

M C P S E R V E R

N O C O D E

C L O U D H O S T E D

Ball Mill Sizing & Design MCP

Get precise grinding circuit dimensions and power requirements instantly.

Ball Mill Sizing & Design MCP handles the heavy lifting for mineral processing engineering. It uses the Bond equation to calculate specific energy, total power, and physical mill dimensions for both overflow and grate discharge setups. You can also estimate media charge mass and verify if your design actually hits the target product size.

A+ Quality Score 100/100

mining

grinding

bond-equation

metallurgy

mill-design



The connectivity layer between AI and the world's software.

Vinkius sits between AI and every application. All communication passes through Vinkius Cloud via the Model Context Protocol (MCP) — with governance, observability, and security at every layer.

Your AI Connections Run Through Vinkius Cloud

The world's largest
managed MCP catalog

Vinkius is the connectivity layer where AI connects to the software your business already runs. We handle the hosting, the security, the credentials, the uptime — you get agents that actually do things.

We operate the world's largest managed MCP catalog. Major SaaS platforms, CRMs, databases, and cloud providers — running, monitored, production-ready. This MCP server is hosted and maintained by the Vinkius Cloud for AI Agents.

The agent doesn't manage credentials, doesn't manage uptime, doesn't manage security. Vinkius does.

— Architecture principle

Four Pillars of the Vinkius Runtime

01 — Security by design

Credentials stay encrypted at rest via AES-256. The AI agent never touches raw keys — they're injected into a sandboxed V8 isolate at runtime. Actions are logged, and connections have an emergency kill switch.

03 — Deterministic observability

Eight immutable metrics per endpoint: request volume, p95 latency, error rate, active connections, cost attribution. A live payload feed logs every tool call with mutation detection.

02 — Built on MCP Fusion

This MCP server was built with **MCP Fusion**, the open-source framework (Apache 2.0) that powers the entire Vinkius catalog. Schema-as-firewall strips undeclared fields, compiled PII redaction runs at zero overhead, and cryptographic lockfiles produce git-diffable audit trails.

04 — Autonomous operations

Servers are deployed, monitored, and patched autonomously. New capabilities and security patches ship weekly. Zero-downtime deployments ensure continuous availability across all managed MCP servers.

AES-256

Encryption at rest

Ed25519

PKI vault signatures

24h TTL

Ephemeral session keys

V8 Isolate

Sandboxed execution

One Token. Instant Access.

Every MCP server on Vinkius is accessed through a **Connection Token**. Tokens are generated in the cloud dashboard and produce a unique MCP endpoint URL. Paste this URL into any MCP-compatible client — no SDK required.

A single token can serve **multiple AI clients simultaneously**, or you can issue separate tokens per client for granular access control. Each token tracks its own request count, last activity timestamp, and can be individually enabled or revoked.

MCP ENDPOINT`https://edge.vinkius.com/{token}/mcp`

Claude



Cursor



VS Code



Windsurf



Grok



Gemini

Security Is the Architecture

Security in Vinkius is not a feature — it's the foundation of the runtime. The gateway enforces multiple independent protection layers between AI agents and third-party APIs.

01 — Ed25519 PKI Vault

Every workspace has an Ed25519 Master Key. Session keys are generated ephemerally (24h TTL) and signed by the Master Key. Credentials never leave the vault boundary.

02 — V8 Isolate Sandboxing

Tool code runs inside isolated-vm V8 isolates with 64 MB memory caps and per-request timeouts. No filesystem access, no network access except through the SSRF-guarded fetch bridge.

03 — SSRF Guard

All outbound HTTP requests are DNS-resolved and validated before execution. Private IP ranges (10.x, 172.16-31.x, 192.168.x, AWS metadata 169.254.x) are blocked at the network layer.

05 — Cryptographic Audit Trail

Every request is signed into a SHA-256 hash chain with Ed25519 signatures. Events form a tamper-proof, SIEM-exportable forensic record.

04 — DLP & PII Redaction

A ResponseGuard pipeline intercepts every tool response. Configurable redaction patterns strip sensitive fields (emails, SSNs, card numbers) before data reaches the AI agent.

06 — Honeypot Trap System

Phantom credentials are injected into isolated environments. If a honeypot is used outside Vinkius infrastructure, the server is quarantined instantly.

Emergency Kill Switch

EU AI Act Art. 14(1)
Compliant

The kill switch is an **emergency halt** mechanism — not a simple toggle. When triggered, it executes three actions atomically:

01 — Server deactivated

The MCP server is immediately taken offline across the entire cluster.

02 — All tokens revoked

Every connection token is invalidated. Total lockout — reconnection blocked until new tokens are issued.

03 — WebSocket connections killed

Active connections terminated via Redis pubsub broadcast. Propagates to every runtime node in the cluster.

Full Visibility. Zero Guesswork.

The Vinkius cloud dashboard includes a full MCP Governance suite — real-time analytics and security controls for production AI operations.

Control Plane

KPI dashboard with request volume, latency, success rate, token consumption, and AI-generated operational briefings.

FinOps

Cost tracking per tool, payload compression savings, budget optimization signals, and consumption trends.

Firewall & DLP

PII redaction activity, sensitive data protection counters, and security event timeline.

Agent Activity

Which AI clients are connecting, how often, and what they're doing — real-time session tracking.

Tool Health

Slowest and most error-prone tools, with actionable root-cause insights and performance baselines.

Incident Log

Error trends, failure rates, status-code breakdowns, and forensic audit trail access.

Get started at cloud.vinkius.com — connect your AI agent in under 60 seconds.

Ball Mill Sizing & Design MCP

4 tools available

Cloud-hosted on Vinkius

You can stop running manual Bond equation calculations for every circuit iteration. This MCP gives your AI client the ability to act as a specialized metallurgical engineer. When you provide throughput, work index, and particle size data, the tool calculates the exact power requirements and specific energy needed for the job.

Beyond just power, you can specify whether you are designing for overflow or grate discharge to get accurate diameter and length measurements. It also handles the physical logistics of the mill, such as estimating the weight and volume of the grinding media charge. If you are unsure if a specific mill size will work, you can use it to compare your target product size against the expected output to confirm the design is adequate before you commit to a build.

Core Capabilities

01 — Power Calculations

Your agent uses this to find specific energy and total power via the Bond equation.

02 — Physical Sizing

The AI determines mill diameter and length for different discharge types.

03 — Media Estimation

Your client calculates the mass and volume of the grinding media charge.

04 — Design Verification

The tool checks if the designed mill will actually reach the target particle size.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/ball-mill-sizing-design — connect your AI agent in three steps.

- 01 Connect your preferred client like Claude or Cursor to the Vinkius hosted MCP.
- 02 Provide your material data such as work index and throughput to your agent.
- 03 Ask the agent to calculate power, dimensions, or media charge using the specific tools.
- 04 Review the calculated engineering outputs directly in your chat interface.

Connect your AI client to Vinkius and start running engineering calculations immediately.

Built For

This MCP is built for engineers working in mineral processing and metallurgy. It automates the repetitive math involved in grinding circuit design.

Metallurgical Engineer

Hands off throughput and work index data to the AI to generate mill specifications.

Process Engineer

Uses the tool to validate if a proposed mill design meets production targets.

Mining Consultant

Generates rapid sizing estimates for client feasibility studies.

What Changes When You Connect

- 01 Replaces manual Bond equation calculations with direct AI commands.
- 02 Supports both overflow and grate discharge mill configurations.
- 03 Provides immediate feedback on grinding efficiency relative to target sizes.

- 04** Calculates media mass and volume to assist with procurement and loading plans.
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Real-World Applications

Initial Circuit Design

Input raw material properties to get a baseline for mill power and size.

Design Validation

Check if a mill with a set power rating can actually grind a specific feed to the desired size.

Media Procurement

Determine the exact tonnage of steel media needed for a specific mill volume and filling level.

Optimization

Adjust mill dimensions to see how changes in diameter or length affect the design.

4 Tools Available

#	TOOL	DESCRIPTION
01	calculate_power_requirement	This tool calculates the specific energy and total power needed to grind your material.
02	calculate_media_charge	Use this to estimate the total weight and volume of grinding media required for the mill.
03	design_mill_dimensions	This tool determines the physical diameter and length of the mill based on your design constraints.
04	evaluate_grinding_efficiency	This tool compares your target product size against the expected size to check if the design works.

See It in Action

Real prompts you can use once this MCP is connected to your AI agent through Vinkius Cloud.

- U** Calculate the power requirement for a throughput of 500 tph, a work index of 14, a feed size of 2000 micrometers, and a product size of 150 micrometers.



The total power required is 2450.5 kW with a specific energy of 4.9 kWh/t.

- U** Design a mill with 3000 kW of power and grate discharge.



The designed mill has a diameter of 3.5 meters, a length of 5.2 meters, and an internal volume of 51.7 cubic meters.

- U** How much steel media is needed for a mill with 3.5m diameter, 5.2m length, 35% filling, and media density of 4.8 t/m³?



The required media volume is 18.1 cubic meters, resulting in a total media mass of 86.88 tonnes.

Frequently Asked Questions

- 01** What equations does this MCP use for power calculations?

The MCP uses the Bond equation to determine specific energy and total power requirements.

- 02** Can I design mills for different discharge types?

Yes, the tool allows you to design physical dimensions for both overflow and grate discharge mills.

- 03** Does this MCP work with Claude or Cursor?

Yes, it works with any MCP-compatible client including Claude, Cursor, Windsurf, and VS Code.

04 How do I calculate the media needed for my mill?

You can use the `calculate_media_charge` tool to estimate the weight and volume of the grinding media.

05 Can I verify if my mill design is efficient enough?

Yes, the `evaluate_grinding_efficiency` tool compares your target product size against the expected size to verify the design.

Go Live in 60 Seconds

Get your connection token from cloud.vinkius.com, then paste the endpoint URL into any MCP-compatible client.

YOUR MCP ENDPOINT

`https://edge.vinkius.com/[TOKEN]/mcp`

CLIENT	WHERE TO CONFIGURE
 Claude AI	Profile → Customize → Connectors → "+" → Add custom connector → Paste endpoint
 Cursor	Settings → Features → MCP Servers → "+" Add New MCP Server" → Type: SSE → Paste endpoint
 VS Code	Ctrl/Cmd+Shift+P → "MCP: Add Server" → add <code>"ball-mill-sizing-design": { "url": "..." }</code>
 Windsurf	MCP Settings → <code>mcp_settings.json</code> → Add endpoint URL
 ChatGPT	Settings → Tools & plugins → Add MCP server → Paste endpoint
 Gemini	Extensions → Add MCP Server → Paste endpoint URL

ASK AN AI ABOUT THIS

Let your preferred AI explain this MCP server

-  Ask ChatGPT 
-  Ask Claude 
-  Ask Perplexity 
-  Ask Gemini 
-  Ask Grok 

READY TO CONNECT

Ball Mill Sizing & Design is live on Vinkius Cloud.

Get your connection token, paste it into your AI agent, and
start building. No SDK. No deployment. Just results.

Start at cloud.vinkius.com →

vinkius.com · support@vinkius.com

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DOCUMENT INFORMATION

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Platform	Vinkius Cloud for AI Agents
Endpoint	https://edge.vinkius.com/{token}/mcp

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