



# **PG25 Fluid Requirements**

Application Note

# Document History

| Version | Date            | Authors        | Description of Change |
|---------|-----------------|----------------|-----------------------|
| 01      | August 19, 2025 | SS, HM, LC, SK | Initial release       |

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# Introduction

This application note is intended to be used to define requirements for PG25 fluids used in liquid cooled 1-phase cold plate-based datacenter deployments in the secondary loop. This includes chemical properties, purity, dilution water quality, inhibitors, additives, impurities, corrosion resistance, thermal stability, anti-foam and filtration.

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# Requirements and Description

The tables in this section describe the chemical requirements.

Table 1. Chemical Properties

| Requirement ID | Item                       | Description                                                                                                                        | Test Method                   |
|----------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| GEN-CHEM-01    | Appearance                 | Clear and particulate free<br>(visual inspection, free of cloudiness)                                                              | Visual                        |
| GEN-CHEM-02    | Propylene Glycol, volume % | <b>PG25:</b> 24.5 - 27.5%<br><i>Inhibitors + water should make-up ~75% of formulation</i>                                          | ASTM D3321 or equivalent test |
| GEN-CHEM-03    | Specific Gravity@ 25°C     | 1.030 — 1.036                                                                                                                      | ASTM D4052 or equivalent test |
| GEN-CHEM-04    | Freeze Point               | <b>PG25:</b> 9 to 14°F<br>(-13 to -10 °C)                                                                                          | ASTM D3321 or equivalent test |
| GEN-CHEM-05    | pH                         | ** For non-organic acid technology (OAT) PG25 fluids<br><br>8.0 - 10.5<br>Fluid pH is dependent on corrosion inhibitor formulation | ASTM D1287 or equivalent test |

| Requirement ID | Item                                   | Description                                                                                                                                                           | Test Method                                                                               |
|----------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
|                |                                        | <p>For OAT PG25 fluids.</p> <p>7 - 10.5</p> <p>Fluid pH is dependent on corrosion inhibitor formulation.</p>                                                          |                                                                                           |
| GEN-CHEM-06    | Reserve Alkalinity                     | <p>&gt; 6 mL, for non OAT based PG25 fluids technologies</p> <p>&gt; 1.5 ml, for OAT-based PG 25 fluids</p>                                                           | <p>ASTM D1121 or equivalent test</p> <p>Based on a 10 mL sample of ready-to-use fluid</p> |
| GEN-CHEM-07    | Total Hardness (as CaCO <sub>3</sub> ) | <p>&lt;25 ppm</p> <p>*High hardness values indicate the use of poor-quality water</p>                                                                                 | <p>&lt;25 ppm</p> <p>*High hardness values indicate the use of poor-quality water</p>     |
| GEN-CHEM-08    | Sulfate                                | <p>&lt; 10 ppm</p> <p>High Sulfate values indicate the use of poor-quality water. There can be an issue with measurement with phosphate-based inhibitor packages.</p> | ASTM D5827 or equivalent test                                                             |
| GEN-CHEM-09    | Chloride                               | <p>&lt;5 ppm</p> <p>High Chloride values indicate the use of poor-quality water</p>                                                                                   | ASTM D5827                                                                                |
| GEN-CHEM-10    | Silicate                               | <p>&lt; 3 ppm as Silicon.</p>                                                                                                                                         | ASTM D5827                                                                                |

| Requirement ID | Item | Description                                                                                                     | Test Method |
|----------------|------|-----------------------------------------------------------------------------------------------------------------|-------------|
|                |      | We do not recommend the use of silicate-based corrosion inhibitors. Please contact Nvidia if this is a concern. |             |

**Table 2. Purity – Base Propylene Glycol Fluid**

| Requirement ID | Item                                | Description     | Test Method                               |
|----------------|-------------------------------------|-----------------|-------------------------------------------|
| PUR-REQ-01     | Base Fluid Glycol Purity. USP grade | >99.5%          | ASTM D5639, D7016 or equivalent test      |
| PUR-REQ-02     | Chloride Undiluted- Base PG Fluid   | < 1 ppm         | ASTM E202, E394 or equivalent test        |
| PUR-REQ-03     | Iron Undiluted- Base PG Fluid       | <0.2 ppm        | ASTM E202, E394 or equivalent test        |
| PUR-REQ-04     | Specific Gravity @ 20°C             | 1.0376 — 1.0389 | ASTM D4052 or equivalent test             |
| PUR-REQ-05     | Acidity as Acetic acid              | < 0.0020 %      | ASTM E202 or equivalent test              |
| PUR-REQ-06     | Color, Pt-Co                        | 10 ppm          | ASTM D5386 or equivalent test             |
| PUR-REQ-07     | Dimer, Trimer and High Polymers     | < 0.100 %       | ASTM D5639, D7016 or equivalent test      |
| PUR-REQ-08     | Ethylene Glycol                     | < 0.008 %       | ASTM D5139 or equivalent test             |
| PUR-REQ-09     | Diethylene Glycol                   | < 0.008 %       | ASTM D5139, D550, E355 or equivalent test |

**Table 3. Inhibitors and Additives**

| Requirement ID | Item                                                                         | Description                                                                                                                                    | Test Method                                 |
|----------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| INHIB-REQ-01   | Benzo/Tolytriazole                                                           | <p>&gt;1000 ppm</p> <p>An equivalent specific azole copper corrosion inhibitor can be used. Please contact Nvidia for additional guidance.</p> | Per supplier method – liquid chromatography |
| INHIB-REQ-02   | Dipotassium Phosphate (Stabilized for example anionic polymer-polyacrylates) | <p>For non-OAT based PG25 fluids<br/>&gt; 5000 ppm as Phosphate</p> <p>For OAT based PG25 fluids<br/>&gt; 500 ppm as Phosphate</p>             | Per supplier method –ion chromatography.    |

**Table 4. Dilution Water Quality**

PG25 fluid should be ready to use without additional dilution required. Range of acceptable vol% of PG is defined in Table 01 (GEN-CHEM-02). Table 3. defines the acceptable water quality, for dilution during blending of the final PG25 fluid product.

| Requirement ID | Item                                         | Description         | Test Method                   |
|----------------|----------------------------------------------|---------------------|-------------------------------|
| DILWAT-REQ-01  | Chloride                                     | < 5 ppm             | ASTM D4327 or equivalent test |
| DILWAT-REQ-02  | Sulfate                                      | <10 ppm             | ASTM D4327 or equivalent test |
| DILWAT-REQ-03  | Sulfide (S <sup>2-</sup> / H <sub>2</sub> S) | < 0.1 ppm           | ASTM D468 or equivalent test  |
| DILWAT-REQ-04  | Silicate                                     | < 3 ppm as Silicon. | ASTM D859 or equivalent test  |

| Requirement ID | Item                                       | Description              | Test Method                                                              |
|----------------|--------------------------------------------|--------------------------|--------------------------------------------------------------------------|
| DILWAT-REQ-05  | Total Hardness (as CaCO <sub>3</sub> )     | <10 ppm                  | ASTM D1126 or equivalent test                                            |
| DILWAT-REQ-06  | Conductivity (μS cm <sup>-1</sup> @ 25 °C) | < 20 μS cm <sup>-1</sup> | ASTM D1125 or equivalent test                                            |
| DILWAT-REQ-07  | Bacteria                                   | < 100 CFUs/ml            | SM 9215 C (R2A agar, 20–28 °C, 5–7 days), ASTM D5465 or equivalent test. |

**Table 3. Corrosion Resistance**

| Requirement ID | Item            | Description                                                                                                                                                  | Test Method |
|----------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| COUP-REQ-01    | Copper          | <5 mg weight loss per coupon (~0.2 mpy)                                                                                                                      | ASTM D8040  |
| COUP-REQ-02    | Brass           | <5 mg weight loss per coupon (~0.2 mpy)                                                                                                                      | ASTM D8040  |
| COUP-REQ-03    | Stainless Steel | <5 mg weight loss per coupon (~0.2 mpy)<br><br>*Note this level of weight loss can be difficult to measure as the cleaning procedure can remove this amount. | ASTM D8040  |

**Table 4. Thermal Stability**

| Requirement ID                             | Item              | Description                                                | Test Method |
|--------------------------------------------|-------------------|------------------------------------------------------------|-------------|
| THERM-REQ-O1<br>**For OAT PG25 fluids only | Thermal Stability | Need to modify test to account for pre-diluted PG25 fluid. | ASTM D7437  |

**Table 5. Antifoam**

| Requirement ID | Item      | Description                                                                        | Description |
|----------------|-----------|------------------------------------------------------------------------------------|-------------|
| ANTI-REQ-01    | Anti foam | Generate <150 mL of foam volume and the foam generated should break in <5 seconds. | ASTM D8039  |

**Table 6. Filtration**

| Requirement ID | Item       | Description | Notes                                                                              |
|----------------|------------|-------------|------------------------------------------------------------------------------------|
| FILT-REQ-01    | Filtration | 5 micron    | Prior to introduction into totes, drums or ISO containers, tanker trucks/railcars. |

For the most recent updates on the list of wetted materials, refer to the associated documentation available on the NVIDIA PID system.

GB200 NVL NVIDIA Approved Liquid Cooling Wetted Materials List ([ID: 1114985](#))

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# PG25 Fluid Documentation

The following table lists the PG25 Fluid documentation used for all requirements.

**Table 7. PG25 Fluid Documentation**

| Requirement ID | Item                          | Description                                                                                                                                                                                                                                                                                                                                      |
|----------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOC-REQ-01     | Materials Safety Data Sheet   | The MSDS should provide detailed information on properties, hazards, safe handling, storage, and emergency measures to ensure safe use and compliance with regulatory standards.                                                                                                                                                                 |
| DOC-REQ-02     | Certificate of Analysis (CoA) | The Certificate of Analysis (CoA) for inhibited propylene glycol provides detailed information on the product's quality and composition. It includes specifications such as the concentration of propylene glycol, the types and levels of inhibitors, physical properties (e.g., pH, specific gravity), and compliance with industry standards. |

Please provide MSDS for the following countries in the languages defined below.

| Country   | Language             |
|-----------|----------------------|
| ARGENTINA | ENGLISH              |
| ARGENTINA | SPANISH              |
| AUSTRALIA | ENGLISH              |
| BELGIUM   | GERMAN               |
| BELGIUM   | ENGLISH              |
| BELGIUM   | FRENCH               |
| BELGIUM   | DUTCH                |
| BRAZIL    | BRAZILIAN PORTUGUESE |

|                |           |
|----------------|-----------|
| BRAZIL         | ENGLISH   |
| BULGARIA       | ENGLISH   |
| BULGARIA       | BULGARIAN |
| CANADA         | ENGLISH   |
| CANADA         | FRENCH    |
| CHILE          | ENGLISH   |
| CHILE          | SPANISH   |
| CHINA          | CHINESE   |
| CHINA          | ENGLISH   |
| COLOMBIA       | ENGLISH   |
| COLOMBIA       | SPANISH   |
| CZECH REPUBLIC | CZECH     |
| CZECH REPUBLIC | ENGLISH   |
| DENMARK        | ENGLISH   |
| DENMARK        | DANISH    |
| ECUADOR        | ENGLISH   |
| ECUADOR        | SPANISH   |
| ESTONIA        | ESTONIAN  |
| ESTONIA        | ENGLISH   |
| FINLAND        | ENGLISH   |
| FINLAND        | FINNISH   |
| FINLAND        | SWEDISH   |
| FRANCE         | ENGLISH   |
| FRANCE         | FRENCH    |
| GERMANY        | GERMAN    |
| GERMANY        | ENGLISH   |

|             |                     |
|-------------|---------------------|
| HONG KONG   | ENGLISH             |
| HONG KONG   | CHINESE TRADITIONAL |
| HUNGARY     | ENGLISH             |
| HUNGARY     | HUNGARIAN           |
| INDIA       | ENGLISH             |
| INDONESIA   | ENGLISH             |
| INDONESIA   | INDONESIAN          |
| IRELAND     | ENGLISH             |
| ISRAEL      | HEBREW              |
| ISRAEL      | ENGLISH             |
| ITALY       | ENGLISH             |
| ITALY       | ITALIAN             |
| JAPAN       | ENGLISH             |
| JAPAN       | JAPANESE            |
| JORDAN      | ARABIC              |
| JORDAN      | ENGLISH             |
| LATVIA      | ENGLISH             |
| LATVIA      | LATVIAN             |
| MALAYSIA    | MALAYSIAN           |
| MALAYSIA    | ENGLISH             |
| MEXICO      | ENGLISH             |
| MEXICO      | SPANISH             |
| NETHERLANDS | ENGLISH             |
| NETHERLANDS | DUTCH               |
| NEW ZEALAND | ENGLISH             |
| NORWAY      | ENGLISH             |

|                |                     |
|----------------|---------------------|
| NORWAY         | NORWEGIAN           |
| PERU           | ENGLISH             |
| PERU           | SPANISH             |
| POLAND         | ENGLISH             |
| POLAND         | POLISH              |
| PORTUGAL       | ENGLISH             |
| PORTUGAL       | PORTUGUESE          |
| SINGAPORE      | ENGLISH             |
| SOUTH AFRICA   | ENGLISH             |
| SOUTH KOREA    | KOREAN              |
| SOUTH KOREA    | ENGLISH             |
| SPAIN          | ENGLISH             |
| SPAIN          | SPANISH             |
| SWEDEN         | ENGLISH             |
| SWEDEN         | SWEDISH             |
| SWITZERLAND    | GERMAN              |
| SWITZERLAND    | ENGLISH             |
| SWITZERLAND    | FRENCH              |
| SWITZERLAND    | ITALIAN             |
| TAIWAN         | ENGLISH             |
| TAIWAN         | CHINESE TRADITIONAL |
| THAILAND       | THAI                |
| THAILAND       | ENGLISH             |
| UGANDA         | ENGLISH             |
| UNITED KINGDOM | ENGLISH             |
| UNITED STATES  | ENGLISH             |

|                      |            |
|----------------------|------------|
| UNITED ARAB EMIRATES | ARABIC     |
| UNITED ARAB EMIRATES | ENGLISH    |
| VIETNAM              | ENGLISH    |
| VIETNAM              | VIETNAMESE |

## **Steps for Global MSDS/SDS Compliance:**

### **1. Identify Applicable Regulations:**

1. Research and identify the chemical regulatory requirements for each target country. This includes understanding regional variations of the Globally Harmonized System (GHS) for classification and labeling.

### **2. Language Translation:**

1. Ensure the MSDS/SDS are translated into the official languages of each country. For example:
  1. English and French for Canada
  2. Spanish for Spain and Latin American countries
  3. German for Germany
  4. Mandarin for China
  5. Japanese for Japan, etc.

### **3. Local Contact Information:**

1. Provide local emergency contact information and addresses for each country or region to ensure compliance and ease of access in case of emergencies.

### **4. Chemical Inventory Listings:**

1. Confirm that the propylene glycol fluid is listed or notified according to each country's chemical inventory requirements:
  1. TSCA (Toxic Substances Control Act) in the United States
  2. REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) in the European Union
  3. WHMIS (Workplace Hazardous Materials Information System) in Canada
  4. ENCS (Existing and New Chemical Substances) in Japan, etc.

### **5. Hazard Communication Standards:**

1. Adhere to the specific hazard communication standards and labeling requirements for each country, ensuring that all necessary safety and handling information is included.

**6. Regular Updates:**

1. Regularly review and update the MSDS/SDS to comply with any changes in regulations or product formulations.

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# Business and Supply Chain Readiness

This section provides the business and supply chain requirements.

**Purpose:** Ensure the supply chain and material readiness to support Ecosystem needs.

**Criteria:**

- > Healthy corporate financial status
- > **Global manufacturing locations:**
  - **North America, Europe and Asia manufacturing capability & capacity.**
- > Sufficient capacity of PG25 fluid manufacturing with global location footprint to support regional demands
- > Strategic sub-tier component buffer
- > Drive multi-source and diversified global footprint of sub-tier component to achieve supply chain resiliency

**Requirements:**

- > Provide financial status and report for risk assessment.
- > Provide global manufacturing location, capability, and capacity
- > Provide supply chain risk assessment and heatmap.
- > Provide supply chain mapping and capacity information of critical components
- > Share sub-component buffer status and risk mitigation plan for long lead time parts
- > Provide multi-source qualification plan and status update reports.
- > Provide the material readiness report including:
  - Critical material readiness
  - On-hand inventory
  - Components
  - Semi-finished goods
  - Finished goods
  - Buffer

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