



# TECHNICAL NOTE

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How to Apply Hoymiles Microinverters in  
an AC-Coupled Solar Battery System



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## 1. Introduction

For the PV sites with an already installed PV system with Hoymiles microinverters, the third-party non-Hoymiles battery system can also be AC-coupled to the existing PV microinverters. This document will explain how to apply Hoymiles microinverters in this kind of AC-coupled solar battery system.

## 2. What is AC-Coupled Solar Battery System?

AC-coupled solar battery system as shown below, is the connection of a battery energy storage system to a solar system via AC (alternating current) electricity. Energy from a solar system is generated in the form of DC (direct current) electricity which is then turned into AC by the solar microinverters. A battery bi-directional / multimode inverter connected to the same electrical network via AC then converts any spare energy not used by the home back into DC so it can be stored in a battery.

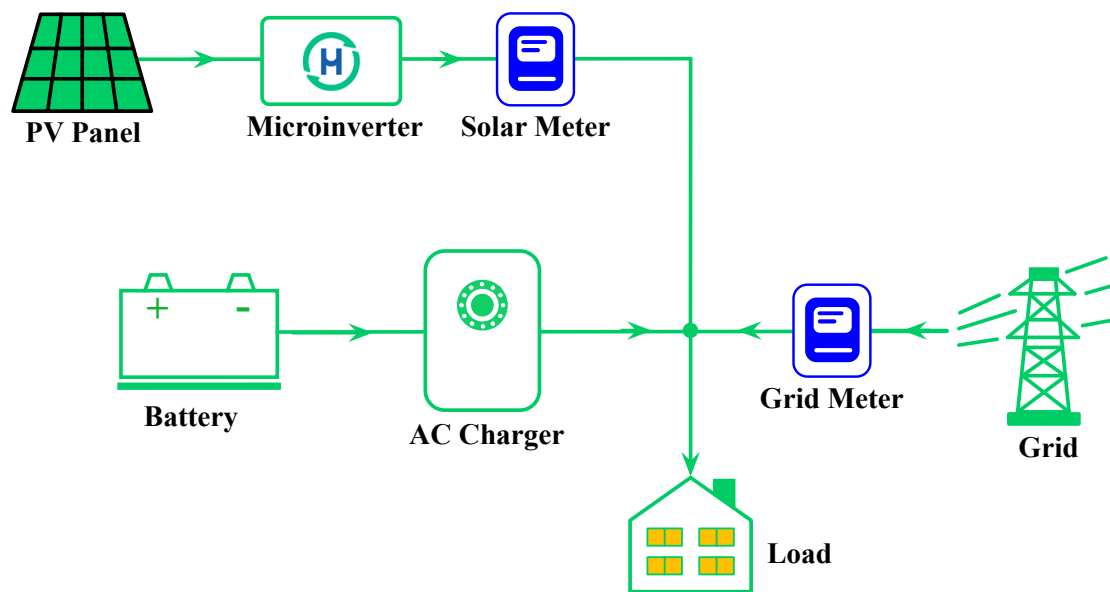


Fig. 1 AC-Coupled Solar Battery System

The AC-coupled solar battery system is more complicated than the traditional grid-tied PV inverter system. But this kind of system can even work when grid outage or the system is the type of off grid. For now, more and more manufacturers have launched AC-coupled solar battery system. Some of these solutions are integrated PV inverters, which others require the installers to select the grid-tied PV inverters to integrate with their battery system.

### 3. AC Coupling Configurations

There are three typical types of AC-coupled solar battery system in which Hoymiles microinverters can be applied. The following table explains that how Hoymiles microinverter system works in these three different types of AC-coupled solar battery system.

| AC Coupling Configurations |                          |                            |                                                    |
|----------------------------|--------------------------|----------------------------|----------------------------------------------------|
| Types                      |                          | Requirement                |                                                    |
| Grid-tied                  | Production Display       | Grid compliance            | Required                                           |
|                            |                          | Microinverter output limit | Not required                                       |
|                            | Zero Export/Export Limit | Grid compliance            | Required                                           |
|                            |                          | Microinverter output limit | Export Limit                                       |
| Off-grid                   | Off-grid                 | Grid compliance            | Not required, change grid profile as needed.       |
|                            |                          | Microinverter output limit | 1) Over-/Under-frequency Trip<br>2) Frequency Watt |

#### 3.1 Production Display

With this kind of solar battery system as shown below, the utility allows these systems export the PV power to the grid and the end users can get incomes.

Sometimes the customers require that the accurate production data measured by the meter should be display on the monitoring platform. Under these circumstances, an additional meter is needed to install at the output of microinverters. This meter is used to measure the PV production and enable the production display on monitoring platform. Please note that this meter is only for display, not for system control.

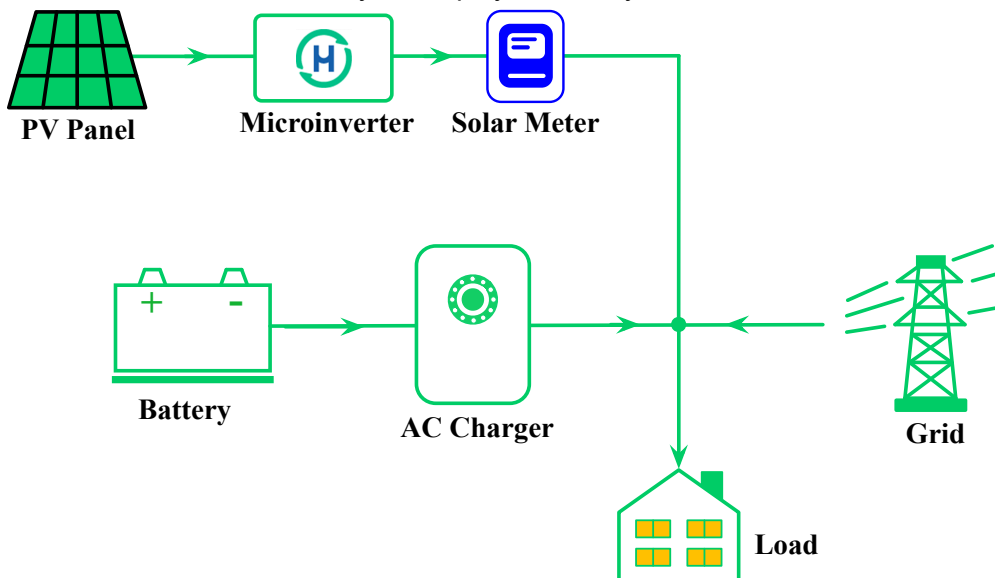


Fig. 2 Production display system

### 3.2 Zero Export / Export Limit

With this kind of AC-coupled solar battery system as shown in Fig. 1, the utility does not allow these systems export the PV power to the grid or these systems can keep the export power under a certain level.

The additional meter at the grid side should be connected to measure the export power, then Hoymiles gateway DTU-Pro can limit the output power of all the microinverters in this system.

### 3.3 Off-grid system

In this type of application as shown in Fig. 3, the microinverters can work when the multimode inverter in the battery system can create the AC voltage and frequency within the ranges in the grid profiles of the microinverters. With no utility grid service in this kind of system, you can freely adjust the parameters in the grid profiles of the microinverters according to your off-grid requirements.

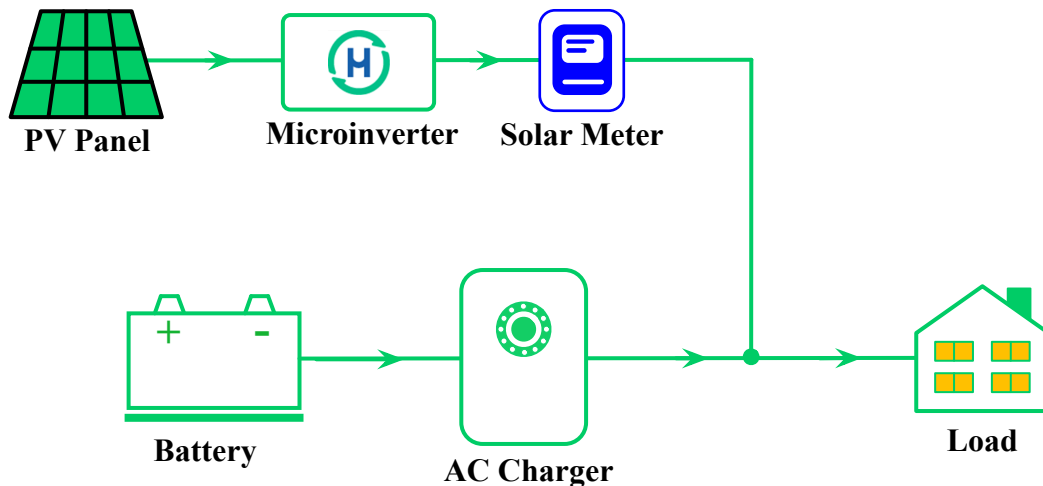


Fig. 3 Off-grid system

## 4. Hoymiles Microinverters Solution

### 4.1 Production display and Export Limit

For AC-coupled solar battery system connected to the grid which requires accurate production display, the production must be measured by the meter and be displayed on Hoymiles monitoring platform. If export limit is required, the PV microinverter system must limit the power export to the grid under a certain limit all the time by adjusting the output of all the microinverters. This limit could be zero or a positive value.

For more information, please refer to Hoymiles technical note “Hoymiles Export Management using 3rd Gen DTU-Pro”.

## 4.2 Off-grid system

### 4.2.1 Over-/Under-frequency Trip

All the grid-tied regulations have the requirement the function of over-/under-frequency. For example, if the AC frequency is higher than the preset over-frequency trip value, the microinverters will stop producing power.

Many battery multimode inverters which are in the off-grid mode can increase the AC frequency when the battery is fully charged, then the microinverters will stop working to protect the battery. When the battery charging is required again, the multimode inverter will decrease the AC frequency and the microinverter will generate and charge the battery again after the reconnection time, e.g. five minutes.

This kind of over-/under-frequency trip can be realized with Hoymiles microinverters of both MI series and HM series.

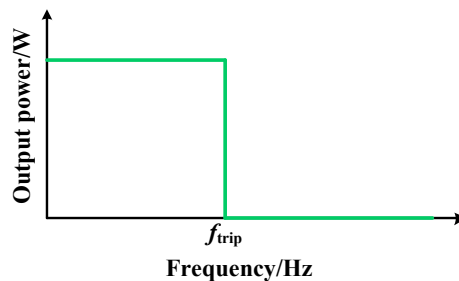


Fig. 4 Over-frequency trip

### 4.2.2 Frequency Watt

Some battery multimode inverters which are working in off-grid mode can increase the AC frequency gradually when the batteries are reaching to be full charged.

Hoymiles microinverters of HM series can gradually decrease the output power when the AC frequency is going higher, which is usually called frequency watt function.

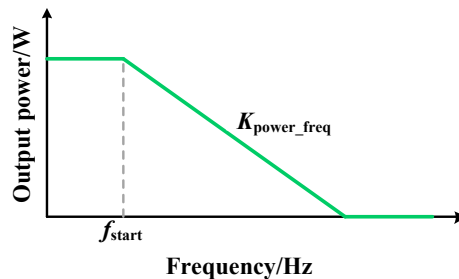


Fig. 5 Over-frequency output power limit

The settings of the following parameters can be adjust in the module of “Frequency Watt (FW)” in the grid profile of Hoymiles microinverters of HM series.

- Start of frequency Watt Droop ( $f_{start}$ , Hz)
- Frequency Watt Droop Slope ( $K_{power\_Freq}$ , Pn%/Hz)
- Recovery Ramp Rate (RRR, Rated/s)
- Setting Time ( $T_r$ )