# ALIGEL GEO SYSTEM


## Non-toxic ANTIFREEZE with bactericide
## For heat pumps and geothermal systems

**DESCRIPTION:**
**Special antifreezing liquid, pure propylene glicol-based heat transfer**, specially formulated for heat pumps and geothermal systems. ALIGEL GEO SYSTEM is a special heat transfer liquid with antifreezing function and protective against corrosion, thanks to its inhibitor package free of amines and nitrite, and bio-fouling (bacterial / algal pollution) thanks to the special biocide additived in its formulation; ALIGEL GEO SYSTEM also prevents the formation of limestone and is non-toxic, making it suitable also for food systems and solar panels. Its protective capabilities are applied to all metals, particularly towards aluminum and copper, which are the main parts of the cooling and heating circuits. Thanks to its anti-algae action it is also able to prevent the development of biological pollutants, suitable also for radiant floor systems where the uncontrolled development of algae or bacterial flora creates obstructions to the regular circulation of water inside the plant.

**CORROSION IN GLYCOLIC CIRCUITS:**

**Premises.**
The phenomenon linked to the chemical-physical characteristics of the recirculating solution that causes the greatest number of problems in glycoled water systems is corrosion. Furthermore, the formation of insoluble metal oxides, which can not be removed in the absence of purging, creates large quantities of sludge which can be deposited on the heat exchange surfaces, lowering the yields. The main causes of corrosion can be:

- Oxidation of metals by the action of oxygen dissolved in water;
- Acid attack promoted by glycol degradation products.

Regarding the first point, remember that at low temperatures typical of glycol circuits the concentration of dissolved oxygen is particularly high (> 15 ppm); the high concentration of oxygen is also due to the decomposition of glycols, an oxidation reaction (Fig. 1) catalyzed by metals such as copper and aluminum, responsible for sudden drops in pH (Fig. 2 and Fig. 3).



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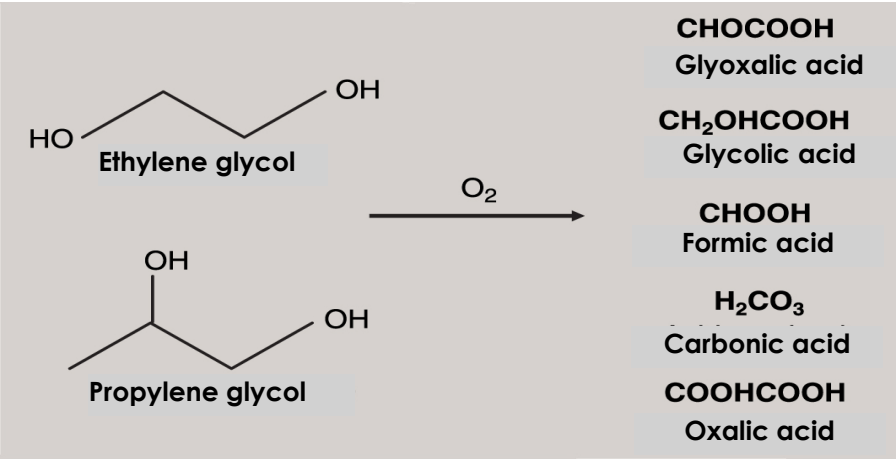


*Fig. 1 – Glycol decomposition reactions with formation of organic acids.*

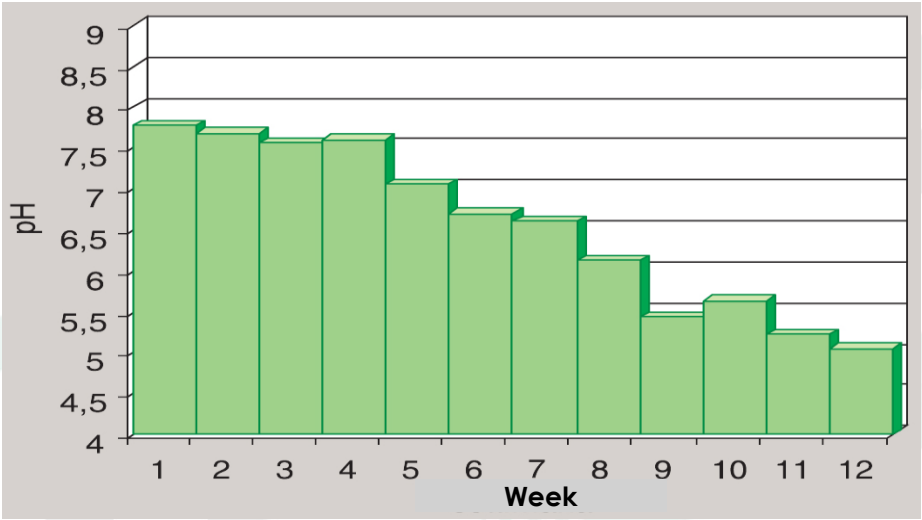


*Fig. 2 – A real case of pH variation in a glycoled water circuit (70% water demi, 30% propylene glycol), no conditioning treatment in place.*





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**Sludge conditioning.** The absence of purging typical of closed systems frequently leads to the formation of sludge due to the accumulation of corrosion products, the precipitation of insoluble salts and the possible precipitation of some glycol degradation product.
It is therefore essential to keep these sludges in suspension in order to reduce the formation of encrustations and avoid the occurrence of abrasion phenomena; for this reason, specific additives with dispersing action must be added to the recirculating solution.

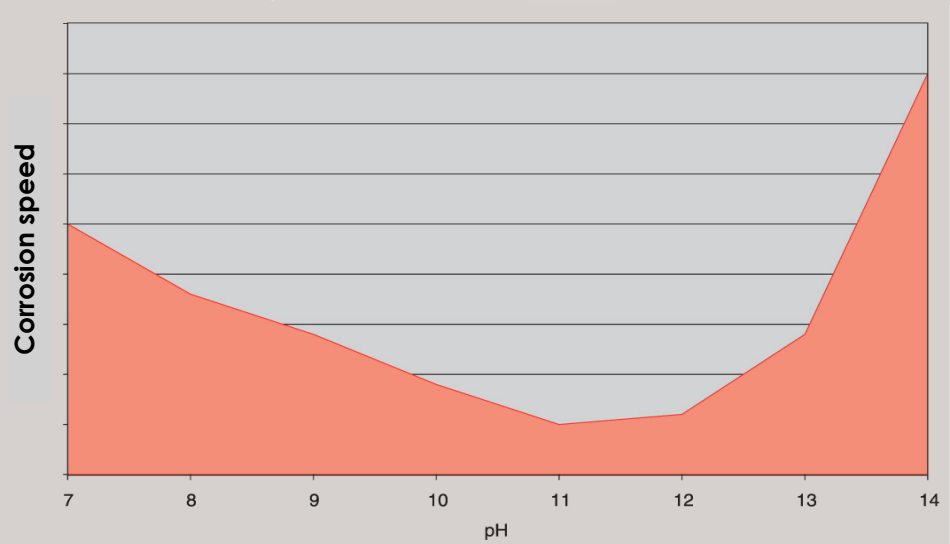


*Fig. 3 – Variation in corrosion rate as a function of pH for carbon steel.*

**Choice of mixing water.** In some systems it is customary to fill the glycoled circuits by mixing the glycol with softened or even demineralized / osmotic water to avoid precipitation of the Calcium Salts: this practice actually turns out to be very often counterproductive; in fact the correct chemical conditioning of the water of these circuits involves the conditioning of the sludge, including those produced by the precipitation of hardness salts, which however in a closed circuit are present in modest quantities, difficult to cause significant drawbacks. The softened waters and even more the demineralized / osmotic waters are instead potentially aggressive, above all for the amphoteric metals (among which Zinc and Aluminum).

**Microbiological control.** If glycol water is used or remains in plants for some time at temperatures above zero degrees Celsius, phenomena of microbial proliferation may occur, promoted by the presence of glycols, very easily metabolized by some bacterial species. Bacterial contamination manifests itself with a sudden drop in pH, the formation of gelatinous deposits, the foul-smelling of the recirculating solution, in some cases a marked increase in viscosity. To avoid this problem it is sufficient to periodically add a biocide (THERMAKIL or ANTIALGA PREVENTORE), paying attention to its compatibility with glycols and corrosion inhibitors (it can not therefore be an oxidizing biocide) and choosing an active ingredient that is the least possible foaming agent. In this regard ALIGEL GEO SYSTEM is formulated with a powerful antibacterial biocide in order to avoid such problems that negatively affect the performance of our products. installations.

**INSTRUCTIONS FOR USE:**
Thoroughly clean the parts of the system concerned in compliance with the regulations in force ex. UNI CTI 8065, 8364, 8884 (Water treatment in heating systems), if necessary to pickle the pipes in order to eliminate rust or welding scraps. Prepare the mixture water-antifreeze separately by mixing the antifreeze in water and not vice versa. **Attention:** For good anticorrosive and anti-algae protection in general, concentrations of ALIGEL GEO SYSTEM between 33 and 50% are recommended, while for solar panels a percentage of 45 - 75% is recommended. These higher concentrations will allow the heat exchange fluid to remain unaltered during periods of stagnation (lack of circulation) of the system even at high temperatures (see graph).

| ANALYSES AND PROPERTIES: | Analyses method | Specific ALIGEL G. S. |
|---|---|---|
| Specific weight @ 15 °C | ASTM D 1122 | 1,04 ÷ 1,06 g/ml |
| Apparent water content | ASTM D 1123 | 4,5 % max |
| pH 50 % vol. in water | ASTM D 1287 | 8,5 ÷ 10,0 |
| Reserve alkalinity | ASTM D 1121 | 15 min |
| Ashes | ASTM D 1119 | 1,5 % max |
| Freezing point (sol. 50 % in vol.) | ASTM D 1177 | -33 °C |
| Freezing point (pure product) | ASTM D 1177 | -60 °C |
| Scroll point | ASTM D 1177 | < -57 °C |
| Boiling point | ASTM D 112 | 180 °C min |
| Indice di rifrazione nD20 | | 1,4310 ÷1,4330 |
| Effect on vehicle finishes | ASTM D 1882 | none |
| Smell | | not offensive |
| Colour | | colorless |
| foaming (ml/sec) | ASTM D 1881 | 50/2 max |
| Solubility in water | - | complete |
| Resistance to hard water | NC 956-14 CUNA | limpid |
| Dynamic viscosity @ 25 °C (77 °F) | Brookfield | 48,6 Centipoise (m Pa s) |
| Dynamic viscosity @ 60 °C (140 °F) | Brookfield | 8,4 Centipoise (m Pa s) |
| Kinematic viscosity @ 20 °C | | 46,7 $mm^2/s$ |
| Kinematic viscosity @ 60 °C | | 8,07 $mm^2/s$ |
| Specific heat @ 25 °C | | 2,51 J/g ° K |
| Thermal conductivity @ 25 °C | | 0,2061 W/m °K |
| Training heat | | -422 KJ/mol (-101 kcal/g mol) |
| Heat of vaporization @ 25 °C | | 67,0 KJ/mol |
| Self-ignition temperature | | 371 °C |
| Flash point (closed vessel) | b ASTM D 92 | 113 °C |

ALIGEL GEO SYSTEM thanks to the PURE SINGLE-GLYCOLINE GLYCOLE base and to the choice of the additives of the inhibitor package is a highly reliable product against both metallic and non-metallic materials that make up the cooling and heating circuits.

**GLASS CORROSION TEST:**
ASTM D 1384 method (weight loss mg / specimen)

| METALS | Limits ASTM D 3306 (mg) | Specific ALIGEL G.S. (mg) |
|---|---|---|
| COPPER | 10 MAX | 0,7 |
| WELDING ALLOY | 30 MAX | 1,4 |
| BRASS | 10 MAX | 0,6 |
| STEEL | 10 MAX | 0,2 |
| CAST IRON | 10 MAX | 0,6 |
| ALUMINIUM | 30 MAX | 0,8 |

**FREEZING / BOILING POINT:**
The values are obtained with different concentrations of ALIGEL GEO SYSTEM in H2O at atmospheric pressure:

| % VOLUM ALIGEL GEO SYSTEM | FREEZING TEMPERATURE (°C) | TEMPERATURE OF BOILING (°C) |
|---|---|---|
| 20 | -8 | 101 |
| 30 | -14 | 103 |
| 40 | -22 | 103 |
| 50 | -33 | 104 |
| 60 | -48 | 106 |
| 100 | -60 | 160 |



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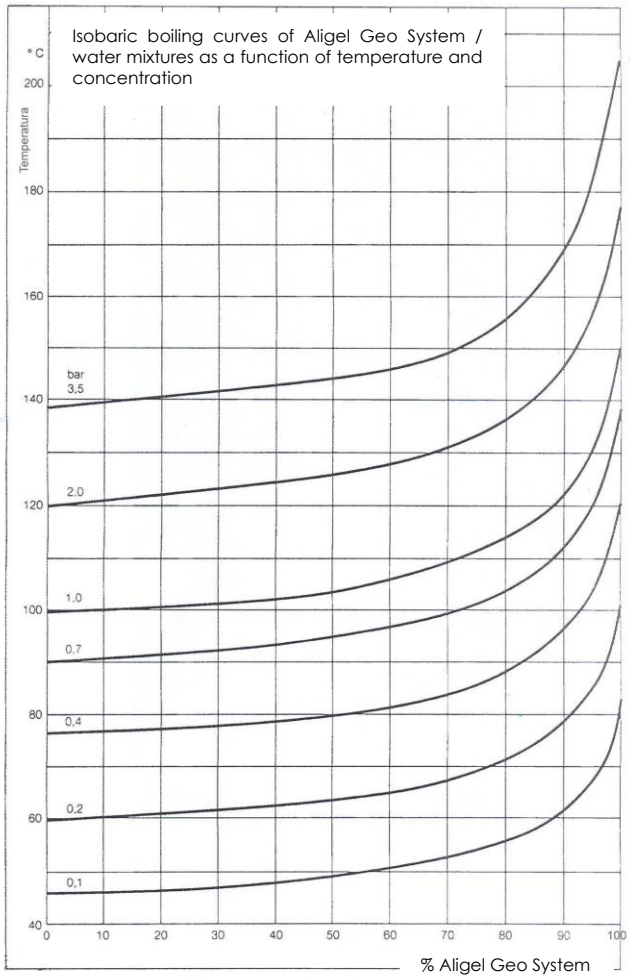
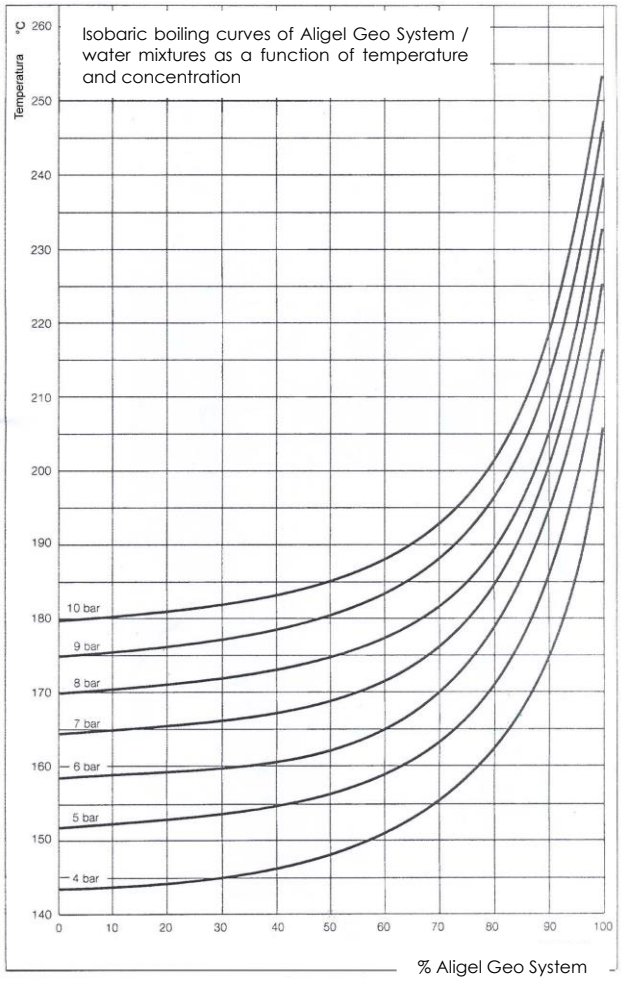
**INTERACTION WITH RUBBER MATERIALS:**
The product is generally compatible with elastomers and in particular with EPDM rubbers. As expected, the product fully complies with the compatibility requirements of the CUNA standards, namely CUNA NC 956-16 and 956-18.

## BOILING CURVES




**TOXICITY:**
The LD50 value is generally used to define oral toxicity, the higher this value, the lower the toxicity of the product examined; in the case of ALIGEL GEO SYSTEM the LD50 value referred to the rat is> 2,000 mg / kg of body weight.
The LD50 value of MONOPROPILENGLICOLE, the basic product of propylene antifreeze is 33 g / kg of body weight (determined on rats), this value is five times higher than the value of traditional antifreeze based on monoethylene glycol (LD50 of 6.2 g / kg). The margin of safety (in the case of accidental ingestion) offered by the use of an anti-freeze on a monopropylene base appears very evident.

Last update: 06.02.2023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