



Glysofor

Glysofor L - Specification

Product features

Glysofor L is a universally useable heat transfer, refrigeration and antifreeze agent for industrial systems and technical, liquid carrying systems.

Due to its physiological and ecological harmlessness, Glysofor L is preferred in the food and luxury foodstuffs sector and in pharmaceutical and ecologically sensitive areas of application.

Typical areas of application for Glysofor L include dairies, the beverage industry, breweries, fish and meat processing operations, deep-freeze chains, solar systems.

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

It is a preferred heat transfer medium in geothermal energy systems.

Glysofor L exhibits long-term resistance to the formation of bio-films, rot, and resistance to microbiological decomposition, which avoids deposition and sludge accumulation.

Glysofor L optimally prevents frost damage, corrosion, deposits, sludge accumulation, and bio-films.

Heat transfer, refrigeration and antifreeze agent

Basis: 1.2 Propylene glycol

Operating temperature: -50 to +150 °C

Free of nitrites, phosphates, amines, borates and silicates

Universally useable

Areas of application: Heating and refrigeration systems in the food industry, solar systems, heat pumps

Glysofor L is completely free of nitrite, amine, phosphate, silicate, and borate. It is biodegradable and environmentally friendly.

Glysofor L exhibits long-term resistance to the formation of bio-films, rot, and resistance to microbiological decomposition, which avoids deposition and sludge accumulation.

Homogeneous Glysofor L/water mixtures do not separate, which ensures continuous frost resistance. This guarantees year-round, long-term, low-maintenance operation of systems filled with Glysofor L.

Glysofor L is a preferred product in e-mobility. It is used both in the cooling circuits of charging stations and in the cooling systems of e-vehicles.

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: | Heating and refrigeration systems, solar systems, heat pumps, borehole heat exchangers, deep freeze chains and other areas with tough requirements on the levels of toxicological and ecological harmlessness |
| Density (20 °C) | 1,045 - 1,055 g/cm ³ |
| pH-value | 7,5 – 8,5 |
| 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) | 0,22 W/m K |
| Dynamic viscosity (20 °C) | 55 mPa s |

Heat transfer medium

In heat pump systems, heat recovery plants, industrial plants, downhole heat exchangers, or water circuits, Glysofor L is used as a heat transfer fluid. This guarantees the heat transfer of previously generated or excess heat to a heat consumer that makes this heat useful. In the geothermal area, use of a product which is as physiologically and environmentally safe as possible may be advisable due to the geographical proximity to surface water, drinking water wells, or areas of natural protection. In this case, Glysofor L water-mixtures often meet such sensitive requirements. In case geo-thermal heat is used, Glysofor L transports the heat absorbed in the downhole heat exchangers at the earth's surface and releases them to a heating system in connection with a heating pump.

Glysofor L is able to function simultaneously as a cooling medium, which guarantees optimal heat removal at the same time as cooling.

Cooling brine / Cooling medium

Glysofor L is used to transfer cold from a central refrigeration system to different cooling consumers. Typical application areas include air-conditioning systems or cooling equipment for food and luxury food production facilities. Glysofor L is supplied as a concentrate and, depending on the frost protection desired, can be mixed with water in any ratio. Thanks to the excellent ability of Glysofor L to lower the freezing point, refrigeration and deep freeze systems can be safely operated at sub-zero temperatures at low as -50 °C.

Antifreeze

Using glycol, in this case monopropylene glycol, Glysofor L significantly lowers the freezing point of water and prevents fluid from freezing, e.g. in heating systems or cooling systems. Glysofor L ensures that the aqueous solutions remain in workable liquid form, even in sub-zero temperatures. With Glysofor L, heating systems can be temporarily switched off, even in frost conditions, while however remaining ready for operation at any time. In temporarily used facilities like sports halls, weekend homes, churches, schools, or events spaces, it can lead to a significant reduction in the used of fuels. Glysofor L reliably avoids frost damage to the system caused by bursting effects.

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

Corrosion protection

Glysofor L contains a complex combination of corrosion inhibitors which optimally protect metals from corrosion. This anticorrosive protection can be used for all important metals that are usually used in solar installations. Installations made of copper, brass, solder, grey iron, aluminium, steel and iron are optimally protected against corrosive attacks, even if they are used in multi-metal installations.

Application

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 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 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 L is premixed, proportional to the desired level of frost protection. The premixed Glysofor 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 L concentration can be determined by means of the specific density of the Glysofor 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

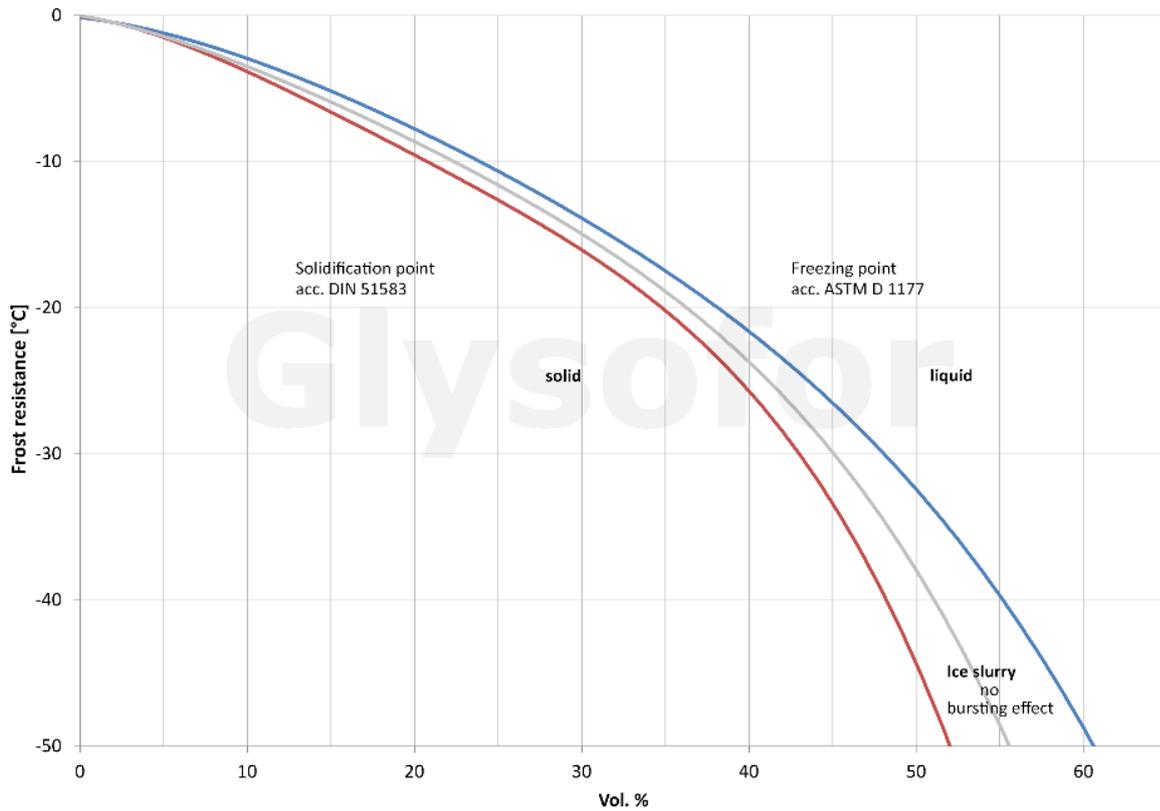
Galvanised components are to be avoided, as zinc is generally volatile with glycol and products which contain glycol. The water that is used for producing the solution should have a maximum hardness of 25 °dH and a maximum chloride content of 100 mg/l. Generally, tap water fulfils these requirements. 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 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 L.



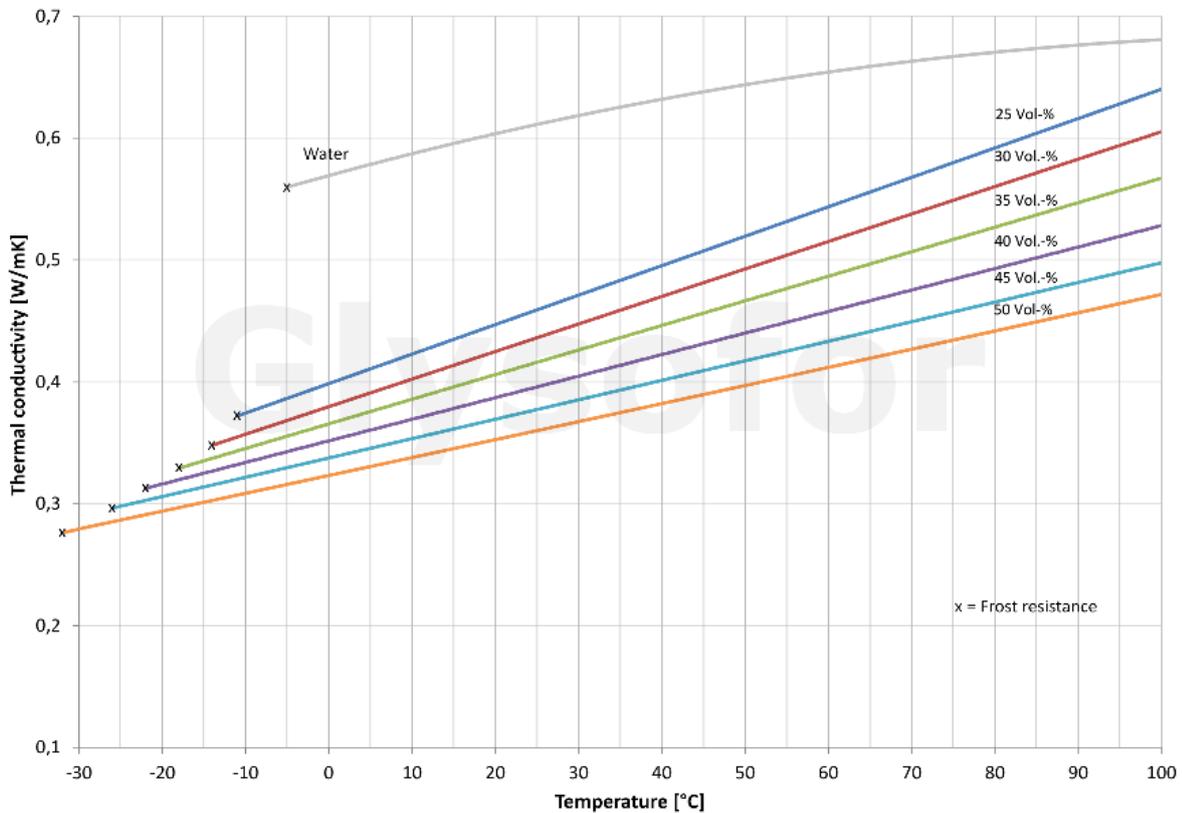
Technical data

| Concentrate [Vol.%] | Frost resistance [°C] | Temp. [°C] | Thermal conductivity [W/m K] | Spec. heat capacity [kJ/kg K] | Density [g/cm ³] | Kinemat. viscosity [mm ² /s] | Cub. Expansion coefficient [K ⁻¹] | 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 | 0,00069 | 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 | 0,00059 | 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 | | |

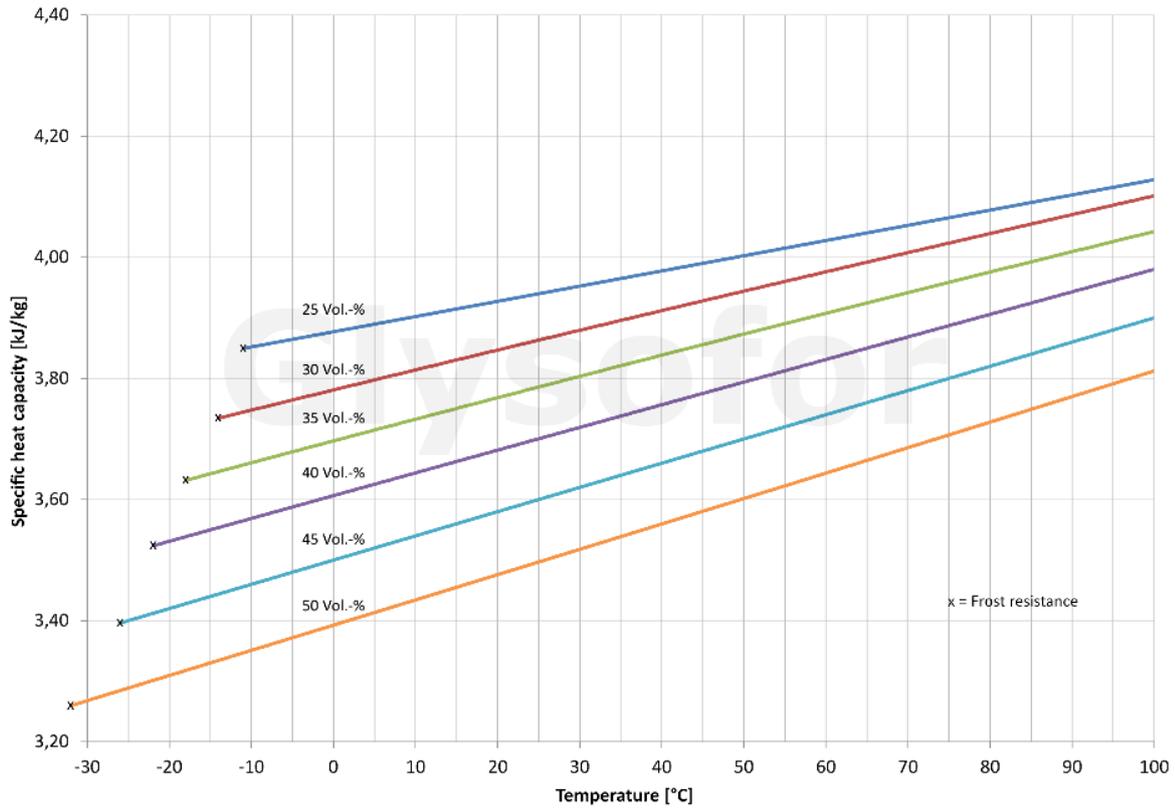
Frost resistance of Glysofor L - water mixtures



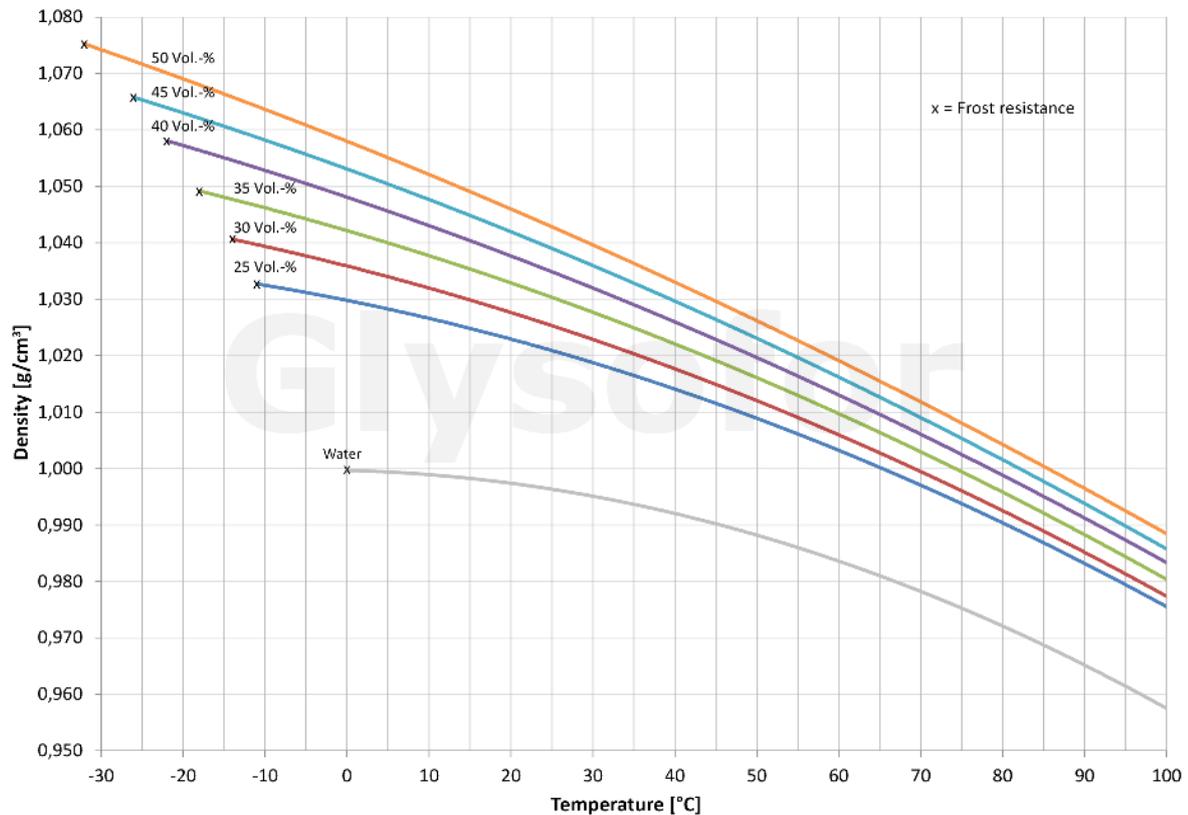
Thermal conductivity of Glysofor L - water mixtures



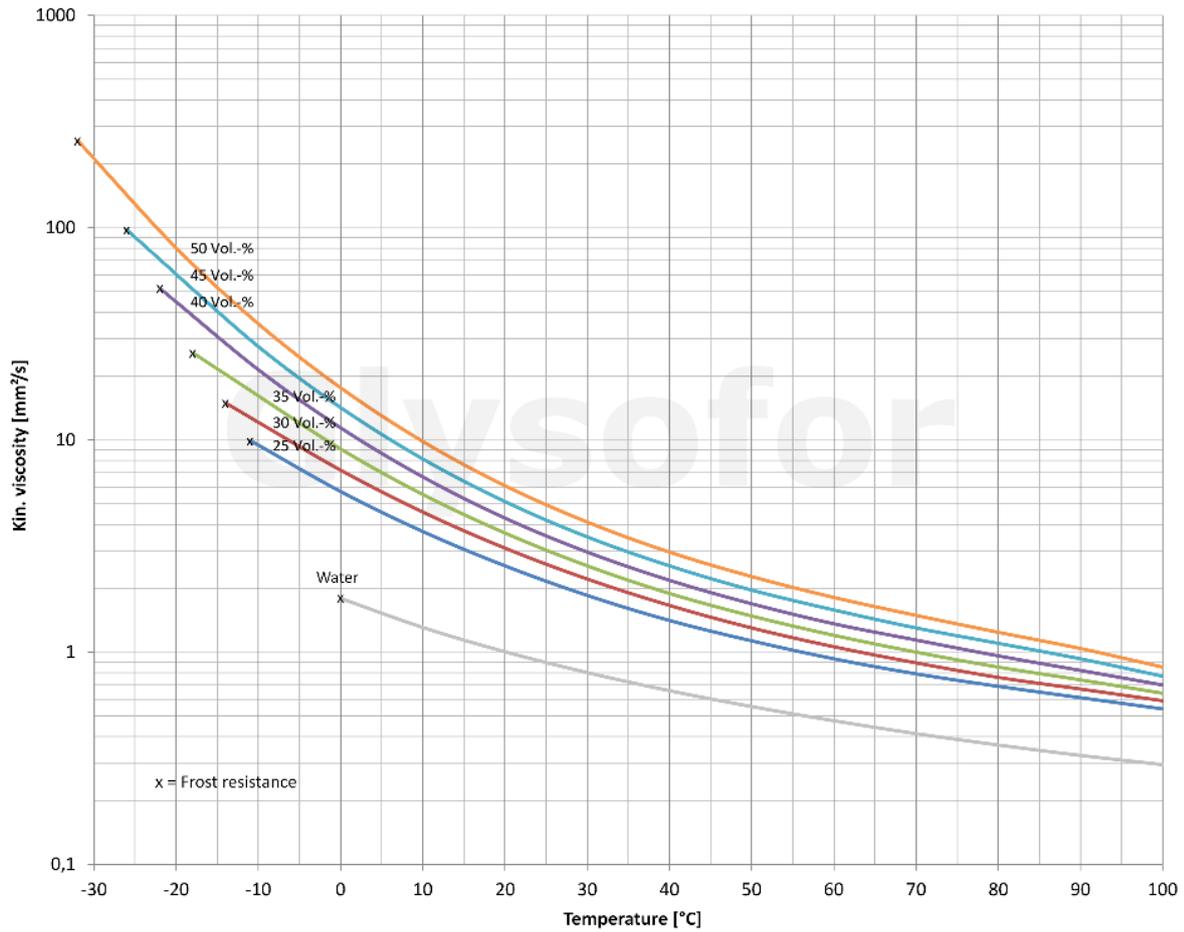
Spec. heat capacity of Glysofor L - water mixtures



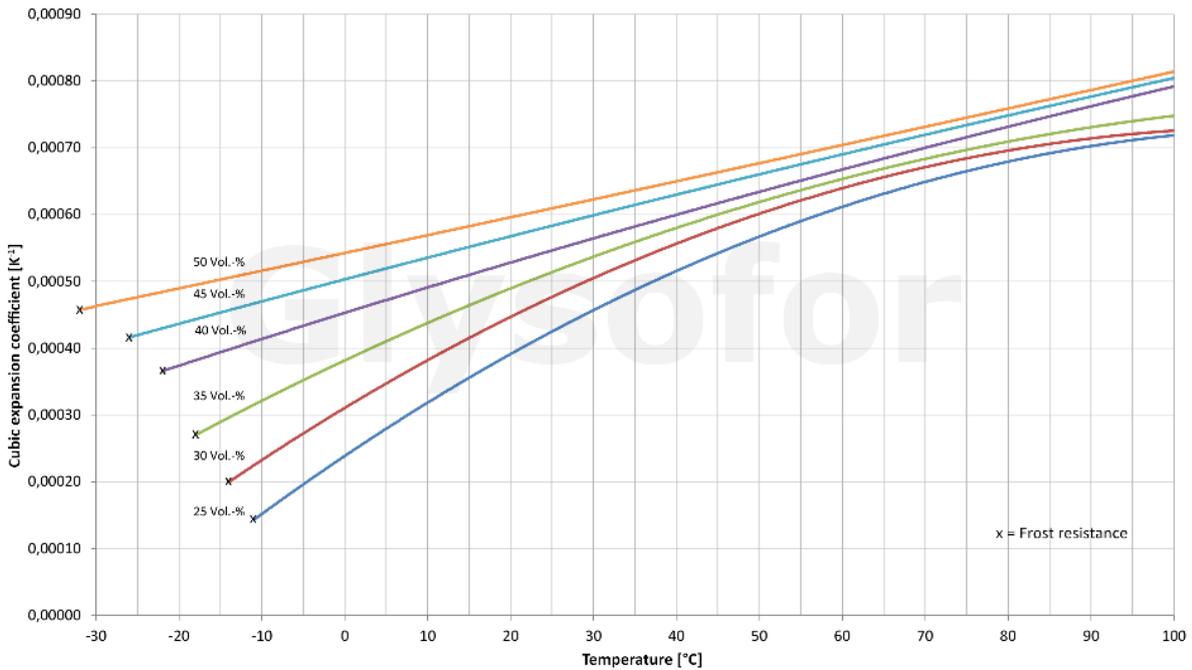
Density of Glysofor L - water mixtures



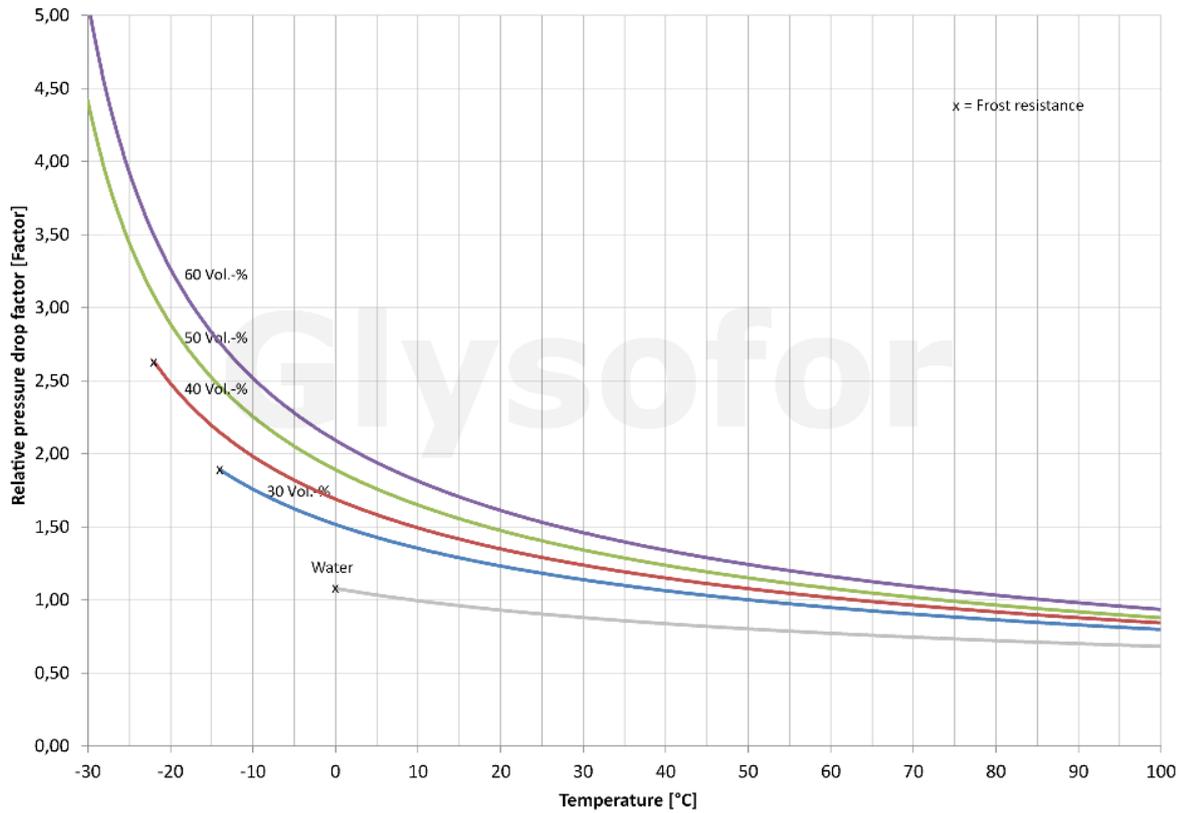
Kinematic viscosity of Glysofor L - water mixtures



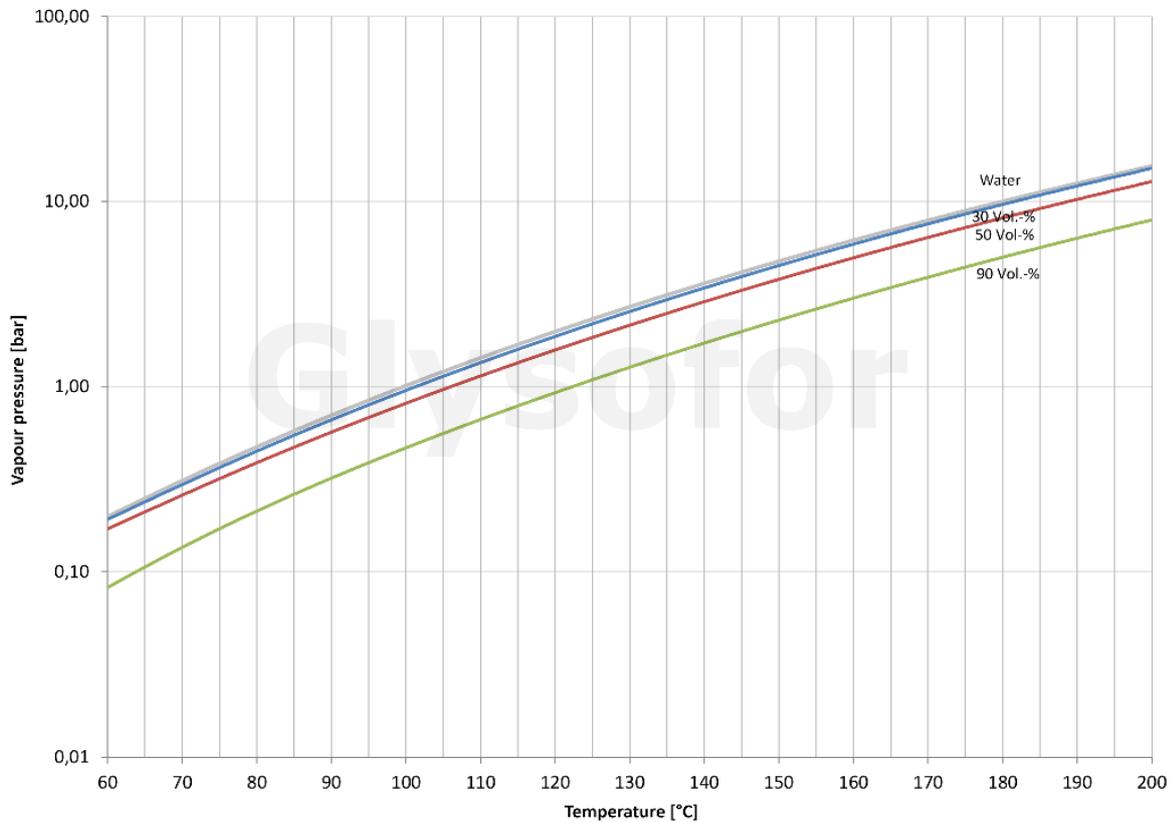
Cub. expansion coefficient of Glysofor L - water mixtures



Relative pressure drop factor of Glysofor L - water mixtures



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