Programmable DC Power Supplies
200W/400W/600W/800W in 2U
Built-in USB, RS-232 & RS-485 Interface
Optional Interface: LAN
IEEE488.2 SCPI (GPIB) Multi-Drop
Isolated Analog Programming

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Features Include:

- High Power Density 200W/400W/600W/800W in 2U: 3.5 Inch (89mm) height
- Wide Range Input (85-265Vac continuous)
- Active Power Factor Correction (0.99 typical)
- Output Voltage up to 650V, Current up to 5A
- Constant Voltage (CV)/(CC) Constant Current auto-crossover
- Built-in RS-232/RS-485 Interface Standard
- Global Commands for Serial RS-232/RS-485 Interface
- Auto-Re-Start / Safe-Start: user selectable
- Last-Setting Memory
- High Resolution 16 bit ADCs & DACs
- Low Ripple & Noise
- Front Panel Lock selectable from Front Panel or Software
- Reliable Encoders for Voltage and Current adjustment
- Parallel Operation with Active Current Sharing, for up to six identical units
- Advanced Parallel Master / Slave. Total Current is programmed and measured via the Master
- External Analog Programming and Monitoring (user selectable 0-5V & 0-10V)
- Reliable Modular and SMT Design
- 19" Rack Mount Capability for ATE and OEM applications
- Optional Interfaces
  - Isolated Analog Programming and Monitoring Interface (0-5V/0-10V & 4-20mA)
  - IEEE 488.2 SCPI (GPIB) Multi-Drop
  - LAN
  - LabView® and LabWindows® drivers
- Arbitrary functions for:
  - Automotive or laser simulation / 4 Pre-Programmed Functions
- Fast Command Processing Time
- Output Sequencing
- Four-cell Memory Settings
- User Programmable Signal Pins

- Five Year Warranty
- Worldwide Safety Agency Approvals; CE Mark for LVD and EMC regulations
Front Panel Description

1. AC ON/OFF Switch
2. Air Intake allows zero stacking for maximum system flexibility and power density.*
3. Reliable encoder controls Output Voltage and power supply setting.
4. Volt Display shows Output Voltage and directly displays and power supply settings.
5. Reliable encoder controls Output Current, and power supply setting.
6. Current Display shows Output Current and power supply setting.
7. Function/Status LEDs:
   - Alarm
   - Foldback Mode
   - Fine Control
   - Remote Mode
   - Preview Settings
   - Output On
8. Pushbuttons allow flexible user configuration
   - Coarse and Fine adjustment of Output Voltage/Current and Advanced Parallel Master or Slave
   - Preview settings and set Voltage/Current with Output OFF, Front Panel Lockout
   - Set OVP, UVP, UVL Limits
   - Set Current Foldback
   - Local/Remote Mode and select Address and Baud Rate
   - Output ON/OFF and Auto-Start/Safe-Start Mode
   - Menu
9. Optional front panel insulated output sockets (Ø 4mm) for modules up to 650V: 5A Max

* Zero stacking - side-by-side mounting of 6 units in a 19" Rack
Rear Panel Description

1. Connector allows (Non-isolated) Analog Program and Monitor and other functions.
2. Remote/Local Output Voltage Sense Connections.
3. Signal Connector
5. RS-485 OUTPUT to other Z+ Power Supplies.
6. USB Interface
7. Wide-Range Input 85-265VAC continuous, 47/63Hz with Active Power Factor Correction (0.99 typical) 
   AC Input Connector: IEC320 -C16.
8. Exhaust air exits at the back. Allows vertical stacking of units without any separation between units 
9. Output Connections:
   MALE CONNECTOR (IC 2,5/ 4-G-5,08 , PHOENIX CONTACT).
   FEMALE PLUG (IC 2,5/4-ST-5,08, PHOENIX CONTACT).
10. Optional Interface Position for LAN Interface.
11. Optional Interface Position for GPIB Interface (shown) or Isolated Analog Interface.
**Power Benchtop Parallel and Series Configurations**

**Benchtop Power Supply**
Parallel operation - Master/Slave:
Active current sharing allows up to six identical units to be connected in an auto-parallel configuration for six times the output power.
In Advanced Parallel Master/Slave Mode, total current is programmed and reported by the Master, Up to six supplies act as one.

**Series operation**
Up to two units may be connected in series to increase the output voltage or to provide bipolar output.

**Remote Programming via Built-in USB, RS-232 & RS-485 Interface**
Standard Serial Interface allows daisy chain control of up to 31 power supplies on the same bus with built-in RS-232 & RS-485 Interface.

**Optional Interface:**
**LAN & IEEE488.2 SCPI (GPIB)**
Multi-Drop
Allows LAN/IEEE Master to control up to 31 slaves over RS-485 daisy-chain
Only the Master needs be equipped with LAN/IEEE Interface.

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**USB**  
**RS-232**  
**RS-485**  
**LAN**  
**IEEE**
Applications
$Z^+$ series power supplies have been designed to meet the demands of a wide variety of applications.

Test and Measurement
Built-in Last-Setting memory based on Flash Memory
no battery or capacitor backup. Simplifies test design and requirements.
Built-in RS-232/RS-485 gives maximum system flexibility along with 0-5V and 0-10V, selectable analog programming.
Wide range of available inputs allows testing of many different devices.

Semiconductor Burn-in
Safe-Start mode ENABLED - to re-start at Output OFF to protect load.
Wide range input (85-265Vac) with Active Power Factor correction rides through input transients easily.

Component Test
High power density, zero stacking and single wire parallel operation, give maximum system flexibility.

Laser Diode
OVP is directly set on Voltage Display, assuring accurate protection settings.
Fast Constant Current response, no over shoot. Current Limit Fold Back assures load is protected from current surges.

Heater Supplies
Smooth, reliable encoders enhance front panel control.
Remote analog programming is user selectable 0-5V or 0-10V.

RF Amplifiers and Magnets
Robust design assures stable operation under a wide variety of loads. High linearity in Voltage & Current mode.

$Z^+$ Series Sequence Programming Applications:

MILITARY STANDARD 704E Testing

Reset behaviour at voltage drop

Discontinuities in supply voltage
Momentary drop in supply voltage
**Options: (200W/400W/600W/800W)**

**Front Panel insulated Output sockets**
Up to 650V Output Module
P/N: Z_ _ - _ _ - L2

Optional front panel insulated output sockets (Ø 4mm) for modules up to 650V: 5A Max - L2

**Z⁺ Assemblies**
Dual Output Housing (for 105mm) 200W/400W/600W/800W
Triple Output Housing (for 70mm) 200W/400W/600W/800W
P/N: Z-NL200 (same p/n for both Dual & Triple Output Housing)

**19” Rack Mounted to 4.8kW**
Six units (70mm) can be assembled into 19-Inch rack/2U high
Four units (105mm) can be assembled into 19-Inch rack/2U high to meet your configuration requirements.
In cases where the entire rack is not occupied with power units, P/N: Z-BP for 70mm, P/N: Z-WBP for 105mm blank panels can be installed:
P/N: Z-NL100

**Power Modules Table**

<table>
<thead>
<tr>
<th>Module Type</th>
<th>200W</th>
<th>400W</th>
<th>600W</th>
<th>800W</th>
</tr>
</thead>
<tbody>
<tr>
<td>0~160V</td>
<td>1.3A</td>
<td>2.6A</td>
<td>4A</td>
<td>5A</td>
</tr>
<tr>
<td>0~320V</td>
<td>0.65A</td>
<td>1.3A</td>
<td>2A</td>
<td>2.5A</td>
</tr>
<tr>
<td>0~650V</td>
<td>0.32A</td>
<td>0.64A</td>
<td>1A</td>
<td>1.25A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19” rack width</th>
<th>1/6 width</th>
<th>1/6 width</th>
<th>1/6 width</th>
<th>1/6 width</th>
</tr>
</thead>
<tbody>
<tr>
<td>19” rack width</td>
<td>1/4 width</td>
<td>1/4 width</td>
<td>1/4 width</td>
<td>1/4 width</td>
</tr>
</tbody>
</table>
**Programming Options (Factory Installed)**

**Digital Programming via IEEE Interface**

- IEEE 488.2 SCPI Compliant
- Program Voltage
- Measure Voltage
- Over Voltage setting and shutdown
- Error and Status Messages
- Multi-Drop
  - Allows IEEE Master to control up to 31 slaves over RS-485 daisy-chain
  - Only the Master needs be equipped with IEEE Interface

**Isolated Analog Programming**

Four Channels to Program and Monitor Voltage and Current.

Isolation allows operation with floating references in harsh electrical environments.

Choose between programming with Voltage or Current.

Connection via removable terminal block: Phoenix MC1.5/8-ST-3.81.

- Power Supply Voltage and Current Programming Accuracy ±1%
- Power Supply Voltage and Current Monitoring Accuracy ±1.5%

**LAN Interface**

- VISA & SCPI Compatible
- TCP / UDP Socket Programming
- Address Viewable on Front Panel
- LAN Fault Indicators
- Auto-detects LAN Cross-over Cable
- Fast Startup

### AC Cord

<table>
<thead>
<tr>
<th>Region</th>
<th>Europe</th>
<th>Japan</th>
<th>North America</th>
<th>Israel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Power</td>
<td>850W</td>
<td>850W</td>
<td>850W</td>
<td>850W</td>
</tr>
<tr>
<td>AC Cords</td>
<td>10A/250Vac</td>
<td>15A/125Vac</td>
<td>13A/125Vac</td>
<td>10A/250Vac</td>
</tr>
<tr>
<td>Wall Plug</td>
<td>INT’L 7/VII</td>
<td>JIS C8303</td>
<td>NEMA 5-15P</td>
<td>SI-32</td>
</tr>
<tr>
<td>Power Supply</td>
<td>IEC320-C15</td>
<td>IEC320-C15</td>
<td>IEC320-C15</td>
<td>IEC320-C15</td>
</tr>
<tr>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Communication Cable**

RS-232/RS-485 Cable is used to connect the power supply to the PC Controller

<table>
<thead>
<tr>
<th>Mode</th>
<th>RS-485</th>
<th>RS-232</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC Connector</td>
<td>DB-9F</td>
<td>DB-9F</td>
</tr>
<tr>
<td>Communication Cable</td>
<td>Shield Ground L=2m</td>
<td>Shield Ground L=2m</td>
</tr>
<tr>
<td>Power Supply Connector</td>
<td>EIA/TIA-568A (RJ-45)</td>
<td>EIA/TIA-568A (RJ-45)</td>
</tr>
<tr>
<td>P/N</td>
<td>Z/485-9</td>
<td>Z/232-9</td>
</tr>
</tbody>
</table>

**Serial Link Cable**

Daisy-chain up to 31 Z+ Series power supplies.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Power Supply Connector</th>
<th>Communication Cable</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-485</td>
<td>EIA/TIA-568A (RJ-45)</td>
<td>Shield Ground</td>
<td>Z/RJ45</td>
</tr>
</tbody>
</table>

* Included with power supply
Power Supply Identification / Accessories

How to order

<table>
<thead>
<tr>
<th>Z</th>
<th>650 -</th>
<th>1.25-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
</table>
| Series Name | Output Voltage (0~650V) | Output Current (0~1.25A) | Factory Options: Output Jack | AC cord Options: Region:
| | | | IEEE | LAN |
| | | | | IS510 |
| | | | | IS420 |
| | | | L2 | E - Europe |
| | | | | J - Japan |
| | | | | U - North America |
| | | | | I - Middle East |
| | | | | C - China |

Factory option

USB Interface built-in Standard: -
RS-232/RS-485 Interface built-in Standard: -
GPIB Interface: IEEE
Voltage Programming Isolated Analog Interface: IS510
Current Programming Isolated Analog Interface: IS420
LAN Interface: LAN
Front panel insulated output sockets (Ø 4mm) for modules up to 650V or 5A Max: L2

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage (VDC)</th>
<th>Output Current (A)</th>
<th>Output Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z160-1.3</td>
<td>0~160 VDC</td>
<td>0~1.3</td>
<td>208</td>
</tr>
<tr>
<td>Z160-2.6</td>
<td>0~160 VDC</td>
<td>0~2.6</td>
<td>416</td>
</tr>
<tr>
<td>Z160-4</td>
<td>0~160 VDC</td>
<td>0~4</td>
<td>640</td>
</tr>
<tr>
<td>Z160-5</td>
<td>0~160 VDC</td>
<td>0~5</td>
<td>800</td>
</tr>
<tr>
<td>Z320-0.65</td>
<td>0~320 VDC</td>
<td>0~0.65</td>
<td>208</td>
</tr>
<tr>
<td>Z320-1.3</td>
<td>0~320 VDC</td>
<td>0~1.3</td>
<td>416</td>
</tr>
<tr>
<td>Z320-2</td>
<td>0~320 VDC</td>
<td>0~2</td>
<td>640</td>
</tr>
<tr>
<td>Z320-2.5</td>
<td>0~320 VDC</td>
<td>0~2.5</td>
<td>800</td>
</tr>
<tr>
<td>Z375-2.2</td>
<td>0~375 VDC</td>
<td>0~2.2</td>
<td>825</td>
</tr>
<tr>
<td>Z650-0.32</td>
<td>0~650 VDC</td>
<td>0~0.32</td>
<td>208</td>
</tr>
<tr>
<td>Z650-0.64</td>
<td>0~650 VDC</td>
<td>0~0.64</td>
<td>416</td>
</tr>
<tr>
<td>Z650-1</td>
<td>0~650 VDC</td>
<td>0~1</td>
<td>650</td>
</tr>
<tr>
<td>Z650-1.25</td>
<td>0~650 VDC</td>
<td>0~1.25</td>
<td>812</td>
</tr>
</tbody>
</table>
Z²200 Series Specifications

**Model**

<table>
<thead>
<tr>
<th>Z</th>
<th>160-1.3</th>
<th>320-0.65</th>
<th>650-0.32</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rated output voltage (*1)</td>
<td>V</td>
<td>160</td>
<td>320</td>
</tr>
<tr>
<td>2. Rated output current (*2)</td>
<td>A</td>
<td>1.3</td>
<td>0.65</td>
</tr>
<tr>
<td>3. Rated output power</td>
<td>W</td>
<td>208</td>
<td>208</td>
</tr>
</tbody>
</table>

**Constant Voltage Mode**

<table>
<thead>
<tr>
<th>Z</th>
<th>160-1.3</th>
<th>320-0.65</th>
<th>650-0.32</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Max. Line regulation (*6)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2. Max. Load regulation (*7)</td>
<td>---</td>
<td>0.01% of rated output voltage</td>
<td>0.15% of rated output current</td>
</tr>
<tr>
<td>3. Ripple r.m.s., 5Hz~1MHz (*14)</td>
<td>mV</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>4. Ripple r.m.s., 5Hz~1MHz (*14)</td>
<td>mV</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>5. Temperature coefficient PPM/°C</td>
<td>---</td>
<td>0.02% of rated output voltage over 30 minutes warm-up</td>
<td>---</td>
</tr>
<tr>
<td>6. Temperature stability</td>
<td>---</td>
<td>Less than +/-0.1% of rated output current over 30 minutes following power on</td>
<td>---</td>
</tr>
<tr>
<td>7. Warm-up drift</td>
<td>---</td>
<td>Less than 0.05% of rated output voltage over 30 minutes following power on</td>
<td>---</td>
</tr>
<tr>
<td>8. Remote sense compensation/wire</td>
<td>V</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>9. Up-prog. Response time: 0~Vomax (*9)</td>
<td>mS</td>
<td>100</td>
<td>170</td>
</tr>
<tr>
<td>10. Down-prog. response time: Full load (*9)</td>
<td>mS</td>
<td>180</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>No load (*10)</td>
<td>S</td>
<td>2</td>
</tr>
</tbody>
</table>

**Protective Functions**

<table>
<thead>
<tr>
<th>Z</th>
<th>160-1.3</th>
<th>320-0.65</th>
<th>650-0.32</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Foldback protection</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2. Over-voltage protection (OVP)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3. Over-voltage trip point</td>
<td>V</td>
<td>5~176</td>
<td>5~353</td>
</tr>
<tr>
<td>4. Output under voltage limit (UVL)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5. Output under voltage protection (UVP)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6. Over temperature protection</td>
<td>---</td>
<td>User selectable, latched or non latched.</td>
<td>---</td>
</tr>
</tbody>
</table>

**Analog Programming and Monitoring**

<table>
<thead>
<tr>
<th>Z</th>
<th>160-1.3</th>
<th>320-0.65</th>
<th>650-0.32</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vout voltage programming</td>
<td>---</td>
<td>0<del>100%, 0</del>5V or 0~10V user selectable. Accuracy and linearity: +/-0.5% of rated Vout.</td>
<td>0<del>100%, 0</del>5V or 0~10V user selectable. Accuracy and linearity: +/-0.5% of rated Vout.</td>
</tr>
<tr>
<td>2. Vout voltage programming (*13)</td>
<td>---</td>
<td>0<del>100%, 0</del>5V or 0~10V user selectable. Accuracy and linearity: +/-0.5% of rated Vout.</td>
<td>0<del>100%, 0</del>5V or 0~10V user selectable. Accuracy and linearity: +/-0.5% of rated Vout.</td>
</tr>
<tr>
<td>3. Vout resistor programming</td>
<td>---</td>
<td>0<del>100%, 0</del>5/10Kohm full scale, user selectable. Accuracy and linearity: +/-1% of rated Vout.</td>
<td>---</td>
</tr>
<tr>
<td>4. Vout resistor programming (*13)</td>
<td>---</td>
<td>0<del>100%, 0</del>5/10Kohm full scale, user selectable. Accuracy and linearity: +/-1% of rated Vout.</td>
<td>---</td>
</tr>
<tr>
<td>5. Shunt (SO) control</td>
<td>---</td>
<td>By electrical Voltage: 0<del>0.6V/4</del>15V or dry contact, user selectable logic.</td>
<td>---</td>
</tr>
<tr>
<td>6. Output current monitor (*13)</td>
<td>---</td>
<td>0<del>5V or 0</del>10V user selectable. Accuracy: +/-1%.</td>
<td>---</td>
</tr>
<tr>
<td>7. Output voltage monitor</td>
<td>---</td>
<td>0<del>5V or 0</del>10V user selectable. Accuracy: +/-1%.</td>
<td>---</td>
</tr>
<tr>
<td>8. Power supply OK signal</td>
<td>---</td>
<td>4~5V-OK, 0V-Fail. 500ohm series resistance.</td>
<td>---</td>
</tr>
<tr>
<td>9. Parallel operation (*8)</td>
<td>---</td>
<td>Possible, up to 6 units in master/slave mode with single wire current balance connection.</td>
<td>---</td>
</tr>
<tr>
<td>10. Series operation</td>
<td>---</td>
<td>2 identical units (with external diodes).</td>
<td>---</td>
</tr>
<tr>
<td>11. CV/CC indicator</td>
<td>---</td>
<td>Open collector, CC mode: On, CV mode: Off. Maximum voltage: 30V, maximum sink current: 10mA</td>
<td>---</td>
</tr>
<tr>
<td>12. Interlock (ILC) control</td>
<td>---</td>
<td>Enables/Disables the PS output by dry contact (Short: On, Open: Off). Source current: less than 3mA.</td>
<td>---</td>
</tr>
<tr>
<td>13. Local/Remote mode Control</td>
<td>---</td>
<td>By electrical signal or Open/Short: 0<del>0.6V or short: Remote, 2</del>15V or open: Local</td>
<td>---</td>
</tr>
<tr>
<td>14. Local/Remote mode Indicator</td>
<td>---</td>
<td>Open collector (shunted by 36V zener). On 0~0.6V, maximum sink current max.2xRemote. Off 30V max.</td>
<td>---</td>
</tr>
<tr>
<td>15. Trigger out</td>
<td>---</td>
<td>Maximum low level output =0.8V. Maximum high level output =3.8V.</td>
<td>Maximum high level output =5V.</td>
</tr>
<tr>
<td>16. Trigger in</td>
<td>---</td>
<td>Maximum high level input =1.2V. Minimum high level input =3.8V. Maximum high level input =5V.</td>
<td>Maximum high level input =5V.</td>
</tr>
<tr>
<td>17. Programmed signal 1</td>
<td>---</td>
<td>Open collector, maximum voltage 25V, maximum sink current 20mA. (Shunted by 27V zener)</td>
<td>---</td>
</tr>
<tr>
<td>18. Programmed signal 2</td>
<td>---</td>
<td>Open collector, maximum voltage 25V, maximum sink current 20mA. (Shunted by 27V zener)</td>
<td>---</td>
</tr>
</tbody>
</table>

**Front Panel**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>Multiple options with 2 Encoders</td>
</tr>
<tr>
<td>---</td>
<td>Vout/fout manual adjust</td>
</tr>
<tr>
<td>---</td>
<td>OVP/UVP/UVP manual adjust</td>
</tr>
<tr>
<td>---</td>
<td>Protection Functions - OVP, UVP, UVP, Foldback, OCP, INT, SO</td>
</tr>
<tr>
<td>---</td>
<td>Communication Functions - Selection of LAN/IEEE (*17), RS232, RS485, USB</td>
</tr>
<tr>
<td>---</td>
<td>Communication Functions - Selection of Baud Rate, Address</td>
</tr>
<tr>
<td>---</td>
<td>Analog Control Functions - Selection Voltage/resistive programming, 5V/10V, 5K/10K programming</td>
</tr>
<tr>
<td>---</td>
<td>Analog Control Functions - Selection of Voltage/Current Monitoring 5V/10V, Output ON/OFF, Front Panel Lock</td>
</tr>
</tbody>
</table>
2. Display --- Vout: 4 digits, accuracy: 0.5% of rated output voltage +/-1 count. 
--- Iout: 4 digits, accuracy: 0.5% of rated output current +/-1 count.
3. Indications --- GREEN LED: FINE, MENU, PREV, PROT, REM, OUTPUT, CV, CC.
--- RED LED: PROT (OVP, UVP, OTP, FOLD, AC FAIL).
4. Function buttons --- FINE, MENU, PREV, PROT, REM, OUTPUT.

**PROGRAMMING AND READBACK (RS232/485, USB, Optional: IEEE**[17], LAN)**

1. Vout programming accuracy --- 0.05% of actual + 0.05% of rated output voltage
2. Vout programming accuracy (*13) --- 0.2% of rated output current
3. Vout programming resolution --- 0.012% of full scale
4. Vout programming resolution --- 0.012% of full scale
5. Vout readback accuracy --- 0.05% of actual + 0.05% of rated output voltage
6. Vout readback accuracy (*13) --- 0.1% of actual +0.5% of rated output current
7. Vout readback resolution --- 0.012% of full scale
8. Vout readback resolution --- 0.012% of full scale

**INPUT CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Z</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>160V≤Vout≤650V</td>
<td>1.3</td>
<td>320-0.65</td>
</tr>
<tr>
<td>2.</td>
<td>85<del>265Vac continuous, 47</del>63Hz, single phase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>2.64/1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>2.64/1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>&gt;0.99 at 100Vac, &gt;0.98 at 200Vac, 100% load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>79/81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>79/81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL CONDITIONS**

| 1. | Operating temperature --- 0~50°C, 100% load. |
| 2. | Storage temperature --- -20~85°C |
| 3. | Operating humidity %  |
| 4. | Storage humidity % |
| 5. | Altitude --- Maximum 3000m. Derate ambient temp above 2000m. |
| 6. | Power Factor (Typ) --- Less than 2mS. |
| 7. | For load voltage change, equal to the unit voltage rating, constant input voltage. |
| 8. | For parallel operation more than 4 units, 20% of total output current is required. |
| 9. | Ripple is measured at 10~100% of rated output voltage and rated output current. |
| 10. | Ripple r.m.s. 5Hz~1MHz (*14) mV |
| 11. | Remote sense compensation/wire V |
| 12. | Warm-up drift --- Less than 0.05% of rated output voltage over 30 minutes following power on. |
| 13. | Max. Line regulation (*6) --- 0.02% of rated output voltage |
| 14. | Ripple and noise (p-p, 20MHz) (*14) mV |
| 15. | Output under voltage protection (UVP) --- |
| 16. | Over-voltage protection (OVP) --- Inverter Shut down method. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port. |
| 17. | Temperature stability --- 0.05% of rated Iout over 8hrs. interval following 30 minutes warm-up. Constant line, load & temperature. |
| 18. | Temperature coefficient PPM/°C 100PPM/°C from rated output current, following 30 minutes warm-up. |
| 19. | Up-prog. Response time, 0~Vomax.(*9) mS 110 170 170 |
| 20. | Shut Off (SO) control --- By electrical Voltage: 0~0.6V/4~15V or dry contact, user selectable logic. |
| 21. | Iout resistor programming (*13) --- 0~100%, 0~5/10Kohm full scale, user selectable. Accuracy and linearity: +/-1.5% of rated Iout. |
| 22. | Output under voltage protection (UVP) --- |
| 23. | Vout resistor programming --- 0~100%, 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-0.5% of rated Vout. |
| 24. | Constant Current Mode |
| 25. | Hold-up time (*19) --- 16mSec Typical. 15mSec Typical. |
| 26. | Trigger in --- Maximum low level input =1.2V, Minimum high level input =3.5V, Maximum high level input =5V, |
| 27. | Trigger out --- Maximum low level output =0.8V, Minimum high level output =3.8V, Maximum high level output =5V, |

**NOTES:**

*1: Minimum voltage is guaranteed to maximum 0.1% of rated output voltage.
*2: Minimum current is guaranteed to maximum 0.2% of rated output current.
*3: For cases where conformance to various safety standards (UL, IEC, etc...) is required, to be described as 100-240Vac (50/60Hz).
*4: Ta=25°C with rated output power.
*5: Not including EMI filter inrush current, less than 0.2mSec at cold start Ta=25°C.
*6: At 85~132Vac or 170~265VAC, constant load.
*7: From No-Load to Full-Load, constant input voltage. Measured at the sensing point in Remote Sense.
*8: For parallel operation up to 4 units, 5% of total output current is required. For parallel operation more than 4 units, 20% of total output current is required.
*9: From 10% to 90% or 90% to 10% of Rated Output Voltage, with rated resistive load.
*10: From 90% to 10% of Rated Output Voltage.
*11: For load voltage change, equal to the unit voltage rating, constant input voltage.
*12: Ripple is measured at 10~100% of rated output voltage and rated output current.
*13: The Constant Current programming, readback and monitoring accuracy do not include the warm-up and Load regulation thermal drift.
*14: Measured with 10:1 probe.
*15: PS with Lan, IEEE, models decrease efficiency by 0.5% and increase input current by 0.5%.
*16: At rated output power.
*17: Max. ambient temperature for using IEEE is 45°C.
*18: P.S with Lan, IEEE models decrease efficiency by 0.5% and increase input current by 0.5%.
*19: For load voltage change, equal to the unit voltage rating, constant input voltage.
*20: For parallel operation more than 4 units, 20% of total output current is required.
*21: Measured at 10:1 probe.
*22: Ripple is measured at 10~100% of rated output voltage and rated output current.
*23: The Constant Current programming, readback and monitoring accuracy do not include the warm-up and Load regulation thermal drift.
*24: Measured with 10:1 probe.
*25: PS with Lan, IEEE, models decrease efficiency by 0.5% and increase input current by 0.5%.
*26: At rated output power.
*27: Max. ambient temperature for using IEEE is 45°C.
# Z'400 Series Specifications

## Constant Voltage Mode

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Z</th>
<th>160-2.6</th>
<th>320-1.3</th>
<th>650-0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Max. Line regulation (*6)</td>
<td>---</td>
<td>0.01% of rated output voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Load regulation (*7)</td>
<td>---</td>
<td>0.01% of rated output voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ripple and noise (p-p, 20MHz) (*14)</td>
<td>mV</td>
<td>100</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>4. Ripple r.m.s. S/N=1MHz (*14)</td>
<td>mV</td>
<td>10</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>5. Temperature coefficient PPM/°C</td>
<td>30PPM/°C from rated output voltage, following 30 minutes warm-up.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Temperature stability</td>
<td>---</td>
<td>0.02% of rated output over 8hrs. interval following 30 minutes warm-up. Constant line, load &amp; temp.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Constant Current Mode

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Z</th>
<th>160-2.6</th>
<th>320-1.3</th>
<th>650-0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Max. Line regulation (*6)</td>
<td>---</td>
<td>0.01% of rated output current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Load regulation (*11)</td>
<td>---</td>
<td>0.09% of rated output current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Load regulation thermal drift</td>
<td>---</td>
<td>Less than 0.05% of rated output current over 30 minutes following load change.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ripple r.m.s. S/N=1MHz (*12) (*14)</td>
<td>mA</td>
<td>1.5</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>5. Temperature coefficient PPM/°C</td>
<td>100PPM/°C from rated output current, following 30 minutes warm-up.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Temperature stability</td>
<td>---</td>
<td>0.05% of rated output over 8hrs. interval following 30 minutes warm-up. Constant line, load &amp; temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Protective Functions

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Z</th>
<th>160-2.6</th>
<th>320-1.3</th>
<th>650-0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Foldback protection</td>
<td>---</td>
<td>Output shut-down when power supply change mode from CV to CC or CC to CV. User selectable. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Over-voltage protection (OVP)</td>
<td>---</td>
<td>Inverter Shut down method. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Over-voltage trip point</td>
<td>V</td>
<td>5−176</td>
<td>5−353</td>
<td>5−717</td>
</tr>
<tr>
<td>4. Output under voltage limit (UVL)</td>
<td>---</td>
<td>Reset by front panel or communication port. Prevents from adjusting output below limit. Does not affect in analog programming.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Output under voltage protection (UVP)</td>
<td>---</td>
<td>Output shut-down when power supply output voltage goes below UVP programming. User selectable. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Over temperature protection</td>
<td>---</td>
<td>User selectable, latched or non latched.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Output under voltage protection (UVP)</td>
<td>---</td>
<td>Output shut-down when power supply output voltage goes below UVP programming. User selectable. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Over temperature protection</td>
<td>---</td>
<td>User Selectable. Latched or non latched.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Analog Programming and Monitoring

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Z</th>
<th>160-2.6</th>
<th>320-1.3</th>
<th>650-0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vout voltage programming</td>
<td>---</td>
<td>0−100%, 0−5V or 0−10V, user selectable. Accuracy and linearity: +/-0.5% of rated Vout.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Iout voltage programming (*13)</td>
<td>---</td>
<td>0−100%, 0−5V or 0−10V, user selectable. Accuracy and linearity: +/-1% of rated Iout.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Vout resistor programming</td>
<td>---</td>
<td>0−100%, 0−5K/10K programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Iout resistor programming (*13)</td>
<td>---</td>
<td>0−100%, 0−10Kohm full scale, user selectable. Accuracy and linearity: +/-1% of rated Iout.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Shut Off (SO) control</td>
<td>---</td>
<td>By electrical Voltage: 0−0.6V/15V or dry contact, user selectable logic.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Output current monitor (*13)</td>
<td>---</td>
<td>0−5V or 0−10V, user selectable. Accuracy: +/-1%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Output voltage monitor</td>
<td>---</td>
<td>0−5V or 0−10V, user selectable. Accuracy: +/-1%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Power supply OK signal</td>
<td>---</td>
<td>4−5V-OK, 0V-Fail. 500ohm series resistance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Parallel operation (*8)</td>
<td>---</td>
<td>Possible, up to 6 units in master/slave mode with single wire current balance connection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Series operation</td>
<td>---</td>
<td>2 identical units (with external diodes).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. CV/CC indicator</td>
<td>---</td>
<td>Open collector, CC mode: On, CV mode: Off. Maximum voltage: 30V, maximum sink current: 10mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Interlock (ILC) control</td>
<td>---</td>
<td>Enables/Disables the FS output by dry contact (Short On, Open Off). Source current: less than 0.5mA. Ena/Dis is activated by front panel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Local/Remote mode Control</td>
<td>---</td>
<td>By electrical signal or Open/Short: 0−0.6V or short: Remote, 2−15V or open: Local</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Local/Remote mode Indicator</td>
<td>---</td>
<td>Open collector (shunted by 36V zener). On 0−0.6V, 10mA sink current max. Off: Local (30V max.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Trigger out</td>
<td>---</td>
<td>Maximum low level output: -0.6V, Minimum high level output: +3.6V, Maximum high level output: 5V, Maximum source current: 16mA, pulse: 20μs Typical.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Trigger in</td>
<td>---</td>
<td>Maximum low level input: -1.2V, Minimum high level input: +3.6V, Maximum high level input: +5V, Maximum sink current: 16mA, positive edge, trigger: tw = 10μs minimum, Trtf = 1μs maximum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Programmed signal 1</td>
<td>---</td>
<td>Open collector, maximum voltage 25V, maximum sink current 100mA. (Shunted by 27V zener)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Programmed signal 2</td>
<td>---</td>
<td>Open collector, maximum voltage 25V, maximum sink current 100mA. (Shunted by 27V zener)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Front Panel

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Z</th>
<th>160-2.6</th>
<th>320-1.3</th>
<th>650-0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control functions</td>
<td>---</td>
<td>Multiple options with 2 Encoders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Vout/Iout manual adjust</td>
<td>---</td>
<td>Vout/Iout manual adjust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. OVP/UVP/UVP manual adjust</td>
<td>---</td>
<td>OVP/UVP/UVP manual adjust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Communication Functions - Selection of Communication, Baud Rate, Address</td>
<td>---</td>
<td>Communication Functions - Selection of Communication, Baud Rate, Address</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Analog Control Functions - Selection of Voltage/Current Monitoring, 5V/10V, 5V/10V</td>
<td>---</td>
<td>Analog Control Functions - Selection of Voltage/Current Monitoring, 5V/10V, 5V/10V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### FRONT PANEL

2. Display  
---  
Vout: 4 digits, accuracy: 0.5% of rated output voltage+/−1 count.  
lout: 4 digits, accuracy: 0.5% of rated output current+/−1 count.

3. Indicators  
---  
GREEN LEDS: FINE, MENU, PREV, PROT, REM, OUTPUT, CV, CC.

4. Function buttons  
---  
FINE, MENU, PREV, PROT, REM, OUTPUT.

### PROGRAMMING AND READBACK (RS232/485, USB, Optional: IEEE(*17), LAN)

1. Vout programming accuracy  
---  
0.05% of actual + 0.05% of rated output voltage

2. lout programming accuracy (*13)  
---  
0.2% of rated output current

3. Vout programming resolution  
---  
0.012% of full scale

4. lout programming resolution  
---  
0.012% of full scale

5. Vout readback accuracy  
---  
0.05% of actual + 0.05% of rated output voltage

6. lout readback accuracy (*13)  
---  
0.1% of actual + 0.3% of rated output current

7. Vout readback resolution  
---  
0.012% of full scale

8. lout readback resolution  
---  
0.012% of full scale

### INPUT CHARACTERISTICS

1. Input voltage/freq. (*3)  
---  
85~265Vac continuous, 47~63Hz, single phase

2. Maximum Input current 100/200Vac(*4) (*15)  
---  
5/2.44

3. Power Factor (Typ)  
---  
0.99 at 100/200Vac, 100% load

4. Efficiency (Typ) 100/200Vac(*4)(*15)  
---  
84.86

5. Inrush current 100/200Vac(*5)  
---  
Less than 25A

### ENVIRONMENTAL CONDITIONS

1. Operating temperature  
---  
0~50°C, 100% load.

2. Storage temperature  
---  
−20~85°C

3. Operating humidity  
---  
20~90%RH (no condensation).

4. Storage humidity  
---  
10~95%RH (no condensation).

5. Altitude  
---  
Maximum 3000m. Derate ambient temp above 2000m.

### SAFETY/EMC

1. Applicable standards:  
---  
UL61010-1, EN61010-1, IEC61010-1. Built to meet UL60950-1, EN60950-1

2. Interface classification  
---  
Output floating: Output J1, J2 are Hazardous; J3, J4, USB, LAN, IEEE/ISOLATED ANALOG are Non Hazardous.

3. Withstand voltage  
---  
160V≤Vout≤650V: Output, J1, J2 are Hazardous; J3, J4, USB, LAN, IEEE/ISOLATED ANALOG are Non Hazardous.

4. Insulation resistance  
---  
More than 100Mohm at 25°C, 70%RH.

5. Conducted emission  
---  
IEC/EN61326-1 Industrial Location - B, FCC part 15-B, VCCI-B

6. Radiated emission  
---  
IEC/EN61326-1 Industrial Location - A, FCC part 15-A, VCCI-A

### MECHANICAL

1. Cooling  
---  
Forced air cooling by internal fan.

2. Weight  
---  
STANDARD Kg

3. Dimensions (WxHxD)  
---  
STANDARD mm

4. Vibration  
---  
Less than 2Gs, half sine, 11mS. Unit is unpacked. According to: IEC60068-2-54

5. Shock  
---  
Less than 2Gs, half sine, 11mS. Unit is unpacked. According to: IEC60068-2-27

### NOTES:

*1: Maximum voltage is guaranteed to maximum 0.1% of rated output voltage.
*2: Minimum current is guaranteed to maximum 0.2% of rated output current.
*3: For cases where conformance to various safety standards (UL, IEC, etc…) is required, to be described as 100-240Vac (50/60Hz).
*4: Ta=25°C with rated output power.
*5: Not including EMI filter inrush current, less than 0.2mSec at cold start Ta=25°C
*6: At 85~13.2Vac or 1.70~265VAC, constant load.
*7: From No-Load to Full-Load, constant input voltage. Measured at the sensing point in Remote Sense.
*8: For parallel operation up to 4 units, 5% of total output current is required.
*9: For parallel operation more than 4 units, 7% of total output current is required.
*10: 90% to 100% of Rated Output Voltage, with rated resistive load.
*11: For load voltage change, equal to the unit input voltage rating, constant input voltage.
*12: Ripple is measured at 0~100% of rated output voltage and rated output current.
*13: The Constant Current programming, readback and monitoring accuracy do not include the warm-up and Load regulation thermal drift.
*14: Measured with 10:1 probe.
*15: PS with Lan, IEEE, models decrease efficiency by 0.25% and increase input current by 0.25%.
*16: At rated output power.
*17: Max. ambient temperature for using IEEE is 45°C.
### Z’600 Series Specifications

#### OUTPUT RATING

<table>
<thead>
<tr>
<th>Z</th>
<th>160-4</th>
<th>320-2</th>
<th>650-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated output voltage (*1)</td>
<td>V</td>
<td>160</td>
<td>320</td>
</tr>
<tr>
<td>Rated output current (*2)</td>
<td>A</td>
<td>4.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Rated output power at 100s/Vins=265Vac, Ta ≤ 50°C</td>
<td>W</td>
<td>640</td>
<td>650</td>
</tr>
</tbody>
</table>

#### CONSTANT VOLTAGE MODE

<table>
<thead>
<tr>
<th>Z</th>
<th>160-4</th>
<th>320-2</th>
<th>650-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. line regulation (*6)</td>
<td>—</td>
<td>—</td>
<td>0.01% of rated output voltage</td>
</tr>
<tr>
<td>Max. load regulation (*7)</td>
<td>—</td>
<td>—</td>
<td>0.01% of rated output voltage</td>
</tr>
<tr>
<td>Ripple and noise (p-p, 20MHz) (*14) (*17) mV</td>
<td>100</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>Ripple r.m.s. 5Hz~1MHz (*14) (*17) mV</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Temperature coefficient PPM/°C</td>
<td>—</td>
<td>30PPM/°C from rated output voltage, following 30 minutes warm-up.</td>
<td></td>
</tr>
<tr>
<td>Temperature stability</td>
<td>—</td>
<td>0.03% of rated output voltage over 8hrs. interval following 30 minutes warm-up, constant line, load &amp; temp.</td>
<td></td>
</tr>
<tr>
<td>Warm-up drift</td>
<td>—</td>
<td>Less than 0.05% of rated output voltage over 30 minutes following power on.</td>
<td></td>
</tr>
<tr>
<td>Remote sense compensation/wire V</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Up-prog. response time, 0~Vmax(*9) mS</td>
<td>55</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Down-prog. response time: Full load (*9) mS</td>
<td>65</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>No load (*10)</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>Hold-up time (*15)</td>
<td>—</td>
<td>16mSec Typical.</td>
<td>14mSec Typical.</td>
</tr>
</tbody>
</table>

#### CONSTANT CURRENT MODE

<table>
<thead>
<tr>
<th>Z</th>
<th>160-4</th>
<th>320-2</th>
<th>650-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. line regulation (*6)</td>
<td>—</td>
<td>—</td>
<td>0.02% of rated output current</td>
</tr>
<tr>
<td>Max. load regulation (*11)</td>
<td>—</td>
<td>—</td>
<td>0.09% of rated output current</td>
</tr>
<tr>
<td>Load regulation thermal drift</td>
<td>—</td>
<td>Less than 0.05% of rated output current over 30 minutes following load change.</td>
<td></td>
</tr>
<tr>
<td>Ripple r.m.s. 5Hz~1MHz (*12) (*14) mA</td>
<td>2</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>Temperature coefficient PPM/°C</td>
<td>—</td>
<td>100PPM/°C from rated output current, following 30 minutes warm-up.</td>
<td></td>
</tr>
<tr>
<td>Temperature stability</td>
<td>—</td>
<td>0.05% of rated output voltage over 30 minutes following power on.</td>
<td></td>
</tr>
<tr>
<td>Warm-up drift</td>
<td>—</td>
<td>Less than +/-0.1% of rated output current over 30 minutes following power on.</td>
<td></td>
</tr>
</tbody>
</table>

#### PROTECTIVE FUNCTIONS

<table>
<thead>
<tr>
<th>Z</th>
<th>160-4</th>
<th>320-2</th>
<th>650-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foldback protection</td>
<td>—</td>
<td>Output shut-down when power supply change mode from CV to CC or CC to CV. User presetable. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
</tr>
<tr>
<td>Over-voltage protection (OVP)</td>
<td>—</td>
<td>Inverter shut-down method. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
</tr>
<tr>
<td>Over-voltage trip point V</td>
<td>5~176</td>
<td>5~353</td>
<td>5~717</td>
</tr>
<tr>
<td>Output under voltage limit (UVL)</td>
<td>—</td>
<td>Preset by front panel or communication port. Prevents from adjusting Vout below limit. Does not affect in analog programming.</td>
<td></td>
</tr>
<tr>
<td>Output under voltage protection (UVP)</td>
<td>—</td>
<td>Output shut-down when power supply output voltage goes below UVP programming. User presetable. Reset by AC input recycle in autostart mode or by OUTPUT button or by rear panel ENABLE, or by communication port.</td>
<td></td>
</tr>
<tr>
<td>Over temperature protection</td>
<td>—</td>
<td>User selectable, latched or non latched.</td>
<td></td>
</tr>
</tbody>
</table>

#### ANALOG PROGRAMMING AND MONITORING

1. Vout voltage programming | — | 0~100%, 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-0.5% of rated Vout. |
2. Output voltage programming (*13) | — | 0~100%, 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1% of rated Vout. |
3. Vout resistor programming | — | 0~100%, 0~5/10Kohm full scale, user selectable. Accuracy and linearity: +/-1% of rated Vout. |
4. Iout resistor programming (*13) | — | 0~100%, 0~5/10Kohm full scale, user selectable. Accuracy and linearity: +/-1% of rated Vout. |
5. Shut Off (SO) control | — | By electrical Voltage: 0~0.6V/4~15V or dry contact, user selectable logic. |
6. Output current monitor | — | 0~5V or 0~10V, user selectable. Accuracy: +/-1%. |
7. Output voltage monitor | — | 0~5V or 0~10V, user selectable. Accuracy: +/-1%. |
8. Power supply OK signal | — | 4~5V, 0V Fail. 500ohm series resistance. |
9. Parallel operation (*8) | — | Possible, up to 6 units in master/slave mode with single wire current balance connection. |
10. Series operation | — | 2 identical units (with external diodes). |
11. CV/CC indicator | — | Open collector, CC mode: On, CV mode: Off. Maximum voltage: 30V, maximum sink current: 10mA. |
12. Interlock (ILC) control | — | Enables/disables the PS output by dry contact (Short On, Open Off). Source current: less than 10mA, Sink current is activated by front panel. |
13. Local/Remote mode Control | — | By electrical signal or Open/Short: 0~0.6V or short: Remote, 2~15V or open: Local |
14. Local/Remote mode Indicator | — | Open collector (shunted by 36V zener). On 0~0.6V: 10mA sink current max.2. Remote. Off (Local 30V max.) |
15. Trigger out | — | Maximum low level output =0.8V, Minimum high level output =3.8V, Maximum high level output =5V, Maximum source current =16mA, pulse =20μs Typical. |
16. Trigger in | — | Maximum low level input =1.2V, Minimum high level input =3.8V, Maximum high level input =5V, Maximum sink current =16mA, positive edge, trigger: tw =10μs minimum, Tr/Tf =1μs maximum. |
17. Programmed signal 1 | — | Open collector, maximum voltage 25V, maximum sink current 100mA. (Shunted by 27V zener) |
18. Programmed signal 2 | — | Open collector, maximum voltage 25V, maximum sink current 100mA. (Shunted by 27V zener) |

#### FRONT PANEL

1. Control functions | — | Multiple options with 2 Encoders |
2. Vout/Iout manual adjust | — | |
3. OVP/UVL/UVF manual adjust | — | |
4. Protection Functions - OVP, UVL, UVF, Foldback, OCP, INT, SO |
5. Communication Functions - Selection of LAN/IEEE (*17), RS232, RS485, USB |
6. Communication Functions - Selection of Baud Rate, Address |
7. Analog Control Functions - Selection Voltage/resistive programming, 5V/10V, 5K/10K programming |
8. Analog Control Functions - Selection of Voltage/Current Monitoring 5V/10V, Output ON/OFF, Front Panel Lock |
FRONT PANEL
2. Display
--- Vout: 4 digits, accuracy: 0.5% of rated output voltage +/-1 count.
--- Iout: 4 digits, accuracy: 0.5% of rated output current +/-1 count.
3. Indications
--- GREEN LEDs: FINE, MENU, PREV, PROT, REM, OUTPUT, CV, CC
--- RED LED: PROT (OVP, UVP, OTP, FOLD, AC FAIL).
4. Function buttons
--- FINE, MENU, PREV, PROT, REM, OUTPUT

PROGRAMMING AND READBACK (RS232/485,USB, Optional: IEEE (*16), LAN)
1. Vout programming accuracy --- 0.05% of actual + 0.05% of rated output voltage
2. Iout programming accuracy (*13) --- 0.2% of rated output current
3. Vout programming resolution --- 0.012% of full scale
4. Iout programming resolution --- 0.012% of full scale
5. Vout readback accuracy --- 0.05% of actual + 0.05% of rated output voltage
6. Iout readback accuracy (*13) --- 0.1% of actual +0.3% of rated output current
7. Vout readback resolution --- 0.012% of full scale
8. Iout readback resolution --- 0.012% of full scale

INPUT CHARACTERISTICS
1. Input voltage/freq. (*3) --- 85~265Vac continuous, 47~63Hz, single phase
2. Maximum Input current 100/200VAC (*4) --- 7.5/3.7 A
3. Power Factor (Typ) --- >0.99 at 100Vac, >0.98 at 200Vac, 100% load
4. Efficiency (Typ) 100/200VAC (*4) % --- 86.5/88.5
5. Inrush current 100/200VAC (*5) --- Less than 30A

ENVIRONMENTAL CONDITIONS
1. Operating temperature --- 0~50°C, 100% load.
2. Storage temperature --- -20~85°C
3. Operating humidity % --- 20~90% RH (no condensation).
4. Storage humidity % --- 10~95% RH (no condensation).
5. Altitude --- Maximum 3000m. Derate ambient temp above 2000m.

SAFETY/EMC
1. Applicable standards:
   - UL61010-1, EN61010-1, IEC61010-1. Built to meet UL60950-1, EN60950-1
   - 160V≤Vout≤650V: Output,J1,J2 are Hazardous. J3,J4,USB, IEEE/ISOLATED Analog ,LAN are Non Hazardous
   - EMV --- IEC/EN61326-1 (Built to meet EN55022/EN55024)
2. Interface classification
   - Output floating: Output, J1, J2 are Hazardous; J3, J4, USB, LAN, IEEE/ISOLATED ANALOG are Non Hazardous
   - Vout≤400V: +Output grounded: Output, J1, J2, J3, J4, USB, LAN, IEEE/ISOLATED ANALOG are Hazardous
   - Vout>400V, +Output grounded: Output, J1, J2, J3, J4, USB, LAN, IEEE/ISOLATED ANALOG are Hazardous
3. Withstand voltage
   - 160≤Vout≤320V models: Input-Output&J1,J2: 2970VDC/1min; Input-Ground: 2828VDC/1min.
   - Output&J1,J2,-Ground: 2000VDC/1min; Output&J1,J2- J3,J4,USB,LAN/IEEE/ISOLATED ANALOG :3200VDC/1min;
   - 650V model: Input-Output&J1,J2: 3704VDC/1min; Input-Ground: 2828VDC/1min.
   - Output&J1,J2,-Ground: 2780VDC/1min; Output&J1,J2- J3,J4,USB,LAN/IEEE/ISOLATED ANALOG :4244VDC/1min;
   - Input-J3,J4,USB,LAN/IEEE/ISOLATDE ANALOG: 4242VDC/1min; J3,J4,USB,LAN/IEEE/ISOLATDE ANALOG Input-Ground: 707VDC/1min.

MECHANICAL
1. Cooling
--- Forced air cooling by internal fan.
2. Weight
   - STANDARD Kg: Less than 2Kg
   - WIDE BODY Kg: Less than 2.5Kg. Wide body with isolated analog or IEEE
3. Dimensions (WxHxD)
   - STANDARD mm: H: 83, W: 70, D: 350 (excluding bus bars, handles…). (Refer to Outline drawing).
   - WIDE BODY mm: H: 83, W: 105, D: 350 (excluding bus bars, handles…). (Refer to Outline drawing).
4. Vibration
--- According to: IEC60068-2-64
5. Shock
--- Less than 20G, half sine, 11ms. Unit is unpacked. According to: IEC60068-2-27

NOTES:
1*: Minimum voltage is guaranteed to maximum 0.1% of rated output voltage.
2*: Minimum current is guaranteed to maximum 0.2% of rated output current.
3*: For cases where conformance to various safety standards (UL, IEC, etc…) is required, to be described as 100-240Vac (50/60Hz).
4*: Ta=25°C with rated output power.
5*: Not including EMI filter inrush current, less than 0.2mSec.
6*: At 85~132Vac or 170~265VAC, constant load.
7*: From No-Load to Full-Load, constant input voltage. Measured at the sensing point in Remote Sense.
8*: For Parallel operation up to 4 units, 5% of total output current is required.
9*: For Parallel operation more than 4 units, 20% of total output current is required.
10*: From 10% to 90% or 90% to 10% of rated output voltage, with rated resistive load.
11*: From 90% to 10% of rated output voltage, with rated resistive load.
12*: Ripple is measured at 10~100% of rated output voltage and rated output current.
13*: The Constant Current programming, readback and monitoring accuracy do not include the warm-up and Load regulation thermal drift.
14: Measured with 10:1 probe.
15: At rated output power.
16*: Max. ambient temperature for using IEEE is 45°C.
17*: Start in low ambient temp. (0°C), 1 min. warm up is required.
### Z’800 Series Specifications

#### OUTPUT RATING

<table>
<thead>
<tr>
<th>Z</th>
<th>160-5</th>
<th>320-2.5</th>
<th>375-2.2</th>
<th>650-1.25</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>160</td>
<td>320</td>
<td>375</td>
<td>650</td>
</tr>
</tbody>
</table>

1. Rated output voltage (*1)

2. Rated output current (*2) at 100≤Vin<265Vac, Ta ≤ 50°C

3. Rated output power at 100≤Vin<265Vac, Ta ≤ 50°C

#### CONSTANT VOLTAGE MODE

<table>
<thead>
<tr>
<th>Z</th>
<th>160-5</th>
<th>320-2.5</th>
<th>375-2.2</th>
<th>650-1.25</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>160</td>
<td>320</td>
<td>375</td>
<td>650</td>
</tr>
</tbody>
</table>

1. Max. Line regulation (*6) --- 0.01% of rated output voltage

2. Max. Load regulation (*) --- 0.01% of rated output voltage

3. Ripple r.m.s. 0.1Hz~1MHz (*14) (*17) mV

4. Ripple r.m.s. 0.1Hz~1MHz (*14) (*17) mV

5. Temperature coefficient PPM/°C 30PPM/°C from rated output voltage, following 30 minutes warm-up.

6. Temperature stability --- 0.05% of rated output current over 30 minutes warm-up.

7. Warm-up drift --- Less than 0.05% of rated output current over 30 minutes following load change.

8. Temperature coefficient PPM/°C 100PPM/°C from rated output voltage, following 30 minutes warm-up.

9. Temperature stability --- 0.05% of rated output current following 30 minutes warm-up.

10. Hold-up time (*15) mS

11. Transient response time mS

12. Hold-up time (*15) mS

#### CONSTANT CURRENT MODE

<table>
<thead>
<tr>
<th>Z</th>
<th>160-5</th>
<th>320-2.5</th>
<th>375-2.2</th>
<th>650-1.25</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>160</td>
<td>320</td>
<td>375</td>
<td>650</td>
</tr>
</tbody>
</table>

1. Max. Line regulation (*6) --- 0.01% of rated output current

2. Max. Load regulation (*11) --- 0.09% of rated output current

3. Load regulation thermal drift --- Less than 0.05% of rated output current over 30 minutes warm-up.

4. Ripple r.m.s. 0.1Hz~1MHz (*12) (*14) mA

5. Temperature coefficient PPM/°C 100PPM/°C from rated output current, following 30 minutes warm-up.

6. Temperature stability --- 0.05% of rated output current following 30 minutes warm-up.

7. Warm-up drift --- Less than +/-0.1% of rated output current over 30 minutes following load change.

8. Temperature coefficient PPM/°C 100PPM/°C from rated output current, following 30 minutes warm-up.

9. Temperature stability --- 0.05% of rated output current over 30 minutes following load change.

10. Hold-up time (*15) mS

11. Transient response time mS

12. Hold-up time (*15) mS

#### PROTECTIVE FUNCTIONS

<table>
<thead>
<tr>
<th>Z</th>
<th>160-5</th>
<th>320-2.5</th>
<th>375-2.2</th>
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</tr>
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<tr>
<td>V</td>
<td>160</td>
<td>320</td>
<td>375</td>
<td>650</td>
</tr>
</tbody>
</table>

1. Foldback protection --- Output shut-down when power supply change mode from CV to CC or CC to CV. User presettable.

2. Over-voltage protection (OVP) --- Inverter Shut down method. Reset by AC input recycle in autostart mode or by OUTPUT button or rear panel ENABLE, or by communication port.

3. Over-voltage trip point V

4. Over-voltage protection (OVP) --- Output shut-down when power supply change mode from CV to CC or CC to CV. User presettable.

5. Output under voltage limit (UVL) --- By electrical Voltage: 0~0.6V/15V or dry contact, user selectable logic.

6. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.

7. Over temperature protection --- User selectable, latched or non latched.

8. Power supply OK signal --- 4~5V-OK, 0V-Fail. 500ohm series resistance.

9. Parallel operation (*8) --- Possible, up to 6 units in master/slave mode with single wire current balance connection.

10. Series operation --- 2 identical units with external diodes. 650VDC MAX. From chassis to ground.

11. Output current monitor  (*13) --- 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

12. Output current monitor  (*13) --- 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

13. Output current monitor  (*13) --- 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

14. Output current monitor  (*13) --- 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

15. Output current monitor  (*13) --- 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

16. Output current monitor  (*13) --- 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

17. Programmed signal 1 --- Open collector, maximum voltage 25V/maximum sink current 100mA. (Shunted by 27V zener)

18. Programmed signal 2 --- Open collector, maximum voltage 25V/maximum sink current 100mA. (Shunted by 27V zener)

#### ANALOG PROGRAMMING AND MONITORING

<table>
<thead>
<tr>
<th>Z</th>
<th>160-5</th>
<th>320-2.5</th>
<th>375-2.2</th>
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<tbody>
<tr>
<td>V</td>
<td>160</td>
<td>320</td>
<td>375</td>
<td>650</td>
</tr>
</tbody>
</table>

1. Vout voltage programming --- 0~100%, 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-0.5% of rated Vout.

2. Iout voltage programming  (*13) --- 0~100%, 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-1%.

3. Vout resistor programming --- 0~100%, 0~5V or 0~10V, user selectable. Accuracy and linearity: +/-0.5% of rated Vout.

4. Iout resistor programming  (*13) --- 0~100%, 0~5/10Kohm full scale, user selectable. Accuracy and linearity: +/-1.5% of rated Iout.

5. Output under voltage limit (UVL) --- By electrical Voltage: 0~0.6V/15V or dry contact, user selectable logic.

6. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.

7. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.

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15. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.

16. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.

17. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.

18. Output under voltage protection (UVP) --- Output shut-down when power supply output voltage goes below UV programming. User presettable.
1. Control functions

- Protection Functions - OVP, UVP, Foldback, OCP, INT, SO
- Communication Functions - Selection of LAN, IEEE (*16), RS232, RS485, USB
- Communication Functions - Selection of baud rate, Address
- Analog Control Functions - Selection of Voltage/Current Monitoring, 5V/10V, Output ON/OFF, Front Panel Lock

2. Display

- Volt: 4 digits, accuracy: 0.5% of rated output voltage/+1 count.
- lout: 4 digits, accuracy: 0.5% of rated output current/+1 count.

3. Indications

- GREEN LEDs: FINE, MENU, PREV, PROT, REM, OUTPUT, CV, CC
- RED LED: PROT (OV, LV, UVP, OVP, FOLD, AC FAIL)

4. Function buttons

- FINE, MENU, PREV, PROT, REM, OUTPUT

### PROGRAMMING AND READBACK (RS232/485, USB, Optional: IEEE (*16), LAN)

- 1. Vout programming accuracy --- 0.05% of actual + 0.05% of rated output voltage
- 2. Iout programming accuracy (**13) --- 0.2% of rated output current
- 3. Vout programming resolution --- 0.012% of full scale
- 4. Iout programming resolution --- 0.012% of full scale
- 5. Vout readback accuracy --- 0.05% of actual + 0.05% of rated output voltage
- 6. Iout readback accuracy (**13) --- 0.1% of actual + 0.3% of rated output current
- 7. Vout readback resolution --- 0.012% of full scale
- 8. Iout readback resolution --- 0.012% of full scale

### INPUT CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Input voltage/freq. (**3)</td>
<td>85<del>265Vac continuous, 47</del>63Hz, single phase</td>
</tr>
<tr>
<td>2. Maximum input current 100/200VAC (**4)</td>
<td>9.35/4.61</td>
</tr>
<tr>
<td>3. Power Factor (Typ)</td>
<td>0.99 at 100Vac, 0.98 at 200Vac, 100% load</td>
</tr>
<tr>
<td>4. Efficiency (Typ) 100/200VAC (**4)</td>
<td>86.5/88.5</td>
</tr>
<tr>
<td>5. Inrush current 100/200VAC (**5)</td>
<td>Less than 30A</td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL CONDITIONS

1. Operating temperature --- 0~50°C, 100% load.
2. Storage temperature --- -20~85°C
3. Operating humidity % 20~90% RH (no condensation).
4. Storage humidity % 10~95% RH (no condensation).
5. Altitude --- Maximum 3000m. Derate ambient temp above 2000m.
6. Radiated emission --- IEC/EN61326-1 Industrial Location - A, FCC part 15-A, VCCI-A
7. Conducted emission --- UL61010-1, EN61010-1, IEC61010-1, Built to meet EN55022/EN55024
8. Insulation resistance --- More than 100Mohm at 25°C, 70%RH.

### SAFETY/EMC

1. Applicable standards:
   - Safety --- UL61010-1, EN61010-1, IEC61010-1, Built to meet UL60950-1, EN60950-1
   - EMC --- IEC/EN61326-1 (Built to meet EN55022/EN55024)
2. Interface classification
   - Output floating: Output. J1, J2 are Hazardous. J3, J4, USB, IEEE/ISOLATED Analog, LAN are Non Hazardous
   - Output grounded: Output, J1, J2 are Hazardous; J3, J4, USB, IEEE/ISOLATED Analog, LAN are Non Hazardous
3. Withstand voltage
   - 160V≤Vout≤320V models: Input-Output&J1,J2: 2970VDC/1min; Input-Ground: 2828VDC/1min.
   - Input&J1,J2- J3,J4,USB,LAN/IEEE/ISOLATED ANALOG: 3200VDC/1min;
4. Insulation resistance --- More than 1000Mohm at 25°C, 70%RH.
5. Conducted emission --- IEC/EN61326-1 Industrial location - B, FCC part 15-B, VCCI-B
6. Radiated emission --- IEC/EN61326-1 Industrial location - A, FCC part 15-A, VCCI-A

### MECHANICAL

1. Cooling --- Forced air cooling by internal fan.
2. Weight
<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD</td>
<td>Kg</td>
</tr>
<tr>
<td>WIDE BODY</td>
<td>Kg</td>
</tr>
<tr>
<td>Less than 2.5kg. Wide body with isolated analog or IEEE</td>
<td></td>
</tr>
</tbody>
</table>
3. Dimensions (WxHxD)
<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD</td>
<td>mm</td>
</tr>
<tr>
<td>WIDE BODY</td>
<td>mm</td>
</tr>
<tr>
<td>H: 83, W: 70, D: 350 (excluding bus bars, handles,...) (Refer to Outline drawing)</td>
<td></td>
</tr>
<tr>
<td>H: 83, W: 105, D: 350 (excluding bus bars, handles,...) (Refer to Outline drawing)</td>
<td></td>
</tr>
</tbody>
</table>
4. Vibration --- According to IEC60068-2-64
5. Shock --- Less than 20G, half sine, 11ms. Unit is unpacked. According to IEC60068-2-27

### NOTES:

1. Minimum voltage is guaranteed to maximum 0.1% of rated output voltage.
2. Minimum current is guaranteed to maximum 0.2% of rated output current.
3. **For cases where conformance to various safety standards (UL, IEC, etc.) is required, to be described as 100-240Vac (50/60Hz).**
4. 5. **Not including EMI filter inrush current, less than 0.2mSec.**
5. **At 85~132Vac or 170~265VAC, constant load.**
7. **From No-Load to Full-Load, constant output voltage. Measured at the sensing point in Remote Sense.**
8. **For Parallel operation up to 4 units, 5% of total output current is required. For Parallel operation more than 4 units, 20% of total output current is required.**
9. **From 10% to 90% or 90% to 10% of rated output voltage, with rated resistive load.**
10. **From 90% to 10% of rated output voltage.**
11. **For load voltage change, equal to the unit voltage rating, constant input voltage.**
12. **Ripple is measured at 10~100% of rated output voltage and rated output current.**
13. **The Constant Current programming, readback and monitoring accuracy do not include the warm-up and Load regulation thermal drift.**
14. **Measured with 10:1 probe.**
15. **At rated output power.**
16. **Max. ambient temperature for using IEEE is 45°C.**
2.7 Z200W/400W/600W/800W Optional IEEE, Isolated Analog Interface, Front Panel insulated Output sockets
GLOBAL NETWORK

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