

## **I. TECHNICAL SPECIFICATION FOR 24V DC, 5A BATTERY CHARGER OF SERIES PASS TRANSISTOR LINEAR TYPE WITH 2X12 V, 40 AH VRLA BATTERIES**

- 1.1. **SCOPE** : This specification covers the design, manufacture, testing before dispatch and delivery of 24V DC, 5A Battery chargers of series pass transistor linear type with 2x12V 40 AH VRLA Batteries suitable for outdoor 33/11kV Sub-Station housed in self supporting outdoor cubicle as per the specification.
- 1.2. The Batteries are intended to be used for operating 33KV, 11KV SF6/Vac. Circuit Breakers with auto reclosing feature and for VHF sets. The rating of closing and opening coils is 400 Watts (Operating time is 100 ms.) and the rated operating sequence is 3 Min. Co-3 Min. – Co or 0-0.3 Sec. –Co.-3 Min.-Co.

The Batteries should have a capacity sufficient to operate 2 Nos. ( in case of 24V) 11KV Vac/SF6 Circuit Breakers simultaneously for about 25 closing operations on each when used without a charger.

### **2. STANDARDS**

- i) IS 1885 ( part VIII) : Electro Technical Secondary cells and batteries
- ii) IS 15549 – 2005 : Stationery valve regulated lead acid batteries
- iii) ID 8320 – 1982 : Sulphuric Acid General requirements and methods of test for lead acid storage batteries.
- iv) IS 1069/ 1964 : Water for storage batteries.

Materials meeting any other equivalent International standards which ensure equal or better quality than the standards mentioned will be acceptable. In such cases the copy of the standards ( English version) adopted should be enclosed to the tender.

**3. CLIMATE CONDITIONS:** The climate conditions under which the equipment shall operate satisfactorily are as indicated in clause 23.1 page 13 of General and Financial terms and conditions for supply of materials.

### **4. RATINGS : For 24V-40AH Batteries**

- 4.1. BATTERY : 2x12 Volts
- 4.1.1. TYPE : Valve Regulated Lead Acid Battery
- 4.1.2. Nominal Voltage of the complete Bank : 24 Volts
- 4.1.3. Voltage / CELL : 2.0 V  
(The cell Voltage shall not exceed 2.25V with a continuous low rate floating charge and shall not be less than 1.75 V at the end of the emergency discharge).
- 4.1.4 Physical dimensions each Battery (LxWxH mm ) : As per the manufacturer design
- 4.1.5. Capacity of Batteries : 40 AH
- 4.1.6 Connecting cables : Cable size selection should provide the lowest voltage Drop possible between battery system and operating Equipment. The maximum voltage drop in the cable between the system and operating equipment should not be more than 0.03 per meter length.

- 4.1.7 Method of charging : Constant voltage method and current limit( variable Current)
- 4.1.8 Recharging time from 0 to 90% State in hours : 4Hours

**4.2. BATTERY CHARGER: (Linear type using series pass transistor method)**

- 4.2.1. TYPE : Constant Voltage and Current limiting charger
- 4.2.2. Input Voltage : Single phase AC supply range from 190V to 300V
- 4.2.3. Charger output :
- 4.2.3.1. Float Voltage : 27V  $\pm$  5% adjustable.
- 4.2.3.2. Boost Voltage : 28V  $\pm$  5% adjustable.  
( Max.)
- 4.2.3.3. Regulation :  $\pm$  1%
- 4.2.3.4. Charger current : 5 A
- 4.2.3.5. Ripple : < 2% rms
- 4.2.3.6. Efficiency : Not less than 50% at full rated load
- 4.2.3.7. Current limit : 105% of rated load
- 4.2.4. Insulation : Not less than 5 mega Ohms.  
i. between DC output terminals and AC input terminals.  
ii. Between AC input terminals and earth
- 4.2.5. Meters :i) D.C voltmeter  
ii) Charger output Ammeter.
- 4.2.6 Indication : Mains on ( Red LED) , Charger on ( Yellow) , Boost on (Yellow LED), Float on (Green LED) and Battery reverse polarity ( Red LED), AC Input Fuse blown ( Red/ LED) LED lamp indication.
- 4.2.7 Protection :Input Fuses for AC & DC.
- 4.2.8 Cooling :External exhaust fan.

Note:- Only Step-down transformers should be provided in the Charger for step down the voltage and then Series Pass Transistors will be used for O/p regulation, the output regulation with stage wise amplification technique. **The switched mode power supply system (SMPS) and other linear types are not acceptable. Only Linear type series pass transistors model/type acceptable**

**5. GENERAL REQUIREMENTS:**

**5.1. BATTERY:**

The Batteries required under this specification are for supplying aux. D.C. supply to control circuits of Circuit Breakers. The battery shall be capable of withstanding large discharge currents for operating 33KV & 11KV SF6 / Vac. Circuit Breakers and for VHF sets. It shall be of rugged construction designed for long life and for working satisfactorily under the severest

operating conditions and shall conform to the relevant Indian / International standard of latest issue. The battery shall be supplied complete with all required accessories for their efficient operations and such parts / accessories shall be deemed to be within the scope of this specification, whether specifically mentioned or not.

The rating of the Batteries is specified at 27 deg.C. However, the battery shall be capable of operating satisfactorily in outdoor applications when it is housed in a Cubicle between 5 deg. C and 50 deg.C ( at reduced capacities) and in locations where the relative humidity between 12% and 100%.

All parts particularly removable once shall be interchangeable with each other.

The separators shall be micro porous absorbent glass material with high porosity. All connections shall be of lead plated copper. All inter cell and nuts and bolts shall be brass and lead plated. The lead plating shall be adequate and tenacious. The cells shall be suitably marked as per I.S.S.

The D.C. Battery shall be operated without intentional ground.

1 No. cell testing center zero volt. Meter with suitable range shall from part of the supply.

## 5.2. BATTERY CHARGER ( FLOAT CUM BOOST):

The battery shall be offered with suitable charger requiring low maintenance. The charger shall be of step down transformer with full wave bridge rectifier type with automatic voltage regulation facility by means of Series Pass Transistors will be used for O/p regulation and with necessary printed circuit boards, and relays etc. The charger shall be provided with a regulator to facilitate controlling of the cell voltage and to stabilize the output voltage within +/- 1% of the set D.C. value, for AC supply voltage variation of 85% to 125% when the variations occurs simultaneously. The charger shall be provided with an automatic current limiting facility, such that when charger output current exceeds 5% above the rated set current, the charger voltage should be brought down automatically so that the charger output current does not exceed the set value. The Peak inverse voltage of transistor shall be minimum of 600 V. Screening circuit to be incorporated for reducing transfer surges.

A manual and automatic changeover arrangement from Boost to Float and vice versa shall be provided, provision should be made to vary the charging current of Trickle / High charge in manual mode also. The O/p connections should be provided such that in the event of A.C. supply failure, battery capacity shall also connected to the DC load. **Deleted**

The charger should include AC ON / OFF switch or preferably MCB of suitable capacity, fuse protection for AC and DC, Battery reverse polarity protection, with “ Power On”, “Charger on”, “ Boost on ” & “ Float on “ LED lamp indications. The equipment shall also include moving coil Voltmeter and ammeter of suitable size 72 x 72 square type and range 0-30V and 0 – 10 Amps 90 degree scale with Red/Black needle. Dials shall be white with black nos. and lettering. The make of the Ammeters, Voltmeters to be provided should be got approved before supply. The charger shall have suitable indicators to visually know its mode of operation.

The battery charging equipment shall be complete with all parts that are necessary for their efficient operation. Such parts shall be deemed to be within the scope of this specification whether specifically mentioned or not.

The control & PCB internal wiring shall be carried out as per the manufacturer standard practice and main off wiring should be with 2.5 Sqmm copper wire. Suitable vertical terminable blocks shall be provided. Terminal connectors provided for wiring shall be stud type and not screw type.

The D.C. output shall be terminated at D.C. terminals, with facility to receive the battery wires and the load cable, with similar arrangements for A.C. input terminals for receiving A.C. wiring cable.

All the external cables to be connected to the charger shall be arranged for bottom / side entry with proper cable glands.

**The service manuals with component details & ckt diagrams are to be supplied with each charger.**

All the important components of the charger must be easily accessible for maintenance, repair, replacement in case of trouble without giving interruption to the total D.C. supply as far as possible.

24V DC, 5 Amp Conventional Type Battery Charger with Batteries :-

1. The Charger should be series pass transaction type with metal construction (BJT Transistor).
2. The cooling FAN must 'Switch ON' automatically when charger output current exceeds 1.5 Amps increasing life of cooling FAN.
3. Charger must be Auto/Manual selector switch. In Auto mode the float charger to Boost charge automatically change over when output current exceeds 1 Amp and vice-versa. The indication of Float and Boost must be according to the charger output mode.
4. The type test must be of NABL Accredited laboratory for the test given in the type tests clause.
5. Stepdown transformer of E and I core type primary and secondary winding with isolation with respect to input system is required (Auto Transformer not acceptable in view of NO isolation properties).

#### 5.2.1. SYSTEM BOX ( FOR 24V BATTERY AND CHARGER)

The 24V Battery and charger shall be housed in self supporting outdoor cubicle designed with good ventilation to cool the components so as to take care of the temperature effects. The units will be located in OUTDOOR YARD by the side of vacuum circuit breaker which are mounted on a suitable angular or tubular structure.

The cubicle housing trickle charger along with electrical instruments / components in the upper compartment and the battery in the lower compartment, shall be completely weather proof & vermin proof. A suitable hood shall be provided to protect the equipment from rain.

The cubicle shall be made of suitable M.S. Angles and sheets of not less than 16 SWG to withstand the weight of charger and battery cells and shall be of robust construction.

The door covering the entire unit shall be provided in the front facilitating reading of instruments inspection / service and maintenance of battery cell and charger components periodically. The door shall be fixed using screws so as to observe all meter readings and indications without opening the door through a perspective sheet.

Suitable provision shall be made for the escape of fumes emanating from the cells and heat from charger components.

Suitable anti corrosive, acid resistive paint is to be provided to interior side of the box.

## **6.0. TESTS:**

### **6.1. ACCEPTANCE AND ROUTINE TESTS**

All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the bidder in presence of purchaser's representatives. End cell voltage shall be as per relevant I.S the trickle charger is to be tested for its rating and the test certificates are to be furnished for approval.

### **6.2 Type Tests :-**

The equipment offered shall be fully type tested in **NABL Accredited laboratory** as per the relevant standards, The bidder shall furnish the type test reports along with the bid. The bids received without type test reports shall be treated as non- responsive.

### **6.3 Acceptance Tests :**

The following shall constitute the acceptance tests as per relevant standards.

#### **Acceptance test for battery charger**

- 6.3.1. Marking
- 6.3.2. Verification of dimensions.
- 6.3.3. Regulation test.
- 6.3.4. Ripple test,
- 6.3.5. Megger values and HV Test.
- 6.3.6. Test for Battery Discharge capacity.

### **6.4 Type Tests:**

Following shall constitute type tests in respect of chargers.

- 6.4.4 Insulation resistance
- 6.4.5 High voltage test at 1.5KV for 1 minute
- 6.4.6. Regulation (Load & Line)
- 6.4.7 Ripple
- 6.4.8 Dry heat test at 55°C for 16 hrs with full load on as per IS: 9000 part 3/Sec5/1977.
- 6.4.9 Damp heat test at 55°C and at 95% RH for two cycles as per IS: 9000 part 5/Sec1/1981
- 6.4.10 Cold test at -10°C for 4 hrs as per IS: 9000 part 2/Sec4/1977

After environmental test the parameters as per 6.4.4 to 6.4.7 shall be checked after recovery period of 1 hour and test results shall be satisfactory.

### **6.5 Type Tests:**

The following shall constitute the type tests in respect of batteries :-

1. Test for Discharge capacity .

## **7. DRAWING & LITERATURE:**

Detailed Drawings, Circuit details and technical literature of batteries shall be enclosed to the offer. Tenders not accompanied by the above are liable for rejections, 2 copies of these drawings circuit details and literature are to be supplied along with each unit in the event of order. Trouble shooting charts shall be supplied with each unit to trace faults in the charger with voltage and resistances to be measured at various test joints.

## **8. PAINTING:**

Before painting, all ungalvanised parts shall be completely cleaned and made free from rust, scale and grease and all external rough surface cavities and casting shall be filled by metal deposition. The interior parts and internal structural steel work shall be cleaned of all scale and rust by sand blasting or other approved method. All external surfaces shall received a minimum of 3 coats of paint. Anticorrosive / Acid resistant paint is to be provided for interior side of the system box. The paint shall be guarantee by 5 years from the date of receipt of material.

## **9. INSPECTION:**

9.1. All routine tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification.

9.2. The purchaser has the right to have tests carried out to suppliers cost by an independent agency wherever there is a dispute regarding the quality of supply.

## **10. PACKING:**

The equipment shall be delivered suitably packed. Although the method of packing is left to the discretion of the manufacturer, it should be robust for rough handling, that is occasioned during transportation by rail / road.

## **GUARANTEED TECHNICAL PARTICULARS**

### **24V, 40AH BATTERIES:**

1.	Type of Design as per I.S.S	:	
2.	Manufacturer's type Designation	:	
3.	Ampere hour capacity 20 Hrs. rate of discharge to 1.75V.	:	
4.	Total No. of Plates per cell	:	
5.	Nominal Cell Voltage (Volts)	:	
6.	No. of Cells in each Bank	:	
7.	No. of Spare Cells if any in each Bank.		
8.	Internal resistance for each Cell (Micro Ohms)	:	
9.	Resistance of the Battery Including inter – connection Between the Cells (ohm)		
10.	Cell discharge rate in Ampere (from rated Voltage to final discharge rate in Amp. 1) 5 Hrs. Discharge rate in Amp. 2) 2Hrs. Discharge rate in Amp. 3) 1 Hrs. Discharge rate in Amp. 4) 30 Min. Discharge rate in Amp. 5) 10 Min Discharge rate in Amp. 6) 1 Min Discharge rate in Amp. 7) 30 Sec. Discharge rate in Amp. 8) 1 Sec. Discharge rate in Amp. (Please furnish a graph showing Amps. Against time for the type of battery offered)	:	
11.	Short circuit current (Amps)	:	
12.	i) Material of cell containers ii) Material used for battery box	: :	
13.	Thickness, type and material of separators	:	
14.	Constructional details and dimension: i) Positive plate ii) Negative plate iii) Surface area of plates in sq.mm.	: : :	
15.	i) Ampere hour efficiency % ii) Watt hour efficiency %	: :	
16.	i) Recommended float charge current and voltage ii) Recommended boost charge current and voltage	: :	
17.	Time required for boost charging from discharged condition	:	
18.	i) Max. charging current/cell ii) Nominal charging rate	: :	
19.	i) Whether explosion proof or vent pugs provided ii) Whether vent is spill proof	: :	
20.	Type of inter cell connection and whether they are covered with plastic sleeves	:	
21.	i) Dimensions of each 12V Block/Cell Length mm Width mm Height mm Thickness of container mm ii) Net weight of the cell complete with acid 12V Block (kg).	: : : : :	
22.	Expected life span of battery	:	
23.	Accessories provided	:	
24.	Special conditions if any	:	

**B) CHARGER :**

1.	i) Charger Type	:	
	ii) Type of Rectifier	:	
2.	No. of Units	:	
3.	Manufacturers Type and Designation	:	
4.	A.C. Supply	:	
5.	Rated D.C. Output (KW)	:	
6.	Rated D.C. Output Voltage (Voltage)	:	
7.	Rated D.C. Output Current (Amps.)	:	
8.	D.C. Output Voltage Regulation from NO load to Full load (Volts)	:	
9.	Maximum Ripple current	:	
10.	Changeover from boost to trickle (Automatic / Manual)	:	
11.	Protection DC short circuit, Reverse polarity protection etc., provided.	:	
12.	Maximum Permissible Temperature rise over an ambient temperature of 500C.		
13.	Overall efficiency	:	
14.	Load Limiting Feature	:	
15.	Unit Dimensions		
	i) Width	:	
	ii) Height	:	
	iii) Depth	:	
16.	Unit Shipping Weight	:	
17.	Recommended Spares	:	
	<i>SYSTEM BOX / RACK</i>		
	<i>E. i) SYSTEM BOX</i>	:	
	a) Dimensions of Box	:	
	b) Weight of box	:	
	c) Guage of Material	:	
	d) Painting details.	:	
	ii) RACK		
	a) Dimensions & Weight	:	
	b) Description	:	
	c) Material	:	