

**SYRIAN ARAB REPUBLIC
MINISTRY OF ELECTRICITY
PUBLIC ESTABLISHMENT FOR TRANSMISSION AND DISTRIBUTION
OF ELECTRICITY (PETDE)
STUDIES DIRECTORATE**

**TECHNICAL SPECIFICATION
FOR 110VDC, 50A AUTO
AND MANUAL
(FLOAT-CUM-BOOST)
BATTERIES CHARGER**

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- **SCOPE :**

This specification covers:

Design,engineering,manufacture,Assembly,Inspection,Testing at manufacturer's works, Delivery to PETDE'S house stores inclusive of packing & transportation, Testing and Commissioning assistance for (12) pcs of 110 VDC ,50 (A) Battery Charger complete with all accessories, three phase Battery charger for (110V, 200 AH,90 cell) set of Batteries in accordance with this specification standards stated herein and Appendices enclosed herewith ,have operation mode(**Float ,cum, Boost**) for new 66/20kv substations in (**Ghabagheb,Mazeh 86,Alareen, Yelda,Khan shikhoun,Senjar**) .

- **TECHNICAL SPECIFICATION FOR BATTERY CHARGER**

1.GENERAL REQUIREMENTS:

The system requires a reliable and uninterrupted D.C. supply for supplying D.C. Power to emergency lights, closing and tripping coils of circuit breakers, relays etc. This will comply with all statues, regulations and safety codes.

2. STANDARDS AND NORMS :

All equipment shall be designed , manufactured and tested at works and on site in conformity with the latest applicable IEC standards .

Whenever no IEC standards have been issued , offerer shall state the available applicable standards or norms to be followed in the design , manufacture and testing of such equipment and shall enclose an English copy of them .

Offer documents shall include a list covering all standards and norms to be applied for manufacture of Offered equipment , construction , installation and testing . The offerer shall also specify the testing procedure to be carried out , keeping in mind

that the testing procedures proposed in these specifications are stated only as a minimum .

3. REQUIRED ELECTRICAL PARAMETERS :

3.1 AC input:

415/230 volts +10 % & -15%, 50 HZ +/- 3%, three phase, four wire supply Input ,Power factor 0.8 minimum at rated load.

3.2 Charger system operation :

3.2.1. The Battery Charging Equipment shall be float-cum-Boost type with facility to supply the DC continuous load of 50 Amp. During normal operation, the Battery is floated across the Battery charger at 128V (1.42 V per cell) and should be compatible for battery as per specification and also supplies the Battery current 50 Amps. into batteries for higher voltage up to 142V (1.58 V per cell). The charger shall provide extra voltage for Boost charging.

3.2.2 During boost charging, voltage across the battery terminal will go higher at the order of about 142.5 volts for which suitable automatic solid state transistorized dropping device shall be provided (maintain 110 V \pm 2 Volts across the terminal).

3.2.3 Battery Charging Equipment shall be fully automatic for Float and Boost charging facility with suitable indication on front of the panel by means of LED indication. For this, automatic solid state change over relay shall be provided. During AC mains fail, Battery supplies the load and gets discharged. The extent of discharge depends on the duration of power failure and the current drawn by load. When the mains are restored after power failure, Battery shall put on automatically on boost mode. During this time, load voltage shall be maintained by load regulator 110 V +/- 2 volts. It should automatically switch over to trickle mode & when

Battery voltage falls below 110 volts, the charger should automatically switchover to Boost mode. Soft start feature shall be provided in the system.

3.2.4- The battery charger shall have one top and one bottom for Manual & Auto Bridge circuit. The bottom module (Auto mode) shall be so connected to the top/other modules that if necessary, it can be taken out for repair by simply disconnecting few links. Each arm of the bridge shall be provided with filter circuit as well as fuse protection in order to rectify the fault if any, at the earliest opportunity.

3.2.5 Automatic changeover of DC load requirement of substation to Battery in the event of Mains power failure should be without any break. i.e should be made without incorporating any relay in the output DC supply.

3.2.6 Automatic changeover of output to charger supply with restoration of incoming power supply and after meeting short time current requirement from battery.

3.2.7 Rating : 110 V Dc outputs(load , batteries) ,50 amp
auto/ manual dual automatic(float ,cum, boost)
Battery charger.

- a. Type : Thyristor controlled.
- b. At Load terminal : During float charging or Boost charging, the load voltage shall be maintained 110 V \pm 2 volt. For AC input voltage variation of +10 & -15 % and load variation of 0 to 100 %. Also system shall provide 50 Amps continuous current and also momentary current of 100 Amps for one second.
- c. At Battery terminal : Trickle charge voltage 128 volts (1.42 V per cell). Boost charge voltage 142.5 volts (1.58 V per cell) at 50 Amps.

- d. Ripple : The ripple content in the DC output of DC output of Battery Charger shall be limited to 2% RMS.
- e. Regulation : $\pm 2\%$
- f. Efficiency : More than 70%
- g. Method of cooling : Natural air with proper ventilating arrangement.

4.0 DESCRIPTION :

- 4.1 The charging equipment shall be housed in a free standing, floor mounted compartmentalized panels having separate compartments for float cum boost charging equipment, battery connection to DC bus, DC distribution equipment, including incoming feeders and outgoing feeders in different compartments. Panels shall have provision for bottom entry of cables with removable cable gland plate. (i.e. separate compartmentalized panels for each (float cum boost) charger .
- 4.2 The panel shall be of CRCA sheet steel construction and provided with concealed hinges. Adequate ventilating grills or louvers with fine brass wire mesh shall be provided. Thickness of sheet steel shall be at least 3.0 mm for load bearing members and 2.0 mm for other sides. Degree of protection provided by the enclosure to the internals of charger shall be IP-42 .
- 4.3 The instruments, switches and indicating lamps shall be flush mounted on the front panel.
- 4.4 Suitable neoprene rubber gaskets shall be provided all around doors and cover plates, for making charger construction dust and vermin proof.
- 4.5 All PCBs used in the charger shall be made of glass epoxy material. Electronic cards shall be plug in type and shall be

mounted on standard racks. Rack shall have PCB guides which shall allow the insertion of PCBs smoothly without requiring force. Racks shall be mounted on hinged pivot to enable the rack to be turned for access to back side terminals. PCBs shall include status indicating LED lights and test connections in the front to facilitate fault diagnosis. PCBs shall be identified with proper permanent labels as per approved drawings.

4.6 Paint shade : Both exterior and Interior – RAL 7032

4.7 The panel must be naturally air cooled type designed for continuous operation in a ambient temp. 50°C. This shall be dust and vermin proof.

5.0 COMPONENTS:

5.1 The Battery charger shall comprise of following components but not limited to the same:

- a) Double pole AC circuit breaker for AC incoming of the battery charger (MCB), MCB ratings shall be for 3 KA rupturing capacity at 110 V DC..
- b. Automatic solid state voltage / current controller for automatic control of voltage and current during float / boost charging the batteries complete with manual control facility.
- c. Auto / manual mode selector switch (25 A rating) with Indication lamp/LED for respective position.
- d. Float/Boost indicator lamps/LED.
- e. Potentiometers to adjust DC output voltage and current in respective modes.
- g. Battery charging current and voltage requirements are to be regulated by using voltage current feedback loops.
- f. Smoothing (filter) circuit comprising of smoothing choke and filter condenser to reduce ripple content in the DC output of the Battery charger to 2% RMS.

- j. DC moving coil Voltmeter of 0-110+0 V rating and 72 sqmm with selection switch and HRC fuse to measure voltage of charger / Battery and Load.
- h. Solid state automatic load voltage regulator to maintain the load voltage of 110 V \pm 2 V (rating of the regulator shall be 50 A continuous and 100A for one second) during Float charging or Boost charging of the Batteries.
- k. Double pole DC circuit breaker for Battery protection (MCB) with auxiliary potential free contacts.
- l. DC contactor to by-pass automatic load voltage regulator in the event of AC mains fails to allow the full battery across the load. There should not be any discontinuity of DC supply to the busbar during any transition period and battery power should be available for tripping circuit, if necessary, even during boost charging.
- m. AC voltmeter 96x96 sqmm of rating 0 to 500 V.
- n. Fuse fail indication lamp / LED for load and Battery fuses.
- o. The indicating instruments shall be class 0.5 accuracy.
- p. The following provisions conforming to relevant IS shall be made on the front panel:-
- (i) Voltmeter to indicate battery/charger DC voltage (0-500V)
 - (ii) Voltmeter for Input AC supply voltage.
 - (iii) Ammeter to indicate Charge/Discharge current of battery (100-0-50 A)
 - (iv) Ammeter to indicate load DC current.
 - (v) Ammeter for earth leakage current of the charger & outgoing ckt. (load side) – (100 – 0 – 100 mA)

5.2 The Charger shall be provided with following LED of reputed make Indication:

- (i) Supply of power--Green
- (ii) Charger on --Green
- (iii) Battery reverse polarity
- (iv) Input power supply fail--Red
- (vi) Output over/under voltage
- (vii) Earth fault

5.3 Audio/Visual alarm to indicate:-

- (i) AC input Power failure.
- (ii) Charger Output failure.
- (iii) Battery disconnection/failure.
- (iv) DC under/Over voltage.
- (v) Condenser Fuse failure.
- (vi) In case of failure of charger on fault, it should give buzzer as well as LED indication. However, the buzzer alarm should be provided for battery fuse fail, load fuse fail and charger trip due to over load indication with an accept and reset switch. The charger shall have provision for an alarm relay contact for remote Indication. Suitable terminals with identification label shall have to be provided.

5.4 Controlling arrangement for following functions shall be provided:

- a) Auto/Manual Selector Switch
- b) Manual operation controlling device
- c) Accept/Reset push button
- d) Voltmeter selector switch

5.5 Wiring: Charger cubicle shall be supplied completely wired up to terminal block for purchasers external connection using solder less crimping type copper lugs. All wiring shall be carried out with 1.1 KV grades PVC insulated multi-strand copper conductor of 2.5 Sqmm and shall be flame/vermin proof. All

wiring shall be neatly bunched without affecting access to equipment/ components mounted within the cabinet. The Charger DC output circuit for Battery and load connection separately shall be wired with 6.00sq.mm PVC insulated cable. Suitable earthing terminal and outgoing terminal shall be supplied to connect the external supply cables.

Control/indication /annunciation circuit shall be wired with suitable size of PVC insulated cable as per scheme requirement colour coded wires should be used to facilitate easy tracing ,as under:

i-single phase AC circuit :

- (a) Yellow for phase
- (b) Green for earthing
- (c) Blue for neutral

ii-DC circuit:

- (a) red for positive
- (b) black for negative

iii. Control Wiring:

- (a) Gray for annunciation and other control circuits.
- (b) Ferrules: Embossed/Engraved core identification ferrules, marked to correspond with the wiring diagram shall be fitted at both ends of each wire.

(c) Termination:

- The input, battery and load terminals shall be located in easy accessible positions. The *terminals shall be* properly labeled for easy identification of Input (Phase

& Neutral), Battery (positive & negative), Load (Positive & negative) and Emergency Lamp (Positive & negative).

- The terminals shall be rated at 25 Amps or more depending on scheme requirement.
- The Input terminals shall be connected to a 3 core PVC insulated multi-stranded copper conductor cable (minimum 2mtr. length) with a 16 Amp 3 pin plug socket at the other end. The earth conductor of the cable shall be provided on the charger body.
- The charger shall incorporate terminals and fuse of 4 Amp rating for connecting wires from outside to bring emergency light in to battery circuit in the event of mains failure.
- All control cables should run through the bottom side of the Charger cubicle with proper gland arrangement.

6. SPECIAL FEATURE :

6.1 All printed circuits boards used in the battery charger shall be solder marked, glass, epoxy, FR 4 grade copper clad material having edge type gold plugging connectors conforming to latest IEC specifications. All assembled PCB conforming coating on component side & epoxy varnish on the other side with suitable protective coating for protection against humidity and corrosion.

6.2 Transformer shall be with class B insulation having a continuous rating at least 125% of the rating of the charger. Reactance of the transformer shall be suitable to take care of regulation and surges. The power transformer rectifier unit of the battery charger shall be designed for adequate VA rating but in any case it should not be less than adequate VA and should be rated for

500 V at factor safety of 3. The heat dissipation and power control system should be designed with a factor of safety of 8. Rating of silicon diode should not be less than 100 A.

Please note that necessary documentary evidence, showing transformer rating of adequate VA along with test certificate from manufacturer. It bought out , shall be enclosed, for approval of the PETDE.

6.3 Following make of components shall be stated in the Battery charging equipment

i)	Switches	
ii)	Meters	
iii)	Contacts/Relay	
iv)	MCB	
v)	HRC fuses	
vi)	SCR	
vii)	Diode	
viii)	Lamps/LED	
ix)	Filter condenser	
x)	Potentiometer	
xi)	Voltmeter A.C.	

6.4 The charger cubicle will be indoor type with all associated and auxiliary equipments mounted there in.

6.5 All fuses shall be HRC cartridge types mounted on plug type fuse bases.

6.6 Electrical indicating instruments shall be flush mounted on panel with only flanges projecting. Dial shall be white with black number and lettering.

6.7 Control & instrument switches shall be of rotary type.

6.8 Indicating lamps shall be LED type with low watt consumption. The LEDs shall be provided with series resistors.

- 6.9 Strip type space heaters of adequate capacity shall be provided inside cabinet to prevent moisture condensation.
- 6.10 All door mounted equipments as well as equipment mounted inside the cabinet shall be provided with individual labels with equipment designation engraved on aluminium/plastic plate (stickers are not acceptable).
- 6.11 POLARITY MARKING:-
The polarity marking of the terminals shall be marked for identification. The positive terminal may be identified by "P" or (+) sign and Red colour mark and the negative terminal may be identified by "N" or (-) and Blue colour. Terminal marking shall be permanent and non-deteriorating.
- 6.12 Terminals – Battery charger cabinet shall be provided with two separate suitable earthing terminals. Separate terminals shall be provided for connecting load & battery leads to the charger. All terminals shall be M12 size. Suitable copper lugs shall be provided by the bidder for use of the purchaser for connecting the load wiring. It would be the bidder's responsibility to prove the adequacy of the design by submitting all technical particulars and relevant graphs to show suitability of charger for supplying load on continuous basis.
- 6.13 Method of cooling of the charger equipment shall be specified by the bidder.
- 6.14 Two earthing studs of MS 50 mm long & 12 mm dia shall be provided for external earth connections. These should be complete with plain washer, spring washer, nuts etc. Earthing Bolts must be welded to prevent removal of the same from the box.
- 6.15 PROTECTION AND ANNUNCIATION:
Following protection with alarm indicating lamps and alarm accept push button and lamp test push button shall be included in the scope of supply.

- i) Load under voltage relay
- ii) DC Earth leakage relay.
- iii) Float charger failure
- iv) AC mains failure
- iv) DC over voltage relay for battery protection.
- v) Boost charger failure.
- vii) HV phase fail/phase sequence reversal protection.
- viii) Semiconductor Fuse fail - Float
- ix) Semiconductor Fuse fail - Boost

7.0 TESTS

7.1 Type Tests:

7.1.2 The following tests shall constitute the type tests as per IEC

- a) DC voltage current test.
- b) Automatic voltage regulator operation.
- c) Efficiency test.
- d) Ripple Voltage test.
- e) High Voltage test.
- f) Temperature rise test.
- g) Degree of Protection test.
- i) Short circuit test at No Load and full Load at rated voltage for sustained short circuit.

7.2 Routine Tests :

The following tests shall constitute the type tests as per IEC

- Physical checking of charger as per approved drawing.
- Insulation resistance test.

- High voltage test.
- Line regulation test at No Load and full load in test at load in Float/ boost mode.
- Full load ripple content measurement test at load terminals in float and boost mode
- Voltage regulation test at load terminal and Battery terminals in float and boost mode.
- DC short circuit test without blowing HRC fuses
And without tripping MCBs at load terminal and also at Battery charger output terminals with observation of total current limit.
- Efficiency measurement test.
- Checking of automatic operation Float to Boost, Boost to float mode as per Battery condition.
- Checking of Battery voltage, load voltage and Load current Boost Mode at different charging current.
- Temperature rise test of complete charger at full load.
- Checking of battery & Load Terminal voltage in manual Mode operation at different position of
- Checking of automatic connection of Battery to load in case of "Mains Failure" or Charger Trip" conditions. Checking of Float voltage setting range and Boost current setting Range in Automatic Mode. Any other routine test shall be

carried on the complete battery Charging equipment.

8.APPROVED OF DRAWINGS:

Before give the order of commencement and starting to manufacturing the panels of chargers ,so the offerer will present the detailed drawings of the a/m panels to get the PETDE'S approval ,after that the offerer can start of manufacturing of the batteries chargers .

9.0-PACKING / MARKING:

a)-The charger shall be dispatched securely packed in wooden crates suitable for handling during transit by Road, so as to avoid any loss or damage during transit.

b)-Name Plate

Each equipment shall be provided with name plate of, corrosion resisting material (Preferably stainless steel) . It shall be fitted on a position clearly visible to the operator .

The plate shall be indelibly marked in English and all units shall be shown in MKS system .

It shall include the information according to the relevant standards. In addition , name plate for main equipment shall include at least the following :

- Manufacturer
- Country of origin
- Type
- Year of manufacture
- Owner : **PETDE**
- Main ratings and terminal codes

–Applicable standards

Name plate shall include also all data specifically noted otherwise in the tender documents .

Details of each label shall be subject to approval of **PETDE** .

10.0-UNPRICED SCHEDULE:

Unpriced schedule (without price) of offered items shall be submitted along with the Technical Bid.
