

ThermoSol Concentrate

NON TOXIC ANTIFREEZE FOR HIGH TEMPERATURES INSTALLATIONS

Description and applications:

Product based on specially selected high boiling temperature glycols and with a higher cracking stability to high temperatures. It resists high thermal loads and maintains its properties for longer periods of time than ethylene and propylene glycol based antifreeze fluids.

The product is presented as a concentrate, it must be diluted before use.

It maintains cooling circuits in perfect condition for longer periods of time than conventional inorganic products due to its antirust organic additives.

Prevents corrosion of metals widely used in thermal circuits.

Its red 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. It does not contain Borates because of its health hazards. Free of silicates, borates and nitrates. Completely organic formulation, better performance, safer for manipulation and environment.

Temperatures of use:

The product is stable in the temperature range of -28°C to 190°C. Sustained temperatures higher than 200°C may cause premature ageing of the product reducing its useful life.

Attributes:

- Prevents circuit damage by freezing.
- Raises boiling point, reducing overheating problems.
- Prevents corrosion of metals widely used in cooling circuits.
- Prevents deposits in solar circuit.
- Biodegradable.
- Non toxic.



Technical Data:

Appearance	Transparent Red Liquid
pH (20°C)	9,0 – 10,0
Density (20°C)	1.12-1.13 kg/l
Viscosity (20°C)	37 mPas
Specific Heat Capacity (20°C)	2,4 KJ/Kg.K
Cubic Expansion Coefficient	0,26 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 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 mixtures Liquid Sun – Water in inhibiting corrosion according to ASTM D 1384. For a comparative porpoise results for water and propylene glycol alone are presented.

Material	<i>ThermoSol Conc. 50%</i>	Propylene glycol (33% v/v)	Tap Water	ASTM D 3306 Max. Limit
Copper	0,50	4	2	10
Solder	0,14	1095	99	30
Brass	-0,51	5	5	10
Mild Steel	-0,96	214	212	10
Cast Iron	-3,71	345	450	10
Aluminum	2,02	15	110	30

The results above are an average change in weight of coupons in mg. A negative number indicates an increase in weight due to the formation of a stable protective layer on the metal's surface.

ASTM D 1384 Test description:

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.

Compatibility table:

Mixtures of water and *ThermoSol Concentrate* are compatible with the common materials of cooling circuits. The next table shows plastics, sealants and elastomers compatible with the product. Data has been gathered in specific bibliography and proprietary tests.

Compatibility with Elastomers			
Material	25°C	80°C	160°C
Adiprene™ L-100	OK	NR	NR
Black Rubber 3773	OK	NR	NR
Buna N (o 25)	OK	OK	--
Buna S	OK	Acceptable	NR
ButylRubber	OK	OK	--
Compressed Asbestos	OK	OK	Acceptable
EPDM	OK	OK	OK
EPR Rubber	OK	OK	OK
Hycar™ D-24	OK	Acceptable	--
Hypalon™	OK	NR	NR
Kalrez™	OK	OK	OK
Natural RubberGum	OK	NR	NR
Neoprene 7797	OK	Acceptable	--
Red Rubber 107	OK	NR	NR
Saraloy™ 300	OK	NR	NR
Silicone Nº 65	OK	OK	--
Thiokol™ 3060	OK	NR	NR
Viton™ A	OK	OK	NR
<i>OK: Recommended</i>	<i>NR: No Recommended</i>		<i>--: No data</i>

Phenolic resins, plasticized PVC and polyurethane elastomers are not compatible with *ThermoSol Concentrate*.

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

Filling the installation:

ThermoSol Concentrate must be diluted before use. The minimum concentration to ensure protection from corrosion is 40% V/V. The recommended maximum is 55% V/V. In systems where aluminium is not present, the dosage can be reduced to 30% of the concentrate product.

Depending on the proportion of concentrated product, the protection temperature against low temperatures is obtained, they can be consulted in the following table.

% V/V <i>ThermoSol Concentrate</i>	Freezing Point (°C)	Frost Protection (°C)	Burst Point (°C) ¹	Measures with Refractometers	
				% Propylene Glycol	°Brix
25	-7	-10	-13	28,0	21,63
30	-10	-14	-17	34,9	25,08
35	-14	-18	-22	41,8	28,54
40	-19	-24	-27	48,7	32,00
45	-27	-30	-34	55,6	35,45
50	-33	-38	-41	62,5	38,91
55	-42	-48	-49	69,4	42,36

Commonly used refractometers are graduated to measure propylene glycol. Since ThermoSol is based on a glycol with higher molecular weight, it does not allow a direct measurement. Results obtained by measuring the concentration of the product with refractometers graduated in °Brix and for propylene glycol are shown in the table.

Water for dilution of the product must be potable water and with a maximum content of chlorides and sulphates of 50 ppm and hardness lower than 50 ppm expressed as CaCO₃ or demineralized water. These indications do not exempt from the compliance with applicable legislation in each place.

Before filling the systems should be flushed with water of the same quality as the mixture in order to remove possible particles or traces of flux.

¹ Freezing point according to ASTM D 1177 is the temperature for the first ice crystal formation. DIN 51583 normative establishes the temperature from the product does not flow and there is danger for the circuit integrity. Between both temperatures exists a mixture of ice crystals and not-frozen fluid that flows without volume increase, thus, without bursting problems.



This product is totally stable and is preserved without alterations for long periods of time in its original container tightly closed and without being exposed to sunlight. In case of transfer to other types of containers make sure they do not contain zinc since it is not compatible with the product. Always store in airtight containers.

Precautions:

As it is a non flammable, non corrosive product, no special precautions are required.

Avoid contact with eyes, in case of splashing wash thoroughly with water.

Do not eat or drink, keep away of children, both the product and its mixtures with water.

Store in a clean and well-ventilated place. Avoid strong heating up of the product.

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Thermosol Concentrated 55% V/V							
Temperature	Density	Specific Heat Capacity	Thermal Conductivity	Dynamic Viscosity	Kinematic Viscosity	N° Prandtl	Vapour pressure
°C	ρ (Kg/m ³)	Cp (KJ/KgK)	λ (W/mK)	μ (mPas)	ν (mm ² /s)		mmHg
-24	1107,3	3,06	0,381	133,03	120,14	1069,20	0,5
-20	1105,3	3,08	0,381	89,00	80,52	719,43	0,8
-10	1100,3	3,11	0,379	39,62	36,01	324,93	1,8
0	1095,3	3,15	0,378	21,13	19,29	175,83	3,9
10	1090,3	3,18	0,377	12,64	11,59	106,70	7,9
20	1085,3	3,22	0,376	8,18	7,54	70,10	15,1
30	1080,3	3,26	0,375	5,61	5,19	48,80	27,5
40	1075,3	3,30	0,374	4,02	3,74	35,52	48,0
50	1070,3	3,34	0,372	2,99	2,79	26,78	80,4
60	1065,3	3,38	0,371	2,28	2,14	20,77	129,9
70	1060,3	3,42	0,370	1,79	1,68	16,49	203,2
80	1055,3	3,46	0,369	1,42	1,35	13,36	308,8
90	1050,3	3,51	0,368	1,15	1,10	11,00	457,0
100	1045,3	3,55	0,367	0,95	0,91	9,20	660,5
110	1040,3	3,59	0,366	0,79	0,76	7,78	933,9
120	1035,3	3,64	0,364	0,67	0,64	6,66	1294,5
130	1030,3	3,68	0,363	0,57	0,55	5,76	1761,8
140	1025,3	3,73	0,362	0,49	0,47	5,02	2358,1
150	1020,3	3,78	0,361	0,42	0,41	4,41	3107,7
160	1015,3	3,83	0,360	0,37	0,36	3,90	4037,9
170	1010,3	3,88	0,359	0,32	0,32	3,48	5177,8
180	1005,3	3,93	0,357	0,28	0,28	3,12	6559,1

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Thermosol Concentrated 50% V/V							
Temperature	Density	Specific Heat Capacity	Thermal Conductivity	Dynamic Viscosity	Kinematic Viscosity	N° Prandtl	Vapour pressure
°C	ρ (Kg/m ³)	Cp (KJ/KgK)	λ (W/mK)	μ (mPas)	ν (mm ² /s)		mmHg
-19	1096,0	3,21	0,393	56,49	51,54	461,67	0,9
-10	1091,5	3,24	0,394	29,40	26,93	242,06	1,8
0	1086,5	3,27	0,394	16,39	15,09	136,16	4,0
10	1081,5	3,31	0,395	10,10	9,34	84,66	8,1
20	1076,5	3,34	0,395	6,68	6,21	56,50	15,5
30	1071,5	3,38	0,396	4,66	4,35	39,75	28,2
40	1066,5	3,41	0,396	3,38	3,17	29,13	49,2
50	1061,5	3,45	0,397	2,54	2,39	22,06	82,4
60	1056,5	3,49	0,398	1,96	1,85	17,15	133,1
70	1051,5	3,53	0,398	1,54	1,46	13,64	208,2
80	1046,5	3,57	0,399	1,23	1,18	11,05	316,4
90	1041,5	3,61	0,399	1,01	0,97	9,09	468,3
100	1036,5	3,65	0,400	0,83	0,80	7,59	676,8
110	1031,5	3,69	0,400	0,70	0,67	6,41	957,0
120	1026,5	3,74	0,401	0,59	0,57	5,48	1326,5
130	1021,5	3,78	0,402	0,50	0,49	4,72	1805,4
140	1016,5	3,83	0,402	0,43	0,42	4,11	2416,3
150	1011,5	3,87	0,403	0,37	0,37	3,60	3184,4
160	1006,5	3,92	0,403	0,33	0,32	3,17	4137,4
170	1001,5	3,97	0,404	0,29	0,29	2,82	5305,4
180	996,5	4,02	0,404	0,25	0,25	2,52	6720,7

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Thermosol Concentrated 45% V/V							
Temperature	Density	Specific Heat Capacity	Thermal Conductivity	Dynamic Viscosity	Kinematic Viscosity	N° Prandtl	Vapour pressure
°C	ρ (Kg/m ³)	Cp (KJ/KgK)	λ (W/mK)	μ (mPas)	ν (mm ² /s)		mmHg
-15	1087,6	3,33	0,414	29,82	27,42	240,33	1,2
-10	1085,1	3,35	0,414	21,81	20,10	176,37	1,9
0	1080,1	3,38	0,415	12,72	11,78	103,63	4,1
10	1075,1	3,41	0,415	8,08	7,52	66,34	8,2
20	1070,1	3,44	0,416	5,46	5,11	45,19	15,8
30	1065,1	3,47	0,416	3,87	3,63	32,28	28,8
40	1060,1	3,50	0,417	2,85	2,68	23,92	50,2
50	1055,1	3,54	0,417	2,16	2,04	18,27	84,0
60	1050,1	3,57	0,418	1,67	1,59	14,31	135,8
70	1045,1	3,61	0,419	1,33	1,27	11,44	212,5
80	1040,1	3,65	0,419	1,07	1,03	9,31	322,9
90	1035,1	3,69	0,420	0,88	0,85	7,69	477,9
100	1030,1	3,73	0,420	0,73	0,70	6,43	690,7
110	1025,1	3,77	0,421	0,61	0,59	5,45	976,6
120	1020,1	3,81	0,421	0,52	0,51	4,66	1353,7
130	1015,1	3,85	0,422	0,44	0,43	4,03	1842,4
140	1010,1	3,89	0,423	0,38	0,38	3,50	2465,8
150	1005,1	3,94	0,423	0,33	0,33	3,07	3249,7
160	1000,1	3,98	0,424	0,29	0,29	2,71	4222,2
170	995,1	4,03	0,424	0,25	0,26	2,41	5414,0
180	990,1	4,08	0,425	0,22	0,23	2,16	6858,2

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Thermosol Concentrated 40% V/V							
Temperature	Density	Specific Heat Capacity	Thermal Conductivity	Dynamic Viscosity	Kinematic Viscosity	N° Prandtl	Vapour pressure
°C	ρ (Kg/m ³)	Cp (KJ/KgK)	λ (W/mK)	μ (mPas)	ν (mm ² /s)		mmHg
-12	1077,6	3,45	0,434	18,02	16,73	143,23	1,6
-10	1076,6	3,46	0,434	16,15	15,00	128,49	1,9
0	1071,6	3,48	0,435	9,85	9,19	78,86	4,1
10	1066,6	3,51	0,436	6,46	6,05	52,01	8,4
20	1061,6	3,54	0,436	4,46	4,21	36,20	16,1
30	1056,6	3,57	0,437	3,22	3,05	26,27	29,3
40	1051,6	3,60	0,437	2,40	2,28	19,71	51,0
50	1046,6	3,63	0,438	1,83	1,75	15,19	85,5
60	1041,6	3,66	0,439	1,44	1,38	11,98	138,2
70	1036,6	3,69	0,439	1,15	1,11	9,64	216,2
80	1031,6	3,73	0,440	0,93	0,90	7,88	328,5
90	1026,6	3,76	0,440	0,76	0,74	6,53	486,2
100	1021,6	3,80	0,441	0,64	0,62	5,48	702,7
110	1016,6	3,84	0,441	0,54	0,53	4,65	993,6
120	1011,6	3,88	0,442	0,45	0,45	3,99	1377,1
130	1006,6	3,92	0,443	0,39	0,39	3,45	1874,3
140	1001,6	3,96	0,443	0,34	0,34	3,01	2508,5
150	996,6	4,00	0,444	0,29	0,29	2,64	3305,9
160	991,6	4,05	0,444	0,26	0,26	2,33	4295,3
170	986,6	4,09	0,445	0,23	0,23	2,08	5507,6
180	981,6	4,14	0,445	0,20	0,20	1,86	6976,7

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Thermosol Concentrated 35% V/V							
Temperature	Density	Specific Heat Capacity	Thermal Conductivity	Dynamic Viscosity	Kinematic Viscosity	N° Prandtl	Vapour pressure
°C	ρ (Kg/m ³)	Cp (KJ/KgK)	λ (W/mK)	μ (mPas)	ν (mm ² /s)		mmHg
-9	1069,9	3,56	0,451	10,34	9,66	81,58	2,1
0	1065,4	3,58	0,453	6,86	6,44	54,28	4,2
10	1060,4	3,61	0,455	4,77	4,50	37,78	8,5
20	1052,3	3,63	0,457	3,53	3,34	28,02	16,3
30	1050,4	3,65	0,459	2,73	2,60	21,73	29,7
40	1045,4	3,68	0,461	2,18	2,09	17,43	51,8
50	1040,4	3,71	0,463	1,79	1,72	14,34	86,8
60	1035,4	3,74	0,465	1,50	1,45	12,05	140,2
70	1030,4	3,77	0,467	1,28	1,24	10,29	219,4
80	1025,4	3,80	0,469	1,10	1,07	8,91	333,4
90	1020,4	3,83	0,471	0,96	0,94	7,81	493,4
100	1015,4	3,87	0,473	0,85	0,83	6,92	713,1
110	1010,4	3,90	0,475	0,75	0,74	6,18	1008,3
120	1005,4	3,94	0,477	0,67	0,67	5,56	1397,6
130	1000,4	3,98	0,479	0,61	0,61	5,04	1902,1
140	995,4	4,02	0,481	0,55	0,55	4,60	2545,7
150	990,4	4,06	0,483	0,50	0,51	4,22	3354,9
160	985,4	4,10	0,485	0,46	0,47	3,89	4358,8
170	980,4	4,14	0,487	0,42	0,43	3,60	5589,1
180	975,4	4,19	0,489	0,39	0,40	3,34	7079,8

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Thermosol Concentrated 30% V/V							
Temperature	Density	Specific Heat Capacity	Thermal Conductivity	Dynamic Viscosity	Kinematic Viscosity	Nº Prandtl	Vapour pressure
°C	ρ (Kg/m ³)	Cp (KJ/KgK)	λ (W/mK)	μ (mPas)	ν (mm ² /s)		mmHg
-7	1062,8	3,67	0,468	7,78	7,32	60,92	2,1
0	1059,3	3,68	0,471	5,45	5,14	42,62	4,2
10	1054,3	3,70	0,474	3,71	3,52	28,99	8,6
20	1049,3	3,72	0,478	2,76	2,63	21,51	16,5
30	1044,3	3,74	0,481	2,17	2,08	16,87	30,1
40	1039,3	3,77	0,485	1,77	1,70	13,75	52,5
50	1034,3	3,79	0,488	1,48	1,43	11,51	87,9
60	1029,3	3,82	0,492	1,27	1,23	9,85	142,0
70	1024,3	3,84	0,495	1,10	1,08	8,57	222,2
80	1019,3	3,87	0,499	0,97	0,96	7,57	337,6
90	1014,3	3,90	0,502	0,87	0,86	6,75	499,8
100	1009,3	3,93	0,505	0,78	0,77	6,08	722,2
110	1004,3	3,97	0,509	0,71	0,71	5,52	1021,2
120	999,3	4,00	0,512	0,65	0,65	5,05	1415,5
130	994,3	4,04	0,516	0,59	0,60	4,65	1926,5
140	989,3	4,07	0,519	0,55	0,55	4,31	2578,3
150	984,3	4,11	0,523	0,51	0,52	4,00	3397,9
160	979,3	4,15	0,526	0,47	0,48	3,74	4414,7
170	974,3	4,19	0,530	0,44	0,45	3,51	5660,7
180	969,3	4,24	0,533	0,42	0,43	3,30	7170,4

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.