

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

Heat Exchanger Sizing Pro is a thermal engineering MCP.

Get precise shell and tube dimensions from thermodynamic data.

Heat Exchanger Sizing Pro handles the heavy lifting for shell and tube thermal design. Your AI client uses this MCP to run thermodynamic calculations, determine Log Mean Temperature Difference, and calculate the physical geometry needed for manufacturing. It moves you from raw fluid data to specific shell diameters and tube counts without manual math errors.

A+ Quality Score 100/100

heat-transfer

thermal-engineering

shell-and-tube

lmtcd

mechanical-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.

Heat Exchanger Sizing Pro MCP

4 tools available

Cloud-hosted on Vinkius

You can now hand off complex thermodynamic calculations to your AI agent. This MCP provides the specific tools needed to size shell and tube heat exchangers from scratch. Instead of manually solving for heat duty or LMTD, you provide the fluid properties and temperatures, and your agent handles the math.

Once the thermal requirements are set, the MCP helps you define the hardware. You can determine the required heat transfer area and the overall heat transfer coefficient to ensure the design meets your process needs. It even extends to physical specifications, letting your agent calculate the exact shell diameter and the number of tubes required based on your specific constraints. It is a complete workflow for mechanical and thermal engineers who want to move from heat duty requirements to a physical equipment specification using an AI-driven interface.

Core Capabilities

01 — Thermal Energy Calculation

Your agent uses this to find the total heat duty between fluids.

03 — Area Sizing

Your agent determines the required heat transfer area and coefficients.

02 — Temperature Gradient Analysis

The AI calculates the LMTD for counter-current or co-current flows.

04 — Physical Geometry Design

The AI calculates shell diameters and tube counts for hardware specs.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/heat-exchanger-sizing-pro — connect your AI agent in three steps.

- 01 Connect your AI client to the Vinkius-hosted MCP.
- 02 Provide your fluid properties, temperatures, or flow rates to your agent.
- 03 The agent calls the specific tool needed for the calculation.
- 04 The agent returns the thermal or physical results to your chat interface.

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

Built For

This MCP is built for engineers working with thermal systems and fluid dynamics.

Thermal Engineers

They use the AI to quickly run duty and LMTD calculations during the design phase.

Mechanical Designers

They hand off thermal requirements to the AI to get physical shell and tube dimensions.

Process Engineers

They use the tool to verify heat exchanger requirements for specific fluid flows.

What Changes When You Connect

- 01 Reduces manual calculation errors in thermodynamic workflows.
- 02 Connects thermal energy requirements directly to physical hardware dimensions.
- 03 Automates the transition from fluid properties to equipment specifications.

Real-World Applications

Initial Design Sizing

Use the MCP to find the required heat transfer area when you only have the fluid temperatures and flow rates.

Process Verification

Check the LMTD for a specific flow configuration to ensure the heat exchanger will perform as expected.

Hardware Specification

Convert a calculated heat transfer area into a specific shell diameter and tube count.

Thermal Duty Audits

Quickly recalculate the total heat duty for a system when fluid properties or flow rates change.

4 Tools Available

#	TOOL	DESCRIPTION
01	calculate_lmtd	This tool calculates the Log Mean Temperature Difference (LMTD) for your thermal calculations.
02	get_heat_duty	Use this to find the total thermal energy transferred between two fluids.
03	get_physical_dimensions	This tool determines the shell diameter and the specific number of tubes needed for the design.
04	size_heat_exchanger	This tool calculates the necessary heat transfer area and the overall heat transfer coefficient.

See It in Action

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

- U** Calculate the heat duty for a hot fluid with a mass flow rate of 5 kg/s, inlet temperature of 100°C, outlet temperature of 60°C, and specific heat of 4.18 kJ/kg·K.



The total heat duty is 836 kW.

- U** What is the LMTD for a counter-current flow where hot fluid goes from 100°C to 60°C and cold fluid goes from 20°C to 40°C?



The Log Mean Temperature Difference (LMTD) is 42.48°C.

- U** Determine the shell diameter and tube count for a required area of 15 m², tube diameter of 0.025 m, tube length of 3 m, and tube pitch of 0.03 m.



The required shell diameter is 0.65 m and the necessary tube count is 127.

Frequently Asked Questions

01 What kind of heat exchangers can I size with this MCP?

This MCP is specifically designed for sizing shell and tube heat exchangers.

02 Which AI clients can I use with this MCP?

You can use this MCP with any compatible client like Claude, Cursor, Windsurf, or VS Code.

03 Can I get physical dimensions from the AI?

Yes, the `get_physical_dimensions` tool allows your agent to determine shell diameter and tube count.

04 Do I need to host the MCP myself?

No, Vinkius hosts and manages the MCP for you. You just connect and use it.

05 Does this tool calculate LMTD?

Yes, it includes a specific tool to calculate the Log Mean Temperature Difference.

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>"heat-exchanger-sizing-pro": { "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

Heat Exchanger Sizing Pro 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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Server ID	01a09107-370b-7291-af12-43a8cb2481cc
Platform	Vinkius Cloud for AI Agents
Endpoint	<code>https://edge.vinkius.com/{token}/mcp</code>

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