



Spellman's DF/FF Series of X-Ray Generators feature our new inverter design which incorporates IGBTs for power switching and provides new levels of reliability. In addition, re-engineering of the DF/FF's internal filament power supply eliminates audio noise at normal operating levels by operating at a higher frequency. The DF/FF's utilize a sine wave current source, produced by phase shifting series resonant circuits at switching frequencies greater than 20kHz to generate high voltage dc. This technique eliminates undesirable electromagnetic radiation normally associated with switching and power control regulators. The high efficiency of these units allows for air cooling in a 5.25" (3U) high chassis.

### TYPICAL APPLICATIONS

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

### OPTIONS

**220FSI** 220Vac Fail Safe Interlock  
**208-3P** 208Vac Three Phase Input

### SPECIFICATIONS

#### Input Voltage:

220Vac  $\pm$ 10%, 50-60Hz, single phase (three phase optional)

#### Input Current:

3kW: 220Vac @ 29.5A, single phase  
208Vac @ 12.8A/phase, three phase  
4kW: 220Vac @ 39.3A, single phase  
208Vac @ 17.0A/phase, three phase

#### Output Voltage:

**DF3:** 0 to 60kV negative polarity  
**FF3:** 0 to 60kV positive polarity  
Other output voltages are available

#### Output Current:

**DF3:** 0 to 80mA  
**FF3:** 0 to 100mA  
Other output currents are available

#### Maximum Output Power:

3kW (4kW optional)

#### Output Voltage Regulation:

Load: 0.005% of rated output for full load change  
Line: 0.005% of rated output over specified input range  
Temperature Coefficient: 50 ppm/ $^{\circ}$ C (20 ppm/ $^{\circ}$ C optional)  
Long Term Stability: 0.01%/8 hours.

- **Ideal for Common XRD & XRF X-Ray Tubes**
- **Compact Size, 5 1/4" (3U) High Chassis**
- **Solid Encapsulation Insures Maintenance-Free Operation**
- **Auto Ramp of the HV Emission Current to Preset Values**
- **OEM Customization Available**

#### Emission Current Regulation:

Load: 0.01% of rated output for a 10 to 60kV change  
Line: 0.005% of rated output over specified inputs  
Temperature Coefficient: 50 ppm/ $^{\circ}$ C  
Long Term Stability: 0.01%/8 hours

#### Ripple:

0.03% rms <1kHz, 0.75% rms above 1kHz

#### Environmental:

Temperature Range:  
Operating: 0 $^{\circ}$ C to 40 $^{\circ}$ C  
Storage: -20 $^{\circ}$ C to 85 $^{\circ}$ C  
Humidity:  
10% to 90%, non-condensing

#### Filament Voltage:

**DF:** 12Vac  
**FF:** 12Vdc

#### Filament Current:

5A (up to 12A max available)

#### Dimensions:

5.25"(3U) H x 19" W x 22" D (13.3cm x 48.3cm x 55.9cm)

#### Weight:

90lbs (40kg)

#### Regulatory Approvals:

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

### ADDITIONAL FEATURES

#### Water Flow Switch:

A 24Vdc signal is available on the rear panel to turn on the cooling water to the X-Ray tube. This signal can be enabled either when control power is on or when the high voltage is turned on. (Customer must specify)

#### Fail Safe Interlock:

A 24Vdc signal is available on the rear panel to energize an external X-Ray on lamp. This signal is energized when the high voltage is turned on. High voltage will not enable if this circuit is open. (A 220Vac signal is optional)

#### Preheat and Ramp:

Automatic preheat and ramp control circuits are provided which ramp the kV and mA slowly to set levels. kV ramps in approximately 10 seconds while mA ramps in approximately 20 seconds.

#### Output Connector:

75kV, 3 conductor Federal Standard X-Ray connector. 60kV is connected to terminal "C". Terminals "S" and "L" are jumped together. The filament output is connected between terminals "C" and "S". Other configurations are optional. (On the FF3, all output connections S, L, & C are connected together)

#### Remote Signal Connector:

Remote interface is available via a 50 pin mini D connector. Extensive remote programming and monitoring is provided.

### Electronic Component (Power Source)

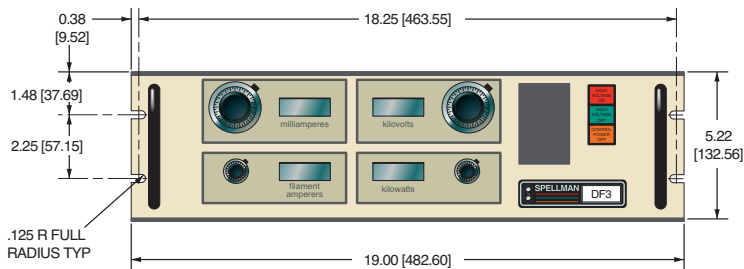
DF/FF series is intended for installation as a component of a system. It is designed to meet CE standards, with conditions of acceptance often being: customer provided enclosure mounting, EMC filtering, and appropriate protection, and isolation devices. The DF/FF series is not intended to be operated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

### JB1 MINI D CONNECTOR 50 PIN

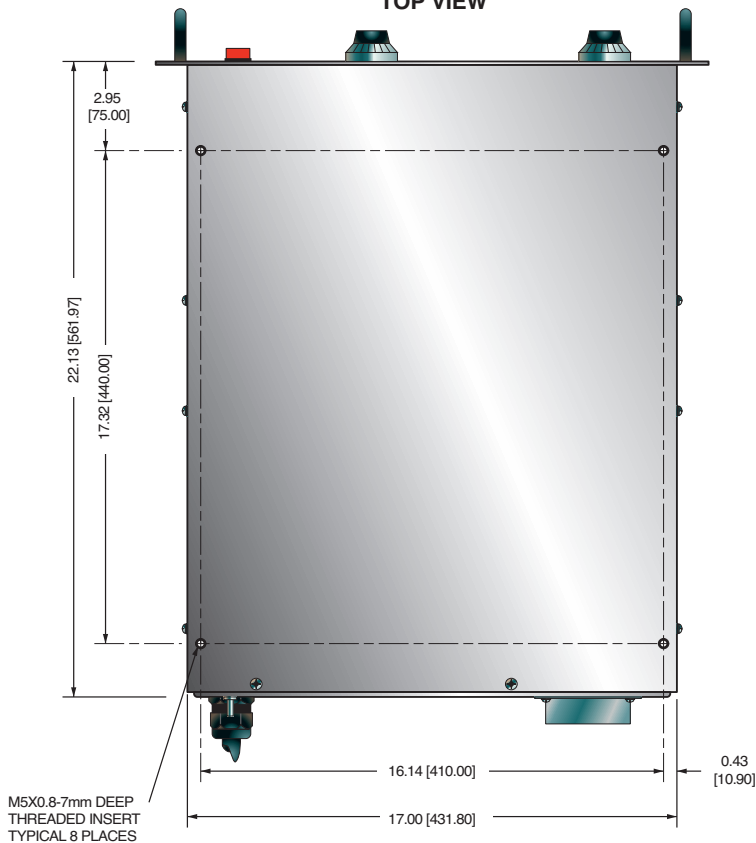
PIN	SIGNAL
1	+5Vdc (or connect to pin-11)
2	Control Power On
3	Intlk
4	X-Ray On
5	X-Ray Off
6	Spare
7	Spare
8	Reset
9	Rmt/Lcl
10	24V Switched
11	+5Vcch
12	X-Ray On Status
13	Overvoltage
14	kV Min
15	Overpower
16	Filament Current Limit
17	mA Current Limit
18	LCL Status
19	Power Supply Fault
20	Gnd
21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

DIMENSIONS: in.[mm]

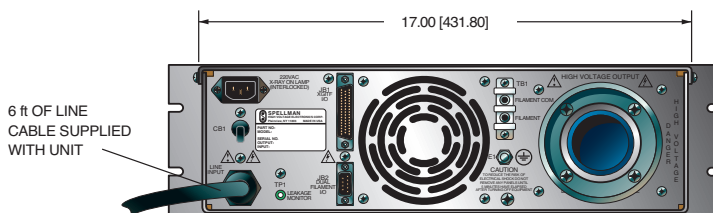
#### FRONT VIEW



#### TOP VIEW



#### BACK VIEW



Cost reduced version for OEM quantities available, contact Sales.

