

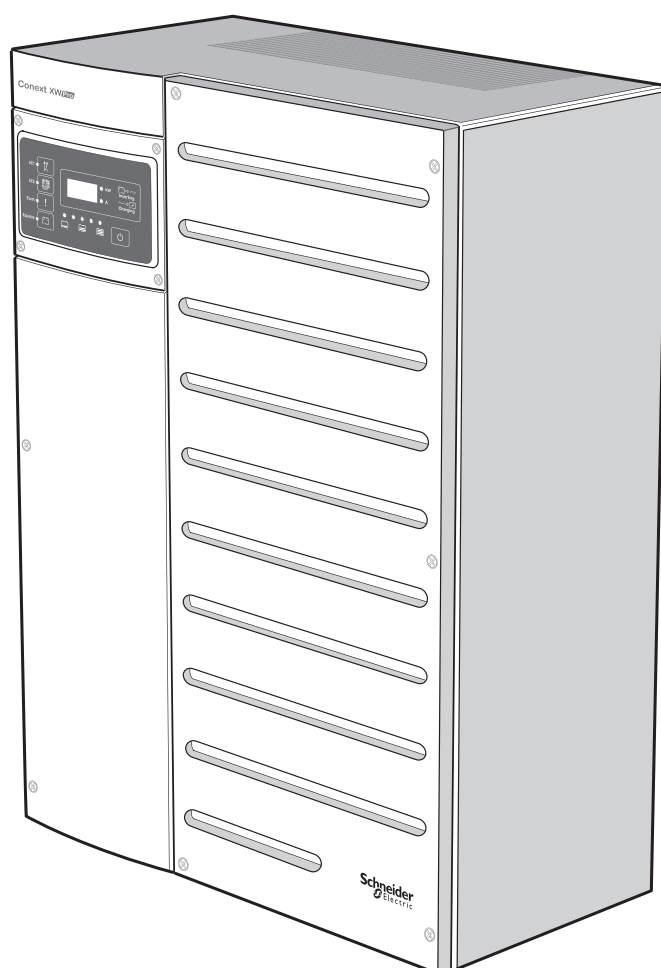
XW Pro

XW Pro 6848 NA

Operation Guide

990-91227F-01

January 2023



<https://se.com/>

Legal Information

The Schneider Electric brand and any trademarks of Schneider Electric SE and its subsidiaries referred to in this guide are the property of Schneider Electric SE or its subsidiaries. All other brands may be trademarks of their respective owners.

This guide and its content are protected under applicable copyright laws and furnished for informational use only. No part of this guide may be reproduced or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), for any purpose, without the prior written permission of Schneider Electric.

Schneider Electric does not grant any right or license for commercial use of the guide or its content, except for a non-exclusive and personal license to consult it on an "as is" basis. Schneider Electric products and equipment should be installed, operated, serviced, and maintained only by qualified personnel.

As standards, specifications, and designs change from time to time, information contained in this guide may be subject to change without notice.

To the extent permitted by applicable law, no responsibility or liability is assumed by Schneider Electric and its subsidiaries for any errors or omissions in the informational content of this material or consequences arising out of or resulting from the use of the information contained herein.

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://se.com/>.

Contact Information

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

Information About Your System

As soon as you open your product, inspect the contents and record the following information and be sure to keep your proof of purchase. If any damage is found, contact customer support.

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

Document Number: 990-91227F-01

Date: January 2023

Model Name:

XW Pro 6848 NA

Product Part Number:

865-6848-21

READ AND SAVE THESE INSTRUCTIONS

Safety Information

Important Information

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.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved. For more information, see Audience.

Label Symbols

NOTE: The term "ground" is equivalent to "earth", and the use of these terms depends on local codes and standards. This document uses the term "ground" throughout.

The following symbols appear on labels on or in the inverter.



Hazardous voltage



Hot surface



Stored energy hazard discharge time



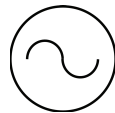
Refer to the Installation or Operation instructions



Protective (grounding) conductor terminal



Direct current



Alternating current

Product Labels

The XW Pro inverter has different product labels designed to provide information on product ratings and specifications, provide safety information, and identify parts and functions of the inverter.

Table 1 Product labels

1	Main product ratings label
2	Front panel label
3	Main product safety label

Main Product Ratings Label

The main product ratings label contains the inverter's product ratings and technical specifications. **Do not remove, cover, deface, or alter the main product label.** A localized main product label is available to install on the product.

Figure 1 Main product ratings label example

Schneider Electric

1 — **Conext™ XW7068 6848 NA**
Inverter/Charger

2 — **Charger Mode (25°C)**

Nominal Input Voltage	120/240V	120V ~
Max. Input Current	48A	48A ~
Input Power Factor	>0,98	>0,98 ~
Input Frequency Range	52-68Hz	52-68Hz ~
Output Voltage Range	40-64V	40-64V ~
Nominal Output Voltage	48.0V	48.0V ~
Max. Output Current	140A	120A =

3 — **Inverter Mode (25°C)**

Nominal Output Voltage	120/240V	120V ~
Nominal Output Frequency	60Hz	60Hz ~
Max. Continuous Output Current	28A	48A ~
Max. Continuous Output Power	6,8kVA	5,76kVA ~
Input Voltage Range	42-60V	42-60V ~
Max. Input Current	180A	180A =

4 — **Grid Interactive Mode (40°C)**

Nominal Grid Voltage	120/240V	120V ~
Grid Voltage Range	211-264V	105,6-132V ~
Nominal Frequency	60Hz	60Hz ~
Output Power Factor	>0,98	>0,98 ~
Max. Continuous Output Current	27A	48A ~
Max. Continuous Output Power	6,0kVA	5,76kVA ~
Input Voltage Range	47-58V	47-58V ~
Max. Continuous Input Current	160A	160A =

5 — **Certified for use with 75°C copper conductors**

Operating Temperature Range -25°C to +70°C

Part Number 865-6848-21

6 — **Serial number**

7 — **Date of Manufacture**

This Class B device complies with Part 15 of the FCC Rules and all requirements of the Canadian interference causing equipment regulations. Operation is subject to the following two conditions:
 1. This device may not cause harmful interference.
 2. This device must accept any interference received, including interference that may cause undesired operation

Factory Configuration 120/240V, 3 Wire
 Optional Configuration 120V, 2 Wire

8 — **UL 1741, CSA 101.1, MC 15949**

IP20 — 9
Type 1, Indoor Use Only

All trademarks are owned by Schneider Electric Industries. Designed in Canada. Made in Philippines.

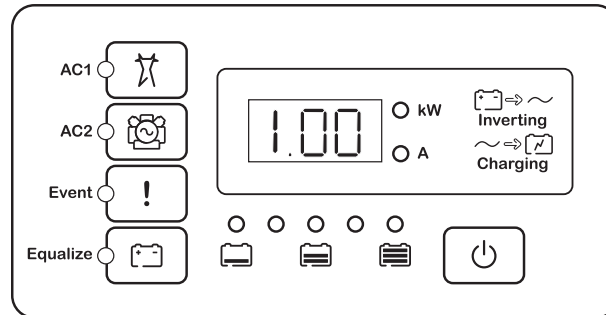
NOTE: This is for illustration purposes only. Actual ratings vary for each model.

1	Name of the product and model number
2	Charger ratings
3	Inverter ratings
4	Grid interactive ratings
5	Product part number and operating temperature range
6	Product serial number information
7	Product date of manufacture information
8	Regulatory markings
9	Enclosure rating

Front Panel Label

The front panel label contains the display and LED indicators. It also identifies the various buttons used in inverter operation. For information on the indicators and control button, see the Figure 9 on page 33.

Figure 2 Inverter Information Panel



Main Product Safety Label

The main product safety label is the main safety label for the inverter which lists general hazards and instructions on avoiding them. The label is applied on the exterior of the inverter.

Do not remove, cover, deface, or alter the main product safety label. A localized label is available to install on the product.

For information on the symbols appearing in the label, see Label Symbols on page 4.

Other Safety Labels

Other safety labels appear on many areas of the equipment to warn of potential hazards within those areas of the inverter or to call attention to information that clarifies or simplifies a procedure. Read and follow all safety labels before proceeding.

Do not remove, cover, deface, or alter safety labels. Localized safety labels are available to install on the product.

For information on the symbols appearing in the label, see Label Symbols on page 4.

Radio Frequency Interference Notices

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Audience

This guide is intended for use by anyone needs to operate, configure, and troubleshoot the XW Pro inverter/charger. Certain configuration tasks should only be performed by qualified personnel in consultation with your local utility and/or an authorized dealer. Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. Keep unqualified personnel away from batteries. Servicing of batteries must only be performed or supervised by qualified personnel with knowledge of batteries and their required precautions. Qualified personnel have training, knowledge, and experience in

- Installing electrical equipment.
- Applying all applicable installation codes.
- Analyzing and reducing the hazards involved in performing electrical work.
- Installing and configuring batteries.
- Selecting and using Personal Protective Equipment (PPE).

This guide does not contain information regarding servicing or de-energization for servicing. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

About

Purpose

This guide provides explanations and procedures for operating the Schneider Electric XW Pro inverter/charger.

- Installation instructions are available in the *XW Pro Installation Guide (document number 990-91228)*
- Instructions for configuring inverter settings are available in this guide.

For explanations and procedures related to other products, please contact the manufacturer of those products.

Scope

This guide provides safety guidelines and information about operating the XW Pro inverter/charger.

The Operation Guide provides safety guidelines and information about operating the XW Pro inverter/charger and related system components. It does not provide details about installation, maintenance, or servicing. See the Operation Guide or Owner's Guide of each device for this information. This Operation Guide does not provide details about particular brands of batteries, photoelectric cells, or generators. Consult individual battery manufacturers for this information.

Abbreviations and Acronyms

CEC	California Energy Commission
CSA	Canadian Standards Association
GT	Grid Tie
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Tracking
NEC	US National Electrical Code NFPA-70
PV	Photovoltaic
PVGFP	PV Ground Fault Protection
UL	Underwriters Laboratories
VAC	Volts Alternating Current
VDC	Volts Direct Current

Related Information

Find more information about Schneider Electric, as well as its products and services at:
<https://se.com/>.

For available accessories, see the *XW Pro Installation Guide* (document number 990-91228).

Product Safety Information

IMPORTANT: Remember to read and follow all product safety information in this document.

General Safety Instructions

Before using the inverter/charger, read all instructions and cautionary markings on the unit, the batteries, and all appropriate sections of this manual.

- Use of accessories not recommended or sold by the manufacturer may result in a risk of fire, electric shock, or injury to persons.
- The inverter/charger is designed to be permanently connected to your AC and DC electrical systems. The manufacturer recommends that all wiring be done by a certified technician or electrician to ensure adherence to the local and national electrical codes applicable in your jurisdiction.
- To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the inverter/charger with damaged or substandard wiring.
- Do not operate the inverter/charger if it has been damaged in any way.
- Most of the parts in this unit are not user-serviceable parts. Do not disassemble the inverter/charger except where noted for connecting wiring and cabling. See your warranty for instructions on obtaining service. Attempting to service the unit yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected.
- To reduce the risk of electrical shock, disconnect both AC and DC power from the inverter/charger before attempting any maintenance or cleaning or working on any components connected to the inverter/charger. Putting the unit in Standby mode will not reduce this risk.
- The inverter/charger must be connected to AC ground, following the instructions in the Conext series.
- Do not expose this unit to rain, snow, or liquids of any type. This product is designed for indoor use only. Damp environments will significantly shorten the life of this product and corrosion caused by dampness will not be covered by the product warranty.
- Remove personal metal items such as rings, bracelets, necklaces, and watches when working with electrical equipment.
- Do not expose this unit to excessive shock or vibration. This product is designed for stationary indoor use only. Mechanical fatigue caused by excessive shock or vibration can significantly shorten the life of this product and will not be covered by the product warranty.

 **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 XW Pro inverter/charger. 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.

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

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized with covers removed
- Energized from multiple sources. Before removing covers identify all sources, de-energize, lock-out, and tag-out and wait 5 minutes for circuits to discharge
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.

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

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

- Disconnect negative and positive DC conductors before servicing. DC conductors are to be treated as Hazardous Live and must be disconnected.
- Normally GROUNDED conductors may be UNGROUNDED and ENERGIZED when a GROUND FAULT is indicated in InsightLocal. Must be serviced by qualified personnel.

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

Precautions when Working with Batteries

NOTE: Battery work and maintenance must be done by qualified personnel knowledgeable about batteries to help ensure compliance with battery handling and maintenance safety precautions.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Remove watches, rings, or other metal objects.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Keep sparks and flames away from the batteries.
- Use tools with insulated handles.
- Wear protective glasses, gloves and boots.
- Do not lay tools or other metal parts on top of batteries.

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

DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR FIRE

- Battery Circuit Breakers must be installed according to the specifications and requirements defined by Schneider Electric.
- Servicing of batteries must only be performed by qualified personnel knowledgeable about batteries and the required precautions. Keep unqualified personnel away from batteries.
- Disconnect the charging source prior to connecting or disconnecting battery terminals.

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

Limitations on Use

WARNING

HAZARD DUE TO UNINTENDED USE

The XW Pro inverter is not intended for use in connection with life support systems or other medical equipment or devices. The XW Pro inverter can only be used in grid-interconnected, off grid, and integrated PV systems. It is not suitable for any other application areas.

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

Explosive Gas Precautions

WARNING

EXPLOSION HAZARD

The XW Pro is not ignition protected. To prevent fire or explosion, do not install this product in locations that require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, as well as joints, fittings, or other connections between components of the fuel system.

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

Working in the vicinity of lead acid batteries is dangerous. Some batteries generate explosive gases during normal operation. Therefore, you must read this Operation Guide and follow the instructions exactly before installing or using your inverter/charger.

To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer and the manufacturer of the equipment in which the battery is installed.

Maintenance

The XW Pro does not require scheduled maintenance. However it is required to be clear of dust and debris, especially around air intake and exhaust areas, at all times. Use a soft-bristle brush to clear the area around the air intake and exhaust.

NOTE: A dirty foam air filter may lead to over-temperature events. If this occurs, qualified personnel may need to clean the foam air filter. See "Troubleshooting" on page 117 for more information.

The surface of XW Pro can be cleaned using a lint-free soft cloth.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

Use only a soft cloth dampened with water and mild soap to clean the inverter.

Do not use solvents or chemicals that are corrosive or flammable.

Failure to follow these instructions can result in equipment damage.

Contents

Legal Information	2
Contact Information	2
Information About Your System	2
Purpose	10
Scope	10
Abbreviations and Acronyms	10
Related Information	11
General Safety Instructions	12
Precautions when Working with Batteries	14
Limitations on Use	14
Explosive Gas Precautions	15
Maintenance	15
Features	22
Performance Highlights	22
Distinguishing Features	22
Available XW Pro Accessories	23
Regulatory Certification	23
Operation	24
Bidirectional Theory of Operation	24
Surge Performance	27
Islanding Protection	27
AC Coupling	28
Multi-unit Operation	29
Auxiliary Output	30
Transfer Relays	31
Monitoring the XW Pro	32
Gateway Device	32
XW Pro Information Panel	33
Monitoring Operation with the Inverter Information Panel	36
Monitoring AC Input Status	37
Monitoring XW Pro Status	37
Monitoring Charger Status	38
Monitoring Events	38
Equalizing Batteries	38
Using Startup/Shutdown/Standby Modes	40
Enabling and Disabling the Inverter	41
Monitoring Battery Level	42

Reading the Display Screen	43
Monitoring Operation with a Gateway Device	43
Accessing the Device in the InsightLocal Web Portal	43
Status Page	44
Performance Page	47
Events Page	47
InsightCloud	47
Initial Setup with a Gateway Device	49
Overview	52
SunSpec Modbus	52
Power Limiting	52
Communications Loss	53
IEEE2030.5	53
Initial Setup with gateway device	57
Changing Settings	57
XW Pro Configuration Page	57
Controls Settings	58
Backup Mode Settings	60
Charger Settings	62
Battery Settings	72
AC Settings	75
AC1 (Grid) Settings	76
AC2 (Generator) Settings	78
Grid Energy Management (Grid Support) Settings	80
Generator Support Settings	83
Auxiliary Relay Settings	85
Trigger Source Descriptions	86
Power Control Settings	88
Multi-Unit Configuration Settings	88
External Contactor Settings	90
Associations Settings	90
Battery Management System Settings	93
Advanced Features	95
Modbus Settings	96
Advanced Device Settings	96
Device Identification	96
Managing Energy Sources with Advanced Features	98
Grid Support	98

Charger Block	100
Peak Load Shaving (PLS)	102
Updating Firmware	103
Managing Compliance Regions	106
Changing Connected Device Settings	108
Power Control System Mode (PCS)	109
Modbus TCP Settings	113
Connecting and Configuring Modbus Devices	113
Removing a Modbus Device	114
Resetting the XW Pro to Default Settings	116
General Troubleshooting Guidelines	118
Inverter Applications	119
Resistive Loads	119
Motor Loads	119
Problem Loads	119
Inverter Troubleshooting	121
Battery Charger Troubleshooting	124
Faults and Warnings	126
Warning Messages	126
Fault Messages	129
Electrical Specifications	140
Mechanical and Regulatory Specifications	143
XW Pro Overload Capability	144
Output Power Versus Ambient Temperature	146
XW Pro Efficiency	147
Regulatory Approvals	148
Grid Support Utility Interactive Functions	149
California Rule 21: Smart Inverter Grid-Support Utility Interactive Functions	150
IEEE 1547-2018 Standard for Interconnecting Distributed Resources with Electric Power System (60Hz)	163
Hawaiian Electric Company (HECO) SRD2.0-2020: Smart Inverter Grid- Support Utility Interactive Functions	175
Puerto Rico Energy Power Authority (PREPA) Technical Requirements for Interconnecting Wind and Solar Generation	177
Default Settings	192

1 Introduction

What's in This Chapter?

Features	22
Performance Highlights	22
Distinguishing Features	22
Available XW Pro Accessories	23
Regulatory Certification	23
Operation	24
Bidirectional Theory of Operation	24
Surge Performance	27
Islanding Protection	27
AC Coupling	28
Multi-unit Operation	29
Auxiliary Output	30
Transfer Relays	31
Monitoring the XW Pro	32
Gateway Device	32
XW Pro Information Panel	33

Features

The XW Pro is a modular building block sine-wave inverter/charger that can be used for residential and commercial battery based off-grid, grid backup, and grid interactive applications.

The XW Pro is a self-contained DC to AC inverter, battery charger, and integrated AC transfer switch. It is configurable in a hybrid system to operate with generators and renewable energy sources. These configurations are capable of extending battery based off-grid/backup autonomy.

Performance Highlights

- High-capacity motor load starting with high 30-minute and 60-second power.
- Off-grid AC Coupling with PV inverters using frequency power curtailment method.
- Operation in hot environments up to 25°C without derating.
- Conversion of DC energy to AC energy for export to the utility grid.
- Power factor corrected charging minimizes AC current required for charging.
- Very low distortion sine wave output.

Distinguishing Features

- Grid-interactive feature set enables time management and prioritization of energy sources and power conversion to support advanced modes of operation such as load shifting, self consumption and peak load shaving.
- Dual AC input connections with 60 A automatic transfer switch integrates both utility grid and generator.
- Auxiliary port assist with relay switching of external devices such as battery room fans, diversion loads and generators, and acts as a driver for the BCS2200.
- Configurable battery parameters for customized battery charging.

Xanbus™ Network Communications Protocol

The XW Pro uses Xanbus™, a network communications protocol developed by Schneider to communicate with other Xanbus-enabled devices.

There are three gateway devices that allow you to configure and monitor the XW Pro through a web portal called InsightLocal on a connected PC or laptop. In addition, the InsightCloud option has available any-where-in-the-world cloud-based monitoring.

You can find information about the following available configuration and monitoring gateway devices at <https://se.com/>.

- Conext Gateway: Conext Gateway Owner's Guide (975-0806-01-03)
- InsightHome: InsightHome Owners Guide (990-91410)
- InsightFacility: InsightFacility Owners Guide (990-91411)

Available XW Pro Accessories

Accessory	Part Number
XW Pro Power Distribution Panel	865-1015-01
XW Pro Power Distribution Panel (Without AC Breakers)	865-1014-01
XW Pro Conduit Box	865-1025-01
XW Pro PDP 120/240V 60A Breaker Kit	865-1215-01
Backup Control Switch (BCS)	865-BCS-2200
Conext Gateway	865-0329
InsightHome	865-0330
InsightFacility	865-0335
Conext AGS Automatic Generator Start	865-1060-01
MPPT 60 150 Solar Charge Controller	865-1030-1
MPPT 80 600 Solar Charge Controller	865-1032
MPPT 100 600 Solar Charge Controller	865-1034
Conext Battery Monitor	865-1080-01

Regulatory Certification

See Mechanical and Regulatory Specifications on page 143.

Operation

Bidirectional Theory of Operation

NOTICE

EQUIPMENT DAMAGE

- The Automatic Transfer Relays are rated at 60 A.
- Loads connected at AC OUT must not exceed the inverter's overload ratings or the 60 A limit, whichever is lower. Unless an external contactor or external transfer switch (such as the Schneider Electric BCS) is used, the 60 A limit also applies to the total combined loads connected to the AC OUT bus of multiple inverters connected in parallel.

Failure to follow these instructions can result in equipment damage.

The XW Pro is a grid forming device consisting of a bidirectional inverter/charger. It is capable of inverting DC power into AC power and controlling the voltage and frequency of its inverter output. It will power external loads attached to AC OUT, see Figure 4 on page 25.

The XW Pro is also capable of charging external batteries by converting AC power into DC power, see Figure 5 on page 25. The XW Pro accepts AC power through connection AC1 (Grid) and AC2 (Generator) for charging batteries, see Figure 6 on page 26.

The XW Pro will convert externally sourced DC power into AC power for export to the utility grid attached to its AC1 connection, see Figure 7 on page 26.

The XW Pro has internal automatic transfer switches (K1, K2), rated at 60 A, which allow either AC1 or AC2 to be connected to the inverter input, but not both at the same time, see Figure 3 on page 25. This allows shared AC energy during charging or to directly passthrough from AC1, or AC2, to AC Out.

Through firmware control over power conversion and the management of K1 and K2, XW Pro can facilitate advanced interaction with the utility grid to optimize the utilization of renewable and non-renewable energy sources. Because the XW Pro is a device capable of forming an AC grid signal (AC voltage and frequency) it is also ideal for use off-grid.

The red arrows in the diagrams below represent the direction of power flow in the respective modes of operation. These modes and other special functions will be explained throughout this manual.

Figure 3 Connection Points and Major Power Conversion Components of XW Pro

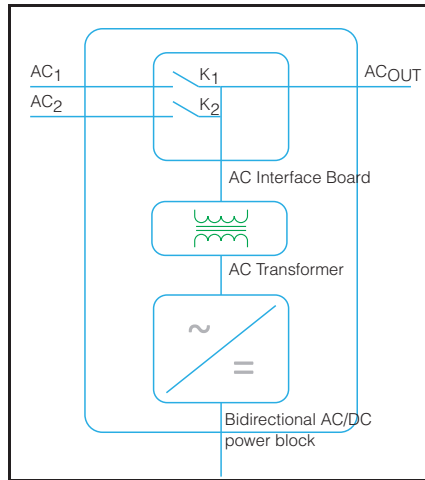


Figure 4 Inverting of DC to AC Connected to AC OUT

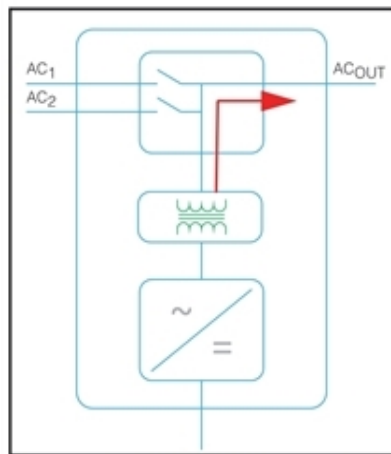


Figure 5 Charging External Batteries and Supplying AC Out with AC Passthrough from AC1 Grid

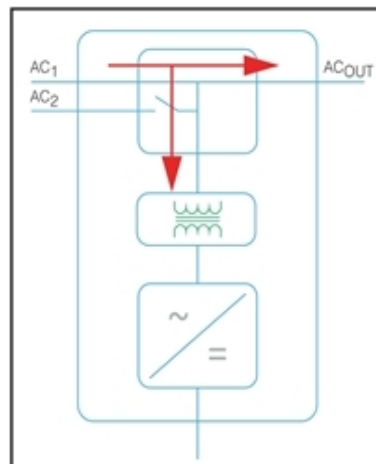


Figure 6 Charging External Batteries and Supplying AC Out with AC Passthrough from AC2 Generator

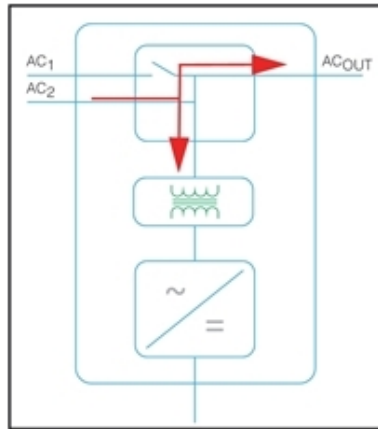


Figure 7 Converting Excess Available DC power for Export to Utility Grid (AC1) and AC Out

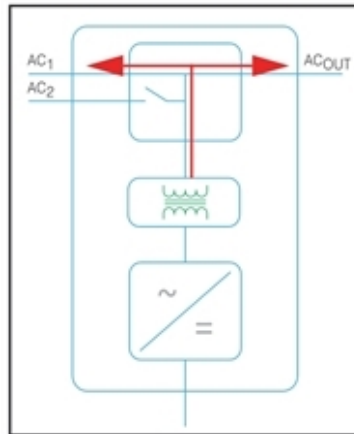
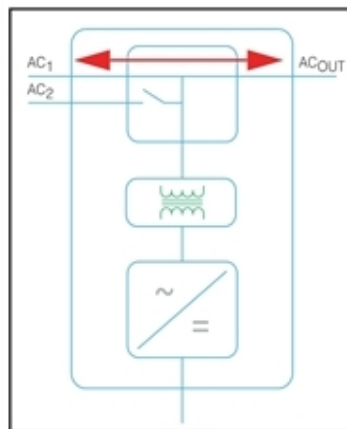


Figure 8 AC Passthrough



Surge Performance

Unlike many other inverters, the XW Pro helps stop voltage from sagging dramatically during surge conditions. The XW Pro handles surges of over twice its rated output power with only a minimal drop in output voltage for limited periods of time.

Islanding Protection

Islanding protection is an essential safety feature that helps reduce harm to those working on the utility grid from a distributed energy source such as the XW Pro. Islanding protection also helps to prevent loads connected to the XW Pro from being damaged by a fluctuating utility grid input. The XW Pro uses proprietary positive feedback control to achieve anti-islanding operation while maintaining low total harmonic distortion at the grid connection. Default software settings are programmed into each XW Pro at the factory so that they comply with applicable safety regulations (such as IEEE 1547 and UL 1741 in North America).

In some instances it may be desirable from both a utility and a customer point of view to adjust the default anti-islanding settings. For example, the XW Pro may experience events if the grid is weak and the voltage falls outside the allowable range specified by regulations. It may be difficult for a utility to adjust the grid to stop this problem. With permission from the utility, the factory settings may be changed to allow the XW Pro to operate over a wider grid voltage range. These settings must only be changed by qualified service personnel.

While exporting energy, the XW Pro continuously monitors grid voltage and frequency at the AC input. Voltage at the grid will always be different than the voltage at the end of a wire. If the grid voltage or frequency move beyond the XW Pro default ranges (for example, during a power surge or outage) the XW Pro stops exporting energy through AC1 and disconnects from the utility. If disconnected due to a grid voltage disturbance, five minutes is the default minimum reconnect time during which the XW Pro does not export energy through AC1 to the grid. The Event LED on the XW Pro information panel will indicate a utility fault. No fault code appears on the display because the fault is with the utility grid, not with the XW Pro.

In addition to the information panel, the InsightLocal indicates any utility faults with details present under all affected instances of XW Pro. The faults cannot be manually cleared. Utility faults will clear automatically when the utility grid voltage and frequency return to within the ranges programmed into the XW Pro. While waiting for the fault to clear, any present voltage will pass through the inverter and charge the batteries. If grid support is enabled and the utility voltage and frequency come back within tolerance, the XW Pro information panel displays a countdown timer for five minutes until the XW Pro can start interacting with the grid again.

AC Coupling

Off-grid AC Coupled system architecture is often used to create a stand-alone grid. Commonly this means that PV inverters are connected to the output of a battery-based inverter/charger putting both on the same AC bus along with the AC loads. In this scenario, the battery powered inverter charger provides the necessary frequency and voltage to enable the PV inverter to produce power. This type of system must be able to maintain power generation in balance with power consumption at all times. If there is more power being generated than can be consumed by the loads, power will flow to the inverter/charger and be converted to DC power which flows into the battery. Once the battery reaches capacity, power generation by the PV inverter must be curtailed to maintain the balance between generation and consumption. As the battery bank reaches capacity, XW Pro curtails PV inverter generation by raising the AC line frequency causing compatible PV inverters to reduce their power output in an orderly manner. This is called Active Frequency Shift Power Curtailment. In some compliance regions, when the grid returns from an outage, XW Pro will cause any AC coupled PV inverter to transition offline via the same mechanism prior to grid reconnection.

During a grid outage even a home with a grid-tie PV inverter system will be without power because PV inverters cannot produce power without the presence of a reference voltage and frequency. To enable the PV inverter to provide power during a grid outage the XW Pro is retrofitted upstream from the PV inverter. The PV inverter is rewired from the grid connection to a critical load (sub) panel and is AC Coupled to the XW Pro AC Output port. When the grid is present, PV inverter power feeds the loads and any excess is exported by XW Pro to the grid using AC1 (where permitted by the local utility). During a grid outage, XW Pro anti-islanding protection helps to prevent power from being exported to grid on AC1. XW Pro then uses Active Frequency Shift Power Curtailment to reduce the power output of compatible PV inverters, maintaining the balance of generation and consumption.

Consult the manufacturer's specifications to determine if your PV inverter is compatible with Active Frequency Shift Power Curtailment. XW Pro AC coupling function is enabled by default (Advanced Features Menu).

NOTICE

AC COUPLED PV INVERTER COMPATIBILITY

AC power generated by AC coupling PV inverters with XW Pro must be consumed by AC loads or used to charge batteries. As an alternative, the excess power produced from a PV inverter can be routed to dump loads. Do not AC couple PV inverters with the XW Pro that are unable to reduce, derate or cease the excess PV inverter power in response to the changes in AC line frequency controlled by the XW Pro. Consult the manufacturer's specifications of your PV inverter and confirm compatibility.

Failure to follow these instructions can result in equipment damage.

The AC coupling advanced setting should remain enabled except in cases when the battery voltage level is allowed to have large variations and the line frequency needs to remain constant.

Further details about AC Coupling can be found in the document *AC Coupling of Inverters Solutions Guide* (976-0240-01-01) available at <https://se.com/>.

Multi-unit Operation

Important: An external transfer switch may be required to protect the internal relays from the combined loads of the system. For more information, see the XW Pro Multi-unit Design Guide (document number 990-91373).

Up to three XW Pro units can be installed together in a split-phase or 3-phase configuration with a single XW Pro PDP (Power Distribution Panel). A maximum of four XW Pro units can be installed together in a single phase configuration with the addition of a second PDP. The PDP is an ideal optional companion for managing AC connections and integrating a battery bank and other DC connections. Regardless of how it is installed, the maximum number of XW Pro units in a single phase or split phase configuration is four.

Multiple XW Pro units and other Xanbus devices with common connections to battery banks, PV arrays, the utility grid or a generator require programming during commissioning to enable correct operation.

Inverting

For multiple units, the primary XW Pro synchronizes operation of other connected units using the same Xanbus network. When AC loads are present, all units produce power. Refer to the XW Pro Multi-unit Design Guide (document number 990-91373) for total system surge ratings.

Parallel Charging

Multiple XW Pro units on the same Xanbus network synchronize their charging stages to help provide efficient charging of the battery bank. When a single unit transitions from bulk to absorption, so do all other units. In absorption, all units must complete the absorption stage before any of them transition to the next stage. Note that units stop sharing charge current just before completing the bulk stage and only share charging load during the bulk stage. Also, it is normal to see units charging at different rates during the Absorb stage.

Each XW Pro unit provides a maximum charging current set by the `Max Charge Rate` setting. The maximum current may be decreased, subject to the internal operating temperature.

NOTICE

RISK OF EQUIPMENT DAMAGE

Ensure the sum of all charging sources does not exceed the battery's max charge rate.

Failure to follow these instructions can result in equipment damage.

When one or more Conext Solar Charge Controllers is installed and operating in the system, XW Pro units synchronize only their bulk charging stage with the charge controllers. If the combined currents of all devices exceeds the battery manufacturer's recommendation, then a Charge Block (XW Pro) must be used during solar hours.

NOTE: Equalization is device specific. Only the device(s) on which equalization was initiated will perform the equalization. Other devices will stay in float or no-float depending on their settings.

AC Transfer

Multiple XW Pro units monitor each other to determine the quality of AC input. If AC input is deemed to be bad by any of the paralleled units, no transfer to AC Out occurs and the AC LED continues to flash on each unit's information panel until the AC is qualified by all. If the system was in passthrough and AC fails on any unit, all units transfer to invert simultaneously.

Faults

When the XW Pro detects a fault condition, the fault code is displayed on the XW Pro. The XW Pro also turns on the Event LED on the XW Pro and inverter information panel. A fault affects the operation of the unit. See "Fault Types" on page 129 for an explanation of the different fault types.

When a single XW Pro secondary unit in a multi-unit system has a fault, only the affected device shuts down.

When a primary unit has an invert mode fault that causes it to stop inverting, it is considered a system-wide fault and all units shut down. Invert mode faults on secondary units only shut down the affected secondary unit.

All units shut down when there is a battery-related fault such as battery over-temperature or over-voltage.

Independent Operation of Features

Each XW Pro grid-interactive feature (e.g. enhanced grid support, grid sell, load shave and generator support) operates independently. This enables XW Pro units in a multi-unit system to be configured to perform multiple functions independently and allows greater flexibility in operating the entire system.

Auxiliary Output

Each XW Pro has one programmable 12 V, 0.25 A auxiliary output that is able to run a small fan or operate an external relay to perform other functions. Examples include remotely starting a two-wire start generator in cases where the Xanbus-enabled XW Pro AGS is not used, disconnecting external non-critical loads, or turning on a diversion load for battery voltage regulation. See "Auxiliary Relay Settings" on page 85 for programing parameters.

NOTE: Using the Aux port for a 2-wire generator does not provide a generator cool-down cycle.

Transfer Relays

The built-in transfer relays, designated K1 and K2, are each rated for 60 amps. Connected loads must not draw currents exceeding this. When an external AC source is detected and qualified on either of the AC1 or AC2 inputs, the relay transfers loads from the XW Pro to the external power source, and then activates the battery charger. The XW Pro design does not allow the K1 and K2 relays to close simultaneously. This design helps stop the generator input (AC2) from back feeding to the utility grid (AC1). Multi-unit systems of three or more require the use of an external AC contactor to manage the AC bus. For more information, see the XW Pro Multi-unit Design Guide (document number 990-91373).

Monitoring the XW Pro

Operation of the XW Pro can be monitored using the factory-installed inverter information panel or the optional gateway device . To configure the XW Pro, operators must use InsightLocal. For more information about InsightLocal, see Monitoring Operation with a Gateway Device on page 43.

Gateway Device

The gateway device is a multi-function communication device that provides an overall view of system performance for residential power monitoring systems. It also provides a communications gateway between a network of Xanbus™-enabled devices and Modbus devices, including third-party controllers. It is the primary tool for monitoring and configuring all Xanbus-enabled devices.

There are three gateway devices that allow you to configure and monitor the XW Pro through a web portal called InsightLocal on a connected PC or laptop. In addition, the InsightCloud option has available any-where-in-the-world cloud-based monitoring.

You can find information about the following available configuration and monitoring gateway devices at <https://se.com/>.

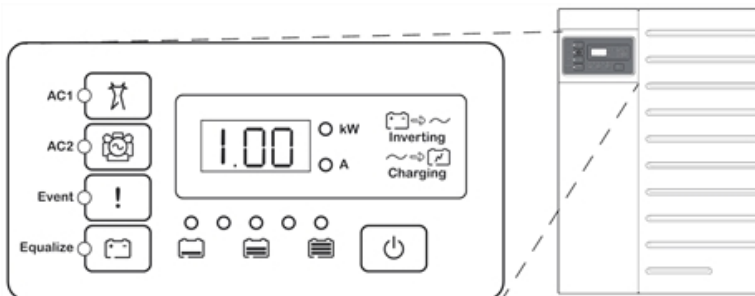
- Conext Gateway: Conext Gateway Owner's Guide (975-0806-01-03)
- InsightHome: InsightHome Owners Guide (990-91410)
- InsightFacility: InsightFacility Owners Guide (990-91411)

XW Pro Information Panel

The XW Pro information panel features:

- Buttons for XW Pro Startup/Shutdown/Standby control, clearing faults and warnings, and battery equalization.
- A three-character display to indicate power output, charge current, anti-islanding countdown or troubleshooting information.
- LEDs to indicate AC input status, output status, battery condition, and system warnings/faults.

Figure 9 XW Pro Information Panel



Symbol	Description
	AC input status.
	Second AC input status.
	Event status.
	Equalizing status.
	Battery level of charge.
	STARTUP/SHUTDOWN button.
	Charging status.
	Inverting status.

2 Monitoring Operation

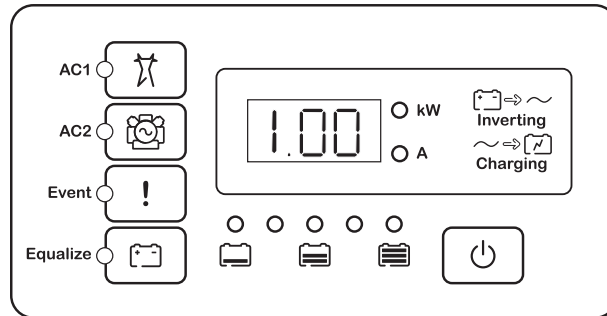
What's in This Chapter?

Monitoring Operation with the Inverter Information Panel	36
Monitoring AC Input Status	37
Monitoring XW Pro Status	37
Monitoring Charger Status	38
Monitoring Events	38
Equalizing Batteries	38
Using Startup/Shutdown/Standby Modes	40
Enabling and Disabling the Inverter	41
Monitoring Battery Level	42
Reading the Display Screen	43
Monitoring Operation with a Gateway Device	43
Accessing the Device in the InsightLocal Web Portal	43
Status Page	44
Performance Page	47
Events Page	47
InsightCloud	47
Initial Setup with a Gateway Device	49

Monitoring Operation with the Inverter Information Panel

The inverter information panel on each XW Pro monitors a single XW Pro. The XW Pro information panel displays basic information and performs start up, shut down, equalization and standby functions. LEDs on the information panel indicate AC input status, XW Pro status, battery condition, and charging and equalization status. The XW Pro LEDs and three-character display screen indicate warning and event conditions.

Figure 10 Inverter Information Panel




Symbol	Description
	AC input status.
	Second AC input status.
	Event status.
	Equalizing status.
	Battery level of charge.
	STARTUP/SHUTDOWN button.
	Charging status.
	Inverting status.

Monitoring AC Input Status


Grid (AC1)

The green Grid (AC1) LED indicates the presence and status of the AC source connected to the AC1 input.

Symbol	LED On	LED Flashing	LED Off
	AC input is present and qualified. The XW Pro is ready to charge batteries, pass AC through to the loads, or interact with the grid.	AC input is present and is being qualified.	The XW Pro is not connected to the grid. AC input is not present, or AC input is present but not within qualifying range.

Gen (AC2)


The green Gen (AC2) LED indicates the presence and status of a generator or other auxiliary AC source on the AC2 input.

Symbol	LED On	LED Flashing	LED Off
	The AC source is present and AC input is qualified. The XW Pro is ready to charge batteries and pass power through to the loads.	AC input is present and is being qualified.	AC input is not present, or AC input is present but not within qualifying range.

When one AC input LED is on and the other AC input LED is flashing, AC input is present on both AC1 and AC2. However, the XW Pro can qualify and receive AC input from only one source at a time. The qualified source is represented by the steadily lit LED. When two sources of AC input are present, the XW Pro uses the source selected under `AC Priority` in the `AC Settings` menu.


Monitoring XW Pro Status

The Green kW LED indicates the XW Pro is inverting DC input to AC output. When this LED is on or flashing, the display screen shows XW Pro output power in kilowatts.

Symbol	LED On	LED Flashing	LED Off
	The XW Pro is inverting and generating an AC output. Display screen shows output power in kW.	The XW Pro is in Grid Selling mode. Display screen shows output power in kW.	The XW Pro is not inverting.

Monitoring Charger Status


The green LED labelled “A” indicates the XW Pro is charging the battery bank. When this LED is on, the numeric display screen shows battery charging current in amps.

Symbol	LED On	LED Flashing	LED Off
	The XW Pro is charging the battery bank. The numeric display screen shows battery charging current in amps.	AC coupled charging is occurring ^a . May flash in AC coupled mode where reverse current greater than 3 A is present. Multiple units are connected in parallel under no load.	The XW Pro is not in charge mode.

When a charge cycle ends or charging is manually disabled, the XW Pro does not leave charge mode immediately, and the charging LED remains on for 60 seconds.


Monitoring Events

The Red Event LED indicates the presence of a fault or warning in the system. To clear active events, briefly press and release the STARTUP/SHUTDOWN button n (see Figure 10 on page 36).

Symbol	LED On	LED Flashing
	The XW Pro has stopped charging or inverting due to a event. The LED also turns on steadily if the unit has both a fault and a warning.	The XW Pro has a warning. A warning may escalate to a fault if the warning condition does not go away.

Equalizing Batteries

Button

Pressing the Equalize button ( symbol) for five seconds initiates a battery equalization cycle. This cycle is used to restore battery capacity when battery life has deteriorated due to sulphation. After the button is pressed the XW Pro begins a full charge cycle, which is automatically followed by an equalization cycle. Equalization functions only when AC is present and qualified and the charger is enabled. Otherwise the XW Pro generates a Cannot Equalize warning (W96).

^aSee the document “AC Coupling of Inverters Solutions Guide” available at <https://se.com/> for more information about AC coupling.

⚠ WARNING**EQUALIZATION HAZARD**

- Only flooded lead acid batteries permitted by the manufacturer should be equalize charged. Hydrogen and oxygen gases are produced when batteries are equalized and can potentially cause an explosion if ignited. Corrosive battery acid can escape.
- Provide adequate ventilation and remove all sources of ignition, such as open flames, sparks, electric motors, relays, light switches, etc.
- Equalization voltage is significantly higher than nominal battery voltage. Detach electronics that can be damaged by high DC voltage.

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

⚠ WARNING**BATTERY TYPE AND SETUP HAZARDS**


- Incorrect battery configurations or settings for battery types can lead to dangerously high battery temperature, fire and explosion. To avoid damaging your batteries during charging or equalization, and to minimize the risk of fire or explosion consult battery manufacturer's documentation before setting battery parameters and follow the battery manufacturer's recommended settings.
- Always use and connect the Battery Temperature Sensor (BTS) unless an external BMS fulfilling this function is used.
- Always verify that the configured battery type matches the battery type being used.
- Custom battery settings should be configured by qualified personnel only.
- When using Lithium-Ion batteries, ensure that the battery pack being used includes a Battery Management System (BMS) with safety controls. Refer to XW Pro Li-Ion Battery Solution Guide (document number 990-6359) for additional information.

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

In a system where more than one device is capable of equalizing batteries (such as a system including multiple XW Pro units and/or XW Pro Solar Charge Controllers), there is no system-wide equalization command for all devices. To equalize with multiple devices, each would have to be enabled individually. Alternatively, equalization can be performed using only the selected device. During the equalization process, one device applies the equalization charge while the other devices continue to operate in synchronized charge mode, typically in float (three-stage charging) or no-float (two-stage charging).

LED

The yellow Equalize LED indicates that the XW Pro is equalizing batteries. Battery equalization is only supported in Lead Acid or Custom battery type.

Symbol	LED On	LED Flashing
	The XW Pro has begun equalizing the batteries.	Equalization has been requested but has not begun. The XW Pro must complete a charge cycle before applying the equalization charge.

Using Startup/Shutdown/Standby Modes

Startup/Shutdown control

When the XW Pro is operating, pressing and holding the STARTUP/SHUTDOWN button (see Figure 10 on page 36) for five seconds shuts down the unit. To return the unit to its operating state, press the STARTUP/SHUTDOWN button again.

<i>NOTICE</i>
EQUIPMENT DAMAGE
Shutting down the system should only be performed by qualified, trained personnel.
Failure to follow these instructions can result in equipment damage.

While the XW Pro is turning off, the other inverter information panel buttons stop working. The shutdown process cannot be cancelled. The XW Pro can only be restarted once the display is blank.

Standby mode

In Standby mode, the XW Pro stops charging and inverting. Also in Standby mode, the XW Pro disconnects its internal transfer switches which stops AC to pass through to the AC output. However, the unit remains powered and present on the Xanbus network. Lastly, in Standby mode, XW Pro basic and advanced settings can be changed and put into effect.

To put the XW Pro into Standby mode, press and hold the STARTUP/SHUTDOWN button and the Equalize button simultaneously for about five seconds. The display shows Stb. To return the XW Pro to operating mode, press the STARTUP/SHUTDOWN button momentarily.

Pressing the STARTUP/SHUTDOWN button momentarily while the XW Pro is operating clears active faults and warnings.

Single-unit installations

In a single-unit installation, when the XW Pro is shut down using the STARTUP/SHUTDOWN button, Xanbus network power is off. When Xanbus network power is off, network-connected accessories such as the Automatic Generator Start (Conext AGS) and gateway device could lose power and stop operating. Solar Charge Controllers continue to operate if Xanbus network power is removed, but they do not continue to communicate with each other.

If the STARTUP/SHUTDOWN button is pressed and held on a XW Pro and a Conext AGS is installed in the system, the unit stops inverting or charging immediately and shuts down completely in 120 seconds. During this time, the display shows OFF. This interval allows the Conext AGS to stop the generator after a cool down period. During the 120 second shutdown time, all network communication is blocked and the unit sends a shutdown command to all other devices in the system. As well, the inverter information panel buttons stop working. The shutdown process cannot be canceled. The XW Pro can only be restarted again once the display is blank.

Multiple-unit installations

If the STARTUP/SHUTDOWN power button is pressed and held on a primary XW Pro and a Conext AGS is installed in the system, the unit stops inverting or charging immediately and turns off completely in 120 seconds. During this time, the display shows OFF. This interval allows the Conext AGS to stop the generator after a cool down period. During the 120 second shutdown time, the primary unit stops network communication and the secondary units issue an external sync fault (F69) or a system configuration fault (F66). As well, the inverter information panel buttons stop working. The shutdown process cannot be cancelled. The XW Pro can only be restarted once the display is blank.

In a multiple-unit installation, when a secondary XW Pro is shut down, other XW Pro units continue to supply Xanbus network power and the Conext AGS and gateway device continue to operate.

Enabling and Disabling the Inverter

To disable the XW Pro inverter when it is in backup mode (Inverting), press both the EQUALIZING and STARTUP/SHUTDOWN buttons simultaneously for a moment. The display will show `dIS`.

To reenble the XW Pro inverter, press both the EQUALIZING and STARTUP/SHUTDOWN buttons simultaneously. The display will momentarily show `En`.

Monitoring Battery Level

When the XW Pro is inverting, the row of five LEDs indicates the approximate available SOC (State of Charge) of the batteries connected to the system. This capacity reading is based on SOC% when there is an external BMS or Conext Battery Monitor installed, or battery voltage if there is no external BMS.

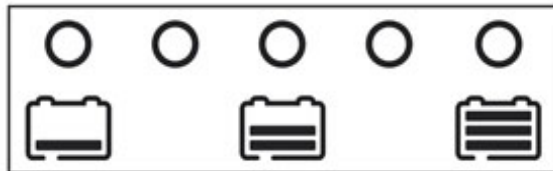
The battery LEDs can retrieve information from various sources depending on the devices installed in the system. SOC information is reported from one of the following devices, listed in order of priority:

1. External BMS/Conext Battery Monitor (if installed)
2. Solar Charge Controller (when operating)
3. XW Pro

When the XW Pro is reporting, there are five battery states from empty to full. When the available battery state is empty, no LEDs are lit. The battery is considered empty when its depth of discharge exceeds approximately 50 per cent. When the battery capacity is low, the two leftmost LEDs are lit. When the battery is at medium capacity, the four leftmost LEDs are lit. When the battery capacity is full, all five LEDs are lit. When the Conext Battery Monitor or Solar Charge Controller devices are reporting, the true SOC will be indicated on the battery level LEDs and all LEDs will be utilized.





NOTE: The battery LEDs are not a precise indicator of battery level. They are to be considered a general guideline rather than an exact measurement. For greatest accuracy, install the Conext Battery Monitor (Part # 865-1080-01) or refer to the external BMS readings, if installed.

Figure 11 Battery Level LEDs



Reading the Display Screen

The numeric display screen shows the following information about the operational state of the XW Pro:

- Output power in kilowatts (when the  =>  (kW) LED is lit).
- Battery charger current in Amps (when the  =>  (A) charging LED is lit).
- Stb when the XW Pro is in Standby mode.
- Sch when the XW Pro is in Search mode.
- OFF when the STARTUP/SHUTDOWN button is pressed and held for five seconds. OFF is displayed briefly before the unit turns off.
- “---” appears when the XW Pro is in transition between modes, when inverter selection is disabled via the gateway device, or operating in AC passthrough mode.
- En appears momentarily when the XW Pro is reenabled.
- dIS appears momentarily when the XW Pro is disabled during backup mode inverting.
- If you have a grid-tied installation, a grid reconnect countdown timer, the time in AC Passthrough before starting the bridge, may appear if there is no other more significant information to display after grid interruption during energy export operation.

Monitoring Operation with a Gateway Device

A gateway device provides remote configuration and monitoring capability for the XW Pro and all other Xanbus-enabled devices in the network via its browser-based web portal. It is the primary and recommended way to monitor operations of all networked devices.

There are three gateway devices that allow you to configure and monitor the XW Pro through a web portal called InsightLocal on a connected PC or laptop. In addition, the InsightCloud option has available any-where-in-the-world cloud-based monitoring.

You can find information about the following available configuration and monitoring gateway devices at <https://se.com/>.

- Conext Gateway: Conext Gateway Owner's Guide (975-0806-01-03)
- InsightHome: InsightHome Owners Guide (990-91410)
- InsightFacility: InsightFacility Owners Guide (990-91411)

Accessing the Device in the InsightLocal Web Portal

Regardless of which gateway device you are using, the InsightLocal web portal is used to gain access to the gateway device user interface. InsightLocal is a web portal that provides an overall view of system performance for residential power monitoring systems. It allows you to monitor and configure your connected devices.

Refer to the Owner's Guide for your gateway device for information on logging in to InsightLocal. If connectivity between system components is working, networked XW Pro units can be accessed by clicking the device icon in the **Dashboard** screen, or its instance under the **Devices** menu.

See the following sections for more information about connecting to InsightLocal to monitor and configure the XW Pro.

Status Page

The XW Pro Status page displays real-time operational data specific to the selected XW Pro instance. Table 2 and Table 3 show all possible states that exist for Inverter Status and Charger Status.

Figure 12 Status page

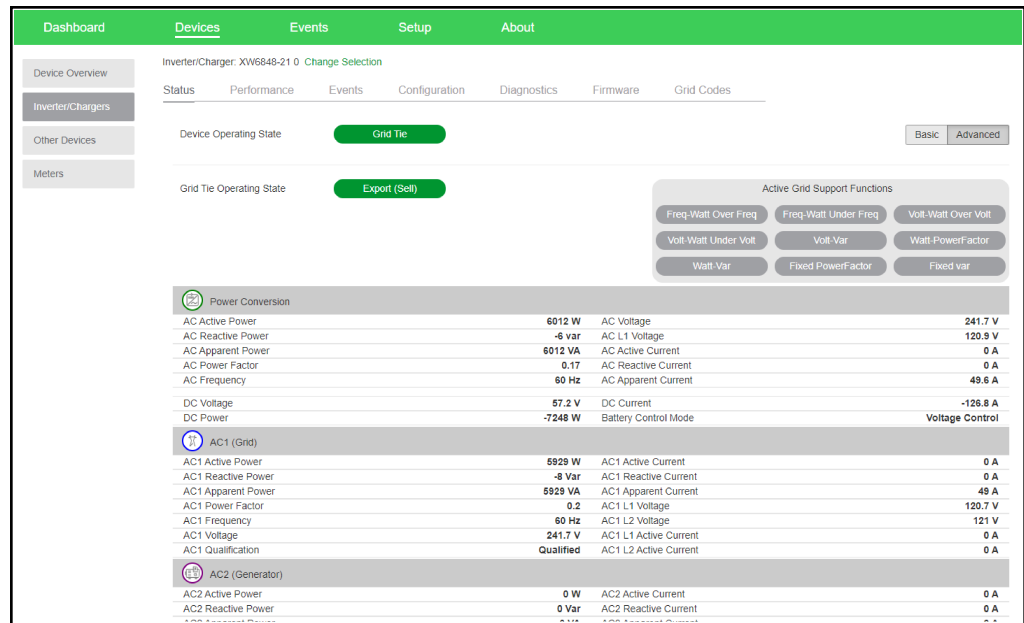


Table 2 Status page inverter states

Status	Displayed when...
Inverting	The XW Pro is supplying power to loads on AC OUT by inverting power from the batteries. AC input from the utility (AC1) or generator (AC2) is absent or out of nominal range.
AC Pass-through	The AC connected to the AC1 or AC2 input is passing directly through the XW Pro to the loads attached to AC Out.
APS only	Battery power is being consumed to power the control circuitry only. During grid outages, the inverter is disabled. To enable the inverter for grid-forming, refer to the Controls submenu in the Configuration menu.
Inverter Disabled	Inverter is disabled or the unit has been placed in standby mode using InsightLocal or the Standby key press (STARTUP/SHUTDOWN and Equalization) on the inverter information panel. To enable the inverter, see "Configuration" on page 55.
Inverter Fault	The XW Pro has an active fault.

Status	Displayed when...
Grid Support	<p>There is AC input from the utility grid on AC1, however the priority for the XW Pro is to supply energy converted from external DC sources to the critical loads on AC Out.</p> <p>The XW Pro enters this state only when Grid Support is set to ON and battery voltage is above the Grid Support Voltage or SOC setting.</p>
Gen Support	<p>There is AC input from the generator on AC2, and the XW Pro is supporting the generator by supplying additional power to the loads attached to AC Out.</p> <p>The XW Pro supports the generator (or other power source connected to the generator [default AC2] input) when the AC load current drawn from the generator exceeds the Generator Support Amps setting for 1 to 2 seconds.</p> <p>The XW Pro uses stored battery energy to load share with the generator until the total AC load current (generator plus XW Pro output) drops by 2 amps plus 10 per cent of the Generator Support Amps setting for 0.5 seconds.</p> <p>For example, if Generator Support Amps is set to 10 amps, the XW Pro starts to support when the load exceeds 10 amps for 2 seconds and stops when it drops more than 3 amps below the Generator Support Amps setting, or 7 amps (2 amps plus 10 per cent of 10 amps = 3 amps).</p> <p>The system can enter this state if the battery voltage is above Low Batt Cut Out +2V and generator support is enabled. Refer to "Configuration" on page 55.</p>
Selling to Grid	<p>The XW Pro is grid-tied and is exporting energy to the utility grid on AC1. Both Grid Support and Sell must be enabled in order to sell power back to the utility. Refer to "Configuration" on page 55. All configurations must comply with local and national electrical codes.</p>
Load Shaving	<p>The XW Pro supports the utility grid when there is AC input on AC1 and the current required to power the loads rises above the Load Shave Amps setting between the Load Shave Start and Load Shave Stop times set on the Grid Support menu. However, AC charging including force charging is disabled during these times. AC charging is enabled when battery voltage falls below [LBCO + 1V], or when battery SOC falls below the SOC LBCO. For an illustration, refer to Figure 17 on page 82.</p> <p>When load shaving, the XW Pro uses stored battery energy to reduce the peak load on the AC1 input by providing the difference between the actual load current and the Load Shave Amps setting. The XW Pro enters this state only when Load Shaving is enabled, the load shave time window is valid and the load draw exceeds the Load Shave Amps setting. The battery voltage must also be between Recharge Volts +0.5 V and the Grid Support Voltage setting or Recharge SOC and Grid Support SOC settings respectively if SOC control is enabled. Refer to "Configuration" on page 55.</p>
AC Coupling	<p>If AC Coupling is enabled, the XW Pro is modulating the incoming power from any AC-coupled PV inverters as needed via frequency-shifting.</p>

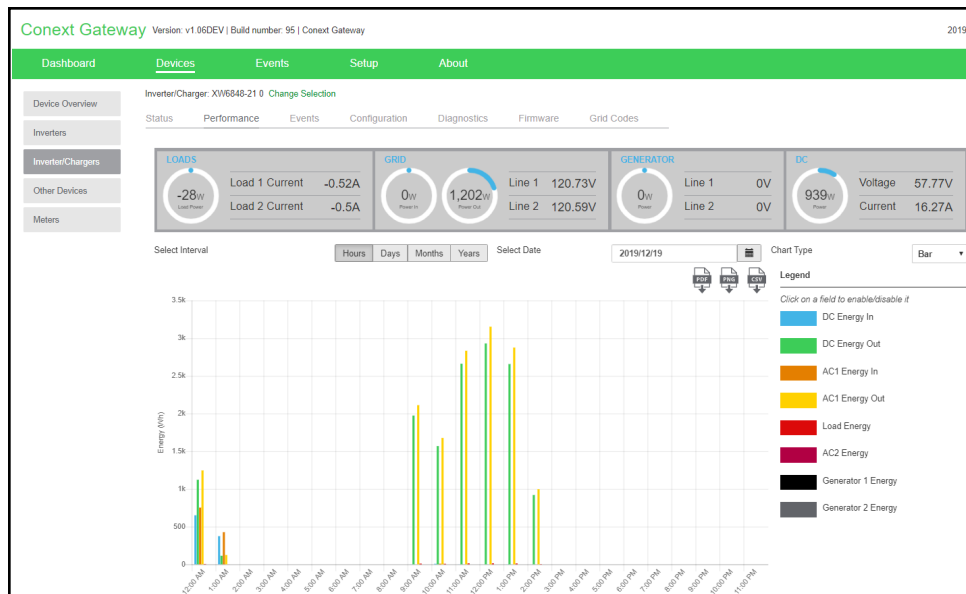
Table 3 Status page charger states

Header 1	Header 2
Absorption Exit Pending	The XW Pro has completed the absorption stage and is waiting for other XW Pro units in the system to complete absorption. This status can occur only when there is another XW Pro also charging the battery.
Bulk	The XW Pro is bulk charging the batteries from qualified AC input from the utility grid (AC1) or a generator (AC2). AC input is also passed through to the load while bulk charging.
Absorption	The XW Pro is absorption charging the batteries from qualified AC input from the utility grid (AC1) or a generator (AC2). AC input is also passed through to the load while absorption charging.
Equalize	Equalization has been turned on and the XW Pro is equalizing the batteries after completing a full charge cycle.
Float	The XW Pro is float charging the batteries from qualified AC input from the utility grid (AC1) or a generator (AC2). The XW Pro is set for three-stage charging. AC input is also passed through to the load while float charging.
Constant Voltage and Current	Charging state when External BMS is selected for Charge Cycle.
Charger Disabled	Charging functionality is disabled. To enable this, refer to "Configuration" on page 55.
Qualifying AC	The XW Pro is determining if AC input on AC1 or AC2 is within a usable voltage and frequency range. Qualifying AC is also displayed when the XW Pro is awaiting application of AC power or a command to enable invert mode.
Qualifying APS	The XW Pro is undergoing a self-test to ensure the power to the control circuitry (Auxiliary Power Supply) is adequate for use.
AC Good	The unit has qualified the input at AC1 or AC2 as within a usable voltage and frequency range.
APS Good	The unit has qualified the Auxiliary Power Supply.
AC Fault	The unit has encountered a fault. The fault description is displayed in the Status or Events menus along with suggested remedies. To clear the fault, refer to the Controls submenu in the Configuration menu.
Charge	The XW Pro is charging the batteries from qualified AC input from the utility grid (AC1) or a generator (AC2). The charge state is in transition to either bulk, absorption, float, or equalize. AC input is also passed through to the load while charging.
Ground Fault	A ground fault has been detected by the system.

Performance Page

The Performance page provides a more graphical dashboard-type interface of energy and power flow through the system, as well as the ability to plot historical incoming/outgoing energy and to export the data into various file formats.

Figure 13 Performance Page



Events Page

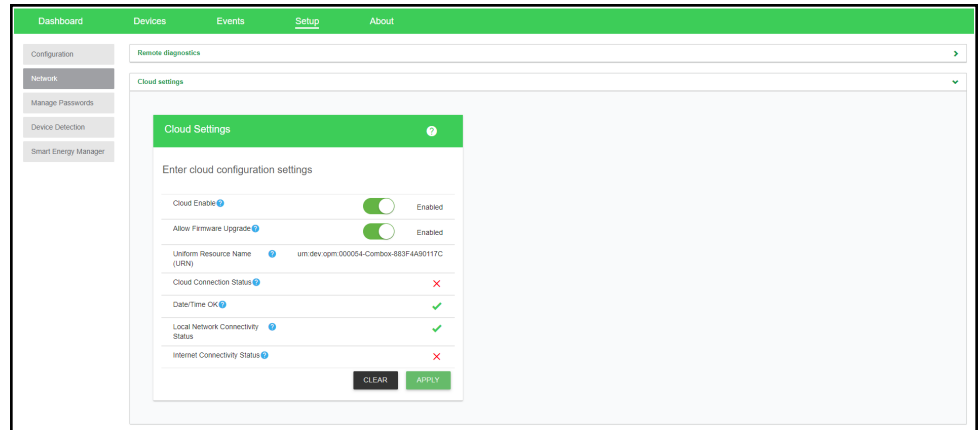
The Events page displays all active faults and warnings and maintains a record of all that has occurred in the past until it is cleared. To clear logged Events, refer to the **Configuration** menu for the XW Pro device instance in InsightLocal, under the **Controls** submenu.

InsightCloud

To use InsightCloud for remote monitoring and configuration, you must configure the Cloud connection for your XW Pro (an Internet connection is required). The **Cloud settings** screen can be used to enable and check your Cloud connectivity. The Cloud is disabled by default.

To configure the Cloud connection for your XW Pro:

1. Go to **Setup > Network > Cloud settings**.
2. Beside “Cloud enable”, toggle the switch to **Enable**.

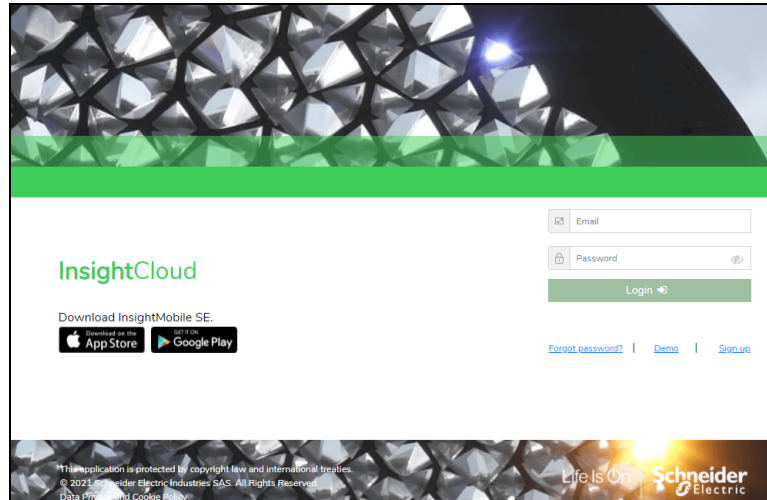


3. If you are setting up the XW Pro on your home network, a proxy is likely not required. However, if you are using a corporate, or other externally managed network, then proxy settings may be required. To use proxy settings:
 - a. Enter the proxy URL and port number.
 - b. If required, enter the proxy username and password.
 - c. Set “Proxy enable” to **Enable**.
4. Click **Apply**.

Once the XW Pro is connected to the Cloud, the “Cloud connection status” indicator will change from red to green, and the “Number of transmitted messages” will start to increase. You can also check the “Last data transfer time from cloud” to check the last time your XW Pro sent a message to the Cloud. This information can be used to troubleshoot connectivity issues.

Create an InsightCloud account:

1. To sign up for an InsightCloud account, go to: <https://www.insightcloud.se.com/#/signup>
2. Once you've received a confirmation email, go to <https://www.insightcloud.se.com> and sign in.



3. To create a site: From the home screen, click **Create Site**, or go to **Configuration > Sites And Devices** and click **Create Site**.

SiteName	Connectivity	Last Data Refresh	Today Export to Grid (kWh)	Today Solar Production (kWh)	Batt. Voltage (V)	Batt. SoC (%)	Alarms / Warnings	Generator	Grid	Gateway Firmware Version	Weather
DemoSite-1	Online	08/10/2021 06:20 PM	1454.19	1454.17	-	-	0 Alarm / 0 Warning	No Generator	ON	v1.11	☀️
DemoSite-2	Online	08/10/2021 09:40 PM	0	24.18	50	100	0 Alarm / 0 Warning	No Generator	ON	-	☁️
DemoSite-3	Online	08/10/2021 09:46 PM	32.3	101.83	50	100	0 Alarm / 0 Warning	Not running	ON	-	☁️
DemoSite-4	Online	08/10/2021 09:44 PM	9.5	55.06	50	100	0 Alarm / 0 Warning	Not running	OFF	-	☁️
DemoSite-6	Disconnected	-	-	-	-	-	-	-	-	-	-
DemoSite-5	Online	08/10/2021 09:44 PM	147.05	347.58	50	96	0 Alarm / 0 Warning	Not running	ON	-	☀️

4. Fill in all of the mandatory fields, following the instructions on screen, and then click **Creat Site**.

Initial Setup with a Gateway Device

To use the gateway device for remote monitoring and configuration, you must first configure the Cloud connection for your XW Pro inverter/charger:

1. Log in to the gateway device.
2. Go to **Setup > Network > Cloud settings**.
3. Click **Apply**.

3 External Monitoring Control

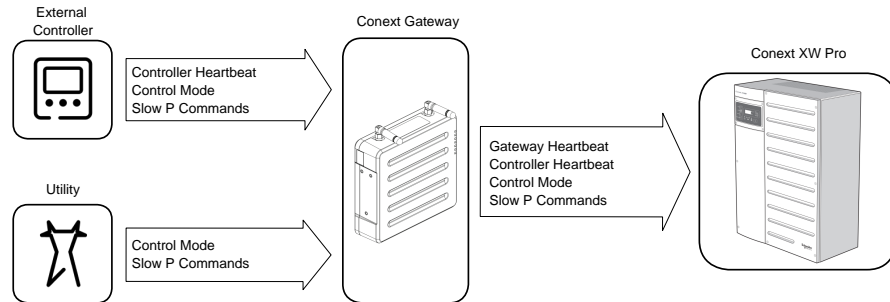
What's in This Chapter?

Overview	52
SunSpec Modbus	52
Power Limiting	52
Communications Loss	53
IEEE2030.5	53

Overview

The XW Pro digital communications interface with the gateway device supports commands from external equipment to control power output and operational modes, which allows support for industry-accepted communication standards SunSpec Modbus and IEEE2030.5.

Figure 14 SunSpec Configuration



SunSpec Modbus

The XW Pro supports the following data models from the SunSpec Modbus specification via the gateway device.

SunSpec Model Name	Description
Model 1	Equipment Identification
Model 102	Split-Phase Inverter Monitoring
Model 121	Basic Settings
Model 123	Immediate Controls
Model 124	Storage Controls
Model 20001	Inverter Custom Model

Power Limiting

Externally-controlled power limits are applied at the AC transformer at the inverter output prior to connecting with the AC bus. During Selling, XW Pro arbitrates between all sources of power limitation, including externally-controlled limits, by taking the minimum. If the system receives a lower power request than what is currently in effect, the XW Pro will control power flow to the new limit.

Similarly, during Peak Load Shaving, the lower of Load Shave Amps and the externally-controlled limit minus the load power is taken.

Communications Loss

Communications with the SunSpec Controller is continuously monitored. When a communications loss with either the gateway device or the SunSpec Controller is detected, the XW Pro supports the following configurable responses via a datapoint in Model 20001. This setting cannot be set in InsightLocal.

Fallback Action	Datapoint Value	Description
Heartbeat Disabled	0 (default)	Commands revert to default until communication is re-established. A warning will not appear.
Do Nothing	1	Continue with the last received set of control parameters. A warning will appear.
Autonomous Operation	2	Commands revert to default until communication is re-established. A warning will appear.
AC Passthrough	3	XW Pro transitions to AC Passthrough mode. A warning will appear.

IEEE2030.5

The XW Pro is IEEE2030.5-certified when connected to the gateway device and External Monitoring & Control is done by client-server communication type. This includes California Rule Phase 3 Functions 1, 2, 3 and 8:

Phase 3 Function 1	Monitor Key DER Data <ul style="list-style-type: none"> ▪ Reactive power (Vars) ▪ Phase voltage ▪ Frequency ▪ Energy storage state of charge (%) ▪ Operational state
Phase 3 Function 2	DER Disconnect and Reconnect Command
Phase 3 Function 3	Limit Maximum Active Power Mode
Phase 3 Function 8	Scheduling Power Values and Modes <ul style="list-style-type: none"> ▪ Volt-Var curve control ▪ Fixed power factor control ▪ Volt-Watt curve control

4 Configuration

What's in This Chapter?

Initial Setup with gateway device	57
Changing Settings	57
XW Pro Configuration Page	57
Controls Settings	58
Backup Mode Settings	60
Charger Settings	62
Battery Settings	72
AC Settings	75
AC1 (Grid) Settings	76
AC2 (Generator) Settings	78
Grid Energy Management (Grid Support) Settings	80
Generator Support Settings	83
Auxiliary Relay Settings	85
Trigger Source Descriptions	86
Power Control Settings	88
Multi-Unit Configuration Settings	88
External Contactor Settings	90
Associations Settings	90
Battery Management System Settings	93
Advanced Features	95
Modbus Settings	96
Advanced Device Settings	96
Device Identification	96
Managing Energy Sources with Advanced Features	98
Grid Support	98
Charger Block	100
Peak Load Shaving (PLS)	102
Updating Firmware	103

Managing Compliance Regions106

Changing Connected Device Settings 108

Power Control System Mode (PCS) 109

 Modbus TCP Settings113

Connecting and Configuring Modbus Devices 113

Removing a Modbus Device 114

Resetting the XW Pro to Default Settings 116

Initial Setup with gateway device

NOTE: Your Xanbus devices should still be in standby mode.

NOTE: A gateway device (see options below) is required for operating, monitoring, and configuring the XW Pro inverter.

When you initially log in to the InsightLocal web portal, most of the setup information appears automatically with the default values. Some information must be changed (such as passwords), some information can be modified as needed, and some information can only be modified by a qualified IT professional.

The following items are part of the gateway device configuration process. You can find information about the following available configuration and monitoring gateway devices at <https://se.com/>.

- Conext Gateway: Conext Gateway Owner's Guide (975-0806-01-03)
- InsightHome: InsightHome Owners Guide (990-91410)
- InsightFacility: InsightFacility Owners Guide (990-91411)

Changing Settings

To change site settings:

1. In the main menu bar, click **Setup > Configuration**.
The **Configuration** settings appear in the main display area.
2. Click any of the following settings:
 - Site Settings
 - Time setup
 - Import & export settings
 - Units
 - Modbus settings
 - Restart gateway
 - Firmware Upgrade (see "Updating Firmware" on page 103)
 - Region Settings (see "Managing Compliance Regions" on page 106)
 - Power control system mode (see "Power Control System Mode (PCS)" on page 109)
3. With only a few exceptions, you may save a setting by clicking **Apply** or ignore changes by clicking **Cancel**.
That portion of the window expands to display the change options for that setting.
The size and content of the expanded window varies depending on the setting type.

XW Pro Configuration Page

The XW Pro device's configurable operating parameters can be found on gateway device under **Devices** (or by clicking the inverter icon from the main dashboard) > **XW Pro > Configuration**. This document also covers the additional parameters available in the **Advanced** view.

⚠ WARNING
RISK OF INJURY OR EQUIPMENT DAMAGE
<ul style="list-style-type: none"> ▪ Advanced menu settings should be used by qualified personnel only. ▪ Consult with the local utility before enabling XW Pro sell mode or grid support functions. ▪ Do not change these settings unless you are under the supervision and direction of qualified personnel.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

To change Advanced settings (qualified personnel only):

1. In the main menu bar in gateway device, click **Devices** and then select Inverter/Charger from the left menu.
2. Click the inverter that you want to configure.
3. On the inverter page, select **Configuration** and then click **Advanced**.
4. Apply the new settings and then click **Apply**.

Controls Settings

The **Controls** menu provides the high-level controls that are expected to be used often.

Table 4 Controls Settings Menu

Item	Description
Operating Mode	Places the XW Pro into Standby or Operating mode.
Reset	Allows the user to reboot the system, reset user settings to factory, or revert all configuration parameters to factory defaults.
Clear	Allows the user to clear active or logged faults and warnings, and other logged statistics.
Backup Mode (Inverter Enable/Disable)	Enable or disable grid-forming functionality.

Sell Enable/Disable	<p>Enables or disables grid export (sell) mode. Unless an external BMS is utilized and Charge Cycle is set accordingly, to allow grid support to function after battery charging has completed, it is recommended to set the Charge Cycle to 2- Stage. The MPPT controllers must still be set to 3-stage. When using closed-loop, the Charge Cycle must be set to Ext_ BMS.</p> <p>When using a Discover battery, set the battery type to Custom, and set the Charge Cycle to 3-stage.</p> <p>When using load shave, turning ON Sell and setting Maximum Export (Sell) Amps to 0.0 is a way to make the net power flow to the grid zero. If sell is not enabled, there will be a net purchase of as much as 2.0 - 3.0 kWh per day due to the current control loop not allowing any outgoing current. If you wish to further reduce grid draw using this function, enable sell mode even if you do not wish to export power and set Maximum Export (Sell) Amps to a value of 0.</p>
Charger Enable/Disable	Enable or disable the charger.
Advanced Controls Settings	
Force Charger State	<p>Manually changes the charge stage to either bulk or float (when 3- Stage cycle is selected), bulk or no float (when 2-Stage cycle is selected), or Constant Voltage and Current (when Lithium-Ion is selected).</p> <p>This command has no effect if load shaving is enabled or if the charge cycle is set to Ext_ BMS. For more information, see Load Shave Mode on page 82.</p>
Auxiliary Output Control	Sets the state of the auxiliary output. Manual On or Manual Off allow manual control of the auxiliary output. When set to Automatic, a trigger source can then be selected.

For defaults, see "Default Settings" on page 192.

Backup Mode Settings

The **Backup Mode Settings** menu contains settings that control when the XW Pro starts and stops producing AC output.

Table 5 Backup Mode Settings Menu

Item	Description
AC Coupling	AC Coupling function is enabled by default and should remain enabled except in cases where the DC voltage level is allowed to have large variations and the AC line frequency needs to remain constant.
Search Mode Enable/Disable	Enable or disable Search Mode.
Advanced Controls Settings	
AC PV Charge SOC Limit ¹	The SOC upper limit during grid forming when AC coupled PV inverters are equipped. Below this level, excess power from the PV inverters would charge the battery. As the actual SOC approaches this level, the XW Pro will shift the grid forming frequency to moderate the PV inverter output power as to prevent further charging of the battery. Takes effect when SOC Control is enabled.
Maximum Search Watts	Maximum Search Watts sets search sensitivity for the XW Pro when search mode is enabled. When a load larger than this setting is present on AC OUT, the inverter starts producing AC output from battery power. Enabling search mode from the same menu can minimize power draw from the battery during periods of low demand from loads. Note that energy-efficient light bulbs may not provide enough power to wake the inverter from Search mode.
Search Delay	Search Delay sets the time between search pulses. When searching for loads, the XW Pro sends out search pulses on AC OUT to determine the presence of a load above Search Watts. XW Pro power draw while in search mode decreases when Search Delay is increased, but the XW Pro response time to active loads is slower.

For defaults, see "Default Settings" on page 192.

¹A battery monitor or external BMS is required for this feature.

Using Search Mode

Why use Search Mode?

Search mode allows the inverter to selectively power only items that draw more than a certain amount of power, which can result in energy savings. The XW Pro has a no-load power draw of about 28 watts. Enabling search mode reduces this power draw to less than 8 watts.

When the XW Pro has search mode enabled, the inverter sends electrical search pulses through its AC output. These search pulses look for connected AC loads. The delay between search pulses is set using the `Search Delay` setting. After a load larger than the `Search Watts` setting is detected, the inverter starts producing AC output.

When to Set up Search Mode

The search mode feature is only valuable if the inverter can spend a fair amount of time “sleeping” each day. Therefore, if search mode is to be used it must be adjusted properly. The initial adjustment should be made so that the XW Pro comes on only when needed.

Certain types of loads can cause search mode to work improperly. These types of loads are described in "Problem Loads" on page 119. If these kinds of loads are in the system, follow the suggestions given to resolve the problem.

If the problem loads cannot be resolved, there are two workaround solutions:

- Disable `Search Mode` from the **Backup Mode Settings** menu, causing the inverter to remain at full output voltage.
- Use a search friendly companion load whose only purpose is to be switched on to wake up the inverter to power the load that is unable to bring the inverter out of search mode.

NOTE: Search mode, by function, cannot work with clocks and timers or devices that need power 24 hours a day. Examples of devices with timers include video recorders, coffee makers with brew timers, refrigerators, and freezers with defrost timers. Examples of devices that need power 24 hours a day include telephone answering machines, alarm systems, motion detection lights, and some thermostats.

When the inverter is searching the output for loads, lights that have a wattage lower than this setting may flash momentarily.

Charger Settings

The **Charger Settings** menu provides options for configuring the XW Pro to operate from your battery bank.

Table 6 Charger Settings Menu

Item	Description
Recharge Voltage	When charger is set for 2-stage operation, sets the battery voltage level at which a new charge cycle begins. Recharge Voltage is automatically temperature compensated to be consistent with the charge voltage (also temperature compensated).
Recharge SOC ¹	Sets the SOC at or under which the XW Pro will terminate any discharging activity and begin to charge the battery if a qualified AC source is available. Takes effect only when SOC Control is enabled (under the Battery Settings menu).
Advanced Charger Settings	
Recharge SOC Delay	Sets the time delay after which the XW Pro will begin to charge the battery when SOC falls below the Recharge SOC, if a qualified AC source is available.
Charge Block Start	Sets the time to halt charging on AC1 (Grid). The charger block start and stop settings allow you to select when the charger stops charging on AC1. To disable the charger block function, set Charge Block Start and Charge Block Stop to the same time. NOTE: In the event that Charge Block is enabled and AC priority is set to AC1, the battery will not be charged from AC2 whenever grid is present on AC1. To rectify this, you will need to change the AC priority to AC2.
Charge Block Stop	Sets the time that charging on AC1 can resume. At the Charge Block Stop time, charging on AC1 is enabled again.

Battery Charger Functions

When AC power is available, the XW Pro can operate as a battery charger. Different battery types and chemistries require different charging voltage levels. Not charging batteries at the required levels can shorten battery life or damage the batteries. The XW Pro is configured at the factory to work with the battery types recommended for inverter applications. If the default settings do not work for your specific installation, you can adjust the charge stage settings (as recommended by the battery manufacturer) by setting the Battery Type to Custom.

NOTE: This information is provided for guidance only. Variations in battery chemistry and site-specific environmental considerations mean that you should consult your system designer or battery manufacturer for specific recommendations for appropriate battery voltage and current settings.

¹A battery monitor or external BMS is required for this feature.

Battery Monitoring

The following table illustrates how to configure the XW Pro for the available battery monitoring methods.

	No External Battery Monitoring	Conext Battery Monitor	External Battery Management System (BMS)
Battery Type	Any ¹	Any	Li-ion
Charge Cycle	2-stage or 3-stage	2-stage or 3-stage	External BMS
State of Charge Control	Disabled	Enabled	Enabled

Without any external battery monitoring, XW Pro operational state transitions, charge control, and AC coupling functions are completely based upon the measured battery voltage.

NOTE: To improve the performance of the battery in a 2-stage or 3-stage charge cycle, be sure to set the Bulk/Boost Voltage Set Point, Absorption Voltage Set Point, and the Float Voltage Set Point (only in 3-stage charge cycle) to match the battery manufacturer's specifications.

⚠ WARNING
RISK OF FIRE DUE TO INCORRECT VOLTAGE
Do not set the Bulk/Boost Voltage Set Point, Absorption Voltage Set Point, and the Float Voltage Set Point to values higher than what is specified by the manufacturer. Contact the battery manufacturer, if needed, to confirm voltage specifications.
Failure to follow these instructions can result in poor battery performance and/or the battery catching fire.

The Conext Battery Monitor is a dedicated piece of hardware that determines the battery bank state of charge, and shares this information with other devices on the same Xanbus network. With the Conext Battery Monitor installed, enabling State of Charge Control is recommended. State transitions will be based on the reported State of Charge and will utilize the corresponding SOC threshold settings. Charge control will be based on SOC and/or battery voltage in 2-stage charge, and battery voltage in 3-stage charge.²

Typically installed with lithium-ion battery packs, external battery monitoring systems take on a more extensive role in monitoring the battery and ensuring it does not operate outside of its safe parameters. When Charge Cycle is set to External BMS, charge control on the XW Pro will be based on the SOC readings from the BMS and will utilize the corresponding SOC threshold settings.

¹ When using Lithium-Ion, the flat voltage profile introduces difficulty in precisely monitoring state of charge. A BMS or Conext Battery Monitor is highly recommended in these applications.

² With float current regulation by SOC before 100% SOC.

Multi-Unit Charger Settings

NOTICE

DAMAGE FROM HAVING DIFFERENT CHARGER SETTINGS

- Make sure that all XW Pro units in the multi-unit setup have the same Charger Settings. For example, if one unit has a Battery Type of Flooded, all XW Pro units **must have** the same Battery Type.
- Make sure that all Xanbus devices in the same network, such as connected MPPT solar charge controllers and the Battery Monitor, have the same Charger settings. Refer to each device's owner's guide for information on how to change the charger settings.

Failure to follow these instructions can result in battery damage.

NOTE: Make sure that every XW Pro unit in the multi-unit configuration is set to `Charger = Enabled` under the `Controls` menu for each inverter.

Multi-Stage Charging Process

The charging cycle is a multi-stage process. Whenever qualified AC power is present at the AC1 or AC2 input, power runs through to the connected load and begins charging the batteries in parallel.

Bulk Stage

Bulk charge is the first stage in the charging process and provides the batteries with a controlled, constant current. Once the battery voltage rises to the `Bulk/Boost Voltage Setpoint`, the charger switches to the absorption stage.

Absorption Stage

During the absorption stage, the XW Pro begins operating in constant voltage mode and the DC charge current falls gradually as energy is returned to the battery. For the first 60 minutes of the absorption stage, the XW Pro regulates the battery voltage at the `Bulk/Boost Voltage Set Point` setting. The voltage limit used for the remaining time in this stage is the `Absorption Voltage Set Point` setting. By default, the bulk and absorption voltage settings are the same for each battery type. The voltage limit settings for bulk and absorption can be adjusted independently if the battery type is set to `Custom`. The XW Pro transitions to the float stage if either one of the following two conditions are met:

The charge current allowed by the batteries falls below the exit current threshold, which is equal to 2% of the programmed battery capacity (for a 500 Ah battery bank, this would be 10 A), for three minutes.

The XW Pro has been in absorption for the programmed maximum absorption time limit. The default is 3 hours, but the time limit is programmable from 1 minute to 8 hours. The timer begins when the battery voltage is above the `Absorption Voltage Setpoint` for three minutes.

NOTE: If there are DC loads on the batteries, the charger's current may not decrease to a level to transition to the next stage of charging. In this case, the charger stays in absorption until the `Absorption Time` setting is reached.

To avoid having the charger remain in absorption for too long, adjust `Absorption Time` on the **Battery Settings** menu. The timer begins at the start of the absorption stage and terminates absorption charging if the charge current does not decrease to below 2 per cent of the battery capacity before the `Absorption Time` setting expires. The `Absorption Time` setting may be increased if the charge cycle continually runs the complete `Absorption Time` in the absence of DC loads. This is an indication of too large a battery bank for the selected `Absorption Time` setting.

Boost Charging

- Boost charging allows for better utilization of flooded lead acid batteries under moderate cycling in off-grid or grid support applications. Boost charging encourages a short duration charging voltage—above the gassing voltage—at the beginning of the absorption charge state. Testing has shown that boost charging improves battery performance by providing a regular mixing of the liquid electrolyte. Boost charging specifically discourages capacity robbing acid stratification and plate sulfation.
- Boost mode charging can be enabled by selecting the Custom battery type and by setting the Bulk/Boost Voltage Set Point higher than the absorption voltage. The multi-stage charge algorithm then attempts to use the higher voltage for the first hour of the absorption stage, unless it is interrupted by the max absorption timer or exit current threshold.
- Boost charging encourages gassing of flooded lead acid batteries.
- Boost charging is NOT recommended for AGM, GEL, some types of Li-ion, or any other electrolyte-limited and/or valve-regulated sealed battery application.
- Boost charging may result in higher than normal water consumption. However, the benefits of boost charging are likely to be greater than the extra watering effort. Check battery water levels at least once per month.
- Boost charging has maximum benefit when used on batteries that experience moderate cycling. An unoccupied cottage, for example, where batteries are full the majority of the time may not benefit from boost charging, especially if battery watering is difficult.
- For equalize charging, a custom Boost charge profile can be configured if the equalize method is not periodically used. Boost charging occurs in the first hour of the absorption stage. It allows for a higher constant voltage than absorption voltage to encourage a “mini equalize” each time the battery is charged.
- The boost voltage is defined by the Bulk/Boost Voltage Set Point setting. The Conext system will still allow manual equalize charging when the boost absorption voltage is implemented. This is for advanced users only who pay strict attention to battery maintenance and have an appropriately vented and protected battery installation. Consult your battery manufacturer for appropriate voltages.

Float Stage

Float charge maintains the batteries slightly above the self discharge voltage of the batteries. The charge current in float is the current necessary to maintain the batteries at the `Float Voltage` setting, limited only by the inverter's capability or other settings that limit the inverter's maximum charge rate. Float charging reduces battery gassing, minimizes watering requirements (for flooded batteries), and helps the batteries remain in a constant state of readiness. When three-stage charging is selected, the charger automatically switches to the float stage after the batteries have received a bulk and absorption charge. The batteries are maintained at the default float voltage level for the selected battery type or the voltage selected under `Float Voltage Set Point` on the **Battery Settings** menu.

NOTE: The battery voltage can increase above the float voltage when using an external charging device such as charge controllers attached to PV arrays or wind turbines, and micro-hydro generators. Be sure to include appropriate charge management equipment with all external DC sources.

Three-Stage Charge Cycle

The three-stage charge mode includes bulk, absorption and float stages described above. The three-stage charge mode is not used with generators or grid-tied systems where grid support features are used.

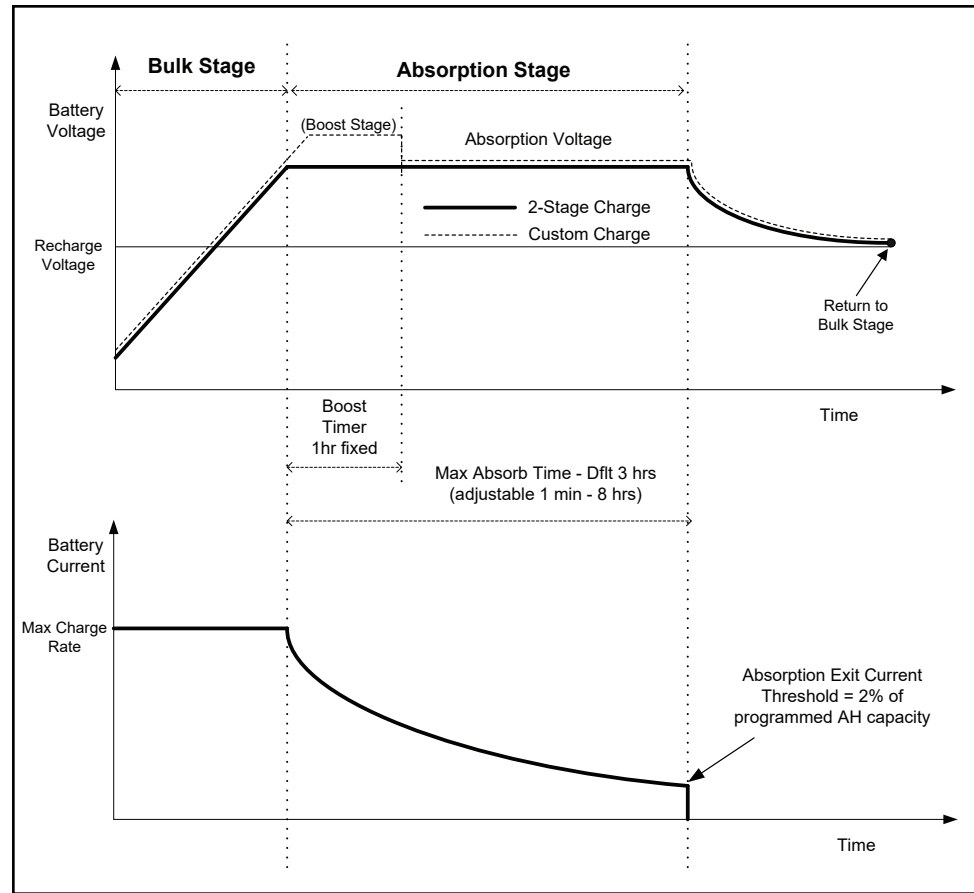
Two-Stage

Two-stage (or no float) mode differs from an ordinary three-stage charge mode in that it does not continuously maintain the battery at float voltage. Instead, the XW Pro begins charging the battery in bulk mode whenever the battery voltage drops below the recharge level. While the battery voltage is above the recharge level the inverter's AC transfer relay continues to pass through power from the utility grid to the loads, but does not actively charge the batteries.

Two-stage mode increases efficiency of utility connected systems by reducing the amount of power consumed by the inverter and batteries compared to when the battery is continuously maintained at `Float Voltage`. This feature can extend the life of many batteries.

Unless an external BMS is installed and `Charge Cycle` is set to `External BMS`, to allow grid support and sell mode to function after battery charging has completed, it is recommended to set `Charge Cycle` to `2-stage`.

Figure 15 Two-Stage Charging Cycle



Charge Cycle Notes

- When the charge cycle is interrupted, the charger will restart charging at the beginning of the multi-stage algorithm.
- If the AC input stops or drops below the lower VAC limit (as set in *AC Settings*), the complete multi-stage charge cycle (bulk, absorption, float/no float) restarts once the source AC recovers to within the acceptable range.
- Exit Current Threshold can be effectively disabled by programming the amp-hour capacity to 0. In this case, absorption will only exit once the Max Absorption timer expires.
- Charge current during equalize state (optional state not shown here) is normally limited to 10% of the programmed amp-hour capacity setting. If this setting is programmed to 0 Ah, the charge current during equalize is instead limited to whatever is programmed for the maximum current limit of the unit (the default current limit in equalize mode is 60 A).
- Synchronized charge states are active when more than one charging device (XW Pro or Solar Charge Controller) is connected in the system via the Xanbus network.
- The first XW Pro or Solar Charge Controller to enter bulk, causes the other chargers to enter bulk.
- The first XW Pro to enter absorption causes the other chargers to enter absorption.
- The last XW Pro ready to exit absorption triggers the rest to exit absorption and exit charge. The XW Pro will not wait for any connected Solar Charge Controllers to transition to absorption or float.

Equalize Charging

Many flooded lead acid battery manufacturers recommend periodic equalize charging to counter cell charge imbalance and capacity robbing sulphation. Equalizing helps to improve battery performance and lifespan by encouraging more of the battery material to become active.

Battery equalization is a controlled overcharging method that reduces sulphation and mixes up stratified electrolyte and reactivates unused areas of the plate material. Periodic equalizing can help to regularly restore flooded lead acid batteries to a healthy state of charge.

Consult the battery manufacturer's recommendation for equalize charging settings. Sealed lead acid, gel, and AGM batteries should not be equalized unless recommended by the battery manufacturer. Consult the battery manufacturer for optimal charging procedures when using sealed batteries.

When `Equalize` mode is enabled, the battery is charged from bulk to absorption, and then to the equalize phase. The XW Pro will transition from the absorption phase to equalize if:

- The DC charge current is below 2% of the configured battery capacity (for example, 8.8 A for 440 Ah).
- The absorption time is exceeded (for example, 180 minutes).

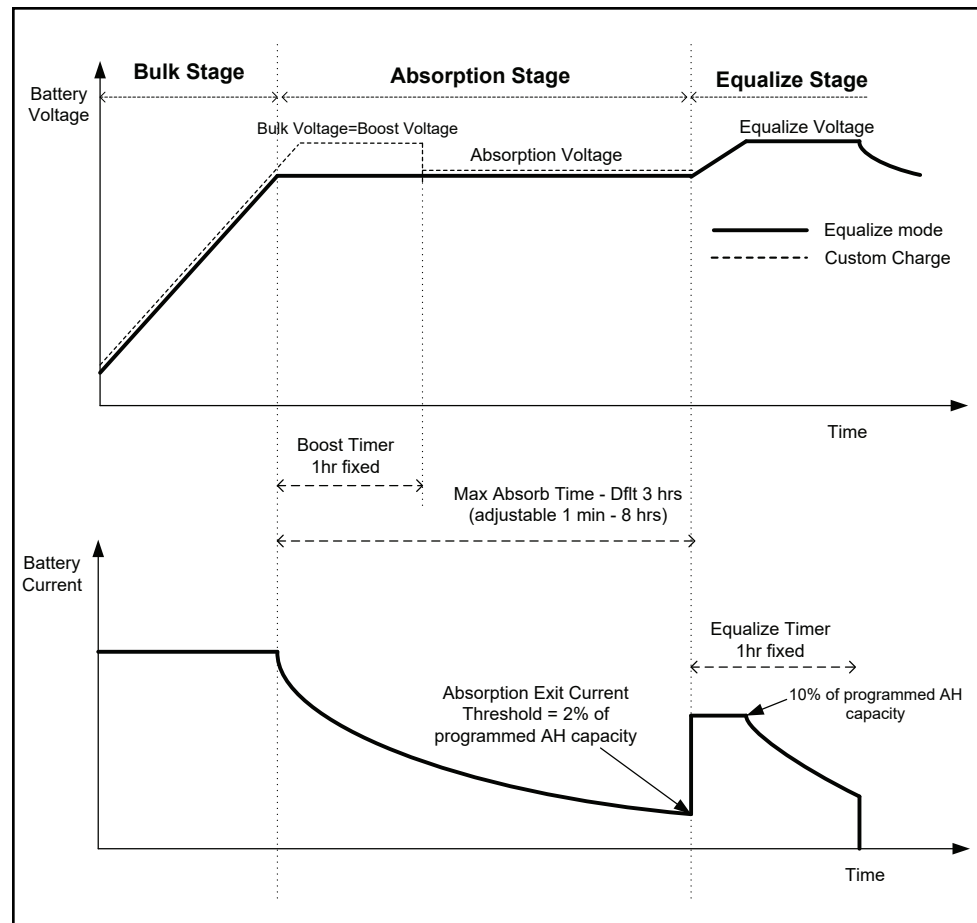
After absorption, the maximum charge DC current is set to 10% of battery capacity (for example, 44 A for 440 Ah). This constant current charge will continue until the voltage has increased to the equalize voltage at which point the battery will be regulated at the temperature compensated equalize voltage.

If the battery capacity is set to zero, the equalize charge current is fixed at maximum 44 A (Ah=0 effectively disables the exit current criteria for the absorption charge stage, making the absorption stage defined by time only).

Equalization duration is fixed at one hour in total.

NOTE: The graphs below apply only to flooded battery types.

Figure 16 Equalize Charging Grid-tie Sell Mode



Equalization Procedure

To start equalizing the batteries, do one of the following:

- In InsightLocal:
 1. Click Devices and select the XW Pro Inverter.
 2. Got to the Configuration tab and then click the **Battery Settings** menu.
 3. Toggle the `Equalize Now` toggle switch to `Enabled`.
- Press the `Equalize` button on the inverter information panel for five seconds.

If the XW Pro will not perform the equalization, see Warning W96 “Cannot Equalize” in Table 4 on page 1.

WARNING

EQUALIZATION HAZARD

Only flooded lead acid batteries should be equalize charged. Hydrogen and oxygen gases are produced when batteries are equalized and can potentially cause an explosion if ignited.

Corrosive battery acid can escape.

- Provide adequate ventilation and remove all sources of ignition, such as open flames, sparks, electric motors, relays, light switches, etc.
- Equalization voltage is significantly higher than nominal battery voltage. Detach electronics that can be damaged by high DC voltage.

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

NOTE: In a system where more than one device is capable of equalizing batteries (such as a system including multiple XW Pro units and Solar Charge Controllers, there is no system-wide equalization command for all devices. To equalize with multiple devices, each would have to be enabled individually. Alternatively, equalization can be performed using only one device. During the equalization process, one device applies the equalization charge while the other devices continue to operate in synchronized charge mode, typically in float (three-stage charging) or no-float (two-stage charging).

Battery Settings

The **Battery Settings** menu contains settings for the connected battery bank. See **Charger Settings** on page 62 for more information.

⚠ WARNING	
BATTERY TYPE AND SETUP HAZARDS	
<ul style="list-style-type: none"> ▪ Incorrect battery configurations or settings for battery types can lead to dangerously high battery temperature, fire and explosion. To avoid damaging your batteries during charging or equalization, and to minimize the risk of fire or explosion consult battery manufacturer's documentation before setting battery parameters and follow the battery manufacturer's recommended settings. ▪ The battery must be sized at a minimum to safely accept the combined charge current from all sources in the system, and the discharge current of all connected loads. Consult the manufacturer for the recommended charge/discharge limits of the selected battery. The <i>Maximum Charge Rate</i> of the XW Pro must also be configured if the battery recommended charge current is less than the XW Pro rating. Refer to the <i>Charger Settings Menu</i> table in Charger Settings on page 62 for information about this setting. ▪ If the inverter is reset to factory defaults, ensure the correct battery settings are re-applied. ▪ Always use and connect the Battery Temperature Sensor (BTS), unless an external BMS fulfilling this function is installed. Confirm with the battery manufacturer when using our BTS with lithium or other advanced-chemistry batteries. Also, confirm with the battery manufacturer what the temperature compensation setting should be when the BTS is installed. ▪ Always verify that the configured battery type matches the battery type being used. ▪ Custom battery settings should be configured by qualified personnel only. ▪ When using Lithium-Ion batteries, ensure that the battery pack being used includes a certified Battery Management System (BMS) with safety controls. Refer to <i>XW Pro Li-Ion Battery Solution Guide (document number 990-6359)</i> for additional information. 	
Failure to follow these instructions can result in death, serious injury, or equipment damage.	

Table 7 Battery Settings Menu

Item	Description
Battery Type	Sets the system battery chemistry and type: Flooded (default), AGM, Gel, Lithium-Ion, and Custom.
Charge Cycle	Sets the charging method: 3-Stage (bulk, absorption, float), 2-Stage (bulk, absorption, no float), or External BMS. Unless an external BMS is used and <i>Charge Cycle</i> is set accordingly to allow grid support to function after battery charging has completed, it is recommended to set the <i>Charge Cycle</i> to 2-Stage. The MPPT controllers must still be set to 3-Stage.

Item	Description
SOC Control Enable	Enables state transitions and charge management based on State of Charge (SOC) information (if disabled, the inverter works in voltage-based control). Requires a compatible BMS or Conext Battery Monitor.
Battery Bank Capacity	Battery capacity in Ah (amp hours). This settings impacts one of the possible battery charging exit conditions: when charge current drops below 2% of the Battery Bank Capacity for 3 min. NOTE: Setting the Battery Bank Capacity to 0 resets the absorb charging current to its default values and implies that the absorption current exit condition is not used.
Maximum Charge Rate	<p>Sets the percentage of the maximum DC output current that is available to the charger. The maximum DC output current is:</p> <ul style="list-style-type: none"> ▪ XW Pro 6848 NA—140 A <p>If multiple XW Pros are charging the same battery bank, set each inverter's Maximum Charge Rate to 1/n of the desired charge rate (where n is the number of inverter/chargers).</p> <p>Always refer to the battery manufacturer's specifications before setting the Maximum Charge Rate. Do not set the Maximum Charge Rate above these specifications.</p>
Advanced Battery Settings	
Default Battery Temperature	Selects the battery temperature charging compensation if a battery temperature sensor is not installed. In the absence of a battery temperature sensor, the charger uses one of three settings: Cool (5 °C/41 °F), Warm (25 °C/77 °F), or Hot (40 °C/104 °F).
Absorption Time	Sets the maximum time spent in the absorption stage, before transitioning to float or no float.
Low Battery Cut Out	Low Battery Cut Out (LBCO) controls when the inverter stops producing AC output due to a low battery voltage condition. The inverter will stop producing AC output only after this level has been reached for the period of time set by the Low Battery Cut Out Delay. This setting is not temperature compensated.
Low Battery Cut Out Delay	<p>Low Battery Cut Out Delay controls how long the inverter is allowed to operate at or below the Low Battery Cut Out level before turning off due to a low battery voltage condition. The inverter will stop producing AC output only after the Low Battery Cut Out level has been reached for this uninterrupted period of time.</p> <p>Once the inverter has shut off, the battery voltage must rise the amount of volts set in Low Battery Cut Out Hysteresis above the Low Battery Cut Out setting for inverter operation to resume.</p>

Item	Description
Low Battery Cut Out Hysteresis	The voltage increment on top of the <code>Low Battery Cut Out</code> parameter above which the battery voltage must be for inverter operation to be allowed to resume.
Low Battery Cut Out Warning Offset	The voltage increment on top of the <code>Low Battery Cut Out</code> parameter above which the DC Under Voltage warning will be generated.
High Battery Cut Out	<code>High Battery Cut Out</code> sets the maximum battery voltage at which the inverter will operate. If the battery voltage exceeds this limit, the XW Pro displays a fault message (F49) and stops charging. The inverter will not support AC loads when in this condition. If a qualified AC source is present, the unit passes AC through to the loads. The inverter automatically restarts when the voltage drops to 6 volts below the <code>High Battery Cut Out</code> setting. If battery voltage continues to rise after shutdown, an external charger may still be charging the batteries. The XW Pro cannot control how external chargers operate.
Bulk Termination Time	<code>Bulk Termination Time</code> sets the time delay to exit the bulk charging stage once the <code>Absorption Voltage</code> setpoint has been reached or exceeded.
Charge Cycle Timeout	Sets the maximum time period that the inverter will remain in a charge cycle.
High SOC Cut Out	State of Charge limit for battery charging when State of Charge Control is enabled and a compatible BMS or Conext Battery Monitor is connected to the system. Battery charge is terminated when the State of Charge is at or above this level for the <code>High SOC Cut Out Delay</code> time (60s). The level must be set higher than the <code>Recharge SOC</code> (50%) (under the Charger Settings menu).
High SOC Cut Out Delay	The time duration for which the battery State of Charge must be at or above <code>High SOC Cut Out (%)</code> before terminating battery charge.
Low SOC Cut Out	State of Charge limit for battery discharge when State of Charge Control is enabled and a compatible BMS or Conext Battery Monitor is connected to the system. Battery discharge is terminated when the State of Charge is at or below this level for the <code>Low SOC Cut Out Delay</code> time. The level must be set lower than the <code>Recharge SOC</code> (under the Charger Settings menu).
Low SOC Cut Out Delay	The time duration for which the battery State of Charge must be at or below <code>Low SOC Cut Out</code> before terminating battery discharge.

For defaults, see "Default Settings" on page 192.

Using the Low Battery Cut Out and LBCO Delay Settings

The `Low Battery Cut Out` setting is the lowest battery voltage or SOC level acceptable for use by the inverter. When the batteries discharge to the `Low Battery Cut Out` setting, and are held at or below this level for the `LBCO Delay` time, the inverter output shuts down. After shutdown, the inverter does not support loads on AC OUT, and AC loads must be powered by grid power (AC1). If the battery voltage or SOC stays below the LBCO threshold for more than 24 hours, the XW Pro shuts down.

AC Settings

The **AC Settings** menu configures the AC1 breaker size, and sets the priority for the AC input source.

Table 8 AC Settings Menu

Item	Description
AC1 Breaker Size	<p>Sets the AC1 (Grid) breaker size, based on the size of the breaker installed upstream from the AC1 connection port. The installed breaker size must not exceed the capacity of the upstream distribution panel. The XW Pro throttles AC charging on AC1 so that the total draw (charging + load) does not exceed 80% of the breaker setting.</p> <p>However, if the connected loads on AC OUT exceed the AC1 breaker setting, the upstream AC breaker trips. The breaker may not trip if grid support is enabled and battery voltage is above the <code>Grid Support Voltage</code> setting (see the Grid Energy Management menu), or if peak load shave is enabled and the load shave time window is active.</p>
AC2 Breaker Size	<p>Sets the AC2 (Gen) breaker size, based on the size of the installed AC breaker upstream from the AC2 connection port. The installed upstream breaker and the AC2 breaker set point must not exceed the capacity of the generator. The XW Pro throttles AC charging on AC2 so that the total draw (charging + load) does not exceed 80% of the breaker setting.</p> <p>However, if the connected loads on AC OUT exceed the AC2 breaker setting, the upstream AC breaker trips. The breaker may not trip if Gen Support is enabled and <code>Gen Amps</code> is configured not to exceed the generator's rated output current.</p>
Advanced AC Settings	
AC Priority	<p>Sets the priority for the AC input source (AC1 or AC2) for qualification and transfer when both AC sources are present.</p> <p>In systems that use both utility grid (AC1) and generator (AC2) input, it is recommended that you set <code>AC Priority</code> to AC1. Assuming the generator is intended for occasional use only, the XW Pro will use utility power. It will use the generator only if AC1 is unavailable, and if the generator is running.</p>

For defaults, see "Default Settings" on page 192.

AC1 (Grid) Settings

The **AC1 Grid Settings** are advanced settings that are only available to qualified personnel.

The **AC1 (Grid) Settings** menu configures the voltage and frequency limits for AC port 1 (Grid). These are the limits at which the XW Pro considers AC input voltage qualified and enters AC passthrough. The XW Pro Region Settings control how the system interacts with the grid and are defined by your local utility.

Table 9 AC1 (Grid) Settings Menu

Item	Description
AC1 Reconnect Time Delay (Transfer Switch Delay)	The time delay between qualifying AC1 and closing its contactor.
AC1 Low Voltage Disconnect	Minimum acceptable input voltage level from the utility grid, below which the inverter will disconnect.
AC1 Low Voltage Reconnect Offset	Determines the reconnect level relative to AC1 Low Voltage Disconnect. AC1 Low Voltage Disconnect plus AC1 Low Voltage Reconnect Offset equals the voltage at which the inverter reconnects. The offset and disconnect levels must be set such that the reconnect is less than the nominal voltage.
AC1 High Voltage Disconnect	Maximum acceptable input voltage level from the utility grid, above which the inverter will disconnect.
AC1 High Voltage Reconnect Offset	Determines the reconnect level relative to AC1 High Voltage Disconnect. AC1 High Voltage Disconnect plus AC1 High Voltage Reconnect Offset equals the voltage at which the inverter reconnects.
AC1 Low Voltage Time Delayed Disconnect	Input voltage level from the utility grid, below which the inverter will have a delay of AC1 Time Delayed Disconnects Delay before disconnecting. This value must be higher than AC1 Low Voltage Disconnect.
AC1 High Voltage Time Delayed Disconnect	Input voltage level from the utility grid, above which the inverter will have a delay of AC1 Time Delayed Disconnects Delay before disconnecting. This value must be lower than AC1 High Voltage Disconnect.
AC1 Low Frequency Disconnect	Minimum acceptable utility grid input frequency, below which the inverter will disconnect.

Item	Description
AC1 Low Frequency Reconnect Offset	Determines the reconnect level relative to AC1 Low Frequency Disconnect. AC1 Low Frequency Disconnect plus AC1 Low Frequency Reconnect Offset equals the frequency at which the inverter reconnects.
AC1 High Frequency Disconnect	Maximum acceptable utility grid input frequency, above which the inverter will disconnect.
AC1 High Frequency Reconnect Offset	Determines the reconnect level relative to AC1 High Frequency Disconnect. AC1 High Frequency Disconnect plus AC1 High Frequency Reconnect Offset equals the frequency at which the inverter reconnects.
AC1 Low Frequency Time Delayed Disconnect	Input frequency level from the utility grid, below which the inverter will have a delay of AC1 Time Delayed Disconnects Delay before disconnecting. This value must be higher than AC1 Low Frequency Disconnect.
AC1 High Frequency Time Delayed Disconnect	Input frequency level from the utility grid, above which the inverter will have a delay of AC1 Time Delayed Disconnects Delay before disconnecting. This value must be lower than AC1 High Frequency Disconnect.
AC1 Time Delayed Disconnects Delay	The time delay used for all AC1 time delayed voltage and frequency setpoints.
Operating Reference Voltage Selection	Sets the effective voltage for operation ¹ . Choose between Use Static to utilize the Static Operating Reference Voltage or Use Dynamic to utilize the Dynamic Operating Reference Voltage Filter Averaging Time. Use Dynamic calculates the average measured voltage over the last Dynamic Operating Reference Voltage Filter Averaging Time number of seconds and uses it as the effective voltage. This accommodates changing nominal voltages over time.

¹ The following functions use effective voltage, not measured voltage: Bridge Reconnect High V, Bridge Reconnect Low V, HVRT, LVRT, HV-CTE, LV-CTE, Q(V), P (V).

Item	Description
Static Operating Reference Voltage	Sets the voltage for static effective voltage. ¹
Dynamic Operating Reference Voltage Filter Averaging Time	Sets the number of seconds queried to calculate the average measured voltage for dynamic effective voltage.

For defaults, see "Default Settings" on page 192.

Configuring Nominal Grid Frequency

This adjustment is performed by selecting the appropriate compliance region for each XW Pro. For instance, by selecting California Rule 21-2018, the unit being configured will adopt a 60 Hz nominal grid frequency. Selecting IEEE 1547-2003 50Hz will similarly configure a 50 Hz nominal grid frequency. All frequency-related functions, including over/underfrequency detection, are based upon these settings. Refer to Managing Compliance Regions on page 106 for information on how to select a compliance region.

AC2 (Generator) Settings

The **AC2 Generator Settings** are advanced settings that are only available to qualified personnel. These settings configure the voltage and frequency limits for AC port 2 (Gen). These are the limits at which the XW Pro considers AC input voltage qualified—that is, suitable for charging batteries or passing through to loads attached to AC OUT. If the input voltage is not qualified according to these settings, the XW Pro reverts to inverting external DC energy to AC energy for loads on AC OUT.

Table 10 AC2 (Generator) Settings Menu

Item	Description
AC2 Reconnect Time Delay (Transfer Switch Delay)	The time delay between qualifying AC2 and closing its contactor.
AC2 Low Voltage Disconnect	Minimum acceptable input voltage level from the generator, below which the inverter will disconnect.

¹ The following functions use effective voltage, not measured voltage: Bridge Reconnect High V, Bridge Reconnect Low V, HVRT, LVRT, HV-CTE, LV-CTE, Q(V), P (V).

Item	Description
AC2 Low Voltage Reconnect Offset	Determines the reconnect level relative to AC2 Low Voltage Disconnect. AC2 Low Voltage Disconnect plus AC2 Low Voltage Reconnect Offset equals the voltage at which the inverter reconnects.
AC2 High Voltage Disconnect	Maximum acceptable input voltage level from the generator, above which the inverter will disconnect.
AC2 High Voltage Reconnect Offset	Determines the reconnect level relative to AC2 High Voltage Disconnect. AC2 High Voltage Disconnect plus AC2 High Voltage Reconnect Offset equals the voltage at which the inverter reconnects.
AC2 Low Voltage Time Delayed Disconnect	Input voltage level from the generator, below which the inverter will have a delay of AC2 Time Delayed Disconnects Delay before disconnecting. This value must be higher than AC2 Low Voltage Disconnect.
AC2 High Voltage Time Delayed Disconnect	Input voltage level from the generator, above which the inverter will have a delay of AC2 Time Delayed Disconnects Delay before disconnecting. This value must be lower than AC2 High Voltage Disconnect.
AC2 Low Frequency Disconnect	Minimum acceptable utility grid input frequency, below which the inverter will disconnect.
AC2 Low Frequency Reconnect Offset	Determines the reconnect level relative to AC2 Low Frequency Disconnect. AC2 Low Frequency Disconnect plus AC2 Low Frequency Reconnect Offset equals the frequency at which the inverter reconnects.
AC2 High Frequency Disconnect	Maximum acceptable generator input frequency, above which the inverter will disconnect.
AC2 High Frequency Reconnect Offset	Determines the reconnect level relative to AC2 High Frequency Disconnect. AC2 High Frequency Disconnect plus AC2 High Frequency Reconnect Offset equals the frequency at which the inverter reconnects.
AC2 Low Frequency Time Delayed Disconnect	Input frequency level from the generator, below which the inverter will have a delay of AC2 Time Delayed Disconnects Delay before disconnecting. This value must be higher than AC2 Low Frequency Disconnect.

Item	Description
AC2 High Frequency Time Delayed Disconnect	Input frequency level from the generator, above which the inverter will have a delay of AC2 Time Delayed Disconnects Delay before disconnecting. This value must be lower than AC2 High Frequency Disconnect.
AC2 Time Delayed Disconnects Delay	The time delay used for all AC2 time delayed voltage and frequency setpoints.

For defaults, see "Default Settings" on page 192.

Grid Energy Management (Grid Support) Settings

The **Grid Energy Management (Grid Support)** Settings menu contains configuration options for grid-tie operation. To enable these settings, `Grid Support` must be enabled in the **Grid Energy Management (Grid Support)** menu. Individual grid-interactive features such as PLS and Sell are enabled individually.

In grid support mode, the XW Pro supports the utility grid by limiting the power drawn from the utility to close to zero. This mode is desirable for using excess energy from auxiliary DC sources like PV, while still maintaining a charged battery bank. No power is sold to the utility in this mode.

NOTE: Grid support and sell functions are modes of operation that are subject to local and/or national grid interconnection requirements in most jurisdictions. It is the responsibility of the installer and system operator to ensure that all applicable procedures and technical requirements are complied with before turning on either of these modes.

The interconnect codes and standards with which the XW Pro complies are listed in Specifications on page 139.

NOTE: Upon startup, the XW Pro does not enable grid support functions for five minutes (300 seconds). During this period the XW Pro connects to AC input and determines whether the utility grid voltage and frequency are stable and within nominal range. If `Grid Support` is enabled, the inverter information panel also displays a 300 second countdown during this period. For more information, see "Islanding Protection" on page 27.

NOTE: In grid support mode, the XW Pro should not draw a large amount of current from the grid. If the XW Pro is drawing more than expected, it is important to note that it cannot distinguish between real power and reactive power. Large current draw will only affect reactive power and not real power, and utility companies generally only charge by real power consumed.

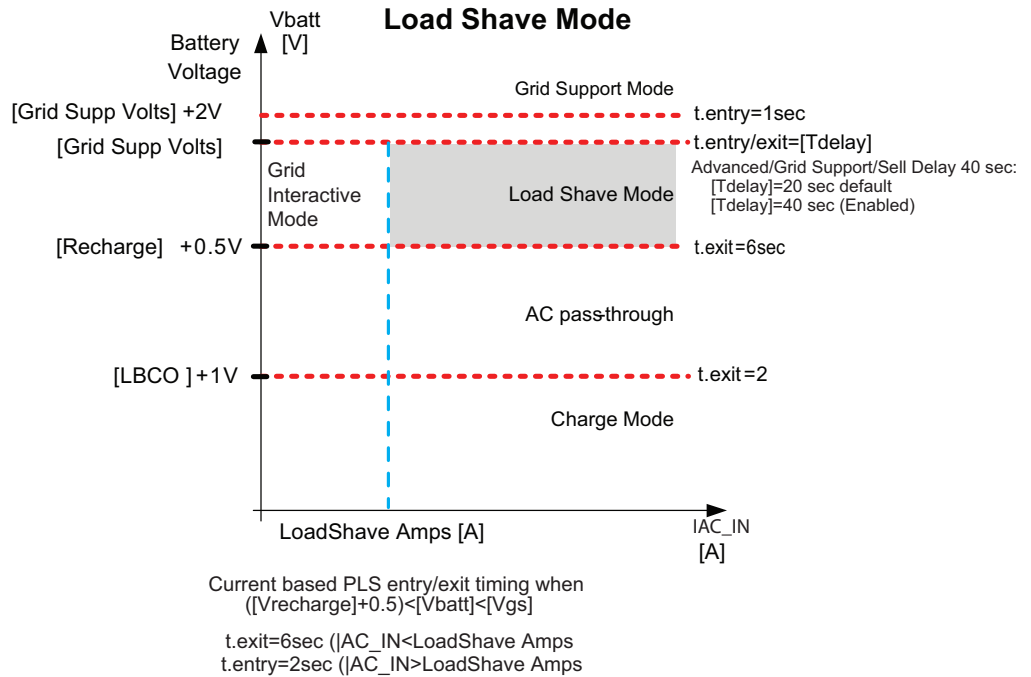
Table 11 Grid Energy Management (Grid Support) Settings Menu

Setting	Description
Grid Support	Turns the Grid Support feature on and off.
Grid Support Voltage	Sets the voltage level above which Grid Support features are enabled. Takes effect when State of Charge Control is disabled.
Grid Support SOC	The SOC threshold above which grid support features are enabled. This threshold takes effect when SOC Control is enabled (see Battery Settings menu).
Grid Peak Load Shave	Turns the load shave feature on and off.
Advanced Grid Support Settings	
Grid Support SOC Exit Delay	Sets a delay period between when SOC falls below the Grid Support threshold and when grid support functions cease.
Maximum Export (Sell) Sell Amps	Maximum amount of current to sell to the grid.
Sell Delay 40 Sec Enable/Disable	<p>When enabled—and other conditions are satisfied—there will be a 40 second delay before the system starts exporting energy to the grid. When disabled, the default value of 20 seconds is used. This feature is useful when the battery voltage is not constant. It also helps avoid power fluctuations during sell.</p> <p>As an exception, there will be zero time delay when the battery voltage suddenly rises to 2 V above Grid Support Voltage. For example, a wind turbine or micro hydro connected to a small battery bank may create a sudden change on the battery voltage. In this case the system will immediately respond to convert the energy from the battery to grid.</p>
Export (Sell) Power Block Start	The time of day from which the selling of power to the grid is not permitted.
Export (Sell) Power Block End	The time of day when the selling of power to the grid is permitted.
Grid Peak Load Shave	Load Shave only applies when the battery is lower than Grid Support Volts and higher than Recharge Volts +0.5v, or lower than Grid Support SoC and higher than Recharge SoC. See Figure 17 on page 82.
Load Shave Amps	The load current above which Grid Peak Load Shave activates and begins to supplement the power drawn from the grid.

Peak Load Shaving Delay	When enabled, Grid Peak Load Shave mode is delayed by 2 hours to allow the MPPT solar charge controller to charge the battery bank first, then when the timer of 2 hours expires, the unit enters Grid Peak Load Shave mode for AC load support.
Load Shave Start	The time of day from which Grid Peak Load Shave is permitted to operate.
Load Shave Stop	The time of day when Grid Peak Load Shave is no longer permitted to operate.

For defaults, see "Default Settings" on page 192.

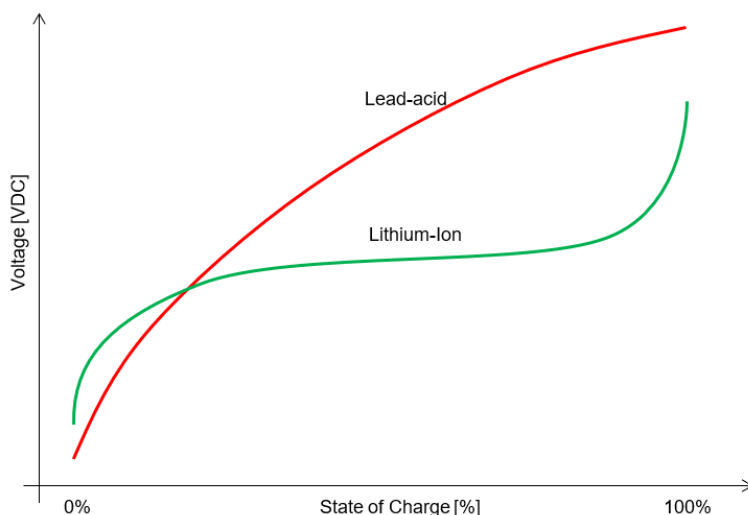
Figure 17 Load Shave Mode



State of Charge Control

Different battery chemistries have associated charge and discharge SOC (State of Charge) versus voltage profiles. Some batteries, such as lead acid, have reasonably large changes in battery voltage across the nominal operating range of 20-80% SOC, allowing the inverter to control battery charging and discharging based on measured voltage. Other batteries, such as Li-ion, have a very small change in voltage across the nominal 20-80% SOC operating range making control decisions based on battery voltage difficult (see Figure 18 for illustrative purposes only). To accommodate battery chemistries such as these, SOC-based control can be enabled in the XW Pro under the **Battery Settings** menu in the **Configuration** tab of gateway device. When enabled, all SOC-based threshold configurations for transitioning between operating modes shall take effect, and their voltage-based counterparts shall be deactivated.

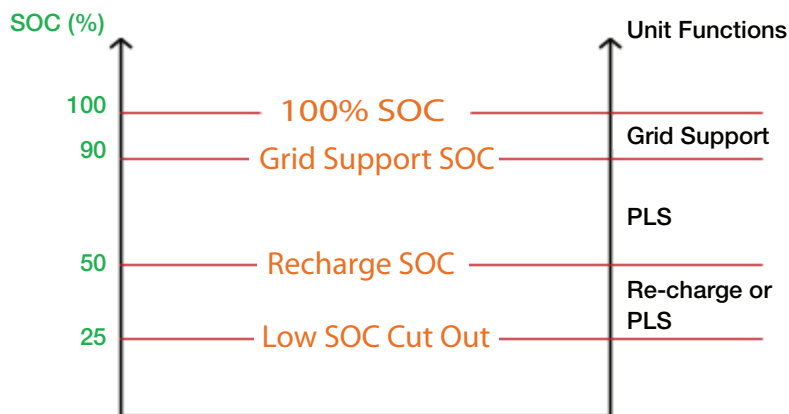
Figure 18 SOC vs. voltage for battery profiles



The battery SOC is typically calculated by a third-party Battery Management System, or Conext Battery Monitor. The BMS also ensures safe operation of the batteries by establishing operational limits for the attached inverter-charger unit.

With lead-acid, the XW Pro utilizes battery voltage to transition between operational modes. A duplicate set of SOC-based thresholds are used when State of Charge Control is enabled, and their voltage-based counterparts are ignored. The following figure depicts the SOC settings available assigned with some typical values.

Figure 19 State of Charge Thresholds



Generator Support Settings

The **Generator Support Settings** are advanced settings that are only available to qualified personnel.

Generator support allows power to be automatically drawn from the batteries to assist an AC generator on AC2 to support heavy loads on AC OUT (loads that exceed the available power from the generator).

Generators have a limited output current and it is possible to reach this limit when operating heavy loads. The XW Pro is designed to assist the generator when heavy

current demands load down the generator by supplying additional power from the batteries.

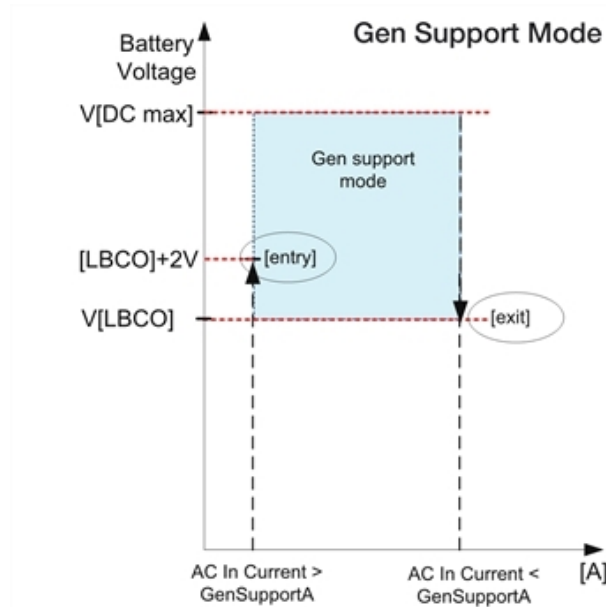
In addition, the battery charger can reduce its charging current to the batteries so the combined AC current required for charging and the total load current do not exceed the capacity of the generator or trip its output breakers or fuses.

For imbalanced loads and small generators, the generator support feature may be used. When *Generator Support Plus* is enabled, under Advanced Features, the XW Pro will connect the center of its transformer to the AC2 input neutral to act as a load balancing transformer. This feature will attempt to balance the load between L1 and L2. Generator support is most effective for generators under 5 kW. See "Generator Support Settings" on the previous page.

NOTE: The passthrough running and startup (peak) currents of generators attached to AC2 are limited to the maximum current limits of the XW Pro.

NOTE: If generator support is used with generators larger than 5 kW, it is possible for current to recirculate. In this case, the efficiency losses would outweigh the benefit of generator support.

Figure 20 Gen Support Mode Graph



Ensure that the battery bank has sufficient energy to support your loads for the anticipated time period, otherwise draining the battery to LBCO may put the system in Fault mode.

Table 12 Generator Support Menu

Setting	Description
Generator Support	Turns the Generator Support mode on and off.
Generator Support Amps	Sets the generator load level at which the XW Pro supplies power from the batteries to support the generator.

NOTE: When `Generator Support Mode` is enabled and actively operating, the XW Pro compensates for active power as a reference for controlling the total current as specified in the `Generator Support Amps` setting. However, there is also reactive power that is not compensated for by the XW Pro. For example, if `Generator Support Amps` is set to 48A, the inverter will only start to assist the generator at a current level which would measure approximately 49A which is 1A higher than the `Generator Support Amps` value.

For defaults, see "Default Settings" on page 192.

Auxiliary Relay Settings

The **Auxiliary Relay Settings** are advanced settings that are only available to qualified personnel. This menu allows you to enable and set the auxiliary output. The auxiliary output provides 12 volts DC at 250 milliamps to power a relay, indicator light, or alarm.

NOTE: Changing `Auxiliary Output Trigger Level` resets the auxiliary output. If an auxiliary output trigger is active, changing the trigger level will clear the trigger.

Table 13 Auxiliary Menu Values

Setting	Description
Auxiliary Output Active Level	Controls the Auxiliary Output Level when <code>Auxiliary Control</code> is set to Automatic . This functionality is disabled if <code>External Contactor</code> (under External Contactor Settings) is enabled, as it shares the same outputs. When set to <code>Active High</code> , the Aux port is energized. When set to <code>Active Low</code> , the Aux port is not energized.
Auxiliary Output Trigger Source	Controls the Auxiliary Output Trigger Source when <code>Auxiliary Control</code> is set to Automatic . This functionality is disabled if <code>External Contactor</code> (under External Contactor Settings) is enabled, as it shares the same outputs.

The following parameter set controls the activation and de-activation conditions for the Auxiliary Output.

Table 14 Auxiliary Menu Values

Setting	Description
Trigger Set	Sets the voltage or temperature level (depending on the selected trigger source) at which the auxiliary output is activated. If the selected <code>Trigger Source</code> is a battery voltage, the range also varies according to the nominal battery voltage of your system.
Trigger Set Delay	Sets a delay period between when the trigger occurs and when the auxiliary output is activated.
Trigger Clear	Sets the voltage or temperature level (depending on the selected trigger source) at which the auxiliary output becomes inactive.

Setting	Description
Trigger Clear Delay	Sets a delay period between when the Low Battery Trigger Clear setting occurs and when the auxiliary output becomes inactive.

For defaults, see "Default Settings" on page 192.

Trigger Source Descriptions

Table 15 Trigger Source Descriptions

Low Battery Voltage	<p>Activates the auxiliary output when the battery voltage falls below Low Battery Voltage after the trigger delay time. The auxiliary output turns off when the battery voltage rises above the clear setting after the Clear Delay time. Use this setting if the auxiliary output needs to control a relay to disconnect loads from a battery or to activate a low battery voltage alarm such as a buzzer or light.</p>
High Battery Voltage	<p>Activates the auxiliary output when the battery voltage rises above High Battery Voltage for the trigger delay time. The auxiliary output turns off when the battery voltage falls below the clear setting for the Clear Delay time. This setting is useful for:</p> <ul style="list-style-type: none"> ▪ Installations that have another external charging source such as a wind generator or hydro generator connected directly to the batteries. The XW Pro auxiliary output can control a relay to disconnect the external charging source from the battery or control a relay to turn on a diversion load. ▪ Activating a high battery voltage alarm such as a buzzer or light. ▪ Activating a vent fan to ventilate the battery compartment.
Low Battery Temperature	<p>Activates the auxiliary output when the battery temperature falls below Low Battery Temperature for the trigger delay time. The auxiliary output turns off when the battery temperature rises above the clear setting for the Clear Delay time. Battery temperature is measured with a battery temperature sensor. Do not use this setting if a battery temperature sensor is not installed.</p>
High Battery Temperature	<p>Activates the auxiliary output when the battery temperature rises above High Battery Temperature for the trigger delay time. The auxiliary output turns off when the battery temperature falls below the clear setting for the Clear Delay time. Battery temperature is measured with a battery temperature sensor. Do not use this setting if a battery temperature sensor is not installed. With this setting, the auxiliary output can turn on a fan to vent the battery compartment.</p>

Fault	Activates the auxiliary output when a fault occurs. The auxiliary output clears when the fault is cleared.
Bulk Exit	Exits bulk charge mode. In bulk charge mode, the XW Pro operates as a constant power source to the battery bank. The aux port clears its state when the inverter exits from Bulk Charge stage.
Absorption Exit	Exits charge absorption mode and starts the following mode, depending on whether the unit is set to two or three-stage charge. The aux port clears its state when the inverter exits from Absorption charge stage.
Heat Sink Over Temperature	Activates the auxiliary output when the heat sink temperature exceeds its trigger set for longer than its set delay. The auxiliary output turns off when the temperature falls below its clear threshold for longer than its clear delay.
Battery Low State of Charge	<p>This feature works in conjunction with the Conext Battery Monitor or an external BMS. This feature activates the auxiliary output when the battery SoC falls below the Low SoC for the trigger delay time. The auxiliary output turns off when the battery SoC rises above the clear setting for the Clear Delay time.</p> <p>This auxiliary output is triggered when the state of charge falls outside of the range of 25-90% of total battery charge.</p>
Time of Day	<p>When <code>Time of Day</code> is selected as a trigger source, the <code>TIME OF DAY TRIGGER SET</code> and <code>TIME OF DAY TRIGGER CLEAR</code> become available. Both can be set to a value between 12:00 AM and 11:59 PM.</p> <p><code>TIME OF DAY TRIGGER CLEAR</code> is when the Auxiliary Output goes into inactive state. <code>TIME OF DAY TRIGGER SET</code> is when the Auxiliary Output goes into active state.</p>

Power Control Settings

The **Power Control Settings** are advanced settings that are only available to qualified personnel.


Table 16 Power Control Settings Menu

Setting	Description
Grid Import Active Power Limit (Charge)	Sets import active power limit at the AC1 terminal.
Generator Import Active Power Limit (Charge)	Sets import active power limit at the AC2 terminal.
EPC Enable	Enable/Disable the External Power Controller (EPC).
EPC Maximum Discharge Power	Maximum discharge power controllable via external interface.
EPC Maximum Charge Power	Maximum charge power controllable via external interface.

For defaults, see "Default Settings" on page 192.

Multi-Unit Configuration Settings

The **Multi-unit Configuration Settings** are advanced settings that are only available to qualified personnel.

 WARNING
<p>ADVANCED CONFIGURATION HAZARD</p> <ul style="list-style-type: none"> ▪ Advanced menu settings should be used by qualified personnel only. ▪ Three phase operation should be configured by qualified personnel only. ▪ Consult with the local utility before enabling XW Pro sell mode or grid support functions. ▪ Do not change these settings unless you are under the supervision and direction of qualified personnel. ▪ Connect the gateway device device and the network router to an assured power source during configuration. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

NOTICE**EQUIPMENT DAMAGE**

- The Automatic Transfer Relays are rated at 60 A.
- Loads connected at AC OUT must not exceed the inverter's overload ratings or the 60 A limit, whichever is lower. Unless an external contactor or external transfer switch (such as the Schneider Electric BCS) is used, the 60 A limit also applies to the total combined loads connected to the AC OUT bus of multiple inverters connected in parallel.

Failure to follow these instructions can result in equipment damage.

The `Multi-Unit Configuration` menu configures the XW Pro to operate as a part of a multi-unit installation.

When installing a multi-unit system, each setting on the `Multi-Unit Configuration` menu (except for `Dev Name`) must be configured for each XW Pro in the system. The settings should be configured in the following order:

- `Dev Number` (see "Device Identification" on page 96)
- `Inverter Mode` (see table below)
- `Associations` (see "Associations Settings" on the next page)

Table 17 Multi-Unit Configuration Menu

Item	Description	Default	Range
<code>Unit Configuration</code>	For a multi-unit system to operate in single and split configurations, one XW Pro must be configured to <code>Primary</code> and the rest as <code>Secondary</code> , otherwise a system-wide fault is asserted.	<code>Split Phase Primary</code>	<ul style="list-style-type: none"> Single Phase Stand Alone Primary Secondary Split Phase Stand Alone Primary Secondary Phase 1 Primary Phase 1 Secondary Phase 2 Primary Phase 2 Secondary Phase 3 Primary Phase 3 Secondary

For defaults, see "Default Settings" on page 192.

External Contactor Settings

The **External Contactor Settings** are advanced settings that are only available to qualified personnel. Use these to set up a Schneider Electric BCS or other external contactor.

Table 18 External Contactor Settings Menu

Item	Description
External Contactor	Enable if an external transfer contactor between the grid point of connection and the inverter is present. With <code>External Contactor</code> mode enabled, all power and connection controls use AC1 (Grid) settings. All generator (AC2) settings are hidden.
External Contactor Mismatch Fault Delay	The trip time needed to activate Fault 72 if the external contactor command does not match the actual status of the external contactor. Adjust this parameter to account for varying close and opening times of the contactors available for use.
External Contactor Backup Mode to Grid/Gen Tied Overlap	The time delay from closing the external contactor (if equipped) due to grid qualification to exiting grid-forming operation. Depending on the external contactor installed, this value must be tuned to accommodate its closing time reliably. By default, this value is set to 0.015 seconds.
External Contactor Grid/Gen Tied to Backup Mode Delay	The time delay from opening the external contactor (if equipped) due to a grid outage to grid-forming operation. Depending on the external contactor installed, this value must be tuned to accommodate its opening time reliably. By default, this value is set to 0.1 seconds. If using a Schneider Electric BCS, set this value to 0 seconds to meet regulation requirements.

For defaults, see "Default Settings" on page 192.

Associations Settings

The **Associations Settings** are advanced settings that are only available to qualified personnel.

The Associations menu contains additional settings to allow the XW Pro to function as part of a multi-unit networked system.

NOTE: To make changes to Association settings, place the inverter in Standby mode which will interrupt power to the AC output and loads.

Setting the connections for a Xanbus-enabled device provides a way of identifying non-network associations for Xanbus-enabled devices and enhancing networked power system management. When connections are set, devices of different types become associated and can share sources, e.g. a common DC input source, or a common grid source.

In multi-unit networked systems, multiple inverter/chargers can be stacked to produce increased charge current. To achieve this functionality, the devices must be configured to the same DC connection, such as House Battery Bank 1. The units will collaborate on battery charging by communicating with other units on this shared DC connection.

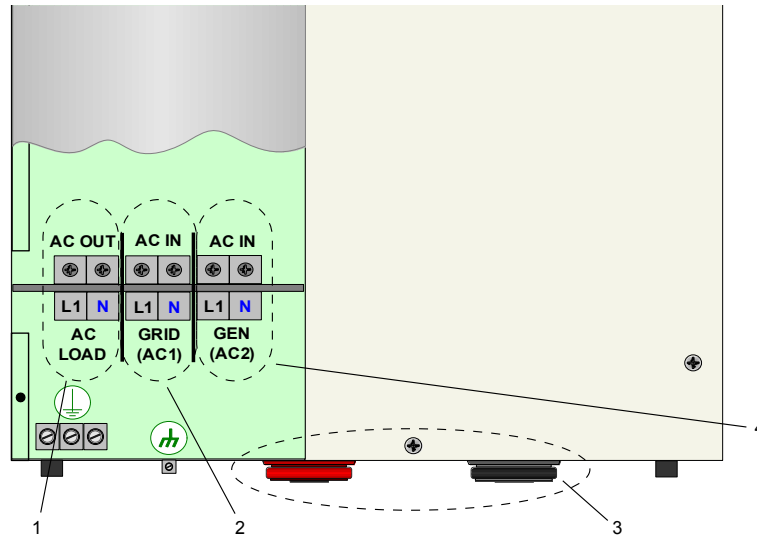
NOTE: When configuring clusters of three XW Pro units (or a grouping of up to 4 units maximum for split-phase operation, or 6 units maximum for 3-phase operation in a grid-tie application), each cluster's DC connections must be set to the same battery bank. If one of the units is set with a different DC connection, a system configuration fault (F66) occurs.

Table 19 Associations Menu

Item	Description
AC1 Association (Grid)	AC1 input connection. This connection specifies a common AC port 1 input for multiple XW Pro units.
AC2 Association (Generator)	AC2 input connection. This connection specifies a common AC port 2 input for multiple XW Pro units.
AC Output Association (Loads)	AC output connection. This connection specifies a common AC output connection shared between XW Pro units. The AC output connection has to be configured so that the units know if they are connected to the same load or not. If connected to the same load, select the same name on all units; for example, "ACLoad1." If connected to separate load banks, use different names for the AC output connection on each unit; for example, "ACLoad1" on one unit and "ACLoad2" on the other.
Battery Association	DC input and output connection. This is the common DC connection shared between the XW Pro, charge controllers, and referenced by the Conext AGS.

For defaults, see "Default Settings" on page 192.

Figure 21 XW Pro Connections Representation



1	AC Out Connection: Select AC Load 1 to 10
2	AC1 Connection: Select Grid 1 to 10, Generator 1 to 10
3	DC Connection: Select House Battery Bank 1 to 5
4	AC2 Connection: Select Grid 1 to 10, Generator 1 to 10

To verify the associations, select the **Status** tab and scroll down to **Device Configuration**. Confirm that all associations are correct.

AC Out (Load)

AC Load Active Power	0 W	AC Load Active Current	0 A
AC Load L1 Voltage	0 V	AC Load Frequency	60 Hz
AC Load L2 Voltage	0 V	AC Load Voltage	0 V
AC Load L1 Active Current	-0.2 A	AC Load L2 Active Current	0.4 A

Device Configuration

Grid Support	Disabled	Charger	Enabled
Grid Export (Sell)	Disabled	Backup Mode	Enabled
Grid Peak Load Shave	Disabled	AC Coupling	Enabled
AC1 Association (Grid)	Grid 1	AC Output Association (Loads)	AC Load 1
AC2 Association (Generator)	Generator 1	Battery Association	House Battery Bank 1

Unit Configuration: Split Phase Master

Battery Management System Settings

The **Battery Management System (BMS) Settings** are advanced settings that are only available to qualified personnel.

Table 20 Battery Management System Menu

Item	Description
BMS Communication Loss Triggers Fault or Warning	Configures the XW Pro's response to lost BMS Status message from gateway device. If Battery Settings > Charge Cycle is configured as External BMS and there is a loss of BMS communication, this determines if a fault or warning is triggered. Fault 90 will put the unit into standby. Warning 90 will allow the unit to operate in fallback mode and charge/discharge the battery using measured voltage/current and the comms lost fallback voltage and current limits configured below, until communication is restored.
BMS Communication Loss Trip Time	The time delay from the moment the BMS Status message is lost to the XW Pro, activating Warning 90 if Fault on loss of BMS status information is disabled, or Fault 90 if enabled.
SOC Communication Loss Triggers Fault or Warning	Configures the XW Pro response to lost BMS State of Charge. If Battery Settings > SOC Control is enabled and there is a loss of communication where SOC is no longer received, this determines if a fault or warning is triggered. Fault will put the unit into standby. Warning will allow the unit to operate in fallback mode. In fallback mode the unit will charge/discharge the battery using its local voltage and current measurements and the comms lost fallback voltage and current limits configured below.
SOC Communication Loss Trip Time	The time delay from the moment the BMS State of Charge Status message is lost to the XW Pro.
Comms Lost Battery Charge Voltage Limit	The charge voltage limit applied when the value normally provided by the associated BMS is no longer being received, or when communication of Battery State of Charge is lost.
Comms Lost Battery Discharge Voltage Limit	The discharge voltage limit applied when the value normally provided by the associated BMS is no longer being received, or when communication of Battery State of Charge is lost.
Comms Lost Battery Charge Current Limit	The charge current limit applied when the value normally provided by the associated BMS is no longer being received.
Comms Lost Battery Discharge Current Limit	The discharge current limit applied when the value normally provided by the associated BMS is no longer being received.

Charge Overcurrent Offset	When Battery Settings > Charge Cycle is set to External BMS, the offset is added to the charge current limit broadcasted by the associated BMS or the Charge Current Limit (BMS status lost) to determine the inverter's trip threshold. When operating in Backup Mode and AC Coupling is enabled, the inverter follows the BMS charge current limit by frequency-shifting AC-coupled PV. The inverter trips if the current exceeds the trip threshold for the Charge Overcurrent Trip Time.
Charge Overcurrent Trip Time	The time delay from the moment charge current exceeds the trip threshold (refer to Charge Overcurrent Offset) until the inverter activates Fault 73.
Discharge Overcurrent Offset	When Battery Settings > Charge Cycle is set to External BMS, the offset is added to the discharge current limit broadcasted by the associated BMS or the Comms Lost Battery Discharge Current Limit (BMS status lost) to determine the inverter's trip threshold. When operating in Backup Mode , the inverter can provide power to the loads up to the trip threshold. The inverter trips if the current exceeds the trip threshold for the Discharge Overcurrent Trip Time.
Discharge Overcurrent Trip Time	The time delay from the moment discharge current exceeds the trip threshold (refer to Discharge Overcurrent Offset) until the inverter activates Fault 71.
Overvoltage Offset	When Battery Settings > Charge Cycle is configured as External BMS, the offset is added to the charge voltage limit broadcasted by the associated BMS or the Comms Lost Battery Charge Voltage Limit (BMS Status Lost) to determine the inverter's trip threshold. The inverter trips if the voltage exceeds the trip threshold for the Overvoltage Trip Time.
Overvoltage Trip Time	The time delay from the moment battery voltage exceeds the trip threshold (refer to Overvoltage Offset) until the inverter activates Fault 75.
Undervoltage Offset	When Battery Settings > Charge Cycle is configured as External BMS, the offset is subtracted from the discharge voltage limit broadcasted by the associated BMS or the Comms Lost Battery Discharge Voltage Limit (BMS status lost) to determine the inverter's trip threshold. The inverter trips if the voltage falls below the trip threshold for the Undervoltage Trip Time.
Undervoltage Trip Time	The time delay from the moment battery voltage falls below the threshold (refer to Undervoltage Offset) until the inverter activates Fault 74.

For defaults, see "Default Settings" on page 192.

Advanced Features

The **Advanced Features** are advanced settings that are only available to qualified personnel.

Table 21 Advanced Features Menu

Item	Description
Device Response To InsightHome/InsightFacility Communication Loss	Configures the inverter's response to communication loss.
Remote Power Off	Enables the Remote Power Off function. Enable if an external switch has been connected to the XW Pro auxiliary port. See the <i>XW Pro Installation Guide</i> for more information about the auxiliary port.
Power Save	When enabled, power save mode can reduce tare loss from the battery by reducing output from 240 volts to 220 volts when the loads are less than 100 watts. When the XW Pro detects loads higher than 100 watts, it produces the full 240 volts. Power Save mode is disabled by default.
Generator Support Plus	When Generator Support Plus is enabled, the XW Pro will connect the center of its transformer to the AC2 input neutral to act as a load balancing transformer. This feature will attempt to balance the load between L1 and L2. See "Generator Support Settings" on page 1 for more details.
Battery Energy Balance	The Battery Energy Balance function is disabled by default and is intended for use with inverters drawing power from a single battery bank. When enabled, this feature helps balance the power draw across multiple battery banks.

Modbus Settings

The **Modbus Settings** are advanced settings that are only available to qualified personnel.

Table 22 Modbus Settings Menu

Item	Description
Modbus Secondary Address (Port 502)	Port 502 is the Sunspec-compliant port for all Sunspec devices. The default address is 10.
Modbus Secondary Address (Port 503)	Port 503 is used for all other Modbus devices, including legacy devices. The default address is 10.

For defaults, see "Default Settings" on page 192.

Advanced Device Settings

The **Advanced Device Settings** are only available to qualified personnel.

Table 23 Advanced Device Settings Menu

Item	Description
Periodic Transmit Enable	When Enabled, the XW Pro will periodically transmit status messages over the Xanbus to all networked monitoring devices. This is enabled by default and required when operating networked with other monitoring devices.
Identify Enable	When Enabled, all illumination elements of the front panel of the XW Pro will flash rapidly to identify itself as the currently selected Inverter-Charger instance in InsightLocal.

For defaults, see "Default Settings" on page 192.

Device Identification

The **Device Identification** menu is only available to qualified personnel.

Table 24 Device Identification menu

Item	Description
Device Name	Allows customization of the default device name. This setting is optional and does not affect operation.
Device Number	Allows setting of a unique unit number. Each device on a Xanbus network should have a unique ID to prevent communication errors.
System Instance	Identifies the Xanbus association of all devices on the same network. Accepts numerical values only.

Setting the Device Name

The *Device Name* setting allows you to customize the name of the XW Pro as it is displayed on other screens and menus.

The characters available are:

- A to Z
- a to z
- 0 to 9
- space

NOTE: Increasing the number of characters in a device name may cause other text on the same line to run off the edge of the screen. Device names should be limited to 10 characters or less.

The XW Pro device name can be set at the device's **Configuration** page, under the **Device Identification** menu.

Setting the Device Number

When several devices of the same type are installed in the Xanbus network, setting the device number is required to give a Xanbus-enabled device a unique identity. When each identical device has a unique number, the gateway device can correctly identify and display status information for each device. A device number can be any whole number ranging from 0 (default) to 31.

If only one of each type of device is installed in the networked power system, a device number is not needed. However, setting the device number to a value other than 0 is recommended in case you need to use the `Reset` command. This command resets the device number to 0. After performing the command, checking that the device number has returned to 0 indicates that the command was successfully completed. The device number can be set at the device's `Configuration` page in the gateway device, under **Device Identification**.

Managing Energy Sources with Advanced Features

The XW Pro can be programmed to control how and when to use utility power as well as external DC sources of energy such as batteries and solar charge controllers. Advanced features allow management of peak loads, time-of-use billing and self consumption.

Grid Support

WARNING

RISK OF INJURY OR EQUIPMENT DAMAGE

- Advanced menu settings should be used by qualified personnel only.
- Consult with the local utility before enabling XW Pro sell mode or grid support functions.
- Do not change these settings unless you are under the supervision and direction of qualified personnel.

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

NOTE: Grid support and sell functions are modes of operation that are subject to local and/or national grid interconnection requirements in most jurisdictions. It is the responsibility of the installer and system operator to ensure that all applicable procedures and technical requirements are complied with before turning on either of these modes. The interconnect codes and standards with which the XW Pro complies are listed in "XW Pro Overload Capability" on page 144.

The grid support mode allows the XW Pro to support local loads by converting excess capacity from external DC sources connected to its battery bank. Examples of external DC sources are solar charge controllers and batteries.

For Grid Support to function, Grid Support must be enabled from the **Grid Energy Management (Grid Support)** menu and either the battery voltage must be above the `Grid Support Voltage` setting or SOC must be above `Grid Support SOC` setting, depending on whether or not `State of Charge Control` is enabled.

There are two modes of operation within Grid Support.

Grid Support Enabled, Sell Disabled

In this mode, available excess DC power is converted and used to power local loads. No power is exported to the utility. If the local load demand exceeds the available power from the external DC sources, power is then drawn from the utility to support the load. However, if the local load demand is less than the power available from external DC sources, the net excess power from the external DC sources is not converted and hence not used.

Grid Support Enabled, Sell Enabled

In this mode, all available excess DC power is first used to power local loads. Any remaining power is exported to the utility grid.

Sell Block

The sell block feature halts the export of energy to the grid connected to AC1 for a period of time each day. This period of time is defined by the Sell Block Start and Sell Block Stop settings. Sell Block can be useful in managing the self consumption of renewable energy.

NOTE: Sell block will not block selling from an AC coupled inverter.

Grid Support and Battery Charging

Charge Cycle Settings

With the charger enabled, the XW Pro enters grid support mode only after completing a charge cycle when it is first powered up or reconnected to the grid. Unless an external BMS is installed with Charge Cycle set accordingly, set the XW Pro Charge Cycle to two-stage (default) to allow grid support to function immediately after the absorption charge stage is completed. See "Managing Energy Sources with Advanced Features" on the previous page for more information.

NOTE: Only the XW Pro needs to be set to two-stage charging. The Solar Charge Controllers can remain set for three-stage charging. The XW Pro should be set in two-stage charging and the charge controllers set in three-stage for solar charging to occur properly. Alternately, charger block can be used for correct charging. See "Managing Energy Sources with Advanced Features" on the previous page for further information.

Grid Support mode

Grid Support can be configured to operate in one of two modes:

- Grid Support with DC Sources Not Communicating Over Xanbus
- Enhanced Grid Support with Conext MPPT Solar Charge Controllers

At this time, `State of Charge Control` is not supported with any sort of DC-coupled sources.

Grid Support with DC Sources Not Communicating Over Xanbus

This setup is suitable for use with DC sources (such as wind turbines, DC generator sets, fuel cells, and so on) that do not communicate with the XW Pro through Xanbus or for mixed systems which have both Xanbus-connected Conext Solar Charge Controllers and other DC sources (such as those listed above). `Grid Support Voltage` is set 0.5 volts below the voltage provided by the DC source (typically the float voltage setting of the DC source or charge controller). Schneider Electric does not provide support for these non-Schneider Conext products or energy sources.

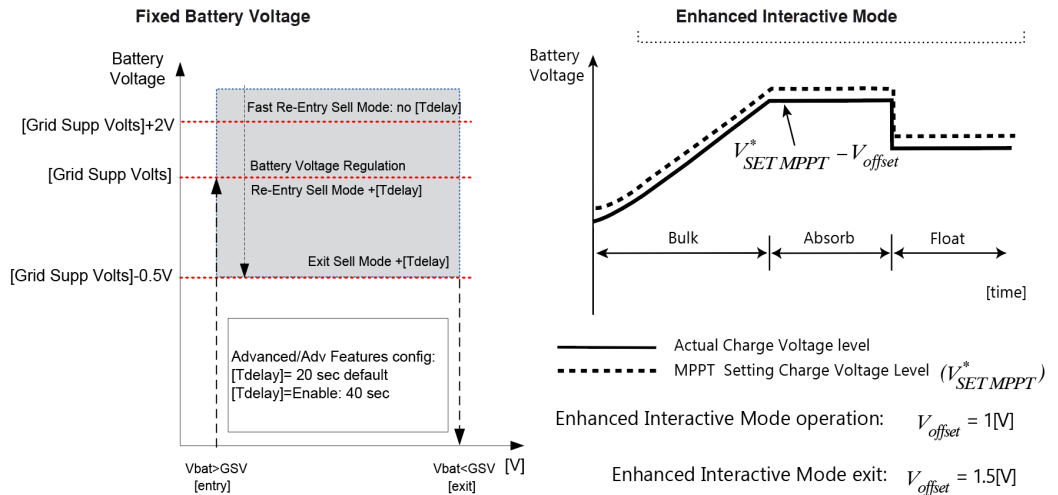
In a 'fixed' battery voltage system configuration, the XW Pro manages the battery voltage to the `Grid Support Voltage` setting. This is done by converting the available DC power to AC power to support the AC loads attached to the inverter output or exports to the utility grid (AC1). Because the battery bank voltage may not reach bulk/absorption voltages in this mode, it is recommended to occasionally force a full charge cycle by either temporarily disabling grid support or forcing a bulk charge cycle from the grid (see `Force Charger State` in "Controls Settings Menu" on page 192).

Enhanced Grid Support with Conext MPPT Solar Charge Controllers

This setup is suitable for Conext Systems with only Conext MPPT Solar Charge Controller(s) networked to XW Pro units through Xanbus. In this configuration, `Grid Support Voltage` is set above the charge controller's Equalization voltage (for example, 64 volts).

In an enhanced grid support set up the XW Pro automatically tracks the Conext MPPT Solar Charge Controller voltage as it transitions through charge states (from bulk to absorption to float). This allows the system to execute a complete battery charge cycle while still converting excess DC power to AC power to support the AC loads or be exported to the utility grid. In doing so, the XW Pro only uses excess DC not required by the battery or used to support local AC loads and sells it to the grid, thereby maximizing the use of the PV array. Since this set up allows the battery bank voltage to reach absorption levels (when PV harvest is adequate), the state of health of the battery is improved. The sell entry and regulation voltage level is the absorption and float voltage of the XWPro. Therefore, for Enhanced Grid Support to operate correctly, the absorption and float voltage setpoints on the MPPT charge controllers and XW Pro(s) must be identical.

Figure 22 Grid Support and Enhanced Grid Support



NOTE: `[Tdelay]` is an entry/exit transition time delay to/from grid support and sell mode. If the battery voltage has higher fluctuations due to DC renewable sources (e.g. charge controllers, wind turbines, and so on), then the time delay can be increased. If the battery voltage has a sudden increase change greater than `Grid Support Volts + 2 V`, then the XW Pro will override the delay and enter grid support or sell mode immediately.

Charger Block

The charger block feature halts charging on AC1 (Grid) for a period of time each day. This period of time is defined by the `Charge Block Start` and `Charge Block Stop` settings. In areas where the utility charges variable rates for electricity, it is preferable to use utility power for charging only during non-peak hours. Charger block

can prevent utility power from being used for battery charging during peak billing periods.

During the time period set between `Charge Block Start` and `Charge Block Stop`, AC1 (Grid) input continues to be passed through to the loads. Inverter operation remains unaffected during the charger block period.

During the charger block period, no charging on AC1 occurs even if the batteries discharge below `Recharge Voltage/SOC` setting. However, a generator connected to AC2 (in the absence of utility/AC1 power) or a Solar Charge Controller may charge batteries during the charger block period. AC priority must be set to AC2 to charge batteries with a generator connected to AC2 during the charger block period.

Table 25 Charging mode versus AC priority

AC1	AC2	Charge Block Enable	AC Priority	XW Pro Enters Charge Mode
120V	0V	YES	AC1	NO
0V	120V	YES	AC1	YES
120V	120V	YES	AC1	NO
120V	120V	YES	AC2	YES
0V	0V	YES	AC1	NO

If the charger is operating (that is, in float, absorption, bulk, or equalize stage) at the `Charge Block Start` time, charging on AC1 stops immediately and the charger enters an idle state identical to no float (see "Charger Settings Menu" on page 193). When the charger block period is over, the charger does not resume the charge stage that was interrupted. Instead, if the batteries are above the `Recharge Voltage/SOC` setting, the charger remains idle.

If the battery voltage discharges below the `Recharge Voltage/SOC` setting during the charger block period, the XW Pro begins a new charge cycle with the bulk stage after the charger block period has expired (at the `Charge Block Stop` time).

For example, charger block is set to start at 5:00 PM and end at 8:00 PM. If the XW Pro is charging from AC1, charging stops at 5:00. When charger block ends at 8:00, the XW Pro does not automatically resume charging. The unit first measures the battery voltage.

- If the voltage is below the `Recharge Voltage` setting, or if the state of charge is below `Recharge SOC`, then the XW Pro starts a new charge cycle from bulk.
- If the voltage is above the `Recharge Voltage` setting, or if the state of charge is above `Recharge SOC`, then the XW Pro remains idle and continues passing through AC to the loads.

The XW Pro also keeps measuring the battery voltage as before to determine whether to start a new charge cycle.

Peak Load Shaving (PLS)

Many utilities impose a surcharge on their customers based on the peak load used by a facility. To reduce utility peak demand charges, the inverter can be configured (using the `Load Shave Amps` setting) to help limit the maximum draw the AC loads place on the utility. The inverter can be programmed to provide power above a specified level to avoid the surcharge. When the utility current draw reaches the maximum level, the inverter assists by sourcing power from the batteries to the loads.

For PLS to be effective, all loads must be connected to the inverter. For large loads, multiple (or stacked) inverters may be required.

To help the batteries supplement the power requirements of the connected load, an additional source of power (solar, wind, or hydroelectric) is recommended.

PLS shall start only if the battery amperage remained at the specified level for the configured time.

Example Settings

```
Load Shave=Enabled, Load Shave Amps=10 A,  
LoadShaveStart=6:00pm, LoadShaveStop=9:00pm,  
Peak Load Shave Delay = Enabled
```

With these example settings, the XW Pro would enter PLS within the configured window of time only if the battery was charged from MPPT in Float (including Absorption) for 2 hours.

NOTE: When actively operating, the XW Pro compensates for active power as a reference for controlling the total current as specified in the `Load Shave Amps` setting. However, there is also reactive power that is not compensated for by the XW Pro. For example, if `Load Shave Amps` is set to 10A, the inverter will only start drawing power from the batteries at a current level which would measure approximately 11A which is 1A higher than the `Load Shave Amps` value to meet the demand of the loads.

Time-of-Use Metering

Utilities use time-of-use metering to determine utility charges during peak usage hours and to impose a surcharge. The XW Pro can be configured (using the `Load Shave Start`, `Load Shave Stop` and `Charger Block` settings) to overcome these peak charges by using utility power to charge the battery bank during the inexpensive energy hours and consuming the battery energy during expensive energy hours.

For example, if `Charger Block` is set between 9:00 AM and 10:00 PM and `Load Shave` is set between 6:00 PM and 9:00 PM, charging on AC1 stops at 9:00 AM and continues to pass through utility AC to the loads. If charging is required during the charger block period, and `AC Priority` is set to AC2, the XW Pro can use any AC source connected to AC2. Loads will transfer to the AC source on AC2 as well. The inverter connects to the utility grid at 6:00 PM and supports loads using the batteries. The inverter continues to run until 9:00 PM. The XW Pro then stops supporting the utility grid and passes utility AC through to the loads. At 10:00 PM utility AC begins maintaining the batteries based on the battery charger settings.

The above example allows an external renewable energy source to be utilized as a primary charging source during a desired time window. The charger (using utility AC connected to AC1) can then be used to supplement the battery charging when the utility rates are low.

When using the system for time-of-use metering, the system should be designed with a battery capacity large enough to support loads during the entire peak rate period without reaching the `Low Battery Cut Out` or `Low Battery Cut Out SOC` setting.

NOTE: If the batteries reach the `Low Battery Cut Out` setting, the XW Pro automatically reconnects to the utility grid to maintain the connected load.

Self-Consumption

PLS can also be used with time-of-use metering to support self-consumption. In the self-consumption mode of operation, the XW Pro is capable of delaying Peak Load Shave mode by a fixed time of 2 hours. This is done by allowing a priority for the MPPT solar charge controller to charge the battery bank.

This configuration can be selected under the XW Pro menu by setting `Peak Load Shaving Delay` under **Grid Energy Management (Grid Support)** (Advanced view) to `Enabled`. The default setting is `Disabled`.

Updating Firmware

IMPORTANT: If upgrading inverter firmware, all devices in the Xanbus network will be out of operation during the upgrade. If installed, use the external bypass (transfer) switch to power home loads from the grid during the firmware upgrade.

Your computer, and all LAN network devices between the computer and gateway device must have an alternate power source.

NOTICE

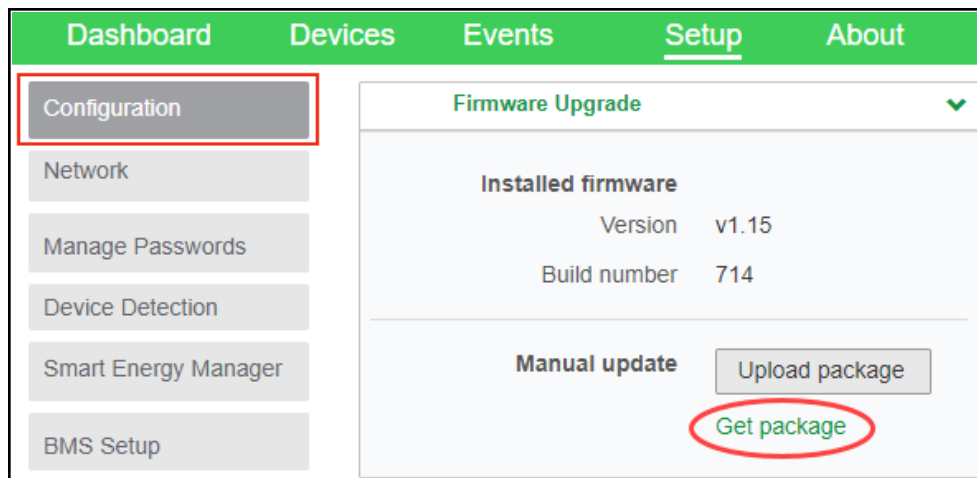
RISK OF EQUIPMENT DAMAGE

- Consult the Guide when changing the device's settings.
- Make sure the device connected on the Xanbus or Modbus network is in Standby mode before changing settings.
- Do not change any settings unless you are familiar with the device.

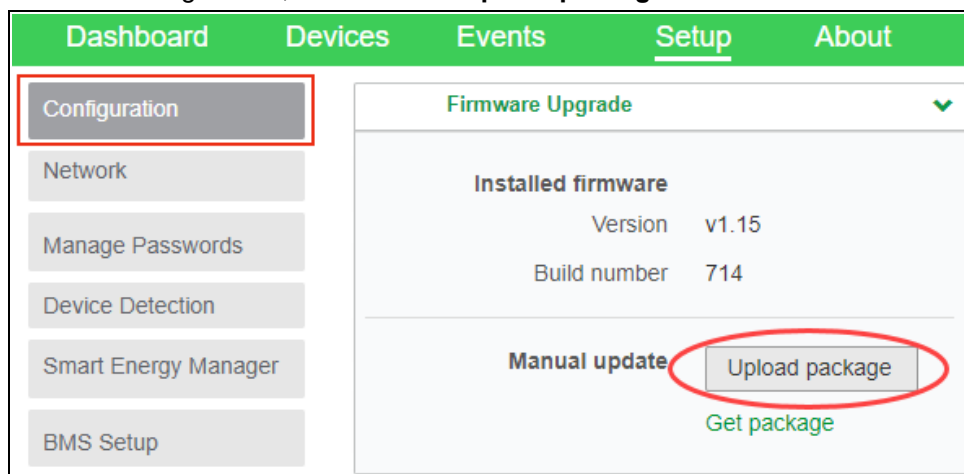
Failure to follow these instructions can result in equipment damage.

Updating Gateway Device Firmware:

1. Login as *Admin* on your gateway device.
2. Go to **Setup > Configuration > Firmware Upgrade**.



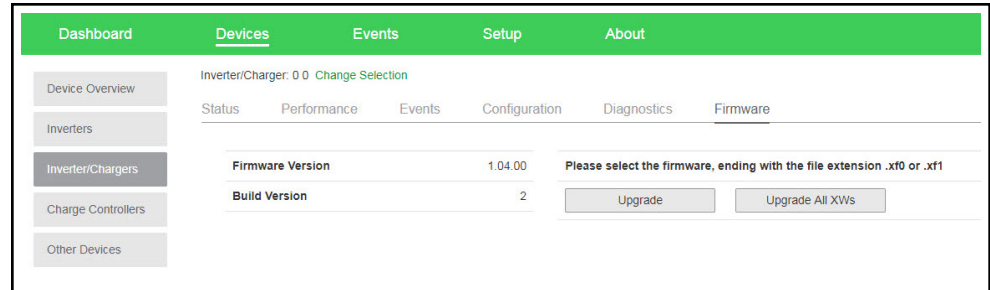
3. Download the firmware package.
 - a. Click **Get package**.
 - b. From the product webpage, go to **Downloads > Firmware**.
 - c. Locate the latest firmware package from the list and click it to begin downloading.
 - d. Save and extract the `.epkg` file to a local directory.
4. Go back to InsightLocal, and then click **Upload package**.



5. Locate and select the firmware package (`.epkg` file) from your local drive.
6. Click **Open** from the Windows dialog. The upgrade begins automatically.
7. As the firmware package is transferred to the gateway device, progress is indicated in percentage, and a message screen indicates when the file transfer has been completed successfully.
8. If prompted, restart the gateway device.

Updating Inverter Firmware:

Figure 23 Firmware tab

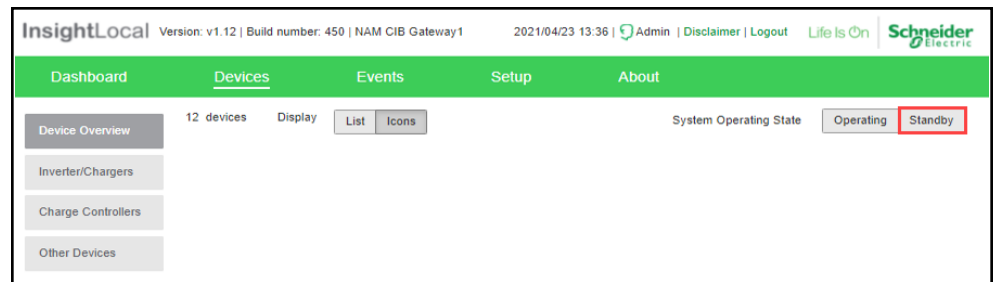


To obtain the firmware package:

1. From a laptop computer, open a web browser.
2. Go to <https://se.com/> and download the latest version of the correct device firmware (contained in a ZIP file):
 - a. Navigate to the appropriate product page.
 - b. Click **Downloads > Firmware**.
 - c. Locate the firmware version for your application: 120–240v for split-phase systems, or 120v for systems that have been converted for single phase or 3-phase applications.
 - d. Click **Download**.
3. Extract the .xf0 file from the ZIP file into a folder onto your local drive.

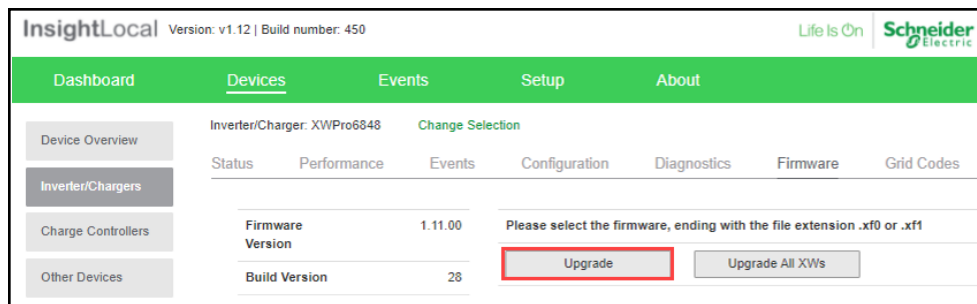
To upgrade inverter firmware:

1. Before installing the firmware update, using the gateway device, place the entire system into **Standby** mode, interrupting the AC output of the inverter(s). While the system is in *Standby* mode, make sure that any computer or LAN networking equipment used for the update has an alternate power source.
 - a. In the main menu bar, click **Devices**.
 - b. On the *Device Overview* page, on the right-hand side next to *System Operating State*, click **Standby**.



2. From the side menu, click **Inverter/Chargers**.
3. Click the **Firmware** tab.

- Click **Upgrade** or **Upgrade All XWs** for single-unit or multi-unit systems, respectively.



- Follow the step-by-step upgrade instructions.
- Note:** This step only applies when performing a conversion from XW Pro 120/240V to 120V firmware.

When the firmware upgrade is complete:

- Navigate to the **Configuration** tab (**Advanced** view).
- Under **Controls > Reset**, select "**Reset All Settings to Factory.**"
- Click **Apply**.

This is to update all 120V model-specific configuration parameters.

After the reset, site specific configuration parameters can be applied.

See *Converting 120 V/240 V Split-phase to 120 V Single-phase* in the XW Pro Installation Guide (document number 990-91228) for more information.

- Once the update is complete, place the system back into **Operating** mode. The Xanbus network will resume normal operation.

Managing Compliance Regions

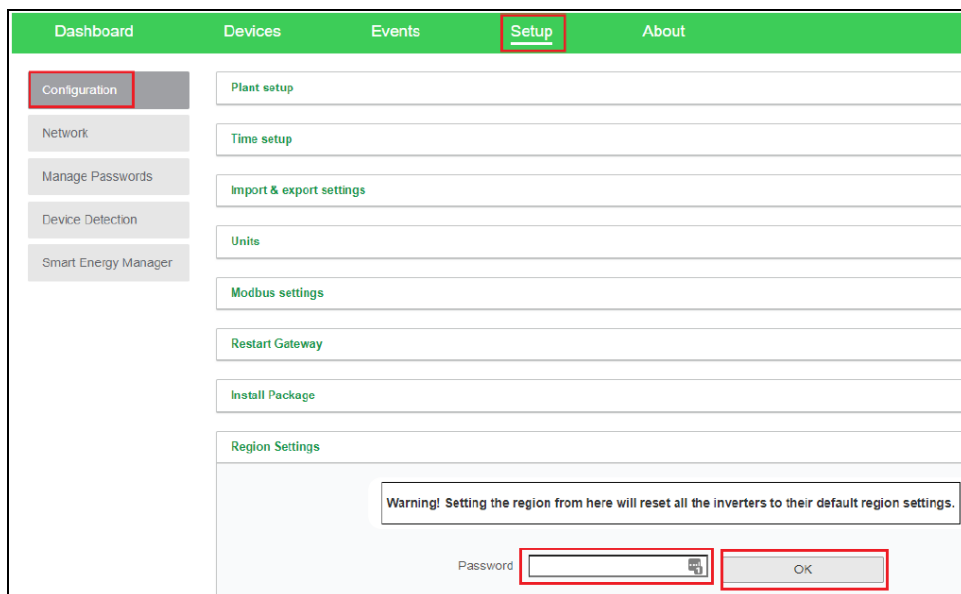
The **Grid Codes** tab in the XW Pro menus provides access to the autonomous grid interactive functionality including active/reactive power curves and ride-through profiles. By selecting the applicable grid compliance region, the XW Pro immediately makes all the appropriate configurations to conform with the requirements of that region, which in turn also sets the nominal grid frequency of the unit. Further adjustments of these functions can be applied after selecting a compliance region. The menu options in this page are password protected.

The password is available to qualified installers to configure systems (grid interactivity) according to local utility requirements. To obtain the region code password, follow the steps outlined in the *Commissioning Guide* or contact Schneider Electric.

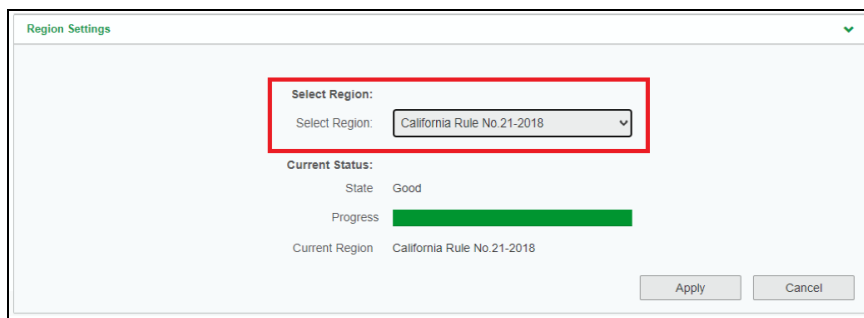
To apply a compliance region to all units connected to a gateway device simultaneously, access the `Region Settings` menu under `Setup > Configuration`. As with compliance settings for individual XW Pro in their respective menus, this menu is accessible only by qualified technicians.

To apply a grid code:

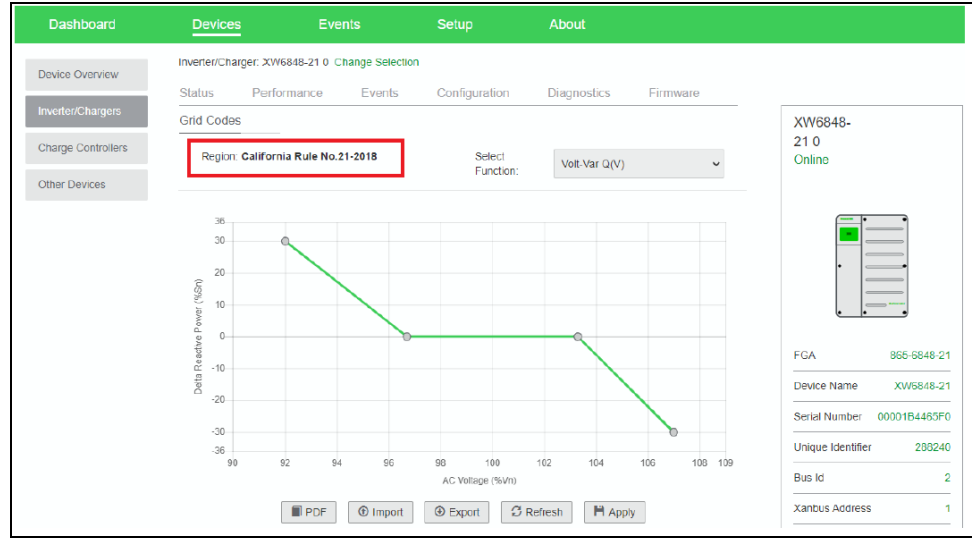
- Using a gateway device, navigate to **Setup > Configuration > Region Settings**.



- Select the appropriate region grid code from the **Select Region** pull-down menu.
 - For grid interactive systems, the appropriate grid code is specified by the utility in their interconnection rules.
 - For AC-coupled systems, ensure that the AC coupled PV inverters are set to the same grid code.
 - Note, off-grid systems may typically use any of the grid codes. For off-grid, a region code must still be applied. For off-grid AC coupled systems, the California Rule no. 21-2018 grid code is recommended for the XW Pro and PV inverters.



- Verify that each inverter accepted the correct Grid Code Region by navigating to **Devices > (inverter) > Grid Codes**.



Changing Connected Device Settings

Before making any changes, familiarize yourself thoroughly with the effects of changing the settings of the device.

NOTICE

RISK OF EQUIPMENT DAMAGE

- Consult the device’s Owner’s Guide when changing the device’s settings.
- Make sure the device connected on the Xanbus or Modbus network is in Standby mode before changing settings.
- Do not change any settings unless you are familiar with the device.

Failure to follow these instructions can result in equipment damage.

Figure 24 Device Overview screen - Icons display

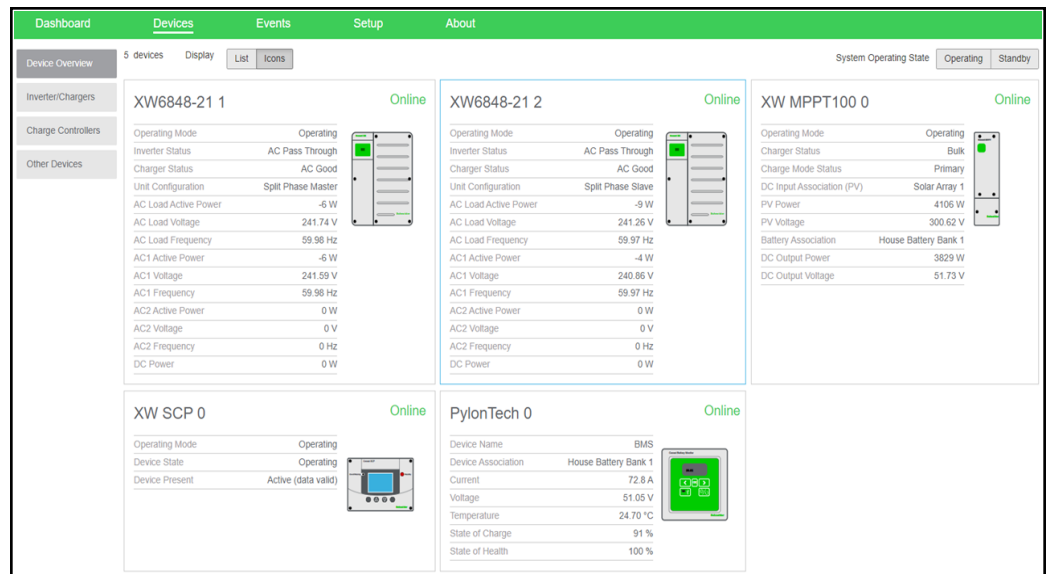


Figure 25 Device Overview screen - List display

Device type	Device Id	Status
XW	532679	Online
XW	527506	Online
HVMPPT	1697665	Online
HVMPPT	1687045	Online
AGS	188196	Online
SCP2	198477	Online
BATTMON	511489	Online

To change a device setting:

- In the main menu bar, click **Devices**. See Figure 24 for a sample of the default display of all connected devices.
- If you want a shorter list of devices, switch to a List display. See Figure 25.
- If required, put the device in to *Standby* mode first.

NOTE: Only some settings require the device to be in *standby* mode. If the setting is greyed out, this indicates that the device must be in *standby* mode in order to make the change.

 - Click a device you want to put in to *Standby* mode.
 - Click **Configuration > Controls**.
 - Search for the control setting **Operating Mode**.
 - Select **Standby**.
 - Click **Apply**.
- Click **Configuration**
- Choose either **Basic** or **Advanced** settings.
- Click a device setting category. For example, **Inverter Settings** in the case of an inverter device.
- Change a specific setting by selecting from a drop-down list, toggling a switch, or entering a different value.
- Click **Apply** to save the changes.
- Use the **Operating Mode** menu to put the device back into normal operating mode.

Power Control System Mode (PCS)

The PCS system monitors and controls the loads to ensure that the branch circuits, feeders, and service are not overloaded.

The **Power control system mode** settings are advanced settings that are only available to qualified personnel, and the menu options on this page are password protected. PCS mode maintains requirements for indoor use only.

⚠ WARNING
HAZARD OF UNEXPECTED OPERATION
Configuration of the PCS system or changes to the settings are to be made by qualified personnel only. Incorrect configuration or setting of the power control settings may result in unexpected operation and unsafe conditions.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ ⚠ WARNING
HAZARD OF ELECTRIC SHOCK
All PCS controlled busbars or conductors shall be protected with suitably rated overcurrent devices appropriately sized for the busbar rating or conductor ampacity.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Export-Only DC Coupled Solar Mode

The XW Pro is by default set to `Unrestricted` mode, and can also be configured for `Export-Only DC Coupled Solar` mode. When `Export-Only DC Coupled Solar` mode is selected, the XW Pro charging from any AC source is disabled. In this mode, batteries are only charged from DC coupled MPPT charge controllers, and can be discharged to power local loads or export to the grid. Figure 26 and Figure 27, on page 111, show the main elements of the Power Control System. Figure 26 shows the use of the internal transfer relays of the XW Pro, whereas Figure 27 shows the use of the Backup Control Switch (BCS) as a Micro-grid Interconnect Device (MID) switch. The BCS is used when the total backup loads exceed 60 A.

⚠ ⚠ WARNING
HAZARD OF ELECTRIC SHOCK
The maximum PCS operating current must not exceed the ampacity of the conductor.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: The maximum operating currents are limited by the number of inverters connected in the power control system.

Table 26 PCS Configuration for Export-only Mode

Configuration	XW Pro 6848 NA	MPPT	Gateway Device	PCS Current Rating
Minimum	1	1	1	27 A
Maximum	4	6		108 A

As shown in Table 26, the minimum configuration for an export-only power control system includes at least one XW Pro and MPPT charge controller, and one gateway

device. The XW Pro and charge controller quantity can be combined in any combination of quantities respecting the minimum and maximum. Please refer to the following table of part numbers valid for the above configurations.

Table 27 Equipment Configurations for Export-Only Mode

PCS Equipment	Model Name	Part Number
XW Pro	XW Pro 6848 NA	865-6848-21
MPPT	MPPT 100 600	865-1034
Gateway Device	InsightHome	865-0330
	InsightFacility	865-0335
	Conext Gateway	865-0329

Figure 26 PCS Without Backup Control Switch

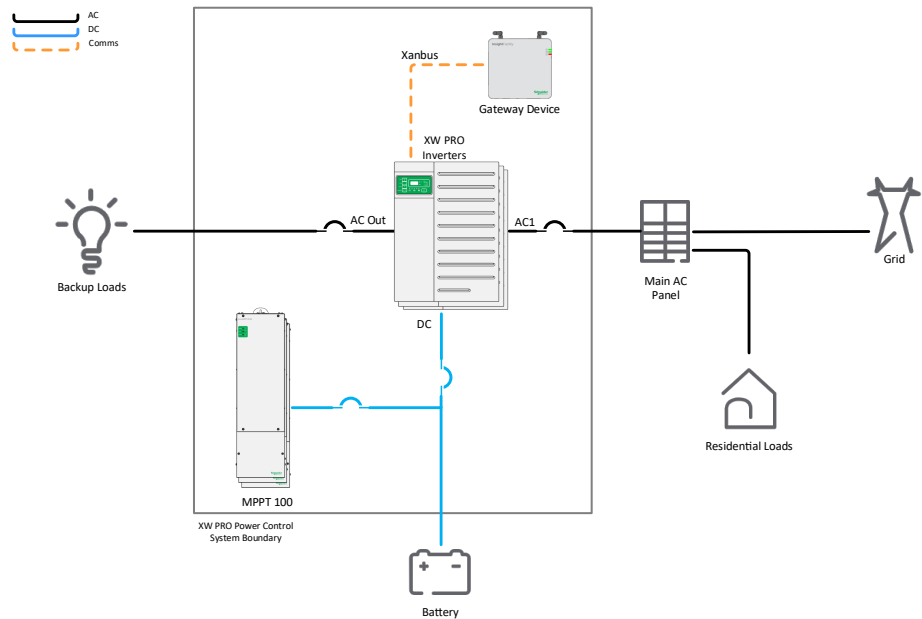
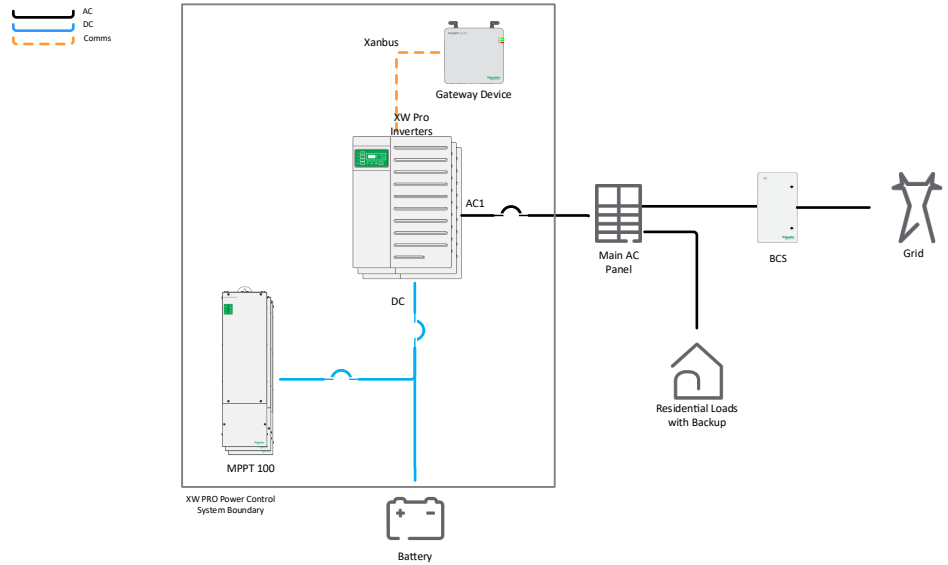
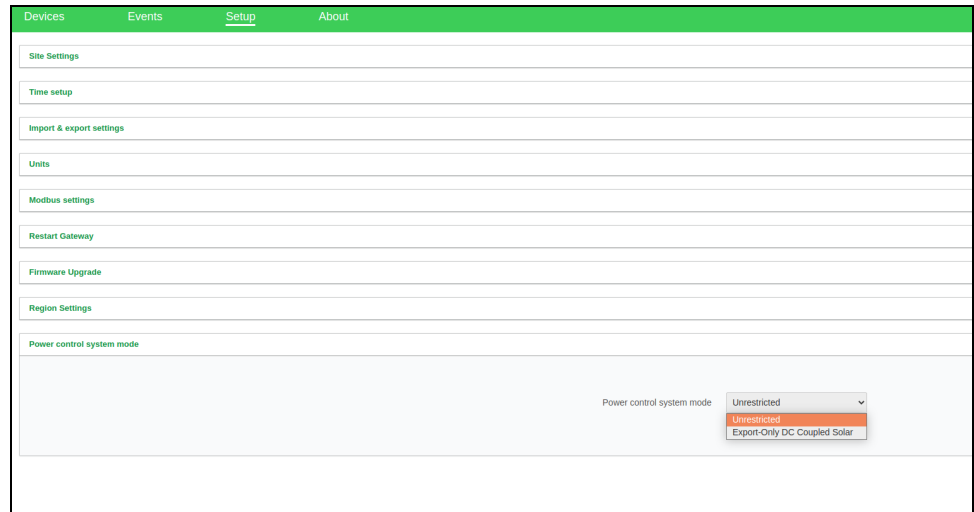


Figure 27 PCS With Backup Control Switch



To apply a power control system mode:

1. Using the gateway device, navigate to **Setup > Power control system mode**, and enter the password.



2. Select the appropriate mode from the **Power control system mode** pulldown menu, and then click **Apply**. The Power Control System (PCS) allows two operating modes:
 - a. **Export-Only DC Coupled Solar** - the energy storage system (ESS) may discharge power to the grid, but will not take power from the grid for the purpose of charging.
 - b. **Unrestricted Mode** - (Default) There is no restriction to the powerflow.

Modbus TCP Settings

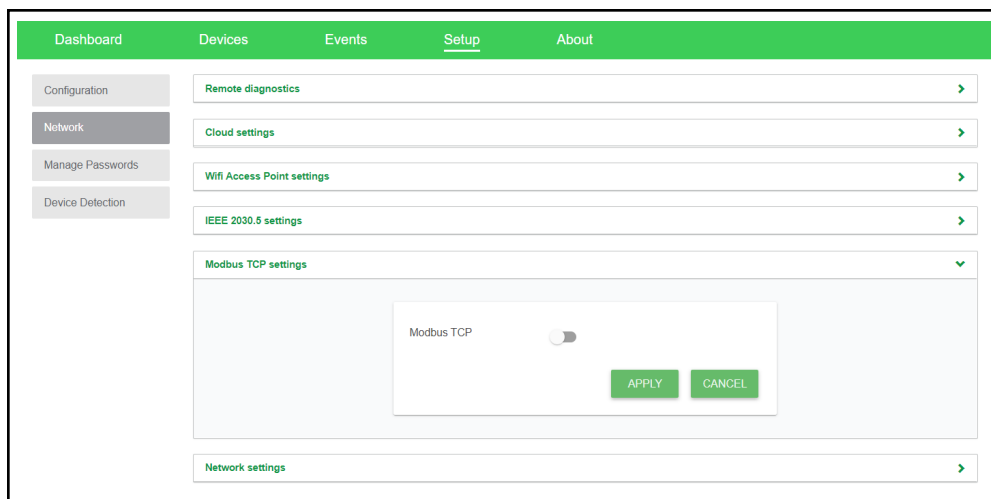
Modbus TCP allows an external controller to communicate with the XW Pro and perform monitoring and control activities.

Important: The Modbus TCP protocol is not secure. **DO NOT** route this protocol over an untrusted public or private network. Ensure adequate cybersecurity protections are enforced on your network. Maintain appropriate firewalls and physical access restrictions.

To enable Modbus TCP:

1. Go to **Setup > Network > Modbus TCP settings**.
2. Slide the toggle switch to the right.
3. Click **Apply**.

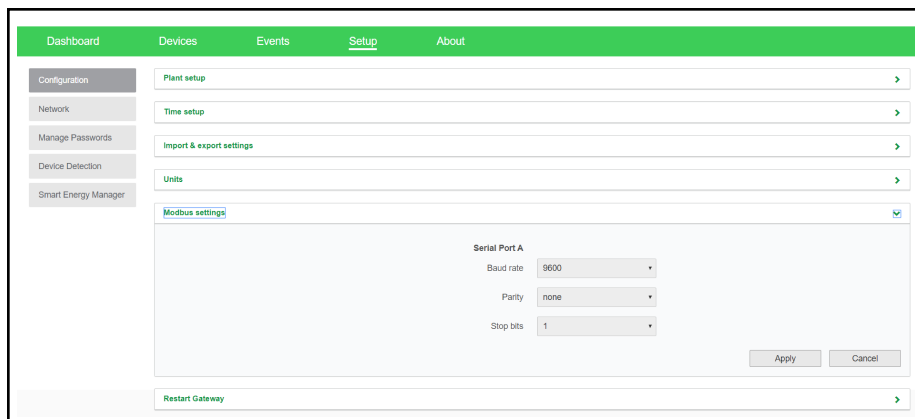
Figure 28 Modbus TCP settings



Connecting and Configuring Modbus Devices

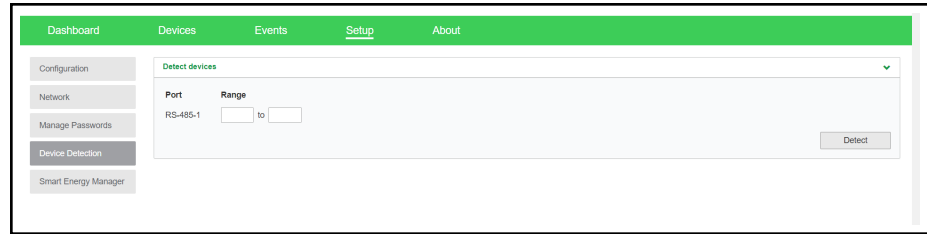
NOTE: For Modbus map information, contact Schneider Electric.

1. Go to **Setup > Configuration > Modbus Settings**.
2. Complete the **Serial Port** setup and then click **Apply**.

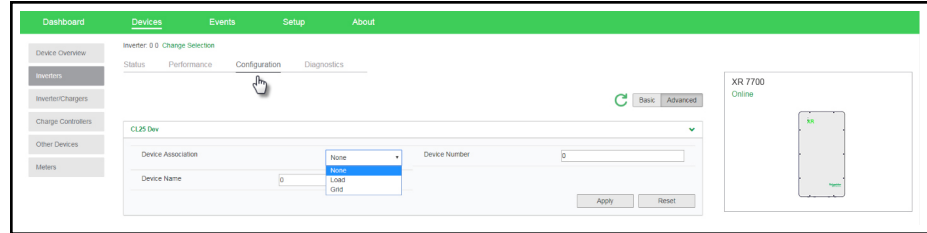


3. Go to **Home > Setup > Detect Devices**.

- Under **Range**, enter a Modbus address range and then click **Detect**.



- Go to **Devices** and then select a device.
- Go to **Configuration** and configure the device. Repeat steps 5 and 6 for each device.

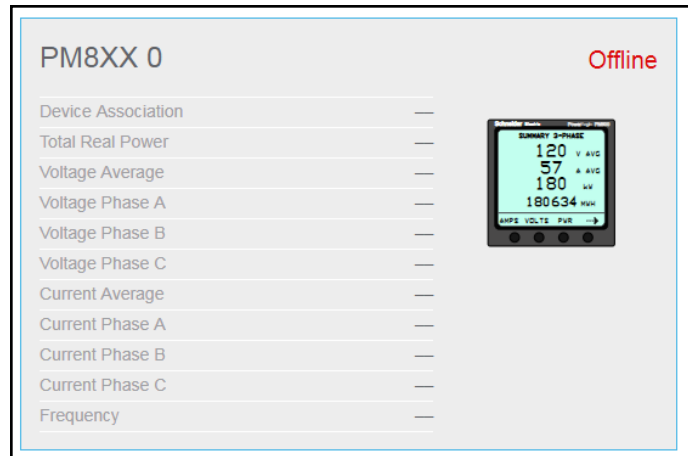


For Modbus settings, see "Modbus Settings" on page 96 and "Default Settings" on page 192.

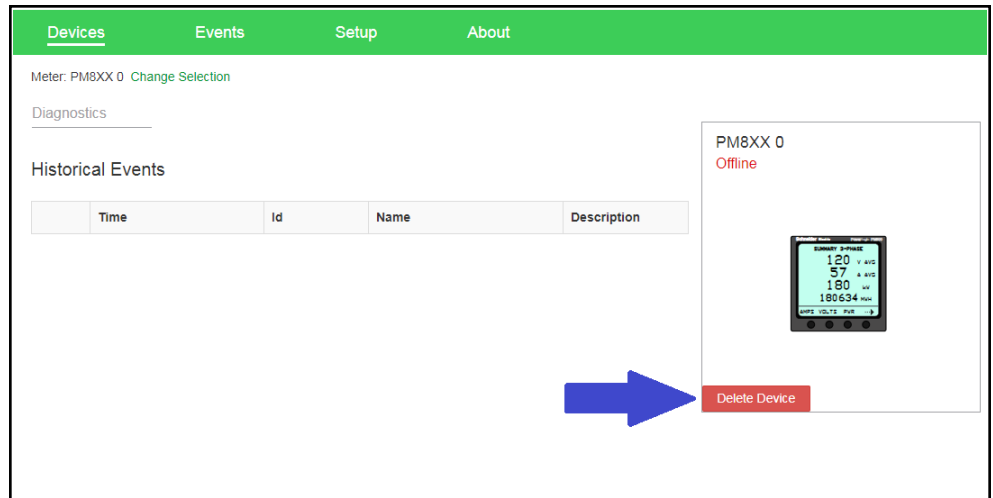
Removing a Modbus Device

To remove a Modbus device:

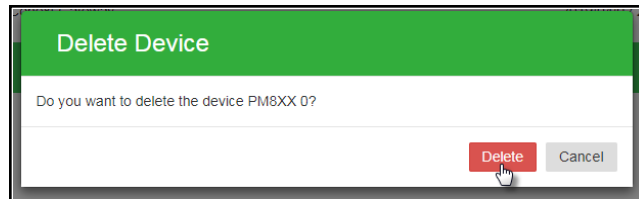
- Disconnect the device from the bus.
- Log in to the gateway device.
- Select the **Devices** tab and then navigate to the Modbus device that you want to remove.
- Verify that the device is "Offline" and then click on the device.



5. Click **Delete Device**.



6. In the *Delete Device* dialog, click **Delete**.



7. Restart your XW Pro (recommended).

Resetting the XW Pro to Default Settings

WARNING

RISK OF INJURY OR EQUIPMENT DAMAGE

- Advanced menu settings should be used by qualified personnel only.
- Consult with the local utility before enabling XW Pro sell mode or grid support functions.
- Do not change these settings unless you are under the supervision and direction of qualified personnel.

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

The **Reset All Settings to Factory** command returns the XW Pro to factory default settings. After using the command, the XW Pro is no longer configured for the power system.

NOTICE

RESTORING DEFAULTS

Do not restore defaults while the XW Pro is operating. De-energize the power system and disconnect the XW Pro AC input before restoring defaults. Reconfigure the XW Pro before reconnecting the AC input and re-energizing the power system.

Failure to follow these instructions can result in equipment damage.

To reset the XW Pro to its default settings:

1. Go to **Devices > Inverters/Chargers**, and then select the inverter.
2. Click the **Configuration** tab, and then click **Advanced**.
3. From the **Controls > Reset** menu, select **Reset All Settings to Factory**.

5 Troubleshooting

What's in This Chapter?

General Troubleshooting Guidelines	118
Inverter Applications	119
Resistive Loads	119
Motor Loads	119
Problem Loads	119
Inverter Troubleshooting	121
Battery Charger Troubleshooting	124
Faults and Warnings	126
Warning Messages	126
Fault Messages	129

General Troubleshooting Guidelines

This section will help you narrow down the source of any problem you may encounter. Please read the following troubleshooting steps:

1. Check for a Warning or Fault message on InsightLocal or a Fault code on the inverter information panel. If a message is displayed, record it immediately.
2. As soon as possible, create a detailed record of the conditions at the time the problem occurred. These details should include, but not be limited to, the following:
 - Loads the XW Pro was running or attempting to run.
 - Battery condition at the time of failure (for example battery voltage or temperature) if known.
 - Recent sequence of events (for example, charging had just finished, utility grid had failed but the inverter did not start up).
 - Any known unusual AC input factors such as low voltage or unstable generator output.
 - Extreme conditions which may have existed at the time (for example, temperature or moisture).
3. Attempt the solution corresponding to the Warning or Fault message in Faults and Warnings on page 126.
4. If the Event LED is not lit up on the front of the inverter information panel or InsightLocal shows no event, check the following list to make sure that the present state of the installation allows proper operation of the unit. See also "Inverter Troubleshooting" on page 121 or "Battery Charger Troubleshooting" on page 124.
 - Is the XW Pro located in a clean, dry, adequately ventilated area?
 - Have the AC input breakers opened? If so, your passthrough load may have exceeded the rating of one or more of the input breakers.
 - Are the battery cables adequately sized and short enough? See the XW Pro Installation Guide (document number 990-91228) for more information.
 - Is the battery in good condition and are all DC connections torqued to the values specified in the *XW Pro Installation Guide (document number 990-91228)*?
 - Are the AC input and output connections torqued to the values specified in the *XW Pro Installation Guide (document number 990-91228)*, and wiring in good condition?
 - Are the configuration settings correct for your particular installation?
 - Is the communications cable properly connected and undamaged?
 - Are the battery temperature sensor and its cable properly connected and undamaged?
5. Contact Customer Service for further assistance. Please be prepared to describe details of your system installation and provide the model and serial number of the unit. See beginning of document for contact information.

Inverter Applications

The XW Pro performs differently depending on the AC loads connected to it. If you are having problems with any of your loads, read this section.

Resistive Loads

Resistive loads are the easiest and most efficient to drive. Voltage and current are in phase, which means they are in step with one another. Resistive loads generate heat in order to accomplish their tasks. Toasters, coffee pots, and incandescent lights are typical resistive loads. It is usually impractical to run larger resistive loads—such as electric stoves and water heaters—from an inverter due to their high current requirements. Even though the inverter may be able to accommodate the load, the size of battery bank will limit inverter run time.

Motor Loads

Induction motors (AC motors without brushes) require up to six times their running current on startup. The most demanding are those that start under load (for example, compressors and pumps). Of the capacitor start motors (typical in tools such as drill presses and band saws), the largest you can expect to run is 1 horsepower. Universal motors are generally easier to start. Check that the Locked Rotor Amps (LRA) rating of the motor load does not exceed the maximum surge current rating of the inverter. Since motor characteristics vary, only testing will determine whether a specific load can be started and how long it can be run.

If a motor fails to start within a few seconds or loses power after running for a time, it should be turned off. When the inverter attempts to start a load that is greater than it can handle, the inverter may shut down from an AC overload fault.

Problem Loads

Very Small Loads

If the power consumed by a device is less than the threshold of the search mode circuitry, and search mode is enabled, the inverter will not run. Most likely the solution will be to disable `Search` mode or lower the sense threshold (see "Backup Mode Settings" on page 60).

Fluorescent Lights and Power Supplies

Some devices cannot be detected when scanned by search mode circuitry. Small fluorescent lights are the most common example. Some computers and sophisticated electronics have power supplies that do not present a load until line voltage is available. When this occurs, each unit waits for the other to begin. To drive these loads, either a small companion load like a light bulb rated for more than the `Search Watts` setting must be used to bring the inverter out of search mode, or the inverter may be programmed to remain on by disabling search mode (see "Backup Mode Settings" on page 60).

Clocks

You may notice that your clocks are not accurate. Some of the clocks on your appliances may reset when the XW Pro is in search mode. Disabling search mode will resolve this issue (see "Backup Mode Settings" on page 60).

In off-grid AC coupled systems, AC frequency shifting may also affect your clock's ability to track time.

Searching

When the inverter is in search mode, it may fail to start some loads even though the rated wattage on the load is more than the `Maximum Search Watts` setting. Disable search or apply an additional load (companion load) to make the inverter exit search mode.

Inverter Troubleshooting

To determine the cause of an inverter error condition, refer to the troubleshooting table below for possible solutions.

Table 28 Troubleshooting Common Problems

Problem	Possible cause	Solution(s)
Unit will not power on (no LEDs are on) and the inverter information panel is blank or off.	Unit was turned off using STARTUP/SHUTDOWN button on front panel.	Turn the unit on again.
	DC voltage on the inverter's DC terminals is incorrect.	Check the battery voltage, fuses or breakers and DC cable connections to the inverter. If the DC voltage on the inverter's DC terminals is correct, have unit serviced.
Unit goes into invert mode and starts producing AC output, but stops quickly (several attempts made).	Excessive load on output.	Reduce loads.
	Unit is in over-temperature protection and needs to cool down.	Stop inverting by putting the inverter into Standby mode, and then allow the unit to cool and increase ventilation. If necessary, replace the foam air filter on the bottom of the unit.
	Remote Power Off signal is present.	Release or reset the Remote Power Off switch.
No AC power output. The inverter information panel displays Sch.	Open AC output breakers or fuses and bad output wire connections. Inverter is disabled. Re-enable inverter.	Check the Load AC Voltage status on the gateway device <i>Status</i> page and check AC voltage on the inverter AC Out terminal block. If the <i>Status</i> page shows correct AC voltage but there is no AC voltage on the inverter AC Out terminal block, check for loose connections on the inverter terminal block. If connections are not loose, the inverter may need to be serviced. If there is correct AC voltage on the <i>Status</i> page and on the inverter AC terminal block, check for open AC output breakers or fuses and bad output wire connections. If AC voltage on the <i>Status</i> page or inverter AC terminal block is incorrect, have unit serviced.
No AC power output. INVERT LED is flashing.	AC load too small for search mode circuit to detect.	Reduce <i>Maximum Search Watts</i> setting, increase load above <i>Maximum Search Watts</i> setting, or disable <i>Search</i> on the <i>Setup</i> menu. If the AC1 LED is on, check inverter output connections and voltage.

Problem	Possible cause	Solution(s)
<p>Low AC power output or low surge power. INVERT LED is on.</p> <p>AC inductive loads are not running at full speed.</p>	<p>Insufficient DC current being provided to the inverter to operate the AC loads.</p>	<p>Check the battery voltage, fuses or breakers and cable connections.</p> <p>Make sure the battery bank is sufficient (check for low DC voltage while running the load).</p> <p>Make sure the cable length and size is correct (see the <i>XW Pro Installation Guide</i> for correct cable).</p> <p>Tie the battery cables together to reduce inductance.</p> <p>Apply a load greater than 100 W or disable <i>Power Save</i> (see "Advanced Features" on page 95).</p>
<p>Inverter goes into invert mode and starts producing AC output and then stops or does not start at all.</p>	<p><i>Maximum Search Watts</i> setting is too low or high.</p> <p>Potential problem loads for search mode:</p> <p>Incandescent lights have a higher starting wattage when the filament is cold than the continuous rating of the bulb.</p> <p>Fluorescent bulbs draw little power until the mercury vapor begins to conduct enough current to light the tube.</p> <p>Other loads: Some appliances draw power even when turned off: TVs with instant-on circuits and VCRs, for example.</p>	<p>If the search sensitivity is set higher than the combined loads, then connect an auxiliary load to bring the inverter out of search mode before the appliances can be turned on.</p> <p>If the sensitivity is set lower than the combination of the loads, the loads will remain on and excess battery drain will occur since the inverter won't ever idle.</p> <p>Another solution is to turn the item off at the wall, use an extension cord with a rocker switch, a switch at the outlet, or an appropriate circuit breaker.</p>
<p>The utility grid is not dropping out, but the unit is disconnecting from the grid.</p>	<p>The AC voltage or frequency provided to the inverter input is outside the AC Setting voltage or frequency range.</p>	<p>Adjust the AC1 voltage and frequency settings (see "AC Settings" on page 75). Raise the high voltage and frequency settings, and lower the low voltage and frequency settings. If Grid support is enabled, these limits are over-ridden by the default anti-islanding AC parameters.</p>

Problem	Possible cause	Solution(s)
<p>The inverter connects to the grid and can charge normally. In a grid interactive mode (Grid Support enabled), the unit is experiencing excessive anti-islanding faults during periods of high sell amperage.</p>	<p>The impedance of the AC connection to the inverter is too high for the power being sold to the grid. The impedance may be on the high end if the installation is too far from the utility point of common connection or if the wires are too small between the XW Pro and the main service panel.</p>	<p>Measure the grid voltage at the service panel (meter base). It is important to measure L1-N, L2-N, L1-L2, and N-Ground. If these measurements are not within the voltage range for sell mode (see "Electrical Specifications" on page 140), contact your utility for resolution. If these measurements are within the voltage range for sell mode (see "Electrical Specifications" on page 140), the most likely event is that the AC wiring between the inverter and the meter base is not sized appropriately. It should be sized for a 1 to 1.5% maximum voltage drop. Alternately, the Max Sell Amps can be reduced until the unit stops disconnecting.</p>

Battery Charger Troubleshooting

To determine the cause of a charger error condition, refer to the troubleshooting solutions below to resolve the situation.

Table 29 Troubleshooting Battery Charger Problems

Problem	Possible Cause	Solution
AC1/AC2 LED is on, but will not start charging (allow 40 seconds to synchronize).	1) Charger is disabled on the <code>Setup</code> menu.	1) Enable the charger.
	2) <code>Charger Block</code> is enabled and the XW Pro is inside of the charger block time window.	2) Disable <code>Charger Block</code> if you need to override this feature.
	3) The XW Pro is load shaving.	3) Check the load shave settings. If the load draw from the grid exceeds <code>Load Shave Amps</code> , the charger will not operate.
	4) Charger is set for 2-stage charging and has completed a full charge cycle.	4) No action required. The charger comes on when the battery reaches the <code>Recharge Volts</code> setting. Otherwise use the <code>Force Charge</code> setting on the device setup menu to force a bulk or float charge.
	5) Battery voltage is below 40 V and AC source could not be qualified.	5) Recharge the batteries with an external battery charger or replace the batteries.
	6) Gen support is enabled and the draw from the loads exceeds the Gen support amps setting.	6) Temporarily disable Gen support mode, or reduce loads below Gen Support Amps setting.
AC1 or AC2 LED is flashing, but will not start charging (allow 40 seconds to synchronize).	AC voltage and frequency at the AC input terminal are within nominal range, but the inverter output is not yet synchronized to the AC source. There are three possible causes: 1) The inverter may already be synchronized to another AC source.	1) The inverter is operating normally.
	2) The AC voltage or frequency applied to the input is outside of the acceptable range of the inverter.	2) Adjust the AC acceptance settings, see "AC Settings" on page 75, or possibly service an unstable generator.
	3) AC voltage and frequency at the AC input terminals are within acceptable range, but the inverter is not yet synchronized to the AC source.	3) For 120 V/240 V units, measure voltage in four places on the input of the inverter: L1-N, L2-N, L1-L2, and N-Ground. These readings must be approximately 120, 120, 240, and 0 respectively. Make sure these readings are within the tolerance for AC acceptance and are stable for at least 60 seconds.

Problem	Possible Cause	Solution
Charger amperage drops off before full charging has finished (no Event LED).	AC frequency at the AC input terminal may be out-of-tolerance (too high or low) or the AC voltage may be outside the <code>Hi AC Volt</code> or <code>Lo AC Volt</code> settings. AC input voltage approaching the low disconnect level.	Check the settings on the <code>AC Settings</code> menu. Check for the correct AC voltage or frequency at the AC input terminal. If the AC source is a generator, adjust the AC voltage or frequency accordingly. Increase the difference between the <code>Hi AC Volt (AC1)</code> and <code>Lo AC Volt (AC1)</code> settings to allow synchronization.
	The charge settings are incorrectly configured for your battery type.	Select the correct battery type or configure a <code>Custom battery type</code> .
	Ambient temperature may be high, causing unit to overheat and ramp down the charging.	Cool the unit down or check for anything preventing air flow around the unit.
	Battery bank has one or more bad cells or inadequate wiring.	Check tightness of battery connections and interconnections. Replace battery.
	Battery Management System on Lithium Ion battery has interrupted charging.	Consult with battery manufacturer for battery compatibility.
Charger stops before full charging (or equalization) has finished. Event LED flashes and AC output drops momentarily.	Cold temperature around batteries with battery temperature sensor (BTS) installed may be causing unit to reach <code>High Batt Cut Out</code> setting.	Disconnect BTS during charging or increase <code>High Batt Cut Out</code> setting.
Charger output is low.	Loose or corroded battery connections.	Check and clean all connections.
	Loose AC input connections.	Check and tighten AC wiring connections to the value specified in the <i>XW Pro Installation Guide</i> (document number 990-91228).
	Worn out batteries.	Replace batteries.
	Battery cables too small or too long.	Refer to cable and battery recommendations in the <i>XW Pro Installation Guide</i> .
Batteries being charged above the bulk/float settings.	If a BTS (Battery Temperature Sensor) is installed, it may be in a cold area or have fallen off the batteries. Another DC charging source may be on the batteries.	Inspect the BTS. Reduce <code>Battery Temperature Coefficient</code> on <code>Custom Battery Settings</code> menu.
	Battery bank size too small relative to charger output.	Increase battery bank size or decrease max charge rate. NOTE: To bring batteries that are cold to the correct state of charge may require charging at a higher voltage. This may be normal BTS operation. Unplug the BTS and determine if your voltage returns to the bulk/float voltage.

Faults and Warnings

When a fault or warning message appears on the gateway device status page, you can acknowledge the message to clear the screen. To acknowledge a fault or warning message, press the Enter button. This action does not clear the fault or warning condition - consult Table 31 on page 126 and Table 34 on page 131 for suggested actions after you have acknowledged the message.

Warning Messages

Warning messages appear on the gateway device to alert you to an impending system change. You can access all past warnings for a device in InsightLocal by navigating to `Events > Historical Events` in the XW Pro status page. Each warning has a time stamp to let you know the date and time that the warning appeared.

If several warning messages occur before you can acknowledge or clear them, they are displayed together on a warning list. This list contains messages from every Xanbus-enabled device, not just the XW Pro. You can select a message and view its details from warning list.

Warning Types

There are two types of warnings: automatic and manual. When the XW Pro detects a warning condition, it displays a warning message on InsightLocal. Table 30 describes how their behavior differs and how you can respond to them.

Table 30 Warning Types and Behavior

Warning type	Behavior
Automatic warning	Clear automatically if the warning condition that generated the message goes away. You can also acknowledge automatic warnings without waiting for them to clear automatically.
Manual warning	Require you to clear them manually via the InsightLocal before you can proceed with configuring or operating the XW Pro.

Table 31 provides descriptions of the warning messages and solutions.

Table 31 Warning Messages

Warning Number	Message Name	Warning Type	Cause	Solution
w44	Battery Over Temperature	Automatic	Battery Over Temperature Warning. Battery temperature is over 50 °C (122 °F).	Check battery voltage and battery cable connections. Stop charging, if necessary. Check for excessive ambient temperature and adequate ventilation in the battery compartment
w45	Capacitor over temperature	Automatic	DC Bulk Capacitor over temperature (100 °C/212 °F)	Ensure adequate ventilation around the XW Pro. Reduce the AC loads.

Warning Number	Message Name	Warning Type	Cause	Solution
w48	DC Under Voltage	Automatic	"F48" on page 133 threshold + "Low Battery Cut Out Warning Offset" on page 194	Check for the correct battery voltage at the inverter's DC input terminals. Check for an external DC load on the batteries. Check condition of batteries and recharge if possible or reduce your Low Batt Cut Out setting.
w49	DC Over Voltage	Automatic	Battery voltage goes within the [High Batt Cut Out - 2V] threshold.	Turn off or check additional charging sources to batteries. Check battery cables. Check for the correct battery voltage at the inverter's DC input terminals. Ensure your DC source is regulated below your high battery cut out or increase your High Batt Cut Out setting.
w57	FET1 Over Temperature	Automatic	Internal temperature is over 85 °C (185 °F). AC input voltage may be too high while charging.	Check for high input AC voltage.
			Operating too large of a load for too long while inverting.	Remove excessive loads.
			Ambient temperature may be high.	Let inverter cool down and try restarting. Improve ventilation and cooling around the inverter.
			Inverter cooling fan may have failed.	Hold a piece of paper to inverter vents to check the fan. If the fan has failed, have the inverter serviced.
			Inverter airflow intake may be blocked.	Increase clearance around the inverter or unclog the fan air intake.
			Charging setting is too high based on ambient temperature around inverter.	Lower the Max Charge Rate setting. Improve ventilation and cooling around the inverter.
w58	FET2 Over Temperature	Automatic	See w57.	See w57.
w63	AC Overload	Automatic	Excessive load on the AC output.	Check for loads above the inverter's capacity. Turn off some loads if necessary.

Warning Number	Message Name	Warning Type	Cause	Solution
w64	AC Overload L1	Automatic	See w63.	See w63.
w65	AC Overload L2	Automatic	See w63.	See w63.
w68	Transformer Over Temperature	Automatic	See w57.	See w57.
w70	Check Phase Configuration	Automatic, AC input is not qualified	1. Units are connected to incorrect utility AC phases. The units will never qualify AC or charge batteries.	1. Fix wiring or fix configuration. If units have been configured in the correct order, fix the wiring, making sure each unit is connected to the correct phase.
			2. Units are configured incorrectly for three phase operation. See three-phase configuration in the user manual.	2. Make sure inverters are configured correctly. Each unit's inverter configuration must correspond with the utility phase to which the unit is connected.
w90	BMS Status Lost	Automatic	BMS Status from the gateway device is not being received.	Verify connectivity between BMS, gateway device, and XW Pro. Verify Battery Type and Charge Cycle settings appropriate for the application.
w91	SOC Level Lost	Automatic	SOC Level information is not being received.	Verify connectivity between external BMS or Battery Monitor, gateway device and XW Pro. If an external BMS or Battery Monitor does not exist in the application, disable State of Charge Control.
w92	gateway device Comms Lost	Automatic	XW Pro has lost communication with the gateway device.	Verify connectivity with gateway device.
w93	SunSpec Controller Comms Lost	Automatic	XW Pro has lost communication with the SunSpec Controller.	Verify connectivity of gateway device with SunSpec Controller. If no SunSpec Controller exists on the network, refer to the Conext Gateway Owner's Guide (975-0806-01-03).
w94	Remote Power Off	Automatic	The unit has been turned off with a Remote Power Off switch.	No action required. The unit stops inverting or charging immediately, and shuts down after five seconds. If the unit is configured as a primary, it signals other network devices to also shut down.
w95	Equalize Abort	Manual	Equalization terminated abnormally because of interrupted AC input.	Wait until AC input (utility grid) returns to in-tolerance condition.

Warning Number	Message Name	Warning Type	Cause	Solution
w96	Cannot Equalize	Manual	The selected battery type should not be equalized.	Change battery type if your batteries should be equalized. Gel or AGM batteries should not be equalized.
			AC input is not qualified or the charge setting is not adequate.	Check for presence of AC. Make sure Charge and Equalize are enabled. Verify the Conext AGS trigger is set to Stop Float. If Stop Voltage is enabled, then the voltage level should be above the Equalize Voltage Setpoint level.
w97	Battery temperature sensor failure	Automatic	Battery Temperature Sensor Shorted	Replace battery temperature sensor.
w500	Lost network connection	Automatic	Lost network connection	Check network cables.
w501	Inv/Chg is trying to fix a memory problem	Manual	Non-volatile memory warning	Normal operation may return or may go to fault. Turn XW Pro off and on to resume normal operation.

Fault Messages

When the XW Pro detects a fault condition, the fault is displayed within the InsightLocal. The XW Pro also illuminates the Event/Warning LED on the inverter information panel. A fault affects the operation of the unit. See Table 32 on page 129 for an explanation of the different fault types.

You can access all past fault messages for a device in InsightLocal by navigating to `Events > Historical Events` in the XW Pro status page.

Fault Types

There are three types of fault messages: automatic faults, manual faults, and escalating automatic faults. Table 32 describes how they differ in their behavior and how you can respond to them when they appear on the gateway device.

Table 32 Fault Types and Behaviors

Fault type	Behavior
Automatic faults	Clear automatically if the fault condition that generated the message goes away. You can also acknowledge automatic faults without waiting for them to clear automatically. It is not possible to clear a fault if the cause of the fault is still present.
Manual faults	Require you to clear them by: <ul style="list-style-type: none"> ▪ selecting Clear Faults on the Main XW Pro menu or on the menu for the Xanbus-enabled device that generated the fault (if the fault condition still exists, the fault message reappears). ▪ correcting the condition that caused the fault.

Fault type	Behavior
Escalating automatic faults	<p>Clear automatically if the fault condition goes away, just like an automatic fault.</p> <p>However, if an escalating automatic fault occurs several times within a defined time period, the escalating automatic fault becomes a manual fault, requiring user intervention. For example, if an AC Overload fault occurs three times in five minutes, it will no longer clear itself and become a manual fault. Then you must identify the problem, correct the fault condition, and clear the fault.</p>

Inverter Operation After Faults

XW Pro operation changes when a fault occurs. How the operation changes depends on the operating state of the unit when the fault occurred—inverting, charging, grid or generator support, AC bypass, and so on—and on which fault has occurred.

Table 33 Inverter Operation After Faults

Faults	State when Faults Occur	Action After Faults
F1, F2: AC Output	Inverting	Unit stops inverting and waits for nominal AC output voltage level, or a manual clear from user.
F17 to F22: Relay Welded	Inverting	Unit stops inverting and waits for user to clear fault.
F23 to F40: Anti-Islanding	Grid Support (Peak Load Shaving or Selling)	Unit moves to AC bypass and waits for nominal grid conditions to return for a minimum of five minutes.
F41, F42: Aux power supply voltage	Unit has qualified AC input.	Unit shuts down and waits for nominal AC output voltage level, or a manual clear from user.
F44: Battery Over Temp F45: Capacitor Over Temp	Any state.	If inverting, the unit shuts down and waits for the temperature to return to nominal value. If in any of the AC-interactive states (charging, peak load shaving, sell, gen support), the unit goes into AC bypass mode until the temperature returns to the nominal value. If the unit is not in AC bypass, it shuts down until the temperature returns to nominal value. After these faults clear, the unit returns to its previous operating state.
F47 to F48: DC Under Voltage	Unit is inverting or has qualified AC input and is preparing to charge.	If inverting, the unit shuts down and waits for nominal voltage. If operating with a qualified AC source, the unit charges if charging is enabled, or remains in AC bypass if charging is disabled.
F63 to F65: AC Overload	Inverting or Grid Support	Unit stops inverting and waits to qualify AC. Unit waits for user to manually clear fault.

Table 34 provides descriptions of the fault messages and solutions. If you are unable to resolve the problem after referring to this table, contact your dealer or Customer Service.

Table 34 Fault Messages

Fault Number	Message	Fault Type	Cause	Solution
F1	AC Output Under Voltage	Escalating Auto Fault. Must occur 3 times in 2 minutes before becoming a manual fault.	AC under voltage shutdown at 108 V. The inverter has shut down to protect the loads.	Clear the fault and attempt restart. If problem persists, call customer service.
F2	AC Output Over Voltage	Escalating Auto Fault. Must occur 3 times in 30 seconds before becoming a manual fault.	AC over voltage shutdown at 135 V. The inverter has shut down to protect the loads.	Clear the fault and attempt restart. If problem persists, call customer service.
F17	Relay(s) Welded	Manual	The AC1 L1 transfer relay is bad or an AC source was wired directly to the AC output.	Disconnect the inverter's output wiring. If error continues, have unit serviced.
F18	Relay(s) Welded	Manual	The AC1 L2 transfer relay is bad or an AC source was wired directly to the AC output.	Disconnect the inverter's output wiring. If error continues, have unit serviced.
F19	Relay(s) Welded	Manual	The AC2 L1 transfer relay is bad or an AC source was wired directly to the AC output.	Disconnect the inverter's output wiring. If error continues, have unit serviced.
F20	Relay(s) Welded	Manual	The AC2 L2 transfer relay is bad or an AC source was wired directly to the AC output.	Disconnect the inverter's output wiring. If error continues, have unit serviced.
F21	Relay(s) Welded	Manual	An unidentified transfer relay is bad or an AC source was wired directly to the AC output.	Disconnect the inverter's output wiring. If error continues, have unit serviced.
F22	Relay(s) Welded	Manual	An unidentified L1 transfer relay is bad or an AC source was wired directly to the AC output.	Disconnect the inverter's output wiring. If error continues, have unit serviced.
F23	AI Over Frequency	Automatic	Over-frequency anti-islanding, caught by the AC qualification limit.	No action required. The inverter stops selling and disconnects from the grid. When the fault clears, a five-minute timer begins counting down. The inverter does not sell again until grid voltage and frequency are within range for five minutes.

Fault Number	Message	Fault Type	Cause	Solution
F24	AI Under Frequency	Automatic	Under-frequency anti-islanding, caught by the AC qualification limit.	See F23.
F25	AI Over Frequency	Automatic	Over-frequency anti-islanding.	See F23.
F26	AI Under Frequency	Automatic	Under-frequency anti-islanding.	See F23.
F27	AI L1 Over Voltage	Automatic	Over-voltage anti-islanding, fast disconnect, 135 VAC.	See F23.
F28	AI L2 Over Voltage	Automatic	See F27.	See F23.
F29	AI L1L2 Over Voltage	Automatic	Over-voltage anti-islanding fault, caught by the qualification limit, voltage difference between L1 and L2.	See F23.
F30	AI L1L2 Over Voltage	Automatic	Over-voltage anti-islanding, fast disconnect, 270 V.	See F23.
F31	AI L1 Over Voltage	Automatic	Over-voltage anti-islanding, slow disconnect, 130 V.	See F23.
F32	AI L2 Over Voltage	Automatic	Over-voltage anti-islanding, slow disconnect, 130 V.	See F23.
F33	AI L1L2 Over Voltage	Automatic	Over-voltage anti-islanding, slow disconnect, 260 V.	See F23.
F34	AI L1 Under Voltage	Automatic	Under-voltage anti-islanding, slow disconnect, 108 V.	See F23.
F35	AI L2 Under Voltage	Automatic	See F34.	See F23.
F36	AI L1L2 Under Voltage	Automatic	See F34.	See F23.
F37	AI L1 Under Voltage	Automatic	Under-voltage anti-islanding, fast disconnect, 66 VAC.	See F23.
F38	AI L2 Under Voltage	Automatic	See F37.	See F23.
F39	AI L1L2 Under Voltage	Automatic	Under-voltage anti-islanding fault, caught by the qualification limit, voltage difference between L1 and L2.	See F23.
F40	AI L1L2 Under Voltage	Automatic	Under-voltage anti-islanding, fast disconnect, 132 V.	See F23.

Fault Number	Message	Fault Type	Cause	Solution
F41	APS Under Voltage	Escalating Auto Fault. Must occur 3 times in 30 seconds before becoming a manual fault.	Auxiliary power supply under-voltage shutdown	Clear the fault and attempt restart. If problem persists, call customer service.
F42	APS Over Voltage	Escalating Auto Fault. Must occur 3 times in 30 seconds before becoming a manual fault.	Auxiliary power supply over-voltage shutdown	Clear the fault and attempt restart. If problem persists, call customer service.
F44	Battery Over Temperature	Automatic	Battery over- temperature shutdown at 60 °C.	Clear the fault and attempt restart. Stop charging, check battery voltage and temperature. Check for excessive ambient temperature and adequate ventilation in the battery compartment. NOTE: Shutdown temperature is above 60 °C. Recovery occurs at 50 °C where the XW Pro will be enabled again.
F45	Capacitor Over Temperature	Automatic	Capacitor over-temperature shutdown at 105 °C.	Clear the fault and attempt restart. Ensure adequate ventilation around the XW Pro. Reduce AC loads.
F46	Controller fault	Manual	Controller fault	Service required.
F47	DC Under Voltage	Automatic	DC under-voltage shutdown (immediate) occurs if DC voltage is below 32 V. The fault clears and the inverter restarts when DC voltage reaches V+4 V.	Check for the correct battery voltage at the inverter's DC input terminals. Check for an external DC load on the batteries. Check condition of batteries and recharge if possible.
F48	DC Under Voltage	Automatic	DC under-voltage shutdown occurs if DC voltage is below LBCO for the LBCO Delay. The fault clears and the inverter restarts when the voltage reaches LBCO + LBCO Hysteresis.	See F47.

Fault Number	Message	Fault Type	Cause	Solution
F49	DC Over Voltage	Escalating Auto Fault.	DC over-voltage shutdown. Occurs if DC voltage goes over the <code>High Batt Cut Out</code> setting. The fault can also occur when batteries are disconnected at the DC breaker while the XW Pro is charging.	Clear the fault and attempt restart. Ensure battery voltage is below HBCO at XW Pro terminals. Check all other charging source outputs, battery cables. Ensure that batteries are connected, or that your DC source is regulated below your high battery cut out or increase your <code>Hi Batt Cut Out</code> setting.
F52	EEPROM Error	Manual		No action. Clear fault and resume operating or configuring the unit. If the fault persists, have the unit serviced.
F53	EEPROM Error	Manual		See F52.
F54	EEPROM Error	Manual		See F52.
F55	EEPROM Error	Manual		See F52.
F56	EEPROM Error	Manual		See F52.
F57	FET1 Over Temperature Shutdown	Automatic	Internal temperature is over 105 °C.	Fault clears when temperature drops to 75 °C.
			AC input voltage may be too high while charging.	Check for high input AC voltage.
			Operating too large of a load for too long while inverting.	Remove excessive loads.
			Ambient temperature may be high.	Let inverter cool down and try restarting.
			Inverter cooling fan may have failed.	Hold a piece of paper to inverter vents to check the fan. If the fan has failed, have the inverter serviced.
			Inverter airflow intake may be blocked.	Increase clearance around the inverter or unclog the fan air intake.
			Charging setting is too high based on ambient temperature around inverter.	Lower the Max Charge Rate setting.
F58	FET2 Over Temperature Shutdown	Automatic	See F57.	See F57.
F59	GOCFG process failed	Manual	Auto-configuration process failed.	Retry the "Copy From" procedure, or configure the unit manually.

Fault Number	Message	Fault Type	Cause	Solution
F63	AC Overload	Escalating Auto Fault. Must occur 3 times in 5 minutes before becoming a manual fault.	Excessive load on the AC output.	Check for loads above the inverter's capacity. Turn off some loads if necessary. To clear the fault: Turn off the unit by holding the power button for 5 sec. Disconnect the XW Pro from the battery bank for 20 sec.
F64	AC Overload L1	Escalating Auto Fault. Must occur 3 times in 5 minutes before becoming a manual fault.	Excessive load on the AC output.	See F63
F65	AC Overload L2	Escalating Auto Fault. Must occur 3 times in 5 minutes before becoming a manual fault.	Excessive load on the AC output.	See F63.
F66	System Configuration Fault	Automatic	Multi-Unit Configuration settings are incorrect.	Ensure only one unit is configured as the primary. For three-phase installations, make sure that only one unit on each phase is configured as the primary. Ensure each unit has a unique Device Number and that Inverter Mode and Connections have been configured correctly. See XW Pro Multi-unit Design Guide (document number 990-91373) for more details.
F67	Watchdog Error	Manual		Service required.
F68	Transformer Over Temperature	Automatic	The transformer temperature is over 140 °C.	The fault clears when the transformer temperature falls to 125 °C. Ensure adequate ventilation around the XW Pro. Reduce AC loads.

Fault Number	Message	Fault Type	Cause	Solution
F69	External Sync Failed	Manual		Check connections and cable on external AC sync port. In a single-inverter system, nothing must be plugged into the AC sync port. Clear fault and try again. If these steps fail, the unit requires service.
F71	Battery Discharge Over Current	Manual	There is an excessive load on the Li-ion battery. (The fault applies only to Li-ion batteries).	Change the default threshold of the max battery discharge current limit or reduce the load.
F72	External AC Contactor Malfunction	Manual	The External AC Contactor or latching relay within the BCS was not set as expected.	<p>Check why the state of the External AC contactor or latching relay within the BCS doesn't match the commanded state. Verify that the AC contactor or BCS has power.</p> <p>Contactor: Check for fusing of coil, damaged or broken wiring and connections, and damaged inverter aux port.</p> <p>BCS: Check for broken (welded) contactor/relay, damaged or broken wiring and connections, and damaged inverter aux port.</p>
F73	Battery Charge Over Current	Manual	Charge current exceeded the BMS limits (this fault applies only to Li-ion batteries).	Change the default threshold of the max. battery charge current limit and clear the fault. If problem persists, call customer service.
F74	Battery Under Voltage	Manual	DC bus voltage is below BMS reference discharge voltage.	Verify DC bus for secure connectivity and confirm battery output voltage is above BMS discharge reference voltage.
F75	Battery Over Voltage	Manual	DC bus voltage exceeds BMS charge reference voltage.	Verify battery pack voltage does not exceed BMS limits + configured offset. If problem persists, call customer service.
F76	External Battery Stop Command	Automatic	Battery charging and discharging stopped due to external command.	Inspect battery pack or other external control devices for conditions that may prompt it to send a stop command. Configure to warning-only if required.

Fault Number	Message	Fault Type	Cause	Solution
F77	AC Breaker Trip	Automatic	Primary/Secondary AC1 or AC2 breaker tripped for multi-unit installation	<p>Check if there is any overload condition.</p> <p>If the fault was triggered by secondary unit, close the breaker. The inverter will try to connect to the grid and the fault will be auto-cleared.</p> <p>If the fault was triggered by primary unit, close the breaker. All the inverters will try to connect to the grid, and the fault will be auto-cleared.</p>
F90	BMS Status Lost	Automatic	BMS Status from the gateway device is not being received	<p>Verify connectivity between external BMS or Battery Monitor, gateway device and XW Pro.</p> <p>Verify Battery Type and Charge Cycle settings appropriate for the application.</p>
F91	SOC Level Lost	Automatic	gateway device is not receiving SOC data from the external BMS or Battery Monitor, and so cannot relay to XW Pro.	<p>Verify connectivity between external BMS or Battery Monitor, gateway device and XW Pro.</p> <p>If an external BMS or Battery Monitor does not exist in the application, disable State of Charge Control.</p>
F92	Gateway Comms Lost	Automatic	see "W92" on page 128	see "W92" on page 128
F93	SunSpec Controller Comms Lost	Automatic	see "W93" on page 128	see "W93" on page 128
F500	Silicon Serial ID Failure	Manual	Silicon Serial ID Failure	Service required.

6 Specifications

What's in This Chapter?

Electrical Specifications	140
Mechanical and Regulatory Specifications	143
XW Pro Overload Capability	144
Output Power Versus Ambient Temperature	146
XW Pro Efficiency	147
Regulatory Approvals	148
Grid Support Utility Interactive Functions	149
California Rule 21: Smart Inverter Grid-Support Utility Interactive Functions	150
IEEE 1547-2018 Standard for Interconnecting Distributed Resources with Electric Power System (60Hz)	163
Hawaiian Electric Company (HECO) SRD2.0-2020: Smart Inverter Grid- Support Utility Interactive Functions	175
Puerto Rico Energy Power Authority (PREPA) Technical Requirements for Interconnecting Wind and Solar Generation	177

This chapter provides the electrical and mechanical specifications for the XW Pro.

DISCLAIMER REGARDING STATUS DATA

Status data reported by the XW Pro are approximate values intended to provide general and non-exact information about the XW Pro. Under no circumstances should this status data be used for precise evaluation of the XW Pro system performance, including efficiency considerations. In systems with a single XW Pro, the measurement capabilities of the inverter/charger allow for deviations of up to 5% of actual values. In systems with multiple inverter/charger units, the compounded effect of accuracy deviations in the status data could result in aggregated deviations exceeding 5% of actual values. For systems requiring higher accuracy status reporting of ac parameters, Schneider Electric recommends the use of external monitoring equipment of appropriate and accurate calibration. For higher accuracy measurement of dc (battery) parameters, Schneider Electric recommends installing an appropriate dc battery monitor in the system.

Electrical Specifications

NOTE: Specifications are subject to change without prior notice. Where settings in the table below indicate a range, the setting is dependent upon the default data in the grid code selected during commissioning.

Table 35 XW Pro Electrical Specifications

Specification	XW Pro 6848 NA (120/240 VAC)	XW Pro 6848 NA (120 VAC)
Continuous Output Power (Inverter Mode @ 25°C)	6,800 W	5,760 W
Continuous Output Power (Inverter Mode @ 40°C)	6,000 W	5,760 W
Surge Rating (Overload for 1 minute)	12,000 W	12,000 W
Surge Rating (Overload for 30 minutes)	8,500 W	7,200 W
Waveform	True Sine Wave	True Sine Wave
Idle Consumption - Inverter Mode, no load	28 W	28 W
Idle Consumption - Search Mode	< 8 W	< 8 W
DC Input Voltage Range	40–64 VDC, 48 VDC nominal	40–64 VDC, 48 VDC nominal
DC Current at Rated Continuous Power (Inverter Mode)	180 A	180 A
Maximum Charge Rate (Charger Mode)	140 A	120 A
Power Factor Corrected Charging	PF 0.98	PF 0.98
Compatible Battery Types	Flooded (default), Gel, AGM, Lithium ion, custom	Flooded (default), Gel, AGM, Lithium ion, custom

Specification	XW Pro 6848 NA (120/240 VAC)	XW Pro 6848 NA (120 VAC)
AC Output Voltage	120/240 V \pm 3%	120 V \pm 3%
Maximum AC Continuous Output Current (Inverter Mode)	L-L: 28 A	L-L: 48 A
Maximum AC Continuous Output Current, Imbalanced line loading on L1-N or L2-N (Inverter Mode)	L-N: 40 A	N/A
Maximum Continuous Output Current (Grid Interactive Mode)	28.3 A	48 A
Surge Current (Inverter Mode)	52 A _{RMS} for 60 seconds (240 V nominal)	104 A _{RMS} for 60 seconds (120 V nominal) ¹
AC Input Voltage Range (Bypass/Charger Mode) ²	156–280 VAC (240 V nominal)	78–140 VAC (120 V nominal)
AC Input Frequency Range (Bypass/Charger Mode)	52–68 Hz (default) 44-70 Hz (allowable)	52–68 Hz (default) 44-70 Hz (allowable)
AC Input Maximum Breaker Capacity	60 A maximum, double-pole	60 A maximum, double-pole
AC Output Maximum Breaker Capacity	60 A maximum, double-pole	60 A maximum
AC1 (Grid) Input Current	3–60 A	3–60 A
AC2 (Generator) Input Current	3–60 A	3–60 A
AC Output Frequency	60.0 \pm 0.1 Hz	60.0 \pm 0.1 Hz
Total Harmonic Distortion	< 5% at rated power	< 5% at rated power
Automatic Transfer Relay Capacity & Typical Transfer Time	60 A / 8 ms	60 A / 8 ms
Auxiliary Relay Output	0–12 VDC, maximum 250 mA	0–12 VDC, maximum 250 mA
Grid Sell Current (Selectable Limit)	0–27 A _{RMS}	0–48 A _{RMS}
Grid Sell Power	6,000 W	5,760 W
Peak Efficiency	95.1%	94.8%
CEC Weighted Efficiency	94.1%	93.6%

¹Limited by the max. 60 A breaker to connect the inverter to other equipment.

²Operation is specific to the active grid code.

Table 36 Measurement Accuracy

Parameter	Accuracy
AC Voltage	+/- 1.0% V nominal
AC Current	+/- 2.0% I nominal
DC Voltage	+/- 2.0% Vdc Nominal
Frequency	+/- 0.05 Hz
Active Power	+/- 5% P _{rated}
Reactive Power	+/- 5% S _{rated} (> 60% Rated Load)
	+/- 7% S _{rated} (< 60% Rated Load)
Time	+/- 0.5 sec (+/-1 sec for ride through duration >= 12 sec)

Mechanical and Regulatory Specifications

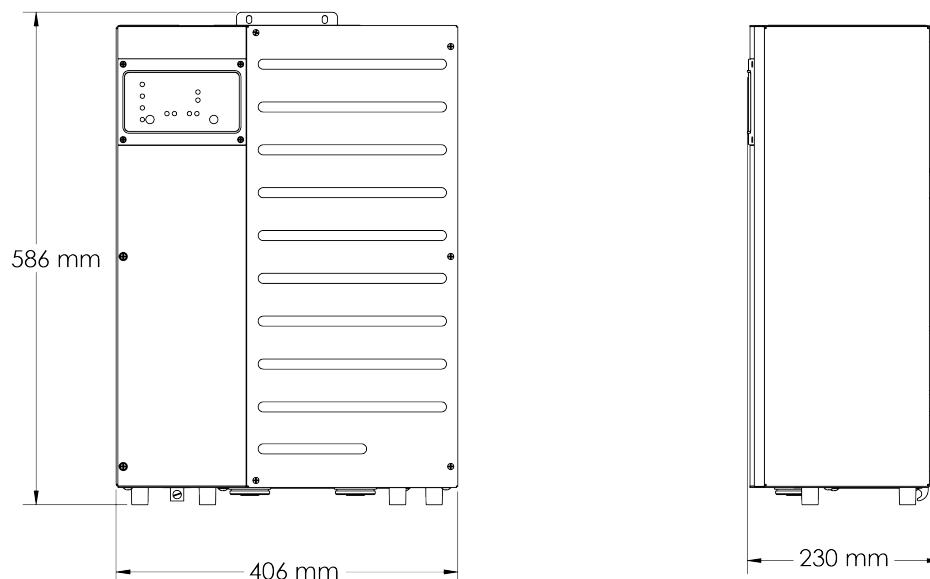
NOTE: Specifications are subject to change without prior notice. Where settings in the table below indicate a range, the setting is dependent upon the default data in the grid code selected during commissioning.

Table 37 XW Pro Mechanical Specifications

Specification	XW Pro 6848 NA
Non-Volatile Memory	Yes
Inverter Information Panel	Status LEDs indicate AC In status, events/warnings, equalize mode, battery level. 3-character display indicates output power or charge current, event/warning codes. STARTUP/SHUTDOWN and equalize button
Multiple Unit Configurations	Up to 3 parallel units in 120/240 three-wire configuration. Electrically, up to 4 parallel units can be connected and operated. See "Multi-unit Operation" on page 29.
System Network	Conext Xanbus™ (publish-subscribe network, no need for hubs or special cards)
Emissions	FCC Part 15, Class B Industry Canada ICES-003 Issue 5, Class B
Regulatory approvals	<ul style="list-style-type: none"> ▪ CSA C22.2 No. 107.1-16 Power conversion equipment ▪ UL 1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources (Third Edition, Revision Dated September 28, 2021) ▪ UL1741 CRD -Power Control Systems (PCS) (Dated March 08, 2019) ▪ IEEE 1547-2018, IEEE 1547.1-2020, IEEE 1547a-2020 ▪ California Electric Rule 21 ▪ Hawaiian Electric Co. SRD-V2.0
Enclosure Type	NEMA Type 1—Indoor
Rated Temperature Range (meets specifications)	32–77 °F (0–25 °C)
Operational Temperature Range	-13–158 °F (-25–70 °C)
Storage Temperature Range	-40–185 °F (-40–85 °C)

Specification	XW Pro 6848 NA
Operational Humidity Range	5 – 95 % Non-Condensing
Altitude	Sea level up to 2000 m
Inverter Dimensions (H × W × D)	23 × 16 × 9" (586 × 406 × 230 mm)
Shipping Dimensions (H × W × D)	28 × 22 ½ × 15 ½" (711 × 572 × 394 mm)
Inverter Weight	122 lb (55.5 kg)
Shipping Weight	132 lb (60 kg)

Figure 29 XW Pro Dimensions



XW Pro Overload Capability

Loads connected to the inverter are seldom constant, and large loads are often operated for short periods. To accommodate larger loads, the XW Pro can temporarily exceed its continuous output power rating.

The graphs below illustrate approximate operation time versus load. Inverter operation time during overload is limited by both inverter internal temperature protection and by the product of AC output current and elapsed time.

Figure 30 AC Overload Capability

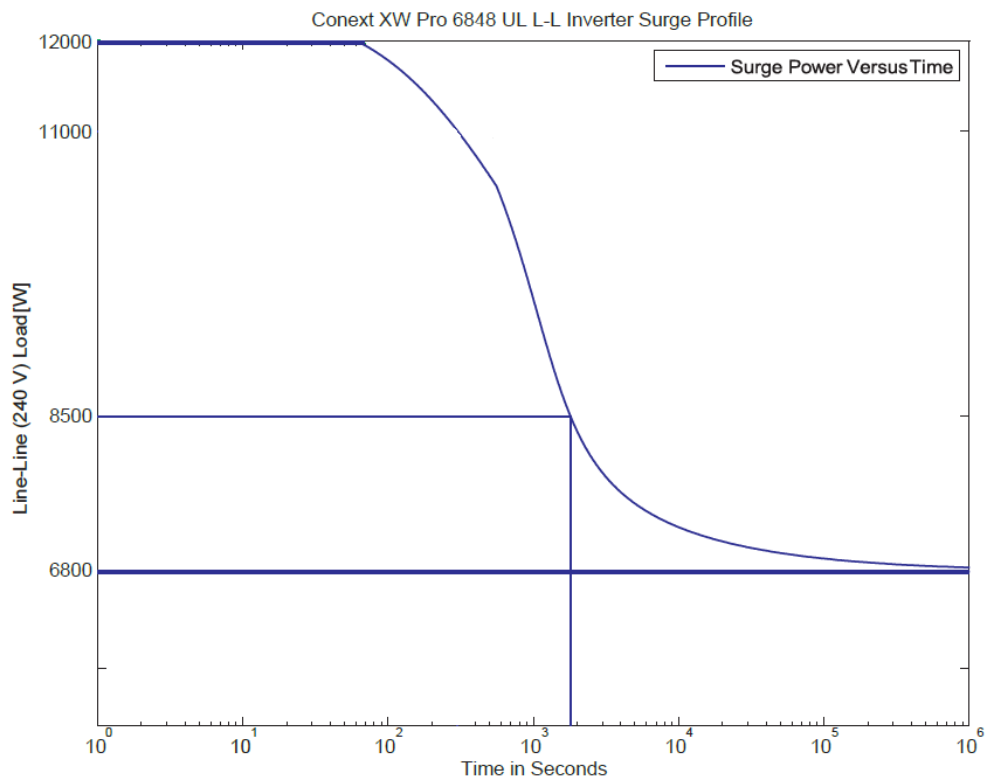
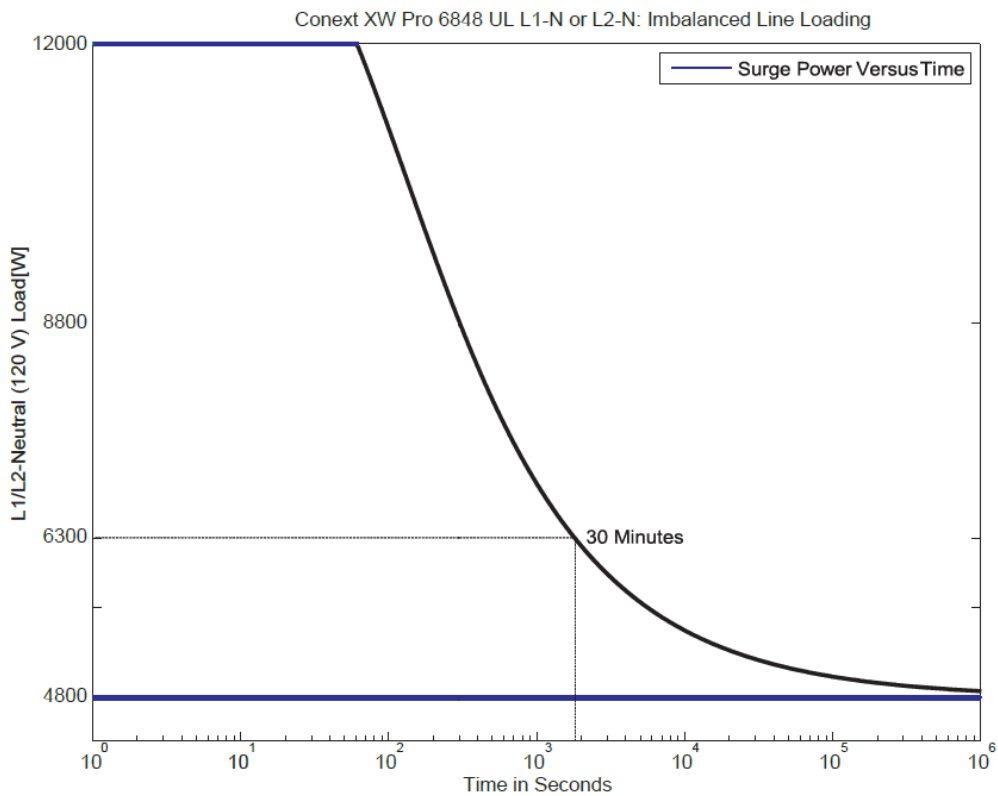


Figure 31 AC Overload Capability

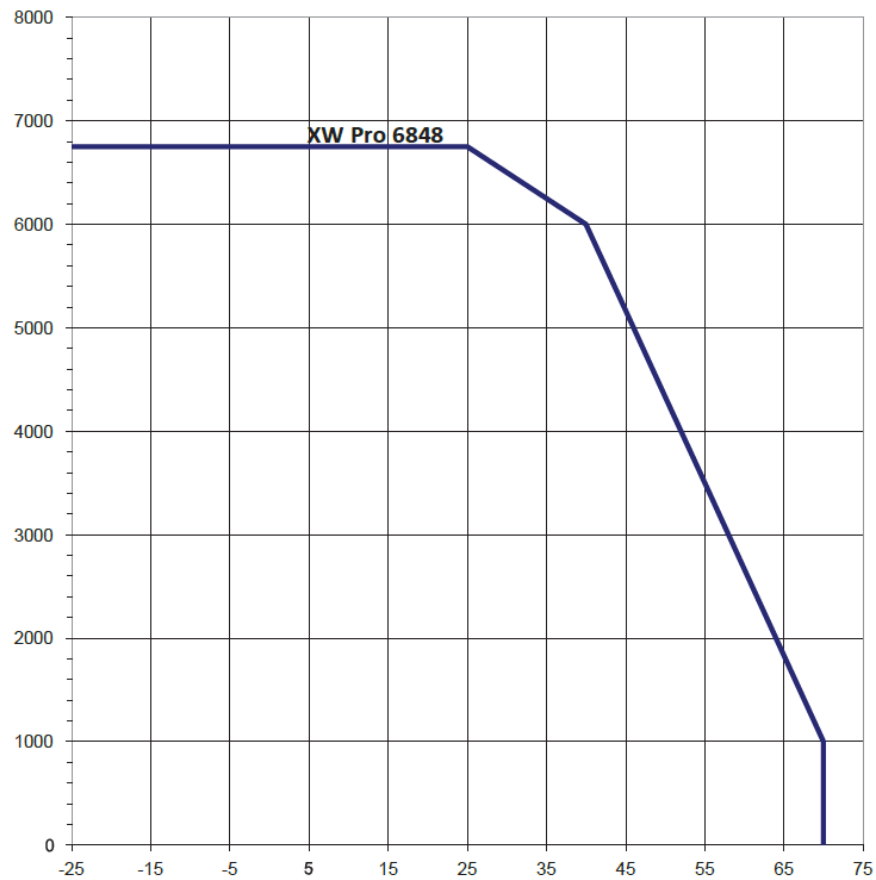


Output Power Versus Ambient Temperature

For the XW Pro 6848 model, the power can be limited by the installed DC and AC breakers. For example, at 8500 W the DC or AC breakers may disconnect before the 30 minute rating.

When the internal temperature of the XW Pro exceeds a preset limit, it begins to limit output power automatically to stop maximum internal temperatures being exceeded.

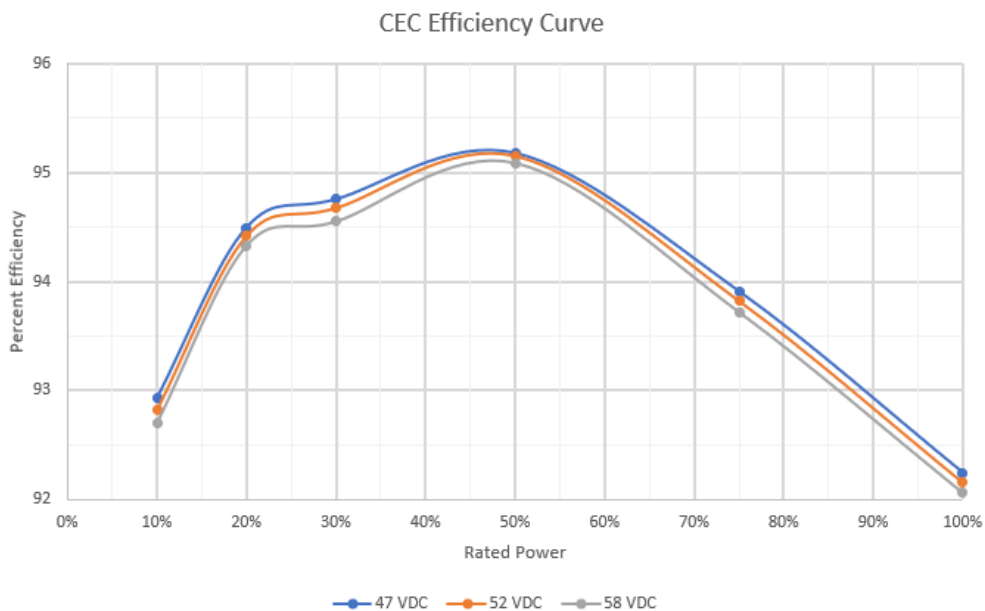
Figure 32 Output Power Versus Ambient Temperature



XW Pro Efficiency

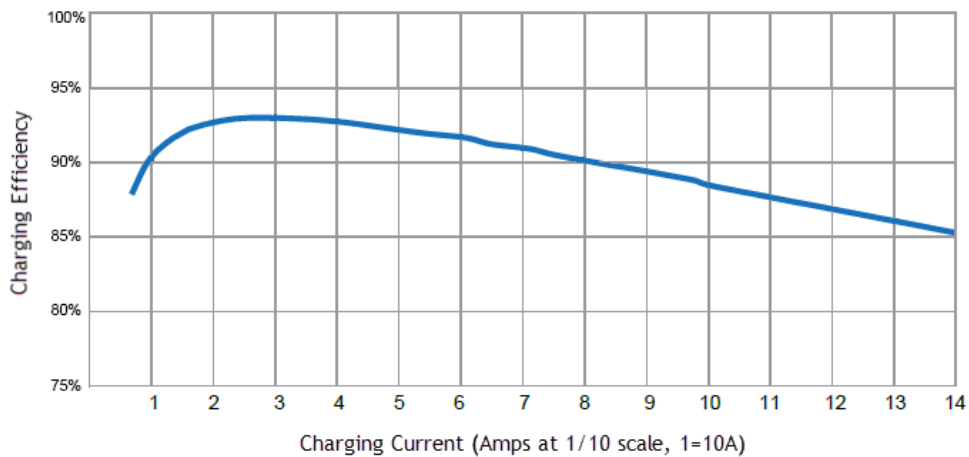
Inverting Efficiency (Typical)

Figure 33 Inverting Efficiency (typical)



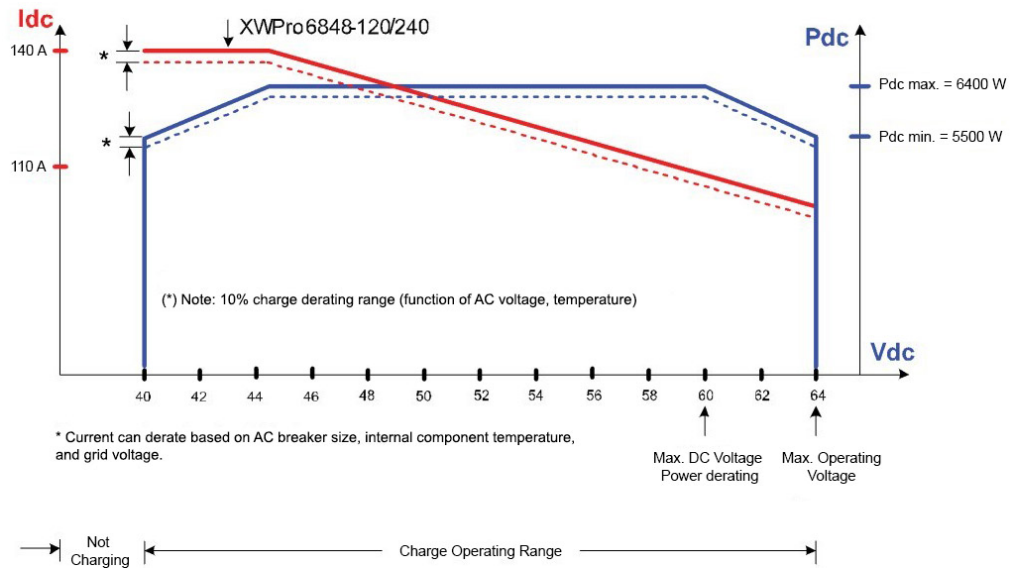
Charging Efficiency (Typical)

Figure 34 Charging Efficiency (typical)



Maximum Charging Current

Figure 35 Charging Current and Charging Power vs Battery Voltage



Regulatory Approvals

Electromagnetic Compatibility

The XW Pro inverter complies with emission limits specified in:

- FCC Part 15B Class B limits
- Industry Canada ICES-003 Class B limits

Utility Interactive

XW Pro inverter qualifies as a Smart Inverter¹ and complies with multiple jurisdictions grid interconnection standard requirements that are currently in effect in different jurisdictions:

- UL1741, 2nd Edition-2018 ("UL1741SA")
- UL1741, 3rd Edition-2021 ("UL1741SB")
- UL1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources (Third Edition, Revision Dated September 28, 2021)
- UL1741 CRD - Power Control Systems (PCS) (Dated March 08, 2019)
- CSA 107.1-2016
- IEEE 1547-2003 Standard for Interconnecting DER with Electric Power Systems
- IEEE 1547.1-2005
- IEEE 1547.1-2020
- IEEE 1547a-2014 (Amd 1)
- IEEE 1547a-2020
- IEEE 1547-2018
- California Rule 21
- Hawaiian Electric Company (HECO SRD 2.0-2020)
- Puerto Rico Energy Power Authority (PREPA)

Grid Support Utility Interactive Functions

These Grid Support Utility Interactive Functions are included in the XW Pro inverter:

- Anti-Islanding
- Voltage Ride-Through (L/HVRT) and disconnection
- Frequency Ride-Through (L/HFRT) and disconnection
 - Available for HECO settings and modified Molokai and Lanai ride through and disconnect settings as well.
- Volt-Var Q(V)
- Soft Start (SS)
- Ramp Rate (RR)
- Fixed Power Factor (FPF)
- Frequency-Watt P(f)
- Volt-Watt P(V)
- TROV
- Voltage and Frequency Reconnection

¹A Smart Inverter is a Distributed Energy Resource (DER) that autonomously performs functions that minimize the risk of unstable grid operations by providing dynamic active and reactive power support, voltage and frequency ride-through, ramp-rate control and other functions.

California Rule 21: Smart Inverter Grid-Support Utility Interactive Functions

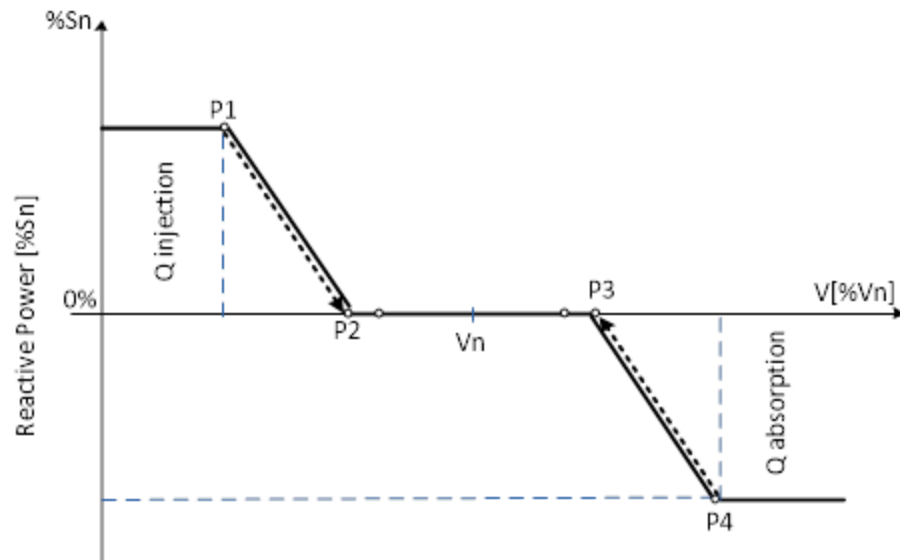
Q(V) Volt-VAr Function

When the Q(V) Volt-VAr function is enabled, the XW Pro is in Grid Support mode. Reactive power output is actively control as a function of the voltage following the Volt-Var piecewise linear characteristic in the figure below.

- The XW Pro dynamically injects reactive power into the grid following the P1P2 segment when AC voltage trends lower than the nominal value.
- The XW Pro dynamically absorbs reactive power from the utility grid following the P3P4 segment when AC voltage trends higher than the nominal value.
- By generating or consuming reactive power in response to grid voltage fluctuations, XW Pro contributes to grid stabilization towards the nominal voltage.

The Q(V) function is enabled by default.

Figure 36 Q(V) Volt-Var Function



Q – The XW Pro output reactive power in percentage of nominal rated apparent power S_n .

For example, $Q_1 = 30\%$ means $Q_1 = 1800 \text{ VAr}$ for $S_n = 6000 \text{ kVA}$ of the XW Pro nominal rated apparent power.

V - Utility grid voltage in percentage) of nominal voltage V_n

For example, $V_1 = 92\%$ means $V_1 = 221 \text{ V}$ for 240 V nominal grid.

Table 38 Rule 21 Q(V) Volt-Var function default and adjustability range settings

Parameter	Voltage [%Vn]		Reactive Power [%Sn]	
	Default	Range	Default	Range
Point P1	92	85 to 98.75	30	+15 to +60
Point P2	96.7	90 to 100	0	0
Point P3	97	90 to 100	0	0
Point P4	103	100 to 110	0	0
Point P5	103.3	100 to 110	0	0
Point P6	107	101.25 to 112.5	-30	-60 to -15

The Reactive Power Volt-Var function has priority over generated active power. The XW Pro may need to reduce produced active power to meet the reactive power demand.

Fixed Power Factor Function

This function allows the user to set the XW Pro output Power Factor in Grid Support Mode.

- The Power Factor (PF) is controllable from 20% to 100% nominal output power and default setting is PF = 0.95 leading.
- Power Factor setting adjustability range from - 0.85 lagging to 0.85 leading (EEI¹ Power Factor sign convention).
- When enabled, the PF setting has priority over other functions, which means that active power may be reduced to achieve the power factor setpoint.

The Fixed Power Factor function is disabled by default.

Figure 37 Fixed Power Factor function

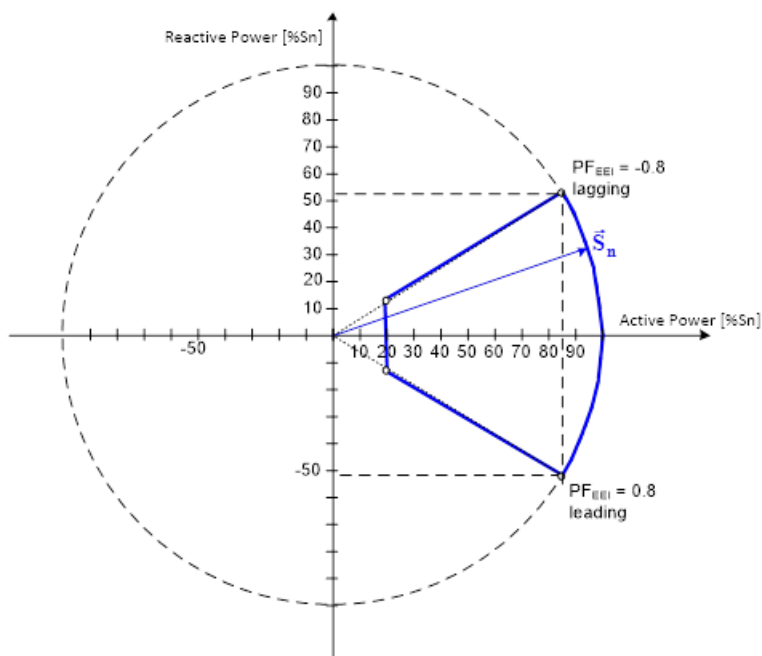


Table 39 Rule 21 Fixed Power Factor Function default and adjustability range settings

Parameter	Default	Range	Observations
Power Factor	0.95 leading	1	EEI Generator reference frame convention ²
		(-0.85 to -0.99) lagging	
		(0.85 to 0.99) leading	

¹EEI – Edison Electric Institute

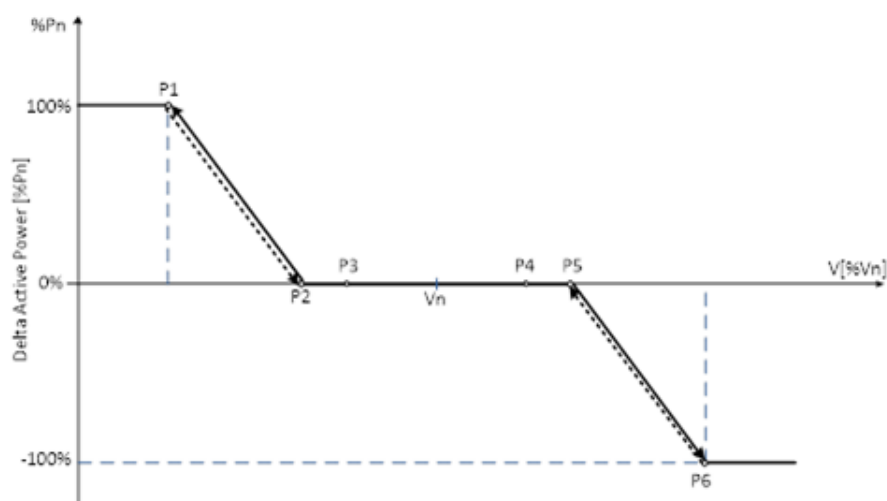
P(V) Volt-Watt Function

When the XW Pro is in Grid Support mode and P(V) function is enabled:

- The XW Pro dynamically increases the active power injected into the utility grid from the pre-disturbance level when AC voltage trends lower than V2, following the P1P2 segment in the figure below.
- The XW Pro dynamically curtails active power injected into the utility grid from the pre-disturbance level when AC voltage trends higher than V5, following P5P6 segment in the figure below.
- By adjusting the active power in response to grid voltage fluctuations, XW Pro contributes to grid stabilization towards the nominal value.

The P(V) function is enabled by default.

Figure 38 P(V) Volt-Watt Function



P – The XW Pro output active power in percentage of nominal rated active power Pn.

V - Utility grid voltage in percentage) of nominal voltage Vn [%Vn]

For example, V1 = 90% means V1=216 V for Vn = 240 V nominal grid.

Table 40 Rule 21 P(V) Volt-Watt function default and adjustability range settings

Parameter	Voltage [% Vn]		Active Power [%Pn]	
	Default	Range	Default	Range
Point P1	90	85 to 99	100	0 to 100
Point P2	94	90 to 99	0	0
Point P3	95	90 to 100	0	0
Point P4	105	100 to 110	0	0
Point P5	106	101 to 110	0	0
Point P6	110	101 to 115	-100	-100 to 0

NOTE: If both P(V) and P(f) are active, the lesser of the two power levels will take precedence (i.e. the curve that is curtailing the active power the most will set the output power level).

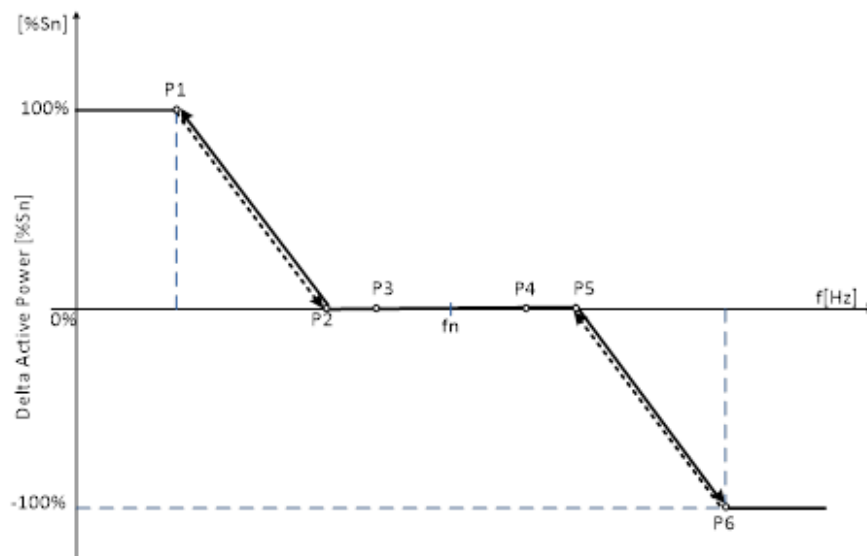
P(f) Frequency-Watt Function

When the XW Pro is in Grid Support mode and P(f) function is enabled:

- The XW Pro dynamically increases the active power injected into the grid from the pre-disturbance level when AC frequency trends lower than f_2 , following the P1P2 segment in the figure below.
- The XW Pro dynamically curtails active power injected into utility grid from the pre-disturbance level when AC frequency trends higher than f_5 following the P5P6 segment in the figure below.
- By adjusting the active power in response to grid frequency fluctuations, XW Pro contributes to grid stabilization towards the nominal value.

The P(f) function is enabled by default.

Figure 39 P(f) Frequency-Watt Function



P – The XW Pro output active power in percentage of nominal rated active power S_n [% S_n].

f - Utility grid frequency in Hz

Table 41 Rule 21 P(f) Frequency-Watt function default and adjustability range settings

Parameter	Frequency [Hz]		Active Power [% P_n]	
	Default	Range	Default	Range
Point P1	58	56 to 59	100	0 to 100
Point P2	59.96	59 to 59.96	0	0
Point P3	59.98	59 to 60	0	0

Point P4	60.02	60 to 61	0	0
Point P5	60.04	60.04 to 61	0	0
Point P6	62	61 to 64	-100	-100 to 0

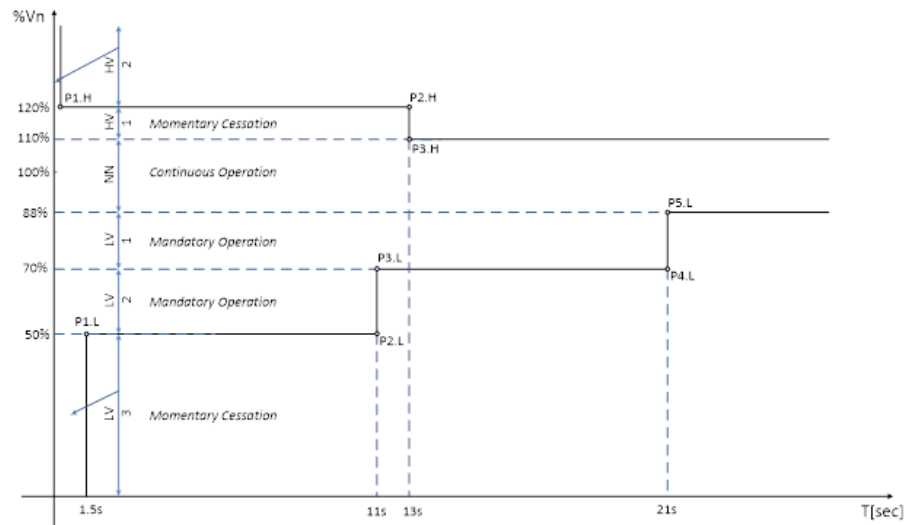
NOTE: If both P(V) and P(f) are active then the lesser of the two power levels shall take precedence (i.e. the curve that is curtailing the active power the most shall set the output power level)

Voltage Ride Through (VRT)

The XW Pro has the capability of remaining connected to the utility grid and operational for defined time intervals (ride-through) while AC voltage deviates from the nominal range, as shown in the figure below. At the end of ride-through time, if the utility grid voltage has not recovered to normal range, the XW Pro will disconnect and transition to Inverter (Grid-Forming) Mode.

Voltage Ride-through is enabled by default.

Figure 40 High/Low Voltage Ride-through (HVRT/LVRT) regions



- When in the Continuous Operation region (Near Nominal), the XW Pro operates indefinitely without tripping.
- When in Low-Voltage 1 (LV1) or Low-Voltage (LV2) region, the XW Pro goes into Mandatory Operation (i.e. generates an output current greater than or equal to 80% of pre-disturbance current value).
- When in the Low-Voltage 3 (LV3) or High-Voltage 1 (HV1) region, the XW Pro goes into Momentary Cessation (i.e. decreases the output current to less than 10% of nominal AC output current and remain online for the ride-through specified time, with the capability of immediate restore normal operation when utility grid voltage returns to near-nominal range).
- When in the High-Voltage 2 (HV2) region, the XW Pro goes into Cease to Energise (i.e. stops injecting output current to the utility grid; it does not imply galvanic isolation or disconnection).

Table 42 Rule 21 High Voltage Ride-through (HVRT) default and adjustability range settings

HVRT	Time [s]		Voltage [%Vn]	
	Default	Range	Default	Range
Point P1.H	0.16	N/A	120	115 to 125
Point P2.H	13	1 to 13	120	115 to 125
Point P3.H	13	1 to 13	110	100 to 115

Table 43 Rule 21 Low Voltage Ride-through (LVRT) default and adjustability range settings

LVRT	Time [s]		Voltage [%Vn]	
	Default	Range	Default	Range
Point P1.L	1.5	0.16 to 1.5	50	0 to 50
Point P2.L	11	1 to 11	50	0 to 50
Point P3.L	11	1 to 11	70	50 to 80
Point P4.L	21	2 to 21	70	50 to 80
Point P5.L	21	2 to 21	88	80 to 100

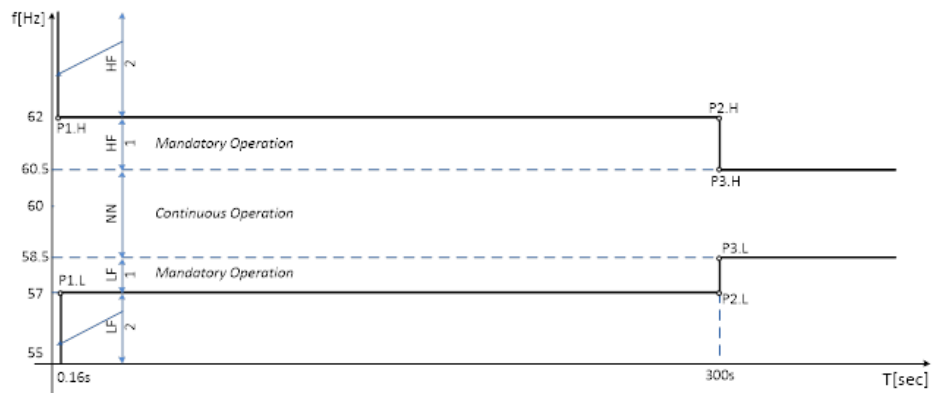
Frequency Ride-Through (FRT)

The XW Pro has the capability of remaining connected to the utility grid and operational for defined time intervals (ride-through) while AC frequency deviates from nominal range, as seen in the figure below.

- At the end of ride-through time, if the utility grid frequency has not recovered to the near nominal (NN) range, the XW Pro will disconnect and transition to Inverter (Grid-Forming) Mode.

Frequency Ride-through is enabled by default.

Figure 41 High/Low Frequency Ride-through (HFRT/LFRT) regions



- When in Continuous Operation region (Near Nominal), XW Pro operates indefinitely without tripping.

- When in Low-Frequency 1 (LF2) or High-Frequency 2 (HV2) regions, XW Pro goes into Momentary Cessation (i.e. stop injecting output current to utility grid; it does not imply galvanic isolation or disconnection).
- When in Low-Frequency 1 (LF1) or High-Frequency 1 (HF1), XW Pro goes into Mandatory Operation (i.e. generates an output current greater than or equal to 80% of pre-disturbance current value).

Table 44 Rule 21 High Frequency Ride-through (HFRT) default and adjustability range settings

HFRT	Time [s]		Frequency [Hz]	
	Default	Range	Default	Range
Point P1.H	0.16	0.16 to 10	62	62 to 64
Point P2.H	300	2 to 300	62	62 to 64
Point P3.H	300	2 to 300	60.5	60.1 to 62

Table 45 Rule 21 Low Frequency Ride-through (LFRT) default and adjustability range settings

LFRT	Time [s]		Frequency [Hz]	
	Default	Range	Default	Range
Point P1.L	0.16	0.16 to 10	57	53 to 57
Point P2.L	300	2 to 300	57	53 to 57
Point P3.L	300	2 to 300	58.5	57 to 59.9

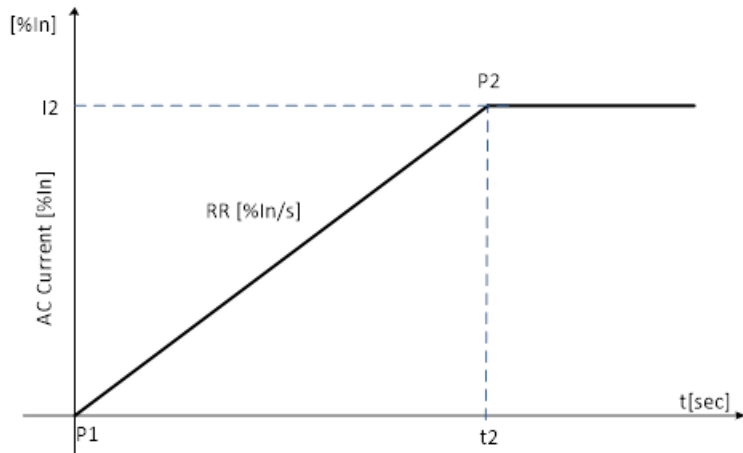
Ramp Rates

Normal Ramp Rate

During normal operation, any transition between power output levels will be executed at a ramp rate no larger than the Normal Ramp Rate setting. Normal Ramp Rate is contingent upon sufficient energy available at the XW Pro DC input port.

Normal Ramp Rate function is enabled by default.

Figure 42 Normal ramp rate



- Normal Ramp rate is defined as a slope measured in percentage of AC nominal current per second [%In/sec].
- Default Normal Ramp Rate value is 100 [%In/sec] with an adjustability range from 1 to 100 [%In/sec].

Parameter	AC Current per second [%In/s]	
	Default	Range
Ramp Rate	100	1 to 100

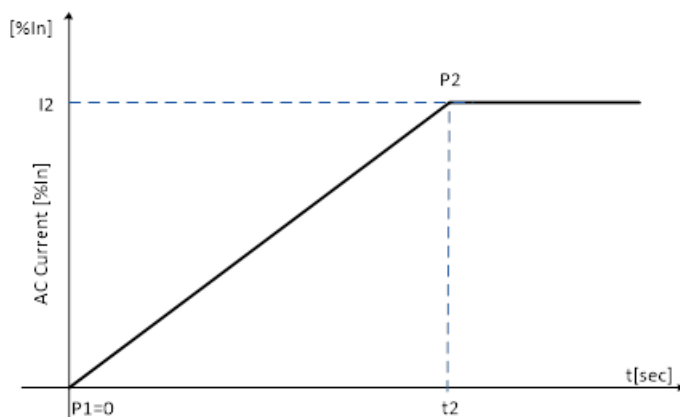
Parameter	Time [s]		AC Current [%In]	
	Default	Range	Default	Range
Point P1	0	N/A	0	N/A
Point P2	1	N/A	100	N/A

Reconnection (Soft-Start) Ramp Rate

Upon starting up, returning to service, or re-connecting, the XW Pro limits the rate of exported/generated active power to no larger than the Ramp Rate setting.

Normal Ramp Rate function is enabled by default.

Figure 43 Reconnection ramp rate



- Normal Ramp rate is defined as a slope measured in percentage of AC nominal current per second [%In/sec].
- The default Normal Ramp Rate value is 2 [%In/sec] with an adjustability range from 1 to 100 [%In/sec].

Parameter	AC Current per second [%In/s]	
	Default	Range
Ramp Rate	2	N/A

Parameter	Time [s]		AC Current [%In]	
	Default	Range	Default	Range
Point P1	0	N/A	0	N/A
Point P2	50	1 to 100	100	N/A

Grid Disconnect Settings

The XW Pro will remain connected to the utility grid as long as voltage and frequency are within the qualified range (i.e. less than the Over Voltage/Frequency limit and higher than the Under Voltage/Frequency limit).

California Rule 21 implements voltage and frequency disconnect limits via High/Low Voltage Ride Through (H/LVRT) and via High/Low Frequency Ride Through (H/LFRT) curves.

Grid voltage and frequency disconnect settings are defined in the table below, and take effect only when the H/LVRT and H/LFRT curves are disabled.

Table 46 Rule 21 Grid Disconnect Settings

Anti-Islanding Disconnect Slow Delay	The disconnection time delay for the grid voltage exceeding an over-voltage voltage level, but lower than the fast disconnection level. The default value for this setting is 0.5 seconds.
Anti-Islanding Disconnect Over Frequency	The frequency above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 62Hz. The disconnect will occur if the inverter is over frequency for 0.1 seconds.
Anti-Islanding Disconnect Under Frequency	The frequency below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 57 Hz, and the disconnect will occur if the inverter is under frequency for 0.1 seconds.
Anti-Islanding Disconnect Over Voltage L-N Fast	The line-to-neutral voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 144 V.
Anti-Islanding Disconnect Over Voltage L-N Slow	The line-to-neutral voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 132 V, and the disconnect will occur if the inverter is over frequency for 0.5 seconds.
Anti-Islanding Disconnect Over Voltage L1-L2 Fast	The line-to-line voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 288 V.
Anti-Islanding Disconnect Over Voltage L1-L2 Slow	The line-to-line voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 264 V, and the disconnect will occur if the inverter is over voltage for 0.5 seconds.
Anti-Islanding Disconnect Under Voltage L-N Fast	The line-to-neutral voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 60 V.
Anti-Islanding Disconnect Under Voltage L-N Slow	The line-to-neutral voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 84 V, and the disconnect will occur if the inverter is under frequency for 0.5 seconds.

Anti-Islanding Disconnect Under Voltage L1-L2 Fast	The line-to-line voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 120 V.
Anti-Islanding Disconnect Under Voltage L1-L2 Slow	The line-to-line voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 168 V, and the disconnect will occur if the inverter is under frequency for 0.5 seconds.
Transient Over-Voltage (TrOV) trip time	The disconnection time delay for the grid voltage exceeding the TrOV Trip level. The default value for this setting is 0.016 seconds.
Transient Over-Voltage (TrOV) trip level	When Transient Over-Voltage is enabled, grid voltage in percentage of nominal value [%Vn], above which the XW Pro will stop operating after the TrOV trip time. The default value is 120 [%Vn].

Table 47 Rule 21 Grid Disconnect default and adjustability range settings

Parameter	Default	Range	Unit
Anti-Islanding Disconnect Slow Delay	0.5	0.2 to 10	[s]
Anti-Islanding Disconnect Over Frequency	62	62 to 64	[Hz]
Anti-Islanding Disconnect Under Frequency	57	53 to 57	[Hz]
Anti-Islanding Disconnect Over Voltage LN Fast	144	138 to 150	[V]
Anti-Islanding Disconnect Over Voltage LN Slow	132	120 to 138	[V]
Anti-Islanding Disconnect Over Voltage L1L2 Fast	288	276 to 300	[V]
Anti-Islanding Disconnect Over Voltage L1L2 Slow	264	240 to 276	[V]
Anti-Islanding Disconnect Under Voltage LN Fast	60	0 to 60	[V]
Anti-Islanding Disconnect Under Voltage LN Slow	84	60 to 96	[V]
Anti-Islanding Disconnect Under Voltage L1L2 Fast	120	0 to 120	[V]
Anti-Islanding Disconnect Under Voltage L1L2 Slow	168	120 to 192	[V]
TrOV trip time	16	10 to 200	[ms]
TrOV trip level	120	100 to 150	[%Vn]

Grid Reconnect Settings

At initial start-up or upon disconnection, the XW Pro will remain offline until the voltage and frequency are within the qualified range (i.e. less than Over Voltage/Frequency limit and higher than Under Voltage/Frequency limit).

Table 48 Rule 21 Grid Reconnection default and adjustability range settings

Parameter	Default	Range	Unit
Anti-Islanding Reconnect Time	300	15 to 300	[s]
HF Reconnect Frequency	60.5	60.1 to 61	[Hz]
LF Reconnect Frequency	58.5	58 to 59.9	[Hz]
HV Reconnect Nominal Voltage	105.83	100 to 110	[%Vn]
LV Reconnect Nominal Voltage	88.33	88 to 100	[%Vn]

Anti-Islanding Reconnect Time	Grid reconnection time delay at initial start-up or upon disconnection. The default value for this setting is 300 seconds.
HF Reconnect Frequency	The frequency below which the XW Pro will initialize grid reconnection process. The default value for this setting is 60.5 Hz.
LF Reconnect Frequency	The frequency above which the XW Pro will initialize grid reconnection process. The default value for this setting is 58.5 Hz).
HV Reconnect Voltage	The voltage below which the XW Pro will initialize grid reconnection process. The default value for this setting is 105.83 [%Vn] (percentage of nominal voltage).
LV Reconnect Voltage	The voltage above which the XW Pro will initialize grid reconnection process. The default value for this setting is 88.33 [%Vn] (percentage of nominal voltage).

IEEE 1547-2018 Standard for Interconnecting Distributed Resources with Electric Power System (60Hz)

XW Pro complies with the following category of operations defined in IEEE 1547:2018 Standard:

- Normal operating performance category: Category B
- Abnormal operating performance category: Category III

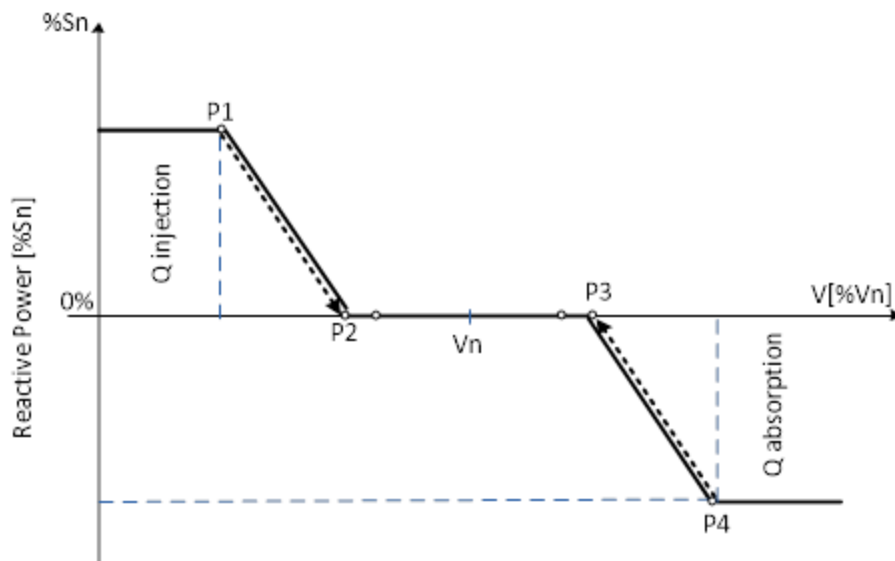
Q(V) Volt-VAr Function

When the Q(V) Volt-VAr function is enabled, the XW Pro is in Grid Support mode and AC voltage deviates from nominal range:

- The XW Pro dynamically injects reactive power into the grid following the P1P2 segment when AC voltage trends lower than the nominal value.
- The XW Pro dynamically absorbs reactive power from the utility grid following the P3P4 segment when AC voltage trends higher than the nominal value.

The Q(V) function is enabled by default.

Figure 44 Q(V) Volt-Var Function



Q – The XW Pro output reactive power in percentage of nominal rated apparent power S_n .

For example, $Q_1 = 30\%$ means $Q_1 = 1800$ VAr for $S_n = 6000$ kVA of the XW Pro nominal rated apparent power.

V - Utility grid voltage in percentage) of nominal voltage V_n

For example, $V_1 = 92\%$ means $V_1 = 221$ V for 240 V nominal grid.

Table 49 IEEE1547-2018 Q(V) Volt-Var function default and adjustability range settings

Parameter	Voltage [%Vn]		Reactive Power [%Sn]	
	Default	Range	Default	Range
Point P1	92	85 to 98.75	30	+15 to +60
Point P2	98	90 to 100	0	0
Point P3	102	100 to 110	0	0
Point P4	108	101.25 to 112.5	-30	-60 to -15

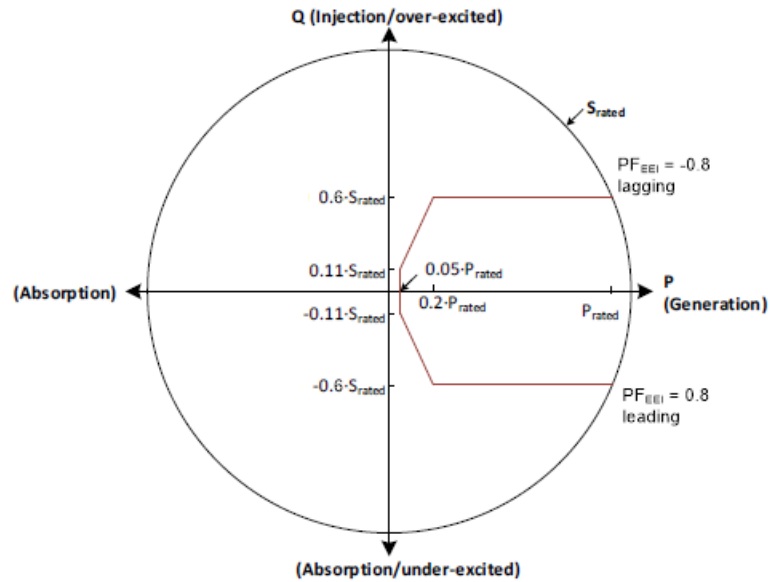
Fixed Power Factor Function

This function allows the user to set the XW Pro output Power Factor in Grid Support Mode.

- The Power factor (PF) is controllable from 20% to 100% nominal output power.
- Default setting is PF = 1 .
- Power Factor setting adjustability range from - 0.80 lagging to 0.80 leading (EEl¹ Power Factor sign convention).
- When enabled, the PF setting has priority over other functions, which means that active power may be reduced to achieve the power factor setpoint.

The Fixed Power Factor function is disabled by default.

Figure 45 Fixed Power Factor function



¹EEl – Edison Electric Institute

Table 50 IEEE1547-2018 Fixed Power Factor Function default and adjustability range settings

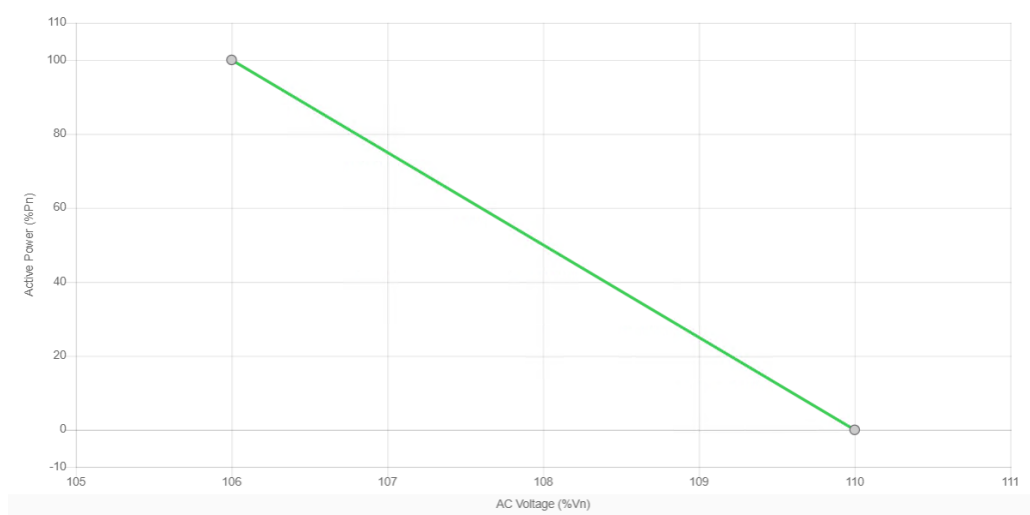
Parameter	Default	Range	Observations
Power Factor	1	1	EEI Generator reference frame convention
		(-0.80 to -0.99) lagging	
		(0.80 to 0.99) leading	

P(V) Volt-Watt Function

When the XW Pro is in Grid Support mode and P(V) function is enabled, the XW Pro dynamically curtails active power injected into the utility grid when AC voltage trends higher than V1, following P1P2 segment in in the figure below.

The P(V) function is disabled by default.

Figure 46 P(V) Volt-Watt Function



P – The XW Pro output active power in percentage of nominal rated active power Pn.

V - Utility grid voltage in percentage) of nominal voltage Vn

For example, V1 = 90% means V1=216 V for Vn = 240 V nominal grid.

Table 51 IEEE1547-2018 P(V) Volt-Watt function default and adjustability range settings

Parameter	Voltage [% Vn]		Active Power [%Pn]	
	Default	Range	Default	Range
Point P1	106	101 to 110	100	0 to 100
Point P2	110	101 to 115	0	0

NOTE: If both P(V) and P(f) are active, the lesser of the two power levels will take precedence (i.e. the curve that is curtailing the active power the most will set the output power level).

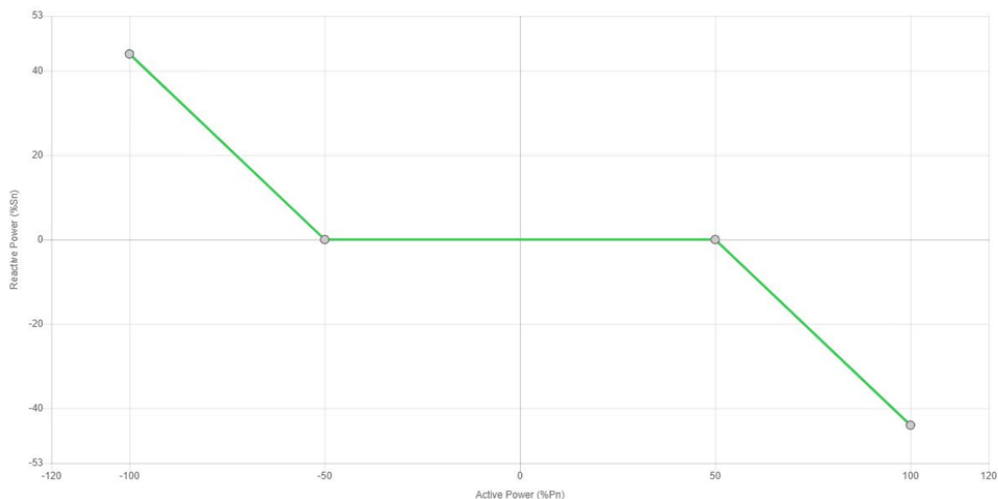
Q(P) Watt-Var Function

When the XW Pro is in Grid Support Mode and if Q(V) curve is enabled,

- The XW Pro dynamically injects reactive power into the grid following the P1P2 segment depending on the active power absorbed by XW Pro from the grid.
- The XW Pro dynamically absorbs reactive power from the utility grid following the P3P4 segment when the active power produced by XW Pro increases.

The Q(P) function is disabled by default.

Figure 47 Q(P) Watt-Var Function



Q – The XW Pro output reactive power in percentage of nominal rated apparent power S_n .

For example, $Q_1 = 30\%$ means $Q_1 = 1800 \text{ VAR}$ for $S_n = 6000 \text{ kVA}$ of the XW Pro nominal rated apparent power.

P – Active power injected or absorbed by XW Pro into or from the grid.

Table 52 IEEE1547-2018 Q(P) Watt-Var function default and adjustability range settings

Parameter	Active Power [%Pn]		Reactive Power [%Sn]	
	Default	Range	Default	Range
Point P1	-100	-100 to +100	44	-100 to +100
Point P2	-50	-100 to +100	0	-100 to +100
Point P3	50	-100 to +100	0	-100 to +100
Point P4	100	-100 to +100	44	-100 to +100

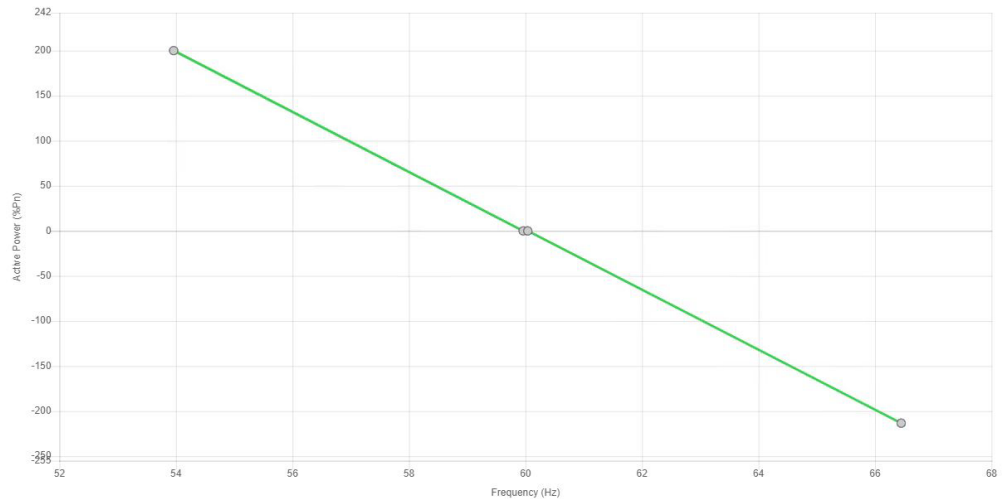
P(f) Frequency-Watt Function

When the XW Pro is in Grid Support mode and P(f) function is enabled:

- The XW Pro dynamically increases the active power injected into the grid from the pre-disturbance level when AC frequency trends lower than f_2 , following the P1P2 segment in the figure below.
- The XW Pro dynamically curtails active power injected into utility grid from the pre-disturbance level when AC frequency trends higher than f_3 , following the P3P4 segment in the figure below.

The P(f) function is enabled by default.

Figure 48 P(f) Frequency-Watt Function



P – The XW Pro output active power in percentage of nominal rated active power P_n [% P_n].

f - Utility grid frequency in Hz

Table 53 IEEE1547-2018 P(f) Frequency-Watt function default and adjustability range settings – 60 Hz

Parameter	Frequency [Hz]		Active Power [% P_n]	
	Default	Range	Default	Range
Point P1	53.96	53 to 59	200	0 to 200
Point P2	59.96	59 to 59.98	0	0
Point P3	60.04	60.2 to 61	0	0
Point P4	66.45	61 to 67	-213.34	-213.34 to 0

NOTE: If both P(V) and P(f) are active then the lesser of the two power levels shall take precedence (i.e. the curve that is curtailing the active power the most shall set the output power level).

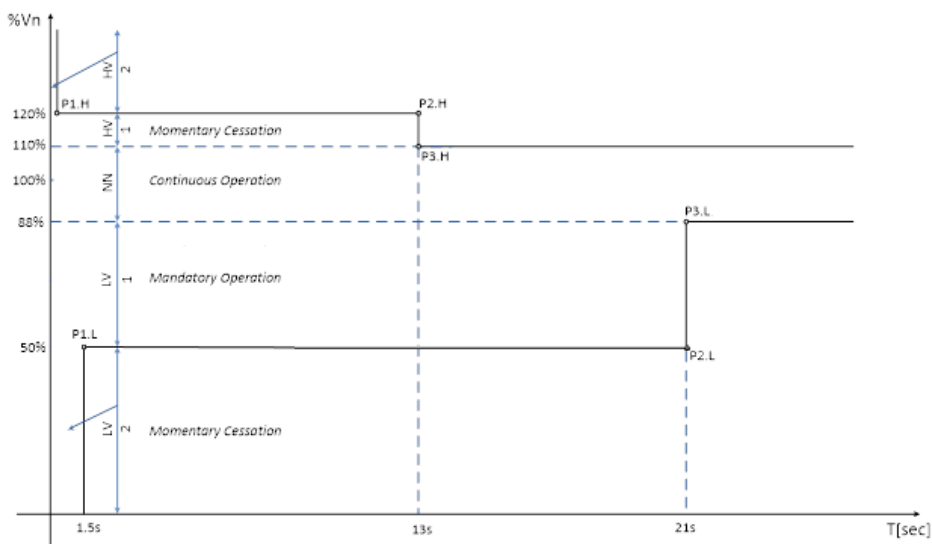
NOTE: The operation of XW Pro in regards to variation in frequency depends on the Frequency-Ride Through settings as well. Refer to the section Frequency Ride-Through (FRT) on page 169

Voltage Ride Through (VRT)

The XW Pro has the capability of remaining connected to the utility grid and operational for defined time intervals (ride-through) while AC voltage deviates from the nominal range, as shown in the figure below. At the end of ride-through time, if the utility grid voltage has not recovered to normal range, the XW Pro will disconnect and transition to Inverter (Grid-Forming) Mode.

Voltage Ride-through is enabled by default.

Figure 49 High/Low Voltage Ride-through (HVRT/LVRT) regions



- When in the Continuous Operation region (Near Nominal), the XW Pro operates indefinitely without tripping.
- When in Low-Voltage 1 (LV1) or Low-Voltage 2 (LV2), the XW Pro goes into Mandatory Operation (i.e. generates an output current greater than or equal to 80% of pre-disturbance current value).
- When in the Low-Voltage 3 (LV3) region or High-Voltage 1 (HV1) region, the XW Pro goes into Momentary Cessation (i.e. decreases the output current to less than 10% of nominal AC output current).
- When in the High-Voltage 2 (HV2) region, the XW Pro goes into Momentary Cessation (i.e. stops injecting output current to the utility grid; it does not imply galvanic isolation or disconnection).

Table 54 IEEE1547-2018 High Voltage Ride-through (HVRT) default and adjustability range settings

HVRT	Time [s]		Voltage [%Vn]	
	Default	Range	Default	Range
Point P1.H	0.16	N/A	120	115 to 125
Point P2.H	13	1 to 13	120	115 to 125
Point P3.H	13	1 to 13	110	100 to 115

Table 55 IEEE1547-2018 Low Voltage Ride-through (LVRT) default and adjustability range settings

LVRT	Time [s]		Voltage [%Vn]	
	Default	Range	Default	Range
Point P1.L	2	0.16 to 2	50	0 to 50
Point P2.L	21	2 to 21	50	50 to 80
Point P3.L	21	2 to 21	88	80 to 100

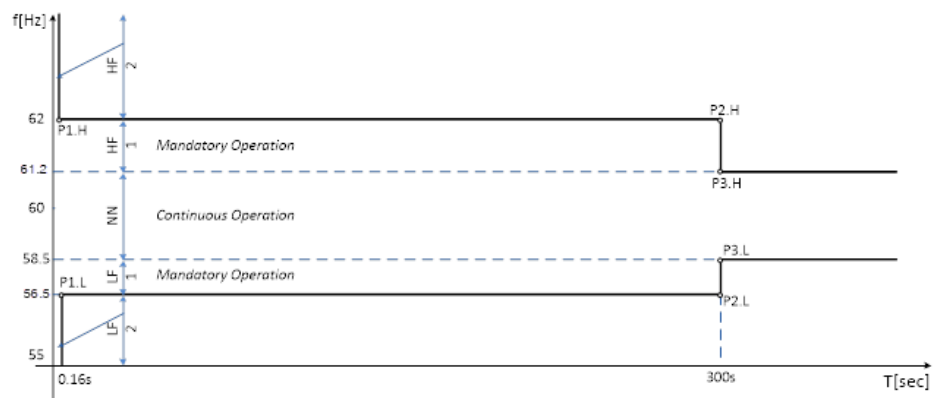
Frequency Ride-Through (FRT)

The XW Pro has the capability of remaining connected to the utility grid and operational for defined time intervals (ride-through) while AC frequency deviates from nominal range, as seen in the figure below.

- At the end of ride-through time, if the utility grid frequency has not recovered to the near nominal or normal range, the XW Pro will disconnect and transition to Inverter (Grid-Forming) Mode.

Frequency Ride-through is enabled by default.

Figure 50 High/Low Frequency Ride-through (HFRT/LFRT) regions



- When in the Low-Frequency 2 (LF2) or High-Frequency 2 (HF2) regions, the XW Pro goes into Momentary Cessation (i.e. stop injecting output current to utility grid; it does not imply galvanic isolation or disconnection).
- When in the Low-Frequency 1 (ULF1) or High-Frequency 1 (HF1), the XW Pro goes into Mandatory Operation (i.e. generates an output current greater than or equal to 80% of pre-disturbance current value).
- When in the Continuous Operation region (Near Nominal), the XW Pro operates indefinitely without tripping.

Table 56 IEEE1547-2018 High Frequency Ride-through (HFRT) default and adjustability range settings – 60 Hz

HFRT	Time [s]		Frequency [Hz]	
	Default	Range	Default	Range
Point P1.H	0.16	0.16 to 10	62	62 to 64
Point P2.H	300	2 to 300	62	62 to 64
Point P3.H	300	2 to 300	61.2	60.1 to 62

Table 57 IEEE1547-2018 Low Frequency Ride-through (LFRT) default and adjustability range settings – 60 Hz

LFRT	Time [s]		Frequency [Hz]	
	Default	Range	Default	Range
Point P1.L	0.16	0.16 to 10	56.5	53 to 57
Point P2.L	300	2 to 300	56.5	53 to 57
Point P3.L	300	2 to 300	58.5	57 to 59.9

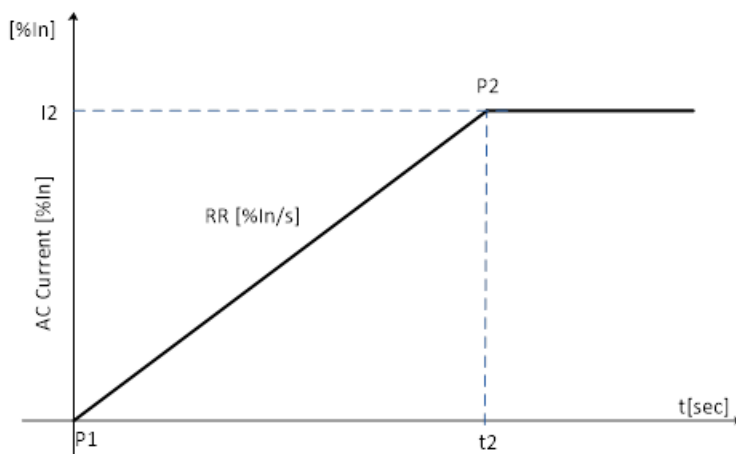
Ramp Rates

Normal Ramp Rate

During normal operation, any transition between power output levels will be executed at a ramp rate no larger than the Normal Ramp Rate setting. Normal Ramp Rate is contingent upon sufficient energy available at the XW Pro DC input port.

Normal Ramp Rate function is enabled by default.

Figure 51 Normal ramp rate



- Normal Ramp rate is defined as a slope measured in percentage of AC nominal current per second [%In/sec].
- Default Normal Ramp Rate value is 100 [%In/sec] with an adjustability range from 1 to 100 [%In/sec].

Parameter	AC Current per second [%In/s]	
	Default	Range
Ramp Rate	100	1 to 100

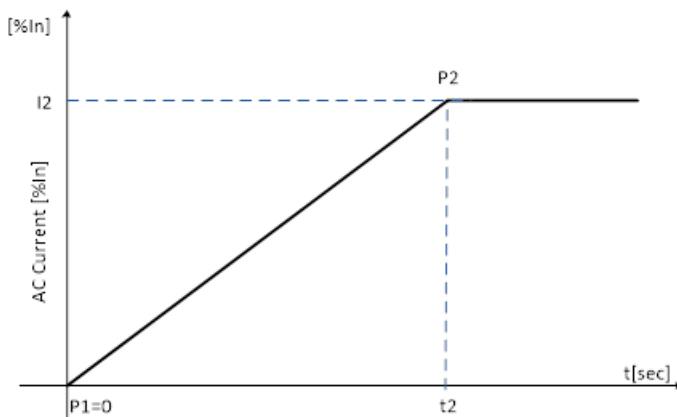
Parameter	Time [s]		AC Current [%In]	
	Default	Range	Default	Range
Point P1	0	N/A	0	N/A
Point P2	1	N/A	100	N/A

Reconnect (Soft-Start) Ramp Rate

Upon starting up, returning to service, or re-connecting, the XW Pro limits the rate of exported/generated active power to no larger than the Ramp Rate setting.

Reconnect Ramp Rate function is enabled by default.

Figure 52 Reconnect ramp rate



- Reconnect Ramp rate is defined as a slope measured in percentage of AC nominal current per second [%In/sec].
- The default Reconnect Ramp Rate value is 0.333 [%In/sec] with an adjustability range from 1 to 100 [%In/sec].

Parameter	AC Current per second [%In/s]	
	Default	Range
Ramp Rate	0.333	N/A

Parameter	Time [s]		AC Current [%In]	
	Default	Range	Default	Range
Point P1	0	N/A	0	N/A
Point P2	300	1 to 1000	100	N/A

Grid Disconnect Settings

The XW Pro will remain connected to the utility grid as long as voltage and frequency are within the qualified range (i.e. less than the Over Voltage/Frequency limit and higher than the Under Voltage/Frequency limit).

Grid voltage and frequency disconnect settings are defined in the table below, and take effect only when the H/LVRT and H/LFRT curves are disabled.

Table 58 IEEE 1547-2018 Grid Disconnect Settings

Reconnect Time Delay	Time delay to reconnect to grid.
Transient Over Voltage	Enable or disable the Transient over voltage feature.
TROV trip time	The disconnection time delay for the grid voltage exceeding the TrOV Trip level.
TROV trip level	When Transient Over-Voltage is enabled, grid voltage in percentage of nominal value [%Vn], above which the XW Pro will stop operating after the TrOV trip time.
10 min average AC over voltage disconnection enable	Enable or disable detection of 10 minute average AC over voltage.
10 min average AC over voltage disconnection level	When 10 minute average AC over voltage detection is enabled, grid voltage (10 minute average) in % of nominal value [%Vn], above which the XW Pro will stop operating after the 10 min average AC over voltage disconnection window time.
10 min average AC over voltage disconnection window time	The disconnection time delay for the 10 minute average grid voltage exceeding the 10 minute average AC over voltage disconnection level.
Aux RPO input mode	Defines the mode of operation for the auxiliary port.
Force disconnect pulse enable/disable	Enables or disables the force disconnection pulse feature. This feature is intended for AC coupling solutions, and to control the PV inverter during grid forming to grid tie transition.
Force disconnect pulse frequency	Defines the frequency used to curtail the PV inverter.
Force disconnect pulse duration	Defines the duration for which frequency to remain at force disconnect pulse frequency level.
Low Volt Frequency Disconnect Exclude Enable	Defines the behavior of XW Pro to under voltage events. If disabled, under voltage events do not cause XW Pro to ignore HF/LF disconnect curve. If enabled, HF/LF disconnect curve will be ignored when grid voltage is less than low voltage frequency disconnect exclude threshold.

Low voltage frequency disconnect exclude threshold	Defines the voltage threshold used when low voltage frequency exclude feature is enabled.
--	---

Table 59 IEEE1547-2018 Grid Disconnect default and adjustability range settings – 60 Hz

Parameter	Default	Range	Unit
Reconnect Time Delay	300	0 - 600	[s]
Transient Over voltage	Enabled	Enabled/Disabled	
TROV Trip time	1.6	1 - 20	[ms]
TROV Trip level	121	100 - 150	%
10 min average AC over voltage disconnection enable	Disabled	Enabled/Disabled	
10 min average AC over voltage disconnection level	110	100 - 125	%
10 min average AC over voltage disconnection window time	600	15 to 3600	
Aux RPO input mode	RPO	Do Nothing, RPO, RS, AC Disconnect	
Force disconnect pulse enable/disable	Disabled	Enabled/Disabled	
Force disconnect pulse frequency	62.5		[Hz]
Force disconnect pulse duration	0.26		[s]
Low Volt Frequency Disconnect Exclude Enable	Enabled	Enabled	
Low Volt Frequency Disconnect Exclude Threshold	30	0 - 100	%

Grid Reconnect Settings

At initial start-up or upon disconnection, the XW Pro will remain offline until the voltage and frequency are within the qualified range (i.e. less than Over Voltage/Frequency limit and higher than Under Voltage/Frequency limit).

Table 60 IEEE1547-2018 Grid Reconnection default and adjustability range settings – 60 Hz

Parameter	Default	Range	Unit
HF Reconnect Frequency	60.1	60.1 to 61	[Hz]
LF Reconnect Frequency	59.5	58 to 59.9	[Hz]
HV Reconnect Nominal Voltage	105	100 to 110	[%Vn]
LV Reconnect Nominal Voltage	91.7	88 to 100	[%Vn]

HF Reconnect Frequency	The frequency below which the XW Pro will initialize grid reconnection process.
LF Reconnect Frequency	The frequency above which the XW Pro will initialize grid reconnection process.
HV Reconnect Voltage	The voltage below which the XW Pro will initialize grid reconnection process.
LF Reconnect Voltage	The voltage above which the XW Pro will initialize grid reconnection process.

Hawaiian Electric Company (HECO) SRD2.0-2020: Smart Inverter Grid-Support Utility Interactive Functions

HECO SRD2.0-2020 Specifications

- Source Requirements Document:
 - Hawaiian Electric IEEE 1547.1-2020 Standard Source Requirement Document Version 2.0
- Programmable Setting Access: Access parameters and/or adjust features using gateway device
- HECO SRD2.0 2020 standard follows the regulations in IEEE 1547-2018 with the following exceptions:
 1. Enter Service - IEEE 1547-2018 allows randomized delay for reconnection or an intentional adjustable delay time. HECO SRD 2.0 2020 requires this delay to be disabled or configured as zero.
 2. Frequency Ride Through - The ride through specifications are same as in IEEE 1547-2018 regulations. HECO SRD 2.0 2020 differs only in the frequency threshold values.
 3. Frequency droop - Functionality of Freq-Droop and the default values are the same as in IEEE 1547-2018.

Only range of kOf, and kUf (the slope of the P(f) curve) has a greater range. (0.02 to 0.05 for IEEE 1547-2018, where HECO SRD 2.0 2020 has the range 0.02 to 0.07)

HECO SRD2.0-2020 settings follows the default Rule 14h from HECO. The following tables summarize the differences in default settings between HECO SRD2.0 2020 and IEEE 1547:2018:

Table 61 HECO SRD2.0 2020 High Frequency Ride-Through (HFRT) default settings

HRFT	HECO SRD2.0 2020		IEEE 1547-2018	
	Time [s]	Frequency [Hz}	Time [s]	Frequency [Hz}
Point P1.L	0.16	65	0.16	62
Point P2.L	180	65	300	62
Point P3.L	180	63	300	61.2

Table 62 HECO SRD2.0 2020 Low Frequency Ride-Through (LFRT) default settings

LRFT	HECO SRD2.0 2020		IEEE 1547-2018	
	Time [s]	Frequency [Hz]	Time [s]	Frequency [Hz]
Point P1.L	0.16	50	0.16	56.5
Point P2.L	180	50	300	56.5
Point P3.L	180	57	300	58.5

Table 63 HECO SRD2.0 2020 Low Voltage Ride-Through (LVRT) default settings

LVRT	HECO SRD2.0 2020		IEEE 1547-2018	
	Time [s]	Frequency [Hz]	Time [s]	Frequency [Hz]
Point P1.L	2	10	2	50
Point P2.L	21	10	21	50
Point P3.L	21	88	21	88

Table 64 HECO SRD2.0 2020 P(f) Frequency-Watt Function default settings

LVRT	HECO SRD2.0 2020		IEEE 1547-2018	
	Frequency [Hz]	Active Power [%Pn]	Frequency [Hz]	Active Power [%Pn]
Point P1	55.16	200	53.96	200
Point P2	59.96	0	59.96	0
Point P3	60.04	0	60.04	0
Point P4	65.16	-213.34	66.45	-213.34

Table 65 HECO SRD2.0 2020 Q(V) Volt-Var function default settings

LVRT	HECO SRD2.0 2020		IEEE 1547-2018	
	Frequency [Hz]	Active Power [%Pn]	Frequency [Hz]	Active Power [%Pn]
Point P1	92	44	92	44
Point P2	98	0	98	0
Point P3	100	0	102	0
Point P4	106	-44	108	-44

Other parameters that are different in HECO SRD2.0 2020:

Table 66 Other parameter differences

Parameter	HECO SRD2.0 2020	IEEE 1547-2018
Q(V) Function	Enabled	Disabled
P(V) Function	Enabled	Disabled
P(F) droop function response time	0.5 sec	5 sec
Constant Power Factor Function	Disabled	Enabled
Power Factor Target	0.9	1
Reactive Power Target	90% of maximum reactive power capability	0

Puerto Rico Energy Power Authority (PREPA) Technical Requirements for Interconnecting Wind and Solar Generation

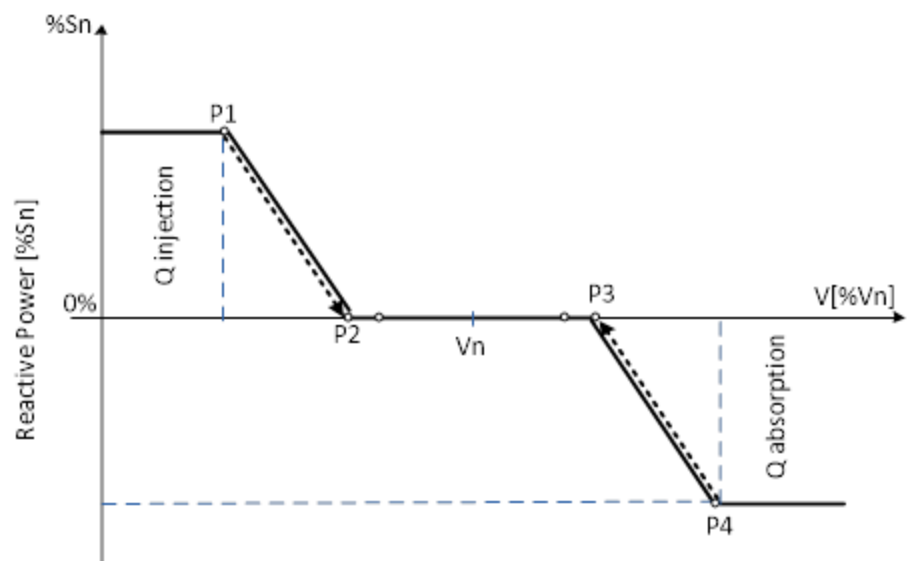
Q(V) Volt-VAr Function

When the Q(V) Volt-VAr function is enabled, the XW Pro is in Grid Support mode. Reactive power output is actively control as a function of the voltage following the Volt-VAr piecewise linear characteristic in the figure below.

- The XW Pro dynamically injects reactive power into the grid following the P1P2 segment when AC voltage trends lower than the nominal value.
- The XW Pro dynamically absorbs reactive power from the utility grid following the P5P6 segment when AC voltage trends higher than the nominal value.
- By generating or consuming reactive power in response to grid voltage fluctuations, XW Pro contributes to grid stabilization towards the nominal voltage.

The Q(V) function is disabled by default.

Figure 53 Q(V) Volt-Var Function



Q – The XW Pro output reactive power in percentage of nominal rated apparent power S_n .

For example, $Q_1 = 30\%$ means $Q_1 = 1800 \text{ VAr}$ for $S_n = 6000 \text{ kVA}$ of the XW Pro nominal rated apparent power.

V - Utility grid voltage in percentage) of nominal voltage V_n

For example, $V_1 = 92\%$ means $V_1 = 221 \text{ V}$ for 240 V nominal grid.

Table 67 PREPA Q(V) Volt-Var function default and adjustability range settings

Parameter	Voltage [%Vn]		Reactive Power [%Sn]	
	Default	Range	Default	Range
Point P1	92	85 to 98.75	30	+15 to +60
Point P2	96.7	90 to 100	0	0
Point P3	97	90 to 100	0	0
Point P4	103	100 to 110	0	0
Point P5	103.3	100 to 110	0	0
Point P6	107	101.25 to 112.5	-30	-60 to -15

The Reactive Power Volt-Var function has priority over generated active power. The XW Pro may need to reduce produced active power to meet the reactive power demand.

Fixed Power Factor Function

This function allows the user to set the XW Pro output Power Factor in Grid Support Mode.

- The Power Factor (PF) is controllable from 20% to 100% nominal output power and default setting is PF = 0.95 leading.
- Power Factor setting adjustability range from - 0.85 lagging to 0.85 leading (EEI¹ Power Factor sign convention).
- When enabled, the PF setting has priority over other functions, which means that active power may be reduced to achieve the power factor setpoint.

The Fixed Power Factor function is disabled by default.

¹EEI – Edison Electric Institute

Figure 54 Fixed Power Factor function

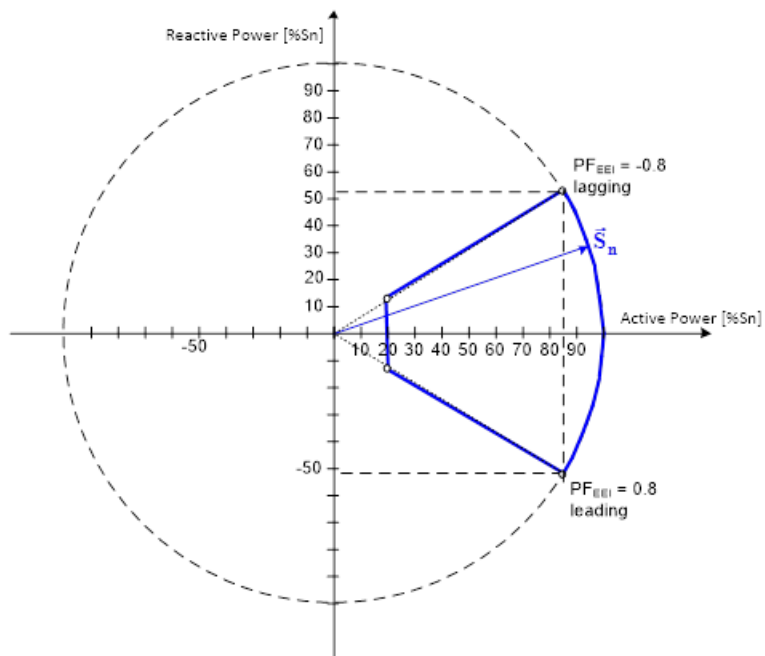


Table 68 PREPA Fixed Power Factor Function default and adjustability range settings

Parameter	Default	Range	Observations
Power Factor	0.95 leading	1	EEI Generator reference frame convention ¹
		(-0.85 to -0.99) lagging	
		(0.85 to 0.99) leading	

¹EEI - Edison Electric Institute

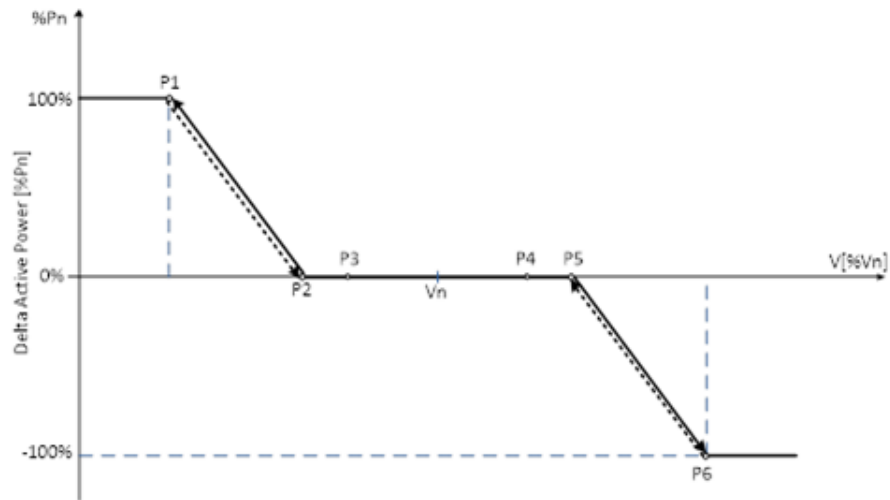
P(V) Volt-Watt Function

When the XW Pro is in Grid Support mode and P(V) function is enabled:

- The XW Pro dynamically increases the active power injected into the utility grid from the pre-disturbance level when AC voltage trends lower than V2, following the P1P2 segment in the figure below.
- The XW Pro dynamically curtails active power injected into the utility grid from the pre-disturbance level when AC voltage trends higher than V5, following P5P6 segment in the figure below.

The P(V) function is disabled by default.

Figure 55 P(V) Volt-Watt Function



P – The XW Pro output active power in percentage of nominal rated active power Pn.

V - Utility grid voltage in percentage) of nominal voltage Vn [%Vn]

For example, V1 = 90% means V1=216 V for Vn = 240 V nominal grid.

Table 69 PREPA P(V) Volt-Watt function default and adjustability range settings

Parameter	Voltage [% Vn]		Active Power [%Pn]	
	Default	Range	Default	Range
Point P1	90	85 to 98	100	0 to 100
Point P2	94	90 to 98	0	0
Point P3	95	90 to 100	0	0
Point P4	105	100 to 110	0	0
Point P5	106	102 to 110	0	0
Point P6	110	102 to 115	-100	-100 to 0

NOTE: If both P(V) and P(f) are active, the lesser of the two power levels will take precedence (i.e. the curve that is curtailing the active power the most will set the output power level).

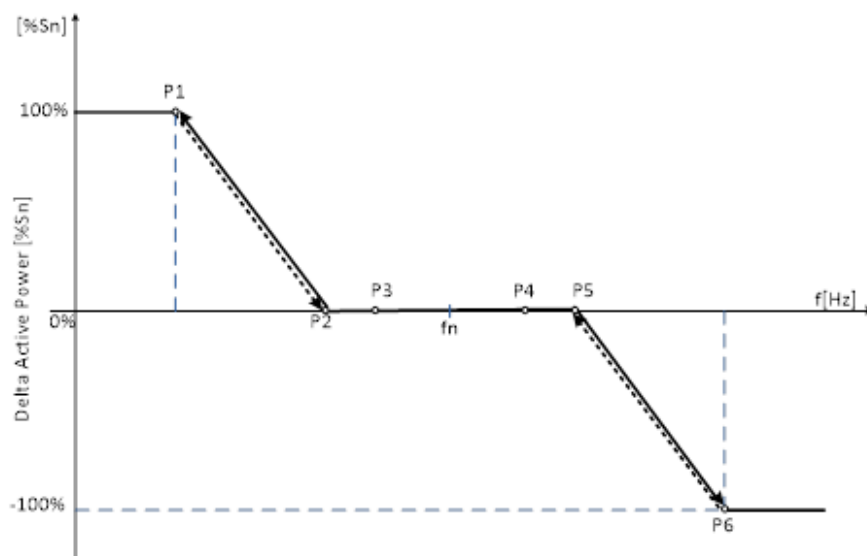
P(f) Frequency-Watt Function

When the XW Pro is in Grid Support mode and P(f) function is enabled:

- The XW Pro dynamically increases the active power injected into the grid from the pre-disturbance level when AC frequency trends lower than f_2 , following the P1P2 segment in the figure below.
- The XW Pro dynamically curtails active power injected into utility grid from the pre-disturbance level when AC frequency trends higher than f_5 following the P5P6 segment in the figure below.

The P(f) function is disabled by default.

Figure 56 P(f) Frequency-Watt Function



P – The XW Pro output active power in percentage of nominal rated active power S_n [% S_n].

f - Utility grid frequency in Hz

Table 70 PREPA P(f) Frequency-Watt function default and adjustability range settings

Parameter	Frequency [Hz]		Active Power [% P_n]	
	Default	Range	Default	Range
Point P1	58	56 to 59	100	0 to 100
Point P2	59.96	59 to 59.96	0	0
Point P3	59.98	59 to 60	0	0
Point P4	60.02	60 to 61	0	0
Point P5	60.04	60.01 to 61	0	0
Point P6	62	61 to 64.22	-100	-100 to 0

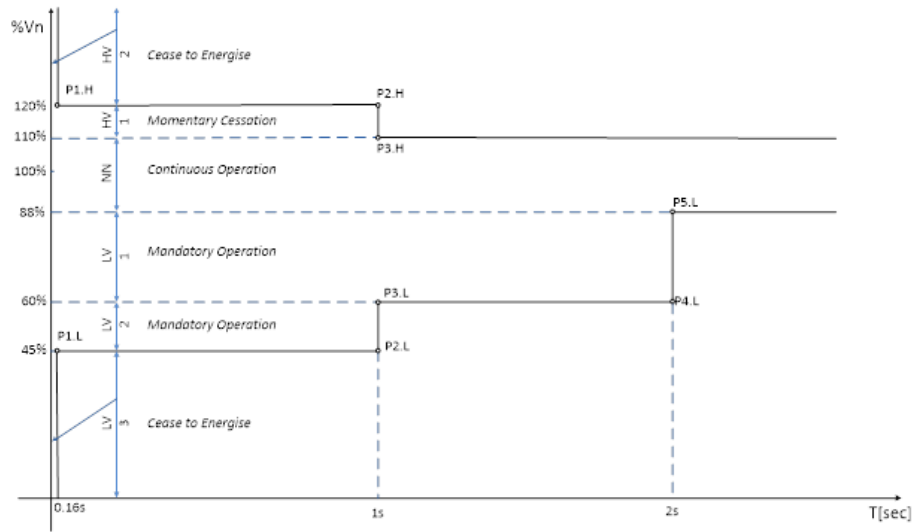
NOTE: If both P(V) and P(f) are active then the lesser of the two power levels shall take precedence (i.e. the curve that is curtailing the active power the most shall set the output power level)

Voltage Ride Through (VRT)

The XW Pro has the capability of remaining connected to the utility grid and operational for defined time intervals (ride-through) while AC voltage deviates from the nominal range, as shown in the figure below. At the end of ride-through time, if the utility grid voltage has not recovered to normal range, the XW Pro will disconnect and transition to Inverter (Grid-Forming) Mode.

Voltage Ride-through is enabled by default.

Figure 57 High/Low Voltage Ride-through (HVRT/LVRT) regions



- When in the Continuous Operation region (Near Nominal), the XW Pro operates indefinitely without tripping.
- When in Low-Voltage 1 (LV1) or Low-Voltage (LV2) region, the XW Pro goes into Mandatory Operation (i.e. generates an output current greater than or equal to 80% of pre-disturbance current value).
- When in the High-Voltage 1 (HV1) region, the XW Pro goes into Momentary Cessation (i.e. decreases the output current to less than 10% of nominal AC output current and remain online for the ride-through specified time, with the capability of immediate restore normal operation when utility grid voltage returns to near-nominal range).
- When in the Low-Voltage 3 (LV3) or High-Voltage 2 (HV2) region, the XW Pro goes into Cease to Energise (i.e. stops injecting output current to the utility grid; it does not imply galvanic isolation or disconnection).

Table 71 PREPA High Voltage Ride-through (HVRT) default and adjustability range settings

HVRT	Time [s]		Voltage [%Vn]	
	Default	Range	Default	Range

Point P1.H	0.16	N/A	120	N/A
Point P2.H	1	1 to 13	120	N/A
Point P3.H	1	1 to 13	110	110 to 115

Table 72 PREPA Low Voltage Ride-through (LVRT) default and adjustability range settings

LVRT	Time [s]		Voltage [%Vn]	
	Default	Range	Default	Range
Point P1.L	0.16	N/A	45	0 to 50
Point P2.L	1	1 to 11	45	0 to 50
Point P3.L	1	1 to 11	60	50 to 80
Point P4.L	2	2 to 21	60	50 to 80
Point P5.L	2	2 to 21	88	80 to 100

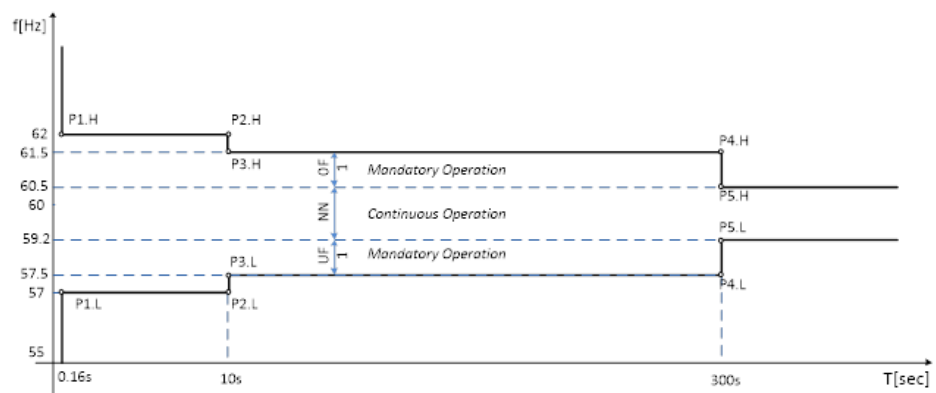
Frequency Ride-Through (FRT)

The XW Pro has the capability of remaining connected to the utility grid and operational for defined time intervals (ride-through) while AC frequency deviates from nominal range, as seen in the figure below.

- At the end of ride-through time, if the utility grid frequency has not recovered to the near nominal (NN) range, the XW Pro will disconnect and transition to Inverter (Grid-Forming) Mode.

Frequency Ride-through is enabled by default.

Figure 58 High/Low Frequency Ride-through (HFRT/LFRT) regions



- When in Continuous Operation region (Near Nominal), XW Pro operates indefinitely without tripping.
- When in Under-Frequency 1 (UF1) or Over-Frequency 1 (OF1), XW Pro goes into Mandatory Operation (i.e. generates an output current greater than or equal to 80% of pre-disturbance current value).

Table 73 PREPA High Frequency Ride-through (HFRT) default and adjustability range settings

HFRT	Time [s]		Frequency [Hz]	
	Default	Range	Default	Range
Point P1.H	0.16	N/A	62	60 to 64
Point P2.H	10	0.16 to 10	62	60 to 64
Point P3.H	10	0.16 to 10	61.5	60 to 64
Point P4.H	300	2 to 300	61.5	60 to 64
Point P5.H	300	2 to 300	60.5	60 to 64

Table 74 PREPA Low Frequency Ride-through (LFRT) default and adjustability range settings

LFRT	Time [s]		Frequency [Hz]	
	Default	Range	Default	Range
Point P1.L	0.16	N/A	57	56 to 60
Point P2.L	10	0.16 to 10	57	56 to 60
Point P3.L	10	0.16 to 10	57.5	56 to 60
Point P4.L	300	2 to 300	57.5	56 to 60
Point P5.L	300	2 to 300	59.2	56 to 60

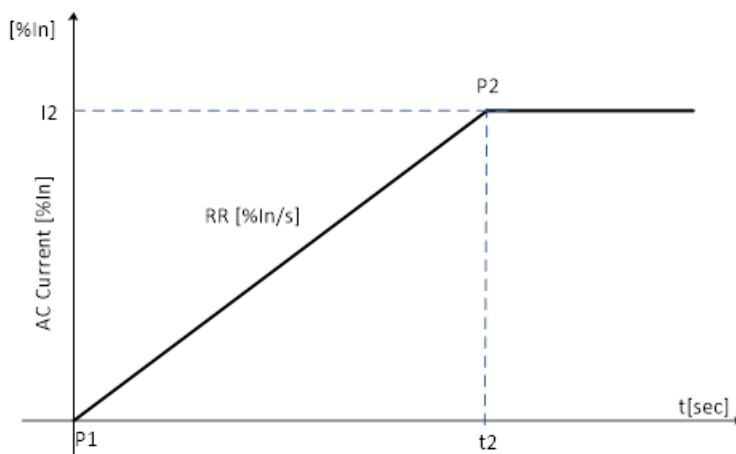
Ramp Rates

Normal Ramp Rate

During normal operation, any transition between power output levels will be executed at a ramp rate no larger than the Normal Ramp Rate setting. Normal Ramp Rate is contingent upon sufficient energy available at the XW Pro DC input port.

Normal Ramp Rate function is enabled by default.

Figure 59 Normal ramp rate



- Normal Ramp rate is defined as a slope measured in percentage of AC nominal current per second [%In/sec].
- Default Normal Ramp Rate value is 50 [%In/sec] with an adjustability range from 1 to 100 [%In/sec].

Parameter	AC Current per second [%In/s]	
	Default	Range
Ramp Rate	50	1 to 100

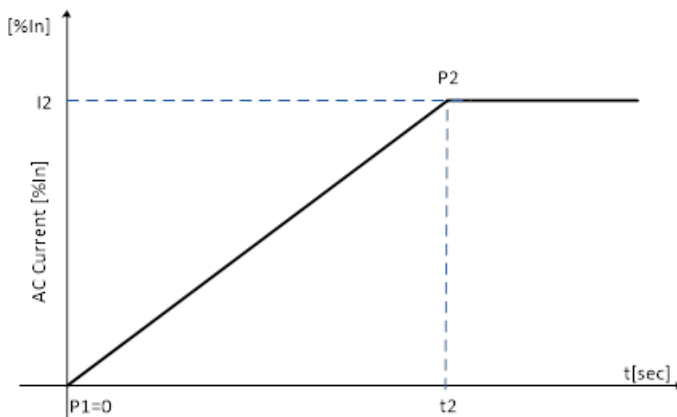
Parameter	Time [s]		AC Current [%In]	
	Default	Range	Default	Range
Point P1	0	N/A	0	N/A
Point P2	2	N/A	100	N/A

Reconnection (Soft-Start) Ramp Rate

Upon starting up, returning to service, or re-connecting, the XW Pro limits the rate of exported/generated active power to no larger than the Ramp Rate setting.

Normal Ramp Rate function is enabled by default.

Figure 60 Reconnection ramp rate



- Normal Ramp rate is defined as a slope measured in percentage of AC nominal current per second [%In/sec].
- The default Normal Ramp Rate value is 2 [%In/sec] with an adjustability range from 1 to 100 [%In/sec].

Parameter	AC Current per second [%In/s]	
	Default	Range
Ramp Rate	2	N/A

Parameter	Time [s]		AC Current [%In]	
	Default	Range	Default	Range
Point P1	0	N/A	0	N/A
Point P2	50	1 to 100	100	N/A

Grid Disconnect Settings

The XW Pro will remain connected to the utility grid as long as voltage and frequency are within the qualified range (i.e. less than the Over Voltage/Frequency limit and higher than the Under Voltage/Frequency limit).

PREPA implements voltage and frequency disconnect limits via High/Low Voltage Ride Through (H/LVRT) and via High/Low Frequency Ride Through (H/LFRT) curves.

Grid voltage and frequency disconnect settings are defined in the table below, and take effect only when the H/LVRT and H/LFRT curves are disabled.

Table 75 PREPA Grid Disconnect Settings

Anti-Islanding Disconnect Slow Delay	The disconnection time delay for the grid voltage exceeding an over-voltage voltage level, but lower than the fast disconnection level. The default value for this setting is 0.5 seconds.
Anti-Islanding Disconnect Over Frequency	The frequency above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 62Hz. The disconnect will occur if the inverter is over frequency for 0.1 seconds.
Anti-Islanding Disconnect Under Frequency	The frequency below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 57 Hz, and the disconnect will occur if the inverter is under frequency for 0.1 seconds.
Anti-Islanding Disconnect Over Voltage L-N Fast	The line-to-neutral voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 144 V.
Anti-Islanding Disconnect Over Voltage L-N Slow	The line-to-neutral voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 132 V, and the disconnect will occur if the inverter is over frequency for 0.5 seconds.
Anti-Islanding Disconnect Over Voltage L1-L2 Fast	The line-to-line voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 288 V.
Anti-Islanding Disconnect Over Voltage L1-L2 Slow	The line-to-line voltage above which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 264 V, and the disconnect will occur if the inverter is over voltage for 0.5 seconds.
Anti-Islanding Disconnect Under Voltage L-N Fast	The line-to-neutral voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 54 V.
Anti-Islanding Disconnect Under Voltage L-N Slow	The line-to-neutral voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 72 V, and the disconnect will occur if the inverter is under frequency for 0.5 seconds.

Anti-Islanding Disconnect Under Voltage L1-L2 Fast	The line-to-line voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 108 V.
Anti-Islanding Disconnect Under Voltage L1-L2 Slow	The line-to-line voltage below which the XW Pro will stop export of power and record an islanding fault. The default value for this setting is 144 V, and the disconnect will occur if the inverter is under frequency for 0.5 seconds.
Transient Over-Voltage (TrOV) trip time	The disconnection time delay for the grid voltage exceeding the TrOV Trip level. The default value for this setting is 0.016 seconds.
Transient Over-Voltage (TrOV) trip level	When Transient Over-Voltage is enabled, grid voltage in percentage of nominal value [%Vn], above which the XW Pro will stop operating after the TrOV trip time. The default value is 120 [%Vn].

Table 76 PREPA Grid Disconnect default and adjustability range settings

Parameter	Default	Range	Unit
Anti-Islanding Disconnect Slow Delay	0.5	0.2 to 10	[s]
Anti-Islanding Disconnect Over Frequency	61.5	62 to 64	[Hz]
Anti-Islanding Disconnect Under Frequency	57.5	53 to 57	[Hz]
Anti-Islanding Disconnect Over Voltage LN Fast	144	138 to 150	[V]
Anti-Islanding Disconnect Over Voltage LN Slow	132	120 to 138	[V]
Anti-Islanding Disconnect Over Voltage L1L2 Fast	288	276 to 300	[V]
Anti-Islanding Disconnect Over Voltage L1L2 Slow	264	240 to 276	[V]
Anti-Islanding Disconnect Under Voltage LN Fast	54	0 to 60	[V]
Anti-Islanding Disconnect Under Voltage LN Slow	72	60 to 96	[V]
Anti-Islanding Disconnect Under Voltage L1L2 Fast	108	0 to 120	[V]
Anti-Islanding Disconnect Under Voltage L1L2 Slow	144	120 to 192	[V]
TrOV trip time	16	10 to 200	[ms]
TrOV trip level	120	100 to 150	[%Vn]

Grid Reconnect Settings

At initial start-up or upon disconnection, the XW Pro will remain offline until the voltage and frequency are within the qualified range (i.e. less than Over Voltage/Frequency limit and higher than Under Voltage/Frequency limit).

Table 77 PREPA Grid Reconnection default and adjustability range settings

Parameter	Default	Range	Unit
Anti-Islanding Reconnect Time	300	15 to 300	[s]
HF Reconnect Frequency	60.5	60.1 to 61	[Hz]
LF Reconnect Frequency	59.3	58 to 59.9	[Hz]
HV Reconnect Nominal Voltage	105.83	100 to 110	[%Vn]
LV Reconnect Nominal Voltage	88.33	88 to 100	[%Vn]

Anti-Islanding Reconnect Time	Grid reconnection time delay at initial start-up or upon disconnection. The default value for this setting is 300 seconds.
HF Reconnect Frequency	The frequency below which the XW Pro will initialize grid reconnection process. The default value for this setting is 60.5 Hz.
LF Reconnect Frequency	The frequency above which the XW Pro will initialize grid reconnection process. The default value for this setting is 59.3 Hz).
HV Reconnect Voltage	The voltage below which the XW Pro will initialize grid reconnection process. The default value for this setting is 105.83 [%Vn] (percentage of nominal voltage).
LV Reconnect Voltage	The voltage above which the XW Pro will initialize grid reconnection process. The default value for this setting is 88.33 [%Vn] (percentage of nominal voltage).

7 Defaults

What's in This Chapter?

Default Settings	192
------------------------	-----

Default Settings

This section contains the default configuration settings and ranges for the XW Pro. Configuration settings can be viewed and changed using gateway device.

Controls Settings Menu

Item	Default Setting	Range	Step Size
Operating Mode	Standby	Standby/Operating	n/a
Backup Mode	Enabled	Enabled/Disabled	n/a
Reset	Reboot	Reboot, Reset User Settings to Factory, Reset all Settings to Factory	n/a
Clear	--	Fault Log, Active Faults, Warning Log, Active Warnings, State Event Log, Communication Statistics, Statistics, User Statistics	n/a
Force Charger State	--	Bulk, float (3- Stage cycle), bulk, no float (2- Stage cycle), CVCI (Lithium-Ion battery)	n/a
Grid Export (Sell) Enable/Disable	Enabled	Enabled/Disabled	n/a
Charger	Enabled	Enabled/Disabled	n/a
Auxiliary Output Control	Manual off	Manual off, Manual on, Automatic	n/a

Backup Mode Settings Menu

Item	Default Setting	Range	Step Size
AC Coupling	Enabled	Enabled/Disabled	n/a
AC PV Charge SOC Limit	90%	0-100%	n/a
Search Mode	Disabled	Enabled/Disabled	n/a
Maximum Search Watts	50 W	25-255 W	5
Search Delay	2 s	1-25 s	1

Charger Settings Menu

Item	Default Setting	Range	Step Size
Recharge Voltage	50 V	40.0-60.0 V	0.1
Recharge SOC	50%	0-100%	1
Recharge SOC Delay	60 s	0-300 s	1
Charge Block Start	12:00 AM	12:00 AM-11:59 PM, 00:00-23:59	1
Charge Block Stop	12:00 AM	12:00 AM-11:59 PM, 00:00-23:59	1

Battery Settings Menu

Item	Default Setting	Range	Step Size
Battery Type	Flooded	Flooded, Gel, AGM, Custom, Li-ion	n/a
Charge Cycle	2 Stage	2 Stage, 3 Stage, External BMS	n/a
SOC Control Enable	Disabled	Enabled/Disabled	n/a
Battery Bank Capacity	440 Ah	0-10000 Ah ^a	1
Maximum Charge Rate	100%	5-100%	1
Default Battery Temperature	Warm	Cold, Warm, Hot	n/a
Absorption Time	10800 s	1-28800 s	1
Low Battery Cut Out	44 V	36-52 V	0.1
Low Battery Cut Out Delay	10 s	0-600 s	1
Low Battery Cut Out Hysteresis	2 V	0-10 V	0.1
Low Battery Cut Out Warning Offset	0.5 V	0.5-2 V	0.1
High Battery Cut Out	65 V	58-70 V	0.1
Bulk Termination Time	1s	1-3600s	1
Charge Cycle TimeOut	480 min	1-1440 min	1
High SOC Cut Out	99%	0-100%	1
High SOC Cut Out Delay	60 s	0-300 s	1
Low SOC Cut Out	25%	0-100%	1
Low SOC Cut Out Delay	60 s	0-300 s	1

^aSetting the battery capacity to 0 will reset the charging current to its default values. Zero Ah battery capacity implies there is no absorption exit current criteria and absorption only exits when the absorption timer (default 3 hrs, range 1 min-8 hr) expires.

AC Settings Menu

Item	Default Setting		Range		Step Size
	120 VAC	240 VAC	120 VAC	240 VAC	
AC Priority	Grid Priority (AC1)		AC1, AC2		N/A
AC1 Breaker Size	60 A		3-60 A		1
AC2 Breaker Size	60 A		3-60 A		1

AC1 (Grid) Settings Menu

Item	Default Setting		Range		Step Size
	120 VAC	240 VAC	120 VAC	240 VAC	
AC1 Reconnect Time Delay (Transfer Switch Delay)	12 s		10-655 s		1
AC1 Low Voltage Disconnect	96 V		54-115 V		1
AC1 Low Voltage Reconnect Offset	6 V		no limit		1
AC1 High Voltage Disconnect	138 V		125-144 V		1
AC1 High Voltage Reconnect Offset	6 V		no limit		1
AC1 Low Voltage Time Delayed Disconnect	99 V		54-120 V		1
AC1 High Voltage Time Delayed Disconnect	135 V		120-144 V		1
AC1 Low Frequency Disconnect	55 Hz		40-70 Hz		1
AC1 Low Frequency Reconnect Offset	3.5 Hz		(Low Frequency Disconnect + Low Frequency Reconnect Offset) <= Nominal Frequency		1
AC1 High Frequency Disconnect	65 Hz		40-70 Hz		1

Item	Default Setting		Range		Step Size
	120 VAC	240 VAC	120 VAC	240 VAC	
AC1 High Frequency Reconnect Offset	3.5 Hz		(High Frequency Disconnect + High Frequency Reconnect Offset) \geq Nominal Frequency		1
AC1 Low Frequency Time Delayed Disconnect	57.5 Hz		40-70 Hz		1
AC1 High Frequency Time Delayed Disconnect	62.5 Hz		40-70 Hz		1
AC1 Time Delayed Disconnects Delay	2 s		0-500 s		
Static Operating Reference Voltage	120 V	240 V	54-144 V		

AC2 (Generator) Settings Menu

Item	Default Setting	Range	Step Size
AC2 Reconnect Time Delay (Transfer Switch Delay)	36 s	10 – 655 s	1
AC2 Low Voltage Disconnect	184 V	112.7 – 220 V	1
AC2 Low Voltage Reconnect Offset	18.4 V	No limit	1
AC2 High Voltage Disconnect	264.5 V	240 – 310.5 V	1
AC2 High Voltage Reconnect Offset	-11.5 V	No limit	1
AC2 Low Voltage Time Delayed Disconnect	195.5 V	112.7 – 230 V	1
AC2 High Voltage Time Delayed Disconnect	258.75 V	230 – 310.5 V	1
AC2 Low Frequency Disconnect	45 Hz	40 – 70 Hz	1
AC2 Low Frequency Reconnect Offset	3.5 Hz	No limit	1
AC2 High Frequency Disconnect	55 Hz	40 – 70 Hz	1
AC2 High Frequency Reconnect Offset	3.5 Hz	No limit	1

Item	Default Setting	Range	Step Size
AC2 Low Frequency Time Delayed Disconnect	47.5 Hz	40 – 70 Hz	1
AC2 High Frequency Time Delayed Disconnect	52.5 Hz	40 – 70 Hz	1
AC2 Time Delayed Disconnects Delay	2 s	0 – 500 s	1

Item	Default Setting		Range		Step Size
	120 VAC	240 VAC	120 VAC	240 VAC	
AC2 Reconnect Time Delay (Transfer Switch Delay)	36s		10-655s		1
AC2 Low Voltage Disconnect	96 V		60-115 V		1
AC2 Low Voltage Reconnect Offset	9.6 V		no limit		1
AC2 High Voltage Disconnect	138 V		125-144 V		1
AC2 High Voltage Reconnect Offset	-6 V		no limit		1
AC2 Low Voltage Time Delayed Disconnect	102 V		60-120 V		1
AC2 High Voltage Time Delayed Disconnect	135 V		120-144 V		1
AC2 Low Frequency Disconnect	55 Hz		40-70 Hz		1
AC2 Low Frequency Reconnect Offset	3.5 Hz		(Low Frequency Disconnect + Low Frequency Reconnect Offset) <= Nominal Frequency		1
AC2 High Frequency Disconnect	65 Hz		40-70 Hz		1

Item	Default Setting		Range		Step Size
	120 VAC	240 VAC	120 VAC	240 VAC	
AC2 High Frequency Reconnect Offset	-3.5 Hz		(High Frequency Disconnect + High Frequency Reconnect Offset) >= Nominal Frequency		1
AC2 Low Frequency Time Delayed Disconnect	57.5 Hz		40-70 Hz		1
AC2 High Frequency Time Delayed Disconnect	62.5 Hz		40-70 Hz		1
AC2 Time Delayed Disconnects Delay	2 s		0-500 s		1

Grid Energy Management (Grid Support) Menu

Item	Default	Range	Step Size
Grid Support	Disabled	Enabled/Disabled	n/a
Grid Support Voltage	53.0 V ^a	42.0-70.0 V	0.1
Grid Support SOC	90 %	0-100%	1
Grid Support SOC Exit Delay	60 s	0-300 s	1
Maximum Export (Sell) Sell Amps ^b	26 A	0-27 A	1
Sell Delay 40 sec	Disabled	Enabled/Disabled	n/a
Export (Sell) Power Block Start	12:00 AM	12:00 AM-11:59 PM, 00:00-23:59	1
Export (Sell) Power Block End	12:00 AM	12:00 AM-11:59 PM, 00:00-23:59	1
Grid Peak Load Shave	Disabled	Enabled/Disabled	n/a
Load Shave Amps	48 A	0-48 A	1

^aThe setting for Grid Supp Volts must be greater or equal to LBCO+2 V. For example, if LBCO is 44 V then the minimum Grid Supp Volts is 46 V.

^bThis setting is restricted to the selected external AC1 breaker size.

Item	Default	Range	Step Size
Peak Load Shaving Delay	Disabled	Enabled/Disabled	n/a
Load Shave Block Start ^a	12:00 AM	12:00 AM-11:59 PM, 00:00-23:59	1
Load Shave Block Stop	12:00 AM	12:00 AM-11:59 PM, 00:00-23:59	1

Generator Support Menu

Setting	Default	Range	Step Size
Generator Support	Disabled	Enabled/Disabled	n/a
Generator Support Amps	48.0 A	0-48.0 A	1

Auxiliary Relay Menu

Item	Default	Range	Step Size
Auxiliary Output Active Level	Active High	Active Low/ Active High	n/a
Auxiliary Output Trigger Source	Low Battery Voltage	Low Battery Voltage High Battery Voltage Low Battery Temperature High Battery Temperature Fault Bulk Exit Absorption Exit Heat Sink Overtemperature Battery Low SOC Time of Day	n/a
Low Battery Trigger Set	44 V	40.0–58.0 V	0.1
Low Battery Trigger Set Delay	1.0 s	0-600.0 s	1
Low Battery Trigger Clear	48 V	40.0–58.0 V	0.1

^aWhen Load Shaving is enabled, if Load Shave Start and Load Shave Stop are set to the same time, the XW Pro load shaves continuously.

Item	Default	Range	Step Size
Low Battery Trigger Clear Delay	1.0 s	0-600.0 s	1

Power Control Settings

Setting	Default	Range	Step Size
Grid Import Active Power Limit (Charge)	11.52 kW	0-11.52 kW	1
Generator Import Active Power Limit (Charge)	11.52 kW	0-11.52 kW	1
EPC Enable	Disabled	Enabled/Disabled	n/a
EPC Maximum Discharge Power	6500 W	0-6500 W	1
EPC Maximum Charge Power	6800 W	0-6800 W	1

Multi-Unit Configuration Menu

Item	Default	Range	Step Size
Unit Configuration	Split Phase Primary	Invalid Single Phase <ul style="list-style-type: none"> • Stand Alone • Primary • Secondary Split Phase <ul style="list-style-type: none"> • Stand Alone • Primary • Secondary Two Phase <ul style="list-style-type: none"> • Phase 1 Primary • Phase 1 Secondary • Phase 2 Primary • Phase 2 Secondary Three Phase <ul style="list-style-type: none"> • Stand Alone • Primary • Secondary • Phase 1 Primary • Phase 1 Secondary • Phase 2 Primary • Phase 2 Secondary • Phase 3 Primary • Phase 3 Secondary 	n/a

External Contactor Settings

Item	Default	Range	Step Size
External Contactor	Disabled	Enabled/Disabled	n/a
External Contactor Mismatch Fault Delay	1 s	1-60 s	1
External Contactor Backup Mode to Grid/Gen Tied Overlap	0.01 s	0-0.03 s	0.001

External Contactor Grid/Gen Tied to Backup Mode Delay	0.1 s ¹	0-0.2 s	0.01
--	--------------------	---------	------

Battery Management System Menu

Item	Default	Range	Step Size
BMS Communication Loss Triggers Fault or Warning	Fault	Fault/Warning	n/a
BMS Communication Loss Trip Time	7 s	0-200 s	1
SOC Communication Loss Triggers Fault or Warning	Warning	Fault/Warning	n/a
SOC Communication Loss Trip Time	7 s	0-200 s	n/a
Comms Lost Battery Charge Voltage Limit	40.0 V	40.0-72.0 V	0.1
Comms Lost Battery Discharge Voltage Limit	72.0 V	40.0-72.0 V	0.1
Comms Lost Battery Charge Current Limit	0 A	0-140.0 A	0.1
Comms Lost Battery Discharge Current Limit	0 A	0-140.0 A	0.1
Charge Overcurrent Offset	5.0 A	0-100.0 A	0.1
Charge Overcurrent Trip Time	2 s	0-900 s	1
Discharge Overcurrent Offset	5.0 A	0-100.0 A	0.1
Discharge Overcurrent Trip Time	2 s	0-900 s	1
Overvoltage Offset	1.0 V	0-10.0 V	0.1
Overvoltage Trip Time	5 s	0-60 s	1
Undervoltage Offset	3.0 V	0-10.0 V	0.1
Undervoltage Trip Time	10 s	0-60 s	1

¹If using a Schneider Electric BCS, set this value to 0 seconds to meet regulation requirements.

Associations Menu

Item	Default	Range	Step Size
AC1 Association (Grid)	Grid 1	None Grid 1-10 Generator 1-10	n/a
AC2 Association (Generator)	Generator 1	None Generator 1-10 Grid 1-10	n/a
AC Output Association (Loads)	AC Load 1	AC Load 1-10	n/a
Battery Association	House Battery Bank 1	House Battery Bank 1-5	n/a

Advanced Features Menu

Item	Default	Range	Step Size
Device Response To InsightHome/Facility Communication Loss	Heartbeat Disabled	Heartbeat Disabled Do Nothing Autonomous Operation AC Passthrough	n/a
Remote Power Off	Disabled	Enabled/Disabled	n/a
Power Save	Disabled	Enabled/Disabled	n/a
Generator Support Plus	Disabled	Enabled/Disabled	n/a
Battery Energy Balance	Disabled	Enabled/Disabled	n/a

Modbus Settings Menu

Item	Default	Range	Step Size
Modbus Secondary Address (Port 502)	10	2-246	1
Modbus Secondary Address (Port 503)	10	2-246	1

Advanced Device Settings Menu

Item	Default	Range	Step Size
Periodic Transmit Enable	Enabled	Enabled/Disabled	n/a
Identify Enable	Disabled	Enabled/Disabled	n/a

Device Identification Menu

Item	Default	Range	Step Size
Device Name	n/a	Custom	n/a
Device Number	0	0-31	1
System Instance	0	0-255	1

Schneider Electric

70 Mechanic Street
Foxborough, Massachusetts 02035
United States
www.se.com

As standards, specifications, and designs change from time to time,
please ask for confirmation of the information given in this
publication.

For other country details please contact your local Schneider
Electric Sales Representative or visit the Schneider Electric website
at: <https://se.com/>

© 2020–2023 Schneider Electric. All Rights Reserved.

990-91227F-01

Printed in: