

# Freecor<sup>®</sup> EV Micro 10

## Low conductive fuel cell coolant

Arteco's **Freecor<sup>®</sup> EV Micro 10** is a low conductive coolant mixture of ultra-pure water and high-purity antifreeze grade ethylene glycol. The coolant contains non-ionic additives for corrosion protection and electrical conductivity suppression. **Freecor<sup>®</sup> EV Micro 10** is compatible with stainless steel, aluminium, copper, brass and common elastomers as well as thermoplastics found in cooling systems

**The coolant is specifically designed as a heat transfer fluid medium for fuel cell applications.**



## PRODUCT BENEFITS



### 5 fold protection



### Excellent flow characteristics

- Smooth flow in the narrow fuel cell channels due to low viscosity
- Reduced backpressure
- Low material stress on the bipolar plates, prevent cracking



### Operation safety for fuel cell

- Stable and low electrical conductivity (< 5 µS/cm)



### Ready to use

- No further manipulation nor dilution needed



### Compatibility

- Compatible with fuel cell cooling system components such as the ion exchanger, radiators and hoses



### Material protection

- Corrosion protection for fuel cell system components, i.a. stainless steel, aluminium, copper, brass and common elastomers as well as thermoplastics found in fuel cell cooling systems

## Application

Arteco's **Freecor® EV Micro 10** is designed as a liquid heat transfer medium for fuel cell applications. Its use is not intended for traditional and conventional engine coolant applications. The use of carbon steel alloys, cast iron and galvanised parts is not recommended. The coolant provides a freezing point of -35°C and boiling point of 108°C.

## Storage

- Arteco advises to test the coolant on electrical conductivity and pH before the product is added to the system as a standard practise, especially when the storage period has exceeded one year.
- To be stored in original unopened containers at max. 30°C, away from direct sunlight

## 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.

## Packaging

Arteco's **Freecor® EV Micro 10** is available as ready-mix in the following packs:



**IBC 1000L**



**20L**



**Bottle  
5L**



**Plastic Drum**

## Contact details

Should you have a questions on Arteco's **Freecor® EV Micro 10**, available packages or colours or one of the other Arteco solutions, please do not hesitate to contact your local Area Sales Manager or send your inquiry to [info@artecco-coolants.com](mailto:info@artecco-coolants.com).

**Addendum - Technical information**

Chemical and Physical Properties			
Property	Typical value	Unit	Specification
Appearance	Clear liquid		
eConductivity (25°C)	0,5	µS/cm	ASTM D1125
eConductivity (80°C)	2,2	µS/cm	ASTM D1125
Density (20°C)	1,065	g/ml	ASTM D5931
Density (80°C)	1,029	g/ml	ASTM D5931
pH as such	6,3		ASTM D1287
Freezing point	-35	°C	ASTM D1177
Kinematic viscosity (20°C)	3,6	mm <sup>2</sup> /s	ASTM D445
Kinematic viscosity (80°C)	1.0	mm <sup>2</sup> /s	ASTM D445
Boiling point	108	°C	ASTM D1120
Pour point	-42	°C	ASTM D97

Chemical and Physical Properties					
Temp.	Density ASTM D5931	Specific Heat	Thermal Conductivity	Vapor Pressure	Volume Expansion
	Observed	Observed	Theoretical*	Theoretical*	Theoretical*
°C	g/ml	kJ/kg.K	W/mK	Pa	V(T)/V(20°C)
0	1,077	3,28	0,380		0,99
20	1,065	3,35	0,391		1,00
40	1,053	3,42	0,405	4993	1,01
60	1,041	3,49	0,417	14156	1,02
80	1,029	3,56	0,426	34428	1,04
100	1,017	3,64	0,435	74190	1,05

\* Ethylene glycol-water mixture with same freezing point

## Addendum - Laboratory test results

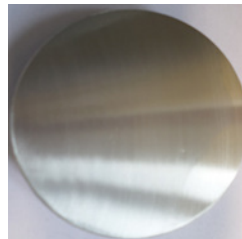
Arteco's **Freecor® EV Micro 10** has been submitted to various lab tests. For more details, please contact your local Area Sales Manager.

### Inhibitor stability

The inhibitor stability tests under heating conditions for extended period of time show that **Freecor® EV Micro 10** remains stable and maintains its electrical conductivity level.



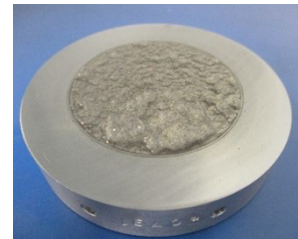
Test setup



**Test specimen**  
Before test



**Freecor® EV Micro 10**  
Showing good protection

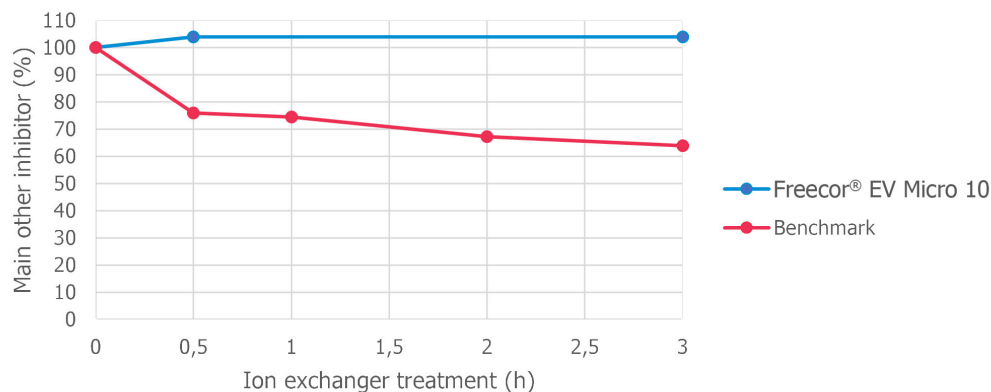


**Benchmark product inhibitor package**  
Showing instability

### Ion exchanger

Arteco's main performance additive package is not removed by the ion exchanger. This keeps it available for active operation.

Main other inhibitor content -  
Ion exchanger contact time



## Bench test results - measuring electrical conductivity while running without ion exchanger

To test the limits of **Freecor® EV Micro 10**, it has been evaluated in a 70kW fuel cell stack in 4 different test procedures: IV curve measurement, hot operation test (90°C), WLTP driving cycles and conductivity stability tests. During a conductivity stability test running 12 hours with 25kW of continuous output, the ion exchanger was bypassed. During this cycle, an increase in electrical conductivity was observed.

The results showed an improvement of the electrical conductivity. The test results clearly show that **Freecor® EV Micro 10** was able to maintain its performance, and more specifically and important notice, its electrical conductivity levels even at actual load conditions. The inhibitor stability tests under heating conditions for extended period of time show that **Freecor® EV Micro 10** remains stable and maintains its electrical conductivity level.

## Handling instructions

Arteco advises to rinse the cooling system with **Freecor® EV Micro 10** or ultra-pure water (electrical conductivity below 5  $\mu\text{S}/\text{cm}$ ) prior to (re)filling the cooling system. Full drain is required after the rinsing.

A conventional engine coolant has electrical conductivity levels more than 1000 times higher, potentially causing damage to the fuel cell system. Therefore, **Freecor® EV Micro 10** should not be mixed with any conventional engine coolant. Even slight additions will increase electrical conductivity and will render the inhibitor system less effective.

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