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 Single-phase 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.
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.

The GIGABYTE One Stop Immersion Solution

“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.
# Immersion Ready Servers

<table>
<thead>
<tr>
<th>Model</th>
<th>Workloads</th>
<th>Form Factor</th>
<th>Processor</th>
<th>Memory</th>
<th>Networking</th>
<th>Storage Bays</th>
<th>Expansion Slots</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>G292-Z45-ICU1/ICM1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>AMD EPYC 7003 series Dual processors</td>
<td>16 x DDR4 RDIMM/LRDIMM</td>
<td>2 x 1GbE LAN, 1 x MLAN</td>
<td>8 x 2.5&quot; SATA/SAS</td>
<td>8 x dual-slot GPUs</td>
<td>[ICU1] Dual 2200W Platinum</td>
</tr>
<tr>
<td>G292-Z43-ICU1/ICM1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>AMD EPYC 7003 series Dual processors</td>
<td>16 x DDR4 RDIMM/LRDIMM</td>
<td>2 x 10GbE LAN, 1 x MLAN</td>
<td>4 x 2.5&quot; Gen4 NVMe/SATA</td>
<td>2 x low-profile slots</td>
<td>[ICU1] Dual 2200W Titanium</td>
</tr>
<tr>
<td>G293-Z42-IAP1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>AMD EPYC 9004 series Dual processors</td>
<td>24 x DDR5 RDIMM slots</td>
<td>2 x 10GbE LAN, 1 x MLAN</td>
<td>4 x 2.5&quot; SATA/SAS</td>
<td>2 x low-profile slots</td>
<td>Dual 3000W Titanium</td>
</tr>
<tr>
<td>G153-Z10- IAE1</td>
<td>HPC, AI, ML, data analytics</td>
<td>1U</td>
<td>AMD EPYC 9004 series Single processor</td>
<td>12 x DDR5 RDIMM</td>
<td>1 x MLAN</td>
<td>4 x 2.5&quot; Gen5 NVMe (internal)</td>
<td>1 x low-profile GPUs</td>
<td>Dual 2000W Titanium</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Workloads</th>
<th>Form Factor</th>
<th>Processor</th>
<th>Memory</th>
<th>Networking</th>
<th>Storage Bays</th>
<th>Expansion Slots</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>G292-280-IAY1/IAP1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>3rd Gen Intel Xeon Scalable Dual processors</td>
<td>24 x DDR4 RDIMM/LRDIMM</td>
<td>2 x 10GbE LAN, 1 x MLAN</td>
<td>8 x 2.5&quot; Gen4 NVMe/SATA</td>
<td>8 x dual-slot GPUs</td>
<td>[IAY1] Dual 3200W Platinum</td>
</tr>
<tr>
<td>G293-S45-IAP1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>4th/5th Gen Intel Xeon Scalable Intel Xeon CPU Max Series Dual processors</td>
<td>16 x DDR5 RDIMM slots</td>
<td>1 x MLAN</td>
<td>12 x 3.5&quot;/2.5&quot; Gen5 NVMe/SATA/ SASS</td>
<td>8 x dual-slot GPUs</td>
<td>Dual 3000W Titanium</td>
</tr>
<tr>
<td>R283-SF0-IAL1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>4th/5th Gen Intel Xeon Scalable Intel Xeon CPU Max Series Single processor</td>
<td>32 x DDR5 RDIMM</td>
<td>1 x MLAN</td>
<td>8 x 3.5&quot;/2.5&quot; Gen5 NVMe/SATA/ SASS</td>
<td>1 x FHHL slot</td>
<td>Dual 2700W Titanium</td>
</tr>
<tr>
<td>R283-ZF0-IAL1</td>
<td>HPC, AI, ML, data analytics</td>
<td>2U</td>
<td>AMD EPYC 9004 series Dual processors</td>
<td>24 x DDR5 RDIMM</td>
<td>1 x OCP 3.0 slot</td>
<td>4 x dual-slot GPUs</td>
<td>1 x FHHL slot</td>
<td>Dual 2700W Titanium</td>
</tr>
</tbody>
</table>
## Immersion Ready Servers

### H263-S64-IAW1
- **Workloads**: HPC, HCI, hybrid/private cloud
- **Form Factor**: 2U 4-Node
- **Processor**: 4th/5th Gen Intel Xeon Scalable Dual processors per node
- **Memory**: 64 x DDR5 RDIMM
- **Networking**: 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 8 x low-profile slots
- **Power Supply**: Dual 3000W Titanium

### H273-Z82-IAW1
- **Workloads**: HPC, HCI, hybrid/private cloud
- **Form Factor**: 2U 4-Node
- **Processor**: AMD EPYC 9004 series Dual processors per node
- **Memory**: 96 x DDR5 RDIMM
- **Networking**: 8 x 1GbE LAN, 4 x MLAN
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: Dual 3000W Titanium

### H262-Z6B-ICU1/ICP1
- **Workloads**: HPC, HCI, hybrid/private cloud
- **Form Factor**: 2U 4-Node
- **Processor**: AMD EPYC 7003 series Dual processors per node
- **Memory**: 64 x DDR4 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE, 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: Dual 3000W Titanium

### S251-3O0-IBC1/IBH1
- **Workloads**: Storage
- **Form Factor**: 2U
- **Processor**: 2nd Gen Intel Xeon Scalable Single processor
- **Memory**: 8 x DDR4 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE LAN, 1 x MLAN
- **Storage Bays**: 24 x 3.5" SATA/SAS 2 x 2.5" SATA on rear side
- **Expansion Slots**: 7 x low-profile slots

### TO15-S40-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: 4th/5th Gen Intel Xeon Scalable Dual processors
- **Memory**: 24 x DDR5 RDIMM
- **Networking**: 2 x 10GbE LAN, 1 x MLAN
- **Storage Bays**: 4 x E1.5 Gen5 NVMe
- **Expansion Slots**: 8 x single-slot GPUs 2 x M.2 slots (optional)
- **Power Supply**: From 48V DC single busbar

### TO15-S41-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: Intel Xeon CPU Max Series Dual processors
- **Memory**: 16 x DDR5 RDIMM
- **Networking**: 2 x 10GbE LAN, 1 x MLAN
- **Storage Bays**: 4 x E1.5 Gen5 NVMe
- **Expansion Slots**: 8 x single-slot GPUs 2 x M.2 slots (optional)
- **Power Supply**: From 48V DC single busbar

### TO15-Z40-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: AMD EPYC 9004 series Dual processors
- **Memory**: 24 x DDR4 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE, 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: Dual 3000W Titanium

### TO15-Z20-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: AMD EPYC 9004 series Dual processors
- **Memory**: 24 x DDR5 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE, 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: Dual 3000W Titanium

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### H263-S64-IAW1
- **Workloads**: HPC, HCI, hybrid/private cloud
- **Form Factor**: 2U 4-Node
- **Processor**: AMD EPYC 9004 series Dual processors per node
- **Memory**: 64 x DDR5 RDIMM
- **Networking**: 2 x 10GbE LAN, 1 x MLAN
- **Storage Bays**: 4 x E1.S Gen5 NVMe
- **Expansion Slots**: 4 x dual-slot GPUs 2 x M.2 slots (optional)
- **Power Supply**: From 48V DC single busbar

### H273-Z82-IAW1
- **Workloads**: HPC, HCI, hybrid/private cloud
- **Form Factor**: 2U 4-Node
- **Processor**: AMD EPYC 7003 series Dual processors per node
- **Memory**: 96 x DDR5 RDIMM
- **Networking**: 8 x 1GbE LAN, 4 x MLAN
- **Storage Bays**: 4 x E1.S Gen5 NVMe
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: From 48V DC single busbar

### H262-Z6B-ICU1/ICP1
- **Workloads**: HPC, HCI, hybrid/private cloud
- **Form Factor**: 2U 4-Node
- **Processor**: AMD EPYC 7003 series Dual processors per node
- **Memory**: 64 x DDR4 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE, 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: From 48V DC single busbar

### S251-3O0-IBC1/IBH1
- **Workloads**: Storage
- **Form Factor**: 2U
- **Processor**: 2nd Gen Intel Xeon Scalable Single processor
- **Memory**: 8 x DDR4 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE LAN, 1 x MLAN
- **Storage Bays**: 24 x 3.5" SATA/SAS 2 x 2.5" SATA on rear side
- **Expansion Slots**: 7 x low-profile slots

### TO15-S40-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: 4th/5th Gen Intel Xeon Scalable Dual processors
- **Memory**: 24 x DDR5 RDIMM
- **Networking**: 2 x 10GbE LAN, 1 x MLAN
- **Storage Bays**: 4 x E1.5 Gen5 NVMe
- **Expansion Slots**: 8 x single-slot GPUs 2 x M.2 slots (optional)
- **Power Supply**: From 48V DC single busbar

### TO15-S41-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: Intel Xeon CPU Max Series Dual processors
- **Memory**: 16 x DDR5 RDIMM
- **Networking**: 2 x 10GbE LAN, 1 x MLAN
- **Storage Bays**: 4 x E1.5 Gen5 NVMe
- **Expansion Slots**: 8 x single-slot GPUs 2 x M.2 slots (optional)
- **Power Supply**: From 48V DC single busbar

### TO15-Z40-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: AMD EPYC 9004 series Dual processors
- **Memory**: 24 x DDR4 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE, 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: Dual 3000W Titanium

### TO15-Z20-IA01
- **Workloads**: HPC, AI, ML, data analytics
- **Form Factor**: 1OU
- **Processor**: AMD EPYC 9004 series Single processor
- **Memory**: 24 x DDR5 RDIMM/LRDIMM
- **Networking**: 8 x 1GbE, 4 x MLAN, 1 x CMC
- **Storage Bays**: 8 x 2.5" Gen4 NVMe/SATA
- **Expansion Slots**: 4 x low-profile slots
- **Power Supply**: Dual 3000W Titanium
# Immersion Tanks

<table>
<thead>
<tr>
<th></th>
<th>A1P0-EB0</th>
<th>A1O3-CC0</th>
<th>A1P0-EA0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware Capacity</strong></td>
<td>21U + 2U x 2 (EIA)</td>
<td>18OU + 2OU (power shelf) + 1U x 2 (EIA)</td>
<td>12U (EIA)</td>
</tr>
<tr>
<td><strong>Cooling Power</strong></td>
<td>80 KW</td>
<td></td>
<td>40 KW</td>
</tr>
<tr>
<td><strong>Unit Size</strong></td>
<td>Tank: W1.16 x D0.91 x H1.49 m CDU: W0.48 x D0.86 x H1.62 m</td>
<td>W0.87 x D1.2 x H1.56 m</td>
<td></td>
</tr>
<tr>
<td><strong>Unit Weight</strong></td>
<td>Tank: 450 kg (w/o coolant), CDU: 325 kg</td>
<td></td>
<td>300 kg (w/o coolant)</td>
</tr>
<tr>
<td><strong>Coolant Volume</strong></td>
<td>750 Liter (615 kg)</td>
<td></td>
<td>400 Liter (320 kg)</td>
</tr>
<tr>
<td></td>
<td>CDU: IEC 60320 C19</td>
<td>Power shelf: IEC 60309 63A – 3P+N+E, 6H, 32A, 380-415VAC, 50/60Hz x2</td>
<td>CDU: IEC 60320 C19</td>
</tr>
<tr>
<td><strong>Input Power Spec</strong></td>
<td>3P+N+E 63A, 380-415VAC, 50/60Hz x2 1P+N+E 15A, 220-240VAC, 50/60Hz x1</td>
<td>3P+N+E 32A, 380-415VAC, 50/60Hz x1 3P+N+E 63A, 380-415VAC, 50/60Hz x1 1P+N+E 15A, 220-240VAC, 50/60Hz x1</td>
<td>3P+N+E 32A, 380-415VAC, 50/60Hz x2</td>
</tr>
<tr>
<td><strong>Depth Supported</strong></td>
<td>900 mm</td>
<td>900 mm</td>
<td>900 mm</td>
</tr>
<tr>
<td><strong>Cooling Pipe Size</strong></td>
<td>2” clamp fitting (Tube OD 50.8 mm / Flange OD 63.9 mm)</td>
<td>PT 1-1/4” Male Adaptor (Pipe OD 42.7 mm)</td>
<td></td>
</tr>
<tr>
<td><strong>Cooling Water Inlet</strong></td>
<td>20-35°C</td>
<td>20-35°C</td>
<td></td>
</tr>
<tr>
<td><strong>Cooling Water Flow</strong></td>
<td>240 LPM</td>
<td></td>
<td>100 LPM</td>
</tr>
</tbody>
</table>

![A1P0-EB0 / A1O3-CC0 Tank](image1)

![A1P0-EA0 Tank](image2)
# POC Tank, Accessories and Coolants

## 4U POC Tank

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Capacity</td>
<td>4U</td>
</tr>
<tr>
<td>Cooling Power</td>
<td>7 KW</td>
</tr>
<tr>
<td>Unit Size</td>
<td>W1.0 x D1.2 x H1.35 m</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>400 kg (w/o coolant)</td>
</tr>
<tr>
<td>Coolant Tank Volume</td>
<td>185 Liter (151 kg)</td>
</tr>
<tr>
<td>Power Plug</td>
<td>IEC 60309 32A – 3P+N+E, 6H, plug x1</td>
</tr>
<tr>
<td>Input Power Spec</td>
<td>3P+N+E 32A; 380-415VAC; 50/60Hz</td>
</tr>
<tr>
<td>Depth Supported</td>
<td>950 mm</td>
</tr>
<tr>
<td>Cooling Type</td>
<td>dry cooler</td>
</tr>
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</table>

## IT Lift

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>W1.15 x D0.85 x H1.53 m</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>200 kg</td>
</tr>
<tr>
<td>Max Loading</td>
<td>70 kg</td>
</tr>
<tr>
<td>Input AC</td>
<td>100-240V~, 50/60Hz, 3.5A</td>
</tr>
<tr>
<td>Power Plug</td>
<td>US 10A 125V</td>
</tr>
<tr>
<td>Chassis Spec</td>
<td>EIA &amp; OCP compatible</td>
</tr>
</tbody>
</table>

## IT Dry Rack

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>W1.23 x D0.63 x H1.25 m</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>75 kg</td>
</tr>
<tr>
<td>Support Size</td>
<td>EIA 19&quot; &amp; OCP 21&quot; compatible</td>
</tr>
<tr>
<td>Support Space</td>
<td>20U or 20OU</td>
</tr>
<tr>
<td>Load Capacity</td>
<td>Under 800 kg</td>
</tr>
</tbody>
</table>

## Coolants

<table>
<thead>
<tr>
<th>Coolant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell</td>
<td>Immersion Cooling Fluid S3 X</td>
</tr>
<tr>
<td></td>
<td>Immersion Cooling Fluid S5 X</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>SpectraSyn™ 6</td>
</tr>
<tr>
<td></td>
<td>SynFluid® PAO 4 cST</td>
</tr>
</tbody>
</table>