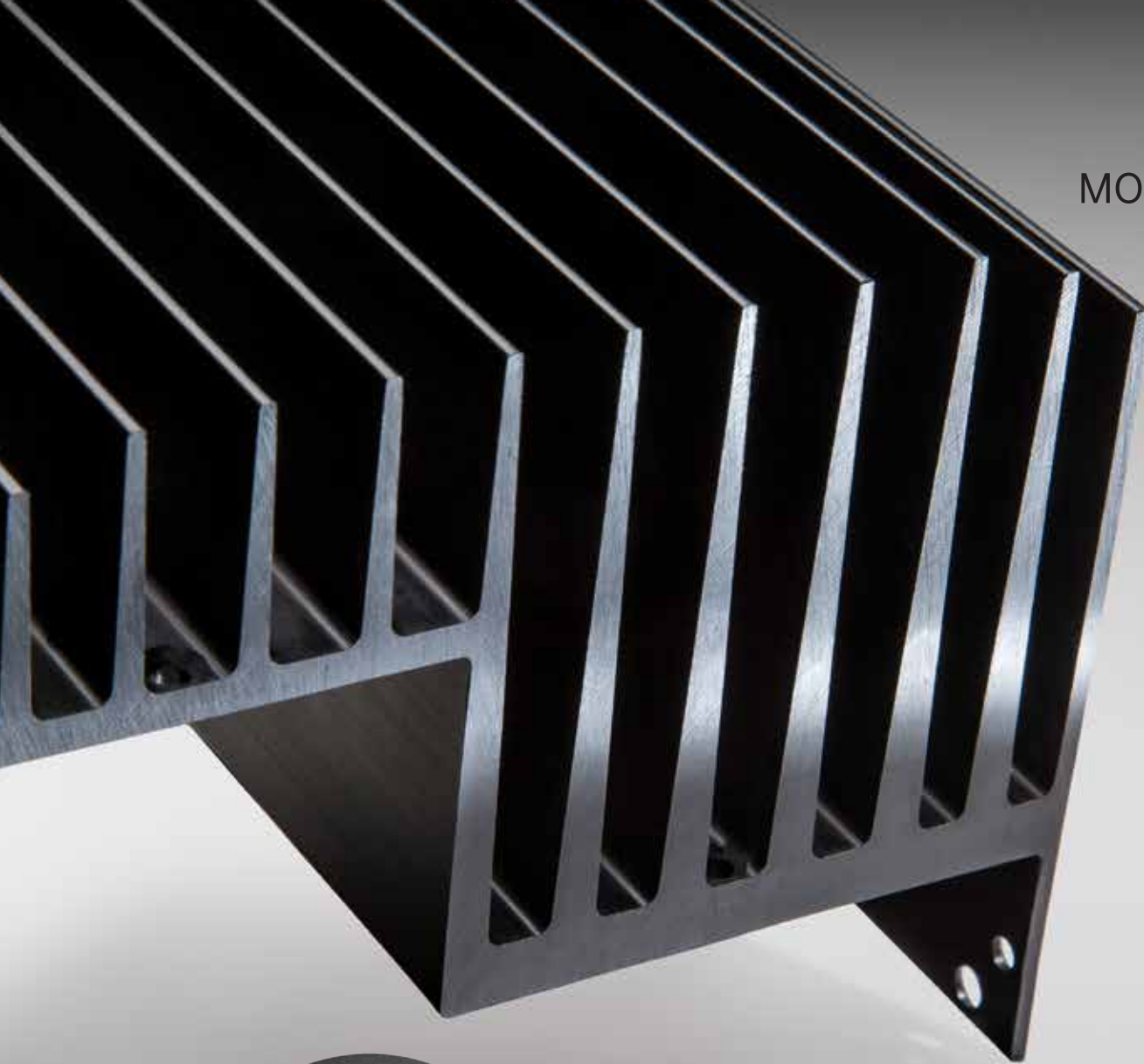




MORNINGSTAR



# Product Catalog

VERSION 15

## What's behind “the world’s leading solar controllers and inverters”?

- **The highest reliability in the solar industry:** with the lowest hardware failure rate, Morningstar has truly earned its reputation for the highest level of reliability in the solar industry. That’s backed by more than 4 million solar controllers and components in over 100 countries since 1993. Morningstar is the first choice among leading solar professionals. In fact, new Morningstar customers often tell us “it’s the brand I should have chosen first.”
- **The most cost-effective solar solution:** the direct result of the industry’s highest dependability rate is reduced long-term costs. Morningstar products typically outlast those of our competitors’ in the field— sometimes by a decade or more. Our extreme reliability means far fewer field service calls, which further lowers operational risk and cost. And since we design and engineer our products for maximum efficiency, that translates into more solar electricity available on-site to power applications while also reducing heat in equipment enclosures.
- **The most advanced technology, design and engineering on-board every model:** Morningstar products start with the advantage of faster, “smarter” signal processing and high-grade “overspec’d” components throughout, all optimized by our in-house, proprietary design and engineering. Next, because heat reduces efficiency and product life, we incorporate state-of-the-art thermal design to ensure that there are no fans to fail-- unlike our in-kind competition. The result: products that set new standards for the rest of the industry.
- **Excellence in every product through employee ownership:** as an employee-owned company not only can we afford to be perfectionists, we have to be—because our brand’s reputation is synonymous with our own. We can design and build for the long-term instead of a bottom line. Our determination and spirit of innovation is what gave Morningstar charge controllers their legendary staying power.



## Morningstar Professional Series

**A series proven by the professionals who depend on it to power their projects**

“Morningstar’s **high quality, reliable controllers** make them [our] No. 1 partner when supplying power to many of the world’s most remote, harshest environments.”

*~Lukas Geider, JCE Group, provider of (Ex) electrical control systems for hazardous and safe area environments*

“The Morningstar TriStar 45A & 60A Controllers are **the best controllers in the world** for diversion load applications...”

*~Florin Fleseriu, EcoVolt (Europe)*

“Having distributed solar products in Africa for years, I know which manufacturers tend to last and which ones fail. **Morningstar being very much in the “lasting” category.**”

*~Lincoln Dahl, African Energy (distributor)*



**Off-shore platform helideck lighting powered by Morningstar. Courtesy Orga BV**

“...I've probably used every model that Morningstar makes at one point or another... In a high-altitude, low-temperature environment with reflective snow cover, the MPPT works incredibly well, providing about 20% to **25% more energy capture...I've measured it side by side...it's astonishing.**”

*~Tracy Dahl, polar power expert using Morningstar in Arctic and Antarctic projects*

“We have chosen Morningstar products for our off-grid solar photovoltaic solutions deployed at about 2,000 sites in the Middle East... [they have] proved to **be a reliable source of power supply even in the harsh desert conditions.**”

*~Agile Europe, provider of system solutions for oil & gas projects throughout the Middle East*

“...**We standardised on Morningstar** MPPT solar controllers in our Hazardous Area Zone-certified solar power systems for use in safety-critical power systems for offshore oil and gas assets... with Morningstar, we know we won’t have to go back for expensive service calls in the field.”

*~Remco Vonk, General Manager Asia & Pacific, Orga BV, a global provider of offshore power, helideck lighting, and marine & aviation navigation marking systems for safety-critical infrastructure assets*




“**We love Morningstar** and generally use it in most applications. It's very rugged, sturdy equipment... It's important for us to have **tested, proven, reliable components...**”

*~Justin Taylor, Sales Manager, Connexa, provider of remote security and surveillance systems*



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## TrakStar MPPT Technology

The industry's reference standard for maximum efficiency in solar charge control. Morningstar's proprietary, patented Maximum Power Point Tracking algorithms are so advanced they've even been copied—don't be fooled by imitations! TrakStar technology works by "sweeping" for the maximum power point some hundreds of times faster than competitors' designs, which greatly reduces lost energy—it more accurately "maps" the full power curve, increasing the total energy harvest. Its ultra-high conversion efficiency is ideal for areas where seasonal, weather and shading conditions cause wide variations in solar "harvesting," and every Watt counts.

## Morningstar PWM Technology

PWM (Pulse-Width Modulation) controllers are simpler than their MPPT counterparts, operating as a switch which "throttles back" solar electricity to prevent battery overcharging. Morningstar builds its PWM controllers to the same exacting high standards as our MPPT models, and as a result they are over-achievers in their class—selected models provide load and diversion control along with battery charging and regulation. PWM technology is ideal for warmer climates with consistent sunlight, minimal shading and no physical space limitations, such as smaller pole-mounted industrial systems with 36 or 72-cell modules.

## Fanless Design

Nearly every higher-powered charge controller employs cooling fans to shed excess heat during operation. Except Morningstar—we use fanless design with advanced passive cooling throughout our line, and go to great lengths to avoid moving parts. There are three reasons why. Fans pull in dirt, dust and debris along with air, which can shorten the life of the controller. Fans have moving parts which ultimately can fail, resulting in expensive service calls at the least convenient times. And fans require electricity to run, making them a parasitic drain on the controller's electricity output. In fact, the inherent unreliability of cooling fans is why some of our competitors exclude them from their full warranty coverage, typically offering only two years on fans. That's an engineering compromise you'll simply never have to worry about with a Morningstar.

## HazLoc Certifications

Of the many thousands of solar charge controller models from the over 700\* brands on the market, only a handful have earned hazardous location certification. Many of them are Morningstars; we now have the widest range of higher-powered controllers rated for HazLoc operations. With HazLoc- rated controllers capable of supporting solar electric systems up to 1100 Watts—including MPPT models enabling larger, more efficient "oversized" systems—Morningstar has emerged as the leader in the field, with both the coveted North American UL/CSA (Class 1/Division 2, Groups A-D) and International/European IECEx/ATEX (Zone 2) hazardous location certifications on selected charge controllers.



## Communications Capabilities

Many Morningstar controllers support Simple Network Management Protocol (SNMP), for system communications and network integration, when used with the Morningstar EMC-1 network adapter. This is especially important for SCADA and other industrial operations. Morningstar offers both serial and Ethernet communications using the industry-standard Modbus™ protocol with many different solar controllers including the ProStar™ and TriStar™ lines.

\*ENF Solar Trade Platform and Directory of Solar Companies <https://www.enfsolar.com>



Our iconic, industry-leading design for larger (up to 4.2kW) engineered systems. TriStars are used around the globe in some of the most challenging critical power situations imaginable—in explosion-proof containers and powering helideck lighting on off-shore oil and gas platforms, for example. In fact, TriStars are often spec'd-in to replace lesser charge controllers in those and other mission-critical applications to ensure against system failure and expensive service calls. As some of our users tell us, "it's the brand I should have bought the first time."

TriStar models offer parallel scalability for charging and load control to achieve system power ratings of up to 45kW, making them ideal for large hybrid system design. They also boast the highest peak efficiency for off-grid controllers in the industry, up to 99%. TriStar MPPT models incorporate TrakStar solar harvesting technology; PWM versions provide charging plus load and diversion control.

TriStar's unique footprint and advanced thermal management with fanless design make them ideal for enclosing in tight spaces, including explosion-proof containers. The success of the TriStar as an industry standard is due to our "ground up" approach in its design—including the new manufacturing technology required to create its uniquely tapered heat sink for perfect heat dissipation.

**"...one of the best charge controllers out there...these things are tanks."**

**"It is a Morningstar, what do you expect! It is great."**





**Aluminum Heat Sink**  
Highly-conductive, precision extruded heat sink with tapered fins (made with new manufacturing technology). Eliminates the need for cooling fans, improves efficiency, increases reliability

**Triple Converter Design**  
Helps achieve industry-leading efficiency— each 20 Amp conversion “engine” kicks-in only when needed (part of the “tri” in TriStar)  
  
Triple design turns on/off the 3 phases sequentially to maximize efficiency and save energy when it's needed most (cloudy days)

**Over-Spec Components**  
For maximum performance and durability under the most extreme temperatures and conditions

**Multi-Layer Electronic Protection Circuitry**

**Large Diameter High Torque, Corrosion-Resistant Terminals**

**Backlit LCD Display**  
For easier monitoring

**Communications Data Port**  
Speaks Modbus, and SNMP (with the EMC-1 adapter)

**5-year warranty** (2 1/2 times longer than many competitors)

**DirectFET™ MOSFET Premium Power Devices**  
For superior internal heat transfer and array isolation

**Rigid, Cast Aluminum Inductor Housing**

**Heavy Duty Copper Coils**  
3-inductor energy storage section with sealed, precision-wound, heavy duty copper coils, one for each charging phase (more of the “tri” in TriStar)

**Higher Grade Copper “Pour”**  
Resists excessive heat on circuit boards

**Patented FET Spring**  
Ensures even, positive contact between heat-producing components and heatsink, improving thermal handling

**Purer Signal Path**  
Soldered, “connectorless” board interconnects provide a purer signal path with no weak points to fail

**State-of-the-Art Control Software**  
Improves response

**Powder-Coated Steel Enclosure**  
For durability

**TrakStar™**  
MAXIMUM POWER POINT TRACKING

Morningstar's acclaimed TrakStar technology ensures the highest yield possible from the solar array

**Simple Network Management Protocol**  
**SNMP**  
COMPATIBLE

**Modbus**

TriStar MPPT™ 600V Controller  
60A at up to 600Voc



Ambient Operating Temperature	40 °C to +45 °C -40 °F to +113 °F
Power Terminals	2.5 mm <sup>2</sup> –35 mm <sup>2</sup> 14 AWG–2 AWG
Product Weight	TS-MPPT-60-600V-48 8.98 kg / 19.8 lbs TS-MPPT-60-600V-48-DB 12.3 kg / 27.1 lbs TS-MPPT-60-600V-48-DB-TR 12.75 kg / 28 lbs
Unit Shipping Weight	TS-MPPT-60-600V-48 9.9 kg / 21.7 lbs TS-MPPT-60-600V-48-DB 12.3 kg / 27.1 lbs TS-MPPT-60-600V-48-DB-TR 13.0 kg / 28.7 lbs
Dimensions	Standard Box 39.2 x 22.1 x 14.9 cm 15.4 x 8.7 x 5.9 in DC Disconnect Box 54.2 x 22.1 x 14.9 cm 21.4 x 8.7 x 5.9 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- ETL Listed [UL-1741 and Canadian CSA C22.2 No. 107.1.01]
- EMC Compliance
- FCC Class B Part 15 Compliant
- U.S. National Electrical Code (NEC) Compliant
- Manufactured in a Certified ISO 9001 Facility

TriStar MPPT

The TriStar MPPT 600V (TS-MPPT-600V) is a breakthrough in charge controller design. By accepting PV array input up to 600 Voc, it enables installers to design systems with longer and fewer strings, reducing cabling and hardware which make installation and wiring easier and faster. Morningstar's advanced digital engineering combined with superior thermal management make the TS-MPPT-600V with TrakStar technology the only charge controller in its class that doesn't require cooling fans, making it both extremely reliable and efficient (with 97.9% peak efficiency). Available in three versions:

- TS-MPPT-60-600V-48: Standard
- TS-MPPT-60-600V-48-DB: with Disconnect Box
- TS-MPPT-60-600V-48-DB-TR: with DC Transfer Switch

Noteworthy features

- Accommodates PV systems > 150 Voc with long wire runs from the array to the controller.
- Uses Morningstar's patented 4-stage charging algorithm to optimize battery health.
- Features extensive system networking, monitoring and communications.
- Optimized for harsh environments and equipped with electronic protections.
- Enables battery back-up for grid-tied systems using more efficient DC-coupling system topology (as opposed to AC-coupling).

TriStar MPPT 600V	All Versions
Maximum Battery Current	60A
Nominal Maximum Operating Power*	3200Wp, 48 Volt
Maximum Open Circuit Voltage	600V
Battery Operating Voltage Range	16 - 72 Vdc
Nominal System Voltage	48 Vdc custom programmable to 24V, 36V and 60V
PV Input Operating Voltage Range	100V to Voc = 525V
Hydro Input Operating Voltage Range	Battery Voltage to 500V

\* Input power can exceed Nominal Maximum Operating Power, but controller will limit and provide its rated continuous maximum output current into batteries. This will not harm the controller.

Options	All Versions
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes
MeterHub (HUB-1)	Yes
Relay Driver (RD-1)	Yes
TriStar Meter-2-600V (TS-M-2-600V)	Yes
TriStar Remote Meter-2 (TS-RM-2)	Yes
Ethernet MeterBus Converter (EMC-1)	Yes
Remote Temperature Sensor (RTS)	Included

TriStar MPPT™ Controller

30A, 45A or 60A at up to 150 Voc

TriStar MPPT

Advanced maximum power point tracking controller for larger off-grid photovoltaic (PV) energy systems up to 4.2 kW. TriStars have been proven in solar installations around the globe and remain the first choice for designers of mission-critical systems where failure is not an option.

- **Maximizes energy harvest** – superior peak power tracking over conventional MPPT controllers.
- **Highest peak efficiency** for off-grid controllers in the industry, up to 99%.
- **Built for reliability and performance**, with an oversized heatsink and over-spec'd components. Fully-rated for operation at temperatures up to 45°C.
- **Extensive networking and communications** features enable system monitoring, data logging, and adjustability.
- **On-board RS-232 port included on all models**; Ethernet included on all 60A models.
- **Extensive electronic protections** include short-circuit, over-current and reverse polarity to ensure the controller will not be damaged by wiring mistakes or overloads.
- **Fanless design** for long-term reliability.

TriStar MPPT	TS MPPT-30	TS MPPT-45	TS MPPT-60	TS MPPT-60M*
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Meter				
TS-M2	Optional	Optional	Optional	Included
TS-RM2	Optional	Optional	Optional	Optional
Maximum Battery Current	30A	45A	60A	
Nominal Maximum Output Power*				
12V	400Wp	600Wp	Max Output 800Wp	Max PV Input* 1100Wp
24V	800Wp	1200Wp	1600Wp	2100Wp
48V	1600Wp	2400Wp	3200Wp	4200Wp
Max Recommended Solar PV Input*	~ 130% of Nominal Max Ouput Power (60 Amp models shown above)			
Nominal System Voltage	12, 24, or 48V DC			

\* The PV array power rating may exceed the controller's Max Nominal Output Power specification. The controller will limit battery current and prevent damage. Array oversizing should be considered on a case by case basis. See our array string sizer tool and related tech documentation. <https://www.morningstarcorp.com/array-oversizing>

Options	TS MPPT-30	TS MPPT-45	TS MPPT-60	TS MPPT-60M
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TriStar Meter-2 (TS-M-2)	Yes	Yes	Yes	Pre-installed
TriStar Remote Meter 2 (TS-RM-2)	Yes	Yes	Yes	Yes
MeterHub (HUB-1)	Yes	Yes	Yes	Yes
Ethernet Port	No	No	Included	Included
EIA-485 Adapter (RSC-1)	Yes	Yes	Included	Included
Remote Temperature Sensor (RTS)	Included	Included	Included	Included
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes	Yes	Yes	Yes
Ethernet MeterBus Converter (EMC-1)	Yes	Yes	Yes	Yes

TriStar™ Controller

45A or 60A at 12-48V

TriStar PWM

Three-function PWM controller for larger systems, providing reliable PWM solar battery charging or load control or diversion regulation.

- **Built for reliability and performance**, with an oversized heatsink and over-spec'd components. Fully-rated for operation at temperatures up to 45°C.
- **More information with LED indicators**. Optional meter displays extensive system and controller information in five languages; automatic self-test and reset.
- **Communications capability** with RS-232 port, connects to a PC for custom settings, data logging, remote monitoring and control.
- **Fully adjustable** with DIP switches for seven digital presets. Additional custom setting via RS-232.
- **Extensive electronic protection** against reverse polarity, short circuits, overcurrent and excessive temperature.
- **Fanless design** for long-term reliability.

"I like to use Morningstar because it's really robust and reliable."



Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	35 mm <sup>2</sup> / 2 AWG
Product Weight	TS-45 1.6 kg / 3.5 lbs TS-60 1.6 kg / 3.5 lbs TS-60M 1.8 kg / 4 lbs
Unit Shipping Weight	TS-45 2.0 kg / 4.4 lbs TS-60 2.0 kg / 4.4 lbs TS-60M 2.2 kg / 4.8 lbs
Dimensions	26.0 x 12.7 x 7.1 cm 10.3 x 5.0 x 2.8 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- ETL Listed [UL-1741 and Canadian CSA C22.2 No. 107.1.01]
- EMC Compliance
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device
- Manufactured in a Certified ISO 9001 Facility

TriStar	TS-45	TS-60	TS-60M
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Rated Solar, Load or Diversion Current	45A	60A	60A
Nominal Maximum Output Power*	12, 24 or 48 Vdc		

Options	TS-45	TS-60	TS-60M
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TriStar Meter-2 (TS-M-2)	Yes	Yes	Pre-installed
TriStar Remote Meter-2 (TS-RM-2)	Yes	Yes	Yes
MeterHub (HUB-1)	Yes	Yes	Yes
EIA-485 Adapter (RSC-1)	Yes	Yes	Yes
Remote Temperature Sensor (RTS)*	Yes	Yes	Yes
Ground Fault Protection Device (GF-PD-150V and GFPD-600V)	Yes	Yes	Yes

\* Required for temperature compensated charging. Not included.

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- ETL Listed [UL-1741 and Canadian CSA C22.2 No. 107.1.01]
- EMC Compliance
- FCC Class B Part 15 Compliant
- U.S. National Electrical Code (NEC) Compliant
- Manufactured in a Certified ISO 9001 Facility



# If you naturally think 'Morningstar first...' ...you're in the best company

For almost 30 years Morningstar has built its reputation on industry-leading dependability and performance. The result: over four million Morningstar products sold, serving in mission-critical applications in over 100 countries— on mountaintops, deserts, at sea, even at the North and South poles.

Morningstar solar components are the first choice for the world's leading off-grid professionals because we've proven ourselves to them over and over again, with products that set performance standards even under the most challenging conditions. With our exceptionally deep, wide range of eight product lines and nearly 40 models plus accessories, you can depend on us for your next off-grid project as well.

*"The Morningstar TriStar 45A & 60A controllers are the best controllers in the world for diversion load applications..."*

~ EUROPE/FLORIN FLESERIU, ECOVOLT

*"...I've probably used every model that Morningstar makes at one point or another..."*

~ TRACY DAHL, POLAR POWER EXPERT  
(has used Morningstar in projects from the Arctic to the Antarctic)

*"...I installed [this Morningstar system] around 20 years ago here in Chile on a rural electrification project and it still works!"*

~ SOUTH AMERICA/JUAN LIVINGSTONE

## For Your Off-Grid Charge Controller and Inverter Needs



## ProStar Charge Controllers



Morningstar controllers powering Marine Aids to Navigation Light Stations in Papua New Guinea, proven in over 10 years of use in this harsh tropical environment

Proven in over two decades of use-- yet continually improving— ProStar is unique in the industry as both “the legend and the latest in the same product.” As a result, ProStars have both decades of experience behind them and reflect the latest in charge controller technology.

An advanced mid-range controller capable of powering oversized systems up to 1400W, ProStar MPPT has TrakStar technology for maximizing solar harvesting. The MPPT and PWM models are now further distinguished as one of the most powerful solar controller choices available for North American and International/ European hazardous location (HazLoc) installations, with both UL/CSA and IECEx/ATEX certification. This enables solar professionals to successfully design even larger remote powering solutions for critical industrial applications requiring HazLoc safety certifications.

All models incorporate Morningstar's hallmark fanless design for long-term reliability, and all ProStar controllers “speak” Modbus, and SNMP (with the optional EMC-1 adapter) for communications and networking integration.

**“...you get what you pay for, and this one is worth every penny ... count on Morningstar.”**

## Inside Look

### High-frequency design

Combined with our premium, “over-spec’d” components, this greatly improves control response which does a lot for the entire system: controls system transients, avoids regulation overshoot, and provides overcurrent/overload protection

### TrakStar™

Morningstar’s hallmark MPPT technology precisely seeks and locks onto the true maximum power point quickly and accurately, to ensure you get the most output possible from your solar array

### Cooling Fan

Just kidding. We’ve never needed them

### Lexan polycarbonate UL listed case

Protects the precision electronics inside with an impact strength 30 times greater than the acrylic thermoplastics commonly used in lesser controllers

### Lithium foldback

Lithium batteries are expensive and vulnerable to cold temperatures. When it gets close to freezing, the controller backs off charging to avoid damaging the batteries

### 5 year warranty

Up to 2 ½ times longer than some competitors in this class. No surprise there—when you build something this well, you’re willing to back it for the long-haul

### Large format, high-resolution backlit LCD

When you’ve been in the field installing, you appreciate being able to read a crisp, high contrast display on site

### Self-diagnostics

ProStar is smart enough to monitor and analyze system performance, and alert you when you need to know

### Premium high-frequency CoilCraft surface mount inductors

They’re worth it, because they allow the faster power “tracking” that lets us build this much power and control into such a compact footprint

### High-speed ARM processor

All-digital calibration for high accuracy, using the same efficient technology found in advanced mobile devices

### Multi-function data port with serial/meter auto-detect

“Talks solar” with standard industry language, to ensure compatibility in a system

### Built-in 4500W Transient Voltage Surge Suppression for lightning protection

Nature, do your worst — this controller can take it

### Large diameter, high torque, corrosion resistant terminals

If you’ve ever trashed a lesser terminal during an installation, you’ll appreciate a bit of “overkill” here

### DirectFET™ MOSFET power devices

This allows us to surface-mount these critical components underneath the main board, next to the heat sink, reducing the distance the heat has to travel to keep the controller even cooler

### Highly-conductive aluminum heatsink extrusion

As opposed to cast aluminum, which is less effective in passive cooling applications

## ProStar™ MPPT Controller

25A or 40A at up to 120 Voc



With optional wirebox



Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Wire Size Range	Power terminals: 2.5 - 16 mm <sup>2</sup> / #14 - 6 AWG (up to #2 AWG with Wire Box)
Product Weight	1.4 kg / 3.1 lbs
Unit Shipping Weight	1.9 kg / 4.2 lbs
Dimensions	20 x 19.3 x 7 cm 7.9 x 7.6 x 2.8 in
Warranty	5 years

### Certifications

- CE and RoHS Compliant
- IEC 62109
- ETL Listed [UL-1741 and Canadian CSA C22.2 No. 107.1.01]
- FCC Class B Part 15 Compliant
- Manufactured in a Certified ISO 9001 Facility
- UL/CSA Class 1, Division 2, Groups A-D for North America
- IECEx/ATEX for Zone 2 International and European use



## ProStar MPPT

The ProStar MPPT solar controller is an advanced maximum power point tracking (MPPT) battery charger for off-grid photovoltaic (PV) systems with PV array max power (Pmp) up to 1400 watts.

- **Maximizes energy harvest** – superior peak power tracking over conventional MPPT controllers.
- **Custom programmable** – with or without a computer.
- **Advanced self-diagnostics** – warns against installation errors.
- **Data logging** – up to 256 days of detailed power & load data.
- **Automatic Lighting Control** – multi-event load control provides powerful options for PV lighting systems.
- **Extensive electronic protections** include short-circuit, over-current and reverse polarity to ensure the controller will not be damaged by wiring mistakes or overloads.
- **Fanless design** for long-term reliability.
- **Ideal for Oil & Gas** and other industrial applications requiring hazardous location (HazLoc) approvals. Certifications include UL/CSA Class 1, Division 2, Groups A-D for North America, and IECEx/ATEX for Zone 2 International and European use.

### ProStar MPPT

	PS-MPPT-25	PS-MPPT-25M	PS-MPPT-40	PS-MPPT-40M
Maximum Battery Current	25A	25A	40A	40A
Nominal Maximum Output Power / Max Recommended Solar PV Input*				
12 volt battery	350W	440W	550W	700W
24 volt battery	700W	880W	1100W	1400W
Maximum PV Open Circuit Voltage (Voc)	120 Volts (without damage to unit)			
Nominal Battery Voltage	12V or 24V			

\*The PV array power rating may exceed the controller’s Max Nominal Output Power specification (< 130% recommended). The controller will limit battery current and prevent damage. Array oversizing should be considered on a case by case basis. See our array string sizer tool and related tech documentation.

<https://www.morningstarcorp.com/array-oversizing>.

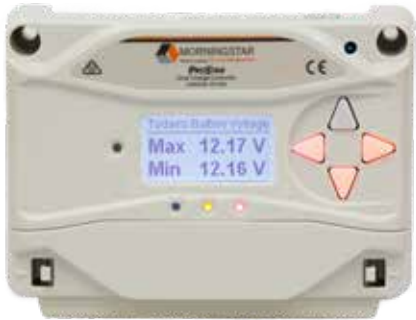
### Options

	PS-MPPT-25	PS-MPPT-25M	PS-MPPT-40	PS-MPPT-40M
Digital Meter	No	Included	No	Included
Remote Meter (RM-1)	Yes	Yes	Yes	Yes
Remote Temperature Sensor (RTS)	Yes	Yes	Yes	Yes
MeterHub (HUB-1)	Yes	Yes	Yes	Yes
Wire Box (PS-MPPT-WB)	Yes	Yes	Yes	Yes
PC Meterbus Adapter (MSC)	Yes	Yes	Yes	Yes
USB MeterBus Adapter (UMC-1)	Yes	Yes	Yes	Yes
Ethernet MeterBus Converter (EMC-1)	Yes	Yes	Yes	Yes



ProStar™ Controller  
15A or 30A at 12/24V

ProStar PWM



Mid-range PWM solar charge controller for both professional and consumer applications, incorporating legendary ProStar design and performance.

- **Longer battery life** through 4-stage charging and temperature compensation. Constant voltage PWM series regulation. Choice of three battery types. Voltage-sense terminals for more accurate battery monitoring.
- **More information** with three battery-level LED indicators. Optional meter includes safety disconnect and displays amps, volts, temperature and self-test.
- **Extensive electronic protection** against reverse polarity, reverse current at night, short circuits, overcurrent and excessive temperature. No mechanical fuses.
- **Fanless design** for long-term reliability.
- **Ideal for Oil & Gas** and other industrial applications requiring hazardous location (HazLoc) approvals. Certifications include UL/CSA Class 1, Division 2, Groups A-D for North America, and IECEx/ATEX for Zone 2 International and European use.

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Wire Size Range	Power terminals: 2.5 - 16 mm2 / 14 - 6 AWG
Product Weight	PS-15 0.3 kg / 0.86 lbs PS-15M 0.4 kg / 0.9 lbs PS-30 0.3 kg / 0.86 lbs PS-30M 0.4 kg / 0.9 lbs
Unit Shipping Weight	PS-15 0.6 kg / 1.4 lbs PS-15M 0.7 kg / 1.6 lbs PS-30 0.6 kg / 1.4 lbs PS-30M 0.7 kg / 1.6 lbs
Dimensions	15.3 x 10.5 x 5.5 cm 6.01 x 4.14 x 2.17 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- Manufactured in a Certified ISO 9001 Facility
- FCC Part-15 Class B Compliant
- UL/CSA Class 1, Division 2, Groups A-D for North America
- IECEx/ATEX for Zone 2 International and European use

	PS-15	PS-15M	PS-30	PS-30M
Rated Solar Current	15A	15A	30A	30A
Rated Load Current *	15A	15A	30A	30A
Nominal System Voltage	12/24 Vdc			

Options	PS-15	PS-15M	PS-30	PS-30M
Digital Meter	No	Included	No	Included
Remote Meter (RM-1)	Yes	Yes	Yes	Yes
Ethernet MeterBus Converter (EMC-1)	Yes	Yes	Yes	Yes
Remote Temperature Sensor (RTS)	Yes	Yes	Yes	Yes
Ground Fault Protection Device (GF-PD-150V and GF-PD-600V)	Yes	Yes	Yes	Yes

\* Low voltage disconnect included on all ProStar controllers.



SunSaver Charge Controllers



SunSavers in remote powering system by Deka Solar and Ameresco, Eagle Ford Shale site in Texas

“The single most successful charge controller in the solar industry,” Morningstar’s legendary SunSaver earned its place through its proven performance, exceptional build quality, and outstanding reliability . Since its introduction in 1998, over 1.5 million SunSaver controllers have served as standard solar equipment in the most demanding installations in oil & gas operations and other industrial applications around the globe. Most are still in use—a testimonial to the built-in excellence and longevity of their design.

The SunSaver MPPT with TrakStar technology is the perfect charging solution for smaller off-grid solar systems up to 520W. The hardened, tropicalized PWM version is the industry’s leading controller for extreme environments, and provides load control.

The MPPT version speaks Modbus, and SNMP with the optional EMC-1 adapter. Both versions are now rated for world-wide use in Hazardous Locations, with UL/CSA for North America and IECEx/ATEX for International and European applications.

“...This is the only one I’d use...  
it’s the one I wish I’d  
bought first”



**High-frequency circuit design**  
Improves control response and guards against system transients, regulation overshoot, and overcurrent/overload conditions

**Self-diagnostics**  
Monitor and analyze system performance

**TrakStar MPPT technology**  
Ensures the maximum output possible from the solar array

**Hazardous location rating**  
UL/CSA Class 1, Division 2, Groups A-D for North America; IECEx/ATEX for Zone 2 International and European use. Ideal for oil & gas and other industrial environments

**Advanced electronic protection**  
Includes on-board surge protection

**High-torque, marine-rated corrosion-resistant terminals**  
Make installation easier and ensure long-term connection integrity

**Extruded aluminum heat sink**  
Provides superior thermal management and eliminates the need for a cooling fan

**Speaks Modbus, and SNMP**  
(with the EMC-1 adapter)



**Self diagnostics**  
Monitor and analyze system performance

**Hardened for field use**  
Through a combination of anodized aluminum enclosure, epoxy encapsulation, marine-rated terminals and high-impact plastics


**High-torque, marine-rated corrosion-resistant terminals**  
Make installation easier and ensure long-term connection integrity

**Advanced electronic protection**  
Includes on-board surge protection

**Extruded aluminum cover with built-in heat sink**  
Provides superior thermal management and eliminates the need for a cooling fan

**Epoxy encapsulation**  
Unique, premium formula with high thermal conductivity and low electrical conduction; protects internal electronics in extreme conditions

**Hazardous location rating**  
UL/CSA Class 1, Division 2, Groups A-D for North America; IECEx/ATEX for Zone 2 International and European use. Ideal for oil & gas and other industrial environments



Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	16 mm <sup>2</sup> / 6 AWG
Product Weight Unit Shipping Weight	0.60 kg / 1.3 lbs 0.7 kg / 1.6 lbs
Dimensions	16.9 x 6.4 x 7.3 cm 6.6 x 2.5 x 2.9 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- ETL Listed [UL-1741 and Canadian CSA C22.2 No. 107.1.01]
- EMC Compliance
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device
- Manufactured in a Certified ISO 9001 Facility
- UL/CSA Class 1, Division 2, Groups A-D for North America
- IECEx/ATEX for Zone 2 International and European use



An industrial-grade design proven in challenging applications, the SunSaver MPPT with TrakStar technology is the perfect solar charging solution for off-grid systems up to 520W.

- **Maximum power point tracking (MPPT)** optimally matches the solar array to the battery—no wasted PV electricity.
- **Use of high voltage modules** - In addition to 12V crystalline modules, enables use of high voltage modules for off-grid battery charging.
- **Converts 36V or 24V arrays** for use with either a 24V or 12V battery.
- **Automatic Lighting Control** - four programmable timer sequences for PV lighting applications using MSView.
- **Extensive electronic protections** include short-circuit, over-current and reverse polarity to ensure the controller will not be damaged by wiring mistakes or overloads.
- **Ideal for Oil & Gas** and other industrial applications requiring hazardous location (HazLoc) approval. Certifications include UL/CSA Class 1, Division 2, Groups A-D for North America, and IECEx/ATEX for Zone 2 International and European use.

SunSaver MPPT	SS-MPPT-15L
Maximum Battery Current	15A
Nominal Max. Output Power / Max Recommended Solar PV Input*	
12V Battery Bank	200W / 260W
24V Battery Bank	400W / 520W
Max. PV open circuit voltage**	60 volts (without damage to unit)
Nominal System Voltage	12/24 Vdc

\*The PV array power rating may exceed the controller's Max Nominal Output Power specification (< 130% recommended). The controller will limit battery current and prevent damage. Array oversizing should be considered on a case by case basis. See our array string sizer tool and related tech documentation. <https://www.morningstarcorp.com/array-oversizing>

\*\*PV Voltage must be greater than Vbattery + 1 Volt to start charging

Options	SS-MPPT-15L
Remote Meter (RM-1)	Yes
Remote Temperature Sensor (RTS)	Yes
MeterHub (HUB-1)	Yes
PC MeterBus Adapter (MSC)	Yes
DIN Rail Clips (DIN-1)	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes
Ethernet MeterBus Converter (EMC-1)	Yes



SunSaver™ Controller  
6A, 10A or 20A at 12V or 24V



SunSaver PWM

The third-generation SunSaver brings over two decades of advances in software and electronics to the same rugged, hardened design that made the original the leading solar powering solution for oil & gas, mining, and other extreme industrial applications.

- **Ideal for Oil & Gas** and other industrial applications requiring hazardous location (HazLoc) approval. Certifications include UL/CSA Class 1, Division 2, Groups A-D for North America, and IECEx/ATEX for Zone 2 International and European use.
- **Longer battery life** through PWM 4-stage charging and temperature compensation. Sealed or flooded battery select.
- **Tropicalization** - hardened for field use with anodized aluminum enclosure, epoxy encapsulation, marine-rated terminals.
- **Additional features** include full electronic protections, 3-state battery LED indicators, terminal cover, dead battery recovery, high voltage load protection for sensitive loads.
- **L-versions** include low-voltage load disconnect.

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	5 mm <sup>2</sup> / 10 AWG
Product Weight Unit Shipping Weight	0.23 kg / 0.5 lbs 0.4 kg / 0.9 lbs
Dimensions	15.2 x 5.5 x 3.4 cm 6.0 x 2.2 x 1.3 in
Warranty	5 years

Certifications

- Hazardous Locations - Class 1, Div. 2 Groups A-D
- CE, RoHS and REACH Compliant
- UL 1604/ANSI/ISA 12.12.01-2000 (USA) and CSA C22.2 No. 213-M1987 (Reaffirmed 2004) (CANADA) Listed
- ETL Listed: UL 1741 (with terminal cover)\*
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device
- Manufactured in a Certified ISO 9001 Facility
- UL/CSA Class 1, Division 2, Groups A-D for North America
- IECEx/ATEX for Zone 2 International and European use

\* Wire terminal cover included with every SunSaver



SunSaver Duo™ Controller  
25A at 12V

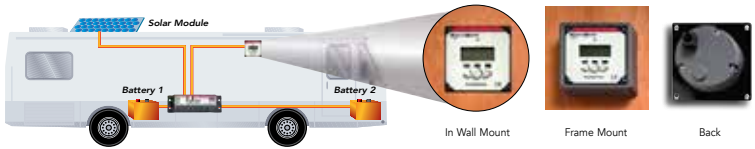


“Love it...it was worth the extra money over other brands that seemed to be of lesser quality”

Sunsaver Duo PWM

A two-battery solar charge controller with optional remote meter, designed for RV/caravan and marine use.

- **Rugged design** - epoxy encapsulation protects against dust and high humidity. Extensive electronic protections include short-circuit, over-current and reverse polarity to ensure the controller will not be damaged by wiring mistakes or overloads.
- **User adjustable** - set parameters with on-board DIP switches or further customize with a PC using Morningstar MSView software.
- **Dual battery charging capability**; house and vehicle for example.



SunSaver SS-6-12V SS-6L-12V SS-10-12V

Rated Solar Current	6A	6A	10A
Rated Load Current	6A	6A	10A
Nominal System Voltage	12 Vdc		
Low Voltage Disconnect	No	Yes	No

SunSaver SS-10L-12V SS-10L-24V SS-20L-12V SS-20L-24V

Rated Solar Current	10A	10A	20A	20A
Rated Load Current	10A	10A	20A	20A
Nominal System Voltage	12Vdc	24Vdc	12Vdc	24Vdc
Low Voltage Disconnect	Yes	Yes	Yes	Yes

Options All Versions

DIN Rail Clips (DIN-1)	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes

Ambient Operating Temperature	-40 °C to +45 °C -40 °F to +113 °F
Terminal	16 mm <sup>2</sup> / 6 AWG
Product Weight SSD-25 SSD-25RM	0.26 kg / 0.57 lbs 0.27 kg / 0.59 lbs
Unit Shipping Weight SSD-25 SSD-25RM	0.6 kg / 1.3 lbs 1.0 kg / 2.2 lbs
Dimensions: without meter	17.0 x 5.6 x 4.1 cm 6.7 x 2.2 x 1.6 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- Manufactured in a Certified ISO 9001 Facility



SunSaver Duo SSD-25 SSD-25RM

Rated Solar Current	25A	25A
Rated Load Current*	None	None
Nominal System Voltage	12Vdc	12Vdc

Options SSD-25 SSD-25RM

Remote Meter (RM-1)	Yes	Included
Remote Temperature Sensor (RTS)	Yes	Yes
PC MeterBus Adapter (MSC)	Yes	Yes
DIN Rail Clips (DIN-1)	Yes	Yes
EIA-485 Adapter (RSC-1)**	Yes	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes	Yes
Ethernet MeterBus Converter (EMC-1)	Yes	Yes

\* There is no load connection on the SunSaver Duo.

\*\* The EIA-485 / RS-232 Adapter can be used in conjunction with the PC MeterBus Adapter to enable these devices to communicate over a 485 network.

# The Digital Oilfield is Going Solar...



Morningstar's line of ProStar™ and SunSaver™ charge controllers, UL/CSA and IECEx/ATEX rated for use in hazardous locations (ProStar HazLoc models available September)



From wellhead to pipeline, operators are using solar to power a range of applications: injection pumping, security monitoring, data and communications, RTUs and PLCs, field instrumentation (temperature, pressure, flow, level), actuated valves, injection pumps, cathodic protection, and much more. With no moving parts, no fuel needed, and little maintenance required, solar works out to be a reliable, cost-effective solution for upstream and midstream systems.

## ...and the solar brand it's going to is Morningstar

Used in over 100 countries and with over four million sold, Morningstar's reliability and technology has been tested and proven in mission-critical installations for nearly 30 years. Now with comprehensive Hazardous Location certifications—UL/CSA in North America and IECEx/ATEX Internationally-- Morningstar has the widest, most dependable line of HazLoc solar controllers in the industry.

"...We standardised on using Morningstar MPPT solar controllers in our Hazardous Area Zone-certified solar power systems for use in safety critical power systems for offshore oil and gas assets. Their **high-efficiency is uniquely suited for our needs...** Most important, with Morningstar, we know we won't have to go back for expensive service calls in the field."

--Remco Vonk, General Manager Asia & Pacific, Orga BV, a global provider of offshore power, helideck lighting, and marine & aviation navigation marking systems for safety critical infrastructure assets

"Morningstar's **high-quality, reliable controllers** make them JCE's No. 1 partner when supplying power to many of the world's most remote, harshest environments."

--Lukas Geider, Business Development Assistant, JCE Group, provider of (Ex) electrical control systems for hazardous and safe area environments

"We have chosen Morningstar products for our off-grid solar photovoltaic solutions deployed at about 2000 sites in the Middle East... [they have] proved to be a **reliable source of power** supply even in the harsh desert conditions"

-- Agile Europe, provider of system solutions for oil & gas projects throughout the Middle East



Morningstar SunKeeper™ UL/CSA rated controller, for single-module systems

**Get the free guide** to *Solar Powered Industrial Systems* and see how operators around the globe achieve solar success with Morningstar



8 Pheasant Run, Newtown, PA 18940 USA | morningstarcorp.com

## SunKeeper™ Controller

6A or 12A at 12V



*"This is a great little unit...an outstanding charge controller"*

## SunKeeper PWM

Compact "point of use" design that mounts directly to the solar panel junction box or module/panel frame in its own IP65-rated case, which eliminates the need for an additional controller housing. ideal for small, single-module solar industrial systems.

- **Ideal for Oil & Gas** and other industrial applications requiring hazardous location (HazLoc) approvals. UL/CSA Class 1, Division 2, Groups A-D certification for use in North America.
- **High temperature rated** – to 70° for operation in high temperatures at the solar module; no need to de-rate.
- **Rugged design** – approved for outdoor use without an additional enclosure. IP65 rated with UV-resistant case; epoxy encapsulated electronics and watertight connection to junction box.

Ambient Operating Temperature	-40 °C to +70 °C -40 °F to +158 °F
Terminal	2.0mm <sup>2</sup> / 14 AWG
Product Weight Unit Shipping Weight	0.11 kg / 0.25 lbs 0.2 kg / 0.4 lbs
Dimensions	9.9 x 5.1 x 1.3 cm 3.9 x 2.0 x 0.5 in
Warranty	5 years

## Certifications

- Hazardous Locations - UL/CSA approved for Class 1, Division 2, Groups A-D use in hazardous locations
- CE, RoHS and REACH Compliant
- UL 1604/ANSI/ISA 12.12.01-2000 and CSA C22.2 No. 213-M1987 Listed
- Manufactured in a Certified ISO 9001 Facility



SunKeeper	SK-6	SK-12
Rated Solar Current	6A	12A
Rated Load Current*	None	None
Nominal System Voltage	12Vdc	12Vdc

Options	All Versions
Remote Temperature Sensor (RTS)**	Yes

\* There is no load connection on the SunKeeper.

\*\* Installation of the RTS to the SunKeeper requires some soldering



**Remote oilfield solar installation with the Morningstar SunKeeper on-board. Courtesy SunWize**



SunLight™ Controller  
10A or 20A at 12V or 24V

SunLight PWM



World's leading solar lighting controller for street and pathway lighting, parking areas, bus stations, signage, and much more.

- **Provides 10 lighting options** with accurate on-board timer. User adjustable for 2 to 10 hours ON or for ON all night. Unique ON/OFF/ON settings conserve energy and turn lights on again for 1 or 2 hours before sunrise. Timer accuracy is within 2 seconds.
- **Easy to set-up**, with test-button feature and LED indicator. To confirm correct installation, test button turns light on during the day and LED indicates selected lighting option.
- **Rugged design** with anodized aluminum enclosure, epoxy encapsulation, corrosion-resistant terminals.



“Bulletproof and dependable...I will use them again and again”

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	5.2mm <sup>2</sup> / 10 AWG
Product Weight Unit Shipping Weight	0.27 kg / 0.6 lbs 0.3 kg / 0.7 lbs
Dimensions	16.8 x 5.5 x 3.4 cm 6.6 x 2.2 x 1.3 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- Manufactured in a Certified ISO 9001 Facility

SunGuard™ Controller  
4.5A at 12V

SunGuard PWM



Single module, compact solar charge controller for small systems, ideal for both professional and consumer use.

- **Rugged design** - 100% solid state, epoxy encapsulated; rated for 25% overloads (no need to de-rate).
- **Longer battery life** - series design PWM charging (instead of shunt) with temperature compensation, low self-consumption.
- **Easy to install** - outdoor rated connecting wires make a waterproof connection to the solar module and battery.

“Rock solid, potted so waterproof, long track-record...great charge controller for a small system”

SunLight	SL-10L-12	SL-10L-24	SL-20L-12	SL-20L-24
Rated Solar Current	10A	10A	20A	20A
Rated Load Current*	10A	10A	20A	20A
Nominal System Voltage	12Vdc	24Vdc	12Vdc	24Vdc

Options	All Versions			
DIN Rail Clips (DIN-1)	Yes	Yes	Yes	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes	Yes	Yes	Yes

\* Low Voltage Disconnect is included in all SunLight Controllers.

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Product Weight Unit Shipping Weight	0.1 kg / 0.2 lbs 0.1 kg / 0.3 lbs
Dimensions	6.4 x 5.1 x 3.8 cm 2.5 x 2.0 x 1.5 in
Warranty	5 years

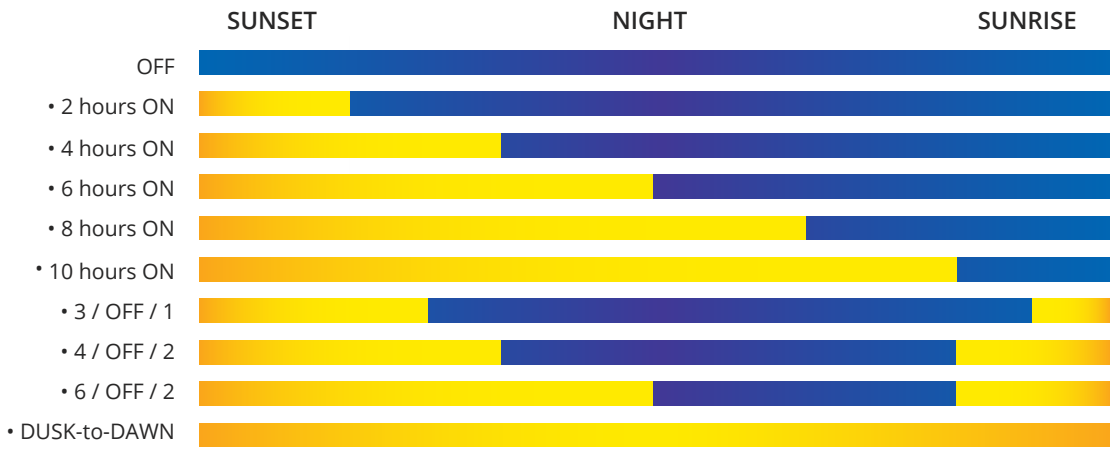
Certifications

- CE, RoHS and REACH Compliant
- Manufactured in a Certified ISO 9001 Facility

SunGuard	SG-4
Rated Solar Current	4.5A
Rated Load Current*	None
Nominal System Voltage	12Vdc

\* There is no load connection on the SunGuard.

Lighting Control Options



SureSine™ Inverter  
300 W; 12 Vdc input, 115 or 220 Vac output

Inverters



“...how all inverters should be made. Thank you, Morningstar”

Compact, powerful and proven in demanding rural electrification projects around the globe, the Morningstar SureSine inverter is the right tool for DC to AC power conversion in residential, mobile and recreational, and light industrial applications. SureSine’s cast, anodized aluminum enclosure and encapsulated circuitry, plus its fanless design, ensure long-term reliability under the harshest conditions. Speaks Modbus, and SNMP with the optional EMC-1 adapter.

- **Improved load operation** – Pure sine wave provides quality AC equivalent to grid power. Toroidal transformer design generates good wave form throughout the range of input voltages. Handles 200% surge up to 600W.
- **High reliability** – No internal cooling fan or other moving parts. Uses epoxy encapsulation, conformal coating, stainless steel hardware and an anodized aluminum enclosure to protect against harsh tropical and marine environments.
- **More power available** – High efficiency and low self consumption maximizes power to the loads. Automatic stand-by reduces consumption during no load conditions.

Ambient Operating Temperature	-40 °C To +45 °C -40 °F To +113 °F
Terminal	35 mm <sup>2</sup> / 2 AWG
Product Weight	4.5 kg / 10 lbs
Unit Shipping Weight	5.2 kg / 11.5 lbs
Dimensions	21.3 x 15.2 x 10.5 cm 8.4 x 6.0 x 4.1 in
Warranty	2 years

Certifications

- CE, RoHS and REACH Compliant
- ETL Listed (UL 458) - 115V version ONLY
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device
- EN 60950-1+A11:2001, rev. 4/4/04
- Manufactured in a Certified ISO 9001 Facility



SureSine inverter being used in a tropical marina dock-side power application

Converter EMC-1



Ethernet Networking Adapter

Connects to any enabled solar controller or inverter to provide enhanced data and network features, including SNMP (Simple Network Management Protocol) and Modbus, an important feature for maintaining telecommunications and other industrial powering systems as well as SCADA operations. EMC-1 allows MeterBus-enabled system components to send data to the internet.

Compatible with:

- TriStar MPPT Controller  
ProStar MPPT Controller  
SunSaver MPPT Controller  
TriStar Controller
- ProStar Controller  
SunSaver Duo Controller  
SureSine Inverter

- Enables communications, monitoring, and networking integration
- Adds IP based MODBUS connectivity for remote communication and SCADA functionality
- LiveView displays system status and logs data directly from the EMC in an easy to view webpage
- Powered via meterbus port on controller, PoE or DC Input for 12,24 or 48V systems

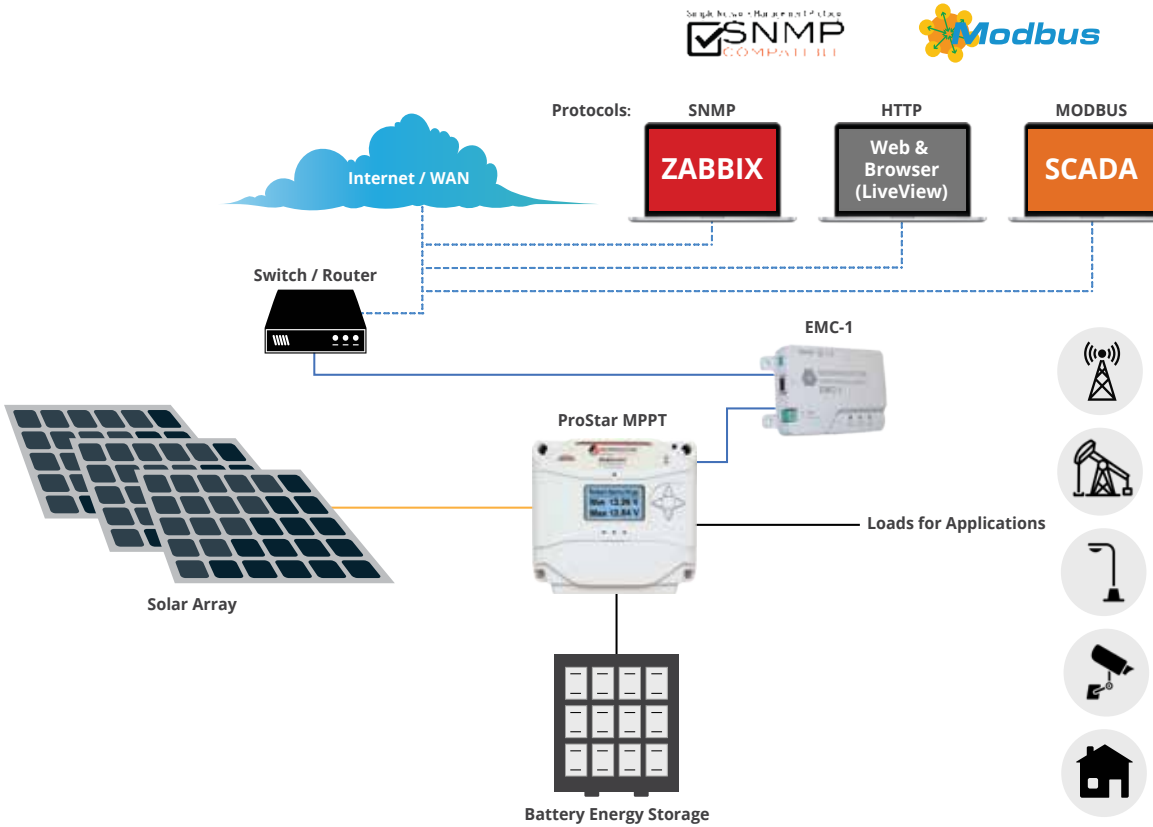
SureSine	SI-300-115V-UL	SI-300-220V
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Continuous Power Rating	300W @ 25 °C	300W @ 25 °C
Peak Power Rating (10 minutes)	600W @ 25 °C	600W @ 25 °C
DC Input System Voltage	10.0 - 15.5V	10.0 - 15.5V
Waveform	Pure Sine Wave	Pure Sine Wave
AC Output Voltage (RMS)	115 Vac +/- 10%	220 Vac +/- 10%
AC Output Frequency	60 Hz +/- 0.1%	50 Hz +/- 0.1%

Options	All Versions	
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Remote Meter (RM-1)	Yes	Yes
PC MeterBus Adapter (MSC)	Yes	Yes
Relay Driver (RD-1)	Yes	Yes
EIA-485 Adapter (RSC-1)*	Yes	Yes
Ethernet Meterbus Converter (EMC-1)	Yes	Yes

\* The EIA-485/RS-232 Adapter can be used in conjunction with the PC Meter-Bus Adapter to enable the SureSine to communicate over a 485 network.





## Accessories

### Ground Fault Protection Device

Off-grid and on-grid PV safety device



Morningstar's Ground Fault Protection Device (GFPD) prevents current from following any unintended paths during a ground fault.

Other ground fault detection/interruption products break the bond to the grounded conductor for the entire system. When this occurs, not only is the earth bond compromised, but the battery and DC loads can also be left ungrounded and floating to potentially dangerous voltages from the PV array. Morningstar's GFPD uses a double pole breaker to isolate the PV array while maintaining the ground bond for the battery and loads.

#### Compatible with:

TriStar MPPT-600V Controller    TriStar MPPT Controller

- Disconnects both the positive and negative conductor and completely isolates PV source circuits
- Trips at 300mA compared to 1A for alternative solutions
- Provides design flexibility to accommodate large and small array configurations
- Uses high quality breaker solutions rather than fuses which are problematic to replace at remote sites
- Works like a traditional AC GFI
- Maintains the integrity of earth bond for battery and loads
- Does not require an extra warning label at the battery per U.S. National Electric Code requirements
- Makes it easier to locate and troubleshoot ground faults
- Powered via the pv system's battery
- Equipped with both visual and audible alarms
- Built to support both single controller and multiple controller systems
- When the earth bond is not broken, Morningstar's GFPD will only shut off affected controllers
- All loads will continue to operate safely with the battery remaining bonded to ground
- Multiple controllers and GFPDs can be added on an as-needed basis

#### Ground Fault Protection Device    GFPD-150V    GFPD-600V

Number of Poles	2	2
Maximum Solar Voltage	150V	600V
Maximum Solar Current	60A	50A
Trip Method	Relay	
Mounting	DIN-rail or Panel-Mount	
Input Voltage	8-72 Vdc	
Self-Consumption	<0.5W	
Ground Fault Threshold Current	300 mA +/- 10%	
Output Trip Signal	12V	
Nominal System Voltage	12, 24, 36 or 48 Vdc	

### Certifications

- CE, RoHS and REACH Compliant
- ETL Listed: UL 1741
- CSA C22.2 No. 107.1-01 Listed
- GFPD-150V is UL-489 Compliant
- GFPD-600V is UL-1077 Compliant
- FCC Class B Part 15 Compliant
- U.S. National Electrical Code (NEC) 690.5 Compliant for use as a GFPD device
- Meets EMC Directives (Immunity, Emissions and Safety)
- Manufactured in a Certified ISO 9001 Facility

## Accessories

### Relay Driver (RD -1)



Logic Module for system control functions. The Relay Driver provides high level system control functions such as high/low voltage alarms, load control and generator start.

#### Compatible with:

TriStar MPPT 600V Controller    SunSaver Duo Controller  
TriStar MPPT Controller    SureSine Inverter  
SunSaver MPPT Controller    MeterHub  
TriStar Controller

- Cost-effective and Highly reliable
- Fully Programmable
- Advanced Generator Control
- Industrial Design
- LED Indicators
- 4 independent relay driver outputs (relays not included)
- Used for high/low voltage alarms, load control, and generator start
- Reads digital data inputs from 'compatible' controllers and inverters
- Reads battery voltage in systems with other controllers

### Wire Box (PS-MPPT-WB)



An optional two-piece enclosure accessory for ProStar MPPT. Provides effective cover for wires and conduit leading to and from the ProStar MPPT controller. This Wire Box may be required or recommended by authorities having jurisdiction to reduce hazards associated with exposed wires, conduits and connections.

#### Compatible with:

ProStar MPPT Controller

- Material: High strength polycarbonate Lexan
- Enclosure space: accommodates 35mm<sup>2</sup> wire
- Meets NEC standards for conduits and wire bending



## Accessories

### Remote Temperature Sensor (RTS)

Sends battery temperature data to controllers.

#### Compatible with:

TriStar MPPT 600V Controller*	TriStar Controller
TriStar MPPT Controller*	ProStar Controller
ProStar MPPT Controller	SunSaver Duo Controller
SunSaver MPPT Controller	SunKeeper Controller

- Improves battery charging by using temperature at the battery for very accurate temperature compensation
- Recommended for solar systems that experience temperature variations during the year or whenever the temperature at the battery will be more than 5 °C (9 °F) different than the temperature at the controller

\*Remote Temperature Sensors included with all TriStar MPPT units.



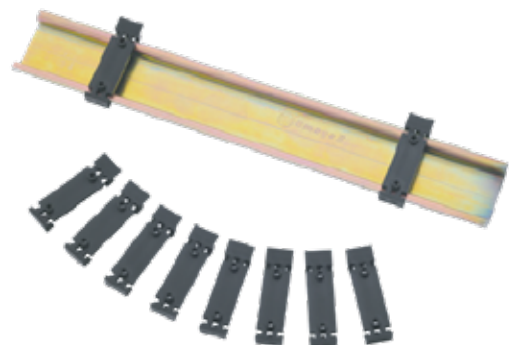
### DIN Rail Clips (DIN-1)

For installing controllers and accessories to DIN Rails.

#### Compatible with:

SunSaver MPPT Controller  
SunSaver Controller  
SunSaver Duo Controller  
SunLight Controller

- Rugged plastic clips match SunSaver and SunLight mounting holes
- Provides a simple way to install controllers to DIN rails
- Enables removal of controllers from DIN rails without removing the clips
- Polypropylene clips
- Fits all 35mm standard DIN rails
- Includes mounting screws



## Accessories

### TriStar Meter-2-600V (TS-M-2-600V)

On-Board Advanced Digital Display for the TriStar MPPT 600V Controller. Displays extensive system and controller information, logged data, bar graph metering, as well as alarms and faults for easy troubleshooting.

#### Compatible with:

TriStar MPPT 600V Controller  
MeterHub

- 2 x 16 character LCD display
- Mounts to the controller\*
- Displays extensive system and controller information, logged data, bar graph metering as well as alarms and faults for easy troubleshooting
- Choice of 5 languages (English, French, German, Portuguese or Spanish)

\* Replaces stock front faceplate



### TriStar Meter-2 (TS-M-2)

On-Board Advanced Digital Display for the TriStar and TriStar MPPT Controllers. The meter will display a great deal of information about your TriStar controller and the operation of your system. In addition, the meter enables manual functions and controller diagnostics. These capabilities will increase your confidence that the system is working properly and will help you to improve reliability, battery life and system performance.

#### Compatible with:

TriStar MPPT Controller  
TriStar Controller  
MeterHub

- 2 x 16 character LCD display
- Mounts to the controller\*
- Displays extensive system and controller information, logged data, bar graph metering as well as alarms and faults for easy troubleshooting
- Choice of 5 languages (English, French, German, Portuguese or Spanish)

\* Replaces stock front faceplate on TriStar and TriStar MPPT controllers.





## Accessories

### TriStar Remote Meter-2 (TS-RM-2)

Remote Digital Display for the TriStar Family Controllers. The TS-RM-2 provides the same data display as the TS-M-2, except that it ships with 30 meters of cable and a flat faceplate. These features enable convenient mounting away from the controller.



#### Compatible with:

TriStar MPPT 600V Controller  
TriStar MPPT Controller  
TriStar Controller  
MeterHub

- 2 x 16 character LCD display
- Displays extensive system and controller information, logged data, bar graph metering, as well as alarms and faults for easy troubleshooting
- Choice of 5 languages (English, French, German, Portuguese or Spanish)

### Remote Meter (RM-1)

Remote Digital Display for viewing a controller or inverter in a separate location. This meter provides comprehensive system information for easy monitoring including voltage, current and temperature.



#### Compatible with:

ProStar MPPT Controller  
SunSaver MPPT Controller  
SunSaver Duo Controller  
SureSine Inverter  
ProStar Controller

- Easy to install and use
- Low self-consumption
- 4 digit display with custom icons
- Displays systems information, logged data\*, alarms and errors
- May be mounted in the wall or on the wall with included frame
- Includes 10 meters of cable

\*Logged data only available for the SunSaver MPPT, ProStar MPPT and ProStar controllers

## Accessories

### MeterHub (HUB -1)

This product electrically isolates devices that supply power to the network, preventing damage to the network in the event of grounding problems.



#### Compatible with:

TriStar MPPT 600V Controller  
TriStar MPPT Controller  
ProStar MPPT Controller  
SunSaver MPPT Controller  
TriStar Controller  
TriStar Meter 2  
TriStar Remote Meter 2  
Relay Driver

- Allows several Morningstar products to communicate over a MeterBus network (maximum 15 devices)
- In multi-controller systems the TS-M-2, TS-M-2-600V and TS-RM-2 are networkable using Morningstar's MeterHub to allow individual controller data and aggregate system data to be displayed together on a single meter.
- Enables multiple controllers to share a TriStar Meter or Relay Driver
- Provides electrical isolation

### PC MeterBus Adapter (MSC)

Converts RJ-11 MeterBus to RS-232 Connector.



#### Compatible with:

ProStar MPPT Controller  
SunSaver MPPT Controller  
SunSaver Duo Controller  
SureSine Inverter

- Used to connect a Morningstar controller or inverter to a PC or other third party serial enabled device
- Communications link enables monitoring and logging of data as well as customizing of set points

## Accessories

### EIA-485 / RS-232 Adapter (RSC-1)

Converts RS-232 to EIA-485 Connector.

#### Compatible with:

TriStar MPPT Controller  
SunSaver MPPT Controller  
TriStar Controller

SunSaver Duo Controller  
SureSine Inverter  
Relay Driver

- Allows up to 128 Morningstar products to communicate on the same communications bus and over much greater distances than with RS-232
- All data is transmitted via MODBUS™ protocol
- Removable four (4) position EIA-485 terminal
- 9-pin RS-232 connector (male)
- Status LED for monitoring and diagnostics
- Molded tabs for attachment to 35mm standard DIN rail
- RS-232 ribbon cable (not shown) with low-profile connectors

#### Typical configurations include:

- Networking several TriStar and/or TriStar MPPT controllers
- Adding Morningstar PC Meterbus Adapters (MSC) for use with an RJ-11 port in multi-device networks
- Adding Morningstar's Relay Driver (RD-1) to a network
- Integrating any compatible Morningstar product into an existing EIA-485 network, such as those used by industrial control or SCADA systems



### USB MeterBus Adapter (UMC-1)

Converts the MeterBus RJ-11 to a standard USB 2.0 interface.

#### Compatible with:

ProStar MPPT Controller  
SunSaver MPPT Controller  
SunSaver Duo Controller  
SureSine Inverter  
ProStar Controller

- Allows communication between a computer and compatible Morningstar products
- Can be used for:
  - Programming custom charging set-points
  - Logging live data
- Communication with third party hardware that supports MODBUS™ communication



THE ONLY SOLAR  
CONTROLLER THAT  
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#### At Morningstar, this is our best side.

Because we're the only complete line of full-powered solar controllers that don't need cooling fans. All of our controllers, including the legendary ProStar MPPT, get rid of excess heat more intelligently, through advanced passive cooling.

From the single-module SunGuard to the breakthrough TriStar 600V, Morningstar controllers—unlike our competition—have no moving parts to fail, no fans to suck in dirt and debris, no fan motor loads to affect solar harvest. It's one reason why leading solar professionals in the oil & gas, telecommunications, security, transportation and other industries have put over four million Morningstars into service since 1993. Learn how we can help your next project at [www.morningstarcorp.com](http://www.morningstarcorp.com)







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