

APPROVAL AND AUTHORIZATION

ISSUER			
Print Name	Function / Firm	Signature	Date (DD/MM/YYYY)
Originator: Mayuri Kedar	Jr. Engineer - Electrical		
	Aevitas		
Checked By: T. M. Panish	Sr. Manager - Electrical		
	Aevitas		
Peer Review by: Kalpesh Chheda	Project Engineering Manager		
	Aevitas		
CLIENT APPROVAL			
Print Name	Function / Firm	Signature	Date (DD/MM/YYYY)
Reviewed by:			
Reviewed by:			
Approved by:			

REVISION DETAILS

REVISIONS			
No.	Date	Description	By
A	25/05/2021	For Internal Review	MAK
B	01/06/2021	Issued for Client Review & Comments	SAB

TABLE OF CONTENTS

1.	SCOPE.....	5
2.	SITE CONDITIONS.....	5
3.	ELECTRICAL SUPPLY SYSTEM	5
4.	CODES & STANDARDS	5
5.	GENERAL SPECIFICATION.....	5
6.	FABRICATION REQUIREMENTS	6
7.	INDICATING LAMPS.....	6
8.	CABLE ENTRY.....	6
9.	NAMEPLATES	6
10.	FINISHING	6
11.	GENERAL REQUIREMENTS	7
12.	DOCUMENTS	7
13.	OTHER REQUIREMENTS.....	7
14.	TESTING & INSPECTION	7
15.	DOCUMENTS FOR APPROVAL WITHIN ONE WEEK OF ORDER (3 COPIES EACH)	8
16.	ERECTION / MAINTENANCE DOCUMENTS BEFORE DESPATCH (4 COPIES)	9
17.	SPECIFIC REQUIREMENTS FOR UPS SYSTEM	9
18.	DEVIATIONS	10
19.	GUARANTEE	10
20.	TERMS OF PAYMENT	10
21.	PENALTY	10
22.	DELIVERY SCHEDULE	10
23.	SPECIFIC REQUIREMENTS	11
24.	ABBREVIATIONS	12

1. SCOPE

This specification covers the requirements of design, manufacture, testing, supply and supervision of installation and commissioning of following rating Online Uninterrupted power supply Unit with bypass feature complete with 30 minutes Battery Backup required by M/s. GV Research Pvt. Ltd. for their Innopolis facility at Hyderabad, Telangana. - Complied

1.1 5 KVA For Substation- 1 No. (3 ϕ I/P & 1 ϕ O/P) - Complied

1.2 10 KVA For 2727 Building-1 No. (3 ϕ I/P & 3 ϕ O/P) - Complied

2. SITE CONDITIONS

- | | | | |
|-----|---------------------|---|---------------------------------------|
| 2.1 | Altitude above MSL | : | Approx 545 mtr. above MSL. - Complied |
| 2.2 | Ambient Temperature | : | Max 41.1°C and Min. 8.9°C - Complied |
| 2.3 | Relative Humidity | : | Below 84% - Complied |
| 2.4 | Atmosphere | : | Industrial - Complied |

3. ELECTRICAL SUPPLY SYSTEM

- | | | | |
|-----|--------------------------|---|----------------------------|
| 3.1 | Voltage | : | 415 V + 10% - Complied |
| 3.2 | Frequency | : | 50 Hz + 3% - Complied |
| 3.3 | No. of phases | : | 3 Phase, 4 Wire - Complied |
| 3.4 | Grounding | : | Solid Earthing - Complied |
| 3.5 | Sym. 3 phase Fault Level | : | 50 KA for 1Sec. - Complied |

4. CODES & STANDARDS - Complied with IEC 62040-1,2,3

4.1 The UPS Panel shall conform to the latest editions of Indian Standard (BIS) specification including, but not limited to the following.

- | | | | |
|-------|---------|---|--|
| 4.1.1 | IS 2147 | : | Degrees of protection provided by enclosures for low voltage switchgear and control gear. |
| 4.1.2 | IS 4237 | : | General requirements for switchgear and control gear for voltages not exceeding 1000 V. |
| 4.1.3 | IS 8623 | : | Factory-built assemblies of switchgear and control gear for voltages upto & including 1000V AC and 1200V DC. |

5. GENERAL SPECIFICATION

5.1 The UPS panel shall be assembled out of vertical sections of uniform height not exceeding 1900 mm and shall comprise of Cable Alley / UPS / Aux components and battery rack of identical weight and width. - Complied

- 5.2 All auxiliary devices for control, indication, measurement & protection such as selector switches, indicating lamps, ammeters, voltmeters, energy meter, protective relays, etc. shall be mounted on the front side of the respective compartment only. - Noted & ammeters, voltmeters, energy meter, protective relays not available.
- 5.3 To keep the section of the cubicle comprising charger & inverters circuits within 35 degrees necessary cooling shall be provided. - Complied
- 6. FABRICATION REQUIREMENTS** - Complied with as per our standard. 1.2mm thickness & doors not available.
- 6.1 The frame of individual vertical panels shall be fabricated using pressed and shaped CRCA sheet steel 2 / 1.6 mm thickness or by using suitable mild steel structural sections. All load bearing sections / Doors shall be of 2 mm sheets. Only inside partitions shall be of 1.6 mm.
- 6.2 The Panel base frame shall be of 6 mm thick and 75 mm height & shall be suitable for directly bolting with the help of foundation bolts & shall be suitable for tack welding at two diagonally opposite points to the Purchasers embedded base frame. All openings, covers & doors shall be provided with neoprene gaskets around the perimeters to make the panel dust and vermin proof. Panel doors construction shall be of double bent type.
- 6.3 All hardware shall be corrosion resistant. All joints and connections of the panel members shall be made by galvanised, zinc passivated or cadmium plated high quality steel bolts, nuts and washers, secured against loosening.
- 6.4 Suitable lifting hooks and / or jacks shall be provided on each panel or shipping section for ease of lifting of the Panel.
- 7. INDICATING LAMPS** - LED+LCD display provided.
- All indicating lamps shall be of the LED cluster type suitable for continuous operation on 230V AC.
- 8. CABLE ENTRY** - Complied with rear side cable entry.
- Cable entry shall be from the Top for incoming and outgoing cables with removable gland plate for all the UPS panels.
- 9. NAMEPLATES** - As per our standard.
- 9.1 Nameplate with the UPS designations shall be fixed at the top of the centre panel.
- 9.2 Engraved nameplates giving feeder details shall be provided for each compartment.
- 9.3 Engraved nameplate shall be provided for each item such as (lamp, push button switch, relay, auxiliary contactor etc.) mounted on the panel. Special warning plates one each on front of a shipping section shall be provided on removable covers / doors giving access to cable terminals and busbars. Special warning labels shall be provided inside the panel also, wherever necessary. Identification tags shall be provided inside the panels matching with those shown on the circuit-diagram.
- 9.4 Nameplates shall be of 0.5 mm thick anodised aluminium, engraved with white / silver letters on Black background.
- 10. FINISHING** - Noted & complied with RAL 9005.
- 10.1 All metal surfaces shall be thoroughly cleaned and degreased to remove mill scale, rust, grease & dirt. Fabricated structures shall be treated by 7-tank process. The under surface shall be made free from all imperfections before undertaking the finishing coat.

10.2 After preparation of the under surface, the panel shall be painted with electrostatic powder coating & shade shall be RAL 7032 inside & outside. Total thickness of painting shall be at least 90-100 microns. The finished panels shall be dried in stoving ovens in dust free atmosphere. Panel finish shall be free of imperfections like pinholes, orange peels, run off paint etc. The vendor shall furnish painting procedure details along with the bid.

10.3 All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust formation. All the moving parts shall be greased.

11. GENERAL REQUIREMENTS

11.1 BATTERY - Noted & will be provided during detailed engineering.

The battery equipment shall be offered complete with all parts that are necessary or usual for their operation. The batteries shall be Sealed Maintenance free type confirming to latest international standards. All the batteries shall be mounted on sheet steel racks. The racks shall be rigid free standing type without wheels, constructed from MS structural materials, shall be free from all dents, bends; welding burr's. The racks will be in tiers suitable to accommodate the batteries specified with all accessories. Vendors shall submit the actual dimensions with drawings for approval.

11.2 BATTERY CHARGER - Rectifier act as a charger & integral part of UPS.

The charger equipment shall be suitable to operate for 230V / 415 V $\pm$ 10% & 50 Hz $\pm$ 3%. It shall be suitable for quick charging the battery without undercharging or overcharging the end cells & at the same time maintaining normal voltage at the D.C bus. Charger shall comprise a float cum boost charger in the same cabinet. The change over from float charging mode to boost charging mode shall be automatic. For the above operation static control methodology shall be applied. The vendor shall submit circuit diagrams explaining the above operations. The battery charger shall also comprise safety protection systems which includes over voltage / under voltage, Overload and overcharging protections.

11.3 INVERTERS - Complied

Inverters shall be IGBT based feedback control type capable of accepting the output of the battery to provide the desired alternating current output. The output of the inverter shall be given to a filter, which besides transforming the square wave to sine wave also regulates the A.C output voltage.

12. DOCUMENTS - Will be provided during detailed engineering.

- 1) On acceptance of the order the supplier shall submit all the relevant drawings for installation.
- 2) Along with the system, 3 copies of manuals for Installation, commissioning and maintenance shall be supplied by the supplier.
- 3) Warranty certificates for batteries shall also be supplied along with the system.

13. OTHER REQUIREMENTS

13.1	Location	:	Substation & Building 2727 - Noted
13.2	Degree of protection	:	IP 20 - Complied
13.3	Battery Bank	:	Battery Bank shall comprise of sealed maintenance.free lead – Acid batteries. - Complied

- 13.4 Capacity : Sufficient to sustain the power output for 60 minutes at full load, in case of failure of mains supply. - Complied with 30mins as per BoQ
- 13.5 Type of batteries : "Sealed Maintenance free" - Complied
- 13.6 Accessories : Battery bank isolation switch (MCB) - Complied
- : Battery mounting rack - Complied
- : Set of Inter row & interbank connectors - Complied
- 13.7 Bypass : Provision for bypassing the UPS shall be Included. (Both Static & Manual) - Complied
- 13.8 Isolation transformer (415 V / 415 V) : Shall be in the input side of Bypass for each rating UPS. - Inbuilt output 1PH IT for 5KVA, external output 3PH IT for 10KVA
- 13.9 Change over Switch with MS enclosure : Suitable for 10 / 5 kVA UPS. - Static switch provided
- 14. TESTING & INSPECTION - Noted**
- 14.1 Representatives of the Owner shall have free access to vendor's works to inspect, expedite and witness shop tests. Any materials or work found to be defective or which does not meet the requirement of the specification will be rejected and shall be replaced at vendor's cost.
- 14.2 Owner reserves the right to carryout stage wise inspection of fabrication, painting and components.
- 14.3 Tests shall be carried out on various equipment / components mounted on the Panel as per relevant IEC Specifications.
- 1) Verification of wiring (continuity test) as per approved wiring diagrams.
 - 2) Mechanical operation test.
 - 3) Insulation test on busbars, power & control wiring circuits with 1000 V megger.
 - 4) High voltage test (2500V for 1 minute).
 - 5) Measurement of sheet steel and painting thickness.
- 15. DOCUMENTS FOR APPROVAL WITHIN ONE WEEK OF ORDER (3 COPIES EACH) - Noted & will be provided during detailed engineering.**
- 1) Single line diagram indicating ratings of all components.
 - 2) Foundation drawings & General arrangement drawings with weight of each shipping section.
 - 3) Typical control schematic diagram.
 - 4) Front & rear view of panel indicating panel numbers & arrangement of components.
 - 5) Bill of materials with make, type / model range / rating etc with tech. literature from suppliers.
 - 6) Sample of paint shade as decided by the client.

16. ERECTION / MAINTENANCE DOCUMENTS BEFORE DESPATCH (4 COPIES) - Noted

- 1) Installation, operating and maintenance manuals.
- 2) Bill of materials giving details of make, range / rating etc.
- 3) Detailed Schematic wiring diagram & control wiring diagram.
- 4) Catalogues and Brochures of all components used.
- 5) Routine Test Certificates.

17. SPECIFIC REQUIREMENTS FOR UPS SYSTEM

17.1 INPUT

- 1) Voltage : 415 V AC $\pm$ 10% - Complied
- 2) Frequency : 50 Hz $\pm$ 3% - Complied

17.2 OUTPUT

- 1) Power : 10 KVA / 5 KVA - Complied
- 2) Voltage : 415 V AC $\pm$ 10% / 230 V AC $\pm$ 10% - Complied with $\pm$ 1%
- 3) Frequency : 50 Hz $\pm$ 3% - Complied
- 4) Inverter efficiency (*) :
 - a. 25% : * 86%
 - b. 50% : * 88%
 - c. 75% : * 89%
 - d. 100% : * 90%
- 5) Overall Efficiency : 88% - Complied with 90%
- 6) Steady state voltage : $\pm$ 1% - Complied
- 7) Dynamic voltage Response : + 5% at 100% load change recovery to 98% in <20ms - Complied
- 8) Harmonic Distortion :
 - a. Linear load : Less than 2.5% THD - Complied
 - b. Non-linear load : Less than 5% THD - Complied
- 9) UPS power factor : >0.96 - Complied
- 10) Output waveform : Pure sine wave. - Complied

11) Transfer time Inverter to

Bypass & Vice versa : 2 to 4 ms - Complied

12) Over load

a. Continuous : 110% < 105% for continuous,
105% to 110% for 10mins,
b. 10 min : 125% 110% to 130% for 1min,
>130% for 3sec
c. 60 secs : 150%

13) Noise Level : < 60 dB. - Complied

14) Frequency regulation

a. Synchronization to line : Upto $\pm 6\%$ - Complied
b. Free running : 0.01% - Complied
c. Slew rate : 1 Hz/Sec - Complied

18. **DEVIATIONS** - Noted

Deviations from the specifications as stated separately in writing by vendor at the quotation stage has been suitably incorporated in the order spec. and hence it is assumed that the requirements of the specification are met without exception.

19. **GUARANTEE** - Noted

The UPS shall be guaranteed for trouble free operation for a period of 12 months from the date of commissioning or 18 months from the date of arrival at site whichever is earlier. Any defect discovered during this period shall be rectified by the supplier free of cost.

20. **TERMS OF PAYMENT** - Noted

Vendors to indicate in percentage, payment terms as follows:

- Post order Advance
- Against Delivery
- Retention money against Performance Guarantee.
- Actual payment terms & condition shall be as mutually agreed with client.

21. **PENALTY** - Noted

Penalty shall be applied in case of delay in vendor's committed delivery date, as per the commercial conditions specified in P.O. Vendors to indicate acceptable Penalty clause in their offer.

22. **DELIVERY SCHEDULE** - Noted

The cables covered by this specification shall be delivered as per project schedule or mutually agreed by upon.

23. SPECIFIC REQUIREMENTS - Refer enclosed

(Vendor to fill in information against each item.)

Refer attached Annexure 509008011S.

24. ABBREVIATIONS

1)	IEC	:	International Electro technical Commission
2)	IP	:	Ingress Protection
3)	I / P	:	Input
4)	MCB	:	Miniature Circuit Breaker
5)	MCCB	:	Moulded Case Circuit Breaker
6)	O / P	:	Output
7)	PVC	:	Polyvinyl Chloride
8)	SWG	:	Standard Wire Gauge