

Information Regarding the Compatibility of Lithium Batteries with Silentwind

1. Introduction

We receive numerous enquiries regarding the possibility of installing our Silentwind generators with lithium battery technology, hence the need to create this document for general guidance.

We developed the Hybrid Boost controller to make it compatible with lithium batteries, and it was released in 2015. Since then, our customers have successfully installed Silentwind systems with this technology.

However, we acknowledge that, due to the specific characteristics of this technology, certain aspects require proper clarification. This document does not aim to be an exhaustive technical guide but rather to provide general guidelines and possible solutions that can be adapted to each installation scenario.

It may not cover every possible solution, but it will highlight the most important considerations to prevent any improper installation that could lead to serious consequences for both the Silentwind controller and the batteries.

The **fundamental principle** to keep in mind is:

The Silentwind controller must never be disconnected from the batteries while the generator (or solar panels, if present) is operating.

This is the most critical point of this document, and all subsequent information is based on this premise.

2. Parameter settings and charging characteristics

Contrary to common misconceptions, Silentwind controllers do not require special settings to charge lithium batteries. The most important parameter is the **End of Charge Voltage**, which must be set on the controller to match the **Maximum Charging Voltage** specified by the battery manufacturer (*valid for Silentwind MPPT charge controller models. For PWM models, refer to the user manual for instructions or consult the information provided below*).

To determine this value, you must consult the technical datasheet of the batteries, as this information is always provided there. Once you have that specification, use it to configure the **End of Charge Voltage** parameter.

Additionally, we are often asked why we do not use concepts such as “Absorption Value” and “Float,” among others. It is important to note that battery manufacturers do not all follow the same approach, and different technologies operate in different ways. Moreover, a wind power system is fundamentally different from solar energy or an alternator.

In our case, although we previously attempted to include many additional parameters, we found that maintaining this data was impractical, ineffective for the effort required, and ultimately caused more confusion than clarity.

For this reason, we adhere to the “Keep it Simple” philosophy, which has proven highly effective, with a successful track record of over a decade in charging lithium-type batteries.

We would also like to add that our controllers incorporate charging algorithms embedded within the device’s firmware—an internal software system designed to optimise battery charging as efficiently as possible, while always prioritising system safety above all else.

Example:

		Values		
Nominal Voltage Models [V]		12	24	48
Battery Maximum Voltage [V] * (example)		14,4	28,8	57,6
MPPT Model	End of Charge Voltage [V]	14,4	28,8	57,6
PWM Model	Absorption [V]	13,4	27,8	56,6



- Hybrid Boost MPPT Model



- Hybrid Boost PWM Model

3. Critical information

It is essential to define and implement measures that ensure the continuous functionality of critical systems. When a solution is already in place, part of the protection for the controller is effectively addressed. In the absence of such measures, implementation becomes imperative. Without a solution, a power supply failure could potentially damage the controller.

We would like to emphasise once again that **the controller must never be switched off while energy is being generated by the generator or solar panels**. It should be regarded as a critical piece of equipment, and therefore it is essential to implement solutions that prevent such events.

4. Battery and BMS

As is widely recognised, the market is currently saturated with a wide range of lithium batteries. Considering this diversity, it is essential for this approach to classify them into distinct virtual categories: batteries whose manufacturers claim they **never shut down**, even under critical conditions; batteries equipped with **external BMS** (ranging from the simplest to the most advanced); and batteries with an **internal, non-accessible BMS**. To make the information easier to understand, we will divide it into several possible combinations.

The battery does not shut down during critical events.

In this scenario, the system ensures that the controller remains active; however, it is essential to guarantee that, in the event of a critical failure, the BMS prevents the controller from continuing to charge the batteries. For this purpose, we provide an optional external brake, which can be requested at the time of purchase and installed directly at the factory. As of the date of this document, this feature is not included by default in new equipment.

For units without a factory-installed brake, this upgrade can be performed at any time on Silentwind Hybrid Boost MPPT models manufactured from 2018 onwards.

For detailed guidance, please refer to the document ***External Brake and Sensor Cables Upgrade.pdf***.

If the document is not available or not consulted, the relevant parts are:

- **SW_COMPO258** – 4 Pin Connector Internal Brake & Sensor Cable
- **SW_COMPO259** – 4 Pin Connector External Brake & Sensor Cable

If the battery uses an internal BMS, the controller cannot activate the brake. In such cases, an alternative approach is required, which will be addressed further in this document. If the BMS is external, it may provide analogue ports—preferably normally open—where the relay closes when the system fails. This analogue port must be connected to the controller’s external brake wire.

If the BMS provides a digital output, an additional circuit will be required to drive a relay, which in turn will activate the brake on the controller, stopping the generator and preventing further charging.

The battery shuts down during critical events

a) Buffer Battery Solution

One alternative is to use batteries that act as a buffer, preferably non-lithium-based. In this configuration, a DC-DC converter can be employed to charge the remaining batteries. Although this approach is not highly efficient due to energy losses, it is a common and widely adopted solution during battery upgrades, where some of the replaced batteries can be repurposed for this purpose. This method has proven effective in practice.

b) Dual Bank Redundancy

For larger battery banks, it is possible to divide them into two independent groups, with an automatic switching device selecting the most suitable bank for charging or supplying power. This redundancy strategy has shown excellent performance with Silentwind generators.

However, an important detail must be considered: the smart switching devices between battery groups should use low-noise contact switching to avoid energy spikes. Energy spikes can trigger the charge controller to enter Brake-On mode as a protective measure. Once activated, the brake cycle requires approximately 10 minutes to return to normal operation.

Inefficient switching devices can cause the generator to remain in Brake-On mode repeatedly, which should be avoided. More importantly, energy spikes are harmful to electronic components, so careful selection of the appropriate device is essential.

c) Relay-Based Braking for External BMS Systems

If none of the above alternatives can be implemented and the battery shuts down—causing the controller to power off as well—but it is equipped with an external BMS, a possible solution is to install a set of high-current relays (minimum 40A per phase for 12V wind generator models). In the event of a power failure, these relays change position, disconnecting the three AC phases coming from the generator from the controller and creating a shunt exclusively between the generator's AC phases, ensuring there is no connection to the charge controller. This effectively applies a brake to the generator.

Although this approach is technically feasible, it introduces certain risks due to the stress generated during relay switching when the generator is producing a significant amount of energy. Nevertheless, these risks are considered lower than the consequences of having no solution in place.

We will not go into further detail, as implementing these systems requires solid technical knowledge. Those who possess such expertise will be able to interpret this information correctly.

d) Batteries Without External BMS

For batteries without an external BMS, solutions (a) or (b) described above can be applied.

5. Conclusion

As mentioned at the beginning, this document is not intended to serve as a technical guide but rather as a clarification outlining several possible solutions. We acknowledge that other approaches may exist that are not covered here. However, we are always open to suggestions for improving our documentation, and feedback from our customers is essential to help us understand challenges and provide better support.

Although our generator is designed for straightforward installation, certain electrical configurations can be more complex. In such cases, we strongly recommend consulting specialised companies for the installation and maintenance of the equipment. These professionals can assess the specific characteristics of the system—not only Silentwind components but also other devices that may form part of the installation.