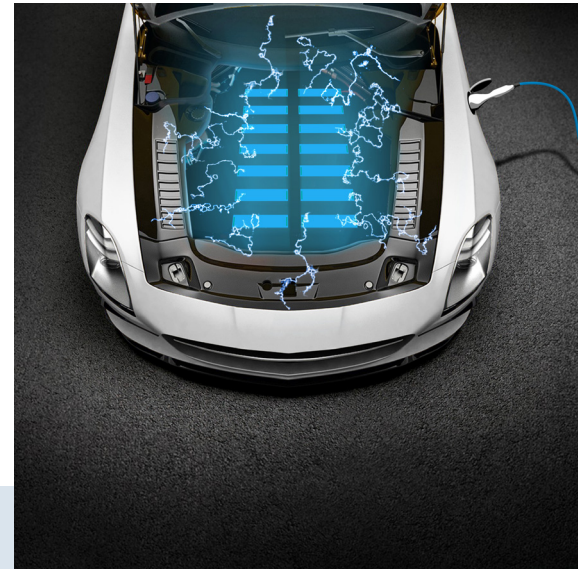


# Freecor® EV Milli 10

## Reduced electrical conductive coolant

Arteco's **Freecor® EV Milli 10** is a coolant specially designed for indirect cooling of Battery Electric Vehicles (BEV). It is developed based on proven OAT technology and combines all-round corrosion protection with **reduced electrical conductivity**. Additionally, **Freecor® EV Milli 10** also contains a **brazing flux compensation** package, reducing the negative effects of CAB brazing.

**Freecor® EV Milli 10** is specifically designed as a reduced electrical conductivity coolant for indirect cooling of Battery Electric Vehicles.



## PRODUCT BENEFITS



### 5 fold protection



### Electrical safety

- Stable and reduced electrical conductivity (< 100 µS/cm);
- Thanks to its **reduced electrical conductivity**, the effects of short circuit paths are minimised;
- Significant reduction of the consequential generation of hydrogen due to hydrolysis compared to classic water-based coolants.



### Material protection

- All-round protection to metals, especially aluminium, cast iron, steel and stainless steel, red and yellow metals such as copper and brass;
- Compatible with common elastomers as well as thermoplastics typically found in these cooling systems;
- Ensured longevity of components and reduced maintenance.



### Flux stabilisation

- **Freecor® EV Milli 10** is the first coolant of its kind to compensate for aluminium CAB brazing flux, improving the compatibility of the coolant.
- Thanks to the exclusive combination of inhibitors and stabilisers, **Freecor® EV Milli 10** ensures low and stable electrical conductivity over time in the cooling system.



### Sustainability

- Carefully selected organic additive technology



### Freezing & boiling point

- Maintenance-free protection against freezing and boiling.

## Application

Arteco's **Freecor® EV Milli 10** is designed as a liquid heat transfer medium for indirect cooling of battery packs. Its use is not intended for traditional engine coolant applications, as it is based on a different additive package. It should also not be used in fuel cell applications nor for immersive cooling applications where direct electrical contact is possible. The coolant as 50vol% in water provides a freezing point of -37°C and boiling point of 108°C.

**Freecor® EV Milli 10** is miscible with other low conductive fluids with a similar conductivity range.

## Storage

- Arteco advises to test the coolant on electrical conductivity and pH before the product is added to the system as a standard practice, 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.

## Colours

**Freecor® EV Milli 10** is available in the following colours:



Blue BL12 for concentrate  
Blue BL07 for ready-mix

## Packaging

Arteco's **Freecor® EV Milli 10** is available as ready-mix and as concentrate **Freecor® EV Milli CC10**, in the following packs:



**IBC 1000L**



**20L**



**Bottle  
5L**



**Plastic Drum**

## Contact details

Should you have a questions on Arteco's **Freecor® EV Milli 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@arteco-coolants.com](mailto:info@arteco-coolants.com).

## Addendum - Technical information

### Chemical and Physical Properties Freecor® EV Milli CC10\*

Property	Typical value	Unit	Specification
Appearance	Light blue		
eConductivity (25°C)	38	µS/cm	ASTM D1125
Density (20°C)	1,112	kg/l	ASTM D1122
pH as such	8,0		ASTM D1287
Kinematic viscosity (20°C)	17,3	mm <sup>2</sup> /s	ASTM D445
Reserve Alkalinity (to pH 5.5)	2,8	ml 0.1 M HCL	ASTM D1121
Equilibrium boiling point	187	°C	ASTM D1120
Hard water stability (6 mmol Ca <sup>2+</sup> )	< 0.1	ml deposit	CEC C-06-T-95
Foaming tendency	50 // 2	ml // s	ASTM D1881

\* Typical values

### Chemical and Physical Properties of Freecor® EV Milli 10 in water\*

	33 v%	40 v%	50 v%	Dilution	Specification
Freezing point	-18	-25	-37	°C	ASTM D1177
Boiling point	108	109	111	°C	ASTM D1120
Pour point	-23,5	-32,5	-45,0	°C	ASTM D97
eConductivity (25°C)	103	102	96	µS/cm	ASTM D1125
eConductivity (60°C)	207	209	188	µS/cm	ASTM D1125
Density (20°C)	1,045	1,053	1,066	kg/l	ASTM D1122
pH	8,3	8,3	8,2		ASTM D1287
Kinematic Viscosity (20°C)	2,1	2,8	3,7	mm <sup>2</sup> /s	ASTM D445
Thermal Conductivity (20°C)	0,47	0,44	0,42	W/mK	ASTM D7895
Specific heat (20°C)	3,8	3,6	3,3	kJ/kg.K	ASTM E1269

\* Typical values

## Addendum - Laboratory test results

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

### Glassware Corrosion test - adapted from ASTM D1384

336h - Coolants at 33v% in UPW<sup>1</sup> -  $T_{LIQUID} = 88^{\circ}C$  - 100 mL/min air - 750 ml coolant

	Freecor® EV Milli 10	Benchmark	
Copper (UNS C11300)	1,0	2,9	mg/coup
Solder coated Brass (Grade 30A)	5,1	38	mg/coup
Brass (UNSC2600)	1,0	6,5	mg/coup
Steel (UNS G10200)	0,1	0,1	mg/coup
Cast Iron (UNS F1007)	-0,2	-0,2	mg/coup
Aluminium (UNS a23190)	0,0	6,6	mg/coup
pH before test	8,2	7,4	
pH after test	8,1	7,0	



#### Freecor® EV Milli CC 10

*Corrosion inhibitors not consumed*



#### Benchmark product

*Principal Si corrosion inhibitor completely consumed*

### Hot Surface Corrosion test - adapted from ASTM D4340

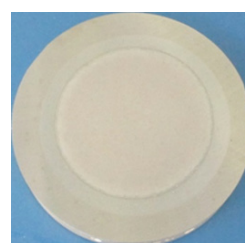
168h - Coolants at 25v% in UPW<sup>1</sup> -  $T_{coupon} = 135^{\circ}C$  - self pressured

	Freecor® EV Milli 10	Benchmark	
Aluminium (UNS A03190)	-0,07	0,10	mg/cm <sup>2</sup> /wk*
pH before test	8,2	7,4	
pH after test	8,1	7,0	

\* Weight gain is indicated by a - sign

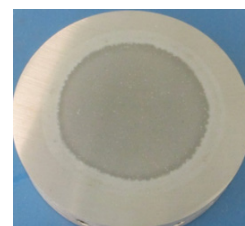


*Test setup*



#### Freecor® EV Milli 10

*After cleaning*



#### Benchmark product

*After cleaning*

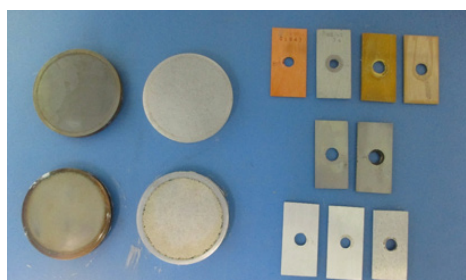
<sup>1</sup> UPW = Ultra Pure Water

## Dynamic Heat Transfer test

48h - 50v% - 1890W on AlSi10Mg - 1890W on EN-GJL-250 EN1561  
3.9 l/min - self-pressured -  $T_{inlet} = 95^{\circ}\text{C}$

	Freecor® EV Milli 10	Alloy	
Rate Cast iron top AC	1,99	EN-GJL-250 EN1561	mg/cm <sup>2</sup> /wk
Rate Cast Iron bottom AC	7,16		mg/cm <sup>2</sup> /wk
Increase $T_{coupon}$	0,10		°C
Rate Aluminium top AC	-0,07	AlSi10Mg	mg/cm <sup>2</sup> /wk
Rate Aluminium bottom AC	0,03		mg/cm <sup>2</sup> /wk
Increase $T_{coupon}$	0,3		°C
Copper AC	-0,3	Cu-ETP EN 1976	mg/coupon
Solder coated brass AC	7,2	CuZn37-Pb60Sn40	mg/coupon
Brass AC	0,6	CuZn37 DIN17660	mg/coupon
Copper-Nickel AC	0,0	CuNi10Fe1Mn DIN17664	mg/coupon
Steel AC	0,2	St14	mg/coupon
Cast iron AC	3,1	EN-GJL-250 EN1561	mg/coupon
Aluminium AC	-0,5	EN AW-2017(A)	mg/coupon
Aluminium AC	-0,5	EN AW-202	mg/coupon
Aluminium AC	-0,2	EN AC -AlSi10Mg(a)T6 EN1706	mg/coupon
eConductivity after test	107		μS/cm
pH after test	8,1		

\* Weight gain is indicated by a - sign  
AC: After chemical cleaning



**Freecor® EV Milli 10**  
Coupons after test

## Radiator compatibility test - CAB brazed OEM radiator

168h - Freecor® EV Milli 10 at 50v% in UPW<sup>1</sup>. Benchmark as such.

T<sub>inlet</sub> = 90°C - Flux brazed radiator cubes

	Freecor® EV Milli 10	Benchmark	
e-Conductivity before test	97	102	µS/cm
e-Conductivity after test	135	214	µS/cm
pH before test	8,1	7,4	
pH after test	8,1	8,1	
Appearance parts	No signs of corrosion	Dull black	
Colour	Light blue	Light blue	

<sup>1</sup> UPW = Ultra Pure Water

## Handling instructions

**Freecor® EV Milli 10** can be obtained by diluting **Freecor® EV Milli CC 10** with the proper amount of water. Dilution should be done with the use of demineralised water, for optimal performance, controlled quality and optimal conductivity levels. Recommended use concentration is 50v%. We refer to our water quality recommendations leaflet for more information.

Arteco advises to rinse the cooling system with **Freecor® EV Milli 10** or ultra-pure water (electrical conductivity below 100 µS/cm) prior to (re)filling the cooling system. A full drain is required after rinsing.

A conventional engine coolant has electrical conductivity levels more than 10 times higher, potentially causing safety hazards in the cooling system. Therefore, **Freecor® EV Milli 10** should not be mixed with any conventional engine coolant. Even slight additions will increase electrical conductivity and may render the inhibitor system less effective. As with any antifreeze coolant, the use of galvanised steel is not recommended for pipes or any other part of the storage/mixing installation.

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