Technical Specification.

New R Series 1, 2 & 3kVA.

Delta Electronics, Inc.
Mission Critical Infrastructure Solution.

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Version Control

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Technical Specification.

Delta New R Series 1kVA, 2kVA & 3 kVA.

Uninterruptible Power Supply System.

1 GENERAL

1.1 SUMMARY

This text description defines the electrical and mechanical characteristics and requirements for a continuous-duty Single-phase, solid-state, uninterruptible power supply (UPS) system. The UPS system shall provide high-quality AC power for sensitive electronic equipment.

1.2 STANDARDS

1.2.1 **CE**

1.2.2 **CB**

1.2.3 **EN 62040-1**

1.2.4 **EN 62040-2 Category C2**

1.2.5	**EN61000-3-2**	**Current Harmonic**
1.2.6	**EN61000-3-3**	**Voltage Fluctuation**
1.2.7	**IEC 61000-4-2 Level 4**	**Electrostatic Discharge**
1.2.8	**IEC 61000-4-3 Level 3**	**Radio-Frequency Electromagnetic Fields**
1.2.9	**IEC 61000-4-4 Level 2**	**Fast Transient/Burst**
1.2.10	**IEC 61000-4-5 Level 2**	**Surges**

1.3 WARRANTY

1.3.1 **Standard warranty**

The UPS shall be covered by a full parts and labor warranty from the manufacturer or authorized service partner for a period of 12 months from UPS commissioning date.

1.3.2 **Extended warranty**

Warranty extensions shall be available on demand.

2 PRODUCT

2.1 Introduction

The R series UPS is a single phase on line UPS providing reliable and consistent sine wave quality power to electronic equipment. It adopts the latest technology and the highest quality components providing output power factor up to 0.9 and its efficiency in on line mode can reach at maximum 93%. The UPS not only provides safe, reliable and uninterrupted power to sensitive electronic equipment at all times, but also produces greater electronic power efficiency at less cost. Its compact design dose not occupies much space and is easy to use. There are three different ratings (1kVA, 2kVA and 3kVA) for selection

2.2 OPERATION MODES

2.2.1 **Standby Mode:** After the UPS is connected to the AC utility, it will power to the UPS and the battery will be charged. The default setting of the UPS is set in “Standby mode”.

2.2.2 **Normal operation mode (Online):** DC power rectified from AC mains input shall charging the batteries and same time powered the inverter, that transforms DC power to stable and clean AC power for various loads. The “Double Conversion” technology allows regulating the utility to provide pure sine wave and stable power to critical load.

2.2.3 **Battery operation mode (Backup):** During a power event (blackout, transient, surge, fluctuation etc.) occurs, the UPS will automatically transfer from normal mode to battery mode, where the battery will provide power to the inverter and then to the critical load. After the restoration of AC mains power on UPS input, the UPS will retransfer from battery to normal operation and will charge the battery. Transfer from normal to battery mode and vice versa are without interruption.

2.2.4 **Bypass operation mode:** When the inverter encounters any abnormal situations (such as over temperature, long-time overload, abnormal output voltage and battery exhausted conditions) the inverter will shut down and automatically transfer power to static bypass. After abnormal situations are eliminated, UPS will transfer power back to the inverter output immediately without interruption**.**

2.2.5 **ECO operation mode:** In ECO mode (economic operation), the load is normally connected by automatic bypass. If bypass power becomes abnormal, the load will automatically transfer to the inverter. After bypass power returns to normal tolerance, the load transferred back to bypass automatically.

2.2.6 **Frequency converter:** Converting frequency from 50Hz to 60Hz or vice versa. This operation mode cannot be used with ECO mode. Automatic or manual bypass transfer is not allowed under this condition.

2.3 SYSTEM DESCRIPTION

2.3.1 **UPS Capacity:** UPS is designed to handle output power factor up to 0.9.

UPS Model –UPS102R2000N Maximum capacity 1000VA / 900W
UPS Model –UPS102R2000B Maximum capacity 1000VA / 900W
UPS Model –UPS202R2000N Maximum capacity 2000VA / 1800W
UPS Model –UPS202R2000B Maximum capacity 2000VA / 1800W
UPS Model –UPS302R2000N Maximum capacity 3000VA / 2700W
UPS Model –UPS302R2000B Maximum capacity 3000VA / 2700W

2.3.2 **UPS Input:** The UPS system input shall be configurable as single powered from a L/N/G Single phase source. Power input cord cable is standard with UPS.

1. Input nominal AC voltage: 200/208/220V/230V/240V.
   Line + neutral + ground.
2. Input AC voltage range: 175 – 280V at 100% load for 220V/230V/240V,
   160 – 280V at 100% load for 200V/208V.
   80 – 175V at 50% ~ 100 % load for 220V/230V/240V,
   80 – 160V at 50% ~ 100 % load for 200V/208V.
3. Input current (@230V): 1kVA: 4.3A.
   (Fully battery charged) 2kVA: 8.4A.
   3kVA: 12.6A.
4. Input frequency range: 50/60 ± 10Hz Auto selectable.
5. Input Power Factor: > 0.99 @ 100% load
6. Input current distortion THDi: < 3% @ 100% load
7. Input Power with fully charged battery and 100% load: 1kVA: 0.99kW.
   2kVA: 1.94kW.
   3kVA: 2.9kW.
8. Input protection:
   a) 1kVA: 10A/250V AC Breaker.
   b) 2kVA: 20A/250V AC Breaker.
   c) 3kVA: 20A/250V AC Breaker.
9. Short circuit capability: 6 times of rated current, 0.1~1.8sec

2.3.3 **UPS Output:**

1. Output nominal AC voltage: 200V/208V/220V/230V/240V,
   Line + neutral + ground.
2. Output nominal current: 1kVA: 3.9A@230V.
   2kVA: 7.8A@230V.
   3kVA: 11.7A@230V.
3. Output THDv%:
   a) < 3% for linear load.
   b) < 5% for non-linear load.
4. Output AC voltage regulation:
   a) ± 2% for linear load.
   b) ± 3% for non-linear load.

5. Transient response: ±5% for 0 - 100% load variations.
6. Transient response recovery time: < 20ms.
7. Output nominal frequency: Auto selectable frequency 50 or 60Hz.
8. Output frequency stability:
   a) ± 0.1Hz.
   b) ± 1% with mains synchronize.
9. Slew rate: < 1Hz/sec.
10. Overload Rating: (± 2%)
    a) < 105% continuous.
    b) 105%~125% for 1 minute.
    c) 125%~150% for 30 seconds.
    d) ≥ 150% for 0.5 second.
11. Inverter short circuit capability:
    1kVA: < 15A, 4~5.cycles
    2kVA: < 35A, 4~5.cycles
    3kVA: < 50A, 4~5.cycles
12. Crest factor: 3:1
13. System AC-AC Efficiency: 1kVA: 91%.
    2kVA: 93%.
    3kVA: 93%
14. Output power factor: 0.9

2.3.4 Bypass:

1. Bypass AC voltage range: ± 5%~15% adjustable.
2. Bypass frequency range: 50/60Hz Auto selectable, ± 5Hz adjustable

2.4 INPUT RECTIFIER, PFC AND CHARGER

2.4.1 **General:** The input section consists of HVCD relay (High Voltage Cutoff Device), rectifier, PFC/booster and battery charger. Input Rectifier and IGBT PFC booster is based on Delta DSP control technology. Controlled bridge converts AC input voltage into DC voltage (approx. 325 VDC), which is boosted and regulated by PFC to DC BUS values ± 370VDC~390 VDC. Dual DC BUS provides power to inverter. Battery charger input is fed from the main AC input and charge the battery directly, it also provides power to aux. power supply unit.

2.4.2 **Input Current Total Harmonic Distortion:** Input THDi% values are less than 3% at full load.

2.4.3 **Input power factor:** Input PFC controlling and correcting input power factor. PF values are more than 0.99 at 100% to full load.

2.4.4 **Charger:** Power unit contains an AC-DC converter - battery charger. Charger input is supplied from AC input in normal and bypass operation mode. Output of battery charger is fixed as below:

UPS rated	1kVA	2kVA	3kVA
Number of battery(12V)	2	4	6
Float charge	27.3Vdc	54.6 VDC	81.9VDC
Boost charge	28.0Vdc	56.0 VDC	84.0VDC

Charging current	4A	4A	4A

Default charging current is 4A

1. Float to Boost charge conditions:
    1. Battery voltage is less than 12.5V/Batt over 30 seconds
2. Boost to Float charge conditions:
    1. Battery voltage is larger than 14.0V/Batt or
    2. The boost time is over 8 hours

2.4.5 **DC Bus voltage ripple:** +/- 2V of DC bus voltage.

2.4.6 **Back-feed Protection:** Back-feed protection is using to turn off input relay to isolate power feedback to input terminals while UPS running in battery mode.

2.5 OUTPUT INVERTER

2.5.1 **General:** Output inverter with capacity 1kVA / 900W or 2kVA / 1800W or 3kVA / 2700W is part of each UPS system. The inverter converts DC BUS voltage to sinusoidal output. Output inverter is based on DSP technology and IGBT with PWM control. This type of inverter has considerable capability to reduce harmonic distortion and increase voltage regulation.

2.5.2 **Overload Capability:** Overload conditions < 150% of system capacity is sustained by the inverter for 30 seconds in normal and battery operation. If overloads remain over the limitation, the critical load will be switched to the automatic static bypass output of the UPS.

2.5.3 **Output Power Factor:** Rated output power factor is can be up 0.9. So it is possible to connect with wide range of load having different power factor.

2.5.4 Inverter Short circuit Capacity**:**

a) 1kVA: 15A/90~100ms.
b) 2kVA: 35A/90~100ms.
c) 3kVA: 50A/90~100ms.

2.6 AUTOMATIC STATIC BYPASS

2.6.1 **General:** The automatic bypass is a reserve power for Online UPS, Load will transfer to static bypass if UPS experiences an overload or similar alarms and back after normal conditions are restored. It is also possible to transfer the load manually from control panel. In the case of any fault inside UPS load will permanently remain in bypass mode.

2.6.2 **Automatic Transfers:** An automatic transfer of load to static bypass will be carried out, whenever the UPS detects overload on inverters or in any case when UPS can't support the critical load. Transfer from static bypass back to inverter output will automatically perform after overload or failure condition is not present in UPS system anymore.

2.6.3 **Overloads:** The static bypass shall be rated and capable of handling overloads equal to or less than 125% of the rated system output continuously. For overloads caused by inrush current or short circuit conditions, the static bypass can sustain overloads of 600% of system capacity for 1second.

2.7 DISPLAY AND CONTROLS

2.7.1 **Control Logic:** UPS is equipped with digital controls DSP. Inverter and PFC are controlled by single DSP.

2.7.2 **Control panel and display:** Mimic panel and LCD display is located on front part of UPS system. Main functions are: UPS status and message display, parameter settings and UPS control, UPS startup and shutdown.

2.7.3 **Supported commands:**

1. Inverter Voltage
2. Inverter Frequency
3. Bypass Range
4. Buzzer Off
5. Overload alarm
6. UPS test
7. Battery Test

2.7.4 **Metered Data:** The following metered data are available on the alphanumeric display:

1. Input voltage/frequency.
2. Output Voltage/Frequency
3. Battery Run time
4. UPS Output Loading %/KVA/KW.
5. Battery Voltage/ Capacity.
6. Internal Temperature.
7. Event code.

2.7.5 **Event code:** The display unit will allow the user to read max. 120 event codes of the recent status.

2.7.6 The display unit shall allow the user to display a log of all active alarms. The following minimum error codes shall be available:

1. E11: Charger warning
2. E12: Fan fault

3. E13: Temperature out of range
4. E14: DC bus High/Low
5. E16: Inverter Fault.
6. E18: DC-DC Fault
7. E19: Abnormal output/Inverter voltage
8. E21: Output Short Circuit
9. E77: Charger fault
10. MBB: MBB shutdown
11. OVL: Overload shutdown
12. Sd0: REPO shutdown
13. Sd1: RPO Shutdown
14. Sd2: “Shutdown After” shutdown
15. Sd3: “Battery Save” shutdown
16. Sd4: Battery Low shutdown
17. Sd5: “Cold Start Battery Empty” shutdown

2.7.7 **Communication Interface:** A communication interface provides the following communication ports which and can be used simultaneously:

1. RS232 / Dry contact
2. USB port
3. Mini card slots
4. RJ45
5. RJ11

2.8 BATTERY

2.8.1 The UPS is designed for use of Valve Regulated Lead Acid (VRLA) type of batteries with capacity according to backup time and final UPS power capacity.

2.8.2 **Number of batteries (12V, 9Ah):**

UPS rated	1kVA	2kVA	3kVA
Number of battery(12V 9Ah)	2	4	6

2.8.3 **Charging Voltage**:

UPS rated	1kVA	2kVA	3kVA

Float charge	27.3Vdc	54.6 Vdc	81.9Vdc
Boost charge	28.0Vdc	56.0 Vdc	84.0Vdc

2.8.4 **Charging Current**:

UPS rated	1kVA	2kVA	3kVA
Charging current	4A	4A	4A

2.8.5 **Low Battery Shutdown voltage:**

UPS rated	1kVA	2kVA	3kVA
Shutdown voltage	20.4Vdc	40.8 Vdc	61.2Vdc

2.9 Function

2.9.1 **Setup mode:** In setup mode it can set up the following items from LCD panel:

a. Inverter voltage

b. Inverter frequency

c. Frequency Converter

d. Standby bypass

e. ECO

f. Bypass Range

g. Buzzer

h. Overload alarm

i. Battery Capacity

j. Battery String

k. Auto-Start To Online

l. Power Factor

m. Restore Default

2.9.2 **Control Function:**

a. Cold start (Battery start): Even there is no utility power, UPS can startup with battery.

b. AC startup (w/o battery)

c. UPS test

d. Battery fail indicator

e. Short circuit protection

f. Overload protection

g. Over temperature protection

h. Out of frequency protection

2.10 ACCESSORIES

2.10.1 Connectivity

The UPS can be controlled and monitored locally or remotely. Connectivity is supported by hardware and software means:

Hardware: USB port and Mini smart card slot, it can connect to mini SNMP card, mini Modbus card, TVSS card and mini Relay I/O card.

Software: UPSentry 2012, Insight Power Client, Insight Power Manager, Shutdown Agent 2012.

2.10.2 Software compatibility

The UPS connectivity software is available for following systems:

1. UPSentry 2012, Communication type: USB.
   a) Windows XP – SP2, Vista, Win7, 8 &10.
   b) Windows 2003/2008.
   c) Windows 2008 Server Core, Hyper-V 2008 R2.
   d) Linux OpenSUSE 11.4, ubuntu 10.04, Fedora 3.1.9.
   e) CentOS 5.8.
   f) Citrix XenServer 6.0.0.
   g) Linux KVM.
2. Shutdown Agent 2012 for graceful shutdown, Communication type: SNMP / RS232 / USB.
   a) Windows XP – SP2, Vista, Win7, 8 &10.
   b) Windows 2003/2008.
   c) Windows 2008 Server Core, Hyper-V 2008 R2.
   d) Linux OpenSUSE 11.4, ubuntu 10.04, Fedora 3.1.9.
   e) CentOS 5.8.
   f) VMWare ESXi 4.1, 5.
   g) Citrix XenServer 6.0.0.
   h) Linux KVM.
3. Insight Power Manager for UPS management, communication and diagnosis

   Communication type: RS232/485, SNMP.

a) Windows XP.

b) Windows 2000/2003/2008.

c) Windows Vista/7/8/10.

4. Insight Power Client for UPS management and safe system shutdown

Communication type: SNMP.

d) Windows XP.

e) Windows 2000/2003/2008.

f) Windows Vista/7/8/10.

2.10.3 **Mini Smart card**

The UPS system provides one mini smart card slots to monitor the UPS or to enhance the UPS function.

1. Mini Relay I/O dry contact card.
2. Mini SNMP card.
3. TVSS card.
4. Mini ModBUS card.

2.11 ENVIRONMENTAL

2.11.1 **Storage temperature range:** -15°C to 50°C.

2.11.2 **Operating temperature range:** 0°C to 45°C.

2.11.3 **Relative humidity:** 5 to 95% non-condensing.

2.11.4 **Altitude:** >1000meter above sea level (no deration). 1% deration every 100m raise.

2.11.5 **Audible noise: (**at 1 meter) < 45dB for 1kVA, <48db for 2k,3kVA

2.11.6 **IP protection:** IP 20

3 APPENDIX

3.1 STANDARD EQUIPMENT

- Automatic, static bypass switch for uninterrupted switching.
- User friendly graphical LCD display to operate with UPS system and allows access to the system parameters (state indicators, measurements, alarms).
- USB communications interface, one mini slot for additional mini cards, input and output dry contacts.

3.2 ACCESSORIES

- Optional: Mini SNMP Card, Mini Modbus card and Mini Relay I/O card(potential free) to monitors and controls the status of the UPS via a network system.
- Optional: Mini TVSS Card, let the UPS communication cable has surge protection function.
- Optional: Dust Filter, to prevent dust from entering into the UPS to ensure UPS reliability.
- Delta UPS software package.

Key functions

	Shutdown OS	Centralized management	Remote control	Virtual Machine Shutdown			
				Hyper-v	ESXi	XenServer	KVM
InsightPower Client	•		•				
UPSentry 2012	•		•	•		•	•
InsightPower Manager		•	•				
ShutdownAgent 2012	•			•	•	•	•

Operating system support

	Windows	Linux	FreeBSD	Sun Sparc
InsightPower Client	•			
UPSentry 2012	•	•	•	•
InsightPower Manager	•			
ShutdownAgent 2012	•	•	•	•

3.3 SUMMARY SPECIFICATION

1. General Data				
Model		1kVA	2kVA	3kVA
Type		Single phase on-line UPS		
Output Power Factor		0.9		
Capacity		900W	1.8kW	2.7kW
Technology		On Line Double Conversion		
2. Input Data				
Nominal AC input voltage		200; 208; 220; 230; 240 (single phase)		
Voltage range	Full Load	200/208/220/230/240: 175~280V		
	50~100% Load	200/208/220/230/240: 80~175V		
Input frequency	Nominal	50/60 Hz (Auto-Selectable)		
	Tolerance	± 10Hz		
Input power factor	Full Load	> 0.99 (Full resistive load)		
THDi	Full Load	< 3%		
Slew rate		< 1Hz/sec.		
Input current (rated @230V)		4.3A	8.4A	12.6A
Protection breaker		10A/250V AC Breaker	20A/250V AC Breaker	20A/250V AC Breaker
3. Output Data				
Nominal output power		900W	1.8kW	2.7kW
Nominal output power with resistive load		900W	1.8kW	2.7kW
Nominal AC output voltage.		200; 208; 220; 230; 240 (single phase)		
Output waveform		Sine wave		
Overall efficiency		91%	93%	
Output voltage regulation				
Static		± 2%		
Dynamic	10-100% Load variation	± 3%		
THDv%		≤ 3% Linear load		
		≤ 5% Nonlinear load		
Output current nominal		3.9A @230V	7.8A @230V	11.7A @230V
Output frequency nominal		50 / 60Hz		
Frequency stability	With internal oscillator	± 0.1Hz		
	With mains synchronize	± 1%		
Slew rate		< 1Hz/sec.		
Overload capability		< 125%: 1min.		
		< 150%: 30sec.		
		> 150%: 1sec.		
Crest factor		3:1		
Output protection		N/A		
Transient voltage (10-100% Load variation)		< 5%		

Recover time(ms)			< 40ms @linear load		
4. Battery / Charger					
Rating voltage (inbuilt battery)			24Vdc	48Vdc	72Vdc
Number of batteries per string (Default)			2	4	6
Protection fuse			30A fuse 2 pcs		
Recharging capability			4A (can be increased to 8A installation via of optional 4A charger board)		
Recharge voltage – Float			27.3±0.3Vdc	54.6±0.7Vdc	81.9±0.7Vdc
Recharge voltage – Boost			28Vdc	56Vdc	84Vdc
Low battery shutdown (Default)			20.4±0.5Vdc	40.8±0.7Vdc	61.2±0.7Vdc
Battery test			Manual, automatic		
6. Operation					
Transfer time	On-line mode	Main power failure	0ms		
		UPS to bypass	< 4ms		
		Bypass to UPS	< 4ms		
	Eco mode	Main power failure	10ms (typical)		
Transfer voltage	On-line mode	AC → Battery	80V±3%, 280V±3%		
		Battery → AC	90V±3%, 280V±3%		
	Eco mode	Inverter To Bypass	±10%(rated voltage)		
		Bypass To Inverter	±10%(rated voltage)		
UPS operation modes					
Normal mode		Single	Yes		
Back-up mode		Single	Yes		
Electronic Bypass		Single	Yes		
ECO mode			Yes		
Frequency Converter			Yes		
7. Communication					
True RS232 DB9 Female		Protocol	DELTA (Regular Format)		
		Version	1.57		
SNMP(web management Card- optional)		Protocol	DELTA (Regular Format)		
		Version	1.57		
Interface Port		035 & 0B0 & 0B6 Models	RS-232 Port x 1, USB Port x 1, Mini Slot x 1		
		09 Model	RS-232 Port x 1, Mini Slot x 1		
Remote emergency power off (REPO)			No		
Management Software Included			Yes		
Optional			Mini SNMP, Mini ModBUS, Mini Relay I/O Card.		
8. Environment					
Audible noise level (EN 50091) at 1 meter			< 40dBA	< 43dBA	< 43dBA
Operation altitude			0 to 3000m		

		0 to 1000m (3300ft) without derating		
Operating temperature range	Full load	0°C to 40°C		
	De-rate to 90%	40°C to 45°C		
	De-rate to 80%	45°C to 50°C		
Storage temperature range		- 15˚C to 50˚C		
Relative humidity		5% to 95% (No Condensing)		
9. Standards				
Safety (LVD)		EN62040-1		
EMC (EMI)		EN62040-2 C2		
IEC 61000-4-2 Level 4 (Electrostatic Discharge)		Contact : 4KV		
		Air : 8KV		
IEC 61000-4-3 Level 3 (Radio-Frequency Electromagnetic Fields)		Field Strength : 3V/m		
IEC 61000-4-4 Level 4 Fast Transient/Burst		Power Supply Port : 1KV		
		I/O Port : 0.5KV		
IEC 61000-4-5 Level 4 (Surges)		1KV line to line, 2KV line to ground; 1.2/50us Combination Wave		
SAFETY APPROVAL		CB		
EMC APPROVAL		CE		
10. Dimensions				
For 09 model				
Height (mm)		88	88	88
Width (mm)		440	440	440
Depth (mm)		335	430	430
Depth with inbuilt battery (mm)		335	430	565
Weight (kg)		5.3	9	9.1
Weight with inbuilt battery (kg)		11.5	20.6	27.5
For 35, B1, B6 model				
Height (mm)		88	88	88
Width (mm)		440	440	440
Depth (mm)		335	430	430
Weight (kg)		5.3	9	9.1
Color code		C-1001 and C-1005		
11. Accessories				
Battery cable tie		1 pc		
Battery Ear		1 pc		
Battery wire		1 pc		
USB cable		1 pc		
Installation & Operation Quick Guide		1 pc		
Input power cord		1 pc		

Output power cord	1 pc
Output test report	Yes
** It depends on operational conditions*	