

Li-ion Battery Solution Guide

Important Safety Information

This document contains important safety instructions that must be followed during installation procedures (if applicable). Read and keep this document for future reference.

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

⚠ ⚠ DANGER**HAZARD OF ELECTRIC SHOCK, EXPLOSION, ARC FLASH, AND FIRE**

This document is in addition to, and incorporates by reference, the relevant product manuals for Conext XW Pro inverter/chargers and connected batteries. Before reviewing this document, you must read the relevant product manuals. Unless specified, information on safety, specifications, installation and operation is as shown in the primary documentation received with the product. Ensure you are familiar with that information before proceeding.

Failure to follow these instructions will result in death or serious injury.

Scope

This Technical Note clarifies technical aspects of Li-ion battery integration for the Conext XW Pro series of inverters by providing information beyond what is available in the Installation and Owner's guides. The information provided here does not modify, replace or waive any of the terms and conditions mentioned in the Installation and Owner's guides, or the limited warranty. This document specifies typical settings for use of Conext XW Pro with Li-ion batteries with BMS integration. The user must consult the battery manufacturer if adjustments are needed. Li-ion batteries used with static charge settings, without communication between the BMS and the Conext XW Pro inverter are out of scope of this document. When applicable, static charge settings (open loop operation) must be provided by battery manufacturers..

⚠ CAUTION**BATTERY TYPE HAZARD**

Ensure that the battery pack being used includes a compatible Battery Management System (BMS) with safety controls. Compatible batteries are listed in "*Appendix A - Battery-Specific Information*" on page 11.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE**RISK OF EQUIPMENT DAMAGE**

Before selecting a battery pack to use with the Conext XW Pro inverter, MPPTs, or the accessories, be sure that the battery pack has been thoroughly tested by the battery manufacturer for safe operation for its intended application and is compatible with all Conext products. For questions or adjustments to the battery settings, contact the battery manufacturer.

Failure to follow these instructions can result in equipment damage.

Overview

The Conext XW Pro is a utility interactive inverter/charger with grid-tied, off-grid, and backup power capability. The Conext XW Pro inverters communicate with third party devices, such as a Li-ion Battery Management System (BMS), through the Conext Gateway. For BMS communication the Conext Gateway provides a CAN Bus or Modbus RTU interface. The Conext XW Pro and Conext Gateway BMS communication can only work with compatible batteries listed in this document.

Li-ion batteries must have an on-board BMS, that, in addition to providing functions of protection, cell balancing, state-of-charge (SOC) and state-of-health (SOH) calculation, also provide a reference for charging voltage and charging current. This reference may be optimized dynamically by the BMS, taking into account the battery SOC, SOH, temperature, or other factors. It is necessary, in such cases, to update the charging characteristics of the Conext XW Pro dynamically as these values change. The operation described in this application note applies to all BMS communication protocols that the system is compatible with.

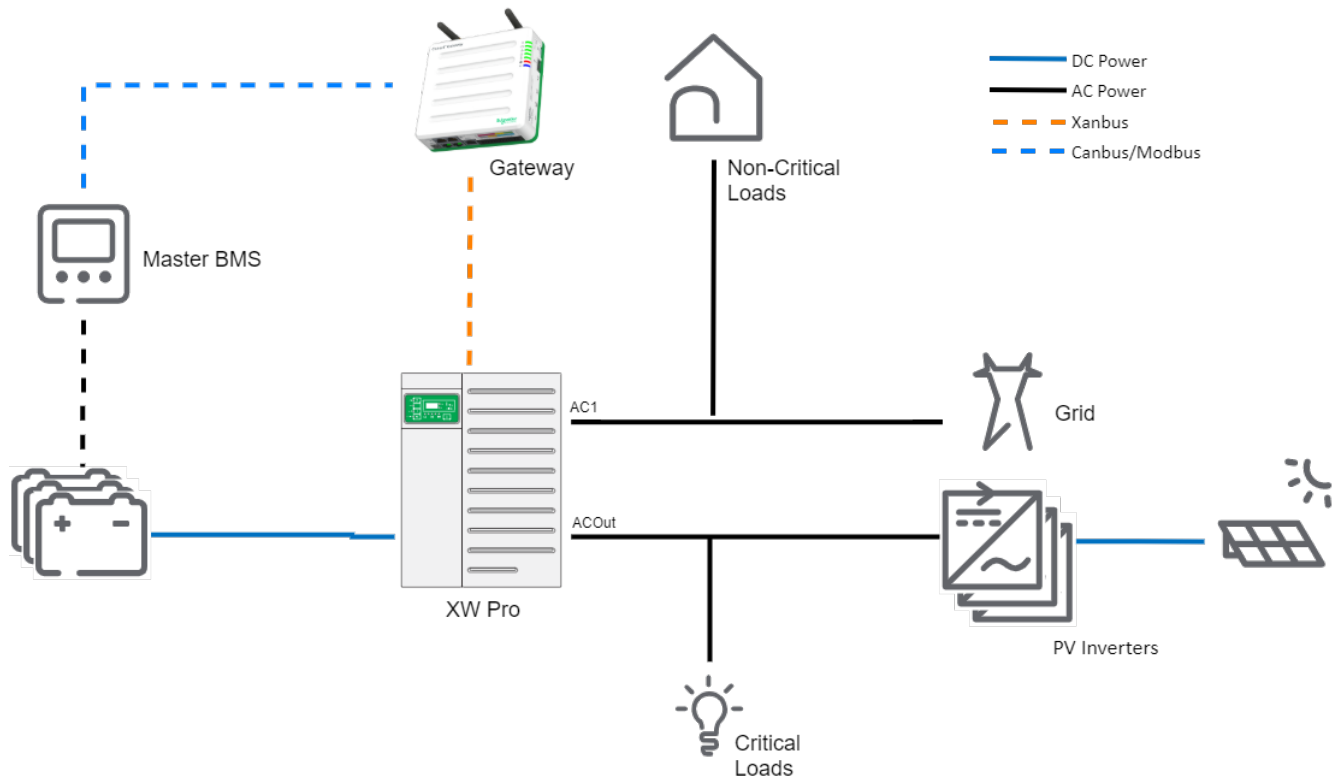
Supported Architectures

The following images provide a typical system architecture of the Conext Gateway, Conext XW Pro, and a Li-ion battery with BMS. Currently BMS communication is supported for systems with a single Conext XW Pro inverter and optional AC coupled PV inverters. Systems with multiple Conext XW Pro inverters and DC coupled systems with Conext MPPT solar charge controller not currently available with BMS communication (future release). Systems with multiple Conext XW Pro inverters and/or DC coupling with Conext MPPT solar charge controller may be installed without BMS communications subject to the battery vendor approval of the use-case. A Conext Battery Monitor is recommended for these applications to monitor the battery SOC.

Single Conext XW Pro with Single Master BMS (Split-Phase and Single-Phase) with AC Coupling

The Conext XW Pro with compatible Li-ion batteries can be used with AC coupled PV inverters or microinverters. The Conext XW Pro will regulate charging from the AC coupled PV inverters using frequency shifting, based on the battery charging limits and SOC information communicated by the BMS. See the Conext XW+ / XW Pro / SW AC Coupling Guide (976-0240-01-01) for information on the design and installation of AC coupled systems, and be sure to follow all system sizing and other application requirements as described in the document.

Figure 1 Single Conext XW Pro with Single Master BMS (Split-Phase and Single-Phase) with AC Coupling



System Compatibility

Each of the system architectures supports a maximum number of compatible devices within a system; beyond the number stated in the table, normal operation of the system is not guaranteed. The following table lists maximum number of compatible devices that have been validated.

Name	Maximum Quantity
Single Conext XW Pro with Single Master BMS	
Conext XW Pro	1 (multi-unit support planned in a future firmware release)
BMS	1 (master)
Li-ion Battery Packs	See "Appendix A - Battery-Specific Information" on page 11
PV Inverter	See Conext XW+ / XW Pro / SW AC Coupling Guide (976-0240-01-01)

Installation and Commissioning

Protection Coordination

WARNING

RISK OF FIRE, ELECTRIC SHOCK, EXPLOSION, AND ARC FLASH

Installation of the battery must be done by qualified and licensed installers following any applicable codes and standards and requirements of local authorities. Installers must ensure that appropriate protection coordination is in place as needed.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Inrush Current

NOTICE

RISK OF BATTERY AND BATTERY INVERTER DAMAGE

Always follow the recommended start-up sequence and minimum number of batteries as described in Appendix A. This is required to avoid excessive inrush current.

Failure to follow these instructions can result in equipment damage.

Battery-based inverter/chargers, such as the Conext XW Pro, contain an internal DC link which is comprised of capacitors. When the DC breaker between the inverter/charger and the battery is turned On, the inverter/charger draws an inrush current to charge the capacitors. Li-ion batteries contain a supervisory protection inside the BMS which may trigger an over-current fault protection to such inrush. For some battery types, multiple battery packs should be connected to the Conext XW Pro inverter simultaneously to share the inrush current between the batteries. This is achieved by closing an installed DC disconnect or breaker at the inverter, after turning on the batteries according to the manufacturer instructions.

BMS Setup

Depending on the battery system brand and the number of battery packs, there might be slave BMSs present. Conext XW Pro only supports communication with a master BMS and you must refer to the battery manufacturer's documentation for information on how to set up slave BMSs to be aggregated into the master BMS.

NOTICE

RISK OF BATTERY DAMAGE

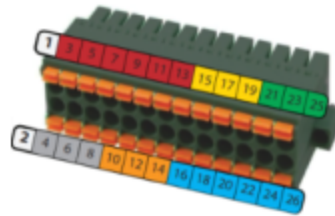
Consult the battery manufacturer's information for handling details if the battery is completely discharged.

Failure to follow these instructions can result in equipment damage.

Wiring Interface

Wire CAN or RS485 interface of the BMS to the 26-pin connector referring to the below diagram. RS485 can be connected to either Port 1 or Port 2 on Conext Gateway. Once the connections are done, power on Conext Gateway and BMS. Refer to the Conext Gateway Owners Guide (Part Number: 975-0806-01-03) for more details on installation.

<i>NOTICE</i>
RISK OF BMS OR CONEXT GATEWAY DAMAGE
BMS and Conext Gateway must be powered off while doing the connections.
Failure to follow these instructions can result in equipment damage.



Port	Signal	Pin Number
RS485 Port 1	ISO2 RS485 1A	18
	ISO2 RS485 1B	20
	ISO2 RS485 GND	16
RS485 Port 2	ISO2 RS485 2A	24
	ISO2 RS485 2B	26
	ISO2 RS485 GND	22
CAN Port 1	ISO1 CANL	12
	ISO1 CANH	14
	ISO1 CAN GND	10

<i>NOTICE</i>
RISK OF BATTERY DAMAGE
Consult the battery manufacturer's information for wiring connection details for use with a BMS.
Failure to follow these instructions can result in equipment damage.

Conext Gateway BMS Communication Setup

Only the master BMS in the system, once discovered, must be associated with the Conext XW Pro inverter to which its battery packs are connected. The association is completed through the Conext Gateway UI Inverter/Charger **Associations** menu.

NOTICE**RISK OF BATTERY DAMAGE**

Consult the BMS manufacturer's information for resolving any faults or errors that occur. Each BMS will have its own instructions for resolving issues.

Failure to follow these instructions can result in equipment damage.

CAN BMS Discovery

CAN BMS systems that are supported by the Conext Gateway have auto-detection, where the Conext Gateway will see the messages from the BMS and detect the battery.

NOTE: Only 500 kbps speed is supported for CAN BMS.

1. After successful login, click Setup along the top bar.
2. On successful device detection, the number of devices will be shown.
3. Navigate to **Devices** and click **Device Overview**. On successful communication, various user information is available.

SECAN_BMS 20

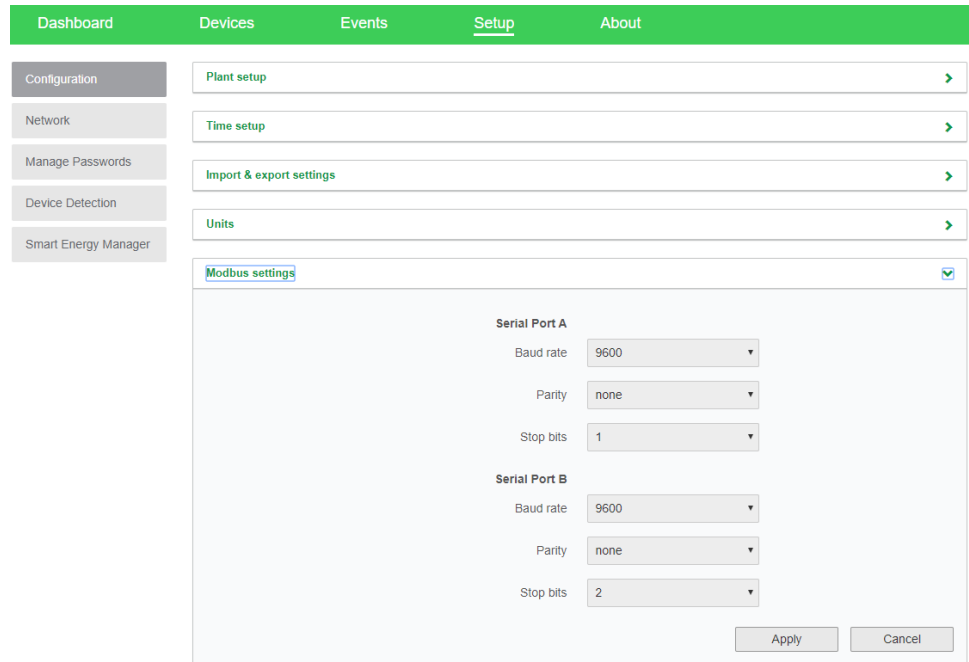
Online

Voltage	48 V
Temperature	20.00 °C
State of Charge	95 %
State of Health	100 %
Device Number	0
Device Name	BMS
Device Association	House Battery Bank 1

**Modbus BMS Discovery**

Modbus BMS systems can be detected through a Modbus discovery feature from the Conext Gateway UI during commissioning. Once completed the device will be remembered unless manually removed from the device list in the Conext Gateway.

1. After successful login, click Setup along the top bar.
2. Click Configuration on the left-hand side, and then click Modbus settings.
3. Configure the Modbus settings. This should be same as the Modbus BMS settings.



4. After configuring the Modbus settings, click **Device Detection** on the left-hand side.
5. Under **Detect Devices**, enter the address range of the Modbus device and click Detect. This should trigger device detection.
6. On successful device detection , the number of devices will be shown. Navigate to **Devices** and click **Device Overview**. On successful communication, various user information is available.

SECAN_BMS 20

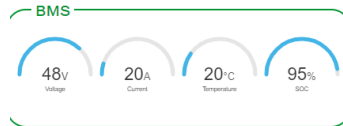
Online

Voltage	48 V
Temperature	20.00 °C
State of Charge	95 %
State of Health	100 %
Device Number	0
Device Name	BMS
Device Association	House Battery Bank 1



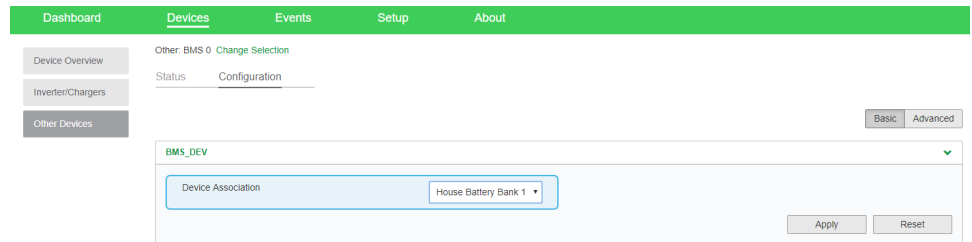
BMS Association

1. Click the BMS device to open BMS Status information.
2. Check the status information to validate various data parameters.

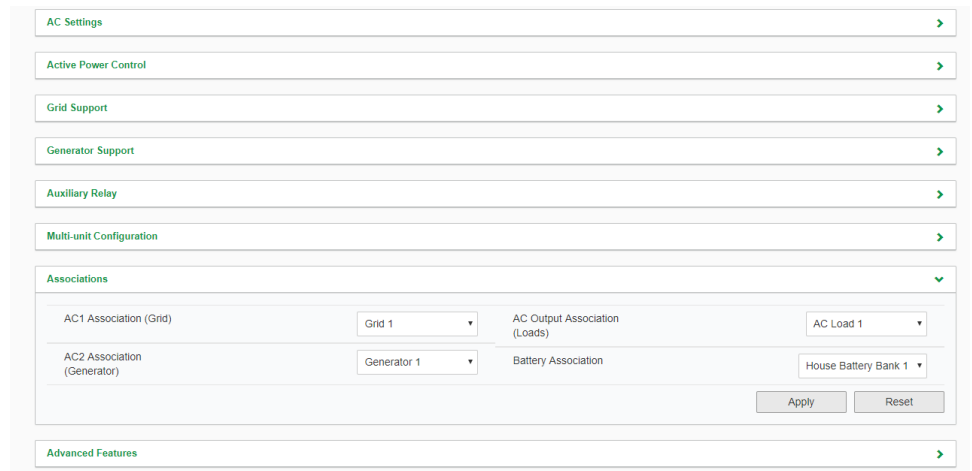


Modbus Address	3	Battery Type	SECAN_BMS
Device Association	House Battery Bank 1	Device Name	BMS
Device Number	0	Current	20 A
Voltage	48 V	Maximum Discharge Current	-25 A
Maximum Charge Current	25 A	Maximum Charge Voltage	54 V
Minimum Discharge Voltage	42 V	Force Charge Low SOC	0
Force Charge Request Calibration SOC	0	Charge Permitted	1
Discharge Permitted	1	State	SelfCheck
Temperature	20.00 °C	State of Charge	95 %
State of Health	100 %	Discharge Over Current Fault	0
Charge Over Current Fault	0	Under Temperature Fault	0
Over Temperature Fault	0	Under Voltage Fault	0
Over Voltage Fault	0	Cell Voltage Difference Too High Fault	0
Communication Error Fault	0	System Error Fault	0
Discharge Current High Warning	0	Charge Current High Warning	0
High Temp Warning	0	Low Temp Warning	0
Voltage High Warning	0	Voltage Low Warning	0
Cell Voltage Difference Too High Warning	0	Communication Error Warning	0

3. Click **Configuration** and then click **Device Association**.



4. In the **Devices** section click **Inverter/Chargers**. Click the respective Conext XW Pro and click **Configuration > Associations** menu set the **Battery Association** to same bank as BMS.



Battery Association

CANbus BMS systems that are supported by the Conext Gateway have auto-detection, where the Conext Gateway will see the messages from the BMS and detect the battery.

MODBUS BMS systems can be detected through a MODBUS discovery feature from the Conext Gateway UI during commissioning. Once completed the device will be remembered unless manually removed from the device list in the Conext Gateway.

Only the master BMS in the system, once discovered, must be associated with the Conext XW Pro inverter to which its battery packs are connected. The association is completed through the Conext Gateway UI Inverter/Charger **Associations** menu.

Note: Depending on the battery system brand and the number of battery packs, there might be slave BMSs present. The Conext XW Pro only supports communication with a master BMS and you must refer to the battery manufacturer's documentation for information on how to set up slave BMSs to be aggregated into the master BMS.

Appendix A - Battery-Specific Information

The following table summarizes the battery models that are compatible with the Conext XW Pro inverter using BMS communication. Batteries that are used with the Conext XW Pro inverter without BMS communication (static manual charge settings) are out of scope of this document. The Absolute Minimum number of batteries is the minimum battery bank sizing to prevent battery tripping on inrush current when connecting to the inverter. The number of batteries for 6.8 / 8.5 / 12 kW discharge describe the number of batteries that could fully utilize the inverter's continuous or overload power ratings respectively during backup power operation. For smaller battery banks, the inverter will limit power according to the BMS and settings. With this information, the system designer can size the batteries based on the expected loads and the desired autonomy.

Table 1 Single Conext XW Pro with Single Master BMS with AC Coupling

Manufacturer	Model	Nominal Rating	Protocol	DC Coupling ¹	AC Coupling	Start-Up Sequence	Number of batteries in Parallel			
							Single Conext XW Pro			
							Absolute Minimum	6.8 kW Continuous Discharge	8.5 kW 30-min Discharge	12 kW 1-min Peak Discharge
Pylontech	US2000	2.4 kWh	CAN	NO	YES	With DC disconnect open, start batteries in sequence. Then close DC disconnect.	1	6	7	5
Pylontech	US3000	3.55 kWh	CAN	NO	YES	With DC disconnect open, start batteries in sequence. Then close DC disconnect.	1	4	5	4

NOTICE

RISK OF DAMAGE TO THE BATTERY AND BATTERY INVERTER

Always follow the recommended settings, which are intended to operate the batteries within their recommended ranges and minimize BMS tripping. Consult the battery manufacturer if adjustments are required.

Failure to follow these instructions can result in equipment damage.

¹ Compatibility with Schneider Electric Conext MPPT solar charge controller is planned in a future release.

Recommended Settings

Conext Gateway Configuration Section	Setting	Description	Recommended Value	
			Pylontech US2000	Pylontech US3000
Charger Settings	Battery Type	Battery chemistry technology used.	Li-ion	Li-ion
Charger Settings	Charge Cycle	2-, 3-stage or External BMS.	External BMS	External BMS
Charger Settings	Battery Bank Capacity	Total capacity of all batteries connected to the system.	2.4 kWh x number of batteries	3.55 kWh x number of batteries
Charger Settings	Absorption Time	If High Cut Out SOC is not reached, charge will be stopped once charge current is <2% of battery bank capacity for this duration.	60 seconds	60 seconds
Charger Settings	Absorption Period Timeout	Overall absorption charge timeout – if High Cut Out SOC is not reached within this timeframe, charge will stop.	60 min x number of batteries	90 min x number of batteries
Grid Support	State of Charge Control	Enables SOC-based energy management state transitions (if disabled then Conext XW Pro works in voltage-based control).	Enabled	Enabled
Inverter Settings	Low Battery Cut Out SOC	Low-end SOC below which discharge is prohibited.	10%	10%
Inverter Settings	High Cut Out SOC	High-end SOC above which charge is prohibited.	100%	100%
Battery Management System Settings	Fault on loss of BMS status information	If Enabled, then Conext XW Pro will shut down when there is a loss of communication with the BMS. If Disabled, then Conext XW Pro will continue to operate with a warning and will follow the charge and discharge limits as defined below.	Enabled	Enabled

Battery Management System Settings	Charge Voltage Limit (BMS status lost)	Target charge voltage limit when there is a loss communication with the BMS.	53.2 V	53.2 V
Battery Management System Settings	Discharge Voltage Limit (BMS status lost)	Internal under-voltage limit when there is a loss communication with the BMS.	47 V	47 V
Battery Management System Settings	Charge Current Limit (BMS status lost)	Target discharge voltage limit when there is a loss of communication with the BMS.	25 A x number of batteries	37 A x number of batteries
Battery Management System Settings	Discharge Current Limit (BMS status lost)	Target current limit when there is a loss of communication with the BMS. When connected to the grid, the inverter will follow the Discharge Current Limit. When operating off-grid, the inverter will follow the current required by the loads up to the Discharge Current Limit plus the Discharge Overcurrent Offset.	25 A x number of batteries	37 A x number of batteries
Battery Management System Settings	Charge Overcurrent Offset	Maximum offset compared to the target charge current before triggering the Charge Overcurrent Trip timer.	5 A x number of batteries	5 A x number of batteries
Battery Management System Settings	Charge Overcurrent Trip Time	Maximum time the inverter can exceed the target charge current plus Charge Overcurrent Offset before the inverter will trip.	2 s	2 s
Battery Management System Settings	Discharge Overcurrent Offset	Maximum offset compared to the target discharge current before triggering the Discharge Overcurrent Trip timer.	25 A x number of batteries	37 A x number of batteries

Battery Management System Settings	Discharge Overcurrent Trip Time	Maximum time the inverter can exceed the target discharge current plus Discharge Overcurrent Offset before the inverter will trip.	60 s	60 s
Battery Management System Settings	DC Undervoltage Offset	Maximum offset compared to the target discharge voltage before triggering the DC Undervoltage Trip timer.	0.5 V	0.5 V
Battery Management System Settings	DC Undervoltage Trip Time	Maximum time the inverter can exceed the target discharge voltage plus DC Undervoltage Offset before the inverter will trip.	30 s	30 s
Battery Management System Settings	DC Overvoltage Offset	Maximum offset compared to the target charge voltage before triggering the DC Overvoltage Trip timer.	0.5 V	0.5 V
Battery Management System Settings	DC Overvoltage Trip Time	Maximum time the inverter can exceed the target charge voltage plus DC Overvoltage Offset before the inverter will trip.	30 s	30 s

NOTE: Offset values and trip times apply to both the target charge and discharge limits communicated by the BMS, as well as the charge and discharge limit settings for a BMS status lost event.

NOTE: Static voltage and current charge/discharge settings not included in the above table are not used when Charge Cycle is set to External BMS and do not need to be configured.

Trademarks are owned by Schneider Electric Industries SAS or its affiliated companies. Other trademarks are owned by their respective companies.

Exclusion for Documentation

UNLESS SPECIFICALLY AGREED TO IN WRITING, SELLER

(A) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN ITS MANUALS OR OTHER DOCUMENTATION;

(B) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSSES, DAMAGES, COSTS OR EXPENSES, WHETHER SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION. THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK; AND

(C) REMINDS YOU THAT IF THIS MANUAL IS IN ANY LANGUAGE OTHER THAN ENGLISH, ALTHOUGH STEPS HAVE BEEN TAKEN TO MAINTAIN THE ACCURACY OF THE TRANSLATION, THE ACCURACY CANNOT BE GUARANTEED. APPROVED CONTENT IS CONTAINED WITH THE ENGLISH LANGUAGE VERSION WHICH IS POSTED AT <https://solar.schneider-electric.com>.

Document Number: 990-6359

Date: August 2020

Contact Information

For country-specific details, please contact your local Schneider Electric Sales Representative or visit the Schneider Electric Solar Business website at: <https://solar.schneider-electric.com>

Information About Your System

As soon as you open your product, record the following information and be sure to keep your proof of purchase.

Serial Number _____
Product Number _____
Purchased From _____
Purchase Date _____

