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**STANDARD SPECIFICATION FOR
AN UNINTERRUPTABLE POWER SUPPLY**

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STANDARD SPECIFICATION FOR AN UNINTERRUPTABLE POWER SUPPLY

1. GENERAL DESCRIPTION

The uninterruptible power supply (UPS) system will consist of the following:

- 1.1 Rectifier/charger
- 1.2 Static inverter (for three phase system)
- 1.3 Associated control logic
- 1.4 Transformers, protective devices
- 1.5 Storage battery.

The equipment may be arranged into two separate housings, i.e. the UPS module consisting of items 1.1 to 1.4 and the battery or alternatively, for smaller units, all equipment and battery may be housed together in a tower case. The equipment shall comply with Transnet and telecommunications authorities RFI Regulations with regard to Noise Suppression (EM/RFI) and to SANS 1474.

2. OPERATION

- 2.1 Primary AC power is converted by the solid state rectifier/charger to DC which is used both to charge the battery and to provide input power to the inverter. The inverter converts the DC power to AC for use by the critical load. (Double conversion true on-line UPS).
- 2.2 Upon failure of the primary AC power, the inverter draws power directly from the battery bank to continue to supply AC power to the critical load without interruption.
- 2.3 Upon reinstatement of primary AC power, the battery is recharged while AC output power continues to be supplied to the critical load without interruption.

3. RECTIFIER CHARGER

- 3.1 For UPS units above 20kVA, the rectifier/charger is to consist of a 3-phase (in the case of a 3 phase UPS), controlled SCR bridge and LC filter, supplying the DC bus. The bridge must control both the output voltage and current. For smaller units the rectifier assembly may consist of a bridge rectifier feeding a charger that will regulate the voltage and current.
- 3.2 The rectifier must be able to operate at full capacity at nominal input AC mains voltage plus/minus 10% and nominal frequency plus/ minus 5%.

- 3.3 When mains is restored after an outage, the power drawn from the mains must be phased in from 0% to 100% over a period of 15 seconds - termed the "power walk-in" period.
- 3.4 The rectifier/charger must have sufficient capacity to supply the maximum output power of the UPS as well as recharging the battery from a fully discharged condition to 95% charge within ten times the discharge period. After the battery is recharged the rectifier/ charger must maintain the battery at full charge.

4. INVERTER

- 4.1 The inverter is to consist of solid state switching devices (GBT's or SCR's, dependent upon the output power).

These devices are to produce pulse width modulated waveforms, which are to be passed through a matching transformer and filter network to produce a smooth and uniform sine wave.

- 4.2 All power semi-conductor devices must be protected against over- current and transient over-voltage.
- 4.3 The incoming supply neutral and outgoing supply neutrals may be commoned. Should total galvanic isolation be required, such as for hospitals or where earthing could be unreliable, then a double wound isolation transformer should be provided.
- 4.4 The inverter must prevent the batteries discharging below 1,67 V/ cell and must switch off when this condition is reached.
- 4.5 The control electronics shall keep the output of the inverter in sync with the utility and during utility outages the inverter shall operate on an internal oscillator which shall keep the inverter within the specified tolerance for frequency.
- 4.6 The system is to be equipped with a static by-pass switch operating in parallel with a mechanical by-pass switch. Should the UPS system malfunction, the static switch is to achieve an uninterrupted transfer of the output from the inverter directly to the AC incoming mains. The mechanical switch must then be able to manually take over from the static switch.

5. CONTROLS, PROTECTION AND CONSTRUCTION

- 5.1 The UPS unit must incorporate a rectifier breaker, reserve breaker and battery isolator as well as a maintenance by-pass switch.
- 5.2 The UPS system is to be protected against over and under voltage mains power surges and transients and voltage surges introduced at the output terminals.

- 5.3 All three phase output UPS units are to be provided with a single line mimic diagram which is to be indelibly drawn on the fascia of the UPS. LED's on this diagram are to indicate the status of the various sections of the circuit.

Single line diagrams without incorporating LED displays will be required on single phase output units.

- 5.4 Voltage free contacts are to be available for remote indication of the status of the major components of the system.
- 5.5 All materials and components used in the UPS are to be new, of high quality and of current manufacture. All relays are to be in dust tight enclosures.
- 5.6 Terminals are to be provided for making all external cable connections. These terminals are to be of the clamp type and not of the pinch screw type.
- 5.7 All electronic control boards are to employ plug-in connectors to facilitate maintenance.
- 5.8 The UPS must be housed in a substantial enclosure constructed from sheet metal, treated and powder epoxy coated. All doors or panels are to be provided with panel key latches or have hinged doors with lockable catches.
- 5.9 Adequate ventilation must be provided to ensure that a safe internal temperature is maintained. Either forced or natural ventilation is to be employed, depending on the power rating of the UPS. The cooling air is to enter the cabinet via a grille. Serviceable filters which are to keep the ingress of dust and dirt to a minimum shall be provided in polluted areas.
- 5.10 The heat sinks for the power semi-conductors must be fitted with heat sensors which are to initiate a shut-down if the safe working temperature is exceeded.

6. STORAGE BATTERY

The storage battery shall be of the lithium battery maintenance free type.

Battery cells shall be contained in a well ventilated enclosure with a corrosion-resistant drip tray.

The anticipated life of the battery cells shall be 10 years or longer.

7. SYSTEM STATUS PANEL (SPP)

The SPP shall provide an electrical flow diagram on the front which shall mimic the current operating status of the UPS. It shall provide the following controls, indicators and meters:-

- 7.1 Indicators

- a) Single or Three Phases of Input Voltage.
- b) Single or Three Phases of Bypass Voltage.
- c) Single or Three Phases of Maintenance Bypass Voltage.

7.2 LED Indicators For:-

- a) Inverter ON
- b) Utility ON
- c) Rectifier ON
- d) Inverter OFF
- e) Battery Charging
- f) Battery Discharging.
- g) Low Battery.
- h) ON Maintenance Bypass.
- i) ON Automatic Operation.
- j) Battery Circuit Breaker Open.
- k) Battery Circuit Breaker Closed

7.3 Analog Meters For :-

- a) Input Voltage.
- b) Output Voltage (Inverter)
- c) Output Voltage (Bypass)
- d) Output Current.
- e) DC Bus Voltage.
- f) DC Bus Current (Inverter)

7.4 Control Switches For :-

- a) Input Voltage.

- b) Output Voltage Inverter.
- c) Output Voltage Bypass.
- d) Output Current.
- e) Emergency Power Off Guarded Push-button.

8.	UPS SPECIFICATION SHEET	
	AN UNINTERRUPTABLE POWER SUPPLY MUST BE SUPPLIED WITH THE FOLLOWING SPECIFICATION	
1	UPS INPUT	
1,1	Voltage	400 V \pm 10%
1,2	Frequency	50 Hz \pm 10%
1,3	Current THD (sinusoidal voltage	10%
2	UPS OUTPUT	
2,1	Rated output at 0.7 IND PF	40 KVA
2,2	Load Power Factor Range	From 0.6 lag to unity
2,3	Rated Output Voltage (3 Phase)	400 V
2,4	Regulation no load to full load (steady state)	\pm 1%
2,5	Voltage regulation with 100% load application	\pm 5%
2,6	Recovery time to steady state	30 milliseconds
2,7	Overload capability	125% for 1 hour
2,8	Overload capability	200% for 30 second
2,9	Output Waveform Type	Sinusoidal
2,1	Total harmonic distortion	less than 3%
2,11	Frequency	50 Hz
3	STATIC TRANSFER SWITCH	
3,1	Transfer time	No break
3,2	O/L rating 100ms	1000%
4	GENERAL	
4,1	Efficiency (Input to Output)	Better than 84%
4,2	Lightning protection	Design to with standard test impulses of 6kV and 3kV
4,3	Noise Suppression (EMI/RFI)	As per Transnet or and

8. UPS SPECIFICATION SHEET	
AN INTERRUPTABLE POWER SUPPLY MUST BE SUPPLIED WITH THE FOLLOWING SPECIFICATION	
	telecommunications authority RFI regulations and SANS regulations
5	ENVIRONMENTAL
5,1	Acoustic noise level <50 dB(A) at 1 metre
5,2	Operating temperature 0-40 deg. C
5,3	Relative humidity (non condensing) 95%
5,4	Operating Altitude Up to 2000m AMSL
6	BATTERY
6,1	Run time at full load 20 minutes
6,2	Type - internal Totally lithium ion battery maintenance free
6,3	Anticipated life 5 years
7	MONITORING
7,1	Voltage free contacts available for remote monitoring by a remote alarm panel or building management system
7,2	RS 232