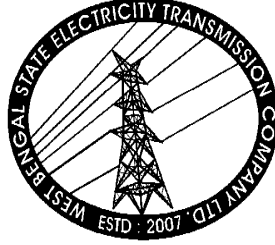


# 220V BATTERY CHARGER

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**March 2015**

*Engineering Department*

**WEST BENGAL STATE ELECTRICITY TRANSMISSION COMPANY LIMITED**

পশ্চিমবঙ্গ রাজ্য বিদ্যুৎ সংবহন কোম্পানি লিমিটেড  
( পশ্চিমবঙ্গ সরকারের একটি উদ্যোগ )

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## **TECHNICAL SPECIFICATION OF 220V BATTERY CHARGER**

### **1. SCOPE :**

- 1.1. This specification covers the design, manufacture, assembly, testing at manufacturer's works, supply, and delivery at site of battery charger with provisions of both float and boost charging of battery. The battery will be procured separately as per specification of battery.
- 1.2. **400/220/132/33KV Sub-Station:** The minimum ampere-hour ratings of battery for 400 KV switchyard of 400/220/132/33KV Sub-Station and all 400KV equipment shall be 300 AH. The voltage rating of 300AH battery shall be 220 +/- 10% volt. For 220KV, 132KV & 33KV switchyard portion of 400/220/132/33KV Sub-Station and equipment minimum ampere-hour rating of battery shall be 400AH. The voltage rating of 400AH battery shall be 220 ± 10% volts. The D.C. system shall consists of two no. Battery Charger of 220V, 300AH for 400KV portion and one no. Battery Charger of 220V, 400AH for 220/132/33KV portion. For 400KV portion there shall be two sets of battery having ampere-hour rating of 300AH and for all other voltage class one no. Battery set having rating of 400AH.
- 1.3. **220/132/33KV Sub-Station:** The minimum ampere-hour rating of battery for 220/132/33KV Sub-Station shall be 300AH. The voltage rating of 300AH battery shall be 220±10%Volt. For 220/132/33KV Sub-station two no. of Battery charger of 300AH shall be required.
- 1.4. **132/33KV Sub-Station:** The minimum ampere-hour rating of battery for 132/33KV Sub-Station shall be 200AH. The voltage rating of 200AH battery shall be 220±10% Volt. For 132/33KV Sub-station there shall be one no. battery charger of 200AH.

### **2. STANDARDS :**

The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the applicable sections of the latest Indian Standard specification and Indian Electricity Rules.

IS :2026	Power Transformer
IS :2959	AC Contactors for voltages not exceeding 1000 Volts.
IS :1248	Indicating instruments
IS : 2208	HRC Fuses
IS :13947(P-3)	Airbreak switches, disconnectors& fuse combination units for voltage not exceeding 1000 V AC or 1200 V DC.
IS :2147	Degree of protection provided by enclosures for low voltage switchgear& control gear
IS :3231	Electrical relays for Power System Protection
IS :3842	Electrical relays for A C System Protection
IS :5	Colours for ready mix paint

### 3. I) **DEVIATION :**

Normally the offer should be as per Technical Specification without any deviation.

### II) **MODIFICATION :**

If any modification felt necessary to improve performance, efficiency and utility of equipment, the same must be mentioned in the 'Modification schedule' with reasons duly supported by documentary evidences and advantages. Such modifications suggested may or may not be accepted, but the same must be submitted along with Pre-Bid Queries. The modifications not mentioned in Schedule will not be considered.

### 4. **MINIMUM RATING OF THE BATTERIES :**

The trickle charge and quick charge voltage per cell of the above batteries shall be 2.15 V to 2.25±0.02 V and 1.85 V to 2.75 V respectively. The range of charging current of the batteries shall be as follows :

	Boost Charging Current	Trickle Charging Current
i) For 300 AH Battery	: 42 A to 21 A	720 mA to 240 mA
ii) For 400 AH Battery	: 56 A to 28 A	960 mA to 320 mA
iii) For 200AH Battery	: 28 A to 14 A	480 mA to 160 mA

### 5. **LOAD IMPOSED ON CHARGERS :**

**The following load will be imposed on the chargers :**

Under normal operating conditions the charger should give a D.C. output equal to the steady demand load for signal lamps, auxiliary relays etc. plus an output to trip coils and closing coils of the circuit breakers and relays as and when required as well as float charging current of the battery.

### 6. **MINIMUM DEMAND LOAD ON THE CHARGERS :**

i) Charger for 300 AH Battery	:	24 A
ii) Charger for 400 AH Battery	:	40 A
iii) Charger for 200AH Battery	:	16 A

### 7. **RATING OF THE CHARGERS :**

The float charger and the float-cum-Boost Charger shall have adjustable minimum output current 30 Amps D.C. for 300 AH for float charging and 60 Amps DC for boost charging. Charger shall have 20% spare capability. The float charger and the float cum-Boost Charger shall have adjustable minimum output current 40Amps. DC for 400AH for float charging and 60 Amps. DC for boost charging, Charger shall have 20% spare capacity. The

float charger and float cum-boost charger shall have adjustable minimum current 25Amps DC for 200AH for float charging and 60Amps DC for boost charging. Charger shall have 20% spare capacity.

**8. GENERAL DESCRIPTION FOR CHARGERS OF 220 V - 300 AH BATTERY,220V-400AH BATTERY AND 220V - 200AH BATTERY :**

- 8.1. The charger shall be enclosed in a sheet steel enclosure made of 14 gauge cold rolled sheet steel, dust and vermin proof, floor mounted type with ventilating louvers with fine wire copper mesh on two sides and with rear access doors. The charger shall be suitable for indoor installation in a clean but hot and humid tropical atmosphere. Removable gland plates for all cables and lugs for power cables shall be within the scope of bidder. The lugs for power cable shall be made of electrolytic copper with tin coat. The charger shall have hinged double leaf doors provided on front and on backside for adequate access to the inside of the charger. All charger cubicle doors shall be properly earthed.
- 8.2. All the elements used in the battery charging scheme shall be suitably rated for the duty involved. The fuses shall be of HRC link type and of proper rating of the circuit to be protected. All the instruments, switches and control equipment shall be from reputed manufacturer and be of best quality and shall conform to the relevant I.S. Specification. The switch shall be complete with position indicators. The switches and indicating lamps shall be flush/semi-flush type mounted on the front panel and shall be provided with name plate of approved type. The meter shall be of 96 mm X 96 mm square dial and shall be flush mounted on the front panel. All the semi conductor devices shall be from reputed manufacturer and shall be protected with power transient suppressor circuit. In addition necessary fuses shall be provided for short circuit protection. The rectifier transformer shall be continuously rated, dry air cooled (AN) of class B insulation type. The rating of the transformer shall have 10% overload capacity. The transformer shall be of suitable rating to comply with maximum output with minimum input voltage. The maximum temperature attained by any part of the equipment of the battery charger at specified rating should not exceed the permissible limits as stipulated in relevant I.S.S. The designing of the equipment shall be made taking 50°C as ambient temperature of the site.
- 8.3. The wiring shall be complete in all respect with PVC insulated stranded copper wire and the size of the wire shall not be less than 2.5 sq.mm. Each wire shall be continuous from end to end and shall not have any joint within itself. The insulation grade of the wiring shall be 1100 V grade. The colour of 3 Phase, 4 Wire AC. supply shall be red, yellow, blue and black for phases and neutral. The D.C. wiring shall be of the colour other than the above (preferably grey) with the +ve and -ve marking in the ferrule. Terminal ends of all the wires shall be provided with numbered ferrules, suitably coloured as mentioned for wires above. All spare contacts of relays and switches shall be wired upto the terminal block. At least 20 % spare terminals shall be provided for control. 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 10 mm shall be maintained throughout right up to terminal lugs. Whenever this clearance is not available, the live parts shall be insulated or shrouded.
- 8.4. The input terminals of the battery charger shall be marked "R,Y,B,N" for AC. supply. The terminals where battery will be connected shall be marked as +ve (110), +ve (92) and -ve common. The terminals from battery charger to the D.C. load bus shall be marked with "LOAD +ve" and "LOAD -ve" marking.
- 8.5. The interior and the exterior of the battery charger cabinet shall be properly painted conforming to the latest issue of relevant ISS. The finishing coat on the exterior of the panels shall be deep grey, polished cellulose enamel or equivalent, sprayed to present delightful

appearance while on interior faces, the finishing coat shall be of light grey shaded paint (Shade - 631 of IS:5), sprayed to give a contrasting effect with the cubicle wiring and shall be according to ISS. The degree of protection of charger enclosure shall be at least IP-42 as per IS:2147.

- 8.6. Calculation for the ratings of the transformer and other particulars of the elements considered in the battery charging scheme are to be furnished by the successful bidder during detailed engineering indicating the basic design data.

**9. SYSTEM DESCRIPTION FOR CHARGERS OF 220 V - 300 AH, 220V - 400AH BATTERY AND 220V -200AH BATTERY :**

- 9.1. The charger shall be suitable for charging the battery and supplying the load simultaneously. The entire charger scheme shall be divided in two sections, "float charger section" and "float-cum-boost charger section". The float-cum-boost charger shall be suitably operated either in float mode or in boost-cum-standby float charger mode.
- 9.2. Under normal operating condition, with the input AC supply present, the float charger section' shall supply the DC load and also float the battery by trickle charging and the "float cum boost charger section" shall be kept off.
- 9.3. In the event of main AC supply failure, the battery shall supply DC power to the Sub-station DC Load. The battery thus discharged shall be charged after resumption of AC. supply by the boost charger. Now, the 'float-cum-boost charger section' shall be kept in boost mode through float/ Boost selector switch and recharging shall be done at the specified current needed for the battery. During this operation, 'the float charger section' shall supply the load current only while boost charger section of float cum boost charger shall boost charge the battery and the load supply shall be disconnected from the battery through a contact of a contactor. If the 'float charger' fails during this period, the battery shall maintain load through tap cell diode, connected at 92nd cell, instantaneously without any interruption of the DC load supply. If the incoming AC supply or the boost charger fails during boost charging, all the cells shall be connected to the load bus through the contact of the same contactor mentioned above. In boost mode the charger shall be capable of quick charging the battery upto 2.75 Volts per cell and also capable of restoring fully discharged battery to a state of full charge in eight hours with 25% spare margin over maximum charging rate.
- 9.4. If there is any trouble in " float charger section ",the float mode of float cum boost charger section ", through Float-Boost selector switch shall supply the D.C. load as well as trickle charge the battery and thus serve as a spare float charger. Suitable arrangement shall be provided at the charger output circuit for isolation of battery during maintenance.
- 9.5. For accommodation of these two sections, separate compartments shall be used so that maintenance or rectification work can be carried out in one section while the other remains in service.
- 9.6. The "float charger section" & the "float cum boost charger section" are detailed below :

Float charger section : The AC input supply, 400 volts  $\pm$  10%, 3 phase, 4 wire, 50 Hz, shall be provided through a 4 pole MCB having thermal over load and short circuit protection. This section is capable of supplying the DC load while floating the battery. The thermal overload contacts shall be used for isolation of charger circuitry from input AC. supply as well as to give audio and visual alarm. The incoming supply shall be fed to a three phase, double wound step down transformer, secondary of which shall be connected to a three phase, full wave thyristor

bridge rectifier unit with suitable surge suppressor circuit. An automatic voltage controller unit shall control the output voltage of the float charger by adjusting the firing angle of the thyristors. Provision shall also be kept for manual operation by adjustment of coarse and fine potentiometer through an auto/manual selector switch. Automatic voltage regulation shall be provided to maintain the float charger DC output voltage within  $\pm 1\%$  from no load to full load and or AC line voltage variation of  $\pm 10\%$ . Suitable choke and filter circuit shall be provided to get stabilised and to limit ripple content within 1% at full load. The DC output voltage shall be connected to the load bus through blocking diode at the positive pole of the output circuit to prevent reverse current flow from battery into the charger and a set of fuses.

- 9.7. Four numbers indicating lamps shall be provided, three for AC. supply ON indication and one for float charger ON indication. One ammeter with necessary shunt, for measuring float charger output current, shall be provided.
- 9.8. All fuses shall be of HRC link type. Necessary number of fuses of proper ratings shall be provided at the output of the transformer and rectifier. Fuse failure alarm both audio and visual shall be provided for battery fuse, rectifier fuse and charger output fuse. One charger failure relay after charger output fuse shall be provided to give audible as well as visual alarm, in case of failure of float charger.
- 9.9. Float cum boost charger section : The AC input supply, 400 Volts  $\pm 10\%$ , 3 phase 4 wire, 50 Hz shall be provided through 4 pole MCB of suitable rating with thermal over load and short circuit protection . This section is capable of either supplying the DC load while charging the battery in float mode or in boost mode for quick charge the battery after heavy drainage through a suitable Float/boost selector switch. An automatic voltage controller for float charging and automatic current controller for boost charging shall control the output voltage and current of the float and boost charge respectively by adjusting the firing angle of the thyristor. The thermal overload relay contacts shall be used for isolation of charger circuitry from input supply as well as to give audible and visual alarm. The incoming supply shall be fed to a three phase, double wound step down transformer. The voltage variation and the battery charging current variation can also be carried out by manual adjustment of 'coarse' and 'Fine' potentiometer through Auto/manual selector switch, for both the float and boost charge mode of operation in addition to normal load supply. The secondary of the transformer shall be connected to a three phase full wave thyristor-bridge rectifier unit with suitable surge suppressor circuit. Suitable choke and filter circuit shall be provided to get stabilised and to limit ripple content within 1% rms at full load. The DC output voltage shall be connected to the load bus through a blocking diode at the positive pole of the output circuit to prevent reverse current flow from battery into the charger & a set of fuses.
- 9.10. Four nos. indicating lamps shall be provided, three for AC. supply 'ON' indication and one for "float cum boost charger" 'ON' indication. Two nos. ammeter with shunt shall be provided for measuring boost and on demand float charger output current. Necessary no. of fuses of proper ratings shall be provided at the output of the rectifier unit. Fuse failure alarm both audio and visual shall be provided for rectifier fuse and charger output fuse.
- 9.11. One charger failure relay after charger output fuse shall be provided to give audible as well as visual alarm, in case of failure of charger.
- 9.12. For the all charger scheme, one voltmeter with fuse and voltmeter selector switch (RY-YB-BR-OFF) shall be provided for measuring the AC. input supply. Another voltmeter with fuse and suitable voltmeter selector switch with provision of OFF position shall be provided to measure the float charger output voltage, float cum boost charger output voltage, battery voltage at 110 and 92 cell and the load voltage. The battery shall be connected to the DC output of the charger through a continuous duty triple pole 100 amp switch, lockable in both ON and OFF position. For the entire charger scheme, the annunciation scheme having audio and visual alarm with common bell and accept reset and test push buttons and separate windows shall be provided for the following types of fault occurrence :

- i) AC Input fail
- ii) Over and under voltage at DC output for variation of DC voltage more than +/- 10% of the rated value
- iii) Under voltage of AC input,
- iv) Individual charger failure,
- v) Individual charger thermal overload,
- vi) Earth fault of the DC bus and
- vii) Battery Earth Fault (+ ve) and (- ve).

9.13. Suitable audio and visual alarm shall be provided for failure of load fuse. One space heater with thermostat and ON-OFF switch and fuse, one cubicle illumination fluorescent tube (230 V, single phase AC), operated from door switch and one D.C. emergency lamp with switch shall be provided for the charger panel.

9.14. Other instruments and devices, required to complete the total scheme shall also be supplied.

9.15. The detailed circuit diagram of the entire scheme as well as separate circuit diagrams of each of the various modules used for the system shall be furnished by the successful bidder.

The terminal numbers and ferrule numbers must be clearly furnished in the drawing.

## **10. PACKING :**

All equipments shall have to be dispatched suitably and securely, packed in wooden crates, suitable for handling during transit by rail and/or road.

## **11. GUARANTEE :**

Electrical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, WBSETCL shall have right to reject the material. Guaranteed Technical Particulars are to be submitted by successful bidder during detailed engineering alongwith submitted drawings/documents. However format for submission of GTP shall be handed over to intending bidders at the time of sale of tender documents.

## **12. CONTACT DRAWINGS, CATALOGUE AND MANUALS :**

In the event of placement of Letter of Award, general arrangement drawing and schematic drawing, manuals and catalogue of different equipment of charger are to be submitted in six (6) copies to the Chief Engineer, Engg. Deptt., WBSETCL, VidyutBhavan (9<sup>th</sup> floor), Salt Lake, Kolkata-700 091, as per schedule of submission of drawings for our approval. After the drawings are approved, ten(10) copies of contract drawings, approved G.T.P., and catalogue of each type of charger shall be submitted. The contract drawings shall cover the following :

- i) General arrangement drawing for the chargers and dimensional details and erection arrangement of the charger.
- ii) Schematic diagram for the charger and detailed circuit diagram of the modules used for the system.

- iii) Wiring diagrams of the charger. The master copy/original plates of all the final contract drawings shall have to be supplied thereafter.
- iv) Other drawings, operation and maintenance manuals for each charger describing therein service and maintenance instructions for the chargers, list of equipments and their particulars provided in the charger, their function and detailed write-up of the method of operation shall also be submitted.

### **13. TESTS AT MANUFACTURER'S WORKS AND TEST CERTIFICATES :**

- 13.1. Battery Chargers shall conform to all types tests as per relevant Indian Standard. Performance tests on the chargers shall be carried out as per specification. Rectifier transformer shall conform to all type tests specified in IS : 4540 and short circuit test as per IS :2026.
- 13.2. The supplier may be required to demonstrate to WBSETCL that the chargers conform to the specification particularly regarding continuous rating, ripple free output, voltage regulation and load limiting characteristics before despatch as well as after installation at site.

The following tests shall be carried out in the presence of WBSETCL's representative, and Three (3) copies of test certificates for each set of charger shall be submitted to the Chief Engineer (Engg.Deptt.), for approval.

- i) Checking of wiring and continuity of circuits.
- ii) High voltage test on the equipment with accessories – All equipments and wiring shall be tested for withstanding the power frequency voltage of 3 KV (rms) to earth for 1 minute.
- iii) Insulation Resistance of each circuit before and after high voltage test.
- iv) Performance test and temperature rise test.
- v) Checking of Load Limiting Features.
- vi) Line Regulation and Load Regulation Test.
- vii) Checking of relay operation and annunciation
- viii) Routine tests according to the relevant national standards on the transformers, rectifiers, instruments and other devices.

WBSETCL reserve the right to reject any equipment/auxiliaries or finished product if the same is not found to comply with the requirements of relevant IS/tests and this specification. The entire cost of acceptance and routine tests that are to be carried out as per relevant IS shall be treated as included in quoted price of the battery chargers. Contractor shall give at least 15 (fifteen) days advance notice intimating the actual date of inspection and details of all tests that are to be carried out.



SPECIFIC TECHNICAL PARAMETERS

SNO	DESCRIPTION	FOR 132/33KV S/stn.	FOR 220KV, 132KV & 33KV SWITCHYARD OF 400/220/132/33KV S/stn	FOR 400KV SWITCHYARD OF 400/220/132/33KV S/stn..& 220/132/33KV S/stn.
1.	D. C. Voltage (V)	220 +/-10%	220 +/-10%	220 +/-10%
2.	Minimum Ampere Hour (AH) rating of battery	200	400	300
3.	No. of cells (No.)	107	107	107
4.	Ratings of voltage/cell a) Trickle charge (V) b) Quick charge (V)	2.15 to 2.25±0.02*	2.15 to 2.25±0.02*	2.15 to 2.25±0.02*
5.	Battery current rating a) Trickle charge (mA) b) Quick charge (A)	480 to 160 **28 to 14	960 to 320 **56 to 28	720 to 240 **42 to 21
6.	Minm. Steady demand load (A)	16	40	24
7.	Minm. Charger current rating a) Float (A) b) Float cum boost (A)	30/25 60/60	40 60	30 60
8.	Sheet steel thickness (SWG)	14	14	14
9.	Dial size of flush mounted Metres (mm <sup>2</sup> )	96	96	96
10.	Ambient Temperature	50°C	50°C	50°C
11.	a) Control Wiring Size (sqmm) b) Insulation Grade(V)	Cu 2.5 1100	Cu 2.5 1100	Cu 2.5 1100
12.	AC Input Supply	400 V ±10% 3ph, 50 Hz	400 V ±10% 3ph, 50 Hz	400 V ±10% 3ph, 50 Hz
13.	Float voltage of Plante Cell (V)	2.25±0.02	2.25±0.02	2.25±0.02
14.	Ampere-hour rating capacity of battery based on discharge rate at 27°C for (hour)	10	10	10

\* Starting rate upto 2.35V/Cell  
Finishing rate upto 2.75V/Cell

\*\* Starting rate upto 28/56/42A  
Finishing rate upto 14/28/21A

GUARANTEED TECHNICAL PARTICULARS FOR 220V BATTERY CHARGER

*(To be filled in and signed by the Bidder)*

<b>SL</b>	<b>DESCRIPTION</b>	<b>400 AH</b>	<b>300 AH</b>	<b>200 AH</b>
1	<b>Battery Charger General</b>			
1.01	Name of Manufacturer			
1.02	Location of the Factory			
1.03	Date of Last Type Test Done			
1.04	Conforming Standard			
1.05	Type & Model of the Charger as per Manufacturer			
1.06	Total Dimension of Float cum Boost Charger ( L X B X H ) in mm.			
1.07	Minimum Thickness of Sheet (mm)			
2	<b>Charger Characteristics</b>			
2.01	Type of Feedback Control ( Thyristor / SMPS)			
2.02	Capacity (min.) of Battery Charger in AH			
2.03	Float/ Trickle Charging Current ( A )			
2.04	Boost /Quick Charging Current (A)			
2.05	Voltage Regulation of float charger ( % )			
2.06	Ripple Content ( %)			
3	<b>Component Parameters</b>			
3.01	Type of Thyristor with Model			
3.02	Manufacturer of Thyristor			
3.03	Rating of Thyristor			
3.04	Type of Diode with Model			
3.05	Manufacturer of Diode			
3.06	Rating of Diode			

3.07	Type of SMPS if applicable			
3.08	Manufacturer of SMPS			
3.09	Rating of SMPS if applicable			
3.1	Rating of three phase Transformer (KVA )			
3.11	Manufacturer of 3 phase Transformer			
4	Manufacturer & Type of Relays & Contractors with Range			
4.02	Input Under Voltage Relay			
4.03	Single phasing Alarm Relay			
4.04	Phase Reversal Relay			
4.05	D.C. Output Overvoltage Relay			
4.06	D.C. Output Undervoltage Relay			
4.07	Charger failure Relay			
4.08	DC Earth fault Relay			
4.09	A.C. Input failure Relay			
4.10	Fuse failure Relay			
4.11	Output Contractor ( Load Side)			
4.12	Output Contractor ( Battery Side)			
4.13	Tap Cell Contractor			
4.14	Confirmation of Both Auto & Manual Feedback Control ( Yes / No)			
4.15	Confirmation of Both Local & Remote Alarm Provision ( Yes / No)			