VIN-FP-114/010

TEMPER®

Non-contractual photo.

TEMPER® is a ready-to-use heat transfer fluid based on Potassium acetate and potassium formate in a water solution. It is non-toxic and non-polluting and contains innovative corrosion inhibitors to protect the system.

TEMPER® may be used as heat transfer fluid in both static and mobile installations.

At low temperatures, it is an advantageous alternative to glycol mixtures in indirect systems (secondary circuits).

It may be used in various applications for refrigeration, freezing, the food industry, large distribution (supermarkets), ice rinks, artificial snow slopes, pharmaceutical industry and shipping.

It may also be used as a heat transfer fluid at higher temperature in air conditioning systems, heating pumps, solar or heat recovery installations.

TEMPER® is a ready-to-use solution and should not be diluted.

Colourless liquid (lightly yellowish), **TEMPER®** contains neither amines nor nitrates.

Available in 7 versions (mixtures) where the description indicates the freezing point:

TEMPER® –10 °C
TEMPER® –15 °C
TEMPER® –20 °C
TEMPER® –30 °C
TEMPER® –40 °C
TEMPER® –55 °C
TEMPER® –60 °C

At its freezing point, **TEMPER®** becomes granular, but does not lead to an increase in volume. The effect of volume variation is therefore kept to a strict minimum.

TEMPER® has increased thermal capacity and is characterised by excellent thermal conductivity in comparison with products with a propylene glycol base.

The viscosity is lower than glycols, which is advantageous for pump and pipe sizing. The investment costs for the installation and running the system are therefore lower.

TEMPER® has good biodegradable characteristics and is neither flammable or explosive.

In sealed packaging and closed systems, **TEMPER®** is stable and, in principle, its shelf life is unlimited.

The special additives present in **TEMPER®** ensure optimum corrosion protection and lubricating properties.

1.PHYSICAL PROPERTIES OF TEMPER®

1.1. Main Specifications

Specifications	TEMPER® –10	TEMPER® –15	TEMPER® –20	TEMPER® –30	TEMPER® –40	TEMPER® –55	TEMPER® –60
Appearance	Lightly yellow liquid						
Boiling point (°C)	109						
pH at 20°C	8.5 ± 0.5						
Freezing point (°C)	-10	-15	-20	-30	-40	-55	-60
Density at 20°C (kg/dm^3)	1.086	1.114	1.142	1.177	1.207	1.240	1.260
Dynamic viscosity at 20°C (mPa.s)	1.45	1.62	1.80	2.10	2.71	4.06	4.28
Kinematic viscosity at 20°C (mm^2/s)	1.33	1.45	1.58	1.78	2.25	3.27	3.40
Mass heat at 20°C (kJ/(kg.K))	3.57	3.45	3.31	3.12	3.01	2.82	2.82
Thermal conductivity at 20°C (w/(m.K))	0.54	0.53	0.51	0.49	0.47	0.44	0.44

1.2. Tables of Properties

Volume mass (kg/m^3)

TEMPER®	-10	-15	-20	-30	-40	-55	-60
Temperature (°C)	FROST ZONE						
- 60							1290
- 55						1269	1289
- 50						1268	1288
- 40					1227	1266	1286
- 30				1192	1225	1262	1282
- 20			1151	1190	1222	1259	1279
- 10	1092	1121	1149	1187	1218	1254	1274
0	1090	1119	1147	1184	1215	1250	1270
10	1088	1117	1145	1181	1211	1245	1265
20	1086	1114	1142	1177	1207	1240	1260
30	1084	1112	1139	1174	1203	1235	1255

* library data

Mass Heat (kJ/(kg.K))

TEMPER®	-10	-15	-20	-30	-40	-55	-60
Temperature (°C)	FROST ZONE						
- 60							2.54
- 55						2.61	2.57
- 50						2.62	2.60
- 40					2.83	2.63	2.63
- 30				2.96	2.88	2.65	2.66
- 20			3.20	3.00	2.92	2.68	2.68
- 10	3.52	3.37	3.23	3.04	2.95	2.71	2.71
0	3.54	3.40	3.26	3.08	2.98	2.75	2.74
10	3.56	3.43	3.29	3.10	3.00	2.78	2.78
20	3.58	3.45	3.32	3.12	3.01	2.82	2.82
30	3.59	3.46	3.34	3.14	3.01	2.85	2.85

* library data

Kinematic Viscosity (cSt)

TEMPER®	-10	-15	-20	-30	-40	-55	-60
Temperature (°C)	FROST ZONE						
- 60							208.86
- 55						112.67	128.89
- 50						74.23	83.46
- 40					52.00	36.13	39.56
- 30				19.60	20.00	19.95	21.45
- 20			8.32	8.51	9.99	12.18	12.93
- 10	4.38	4.06	4.32	4.80	5.96	8.06	8.48
0	2.58	2.57	2.77	3.18	4.01	5.69	5.95
10	1.79	1.86	2.01	2.34	2.94	4.23	4.40
20	1.37	1.45	1.57	1.84	2.29	3.27	3.40
30	1.10	1.20	1.30	1.52	1.86	2.62	2.71

* library data

Dynamic Viscosity (mPa.s)

TEMPER®	-10	-15	-20	-30	-40	-55	-60
Température (°C)	FROST ZONE						
- 60							269.36
- 55						142.95	166.14
- 50						94.11	107.50
- 40					63.80	45.72	50.86
- 30				23.40	24.50	25.18	27.50
- 20			9.58	10.10	12.20	15.33	16.53
- 10	4.78	4.55	4.97	5.69	7.26	10.11	10.81
0	2.81	2.88	3.17	3.77	4.88	7.11	7.55
10	1.95	2.07	2.30	2.76	3.56	5.26	5.56
20	1.48	1.62	1.79	2.17	2.76	4.06	4.28
30	1.20	1.33	1.48	1.79	2.23	3.24	3.40

* library data

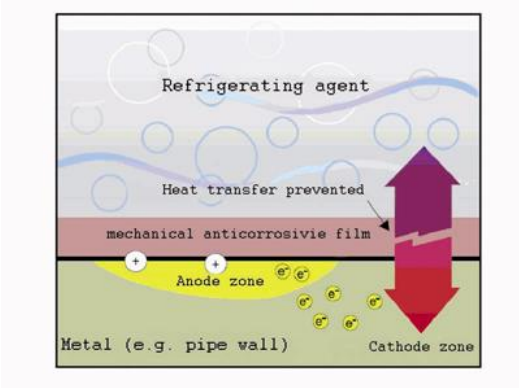
Thermal Conductivity (W/(m.K))

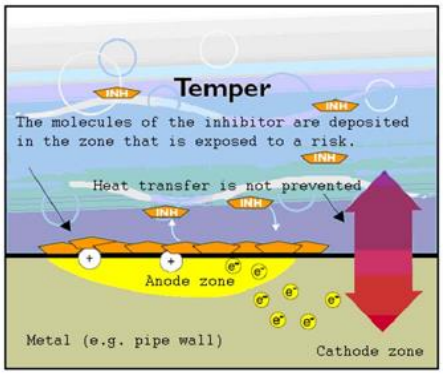
TEMPER®	-10	-15	-20	-30	-40	-55	-60
Temperature (°C)	FROST ZONE						
- 60							0.38
- 55						0.37	0.38
- 50						0.38	0.38
- 40					0.40	0.39	0.39
- 30				0.42	0.41	0.40	0.40
- 20			0.45	0.44	0.42	0.41	0.41
- 10	0.50	0.48	0.47	0.45	0.43	0.41	0.42
0	0.51	0.50	0.48	0.46	0.44	0.42	0.42
10	0.53	0.51	0.49	0.47	0.45	0.43	0.43
20	0.54	0.53	0.51	0.49	0.47	0.44	0.44
30	0.56	0.54	0.52	0.50	0.48	0.45	0.45

* library data

1.3. Corrosion protection of TEMPER®

Galvanic corrosion arises because of differences of electric potential between metals in the circuit. The traditional heat transfer fluid corrosion inhibitors form a uniform mechanical film on the inside of all components which provides protection against corrosion (figure 1).





Temper® contains special corrosion inhibitors which do not form a general protective film, but act only where there are differences in electrical potential.

The molecules of the inhibitors are only deposited in the areas where there is a risk of corrosion, and form an extremely thin layer which makes practically no difference to the thermal transfer.

For this reason the corrosion inhibitors of Temper® do not tend to wear out.

Once the corrosion risk is blocked and compensated, the molecules of the inhibitors are free in the Temper® and can once again be deposited in other places where there is a difference in electricity potential (see figure 2).

2. RECOMMENDATIONS FOR USE AND APPLYING TEMPER®

2.1. Cleaning the installation and application

It is strongly recommended to clean the installation thoroughly before filling with **Temper®.**

If there are deposits, and especially of metal oxides, we recommend cleaning with Dispersant D.

It should be done in the following manner:

- circulate water in the system for 1 to 2 hours, then drain the installation quickly and fully to the lowest point.

- prepare and add "Dispersant D*" solution at 20 g/litre of water in the installation

- let the product circulate for at least 2 hours and then drain the installation quickly to the lowest point;

- carefully and adequately rinse with water until it is clear and the pH is approximately 7 (± 0.5).

- The system must then be dried quickly (by emptying or with nitrogen) and then filled from the lowest point.

Depending on the state of the circuit, it may be necessary to clean several times.

It is important to drain and carefully rinse with water after every time it has been cleaned.

Please note: If there are deposits on the installation and it is seriously oxidised with scale, it is advisable to first treat the circulation with a solution of "Desoxydant P*" at approximately 100 g/l of water at 50°C for 2 hours.

After it has been emptied, follow the treatment with "Dispersant D*" in the abovementioned manner.

In principle, a current installation containing other heat transfer fluids may be switched to **Temper®**.

One generally achieves a net power increase, thanks to the improved properties of the Temper® thermal transfer.

Before changing to **Temper®**, it is essential to check the compatibility of the pumps, valves, materials and accessories of the installation and change where necessary.

The system must then be treated with a cleaning product strong enough to eliminate the old corrosion inhibitors and then flushed with neutral pH distilled water.

The sieves and filters (recommended mesh 0.6-0.8 mm) must be cleaned/replaced.

Temper® may then be put into the installation to be used again.

2.2. Principles of use

Temper® should only be used in sealed systems under pressure.

If it is used in an open system, evaporation will lead to a change of the composition/concentration of Temper®, which will lead to the solution thickening, as well as crystallisation and oxidisation of metal parts.

An air purger system must be installed in the system.

Materials / Valves

Commonly used materials, such as copper, brass, stainless steel, cast iron and plastic materials, (ABS, PE) approved for the planned temperatures, may be used with **Temper®**.

It must not be used with galvanised steel, zinc or metal with soft solder.

Filters

Use filters with mesh of 0.6 to 0.8 mm for optimum filtration.

Pumps

Inform the pump manufacturer that you have chosen **Temper®** as the heat transfer fluid. Choose the approved materials for the seals and pump housing.

If there is a leak of **Temper®** on the seals, it is essential to clean the surfaces on which the **Temper®** has been spilt with water as quickly as possible and to remove all traces of it.

It is possible to use pumps without seals.

Seal materials /gaskets

On flange connections, it is advisable to use EPDM rubber that can withstand the temperatures of the application.

On traditional threaded connections, it is possible to use a paste called Uni-Pack or Locher type. Please ask your supplier for more details.

Fibre joints or gaskets, hemp joints, Teflon and Viton may not be used with **Temper®**.

Isolation

It is advisable not to insulate flanges and connections to be able to control possible leaks linked to metal expansion.

**** The data stated in paragraph 1 of this document are merely indicative and do not constitute a sales specification.***