



# Glysofor

## Glysofor F - Specification

### Product features

Glysofor F is a certified, physiologically harmless heat transfer and cooling medium based on propylene glycol.

All of the substances contained in Glysofor F are approved as food additives (EU/USA), and have very low levels of oral toxicity.

Glysofor F is used particularly in the food and beverage industry.

With regard to the requirements of the food industry, Glysofor F offers a series of advantages.

This product is largely flavourless, colourless, and odourless.

All of the substances it contains are Generally Recognized As Safe (GRAS) by US supervisory body the FDA (Food and Drug Administration).

Glysofor F complies with the FCC (Food Chemical Codex), and can therefore be used for applications where there is direct or indirect contact with foodstuffs (specific concentration limits).

Glysofor F offers optimal corrosion protection for metals such as copper, brass, solder, grey cast iron, steel, and aluminium.



Nonfood Compounds  
Program Listed (HT1)

Physiologically harmless heat transfer and cooling medium in the food and beverage industry

Basis: 1.2 Propylene glycol

All ingredients are approved as food additives (EU/USA)

Operating temperature: -45 to +120 °C

Areas of application: Refrigeration and deep-freeze facilities in the food industry, heat transfer medium, antifreeze and corrosion protection agents in water circuits

Glysofor F serves as an antifreeze, corrosion protection agent, and heat transfer medium or cooling medium (cooling brine) in heating and cooling systems.

The corrosion inhibition and the concentration of Glysofor F can be checked by simple methods, and if necessary adjusted.

Typical application areas for Glysofor F are the refrigeration and freezing of foodstuffs as well as defrosting processes, for instance in dairies, the beverage industry, breweries, fish and meat processing businesses, and frozen food chains.

Glysofor F optimally prevents frost damage, corrosion, deposits, and sludge accumulation. It exhibits longterm resistance to the formation of biofilms, rot, and microbiological decomposition.

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

The **NSF** has certified the concentrate and ready mixes of Glysofor F.

Each individual concentration has a separate registration number, which can also be on the NSF website at [www.nsfwhitebook.org](http://www.nsfwhitebook.org), indicating the company name: Wittig Umweltchemie GmbH or the product name: Glysofor F.

## Product data

Chemical name	1.2 Propylene glycol, aqua dest., corrosion protection additive
Appearance	Colorless 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:	-45 bis +120 °C
Areas of application:	Refrigeration and deep-freeze facilities in the food industry, heat transfer medium, antifreeze and corrosion protection agents in water circuits
Density (20 °C)	1,05 - 1,06 g/cm <sup>3</sup>
Freezing point 50% solution	-32 °C
Boiling point (1013 mbar)	approx. 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
Flash point <80% solution	no flash point

## Heat transfer medium

Glysofor F is a favoured heat transfer medium used in the food industry. In food production, due to a specific manufacturing process, use of a physiologically harmless product may be indicated. In this case, Glysofor F frequently meets the sensitive requirements, as it consists exclusively of food additives, and is practically colourless, odourless, and flavourless.

## Cooling brine / Cooling medium

Glysofor F is used in the food industry as a cooling brine. Typical applications are for refrigeration processes in the beverage industry or in the processing of milk, meat, or fish products. Glysofor F is supplied as a concentrate and, depending on the frost resistance required, can be mixed with water. Thanks to the excellent ability of Glysofor F to lower the freezing point, refrigeration and deep freeze systems can be safely operated at sub-zero temperatures at low as  $-45^{\circ}\text{C}$ . This optimises the refrigeration and freezing processes and thereby contributes to making cost savings and increasing productivity. Glysofor F can be used in a broad range of temperatures from  $-45^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ , which gives it a high level of flexibility and extremely variable control of the temperature. Glysofor F is normally used in 30 to 50% concentration. The aqueous solution is used in cooling systems with central cooling units which cool the fluid down to the desired target temperature. Then the cooled Glysofor F solution is conducted, for example, through a system of cooling coils, through which the cold is transferred into the foodstuffs being cooled.

### Fermentation

For fermentation processes, Glysofor F offers excellent cooling performance and temperature control. Glysofor F is used particularly in the production of beer and wine to cool fermentation and mash tanks as well as to cool wine and brewer's yeast.

### Cooling processes

Typical cooling processes can be found in wine and beer production, juice production, and the dairy, meat, and fish industry. Glysofor F is also used in dispensing systems to adjust beverages to the desired temperature for consumption.

When dispensing carbonated beverages, Glysofor F is used to set the optimal dispensing temperature, in order to keep the carbon dioxide content constant during the dispensing process. During traditional champagne production, the bottle necks are immersed in deep-frozen Glysofor F solution, in order to induce rapid freezing of the bottle neck, and remove undesirable substances from the bottle by the champagne method.

### Production of food packaging

During the production of plastic food packaging, Glysofor F is used to cool the tools. During the production processes, blow moulds for bottles and containers can be cooled more efficiently with Glysofor F than with water, which increases production volume.

### Immersion cooling processes

Glysofor F is used to freeze packaged foodstuffs such as meat, fish, vegetables, etc., by immersing the packaging in a Glysofor F solution deep frozen to  $-45^{\circ}\text{C}$  (standard temperature  $-10$  to  $-15^{\circ}\text{C}$ ). Due to its efficiency, this process has clear advantages over cooling in blast freezers or plate freezers.

## Antifreeze

Based on propylene glycol, Glysofor F significantly lowers the freezing point of water and prevents heating systems or cooling systems, for example, from freezing. Glysofor F ensures that the aqueous solutions remain in workable liquid form, even in sub-zero temperatures. With Glysofor F, heating systems can be temporarily switched off, even in frost conditions, while however remaining ready for operation at any time. Glysofor F reliably avoids bursts caused by frost, which also result in damage to the system. Due to its physiologically harmless nature, Glysofor F can be used to provide frost protection for drinking water lines and drinking water systems.

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

## Corrosion protection

Glysofor F contains special corrosion inhibitors optimised for the food industry, which provide the best possible corrosion protection for metals. This corrosion protection is effective on all important metals that are generally used in heating and refrigeration system construction as well as in industrial plant building. Installations made of copper, brass, solder, grey cast iron, aluminium, steel, and iron are optimally protected from corrosion, even if they are implemented as multi-metal installations.

Corrosion test according to ASTM D1384 / 34 Vol.% Glysofor F in water

Copper	Brass	Steel	Cast iron	Solder	Aluminum
-1,02 (-0,80)	-1,40 (-2,00)	-0,36 (-84,80)	-1,12 (-180,00)	-0,40 (-39,60)	+0,76 (-44,00)

Weight loss / increase in weight (g/m<sup>2</sup>).

Permitted according to ASTM D3306-08a 10 to 30 g/m<sup>2</sup> (Aluminum).

For comparison, the values of pure water are listed in parentheses.

The corrosion inhibition and the concentration of Glysofor F can be checked by simple methods, and if necessary adjusted.

## Application

**Glysofor F 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 F 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 F. 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 F is premixed, proportional to the desired level of frost protection. The premixed Glysofor F /water mixture is then filled into the system.

**Others:** After the system has been filled, a several hours long circulation should take place (overnight, if possible).

## Application guidelines

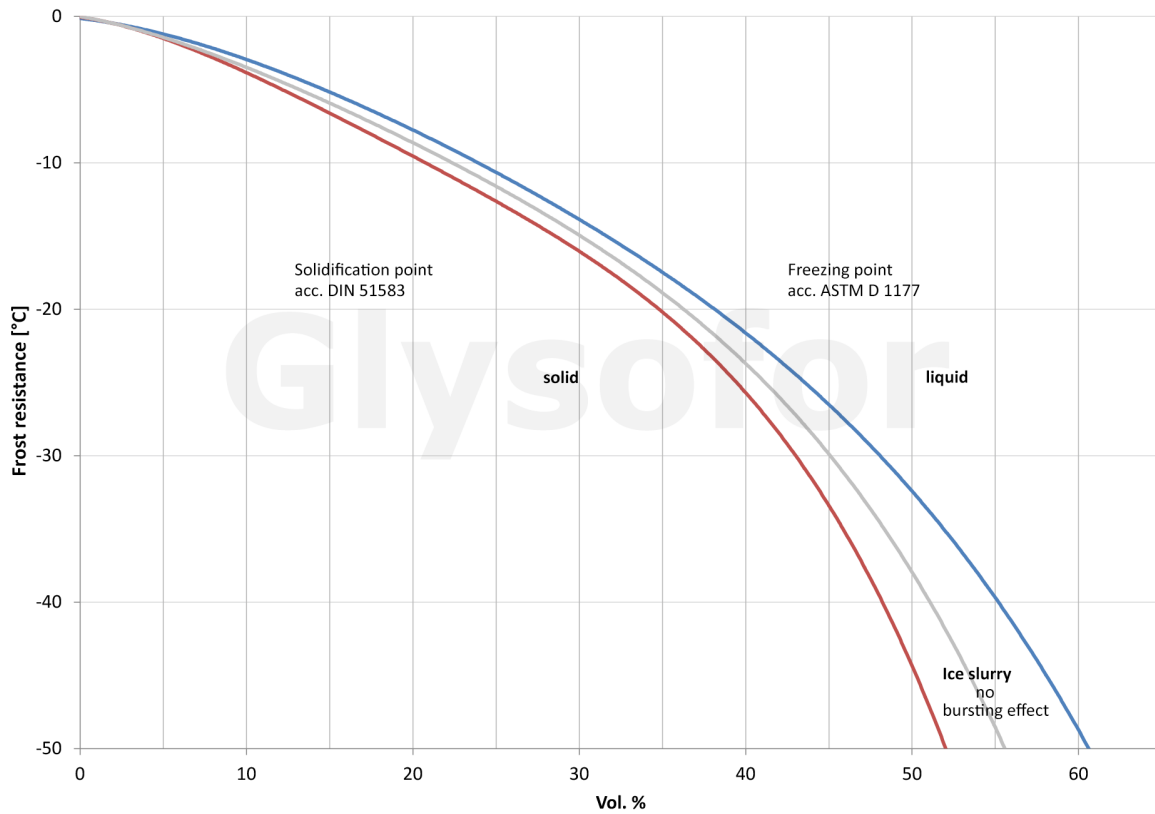
Galvanised components are to be avoided, as zinc is generally volatile with glycol and products which contain glycol. The water that is used for producing the solution should have a maximum hardness of 25 °dH and a maximum chloride content of 50 mg/l. Generally, tap water fulfils these requirements. 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 F 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 F.



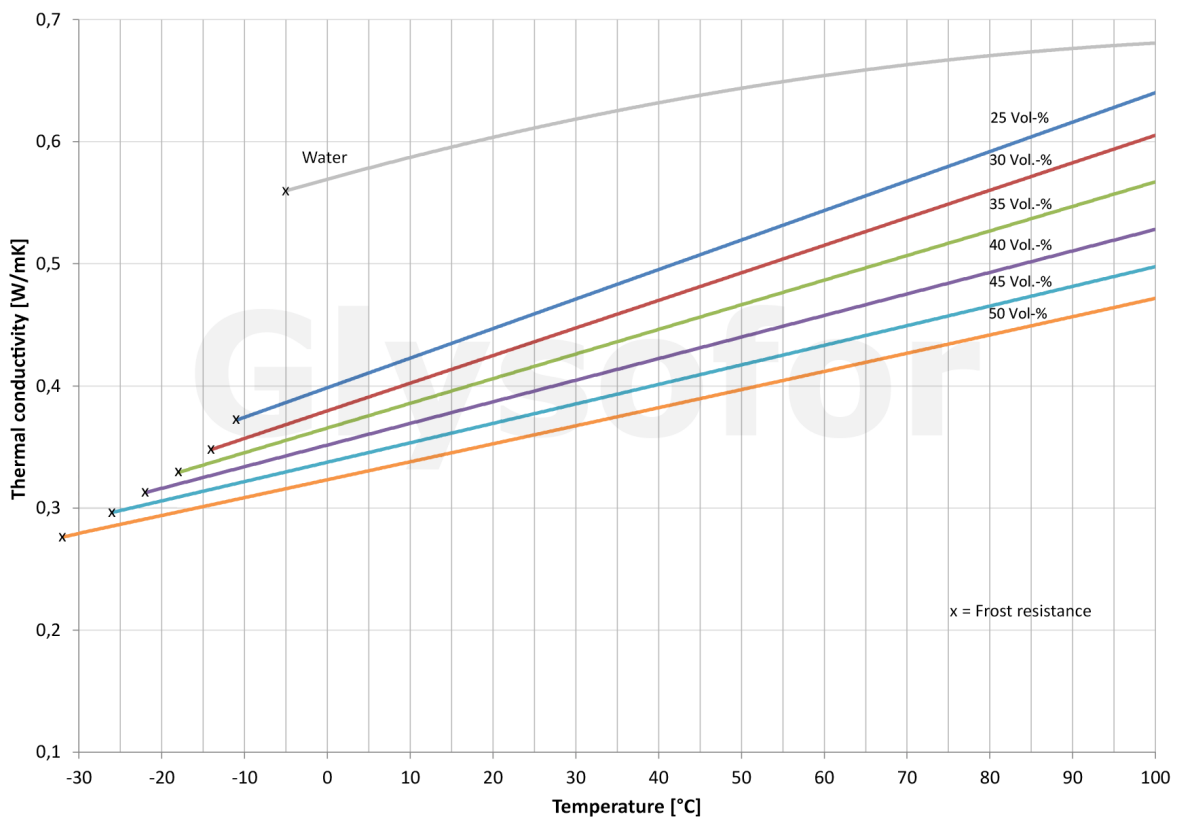
# Technical data

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
30	-14	100	0,641	4,14	0,976	0,53	0,00070	0,80
		-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
35	-18	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
		-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
40	-22	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
		-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
45	-26	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
		-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
50	-32	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
		-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 F - water mixtures

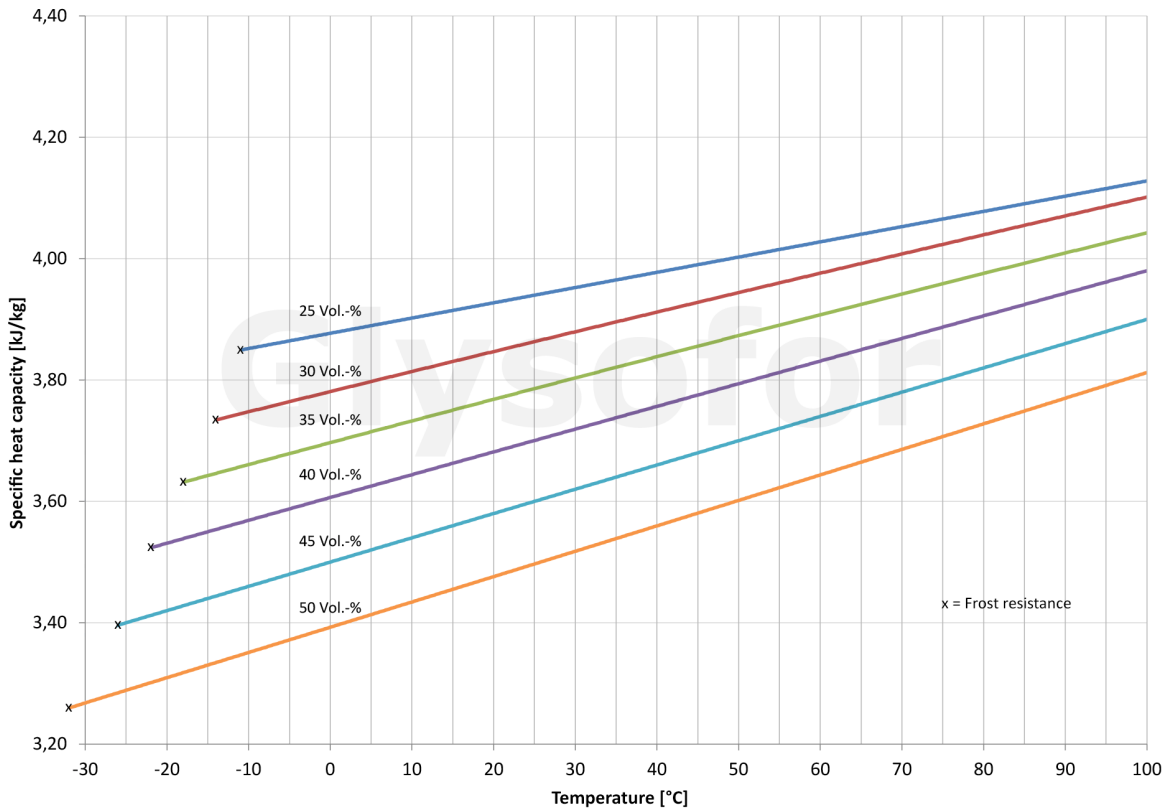


### Thermal conductivity of Glysofor F - water mixtures

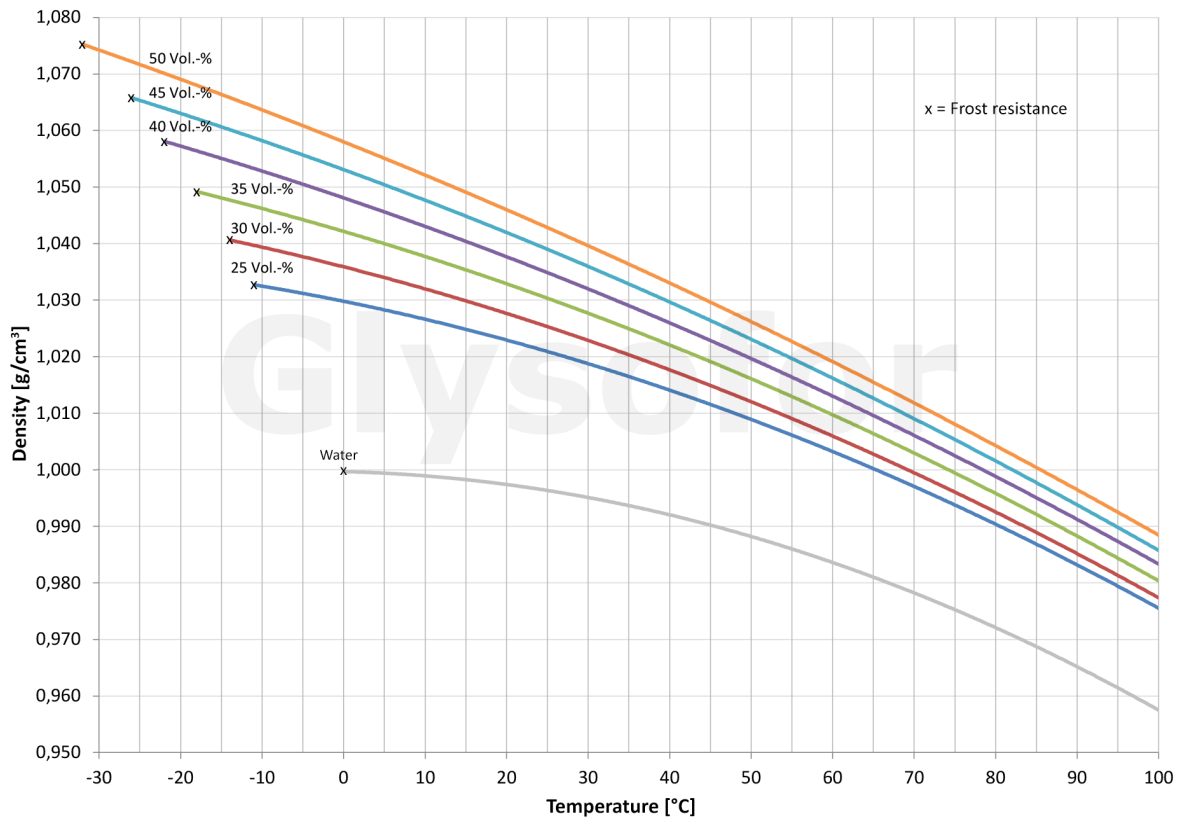




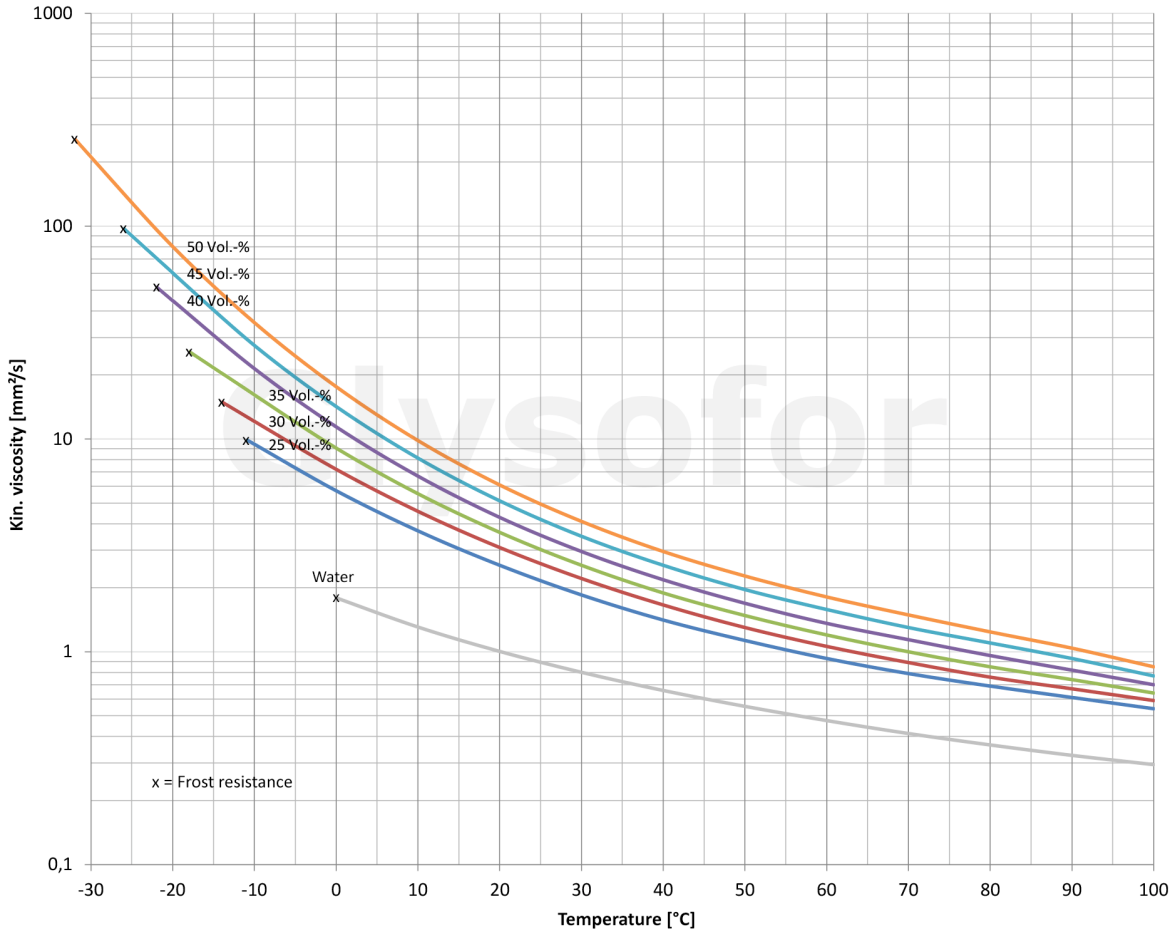
### Spec. heat capacity of Glysofor F - water mixtures



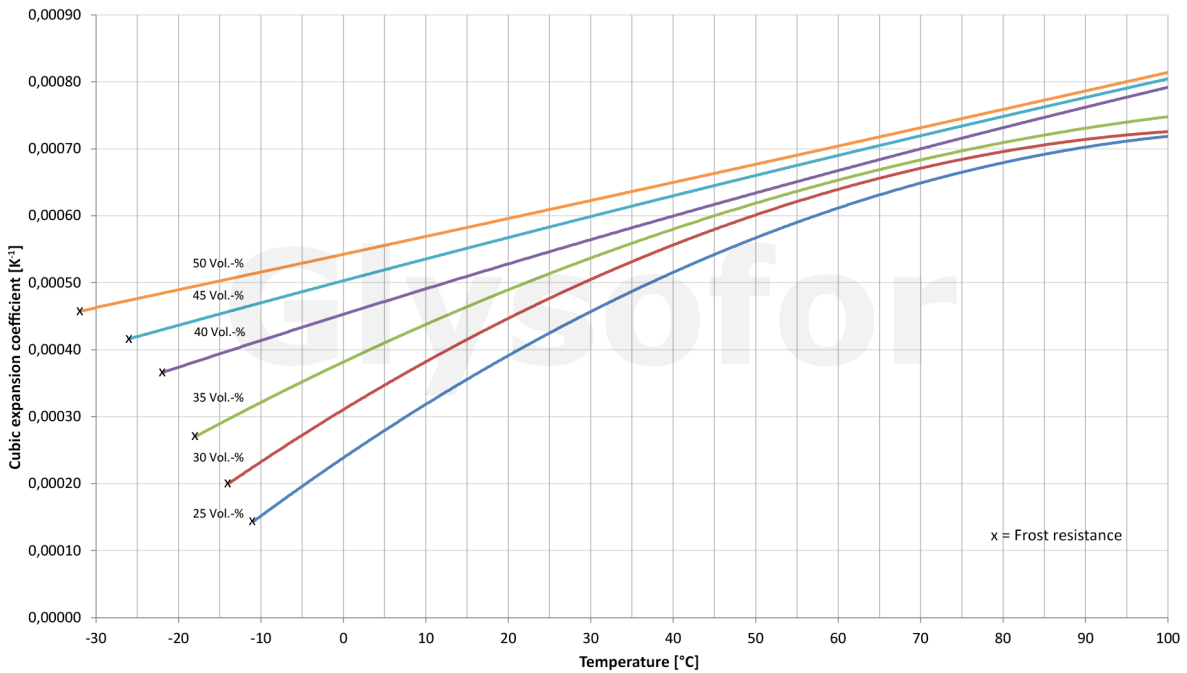
### Density of Glysofor F - water mixtures



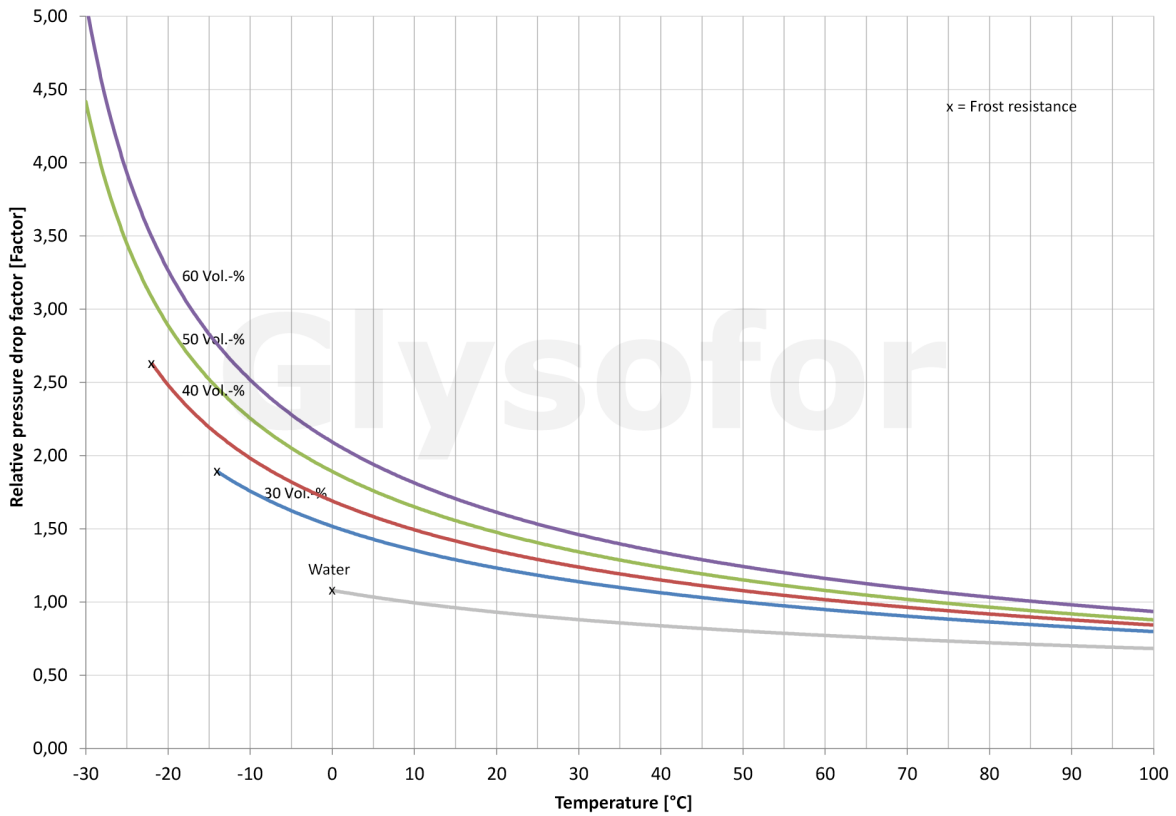
### Kinematic viscosity of Glysofor F - water mixtures



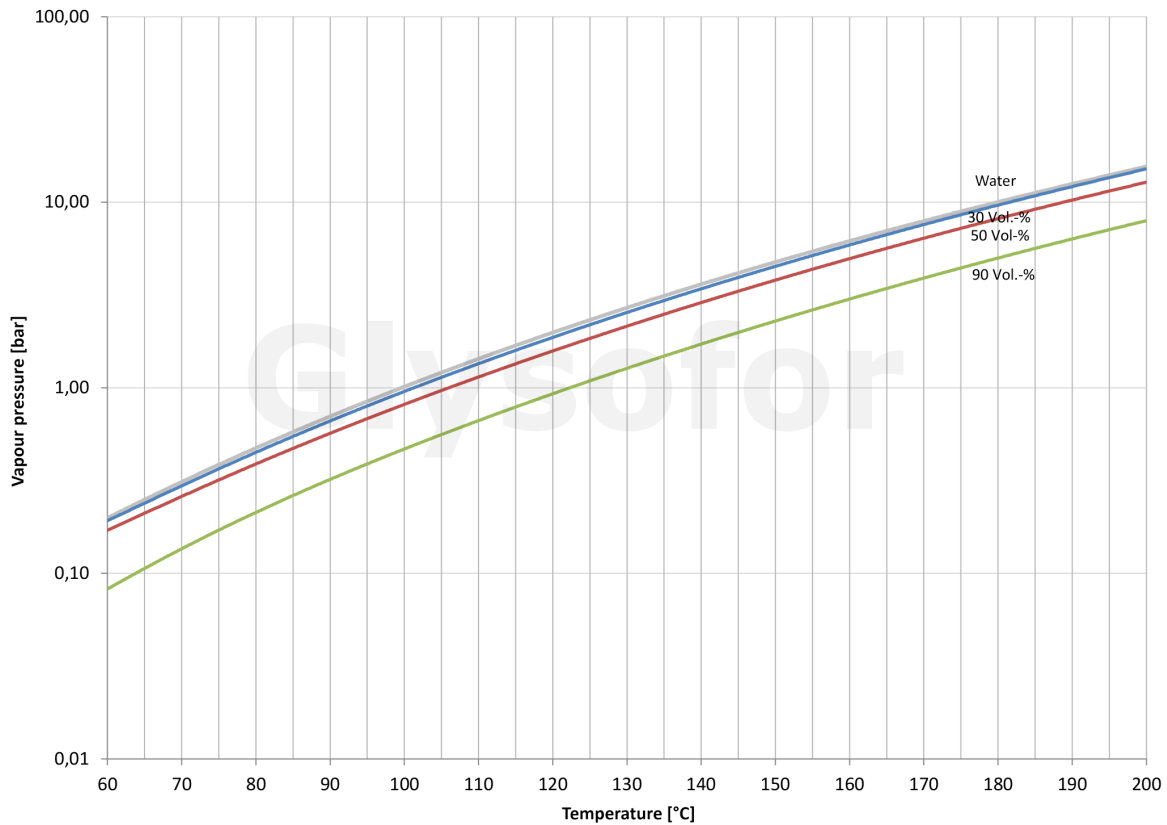
### Cub. expansion coefficient of Glysofor F - water mixtures



### Relative pressure drop factor of Glysofor F - water mixtures



### Vapour pressure of Glysofor F - water mixtures



## Other

Pure water/glycol mixtures have very distinctive corrosive properties. You must therefore never use pure water/glycol mixtures without inhibitor equipment.

## 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 F 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 F is free of nitrites, phosphates or amine. The raw materials which the product contains possess the highest possible levels of purity. Glysofor F 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) 1.1 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 F and its dilutions are easily biodegradable. Glysofor F 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 F 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 F is not flammable; classification in one of the hazard classes for flammable liquids is omitted. Glysofor F 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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