

<b>Technical Requirements for Electrical Equipment</b>  <small>/Title</small> <b>Technical Requirements for stationary batteries valve regulated types (AGM)</b>	Document	TBE 113:2
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# **1 General**

## **1.1 Introduction**

The battery shall operate in parallel with the rectifier and act as a backup for the direct current system.

The requirements specified in TBE 100 - General Technical Requirements and explanations - shall apply where appropriate in addition to the regulations specified in this document. If seismic requirements exist TBE 102:2 applies.

## **1.2 Scope**

These Technical Requirements include general requirements in respect of the design, manufacture and documentation of electrical accumulators, henceforth referred to as batteries. These regulations shall apply to valve regulated (AGM) batteries.

# **2 Definitions**

## **Battery**

A construction comprising of one or more externally connected cells, monoblocs or a combination of these.

## **Cell**

An assembly of electrodes, electrolyte and other design elements which constitutes the basic unit of a battery.

## **Cell voltage**

Voltage between the terminals of a cell.

## **Monobloc battery**

A battery with more than one cell in its container.

## **Terminal voltage**

Voltage between the terminals of a battery.

### 3 Product Requirements

#### 3.1 Standards

The following standard shall be adhered to where applicable unless otherwise pre-scribed below or in the TS (Technical Specification).

IEC 60896-21 Stationary lead acid batteries - Part 21: Valve regulated types – Methods of test

IEC 60896-22 Stationary lead acid batteries - Part 22: Valve regulated types – Requirements

#### 3.2 General product requirements

The battery, which in all respects shall be of well proven design, shall have sufficient capacity to meet the requirements specified in the TS.

The battery shall be designed so that a service life of 12 years without failing to meet the decisive load profile is likely.

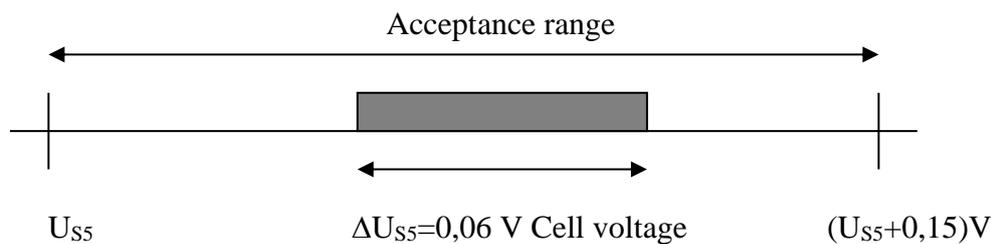
The battery shall be fully charged at start of the testing.

#### 3.3 Battery data

##### 3.3.1 Cell voltage

The average voltage of the fully-charged cells during float charging shall be specified by the Manufacturer. The permitted cell voltage spread, at float charge and with a fully charged battery, must be within  $\pm 0,08$  V of the average cell voltage.

The general acceptance range and the permitted cell voltage spread during discharge are shown in the diagram below.



$U_{S5}$  = Lowest final voltage specified by the Manufacturer for individual cells after discharge with five-hour current for five hours at 20°C.

$\Delta U_{S5}$  = Maximum permitted voltage spread between cells in a given battery.

The spread range may be moved within the acceptance range. If the final voltages is higher than the acceptance range specified, the discharge time shall be extended beyond five hours until the final voltages is less than  $(U_{S5} + 0,15)$  V as shown above.

### **3.3.2 Terminal voltage**

The lowest permissible terminal voltage after discharging with the specified load profile or five-hour discharging is shown in the established TS.

### **3.3.3 Battery temperature**

Specified ratings shall apply at an battery temperature of +20°C.

### **3.3.4 Ambient temperature**

Batteries in accordance with these regulations are intended for stationary use at an ambient temperature of between +15°C and +25°C.

The ambient temperature is usually +20°C.

### **3.3.5 Ripple current**

The battery shall withstand a continuous ripple current with a root mean square value of 5 A per 100 Ah<sub>10</sub> battery capacity at float charge.

## **3.4 Mechanical design**

### **3.4.1 Battery**

Batteries must be assembled with cells in impact resistant containers.

The material in the Containers shall be flame retardant.

The battery vents shall be electrolyte-separating and flame-retardant.

End terminals shall be adapted for the connection of cables or rails of the area stated in TS. It shall be possible to inspect exterior cell connections.

Fixed connections, cable lugs and cable connectors shall be made of copper and be protected against electrolyte.

All live parts shall be reliably protected against accidental touching by means of a transparent material to enclosure class IP20 as a minimum.

It shall be possible to measure the cell voltages without having to remove the protection covering.

### **3.4.2 Battery stands**

Batteries shall be placed on electrically insulated stands which are resistant to electrolyte. These stands shall be designed so that the batteries are positioned at a height which facilitates work on them.

Batteries shall be positioned so that service and maintenance are facilitated.

The Manufacturer/Vendor shall provide the Purchaser with a drawing of the battery stands and a proposed layout plan for inspection and approval.

## 3.5 Marking

Each battery shall be provided with one or more rating plates with permanent text and positioned so that they are visible and legible when the battery is operational at its site of use. The text shall be in Swedish.

Each cell or monobloc shall be marked as follows:

- type designation
- name or company logo of Manufacturer
- year and month of manufacturing
- cell number, numbering in sequence starting with 1 at the battery's positive terminal

Cells shall be numbered as follows:

### Alternative 1

If the battery comprises two or more sub-batteries connected in parallel, the cells of each sub is designated A, B, C, D, etc. in the said order before the cell number.

### Alternative 2

If the battery has no sub-batteries connected in parallel, each cell is given a cell number without a preceding letter.

Batteries shall be marked prior to delivery release inspection.

Each battery shall be provided with an engraved plate or permanent data sheet containing the following information:

- type designation
- number of cells
- rated voltage
- capacity at five-hour discharge rate, discharge current and lowest final voltage per cell
- highest permissible charging current prior to gassing
- highest permissible charging current during gassing
- float charge voltage per cell
- highest permissible charging voltage per cell

## 4 Other Requirements

The delivery shall include a complete battery with the connections and terminals necessary for connection to the terminal voltage and capacity stated in the order.

The method used to attach and seal the battery container lid, and the design of the terminal pillar penetrations shall be presented to the Purchaser. For monobloc batteries shall also documentation of internal connections be supplied.

## 5 Documentation

In addition to applicable parts of the documentation required in TBE 100 and KBE 100 the Manufacturer/Supplier is to submit the following documents as part of the Tender.

- Instructions for operation and maintenance of flame retardant vents.

Deviations from the documentation requirements in this document are to be clearly stated in the tender. Documentation that cannot be submitted until the delivery of the equipment must also be specified in the tender.

## 6 Agreements between Manufacturer/Vendor and Purchaser

This list should be as a frame in discussions manufacturer/vendor and purchaser when discussing orders or bids

	<b>General requirements</b>	
	Review and completing Technical Specification	
	Review of Inspection Plan and Examination Procedures	
	Application of standard	
	Quality assurance	
	Data of reliability, if requested in Tender	
	Expected lifetime	
	Verification of Seismic Requirements, aging before test	
	Flame retardant material in Containers	
	Battery vents, flame barrier	
	Protection against accidental touching, class IP20 as a minimum	
	Selection of equipment eg. connections and terminals	
	Dimensioning in general	
	Calculation margin (10-15%)	
	Ageing margin (25%)	
	Required cycling before capacity and profilettest	
	Load profile	
	Cell voltage spread at float charge and discharge	
	Terminal voltage, according to 3.3.2	
	Marking according to 3.5	
	Batterystands: electricly insulated, seismic requirements	
	Review of inspection documentation	
	Review of other documentation, drawings etc.	
	CE requiremets	