Batteries Division

ZVEI: Die Elektroindustrie

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Information on degassing systems for valve-regulated lead batteries in stationary applications

1. Objectives

This document aims to reduce potential risks in degassing systems for valve-regulated batteries (Gel or AGM technology). It is in line with the applicable standards and guidelines for practical implementation of the IEC 62485-2:2010 Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries (international applications) or DIN EN 50272-2 VDE 0510-2:2001-12 Safety Requirements on Batteries and Battery Equipment – Part 2: Stationary batteries (regional applications).

2. Scope of application

This document applies to:

- valve-regulated lead batteries ("VRLA") with immobilized electrolyte using gel or AGM technology,
- stationary applications,
- battery cabinets or containers inside or outside buildings where hydrogen is routed outdoors through a degassing system. For simplicity, in this text "battery cabinets" may also include appropriate battery rooms.

Vented lead batteries with liquid electrolytes are specifically excluded. This is because they have higher gassing rates than VRLA batteries which, in connection with the liquid electrolytes, can lead to heavier formation of acid aerosols which could block the frit system used as backfire protection. Acid aerosols can cause electrolytic short-circuits in a degassing system, or pools of liquid which block it.

3. Gas tightness of materials used

This document assumes that the hydrogen will not only be routed outdoors from the degassing system, but will also be able to escape into the battery cabinet by diffusion through the walls of, for example, battery housings, hoses or fittings or through micro-leakages at connections which cannot be determined using pressure tests. So the ventilation requirements in the current valid standards must be observed, to stop a potentially explosive hydrogen/air mixture forming in the battery cabinet.

4. Function of the degassing system

The degassing system routes the hydrogen/oxygen mixture formed during battery charging out of the battery cabinet or battery room and directly outside, without letting it mix with the surrounding air.

In this respect it differs from a battery room ventilation system, which thins the hydrogen/oxygen mixture using air (fed in naturally or mechanically) until it is below the explosion limit.

A central degassing system collects the hydrogen/oxygen mixture that is normally released by several cells or blocks and routed outdoors; it represents a special case for a degassing system.

The location where the hydrogen leaves the battery is moved from the battery valves to the end of the degassing system.

For this reason, the requirements stipulated in IEC 62485-2 Chapter 7.7 or DIN EN 50272-2:2001 VDE 0510-2:2001-12 Chapter 8.7 on the necessary safety distance no longer apply to the degassing openings directly on the battery but to those at the end of the degassing system.

This means that any electronic or electric components required for operational reasons which

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could cause sparks can be installed closer to the battery inside the battery cabinet, thus allowing the available space to be used more effectively.

5. Information on effective removal of hydrogen using the degassing system

The number of connections between gas-removing components in a degassing system in the cabinet should be minimized.

The degassing system must be designed in a way that the protective measures against ignition of gases are effective inside the cells, between the cells/blocks, and in the degassing system itself. An example of safety equipment is a valve/flameproof seal arrangement.

The connections must be mechanically safeguarded to prevent functional impairment as a result of proper use (mechanical and thermal loading during transport and operation) or negligent use (e.g. damage during maintenance). Further measures must be taken if required.

The following items need special attention:

- the connection of the gas hose to the battery
- routing outdoors of the gassing hoses out of the battery cabinet
- Measures must be taken to prevent pulling off, loss or blockage (by kinking) caused by, for example:
  - hose fixings
  - hoses routed as tension-relievers in loops
  - safeguarding of connections between parts in the degassing system against inadvertent pulling-off
  - Route hoses at sufficiently large radii to prevent blockage caused by kinking.

Measures for mechanical safeguarding of connections (e.g. hose clamps or cable binders) must be implemented so that gas-tightness is not reduced.

The degassing system must be designed to ensure functionality in any environmental conditions over the entire battery service life. Care must be taken to prevent freezing of any condensate which may occur in the hoses, and to ensure that liquid pooling caused by condensate or aerosols does not block the degassing system, for example due to siphons forming. A liquid separator must be used to ensure that such liquid is not disposed of outdoors.

6. Protection against overpressure

The degassing system must be designed in a way that the system cannot fail due to overpressure (bursting, cracking or opening of components and connections) during malfunctions resulting in excessive gas formation.

The system must be designed in a way that the degassing opening cannot be blocked and overpressure cannot cause system failure due to blockage of a degassing opening. This can be ensured through:

- redundant design of the degassing outlet
- protection of the degassing outlet against blockage.

7. Routing

It is recommended that gases produced by different cells or blocks are not collected and disposed of collectively through the interconnection of fittings. If this is necessary, however, the following must be considered:

An ion-conductive medium can form in the hoses through condensate and acid aerosols. The hoses in a degassing system connect cells with a voltage difference, which can cause creep currents in the degassing system. Creep currents which are too high can cause electrical hazards and fire risks.

The larger the voltage differences between cells or blocks connected directly by the degassing system, the higher the creep currents. To keep these currents as low as possible, the degassing system must only connect units with the lowest-possible voltage difference. This routing method is known as "parallel to the electrical connection". For example, with a system voltage at 384 V, creep currents can be up to 100 times larger than at optimal hose routing. Please refer to the following figure for more information:

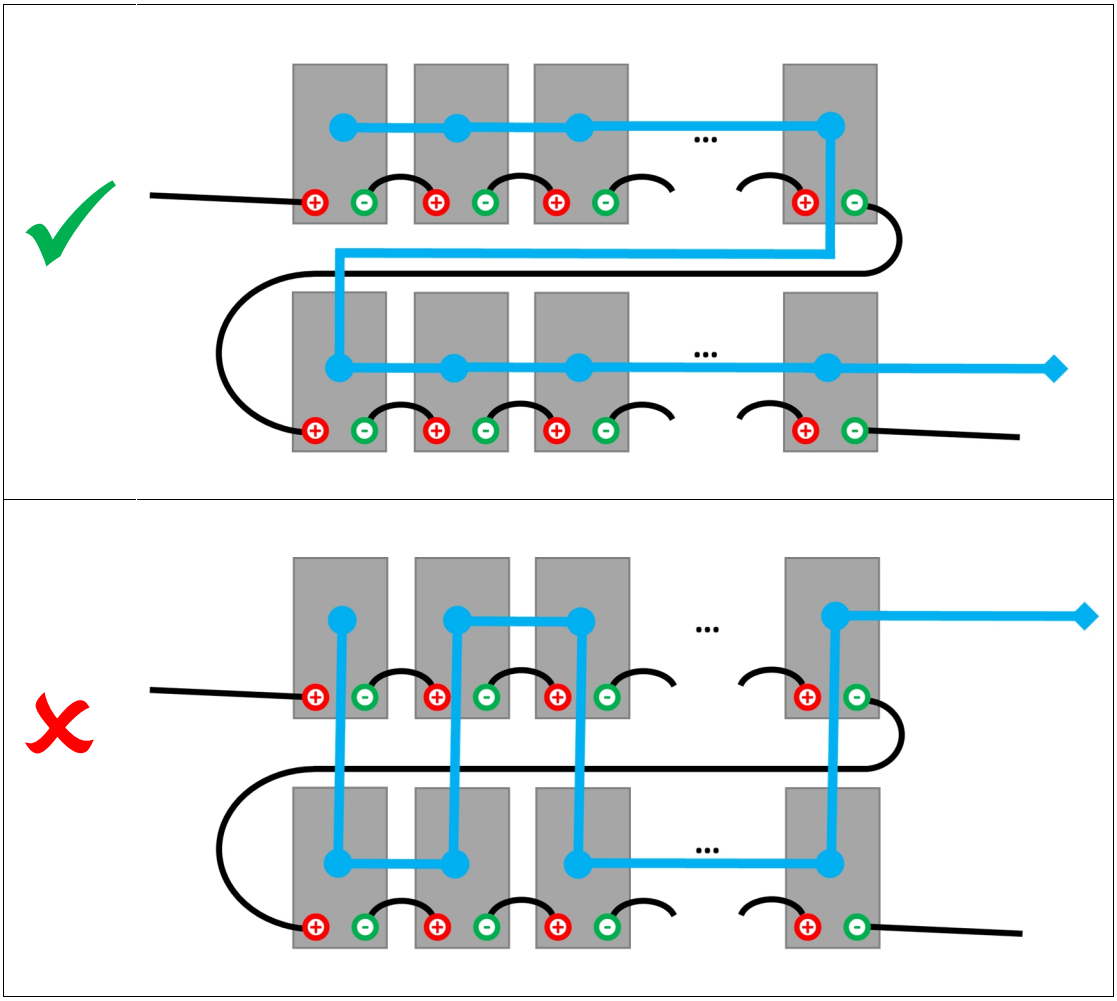

Figure: Recommended hose routing "parallel to the electrical connection" and hose routing not recommended

8. Inspection

Inspection of the degassing system during installation, commissioning, and regular battery maintenance:

- Check that hose seatings are properly fixed, in addition to connections or connecting unions.
- Visual check: Are hoses routed without kinks? Are all connections functioning properly? Is the degassing opening free?
- Check tightness of seals.

The degassing opening must be labelled with appropriate warnings (no fires, smoking prohibited).

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