Nitrite-free, ready-to-use heat-transfer fluid based on non-toxic glycols, especially for utilization in solar heating equipment under elevated thermal conditions.
Chemical composition 1,2-propylene glycol, polyglycol, water, and inhibitors.

Appearance Clear liquid without solid extraneous material. Color: Blue-green

Technical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (20 °C)</td>
<td>1.0525 – 1.0555</td>
<td>ASTM D 1122</td>
</tr>
<tr>
<td>Refractive index (20 °C)</td>
<td>1.3930 – 1.3955</td>
<td>DIN 51 757</td>
</tr>
<tr>
<td>pH value (20 °C)</td>
<td>7.5 – 8.5</td>
<td>ASTM D 1287</td>
</tr>
<tr>
<td>Alkali reserve</td>
<td>0.1 n HCl min. 9 ml</td>
<td>ASTM D 1121</td>
</tr>
<tr>
<td>Viscosity</td>
<td>6.5 – 8.0 mm²/s</td>
<td>DIN 51 562</td>
</tr>
<tr>
<td>Boiling point</td>
<td>107 °C</td>
<td>ASTM D 1120</td>
</tr>
<tr>
<td>Flash point</td>
<td>none</td>
<td>DIN 51 376</td>
</tr>
<tr>
<td>Content of water</td>
<td>% approx. 50</td>
<td>DIN 51 777</td>
</tr>
<tr>
<td>Frost resistance</td>
<td>°C down to -35</td>
<td>ASTM D 1177</td>
</tr>
</tbody>
</table>

Quality Assurance

Above mentioned average data are typical and representative of the product. They do not possess the significance of a product specification. Specified characteristical values are part of a particular product specification.

Properties

Tyfocor HTL is a clear, blue-green colored liquid with a faint odour and is based on 1,2-propylene glycol and polyethylene glycol.

The corrosion inhibitors contained in Tyfocor HTL reliably protect the metals normally used in solar collectors and other heating equipment against corrosion, ageing and deposits over long periods. Static temperatures higher than 200 °C casually may cause formation of decomposition products. In this case, the combination of selected glycols and inhibitors prevents the solar installation from breakdown if the customer holds to the application guidelines given below. Tyfocor HTL does not contain any nitrites, phosphates or amines.

Application

Tyfocor HTL is utilizable for solar heating equipment with high stagnation temperatures (evacuated tubular collectors).

Temperature stability in solar heating equipment

Tyfocor HTL should be exposed to temperatures higher than 170 °C only for short periods of time. Sustained exposure to temperatures higher than 200 °C causes chemical change (e.g. darkening, decomposition), and therefore the heat transfer fluid may age prematurely. In order to keep the temperature strain of Tyfocor HTL as low as possible under static conditions, we recommend that the capacity of the expansion tanks should be sufficient to ensure that all of the heat transfer fluid can drain out of the solar collectors. It should be ensured that during stagnation operation of the solar equipment discharge of Tyfocor HTL into the collectors will be interrupted when a fluid temperature of more than 170 °C is reached.

Corrosion tests according to ASTM D 1384:

<table>
<thead>
<tr>
<th>Metals or alloys</th>
<th>Average change in weight of coupons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper (SF Cu)</td>
<td>± 0.1 g/m²</td>
</tr>
<tr>
<td>Soft solder (LSn 30)</td>
<td>± 0.2 g/m²</td>
</tr>
<tr>
<td>Brass (MS 63)</td>
<td>± 0.1 g/m²</td>
</tr>
<tr>
<td>Steel (HI)</td>
<td>± 0.1 g/m²</td>
</tr>
<tr>
<td>Grey cast iron (GG26)</td>
<td>± 0.2 g/m²</td>
</tr>
<tr>
<td>Cast aluminium (GAlSi6Cu4)</td>
<td>± 0.2 g/m²</td>
</tr>
</tbody>
</table>

Elastomer resistance

Tyfocor HTL does not attack the sealants normally used in heating systems. The following list of sealants, elastomers and plastics that are resistant to Tyfocor HTL has been compiled from experimental results, experience, and the literature.
Examples of sealants are Fermit® and Fermitol® (registered trademarks of Nissen & Volk GmbH, Hamburg), and hemp

- Butyl rubber
- Chloroprene
- Ethylene propylene-diene-rubber
- Fluorocarbon elastomers
- Nitrile rubber
- Nylon at temperatures up to 115 °C
- Polyethylene, soft/hard
- Polyethylene, cross-linked
- Polypropylene
- Polytetrafluoroethylene
- Polyvinyl chloride, rigid
- Styrene-butadiene-rubber at temperatures up to 100 °C
- Unsaturated polyester resins

Phenolic and urea resins, plasticized PVC, and polyurethane elastomers are not resistant.

An important point to note is that the performance of elastomers such as EPDM is determined by the nature and amount of the constituent additives and the vulcanization conditions, as well as the properties of the rubber itself. For this reason, we would recommend testing the resistance of these elastomers to Tyfocor HTL before they are put into service for the first time. This applies particularly to elastomers intended as membranes for expansion tanks as described in DIN 4807.

Gaskets made from Aramid and special NBR, such as Centellen 3820*, and elastomer gaskets up to 180 °C made from 70 EPDM 281** have been shown to be resistant to hot Tyfocor HTL.

Application guidelines

In view of the specific properties of Tyfocor HTL, the following instructions must be adhered to for ensuring long-term protection.

1. Solar heating equipment must be designed as a closed circuit, because exposure to atmospheric oxygen causes the inhibitors in Tyfocor HTL to be consumed more rapidly.
2. Flexible-membrane expansion tanks must conform to DIN 4807.
3. The use of soft solder on joints is admissible, but silver or copper brazing solders are to be utilized preferably. Fluxes must not contain any chlorides.
4. The only flexible connections that are permissible are hoses, preferably metal, that do not permit the diffusion of oxygen.
5. Equipment must not be fitted with galvanised heat exchangers, heat reservoirs, tanks or pipes, because glycol/water mixtures can corrode zinc.
6. It must be ensured that no external voltages are applied between items of equipment that come into contact with Tyfocor HTL, as otherwise corrosion may occur.
7. The layout of the tubes must ensure that circulation cannot be disturbed by gas pockets or deposits.
8. The level of the heat-transfer liquid must never be allowed to fall below the highest point in the system.
9. Dirt and water must not be allowed to enter the installation or its components during assembly and before filling. After assembly has been completed and the connections have been soldered, the system must be flushed to remove any foreign matter (swarf, fluxes, etc.) and assembly aids. For reason of corrosion protection, the water must be removed completely after the cleaning process has been finished. The system should then be filled by the heat transfer fluid immediately.

*: Hecker Werke GmbH & Co., D -71093 Weil im Schönbuch
** C. Freudenberg Dichtungs- u. Schwungungstechnik, Pf 100363, D-69465 Weinheim
10. It must be ensured that no air pockets remain in the installation after it has been filled. It is essential to eliminate gas pockets because a vacuum would be formed if they collapsed following a drop in temperature, and this would cause air to be sucked into the system.

11. In order to ensure that there are no obstructions to the flow of the heat-transfer liquid, the in-circuit filters must be cleaned within 14 days, at the latest, after the equipment has been filled with heat transfer fluid and put into operation for the first time.

12. If losses occur due to leakage or discharge, the system must be topped up with Tyfocor HTL.

**Shelf life**

Tyfocor HTL has a shelf life of at least three years in airtight containers. It must not be stored in galvanised containers, due to reasons of corrosion protection.

**Packaging**

Tyfocor HTL is supplied in 200 l non-returnable drums, in 30 l, 20 l, and 10 l non-returnable cans.

**Safety Data Sheet**

A Safety Data Sheet has been drawn up for Tyfocor HTL in accordance with EEC Directives 91/155/EEC and 2001/58/EEC, resp.

**Disposal**

Tyfocor HTL spills must be taken up with an absorbent binder and disposed of in accordance with the regulations. Tyfocor HTL can be disposed of by special treatment, e.g., combustion in an authorized incinerator, in accordance with local authority regulations. Regulations on waste avoidance and disposal must be observed.

**Ecology**

Tyfocor HTL is biodegradable. It does not impair the efficiency of the activated sludge if it is run with the appropriate care into an acclimated effluent treatment plant.

**Handling**

The usual safety and industrial hygiene measures relating to chemicals and flammable liquids must be observed in handling Tyfocor HTL. The information and instructions given in our Safety Data Sheet must be strictly observed.

**Density of Tyfocor HTL [g/cm³]**

![Graph showing the density of Tyfocor HTL across different temperatures.](image)
Kinematic Viscosity of Tyfocor HTL [mm$^2$/s]

Vapour Pressure of Tyfocor HTL [bar]
Specific Heat Capacity of Tyfocor HTL [kJ/kg·K]

Temperature [°C]

Thermal Conductivity of Tyfocor HTL [W/m·K]

Temperature [°C]
The information submitted in this publication is based on our current knowledge and experience. In view of the many factors that may affect processing and application these data do not relieve processors of the responsibility of carrying out their own tests and experiments, neither do they imply any legally binding assurance of certain properties or of suitability for a specific purpose. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislations are observed.

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