OPTIMUS
MECHATRONICS

DUAL-AXIS SOLAR TRACKER – TECHNICAL DATASHEET

Utility-Scale High-Performance Solar Tracking System

---

1. Product Overview

The Dual-Axis Solar Tracker is an advanced photovoltaic mounting and tracking system designed to maximize energy generation by continuously aligning solar modules with the sun's position throughout the day and across seasons.
By independently controlling **East–West (azimuth)** and **North–South (elevation)** movement, the system significantly increases incident solar irradiance on the modules, resulting in higher annual energy yield and improved Capacity Utilization Factor (CUF) compared to fixed-tilt and single-axis systems.

The system is engineered for **utility-scale and large commercial solar projects**, with emphasis on structural robustness, long service life, autonomous operation, and ultra-low maintenance.

---

2. Key Advantages

- Higher annual energy yield compared to fixed-tilt and single-axis systems
- True dual-axis tracking for daily and seasonal sun-path optimization
- Robust structural design suitable for Indian climatic and wind conditions
- Ultra-low mechanical maintenance due to optimized intermittent movement
- Modular and scalable architecture for MW-scale deployment
- Autonomous operation without dependence on continuous connectivity

OPTIMUS
MECHATRONICS

3. Mechanical & Structural Specifications

Parameter	Description
Tracking Type	Dual-Axis (Azimuth + Elevation)
Structural Material	High-strength structural steel
Corrosion Protection	Hot-dip galvanization or equivalent
Design Life	25+ years
Wind Safety	Automatic stow configuration during high-wind conditions
Foundation Type	RCC / pile foundation (site dependent)

4. Tracking & Motion System

Parameter	Description
Tracking Method	Algorithm-based astronomical sun-position tracking
Sensor Dependency	Does not rely on irradiance or orientation sensors
Tracking Accuracy	±2° (typical, site dependent)
Motion Mechanism	Electrically actuated linear motion system
Movement Strategy	Intermittent indexing (non-continuous movement)
Typical Daily Adjustments	~70 indexing movements per day
Typical Movement Duration	~2 seconds per adjustment
Safeguards	Mechanical end-stops and software-defined limits
Stow Positions	Automatic night-time and adverse-weather stow

OPTIMUS
MECHATRONICS

5. Control & Automation

Feature	Description
Control Logic	Time-based astronomical sun-position algorithm
Operating Mode	Fully autonomous local operation
Time Reference	Internal high-accuracy timekeeping
System Coordination	Independent tracker operation to avoid synchronized loads
Communication	Optional interface for monitoring and diagnostics
Offline Capability	Full operation without network availability

6. Power & Auxiliary Consumption

Auxiliary Power Consumption: ≤ 12 kWh per tracker per year

7. Environmental & Protection Ratings

Parameter	Specification
Operating Temperature	Suitable for extreme outdoor conditions (typical −20 °C to +80 °C)
Wind & Environmental Loads	Designed as per applicable site-specific standards
Dust & Moisture Protection	Outdoor-rated enclosures (minimum IP65 or equivalent)
Terrain Suitability	Plain, agricultural, and semi-rocky land

OPTIMUS
MECHATRONICS

8. Performance & CUF

Parameter	Value
Expected CUF	**Up to ~26%**
Relative Yield vs Fixed Tilt	**~25–36% higher annual generation**

Actual CUF depends on site irradiation, system losses, and grid availability.

9. Financial Impact (Indicative)

IRR Impact: By increasing CUF and annual energy generation, the dual-axis tracking system improves project cash flows and enhances long-term project IRR compared to fixed-tilt installations.

- **Indicative Project IRR (Pre-Tax):** up to **~18%** for projects achieving ~26% CUF
- *(Subject to tariff, financing structure, O&M costs, and grid availability)*

10. Applications

- Utility-scale solar power plants
- Government and PSU solar projects
- Industrial captive power plants
- High-CUF and land-constrained installations

---

11. Summary

The Dual-Axis Solar Tracker is designed for projects where **maximum energy generation, improved CUF, and long-term financial performance** are critical. Its robust mechanical design, autonomous control philosophy, and low auxiliary power consumption make it a strong solution for **large-scale solar deployments in demanding environments**.