TriStar MPPT™ 60 Competitive Advantages

MPPT Controller Comparison Criteria	Morningstar TriStar MPPT	OutBack FLEXmax 60/80	Schneider XW 60 150
Controller Efficiency	• Peak Efficiency = 99% • Multi-Stage power >+3% higher efficiency at lower power • Highest efficiency for all operating conditions	• Peak Efficiency = 98.1% • 2% efficiency drop at full high power levels • >3% less efficient than TS-MPPT at low power	• Not published but tested at lower efficiency under all operating conditions • >3% less efficient than the TS-MPPT at low power
Self-Consumption	• 1.7W (+1W with Ethernet) • No fans	• 9 Watts max • Fan uses power	• 4 Watts max • No fans • Highest idle power usage
Reliability, Performance & Operation	• Epoxy Encapsulated Inductors • Conformally Coated Circuit Boards • No fans • No mechanical relays	• Noisy Fans • Mechanical Relays • Both prone to failure	• Mechanical relays prone to failure • 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	• ¼ - ½ second sweep • Adjusts frequency of sweeps for conditions	• Losses power due to very slow tracking • 30-60 second sweep	• Can get stuck on non-maximum power point
PC / Remote Communication Capabilities (Built-In or Auxiliary) Open or Proprietary	• Ethernet, EIA-232 orEIA-485 • MODBUS Open Industry-Standard Protocol	• Mate/Mate2 - RS-232 only • Costly Mate3 - Ethernet (Non-Industry Standard)	• XW CT- PC connection only configuration/firmware only • Added cost
Voltage Sensor - obtains accurate battery voltage level so there is no undercharging due to voltage drop	• Voltage sensor • 16 to 24 AWG terminal	• Operator must measure V battery & calibrate	• No Voltage Sensor • No Calibration Option
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	40% larger by volume 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	No FCC Compliancy	FCC Class B Part 15 Compliant

Consistency of Ownership & Management	• 20+ Years of the same:
	  • Ownership
	  • Management
	  • Long-term Employees
		• Taken over by larger Corp
		• New president & large turnover of employees
		• Manufacturing in China
			• Taken over by large Corp
			• Degraded return policy
			• Major turnover in management

Experience	• Over 2 million solar charge controller & inverter installations • Available from over 230 long-term authorized Morningstar distributors • Installed in over 111 countries	• Inverter supplier primarily	• Electrical distribution and inverter supplier primarily

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)