

RainbowTM

Rainbow pyrolysis vetting program Powermax - BRKC 1000

Manufacturer	Powermax
Model	BRKC 1000
Year	2026

Summary

Manufacturer	Wuxi Powermax Renewable Energy Technology Co., Ltd.
Model	BRKC 1000
Vetting decision	Approved
Manufacturer representative	Yuyang Yuan - Pre-sales Technical Support
Rainbow representative	Samara Vantil (certification@rainbowstandard.io)
Methodology name	Biomass carbon removal and storage (BiCRS)
Methodology ID	RBW-BICRS-GEN-V1.1
Date of assessment	10-08-2026
Date of decision	03-09-2026

The vetting decision for the model BRKC 1000 of Wuxi Powermax Renewable Energy Technology Co., Ltd. applies exclusively to its use under the Rainbow methodology Biomass Carbon Removal and Storage (BiCRS) V1.1. The technology shall be reassessed following changes in methodology or major changes in machinery specifications. Wuxi Powermax Renewable Energy Technology Co., Ltd. is responsible for communicating any major change likely to affect the performance of the machinery under the Rainbow methodology or Rainbow Standard rules.

The approval status gives project developers the certainty that the Wuxi Powermax Renewable Energy Technology Co., Ltd. model BRKC 1000 is capable of operating and delivering as per Rainbow methodology requirements. However, project developers must independently verify compliance with Rainbow methodology and Rainbow Standard rules, and ensure optimal conditions are met to deliver biochar quality as specified by BiCRS V1.1.

1. About Wuxi Powermax Renewable Energy Technology Co., Ltd.

Wuxi Powermax Renewable Energy Technology Co., Ltd. (established 13 January 2023) is headquartered in Wuxi, Jiangsu Province, and trades its biochar and carbonization equipment under the “Pyrogreen” product line. Per manufacturer clarification, Powermax is the group’s dedicated entity for international business operations — export trade, overseas market development, international EPC project management, customer coordination, and global after-sales service — consistent with its registered headcount of approximately 5–9 employees. Domestic manufacturing, R&D, production management, and engineering support are handled by Wuxi Teneng Power Machinery Co., Ltd. (established 2003), which holds a 99% equity stake in Powermax, making Powermax a majority-owned

Teneng subsidiary. The company's previously noted heritage claim of over 40 years' gasification and carbonization experience, dating to 1986, has been clarified by the manufacturer as tracing to a workshop established by the founders that year for pyrolysis equipment production and development, predating Teneng's formal incorporation in 2003; Powermax inherits this heritage through Teneng.

Beyond pyrolysis and carbonization, the company manufactures biomass and coal gasification systems, gas generator sets, gas purification equipment, biogas power plants, and syngas-to-hydrogen/ammonia/methanol conversion units, with reported gasification capacities from 50 kWe to 20 MWe. Its carbonization/torrefaction range includes rotary-kiln and screw-conveyor carbonizers and updraft fixed-bed systems. The company reports installations in Myanmar, Taiwan, Malaysia, Indonesia, and Vietnam, and states CE conformity marking for the EU market and ISO 9001 certification.

2. BRKC 1000 Model

The BRKC 1000 is a continuous, externally heated rotary-kiln carbonization furnace in which flue gas from the unit's own combustion chambers indirectly heats the drum through the furnace jacket, keeping the heat source physically isolated from the feedstock. It processes biomass at up to 300 kg/h — 2,400 t/yr at 15% moisture content (wet basis) — and yields biochar at up to 90 kg/h, or 720 t/yr at 0% moisture content.

Feedstock must be sized below 50 mm with moisture content at or below 15% before entering the furnace. Carbonization runs at 500–650°C with a material residence time of 30–45 minutes. Reactor temperature is monitored at the head, middle, and tail of the drum plus both burners (13 sensor points, Type K thermocouples), and the gas path is sealed via a dual packing-gland structure under a fully enclosed, negative-pressure circuit. The design is auto-thermal: diesel (~60 L per start) is used only during start-up, after which the pyrolysis gas generated by the feedstock itself supplies all subsequent heat with no further fossil fuel input. Biochar is cooled via a water-cooled, oxygen-isolated screw conveyor before discharge.

All pyrolysis gas is routed to a two-stage combustion chamber — approximately 1,050–1,150°C in the first stage to crack tar and heavy hydrocarbons, approximately 780–820°C in the second to burn out residual combustibles — giving a flue-gas residence time of more than 2 seconds. Combustion air is staged (primary/secondary injection) with continuous Type K thermocouple monitoring, and a built-in flame detector triggers an alarm and full system shutdown on flame-out. All generated syngas is fully combusted within the integrated combustion system, with no bio-oil or excess syngas available for export; a waste-heat boiler recovers surplus heat as hot air, hot water, or steam depending on configuration, before an induced-draft fan discharges the flue gas through the chimney under negative pressure.

2.1 Specifications provided by Powermax (publicly disclosable)

- Machine model and type: BRKC 1000, continuous externally-heated rotary kiln carbonizer
- Feedstock throughput range: 2,400 t/yr at 15% moisture content (wet basis)

- Biochar output range: 720 t/yr at 0% moisture content
- Pyrolysis temperature range: 500–650°C
- Capable to provide biochar with H/Corg results listed for the feedstock types disclosed: rice husk, wood chip
- Capable of providing biochar with H/Corg < 0.7: rice husk 0.33, wood chip 0.36
- Combustion type and temperature: dual adiabatic combustion chambers, ~1,050–1,150°C then ~780–820°C
- Syngas handling: fully captured and combusted internally, zero routine venting
- Methane emission rate: 0.99 mg/m³ (7.50×10⁻⁴ kg/h) per single third-party test campaign
- NOx minimization approach: staged two-stage combustion with oxygen-deficient reducing atmosphere; measured 78 mg/m³
- Data logging capability and format: Excel spreadsheet, timestamped
- Data access method for audits: manual reports, daily frequency
- Electricity consumption: 45 kWh per operating hour / 500 kWh per tonne biochar
- Fuel for cold starts: diesel, ~60 L per start
- Net thermal output: 350 kWth; heat medium available as hot air, hot water, or steam depending on configuration
- Bio-oil output: none produced — the design combusts all condensable by-products internally
- Excess syngas for export: none — all generated syngas is combusted internally for process heat
- Machine weight: 41,800 kg (per revised Bill of Materials)
- Footprint of the system: 15 m x 10.5 m
- Operational lifetime: 20 years / 160,000 operating hours
- Target uptime: 8,000 running hours/year
- Regional service coverage: video guidance as default; on-site technician dispatch with no stated regional restriction
- Maintenance schedule provided: yes, detailed Equipment Maintenance Record attached

3. Compliance Assessment

The Wuxi Powermax Renewable Energy Technology Co., Ltd. BRKC 1000 has been assessed against the Rainbow Standard — Machinery & Infrastructure Module for Biomass Carbon Removal and Storage (BiCRS) and has been found to **comply**. The model is hereby **Rainbow Vetted**.

The following requirements were verified during the vetting assessment:

- Machine type and reactor technology (continuous externally-heated rotary-kiln carbonization furnace) were confirmed through the vetting program form, Technical Specification, and Piping and Instrumentation Diagram (P&ID).
- Annual feedstock throughput (2,400 tonnes/year at 15% moisture content, wet basis) was confirmed through the vetting program form and Test Conditions document, cross-checked against the disclosed 300 kg/h feed rate.

- Annual biochar output (720 tonnes/year at 0% moisture content) was confirmed through the vetting program form and Test Conditions document, cross-checked against the disclosed 90 kg/h output rate.
- Validated biomass feedstock types were confirmed through the vetting program form and Technical Specification §4.1.
- Thermocouple location, count, and sensor type (13 points, Type K, at drum head/middle/tail and both burners) were confirmed through the vetting program form, P&ID, and the temperature/residence-time operating log.
- Equipment sealing against leakage (dual packing-gland structure, fully enclosed negative-pressure circuit) was confirmed through the vetting program form and Equipment Maintenance Record.
- Syngas capture, cleaning, and combustion with no venting was confirmed through the vetting program form, Technical Specification §2.2/§3.4, and P&ID.
- Combustion chamber features (forced air flow, insulation, ≥ 2 second residence time, primary/secondary air injection, continuous temperature monitoring) were confirmed through the vetting program form, P&ID, and Combustion Chamber Design Specs.
- Combustion chamber residence time of more than 2 seconds was confirmed through the Combustion Chamber Design Specs flue-gas residence-time calculation.
- Reactor residence time (30–45 minutes at 500–650°C) was confirmed through the vetting program form, Technical Specification §3.7.2, and manufacturer clarification reconciling earlier inconsistent figures.
- Complete combustion design and tar-prevention measures (two-stage combustion at 1,050–1,150°C then 780–820°C with staged air and PLC control) were confirmed through the vetting program form and Technical Specification §3.4.
- Automatic flame-out protections (built-in flame detector triggering alarm and full shutdown) were confirmed through the vetting program form and Technical Specification §3.7.3.
- Methane emissions monitoring approach was confirmed through the vetting program form, Flue Gas Emission Test Report, and manufacturer clarification specifying periodic per-startup testing rather than continuous monitoring.
- Average methane emission rate (0.99 mg/m³) was confirmed through the vetting program form and Flue Gas Emission Test Report.
- Local regulatory compliance was confirmed through the vetting program form, the Environmental Assessment Permit filing, and the manufacturer's Environmental Compliance Statement explaining China's plant-level EIA licensing framework.
- NO_x minimization features (staged two-stage combustion with an oxygen-deficient atmosphere, measured 78 mg/m³) were confirmed through the vetting program form, Technical Specification §3.7.3, and Core Standard Data Values.
- H/Corg below 0.7 across three distinct feedstocks (rice husk: 0.33, mixed wood: 0.36, fruitwood: 0.518–0.559) was confirmed through DAkkS-accredited Ruhr Lab reports for rice husk and mixed wood, and a manufacturer in-house test report for fruitwood.
- Random Reflectance (Ro) data was confirmed through the Ruhr Lab biochar analysis reports for rice husk and mixed wood.

- Consistent carbonization across feedstocks (PLC-controlled drum speed, multi-point temperature sensing, optional waste-heat dryer) was confirmed through the vetting program form and Technical Specification §3.7.2.
- Verifiable uptime data was confirmed through the vetting program form and Equipment Maintenance Record.
- Systems to prevent unplanned downtime (tar elimination, multi-layer PLC interlocks, flame detection, pressure relief) were confirmed through the vetting program form, Technical Specification §3.7.3, and Equipment Maintenance Record.
- Regional maintenance support (video guidance as default, technician dispatch with no stated regional restriction) was confirmed through the vetting program form.
- Methane emissions linkable to feedstock and biochar tonnage were confirmed through the vetting program form and the manufacturer's Methane Emissions Calculation, which derives 2.49 g CH₄/t feedstock and 8.31 g CH₄/t biochar from a full carbon-balance calculation.
- Data access for audits (manual reports, daily frequency) was confirmed through the vetting program form.
- Willingness to participate in a CH₄ measurement trial was confirmed through the vetting program form.
- Pyrolyzer weight (41,800 kg per the Bill of Materials) was confirmed through the vetting program form and the manufacturer's reissued Bill of Materials.
- Operational lifetime (20 years / 160,000 total operating hours) was confirmed through the vetting program form, internally consistent with the disclosed annual target uptime.
- Annual target uptime (8,000 running hours/year) was confirmed through the vetting program form.
- Footprint dimensions (15 m x 10.5 m) were confirmed through the vetting program form and Technical Specification §2.1.
- Essential auxiliary equipment weights were confirmed through the vetting program form, the revised Bill of Materials, and manufacturer clarification identifying silos and gas-cleaning systems as optional accessories outside the base scope.
- Material composition and Bill of Materials completeness were confirmed through the manufacturer's Bill of Materials, totaling 41,800 kg.
- Electricity consumption (45 kWh/operating hour, 500 kWh/tonne biochar) was confirmed through the vetting program form and Test Conditions document.
- Fuel for cold starts (diesel, ~60 L per start) was confirmed through the vetting program form and Technical Specification §3.7.1.
- Bio-oil non-capture was confirmed through the vetting program form and Technical Specification §2.2, confirming that no bio-oil is produced and all condensable by-products are combusted internally.
- Excess syngas for export was confirmed through the vetting program form and Technical Specification §3.5, confirming no exportable surplus, as all pyrolysis gas is combusted internally.
- Technical Specifications/Datasheet (mandatory) was confirmed present and structurally complete.

- Detailed Bill of Materials (mandatory) was confirmed present and reconciled with the disclosed machine weight following manufacturer reissue.
- Process Flow Diagram / P&ID (mandatory) was confirmed present as a complete, legible reference covering feed, carbonization drum, combustion chambers, spray tower, induced-draft fan, chimney, cooling tower and instrumentation.
- Biochar Lab Analysis covering three distinct feedstocks (mandatory) was confirmed through the Ruhr Lab reports and the manufacturer's fruitwood test report.
- Environmental Permit / Compliance Report (mandatory) was confirmed through the Environmental Assessment Permit filing and the manufacturer's Environmental Compliance Statement.
- Emissions Test Reports for CH₄/syngas (mandatory) were confirmed through the Flue Gas Emission Test Report, corroborated by the manufacturer's clarification on the tested entity's relationship to Wuxi Powermax.
- Maintenance Schedule (mandatory) was confirmed to be present and detailed, covering 24+ line items across all major systems.
- Combustion Chamber Design Specs (mandatory) were confirmed present, consistent with the form's residence-time and insulation claims, including a full syngas composition and mass-balance calculation.

Supporting documents provided: Rainbow Pyrolysis Endorsement Program - Form, BRKC Technical Specification.docx, Piping and Instrumentation Diagram (P&ID) - CN.PDF, Test Conditions.docx, Temperature-Residence Time Operating Log Sample.xlsx, Equipment Maintenance Record.xlsx, Combustion Chamber Design Specs.docx, Combustion Chamber Design Specs-Flue gas residence time.docx, Flue Gas Emission Test Report - CN.pdf, Environmental Assessment Permit-CN.pdf, Explanation on Standard Replacement.docx, Core Standard Data Values.docx, Detailed Bill of Materials (BOM).xlsx, Rice Husk Biochar Analysis Report - Ruhr Lab - EN.pdf, Mixed Wood Biochar Test Report - Ruhr Lab - EN.pdf, Rice Husk Biochar Test Report - SGS - EN.pdf, Wood Biochar Test Report - EN.pdf, Methane Emissions Calculation - EN.pdf, Environmental Compliance Statement.pdf

4. Limitations

This vetting assessment evaluates the capability of the Wuxi Powermax Renewable Energy Technology Co., Ltd. BRKC 1000 to operate within Rainbow Standard requirements based on manufacturer-provided documentation, data logs, lab analyses, and technical specifications. Many operational parameters, such as actual biochar H/Corg ratios, pyrolysis temperature consistency, residence times, and emission levels, are inherently dependent on the day-to-day operation of the machine, the feedstock characteristics used, and the maintenance practices followed by the operator. Therefore, **what has been assessed is that the Wuxi Powermax Renewable Energy Technology Co., Ltd. BRKC 1000 is capable of operating under conditions that meet Rainbow Standard and methodology requirements, not that it will do so in all circumstances.**

This approval is strictly limited in scope to the technical and operational parameters assessed at the time of review. **It does not constitute a warranty, guarantee, or representation regarding the machinery's performance under any specific project conditions.** Rainbow accepts no liability for non-conformance arising from changes to the machinery, its operation, or applicable methodology requirements occurring after the date of this approval, where such changes have not been formally communicated and reassessed. This approval is issued on an as-assessed basis. Rainbow makes no representation that the machinery will perform in conformance with methodology requirements under all operating conditions or in all project contexts.

Approval of the BRKC 1000 model does not constitute an endorsement of Wuxi Powermax Renewable Energy Technology Co., Ltd. as an entity, its commercial representations, or any claims made outside the scope of this assessment.

Compliance with Rainbow Standard requirements during actual project operations remains the responsibility of the project developer. Project developers shall independently verify that their specific installation, operational parameters, feedstock supply, and maintenance routines meet Rainbow Standard requirements on an ongoing basis. Project developers shall not rely solely on this approval status as evidence of compliance; independent verification of site-specific conditions, operational practices, and output quality remains their sole responsibility. **The vetting status of the BRKC 1000 does not exempt the project developer from demonstrating operational compliance during audits and monitoring periods.**

5. Remarks

3.2 Environmental permit: The environmental compliance documentation submitted covers the manufacturer's factory-level Environmental Impact Assessment (EIA) filing under Chinese regulation, which licenses the whole plant rather than this specific piece of equipment. Project developers must independently obtain and validate any environmental permits required at their own installation site; this vetting decision does not substitute for site-specific environmental compliance.

4.1 Biochar lab analysis accreditation: H/Corg compliance is confirmed for three distinct feedstocks. Rice husk and mixed wood results are from accredited laboratory reports; the fruitwood result is from a manufacturer in-house test report that is not independently accredited. Project developers should independently verify H/Corg compliance for feedstocks not covered by an accredited laboratory test.

7.5 Net thermal output and heat medium: The disclosed net thermal output of 350 kWth is available as hot air, hot water, or steam depending on the optional Waste Heat Boiler configuration installed. Project developers should confirm with the manufacturer which heat medium is actually delivered in their specific configuration before claiming heat-recovery co-benefits.

Machinery lifetime: The operational lifetime of 20 years is a manufacturer assumption based on design specifications. This figure cannot be warranted, as actual machinery lifespan depends on operating conditions, maintenance practices, feedstock characteristics, and environmental factors at each installation site.

Type of biomass: Powermax's BRKC 1000 can process forestry by-products, wood-processing residues, waste wood, garden and landscaping waste, agricultural residues, food-processing by-products, purpose-grown crops, algae and aquatic plants, food waste, and separated waste paper or other biogenic waste materials, per the Technical Specification. Project developers must independently confirm feedstock compatibility with Powermax. Laboratory H/Corg results are available for rice husk, mixed wood (Acacia/Petai/Rubber blend), and fruitwood. Project developers should confirm this parameter with Powermax for their specific biomass.

Clément Georget, certifies and acknowledges awareness of the content of this document.

Clément Georget 2026-09-21

Rainbow

Audit trail

Details

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