Technical Data Sheet
ANTIFROGEN® N

HEAT TRANSFER FLUID

Product Description

Antifrogen N is a versatile, ethylene glycol based coolant and heat transfer fluid with highly efficient anti-corrosion additives.
Antifrogen N mixed with water offers reliable and long-lasting protection from frost, corrosion and deposits for closed heating and cooling systems and is used in a wide range of applications such as in HVAC, temperature control of industrial processes or component cooling in manufacturing technology.

CLARIANT INTERNATIONAL LTD

Rothausstrasse 61
4132 Muttenz
Switzerland

BUSINESS UNIT INDUSTRIAL & CONSUMER SPECIALTIES

www.ics.clariant.com
www.clariant.com

- Appearance: yellow liquid
- Ethylene glycol based
- Contains highly efficient corrosion inhibitors
- Fulfills and exceeds ASTM D 1384-05 corrosion test standard
- Free of borates, phosphates, nitrites, amines, silicates and CMR-substances (cancerogenic, mutagenic and reprotoxic)
- Minimum usage concentration: 20 % v/v Antifrogen N in water (corresponds to freezing point of ca. -9 °C)
- Permanent usage temperatures: ca. -50 °C to +150 °C
- Produced exclusively with high quality, pure glycol. No recycled glycol
- Available in both concentrate and various water mixtures

Applications

Antifrogen N is used as heat transfer fluid, antifreeze and corrosion inhibitor in closed cooling and heating systems (chillers, chilled water air-conditioning systems, re-coolers, heat pumps, heating circuits prone to frost, etc.) for various applications:

- Heating, ventilation and air conditioning – HVAC (shopping malls, clinics, hotels, office buildings, production, storage and exhbitions halls, data centers)
- Process cooling in chemical and plastic processing industry (injection moulding, thermoforming, blow moulding)
- Industrial heat recovery
- Dissipation of heat loads from CNC machines used in production engineering (spindle cooling, laser cooling, converter cooling)
- Cooling of frequency converters in trains, wind turbines, solar parks
- Under-soil heating systems
- Refrigeration of ice rinks

Technical Data[1]

Antifrogen N Concentrate

Basic composition	ethylene glycol, water, corrosion inhibitors	
Appearance	clear, yellow liquid	
Odor	almost odorless	
Density (20 °C)	1.114 g/cm³	DIN 51757
Refractive index (20 °C)	1.432	DIN 51423 part 2
pH value (20 °C, 33 %v/v in DI-water)	ca. 8	DIN 19268
Reserve alkalinity	min. 4 ml 0.1M HCl/ml	ASTM D 1121
Kin. viscosity (20 °C)	20 mm²/s	DIN 51562
Surface tension (20 °C, 33 %v/v in DI-water)	35 mN/m	DIN EN 14370
Electr. conductivity (25 °C, 33 %v/v in DI-water)	ca. 3000 µS/cm	DIN EN 27888
Boiling point (1013 mbar)	166 °C	ASTM D 1120
Flash point	119 °C	ASTM D 6450

[1] These characteristics are for guidance only and not to be taken as product specifications.

For further physical data, please see the **Antifrogen Online Calculator** on www.antifrogen.com.

Corrosion Protection

Antifrogen N contains a highly efficient combination of corrosion inhibitors which provide long-term corrosion protection for the metals of the cooling and heating installations by forming a thin protective film on the metal surface. In addition, Antifrogen N stabilizes the pH value of the liquid and keeps it within the optimal range. Metals such as carbon steel, brass, copper, cast iron, cast aluminum and many other metal alloys are thus protected against corrosion for many years.

To determine the efficiency of corrosion inhibitors in heat transfer fluids, the corrosion test ASTM D 1384 (88 °C, 6 l/h air, 336 h, synthetic corrosive water for dilution) has become established. The following table shows the results of Antifrogen N compared to ethylene glycol without any corrosion inhibitors.

Average change in weight of metals in g/m² due to corrosion, tested according to ASTM D 1384 (88 °C, 6 l/h air, synthetic corrosive water for dilution)

Metal	33 % v/v Antifrogen N in water (336 h)	33 % v/v Antifrogen N in water (3000 h)	33 % v/v Ethylene glycol without additives in water (336 h)	Limits[2]
Copper (SF Cu)	**-0.3**	**-0.6**	**-2.8**	**3.6**
Soft Solder (WL 30)	**-0.9**	**-1.0**	**-135**	**11.2**
Brass (MS 63)	**-0.5**	**-0.6**	**-7.6**	**3.6**
Steel (C15)	**-0.1**	**-0.2**	**-152**	**3.6**
Cast iron (CG 22)	**-0.2**	**-1.0**	**-273**	**3.5**
Cast aluminium (AlSi6Cu3)	**-0.6**	**-0.6**	**-16**	**10.4**

[2] maximum permitted weight changes acc. to ASTM D 3306-05 (for 336 h)

Antifrogen N shows superior performance in corrosion protection even after an extended test period of 3000 hours. The minimal weight losses of the tested metals and alloys confirm the suitability of Antifrogen N for long-term operation.

In contrast, **ethylene glycol-water mixtures without the addition of inhibitors** cannot be used due to their highly corrosive properties.

Galvanized components should be **avoided** if possible, as all glycol-water mixtures can dissolve zinc.

Frost Protection

The anti-freeze agent used in Antifrogen N is ethylene glycol. The frost protection depends on the mixing ratio with water (see table below).

Antifrogen N in water	Freezing point (ASTM D 1177)	Pour Point (DIN EN 23015)	Density, 20 °C (DIN 51757)	nD20 (DIN 51423)
20 % v/v	-9 °C	ca. -13 °C	1.028 g/cm³	1.355
25 % v/v	-12 °C	ca. -17 °C	1.035 g/cm³	1.360
30 % v/v	-16 °C	ca. -21 °C	1.042 g/cm³	1.365
35 % v/v	-20 °C	ca. -26 °C	1.049 g/cm³	1.371
40 % v/v	-25 °C	ca. -31 °C	1.056 g/cm³	1.376
45 % v/v	-31 °C	ca. -36 °C	1.063 g/cm³	1.381
50 % v/v	-37 °C	ca. -44 °C	1.069 g/cm³	1.387
55 % v/v	-45 °C	< -50 °C	1.075 g/cm³	1.392
60 % v/v	-53 °C	< -50 °C	1.081 g/cm³	1.397

The freezing point is the temperature at which ice crystals begin to form when cooling an Antifrogen N water mixture. If the temperature is lowered further, an ice slurry (still pumpable) is formed until the mixture eventually solidifies at the pour point. Below this temperature there is a risk of bursting for the installation.

Mixtures with an **Antifrogen N concentration of more than 60 % v/v** are **not recommended** because, as with all ethylene glycol water mixtures, the freezing point does not decrease any further from this concentration on, but rises instead.

To **determine the frost protection** of Antifrogen N water mixtures, a refractometer or an antifreeze tester suitable for ethylene glycol water mixtures (available from Antifrogen distributors) can be used for instance.

Our **Antifrogen Online Calculator** (www.antifrogen.com) assists you in calculating the amount of Antifrogen N or water needed to **increase or decrease the frost protection of your installation**. It also provides a more detailed conversion table for Antifrogen concentration – freezing point – refractive index.

Compatibility with Sealing Materials / Plastics

The plastics and elastomers listed in the following table are resistant to Antifrogen N water mixtures based on our experimental results and literature references. Please also refer to the data provided by the respective manufacturers regarding the chemical resistance of these materials.

ABS	Acrylonitrile-butadiene-styrene	**PA**	Polyamide
CPE	Polyethylene crosslinked	**PB**	Polybutene
CR	Polychlorbutadiene elastomers	**PC**	Polycarbonate
EPDM	Olefin rubber	**POM**	Polyacetal
FKM	Fluorocarbon elastomers	**PP**	Polypropylene
HR	Butyl rubber	**PTFE**	Polytetrafluorethylene
HDPE **LDPE**	Polyethylene high density Polyethylene low density	**uPVC**	Polyvinylchloride unplasticized
MFQ	Fluorosilicone rubber	**SBR**	Styrene butadien rubber up to 100 °C
NBR	Nitril rubber	**SI**	Silicone rubber
NR	Nature rubber up to 80 °C	**UP**	Polyester resins

Polyurethane elastomers (PU), flexible PVC and phenol formaldehyde resins are **not resistant**.

For pipe thread connections in which hemp is used, the application of sealing compounds such as Fermit® or Fermitol® has proven to be effective.

When sealing tapes made of polytetrafluoroethylene (PTFE) are used, leaks may occur due to the low surface tension of Antifrogen N water mixtures.

The lower surface tension and thus better wetting capacity of Antifrogen N in comparison to water can cause rust that is already present to get detached. Small corrosion damages can thus become visible as leaks when changing from water to an Antifrogen N water mixture.

Application Guidelines

1. Antifrogen N is is **only to be applied in dilution with water**, for which demineralized water or tap water (chloride content: < 100 mg/kg, water hardness: 0 to 25 °dH) can be used. Concentrations lower than the **minimum concentration of 20 % v/v Antifrogen N in water** must not be used as too dilute mixtures do not provide sufficient corrosion protection and might lead to the growth of microorganisms and formation of biofilms. The maximum recommended usage concentration is 60 % v/v Antifrogen N in water. Homogeneous mixtures of water and Antifrogen N do not de-mix.
2. Antifrogen N should only be used in **closed systems**, since the contact with atmospheric oxygen can affect the corrosion protection performance.
3. When installing the system, only **chloride-free solders** should be used as chloride residues can cause pitting corrosion.
4. Contact of Antifrogen N with **galvanized components** should be **avoided**, as zinc is dissolved by glycol-water mixtures. Though the steel under the zinc layer is protected by the Antifrogen N corrosion inhibitors, the zinc deposits can cause pump damage etc. in the system. To remove these deposits, the installation of a fine filter with a mesh size of approx. 100 to 150 µm has proven to be effective.
5. **Before the system is filled** with an Antifrogen N water mixture, it hast to be emptied, thoroughly rinsed with water (esp. if the system was filled with a brine or chloride containing fluid) and **checked for corrosion damages**. If necessary, **professional cleaning** (e.g. acid pickling) is recommended to remove rust, deposits or third-party products. Systems with corrosion or deposits (e.g. limescale, biofilm) present, cannot be operated corrosion-proof with Antifrogen N as the metals may be unevenly inhibited and the inhibitors may be prematurely consumed.
6. **Emptied systems** should be **refilled immediately** to avoid any risk of corrosion, even if the system is not to be put into operation until a later date.
7. **Mixing with other products must be avoided** as it can lead to corrosion, precipitations and foaming The system may only be topped up with an Antifrogen N water mixture!
8. Information about our Antifrogen Service can be found on www.antifrogen.com.

Physical Data

Physical data of Antifrogen N water mixtures are available in the **Antifrogen Online Calculator** on www.antifrogen.com.

Saftey Data Sheet

The latest Material Safety Data Sheet (MSDS) can be downloaded from www.antifrogen.com. It also contains information on storage, transport and disposal.

Antifrogen N is based on ethylene glycol and therefore classified as harmful if swallowed according to EC Regulation No. 1272/2008. It must not be used in systems where contamination of the food, pharmaceutical or drinking water areas cannot be completely excluded. For such applications, as well as for use in sprinkler systems, Antifrogen L is recommended, which is based on propylene glycol that is harmless to health.

Distributors

Antifrogen N is available as a concentrate or as a ready-to-use water mixtures from our Antifrogen distributors (see distributor overview on www.antifrogen.com).