Spellman High Voltage... Your Global Resource for High Voltage Power Conversion

MEETING CUSTOMER NEEDS
For over 65 years, Spellman has been helping technology companies grow by providing standard and custom high voltage power converters and X-Ray generators 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 65 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

spellmanhv.com
Modular Supplies offer a single output up to 1200W in diverse form factors, and are designed to be integrated into systems, with either analog or digital control.

Rack Mounted Supplies from 1U to 6U, provide single or multiple outputs and either full featured front panel controls, or a blank front with digital interfaces for integration in OEM systems.

X-Ray Generators consist of integrated high voltage and filament power supplies and emission loop control circuitry. They may be modular or rack mounted.

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Spellman’s MS Modules have been designed for printed circuit board mounting with high reliability, small size and light weight. Each module provides 3W of output power to 3kV with well regulated low ripple, high stability and high voltage in a versatile, compact 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**
- Isolated Input to Output
- Isolation Voltage: 40V for units up to 1kV
  100V for units >1kV

**SPECIFICATIONS**
- **Input Voltage:** +12Vdc ±1V. Other input voltages also available.
- **Input Current:** < 0.56A at full output.
- **Output Voltage:** Continuously adjustable over each entire range. Models available in either positive or negative polarity. See table for voltage ranges.

- **Line Regulation:** < 0.005% for input change of 1 volt.
- **Load Regulation:** < 0.05% for 100μA to full load change. (at max. voltage)
- **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 1 Volt.
  - Load: 0.05% for 100μA to full load change at maximum voltage.
- **Ripple:** < 0.01% p-p of full output voltage.
- **5Vdc Reference:** +5.0V (±0.2V)
  A maximum of 1mA can be drawn from this output.
- **Temperature:**
  - Operating: 0°C to +50°C.
  - Storage: -35°C to +85°C.
- **Temperature Coefficient:** 50ppm/°C typical.
- **Stability:** < 0.05%/8 hrs at constant operating conditions after one hour warm-up.
- **Humidity:** 0 to 90% non-condensing.
- **Dimensions:**
  - Up to 1000Vdc: .87”H x 2.1”W x 3.1”D (23mm x 53mm x 78mm).
  - 1000V to 3000Vdc: 1.1”H x 2.36”W x 4.2”D (28mm x 60mm x 106mm).
- **Weight:**
  - Up to 1000V: 0.2lb (80g).
  - Over 1000V: 0.4lb (160g).
- **Regulatory Approvals:** Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

- **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**
**MS SELECTION TABLE**

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<td>0.03</td>
<td>MS0.3*C</td>
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<td>6</td>
<td>0.05</td>
<td>MS0.5*C</td>
</tr>
<tr>
<td>750</td>
<td>4</td>
<td>0.075</td>
<td>MS0.75*C</td>
</tr>
<tr>
<td>1000</td>
<td>3</td>
<td>0.10</td>
<td>MS1*C</td>
</tr>
<tr>
<td>1500</td>
<td>2</td>
<td>0.15</td>
<td>MS1.5*C</td>
</tr>
<tr>
<td>2000</td>
<td>1.5</td>
<td>0.20</td>
<td>MS2*C</td>
</tr>
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<td>2500</td>
<td>1.2</td>
<td>0.25</td>
<td>MS2.5*C</td>
</tr>
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<td>1</td>
<td>0.30</td>
<td>MS3*C</td>
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</table>

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

**DIMENSIONS:** in.[mm]

**UNIT UP TO 1000V**

**SIDE VIEW**

- DRILL DIA FOR PINS 1mm
- 0.91 [23]

**BOTTOM VIEW**

- 0.26 [6.5]
- 2.22 [56.5]
- 1.57 [40.00]
- 0.85 [12.7]
- 0.50 [12.73]

**UNIT > 1000V UP TO 3000V**

**SIDE VIEW**

- DRILL DIA FOR PINS 1mm
- 1.10 [28]

**BOTTOM VIEW**

- 0.26 [6.5]
- 3.05 [77.47]
- 1.58 [40.03]
- 0.86 [21.7]
- 0.50 [12.73]

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 ± 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: ±12Vdc to ±18Vdc @ 400mA
specify “-1” (option 1) or “-3” (option 3) when ordering

**Efficiency:**
≈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: ±0.001% of rated output voltage for a +1% input line change
- Load: ±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
- CE Listed, UL Recognized and RoHS Compliant

**Ripple:**
See “model selection” table

**Stability:**
≤0.005% per hour, 0.02% per 8 hours, after a 1/2 hour warm up

**Accuracy:**
- Remote Programming ±(2% of setting, +0.5% of maximum)
- Voltage Monitor ±2%

**Temperature Coefficient:**
±50ppm/°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°C to +50°C

**Storage Temperature:**
-40°C to +85°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 x32mm x 160mm)

**Weight:**
≤2.0 pounds (0.9kg)

**Regulatory Approvals:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. UL/CUL recognized, File E137710. Compliant to 2002/95/EC, RoHS
### MODEL SELECTION TABLE

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<td>0 to 8mA</td>
<td>5mV</td>
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<td>PMT-10C-P,N</td>
<td>0 to 1kV</td>
<td>0 to 4mA</td>
<td>4mV</td>
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<td>PMT-20C-P,N</td>
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<td>2mV</td>
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<td>PMT-50C-P,N</td>
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<td>0 to 0.5mA</td>
<td>10mV</td>
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<td>PMT-75C-P,N</td>
<td>0 to 7.5kV</td>
<td>0 to 0.25mA</td>
<td>100mV</td>
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</tbody>
</table>

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

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<td>50k ohms</td>
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<td>10k ohms</td>
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<td>0 to 3 volts</td>
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<td>PMT-50C-P,N</td>
<td>0 to 5 volts</td>
<td>100k ohms</td>
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<tr>
<td>PMT-75C-P,N</td>
<td>0 to 7.5 volts</td>
<td>200k ohms</td>
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Note: The Voltage Monitor polarity matches the high voltage output polarity.
 SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION

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 +4.64 Vdc equals zero to full scale rated). A voltage programming input is provided where 0 to +4.64 Vdc 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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. UL/CUL recognized, File E227588. Compliant to 2002/95/EC, RoHS.
**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

---

**UM 4W SELECTION TABLE**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V (Vp-p)</th>
<th>Output Current (mA)</th>
<th>Low Freq. Ripple @ 1Hz-1kHz (%)</th>
<th>High Freq. Ripple @ 1kHz-1MHz (%)</th>
<th>Output Capacitance (μF)</th>
<th>Arc Limiting Resistance (Ω)</th>
<th>I Sense Scaling Full Scale Signal (mV)</th>
<th>High Voltage Divider Resistance (MΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM0.062*4</td>
<td>0 to 62.5V</td>
<td>64mA</td>
<td>0.030</td>
<td>0.028</td>
<td>8.8μF</td>
<td>1Ω</td>
<td>1.5V</td>
<td>0.5MΩ</td>
</tr>
<tr>
<td>UM0.125*4</td>
<td>0 to 125V</td>
<td>32mA</td>
<td>0.045</td>
<td>0.014</td>
<td>8.8μF</td>
<td>4.4Ω</td>
<td>2.75V</td>
<td>0.88MΩ</td>
</tr>
<tr>
<td>UM0.25*4</td>
<td>0 to 250V</td>
<td>16mA</td>
<td>0.034</td>
<td>0.017</td>
<td>2.2μF</td>
<td>20Ω</td>
<td>4.9V</td>
<td>1.50MΩ</td>
</tr>
<tr>
<td>UM0.5*4</td>
<td>0 to 500V</td>
<td>8mA</td>
<td>0.036</td>
<td>0.040</td>
<td>0.8μF</td>
<td>94Ω</td>
<td>10.1V</td>
<td>2.50MΩ</td>
</tr>
<tr>
<td>UM1*4</td>
<td>0 to 1kV</td>
<td>4mA</td>
<td>0.025</td>
<td>0.015</td>
<td>0.2μF</td>
<td>470Ω</td>
<td>10.75V</td>
<td>20MΩ</td>
</tr>
<tr>
<td>UM2*4</td>
<td>0 to 2kV</td>
<td>2mA</td>
<td>0.022</td>
<td>0.015</td>
<td>0.097μF</td>
<td>1.0KΩ</td>
<td>10.4V</td>
<td>30MΩ</td>
</tr>
<tr>
<td>UM4*4</td>
<td>0 to 4kV</td>
<td>1mA</td>
<td>0.019</td>
<td>0.017</td>
<td>0.012μF</td>
<td>9.4KΩ</td>
<td>11.1V</td>
<td>100MΩ</td>
</tr>
<tr>
<td>UM6*4</td>
<td>0 to 6kV</td>
<td>0.67mA</td>
<td>0.016</td>
<td>0.015</td>
<td>0.007μF</td>
<td>20KΩ</td>
<td>9.9V</td>
<td>150MΩ</td>
</tr>
</tbody>
</table>

**UM 20W SELECTION TABLE**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V (Vp-p)</th>
<th>Output Current (mA)</th>
<th>Low Freq. Ripple @ 1Hz-1kHz (%)</th>
<th>High Freq. Ripple @ 1kHz-1MHz (%)</th>
<th>Output Capacitance (μF)</th>
<th>Arc Limiting Resistance (Ω)</th>
<th>I Sense Scaling Full Scale Signal (mV)</th>
<th>High Voltage Divider Resistance (MΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM0.062*20</td>
<td>0 to 62.5V</td>
<td>320mA</td>
<td>0.060</td>
<td>0.044</td>
<td>8.8μF</td>
<td>10Ω</td>
<td>6.75V</td>
<td>0.88MΩ</td>
</tr>
<tr>
<td>UM0.125*20</td>
<td>0 to 125V</td>
<td>160mA</td>
<td>0.067</td>
<td>0.044</td>
<td>8.8μF</td>
<td>4.4Ω</td>
<td>2.75V</td>
<td>0.88MΩ</td>
</tr>
<tr>
<td>UM0.25*20</td>
<td>0 to 250V</td>
<td>80mA</td>
<td>0.035</td>
<td>0.019</td>
<td>2.2μF</td>
<td>200Ω</td>
<td>4.9V</td>
<td>1.50MΩ</td>
</tr>
<tr>
<td>UM0.5*20</td>
<td>0 to 500V</td>
<td>40mA</td>
<td>0.041</td>
<td>0.040</td>
<td>0.8μF</td>
<td>940Ω</td>
<td>10.1V</td>
<td>2.50MΩ</td>
</tr>
<tr>
<td>UM1*20</td>
<td>0 to 1kV</td>
<td>20mA</td>
<td>0.039</td>
<td>0.095</td>
<td>0.2μF</td>
<td>4.90Ω</td>
<td>10.75V</td>
<td>20MΩ</td>
</tr>
<tr>
<td>UM2*20</td>
<td>0 to 2kV</td>
<td>10mA</td>
<td>0.026</td>
<td>0.016</td>
<td>0.097μF</td>
<td>1.0KΩ</td>
<td>10.4V</td>
<td>30MΩ</td>
</tr>
<tr>
<td>UM4*20</td>
<td>0 to 4kV</td>
<td>5mA</td>
<td>0.023</td>
<td>0.028</td>
<td>0.012μF</td>
<td>9.4KΩ</td>
<td>11.1V</td>
<td>100MΩ</td>
</tr>
<tr>
<td>UM6*20</td>
<td>0 to 6kV</td>
<td>3.3mA</td>
<td>0.017</td>
<td>0.018</td>
<td>0.007μF</td>
<td>20KΩ</td>
<td>9.9V</td>
<td>150MΩ</td>
</tr>
</tbody>
</table>

**UM 30W SELECTION TABLE**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V (Vp-p)</th>
<th>Output Current (mA)</th>
<th>Low Freq. Ripple @ 1Hz-1kHz (%)</th>
<th>High Freq. Ripple @ 1kHz-1MHz (%)</th>
<th>Output Capacitance (μF)</th>
<th>Arc Limiting Resistance (Ω)</th>
<th>I Sense Scaling Full Scale Signal (mV)</th>
<th>High Voltage Divider Resistance (MΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM0.062*30</td>
<td>0 to 62.5V</td>
<td>480mA</td>
<td>0.075</td>
<td>0.056</td>
<td>8.8μF</td>
<td>10Ω</td>
<td>6.75V</td>
<td>0.88MΩ</td>
</tr>
<tr>
<td>UM0.125*30</td>
<td>0 to 125V</td>
<td>240mA</td>
<td>0.075</td>
<td>0.056</td>
<td>8.8μF</td>
<td>4.4Ω</td>
<td>2.75V</td>
<td>0.88MΩ</td>
</tr>
<tr>
<td>UM0.25*30</td>
<td>0 to 250V</td>
<td>120mA</td>
<td>0.055</td>
<td>0.021</td>
<td>2.2μF</td>
<td>200Ω</td>
<td>4.9V</td>
<td>1.50MΩ</td>
</tr>
<tr>
<td>UM0.5*30</td>
<td>0 to 500V</td>
<td>60mA</td>
<td>0.085</td>
<td>0.041</td>
<td>0.8μF</td>
<td>940Ω</td>
<td>10.1V</td>
<td>2.50MΩ</td>
</tr>
<tr>
<td>UM1*30</td>
<td>0 to 1kV</td>
<td>30mA</td>
<td>0.032</td>
<td>0.112</td>
<td>0.2μF</td>
<td>220Ω</td>
<td>6.5V</td>
<td>20MΩ</td>
</tr>
<tr>
<td>UM2*30</td>
<td>0 to 2kV</td>
<td>15mA</td>
<td>0.031</td>
<td>0.112</td>
<td>0.097μF</td>
<td>470Ω</td>
<td>9.85V</td>
<td>20MΩ</td>
</tr>
<tr>
<td>UM4*30</td>
<td>0 to 4kV</td>
<td>7.5mA</td>
<td>0.028</td>
<td>0.071</td>
<td>0.012μF</td>
<td>4.9KΩ</td>
<td>9.85V</td>
<td>100MΩ</td>
</tr>
<tr>
<td>UM6*30</td>
<td>0 to 6kV</td>
<td>5mA</td>
<td>0.020</td>
<td>0.051</td>
<td>0.007μF</td>
<td>9.4KΩ</td>
<td>10.0V</td>
<td>150MΩ</td>
</tr>
</tbody>
</table>

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

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

**Legacy 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.

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

**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.

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.

**Legacy 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.

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

C Option
Fast Rise Time Applications-
If applications demand a power supply that is optimized for fast rise time/low overshoot requirements, then the C Option should be considered. A Hysteretic control circuit is employed providing improved performance in these unique applications with higher ripple observed (1% Vpp typical). If used for capacitor charging, a Spellman Capacitor Charging Questionnaire should be filled out to assure all aspects of the intended usage is understood assuring the appropriate unit is provided. Speak to a Spellman sales person for more details.

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.

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.

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

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.

SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION

Maximum short circuit discharge rate:
\[ \frac{C V^2}{2} \leq (f) <1 \text{ watt} \]

<table>
<thead>
<tr>
<th>C</th>
<th>Output capacitance of unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>C ext</td>
<td>External capacitance</td>
</tr>
<tr>
<td>V</td>
<td>Maximum rated voltage</td>
</tr>
<tr>
<td>f</td>
<td>Frequency of discharge</td>
</tr>
<tr>
<td>T</td>
<td>Nominal output current</td>
</tr>
<tr>
<td>tR</td>
<td>Rise time</td>
</tr>
</tbody>
</table>

Typical Rise Time:
\[ tR = \frac{C + C ext}{I} \]

Minimum rise time is 3mS

SHIELDING

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).
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

OPTON | OPTION CODE
--- | ---
Legacy Interface | L
Fast Rise Time | C
Low Temperature Coefficient | T
Adapter Board | A
Terminal Block | B
Mu Metal Shield | M
HF-tight Shielded Can | S
Eared Mounting Plate | E
Eared Mounting Plate/Adapter Board | E2

OPTION ORDERING EXAMPLE

UM4P30/L/E
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:
### 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)
- Disables: 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:**
- 2% on all programming and monitoring, except I Sense 10%
- 0.01% per 8 hours, 0.02% per day after 30 min. warmup

**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)

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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V</th>
<th>Output Current</th>
<th>Ripple(max)</th>
<th>Output</th>
<th>Arc Limiting</th>
<th>I Sense Scaling</th>
<th>High Voltage Divider</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM4*15</td>
<td>0 to 8kV</td>
<td>0.5mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM10*15</td>
<td>0 to 10kV</td>
<td>0.4mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM12*15</td>
<td>0 to 12kV</td>
<td>0.33mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM15*15</td>
<td>0 to 15kV</td>
<td>0.26mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM20*15</td>
<td>0 to 20kV</td>
<td>0.2mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM25*15</td>
<td>0 to 25kV</td>
<td>0.16mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM30*15</td>
<td>0 to 30kV</td>
<td>0.13mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM35*15</td>
<td>0 to 35kV</td>
<td>0.115mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM40*15</td>
<td>0 to 40kV</td>
<td>0.1mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V</th>
<th>Output Current</th>
<th>Ripple(max)</th>
<th>Output</th>
<th>Arc Limiting</th>
<th>I Sense Scaling</th>
<th>High Voltage Divider</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM15*15</td>
<td>0 to 8kV</td>
<td>1.875mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM10*15</td>
<td>0 to 10kV</td>
<td>1.5mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM12*15</td>
<td>0 to 12kV</td>
<td>1.25mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM15*15</td>
<td>0 to 15kV</td>
<td>1.0mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM20*15</td>
<td>0 to 20kV</td>
<td>0.75mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM25*15</td>
<td>0 to 25kV</td>
<td>0.6mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM30*15</td>
<td>0 to 30kV</td>
<td>0.5mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM35*15</td>
<td>0 to 35kV</td>
<td>0.42mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM40*15</td>
<td>0 to 40kV</td>
<td>0.375mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V</th>
<th>Output Current</th>
<th>Ripple(max)</th>
<th>Output</th>
<th>Arc Limiting</th>
<th>I Sense Scaling</th>
<th>High Voltage Divider</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM30*30</td>
<td>0 to 8kV</td>
<td>3.75mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM10*30</td>
<td>0 to 10kV</td>
<td>3mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM12*30</td>
<td>0 to 12kV</td>
<td>2.5mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM15*30</td>
<td>0 to 15kV</td>
<td>2mA</td>
<td>0.06</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM20*30</td>
<td>0 to 20kV</td>
<td>1.5mA</td>
<td>0.06</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM25*30</td>
<td>0 to 25kV</td>
<td>1.2mA</td>
<td>0.06</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM30*30</td>
<td>0 to 30kV</td>
<td>1mA</td>
<td>0.06</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM35*30</td>
<td>0 to 35kV</td>
<td>0.857mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
<tr>
<td>UM40*30</td>
<td>0 to 40kV</td>
<td>0.75mA</td>
<td>0.05</td>
<td>6830pF</td>
<td>50Ω</td>
<td>3.32V</td>
<td>20Ω</td>
<td></td>
</tr>
</tbody>
</table>

### Environmental
- **Temperature Range:**
  - Operating: -40°C to 65°C case temperature
  - Storage: -55°C to 105°C, non operational

### 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 1.14” H (93.98mm X 38.10mm X 28.87mm)
- 15kV-20kV: 4.21V 550MΩ
- 25kV-40kV: 4.21V 550MΩ

### 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)

**Grayed text indicates Legacy interface signals.**
**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.

---

**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

C Option
Fast Rise Time Applications-
If applications demand a power supply that is optimized for fast rise time requirements, then the C Option should be considered. If used for capacitor charging, a Spellman Capacitor Charging Questionnaire should be filled out to assure all aspects of the intended usage is understood assuring the appropriate unit is provided. Speak to a Spellman sales person for more details.

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.

**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**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Option Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 8kV</td>
<td>8</td>
</tr>
<tr>
<td>0 to 10kV</td>
<td>10</td>
</tr>
<tr>
<td>0 to 12kV</td>
<td>12</td>
</tr>
<tr>
<td>0 to 15kV</td>
<td>15</td>
</tr>
<tr>
<td>0 to 20kV</td>
<td>20</td>
</tr>
<tr>
<td>0 to 25kV</td>
<td>25</td>
</tr>
<tr>
<td>0 to 30kV</td>
<td>30</td>
</tr>
<tr>
<td>0 to 35kV</td>
<td>35</td>
</tr>
<tr>
<td>0 to 40kV</td>
<td>40</td>
</tr>
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</table>

**Polarity**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Option Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>P</td>
</tr>
<tr>
<td>Negative</td>
<td>N</td>
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**Power**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Option Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watts Output 4</td>
<td></td>
</tr>
<tr>
<td>Watts Output 15</td>
<td></td>
</tr>
<tr>
<td>Watts Output 30</td>
<td></td>
</tr>
</tbody>
</table>

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**OPTION ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Option</th>
<th>Option Code</th>
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</thead>
<tbody>
<tr>
<td>Legacy Interface</td>
<td>L</td>
</tr>
<tr>
<td>Fast Rise Time</td>
<td>C</td>
</tr>
<tr>
<td>Low Temperature Coefficient</td>
<td>T</td>
</tr>
<tr>
<td>Mu Metal Shield</td>
<td>M</td>
</tr>
<tr>
<td>RF Tight Shielded Can</td>
<td>S</td>
</tr>
<tr>
<td>Eared Mounting Plate</td>
<td>E</td>
</tr>
<tr>
<td>Terminal Block</td>
<td>B</td>
</tr>
</tbody>
</table>

**OPTION ORDERING EXAMPLE**

**UM25P15/L/E**

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage</th>
<th>Polarity</th>
<th>Power</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM25</td>
<td>25</td>
<td>15</td>
<td>L</td>
<td>P</td>
</tr>
</tbody>
</table>

---

**STANDARD UNIT ORDERING EXAMPLE**

**UM30N30**

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage</th>
<th>Polarity</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM30</td>
<td>30</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
UM8-40 HIGH VOLTAGE MODULE

DIMENSIONS: in. (mm)

15 PIN - Standard Interface

MOUNTING HOLES:
2-56 UNC X .187 (4.76) DEEP

CABLE:
DIA. 0.175
36.00 (914.4)
MIN. LENGTH

9 PIN - Legacy Interface

MOUNTING HOLES:
2-56 UNC X .187 (4.76) DEEP

CABLE:
DIA. 0.175
36.00 (914.4)
MIN. LENGTH

PINS:
GOLD-PLATED 0.025
(0.64) SQ.

CABLE:
DIA. 0.175
36.00 (914.4)
MIN. LENGTH

PINS:
GOLD-PLATED 0.025
(0.64) SQ.

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e-mail: sales@spellmanhv.com

www.spellmanhv.com
128074-001 REV. K

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.

A fully featured remote user interface is provided via 15-pin D-type connector as standard and an optional RS-232 or RS-485 serial interface is also available. 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
- Electron and Ion Beams
- Electromultiplier Detectors
- Microchannel Plate Detectors
- Nuclear Instruments
- Electrostatic Printing
- Scintillators
- Mass Spectrometry
- Electrostatic Lenses

**OPTIONS**
- **VCC** Variable Current Control
- **HS** High Stability
- **DCC 2** RS-232
- **DCC 4** RS-485

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

**SPECIFICATIONS**

**Input Voltage:**
+24 Vdc, ±2Vdc

**Input Current:**
≤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:** ≤0.001% of rated output voltage over specified input voltage
- **Load:** ≤0.001% of rated output voltage for full load change

**Current Regulation (VCC Option):**
- **Line:** ≤0.01% for 1V input voltage change under any load conditions
- **Load:** ≤0.01% for full load to short circuit

**Ripple:**
See "model selection" table

**Stability:**
≤0.007% per hour, 0.02% per 8 hours after 1.0 hour warm up period.
≤0.05% per 1000 hours after 1.0 hour warm up period (HS option)

**Temperature Coefficient:**
≤25ppm per degree C
≤10ppm 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
MPS ANALOG INTERFACE—15 PIN D CONNECTOR (NON-DCC UNITS)

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power/Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>+24Vdc Input</td>
<td>+24Vdc @ 1 amp maximum</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Monitor Output</td>
<td>0 to 10Vdc=0 to 100% Rated Output, Zout =10kΩ provided</td>
</tr>
<tr>
<td>4</td>
<td>Local Programming</td>
<td>Potentiometer connected to +10Vdc and Ground, 0 to 10Vdc adjustable wiper output provided</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Program Input</td>
<td>0 to 10Vdc=0 to 100% Rated Output, Zin=10MΩ</td>
</tr>
<tr>
<td>6</td>
<td>Voltage Program Differential</td>
<td>0 to 10Vdc=0 to 100% Rated Output, Zout =10kΩ provided</td>
</tr>
<tr>
<td>7</td>
<td>Amplifier Input—Positive</td>
<td>0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of rated output, diode clamped to ground, Zin =38kΩ</td>
</tr>
<tr>
<td>8</td>
<td>Current Monitor Output</td>
<td>0 to 10Vdc = 0 to 100% Rated Output, Zout =10kΩ</td>
</tr>
<tr>
<td>9</td>
<td>Voltage Program Differential</td>
<td>0 to 10Vdc differential between pin 7 and pin 9 = 0 to 100% of Rated Output, diode clamped to ground, Zn =38kΩ</td>
</tr>
<tr>
<td>10</td>
<td>No Connection</td>
<td>No Connection</td>
</tr>
<tr>
<td>11</td>
<td>Current Program Input</td>
<td>Standard: Internally connected to provide 110% fixed current limit VCC Option: 0 to 10Vdc=0 to 100% Rated Output, Zin=1MΩ</td>
</tr>
<tr>
<td>12</td>
<td>Enable Input</td>
<td>Low = Enable, TTL, CMOS, Open Collector Compliant</td>
</tr>
<tr>
<td>13</td>
<td>Internal Connection</td>
<td>No Connection</td>
</tr>
<tr>
<td>14</td>
<td>Vref (HS unit only)</td>
<td>+10V ultra high stability reference output. On standard units the reference voltage is available on pin 4</td>
</tr>
<tr>
<td>15</td>
<td>Analog Signal Ground (15kV to 20kV units)</td>
<td>Analog Signal Ground (No connection for (1kV to 10kV units)</td>
</tr>
</tbody>
</table>

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 ANALOG INTERFACE—15 PIN D CONNECTOR (DCC UNITS)

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

MPS SELECTION TABLE

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

*Specify “P” for positive polarity or “N” for negative polarity. Custom units available.
DIMENSIONS: in.[mm]

1-20kV

1-10kV

15-20kV

30kV

M3 x 5
DEEP MAX.
3 PLS.

2.75 [70]

1.18 [30]

2.95 [75]

1.37 [35]

1.93 [49]

1.10 [28]

1.93 [49]

1.10 [28]

M3 x 5
DEEP MAX.
3 PLS.

1.81 [46]

0.27 [7]

1.81 [46]

0.27 [7]

0.53 [13.6]

0.53 [14.0]

0.37 [9.5]

0.37 [9.5]

5.12 [130]

6.50 [165]

8.47 [215]

1.93 [49]
The MP Series has been designed as high performance dc to dc converters with output voltages up to 40kV. Each module provides well regulated, low ripple and high stability high voltage in a highly versatile compact design, combining linear and switched mode techniques to minimize internal dissipation and generated EMI/RFI interference. The higher voltage modules are vacuum encapsulated to ensure corona free operation. Specialist cell manufacture of the MP Series ensures prompt delivery.

**TYPICAL APPLICATIONS**

- Photomultiplier Tubes
- Scintillators
- Electron Guns
- Ion Guns
- Nuclear Instruments
- Electrostatic lenses
- Spectroscopy
- Microchannel Plates

**OPTIONS**

- **F** Flange Mounting
- **P** Positive Output Polarity
- **N** Negative Output Polarity
- **LL** Optional Lead Length

**SPECIFICATIONS**

**Input Voltage:**

+24Vdc±2V. Other input voltages available on special order.

**Input Current:**

Less than 1A at full output.

**Output Voltage:**

Continuously adjustable over entire output range. Available in either positive or negative output polarity. See table for voltage ranges.

**Output Voltage Control:**

Controlled by either:

1) Internal ten-turn potentiometer
2) External potentiometer 5k to 100k (set internal pot. to max.)
3) Remote differential voltage programming (0 to +10V gives 0 to full output).

Accuracy 0.1%.

**Remote Control:**

Remote programming Common Mode Range: -5VDC to +15VDC

**Line Regulation:**

0.001% for input change of 1V.

**Load Regulation:**

0.001% for 100μA to full load change (at maximum voltage).

**Temperature Coefficient:**

Better than 25ppm/°C.

**Stability:**

<0.007%/hr at constant operating conditions after 1 hour warm-up.

**Output Voltage and Current Monitors:**

Voltage: 0 to +10V represents zero to full output ±1%.
Current: 0 to +10V represents zero to full output ±2%.

**Temperature:**

Operating: 0°C to +50°C.
Storage: -35°C to +85°C.

**Connectors:**

Input: 10 pin connector (mating connector supplied).
Output: Output voltage 1-20kV: 500mm screened cable URM76
Output voltage 30kV: 500mm screened cable RG59
Output voltage 40kV: 500mm silicone rubber cable

**Dimensions:**

- Stud mounted case
  - MP1 to MP5: 1.65”H x 3.86”W x 5.83”D (42mm x 98mm x 148mm)
  - MP10 to MP15: 1.65”H x 3.86”W x 7.48”D (42mm x 98mm x 190mm)
  - MP20 to MP30: 1.65”H x 3.86”W x 9.45”D (42mm x 98mm x 240mm)

Two M3 metric studs on case as standard (mating hardware supplied)

www.spellmanhv.com/manuals/MP
Flange case
- MP1 to MP5: 1.65”H x 3.86”W x 6.61” (42mm x 98mm x 168mm)
  - Fixing center: 6.14” (156mm)
- MP10 to MP15: 1.65”H x 3.86”W x 8.27” (42mm x 98mm x 210mm)
  - Fixing center: 7.80” (198mm)
- MP20 to MP30: 1.65”H x 3.86”W x 10.2” (42mm x 98mm x 260mm)
  - Fixing center: 9.77” (248mm)
- MP40: 1.81”H x 3.86”W x 13.0” (46mm x 98mm x 330mm)
  - Fixing center: 12.5” (318mm) (4 x 3.3mm mounting holes)

Weight:
- MP1 to MP5: 21.18 oz. (600g)
- MP10 to MP15: 35.3 oz. (1000g)
- MP20 to MP30: 51.18 oz. (1450g)
- MP40: 76.24 oz. (2160g)

Regulatory Approvals:
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

### MP SELECTION TABLE

<table>
<thead>
<tr>
<th>OUTPUT VOLTAGE (kV)</th>
<th>MAX. CURRENT (mA)</th>
<th>RIPPLE (full load) (mV)</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1</td>
<td>10</td>
<td>10mV p-p</td>
<td>MP1*</td>
</tr>
<tr>
<td>0 to 1.5</td>
<td>6</td>
<td>10mV p-p</td>
<td>MP1.5*</td>
</tr>
<tr>
<td>0 to 2</td>
<td>5</td>
<td>10mV p-p</td>
<td>MP2*</td>
</tr>
<tr>
<td>0 to 2.5</td>
<td>4</td>
<td>10mV p-p</td>
<td>MP2.5*</td>
</tr>
<tr>
<td>0 to 3</td>
<td>3</td>
<td>10mV p-p</td>
<td>MP3*</td>
</tr>
<tr>
<td>0 to 5</td>
<td>2</td>
<td>20mV p-p</td>
<td>MP5*</td>
</tr>
<tr>
<td>0 to 10</td>
<td>1</td>
<td>100mV p-p</td>
<td>MP10*</td>
</tr>
<tr>
<td>0 to 15</td>
<td>0.60</td>
<td>150mV p-p</td>
<td>MP15*</td>
</tr>
<tr>
<td>0 to 20</td>
<td>0.50</td>
<td>200mV p-p</td>
<td>MP20*</td>
</tr>
<tr>
<td>0 to 30</td>
<td>0.33</td>
<td>300mV p-p</td>
<td>MP30*</td>
</tr>
<tr>
<td>0 to 40</td>
<td>0.2</td>
<td>400mV p-p</td>
<td>MP40*</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity.

### MP CONNECTOR 10 PIN

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PIN</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Synchronization</td>
<td>6</td>
<td>Remote Control</td>
</tr>
<tr>
<td>2</td>
<td>+24V Input</td>
<td>7</td>
<td>Vprog+</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Monitor</td>
<td>8</td>
<td>Current Monitor</td>
</tr>
<tr>
<td>4</td>
<td>Local Control</td>
<td>9</td>
<td>Vprog-</td>
</tr>
<tr>
<td>5</td>
<td>Remote / Local Link</td>
<td>10</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>
Spellman’s Bertan brand of 230 Series high voltage power supplies provide regulated high voltage outputs from 1 to 30kV. The low noise, linear topology employed results in extremely low output ripple specifications. These 12 to 15W units are inherently reversible by design, providing either positive or negative output polarity. The 230 Series is fully arc and short circuit protected. Excellent regulation specifications are featured along with outstanding stability performance.

**TYPICAL APPLICATIONS**
- HiPot Testing
- Electrostatics
- General Laboratory Usage

**OPTIONS**
- F Isolated (Floating) Output

**SPECIFICATIONS**

**Input Voltage:**
- 115Vac, ±10%, 50/60Hz @ 0.5A
- 230Vac, ±10%, 50/60Hz @ 0.25A
Input voltage is switch selectable

**Output Voltage:**
See “model selection” table

**Output Polarity:**
All units are reversible polarity by design

**Output Current:**
See “model selection” table

**Voltage Regulation:**
- Line: ±0.002% of rated output voltage over specified input voltage range
- Load: ±0.005% of rated output voltage for a full load change

**Current Regulation:**
Internally set to limit at least than 125% of rated current. A rear panel switch allows limiting at 25% of rated full current.

**Ripple:**
See “model selection” table

**Temperature Coefficient:**
≤100ppm/°C

**Stability:**
≤0.01%/hour, 0.02% per 8 hours after a 1/2 hour warm up

**Accuracy:**
- Front panel control: ±(0.2% of setting + 0.2% of maximum)
- Front panel Meter: Voltage ±(0.5% of setting + 0.5% of maximum), Current ±(2% of setting + 0.5% of maximum)
- Remote Programming: ±(0.1% of setting + 0.1% of maximum)
- Voltage Monitor: ±(0.1% of reading + 0.1% of maximum)
- Current Monitor: ±(2% of reading + 1% of maximum)

**Front Panel Metering and Controls:**
- Power ON/OFF switch
- 3.5 digit metering for voltage and current, switch selectable
- Polarity indicator
- 10 turn locking potentiometer to set output voltage
- HV output connector
- Ground stud

**Operating Temperature**
0°C to +50°C

**Storage Temperature:**
-40°C to +85°C

**Humidity:**
20% to 85% RH, non-condensing

**Input Line Connector:**
IEC320 EMI filter/input connector, a detachable line cord is provided

**Interface Connector:**
9 pin “D” connector, a mating connector is provided

**Output Connector:**
A detachable 10 foot (3 meter) HV cable is provided for units up to 5kV; 10kV through 20kV: 59” (1.5 meter); 30kV: 10 foot (3 meter)

**Cooling:**
Convection cooled

**Dimensions:**
7.63” W X 5.03” H X 8.91” D
(194mm x 128mm x 226mm)

**Weight:**
≤10lbs (4.5kg)

**Regulatory Approvals:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>Series</th>
<th>Voltage</th>
<th>Current</th>
<th>Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>230-01R</td>
<td>0 to 1kV</td>
<td>0 to 15mA</td>
<td>10mV</td>
</tr>
<tr>
<td>230-03R</td>
<td>0 to 3kV</td>
<td>0 to 5mA</td>
<td>30mV</td>
</tr>
<tr>
<td>230-05R</td>
<td>0 to 5kV</td>
<td>0 to 3mA</td>
<td>50mV</td>
</tr>
<tr>
<td>230-10R</td>
<td>0 to 10kV</td>
<td>0 to 1.5mA</td>
<td>500mV</td>
</tr>
<tr>
<td>230-20R</td>
<td>0 to 20kV</td>
<td>0 to 0.5mA</td>
<td>2V</td>
</tr>
<tr>
<td>230-30R</td>
<td>0 to 30kV</td>
<td>0 to 0.4mA</td>
<td>5V</td>
</tr>
</tbody>
</table>

INTERFACE CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voltage Monitor</td>
<td>0 to 5Vdc = 0 to 100% rated voltage, Zout = 10KΩ</td>
</tr>
<tr>
<td>2</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>3</td>
<td>Enable</td>
<td>TTL &quot;0&quot; disables HV, TTL &quot;1&quot; or open enables HV</td>
</tr>
<tr>
<td>4</td>
<td>+5Vdc Reference</td>
<td>+5.0Vdc @ 10mA, maximum</td>
</tr>
<tr>
<td>5</td>
<td>Current Monitor</td>
<td>0 to 5Vdc = 0 to 100% rated current, Zout = 10KΩ</td>
</tr>
<tr>
<td>6</td>
<td>Voltage Program Input</td>
<td>0 to 5Vdc = 0 to 100% rated voltage, Zin = 1MΩ</td>
</tr>
<tr>
<td>7</td>
<td>Analog Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>8</td>
<td>Digital Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>9</td>
<td>Polarity Indicator</td>
<td>Open collector, 30V @ 25mA, positive = ON</td>
</tr>
</tbody>
</table>

OPTIONS:
Isolated (Floating) Output-Option F
Units up to and including 5kV can be provided with differential outputs capable of floating up to ±2kV from ground. Voltage programming and monitoring functions are normally referenced to ground. Current monitoring and metering is eliminated. Replace “R” suffix with “F” for this option. Output connectors (positive, negative and ground) for 1kV and 3kV models are 3-way binding posts; 5kV model uses Spellman P/N JAC for positive and negative outputs with 3-way binding post for ground. Mating connectors are Spellman P/N PA (MHV type 1705-14)
Spellman’s new MPS20W series are a family of high voltage 20 Watt modules that provide output voltages ranging from 1kV to 10kV.

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, ±2Vdc
- **Input Current:** ≤1.5 amps
- **Output Voltage:**
  - 5 models available from 1kV to 10kV

Output Polarity:
- Positive or negative, specify at time of order

Power:
- ≤20 watts

Voltage Regulation:
- Line: ≤0.001% of rated output voltage over specified input voltage
- Load: ≤0.001% of rated output voltage for full load change

Current Regulation (Vcc Option):
- Line: ≤0.01% for 1V input voltage change under any load conditions
- Load: ≤0.001% for 0 to full load

Ripple:
- See “model selection” table

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: -35°C to 85°C
- Humidity:
  - 20% to 85% RH, non-condensing

Cooling:
- Convection cooled

Dimensions:
- 1.31” H X 3.74” W X 5.91” D (33.5mm x 95mm x 150mm)

Weight:
- 1-2kV: 15.17 oz. (430g)
- 3-10kV: 25.76 oz. (730g)

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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
**MPS20W SELECTION TABLE**

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage</th>
<th>Output Current</th>
<th>Ripple (Vpp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPS1*20/24</td>
<td>0-1kV</td>
<td>20mA</td>
<td>&lt;25mV</td>
</tr>
<tr>
<td>MPS2*20/24</td>
<td>0-2kV</td>
<td>10mA</td>
<td>&lt;50mV</td>
</tr>
<tr>
<td>MPS3*20/24</td>
<td>0-3kV</td>
<td>6.67mA</td>
<td>&lt;75mV</td>
</tr>
<tr>
<td>MPS5*20/24</td>
<td>0-5kV</td>
<td>4mA</td>
<td>&lt;125mV</td>
</tr>
<tr>
<td>MPS10*20/24</td>
<td>0-10kV</td>
<td>2mA</td>
<td>&lt;250mV</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity. Custom units available.

**MPS20W ANALOG INTERFACE—15 PIN D CONNECTOR**

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

**DIMENSIONS: in.[mm]**

- **FRONT VIEW**
  - 3.74 [95]
- **BOTTOM VIEW**
  - 2.71 [69]
  - 1.89 [48]
  - 0.31 [8]
  - 0.47 [12]
  - 1.81 [46]
  - 5.91 [150]
- **SIDE VIEW**
  - 1.32 [33.5]

**Spellman High Voltage Electronics Corporation**

High Voltage Module MPS20W

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The EPM Series of power supplies utilize proprietary circuitry which yields full output current from near zero to maximum output voltage. Current regulation is standard on all models and is particularly valuable in applications that require a current source into the load.

**TYPICAL APPLICATIONS**

- Electrophoresis
- Photomultipliers
- Electron Beam Laboratory Applications
- Ion Source

**SPECIFICATIONS**

**Input:**
+24Vdc ±10%

**Output:**
8 models from 1kV to 30kV. Each model is available in positive or negative polarity outputs.

**Voltage Regulation:**
Load: Static: 0.02% of output voltage for a full load change. Dynamic: 10V/100μA. Line: 0.01% for ±10% change in input voltage.

**Current Regulation:**
Load: 0.01% of output current from 0 to rated voltage. Line: 0.01% of rated current over specified input range.

**Ripple:**
0.1% p-p of output voltage.

**Dimensions:**
2”H x 5.7”W x 5.7”D (5.1cm x 14.5cm x 14.5cm)

**Input Connector:**
9 pin AMP Metri-Mate. Mating connector and pins supplied.

**Output Cable:**
18” ±1” (45.7cm) of UL® listed high voltage wire.

**Voltage Stability:**
0.02% per 8 hours (after 1/2 hour warm-up).

**Voltage Temperature Coefficient:**
0.01% per °C.

**Voltage Test Point:**
10V±2% = Max. rated output.

**Current Test Point:**
10V±2% = Max. rated output.

**Remote Enable:**
>3.4V= HV ON. <1.0V or open= HV OFF.

**Regulatory Approvals:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

---

**EPM SELECTION TABLE**

<table>
<thead>
<tr>
<th>Maximum Rating</th>
<th>kV</th>
<th>mA</th>
<th>Model Number</th>
<th>kV</th>
<th>mA</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>1</td>
<td>EPM 1*30</td>
<td>15</td>
<td>2</td>
<td>EPM 15*30</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>2</td>
<td>EPM 3*30</td>
<td>20</td>
<td>1.5</td>
<td>EPM 20*30</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>1.2</td>
<td>EPM 5*30</td>
<td>25</td>
<td>1.2</td>
<td>EPM 25*30</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>1</td>
<td>EPM 10*30</td>
<td>30</td>
<td>1</td>
<td>EPM 30*30</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity.

---

**EPM CONNECTOR 9 PIN**

**J1 SIGNAL**

1. Ground
2. +24Vdc
3. High Voltage Enable/Inhibit
4. Voltage Test Point
5. Current Test Point
6. Voltage Programming
7. Current Programming
8. +10Vdc Reference
9. Program and Test Point Return

---

**DANGER**

HIGH VOLTAGE

---

**EPM CONNECTOR 9 PIN**

**AMP CONNECTOR 207439-1**

**SIDE VIEW**

**TOP VIEW**

**FRONT VIEW**

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128003-001 REV. G
The V6 Series is a family of regulated, fixed output polarity modular high voltage power supplies which provide exceptional performance and value in many applications. The V6 Series units are fully enclosed and designed for system or bench top operation. A wide range of output voltages, up to 30kV is available.

The output voltage is controlled locally by an internal multi-turn potentiometer. Remote analog voltage or resistance programming capability is included in all models. Analog monitor outputs are also included for remote monitoring of both the high voltage and current outputs.

TYPICAL APPLICATIONS
- Spectrometers
- CRT Testing
- Detectors
- E Beam Systems
- General Laboratory Usage

OPTIONS
- RS RS-232 Interface

SPECIFICATIONS
Input Voltage:
- AC Model: 100-240Vac, ±10%; 50/60 Hertz; 1 amp
- DC Model: 24Vdc ±10%, 2 Amps

Voltage Regulation:
- Line: ±0.001% of maximum 90-240Vac input line change
- ±0.001% of maximum ±10%Vdc input line change
- Load: ±0.002% of maximum for 0 to maximum rated output current change

Current Regulation:
- Line: ±0.05% of maximum current for 90-240Vac input line change
- 0.05% of maximum current for ±10% Vdc input change
- Load: 0.15% of maximum current for 0 to maximum rated output voltage change

Ripple:
- See “model selection” table

• Compact Models up to 30kV
• High Stability
• Low Ripple and Noise
• Local and Remote Programming
• Voltage and Current Monitoring
• Arc and Short Circuit Protected
• OEM Customization Available
• RoHS Compliant

Temperature Coefficient:
- ±50ppm/°C

Stability:
- ±0.01%/hour, 0.02% per 8 hours after a 1/2 hour warm up

Operating Temperature:
- 0°C to +50°C

Storage Temperature:
- -40°C to +85°C

Humidity:
- 20% to 85%RH, non-condensing

Local Control:
- Internal multi-turn potentiometer for 0 to maximum output voltage (±0.2%)

Remote Programming:
- 0 to +5Vdc analog input signal proportional to 0 to maximum rated output. Accuracy is ±(0.1% of setting +0.1% of maximum). The programming input impedance is 20 megohms.

Voltage Monitor:
- 0 to +5V proportional to 0 to maximum output voltage. Accuracy is ±(0.1% of reading +0.1% of maximum). The monitor impedance is 10 kilohms.

Current Monitor:
- 0 to +5V proportional to 0 to maximum output voltage. Accuracy is ±(2.0% of reading +1.0% of maximum). The monitor impedance is 10 kilohms.

Enable:
- Remote interlock enables (low) disables internally (high) the high voltage output. Signal is normally high and supply will default to a disabled condition.

Current Limit:
- All units provide short circuit current limiting to less than 110% of the maximum rated output current. Supply is self restoring upon removal of cause limit condition.

Arc/Short Circuit:
- Short circuit and arc protected; self restoring.

Cooling:
- Convection cooled
Output Connector:
Models up to and including 5kV use a Spellman P/N JAC high voltage connector. The required mating connector is a Spellman P/N 105808-384, which is provided. The 10kV through 30kV units use a Spellman P/N JGP high voltage connector (Alden 8101). All 10 through 30kV units are provided with mating connectors assembled to 2.0 meters of high voltage cable.

Dimensions:
AC Model: 3.05"W X 5.1"H X 7.06"D (77mm X 132mm X 179mm)
DC Model: 2.32"W X 5.1"H X 7.06"D (59mm X 132mm X 179mm)

Weight:
AC Model: 4.5 pounds (2.0kg)
DC Model: 3.75 pounds (1.7kg)

Regulatory Approvals:
RoHS Compliant

V6A MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>V6 AC Series</th>
<th>Voltage</th>
<th>Current</th>
<th>Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>V6A1*30</td>
<td>0 to 1kV</td>
<td>0 to 30mA</td>
<td>15mV</td>
</tr>
<tr>
<td>V6A1.5*30</td>
<td>0 to 1.5kV</td>
<td>0 to 20mA</td>
<td>15mV</td>
</tr>
<tr>
<td>V6A3*30</td>
<td>0 to 3kV</td>
<td>0 to 10mA</td>
<td>30mV</td>
</tr>
<tr>
<td>V6A5*30</td>
<td>0 to 5kV</td>
<td>0 to 6mA</td>
<td>50mV</td>
</tr>
<tr>
<td>V6A10*30</td>
<td>0 to 10kV</td>
<td>0 to 3mA</td>
<td>200mV</td>
</tr>
<tr>
<td>V6A15*30</td>
<td>0 to 15kV</td>
<td>0 to 2mA</td>
<td>450mV</td>
</tr>
<tr>
<td>V6A20*30</td>
<td>0 to 20kV</td>
<td>0 to 1.5mA</td>
<td>800mV</td>
</tr>
<tr>
<td>V6A30*30</td>
<td>0 to 30kV</td>
<td>0 to 1mA</td>
<td>1.8 volts</td>
</tr>
</tbody>
</table>

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

V6D MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>V6 DC Series</th>
<th>Voltage</th>
<th>Current</th>
<th>Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>V6D1*30</td>
<td>0 to 1kV</td>
<td>0 to 30mA</td>
<td>15mV</td>
</tr>
<tr>
<td>V6D1.5*30</td>
<td>0 to 1.5kV</td>
<td>0 to 20mA</td>
<td>15mV</td>
</tr>
<tr>
<td>V6D3*30</td>
<td>0 to 3kV</td>
<td>0 to 10mA</td>
<td>30mV</td>
</tr>
<tr>
<td>V6D5*30</td>
<td>0 to 5kV</td>
<td>0 to 6mA</td>
<td>50mV</td>
</tr>
<tr>
<td>V6D10*30</td>
<td>0 to 10kV</td>
<td>0 to 3mA</td>
<td>200mV</td>
</tr>
<tr>
<td>V6D15*30</td>
<td>0 to 15kV</td>
<td>0 to 2mA</td>
<td>450mV</td>
</tr>
<tr>
<td>V6D20*30</td>
<td>0 to 20kV</td>
<td>0 to 1.5mA</td>
<td>800mV</td>
</tr>
<tr>
<td>V6D30*30</td>
<td>0 to 30kV</td>
<td>0 to 1mA</td>
<td>1.8 volts</td>
</tr>
</tbody>
</table>

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

V6A ANALOG/DIGITAL INTERFACE—J1 15 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local Voltage Program</td>
<td>Multi-turn front panel potentiometer</td>
</tr>
<tr>
<td>2</td>
<td>TX (optional)</td>
<td>RS232 Receive Data</td>
</tr>
<tr>
<td>3</td>
<td>RX (optional)</td>
<td>RS232 Transmit Data</td>
</tr>
<tr>
<td>4</td>
<td>Voltage Program Input</td>
<td>0 to 5V=0 to 100% Rated Output, Zin=20MΩ</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>RS232 Ground (optional)</td>
</tr>
<tr>
<td>6</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>5.0V Reference Out</td>
<td>+5V @ 1mA Max.</td>
</tr>
<tr>
<td>8</td>
<td>HV Enable Input</td>
<td>Active Low to Enable the HV</td>
</tr>
<tr>
<td>9</td>
<td>Current Program Input</td>
<td>0 to 5V=0 to 100% Rated Output, Zin=20MΩ</td>
</tr>
<tr>
<td>10</td>
<td>Current Monitor</td>
<td>0 to 5V=0 to 100% Rated Output, Zout=10kΩ</td>
</tr>
<tr>
<td>11</td>
<td>Voltage Monitor</td>
<td>0 to 5V=0 to 100% Rated Output, Zout=10kΩ</td>
</tr>
<tr>
<td>12</td>
<td>HV Enable Output</td>
<td>Active Low HV is Enabled</td>
</tr>
<tr>
<td>13</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>14</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>15</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

V6D ANALOG/DIGITAL INTERFACE—J1 15 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local Voltage Program</td>
<td>Multi-turn front panel potentiometer</td>
</tr>
<tr>
<td>2</td>
<td>TX (optional)</td>
<td>RS232 Receive Data</td>
</tr>
<tr>
<td>3</td>
<td>RX (optional)</td>
<td>RS232 Transmit Data</td>
</tr>
<tr>
<td>4</td>
<td>Voltage Program Input</td>
<td>0 to 5V=0 to 100% Rated Output, Zin=20MΩ</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>RS232 Ground (optional)</td>
</tr>
<tr>
<td>6</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>5.0V Reference Out</td>
<td>+5V @ 1mA Max.</td>
</tr>
<tr>
<td>8</td>
<td>HV Enable Input</td>
<td>Active Low to Enable the HV</td>
</tr>
<tr>
<td>9</td>
<td>Current Program Input</td>
<td>0 to 5V=0 to 100% Rated Output, Zin=20MΩ</td>
</tr>
<tr>
<td>10</td>
<td>Current Monitor</td>
<td>0 to 5V=0 to 100% Rated Output, Zout=10kΩ</td>
</tr>
<tr>
<td>11</td>
<td>Voltage Monitor</td>
<td>0 to 5V=0 to 100% Rated Output, Zout=10kΩ</td>
</tr>
<tr>
<td>12</td>
<td>HV Enable Output</td>
<td>Active Low HV is Enabled</td>
</tr>
<tr>
<td>13</td>
<td>+24V Return</td>
<td>Input Voltage Return</td>
</tr>
<tr>
<td>14</td>
<td>+24Vdc Input</td>
<td>Input Voltage 24V±10%, 2A</td>
</tr>
<tr>
<td>15</td>
<td>+24Vdc Input</td>
<td>Input Voltage 24V±10%, 2A</td>
</tr>
</tbody>
</table>

ORDERING EXAMPLE

V6 A 15 P 30 RS

Model AC Input Voltage Polarity Power RS232 Option

V6 A 15 P 30 RS

www.spellmanhv.com
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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 ±10%

**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: ±0.01% for ±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 °C, voltage or current regulated.

**Ripple:**
0.1% p-p of maximum output voltage.

**Environmental:**
- Temperature Range:
  - Operating: 0°C to 40°C
  - Storage: -40°C to 85°C
- Humidity:
  - 0 to 90%, non-condensing

**Dimensions:**
3 ¼” H x 5 ⅞” W x 9 ¼” 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”±1” (45.7cm) of UL® approved high voltage wire

**Front Panel Ground Connection:**
Threaded 8-32 ground stud, nut provided

**Regulatory Approvals:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive; Installation Category II. Compliant to 2002/95/EC, RoHS.
SMS SELECTION TABLE

<table>
<thead>
<tr>
<th>Maximum Rating</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>kV  mA</td>
<td></td>
</tr>
<tr>
<td>1  60</td>
<td>SMS 1*60</td>
</tr>
<tr>
<td>3  20</td>
<td>SMS 3*60</td>
</tr>
<tr>
<td>5  12</td>
<td>SMS 5*60</td>
</tr>
<tr>
<td>10 6</td>
<td>SMS 10*60</td>
</tr>
<tr>
<td>15 4</td>
<td>SMS 15*60</td>
</tr>
<tr>
<td>20 3</td>
<td>SMS 20*60</td>
</tr>
<tr>
<td>30 2</td>
<td>SMS 30*60</td>
</tr>
<tr>
<td>40 1.5</td>
<td>SMS 40*60</td>
</tr>
<tr>
<td>50 1.2</td>
<td>SMS 50*60</td>
</tr>
<tr>
<td>60 1.0</td>
<td>SMS 60*60</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity.

CONNECTOR 12 PIN

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

www.spellmanhv.com/manuals/UMW

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 (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 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: -40°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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. Compliant to 2002/95/EC, RoHS, UL/CUL recognized, File E227588, Volume X1-A21

UMW 60W SELECTION TABLE

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V</th>
<th>Output Current</th>
<th>Ripple(max) %Vp-p</th>
<th>Capacitance</th>
<th>Resistance</th>
<th>Full Scale Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMW8*60</td>
<td>0 to 8kV</td>
<td>7.5mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>3553pF</td>
<td>14.1kΩ</td>
<td>1.6V</td>
</tr>
<tr>
<td>UMW10*60</td>
<td>0 to 10kV</td>
<td>6mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>3553pF</td>
<td>14.1kΩ</td>
<td>1.47V</td>
</tr>
<tr>
<td>UMW12*60</td>
<td>0 to 12kV</td>
<td>5mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>2870pF</td>
<td>30kΩ</td>
<td>1.24V</td>
</tr>
<tr>
<td>UMW15*60</td>
<td>0 to 15kV</td>
<td>4mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>2460pF</td>
<td>30kΩ</td>
<td>1.0V</td>
</tr>
<tr>
<td>UMW20*60</td>
<td>0 to 20kV</td>
<td>3mA</td>
<td>&lt;1.0 (C load ≥0.01μF)</td>
<td>2460pF</td>
<td>45kΩ</td>
<td>4.61V</td>
</tr>
</tbody>
</table>

UMW 125W SELECTION TABLE

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output V</th>
<th>Output Current</th>
<th>Ripple(max) %Vp-p</th>
<th>Capacitance</th>
<th>Resistance</th>
<th>Full Scale Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMW8*125</td>
<td>0 to 8kV</td>
<td>15.5mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>7106pF</td>
<td>3kΩ</td>
<td>1.1V</td>
</tr>
<tr>
<td>UMW10*125</td>
<td>0 to 10kV</td>
<td>12.5mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>7106pF</td>
<td>3kΩ</td>
<td>1.15V</td>
</tr>
<tr>
<td>UMW12*125</td>
<td>0 to 12kV</td>
<td>10.5mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>5740pF</td>
<td>6.6kΩ</td>
<td>1.4V</td>
</tr>
<tr>
<td>UMW15*125</td>
<td>0 to 15kV</td>
<td>8.3mA</td>
<td>&lt;1.0 (C load ≥0.05μF)</td>
<td>4920pF</td>
<td>6.6kΩ</td>
<td>1.1V</td>
</tr>
<tr>
<td>UMW20*125</td>
<td>0 to 20kV</td>
<td>6.25mA</td>
<td>&lt;1.0 (C load ≥0.01μF)</td>
<td>4920pF</td>
<td>14.1kΩ</td>
<td>9.57V</td>
</tr>
</tbody>
</table>

Ordering Example

UMW15P125/L

Model Voltage Polarity Power Option

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

### 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.

### 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.

### 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.
Spellman’s AC input PMC Series of 120 watt high voltage power supply modules feature a power factor corrected front end, providing 0.99 power factor along with universal input voltage (85Vac to 265Vac) capabilities. 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 PCM 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:
85-265Vac, 47-63Hz, power factor corrected.
UL® rated for 85-250Vac input for 1kV to 5kV models.

Power Factor (Typical):
FL: 0.99
NL: 0.98

Efficiency:
80 to 85%, typical

Output:
11 models from 1kV to 70kV. Positive or negative polarity outputs, specify at time of order.

Voltage Regulation:
Load: 0.01% of output voltage, no load to full load.
Line: ±0.01% for ±10% change in input voltage.

Current Regulation:
Load: 0.01% of output current from 0 to rated voltage.
Line: 0.01% of rated current over specified input range.

Output Voltages from 1kV to 70kV
Arc and Short Circuit Protected
Low Stored Energy
Test Point for Output Current and Voltage
Enable/Inhibit Control of Output
Safety Interlock Circuit
OEM Customization Available

www.spellmanhv.com/manuals/PCM

Ripple:
0.1% p-p of maximum output voltage.

Voltage Stability:
0.02% per 8 hours.

Temperature Coefficient:
100ppm per °C, voltage or current regulated.

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

Dimensions:
1kV to 50kV: 3.65"H x 5"W x 9"D
(9.27cm x 12.7cm x 22.9cm).
60, 70kV: 3.65"H x 5"W x 11"D
(9.27cm x 12.7cm x 27.9cm).

Weight:
7 pounds (3.18kg)

AC Input Connectors:
IEC320 with mating cable.

Interface Connector:
15 pin D connector.

HV Output Cable:
Spellman Delrin type connector with 36” (91.4cm) shielded cable.

Front Panel Ground Connection:
Threaded 8-32 ground stud

Regulatory Approvals:
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
UL/CUL recognized, File E148969 (up to 60kV only).
**PCM SELECTION TABLE**

<table>
<thead>
<tr>
<th>Maximum Rating</th>
<th>mA</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120</td>
<td>PCM 1*120</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>PCM 3*120</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>PCM 5*120</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>PCM 10*120</td>
</tr>
<tr>
<td>15</td>
<td>8</td>
<td>PCM 15*120</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
<td>PCM 20*120</td>
</tr>
<tr>
<td>30</td>
<td>4</td>
<td>PCM 30*120</td>
</tr>
<tr>
<td>40</td>
<td>3</td>
<td>PCM 40*120</td>
</tr>
<tr>
<td>50</td>
<td>2.4</td>
<td>PCM 50*120</td>
</tr>
<tr>
<td>60</td>
<td>2.0</td>
<td>PCM 60*120</td>
</tr>
<tr>
<td>70</td>
<td>1.7</td>
<td>PCM 70*120</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity.

**PCM D CONNECTOR 15 PIN**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote mA Program</td>
<td>0 to 10Vdc = 0 to 100% of rated output</td>
</tr>
<tr>
<td>2</td>
<td>Remote kV Program</td>
<td>0 to 10Vdc = 0 to 100% of rated output</td>
</tr>
<tr>
<td>3</td>
<td>High Voltage Enable/Inhibit</td>
<td>Open = HV Inhibit, Ground = HV ON</td>
</tr>
<tr>
<td>4</td>
<td>mA Monitor</td>
<td>0 to 10Vdc = 0 to 100% of rated output</td>
</tr>
<tr>
<td>5</td>
<td>Interlock Return</td>
<td>Connect to pin 6 to close interlock circuit</td>
</tr>
<tr>
<td>6</td>
<td>Interlock Out</td>
<td>Connect to pin 5 to close interlock circuit</td>
</tr>
<tr>
<td>7</td>
<td>kV Monitor</td>
<td>0 to 10Vdc = 0 to 100% of rated output</td>
</tr>
<tr>
<td>8</td>
<td>Local kV Program</td>
<td>Multi-turn front panel pot (screwdriver)</td>
</tr>
<tr>
<td>9</td>
<td>Power Supply Fault</td>
<td>0Vdc = No Fault, +15Vdc @ 1mA = Fault</td>
</tr>
<tr>
<td>10</td>
<td>+10Vdc Reference</td>
<td>+10Vdc @ 1mA maximum</td>
</tr>
<tr>
<td>11</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>12</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
<tr>
<td>13</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
<tr>
<td>14</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
<tr>
<td>15</td>
<td>Local mA Program</td>
<td>Multi-turn front panel pot (screwdriver)</td>
</tr>
</tbody>
</table>
Spellman’s PTV Series of modular high voltage power supplies deliver up to 350W of continuous power. A quasi-resonant inverter design provides over 80% efficiency with very fast dynamic response. PTV power supplies incorporate extensive standard features in two power output ranges (200W and 350W) with a wide range of output voltages operating to the most exacting specifications.

**TYPICAL APPLICATIONS**
- Projection Television
- X-ray Systems
- E-beam Systems
- Capacitor Charging systems
- CPT/CRT Testing

**OPTIONS**
- FG: Floating Ground (50V max)
- BPM/S: Bipolar Master/Slave
- NSS: No Slow Start
- TP(x): Alternate Test Point Scaling

**SPECIFICATIONS**

**Input:**
- 115Vac±10%, 50/60Hz.
- 220Vac±10%, 50/60Hz.
- Optional: 100Vac±10%, 50/60Hz.
- Specify at time of ordering.

**Output:**
- Models from 1kV to 70kV, 200W or 350W. Each model is available in positive or negative polarity outputs.

- **Voltage Regulation:**
  - Load: 0.01% of output voltage no load to full load.
  - Line: ±0.01% for a ±10% change in input voltage.

- **Current Regulation:**
  - Load: 0.01% of output current from 0 to rated voltage.
  - Line: 0.01% of rated current over specified input range.

- **Efficiency:**
  - 80%, typical.

- **Ripple:**
  - PTV200: 0.1% p-p of output voltage.
  - PTV350: 0.2% p-p of output voltage.

- **Switching Frequency:**
  - 45-65kHz, nominal

- **Temperature:**
  - Operating: 0°C to +40°C.
  - Storage: -40°C to +85°C.

- **Voltage Temperature Coefficient:**
  - 0.01%/°C

- **Stability (voltage & current):**
  - 0.01%/hr after 1/2 hour warm-up.
  - 0.02% per 8 hours.

- **Cooling:**
  - 200W: Convection cooled.
  - 350W: Fan cooled, rear air intake.

- **Dimensions:**
  - 1-40kV: 3¾"H x 10¾"W x 10"D
    (8.1cm x 27.3cm x 25.4cm).
  - 50-70kV: 4¾"H x 10¾"W x 11½"D
    (10.65cm x 27.6cm x 35.1cm).

- **HV Output:**
  - Flying lead 18"±1" (45.7cm) UL listed.
  - AMP LGHI connector available for 40kV only.

- **Power Input Connector:**
  - IEC320.

- **AC Line Voltage Input Cable:**
  - Length: 8’ (2.4m).

- **Regulatory Approvals:**
  - Compliant to 2004/108/EC, the EMC Directive
  - and 2006/95/EC, the Low Voltage Directive.
  - UL/CUL recognized, File E148969 (up to 5kV only).
PTV SELECTION TABLE

<table>
<thead>
<tr>
<th>kV</th>
<th>mA</th>
<th>Model PTV200</th>
<th>kV</th>
<th>mA</th>
<th>Model PTV350</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200</td>
<td>PTV1*200</td>
<td>1</td>
<td>350</td>
<td>PTV1*350</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>PTV3*200</td>
<td>3</td>
<td>117</td>
<td>PTV3*350</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>PTV5*200</td>
<td>5</td>
<td>70</td>
<td>PTV5*350</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>PTV10*200</td>
<td>10</td>
<td>35</td>
<td>PTV10*350</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>PTV15*200</td>
<td>15</td>
<td>23</td>
<td>PTV15*350</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>PTV20*200</td>
<td>20</td>
<td>18</td>
<td>PTV20*350</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
<td>PTV25*200</td>
<td>25</td>
<td>14</td>
<td>PTV25*350</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
<td>PTV30*200</td>
<td>30</td>
<td>12</td>
<td>PTV30*350</td>
</tr>
<tr>
<td>40</td>
<td>5</td>
<td>PTV40*200</td>
<td>40</td>
<td>9</td>
<td>PTV40*350</td>
</tr>
<tr>
<td>50</td>
<td>4</td>
<td>PTV50*200</td>
<td>50</td>
<td>7</td>
<td>PTV50*350</td>
</tr>
<tr>
<td>60</td>
<td>3.3</td>
<td>PTV60*200</td>
<td>60</td>
<td>5.8</td>
<td>PTV60*350</td>
</tr>
<tr>
<td>70</td>
<td>2.85</td>
<td>PTV70*200</td>
<td>70</td>
<td>5.0</td>
<td>PTV70*350</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity.

INTERFACE CONNECTOR 9 PIN

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+10Vdc Reference</td>
<td>+10Vdc @ 1mA, maximum</td>
</tr>
<tr>
<td>2</td>
<td>Current Program</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zin = 10MΩ</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Monitor</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ</td>
</tr>
<tr>
<td>4</td>
<td>Voltage Program</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zin = 10MΩ</td>
</tr>
<tr>
<td>5</td>
<td>Common Ground</td>
<td>Power Ground</td>
</tr>
<tr>
<td>6</td>
<td>Current Monitor</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ</td>
</tr>
<tr>
<td>7</td>
<td>Enable/Inhibit</td>
<td>Ground = Inhibit, Open = HV ON</td>
</tr>
<tr>
<td>8</td>
<td>OVP Indicator</td>
<td>Collector w/1kΩ pull up to +5Vdc, transistor on =OVP</td>
</tr>
<tr>
<td>9</td>
<td>Signal Return</td>
<td>Signal Return</td>
</tr>
</tbody>
</table>

DIMENSIONS: in.[mm]

TOP VIEW FOR 350W UNIT ONLY

INTERFACE CONNECTOR 9 PIN

<table>
<thead>
<tr>
<th>PIN NO. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG-320 TYPE AC CONNECTOR</td>
</tr>
<tr>
<td>SIGNAL INPUT CONN. MOLEX 03-09-2091 (9 POSITION PLUG)</td>
</tr>
</tbody>
</table>

Spellman’s SLM Series of high voltage modules are designed for OEM applications up to 70kV 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
- HiPot Testing
- CRT Testing
- Electrostatics
- E Beam Systems
- CW Lasers

**FIRMWARE CONFIGURATIONS**
**STANDARD BASED FEATURES**
- AOL: Adjustable Overload Trip
- AT: Arc Trip
- NAD: No Arc Detect
- NSS: No Slow Start
- PSS: Programmable Slow Start
- RFR: Remote Fault Reset
- RMI: Remote Mode Indicators
- ROV: Remote Overvoltage Adjust

**SPECIFICATIONS**
**Input Voltage:**
- Power factor corrected input, ≥0.98
- 90-264Vac, 47-63 Hertz, for 300 watt units
- 180-264Vac, 47-63 Hertz for 600 and 1200 watt units

**Output Voltage:**
- 11 models—1kV to 70kV

**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:**
- ≤0.01% of rated output voltage over specified input voltage range
- ≤0.01% of rated output voltage for a full load change

**Current Regulation:**
- ≤0.01% of rated output current over specified input voltage range
- ≤0.01% of rated output current for a ±100μA for a full voltage change

**Ripple:**
- ≤0.2% rms of maximum rated voltage, measured with a 10 foot long HV cable

**Stability:**
- ≤50ppm/hr after a 2 hour warm up

**Temperature Coefficient:**
- ≤100ppm per degree C

**Environmental:**
- Temperature Range:
  - Operating: 0˚C to 40˚C
  - Storage: -40˚C to 85˚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%.

**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%.

**Cooling:**
- Forced air

**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)

**Weight:**
- 300/600 watts: 14 pounds (6.35kg)
- 1200 watts: 26 pounds (11.8kg)
**INPUT LINE CONNECTOR:**
IEC320 cord set with integrated EMI filter

**OUTPUT CABLE:**
A detachable 10’ (3.3m) long shielded HV cable is provided

**REGULATORY APPROVALS:**
Compliant to 204/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. UL/CUL recognized, File 227588. Compliant to 2002/95/EC, RoHS.

---

**SLM SELECTION TABLE - 300W**

<table>
<thead>
<tr>
<th>kV</th>
<th>mA</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300</td>
<td>SLM1*300</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
<td>SLM3*300</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>SLM5*300</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>SLM10*300</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>SLM15*300</td>
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<td>20</td>
<td>15</td>
<td>SLM20*300</td>
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<tr>
<td>30</td>
<td>10</td>
<td>SLM30*300</td>
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<td>40</td>
<td>7.5</td>
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<td>SLM60*300</td>
</tr>
<tr>
<td>70</td>
<td>4.28</td>
<td>SLM70*300</td>
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</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity

---

**SLM SELECTION TABLE - 600W**

<table>
<thead>
<tr>
<th>kV</th>
<th>mA</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>600</td>
<td>SLM1*600</td>
</tr>
<tr>
<td>3</td>
<td>200</td>
<td>SLM3*600</td>
</tr>
<tr>
<td>5</td>
<td>120</td>
<td>SLM5*600</td>
</tr>
<tr>
<td>10</td>
<td>60</td>
<td>SLM10*600</td>
</tr>
<tr>
<td>15</td>
<td>40</td>
<td>SLM15*600</td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td>SLM20*600</td>
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<tr>
<td>30</td>
<td>20</td>
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<td>15</td>
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<td>50</td>
<td>12</td>
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<tr>
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<td>10</td>
<td>SLM60*600</td>
</tr>
<tr>
<td>70</td>
<td>8.56</td>
<td>SLM70*600</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity

---

**SLM SELECTION TABLE - 1200W**

<table>
<thead>
<tr>
<th>kV</th>
<th>mA</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1200</td>
<td>SLM1*1200</td>
</tr>
<tr>
<td>3</td>
<td>400</td>
<td>SLM3*1200</td>
</tr>
<tr>
<td>5</td>
<td>240</td>
<td>SLM5*1200</td>
</tr>
<tr>
<td>10</td>
<td>120</td>
<td>SLM10*1200</td>
</tr>
<tr>
<td>15</td>
<td>80</td>
<td>SLM15*1200</td>
</tr>
<tr>
<td>20</td>
<td>60</td>
<td>SLM20*1200</td>
</tr>
<tr>
<td>30</td>
<td>40</td>
<td>SLM30*1200</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
<td>SLM40*1200</td>
</tr>
<tr>
<td>50</td>
<td>24</td>
<td>SLM50*1200</td>
</tr>
<tr>
<td>60</td>
<td>20</td>
<td>SLM60*1200</td>
</tr>
<tr>
<td>70</td>
<td>17.14</td>
<td>SLM70*1200</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity

---

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX out</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX in</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGN D</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
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</tbody>
</table>

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**USB DIGITAL INTERFACE—J4 4 PIN USB “B” CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
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<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5 Vdc</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data -</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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**ETHERNET DIGITAL INTERFACE—J5 8 PIN RJ45 CONNECTOR**

<table>
<thead>
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<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
DIMENSIONS: in.[mm]

300/600 Watt

BOTTOM VIEW

1200 Watt

BOTTOM VIEW

FRONT VIEW

SIDE VIEW

10-32 BLIND PEM 4 PLCS

10-32 BLIND PEM 4 PLCS

AIR FLOW

AIR FLOW
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
- CPT/CRT Testing
- Electrostatics
- E-Beam Systems
- Capacitor Charging
- Hipot Testing
- General Laboratory
- 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, Over Power (Optional).

**Input:**
115Vac or 220Vac±10%, 50/60Hz. Specify with order.
1200W model available in 200/220Vac only.

**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: ±0.005% of full voltage ±500mV over specified input range

**Current Regulation:**
- Load: 0.01% of maximum current ±100μA for full voltage change.
- Line: ±0.005% of maximum current for a ±10% input line change.

**Ripple:**
0.1% p-p +1Vrms.

**Temperature Coefficient:**
- 100ppm/°C voltage or current regulated. Higher stability is available on special order.
- 100ppm/hour after 1/2 hour warm-up for both voltage and current regulation.

**Metering:**
Digital voltage and current meters, 3½ digit ±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: 1¾”H(1U) x 19”W x 19”D**
  (4.45cm x 48.3cm x 48.3cm).
- 600W – 1200W: 3½”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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

Current Regulation: 100ppm/°C voltage or current regulated. Higher stability is available on special order.

Environmental:
- Temperature Range:
  Operating: 0°C to 50°C.
  Storage: -40°C to 85°C.
- Humidity:
  10 to 90% relative humidity, non-condensing

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

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.

**OPTIONS**

See page 4 for options and descriptions

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- Line: ±0.005% of maximum current for a ±10% input line change.

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  Operating: 0°C to 50°C.
  Storage: -40°C to 85°C.
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**OPTIONS**

See page 4 for options and descriptions

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Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
### SL SELECTION TABLE - 10W, 30W, 60W

<table>
<thead>
<tr>
<th>kV</th>
<th>10 Watt</th>
<th>30 Watt</th>
<th>60 Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>3.3</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>1.7</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>1.25</td>
<td>3.75</td>
<td>7.5</td>
</tr>
<tr>
<td>10</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>0.67</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>20</td>
<td>0.50</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>30</td>
<td>0.33</td>
<td>1.0</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
<td>0.25</td>
<td>0.75</td>
<td>1.5</td>
</tr>
<tr>
<td>50</td>
<td>0.20</td>
<td>0.60</td>
<td>1.2</td>
</tr>
<tr>
<td>60</td>
<td>0.17</td>
<td>0.50</td>
<td>1.0</td>
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<tr>
<td>70</td>
<td>0.14</td>
<td>0.43</td>
<td>0.85</td>
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<tr>
<td>80</td>
<td>0.13</td>
<td>0.38</td>
<td>0.75</td>
</tr>
<tr>
<td>100</td>
<td>0.10</td>
<td>0.30</td>
<td>0.60</td>
</tr>
<tr>
<td>120</td>
<td>0.10</td>
<td>0.25</td>
<td>0.50</td>
</tr>
<tr>
<td>130</td>
<td>0.10</td>
<td>0.25</td>
<td>0.46</td>
</tr>
</tbody>
</table>

*Specify “P” for positive, “N” for negative, or “PN” for reversible polarity.

Higher voltage models available on special order.

### SL TERMINAL BLOCK 26 PIN

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

### SL SELECTION TABLE - 150W, 300W

<table>
<thead>
<tr>
<th>kV</th>
<th>150 Watt</th>
<th>300 Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>18.75</td>
<td>37.5</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>20</td>
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<tr>
<td>20</td>
<td>7.5</td>
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<td>40</td>
<td>3.75</td>
<td>7.5</td>
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<td>3.00</td>
<td>6.0</td>
</tr>
<tr>
<td>60</td>
<td>2.50</td>
<td>5.0</td>
</tr>
<tr>
<td>70</td>
<td>2.1</td>
<td>4.28</td>
</tr>
<tr>
<td>80</td>
<td>1.90</td>
<td>3.75</td>
</tr>
<tr>
<td>100</td>
<td>1.50</td>
<td>3.00</td>
</tr>
<tr>
<td>120</td>
<td>1.25</td>
<td>2.50</td>
</tr>
<tr>
<td>130</td>
<td>1.15</td>
<td>2.30</td>
</tr>
</tbody>
</table>

*Specify “P” for positive, “N” for negative, or “PN” for reversible polarity.

Higher voltage models available on special order.

### SL SELECTION TABLE - 600W, 1200W

<table>
<thead>
<tr>
<th>kV</th>
<th>600 Watt</th>
<th>1200 Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>600</td>
<td>1200</td>
</tr>
<tr>
<td>2</td>
<td>300</td>
<td>600</td>
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<td>3</td>
<td>200</td>
<td>400</td>
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<td>50</td>
<td>12</td>
<td>24</td>
</tr>
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<td>60</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>70</td>
<td>8.6</td>
<td>17</td>
</tr>
<tr>
<td>80</td>
<td>7.5</td>
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<tr>
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<td>6.0</td>
<td>12</td>
</tr>
<tr>
<td>120</td>
<td>5.0</td>
<td>10</td>
</tr>
<tr>
<td>130</td>
<td>4.6</td>
<td>9.2</td>
</tr>
</tbody>
</table>

*Specify “P” for positive, “N” for negative, or “PN” for reversible polarity.

Higher voltage models available on special order.

---

**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.
**10W-300W**

**TOP VIEW**

- 0.38 [9.53] 4 PL
- 0.25 [6.35] 4 PL
- 0.34 [8.73]
- 19.00 [482.60]
- 18.31 [465.14]
- 0.23 [5.97] TYP

**BACK VIEW**

- IEC 320 INPUT CONNECTOR
- 16.88 [428.62]
- 26 PIN TERMINAL BLOCK FOR REMOTE CONTROL MONITORING
- MATING CONNECTOR AND 10ft. OF HIGH VOLTAGE CABLE SUPPLIED WITH UNIT
- 2 PIN TERMINAL BLOCK LOAD RETURN (CHASSIS GROUND)

**26 PIN TERMINAL BLOCK FOR REMOTE CONTROL MONITORING**

- 6 ft OF LINE CABLE SUPPLIED WITH UNIT
- 2 PIN TERMINAL BLOCK LOAD RETURN (CHASSIS GROUND)

**600W-1200W**

**TOP VIEW**

- 0.38 [9.52] 4 PL
- 0.25 [6.35] 4 PL
- 0.34 [8.73]
- 19.00 [482.60]
- 18.31 [465.14]
- 0.23 [5.72] TYP

**BACK VIEW**

- MATING CONNECTOR AND 10ft. OF HIGH VOLTAGE CABLE SUPPLIED WITH UNIT
- 16.87 [428.62]

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

BPM  Bipolar Master
BPS  Bipolar Slave
This option configures two identical but opposite polarity units to function as a single tracking bipolar supply. The voltage feedback of the master (positive unit) is provided to the voltage programming input of the slave (negative unit).

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 shut down due to a fault condition.

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. Non standard lengths can be custom ordered.

LR  Low Ripple
Done on a case by case basis, the standard unit is evaluated and modifications are done to improve 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.
Spellman’s Bertan brand of 205B Series high voltage power supplies provide regulated high voltage outputs from 1 to 50kV. The low noise, linear topology employed results in extremely low output ripple specifications. These 15 to 30W units are inherently reversible by design, providing either positive or negative output polarity. The 205B is fully arc and short circuit protected. Excellent regulation specifications are featured along with outstanding stability performance.

**TYPICAL APPLICATIONS**
- HiPot Testing
- CRT Testing
- Electrostatics
- E Beam Systems
- General Laboratory Usage

**OPTIONS**
- RF  Isolated (Floating) Output

**SPECIFICATIONS**

**Input Voltage:**
- 115Vac, ±10%, 50/60Hz @ 1A
- 230Vac, ±10%, 50/60Hz @ 0.5A
Input voltage is switch selectable

**Output Voltage:**
- See “model selection” table

**Output Polarity:**
- All units are reversible polarity by design

**Output Current:**
- See “model selection” table

**Voltage Regulation:**
- Line: ≤50ppm/0.001% of rated output voltage over specified input voltage range
- Load: ≤0.005% of rated output voltage for a full load change

**Current Regulation:**
- Internally set to limit at 105% of rated current at full output voltage. Maximum output current at any other voltage setting must be derated linearly down to 30% of maximum at zero output voltage.

**Ripple:**
- See “model selection” table

**Temperature Coefficient:**
≤50ppm/°C

**Stability:**
≤0.01%/hour, 0.02% per 8 hours after a 1/2 hour warm up

**Accuracy:**
- Current Monitor: ±(0.5% of reading + 0.25% of maximum)
- Remote Programming: ±(0.1% of setting + 0.1% of maximum)
- Voltage Monitor: ±(0.1% of reading + 0.1% of maximum)
- Front Panel Meter: Voltage ±(0.1% of setting + 0.1% of maximum)
- Current: ±(0.25% of setting + 0.25% of maximum)
- Front Panel Control: ±(0.25% of setting + 0.05% of maximum)

**Operating Temperature:**
0°C to +50°C

**Storage Temperature:**
-40°C to +85°C

**Humidity:**
- 20% to 85%RH, non-condensing

**Input Line Connector:**
- IEC320 EMI filter/ input connecter, a detachable line cord is provided

**Interface Connector:**
- 9 pin “D” connector, a mating connector is provided

**Output Connector:**
- A detachable 10 foot (3 meter) long HV cable is provided

**Cooling:**
- Convection cooled

**Dimensions:**
- 1-20kV: 19.0” W X 3.5” H X 9.625” D  
  (483mm X 89mm X 244mm)
- 30-50kV: 19.0” W X 5.25” H X 16.0” D  
  (483mm X 133mm X 406mm)

**Weight:**
- ≤20lbs (9.1kg) up to and including 20kV units,
- ≤35lbs (15.9kg) for 30kV and 50kV units

**Regulatory Approvals:**
- Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
## MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>205B Series</th>
<th>Voltage</th>
<th>Current</th>
<th>Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>205B-01R</td>
<td>0 to 1kV</td>
<td>0 to 30mA</td>
<td>10mV</td>
</tr>
<tr>
<td>205B-03R</td>
<td>0 to 3kV</td>
<td>0 to 10mA</td>
<td>30mV</td>
</tr>
<tr>
<td>205B-05R</td>
<td>0 to 5kV</td>
<td>0 to 5mA</td>
<td>50mV</td>
</tr>
<tr>
<td>205B-10R</td>
<td>0 to 10kV</td>
<td>0 to 2.5mA</td>
<td>100mV</td>
</tr>
<tr>
<td>205B-20R</td>
<td>0 to 20kV</td>
<td>0 to 1mA</td>
<td>300mV</td>
</tr>
<tr>
<td>205B-30R</td>
<td>0 to 30kV</td>
<td>0 to 0.5mA</td>
<td>400mV</td>
</tr>
<tr>
<td>205B-50R</td>
<td>0 to 50kV</td>
<td>0 to 0.3mA</td>
<td>2V</td>
</tr>
</tbody>
</table>

## INTERFACE CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voltage Monitor</td>
<td>0 to 5Vdc = 0 to 100% rated voltage, Zout = 10KΩ</td>
</tr>
<tr>
<td>2</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>3</td>
<td>Enable</td>
<td>TTL “0” disables HV, TTL “1” or open enables HV</td>
</tr>
<tr>
<td>4</td>
<td>+5Vdc Reference</td>
<td>+5.0Vdc @ 10mA, maximum</td>
</tr>
<tr>
<td>5</td>
<td>Current Monitor</td>
<td>0 to 5Vdc = 0 to 100% rated current, Zout = 10KΩ</td>
</tr>
<tr>
<td>6</td>
<td>Voltage Program Input</td>
<td>0 to 5Vdc = 0 to 100% rated voltage, Zin = 1MΩ</td>
</tr>
<tr>
<td>7</td>
<td>Analog Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>8</td>
<td>Digital Ground</td>
<td>Ground (for use only with 200-C488, sold separately)</td>
</tr>
<tr>
<td>9</td>
<td>Polarity Indicator</td>
<td>Open collector, 30V @ 25mA, positive = ON</td>
</tr>
</tbody>
</table>

### OPTIONS:
- **Isolated (Floating) Output-Option RF**
  Units can be provided with the output capable of floating up to ±2kV from ground. All controls, programming and monitoring functions are normally referenced to ground. The high voltage output polarity with respect to the floating input terminal is reversible. Floating input connector is Spellman P/N JDK. Mating connector is provided with each unit (Spellman P/N PDB, MHV type UG-932/U). Replace “R” suffix with “RF” for this option.
Spellman’s Bertan brand of 210 Series of 125 to 225W high voltage power supplies provide regulated high voltage outputs from 1 to 50kV. The low noise, linear topology employed results in extremely low output ripple specifications. Units are inherently reversible by design, providing either positive or negative output polarity. The 210 is fully arc and short circuit protected. Excellent regulation specifications are featured along with outstanding stability performance.

TYPICAL APPLICATIONS

- HiPot Testing
- CRT Testing
- Electrostatics
- E Beam Systems
- General Laboratory Usage

SPECIFICATIONS

Input Voltage:
- 115Vac, ±10%, 50/60Hz @ 5A
- 230Vac, ±10%, 50/60Hz @ 2.5A
Input voltage is switch selectable

Output Voltage:
See “model selection” table

Output Polarity:
1kV to 50kV units are inherently reversible by design

Output Current:
See “model selection” table

Voltage Regulation:
- Line: ≤0.001% of rated output voltage over specified input voltage range
- Load: ≤0.005% of rated output voltage for a full load change

Current Regulation:
Internally set to limit at 105% of rated current at full output voltage. Maximum output current at any other voltage setting must be derated linearly down to 30% of maximum at zero output voltage

Ripple:
See “model selection” table

Temperature Coefficient:
≤50ppm/°C

Stability:
≤0.01%/hour, 0.02% per 8 hours after a 1/2 hour warm up

Accuracy:
Voltage Monitor: ±(0.25% of reading + 0.25% of maximum)
Current Monitor: ±(0.5% of reading + 0.25% of maximum)
Remote Programming: ±(0.25% of setting + 0.05% of maximum) for 1kV to 30kV ±(0.5% of setting + 0.25% of maximum) for 50kV
Front Panel Control: ±(0.25% of setting + 0.05% of maximum)
for 1kV to 30kV ±(0.5% of setting + 0.25% of maximum)
for 50kV
Front Panel Meter: ±2% of full scale

Operating Temperature
0°C to +50°C

Storage Temperature:
-40°C to +85°C

Humidity:
20% to 85% RH, non-condensing

Input Line Connector:
A captive 3 conductor line cord and NEMA plug is provided

Interface Connector:
7 pin Amphenol 126-198, mating connector and pins provided

Output Connector:
A detachable 10 foot (3 meter) long HV cable is provided

Cooling:
Internal fan, forced-air cooling

Dimensions
- 1-5kV: 19.0” W X 5.25” H X 11.0” D
  (483mm X 133mm X 279mm)
- 10-50kV: 19.0” W X 5.25” H X 16.0” D
  (483mm X 133mm X 406mm)

Weight:
≤40lbs (18.1kg) up to and including 30kV units
≤50lbs (22.7kg) for 50kV unit

Regulatory Approvals:
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>210 Series</th>
<th>Voltage</th>
<th>Current</th>
<th>Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-01R</td>
<td>0 to 1kV</td>
<td>0 to 225mA</td>
<td>50mV</td>
</tr>
<tr>
<td>210-1.5R</td>
<td>0 to 1.5kV</td>
<td>0 to 130mA</td>
<td>100mV</td>
</tr>
<tr>
<td>210-2R</td>
<td>0 to 2kV</td>
<td>0 to 100mA</td>
<td>100mV</td>
</tr>
<tr>
<td>210-3R</td>
<td>0 to 3kV</td>
<td>0 to 75mA</td>
<td>100mV</td>
</tr>
<tr>
<td>210-6R</td>
<td>0 to 6kV</td>
<td>0 to 40mA</td>
<td>200mV</td>
</tr>
<tr>
<td>210-10R</td>
<td>0 to 10kV</td>
<td>0 to 15mA</td>
<td>500mV</td>
</tr>
<tr>
<td>210-20R</td>
<td>0 to 20kV</td>
<td>0 to 7mA</td>
<td>1V</td>
</tr>
<tr>
<td>210-30R</td>
<td>0 to 30kV</td>
<td>0 to 4.5mA</td>
<td>1.5V</td>
</tr>
<tr>
<td>210-50R</td>
<td>0 to 50kV</td>
<td>0 to 2.5mA</td>
<td>5V</td>
</tr>
</tbody>
</table>

INTERFACE CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-5Vdc Reference</td>
<td>-5.0Vdc @ 5mA, maximum</td>
</tr>
<tr>
<td>B</td>
<td>Voltage Program Input</td>
<td>0 to -5Vdc = 0 to 100% rated voltage, Zout = 10KΩ</td>
</tr>
<tr>
<td>C</td>
<td>Analog Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>D</td>
<td>Current Monitor</td>
<td>0 to 5Vdc = 0 to 100% rated current, Zout = 10KΩ</td>
</tr>
<tr>
<td>E</td>
<td>Voltage Monitor</td>
<td>0 to 5Vdc = 0 to 100% rated voltage, Zout = 10KΩ</td>
</tr>
<tr>
<td>F</td>
<td>Polarity Indicator</td>
<td>Open collector output, ON = Positive Polarity</td>
</tr>
<tr>
<td>G</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

DIMENSIONS: in.[mm]

FRONT VIEW

TOP VIEW

BACK VIEW
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
- 200Vac Input Voltage
- Adjustable Overload Trip
- Adjustable Power Trip
- Arc Trip
- Blank Front Panel
- Constant Power Control
- 4.5 Digit Panel Meters
- External Fault Relay
- Non-Standard HV Cable Length (10 standard)
- No Arc Detect
- No Slow Start
- Remote Fault Reset
- 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 ±10%, 50/60 Hertz

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: ±0.01% of rated current over specified input voltage range

Current Regulation:
- Load: 0.01% of rated current ±100μA for full voltage change.
- Line: ±0.01% of rated current over specified input voltage range

Ripple:
- 0.1% peak to peak of maximum output

Temperature Coefficient:
- 100ppm/°C.

Stability:
- 100ppm/hr after a 2 hour warm up, for both voltage and current regulation
**Operating Temperature:**
0 to 40°C operating

**Storage Temperature:**
-40 to +85°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:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

---

**SL150 ANALOG INTERFACE—JB4 25 PIN MALE D CONNECTOR**

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

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.

---

**Operating Temperature:**
0 to 40°C operating

**Storage Temperature:**
-40 to +85°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:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
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
Electrostatics
E-Beam Systems
Capacitor Charging
CPT/CRT Testing
Hipot Testing
General Laboratory
CW Lasers

OPTIONS
See page 3 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 ±10%, 50/60Hz., three phase
Optional: 220Vac ±10%, 50/60Hz., 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: ±0.005% of full voltage +500mV over specified input range

Current Regulation:
Load: 0.01% of maximum current ±100μA for full voltage change.
Line: ±0.005% of maximum current for a ±10% input line change.

Temperature Coefficient:
Load: 0.005% of maximum voltage +500mV for full load change.
Line: ±0.005% of maximum current for a ±10% input line change.

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

Environmental:
Temperature Range:
Operating: 0°C to 50°C.
Storage: -40°C to 85°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, 3½ digit ±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:
3½”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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

www.spellmanhv.com/manuals/SL2KW

Current Load:
Load: 0.01% of maximum current ±100μA for full voltage change.
Line: ±0.005% of maximum current for a ±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/°C voltage or current regulated. Higher stability is available on special order.

Environmental:
Temperature Range:
Operating: 0°C to 50°C.
Storage: -40°C to 85°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, 3½ digit ±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:
3½”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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

www.spellmanhv.com/manuals/SL2KW

Current Load:
Load: 0.01% of maximum current ±100μA for full voltage change.
Line: ±0.005% of maximum current for a ±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/°C voltage or current regulated. Higher stability is available on special order.

Environmental:
Temperature Range:
Operating: 0°C to 50°C.
Storage: -40°C to 85°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, 3½ digit ±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:
3½”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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

www.spellmanhv.com/manuals/SL2KW
**SL2KW SELECTION TABLE**

<table>
<thead>
<tr>
<th>MAXIMUM RATING</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>kV</td>
<td>mA</td>
</tr>
<tr>
<td>0.5</td>
<td>4000</td>
</tr>
<tr>
<td>1</td>
<td>2000</td>
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<td>2</td>
<td>1000</td>
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<td>50</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity or “PN” for reversible polarity

**SL2KW 25 PIN D CONNECTOR**

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

**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.
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.

BPM Bipolar Master

BPS Bipolar Slave
This option configures two identical but opposite polarity units to function as a single tracking bipolar supply. The voltage feedback of the master (positive unit) is provided to the voltage programming input of the slave (negative unit).

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.

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.
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

**SPECIFICATIONS**

- **Input Voltage:**
  220Vac±10%, three phase, 50/60Hz. (200Vac±10% optional).

- **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:
  Depends on model specified.

- **Distance from Stack to Driver:**
  2.5 meters ±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
  Current Control Mode
  Interlock Open
  Interlock Closed
  High Voltage Inhibit
  Overtemperature (optional)

- **Regulatory Approvals:**
  Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
**SLS SELECTION TABLE**

<table>
<thead>
<tr>
<th>MAXIMUM RATING</th>
<th>mA</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>12.5</td>
<td>SLS160*2000</td>
</tr>
<tr>
<td>200</td>
<td>10.0</td>
<td>SLS200*2000</td>
</tr>
<tr>
<td>260</td>
<td>7.7</td>
<td>SLS260*2000</td>
</tr>
<tr>
<td>300</td>
<td>6.6</td>
<td>SLS300*2000</td>
</tr>
<tr>
<td>360</td>
<td>5.5</td>
<td>SLS360*2000</td>
</tr>
</tbody>
</table>

*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**

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

**DIMENSIONS:** in.[mm]

**FRONT VIEW**

**TOP VIEW**

**BACK VIEW**

 Spellman High Voltage Electronics Corporation

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e-mail: sales@spellmanhv.com
www.spellmanhv.com

128016-001 REV. F
Spellman High Voltage is an ISO 9001:2008 and ISO 14001:2004 registered company
Copyright © 2004 Spellman High Voltage Electronics Corp.
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. 1kV to 8kV 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 ±100µA 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:
2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

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 with the STA that allows the customer to both customize operational features of the STA while also providing basic power supply operational features. Details of the STA’s digital interface capability are described in the STA manual, downloadable via the link on the first page of this data sheet.

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.

<table>
<thead>
<tr>
<th>kV</th>
<th>MAXIMUM RATING (mA)</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4,000</td>
<td>STA1*4</td>
</tr>
<tr>
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<td>2,000</td>
<td>STA2*4</td>
</tr>
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<td>STA3*4</td>
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<tr>
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<tr>
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<tr>
<td>60</td>
<td>67</td>
<td>STA60*4</td>
</tr>
<tr>
<td>70</td>
<td>57</td>
<td>STA70*4</td>
</tr>
</tbody>
</table>

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

**DIMENSIONS: in.[mm]**

- **Front View**
  - 0.37 [9.52]
  - 1.48 [37.69]
  - 2.25 [57.15]
  - 5.22 [132.56]
  - 18.25 [463.56]
  - 19.00 [482.60]

- **Top View**
  - 12.5 R
  - 16.88 [428.75]
  - 21.10 [535.94]
  - 22.60 [574.04]

- **Back View**
  - AIR INTAKE
  - AIR EXHAUST
  - 17.00 [431.80]

**Additional Information**

- Corporate Headquarters
  - Hauppauge, New York USA
e-mail: sales@spellmanhv.com

www.spellmanhv.com

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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 ±100µA 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: <100 pounds (45.36kg)
60kV to 120kV: <140 pounds (63.50kg)
150kV: <150 pounds (68kg)

Individual kV models may vary

Regulatory Approvals:
2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive, approval pending.

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. Details of the STR’s digital interface capability are described in detail in the STR manual, downloadable via the link on the first page of this data sheet.

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 SELECTION TABLE

<table>
<thead>
<tr>
<th>MAXIMUM RATING</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1kV ≤ 10kV</td>
<td>STR1*6</td>
</tr>
<tr>
<td>10kV ≤ 15kV</td>
<td>STR2*6</td>
</tr>
<tr>
<td>15kV ≤ 20kV</td>
<td>STR3*6</td>
</tr>
<tr>
<td>20kV ≤ 25kV</td>
<td>STR4*6</td>
</tr>
<tr>
<td>25kV ≤ 30kV</td>
<td>STR5*6</td>
</tr>
<tr>
<td>30kV ≤ 35kV</td>
<td>STR6*6</td>
</tr>
<tr>
<td>35kV ≤ 40kV</td>
<td>STR7*6</td>
</tr>
<tr>
<td>40kV ≤ 45kV</td>
<td>STR8*6</td>
</tr>
<tr>
<td>45kV ≤ 50kV</td>
<td>STR9*6</td>
</tr>
<tr>
<td>50kV ≤ 55kV</td>
<td>STR10*6</td>
</tr>
<tr>
<td>55kV ≤ 60kV</td>
<td>STR11*6</td>
</tr>
<tr>
<td>60kV ≤ 65kV</td>
<td>STR12*6</td>
</tr>
<tr>
<td>65kV ≤ 70kV</td>
<td>STR13*6</td>
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<tr>
<td>70kV ≤ 75kV</td>
<td>STR14*6</td>
</tr>
<tr>
<td>75kV ≤ 80kV</td>
<td>STR15*6</td>
</tr>
<tr>
<td>80kV ≤ 85kV</td>
<td>STR16*6</td>
</tr>
<tr>
<td>85kV ≤ 90kV</td>
<td>STR17*6</td>
</tr>
<tr>
<td>90kV ≤ 95kV</td>
<td>STR18*6</td>
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</tr>
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</tr>
<tr>
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</tr>
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<td>115kV ≤ 120kV</td>
<td>STR23*6</td>
</tr>
<tr>
<td>120kV ≤ 125kV</td>
<td>STR24*6</td>
</tr>
<tr>
<td>125kV ≤ 130kV</td>
<td>STR25*6</td>
</tr>
<tr>
<td>130kV ≤ 135kV</td>
<td>STR26*6</td>
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<tr>
<td>135kV ≤ 140kV</td>
<td>STR27*6</td>
</tr>
<tr>
<td>140kV ≤ 145kV</td>
<td>STR28*6</td>
</tr>
<tr>
<td>145kV ≤ 150kV</td>
<td>STR29*6</td>
</tr>
</tbody>
</table>

*Substitute “P” or 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.
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<thead>
<tr>
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<th>SIGNAL</th>
<th>PARAMETERS</th>
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<td>Return for External Interlock</td>
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<td>Local mA Program Output</td>
<td>0-10Vdc = 0-100% rated output, front panel pot</td>
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</table>

**Diagram**

- **Front View**
- **Top View**
- **Back View**

**Dimensions:** in.[mm]

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Spellman's ST Series of 12kW 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 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

**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:**
- 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 ±100µA 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.

**Digital Interface:**
- Ethernet and RS-232 digital interface implemented with 12 bits of resolution. A VB GUI is provided.
**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:**
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: <100 pounds (45.36kg)
- 60kV to 120kV: <140 pounds (63.50kg)
- 150kV: <150 pounds (68.03kg)

**Regulatory Approvals:**
2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

**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. Details of the ST’s digital interface capability are described in detail in the ST manual, downloadable via the link on the first page of this data sheet.

**Parallel Capability**
The ST series is designed to offer additional power capability by adding chassis in parallel to create a Master/Slave configuration providing up to and beyond 100kW’s. The Master chassis is the point of connection for customer interfacing; this multi chassis system effectively functions as a single power supply. The Master unit retains the full featured front panel, while Slave 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)

**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 MAXIMUM RATING

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

Substitute “P” or 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. Intermediated voltage units are available without special order. 150kV units are limited to a maximum output of 10kW's.

Parallel operation:
Additional power can be provided in increments of 12kW's by connecting chassis in parallel via the use of the ST's master/slave 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

J81 ST ANALOG INTERFACE—50 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Supply Common</td>
<td>Power Supply Ground</td>
</tr>
<tr>
<td>2</td>
<td>Reset/HV Inhibit</td>
<td>Normally open, Low = Reset/Inhibit</td>
</tr>
<tr>
<td>3</td>
<td>External Interlock</td>
<td>+24Vdc @ open, +25mA @ closed</td>
</tr>
<tr>
<td>4</td>
<td>External Interlock Return</td>
<td>Return for External Interlock</td>
</tr>
<tr>
<td>5</td>
<td>mA Test Point</td>
<td>0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%</td>
</tr>
<tr>
<td>6</td>
<td>kV Test Point</td>
<td>0-10Vdc = 0-100% rated output, Zout= 1KΩ, 1%</td>
</tr>
<tr>
<td>7</td>
<td>+10Vdc Reference Output</td>
<td>+24Vdc @ 1mA</td>
</tr>
<tr>
<td>8</td>
<td>mA Program Input</td>
<td>0-10Vdc = 0-100% rated output, Zin&gt;10MΩ</td>
</tr>
<tr>
<td>9</td>
<td>Local mA Program Output</td>
<td>0-10Vdc = 0-100% rated output, front panel pot</td>
</tr>
<tr>
<td>10</td>
<td>kV Program Input</td>
<td>0-10Vdc = 0-100% rated output, front panel pot</td>
</tr>
<tr>
<td>11</td>
<td>Local kV Program Output</td>
<td>0-10Vdc = 0-100% rated output, front panel pot</td>
</tr>
<tr>
<td>12</td>
<td>Remote Power On Output</td>
<td>+24Vdc @ open, +25mA @ closed</td>
</tr>
<tr>
<td>13</td>
<td>Remote Power On Return</td>
<td>Return for Remote Power On</td>
</tr>
<tr>
<td>14</td>
<td>Remote HV Off</td>
<td>+24Vdc @ open, +25mA @ closed, connect to pin 15 for front panel operation</td>
</tr>
<tr>
<td>15</td>
<td>Remote HV Off/On Common</td>
<td>HV On/Off Common</td>
</tr>
<tr>
<td>16</td>
<td>Remote HV On</td>
<td>+24Vdc @ open, +25mA @ closed, momentarily connect to pin 15 enable high voltage</td>
</tr>
<tr>
<td>17</td>
<td>HV Off Indicator</td>
<td>+24Vdc @ 25mA = HV Off</td>
</tr>
<tr>
<td>18</td>
<td>HV On Indicator</td>
<td>+24Vdc @ 25mA = HV On</td>
</tr>
<tr>
<td>19</td>
<td>Power Supply Common</td>
<td>Supply Ground</td>
</tr>
<tr>
<td>20</td>
<td>+24Vdc Output</td>
<td>+24Vdc @ 100mA, maximum</td>
</tr>
<tr>
<td>21</td>
<td>Voltage Mode Status</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>22</td>
<td>Current Mode Status</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>23</td>
<td>Power Mode Status</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>24</td>
<td>Interlock Closed Status</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>25</td>
<td>Power Test Point</td>
<td>0-10Vdc = 0-100% rated output, Zout= 5KΩ, 1%</td>
</tr>
<tr>
<td>26</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Remote Overvoltage Adjust</td>
<td>0-10Vdc = 0-100% rated output</td>
</tr>
<tr>
<td>29</td>
<td>Over Power Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>30</td>
<td>Over Voltage Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>31</td>
<td>Over Current Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>32</td>
<td>System Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>33</td>
<td>RGLT Error Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>34</td>
<td>Arc</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>35</td>
<td>Over Temp Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>36</td>
<td>AC Fault</td>
<td>Open Collector, Low = Active</td>
</tr>
<tr>
<td>37</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Remote Power Program Input</td>
<td>0-10Vdc = 0-100% rated output, Zin&gt;10MΩ</td>
</tr>
<tr>
<td>43</td>
<td>Local Power Program Output</td>
<td>0-10Vdc = 0-100% rated output, internal pot</td>
</tr>
<tr>
<td>44</td>
<td>+6Vdc Output</td>
<td>+6Vdc @ 100mA, maximum</td>
</tr>
<tr>
<td>45</td>
<td>+15Vdc Output</td>
<td>+15Vdc @ 100mA, maximum</td>
</tr>
<tr>
<td>46</td>
<td>-15Vdc Output</td>
<td>-15Vdc @ 10mA, maximum</td>
</tr>
<tr>
<td>47</td>
<td>RS232 Tx</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>RS232 Rx</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>RS232 GND</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Power Supply Common</td>
<td>Power Supply Ground</td>
</tr>
</tbody>
</table>
DANGER
TO REDUCE THE RISK OF ELECTRICAL SHOCK DO NOT REMOVE ANY PANELS UNTIL 5 MINUTES HAVE ELAPSED AFTER TURNING OFF EQUIPMENT.

WARNING REFER SERVICE TO QUALIFIED PERSONNEL. INTERNAL PARTS MAY PRESENT A RISK OF ELECTRICAL SHOCK DURING SERVICING.

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

**SPECIFICATIONS**

**Input Voltage:**
115Vac±10%, 50-60Hz single phase or 220Vac±10%, 50-60Hz single phase.

**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: ±1%. Input Impedance: 10Mohm.

**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 ±100μA 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/°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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.

**FRONT PANEL STATUS INDICATORS:**
- Overvoltage
- Overtemperature
- Regulation Error
- Arc
- HV ON: Red
- Voltage Control Mode
- Current Control Mode
- Interlock Open
- Interlock Closed
- HV OFF: Green

www.spellmanhv.com/manuals/XLG
XLG SELECTION TABLE 0.1mA, 0.2mA, 0.5mA

<table>
<thead>
<tr>
<th>kV</th>
<th>0.1mA</th>
<th>0.2mA</th>
<th>0.5mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>XLG30P3*</td>
<td>XLG30P6*</td>
<td>XLG30P15*</td>
</tr>
<tr>
<td>35</td>
<td>XLG35P3.5*</td>
<td>XLG35P7*</td>
<td>XLG35P17.5*</td>
</tr>
<tr>
<td>40</td>
<td>XLG40P4*</td>
<td>XLG40P9*</td>
<td>XLG40P20*</td>
</tr>
<tr>
<td>50</td>
<td>XLG50P5*</td>
<td>XLG50P10*</td>
<td>XLG50P25*</td>
</tr>
<tr>
<td>60</td>
<td>XLG60P6*</td>
<td>XLG60P12*</td>
<td>XLG60P30*</td>
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<td>80</td>
<td>XLG80P8*</td>
<td>XLG80P16*</td>
<td>XLG80P40*</td>
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<tr>
<td>100</td>
<td>XLG100P10*</td>
<td>XLG100P20*</td>
<td>XLG100P50*</td>
</tr>
<tr>
<td>120</td>
<td>XLG120P12*</td>
<td>XLG120P24*</td>
<td>XLG120P60*</td>
</tr>
<tr>
<td>130</td>
<td>XLG130P13*</td>
<td>XLG130P26*</td>
<td>XLG130P65*</td>
</tr>
</tbody>
</table>

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

XLG SELECTION TABLE 1.0mA, 2.0mA, 3.0mA

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

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

XLG CONNECTOR 25 PIN

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

Powering grounded cathode X-ray tubes from Kevex, Oxford, RTW, Superior, Varian and Trufocus.

**OPTIONS**

- **XCC** XRM Compatible HV Cable (50kV only)
- **5VPM** 0 to 5 Volt Programming and Monitor Scaling
- **K5302** Mammoflex HV cable for MNX
- **K2001** Mammoflex HV cable for MNX w/XCC option

**SPECIFICATIONS**

**Input:**
- +24Vdc ±10%, 5.0A maximum for either 50 Watts or 75 Watts.
- +24Vdc ±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.

**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: ±1%. $Z_{in}$: 10Mohm.

**Voltage Control:**

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

**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: ±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:** ±0.01% for ±10% change in input voltage.

**Current Regulation:**
- **Load:** 0.01% of output current from 0 to rated voltage.
- **Line:** ±0.01% for ±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 ±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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. UL/CUL recognized, File E227588. Compliant to 2002/95/EC, RoHS.

www.spellmanhv.com/manuials/MNX
### J2 POWER INPUT CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V Input</td>
<td>+24 volts @ 5A, max.</td>
</tr>
<tr>
<td>2</td>
<td>24V Return (Gnd.)</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

### J3 FILAMENT CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Filament Out</td>
<td>0.3A to 3.5A, 5 volt, max.</td>
</tr>
<tr>
<td>2</td>
<td>Filament Return</td>
<td>Filament Ground</td>
</tr>
</tbody>
</table>

### J4 ANALOG INTERFACE CONNECTOR

**MALE 15 PIN MINI “D”**

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

*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.

**K5302:** A one meter (39.4") long Mammoflex mating high voltage cable is provided, SHV p/n 201946-007

**K2001:** A one meter (39.4") long Mammoflex mating high voltage cable is provided, compatible with the XCC Option SHV p/n 201946-002

### 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
**Typical MNX Operating Setup**

- **24V Input Connections**: J3-1 to J3-2

**Analog Interface**

- **Filament Connections**: J1 to X-Ray Tube Filament
- **VOLTAGE PROGRAM IN**: +10.00V
- **CURRENT PROGRAM IN**: +10.00V
- **EXTERNAL CURRENT CONTROL**: Jumper J4-7 to J4-8 to Use Local Voltage Control
- **EXTERNAL VOLTAGE CONTROL**: Jumper J4-10 to J4-11 to Use Local Current Control

**Fail Safe Interlock / HV ON Connections**

- **Power to HV Circuits**: +24V to HV Circuits
- **Filament Connections**: +24V to 4A Input Power

**Alternate Interlock Configurations**

- **Fail Safe Interlock (X-Ray ON)**:
  - J5 to X-Ray ON
  - J6 to X-Ray ON

**Alternate Interlock Configuration**:

- **Customer Provided +12V For HV ON Relay**: Relay, Relay Return Grounded

---

**Addendum**

- **Spellman High Voltage Electronics Corporation**
  - Corporate Headquarters
  - Hauppauge, New York USA
  - e-mail: sales@spellmanhv.com

**Copyright © 2004 Spellman High Voltage Electronics Corp.**
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**

Powering grounded cathode X-Ray tubes from Kevex, Oxford, RTW, Superior, Varian and Trufocus.

**OPTIONS**

- **XCC** XRM Compatible HV Cable (50kV only)
- **5VPM** 0 to 5 Volt Programming and Monitor Scaling
- **GB** Grid Bias Option
- **KSB** Mammoflex HV cable for uX
- **K2001** Mammoflex HV cable for uX w/XCC option

**SPECIFICATIONS**

**Input:**
- +24Vdc ±10%, 5.0A maximum for either 50 Watts or 75 Watts.
- +24Vdc ±1%, 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: ±1%. Zin: 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: ±1%. Zin: 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 ±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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive (approval pending). UL/CUL recognized, File E227588 (approval pending). Compliant to 2002/95/EC, RoHS.

- **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**
Grid Bias Option (GB):
Plug-n-Play compatibility for Oxford’s Apogee X-Ray Tube
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 sepa-
rate integrated high frequency switching circuit, providing maxi-
mum 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 ±10% change in input voltage
Ripple: 1% of maximum rated voltage

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.

**K5302:** A one meter (39.4”) long Mammoflex mating high voltage cable is provided. SHV p/n 201946-007

**K2001:** 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/FILAMENT CONNECTOR**

4 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V Input</td>
<td>+24 volts @ 5A, max.</td>
</tr>
<tr>
<td>2</td>
<td>24V Return (Gnd.)</td>
<td>Power Ground</td>
</tr>
<tr>
<td>3</td>
<td>Filament Out</td>
<td>0.3A to 3.5A, 5 volt, max.</td>
</tr>
<tr>
<td>4</td>
<td>Filament Return</td>
<td>Filament Return</td>
</tr>
</tbody>
</table>

Note: 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 consult the factory.

**ANALOG INTERFACE CONNECTOR**

MALE 15 PIN MINI “D”

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

*Denotes 10 turn potentiometer accessible through holes in cover

**GRID BIAS CONNECTOR**

2 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>2</td>
<td>Grid Bias</td>
<td>0 to -300Vdc</td>
</tr>
</tbody>
</table>

**USB DIGITAL INTERFACE—4 PIN USB “B” CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5 Vdc</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data -</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX out</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX in</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

**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
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 filamentry 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 ±10%, 5.0A maximum for either 50 Watts or 75 Watts.
+24Vdc ±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: ±1%. Zin: 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: ±1%. Zin: 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: ±0.01% for ±10% change in input voltage.

Current Regulation:
Load: 0.01% of output current from 0 to rated voltage.
Line: ±0.01% for ±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 ±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)
**J2 POWER INPUT CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V Input</td>
<td>+24 volts @ 5A, max.</td>
</tr>
<tr>
<td>2</td>
<td>24V Return (Gnd.)</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

**J4 ANALOG INTERFACE CONNECTOR**

**MALE 15 PIN MINI “D”**

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

*Denotes 10 turn potentiometer located on front panel

**J1 CATHODE OUTPUT**

**CLAYMOUNT HV CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>OUTPUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>High Voltage Output</td>
</tr>
<tr>
<td>S</td>
<td>High Voltage Output</td>
</tr>
<tr>
<td>L</td>
<td>Filament Output</td>
</tr>
<tr>
<td>G</td>
<td>Filament Output</td>
</tr>
</tbody>
</table>

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 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
## MFX Power Supply

### 50W/65W/75W X-RAY POWER SUPPLY

**DIMENSIONS:** in. [mm]

### 65KV

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-RAY TUBE</td>
<td>8.00 [203.25]</td>
</tr>
<tr>
<td>CATHODE (FILAMENT)</td>
<td>1.63 [41.3]</td>
</tr>
<tr>
<td>ANODE</td>
<td>2.87 [72.90]</td>
</tr>
<tr>
<td>M4x.7 x28 [7.1] DP</td>
<td></td>
</tr>
</tbody>
</table>

### 65KV WITH SIC OPTION

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-RAY TUBE</td>
<td>8.00 [203.25]</td>
</tr>
<tr>
<td>CATHODE (FILAMENT)</td>
<td>1.63 [41.3]</td>
</tr>
<tr>
<td>ANODE</td>
<td>2.87 [72.90]</td>
</tr>
<tr>
<td>M4x.7 x28 [7.1] DP</td>
<td></td>
</tr>
</tbody>
</table>

---

**Typical MFX Operating Setup**

**MFX Power Supply +24V Input Connections**

- +24V @ 5A

**Analog Interface**

- **VOLTAGE MONITOR**
- **CURRENT MONITOR**
- **FILAMENT MONITOR**
- **FILAMENT LIMIT SETPOINT**
- **FILAMENT PREHEAT SETPOINT**
- **EXTERNAL CURRENT CONTROL**
- **EXTERNAL VOLTAGE CONTROL**

**Alternate Interlock Configurations**

- **Fall Safe Interlock / HV ON Connections**
  - MFX Power Supply
  - +24V Power to HV Circuits
  - Fall Safe Interlock / HV ON: Customer Provided +12V For HV ON Relay, Relay Return Grounded

---

**Alternate Interlock Configuration:**

- Fall Safe Interlock Replaced With a 270 Ohm Resistor

---

**Fail Safe Interlock Configuration:**

- MFX Power Supply
- +24VDC
- Jumper J4-10 to J4-11 to Use Local Current Control
- Jumper J4-7 to J4-8 to Use Local Voltage Control

---

**Alternate Interlock Configuration:**

- MFX Power Supply
- +24VDC
- Jumper J4-10 to J4-11 to Use Local Current Control
- Jumper J4-7 to J4-8 to Use Local Voltage Control

---

**MFX Power Supply**

- +24VDC
- Jumper J4-10 to J4-11 to Use Local Current Control
- Jumper J4-7 to J4-8 to Use Local Voltage Control

---

**Corporate Headquarters**

Spellman High Voltage is an ISO 9001:2008 and ISO 14001:2004 registered company

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Spellman's XRF Series allow 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 Series is 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 Series incorporates 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

**Options**
- DF Dual Filament
- GS Grid Supply
- SL Slides
- AT Arc Trip
- IO Instant ON
- SS(X) Non Standard Slow Start

**Specifications**

- **Input Voltage:**
  - 80W: 90-125 and 180-264Vac at 48-62Hz.
  - 320W: 180-264Vac at 48-62Hz.
  - 640W: 180-264Vac at 48-62Hz.

- **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.

- **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:**
    - 160kV European Conical connector with 2-ring and center pin end.
  - **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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
**160kV XRF SELECTION TABLE**

<table>
<thead>
<tr>
<th>OUTPUT VOLTAGE (kV)</th>
<th>OUTPUT CURRENT (mA)</th>
<th>OUTPUT POWER (W)</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>0.5</td>
<td>80</td>
<td>XRF160N80</td>
</tr>
<tr>
<td>160</td>
<td>2.0</td>
<td>320</td>
<td>XRF160N320</td>
</tr>
<tr>
<td>160</td>
<td>4.0</td>
<td>640</td>
<td>XRF160N640</td>
</tr>
</tbody>
</table>

**J2 AC INPUT CONNECTOR WIRING**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Auxiliary (Logic) Line</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>Auxiliary (Logic) Neutral</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>Ground</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>Main (Inverter) Line</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>Main (Inverter) Neutral</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Signal Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Interlock</td>
<td>Jumper to TB1-2 to close interlock</td>
</tr>
<tr>
<td>2</td>
<td>Interlock Return</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>KV Monitor</td>
<td>0-10V = 0-160kV</td>
</tr>
<tr>
<td>4</td>
<td>mA Monitor</td>
<td>0-10V = 0-100% Rated Output</td>
</tr>
<tr>
<td>5</td>
<td>Filament Monitor</td>
<td>0-5V = 0-5A</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>HV ON Indicator</td>
<td>+15V = HV ON</td>
</tr>
<tr>
<td>8</td>
<td>Voltage Mode Indicator</td>
<td>Low = Voltage Mode.</td>
</tr>
<tr>
<td>9</td>
<td>Current Mode Indicator</td>
<td>Low = Current Mode.</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>
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 Varian, Kevex, Oxford, RTW, Superior and Trufocus.

SPECIFICATIONS

Input:
+24Vdc ±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: ±1%. Zin = 10Mohm.

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: ±1%. Zin = 10Mohm. Filament limit and filament preheat control capability is also provided.

Voltage and Current Monitors:
0 to 10Vdc = 0 to 100% rated output
Accuracy: ±1%. Zout = 1kohm

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.

Stability:
0.005% 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° C to +50° C
Storage: -40° C to +85° C
Humidity: 0% to 90%, non-condensing

Dimensions:
50/65kV Unit: 7.00”H x 3.07”W x 9.50”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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive (approval pending). Compliant to 2002/95/EC, RoHS.
**uXHP MODEL SELECTION TABLE**

<table>
<thead>
<tr>
<th>OUTPUT VOLTAGE</th>
<th>OUTPUT CURRENT</th>
<th>OUTPUT POWER</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-50kV</td>
<td>0-5mA</td>
<td>100W</td>
<td>uXHP50P100</td>
</tr>
<tr>
<td>0-65kV</td>
<td>0-5mA</td>
<td>100W</td>
<td>uXHP65P100</td>
</tr>
<tr>
<td>0-80kV</td>
<td>0-5mA</td>
<td>100W</td>
<td>uXHP80P100</td>
</tr>
</tbody>
</table>

**CONTROL POWER/FILAMENT CONNECTOR**

4 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V Control Power</td>
<td>+24V @ 1A max</td>
</tr>
<tr>
<td>2</td>
<td>+24V Control Power Return</td>
<td>Power Ground</td>
</tr>
<tr>
<td>3</td>
<td>Filament Output</td>
<td>0.3A to 3.5A @ 5V, max</td>
</tr>
<tr>
<td>4</td>
<td>Filament Return</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

**HIGH VOLTAGE POWER INPUT CONNECTOR**

2 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V High Voltage Power Input</td>
<td>+24V @ 7.75A max</td>
</tr>
<tr>
<td>2</td>
<td>+24V High Voltage Power Return</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

**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:**

- **K5302**: (50kV/65kV units only) A one meter (39.4") long Mammoflex mating high voltage cable is provided, SHV p/n 201946-007
- **K2001**: (50kV/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

**ANALOG INTERFACE CONNECTOR**

MALE 15 PIN “D”

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

| Denotes 10 turn potentiometer accessible through holes in cover |

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

**USB DIGITAL INTERFACE—4 PIN USB “B” CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5Vdc</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data -</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX out</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX in</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>Voltage Monitor 2</td>
<td>0-10V = 0 to full scale, Zout = 1KΩ</td>
</tr>
<tr>
<td>9</td>
<td>Power Supply OK</td>
<td>+15V = OK, 0V = Fault, Sink/Source 3mA max</td>
</tr>
</tbody>
</table>

*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.
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 are described in detail in the uXHP manual.
Spellman’s new DXM Series of X-Ray generator modules are designed for OEM applications up to 75kV 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
  - 90-264Vac, 47-63 Hertz, for 300 watt units
  - 180-264Vac, 47-63 Hertz for 600 and 1200 watt units

**Output Voltage:**
- 7 models—20kV, 30kV, 40kV, 50kV, 60kV, 70kV and 75kV

**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:**
- ≤0.01% of rated output voltage over specified input voltage range
- ≤0.01% of rated output voltage for a full load change

**Emission Current Regulation:**
- ≤0.01% of rated output current over specified input voltage range
- ≤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:**
- ≤1%rms at >20 kHz, 0.1%rms below 20 kHz

**Stability:**
- ≤25ppm/hr after a 2 hour warm up

**Temperature Coefficient:**
- ≤50ppm per degree C

**Environmental:**
- Temperature Range:
  - Operating: 0°C to 40°C
  - Storage: -40°C to 85°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. 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 RS232 are standard.
  - All digital monitors have an accuracy specification of 2%

**Control Software:**
- A Windows graphical user interface example is provided. Built-in diagnostics can be performed over Ethernet via a Java applet and any standard web browser

**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:**
- 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)

www.spellmanhv.com/manuals/DXM
**DXM SELECTION TABLE— 300W, 600W, 1200W**

<table>
<thead>
<tr>
<th>kV</th>
<th>300 Watt Model</th>
<th>600 Watt Model</th>
<th>1200 Watt Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>DXM20*300</td>
<td>DXM20*600</td>
<td>DXM20*1200</td>
</tr>
<tr>
<td>30</td>
<td>DXM30*300</td>
<td>DXM30*600</td>
<td>DXM30*1200</td>
</tr>
<tr>
<td>40</td>
<td>DXM40*300</td>
<td>DXM40*600</td>
<td>DXM40*1200</td>
</tr>
<tr>
<td>50</td>
<td>DXM50*300</td>
<td>DXM50*600</td>
<td>DXM50*1200</td>
</tr>
<tr>
<td>60</td>
<td>DXM60*300</td>
<td>DXM60*600</td>
<td>DXM60*1200</td>
</tr>
<tr>
<td>70</td>
<td>DXM70*300</td>
<td>DXM70*600</td>
<td>DXM70*1200</td>
</tr>
<tr>
<td>75</td>
<td>DXM75*300</td>
<td>DXM75*600</td>
<td>DXM75*1200</td>
</tr>
</tbody>
</table>

*Specify “P” for positive polarity or “N” for negative polarity

**FILAMENT TERMINAL BLOCK— TB1 TWO POSITION TERMINAL BLOCK**

<table>
<thead>
<tr>
<th>POSITION</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Filament Output</td>
<td>0-5 amps, 10Vdc Maximum</td>
</tr>
<tr>
<td>2</td>
<td>Filament Return</td>
<td>Filament Return</td>
</tr>
</tbody>
</table>

For positive polarity/ground referenced filament units

**HIGH VOLTAGE OUTPUT CONNECTOR— J6: FLOATING FILAMENT**

Negative Polarity: Claymount Mini Federal Standard X-ray connector

**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

**USB DIGITAL INTERFACE— J4 4 PIN USB “B” CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5 Vdc</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data -</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX out</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX in</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

**FILAMENT TERMINAL BLOCK— J2 15 PIN MALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Supply Fault</td>
<td>Open Collector, 35V @ 10mA Maximum</td>
</tr>
<tr>
<td>2</td>
<td>Current Program In</td>
<td>0 to 10V=0 to 100% Rated Output, Zin=10MΩ</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Program In</td>
<td>0 to 10V=0 to 100% Rated Output, Zin=10MΩ</td>
</tr>
<tr>
<td>4</td>
<td>Filament Limit Input</td>
<td>0 to 10V=0 to 100% Rated Output, Zin=10MΩ</td>
</tr>
<tr>
<td>5</td>
<td>Local Filament Limit</td>
<td>Multi-turn front panel potentiometer</td>
</tr>
<tr>
<td>6</td>
<td>Filament Preheat Input</td>
<td>0 to 10V=0 to 100% Rated Output, Zin=10MΩ</td>
</tr>
<tr>
<td>7</td>
<td>Local Filament Preheat</td>
<td>Multi-turn front panel potentiometer</td>
</tr>
<tr>
<td>8</td>
<td>Voltage Monitor</td>
<td>0 to 10V=0 to 100% Rated Output, Zout =4.99k, 1%</td>
</tr>
<tr>
<td>9</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>10</td>
<td>Current Monitor</td>
<td>0 to 10V=0 to 100% Rated Output, Zout =4.99k, 1%</td>
</tr>
<tr>
<td>11</td>
<td>X-ray Enable Input</td>
<td>Connect to Pin 12 to HV Enable Supply</td>
</tr>
<tr>
<td>12</td>
<td>X-ray Enable Output</td>
<td>+15V @ Open, ≤15mA @ Closed</td>
</tr>
<tr>
<td>13</td>
<td>Filament Monitor</td>
<td>1 Volt=1 Amp, Zout=10kΩ</td>
</tr>
<tr>
<td>14</td>
<td>X-ray On Output Signal</td>
<td>Open Collector, 35V @10mA Maximum</td>
</tr>
<tr>
<td>15</td>
<td>Spare</td>
<td>N/C</td>
</tr>
</tbody>
</table>

**CLAYMOUNT HV CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>OUTPUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C (common)</td>
<td>High Voltage Output</td>
</tr>
<tr>
<td>S (small)</td>
<td>High Voltage Output</td>
</tr>
<tr>
<td>L (large)</td>
<td>Filament Output</td>
</tr>
<tr>
<td>G (grid)</td>
<td>Filament Output</td>
</tr>
</tbody>
</table>

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

**Weight:**

- 300/600 Watts: 14 pounds (6.35kg)
- 1200 Watts: 26 pounds (11.8kg)

**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:**

300/600 Watt

**Bottom View**

- 10-32 Blind PEMs 4 PLCs
- 0.75 [19]
- 10.50 [266]
- 3.88 [99]
- 1.06 [27]

**Front View**

- 4.75 [120]
- 6.00 [152]

**Side View**

- 12.00 [304]

- Negative Polarity - Floating Filament
- Positive Polarity - Ground Filament

**Danger**

- High Voltage

---

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DIMENSIONS: in. [mm]

1200 Watt

DANGER
HIGH VOLTAGE

10-32 BLIND PEM 4 PLCS

AIR FLOW

Negative Polarity - Floating Filament

Positive Polarity - Ground Filament

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Spellman’s new DXB Series of bipolar X-Ray generator modules are designed for OEM applications up to 140kV (±70kV) 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
- Crystal Inspection
- Plating Measurement
- Thickness Gauging
- Food Inspection
- Mineral Analysis
- X-Ray Fluorescence
- X-Ray Diffraction

**SPECIFICATIONS**

**Input Voltage:**
- Power factor corrected input
- 90-264Vac, 47-63 Hertz, for 300 and 600 watt units
- 180-264Vac, 47-63 Hertz for 1200 watt units

**Output Voltage:**
- 6 models: 40kV, 60kV, 80kV, 100kV, 120kV and 140kV

**Output Polarity:**
- ± 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:**
- ≤0.01% of rated output voltage over specified input voltage range
- ≤0.01% of rated output voltage for a full load change

**Emission Current Regulation:**
- ≤0.01% of rated output current over specified input voltage range
- ≤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:**
- ≤1% rms at >20 kHz, 0.1% rms below 20 kHz

**Stability:**
- ≤25ppm/hr after a 2 hour warm up

**Temperature Coefficient:**
- ≤50ppm per degree C

**Environmental:**
- Temperature Range:
  - Operating: 0°C to 40°C
  - Storage: -40°C to 85°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.
- 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. Built-in diagnostics can be performed over Ethernet via a Java applet and any standard web browser
- **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:**
- 4.75” H X 12” W X 12” D
  - (120.65mm x 304.8mm x 304.8mm)

**Weight:**
- 26 pounds (11.8kg)

**Input Line Connector:**
- IEC320 with EMI filter

**Output Connectors:**
- Claymount Mini Federal Standard X-ray connectors.
- Other connectors and pinouts available on special order.

**Regulatory Approvals:**
**DXB SELECTION TABLE — 300W, 600W, 1200W**

<table>
<thead>
<tr>
<th>kV</th>
<th>300 Watt mA</th>
<th>Model</th>
<th>600 Watt mA</th>
<th>Model</th>
<th>1200 Watt mA</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>7.50</td>
<td>DXB40PN300</td>
<td>15.0</td>
<td>DXB60PN600</td>
<td>30.0</td>
<td>DXB40PN1200</td>
</tr>
<tr>
<td>60</td>
<td>5.00</td>
<td>DXB60PN300</td>
<td>10.0</td>
<td>DXB60PN600</td>
<td>20.0</td>
<td>DXB60PN1200</td>
</tr>
<tr>
<td>80</td>
<td>3.75</td>
<td>DXB80PN300</td>
<td>7.50</td>
<td>DXB80PN600</td>
<td>15.0</td>
<td>DXB80PN1200</td>
</tr>
<tr>
<td>100</td>
<td>3.00</td>
<td>DXB100PN300</td>
<td>6.00</td>
<td>DXB100PN600</td>
<td>12.0</td>
<td>DXB100PN1200</td>
</tr>
<tr>
<td>120</td>
<td>2.50</td>
<td>DXB120PN300</td>
<td>5.00</td>
<td>DXB120PN600</td>
<td>10.0</td>
<td>DXB120PN1200</td>
</tr>
<tr>
<td>140</td>
<td>2.14</td>
<td>DXB140PN300</td>
<td>4.28</td>
<td>DXB140PN600</td>
<td>8.57</td>
<td>DXB140PN1200</td>
</tr>
</tbody>
</table>

**DXB ANALOG INTERFACE — J2 15 PIN MALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Supply Fault</td>
<td>Open Collector, 3V @ 10mA Maximum</td>
</tr>
<tr>
<td>2</td>
<td>Current Program In</td>
<td>0 to 10V=0 to 100% Rated Output, Zi=10MΩ</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Program In</td>
<td>0 to 10V=0 to 100% Rated Output, Zi=10MΩ</td>
</tr>
<tr>
<td>4</td>
<td>Filament Limit Input</td>
<td>0 to 10V=0 to 100% Rated Output, Zi=10MΩ</td>
</tr>
<tr>
<td>5</td>
<td>Local Filament Limit</td>
<td>Multi-turn front panel potentiometer</td>
</tr>
<tr>
<td>6</td>
<td>Filament Preheat Input</td>
<td>0 to 10V=0 to 100% Rated Output, Zi=10MΩ</td>
</tr>
<tr>
<td>7</td>
<td>Local Filament Preheat</td>
<td>Multi-turn front panel potentiometer</td>
</tr>
<tr>
<td>8</td>
<td>Voltage Monitor</td>
<td>0 to 10V=0 to 100% Rated Output, Zout=49kΩ, 1%</td>
</tr>
<tr>
<td>9</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>10</td>
<td>Current Monitor</td>
<td>0 to 10V=0 to 100% Rated Output, Zout=49kΩ, 1%</td>
</tr>
<tr>
<td>11</td>
<td>X-ray Enable Input</td>
<td>Connect to Pin 12 to HV Enable Supply</td>
</tr>
<tr>
<td>12</td>
<td>X-ray Enable Output</td>
<td>+15V @ Open, ≤15mA @ Closed</td>
</tr>
<tr>
<td>13</td>
<td>Filament Monitor</td>
<td>1 Volt=1 Amp, Zout=1MΩ</td>
</tr>
<tr>
<td>14</td>
<td>X-ray On Output Signal</td>
<td>Open Collector, 3V @ 10mA Maximum</td>
</tr>
<tr>
<td>15</td>
<td>Spare</td>
<td>N/C</td>
</tr>
</tbody>
</table>

**USB DIGITAL INTERFACE — J4 4 PIN USB “B” CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5 Vdc</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data -</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

**ETHERNET DIGITAL INTERFACE — J5 8 PIN RJ45 CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

**CLAYMOUNT HV CONNECTOR PINOUT J6 CATHODE OUTPUT**

<table>
<thead>
<tr>
<th>PIN</th>
<th>OUTPUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>+High Voltage Output</td>
</tr>
<tr>
<td>S</td>
<td>+High Voltage Output</td>
</tr>
<tr>
<td>L</td>
<td>Filament Output</td>
</tr>
<tr>
<td>G</td>
<td>Filament Output</td>
</tr>
</tbody>
</table>

**CLAYMOUNT HV CONNECTOR PINOUT J7 ANODE OUTPUT**

<table>
<thead>
<tr>
<th>PIN</th>
<th>OUTPUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>+High Voltage Output</td>
</tr>
<tr>
<td>S</td>
<td>+High Voltage Output</td>
</tr>
<tr>
<td>L</td>
<td>+High Voltage Output</td>
</tr>
<tr>
<td>G</td>
<td>+High Voltage Output</td>
</tr>
</tbody>
</table>

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 wire
DIMENSIONS: in.[mm]

BOTTOM VIEW

FRONT VIEW

SIDE VIEW

DANGER
HIGH
VOLTAGE

10-32 BLIND PEMG
4 PLCIS

AIR IN

AIR OUT

AIR OUT

AIR OUT

AIR OUT

4.75 [120]

9.875 [250.36]

0.75 [19]

1.06 [27]

10.50 [266]
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, ≥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:**
  - ≤0.01% of rated output voltage over specified input voltage range
  - ≤0.01% of rated output voltage for a full load change
- **Emission Current Regulation:**
  - ≤0.01% of rated output current over specified input voltage range
  - ≤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:**
  - ≤1% rms at >20 kHz, 0.1% rms below 20 kHz
- **Stability:**
  - ≤25ppm/hr after a 2 hour warm up
- **Temperature Coefficient:**
  - ≤50ppm per degree C
- **Environmental:**
  - Temperature Range:
    - Operating: 0°C to 40°C
    - Storage: -40°C to 85°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. 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 RS232 are standard.
    - All digital monitors have an accuracy specification of 2%
- **Control Software:**
  - A Windows graphical user interface example is provided. Built-in diagnostics can be performed over Ethernet via a Java applet and any standard web browser
- **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 ≥105% of the set point value. When an over power fault occurs the high voltage output will be disabled and the Over Power Fault indictor 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’ (1.83mm) cord set provided

**Output Connector:**
- CA10 (R10). See table for pin out information

**Regulatory Approvals:**
### ETHERNET DIGITAL INTERFACE—J5 8 PIN RJ45 CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>RX-</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

**Note:** No high voltage cable is provided

### J6 CA10 (R10) HV CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>OUTPUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>High Voltage Output</td>
</tr>
<tr>
<td>S</td>
<td>High Voltage Output</td>
</tr>
<tr>
<td>L</td>
<td>Filament Output</td>
</tr>
</tbody>
</table>

Corporate Headquarters
Hauppauge, New York USA
+1-631-630-3000 FAX: +1-631-435-1620
e-mail: sales@spellmanhv.com

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www.spellmanhv.com

128107-001 REV. C
**DXM100 1200W X-RAY GENERATOR MODULE**

**SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION**

**PAGE 3 OF 3**

**DIMENSIONS:** in. [mm]

**BOTTOM VIEW**

- 9.875 [250.36]
- 1.06 [27]
- 0.75 [19]
- 14.00 [355.60]

**FRONT VIEW**

- 6.25 [158.75]

**SIDE VIEW**

- 15.50 [393.70]

**HIGH VOLTAGE MATING FLANGE BOLT CIRCLE DETAIL**

- M5 0.39 [10.0] DEEP 4X

**AIR FLOW**

 Spellman High Voltage is an ISO 9001:2008 and ISO 14001:2004 registered company
Copyright © 2014 Spellman High Voltage Electronics Corp.
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**
- APT: Adjustable Power Trip
- AT: Arc Trip
- SS(x): Non-Standard Slow Start
- NSS: No Slow Start
- IO: Instant ON
- SL: Slides

**SPECIFICATIONS**

**Input Voltage:**
- XLF 600W:
  - 115Vac±10%, 50-60Hz single phase or 220Vac±10%, 50-60Hz single phase
- XLF 1200W:
  - 220Vac±10%, 50-60Hz single phase only

**Voltage and Current Control:**
- Local: continuously adjustable from zero to maximum rating via a ten-turn potentiometer
- Remote: 0 to +10Vdc proportional to full output
- Accuracy: ±1%
- Input Impedance: 10Mohm

**TYPICAL APPLICATIONS**
- 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 ±100μA 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/°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:**

**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

www.spellmanhv.com/manuals/XLF
### 600W, 1200W XLF SELECTION TABLE

<table>
<thead>
<tr>
<th>600 Watt</th>
<th>1200 Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>kV</strong></td>
<td><strong>mA</strong></td>
</tr>
<tr>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>50</td>
<td>12</td>
</tr>
<tr>
<td>60</td>
<td>10</td>
</tr>
</tbody>
</table>

### JB1 CONNECTOR 25 PIN

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

### HIGH VOLTAGE CONNECTOR PINOUT
Spellman's XRV series of X-Ray high voltage powers 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.

**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 ≥0.98
- 6.0kW models: 208Vac, ±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

**Output Voltage:**
- Accuracy: 0.25%
- Stability: ±0.1% per 8 hours, after 1 hour warm up
- 1.8kW, 3.0kW, 4.0kW and 4.5kW models:
  - Load: ±0.05% of rated output voltage for a full load change
  - Line: ±0.05% of rated output voltage over specified input voltage range
- 6.0kW models:
  - Load: ±0.1% of rated output voltage for a full load change
  - Line: ±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:
  - Load: ±0.1% of rated output voltage for a change from 30% to 100% of rated output voltage
  - Line: ±0.1% of rated output voltage over specified input voltage range
- 6.0kW models:
  - Load: ±0.1% of rated output current for a change from 30% to 100% of rated output voltage
  - Line: ±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 VB GUI is provided for RS-232/USB, the Ethernet interface has an embedded applet for control (see page 2)

**Operating Temperature**
- 0°C to +50°C

**Storage Temperature**
- -40°C to +85°C

www.spellmanhv.com/manuals/XRV

**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

www.spellmanhv.com
The 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.

**Features of the GUI control:**
- Automatic warm-up X-Ray tube
- Max watts operation
- Timed or Continuous Exposure modes
- Configuration menu for user options setting of HVPS
- Fault and status monitor

### XRV160/320/350 SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>XRV160*1800</th>
<th>XRV160*3000</th>
<th>XRV160*4000</th>
<th>XRV160*6000</th>
<th>XRV320P&amp;N1800</th>
<th>XRV320P&amp;N4500</th>
<th>XRV350P&amp;N4500</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Output Voltage</td>
<td>0 to 160kV</td>
<td>0 to 160kV</td>
<td>0 to 160kV</td>
<td>0 to 160kV</td>
<td>0 to ±160kV</td>
<td>0 to ±160kV</td>
<td>0 to ±175kV</td>
</tr>
<tr>
<td>Polarity*</td>
<td>Pos or Neg</td>
<td>Pos or Neg</td>
<td>Pos or Neg</td>
<td>Pos or Neg</td>
<td>Bipolar</td>
<td>Bipolar</td>
<td>Bipolar</td>
</tr>
<tr>
<td>Output Rated Current</td>
<td>0-30mA</td>
<td>0-30mA</td>
<td>0-50mA</td>
<td>0-50mA</td>
<td>0-30mA</td>
<td>0-30mA</td>
<td>0-30mA</td>
</tr>
<tr>
<td>Output Power</td>
<td>1.8kW</td>
<td>3.0kW</td>
<td>4.0kW</td>
<td>6.0kW</td>
<td>1.8kW</td>
<td>4.5kW</td>
<td>4.5kW</td>
</tr>
<tr>
<td>Ripple/Noise (p-p)</td>
<td>&lt;0.025%</td>
<td>&lt;0.05%</td>
<td>&lt;0.1%</td>
<td>&lt;0.25%</td>
<td>&lt;0.025%</td>
<td>&lt;0.1%</td>
<td>&lt;0.1%</td>
</tr>
<tr>
<td>Dimensions</td>
<td>10.09˝H x 17.16˝W x 24˝D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 x (10.09˝H x 17.16˝W x 24˝D)</td>
</tr>
<tr>
<td>Weight</td>
<td>150 lbs. (69kg)</td>
<td>150 lbs. (69kg)</td>
<td>150 lbs. (69kg)</td>
<td>155 lbs. (70.3kg)</td>
<td>300 lbs. (136 kg)</td>
<td>300 lbs. (136 kg)</td>
<td>300 lbs. (136 kg)</td>
</tr>
<tr>
<td>Output Connector</td>
<td>R24</td>
<td>R24</td>
<td>R24</td>
<td>R24</td>
<td>Two R24</td>
<td>Two R24</td>
<td>Two R24</td>
</tr>
</tbody>
</table>

### XRV225/450 SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>XRV225*1800</th>
<th>XRV225*3000</th>
<th>XRV225*4000</th>
<th>XRV450P&amp;N1800</th>
<th>XRV450P&amp;N4500</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Output Voltage</td>
<td>0 to 225kV</td>
<td>0 to 225kV</td>
<td>0 to 225kV</td>
<td>0 to ±225kV</td>
<td>0 to ±225kV</td>
</tr>
<tr>
<td>Polarity*</td>
<td>Pos or Neg</td>
<td>Pos or Neg</td>
<td>Pos or Neg</td>
<td>Bipolar</td>
<td>Bipolar</td>
</tr>
<tr>
<td>Output Rated Current</td>
<td>0-30mA</td>
<td>0-30mA</td>
<td>0-30mA</td>
<td>0-30mA</td>
<td>0-30mA</td>
</tr>
<tr>
<td>Output Power</td>
<td>1.8kW</td>
<td>3.0kW</td>
<td>4.0kW</td>
<td>1.8kW</td>
<td>4.5kW</td>
</tr>
<tr>
<td>Ripple/Noise (p-p)</td>
<td>&lt;0.025%</td>
<td>&lt;0.05%</td>
<td>&lt;0.1%</td>
<td>&lt;0.25%</td>
<td>&lt;0.1%</td>
</tr>
<tr>
<td>Dimensions</td>
<td>15.90˝H x 17˝W x 30.72˝D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>240 lbs. (109kg)</td>
<td>240 lbs. (109kg)</td>
<td>240 lbs. (109kg)</td>
<td>480 lbs. (218 kg)</td>
<td>480 lbs. (218 kg)</td>
</tr>
<tr>
<td>Output Connector</td>
<td>R28</td>
<td>R28</td>
<td>R28</td>
<td>Two R28</td>
<td>Two R28</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>HV Output</td>
<td>XRV160 and XRV225—R24 Connector XRV450—R28 Connector</td>
</tr>
<tr>
<td>S</td>
<td>Small Filament Output</td>
<td>0 to 6 amps @ 10Vdc</td>
</tr>
<tr>
<td>L</td>
<td>Large Filament Output</td>
<td>0 to 6 amps @ 10Vdc</td>
</tr>
</tbody>
</table>

### J2 ANALOG INTERFACE—25 PIN D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Supply Fault</td>
<td>Low, sum of faults, HVPS detected a fault, open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>2</td>
<td>mA Program</td>
<td>0 to 10V FS Z in = 10M ohms</td>
</tr>
<tr>
<td>3</td>
<td>KV Program</td>
<td>0 to 10V FS Z in = 10M ohms</td>
</tr>
<tr>
<td>4</td>
<td>Filament Limit L/S Ref.*</td>
<td>0 to 10V FS Z in = 10M ohms</td>
</tr>
<tr>
<td>5</td>
<td>Filament Preheat L/S Ref.*</td>
<td>0 to 10V FS Z in = 10M ohms</td>
</tr>
<tr>
<td>6</td>
<td>kV Monitor</td>
<td>0 to 10V FS Z out = 4.99k ohms</td>
</tr>
<tr>
<td>7</td>
<td>mA Monitor</td>
<td>0 to 10V FS Z out = 4.99k ohms</td>
</tr>
<tr>
<td>8</td>
<td>Filament Current Monitor*</td>
<td>0 to 10V FS Z out = 4.99k ohms</td>
</tr>
<tr>
<td>9</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>10</td>
<td>X-Ray Enable</td>
<td>+24Vdc = X-Ray ON, connect to pin 14 with dry contact relay</td>
</tr>
<tr>
<td>11</td>
<td>Filament ON*</td>
<td>Filament ON status, low, filament ON open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>12</td>
<td>Interlock 1</td>
<td>Active low, interlock is closed, safe to enable HV</td>
</tr>
<tr>
<td>13</td>
<td>Interlock 2</td>
<td>Active low, interlock is closed, safe to enable HV</td>
</tr>
<tr>
<td>14</td>
<td>+24Vdc</td>
<td>+24Vdc @ 100mA, maximum</td>
</tr>
<tr>
<td>15</td>
<td>Filament Enable*</td>
<td>Active low, turn filament ON</td>
</tr>
<tr>
<td>16</td>
<td>Filament Control*</td>
<td>Active low, filament is regulated by ECR (HV must be ON). Not active, the filament is regulated by the preheat reference</td>
</tr>
<tr>
<td>17</td>
<td>Filament L/S Select</td>
<td>Filament selection large or small, low = small spot is selected</td>
</tr>
<tr>
<td>18</td>
<td>Filament L/S Confirm</td>
<td>Open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>19</td>
<td>HVPS RDY</td>
<td>Low = HVPS ready, open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>20</td>
<td>X-Ray ON</td>
<td>X-Ray ON status, low = X-Rays are ON open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>21</td>
<td>Interlock Status</td>
<td>Low, interlocks are closed, can enable HV open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>22</td>
<td>GND</td>
<td>Digital ground</td>
</tr>
<tr>
<td>23</td>
<td>X-Ray ON Pre-Warn</td>
<td>Pre-warming, low, before X-Ray ON open collector, 50V @ 10mA max</td>
</tr>
<tr>
<td>24</td>
<td>Heisel</td>
<td>Active low, minimum 10mA transition</td>
</tr>
<tr>
<td>25</td>
<td>Arc fault</td>
<td>Low, arc fault, the HVPS has detected an arc open collector, 50V @ 10mA max</td>
</tr>
</tbody>
</table>

### J3 9 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX out</td>
<td>Receive Data</td>
</tr>
<tr>
<td>3</td>
<td>RX in</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

### ETHERNET DIGITAL INTERFACE—J4 8 PIN RJ45 CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

### USB DIGITAL INTERFACE—J5 4 PIN USB “B” CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>+5Vdc</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
<td>Data</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
<td>Data +</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

### MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>MODEL</th>
<th>VOLTAGE</th>
<th>POWER</th>
<th>POLARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>XRV160*1800</td>
<td>160kV</td>
<td>1.8kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV160*2000</td>
<td>160kV</td>
<td>3.0kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV160*4000</td>
<td>160kV</td>
<td>4.0kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV160*8000</td>
<td>160kV</td>
<td>6.0kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV225*1000</td>
<td>225kV</td>
<td>1.8kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV225*3000</td>
<td>225kV</td>
<td>3.0kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV225*4000</td>
<td>225kV</td>
<td>4.0kW</td>
<td>Pos or Neg</td>
</tr>
<tr>
<td>XRV320P&amp;N1800</td>
<td>±160kV</td>
<td>1.8kW</td>
<td>Bipolar</td>
</tr>
<tr>
<td>XRV320P&amp;N4000</td>
<td>±160kV</td>
<td>4.5kW</td>
<td>Bipolar</td>
</tr>
<tr>
<td>XRV450P&amp;N4000</td>
<td>±175kV</td>
<td>4.5kW</td>
<td>Bipolar</td>
</tr>
<tr>
<td>XRV450P&amp;N1800</td>
<td>±225kV</td>
<td>1.8kW</td>
<td>Bipolar</td>
</tr>
<tr>
<td>XRV450P&amp;N4000</td>
<td>±225kV</td>
<td>4.5kW</td>
<td>Bipolar</td>
</tr>
</tbody>
</table>

*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.

### JB1 MAIN AND AUXILIARY INPUT POWER—TYPE 97-3102A-24-1P (Single Phase Units)

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Auxiliary AC Line Power</td>
<td>180-264Vac</td>
</tr>
<tr>
<td>2</td>
<td>Auxiliary Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Auxiliary AC Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>4</td>
<td>Main AC Line Power</td>
<td>180-264Vac</td>
</tr>
<tr>
<td>5</td>
<td>Main Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>Main AC Neutral</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

### JB1 MAIN AC INPUT POWER—TYPE 97-3102A-24-2P (Three Phase Units)

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line 1</td>
<td>208Vac ±10%, 50/60Hz @ 25amps</td>
</tr>
<tr>
<td>2</td>
<td>Line 2</td>
<td>208Vac ±10%, 50/60Hz @ 25amps</td>
</tr>
<tr>
<td>3</td>
<td>Line 3</td>
<td>208Vac ±10%, 50/60Hz @ 25amps</td>
</tr>
<tr>
<td>4</td>
<td>DND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Note: Use 4 conductor cable or single isolated wires rated no less that 600Vac, 30 amps (10AWG, minimum)

### JB2 AUXILIARY AC INPUT POWER—TYPE 97-3102A-20-3P (Three Phase Units)

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line 1</td>
<td>208Vac ±10%, 50/60Hz (source 3 phase L1, L2)</td>
</tr>
<tr>
<td>2</td>
<td>Line 2</td>
<td>208Vac ±10%, 50/60Hz (source 3 phase L1, L2)</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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.

*Not active on positive models
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 1/4" (3U) high chassis.

**TYPICAL APPLICATIONS**

- X-ray Diffraction (XRD)
- X-ray Fluorescence (XRF)

**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.

**OPTIONS**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232</td>
<td>RS232 Interface</td>
</tr>
<tr>
<td>220FSI</td>
<td>220Vac Fail Safe Interlock</td>
</tr>
<tr>
<td>208-3P</td>
<td>208Vac Three Phase Input</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

**Input Voltage:**
220Vac ±10%, 50 or 60 Hz, single phase (three phase optional).

**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/°C (20 ppm/°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/°C
- Long Term Stability: 0.01%/8 hours.

**Ripple:**
0.03% rms <1kHz, 0.75% rms above 1kHz.

**Environmental:**
- Temperature Range:
  - Operating: 0°C to 40°C
  - Storage: -20°C to 85°C
- Humidity: 10% to 90%, non-condensing.

**Filament Voltage:**
12Vac (dc filament optional).

**Filament Current:**
5A (up to 12A max available).

**Dimensions:**
- 5'/"(3U) H x 19" W x 22" D (13.3cm x 48.3cm x 55.9cm).

**Weight:**
90 lbs (40kg).

**Regulatory Approvals:**
Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive.
### JB1 MINI D CONNECTOR 50 PIN

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5Vdc (or connect to pin-11)</td>
</tr>
<tr>
<td>2</td>
<td>Control Power On</td>
</tr>
<tr>
<td>3</td>
<td>Init</td>
</tr>
<tr>
<td>4</td>
<td>X-ray On</td>
</tr>
<tr>
<td>5</td>
<td>X-ray Off</td>
</tr>
<tr>
<td>6</td>
<td>Spare</td>
</tr>
<tr>
<td>7</td>
<td>Spare</td>
</tr>
<tr>
<td>8</td>
<td>Reset</td>
</tr>
<tr>
<td>9</td>
<td>Rmt/Lcl</td>
</tr>
<tr>
<td>10</td>
<td>24V Switched</td>
</tr>
<tr>
<td>11</td>
<td>+5Vcch</td>
</tr>
<tr>
<td>12</td>
<td>X-ray On Status</td>
</tr>
<tr>
<td>13</td>
<td>Overvoltage</td>
</tr>
<tr>
<td>14</td>
<td>kV Min</td>
</tr>
<tr>
<td>15</td>
<td>Overpower</td>
</tr>
<tr>
<td>16</td>
<td>Filament Current Limit</td>
</tr>
<tr>
<td>17</td>
<td>mA Current Limit</td>
</tr>
<tr>
<td>18</td>
<td>ECL Status</td>
</tr>
<tr>
<td>19</td>
<td>Power Supply Fault</td>
</tr>
<tr>
<td>20</td>
<td>Gnd</td>
</tr>
<tr>
<td>21</td>
<td>Spare</td>
</tr>
<tr>
<td>22</td>
<td>(DF) Remote X-ray On</td>
</tr>
<tr>
<td>23</td>
<td>(DF) Remote X-ray On Ret</td>
</tr>
<tr>
<td>24</td>
<td>Spare</td>
</tr>
<tr>
<td>25</td>
<td>Gnd</td>
</tr>
<tr>
<td>26</td>
<td>kV Ref</td>
</tr>
<tr>
<td>27</td>
<td>kV Com</td>
</tr>
<tr>
<td>28</td>
<td>mA Ref</td>
</tr>
<tr>
<td>29</td>
<td>mA Com</td>
</tr>
<tr>
<td>30</td>
<td>Spare</td>
</tr>
<tr>
<td>31</td>
<td>Spare</td>
</tr>
<tr>
<td>32</td>
<td>Spare</td>
</tr>
<tr>
<td>33</td>
<td>Pwr. Limit (OL Ref)</td>
</tr>
<tr>
<td>34</td>
<td>Pwr. Limit Com (OL Com)</td>
</tr>
<tr>
<td>35</td>
<td>Filament Current Limit</td>
</tr>
<tr>
<td>36</td>
<td>Filament Current Limit Com</td>
</tr>
<tr>
<td>37</td>
<td>Spare</td>
</tr>
<tr>
<td>38</td>
<td>kV Monitor</td>
</tr>
<tr>
<td>39</td>
<td>mA Monitor</td>
</tr>
<tr>
<td>40</td>
<td>Spare</td>
</tr>
<tr>
<td>41</td>
<td>Spare</td>
</tr>
<tr>
<td>42</td>
<td>kV Ref Mon</td>
</tr>
<tr>
<td>43</td>
<td>mA Ref Mon</td>
</tr>
<tr>
<td>44</td>
<td>Spare</td>
</tr>
<tr>
<td>45</td>
<td>Spare</td>
</tr>
<tr>
<td>46</td>
<td>Filament Monitor</td>
</tr>
<tr>
<td>47</td>
<td>Mon Common</td>
</tr>
<tr>
<td>48</td>
<td>Spare</td>
</tr>
<tr>
<td>49</td>
<td>Gnd</td>
</tr>
<tr>
<td>50</td>
<td>Spare</td>
</tr>
</tbody>
</table>

---

**DIMENSIONS: in.[mm]**

**FRONT VIEW**

- 18.250 [463.55]
- 5.219 [132.56]
- 0.375 [9.52]

**TOP VIEW**

- 2.953 [75.00]
- 22.125 [561.97]
- 2.563 [65.00]
- 17.323 [440.00]

**BACK VIEW**

- 16.142 [410.00]
- 17.00 [431.80]
- 0.429 [10.90]

---

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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 (±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

**Ripple:** ≤1%
**Stability:** ≤0.01% per 8 hours
**Temperature Coefficient:** ≤100ppm/°C

**Output Current/Power**
- **Output Current Range:** 10mA to 200mA
- **Output Power:** 5kW @ 0.1 second loading time
- **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°C to 40°C
  Storage: -40°C to 85°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:
VMX40P5 platform is designed to meet applicable requirements of IEC60601-1 and IEC60601-2-7 and IEC60601-2-45.
Spellman will support customers needs when system certification is needed (subject to additional cost and lead time). UL/CUL recognized, File E242584. Compliant to 2002/95/EC, RoHS.

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

---

**VMX STANDARD SYSTEM INTERFACE—JB1 25 PIN MALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>2</td>
<td>+5Vdc Out</td>
<td>+5Vdc, 100mA max.</td>
</tr>
<tr>
<td>3</td>
<td>RS-232 Tx Out</td>
<td>RS-232 Transmit</td>
</tr>
<tr>
<td>4</td>
<td>RS-232 Rx In</td>
<td>RS-232 Receive</td>
</tr>
<tr>
<td>5</td>
<td>PREP</td>
<td>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 to boost the rotor. Contact connection to pin 24. Closed = PREP, the filament is placed in preheat mode</td>
</tr>
<tr>
<td>6</td>
<td>READY</td>
<td>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</td>
</tr>
<tr>
<td>7</td>
<td>ROTOR SHUTDOWN</td>
<td>User signal to brake the rotor drive</td>
</tr>
<tr>
<td>8</td>
<td>EXPOSURE</td>
<td>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</td>
</tr>
<tr>
<td>9</td>
<td>X-Ray ON 75% Status</td>
<td>Transistor output to indicate X-Ray ON status synchronized with 75% of kVP setting point</td>
</tr>
<tr>
<td>10</td>
<td>X-Ray ON Status</td>
<td>Transistor output to indicate X-Ray ON status synchronized with kV start up</td>
</tr>
<tr>
<td>11</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>12</td>
<td>X-Ray SHUTDOWN/AEC</td>
<td>User signal to generator to rapidly turn HV OFF and ON during serial exposure sequence</td>
</tr>
<tr>
<td>13</td>
<td>RS-232 ISO Ground</td>
<td>Isolated ground from RS-232 transceiver IC</td>
</tr>
<tr>
<td>14</td>
<td>HVG FAULT Status</td>
<td>Generator signal indicating generator fault. Open collector transistor output, Low/Active = Fault</td>
</tr>
<tr>
<td>15</td>
<td>Status Bit 1</td>
<td>3 bit status lines for up to 6 status messages. See separate matrix describing functionality. Open Collector, Low/Active = Message</td>
</tr>
<tr>
<td>16</td>
<td>Status Bit 2</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Status Bit 3</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>19</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>20</td>
<td>kV Monitor</td>
<td>Signal from generator. 0-10V = 0-40kV, Zout = 1kΩ</td>
</tr>
<tr>
<td>21</td>
<td>Emission Monitor</td>
<td>Signal from generator. 0-10V = 0-200mA, Zout = 1kΩ</td>
</tr>
<tr>
<td>22</td>
<td>Filament Current Monitor</td>
<td>Signal from generator. 0-10V = 0-6A, Zout = 1kΩ</td>
</tr>
<tr>
<td>23</td>
<td>Program/Monitor Return</td>
<td>Ground for reference of program and monitor signals</td>
</tr>
<tr>
<td>24</td>
<td>+24Vdc Out</td>
<td>For connection to PREP and EXPOSURE control relay coils</td>
</tr>
<tr>
<td>25</td>
<td>SHIELD/GND</td>
<td>For connection of interface cable shield to generator chassis ground</td>
</tr>
</tbody>
</table>

---

**TB2 ROTOR INTERFACE**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB2-1</td>
<td>PHASE</td>
<td>To tube auxiliary winding</td>
</tr>
<tr>
<td>TB2-2</td>
<td>RUN</td>
<td>To tube principle winding</td>
</tr>
<tr>
<td>TB2-3</td>
<td>COM</td>
<td>To tube common winding</td>
</tr>
<tr>
<td>TB2-4</td>
<td>GROUND</td>
<td>To tube housing ground</td>
</tr>
</tbody>
</table>

**TB3 TUBE AND INTERLOCK INTERFACE**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB3-1</td>
<td>SMALL FIL</td>
<td>Connection to tube small filament</td>
</tr>
<tr>
<td>TB3-2</td>
<td>COMMON</td>
<td>Connection to tube filament common</td>
</tr>
<tr>
<td>TB3-3</td>
<td>LARGE FIL</td>
<td>Connection to large filament</td>
</tr>
<tr>
<td>TB3-4</td>
<td>GROUND</td>
<td>Generator chassis for cable shield connection</td>
</tr>
<tr>
<td>TB3-5</td>
<td>Interlock 2+</td>
<td>Used if tube has separate thermostat switch</td>
</tr>
<tr>
<td>TB3-6</td>
<td>Interlock 2-</td>
<td>Open = OVER TEMP. (short terminals if not used)</td>
</tr>
<tr>
<td>TB3-7</td>
<td>Interlock 3+</td>
<td>Used if tube has cooling circulator flow switch</td>
</tr>
<tr>
<td>TB3-8</td>
<td>Interlock 3-</td>
<td>Open = NO FLOW. (short terminals if not used)</td>
</tr>
<tr>
<td>TB3-9</td>
<td>Safety Interlock+</td>
<td>User signal (Contact Closure) for safety interlocks such as door interlocks. Open turns HV OFF, or inhibits HV from being generated. Closed = OK, 24Vdc @ &lt;1A typical</td>
</tr>
<tr>
<td>TB3-10</td>
<td>Safety Interlock-</td>
<td></td>
</tr>
<tr>
<td>TB3-11</td>
<td>Contactor Coil+</td>
<td>Option for contactor coil control</td>
</tr>
<tr>
<td>TB3-12</td>
<td>Contactor Coil-</td>
<td></td>
</tr>
<tr>
<td>TB3-13</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>TB3-14</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>TB3-15</td>
<td>Tube Current+</td>
<td>Tube current flows out from this pin</td>
</tr>
<tr>
<td>TB3-16</td>
<td>Tube Current-</td>
<td>Tube current flows into this pin</td>
</tr>
</tbody>
</table>
Spellman's new MAMX Series of X-Ray generators set the standard for compact, high performance Mammography applications. Microprocessor based SMT control circuitry provides RS-232/RS-422 interfacing. Spellman’s proprietary pulse width modulated inverter topology allows for unprecedented efficiencies and power densities. A solid encapsulated high voltage section further reduces size and provides reliable, maintenance free operation.

The internal AC output, current regulated filament supply is controlled via sophisticated emission current regulation circuitry to provide accurate and stable X-Ray tube currents. A high speed starter complete with Boost and Brake functions is also incorporated into this efficient, space saving X-Ray generator.

**SPECIFICATIONS**

**Input Voltage:**
- **Standard**
  - Mains - 380 to 415Vac, 3 phase, ±10% 50/60Hertz
  - Auxiliary - 230Vac, single phase, ±10%, 50/60Hertz

**Output Voltage:**
- 20kV to 40kV
- Polarity: Positive, for grounded cathode X-ray tube
- Accuracy: <1%
- Reproducibility: <0.5%
- Setting Time: ≤50mS to within 95% of programmed voltage
- Ripple: ≤1%rms >10 kHz, 0.1%rms below 10 kHz
- Stability: ≤0.01% per 8 hours
- Temperature Coefficient: ≤100ppm°C

**Emission Current:**
- 50mA to 230mA
- Power: 9kW peak, 1.17kW average (13% duty cycle)
- Accuracy: <1%
- Reproducibility: <0.5%
- Setting Time: ≤70mS to within 95% of programmed current

**Filament:**
- Configuration: AC filament drive. Closed loop emission control regulates filament setting to provide desired Xray tube emission current.
- Output: 0-7 amps at a compliance of 5.5 volts, maximum.
- Dual Focal Spot: Standard

**High Speed Starter:**
- Rotational Speed: Anode rotation speed of at least 10,000 RPM
- Functionality: Boost and Brake capability provided

**Control Interface:**
- Remote Interface: RS-232/RS-422 are standard.
- Control Software: A VB GUI will be provided for RS-232/RS-422

**Environmental:**
- Operating Temperature: 0°C to +40°C
- Storage Temperature: -40°C to +85°C
- Humidity: 20% to 85% RH, non-condensing

**Input Connector:**
- 3 position terminal block (mains)
- 2 position terminal block (aux)

**HV Output Connector:**
- 60kV, Claymount CA-3 type

**Stator/Filament Connector:**
- 9 pin AMP 211769-1

**Interface Connector:**
- 25 pin D connector

**Cooling:**
- Forced air

**Dimensions:**
- 7.87”W X 3.93” D X 27.62” H
- (200mm X 160mm X 701mm)

**Weight:**
- 50 lbs. (22.68 kg)

**Regulatory Approvals:**
DIMENSIONS: in.[mm]

TOP VIEW

SIDE VIEW

FRONT VIEW

BACK VIEW
Spellman has produced CT Scanner X-Ray generators for over 25 years and was the first supplier to provide generators for continuous rotation in a production system.

This expertise has made it possible to develop and produce highly reliable power supplies specifically designed to meet the exacting requirements for helical scanning. These units are designed for high speed gantry rotation and their fast rise time and low ripple outputs make enhanced image quality possible.

Various other power levels and configurations are available for OEM requirements. Contact our sales department for additional details.
Spellman’s LPX Series are perfectly suited for today’s demanding NDT inspection requirements. LPX 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 LPX systems allow for lower kV per exposure, shorter exposure times and increased film contrast for superior radiographic imaging.

The LPX microprocessor-driven control unit provides automatic warm-up and comprehensive self-diagnostic circuitry. Memory to store and recall up to 250 exposure parameters is retained before powering down. The LPX 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; mAs is variable from 0 to 29995 mAs.

**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:**
5 to 160kV, 0.1 to 5.0mA
Constant potential, end-grounded anode, air or liquid cooled versions available

- 5 to 160kV, 0.1 to 5mA
- Constant Potential Output
- End Grounded Exposed Anode
- Portable, Repeatable, Accurate
- 100% Duty Cycle
- Unparalleled Resolution Imaging
- Liquid or Air Cooled Models
- Penetration of up to 25.4mm Fe

www.spellmanhv.com/manuals/LPX160

X-Ray Tube Window:
Beryllium 0.8mm (Directional), Nickel 0.6mm (Panoramic)

Radiation Coverage:
40° directional or 360° panoramic tube available

Radiation Output:
14R/min at 50cm filtered with 0.5 inches (12.7mm) aluminum at 160kV, 5mA

Duty Cycle:
100% - liquid or air cooled

Effective Focal Spot:
Standard: 0.060 in. sq. (1.5mm. sq.)
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.

Ambient Temp:
100% duty cycle @ 120°F (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 and cooling unit, or fan-forced air cooling

Liquid Cooling Unit Dimensions:
12.7˝ H x 15.5˝ W x 15.7˝ D
(322.6mm x 393.7mm x 398.8mm)

Liquid Cooling Unit Weight:
54lbs. (15.4kg) approx.

LPX160 Tube Head Dimensions:
Liquid Cooled: 7.25˝ Diam. x 28.5˝ L (184.2mm x 723.9mm)
Air Cooled: 7.25˝ Diam. x 30.5˝ L (184.2mm x 774.7mm)
Panoramic: 7.25˝ Diam. x 28.0˝ L (184.2mm x 711.2mm)

LPX160 Tube Head Weight:
Liquid Cooled: 29lbs. (13.15kg)
Air Cooled: 33lbs. (14.97kg)
Panoramic: 29lbs. (13.15kg)

X-Ray Control Unit:
Digital microcomputer based

X-Ray Control Unit Dimensions:
12.7˝ H x 17.5˝ W x 10.5˝ D
(322.58mm x 441.96mm x 266.7mm)

X-Ray Control Unit Weight:
34lbs. (12.68kg) 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

Radiation Leakage:
Less than 0.8 Roentgens per hour at 1 meter from the X-Ray tube target. 2.0 Roentgens per hour for Air Cooled units

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

**LPX160 MODEL SELECTION TABLE**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-0778</td>
<td>Air cooled, 40° directional beam, glass insert</td>
</tr>
<tr>
<td>3-000-1581</td>
<td>Liquid cooled, 40° directional beam, glass insert</td>
</tr>
<tr>
<td>3-000-0777</td>
<td>Liquid cooled, panoramic beam, glass insert</td>
</tr>
</tbody>
</table>

**LPX160 OPTIONS**

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-0754</td>
<td>LPX160/200 tubehead stand</td>
</tr>
<tr>
<td>3-000-0792</td>
<td>Laser pointer for liquid cooled</td>
</tr>
<tr>
<td>9-200-0110</td>
<td>Laser pointer adapter for air cooled</td>
</tr>
</tbody>
</table>

**OPTIONAL ACCESSORIES**

**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.

**Model 1620 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 tubehead 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.

**Optional 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.

**Optional 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.

This chart is for reference only (actual settings may vary due to SFD, material, and film type)
SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION

LPX160 PORTABLE X-RAY NDT SYSTEMS

CAUTION: PRESSURIZED COOLANT MIXTURE
14 PARTS METHYL ALCOHOL
7 PARTS WATER
1 PART TEXACO SOLUBLE "D" OIL
NOTE: DO NOT USE ETHYLENE GLYCOL

kV                  mA                    Exposure

Scroll                                 Mode

Safety                 Mains                                                                X-Ray

Units          Time          Reset

Interlock

Tubehead

Cooler

Power

Locked Off
On
On
Off

Memory                      Enter

On Off

CAUTION: This equipment produces X-Rays when energized.
To be operated by qualified personal only.

CONTROL UNIT
TOP VIEW

COOLER
TOP VIEW

LPX160 LIQUID COOLED TUBE HEAD
SIDE VIEW

DIMENSIONS: in.[mm]

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Spellman's LPX Series are perfectly suited for today's demanding NDT inspection requirements. LPX 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 LPX systems allow for lower kV per exposure, shorter exposure times and increased film contrast for superior radiographic imaging.

The LPX microprocessor-driven control unit provides automatic warm-up and comprehensive self-diagnostic circuitry. Memory to store and recall up to 250 exposure techniques is standard and the last set of exposure parameters is retained before powering down. The LPX 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; mAs is variable from 0 to 29995 mAs.

**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:**
10 to 200kV, 0.1 to 10.0mA (900 watts max.)
Constant potential, end-grounded anode, air or liquid cooled versions available

**X-Ray Tube Window:**
Beryllium 1.0mm

**Radiation Coverage:**
40° directional or 360° panoramic tube available

**Radiation Output:**
21R/min at 50cm filtered with 0.5 inches (12.7mm) aluminum at 200kV, 4.5mA

**Duty Cycle:**
100% - liquid or air cooled

**Effective Focal Spot:**
- Standard: 0.060 in. sq. (1.5mm. sq.)
- Panoramic: 0.4x4.0mm (IEC336)

**Ambient Temp:**
100% duty cycle @ 120°F (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:**
12.7˝ H x 15.5˝ W x 15.7˝ D
(322.6mm x 393.7mm x 398.8mm)

**Liquid Cooling Unit Weight:**
54lbs. (15.4kg) approx.

**LPX200 Tube Head Dimensions:**
- Liquid Cooled: 8.38” Diam. x 26.5” L (212.9mm x 673.1mm)
- Air Cooled: 8.38” Diam. x 30.0” L (212.9mm x 762mm)
- Panoramic: 8.38” Diam. x 26.5” L (212.9mm x 673.1mm)

**LPX200 Tube Head Weight:**
- Liquid Cooled: 37lbs. (16.78kg)
- Air Cooled: 41lbs. (18.60kg)
- Panoramic: 37lbs. (16.78kg)

**X-Ray Control Unit:**
Digital microcomputer based

**X-Ray Control Unit Dimensions:**
12.7˝ H x 15.5˝ W x 10.5˝ D
(322.58mm x 393.7mm x 266.7mm)

**X-Ray Control Unit Weight:**
34lbs. (15.4kg) 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

Radiation Leakage:
Less than 0.8 Roentgens per hour at 1 meter from the X-Ray tube target. 2.0 Roentgens per hour for Air Cooled units

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

LPX200 MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-3065</td>
<td>Air cooled, 40° directional beam, metal ceramic insert</td>
</tr>
<tr>
<td>3-000-3064</td>
<td>Liquid cooled, 40° directional beam, metal ceramic insert</td>
</tr>
<tr>
<td>3-000-3262</td>
<td>Air cooled, 40° directional beam, glass insert</td>
</tr>
<tr>
<td>3-000-3261</td>
<td>Liquid cooled, 40° directional beam, glass insert</td>
</tr>
<tr>
<td>3-000-3131</td>
<td>Liquid cooled, panoramic beam, metal ceramic insert</td>
</tr>
</tbody>
</table>

LPX200 OPTIONS

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-0754</td>
<td>LPX160/200 tubehead stand</td>
</tr>
<tr>
<td>3-000-0792</td>
<td>Laser pointer</td>
</tr>
<tr>
<td>9-200-0327</td>
<td>Laser pointer adapter for air cooled</td>
</tr>
<tr>
<td>9-200-0370</td>
<td>Laser pointer adapter for liquid cooled</td>
</tr>
</tbody>
</table>

OPTIONAL ACCESSORIES

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.

Model 1620 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 tubehead 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.

Optional 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.

Optional 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.

This chart is for reference only (actual settings may vary due to SFD, material, and film type)
**CAUTION: PRESSURIZED COOLANT MIXTURE**

14 parts Methyl Alcohol
7 parts Water
1 part TEXACO SOLUBLE "D" Oil

**NOTE: DO NOT USE ETHYLENE GLYCOL**

**kV**                   **mA**                    **Exposure**

**Scroll**                                 **Mode**

**Safety**                 **Mains**                                                                **X-Ray**

**Units**          **Time**          **Reset**

**Interlock**

**Tubehead**

**Cooler**

**Power**

**Locked Off**

**On**

**Off**

**Memory**                      **Enter**

**On** Off

**CAUTION:** This equipment produces X-Rays when energized. To be operated by qualified personnel only.

**LPX200 CONTROL UNIT**

**TOP VIEW**

**SIDE VIEW**

**FRONT VIEW**

**DIMENSIONS:** in. [mm]

**CONTROL UNIT**

**TOP VIEW**

17.50 [441.96]

10.50 [266.70]

**COOLER**

**TOP VIEW**

15.70 [398.76]

**SIDE VIEW**

12.70 [322.58]

12.70 [322.58]

10.50 [266.70]

15.50 [393.70]

26.50 [673.10]

15.50 [393.70]

**LPX200 LIQUID COOLED TUBE HEAD**

**SIDE VIEW**

12.70 [322.58]

12.70 [322.58]

12.70 [322.58]

15.50 [393.70]

8.38 [212.80]
Spellman’s LPX Series are perfectly suited for today’s demanding NDT inspection requirements. LPX 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 LPX systems allow for lower kV per exposure, shorter exposure times and increased film contrast for superior radiographic imaging.

The LPX microprocessor-driven control unit provides automatic warm-up and comprehensive self-diagnostic circuitry. Memory to store and recall up to 250 exposure techniques is standard and the last set of exposure parameters is retained before powering down. The LPX 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; mAs is variable from 0 to 29995 mAs.

**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:**
- 10 to 300kV, 0.1 to 10.0mA (900 watts max.)
- Constant potential, end-grounded anode, liquid cooled

**X-Ray Tube Window:**
- Beryllium 1.0mm

**Radiation Coverage:**
- 40° x 60°

**Radiation Output:**
- 30R/min at 50cm filtered with 0.5 inches (12.7mm) aluminum at 300kV, 3.0mA

**Duty Cycle:**
- 100% - liquid cooled

**Effective Focal Spot:**
- 0.060 in. sq. (1.5mm. sq.)

**Ambient Temp:**
- 100% duty cycle @ 120°F (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

**Liquid Cooling Unit Dimensions:**
- 12.7” H x 15.5” W x 15.7” D (322.6mm x 393.7mm x 398.8mm)

**Liquid Cooling Unit Weight:**
- 54lbs. (15.4kg) approx.

**LPX300 Tube Head Dimensions:**
- Liquid Cooled: 12.00” Diam. x 43.00” L (304.8mm x 1092.2mm)
- Air Cooled: 12.00” Diam. x 49.00” L (304.8mm x 1244.6mm)

**LPX300 Tube Head Weight:**
- Liquid Cooled: 98lbs. (44.5kg)
- Air Cooled: 105lbs. (47.61kg)

**X-Ray Control Unit:**
- Digital microcomputer based

**X-Ray Control Unit Dimensions:**
- 12.7” H x 17.5” W x 10.5” D (322.58mm x 441.96mm x 266.7mm)

**X-Ray Control Unit Weight:**
- 34lbs. (12.68kg) 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
• Control Unit Safety Keyswitch
• Microcomputer-based Self Diagnostics
• Continuous Exposure Parameter Display

Radiation Leakage:
Less than 2.0 Roentgens per hour at 1 meter from the X-Ray tube target.

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
• Cooler power cable

Optional Accessories
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.

Model 1620 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 tubehead 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.

LPX300 MODEL SELECTION TABLE

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-3172</td>
<td>Liquid cooled, 40° directional beam, metal ceramic insert</td>
</tr>
<tr>
<td>3-000-3073</td>
<td>Air cooled, 40° directional beam, metal ceramic insert</td>
</tr>
</tbody>
</table>

LPX300 OPTIONS

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-0756</td>
<td>LPX300 tubehead stand</td>
</tr>
<tr>
<td>3-000-0792</td>
<td>Laser pointer</td>
</tr>
<tr>
<td>9-200-0466</td>
<td>Laser pointer adapter for air cooled</td>
</tr>
<tr>
<td>9-200-0465</td>
<td>Laser pointer adapter for liquid cooled</td>
</tr>
</tbody>
</table>

Optional 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.

This chart is for reference only (actual settings may vary due to SFD, material, and film type)
CAUTION: PRESSURIZED COOLANT MIXTURE
14 PARTS METHYL ALCOHOL
7 PARTS WATER
1 PART TEXACO SOLUBLE “D” OIL
NOTE: DO NOT USE ETHYLENE GLYCOL

CAUTION: This equipment produces X-Rays when energized.
To be operated by qualified personal only.
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.

**LPX1620 MODEL SELECTION TABLE**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-000-0754</td>
<td>Tubehead stand for LPX160 and LPX200</td>
</tr>
<tr>
<td>3-000-0756</td>
<td>Tubehead stand for LPX300</td>
</tr>
</tbody>
</table>

- **Heavy-Duty Aluminum Construction**
- **Quick Set Up**
- **Allows 3-Axis Positioning of Tubehead**
- **Provides Rigid Support for Optimal Image Quality**
DIMENSIONS: in. [cm]

- 83.50 [212]
- 45.50 [115]
- 16.00 [40.65]
- 43.00 [109] Min.
- 70.50 [179] Max.
- 96.00 [244]
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 608251)
- **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.
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.

**TYPICAL APPLICATIONS**
- UV light sources for curing and sterilization
- Industrial and medical laser applications

**SPECIFICATIONS**

**Input Voltage:**
- 90-264 Vac, 47-63 Hertz, power factor corrected input ≥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:**
- ±0.2% up to 1kHz

**Temperature Coefficient:**
- ≤100ppm 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˚C to 40˚C
  - Storage: -40˚C to 85˚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:**
- M4 screw. Max. depth is 0.188” (4.78mm)

**Weight:**
- 6.9lb. (3.13kgs)

**Regulatory Approvals:**
- Compliant to 2002/95/EC, RoHS. Compliant to EN60601-1 UL/CUL recognized, File 242584
ANALOG INTERFACE A—15 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inhibit/Fault Reset</td>
<td>Ground = HV Enable, Open/+15Vdc = HV Inhibit</td>
</tr>
<tr>
<td>2</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>3</td>
<td>OverTemp Fault</td>
<td>No OT Fault = +15Vdc @ 3mA, OT Fault = Ground</td>
</tr>
<tr>
<td>4</td>
<td>Signal Ground</td>
<td>Signal Ground (optional)*</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Program</td>
<td>0 to 10Vdc = 0 to 100% rated output voltage</td>
</tr>
<tr>
<td>6</td>
<td>Overvoltage Status</td>
<td>No OVP = +15Vdc @ 3mA, OVP Fault = Ground</td>
</tr>
<tr>
<td>7</td>
<td>Peak Hold Monitor</td>
<td>Peak output voltage displayed, 0 to 10Vdc = 0 to 100% rated output voltage with a 5 second time constant</td>
</tr>
<tr>
<td>8</td>
<td>Voltage Monitor</td>
<td>0 to 10Vdc = 0 to 100% rated output voltage, ±1%</td>
</tr>
<tr>
<td>9</td>
<td>+15Vdc</td>
<td>+15Vdc @ 150mA, maximum**</td>
</tr>
<tr>
<td>10</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>11</td>
<td>+15Vdc</td>
<td>+15Vdc @ 150mA, maximum (optional)**</td>
</tr>
<tr>
<td>12</td>
<td>Signal Ground</td>
<td>Signal Ground (optional)*</td>
</tr>
<tr>
<td>13</td>
<td>End of Charge</td>
<td>Charging = +15Vdc @ 1.5mA, End of Charge = Ground</td>
</tr>
<tr>
<td>14</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>15</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
</tbody>
</table>

Note: Output status signals are NMOS transistor controlled, 100mA maximum sink current. Actual signals are 5kΩ 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 ±10% is provided on the standard unit. Optional +12Vdc ±5%/100mA, maximum can be provided.

INTERFACE B—4 PIN MALE D HEADER

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inhibit/Fault Reset</td>
<td>Ground = HV Enable, Open/+15Vdc = HV Inhibit</td>
</tr>
<tr>
<td>2</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Program</td>
<td>0 to 10Vdc = 0 to 100% rated output voltage</td>
</tr>
<tr>
<td>4</td>
<td>+15Vdc</td>
<td>+15Vdc @ 150mA, maximum (optional)*</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>OPTION</th>
<th>OPTION CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHV UG-931/U HV Connector</td>
<td>MVH</td>
</tr>
<tr>
<td>Legacy Interface Signals</td>
<td>L</td>
</tr>
</tbody>
</table>

CCM1KW SELECTION TABLE

<table>
<thead>
<tr>
<th>kV</th>
<th>JOULES/SECOND</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500</td>
<td>CCM1*500</td>
</tr>
<tr>
<td>2</td>
<td>500</td>
<td>CCM2*500</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
<td>CCM4*500</td>
</tr>
<tr>
<td>1</td>
<td>1000</td>
<td>CCM1*1000</td>
</tr>
<tr>
<td>2</td>
<td>1000</td>
<td>CCM2*1000</td>
</tr>
<tr>
<td>4</td>
<td>1000</td>
<td>CCM4*1000</td>
</tr>
</tbody>
</table>

*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.
**CCM1KW**

**CAPACITOR CHARGING MODULE**

500 Joules per second
(unit with internal fan)
DIMENSIONS: in.[mm]

---

1000 Joules per second
(unit with internal and external fan)
DIMENSIONS: in.[mm]

---

**REAR VIEW**

**FRONT VIEW**

**BOTTOM VIEW**

---

**SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION**

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Hauppauge, New York USA
+1-631-630-3000  FAX: +1-631-435-1620
e-mail: sales@spellmanhv.com

www.spellmanhv.com

Copyright © 2012 Spellman High Voltage Electronics Corp.
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:**
- 180-264 Vac, 47-63 Hertz, power factor corrected input ≥0.98, fused via externally accessible fuses

**Efficiency:**
- >85%

**Output Power:**
- 3100 Joules per second, average

**Output Voltage:**
- 4000 Volts, maximum

**Output Polarity:**
- Positive or negative, specify at time of order

**Pulse to Pulse Repeatability:**
- ±0.6% up to 120 Hertz

**Temperature Coefficient:**
- ≤100ppm per degree C

**Fault Diagnostic System:**
- Over Temperature, Over Voltage and Open Load sensing

**Compact & Lightweight Package**
**Power Factor Corrected Input**
**Low Cost Modular OEM Platform**
**Rugged IGBT Inverter Design**
**Auxiliary +24Vdc @ 2.2 Amp Output Provided**

**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

**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:**
- UL Safety Test Standards:
  - ANSI/AAMI ES60601-1 (2005 + C1:09 + A2:10)
- EMC Test Standard:
  - IEC 60601-1-2

www.spellmanhv.com/manuals/CCM
### AUXILIARY +24VDC CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24Vdc</td>
<td>+24Vdc @ 2.2 amps</td>
</tr>
<tr>
<td>2</td>
<td>Ground</td>
<td>Ground</td>
</tr>
</tbody>
</table>

### CCM ANALOG INTERFACE—J1 15 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inhibit</td>
<td>Ground = HV ON, High = HV OFF</td>
</tr>
<tr>
<td>2</td>
<td>Temperature Fault</td>
<td>Ground = No Fault, +15Vdc = Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+15Vdc through 6.8kΩ</td>
</tr>
<tr>
<td>3</td>
<td>General Fault</td>
<td>Ground = No Fault, +15Vdc = Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+15Vdc through 6.8kΩ</td>
</tr>
<tr>
<td>4</td>
<td>HV ON Indicator</td>
<td>Ground = HV ON, +15Vdc = HV OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+15Vdc through 6.8kΩ</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Program</td>
<td>0 to 10Vdc = 0 to 100% Rated Output</td>
</tr>
<tr>
<td>6</td>
<td>Open Circuit Detector</td>
<td>Ground = Open Circuit, +15Vdc = OK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+15Vdc through 6.8kΩ</td>
</tr>
<tr>
<td>7</td>
<td>Peak Voltage Monitor</td>
<td>0 to 10Vdc = 0 to 100% Rated Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>held for 10 seconds at peak level</td>
</tr>
<tr>
<td>8</td>
<td>Voltage Monitor</td>
<td>0 to 10Vdc = 0 to 100% Rated Output,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Instantaneous output</td>
</tr>
<tr>
<td>9</td>
<td>+15Vdc Output</td>
<td>+15Vdc @ 150ma output, maximum</td>
</tr>
<tr>
<td>10</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>11</td>
<td>+15Vdc Output</td>
<td>+15Vdc @ 150ma output, maximum</td>
</tr>
<tr>
<td>12</td>
<td>+15Vdc Output</td>
<td>+15Vdc @ 150ma output, maximum</td>
</tr>
<tr>
<td>13</td>
<td>End of charge Indicator</td>
<td>Ground = End of Charge, High Impedance = Charging</td>
</tr>
<tr>
<td>14</td>
<td>Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>15</td>
<td>Ground</td>
<td>Ground</td>
</tr>
</tbody>
</table>

---

**DIMENSIONS: in. [mm]**

**FRONT VIEW**

**TOP VIEW**

**BACK VIEW**
Spellman's new EVA Series of rack mountable high voltage power supplies are specifically designed for demanding electron beam coating applications. A full featured front panel allows easy local control, while an extensive analog interface provides comprehensive 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 e beam applications. Fast arc recovery times (< 2ms) allows the output voltage to quickly recover minimizing 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.

**HARDWARE BASED OPTIONS**

3PH 180-264Vac Three Phase Input
1PH 180-264Vac Single Phase Input (3kW & 6kW only)
400VAC 360-528Vac, Three Phase Input (12kW only)
LL(X) High Voltage Cable Length
HV2 Two High Voltage Output Connecters
HV3 Three High Voltage Output Connectors
FIL1 Filament Gun Supply—One Channel
FIL2 Filament Gun Supply—Two Channels
FIL3 Filament Gun Supply—Three Channels
HPF 50 Amp Filament Supply

**SOFTWARE CONFIGURABLE FEATURES**

Adjustable Overload Trip
Arc Trip Count
Arc Quench Time
Arc Reramp Time
Arc Window Time

**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 (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, 50/60Hz, three phase, 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:**
<1% p-p 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:**
2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive, approval pending.

**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**

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 ≈ 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 15" W x 19”D (4.45 x 48.3 X 38.1cm)
Gun Output Box:
4”H x 6.25”W x 10”D (10.2 x 15.9 x 25.4cm)

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

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

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

### Beam Controller Interface—25 Pin Female D Connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Supply Common</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>2</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>External Interlock</td>
<td>+15Vdc at Open, &lt;15mA @ Closed</td>
</tr>
<tr>
<td>4</td>
<td>External Interlock Return</td>
<td>Return for Interlock</td>
</tr>
<tr>
<td>5</td>
<td>Filament Current Test Point</td>
<td>0 to 10Vdc = 0 to 10% rated output</td>
</tr>
<tr>
<td>6</td>
<td>Beam Current Test Point</td>
<td>0 to 10Vdc = 0 to 100% rated output</td>
</tr>
<tr>
<td>7</td>
<td>+10Vdc Reference</td>
<td>+10Vdc = 1mA</td>
</tr>
<tr>
<td>8</td>
<td>Filament Limit Program Input</td>
<td>0 to 10Vdc = 0 to 100% rated output</td>
</tr>
<tr>
<td>9</td>
<td>Local Filament Limit Program</td>
<td>Front panel potentiometer wiper</td>
</tr>
<tr>
<td>10</td>
<td>Beam Current Program Input</td>
<td>0 to 10Vdc = 0 to 100% rated output</td>
</tr>
<tr>
<td>11</td>
<td>Local Beam Current Program</td>
<td>Front panel potentiometer wiper</td>
</tr>
<tr>
<td>12</td>
<td>Filament Preheat Program In</td>
<td>0 to 10Vdc = 0 to 100% rated output</td>
</tr>
<tr>
<td>13</td>
<td>Local Fil. Preheat Program</td>
<td>Internal potentiometer</td>
</tr>
<tr>
<td>14</td>
<td>Beam Off</td>
<td>+15Vdc at Open, &lt;25mA @ Closed</td>
</tr>
<tr>
<td>15</td>
<td>Beam On/Off Common</td>
<td>Connect together for FP operation</td>
</tr>
<tr>
<td>16</td>
<td>Beam On</td>
<td>Momentarily connect to pin 15 = Beam On</td>
</tr>
<tr>
<td>17</td>
<td>Remote Beam Off Indicator</td>
<td>0=Beam On, +15V, 10mA Max=Beam Off</td>
</tr>
<tr>
<td>18</td>
<td>Remote Beam On Indicator</td>
<td>0=Beam Off, +15V, 10mA Max=Beam On</td>
</tr>
<tr>
<td>19</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Remote PS Fault</td>
<td>0 = Fault, +15Vdc @ 0.1mA = No Fault</td>
</tr>
<tr>
<td>23</td>
<td>Spare</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Power Supply Common</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>25</td>
<td>Shield Return</td>
<td>Chassis Ground</td>
</tr>
</tbody>
</table>
The EBM powers E-Beam Columns in 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 EBM provides a highly regulated, low noise, ultra stable accelerator supply programmable from 0 to -30kV at 170uA. The EBM 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 EBM is arc and short circuit immune, along with over voltage and over current protection.

**TYPICAL APPLICATIONS**

Scanning Electron Microscope

**SPECIFICATIONS**

**Input Voltage:**
+24Vdc, ±5%

**High Voltage Outputs:**

**ACCELERATOR:**
- **Voltage:** 0V to -30kV full load with respect to ground
- **Current:** 170μA maximum, continuous from -300V to -3kV
- **Accuracy:** ±2% or ±15V (whichever is greater)
- **Load Regulation:** <±100ppm
- **Line Regulation:** <±100ppm for 22.8V to 26.4V line change
- **Ripple:** <15ppm p-p at -30kV, 170μA, maximum bias and filament output
- **Temperature Coefficient:** <100ppm/°C
- **Stability:** 8ppm/3 minutes at 150μA load current after 1 hour warm up

**BIAS:**
- (Referenced to Accelerator)
- **Voltage:** 0 to +3.5kV (max allowable output limited to 2kV)
- **Current:** 150μA maximum
- **Accuracy:** ±5% of full scale

**FILAMENT:**
- (Referenced to Accelerator)
- **Power:** 0 to 15W
- **Load Resistance:** 1 ±5%
- **Accuracy:** ±3% of FS or 0.1V, which ever is greater
- **Load Regulation:** <2% for 10% change in load resistance
- **Line Regulation:** <1% for 10% line change
- **Ripple:** <0.1% p-p max
- **Temperature Coefficient:** <300ppm/°C
- **Stability:** 100ppm/10 minutes

**INTERFACE:**

- **Input:** Analog control for beam energy, filament and bias
- **Output:** Mini75 receptacle (Claymount CA11 or similar)

**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 any mounting brackets

**Weight:**
- <22 lbs. (10kg)

**Regulatory Approvals:**
- Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. UL/CUL recognized, File E227588. Compliant to 2002/95/EC, RoHS.

- 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, CE and RoHS Compliant
Spellman’s precision Electron Gun Power Supply is designed to achieve extremely high stability and low ripple. The EGM50 incorporates an integral floating filament supply and active bias. Full control via RS-232 interface reduces end-product development time and eases system integration. Safe, ground level local and remote control of beam energy, filament power and emission current provides optimum operational efficiency.

**TYPICAL APPLICATIONS**
- Electron-Beam Lithography
- Semiconductor Inspection
- Scanning Electron Microscopes

**SPECIFICATIONS**

- **Input Voltage:** 90-260Vac
- **Input Current:** <1.1A @ 100Vac
- **Input Frequency:** 47 to 63Hz
- **Input Protection:** IEC inlet 3.15A “T” fuse
- **Temperature Range:**
  - Operating: 20˚C to 25˚C
  - Storage: -10˚C to 70˚C
- **Operating Humidity:** 10 to 70% RH
- **Connections and Cables:**
  - 9-pin “D” type: System Interlocks
  - 25-pin “D” type: RS232
  - RJ485: Optional Ethernet
  - Optional HV Cable: 8m (XPVD-75-3Y) Hitachi
  - 3-pin HV: 75kV DC Standard Federal Connector
- **Local Control:**
  - Front panel push button for filament power and emission current increments
  - Beam energy on and off
- **Remote Control:**
  - Via an RS-232C for Beam Energy, Filament Power, and Active Bias
- **Monitoring:**
  - Digital monitoring via RS232C.
  - Analog output monitoring provided via BNC connectors on the rear panel
- **Front Panel Monitor:**
  - Display 1: Beam energy or bias voltage
  - Display 2: Emission current
  - Display 3: Filament power
- **Dimensions:** 2 x 3U 19” Rack Units
- **Weight:**
  - Control Module 10kg (22lbs.)
  - HV Module 40kg (68lbs.)
- **Regulatory Approvals:**

**BEAM ENERGY**

- **Output Voltage:** -50kV fixed, adjustable ± 2% via remote control.
  (Other output voltages available upon request)
- **Output Current:** 500μA maximum
- **Polarity:** Negative
- **Line Regulation:** <10ppm for a 10% line change at 50kV 500μA
- **Load Regulation:** <10ppm for 100 to 500μA emission current change
- **Stability:** <2.0ppm/48hours/0.5˚C
- **Warm Up Time:** 5 hours for full stability
- **Ripple and Noise:** <2.5ppm.
- **Overcurrent Protection:**
  - Protected against overcurrent to 120% of the rated current.
  - Unit will shutdown for over current condition greater than 100ms
- **Arc Protection:** Included

**www.spellmanhv.com/manuals/EGM**
**FILAMENT POWER SUPPLY**

Output Power:
- 10W max. (adjustable in 0.1W steps)
- 2A maximum current
- 8.4V maximum voltage

Regulation:
- Constant with secondary side control

Line Regulation:
- <10ppm for 10% line change

Load Regulation:
- <5% change in power from 4W to 7W (1Ω to 7Ω)

Drift:
- <50ppm/12 hours/0.5°C after warm-up

Warm Up:
- <3 hours for full stability

Ripple and Noise:
- <0.1% (operating frequency)
- <50ppm (10Hz to 3 kHz)

Monitor:
- +1.00V for 10W
- 100ppm Stability
- 0.5% accuracy

**ACTIVE BIAS**

Voltage Range:
- Low: -200 to -1100V ref to filament center tap
- High: -200 to -2000V ref to filament center tap

Low or high range selected via rear panel switch

Temperature Coefficient:
- <100ppm/°C

Emission Control:
- 0 to 500μA adjustable in steps of 0.1μA

Emission Monitor:
- +5V for 500μA output
- 100ppm stability
- 0.1% accuracy

**INTERFACE CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PSU on</td>
<td>Volt free contacts to indicate that there is power on the unit</td>
</tr>
<tr>
<td>2</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>0V</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>Interlock/HV Enable</td>
<td>Link to 0V to enable HV output</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>PSU on</td>
<td>Volt free contacts to indicate that there is power on the unit</td>
</tr>
</tbody>
</table>

**RS-232 DIGITAL INTERFACE—**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX</td>
<td>PSU Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX</td>
<td>PSU Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Ready to Send</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>Clear to Send</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>+12Vdc up to 100mA, switchable</td>
</tr>
<tr>
<td>10</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>11</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>12</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>13</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>14</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>15</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>16</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>17</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>18</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>19</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>20</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>21</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>22</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>23</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>24</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>25</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
Spellman's FIBX power supply is an integrated multiple output high voltage power supply specifically designed for focused ion beam. Typical applications include transmission and scanning electron microscopy; semiconductor analysis, milling and repair; disc drive head trimming, ion beam etching and focused ion-beam lithography.

A modular design approach allows individual sub-assemblies to be easily configured in a common rack mounted 6U chassis assembly. Interface, logic and control circuitry utilizes surface mount technology, minimizing cost and size. Spellman's leadership in patented power conversion technology and proprietary high voltage packaging and encapsulation techniques provides reliable and fault free operation in all FIB operating environments.

Individual supplies (Accelerator, Filament, Extractor, Suppressor or Lens) are designed to exacting application specific standards, with ultra low output ripple, excellent regulation, stability, temperature coefficient, drift and accuracy specifications. Isolation and control of the respective floating sources are provided via Spellman's proprietary high voltage isolation techniques.

Customer control of this integrated FIB power supply system is accomplished via a fiber optic isolated RS-232 interface. All high voltage safety interlocks are of a fail-safe hardware based design. The FIBX is CE marked and is designed to be compliant with applicable IEC, UL and SEMI standards.

**TYPICAL APPLICATIONS**
- Transmission scanning electron microscopy
- Scanning electron microscopy
- Semiconductor analysis, milling and repair
- Ion beam etching
- Focused ion-beam lithography

**SPECIFICATIONS**

**Input Voltage:**
105 to 240Vac, 47 to 63 Hz

**ACCELERATOR SUPPLY**
- Referenced to Ground
- Output Voltage: 0 to +45 kV
- Output Current: 30 μA
- Ripple: 200 mV p-p, from 0.1 Hz to 1 MHz
- Line Regulation: 100 mV for +/-10% line change
- Load Regulation: ±0.01% of maximum voltage for full load change
- Stability: 1.5 volts/10 hours after 2 hour warm-up
- Temperature Coefficient: 25 ppm/°C

**FILAMENT SUPPLY**
- Referenced to Accelerator
- Output Voltage: 0 to 5 Vdc
- Output Current: 0 to 5 A
- Ripple: 10 mA p-p from 0.1 Hz to 1 MHz
- Line Regulation: 5 mA for +/-10% line change
- Load Regulation: ±0.1% of maximum voltage for full load change
- Stability: 5 mA/10 minutes after 2 hour warm-up
- Temperature Coefficient: 200 ppm /°C
**SUPPRESSOR SUPPLY**  Referenced to Accelerator

- **Output Voltage:** -2 kV to +2 kV
- **Output Current:** 30 μA
- **Ripple:** 150 mV p-p from 0.1 Hz to 1 MHz
- **Line Regulation:** 100 mV for +/-10% line change
- **Load Regulation:** ±0.01% of maximum voltage for full load change
- **Stability:** 500mV/10 hours after 2 hour warm-up
- **Temperature Coefficient:** 25 ppm/°C

**EXTRACTOR SUPPLY**  Referenced to Accelerator

- **Output Voltage:** 0 to -15 kV
- **Output Current:** 400 μA
- **Ripple:** 100 mV p-p, from 0.1 Hz to 1 MHz at 30 μA and below
- **Line Regulation:** 100 mV for +/-10% line change
- **Load Regulation:** ±0.01% of maximum voltage for full load change
- **Stability:** 500mV/10 hours after 2 hour warm-up
- **Temperature Coefficient:** 25 ppm/°C

**LENS 1 SUPPLY**  Referenced to Ground

- **Output Voltage:** 0 to -40 kV
- **Output Current:** 30 μA
- **Ripple:** 150 mV p-p from 0.1 Hz to 1 MHz
- **Line Regulation:** 100 mV for +/-10% line change
- **Load Regulation:** ±0.01% of maximum voltage for full load change
- **Stability:** 500 mV/10 hours after 2 hour warm-up
- **Temperature Coefficient:** 25 ppm/°C

**LENS 2 SUPPLY**  Referenced to Ground

- **Output Voltage:** 0 to +25 kV
- **Output Current:** 30 μA
- **Ripple:** 150 mV p-p from 0.1 Hz to 1 MHz
- **Line Regulation:** 100 mV for +/-10% line change
- **Load Regulation:** ±0.005% of maximum voltage for full load change
- **Stability:** 1.0 volts/10 hours after 2 hour warm-up
- **Temperature Coefficient:** 25 ppm/°C

**Remote Interface:**
A fiber optic isolated RS232 interface is provide for remote digital control and monitoring of all power supplies and their functions.

**Environmental:**
- **Operating temperature:** 10°C to 40°C
- **Storage temperature:** -30°C to 70°C
- **Humidity:** 10% to 90%, non-condensing

**Connectors:**
- Accelerator, Filament and Suppressor: 75kV, 3 conductor Federal Standard Xray connector
- Extractor: LGH 2I
- Lens 1: LGH 3I
- Lens 2: LGH 21

**Input Voltage:**
IEC320 EMI filtered input connector

**Dimensions:**
Industry standard 6U rack mounted chassis
10.5” High X 19” Wide X 21” Deep
26.7 cm X 48.3 cm X 53.34 cm

**Weight:**
Approximately 73 lbs (33 kg)

**Regulatory Approvals:**
The Bertan VS100 high voltage power supply was specifically designed for precision electron beam applications like semiconductor nano-lithography, micro-optics and development mask work. It’s ultra low ripple and excellent stability specifications make it ideal for use in these demanding applications. A switch selectable low and high output current range is featured.

The solid encapsulated high voltage section eliminates any user maintenance issues, while isolating the components from environmental variables. The unit is fully overload, arc and short circuit protected. Remote control programming and monitoring capability is provided. A second high voltage monitor, separate from the control electronics is provided. This allows accurate passive measurement of the high voltage output.

**TYPICAL APPLICATIONS**
- Micro-Optics
- Semiconductor lithography
- Development mask work

**SPECIFICATIONS**

**Input Voltage:**
220Vac, ±10%, single phase 50/60 Hertz

**Output Voltage:**
0 to 100kV, negative polarity. Externally switch selectable to 105kV, ±500 volts

**Output Current:**
- 0-10µA, low range
- 0-100µA, high range
- Switch selectable

**Line Regulation:**
±0.001% of rated voltage over specified input voltage range

**Load Regulation:**
≤20V for a current change of 25µA to 60µA and 60µA to 25µA

**Ripple:**
≤75mV peak to peak

**Partial High Voltage Discharge:**
less than 200mV

**Stability:**
0.001% per 8 hours after a 6 hour warm up, for a temperature of 20°C ±0.2°C

**Temperature Coefficient:**
500ppm per degree C over a 10°C to 40°C range

**Environmental:**
- Operating Temperature: 0 to 40 degrees C
- Storage Temperature: -40 to 85 degrees C
- Humidity: 10 to 90% RH, non condensing

**Cooling:**
- Forced Air-control chassis;
- Convection Cooled- high voltage chassis

**Front Panel:**
- Power ON/OFF switch
- HV ON/OFF switch
- HV ON/OFF indicator
- Analog output voltage meter

**Dimensions:**
- Control Chassis: 5.25" H X 19" W X 15.3" D (13.3cm X 48.3cm X 38.4cm)
- HV Chassis: 10.25" H X 19" W X 27" D (26.7cm X 48.3cm X 55.9 cm)

**Weight:**
- Control Chassis: 20 pounds (9kg)
- HV Chassis: 116 pounds (50kg)

**Interface Connector:**
- 19 pin Burndy GOB1619SNE (mating connector provided)

**AC Input Connector:**
- 3 pin IEC320 input socket

**Output HV Connector:**
- Claymount 2050-073

**Output HV Cable:**
- Detachable at rear panel, cable not provided.

**Regulatory Approvals:**
## Remote Interface Connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Signal</th>
<th>Signal Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-5V Reference</td>
<td>-5.0 volts @ 10mA output</td>
</tr>
<tr>
<td>B</td>
<td>Voltage Programming</td>
<td>0 to -5V = 0 to 100% rated output, Zin = 100KΩ</td>
</tr>
<tr>
<td>C</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>D</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>E</td>
<td>Monitor Common</td>
<td>Ground</td>
</tr>
<tr>
<td>F</td>
<td>HV Status</td>
<td>TTL High = HV OFF, TTL Low = HV ON</td>
</tr>
<tr>
<td>G</td>
<td>+5V</td>
<td>5.0 volts @ 250mA output</td>
</tr>
<tr>
<td>H</td>
<td>Interlock</td>
<td>Ground or TTL low to enable interlock</td>
</tr>
<tr>
<td>J</td>
<td>Program Common</td>
<td>Ground</td>
</tr>
<tr>
<td>K</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>L</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>M</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>N</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>P</td>
<td>Voltage Monitor</td>
<td>0 to -5V = 0 to 100% rated output, Zout = 10KΩ</td>
</tr>
<tr>
<td>Q</td>
<td>Current Monitor</td>
<td>0 to -5V = 0 to 100% rated output, Zout = 10KΩ</td>
</tr>
<tr>
<td>R</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>S</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>T</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>U</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>V</td>
<td>Spare</td>
<td>N/C</td>
</tr>
</tbody>
</table>

### Dimensions: in.[mm]

- **Front View**
  - HV Chassis: 11.38 [289], 10.50 [267]
  - Control Chassis: 5.25 [133]
- **Top View**
  - HV Chassis: 19.00 [483], 0.34 [8.73]
  - Control Chassis: 16.68 [424], 22.00 [559]
- **Back View**
  - HV Chassis: 18.31 [465.12], 19.00 [483]
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**

**ESC5PN25**

**Output Configuration:**
Single ground referenced HV output, positive or negative polarity

**Input:**
+24Vdc, ±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:**
±0.7% over specified range

**Load Regulation:**
±0.7% over specified range

**Output Voltage Accuracy:**
<2% of set point value between 50-5000Vdc

Program/Monitor Accuracy:
1% of full scale, ±50mV

Dimensions:
9 W x 1.5 H x 6.1 L (228.6mm x 30.5mm x 155mm)

Weight:
4.5lbs. (2kg)

**ESC01.5PN7.5**

**Output Configuration:**
Floating, reversible polarity bipolar output with floating center tap

**Input:**
+24Vdc, ±10% @ 2 amps, maximum

**Output:**
Bipolar, 0 to ±750Vdc (0 to 1500Vdc total) @ 5mA

**Short Circuit Current Limit:**
5.5mA, maximum

**Output Isolation:**
Center tap is isolated for ±2kV from ground

**Slew Rate:**
40ms, typical

**Maximum Cycle Frequency:**
10 times per second

**Ripple:**
2.5Vrms

**Line Regulation:**
±0.7% over specified range

**Load Regulation:**
±0.7% over specified range

**Output Voltage Accuracy:**
<1% of set point between 50-1500Vdc

Program/Monitor Accuracy:
0.5% of full scale, ±50mV

Dimensions:
3.4 W x 3 H x 10.5 L (86.5mm x 76.5mm x 266.7mm)

Weight:
5lbs. (2.3kg)
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 300μA 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 +10Vdc 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, ±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 300μA

**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/°C

**Operating Temperature:**

- 0°C to 40°C

**Storage Temperature:**

- -40°C to 85°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:**


www.spellmanhv.com/manuals/CZE1000R
CZE1000R TERMINAL BLOCK 14 PIN

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+10Vdc Reference Output</td>
<td>+10Vdc, 4mA maximum</td>
</tr>
<tr>
<td>2</td>
<td>Internal Voltage Control</td>
<td>Front Panel Program Voltage (programming potentiometer)</td>
</tr>
<tr>
<td>3</td>
<td>Voltage Program Input</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zin = 10MΩ</td>
</tr>
<tr>
<td>4</td>
<td>Internal Current Control</td>
<td>Front Panel Current Control (programming potentiometer)</td>
</tr>
<tr>
<td>5</td>
<td>Current Program Input</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zin = 10MΩ</td>
</tr>
<tr>
<td>6</td>
<td>Signal Common</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>Voltage Test Point</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ, 1%</td>
</tr>
<tr>
<td>8</td>
<td>Current Test Point</td>
<td>0 to 10Vdc = 0 to 100% Rated Output, Zout = 10kΩ, 1%</td>
</tr>
<tr>
<td>9</td>
<td>External Interlock Out</td>
<td>32Vdc @ 2 amps, max, (connect to pin 10 through safety switch)</td>
</tr>
<tr>
<td>10</td>
<td>External Interlock In</td>
<td>Return for interlock (connect to pin 9 through safety switch)</td>
</tr>
<tr>
<td>11</td>
<td>+10Vdc Reference Output</td>
<td>+10Vdc, 4mA maximum</td>
</tr>
<tr>
<td>12</td>
<td>Enable</td>
<td>Open or ground = HV OFF, &gt;3.4Vdc (up to 15Vdc) = HV ON</td>
</tr>
<tr>
<td>13</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
<tr>
<td>14</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

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.
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, ±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

- **Ideal for Electrospinning**
- **0-30kV Remotely Programmable**
- **0-300µA Remotely Programmable**
- **Polarity Reversible Upon Command in <1 Sec at No Load**
- **Low Stored Energy, Current Limited Output**
- **Cost Effective Modular Design**

**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/°C

**Operating Temperature:**
- 0°C to 40°C

**Storage Temperature:**
- -40°C to 85°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:**

www.spellmanhv.com/manuals/CZE2000
## CZE2000 25 PIN MALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24Vdc Return</td>
<td>Power Return</td>
</tr>
<tr>
<td>2</td>
<td>+24Vdc Return</td>
<td>Power Return</td>
</tr>
<tr>
<td>3</td>
<td>+24Vdc Return</td>
<td>Power Return</td>
</tr>
<tr>
<td>4</td>
<td>HV Enable/Inhibit</td>
<td>Open or &lt;1Vdc = HV OFF; &gt;3.4Vdc (up to 15Vdc) = HV ON</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Test Point</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ, 1%</td>
</tr>
<tr>
<td>6</td>
<td>Current Test Point</td>
<td>0 to 10Vdc = 0 to 100% rated output, Zout = 10kΩ, 1%</td>
</tr>
<tr>
<td>7</td>
<td>Chassis Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>8</td>
<td>Remote Voltage Control</td>
<td>0 to 10Vdc = 0 to 100% Rated Output, Zin = 10MΩ</td>
</tr>
<tr>
<td>9</td>
<td>Remote Current Control</td>
<td>0 to 10Vdc = 0 to 100% Rated Output, Zin = 10MΩ</td>
</tr>
<tr>
<td>10</td>
<td>+10Vdc Reference Output</td>
<td>+10Vdc, 4mA maximum</td>
</tr>
<tr>
<td>11</td>
<td>Signal Return</td>
<td>Signal Return</td>
</tr>
<tr>
<td>12</td>
<td>Polarity Control</td>
<td>Open or &gt;3.4Vdc (up to 15Vdc) = Positive Polarity. Grounded or &lt;1Vdc = Negative Polarity</td>
</tr>
<tr>
<td>13</td>
<td>Positive Polarity Indicator</td>
<td>+24Vdc sourced through a 1000 series limiting resistor. +24Vdc = active signal</td>
</tr>
<tr>
<td>14</td>
<td>+24Vdc Input</td>
<td>Power Input</td>
</tr>
<tr>
<td>15</td>
<td>+24Vdc Input</td>
<td>Power Input</td>
</tr>
<tr>
<td>16</td>
<td>Chassis Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>17</td>
<td>Negative Polarity Indicator</td>
<td>+24Vdc sourced through a 1000 series limiting resistor. +24Vdc = active signal</td>
</tr>
<tr>
<td>18</td>
<td>I Mode Indicator</td>
<td>Open collector pulled up internally to +15Vdc through 2.7kΩ resistor with a 470Ω limiting resistor in series. Transistor OFF = signal active</td>
</tr>
<tr>
<td>19</td>
<td>V Mode Indicator</td>
<td>Open collector pulled up internally to +15Vdc through 2.7kΩ resistor with a 470Ω limiting resistor in series. Transistor OFF = signal active</td>
</tr>
<tr>
<td>20</td>
<td>Return Current Test Point</td>
<td>0 to 10Vdc = 0 to 100% rated output current, as measured returned from load. Zout = 10kΩ, 1%</td>
</tr>
<tr>
<td>21</td>
<td>Load Return</td>
<td>High Voltage Return Point. Required for GFI circuit functionality</td>
</tr>
<tr>
<td>22</td>
<td>Ground Fault Indicator</td>
<td>Open collector pulled up internally to +15Vdc through 4.7kΩ resistor with a 470Ω limiting resistor in series. Transistor OFF = signal active</td>
</tr>
<tr>
<td>23</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
<tr>
<td>24</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
<tr>
<td>25</td>
<td>Spare</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

### CZE2000 SELECTION TABLE

<table>
<thead>
<tr>
<th>MAXIMUM RATING</th>
<th>MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>kV</td>
<td>mA</td>
</tr>
<tr>
<td>5</td>
<td>2.0</td>
</tr>
<tr>
<td>10</td>
<td>1.0</td>
</tr>
<tr>
<td>15</td>
<td>0.67</td>
</tr>
<tr>
<td>20</td>
<td>0.50</td>
</tr>
<tr>
<td>30</td>
<td>0.30</td>
</tr>
</tbody>
</table>

## DIMENSIONS: in.[mm]

**FRONT VIEW**

- HV OUTPUT
- JST CONNECTOR JBY-25P-1A1A SHV P/N 105708-652

**TOP VIEW**

- 4-40 SELF-CLINCHING NUT FLUSH HEAD STUD 4 PL.

**BOTTOM VIEW**

- INTERNAL THREADS 8-32 X .28 DEEP TYP. 4 PL.

---

**Spellman High Voltage**

**Corporate Headquarters**

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[128076-001] REV. D

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www.spellmanhv.com
Spellman High Voltage Electronics Corporation continues to set the standards for high voltage power conversion technology with the new DGM high voltage power supply for Image Intensifier applications.

The DGM was developed in conjunction with a leading supplier of medical rediagnostic imaging systems. 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
- Astronomical Observations
- Spectrophotometry
- Non Destructive X-Ray Inspection
- Image Intensifiers

**SPECIFICATIONS**

**Input Voltage:**
+15Vdc and -15Vdc

**Input Current:**
0.5A at full output

**Programmable Output Voltages:**
1. **Anode Voltage**
   - Output Voltage 33kV (40kV available)
   - Ripple 0.03% p-p
2. **Grid 1**
   - Output Voltage 15kV
   - Ripple 0.045% p-p
3. **Grid 2**
   - Output Voltage 1kV
   - Ripple 0.1% p-p
4. **Cathode**
   - Output Voltage 250V
   - Ripple 0.2% p-p
5. **Pump**
   - Output Voltage 2kV
   - Ripple 1% p-p

**Temperature:**
- Operating: +10°C to +50°C

**Signal Connector:**
- High voltage socket output connectors
- Input D-type connector

**Dimensions:**
- 6.8”H x 4.68”W x 1.37”D (173mm x 119mm x 35mm)

**Weight:**
- 2.86 lb. (1.3kg)

**Custom Products**
- Available with Multiple Anodes, Focus and Grid Outputs.
- Please consult factory for custom requirements

**Regulatory Approvals:**
Spellman’s MCP Module is a well-regulated, high performance DC-DC converter featuring a floating 3kV output, isolated to 16kV. 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, ±0.5 volts

**Input Current:**
600 mA maximum

**Output Voltage:**
+100V to +3kV, continuously variable over the entire output range

**Output Current:**
330uA maximum

**Polarity:**
Positive

**Isolation Voltage:**
Up to 16kV total to ground
(resistance to ground 600M on each output)

**Line Regulation:**
≤0.01% for input voltage change of 1V

**Load Regulation:**
≤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:**
±1% from 10% to 100% of output.
Below 10% accuracy spec is not guaranteed

**Ripple:**
≤0.1% Volts p-p, 0.1Hz to 1MHz

**Stability:**
≤1000 ppm/hour at constant operating conditions after a 1 hour warm up

**Temperature Coefficient:**
≤300ppm 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:**
1.49” 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

**HV Output Connector:**
HV positive: 29.5” (750mm) flying lead, coaxial HV cable
HV negative: 29.5” (750mm) flying lead, coaxial HV cable

**Regulatory Approvals:**
MCP INTERFACE/POWER CONNECTOR

<table>
<thead>
<tr>
<th>JB1</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>2</td>
<td>Voltage Programming Input</td>
<td>0-10Vdc = 0-100% of Rated Output</td>
</tr>
<tr>
<td>3</td>
<td>+24V Input</td>
<td>+24V Input</td>
</tr>
<tr>
<td>4</td>
<td>+24V Input</td>
<td>+24V Input</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Monitor</td>
<td>0-5Vdc=0-100% of Rated Output</td>
</tr>
<tr>
<td>6</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
<tr>
<td>7</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
<tr>
<td>8</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
<tr>
<td>9</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

DIMENSIONS: in.[mm]

FRONT VIEW

BACK VIEW

TOP VIEW

MOUNTING HOLES
4 x 3.5
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. The ML430 is CE and UL approved.

**TYPICAL APPLICATIONS**

- High Voltage Amplifiers
- Electrostatic Lenses

**SPECIFICATIONS**

**Input Voltage:**

+24 Vdc, ±1.2Vdc

**Input Current:**

≤1.2 amp

**Output Voltage:**

Output 1-Positive: +430 volts fixed. Accuracy ±7%
Output 2-Negative: -430 volts fixed. Accuracy ±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)

±0.1% – Positive output
±1.0% – Negative output

**Load/Cross Regulation:** (typical)

±0.1% – Positive output
±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:**

≤0.5% p-p of full rated output voltage

**Stability:**

≤0.25% per hour, constant operating conditions after 1 hour warm up

**Temperature Coefficient:**

≤200ppm per degree C

**Environmental:**

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

How to Order:
PART NO.: ML430P/N16/24
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. The ML1350 is CE and UL approved.

**TYPICAL APPLICATIONS**
- Quadrupole HVPS
- Electrostatic Lenses

**SPECIFICATIONS**

- **Input Voltage:**
  - +24 Vdc, ±1.2Vdc

- **Input Current:**
  - ≤3.0 amps

- **Output Voltage:**
  - Output 1-Positive: +245 volts, fixed, accuracy <±10%
  - Output 2-Negative: -245 volts, fixed, accuracy <±10%
  - Output 3-Positive: +1350 volts, fixed, accuracy <±7%
  - Output 4-Negative: -1350 volts, fixed, accuracy <±7%

- **Output Current:**
  - 15mA maximum for each output

- **Line Regulation:** (typical)
  - ±1 volt all outputs

- **Load Regulation:** (typical)
  - ±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:**
  - ≤0.1% p-p of full rated output voltage

- **Stability:**
  - ≤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:**
  - ≤200ppm per degree C

- **Environmental:**
  - Temperature Range:
    - Operating: 0˚C to 50˚C
    - Storage: -35˚C to 85˚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:**
How to Order:
PART NO.: ML1350/N50/24
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 @ 60μA 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, ±0.5 volt

**Input Current:**
<200mA continuous

**Output Voltage:**
±100Vdc to ±2.5kV

**Output Current:**
0 to 60μA max.

**Polarity:**
- Remotely reversible via logic signal, 300mS to settle to ±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:**
  ±1% Voltage Programming/Monitor
  ±2% Current Monitor

- **Ripple:**
  ≤0.02% Volts p-p

- **Stability:**
  0.02% per hour after 1 hour warmup

- **Temperature Coefficient:**
  ≤50ppm 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:**
### MX2.5 INPUT/OUTPUT CONNECTIONS

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24V</td>
<td>Power Input</td>
</tr>
<tr>
<td>2</td>
<td>0v</td>
<td>Signal and Power Ground</td>
</tr>
<tr>
<td>3</td>
<td>Vprog</td>
<td>0-10V Programming Voltage</td>
</tr>
<tr>
<td>4</td>
<td>Polarity Change</td>
<td>Polarity Change Input</td>
</tr>
<tr>
<td>5</td>
<td>Shutdown</td>
<td>Output Inhibit, Disables HV Output Down to &lt;60V Within 300ms</td>
</tr>
<tr>
<td>6</td>
<td>Vmon</td>
<td>0-10V Output Voltage Monitor</td>
</tr>
<tr>
<td>7</td>
<td>Output</td>
<td>HT Output</td>
</tr>
<tr>
<td>8</td>
<td>Imon</td>
<td>0-10V Output Current Monitor</td>
</tr>
</tbody>
</table>

### How to Order:
Standard: PART NO.: MX2.5PN24

---

**SIDE VIEW**

**BOTTOM VIEW ON PINS**

**DIMENSIONS: mm**

- Ø1.1 (P1-P8)
- LUG 1.0 X 0.6mm (4 OFF)
- POSITION "X"
Spellman’s RoHS compliant 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 (see note 1)

Output Current:
- 100µA

Output Polarity:
- Bipolar

Voltage Regulation:
- Line: ≤±0.1% for ±10% input voltage change
- Load: ≤0.1% for 0 to full load

Current Regulation:
- Line: ±0.1% for +1V input voltage change for any load condition
- Load: ±0.1% for full load to short circuit

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

Polarity Reversal Time:
- <25ms from command to 90% into 100pF load capacitance (see note 2)

Protection:
- Arc and short circuit protected

Output Voltage Limit:
- Output voltage must 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:
- Approximately 3.3 pounds (1.5kg)

Input Connector:
- 14 way Molex housing p/n 39-01-2140 or similar with female terminals. Cable length 508mm

Output Connector:
- Alden F303D24

Regulatory Approvals:
- Compliant to 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. Compliant to 2002/95/EC, RoHS.

Note 1: Linearity not guaranteed below 200V. Maximum offset ±20V when programmed to zero or disabled using remote enable.

Note 2: 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.
### MX8 PLUS 14 PIN SOCKET

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24Vdc Input</td>
</tr>
<tr>
<td>2</td>
<td>Chassis and 24Vdc Ground</td>
</tr>
<tr>
<td>3</td>
<td>Enable/Inhibit Input</td>
</tr>
<tr>
<td>4</td>
<td>8kV Voltage Monitor output</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Control Input</td>
</tr>
<tr>
<td>6</td>
<td>Current Monitor Output</td>
</tr>
<tr>
<td>7</td>
<td>Current Control Input</td>
</tr>
<tr>
<td>8</td>
<td>Polarity Control Input</td>
</tr>
<tr>
<td>9</td>
<td>Analog Ground</td>
</tr>
<tr>
<td>10</td>
<td>Current/Voltage Control Indicator</td>
</tr>
<tr>
<td>11</td>
<td>N/C</td>
</tr>
<tr>
<td>12</td>
<td>N/C</td>
</tr>
<tr>
<td>13</td>
<td>N/C</td>
</tr>
<tr>
<td>14</td>
<td>N/C</td>
</tr>
</tbody>
</table>

**How to Order:**

Standard: PART NO.: MXP8PN24

---

**DIMENSIONS:** in. [mm]

**SIDE VIEW**

- 0.74 [18.6]
- 1.48 [37.6]
- 8.10 [205.74]

**TOP VIEW**

- 0.49 [12.4]
- 9.45 [240]
- 2.25 [57.15]
- 3.23 [82]
- 8.32 UNC INSERTS X 7MM DEEP 6X
- 8.10 [205.74]
- 0.67 [17.1]

**FRONT VIEW**
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, ±1 volt

**Input Current:**
<400mA continuous  
<1.2A during reversing

**Output Voltage:**
±200Vdc to ±10kV

**Output Current:**
0 to 100uA max.

**Polarity:**
Remotely reversible via logic signal, 250mS to settle to ±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:**
±2%

**Ripple:**
≤0.005% Volts p-p

**Stability:**
0.1% per hour after 1 hour warmup

**Temperature Coefficient:**
≤100ppm 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:**

[www.spellmanhv.com/manuals/MX10](http://www.spellmanhv.com/manuals/MX10)
### MX10 TERMINAL BLOCK 9 PIN

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voltage Monitor</td>
<td>0-10V = 0-100% of Rated Output</td>
</tr>
<tr>
<td>2</td>
<td>External Inhibit Input</td>
<td>Open or &gt;10V = “OFF”; &lt;4V = “ON”</td>
</tr>
<tr>
<td>3</td>
<td>Current Programming Input</td>
<td>0-10Vdc = 0-100% of Rated Output (on VCC option)</td>
</tr>
<tr>
<td>4</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>5</td>
<td>Current Monitor</td>
<td>0-10Vdc = 0-100% of Rated Output</td>
</tr>
<tr>
<td>6</td>
<td>Polarity Control Input</td>
<td>Open or &gt;10V = “NEGATIVE”; &lt;4V = “POSITIVE”</td>
</tr>
<tr>
<td>7</td>
<td>Voltage Programming Input</td>
<td>0-10Vdc = 0-100% of Rated Output</td>
</tr>
<tr>
<td>8</td>
<td>+24V Input</td>
<td>+24V Input</td>
</tr>
<tr>
<td>9</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

#### How to Order:
- Standard: PART NO.: MX10PN24
- VCC Option: PART NO.: MX10PN24/VCC
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 2004/108/EC, the EMC Directive and 2006/95/EC, the Low Voltage Directive. Compliant to 2002/95/EC, RoHS.

**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: 0 to -2.3kV
- **Output Polarity:** Negative
- **Output Current:** ≤230μA
- **Voltage Regulation:** Line: ≤0.02% for a 1.5V input voltage change
  - Load: <5V for 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

• ±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
**MX10 PLUS TERMINAL BLOCK 20 PIN**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+15Vdc Input</td>
</tr>
<tr>
<td>2</td>
<td>+15Vdc Input</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>Output Voltage Control</td>
</tr>
<tr>
<td>8</td>
<td>Signal Reference Ground</td>
</tr>
<tr>
<td>9</td>
<td>10kV On</td>
</tr>
<tr>
<td>10</td>
<td>10kV On</td>
</tr>
<tr>
<td>11</td>
<td>Output Polarity Control</td>
</tr>
<tr>
<td>12</td>
<td>EM Protect</td>
</tr>
<tr>
<td>13</td>
<td>-2.3kV Output Monitor</td>
</tr>
<tr>
<td>14</td>
<td>EM On</td>
</tr>
<tr>
<td>15</td>
<td>Ground</td>
</tr>
<tr>
<td>16</td>
<td>Ground</td>
</tr>
<tr>
<td>17</td>
<td>±10kV Output Monitor</td>
</tr>
<tr>
<td>18</td>
<td>N/C</td>
</tr>
<tr>
<td>19</td>
<td>+15Vdc Input</td>
</tr>
<tr>
<td>20</td>
<td>+15Vdc Input</td>
</tr>
</tbody>
</table>

**DIMENSIONS:** in.[mm]

**SIDE VIEW**

**TOP VIEW**

**FRONT VIEW**

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**How to Order:**

Standard: PART NO.: MXP10PN15

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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: Voltage and Current Control

**SPECIFICATIONS**

**Input Voltage:**
- +24Vdc, ±1.2 volts

**Input Current:**
- <500mA continuous
- <1.2A during reversing

**Output Voltage:**
- ±500Vdc to ±20kV

**Output Current:**
- 0 to 100uA max.

**Polarity:**
- Remotely reversible via logic signal, 500mS to settle to ±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

**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 Monitor:**
- ±2% Voltage Programming/Monitor
- ±5% Current Programming/Monitor

**Ripple:**
- ≤0.0025% Volts p-p

**Stability:**
- 0.1% per hour after 1 hour warmup

**Temperature Coefficient:**
- ≤100ppm 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:**
MX20 TERMINAL BLOCK 9 PIN

<table>
<thead>
<tr>
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<th>SIGNAL PARAMETERS</th>
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<td>1</td>
<td>Voltage Monitor</td>
<td>0-10V=0-100% of Rated Output</td>
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<td>Current Programming Input</td>
<td>0-10Vdc = 0-100% of Rated Output (on VCC option)</td>
</tr>
<tr>
<td>4</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>5</td>
<td>Current Monitor</td>
<td>0-10Vdc = 0-100% of Rated Output</td>
</tr>
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<td>6</td>
<td>Polarity Control Input</td>
<td>Open or &gt;10V = “NEGATIVE”; &lt;4V = “POSITIVE”</td>
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<tr>
<td>7</td>
<td>Voltage Programming Input</td>
<td>0-10Vdc = 0-100% of Rated Output</td>
</tr>
<tr>
<td>8</td>
<td>+24V Input</td>
<td>+24V Input</td>
</tr>
<tr>
<td>9</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
</tbody>
</table>

How to Order:
Standard: PART NO.:MX20PN24
VCC Option: PART NO.:MX20PN24/VCC
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 @ 400μA 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 100μA 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:
≤70mV 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 ±30kV, Zin ≥ 1 megohm

Program Accuracy:
±0.15% at 19kV, with overall accuracy of ±0.25% of maximum output

TTL Polarity Reversal:
High = positive polarity
Low = negative polarity

Voltage Monitor:
0 to 10Vdc corresponds to 0 to 30KV, Zout = 4.7Kohm

Current Monitor:
0 to 10Vdc corresponds to 0 to 400uA, Zout = 4.7Kohm

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:
**JB1 INTERFACE CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>SIGNAL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>2</td>
<td>Voltage Program</td>
<td>0 to 10V=0 to 100% Rated Output</td>
</tr>
<tr>
<td>3</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>Voltage Monitor</td>
<td>0 to 10V=0 to 100% Rated Output</td>
</tr>
<tr>
<td>6</td>
<td>TTL Polarity Control Signal</td>
<td>Hi=Positive Polarity, Low=Negative Polarity</td>
</tr>
<tr>
<td>7</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>8</td>
<td>Power Ground</td>
<td>Power Ground</td>
</tr>
<tr>
<td>9</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>10</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>11</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>12</td>
<td>TTL HV Enable</td>
<td>Hi=Inhibit, Low=Enable</td>
</tr>
<tr>
<td>13</td>
<td>Current Monitor</td>
<td>0 to 10V=0 to 100% Rated Output</td>
</tr>
<tr>
<td>14</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>15</td>
<td>+24Vdc</td>
<td>+24Vdc</td>
</tr>
</tbody>
</table>

**DIMENSIONS:** in.[mm]

**FRONT VIEW**

**BACK VIEW**

**TOP VIEW**

**BOTTOM VIEW**
Spellman’s PMTS is a custom designed high voltage power supply and integrated mounting socket for standard 1.125 inch (28mm) side-on photomultiplier tubes. Ten equally divided, incremental output voltages are generated and provided via the use of a 10 stage voltage multiplier arrangement.

The output voltage is programmable over the entire rated range via a ground referenced 0 to 5Vdc signal. The stable, well regulated and low ripple outputs enhance PMT operation and performance. An internal feedback divider resistor allows output regulation, provides a bleed function while also generating a ground referenced output voltage monitoring signal.

The PMTS is fully encapsulated for optimum reliability. Isolating the high voltage circuitry from the local environment minimizes contamination concerns while enhancing user safety. The Anode current signal is provided via a length of shielded coaxial cable to preserve signal integrity. A metal installation flange is provided allowing easy mounting and installation.

**SPECIFICATIONS**

**Input Voltage:**
+15Vdc, ±5%

**Input Current:**
≤200mA maximum, typically 100mA

**Output Voltage:**
0 to 1000 volts, via 10 equally divided incremental taps

**Output Polarity:**
Negative, with respect to ground

**Output Current:**
20 microamps, maximum

**Voltage Regulation:**
- Line: ≤0.005% of rated output voltage over specified input voltage range
- Load: ≤0.005% of rated output voltage for a full load change

**Ripple:**
≤1.0 millivolt peak to peak, photoelectron spikes excluded

**Temperature Coefficient:**
≤100ppm ppm/˚C

**Stability:**
≤0.01%/hr, after 1/2 hour warm up

**Accuracy:**
±2% at maximum output

**Operating Temperature:**
0˚C to +50˚C

**Storage Temperature:**
-40˚C to +85˚C

**Humidity:**
10% to 85% RH, non-condensing

**Input Connector:**
4 pin Molex, mating connector provided

**PMT Current Signal Cable:**
9.25” (235mm) of RG174/U, terminated as required

**PMT Socket:**
Standard 1.125” (28mm) socket for side on photomultiplier tubes

**Cooling:**
Convection cooled

**Dimensions:**
1.25” diameter X 2.52” long (31.75mm X 64mm)
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, (LVPFE). This proposed new LVPFE is targeted at the emerging requirements for shorter submarine cable installations, while addressing underlying markets issues such as lower cost, smaller footprint, 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:
The XRV 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 5.25 inch tall (3U) rack mount 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.

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

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

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.

SPECIFICATIONS
Input Voltage:
180-264Vac, 50/60Hertz

Dimensions:
5.25”H x 19”W x 13”D (133.35mm x 482.6mm 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
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 Plexiglas cylinder containing a matched set of precision metal film resistors which have a temperature coefficient of less than 25 ppm. 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.

*Impedance of 10Gohm or higher.

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### HVD Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>0-100kVdc</td>
<td>0-200kVdc</td>
<td>0-400kVdc</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>1000Mohms</td>
<td>2000Mohms</td>
<td>4000Mohms</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>1M; 100kohms</td>
<td>20kohms</td>
<td>40kohms</td>
</tr>
<tr>
<td>Output Taps</td>
<td>100V, 10V</td>
<td>2V</td>
<td>4V</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.5%: (0.1% opt)*</td>
<td>0.5%: (0.25% opt)**</td>
<td>0.5%: (0.25% opt)**</td>
</tr>
<tr>
<td>Stability</td>
<td>0.01%/8hrs</td>
<td>0.025%/8hrs</td>
<td>0.025%/8hrs</td>
</tr>
<tr>
<td>Temp. Coefficient</td>
<td>25ppm/˚C</td>
<td>25ppm/˚C</td>
<td>25ppm/˚C</td>
</tr>
<tr>
<td>Height</td>
<td>17.5” (44.5cm)</td>
<td>33.5” (84.5cm)</td>
<td>61” (154.94cm)</td>
</tr>
<tr>
<td>Max. Diameter</td>
<td>10” (25.4cm)</td>
<td>12” (30.5cm)</td>
<td>20” (50.8cm)</td>
</tr>
<tr>
<td>Weight</td>
<td>6.75 lbs (3.1kg)</td>
<td>12 lbs (5.5kg)</td>
<td>24.45 lbs (11.8kg)</td>
</tr>
<tr>
<td>Output Connector</td>
<td>BNC type</td>
<td>BNC type</td>
<td>BNC type</td>
</tr>
</tbody>
</table>

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**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.
HARDWARE FEATURES

The digital hardware includes a 40MIPS digital signal processor, a network processor, and a USB processor/controller. Serial port 0 of the DSP is jumper selectable to allow firmware updating through either the RS-232 port or the Ethernet interface.

RS232 INTERFACE
- 115k bits per second
- No Parity
- 8 Data Bits
- 1 Stop Bit
- No Handshaking
- DB-9 Connector (as shown)

ETHERNET INTERFACE
- 10/100-Base-T
- IP Address can be set by the system integrator
- Network Mask can be set by the system integrator
- TCP Port Number can be set by the system integrator
- RJ-45 connector
- Network attachment via Crossover and standard Ethernet cables
- Supported Operating Systems: Windows 98 2ED, Windows 2000 (SP2), Windows NT (SP6), Windows XP Professional, and most other major operating systems

USB—UNIVERSAL SERIAL BUS INTERFACE
- Compliant with USB 1.1 and USB 2.0 specifications
- Type B male connector
- Included driver can be communicated with via standard Windows serial communications methods

RS-232 CABLING
A standard RS-232 cable where lines 2 and 3 are reversed is used to connect the SIC serial port to the serial port on a standard personal computer

ETHERNET CABLING
Category 5 (CAT5) Ethernet patch cables are used to connect the SIC to the host computer. There are two ways to connect the SIC board via Ethernet: the first is to directly cable between the host and the SIC board, and the second is through the use of a hub, switch or network

USB CABLING
A high-quality double-shielded USB 2.0 Type A or B (host to slave) cable should be used in all applications. This type of cable is a standard PC to peripheral cable that utilizes full size connectors.

High EMI Environments
If the SIC USB interface is being used in a high-EMI environment, ferrites should be added to the USB cable.

The SIC Option Provides 3 Types of Communications Interfaces:
- RS-232
- Ethernet (10/100-Base-T)
- USB—Universal Serial Bus

Data Acquisition and Control capabilities are Provided by:
- 14 Channels of 12 Bit Analog to Digital Converters
- 2 Additional Analog Channels that Monitor the Housekeeping Power Supply and Ambient Temperature
- 5 Digital Output Bits
- 8 Digital Input Bits
- 3 Relays/Interlocks

www.spellmanhv.com/manuals/SIC
SOFTWARE COMPATIBILITY

RS232
The RS-232 interface makes use of a standard ‘command/response’ communications protocol. All software that addresses the RS-232 interface must adhere to the following parameters:
— 115k bits per second
— No Parity
— 8 Data Bits
— 1 Stop Bit
— No handshaking

ETHERNET
The SIC board contains an embedded diagnostic web server that can be accessed through any standard web browser by browsing to the SIC’s IP address. The Ethernet interface communicates using the following protocols:
— TCP/IP
— HTTP
— Telnet
— FTP
These assemblies can auto-switch between 10 Mb/s and 100Mb/s

USB
The USB interface makes use of a standard ‘command/response’ communications protocol. The USB interface is accessed through a Windows USB driver that emulates a standard communications port (just like in RS-232). Before you can communicate with the SIC USB interface, you must load the supplied USB driver disc. This driver will create a ‘virtual’ comm port that can be checked by using Windows Device Manager.
Common High Voltage Power Supply Safety Questions

THE OUTPUT OF ANY HIGH VOLTAGE SUPPLY SHOULD NEVER BE CONSIDERED “SAFE TO TOUCH” UNLESS THE PROPER SERVICING PROCEDURES HAVE BEEN FOLLOWED. REFER TO YOUR OPERATIONS MANUAL FOR INSTRUCTIONS.

Q: Can I safely touch the output of one of your high voltage supplies without being hurt?

A: Safety is paramount. There is no "safe" level of high voltage that one can touch without risk. Using this guideline, every situation involving high voltage is potentially hazardous. Even with a very low current supply there can be a brief pulse of much higher current due to the discharge of the power supplies output capacitance and high voltage cable capacitance. For proper handling procedures, consult your operations manual.

Q: What is safe to touch when working with one of your high voltage power supplies?

A: There are parts of the supply that are safe to touch; refer to the instructions of your operations manual. Typically the chassis of the power supply is safe to touch along with all operator controls and most interface connectors. Some other connectors could have line voltage or other potentially hazardous voltages present.

Q: How does someone safely use one of your high voltage power supplies?

A: To safely use of our high voltage supplies, one needs to comply in all respects with the procedures set forth in the operations manual. In addition, users should comply with the IEEE 510-1983 standard for high voltage practices. The rigorous enforcement of comprehensive and consistent safety practices is the best method of ensuring user safety.

Recommended Safety Reference Material

Spellman USA and Corporate HQ
475 Wireless Blvd.
Hauppauge, NY 11788
United States
tel: +1-631-630-3000
fax: +1-631-435-1620

Spellman Valhalla NY USA
One Commerce Park
Valhalla, NY 10595
United States
tel: +1-914-686-3600
fax: +1-914-686-5424

Spellman Bohemia NY USA
30 Crossways East
Bohemia, NY 11716
United States

Spellman UK
Broomers Hill Park #14, Broomers Hill
Pulborough, West Sussex,
United Kingdom RH20 2RY
tel: +44 (0) 1798 877000
fax: +44 (0) 1798 872479

Spellman Japan
4-3-1 Kamitoda,
Toda-shi, Saitama-ken,
Japan 335-0022
tel: +81(0) 48-447-6500
fax: +81(0) 48-447-6501

Spellman China
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Block D, No.16 SuTong Road,
Suzhou Industrial Park 215021 China
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fax: +(86)-512-67630030

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Yeonsu-Gu, Incheon, Korea 406-081
tel: +82-32-719-2300
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100,000-square-foot facility, including design, manufacturing and corporate management.

20,000-square-foot facility dedicated to design, manufacturing, sales and service.

30,000-square-foot facility, dedicated to metal fabrication and electronic assembly.

27,500-square-foot facility dedicated to design, manufacturing, sales and service.

7,000-square-foot facility dedicated to sales and service.

39,000-square-foot facility dedicated to engineering, manufacturing, sales and service.

1,420-square-foot facility dedicated to sales and service.

101,500-square-foot facility supporting Plant 3 including sheet metal fabrication capabilities

127,000-square-foot manufacturing center, mirroring our New York headquarters in capital equipment and production process technologies.

15,000-square-foot facility dedicated to manufacturing, sales and service.