



**GUJARAT ENERGY TRANSMISSION
CORPORATION LTD.**
SARADAR PATEL VIDYUT BHAVAN,
RACE COURSE, VADODARA - 390 007

TECHNICAL SPECIFICATIONS

FOR

220 V BATTERY CHARGER

GETCO / E / TS- BCHR 3202 / R3 June 2022

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TECHNICAL SPECIFICATIONS OF BATTERY CHARGER SUITABLE FOR 220V, LEAD ACID OR Ni-Cd TYPE BATTERY SETS

1.1. SCOPE :

This specification covers Design, Manufacture, Testing at works and supply of the complete three phase Battery Charger with DCDB for 220V Battery sets.

The scope shall also include SCADA compatibility if indicated in schedule-A of respective tender.

1.2. APPLICABLE STANDARDS:

1.2.1. The design, manufacture and performance of the equipment shall comply with all currently applicable standards, regulations and safety codes. Nothing in this Specification shall be construed to relieve the Bidder of their responsibility.

1.2.2. Unless otherwise specified, the battery charger shall conform to the latest applicable Indian / IEC standards and in particulars to the following standards.

- | | | | |
|----|---------|---|---|
| a) | IS-3895 | - | Specification for rectifier equipment in general |
| b) | IS-2208 | - | Specification for HRC fuses. |
| c) | IS-1248 | - | Specification for Indicating Instruments. |
| d) | IS-2147 | - | Degree of protection for cubicles |
| e) | IS-375- | - | Specification for wiring |
| f) | IS-4540 | - | Mono crystalline semiconductor rectifier Assemblies and equipment |
| g) | IS-6619 | - | Safety code for semi conductor rectifier equipment. |
| h) | IS-2026 | - | Transformers |
| i) | IS-2959 | - | A.C contactor for voltages not exceeding 1000V |
| j) | IS-6005 | - | Code of practice for phosphating of Iron and Steel. |
| k) | IS-5921 | - | Printed circuit boards. |
| l) | IS-249 | - | Printed circuit boards |

1.2.3. The bidder shall clearly state the Standards to which the equipment offered by him conforms.

1.3. CONSTRUCTION:

- i) It will be indoor, freestanding, floor mounting and naturally air cooled type, designed for continuous operation in the ambient temperature of 50°C. Good ventilation shall be made through side louvers.
- ii) Each charging equipment offered shall be housed in a sheet steel cubicle reinforced by angle iron frame and shall be mechanically strong. The cubicle shall be dust and vermin proof. The rear and front door cover of the cubicle shall be hinged and shall have locking arrangement. Thickness of sheet steel shall be 3 mm for load bearing members and 2 mm for other sides.
- iii) All the accessories and equipment shall be of adequate rating to suit the above requirements.
- iv) Gland plate: Gland plate of 3 mm thickness for incoming / outgoing cables shall be provided. Earthing with two separate earthing terminals shall also be provided.
- v) Dimensions of the Battery charger shall be within the following range for 220V, 30/50-55 Amp Battery Charger:
 - Width 1500-2000 mm x Depth 600-800 mm x Height 1850-2000 mm.

For other ratings of Battery Charger minimum dimensions shall be;
≥ Width - 2000 mm x Depth - 800 mm x Height 2000- mm by maintaining sufficient working space as well as adequate clearances which shall be decided during detailed engineering.
- vi) All the door mounted equipments as well as equipments mounted inside the cabinet shall be provided with individual riveted /life lasting adhered labels with equipment description engraved.
- vii) Electrical indicating instruments shall be flush mounted on the panel with only flange projecting. The dial shall be white with black numbers and lettering.
- viii) The electronic control circuitry should have built in feature of soft start so that whenever the charger is switched on, the output voltage should increase gradually.

- ix) Battery Charger shall be provided with earth bus bar of tinned copper flat, having minimum cross section 19 x 3 Sq. mm flat securely fixed along with base and provision on both the sides of earth bus for connecting purchaser's earthing grid.

1.3.1. FINISH:

Each cubicle will undergo a through process of de-rusting, cleaning, application of red oxide primer paint followed by the two coats of light grey synthetic enamel paint shade 631 of IS: 5. Paint thickness shall be 60 to 100 microns.

1.3.2. WIRING:

All chargers will be complete with internal wiring and input and output terminals. The components shall be liberally rated. Standard colour code practice shall be followed, with the use of ferrule for numbering and identification of wires. 1.1 KV grade FR & C1 type copper conductor of suitable size shall be used. All hardware such as screws nuts, studs, washers shall be of brass and no ferrous parts shall be used in electrical circuitry control / power.

1.3.3 RATINGS:

The charger for 220V batteries consisting of 110 Nos., 2.0 Volts Lead Acid (Tubular/Plante') battery set shall have following output ratings.

In case of Ni-Cd battery set (If specified in schedule-A) having equivalent nos. of 1.2 V Ni-Cd cells, the charger output ratings shall be in accordance to the requirement of Ni-Cd battery.

- (a) 220 V Battery charger (Three phase):
 - (i) Float charging and load current ratings:
30 Amp / 60Amp / 70Amp / 100Amp at 220 V to 252 V D.C.
 - (ii) Boost charging current rating:
50 Amps / 55Amp / 60Amp / 70Amp / 80Amp / 100 Amp at
198 V to 296/302 V D.C.

1.4. DUTY:

- 1.4.1. The composite charger shall consist of two separate chargers, viz. the float charger and the boost charger. The charger shall be required to cater the following requirements.
- 1.4.2. The float section of the charger shall be compatible to operate in auto (fully automatic) as well as manual mode with a provision of selection through Auto/Manual switch and all related components & scheme.
 - 1.4.2.1. Normally the float charger shall operate in parallel with the 220 V, battery set and the load. The float charger shall supply the DC loads of the sub-station and also provide the trickle charge for keeping the battery set floating totaling up to full capacity. For this condition, the float charger shall be designed to trickle charge all the cells between 220 V to 252 V and supply DC load of the sub-station, keeping the load bus-bar voltage approximately at rated voltage of DC load components by using dropper diodes.
 - 1.4.2.2. The float charger shall supply the DC output voltage as specified in Cl. 1.3.3.a.(i) with + / - 1% stability of adjusted value for AC voltage fluctuations as specified at Cl. 1.5.2 of the Specification and for DC load variation from zero to 100% load.
- 1.4.3. During emergency, when the AC supply fails, the battery shall meet the DC load of the sub-station and in doing so, will get discharged gradually. The battery will need boost charging, for which, a separate charger, called the boost charger shall be required.
 - 1.4.3.1. Boost charger shall have adequate rating to quick charge the battery fully within 10 hrs (Lead Acid) / 5 hrs (Ni-Cd) after an emergency during which the complete DC load is met by the battery.
 - 1.4.3.2. During boost charging the battery set, the charger may also be required to supply the DC load of the sub-station incase of float charger failure. Based on the condition of the battery, it shall be possible to set the boost charging voltage between 198 V to 296/302(Plante') V for 110 / 174 (Ni-Cd) cells with a total output current between zeros to full load capacity of the charger with the voltage on the load bus bar not exceeding 252 volts. The required dropper diodes shall be provided to restrict load bus bar voltage.
 - 1.4.3.3. Boost charger shall incorporate static components comprising silicon-controlled rectifiers with necessary protection. Boost charger, apart from normal constant current operation shall also be capable of constant voltage operation which shall enable it to operate as a float

charger delivering stabilized DC output voltage within + / - 1 % from no load to full load in case of float charger failure. Suitable electrical circuitry shall be provided for this purpose. In the constant current mode it shall have a current stability of +2% of the set value. The constant current setting shall have step less range from 10 % to 100 % of full rated current. Further, the boost charger shall have a provision for manual mode of operation, over and above auto mode of operation. Required circuitry arrangement with auto / manual selector switch etc. shall also be provided for the purpose.

- 1.4.3.4. The boost charger and the float charger shall be so interlocked electrically that during boost charging of the battery, the float charger will supply the DC constant load without supplying to the battery, and at the same time will be in parallel with the battery through a reverse current blocking diode at a suitable tapping. One DC contactor may be incorporated which shall get engaged through N/C contact of the contactor on AC side of the boost charger. In case of failure of AC supply, this contactor shall connect the entire battery supply to the load through one of its N/O contacts automatically without any interruption of DC supply even of a momentary nature. Under no circumstances the voltage across lower tapped terminals shall exceed (+) 10% or fall below (-) 15% of the rated voltage.

1.4.4. LOAD LIMITING:

- 1.4.4.1. The charger shall be provided with load limiting feature for protection against over load. The load limiting curves shall be submitted with the offer. The SCRs / Thyristors shall be protected against voltage surges by providing voltage suppressor devices and/or other latest method of protection.

1.5. INCOMING SUPPLY:

Three Phase, 415Volts (+10%, -15%), 50 Hz, $\pm 3\%$

1.6. CHARGER OUTPUT:

Suitable ripple filtering circuits shall be provided to give a smooth DC output. The ripple content, without the battery connected shall be limited to less than 3% on resistive load. The DC output shall be free from switching surges, transients, etc.

1.7. SPECIFIC PROVISIONS:

As specified in Clause – 1.4.1, the composite charging equipment shall have a separate float charger and a boost charger. Each charger shall consist of the following components and components shall be of the best quality and bill of materials along with rating of the same shall be submitted invariably with the offer.

1.7.1. Float Charger (Three Phases):

- 1) Three phase AC input ON / OFF main switch
- 2) AC input HRC fuses
- 3) Fuse fail and phase sequence reversal detector (Solid state type) for AC input.
- 4) LED type Indicator for AC supply 'ON' indication (after main AC fuse).
- 5) Two winding copper wound naturally air cooled three phase transformer of adequate rating with -15% to +10 % tapping (5% step) on primary side with necessary secondary tapes for achieving required control DC output voltage.
- 6) Full wave controlled Rectifier Bridge comprising of silicon diodes and silicon controlled rectifiers (SCR) with R/C surge suppressor net work and suitable heat sink along with free wheeling diodes and semi conductor fuse protection.
- 7) Fuse fail detector (Solid state type) for semi conductor fuses
- 8) Ammeter of (with external shunt) for measuring DC output current of float charger
- 9) Auto / manual mode selector switch.
- 10) Potentiometer for controlling DC output voltage in auto and manual modes.
- 11) Suitable filter circuit comprising filter choke, filter condenser with HRC fuse protection and bleeder resistor.

Bleeder resistor shall be automatically isolated from the circuit, when float charger current reaches to a value which is sufficient to keep the SCRs ON and it comes back into circuit when float charger current decreases to a value just above the hold ON current of the SCR.

- 12) Blocking diode with suitable heat sink.
- 13) DC output ON / OFF switch.
- 14) DC output fuses (HRC type).
- 15) DC 'ON' LED type indicating lamp
- 16) Dropper diode selector switch with minimum three positions.
- 17) Diodes for dropper diode scheme (minimum 20 nos.).
- 18) Dropper Diode Bypass scheme in case of AC supply fail

- 19) Any item not specifically mentioned, but required for efficient working of the equipment.

1.7.2. Boost Charger (Three Phase)

- 1) Three phase AC input ON / OFF main switch
- 2) AC input HRC fuse of required capacity
- 3) Fuse fail and phase sequence reversal detector (Solid state type) for AC input.
- 4) LED type Indicator for AC supply 'ON' indication indicating lamp for AC supply 'ON' indication (after main AC fuse).
- 5) Two winding copper wound naturally air cooled three phase transformer of adequate rating with -15% to +10 % tapping (5% step) on primary side with necessary secondary tapes for achieving required control DC output voltage.
- 6) Full wave controlled Rectifier Bridge comprising of silicon diodes and silicon controlled rectifiers (SCR) with R/C surge suppressor net work and suitable heat sink along with free wheeling diodes and semi conductor fuse protection.
- 7) Fuse fail detector (Solid state type) for semi-conductor fuses
- 8) Ammeter of (with external shunt) for measuring DC output current of float charger
- 9) Auto / manual mode selector switch
- 10) Constant current constant voltage mode selector switch.
- 11) Potentiometer for adjustment of constant current in boost mode.
- 12) Potentiometer for controlling DC output voltage in float mode (auto and manual modes).
- 13) Suitable filter circuit comprising filter choke, filter condenser with HRC fuse protection and bleeder resistor.

Bleeder resistor shall be automatically isolated from the circuit when float charger current reaches to a value which is sufficient to keep the SCRs ON and it comes back into circuit when float charger current decreases to a value just above the hold ON current of the SCR.

- 14) Thermal relay for overload protection.
- 15) Blocking diode with suitable heat sink.
- 16) Double pole DC output ON / OFF switch.
- 17) DC output fuses (HRC).
- 18) DC 'ON' LED type indicating lamp with series resistor.
- 19) Dropper diode scheme ON / OFF switch.
- 20) Dropper diode selector switch with minimum four positions.
- 21) Diodes for dropper diode scheme (minimum 56 nos.).
- 22) Any item not specifically mentioned, but which is needed basically for efficient working of the equipment.

1.7.3 Common Components (Three Phase Charger)

- 1) DC Voltmeter, double pole 4 position rotary type to measure DC voltage across float section, boost section, load and battery with HRC fuse protection.
- 2) AC voltmeter to measure the AC input voltage with suitable fuse link and selector switch arrangement.
 - a) Range 0 - 500V for Three phase charger.
- 3) DC charge / discharge ammeter with suitable external shunt to read discharge / charge current of the battery.
- 4) Ammeter (range 100 – 0 – 100 mA) showing the earth leakage current of the charger & out going circuit (load side).
- 5) Space heater (80W) with thermostat (30-85 Deg), ON / OFF switch and required fuses
- 6) The charger shall be provided with horizontal CFL tube of 14W with fixture including reflector, front cover etc. It shall be controlled by door operated switch.
- 7) Detachable cable gland plates min. 2 Nos. for cable entry from bottom and size suitable for required cables.
- 8) DC contactor interlocked with boost charger AC contactor.
- 9) Silicon blocker diode with suitable heat sink to be connected to a suitable tapping of battery to maintain DC continuity during power failure while batteries are on boost charge.
- 10) Multipin socket (15A, 230V rating) with switch and fuse.
- 11) Foundation bolts as per requirements.
- 12) All switches shall be rotary type.
- 13) Lifting lugs

Note:

1. All selector switches shall be rotary stay put type with adequate rating
2. All Ammeters shall be of analogue type with 90 deg. dial scale and size 96x96 sq.mm.
3. The LED type indicating lamp shall be of 7 segment type with overall diameter of lamp shall be 30 mm while that of cut out shall be 22.5 mm.
4. All equipments/components shall be of adequate rating as per Battery charger requirement.

1.7.4 SCADA Compatibility (If specified in Schedule – A)

The Battery Charger shall be fully SCADA compatible. It shall have sufficient Nos of potential free contacts & transducers (4-20mA output) for digital and analogue signals respectively. It shall also be possible to control various functionality of Battery Charger from SCADA system through hard wire connection.

Typical I/O requirement is tabulated here under. The exact number and description shall be as per detailed engineering.

PARAMETERS	DIGITAL INPUTS	CONTROL OUTPUTS	ANALOGUE INPUTS (4-20mA)
AC mains fail	√		
Load Bus Over Voltage	√		
Load Bus Under Voltage	√		
Float Charger fail	√		
Earth Leakage	√		
Float Charger On	√	√	
Float Charger Off	√	√	
Float Charger on Auto mode	√		
Float Charger on Manual mode	√		
Boost Charger On	√	√	
Boost Charger Off	√	√	
Boost Charger On CV mode	√	√	
Boost Charger On CC mode	√	√	
Charger on local mode	√		
Charger on Remote mode	√		
Battery Voltage			√
Boost Voltage			√
Float Voltage			√
Load Voltage			√
Battery Current			√
Boost Current			√
Float Current			√
Load Current			√
Battery Room Temperature			√

1.8 OUT GOING CIRCUITS:

The following out going circuits comprising of a double pole ON – OFF rotary switch, HRC fuses and LED type indicating lamps shall be provided. The separate DCDB shall be provided with battery charger which shall include all DC distribution feeders stated below.

- 1) 50 Amps. Feeders: 2 Nos.
- 2) 30 Amps. Feeders: 3 Nos.
- 3) 20 Amps. Feeders: 5 Nos.
- 4) 10 Amps. Feeders: 4 Nos.

1.9 PROTECTION AND ANNUNCIATION:

Following alarms with alarm indicating lamps and alarm accept push button and lamp test push button shall be included in the scope of supply.

- 1) Load under voltage
- 2) DC Earth leakage
- 3) Float charger fail
- 4) Main AC supply fail
- 5) DC over voltage relay for battery protection.
- 6) HV phase fail/phase sequence reversal protection
- 7) Boost charger failure
- 8) Semiconductor Fuse Fail - Float
- 9) Semiconductor Fuse Fail – Boost
- 10) AC Input Fuse fail – Float
- 11) AC Input Fuse fail – Boost

1.10 Looking to the detailed description of duty requirements of the charger and the battery, the manufacturer shall design a circuit which shall be capable of providing complete protection to various components of the unit and automatic i.e. with automatic voltage regulator in the float circuit operation of the unit without interruption.

1.11 **Necessary product information booklet, drawings, circuit diagrams, operation & maintenance manual, Quality Assurance Plan for Manufacturing Process, etc. shall be submitted along with the offer.**

1.12 Successful bidder shall submit the following drawings in duplicate for approval.

- a) GA drawings – Front view, Rear view, Top view, Side View, Internal front view, Internal rear view, Sectionalized side view.
- b) Foundation drawing showing cable cutouts and foundation bolt pockets.
- c) Rating plate details.
- d) Float cum boost charger circuit schematic.
- e) Float charger circuit schematic.
- f) Annunciation and indication circuit schematic.
- g) DC distribution circuit schematic.
- h) Illumination and heating circuit schematic.
- i) Terminal block details.
- j) Bill of material.

1.13 TESTS:

TYPE TESTS:-

The following tests from NABL accredited laboratory shall be carried out in accordance with latest / amended / up to date IS/IEC. The bidder has to submit all the type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than seven years. Type test reports shall be valid as on the last date of submission of bid. Tests shall be carried out as per procedures specified in Annexure-I.

1. Voltage regulation test
2. Load limiter characteristics test
3. Measurement of Efficiency
4. High voltage test
5. Temperature rise test
6. Short circuit test at no load and full load at rated voltage for sustained short circuit.
7. Degree of protection test – IP 42
8. Measurement of ripple by Oscilloscope
9. Temperature compensation feature demonstration
10. **Short Circuit test of Rectifier Transformers**

Important Note:

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

ACCEPTANCE / ROUTINE TESTS:-

The following test shall be carried out by the manufacturer on each battery charger.

- 1) Visual inspection and dimensions.
- 2) Checking of wiring & continuity of circuits
- 3) Insulation resistance.
- 4) HV test
- 5) Ripple content measurement
- 6) No load test
- 7) Load test
- 8) Efficiency tests

- 9) Operational tests for protection, alarm, indication.
- 10) Auto/Manual operation test.

1.14 Three sets of each of the detailed dimensional drawings (front view, side view, top view, cross sectional view etc.), Schematics, Commissioning and Operating Instructions Manual, literature, write up, test certificates of bought items, and Field Quality Plan(FQP) shall be supplied with each of the battery charger.

1.15 PACKING AND MARKING:

The equipment shall be dispatched securely packed in wooden crates suitable for handling during transit by rail / road, so as to avoid any loss or damage during transit. The crate should be marked with the legible details like Make, Sr.No., Type of Charger and A/T (purchase order) no. etc.

Note:

In case the rating of the battery charger asked in Schedule-A is different than mentioned in specification then rating of all the components and equipments shall be adequate to meet the specified rating.

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS
FOR BATTERY CHARGER

(To be filled up and submitted along with the offer of Battery Charger)

The bidder must fill up all the point of GTP for offered item/s. Instead of indicating “refer drawing, or as per IS/IEC”, the exact value/s must be filled in.

GTP IN CHECK LIST FORMAT - 220V BATTERY CHARGER				
Supplier :-				
Manufacturer :-				
Rating / Type :- 220 V Battery Charger for (250AH/350AH/450AH) LEAD ACID/Ni-Cd Battery Set				
Quantity :- Nos.				
Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	Manufacturer			
	Type & Designation if any			
A	Product Specification Sheet			
	<i>Constructional details</i>			
	Colour Shade	Light Grey as per 631 of IS:5		
	Paint thickness Nos. of coats	60-100 micron Two		
	- Outside			
	- Inside			
	Thickness of CR sheet steel	3 mm for load bearing parts & 2 mm for others		
	Gland Plates	2 Nos, 3 mm		
	- All sides			
	- Doors			
	Reinforcement by MS angles			
	- Degree of Protection	IP 42		

Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	- Indoor type			
	- Floor mounting			
	- Free standing			
	- Naturally air cooled type			
	- Designed for continuous operation in a ambient temperature of 50 Deg. C			
	- Gaskets			
	- Material	Neoprene / Synthetic Rubber		
	- Size			
	Recommended clearance at rear			
	Input AC supply	3 - Ph 4 wire, 415 V, 50 Hz (+10 % , -15 % for Voltage & + / - 3% for Frequency)		
	Output DC			
	- Float Charger	220 to 252V		
	- Boost Charger	198 to 296 V / 302V		
	DC Bus Bar			
	- Material	Electrolytic copper		
	- Size			
	Earthing Bus			
	- Material	Electrolytic copper		
	- Size	19 x 3 sq.mm		
	Wiring	1.1KV FR & C1 copper conductors		
	Weight			
	Hard ware (N/Bs, Screws etc.)	Brass, Non Ferrous parts		
	Ripple Content at rated Load - With Battery - Without Battery	< 3%		

Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	Guaranteed Efficiency Float section			
	- At 20% Load - At 50% Load - At rated Load	> 75% > 80%		
	Guaranteed Efficiency Float cum Boost section			
	- At 20% Load - At 50% Load - At rated Load	> 75% > 80%		
B	GA Drawing			
	Charger Size	For 30/50-55 Amp		
	- Height (mm)	1850-2000 mm		
	- Width (mm)	1500-2000 mm		
	- Depth (mm)	600-800 mm		
	Front View			
	Hinged Doors			
	Door width			
	Door Locking Arrangement	At Three Points		
	Meters			
	Ammeters for			
	Type & size	Analogue 90 Deg Scale, 96x96 Sq.mm		
	- Float Charger Current			
	- Boost Charger Current			
	- Battery Charger Current			
	- Earth Leakage Current			
	Voltmeters for			
	Type & size	Analogue 90 Deg Scale, 96x96 Sq.mm		
	- Charger Voltage			
	- Input AC Supply			

Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	Switches			
	Type	Rotary		
	Supply Switches for			
	- Float Charger AC Input			
	- Float Charger DC Output			
	- Boost Charger AC Input			
	- Boost Charger AC Contactor			
	- Battery Charger DC Output			
	- Feeders – 50 Amp (2 Nos.)			
	- Feeders - 10 Amp (3 Nos.)			
	- Feeders - 20 Amp (5 Nos.)			
	- Feeders - 30 Amp (4 Nos.)			
	Voltage Selector Switches for			
	- DC Voltage			
	- Input AC Supply			
	Mode Selector Switches for			
	- Float Charger Auto / Manual			
	- Boost Charger Auto/Manual			
	- Boost Charger CC / CV			
	Dropper Diode scheme for Float Charger			
	Dropper Diode scheme for Float Cum Boost Charger			
	- ON / OFF			
	- Selection			
	Earth leakage Ammeter switch			
	Setting Potentiometers			
	-Float Charger Voltage - Auto			
	- Float Charger Voltage -Manual			
	- Boost Charger CV - Auto			
	- Boost Charger CV - Manual			

Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	- Boost Charger CC			
	Indicating Lamps	7 segment LED Type, 30mm dia, 22.5 mm cutout		
	- Main AC Supply ON			
	- Boost Charger AC ON	For all the Three Phases		
	- Float Charger AC ON	For all the Three Phases		
	- Boost Charger DC ON			
	- Float Charger DC ON			
	- Feeder ON (14 Nos.)			
	Alarm Indicating Lamps	LED Type Lamps / Annunciation Scheme		
	- AC Mains Fail			
	- Float Charger Fail			
	- Battery Over Voltage			
	- Load Under Voltage			
	- Earth Leakage			
	- Boost Charger Fail			
	- Semiconductor Fuse Fail - Float			
	- Semiconductor Fuse Fail - Boost			
	- Phase Seq. Reversal			
	- AC Input Fuse fail – Float			
	- AC Input Fuse fail – Boost			
	Push Buttons			
	- Alarm Accept			
	- Alarm Reset			
	Top View			
	Gland plates			
	Foundation Drawing			

Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	- Cable cutouts			
	- Foundation Bolt pockets			
	Rear View			
	Hinged Doors			
	Door width			
	Door Locking Arrangement	At Three Points		
	Side View			
	Louvers			
	Wire mesh behind louvers			
	Sectional View (showing Inside Arrangement)			
	Earth Bus			
	Arrangement of earthing connection			
	Name Plate			
	<i>Material</i>			
	Make			
	Type			
	Input Supply	415 V, (+10 %, -15 %), 3-Ph 50Hz (+ / - 3%)		
	DC Output			
	- Boost voltage at rated current	198 to 296/302 V		
	- Float voltage at rated current	220 to 252V		
	Sr. No.			
	Year Of manufacturing			
	Weight			
	A/T No.			
	Property of GETCO			
C	Schematic Drawings			
	AC & DC Circuit			
	Boost Charger			

Sr. No.	Parameter	Acceptable Design Data	Particulars to be filled by bidder	Remarks
	Float Charger			
	DC Distribution Circuit			
	SCADA Interface circuit for Transducers and Contactors (if applicable)			
	Annunciation Circuit			
	Control Circuit			
	- Float Charger			
	- Boost Charger			
	Terminal Block Details			
	- AC supply			
	- Battery			
	- Feeders			
	BOM			
B	TYPE TESTS			
1	Voltage regulation test			
2	Load limiter characteristics test			
3	Efficiency tests			
4	High voltage tests			
5	Temperature rise test			
6	Short circuit test at no load and full load at rated voltage for sustained short circuit.			
7	Degree of protection test -IP42			
8	Measurement of ripple by Oscilloscope			
9	Temperature compensation feature demonstration			
10	Short Circuit test of Rectifier Transformers			

ANNEXURE-I
Type test procedure for Battery Charger

Sr. No	Test description
1	<p><u>Voltage regulation test:</u> A) Float charger B) Float mode of boost charger: Test condition: -</p> <ul style="list-style-type: none"> • The adjustment of output voltage at no load is verified by front panel Potentiometer. • Output voltage of charger is set at maximum voltage setting and input voltage is varied from -15% & +10% of nominal volts; Variation in output voltage is verified. • The unit is loaded up to 100% rated load and output voltage is observed. Under this condition, the input voltage is varied as specified above and variation in output voltage is verified. Regulation should be limited to or less than $\pm 1\%$ of rated output voltage of the charger.
2	<p><u>Load limiter characteristics test: -</u> A) Float charger B) Float mode of boost charger: Test Condition: -</p> <ul style="list-style-type: none"> • The current limit potentiometer is adjusted such that current limit starts beyond 100% load i.e. current beyond rated current. Now Load resistance is reduced and drooping characteristic of output voltage is verified.
3	<p><u>Efficiency test:</u> To be carried out on Float Charger & Boost Charger separately at max. Power rating. Test condition: -</p> <ul style="list-style-type: none"> • Float charger: - Efficiency test is carried out at nominal AC input voltage , DC output voltage adjusted to maximum voltage setting, by loading only the Float charger at 20%, 50%, & 100% load of rated current at Feeder Terminals & keeping the Boost charger 'OFF'. AC input power is measured by Digital/Analog Power Meter and DC output is measured by calibrated Voltmeter and Ammeter other than the provided in the Float charger. • Boost Charger: - Efficiency test is carried out as per above procedure for Boost Charger keeping float charger 'OFF' & adjusting maximum voltage setting at Battery Terminals with Boost Charger constant current setting at 20% 50% & 100% load of rated current with the help of suitable resistors at Battery Terminals. <p>Efficiency should be better than 75% at 20% load & better than 80% at 50 % & 100% load as per GTP.</p>
4	<p><u>High voltage test:</u> Test condition: -</p> <ul style="list-style-type: none"> • The power frequency voltage of 2 KV shall be applied between AC circuit & Earth, DC circuit & Earth and AC circuit & DC circuit for 1 Minute. During High Voltage Test, all low voltage circuits (Electronics circuit, Lamps etc.) are isolated and gate – cathode, anode – cathode terminals are shorted. Charger should withstand it and there shall not be any mal function or deformation and it should work satisfactory after the test.

5	<p><u>Temperature rise test: -</u> Test Condition: -</p> <ul style="list-style-type: none"> Rated mains supply is to be applied to charger. Float charger DC Output voltage to be set to maximum voltage setting & load current is to be adjusted to 100% rated load of float charger at feeder terminals & simultaneously Boost charger DC Output current is to be set to 100% rated load of boost charger by variation of set boost current potentiometer on front panel. Battery terminal voltage is to be adjusted to maximum voltage setting of Boost Charger by varying the resistive load connected to 'Battery Terminals'. Temperature readings of ambient temperature, Float & Boost Rectifier Stack heat sink, windings & cores of Float & Boost Rectifier Transformer & filter choke, & to be noted for every hour, till temperature rise is stable. After completion of this test Normal functioning of the battery Charger to be verified by carrying out the following tests: 1) High voltage. 2) Voltage regulation test. 3) Short circuit Test.
6	<p><u>Short circuit test at no load and full load at rated voltage for sustained short circuit at load Terminals:</u> A) Float charger (Auto mode). B) Float mode of Boost charger (Auto Float) Test condition: -</p> <ul style="list-style-type: none"> This test is carried out on LOAD TERMINALS with Float charger & Float mode of Boost Charger. The output DC voltage at load terminal is adjusted maximum voltage setting with rated AC input volts. The load terminals are shorted with following test conditions. <ol style="list-style-type: none"> No load at load terminals Full load of rated current at Load Terminals. <p>In no load condition, the load terminals are shorted first and then charger is switched ON. Moreover, in full load condition, increase the load from rated current 100% to till short circuit at LOAD TERMINALS. The Battery Charger should sustain this short circuit with mains variation from -15% & +10% of nominal input volts and the Battery charger should function normal after removal of short circuit at load terminals.</p>
7	<p><u>Temperature Compensation Feature Demonstration test:</u> Auto Float Charger Test condition: -</p> <ul style="list-style-type: none"> To observe that DC output of Battery Charger changes proportional to 4-20 mA input signal available from temperature transducer. The required change in output voltage is 3mv per 1^o C (degree centigrade) per cell of 2volts of L. A. Battery. The temperature transducer produces 1mA signal per 2.5^o C change in ambient temperature. Therefore for 55 Cells (110V Battery Set), it will be 7.5mV x 55 Cells = 0.4125V per mA. The charger output voltage should decrease by 0.4125V for increase of 1 mA and vice-versa. The reference temperature is 27^oC at which 11mA signal will be available from transducer. The charger output should be set to 121V (i.e. rated output) at 11mA signal. The input signal should be changed from 4 mA to 20mA & DC output should be observed. The DC output should vary @ 0.4125Volts per mA. <p>Similarly, for 110 Cells (220V Battery Set), it will be 7.5mV x 110 Cells = 0.8250V per mA. The charger output voltage should decrease by 0.8250V for increase of 1 mA and vice-versa. The charger output should be set to 242V (i.e. rated output) at 11mA signal. The input signal should be changed from 4 mA to 20mA & DC output should be observed. The DC output should vary @ 0.8250Volts per mA.</p>

8	<p>Degree of protection test: -</p> <ul style="list-style-type: none"> • Degree of protection shall be IP 42.
9	<p>Measurement of ripple by Oscilloscope: -</p> <ul style="list-style-type: none"> • AC supply with variation ($\pm 15\%$) & Frequency variation ($\pm 3\%$) shall be supplied to the charger and ripple in the output voltage at 0, 50 & 100 % load shall be measured with the oscilloscope. It shall be within $\pm 3\%$.
10	<p>Type tests of Rectifier Transformers</p> <ul style="list-style-type: none"> • Short circuit test as per latest IS / IEC.