

## ANNEX - 01

### Supply, installation, testing and commissioning of 1 x 120 KVA 3-Phase Uninterrupted Power

#### Supply System

**Quantity: 01**

#### Specifications;

<p><b>General Specification</b></p>	<ul style="list-style-type: none"> <li>❖ The system shall consist of 1 Number On-line UPS of 120 KVA capacity. In case of additional power requirement in future, the increase in power should be possible by successively adding more UPS units in parallel to these UPS units without affecting the general operation of the system.</li> <li>❖ Must be easy to install &amp; maintain also having true voltage &amp; frequency independent, online, double-conversion UPS designed to provide robust power protection for a wide range application. Transformer less design, compact, quiet, and easily transportable.</li> <li>❖ UPS shall have a static switch and rectifier/charger which shall convert AC Power from normal AC source supply into DC power for the normal inverter input and shall float charge or recharge the battery.</li> <li>❖ Shall be provided with separate battery bank &amp; rack.</li> <li>❖ The battery bank shall provide backup power to the inverter in the event of a voltage drop or a normal AC source failure.</li> <li>❖ Inverter shall convert the DC power supplied by the battery bank or the rectifier into AC power for the load.</li> <li>❖ Static bypass module shall ensure the instantaneous transfer of load to the bypass AC source input. Maintenance bypass switch shall isolate the UPS for maintenance and transfer the load to the bypass AC source input without interrupting the supply of power.</li> <li>❖ UPS shall have complete isolation facility at input and output both for repair purpose.</li> <li>❖ Adequate Ventilation fans shall be provided in the panel with wire mesh screen to limit the ingress of dust. All sheet steel work shall be provided with proper anti corrosion treatment with powder coated finish.</li> <li>❖ The UPS shall be designed to operate as on-line, double conversion, voltage and frequency Independent System in the following modes: -             <ul style="list-style-type: none"> <li>• Normal: A.C. load shall be continuously supplied by the UPS inverter which is fed through converter D.C. power. The battery charger shall maintain a float charge on the battery.</li> <li>• Auto restart &amp; Battery recharge: On restoration of AC main supply, converter shall restart automatically and resume supply to the inverter. The battery charger shall start charging the batteries.</li> <li>• By pass:                 <ul style="list-style-type: none"> <li>▪ In case of failure of UPS due to internal faults the load shall be fed by the bypass mains automatically, provided the Mains voltage and frequency are within acceptable limits.</li> <li>▪ In case of temporary over loads the system shall be designed to switch over the</li> </ul> </li> </ul> </li> </ul>
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	<p>bypass mains provided the Mains voltage and frequency are within acceptable limits. After removal of the temporary overload, the system shall automatically switch back to UPS mode from bypass mode.</p> <ul style="list-style-type: none"> <li>▪ In case of service or maintenance of the UPS, it should be possible to transfer the load by manual activation of the bypass switch on the UPS without load sensing any power break.</li> <li>• Battery: On failure of AC mains supply, the AC load shall be supplied by the inverter from the battery power without any interruption in power supply to the load. Upon restoration of mains supply there shall be no interruption in the power supply to the load.</li> <li>• Battery stand: The stand shall be fabricated with MS angle with 6 mm thickness, duly treated and powder coated. The battery stand shall have adequate shelves for placing the batteries. The battery bank shall consist of required number of 12 volts valve regulated Lead Acid Batteries Sealed Maintenance Free (SMF) with fire retardant casings of required Ampere Hour capacity to meet the backup requirement. The interconnection of battery shall be with copper cables (FRLS) of suitable size and capacity with necessary Proper insulation, terminal blocks, nuts bolts etc. and all the cables shall be dressed in a neat manner. Every battery bank shall be provided with an isolator of required capacity.</li> </ul>
<p><b>Technical Specification</b></p>	<ul style="list-style-type: none"> <li>❖ Input: IGBT based PWM Rectifier with Input Current Harmonic (THDI) Reduction             <ul style="list-style-type: none"> <li>• Voltage: 400 volts + 10%, 3 Phase and neutral</li> <li>• Frequency: 50 Hz + 6%</li> <li>• Power factor: &gt; 0.93 (Electronically regulated)</li> <li>• Current Harmonics: &lt; 5% (Electronically regulated)</li> </ul> </li> <li>❖ Output: IGBT based PWM Inverter with Sine wave, Microprocessor Control             <ul style="list-style-type: none"> <li>• Voltage: 400 volts +1%</li> <li>• Frequency: 50Hz +1%</li> <li>• Distribution: 3 Phase, Neutral</li> <li>• Total Nominal capacity: 120 KVA unit.</li> <li>• Overload:                 <ul style="list-style-type: none"> <li>▪ 125% for 10 minutes</li> <li>▪ 150% for 60 seconds</li> <li>▪ 200% for 100 milliseconds</li> </ul> </li> <li>• Voltage Regulation:                 <ul style="list-style-type: none"> <li>▪ +1% during steady state condition</li> <li>▪ Not to exceed + 5% when load equivalent to 100% of the total capacity is cut in or cut out.</li> </ul> </li> <li>• Recovery time: Less than 20 milli seconds in all the above conditions.</li> <li>• Wave Form: Sinusoidal</li> <li>• Wave Form Distortion: Not more than 4% (single component not exceeding 3%)</li> <li>• Crest factor 3:1</li> <li>• Load power factor: Unity to 0.7 lagging, 0.9 leading.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Rectifier capacity: Should be able to boost charge the batteries to 80% of the full load capacity in about 6 hours' time in fully discharged condition along with normal working of the UPS.</li> <li>• No Load Loss: Should not exceed 4% of the rated capacity</li> <li>• Minimum Overall Efficiency (AC to AC):             <ul style="list-style-type: none"> <li>▪ At 100% of rated capacity at 0.8 pf – 93%</li> <li>▪ At 75% of rated capacity at 0.8 pf – 90%</li> <li>▪ At 50% of rated capacity at 0.8 pf – 90%</li> <li>▪ At 25% of rated capacity of 0.8 pf – 90%</li> </ul> </li> </ul> <p>❖ Features to be provided</p> <ul style="list-style-type: none"> <li>• Manual by pass switch (make before break type)</li> <li>• Static by pass switch</li> <li>• Emergency Trip (Input to the UPS, Batteries and out of the UPS shall be disconnected with the help of breakers on activation of Emergency Trip)</li> <li>• Output voltage adjustment for + 15 volts</li> <li>• Automatic battery circuit Breaker</li> <li>• Reverse phase sequence protection</li> <li>• On line temperature display</li> <li>• On line battery monitoring &amp; battery alert</li> </ul> <p>❖ Alarm Indication and Trips</p> <ul style="list-style-type: none"> <li>• Output frequency error</li> <li>• Output voltage error</li> <li>• Load on mains</li> <li>• Load on batteries</li> <li>• Battery voltage low</li> <li>• Low input frequency</li> <li>• Equipment over temperature</li> <li>• Equipment overload</li> <li>• Ventilation fan failure as alarm</li> <li>• Battery output breaker open</li> </ul> <p>❖ LCD: Display shall be able to provide the following measurement option</p> <ul style="list-style-type: none"> <li>• Voltage             <ul style="list-style-type: none"> <li>▪ Input Converter (1-2-3 Phase / Neutral)</li> <li>▪ Input by pass (1-2-3 Phase / Neutral)</li> <li>▪ UPS output (1-2-3 Phase / Neutral) Battery</li> </ul> </li> <li>• Current             <ul style="list-style-type: none"> <li>▪ UPS input (Phase 1-2-3)</li> <li>▪ UPS output (Phase 1-2-3)</li> <li>▪ Battery charging / discharging</li> </ul> </li> <li>• Frequency             <ul style="list-style-type: none"> <li>▪ UPS Input</li> <li>▪ UPS Output</li> </ul> </li> <li>• Battery – Remaining back-up time (in minutes) capacity</li> </ul>
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	<ul style="list-style-type: none"> <li>• Power             <ul style="list-style-type: none"> <li>▪ UPS active output KW (Phase 1-2-3)</li> <li>▪ UPS active Input KW (Phase 1-2-3)</li> <li>▪ UPS output KVAR (Reactive)</li> <li>▪ UPS load % (Phase 1-2-3)</li> </ul> </li> <li>❖ Environmental conditions             <ul style="list-style-type: none"> <li>• Ambient temperature: 10 deg. C to 50 deg. C</li> <li>• Ambient Relative Humidity: 0-95% non-condensing</li> <li>• Permissible temperature rise: 40 deg. C</li> <li>• Room Cooling: Natural / Exhaust or Air Conditioning</li> <li>• Equipment Cooling: Shall be done by means of suitable capacity fans.</li> </ul> </li> <li>❖ Protection             <ul style="list-style-type: none"> <li>• Fast acting semi-conductor fuses</li> <li>• HRC fuses for inverter output / input unit</li> <li>• Current limiting features</li> <li>• HRC fuses for DC filter capacitors</li> <li>• HRC fuses for control circuits</li> <li>• Inverter tripping without fuse failure on output short circuit</li> </ul> </li> <li>❖ Enclosure             <ul style="list-style-type: none"> <li>• Protection IP 21</li> <li>• Cable Entry: Top / Bottom preferred</li> </ul> </li> <li>❖ Noise level: Not to exceed 62 DB(A) (to be measured 1 meter away from the body of UPS)</li> <li>❖ Communication Features: - The UPS shall have the following features:             <ul style="list-style-type: none"> <li>• RS 232/ 485 serial port</li> <li>• Remote access panel</li> <li>• LAN connectivity interface</li> <li>• Software for UPS remote maintenance and operation</li> </ul> </li> <li>❖ Battery Back-up             <ul style="list-style-type: none"> <li>• 30 minutes supply stand-by power back-up for the full load of 120 KVA shall consist of required number of 12 volts valve regulated Lead Acid Batteries (SMF) of sufficient Ampere Hour capacity complete with battery stand inter-connection, jumper cables and terminal connectors. After supply of the batteries, a certificate from the original manufactures shall be submitted for a) fire retardant casing b) installation of batteries is as per their standard and batteries are in good condition.</li> </ul> </li> <li>❖ Advance Battery Management             <ul style="list-style-type: none"> <li>• To prolong the battery life, the UPS shall be provided with temperature – compensated battery charging, with protection against overcharging of battery.</li> </ul> </li> </ul>
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	<p>The battery charger should be ripple free. Protection against deep discharge of batteries shall be incorporated.</p> <ul style="list-style-type: none"> <li>• The UPS shall have an arrangement for on-line battery testing periodically. In case of failure of battery, the UPS will go to normal mode and failure signals (visual &amp; audio) shall be raised.</li> </ul> <p>❖ Load testing</p> <ul style="list-style-type: none"> <li>• The UPS unit shall be tested at factory before delivery to check all the above parameters. To ascertain the minimum Overall Efficiency of a particular UPS, tests will be carried out on individual UPS at 100%, 75%, 50% and 25% of the full load capacity at 0.8 lagging power factor and at 50 Hz frequency. Overall efficiency will be calculated by measuring the difference between the INPUT power utilized by the UPS and OUTPUT power delivered with the help of Kilowatt meters simultaneously at input and output both. UPS which falls short of our prescribed minimum Overall Efficiency will not be accepted. 100% load testing for 4 hours continuously shall be carried out at factory through power analyzer.</li> </ul> <p>❖ Short circuit withstands</p> <ul style="list-style-type: none"> <li>• The UPS shall withstand a bolted fault short circuit on the output without damage to the UPS module</li> <li>• The supplier shall under take at least one preventive maintenance visit and attend to all break down calls during warranty period.</li> <li>• The supplier/tenderer must/should provide at least 2 years of warranty for UPS.</li> <li>• The supplier/tenderer must require to take the service contract for UPS after warranty period &amp; should be able to provide either AMC or CMC according to the hospital need/requirement.</li> </ul>
<p><b>REFERENCE STANDARDS</b></p>	<ul style="list-style-type: none"> <li>❖ UPS shall be design compliance with IEC standards</li> <li>❖ The UPS Manufacturer Company must have ISO9001 certification for development, production, and services.</li> <li>❖ The static uninterruptible power system must be designed and produced in compliance with the following international standards:             <ul style="list-style-type: none"> <li>• EN/IEC 62040-1 "General and safety requirements for UPS used in operator access areas"</li> <li>• EN/IEC 62040-2 "Electromagnetic compatibility requirements (EMC)"</li> <li>• EN/IEC 62040-3 "Performance requirements and test methods"</li> <li>• The UPS must have CE marking in accordance with European Directives 73/23, 93/68, 89/336, 92/31,93/68</li> </ul> </li> </ul>