

Technical Information

Premium coolant for battery systems in electric vehicles



FROSTOX[®] LC100

HAERTOL
Chemie GmbH 

Characteristics of FROSTOX® LC100

FROSTOX® Low Conductivity 100 (LC100)

has been developed especially for the use with batteries and battery systems such as electric vehicles. It must not be used as engine coolant in conventional combustion engines. Conventional engine coolants having a very high electrical conductivity which may cause problems in applications utilizing batteries.

FROSTOX® LC100

through its selected inhibitors exhibits a very low, long-term stable electrical conductivity. This assures safe operation of the electrified power unit. FROSTOX® LC100 offers a safe freeze protection down to -36°C and good heat dissipation. Components currently used in the construction of electrified cooling systems are well protected against corrosion.

FROSTOX® LC100

is ready to use and does not need any further make up with water. It contains 50% vol ethylene glycol. Further dilution with distilled or demineralized water is possible provided that the electrical conductivity of the water does not exceed 2 µS/cm at 25 °C. However, by addition of water corrosion protection decreases. The amount of water used should be less than 10%. Addition of extra ethylene glycol slightly improves the frost protection but impairs the corrosion protection as well.

Temperature (°C)	Density (kg/m ³)	Viscosity (cP, Centipose)	Thermal Conductivity W/(m·k)	Heat Capacity/ Specific Heat (kJ/kg·C)	Relative Volume (V[T]/V[20°C])	Vapor Pressure (kPa)
-35	1097	72.86	0.406	3.30	0.977	0.022
-30	1096	45.28	0.408	3.32	0.979	0.036
-25	1094	31.06	0.409	3.33	0.981	0.059
-20	1092	23.40	0.410	3.35	0.982	0.092
-15	1090	17.06	0.412	3.36	0.984	0.142
-10	1088	13.01	0.413	3.38	0.986	0.214
-5	1086	10.07	0.414	3.39	0.988	0.318
5	1081	6.32	0.415	3.43	0.992	0.664
10	1078	5.24	0.416	3.44	0.995	0.939
15	1076	4.27	0.416	3.46	0.997	1.308
20	1072	3.59	0.417	3.47	1.000	1.799
25	1069	3.09	0.417	3.49	1.003	2.443
30	1066	2.70	0.417	3.50	1.006	3.278
35	1063	2.37	0.417	3.52	1.008	4.351
40	1061	2.09	0.417	3.53	1.011	5.715
45	1058	1.85	0.417	3.55	1.014	7.432
50	1055	1.64	0.416	3.56	1.017	9.574
55	1051	1.47	0.416	3.58	1.020	12.225
60	1048	1.32	0.416	3.59	1.023	15.478
65	1045	1.19	0.415	3.61	1.026	19.442
70	1042	1.09	0.414	3.62	1.029	24.234
75	1038	1.00	0.413	3.64	1.033	29.991
80	1035	0.93	0.412	3.66	1.036	36.861
85	1031	0.87	0.411	3.67	1.040	45.009
90	1028	0.81	0.410	3.69	1.044	54.616
95	1024	0.76	0.409	3.70	1.048	65.879
100	1019	0.72	0.407	3.72	1.052	79.015
105	1014	0.68	0.406	3.73	1.057	94.256

FROSTOX® LC100: Major Characteristics

Characteristics	Specifications	Typicals	Method
Chloride	25 PPM, max.	<10	ASTM D3634
Silicon	50–100	90	–
Specific gravity, 60/60° F	1.067–1.073	1.070	ASTM D1122
Freezing point, undiluted	–34 °F/–36 °C	–34 °F/–36 °C	ASTM D1177
Boiling point, undiluted	226 °F/108 °C	226 °F/108 °C	ASTM D1120
Effect on engine or vehicle finish	No Effect	No Effect	–
Ash content, mass %	5 maximum	<1	ASTM D1119
pH, 50% V/V	8.0–9.0	8.5	ASTM D1287
Reserve Alkalinity, mL	1–4	2	ASTM D1125
Conductivity 50% V/V, $\mu\text{S}/\text{cm}$ @25°C	100 maximum	90	ASTM D1123
Water mass %	47–52	50	–
Color	clear	clear	–
Effect on nonmetals	No Adverse Effect	No Adverse Effect	–
Storage stability	–	1 year	ASTM D1881
Foaming	70 ml vol., max., 3 sec. Break, max.	20 ml, nach 1 Sec.	ASTM D1881

FROSTOX® LC100: Typical Corrosion Test Results

Glassware Corrosion Test	Weight Loss Mg/Specimen		ASTM-Method
	Spec.	Actual	
Copper	10	–2	D1384*
Brass	10	2	
Aluminum	30	–2	
Solder	30	1	
Copper	±5	1	GB 29743.2-20XX
Brass	±5	0	
Steel	±5	1	
Cast Aluminum	±5	–3	
Aluminum 3003	±5	–1	
Aluminum 4043	±5	–2	
Aluminum 6063	±5	–1	

Hot Surface Corrosion	mg/cm ² /wk		
Specimen weight loss	1.0	0	D4340*
Specimen weight loss	1.0	0	GB 29743.2-20XX

*Fluid tested not modified with corrosive water as ASTM method suggested.

FROSTOX® LC100 operates at temperatures between -30°C and 90°C. Stability of the fluid is confirmed in the temperature range without any sediment, haze or other negative changes. Please be aware that stability of the electrical conductivity depends on the materials used in the low conductivity cooling system and should be individually checked.

FROSTOX® LC100 – Miscibility

Mixing, even in small amounts with conventional coolant/antifreeze or other ion-containing fluids disables this low conductivity coolant. Scrupulous cleanliness is indispensable to maintain the quality of the coolant. Close containers with FROSTOX® LC100 tightly after usage.

FROSTOX® LC100 – Electrical Conductivity

In contrast to deionized water (DI-water) FROSTOX® LC100 protects the system from frost. The electrical conductivity of FROSTOX® LC100 - compared to conventional coolant mixtures – stays low, hence secures the electrical safety of the system and avoids loss of energy.

FROSTOX® LC100 – Material Compatibility

As the development of low conductivity systems is rather innovative, the compatibility of the coolant with construction materials must be tested for the individual application.

The following types of construction materials have been tested with FROSTOX® LC100 product.

Compatible: Stainless steel, titanium, aluminum, copper, brass, graphite, PTFE, PE

Not compatible: Zinc, galvanized steel, cast iron, carbon steel.

Consider that compatible polymeric materials and elastomers often contain considerable amounts of fillers and adjuvants, which might impact the electrical conductivity of the coolant. Examples are EPDM, PVC, PA 66, silicone rubber, Viton, etc.

FROSTOX® LC100 – Quality Control

The above-listed data represent average values at the time when going to press of this Technical Information. They are intended as guide to facilitate handling and cannot be regarded as specified data. Specified product data are issued as a separate product specification.

FROSTOX® LC100 – Storage Stability

FROSTOX® LC100 may be stored in unopened, air-tight containers at a temperature of 30°C max. for 1 (one) year. After that, the applicability should be tested by measuring electrical conductivity and pH.

