

## Lithium Werks & Morningstar

### Introduction:

With over four million sold since 1993, Morningstar is recognized as the expert in charging technology throughout the solar industry. As solar-plus-storage becomes more prevalent in mainstream installations, battery chemistries are becoming more advanced—and battery makers are increasingly looking for ways to help their customers maintain and protect their long-term investment.

Morningstar's *Energy Storage Partner program* (ESP) makes it possible for selected premium battery partners to offer additional value and support for their customers by offering them a more proven, better documented and controlled storage system. With energy storage typically accounting for a very large share of the overall system's cost, ESP helps advanced chemistry battery manufacturers to provide the maximum level of assurance that system owners and operators need. This document is intended to provide essential information and recommendations for integrating Morningstar charge controllers with the Energy Storage Partner's batteries. Proper integration of these products is dependent upon successful implementation of the custom settings outlined in the sections below. These settings are the result of cooperation between manufacturers and have been agreed upon by both parties.

### Battery Overview:

Valence offers a range of 12V, 18V, 24V and 36V lithium iron magnesium phosphate (LiFeMgPO<sub>4</sub>) battery modules, offering intrinsic safety, and comprehensive voltage and capacity options. U-Charge® energy storage solutions enable twice the run time and up to 10 times more cycles at 2/3 the weight of similar sized lead-acid battery modules.

Valence integrates battery management throughout the [U-Charge® product line](#). Each U-Charge® battery contains internal circuitry to monitor and balance each cell. Through built-in communication cables, the modules are able to communicate to the U-Charge® Battery Management System (BMS), which monitors the system as a whole. The BMS initiates module-to-module balancing, as well as controls opening and closing the contactors. The BMS asserts warnings and alarms, and outputs data via digital and analog outputs. The BMS is small and compact, and can be mounted in the battery pack or remotely. It uses CANbus to communicate with other equipment and can control such items as chargers and fuel cells. The BMS can also connect to a PC/Laptop via the [CANbus Monitoring Kit](#), for easy configuration, monitoring, or recording.

Models: [U1-12XP](#), [U24-12XP](#), [U27-12XP](#), [UEV-18XP](#), [U24-24XP](#), [U27-24XP](#), [U27-36XP](#)

Voltages: 12V, 18V, 24V, 36V

Amp Hour Capacities: 40-138Ah



**Note:** For information regarding battery bank configuration options, please contact the battery manufacturer.

**For optimal integration, the recommended settings (based on 12V nominal values) are as follows:**

**Critical Settings:**

Absorption Voltage = 14.60 V

Absorption Time = Arbitrary value (regulation voltage maintained indefinitely throughout charging cycle)

Temperature Compensation = 0.0 V/degC (Disabled)

Float = Not enabled

Equalize = Not enabled

Battery HVD/High Voltage Disconnect/Reconnect = Enable/14.70 V/14.60 V

Load LVD (Low Voltage Disconnect) ..... 12.50 V

Load LVR (Low Voltage Reconnect) ..... 13.25 V

**Note:**

Many lithium batteries include a BMS that can implement an internal battery disconnect in the event of a deep discharge to prevent permanent damage to the battery chemistry. It is important that proper low voltage load disconnect settings are used to prevent this from occurring during charging. Damage to the controller due to a battery disconnect during charging is typically not covered under warranty. Incidental damage to loads is also not covered under warranty.

**Optional Recommended Settings:**

Absorption Ext = Not enabled

Low Battery Temperature Foldback = Optional (High limit = 1 degC, Low limit = 0 degC)

Battery Service Reminder = Not enabled (Monitor SoH/cycle life with external shunt or compatible CAN-bus software)

Max Regulation Limit = Not enabled

Battery Current Limit = Optional (Max recommended charge current = 0.5C)

Delay Before Load LVD ..... 1 min (Possibly longer for cold temperatures)

Load Current Compensation ..... Default = 0.004 Ω (V/A), should be calculated based on 0.35/C (Reduces Load LVD based on size of load with respect to battery Ah capacity)





Load HVD/High Voltage Disconnect/Reconnect..... Enable/15.00 V/14.70 V (May help to protect loads from potentially harmful voltage spikes that can be caused by external charging sources continuing to operate during battery removal)

Battery Charge LED Indications (Not intended for accurate SoC measurement):

LED G → G/Y 75%+ = 14.2 V (3.55 V/per cell)

LED G/Y → Y 50% - 74% = 14.0 V (3.50 V/per cell)

LED Y → Y/R 25% - 49% = 13.8 V (3.45 V/per cell)

LED Y/R → R 10% or below = 13.6 V (3.40 V/per cell)

*(More information regarding these settings provided by Morningstar)*

These settings are available for the Morningstar controllers listed below:

**12-24V systems:**

ProStar MPPT (includes low temperature foldback to limit the max. charge current)

SunSaver MPPT

ProStar (PWM) Gen 3 (includes low temperature foldback to limit the max. charge current)

**12-48V systems:**

TriStar MPPT (compatible with 12V, 24V, 36V, 48V, 60V nominal systems)

TriStar MPPT 600V (compatible with 24V, 36V, 48V and 60V nominal systems)

TriStar [PWM] (compatible with 12V, 24V, 36V and 48V nominal systems)

**Communications hardware required for programming Custom Settings with MSView:**

ProStar MPPT, ProStar (Gen 3), SunSaver MPPT

UMC-1 USB MeterBus Adapter- <http://www.morningstarcorp.com/products/usb-meterbus-adapter/>

MSC PC RS-232 MeterBus Adapter- <http://www.morningstarcorp.com/products/pc-meterbus-adapter/>

EMC-1 Ethernet MeterBus Converter-

<http://www.morningstarcorp.com/products/ethernet-meterbus-converter/>

TriStar, TriStar MPPT, TS-MPPT-600V

Includes an RS-232 port for connection to a PC.



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PARTNER PROGRAM™

**LithiumWerks**  
New Energy. New World.

EMC-1 Ethernet MeterBus Converter-

<http://www.morningstarcorp.com/products/ethernet-meterbus-converter/>

Tripp Lite U209-000-R USB / Serial DB-9 (RS-232) Adapter Cable (not available from Morningstar)

All TS-MPPT-60 (150V and 600V) models also include an Ethernet port and EIA-485 port.

**MSView Software Download:** <http://www.morningstarcorp.com/msview/>

**MSView Configuration Files:**

<https://www.morningstarcorp.com/wp-content/uploads/2019/03/Lithium-Werks-MSView-Configuration-Files.zip>

**Other links:**

[Morningstar Best Practices by Battery Chemistry](#)

[Morningstar Custom Settings Info Pages](#)

**IMPORTANT:**

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Some of the material being presented may be based on information that has been provided by other parties such as battery specs and operational parameters.

Performance may vary depending on use conditions and application.