

**JOHANNESBURG WATER (SOC) Ltd.**

**BULK WASTEWATER**

**PARTICULAR SPECIFICATION**

**E16 : ELECTRICAL UNINTERRUPTIBLE**

**POWER SUPPLY UNIT**



Johannesburg Water (SOC) Ltd.  
PO Box 61542  
Marshalltown  
2107

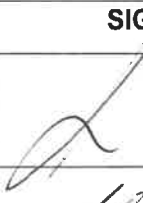
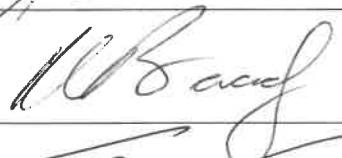

## DOCUMENT CONTROL SHEET

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**PARTICULAR SPECIFICATION: VOLUME E16: ELECTRICAL UNINTERRUPTIBLE POWER SUPPLY UNIT  
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## **E16.1 INTRODUCTION**

This specification is for the supply and installation of Single Online Double Conversion Static Uninterrupted Power Supply Units (UPS) for use in office and industrial environments.

The UPS Unit will be used for backing up critical electrical loads, such as lighting, dedicated sockets, air conditioning in computer rooms etc.

The UPS Unit will be installed via Normal Power or via a Diesel Standby Generator.

## **E16.2 SCOPE**

The scope of work includes the furnishing of all labour, material and services for the design, supply, manufacture, delivery to site, off load, install in position, fix on site, testing, commissioning and inspection of the equipment and installation works at the manufacturers premises and on site of an UPS Unit and its installation.

The Tenderer has to complete all required returnable schedules. Failure to comply with this request will lead to immediate disqualification.

The Tenderer will be responsible for connecting electrical cables to their own equipment that is supplied and installed under this contract. All cables will be properly glanded to the units.

## **E16.3 STATUTORY DOCUMENTS AND STANDARDS**

### **E16.3.1 Standards**

In addition to any client specifications and general operating procedures, the UPS Units shall comply with the requirement of the following specifications, and any amendments thereto, the SANS specification taking preference:

The equipment offered and work performed, shall comply with the requirements of the governing occupational Health and Safety act, at time of tender.

The Uninterruptible power supply system shall comply with the requirements of SANS 1474 or an International standard such as BS or DIN, and shall be produced in a factory with ISO9000 rating and the applicable quality assurance standards.

- |                        |   |   |
|------------------------|---|---|
| (a) SANS 60439         | : | Low Voltage Switchgear and Control Gear Assemblies  |
| (b) SANS 60529/IEC 529 | : | Degrees of Protection Provided by Enclosures (IP Code)  |
| (c) SANS 60947/IEC 947 | : | Low-voltage switchgear and controlgear  |
| (d) IEC 60146          | : | General requirements and line commutated converters   |
| (e) IEC 747            | : | Semi-conductor Devices (including Thyristors)   |
| (f) IEC 60269-4        | : | Low-voltage fuses - Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices |
| (g) IEC 60269-5        | : | Low-voltage fuses - Part 5: Guidance for the application of low-voltage fuses                                     |
| (h) SANS 10142-1       | : | The wiring of premises Part 1: Low-voltage installations  |
| (i) SANS 156           | : | Moulded-case circuit-breakers   |
| (j) SANS 1195          | : | Busbars   |
| (k) SANS 61238         | : | Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV)                |

The following particular specifications shall be read in conjunction with the Project Specification:

- |         |   |  |
|---------|---|--|
| (a) E23 | : | ELECTRICAL SPECIFICATION FOR COLOUR CODE             |
| (b) G02 | : | PARTICULAR SPECIFICATION FOR CORROSION PROTECTION    |
| (c) E06 | : | ELECTRICAL MEDIUM AND LOW VOLTAGE CABLE INSTALLATION |
| (d) E05 | : | LOW VOLTAGE POWER AND CONTROL CABLE                  |
| (e) E08 | : | WIRING   |
| (f) E11 | : | GENERAL EARTHING AND LIGHTNING PROTECTION            |

E16.4.1 General

- (a) All Single Online Double Conversion Static UPS Units will be continuous duty single or three phase units.
- (b) The UPS must be a TRUE on-line, double conversion transformer-based unit (i.e. using a transformer that is an integral part of the UPS, on the input to the UPS). Hybrids, transformerless units or units with external, separate transformers will not be acceptable.
- (c) The UPS must employ PWM technology.
- (d) The UPS must have battery backup for at least 30 minutes at the full rated load of the UPS.
- (e) The output waveform shall be sinusoidal in form with the THD at full line load not exceeding 3%.
- (f) The output voltage variation must not exceed 2%.
- (g) Interference shall not exceed the limits laid down by ICASA
- (h) The UPS must have a battery low voltage/DC cut-off which is not lower than 1,67 Vpc.
- (i) The UPS must be accompanied by the tenderer's proof of their ability to install, test, service, repair, etc. these devices in the field and that they have a suitable after-sales infrastructure.
- (j) The UPS must be equipped with an integral static bypass switch as well as an integral manual/maintenance bypass switch.
- (k) The UPS static bypass switch must be upgradable in order to be matched to the load inrush current.
- (l) The tenderer must be willing and able to provide a complete factory load test, which can be witnessed by the engineer and/or client.
- (m) A voltage free contact rated for 230V AC at 2 amps shall be provided in all the UPS units. This general alarm relay shall be internally wired to energise when a collective signal from all alarms is healthy. Alternatively, this relay shall de-energise when a fault occurs, raw mains is interrupted or the battery power is low.

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- (n) The UPS must be supplied complete with maintenance free batteries and with a capacity to run the system for 30 minutes at full load. If external battery packs are provided, the battery charger must be adequately rated to re-charge the additional batteries at the C/10 rate.
- (o) The UPS system shall be suitable for operation from a 230V AC single-phase supply and must supply a nominal single phase 230 Volt, 50 Hz output.
- (p) Tenderers must satisfy themselves that the UPS rating is adequate to supply all the equipment which they are offering
- (q) The units shall be able to sustain an overload of 125% for one minute or 150% for ten seconds whereupon it shall switch itself off. A full short circuit shall cause the unit to switch off without sustaining damage.
- (r) The UPS must be able to operate normally in an ambient service temperature of 0°C to +35°C and a relative humidity of 5 to 95% non-condensing at 1500 to 3000m above sea level.
- (s) The rated output voltage must be user selectable from 220/230/240V.
- (t) The output frequency must not vary by more than 3Hz.
- (u) The UPS module shall consist of the following main components:
  - i. Transformer - choke input stage,
  - ii. Rectifier/Charger and DC link,
  - iii. Static Inverter,
  - iv. Static Bypass Switch and Manual Bypass Switch,
  - v. Control Panel and Mimic Panel with LCD Display,
  - vi. Output Isolation Transformer,

E16.4.2 UPS Rating

- (a) The UPS should be able to supply a load with a power factor of 0.7 to unity. Tenderers must submit both the VA and Wattage rating of each UPS offered.
- (b) The UPS efficiency must be no less than 89% from zero to full load.
- (c) The UPS must be suitably rated to supply all the required equipment specified in this tender and any attached specifications and provide backup to this equipment for no less than 30 minutes at full load. Even if the equipment does not require it however, the UPS must not have a rating of less than 3kVA

E16.4.3 UPS Backup Batteries

- (a) Tenderers must state the exact number of batteries that will be used.
- (b) Tenderers must state the type of batteries that will be used.
- (c) Tenderers must state the Ah rating of the batteries that will be used.
- (d) Tenderers must state the design life of batteries that will be used (3-5years, 10 years, etc.).

E16.4.4 UPS Standards

- (a) All imported UPSs must have a CE rating
- (b) The UPS must have CE, LGA/GS markings.
- (c) The UPS must comply with safety conformance to EN-50091-1.
- (d) The UPS must have EMC conformance to EN-50091-2 and EN-61000-3-2.

E16.4.5 Module Modes of Operation

The UPS unit will operate as an online, fully automatic system in the following modes:-

- (a) Normal:
  - i. The inverter shall continuously supply the critical load.
  - ii. The Rectifier/Charger shall derive power from the commercial AC source and shall supply DC power to the Inverter while simultaneously float charging the batteries.
- (b) Batteries:
  - i. Upon failure of the commercial AC power, the critical load shall continue to be supplied by the Inverter, which shall obtain power from the batteries without any operator intervention. There shall be no interruption to the critical load upon failure or restoration of the commercial AC source.
  - ii. The UPS must have a battery low voltage/DC cut-off which is not lower than 1,67 Vpc.
- (c) Recharge:
  - i. Upon restoration of the AC source, the Rectifier/Charger shall recharge the batteries and simultaneously provide power to the Inverter.
  - ii. This shall be an automatic function and shall cause no interruption to the critical load.
- (d) Bypass:
  - i. No-break transfer to and from Bypass mode shall be capable of being initiated manually, without operation of the static switch.

E16.4.6 Cabinets/Enclosures

The UPS Unit and the back-up batteries must each be supplied and installed in a freestanding double front steel metal cabinet/enclosure (safety shield behind doors) on adjustable/levelling feet, all pre-powder coated. The cabinets/enclosures shall be designed for industrial and computer room applications in accordance with the environment requirements. The cabinets will have a minimum standard Ingress Protection of 20 (IP20) in office environments and a minimum Ingress Protection of 23 (IP23) in dusty conditions.

Cabinets will be provided with lockable removable doors/panels and seal protection as required. These doors/panels will be cut to accommodate the control panel displays and metering as required. Cabinets must be provided with forced air-cooling ventilation fans. Should the fans be installed on the top section, the cabinets must be fitted with drip trays.

The cabinets must ensure that cable entry and connection will be from the bottom and additional support is provided for cable glands. A dedicated wire way shall be provided within the UPS module for routing user input and output wiring.

UPS Unit plus Battery Cabinet must line up and match up in style and colour.

Service Area Requirements: The UPS module shall require no more than 1 meter of front and side service access room.

Refer to Environment Conditions – Cabinets/Enclosures must be built to suit all temperatures and humidity conditions.

Cabinets/Enclosures must be labelled with 50mm high black engraved letters on white background fixed to cabinet with screw in centre of units.

E16.4.7 Manufacturer's Field Service

(a) Field Engineering Support:

- i. The UPS manufacturer shall have a countrywide field service department staffed by factory-trained field service engineers dedicated to start-up, maintenance, and repair of UPS equipment. The organization shall consist of local offices managed from a central location.
- ii. Field engineers shall be deployed in key population areas to provide on-site emergency response within 24 hours 80% of the time.
- iii. Location of all field service offices must be submitted with the proposal.
- iv. Third-party maintenance will not be accepted.

(b) Spare Parts Support:

- i. Parts be available within 24 hours.

(c) Operational Training:

- i. Before leaving the site, the field service engineer shall familiarize responsible personnel with the operation of the UPS. The UPS equipment shall be available for demonstration of the modes of operation.

(d) Product Enhancement Program:

- i. The UPS manufacturer shall make available feature upgrade service offerings to all users as they are developed. These products shall be proposed as a field-installable, optional kit.

E16.4.8 UPS Data Sheets (Returnable Schedule)

The tenderer must complete the data sheet below with his tender:

**Technical Data Sheet: UPS**

DESCRIPTION	DATA
Make/Manufacturer	
Type/Model (E.g. true on-line, double conversion)	
Transformer-based unit (Y/N?)	
Technology employed (E.g. pulse width modulation)	
Output voltage variation	
Output frequency variation	
UPS rating (VA and Watts)	
UPS efficiency from zero to full load	
Maximum harmonic distortion at full load	



Overload handling capabilities (E.g. "x"% load for "y" minutes)	
Power backup period from batteries at full rated load	
Compliance with standards rating and markings (E.g. "Yes, full compliance" or "No").	
Tenderer to provide complete factory load test that can be witnessed by the Engineer	
Staff available for installation, testing and backup service?	
Number of batteries to be used	
Type of batteries to be used	
Ah rating of batteries	
Design life of batteries	
Local agent (Y/N)?	
Local agent contact details	
Guarantee period	

#### E16.5

#### QUALIFICATIONS

- (a) The UPS manufacturer shall have a minimum of ten years' experience in the design, manufacture and testing of solid-state UPS. A list of installed UPS of the same type as the manufacturer proposes to furnish for this application shall be supplied with the proposal.
- (b) The UPS manufacturer shall have ISO 9001 certification for engineering/R&D and manufacturing facilities.
- (c) If it is an imported UPS, the vendor must be the ACTUAL importer of the UPS. In other words, a middleman who cannot provide factory load tests or suitable after-sales service and backup will not be acceptable.

#### E16.6

#### GUARANTEE

The successful vendor/supplier will guarantee the installation works and equipment for a period of twelve months after first delivery was taken by the Engineer.

#### E16.7

#### TESTING AND INSPECTION:

- (a) The testing and inspection procedures shall be approved prior to the commencement of manufacture.
- (b) The Contractor shall assemble the complete UPS for inspection and factory testing, and present the system to the Engineer, to who it shall be demonstrated that the equipment meets the requirements of the specification.
- (c) The tenderer must be willing and able to provide a complete factory load test, which can be witnessed by the engineer and/or client.
- (d) The Contractor shall provide suitably qualified personnel and all necessary equipment to carry out the tests to demonstrate conformance with the specification and simulate the operation of the system in its final operating state.
- (e) The Contractor shall prepare a set of completed test and inspection certificates for approval.

- (f) The contractor is required to perform site acceptance tests (SAT) on the UPS witnessed by the employer and the engineer, prior to commissioning the UPS. A schedule of the checks, tests and results of the SAT must be available for signing by the engineer at the completion of the SAT.
- (g) A thermal imaging record of the UPS shall be taken after the UPS has been in operation for a minimum one week under typical normal conditions and while running. The thermal imaging record will form part of the deliverable documentation together with Operation and Maintenance Manuals and delivered to the employer on completion of the works.

## **E16.8 PACKING AND MARKING**

### **E16.8.1 Packing**

The Contractor shall protect the equipment against scratching and damage by suitable wrapping, packing and crating of the equipment items.

### **E16.8.2 Marking**

Each separately packed and transported piece of equipment shall be clearly marked.

**E16.10**

**MEASUREMENT AND PAYMENT**

<u>Item</u>	<u>Unit</u>
-------------	-------------

Supply and deliver UPS .....	No
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The tendered rate shall include full compensation for the manufacture, supply, testing and delivery of the UPS incorporating all options/extras as detailed in the detail specification.

<u>Item</u>	<u>Unit</u>
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Install UPS .....	No
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The tendered rate shall include full compensation for the installation, site testing and commissioning plus the 12 months maintenance of the UPS incorporating all options/extras as detailed in the detail specification.

<u>Item</u>	<u>Unit</u>
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Supply and deliver support platform/stand for UPS .....	No
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The tendered rate shall include full compensation for the manufacture, supply, testing and delivery of the support platform/stand for UPS as detailed in the detail specification.

<u>Item</u>	<u>Unit</u>
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Install support platform/stand for UPS .....	No
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The tendered rate shall include full compensation for the installation of the support platform/stand as detailed in the detail specification.