

## Green Sun -15°C

### NON TOXIC – RENEWABLE ANTIFREEZE

#### Description y applications:

*Green Sun -15°C* is a transparent green liquid based on 1,3 isomer propylene glycol.

The raw material comes from renewable sources (corn mainly) instead of regular glycols that come from petroleum. This renewable propylene glycol fits better in the solar thermal, geothermal and another green energies philosophy. Besides this product has a CO<sub>2</sub> emission more than 40% lower than the same product based on regular propylene glycol from petroleum<sup>1</sup>.

1, 3 Propylene Glycol comparative with standard 1, 2 isomer:

- ✓ Lower viscosity at low temperatures.
- ✓ Less pumping pressure at lower temperatures, less energy consumption.
- ✓ High resistance to thermal cracking at high temperatures (Ej: Stagnation Temperatures in Solar Thermal Systems).
- ✓ Both are non-toxic and biodegradable.
- ✓ Equals or beats standard propylene glycol in all important metrics.

*Green Sun -15°C* meets with European quality specifications and standards.

The product is presented ready to use. Do not dilute because the properties would not be guaranteed.

It maintains cooling circuits in perfect condition for longer periods of time than conventional products due to its antirust organic additives. This product optimises heat transference and so enhances the performance of the installations.

It protects from corrosion: aluminium, copper, brass, steel and cast iron.

Its green colour helps to detect leaks.

It does not contain Nitrite or Amine as these are products that may react to give nitrosamines which are potential carcinogen agents. It does not contain phosphates either as their environmental implications have been questioned. Borate, Silicate and Nitrate free product.

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<sup>1</sup> According to 1,3 propylene glycol manufacturer information.

**Technical Data:**

Appearance	Transparent Green Liquid
1,3 Propylene Glycol	35 % P/P
pH (20°C)	8,0 – 9,5
Boiling Point <sup>2</sup>	105°C
Freezing Point	-15 °C
Density (20°C)	1,03-1,04 g/ml
Viscosity (20°C)	3,69 mPa s
Specific Heat Capacity (20°C)	3,84 KJ/KgK
Thermal Conductivity (20°C)	0,423 W/mK

Data has been gathered in specific bibliography and proprietary tests. It is not part, necessarily, of the technical specifications.

**Corrosion Table:**

Mixtures of propylene glycol and water are more corrosive than pure water so additives should be used in order to ensure the integrity of the circuit.

The following table shows the effectiveness of Green Sun in inhibiting corrosion according to ASTM D 1384. For a comparative purpose results for water and propylene glycol alone are presented.

Material	<i>Green Sun</i> (33% v/v)	Propilenglicol (50% v/v)	Water
<b>Cooper</b>	-0,15	-1,2	-1,0
<b>Solder</b>	-0,36	-136	-11
<b>Brass</b>	0,33	-2,5	-1,0
<b>Steel</b>	0,40	-225	-76
<b>Cast Iron</b>	2,09	-92	-192
<b>Aluminum</b>	-0,68	-68	-32

The results above are an average change in weight of coupons in g/m<sup>2</sup>. A positive number indicates an increase in weight due to the formation of a stable protective layer on the metal's surface.

<sup>2</sup>Atmospheric pressure.  
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***Test description:***

**ASTM D 1384:**

*In this test method, specimens of metals typical of those present in engine cooling systems are totally immersed in aerated engine coolant solutions with corrosive water for 336 h at 88°C (190°F). The corrosion inhibitive properties of the test solution are evaluated on the basis of the weight changes incurred by the specimens. Each test is run in triplicate, and the average weight change is determined for each metal.*

**Compatibility table:**

*Green Sun -15°C* is compatible with the usual materials of cooling and solar thermal circuits. The next table shows plastics, sealants and elastomers compatible with the product. Data has been gathered in specific bibliography and proprietary tests.

<b>Name</b>	<b>Abbreviation</b>
Ethylene-propylene-diene rubber	EPDM
Fluorocarbon elastomers	FPM
Natural rubber up to 80°C	NR
Nitrile Rubber	NBR
Polyacetal	POM
Polyamide up to 115°C	PA
Polybutene	PB
Polyethylene high/low density	PE-LD/PE-HD
Polypropylene	PP
Poly (tetrafluoroethylene)	PTFE
Silicone Rubber	Si

Phenolic resins, plasticized PVC and polyurethane elastomers are not compatible with Green Sun -15°C.

Zinc is not compatible with propylene glycol or their mixtures with water, avoid zinc or galvanized reservoirs.

**Filling the installation:**

After pressure testing, which also affords an opportunity to determine the volume of the system from the amount of water used (water meter), the system should be drained and then filled immediately with the antifreeze. Air pockets are to eliminate immediately.

Before filling the systems should be flushed with water to remove traces of flux, especially when chlorine containing flux has been used.



After draining the circuit of old antifreeze, it should be flushed with water in order to clean possible deposits and particles before filling with *Green Sun -15°C*. The product's useful life will be reduced if the system is already corroded. If corrosion is detected, corrective action should be taken before filling up the circuit.

Mixtures with other kind of antifreeze should be avoided for possible incompatibilities which would reduce the useful life of the product. For specific compatibilities you can contact our technical department: please email [carpemar@carpemar.com](mailto:carpemar@carpemar.com).

Long-term no-load operation of the system should be avoided because this can adversely affect the stability of the heat transfer medium and considerably reduce its service life.

*Green Sun -15°C* is stable for at least two years in regular stocks conditions in airtight containers.

Equipment must not be fitted with galvanized heat exchangers, heat reservoirs, tanks or pipes, because propylene glycol can dissolve zinc.

The minor surface tension of *Green Sun -15°C* compared with water may make minor damage due to corrosion more apparent.

### **Heat Resistance:**

1,3 Propylene glycol presents better high temperature resistance but sustained temperatures higher than 180°C may cause premature ageing of propylene glycol and are not recommended. For solar thermal systems with stagnation temperatures above 180°C it is thus recommended to choose expansion vessels of sufficient size to ensure that the solar antifreeze will be taken up completely in case of stagnation.

Temperatures above 200°C lead to slow alteration of the chemical properties of antifreeze fluid, with the result that the reliability of operation of the system may be endangered.

In the case of not-closed systems or the insert of oxygen (e.g. via valves) the maximum usage temperature is lower.

### **Precautions:**

*Green Sun -15°C* is a non flammable, non corrosive product, so no special precautions are required. In any case good industrial practices are recommendable.

Avoid contact with eyes, in case of splashing flush with running water for at least 10 minutes. Do not eat or drink, keep away of children.

Store in a clean and well-ventilated place. Tightly sealed containers are recommended in order to maintain the properties of the product.



Temperature (°C)	Density (Kg./m3)
-15	1.047
-10	1.045
-5	1.044
0	1.042
5	1.040
10	1.038
15	1.036
20	1.033
25	1.031
30	1.028
35	1.026
40	1.023
45	1.020
50	1.017
55	1.014
60	1.011
65	1.007
70	1.004
75	1.000
80	996
85	992
90	988
95	984
100	979

Temperature (°C)	Cp (KJ/KgK)
-15	3,637
-10	3,666
-5	3,695
0	3,724
5	3,753
10	3,782
15	3,811
20	3,840
25	3,869
30	3,898
35	3,927
40	3,956
45	3,986
50	4,015
55	4,044
60	4,073
65	4,102
70	4,131
75	4,160
80	4,189
85	4,218
90	4,247
95	4,276
100	4,305

Temperature (°C)	Thermal Cond. (W/mK)
-15	0,385
-10	0,392
-5	0,398
0	0,404
5	0,409
10	0,414
15	0,419
20	0,423
25	0,427
30	0,431
35	0,435
40	0,438
45	0,441
50	0,444
55	0,446
60	0,449
65	0,451
70	0,453
75	0,454
80	0,456
85	0,457
90	0,458
95	0,458
100	0,458

Temperature (°C)	Viscosity (mPas)
-15	16,740
-10	13,261
-5	10,542
0	8,412
5	6,747
10	5,455
15	4,454
20	3,691
25	3,082
30	2,603
35	2,224
40	1,923
45	1,681
50	1,485
55	1,324
60	1,190
65	1,079
70	0,986
75	0,908
80	0,844
85	0,793
90	0,751
95	0,715
100	0,683

The information contained in this document is based on our current knowledge and experience. This information is presented for good use of the products and it is not part, necessarily, of the technical specifications.

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