



# Glysofor

## Glysofor EVO L - Specification

### Product features

Glysofor EVO L is an environmentally-friendly antifreeze concentrate and heat transfer medium based on physiologically harmless propylene glycol.

The field of application of Glysofor EVO L is heating and cooling systems, heat pumps, or other water circuits susceptible to frost.

It was specially developed for application areas with particular environmental requirements, especially in respect of biodegradability.

Glysofor EVO L is formulated such that, in the event of unintentional release (e.g. by a leak), the microbial breakdown is not expected to be hindered.

Specifically, the good rates at which the individual ingredients biodegrade is not negatively impacted by the combination of substances in the recipe.

Extended half-life periods or an accumulation of persistent intermediate degradation products are also not anticipated during the biodegradation of Glysofor EVO L.

The corrosion inhibition of Glysofor EVO L is completely free of nitrite, borate, phosphate, triazole, and silicate.

Antifreeze concentrate and heat transfer medium based on physiologically harmless propylene glycol

Frost protection -50 °C

The corrosion inhibition is free of triazole

Optimised biodegradability

All ingredients WHC 1

Areas of application: Heating and refrigeration systems, heat pumps and other water circuits

The main ingredient propylene glycol is preferred in the food and luxury foodstuffs sector due to its physiologically and environmentally harmless properties.

Glysofor EVO L ideally prevents frost damage, corrosion, deposits, sludge accumulation, and biofilms.

Homogeneous Glysofor EVO L/water mixtures do not separate, which ensures continuous frost resistance. This guarantees low-maintenance operation of systems operated with Glysofor EVO L.

## Product data

Chemical name	1.2 Propylene glycol, aqua dest., corrosion protection additive
Appearance	Blue liquid
Packaging	Canisters / barrels / IBCs / tank vehicles
ADR	KI 0 number
CAS-No.	57-55-6
WHC	1
Labelling	---
Applied concentration:	At least 25 Vol% (Frost protection up to approx. -11 °C)
Operating temperature range:	-50 to +150 °C
Areas of application:	Heat transfer medium, Antifreeze
Density (20 °C)	1,03 - 1,04 g/cm <sup>3</sup>
pH-value	7,5 – 8,5
Boiling point (1013 mbar)	ca. 187 °C
Vapour pressure (20 °C)	0,11 mbar
Specific heat (20 °C)	2,49 kJ/kg K
Thermal conductivity (20 °C)	0,20 W/m K
Dynamic viscosity (20 °C)	55 mPa s

## Heat transfer medium

In heating and cooling systems, Glysofor EVO L serves as a heat transfer fluid or cooling brine. In this respect, it is able to function simultaneously as a cooling medium, which guarantees optimal heat removal at the same time as cooling. In many application areas, due to the geographical proximity to surface water, drinking water wells, or areas of natural protection, use of a product which is a physiologically and environmentally safe as possible may be indicated. In this case, Glysofor EVO L often meets such sensitive requirements.

## Antifreeze

Using glycol, in this case monopropylene glycol, Glysofor EVO L significantly lowers the freezing point of water and prevents freezing. Glysofor EVO L ensures that the aqueous solutions remain in workable liquid form, even in sub-zero temperatures. With Glysofor EVO L, heating, cooling, and water circuits can be temporarily switched off, even during frost conditions, while however remaining ready for operation at any time. Glysofor EVO L reliably avoids bursts caused by frost, which also result in damage to the system.

Glysofor EVO L – active content (volume)	Frost protection up to °C
25 %	-11
30 %	-14
35 %	-18
40 %	-22
45 %	-26
50 %	-32

## Corrosion protection

Glysofor EVO L contains a combination of corrosion inhibitors, which provide optimal corrosion protection for metals. All of the corrosion inhibitors used are classed in the lowest water pollution class 1 and have optimum biodegradability. The use of nitrate, nitrite, phosphate, borate, silicate, and triazole was consciously dispensed with in the formulation of Glysofor EVO L.

## Application

**Glysofor EVO L is delivered as a concentrate and, depending on the desired frost protection value, must be diluted with water.**

**Preparation:** Before the plant is filled for the first time, it should be tested for leaks. For this purpose, the plant should initially be filled with chloride-free water in the amount specified by the plant manufacturer, so that if any leakage occurs, no frost protection agent will be released accidentally. If the capacity of the plant is not known, the filling in of water must be closely monitored in order to simultaneously determine the exact capacity (via the water meter, where necessary). Determining the capacity proves helpful for calculating and adjusting the desired frost protection value. If it is not possible to test the plant using water (e.g. due to low temperatures), the plant should be observed during the filling process as far as possible.

**Filling:** If the capacity of the plant is not known, the required quantity of Glysofor EVO L can be calculated using the table below. In order to ensure an ideal distribution, the system should first be filled with approx. 50% of the required quantity of water, followed by the entire required quantity of Glysofor EVO L and finally the remaining quantity of water.

**Refilling:** If the system needs to be refilled, and the required refilling quantity is not known, an estimated quantity of Glysofor EVO L is premixed, proportional to the desired level of frost protection. The premixed Glysofor EVO L /water mixture is then filled into the system.

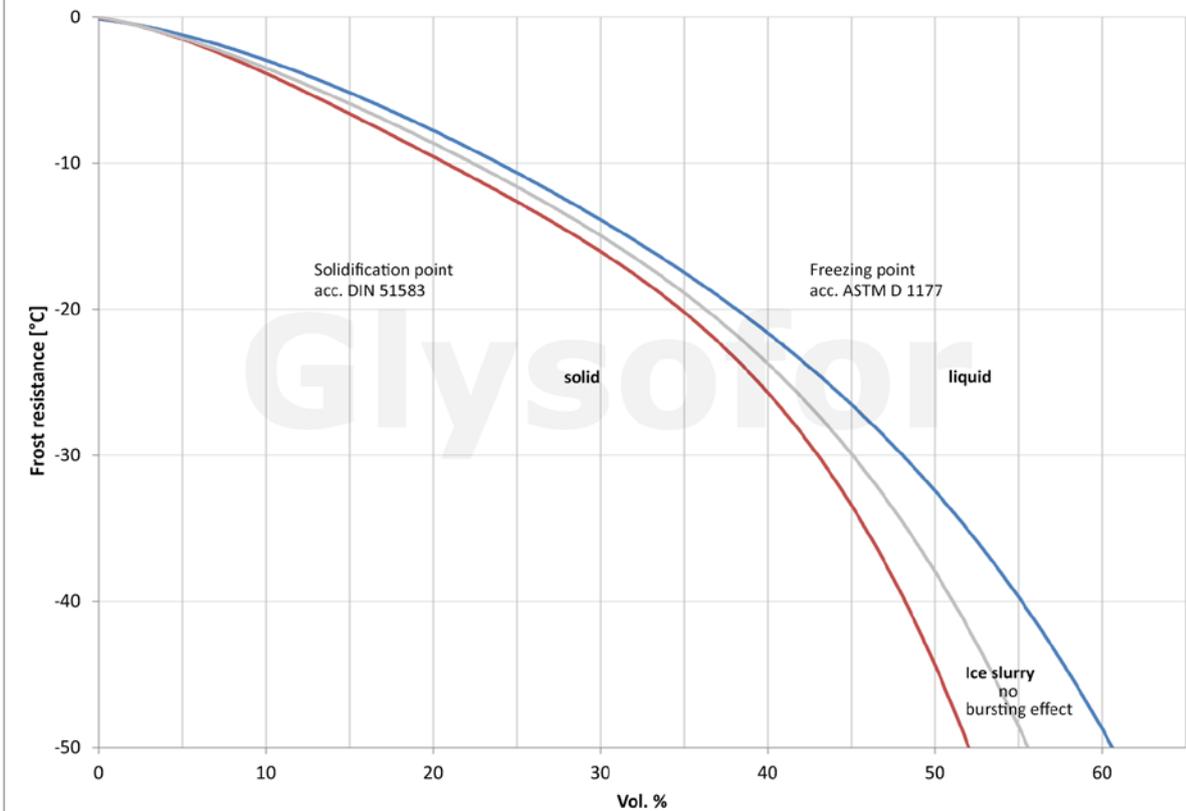
**Testing the frost protection:** After the system has been filled, a several hours long circulation should take place (overnight, if possible). The Glysofor EVO L concentration can be determined by means of the specific density of the Glysofor EVO L/water mixture. The values listed in the table below represent the weight in grams per litre. The frost protection value setting is determined based on the temperatures that can be expected in that region. In order to ensure reliable frost protection at all times, we recommend a 5 to 10 % higher setting for this value.

## Application guidelines

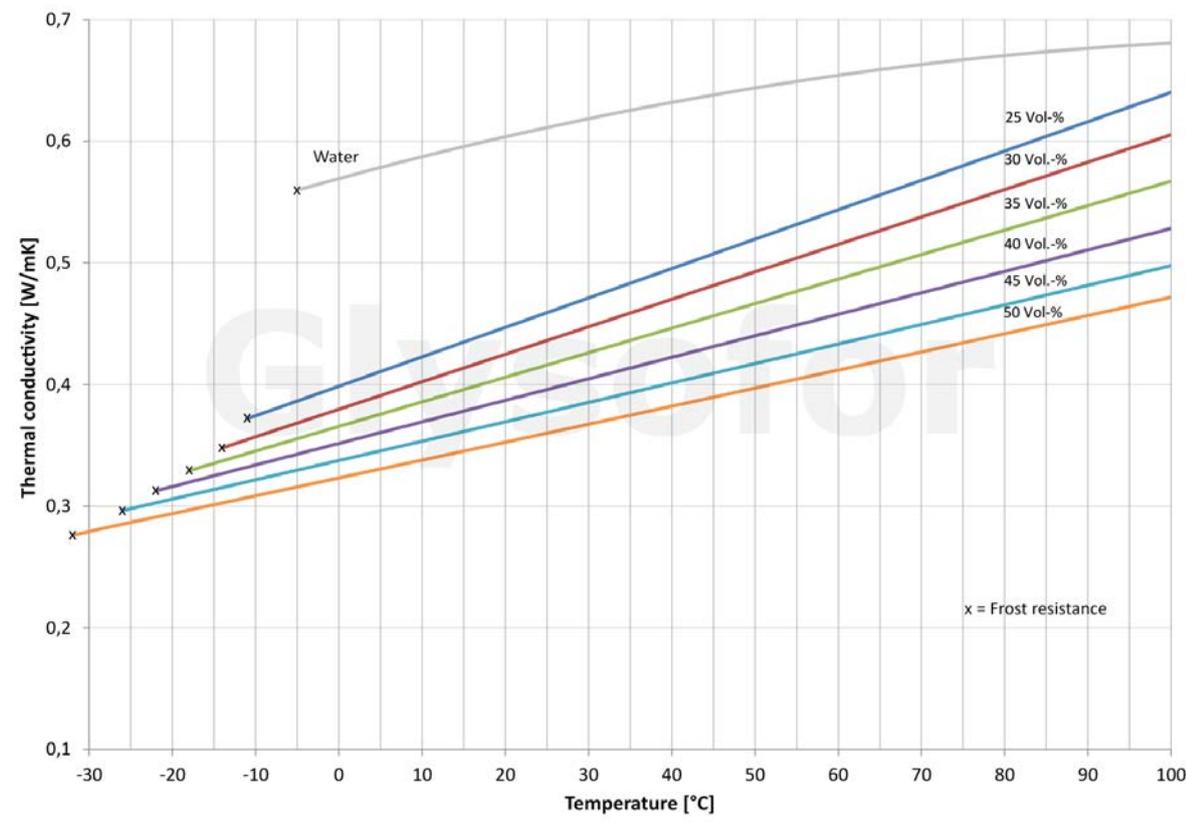
Galvanised components are to be avoided, as zinc is generally volatile with glycol and products which contain glycol. The water that is used for producing the solution should have a maximum hardness of 25 °dH and a maximum chloride content of 100 mg/l. Generally, tap water fulfils these requirements. Pipe connections are to be made of hard solder and chloride-containing flux materials are to be avoided or are to be removed completely by flushing after usage. Scalings on copper components, metal swarf and contaminations are to be removed completely before the plant is filled. Plants that are to be operated with Glysofor must not be in contact with any external electrical potential. When installing the plant, it must be ensured that the future operation is not interrupted by circulatory disturbances caused by air cushions or debris. Plants that are operated with Glycogard must be installed as closed systems and are to be filled completely and vented directly after the pressure test is carried out. Gas and air cushions are to be removed immediately. Breathers are to be applied in such a way that they keep the system free from air and oxygen at all times and that, in the case of low pressure, no air can be sucked in. If an existing plant is to be filled with Glysofor, the corrosion status should be checked beforehand. Before a system that is damaged by corrosion is filled, it must be completely reconstructed. In order to ensure a sufficient level of functionality and frost protection at all times, the condition and concentration of Glysofor EVO L should be tested at least once per year. This is particularly advisable if work has been carried out on the operated system or the liquid has been refilled. Overheating must be strictly avoided, as this can lead to damage and the premature ageing of Glysofor EVO L.

Concentrate [Vol.%]	Frost resistance [°C]	Temp. [°C]	Thermal conductivity [W/m K]	Spec. heat capacity [kJ/kg K]	Density [g/cm <sup>3</sup> ]	Kinemat. viscosity [mm <sup>2</sup> /s]	Cub. Expansion coefficient [K <sup>-1</sup> ]	Rel. Pressure drop factor [Factor]
25	-11	-10	0,375	3,86	1,032	9,44	0,00014	1,70
		0	0,399	3,89	1,030	5,69	0,00023	1,48
		10	0,424	3,92	1,027	3,69	0,00031	1,31
		20	0,448	3,94	1,023	2,54	0,00038	1,20
		30	0,472	3,96	1,019	1,83	0,00045	1,10
		40	0,496	3,99	1,014	1,40	0,00051	1,04
		50	0,519	4,02	1,009	1,11	0,00056	0,97
		60	0,545	4,04	1,003	0,92	0,00061	0,92
		70	0,569	4,06	0,997	0,78	0,00064	0,88
		80	0,594	4,09	0,990	0,67	0,00067	0,84
		90	0,617	4,12	0,983	0,59	0,0006	0,81
100	0,641	4,14	0,976	0,53	0,00070	0,80		
30	-14	-10	0,358	3,76	1,039	12,09	0,00022	1,74
		0	0,381	3,79	1,036	7,18	0,00030	1,52
		10	0,403	3,82	1,032	4,56	0,00037	1,34
		20	0,425	3,86	1,028	3,08	0,00044	1,23
		30	0,448	3,89	1,023	2,19	0,00051	1,13
		40	0,471	3,92	1,018	1,65	0,00054	1,06
		50	0,494	3,95	1,012	1,29	0,0005	1,00
		60	0,516	3,99	1,006	1,05	0,00063	0,93
		70	0,539	4,02	0,999	0,87	0,00066	0,89
		80	0,562	4,05	0,992	0,75	0,00068	0,85
		90	0,584	4,08	0,985	0,66	0,00060	0,82
100	0,606	4,10	0,978	0,57	0,00073	0,80		
35	-18	-10	0,346	3,67	1,046	16,08	0,00031	1,97
		0	0,367	3,71	1,042	9,05	0,00037	1,66
		10	0,386	3,74	1,038	5,52	0,00043	1,44
		20	0,407	3,77	1,033	3,63	0,00048	1,29
		30	0,427	3,81	1,028	2,53	0,00053	1,18
		40	0,447	3,85	1,022	1,87	0,00056	1,09
		50	0,467	3,88	1,016	1,47	0,00061	1,03
		60	0,488	3,92	1,010	1,19	0,00064	0,97
		70	0,508	3,95	1,003	1,00	0,00067	0,91
		80	0,528	3,99	0,995	0,84	0,00071	0,88
		90	0,548	4,02	0,988	0,73	0,00072	0,85
100	0,568	4,05	0,981	0,62	0,00074	0,83		
40	-22	-20	0,317	3,54	1,057	44,69	0,00037	2,43
		-10	0,335	3,58	1,053	21,38	0,00041	2,01
		0	0,353	3,62	1,048	11,39	0,00044	1,71
		10	0,369	3,65	1,043	6,68	0,00048	1,49
		20	0,388	3,69	1,038	4,26	0,00052	1,33
		30	0,406	3,73	1,032	2,95	0,00055	1,22
		40	0,423	3,77	1,026	2,17	0,00060	1,13
		50	0,441	3,79	1,020	1,68	0,00062	1,06
		60	0,459	3,84	1,013	1,35	0,00065	1,01
		70	0,476	3,88	1,006	1,13	0,00068	0,94
		80	0,493	3,92	0,998	0,94	0,00073	0,91
90	0,512	3,95	0,991	0,81	0,00076	0,88		
100	0,529	3,98	0,984	0,68	0,00077	0,85		
45	-26	-20	0,306	3,43	1,063	60,19	0,00043	2,75
		-10	0,323	3,47	1,058	27,48	0,00046	2,26
		0	0,339	3,51	1,053	14,19	0,00049	1,88
		10	0,355	3,55	1,048	8,12	0,00052	1,67
		20	0,372	3,58	1,042	5,11	0,00056	1,46
		30	0,386	3,63	1,036	3,47	0,00059	1,29
		40	0,402	3,67	1,030	2,54	0,00062	1,20
		50	0,418	3,71	1,023	1,95	0,00065	1,12
		60	0,434	3,75	1,016	1,57	0,00068	1,05
		70	0,449	3,79	1,009	1,28	0,00071	0,98
		80	0,466	3,83	1,001	1,09	0,00074	0,91
90	0,483	3,87	0,994	0,92	0,00077	0,89		
100	0,499	3,91	0,986	0,75	0,00079	0,87		
50	-32	-30	0,278	3,28	1,074	210,98	0,00045	
		-20	0,295	3,32	1,069	80,19	0,00048	2,79
		-10	0,309	3,36	1,064	35,19	0,00051	2,29
		0	0,325	3,39	1,058	17,58	0,00053	1,91
		10	0,339	3,44	1,052	9,82	0,00056	1,70
		20	0,354	3,49	1,046	6,07	0,00058	1,48
		30	0,369	3,53	1,040	4,08	0,00061	1,31
		40	0,384	3,57	1,033	2,95	0,00064	1,22
		50	0,397	3,61	1,026	2,26	0,00067	1,14
		60	0,412	3,65	1,019	1,79	0,00070	1,07
		70	0,427	3,69	1,012	1,48	0,00072	1,01
80	0,442	3,74	1,004	1,23	0,00075	0,93		
90	0,458	3,78	0,996	1,03	0,00077	0,91		
100	0,474	3,82	0,989	0,82	0,00081	0,89		

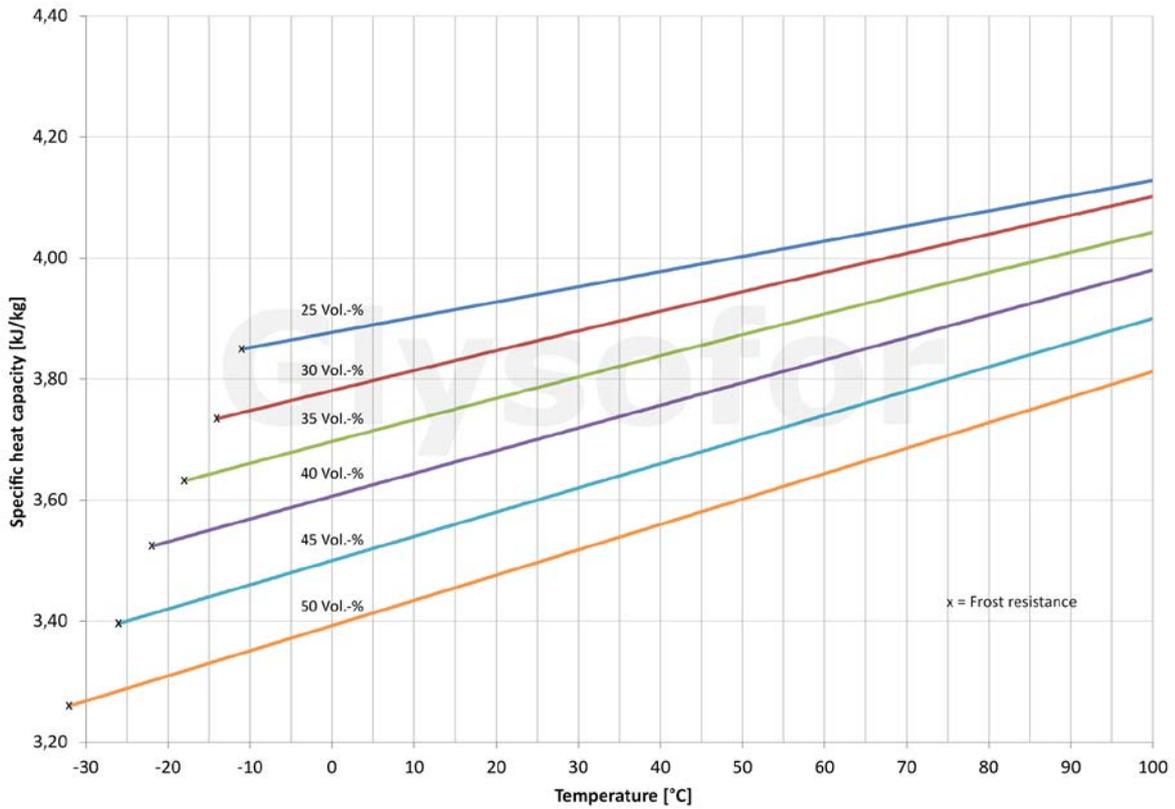
### Frost resistance of Glysofor EVO L - water mixtures



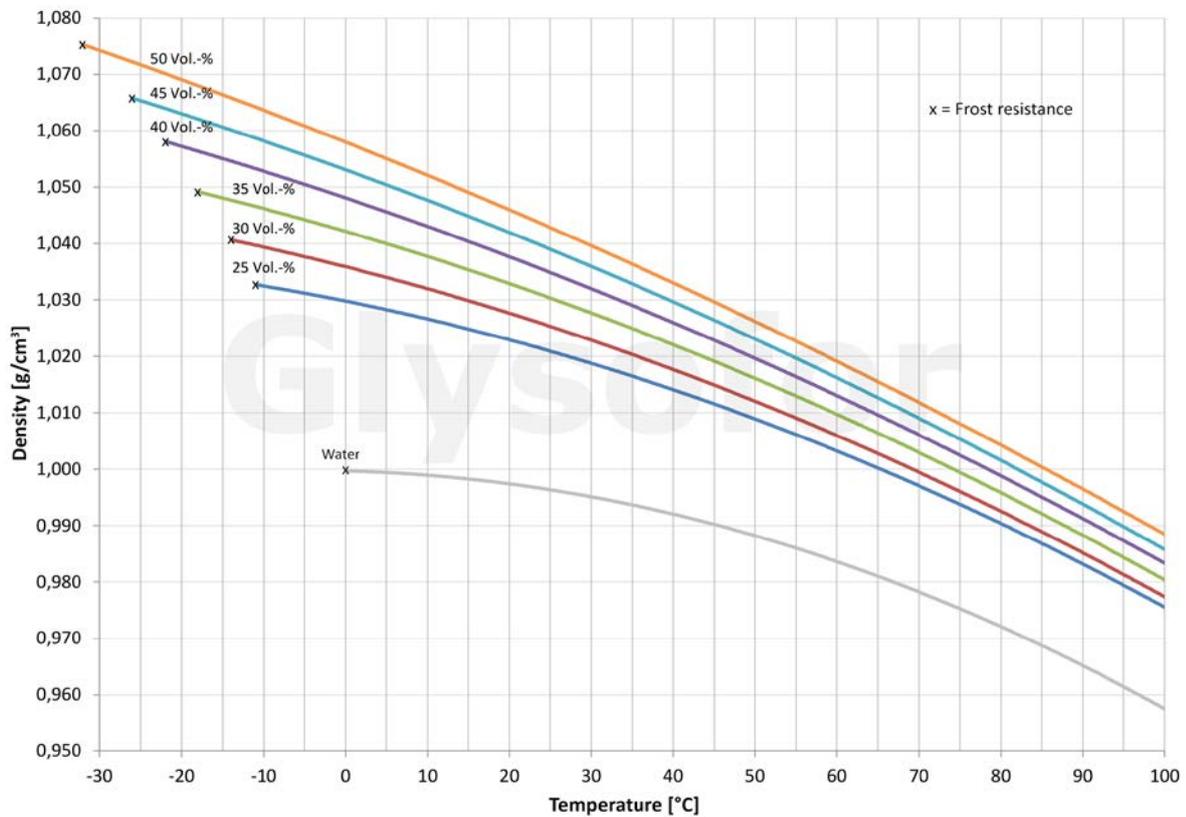
### Thermal conductivity of Glysofor EVO L - water mixtures



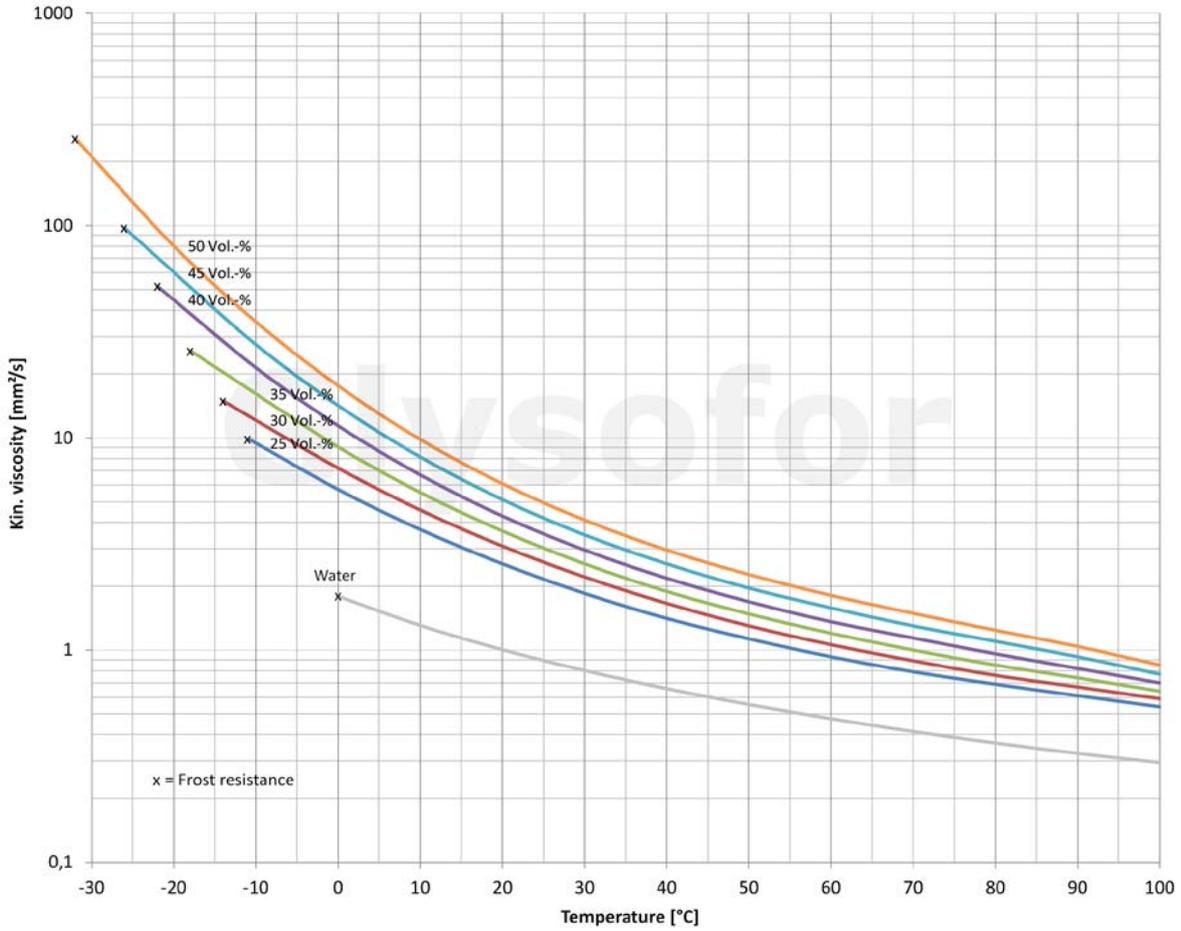
### Spec. heat capacity of Glysofor EVO L - water mixtures



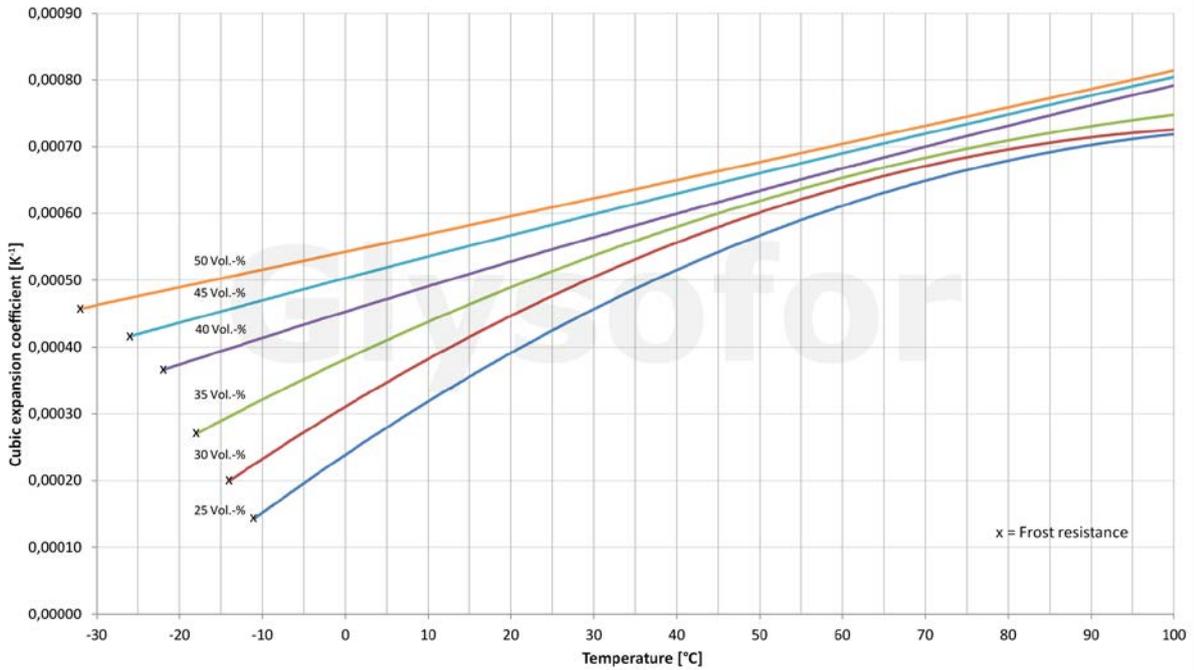
### Density of Glysofor EVO L - water mixtures



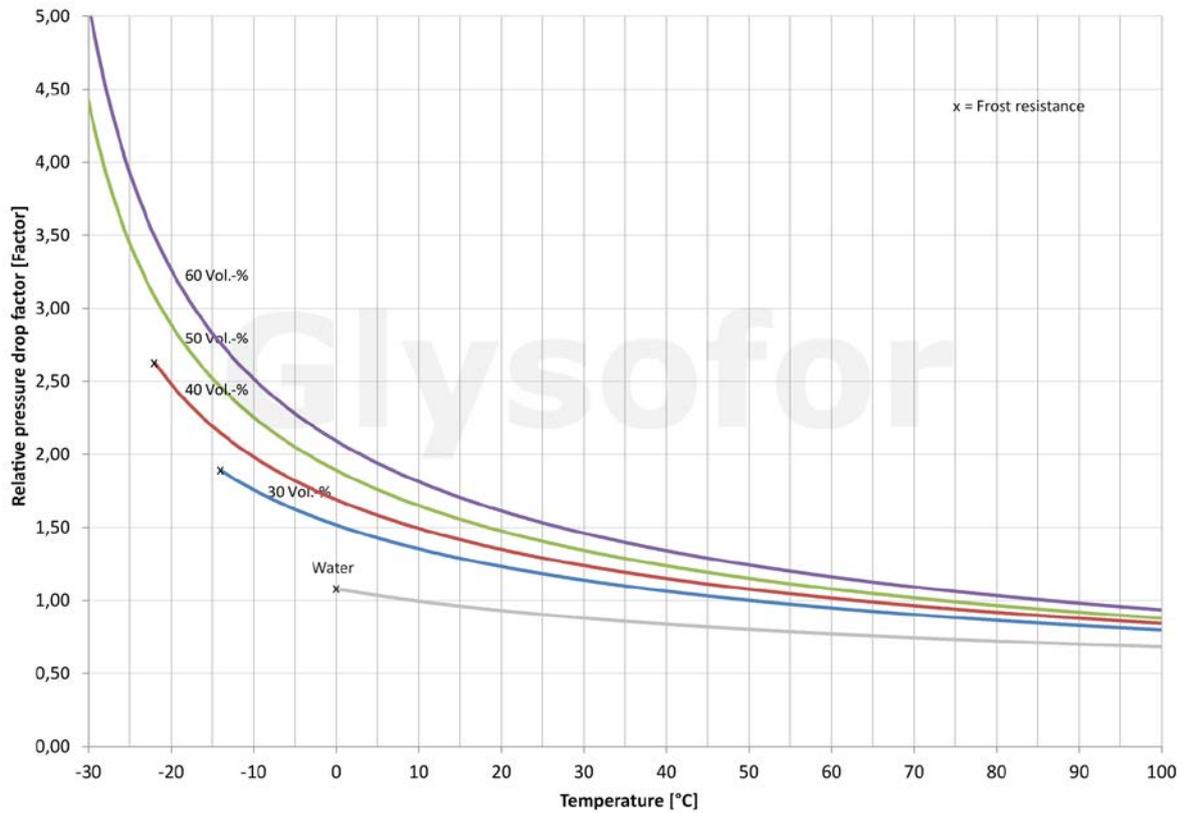
### Kinematic viscosity of Glysofor EVO L - water mixtures



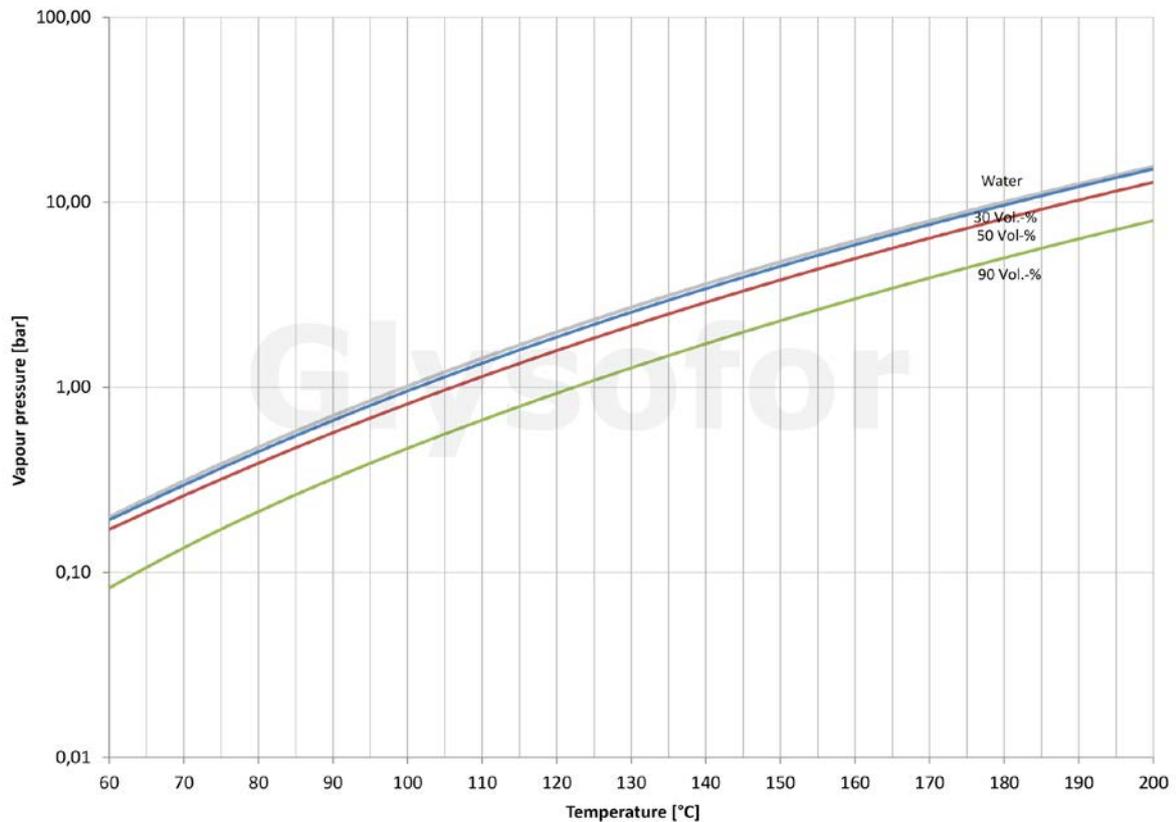
### Cub. expansion coefficient of Glysofor EVO L - water mixtures



### Relative pressure drop factor of Glysofor EVO L - water mixtures



### Vapour pressure of Glysofor EVO L - water mixtures



## Other

Pure water/glycol mixtures have very distinctive corrosive properties. You must therefore never use pure water/glycol mixtures without inhibitor equipment. We recommend Glysofor L, based on propylene, for applications in connection with food and the refrigeration or heating of food.

## Packaging sizes

- 10 kg canister
- 25 kg canister
- 30 kg canister
- 220 kg barrel
- 1.000 kg IBC
- 24.000 kg tank vehicle

Pursuant to the national and international classification criteria, Glysofor EVO L is not a hazardous material. A toxic effect results neither from when it is in concentrated form nor from when it is diluted. The product is odourless and harmless to the skin. Product has no irritant effect which can lead to the irritation of the skin or to mucosa. Glysofor EVO L is free of nitrites, phosphates or amine.

Glysofor EVO L is free of nitrite, borate, phosphate, triazole, and silicate.

The raw materials which the product contains possess the highest possible levels of purity. Glysofor EVO L is formulated on the basis of 1.2 propylene glycol which fulfils the requirements of both the DAB as well as the European and the US pharmacopeia. 1.2 propylene glycol is permitted as an additive pursuant to the foods and additives regulations (status 10.07.1984) and as a solution and extraction agent (BGB (German civil code) 1.I p.897, appendix 2, list 9). In the USA, propylene glycol is categorized as a generally harmless food additive (Federal Register, as at 1.4.1985, § 184.1666). Glysofor EVO L and its dilutions are easily biodegradable. Glysofor EVO L is in the lowest water hazard class, WGK 1 (very limited hazard to water). In borehole heat exchangers with a volume of up to 200 litres, Glysofor EVO L can be used harmlessly pursuant to § 7 of the VAWS (Law on materials hazardous to water, Germany) and VDI (Association of German Engineers) guideline no. 4640. Workplace related protection measures when using this product are not required. Glysofor EVO L is not flammable; classification in one of the hazard classes for flammable liquids is omitted. Glysofor EVO L is not subject to a labelling requirement, and is not a dangerous good according to the national / international transport regulations. The supply containers consist of mono-fraction PE and can also be recycled subsequent to use. The product should be kept sealed at all times. Due to its extremely high level of purity, the product should not be decanted into other containers or contaminated with other products.

*This data relates to the correct and appropriate application of our products, with due consideration of the professional standards and regulations of the area of application. It is for informational purposes only and does not absolve the obligation to carry out the due materials testing upon arrival. The data is based on our current state of knowledge and is not meant to guarantee specific properties. No general or legally binding statement on certain features, in a concrete application, can be derived from the above data. It is meant to describe our products with regard to their composition and offer application advice. Any industrial property rights of third parties and the suitability for a special application purpose are to be observed and verified by the user.*

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