Hybridformblatt EN

Whitepaper for the Integration of Hybrid Systems

Objective

The purpose of this document is to obtain a clear technical description from the manufacturer of all available control functions. In particular, the required registers, command sequences, and operating conditions shall be documented to enable reliable integration and control of the hybrid system by our Energy Management System (EMS).

Due to the different architectures of hybrid systems (PV generation, battery storage, and inverter combined within one system), both AC-side and DC-side control capabilities must be evaluated.

1. Active Power Limitation PV – at POC [AC]

Description of the registers and command sequence required to limit the active power output of the generating unit at the AC terminals of the inverter.

Battery charging and discharging control is handled internally by the inverter or hybrid system.

Objective: Limit the active power output at the AC terminals of the inverter.

Required Information

Registers used:

Command sequence:

Supported operating range:

Special operating conditions:

Practical example:

2. Active Power Limitation PV – at PV Input [DC]

Description of the registers and command sequence required to directly limit PV power on the DC side.

Battery charging and discharging control is performed by our EMS.

Objective: Limit the active power at the DC inputs of the PV generators.

Required Information

Registers used:

Command sequence:

Supported operating range:

Special operating conditions:

Practical example:

3. Active Power Setpoint PV – at Metering Point [AC]

Description of the registers and command sequence required to apply an active power setpoint at the grid connection point or metering point.

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Battery charging and discharging control is handled internally by the hybrid system.

Objective: Control a target active power value at the grid connection point.

Required Information

Registers used:

Command sequence:

Supported operating range:

Control principle:

Practical example:

4. Active Power Limitation PV – at Metering Point [AC]

Description of the registers and command sequence required to limit active power export at the grid connection point.

Battery charging and discharging control is handled internally by the hybrid system.

Objective: Limit active power export at the grid connection point.

Required Information

Registers used:

Command sequence:

Supported operating range:

Special operating conditions:

Practical example:

5. Reactive Power Setpoint PV – at POC

Description of the registers and command sequence required to apply a reactive power setpoint directly at the inverter.

We require the ability to specify an absolute or relative reactive power value. A power factor (cos φ) specification alone is not sufficient.

Objective: Control a reactive power setpoint at the AC terminals of the inverter.

Required Information

Registers used:

Command sequence:

Supported operating range:

Unit (kvar, %, etc.):

Practical example:

6. Reactive Power Setpoint PV – at Metering Point

Description of the registers and command sequence required to apply a reactive power setpoint at the grid connection point.

We require the ability to specify an absolute or relative reactive power value. A power factor (cos φ) specification alone is not sufficient.

Objective: Control a reactive power setpoint at the grid connection point.

Required Information

Registers used:

Command sequence:

Supported operating range:

Unit (kvar, %, etc.):

Practical example:

7. Battery Charge Power Setpoint

Description of the registers and command sequence required to actively charge the battery.

This functionality is required, for example, to charge the battery from the public grid during periods of low electricity prices or to implement EMS-controlled charging strategies.

Objective: Allow the EMS to specify a battery charging power setpoint.

Required Information

Registers used:

Command sequence:

Supported operating range:

Minimum response time:

Practical example:

8. Battery Discharge Power Setpoint

Description of the registers and command sequence required to actively discharge the battery.

This functionality is required, for example, to provide power for energy communities, balancing services, or EMS-controlled discharge strategies.

Objective: Allow the EMS to specify a battery discharge power setpoint.

Required Information

Registers used:

Command sequence:

Supported operating range:

Minimum response time:

Practical example:

9. Dynamic Performance Requirements

For participation in grid services, power plant control, and energy market applications, information about the dynamic behavior of the system is required.

Setpoint Processing

Time between receiving a new setpoint and beginning the power adjustment [ms]:

Time required to reach 90% of the requested setpoint [ms]:

Maximum guaranteed response time [ms]:

Supported setpoint update rate:

Internal ramp limits or filtering mechanisms:

10. EMS Operating Mode Priority and External Control

Many hybrid systems include internal operating modes that may partially or fully override external control commands.

Examples include:

- Self-consumption optimization
- Peak shaving
- Backup reserve operation
- Time-of-use optimization
- Grid service functions
- Manufacturer-specific energy management functions

To ensure reliable EMS integration, we require a detailed description of all operating modes that may influence externally commanded active power, reactive power, battery charging, or battery discharging setpoints.

Required Information

Which operating modes may override external commands?

Which operating modes must be disabled to allow full EMS control?

Are there priority settings between internal and external control?

Practical example:

11. Development Contact

For implementation and troubleshooting purposes, we require a direct technical contact within the manufacturer's development or engineering department.

Name:

Department:

E-mail:

Phone:

Availability:

12. Additional Information

Further technical comments:

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