

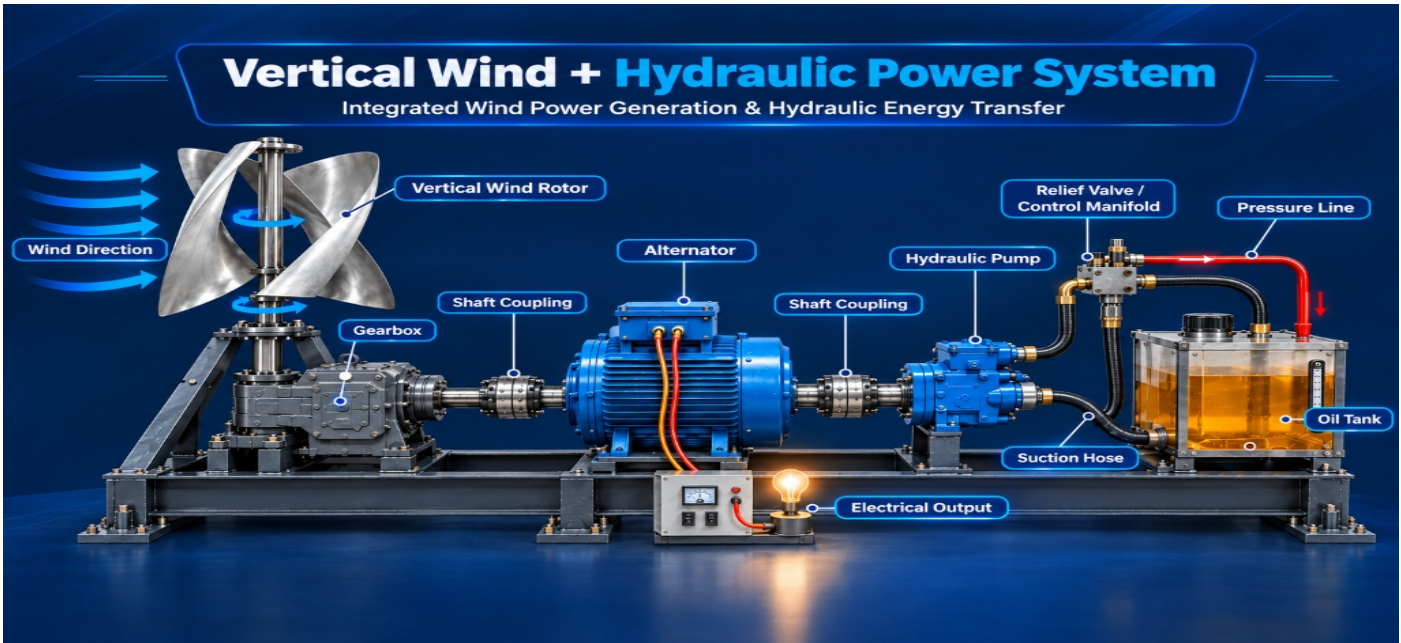


50 YEARS DESIGN LIFE Engineered Heavy Fatigue Endurance	5 YRS WARRANTY + 5 YRS SERVICE Factory Support & Scheduled Upkeep	5 kW TO 100 kW RANGE 11 Confirmed Commercial Capacities
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Kamarta Wind + Hydraulic Power System

Integrated Vertical Wind Kinetic Power & Industrial Hydraulic Energy Transfer (5 kW – 100 kW)

Kamarta's flagship Wind + Hydraulic Power System represents an engineering breakthrough in decentralized renewable generation. By combining high-efficiency vertical-axis wind turbine (VAWT) aerodynamics with heavy-duty industrial hydraulic fluid power transmission, the system captures continuous omnidirectional wind energy across variable wind velocities. It delivers dual outputs: stable electricity generation via permanent magnet alternators and direct fluid power transfer through hydraulic circuits for high-torque industrial work.



Dual-Path Energy Conversion Simultaneous high-efficiency electricity generation and direct fluid power transfer without conversion bottlenecks.	Omnidirectional 360° Capture Operates in turbulent urban, coastal, and gusting winds without yaw mechanisms or directional tracking motors.	Ultra-Low Acoustic Footprint Engineered subsonic tip speeds ensure quiet operation (<42 dB), ideal for commercial rooftops and sensitive zones.
ELECTRICAL OUTPUT: 5 kW to 100 kW Pure Sinusoidal Grid-Tie / Off-Grid Power	HYDRAULIC OUTPUT: Up to 250 Bar High-Pressure Fluid Power Transfer	LIFESPAN: 50-Year Structural Fatigue Engineering



1. Industrial Hydraulic Energy Transfer Subsystem

The hydraulic subsystem harnesses high-torque rotational shaft energy directly from the turbine rotor, converting mechanical force into high-pressure fluid power. This isolates generation equipment from harsh aerodynamic shock loads while allowing decoupled fluid power delivery.

1. High-Displacement Hydraulic Pump Directly shaft-coupled positive displacement hydraulic pump converting high-torque low-RPM rotor motion into continuous fluid pressure up to 250 bar. Eliminates fragile multi-stage mechanical gearboxes.	2. Multi-Port Control Manifold Precision valve block regulating flow distribution and dynamic backpressure. Modulates systemic fluid volume during severe gusts and provides automated over-pressure relief protection.
3. Closed-Loop Baffled Oil Reservoir Heavy-duty fluid reservoir equipped with internal multi-chamber cooling baffles, high-efficiency particulate filtration, and thermal stability expansion chambers for continuous industrial duty.	4. High-Pressure Fluid Lines & Motor Reinforced steel-braided hydraulic circuits transferring pressurized fluid to secondary hydraulic drive motors or ground-level auxiliary alternators, minimizing electrical transmission cabling losses.

2. Individual VAWT Aerodynamic Rotor Configurations

Kamarta manufactures seven specialized Vertical Axis Wind Turbine aerodynamic rotor architectures, each engineered for specific terrain topography, wind shear profiles, and cut-in velocity requirements:

1. Darrieus (Curved Troposkein) Aerodynamic Profile: Lift-driven curved airfoil rotor. Key Advantage: High tip-speed ratio (TSR 3–5) and exceptional peak aerodynamic efficiency. Best suited for open terrains and coastal wind farms.	2. Savonius (S-Type Drag Rotor) Aerodynamic Profile: High-torque differential drag rotor. Key Advantage: Exceptional self-starting torque at ultra-low cut-in wind speed (1.5 m/s). Excellent for turbulent rooftop and complex urban wind flows.
3. Hybrid H-Darrieus Aerodynamic Profile: Straight vertical airfoils + central Savonius. Key Advantage: Combines Savonius self-starting capability with high-speed H-rotor aerodynamic efficiency across variable wind velocities.	4. Helical / Gorlov Rotor Aerodynamic Profile: 60° spiral continuous helical twist. Key Advantage: Eliminates cyclical aerodynamic torque pulsation, delivering ultra-smooth rotation, zero structural vibration, and silent acoustic profile.
5. Twisted Savonius Aerodynamic Profile: 180° helical aerodynamic bucket geometry. Key Advantage: Delivers smooth, uniform 360° torque with no dead angles. Ensures seamless pump pressure engagement in turbulent wind gusts.	6. Combined Wind-Hydraulic Drive Aerodynamic Profile: High-solidity multi-stage vertical rotor. Key Advantage: Dual-shaft power head simultaneously driving an axial-flux electric alternator and positive displacement hydraulic pump.
7. Ducted / Concentrator VAWT Aerodynamic Profile: Omni-stator aerodynamic shroud. Key Advantage: Aerodynamically accelerates incoming wind velocities through internal venturi effect, boosting localized energy density by up to 40%.	Modular Scalability (5 kW – 100 kW) Universal Compatibility: All 7 aerodynamic architectures are fully compatible across Kamarta's confirmed 5 kW to 100 kW commercial and industrial capacity series.

3. Rotor Aerodynamic Selection Matrix

Model Architecture	Aerodynamic Principle	Cut-in Speed	Tip Speed Ratio	Optimal Site Topography
Darrieus Troposkein	Lift-Driven Airfoil	2.8 m/s	TSR 3.5 – 5.0	Open Plains & Coastal Wind Corridors
Savonius Drag Rotor	Differential Drag	1.5 m/s	TSR 0.8 – 1.2	Urban Commercial Rooftops & Turbulent Zones
Hybrid H-Darrieus	Lift + Starter Drag	1.8 m/s	TSR 2.5 – 4.0	Agricultural Estates, Warehouses & Campuses
Helical Gorlov Rotor	Continuous Helical Lift	2.0 m/s	TSR 2.0 – 3.2	Acoustically Sensitive Commercial Sites
Ducted Concentrator	Venturi Shrouded Flow	1.2 m/s	TSR 3.0 – 4.5	Low-Wind Inland Industrial Zones



Confirmed Commercial & Industrial System Capacities (5 kW – 100 kW)

Illustrative Generation Model: Generation estimates are calculated assuming a standard **60% Net Capacity Factor (NCF)** benchmark based on U.S. Department of Energy (DOE) Small Wind Guidebook criteria (formula: $Rated\ kW \times 24\ hrs \times 60\%\ NCF$; 1 Unit = 1 kWh). Actual operational generation varies with site-specific wind velocity regimes and installation heights; figures do not constitute a performance guarantee.

System Capacity	Target Application	Daily Yield (kWh)	Monthly (30 Days)	Annual (365 Days)	5-Year Energy (kWh)	50-Year Design (kWh)
5 kW System	Commercial Rooftops & Microgrids	72 units	2,160 units	26,280 units	1,31,400 units	13,14,000 units
10 kW System	Small Manufacturing & Telecom Towers	144 units	4,320 units	52,560 units	2,62,800 units	26,28,000 units
15 kW System	Resorts, Campuses & Institutions	216 units	6,480 units	78,840 units	3,94,200 units	39,42,000 units
20 kW System	Agro-Processing & Warehouses	288 units	8,640 units	1,05,120 units	5,25,600 units	52,56,000 units
25 kW System	Cold Storage Logistics & Pumping	360 units	10,800 units	1,31,400 units	6,57,000 units	65,70,000 units
30 kW System	Heavy Engineering & Food Processing	432 units	12,960 units	1,57,680 units	7,88,400 units	78,84,000 units
35 kW System	Industrial Duty & Foundry Auxiliaries	504 units	15,120 units	1,83,960 units	9,19,800 units	91,98,000 units
40 kW System	Industrial Estate & Cluster Microgrids	576 units	17,280 units	2,10,240 units	10,51,200 units	1,05,12,000 units
45 kW System	Hydraulic Mechanical Power Transfer	648 units	19,440 units	2,36,520 units	11,82,600 units	1,18,26,000 units
50 kW System	Sub-Station Decentralized Integration	720 units	21,600 units	2,62,800 units	13,14,000 units	1,31,40,000 units
100 kW System	Flagship Utility Microgrid Power Hub	1,440 units	43,200 units	5,25,600 units	26,28,000 units	2,62,80,000 units

Site Wind Velocity Classification (Rayleigh Dynamics)

- **Class 1 (Low Wind, 3.0 – 4.5 m/s):** Optimized for Savonius & Ducted VAWT models. Delivers predictable baseload power for urban rooftops and telecom installations.
- **Class 2 (Moderate Wind, 4.5 – 6.5 m/s):** Ideal for Hybrid H-Darrieus and Gorlov models. Standard commercial payback across agricultural estates and warehouse hubs.
- **Class 3 (High Wind, >6.5 m/s):** Coastal corridors and mountain passes where Darrieus rotors and hydraulic drives harvest maximum kinetic power.

Decentralized Microgrid Integration Options

- **Direct Grid-Tie Sync:** Seamlessly feeds 380V / 415V 3-phase power directly into facility distribution panels via smart anti-islanding MPPT inverters.
- **Battery Energy Storage (BESS):** High-rate DC charging compatible with Lithium Ferro Phosphate (LFP) and Flow Battery storage systems.
- **Direct Mechanical Hydraulic Drive:** Pressurized fluid powers direct displacement water pumping, irrigation, or auxiliary hydraulic machinery.
- **Solar-Wind Hybrid Sync:** Bridges overnight & monsoon generation gaps.



Standard Scope of Supply & Factory Deliverables

A. Rotor & Aerodynamic Assembly - Marine-grade anti-corrosive alloy or composite airfoils - Heavy-duty precision vertical mainshaft & dual flange mount - SKF / FAG industrial sealed dual-bearing cartridge hubs	B. Electrical Generation Package - Coreless Axial-Flux Alternator / Permanent Magnet (PMG) - Pure sinusoidal MPPT grid-tie wind power inverter - Integrated lightning, over-voltage & reverse current protection
C. Hydraulic Power Drive Train - Shaft-coupled positive displacement hydraulic pump - Multi-port manifold with adjustable pressure relief valving - Filtered reservoir oil tank with cooling baffle circuits	D. Safety, Braking & Factory Backing - Dual aerodynamic stall regulation + hydraulic fail-safe brake 5-Year Comprehensive Manufacturer Warranty 5-Year Free Factory-Scheduled Maintenance Service

Engineering Design Parameters & Environmental Limits

Cut-in Wind Speed: 1.5 – 2.5 m/s	Rated Wind Speed: 10.0 – 12.0 m/s	Survival Wind Speed: 50.0 – 55.0 m/s
Acoustic Emission: <42 dB at 10m	Operating Temperature: -20°C to +60°C	Structural Lifespan: 50 Years Engineered

ISO 9001:2015 Certified Manufacturing Plant	IEC 61400-2 COMPLIANT Small Wind Turbine Safety Standard	CE & NABL CERTIFIED Electrical & Alternator Testing
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Turnkey Project Delivery & EPC Execution Workflow

1. Site Wind Assessment Comprehensive anemometer data analysis, terrain roughness calculation, and localized CFD wind flow simulation.	2. Foundation & Civil Design Soil bearing geotechnical calculation, structural tower anchor-cage fabrication, and vibration dampening layout.	3. Factory Hydrostatic Pre-Test Rigorous dynamo load testing of alternator, manifold pressure leak check, and automated safety brake validation.	4. Grid-Tie & SCADA Sync On-site tower erection, pure sinusoidal inverter grid connection, and real-time cloud telemetry activation.
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IMPORTANT ENGINEERING NOTICE & DISCLAIMER:

All electricity generation metrics (daily units, monthly totals, annual kWh), financial savings projections, and payback period calculations presented in this document are illustrative engineering models. They are calculated based on an assumed 60% Net Capacity Factor (NCF) benchmark referencing U.S. Department of Energy (DOE) Small Wind Guidebook criteria (formula: $Rated\ kW \times 24\ hrs \times 60\%\ NCF$; where 1 Unit = 1 kWh). Actual operational generation and energy yields are strictly site-dependent and influenced by local aerodynamic wind velocity distributions, installation elevation, topographical terrain roughness, local turbulence intensity, grid interconnection stability, and seasonal weather patterns. These figures are provided solely for preliminary technical evaluation and system sizing, and do not constitute a contractual performance guarantee or legally binding commercial warranty.

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