

ANTIFROGEN[®] SOL HT

HEAT
TRANSFER
FLUID



PREMIXED HEAT TRANSFER MEDIUM FOR SOLAR APPLICATIONS WITH ANTIFREEZE AND CORROSION INHIBITING PROTECTION.

Product description

Antifrogen[®] SOL HT is a physiologically harmless, yellowish, clear liquid based on an aqueous solution of higher boiling glycols, which is used as a heat transfer medium in solar heating systems, also those exposed to high thermal loads. The product is inhibited without the use of nitrites-, borates-, silicates- and phosphates. It meets the requirements of DIN 4757, part 3, for solar heating systems. The optimization of the corrosion inhibition system was performed without the use of CMR-substances (cancerogenic, mutagenic, reprotoxic).

According to the formulation Antifrogen[®] SOL HT doesn't contain any restricted substances as described in the EG-guideline 2011/65/EU (RoHS = Restriction of Hazardous Substances, Artikel 4§1): Lead, mercury, hexavalent chromium, polybrominated biphenyl (PBB) respectively polybrominated diphenyl ether (PBDE).

Declaration of Reach-Conformity

Clariant declares that all of its products marketed in the EU, i.e. substances, preparations or sarticles within meaning the Article 3, Section 1-3 of Regulation (EC) 1907/2006 of the European Parliament and the Council of 18.12.2006 (REACH), hereinafter referred to as „substances“ are delivered in accordance with all applicable chemical laws, with special references to the Reach Regulations (EC).

CLARIANT INTERNATIONAL LTD

Rothausstrasse 61
4132 MuttENZ
Switzerland

BUSINESS UNIT INDUSTRIAL &
CONSUMER SPECIALTIES

TECHNICAL APPLICATIONS
EMEA IA

www.antifrogen.com

Based on higher boiling glycols

Plus anticorrosion additives

Premixed heat transfer medium

Permanent usage temperatures: approx. - 23 to + 200 °C

Harmless to health

Applicable in any thermal solar collector

You can find further information regarding the products on our homepage
www.antifrogen.com.

Technical data:

Appearance	-	sl. yellow
Density at 20 °C (DIN 51757)	g/cm ³	approx. 1.082
Refractive index at 20 °C (DIN 51423, Teil 2)	-	approx. 1.401
pH-value (undiluted, DIN 51369)	-	approx. 9
Reserve alkalinity (ASTM D 1121)	ml c (HCl) 0.1 M	min. 4
Boiling point at 1013 mbar (ASTM D 1120)	°C	approx. 105
Pour point (DIN 51583)	°C	approx. -28
Kinematic viscosity at 20 °C (DIN 51562)	mm ² /s	approx. 7.4
Kinematic viscosity at 80 °C (DIN 51562)	mm ² /s	approx. 1.44
Specific heat at 20 °C	kJ/kg*K	approx. 3.2
Thermal conductivity at 20 °C	W/m*K	approx. 0.36
Spec. el. conductivity at 25 °C	µS/cm	> 1000
Freezing Point (ASTM D 1177)	°C	approx. -23

Product properties

The certified quality system in accordance with DIN EN ISO 9001 is used in production and quality control. This ensures consistently high product quality.

The technical data below are used to describe the product and is taken from our own measurements or from literature. It does not constitute part of the delivery specification. The actual product specification may be obtained upon request.

Application properties

Antifrogen® SOL HT was developed especially for use as a heat transfer medium in solar systems. The product is physiologically harmless.

Frost resistance and usage concentration

The frost resistance of Antifrogen® SOL HT is adjusted to a freezing point of approx. -23 °C (corresponding pour point: approx. -28°C). Trials have shown that this formulation will not cause bursts in system components because slush ice is formed when the product is cooled below the crystallization point.

The frost resistance of the mixture does not change even after many years of use, provided the Antifrogen® SOL HT concentration remains constant.

Furthermore phase separation of Antifrogen® SOL HT/water mixtures does not occur.

Higher water contents decreases the frost resistance, as is evident from the graphs in the appendix.

The good corrosion-inhibiting properties of Antifrogen® SOL HT/water mixtures decrease as expected with increasing water content.

Antifrogen® SOL HT should always be used undiluted.

Material compatibilities

Antifrogen® SOL HT contains corrosion inhibitors that protect the metals of the cooling and heating systems, even in combined systems, permanently against corrosion and prevent the formation of boiler scale.

The effectiveness of the inhibitor combinations is checked constantly by the manufacturer by means of the well-known corrosion test method:

ASTM D 1384 (American Society for Testing and Materials).

The following table shows the relatively low corrosion of common metals caused by Antifrogen® SOL HT (frost protection = approx.-23 °C) compared with a higher boiling glycol/water mixture.

The values, determined by the above mentioned method (ASTM D 1384), show the weight loss of metals in g/m² due to corrosion after 336 h and 3000 h.

Corrosion of metals in g/m², tested with ASTM D 1384 (88 °C / 6 l air/h):

	higher boiling glycols ^a	Antifrogen® SOL HT ^b 336 h	Antifrogen® SOL HT ^b 3000 h	weight- change limits
Copper	-15	-1.1	-2.7	10
Soft solder (WL 30)	-68	-2.2	-3.9	30
Brass (MS 63)	-64	-0.6	-4.2	10
Steel (C15)	-149	-0.1	-0.1	10
Cast iron (GG 22)	-74	-0.2	-0.1	10
Cast aluminium (AlSi6Cu3)	-7	+0.1	-1.4	30

^a higher boiling glycols (1:1 v/v without inhibitors) ^b Antifrogen® SOL HT (undiluted)

Glycol/water mixtures without inhibitors should not be used as this combination shows more corrosiveness than pure water.

Do not use the product in galvanized pipelines as all glycol/water mixtures can dissolve zinc and precipitate as zinc glycolate. If despite our recommendation galvanized pipelines were used and the formation of zinc glycolate were observed, we suggest to install a microfilter (approx. 100 to 150 µm). In case the zinc is dissolved the subjacent steel is protected against corrosion due to the corrosion additive package of Antifrogen® SOL HT.

According to data published in literature and the results of our own tests and trials, the following plastics and elastomers are suitable for the manufacture of components coming into contact with Antifrogen® SOL HT*:

Polyethylene	(HDPE)
Polypropylene	(PP)
Polybutene	(PB)
Polytetrafluoroethylene, e.g. Hostaflon® (Dyneon)	(PTFE)
Polyester resins	(UP)
Polyacetal	(POM)
Nature rubber up to 80 °C	(NR)
Styrene butadien rubber up to 100 °C	(SBR)
Butyl rubber	(IIR)
Olefin rubber	(EPDM)

Fluorocarbon elastomers, e.g. Viton® (Du Pont)	(FPM)
Silicone rubber, e.g. Elastosil® (Wacker)	(Si)

* The materials have been tested at -105 °C (boiling point) in specific conditions. Please consider the specifications and material compatibilities given by the manufacturer of the elastomers and plastics. [We will check not listed materials on compatibility with Antifrogen® SOL HT.](#)

Polyurethane elastomers, plasticized PVC and phenolformaldehyde resins are not resistant. Experience has shown that EPDM elastomer seals are suitable for these systems.

Graphite cords can be used as gland seals and for threaded pipe connections hemp. For threaded pipe connections in which hemp is used as a seal, coating with Fermit® or Fermitol® (Nissen & Volk) has proved successful. Leaks may occasionally occur when polytetrafluoroethylene (PTFE) sealing tapes are used.

Using circulation pumps it has to be considered that they are compatible with antifreeze agents. Pump elements made out of e.g. phenolic resins normally don't meet the requirements.

Heat resistance

Antifrogen® SOL HT was developed because of the increased use of vacuum collectors, which may have stagnation phase temperature of over +200 °C. The usual heat transfer media, based on propylene glycol, tend to evaporate in such systems at high temperature owing to the low boiling point of these glycols. They leave partially insoluble, salt-like residues that can lead to operating problems if the collector is frequently idle and can result in failure of the system. Furthermore, high temperatures can degrade the 1,2-propylene glycol commonly used in solar installations in the stagnation phase. The formation of oily, tarry products are the result. Antifrogen SOL HT consists predominantly of higher boiling, physiologically harmless glycols with a boiling point of over +270 °C at 1013 mbar. Due to the boiling point of the glycols the above-mentioned effect will be avoided. Due to the increased thermal stability of the glycols used in Antifrogen SOL HT, the risk of formation of decomposition products is significantly reduced.

Nevertheless, operating temperatures of more than +200 °C should be avoided. In the case of not-closed systems or the insert of oxygen (e.g. via valves) the maximum usage concentration is lower.

Notes for use in solar heating systems

Antifrogen® SOL HT is a heat transfer medium suitable for solar heating systems, particularly those with vacuum collectors. The materials normally used in solar heating systems, such as copper, stainless steel and aluminum, are protected from corrosive attack for many years by special corrosion inhibitors. To ensure optimum protection, the following advice should be followed:

- The systems should conform to the requirements of DIN 4757 and must be designed as closed circuits. The membrane pressure surge compensators must conform with DIN 4807.
- Before filling, the systems should be flushed with water and pipe joints, valves and circulating pumps should be pressure-tested for leaks.
- Hard-soldered joints are preferable to soft-soldered. Traces of flux (chloride-free) must be removed flushing through with hot water.
- Galvanized components should not be used in the system because zinc is not resistant to the product and tends to start dissolving, which can lead to formation of sludge. If despite our recommendation galvanized pipelines were used and the formation of zinc glycolate were observed, we suggest to install a microfilter (approx. 100 to 150 µm).
- 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 Antifrogen® SOL HT. Air pockets (gas pockets) are to eliminate immediately.
- 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.
- In the event of leaks, top up with Antifrogen® SOL HT. Avoid mixing it with other products. If accidentally water is used to top up the system, the concentration (= frost resistance) of the heat transfer medium should be checked with a Brix refractometer and an Antifrogen data slide.

Service and Monitoring

According to our experience Antifrogen® SOL HT can be used in installations for many years. However, the Antifrogen® SOL HT concentration in the installation should be checked annually. This check is also advisable when the installation is topped up with liquid. The reference source for Brix refractometer and Antifrogen data slider can be provided upon request.

The performance of the Antifrogen® SOL HT should also be checked at intervals of two years. If a 250 ml sample is provided, the distributors can also perform this service.

For major industrial installations these tests can also be performed directly by Clariant Produkte (Deutschland) GmbH, Werk Gendorf, BU ICS / TA, D-84508 Burgkirchen, Germany, phone +49(0) 86 79/7-22 72, (www.antifrogen.com, see Technical service).

The data in our service report relate solely to the sample sent to us. Guidance on further use for the product tested assumes that the system is in proper condition and properly operated. We would expressly point out that, particularly where corrosion or scale is already present in the system, interactions with the product may occur with unpredictable consequences. We accept no liability whatsoever for any damage resulting from the improper condition or operation of the system.

Safety and Handling

Flash point (DIN 51758)	°C	> 105 (not be determined)
Ignition temperature (DIN 51794)	°C	> 420
Temperature class(DIN/VDE 0165)		T2

Antifrogen® SOL HT has neither a flash point nor a fire point.

Spent Antifrogen® SOL HT can be disposed off in accordance with local regulations. According to the 2nd general administrative regulation relating to the German waste management act of 10.04.1990, reuse is preferable to disposal. The product is recyclable.

Higher boiling glycols, the product on which Antifrogen® SOL HT is based, is classified in water hazard class **WGK 1 (slightly water-polluting)** according to the list of water-polluting substances (VwVwS from 17.05.1999).

Antifrogen® SOL HT can be described by the usual classification as toxicologically harmless. In concentrations up to 1000 mg/l, Antifrogen® SOL HT shows no acute harmful effects on fish and bacteria. Antifrogen® SOL HT is readily biodegradable.

Further information will be found in the current EG safety data sheet.

Transport and storage

VbF	-
GGVE/RID	non-regulated
GGVS/ADR	non-regulated
ADNR	non-regulated
IMDG-Code	non-regulated
UN number	-
IATA-DGR	non-regulated

Antifrogen® SOL HT is supplied by our Antifrogen® distributors in road tankers, non-returnable corrugated drums (220 kg), intermediate bulk containers (IBC, 1050 kg), and diverse small containers. Further informations about our Antifrogen® distributors you can find on our homepage www.antifrogen.com.

Antifrogen® SOL HT has a storage stability of two years if stored in closed original packaging. As zinc is not resistant to Antifrogen® SOL HT, this should be considered when the product is transferred to other containers.

Antifrogen® Homepage

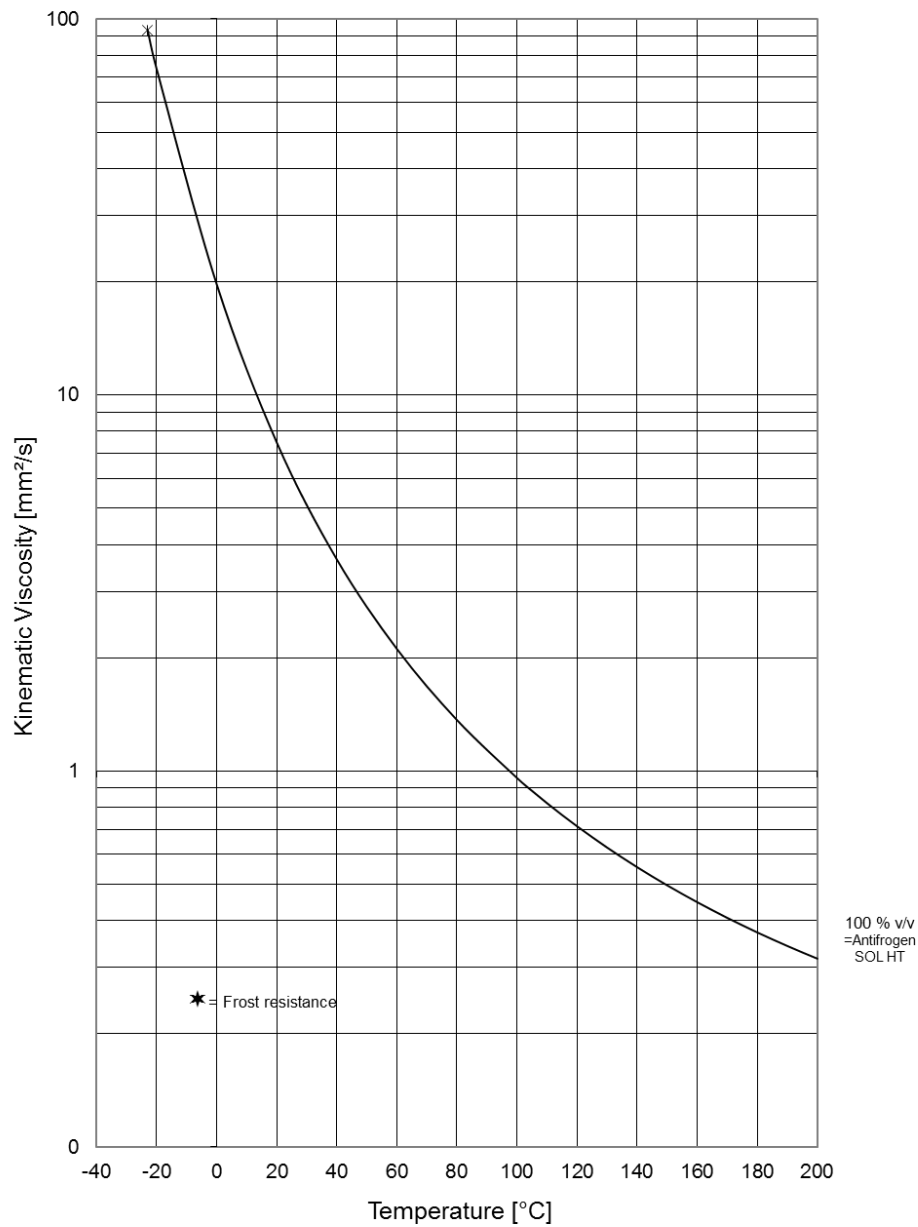
Please visit us at www.antifrogen.com, where you can find newest informations on our product range. Additionally, a technical calculation program with all relevant physical data can be used and the technical leaflets can be downloaded there.

Appendix

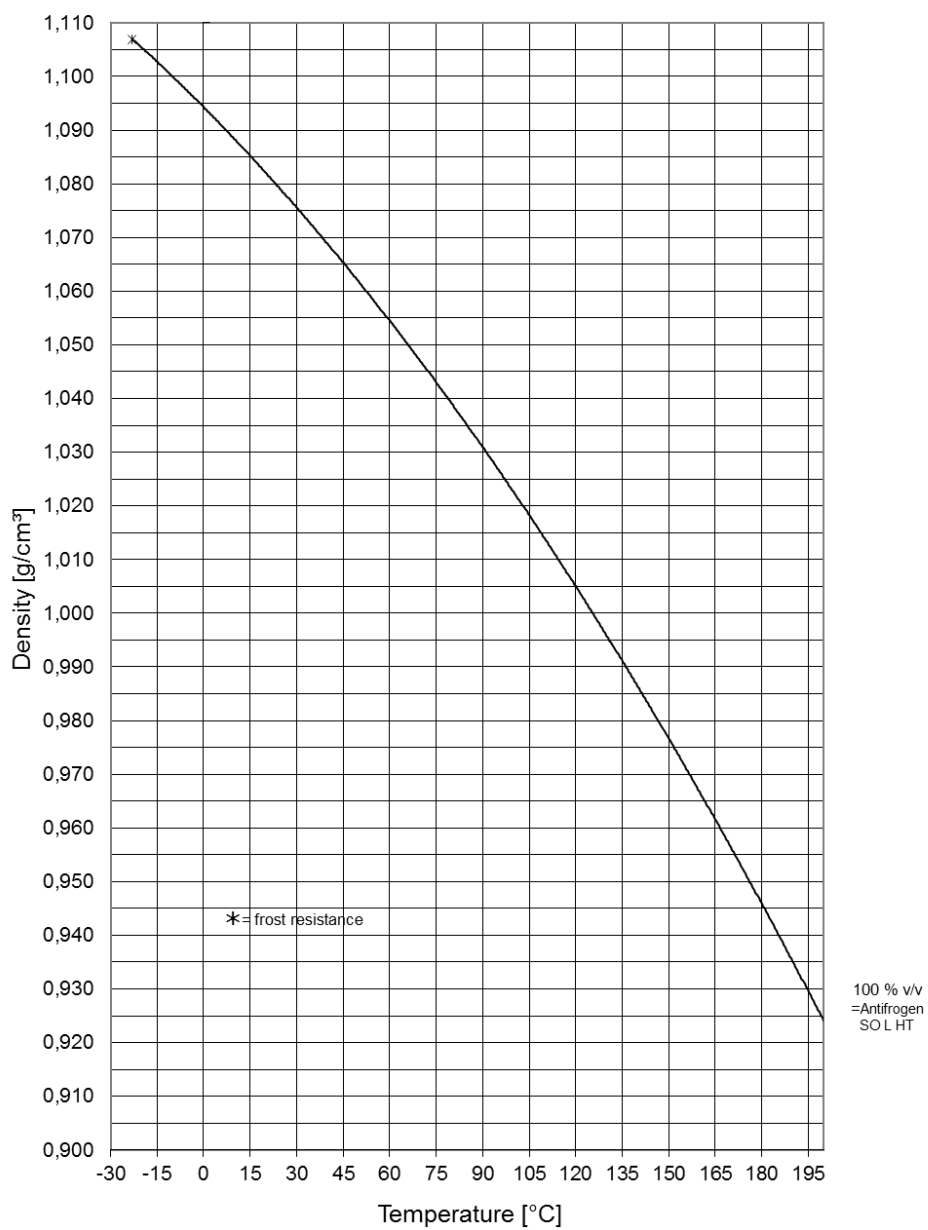
The following graphs show the most important physical properties of Antifrogen® SOL HT.

Due to the calculation software, which has been used to gain the related curves, small variances of the physical values are possible. With temperatures above 100°C – the boiling point of the Antifrogen® SOL HT has to be taken into consideration.

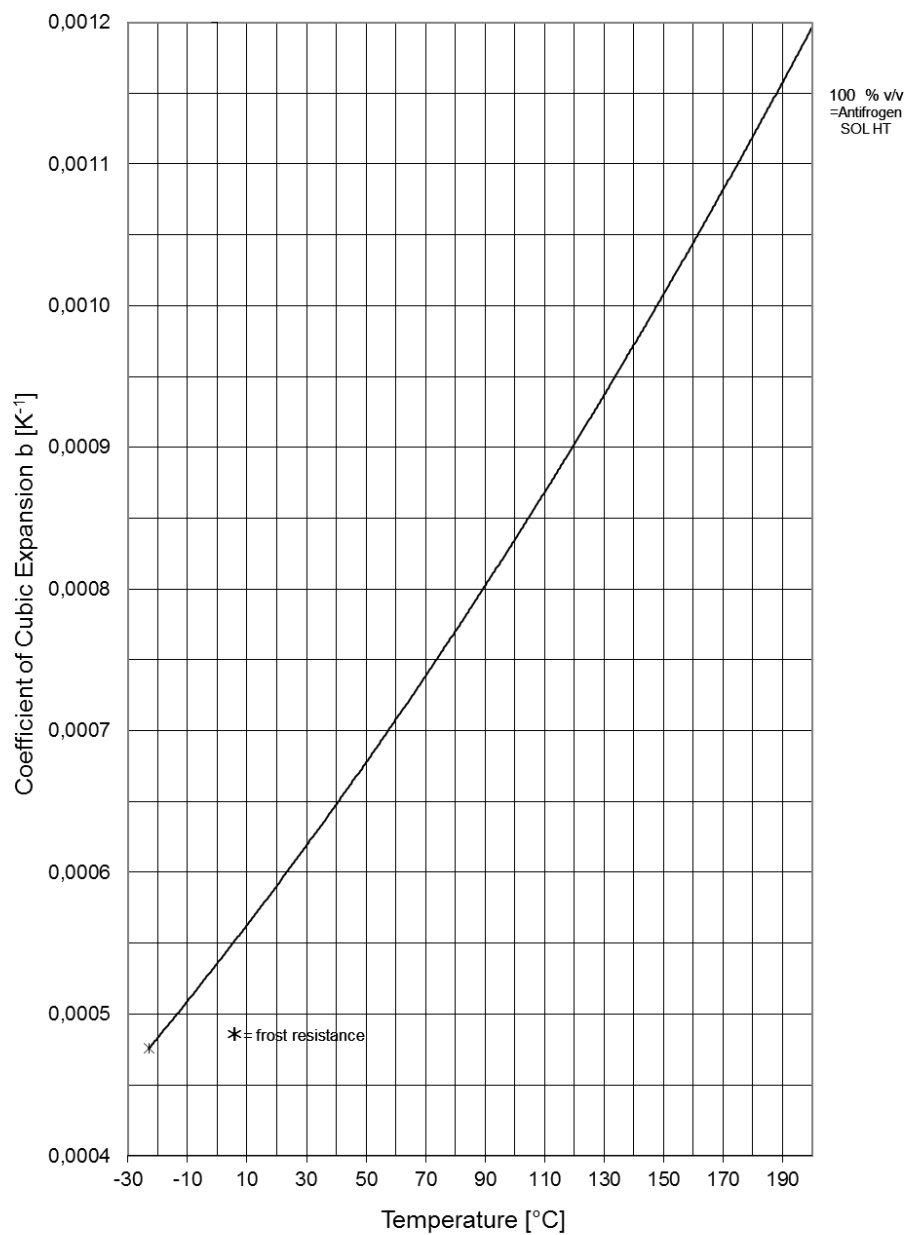
Kinematic Viscosity of Antifrogen SOL HT



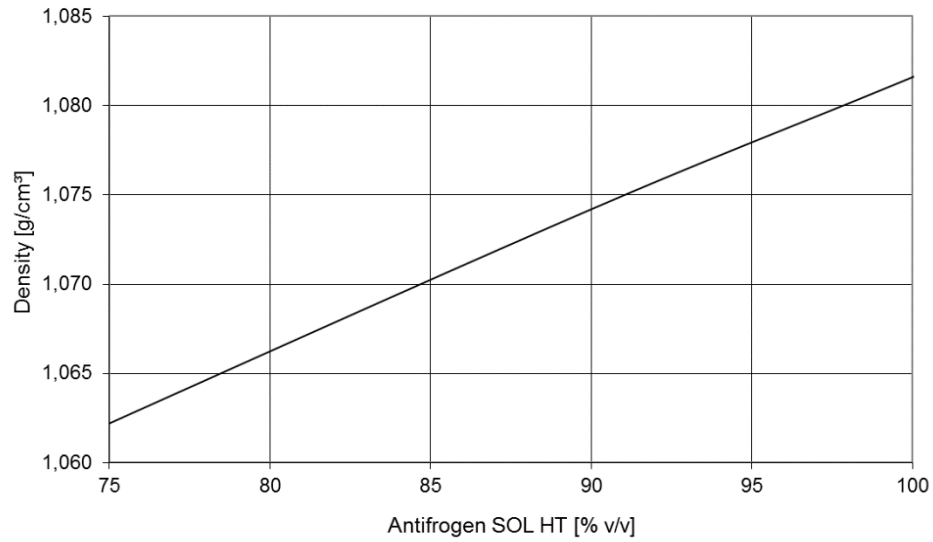
Density
of Antifrogen SOL HT



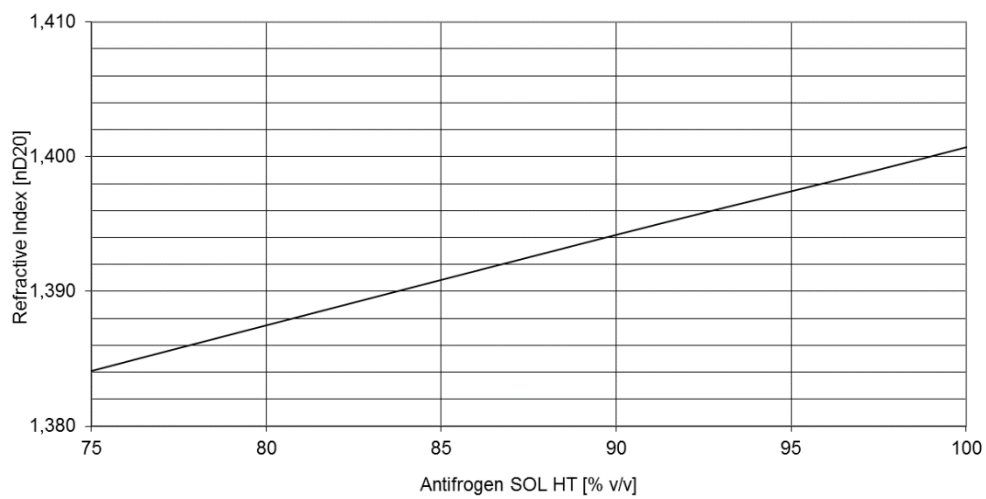
Coefficient of Cubic Expansion of Antifrogen SOL HT



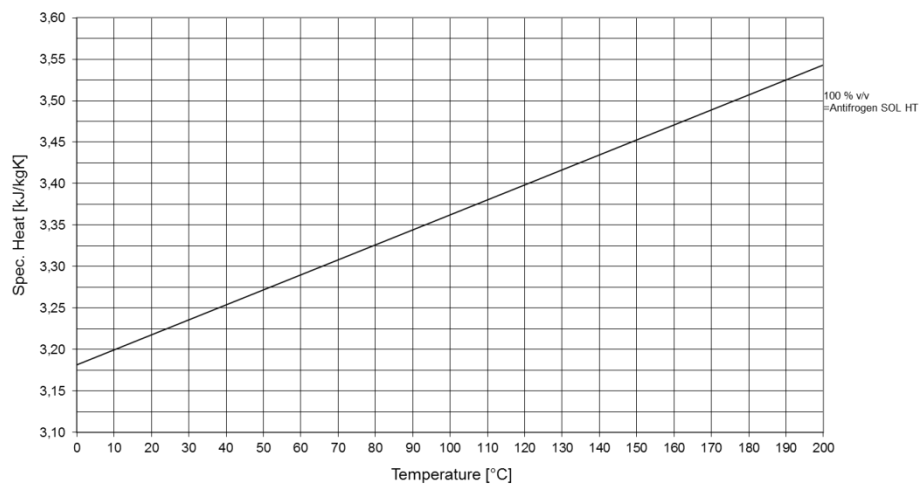
Density
of Antifrogen SOL HT - water mixtures



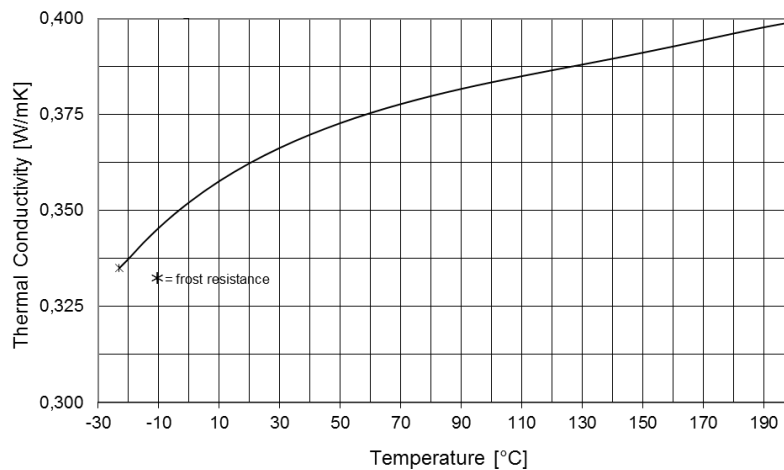
Refractive Index
of Antifrogen SOL HT - water mixtures



Specific Heat of Antifrogen SOL HT

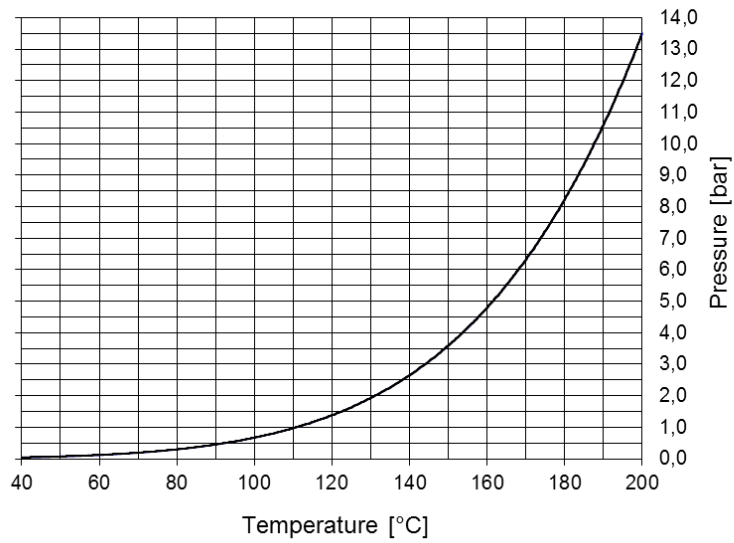


Thermal Conductivity of Antifrogen SOL HT

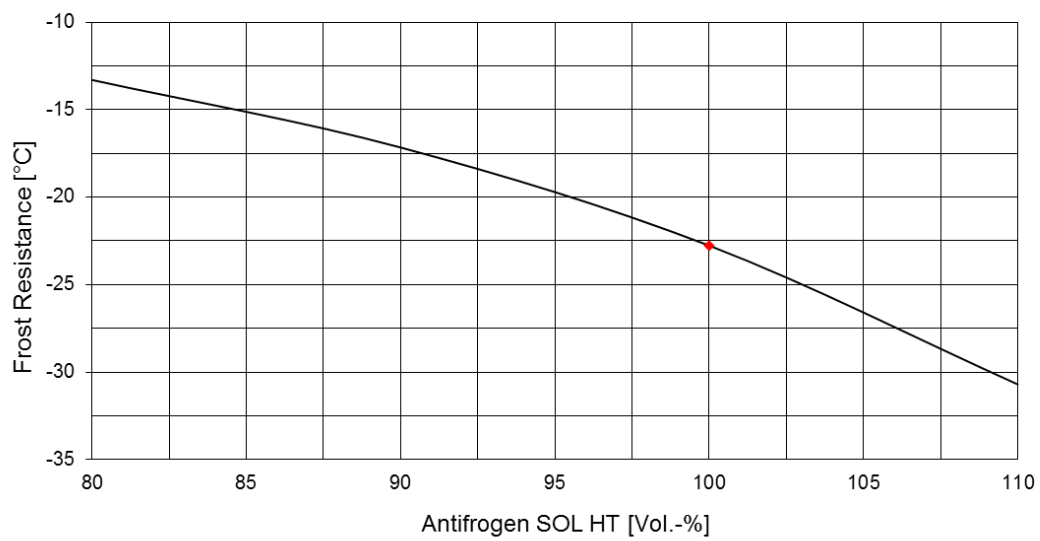


The thermal conductivity have been determined in two independent external instituts. There has been detected a mulplied spread of the values, especially at low temperatures. In the grafic the mean values are illustrated.

Vapor Pressure
of Antifrogen SOL HT



Frost Resistance
of Antifrogen SOL HT-water mixtures



This information corresponds to the present state of our knowledge and is intended as a general description of our products and their possible applications. Clariant makes no warranties, express or implied, as to the information's accuracy, adequacy, sufficiency or freedom from defect and assumes no liability in connection with any use of this information. Any user of this product is responsible for determining the suitability of Clariant's products for its particular application.* Nothing included in this information waives any of Clariant's General Terms and Conditions of Sale, which control unless it agrees otherwise in writing. Any existing intellectual/industrial property rights must be observed. Due to possible changes in our products and applicable national and international regulations and laws, the status of our products could change. Material Safety Data Sheets providing safety precautions, that should be observed when handling or storing Clariant products, are available upon request and are provided in compliance with applicable law. You should obtain and review the applicable Material Safety Data Sheet information before handling any of these products. For additional information, please contact Clariant.

*For sales to customers located within the United States and Canada the following applies in addition: NO EXPRESS OR IMPLIED WARRANTY IS MADE OF THE MERCHANTABILITY, SUITABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE OF ANY PRODUCT OR SERVICE.

® Trademark registered in many countries and owned by Clariant
© 2012 Clariant International Ltd, Rothausstrasse 61, 4132 Muttenz, Switzerland



Clariant International Ltd