

# PETRONAS IONA TERA

**Accelerating Efficiency  
with advanced thermal  
management solutions**



# INTRODUCTION





# WE ARE ENGINEERING TOMORROW, TODAY.

The rapid growth of high power density and data centers is driving the need for a cooling revolution. These centers, generating significant heat, demand innovative cooling solutions to sustain efficiency and reliability.

Reducing operational energy costs, which can account for up to 40% of total energy consumption in data centers, is becoming a top priority\*. With water usage also emerging as a growing concern, data center owners and operators are increasingly focused on enhancing efficiency to reduce resources consumption.

In 2022, data centers consumed nearly 2% of global electricity, and this figure is expected to double by 2026\*. The challenge is clear: traditional air cooling methods are no longer adequate for sustainable operations.

**The future lies in liquid cooling, an advanced solution that meets the demands of high-performance computing, AI, crypto currency mining, and more high-heat generation hardwares.**

**By adopting liquid cooling, data centers can decrease cooling costs, and improve water and energy efficiency, all without compromising uptime.**

\*source: IEA Electricity 2024 report

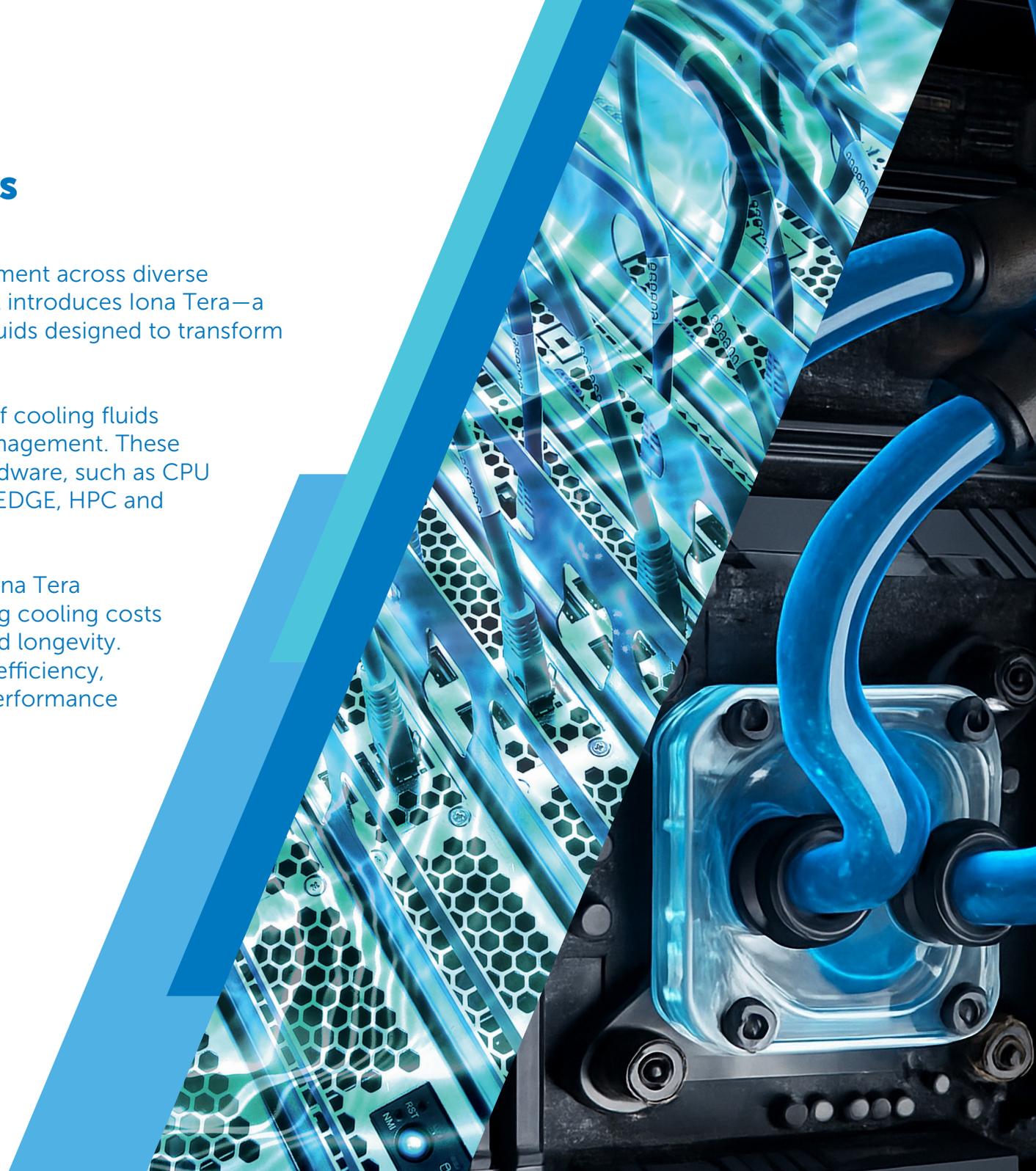
# PETRONAS IONA TERA

## Thermal Intelligent Fluids

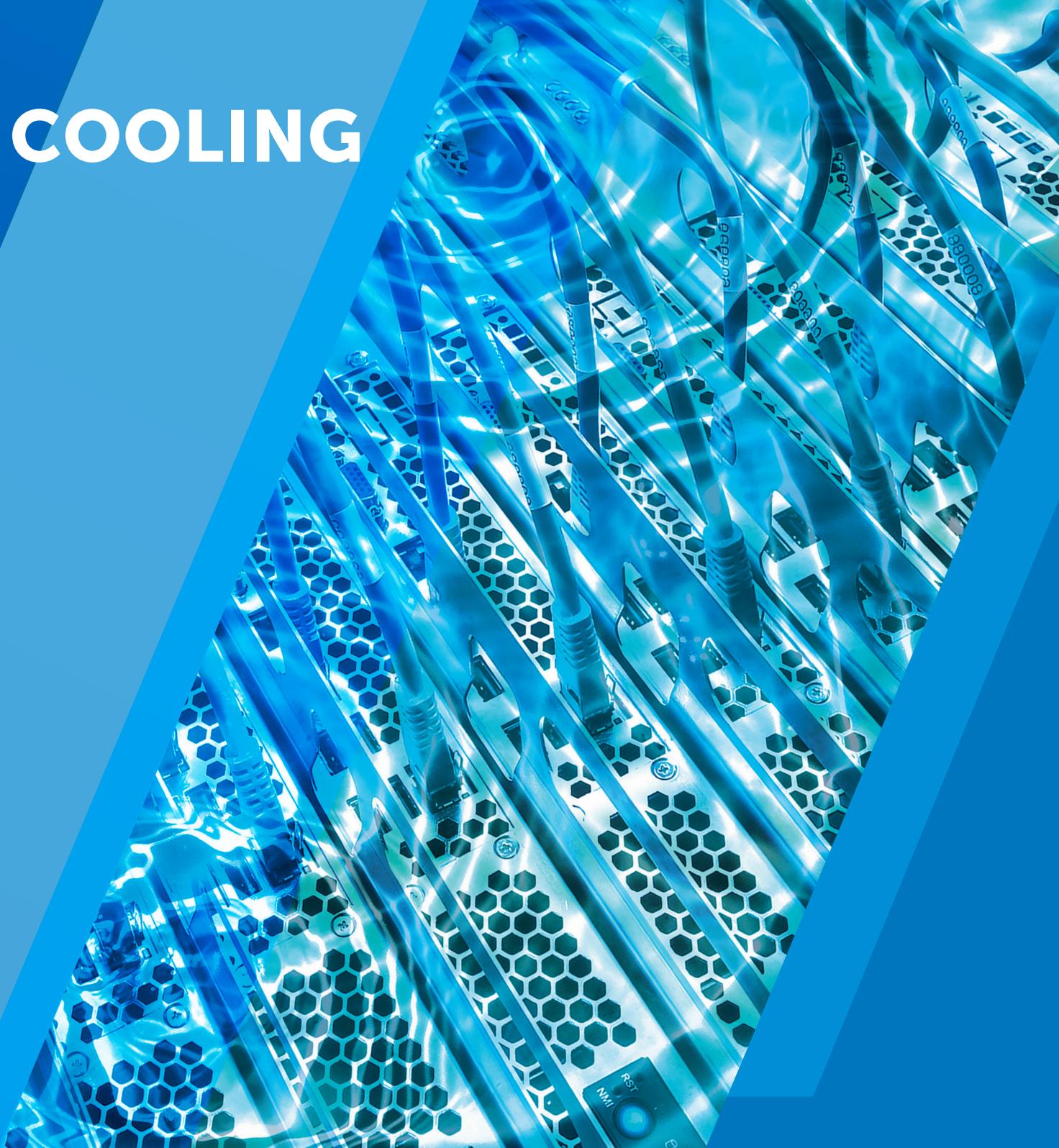
Building on years of expertise in heat management across diverse industries, PETRONAS Lubricants International introduces Iona Tera—a groundbreaking range of thermal intelligent fluids designed to transform the future of data center cooling worldwide.

PETRONAS Iona Tera is a cutting-edge suite of cooling fluids engineered to deliver exceptional thermal management. These fluids are compatible with a wide range of hardware, such as CPU and GPU with high TDP, Data Center servers, EDGE, HPC and blockchain operations.

By providing superior cooling performance, Iona Tera effectively manages heat, significantly lowering cooling costs while enhancing system reliability, stability, and longevity. PETRONAS Iona Tera sets a new standard for efficiency, ensuring your data center operates at peak performance for years to come.

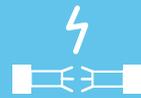


# IMMERSION COOLING



# KEY PRODUCT FEATURES FOR ENHANCED PERFORMANCE

(without compromise on safety)



## Dielectric fluids

Our high-performance dielectric fluids are designed for immersive cooling systems, offering exceptional thermal management without risking short circuits or hardware damage. This ensures optimised performance and increased durability.



## Enhanced Heat Dissipation

Capable of handling high thermal loads, our fluids support cutting-edge cooling systems, enhancing their efficiency and effectiveness.



## Proven Material Compatibility

Rigorously tested, our fluids are compatible with a wide range of materials including alloys, polymers, and sealants. This ensures prolonged lifespan for critical electronic components such as CPUs, GPUs, and servers.



## Non-Flammable

Featuring a high flashpoint, our fluids are not flammable according to 67/548/CEE classification.



## Non-Toxic

Not toxic and not corrosive for a safe contact with server electronics\*.



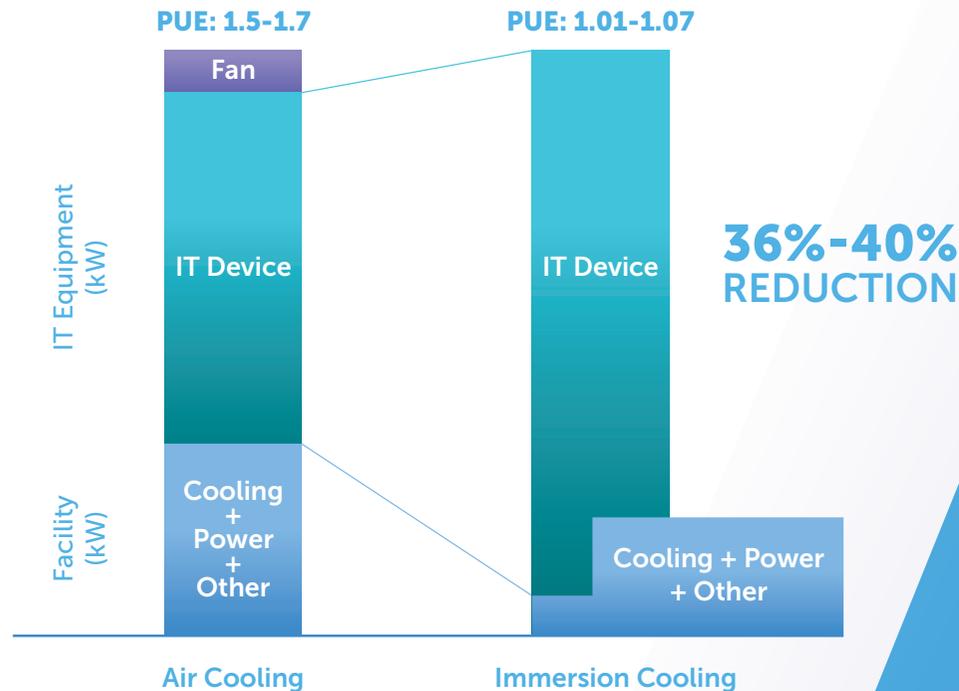
## Climate Resilience

Our single-phase cooling fluids operate efficiently across a broad range of climate conditions, including extreme temperatures up to 50°C, ensuring reliable performance regardless of environmental factors.

\* Always refer to safety data sheet for product handling

# DISCOVER THE ADVANTAGES OF IMMERSION COOLING

## Power Consumption Comparison: Air-Cooling vs Immersion Cooling



Refer to the green grid. PUE (Power Usage Effectiveness) measures how efficiently a data center uses energy, comparing the total energy the facility uses to the energy delivered to computing equipment.

Multiple sources, GRC, Alibaba, participants of OCP Summit; Curated by Mordor intelligence

Unlike traditional air-cooling systems, Iona Tera's immersion cooling fluids offer unparalleled heat transfer and dissipation across a larger volume.

This advanced technology enhances cooling efficiency, providing the following key benefits:

**Energy Efficiency:** Achieve up to 40% improvement in Power Usage Effectiveness (PUE), significantly reducing the energy required to cool hardware.

**Enhanced reliability:** By operating servers at lower temperatures within a controlled, dust-free environment—with fewer moving parts and no fans—our technology enhances reliability. This reduces system complexity and minimises potential failure points.

**Significant Savings:** With fewer moving parts, our immersion cooling technology cuts water and energy usage, minimises operational downtime, and reduces the total cost of ownership (TCO) by up to 40% over the life of your facility.

**Optimised Performance:** Immersion cooling creates a consistent, efficient work environment by eliminating hot and cold spots, resulting in silent operation and improved uptime and performance.

**Uncompromised Safety:** Our immersion cooling fluids are dielectric, not flammable according to 67/548/CEE classification, non-toxic and not corrosive for a safe contact with server electronics\*, ensuring safety for your hardware and the environment with lower CO2 emissions.

\*Always refer to safety data sheet for product handling

# PRODUCT PORTFOLIO

PETRONAS IONA TERA is a range of high-performance dielectric fluids engineered to cater for immersive cooling setups and effectively thermal manage the hardware components delivering optimized performance and durability for today's precision liquid cooling solutions.



## TERA

## TERA CORE

## TERA BIO-S

## TERA PLUS

## TERA ULTRA

- Our entry level offer, with a competitive price point

- Our reduced carbon footprint offer

- Our biodegradable offer

- Our high-quality solution for high performance hardware

- Our top-tier offer tailored for high performance hardware

- Technology suitable for generic CPU, GPU and servers

- Technology suitable for generic CPU, GPU and servers

- Technology suitable for CPU and GPU, Data Center / EDGE servers

- Technology suitable for CPU and GPU with high TDP, Data Center / EDGE servers

- Technology suitable for CPU and GPU with high TDP, Data Center / EDGE servers, HPC and block-chain operations

- Enhances Power Usage Effectiveness (PUE)



FROM RECYCLED RESOURCES

- Offers Superior protection



BIODEGRADABLE

- Offers Superior protection



HIGH-PERFORMANCE

- Offers Superior protection



HIGH-PERFORMANCE LONG-LIFE

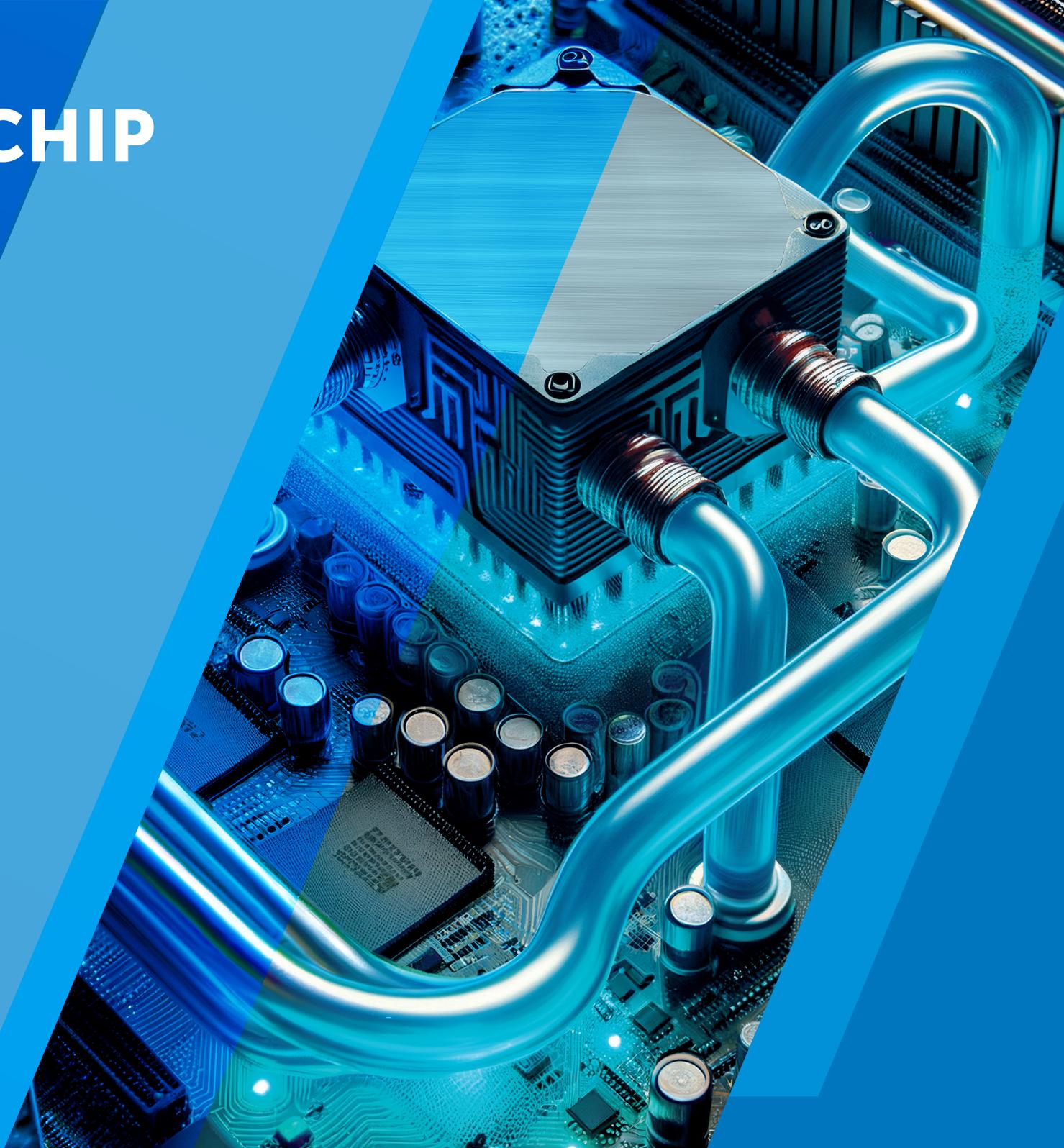
# PHYSICAL AND CHEMICAL PARAMETERS

Formulations developed and tested in accordance with OCP specifications.



PRODUCT NAME	kV (100 °C) cSt	kV (40 °C) cSt	Pour Point °C	Flash Point Closed Cup °C	Fire Point °C	Auto Ignition Point °C	Dielectric Strength kV (2.5 mm Gap)	Volume Resistivity GΩ	Oxidation Stability -	Material Compatibility -
	ASTM D445	ASTM D445	ASTM D97	ASTM D93	ASTM D92	ASTM E659	IEC 60156	ASTM D1169	IEC 61125	OCP
<b>TERA</b>	3.5	14.0	-45	194	237					+++
<b>TERA CORE</b>	3.0	12.0	-51	174	220				<i>Limit not achieved</i>	+++
<b>TERA BIO-S</b>	2.5	8.6	-57	165	195	>300	>55	>50	>500h at 120°C	+++
<b>TERA PLUS</b>	2.0	6.5	-69	160	160					+++
<b>TERA ULTRA</b>	1.8	5.6	-69	155	155					+++

# DIRECT TO CHIP



# PETRONAS IONA TERA

## Direct-to-Chip Liquid Cooling Solutions

High-performance computing applications such as artificial intelligence, cryptocurrency, augmented reality, and machine learning are growing rapidly. This advancement requires an increase in power-demanding hardware which generates more heat and requires greater cooling capacity.

Modern CPUs and GPUs offer unprecedented performance, but they require innovative cooling solutions to dissipate heat while maintaining their performance and energy efficiency.

Direct-to-chip liquid cooling is the right solution to approach modern cooling without significantly impacting data centre facilities and equipment. By circulating fluid through a plate that is in direct contact with major heat sources, such as CPUs and GPUs, heat can be removed faster while using less energy compared to traditional air cooling systems.

**TERA**  
**PG**

PETRONAS Lubricants International, building on years of expertise in heat management across diverse industries, has developed a Propylene Glycol

Based fluid to provide best-in-class performance for Direct-to-chip liquid cooling systems.



# PETRONAS LUBRICANTS INTERNATIONAL: Your Trusted Global Partner

At PETRONAS Lubricants International, we are your global, strategic partner dedicated to data centre excellence. With decades of experience across diverse industries, cutting-edge research, and advanced technology at our disposal, we are equipped to deliver tailored solutions that meet your specific needs. Our in-house testing capabilities ensure that our solutions are meticulously refined to achieve optimal performance.

By combining our expertise with your insights, we can co-engineer bespoke solutions that revolutionise thermal management and drive accelerated efficiency in your facility.

## We are open to collaborate with you on:

-  Design Requirements
-  Fluid Validation & Testing Fluid
-  Approval & Commercialisation

## As your trusted partner, we offer:

-  Fluid Research
-  Fluid Development
-  Formulation Improvement
-  Technology Advancement
-  Technology Commercialisation

## OUR PRODUCTS HAVE BEEN INTENSIVELY TESTED BY:



# PETRONAS IONQ TERA

Let PETRONAS Lubricants International help you achieve unparalleled success in your data centre operations.



