# Powerstax

## Multistax® Series - Premium

*ITE & medical modular power supplies - 400W to 1200W - 1*

- **Up to 1200W in <1U chassis**
- **Efficiency up to 92%**
- **1.5V to 58V standard output voltages**
- **All outputs fully floating**
- **Series / Parallel of Multiple outputs**
- **19" Rack-Mount Version Available**
- **Dual Safety Approvals**
  - **UL/EN60950-1 2nd Edition**
  - **UL/EN60601-1 3rd Edition**

CE RoHS c UL us
E223750
E223749

Multistax® Premium

### POWER SUPPLY DESIGN EXCELLENCE

The Multistax® Premium family of configurable power supplies provides up to 1200W in an extremely compact 1U package. These units are ideally suited to solving complex power system requirements where a full custom design is not an option. The fully floating outputs can be combined in series or parallel (or series-parallel) to achieve virtually any output combination you can imagine.

The Multistax® premium family comprises 2 different chassis, 4 slot 600W and 6 slot 1200W, and a total of 11 output module types giving you almost infinite possibilities to configure the outputs you need. Output voltages may be set manually via a potentiometer or dynamically using the various control inputs.

A bias supply is included to power areas of your circuit needing to be kept on at all times.

The architecture is based upon low loss technologies, thus reducing thermal build-up in your system and providing market leading power densities up to 14.1W/in$^3$ and efficiencies up to 92%.

Each Multistax® premium chassis is a fully functioning power supply. Multiple supplies can be combined into a 1U 19" rack to produce complex system-level power – in a very short time-scale.

The system is fully UL/EN60950-1 2nd Edition as well as UL/EN60601-1 3rd Edition approved and is CE marked to the Low Voltage Directive – meaning that any custom combination immediately carries these approvals.

| CHASSIS NUMBER | MODULE SLOTS | OUTPUT POWER | MAX. INPUT CURRENT [1] | INPUT FUSE [3] | DIMENSIONS mm (inches) |
|---|---|---|---|---|---|
| MF1U-4 | 4 | 600W | 7.5A @ 400W [1] | 8A | 89w x 40.4h x 269.8l (3.5w x 1.6h x 10.6l) |
| MF1U-6 | 6 | 1200W | 11.5A @ 850W [2] | 12A | 127w x 40.4h x 269.8l (5.0w x 1.6h x 10.6l) |

NOTES: 1. 85VAC input, 400W output .
2. 85VAC input, 850W output.
3. 250V HRC, 5 x 20mm.



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## GENERAL SPECIFICATIONS

| INPUT SPECIFICATIONS | |
|---|---|
| Input Voltage Range | 85-264VAC single phase / 120-380VDC |
| Input Frequency Range | 47-440Hz / DC |
| Input Current | see model table |
| Inrush Current @ 230VAC, 25°C | <25A |
| Under Voltage Lockout | 65-74V (shut-down) |
| Leakage Current @250VAC, 60Hz, 25°C | <300µA standard, 150µA option 4 |

| ENVIRONMENTAL SPECIFICATIONS | |
|---|---|
| Temperature Range<br>Operating<br>Storage | <br>-40°C to +70°C, operates to specification below -20°C after 10 mins warm-up<br>-40°C to +85°C |
| Derating | see graphs |
| Humidity | 5-95%RH, non-condensing |
| Cooling | 4-slot - single internal fan, 6-slot - two internal fans |
| Shock | >60G |
| Vibration | MIL-STD810G |
| Reliability @ 40°C, full load | MF1U-4 with 2 x MZA modules - >870kHrs (Telcordia SR-332) |
| Altitude | Up to 3,000m (10,000ft) |

| SAFETY & EMC SPECIFICATIONS | | |
|---|---|---|
| Safety Standards | EN60950-1, UL609501-1, CAS22.2 No.60950-1 2nd Ed. (UL file no. E223750)<br>EN60601-1, UL60601-1, CSA22.2 No.60601-1 3rd Ed. (UL file no. E223749) | |
| Isolation | 1500VAC input - chassis<br>4000VAC input - output<br>500VAC output - output / output - chassis | |
| Emissions<br>(Conducted & Radiated) | Conducted<br>Radiated<br>Harmonic Distortion<br>Flicker & Fluctuation | EN55011, EN55022, FCC - Level B<br>EN55011, EN55022, FCC - Level B<br>EN61000-3-2 Class A Compliant<br>EN61000-3-3 Compliant |
| Immunity | ESD<br>Radiated<br>Fast Transients - Burst<br>Input Line Surges<br>Conducted<br>Voltage Dips | EN61000-4-2 Level 2<br>EN61000-4-3 Level 3<br>EN61000-4-4 Level 3<br>EN61000-4-5 Level 3<br>EN61000-4-6 Level 3<br>EN61000-4-11 Compliant |

| BIAS OUTPUT, SIGNALS & CONTROLS | |
|---|---|
| Bias Supply Voltage, Tolerance | 5VDC, 4.8-5.2VDC |
| Bias Supply Current | 500mA max. |
| AC Fail | >5mS warning, optical isolated 4mA sink current |
| Inhibit [1] | contact closure inhibits all module outputs and fans |
| Enable [1] | contact closure enables all module outputs and fans |

1. bias supply remains on whenever input supply is present.



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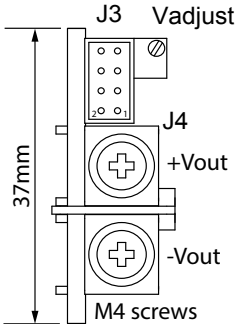
## AVAILABLE MODULES & OUTPUT SPECIFICATIONS

| MODULE NUMBER | Vmin (trim) | Vmin (pot) | Vnom | Vmax | Imax | POWER | REMOTE SENSE | POWER GOOD |
|---|---|---|---|---|---|---|---|---|
| Mz1 | 1.0V | 1.5V | 2.5V | 3.6V | 40.0A | 100W | YES | YES |
| Mz2 | 1.5V | 3.2V | 5.0V | 6.0V | 36.0A | 180W | YES | YES |
| Mz3 | 4.0V | 6.0V | 12.0V | 15.0V | 18.3A | 220W | YES | YES |
| Mz4 | 8.0V | 12.0V | 24.0V | 30.0V | 9.2A | 220W | YES | YES |
| Mz5 | 8.0V | 24.0V | 48.0V | 58.0V | 5.0A | 240W | YES | YES |
| Mz7 | - | 5.0V | 24.0V | 28.0V | 5.0A | 120W | - | YES |
| Mz8 | -<br>- | 5.0V<br>5.0V | 24.0V<br>24.0V | 28.0V<br>28.0V | 3.0A<br>3.0A | 72W<br>72W | -<br>- | YES |
| Mz9 | - | 10.8V | 12.0V | 15.6V | 12.5A | 150W | - | - |
| Mz10 | - | 19.2V | 24.0V | 26.4V | 8.3A | 200W | - | - |
| Mz11 | - | 28.8V | 36.0V | 39.6V | 5.6A | 200W | - | - |
| Mz12 | - | 38.5V | 48.0V | 50.4V | 4.2A | 200W | - | - |

| OUTPUT SPECIFICATIONS | |
|---|---|
| Output Power | see model table |
| Output Voltage(s) | dependent on installed modules |
| Minimum Load | 0A |
| Line Regulation | <±0.1% for ±10% change in input from nominal |
| Load Regulation | <±0.2% for 25% to 75% load change |
| Cross Regulation | <±0.2% for 25% to 75% load change on any other output |
| Ripple & Noise, 20MHz bandwidth | <100mV or 1.0% pk-pk (150mV on Mz9) |
| Overvoltage Protection | 110-150%, latching |
| Overcurrent Protection | Straight line with hiccup activation at <30% of Vnom - 110-160% |
| Remote Sense Compensation | 0.5VDC max (Mz1-Mz5 only) |
| Overshoot | <2% |
| Turn On Delay | AC ON / Global Enable - 300mS nom, Module Enable - 2mS nom |
| Rise Time, monotonic | 15mS nom. |
| Hold Up Time, Vnom, Full Load | 15-20mS |
| Efficiency @ 230VAC, 1200W/24V | 90-92% |

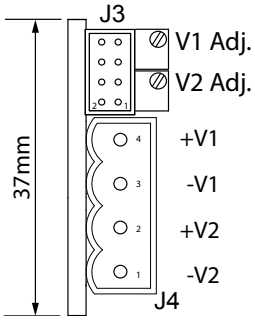
## MODULE CONNECTIONS

### Single Output




| Module | J3 Pin Function | |
|---|---|---|
| Mz1 to Mz5 | 1: +Sense<br>3: Vtrim<br>5: +Inh/En<br>7: +PG | 2: -Sense<br>4: Itrim<br>6: -Inh/En<br>8: -PG |
| Mz7 | 1: -<br>3: -<br>5: -PG<br>7: Inh | 2: -<br>4: Com<br>6: +PG<br>8: Com |
| Mz9 to Mz12 | 1: -<br>3: -<br>5: +Inh<br>7: - | 2: Com<br>4: -<br>6: -Inh<br>8: - |

### Dual Output




| Module | J3 Pin Function | |
|---|---|---|
| Mz8 | 1: -PG V2<br>3: Inh V2<br>5: -PG V1<br>7: Inh V1 | 2: +PG V2<br>4: Com V2<br>6: +PG V1<br>8: Com V1 |

**J3 Mating Connector**
Housing:
Molex 51110-0860 - Locking
Molex 51110-0850 - Non Locking
Crimp Terminal: Molex 50394

**J4 Mating Connector (MZ6 only)**
Camden 9200/4A

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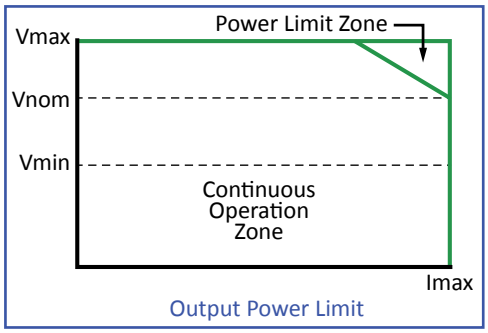
## MODULE POWER LIMITING

Multistax® modules have several levels of protection to ensure that the power supply is not damaged if used under overload conditions. When the output voltage setting (Vset) is less than or equal to the nominal setting (Vnom), the current limiting is at the current limit set point. However if Vset is greater than Vnom, the output power is limited to ensure that the module does not exceed its power rating.

For example, Mz4 is adjustable between 12V and 30V. Imax is 9.2A. Power rating is 220W. At 24V the module can deliver 9.2A continuously, i.e. 240W. At 30V, the module can still deliver 220W, 7.3A continuous.

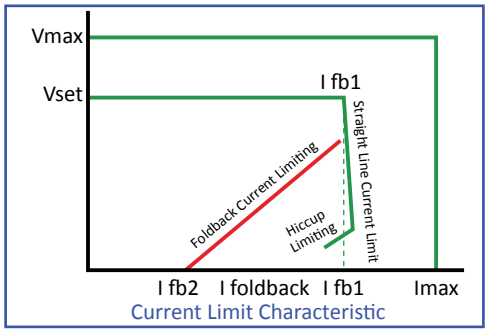


Output Power Limit

## MODULE CURRENT LIMIT PROGRAMMING

A variety of over current protection methods are possible with the Multistax® modules. Modules type Mz1 to Mz7 can be programmed for Straight-line current limiting or Foldback current limiting while modules Mz8 to Mz12 employs only Straight-line current limiting. Simple external application circuits may be used to achieve programmable foldback current and user programmable reduced current limit levels. See the Multistax® Designers' Manual for full details.

The default current limit characteristic is Straight Line Current Limiting.



Current Limit Characteristic

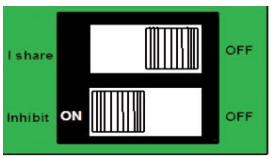
## CURRENT SHARE DETAIL

### Parallel Connection Setup

To parallel connect the following steps must be implemented:

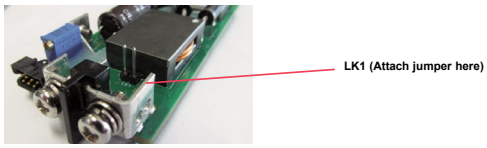
1. Switch on IShare switch to ON for modules Mz1 to Mz5 or add jumper to current share header LK1 for modules Mz9 to Mz12.
2. Connect the Negative Parallel Link.
3. Adjust the output voltages of connected modules to within 5mV of each other.
4. Connect the Positive Parallel Link.

### DIP Switches for Current Share & Inhibit/Enable (Mz1 to Mz5)




DIP switch settings shown above are:
Current share = OFF
Inhibit ON = Normally ON

### LK1 for Current Share (Mz9 to Mz12)




Recommended Jumper for LK1: Harwin M7567-05
(Jumper Socket, Black, 2.54mm, 2-way)

### DIP Switch Option for Mz1 to Mz5

Modules Mz1 to Mz5 can be configured to be normally ON or normally OFF by appropriate setting of the DIP switch. (default mode is normally ON).
The module will deliver output voltage when mains is applied (and the chassis is enabled). The module requires an external 5V signal (between +IN/EN and -IN/EN) to disable the output. This may be reversed by setting of the dip switch to the OFF position.

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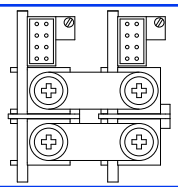
### Voltage Adjustment - Local
The mult-turn potentiometer that adjusts each output within the specified range may be accessed via the output panel of the power supply. Clockwise rotation increases output voltage. Resolution is approximately 5% of nominal voltage (Vnom) per turn.

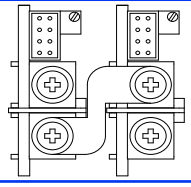
### Voltage Adjustment - Remote (resistive / electronic)
The output voltage may be adjusted or trimmed by means of an external resistor or potentiometer network connected to the Vtrim pin on the J3 connector on the module. Linear Electronic programming is also possible and may be implemented according to the formula Vout = K Vcontrol. See the Designers' Manual for full details.

### Parallel Operation
To achieve increased current capacity, simply parallel outputs using the standard parallel links. Powerstax 'wireless' sharing ensures that current hogging is not possible. See 'current share detail' on previous page.



Standard parallel links can be supplied. To order, please use part number MP1.

### Serial Operation
To achieve increased output voltages, simply series outputs using standard series links, paying attention to the requirements to maintain SELV levels if required in your system.



Standard series links can be supplied. To order, please use part number MS1.

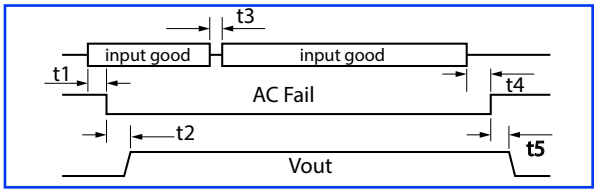
### Remote Sensing
When the load is remote from the power supply, the remote sense pins may be used to compensate for drops in the power leads. Where the power cabling contributes significant dynamic impedance, see Designers' Manual.

### Current Limit Adjustment
The output current limit setting may be adjusted (downwards only) by means of an external resistor connection to the Itrim pin on the J3 connector on the module.

### Bias Voltage (Located in chassis)
A SELV isolated 5V (always on) bias voltage rated at 500mA is provided on J2 to facilitate miscellaneous control functions.

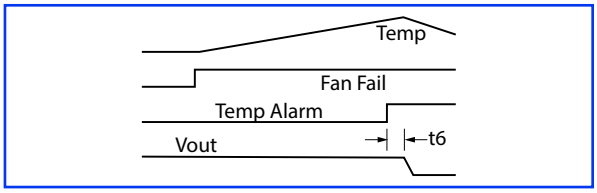
### Inhibit/Enable
Inhibiting may be implemented either globally or on a per module basis (Power Unit or Power Module inhibiting). Reverse logic (Enabling) may also be implemented, see Designers' Manual.

### AC Fail
Open collector signal indicating that the input voltage has failed or is less than 80Vac. This signal changes state giving 5mS of warning before loss of output regulation. See Designers' Manual for full specifications.

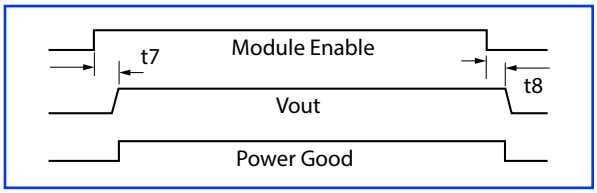



### Temperature Alarm
Open collector signal indicating excessive power unit temperatures due to fan failure or operation beyond ratings. This signal is activated at least 10ms prior to system shut-down.

### Fan Fail
Open collector signal indicating that at least one of the system fans have failed. This does not cause system shut-down.




### Power Good
Opto-isolated output signal indicates that the power module is operating correctly and output voltage is within normal band. Opto transistor ON = Good.




### Indication LEDs
Each Power Module has a visual indicator to identify that it is operating within normal ratings. Very useful for system diagnosis.

### Connecting to Capacitive Loads
When connecting Multistax® units to capacitive loads external blocking diodes of appropriate current capacity must be used.



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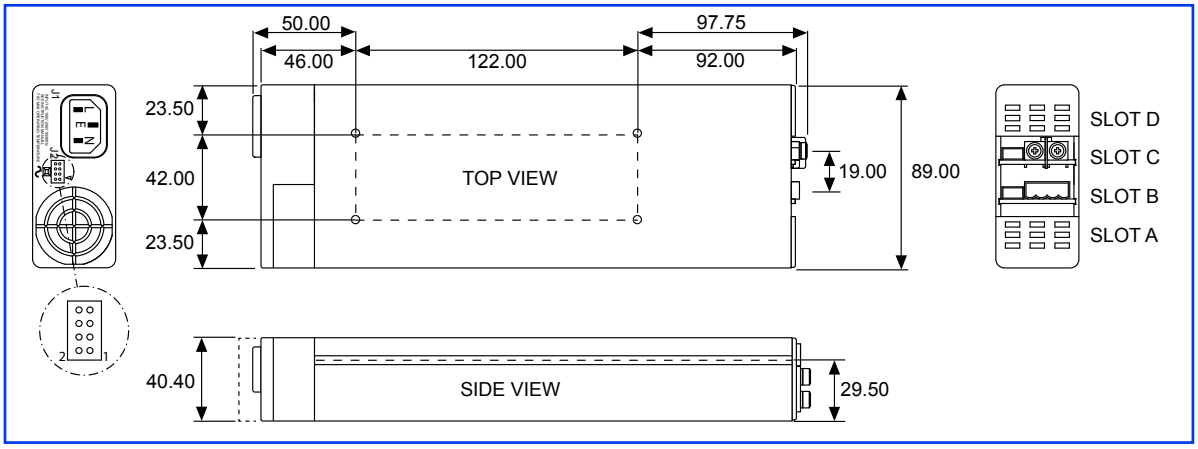
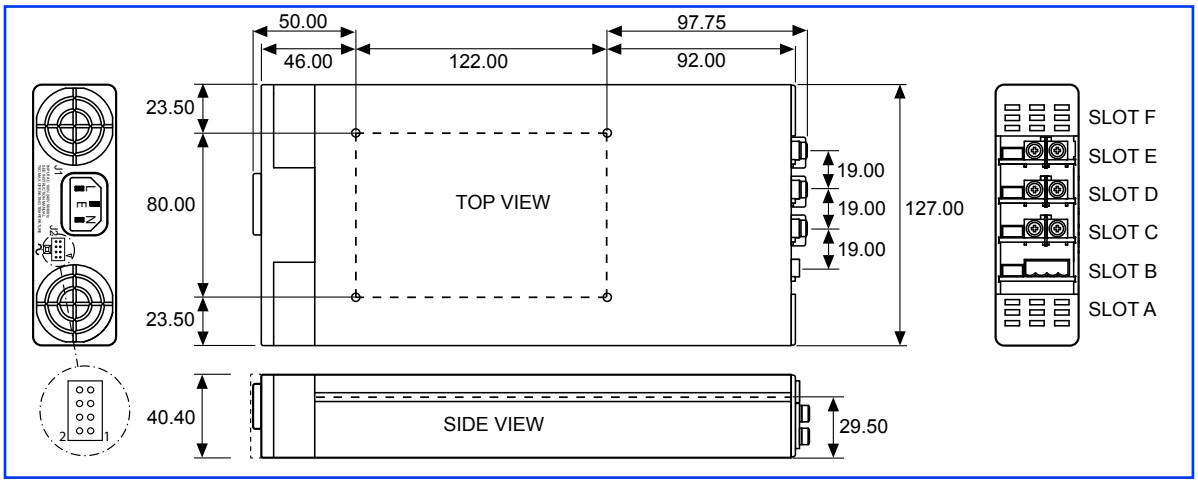
## MECHANICALS - MF1U-4




## MECHANICALS - MF1U-6




Drawings are third angle projections.
All dimensions are in mm.

| J2 Pin Function | |
|---|---|
| 1: Common | 2: +5V Bias |
| 3: - | 4: AC Fail |
| 5: Fan Fail | 6: Global Enable |
| 7: Temp. Alarm | 8: Global Inhibit |

**Mounting Holes**
4 x M4 threaded holes on Base.
Max screw penetration is 6mm from Base.

**Fleximount Side Mounting Slots**
Use with self-clinching PEM studs type FH-M4-X
or FH-832-X (X= stud length) or equivalent

**IEC to Screw Terminal Adaptor**
Order part number **MC1**

**J2 Mating Connector**
Housing: Molex 51110-0860 - Locking
Molex 51110-0850 - Non Locking
Crimp Terminal: Molex 50394

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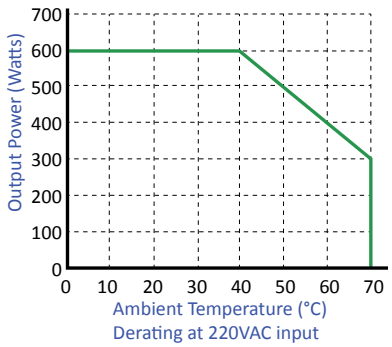
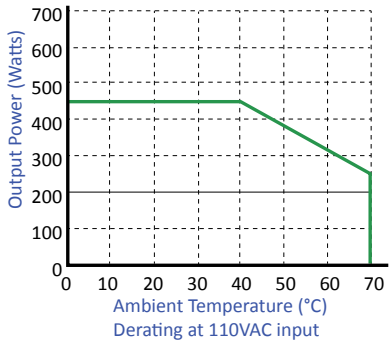
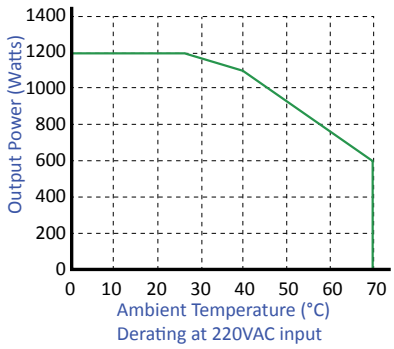
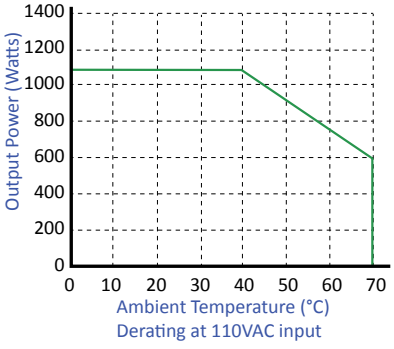
## DERATING CURVES - MF1U-4




## DERATING CURVES - MF1U-6




## MODEL NUMBER CONFIGURATION GUIDE

**MF1U-wxxxx(xx)-yyyy-zzzz**

- **Type**
- **No. of Slots (4 or 6)**
- **Output Modules Fitted**
- **Output Setting (see table)**
- **Customer Special Code (omit if not used)**
- **Input Type (0=IEC, D=Cable)**
- **Options (see table)**
- **Ruggedisation (see table)**

| OUTPUT SETTING | |
|---|---|
| C | Custom Setting |
| - | Default Voltage |

| RUGGEDISATION | |
|---|---|
| C | Conformal Coating |
| - | |

| OPTIONS | |
|---|---|
| 2 | Reverse Fan |
| 4 | 150µA Leakage |
| 6 | Reverse Fan + 150µA Leakage |
| 0 | No options |

### Pre-set Units

Units are shipped with nominal output voltages unless pre-setting is specified.
Powerstax can pre-set units to exact customer requirements through use of appropriate parallel and series links as well as voltage adjustment to specific pre-set levels.

All specifications are typical at nominal line input, full load and 25°C unless otherwise stated.

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