

Battery System Integration Requirements

Direct control, communication and dynamic performance questionnaire for BESS integration

This questionnaire defines the technical requirements for the direct integration of a Battery Energy Storage System (BESS) into the EcoData Park Controller. It is used to determine whether the battery system can be controlled directly, individually, quickly and accurately enough for active power control, reactive power control and grid support applications.

The questionnaire must be completed for the exact battery system, PCS configuration, firmware version and communication interface intended for integration.

Important integration requirement

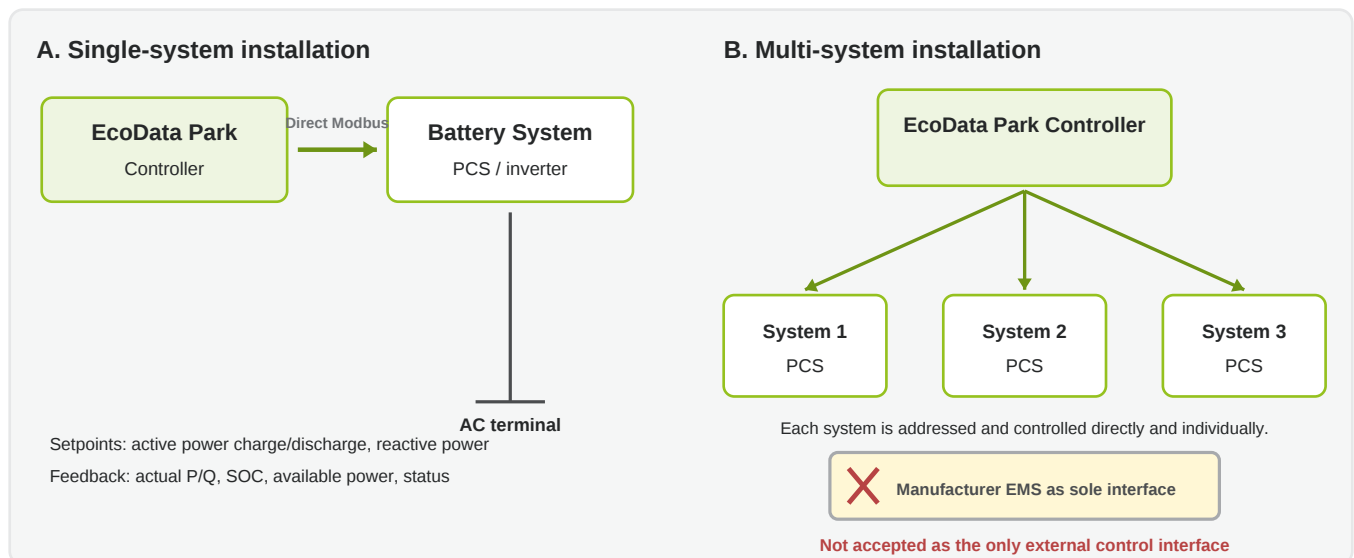
Direct control of the battery system is a mandatory prerequisite. For installations with multiple battery systems, EcoData must be able to control each individual system directly. A higher-level manufacturer EMS must not be the only available external control interface.

1. General Information

Manufacturer / System	
Model / Type	
Firmware / Software Version	
Technical Contact	
Phone	
E-Mail	

2. Required Control Architecture

The EcoData Park Controller must communicate directly with the battery system. EcoData provides active power and reactive power setpoints and reads the required measured values and operating information directly from the controlled system. A manufacturer EMS may be used internally for battery management and protection, but it must not be the only external control interface.



Manufacturer confirmation

- | | | | |
|--|------------------------------|-----------------------------|------------------------------|
| 2.1. Can the individual battery system be controlled directly by the EcoData Park Controller? | ☐ Yes | ☐ No | |
| 2.2. Can active power charging and discharging setpoints be written directly to the individual battery system? | ☐ Yes | ☐ No | |
| 2.3. Can reactive power setpoints be written directly to the individual battery system? | ☐ Yes | ☐ No | |
| 2.4. If multiple systems are installed, can each system be addressed and controlled separately by EcoData? | ☐ Yes | ☐ No | ☐ N/A |
| 2.5. Can active power setpoints be written directly and individually to each battery system? | ☐ Yes | ☐ No | ☐ N/A |
| 2.6. Can reactive power setpoints be written directly and individually to each battery system? | ☐ Yes | ☐ No | ☐ N/A |
| 2.7. Is a higher-level manufacturer EMS mandatory as the only external control interface? | ☐ Yes | ☐ No | |
- 2.8 Please describe limitations, mandatory components or prerequisites for direct individual control:

Mandatory condition

Direct individual control of each battery system is a prerequisite for integration into the EcoData system.

3. Communication Interface

Supported communication protocol(s):

☐ Modbus TCP
 ☐ Modbus RTU
 ☐ Other documented protocol
 If other, please specify:

TCP port		e.g. 502
Unit ID / Slave ID		
Recommended polling interval		ms
Maximum supported read cycle time		ms
Maximum supported write cycle time		ms

Additional communication requirements:

Clarification

Read and write cycle times describe the communication performance of the interface. They are not the same as the total power response time of the battery system.

4. Required Measured Values

Measured value	Supported	Register address	Data type / scaling / unit	Comment
Actual active power at the AC terminal	☐ Yes ☐ No			
Actual reactive power at the AC terminal	☐ Yes ☐ No			
State of Charge (SOC)	☐ Yes ☐ No			
State of Health (SOH)	☐ Yes ☐ No			

Required sign conventions

Please state the sign convention for charging/discharging active power and for inductive/capacitive or underexcited/overexcited reactive power in the applicable comment fields.

4. Required Measured Values - Continued

Measured value	Supported	Register address	Data type / scaling / unit	Comment
Currently available charging power	☐ Yes ☐ No			
Currently available discharging power	☐ Yes ☐ No			
Nominal charging power	☐ Yes ☐ No			
Nominal discharging power	☐ Yes ☐ No			
Nominal reactive power	☐ Yes ☐ No			

Available power requirement

Available charging and discharging power must report the **actual current capability** and include SOC, battery temperature, BMS/PCS restrictions, protection functions and temporary operating limits.

Example: Nominal power 1,000 kW, currently available 200 kW - the register must report 200 kW.

5. Required Control Values

Control function	Supported	Register address	Data type / scaling / unit	Comment
Active power charge/discharge setpoint at the AC side	☐ Yes ☐ No			
Reactive power setpoint	☐ Yes ☐ No			
External control enable, if required	☐ Yes ☐ No ☐ N/A			
Operating mode selection, if required	☐ Yes ☐ No ☐ N/A			
Start/stop or charge/discharge release, if required	☐ Yes ☐ No ☐ N/A			

Supported reactive power setpoint format(s):

☐ % of nominal reactive power ☐ var ☐ kVar

Important

A cos phi or power factor setpoint alone is not sufficient. If a percentage setpoint is used, nominal reactive power must also be available through the communication interface.

6. Setpoint Step Response Requirement

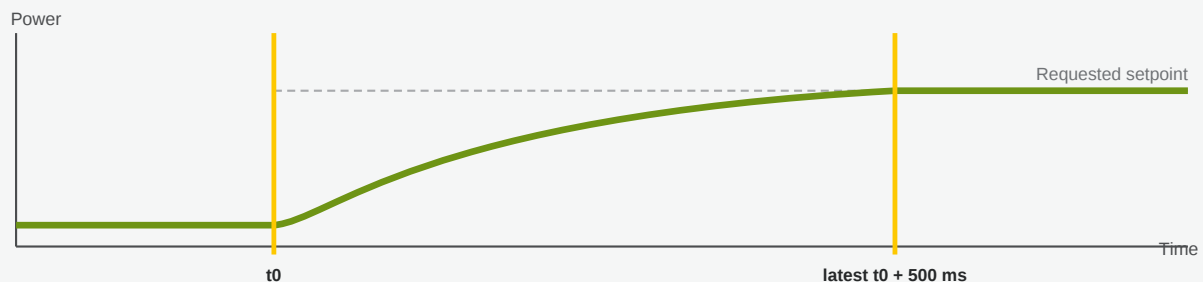
Maximum total response time: 500 ms

From the moment the EcoData Park Controller successfully writes a new active power or reactive power setpoint into the Modbus server of the battery system, the system has a maximum of 500 ms to implement the requested setpoint at the AC terminal of the battery system.

t_0 : successful Modbus write

$t_0 + 500$ ms: requested AC power reached

Complete response chain: maximum 500 ms



How the 500 ms are measured

Start of measurement:

The new setpoint has been successfully written into the Modbus server.

End of measurement:

The requested active or reactive power is physically achieved at the AC terminal.

What does not count as implementation

The following is not sufficient:

- write command acknowledged only
- internal target register updated only
- EMS or PCS accepted the command only
- power change started, but requested AC power not reached

Example: At t_0 , EcoData writes a new active power setpoint of 250 kW. The actual active power at the battery AC terminal must reach 250 kW no later than $t_0 + 500$ ms.

Scope of this requirement

The 500 ms requirement applies to charging and discharging active power setpoints as well as inductive and capacitive reactive power setpoints. The complete chain from Modbus write to physical AC power is included.

Does the specified battery system comply with the complete 500 ms requirement?

☐ Yes

☐ No

7. Dynamic Control Behaviour

7.1. Can active power setpoints be implemented at the AC terminal without an additional internal ramp limitation?

☐ Yes ☐ No

7.2. Can reactive power setpoints be implemented at the AC terminal without an additional internal ramp limitation?

☐ Yes ☐ No

7.3. Does the written setpoint directly affect the actual AC power input or output?

☐ Yes ☐ No

7.4. Does the system apply any internal ramp limitation, smoothing, filtering, averaging, delayed execution or slew-rate limitation?

☐ Yes ☐ No

7.5 If yes, describe all functions and state whether they can be disabled or configured:

7.6 Manufacturer-specified total response time from successful Modbus write to requested power at the AC terminal

ms

7.7 Maximum charging ramp rate

kW/s or % Pn/s

7.8 Maximum discharging ramp rate

kW/s or % Pn/s

Disclosure requirement

Any internal function that prevents the requested setpoint from being achieved at the AC terminal within 500 ms must be disclosed. Such functions may prevent integration into the EcoData system.

8. Integration Conditions

8.1. Is a real and operational test system available for integration and communication testing?

☐ Yes ☐ No

8.2. Is a technical contact person from the manufacturer available during the integration process?

☐ Yes ☐ No

8.3. Is the technical contact familiar with the interface, register map and controller configuration?

☐ Yes ☐ No

8.4. Has a complete register map been provided?

☐ Yes ☐ No

8. Integration Documentation - Continued

8.5 The register documentation includes:

- | | | |
|--|---|---|
| ☐ Register addresses | ☐ Read/write permissions | ☐ Data types |
| ☐ Scaling factors | ☐ Units | ☐ Sign conventions |
| ☐ Byte order / word order | ☐ Communication parameters | ☐ Required enable or operating modes |

8.6 Applicable register map document name and version:

8.7 Additional integration notes:

Integration prerequisites

Integration can only be performed if a real test system is available. A technically qualified contact from the battery system manufacturer must be available during integration. The manufacturer is responsible for complete and correct documentation of all registers, data types, scaling factors, units, sign conventions and communication parameters.

9. Confirmation

The undersigned confirms that the information provided in this questionnaire is complete and technically correct to the best of their knowledge. The undersigned also confirms that the stated control architecture and dynamic response behaviour apply to the exact battery system and configuration specified in this questionnaire.

Place / Date

Name

Position

Company

Signature / Company stamp