



CompuZol™

IMMERSION FLUID SOLUTION

By **Lubrizol**

# MATERIAL COMPATIBILITY GUIDE

## Overview

This guide specifies the material compatibility of common data center hardware with dielectric CompuZol™ immersion cooling fluids by Lubrizol®.

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## Compatibility Definitions



**Compatible** – Successfully passed all testing and deemed acceptable for use in this application. In some cases, testing resulted in some minor change (e.g., haziness of fluid, leaching of polymers, yellowing of material, etc.), but the change was deemed minimal and insignificant.



**Partially Compatible** – Testing resulted in some change (e.g., component lost structural integrity, leached contaminants into the fluid, altered the fluid color, or created haze). However, components with this designation may be acceptable in specific applications.







**Not Recommended** – Testing resulted in some critical failure (e.g., component ceased to function, lost all or most of its structural integrity, or leached contaminants into the fluid that may affect desired fluid properties). Lubrizol does not recommend components with this designation for use with CompuZol immersion cooling fluids.

# CPU PACKAGE MATERIALS, THERMAL INTERFACE MATERIALS, AND THERMAL GREASES

## Primary Testing Methods








Materials soaked for three (3) days at 110 °C. Following testing, materials were evaluated visually and quantitatively for changes to physical strength and integrity. Fluids were evaluated visually and via advanced analytical testing to identify trace contaminants and/or instances of fluid degradation. **Specific material names of representative examples are available upon request.**

Generic Category/ Family	Compatibility	Notes
Cured Epoxy Gap Filler		Typical phenomena observed include haziness of fluid and leaching of silicone and silane polymers
Thermal Grease (Silicone-based)		Typical phenomena observed include haziness of fluid, leaching of silicone polymers, loss of structural integrity and dissolution
Thermal Pad (Silicone-based)		Typical phenomena observed include haziness of fluid, leaching of silicone polymers and lost structural integrity
Thermal Pad (Hydrocarbon-based)		Typical phenomena observed include loss of structural integrity and disintegration

# SERVER AND BOARD COMPONENTS

## Primary Testing Methods












Components soaked for five (5) days at 80 °C. Fluids were evaluated visually and via advanced analytical testing for contaminants. Board components were tested for changes in weight, visual appearance, and functionality. **Specific material names of representative examples are available upon request.**

Generic Category/ Family	Compatibility	Notes
PVC Insulated Cables		Typical phenomena observed include leaching of plasticizers into fluid, cloudiness in fluid, and cable rigidity; functionality unaffected
Memory and Storage PCBs		No changes in component or fluid quality
Metal Heatsinks		No changes in component or fluid quality
Coin Cell Batteries		No changes in component or fluid quality
Power Supply		Typical phenomena observed include cloudiness attributed to TIM in PSU
Aluminum Organic Polymer Capacitors		No changes in component or fluid quality
Motherboard and Networking PCBs		Typical phenomena observed include degradation of TIM under heat spreader






# ELASTOMERS, PLASTICS, AND SEAL MATERIALS

## Primary Testing Methods

Materials soaked for seven (7) days at 70 °C. Fluids were evaluated visually and via advanced analytical testing for contaminants. Materials were tested for changes in weight, volume, hardness, tensile strength, and tensile elongation. **Specific material names of representative examples are available upon request.**

Example Tested	Compatibility	Notes
Polypropylene (PP)		No visible changes in material or fluid
High Density Polyethylene (HDPE)		No visible changes in material or fluid
Nylon (PA66)		No visible changes in material or fluid
Polyurethane (PU)		No visible changes in material or fluid
Polyethylene Terephthalate (PET)		Typical phenomena observed include warping of plastic, but no visible changes in fluid
Polyphenyl Ether (PPE)		No visible changes in material or fluid
Non-Plasticized Polyvinyl Chloride (PVC)	 (plasticized PVC not recommended)	No visible changes in material or fluid
Low Density Polyethylene (LDPE)		Typical phenomena observed include yellowing of material, but no visible changes in fluid
Polyether Ether Ketone (PEEK)		No visible changes in material or fluid
Polyphenylene Sulfide (PPS)		No visible changes in material or fluid
Braid-Reinforced Silicone Tubing		Typical phenomena observed include warping of material, but no visible changes in fluid

## Elastomers, Plastics, and Seal Materials Continued

Fluoroelastomers (FKM)		No visible changes in material or fluid
Nitrile, Buna-N or NBR Elastomer Seals		Typical phenomena observed include swelling of material and browning of fluid
Flextral Petroleum Hose (Nitrile-Synthetic Rubber)		No visible changes in material or fluid
Ethylene Propylene Diene Monomer Rubber (EPDM)		Typical phenomena observed include swelling and pitting of material and browning of fluid
Polyisoprene Natural Rubber (PI)		Typical phenomena observed include swelling and pitting of material and browning of fluid

### Testing Notes:

#### Primary Testing Methods

See category sections for explanations of primary testing methodologies.

#### Additional Testing Methods

After primary testing was completed, each test material and fluid were subjected to further evaluation. This testing was conducted to validate and reinforce compatibility recommendations:

- **Advanced Analytical Testing**

Refers to proprietary spectroscopy, chromatography, elemental analysis and spectrometry methodologies used to evaluate material compatibility, fluid contamination, and stressed fluid durability.

- **Advanced Physical Properties Testing**

Refers to standardized testing to assess material physical properties impact, e.g. adhesion, tensile strength. Specific test methodology was determined by material type and use case in the system.

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