

**TECHNICAL SPECIFICATION**  
**OF**  
**BATTERY CHARGER 24 VOLT (SUITABLE FOR 150 AH BATTERY SET)**  
**(FLOAT CUM BOOST CHARGER)**

1. **SCOPE:-** This specification covers the requirement and tests for indoor Type battery charger 24volts (float cum boost) for use at 33/11KV sub-station.
2. **RATING OF THE CHARGER:-**
  - a) Trickle charge voltage across the battery terminals : 24.8-26.4 V
  - b) Quick charge voltage across the battery terminals : 24-32.4 V
  - c) Voltage per cell at the end of discharge @ 10 HR : 1.85 V
  - d) Range of trickle charging : 150-600 m A
  - e) Range of quick charging : 15 Amp
  - f) Charger Rating : 30 Amp
  - g) Efficiency at rated load : Better than 70%
  - h) power factor at rated load : Better than 0.65 lag at nominal AC I/P voltage.
3. **SYSTEM DESCRIPTION:-** The charger shall be naturally air-cooled type and shall be suitable for charging the battery and also supplying the load (not exceeding 10 Amps) simultaneously. The charger shall be suitable for operation with 240V $\pm$ 20% single phase AC supply. The charger shall be automatic type for both trickle and quick charge mode of operation. It should be ensured that during quick charging also the voltage at load point should be 26.4 V.
4. **GENERAL REQUIREMENTS:-**
  - 4.01 For the DC system for 24 Volt DC, the Battery Chargers as well as their automatic regulators shall be of static type. All battery chargers shall be capable of continuous operation at the respective rated load in float charging mode, i.e. Float charging the associated DC Lead-Acid Batteries at 2.15 to 2.20 Volts per cell while supplying the DC load. The chargers shall also be capable of Boost charging the associated DC Battery at 2.0-2.7 volts per cell at the desired rate.
  - 4.02 All Battery Chargers shall be provided with facility for both automatic and manual control of output voltage and current. A selector switch shall be provided for selecting the mode of output voltage/current control, whether automatic or manual. When on automatic control mode during Float charging, the Charger output voltage shall remain within  $\pm 1\%$  of the set value, for AC input voltage variation of  $\pm 10\%$ , frequency variation of  $\pm 5\%$ , a combined voltage and frequency variation of  $\pm 10\%$ , and a DC load variation from zero to full load.
  - 4.03 All battery chargers shall have constant voltage characteristics throughout the range (from zero to full load) at the floating value of the voltage so as to keep the battery fully charged but without harmful overcharge.
  - 4.04 All chargers shall have load limiters having drooping characteristic, which shall cause, when the voltage control is in automatic mode, a gradual lowering of the output voltage when the DC load current exceeds the Load limiter setting of the Charger. The Load-limiter characteristics shall be such that any sustained overload or short circuit in DC System shall not damage the Charger, nor shall it cause blowing of any of the Charger fuses. The Charger shall not trip on overload or external short circuit.
  - 4.05 Uniform and step less adjustments of voltage setting (in both manual and automatic modes) shall be provided on the front of the Charger panel covering the entire float charging output range specified. Step-less adjustments of the Load-limiter setting shall also be possible from 80% to 100% of the rated output current for Charging mode.

- 4.06 During Boost Charging, the Battery Charger shall operate on constant current mode (when automatic regulator is in service). It shall be possible to adjust the Boost charging current continuously over a range of 50 to 100% of the rated output current for Boost charging mode.
  - 4.07 The Charger output voltage shall automatically go on rising, when it is operating on Boost mode, as the Battery charges up. For limiting the output voltage of the Charger, a potentiometer shall be provided on the front of the panel, whereby it shall be possible to set the upper limit of this voltage any where in the output range specified for Boost Charging mode.
  - 4.08 The Charger manufacturer may offer an arrangement in which the voltage setting device for Float charging mode is also used as output voltage limit setting device for Boost charging mode and the Load-limiter of Float charging mode is used as current setting device in boost charging mode.
  - 4.09 Suitable filter circuits shall be provided in all the chargers to limit the ripple content in the output voltage to 1% (rms), irrespective of the DC load level, when they are connected to a Battery.
  - 4.10 Detailed dimensional drawings / commissioning / operating / instructions manuals shall be supplied with the equipment.
5. **RECTIFIER TRANSFORMER:** The rectifier transformer shall be continuously rated, dry air cooled (A.N) and of class F insulation type. The rating of the rectifier transformer shall have 10% overload capacity.
- 5.01 **RECTIFIER ASSEMBLY:** The rectifier assembly shall be fully/half controlled bridge type and shall be designed to meet the duty as required by the respective Charger. The rectifier shall be provided with heat sink having their own heat dissipation arrangements with natural air-cooling. Necessary surge protection devices and rectifier type fast acting HRC fuses shall be provided in each arm of the rectifier connections.
6. **INSTRUMENTS:** One AC voltmeter and one AC ammeter alongwith selector switches shall be provided for all chargers. One DC voltmeter and DC ammeter (with shunt) shall be provided for all Chargers. The instruments shall be flush type, dust proof and moisture resistant. The instruments shall have easily accessible means for zero adjustment. The instruments shall be of 1.5 accuracy classes.
7. **AIR BREAK SWITCHES:** One AC input & One DC output switch shall be provided in all chargers. They shall be air break type suitable for 300 volts AC/ 250 V DC. The contacts of the switches shall open and close with a snap action. The operating handle of the switch shall be fully insulated from circuit. 'ON' and 'OFF' position on the switch shall be clearly indicated. Rating of switches shall be suitable for their continuous load. Alternatively, MCCBs of suitable ratings shall also be acceptable in place of Air Break Switch.
8. **FUSES:** All fuses shall be HRC Link type. Fuses shall be mounted on fuse carriers, which are in turn mounted on fuse bases. Wherever it is not possible to mount fuses on carriers, fuses shall be directly mounted on plug-in type base. In such case one insulated fuse pulling handle shall be supplied for each charger. The Bidder depending on the circuit requirement shall choose fuse rating. All fuses in the chargers shall be monitored. Fuse failure annunciation shall be provided on the failure of any fuse.
9. **BLOCKING DIODE:** Blocking diode shall be provided in the positive pole of the output circuit of each charger to prevent current flow from the DC Battery into the Charger.

10. **ANNUNCIATION SYSTEM:** Audio-visual indications through bright LEDs shall be provided in all Chargers for the following abnormalities:

- a) AC power failure
  - b) Rectifier/chargers fuse blown.
  - c) Over voltage across the battery when boost charging.
  - d) Abnormal voltage (High/Low)
- Any other annunciation if required.

Indication for charger in float mode and boost mode through indication lamps shall be provided for chargers. Also power supply 'ON' indication shall be provided.

11. **NAME PLATES AND MARKING:** The nameplates shall be white with black engraved letters. On top of each Charger, on front as well as rear sides, larger and bold nameplates shall be provided to identify the Charger. Nameplates with full and clear inscriptions shall also be provided on and inside of the panels for identification of the various equipments and ease of operation and maintenance.

12. **PROTECTION:** Thyrister protection fuse, filter condenser fuse, soft start feature, electronic current limit, MCCB at AC I/P , DC O/P voltage.

13. **CHARGER CONSTRUCTION:** The Chargers shall be indoor, floor-mounted, self-supporting sheet metal enclosed cubicle type. The Contractor shall supply all necessary base frames, anchor bolts and hardware. The Chargers shall be fabricated from 1.5 mm cold rolled sheet steel and shall have folded type of construction. Removable gland plates for all cables and lugs for power cables shall be supplied by the Contractor. The Charger shall be tropicalised and vermin proof. Ventilation louvers, if provided shall be backed with metallic screens. All doors and covers shall be fitted with synthetic rubber gaskets. The chargers shall have hinged double leaf doors provided on front and on backside for adequate access to the Charger's internals. All the charger cubicle doors shall be properly earthed. The degree of protection of Charger enclosure shall be at least IP-42 as per IS: 2147.

13.01 All indicating instruments, control switches and indicating lamps shall be mounted on the front side of the Charger.

13.02 Each Charger shall be furnished completely wired upto power cable lugs and terminal blocks and ready for external connections. The control wiring shall be carried out with PVC insulated, 1.5 sq. mm. stranded copper wires. Control terminals shall be suitable for connecting two wires, with 2.5 sq. mm stranded copper conductors. All terminals shall be numbered for ease of connections and identification. Each wire shall bear a ferrule or tag on each end for identification. At least 20% spare terminals shall be provided for control circuits.

13.03 The insulation of all circuits, except the low voltage electronic circuits shall withstand test voltage of 2 KV AC for one minute. An air clearance of at least ten (10) mm shall be maintained throughout for such circuits, right up to the terminal lugs. Whenever this clearance is not available, the live parts shall be insulated or shrouded.

13.04 Battery charger cabinet shall be provided with two separate suitable earthing terminals.

14. **PAINTING:** All sheet steel work shall be pretreated, in tanks, in accordance with IS:6005. Degreasing shall be done by alkaline cleaning. Rust and scale shall be removed by pickling with acid. After pickling, the parts shall be washed in running water. Then these shall be rinsed in slightly alkaline hot water and dried. The phosphate coating shall be 'Class-C' as specified in IS:6005. Welding shall not be done after phosphating. The phosphating surfaces shall be rinsed and passivated prior to application of stoved lead oxide primer coating. After primer application, two coats of finishing synthetic enamel paint of shade-692 (smoke grey) of IS:5 shall be applied, unless required otherwise by the Employer. The inside of the chargers shall be glossy white.

Each coat of finishing synthetic enamel paint shall be properly staved. The paint thickness shall not be less than fifty (50) microns.

## 15. **TESTS**

### 15.01 **TYPE TESTS:**

Battery chargers shall conform to all type tests as per relevant Indian Standard. Performance test on the Chargers as per Specification shall also be carried out on each Charger as per specification. Rectifier transformer shall conform to all type tests specified in IS: 4540 and short circuit test as per IS: 2026. Following type tests shall be carried out for compliance of specification requirements:

- a) Voltage regulation test
- b) Load limiter characteristics test
- c) Efficiency tests
- d) High voltage tests
- e) Temperature rise test (Charging in lot)
- f) Short circuit test at no load and full load at rated voltage for sustained short-circuit.
- g) Degree of protection test
- h) Measurement of ripple by oscilloscope.

### 15.02 **ACCEPTANCE TESTS:**

- a) Voltage regulation test
- b) Load limiter characteristics test
- c) Efficiency tests
- d) High voltage tests
- e) Temperature rise test (Charging in lot)
- f) Short circuit test at no load and full load at rated voltage for sustained short-circuit.
- g) Measurement of ripple by oscilloscope
- h) Annunciation Test
- i) Performance Test
- j) Insulation Resistance Test

16. **TESTING AND INSPECTION:** - A copy of type tests report of the 24 volt- Lead acid Battery with charger being offered should be enclosed with the Tender. Type test conducted at any recognized laboratory of repute for the same design, shall be acceptable, otherwise the supplier shall be required to conduct type test at his own cost including to and fro transportation charges.

"The purchaser also reserves the right to get type tests conducted on the above equipment at any time during the currency of the contract. These test shall be witnessed by the representatives of purchaser. Actual testing charges shall be borne by purchaser for testing only. Payment of testing shall be made by purchaser on presentation of bill after successful testing of offered equipment.

All routine tests and inspection shall be made at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and the purchaser. The manufacturer shall provide all the reasonable facilities without extra charges in conducting the specified test in accordance with the specification.