Subject: Technical Specification for Supply and installation of Office (Online) type UPS system

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GUJARAT ENERGY
(Erstwhile Gujarat Gas Limited)

TECHNICAL SPECIFICATIONS
FOR
OFFICE (ONLINE) TYPE UPS SYSTEM

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1. SCOPE

The specification defines a complete UPS System, as specified herein, to supply, installation, testing & commissioning of UPS to provide continuous, regulated AC power to critical conditions, including loss of the utility AC power. The UPS shall be completely solid-state except for bypass switches which shall be mechanical.

2. STANDARD

2.1. The equipment shall conform to the latest issue of the following and relevant Indian Standard specifications or equivalent specification of the country of origin or IEC specifications.

2.2. The equipment offered shall generally conform to the following codes / standards:

IS:9000 (part 3/sec.5)1977 (reaffirmed 2007)

IS: 13314 -- Solid state inverters run from storage batteries.

IS : 11260 -- Stabilized power supplies AG output.

lEC: 146 -- Solid state inverters.

2.3. The equipment shall also conform to the provision of Indian Electricity Rules, Indian Electricity Act and any other statutory regulations in force from time to time.

2.4. In the event of conflict between this specification and other documents, the following order of priority may be followed:

a) Data sheets

b) This specification
c) Codes & Standards

The UPS shall be designed in accordance and be compliant with the applicable sections of the current revision of the following standards.

- ✓ ANSI C62.41 (IEEE 587)
- ✓ National Electrical Code
- ✓ NEMA PE-1
- ✓ NFPA
- ✓ OSHA
- ✓ UL Standard 1778

3. SYSTEM DESCRIPTION

The UPS system shall consist of a UPS module, a storage battery, and a battery disconnect switch. The AC output of the UPS module will be connected to the critical loads. The storage battery will be connected to the DC input of the UPS module through the battery disconnect switch. Utility AC power will be connected to the normal source AC input of the UPS module. Also, utility power will be connected to the alternate AC input of the UPS module to provide power to the critical loads during maintenance. The alternate AC input must match the UPS output in voltage, phasing and capacity.

3.1. SYSTEM OPERATION

3.1.1. NORMAL **-** The UPS shall supply AC power continuously to the critical loads through the static transfer switch. The UPS output shall be synchronized with the alternate AC power source provided that the alternate AC power source is within the specified frequency range. The rectifier/charger shall convert the normal AC input power to DC power for the UPS and for float charging the storage battery.

3.1.2. LOSS OF NORMAL AC INPUT POWER **-** The storage battery shall supply DC power to the UPS so that there is no interruption of AC power to the critical loads whenever the normal AC input power source of the UPS module deviates from the specified tolerances or fails completely. The battery shall continue to supply power to the UPS for the specified protection time.

3.1.3. **RETURN OF NORMAL AC POWER SOURCE** - The rectifier/charger shall start and assume the DC load from the battery when the normal AC power source returns. The rectifier/charger shall then simultaneously supply the UPS with DC power and recharge the storage battery. This shall be an automatic function and shall cause no disturbance to the critical loads.

3.1.4. **TRANSFER TO ALTERNATE SOURCE** - If the static transfer switch of primary UPS system senses an overload, an UPS shutdown signal or degradation of the UPS output, then it shall automatically transfer the critical loads from the UPS output to the stand by UPS system without an interruption of power. If the alternate AC power source is below normal voltage limits, then the transfer shall be inhibited.

3.1.5. **RETRANSFER TO UPS** - The static transfer switch shall be capable of automatically retransferring the load back to the UPS after the UPS has returned to normal voltage and stabilized for a period of time. Retransfer shall not occur, if the two sources are not in phase.

3.1.6. **DOWNGRADE** - If the battery is taken out of service for maintenance, it shall be disconnected from the rectifier/charger and UPS by the battery disconnect switch. The UPS shall continue to function and meet all the performance criteria specified herein except for the battery reserve time capability.

3.2. DESIGN REQUIREMENTS

3.2.1. **Life -** The system shall use components of adequate rating to provide an expected service life of 10 (Ten) years continuous duty and ten years without component replacement. The system shall contain no continuously moving parts other than cooling fans which shall have permanently lubricated bearings.

3.2.2. **Environmental conditions**: Ambient Operating Temperature shall be 40 deg C, the components shall be used 40 deg C rated to provide an expected service life. .

3.2.3. **Maintenance** - Provisions shall be provided for testing the control circuits while the critical loads are bypassed to one of the power sources. All adjustments and tests shall be possible with the use of a standard volt-ohm-milliampere meter and oscilloscope. Test points and diagnostic lights shall be provided to allow easy adjustment of the control. Control circuits shall be mounted on etched circuit boards with plug-in connections for ease and speed of repairs.

3.3. PARTICULAR TECHNICAL SPECIFICATION

A particular specification is detailed in DATA SHEET as **ANNEXURES** herewith.

3.4. QUALITY ASSURANCE

The manufacturer shall have a quality assurance program with checks on incoming parts, modular assemblies and final products. A final test procedure for the product shall include a check of all performance specifications and a minimum 24-hour "burn-in". An on-site test procedure shall include a check of controls and indicators after installation of the equipment.

3.5. SUBMITTALS

3.5.1. With Proposals - Catalog / data sheets describing the proposed equipment shall be submitted with the proposal. A user's listing shall be furnished giving company names, locations and UPS's installed. All deviations to this specification shall be listed and included with the proposal.

3.5.2. After Receipt of Order - A minimum of two sets of the following documents shall be sent :

a) System configuration with single-line diagrams.
b) Functional relationship of equipment including weights, dimensions, and heat
c) Dissipation.

d) Size and weight of shipping units to be handled
e) Detailed layouts of customer power and control connections.
f) Detailed installation drawings including all terminal locations.

3.5.3. After installation of Equipment.

3.5.3.1. Minimum two copies of as built drawings shall be furnished for each of the following:

a) Equipment installation outline.
b) Connection diagram for external cabling.
c) Equipment internal wiring diagram.

3.5.3.2. Minimum two instruction manuals shall be furnished and shall include as a minimum the following:

a) Installation procedures.
b) Operation procedures.
c) Servicing procedures.
d) Troubleshooting instructions.
e) List of recommended spare parts.

One certified copy of the final test report shall be furnished with the equipment.

3.5.3.3. After commissioning of Equipment **-** A signed field service report describing start-up and on-site testing shall be furnished.

3.6. DELIVERY, STORAGE AND HANDLING

The equipment shall be covered with clear plastic sheeting to prevent dust and dirt from entering the cabinet during shipment and storage.

The supplier to ensure delivery within 30 days from the date of purchase order.

3.7. WARRANTY

The manufacturer shall state his warranty of the equipment. In no case shall it be less than 12 months after start-up or 18 months after shipment, whichever occurs first.

4. CONSTRAUCTION DETAILS

4.1. COMPONENT

4.1.1. **Rectifier / Charger**

The rectifier / charger shall consist of an input circuit breaker (optional), an isolation transformer, surge suppressors and a solid-state single-phase rectifier with control circuitry to provide constant voltage/constant current regulation and a ramping current walk-in on start-up of the charger.

4.1.2. **Overcurrent Protection.**

a) The input of the rectifier/charger shall be protected by a circuit breaker.

b) The output of the rectifier/charger shall be both fused and electronically current limited to protect the connections to the UPS input and to prevent damage to the battery.

4.1.3. **Input Transformer.**

a) The input transformer to the rectifier/charger shall be a separate, rating specified in SOR, 230V, 50 Hz, Single phase, having copper windings for galvanic isolation. The charges shall be paid extra as per SOR.

b) Input and Output cables shall be provided along with isolation transformer.

c) The transformer windings shall be designed with extra leakage reactance to minimize notching of the input power lines due to SCR commutations.

d) The transformer core shall be designed to limit the sub cycle magnetizing inrush currents to four times the maximum peak input currents during battery recharge.

4.1.4. **Surge Suppressors.**

The rectifier/charger shall be furnished with surge suppressors on the secondary side of the input transformer to assure proper operation of the UPS module in the event spikes or surges are present in the normal input power source.

4.1.5. **Control Circuitry.**

a) The rectifier/charger shall be equipped with control circuitry to provide constant DC voltage regulation of ± 1% for ± 10% AC input voltage change, for ± 5% input frequency change, or for 10 to 100% load variations.

b) The control circuitry shall electronically current limit the output of the rectifier/charger by droping the DC voltage whenever the DC current exceeds a pre-set limit.

c) Whenever AC power is applied to the rectifier/charger, the control circuitry shall gradually ramp up the output current over a period of approximately 15 seconds to allow gradual loading of the normal input AC power source.

d) The control circuitry shall automatically provide a boost (equalize) voltage after a failure of the normal input AC power. Provisions shall be made to also initiate equalization manually.

4.1.6. **Output Filter**

The rectifier/charger shall be furnished with output filtering to limit ripple currents into the battery.

4.1.7. **Battery Recharge**

In addition to supplying power for the UPS load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times

the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

4.2. UPS

4.2.1. The UPS shall consist of DC filter capacitors, DC surge protection, a solid-state pulse width modulated (PWM) UPS, an output isolation transformer, an output filter and control circuitry to provide precise AC voltage regulation and electronically controlled current limiting.

4.2.2. **Overload Capability**

The UPS shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.

4.2.3. **Fault Clearing and Current Limit**

The UPS shall be capable of supplying an overload current of 150% of its full-load rating for thirty seconds. For greater currents or longer time duration, the UPS shall have electronic current-limiting protection to prevent damage to components. The UPS shall be self-protecting against any magnitude of connected output overload. UPS control logic shall sense and disconnect the UPS from the critical AC load without the requirement to clear protective fuses.

4.2.4. **DC Surge Protection**

The UPS input shall have DC surge protection to assure proper operation in the event that there are surges or spikes on the UPS input.

4.2.5. **Output Transformer**

The UPS shall be furnished with an isolation type output transformer with copper windings.

4.2.6. **Output Filter**

The UPS shall have an output filter to maintain the total harmonic distortion (THD) of the output voltage to the specified limits.

4.2.7. **Control Circuitry**

a) The UPS shall be provided with control circuitry to provide constant AC voltage regulation as specified.

b) The control circuitry shall electronically current limit the output of the UPS by dropping the AC voltage when the output current exceeds a preset limit.

c) The circuitry shall provide a low voltage initial start-up of the UPS and ramp up to full voltage in less than 5 seconds.

d) The control circuitry shall automatically synchronize, and phase lock the UPS output to the alternate power source as long as the source is within 50 ± 0.1 Hertz. If the alternate power source is not within these limits, then the control circuitry shall break synchronization and lock to an internal oscillator.

e) The control circuitry shall interface with a DC low voltage sensor and turn off the UPS at the 1.75 volts per cell level to prevent damage to the battery.

f) Test points shall be provided to facilitate adjustments and diagnoses.

g) Provisions shall be made for easily testing logic circuitry without operating the power circuits.

4.2.8. **UPS Shutdown**

For rapid removal of the UPS from the critical load, the UPS control electronics shall instantaneously turn off the UPS transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.

4.2.9. **Output Frequency**

The output frequency of the UPS shall be controlled by an oscillator. The oscillator shall be temperature compensated and hold the UPS output frequency to +/- 0.1% for steady state and transient conditions. Drift shall not exceed 0.1% during a 24-hour period. Total frequency deviation, including short time fluctuations and drift, shall not exceed 0.1% from the rated frequency.

4.3. STATIC TRANSFER SWITCH

4.3.1. The static transfer switch shall consist of two pairs of Silicon Controlled Rectifiers (SCR's) per phase with each pair connected in inverse parallel (back to back). One set of SCR's shall be connected to the UPS while the other set of SCR's is connected to the alternate, or bypass, power source. The outputs of the two sets of SCR's are connected together and furnish power to the critical loads.

4.3.2. UPS Failure - If the UPS is out of normal limits due to fast or slow under voltages or due to over voltages, the static transfer switch shall turn on the alternate source SCR's to provide power to the loads from the alternate power source. At the same time, the UPS side shall be turned off to prevent the alternate power source from back feeding power to the UPS. If the alternate power source is not within normal voltage limits, then the transfer shall be inhibited.

4.3.3. Retransfer to UPS - The static transfer switch shall be capable of automatically retransferring the load back to the UPS after the UPS has returned to normal voltage and stabilized for a period of time. Retransfer shall not occur, whether initiated manually or automatically, if the two sources are not in phase.

4.3.4. Overcurrent Protection - Fuses shall be placed in the UPS and alternate sources of the static transfer switch.

4.3.5. Surge Protection - The static transfer switch shall have surge protection on the alternate source side.

4.3.6. **Transfer Conditions**

- ✓ The static transfer switch shall transfer from the UPS to the alternate power source for the following conditions:
  a. UPS under voltage. 90% of nominal.
  b. UPS over voltage. 110% of nominal.
  c. UPS overload.
  d. Blown fuse in the UPS.
  e. Manual signal.
- ✓ Automatic Retransfer Conditions - The system shall automatically retransfer the load to the UPS provided all of the following conditions are met:
  a. The UPS and the alternate source are in phase.
  b. UPS voltage is within ± 10% of nominal for more than five seconds on all phases.

4.3.7. Transfer Sensing Time - Maximum transfer sensing time for loss of UPS voltage shall be 1/4 cycle maximum.

4.3.8. Transfer Time - Maximum transfer time to switch from UPS to alternate power source shall be 100 microseconds and from Utility power to battery shall be zero millisecond.

4.4. DISPLAY AND CONTROLS

4.4.1. MONITORING AND CONTROL

The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. A system power flow diagram shall be provided as part of the monitoring and controls sections which depicts a single-line diagram of the UPS. Illuminated visual indicators shall be of the long-life light-emitting diode (LED) type. All of the operator controls and monitors shall be located on the front of the UPS cabinet. The monitoring functions such as metering, status and alarms shall be displayed on an alphanumeric LCD display. Additional features of the monitoring system shall include:

- Menu-driven display with text format
- Real time clock (time and date)
- Alarm history with time and date stamp
- Battery back-up memory

4.4.2. METERING

The following parameters shall be displayed:

- Input AC voltage
- Input AC current

- Input frequency
- Battery voltage
- Output AC voltage
- Output AC current
- Output frequency
- Percent of rated load being supplied by the UPS
- Battery time left during battery operation

4.5. MESSAGES

4.5.1. **ALARM MESSAGES**

The following alarm messages shall be displayed:

- Input power failed
- Charger in reduced current mode
- Battery charger problem
- Battery failed test
- Low battery warning
- Low battery shutdown
- DC bus overvoltage
- Bypass frequency out of range
- Load transferred to bypass
- Static switch failure
- System output overloaded
- Overload shutdown
- Over temperature shutdown

An audible alarm shall be provided and activated by any of the above alarm conditions.

4.5.2. **STATUS MESSAGES**

The following UPS status messages shall be displayed:

- Normal operation
- Load on UPS
- Load on static bypass
- System shutdown
- UPS on battery

4.6. CONTROLS

UPS start-up, shutdown, and maintenance bypass operations shall be accomplished by a single rotary control switch. An advisory display and menu-driven user prompts shall be provided to guide the

operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms.

4.7. POWER STATUS DIAGRAM

A mimic panel shall be provided to illustrate a single line diagram of the UPS. Indicating lights shall be integrated within the single line diagram to illustrate the status of the UPS. Two LEDs located on the diagram shall indicate whether UPS input and/or output power is present. The diagram shall be color coded for visual confirmation of the UPS operating mode.

4.8. CONSTRUCTION

4.8.1. MATERIAL

All materials of the UPS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.

4.8.2. ENCLOSURE

The UPS electronics shall be housed in a code gauge steel, NEMA 1 enclosure requiring access from the front only for all servicing adjustments and connections. The enclosure shall be primed and painted inside and outside with a suitable semi-gloss enamel. The enclosure shall be a free-standing floor mount design with removable side and back panels to provide flexibility of installation and configuration.

4.8.3. LAYOUT

Modules and subassemblies shall be mounted in open construction style so that each may be easily replaced. The equipment shall be constructed so that each power component can be replaced without a soldering iron or special tools.

4.8.4. WIRING

Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (NFPA 70). All bolted connections of bus bars, lugs, and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections are to be torqued to the required value and marked with a visual indicator.

Provision shall be made for power cables to enter or leave from the backside of the UPS cabinet.

4.8.5. WORKMANSHIP

a) Workmanship shall be first class in every respect.
b) All material shall be new and of best commercial grade.
c) Brackets and securing hardware shall be electroplated with corrosion resistant material.
d) Internal wiring conductors shall be combined into cables or bundles and shall be tied securely together.

4.8.6. **COOLING**

Cooling shall be by natural convection or forced air by fans.

4.9. STORAGE BATTERY

4.9.1. The storage battery shall have sufficient capacity to maintain the UPS output at full rated load for the time specified herein. The battery shall be designed for use with UPS modules. The battery shall be the sealed maintenance free with terminal cap. Preferred Make: Exide.

4.9.2. Voltages.

Battery shall be of 12v each and sealed maintenance free (SMF) type.

4.9.3. The storage battery shall be furnished with electrically insulated rack(s), connecting hardware and standard service accessories. The battery shall be delivered charged and filled, ready for service.

4.10. COMMUNICATION / SCADA CONNECTIVITY

A serial interface port shall be provided for remote display of UPS status information at a computer terminal (by others). The UPS via the serial port will support an Enhanced Terminal interface feature. The UPS will "draw" a picture of its own display panel on the remote terminal screen. The UPS will treat the terminal as if it were the front panel LCD display and pushbuttons, enabling the remote user to view screens, set any modifiable values, turn the load on or off, or otherwise be able to perform any functions possible through the normal front panel display.

5. EXECUTION

5.1. FIELD QUALITY CONTROL

The following inspections and test procedures shall be performed by factory trained field service personnel during the UPS startup.

5.1.1. **Visual Inspection**

- Inspect equipment for signs of damage
- Verify installation per drawings
- Inspect cabinets for foreign objects
- Verify neutral and ground conductors are properly sized and configured
- Inspect battery cases
- Inspect battery for proper polarity
- Verify all printed circuit boards are configured properly

5.1.2. **Mechanical Inspection**

- Check all control wiring connections for tightness
- Check all power wiring connections for tightness

- Check all terminal screws, nuts, and/or spade lugs for tightness

5.1.3. **Electrical Inspection**

- Check all fuses for continuity
- Confirm input voltage is correct
- Verify control transformer connections are correct for voltages being used
- Assure connection and voltage of the battery string(s)

5.2. **UNIT START-UP AND SITE TESTING**

Site testing shall be provided by the manufacturer's field service personnel. Site testing shall consist of a complete test of the UPS system and the associated accessories supplied by the manufacturer. A full load power test including a partial battery discharge test shall be provided as part of the standard start-up procedure. The test results shall be documented, signed, and dated for future reference.

5.3. **MANUFACTURER'S FIELD SERVICE**

The UPS manufacturer shall directly employ a nationwide service organization, consisting of factory trained field service personnel dedicated to the start-up, maintenance, and repair of UPS and power equipment. The organization shall consist of regional and local offices.

The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours/day, 7 days/week, 365 days/year. If emergency service is required, response time shall be 8 Hrs. or less.

5.4. **UPS MAINTENANCE TRAINING**

Maintenance training courses for customer employees shall be available by the UPS manufacturer. This training is in addition to the basic operator training conducted as a part of the system start-up.

The training course shall cover UPS theory, location of subassemblies, safety, battery considerations and UPS operational procedures. The course shall include AC to DC conversion and DC to AC inversion techniques as well as control, metering, and feedback circuits to the Printed Circuit Board (PCB) level. Troubleshooting and fault isolation using alarm information and internal self-diagnostics should be stressed.

6. INSPECTION AND TESTING

6.1. **WORKSHOP TEST**

The bidder shall carry out workshop testing in line with approved QAP and approved drawings/documents. The following tests and checks shall be carried out in the manufacturer’s shops as per reference standards, the Test reports shall be submitted for Engineer’s approval.

- All test as required by the manufacture’s practice or by applicable standards during the manufacture stage.

- Performance tests.
- Full Load test
- Functional tests
- Routine tests
- Temperature rise test
- Dry Heat Test, Damp Heat Teat and Cold test

Bidder shall submit Inspection Report from approved Third party Inspection Agency (TPIA) prior to dispatch UPS System at site. QAP shall be submitted by the vendor well in advance (minimum 3 weeks before supply) for GEL approval, inspection shall be carried out only after the QAP is approved.

Bidder shall appoint a Third-Party Agency approved by GEL (Lloyds / KPMG / SGS / BVQI / DNV/ TUV /Davy Power Gas) to witness all tests at the manufacturers at work shop. The expenses on inspection / testing shall be borne by bidders.

6.2. **SITE TESTS**

The following tests shall be carried out after installation at site:

- No Load and Load Test
- Functional test of all alarms
- Battery Back-up at full load

7. PREFERED LIST OF MANUFACTURERS

Following make shall be considered as GEL approved make for UPS System

1. Emersion
2. APC Schneider
3. Aplab
4. Hitachi Hi-Rel
5. Suvik
6. Su-kam

Note: In case bidder offers, UPS make other than those mentioned in the list above, he shall meet Bidder Qualification Criteria(BQC) given in tender document and bidder's credentials will be evaluated by GEL/GEL authorized representative for qualifying them against the tender

8. ENCLOSURE

8.1. ANNEXURE-I	:	TECHNICAL DATA SHEET of 1 kVA Office (Online) type UPS System
8.2. ANNEXURE-II	:	TECHNICAL DATA SHEET of 3 kVA Office (Online) type UPS System
8.3. ANNEXURE-III	:	TECHNICAL DATA SHEET of 1/3 kVA Servo Stabilizer
8.4. ANNEXURE-IV	:	TYPICAL QAP

ANNEXURE - I

PARTICULAR TECHNICAL SPECIFICATION – DATA SHEET

1 KVA ONLINE UPS SYSTEM

1.0	**GENERAL**			
	1.1	**Ref. Standard**	:	IEC/EN 62040-1-1, IEC/EN61000-3-2, IEC/EN61000-3-3 Directives EEC 73/23-93/68-89/336 Reference Indian Standards
2.0	**AMBIENT CONDITIONS**			
	2.1	Max. Temp.	:	40 ^{0}C
	2.2	Min. Temp.	:	10 ^{0}C
	2.3	Design Temp.	:	40 ^{0}C
	2.4	Relative Humidity	:	95 %
	2.5	Location	:	Indoor
3.0	**TESTS**		:	Routine Test (In presence of GEL representative)
4.0	**SUPPLY**		:	UPS – Rectifier Cum Battery Charger (On-Line Office type)
			:	Inverter
			:	Batteries 12 V, 1500 VAH
			:	Interconnecting Cable
			:	1.5 feet Angle size (65x65x5 mm) Stand for keeping UPS & IT
5.0	**LOADING-UNLOADING, ERECTION, TESTING & COMMISSIONING**		**:**	Vendor Scopes
6.0	**QUANTITY**		**:**	As per SOR
7.0	**LOCATIONS**		**:**	Gujarat, Maharashtra, Rajasthan, Madhya Pradesh, Punjab, Haryana and Dadra Nagar Haveli
8.0	**UPS – INPUT**			
	8.1	Rated Voltage	:	230 ± 10 %
	8.2	Rated Frequency	:	50 Hz ± 5 %
	8.3	no. of Phase & Wire	:	1P, 1N, 3W
	8.4	Earthing Mode	:	Solidly Earthed
	8.5	Power Factor	:	Near To Unity

9.0 UPS – OUTPUT

9.1	Rated Power	:	1 KVA
9.2	Voltage	:	230 ± 1 %
9.3	Waveform	:	Sinusoidal
9.4	Frequency	:	50 Hz ± 0.5 %
9.5	No. of Phase & Wire	:	1P, 1N, 3W
9.6	Load Power factor range:		0.8 lag to 1
9.7	Total Harmonic Distortion:		<3% LL, <5%NLL
9.8	Current Crest Factor	:	Up to 3
9.9	Unbalance Load	:	Up to 100 %
9.10	Overload Capacity	:	125 % for 10 minutes, 150 % for 1 minute
9.11	Inverter Efficiency	:	>90 %
9.12	Back up time	:	1 Hour (full load condition)

10.0 BATTERY : Sealed Lead Acid Battery Bank,SMF 12 V,1500 VAH

11.0 Charging Method : Constant voltage constant current (CVCC)

12.0 Enclosure Protection Grade : IP – 20 and above

13.0 LED Indications : Online Inverter ON, Bypass supply ON, Load on battery, Battery charging Indication

14.0 CABLE SIZE

UPS Incomer	:	3 C 4 Sq. mm YWY (min.)
UPS Outgoing	:	3 C 4 Sq. mm YWY (min.)
Battery	:	2C 6 Sq. mm YWY (min.)

15.0 PAINTING TYPE & SHADE : As manufacturer Standards

16.0 SPECIFICATION REQUIREMENTS

The UPS & Servo Bypass system will be designed as follows:

16.1 The system includes one rectifier and one inverter.

16.2 Bypass switch shall be provided to run the Servo Stabilizer system temporarily during breakdown of UPS system

16.3 MCB will be provided for battery, UPS inputs – outputs.

16.4 UPS System is sized for 100 % continuous full load.

16.5 Sealed Lead Acid Battery Bank shall give 1 hr. back up to UPS.

16.6 Contractor shall carry out the full load test of UPS at works & site.

16.7 The acoustic noise level of the system shall not exceed 50 dbA at a distance of 1 meter from the UPS.

16.8 Warranty period shall be one year from date of Commissioning or 18 months from date of supply.

ANNEXURE - II

PARTICULAR TECHNICAL SPECIFICATION – DATA SHEET

3 KVA ONLINE UPS SYSTEM

1.0	**GENERAL**			
	1.1	**Ref. Standard**	:	IEC/EN 62040-1-1, IEC/EN61000-3-2, IEC/EN61000-3-3 Directives EEC 73/23-93/68-89/336 Reference Indian Standards
2.0	**AMBIENT CONDITIONS**			
	2.1	Max. Temp.	:	40 ^{0}C
	2.2	Min. Temp.	:	10 ^{0}C
	2.3	Design Temp.	:	40 ^{0}C
	2.4	Relative Humidity	:	95 %
	2.5	Location	:	Indoor
3.0	**TESTS**		:	Routine Test (In presence of GEL representative)
4.0	**SUPPLY**		:	UPS – Rectifier Cum Battery Charger (On-Line Office type)
			:	Inverter
			:	Batteries 12 V ,4600 VAH
			:	Interconnecting Cable
			:	1.5 feet Angle size (65x65x5 mm) Stand for keeping UPS & IT
5.0	**LOADING-UNLOADING, ERECTION, TESTING & COMMISSIONING**		:	Vendor Scopes
6.0	**QUANTITY**		:	As per SOR
7.0	**LOCATIONS**		:	Gujarat, Maharashtra, Rajasthan, Madhya Pradesh, Punjab, Haryana and Dadra Nagar Haveli
8.0	**UPS – INPUT**			
	8.1	Rated Voltage	:	230 ± 10 %
	8.2	Rated Frequency	:	50 Hz ± 5 %
	8.3	no. of Phase & Wire	:	1P, 1N, 3W
	8.4	Earthing Mode	:	Solidly Earthed
	8.5	Power Factor	:	Near To Unity

9.0 UPS – OUTPUT

9.1	Rated Power	:	3 KVA
9.2	Voltage	:	230 ± 1 %
9.3	Waveform	:	Sinusoidal
9.4	Frequency	:	50 Hz ± 0.5 %
9.5	No. of Phase & Wire	:	1P, 1N, 3W
9.6	Load Power factor range:		0.8 lag to 1
9.7	Total Harmonic Distortion:		<3% LL, <5%NLL
9.8	Current Crest Factor	:	Up to 3
9.9	Unbalance Load	:	Up to 100 %
9.10	Overload Capacity	:	125 % for 10 minutes, 150 % for 1 minute
9.11	Inverter Efficiency	:	>90 %
9.12	Back up time	:	1 Hour (full load condition)

10.0 BATTERY : Sealed Lead Acid Battery Bank,SMF 12 V,4600 VAH

11.0 Charging Method : Constant voltage constant current (CVCC)

12.0 Enclosure Protection Grade : IP – 20 and above

13.0 LED Indications : Online Inverter ON, Bypass supply ON, Load on battery, Battery charging Indication

14.0 CABLE SIZE

UPS Incomer	:	3 C 4 Sq. mm YWY (min.)
UPS Outgoing	:	3 C 4 Sq. mm YWY (min.)
Battery	:	2C 6 Sq. mm YWY (min.)

15.0 PAINTING TYPE & SHADE : As manufacturer Standards

16.0 SPECIFICATION REQUIREMENTS

The UPS & Servo Bypass system will be designed as follows:

16.1 The system includes one rectifier and one inverter.

16.2 Bypass switch shall be provided to run the Servo Stabilizer system temporarily during breakdown of UPS system

16.3 MCB will be provided for battery, UPS inputs – outputs.

16.4 UPS System is sized for 100 % continuous full load.

16.5 Sealed Lead Acid Battery Bank shall give 1 hr. back up to UPS.

16.6 Contractor shall carry out the full load test of UPS at works & site.

16.7 The acoustic noise level of the system shall not exceed 50 dbA at a distance of 1 meter from the UPS.

16.8 Warranty period shall be one year from date of Commissioning or 18 months from date of supply.

ANNEXURE - III

PARTICULAR TECHNICAL SPECIFICATION – DATA SHEET

1 KVA / 3 KVA –SERVO VOLTAGE STABILIZER

Sr.	Parameter	Details
1	KVA	1/3 kva, 1-Phase, 2-Wire + Earth
2	Input Voltage	170V to 270V (PN)
3	Frequency	47 to 53 Hz
4	Output Voltage	220 Volts (L-N) -settable
5	Regulation	+/-1%
6	Load Current	As per KVA rating
7	Control	Micro Processor/controller based Digital
8	Operation	Auto
9	Response Time	10 mSecond
10	Type	Servo Controlled Automatic Voltage Regulator
11	Accuracy	+/- 1%
12	Rate of Correction	35-45 Volts/Sec
13	Efficiency	>95%
14	Waveform Distortion	Nil - Replica of Input waveform
15	Protections	
	Over Voltage Cutoff	230Volts (L-N)-settable
	Under Voltage Cutoff	210Volts (L-N) -settable
	Over load Cutoff	Through electronic PCB Sensing
	Short Circuit Protection	Provided through MCB
	Surge/Spike Suppressor	Provided through MOV
	Fault Indications	Provided on LCD Display
16	Bypass	Manual Switch
17	Metering	Input Voltage on LCD Display
		Output Voltage on LCD Display
		Output Current on LCD Display
18	Cable entry	Back side
19	Cooling	Air cooled
20	Duty Cycle	Continuous
21	Installation	Indoor
22	Operating Temperature	0-45 deg Cel
23	Storage Temperature	0-60 deg Cel

ANNEXURE - IV

TYPICAL QAP

QUALITY ASSURANCE PLAN – OFFICE (ONLINE) TYPE UPS SYSTEM

Sr. No.	Component/ Operation	Characteristics	Type of Check	Quantum of Check	Reference Documents	Acceptance Standards	Types of records	Inspection By		
								M	TPIA	GEL
1	Bill of materials	Enclosure having NEMA-1 standard	Physical Check	100%	GTS / Approved Drg.	Provision	Report	P	W	W
		Microprocessor based unit status display and controls section								
		Rectifier/Charger								
		UPS								
		Static Transfer Switch								
		Input Isolation Transformer-Copper wound								
		Output Isolation Transformer-Copper wound								
		Surge suppressor at IT secondary side								
		DC Surge Suppressor at UPS input								
		Surge Suppressor at Static Transfer Switch								
		Interconnecting Cable								
		SMF Batteries-12 V								
		Output Filter								
		A serial interface port shall be provided for remote display								
		Cooling Fans								
2	Visual Inspection	Dimension	Measurement	100%	Appd. Drg.	Approved Drgs.	Report	P	W	W
		Makes of UPS/Batteries	Physical Check		GTS	Emersion/APC /Aplab/Hitachi Hi-Rel/Suvik/Su-kam, Battery-Exide/Amaron				

						Quonta/AMCO /Rocket/HBL				
		Name Plate details			-	Filled Details				
		Rating			GTS	Input: 415V±15%, 3Ph Output: 230V±1%, 1Ph				
		Type			GTS	Indoor, Floor Mounted				
		Ingress Protection/Enclosure			GTS	NEMA PE-1				
3	Final Testing	Mains Failure Test	Phy. Check	100%	IEC-62040-3 / Tender Specs/	Working Ok	Report	P	W	W
		Measurement of Tightness of Termination	By Torque Wrench			Found Ok				
		Insulation Resistance test	IR test			As per ref standards				
		Over Load Test	Elect. Test			a.125% for 10 minutes. b. 150% for 60 seconds. c. 750% for 100 ms				
		High Voltage test	Elect. Test			As per ref standards				
		Noise Level	Noise Test			55 dBA @1 Mt				
		Annunciations	Elect. Test			As per tender Cls 2.5.1				
		Functional Check of Meters, Setting of Parameters	Working Check			As per Manual				
		Alarms Status, Mesasage display	Type			As per tender Cls 2.5				
		Voltage Regulation	Elect. Test			±1%				
		Short Circuit test	Elect. Test			As per ref standards				

4	Final Testing	Battery Back-up Test	Elect. Test	100%	IEC-62040-3 / Tender Specs	1 Hr at Full Load				
		Frequency Slew rate	Elect. Test			1.0 Hertz/second maximum				
		Voltage Transient Response	Elect. Test			10% maximum deviation ave over 1/2 cycle with recovery to within 5% after 1/2 cycle for 100% load				
		Voltage Adjustability	Elect. Test			± 5%				
		Overall Efficiency	Elect. Test			At 100 % load > 95 % At 50 % Load > 90 %				
5	Documents	Test Certificates	REVIEW OF DOCUMENTS	100%	GTS Cl.	Provided	TC	P	R	R
		Type Test Report From Central Govt. /NABL/ILAC Accredited Lab Covering All Technical Requirements.								
		Manuals								
		Warranty Certificates								
		Wiring Diagrams								
		GA Drawings								
		Testing Reports								
		Instrument Scheduled with Setting parameters								
		Operation Philosophy, Commissioning procedure								

P: Perform, R= Review, W= Witness, TC – Test Certificates, M-Manufacturer, TPIA- Approved Third Party Agency .

Note:

This QAP is for reference. Vendor shall submit QAP/FAT well in advance (3 weeks before supply of UPS) for GEL approval; inspection shall be carried out only after the QAP is approved. Bidder shall appoint a Third-Party Agency approved by GEL to witness all tests at the manufacturers at work shop.