



45 or 60 amps at  
12, 24 or 48 volts

## TriStar™

### THREE FUNCTION SOLAR CONTROLLER

- High Reliability & Efficiency
- More Power
- Fully Adjustable
- Extensive Electronic Projections

Morningstar's TriStar Controller is a three-function, programmable controller that provides reliable solar battery charging, load control or diversion regulation. The controller operates in one of these modes at a time and two or more controllers may be used to provide multiple functions.

The TriStar uses advanced technology and automated production to provide exciting new features at a competitive cost. The optional TriStar meter is the most sophisticated and informative controller meter on the market. The 60 amp version is also available with a factory installed meter. The controller is ETL Listed (UL1741) and TUV (IEC62109-1), and is designed for home systems and professional applications.

## KEY FEATURES AND BENEFITS

- **High Reliability**  
Large heat sink **1** and conservative design enables operating at full ratings to 60°C. No need to de-rate.
- **More Power**  
Ratings to 60A at 48VDC will handle solar arrays up to 4kW.
- **Communications Capability**  
RS-232 **2** connects to a personal computer for custom settings, data logging and remote monitoring and control.
- **Fully Adjustable**  
DIP switch **3** provides user with a choice of 7 different digital presets and custom settings via RS-232.
- **Extensive Electronic Protections**  
Fully protected against reverse polarity, short circuit, overcurrent, high temperature and overvoltage.
- **Simple Mechanical Interface**  
Larger power terminals **4** and conduit knockouts **5**. Extra space for wire turns. Fits on power panels.



- **Better Battery Charging**  
Connecting battery sense wires **6** and optional remote temperature sensor **7** will improve control accuracy. Constant voltage series PWM algorithm increases battery capacity and life.
- **More Information**  
3 LED's **8** to indicate status, faults and alarms. Optional meter **9** displays extensive system and controller information, automatic self-test and reset capabilities. Meter connection via RJ-11 phone jack **10**.
- **Easy to Reset**  
Pushbutton **11** provides manual reset and stop/start battery equalization or load disconnect.
- **Low Telecom Noise**  
DIP switch setting will change PWM to "On-Off" battery charging.

## Technical Specifications

Versions	TrStar-45, TriStar-60 and TriStar-60M
<b>Electrical</b>	
Rated solar, load or diversion current	TriStar-45 45A TriStar-60 60A TriStar-60M 60A
System Voltage	12, 24, 48V
Accuracy	12/24V ≤0.1% ±50mV 48V ≤0.1% ±100mV
Minimum voltage to operate	9V
Maximum solar voltage (Voc)	125V
Self-consumption	
Controller	<20mA
Meter	7.5mA
<b>Mechanical</b>	
Dimensions	Height: 26.0cm/10.3 in Width: 12.7cm/5.0 in Depth: 7.1cm/2.8 in
Weight	1.6kg/3.5lb
Largest Wire	35mm <sup>2</sup> /2 AWG
Conduit knockouts	Eccentric 2.5/3.2 cm (1.0/1.25 in)
Enclosure	Type 1, indoor rated
<b>Environmental</b>	
Operating ambient temperature	Controller -40°C to +60°C Meter -40°C to +60°C
Storage temperature	-55°C to +85°C
Humidity	100% (non-condensing)
Tropicalization	Conformal coating on both sides of all printed circuit boards

### Electronic Protections

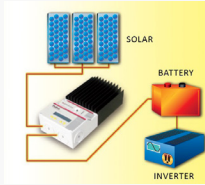
- Reverse polarity protection (any combination)
- Short-circuit protection
- Overcurrent protection
- Lightning and transient surge protection using 4500W transient voltage suppressors
- High temperature protection via automatic current reduction or complete shutdown
- Prevents reverse current from battery at night

### Certifications

- CE Compliant
- ETL Listed (UL 1741)
- cETL (CSA-C22.2 No.107.1-95)
- TUV (IEC 62109-1)
- Complies with U.S. National Electric Code
- Manufactured in a certified ISO 9001 facility
- MET Labs (EN 60335-1, EN 60335-2-29)

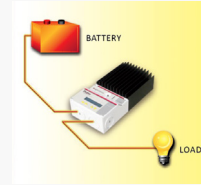
### Charge Control

1



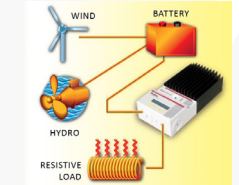
### Load Control

2



### Diversion Control

3



- » Constant voltage series PWM design to provide highly efficient battery charging
  - » 4-stage charging to increase battery capacity and life: bulk charge, PWM regulation, float and equalize
  - » Parallel for larger solar arrays up to 300 amps or more
- » Starts large loads including motors and pumps with no damage to controller
  - » Allows inrush current to 300 amps
  - » Electronic short-circuit and overload protection with automatic reconnect
  - » LVD is current compensated and has a delay to avoid false disconnects
- » May be used for solar, wind or hydroelectric
  - » To protect against battery overcharge, excess energy is diverted from the battery to an alternate DC resistive load
  - » PWM reduces power into diversion load during overcurrent conditions

### Options

- **TriStar Meter-2 (TS-M-2)** – Included with the TriStar-60M, this 2 x 16 character LCD display mounts to controller and provides system and controller information, data logging (90 days internally logged), bar graphs, and choice of five languages. The TriStar 60 amp version is available with optional factory installed meter, TS-MPPT-60M

13.5v 25c 12.3A  
1234.5Ah FLOAT

V   
A 

14.4 V 1135 7Ah  
12.3 V 11.3 kWh

- **TriStar Remote Meter (TS-RM-2)** – Includes 30 meters of cable for mounting meter away from the controller
- **Remote Temperature Sensor (RTS)** – Provides temperature compensated charging by measuring temperature at the battery (10 meter cable)
- **Ethernet Meterbus Converter (EMC-1)** – IP based network and internet connectivity
- **MeterHub (HUB-1)** – Allows multiple Morningstar products to communicate over a Meterbus network
- **PC MeterBus Adapter (MSC)** – Converts a controller's meter port to RS-232
- **Relay Driver (RD-1)** – Logic module providing high level system control