Online Double Conversion UPS System
Increased Efficiency with URD Technology
Paralleling Capability Provides Power Up to 1200KVA
Digital Circulation Current Control Technology enhances parallel redundancy
Advanced Battery Management System/ Battery Testing
Modularized Design of Subsystems to Facilitate Field Maintenance
High MTBF and Low MTTR ensures system dependability
Double DSP Control

A power dense UPS with high efficiency and a small footprint

RELIABILITY Model REL-4500 Series Uninterruptible Power Supply (UPS) Systems
30KVA—200KVA

RELIALIBILITY Power Systems
Features & Benefits

- True online double conversion supplies the load power factor close to unity.
- REL4500 provides protection for mission critical systems with overload capability.
- Fully digitized control system manages the IGBT rectifier, inverter, charger and discharger to facilitate system efficiency and increase dependability.
- Wide input voltage range increases UPS' compatibility with various utility powers.
- High input power factor and low current Total Harmonic Distortion (THD) increases the efficiency of the REL4500 making it part of Reliability Power Systems' Green technology.
- Intelligent battery management system enhances battery life by providing periodic battery maintenance.
- Self diagnosis function provides protection from various faults and records fault in system history for future review to facilitate troubleshooting.
- REL4500 has been designed to ensure field maintenance can be carried out safely and easily through a modularized design of subsystems.
- LCD display provides user friendly interface.
Rectifier Function

Power Factor Correction
Reliability Power Systems’ REL4500 series corrects the power factor of the system by incorporating an IGBT designed rectifier with a high power factor, greater than 0.99 on full load. Input THD current is kept <3% which further helps in power factor correction.

UPS Soft Start
The REL4500 series’ microcontroller has been programmed to start the UPS from the DC bus if utility power is not available. Additionally the microcontroller prevents any surge current flow to the DC capacitors.

Input Voltage Regulation
If the input voltage is outside the input voltage range on any one of the phases, the REL4500 will shutdown its rectifier and transfer the UPS to battery mode. Simultaneously the REL4500 will display an alarm on the LCD and also sound an audible alarm to alert maintenance.

Frequency Regulation
If the input frequency is outside the frequency range on any one of the phases, the REL4500 will shutdown its rectifier and transfer the UPS to battery mode. Simultaneously the REL4500 will display an alarm on the LCD and also sound an audible alarm to alert maintenance.

Phase Rotation Protection
To ensure the phases are connected correctly, the UPS monitors the input phase angles at start up. If the phase rotation is incorrect, the rectifier will not start and display an alarm on the LCD.

DC Bus Protection
To prevent system damage through high or low DC Bus voltage, the UPS will transfer to battery mode if DC voltage falls below 344V. If the DC Bus voltage falls below 300V or above 400V the UPS will shutdown the rectifier and transfer to static bypass if utility power is within acceptable voltage range.

Battery Charger/Discharger Functions

Battery Charger Function
Reliability Power Systems’ REL4500 series charger automatically charges the batteries if utility power is available and the rectifier is operational. The charger switches between constant current charging, constant voltage charging to float voltage charging smoothly.

Battery Discharger Function
In case of rectifier failure, the battery discharger supplies power from the batteries to the inverter.

Battery End Of Discharge (EOD) Protection
To protect batteries from deep discharge and to prolong battery life, the REL4500 shuts down the battery discharger at 1.65V per cell.
Battery Discharge Protection
If the output current of the battery discharger is 2—2.5 times higher than the rated current, the discharger will trigger pulse by pulse current limitation function.

Battery Capacity & Autonomous Time Display
During UPS operation battery capacity can be viewed from the LCD screen. Furthermore, during battery mode, the UPS will predict the autonomous time remaining and will sound an alarm before reaching the EOD.

Battery Over-Charge Protection
Reliability Power Systems’ REL4500 series prevents batteries from over-charging by shutting down the charger if the charging voltage is >10% for more than 5 minutes.

Inverter & Bypass Functions

Inverter Overload Operation
- Load is 105% of rated load, can remain operational for a long time
- Load is 110% of rated load, transfers to the bypass after 1 hour
- Load is 125% of rated load, transfers to the bypass after 10 minutes
- Load is 150% of rated load, transfers to the bypass after 1 minute
- Load is >150% of rated load, transfers to the bypass after 200ms

Bypass Overload Operation
- Load is 150% of rated load, can remain on bypass for a long time
- 150%< Load is <180% of rated load, can remain on bypass for 1 minute
- Load is >1000% of rated load, can remain on bypass for 100 ms
Bypass Configuration

- The transfer window exists to determine whether the changeover from inverter to bypass is interruptible or uninterruptible. If the bypass voltage or frequency exceeds the acceptable range, UPS will perform interruptible transfer. The voltage transfer window is ±15%.
- When the bypass voltage and frequency are within the synchronous window, the inverter can trace the bypass. If voltage or frequency exceeds the acceptable limit of the synchronous window the invert can no longer trace the bypass. The synchronous window can be set by the user, by default it is at ±3Hz.
- If the voltage or frequency exceeds the protection range, the bypass no longer supplies power to the load.

Inverter ON/OFF Control

The inverter can be turned on manually by pressing the INV ON button or FAULT CLEAR button if recovering from a fault. When utility power returns, the inverter will resume operation automatically. The inverter can be turned off manually or it will turn off automatically if a fault is detected. Some serious faults, such as static switch fault, will shut off the inverter permanently until system is powered off and restarted.

ECO Mode

On ECO mode, the load is fed through the static bypass, and the inverter is on standby status. This mode can achieve high efficiency of 98%.

Parallel Operation

Reliability Power Systems’ REL4500 Series allows a maximum of 6 UPS’ to be paralleled to increase redundancy of the system. Flexible operation logic can ensure the high dependability and stability of the parallel system. The digital parallel logic can manage the operation of all the inverters inside the parallel system.
## Technical Specifications

<table>
<thead>
<tr>
<th>RELIABILITY UPS SERIES</th>
<th>REL-4500</th>
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</thead>
<tbody>
<tr>
<td>Rating</td>
<td>30KVA</td>
<td>40KVA</td>
<td>60KVA</td>
<td>80KVA</td>
<td>100KVA</td>
<td>120KVA</td>
<td>160KVA</td>
<td>200KVA</td>
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</table>

### Mains Input

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>380V/400V/415V (Line to Line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Connection</td>
<td>Three Phase Four Wires</td>
</tr>
<tr>
<td>Power Factor</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>Input Current THD</td>
<td>&lt;3%</td>
</tr>
<tr>
<td>Input Voltage Range</td>
<td>+20% — -20%, Full Load</td>
</tr>
<tr>
<td></td>
<td>-20% — -40%, Power derating between 100% to 70%</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>40Hz — 70Hz</td>
</tr>
</tbody>
</table>

### Bypass Input

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>380V/400V/415V</th>
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<tbody>
<tr>
<td>Operating Range</td>
<td>+20% — -50%</td>
</tr>
<tr>
<td>Input Wiring</td>
<td>Three Phase four wires</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>40Hz — 70Hz (adjustable)</td>
</tr>
</tbody>
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### Output

| Voltage accuracy (Balanced Load) | ± 0.5% |
| Voltage accuracy (Unbalanced Load) | 2% |
| Output Voltage Transient       | 2% (0 — 100% load step) |
| Voltage THD (linear load)      | THD<0.5% |
| Power Factor                   | 0.8 (lagging) |
| Frequency Tracking Range       | 50/60Hz ± 3Hz |
| Frequency Precision (Free Running) | ± 0.01% |
| Phase Tolerance                | 120 ± 0.5% (balanced and unbalanced load) |
| V-deg 100% unbalanced Load     | ± 3% |
| Frequency Tracking Speed       | 0.5Hz/s to 5Hz/s, adjustable |

### System

| System Efficiency (Linear Load) | Normal Mode 91% |
| ECO Mode 98%                   |
| Battery Mode 91%               |
| EMI                            | IEC62040-2      |
| Noise (1m)                     | <62dB           |
| Insulation Resistance          | >2M (500VDC)    |
| Dielectric Strength            | (Input, Output to PE) 2820VDC, leakage current lower than 3.5mA, No flashover in 1 min |
| Battery Configuration          | 456-504VDC (38-42Pcs 12V Batteries) |
| Operating Temperature          | 0 — 45°C        |
| Noise (dB)                     | 55  62  65      |
| Weight (Kg)                    | 300 320 360 400 570 600 |
| UPS Dimensions (mm) WxDxH      | 700x800x1820 1000x800x1880 |
| Packing Dim. (mm) WxDxH        | 785x885x1980 1095x895x2100 |
Reliability Power Systems — Australia

32 Duekett St
Beaudesert, QLD 4285
Australia
Tel: +61-7-5641-0517
reliability.australia@reliabilityups.com

Reliability Power Systems — USA/Canada

8 Godstone Road
Toronto, ON M2J3C4
Canada
Tel: +1-416-493-1939
reliability@reliabilityups.com

Reliability Power Systems — Europe

Via Primo Maggio, 1
Sasso Marconi, BO 40037
Italy
Tel: +39-051-054-5068
reliability.europe@reliabilityups.com

Reliability Power Systems — Middle East

PO Box 127138
Jeddah 21352
Saudi Arabia
Tel: +966-2-287-3071
reliability.middleeast@reliabilityups.com

Reliability Power Systems — China

6 Northern Industry Road
Songshan Lake, Dongguan
China
Tel: +852-8125-6519
reliability.china@reliabilityups.com