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Table of contents

Nexalus Cold Plate: Example Design Architecture Overview

Upper Housing
- Contains fluid inlet and outlet ports
- Houses internal stagnation chamber to create uniform pressure above jet orifice array(s)
- Pressure equalization ensures uniformity of high velocity jets across entire array

Jet Orifice Plate
- Polymer insert between upper housing and baseplate
- Contains array of jet orifice nozzles
- Nozzles and array pattern designs optimized for specific processor using CFD

Baseplate
- Typically nickel-plated copper or aluminium
- Target cooling plate with processors mounted on bottom side and jets impinge on upper side
- Jets can impinge into cylindrical wells for enhanced heat transfer in jet impingement zone if required
- Miniature pin fins or other surface features can be included to enhance heat transfer in jet-peripheral region with minimal additional hydraulic penalty

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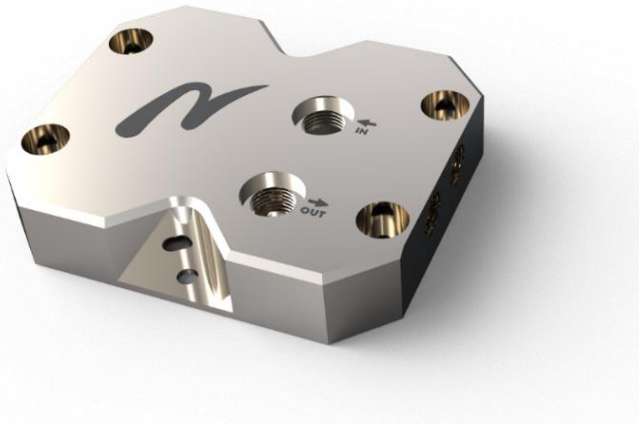
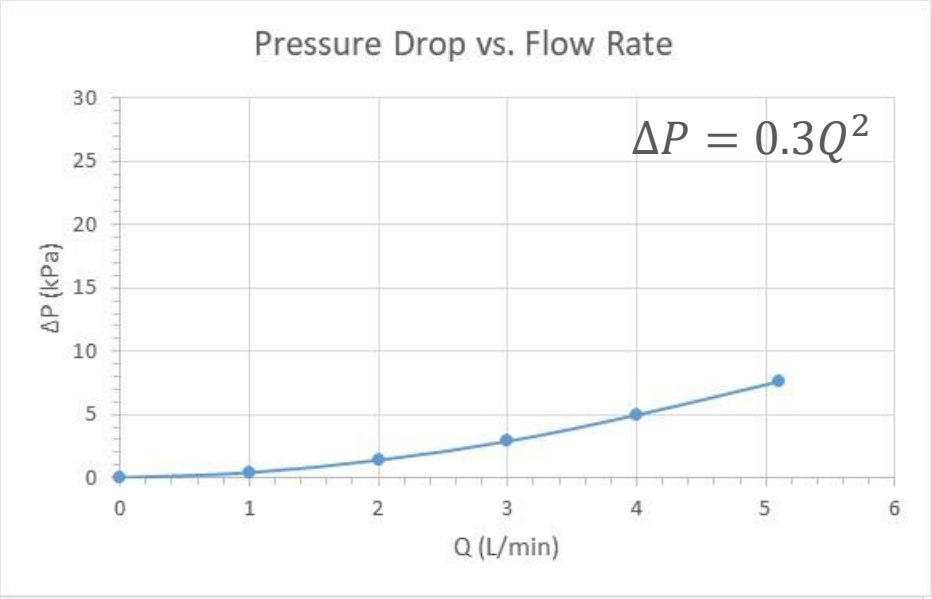
Example CPUs

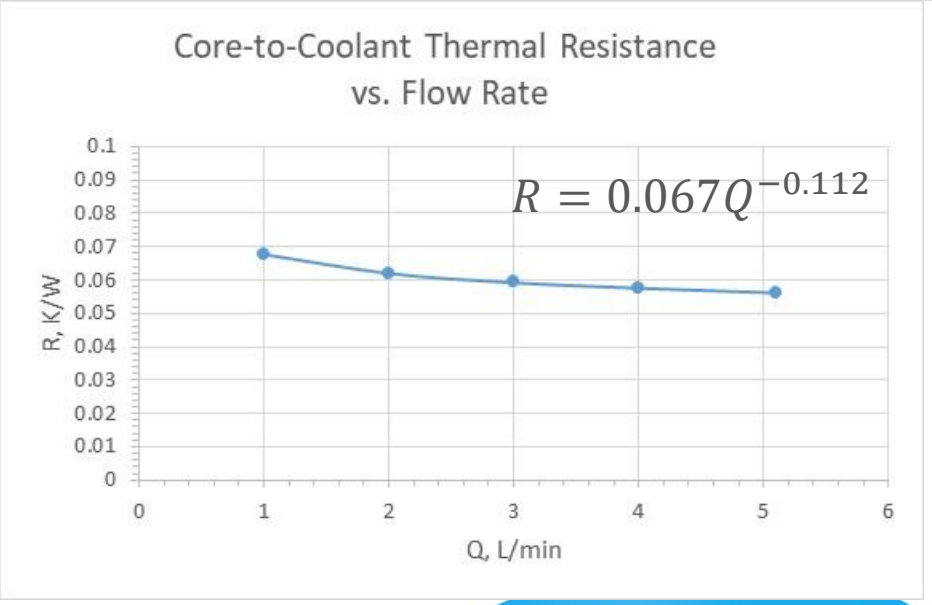
Nexalus Cold Plate for AMD EPYC 9474F



General Description

- Polymer or metal upper housing
- Polymer jet orifice plate
- 57 inline jets: 1.0 mm diameter, 3.2 mm pitch, with core-targeting design
- Nickle-plated copper baseplate
- 520 inline square pin fins





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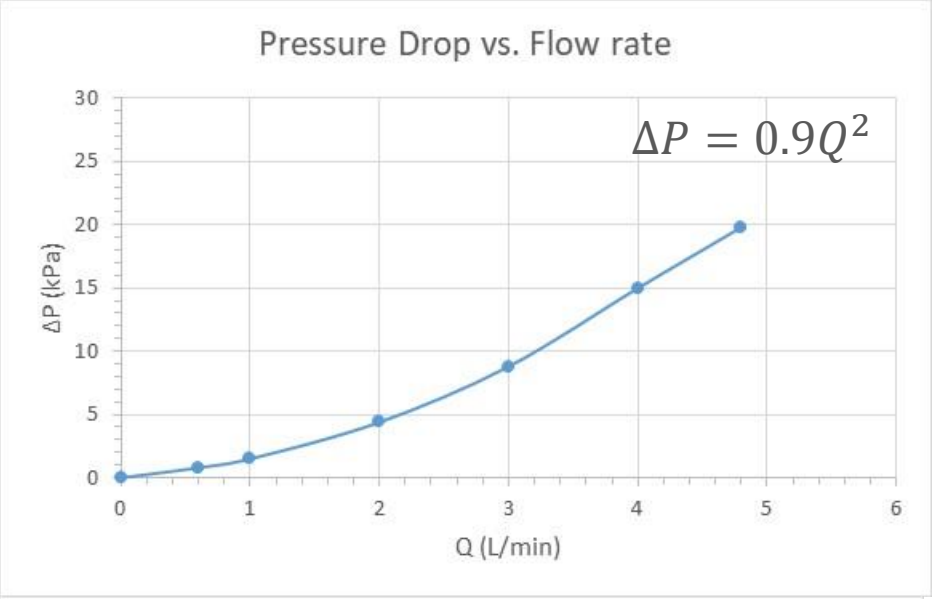
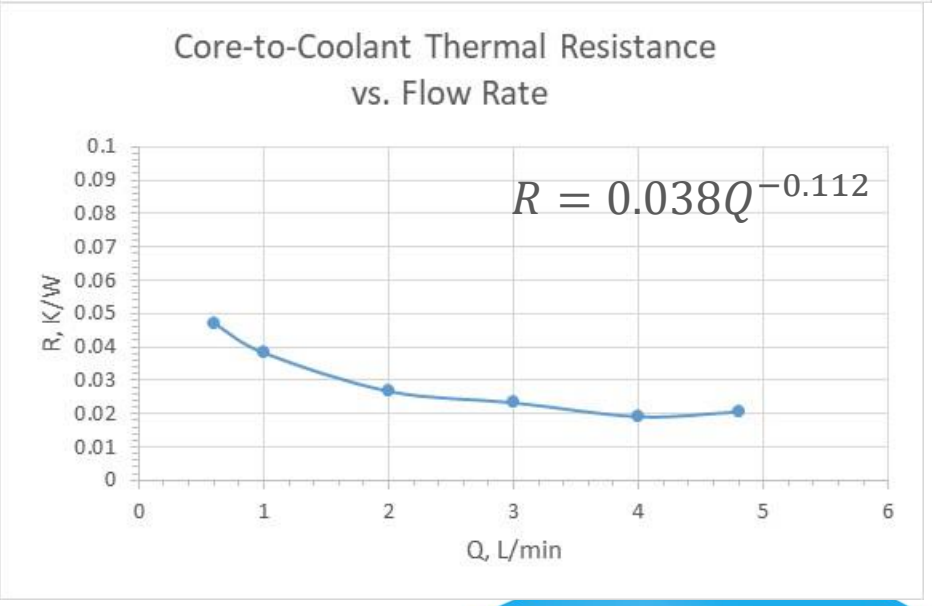
Nexalus Cold Plate for Intel Xeon Gold 6443N (Sapphire Rapids)

General Description

- Polymer or metal upper housing
- Polymer jet orifice plate
- 80 inline jets: 0.7 mm diameter, 2.75 mm pitch, with core-targeting design
- Nickle-plated copper baseplate
- 92 inline square pin fins





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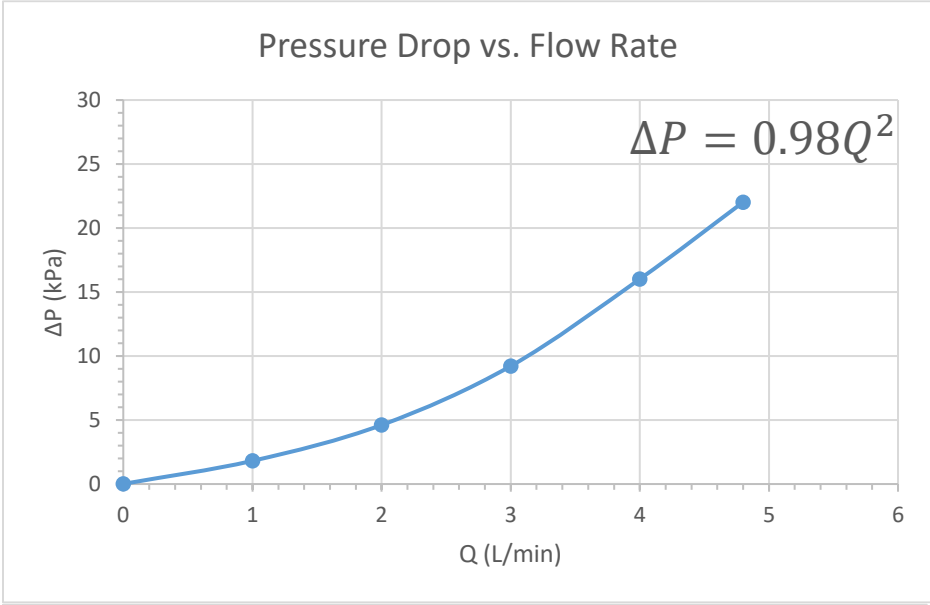
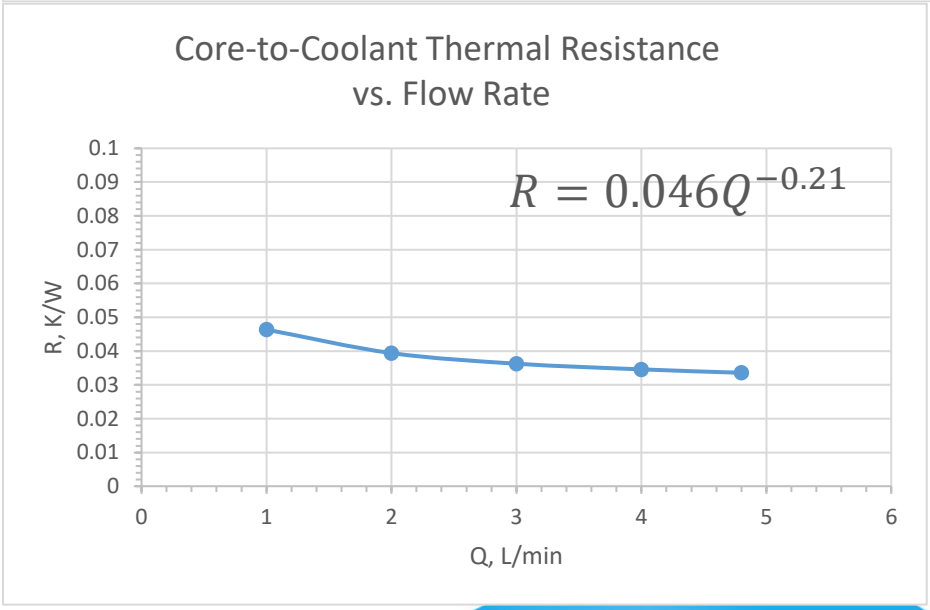
Example GPUs

Nexalus Cold Plate for NVIDIA GeForce RTX 4090

General Description

- Polymer or metal upper housing
- Polymer jet orifice plate
- 67 inline jets: 0.7 mm diameter, 2 mm pitch, with core-targeting design
- Nickle-plated copper baseplate
- 100 inline square pin fins





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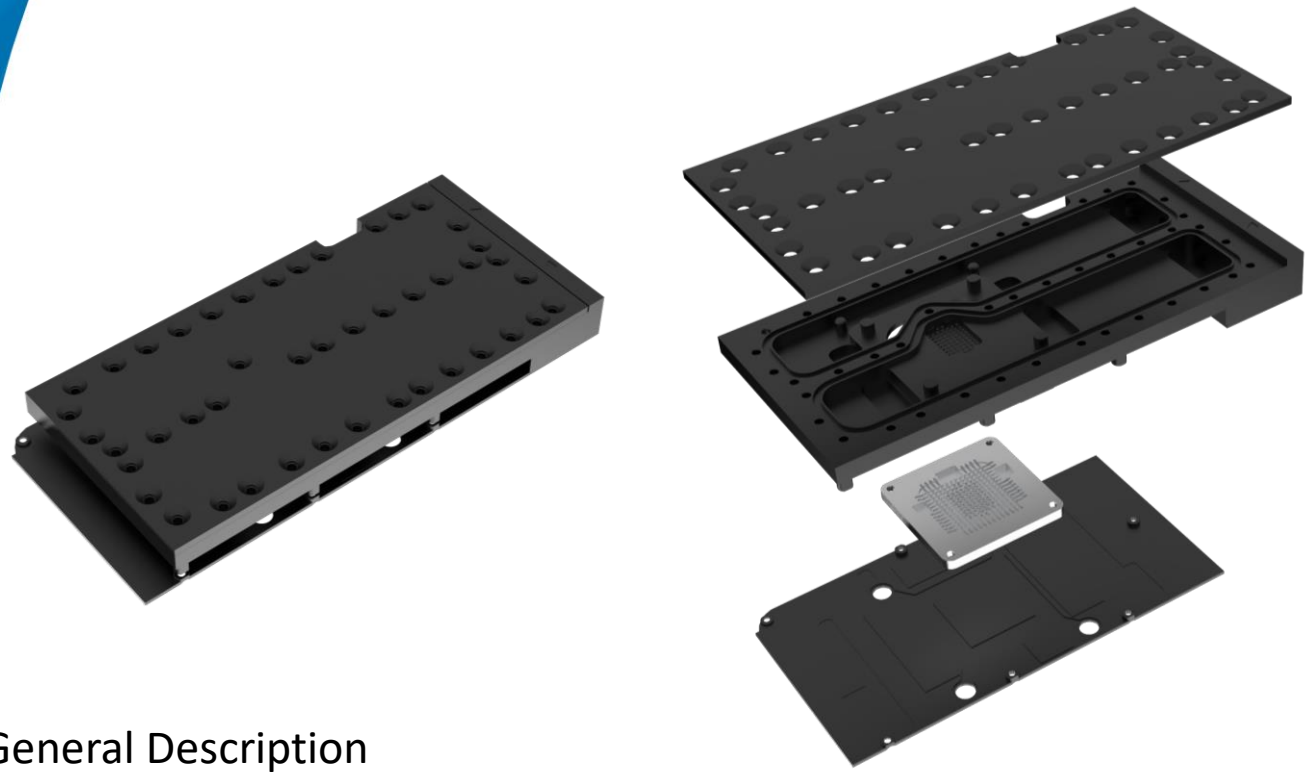
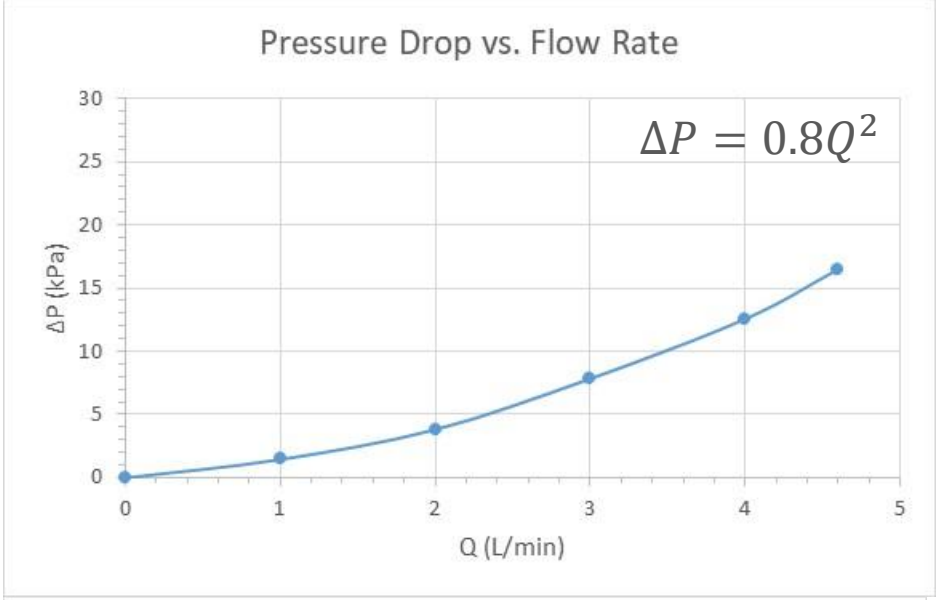
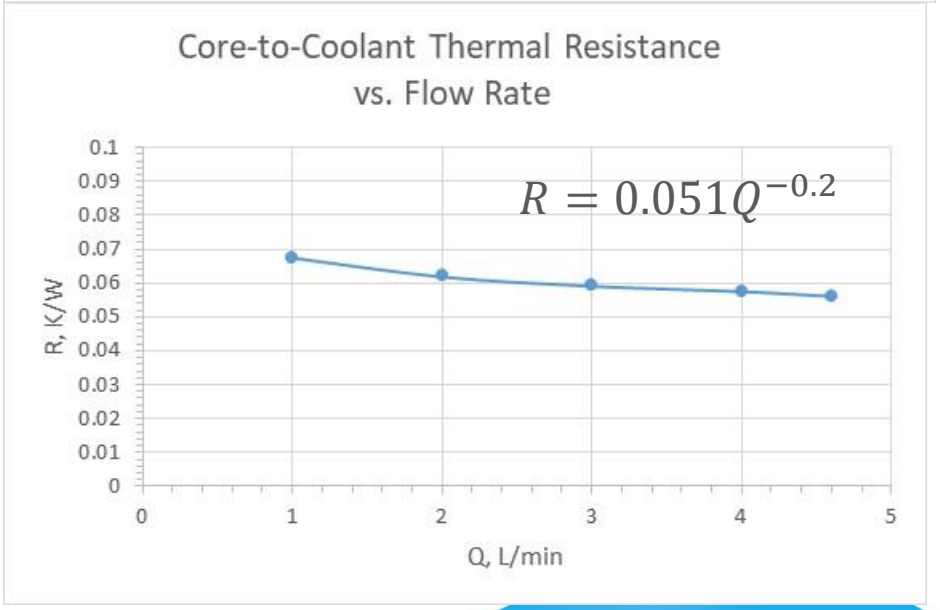
Nexalus Cold Plate for NVIDIA RTX 6000 Ada Generation



General Description

- Polymer or metal upper housing
- Polymer jet orifice plate
- 67 inline jets: 0.7 mm diameter, 2 mm pitch, with core-targeting design
- Nickle-plated copper baseplate
- 100 inline square pin fins





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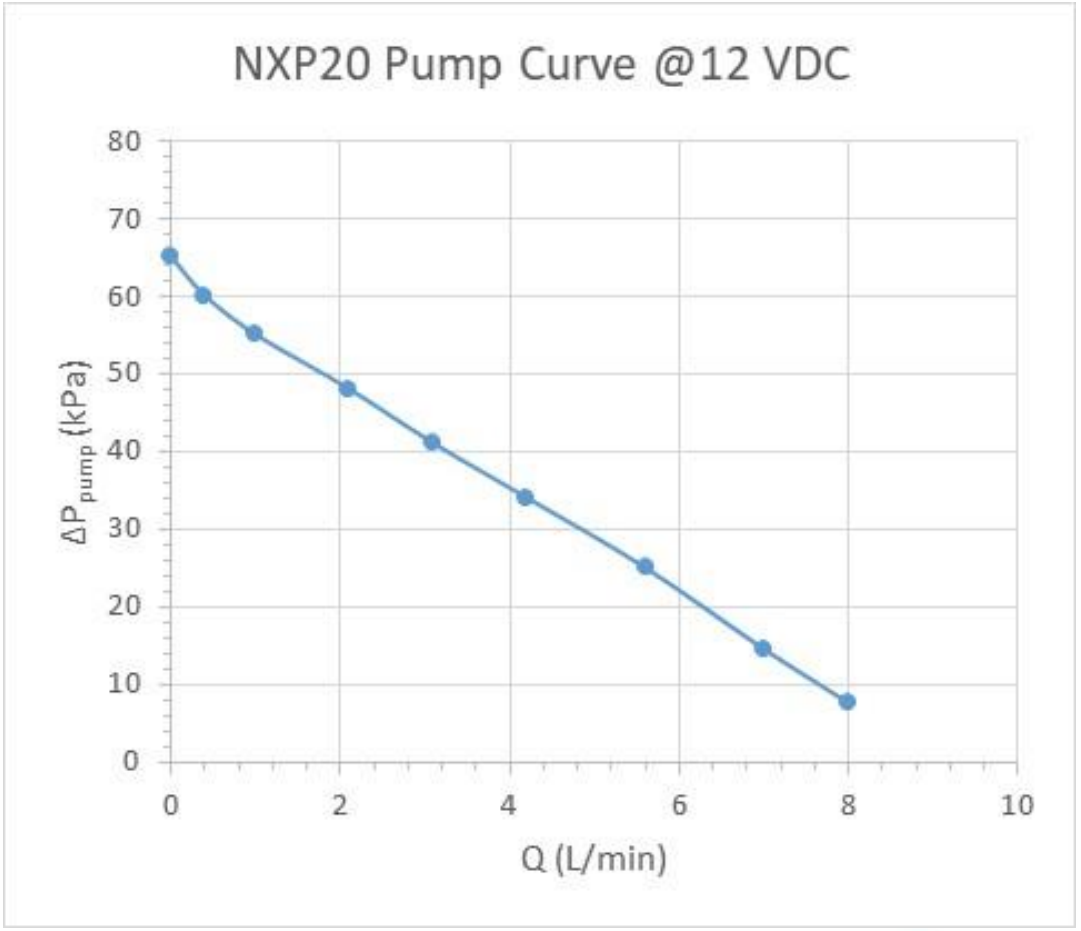
Internal Pump

Nexalus NXP20 High Flow Pump



General Description

- Compact (66.5 mm x 37.9 mm x 26.7 mm)
- Brushless motor
- Mechanically and chemically rugged (aerospace qualified)
- PWM input
- 12V DC input

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Complete Nexalus Thermal Management Solution Overview

Nexalus Sealed Server with Independent Flow Control with Integrated Pump

Brief Description

- All of the electricity consuming / heat generating server hardware is sealed in an air-tight case enclosure
- High-powered processors are direct liquid-cooled (DLC) with cold plates
- Water-based coolant circulated by dedicated internal pump(s)
- Low-powered hardware is air-cooled by recirculated internal air in the enclosure via native server fans
- Enclosed air temperature maintained via internal liquid-air heat exchangers plumbed into main liquid circuit
- Entering the server are electricity and the water-based liquid coolant
- Exiting the server are workload data and heated liquid coolant

Key Benefits

- Server-level flow control
- Low feed-return line pressures and pressure differential
- ~100% heat recovery and high temperature possible
- Low cooling power consumption (fans & pump)
- Very low dB

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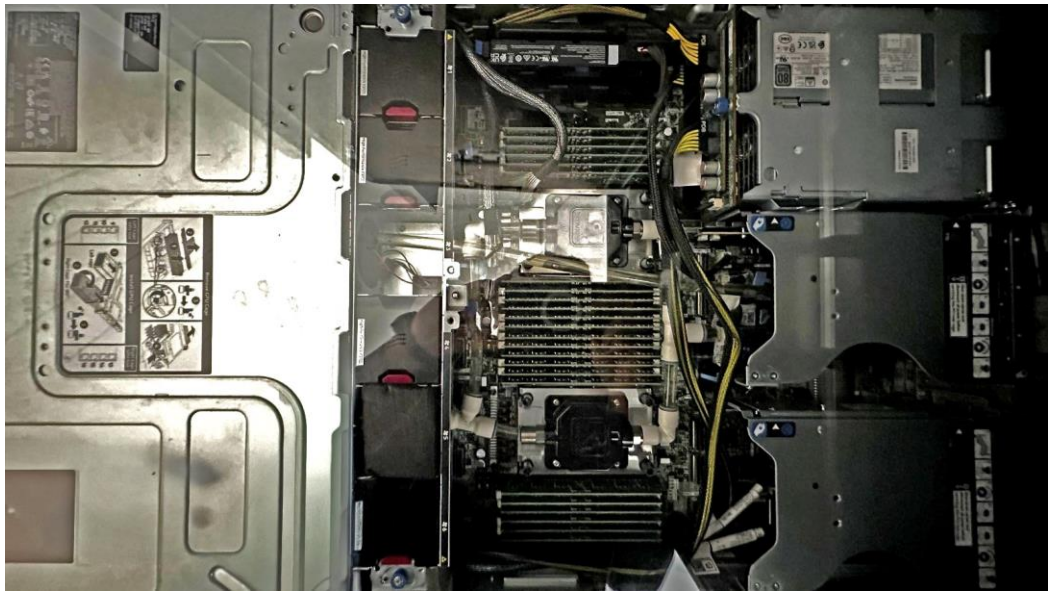
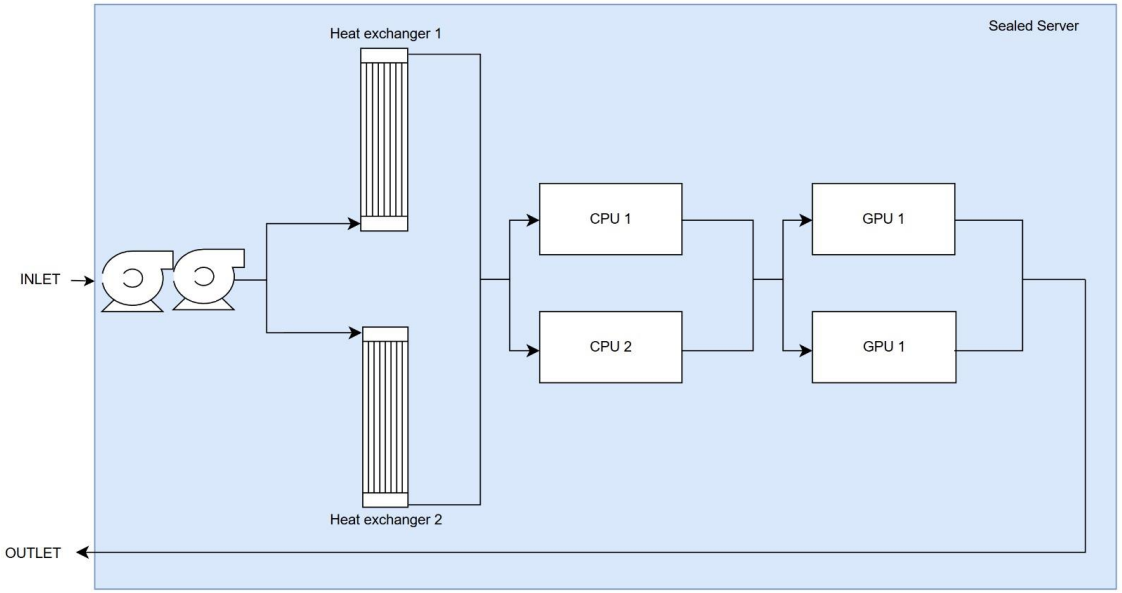
Nexalus Sealed Server: HPE ProLiant DL380 Gen11





Thermal performance for T_{inlet}=31°C

	NAME	QTY	Power, W	$T_{core,avg}$, °C
SERVER	HPE ProLiant DL380 Gen11		1106	
CPU	Intel Xeon Silver 4416	2	165	40
GPU	L40	2	278	51
DIMMs	DDR5 ECC RDIMM, 16 GB (1Rx8) PC5-4800B	24	15	40

Hydraulic performance

	NAME	QTY	Flow rate, L/min	Total pressure drop, kPa
PUMP	NXP20	1+1 redundant	2	4.5

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Thank You