MORNINGSTAR
WORLD'S LEADING SOLAR CONTROLLERS & INVERTERS

+1-215-321-4457
sales@morningstarcorp.com

45 or 60 amps at
12, 24 or 48 volts

Shown with optional meter

TriStar™

THREE FUNCTION SOLAR CONTROLLER

- Fanless design for long-term reliability
- Fully Adjustable with DIP switches for seven digital presets
- Rated for operation at temperatures up to 60°C ambient
- Additional custom settings via RS-232

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

Three-function Pulse-Width Modulation (PWM) controller for larger systems, providing reliable PWM solar battery charging or load control or diversion regulation. PWM technology controllers are ideal for use in solar energy situations where 36 or 72 cell PV modules are available and the site is unshaded with no physical space limitations. TriStar models incorporate advanced thermal design requiring no cooling fans, which ensures long-term reliability with no moving parts to fail-- a unique feature among higher- powered controllers.

» **Built for reliability and performance,** with an oversized heatsink and over-spec'd components
» 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
» **"Speaks" Modbus, and also SNMP** (with the optional EMC-1 adaptor) for monitoring and control in network applications
» **Extensive electronic protection** against reverse polarity, short circuits, overcurrent, and excessive temperature
» **Detailed battery programming** options allow for advanced battery support for the latest Lithium, Nickel Cadmium, and Lead Acid battery types.

KEY FEATURES AND BENEFITS

- **High Reliability**
  Large heat sink 1 and conservative design enables operation at up to 60°C ambient.
- **More Power**
  Ratings to 60A at 48VDC will handle solar arrays of up to 3.2kW of continuous power.
- **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.

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Technical Specifications

Versions	TS-45, TS-60 and TS-60M
Electrical	
Rated solar, load or diversion current	TS-45 45A TS-60 60A TS-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
Mechanical	
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	35mm²/2 AWG
Conduit knockouts	Eccentric 2.5/3.2 cm (1.0/1.25 in)
Enclosure	Type 1, indoor rated IP 20
Environmental	
Ambient operating temperature range	Controller –40°C to +60°C Meter –40°C to +60°C
May derate above the following temperature*	TS-PWM-60 and TS-PWM-45 = 55°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

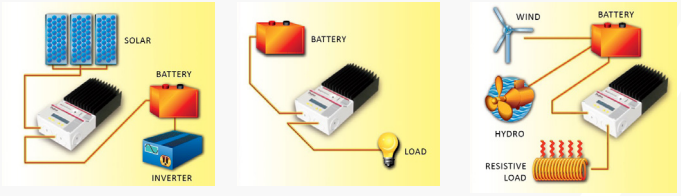
- Reverse polarity protection (any combination)
- Short-circuit protection
- Overcurrent protection
- Lightning and transient surge protection using 4500W transient voltage suppressors
- High temperature protection via automatic current reduction or complete shutdown
- Prevents reverse current from battery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

1 2 3



1
- » 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

2
- » 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

3
- » 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

- **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
- **Relay Driver (RD-1)** — Logic module providing high level system control

Simple Network Management Protocol SNMP COMPATIBLE

* Based on Bulk charging operation, unvented enclosure. The controller may derate with lower temperatures during PWM charging operation.

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

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Due to Morningstar's policy of continuous improvement, product availability, features and specifications are subject to change without notice.