

USER MANUAL

ECO-CLIMATEC



ECO-ClimaTEC[®]
climate control for electric vehicles

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Thank you for purchasing module(s) of the ECO-ClimaTEC system. Please read this manual carefully before installing and operating the product. Always keep it on hand for quick reference.

INTRODUCTION

The ECO-ClimaTEC is able to cool or heat every single component in the vehicle like airco, cargo, seating, electronics, battery and so on and is based on an easy to fit and easy to install Thermo Electric Cooler.

Never was integrating cooling features so easy thanks to the plug-and-play functionality of this new modular low pressure water circulating electric cooling system.

Making use of only environmental friendly materials and using water as main cooling liquid, the ECO-ClimaTEC operates as a clever and efficient cooling/heating device and realises a high efficient heating process by creating a heat pump effect and using waste energy of other components in the vehicle.

The system is the solution to green minded vehicle builders that are looking for a clever and environmental friendly system they can use in their vehicles.

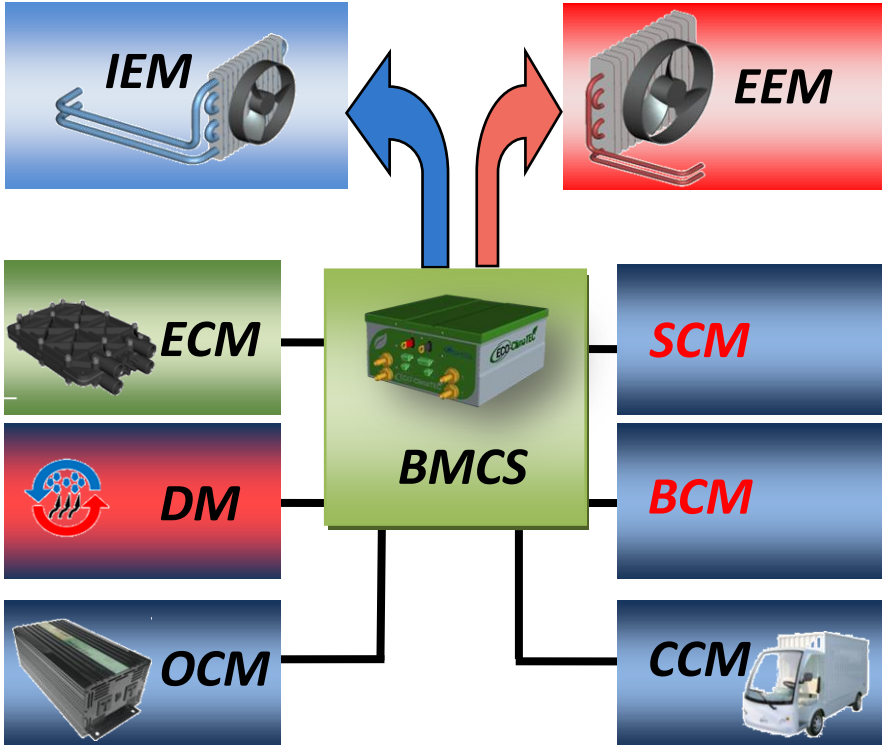
By simple not wasting any valuable cold/hot energy by redirecting this directly to the desired location in the vehicle, the system is setting a new approach for efficient cooling and facilitates all kinds of new smart possibilities for the automotive industry like spot cooling, active seat-cooling and many more.

This advanced cooling and heating system utilises patented Peltier technology with the use of standard TCT-units from the renowned and entrusted PowerPack-series

The central module (BMCS) is provided with several components that safely monitor and automatically control the thermal properties of the system. The module is connected to the heat and cold exchange modules.

APPLICATIONS

The ECO-ClimaTEC can be used for different applications. These applications are summarized in the following schedule. Obviously it can be used for many other options or additional purposes.



Applications/modules for the ECO-ClimaTEC system

Definitions applicable in this manual:

"ECO-ClimaTEC" will mainly be considered as the BMCS-module or the total system.

"interior" = inside the vehicle

"exterior" = outside the vehicle

NAMING OF THE ECO-CLIMATEC SYSTEM COMPONENTS

To determine what type of system component(s) you have received/ordered, the system was given an article code. The article code is built as shown in the example below:

For example: BMCS-4x-TCT 4-PP-FC4-HC-12

module	units	type	connections	purpose	power
BMCS	- 4x	- TCT 4-PP	- FC4	- HC	- 12

Module	BMCS	stands for B asic M odule C ar S ystem
Units	4 x	number of TCT-units
Series name	TCT 4-PP	P ower P ack series with 4 peltier elements per TCT -unit
Tube connections	FC4	F rontpanel tube C onnections (4x)
	BC4	B ackpanel tube C onnections (4x)
	FC2BC2	F rontpanel tube C onnections (2x) and B ackpanel tube C onnections (2x)
Heating/Cooling	HC	system for H eating and C ooling
	H	system for H eating
	C	system for C ooling
Operating power	12	12VDC
	24	24VDC
Related modules	BMCS	B asic M odule C ar S ystem
	EEM	E xterior E xchange M odule
	IEM	I nterior E xchange M odule
	ECM	E xpandable C ooling M odule
	CCM	C argo C ooling M odule
	OCM	O ptional C ooling M odule
	SCM	S eat C limate M odule
	BCM	B attery C limate M odule
DM	D ehumidifying M odule	

PRECAUTIONS



WARNINGS FOR USE

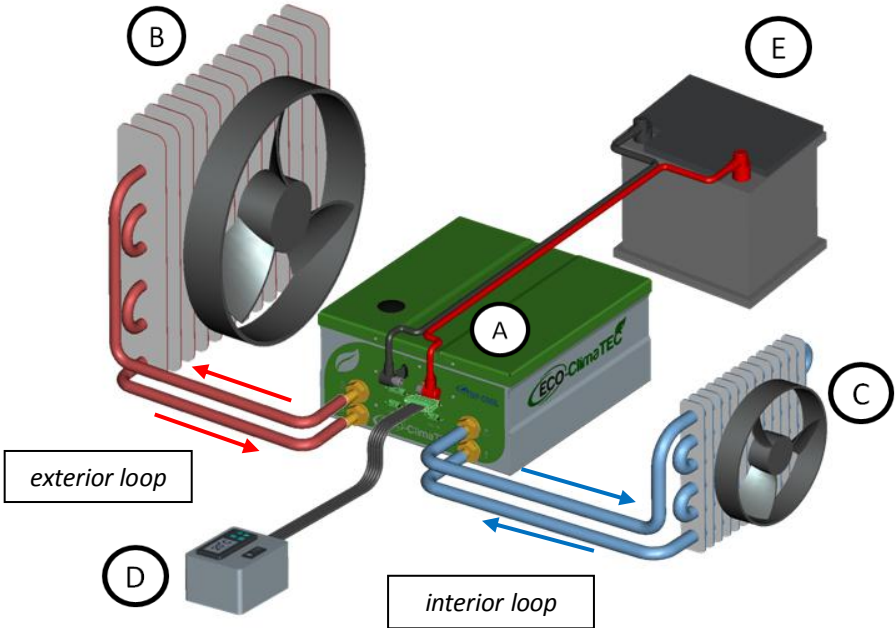
1. Before installation and operating make sure you have read the user manual.
2. Use the system only with a recommended liquid and without contamination. See chapter OPERATING LIQUIDS for more information.
3. The ECO-ClimaTEC can only be used in a specified temperature range because of the limitations of the cooling fluid. See OPERATING LIQUIDS for more information.
4. Do not use the system on a higher voltage as recommended.
5. Electric connections or components that are connected to a module of the ECO-ClimaTEC system, (such as the power supply, fans, controller, ect.) must be provided with an appropriate safety fuse.

ITEMS PACKED WITH THIS ECO-CLIMATEC MODULE

1. ECO-ClimaTEC [BMCS]
2. This manual
3. Electric installation kit (optional)
4. Mechanical installation kit (optional)

ECO-CLIMATEC COMPONENTS

A basic ECO-ClimaTEC operating system consists of a number of identifiable system components:



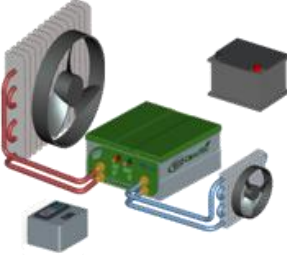
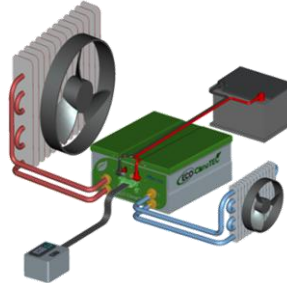
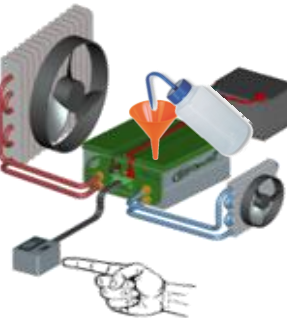
Basic ECO-ClimaTEC system in "interior cooling mode"

- A. ECO-ClimaTEC, [BMCS]
- B. Radiator/fan combination for the exterior loop [EEM]
- C. Radiator/fan combination for the interior loop [IEM]
- D. Control board
- E. Power supply

Note: "interior" and "exterior" corresponds to the signals of the control board.

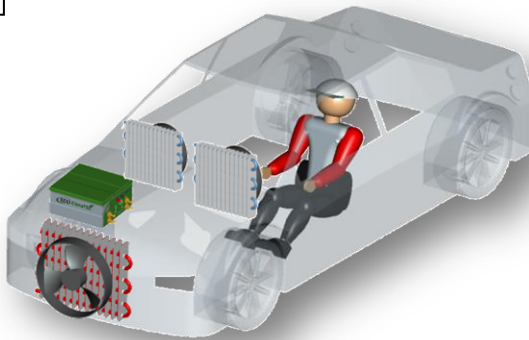
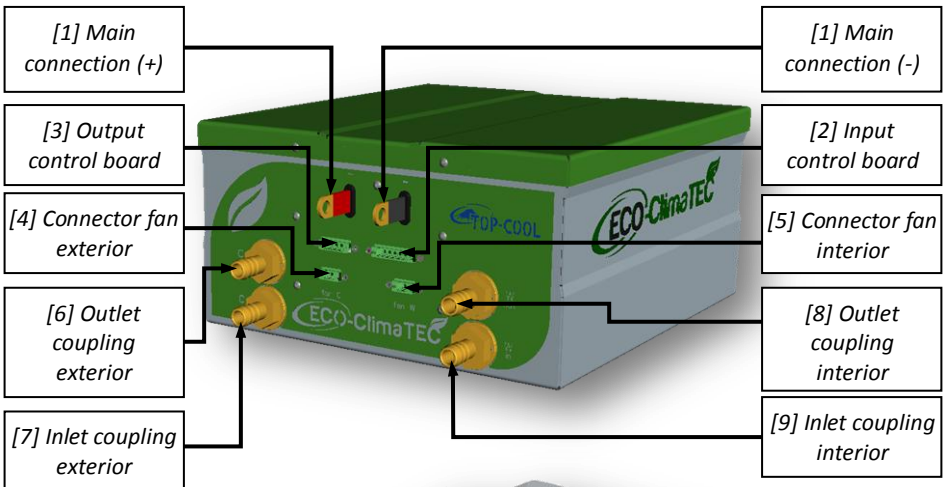
INSTRUCTION STEPS

This chapter gives information on how to instal an ECO-ClimaTEC system. Every set of steps in this chapter is explained more extensive in other chapters in this manual.

See chapter Mechanical Installation Instructions	
Step 1. Position the ECO-ClimaTEC	
Step 2. Place and connect the exterior radiator/fan	
Step 3. Place and connect the interior radiator/fan	
Step 4. Connect the tubing of the radiator with the ECO-ClimaTEC	
See chapter Electrical Installation Instructions	
Step 5. Connect the main power connections	
Step 6. Connect the control board electrically	
Step 7. Connect the interior fan electrically	
Step 8. Connect the exterior fan electrically	
See chapter Operating Instructions	
Step 9. Fill the reservoir with cooling fluid	
Step 10. Start the system	

INTERFACE PART NAMES

1. Main connection 12VDC/24VDC (depends on system)
2. Input control board
3. Output control board
4. Connector fan exterior
5. Connector fan interior
6. Outlet coupling exterior
7. Inlet coupling exterior
8. Outlet coupling interior
9. Inlet coupling interior



Example positioning in vehicle



MECHANICAL INSTALLATION INSTRUCTIONS

These instructions describe how to install an ECO-ClimaTEC system mechanically.

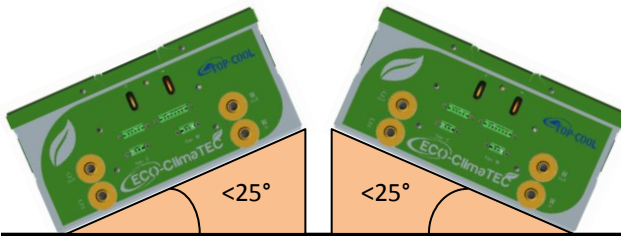


POSITIONING THE ECO-CLIMATEC

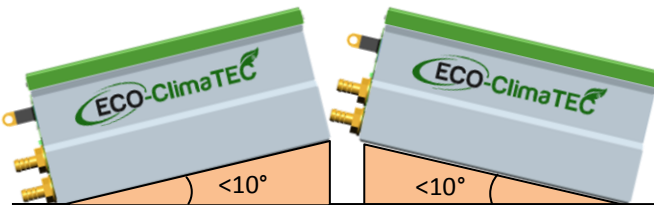


Step 1. Position the ECO-ClimaTEC

It's strongly preferred to mount the system horizontally and not at an angle while the system is operating. Ensure to mount the module to the chassis and secure the system tightly so it cannot move or shift while operating.



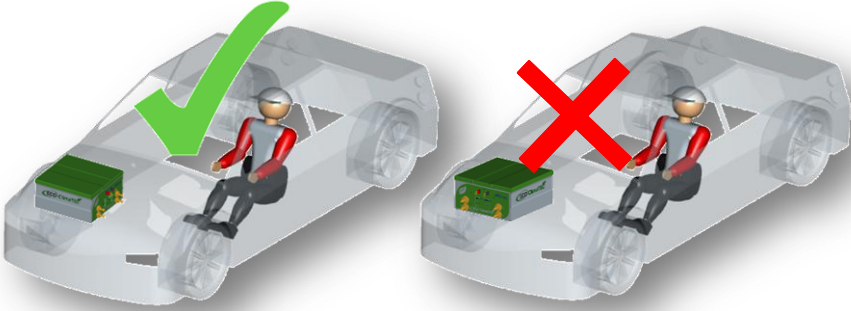
When completely filled, the system will shut down at an angle $>25^\circ$



When completely filled, the system will shut down at an angle $>10^\circ$

Positioning of the ECO-ClimaTEC

It is recommended to position the ECO-ClimaTEC horizontal with its liquid connectors to the side of the vehicle because of the level fluctuations of the liquid caused by accelerations.



Preferred orientation of the ECO-ClimaTEC in the vehicle



It is important to clear some space around the ECO-ClimaTEC for the heat expel of the internal electric components in the device. There is no need for an additional forced air flow as long as sufficient heat expel is maintained for the unit.

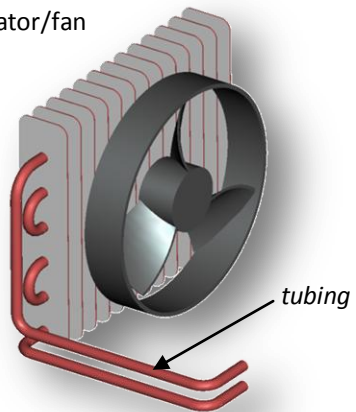


RADIATOR/FAN COMBINATION (EXTERIOR LOOP) [EEM]

Step 2. Place and connect the exterior radiator/fan

To create a high performance cooling system it is very important to expel sufficient heat in the exterior loop. Therefore this loop must be connected to a radiator/fan combination with adequate performance.

Depending on the system It is recommended to use a combination that is able to expel approximately 150 to 200 W/°C. It's preferred to enter the



Radiator/fan combination (exterior loop)

radiator on the bottom to prevent trapped air inside the radiator.



For a good operating system a common temperature difference between the average liquid (inlet and outlet) temperature and its ambient is maximal 10°C.



In principle the radiator can be placed anywhere in the vehicle but do always ensure there is sufficient ambient air entering the air inlet of the radiator and there are no obstacles limiting the air flow of the in- and outlet.



It is recommended to place the radiator there where relatively cold air is drawn through the radiator. For example on the front of the vehicle (due to the air flow generated by the moving vehicle), or on the bottom of the vehicle at stationary situations such as parking. It's recommended to mount the fan with its air drawing side onto the radiator. It is also recommended to use a shroud for a better air flow.

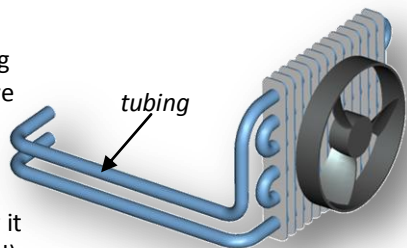


RADIATOR/FAN COMBINATION (INTERIOR LOOP) [IEM]

Step 3. Place and connect the interior radiator/fan

To transfer the cold/heat energy to the interior, a low pressure water radiator can be used. It is recommended to use a radiator/fan combination that is able to expel approximately 60 W/°C for the interior of a vehicle.

To reach a more efficient cooling for big interiors it is recommended to use more radiators or a combination that is capable to expel more than 60 W/°C. For reaching lower temperatures of the outgoing airflow it is possible to; reduce the airflow (speed),



*Radiator/fan combination
(interior loop)*



use a thicker radiator or to use (semi) recirculation. In this situation the maximum efficiency/performance of the system will

decrease though.

Try to place the radiator on a position where relatively cold air is drawn through the radiator. Avoid pre-heated air entering the radiator.



Ensure that moisture and water on the radiator caused by condensation or dehumidification effects can be drained.

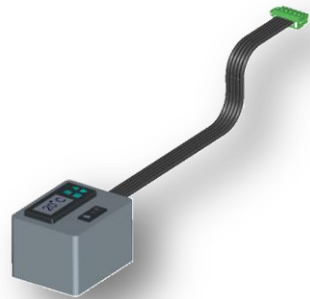


Cover the liquid tubes with insulation foam to prevent unnecessary loss of cooling power.

CONTROL BOARD

The purpose of the control board is to control and to monitor the system while operating. The control board may be connected to a temperature controller for regulating the temperature of the interior. Also LED's can be connected to detect possible fault situations in the ECO-ClimaTEC like:

level low, overheating, etc. For more information see chapter: ***additional information***. For more information about how to connect the control board see chapter: ***Electrical Instalation Instructions***.

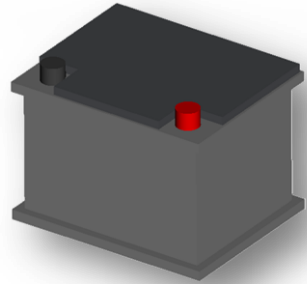


Control board

POWER SUPPLY

The ECO-ClimaTEC must be connected to a Direct Current power supply (VDC). Use a power supply, battery, generator, etc. with sufficient power and adequate connections. To select an appropriate power supply, see the table below.

For more information about how to connect the power supply see chapter: **Electrical Instalation Instructions.**



Power supply

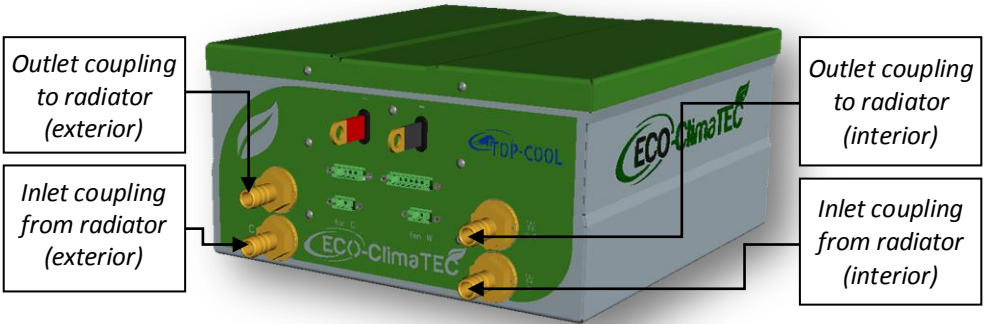
System configurations			
TCT-units	4 xTCT-4PP-15V10A	4 xTCT-4PP-24V13A	2 xTCT-4PP-15V10A 2 xTCT-4PP-24V13A
Operating voltage (V)	12 VDC	12 VDC	24VDC
Maximum Current on main Power Connection (Amp)	145 Amp	120 Amp	70 Amp
Power supply (W)	12 x 145 = min. 1740 W	12 x 120 = min. 1440 W	24 x 70 = min. 1680 W

LIQUID COUPLINGS

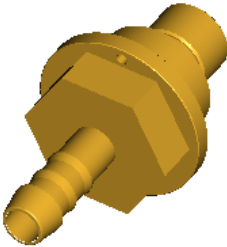
The ECO-ClimaTEC has two liquid loops. These loops are called the interior and exterior loop. The interior loop is responsible for the conditioning of the interior of the vehicle. The exterior loop takes care of the expel of heat/cold into the exterior ambient.

There are used four couplings to connect the ECO-ClimaTEC with the radiator/fan combinations of these loops.

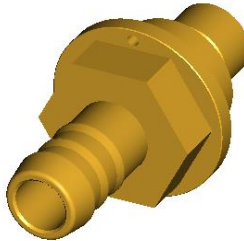
These four front couplings are exchangeable with six types of couplings.



Couplings for connecting the interior and exterior loop with the ECO-ClimaTEC



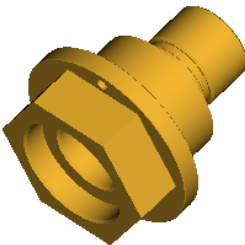
3/8" tailpiece OD10



3/8" tailpiece OD16



3/8"-1/4"



3/8"-3/8"



3/8"-1/2"



3/8"-3/4"

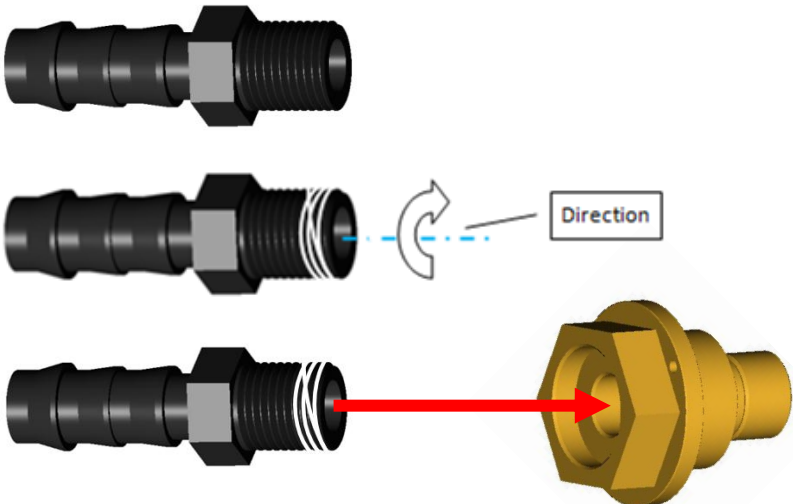
Possible liquid connection couplings

Because the heat/cold in the ECO-ClimaTEC is transported by a liquid flow, the system needs to be connected to an interior and an exterior radiator/fan combination. The interior radiator/fan combination is stationed there where the heat/cold gets expelled for maintain cooling/heating to control the temperature inside the vehicle.

There are four liquid connection couplings that have no tailpiece. Therefore a tailpiece must manually be mounted into these liquid connectors. These tailpieces did not come with the ECO-ClimaTEC. Except if you have also ordered a "*Mechanical installation kit*". For male BSP couplings it's strongly advised to use a sealing cord on the outside of the thread. The sealing cord is applicable for cold and hot liquids. It's recommend to use Loctite 55. Make at least 2-4 full loops and mount the couplings into the liquid connector couplings.



Example of a properly used sealing cord and mounting of the tailpiece:



Note: There are also many other types of BSP couplings that can be used like elbow-, quick-, push in-, push on- and T-piece couplings.



TUBING

Step 4. Connect the tubing of the radiator with the ECO-ClimaTEC

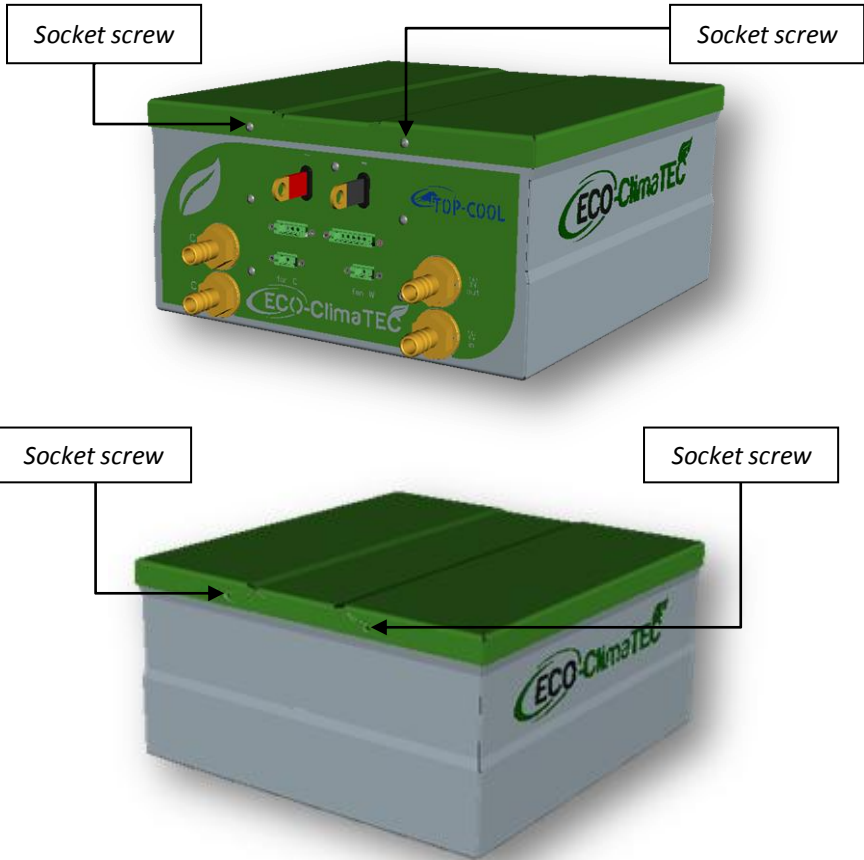
The ECO-ClimaTEC can be connected to the radiators with flexible tubing. The system runs on a liquid flow and not on high pressure (ca. 1 bar, 14.5 PSI).

Use appropriate tubing with an inner diameter of at least 10mm to create sufficient flow. Always keep the length of the tubing to a minimum and cover the tubing with insulation.

Use couplings or anti-kink features to ensure that the tubing will not kink. Be aware that kink can occur more easily at higher temperatures.

MOUNTING THE LID

The system is covered by a lid that is mounted onto the housing by four M4 socket screws. A hex key with a width of 2,5mm can be used for mounting and demounting the screws.



Mounting the lid



ELECTRICAL INSTALLATION INSTRUCTIONS

The following information is very important for a good and safe working system. Electrical work should be performed by a qualified operator, always observe applicable codes or regulations.

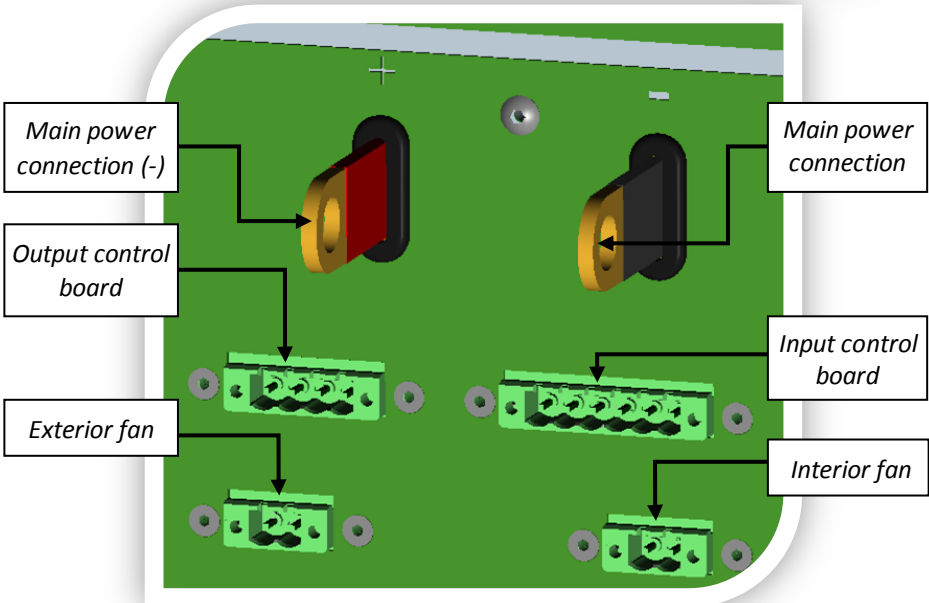
These instructions describe how to electrically install an ECO-ClimaTEC system.

The electric connections of the ECO-ClimaTEC consist of the following parts:

1. Main power connection

Connector pins

2. Output control board
3. Three way rocker switch connection
4. Interior fan connection
5. Exterior fan connection



Electric connections



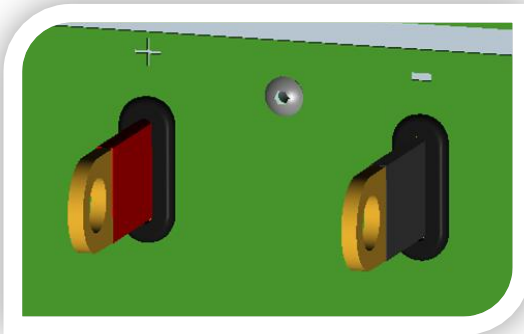
MAIN POWER CONNECTION

Step 5. Connect the main power connections

The 12VDC/24VDC connection is the main power supply for the system. It gives electric power to all the components in the system. The power should be connected by using an eyelet mounted with an M10 bolt and nut onto the main connections. These connections must be mounted tight to prevent the connections from heating up and causing hazardous situations.



It is obliged to also clamp/support the electric wires of the main connection onto the chassis or any other solid component of the vehicle near the main connection, to prevent them from moving or vibrating and applying forces onto the connections that can possibly damage them.



Main power connection



The connection can also be covered by two eyelet covers. Whether to use a 12VDC or 24VDC power supply depends on the type of ECO-ClimaTEC.



The ECO-ClimaTEC works with high currents while operating due to the high power on low voltage. To make sure the system will operate efficient and non hazardous it is important to choose the correct wire thickness for the main connections. Following table

gives a summary of the electric specifications of the main connection of possible system configurations.

System configurations			
TCT-units	4 xTCT-4PP-15V10A	4 xTCT-4PP-24V13A	2 xTCT-4PP-15V10A 2 xTCT-4PP-24V13A
Operating voltage (V)	12 VDC	12 VDC	24VDC
Maximum Current on main Power Connection (Amp)	145 Amp	120 Amp	70 Amp
Power supply (W)	12 x 145 = 1740 W	12 x 120 = 1440 W	24 x 70 = 1680 W

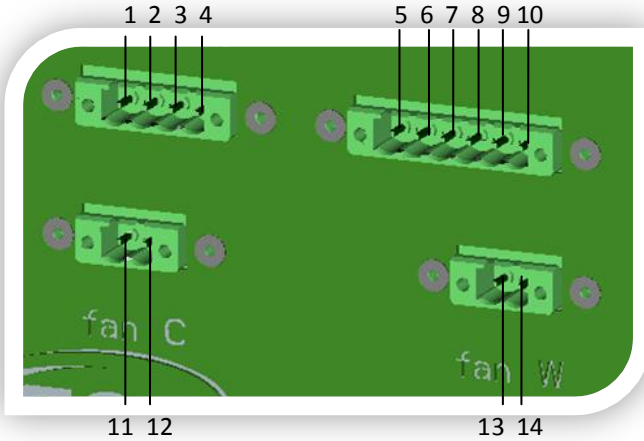


It is also necessary to provide the main connection with a safety fuse.



CONNECTOR PINS

The ECO-ClimaTEC consists of 14 connector pins. These connector pins must be connected to four different connectors. The picture below shows all connector pins on the interface of the system.



Available connector pins

The 14 connections and their description are listed below:

- 1) Exterior (-) connection for LED Level to Low
- 2) Exterior (+) connection for LED No Flow
- 3) Temperature controller (+)
- 4) Temperature controller (-)
- 5) Cooler Switch
- 6) Common Switch
- 7) Heater Switch
- 8) Fan Switch
- 9) Pump Switch
- 10) (-) Connection for fan and pump switch
- 11) (+) Connection for exterior fan
- 12) (-) Connection for exterior fan
- 13) (+) Connection for interior fan
- 14) (-) Connection for interior fan

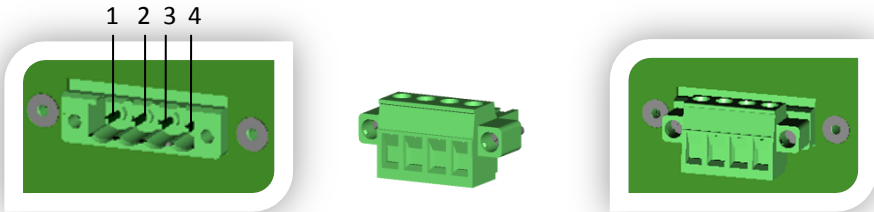
The electric connectors do not come with the ECO-ClimaTEC and are therefore not mounted yet.



OUTPUT CONTROL BOARD

Step 6. Connect the controll board electrically

- 1) Exterior (-) connection for LED Level to Low
(same voltage as main connection)
- 2) Exterior (-) connection for LED No Flow
(same voltage as main connection)
- 3) Temperature controller (+)
- 4) Temperature controller (-)



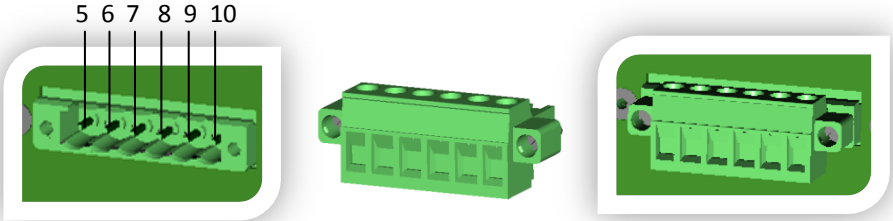
Connector - MSTBT 2,5/ 4-STF-5,08 - [1805327]

The ECO-ClimaTEC consists of a couple of safety controllers, the electric connector above gives the ability to monitor these safety controllers to LED's. These LED's can be used for monitoring purposes and they will light up when an error occurs. The connector can also be used for connecting a temperature controller.



INPUT CONTROL BOARD

- 5) Cooler Switch
- 6) Common Switch
- 7) Heater Switch
- 8) Fan Switch
- 9) Pump Switch
- 10) (-) Connection for fan and pump switch

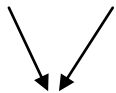


Connector - MSTBT 2,5/ 6-STF-5,08 - [1805343]

The ECO-ClimaTEC can be used for cooling and heating. Whether to cool or heat depends on the position of the three position rocker switch. For cooling and heating the switch must be connected as described in the following picture.

Cooler + Common
switch Switch

Heater + Common
Switch Switch



Cooling



Heating

The cooling engine (TCT-units) can then be controlled in three different ways:

- 0: off (passive)
- I: interior warm (active)
- II: interior cold (active)



Three position rocker switch

Active cooling

During active cooling all the components in the system are running. The temperature of the system depends on the radiator/fan combinations. It is also possible to control the temperatures in the system by using a temperature controller that controls the temperatures between manually set limits.

Passive cooling

During passive cooling the TCT-units are shut down. The rest of the system is still running this results in a need of less electric power and lower cooling performance.

0: off (passive)

This means that the TCT-units for active cooling are shut down while the pumps and fans are still running. This mode can be used for passive cooling (optional).

I: interior warm (active)

In this mode the system will heat the interior loop up and cool the exterior loop down.

II: interior cold (active)

In this mode the system will cool the interior loop down and heat the exterior loop up.

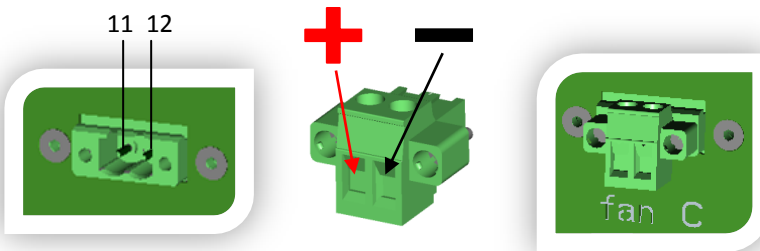


INTERIOR FAN CONNECTION

Step 7. Connect the interior fan electrically

- 11) (+) Connection for interior fan
- 12) (-) Connection for interior fan
(Voltage as applied to main connection)

The interior radiator/fan combination blows the conditioned air into the interior of the vehicle. The radiator/fan combinations are not standard components of the ECO-ClimaTEC and can therefore separately be connected to the ECO-ClimaTEC. Keep in mind that this connection works on the same voltage as the main connection of the ECO-ClimaTEC.



Connector - MSTBT 2,5/ 2-STF-5,08 - [1805301]



To prevent the fan, the ECO-ClimaTEC components and integration, this connection has to be secured by an additional safety fuse. The fan connection can handle a maximum current of 5A 30VDC.

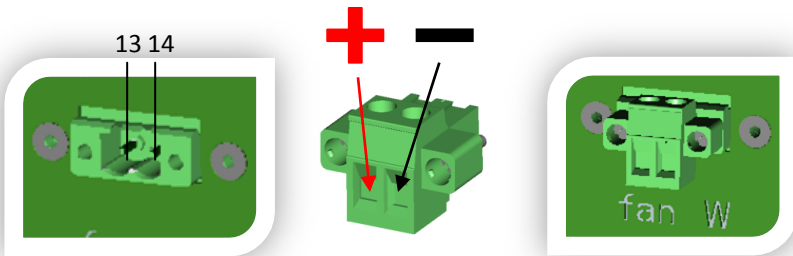


EXTERIOR FAN CONNECTION

Step 8. Connect the exterior fan electrically

- 13) (+) Connection for exterior fan
- 14) (-) Connection for exterior fan
(Voltage as applied to main connection)

The exterior fan enables the radiator to expell its heat/cold to the ambient air.



Connector - MSTBT 2,5/ 2-STF-5,08 - [180530]



To prevent the fan, the ECO-ClimaTEC components and integration, this connetion has to be secured by an additional safety fuse. The fan connection can handle a maximum current of 5A 30VDC.

TIPS

1. Electrical work should be performed by a qualified operator, always observe applicable codes or regulations.
2. Do always use safety fuses to prevent the ECO-ClimaTEC and its components and wiring from breaking down and avoiding hazardous situations.
3. Use cable end sleeves for a proper connection of the wires into the connectors.
4. Choose a wire thickness that is suitable for the current that it is used for.

OPERATING INSTRUCTIONS

This chapter will give instructions on how to start up the system after mechanical and electrical installation.



FILLING

Step 9. Fill the reservoir with cooling fluid

Before the system is operational, the system has to be filled with a cooling fluid. This can be done by filling the reservoirs in the ECO-ClimaTEC. The lid must be taken off before the reservoirs can be filled. See chapter "OPERATING LIQUIDS" for more reference.

On top of both reservoirs there are mounted two filling plugs that can be removed for filling the reservoirs (see next picture). It's not relevant which of the two filling plugs in every reservoir is removed.



It is not allowed to remove any other plugs than the pointed out ones in the following picture. The plugs may not be removed because they are meant for sealing a built-in air chamber that prevents the reservoirs from cracking as a result of expansion of the cooling fluid in the reservoirs.



During the filling it is recommended to activate the pumps for a gradually filling of the reservoir/system. The filling can best be done after all mechanical and electric components are already installed.

The liquid level in the reservoir should approximately reach up to the screw thread of the plug while the pumps are running. When both loops are filled with cooling fluid the whole system is ready for use.



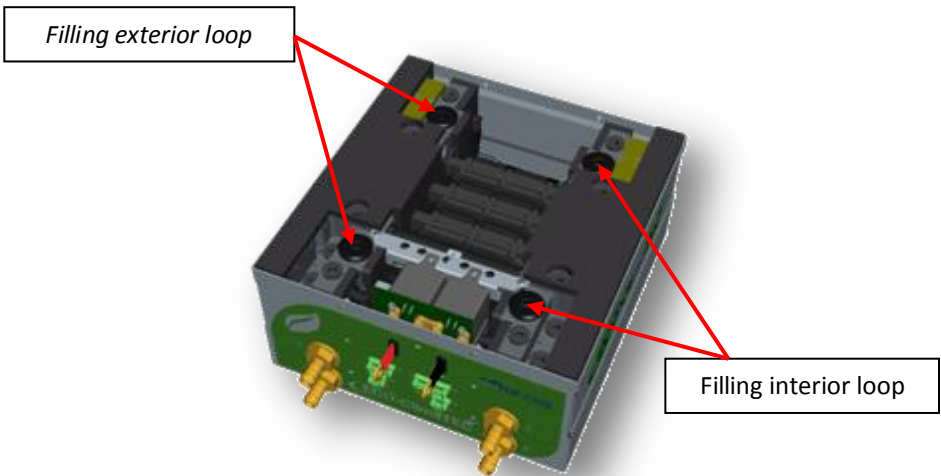
The plugs must be mounted back into the reservoir with a torque of 2,0 Nm to ensure proper sealing. Do this while the pumps are already running to prevent the reservoir from overflow.

Every reservoir must contain approximately 1 liter of cooling fluid. Do not forget that the whole interior and exterior loop must be filled. The amount of fluid that is needed for filling the radiators and tubes depends on the chosen radiator and tube lengths.



Make sure that the amount of liquid in the different loops (interior and exterior) is maximal 4 liters each. This means the reservoir, tubes and radiator. This prevents exceeding the maximal acceptable internal pressure of the reservoir due to liquid expansion during heating.

With more volume or when higher pressure occurs a pressure valve is compulsory. When one of the loops has more volume, this loop must be provided with a pressure valve of maximal 1,5 bar (22PSI).



Filling the reservoirs

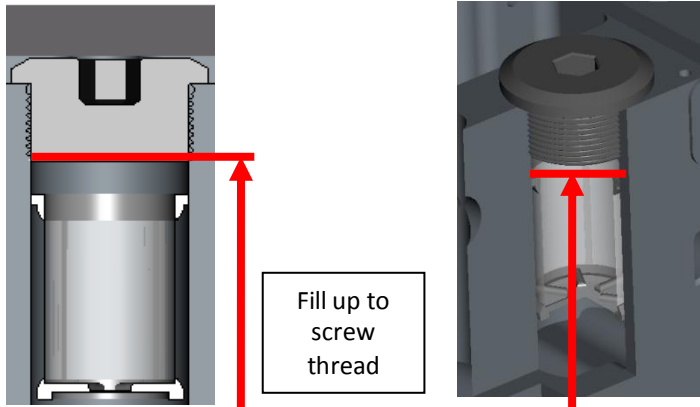
For easy filling, it's recommended to fill the reservoir with a funnel or a wash bottle.



Funnel (left) and wash bottle (right)

TIPS

1. If the radiator is mounted on a higher position than the reservoirs, the reservoir will overflow by the fluid pressure in the radiator when the filling plug is demounted. To prevent the reservoir from overflowing it is recommended to fill the reservoirs while the pumps of the ECO-ClimaTEC are activated. This can be done after the module is electrically connected.
2. Note: There is always trapped air and dissolved air in the liquid that arises after a certain time that will collect in the reservoir, therefore give the reservoir a refill after one hour.
3. It is recommended to refill to the maximal level (up to screw thread). See picture.



Filling the reservoir

STARTUP

Step 10. Start the system

When all installation requirements are met, the ECO-ClimaTEC is ready to be started up. Be sure to check if there is no leakage at the liquid connectors of the entire system. Do also check if all actions and requirements of this manual are met.

If everything has been checked the main power supply can be turned on and the ECO-ClimaTEC can start cooling/heating.

Before and after the startup there are a couple of items that should be checked:

1. Make sure the main power is ready to be started.
2. Check the liquid level in the reservoirs after the ECO-ClimaTEC has been operative for one hour.
3. Check again if there is no leakage at the couplings after an hour of operating time.

When all installation and start-up checks are successfully done, the ECO-ClimaTEC is ready for use.



OPERATING TEMPERATURE CONDITIONS

Operating temperature range of a system filled with:

	Water (°C)	MEG 20% -10 (°C)	MEG 40% -26 (°C)
Hot side out max.	50	50	50
Cold side out min.	5	-5	-21
ambient BMCS max.	40	40	40
ambient BMCS min.	5	-5	-21



Be aware of the reduction of the efficiency of the ECO-ClimaTEC when using MEG (Mono Ethylene Glycol) because of its lower thermal conductivity.

OPERATING PRESSURE

The liquid pressure inside the system during operating may maximal be ca. 1 bar (14.5 PSI). The flow of the fluid is about ca. 2,5 L/min at the outlet coupling but is strongly depending on the flow resistance created by the interior and exterior used components like the tubing and radiator.

OPERATING LIQUIDS

Only use the following liquids. Top-Cool doesn't support or give warranty if any other liquid is used as stated below.

- Clean water / demineralised water (demineralised water is preferred because it does not contain lime)
- Mono Ethylene Glycol (MEG), up till 50% MEG / 50% water (-37°C)

The cold-side of the cooling system can freeze if the liquid used is operating near its freezing temperature. The fluid will always freeze inside the TCT-units first and is not notable.

It is not allowed to regulate the system in a mode that is operating above/beneath or near the temperature limits.

There will be given no support and warranty will void when the ECO-ClimaTEC is used near these temperature limits.



Observe if the flow is clear of air. Air bubbles in the flow can influence the performance of the ECO-ClimaTEC.

The MEG coolant is mixed with water. The mixing ratio determines the freezing temperature of the liquid. This mixing ratio can change due to, for example, evaporation of the water (especially when a open loop is used). Therefore it is recommended to check the mixing ratio of the liquid regularly with a refractometer and to maintain the desired freezing point by adding additional coolant.

MAINTENANCE

The ECO-ClimaTEC does not require any maintenance at short terms.



Basic maintenance on system components on long terms:

1. Make sure the liquid level in the reservoir is correct (see chapter '*filling*' for more information).
2. Make sure there is no contamination in the liquid.
If there is contamination than refill the reservoirs.
3. Observe if the liquid flow is clear of air bubbles.
4. Before refilling the reservoirs, make sure the filter in the fill opening is clear of contamination, to prevent the ECO-ClimaTEC from running on contaminated cooling fluid.
Replace or clean the filter if it is not clean.
5. The radiator and fan must be cleaned when polluted.
6. When airfilters are used, these must be cleaned or exchanged when they are polluted.
7. Do regularly control the electric connections and tighten them if they are loose.
8. Do regularly check the condition of the liquid tubes and couplings. If they are internally contaminated they can hold back the performance of the ECO-ClimaTEC. Replace them if necessary.
9. When the ECO-ClimaTEC is polluted, clean the outer surface with a water soaked cloth.

TROUBLESHOOTING

Please try the following instructions before calling for service:

States	Possible cause	Instruction
All components are shut down	Level low / no flow	Refill both reservoirs
Only the cooling unit has shut down	System overheated, the temperature limiter has shut down the module	Wait until the cooling unit has cooled down below 35°C
The ECO-ClimaTEC is not heating/cooling correctly	Power capacity shortage	Check the applied voltage and current
	Not enough flow	Decrease the flow resistance in the liquid loops
	Chosen the wrong radiator/fan combinations	Try another combination
The ECO-ClimaTEC is not heating/cooling at all	No electric power	Inspect the power supply
	Wrong wiring	Inspect the wiring

ADDITIONAL INFORMATION

This chapter contains additional information about components that are not visible on the outside of the ECO-ClimaTEC but are responsible for securing the ECO-ClimaTEC itselfs.

This chapter gives you some inside information for reference.

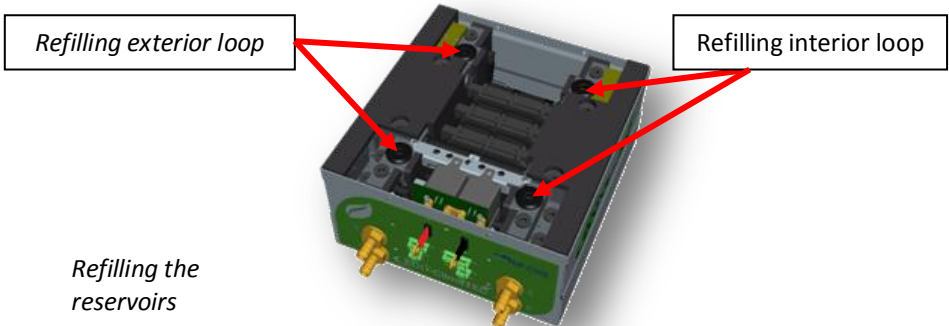
TEMPERATURE LIMITER

The temperature limiters are mounted on top of the TCT-units. These limiters will shut the system down when the unit has reached a temperature of ca. 50°C. This temperature is reached when the liquid flow inside the TCT-unit has a temperature of ca. 65°C. The limiter avoids that the components in the ECO-ClimaTEC get damaged by overheating. The system will restart when the outer surface of the TCT-unit has cooled down to a temperature of approximately 35°C. At room temperature this takes about 20 min.

LEVEL SWITCH

The level switch checks the liquid level inside the reservoirs. If the level of the liquid gets below a certain level, the level switch will shut the system down. This problem can be solved by refilling the reservoir. This refilling can be done by removing the lid of the ECO-ClimaTEC and the plugs on top of the reservoirs. After removing the plugs, the cooling fluid can be poured into the reservoir until the level of the fluid is on an equal height as the starting plane of the screw thread of the plug.

It is recommended to refill the reservoirs while the system is still running. After refilling the plugs should be mounted back on their positions before the system is shut down again.

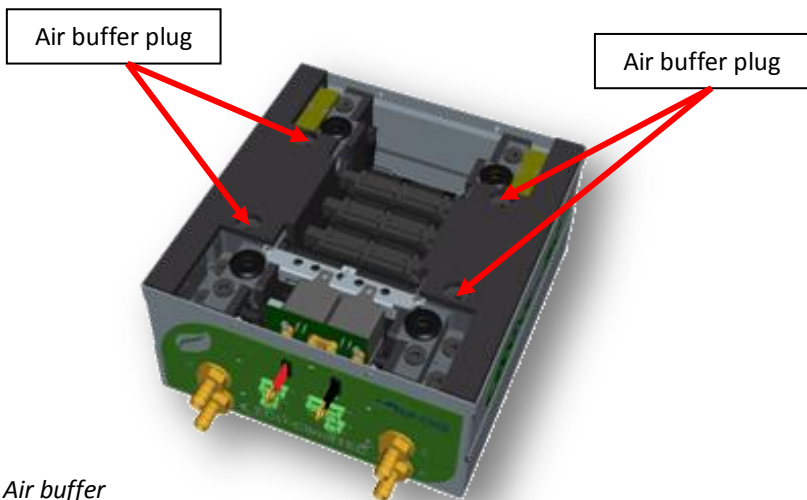


FLOW SWITCH

The flow switch monitors if there is a liquid flow in the system. When there is no sufficient liquid flow present as a result of an error, for example when the liquid is frozen or air in the pump-housing, the system will shut down. This error can be caused by a lack of liquid in one of the reservoirs. This error can be solved by refilling the reservoirs. This can be done by removing the plug on top of the reservoirs and refilling the reservoirs with cooling fluid (*see picture: Refilling the reservoirs*).

AIR BUFFER

The reservoirs contain an integrated air buffer that levels out pressure valuations. The air buffer is hidden under the plugs on top of the reservoirs. Therefore these plugs may never be removed. For a more flexible system concerning the positioning of the ECO-ClimaTEC in the vehicle, it is also possible to fill the reservoir completely, including the air buffer. Instead of the air buffer an overpressure valve is mandatory in this situation.



FILTERS

There are filters underneath every fill opening of the reservoirs, that prevents contamination from getting into the reservoir. There is also a filter in front of every pump in the reservoir (not visible) for the same reason. This filter can only be replaced by refurbishment.



SAFETY INSTRUCTIONS

1. Before making any modifications in your system, or disconnecting the ECO-ClimaTEC, turn off the electric power of the system.
2. Always follow the instructions and regulations conform this manual or more stricter local regulations if they apply.



TIPS

1. If any doubts occur how to use the ECO-ClimaTEC otherwise as listed in this manual, contact Top-Cool for instructions or confirmation.
2. If there is doubt about a (sufficient) flow, you can use a flow switch, a flow meter or flow indicator (like a propeller) in the flow to visually check if there is still a flow in the system.
3. You can use the ECO-ClimaTEC for cooling but also for heating as main operating purpose!
4. For a better performance of the ECO-ClimaTEC it is recommended to cover the tubes between the ECO-ClimaTEC and the radiator/fan combination with insulation foam. It also recommended using tubes that are as short as possible to reduce loss of energy.
5. Make sure there are no kinks in the liquid tubes that can block the liquid flow.
6. To reach a high efficiency the temperature of the cooling fluid that is leaving the radiator should maximal be 10°C above the ambient temperature.

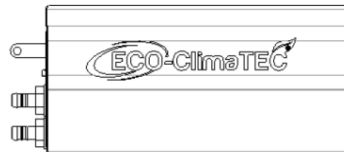
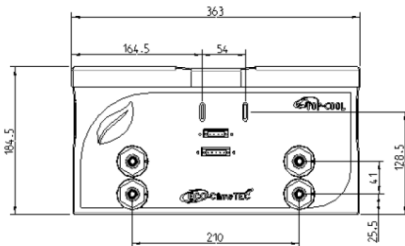
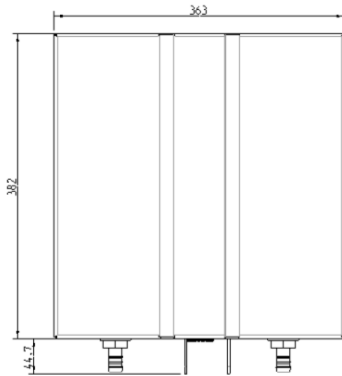
TECHNICAL DATA

DIMENSIONS

Dimensions: 382 x 363 x 184,5mm

Weight: +/- 18kg unfilled (depending on model)

Top, Front & Side view (dimensions in mm):



TECHNICAL SPECIFICATIONS

Electric connection	12VDC / 24VDC (depends on system)
Main connection	M10 cable lugs
Pump (4x)	12VDC (12V system)
Pump (4x)	24VDV (24V system)
Housing material	Stainless steel
Cooling fluid	Water, MEG (Mono Ethylene Glycol)
Reservoir content	1 Liter each
Main dimensions	382 x 363 x 184,5mm
Weight (unfilled)	± 18kg

	Water (°C)	MEG 20% -10 (°C)	MEG 40% -26 (°C)
Storage temperature (when filled)	5 till 50°C	-5 till 50°C	-21 till 50°C

Optional components
Electric installation kit
Mechanical installation kit
EEM (Exterior Exchange Module)
IEM (Enterior Exchange Module)

MISCELLANEOUS

MARKS USED



Caution: read these chapters very carefully, the information given is very important for safety, installation and operating. If these points are not followed strictly, Top-Cool doesn't support or give warranty whatsoever.



Important information: actions to be taken concerning the electric wiring and power (you will need electrical equipment).



Important information: action to be taken concerning installation of the ECO-ClimaTEC and maintenance to the total system (you will need tools to complete these actions).



Important tips: these tips are very useful on how to install or to use the system based on years of experience to maintain thermal performance.

ENVIRONMENTAL

For disposal of any damaged or used TCT-unit, dispose accordance local regulations.

CERTIFICATIONS

ECO-ClimaTEC system components certifications to be defined

The internal **TCT-unit** is in conformity with the following guidelines:



CE, declaration of conformity

The product is in conformity with the essential requirements of the applicable EC directives.

NEN-EN-IEC 60079-14

NEN-EN-IEC 60079-15

NEN-EN-IEC 60529



ATEX directive

This equipment is suitable for operating in potential explosive atmospheres (zone 2 and zone 22, potential gas and dust explosions).

According to the requirements of the Directive: ATEX Directive 94/9/EG.

The products are in conformity with ATEX under the following guidelines:

Ex II, 3 G/D, EexnC, IIC, T6, IP54 (Standard version)

Ex II, 3 G/D, EexnC, IIC, T6, IP67 (Sealed version)



IP-classification (International Protection)

IP54: protection against dust and splash proof.

IP67: dust-tight and protection against submersion for 30 minutes long.



Mechanical impact

The unit has undergone vertical drop tests, from 2 meters in vertical and horizontal orientation with maximum impact to solid ground, and successfully passed.



RoHS

The TCT-unit does not contain any of the 'restriction of hazardous substances' (RoHS) listed substances.



Common used materials for food applications

The parts of the unit contains the following common used materials in food applications:

- Polypropylene (PP)
- Ceramic material
- Thermoplastic elastomers (TPE)
- Stainless steel fasteners

STORAGE AND TRANSPORT

The ECO-ClimaTEC can be transported in any orientation when the system is not filled.

The system must be stored in an ambient that is 5 degrees higher than the liquids freezing point.

Only a completely empty system is allowed to be stored under 0°C.

DISCLAIMER AND WARRANTY

DISCLAIMER

This manual should be kept in a safe place for handy reference. All efforts have been made to provide the most comprehensive manual possible, though everything without prejudice. Top-Cool is never responsible for any kind of damage to persons, products, systems, the module itself or whatsoever due to the Device. Top-Cool assumes no liability expressed or implied for any damage(s) occurring to any component as result of using products of Top-Cool. The user or purchaser of this product will confirm to the general Terms of Delivery of Top-Cool.

WARRANTY

An ECO-ClimaTEC module is guaranteed for 12 months from the date of purchase. The purchaser should register within 30 days after purchase with Top-Cool to ensure warranty. During the warranty period, warranty is given to the module for defects in material and workmanship, under condition that:

1. All the precautions, installation, operation and security instructions are strictly followed.
2. The module does not show any signs of damage as a result of not following instructions, handling or negligence.
3. The module does not show any sign of modifications, demounts, adjustments or whatsoever.
4. All labels are present, unaffected and clearly readable.
5. The module does not show any signs of excessive wear
6. The user can show the original invoice with date and place of purchase.

Normal wear is excluded from warranty.

After receiving the unit, the RMA report and original invoice, Top-Cool will examine if warranty is applicable. Only when warranty is applicable Top-Cool is obliged to repair/replace components or replace the whole module, with the same or nearest equivalent. Top-Cool reserves the right to reject or determine the RMA-procedure when warranty is void.

The installation and operating instructions reflect the current technical specifications at time of print. We reserve the right to change any specifications or notes to this manual or described products without notice. Nothing of this manual may be exposed, copied, made public or distributed without written permission of Top-Cool. All rights reserved.



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