

Single-phase Immersion Cooling

One Stop Solution

Data centers must be reimagined if they are to sustain the compute performance required to continue quantum leaps in discoveries and provide timely insights. To keep pace, GIGABYTE has researched and developed a new approach that goes beyond air cooled infrastructure, and into a method that dissipates heat better, Single-phase Immersion Cooling. This has proven to be more energy efficient and scalable for deployments across the globe, while being environmentally friendly and safe. For this new approach, GIGABYTE has created a one stop solution.



GIGABYTE Immersion Cooling Solution

Dandy Yeh, Founder and Chairperson of GIGABYTE, stated, "GIGABYTE has always been focused on improving server performance. Today, in the face of cooling issues for CPUs and GPUs with higher and higher computing performance, we are not only working with industry-leading partners to help companies care for their operations and sustainable development, we have also developed single-phase immersion cooling products, allowing users to deploy green computing quickly."

The effects of the pandemic have brought many changes to traditional business models. Large-scale remote work and a shift to online activities is widespread. Coupled with mainstream e-commerce and financial technologies, the need for big data and cloud computing has greatly increased, leading to "resilience challenges" for data centers of large companies. At the same time, Taiwan aims to realize the goal of net-zero emissions by 2050. Therefore, while attempting to reduce the power consumption of data centers, improving energy efficiency has become an urgent matter for all IT infrastructures. To remedy this, GIGABYTE has launched a one-stop solution for single-phase immersion cooling by leveraging expertise in high-performance computing and cooling designs.

"Net-zero emissions cannot be delayed. Our single-phase immersion cooling products are not only compact in size and comprehensive, allowing for fast deployment, but also able to reduce the total cost of ownership (TCO) for our customers. We are able to overcome the traditional high costs associated with new data centers and become an accelerator for corporate net-zero emissions," said Dandy Yeh.

In 2022, GIGABYTE dipped its toes into immersion cooling, and has since gone all in. For its efforts, GIGABYTE has received the recognition of academia, scientific research institutes, government agencies, and corporate customers, including the adoption of GIGABYTE's immersion computing products by internationally renowned foundries and telecommunication giants.

GIGABYTE possesses a complete server product line and a wealth of manufacturing experience, and it has directly translated into the success of new immersion cooling solutions as customers' demand for green computing continues to grow.



▲ A1P0-EB0 Tank



▲ A1O3-CC0 Tank



▲ Overhead view of A1P0-FB0 Tank



▲ 4U POC Tank & IT Lift

Charting a New Path with Advanced Cooling

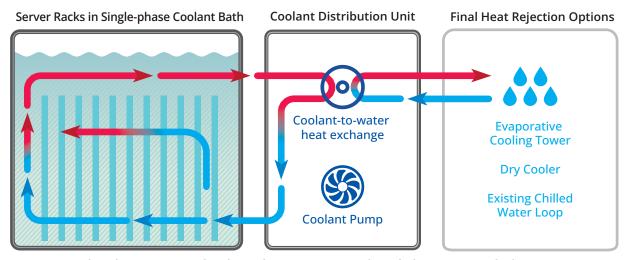
Reliability, availability, and serviceability are all traits found in the best data centers of today and tomorrow. As IT hardware and technology continue to improve, they are also making it tough for current data centers to be sustainable with the traditional fans, HVAC, and hot/cold aisles.

Why? A major reason - increase in rack power density. For each new generation of chips, the die size is shrunk while the number of transistors has increased, and this translates to higher performance, but also more heat. For instance, a GPU dense server can support CPUs and GPUS up to 300W TDP each component, but new generations of hardware are increasing the TDP by 25% or more, which is unsustainable in the same footprint. Consequently, servers are reaching thermal limitations. To maintain the same hardware density, a more efficient cooling approach is needed.

Data center architects realize this and quantify this efficiency using power usage effectiveness (PUE). PUE is a ratio that compares how much power enters the data center to the power delivered to IT equipment. Ideally, the PUE value would be 1.0; however, traditional air-cooled data centers achieve a PUE of ~1.65, which isn't horrible, but it shows room for improvement. Single-phase immersion cooling can achieve a PUE in the ballpark of 1.02-1.03.

How it Works

Single-phase immersion cooling redefines the data center from how IT equipment is cooled to the reduction in the amount and complexity of the data center infrastructure. By submerging IT equipment into a dielectric liquid bath, heat is removed faster than air while no damage or degrading occurs to all components. The liquid coolant with a higher specific heat capacity than air can quickly remove the heat. The heat given off by CPUs, GPUs, and other components is transferred directly to the liquid or via a heatsink. The warm liquid is then pumped out by a coolant distribution unit (CDU) or dry cooler. In the CDU cases, a second transfer occurs as the heat is then transferred to facility water. The resulting cooled coolant is pumped back into the immersion tank while the warmed water continues on to a heat exchanger to be expelled. And the cycle continues. Also, as the name implies, the fluid in the immersion tank does not change state, so there is no evaporation or condensation occurring, which ensures operator safety and allows for easy servicing of the tank and IT equipment.



▲ Heated coolant exits top of rack. Coolant returns to rack cooled at user-specified temperature.

The GIGABYTE One Stop Immersion Solution

66 Immersion Tank + Immersion Ready Server + Coolant + Service >>

GIGABYTE aims to give customers a hub to design and acquire all the necessary technology to deploy a single-phase immersion cooling data center. As a leader in enterprise technology, GIGABYTE has the ability to leverage current server designs to accommodate new specialized servers for immersion cooling deployments in tanks provided by GIGABYTE or its other global immersion partners. The first wave of immersion ready servers came as a result of customers' requests so it's best to contact a GIGABYTE sales representative to start the path to joining the immersion era.













High Performance

Power Efficiency

Lower TCO

High Availability

	G294-S42-IAP1	G293-S45-IAP1	G293-Z42-IAP1
Workloads	HPC, AI, ML, Data analytics	HPC, AI, ML, Data analytics	HPC, Al, ML, Data analytics
Form Factor	2U GPU Server	2U GPU Server	2U GPU Server
Processor	Dual Intel® Xeon® 6 (6700E/6700P/6500P-series)	Dual 5th/4th Gen Intel® Xeon® Scalable Dual Intel® Xeon® CPU Max Series	Dual AMD EPYC™ 9005/9004
Memory	24 x DDR5 RDIMM/MRDIMM	16 x DDR5 RDIMM slots	24 x DDR5 RDIMM slots
Networking	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN
Storage	8 x 2.5" Gen5 NVMe/SATA/SAS4	8 x 2.5" SATA/SAS *NVMe support requires additional NVMe cables	4 x 2.5" Gen5 NVMe/SATA/SAS 4 x 2.5" SATA/SAS
Expansion Slots	8 x Dual slot Gen5 GPUs 2 x LP PCle Gen5 x16 slots	8 x Dual slot Gen5 GPUs 2 x LP PCIe Gen5 x16 slots	8 x Dual slot Gen5 GPUs 2 x LP PCle Gen5 x16 slots
Power Supply	Dual 3000W Titanium	Dual 3000W Titanium	Dual 3000W Titanium

	G292-Z45-ICU1/ICM1	G292-Z43-ICU1/ICM1	G292-280-IAY1/IAP1
Workloads	HPC, Al, ML, Data analytics	HPC, AI, ML, Data analytics	HPC, Al, ML, Data analytics
Form Factor	2U GPU Server	2U GPU Server	2U GPU Server
Processor	Dual AMD EPYC™ 7003/7002	Dual AMD EPYC™ 7003/7002	Dual 3rd Gen Intel® Xeon® Scalable
Memory	16 x DDR4 RDIMM/LRDIMM	16 x DDR4 RDIMM/LRDIMM	24 x DDR4 RDIMM/LRDIMM
Networking	2 x 1GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN
Storage	8 x 2.5" SATA/SAS	4 x 2.5" Gen4 NVMe/SATA/SAS 4 x 2.5" SATA/SAS	4 x 2.5" Gen4 NVMe/SATA/SAS 4 x 2.5" SATA/SAS
Expansion Slots	8 x Dual slot Gen4 GPUs 2 x LP PCle Gen4 x16 slots	16 x Single slot Gen4 GPUs 2 x LP PCIe Gen4 x16 slots	8 x Dual slot Gen4 GPUs 2 x LP PCle Gen4 x16 slots
Power Supply	[ICU1] Dual 2200W Platinum [ICM1] Dual 2200W Titanium	[ICU1] Dual 2200W Platinum [ICM1] Dual 2200W Titanium	[IAY1] Dual 3200W Platinum [IAP1] Dual 3000W Titanium

	G152-Z12-200	G152-Z12-400	S251-300-IBC1/IBH1
Workloads	HPC, AI, ML, Data analytics	HPC, Al, ML, Data analytics	Storage
Form Factor	1U GPU Server	1U GPU Server	2U
Processor	Single AMD EPYC™ 7003/7002	Single AMD EPYC™ 7003/7002	Single 2nd Gen Intel® Xeon® Scalable Single Intel® Xeon® W-3200
Memory	8 x DDR4 RDIMM/LRDIMM	8 x DDR4 RDIMM/LRDIMM	8 x DDR4 RDIMM/LRDIMM
Networking	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 1GbE LAN, 1 x MLAN
Storage	4 x 2.5" Gen4 NVMe (internal)	4 x 2.5" Gen4 NVMe (internal)	24 x 3.5" SATA/SAS + 2 x 2.5" SATA 1 x M.2 slot (PCle Gen3 x4)
Expansion Slots	2 x Dual slot Gen4 GPUs 2 x LP PCle Gen4 x16 slots	4 x Single slot Gen4 GPUs 2 x LP PCle Gen4 x16 slots	3 x LP PCle Gen3 x16 slots 3 x LP PCle Gen3 x8 slots 1 x LP PCle Gen3 x4 slots
Power Supply	Dual 2000W Platinum	Dual 2000W Platinum	[IBC1] Dual 1300W Platinum [IBH1] Dual 1300W Titanium

	XV24-AX0-IAJ1	XV23-ZX0-IAJ1	
Workloads	HPC, AI, ML, Data analytics	HPC, AI, ML, Data analytics	
Form Factor	2U MGX Server	2U MGX Server	
Processor	Dual Intel® Xeon® 6 (Intel Xeon 6900-series)	Dual AMD EPYC™ 9005/9004	
Memory	24 x DDR5 RDIMM/MRDIMM	24 x DDR5 RDIMM	
Networking	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	
Storage	6 x 2.5" Gen5 NVMe/SATA/SAS4 *Storage card is required to support SATA/SAS	6 x 2.5" Gen5 NVMe/SATA/SAS4 *Storage card is required to support SATA/SAS	
Expansion Slots	4 x Dual slot Gen5 GPUs 3 x FHFL PCIe Gen5 x16 slots	4 x Dual slot Gen5 GPUs 3 x FHFL PCIe Gen5 x16 slots	
Power Supply	4 x 2000W Titanium	4 x 2000W Titanium	

	H374-A81-IAW1	H274-S61-IAW1	H263-S64-IAW1
Workloads	HPC, HCI, Hybrid/private cloud	HPC, HCI, Hybrid/private cloud	HPC, HCl, Hybrid/private cloud
Form Factor	3U 4-node High Density Server	2U 4-Node High Density Server	2U 4-Node High Density Server
Processor	Dual Intel® Xeon® 6 per node (Intel Xeon 6900-series)	Dual Intel® Xeon® 6 per node (6700E/6700P/6500P-series)	Dual 5th/4th Gen Intel® Xeon® Scalable per node
Memory	96 x DDR5 RDIMM/MRDIMM	64 x DDR5 RDIMM/MRDIMM	64 x DDR5 RDIMM
Networking	8 x 1GbE LAN, 4 x MLAN	8 x 1GbE LAN, 4 x MLAN	4 x MLAN, 1 x CMC
Storage	8 x 2.5" Gen5 NVMe/SATA/SAS4 *Storage card is required to support SATA/SAS	8 x 2.5" Gen5 NVMe/SATA/SAS4 Optional 4 x M.2 slots (PCle Gen4 x4)	8 x 2.5" Gen4 NVMe/SATA/SAS Optional 4 x M.2 slots (PCIe Gen4 x4)
Expansion Slots	16 x LP PCIe Gen5 x16 slots	8 x LP PCIe Gen5 x16 slots 4 x OCP 3.0 Gen5 x16 slots	4 x LP PCle Gen5 x16 slots 4 x OCP 3.0 Gen5 x16 slots
Power Supply	3 x 3000W Titanium	Dual 3000W Titanium	Dual 3000W Titanium Optional 2+1 redundant PSU

	H273-Z82-IAW1	H262-Z6B-ICU1/ICP1	H174-A80-IAS1
Workloads	HPC, HCI, Hybrid/private cloud	HPC, HCI, Hybrid/private cloud	HPC, HCl, Hybrid/private cloud
Form Factor	2U 4-Node High Density Server	2U 4-Node High Density Server	1U 2-Node High Density Server
Processor	Dual AMD EPYC™ 9005/9004 per node	Dual AMD EPYC™ 7003/7002 per node	Dual Intel® Xeon® 6 per node (Intel Xeon 6900-series)
Memory	96 x DDR5 RDIMM	64 x DDR4 RDIMM/LRDIMM	48 x DDR5 RDIMM/MRDIMM
Networking	8 x 1GbE LAN, 4 x MLAN	8 x 1GbE LAN, 4 x MLAN, 1 x CMC	4 x 1GbE LAN, 2 x MLAN
Storage	8 x 2.5" Gen4 NVMe/SATA/SAS Optional 4 x M.2 slots (PCIe Gen4 x4)	8 x 2.5" Gen4 NVMe/SATA/SAS 4 x M.2 slots (PCIe Gen4 x4)	4 x 2.5" Gen5 NVMe/SATA/SAS4 *Storage card is required to support SATA/SAS
Expansion Slots	4 x LP PCIe Gen5 x16 slots 4 x OCP 3.0 Gen5 x16 slots	8 x LP PCIe Gen4 x16 slots 4 x OCP 3.0 Gen4 x16 slots	4 x LP PCle Gen5 x16 slots
Power Supply	Dual 3000W Titanium	[ICU1] Dual 2200W Platinum [ICP1] Dual 3000W Titanium	Dual 3200W Titanium

	R284-A90-IAL1	R284-SF0-IAL1	R283-SF0-IAL1
Workloads	Networking, Hybrid/private cloud	HPC, AI, ML, Networking, Cloud	HPC, AI, ML, Networking, Cloud
Form Factor	2U Rack Server	2U Rack Server	2U Rack Server
Processor	Dual Intel® Xeon® 6 (Intel Xeon 6900-series)	Dual Intel® Xeon® 6 (6700E/6700P/6500P-series)	Dual 5th/4th Gen Intel® Xeon® Scalable Dual Intel® Xeon® CPU Max Series
Memory	24 x DDR5 RDIMM/MRDIMM	32 x DDR5 RDIMM/MRDIMM	32 x DDR5 RDIMM
Networking	2 x 1GbE LAN, 1 x MLAN	1 x MLAN	1 x MLAN
Storage	12 x 3.5"/2.5" Gen5 NVMe 2 x 2.5" SATA 2 x M.2 slots (PCIe Gen5 x4)	12 x 3.5"/2.5" Gen5 NVMe 1 x M.2 slot (PCle Gen5 x4)	12 x 3.5"/2.5" Gen5 NVMe/SATA/SAS4
Expansion Slots	4 x FHHL PCIe Gen5 x16 slot 1 x LP PCIe Gen5 x16 slot 1 x OCP 3.0 Gen5 x16 slot	4 x Dual slot Gen5 GPUs 1 x FHHL PCIe Gen5 x16 slot 1 x OCP 3.0 Gen5 x16 slot	4 x Dual slot Gen5 GPUs 1 x FHHL PCIe Gen5 x16 slot 1 x OCP 3.0 Gen5 x16 slot
Power Supply	Dual 2700W Titanium	Dual 2700W Titanium	Dual 2700W Titanium

	H173-Z80-IAS1	R283-ZK0-IAL1	R283-ZF0-IAL1
Workloads	HPC, HCI, Hybrid/private cloud	HPC, AI, ML, Data analytics	HPC, Al, ML, Data analytics
Form Factor	1U 2-Node High Density Server	2U Rack Server	2U Rack Server
Processor	Dual AMD EPYC™ 9005/9004 per node	Dual AMD EPYC™ 9005/9004	Dual AMD EPYC™ 9005/9004
Memory	48 x DDR5 RDIMM	48 x DDR5 RDIMM	24 x DDR5 RDIMM
Networking	4 x 1GbE LAN, 2 x MLAN	2 x 1GbE LAN, 1 x MLAN	1 x MLAN
Storage	4 x 2.5" Gen5 NVMe/SATA/SAS4 Optional 2 x M.2 slots (PCIe Gen4 x4)	8 x 2.5" Gen5 NVMe 4 x 2.5" SATA/SAS4 2 x M.2 slots (PCIe Gen3 x4/ x2)	8 x 3.5"/2.5" Gen5 NVMe/SATA/SAS4 4 x 3.5"/2.5" SATA/SAS4
Expansion Slots	2 x LP PCIe Gen5 x16 slots 2 x OCP 3.0 Gen5 x16 slot	4 x Dual slot Gen5 GPUs 1 x FHHL PCle Gen5 x16 slot 1 x OCP 3.0 Gen5 x16 slot	4 x Dual slot Gen5 GPUs 1 x FHHL PCle Gen5 x16 slot 1 x OCP 3.0 Gen5 x16 slot
Power Supply	Dual 3200W Titanium	Dual 2700W Titanium	Dual 2700W Titanium

	R183-SF2-IAL1	R183-ZF2-IAL1	TO15-Z20-IA01
Workloads	HPC, Al, ML, Networking, Cloud	HPC, Al, ML, Networking, Cloud	HPC, AI, ML, Data analytics
Form Factor	1U Rack Server	1U Rack Server	10U ORv3 GPU Server
Processor	Dual 5th/4th Gen Intel® Xeon® Scalable Dual Intel® Xeon® CPU Max Series	Dual AMD EPYC™ 9005/9004	Single AMD EPYC™ 9005/9004
Memory	32 x DDR5 RDIMM	24 x DDR5 RDIMM	12 x DDR5 RDIMM
Networking	1 x MLAN	1 x MLAN	2 x 10GbE LAN, 1 x MLAN
Storage	2 x 2.5" Gen5 NVMe/SATA/SAS-4	2 x 2.5" Gen5 NVMe/SATA/SAS4 2 x M.2 slots (PCIe Gen3 x4)	4 x 15mm E1.S NVMe 2 x M.2 slots (PCIe Gen5 x4) Optional 2 x M.2 slots (SATA)
Expansion Slots	4 x Dual slot Gen5 GPUs 1 x FHFL PCIe Gen5 x16 slot 1 x FHHL PCIe Gen5 x16 slot 1 x Internal LP PCIe Gen4 x8 slot 1 x OCP 3.0 Gen5 x16 slot	4 x Dual slot Gen5 GPUs 1 x FHHL PCle Gen5 x16 slot 1 x Internal LP PCle Gen5 x16 slot 1 x OCP 3.0 Gen5 x16 slot	4 x Dual slot Gen5 GPUs 2 x LP PCle Gen5 x16 slots
Power Supply	Dual 2700W Titanium	Dual 2700W Titanium	From 48V DC single busbar

	TO15-S40-IA01	TO15-S41-IA01	TO15-Z40-IA01
Workloads	HPC, Al, ML, Data analytics	HPC, Al, ML, Data analytics	HPC, AI, ML, Data analytics
Form Factor	10U ORv3 GPU Server	10U ORv3 GPU Server	10U ORv3 GPU Server
Processor	Dual 5th/4th Gen Intel® Xeon® Scalable Dual Intel® Xeon® CPU Max Series	Dual 5th/4th Gen Intel® Xeon® Scalable Dual Intel® Xeon® CPU Max Series	Single AMD EPYC™ 9005/9004
Memory	24 x DDR5 RDIMM	16 x DDR5 RDIMM	24 x DDR5 RDIMM
Networking	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN
Storage	4 x 15mm E1.S NVMe Optional 2 x M.2 slots (SATA)	4 x 15mm E1.S NVMe Optional 2 x M.2 slots (SATA)	4 x 15mm E1.S NVMe Optional 2 x M.2 slots (SATA)
Expansion Slots	4 x Dual slot Gen5 GPUs 2 x LP PCIe Gen5 x16 slots	8 x Single slot Gen5 GPUs 2 x LP PCle Gen5 x16 slots	4 x Dual slot Gen5 GPUs 2 x LP PCIe Gen5 x16 slots
Power Supply	From 48V DC single busbar	From 48V DC single busbar	From 48V DC single busbar

Immersion Cooling Tank

	A1P0-EB0	A103-CC0
	21U	180U
Hardware Capacity	21U + 2U x 2 (EIA)	18OU + 2OU (power shelf) + 1U x 2 (EIA)
Heat Dissipation Capacity	80 kW with 25°C inlet water 60 kW with 35°C inlet water	
Dimensions (L x W x H)	Tank: 0.91m x 1.16m x 1.49m CDU: 0.86m x 0.48m x 1.62m	
Weight	Tank: 450 kg (w/o co	oolant); CDU: 325 kg
Coolant Volume	750 Liter	r (615 kg)
Power Plug	PDU: IEC 60309 63A-3P+N+E, 6H, Plug x2 CDU: IEC 60320 C19, Plug x1	PDU: IEC 60309 32A-3P+N+E, 6H, Plug x1 Power Shelf: IEC 60309 63A-3P+N+E, 6H, Plug x1 CDU: IEC 60320 C19, Plug x1
Input Power Spec	3P+N+E 63A, 380-415VAC, 50/60Hz x2 3P+N+E 32A, 380-415VAC, 50/60Hz x1 1P+N+E 15A, 220-240VAC, 50/60Hz x1 1P+N+E 15A, 220-240VAC, 50/60Hz x1	
Depth Supported	900 mm	
Cooling Pipe Size	2" clamp fitting (Tube OD 50.8 mm / Flange OD 63.9 mm)	
Cooling Water Inlet	20-35°C	
Cooling Water Flow	240	LPM

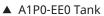


▲ A1P0-EB0 / A1O3-CC0 Tank

Immersion Cooling Tank

	A1P0-EE0	A1P0-EA0
	24U 2U or 1U x2 •-	12U
Hardware Capacity	24U + 2U x 2 (EIA)	12U (EIA)
Heat Dissipation Capacity	80 kW with 25°C inlet water 50 kW with 35°C inlet water	40 kW with 20°C
Dimensions (L x W x H)	Tank: 1.15m x 1.33m x 2m	Tank: 1.2m x 0.87m x 1.56m Tank + Switch: 1.2m x 0.93m x 1.56m
Weight	880 kg (w/o coolant)	300 kg (w/o coolant)
Coolant Volume	900 Liter (1647 Kg)	400 Liter (320 kg)
Power Plug	PDU: 100A-200-240/346-416Vac, 3PH, WYE	PDU: IEC 60309 32A – 3P+N+E, 6H, plug x2
Input Power Spec	3P+N+E 125A, 380-415VAC, 50/60Hz x2	3P+N+E 32A, 380-415VAC, 50/60Hz x2
Depth Supported	900 mm	900 mm
Cooling Pipe Size	2" Pipe / PT 2" Female Thread	PT 1-1/4" Male Adaptor (Pipe OD 42.7 mm)
Cooling Water Inlet	20-35°C	20-35°C
Cooling Water Flow	200 LPM	100 LPM







▲ A1P0-EA0 Tank

Immersion Cooling POC Tank



	4U POC Tank
Hardware Capacity	4U (Supports server length up to 950 mm)
Cooling Power	7 KW
Unit Size	W1.0 x D1.2 x H1.35 m
Unit Weight	400 kg (w/o coolant)
Coolant Tank Volume	185 Liter (151 kg)
Power Plug	IEC 60309 32A – 3P+N+E, 6H, plug x1
Input Power Spec	3P+N+E 32A; 380-415VAC; 50/60Hz
Cooling Type	dry cooler

Accessories and Coolants



IT Lift

Dimension: W1.15 x D0.85 x H1.53 m

Unit weight: 200 kg

Lifting load: 70 kg

Input AC: 100-240V~/ 3.5A, 50/60Hz

Power Plug: US ,10A, 125V



IT Dry Rack

Dimension: W 1.23 x D 0.63 x H 1.25 m

Unit weight: 75 kg

Server depth supported: 900 mm

Support space: 20 U or 20 OU

Load capacity: 800 kg



Coolants

SK Enmove: GC-5X

SK enmove

Shell: Immersion Cooling Fluid S3 X, Immersion Cooling Fluid S5 X

Exxon Mobil: SpectraSyn™ 6

Chevron: SynFluid® PAO 4 cST



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