

Freecor® LPC

1 Description

In today's combustion engines, the engine and cooling system needs protection. Therefore, the engine coolant needs to provide freezing and boiling protection, be compatible with commonly used metals and elastomers while providing efficient heat transfer.

Freecor® LPC is an ethylene glycol based coolant containing cutting-edge phosphate-inhibitor technology backed by a robust organic backbone (*P-OAT* "Phosphated Organic Additive Technology").

Exempt from potentially harmful additives such as nitrites, borates and amines, the coolant also contributes to a safer environment. **Freecor® LPC** is free of silicates, which excludes any possible issues caused by instable silicate gel or silicate drop-out.

Freecor® LPC is an all-round coolant that exceeds the industry standards **JIS K 2234-2018**, **ASTM D3306** and **ASTM D6210**, and is suitable for use in Japanese and Korean vehicles.

2 Benefits

Freecor® LPC offers many benefits to the engine designer as well as to the end-user:

- | | |
|--|---|
| ▪ Long life coolant | by a synergistic combination of virtually —non-depleting organic corrosion inhibitors |
| ▪ Excellent hard water stability | a unique matrix of hard water stabilisers & sequestrants |
| ▪ Premium cavitation protection | thanks to synergy of P-OAT inhibitor technology |
| ▪ Excellent compatibility with CAB* brazed material | unique inhibitor package neutralising the negative effects from flux residues |
| ▪ Reduces repairs | to thermostat, radiator and water pump |
| ▪ Environmentally friendly | long-life OAT technology |
| ▪ Time & cost savings | maintenance free coolant |
| ▪ Reliability | depletion-free and stable inhibitors |
| ▪ Superior heat transfer | absence of silicates |
| ▪ Suitable for mixed fleets | fit for automotive and heavy-duty application |

Based on a *Phosphated Organic Additive Technology* (P-OAT), **Freecor® LPC** provides corrosion protection for all engine cooling system metals, including aluminium and ferrous alloys at all stages of their life-cycle. **Freecor® LPC** successfully passes the industry standards ASTM D3306, ASTM D6210 and JIS K2234. The high temperature stability combined with flux passivation properties makes this coolant an excellent and future proof choice for today's and tomorrow's engine cooling systems.

* CAB: *Controlled Atmosphere Brazing*

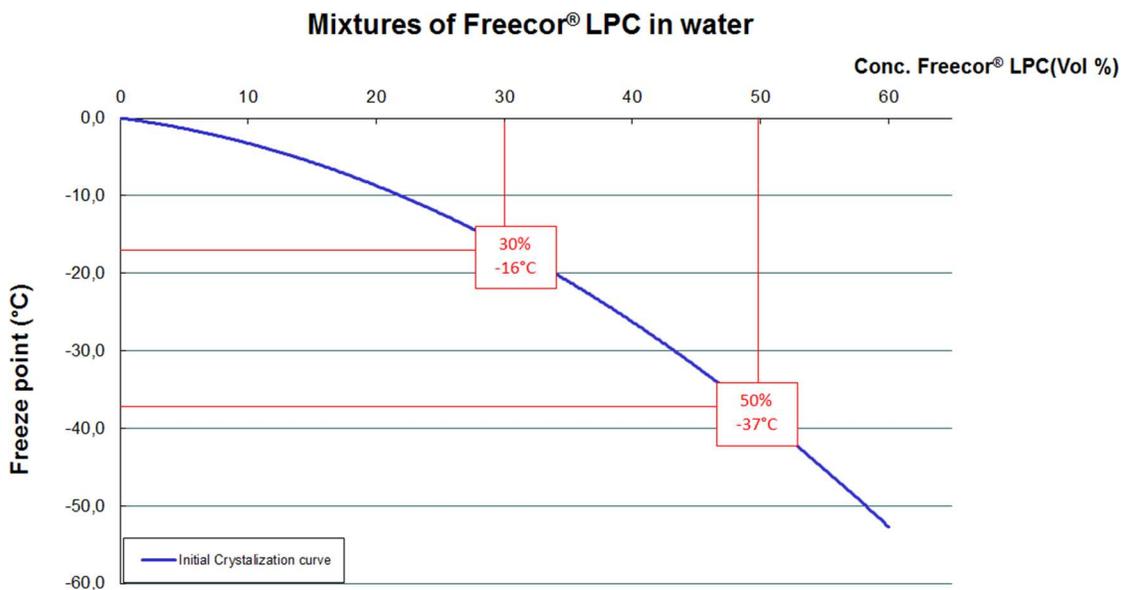
Freecor[®] LPC

3 Application

Freecor[®] LPC provides year-round frost and corrosion protection. It is recommended to use at least 30 vol. % of the antifreeze in the final coolant solution. This provides a freeze point of -16°C. Typical mixtures in Northern Europe are 50/50, offering a freeze point down to -37°C. Concentrations higher than 70 vol.% are not recommended as the maximum frost

protection is reached. **Freecor[®] LPC** may be used with confidence in engines manufactured from cast iron, aluminium or combinations of the two metals, and in cooling systems made of aluminium or copper alloys.

Freecor[®] LPC is particularly recommended for use for Asian OEM's, in line with their basic chemistry requirements.



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4 Compatibility and mixability

Freecor® LPC is compatible with most other coolants based on ethylene glycol. Exclusive use of **Freecor® LPC** is however recommended for optimum performance.

As for any coolant, we recommend the use of deionised or distilled water to prepare the

ready-to-use dilutions for optimal performance and controlled quality.

We refer to our product information leaflet on water quality recommendations. Contact your local area sales manager for more information.

5 Proof of performance & Standards

Freecor® LPC fully complies with following standards:

- JIS K 2234
- ASTM D3306
- ASTM D6210

6 Availability

Freecor® LPC is available in bulk. Please contact your local Artec area sales manager on availability of packages, dilutions and colours.

7 Storage requirements & Product handling

The product should be stored above -20°C and preferably at ambient temperatures. Periods of exposure to temperatures above 35°C should be minimized.

Further it is strongly advised not to expose the coolant in translucent packages to direct sunlight because this can result in fading of the colour or discoloration over time. This reaction can be accelerated if coupled with high ambient temperatures. It is therefore advisable to store the coolant indoors to avoid this issue.

Freecor® LPC can be stored for minimum 3 years in unopened containers without any effect on the product quality or performance. It is strongly recommended to use new and not recycled containers.

As with any antifreeze coolant, the use of galvanized steel is not recommended for pipes or any other part of the storage/blending installation.

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8 Toxicity & safety

For Toxicity and Safety Data we refer to the Safety Data Sheet. The information and advice given should be observed and due attention should be given to the precautions

necessary for handling chemicals. This product should not be used to protect the inside of drinking water systems against freezing. The transport is not regulated.

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Addendum - technical information

Chemical and physical properties
Freecor® LPC

	Freecor® LPC	ASTM D3306 requirements	method
ethylene glycol, % w/w	92 % min	base	
other glycols, % w/w	1 % max.	5 % max.	
inhibitor content, % w/w	4 % typ.		
water content, % w/w	3.7 % max.	5 % max	ASTM D1123
ash content, % w/w	1.5 % typ.	5 % max	ASTM D1119
nitrite, amine, borate, silicate	nil		
colour	coloured or uncoloured		
specific gravity, 15°C	1.124 typ.	1.110 to 1.145	ASTM D5931
density, 20°C, kg/l	1.119 typ.		ASTM D1122
equilibrium boiling point, °C	178 typ.	> 163	ASTM D1120
reserve alkalinity (pH 5.5)	8.9 typ.	report	ASTM D1121
pH, 20°C	8.3 typ.		ASTM D1287
refractive Index, 20°C	1.437 typ.		ASTM D1218

Chemical and physical properties
dilutions

	50 % dilution	40 % dilution	30 % dilution	ASTM D3306	Method
pH	7.9	7.8	7.8	7.5 – 11.0	ASTM D1287
foaming properties at RT					
• Volume , ml	< 100		< 100		CEC C-10-X-97
• break time, s	< 15		< 15		
initial crystallization, °C	< -36.5	< -24.0	< -15.0	< -36.4	ASTM D1177
Density, 20°C, kg/l	1.071 typ.	1.058 typ.	1.044 typ.		ASTM D5931
equilibrium boiling point, °C	113 typ.	110 typ.	108 typ.		ASTM D1120
staining characteristics	no effect			no effect	ASTM D 1882
hard water stability	no precipitate		no precipitate		GFC L-106-A-90

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ASTM D1384 glassware corrosion test

	Weight loss in mg/coupon ¹					
	Brass	Copper	Solder	Steel	Cast Iron	Aluminium
ASTM D3306 (max)	10	10	30	10	10	30
Freecor® LPC	0	1	1	1	1	2

¹ Weight loss AFTER chemical cleaning acc. to ASTM procedure. Weight gain is indicated by a - sign.

ASTM D4340 Aluminium heat rejection test

	Weight loss in mg/cm ² /week ¹
ASTM D3306 (max)	1.0
Freecor® LPC	-0.1

¹ Weight loss or gain AFTER chemical cleaning acc. to ASTM procedure. Weight gain is indicated by a – sign

Dynamic corrosion test CEC-C23-T-99 (cast iron 1400W/aluminium 1000W, 20vol%, 72Hrs)

	weight change in mg/coupon		
	Cast iron	Aluminium	
		before chemical treatment	after chemical treatment
Freecor® LPC	2	-3	-11

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JIS K2234-2018 Circulating Corrosion Properties, (30v%, 88°C, 1000 hours)

	Weight change in mg/cm ²					
	Brass	Copper	Solder	Steel	Cast Iron	Aluminium
JIS K2234-2018	±0.30	±0.30	±0.60	±0.30	±0.30	±0.60
Freecor® LPC	0.04	0.02	-0.16	-0.09	-0.11	-0.04

	pH	
	after test	change
JIS K2234-2018	6.5 to 11	+/- 1.0
Freecor® LPC	8.1	0.1