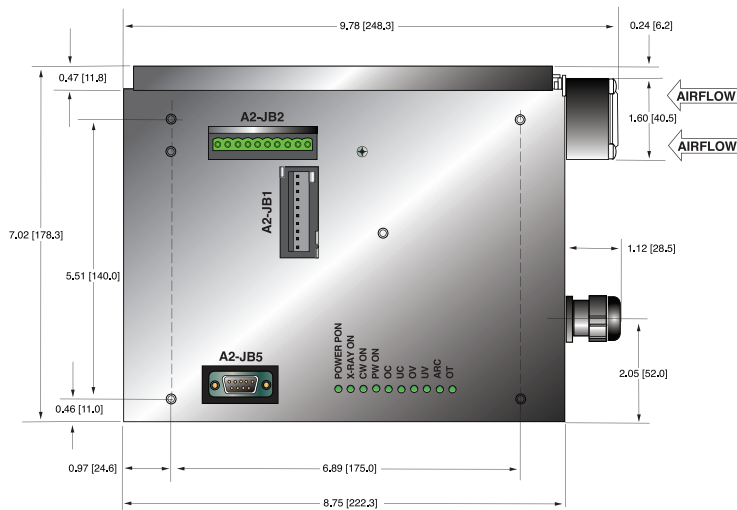
#### PDM Inverter/Controller

DIMENSIONS: in.[mm]

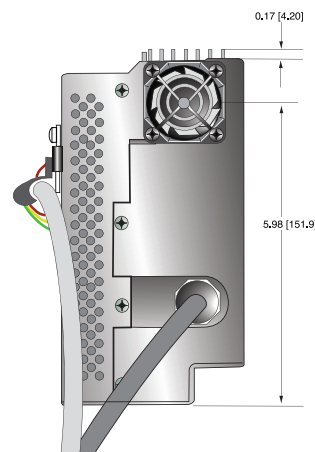
##### TOP VIEW



##### FRONT VIEW



##### SIDE VIEW





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **<1ms Rise Time is Ideal for Extremities**
- **Specifically designed for the C-Arm OEM**

Spellman's MMB125PN3.5 Medical Monoblock® with <1ms rise time is ideal for extremities, specialized applications and vascular imaging. Benefit from Spellman's 70 plus years of high voltage innovation with this MMB125PN3.5 Monoblock® X-Ray source specifically designed for the C-Arm OEM. Our advanced technology and design expertise in conjunction with our depth of manufacturing capabilities position Spellman as the wise choice for your Monoblock® requirements.

Spellman's Ultra-Fast MMB Series utilizes our unique technologies that increases the quality of the X-Ray beam and significantly reduces patient dose. Pulsed Fluoroscopy enhances imaging of dense and complex anatomy to further support dose management. With a rise time of <1ms, Spellman's MMB Series is among the fastest in the industry.

### TYPICAL APPLICATIONS

C-Arm OEM

### SPECIFICATIONS

#### X-Ray Characteristics:

Focal Spot:	0.5mm for small focus 1.6mm for large focus
Target Angle:	16°
Target Material:	Tungsten
Beam Filter:	0.8mm Al
Beam Geometry:	Refer to line drawing
X-Ray Leakage:	Less than <1mGy/hour @ 1meter from tank surface.
Maximum Filament Current:	4.3A
Filament Inverter Switching Frequency:	20kHz
Anode Heat Content:	35.5kJ
Maximum Anode Heat Dissipation:	600W
Distance Between Focal Spot to X-Ray Output Window:	45mm
Focal Spot Position:	Refer to outline drawing, additionally it is marked on tank cover.

#### Input Power:

Input Voltage:	190-264Vac, single phase, 50/60 Hz
Continuous Current:	≤9A @ 600W, 220V
Peak Current:	≤34A @ 3500W, 220V

#### X-Ray Tube Voltage:

Operational Range:	40 to 125kV
kV Rise Time:	<1ms (from 10% to 90%)
Reproducibility:	≤0.05 per IEC60601-2-54
kV Ripple:	≤1%
kV Accuracy:	
Fluoroscopy:	±5%
kV Overshoot:	≤5%

#### X-Ray Tube Current:

Fluoro:	0.2mA to 6mA (small focal spot)
Pulsed Fluoro:	0.5mA to 10mA (small focal spot)
Radiography:	10mA to 40mA (large focal spot)
mA Accuracy:	±10%

#### Maximum Operating Conditions:

Continuous Low Level Fluoro:	6 mA for 5 minutes
Continuous High Level Fluoro:	10 mA for 2 minutes
Pulsed Fluoro:	0.5fps, 1fps, 2fps, 4fps, 8fps, 15fps, 25fps, 30fps for 2 minutes
Pulse on time:	the lower value of 40ms or 50% duty cycle
Radiographic:	Single shot large focal spot, 0.1 seconds @ 3500 watts
Maximum Anode Heat Dissipation:	600W
Average Power:	600W for 5 minutes
Tank Heat Content:	No less than 675kHU
Max. Cooling Rate:	150W

#### X-Ray Tube Current Protection:

- Over Current (High mA): Trip point is set at 15% over maximum rated current, or at 15% over programmed output current value for longer than 50ms.
- Under Current (High mA): Trip point is set at 15% under programmed output current value for longer than 50ms.
- Over Current (Low mA): Trip point is set at 20% over maximum rated current, or at 20% over programmed output current value for longer than 50ms.
- Under Current (Low mA): Trip point is set at 20% under programmed output current value for longer than 50ms.

#### X-Ray Tube Voltage Protection:

Over Voltage (High kV): Trip point is when the kV output exceeds 137.5kV for more than 10ms or it set is at 10% over programmed output voltage value for longer than 30ms.

Under Voltage (Low kV): Trip point is set at 10% under the programmed output voltage value for longer than 30ms.

#### X-Ray Tube Arc Protection:

Arc Intervention: Unit will detect an Arc but HV will not be shut down, but if multiple arcs occur (4 arcs in 10 seconds) the unit will shut down.

#### Over Temperature Protection:

Over Temperature: Over temperature of tank cover trip point shall be within 60°C ±5°C. Over temperature of tank oil trip point shall be set 65°C.

**Operating Temperature:** 0 to +40 °C.

**Storage Temperature:** -20 to +70 °C

**Altitude:** 0 to 8000 feet (0 to 2438 meters)

**Humidity:** 5 to 95%, non-condensing.

#### Dimensions:

X-Ray Tank: 12.2" x 6.2" x 5.7" (310mm x 158mm x 145mm)  
Refer to outline drawing.

Controller: 14.9" x 10.6" x 3.2" (380mm x 270mm x 83mm)  
Refer to outline drawing.

#### Weight:

X-Ray Tank: 27.5 pounds (13kg)  
Controller: 9.9 pounds (4.5kg)

#### Regulatory Approvals:

Designed to be compliant to:

IEC 60601-1:2005+A

Medical electrical equipment Part 1: General requirements for basic safety and essential performance.

IEC 60601-1-2

2007 Medical electrical equipment Part 1-2: General requirements for basic safety and essential performance- Collateral standard: Electromagnetic compatibility—Requirements and tests.

IEC 60601-1-3

2008 Medical electrical equipment Part 1-3: General requirements for basic safety and essential performance- Collateral standard: Radiation protection in diagnostic X-Ray equipment.

IEC 60601-2-54

2009 Medical electrical equipment Part 2: Particular requirements for the basic safety and essential performance of X-Ray equipment for radiography and radioscopy.

#### EMC

Designed to meet IEC requirements for medical components. (Note: External EMI filter may be required)

#### RoHS

Controller and Tank Assembly are RoHS compliant.

#### AC LINE POWER CONNECTOR— TE: 1-350943-0

PIN	SIGNAL	PARAMETERS
1	Ground	Earth Ground
2	AC Input 1	190 - 264Vac, single phase, 50/60Hz, 34A max.
3	AC Input 2	190 - 264Vac, single phase, 50/60Hz, 34A max.

Note: Ground stud is provided on chassis

#### DIGITAL INTERFACE—9 PIN FEMALE D CONNECTOR TE: 5747844-5

PIN	SIGNAL	PARAMETERS
1	NC	No Connection
2	RS-232 TX Out	RS-232 Transmit
3	RS-232 RX In	RS-232 Receive
4	NC	No Connection
5	RS-232 Ground	Ground from RS-232 transceiver IC
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

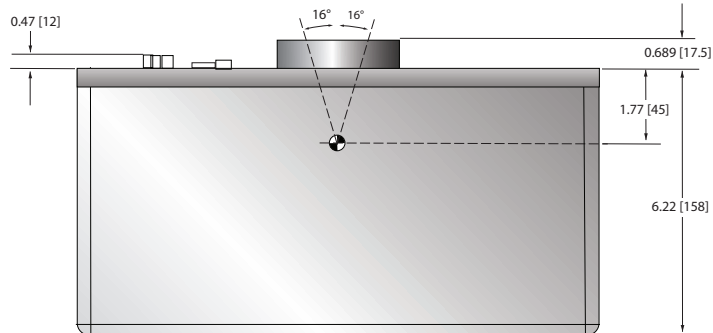
#### ANALOG INTERFACE—15 PIN FEMALE D CONNECTOR TE: 5747845-5

PIN	SIGNAL	PARAMETERS
1	GND	Signal Ground
2	+5Vdc Out	+5Vdc, 100mA max.
3	Prep	User signal (Contact Closure) to alert the generator that exposure sequence will begin. Once this signal is active, exposure parameters are locked in and cannot be changed. Contact connection to pin 14. Closed = PREP, the filament is placed in preheat mode
4	Ready	The generator is ready for X-Ray exposure. Open Collector. Low/Active = Ready
5	Exposure	User signal (Contact Closure) to generator to generate X-Rays. Filament is boosted, and high voltage is generated after the boost time. Contact connection to pin 14. Closed = Exposure
6	X-Ray ON 75% Status	Transistor output to indicate X-Ray ON status synchronized with 75% of kV set point
7	X-Ray ON Status	Transistor output to indicate X-Ray ON status synchronized with kV start up
8	X-Ray Shutdown	User signal to generator to rapidly turn HV OFF and ON during serial exposure sequence. Low/Active=HV OFF
9	HVG Fault Status	Generator signal indicating generator fault. Open collector transistor output. Low/Active = Fault
10	kV Monitor	Signal from generator. 0-10V = 0-140kV
11	mA Monitor	Signal from generator. Large focus: 0-10V = 0-50mA Small focus: 0-5V=0-10mA
12	Filament Current Monitor	Signal from generator. 0-10V = 0-6A
13	Monitor GND	Ground for reference of monitor signals
14	+24Vdc Out	For connection to PREP and EXPOSURE control relay coils
15	Shield Ground	For connection of interface cable shield to generator chassis ground

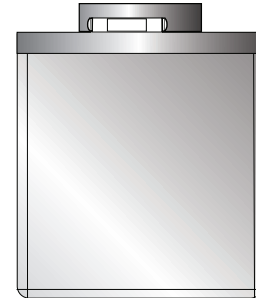
DIMENSIONS: in.[mm]

#### GENERATOR TANK

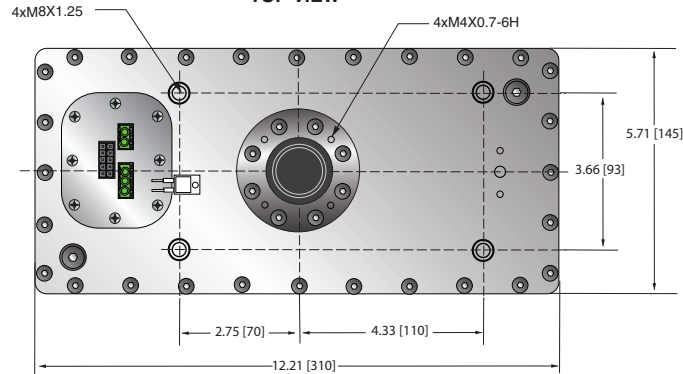
##### FRONT VIEW



##### SIDE VIEW



##### TOP VIEW

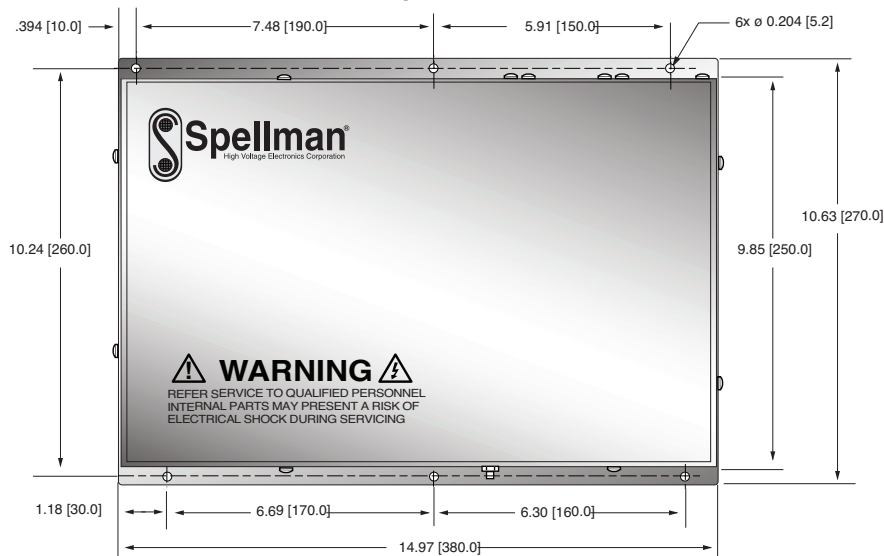


#### CONTROL UNIT

##### FRONT VIEW



##### TOP VIEW





Spellman's MI1.5PN24 is a well-regulated, high performance DC-DC converter featuring a floating 1.5kV @ 6.5mA output, it has an operational range 300V-1500V. The output is isolated; this allows connection to loads of +Ve, -Ve or switchable polarity and for pulse currents to be contained within prescribed paths, reducing noise and interference signatures. The MI1.5PN24 low output ripple specification makes it ideal for use with pulsers in Mass Spectrometry applications. This module is packaged in a shielded metal enclosure and the high voltage output is provided via two captive cables. The MI1.5PN24 has a large, high quality capacitance and rugged output network, this allows high energy pulsed loads to be powered continuously without significant voltage drop or damage to the unit circuitry. The unit has remote 0-10Vdc = 0-100% rated voltage programming and voltage monitor. A TTL compliant Enable signal provides simple control of the high voltage output.

### TYPICAL APPLICATIONS

Mass spec pulsers  
Pulsed load requirements

### SPECIFICATIONS

#### Input Voltage:

+24Vdc,  $\pm 10\%$ . Protected against reverse connection

#### Input Current:

725mA maximum at 1500V @ 6.5mA

#### Output Voltage:

300V to 1.5kV, continuously variable over entire output range

#### Polarity:

Positive or negative, isolated to 1.5kV

#### Load Current:

6.5mA, maximum

#### Power:

9.75 watts, maximum

#### Regulation:

Line:  $<0.5\%$  for line change of  $\pm 10\%$

Load:  $<0.1\%$  for zero to full load

#### Stability:

Better than 300ppm/hour after 1 hour warm up. 100ppm/hour after 2 hour warm up at constant operating conditions. Typically, 50ppm/hour after 1 hour and 15ppm/hour after 2 hours.

#### Temperature Coefficient:

$<100\text{ppm}/^\circ\text{C}$ , typically  $25\text{ppm}/^\circ\text{C}$

- **Floating, Programmable 1.5kV Output**
- **Well Regulated, Low Ripple**
- **Low Z Output Network for Pulsed Load Applications**
- **Compact Design**

#### Ripple:

$<75\text{mV}$  peak to peak at full load when either end is grounded.

#### Output Current Limit:

The module will have an output current limit of 9mA. The module is capable of withstanding an indefinite short circuit or overload on its output and will recover automatically once the short circuit is removed.

#### Supply Voltage Dynamic Rejection:

$< 20\text{mV}$  for an input step of 1 volt  
(within the range of +24Vdc,  $+10\%/-2\%$ )

#### Settling Time:

500 milliseconds maximum under all conditions.

#### Output Capacitance:

$>400\text{nF}$  – Connected directly between POSITIVE to NEGATIVE output nodes

#### Environmental:

Temperature Range:

Operating:  $+15^\circ\text{C}$  to  $+50^\circ\text{C}$

Storage:  $-40^\circ\text{C}$  to  $70^\circ\text{C}$

Humidity: 5% to 95% RH @  $40^\circ\text{C}$  non-condensing

#### Cooling:

Convection cooled

#### Interface Connector:

20 pin IDC male connector

#### High Voltage Output Connectors:

Two Varex CA166 (Connectronics SCID compatible) right angle connectors, 10 inches (254mm) long. The +Ve cable will have a RED band and "POS" printed on the cable. The -Ve cable will have a BLUE band and "NEG" printed on the cable. High voltage outputs are floating.

#### Star Ground Network:

+24Vdc Return is central; case, analog input ground and digital ground are returned through a  $100\Omega$  resistor in parallel with a  $0.001\mu\text{F}$  capacitor to the +24Vdc Return.

#### Dimensions:

4.53"L x 3.74"W x 1.54"D (115mm X 95mm X 39.2mm)

#### Weight:

0.66lbs. (0.3kg)

#### Regulatory Approvals:

The unit is CE marked. The unit has been designed to meet the requirements of EN61010, UL1950 and CSA 22.2 No. 950.

#### EMC:

As the unit is a component it will not be tested as a stand alone unit to meet the EMC directive. The user will need to follow sensible EMC precautions in using the unit.

### INTERFACE CONNECTOR — 20 PIN IDC MALE CONNECTOR

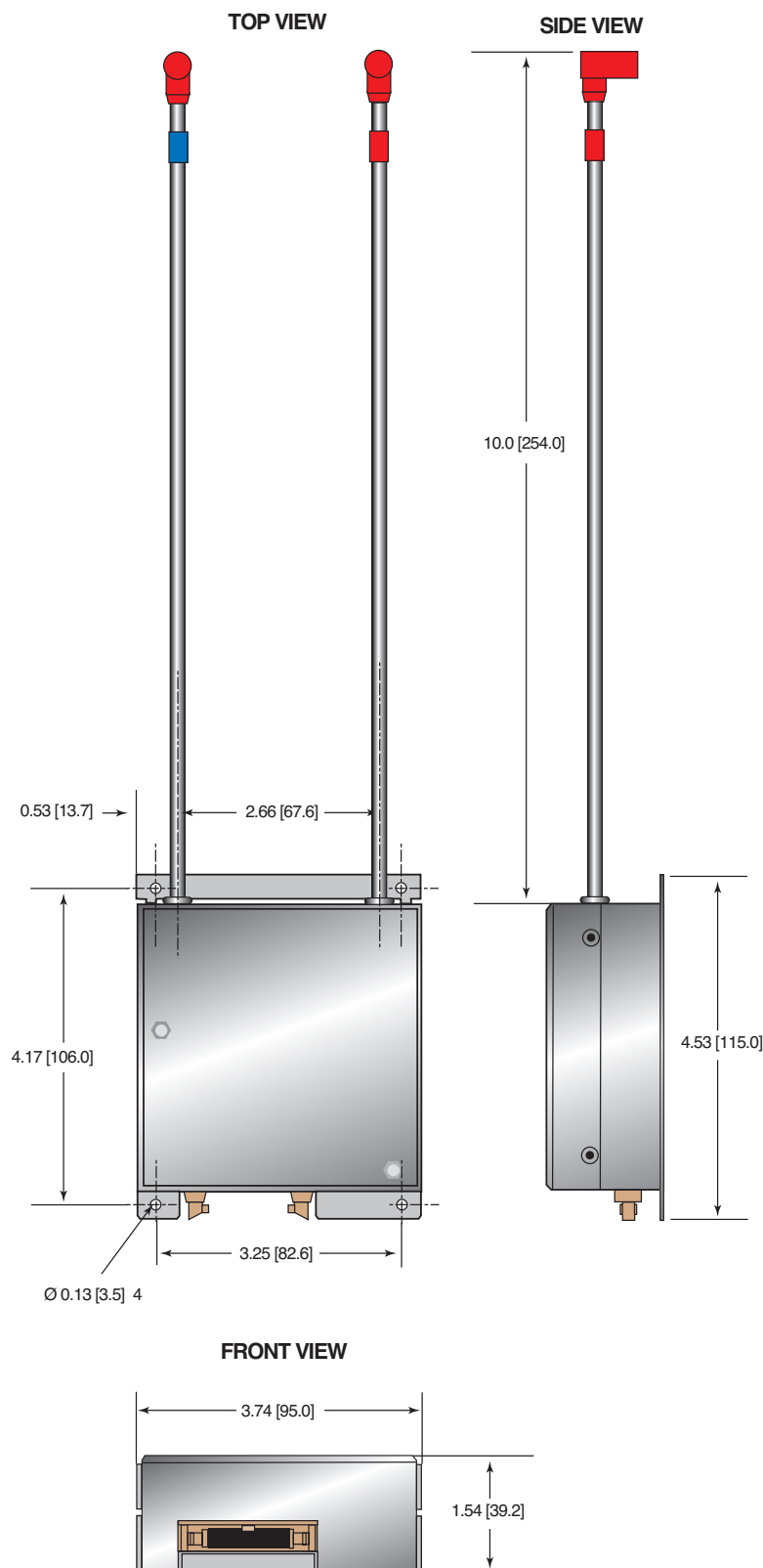
PIN	SIGNAL	SIGNAL PARAMETERS
1	Voltage Control Return	Analog Ground
2	Voltage Control*	0Vdc to +10Vdc = 0 to 1.5kV (differential Input) Zin = 100kΩ. Protected against inputs of <11 volts and reverse voltages.
3	Voltage Control Return	Analog Ground
4	N/C	No Connection
5	Voltage Control Return	Analog Ground
6	N/C	No Connection
7	Voltage Control Return	Analog Ground
8	N/C	No Connection
9	Voltage Control Return	Analog Ground
10	Voltage Monitor	+2Vdc to +10Vdc = 300 volts to 1.5kV, ±1%, Zout = 1kΩ
11	N/C	No Connection
12	Enable	TTL: Low = HV ON. Referenced to +24Vdc Return.
13	N/C	No Connection
14	N/C	No Connection
15	N/C	No Connection
16	N/C	No Connection
17	+24Vdc Return	Power Return (Power Ground)
18	+24Vdc Power	+24Vdc @ 725mA
19	+24Vdc Return	Power Return (Power Ground)
20	+24Vdc Power	+24Vdc @ 725mA

\*At voltage programming voltages less than 2 volts, parameters in this specification may not be met.

#### How to Order:

Standard: PART NO.: Mi1.5PN24

DIMENSIONS: in.[mm]





- **High Voltage Lens Power Supply**
- **Dual Positive and Negative Outputs**
- **Low Cost, Air Insulated Design**
- **SMT Design—Small Size and Low Weight**
- **UL Approved to UL61010-1**
- **Arc and Short Circuit Protected**
- **Remote Enable Control Provided**

Spellman's ML430 power supply module has been designed specifically to drive high voltage amplifiers. This compact, low cost, SMT based high performance module is printed circuit board mountable. Its dual output is ideal for amplifier driver requirements together with electrostatic lenses, deflectors and biasing supplies.

This voltage regulated, current limited, fixed, dual output unit provides up to 25mA of load current. The ML430 is fully protected against arc and short circuit conditions. The grounded metal case provides both shielding and heat sinking functions. An Enable feature is provided, allowing simple remote operation of the supply.

### TYPICAL APPLICATIONS

High Voltage Amplifiers  
Electrostatic Lenses

### SPECIFICATIONS

#### Input Voltage:

+24 Vdc,  $\pm 1.2$ Vdc

#### Input Current:

$\leq 1.2$  amp

#### Output Voltage:

Output 1-Positive:  
+430 volts fixed. Accuracy  $\pm 7\%$

Output 2-Negative:  
-430 volts fixed. Accuracy  $\pm 7\%$

Accuracy specified over full temperature, input voltage and load ranges

#### Output Current:

12mA maximum – Output 1-Positive  
25mA maximum – Output 2-Negative

#### Line Regulation: (typical)

$\pm 0.1\%$  – Positive output  
 $\pm 1.0\%$  – Negative output

#### Load/Cross Regulation: (typical)

$\pm 0.1\%$  – Positive output  
 $\pm 3.5\%$  – Negative output

#### Output Current Limit:

An auto-recovering short circuit fold back limit is employed.  
Fully arc protected, capable of 10 arcs in 5 seconds.

#### Ripple:

$\leq 0.5\%$  p-p of full rated output voltage

#### Stability:

$\leq 0.25\%$  per hour, constant operating conditions after  
1 hour warm up

#### Temperature Coefficient:

$\leq 200$ ppm per degree C

#### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$   
Storage:  $-35^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

Humidity:  
10% to 90% RH, non-condensing

#### Cooling:

Unit must be mounted in free air, in any position with the exception of inverted (pins up). Forced air cooling is recommended

#### Dimensions:

0.984" H X 2.362" W X 2.362" D (25mm x 60mm x 60mm)

#### Weight:

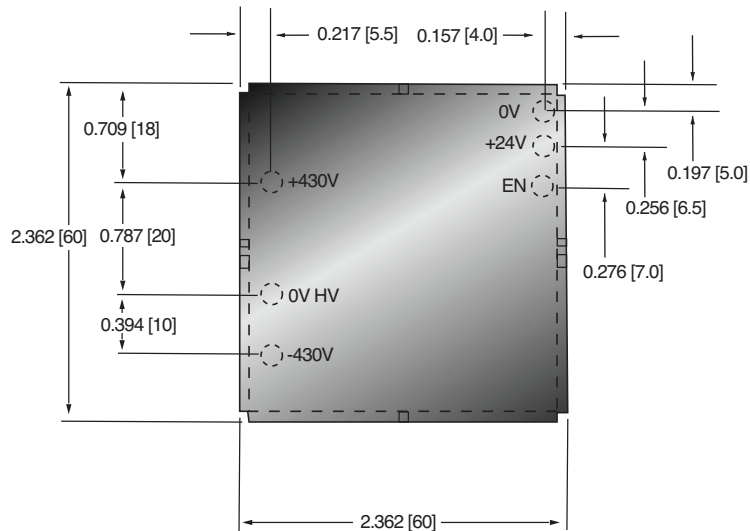
3.31 oz. (94g)

#### Regulatory Approvals:

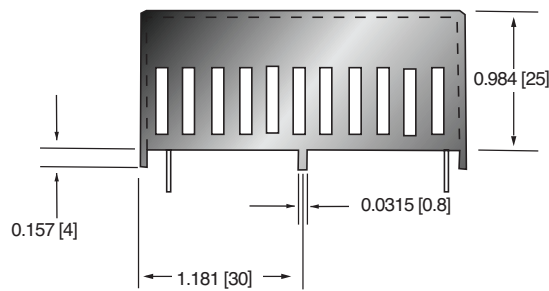
Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E227588 & E354595. RoHS compliant.

DIMENSIONS: in.[mm]

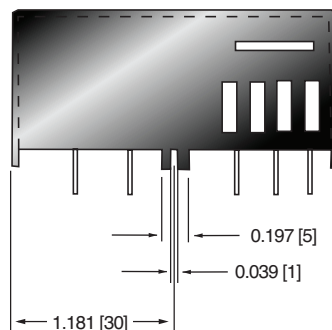
## TOP VIEW



## FRONT VIEW



## SIDE VIEW



### How to Order:

PART NO.: ML430P/N16/24





- **Quad Output High Voltage Power Supply**
- **Low Cost, Air Insulated Design**
- **SMT Design—Small Size and Low Weight**
- **Arc and Short Circuit Protected**
- **Remote Enable Control Provided**
- **UL Approved to UL61010-1**

Spellman's ML1350 power supply module has been designed specifically to drive quadrupoles used in mass spectrometry. This compact, low cost, SMT based high performance module is printed circuit board mountable. This quad output supply is ideal for quadrupole drivers and electrostatic lenses.

This voltage regulated, current limited, fixed quad output unit provides up to 15mA of load current from each output. The ML1350 is fully protected against arc and short circuit conditions. The grounded metal case provides both shielding and heat sinking functions. An Enable feature is provided, allowing simple remote operation of the supply.

## TYPICAL APPLICATIONS

Quadrupole HVPS  
Electrostatic Lenses

## SPECIFICATIONS

### Input Voltage:

+24 Vdc,  $\pm 1.2$ Vdc

### Input Current:

$\leq 3.0$  amps

### Output Voltage:

Output 1-Positive:

+245 volts, fixed, accuracy  $< \pm 10\%$

Output 2-Negative:

-245 volts, fixed, accuracy  $< \pm 10\%$

Output 3-Positive:

+1350 volts, fixed, accuracy  $< \pm 7\%$

Output 4-Negative:

-1350 volts, fixed, accuracy  $< \pm 7\%$

### Output Current:

15mA maximum for each output

### Line Regulation: (typical)

$\pm 1$  volt all outputs

### Load Regulation: (typical)

$\pm 3\%$  all outputs

### Output Current Limit:

An auto-recovering short circuit fold back limit is employed. Fully arc protected, capable of 10 arcs in 5 seconds.

### Ripple:

$\leq 0.1\%$  p-p of full rated output voltage

### Stability:

$\leq 0.25\%$  per hour, constant operating conditions after 1 hour warm up.

### Under Voltage Shutdown:

The power supply will shut down when an input under voltage condition is detected. When the input voltage is restored above 11.8 volts, operating the enable pin will reset this fault.

### Temperature Coefficient:

$\leq 200$ ppm per degree C

### Environmental:

Temperature Range:

Operating:  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$

Storage:  $-35^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

Humidity:

10% to 90% RH, non-condensing

### Cooling:

Unit must be mounted in free air, in any position with the exception of inverted (pins up). Forced air cooling is recommended.

### Dimensions:

0.984" H X 4.331" W X 3.150" D (25mm x 110mm x 80mm)

Width does not include mounting tab

### Weight:

7.27 oz. (206g)

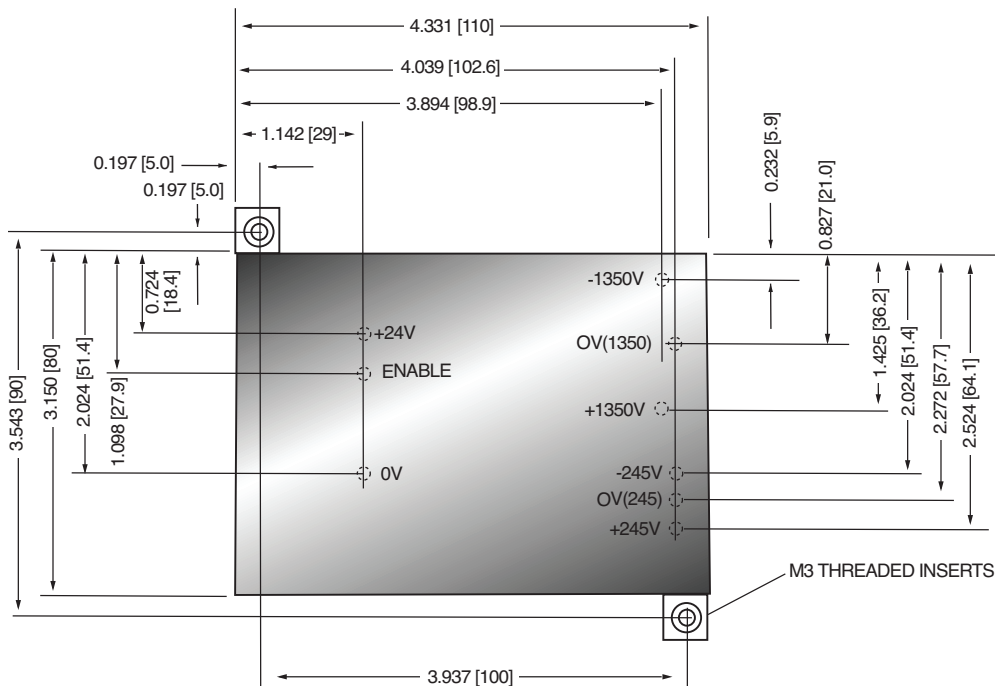
### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC

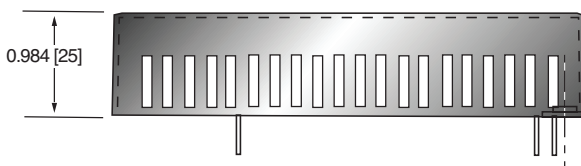
Low Voltage Directive. UL/CUL recognized file E227588 & E354595. RoHS compliant.

DIMENSIONS: in.[mm]

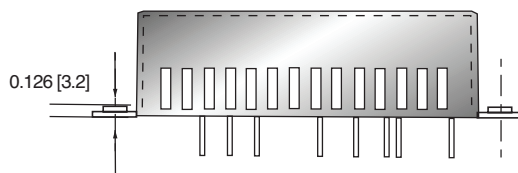
## TOP VIEW



## FRONT VIEW



## SIDE VIEW



### How to Order:

PART NO.: ML1350P/N50/24





- **Hot Switchable Polarity Reversible Via a Logic Signal**
- **Well Regulated, Low Ripple**
- **Polarity Reversal Within 300mS**
- **Voltage and Current Monitor Outputs**
- **Remote HV Inhibit**
- **Small PCB Mount Module**
- **Arc and Short Circuit Protected**

Spellman's MX2.5 is a well-regulated high performance DC-DC converter featuring a "hot switchable" polarity reversal capability. The MX's low ripple specification makes it ideal for Mass Spectrometry applications; especially security detection systems, Dynodes, sample ionization as well as capillary electrophoresis and electrostatic printing applications.

The MX2.5 is rated at 2.5kV @ 60uA and is packaged in a shielded metal enclosure. This unit features a logic signal input to control output polarity reversal. A HV inhibit feature, along with voltage and current monitors are provided. Easily customized to meet OEM requirements, the MX2.5 can be provided with improved ripple performance and higher voltage and current capabilities.

### TYPICAL APPLICATIONS

Mass Spectrometry  
Capillary Electrophoresis  
Electrostatic Printing

### SPECIFICATIONS

#### Input Voltage:

+24Vdc,  $\pm 0.5$  volt

#### Input Current:

<200mA continuous

#### Output Voltage:

$\pm 100$ Vdc to  $\pm 2.5$ kV

#### Output Current:

0 to 60uA max.

#### Polarity:

Remotely reversible via logic signal, 300mS to settle to  $\pm 1\%$ , 1 Hz maximum switch rate

#### Voltage Regulation:

Load: 0.05% of maximum output voltage for a no load to full load change

Line: 0.05% of maximum output voltage for a 1 volt input line change

#### Voltage Programming:

0 to 10 volt corresponds to 0 to 100% of rated output voltage

#### Voltage/Current Monitor:

0 to 10 volt corresponds to 0 to 100% of rated output voltage/current

#### Programming and Monitor Accuracy:

$\pm 1\%$  Voltage Programming/Monitor  
 $\pm 2\%$  Current Monitor

#### Ripple:

$\leq 0.02\%$  Volts p-p

#### Stability:

0.02% per hour after 1 hour warmup

#### Temperature Coefficient:

$\leq 50$ ppm per degree C

#### Environmental:

Temperature Range:

Operating: 0°C to 40°C

Storage: -40°C to 85°C

Humidity:

10% to 90%, non-condensing

#### Cooling:

Convection cooled

#### Dimensions:

1.18" H X 2.36" W X 4.72" D (30mm X 60mm X 120mm)

#### Weight:

Approximately 8.82 oz. (250g)

#### Interface/Power Connector:

PCB mount pins

#### HV Output Connector:

PCB mount pins

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

## MX2.5 INPUT/OUTPUT CONNECTIONS

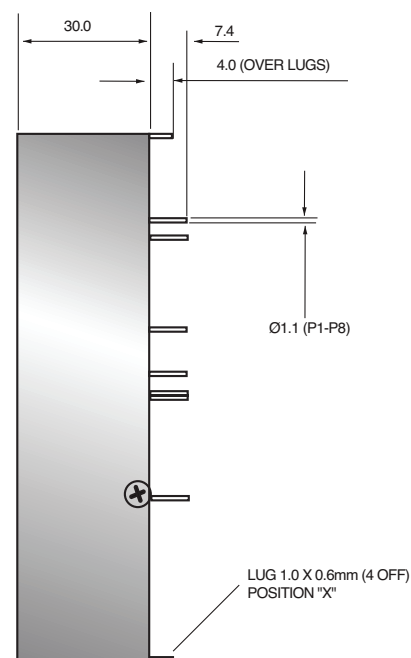
PIN	SIGNAL	SIGNAL PARAMETERS
1	+24V	Power Input
2	0v	Signal and Power Ground
3	V <sub>prog</sub>	0-10V Programming Voltage
4	Polarity Change	Polarity Change Input
5	Shutdown	Output Inhibit, Disables HV Output Down to <60V Within 300ms
6	V <sub>mon</sub>	0-10V Output Voltage Monitor
7	Output	HT Output
8	I <sub>mon</sub>	0-10V Output Current Monitor

### How to Order:

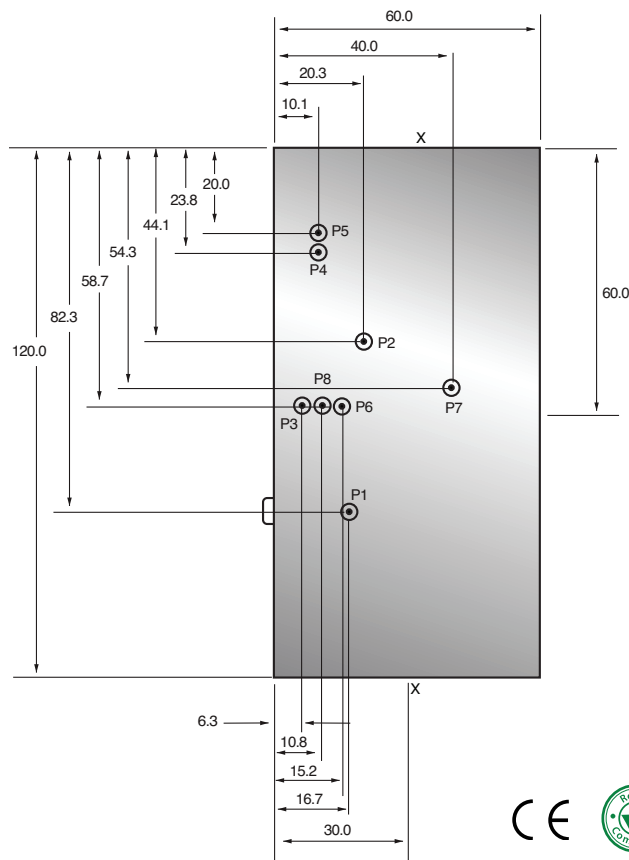
Standard: PART NO.:MX2.5PN24

DIMENSIONS: mm

### SIDE VIEW



### BOTTOM VIEW ON PINS





- ***±8kV 25mS Polarity Reversing Speed***
- ***Optimized for EI and APCI Applications***
- ***Precision Analog Voltage and Current Controls and Monitors***
- ***High Stability***
- ***Low Ripple and Noise***
- ***High Voltage Inhibit Control***
- ***UL Recognized, CE Marked and RoHS Compliant***

Spellman's MX8 *Plus* is a well-regulated high performance fast reversible supply featuring a 25ms "hot switchable" polarity reversing capability.

The MX8 *Plus*'s low ripple specification is typical of the topologies that make Spellman High Voltage your ideal choice for mass spectrometry applications; especially security detection systems, dynodes, sample ionisation as well as capillary electrophoresis and electrostatic printing applications. The MX8 has been designed especially for EI and APCI applications.

The MX8 *Plus* can be easily tailored to an OEM's requirement, such as improved ripple performance, or different voltage and/or current capabilities.

### TYPICAL APPLICATIONS

Mass Spectrometry  
Capillary Electrophoresis  
Electrostatic Printing

### SPECIFICATIONS

#### Input Voltage:

+24Vdc, ±10%

#### Input Current:

<0.5A nominal continuous  
<1.2A peak during reversing

#### Output Voltage:

0V to ±8kV

(Linearity not guaranteed below 200V. Maximum offset ±20V when programmed to zero or disabled using remote enable.)

#### Output Current:

0 to 100µA max

#### Output Polarity:

Remotely reversible via TTL logic signal

#### Polarity Reversal Time:

<25ms from change of polarity command to 90% of output into 100pF load capacitance.

(Unit incorporates circuitry to minimize the effects of low programmed current on reversing time. Polarity reversal time applies when current is programmed to 3µA or above.)

#### Voltage and Current Regulation:

Line: <0.1% for ±10% input voltage change  
Load: <0.1% for 0 to full load

#### Ripple:

<0.1% p-p @ 100µA

#### Temperature Coefficient:

<100ppm per degree C

#### Environmental:

Temperature Range:  
Operating: 5°C to 45°C  
Storage: -35°C to 85°C

Humidity:

10% to 85%, non-condensing

#### Stability:

<0.05% per hour after 1 hour warm up

#### Protection:

Arc and short circuit protected

#### Output Voltage Limit:

Output voltage does not exceed ±8kV ±250V under any input or output conditions

#### Dimensions:

1.48" H X 3.23" W X 9.45" D (37.6mm X 82mm X 240mm)

#### Weight:

2.4 pounds (1.1kg)

#### Input Connector:

14 way Molex receptacle p/n 39-01-2140. Cable length 508mm, mating connector not provided

#### Output Connector:

Alden F303RX, mating connector not provided

#### Regulatory Approvals:

UL/CUL recognized, File E354595. Compliant to EEC Low Voltage Directive. UK Conformity Assessed. RoHS Compliant.

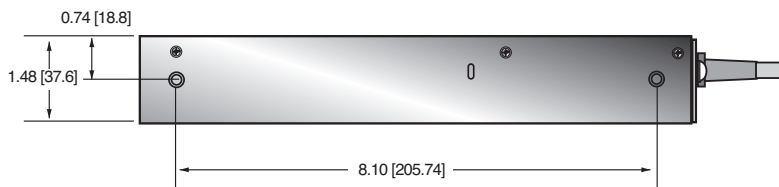
## MX8 PLUS - POWER AND CONTROL 14 PIN MOLEX MINI-FIT JR RECEPTACLE

PIN	SIGNAL
1	+24Vdc Input
2	Ground return for +24Vdc Input
3	Enable/Inhibit input. TTL high is enabled, TTL low is disabled (see Note 1)
4	Output voltage monitor. 0 to +8V for 0V to ±8kV output. Accuracy ±1%
5	Voltage control input. 0 to +8V for 0V to ±8kV output. Accuracy ±1%
6	Current monitor output. 0 - 10V for 0A to 100μA. Accuracy ±2%
7	Current control input. 0 to +10V for 0A to 100μA. Accuracy ±1%
8	Polarity control input. TTL high is positive, TTL low is negative (see Note 1)
9	Analog ground
10	Current/Voltage control indicator. TTL compatible output (3.3V max). TTL high when in current mode. TTL low when in voltage mode.
11	N/C
12	N/C
13	N/C
14	N/C

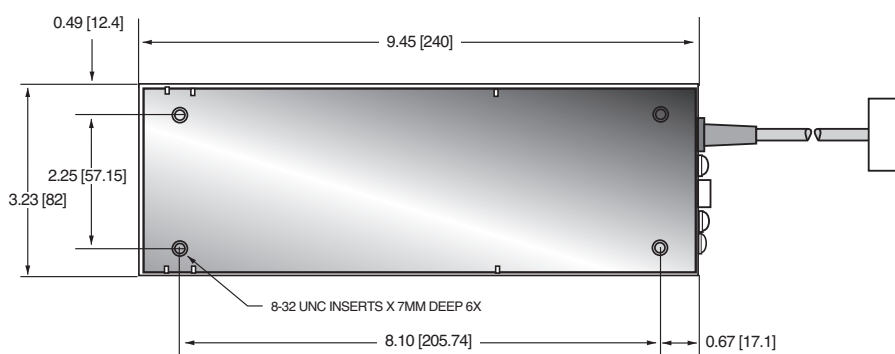
Note 1: TTL input. The threshold is set to 1.65V for use with 3.3V or 5V input levels although the input will tolerate up to 15V being applied.

DIMENSIONS: in.[mm]

### SIDE VIEW



### TOP VIEW



### FRONT VIEW



### How to Order:

Standard: PART NO.: MXP8PN24





- **Hot Switchable Polarity Reversible Via a Logic Signal**
- **Well Regulated, Low Ripple**
- **Polarity Reversal Within 250mS (Option to Improve to 100mS)**
- **Voltage and Current Monitor Outputs**
- **Remote HV Inhibit**
- **Flying High Voltage Output Cable**
- **Voltage or Current Control Options**

Spellman's MX10 is a well-regulated high performance DC-DC converter featuring a "hot switchable" polarity reversal capability. The MX10's low ripple specification makes it ideal for Mass Spectrometry applications; especially security detection systems, Dynodes, sample ionization as well as capillary electrophoresis and electrostatic printing applications.

The MX10 is rated at 10kV @ 100uA and is packaged in a shielded metal enclosure. This unit features a logic signal input to control output polarity reversal. A HV inhibit feature, along with voltage and current monitors are provided. Easily customized to meet OEM requirements, the MX10 can be provided with current control, improved ripple performance and higher voltage and current capabilities.

## TYPICAL APPLICATIONS

Mass Spectrometry  
Capillary Electrophoresis  
Electrostatic Printing

## OPTIONS

**VCC:** Voltage and Current Control

## SPECIFICATIONS

### Input Voltage:

+24Vdc,  $\pm 1$  volt

### Input Current:

<400mA continuous  
<1.2A during reversing

### Output Voltage:

$\pm 200$ Vdc to  $\pm 10$ kV

### Output Current:

0 to 100uA max.

### Polarity:

Remotely reversible via logic signal, 250mS to settle to  $\pm 2\%$ , 1 Hz maximum switch rate

### Voltage Regulation:

Load: 0.1% of maximum output voltage  
for a no load to full load change  
Line: 0.1% of maximum output voltage for a  
1 volt input line change

### Current Regulation: (VCC Option)

Load: 0.1% of maximum rated current for a  
0 to 100% voltage change  
Line: 0.1% of maximum rated current for a  
1 volt input line change

### Voltage/Current Programming:

0 to 10 volt corresponds to 0 to 100% of rated  
output voltage

### Voltage/Current Monitor:

0 to 10 volt corresponds to 0 to 100% of rated  
output voltage

### Programming and Monitor Accuracy:

$\pm 2\%$

### Ripple:

$\leq 0.005\%$  Volts p-p

### Stability:

0.1% per hour after 1 hour warmup

### Temperature Coefficient:

$\leq 100$ ppm per degree C

### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -40°C to 85°C  
Humidity:  
10% to 90%, non-condensing.

### Cooling:

Convection cooled

### Dimensions:

1.63" H X 6.61" W X 4.53" D (41.5mm X 168mm X 115mm)

### Weight:

Approximately 3 pounds (1.4kg)

### Interface/Power Connector:

9 pin male D connector

### HV Output Connector:

39.4" (1m) Flying Lead of URM76 LSF cable

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. UL/CUL recognized file E227588.  
RoHS Compliant.

## MX10 TERMINAL BLOCK 9 PIN

PIN	SIGNAL	SIGNAL PARAMETERS
1	Voltage Monitor	0-10V=0-100% of Rated Output
2	External Inhibit Input	Open or >10V = "OFF"; <4V = "ON"
3	Current Programming Input	0-10Vdc = 0-100% of Rated Output (on VCC option)
4	Signal Ground	Signal Ground
5	Current Monitor	0-10Vdc = 0-100% of Rated Output
6	Polarity Control Input	Open or >10V = "NEGATIVE"; <4V = "POSITIVE"
7	Voltage Programming Input	0-10Vdc = 0-100% of Rated Output
8	+24V Input	+24V Input
9	Power Ground	Power Ground

### How to Order:

Standard: PART NO.:MX10PN24

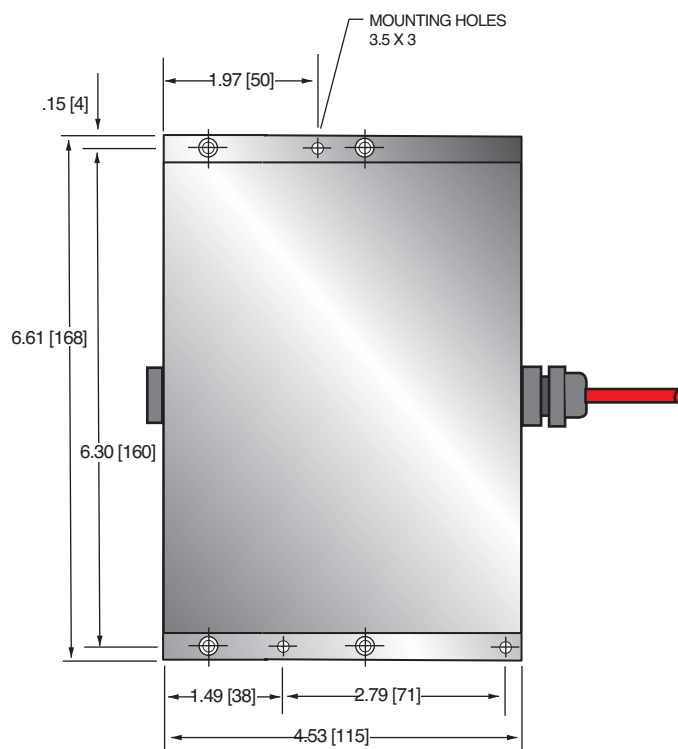
VCC Option: PART NO.:MX10PN24/VCC

DIMENSIONS: in.[mm]

### SIDE VIEW



### TOP VIEW





Spellman's MX20 is a well-regulated high performance DC-DC converter featuring a "hot switchable" polarity reversal capability. The MX20's low ripple specification makes it ideal for Mass Spectrometry applications; especially security detection systems, Dynodes, sample ionization as well as capillary electrophoresis and electrostatic printing applications.

The MX20 is rated at 20kV @ 100uA and is packaged in a shielded metal enclosure. This unit features a logic signal input to control output polarity reversal. A HV inhibit feature, along with voltage and current monitors are provided. Easily customized to meet OEM requirements, the MX20 can be provided with current control, improved ripple performance and higher voltage and current capabilities.

## TYPICAL APPLICATIONS

Mass Spectrometry  
Capillary Electrophoresis  
Electrostatic Printing

## OPTIONS

**VCC:** Variable Current Control

## SPECIFICATIONS

### Input Voltage:

+24Vdc,  $\pm 1.2$  volts

### Input Current:

<500mA continuous  
<1.2A during reversing

### Output Voltage:

$\pm 500$ Vdc to  $\pm 20$ kV

### Output Current:

0 to 100uA max.

### Polarity:

Remotely reversible via logic signal, 500mS to settle to  $\pm 2\%$ , 1 Hz maximum switch rate

### Voltage Regulation:

Load: 0.02% of maximum output voltage  
for a no load to full load change  
Line: 0.01% of maximum output voltage for a  
1 volt input line change

- **Hot Switchable Polarity Reversible Via a Logic Signal**
- **Well Regulated, Low Ripple**
- **Polarity Reversal Within 500mS**
- **Voltage and Current Monitor Outputs**
- **Remote HV Inhibit**
- **Flying High Voltage Output Cable**
- **Current Control Option**

### Current Regulation: (VCC Option)

Load: 0.1% of maximum rated current for a  
0 to 100% voltage change  
Line: 0.01% of maximum rated current for a  
1 volt input line change

### Voltage/Current Programming:

0 to 10 volts corresponds to 0 to 100% of rated  
output voltage/current

### Voltage/Current Monitor:

0 to 10 volts corresponds to 0 to 100% of rated  
output voltage/current

### Programming and Monitor Accuracy:

$\pm 2\%$  Voltage Programming/Monitor  
 $\pm 5\%$  Current Programming/Monitor

### Ripple:

$\leq 0.0025\%$  Volts p-p

### Stability:

0.1% per hour after 1 hour warmup

### Temperature Coefficient:

$\leq 100$ ppm per degree C

### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -40°C to 85°C  
Humidity:  
10% to 90%, non-condensing

### Cooling:

Convection cooled

### Dimensions:

2.05" H X 6.61" W X 6.50" D (52mm X 168mm X 165mm)

### Weight:

Approximately 5.51 pounds (2.5kg)

### Interface/Power Connector:

9 pin male D connector

### HV Output Connector:

39.4" (1m) Flying Lead of URM76 LSF cable

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. RoHS Compliant.

### MX20 TERMINAL BLOCK 9 PIN

PIN	SIGNAL	SIGNAL PARAMETERS
1	Voltage Monitor	0-10V=0-100% of Rated Output
2	External Inhibit Input	Open or >10V = "OFF"; <4V = "ON"
3	Current Programming Input	0-10Vdc = 0-100% of Rated Output (on VCC option)
4	Signal Ground	Signal Ground
5	Current Monitor	0-10Vdc = 0-100% of Rated Output
6	Polarity Control Input	Open or >10V = "NEGATIVE"; <4V = "POSITIVE"
7	Voltage Programming Input	0-10Vdc = 0-100% of Rated Output
8	+24V Input	+24V Input
9	Power Ground	Power Ground

#### How to Order:

Standard: PART NO.:MX20PN24

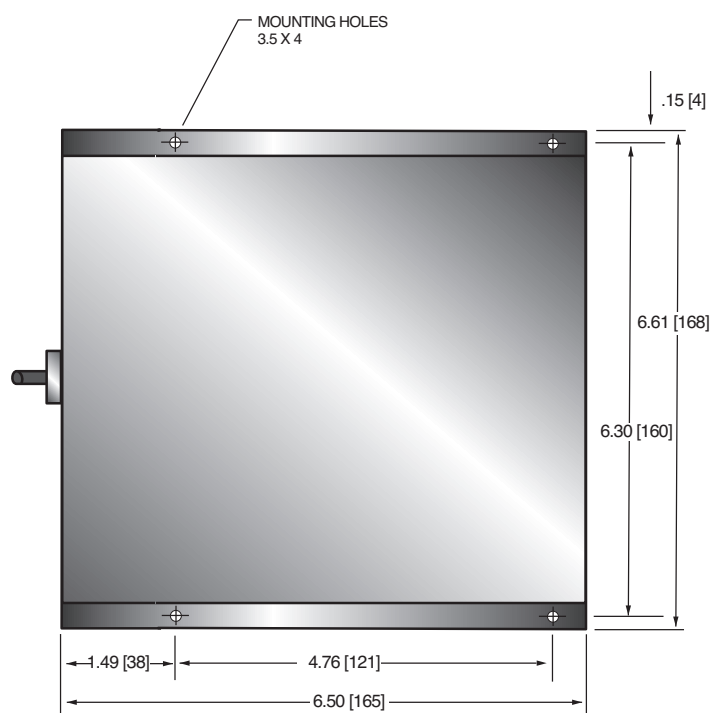
VCC Option: PART NO.:MX20PN24/VCC

DIMENSIONS: in.[mm]

SIDE VIEW



TOP VIEW





- **Hot-switchable polarity reversing modules from 2.5kV to 10kV, at 200 $\mu$ A**
- **Differential Analog Voltage Control**
- **Voltage and Current Monitors**
- **High Stability, Low Temperature Coefficient**
- **Ultra Low Ripple and Noise, Specified Down to 1/f Band**

Spellman's MXE series is a family of high voltage, high performance, ultra-compact, hot-switchable polarity reversing modules with output voltages ranging from 2.5kV to 10kV.

The MXE series is controlled via analog interface, provided via a standard 15-pin D-type connector. The units feature a differential voltage program input for low noise control and TTL compatible Enable and Polarity control signal inputs.

Spellman's advanced low noise, high stability technology provides the high quality and performance needed for precision applications.

#### TYPICAL APPLICATIONS

Mass Spectrometry	Electrostatic Printing
Automatic Test Equipment	Electrostatic Lenses
Capillary Electrophoresis	Electrospinning
Dual Ion Surface Analysis	Precision Laboratory

#### SPECIFICATIONS

##### Input Voltage:

+24Vdc,  $\pm 1.2$ Vdc

##### Input Current:

0.5A maximum

##### Output Voltage:

3 models available:  $\pm 2.5$ kV,  $\pm 5$ kV and  $\pm 10$ kV  
The minimum programmable voltage is  $\pm 20$ V  
The output is not designed to sink current

##### Output Polarity:

Hot-switchable polarity reversing

##### Output Current:

200 $\mu$ A maximum

##### Voltage Regulation:

Line: For a 5% line change 20ppm  
Load: 0-100% load 20ppm

##### Accuracies:

Voltage Programming:  $\pm 1\%$  or  $\pm 10$ V\*

Voltage Monitor:  $\pm 2\%$  or  $\pm 20$ mV\*

Current Monitor:  $\pm 5\%$  or  $\pm 50$ mV\*

\*whichever is greater

##### Current Limit:

110% of rated output current.

##### Polarity Reversal Time:

10s to within 2ppm at max output voltage amplitude and 100pF load

##### Output Decay Time:

5s to <50V at no-load condition

##### Ripple:

30mV between 0.01Hz and 20MHz

##### Stability:

15ppm/8h after one hour warm up period

##### Temperature Coefficient:

15ppm per degree C

##### Protection:

Arc and short circuit protected.

The power supply will fully recover once the short is removed with no subsequent damage to load, supply, input control, or input supply

##### Environmental:

Temperature Range:

Operating: 10°C to 45°C

Storage: -20°C to 85°C

Humidity:

5% to 90% RH, non-condensing

##### Cooling:

Convection cooled

##### Dimensions:

1.9" H X 5.7" W X 6.8" D (48mm x 144mm x 172mm)

##### Weight:

3.74 lbs (1.7kg)

##### Interface Connector:

15 pin male D connector

##### Output Connector:

Captive 39.4" (1 meter) long un-terminated shielded HRG58 HV cable (URM76 compatible)

##### Regulatory Approvals:

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

### MXE SELECTION TABLE

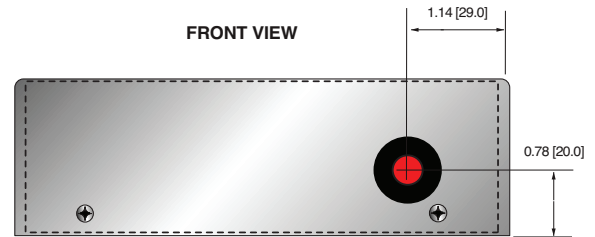
Model	Output Voltage	Output Current
MXE2.5PN24	±2.5kV	200μA
MXE5PN24	±5kV	200μA
MXE10PN24	±10kV	200μA

### MXE EXTERNAL INTERFACE— 15 PIN MALE D CONNECTOR

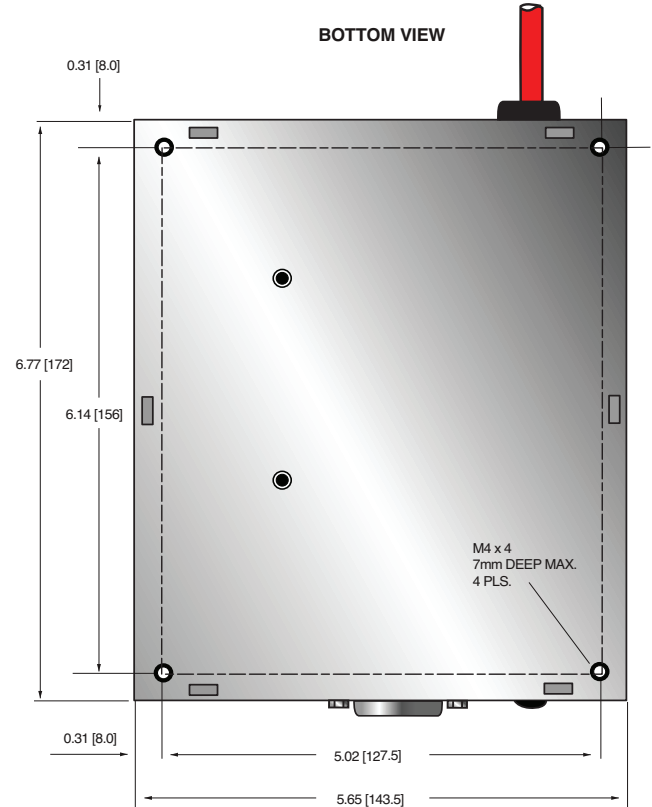
PIN	SIGNAL	SIGNAL PARAMETERS
1	24Vdc Return	Input voltage return
2	+24Vdc Input	Input voltage +24dc @ 0.5A max
3	Voltage Monitor Output	0 to 10Vdc = 0 to 100% rated output, Zout=330Ω
4	Polarity Set Input	TTL level or open/short contact signal. Low or short = Positive, high or open = Negative
5	N/C	Pin used internally - do not connect
6	Voltage Program Return	0 to 10Vdc differential between pin 7 and pin 6 =
7	Voltage Program Input	0 to 100% of rated output, Zin=100kΩ
8	Current Monitor Output	0 to 10Vdc = 0 to 200μA, Zout=330Ω
9	N/C	Pin used internally - do not connect
10	N/C	Pin used internally - do not connect
11	Signal Ground	Signal ground for control and monitoring
12	Enable Input	TTL level or open/short contact signal. Low or short = enabled, high or open = disabled
13	Control Pin	Connect to pin 14
14	Control Pin	Connect to pin 13
15	N/C	Pin used internally - do not connect

DIMENSIONS: in.[mm]

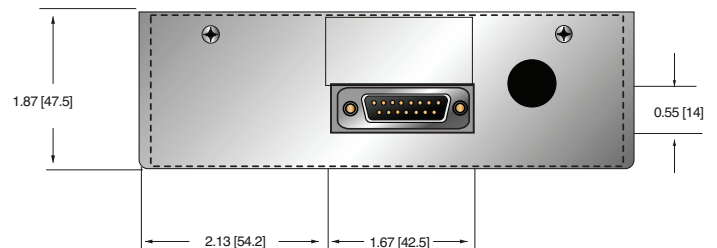
FRONT VIEW



BOTTOM VIEW



REAR VIEW



SIDE VIEW





- ***±10kV 25ms Polarity Reversing Speed***
- ***Integrated Electron Multiplier Supply***
- ***Precision Analog Voltage Control***
- ***High Stability***
- ***Low Ripple and Noise***
- ***High Voltage Inhibit Control***
- ***RoHS Compliant***

Spellman's RoHS compliant MX10 *Plus* is a well-regulated high performance fast reversible dynode supply featuring a 25ms "hot switchable" polarity reversing capability with an integrated -2.3kV electron multiplier supply.

The MX10 *Plus*'s low ripple specification is typical of the topologies that make Spellman High Voltage your ideal choice for mass spectrometry applications; especially security detection systems, dynodes, sample ionisation as well as capillary electrophoresis and electrostatic printing applications. The MX10 *Plus* has been designed especially for dynode detector applications.

The MX10 *Plus* can be easily tailored to an OEM's requirement, such as improved ripple performance, or different voltage and/or current capabilities.

## TYPICAL APPLICATIONS

Dynode Supply  
Electron Multiplier Supply

## SPECIFICATIONS

### Input Voltage:

+15Vdc, ±.75Vdc

### Input Current:

≤500mA nominal continuous  
<2A during reversing

### Temperature Coefficient:

≤100ppm per degree C

### Environmental:

Temperature Range:  
Operating: 5°C to 45°C  
Storage: -35°C to 85°C

Humidity:  
10% to 85%, non-condensing

### Stability:

(constant operating conditions)  
≤300ppm per hour after 1 hour warm up

### Protection:

Arc and Short circuit protected

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant.

## DYNODE SPECIFICATIONS

### Output Voltage:

±10kV

### Output Current:

10μA

### Output Polarity:

Remotely reversible via TTL logic signal

### Switching Speed:

25ms to settle 90% into 50pF load

### Voltage Regulation:

Line: ≤0.02% for a 1.5V input voltage change

### Ripple:

≤10 Volts p-p

## ELECTRON MULTIPLIER SPECIFICATIONS

### Output Voltage:

Fixed: -2.3kV

### Output Polarity:

Negative

### Output Current:

≤230μA

### Voltage Regulation:

Line: ≤0.02% for a 1.5V input voltage change

Load: <5V for no load to 22M Ohms load change

### Ripple:

≤200mV p-p @ 2.3kV into 22M Ohm load

### Output Rise Time:

10ms

### Output Fall Time:

10ms

### Dimensions:

2.00" H X 5.30" W X 8.00" D (50.8mm X 134.6mm X 203mm)

### Weight:

Approximately 3.3 pounds (1.5kg)

### Interface/Power Connector:

20 pin flat ribbon connector

### Output Connector:

±10kV: modified Alden #A200 connector

-2.3kV: MHV Kings bulkhead KV-79-15 or similar

## MX10 PLUS TERMINAL BLOCK 20 PIN

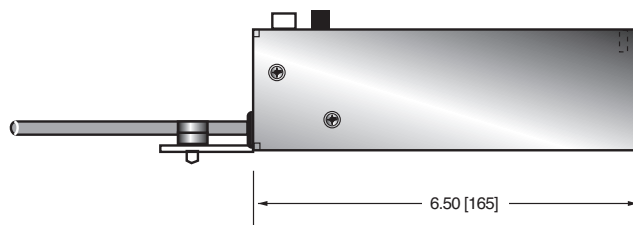
PIN	SIGNAL
1	+15Vdc Input
2	+15Vdc Input
3	N/C
4	N/C
5	Ground
6	Ground
7	Output Voltage Control
8	Signal Reference Ground
9	10kV On
10	10kV On
11	Output Polarity Control
12	EM Protect
13	-2.3kV Output Monitor
14	EM On
15	Ground
16	Ground
17	±10kV Output Monitor
18	N/C
19	+15Vdc Input
20	+15Vdc Input

### How to Order:

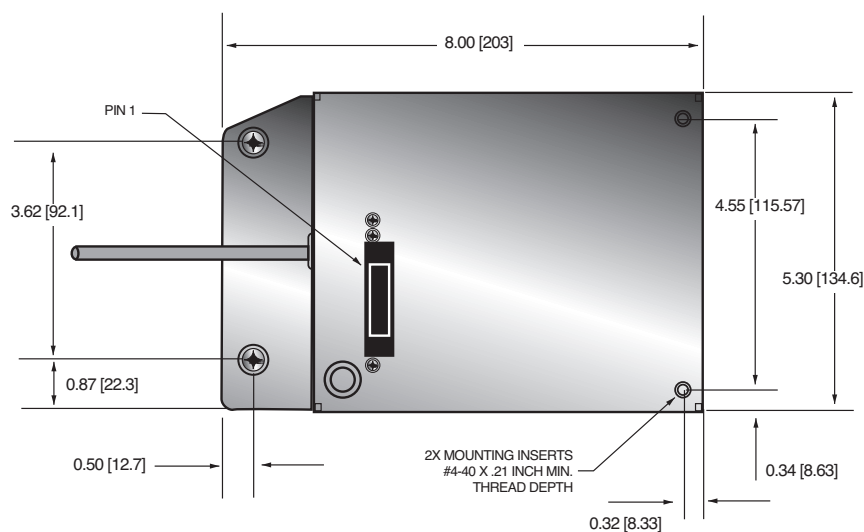
Standard: PART NO.:MXP10PN15

DIMENSIONS: in.[mm]

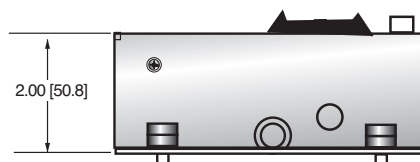
SIDE VIEW



TOP VIEW



FRONT VIEW





- **Hot Switchable Reversible Polarity, Settles to <3ppm Within 2s**
- **Voltage and Current Monitor Outputs**
- **Arc and Short Circuit Protected**
- **Well Regulated, Low Ripple, High Stability**
- **UL Recognized, CE Marked and RoHS Compliant**
- **OEM Customization Available**

Spellman's MXR Series are well-regulated high performance DC-DC converters. The MXR's low ripple specification makes it ideal for Mass Spectrometry and electron microscopes. The MXR20 is rated at 20kV @ 300uA and MXR30 is rated at 30kV @ 300uA. Both are packaged in a shielded metal enclosure and are available either in analog or RS-232 digital control options. These units feature a logic signal input to control output polarity reversal. Voltage, polarity and current monitors are provided. The digital version also features an opto isolated interlock input (HV Enable/Inhibit). Easily customized to meet OEM requirements, the MXR Series can be provided with current control, improved ripple performance and higher voltage and current capabilities.

## TYPICAL APPLICATIONS

Mass Spectrometry  
Electron Microscopes  
Capillary Electrophoresis  
Electrostatic Printing

## OPTIONS

MXR can be ordered as an analog or a digital controlled unit. See How To Order information below.  
Custom captive cable options available upon request.

## SPECIFICATIONS

### Input Voltage:

24Vdc ( $\pm 5\%$ )

### Input Current:

$\leq 1.25$  A nominal continuous  
 $\leq 4.5$  A peak during reversing

### Output Voltage:

0V to  $\pm 20$ kV (MXR20)  
0V to  $\pm 30$ kV (MXR30)

### Output Current:

$< 300\mu\text{A}$

### Voltage Regulation:

Load:  $< 50$ ppm of maximum output voltage for a no load to full load change  
Line:  $< 20$ ppm of maximum output voltage for a 5% input line change

### Programming and Monitor Accuracy:

$\pm 2\%$  Voltage Programming/Monitor

### Ripple:

20kV: 100mVp-p  
30kV: 150mVp-p

### Stability:

1hr = 10ppm max. after 1 hr warm-up  
8hrs = 20ppm max. after 1 hr warm-up

### Temperature Coefficient:

10ppm/ $^{\circ}\text{C}$

### Reversing Time:

2s for  $+20$ kV to  $-20$ kV or  $+30$ kV to  $-30$ kV settling to  $< 3$ ppm. Faster switching times available on request.

### Environmental:

Temperature Range:  
Operating:  $10^{\circ}\text{C}$  to  $50^{\circ}\text{C}$   
Storage:  $-35^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
Humidity:  
0% to 85%, non-condensing

### Cooling:

Convection cooled

### Dimensions:

2.05" H X 8.47" W X 9.45" D (52mm X 215mm X 240mm)

### Weight:

8.80 pounds (4.0kg)

### Input Connectors:

Analog units:  
Power and Control: 12 way Samtec FWS 12-04-T-S-RA  
Digital units:  
Power: 2 way Molex Mini-fit Jr 39-30-1022  
Control: 10 way 'IDC Ribbon cable' connector  
3M N3793-5302RB

### Output Connector:

Standard output is GES HB30 receptacle (GES p/n: 7331051). Mating plug is GES HS30 (p/n: 7331050, not included). Mating cable assembly can be ordered separately, see How To Order information below.

### Regulatory Approvals:

UL recognized component (RC). File number E354595. Compliant to IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1. UKCA marked to BS EN 61010-1. RoHS compliant. As the unit is designed for incorporation within the user's system it is not tested against any specific EMC standards. Compliance with any relevant EMC standards on a system level are the responsibility of the equipment designer.

#### ANALOG UNITS—POWER AND CONTROL 12 PIN SAMTEC FWS CONNECTOR

PIN	SIGNAL
1	Current monitor output 0-10V = 0V to 500μA Zout=10kΩ, Accuracy ±5%
2	+24Vdc Input
3	Voltage monitor output 0-10V = 0V to Max V Zout=10kΩ, Accuracy ±2%
4	N/C
5	N/C
6	N/C
7	Voltage program input 0-10V = 0V to Max V Zin>1MΩ, Accuracy ±2%
8	Polarity set input, TTL levels: LO = +VE, HI/Open = -VE
9	Signal ground
10	Ground return for +24Vdc
11	N/C
12	Polarity status output LO (<200mV, source 1.5kΩ) = +VE, HI (+24V, source 2.2kΩ) = -VE

#### DIGITAL UNITS—POWER 2 PIN MOLEX MINI-FIT JR

PIN	SIGNAL
1	+24Vdc Input
2	Ground return for +24Vdc

#### DIGITAL UNITS—CONTROL 10 PIN IDC RIBBON CONNECTOR

PIN	SIGNAL
1	Transmit data (output) with respect to pin 2
2	Serial signal ground return (if required)
3	Receive data (input) with respect to pin 2
4	N/C
5	N/C
6	N/C
7	Interlock opto-isolator input (0mA = Voltage Inhibit) see*
8	Interlock opto-isolator signal return
9	Polarity set opto-isolator input (0mA = -VE) see*
10	Polarity set signal opto-isolator signal return

\*Note: 3.3V@6mA or 5V@10mA

#### How to Order:

Analog (standard): PART NO.: MXR20PN24  
PART NO.: MXR30PN24

Digital (option): PART NO.: MXR20PN24/DCC2  
PART NO.: MXR30PN24/DCC2

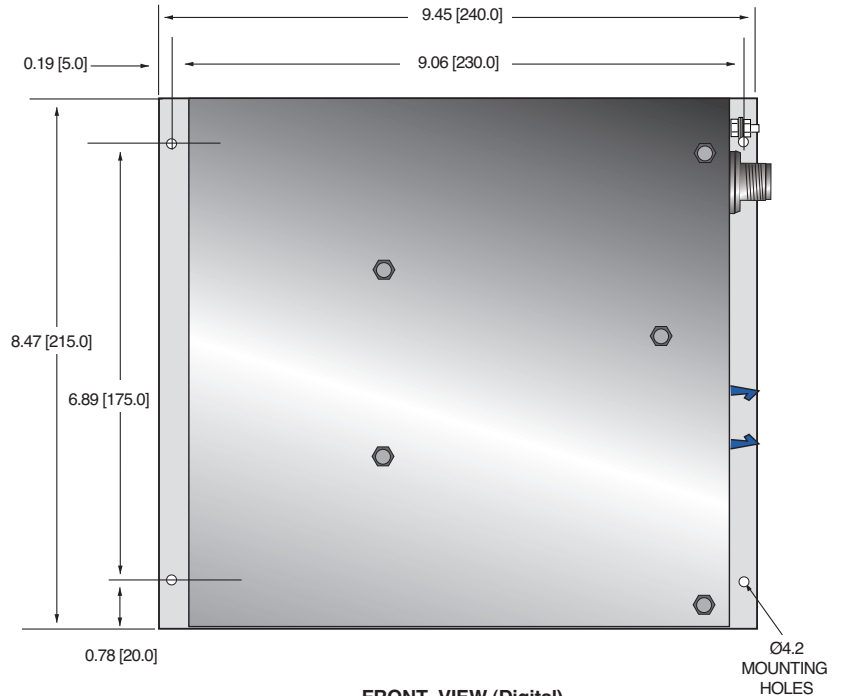
Mating cable,  
length 2m: PART NO.: HVC30/1S/1279

DIMENSIONS: in.[mm]

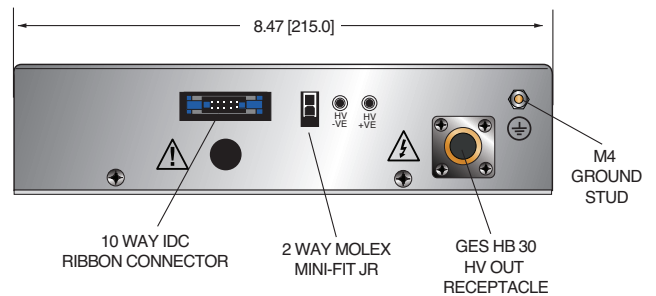
SIDE VIEW



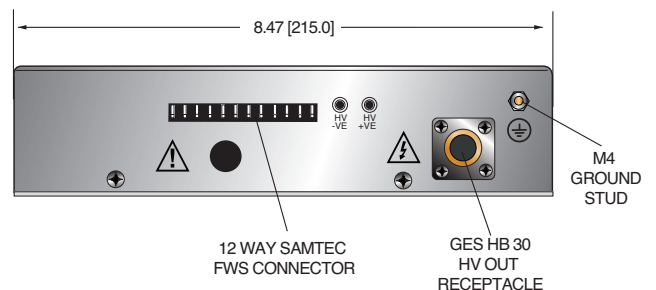
TOP VIEW



FRONT VIEW (Digital)



FRONT VIEW (Analog)





- **Floating, Programmable 3kV Output**
- **Output Isolated to 15kV**
- **Well Regulated, Low Ripple**
- **Output Voltage Monitor**
- **Compact Shielded Metal Enclosure**
- **Arc and Short Circuit Protected**

Spellman's MCP Module is a well-regulated, high performance DC-DC converter featuring a floating 3kV output, isolated to 15kV. The MCP low output ripple specification makes it ideal for use with detectors in Mass Spectrometry applications like: Electron Multipliers (EM's), Microchannel Plates Detectors (MCP's) and Channel Electron Multipliers.

This +3kV @ 330uA module is packaged in a shielded metal enclosure. The unit has remote voltage programming and a voltage monitor, and features low injected ripple when used with biasing supplies. The MCP module is easily customized to meet OEM requirements with improved ripple performance, improved stability and configurable output lead terminations as required.

## TYPICAL APPLICATIONS

Mass Spectrometry Detectors  
Microchannel Plates  
Electron Multipliers  
Channel Electron Multipliers

## SPECIFICATIONS

### Input Voltage:

+24Vdc,  $\pm 0.5$  volts

### Input Current:

600mA maximum

### Output Voltage:

+100V to +3kV, continuously variable over the entire output range

### Output Current:

330uA maximum

### Polarity:

Positive

### Isolation Voltage:

Up to 15kV total to ground  
(resistance to ground 600M on each output)

### Line Regulation:

$\leq 0.01\%$  for input voltage change of 1V

### Load Regulation:

$\leq 0.1\%$  for a no load to full load change

### Voltage Programming:

0 to 10 volt corresponds to 0 to 100% of rated output voltage

### Voltage Monitor:

0 to 5 volts corresponds to 0 to 100% of rated output voltage

### Accuracy:

$\pm 1\%$  from 10% to 100% of output.  
Below 10% accuracy spec is not guaranteed

### Ripple:

$\leq 0.1\%$  Volts p-p, 0.1Hz to 1MHz

### Stability:

$\leq 1000$  ppm/hour at constant operating conditions  
after a 1 hour warm up

### Temperature Coefficient:

$\leq 300$ ppm per degree C

### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$   
Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
Humidity:  
10% to 90%, non-condensing.

### Cooling:

Convection cooled

### Dimensions:

1.49" H X 4.09" W X 6.73" D (38mm X 104mm X 171mm)

### Weight:

2.2 pounds (1kg)

### Interface/Power Connector:

9 pin male D connector

### High Voltage Output Cable:

HV positive: 29.5" (750mm) fly wire, URM76 coaxial HV cable  
HV negative: 29.5" (750mm) fly wire, URM76 coaxial HV cable

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. RoHS compliant.

#### MCP INTERFACE/POWER CONNECTOR

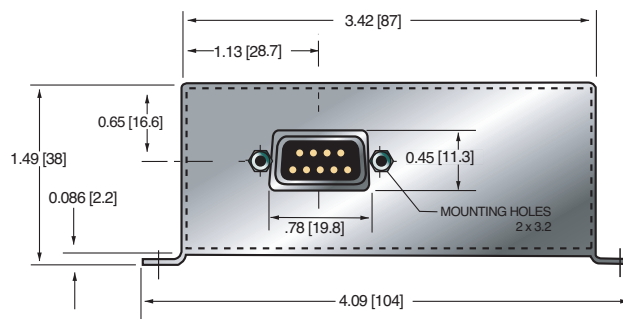
JB1	SIGNAL	SIGNAL PARAMETERS
1	Signal Ground	Signal Ground
2	Voltage Programming Input	0-10Vdc = 0-100% of Rated Output
3	+24V Input	+24V Input
4	+24V Input	+24V Input
5	Voltage Monitor	0-5Vdc=0-100% of Rated Output
6	Power Ground	Power Ground
7	Power Ground	Power Ground
8	Power Ground	Power Ground
9	Power Ground	Power Ground

DIMENSIONS: in.[mm]

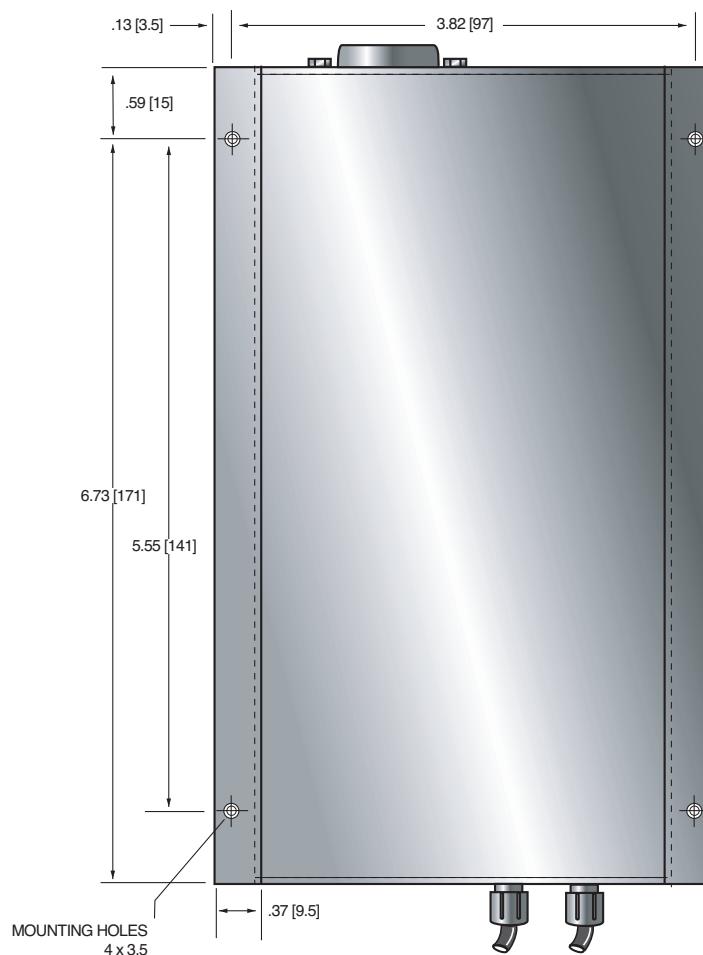
#### FRONT VIEW



#### BACK VIEW



#### TOP VIEW





- **Remote Output Polarity Reversibility Via TTL Signal Control**
- **Ultra Low Ripple and Noise**
- **Small Footprint OEM Modular Packaging**
- **Encapsulated for Reliable, Long Term Corona Free Operation**
- **CE and RoHS Compliant**

The TOF3000 offers critical specifications like ultra low ripple and noise, excellent temperature coefficient; a stable, repeatable and accurate output, along with remote output polarity reversing capability. These superior specifications result in improved mass spectrometer resolution. Unique high voltage packaging and surface mount fabrication techniques, coupled with Spellman's proprietary encapsulation technology provide this unit in an attractive sized OEM package.

Featuring a 0-30kV @ 400 $\mu$ A output with remote polarity reversing capability and dimensions of 3"H x 5"W x 12 5/8"L, the TOF3000 is a small, cost-effective high voltage power supply with technology that sets the standard for the future of Mass Spectrometry applications.

## TYPICAL APPLICATIONS

Mass Spectrometry

## SPECIFICATIONS

### Input Voltage:

+24 Vdc, +5%, -2%

### Input Current:

2 amps maximum

### Output Voltage:

0 to 30kV

### Output Current:

0 to 400 microamperes

### Polarity:

Positive or Negative with respect to ground, reversible via TTL signal

### Voltage Regulation:

Line: 0.001% for input change of 1 volt  
Load: 0.001% for 100 $\mu$ A to full load change

### Current Regulation:

Line: 0.05% for +5% to -2% input change  
Load: 0.1% for 0 to maximum output voltage

### Ripple:

$\leq 70$ mV peak to peak

### Stability:

0.01% per hour, 0.02% per 8 hours after  
1.0 hour warm up period

### Temperature Coefficient:

25ppm per degree C

### Environmental:

Temperature Range:

Operating: 0°C to 50°C

Storage: -20°C to 65°C

Humidity:

10% to 90% RH, non-condensing

### Control Interface

#### Voltage Program Input:

0 to +10Vdc corresponds to 0 to  $\pm 30$ kV,  $Z_{in} \geq 1$  megohm

#### Program Accuracy:

$\pm 0.15\%$  at 15KV, with overall accuracy  
of  $\pm 0.25\%$  of maximum output

#### TTL Polarity Reversal:

High = positive polarity

Low = negative polarity

#### Voltage Monitor:

0 to 10Vdc corresponds to 0 to 30KV,  $Z_{out} = 4.7$ Kohm

#### Current Monitor:

0 to 10Vdc corresponds to 0 to 400 $\mu$ A,  $Z_{out} = 4.7$ Kohm

### Cooling:

Convection cooled

### Dimensions:

3"H X 5"W X 12.625"D (76.2mm x 127mm x 321.7mm)

### Weight:

9.5 pounds (4.31kg)

### Interface Connector:

15 pin male D connector

### Output Connector:

Alden B102, which accepts Alden B200 cable plug

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC  
Low Voltage Directive. UL/CUL recognized, File 148969.  
RoHS Compliant

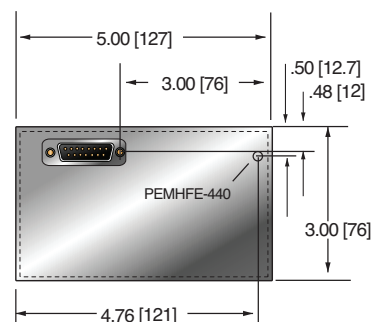
### JB1 INTERFACE CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Spare	N/C
2	Voltage Program	0 to 10V=0 to 100% Rated Output
3	Spare	N/C
4	Spare	N/C
5	Voltage Monitor	0 to 10V=0 to 100% Rated Output
6	TTL Polarity Control Signal	Hi=Positive Polarity, Low=Negative Polarity
7	Signal Ground	Signal Ground
8	Power Ground	Power Ground
9	Spare	N/C
10	Spare	N/C
11	Spare	N/C
12	TTL HV Enable	Hi=Inhibit, Low=Enable
13	Current Monitor	0 to 10V=0 to 100% Rated Output
14	Spare	N/C
15	+24Vdc	+24Vdc

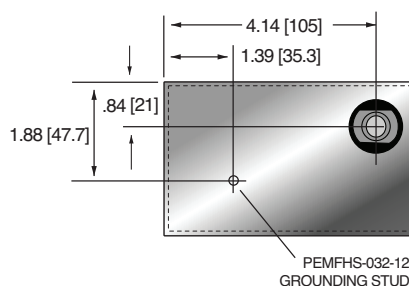


DIMENSIONS: in.[mm]

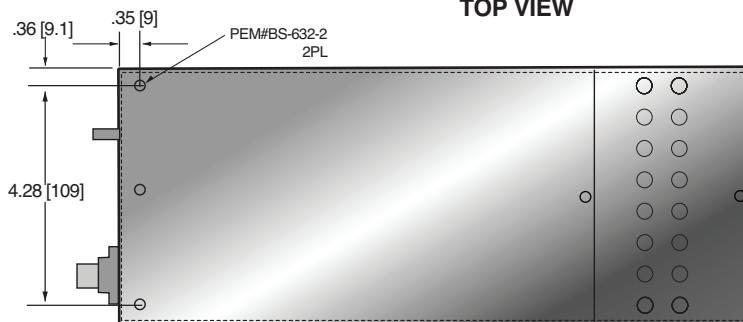
#### FRONT VIEW



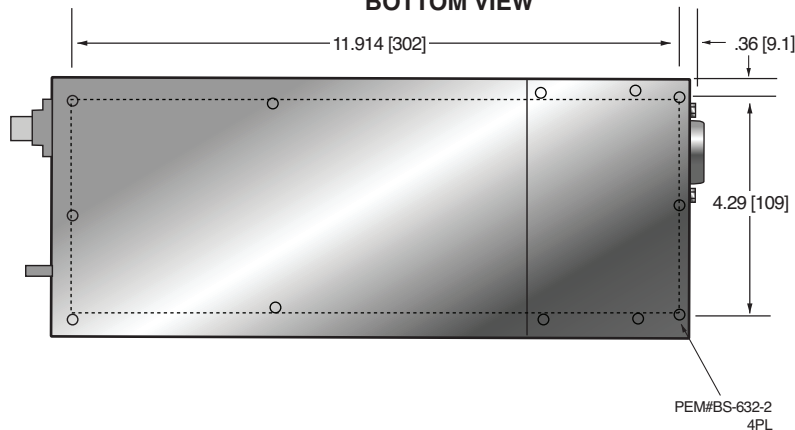
#### BACK VIEW



#### TOP VIEW



#### BOTTOM VIEW





- **Floating, Programmable 4kV Output**
- **Output Isolated to 15kV**
- **Well Regulated, Low Ripple**
- **Output Voltage Monitor**
- **Compact Shielded Metal Enclosure**
- **Arc and Short Circuit Protected**

Spellman's MCP4 is a well-regulated, high performance DC-DC converter featuring a floating 4kV @ 600uA output, isolated to 15kV. The MCP4 low output ripple specification and high stability make it ideal for use with detectors in Mass Spectrometry applications such as: Electron Multipliers (EM's), Microchannel Plates Detectors (MCP's) and Channel Electron Multipliers. This module is packaged in a shielded metal enclosure and the high voltage output is provided via two captive one meter long shielded coaxial cables. The unit has remote 0-10Vdc = 0-100% rated voltage programming and voltage monitor. A TTL compliant Enable signal provides simple control of the high voltage output. This unit has specifically designed to minimize crosstalk with the high voltage source which it is floated upon. The MCP4 can be customized to meet OEM requirements.

### TYPICAL APPLICATIONS

Mass Spectrometry Detectors  
Microchannel Plates  
Electron Multipliers  
Channel Electron Multipliers

### SPECIFICATIONS

#### Input Voltage:

+24Vdc,  $\pm 5\%$

#### Input Current:

700 mA maximum

#### Output Voltage:

0 to 4kV, continuously variable over the entire output range

#### Output Current:

600uA maximum

#### Current Limit:

1900uA maximum

#### Polarity:

+VE Positive with respect to the high voltage source  
(-VE) which it is floated upon

#### Isolation Voltage:

Up to 15kV total to ground.

Note: When the unit output is set to zero and no load is connected: If the reference supply is positive (up to +15kV), +VE will always be less than 100V with respect to -VE. If the reference supply is negative (up to -15kV), a 47M $\Omega$  pre-load resistor fitted within the MCP4 limits +VE (with respect to -VE) to  $\leq 1400V$

#### Line Regulation:

50ppm for a  $\pm 5\%$  line change

#### Load Regulation:

300ppm for a 10% to 100% load change

#### Voltage Programming:

0 to 10 volt corresponds to 0 to 100% of rated output voltage

#### Voltage Monitor:

0 to 10 volts corresponds to 0 to 100% of rated output voltage. Accuracy  $\pm 1\%$ . Iout=300uA maximum

#### Ripple:

100mVpp

#### Injected Ripple:

30mVpp, on an appropriate, properly connected ground referenced high voltage generator

#### Temperature Coefficient:

20ppm per degree C

#### Drift:

50ppm, maximum excursion in any 8 hours period at 40°C

#### Environmental:

Temperature Range:

Operating: 0°C to 50°C

Storage: -30°C to 85°C

Humidity:

5% to 90%, non-condensing.

#### Cooling:

Convection cooled

#### Dimensions:

1.81" H X 5.74" W X 9.53" D (46mm X 139mm X 242mm)

#### Weight:

3.85 pounds (1.75kg)

#### Interface/Power Connector:

9 pin male D connector

#### High Voltage Output:

Both HV cables (+VE and -VE):

HRG58 coaxial 45.3"(1150mm)

#### Regulatory Approvals:

Designed to meet IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1. UKCA marked to BS EN 61010-1. RoHS compliant.

#### EMC:

As the unit is designed for incorporation within the users system it is not tested against any specific EMC standards. The user will need to take sensible EMC precautions when designing the unit in and verify the overall system EMC performance against any relevant standards.

## INTERFACE/POWER CONNECTOR—9 PIN MALE D

PIN	SIGNAL	SIGNAL PARAMETERS
1	Voltage Programing Input	0 to 10 volt. Accuracy=2% Zin=20k $\Omega$
2	Voltage Programing Return	Differential return for Voltage programming
3	Enable	Enable = High (>2V) Vmax = 11V, Imax = 19mA
4	Enable Return	Differential return for Enable
5	Power Ground	Power Ground
6	Signal Ground	Signal Ground
7	Voltage Monitor	0 to 10 volt corresponds to 0 to 100% of rated output. Accuracy $\pm 1\%$ . Iout=300 $\mu$ A maximum
8	N/C	N/C
9	+24V Input	+24Vdc Input

### How to Order:

Standard: PART NO.:MCP4P

### SIDE VIEW

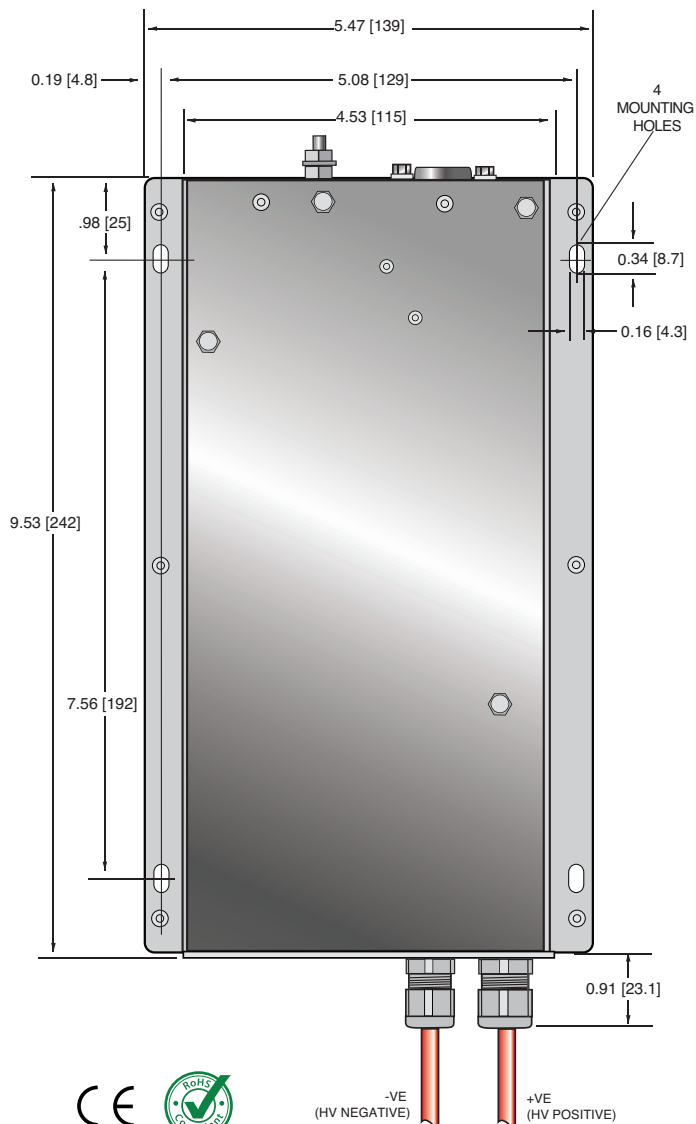


DIMENSIONS: in.[mm]

### FRONT VIEW



### TOP VIEW





- **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,  $\pm 5\%$  @ 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
<b>Output Voltage</b>	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)
<b>Output current - max</b>	30μA	5A	30μA	400μA	30μA or 50μA (see config. table)
<b>Output current limit</b>	30μA	current controlled	30μA	programmable 8 bit, 0 to 400μA	30μA or 50μA ( see config. table)
<b>Output Absolute Accuracy</b>	100V	5mA	20V	100V	100V
<b>Load Regulation</b>	±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
<b>Line Regulation</b>	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
<b>Ripple p-p from 0.1Hz to 1MHz</b>	200mV at max output	10mA	150mV	100mV at 30μA and below	200mV for 30kV bipolar outputs. 150mV for all other output ratings
<b>Temperature Coefficient</b>	25 ppm/°C	200 ppm/°C	25 ppm/°C	25 ppm/°C	25 ppm/°C
<b>Stability (after 2h warm up)</b>	1.5V / 10h	5mA/10min	0.5V / 10h	0.5V / 10h	1V / 10h
<b>Programming</b>	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
<b>Voltage Monitoring</b>	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
<b>Current Monitoring</b>	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
<b>Response (see note 1)</b>	<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
<b>Additional info</b>				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

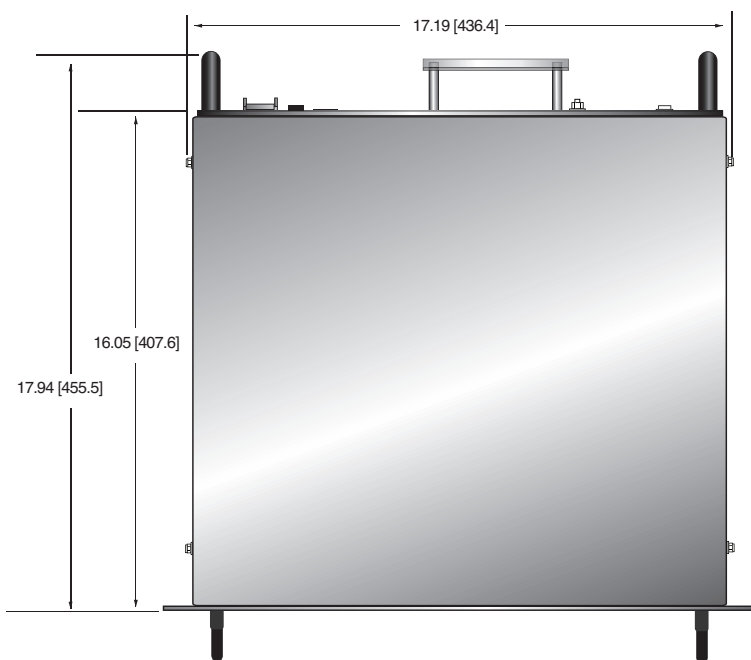
Available as Standard		Lens 1 Output		Lens 2 Output	
Part number	Voltage	Current	Voltage	Current	
LGM30P/25PN	0V to +30kV	30uA	-25kV to +25kV	30uA	
LGM30P/30P	0V to +30kV	30uA	0V to +30kV	30uA	
LGM30P/25N	0V to +30kV	30uA	0V to -25kV	30uA	
Available on Request		Lens 1 Output		Lens 2 Output	
LGM20PN/30PN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

Please consult with factory for availability and custom configuration requests.

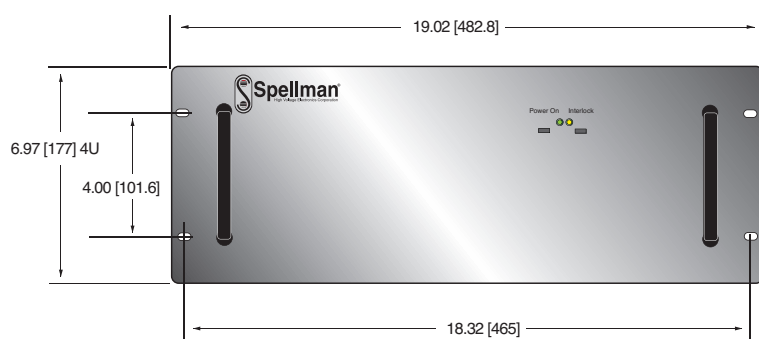
## Main Chassis

DIMENSIONS: in.[mm]

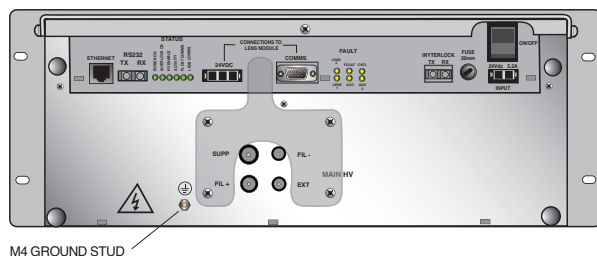
### TOP VIEW



### FRONT VIEW



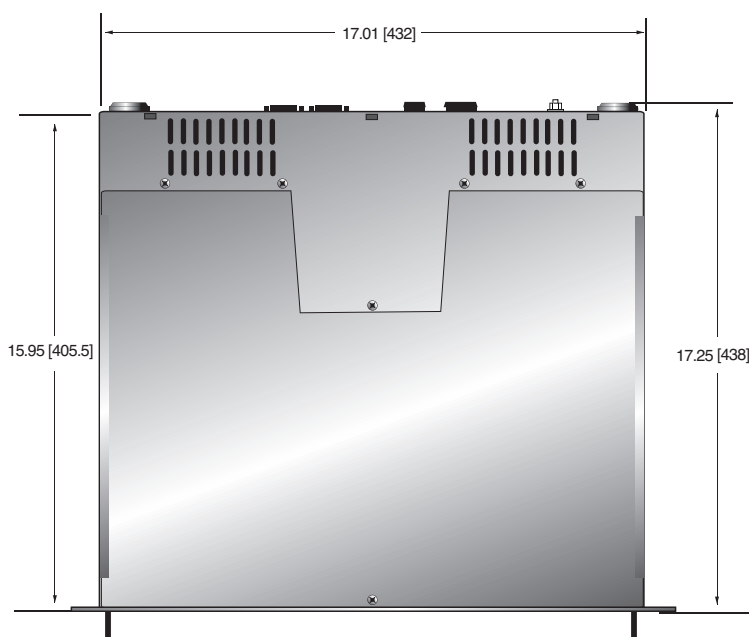
### REAR VIEW



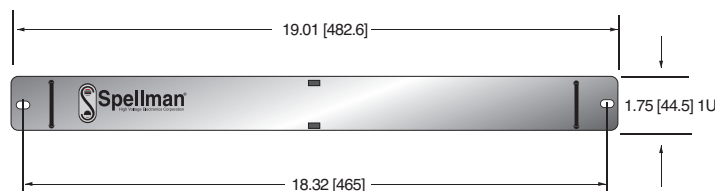
## Lens Chassis

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





- **Triode Supply for Electron Beam Columns**
- **High Precision, Low Noise, Ultra Stable**
- **Over Current/Voltage Protection**
- **Arc and Short Circuit Protection**
- **OEM Customization Available**
- **UL Certified, CE Marked and RoHS Compliant**

The EBM20N5/24 powers E-Beam Columns in Thermionic Scanning Electron Microscopes providing acceleration, bias and filament sources in a single compact package. Spellman's proprietary HV packaging and encapsulation technology gives dramatic improvements in size, cost and performance compared to other SEM power supply offerings. The EBM20N5/24 provides a highly regulated, low noise, ultra stable accelerator supply programmable from 0 to -20kV at 250uA. The EBM20N5/24 has floating bias and filament supplies referenced to the accelerator. Programming signals utilize differential analog inputs to minimize external noise and offset voltages effects. A ground referenced accelerator current monitor is provided. The EBM20N5/24 is arc and short circuit immune, along with over voltage and over current protection.

### TYPICAL APPLICATIONS

Scanning Electron Microscope

### SPECIFICATIONS

#### Input Voltage:

+24Vdc,  $\pm 5\%$ , 1.5A maximum

#### High Voltage Outputs:

##### ACCELERATOR:

###### Voltage:

0V to -20kV full load with respect to ground

###### Current:

250uA maximum (including feedback current), continuous from -500V to -20kV

###### Current Trip Level:

275mA,  $\pm 10\%$ . Trips off all outputs, reset by cycling input power

###### Accuracy (voltage program):

$\pm 1\%$  from -500V to -20kV

###### Load Regulation:

$< \pm 100\text{ppm}$ , 20uA to 250uA load change

###### Line Regulation:

$< \pm 100\text{ppm}$  for 10% line change

###### Ripple:

$< 20\text{ppm}$  p-p at -20kV, 250uA, maximum bias and filament output

###### Temperature Coefficient:

$< 100\text{ppm}/^\circ\text{C}$

###### Stability:

30ppm/3 minutes at 100uA load current after 1 hour warm up

#### Rise Time (switch ON):

$< 3$  seconds (0% to 90%) with no overshoot

#### Fall Time (switch OFF):

$< 100$  seconds (to  $< 50$  volts)

#### BIAS:

(Referenced to Accelerator)

##### Voltage:

0 to +1.5kV (max allowable output limited to 2kV)

##### Current:

150uA maximum

##### Accuracy (voltage program):

$\pm 3\%$  of full scale

##### Line Regulation:

$< \pm 0.1\%$  for 10% line change

##### Ripple:

$< 0.1\%$  p-p

##### Temperature Coefficient:

$< 1000\text{ppm}/^\circ\text{C}$

##### Stability:

1%/10 minutes

#### Rise Time (switch ON):

$< 3$  seconds (0% to 90%) with no overshoot

#### Fall Time (switch OFF):

$< 100$  seconds (to  $< 50$  volts)

#### FILAMENT:

(center voltage WRT accelerator output)

##### Power:

0 to 12W

##### Load Resistance:

$1.33\Omega \pm 5\%$

##### Accuracy:

$\pm 3\%$  of FS

##### Load Regulation:

$< 1\%$  for 10% change in load resistance

##### Line Regulation:

$< 1\%$  for 10% line voltage change

##### Ripple:

$< 0.1\%$  p-p max

##### Temperature Coefficient:

$< 300\text{ppm}/^\circ\text{C}$

##### Stability:

100ppm/10 minutes

### INTERFACE:

#### Input:

Analog control for accelerator, filament and bias

#### High Voltage Output:

Custom 3 pin receptacle and cable assembly

#### Temperature:

Operating: 5°C to +40°C

Storage: -20°C to +50°C

#### Humidity:

20% to 85% RH, non-condensing

#### Dimensions:

10.63"H x 2.36"W x 7.87"D (270mm x 60mm x 200mm)  
excluding any mounting brackets

#### Weight:

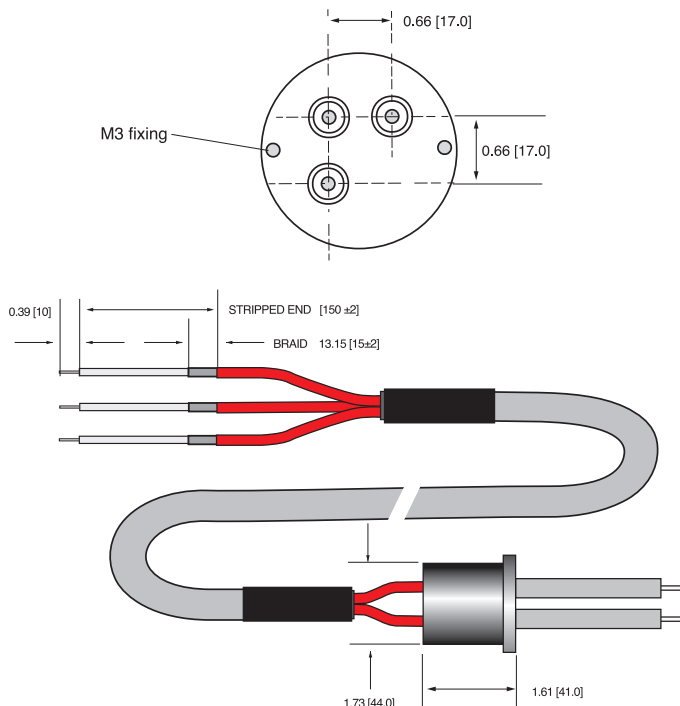
<10 lbs. (4.5kg)

### Regulatory Approvals:

UL recognized component (RC). File number E354595.  
Compliant to IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use;  
CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1. UKCA marked to BS EN 61010-1. RoHS compliant.

As the unit is designed for incorporation within the users system it is not tested against any specific EMC standards. The user will need to take sensible EMC precautions when designing the unit in and verify the overall system EMC performance against any relevant standards.

### HV CABLE ASSEMBLY DETAILS



### POWER INPUT CONNECTOR JHA2 3 PIN JST MODEL B 3PS-VH

PIN	SIGNAL	PARAMETER
1	+24V High Voltage Power Input	+24Vdc Input
2	0V Input	+24Vdc Common
3	FG	Chassis Ground

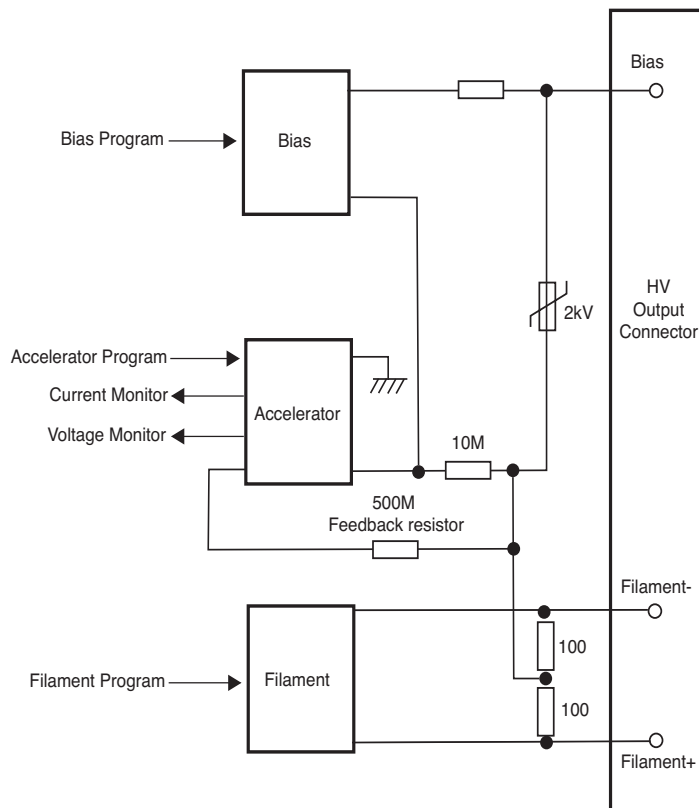
### CONTROL AND MONITORING CONNECTOR JHA3 10 PIN JST MODEL S10B-EH

PIN	SIGNAL	PARAMETER
1	FIL PROG (+)	Filament Program (+) Input
2	GND	Ground
3	BIAS (+)	Bias (+) Input
4	GND	Ground
5	ACC PROG (+)	Acc Voltage Program (+) Input
6	GND	Ground
7	EMS	Emission Current Monitor Output
8	GND	Ground
9	ACC MON	ACC Voltage Monitor Output
10	GND	Ground

#### How to Order:

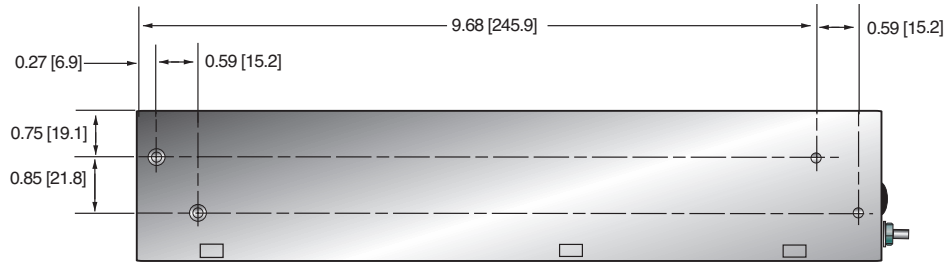
Standard: PART NO.:EBM20N5/24

HV Cable: PART NO.:HVC30/3IS/LL1650 (1.65m Cable)

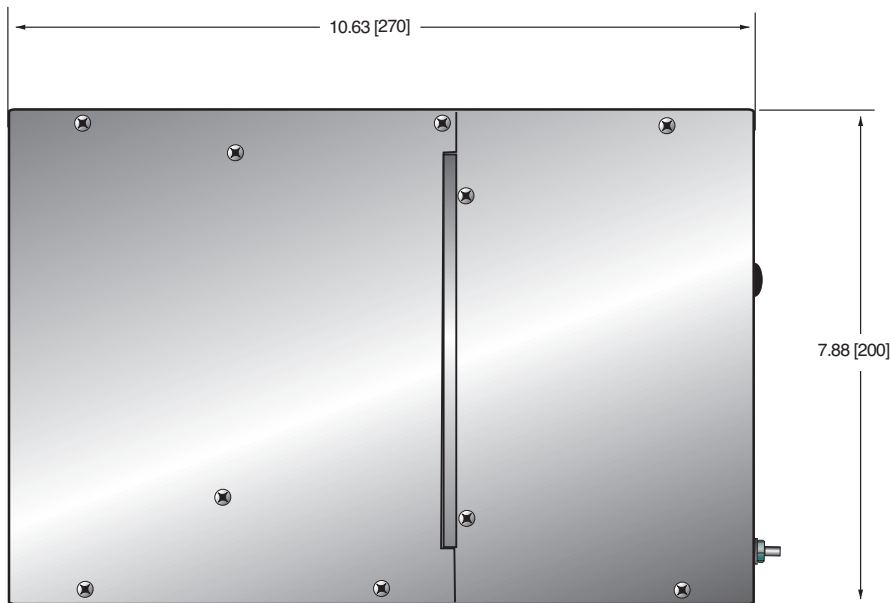


DIMENSIONS: in.[mm]

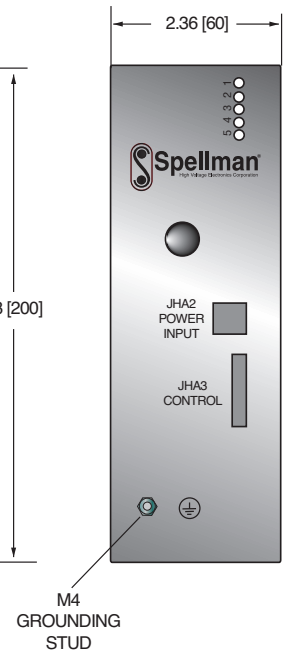
**SIDE VIEW**



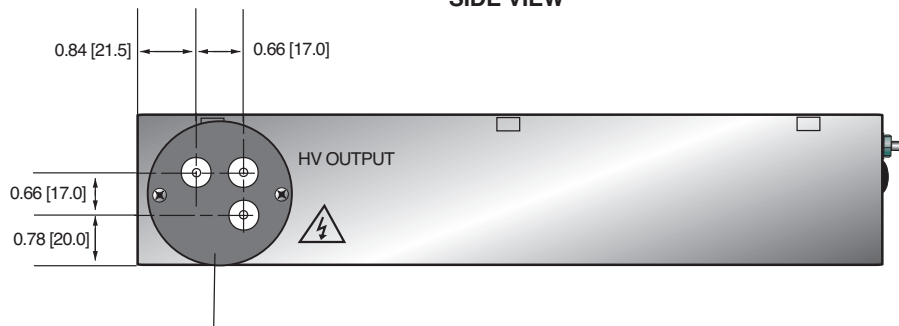
**TOP VIEW**



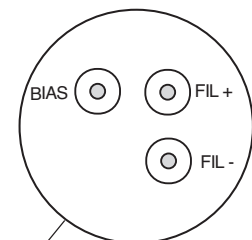
**FRONT VIEW**



**SIDE VIEW**



**PIN OUT DETAIL**





- **Triode Supply for Thermionic Emission SEM**
- **High Precision, Low Noise, Ultra Stable**
- **Over Current/Voltage Protection**
- **Arc and Short Circuit Protection**
- **OEM Customization Available**
- **UL, CE and RoHS Compliant**

The EBM30N/TEG is an integral solution that provides the high voltage required by Thermionic Emission Scanning Electron Microscope (SEM). Spellman's proprietary packaging and encapsulation technology gives dramatic improvements in size, cost and performance compared to other SEM power supply offerings.

This unit provides a highly regulated, low noise, ultra-stable Accelerator supply programmable from 0 to -30kV at 170uA, together with Floating Filament and Bias supplies referenced to the Accelerator to control the beam. The unit also includes high voltage outputs to drive the Detector, comprising PMT, Scintillator and Collector grounded outputs.

Programming signals utilize differential analog inputs to minimize external noise and offset voltages effects. A ground referenced emission current monitor and a filament failure signal are provided.

## SPECIFICATIONS

### Input Voltage:

+24Vdc,  $\pm 5\%$  @ 2.5A max.

### High Voltage Outputs:

CA11 Mini 75 receptacle from Claymount. Spellman HV offers mating cable assemblies at different lengths (see HOW TO ORDER table below).

### Scintillator Output:

Custom 'Poke home' receptacle manufactured by Spellman. For mating cables, see HOW TO ORDER information below.

### PMT and Collector Outputs:

Industry standard BNC.HT receptacle: Radiall R316 553

### Temperature:

Operating: 0°C to +45°C  
Storage: -20°C to +75°C

### Humidity:

0 to 85% RH, non-condensing

### Dimensions:

4.13" H x 9.85" W x 7.48" D (105mm x 250mm x 190mm) excluding the top mounting bracket

### Weight:

16.5 lbs. (7.5kg)

### Regulatory Approvals:

UL recognized component (RC). File number E354595.  
Compliant to IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use;  
CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1.  
UKCA marked to BS EN 61010-1. RoHS compliant.

(As the unit is designed for incorporation within the users system it is not tested against any specific EMC standards. The user will need to take appropriate EMC precautions when designing the unit in and verify the overall system EMC performance against any relevant standards.)

## OUTPUTS SPECIFICATIONS

Output	Accelerator (Internal Supply)	Bias Cancellation (Internal Supply)	Filament	PMT	Scintillator	Collector
<b>Output Voltage</b>	0 to -30kV, referenced to ground	0 to +3.5kV referenced to Accelerator*	-1.936 to +1.936V referenced to Accelerator	0 to -1300V referenced to ground	+8kV to +11kV referenced to ground	30V to 500V referenced to ground
<b>Output current - max</b>	170μA	150μA	3.87A	1mA (current trip level: 1.2mA)	250μA	5mA
<b>Accuracy</b>	$\pm 2\%$ or $\pm 20V$ (whichever is greater)	$\pm 10\%$ or $\pm 180V$ (whichever is greater)	0.1V	$\pm 2\%$ or $\pm 1V$ (whichever is greater)	$\pm 2\%$	$\pm 5\%$
<b>Load Regulation</b>	<100ppm for 0 to 170μA	N/A	<2% for 10% change in load resistance	<100ppm for 0 to 1mA	<500ppm for 0 to 250μA	<5% for 0 to 5 mA
<b>Line Regulation for a <math>\pm 5\%</math> line change</b>	<100ppm	<0.1%	<1%	<100ppm	<500ppm	<5%
<b>Ripple p-p at max output</b>	<20ppm	<5ppm	<0.1%	<200mV	<0.1%	<0.2%
<b>Temperature Coefficient</b>	<100 ppm/°C	<1000 ppm/°C	<300 ppm/°C	<1000 ppm/°C	<100 ppm/°C	<1000 ppm/°C
<b>Stability (1hr warm up)</b>	8ppm/3min	1%/10min	100ppm/10min	200ppm/1h	500ppm/8h	<1500ppm/1h
<b>Rise time (switch on)</b>	1 to 3s (0 to 90%)	<1s (0 to 90%)	250ms (0 to 90%)	<1s (0 to 90%)	<1s (0 to 90%)	<1s (0 to 90%)
<b>Fall time (switch off)</b>	<100s (to < 50V)	<100s (to < 50V)	<0.5s (100% to 10%)	<10s (to < 50V)	<10s (to < 100V)	<10s (to < 50V)

\*The positive Bias Cancellation voltage reduces the negative Bias output, allowing the Emission current to flow (see User Guide for more information).

### PL1 INPUT POWER CONNECTOR JST MODEL B 5PS-VH

PIN	SIGNAL	I/O	SIGNAL PARAMETERS	REMARKS
1	+24V	I	DC24V Input	Pins connected internally
2	+24V	I	DC24V Input	
3	0V	I	DC24V Common	Pins connected internally
4	0V	I	DC24V Common	
5	FG	-	Case ground	Internally connected to 0V

### PL2 DIGITAL I/O CONNECTOR JST MODEL S10B-EH

PIN	SIGNAL	I/O	SIGNAL PARAMETERS
1	Remote on/off	I	Outputs 1,2 and 3 (Acc., Bias, Fil.) remote on/off. High = off
2	Remote 4 on/off	I	P.M.T remote on/off. High = off
3	Remote 5 on/off	I	Scintillator remote on/off. High = off
4	Remote 6 on/off	I	Collector remote on/off. High = off
5	Remote signal gnd	I	0V connection for remote controls
6	Filament open cct	O	High = failed
7	Filament OC return	O	0V
8	N/C	-	N/C
9	N/C	-	N/C
10	N/C	-	N/C

### PL3 ANALOG I/O CONNECTOR JST MODEL S15B-EH

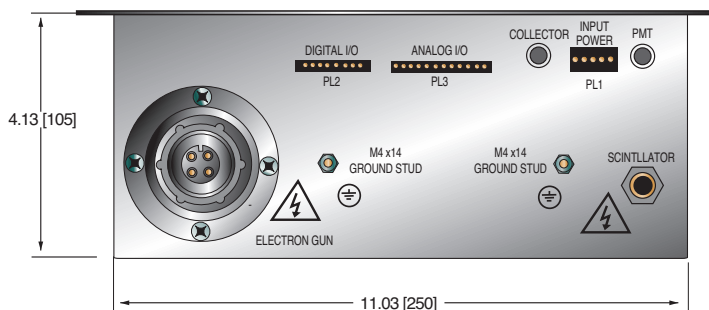
PIN	SIGNAL	I/O	SIGNAL PARAMETERS
1	Fil Prog (+)	I	0 to 4V differential input = 0 to 4V Filament output
2	Fil Prog (-)	I	
3	Bias Cancel Prog (+)	I	0 to 3.5V differential input = 0 to 3.5kV Bias Cancellation output
4	Bias Cancel Prog (-)	I	
5	Acc Prog (+)	I	0 to 6V differential input = 0 to -30kV Accelerator output
6	Acc Prog (-)	I	
7	EMS Monitor	O	Emission Current Monitor Output. 0 to 10V = 0 to 200µA Limited to 12V max. ±3% or 0.1V, whichever is greater
8	EMS Mon 0V	O	
9	PMT Prog (+)	I	0 to 6.5V differential input = 0 to 1300V P.M.T output
10	PMT Prog (-)	I	
11	Scintillator Prog (+)	I	0 to 5.5V differential input = 0kV to 11kV Scintillator output
12	Scintillator Prog (-)	I	
13	Collector Prog	I	0 to 5V differential input = 0 to 500V Collector output
14	Collector Prog 0V	I	
15	N/C	-	N/C

### HOW TO ORDER

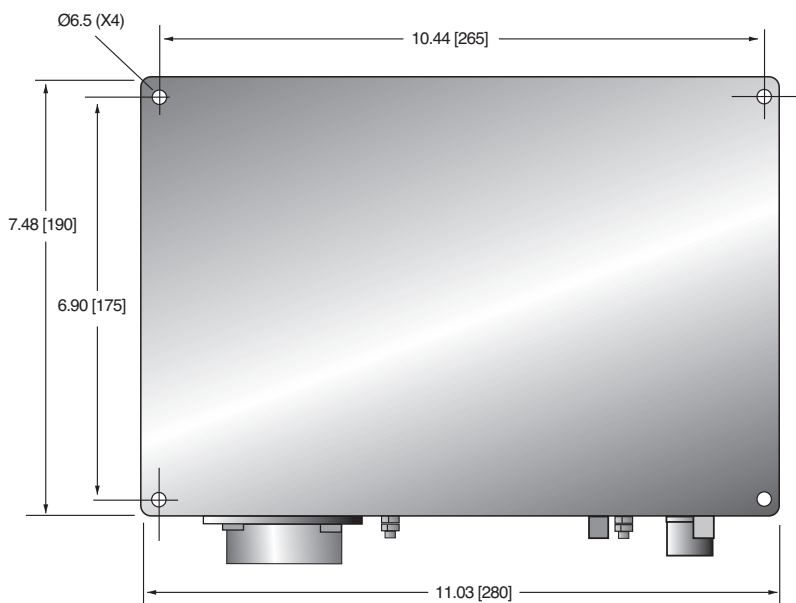
Description	Part Number
EBM-TEG	EBM30N/TEG
Low voltage mating connectors accessory Kit	13802-27
HV Out Cable - 2 meters	HVC30/3SO/1317
HV Out Cable - 3 meters	HVC30/3SO/1314
HV Out Cable - 5 meters	HVC30/3SO/1315
Scintillator Cable - 1 meter	HVC11/1SO/1320
Scintillator Cable - 2 meters	HVC11/1SO/1316

DIMENSIONS: in.[mm]

### FRONT VIEW



### TOP VIEW



### SIDE VIEW



Note: An accessory kit which contains the mating housings and crimps for the low voltage connectors is available to order free of charge. See HOW TO ORDER table.





- **Triode Supply for Thermionic Emission SEM**
- **High Precision, Low Noise, Ultra Stable**
- **Over Current/Voltage, Arc and Short Circuit Protection**
- **RS-232 or RS-485 Digital Interface**
- **Free GUI for Testing and Development Work**
- **OEM Customization Available**
- **CE, UKCA and RoHS Compliant**

The EBM-TEGR is an integral solution that provides the high voltage required by Thermionic Emission Scanning Electron Microscope (SEM) in a 19" rack mountable chassis.

Spellman's proprietary packaging and encapsulation technology gives dramatic improvements in size, cost and performance compared to other SEM power supply offerings.

This unit provides a highly regulated, low noise, ultra stable Accelerator supply programmable up to -30kV at 400uA. This, together with Floating Filament and Grid supplies referenced to the Accelerator control the beam. The unit also includes high voltage outputs to drive the Detector, comprising PMT, Scintillator and Collector grounded outputs.

Customer control of this integrated EBM-TEGR power supply system is accomplished via RS-232 or the optional RS-485 interface. Five interlocks are provided. The unit is CE and UKCA marked.

## SPECIFICATIONS

### Input Voltage:

100 to 264 Vac @2A max. 47 to 63Hz

### Temperature:

Operating: 10°C to +45°C  
Storage: -10°C to +70°C

### Humidity:

0 to 90% RH, non-condensing

### Interlocks:

Five functional interlocks are provided on a 9 pin D connector (see pinout details).

The EHT, Collector, Scintillator and PMT interlocks disable the corresponding outputs when open (the other outputs can be powered up).

The Vacuum interlock disables the gun supplies (EHT and heater) when open.

### Front Panel Indicators:

POWER ON: Green LED

INTERLOCKS: Yellow LED indicates that all the interlocks are closed and the unit is able to generate high voltage.

HV ON: Yellow LED indicates that the high voltage EHT (Accelerator) Output is energized.

RS-232/RS-485: Yellow LED indicates when communications are taking place on the RS-232/RS-485 bus.

FAULT: Red LED indicates that an Error condition has occurred.

### Input Power Connector:

I.E.C. 320 Receptacle with integral fuse

### High Voltage Output Connectors:

Grid and Filament: Claymount CA1 type 03 (see drawing)  
A mating cable assembly is available (see drawing and How To Order table)

Collector and PMT: BNC HT-MHV Receptacle Radiall R316553000

Scintillator: SHV Receptacle Radiall R317580000

## OUTPUTS SPECIFICATIONS

Output	Accelerator (EHT)	Filament	Grid	PMT	Scintillator	Collector
<b>Output Voltage</b>	-100V to -30kV, referenced to ground	5V max, 15W max center tapped to the Accelerator	-35V to -1650V referenced to Accelerator	0V to -1300V referenced to ground	+50V to +11kV referenced to ground	-400V to +400V referenced to ground
<b>Output current - max</b>	400μA	5A	400μA	1mA (current trip level: 1.2mA)	200μA	4μA
<b>Accuracy</b>	±2% or ±30V (whichever is greater)	±5% or ±100mA (whichever is greater)	N/A	±2% or ±1V (whichever is greater)	<1% or ±10V (whichever is greater)	±2% or ±2V (whichever is greater)
<b>Load Regulation</b>	<10ppm for 30μA to 400μA	<5mA for a 0.4Ω to 1Ω change at 3A	N/A	<±100ppm for 0 to 1mA	<100ppm for 10μA to 200μA	<5% for 0 to 5 mA
<b>Line Regulation at full load ±10% line change</b>	<10ppm	<5mA	N/A	<100ppm	<100ppm	<10mV
<b>Ripple p-p at max output</b>	<100mV	1mA at 50Hz 30mV at 100kHz at 3A, 1Ω	N/A	<200mV	<100mV	<25mV
<b>Temperature Coefficient</b>	<50 ppm/°C	<300 ppm/°C	N/A	<100 ppm/°C	<250 ppm/°C	<50 ppm/°C
<b>Stability (1hr warm up)</b>	<10 ppm/15min <25 ppm/1h	<2mA/1h	<0.4μA/15min	200 ppm/1h	<1%/1h	<50mV/15min

### Protection:

- All outputs are protected from arcs in the load and continuous short circuit to ground and between each other.
- If the Beam Energy has more than 4 arcs in a 10 minutes period, unit will disable all outputs and sets all programs to zero.
- In case of an over temperature condition for greater than 100° C for ten seconds all outputs will be disabled.
- Over voltage, over current and internal communication issues are also monitored and trigger fault conditions.
- The unit reports fault or trip conditions through status flags. After a Trip occurs, the unit can be reset through software (digital interface) or power cycle.

### Dimensions:

See drawing

### Weight:

39.7 lbs. (18kg)

### Regulatory Approvals:

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

### INTERLOCKS CONNECTOR 9 PIN D SUB-FEMALE

PIN	SIGNAL	I/O	SIGNAL PARAMETERS
1	0V	-	Ground
2	24V	O	24V Output from unit (connected to pin 6 internally)
3	Collector	I	Input for collector interlock
4	Scintillator	I	Input for Scintillator interlock
5	Vacuum	I	Input for vacuum interlock (connected to pin 8 internally)
6	24V	O	24V output from unit (connected to pin 2 internally)
7	EHT	I	Input for EHT interlock
8	Vacuum	I	Input for vacuum interlock (connected to pin 5 internally)
9	PMT	I	Input for PMT interlock

### DIGITAL COMMUNICATIONS CONNECTOR 9 PIN D SUB-MALE

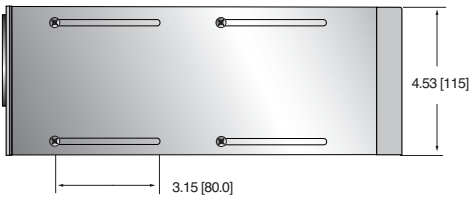
PIN	RS-232	RS-485	DESCRIPTION
1	-	-	N/C
2	RS-232 RxD	-	RS-232 data receive
3	RS-232 TxD	Z	RS-232 data transmit or RS-485 inverting
4	-	-	N/C
5	GND	GND	Ground
6	-	-	N/C
7	-	Y	RS-485 non-inverting
8	-	-	N/C
9	-	-	N/C

### HOW TO ORDER

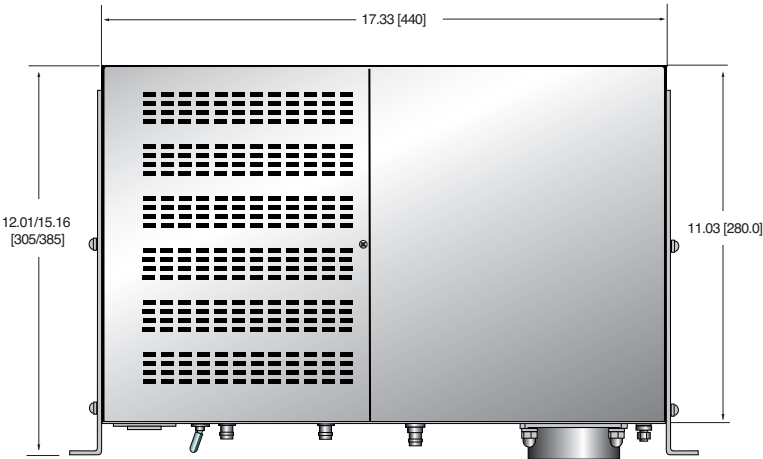
Description	Part Number
EBM-TEGR	EBM30N12/TEGR
EBM-TEGR with RS-485 option	EBM30N12/TEGR/DCC4
HV Output cable - 4 meters	HVC75/3SO/1382

DIMENSIONS: in.[mm]

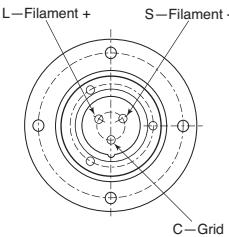
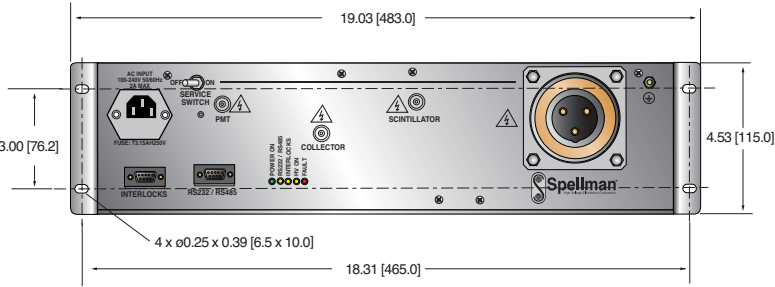
### SIDE VIEW



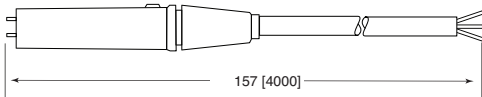
### TOP VIEW



### FRONT VIEW



HV output connector



HV output mating cable



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128160-001 REV. C

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Spellman's EBM-FEG Series is an integrated, multiple output high voltage power supply specifically designed to drive Scanning Electron Microscope (SEM) Columns. Spellman's extensive applications knowledge has enabled us to develop a range of technology platforms that can be customized to meet the demanding requirements of SEM.

The main Acceleration Voltage is a high stability 30kV supply, with integrated floating Filament, Extractor and Suppressor outputs required to drive Field Emission, Cold Cathode and Schottky Electron Sources in a compact solution with extenders to mount in a 19" rack. All outputs are offered with ultra-low output ripple, minimal micro-discharge, excellent regulation, stability, temperature coefficient and accuracy specifications for unprecedented image quality and resolution. Isolation and control of the respective floating sources is provided via Spellman's proprietary high voltage isolation techniques.

Customer control of this integrated EBM-FEG power supply system is accomplished via a fiber optic RS-232 interface. All high voltage safety interlocks are of a failsafe hardware based design. The unit is UL and CE marked and is designed to be compliant with SEMI standards.

### TYPICAL APPLICATIONS

Scanning Electron Microscopes (SEM)  
Electron Beam Controller

### SPECIFICATIONS

#### Input Voltage:

+24Vdc,  $\pm 5\%$  @ 4 amps max. 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.

#### Mechanical:

The unit is provided with a pair of removable mounting flanges; these allow the unit to mount in a 19" rack system. The unit can be operated in any orientation.

- **Integrated Tetrode Supply for Field Emission SEM**
- **Very Low Ripple and Ultra Stable Outputs**
- **Robust Arc and Short Circuit Protection**
- **Designed to Minimize Micro-discharge Events**
- **Optically Isolated Digital Interface**
- **Free GUI for Testing and Development Work**
- **UL Recognized, CE Marked & Designed to Meet SEMI S2**

#### Vacuum Interlock:

The vacuum interlock is an optical interlock which is made when light is present on the fiber. When no light is present the interlock is broken and the unit disables all of the outputs.

#### Front Panel Indicators:

##### Power On:

An illuminated green LED indicates that +24V power is present and it will be illuminated over the range 22.8 to 25.2 volts and will flash with a 1 second period when out of range.

##### Vacuum Interlock:

An illuminated yellow LED indicates that the vacuum interlock is closed. The vacuum interlock LED must be illuminated for the unit to be able to generate high voltage.

#### Test GUI:

A product GUI can be provided free of charge for customer testing and development work.

#### Protection:

All outputs are protected from arcs in the load and continuous short circuit to ground and between each other.

All low voltage inputs are protected against over voltages of  $\pm 30$  volts. The power input is protected against over voltage and reversed connection.

If the Beam Energy has more than 'A' arcs in a nominal 'B' time (sec) period the unit will disable all outputs and sets all programs to zero. If there are less than 'A' arcs the unit will continue to operate. The default values are A = 8 and B = 10. Both 'A' and 'B' are settable via optical bus commands and GUI.

In case of an over temperature condition for greater than ten seconds all outputs will be disabled.

The unit reports fault or trip conditions through status flags.

After a Trip occurs (arc, over current, over voltage, temperature etc.), the unit can be reset through software (optical bus command) or power cycle.

#### Weight:

44 lbs. (20kg)

#### Regulatory Approvals:

UL recognized component (RC). File number E354595.

Compliant to IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1. CE marked to EN 61010-1. UKCA marked to BS EN 61010-1. RoHS compliant.

As the unit is designed for incorporation within the user's system it is not tested against any specific EMC standards. The user will need to take appropriate EMC precautions when designing the unit in and verify the overall system EMC performance against any relevant standards.

### OUTPUTS SPECIFICATIONS

OUTPUT	Beam Energy	Filament	Suppressor	Extractor
<b>Output Voltage</b>	-20V to -30kV referenced to ground. Amplitude does not exceed 35kV and is <60 V when output disabled. Conditioning voltage -32.5kV at zero load current.	nominal 1.8V max 3V referenced to Beam Energy	-100V to -1kV referenced to Beam Energy	100V to 10kV referenced to Beam Energy
<b>Output current - max</b>	200μA	3A	100μA	700μA
<b>Current Trip</b>	250μA ±10% for 1s Output disabled and program set to zero	>3.15A for 10s. All outputs disabled and programs set to zero	>100mA ±10% for 5s. All outputs disabled and programs set to zero	Programmable 0 to 735μA. All outputs disabled and programs set to zero
<b>Accuracy</b>	<1% or ±10V (whichever is greater)	±5mA (between 2A to 3A)	<2% or ±6V (whichever is greater)	<1% or ±20V (whichever is greater)
<b>Linearity</b>	<± 25V	±10mA (between 0.5A to 3A)	±5V	±20V
<b>Load Regulation</b>	<±100mV for 30μA to 200μA	<5mA for 0.4Ω to 1Ω change at 3A	<120mV for 10μA to 100μA	<100mV at 40μA 0.1Hz to 20MHz, <1V at 10 - 700μA
<b>Line Regulation for a ± 5% line change</b>	<10ppm	<1mA	<5ppm	<5ppm
<b>Ripple p-p at max. output</b>	<50mVp-p 0.1Hz to 20MHz	<1mA p-p 20Hz to 10kHz <30mVp-p at approx 100kHz	<20mVp-p at 0.1Hz to 20MHz	<100mV p-p at 0.1Hz to 20MHz
<b>Temperature Coefficient</b>	<5 ppm/°C from 20°C to 30°C, <10 ppm/°C otherwise	<50 ppm/°C	<50 ppm/°C	<25 ppm/°C
<b>Stability (1h warm up)</b>	200mV/15min	<0.5mA/60min	<0.3V/15min	<0.3V/15min
<b>Ramp Rate Programable Range</b>	50 to 5000 V/s	1 to 3000 mA/s	10 to 1000 V/s	10 to 1000 V/s
<b>Voltage Monitor Resolution</b>	0.5V	2.5mV	0.25V	2.5V
<b>Voltage Monitor Accuracy</b>	±2% or ±10V	±5% or ±25mV	±2% or ±250mV	±1% or ±20V
<b>Current Monitor Resolution</b>	100nA	1mA	0.25μA	0.25μA
<b>Current Monitor Accuracy</b>	±2% or ±1μA	±10mA	±10%	±2% or ±2μA
<b>Additional info</b>	Programmable Wobble feature. Sinusoidal, amplitude up to 5% Beam Energy voltage, 0.5Hz to 1.6Hz	Open Circuit detection: Vout > 5.2 ± 0.1V All outputs disabled and programs set to zero. Filament supply optimized for a nominal load resistance of 0.6Ω		

### INPUT POWER CONNECTOR UNIVERSAL MATE-N-LOK 1-350942-0

PIN	SIGNAL	PARAMETER
1	+24Vdc	+24Vdc @ 4A
2	Power Ground	Power Ground

### VACUUM INTERLOCK CONNECTOR

The vacuum interlock connector is a dual channel Avago HFBR- 2524z/1524z connector.

### OPTICAL COMMUNICATIONS CONNECTOR

The fiber optics communications connector is a dual channel Avago HFBR- 2524z/1524z connector. A suitable Serial to optical communication kit including fiber optic cables, optic to RS-232 converter, RS-232 extension lead and RS-232 to USB cable is available. Optical to RS-232 converter can be ordered separately. See HOW TO ORDER table.

### HIGH VOLTAGE OUTPUT CONNECTOR

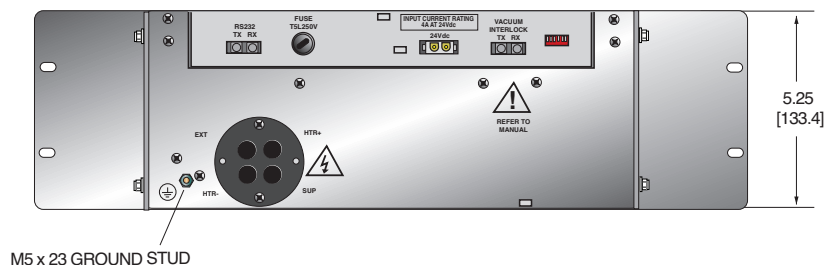
The unit uses a custom high voltage 4 pole receptacle. A mating cable assembly in different lengths is available. See HOW TO ORDER table.

#### HOW TO ORDER

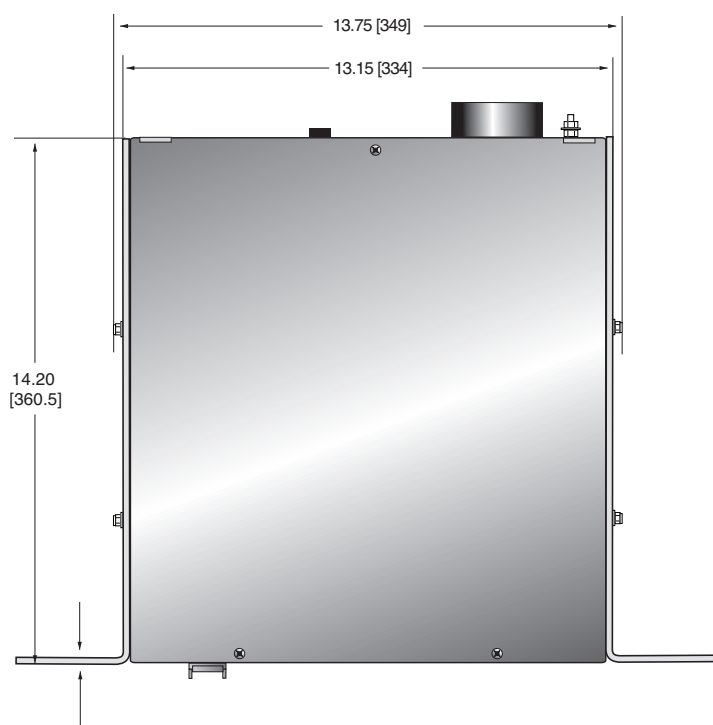
Description	Part Number
EBM-FEG	EBM30N6/FEG
Optical to RS-232 Communication Kit	EBMKFEG
Optical to RS-232 Converter (included in the above kit)	21777
HV Output Cable - 1.5 meters	HVC30/4ISO/1201
HV Output Cable - 2.8 meters	HVC30/4ISO/1197

DIMENSIONS: in.[mm]

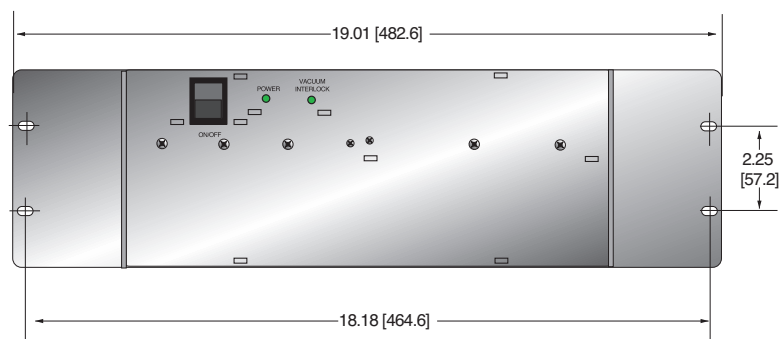
#### REAR VIEW



#### TOP VIEW



#### FRONT VIEW





- **Integrated Tetrode Supply for Field Emission SEM**
- **Very Low Ripple and Ultra Stable Outputs**
- **Robust Arc and Short Circuit Protection**
- **Designed to Minimize Micro-discharge Events**
- **RS-232 Digital Interface**
- **Free GUI for Testing and Development Work**
- **CE, UKCA and RoHS Marked**

Spellman's EBM60-FEG Series is an integrated, multiple high voltage power supply specifically designed to drive Field Emission Scanning Electron Microscope (SEM) columns. Spellman's extensive applications knowledge has enabled us to develop a range of technology platforms that can be customized to meet the demanding requirements of SEM.

The main Acceleration Voltage is a high stability 60kV supply, with integrated floating Filament, Extractor and Suppressor outputs required to drive Field Emission, Cold Cathode and Schottky Electron Sources. All outputs are offered with ultra-low output ripple, minimal micro-discharge, excellent regulation, stability, temperature coefficient and accuracy specifications for unprecedented image quality and resolution. Isolation and control of the respective floating sources is provided via Spellman's proprietary high voltage isolation techniques.

Customer control of this integrated EBM60-FEG power supply system is accomplished via an RS-232 interface. The unit is CE and UKCA marked.

### TYPICAL APPLICATIONS

Scanning Electron Microscopes (SEM)  
Electron Beam Controller

### SPECIFICATIONS

#### Input Voltage:

100 to 240 Vac  $\pm 10\%$  @1A max. 50 to 60 Hz  $\pm 5\%$

#### 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:

-25°C to +60°C

Humidity:

0 to 85% RH, non-condensing

#### Mechanical:

The unit can be operated in any orientation.

#### Front Panel Indicators:

- Power On
- Interlocks enabled (both interlocks are closed)
- HV On (any of the HV outputs are enabled)
- Warning (any of the internal warning levels exceeded)
- Operating (unit running correctly)
- Trip
- Fault
- Serial Bus (communication taking place)

#### Status Outputs:

The unit has three digital outputs to indicate status conditions through TTL signals (high when the corresponding LED is illuminated)

- 1- HV on
- 2- Fault
- 3- Unit Operating

#### Test GUI:

A product GUI can be provided free of charge for customer testing and development work.

#### Interlocks:

Two separate interlocks are provided:

- Gun interlock: 24V output provided for an external volt free interlock
- HV cable interlock: interlock plate mounted over the HV connector

If any interlock is not present: all high voltage supplies including filament are shut down, however communication over the serial interfaces remains operational.

#### Protection:

- All outputs are protected from arcs in the load (repetition rate up to 0.1 Hz) and continuous short circuit.
- The unit monitors the temperature of the main power semiconductors and shutdown the relevant outputs if a temperature become excessive.
- All low voltage inputs are protected against over voltages of  $\pm 30$  Volts.
- The power input is protected against over voltage and reversed connection.

#### Weight:

86 lbs. (39kg)

#### Regulatory Approvals:

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

## OUTPUTS SPECIFICATIONS

OUTPUT	Accelerator	Filament	Suppressor	Extractor
<b>Output Voltage</b>	-200V to -60kV referenced to ground	nominal 1V max 1.5V referenced to Accelerator	-10V to -1kV referenced to Beam Energy	200V to 5kV referenced to Beam Energy
<b>Output current - max</b>	300 $\mu$ A	3A	100 $\mu$ A	500 $\mu$ A
<b>Current Trip</b>	350 $\mu$ A $\pm$ 10% Output disabled and program set to zero	>3.15A for 10s. All outputs disabled and programs set to zero	>120mA $\pm$ 10% All outputs disabled and programs set to zero	600 $\mu$ A $\pm$ 10% All outputs disabled and programs set to zero
<b>Accuracy</b>	$\pm$ 5V	$\pm$ 5mA (between 2A to 3A)	$\pm$ 14V	$\pm$ 2%
<b>Linearity</b>	< $\pm$ 5V between 500V and 60kV	$\pm$ 10mA	$\pm$ 14V	$\pm$ 2V
<b>Load Regulation</b>	< $\pm$ 10ppm for 30 $\mu$ A to 400 $\mu$ A	<5mA for 10% in load resistance	< $\pm$ 100ppm for 10 $\mu$ A to 90 $\mu$ A	< $\pm$ 100ppm for 10 $\mu$ A to 500 $\mu$ A
<b>Line Regulation for a <math>\pm</math> 10% line change</b>	< $\pm$ 10ppm	<1mA	< $\pm$ 10ppm	< $\pm$ 10ppm
<b>Ripple p-p at max. output</b>	<120mVp-p at 1Hz to 1MHz	<40mA p-p 20Hz to 10kHz across 0.5 $\Omega$ @ 2.5A	<10mVp-p at 1Hz to 1MHz	<50mV p-p at 1Hz to 1MHz
<b>Temperature Coefficient</b>	<20 ppm/ $^{\circ}$ C at 60kV after 1h warm up	<20 ppm/ $^{\circ}$ C	<50 ppm/ $^{\circ}$ C	<25 ppm/ $^{\circ}$ C
<b>Stability</b> (1h warm up)	<15ppm or 40mV (whichever is greater) /10min	<30ppm/10min and 5mA/3 months @ 2.5A	<100ppm/10min	<20ppm/10min
<b>Voltage Monitor Resolution</b>	1.14V	62.5 $\mu$ V	19mV	97mV
<b>Voltage Monitor Accuracy</b>	$\pm$ 1% or $\pm$ 50V	$\pm$ 5% or $\pm$ 25mV	$\pm$ 0.5% or $\pm$ 0.5V	$\pm$ 0.5% or $\pm$ 3V
<b>Current Monitor Resolution</b>	5.7nA	62.5 $\mu$ A	2.3nA	11nA
<b>Current Monitor Accuracy</b>	$\pm$ 1 $\mu$ A	$\pm$ 1% or $\pm$ 5mA	$\pm$ 2 $\mu$ A	$\pm$ 0.5% or $\pm$ 2 $\mu$ A
<b>Additional info</b>	Programmable Wobble feature. Sinusoidal, 0V to 500V p-p, 0.2Hz to 2Hz	Open Circuit detection: Vout > 3.1 $\pm$ 0.1V All outputs disabled and programs set to zero.  Optimized for a nominal load resistance of 0.5 $\Omega$		

### GUN INTERLOCK CONNECTOR 3 PIN MATE-N-LOK (TE CONN. P/N: 1-350943-0)

PIN	SIGNAL	I/O	PARAMETER
1	Interlock -	I	24V Return
2	N/C	-	
3	Interlock +	O	24V Drive

### STATUS OUTPUT CONNECTOR 9 PIN FEMALE D

PIN	SIGNAL	I/O	PARAMETER
1	HV ON	O	High voltage status, logic high* when any of the HV outputs is enabled
2	HV ON GND	-	High voltage status return
3	Fault	O	Fault status, logic high* when any internal fault is detected
4	Fault GND	-	Fault status return
5	UO	O	Unit Operating status, logic high* when the unit is running correctly
6	UO GND	-	Unit Operating status return
7	N/C	-	No connection
8	N/C	-	No connection
9	N/C	-	No connection

\*TTL Signal: High > 2.7V, Low < 0.8V

### RS-232 COMMUNICATION CONNECTOR 9 PIN MALE D

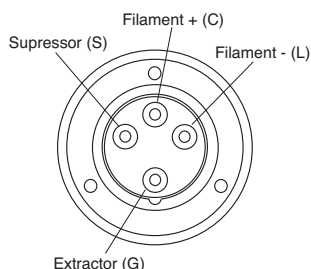
PIN	SIGNAL	I/O	PARAMETER
1	N/C	-	No connection
2	RS232 RXD	I	RS-232 receive data
3	RS232 TXD	O	RS-232 transmit data
4	N/C	-	No connection
5	GND	-	Ground
6	N/C	-	No connection
7	N/C	-	No connection
8	N/C	-	No connection
9	N/C	-	No connection

### INPUT POWER CONNECTOR

I.E.C. 320 Receptacle with integral fuse

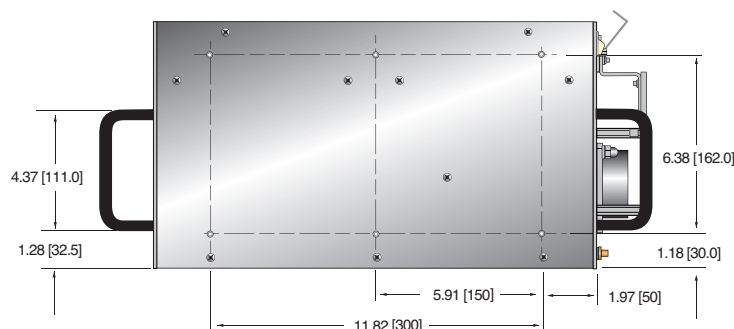
### HIGH VOLTAGE OUTPUT CONNECTOR

The unit uses a Claymount CA4 75kV 4 pin receptacle. Mating cable assemblies in different lengths are available. See HOW TO ORDER table.

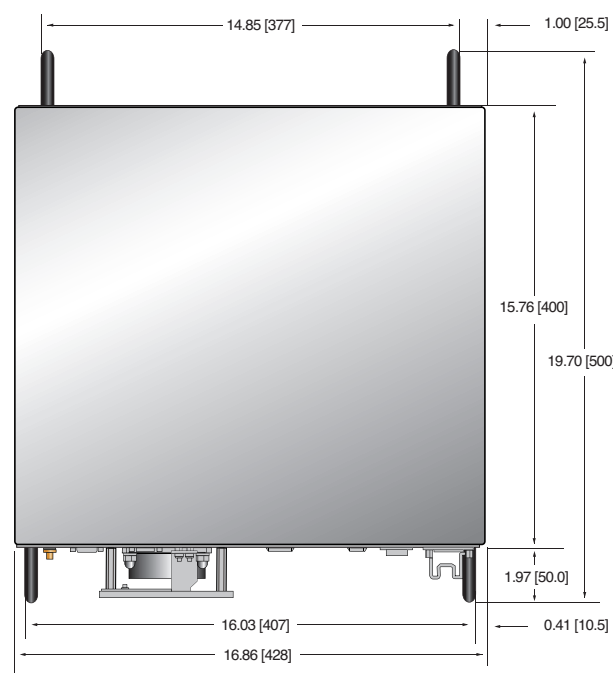


DIMENSIONS: in.[mm]

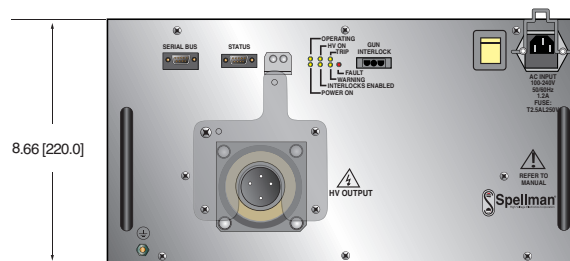
SIDE VIEW



TOP VIEW



REAR VIEW



### HOW TO ORDER

Description	Part Number
EBM60-FEG	EBM60N18/FEG
HV Output Cable - 3 meters	HVC75/4SO/1365
HV Output Cable - 4 meters	HVC75/4SO/1366



Spellman's shipborne and land-based power feed equipment (PFE) is used to power submarine fiberoptic cable repeaters for telecommunications shore stations and during cable laying and repair operations. We are the leading supplier of Power Feed Equipment to the Submarine Telecom Industry.

Spellman's Portable PFE (PFE-P) provides the consistent, reliable and safe high voltage power in a compact footprint. The PFE-P incorporates the same advanced digital management system as Spellman's Shipborne PFE (PFE-SB); including voltage and current control, push-button polarity setting, continuous monitoring and alarm reporting from the Main Control Unit (MCU).

The system can be configured with the optional System Management Terminal (SMT) to provide programmable electroding functions, data and event logging and fully adjustable ramp rates, trips and alarms.

The system is powered from a 230Vac single phase mains supply.

## SPECIFICATIONS

### Input Voltage:

230Vac  $\pm 10\%$  50/60Hz (Single Phase)

### Input Current:

50A ac maximum at minimum line voltage

### Output Voltage:

0 to 6kV, linearly controllable via the MCU

### Output Current:

1A maximum at any output voltage up to 6kV

### Polarity:

Reversible by selecting positive or negative mode on the MCU when the HV is disabled.

### Voltage and Current Ramp Rates:

See MCU and SMT description.

### Voltage Ripple:

$< 0.1\%$  pk-pk of max output +1Vrms

### Stability:

Typically  $< 0.25\%$  over any 24 hour period with a temperature range of 0°C to 30°C.

- **6kV 1A Portable Power Feed Equipment**
- **Can be Used as an Emergency or Auxiliary PFE**
- **Up and Down Ramp Rates for Voltage and Current**
- **Push-button Electronic Polarity Setting**
- **Alarm and Trip Functions**
- **SMT Option Offers Touch Screen Control, Programmable Electroding Function and Data/Event Logging**

### Voltage Regulation:

Load: 0.05% of full voltage +500mV for full load change

Line:  $\pm 0.05\%$  of full voltage +500mV over specified range

### Current Regulation:

Load: 0.05% of full current for any voltage change

Line:  $\pm 0.05\%$  of full current over specified input range

### Temperature Coefficient:

$< 100$  ppm/°C

### Operating Temperature:

0 to +30°C

### Humidity:

0% to 90%, non-condensing

### Cooling:

Local cooling and/or ventilation needs to be adequate to balance the system heat dissipation of 1.2kW at 6kV, 1A output.

### Safety:

The MCU is equipped with an Emergency Stop Button. Terminals in the rear of the cabinet allow connection of external emergency stop devices.

### Clamp/Safety Chassis:

Protects the connected line and PFE-P. A HV dump circuit will quickly and safely discharge the system in the event of emergency shutdown. Front panel mounted lamps indicate if the PFE-P output is safe or energized.

### HV Output:

The unit is supplied with 10 meters of RG213/URM67 cable terminated with a 15kV Lemo plug.  
See HV Output cable detail dwg.

### Control:

Manual controls for output voltage and current are provided on the MCU front panel. The PFE-P is capable of operating in either Constant Current or Constant Voltage mode as required by the operator.

### Protection:

Over-voltage and Over-current protection levels are settable on the MCU. In the event of a cooling fan failure, the internal temperature limit ensures a safe system shutdown.

### Regulatory Approvals:

RoHS compliant. Designed to meet IEC/UL 61010-1 safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1.

### Main Control Unit (MCU):

The system can be controlled manually using the MCU front panel controls.



- 4.2" LCD display
- Full output control and monitoring including polarity reversal
- 4mm socket monitor points for voltage and current
- Front panel controls for voltage and current
- Ramp rates available:  
Default: 60kV/min 6A/min  
Slow: 500V/min 0.2A/min
- Over volts/current trips
- HV ON and Alarm outputs provided for customer installation of warning lights and alarms

### Interlock System:

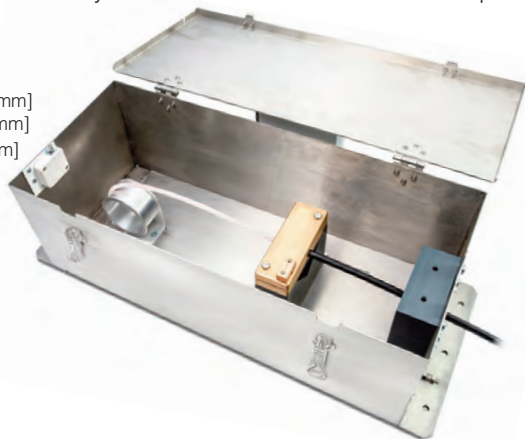
Full protection for user and connected equipment. All PFE-P access panels and patch panel connections are interlocked. External connection terminals are provided to allow connection to CTCs, associated equipment or external E-Stop devices.

### OPTIONS

#### Cable Termination Cubicle (CTC12/377)

Facility to safely accommodate half joints and bare cables for installation and repairs. The CTC provides a safe, interlocked enclosure for connection of the PFE HV to the cable conductors. 2 clamps and strain relief allow the fiber core to be separated and safely routed out of the box to external optical equipment.

W 27.26" [692mm]  
D 10.44" [265mm]  
H 8.27" [210mm]



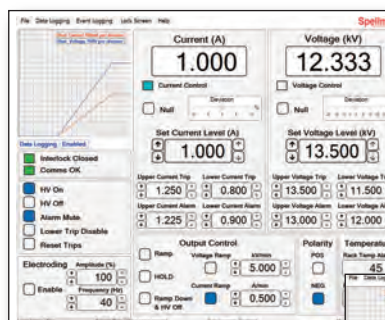
### System Management Terminal (SMT):

The optional SMT is an advanced touchscreen control and monitoring system which can be installed on top of the PFE or remotely up to 80m from the PFE.

- Full output control and monitoring
- Fully adjustable ramp rates in current or voltage control: 10V-10kV/min and 10mA-10A/min
- User settable over/under voltage and current trips and alarms
- Output voltage and current logging
- Event logging
- Programmable electroding (tone generator 10-40Hz provided)

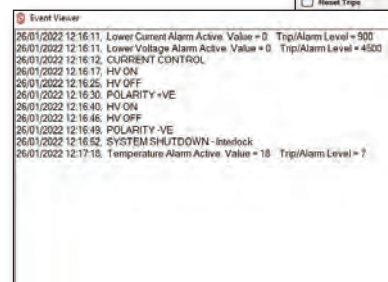


### Typical System Management Screens:



SMT Main Screen

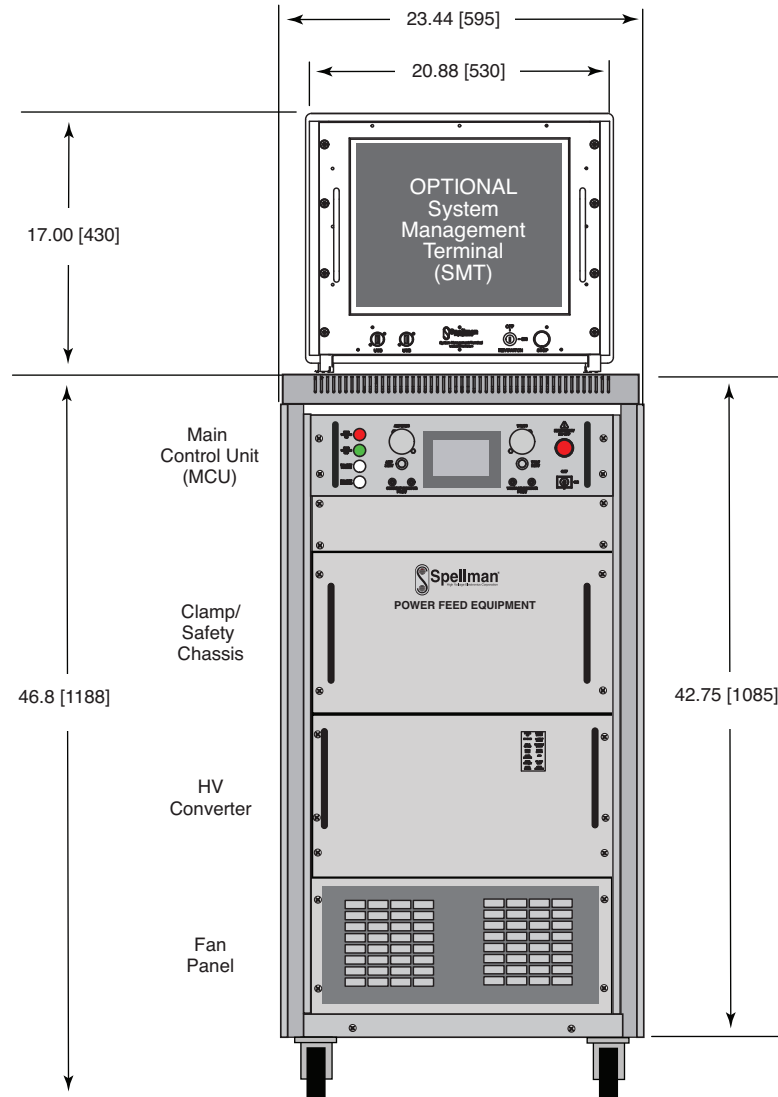
SMT Over Current Trip Screen



SMT Event Log

DIMENSIONS: in.[mm]

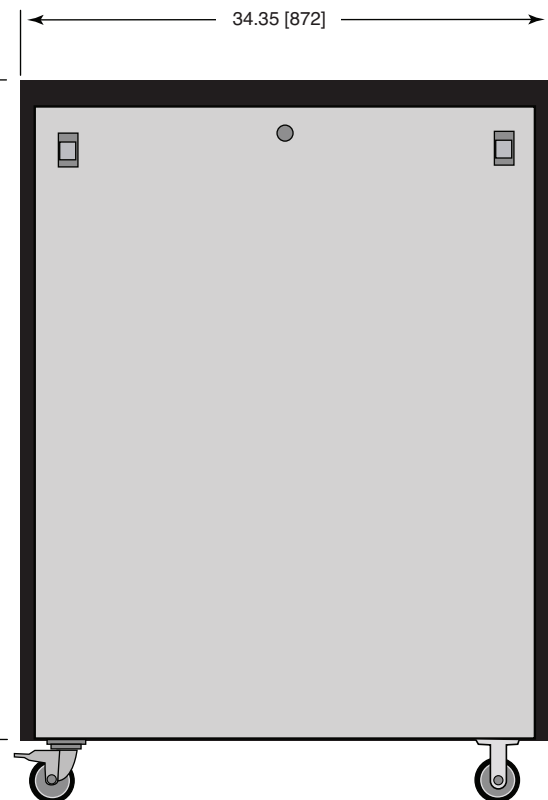
#### FRONT VIEW



#### PFE-P Weight

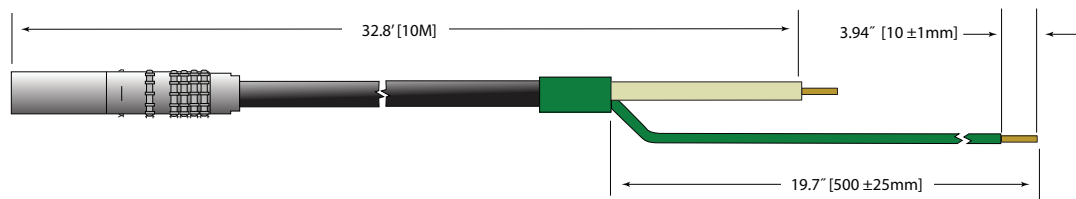
Optional SMT	33lbs. [15kg]
PFE-P	298lbs. [135kg]

#### SIDE VIEW



#### HV Output Cable

The unit is supplied with 10 meters of RG213/URM67 cable. Assembly terminated with a 15kV Lemo plug.





- **Full Array of Dry Contact Closures Available for Remote Station Alarm Monitoring**
- **Fully-Programmable Electronic Test Load Capable of Dissipating 5kW**
- **Electroding Functions Provided**
- **Single Cabinet. Rear Door Provided for Safety Interlocking**

Spellman High Voltage Electronics, the leading independent supplier of Power Feed Equipment to the Telecom industry, has developed a new generation of Low Voltage Power Feed Equipment, (PFE-LV). This proposed new PFE-LV is targeted at the emerging requirements for shorter submarine cable installations, while addressing underlying markets issues such as lower cost, smaller foot print, and easier operation.

### KEY FEATURES

Redundancy is provided for the converters (1+1)

Simplified sliding drawers for PFE open, grounding, test modes

Redundancy is provided for the LCU. In case of failure of LCU, the PFE will continue to operate normally

LCU contains pull-out 17" LCD screen, keyboard, trackball and CPU

Simplified keylock scheme ensures safety of operating personnel

Highly visible Vacuum Fluorescent Display (VFD) on each Converter displays voltage, current and modes of operation

Unique protective "trap door" barrier allows a converter or test load to be replaced safely while the PFE is still powering the cable

### SPECIFICATIONS

#### Output Voltage:

6kV maximum rated continuous operation, 5kV nominal

#### Output Current:

1.2A maximum rated continuous operation, 1.0A nominal

#### Output Power:

5kW for 1+1 redundancy

#### Input Voltage:

-40.5 VDC to -60 VDC

#### Programming:

Full-featured programming, monitoring, alarms, diagnostics, and ramping functions provided via LCU module.

#### Monitoring:

Full local and remote monitoring via Ethernet connection.

#### Current Ripple:

10mA peak to peak of maximum output

#### Voltage Ripple:

0.2% peak to peak of maximum output

#### Current Stability:

0.1% (constant load) after a 4 hour warm up

#### Operating Temperature:

5 to 40°C operating

#### Storage Temperature:

-40 to +85°C storage

#### Humidity:

5% to 85%, non-condensing

#### Cooling:

Forced Air

#### Dimensions:

86.68"H x 23.64"W x 23.64"D  
(2200mm x 600mm x 600mm)

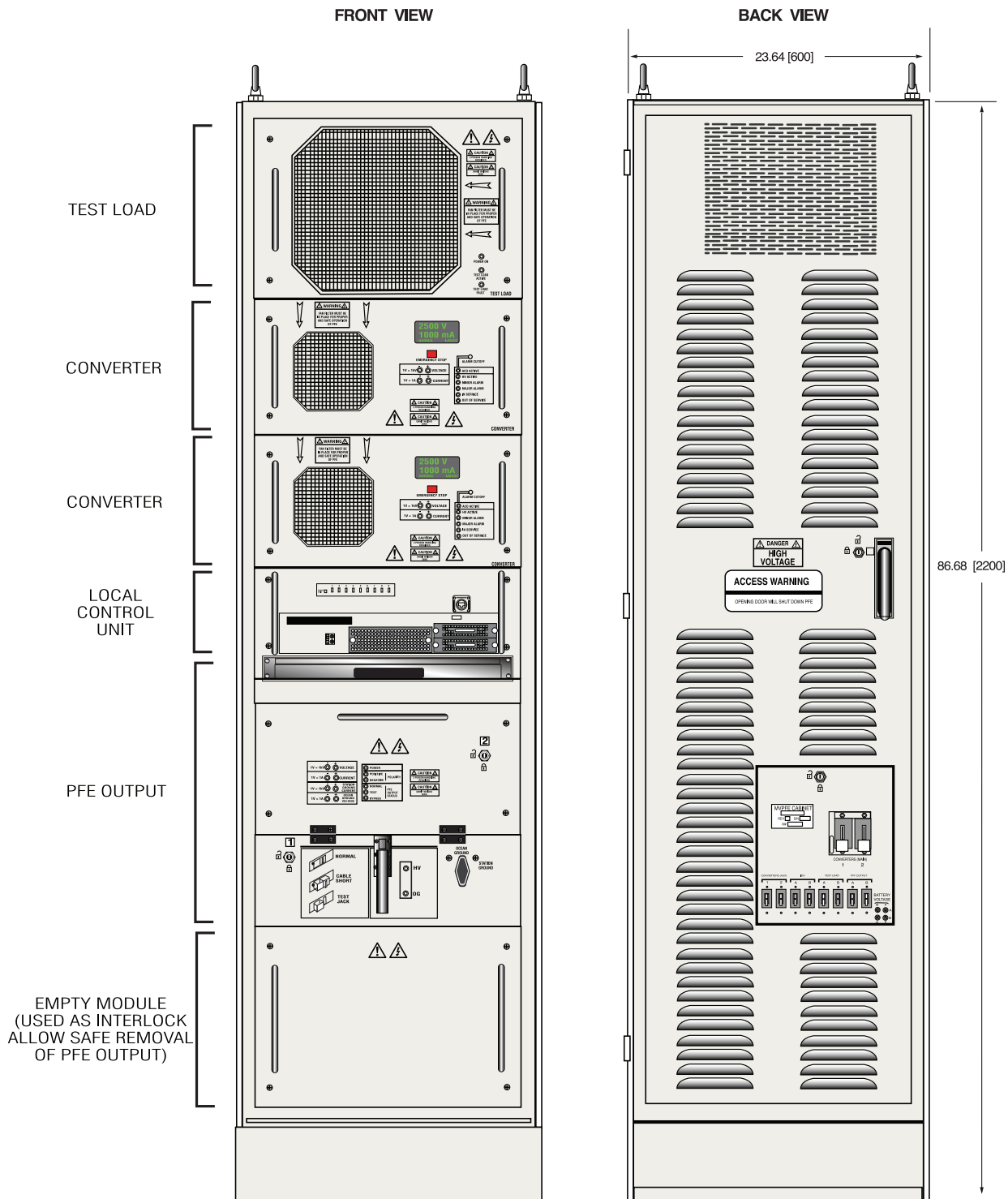
#### Weight:

900 pounds (335.9kg)

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. X2744 is GR-63-CORE, GR-189-CORE, ETSI ETS 300 019, ETS 300 118, ETS 300 127, ETSI EN 300 132-2, ETSI EN 300 386, EN 60950. UL/CUL recognized file E148969 (A5) (X2743, X2744, X2745).

DIMENSIONS: in.[mm]





Spellman High Voltage Electronics, the leading independent supplier of Power Feed Equipment to the Telecom industry, has developed a new generation of High Voltage Power Feed Equipment, (PFE-HV). This PFE-HV is targeted at the emerging requirements for longer submarine cable installations, while addressing underlying issues such as lower cost, smaller foot print, and easier operation.

### KEY FEATURES

Redundancy is provided for the converters (n+1)

Simplified sliding drawers for PFE open, grounding, test modes

Redundancy is provided for the LCU. In case of failure of LCU, the PFE will continue to operate normally

LCU contains pull-out 17" LCD screen, keyboard, mouse pad and CPU

Simplified keylock scheme ensures safety of operating personnel

Highly visible Vacuum Fluorescent Display (VFD) on the output module (OMU) and each converter displays voltage, current and modes of operation

Unique protective "trap door" barrier allows a converter to be replaced safely while the PFE is still powering the cable

### SPECIFICATIONS

#### Output Voltage:

18kV maximum rated continuous operation, up to 15kV nominal

#### Output Current:

1.8A maximum rated continuous operation, 1.5A nominal

- **6, 9, 12, 15kV Versions Available, each @ 1.5A**
- **Full Array of Dry Contact Closures for Remote Station Alarm Monitoring**
- **Fully-Programmable Electronic Test Load Bay Capable of Dissipating 22.5kW**
- **Electroding Functions Provided**
- **3-Bay Design. Rear Doors Provided for Safety Interlocking**
- **Built-in Data Logger Functions Capture Data Every 10ms**

#### Output Power:

Up to 22.5kW for n+1 redundancy

#### Input Voltage:

-40.5Vdc to -60Vdc

#### Programming:

Full-featured programming, monitoring, alarms, diagnostics, and ramping functions provided via LCU module.

#### Monitoring:

Full local and remote monitoring via Ethernet connection.

#### Current Ripple:

10mA peak to peak of maximum output

#### Voltage Ripple:

0.2% peak to peak of maximum output

#### Current Stability:

0.1% (constant load) after a 4 hour warm up

#### Operating Temperature:

5 to 40°C operating

#### Storage Temperature:

-40 to +85°C storage

#### Humidity:

5% to 85%, non-condensing

#### Cooling:

Forced Air

#### Dimensions: (per bay)

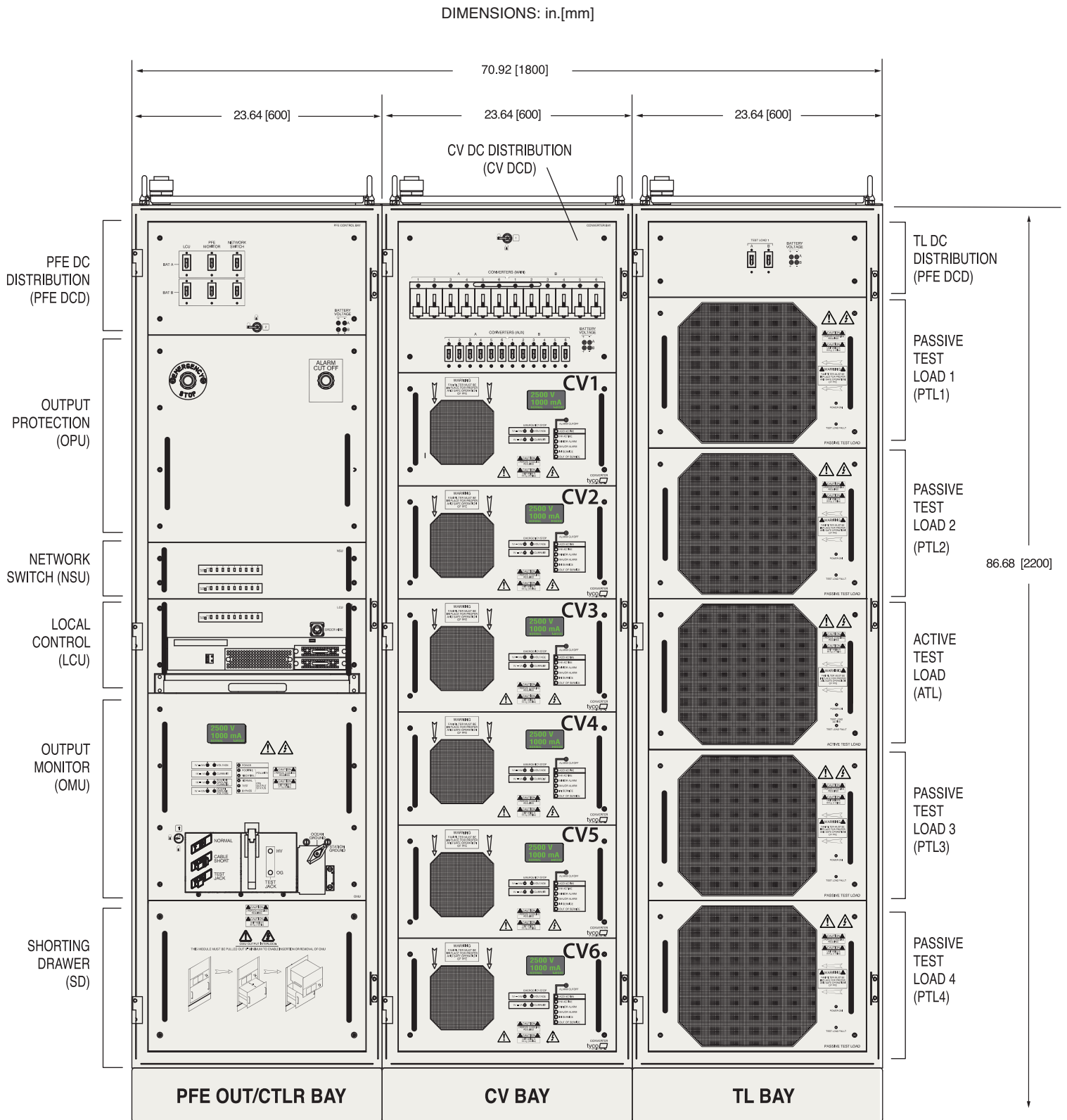
86.68"H x 23.64"W x 23.64"D  
(2200mm x 600mm x 600mm)

#### Weight: (per bay)

900 pounds (335.9kg)

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. GR-63-CORE, GR-189-CORE, ETSI ETS 300 019, ETS 300 118, ETS 300 127, ETSI EN 300 132-2, ETSI EN 300 386, EN 60950. Safety IEC 60950-1 E148969- (A5) (X4146, X4147, X4148, X4149, X4750)





- **6kV to 20kV Versions Available**
- **Continuously Variable Electronic Test Load Capable of Dissipating 30kW**
- **Up and Down Ramp Rates for Voltage and Current**
- **Programmable Electroding Functions Provided**
- **Electronic Polarity Reversal**
- **Data and Event Logging Functions**
- **Alarm and Trip Functions**

Spellman High Voltage is the leading independent supplier of Power Feed Equipment to the Telecom industry and most frequently utilized power supplies for shipborne uses. Our Power Feed Equipment (PFE-SB) has been optimized for shipborne use to provide continuous power to a line whilst being laid and is known for its reliability and quality. It is used with repeatered fiber optic cable systems for telecommunications and has been installed on numerous cable laying ships around the world.

It provides all of the features to allow safe, reliable operation with configuration functions to suit all cable installation requirements. The PFE system is designed to provide a well-regulated, low ripple, high voltage supply at varying current requirements.

An advanced digital management system provides output configuration, control, polarity setting, continuous monitoring and alarm reporting from the Main Control Unit (MCU), or the System Management Terminal (SMT).

The Electronic Test Load is an active solid-state design allowing the load to be dynamically varied using a manual front panel control.

The system is powered directly from 3-phase supply without the need for autotransformers.

### Input Wiring:

3Φ + Neutral (Star). For a 3Φ supply without a neutral (delta), a single phase 230Vac 10A supply will be required to power the control modules.

### Voltage Ripple:

<0.3%

### Stability:

Typically <0.25% over any 24 hour period with a temperature range of 0°C to 30°C.

### Voltage Regulation:

Load: 0.05% of full voltage for full load change  
Line: +/-0.05% of full voltage +500mV over specified range

### Current Regulation:

Load: 0.05% of full current for any voltage change  
Line: +/-0.05% of full current over specified input range

### Temperature Coefficient:

< 100 ppm/°C

### Operating Temperature:

0 to +30°C

### Storage Temperature:

-10 to +70°C

### Humidity:

0% to 90%, non-condensing

### Cooling:

Forced Air. 210 liters/sec (445 cfm) per cabinet, 1500 liters/sec (3180 cfm) for the test load

### Regulatory Approvals:

Designed to meet IEC/UL 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use; CAN/CSA-C22.2 No.61010-1.

## SPECIFICATIONS

### PFE-SB—Input/Output

Model	Output Voltage	Output Current	Input Voltage	Input Current (per phase max)
PFESB6PN12	6kV	2A max	400Vac 3 phase ±10% 50/60Hz	25A
PFESB10PN24	10kV	2.4A max		40A
PFESB15PN36	15kV	2.4A max		60A
PFESB20PN40	20kV	2A max		75A

### KEY FEATURES

#### Clamp/Safety Chassis:

Protects the repeaters/cable and PFE. A HV relay and dump circuit will quickly and safely discharge the system in case of emergency shutdown. A front panel mounted lamp indicates if the PFE output is energized.

#### Output Control:

Using either the Main Control Unit (MCU) or SMT; the system output can be operated in constant current or constant voltage control and as a feed for a single end, double end or branched line.

#### System Management

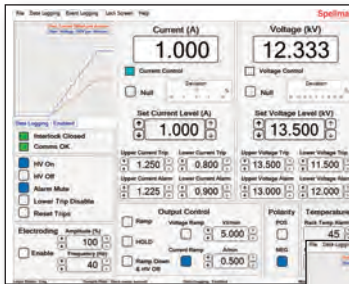
##### Terminal (SMT):

The SMT is an advanced touchscreen control and monitoring system which can be installed within the PFE cabinets or remotely up to 80m from the PFE.



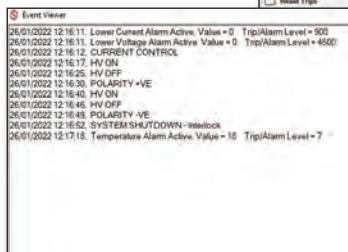
- Full output control and monitoring
- Fully adjustable ramp rates in current or voltage control: 10V-10kV/min and 10mA-10A/min
- User settable over/under voltage and current trips and alarms
- Output voltage and current logging
- Event logging
- Programmable electroding (tone generator 10-40Hz provided)

#### Typical System Management Screens:



SMT Main Screen

SMT Over Current Trip Screen



SMT Event Log

#### Main Control Unit (MCU):

The system can be controlled manually using the MCU front panel controls.



- 4.2" LCD display
- Full output control and monitoring including polarity reversal
- Test points for voltage and current
- Front panel controls for voltage and current
- Ramp rates available:  
Default: 60kV/min 6A/min  
Slow: 500V/min 0.2A/min
- Over volts/current trips
- HV and Alarm outputs

#### Patch Panel:

User configurable interconnects from Converter(s) to Electronic Load or Cable Termination Cubicles (CTC's).

#### Electronic Load:

Fully isolated and actively adjustable resistance by the user.

- Max power: 30kW
- Max voltage:  $\pm 15kV @ 2A$
- Max current: 2.4A @  $\pm 12.5kV$

#### Interlock System:

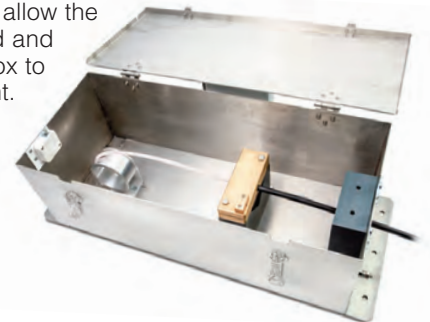
Full protection for user and connected equipment. All PFE access panels and patch panel connections are interlocked. External connection terminals are provided to allow connection to CTCs, associated equipment or external E-Stop circuits.

#### Optional Hood (17668-4)

A flange at the rear provides attachment of exhaust ducting, allowing most of the heat dissipated from the system to be transferred outside the immediate environment of the PFE.

#### Optional Cable Termination Cubicle (CTC12/377)

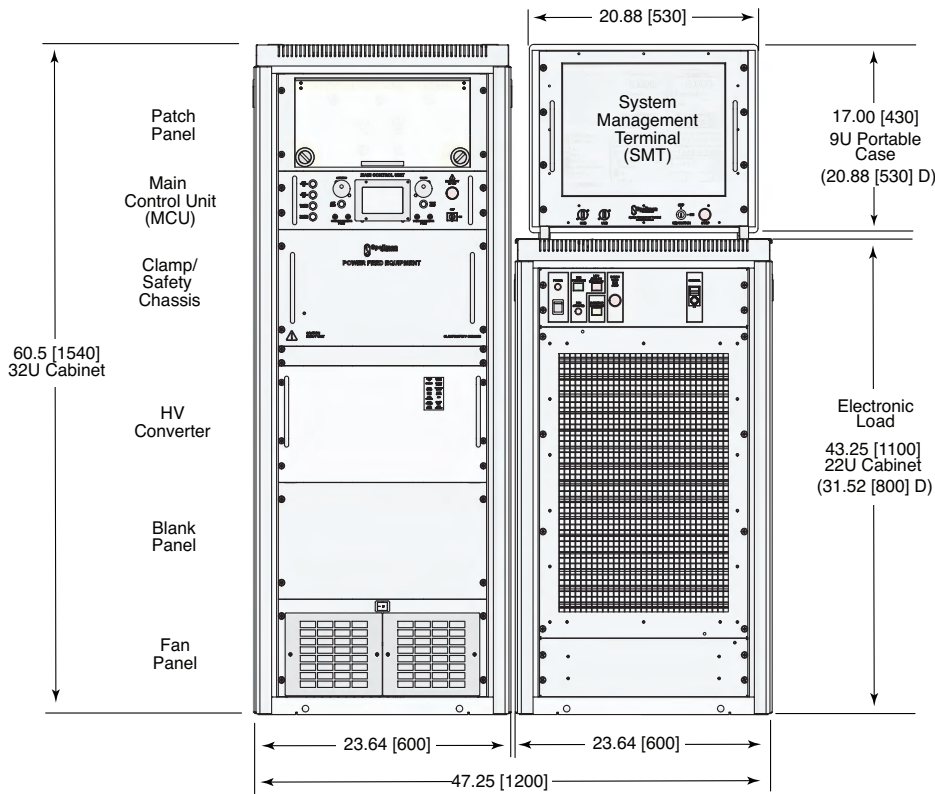
Facility to safely accommodate half joints and bare cables for installation and repairs. The CTC provides a safe, interlocked enclosure for connection of the PFE HV to the cable conductors. 2 clamps and strain relief allow the fiber core to be separated and safely routed out of the box to external optical equipment.



- W 27.26" [692mm]
- D 10.44" [265mm]
- H 8.27" [210mm]

DIMENSIONS: in.[mm]

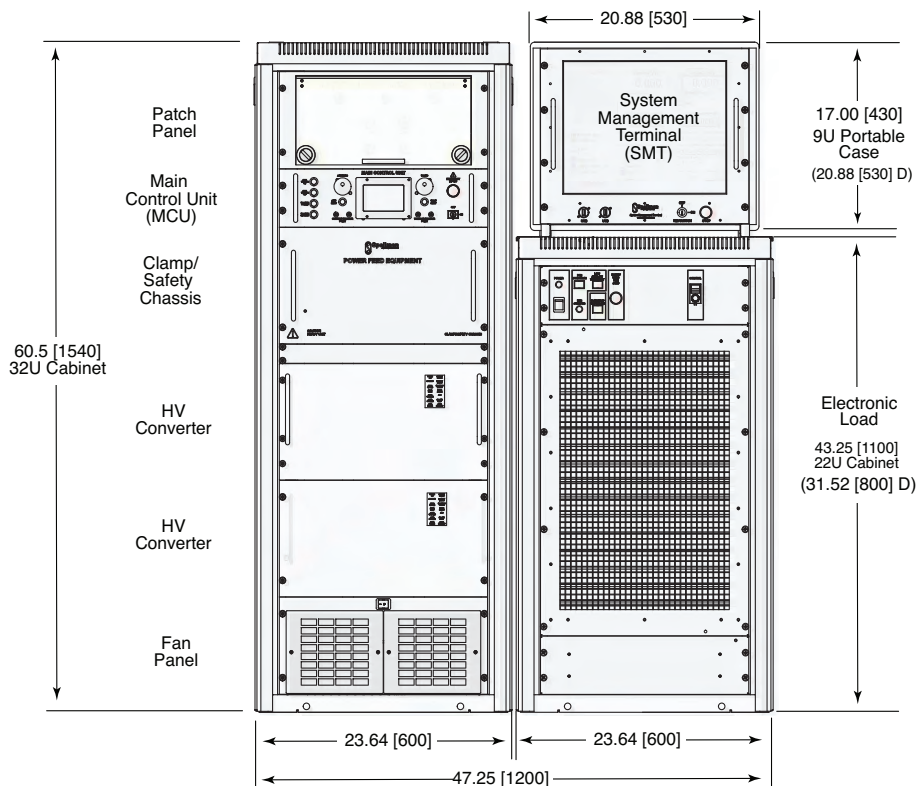
### PFESB6PN12



#### PFESB6PN12 Weight

Cabinet 1	441lbs. [200kg]
SMT	33lbs. [15kg]
Electronic Load	364lbs. [165kg]

### PFESB10PN24

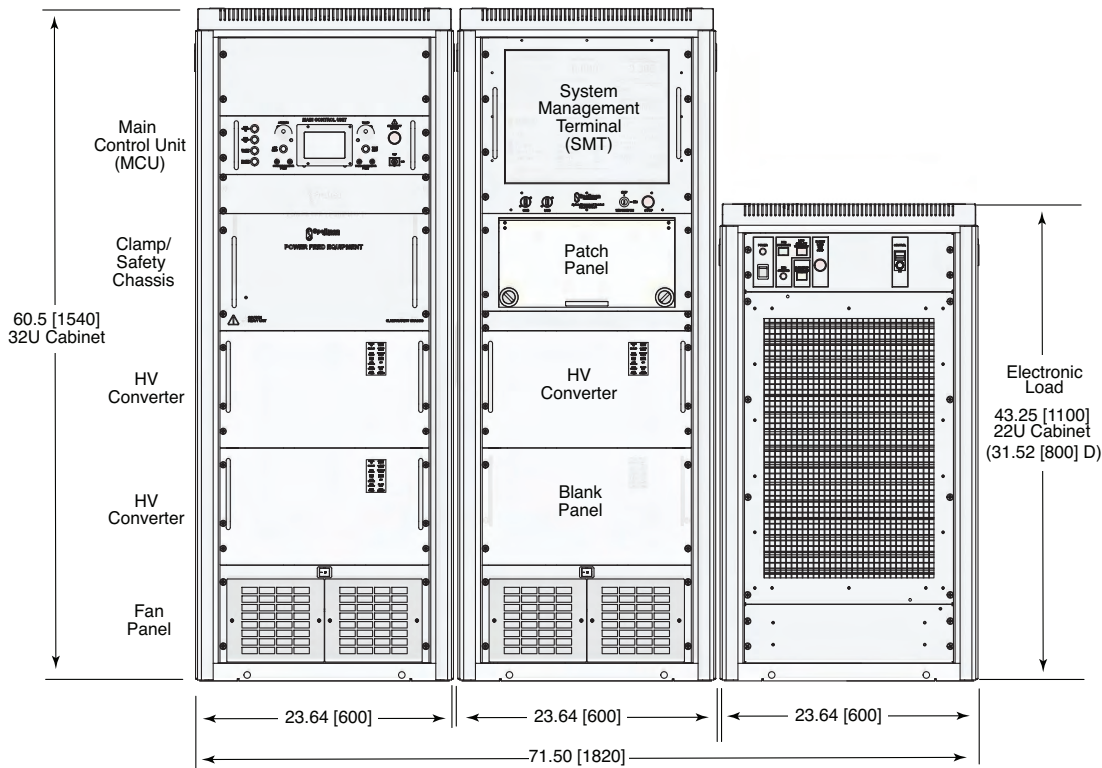


#### PFESB10PN24 Weight

Cabinet 1	529lbs. [240kg]
SMT	33lbs. [15kg]
Electronic Load	364lbs. [165kg]

DIMENSIONS: in.[mm]

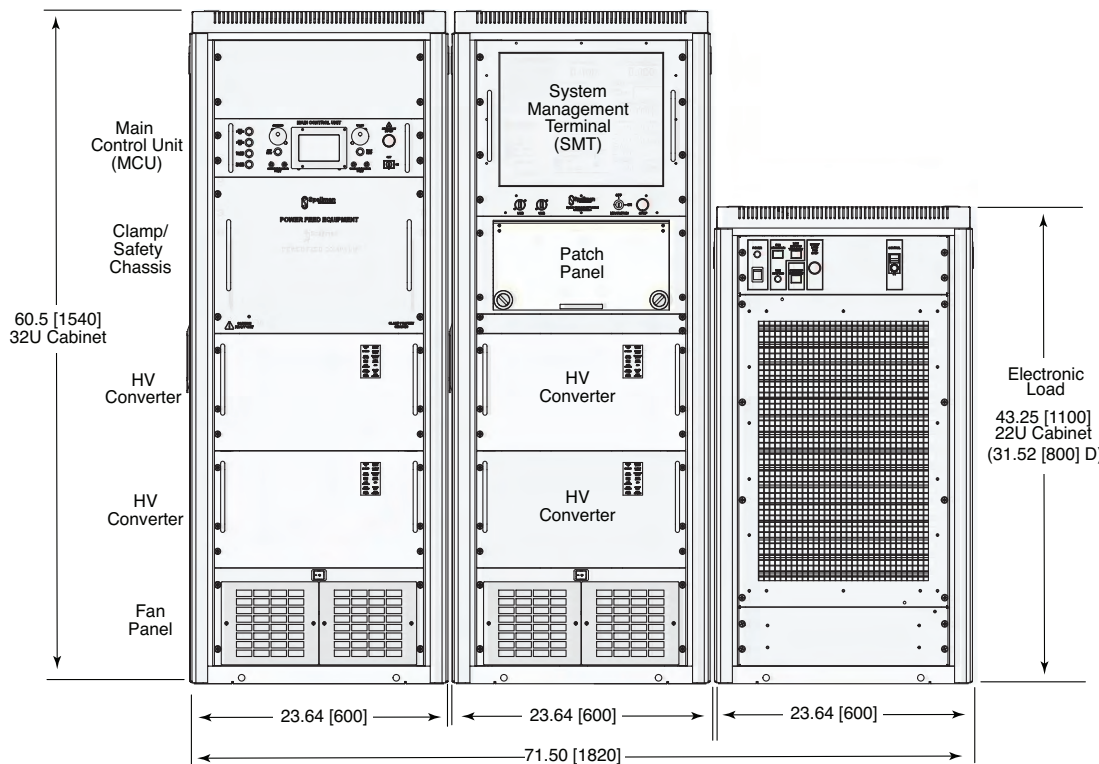
### PFESB15PN36



#### PFESB15PN36 Weight

Cabinet 1	507lbs. [230kg]
Cabinet 2	309lbs. [140kg]
Electronic Load	364lbs. [165kg]

### PFESB20PN40



#### PFESB20PN40 Weight

Cabinet 1	507lbs. [230kg]
Cabinet 2	419lbs. [190kg]
Electronic Load	364lbs. [165kg]



- **Multiple Outputs**
- **Simple Interface Via Three Control Inputs**
- **Pre set Adjustment of Output Voltages in Four Mode Operation**

Spellman's new DGM935 high voltage power supply for Image Intensifier applications continues to set the standards for high voltage power conversion technology. The DGM series can be adapted to suit specific requirements with a wide selection of multiple output voltages and power capabilities in a compact package, making it perfect for the OEM user.

Monitoring of all output voltages is possible via local test points. The unit can operate in four modes selectable via three inputs. The output voltages are independently adjustable in each mode by the pre-set potentiometer located on the front of the unit.

## TYPICAL APPLICATIONS

Radiology  
Cardiology  
Neuroradiology  
Night Surveillance  
Non Destructive X-Ray Inspection  
Image Intensifiers

## SPECIFICATIONS

### Input Voltage:

+24Vdc  $\pm 1\%$

### Input Current:

500mA maximum

### Output Voltages:

#### Anode:

Output Voltage: 30kV  
Output Current: 30 $\mu$ A

#### Electrode 1:

Output Voltage: 50V to 300V  
Output Current: 0 to 1 $\mu$ A

#### Electrode 2:

Output Voltage: 300V to 2kV  
Output Current: 0 to 1 $\mu$ A

#### Electrode 3:

Output Voltage: 2kV to 18kV  
Output Current: 0 to 18 $\mu$ A

### Ripple:

<0.3%

### Temperature Coefficient:

<200ppmK<sup>-1</sup>

### Stability:

<0.3% over 8 hrs

### Temperature:

Operating: +5°C to +55°C

### Input:

8 pin header

### Dimensions:

6.30"H x 5.51"W x 1.93"D (160mm x 140mm x 49mm)

### Weight:

2.86 lb. (1.5kg)

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. Compliant to IEC 60601-1. UL/CUL recognized, File E242588. RoHS Compliant.

## INPUT/OUTPUT CONNECTORS

### Test Point Terminals:

Wire type suitable for clip on probe.

### Output Terminals (0V, OVP and GND):

6.3mm Fast-on connector and M4 x 12mm stud

### Output Connector Anode:

M14 X 1 thread, 53mm deep x 8.5mm internal diameter.

### Output Connector (electrodes 1 & 2):

5/16 x 32 UNF thread, 26.5mm deep x 5mm internal diameter.

### Inputs PC and G:

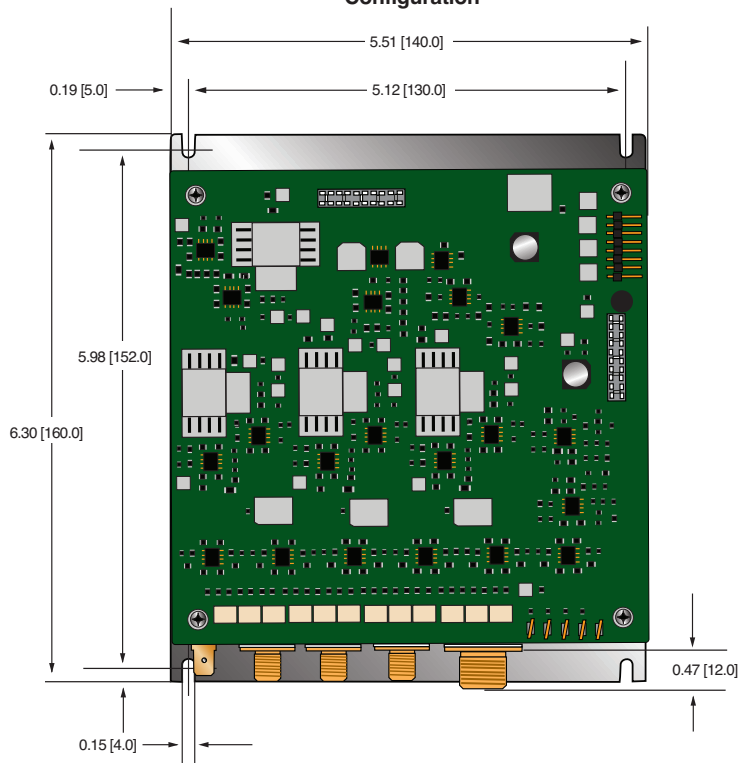
6.3mm Fast-on connector

Note: 0V, OVP and GND are all connected together internally.

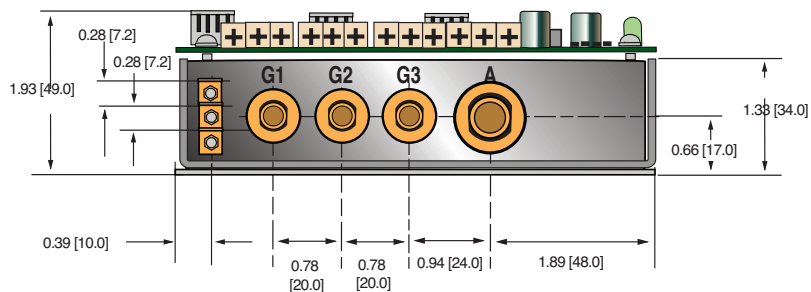
All outputs are protected against high voltage breakdown in the user's equipment and short-circuit protected.

DIMENSIONS: in.[mm]

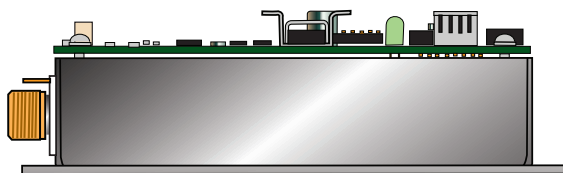
**TOP VIEW**  
(A)  
Configuration



**FRONT VIEW**



**SIDE VIEW**

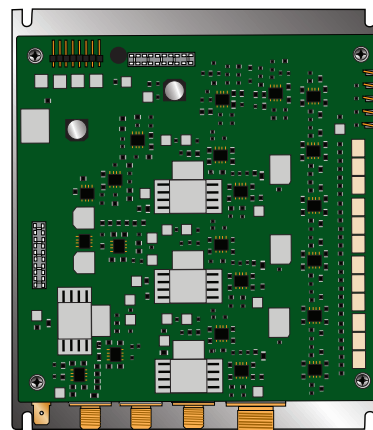


### INPUT 8 PIN HEADER

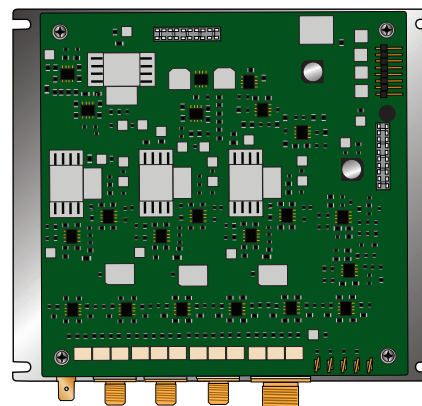
PIN	SIGNAL	SIGNAL PARAMETERS
1	24V	Power Input
2	0V	Power Ground
3	0V	Power Ground
4	24V	Linked internally to pin1
5	M2	Mode select input 2
6	M1	Mode select input 1
7	N/C	N/C
8	M3	Mode select input 3

### ALTERNATE CONFIGURATIONS AVAILABLE (Specify at time of order)

(B)  
Configuration



(C)  
Configuration





- **Multiple Outputs**
- **Three Control Inputs**
- **Three Optical Encoders**
- **RS-232 Serial Port for Control and Monitoring**
- **OEM Customization Available**

## SPECIFICATIONS

### Input Voltage:

+24Vdc  $\pm 10\%$

### Input Current:

500mA maximum

### Programmable Output Voltages:

#### Anode:

Output Voltage: 30kV

Output Current: 5 $\mu$ A continuous (50 $\mu$ A peak)

#### Electrode 1:

Output Voltage: 10V to 350V

Output Current: 0 to 10 $\mu$ A

#### Electrode 2:

Output Voltage: 200V to 2kV

Output Current: 0 to 10 $\mu$ A

#### Electrode 3:

Output Voltage: 2kV to 20kV

Output Current: 0 to 20 $\mu$ A

#### Electrode 4:

Output Voltage: 2.7kV

Output Current: 0 to 10 $\mu$ A

### Ripple:

<0.3%

### Temperature Coefficient:

<200ppmK<sup>-1</sup>

### Stability:

<0.3% over 8 hrs

### Temperature:

Operating: +5°C to +55°C

### Input Connector:

15 pin male sub D

### Dimensions:

5.47"H x 5.67"W x 1.97"D (139mm x 144mm x 50mm)

### Weight:

2.86 lb. (1.3kg)

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. Compliant to IEC 60601-1. UL/CUL recognized, File E242588. RoHS Compliant.

Spellman's new DGM945 high voltage power supply for Image Intensifier applications continues to set the standards for high voltage power conversion technology.

The DGM945 also has inputs to allow measurement of the photocathode current and getter current. The photocathode measurement has two ranges : sensitive range: 0 to 50nA and a standard range: 0 to 15 $\mu$ A. The sensitive input is used to provide a monitor output with a sensitivity of 0.1V/nA. The getter input allows measurement of the getter current, indicating if the Image Intensifier tube is still holding a good vacuum and is without gases causing ions.

Monitoring of all output voltages is possible via local test points or over the serial interface. The unit can also store up to eight modes of operation. The output voltages are independently adjustable in each mode either by the rotary encoders built into the unit or via the serial interface.

The DGM series can be adapted to suit specific requirements with a wide selection of multiple output voltages and power capabilities in a compact package, making it perfect for the OEM user.

## TYPICAL APPLICATIONS

Radiology  
Cardiology  
Neuroradiology  
Night Surveillance  
Non Destructive X-Ray Inspection  
Image Intensifiers

## INPUT 15 PIN MALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	0V	Signal Ground
2	RxD	RS-232 receive data input
3	TxD	RS-232 transmit data output
4	0V	Signal Ground
5	0V	Signal Ground
6	UC2	Mode select input 2
7	0V	Signal Ground
8	0VP	Power return
9	DTR	RS-232 Data terminal ready output
10	CTS	RS-232 Clear to send input
11	N/C	N/C
12	Ipc	Ipc = 10nA / volt
13	UC3	Mode select input 3
14	UC1	Mode select input 1
15	24V	Power input

## INPUT/OUTPUT CONNECTORS

### Test Point Terminals:

Copper pad plus 1.1 mm Ø pth.

### Output Terminals (0V, OVP and GND):

6.3mm Fast-on connector and M4 x 12mm stud

### Output Connector Anode:

LGH1

### Output Connector (other electrodes):

LGH½

### Inputs PC and G:

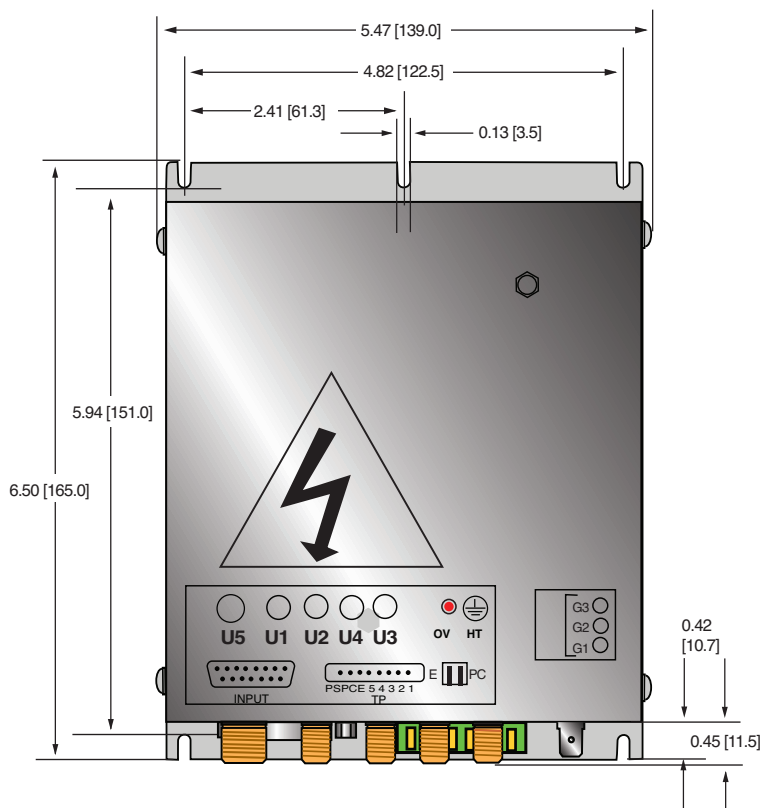
6.3mm Fast-on connector

Note: 0V, OVP and GND are all connected together internally.

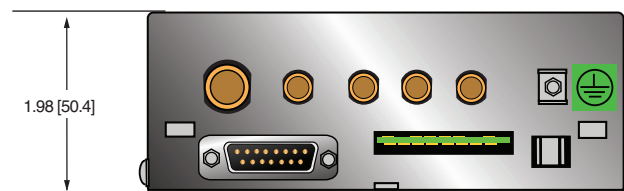
All outputs are protected against high voltage breakdown in the user's equipment and short-circuit protected.

DIMENSIONS: in.[mm]

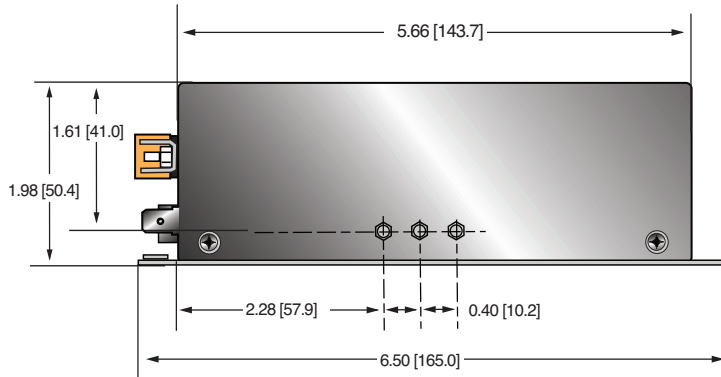
### TOP VIEW



### FRONT VIEW



### SIDE VIEW





- **Ideal for Electrospinning**
- **0-30kV Local or Remote Programming**
- **0-300 $\mu$ A Local or Remote Programming**
- **Polarity Reversible Upon Command in <1 Sec at No Load**
- **Low Stored Energy, Current Limited Output**
- **Full Feature Front Panel, Ideal for Laboratory Usage**

Spellman's CZE1000R is a full feature rack mountable high voltage power supply ideal for laboratory usage. It's designed to meet the needs of applications requiring a hot switched reversible output voltage. The output polarity can be quickly and safely reversed via a front panel switch.

Both the output voltage and current are fully adjustable from 0 to 30kV and 0 to 300 $\mu$ A via front panel ten turn locking counting dials. Remote control operation is done by 0 to +10Vdc programming signals; either user generated or using the provided +10 Vdc reference and external potentiometers.

Front panel voltage and current meters provide local monitoring. Voltage and current test points are provided such that 0 to 10Vdc corresponds to 0 to 100% rated output.

A two position, normally closed, external interlock is provided for protection of external high voltage accessible areas. If the interlock is opened the high voltage will shut off and fall to zero in less than one second and not be able to be re-energized until the interlock is closed.

Excellent load and line regulation specifications along with outstanding stability and low ripple of the CZE1000R assure a stable high voltage output for consistent process results.

## TYPICAL APPLICATIONS

Electrospinning  
Mass Spectrometry  
Capillary Electrophoresis  
Electrostatic Research

## OPTIONS

**220** 220Vac Input Voltage  
**RPO** Rear Panel HV Output

## SPECIFICATIONS

### Input Voltage:

115Vac,  $\pm 10\%$ , 50/60Hz

### Input Current:

Less than 1 amp

### Efficiency:

75% typical

### Output Voltage:

0 to 30kV

### Polarity:

Auto reversible via front panel switch

### Output Current:

0 to 300 $\mu$ A

### Power:

9 watts, maximum

### Line Regulation:

0.01% for a 10% input voltage change

### Load Regulation:

0.01% for a full load change

### Ripple:

0.1% Vp-p

### Stability:

0.02% per 8 hours (after 1/2 hr warmup)

### NL Time Constant:

100ms

### Stored Energy:

0.2 Joules at 30kV

### Temperature Coefficient:

100ppm/ $^{\circ}$ C

### Operating Temperature:

0 $^{\circ}$ C to 40 $^{\circ}$ C

### Storage Temperature:

-40 $^{\circ}$ C to 85 $^{\circ}$ C

### Humidity:

10% to 85% RH, non condensing

### Cooling:

Convection cooled

### Dimensions:

5.25"H x 19"W x 17"D (13.3cm x 48.3cm x 43.2cm).

### Weight:

22lbs. (10kg)

### Interface Connector:

14 pin terminal block

### AC Input Connector:

IEC320 connector with 6' (1.83m) cord

### HV Output Connector:

Detachable 36" (0.91m) cable provided

### Regulatory Approvals:

Designed to meet EEC EMC Directive. Designed to meet EEC Low Voltage Directive.

DIMENSIONS: in.[mm]

### CZE1000R TERMINAL BLOCK 14 PIN

PIN	SIGNAL	PARAMETERS
1	+10Vdc Reference Output	+10Vdc, 4mA maximum
2	Internal Voltage Control	Front Panel Program Voltage (programming potentiometer)
3	Voltage Program Input	0 to 10Vdc = 0 to 100% rated output, Zin = 10MΩ
4	Internal Current Control	Front Panel Current Control (programming potentiometer)
5	Current Program Input	0 to 10Vdc = 0 to 100% rated output, Zin = 10MΩ
6	Signal Common	Ground
7	Voltage Test Point	0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ, 1%
8	Current Test Point	0 to 10Vdc = 0 to 100% Rated Output, Zout = 10kΩ, 1%
9	External Interlock Out	32Vdc @ 2 amps, max, (connect to pin 10 through safety switch)
10	External Interlock In	Return for interlock (connect to pin 9 through safety switch)
11	+10Vdc Reference Output	+10Vdc, 4mA maximum
12	Enable	Open or ground = HV OFF, >3.4Vdc (up to 15Vdc) = HV ON
13	Spare	No Connection
14	Spare	No Connection

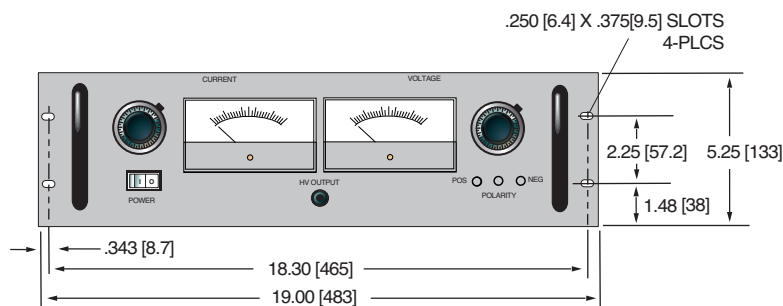
#### Note:

The unit is shipped with the following pins jumpered for front panel operation: 2-3, 4-5, 9-10, 11-12. It is strongly recommended to remove the 9-10 jumper and use a high voltage safety interlock switch.

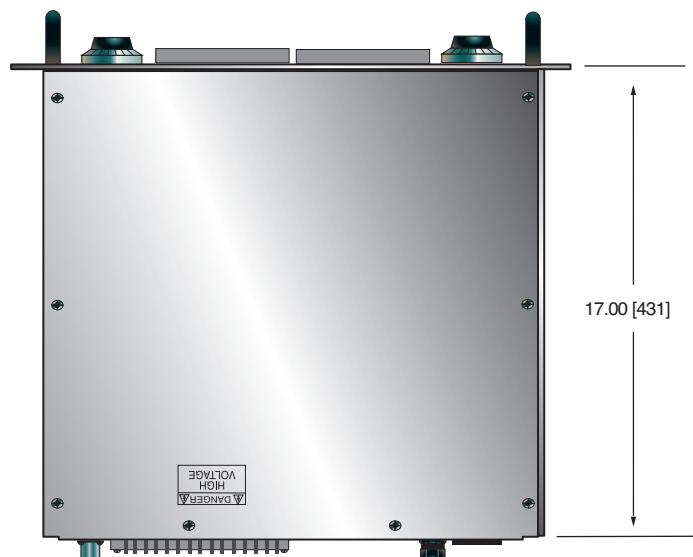
#### High Voltage Cable:

A mating high voltage connector is provide with the unit. Have a spare on hand or replace broken/lost mating high voltage cables by ordering Spellman part number 105719-034

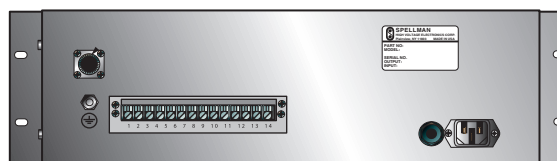
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW





- **Ideal for Electrospinning**
- **0-30kV Remotely Programmable**
- **0-300 $\mu$ A Remotely Programmable**
- **Polarity Reversible Upon Command in <1 Sec at No Load**
- **Low Stored Energy, Current Limited Output**
- **Cost Effective Modular Design**

Spellman's CZE2000 modular high voltage power supply is ideal for OEM usage. It is specifically designed to meet the needs of applications requiring a hot switched reversible output voltage. The output polarity of the unit can be quickly and safely reversed via the Polarity Control Signal provided on the interface connector.

Both the output voltage and current are fully adjustable via ground referenced remote programming signals such that 0 to 10Vdc corresponds to 0 to 100% rated output voltage and current.

Remote motioning functionality is provided by voltage and current test points such that 0 to 10Vdc corresponds to 0 to 100% rated voltage and current. Additionally remote polarity and mode indicators provide a comprehensive overview of power supply operation.

Excellent load and line regulation specifications along with outstanding stability and low ripple assure a stable high voltage output for consistent process results.

## TYPICAL APPLICATIONS

Electrospinning  
Mass Spectrometry  
Capillary Electrophoresis  
Electrostatic Research

## SPECIFICATIONS

### Input Voltage:

24Vdc,  $\pm 10\%$

### Input Current:

Less than 1 amp

### Efficiency:

75% typical

### Output Voltage:

See selection table

### Output Current:

See selection table

### Polarity:

Auto reversible via command

### Power:

10 watts, maximum

### Line Regulation:

0.01% for a 10% input voltage change

### Load Regulation:

0.01% for a full load change

### Ripple:

0.1% Vp-p

### Stability:

0.02% per 8 hours (after 1/2 hr warmup)

### NL Time Constant:

100ms

### Stored Energy:

0.2 Joules at 30kV

### Temperature Coefficient:

100ppm/ $^{\circ}$ C

### Operating Temperature:

0 $^{\circ}$ C to 40 $^{\circ}$ C

### Storage Temperature:

-40 $^{\circ}$ C to 85 $^{\circ}$ C

### Humidity:

10% to 85% RH, non condensing

### Cooling:

Convection cooled

### Dimensions:

3.5"H x 5"W x 10"D (8.9cm x 12.7cm x 25.4cm).

### Weight:

6.2lbs. (2.8kg)

### Interface Connector:

25 pin male D connector

### HV Output Connector:

Detachable 36" (0.91m) cable provided

### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E148969. RoHS Compliant.

#### CZE2000 SELECTION TABLE

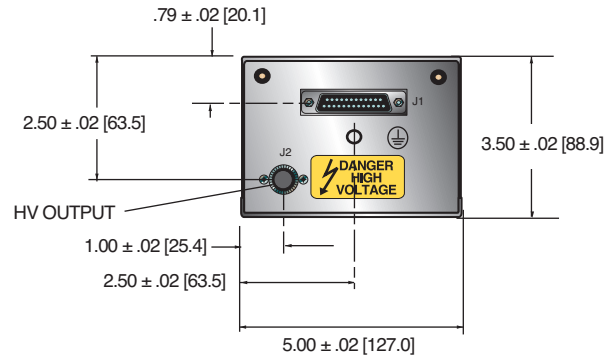
MAXIMUM RATING		MODEL NUMBER
kV	mA	
5	2.0	CZE5PN2000
10	1.0	CZE10PN2000
15	0.67	CZE15PN2000
20	0.50	CZE20PN2000
30	0.30	CZE2000

#### CZE2000 25 PIN MALE D CONNECTOR

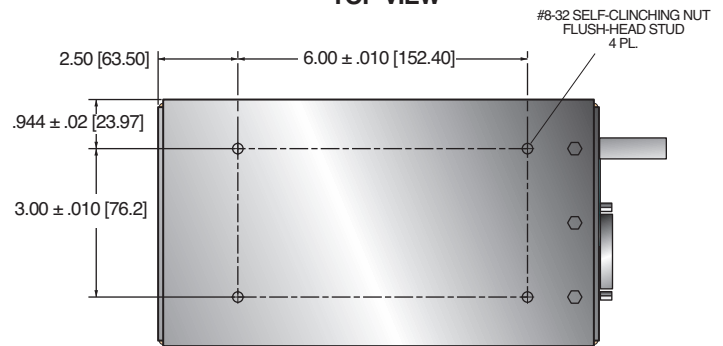
PIN	SIGNAL	PARAMETERS
1	+24Vdc Return	Power Return
2	+24Vdc Return	Power Return
3	+24Vdc Return	Power Return
4	HV Enable/Inhibit	Open or <1Vdc = HV OFF, >3.4Vdc (up to 15Vdc) = HV ON
5	Voltage Test Point	0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ, 1%
6	Current Test Point	0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ, 1%
7	Chassis Ground	Ground
8	Remote Voltage Control	0 to 10Vdc = 0 to 100% Rated Output, Zin = 10MΩ
9	Remote Current Control	0 to 10Vdc = 0 to 100% Rated Output, Zin = 10MΩ
10	+10Vdc Reference Output	+10Vdc, 4mA maximum
11	Signal Return	Signal Return
12	Polarity Control	Open or >3.4Vdc (up to 15Vdc) = Positive Polarity. Grounded or <1Vdc = Negative Polarity
13	Positive Polarity Indicator	+24Vdc sourced through a 100Ω series limiting resistor. +24Vdc = active signal
14	+24Vdc Input	Power Input
15	+24Vdc Input	Power Input
16	Chassis Ground	Ground
17	Negative Polarity Indicator	+24Vdc sourced through a 100Ω series limiting resistor. +24Vdc = active signal
18	I Mode Indicator	Open collector pulled up internally to +15Vdc through 2.7kΩ resistor with a 470Ω limiting resistor in series. Transistor OFF = signal active
19	V Mode Indicator	Open collector pulled up internally to +15Vdc through 2.7kΩ resistor with a 470Ω limiting resistor in series. Transistor OFF = signal active
20	Return Current Test Point	0 to 10Vdc = 0 to 100% rated output current, as measured returned from load. Zout = 10kΩ, 1%
21	Load Return	High Voltage Return Point. Required for GFI circuit functionality
22	Ground Fault Indicator	Open collector pulled up internally to +15Vdc through 4.7kΩ resistor with a 470Ω limiting resistor in series. Transistor OFF = signal active
23	Spare	No Connection
24	Spare	No Connection
25	Spare	No Connection

DIMENSIONS: in.[mm]

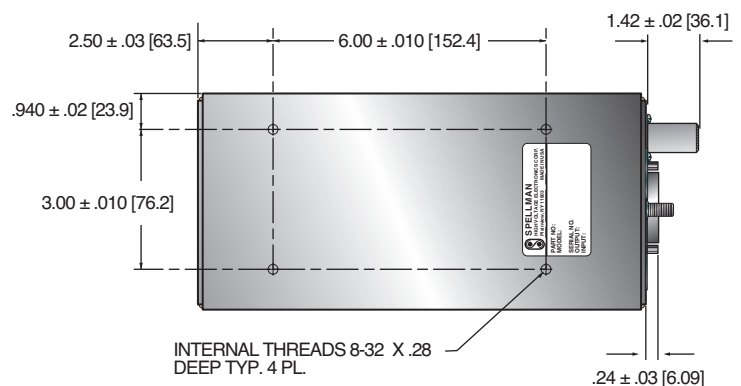
#### FRONT VIEW



#### TOP VIEW



#### BOTTOM VIEW





Spellman's CCM1KW capacitor charging module is designed to provide up to 1000 Joules per second at an output voltage up to 4000 Volts. The power factor corrected AC input, small package size and both a comprehensive and minimal analog interface simplifies integrating the CCM1KW into your OEM system design. Available in either positive or negative polarity, the CCM1KW is fully arc, open and short circuit protected. Units can be operated in parallel for applications requiring higher power (see manual for details).

### TYPICAL APPLICATIONS

UV light sources for curing and sterilization  
Industrial and medical laser applications

### SPECIFICATIONS

#### Input Voltage:

90-264 Vac, 50/60 Hertz, power factor corrected input  $\geq 0.98$

#### Input Current:

14 Amps worst case, 1000 Joules per second  
7 Amps worst case, 500 Joules per second

#### Efficiency:

$>85\%$

#### Output Power:

1000 Joules per second, 500 Joules per second

#### Output Voltage:

0-1kV, 0-2kV and 0-4kV version available

#### Output Polarity:

Positive or negative, specify at time of order

#### Stored Energy:

Less than 0.2 Joules

#### Pulse to Pulse Repeatability:

$\pm 0.2\%$  up to 1kHz

- **Compact & Lightweight Package**
- **Universal/Power Factor Corrected Input**
- **Low Cost Modular OEM Platform**
- **Advanced Resonant Soft Switching Inverter Topology**
- **RoHS Compliant**
- **UL/CUL Recognized**

#### Temperature Coefficient:

$\leq 100$ ppm per degree C

#### Fault Diagnostic System:

Over Temperature and Over Voltage  
Over Voltage Fault is latched requiring AC power recycle to clear.  
Over Temperature Fault is latched but can be cleared via inhibit/fault reset line.

#### Environmental:

Temperature Range:  
Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$   
Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
Humidity:  
10% to 90% RH, non-condensing

#### Cooling:

Forced air

#### Input Line Connector:

2 position Phoenix MSTB connector, straight and right angle mating connector provided

#### HV Output Connector:

Standard: Kings/Winchester Electronics SHV 1707-1  
Optional: Amphenol MHV UG-931/U

#### Interface-A Connector:

15 pin D, female

#### Interface-B Connector:

4 pin male Molex 705530038

#### Ground Stud:

10-32, nut supplied

#### Dimensions:

3" H X 6" W X 9" D (76.2mm x 152.4mm x 228.6mm)

#### Mounting:

M4 screw. Max. depth is 0.188" (4.78mm)

#### Weight:

6.9lb. (3.13kgs)

#### Regulatory Approvals:

Compliant to 60601-1-1. Compliant to 60601-1-2. UL/CUL recognized file E242584. RoHS compliant.

## AC INPUT-2 POSITION TERMINAL BLOCK

PIN	SIGNAL	SIGNAL PARAMETERS
1	AC Input High/Phase 1	Line Hot/Phase 1
2	AC Input Low/Phase 2	Line Neutral/Phase 2

ANALOG INTERFACE A—  
15 PIN FEMALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Inhibit/Fault Reset	Ground = HV Enable, Open/+15Vdc = HV Inhibit
2	N/C	N/C
3	OverTemp Fault	No OT Fault = +15Vdc @ 3mA, OT Fault = Ground
4	Signal Ground	Signal Ground (optional)*
5	Voltage Program	0 to 10Vdc = 0 to 100% rated output voltage
6	Overvoltage Status	No OVP = +15Vdc @ 3mA, OVP Fault = Ground
7	Peak Hold Monitor	Peak output voltage displayed, 0 to 10Vdc = 0 to 100% rated output voltage with a 5 second time constant
8	Voltage Monitor	0 to 10Vdc = 0 to 100% rated output voltage, $\pm 1\%$
9	+15Vdc	+15Vdc @ 150mA, maximum**
10	N/C	N/C
11	+15Vdc	+15Vdc @ 150mA, maximum (optional)**
12	Signal Ground	Signal Ground (optional)*
13	End of Charge	Charging = +15Vdc @ 1.5mA, End of Charge = Ground
14	Signal Ground	Signal Ground
15	Signal Ground	Signal Ground

Note: Output status signals are NMOS transistor controlled, 100mA maximum sink current. Actual signals are 5k $\Omega$  pull ups to the internal +15Vdc logic source.

\*Optional interface signals can be provided to be compatible with other pre-existing legacy interfaces. On standard units these signals are N/C.

\*\*+15Vdc  $\pm 10\%$  is provided on the standard unit. Optional +12Vdc  $\pm 5\%$ /100mA, maximum can be provided.

## INTERFACE B-4 PIN MALE D HEADER

PIN	SIGNAL	SIGNAL PARAMETERS
1	Inhibit/Fault Reset	Ground = HV Enable, Open/+15Vdc = HV Inhibit
2	Signal Ground	Signal Ground
3	Voltage Program	0 to 10Vdc = 0 to 100% rated output voltage
4	+15Vdc	+15Vdc @ 150mA, maximum (optional)*

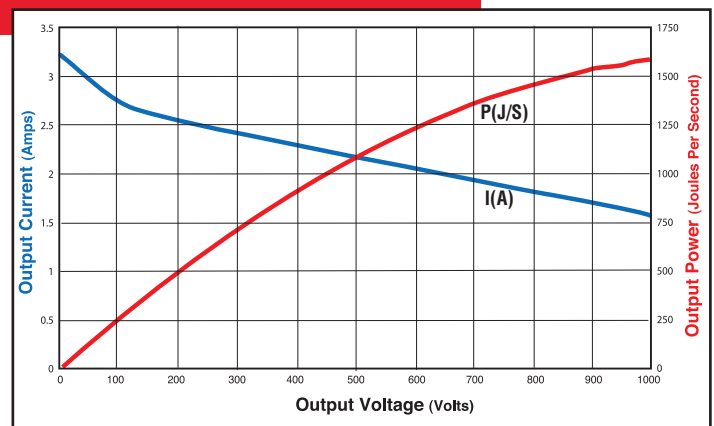
## CCM1KW SELECTION TABLE

kV	JOULES/SECOND	MODEL
1	500	CCM1*500
2	500	CCM2*500
4	500	CCM4*500
1	1000	CCM1*1000
2	1000	CCM2*1000
4	1000	CCM4*1000

\*Specify P for positive or N for negative

500 J/s units have a single internal fan, 1000 J/s units have both an internal and external fan.

## TYPICAL GRAPH FOR CCM1P1000



By utilizing a unique inverter topology, a reduction in peak power is achieved for the same average output power



Straight and right angle AC input mating connectors are provided

## OPTION ORDERING INFORMATION

OPTION	OPTION CODE
MHV UG-931/U HV Connector	MVH
Legacy Interface Signals	L

## OPTION ORDERING EXAMPLE

CCM4P1000/MHV

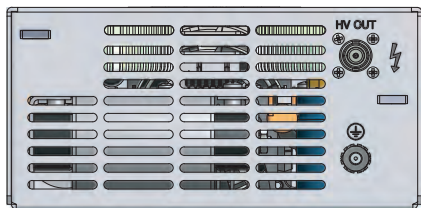
Model | Voltage | Polarity | J/S | Option

**500 Joules per second**

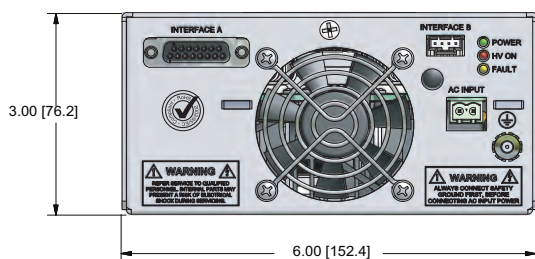
(unit with internal fan)

DIMENSIONS: in.[mm]

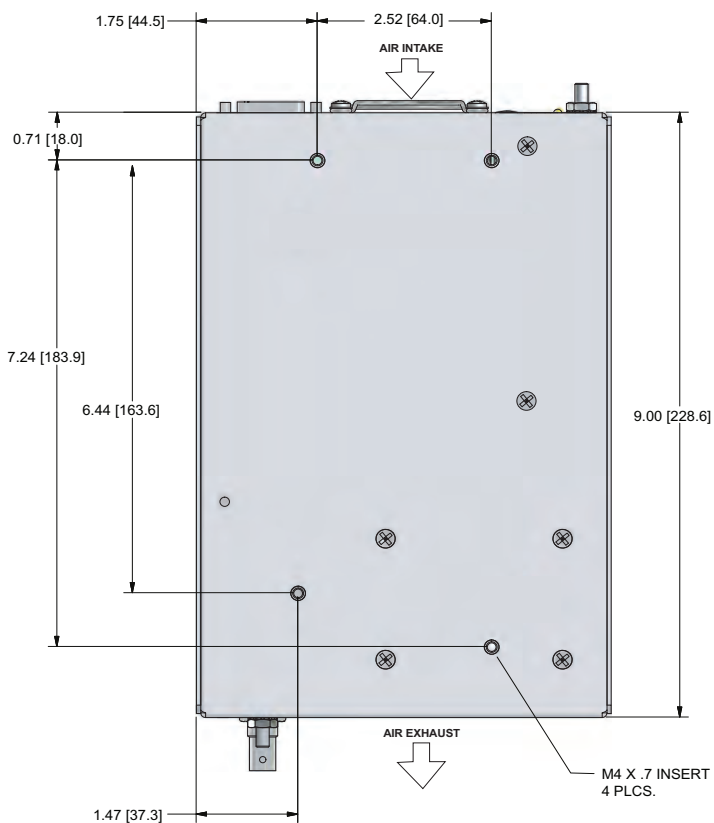
**REAR VIEW**



**FRONT VIEW**



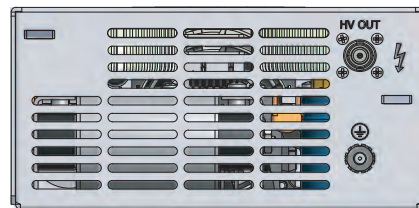
**BOTTOM VIEW**



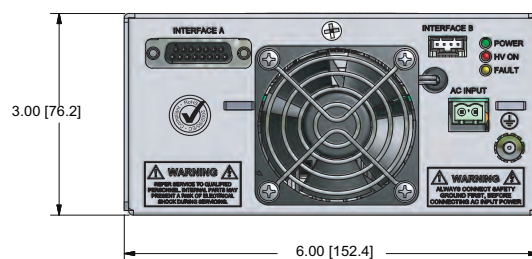
**1000 Joules per second**  
(unit with internal and external fan)

DIMENSIONS: in.[mm]

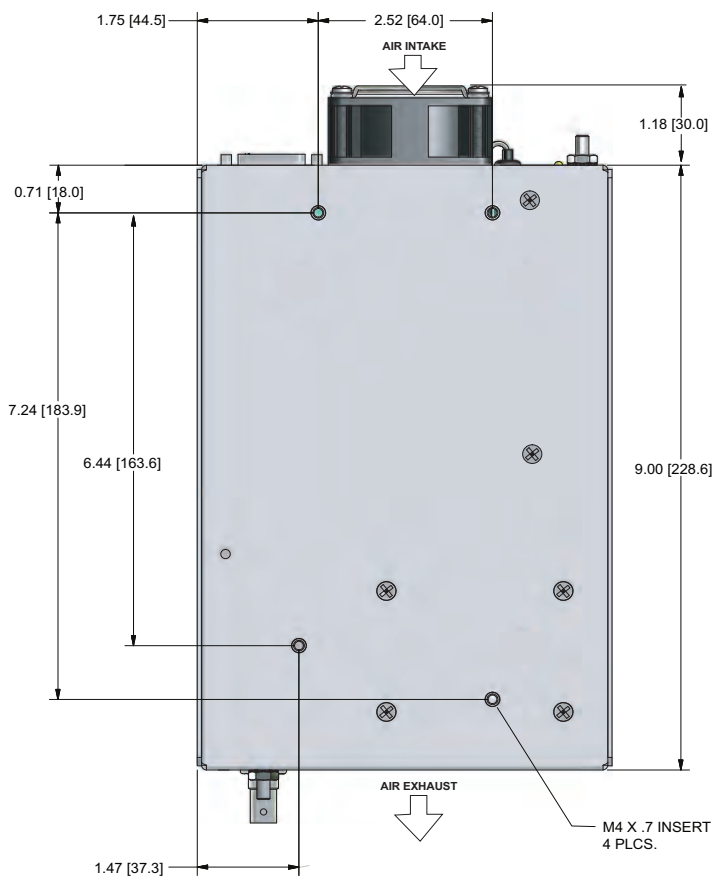
**REAR VIEW**



**FRONT VIEW**



**BOTTOM VIEW**





- **Compact & Lightweight Package**
- **Power Factor Corrected Input**
- **Low Cost Modular OEM Platform**
- **Rugged IGBT Inverter Design**
- **Auxiliary +24Vdc @ 2.2 Amp Output Provided**

Spellman's CCM capacitor charging module is designed to provide 3100 joules per second at an output voltage up to 4000 Volts. With a power density of 6.6 watts per cubic inch, the CCM packs more than 30% more power into the same volume when compared to other commercially available units. The power factor corrected AC input, small package size and comprehensive analog interface simplifies integrating the CCM into your OEM system design. Available in either positive or negative polarity, the CCM is fully arc, open and short circuit protected.

### TYPICAL APPLICATIONS

UV light sources for curing and sterilization  
Industrial and medical laser applications  
ICP-MS applications

### SPECIFICATIONS

#### Input Voltage:

Power factor corrected input  $\geq 0.98$   
180-264Vac @ 20.3A, 47-63Hz, fused via externally accessible fuses

#### Efficiency:

$>85\%$

#### Output Power:

3100 Joules per second, average

#### Output Voltage:

4000 Volts, maximum

#### Output Polarity:

Positive

#### Pulse to Pulse Repeatability:

$\pm 0.6\%$  up to 120Hz

#### Temperature Coefficient:

$\leq 100$ ppm per degree C

#### Fault Diagnostic System:

Over Temperature, Over Voltage and Open Load sensing

#### Environmental:

Temperature Range:

Operating:  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$

Storage:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

Humidity:

10% to 90% RH, non-condensing

#### Cooling:

Forced air

#### Ground Stud:

M6 X10mm, M6 nut supplied

#### Input Line Connector:

2 position Phoenix HDFK4 connector

#### HV Output Connector:

Kings KV-79-15, Bulkhead mounted

#### +24Vdc Output Connector:

AMP #1-350942-0

#### Dimensions:

5.81" H X 5.8" W X 14" D (148mm x 147mm x 356mm)

#### Weight:

14.5lb. (6.6kgs)

#### Regulatory Approvals:

Compliant to the EEC EMC directive. Compliant to EEC low voltage directive.

## AUXILIARY +24VDC CONNECTOR J2 2 POSITION AMP CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	+24Vdc	+24Vdc @ 2.2 amps
2	Ground	Ground

## CCM ANALOG INTERFACE— J1 15 PIN FEMALE D CONNECTOR

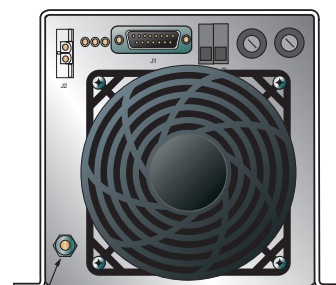
PIN	SIGNAL	SIGNAL PARAMETERS
1	Inhibit	Ground = HV ON, High = HV OFF
2	Temperature Fault	Fault = OV; no fault = +15Vdc through 6.8kΩ
3	General Fault	Fault = OV; no fault = +15Vdc through 6.8kΩ
4	HV ON Indicator	Ground = HV ON, +15Vdc = HV OFF +15Vdc through 6.8kΩ
5	Voltage Program	0 to 10Vdc = 0 to 100% Rated Output
6	Open Circuit Detector	Fault = OV; no fault = +15Vdc through 6.8kΩ
7	Peak Voltage Monitor	0 to 10Vdc = 0 to 100% Rated Output held for 10 seconds at peak level
8	Voltage Monitor	0 to 10Vdc = 0 to 100% Rated Output, Instantaneous output
9	+15Vdc Output	+15Vdc @ 150ma output, maximum
10	N/C	N/C
11	+15Vdc Output	+15Vdc @ 150ma output, maximum
12	+15Vdc Output	+15Vdc @ 150ma output, maximum
13	End of charge Indicator	Ground = End of Charge, High Impedance = Charging
14	Ground	Ground
15	Ground	Ground

### How to Order:

Standard: PART NO.: CCM4P3

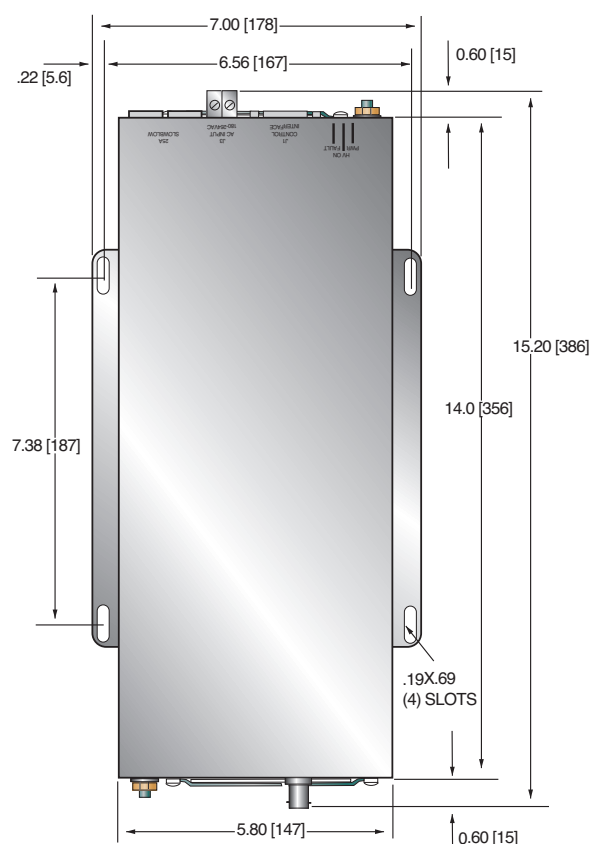
DIMENSIONS: in.[mm]

### FRONT VIEW

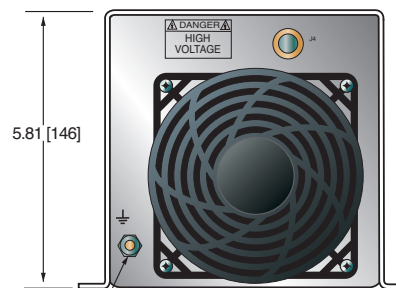


M6 X 10mm STUD  
M6 NUT SUPPLIED

### TOP VIEW



### BACK VIEW



M6 X 10mm STUD  
M6 NUT SUPPLIED





12kW 10.50" (6U) Chassis



Spellman's new EVA Series is specifically designed for demanding electron beam coating applications. A full featured front panel provides local control, while an extensive analog interface allows remote capability. The included Ethernet and RS-232 digital interfaces simplify integrating the EVA into your system design.

The EVA's robust IGBT inverter design is inherently fault tolerant. The proprietary low capacitance, low stored energy high voltage output section is ideal for dynamic load and fault conditions encountered in coating applications. Fast arc recovery times (<2ms) minimize process interruptions. Many operational parameters can be configured by the user to suit their particular requirements via the provided graphical user interface (GUI).

An optional filament gun supply is available. The EVA can support one, two or three filament gun supply channels providing unprecedented flexibility and cost effectiveness.



3kW/6kW 5.25" (3U) Chassis

### HARDWARE BASED OPTIONS

<b>3PH</b>	180-264Vac Three Phase Input
<b>1PH</b>	180-264Vac Single Phase Input (3kW & 6kW only)
<b>400VAC</b>	360-528Vac, Three Phase Input (6kW & 12kW only)
<b>LL(X)</b>	High Voltage Cable Length
<b>HV2</b>	Two High Voltage Output Connectors
<b>HV3</b>	Three High Voltage Output Connectors
<b>FIL1</b>	Filament Gun Supply—One Channel
<b>FIL2</b>	Filament Gun Supply—Two Channels
<b>FIL3</b>	Filament Gun Supply—Three Channels
<b>HPF</b>	50 Amp Filament Supply

### SOFTWARE CONFIGURABLE FEATURES

Adjustable Overload Trip  
Arc Trip Count  
Arc Quench Time  
Arc Reramp Time  
Arc Window Time

- **Specially Designed for E Beam Coating Applications**
- **3kW, 6kW and 12kW Power Levels**
- **Remote Analog and Ethernet/RS-232 Interface**
- **Arc and Short Circuit Protected, Fast Arc Recovery**
- **User Configurable Dynamic Arc Intervention**
- **Optional Filament Gun Supply (up to 3 channels)**
- **OEM Customization Available**

### 3/6/12KW HV SPECIFICATIONS

#### Input Voltage: (must be specified at time of order)

- Option 3PH: 180-264Vac, 50/60Hz, three phase, 90% efficiency, 0.85 power factor
- Option 1PH: 180-264Vac 50/60Hz, single phase, 90% efficiency, 0.65 power factor (3kW & 6kW only)
- Option 400VAC: 360-528Vac 50/60Hz, three phase, 90% efficiency, 0.85 power factor (6kW & 12kW only)

#### Input Current:

- Option 3PH: 180-264Vac, 50/60Hz, three phase  
3kW—13 amps, maximum  
6kW—25 amps, maximum  
12kW—50 amps, maximum
- Option 1PH: 180-264Vac, 50/60Hz, single phase  
3kW—29 amps, maximum  
6kW—57 amps, maximum
- Option 400VAC: 360-528Vac, 50/60 Hz, three phase,  
6kW—13 amps, maximum  
12kW—25 amps, maximum

#### Output Voltage:

- 5kV @ 600mA, negative polarity. 3kW maximum.
- 10kV @ 600mA, negative polarity. 6kW maximum.
- 10kV @ 1200mA, negative polarity. 12kW maximum.

#### Local Output Controls:

Voltage is continuously adjustable over entire range via a 10 turn potentiometer.

#### Voltage Regulation:

- Load: 0.05% of full voltage +500mV for full load change.
- Line: 0.05% of full voltage +500mV over specified input range.

#### Ripple:

<3% Vrms

#### Stability:

0.02%/hr. after 1 hour warm-up.

#### Temperature Coefficient:

100ppm/°C.

#### Environmental:

Temperature Range:  
Operating: 0°C to 40°C  
Storage: -40°C to 85°C  
Humidity:  
10% to 90% RH, non-condensing.

#### Cooling:

Forced air; inlet through side panels, outlet at rear panel

#### Metering:

Front panel digital voltage and current meters, 3.5 digit, accurate to within 1%.

**3/6/12KW HV SPECIFICATIONS****System Status Display:**

"Dead Front" type indicators provide status of up to 12 system parameters including voltage regulation, fault conditions and circuit control.

**Input Power Connector:**

A 6 foot (1.8 meter) long captive line cord will be provided.

**Analog Interface Connector:**

50 pin female D connector

**High Voltage Output Cable:**

10 ft (3.05m) shielded high voltage cable, removable at rear panel.

**Dimensions:**

3kW/6kW Units:

5.25"(3U)H x 19" W x 21" D (133mm x 482mm x 533mm)

12kW Units:

10.5"(6U)H x 19" W x 21" D (266mm x 482mm x 533mm)

**Weight:**

3kW/6kW Units: 46 pounds (20.87kg)

12kW Units: 90 pounds (40.82kg)

**Regulatory Approvals:**

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E227588. RoHS compliant.

**Digital Interface**

The EVA features a standard RS-232 and Ethernet digital interface, simplifying power supply communication requirements saving the user time and money, while enhancing functionality and overall capability. Spellman provides a GUI allowing customization of operational features while also providing basic power supply functionality and control via a sample simulated front panel.

**Arc Intervention**

Spellman's EVA power supplies sense arc events via a fast acting current sense transformer. The arc intervention circuitry prevents power supply damage from continuous, long term arcing. Customers can change arc intervention parameters (Arc Count, Arc Quench, Reramp Time, and Window Time) within preset limits via the provided GUI. Customized units can be configured for unique arc prone environments, contact Spellman for details.

**Additional High Voltage Output Connectors**

Spellman's EVA is designed to provide 1, 2 or 3 parallel configured high voltage output connectors. The standard unit provides one high voltage output connector. If you intend to use the EVA in a multi channel application but want to utilize your own filament power supply, this factory installed option provides the additional high voltage connections required. Hardware Option HV2 provides two high voltage output connectors, while Hardware Option HV3 provides three high voltage output connectors.

**Optional Beam Controller (Filament Power Supply) and Gun Output Box**

Beam Controller  
1.75" (1U) Chassis

Gun Output Box

Multiple beam control units can be provided, allowing 1, 2 or 3 separate electron guns to be independently operated.

Each beam control unit consists of a beam controller and a gun output box. The beam controller is a 1U rack-mounted chassis containing the filament power, control and emission regulation circuitry. The gun output box contains the high frequency filament transformer which is referenced to the high voltage output potential. This box should be mounted close to the electron gun to minimize the length of the high current filament connections. The box also contains electron gun emission current monitoring circuitry and provides a feedback signal used to regulate the electron gun emission current.

Each beam control channel, if operated alone, can utilize 0 to 100% of the rated emission current capacity. When two or three beam control channels are used at the same time, the total system emission current capacity remains the same. Individual channel programming must be done such that the total current does not exceed the system's total emission current available.

**BEAM CONTROLLER SPECIFICATIONS****Input Voltage:**

180-264 Vac, 50/60Hz, single phase, 7.5 amps maximum

**Output Voltage/Current:**

0-12Vrms at  $\approx$  30kHz, 0-35 amps. An optional 50 amp filament (HPF) is available.

**Metering:**

Front panel digital filament current and emission current meters, 3.5 digit, accurate to within 1%.

**System Status Display:**

"Dead Front" type indicators provide status of up to 12 system operations including voltage regulation, fault conditions and circuit control.

**Input Power Connector:**

A 6 foot (1.8 m) long IEC320 Cord Set will be provided.

**BEAM CONTROLLER SPECIFICATIONS****Analog Interface Connector:**

Male 25 pin D connector

**Filament Output Connections:** (gun drive cable)

The secondary leads of the filament power transformer exiting the gun output box are 36" (91.44cm) long. The cover of this box is interlocked for safety purposes.

**Environmental:**

Temperature Range:

Operating: 0°C to 40°C

Storage: -40°C to 85°C

Humidity:

10% to 90% RH, non-condensing.

**Cooling:**

Forced air; inlet through side panels, outlet at rear panel.

**Dimensions:**

Beam Controller:

1.75" H (1U) x 19" W x 15" D (44.5 x 482 X 381mm)

Gun Output Box:

4.06" H x 6.13" W x 11" D (103.2 x 155.7 x 279.4mm)

**Weight:**

Beam Controller:

18 pounds (8.1kg)

Gun Output Box:

6 pounds (2.7kg)

Emission current is programmed locally (front panel adjustment) or remotely (0-10Vdc = 0-100% of rated current) via each beam controller. Filament Limit Set Point, Filament PreHeat Set Point, and Automatic. Filament PreHeat functionality are provided.

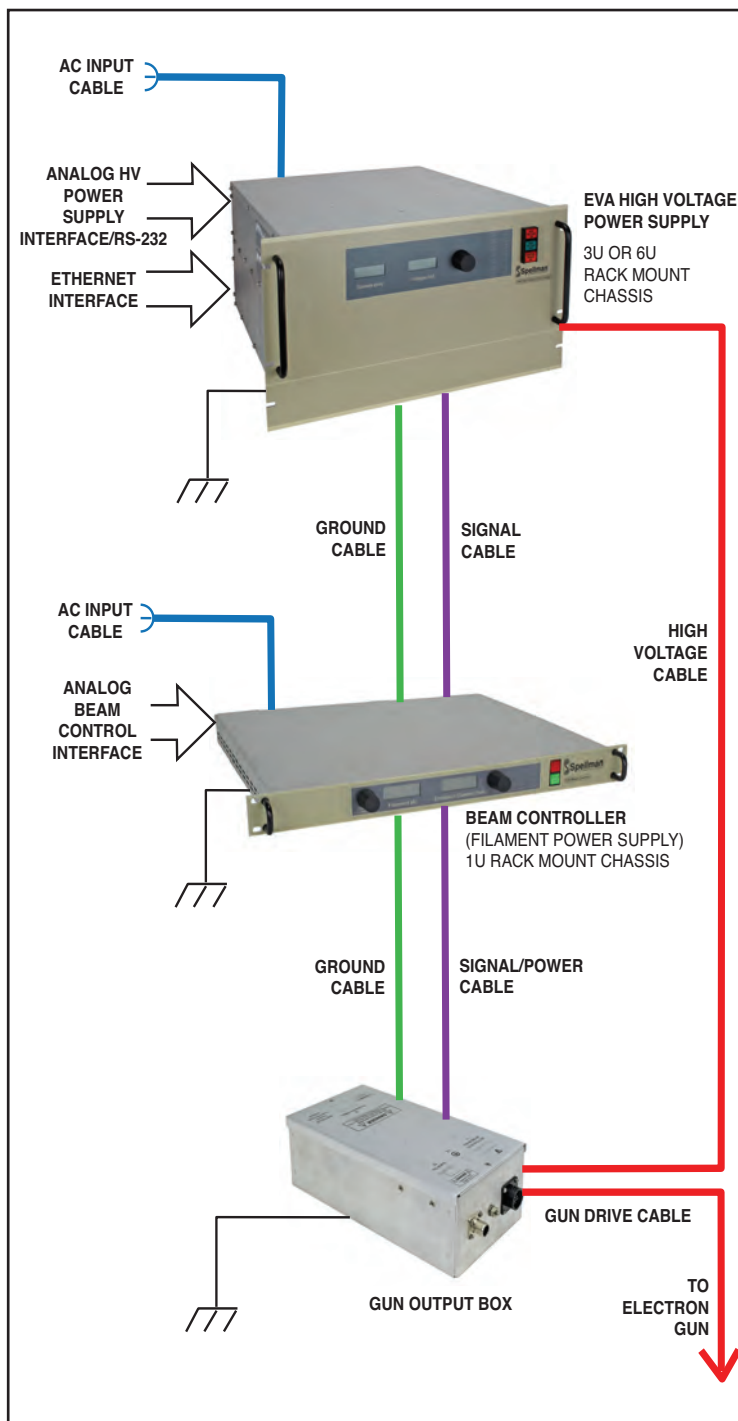
**EVA MODEL CONFIGURATION****Ordering:**

EVA5N3/1PH	3 kilowatt unit, single phase
EVA10N6/3PH	6 kilowatt unit, three phase
EVA10N12/400VAC	12 kilowatt unit, 360-528Vac

Note: Input voltage must be specified at time of order. EVA model number must contain input voltage option code to be valid.

**Sample Options:**

EVA10N6/1PH/HV2	Single Phase Input & 2 HV Connectors
EVA10N12/400VAC/FIL3	360-528Vac Input & 3 Gun Supplies

**TYPICAL EVA OPERATING SETUP**

The signal cable connecting the high voltage power supply to the beam controller is 39.4" (1m) long. A captive but field replaceable 10 foot (3.05m) long high voltage cable is provided to connect each beam control output box to the high voltage power supply.

HV POWER SUPPLY INTERFACE—  
50 PIN FEMALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Common	Power Supply Ground
2	Reset/HV Inhibit	Normally open, Low = Reset/Inhibit
3	External Interlock	+24Vdc @ open, <25mA @ closed
4	External Interlock Return	Return for External Interlock
5	mA Test Point	0-10Vdc = 0-100% rated output, Zout= 1K $\Omega$ , 1%
6	kV Test Point	0-10Vdc = 0-100% rated output, Zout= 1K $\Omega$ , 1%
7	+10Vdc Reference Output	+10Vdc @ 1mA
8	mA Program Input	0-10Vdc = 0-100% rated output, Zin>10M $\Omega$
9	Local mA Program Output	0-10Vdc = 0-100% rated output, front panel pot
10	kV Program Input	0-10Vdc = 0-100% rated output, Zin>10M $\Omega$
11	Local kV Program Output	0-10Vdc = 0-100% rated output, front panel pot
12	Remote Power On Output	+24Vdc @ open, <25mA @ closed
13	Remote Power On Return	Return for Remote Power On
14	Remote HV Off	+24Vdc @ open, <25mA @ closed, connect to pin 15 for front panel operation
15	Remote HV Off/On Common	HV On/Off Common
16	Remote HV On	+24Vdc @ open, <25mA @ closed, momentarily connect to pin 15 enable high voltage
17	HV Off Indicator	+24Vdc @ 25mA = HV Off
18	HV On Indicator	+24Vdc @ 25mA = HV On
19	Power Supply Common	Supply Ground
20	+24Vdc Output	+24Vdc @ 100mA, maximum
21	Voltage Mode Status	Open Collector, Low = Active
22	Current Mode Status	Open Collector, Low = Active
23	Spare	
24	Interlock Closed Status	Open Collector, Low = Active
25	Spare	
26	Spare	
27	Spare	
28	Remote Overvoltage Adjust	0-10Vdc = 0-100% rated output
29	Spare	
30	Over Voltage Fault	Open Collector, Low = Active
31	Over Current Fault	Open Collector, Low = Active
32	System Fault	Open Collector, Low = Active
33	RGLT Error Fault	Open Collector, Low = Active
34	Arc	Open Collector, Low = Active
35	Over Temp Fault	Open Collector, Low = Active
36	AC Fault	Open Collector, Low = Active
37	Spare	
38	Spare	
39	Spare	
40	Spare	
41	Spare	
42	Spare	
43	Spare	
44	+5Vdc Output	+5Vdc @ 100mA, maximum
45	+15Vdc Output	+15Vdc @ 100mA, maximum
46	-15Vdc Output	-15Vdc @ 10mA, maximum
47	RS232 Tx	
48	RS232 Rx	
49	RS232 GND	
50	Power Supply Common	Power Supply Ground

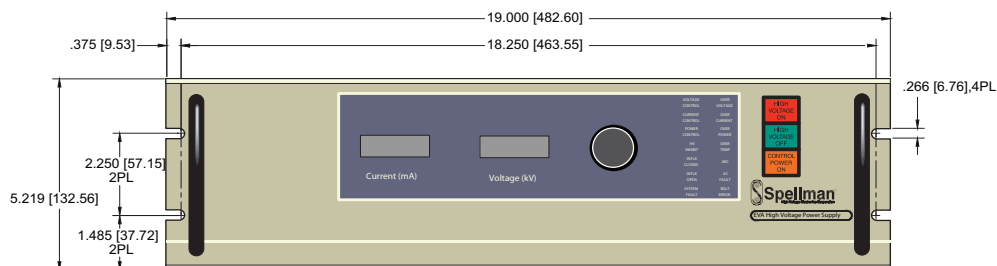
BEAM CONTROLLER INTERFACE—  
25 PIN FEMALE D CONNECTOR

PIN	SIGNAL	SIGNAL PARAMETERS
1	Power Supply Common	Signal Ground
2	Spare	
3	External Interlock	+15Vdc at Open, <15mA @ Closed
4	External Interlock Return	Return for Interlock
5	Filament Current Test Point	0 to 10Vdc = 0 to 100% rated output
6	Beam Current Test Point	0 to 10Vdc = 0 to 100% rated output
7	+10Vdc Reference	+10Vdc, 1mA Max
8	Filament Limit Program Input	0 to 10Vdc = 0 to 100% rated output
9	Local Filament Limit Program	Front panel potentiometer wiper
10	Beam Current Program Input	0 to 10Vdc = 0 to 100% rated output
11	Local Beam Current Program	Front panel potentiometer wiper
12	Filament Preheat Program In	0 to 10Vdc = 0 to 100% rated output
13	Local Fil. Preheat Program	Internal potentiometer
14	Beam Off	+15Vdc at Open, <25mA @ Closed
15	Beam On/Off Common	Connect together for FP operation
16	Beam On	Momentarily connect to pin 15 = Beam On
17	Remote Beam Off Indicator	0=Beam On, +15V, 10mA Max=Beam Off
18	Remote Beam On Indicator	0=Beam Off, +15V, 10mA Max=Beam On
19	Spare	
20	Spare	
21	Spare	
22	Remote PS Fault	0 = Fault, +15Vdc @ 0.1mA = No Fault
23	Spare	
24	Power Supply Common	Signal Ground
25	Shield Return	Chassis Ground

DIMENSIONS: in.[mm]

## 3U 6kW Power Supply

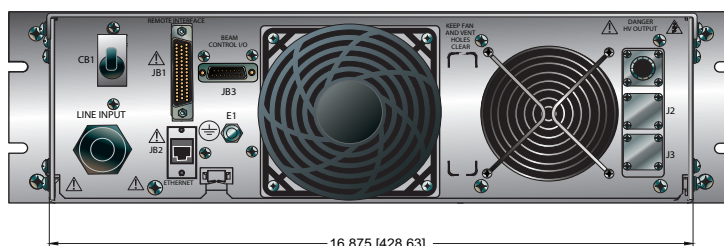
### FRONT VIEW



### TOP VIEW



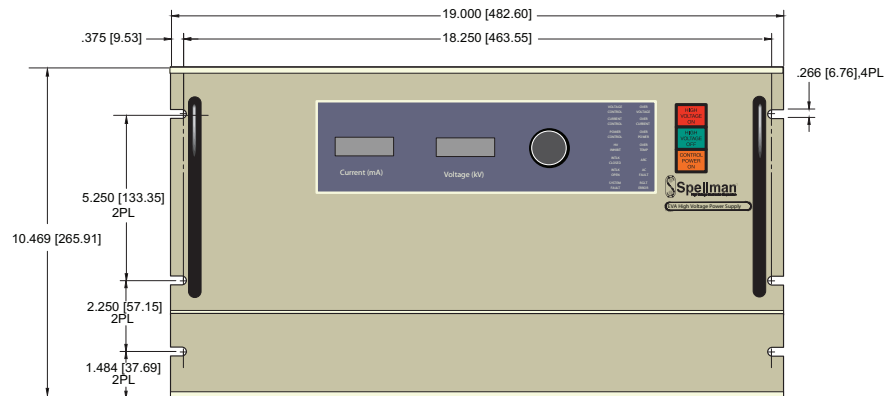
### BACK VIEW



DIMENSIONS: in.[mm]

## 6U 12kW Power Supply

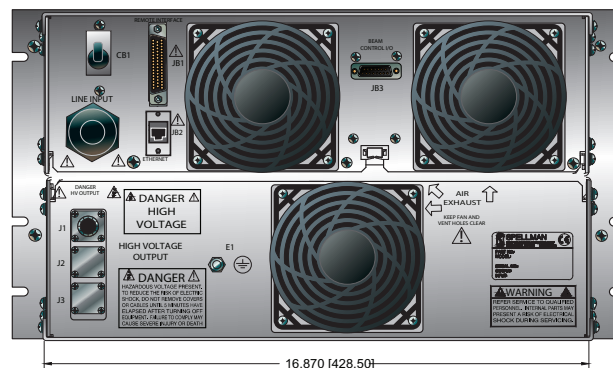
### FRONT VIEW



### TOP VIEW



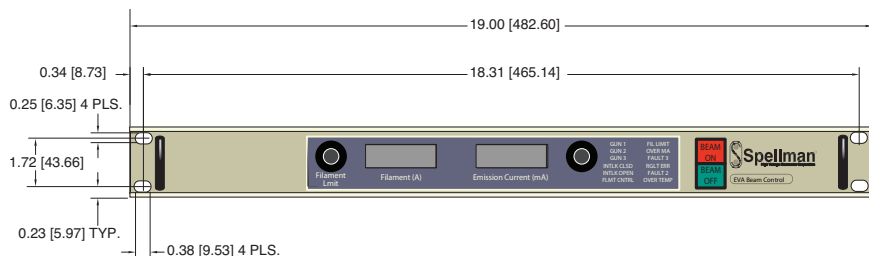
### BACK VIEW



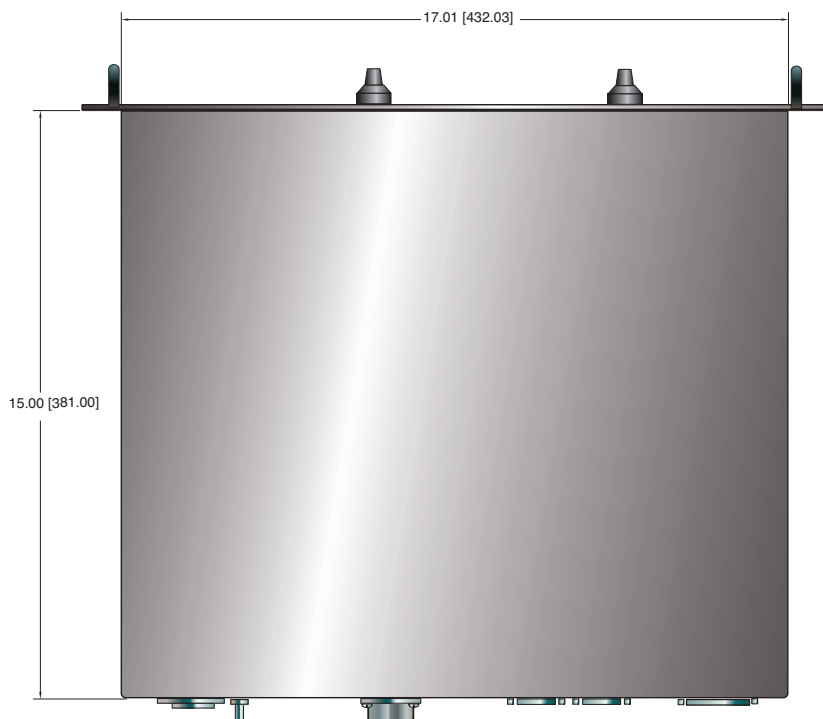
DIMENSIONS: in.[mm]

**Beam Controller**

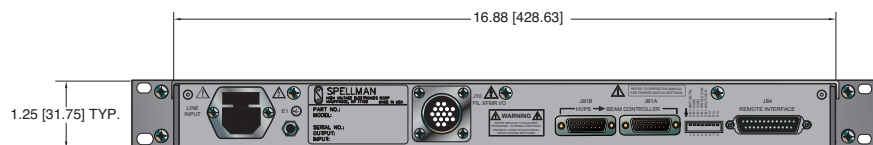
### FRONT VIEW



### TOP VIEW



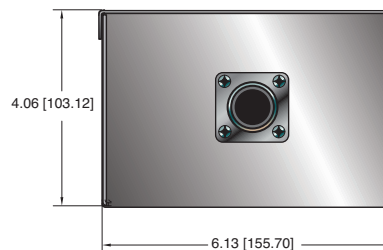
## BACK VIEW



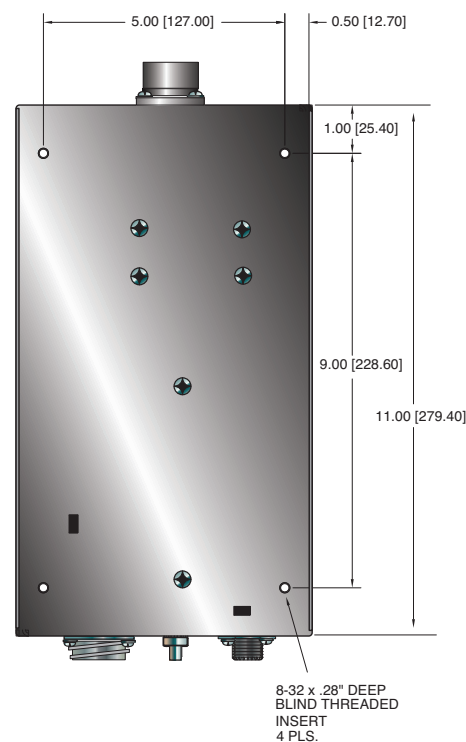
DIMENSIONS: in.[mm]

**Gun Output Box**

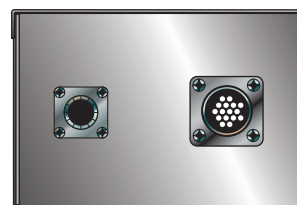
### FRONT VIEW



### TOP VIEW



## BACK VIEW





The MSC2.5PN7.5 is a bipolar reversible power supply specifically designed for electrostatic chuck clamping applications. Two 0 to 2500 volt @ 7.5 watt reversible outputs that are of opposite polarity are provided on the two high voltage output connectors. Front panel controls via programming buttons and an OLED display allow local operation and control of the unit. The RS-232/RS-485 /Ethernet digital interface allows for simple OEM integration into complex system designs.

### SPECIFICATIONS

#### Input :

+24Vdc  $\pm 5\%$  @ <2 amps. Switch controlled on front panel and fuse protected.

#### High Voltage Output 1 and Output 2

##### Voltage:

0 to  $\pm 2500$  volts. Output 1 and 2 amplitudes are independently programmable

##### Current:

0 to 3mA

##### Current Limit:

Output current limits can be independently set in the range of 0.1mA to 3.0mA in 0.1mA steps.

##### Power:

7.5 watts, maximum

##### Polarity:

Bipolar, High Voltage Output 1 polarity always opposite of High Voltage Output 2

##### Voltage Control:

Resolution = 1V  
Accuracy =  $\pm 1\%$  of programmed value

##### Regulation:

Line: <0.1% for 10% input voltage change under any load conditions  
Load: <1.3% for zero to full load

##### Stability:

<0.1%/hour, <0.2%/8 hours at constant operating conditions after 1 hour warm up

##### Temperature Coefficient:

<50ppm per degree C

##### Ripple:

<0.1% p-p at full load, maximum output

##### Rise and Fall Times:

Rise time (0V to  $\pm 2500$  V) and fall time ( $\pm 2500$ V to 0V) are separately programmable in the range of 300ms to 9.9s (to within 1% of final voltage value)

- **Specifically Designed for E-Chuck Applications**
- **Two Reversible Outputs of Opposite Polarity**
- **Rated 2.5kV 3mA. Amplitudes are Set Independently**
- **Automatic User Configurable De-chucking Function**
- **300mS Slew Time Driving 20nF of Load Capacitance**
- **Front Panel Control via Buttons and LCD Display**
- **RS-232, RS-485 and Ethernet Interface**
- **Free GUI for Testing and Development Work**

#### Voltage Monitor:

Resolution = 1V  
Accuracy =  $\pm 1\%$  of actual output ( $\pm 8$  volt offset)

#### Current Monitor:

Resolution = 1.25  $\mu$ A  
Accuracy =  $\pm 2\%$  of actual output  $\pm 100\mu$ A offset

#### Typical Load Capacitance:

<20nF (for other load capacitance, contact Spellman)

#### Protection:

Arc and short circuit protected. Equipped with input and output current limits. Output current limit settable from 0.1mA to 3mA. Not designed to withstand continuous arcing.

#### Auto-Toggle/De-Chucking Function:

This unit has both a manual and a customer configurable automatic toggle function (degauss/de-chuck).

#### Communication:

The unit can be operated locally from the front panel. It can also be controlled through the RS-232/RS-485 serial interface, or Ethernet. The serial interface can be configured via the front panel to either RS-232 or RS-485. The unit is shipped from the factory set to RS-232. 9600 baud, no parity, no handshake or flow control. Note: When Ethernet is connected to the LAN port, Serial comms is disabled

#### Front Panel Indicators:

The unit has a 20 character by 2 line back lit OLED display and a high voltage status LED. Configuration and setting of various parameters can be accomplished via push button switches. The OLED will power down after five minutes and is reactivated by pressing any button. The red LED indicator illuminates when high voltage is being produced. When the unit is shutdown due to a fault the LED will flash at a 1 Hertz rate until the fault is cleared.

#### Front Panel Controls:

The unit has front panel buttons for local control.

##### Local

Front panel control and monitoring via the OLED display

##### Toggle

Manual change of output polarity

##### Output On/Off

Soft turns the high voltage output on and off

##### Mode

Changes the mode of operation and navigation menu

##### Rotary Control/Enter

For navigating and entering value changes

### Environmental:

Temperature Range:  
Operating: 0°C to 45°C  
Storage: -35°C to 85°C  
Humidity:  
0 to 85% RH, non-condensing

### Cooling:

Convection cooled

### Input Power Connector:

2 pin Molex VersaBlade connector. A mating input cable is available (see How To Order table)

### Serial Communications Connector:

9 pin female D connector

### High Voltage Output Connectors:

Radial BNC-HT/MHV connector. Mating HV output cables are available (see How To Order table)

### Installation Brackets:

A kit including 2 brackets and installation screws (M4x10) allows the unit to be mounted on a half width rack (see How To Order table)

### Dimensions:

12.45" L x 8.03" W x 3.46" D (316mm x 204mm x 88mm)

### Weight:

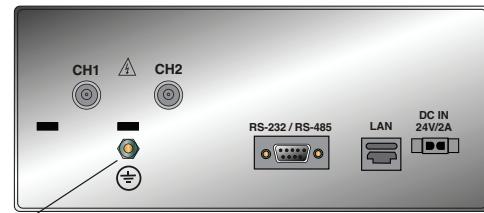
3.09lbs. (1.4kg)

### Regulatory Approvals:

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

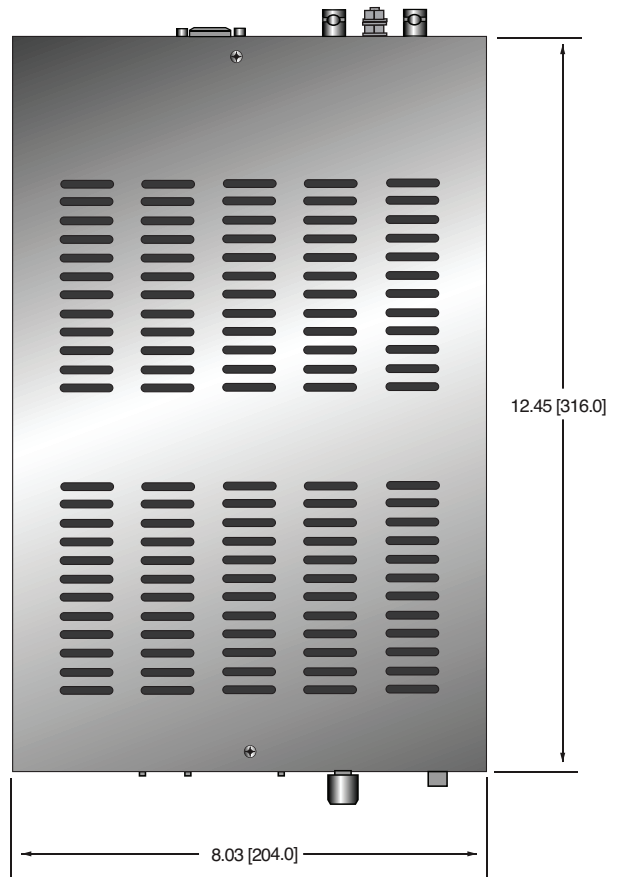
DIMENSIONS: in./[mm]

### REAR VIEW

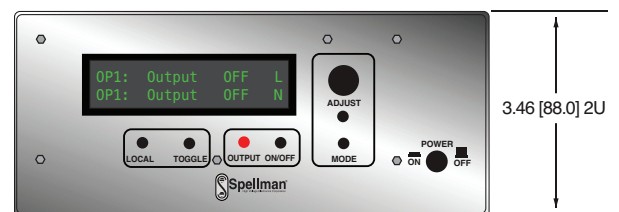


M5 GROUND STUD

### TOP VIEW



### FRONT VIEW



### INPUT POWER — MOLEX VERSABLADE 2 PIN CONNECTOR

PIN	SIGNAL	PARAMETER
1	+24Vdc	+24Vdc @ 2A
2	+24Vdc Return (Gnd.)	Power Ground

### SERIAL COMMUNICATIONS— 9 PIN FEMALE D CONNECTOR

PIN	SIGNAL	I/O	SIGNAL PARAMETERS
1	NC	-	Connection
2	Z/TXD	I/O	TXD RS-232/RS-485 Inverting
3	Y/RXD	I/O	RXD RS-232/RS-485 Non Inverting
4	NC	-	No Connection
5	GND	-	Ground
6	NC	-	No Connection
7	NC	-	No Connection
8	NC	-	No Connection
9	NC	-	No Connection

### HOW TO ORDER

Description	Part Number
MSC Power Supply	MSC2.5PN7.5
Power input cable, 3m	HVC05/2NSO/1229
HV Output cable, 3m	HVC5/1ISO/1228
Set of brackets for rack mount	MSCK100



Spellman's ESC Series of electrostatic chuck power supplies provide clean and accurate voltages required for electrostatic chuck wafer processing applications. These custom designed, well regulated supplies precisely secure the wafer during lengthy process cycles. Versions are available with a ground referenced reversible output in addition to units featuring a true floating bipolar output with associated floating center tap point. Comprehensive fault diagnostic circuitry monitors power supply functionality and communicates status data to the user interface. Spellman's ESC Series power supplies are housed in compact, lightweight packages designed for OEM installations requiring minimal system footprint space.

### TYPICAL SPECIFICATIONS

#### Type 1

**Output Configuration:**

Single ground referenced HV output, positive or negative polarity

**Input:**

+24Vdc,  $\pm 5\%$  @ 2 amps, maximum

**Output:**

+2kV to -5kV. 2mA @ +2kV, 5mA @ -5kV

**Short Circuit Current Limit:**

5.5mA, maximum

**Output Isolation:**

None, ground referenced output

**Slew Rate:**

80ms, typical

**Maximum Cycle Frequency:**

10 times per second

**Overshoot:**

<10% of set point value

**Ripple:**

10Vrms

**Line Regulation:**

$\pm 0.7\%$  over specified range

**Load Regulation:**

$\pm 0.7\%$  over specified range

- **Platform Product Capability**
- **Ground Referenced, Reversible Output**
- **Floating, Reversible Bipolar Output**
- **+24Vdc DC Input**
- **Comprehensive Fault Diagnostics**
- **High Voltage Safety Interlock**
- **Custom "X" Number Required**

**Output Voltage Accuracy:**

<2% of set point value between 50-5000Vdc

**Program/Monitor Accuracy:**

1% of full scale,  $\pm 50\text{mV}$

**Dimensions:**

9"W x 1.5"H x 6.1"L (228.6mm x 30.5mm x 155mm)

**Weight:**

4.5lbs. (2kg)

#### Type 2

**Output Configuration:**

Floating, reversible polarity bipolar output with floating center tap

**Input:**

+24Vdc,  $\pm 10\%$  @ 2 amps, maximum

**Output:**

Bipolar, 0 to  $\pm 750\text{Vdc}$  (0 to 1500Vdc total) @ 5mA

**Short Circuit Current Limit:**

5.5mA, maximum

**Output Isolation:**

Center tap is isolated for  $\pm 2\text{kV}$  from ground

**Slew Rate:**

40ms, typical

**Maximum Cycle Frequency:**

10 times per second

**Ripple:**

2.5Vrms

**Line Regulation:**

$\pm 0.7\%$  over specified range

**Load Regulation:**

$\pm 0.7\%$  over specified range

**Output Voltage Accuracy:**

<1% of set point between 50-1500Vdc

**Program/Monitor Accuracy:**

0.5% of full scale,  $\pm 50\text{mV}$

**Dimensions:**

3.4"W x 3"H x 10.5"L (86.5mm x 76.5mm x 266.7mm)

**Weight:**

5lbs. (2.3kg)



- **Multi-Output E-Gun Supply**
- **Fast Rise Time Pulsed Cathode Current**
- **Remote Programming via Ethernet**
- **Customizable for OEM Applications**

Spellman's Injector Control Assembly (ICA) multi-output high voltage power supplies are used to supply the appropriate electrode voltages to a triode electron gun in order to inject electrons into a Linear Accelerator (LINAC). The resulting high-energy electron pulses are used to create high-energy X-Rays for applications such as cargo screening and cancer therapy.

This multi-output, rack mount power supply provides the Cathode, Heater and Grid voltages required by the e-gun. The Cathode current can be pulsed up to 500Hz. The Heater and Grid supplies float at the Cathode voltage potential, typically up to -15kV. Injector current is regulated by programming the Grid Pulse Voltage. Remote control and monitoring is via standard Ethernet protocols. LED indicators on the front panel provide basic output and fault status, including Cathode Current and Arc faults.

The ICA series can be customized for specific system requirements.

## TYPICAL APPLICATIONS

Cargo screening, cancer therapy

## SPECIFICATIONS

### Input Voltage:

100-240Vac, 50-60Hz

### Cathode:

#### Output Voltage:

0 to -15kV

#### Pulsed Cathode Current:

200mA to 1500mA

#### Mean Cathode Current:

5.5mA (max)

#### Current Pulse Width:

Up to 6 $\mu$ s (90% to 90%)

#### Current Pulse Frequency:

Up to 500Hz

#### Current Risettime:

200ns (typical)

### Heater:

#### Output Voltage:

0 to -6.5Vdc (wrt Cathode)

#### Current:

3A

#### Resistance:

0.7ohm

### Grid (fixed):

#### Voltage:

-60 to -135Vdc (wrt Cathode)

#### Current:

250mA

#### Pulse Voltage:

0 to 340Vdc (wrt Cathode)

Injector current is regulated by programming the Grid Pulse Voltage

### Connections:

#### Front Panel:

Ethernet (RJ45 jack)

Interlock (24V nominal, 9 pin D-sub male pin plug)

Pulse Input (BNC)

#### Rear Panel:

AC Power In (IEC320 C14 male pin receptacle)

HV Out (3 pin terminal block)

### Interlock:

24V must be present to enable output high voltage cathode. It is intended to connect to the system to disable the ICA in case any system interlocks have not been satisfied.

### Operating Temperature:

10°C to +40°C

### Storage Temperature:

-40°C to +70°C

### Humidity:

30% to 60% relative humidity, non-condensing

### Weight:

15lbs. (6.8kg)

### Regulatory Approvals:

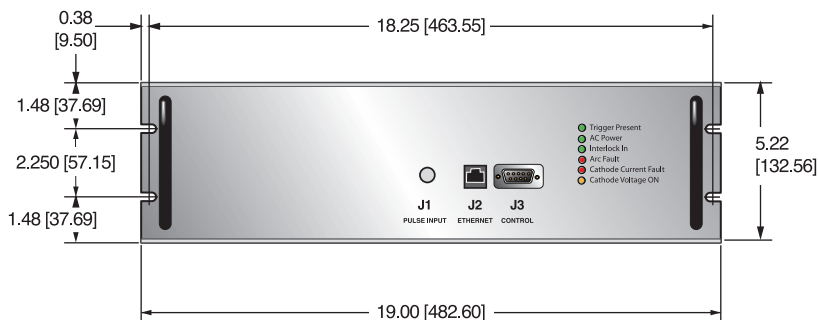
The ICA is designed to meet 60601-1, and is RoHS compliant.

## FRONT PANEL LED INDICATORS

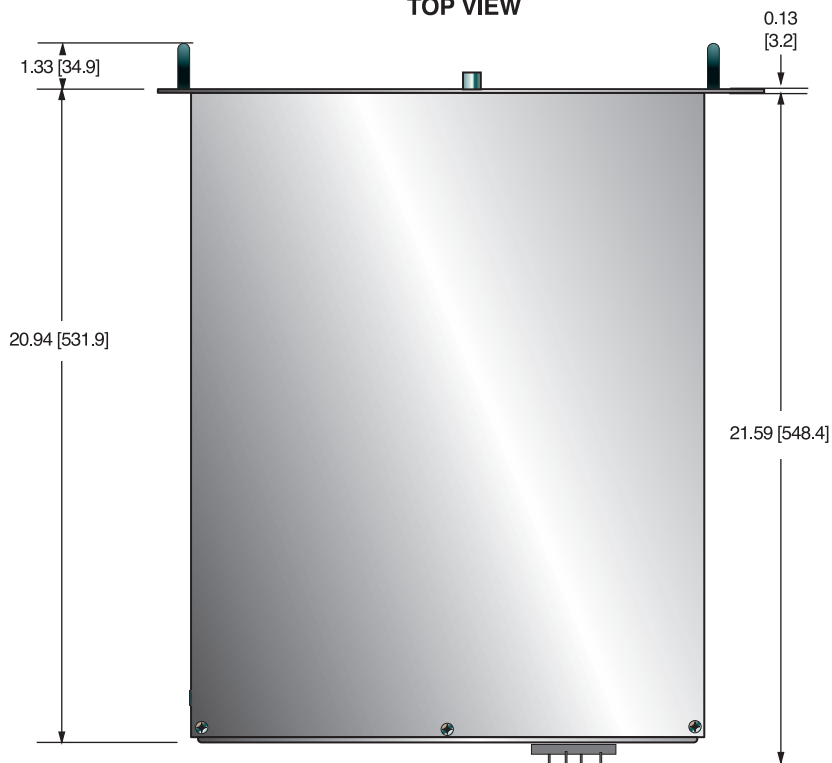
INDICATOR	COLOR	CONDITION Illuminated When...
Trigger Present	Green	Input trigger is present
AC Power	Green	AC supply voltage is present
Interlock In	Green	Interlock in signal is present
Arc Fault	Red	Arc fault signal is active
Cathode Current Fault	Red	Cathode current fault signal is active
Cathode Voltage ON	Amber	Cathode high voltage is present

DIMENSIONS: in.[mm]

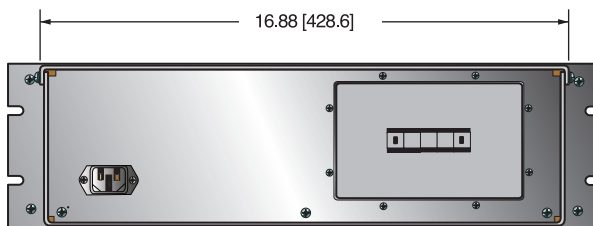
## FRONT VIEW



## TOP VIEW



## BACK VIEW





The XRVC Controller (XRVC) provides intuitive, touch screen driven programming and control of any of Spellman's popular XRV Series of X-Ray generators. This sophisticated and robust controller was designed using an embedded computing system running a custom Graphical User Interface (GUI). The GUI, embedded computer and ancillary hardware are housed in a rugged rack mount or bench top chassis. Capability of the XRVC include: creation of custom X-Ray tube seasoning profiles, one shot or continuous user fabricated operational profiles, automatic X-Ray tube configuration and much more.

### SPECIFICATIONS

#### Input Voltage:

180-264Vac, 50/60Hertz

#### Dimensions:

Rack mount:

5.25"H x 19"W x 13"D (133.35mm x 482.6mm x 330.2mm)

Bench top:

5.21"H x 17"W x 13"D (132.35mm x 431.8mm x 330.2mm)

#### Weight:

12 lbs (5.44kg)

#### Input Power Connector:

14 pin circular connector type 97-3102A-22-19P

#### Environmental:

Temperature Range:

Operating: 0°C to +50°C

Storage: -20°C to +80°C

Humidity:

0% to 95% RH

#### Cooling:

Convection cooled

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC

Low Voltage Directive. RoHS Compliant

### ADVANCED CONTROLLER FUNCTIONALITY

#### Seasoning

- Ability to create, save and load customized seasoning profiles (Default profiles are included)
- Real time seasoning progress, elapsed time and remaining time clocks
- Automatic notice when seasoning is required

- **Intel Atom N270 CPU @ 1.6GHz**
- **1GB Ram**
- **7" Touch Screen LCD @ 800 x 600**
- **Intel 945 Express Graphics**
- **10/100/1000Mbit Ethernet**
- **RS-232 Serial Ports**
- **160GB Internal Hard Drive**

#### Communications

- Ability to communicate with the XRV over RS-232 serial port
- Ability to communicate with the XRV over a direct crossover Ethernet connection or Ethernet switch

#### One Shot Profiles

- Ability to create, save and load customized one shot profiles
- Verification of profiles within the operating capabilities of the connected XRV unit

#### X-Ray Tube Selection

- Specific X-Ray tubes automatically configures the system with the recommended manufactureres operational profiles
- Supported tubes for automatic configuration can be uploaded into the XRVC

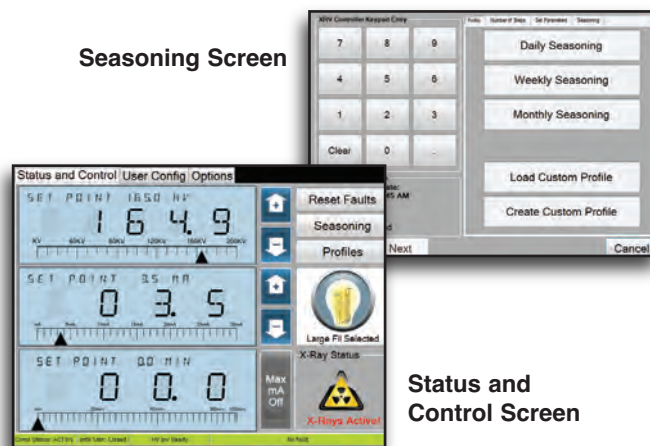
#### Easy to Use

- Intuitive, touch-centric, menu driven system allows operator use with little to no learning curve.
- Communication settings are retained by the XRVC, requiring only a single configuration session.
- Comprehensive status/control screen provides information on all critical operational parameters and system status indicators.

### SOFTWARE FEATURES

- Designed for compact, touch centric environment
- Integrated on screen keyboard provides rich input capabilities for operation without an external keyboard
- Adaptive software detects XRV controller and configures accordingly
- Dynamic feedback allows control of unit with real time viewing of the output

#### Seasoning Screen



Status and Control Screen



- **Mains to Cooler/Chiller, XRV Generator and XRV Touch Screen Controller**
- **Integrates all Necessary Safety Mechanisms to X-Ray System Environment to Meet International Standards**
- **X-Ray On, Pre-Warn and Safety Circuit Lamps**
- **Monitors Tube Cooling and Door Interlocks**
- **Rack and Wall Mount Versions Available**
- **Fail Safe Interlock Option Available**

Spellman's optional XRV I/O box is the ideal accessory for integrating Spellman's XRV X-Ray generators to a system environment. The XRV can now easily be packaged with industry standard metal ceramic X-Ray tubes, coolers and chillers while meeting all necessary safety and interlock requirements. The XRV I/O box is capable of accommodating a number of control interface options and can be installed in rack or wall configurations to best suit the integrators system placement requirements.

### TYPICAL APPLICATIONS

Power distribution for system components

### SPECIFICATIONS

#### Input Voltage:

180-264Vac, 50/60Hz

#### Operating Temperature:

0°C to +50°C

#### Storage Temperature:

-20°C to +80°C

#### Humidity:

0% to 95% relative humidity, non-condensing

#### Cooling:

Convection

#### Dimensions:

19.0"W X 5.21"H X 18.00"D

(482.6mm X 132.33mm X 330.2mm)

#### Weight:

30lbs (11.19kg)

#### Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. RoHS Compliant

### TYPICAL SYSTEM SET UP



See detailed schematic page 3

## XRV I/O BOX SELECTION TABLE

MODEL NUMBER	DESCRIPTION
XRV-9-1	Rack mount without XRV controller
XRV-9-2	Rack mount with XRV controller
XRV-9-3	Wall mount without XRV controller
XRV-9-4	Wall mount with XRV controller
XRV-9-5	Rack mount without XRV controller with optional safety relay for interlocks
XRV-9-6	Rack mount with XRV controller with optional safety relay for interlocks

## TB1, TB2, TB3-MAIN AC INPUT POWER—

PIN	SIGNAL	PARAMETERS
TB1-1	Line 1	180 - 264Vac
TB2-1	Line 2	Neutral or 180 - 264Vac (3 phase source)
TB3-1	GND	Ground

## TB4- COOLER / CHILLER—MAINS AC OUTPUT

PIN	SIGNAL	PARAMETERS
1	Line 1	180 - 264Vac
2	Line 2	180 - 264Vac or Neutral
3	GND	Ground

## TB5-COOLER / CHILLER INTERLOCKS

PIN	SIGNAL	PARAMETERS
1	Flow INTLK	Dry contacts, $\leq 24\text{Vdc}$
2	Common	Dry contacts, $\leq 24\text{Vdc}$
3	Temp INTLK	Dry contacts, $\leq 24\text{Vdc}$

## TB6-LOW VOLTAGE / DOOR INTERLOCKS

PIN	SIGNAL	PARAMETERS
1	Door INTLK	Dry contacts, $\leq 24\text{Vdc}$
2	Door INTLK	Dry contacts, $\leq 24\text{Vdc}$

## TB7-XRV I/O MAINS TO CDRH\* SAFETY INTERLOCK

PIN	SIGNAL	PARAMETERS
1	Power INTLK Line 1 OUT	180 - 264Vac
2	Line 1 IN	180 - 264Vac
3	Power INTLK Line 2 OUT	Neutral or 180 - 264Vac (3 phase source)
4	Line 2 IN	Neutral or 180 - 264Vac (3 phase source)
5	GND	Ground

\*CDRH (Center for Devices and Radiological Health) Safety Interlock Switch meets FDA 21 CFR 1020.40 requirements.

This switch has both low voltage interlock and power interlocks for the XRV mains.

## TB8-XRV AUX AC OUTPUT—TO XRV JB1

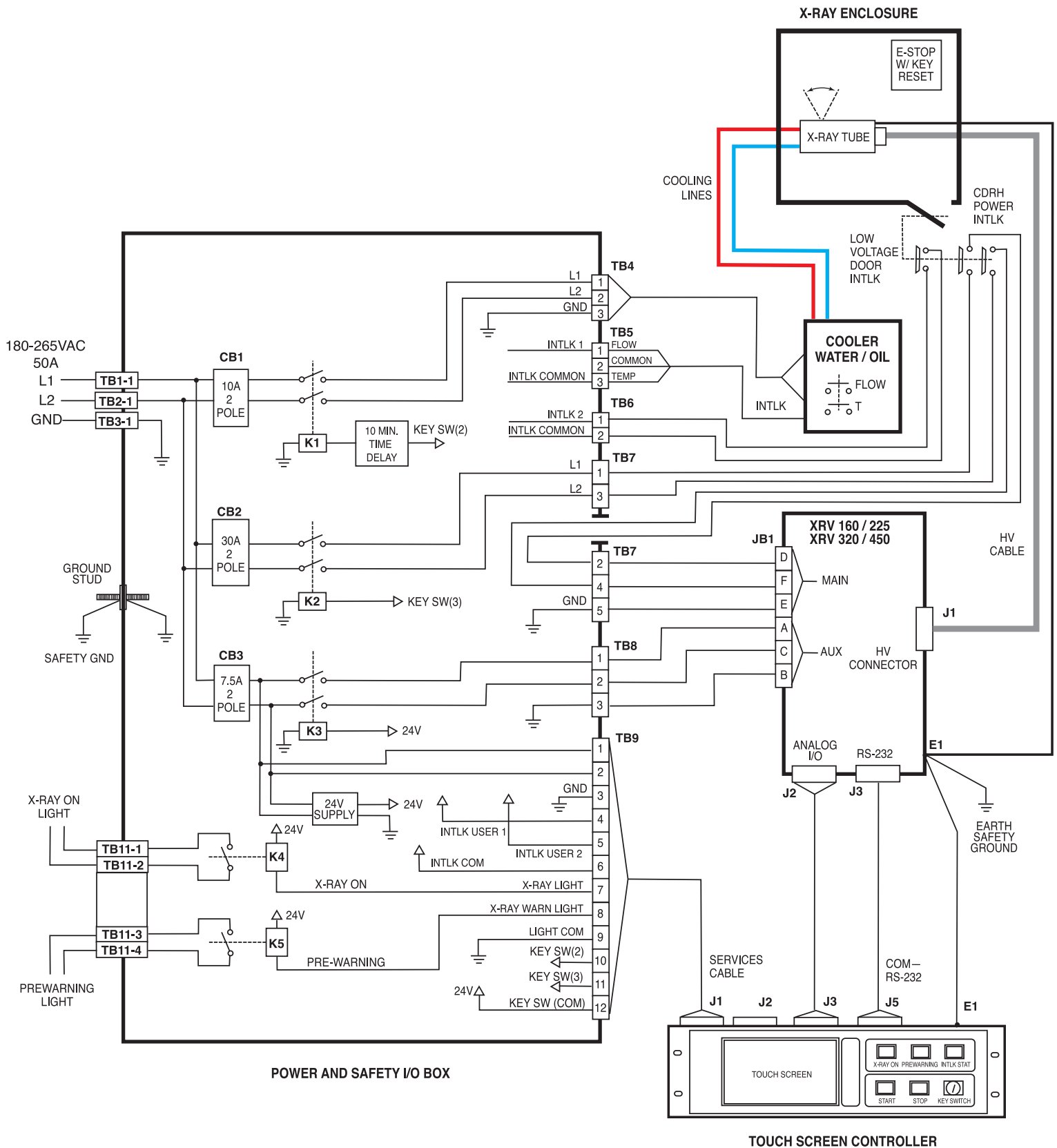
PIN	SIGNAL	PARAMETERS
A	Line 1	180 - 264Vac
B	Line 2	Neutral or 180 - 264Vac (3 phase source)
C	GND	Ground

## TB9-XRV I/O TO XRV CONTROLLER INTERFACE

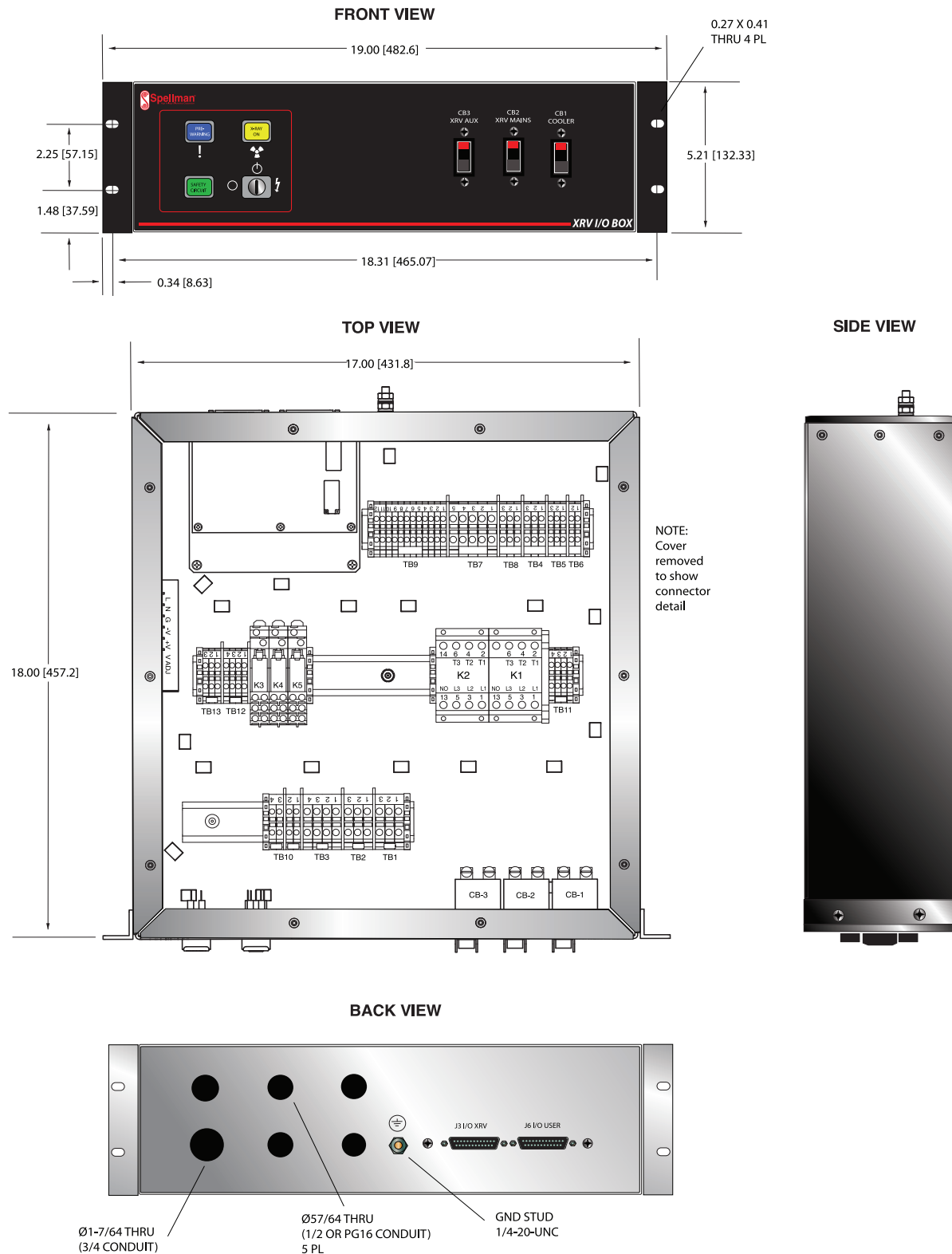
PIN	SIGNAL	PARAMETERS
1	Line 1	180 - 264Vac
2	Line 2	Neutral or 180 - 264Vac
3	GND	Ground
4	INTLK 1	Dry contacts, $\leq 24\text{Vdc}$
5	INTLK 2	Dry contacts, $\leq 24\text{Vd}$
6	INTLK Common	Common for INTLK 1, 2
7	X-Ray ON Light	Dry contacts, $\leq 24\text{Vdc}$
8	Pre-Warn Light	Dry contacts, $\leq 24\text{Vdc}$
9	Light Common	Light common
10	Key Switch 2	Dry contacts, $\leq 24\text{Vdc}$
11	Key Switch 3	Dry contacts, $\leq 24\text{Vdc}$
12	Key Switch Common	Key common

## TB11-X-RAY ON / PRE-WARN LIGHTS

PIN	SIGNAL	PARAMETERS
1	X-Ray ON Light	180 - 264Vac, 5 amp
2	X-Ray ON Light	180 - 264Vac, 5 amp
3	Pre-Warn Light	180 - 264Vac, 5 amp
4	Pre-Warn Light	180 - 264Vac, 5 amp



DIMENSIONS: in.[mm]



## Resistive Voltage Dividers

...for the measurement of high voltages  
using a standard digital voltmeter\*

Spellman's HVD Series of high voltage dividers provide laboratory or production facilities with a convenient method of measuring up to 100kVdc, 200kVdc or 400kVdc with accuracy better than 0.5%. These dividers are designed for use with high impedance digital voltmeters. All HVD dividers are housed in a polycarbonate cylinder containing a matched set of precision metal film resistors which have a temperature coefficient of less than 25ppm. A ladder-type construction technique is used in conjunction with polished high voltage bushings specifically designed to minimize corona. BNC connectors are used to provide the low voltage proportional output signal.

The HVD Series of high voltage dividers have no inferred bandwidth measurement capability what so ever. They are intended for DC steady state measurement only.

### Custom Encapsulated OEM High Voltage Dividers

Spellman designs and manufactures a wide array of custom encapsulated high voltage dividers for OEM applications like ion beam implantation for semiconductor manufacturing. Unique HV divider sizes, shapes, mounting arrangements and terminations can be provided addressing specific custom requirements. Contact Spellman to discuss your needs with our knowledgeable sales staff.

### Calibration

Spellman provides an NIST traceable calibration certificate with each HVD. A yearly recalibration cycle is recommended. Contact Spellman for calibration services.

- **High Input Impedance**
- **25ppm Temperature Coefficient**
- **100kV, 200kV and 400kV Models**
- **Corona Free Operation**
- **0.5% Accuracy**  
(higher accuracies available)



### HVD

	HVD100	HVD200	HVD400
Input Voltage	0-100kVdc	0-200kVdc	0-400kVdc
Input Impedance	1000Mohms	2000Mohms	4000Mohms
Output Impedance	1M; 100kohms	20kohms	40kohms
Output Taps	100V, 10V	2V	4V
Accuracy	0.5%: (0.1% opt) <sup>1</sup>	0.5%: (0.25% opt) <sup>2</sup>	0.5%
Stability	0.01%/8hrs	0.025%/8hrs	0.025%/8hrs
Temp. Coefficient	25ppm/°C	25ppm/°C	25ppm/°C
Height	17.5" (44.5cm)	33.5" (84.5cm)	61" (154.94cm)
Max. Diameter	10" (25.4cm)	12" (30.5cm)	20" (50.8cm)
Weight	6.75 lbs (3.1kg)	12 lbs (5.5kg)	24.45 lbs (11.8kg)
Output Connector	BNC type	BNC type	BNC type

(1) For accuracy of 0.1% specify HVD100-1

(2) For accuracy of 0.25% specify HVD200-1

\*for use with digital voltmeter 10Gohms or higher.

Note: Due to the high input impedance requirement connecting the HVD to an oscilloscope input (1Mohms input impedance) will cause erroneous, inaccurate measurements.

### WARNING

DANGEROUS LIFE THREATENING VOLTAGES MAY BE PRESENT ON THIS EQUIPMENT. OBSERVE EXTREME CAUTION WHEN OPERATING OR WORKING NEAR HIGH VOLTAGE DEVICES. NEVER TOUCH ANY HIGH VOLTAGE ASSEMBLY THAT IS SUSPECTED TO BE ENERGIZED OR CHARGED. DO NOT HANDLE OR COME WITHIN THE PROXIMITY OF HIGH VOLTAGE CONNECTIONS UNTIL ALL EQUIPMENT IS TURNED OFF AND THE SETUPS CAPACITANCE IS DISCHARGED. FAILURE TO FOLLOW SAFETY PROCEDURES MAY BE FATAL.

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