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# Havoline® XLI

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## 1 Description

**Havoline® XLI (Havoline® Extended Life Corrosion Inhibitor)** is an environmentally friendly inhibitor concentrate. Based on patented carboxylate additive technology, **Havoline® XLI** provides long-life corrosion protection in aqueous solutions for all engine metals, including aluminium, iron, copper and solder alloys.

Mixed with the appropriate amount of water, **Havoline® XLI** is recommended as a coolant,

flushing fluid or hot test fluid for engine blocks and all cooling systems. During extensive field testing, the synergistic combination of mono- and di-carboxylic additives has proven to provide superior protection for at least **32,000 hours** in marine and stationary applications. The product is compatible with glycol-based engine coolants. It is recommended to change the coolant every five years or when above operating times are reached, whichever comes first.

## 2 Benefits

**Havoline® XLI** offers a lot of benefits to the engine designer as well as to the user:

- **Extended & superior corrosion protection** by synergistic combination of additives
- **Superior technology** provides more flexibility to engine design
- **Excellent protection** of thermostat, radiator and water pump
- **Reliability** depletion free and stable inhibitor
- **Improved hard water stability** absence of silicates and phosphates
- **Save time and money** maintenance-free inhibitor
- **Environmentally friendly** by using carboxylic additives in the inhibitor package

**Havoline® XLI** provides long-life protection against all forms of *corrosion* by using optimised and patented organic corrosion inhibitors. Excellent and lasting high temperature corrosion protection is provided for the **aluminium** heat transfer surfaces

contained in modern engines. The inhibitor package of **Havoline® XLI** offers excellent cavitation protection even without using nitrite or nitrite-based supplemental coolant additives (SCA's).

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## 3 Application

**Havoline® XLI** provides long-life corrosion protection. Depending on the actual application the dosage may vary from 5 - 10 % but a minimum of 5 vol. % of **Havoline® XLI** in water should be used. **Havoline® XLI** 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. The correct dosage of **Havoline® XLI** is being checked with a refractometer. Please contact your local Arteco Area Sales Manager for more information.

**Havoline® XLI** is particularly recommended for hi-tech engines like racing cars and heavy duty off-road equipment, where high temperature aluminium protection is important.

- In **marine** application the concentration of **Havoline® XLI** should not be lower than 5 vol.% At this dosage the recommended life-time is at least 32,000 hours. When **Havoline® XLI** is replenished regularly to compensate for leakage, the cooling water can be considered as fill for life.
- Small marine engines sometimes require limited frost protection. This can be obtained by using the adequate dosage of **Havoline® XLC (Havoline® Extended Life Coolant)**, based on ethylene glycol, supplemented with 5 vol.% **Havoline® XLI**. For frost protections of -10 and -15°C, the required **Havoline® XLC** dosages are respectively 22 and 29 vol.%
- For **off-road, truck and bus** application the recommended life time is 8,000 hours or 650,000 km, provided a concentration of 7.5 vol.% **Havoline® XLI** is used.
- At 7.5 vol.%, **Havoline® XLI** will provide outstanding corrosion protection in **stationary** engines for at least 32,000 hours.
- **Havoline® XLI** can also be used at 10 vol.% as a **hot test liquid** for new engine blocks. Newly manufactured engines are tested for duration of approximately 5 to 10 minutes, after which the fluid is drained and usually reused. If the engine blocks are not immediately built into vehicles, **Havoline® XLI** will provide corrosion protection of the empty engine for up to two months.
- At 5 vol.% **Havoline® XLI** performs as a **flushing fluid** to clean cooling systems that were filled with other inhibitor packages. In most cases it is required to flush the system twice. For a good result it is important that the engine has reached normal operating temperatures and all thermo-valves are opened.
- **Havoline® XLI** can also be applied as an inhibitor package for central heating systems, hydraulic safety fluids and mining fluids.

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## 4 Compatibility and mixability

For optimal performance and controlled quality, we recommend the use of deionised or distilled water to prepare the ready-to-use dilutions although lab testing has shown that acceptable corrosion results are still obtained with water of 20°dH, containing up to 500 ppm chlorides or 500 ppm sulfates. The

water used for dilution should be free of zinc as presence of zinc will result in the formation of a precipitate. We refer to our information leaflet on water quality recommendations. Contact your local Area Sales Manager for more information.

## 5 Approvals by OEMs & National Authorities

**Havoline® XLI** has been approved by several engine manufactures and an up-to-date list with approvals is available upon request. Even though a formal approval has not been

obtained from some OEMs, **Havoline® XLI** is suitable for use in the applications as described in chapter 3.

## 6 Availability

**Havoline® XLI** is available in bulk and various packages. Please contact your local Artec Area Sales Manager on availability of packages, dilutions and colours.

In the range of organic additive technology Artec can offer:

- **Havoline® XLC (Havoline® Extended Life Antifreeze Coolant)** is the MEG-based coolant concentrate
- **Havoline® XLB (Havoline® Extended Life Antifreeze Base)** is a MEG-based superconcentrate. **Havoline® XLC** is obtained by mixing 25 % wt of **Havoline® XLB** with 75 % MEG

Separate information leaflets with more details are available for these different products.

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## 7 Storage Requirements

The product should be stored above -5°C and preferably at ambient temperatures. Periods of exposure to temperatures above 35°C should be minimized.

Further, it is strongly advised to use new dark containers and not recycled ones. Exposure to direct sunlight might cause discoloration,

although the product itself and the properties remain stable.

**Havoline® XLI** can be stored for minimum 5 years in unopened containers without any effect on the product quality or performance. As with any antifreeze coolant, the use of galvanised steel is not recommended for pipes or any other part of the storage/mixing installation.

## 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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## Havoline® XLI

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### Addendum - Technical information

Chemical and physical properties

	Havoline® XLI	method
Inhibitor content	32 % w/w	
Water content	68 % w/w	ASTM D1123
Nitrite, amine, phosphate, borate, silicate	nil	
Colour	Uncoloured	
Specific gravity, 20°C	1.058 typ.	ASTM D1122
pH	9.4 typ.	ASTM D1287
Cloud point	- 15°C typ.	
	5% dilution	method
pH	8.1 typ.	ASTM D1287
Effect on non-metals	no effect	GME 60 255
Hard water stability	no precipitate	VW PV 1426

# Havoline® XLI

## Modified ASTM D1384 glassware corrosion tests – 300ppm chloride

	Weight loss in mg/coupon <sup>1</sup>						
	Brass	Copper	Solder	Steel	Cast Iron	Aluminium	AlMn
ASTM D3306 (max)	10	10	30	10	10	30	-
<b>5% Havoline® XLI</b>	0.6	0.6	4.5	0.0	0.7	9.8	4.8

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

## Modified MTU High Temperature corrosion test (2000 W)

test duration, 116 hrs	Weight loss in mg/coupon <sup>2</sup>		
	Cast Iron	Aluminium	
		SAE 329	AlMgSil
<b>5 % Havoline® XLI</b> in deionised water - hot coupon	-1.3	9.3	1.8
<b>5 % Havoline® XLI</b> in FVV water - hot coupon	-9.0	-16.4	40.7

<sup>2</sup> Weight loss AFTER chemical cleaning acc. to (shortened) MTU procedure. Weight gain is indicated by a - sign.

<sup>3</sup> Reference coolant is a conventional, high quality, silicate-based MEG coolant

Corrosion Protection

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## Aging test

To emphasise the corrosion protection offered by **Havoline® XLI**, the aging test is conducted under more severe conditions compared to those commonly used in the industry.

Test Conditions	Typical Industry	Havoline®
Test duration	169 h	504 h
Fluid content	5.0 l	6.0 l
Pressure	1.5 bar	2.5 bar
Flow	3.0 l/min	3.5 l/min
Heat input	5500 W	5000 W
Temperature in heating vessel	95 °C	115°C
Temperature in cooling vessel	75 °C	95°C
Concentration of coolant in water	40 vol.%	20 vol.%

## Corrosion Protection

	Weight loss in g/m <sup>2</sup> (using Artec test parameters) <sup>1</sup>						
	Al <sup>2</sup>	AlMn	Cast Iron	Steel	Cu	CuZn	Solder CB
<b>Reference Coolant<sup>3</sup></b>							
after initial cleaning	82.10	64.02	-2.19	-1.68	3.62	2.90	21.45
after final cleaning	125.01	94.33	-0.36	0.11	4.99	5.66	25.83
<b>Havoline® XLI</b>							
after initial cleaning	23.91	27.05	0.52	0.36	1.03	1.13	0.27
after final cleaning	60.16	63.15	0.69	0.40	1.46	1.76	0.52

<sup>1</sup> Weight loss AFTER chemical cleaning acc. to (shortened) MTU procedure. Weight gain is indicated by a - sign.

<sup>2</sup> Aluminium SAE 329.

<sup>3</sup> Reference coolant is a conventional, high quality, silicate-based MEG coolant