

# ANTICORA<sup>®</sup>

## Concentrate

High-Performance Cooling Brine for Systems  
made of Stainless Steel or Non-Alloyed Steel



## Characteristics of ANTICORA® 1.45 Concentrate

Appearance	Clear, colourless to light yellow liquid	
Boiling point	> 100 °C	ASTM D 1120
Freezing point	-30.0 °C	ASTM D 1177
Density (20 °C)	1.450–1.455 g/cm <sup>3</sup>	DIN 51757
pH value (20 °C)	12.0–13.0	ASTM D 1287
Viscosity (20 °C)	3.5–4.5 mm <sup>2</sup> /s	DIN 51562

The above data represent average values that were valid when this Technical Information Bulletin went into print. They do not have the status of a product specification. Specified values are the subject of a special leaflet.

## Properties

**ANTICORA®** is a high-performance cooling brine which has proven its reliability for more than 70 years. The quality of the product was subject to permanent improvement over these years, following up the advance of refrigeration and cooling plant construction techniques.

**ANTICORA®** is based on the food additive potassium carbonate. The heat transfer properties of the product are significantly better in comparison to glycol/water mixtures, and thus economical operation of refrigeration systems is rendered possible even at low working temperatures. The non-toxic, odourless liquid contains specific corrosion inhibitors, stabilizers and buffers, and is free of borax, nitrites, phosphates and amines.

## Scope of Application

**ANTICORA®** is suitable for cooling systems that consist of stainless steel and/or non-alloyed steel. The product is furthermore largely compatible with aluminium and aluminium alloys when used in closed circuits. Moreover, a specific corrosion inhibitor package is available for **ANTICORA®** in case the installation consists of components made of copper, brass, red brass or bronze. Please consult our technical department in any case of application-specific questions.

## Characteristics of ANTICORA®/water mixtures

ANTICORA® 1.45 Concentrate	Lower cooling limit	Density (20 °C) (Product name)
20.0 vol. %	-3.0 °C	1.10 g/cm <sup>3</sup>
33.0 vol. %	-5.0 °C	1.15 g/cm <sup>3</sup>
44.0 vol. %	-8.0 °C	1.20 g/cm <sup>3</sup>
56.0 vol. %	-12.0 °C	1.25 g/cm <sup>3</sup>
67.0 vol. %	-16.0 °C	1.30 g/cm <sup>3</sup>
71.0 vol. %	-19.0 °C	1.32 g/cm <sup>3</sup>
75.0 vol. %	-22.0 °C	1.34 g/cm <sup>3</sup>
80.0 vol. %	-25.0 °C	1.36 g/cm <sup>3</sup>
84.0 vol. %	-28.0 °C	1.38 g/cm <sup>3</sup>
89.0 vol. %	-35.0 °C	1.42 g/cm <sup>3</sup>
100 vol. %	-30.0 °C	1.45 g/cm <sup>3</sup>

## Application

Dilute **ANTICORA® 1.45 Concentrate** with potable water (low hardness, content of chlorides < 50 mg/l) or demineralised water to the

required concentration or density, respectively. In order to maintain effective corrosion protection, the concentration of **ANTICORA®** must not fall below 75.0 percent by volume (i.e. **ANTICORA® 1.34**). All other data have been listed in the table for general information purposes only.

## Miscibility

**ANTICORA®** must on no account be mixed with chloride- and/or calcium-containing brines, organic salt based secondary coolants or glycol/water mixtures, since this may lead to precipitation of solid material or chemical reactions occurring. Systems that were previously operated with other secondary coolants must be washed out and cleansed very thoroughly before refilling with **ANTICORA®**.

## Temperature stability

**ANTICORA®** is solely intended for application below 0 °C. Please consult our technical department in any case of application-specific questions.

## Compatibility with Sealing Materials

**ANTICORA®** does not attack the sealing materials commonly used in refrigeration technology. Durable materials are, according to own testing and experience and literature data, hemp, sealants, and

Butyl rubber	IIR
Polyethylene, soft, rigid	LDPE/HDPE
Ethylene-propylene-diene rubber	EPDM
Polyethylene, crosslinked	PE-X
Epoxy resins	EP
Polypropylene	PP
Fluorocarbon elastomers	FPM
Polytetrafluoroethylene	PTFE
Natural rubber	NR
Nitrile rubber	NBR
Styrene-butadiene rubber	SBR
Polychlorobutadiene rubber	CR

An important point to note is that the performance of elastomers is not only governed by the properties of the rubber itself, e.g. EPDM, but also by the nature and amount of the constituent additives and the vulcanisation conditions. For this reason, it is recommended that their resistance to the secondary coolant is checked by performance tests before these materials are taken into use for the first time.

## Application guidelines

The following application guidelines must be strictly observed to achieve long-term corrosion protection for systems operated with **ANTICORA®**.

**1.** We recommend to use **ANTICORA®** in closed secondary loops. Otherwise contact with atmospheric oxygen will accelerate the consumption of the corrosion inhibitors. If an open circuit is used, however, it must be ensured that the return lines are situated below the surface level of the fluid to avoid any unnecessary entrainment of air. The pH value of the fluid must be checked more frequently as in case of closed systems.

**2.** A settling pot must be installed at the lowest part of the circuit to trap any washed down matter.

**3.** Piping must be installed so that no disruption of coolant circulation may occur due to the formation of gas pockets or deposits.

**4.** The level of the cooling brine must always be kept at the highest point in the circuit. A closed tank with a venting valve should also be installed at this point. Do not use automatic venting valves of a type that might allow air to enter the system.

**5.** Internally galvanized pipes or tanks must not be used. In case exterior galvanized coatings (e.g. cover plates, beams) have come into contact with the cooling brine, immediately wash down with plenty of water.

**6.** External surfaces of plant components that have been exposed to the product should be rinsed immediately with plenty of water and then dried using clean cloths. The use of warm water or steam improves the cleansing efficiency. Industrial floors are to be treated in the same manner.

**7.** It must be ensured that no external electrical potential exists between parts of the system that come into contact with the secondary coolant.

**8.** Dirt and water must not be allowed to enter the system or its components during installation or before it is filled. After the installation is finished, the system should be flushed out in order to remove any foreign material (swarf, scale, remains of packaging etc.) and other contaminants. After internal cleaning and a leak test have been carried out, the system must be emptied completely and immediately filled with the cooling brine to protect it from corrosion – even if the plant will be set into operation at a later date.

**9.** It must be ensured that no air pockets remain in the brine circuit after it has been filled. It is essential to eliminate any existing gas pockets, because their collapse following a drop in temperature would give rise to a vacuum and thus cause air to be sucked into the system. Insufficient deaeration of the brine circuit furthermore affects the efficiency of the system.

**10.** In-circuit filter elements must be cleaned within 14 days at the latest after the system was put into operation. This is necessary to ensure that neither obstruction to the fluid flow, nor malfunction of the system pumps might occur.

**11.** Fluid losses caused by leakage or removal from the system must be replaced by an **ANTICORA® 1.45 Concentrate**/water mixture of equal concentration. In cases of doubt, the content of **ANTICORA®** can be checked via density measurement (hydrometer).

**12.** We provide a check of the relevant fluid parameters, i.e. density, inhibitor concentration, pH value etc., upon request. A sample of 0.2 litres can be sent to our lab for initial analysis within one month after the system was set into operation. The client will receive a test report on the analytical results. Further samples should be sent after six months and one year of operation.

## Storage stability

**ANTICORA®** has a shelf life of at least three years in airtight containers. The product must never be stored in galvanised containers.

## Delivery form and packaging

**ANTICORA®** is available as a concentrate or ready-mix according to customer's specification. It is supplied in road tankers, in 1,000 litre IBCs, in 200 litre PE drums, and in 30, 20 and 10 litre non-returnable plastic cans.

## Disposal

Spills or leakages of **ANTICORA®** must be taken up with an absorbent binder and disposed of in accordance with the regulations. For further information please refer to the Safety Data Sheet.

## Ecology

**ANTICORA®** is classified in water hazard class 1, (WGK 1, low-rate endangering) according to German water hazard regulations 'Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen vom 18. April 2017' (AwSV). The product does not cause any biological oxygen depletion in the event of a leakage into the environment.

## Handling

The usual safety and industrial hygiene measures relating to chemicals must be observed in handling **ANTICORA®**. The information and instructions given in our Safety Data Sheet must be strictly observed.

## Safety Data Sheet

A Safety Data Sheet in accordance with Directive 1907/2006/EC [REACH] is available for download on [www.tyfo.de](http://www.tyfo.de).

## Density of ANTICORA®/water mixtures [kg/m<sup>3</sup>]

as a function of temperature and concentration

T [°C]	20.0 vol. %	33.0 vol. %	44.0 vol. %	56.0 vol. %	67.0 vol. %	71.0 vol. %	75.0 vol. %	80.0 vol. %	84.0 vol. %	89.0 vol. %
20	1100	1150	1200	1250	1300	1320	1340	1360	1380	1420
10	1103	1153	1204	1255	1305	1325	1345	1365	1385	1425
0	1105	1156	1208	1259	1309	1329	1349	1370	1390	1430
-10	-	-	-	1263	1313	1333	1353	1374	1394	1435
-20	-	-	-	-	-	-	1356	1377	1397	1439
-30	-	-	-	-	-	-	-	-	-	1442

## Specific heat capacity of ANTICORA®/water mixtures [kJ/kg·K]

as a function of temperature and concentration

T [°C]	20.0 vol. %	33.0 vol. %	44.0 vol. %	56.0 vol. %	67.0 vol. %	71.0 vol. %	75.0 vol. %	80.0 vol. %	84.0 vol. %	89.0 vol. %
20	3.643	3.433	3.266	3.098	2.931	2.889	2.847	2.805	2.763	2.680
10	3.628	3.418	3.251	3.078	2.897	2.855	2.814	2.772	2.730	2.638
0	3.613	3.403	3.236	3.063	2.872	2.830	2.780	2.738	2.696	2.596
-10	-	-	-	3.048	2.822	2.780	2.730	2.688	2.646	2.550
-20	-	-	-	-	-	-	2.688	2.642	2.596	2.504
-30	-	-	-	-	-	-	-	-	-	2.458

## Thermal conductivity of ANTICORA®/water mixtures [W/m·K]

as a function of temperature and concentration

T [°C]	20.0 vol. %	33.0 vol. %	44.0 vol. %	56.0 vol. %	67.0 vol. %	71.0 vol. %	75.0 vol. %	80.0 vol. %	84.0 vol. %	89.0 vol. %
20	0.577	0.571	0.565	0.559	0.554	0.551	0.549	0.547	0.544	0.540
10	0.560	0.554	0.548	0.543	0.538	0.536	0.534	0.531	0.529	0.513
0	0.544	0.536	0.532	0.523	0.523	0.521	0.519	0.516	0.513	0.498
-10	-	-	-	0.510	0.508	0.506	0.502	0.500	0.497	0.480
-20	-	-	-	-	-	-	0.486	0.483	0.480	0.465
-30	-	-	-	-	-	-	-	-	-	0.450

## Kinematic viscosity of ANTICORA®/water mixtures [mm<sup>2</sup>/s]

as a function of temperature and concentration

T [°C]	20.0 vol. %	33.0 vol. %	44.0 vol. %	56.0 vol. %	67.0 vol. %	71.0 vol. %	75.0 vol. %	80.0 vol. %	84.0 vol. %	89.0 vol. %
20	1.2	1.3	1.5	1.7	1.9	2.0	2.2	2.4	2.7	3.2
10	1.6	1.7	1.9	2.1	2.5	2.6	2.9	3.2	3.5	4.6
0	2.0	2.2	2.5	2.8	3.4	3.6	3.9	4.3	4.8	6.3
-10	-	-	-	3.9	4.7	5.1	5.6	6.2	6.9	9.1
-20	-	-	-	-	-	-	8.6	9.6	11.1	15.3
-30	-	-	-	-	-	-	-	-	-	26.4

## Dynamic viscosity of ANTICORA®/water mixtures [mPa·s]

as a function of temperature and concentration

T [°C]	20.0 vol. %	33.0 vol. %	44.0 vol. %	56.0 vol. %	67.0 vol. %	71.0 vol. %	75.0 vol. %	80.0 vol. %	84.0 vol. %	89.0 vol. %
20	1.3	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.7	4.5
10	1.8	2.0	2.3	2.6	3.2	3.5	3.9	4.4	4.8	6.5
0	2.2	2.5	3.0	3.5	4.4	4.8	5.3	5.9	6.6	9.0
-10	-	-	-	4.9	6.2	6.8	7.6	8.5	9.6	13.0
-20	-	-	-	-	-	-	11.7	13.2	15.5	22.0
-30	-	-	-	-	-	-	-	-	-	38.0

## Prandtl numbers of ANTICORA®/water mixtures

as a function of temperature and concentration

T [°C]	20.0 vol. %	33.0 vol. %	44.0 vol. %	56.0 vol. %	67.0 vol. %	71.0 vol. %	75.0 vol. %	80.0 vol. %	84.0 vol. %	89.0 vol. %
20	8.21	9.02	10.40	11.64	12.70	14.16	15.57	16.92	18.79	22.33
10	11.66	12.34	13.64	14.74	17.23	18.64	20.56	22.97	24.77	33.42
0	14.61	15.87	18.25	20.50	24.18	26.07	28.39	31.31	34.69	46.92
-10	-	-	-	29.28	34.44	37.36	41.33	45.70	51.11	69.06
-20	-	-	-	-	-	-	64.71	72.20	83.83	118.47
-30	-	-	-	-	-	-	-	-	-	207.56

### Note

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.

# The TYFO product range

**TYFOCOR®** is a long-life, corrosion-inhibiting antifreeze based on ethylene glycol for cooling and heating, air-conditioning, heat pump, and under-soil heating systems. It can be supplied as a concentrate or a pre-mixed, ready-to-use product as desired.

**TYFOCOR® GE** is a long-life, corrosion-inhibiting antifreeze based on ethylene glycol specially formulated for use in geothermal heat pump systems. It can be supplied as desired in the form of a concentrate or a pre-mixed, ready-to-use product.

**TYFOCOR® L** is a long-life corrosion-inhibiting antifreeze based on propylene glycol for heating and air-conditioning, solar thermal, and heat pump systems. It is also used as a special food-grade brine by food and beverage manufacturers and is supplied both as a concentrate and a pre-mixed, ready-to-use product.

**TYFOCOR® Leco®** is a long-life corrosion-inhibiting antifreeze based on propylene glycol that covers the same applications as **TYFOCOR® L**. Practically all of the substances contained in the product are derived from 100% renewable resources.

**TYFOCOR® LS®** is a special, ready-to-use, almost completely vaporizable, propylene-glycol-based heat transfer fluid for use in solar systems that are subject to extreme thermal conditions.

**TYFOCOR® G-LS** is a special, ready-to-use, almost completely vaporizable, propylene-glycol-based heat transfer fluid for use in solar systems that are subject to extreme thermal conditions. It contains a glass protection additive that makes it suitable for use in all-glass solar collectors.

**TYFOCOR® HTL** is a special, ready-to-use heat transfer fluid based on non-toxic glycols for use in solar systems that are subject to extreme thermal conditions.

**TYFO-SPEZIAL** is a special, high-performance brine formulated for geothermal heat pumps located in areas subject to special government regulations. Due to its lack of glycols, it does not cause any underground biological oxygen depletion in the event of a leak.

**TYFOXIT® 1.15–1.25** are non-toxic, high-performance, glycol-free secondary coolants based on potassium acetate with very low viscosities for chiller systems with secondary cooling. They are available as concentrates (**TYFOXIT® 1.25**) and ready-to-use mixtures ranging from  $-20\text{ °C}$  (**TYFOXIT® 1.15**) to  $-55\text{ °C}$  (**TYFOXIT® 1.25**).

**TYFOXIT® F15–50** are non-toxic, high-performance, glycol-free, potassium-formate-based secondary coolants with very low viscosities for chiller systems with secondary cooling. They are available as ready-to-use mixtures ranging from  $-15\text{ °C}$  (**TYFOXIT® F15**) to  $-50\text{ °C}$  (**TYFOXIT® F50**).

To learn more about our products, visit [www.tyfo.de](http://www.tyfo.de)





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