Revised on 29.03.2014

TECHNICAL SPECIFICATION FOR 24V (2 X 12 V), 40 AH Batteries (SMF – VRLA) with chargers of Conventional type (linear type).

1.1. **SCOPE** : This specification covers the design, manufacture, testing before dispatch supply and delivery of 24V **(2 X 12 V)** 40 AH SMF – VRLA flat pasted batteries with chargers suitable for outdoor applications.

1.2. The Batteries are intended to be used for operating 33kV, 11kV SF6/Vac. Circuit Breakers with auto re-closing feature. 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 15):2008/IEC 600504(482):2004 : Electro technical vocabulary for primary and secondary cells and Batteries

ii) IS-15549/2005 or latest version: Valve regulated maintenance free 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 : 24 Volts

4.1.1. TYPE : Sealed and maintenance free Lead Acid battery.

4.1.2. Nominal Voltage of the complete Bank : 24 Volts

4.1.3. Voltage / CELL	: 2.0 V a) (The cell Voltage shall not exceed 2.25 with a continuous low rate floating charge and shall not be less than 1.75 V at the end of the emergency discharge). b) Battery Voltage:24V i.e 2Nos 12V Batteries. Each 12V Battery Comprising of 6Nos 2V Cells.
4.1.4 Physical dimensions each Battery (LxWxH mm)	: ----
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 Volts 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	**: (Conventional type)**
4.2.1. TYPE	: Constant Voltage and Current limiting charger
4.2.2. Input Voltage	: Single phase (2 wire) voltage 250V AC +30% to -20% Frequency 50Hz ± 5%..
4.2.3. **Charger output**	
4.2.3.1. Float Voltage	: 27V DC ± 2%.
4.2.3.2. Boost Voltage	: 27.6V DC ± 2%.
4.2.3.3. Regulation	: ± 1%
4.2.3.4. Charger current	: 5 A
4.2.3.5. Ripple	: < 2% rms
4.2.3.6. Efficiency	: Not less than 65% 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) Separate D.C voltmeter (Digital – (72 X 72 mm) with one decimal) for checking batteries and charger voltage. Auxiliary supply of 27 V AC/DC. ii)Charger output digital Ammeter – (72 X 72 mm).
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), O/p DC fuse blown (Red/ LED) LED lamp indication. With 6mm dia.
4.2.7 Protection	: Input single pole MCB's for AC & DC and along with 8 A fuses for DC. (5 Nos spares to be provided).
4.2.8 Cooling	: External exhaust fan.
4.2.9 Dimensions of the Box(System box)	: 500(L)X600(H)X350(D) mm
Dimensions of the charger box	: 340(L)*250(H)*300(D)

Note:- Only Step-down transformers should be provided in the Charger for step down the voltage with thyristor based will be used for O/p regulation. **The Switched Mode Power Supply system (SMPS) Type is not acceptable.**

4.3. RATINGS : For 12V 40 AH SMF Batteries

4.3.1. BATTERY	: 12 Volts
4.3.2. TYPE	: VRLA Maintenance Free Lead Acid Battery
4.3.3. Nominal Voltage of the complete bank	: 12 Volts
4.3.4. Voltage / CELL	: 2.0 V (The cell Voltage shall not exceed 2.25 with a continuous low rate floating charge and shall not be less than 1.75V at the end of the emergency discharge).
4.3.5. Capacity of Batteries (in Amp. Hours at 10 Hour rate to an end voltage of 1.75V per cell).	: 40 AH
4.3.6 Efficiency	: Not less than 90% at full rated load

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. 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 microporous 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 half controlled Thyristor (SCR) based bridge rectifier type with automatic voltage regulation facility will be used for O/p regulation. 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 mains supply voltage variation of 80% to 130% when the variations occur 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. 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.

The charger should include AC ON / OFF MCB of suitable capacity, fuse protection for DC, Battery reverse polarity protection, with " Power On", "Charger on", " Boost on " & " Float on" LED lamp indications. An electronic hooter / bell to be provided for giving alarm with indication in case of AC supply failure / charging failure. The equipment shall also include digital Voltmeter and ammeter of suitable size 72 x 72 square type & range 0-40V and range 0-10 Amps respectively. The indicating instruments shall be of flush mounting type with dust tight covers.
The following makes of the indicating instruments shall be provided.

1. AE
2. Rishab
3. Meco
4. Motwane
5. IMP
6. Secure
7. Conzerv

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 internal wiring of the charger shall be carried out with PVC insulated 650V grade standard copper conductor. The control wiring shall be carried out with 2.5 Sq.mm copper conductors. All wiring for external connections shall be brought to 650V grade single piece mounted terminal blocks with batteries. Suitable vertical terminable blocks shall be provided. Terminal connectors shall be provided for wiring shall be four way, stud type, tin coated 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 entry with proper cable glands. The entries for AC and DC connections shall be provided on either side of bottom i.e left and right sides respectively.

The service manuals with component details & circuit 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.

Dimensions of the charger box : 340(L)*250(H)*300(D)

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 vaccum 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. 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. Box dimensions should be 500(L)X600(H)X350(D)

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 recognized NABL 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. The type tests as specified in the IS should be carried out not later than 5 years from the date of opening of bid.

6.3 Acceptance Tests :

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

Acceptance test for battery charger with batteries.

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 and batteries.

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
6.4.11 Batteries: Test for discharge capacity.

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.

7. DRAWING & LITERTURE:

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 joists.

8. PAINTING:

The box shall be painted with powder coating with siemens grey colour.

9. INSPECTION:

9.1. All acceptance and 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.

11.GUARANTEE

The batteries with chargers supplied are guaranteed for a period of 18 months from date of supply.

GUARANTEED TECHNICAL PARTICULARS

A) BATTERY (24V 40AH)

1.	Type of Designation as per I.S.S	:	
2.	Manufacturer's type Designation	:	
3.	Ampere hour capacity 10 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 Min 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 plateiii) 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 fully 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 24V 40AH: (THYRISTOR BASED)

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 over voltage, under voltage protection Reverse polarity protection etc., provided.	:	
12.	Maximum Permissible Temperature rise over an ambient temperature of 50^0C.		
13.	Overall efficiency	:	
14.	Load Limiting Feature	:	
15.	Unit Dimensions i) Width ii) Height iii) Depth	 : : :	
16.	Unit Shipping Weight	:	
17.	Recommended Spares	:	
	SYSTEM BOX		
	a) Dimensions of Box b) Weight of box c) Guage of Material d) Painting details	 : : : : : : :	