



GREENWAY® NEO

climalife®

VIN-FP-115/008

GREENWAY® NEO



Non contractual photo.

GREENWAY® NEO is a concentrated antifreeze heat transfer fluid, based on 1,3-propanediol and corrosion inhibitors, It is suitable for refrigeration, air conditioning, and fire protection system circuits, as well as under-floor heating/cooling circuits.

Once diluted with water, **GREENWAY® NEO** provides excellent protection against freezing and gives enhanced protection against the corrosion of metals in various circuits of different designs (steel, aluminium, copper, brass, solder, etc.). It also prevents sludge from forming inside the circuits.

The green colour of **GREENWAY® NEO** makes it easily identifiable.

Specific features of GREENWAY® NEO :

The renewable raw material of plant origin, 1,3 Propanediol, has a lower viscosity than that of Mono-Propylene Glycol.

Its formulation without biocide or volatile organic compound is free of Borax, a toxic additive according to the 30th European ATP (Adaptation to Technical Progress).

Its formulation is compatible with hard water without the risk of precipitate inhibition agents. However, dilution with demineralised water is preferable to avoid scaling.

The corrosion inhibitor technology is organic, based on neutralised carboxylic acids, without phosphates, nitrites or amines. These anti-corrosion agents provide long lasting protection.

GREENWAY® NEO is bacteriostatic from a concentration of $\geq 30\%$ by volume (i.e. prevents bacterial growth in a circuit).

According to OECD standard 302B to evaluate biodegradability, **GREENWAY® NEO** demonstrates "ultimate intrinsic biodegradability without preadaptation" and "primary intrinsic biodegradability" extrapolated to a finished product.

GREENWAY® NEO is, **authorised by the French health administration (Direction Générale de la Santé), according to the directives of the French regulatory agency ANSES**, as a heat transfer fluid for thermal processing in simple exchange systems for sanitary water production up to a maximum concentration of 70% of the volume.

GREENWAY® NEO is also **approved by Belgaqua**, (the Belgian federation in the water sector), according to the standard NBN-EN 1717 as a fluid category 3.

GREENWAY® NEO is recorded as HT2 category on the list of NSF Nonfood Compounds for use in food premises as a coolant with no food contact.



1. PHYSICAL AND CHEMICAL PROPERTIES OF GREENWAY® NEO

| | |
|--|----------------------------------|
| Appearance | Green liquid |
| Density at 20°C (AFNOR NF R 15-602-1 / ASTM D 1122)..... | 1.060 ± 0.002 kg/dm ³ |
| pH (AFNOR NF T 90 008 / ASTM D 1287) | |
| at 50% by volume in water | 8.3 to 8.8 |
| at 33% by volume in water | 8.0 to 8.5 |
| Alkaline Reserve (AFNOR NF T 78-101 / ASTM D 1121) (ml HCl N/10 for 10 ml of GREENWAY® NEO) | ≥ 4 ml |
| Freezing point °C (AFNOR NF T 78-102 / ASTM D 1177) | |
| at 33 % by volume in water | - 13 ± 2°C |
| at 50 % by volume in water | - 27 ± 2°C |
| Boiling point °C (AFNOR R 15-602-4 / ASTM D 1120) | |
| at atmospheric pressure | 144 ± 2°C |

2. PHYSICAL AND CHEMICAL PROPERTIES OF AQUEOUS SOLUTIONS OF GREENWAY® NEO

GREENWAY® NEO is miscible with water in all proportions.

2.1. Freezing point of aqueous solutions of GREENWAY® NEO (in °C)

The freezing points of aqueous solutions of GREENWAY® NEO shown below correspond to the formation of a crystalline mix and not a compact mass.

| | | | | | | | | | | | | |
|--|-----|-----|-----|------|------|------|------|------|------|------|-----|-----|
| GREENWAY® NEO concentration (as a % of volume) | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| Freezing point in °C ± 2 | - 5 | - 6 | - 9 | - 11 | - 14 | - 17 | - 22 | - 27 | - 31 | - 39 | -47 | -55 |

Relevant standards: AFNOR NF T 78-102 / ASTM D 1177

N.B.: in addition to freezing protection, we recommend using solutions of GREENWAY® NEO with a concentration of at least 33% to obtain optimal corrosion protection.

Freezing points are however subject to variation due to super-cooling phenomena which may occur.

temperatures below 0°C, it is essential that the viscosity is taken into consideration for calculating the pressure loss.

When used as a transfer fluid and particularly at

**Conservation of the antifreeze / anti-corrosion power of aqueous solutions**

The loss of GREENWAY® NEO from aqueous solutions, even when brought to the boiling point, is virtually nil due to its low volatility and because it does not form an azeotrope with water.

As the installations are generally closed circuit systems, water cannot evaporate and the antifreeze power of the aqueous solutions is maintained where there is no leakage.

When used in older installations with an open-air expansion tank, it is recommended to monitor the pressure gauge and add water if necessary when checking the concentration of GREENWAY® NEO by density.

In all cases, it is advisable to check the concentration of the GREENWAY® NEO mixture, at least once a year, by measuring its density at 20°C using a suitable hydrometer or by checking its freezing point using an appropriate refractometer

It is essential to check the pH of the fluid, exterior corrosion of pipework, and identify areas of poor circulation or any blocking of valves.

2.2. Density of aqueous solutions of GREENWAY® NEO at 20°C (in kg/m³)

| GREENWAY® NEO concentration (as a % of volume) | Density of the solution kg/dm ³ |
|--|--|
| 20 | 1.014 |
| 25 | 1.018 |
| 30 | 1.023 |
| 35 | 1.026 |
| 40 | 1.030 |
| 45 | 1.034 |
| 50 | 1.038 |
| 55 | 1.042 |
| 60 | 1.044 |
| 65 | 1.048 |
| 70 | 1.050 |

Relevant standards: AFNOR NF R 15-602-1 / ASTM D 1122

Densities read on the scale of a suitable hydrometer more or less match the density indicated at 20°C. A thermometric correction will need to be used below and above this temperature.

2.3. Boiling points of aqueous solutions of GREENWAY® NEO (in °C)

| GREENWAY® NEO concentration (as a % of volume) | 20 | 30 | 40 | 50 | 60 | 70 |
|--|-----|-----|-----|-----|-----|-----|
| Boiling point (in °C) | 101 | 102 | 103 | 104 | 106 | 109 |

Relevant standards: AFNOR NF R 15-602-4 / ASTM D 1120



2.4. Density relative to the temperature of GREENWAY® NEO

(in kg/dm³)

| GREENWAY® NEO concentration (as a % of volume) | 30 | 40 | 50 | 55 | 60 | 65 | 70 | | | | | | | | |
|--|---------------|-------|-------|-------|-------|-------|-------|--|--|--|-------|-------|-------|-------|-------|
| Temperature in °C | FREEZING ZONE | | | | | | | | | | | | | | |
| -50 | | | | | | | | | | | | | | 1.079 | |
| -40 | | | | | | | | | | | | | 1.072 | 1.074 | |
| -30 | | | | | | | | | | | | 1.066 | 1.066 | 1.070 | 1.072 |
| -20 | | | | | | | | | | | 1.059 | 1.062 | 1.064 | 1.068 | 1.070 |
| -10 | 1.035 | 1.042 | 1.053 | 1.056 | 1.058 | 1.062 | 1.064 | | | | | | | | |
| 0 | 1.030 | 1.037 | 1.048 | 1.051 | 1.053 | 1.057 | 1.059 | | | | | | | | |
| 10 | 1.025 | 1.032 | 1.043 | 1.046 | 1.048 | 1.052 | 1.054 | | | | | | | | |
| 20 | 1.023 | 1.030 | 1.038 | 1.042 | 1.044 | 1.048 | 1.050 | | | | | | | | |
| 30 | 1.020 | 1.026 | 1.033 | 1.037 | 1.039 | 1.043 | 1.045 | | | | | | | | |
| 40 | 1.017 | 1.023 | 1.029 | 1.032 | 1.036 | 1.040 | 1.042 | | | | | | | | |
| 50 | 1.014 | 1.020 | 1.027 | 1.031 | 1.033 | 1.037 | 1.039 | | | | | | | | |
| 60 | 1.011 | 1.017 | 1.024 | 1.028 | 1.030 | 1.034 | 1.036 | | | | | | | | |
| 70 | 1.008 | 1.014 | 1.021 | 1.025 | 1.027 | 1.031 | 1.033 | | | | | | | | |
| 80 | 1.005 | 1.011 | 1.018 | 1.022 | 1.024 | 1.028 | 1.030 | | | | | | | | |
| 90 | 1.001 | 1.007 | 1.014 | 1.018 | 1.020 | 1.024 | 1.026 | | | | | | | | |
| 100 | 0.998 | 1.004 | 1.011 | 1.015 | 1.017 | 1.021 | 1.023 | | | | | | | | |

Bibliographic data provided for information purposes.

2.5. Kinematic viscosity of aqueous solutions of GREENWAY® NEO (incSt)*

| GREENWAY® NEO concentration (as a % of volume) | 30 | 40 | 50 | 55 | 60 | 65 | 70 | | | | | | | | |
|--|---------------|-------|-------|-------|-------|-------|-------|--|--|--|-------|-------|--------|--------|--------|
| Temperature in °C | FREEZING ZONE | | | | | | | | | | | | | | |
| -50 | | | | | | | | | | | | | | 860.79 | |
| -40 | | | | | | | | | | | | | 325.98 | 386.00 | |
| -30 | | | | | | | | | | | | 84.61 | 116.65 | 142.98 | 169.30 |
| -20 | | | | | | | | | | | 29.52 | 41.79 | 56.14 | 67.17 | 78.19 |
| -10 | 8.97 | 12.67 | 19.21 | 22.48 | 29.59 | 34.64 | 39.68 | | | | | | | | |
| 0 | 5.43 | 7.58 | 11.94 | 13.04 | 16.95 | 19.46 | 21.98 | | | | | | | | |
| 10 | 3.51 | 4.85 | 7.06 | 8.14 | 10.44 | 11.81 | 13.17 | | | | | | | | |
| 20 | 2.42 | 3.30 | 4.52 | 5.52 | 6.88 | 7.69 | 8.49 | | | | | | | | |
| 30 | 1.76 | 2.37 | 2.89 | 3.76 | 4.80 | 5.31 | 5.81 | | | | | | | | |
| 40 | 1.34 | 1.78 | 2.23 | 2.83 | 3.53 | 3.87 | 4.21 | | | | | | | | |
| 50 | 1.07 | 1.40 | 1.76 | 2.24 | 2.70 | 2.94 | 3.18 | | | | | | | | |
| 60 | 0.86 | 1.13 | 1.51 | 1.78 | 2.15 | 2.32 | 2.50 | | | | | | | | |
| 70 | 0.73 | 0.94 | 1.19 | 1.48 | 1.74 | 1.88 | 2.02 | | | | | | | | |
| 80 | 0.63 | 0.79 | 1.0 | 1.25 | 1.45 | 1.56 | 1.66 | | | | | | | | |
| 90 | 0.53 | 0.67 | 0.88 | 1.05 | 1.22 | 1.31 | 1.39 | | | | | | | | |
| 100 | 0.46 | 0.57 | 0.74 | 0.90 | 1.03 | 1.10 | 1.16 | | | | | | | | |

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2.6. Specific heat of aqueous solutions of GREENWAY® NEO

(in kJ. kg⁻¹.K⁻¹)*

| GREENWAY® NEO concentration (as a % of volume) | 30 | 40 | 50 | 55 | 60 | 65 | 70 | | | | | | | |
|--|---------------|------|------|------|------|------|------|--|--|------|------|------|------|------|
| Temperature in °C | FREEZING ZONE | | | | | | | | | | | | | |
| -50 | | | | | | | | | | | | | | 2.16 |
| -40 | | | | | | | | | | | | | 2.43 | 2.25 |
| -30 | | | | | | | | | | | 2.94 | 2.69 | 2.52 | 2.35 |
| -20 | | | | | | | | | | 3.23 | 3.05 | 2.78 | 2.62 | 2.45 |
| -10 | 3.89 | 3.63 | 3.31 | 3.13 | 2.88 | 2.72 | 2.55 | | | | | | | |
| 0 | 3.95 | 3.70 | 3.39 | 3.22 | 2.97 | 2.81 | 2.66 | | | | | | | |
| 10 | 4.02 | 3.77 | 3.47 | 3.31 | 3.07 | 2.91 | 2.76 | | | | | | | |
| 20 | 4.07 | 3.84 | 3.55 | 3.39 | 3.16 | 3.01 | 2.86 | | | | | | | |
| 30 | 4.13 | 3.91 | 3.63 | 3.48 | 3.25 | 3.11 | 2.97 | | | | | | | |
| 40 | 4.20 | 3.98 | 3.71 | 3.57 | 3.35 | 3.21 | 3.07 | | | | | | | |
| 50 | 4.26 | 4.05 | 3.79 | 3.65 | 3.44 | 3.31 | 3.17 | | | | | | | |
| 60 | 4.33 | 4.12 | 3.88 | 3.74 | 3.54 | 3.41 | 3.27 | | | | | | | |
| 70 | 4.39 | 4.18 | 3.96 | 3.83 | 3.63 | 3.50 | 3.38 | | | | | | | |
| 80 | 4.45 | 4.25 | 4.04 | 3.92 | 3.73 | 3.60 | 3.48 | | | | | | | |
| 90 | 4.52 | 4.32 | 4.12 | 4.00 | 3.82 | 3.70 | 3.58 | | | | | | | |
| 100 | 4.58 | 4.39 | 4.20 | 4.09 | 3.91 | 3.80 | 3.68 | | | | | | | |

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2.7. Thermal conductivity of aqueous solutions of GREENWAY® NEO (in W.m⁻¹.K⁻¹)*

| GREENWAY® NEO concentration (as a % of volume) | 30 | 40 | 50 | 55 | 60 | 65 | 70 | | | | | | | |
|--|---------------|-------|-------|-------|-------|-------|-------|--|--|-------|-------|-------|-------|-------|
| Temperature in °C | FREEZING ZONE | | | | | | | | | | | | | |
| -50 | | | | | | | | | | | | | | 0.326 |
| -40 | | | | | | | | | | | | | 0.303 | 0.333 |
| -30 | | | | | | | | | | | 0.335 | 0.320 | 0.319 | 0.317 |
| -20 | | | | | | | | | | 0.357 | 0.345 | 0.328 | 0.327 | 0.325 |
| -10 | 0.429 | 0.395 | 0.366 | 0.353 | 0.336 | 0.334 | 0.332 | | | | | | | |
| 0 | 0.442 | 0.406 | 0.375 | 0.361 | 0.343 | 0.340 | 0.337 | | | | | | | |
| 10 | 0.454 | 0.415 | 0.382 | 0.368 | 0.348 | 0.345 | 0.342 | | | | | | | |
| 20 | 0.465 | 0.424 | 0.389 | 0.374 | 0.353 | 0.349 | 0.346 | | | | | | | |
| 30 | 0.476 | 0.432 | 0.394 | 0.379 | 0.358 | 0.353 | 0.348 | | | | | | | |
| 40 | 0.485 | 0.439 | 0.399 | 0.383 | 0.361 | 0.356 | 0.350 | | | | | | | |
| 50 | 0.493 | 0.445 | 0.403 | 0.387 | 0.364 | 0.358 | 0.352 | | | | | | | |
| 60 | 0.500 | 0.450 | 0.406 | 0.389 | 0.365 | 0.359 | 0.352 | | | | | | | |
| 70 | 0.506 | 0.454 | 0.408 | 0.391 | 0.367 | 0.359 | 0.352 | | | | | | | |
| 80 | 0.512 | 0.457 | 0.409 | 0.392 | 0.367 | 0.359 | 0.352 | | | | | | | |
| 90 | 0.516 | 0.459 | 0.409 | 0.392 | 0.367 | 0.359 | 0.350 | | | | | | | |
| 100 | 0.519 | 0.460 | 0.409 | 0.392 | 0.366 | 0.357 | 0.349 | | | | | | | |

Bibliographic data provided for information purposes



2.8. Protection of metals by GREENWAY® NEO in aqueous solution

These tests were performed on the GREENWAY® NEO diluted to 33% volume in synthetically corrosive water. For information, the table shows the performance requirements defined by standards AFNOR NF R 15-601 and ASTM D 3306 for coolant liquids.

| Metals | Weight loss (mg / test piece) | Limits of the standard NF R 15-601 | Limits of the standard ASTM D 3306 |
|-----------|----------------------------------|---------------------------------------|---------------------------------------|
| Copper | ± 2 | [- 5; +5] | [- 10; +10] |
| Solder | ± 3 | [- 5; +5] | [- 30; +10] |
| Brass | ± 2 | [- 5; +5] | [- 10; +10] |
| Steel | ± 1 | [- 2.5; +2.5] | [- 10; +10] |
| Cast iron | ± 2 | [- 4; +4] | [- 10; +10] |
| Aluminium | ± 7 | [- 10; +20] | [- 30; +30] |

Standards governing test method: AFNOR NF R 15-602-7 / ASTM D 1384

*** The data given in paragraph 2 of this document are purely indicative and do not constitute a sales specification.**

3. PRESSURE LOSS

When using a GREENWAY® NEO solution in a heat transfer circuit at temperatures both above 0°C and in particular below 0°C, it is advisable to take account of the viscosity of the aqueous solution to calculate pressure losses.



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4. RECOMMENDATIONS FOR IMPLEMENTATION

4.1. System cleaning

It is strongly recommended to conduct thorough cleaning of an installation with Dispersant D* before filling with the GREENWAY® NEO solution, if it contains large deposits of metal oxides.

The procedure for use is as follows:

- Have water flow through the circuit for one to two hours, and then quickly and thoroughly drain the installation at the lowest point.
- Prepare and add a 20g/litre solution of "Dispersant D*" to the system
- Let the product circulate for at least two hours.
- Quickly drain the installation at the lowest point.

- Carefully and thoroughly rinse with water until the water runs clear and the pH is close to 7 (\pm 0.5).

Cleaning may sometimes need to be repeated, depending on the state of the circuit.

After cleaning, it is important to drain and rinse thoroughly with water.

Note: If the installation is scaled and the deposits are highly oxidised, it is advisable to pre-treat with a solution containing about 100 g/l of "Deoxidiser P*" in water with circulation for 2 hours at 50°C. After draining, continue the treatment with "Dispersant D*" as per the procedure described above.

4.2. Recommendations and adding GREENWAY® NEO to the installation.

To ensure proper homogeneity, it is recommended to prepare the mixture prior to adding it to the installation, and to fill using a suitable pump connected to the drain point.

In practice, to obtain sufficient protection against corrosion, the minimum recommended concentration is 33% by volume.

It is advisable, for bio-sourced 1,3-propanediol solutions with greater wetting properties than water alone, to ensure compatibility of the system's seals with this product (particularly porous paper-type seals, hemp, etc.).

When filling an installation, it may be necessary to tighten the seals and joints to prevent any seepage.

Given the diversity of materials encountered in installations (heat exchangers, pipes, seals, etc.), it

is advisable to check with component manufacturers that their products are compatible with bio-sourced 1,3-propanediol.

GREENWAY® NEO must not be used with galvanized steel.

An annual check on the concentration of GREENWAY® NEO with APC* analysis is recommended during maintenance operations (at least once a year) to ensure the product remains in good condition.

The data provided (viscosity, specific heat, etc.) are intended to assist the user to implement the product. It is the user's responsibility to make any calculation (pressure loss, etc.) required for the proper operation of the installation.

** Marketed by Climalife.*

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