



mounting
systems

SIGMA

Ground-mounted systems



THE SIGMA PORTFOLIO

OUR SIGMA PORTFOLIO IS DESIGNED FOR GROUND-MOUNTED PROJECTS OF ANY SIZE.

OUR FIXED-TILT AND TRACKER SOLUTIONS ARE SUITABLE FOR ALL TYPES OF MONO- AND BIFACIAL SOLAR PANELS – FRAMED OR UNFRAMED, PORTRAIT OR LANDSCAPE.

We aim to offer strong constructions to our customers in order to maximize the overall efficiency of their photovoltaic plants.

Ramming posts replace expensive ground work and enable construction even on uneven ground. Depending on customers' requirements, environmental conditions, we use long-lasting, corrosion resistant steel or aluminum structures in order to minimize the levelized cost of energy (LCOE).

In the last five years alone, we have installed over 9 GWp of the Sigma structures in 52 different countries. The four maxims which have consistently guided us over the last 27 years distinguish our products and services:

PERFECT TECHNOLOGY

We develop and produce high-quality mounting systems. Our engineers are continuously improving the structural design, use of materials and mounting processes.

TOP QUALITY

We provide the utmost in quality, work efficiently and reliably. And deliver on time. Our products and quality management are certified.

EFFICIENT LOGISTICS

Our packaging solutions optimize the freight costs. As an approved exporter and importer, we support the entire customs process.

RELIABLE CUSTOMER SERVICE

We provide customized solutions and detailed offers including all structural calculations. For long-term project efficiency.

THE SIGMA MOUNTING SYSTEMS

Whether steel or aluminum, fix-tilt or tracker: our Sigma structures carry all modules and permit countless different module arrangements.

THE TECHNICAL DETAILS AND MATERIALS OVERVIEW

SIGMA SYSTEMS

| | |
|--------------------------|---|
| MODULS | Framed, unframed, monofacial, bifacial, half-cut |
| MODULE TILT | 5° - 60° |
| MODULE ORIENTATION | Vertical/portrait, horizontal/landscape |
| GROUND CLEARANCE | As required by customer |
| WARRANTY | 10 years (standard), extendable up to 20 years |
| GROUND SLOPE NORTH-SOUTH | Up to 45° |
| MODULE FASTENING | Clamps, screws, rivets – in accordance with standard fastening requirements of module OEM |
| FOUNDATION | Driven piles, ground screws, concrete foundation, in-cast concrete solution |

MATERIALS COMPARISON

STEEL

More affordable than aluminium for large projects
Long-lasting thanks to high-quality galvanizing
Assembly-friendly design
Very robust construction

ALUMINUM

Very flexible for project-specific adaptation
Low weight for transportation and assembly
Adapts well to different terrains
High resistance to corrosion

SIGMA II

The Sigma II mounting system provides high adaptability and cost-efficiency. The system, primarily made out of steel, is available as a single- and double-post version.



| | |
|-------------------------------------|--|
| MAXIMUM TABLE LENGTH | Approx. 50 m |
| STANDARDS | Eurocode 1 – Impacts on structures Eurocode 3 – Design of steel structures |
| SMALL PARTS | Stainless steel, geomet-coated steel, hot-galvanized steel, aluminium |
| BONDING | UL certification (integrated bonding – low-ohmic transition resistances between components) |
| RAMMING POSTS | C-profile (IPE-profile), hat-profile posts |
| CORROSION PROTECTION | Steel profiles zinc-coated (standard), zinc-magnesium (optional), hot-galvanized pile-driven mounting posts |
| GROUND INCLINATION EAST-WEST | Up to 10° |
| MODULE FASTENING | Clamps, screws, rivets – in accordance with standard fastening requirements of module OEM |
| MODULE SUPPORT | Hat profile rails, C module support rail |

MODULE CONFIGURATION

| | STANDARD MODULE * | | UNFRAMED MODULE | |
|--------------------|-------------------|-----------|-----------------|-----------|
| | portrait | landscape | portrait | landscape |
| SINGLE-POST | 2 | 2 - 4 | - | 4 - 6 |
| DOUBLE-POST | 2 - 4 | 3 - 8 | - | 4 - 9 |

*Assumed module dimensions: standard = 144 HC-cell (2.0 x 1m); ** on request

SIGMA II Bifacial

The bifacial variant of the Sigma Steel is designed to minimize shading on the backside of modules. The system combines all features from Sigma Steel with the needs of bifacial modules.



| | |
|-------------------------------------|--|
| MAXIMUM TABLE LENGTH | Approx. 50 m |
| STANDARDS | Eurocode 1 – Impacts on structures Eurocode 3 – Design of steel structures |
| SMALL PARTS | Stainless steel, geomet-coated steel, hot-galvanized steel, aluminium |
| BONDING | UL certification (integrated bonding – low-ohmic transition resistances between components) |
| RAMMING POSTS | C-profile (IPE-profile), hat-profile posts |
| CORROSION PROTECTION | Steel profiles zinc-coated (standard), zinc-magnesium (optional), hot-galvanized pile-driven mounting posts |
| GROUND INCLINATION EAST-WEST | Up to 10° |
| MODULE FASTENING | Screw, clamps |
| MODULE SUPPORT | Hat profile, module rails |

MODULE CONFIGURATION

| | STANDARD MODULE * | | UNFRAMED MODULE | |
|--------------------|-------------------|-----------|-----------------|-----------|
| | portrait | landscape | portrait | landscape |
| SINGLE-POST | 2 | 2 - 4 | - | 4 - 6 |
| DOUBLE-POST | 2 - 4 | 3 - 8 | - | 4 - 9 |

*Assumed module dimensions: standard = 144 HC-cell (2.0 x 1m); ** on request

SIGMA TRACKER

True Bifacial

The moving unit in the Sigma portfolio for even greater solar yields. Horizontal single-axis tracker system is a part of the Sigma product line, which optimally tracks the course of the sun.



| | |
|---------------------------|--|
| MODULE TYPES | All mono- and bifacial options, framed or laminates |
| MODULE LAYOUT | 2V (vertical/portrait) 4H (horizontal/landscape) Flexible string configuration Up to 240 PV modules per tracker |
| MODULE CLAMP | Clickstone, screws, hammerhead (laminare clamp) |
| TRACKING ANGLE | +50° east to -50° west |
| ROW LENGTH | Up to 125 m |
| TRACKING MECHANISM | Threaded scissor jack mechanism Self-locking system on each post |
| CORROSION CATEGORY | Standard corrosion class C3 |
| BONDING | Low-ohmic transition resistances between frame components without additional parts |
| FOUNDATION | Driven piles, concrete foundation, screw piles |
| CONTROL SYSTEM | Based on standard industrial automation components Siemens - motor, frequency drive, PLC Open protocol to integrate with SCADA Web-enabled user interface |
| WARRANTY | Standard 10 years on structural parts 5 years on moving parts and electronics |

* Depending on project-specific design

SIGMA TRACKER

True Bifacial

MECHANICAL FEATURES

| | |
|------------------------------|--|
| Wind protection | Stow position 0° Up to 90 km/h with tracking * Up to 260 km/h in stow position * |
| Operating temperature | -25°C to +60°C |
| Foundation | Driven piles, concrete foundation, screw piles |
| Support profiles | Steel profile (anti-corrosive coating) |
| Module fastening | Screws, clamps – in accordance with standard fastening requirements of module OEM |

TRANSMISSION SYSTEM

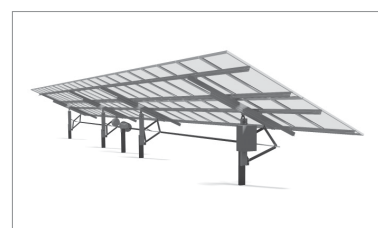
| | |
|-----------------------|--|
| Drive | Single row drive with non-static torque tube |
| Motor | Asynchronous standard motor with integrated gear and chain drive |
| Lifting system | Tilting rafter driven by scissor jack on each structural pile |

ELECTRICAL SYSTEM

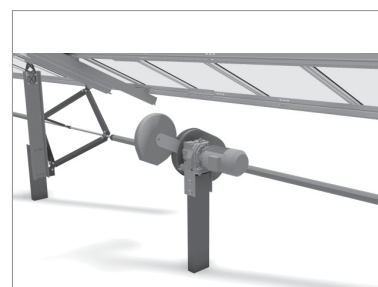
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|---------------------------|--|
| Power Input | Standard 400V, 50Hz, 0.55 kW per tracker Optional: 230V, 50/60Hz, 0.55 kW per tracker |
| Annual consumption | 90kWh per tracker in standard operation |

CONTROL SYSTEM

| | |
|------------------------------|--|
| General | Decentralized control system on each tracker Control cabinet mounted to existing structural pile |
| Operating modes | Automatic mode with backtracking; manual mode, cleaning mode, maintenance mode (freely programmable) |
| Hardware | Siemens SIMATIC S7 including Variable Frequency Drive |
| Tracking software | Astronomical based on Siemens solar library including adaptable backtracking |
| Sensors | 2 x tilt sensor with +/-0.5° accuracy Wind sensor – quantity depending on project site topology |
| Control system design | Master Control Box for up to 30 trackers Slave Control Box for each tracker |
| Communication | MODBUS RS485 between Master and Slave Control Box; PROFINET project wide communication |
| Data interface | SIGMA VIEW 1.3 SCADA Exchange – Modbus/TCP or SQL |



Structural system



Drive system



Transmission system

* Subject to project details and static requirements

* Standard values. Design solutions available for higher wind speeds

** For terms and conditions please refer to the Mounting Systems GmbH warranty

*** All technical details are subject to project specifications and might occasionally be exceeded



PROJECT

POWER OUTPUT

LOCATION

| | | |
|-------------------|---------------------|-------------|
| POBEDA | 50 MW _p | BULGARIA |
| FINOW II & III | 60 MW _p | GERMANY |
| KENKOT HILL | 38 MW _p | UK |
| WELSPUN | 15 MW _p | INDIA |
| TATA I & II | 18 MW _p | HUNGARY |
| VOLO, ELISTA ETC. | 135 MW _p | RUSSIA |
| PEDRO GREEN | 50 MW _p | PHILIPPINES |
| UCEA DE SUS | 55 MW _p | ROMANIA |
| THAI SOLAR | 32 MW _p | THAILAND |
| VOSHOPD I | 54 MW _p | UKRAINE |
| BENBAN | 130MW _p | EGYPT |



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Our team for ground-mounted projects:

Tel. +49 30 328972 00

Fax. +49 30 328972 00

projects@mounting-systems.com

Mounting Systems GmbH

Tempelhofer Weg 39-47

D 10829 Berlin

Tel. +49 30 / 32 89 72-100

Fax. +49 30 / 32 89 72-199

www.mounting-systems.com

With 9 GW of installed capacity, we are one of the biggest manufacturers of mounting systems for photovoltaic systems in the world.