SOLAR POWERED
Telecommunications





TELECOM, DATA COMMUNICATIONS & BROADCASTING

MORNINGSTAR PROFESSIONAL SERIES
WORLD'S LEADING SOLAR CONTROLLERS & INVERTERS

Applications:

1. Solar retrofit of existing grid-connected sites pre-equipped with rectifiers: Solar reduces electricity costs (OPEX), provides greater security and keeps the site up and running during prolonged outages.

2. New sites: Off-grid sites with no or limited and intermittent access to grid electricity sites can feature solar alone or also include a Genset and use solar to offset diesel/propane costs. Whether off-grid or grid-connected, new sites can benefit from an upgrade from conventional rectifiers.

Systems and Applications Include:

- Remote towers
- Back-up
- Repeater stations
- Base transceiver stations (BTS)
- Land mobile radio trunks (LMR)
- Rural telephony
- VSATs
- PTP private networks
- Mobile networks with satellite backhaul
- WISPs (Wireless Internet Service Providers)

From densely populated urban centers to remote isolated areas far from any electrical grid, solar electricity makes telecommunication operations easier and more cost-effective. Efficiency and reliability are paramount in telecommunication projects which may require as much autonomy as possible to get through long stretches without sunlight or refueling. Morningstar components and solar are a perfect match for providing maximum dependability under these challenging conditions. This guide spans several decades of Morningstar system installations that prove this point, going back to 1999.

Morningstar offers both serial and Ethernet communications using industry standard MODBUS™ protocol with many different solar controllers including the ProStar and TriStar families. Selected Morningstar components are now also SNMP-compatible (Simple Network Management Protocol), an internet standard protocol that is used to manage and monitor devices on an IP network. Within an existing network infrastructure, SNMP allows for a simple and convenient way to view and modify the status of critical system components on a private Local Area Network (LAN) or across a WAN (Wide Area Network), if so desired. Morningstar's SNMP-enabled Ethernet MeterBus Converter EMC-1 provides this capability.

Morningstar also now has the widest range of higher-powered solar controllers rated for hazardous locations (HazLoc) meeting both North American UL/CSA division group and International IECEx/ATEX zone requirements.

Morningstar's proprietary TrakStar™ solar harvesting technology and fanless design make for inherently more reliable and efficient systems. With over four million products installed in the field since 1993, Morningstar is the first choice for leading solar contractors in mission-critical installations around the globe. The following pages feature some of the ways our customers are using our products.

Telecommunications in Canada's Northwest

Location: Wolverine Creek, Northwest Territories, Canada
Product: TriStar MPPT™ 600V charge controllers and ground-fault protectors
System size: 15.6 kW of solar
Partners include: NorthwesTel, Howell-Mayhew Engineering, Action Electric, Conergy

Canada's vast Northwest Territories encompass large areas of forests, lakes and tundra. Howell -Mayhew Engineering developed a telecom PV system on the top of a mountain at Wolverine Creek near Great Bear Lake. The system includes 60 Conergy 260W multi-crystalline silicon modules and six Morningstar 600V ground-fault protectors and charge controllers.

Photo courtesy of Howell-Mayhew Engineering

Simple Network Management Protocol
SNMP
COMPATIBLE

TriStar MPPT 600V

IN THE FIELD

Cost-Saving Telecommunications in Weasel Lake

Photo courtesy of Howell-Mayhew Engineering

Location: Weasel Lake, Yukon, Canada
Product: TriStar MPPT 600V charge controllers and ground-fault protectors
System size: 10kW of solar PV
Partners include: NorthwesTel, Howell-Mayhew Engineering, Action Electric

A solar-powered telecom system on a mountaintop at Weasel Lake reduces reliance on diesel. The goal is to eliminate the use of generators for six summer months of the year. Using a generator only half of the year significantly reduces fuel and helicopter-transportation costs. High-voltage TriStar 600V charge controllers and ground-fault protectors allow wiring sub-arrays straight into the charge controllers without any combiner boxes, which lowers costs by reducing installation time on site.

Tier-one Telecom Company's Remote Integrated Arctic Solar Solution

Photo courtesy of Apeiron Energy

Location: Arctic site deployments
Product: MPPT 600V charge controller
System size: 13.4kW hinged array with 40 340W modules and 1,200Ah lithium-ion Polarium battery bank
Partners include: Apeiron Energy, Polarium Battery

ARIAS stands for Apeiron Remote Integrated Arctic Solar/ Solution, and is designed to provide operators of telecom/wireless, mining and remote community communications systems with "complete off-grid critical communications functionality" in the most extreme operating conditions. ARIAS is engineered as a complete solution capable of reducing a client's annual fuel costs 90% and helping them achieve ESG (Environmental, Social & Governance) goals. In this ARIAS configuration provided for Apeiron's telecom client, four strings of ten solar modules feed into four Morningstar TriStar MPPT 600V solar controllers. TriStars were chosen for their ultra-high reliability so critical in remote, difficult to access installations, as well as their contribution to simpler, leaner system design and installation through fewer module strings and less wiring.

Solar at Canada's Paterson Lake Telecom System Reduces Generator Use by 60%

Location: Paterson Lake, Northwest Territories, Canada
Product: TriStar MPPT 600V charge controllers and ground-fault protectors
System size: 15.6kW
Partners include: NorthwesTel, Howell-Mayhew Engineering, Action Electric, JA Solar

An off-grid telecom system at Paterson Lake in Canada's Northwest Territories traditionally relied on a diesel generator for electricity. Despite uneven slabs of rock, Howell-Mayhew Engineering and Action Electric developed a 15kW solar PV system to reduce generator use by 60%. Workers dropped off equipment from a helicopter because of no road access for 50 miles/80 kilometers. The installation uses black 260W JA Solar modules and batteries for clean, reliable, cost-effective solar electricity. The project also incorporated Morningstar 600V ground-fault protectors and charge controllers. Now, the system only requires the generator during the winter.

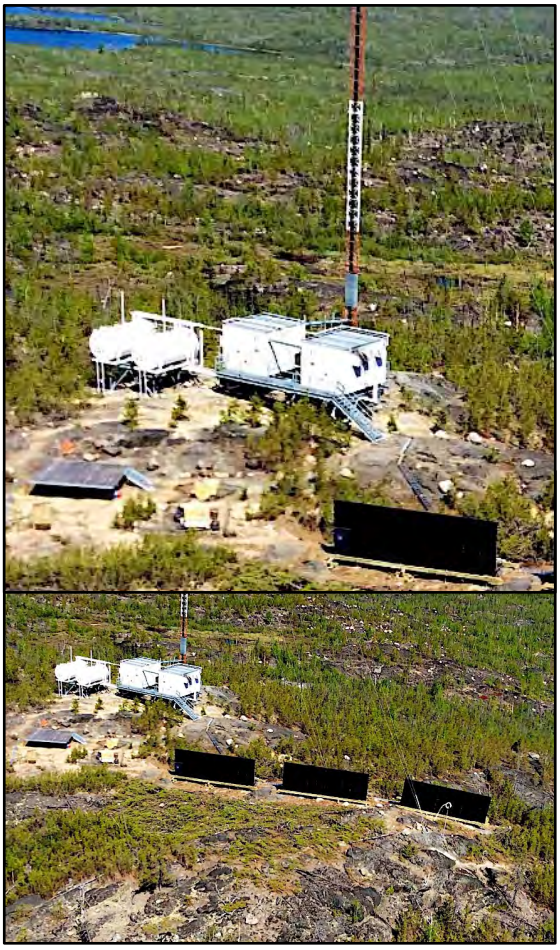


Photo courtesy of Howell-Mayhew Engineering

Helping Remote Arctic Verizon Facility Save on Fuel

Location: Canadian Arctic
Product: TriStar MPPT 600V, disconnect box
System size: 7.2kW of solar, 15kW generator, 3,000Ah, 48V battery
Partners include: Sunwize Technologies, Howell-Mayhew Engineering, East Penn Manufacturing

Sunwize chose the Morningstar TriStar MPPT 600V controller for a Verizon facility in Canada because the device could withstand arctic regions with temperatures of -67°F to +86°F (-55°C to +30°C). The controller's long wire-runs, reliability and ease of installation to produce a low angle of incidence were also considerations for its selection. In addition to solar, the project included a generator that used four, 3.6kW inverters on a custom control panel. This generator hybrid project saved 70% on fuel consumption for off-grid cell towers with a microwave uplink.

Lifeline Telecom Services in Central Oregon

Location: Oregon
Product: TriStar MPPT
System size: Two 235W solar panels
Partners include: Rural Technology Group, SolarWorld

A Morningstar TriStar MPPT controller helps distribute internet services to a rural community in Central Oregon where many residents live without a telephone or cell service. Morningstar partnered with Rural Technology Group for an experimental project to expand internet service in rural areas with rugged terrain.

The team successfully installed a solar-powered microwave relay site on top of a mountain. A high-speed connection VOIP service now gives the community access to lifesaving emergency calls.

So far, the project has survived hurricane-strength winds, periods of dark and snowy days and temperatures in excess of 105°F to -4°F (41°C to -20°C). This relay also cost less than $3,500 to construct and commission.

Photos courtesy of Rural Technology Group

Simple Network Management Protocol
SNMP
COMPATIBLE

TriStar MPPT and PWM

IN THE FIELD

Internet Access Changes Lives in Kenya

Location: Kenya
Product: TriStar MPPT
Partners include: Mawingu Networks, Microsoft

Half of the world doesn't have access to the internet, let alone cell service. To address this issue, Microsoft partnered with start-up Mawingu Networks to unitize the TV broadcasting spectrum and deliver affordable internet virtually anywhere. Internet cafes and other public hotspots in Kenya help increase communication and opportunity, changing people's lives. For example, doctors from various clinics are able to hold weekly online telemedicine meetings with the main hospital rather than traveling for days to meet in person. Such virtual connections have become even more essential during the COVID-19 pandemic.

The internet hotspots are driven by solar-powered main access points, the largest of which can service up to 1,000 people. Morningstar TriStars keep the access points operating reliably to ensure critical systems remain available.

Hybrid Cell Towers for Verizon Wireless

Location: Lake Havasu City, Arizona and Twentynine Palms, California
Product: TriStar MPPT-60
System size: 7.2kW of solar
Partners include: Verizon Wireless, SunWize, PV Pros, East Penn Manufacturing

Solar power helps two Verizon Wireless generator-hybrid cell towers with microwave uplink systems save 70% on fuel consumption. Each system includes 7.2kW of solar with several TriStar TS MPPT-60 controllers and East Penn AGM batteries.

Bringing Telecommunications to Rural Communities in Peru

Location: Peru
Product: TriStar™ TS-60, TriStar MPPT-60, MeterHub, Relay Driver
Partners include: CIME, Peru Ministry of Transportation

Many Peruvians living in rural areas do not have access to cell service; they can walk to a payphone if they are lucky. The lack of quick communication and the time and money spent on travel negatively affects communities throughout Peru.

The Peruvian government introduced the Fitel Centro Norte y Fitel Centro Sur initiative to reduce the gap in access to telecommunication services in rural areas. It hired CIME Comercial S.A. to design and install a standalone battery-based, solar-powered solution for the VSAT network, a two-way satellite ground station with a dish antenna. Each of the eight installations include a TriStar-60 and three TriStar TS MPPT-60 solar controllers, two Relay Drivers, one Remote Meter and one MeterHub. Enclosed in a shelter along with batteries and solar modules, this system brings communication to places the electric grid is unable to reach.

Peru's telecommunications systems have increased the well-being of the rural communities, giving farmers access to market trends and agricultural information and saving lives with healthcare connections.

Telecommunications at Zimbabwe's Matusadona National Park

Location: Zimbabwe
Product: TriStar solar controller
System size: 1kW of solar
Partners include: Samansco

Wildlife management usually takes place in challenging, remote locations so many times these systems are powered by solar. A TriStar unit controls this solar installation at the Matusadona National Park in Zimbabwe. The 1kW PV system powers lights and a satellite system while charging communication equipment. This installation power system is used to protect local wildlife.

Photo courtesy of Samansco

Connecting a Catholic Mission in West Africa

Location: Guinea Bissau, West Africa
Product: TriStar MPPT-60
System size: 6kW of solar and 12, 100Ah, 12V batteries
Partners: MD Electrical Installations

Nuns at the Catholic mission of Nossa Senora Apparecida benefit from a solar installation that powers their essential needs including communication. Several TriStar TS MPPT-60 controllers help drive the installation. The system consists of 32 190W solar panels formed in three strings for a maximum power of 6.08kW. The system also includes 12, 12V, 100Ah batteries for backup power.

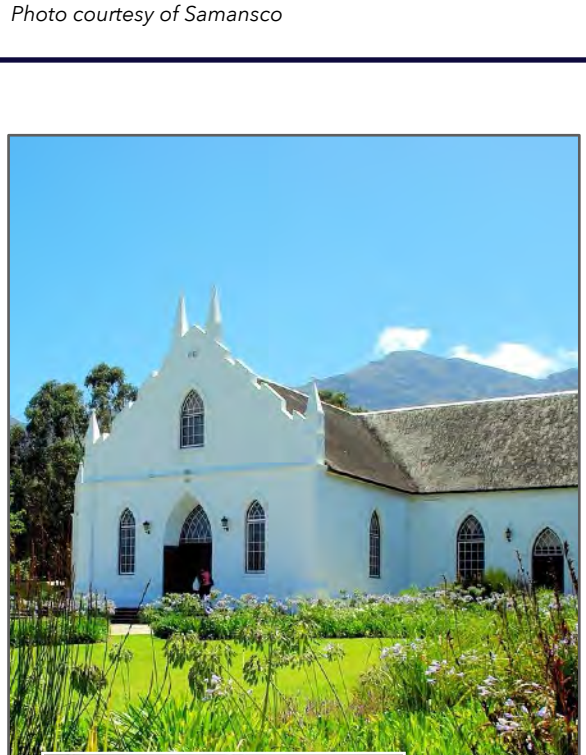


Photo courtesy of Mr. Moreno Mazzi, MD Electrical Installations

Wireless Cellular Network for Remote U.S. Locations

Location: United States
Product: TriStar TS MPPT-60
Systems: Solar panel and diesel generator (four sites)
Partners include: Motive Energy, EnerSys, Emerson

Motive Energy installed solar, a diesel generator, two 1,500Ah EnerSys deep-cycle battery strings, eight Emerson NetSure 502 power plant 30A inverter chargers and TriStar MPPT-60 controllers for four outdoor remote locations without access to commercial power.

Photo courtesy of Solara AG

Seismic Measuring Systems in Italy

Location: Italy
Product: TriStar TS-45
System size: 30 PV systems
Partners include: Solara AG

Over the last 2,000 years, more than 400 destructive earthquakes have been documented in Italy with 15 major earthquakes since 1905. Therefore, early detection is critical to save lives. Solar powers more than 30 Electtronica measurement systems in Italy. Each station is equipped with two Solara AG solar modules, two Morningstar TriStar TS-45 controllers and two GEL batteries. The systems power two seismic detection sensors for earthquakes, one radio bridge for remote data transmission and one GSM modem for alarms transmission.

Telecommunications in Egypt's Extreme Climate

Location: Egypt
Product: TriStar TS MPPT- 60
System size: 4,950W of solar and 1,200Ah battery backup
Partners include: Independent Energy

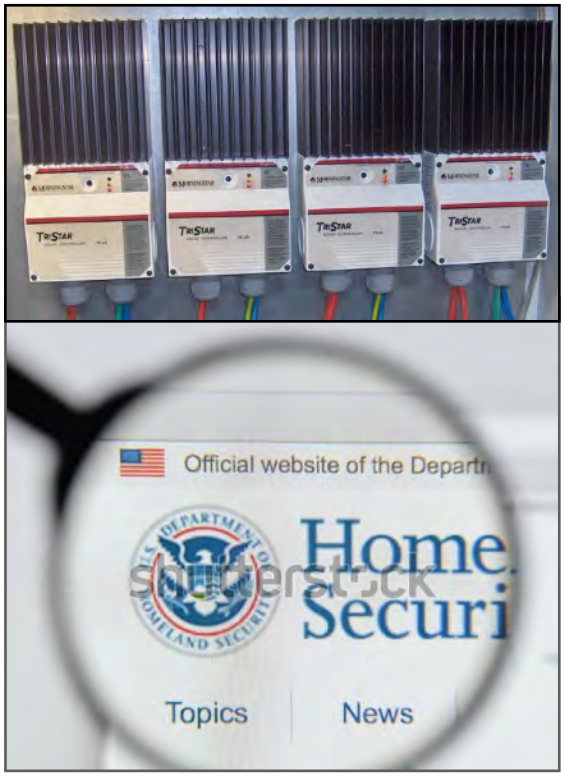
Morningstar products thrive in extreme desert environments. The TriStar superior thermal management capabilities and fanless design made it the first choice for this project in Egypt. Four TriStar TS MPPT-60 controllers, a RD-1 Relay Driver, a HUB-1 MeterHub and a TS-RM-2 TriStar Remote Digital Meter drive this solar installation which powers remote telecommunications. Three TriStar MPPT-60 units help charge while one regulates loads. The RD-1 and HUB-1 signal alarms for aspects such as low voltage. The system has ground-fault monitoring and 1,200Ah of battery backup.

Photos courtesy of Independent Energy

Homeland Security Communications

Location: United States
Product: TriStar
System size: 10kW of solar
Partners include: S.U.R. Energy Systems, Uni-Solar

Like many other mission-critical and sensitive solar power installations, this homeland security communications system backs up power for a repeater using Morningstar TriStar controllers. The 10kW project includes 588 Uni-Solar shingles as well as 24 batteries.



Controlling Railroad Signaling
Power Systems

Location: United States
Product: TriStar TS MPPT-45
System size: 3,360W of solar
Partners include: Ameresco, EMI

Morningstar's TriStar helps control solar-powered railroad wayside signaling applications, such as this intermediate signal. Three 20-foot towers make up the system and each retractable tower holds 1,120W with two TriStar TS MPPT-45 units (each regulating 580W).

EMI exclusively manufactures each tower for Ameresco Solar. The systems are shipped complete and assembled in the field. On-site training and audits ensure proper operation. Currently, Ameresco Solar has several hundred of these systems installed in North America on all Class 1 railroads.

Photos courtesy of AMERESCO Solar

Enabling Remote Telecommunications in China

Location: China
Product: TriStar
System size: 9.6kW of solar
Partners include: China Mobile

This China Mobile project for a remote telecom site consists of a 3G relay station powered by solar.

Powering Spanish Telecommunications

Location: Spain
Product: TriStar TS MPPT-60, Relay Driver
System size: Six, 135W solar modules
Partners include: Bureau Baterias

This telecommunications system in Spain includes six 130W solar modules and a 12V battery bank with six 2V, OPzS cells. Five paralleled TriStar TS MPPT-60s and a Relay Driver help control the system.

Powering Satellite Communications Around the Globe

Location: Multiple Countries
Product: TriStar MPPT-60, TriStar TS-60
System size: 4kW of solar, 29 sites

Satellite communication is important for many areas around the globe. Morningstar equipment helps power these projects. For example, two TriStar TS MPPT-60 controllers and one TriStar TS-60 for load control work with 4kW solar systems at 29 sites, such as this one depicted.

Photos courtesy of SunWize Technology

Reliable Power to Detect Earthquakes and Other Seismic Events

Location: Oregon and Washington
Product: SunSaver MPPT™
Partners include: The Pacific Northwest Seismic Network

Unlike severe weather, which can be tracked and mapped for days and even weeks before landfall, earthquakes appear suddenly and without warning. Advances in technology now allow detecting earthquakes within life-saving seconds before shaking has begun.

The Pacific Northwest Seismic Network (PNSN) monitors ground motion and generates real-time earthquake information to emergency responders, the press and the public. The project has more than 400 stations, making it the second largest seismic network in the United States. Strong-motion instrumentation, especially with real-time digital communications, requires a reliable power source. Because weather hazards often cause widespread power outages, each system must have a backup battery system with enough capacity to operate continuously for four days.

Morningstar's SunSavers enable many of PNSN™ power supply systems. The Ethernet MeterBus Converter (EMC-1) adapter allows monitoring critical data in real-time, alerting technicians of any issues. The EMC also integrates with the Simple Network Management Protocol (SNMP) to help PNSN engineers plan for maintenance.

Simple Network Management Protocol SNMP COMPATIBLE

SunSaver MPPT and PWM

IN THE FIELD

Powering Public Radiation and Weather-Monitoring Stations

Location: Nevada
Product: SunSaver™
System size: 50 and 60W solar panels on 24 sites
Partners include: The Desert Research Institute

The Desert Research Institute (DRI) of the Nevada System of Higher Education administers the Community Environment Monitoring Program (CEMP) to watch the ambient environment for radiation from past nuclear testing, ensuring the safety of nearby communities. The program encompasses 24 publicly accessible radiation and weather-monitoring stations.

Solar panels (50W and 60W) operate in conjunction with a deep-cell battery to power all CEMP station instrumentation. Morningstar solar charge controllers have kept these systems reliably running for more than two decades.

Direct participation in collecting data and disseminating information from these stations gives residents a greater sense of security. All information collected from automated sensors at these stations is posted online and updated at least hourly.

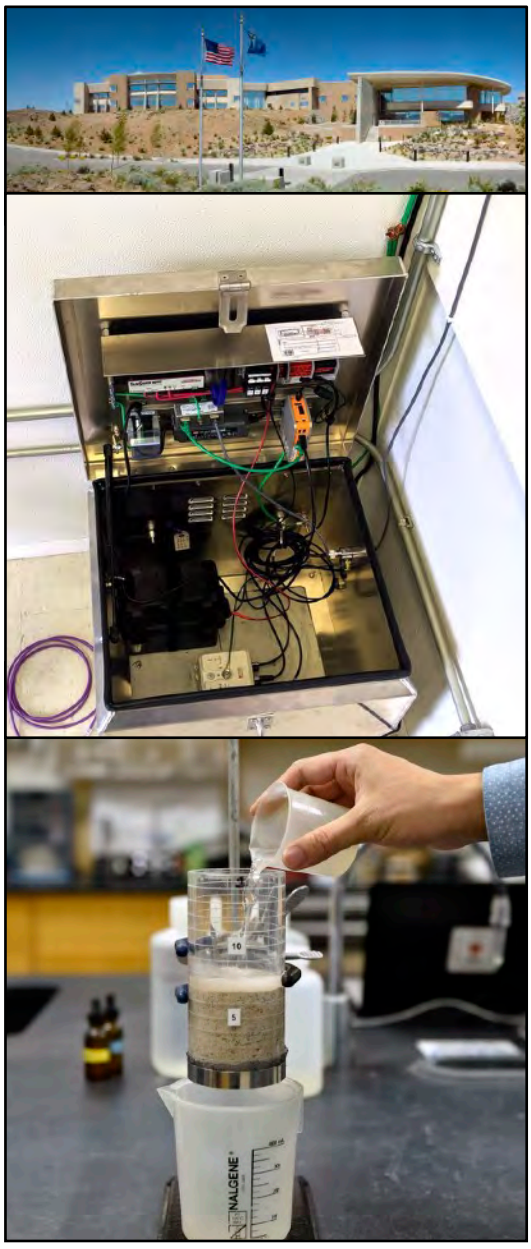


Photo courtesy of Nunatak Alternative Energy Solutions

Data Monitoring at a Colorado Mine Cleanup Site

Location: Colorado
Product: ProStar™ PS-30 and TriStar TS-45
Partners include: Nunatak Alternative Energy Solutions, Ameresco

Morningstar's ProStar PS-30 and TriStar TS-45 control this data monitoring system at a Colorado mine cleanup site where temperatures can drop to -40°F (-40°C). Morningstar controllers have built-in cold weather protection features and circuitry designed to protect batteries from damage when charging in extremely cold conditions.

Photo courtesy of Kyocera Solar Do Brasil LTDA

Powering Brazil's Telecom Universalization Program

Location: Brazil
Product: ProStar-PS-15 and ProStar-PS-30
System size: 320W or 180W of solar with batteries, 2,500+ sites
Partners include: Kyocera Solar, Embratel

Morningstar deployed nearly 2,000 ProStar-15 and ProStar-30 systems to small villages through Brazilian's Telecom Universalization Program. Phone company Embratel installed more than 2,500 solar-powered systems for public telephones. Each site includes VSAT equipment from Hughes Network Systems or Gilat Satellite Networks. The Hughes stations include four 80W Kyocera Solar modules and four 150Ah batteries. The Gilat stations have three 60W Kyocera Solar modules and two batteries.

ProStar MPPT and PWM

IN THE FIELD

Simple Network Management Protocol SNMP COMPATIBLE

International Certification Agency Selects Morningstar for Success Story

Location: Massachusetts
Product: All
Partners include: TUV Rheinland

When the people responsible for certifying compliance and safety for the industry want to profile your brand for a case study, you know you're doing something right. At Morningstar, we're proud that TUV Rheinland—an international organization at the forefront of testing, standards and certification for everything from consumer products to industrial and medical devices—selected us for its own case study in solar.

As the case study notes, in the solar industry, standards and regulations change quickly, with new standards emerging at a rapid pace. Morningstar's advanced designs and proven reliability provided TUV with an ideal partner to showcase in this category.

Photo courtesy of TUV Rheinland

TÜVRheinland®

Products Featured

TriStar MPPT™ 600V series

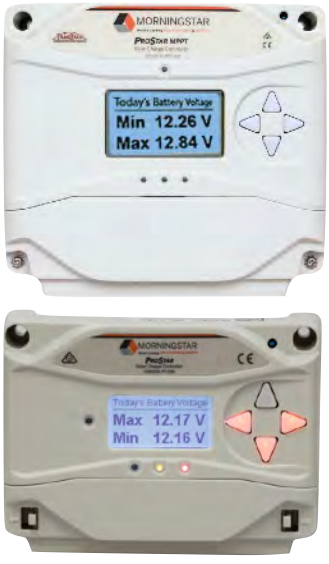
60A at up to 600 Voc

A breakthrough in solar controller technology and a new standard for the telecom industry. Even at this level the controller needs no cooling fans thanks to Morningstar's advanced thermal management engineering. 97.9% peak efficiency and fanless design ensures long-term reliability. Available in four versions, including GFPD and DC Transfer Switch models. Speaks Modbus and SNMP with the optional EMC-1 adaptor.

TriStar MPPT™ and TriStar™ PWM solar controllers

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

Iconic, industry-leading design for larger (up to 4.2 kW) engineered systems. Parallel scalability of chargers and load controllers to power rating of up to 45 kW; ideal for large hybrid system design. Highest peak efficiency for off-grid controllers in the industry: 99% (TS-150). TriStar MPPT has TrakStar solar harvesting technology; PWM version provides charging plus load and diversion control. Fully-rated for operation at temperatures up to 45°C. Fanless design for long-term reliability. Speaks Modbus and SNMP with the optional EMC-1 adaptor.



ProStar™ MPPT and ProStar™ PWM solar controllers

25A or 40A at up to 120 Voc

Proven in over two decades of use and continually improving, both "are the legend and the latest in a single product." An advanced controller for mid-range systems up to 1,100W. MPPT version has TrakStar solar harvesting technology for maximum solar harvesting. Fanless design for long-term reliability. Speaks Modbus and SNMP with the optional EMC-1 adaptor. **Both versions now rated for use in Hazardous Locations, certified for UL/CSA Class/Division and IECEx/ATEX Zone applications**.

"Best of the best. Have used and seen many others. This is the most durable..."

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

SunSaver™ MPPT and SunSaver PWM solar controllers

15A at up to 75V

The "single most successful charge controller in the solar industry." SunSaver MPPT with TrakStar technology is the perfect charging solution for smaller off-grid solar systems up to 400W. The hardened, tropicalized SunSaver model is the leading controller choice for use in extreme and hazardous environments–Division 1, Class 2. Includes load control; speaks Modbus and SNMP with the optional EMC-1 adaptor. **Both versions now rated for use in Hazardous Locations, certified for UL/CSA Class/Division and IECEx/ATEX Zone applications.**

"...This is the only one I'd use...it's the one I wish I bought first"

SureSine™ Classic DC-to-AC inverter

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

Compact, powerful and proven in demanding rural electrification projects around the globe. Ideal for industrial communications, security and other applications using DC electricity generated from solar to power AC-based systems up to 300W with 600W peak/surge power. A cast, anodized aluminum enclosure and encapsulated circuitry plus no internal cooling fan needed ensure long-term reliability under the harshest conditions. Speaks Modbus and SNMP with the optional EMC-1 adaptor.

"...how all inverters should be made. Thank you, Morningstar"

Ethernet MeterBus Converter (EMC-1)

Connects to any enabled controller or inverter to provide enhanced data and network features, including SNMP or Simple Network Management Protocol, an important feature for maintaining telecommunications power systems, and Modbus. EMC-1 allows MeterBus-enabled products to send data to the internet.

Relay Driver™ (RD-1)

Logic module for high-level system control functions such as high/low voltage alarms, load control, generator start.

Solar powers telecommunications. And we power solar

MORNINGSTAR PROFESSIONAL SERIES
WORLD'S LEADING SOLAR CONTROLLERS & INVERTERS

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