

TriStar MPPT™ 60 Competitive Advantages

MPPT Controller Comparison Criteria	Morningstar TriStar MPPT	OutBack FLEXmax 60/80	Schneider XW 60 150
Controller Efficiency	<ul style="list-style-type: none"> Peak Efficiency = 99% Multi-Stage power >+3% higher efficiency at lower power Highest efficiency for all operating conditions 	<ul style="list-style-type: none"> Peak Efficiency = 98.1% <ul style="list-style-type: none"> <u>2% efficiency drop at full high power levels</u> <u>>3% less efficient than TS-MPPT at low power</u> 	<ul style="list-style-type: none"> Not published but tested at lower efficiency under all operating conditions <u>>3% less efficient than the TS-MPPT at low power</u>
Self-Consumption	<ul style="list-style-type: none"> 1.7W (+1W with Ethernet) No fans 	<ul style="list-style-type: none"> <u>9 Watts max</u> Fan uses power 	<ul style="list-style-type: none"> <u>4 Watts max</u> No fans <u>Highest idle power usage</u>
Reliability, Performance & Operation	<ul style="list-style-type: none"> Epoxy Encapsulated Inductors Conformally Coated Circuit Boards No fans No mechanical relays 	<ul style="list-style-type: none"> Noisy Fans Mechanical Relays <u>Both prone to failure</u> 	<ul style="list-style-type: none"> <u>Mechanical relays prone to failure</u> Relays make irritating clicking noise
Ambient Operating Temperature Rating at Full Power	-40°C to +45°C	-40°C to +40°C	-20°C to +45°C
MPPT Tracking Accuracy & Efficiency	<ul style="list-style-type: none"> ¼ - ½ second sweep Adjusts frequency of sweeps for conditions 	<ul style="list-style-type: none"> Losses power due to very slow tracking <u>30-60 second sweep</u> 	<ul style="list-style-type: none"> <u>Can get stuck on non-maximum power point</u>
PC / Remote Communication Capabilities (Built-In or Auxiliary)	<ul style="list-style-type: none"> Ethernet, EIA-232 or EIA-485 MODBUS Open Industry-Standard Protocol 	<ul style="list-style-type: none"> Mate/Mate2 - RS-232 only Costly Mate3 - Ethernet (<u>Non-Industry Standard</u>) 	<ul style="list-style-type: none"> XW CT- PC connection only configuration/firmware only Added cost
Open or Proprietary			
Voltage Sensor - obtains accurate battery voltage level so there is no undercharging due to voltage drop	<ul style="list-style-type: none"> Voltage sensor 16 to 24 AWG terminal 	<ul style="list-style-type: none"> <u>Operator must measure V battery & calibrate</u> 	<ul style="list-style-type: none"> <u>No Voltage Sensor</u> <u>No Calibration Option</u>
Form Factor / Size	29 x 13 x 14.3 cm 4.17 kg	35 / 41.3 x 14.6 x 11.4 cm 5.28 / 5.53 kg	<u>40% larger by volume</u> 36.8 x 14.6 x 14 cm 4.88 kg
Radio Frequency Radiation Interference / FCC Class B Part 15 Compliance	FCC Class B Part 15 Compliant	<u>No FCC Compliancy</u>	FCC Class B Part 15 Compliant
Consistency of Ownership & Management	<ul style="list-style-type: none"> 20+ Years of the same: <ul style="list-style-type: none"> Ownership Management Long-term Employees 	<ul style="list-style-type: none"> Taken over by larger Corp New president & large turnover of employees Manufacturing in China 	<ul style="list-style-type: none"> Taken over by large Corp Degraded return policy Major turnover in management
Experience	<ul style="list-style-type: none"> Over 2 million solar charge controller & inverter installations Available from over 230 long-term authorized Morningstar distributors Installed in over 111 countries 	<ul style="list-style-type: none"> Inverter supplier <u>primarily</u> 	<ul style="list-style-type: none"> Electrical distribution and inverter supplier <u>primarily</u>



TriStar MPPT™ 60

Competitive Advantages



- **Highest Efficiency** for all Operating Conditions = Highest MPPT boost
 - Multiple Power Stages: **Superior Low Power Performance** during sunrise & low solar levels provides more charging for critical time periods (several days of cloudy weather)
- **Lowest Self Consumption** (No fans)
- **Widest ambient temperature rating at full power**
- **Built in Voltage Sensor**
 - Obtains accurate battery voltage level so there is no undercharging due to voltage drop
- **Form Factor**
 - The smallest footprint & overall form factor at this power level (cm & kg)
- **FCC Class B Part 15 Compliant**
 - Meets U.S. & International Radio Frequency Radiation Interference Limitations
- **Highest Reliability** due to best environmental protections and fewer components prone to failure
 - Less maintenance & remote site visits
 - Quieter Operation : No fans or mechanical relays
- **Best MPPT Tracking (TrakStar™ Technology)**
 - Most Accurate & Highest Efficiency
 - More energy harvest due to more time operating on the maximum power point
- **Open / Built-in PC or Remote Communication Capabilities**, including Ethernet, EIA-485 & EIA-232
 - No need to buy expensive auxiliary equipment
 - More communications options at lower cost
 - MODBUS™ (Open / Standards-based Protocol)