

## Exploding Batteries



During operation and charging, lead acid batteries produce hydrogen and oxygen which occupies the headspace in a battery above the electrolyte. If such gasses are not vented correctly or are exposed to a source of ignition, battery explosion can occur. In order for a battery to explode two elements must be present – explosive gasses, namely hydrogen and oxygen, plus a source of ignition, external or originating from within the battery.

### Causes of Battery Explosion?

#### Normal Operation, Overcharging and Faulty Systems

Under normal operating circumstances, it is possible for a flooded lead acid battery to maintain a hydrogen and oxygen concentration above the level where an ignition source may cause an explosion.

Overcharging as a result of faulty vehicle charging systems can produce more of these gasses and as such can increase the risk of explosion. Overcharging can also increase the rate of grid corrosion breakdown of the internal battery plate and separators leading to the possibility of short circuit and explosion.

#### External Sources of Ignition

Primary sources of ignition such as static sparks, naked flames, cigarettes and sparks caused by metal objects touching or shorting the battery terminals, loose battery connections and corroded cables can ignite the flammable gasses built up in a battery.

#### Engine Starting

Starting the engine places a load on the battery that can trigger an explosion when there is an underlying problem. This is more likely when a battery is near its' end of life. Both internal plate corrosion or a manufacturing fault increases the risk of a short circuit especially when the electrolyte level is low and the potential short is in the gas space.

#### Manufacturing Faults

Defects or faults in the manufacturing process can cause a battery to short circuit. For example if the internal terminal post is not correctly fused to the external terminal lead, arcing can occur. Such a fault is detected by a complete absence of voltage with intermittent spikes up to normal voltage levels. This is a dangerous situation as just physically moving the battery can cause a short circuit. Inter-cell welds located above the electrolyte are subject to high current flow during operation and engine starting. If the weld is faulty or corroded, the surface area available for the passage of an electrical current may be reduced, generating high temperatures and breakdown of the weld leading to arcing or melting of the lead itself. Both of these condition are rare.

#### End of Life

Batteries nearing their end of life will exhibit increased signs of grid corrosion and degradation of active material on the battery plates. This

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can gather in the plate separators leading to a possibility of short circuits between the battery plates. Blocked vent plugs can also cause a short circuit as the battery cell expands under pressure.

#### Poorly Maintained Batteries

Batteries which have been left in a poorly maintained state for extended periods of time can lead to an increased possibility of explosion. If electrolyte levels are allowed to fall exposing the top of the battery plates, they will corrode faster than the section below causing growth, the possibility of plate contact and an increased risk of a short circuit occurring.

Regular battery care and maintenance can help reduce the risk of a battery exploding. Century Ultra Hi and Hi Performance batteries are maintenance enabled allowing electrolyte levels to be topped up, reducing the risk of explosion, problems caused by excessive water loss and to help maximise the life of the battery.

### Battery Types & Risk of Explosion

Battery Technology	Risk of Explosion	Comment
Maintenance Free Lead Acid	High	Maintenance free construction prevents ability to top up electrolyte levels and reduce potential for short circuit from exposed plates. Susceptible to manufacturing faults and external ignition sources.
Maintainable Lead Acid	Medium	Ability to maintain electrolyte levels reduces potential for explosion from exposed battery plates. Susceptible to manufacturing faults and external ignition sources.
AGM VRLA	Low	Recombinant design and absence of loose electrolyte minimise's risk of short circuit from exposed plates. Susceptible to manufacturing faults.
GEL VRLA	Low	Recombinant design and absence of loose electrolyte minimise's risk of short circuit from exposed plates. Susceptible to manufacturing faults.

*Note: Maintenance free batteries are manufactured with sufficient electrolyte levels for recommended service life and application. Excess use, lack of maintenance and incorrect application can increase water loss rates and gassing leading to lower electrolyte levels.*

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# Preventing Battery Explosion

Regular battery care and maintenance is the key to maximising battery life and help avoid the risk of battery explosion.

- When maintaining or handling batteries always work in a well ventilated area
- Keep sources of ignition and metal objects away from battery and terminals
- Inspect and ensure battery cables, connections, terminals, screws, clamps are free from damage – replace as necessary
- Ensure battery hold downs are secure and properly maintained
- Inspect the battery case for any obvious signs of physical damage or warping
- Ensure the electrolyte levels are above the plate cells – and top up where necessary
- Test the battery using a voltmeter or hydrometer and charge where necessary
- Always use an Australian approved battery charger suitable for the size of battery, refer to manufacturer's guidelines.

## Choosing the Correct Battery Charger

As a general rule of thumb, when selecting a charger choose an Australian approved battery charger equal to at least 10% of the batteries rated Ah capacity i.e. for a 120Ah battery choose a 15A charger.

In the absence of an Ah rating use the following table to quickly determine the Ah capacity of a Century battery. Always round up to the next size battery charger.

Approximate Amp Hour Charger for Battery Type	
TYPE	Amp Hour
47	40
57	50
67	55
NS70	60
N70	70
86	85

## Correct Charging Times

Avoid fast charging as this only charges the surface of the battery plates, can increase the chance of overheating, cause permanent damage and lead to the excessive build up of explosive gasses.

The following table can be used as a quick reference guide to determine approximate charge times according to a battery's state of charge.

Approximate Charge Times* Ultra High Performance Batteries					
% STATE OF CHARGE	OPEN CIRCUIT VOLTAGE	50RC	100RC	150RC	200RC
100%	12.7	N/A	N/A	N/A	N/A
75%	12.45	2.3 HRS	3.9 HRS	2.7 HRS	3.4 HRS
50%	12.25	4.2 HRS	7.0 HRS	4.8 HRS	6.1 HRS
25%	12.05	6.3 HRS	10.5 HRS	7.2 HRS	9.2 HRS
DISCHARGED	11.9	8.4 HRS	14.0 HRS	9.6 HRS	12.2 HRS

\*Assumes charging 50 to 100 RC using a standard domestic 5A charger  
150 to 200 RC using a standard domestic 10A charger

## Battery Health and Safety Information

The following health and safety guidelines should be followed when handling or working with batteries.

### Battery Acid

Can cause burns. PVC or other suitable hand protection, eye and face protection and protective clothing must be worn.

### Exploding Battery

Batteries generate explosive gases during vehicle operation and when charged separately. Flames, sparks, burning cigarettes or other ignition sources must be kept away at all times.

### Always Shield Eyes When Working Near Batteries:

When charging batteries, work in a well ventilated area - never in a closed room. Always turn battery charger or ignition off before disconnecting a battery.

### If It Is Necessary To Prepare Electrolyte

Always add concentrated acid to water never water to acid. Store electrolyte in plastic containers with sealed cover. Do not store in the sun.

### Acid Spill Response

Dyke and neutralise spills with soda ash or other suitable alkali. Dispose of residue as chemical waste or as per local requirements.

### If Electrolyte Is Swallowed

Do NOT induce vomiting – give a glass of water. Seek immediate medical assistance.

### First Aid

For advice, contact a poisons information centre (phone 13 11 26 in Australia) or a doctor at once. If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by poisons information centre or doctor, or for at least 15 minutes. If skin or hair contact occurs, remove contaminated clothing and flush skin or hair with running water.



Century Yuasa Batteries Pty Ltd has compiled this information from a variety of sources, including automobile manufacturers and unpublished information sources. It is intended as a guide only and does not guarantee that a battery will not explode if these steps are followed.

For more information contact your Century Yuasa representative. [www.centurybatteries.com.au](http://www.centurybatteries.com.au)

