FJ Series

XP Power

120W RACK MOUNT

AC-HVDC POWER SUPPLIES

Designed for electrical design engineers and system integration engineers in a wide range of industries including ion implant, e-beam welding and e-beam additive manufacturing and many other application specific markets, the FJ series addresses challenges engineers face with limited high voltage integration experience and tight time lines.

The FJ series offers a wide range of standard outputs up to 60kV at 120W in a light form factor with various output control options, input voltages, and low output discharge currents allowing for extremely simple integration into a new system or tool.

Showcasing high quality, high performance, high reliability and high stability with air insulation, the FJ series facilitates a low cost of ownership with the excellence and technical support of XP Power engineering.

As with all our products the FJ series is designed with maximum flexibility in mind so can easily be adapted to your requirements in this voltage and power level, please do contact us for derivative requests.

Applications

Semiconductor Manufacturing

High Power E-beam

Industrial Electronics

Technology

Features

- Output voltages up to 60kV
- 0 to 100% programmable voltage and current
- Local, analog and RS232/USB digital control, Ethernet is optional
- Single phase AC input, selectable
- Output voltage and current regulated
- Automatic crossover between constant kV/constant mA operation
- Voltage and current monitor outputs
- Operating temperature: -20°C to +40°C, no derating
- Short circuit, arc quench, arc count, overload and thermal protection
- Efficiency >85%
- Low ripple <0.02% RMS of rated voltage at full load
- 1 year warranty

Dimensions

1.72"H x 17.00"W x 20.00"D (43.6 x 431.8 x 508.0mm)
1U 19" rack mount

Benefits

- Custom capability and monitoring allow maximum flexibility and control
- Air insulation makes the FJ series lightweight and easy to maintain
- Arc sensing ensures safe operation providing maximum protection to the PSU, the load and the user
- High efficiency drives towards carbon neutral goals
- Low cost of ownership

Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage (Selectable)	102		132	VAC	48-63Hz
	198		264		
Input Connector	IEC60320 C14 receptacle, AC power cord not included				

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage Range	0		60	kV	See Models and Ratings
Output Current Range	2		120	mA	See Models and Ratings
Polarity	Available with either positive, negative or reversible polarity with respect to chassis ground				
Line Regulation			±0.005	%	For specified line variations
Load Regulation			±0.005	%	+0.5mV/mA for no load to full load variations
Dynamic Voltage Regulation	<2% deviation with load changes from 10% to 99% or 99% to 10%. Recovery <1% in 500µs, recovery <0.1% in 1ms				
Current Regulation		>0.1		%	Current regulation mode. Short circuit to rated voltage at any load condition
Set Point Resolution		±0.1		%	Rated
Stability		0.01		%/hr	After 30 minute warm up
		0.05			Per 8 hours under constant conditions after 30 minute warm up
Temperature Coefficient		0.01		%/°C	
Voltage Rise Time Constant		50		ms	For all models using either HV enable or remote programming control
Voltage Decay Time Constant		50		ms	1kV to 8kV models: 10% resistive load 10kV to 60kV models: 80% resistive load
Voltage Ripple			0.02	%	+0.5V RMS at full load
Output Voltage Adjustment	Continuous stable adjustment from 0 to rated voltage or current by panel mounted optical rotary encoder, by external +10V analog signal, RS232, USB or optional ethernet				
HV Output Connection	Mating HV connector and 10ft (3m) shielded coaxial cable supplied				
Protection	Overload, short circuit, arc, over temperature and surge protection				
Voltage Accuracy		0.5		%	Of setting plus 0.2% of rated
Optical Rotary Encoder Resolution		0.025		%	With fine adjustment mode selected
		0.25			With coarse adjustment mode selected (default)
Repeatability		<0.1		%	Of rated
Arc Quench	An arc quench feature provides sensing of each load arc and quickly inhibits the HV output for approximately 20ms after each arc. Standard on 8kV to 60kV models; optional on 1kV to 6kV models				
Arc Count	Internal circuitry senses the number of arcs caused by external load discharges. If the rate of consecutive arcs exceeds approximately one arc per second for five arcs, the supply will turn off for approximately 5 seconds to allow clearance of the fault. After this period the supply will automatically return to the programmed kV value with the rise time constant indicated. If the load fault still exists, the above cycle will repeat. Standard on 8kV to 60kV models; optional on 1kV to 6kV models				

General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	85			%	At full load
HV Insulating Medium	Air insulated				
Accessories	Detachable, 8 foot, shielded high voltage coaxial cable (see models chart for cable type), 6 foot NEMA 5-15 line cord, 6 foot NEMA 6-15 line cord, 10 foot null modem cable and 10 foot USB cable are provided.				

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Ambient Temperature	-20		+40	°C	Operating
	-40		+85	°C	Storage
Thermal Overload Protection	Thermal switches and RPM sensing fan protected				

EMC: Emissions

Phenomenon	Standard	Test Level	Notes & Conditions
Conducted Emissions	EN61000-6-4	Class A	Cisper II
Radiated Emissions	EN61000-6-4	Class A	Cisper II
Line Harmonics	EN61000-3-2	Class A	

EMC: Immunity

Phenomenon	Standard	Performance Criteria	Notes & Conditions
ESD Immunity	EN61000-6-2	Class B	
Radiated Immunity	EN61000-6-2	Class A	
EFT/Burst	EN61000-4-4	Class B	
Surge	EN61000-4-5	Class B	
Conducted	EN61000-6-2	Class A	
Voltage Dips & Interruptions	EN61000-4-11	Class B & C	

Safety Approvals

Safety Agency	Standard	Test Level	Notes & Conditions
EN	EN61010/IEC61010	-	Safety
CE	Meets all applicable directives		
UKCA	Meets all applicable legislation		

Notes:

1. Specifications apply from 5% to 100% rated voltage. Operation is guaranteed down to zero voltage with a slight degradation of performance.

Signals & Controls

	Function	
Front Panel Control	AC power On/Off rocker switch, HV On/Off, SS Slope, Standby, Remote Enable, Remote Program, rotary encoders for voltage and current control, fine and coarse adjustment, Preset, Control Lock	
Front Panel Indicators	AC Power, Current Mode, Voltage Mode, Polarity +/-, Fault, Fine Adjustment, Preset, Control Lock, Remote Enable, Remote Program, HV On Output voltage and current display meters: 3.5 digits, 1250 count maximum.	
Rear Panel Elements	AC power entry connector, fuses, power on indicator, ground stud, HV output connector, remote interface connector (J3), RS232/USB connectors, and input voltage selector switch.	
Output Interface Signals	Output voltage 0 to +10V = 0 to rated voltage. Output current 0 to +10V = 0 to rated current. Accuracy: 1% of reading + 0.1% of rated. Impedance is 10KΩ and a +10V reference source HV status, fault status, I/V mode status	
External Interlock	Open = Off, closed = On. Latching (default). Blank front panel version non-latching	
Remote HV Enable/Disable	0 - 1.5V = Off, 2.5 - 15V = On	
RS232/USB/Ethernet Programming (Optional)	Resolution	0.025% of full scale for both the voltage and the current programs. 0.1% of full scale for both the voltage and the current monitors
	Remote setting accuracy	Voltage setting accuracy is better than 0.5% of setting +0.2% of rated
	Remote reading accuracy	Voltage reading accuracy is 0.5% of reading +0.2% of rated. Current reading accuracy is 1% of reading +0.1% of rated

Models & Ratings

Model Number	Polarity	Output Voltage	Output Current	Max Stored Energy	Output Cable
FJ01P120	Positive	0 to +1kV	0 to 120mA	0.2J	RG-58U
FJ01N120	Negative	0 to -1kV			RG-58U
FJ01R120	Reversible	0 to ±1kV			RG-58U
FJ01.5P80	Positive	0 to +1.5kV	0 to 80mA	0.45J	RG-58U
FJ01.5N80	Negative	0 to -1.5kV			RG-58U
FJ01.5R80	Reversible	0 to ±1.5kV			RG-58U
FJ02P60.0	Positive	0 to +2kV	0 to 60mA	0.1J	RG-58U
FJ02N60.0	Negative	0 to -2kV			RG-58U
FJ02R60.0	Reversible	0 to ±2kV			RG-58U
FJ03P40.0	Positive	0 to +3kV	0 to 40mA	0.2J	RG-58U
FJ03N40.0	Negative	0 to -3kV			RG-58U
FJ03R40.0	Reversible	0 to ±3kV			RG-58U
FJ05P24.0	Positive	0 to +5kV	0 to 24mA	0.3J	RG-58U
FJ05N24.0	Negative	0 to -5kV			RG-58U
FJ05R24.0	Reversible	0 to ±5kV			RG-58U
FJ06P20.0	Positive	0 to +6kV	0 to 20mA	0.25J	RG-8U
FJ06N20.0	Negative	0 to -6kV			RG-8U
FJ06R20.0	Reversible	0 to ±6kV			RG-8U
FJ08P15.0	Positive	0 to +8kV	0 to 15mA	0.3J	RG-8U
FJ08N15.0	Negative	0 to -8kV			RG-8U
FJ08R15.0	Reversible	0 to ±8kV			RG-8U
FJ10P12.0	Positive	0 to +10kV	0 to 12mA	0.4J	RG-8U
FJ10N12.0	Negative	0 to -10kV			RG-8U
FJ10R12.0	Reversible	0 to ±10kV			RG-8U
FJ12P10.0	Positive	0 to +12kV	0 to 10mA	0.7J	RG-8U
FJ12N10.0	Negative	0 to -12kV			RG-8U
FJ12R10.0	Reversible	0 to ±12kV			RG-8U
FJ15P08.0	Positive	0 to +15kV	0 to 8mA	1.1J	RG-8U
FJ15N08.0	Negative	0 to -15kV			RG-8U
FJ15R08.0	Reversible	0 to ±15kV			RG-8U
FJ20P06.0	Positive	0 to +20kV	0 to 6mA	0.85J	RG-8U
FJ20N06.0	Negative	0 to -20kV			RG-8U
FJ20R06.0	Reversible	0 to ±20kV			RG-8U
FJ25P04.8	Positive	0 to +25kV	0 to 4.8mA	1.0J	RG-8U
FJ25N04.8	Negative	0 to -25kV			RG-8U
FJ25R04.8	Reversible	0 to ±25kV			RG-8U
FJ30P04.0	Positive	0 to +30kV	0 to 4mA	1.0J	RG-8U
FJ30N04.0	Negative	0 to -30kV			RG-8U
FJ30R04.0	Reversible	0 to ±30kV			RG-8U
FJ40P03.0	Positive	0 to +40kV	0 to 3mA	1.5J	RG-8U
FJ40N03.0	Negative	0 to -40kV			RG-8U
FJ40R03.0	Reversible	0 to ±40kV			RG-8U
FJ50P02.4	Positive	0 to +50kV	0 to 2.4mA	2.0J	RG-8U
FJ50N02.4	Negative	0 to -50kV			RG-8U
FJ50R02.4	Reversible	0 to ±50kV			RG-8U
FJ60P02.0	Positive	0 to +60kV	0 to 2mA	2.4J	RG-8U
FJ60N02.0	Negative	0 to -60kV			RG-8U
FJ60R02.0	Reversible	0 to ±60kV			RG-8U

Notes:

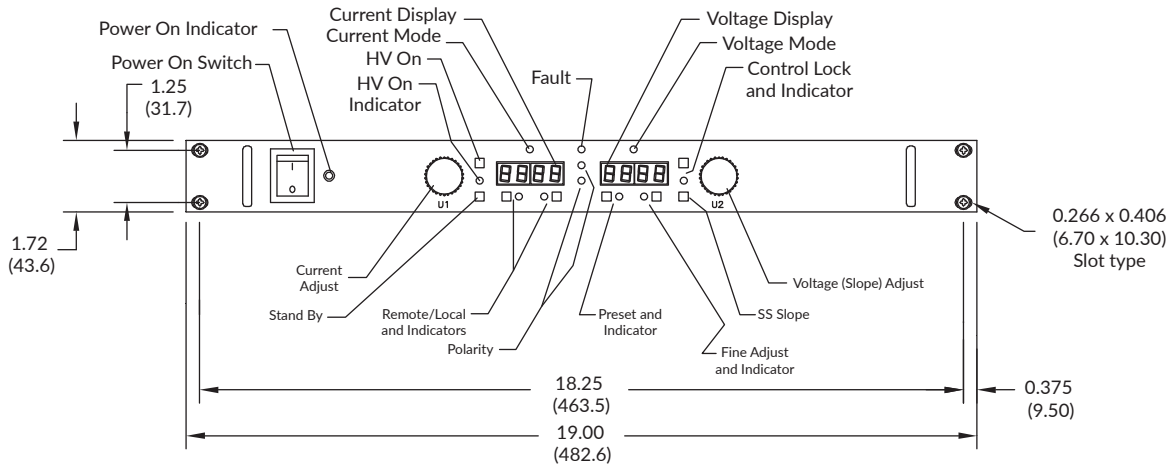
1. For reversible polarity units two high voltage assemblies will be supplied. Cover must be removed to change polarities.

Options

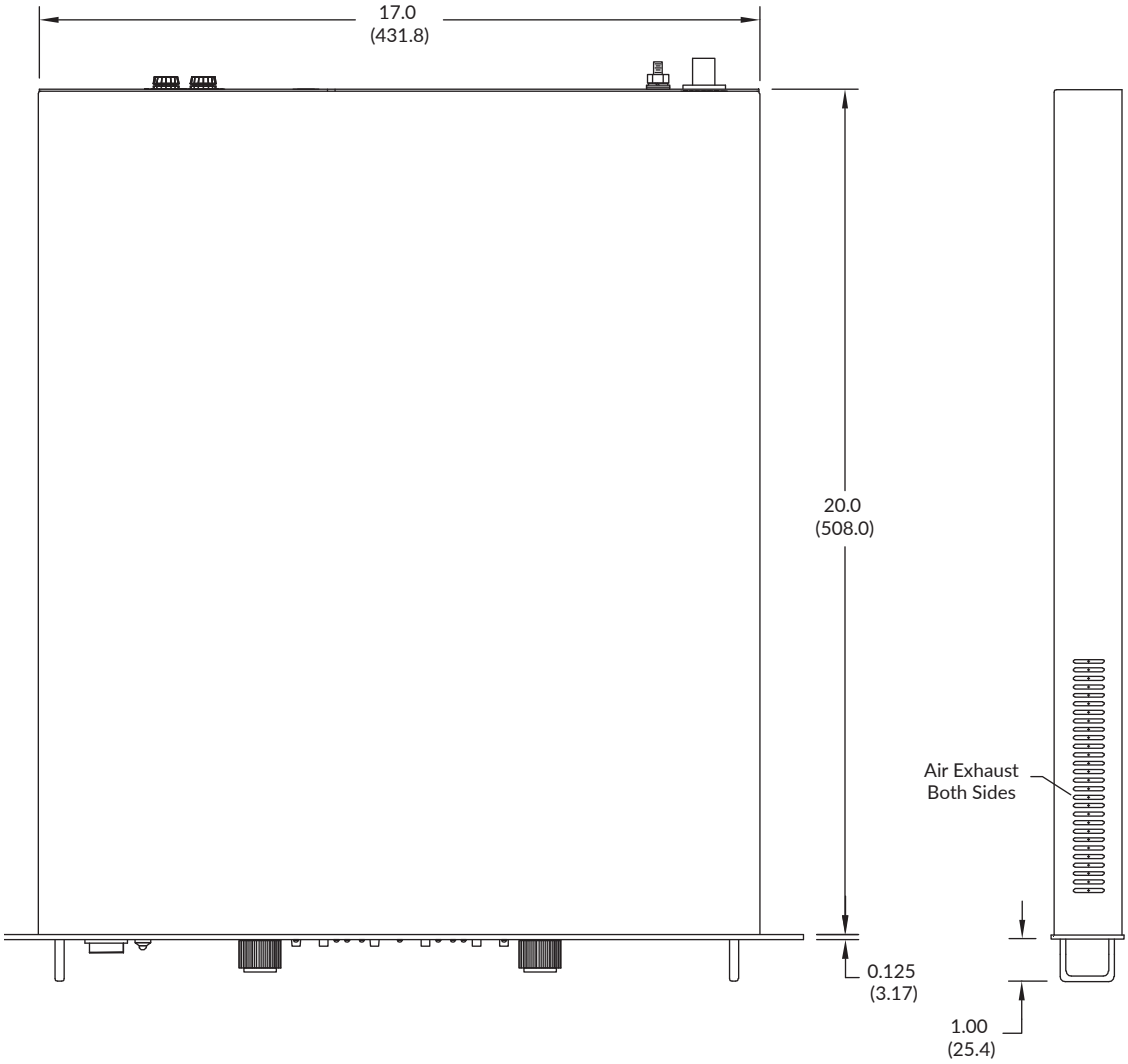
Symbol	Description
-A	100/200VAC ±10%, 48 to 63Hz, Selectable. Shipped set for 200VAC
-22	Required for CE Compliance - AC Input line rated for 198 to 264VAC, 48 to 63Hz. (AC Line voltage selector switch removed) One NEMA 6-15 cord provided
-NC	Blank front panel, power switch and indicator only
-ZR	Zero start interlock. Voltage control, local or remote, must be at zero before the HV will enable
ARC	Arc count and quench as described in the specifications for 1kV to 6kV models
-AC	Arc count only
-AQ	Arc quench only
ETH	Virtual RS-232 COM port over Ethernet network (requires compatible OS (e.g. Windows) for COM drivers)

Mechanical Details

Front View

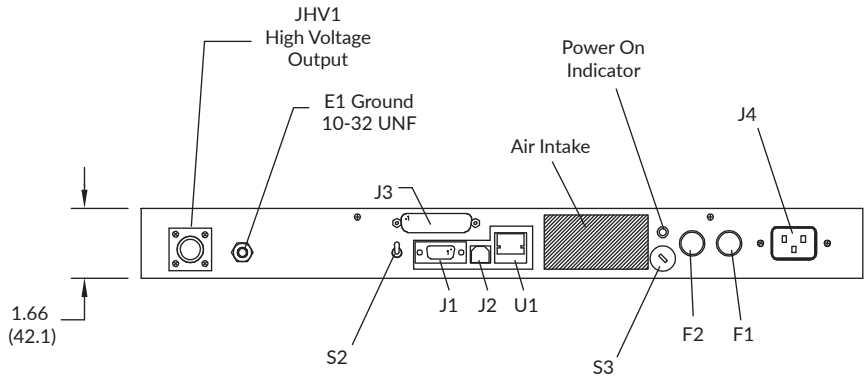


Top View



Mechanical Details

Rear View



J1	
Pin	Function
1	DCD
2	RX
3	TX
4	DTR
5	Common
6	DSR
7	RTS
8	CTS

J2	
Pin	Function
1	+5V
2	-D
3	+D
4	Common

J3	
Pin	Function
1	Ground
2	Common
3	Interlock
4	Reserved
5	Reserved
6	Voltage Program
7	Current Program
8	Common
9	Voltage Monitor
10	Current Monitor

J3	
Pin	Function
11	Common
12	Reference
13	Reserved
14	Reserved
15	Remote HV On
16	Remote HV On
17	Reserved
18	Reserved
19	Reserved
20	HV Enable

J3	
Pin	Function
21	HV Status
22	Fault Status
23	Mode Status
24	Arc Status
25	Ground

U1 OPTION	
Pin	Function
1	+TXD
2	-TXD
3	+RXD
4	+E Power
5	+E Power
6	-RXD
7	-E Power
8	-E Power

J4: Input receptacle C14 per: IEC60320
JHV1: HV Output, 1kV to 5kV Kings SHV 1704-1 or equivalent
6kV to 60kV Amphenol 83-1R-RFX or equivalent
S2: CT/CL select
S3: 115/230VAC selector

Notes:

1. All dimensions are in inches (mm)
2. Weight: 12lbs approx. (5.4kg)