



SUPPLY CHAIN MANAGEMENT

THIRUVANANTHAPURAM

SPECIFICATION

110V, 100 AH VRLA BATTERY

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Technical Specification and Evaluation Committee for Transmission Material



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(i) Document Approval & Control Status

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Date	09/04/2021	23/04/2021	03/05/2021
Signature	Sd/-	Sd/-	Sd/-

(ii) Amendments and History

Sec. #	Rev. #	Date	History of Change



SUPPLY CHAIN MANAGEMENT
Thiruvananthapuram

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

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1. PURPOSE:

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **110V, 100AH VRLA Battery** in a professional manner

2. SCOPE:

The Scope of this document is to inform and alert all relevant stakeholders including KSEBL, Public, KSERC etc regarding the current specifications and historical changes adopted in specifications of **110V, 100AH VRLA Battery** used in field by KSEBL

3. RESPONSIBILITY:

The Executive Engineer (T), Office of Chief Engineer, Supply Chain Management shall compile and take necessary steps to publish the specification in KSEBL website and shall inform relevant stakeholders regarding updates and revisions

4. PROCEDURE FOR REVISION:

Modifications if any, in the technical specification will be incorporated as **Revisions**. Any changes in values, minor corrections in pages, incorporation of small details etc. will be considered as Minor Modification. **The Revisions due to minor modifications will be assigned as Rev. No.0.1, 0.2 etc.**

A complete updation of the technical specification will be considered as Major modification. **The Revisions due to major modifications will be assigned as Rev. No.1.0, 2.0 etc.**

All the details of regarding the revisions (both minor and major) will be incorporated in **“(ii)-Amendments and history”** above.

The concerned officers, in consultation with the Technical Committee will review and suggest changes required and the revision suggestion will be approved by **Chief Engineer (SCM)**. Those who notice any discrepancy or have any suggestion regarding revision, may bring the matter to the attention of Chief Engineer (SCM) in writing or through e-mail id:**cescm@kseb.in**



SUPPLY CHAIN MANAGEMENT
Thiruvananthapuram

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

CONTENTS

1) Scope of Supply:	5
2) Specification and Standards for Batteries	5
3) Constructional Features of Battery	6
4) Constructional details of Battery.....	6
5) Accessories	8
6) Type Test	9
7) Guaranteed Technical Particulars	10



SUPPLY CHAIN MANAGEMENT
Thiruvananthapuram

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

TECHNICAL SPECIFICATION FOR 110V, 100 AH VRLA BATTERY

This section covers the salient aspects and technical particulars of design, manufacture, testing at manufacturer's works of 100AH VRLA Batteries, and associated accessories for indoor installation. Erection and commissioning charges included in the scope of supply.

- 1) **Scope of Supply:-** The scope of this specification covers design, manufacture, assembly, testing at manufacturer's works, packing, forwarding, delivery at site, erection, testing and commissioning of the following equipment for D.C System of 110V. The site is Transmission Stores Division, Angamaly. But the consignment shall be delivered anywhere in Kerala, without any extra cost, if required by the Board.

110V, 100AH capacity, maintenance free sealed valve regulated lead-acid stationary batteries, along with necessary accessories, fittings etc. are to be supplied.

- 2) **Specification and standards for Batteries:-**

- a) Valve regulated lead acid batteries : IEEE 1187, 1188 & 1189/1996; IEC-60896 –2 and latest amendments
- b) Sulphuric acid : IS:266
- c) Rubber and plastic container for lead acid storage batteries : IS:1146
- d) Water for storage batteries : IS:1069

The capacitive voltage and other details required are given below:

1)	Ampere-hour capacity at 10 hour rate of discharge	Ampere hour capacity at 1 hour rate of discharge	Nominal voltage of battery	Nominal voltage of each cell	No. of Cells
	100AH	60AH	110V	2V	55
2)	Design ambient temperature		-	-250 C to 400 C	
3)	Humidity max.		-	100%	
4)	Maximum charging current		-	15A for 100 AH	
5)	Normal charging time after complete discharge hours		-	9 hour for 90% at constant potential charging at 2.3 V PC.	
6)	Watt hour efficiency when discharged at 1 hour		-	Above 80%	
7)	Ampere hour efficiency		-	90% minimum	
8)	No. of stacks in which cells are to be arranged		-	2 stacks	

Provision should be available for replacing modules/cells whenever necessary.

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

3) Constructional Features of Battery:-

1)	Container and lid material	Poly-propylene co-polymer plastic
2)	Thickness	2-3 mm
3)	Separator type and material	Highly absorbent glass/Synthetic material microporous matrix.
4)	Electrolyte	Prepared from the battery grade sulphuric acid conforming to IS 266:
5)	Type of positive plates	Flat pasted plate type with lead alloy
6)	Type of negative plates	Flat pasted plate type with lead alloy
7)	Type of vent plug	Explosion proof, pressure regulating and self releasing safety vent plugs
8)	Rack material	Mild steel with powder coating
9)	Self discharge rate of battery	Less than 0.5% capacity per week
10)	Designed float life expectancy of the battery	Not less than 15 years
11)	Terminals	Integral lead terminal with solid copper core.
12)	Connectors	Heavy duty, lead plated copper connectors

4) Constructional details of Battery:-

- 4.1) **Type:-**The battery shall be Valve Regulated Lead Acid (VRLA) sealed maintenance free type. Battery shall not require water addition ever and shall suppress generation of hydrogen gas.
- 4.2) **Plates:-** Positive plates shall be made of flat pasted type using lead alloy. Negative plates shall be heavy, durable flat-pasted type using lead alloy. Negative plates shall be designed to match the positive plates and combination of positive and negative plates shall ensure long life and trouble free operation of battery.
- 4.3) **Separators:-** Separators shall be made of either glass or Synthetic material, micro porous matrix and shall be resistant to sulphuric acid. It shall be capable of keeping all the electrolyte. It shall be electrically insulated. Internal resistance shall ensure discharge characteristics under all operating conditions. Sufficient separator overlap and PVC shield protection to bottom edges of the plates is to be provided to prevent short circuit formation between the edges of adjacent plates. Minimum two layers of separators shall be provided between the plates.
- 4.4) **Containers and lids:** The containers and lids shall be made of special grade polypropylene copolymer plastics. They shall be sufficiently robust and not liable to deformation under internal

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

operating pressures and with in the temperature ranges naturally encountered. It should be leak proof, non-absorbent and resistant to the acid with low water vapour permeability.

Provision for by passing any defective cell during service for replacements etc. may be made.

- 4.5)** Sealing and Venting: Vent plugs shall be, made of suitable plastic material, pressure regulating, explosion proof and self-resealing. Venting shall only occur through porous disc. The vents shall release excess pressure and reseal when the pressure is low.
- 4.6)** Electrolyte: The electrolyte shall be prepared from the battery grade H_2SO_4 confirming to IS:266. The batteries shall be supplied in factory filled and charged condition.
- 4.7)** Water:- Water required for preparation of electrolyte shall be conform to IS:1069.
- 4.8)** **Connectors:** The connectors shall be lead coated copper of suitable size to join the cells. The connectors shall be suitably designed and coated to withstand corrosion due to sulphuric acid may be used where the cells are called upon to discharge at very high rates. The coating should be adequate and tenacious.
- 4.9)** **Plate connections:-** Lugs of plates of like polarity shall be connected by lead burning to horizontal strap having an upstanding terminal post adopted for connection to external circuit. Strap and post shall be cast with lead antimony alloy. The positive and negative terminal posts shall be clearly marked for unmistakable identification.
- 4.10)** **Nuts and Bolts:-** Nuts and Bolts for connecting the cells shall be effectively lead coated to prevent corrosion.
- 4.11)** **Terminals:-** Terminals shall be of integral lead terminal with solid copper core.
- 4.12)** **Supporting racks:-** Batteries shall be installed on MS racks to be supplied by the contractor to fit in the battery/battery charger room. Layout of batteries in the battery room shall be approved by the KSEB Limited.

Racks/trays shall be powder coated with anti corrosive paint and supplied in unassembled state. Racks/tray shall be subjected to 7 tank process before painting for protection against fungus growth and other harmful effect due to tropical environment. Size of the rack including the angle iron sizes to be mentioned in the offer.

- 4.13)** **Charging:-** The supplier shall specify lower optimum voltage to be maintained by chargers to maintain batteries in fully charged condition for minimum evaporation and maximum battery life for the systems. The supplier shall also specify freshening charge requirement if any, for optimum battery life as well as boost charging cycles of the battery. Periodic discharge recharge

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

cycling of the batteries is not envisaged. Batteries should be supplied in factory fitted, charged and ready –to-use condition.

4.14) Electrical Characteristics:- Design should ensure that

- a) Battery shall be suitable for constant current, constant voltage charging.
- b) Nominal float voltage shall not exceed 2.25 V per cell @ 27⁰C.
- c) Recharging shall be done at normal float voltage.
- d) Charging current shall not exceed 0.15C, where 'C' is the capacity in AH @ 10hours of discharge to end cell voltage 1.75V @27⁰C.
- e) Except during commissioning, battery shall not demand boost charging at any point of time during its operation.
- f) Battery shall not demand equalizing charge at any point of time during its operation.

4.15) Operation:- The DC battery will be operated without an intentional ground. For indicating the incidence and degree of a ground fault on the DC control circuitry, the midpoint of the battery shall be earthed through a high resistance with an ammeter. The high resistance shall be so proportional that the current flowing under the worst earth fault shall not exceed 50mA.

4.16) Ventilation:- The supplier shall indicate the requirement of ventilation of the battery room.

Battery banks are proposed to be installed in the battery room. The tenderer may furnish a layout of the battery keeping in view of the working space required.

4.17) Marking:- Each cell shall be marked in a permanent manner to indicate the following information.

- a) Manufacturer's type and trade name
- b) Cell number
- c) Type of plate
- d) AH capacity at 10 hr. rate
- e) Type of container
- f) Month and year of manufacture

5) Accessories:- Each battery set shall be complete with all accessories and devices including the following:



SUPPLY CHAIN MANAGEMENT
Thiruvananthapuram

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery** Rev.#: 0 Effective Date 31/03/2021

- | | |
|--|-------|
| 1) Centre zero 3-0-3V DC cell testing voltmeter with two spikes each | 1 No. |
| 2) Insulated Spanners for the battery terminals and bolts | 1 Set |
| 3) Insulated Torque wrench | 1 No. |
| 4) Cell removing tool | 1 No. |

6) Type Test:-

- a) Visual examination.
- b) Checking of dimension as per manufacturer's drawing
- c) Test for C 10 capacity and voltage during discharge.
- d) Test for C 1 capacity and voltage during discharge.
- e) Ampere hour and Watt hour efficiency test.
- f) Test for retention of charge.
- g) Acid retention capability test on separators.
- h) Wicking test on separators.
- i) Test on vent seal operation.
- j) Test for oxygen recombination efficiency.
- k) Endurance life cycle test.



SUPPLY CHAIN MANAGEMENT

Thiruvananthapuram

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

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GUARANTEED TECHNICAL PARTICULARS FOR 110V, 100 AH VRLA BATTERY

I)	General	KSEBL Requirement
a)	Manufacturer's Name and country of manufacture	
b)	Applicable standards	1. VRLA battery- IEEE 1187, 1188 & 1189/1996; IEC-60896 –2 and latest amendments 2. Sulphuric acid- IS:266 3. Rubber and plastic container for lead acid storage batteries- IS:1146 4. Water for storage batteries- IS:1069
II)	Station Battery particulars	
1)	Type of designation as per IS	
2)	Manufacturer's type designation	
3)	Discharge capacity at one hour rate	57AH at 1.75 ECV at 27 ⁰ C
4)	Ampere-hour capacity at 10hr. rate of discharge	100AH at 1.75 ECV at 27 ⁰ C
5)	No. of positive plates per cell and their type	2 Nos & Flat pasted
6)	No. of negative plates per cell and their type	3 Nos & Flat pasted
7)	Capacity in amperes of the battery for Amps and voltage per cell	
i)	1 Minute Load	
ii)	2 Hour Load	

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

iii)	1 Hour Load		
8)	Nominal cell voltage (Volts)	Min 2V	
9)	No. of cells in the bank	55 Cells	
10)	Method of connection between cells	Bolted	
11)	Internal resistance for each cell (ohms)	< 1.118 +/-15% m.ohm	
12)	Resistance of the battery including inter connection between the cells (ohms)	< 64.56 +/-15% m.ohm	
13)	Short circuit current (Amps)	1.85 +/-15% kA	
14)	Material of containers	Polypropylene Co-Polymer	
15)	Type and material of separators	Either glass or Synthetic material, micro porous	
16)	Construction details and dimensions of		
a)	Positive plate	Flat pasted high purity lead alloy	
b)	Negative plate	Flat pasted Lead Calcium alloy	
17)	Dimensions of each cell (mm)		
a)	Length		
b)	Width		
c)	Height		
d)	Thickness of container		
18)	Distance between centers of cells when erected (mm)		
19)	Net weight of the cell, complete with acid (kg)		

TECHNICAL SPECIFICATION

110V, 100 AH VRLA BATTERY

Doc. #: **SCM-SPEC/XT/110V,100AH VRLA Battery**

Rev.#: 0

Effective Date 31/03/2021

20)	Ampere hour efficiency	Min. 95%	
a)	%		
b)	Watt hour efficiency %	Min.85%	
21)	Recommended float charge current and voltage (Amps/volts)	Voltage:2.250 +/- 0.05V/ Cell at 27 ⁰ C Current: 0.1C10A to 0.2C10A	
22)	Recommended boost charge current and voltage(Amps/Volts)	Voltage:2.30 +/- 0.05V/ Cell at 27 ⁰ C Current:01C10A to 0.2C10A	
23)	Time required for boost charging from fully discharged condition	21 hours (Approx.) with a voltage of 2.3V PC and 20% current limit	
24)	Maximum charging current	20% of rated capacity	
25)	Nominal charging rate (Amps)	10% to 20% of rated capacity	
26)	Type of inter cell connectors	Lead Plated Copper ICC's	
27)	Type of stand	MS-Stackable Modules	
28)	Whether explosion proof vent plugs are provided	YES	
29)	Expected life span of battery	The Design float life is 20 Years at 27 ⁰ C, under recommended charging methods	
30)	Proposed layout		
31)	Ventilation required in battery room		
32)	Shipping details		
a)	No. of units		
b)	Unit weight- kgs.		



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110V, 100 AH VRLA BATTERY

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Effective Date 31/03/2021

c)	Unit length, mm		
d)	Unit width, mm		
e)	Unit height, mm		
33)	Design float life (at 270C)		
34)	Design cycle life (at 270C)	20 Years under recommended charging method	
35)	No. of tiers in which cells are to be arranged	1200 Cycles at 80 % DOD at 27 ⁰ C	