Coolex® N

Heat transfer fluid based on monoethylene glycol (MEG), offering protection against frost and corrosion in technical systems.

Brief description

- Red colored
- Corrosion inhibitor/antifreeze concentrate to be diluted with water
- Permanent usage temperature: approx. -35 to +150 °C
- Nitrite-, nitrate-, amine-, silicate-, borate-, phosphate- and heavy metal free
- Minimum usage concentration 20 % v/v
- Free of CMR substances (cancerogene, mutagene, reprotoxic), e.g. borate
- Water hazard class: WGK 1 (slightly water polluting)
- Readily biodegradable and environmentally friendly
- Long-living product (OAT product; organic acid technology)
- Not suitable for food-related and pharmaceutical applications (→ Coolex® L)
- Non-regulated according to ADR/GGVE/GGVSEB

Product description

Coolex® N is a red colored corrosion inhibitor and antifreeze concentrate based on monoethylene glycol. It protects the circuits in technical systems – even in mixed installations – against frost and corrosion. The heat transfer fluid is formulated free of CMR substances as well as nitrite, nitrate, amine, silicate, borate and phosphate. Additionally, it prevents the circuit from scaling.

Coolex® N is universally applicable in many installations such as:

- Heating and cooling systems
- Warm water heating circuits
- Heat pumps
- Geothermal systems
- Heat recovery systems
- Air conditioning

  etc.

Coolex® N is not applicable as a car coolant.

The corrosion inhibitors in Coolex® N protect the whole heating or cooling circuit sustainably from corrosion.

Coolex® N must always be mixed homogeneously with water (see also at *frost protection* and *usage notes*).

Physical parameters

Parameter	Unit	Value	Standard
Density (20 °C)	g/cm³	approx. 1.112	DIN 51757
Refractive index nD_{20}	---	approx. 1.431	DIN 51423
pH value, 1:2 in water	---	approx. 8.0	DIN 51369
Reserve alkalinity	ml 0.1 M HCl	approx. 4.5	ASTM D 1121
Boiling point (1,013 mbar)	°C	approx. 160	ASTM D 1120
Kinematic viscosity (20 °C)	mm²/s	approx. 22.7	DIN 51562-1
Specific heat (20 °C)	kJ/(kg*K)	approx. 2.40	--- (calculated)
Thermal conductivity (20 °C)	W/(m*K)	approx. 0.29	--- (calculated)
Specific electrical conductivity (25 °C), 1:2 in water	µS/cm	approx. 2,350	DIN EN 27888

Corrosion protection

The inhibitor system in Coolex® N protects all common used metals in technical systems effectively and sustainably from corrosion.
The following table shows the corrosion performance (**weight loss in g/m²**) according to ASTM D 1384[1].

Material	Coolex® N 20 % v/v	Coolex® N 33 % v/v	Pure MEG[2] without inhibitors 33 % v/v	ASTM limit[3] at 33 % v/v
Copper	-0.2	-0.2	-2.6	-3.6
Soft solder	-0.4	-0.1	-143	-10.9
Brass	-0.4	-0.3	-7.2	-3.6
Steel	-0.5	-0.2	-158	-3.6
Cast iron	±0	±0	-285	-3.3
Cast aluminium	-1.6	-0.6	-19	-10.0

[1] Modified ASTM D 1384 test: Instead of using the standard ASTM concentration of 33 % v/v, the usage concentration was reduced to a minimum of 20 % v/v. The reduced concentration intensifies the standard significantly.
The analyses were executed by an independent, certified and accredited laboratory.
The abbreviation „ASTM“ stands for „American Society for Testing and Materials“.

[2] For comparison.

[3] The limits for the maximum acceptable weight changes are given according to the standard ASTM D 3306.

Frost protection and general usage notes

Basically, Coolex® N can be diluted with water in any concentration. Though, the minimum usage concentration of 20 % v/v must not be lowered. The desired frost protection can be adjusted by means of the following table.
Coolex® N should be used as a mixture with water only. The minimum usage concentration of Coolex® N is 20 % v/v. This concentration represents a frost protection (= crystallization point) of approx. -9 °C.

Usage concentrations and frost protection:

Coolex® N/water mixture	Concentration of Coolex® N % m/m	Frost protection: Crystallization point (ASTM D 1177)	Frost protection: Solidifying point (DIN ISO 3016)	Density [g/cm³]
20 % v/v	21.78	approx. -9 °C	approx. -12 °C	approx. 1.027
25 % v/v	27,10	approx. -12 °C	approx. -16 °C	approx. 1.035
27 % v/v	29.18	approx. -14 °C	approx. -18 °C	approx. 1.038
30 % v/v	32.32	approx. -16 °C	approx. -20 °C	approx. 1.042
34 % v/v	36.47	approx. -19 °C	approx. -24 °C	approx. 1.047
39 % v/v	41.60	approx. -24 °C	approx. -30 °C	approx. 1.054
44 % v/v	46.68	approx. -29 °C	approx. -35 °C	approx. 1.060
50 % v/v	52.70	approx. -36 °C	approx. -43 °C	approx. 1.068

Mixtures with Coolex® N concentrations above 60 % v/v are not reasonable since the frost protection is decreasing at concentrations higher than 60 % v/v (exceeding the Eutectic Point of the mixture).

The frost resistance of Coolex® N/water mixtures can be determined with an antifreeze tester or a refractometer.
Both instruments can be obtained at Coolex Chemie GmbH – please contact us!

Application fields

Coolex® N/water mixtures are universally applicable in all common heating and cooling systems like heat pumps, air conditioning or warm water heating systems, heat recovery or geothermal systems as well as a heat transfer medium in industrial production plants.
Coolex® N is not suitable for any food-related or pharmaceutical application. Alternatively, Coolex® L is recommended.

Application notes

- Coolex® N must be always diluted with water homogeneously. Homogeneous Coolex® N/water mixtures do not seperate anymore – even after years of application.
- For diluting Coolex® N only water with a chloride concentration below 100 ppm must be used. Ideally, de-ionized water is used only.
  Factory-made Coolex® N/water mixtures are made with de-ionized water only – to offer optimal water quality.
- The minimum usage concentration of Coolex® N/water mixtures is 20 % v/v. This represents a frost resistance (crystallization point) of approx. -9 °C.
  Due to the danger of bacterial growth and microbial induced corrosion, the minimum usage concentration should not fall short.

- The frost resistances relating to each specific application can be found in the table „usage concentrations and frost protection“.
- Since Coolex® N/water mixtures are based on glycol, they show a much lower surface tension than pure water. This may lead to a dissolution of existing rust layers if an old system is topped up with the heat transfer fluid. Thus, old systems should be flushed with water until they are rust-free. In particular cases, sufficient cleaning of the old system by pickling may be necessary. Coolex® N/water mixtures should be filled only in clean systems without rust damages.
  Please note: Due to their huge surface, fine residues of rust can lead to an early waste of the corrosion inhibitors.
- Zinc-coated (galvanized) pipes should be avoided in the installation. Glycol/water mixtures dissolve the zinc surface and lead to both elemental zinc and – as a result of its reaction with glycol – zinc glycolates. This does not affect the corrosion performance of Coolex® N since the corrosion inhibitors will protect the steel surface under the zinc layer. However, zinc and/or zinc glycolates may settle at the mechanical seal of the circulating pump and damage it, which may eventually lead to a leakage. In order to get rid of the deposits, a fine filter can be installed and cleaned regularly (e.g. in a bypass). In practice a mesh size of 100 to 150 µm proved to be adequate for this application.
- Before initial filling of the heating or cooling circuit all parts of the system must be cleaned thoroughly (e.g. flushing). Rust and tinder must be removed.
- Temporarily emptied systems should be refilled as soon as possible (within a few days) in order to prevent a possible corrosion damage.
- Because Coolex® N/water mixtures have a much higher viscosity than pure water, the pressure drop in the system pipes must be taken into account. Specific data can be provided at request.
- Please note: Pure glycol/water mixtures without corrosion inhibitors should not to be used since these fluids are more corrosive than pure water.

Material compatibility

All plastics and elastomers which are compatible with Coolex® N/water mixtures are given in the following table:

Nitril rubber	NBR	Polyamide	PA (up to approx. 110 °C)[5]
Olefin rubber	EPDM	Silicone rubber	Si
Nature rubber	NR	Polypropylene	PP
Styrene butadiene rubber	SBR (up to approx. 100 °C)[5]	Fluorocarbon elastomers	FKM
Polyethylene (low and high density)	LD-PE, HD-PE	Acrylonitrile butadiene styrene	ABS
Polytetrafluoroethylene	PTFE	Polyester resins	UP
Polyvinylchloride (hard)	PVC, h	Polyacetal	POM

[4] All plastics and elastomers were tested at a temperature of +80 °C. Additionally, please consult the product informations of the manufacturers.

[5] Literature values.

Additionally, hemp and PTFE tapes are suitable for pipe thread sealing as well.

Packaging

Standardly, Coolex® N (concentrate) is available in polyethylene containers, steel drums, IBC's (Intermediate Bulk Containers) and road tankers:

Packaging	***PE container***			***PE container***	***Steel drum***	***IBC***	***Road tanker***
Packing content	***10 liters***	***20 liters***	***30 liters***	***60 liters***	***216 liters***	***1,000 liters***	***23,000 kg***
Filling weight Coolex® N (concentrate)	10 kg	20 kg	30 kg	60 kg	230 kg	1,100 kg	10,000 to 23,000 kg
	AT REQUEST						

Coolex® N/water mixtures are available in IBC's (1,000 liters) or road tankers (min. 10,000 kg).

Ecology and toxicology

Coolex® N does not contain any toxic inhibitors and has a good biodegradability. Due to its MEG base, Coolex® N is rated as „H302: Harmful if swallowed and H373: May cause kidney disease through prolonged or repeated exposure".

Additionally, the product is labeled with the pictograms  and  .
This labeling is valid even for the corresponding water mixtures.
According to VwVwS, both Coolex® N concentrate and its corresponding water mixtures are rated as WGK 1 (slightly water polluting).
For more details, please consult the corresponding safety data sheets.

Special/Miscellaneous

- **WGK**: Both the concentrate and the corresponding water mixtures of Coolex® N are classified in water hazard class 1 (slightly water polluting). Coolex® N is environmentally friendly and good biodegradable.
- **CMR free formulation**: Coolex® N does not contain any CMR substances (cancerogenic, mutagenic and reprotoxic effects).
- **RoHS**: The Coolex® N formulation does not contain any substances which are restricted according to EU Directive 2011/65/EU (lead, mercury, cadmium, chromium, chrome (VI), polybrominated biphenyl, polybrominated diphenyl ether).
- Coolex® N is a modern, long-living heat transfer fluid based on Organic Acid Technology (**OAT**) with extreme long change intervals.

- **REACH** (Registration, Evaluation, Authorization and Restriction of Chemicals): All substances in Coolex® N are registered or pre-registered according to EC Regulation No. 1907/2006.
- Coolex® N is also suitable as an additive according to **VDI 2035**.

Contact

Please call us – we would be happy to advice you!

Coolex Chemie GmbH
Münchener Str. 9a
D-85247 Schwabhausen
Tel.: +49 (0) 8138 / 69 75 45-0
Fax: +49 (0) 8138 / 69 75 45-4
info@coolex.de
www.coolex.de

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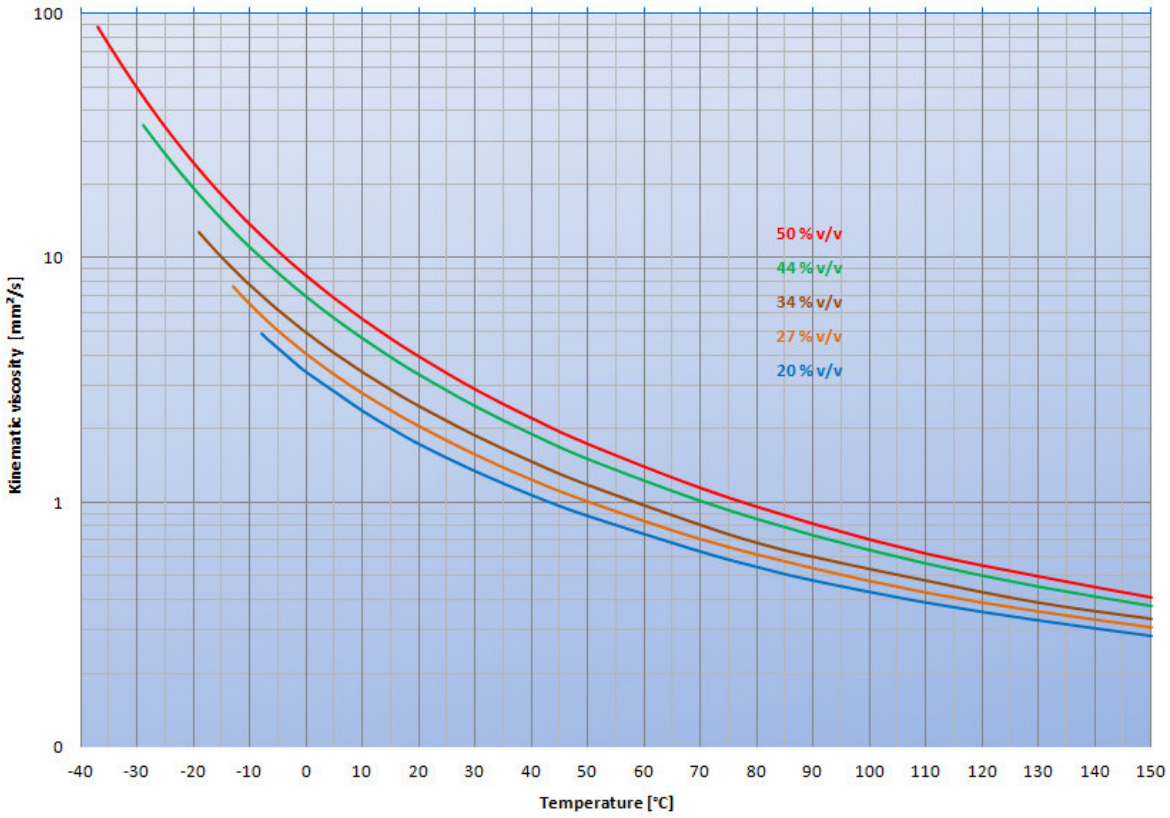
Physical data of Coolex® N

Crystallization point [°C]	Concentration [% v/v]	Concentration [% m/m]	Temperature [°C]	Density [kg/m³]	Kinematic viscosity [mm²/s]	Specific heat [kJ/(kg*K)]	Cubic expansion coefficient [*10⁻⁶/K]
-9	20	21.78	-5	1034	4.3	3.78	264
			0	1033	3.4	3.78	290
			10	1030	2.4	3.79	340
			20	1028	1.8	3.80	388
			40	1019	1.1	3.83	478
			70	1002	0.63	3.90	598
			90	988	0.49	3.95	667
-12	25	27,10	-10	1046	6.0	3.66	266
			-5	1044	4.8	3.67	292
			0	1043	3.9	3.67	316
			20	1035	2.0	3.70	409
			40	1025	1.2	3.73	495
			70	1007	0.71	3.78	610
			90	994	0.53	3.81	677
-14	27	29.18	-10	1048	6.5	3.63	277
			-5	1046	5.0	3.63	303
			0	1045	4.1	3.64	326
			20	1038	2.1	3.66	418
			40	1027	1.3	3.70	502
			70	1010	0.70	3.76	615
			90	997	0.55	3.81	681
-19	34	36.47	-15	1063	10.0	3.48	310
			-10	1061	7.8	3.48	332
			-5	1059	6.1	3.49	353
			0	1056	4.9	3.50	375
			10	1052	3.5	3.51	417
			20	1047	2.5	3.53	458
			40	1037	1.5	3.56	534
			70	1019	0.81	3.63	636
			90	1005	0.60	3.68	695
-29	44	46.68	-25	1082	27.3	3.28	335
			-15	1078	15.0	3.29	373
			-5	1073	8.6	3.31	411
			0	1070	7.0	3.32	431
			10	1065	4.8	3.33	466
			20	1060	3.4	3.35	501
			40	1048	1.9	3.39	568
			70	1029	1.0	3.45	659
			90	1016	0.73	3.50	712
-36	50	52.70	-35	1097	74.5	3.15	328
			-25	1092	34.4	3.17	367
			-15	1087	18.6	3.18	404
			-5	1082	10.9	3.20	439
			0	1079	8.5	3.20	456
			10	1074	5.8	3.22	490
			20	1067	4.0	3.24	523
			40	1056	2.2	3.27	585
			70	1037	1.2	3.33	669
			90	1023	0.83	3.38	720

All values given in the table above are calculated with mathematical formulas which base on experimental data (can be provided on request). Small deviations from the real values are unavoidable.

Coolex® N: Kinematic viscosity [mm²/s]



Coolex® N: Frost protection (crystallization point / solidifying point) [°C]