# Technical Bulletin | TPPL Batteries: Identifying and Assessing Swelling

## Overview

Swelling in Valve Regulated Lead Acid (VRLA) Thin Plate Pure Lead (TPPL) batteries results from gas accumulation due to internal chemical reactions or operational stress. Accurate identification and root cause analysis are essential for maintaining safety and reliability. ODYSSEY® AGM$^2$ batteries are sealed and efficiently recombine gases, but overcharging or high temperatures can still lead to venting and swelling. Severely discharged batteries may sulfate and swell during recharging due to gas formation and heat. High internal resistance, measured in mΩ with a recommended battery tester, is a reliable indicator of sulfation and internal battery condition. A fully charged new battery typically has about 2 mΩ resistance; this value increases with degradation and leads to heat generation. Properly regulated charging helps prevent the thermal buildup needed for case deformation. Swelling is typically caused by sulfation or corrosion unless continuous overcharging is present. Swelling in a single battery may indicate imbalance in the pack and warrants further diagnosis and possible removal. Swelling across an entire set point to systemic issues such as sulfation, corrosion or overcharging. Batteries should reach a minimum of 12.6V before testing to help ensure accurate resistance readings.

## Swelling Levels

- Normal: Slight case impressions (as seen below) from internal battery cell dividers are considered normal due to battery construction.

- Caution (Moderate): Visible deformation indicates potential issues, usually environmental or related to deep or over-discharge conditions. Allow hot batteries to cool. If swelling reduces after cooling,

recharge and test the battery. Typically, it is evident at the end wall.


- Critical (Severe): Significant deformation requires immediate isolation and battery replacement. These batteries are too far gone to consider serviceable.

## Recommended Assessment Method

- Visual Inspection: Look for obvious bulges or deformation.
- Straight-Edge Test: Use a ruler or straight edge along the battery surface to quickly assess deformation severity.

## Recommended Actions

- Moderate Swelling: Plan preventive maintenance or replacement based on test results.
- Severe Swelling: Immediately disconnect, isolate and replace.

## Safety Considerations

- Always ventilate the area, disconnect severely swollen batteries promptly.
- Store and dispose of damaged batteries following environmental and safety guidelines.

Regular monitoring and adherence to these guidelines will maintain optimal safety and performance of ODYSSEY® AGM² TPPL batteries.

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