

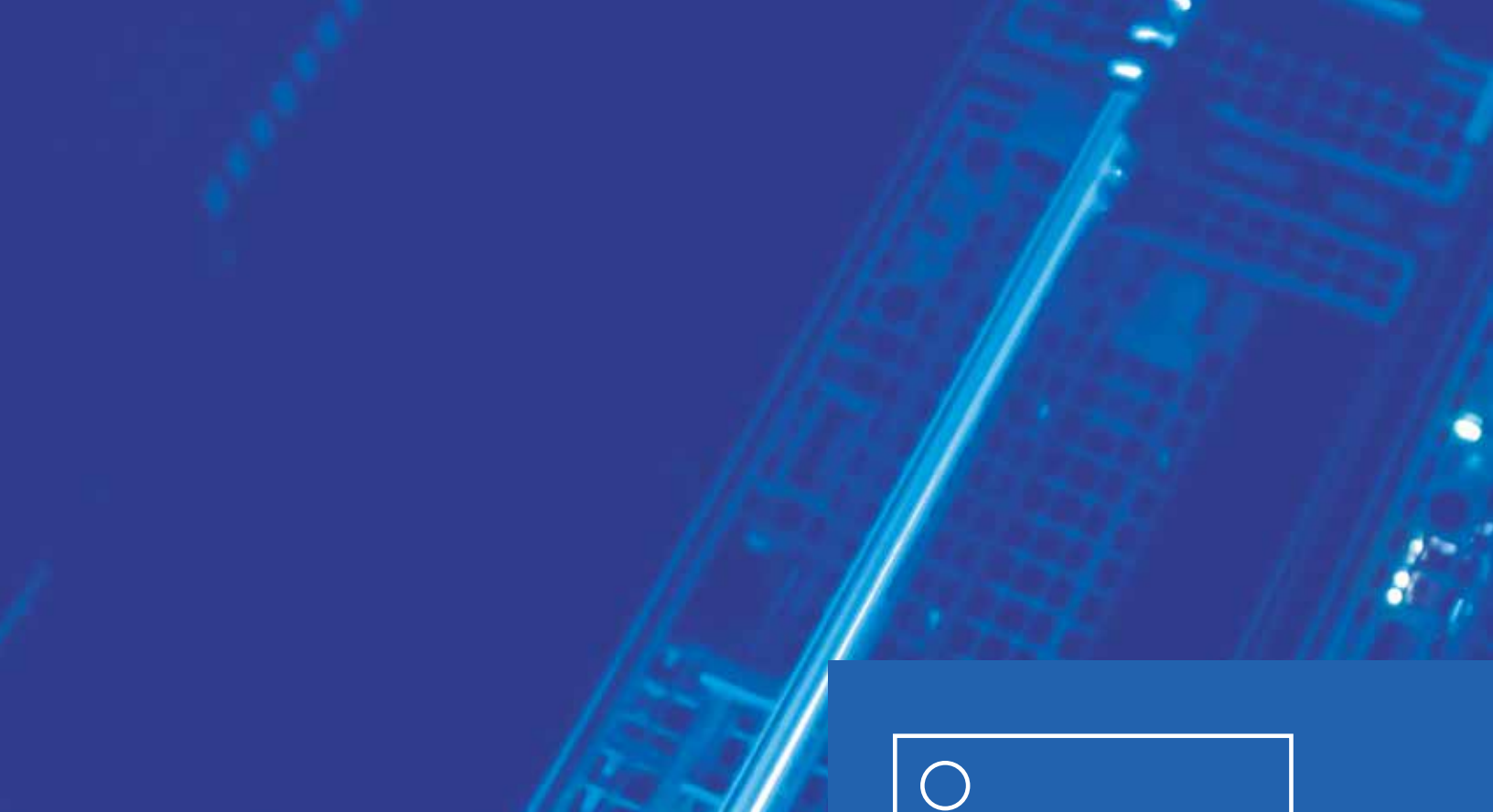


CompuZol™

IMMERSION FLUID SOLUTION

By **Lubrizol**


ENABLING NEXT-GENERATION DATA  
CENTERS, HIGH PERFORMANCE COMPUTING  
AND THE TRANSITION TO THE EDGE



Meaning less energy, less physical space and less downtime... all with more consideration of environmental impact. **CompuZol™ Immersion Fluid Solution, engineered by Lubrizol®**, is a key part of a practical, long-term solution to overcome the heat issues that plague power-dense data centers while providing added benefits from energy efficiency, to system longevity, to addressing environmental challenges.



Although market projections vary, immersion cooling deployments are multiplying and consensus is building that the technology will continue to grow over the coming years.



THE DIGITAL AGE IS PUSHING COMPUTING  
TO THE LIMITS. IMMERSION COOLING CAN  
SUSTAIN THE DIGITAL REVOLUTION.

## Taking the Heat Off

Tomorrow's data centers need to do more with less. This means reducing energy and water consumption, a smaller physical footprint and less downtime, all while mitigating environmental impact as the importance of Sustainability continues to grow.



# COMPUZOL™ IMMERSION COOLING FLUIDS OUTPERFORM



Heat Transfer Performance



Improved Data Center Footprint



System Compatibility & Durability



Low Environmental Impact



Regulatory Compliance



Global Supply Chain

## Tailor-formulated and Turnkey

Lubrizol has created its line of CompuZol™ immersion cooling fluids with input from world-leading OEMs in microchip, server and immersion tank technologies. That means data center operators can rely on Lubrizol for turnkey solutions uniquely formulated to outperform similar products in the marketplace... many of which were not originally-created for data center applications.

A Berkshire Hathaway company, Lubrizol has accumulated 30+ years of thermal management formulating expertise that has led to tailor-formulated solutions for the data center marketplace, including scalable x86 infrastructure.

## Exceptional Performance and Extended Life

CompuZol™ Immersion Fluid Solution offers best-in-class material compatibility, durability and dependable thermal performance to enable increased computing density. What's more, it addresses growth barriers posed by conventional cooling methods. For instance, by enabling elimination of moving parts required in air cooled technology, CompuZol™ Immersion Fluid Solution helps data centers to maximize mean time between failures and extend the serviceable life of server hardware. Two fundamental types of immersion cooling systems are in use today, known as single-phase and two-phase. Though both methods involve fully submerging hardware in fluid, each approach is markedly different.

**“BEST -IN-CLASS MATERIAL COMPATIBILITY, DURABILITY AND TERMINAL PERFORMANCE TO ENABLE INCREASED COMPUTING DENSITY.”**

## Sustainability and Energy Management

Enabling elimination of power-hungry air cooling systems, CompuZol™ ImmersionFluid Solution helps data centers reduce cooling costs by up to 30 percent.

Equally significant, more kilowatt consumption can be diverted away from cooling and directly to servers, greatly improving Power Usage Effectiveness (PUE).

Add in the capital expenditure savings in contrast to installing expansive air cooling systems and data centers operators can realize a significantly lower total cost of ownership.

Compared to other cooling methods, technologies supported by CompuZol™ Immersion Fluid Solution benefit data center operators in the following ways:

- **reduce carbon emissions**
- **consume less water**
- **avoid use of fluorocarbon-based fluids with high global warming potential**

- **Formulating solutions to enable tomorrow's compute-intensive equipment**
- **Lubrizol regulatory team engagement during product development and deployment**
- **Optimizing fluid performance and properties such as viscosity to improve facility PUE**
- **Reduced global warming potential compared to two-phase alternatives**
- **Hassle-free access to performance fluids at scale**
- **Targeting equipment reliability through rigorous compatibility testing**

# COMPUZOL™ PROPERTIES

Lubrizon has developed a family of single-phase immersion fluids that have been tailor-formulated to enhance thermal performance, material compatibility, durability and sustainability. The development of this family of fluid solutions has considered the global safety and regulatory requirements of immersion technologies in applications such as data centers, edge, high-performance computing, among others.

<i>at 25°C unless noted</i>	CompuZol™ IM2015	CompuZol™ IM2020	CompuZol™ IM2025
<b>Thermal Properties</b>			
Kinematic Viscosity (100 °C, cSt)	1.6	2.5	5.3
Kinematic Viscosity (40 °C, cSt)	4.6	8.6	25.7
Kinematic Viscosity (25 °C, cSt)	6.9	13.8	47.2
Thermal Conductivity (W/m°K)	0.143	0.143	0.153
Density (25°C, g/ml)	0.80	0.81	0.83
Specific Heat (J/g°C, 25°C)	2.028	2.107	1.810
Pour Point (D5950, °C)	-39	-54	-48
Boiling Range (50% temp, ASTM D2887)	325	375	469
<b>Dielectric Properties</b>			
Dielectric Constant @ 1 kHz at 25°C	2.28	2.26	2.21
Volume Resistivity (MOhm-m, 22°C)	2245	1869	2699
<b>Fire Safety &amp; Global Distribution</b>			
Open Cup Flash Point (°C, ASTM D92)	160	202	251
Closed Cup Flash Point (°C, ASTM D93)	142	180	235
<b>Environmental Impact</b>			
Contains Fluorinated Species (Per- or Polyfluoroalkyl Substances)	No	No	No

## Two-phase Cooling

Involves fluorocarbon-based fluid known to have extremely high global warming potential

VS

## Single-phase Cooling

Low global warming potential, longer fluid lifetimes and improved safety



For more information, visit us online at <http://go.lubrizol.com/compuzol>

## The Safer Immersion Cooling System

There are two fundamental types of immersion cooling systems. Two-phase cooling involves fluorocarbon-based fluid known to have extremely high global warming potential. **CompuZol™ Immersion Fluid Solution supports single-phase cooling technologies**, which have become the preferred method based on thermal management properties, low global warming potential, fluid life/durability and improved safety.

## THE LUBRIZOL ADVANTAGE

### Consultive Expertise Comes Included

Drawing on its longstanding role as a global fluid leader, Lubrizol is not only uniquely positioned to develop next-generation immersion fluids but can also inform data center stakeholders of best practices for fluid management up and down the value chain. Fluid maintenance is a prime example as data centers need reliable processes for drain interval and disposal management — two areas where Lubrizol can provide expert guidance.

### Let's Put Our Next-Generation Thinking Together

The Lubrizol high-performance fluid engineering team is here to help you innovate and evolve your data center cooling technology beyond what is believed to be possible today. One example is energy recapture and reuse... something that could one day power data centers themselves or even nearby communities. Drawing on Lubrizol expertise today is the best way to accelerate your data center cooling solutions of tomorrow.

**Lubrizol**

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