



**MODEL RATINGS**

	ProStar-12	ProStar-20	ProStar-30	
PV current (amps)	12	20	30	• All models both 12 V and 24 V (automatic selection)
Load current (amps)	8	16	30	

Note: Current ratings can be exceeded by 25% for up to 5 minutes.

**RELIABILITY**

- 5-year failure rates at a 90% confidence level
- ProStar-12 ..... < 0.1%
- ProStar-20 ..... < 0.1%
- ProStar-30 ..... 0.4%

**ENVIRONMENTAL**

- Operating temperature ..... -40 to +85°C
- Max ambient temperature ..... +60°C
- Storage temperature ..... -55 to +100°C
- Humidity ..... 100% (NC)

**PERFORMANCE / ELECTRICAL**

- Accuracy 12V ..... +/- 40 mV
- 24V ..... +/- 60 mV
- Maximum array voltage ..... 50 V
- Min voltage to operate ..... 8.0 V
- Ground ..... negative
- Parallel capability ..... yes
- Self-consumption (tare):
  - Night ..... 11 mA
  - Charging ..... 12 mA
  - Load disconnected ..... 10 mA
- Voltage drops:
  - Maximum: PV/Batt ..... 0.7 V
  - Batt/Load ..... 0.4 V
  - Typical: PV/Batt ..... 0.5 V
  - Batt/Load ..... 0.1 V
- Operating life 15 years
- Noise:
  - µP protection ..... all inputs
  - Output noise pulses ..... < 400 mV
  - Noise pulse width ..... < 500 nanosec
  - Radiated noise ..... < 100 picowatts/kHz
- FET's:
  - Rds (on resistance) ..... 0.018 ohm
  - Pulse rating ..... 120 A
  - Junction temp rating ..... 175°C
  - Operating junction temp ..... 110°C
- µP memory ..... 2k ROM
- µP clock speed ..... 2 MHz
- Transient surge suppressors:
  - Pulse power rating ..... 1500 watts
  - Response ..... < 5 nanosec
- LED's:
  - Pulse rate ..... 300 Hz
  - Current consumption ..... < 1 mA/LED

**METER DISPLAY**

- Type ..... LCD
- Display ..... 3-digit x .5 inch
- Temp rating ..... -30 to +85°C
- Voltage accuracy ..... 0.5%
- Current accuracy ..... 2.5%
- Status LED's ..... 3
- Self-consumption (tare) ..... 10 mA
- Manual disconnect ..... < 100 microsec

**MECHANICAL**

- Dimensions: (inches) ..... 6.01 (W) x 4.14 (H) x 2.17 (D)
- (mm) ..... 153 (W) x 105 (H) x 55 (D)
- Weight: (oz) ..... 12
- (kg) ..... 0.34
- Wire terminals ..... Euro-style
- Max wire size:
  - (solid) ..... #6 AWG/16 mm<sup>2</sup>
  - (multistrand) ..... #6 AWG/10 mm<sup>2</sup>
  - (fine strand) ..... #8 AWG/10 mm<sup>2</sup>
- Terminal diameter ..... 0.2 inch/5 mm
- Mounting orientation ..... vertical
- Case:
  - Material ..... VALOX #310 SEO
  - Fungicidal resistance ..... ASTM G21-70
  - Moisture absorption ..... < 0.4%
  - UL Thermal Index ..... 120°C/140°C

**ELECTRONIC FUSE / SYSTEM SAFETY**

- Load short-circuit ..... Short-circuit is > 10X load rating for > 5 msec
- Load disconnected < 50 microsec
- Emergency disconnect ..... If voltage < 2.4 V, PV/load disconnected < 0.1 sec
- Reverse polarity ..... All 4 system inputs fully protected
- High temp shutdown ..... 70°C disconnect PV input
- 80°C disconnect load
- 60°C reconnect load
- 50°C reconnect PV

**CONTROL SETPOINTS**

	12 Volt	
	Sealed	Flooded
• Low volt load disconnect	11.4	11.5
• LVD reconnect	12.5	12.6
• Constant-voltage regulation	14.1	14.3
• Equalization	14.35	14.6
• HVD	15.5	15.5

(24 V setpoints are twice 12 V values)

**CONTROL PARAMETERS**

- Charge algorithm ..... constant-voltage
- PWM pulse charging
- series configuration
- Temp comp coefficient ..... -5.0 mV/°C/cell (25°C ref)
- LVD current coefficient ..... -20 mV/amp load
- Auto equalize:
  - Sealed ..... 16 days or 11.9/23.8 V
  - Flooded ..... 11 days or 12.0/24.0 V
- Temp comp setpoints ..... Regulation, Equalize, HVD
- Software delays ..... LVD = 55 sec; HVD = 7 sec
- Software filtering ..... average 2 inputs/50 µsec
- Measurement rate ..... 37.5 samples/sec

Specifications subject to change without notice.

Manufactured in the U.S.A.

**WARRANTY:** FIVE YEAR WARRANTY PERIOD.  
CONTACT MORNINGSTAR OR YOUR AUTHORIZED DISTRIBUTOR FOR COMPLETE TERMS.

**AUTHORIZED MORNINGSTAR DISTRIBUTOR:**



1098 Washington Crossing Road  
Washington Crossing, PA 18977 USA  
Tel: 215-321-4457 Fax: 215-321-4458  
E-mail: info@morningstarcorp.com  
Website: www.morningstarcorp.com



**PROSTAR**

PATENTED

USING ADVANCED TECHNOLOGY FOR:

- High Reliability
- Low Cost
- PWM Battery Charging

PROSTAR™  
MID-RANGE PHOTOVOLTAIC CONTROLLERS

## PROSTAR SIMPLE, FLEXIBLE, EASY TO USE

**AUTOMATIC VOLTAGE SELECT**  
Provides flexibility for either 12 V or 24 V systems. Processor automatically configures for correct system voltage.

**PREVENTS REVERSE CURRENT**  
Series switching prevents battery from discharging at night through the PV modules.

**TEMPERATURE COMPENSATION**  
Corrected setpoints referenced to ambient temperature.

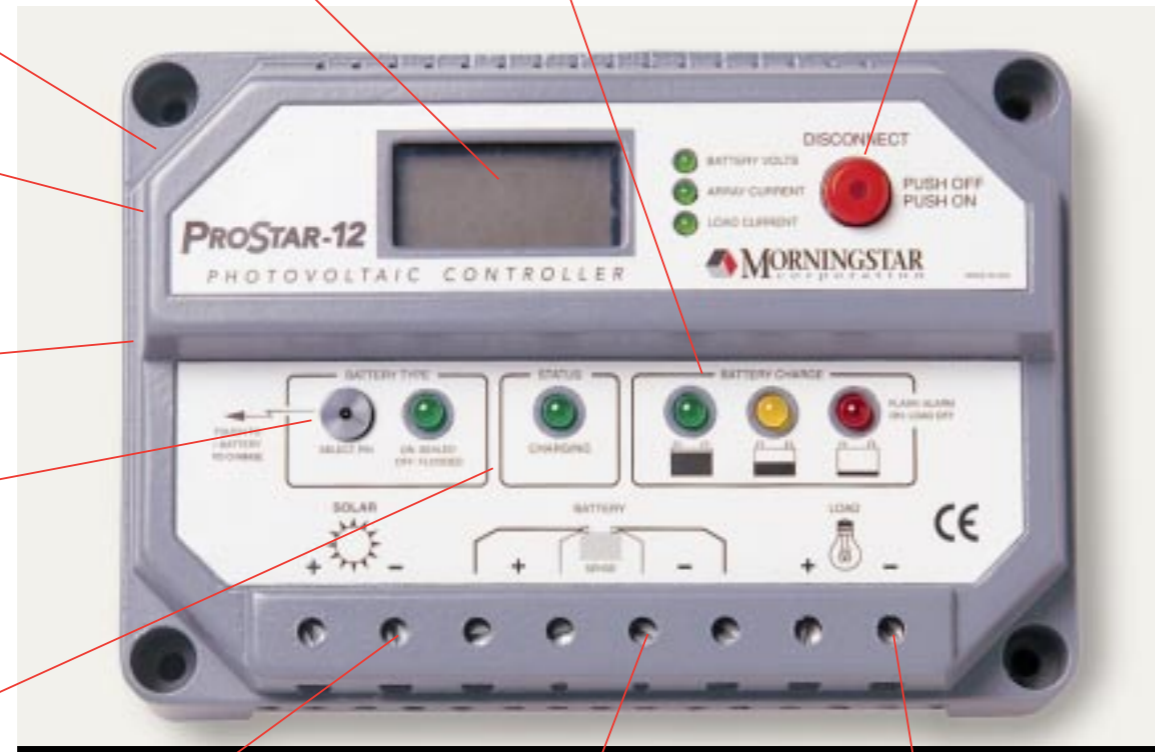
**FIELD SELECTABLE BATTERY TYPE**  
Electronic selection of either a sealed or flooded battery. Two sets of optimized control parameters are built into the processor.

**PWM BATTERY CHARGING**  
Series PWM design will reduce heating and system voltage drops. Precise finishing charge under all system conditions.

**LCD METER**  
(Option) Three-digit display with reflective foil for easy readability. Wide temperature range from -30°C to +85°C. Values displayed are accurate to within 1 and 2 percent.

**BATTERY CHARGE LED'S**  
Three LED's indicate relative battery state-of-charge. All LED's are pulsed to minimize parasitic loads.

**MANUAL DISCONNECT**  
(Option) Button will instantly disconnect all PV and load connections. Same button serves as a manual reconnect.



**REVERSE POLARITY PROTECTED**  
Full electronic protection against any sequence of reversed wire connections.

**BATTERY SENSE TERMINALS**  
Eliminates voltage drops for more accurate control. Automatic default to battery connections if sense is not connected.

**LOW VOLTAGE LOAD DISCONNECT (LVD)**  
Low resistance FET's will handle load starting currents up to 10 times rating. Electronic short-circuit protection. LVD is current compensated with no parasitic loss.

## PROSTAR OPTIONS TO MEET YOUR SPECIAL NEEDS

- LCD meter with manual disconnect button
- conformal coating for corrosive environments
- EPROM for custom setpoints (quantities over 500)

### FUTURE PROSTAR OPTIONS

- 48 volts and positive ground
- field adjustable setpoints
- additional inputs/outputs
- remote temperature probe
- RS-232 communications port with data acquisition

## PROSTAR SUPERIOR SERIES SWITCHING

Design by experienced PV system engineers, ProStar's series design provides many advantages compared to shunt controllers.

Series regulation reduces FET heating and lowers voltage stress on the power FETs. A series configuration also improves protection against lightning surges and reduces switching noise.

The series design improves charging accuracy. In PWM, series switching becomes self-correcting for temperature and system voltage drops.

## PROSTAR UNMATCHED SPECIFICATIONS

**THERMAL DESIGN**  
Low FET junction temperatures hold 5-year failure rates to less than 1 per 1,000 controllers. Expected life of 15 years.

**FIELD EFFECT TRANSISTORS (FET'S)**  
Eliminates problems with mechanical relays. Rugged, low resistance FET's used for all control functions.

**INDUSTRIAL RATED COMPONENTS**  
Rated operating temperatures of -40°C to +85°C. Controller designed for ambient temperatures up to 60°C.

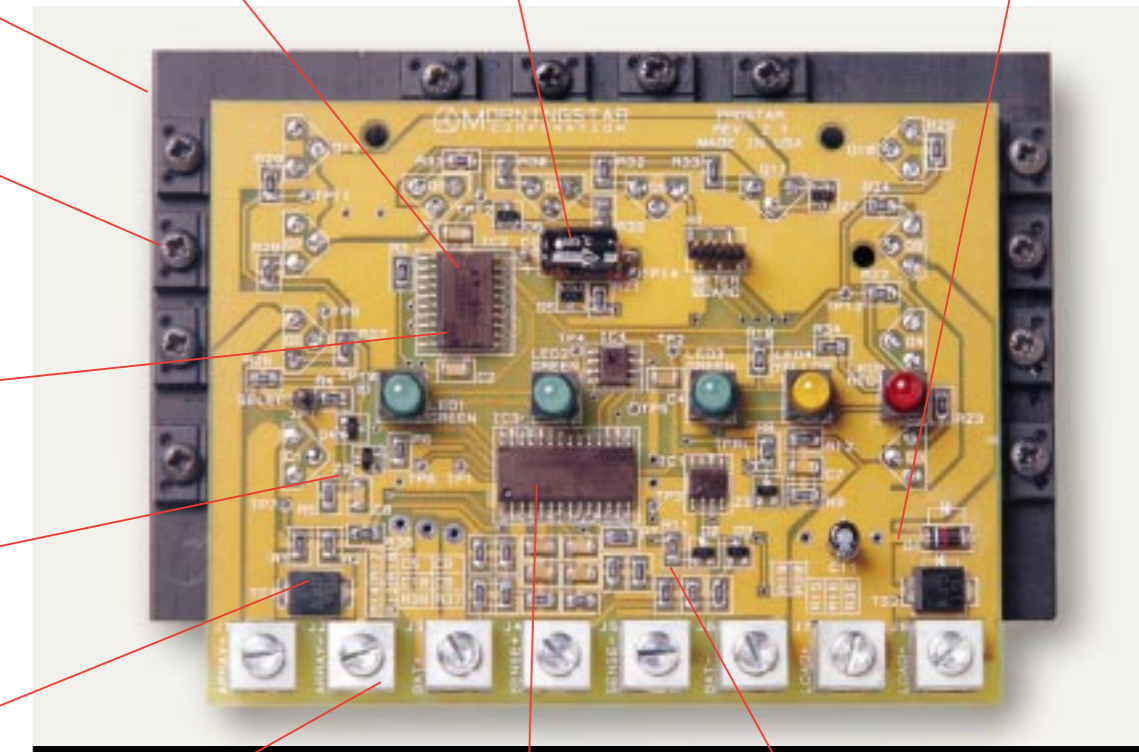
**HIGH EFFICIENCY**  
Designed to minimize energy losses with very low self-consumption losses and voltage drops.

**TRANSIENT VOLTAGE SUPPRESSORS**  
Each rated for 1500 W. React in nanoseconds for complete surge and transient protection.

**ELECTRONIC SAFETY DISCONNECTS**  
Eliminates the need for troublesome fuses. Electronic FET interrupt functions reliably protect against short-circuits, reverse polarity and high voltage.

**NO NEED TO DERATE**  
All electrical and mechanical designs are for worst-case conditions. In addition, a 1.25 minimum design margin is used.

**LOW NOISE**  
All  $\mu$ P inputs are filtered. Output line noise held to less than 400 mV pulses under 500 nsec width. Radiated noise less than 100 picowatts/KHz.



**EURO-STYLE TERMINALS**  
Sized for #6 AWG wire (up to 16 mm<sup>2</sup>). Plastic case provides terminal isolation. Stainless steel screws.

**CUSTOM MASKED MICROPROCESSOR**  
Single-chip microcomputer clocked at 2 MHz. Includes onboard ROM, serial port, A/D converter and multiple I/O channels.

**SURFACE MOUNT TECHNOLOGY**  
Efficient high-speed automated assembly and testing. Results in consistently high quality product at lowest cost.

## PROSTAR EXTENDED BATTERY LIFE

### INDUSTRY PROBLEM

It has been well documented in recent years that PV batteries suffer extremely low lifetimes, high maintenance needs and unpredictable load availability. The common on/off PV regulators are simple, but ineffective. Typical PV battery problems include:

- sulfation
- extended periods at low state-of-charge
- stratification
- permanent loss of capacity

- positive plate grid corrosion
- excessive gassing and heating
- premature failure

### PROSTAR SOLUTION

ProStar's intelligent control and unique features significantly improve battery performance. Features include:

- constant-voltage algorithm
- pulse-width modulation (PWM)
- automatic equalization
- digital control precision
- temperature compensation

- highly accurate setpoints
- low voltage drops
- sealed & flooded control parameters

ProStar provides higher charging efficiency, increases the battery capacity, reduces water loss, and extends the life of the battery.