

REINHARTIN[®]

Concentrate

High-Performance Cooling Brine for Ice Machines,
Cooling and Refrigerating Systems



TYFOROP Chemie GmbH

Characteristics of REINHARTIN® 1.285 Concentrate

Appearance	Clear, colourless to light yellow liquid	
Boiling point	> 100 °C	ASTM D 1120
Freezing point	-16.5 °C	ASTM D 1177
Density (20 °C)	1.285–1.290 g/cm ³	DIN 51757
pH value (20 °C)	6.5–7.0	ASTM D 1287
Viscosity (20 °C)	3.5–4.5 mm ² /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

REINHARTIN® is a high-performance cooling brine which has proven its reliability for more than 90 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.

REINHARTIN® is based on the food additives calcium chloride and magnesium chloride. Depending on the mixing ratio, blends of the product with water allow to achieve cooling limits down to -50 °C. The heat transfer properties of **REINHARTIN®** are significantly better in comparison to glycol/water mixtures, and thus economical operation of ice machines and cooling and refrigerating systems is rendered possible even at very low working temperatures. The non-toxic, odourless liquid contains specific corrosion inhibitors, stabilizers and buffers, and is free of borax, nitrites and amines.

Scope of Application

REINHARTIN® is used for cooling systems that mainly consist of non-alloyed steel. The cooling brine must **not** be applied for installations containing components made of aluminium, aluminium alloys or stainless steel. Please consult our technical department in any case of application-specific questions.

Characteristics of REINHARTIN®/water mixtures

REINHARTIN® 1.285 Concentrate	Lower cooling limit	Density (20 °C) (Product name)
19.5 vol. %	-5.0 °C	1.06 g/cm ³
26.0 vol. %	-7.0 °C	1.08 g/cm ³
32.5 vol. %	-10.0 °C	1.10 g/cm ³
39.4 vol. %	-13.0 °C	1.12 g/cm ³
46.5 vol. %	-17.0 °C	1.14 g/cm ³
53.5 vol. %	-22.0 °C	1.16 g/cm ³
61.0 vol. %	-27.0 °C	1.18 g/cm ³
68.3 vol. %	-34.0 °C	1.20 g/cm ³
75.8 vol. %	-41.0 °C	1.22 g/cm ³
83.3 vol. %	-50.0 °C	1.24 g/cm ³
100 vol. %	-16.5 °C	1.285 g/cm ³

Application

Dilute **REINHARTIN® 1.285 Concentrate** with potable water or demineralised water to the required concentration or density, respectively.

In order to maintain effective corrosion protection, the concentration of **REINHARTIN®** must not fall below 68.3 percent by volume (i.e. **REINHARTIN® 1.20**). All other data have been listed in the table for general information purposes only.

Miscibility

REINHARTIN® must on no account be mixed with carbonate-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 **REINHARTIN®**.

Temperature stability

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

Compatibility with Sealing Materials

REINHARTIN® 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 **REINHARTIN®**.

1. We recommend to use **REINHARTIN®** 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 a **REINHARTIN® 1.285 Concentrate**/water mixture of equal concentration. In cases of doubt, the content of **REINHARTIN®** 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

REINHARTIN® 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

REINHARTIN® 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 **REINHARTIN®** 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

REINHARTIN® is classified in water hazard class 1, (low-rate endangering, Germany) according to current German water hazard regulations. 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 **REINHARTIN®**. The information and instructions given in our Safety Data Sheet must be strictly observed.

Safety Data Sheet

A current Safety Data Sheet in accordance with EU Directive 1907/2006/EC [REACH] is available on our website www.tyfo.de.

Density of REINHARTIN®/water mixtures [kg/m³]

as a function of temperature and concentration

T [°C]	19.5 vol. %	26.0 vol. %	32.5 vol. %	39.4 vol. %	46.5 vol. %	53.5 vol. %	61.0 vol. %	68.3 vol. %	75.8 vol. %	83.3 vol. %
20	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240
10	1063	1083	1103	1124	1144	1164	1184	1204	1224	1244
0	1064	1084	1105	1127	1147	1167	1187	1207	1228	1248
-10	-	-	1106	1129	1149	1169	1189	1210	1231	1251
-20	-	-	-	-	-	1171	1191	1212	1234	1254
-30	-	-	-	-	-	-	-	1214	1236	1257
-40	-	-	-	-	-	-	-	-	1238	1259
-50	-	-	-	-	-	-	-	-	-	1261

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

as a function of temperature and concentration

T [°C]	19.5 vol. %	26.0 vol. %	32.5 vol. %	39.4 vol. %	46.5 vol. %	53.5 vol. %	61.0 vol. %	68.3 vol. %	75.8 vol. %	83.3 vol. %
20	3.817	3.696	3.578	3.469	3.365	3.264	3.163	3.071	2.987	2.904
10	3.792	3.671	3.553	3.467	3.340	3.237	3.138	3.046	2.952	2.877
0	3.767	3.646	3.528	3.442	3.315	3.210	3.113	3.021	2.937	2.849
-10	-	-	3.503	3.417	3.290	3.189	3.088	2.996	2.912	2.824
-20	-	-	-	-	-	3.168	3.067	2.967	2.883	2.799
-30	-	-	-	-	-	-	-	2.941	2.858	2.774
-40	-	-	-	-	-	-	-	-	2.832	2.749
-50	-	-	-	-	-	-	-	-	-	2.724

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

as a function of temperature and concentration

T [°C]	19.5 vol. %	26.0 vol. %	32.5 vol. %	39.4 vol. %	46.5 vol. %	53.5 vol. %	61.0 vol. %	68.3 vol. %	75.8 vol. %	83.3 vol. %
20	0.586	0.583	0.578	0.573	0.570	0.565	0.561	0.556	0.552	0.548
10	0.570	0.567	0.563	0.558	0.555	0.550	0.546	0.541	0.536	0.532
0	0.555	0.552	0.548	0.543	0.540	0.534	0.530	0.526	0.521	0.516
-10	-	-	0.532	0.528	0.525	0.518	0.514	0.509	0.505	0.501
-20	-	-	-	-	-	0.502	0.498	0.494	0.492	0.486
-30	-	-	-	-	-	-	-	0.480	0.476	0.472
-40	-	-	-	-	-	-	-	-	0.463	0.459
-50	-	-	-	-	-	-	-	-	-	0.448

Kinematic viscosity of REINHARTIN®/water mixtures [mm²/s]

as a function of temperature and concentration

T [°C]	19.5 vol. %	26.0 vol. %	32.5 vol. %	39.4 vol. %	46.5 vol. %	53.5 vol. %	61.0 vol. %	68.3 vol. %	75.8 vol. %	83.3 vol. %
20	1.1	1.2	1.3	1.4	1.5	1.6	1.9	2.1	2.3	2.7
10	1.5	1.6	1.7	1.8	1.9	2.1	2.3	2.5	2.8	3.3
0	2.0	2.1	2.2	2.4	2.5	2.7	2.9	3.2	3.5	4.0
-10	-	-	3.0	3.3	3.7	4.1	4.4	4.8	5.3	6.0
-20	-	-	-	-	-	6.7	7.0	7.4	8.9	10.4
-30	-	-	-	-	-	-	-	12.4	14.6	19.1
-40	-	-	-	-	-	-	-	-	28.3	41.3
-50	-	-	-	-	-	-	-	-	-	103.1

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

as a function of temperature and concentration

T [°C]	19.5 vol. %	26.0 vol. %	32.5 vol. %	39.4 vol. %	46.5 vol. %	53.5 vol. %	61.0 vol. %	68.3 vol. %	75.8 vol. %	83.3 vol. %
20	1.2	1.3	1.4	1.6	1.7	1.9	2.2	2.5	2.8	3.3
10	1.6	1.7	1.9	2.0	2.1	2.4	2.7	3.0	3.4	4.1
0	2.1	2.3	2.4	2.7	2.8	3.1	3.4	3.8	4.3	5.0
-10	-	-	3.3	3.7	4.3	4.8	5.2	5.8	6.5	7.5
-20	-	-	-	-	-	7.8	8.3	9.0	11.0	13.0
-30	-	-	-	-	-	-	-	15.0	18.0	24.0
-40	-	-	-	-	-	-	-	-	35.0	52.0
-50	-	-	-	-	-	-	-	-	-	130.0

Prandtl numbers of REINHARTIN®/water mixtures

as a function of temperature and concentration

T [°C]	19.5 vol. %	26.0 vol. %	32.5 vol. %	39.4 vol. %	46.5 vol. %	53.5 vol. %	61.0 vol. %	68.3 vol. %	75.8 vol. %	83.3 vol. %
20	7.81	8.24	9.90	9.99	10.04	10.98	12.40	13.81	15.15	17.49
10	9.49	11.01	12.00	12.42	12.64	14.13	15.52	16.89	18.73	22.17
0	14.25	15.19	15.45	17.10	17.18	18.64	19.97	21.82	24.24	27.61
-10	-	-	21.73	23.95	26.95	29.55	31.24	34.14	37.48	42.28
-20	-	-	-	-	-	49.22	51.12	54.05	64.46	74.87
-30	-	-	-	-	-	-	-	91.91	108.08	141.05
-40	-	-	-	-	-	-	-	-	214.08	311.44
-50	-	-	-	-	-	-	-	-	-	790.45

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.



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