



2008/2009

Product Catalog

IN ENGLISH

The
World's
Leading
SOLAR
Controllers
& Inverters

 **MORNINGSTAR**
corporation

OUR COMPANY

Morningstar Corporation, founded in 1993, is the world's leading supplier of photovoltaic (PV) controllers. In 2007 we shipped over 200,000 controllers and inverters to the industry's leading PV companies. Our products have set new standards in the industry for quality, high reliability and extended battery life.

Morningstar is an independent, privately owned U.S. corporation. Our commercial office is located near Philadelphia, and our engineering lab is based near Baltimore. Our products are manufactured in an ISO 9001 facility and are shipped to our customers worldwide from a warehouse in Los Angeles.

OUR MISSION

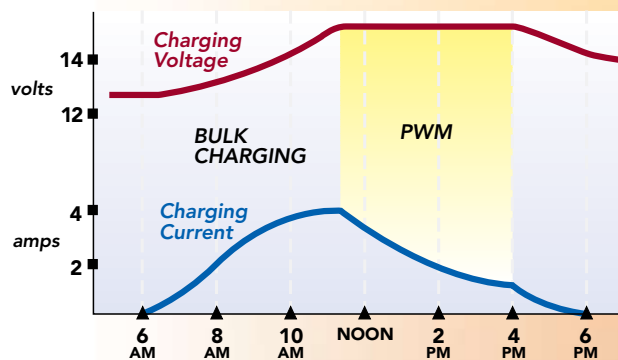
Morningstar's mission is to enhance our global market position as the market and technological leader in PV electronics. By employing the latest electronics technologies, our goal is to continually introduce innovative new products that are highly differentiated, yet priced competitively. In addition to the highest quality products, we strive to provide the best customer service in the PV industry.

OUR DISTRIBUTION CHANNELS

Morningstar's products are marketed through 167 highly qualified distributors in 73 countries. Our authorized distributors are typically the leading solar distributors in each country. We only sell wholesale, and do not sell directly to OEMs, dealers or users. Our distributors are a vital part of the Morningstar marketing team and have become our long-term business partners.

OUR ADVANCED PWM CHARGING

THE KEY TO LONGER BATTERY LIFE



- Typically 30% more solar energy into the battery per day
- Average battery State-of-Charge is 90 - 95% compared to 55 - 60% for other controllers
- Ability to recover lost battery capacity and desulfate a battery

Morningstar

INVERTERS



SURESINE
12 volts DC input,
115 or 220 volts AC output 3

CONTROLLERS



TRISTAR
45 & 60 amps at 12-48 volts 3



PROSTAR
15 & 30 amps at 12/24 or 48 volts . . . 4



SUNSAVER
6, 10 or 20 amps at 12 or 24 volts. . . . 4



SUNSAVER DUO
25 amps at 12 volts 5



SUNSAVER MPPT
15 amps at 12 or 24 volts 5

CONTROLLERS CONTINUED



SUNKEEPER
6 & 12 amps at 12 volts. 6



SUNLIGHT
10 & 20 amps at 12 or 24 volts 6



SUNGUARD
4.5 amps at 12 volts. 7



SHS
6 & 10 amps at 12 volts. 7

ACCESSORIES



RELAY DRIVER
4 Channel Logic Module Accessory . . 8



REMOTE METER
4 Digit Universal Display. 8

OUR ADVANTAGE

- **THE BEST OVERALL VALUE** – Combination of performance, features and competitive price results in the best controller and inverter value on the market.
- **EXTREMELY HIGH RELIABILITY** – Failure rates of less than 1 per 1,000 units shipped.
- **OUTSTANDING BATTERY CHARGING** – PWM charging can double the life of the battery and recover capacity in a sulfated battery. Series design (not shunt) reduces heating and stress on the electronic components.
- **HIGHEST QUALITY** – Manufactured in a fully automated, world-class ISO 9001 factory. Quality control using the latest computerized test equipment.
- **ELECTRONIC PROTECTIONS** – Fully protected against reverse polarity, short circuit, overcurrent, high temperature and reverse current at night. No mechanical fuses.
- **ENVIRONMENTAL PROTECTIONS** – Rated for ambient temperatures of -40°C to $+60^{\circ}\text{C}$. Epoxy encapsulated or conformal coating to protect printed circuit boards from corrosion.
- **NO NEED TO DERATE** – Designed with a 25% safety margin, controllers and inverters may be used up to their full “nameplate” ratings.
- **EXPECTED 15 YEAR LIFE** – 5-year warranty, with an expected operating life of 15 years or more. The Suresine inverter and SHS controller have a 2-year warranty.
- **EASY TO USE** – Large clearly marked wire terminals, LED and meter displays, well-written manuals and timely technical support.
- **MULTIPLE LANGUAGES** – Product documentation available in five languages: English, French, German, Portuguese and Spanish.

IN 2005
Morningstar became
the world's
#1 SUPPLIER
OF SOLAR CONTROLLERS

SureSine

SURESINE INVERTER

300 Watts: 12 volts DC input, 115 or 220 volts AC output



THE SURESINE IS A PURE SINE WAVE INVERTER FOR OFF-GRID PV APPLICATIONS REQUIRING AC POWER. APPLICATIONS INCLUDE RURAL ELECTRIFICATION, TELECOM, REMOTE HOMES, RV/CARAVANS AND BOATS.

- **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 600 watts.
- **HIGH RELIABILITY** – No internal cooling fan or other moving parts prone to failure. 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

AC TERMINAL SIZE
4 mm² / 12 AWG

DC TERMINAL SIZE
2.5 to 35 mm²
14 to 2 AWG

WEIGHT
4.5 kg / 10 lb

DIMENSIONS
21.3 x 15.2 x 10.5 cm
8.4 x 6.0 x 4.1 inch

CERTIFICATIONS
CE, UL* cUL*

WARRANTY
2 years

*UL certified for 115V version only

SURESINE

SI-300

Continuous Power Rating	300 watts @ 25°C
Peak Power Rating (10 minutes)	600 watts @ 25°C
DC Input System Voltage	10.0-15.5V
Waveform	pure sine wave
AC Output Voltage (RMS)	220V or 115V +/- 10%
AC Output Frequency	50 or 60 Hz +/- 0.1%

OPTIONS:

Remote Meter	yes
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TriStar

TRISTAR CONTROLLER

45 or 60 amps at 12-48 volts



THE TRISTAR IS A THREE-FUNCTION CONTROLLER THAT PROVIDES RELIABLE SOLAR BATTERY CHARGING, LOAD CONTROL OR DIVERSION REGULATION.

- **HIGHEST RELIABILITY** – Large heat sink and conservative design enables operating at full ratings to 45°C.
- **MORE INFORMATION** – Optional meter displays extensive system and controller information, automatic self-test and reset. Displays in 5 languages.
- **COMMUNICATIONS CAPABILITY** – RS-232 connects to a personal computer for custom settings, data logging and remote monitoring and control.
- **FULLY ADJUSTABLE** – DIP switch provides user with choice of 7 digital presets. Additional custom settings via RS-232.
- **EXTENSIVE ELECTRONIC PROTECTIONS** – Fully protected against reverse polarity, short circuit, overcurrent, high temperature and overvoltage.

AMBIENT OPERATING TEMPERATURE
–40°C to +45°C

TERMINAL SIZE
35 mm² / 2 AWG

WEIGHT
1.6 kg / 3.5 lb

DIMENSIONS
26.0 x 12.7 x 7.1 cm
10.3 x 5.0 x 2.8 inch

CERTIFICATIONS
CE, UL, cUL

WARRANTY
5 years

TRISTAR

TS-45

TS-60

Rated Solar, Load or Diversion Current	45A	60A
System Voltage	12-48V	12-48V

OPTIONS:

TriStar Meter	yes	yes
TriStar Remote Meter	yes	yes
Remote Temperature Sensor	yes	yes

ProStar

PROSTAR CONTROLLER

15 or 30 amps at 12/24 volts or 48 volts



THE PROSTAR IS A MID-RANGE SOLAR CONTROLLER FOR BOTH PROFESSIONAL AND CONSUMER APPLICATIONS.

- **LONGER BATTERY LIFE** – Constant voltage PWM series regulation uses 4-stage charging. Temperature compensation and choice of 3 battery types. Voltage sense terminals for more accurate battery reading.
- **MORE INFORMATION** – Includes three battery level LED indicators. Optional meter includes a safety disconnect and displays amps, volts, temperature and self-test.
- **EXTENSIVE ELECTRONIC PROTECTIONS** – Avoids use of mechanical fuses. Electronic protections for short-circuit, overload, reverse polarity, high voltage and temperature, and reverse current at night.

AMBIENT OPERATING TEMPERATURE

–40°C to +60°

TERMINAL SIZE 16 mm² / 6 AWG

WEIGHT 0.34 kg / 0.75 lb

DIMENSIONS 15.3 x 10.5 x 5.5 cm
6.0 x 4.1 x 2.2 inch

CERTIFICATIONS CE

WARRANTY 5 years

PROSTAR	PS-15	PS-30	PS-15M-48V
Rated Solar Current	15A	30A	15A
Rated Load Current*	15A	30A	15A
System Voltage	12/24V	12/24V	48V

OPTIONS:

Digital Meter	yes	yes	standard
Positive Ground	no	yes	yes
Remote Temp Sensor	yes	yes	yes

* low voltage disconnect included on all ProStar controllers

SunSaver

SUNSAVER CONTROLLER

6, 10 or 20 amps at 12 or 24 volts



THE SUNSAVER IS THE WORLD'S LEADING SMALL SOLAR CONTROLLER FOR INDUSTRIAL AND LEISURE MARKETS.

- **EXTENDED BATTERY LIFE** – PWM series battery charging with temperature compensation. Sealed/flooded battery select.
- **TROPICALIZATION** – Epoxy encapsulation, marine rated terminals and anodized aluminum case provides environmental protection.
- **IDEAL FOR OIL/GAS APPLICATIONS** – Approved for use in hazardous locations: Class 1, Division 2, Groups A-D.

AMBIENT OPERATING TEMPERATURE

–40°C to +60°C

TERMINAL SIZE 5.2 mm² / 10 AWG

WEIGHT 0.23 kg / 0.5 lb

DIMENSIONS 15.2 x 5.5 x 3.4 cm
6.0 x 2.2 x 1.3 inch

CERTIFICATIONS CE, hazardous locations

WARRANTY 5 years

SUNSAVER	SS-6	SS-10	SS-20
Rated Solar Current	6.5A	10A	20A
Rated Load Current	6.0A	10A	20A
System Voltage	12V	12 or 24V	12 or 24V

OPTIONS:

Low Voltage Disconnect	yes	yes	yes
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SunSaver Duo

SUNSAVER DUO CONTROLLER

25 amps at 12 volts



THE SUNSAVER DUO IS A TWO BATTERY SOLAR CONTROLLER WITH OPTIONAL REMOTE METER FOR RV'S, CARAVANS AND BOATS.

- **TWO BATTERY CHARGING** – Solar charge current is shared between two batteries based on a user selectable priority. When one battery is fully charged, all of the charge current flows to the other battery.
- **HIGHLY RELIABLE** – Epoxy encapsulation protects the controller against dust and high humidity. Extensive electronic protections, including short circuit, over current and reverse polarity, ensure that the controller will not be damaged by wiring mistakes or overloads.
- **USER ADJUSTABLE** – Control parameters may be adjusted using the DIP switch on the controller. Further customization is enabled by connecting to a personal computer and using Morningstar's PC software.

AMBIENT OPERATING TEMPERATURE CONTROLLER –40°C to +45°C

LARGEST TERMINAL WIRE

16 mm² / 6 AWG

WEIGHT 0.26 kg / 0.57 lb

DIMENSIONS 17.0 x 5.6 x 4.1 cm
6.7 x 2.2 x 1.6 inch

CERTIFICATIONS CE

WARRANTY 5 years

SUNSAVER DUO

SSD-25

SSD-25RM

Rated Solar Current	25A	25A
Rated Load Current*	none	none
System Voltage	12V	12V

* there is no load connection on the SunSaver Duo

OPTIONS:

Remote Meter	yes	standard
Remote Temperature Sensor	yes	yes

SunSaver MPPT

SUNSAVER MPPT CONTROLLER*

15 amps at 12 or 24 volts



THE SUNSAVER MPPT CONTROLLER WILL HANDLE A SUGGESTED MAXIMUM PV INPUT OF 200Wp (12V BATTERY) OR 400Wp (24V BATTERY).

- **POWER BOOST** – Maximum power point tracking provides an increase of amps from the PV array into the battery.
- **USE OF HIGH VOLTAGE MODULES** – In addition to 12 volt crystalline modules, enables the use of high voltage and thin film modules for off-grid battery charging.
- **CONVERTS 24V TO 12V** – Provides a means to use a 24V PV array to charge a 12V battery, reducing power losses in systems with a long cable run between the PV array and the battery.

AMBIENT OPERATING TEMPERATURE –40°C to 60°C

TERMINAL 5.2 mm² / 10 AWG

WEIGHT 0.60 kg / 1.3 lb

DIMENSIONS 16.8 x 5.5 x 7.0 cm
6.61 x 2.17 x 2.76 inch

CERTIFICATIONS CE

WARRANTY 5 years

*expected availability in March 2008

SUNSAVER MPPT

SSMPPT-15L

Maximum Battery Current	15A
Maximum Open Circuit Voltage	75V
Maximum PV Input	200Wp (12V Battery) 400Wp (24V Battery)
System Voltage	12/24V

OPTIONS:

Remote Meter	yes
Remote Temperature Sensor	yes

SunKeeper

SUNKEEPER CONTROLLER

6 or 12 amps at 12 volts



THE SUNKEEPER SOLAR CONTROLLER MOUNTS DIRECTLY TO THE SOLAR MODULE JUNCTION BOX AND ELIMINATES THE NEED FOR AN ADDITIONAL CONTROLLER HOUSING.

- **HIGH TEMPERATURE RATED** – Rated to 70°C to operate in high temperatures at the solar module. No need to de-rate.
- **OUTDOOR RATED** – Approved for outdoor use without an additional enclosure. IP65, UV resistant case. Epoxy encapsulated electronics and watertight connection to the module junction box.
- **IDEAL FOR OIL/GAS APPLICATIONS** – Approved for use in hazardous locations: Class 1, Division 2, Groups A-D.

AMBIENT OPERATING TEMPERATURE
–40°C to +70°C

WIRE TERMINATIONS
#8 fork connectors

WEIGHT
0.11 kg / 0.25 lb

DIMENSIONS
9.9 x 5.1 x 1.3 cm
3.9 x 2.0 x 0.5 inch

CERTIFICATIONS
CE, hazardous locations

WARRANTY
5 years

SUNKEEPER	SK-6	SK-12
Rated Solar Current	6A	12A
Rated Load Current*	none	none
System Voltage	12V	12V

* there is no load connection on the SunKeeper

OPTIONS:

Remote Temperature Sensor	yes	yes
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Sunlight

SUNLIGHT CONTROLLER

10 amps or 20 amps at 12 or 24 volts



THE SUNLIGHT IS THE WORLD'S LEADING SOLAR LIGHTING CONTROLLER FOR STREET AND PATHWAY LIGHTING, PARKING AREAS, BUS STATIONS AND SIGNAGE.

- **PROVIDES 10 LIGHTING OPTIONS** – User adjustable for 2 to 10 hours on or for on all night. Unique ON/OFF/ON settings conserve energy and turns light on again for 1 or 2 hours before sunrise. Timer accuracy is within 2 seconds.
- **EASY TO INSTALL** – To confirm correct installation, test button turns light on during the day and LED indicates selected lighting option.
- **RUGGED INDUSTRIAL DESIGN** – Epoxy encapsulated electronics, marine rated terminals and anodized aluminum case.

AMBIENT OPERATING TEMPERATURE
–40°C to +60°C

TERMINAL SIZE
5.2 mm² / 10 AWG

WEIGHT
0.26 kg / 0.6 lb

DIMENSIONS
16.8 x 5.5 x 3.4 cm
6.6 x 2.2 x 1.3 inch

CERTIFICATIONS
CE

WARRANTY
5 years

SUNLIGHT	SL-10	SL-20
Rated Solar Current	10A	20A
Rated Load Current*	10A	20A
System Voltage	12V or 24V	12V

*low voltage disconnect included on all SunLight controllers

SunGuard

SUNGUARD CONTROLLER

4.5 amps at 12 volts



THE SUNGUARD IS A ONE MODULE SOLAR CONTROLLER FOR PROFESSIONAL AND LEISURE MARKETS.

- **HIGHLY RELIABLE** – 100% solid state design and epoxy encapsulated for environmental protection. Rated for 25% overloads and no need to de-rate.
- **EXTENDED BATTERY LIFE** – Series design (not shunt) PWM battery charging with temperature compensation. Low self-consumption.
- **EASY TO INSTALL** – Outdoor rated connecting wires for waterproof connection to solar module and battery.

AMBIENT OPERATING TEMPERATURE	-40°C to +60°C
WEIGHT	0.09 kg / 0.2 lb
DIMENSIONS	6.4 x 5.1 x 3.8 cm 2.5 x 2.0 x 1.5 inch
CERTIFICATIONS	CE
WARRANTY	5 years

SUNGUARD

SG-4

Rated Solar Current	4.5A
Rated Load Current*	none
System Voltage	12V

*there is no load connection on the SunGuard

SHS

SHS CONTROLLER

6 or 10 amps at 12 volts



THE SHS IS A LOW COST CONTROLLER FOR RURAL ELECTRIFICATION PV SYSTEMS*.

- **LOW COST** – Designed to meet the economic needs of developing country rural markets. The latest electronic technology and high volume automated production resulted in lower costs.
- **HIGH RELIABILITY** – Built-in electronic fuses ensures that any wiring mistakes during installation will not damage the controller. The printed circuit board is conformally coated for protection against humidity and nesting insects.
- **EASY TO USE** – LED indicators display battery level and system status. All control functions are automatic and require no user adjustments.

AMBIENT OPERATING TEMPERATURE	-25°C to +50°C
TERMINAL SIZE	6 mm ²
WEIGHT	113 g
DIMENSIONS	15.1 x 6.6 x 3.6 cm
CERTIFICATIONS	CE, World Bank
WARRANTY	2 years

SHS

SHS-6

SHS-10

Rated Solar Current	6A	10A
Rated Load Current**	6A	10A
System Voltage	12V	12V

*not sold in USA or Canada

**low voltage disconnect included on all SHS controllers

100% of our ownership, management, & strategy is unchanged since we started 15 years ago

Relay Driver

RELAY DRIVER

Four 750 milliamp channel relay drivers at 12-48 volts



THE RELAY DRIVER IS A LOGIC MODULE ACCESSORY FOR SOLAR CONTROLLERS PROVIDING HIGH/LOW VOLTAGE ALARMS, LOAD CONTROL AND GENERATOR START.

- **COST EFFECTIVE** – Provides 1 to 4 control functions at a lower cost than other alarm and generator start packages.
- **FULLY PROGRAMMABLE** – The system designer may select the exact relay needed and program the relay driver via RS-232 connection using the included PC software. Uses MODBUS commands.
- **ADVANCED GENERATOR CONTROL** – Able to control 1, 2 or 3-wire generator schemes and complete control of all generator parameters.

AMBIENT OPERATING TEMPERATURE	-40°C to +45°C
TERMINAL SIZE	1.0 mm ² / 16 AWG
DIN RAIL ATTACHMENT	35 mm standard
WEIGHT	0.2 kg / 0.4 lb
DIMENSIONS	16.3 x 8.1 x 3.3 cm 6.4 x 3.2 x 1.3 inch
CERTIFICATIONS	CE
WARRANTY	5 years

RELAY DRIVER	RD-1
Max. Channel Current	750mA
System Voltage	12-48V
Comm Ports	(2) RJ-11 meter bus connections (1) 9-pin serial RS-232
Input Options	All TriStar parameters Battery voltage Relay Driver temperature Other input voltages

Remote Meter

REMOTE METER*

Universal digital display for Morningstar products**



THE REMOTE METER IS A FOUR-DIGIT DISPLAY WITH CUSTOM ICONS THAT IS COMPATIBLE WITH SEVERAL MORNINGSTAR CONTROLLERS AND INVERTERS.

- **PROVIDES USEFUL INFORMATION** – The digital meter displays voltage, current, temperature and error reporting for easy troubleshooting. Present, cumulative and maximums/minimums are indicated. The LED's indicate battery level and operating state.
- **EASY TO INSTALL** – May be mounted in the wall or on the wall using the included frame. Also includes 10 meters of wiring with RJ-11 connectors.
- **EASY TO USE** – Three soft buttons allow for easy navigation of the meter menus. Custom icons and back lighting make the meter easy to read and understand.

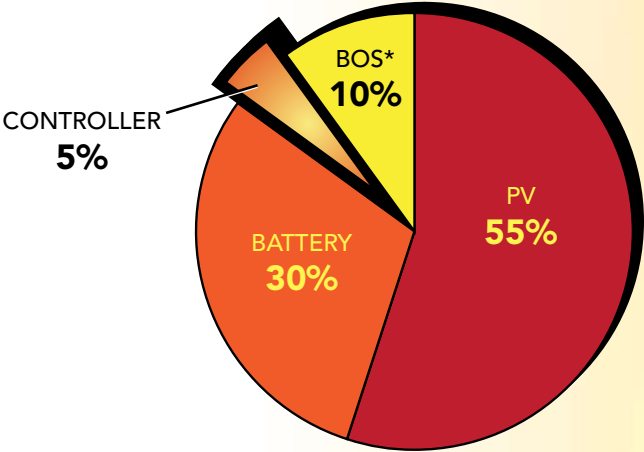
AMBIENT OPERATING TEMPERATURE	-20°C to +60°C
CONNECTOR TYPE	RJ-11 (6 pin)
WEIGHT	0.14 kg / 0.3 lb
DIMENSIONS	9.7 x 9.7 x 3.1 cm 3.8 x 3.8 x 1.2 inch
CERTIFICATIONS	CE
WARRANTY	5 years

REMOTE METER	RM-1
Self-consumption	
Backlight off	6mA
Backlight on	15mA
Minimum Operating Voltage	8V

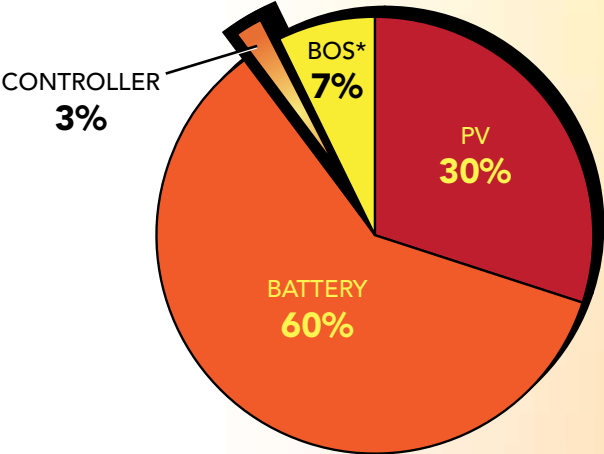
**may be used with SureSine inverter and select SunSaver controllers

*expected availability in March 2008

OFF GRID PV SYSTEM ECONOMICS



FIRST YEAR COST



TWENTY YEAR LIFE CYCLE COST

**balance of system*

A good controller is a relatively inexpensive way to increase the life of an expensive battery.



Morningstar

Performance & Stability You Can Count On ... For a Long Time

97.6% of our orders ship within 2 days

99.6% of our products never fail

99.8% of our customers are satisfied

100% of our ownership, management,
& strategy is unchanged since
we started 15 years ago

This catalog is available in multiple languages. Please contact Morningstar for details.

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