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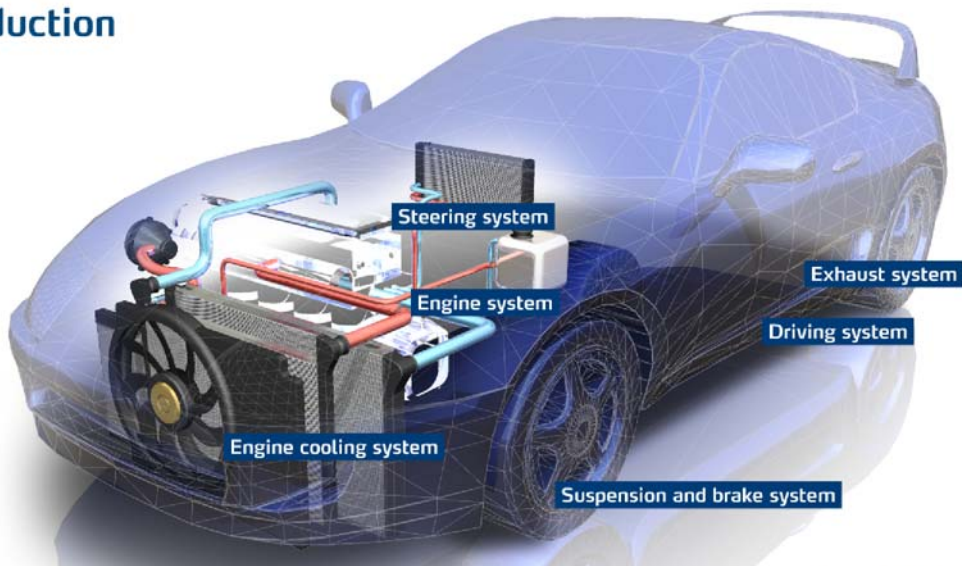
Nissens' technical presentation



EC
Main menu



EC introduction



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EC History



Model T as a precursor in the twenties



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EC History



Water pump driven by the engine



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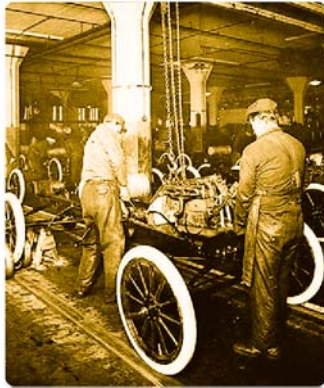
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EC History



System chilled by liquid coolant



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EC History



Today the system consists of the same components



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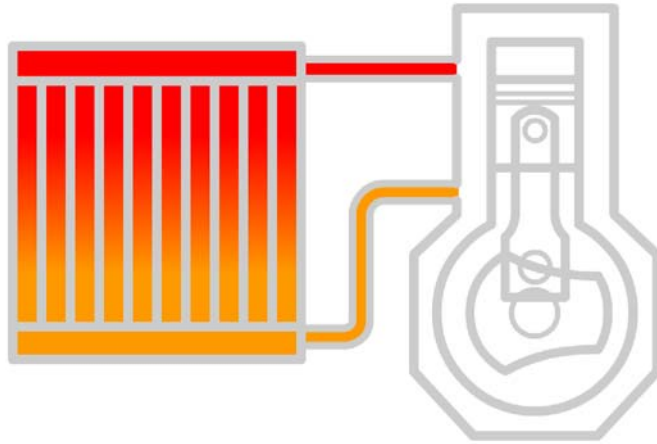
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EC purpose

In an engine, there may be as many as 4,000 explosions per minute, each with temperatures up to 1500C

The purpose of the engine cooling system is to efficiently transfer a substantial surplus of heat to the air surrounding the vehicle.



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EC function

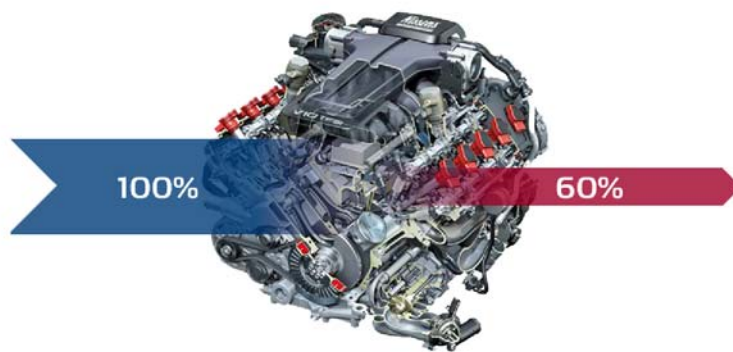
Out of the 100% chemical energy in terms of fuel, only 40% is transformed into mechanical energy

The remaining 60% energy is lost as exhaust, engine cooling, friction and driving other equipment

Efficiency of automotive combustion engines:

Petrol engines 30-40%

Diesel engines 50-60%



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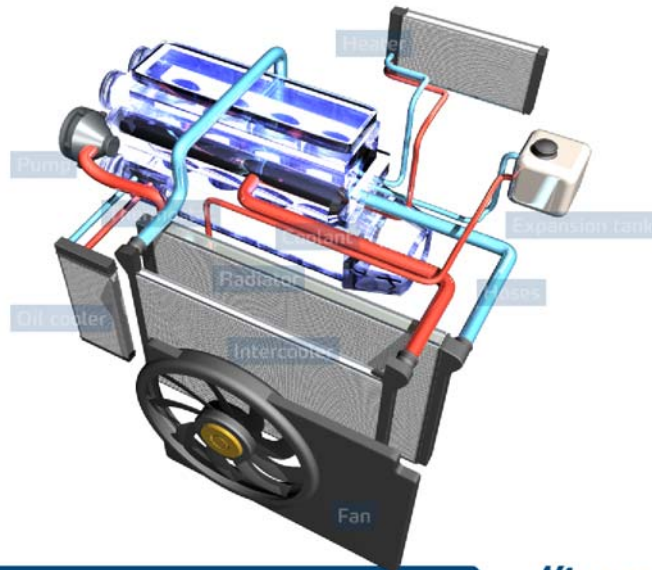
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EC elements

Please roll over the hotspots to see the elements of the engine cooling system...

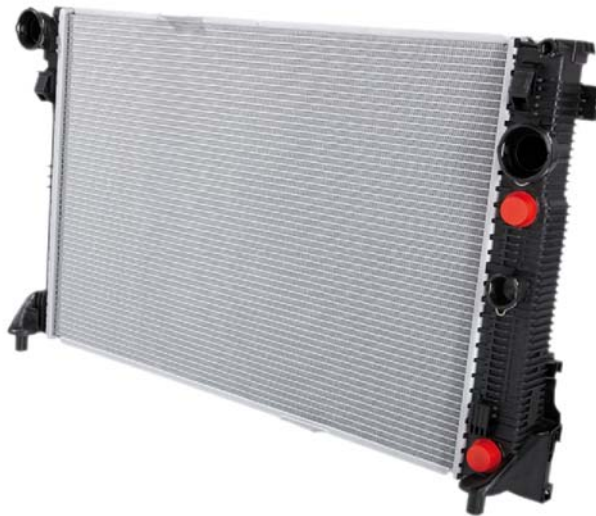


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EC radiator

The radiator transfers heat from the coolant to the surrounding air.



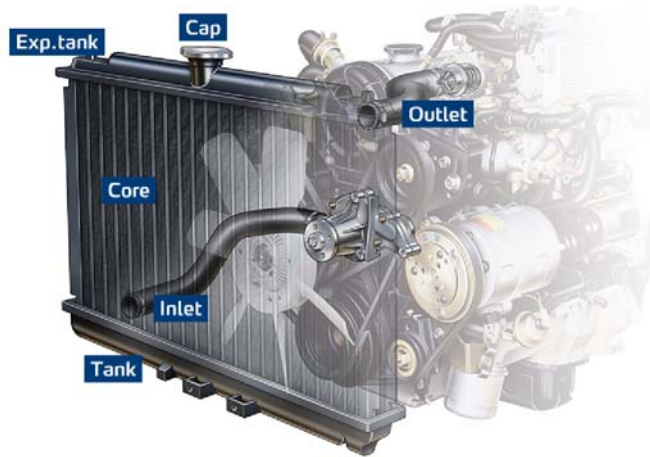
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EC radiator components



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EC heater

The heater utilizes the surplus of heat to heat the cabin of the car



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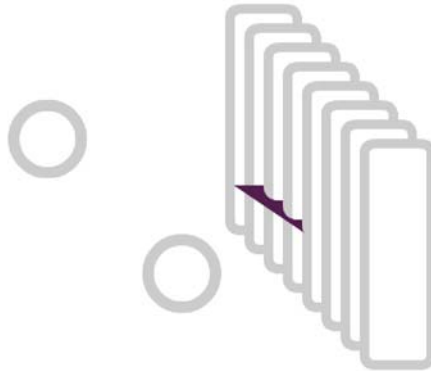
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EC heater function

An electrically driven fan sends air through the heat exchanger and into the cabin



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EC thermostat

The thermostat controls the flow through the system



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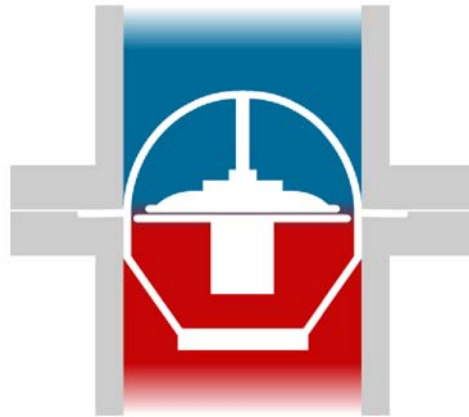
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EC thermostat function

The thermostat controls the flow depending on the temperature of the coolant
The secret lies in the small cylinder located on the engine side of the device



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EC pump

The pump provides flow through the system



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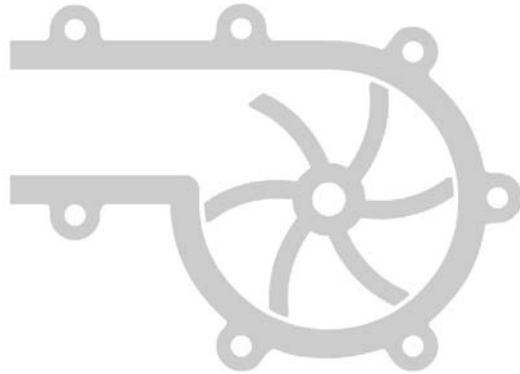
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EC pump function

Coolant is continuously drawn to the centre of the pump and sent outwards due to the centrifugal forces

This principle is very robust and capable of handling a substantial amount of dirt in the coolant



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EC expansion tank

The expansion tank absorbs fluctuations in coolant volume



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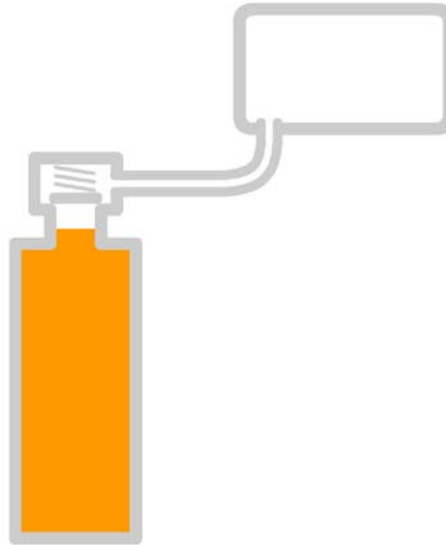
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EC expansion tank function

As the coolant gets hot, it expands. Since the cooling system is sealed, this expansion causes an increase of pressure in the cooling system. This is quite normal and part of the design



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EC hoses

The hoses connect various parts of the cooling system



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EC hose elements

The hoses are easily installed and serviced due to the quick fit connectors

The hose body is made of strong reinforced rubber which is resistant to high temperatures



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EC coolant

Fills the system



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EC coolant points of importance

To have a properly working cooling system even during extreme cold weather, remember a few important steps

- always flush the system when a new part is installed.
- Use only a good coolant recommended by the car producer.
- Use a proper mix between anti-freeze and water, always at least 50% anti-freeze.
- Never mix different kinds of coolants



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EC fan

Supports the cooling process



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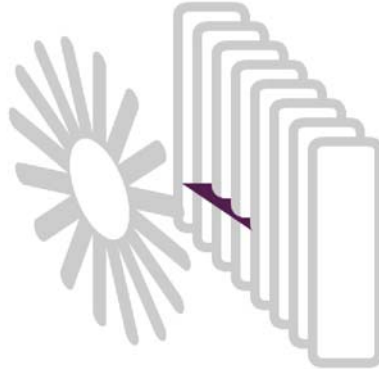
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EC fan function

The fan provides airflow to the cooling system independent of car velocity.

Today most fans are driven by an electrical motor, in which case control is provided through a thermo switch.

Some fans are driven mechanically from the engine. Most of these use a thermo clutch, also called "visco", which senses the coolant pressure.



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EC oil cooler

The oil cooler provides cooling of additional equipment.



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EC oil cooler function

Cooling of automatic transmissions

Cars with automatic transmission are most often equipped with an oil cooler placed in the tank of the radiator. But the efficiency is rather low as the working temperature of the radiator usually lies around 90°C.

An aftermarket oil cooler placed outside the radiator is capable of a much better cooling. This is highly recommended for high-performance or towing vehicles.

Cooling of engine oil

Nowadays, an increasing number of cars are equipped with engine oil cooler, which helps the radiator to cool the engine. The constant increase of engine power makes it necessary to use an additional radiator to be able to transfer heat from the engine.



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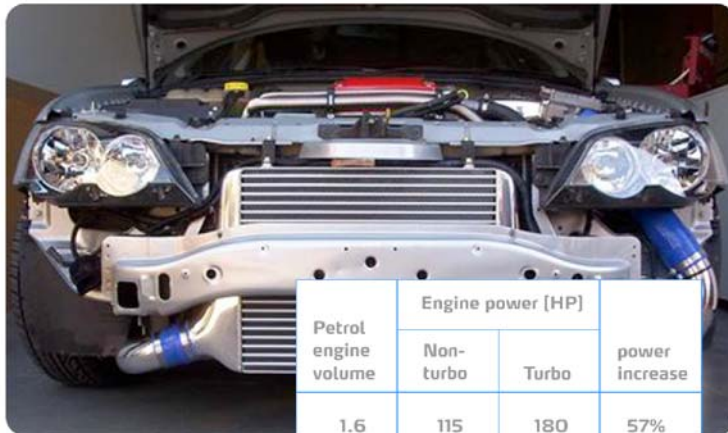
EC intercooler

The intercooler cools the charge air.

Applying an intercooler in a turbocharged system significantly improves the combustion process, and the outcome is an increased engine power effect. This is one of the best ways to safely increase horsepower in turbo-powered engines.

Benefits:

- Increased engine power and efficiency
- Lower fuel consumption – leading to better economy
- Lower engine emission values, polluting less, and thus respecting the environment more
- Lower thermal stress on the engine and its equipment



Petrol engine volume	Engine power [HP]		power increase
	Non-turbo	Turbo	
1.6	115	180	57%
1.4	85	160	88%
2.0	150	200	33%

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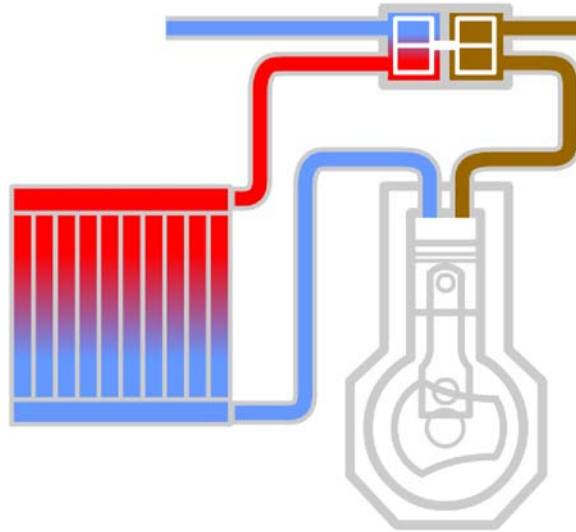
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EC intercooler function

Intercoolers reduce the temperature of the hot air compressed by the turbocharger, before it gets to the engine combustion chamber. This has a distinctive impact on the charge effect as the cooled air has a much higher density in terms of more air molecules per cubic centimeter. The results: a marked increase of air intake and a much better engine output.

Temperatures

When the air enters the turbocharger, the air temperature is 20°C
When leaving the turbocharger, the temperature is increased to 84°C
Before entering the engine, the intercooler cools the air to 36°C
The exhaust gas driving the turbocharger is approx. 1000°C



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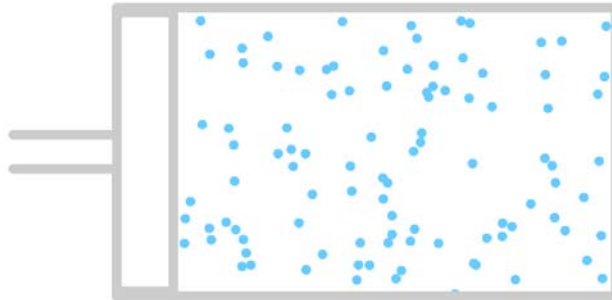
How does it work?

Turbocharging

Feeding the engine with compressed air from the turbocharger means the combustion can be increased without increasing the engine size

Cooling the airfeed

When air is compressed, the air molecules gain speed, and the temperature increases
When the air is compressed in the turbocharger, the temperature may be increased up to more than 60°C. This is not ideal as the combustion process runs most efficiently at an air temperature of approx. 20°C. The intercooler cools the air from the turbocharger, thus ensuring an optimum combustion and a maximum increase in horsepower.



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Failures

Symptoms of a defective or leaking intercooler:

- Noticeable drop of the engine power effect – caused by improper pressure in the turbo-charge system and improper ratio of oxygen in the fuel/air mixture
- Increased fuel consumption – loss of oxygen causes an excessive intake of fuel to the mixture for the combustion process
- Unnatural smoking from the exhaust system – provoked by a surplus of the fuel that cannot be combusted and is consequently emitted from the exhaust system
- Failures of the turbocharger, the engine or the exhaust filters. (DPF/FAP for diesel engines and catalysts for petrol engines.

Frequent causes of intercooler failures and consequences:

- Frontal accidents and stones/particles thrown from the road – physical, external damage leading to leaks
- Turbocharger failure/replacement – intercooler tubes clogged by oil, particles or damaged turbo parts reducing the internal air flow
- Improper sealing of the turbo unit (worn or defective gaskets) – besides clogging, oil blown to the intercooler quickly damages its rubber gaskets, leading to leakages between the core and tanks or to a 'blown tanks' effect
- Soiled surface of the intercooler, reducing the air flow and thus the cooling performance of the unit

CAUTION: Always replace the intercooler when installing a new turbocharger!

In case of turbo failure, oil from the charger, as well as the swarf from its damaged parts, are sent through the entire system and may clog the intercooler channels. When a new charger has been installed, the system will again operate with the proper, high pressure, and both the oil and the particles collected in the intercooler risk being instantly blown to the combustion chamber, which may damage the engine.

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Nissens' products

Efficient cooling through the high performing and durable Nissens' parts

More than 7,000 high-quality engine cooling products for cars, vans and trucks:

- Radiators
- Intercoolers
- Oil coolers
- Fans

We know that quality matters and we never compromise on quality.

All Nissens products are designed, developed and manufactured as original quality parts for automotive engine cooling and climate systems in accordance with the requirements of the highest quality standards ISO 9001 / TS 16949 and match OE standards 100%.



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EC Radiators

Characterized by an excellent performance and durability due to a unique technology called double-folded fins. Produced in several systems from the best quality raw materials such as aluminum and copper for cores, and plastic reinforced with fibre glass for tanks.

The Nissens range consists of radiators for almost any type of known makes and models of:

- Passenger cars
- Vans
- Trucks and busses



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EC radiator technologies



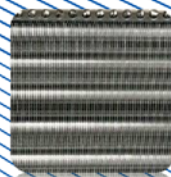
Brazed



Brazed 5 mm



Full-Aluminum



Mechanical Aluminum

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Brazed Aluminum Radiators (McCord)

Radiator construction consists of aluminum core in McCord System and plastic water tanks.

Cores in McCord system

The McCord cores are made with highly efficient fins, optimally formed louvres and a very small tube distance - ensuring excellent durability and cooling performance. In the aluminum McCord system, the core parts are brazed (Nocolok) to form a strong, durable structure.

Cores are equipped with double-folded fins, i.e. fins with folded edges, reinforcing the fin itself and protecting it against damages and increasing the unit durability and better cooling performance.

Tanks

The radiator plastic tanks are reinforced and made of plastic containing at least 30-35% fibre glass. No recycled plastics are used in our tanks.

The tank gaskets are made in high-quality elastic rubber to prevent it from bursting or shrink when it gets older or is exposed to extreme temperatures.



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Brazed Aluminum Radiators - 5 mm system

The 5 mm radiator construction consists of the same components as aluminum brazed radiators: Core in McCord System and plastic water tanks.

The 5 mm system

The 5 mm term indicates that the spaces between the tubes in the radiator core are 5 mm. Until recently, the majority of aluminum radiators for cars were made with 10 mm tube distance. The remarkable distance reduction in 5 mm radiators generates a number of interesting benefits in comparison to the standard systems of 10 mm:

- Better cooling performance
- Reduction in cooling unit size; mainly in thickness in terms of less rows, but also in width and height
- Lower weight

Nissens is the first manufacturer in Europe to offer radiators produced in-house based on the 5 mm technology.



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Brazed full aluminum

The perfect Choice for excellent Engine Cooling

Nissens now offers an interesting range of market-popular full-aluminum radiators. For decades, we have developed and mastered in-house production of Controlled Atmosphere Brazing (CAB) processes in our factories in Europe. The result is aluminum cooling products with excellent brazing quality and uniform flux coatings.

Nissens' proven Performance in Full-Aluminum Technology

- The full-aluminum radiators from Nissens are produced on the basis of the latest and most advanced technologies, including fully automatic manufacturing and assembly lines.

- The Controlled Atmosphere Brazing (CAB) process applied to manufacture our full-aluminum radiator elements ensures a cooling unit with very strong and durable structures.

- We use Paint Flux on all critical components in order to ensure a high and consistent quality of the brazed full-aluminum radiators.

- The cores of the radiators are produced with heavy-duty tubes, highly efficient double-folded fins, optimally shaped louvres and a small tube distance to ensure excellent durability and cooling performance.

- Nissens' full-aluminum radiators are easy to handle and install into the plastic cassette. Furthermore, our Multi-Fit concept ensures a quick and flawless installation in more than one application.

- All our full-aluminum products have been thoroughly tested in corrosion, vibration, pressure impulse, thermal expansion and thermal performance test series.

- It is important for Nissens to take the impact on our environment into consideration, when we design and manufacture our products. We are certified according to ISO 14001.



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FULL-ALUMINUM RADIATORS

A photograph of a cardboard box for Nissens Full-Aluminum Radiators. The box is light brown and features a clear window showing the radiator components inside. The Nissens logo and tagline are printed on the box. The text "NISSENS FULL-ALUMINUM RADIATORS" is overlaid in large white letters across the center of the box. The text "Engine Cooling & Climate Parts" is visible on the bottom left of the box.

NISSENS FULL-ALUMINUM RADIATORS

Engine Cooling & Climate Parts

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The Nissens logo, featuring the brand name in a blue, italicized serif font with a horizontal line underneath, and the tagline "DELIVERING THE DIFFERENCE" in a smaller, blue, sans-serif font below it.

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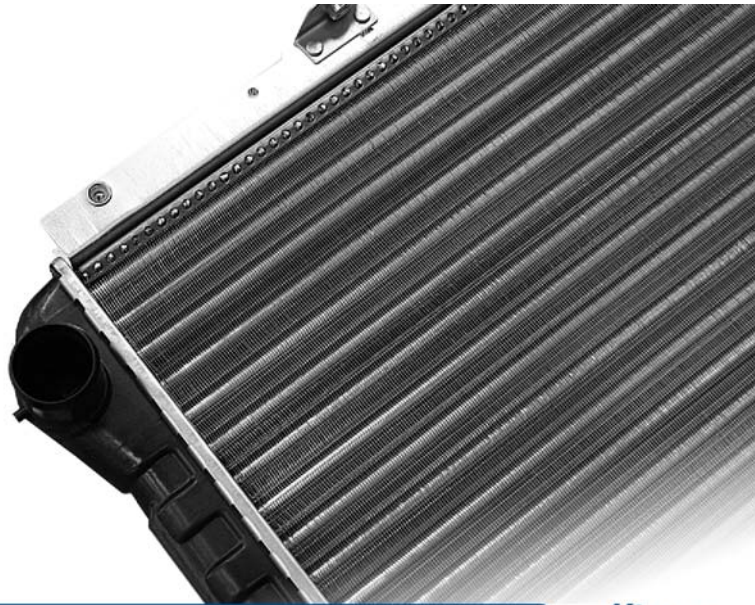
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Mechanical aluminum

Radiator construction consists of aluminum core and plastic water tanks.

The Mechanical Aluminum term indicates that the core elements like fins and tubes are assembled mechanically. Due to less advanced technology and faster assembling, the mechanical aluminum radiators are relatively cheaper than brazed constructions, but still offer sufficient cooling performance.

This type of construction is mainly applied in radiators for smaller engines and older car park.



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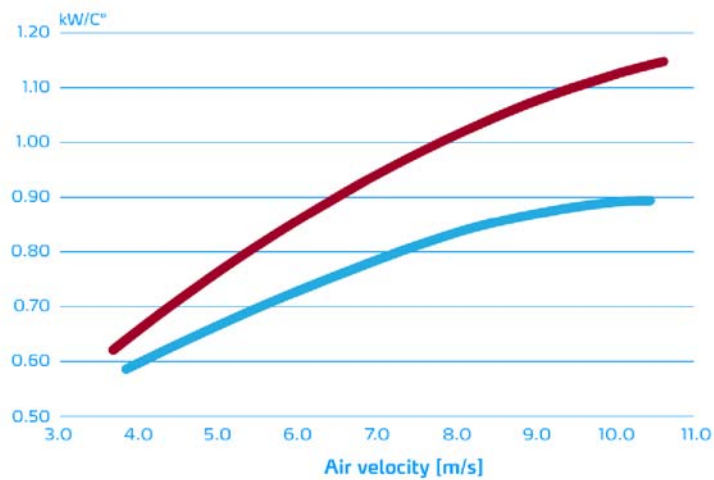
EC performance - MC system

Comparison of Mechanical radiator and Nissens #60743A

Cooling performance at the same internal pressure drop level.

RED: Nissens radiator - 32 mm thickness brazed Alu McCord

BLUE: Mechanical aluminum radiator - 34 mm thickness



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Efficiency – brazed vs. mechanical aluminum

In general, brazed aluminum radiators are approx. 30% more efficient than the mechanical assembled ones

Mechanical aluminum

The tubes have a relatively large diameter, but the surface of the heat exchanger is smaller, and the main stream of hot coolant has no contact with the tube wall

Brazed aluminum

Thanks to flat tubes, with a small volume, the hot coolant has a better contact with the surface of the tube, where the heat is transferred.

The market tendency

Since the mechanical aluminum technology is cheaper in production, there are many car manufacturers that apply this technology especially for smaller capacity engines.

To ensure the optimal cooling efficiency, all Nissens equivalents of the OE mechanical aluminum products are manufactured as brazed aluminum radiators.



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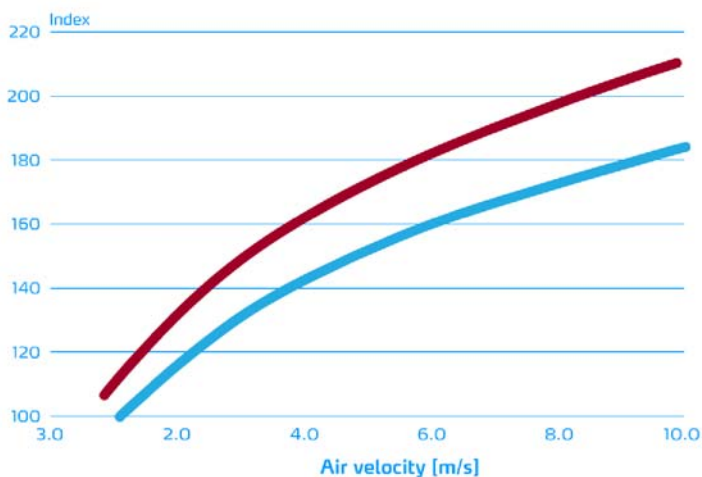
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Performance 5 mm

Comparison between radiators in systems 5 mm and 10 mm

RED: Nissens radiator built in system 5 mm

BLUE: Typical radiator built in system 10 mm



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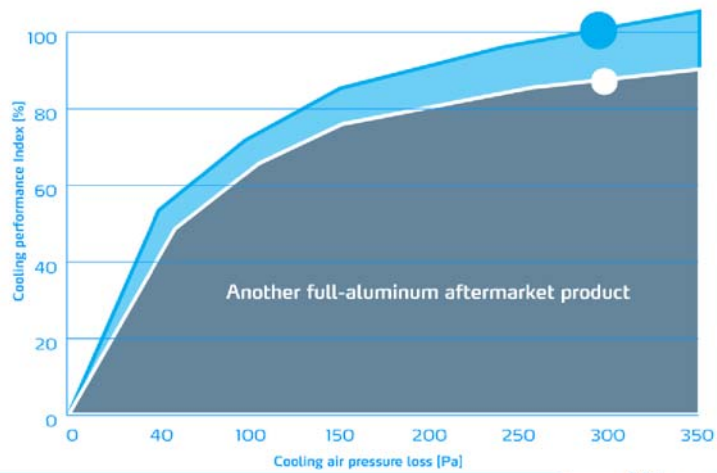
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Nissens Full-Aluminum Performance

Since product quality and technology are highly valued by Nissens, we are proud to document our unique performance in comparison with other aftermarket products.

The table shows the result of a cooling performance test of two identical full-aluminum radiators. One of the radiators is produced by an established aftermarket supplier. The other is produced by Nissens. The conclusion is that Nissens' full-aluminum radiator performs better than the competitive product.

- Nissens' products always comply with the applicable OE standards



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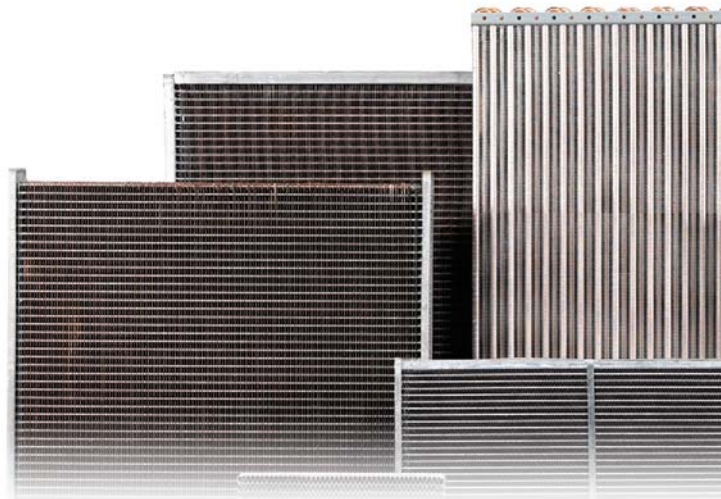
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EC cores

Nissens has solutions for both cars, vans, trucks and buses

- More than 3,000 different products
- Customized solutions
- Five different core systems



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EC core system in applications

- Some cars (MCCord)
- Trucks and vans (MCCord and Flatfin)
- Commercial vehicles and buses (MCCord)
- Agricultural machines (Flat Fin)
- Extreme sports and othe extreme purposes (MCCord and blocks)



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EC cores standard industrial products

Nissens' standard and customized industrial products offer you a wide selection of cooling solutions for almost any kind of automotive or industrial applications such as cars, vans, trucks, buses, agricultural and building machinery, compressors, lifts, boats, power generators and many, many others.

The high-quality products with superior cooling performance up to 1000 kW and durability up to 20 bar will fit the most complex cooling requirements.



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EC NO + NC coolers/combi-coolers

Two shell cooler series designed for oil, water or air cooling in all kinds of installations with a working pressure up to 13 bar. The NO + NC series are based on 11 cooler sizes. NO coolers are used for cooling hydraulic oil/lubricating oil. NC combi-coolers are made up of two combined sections cooling two different media: one cooling hydraulic oil/lubricating oil and the other cooling water or air. The coolers are manufactured from aluminum and are constructed by means of highly advanced pressing tools, which give the cooler its particular shell shape. The compact cooler sizes are suitable for mobile installations and are often applied on contractor's equipment, forest machinery etc.



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EC HP + HPC high-pressure coolers

Based on our deep variety of cores for reconditioning of radiators, heaters, intercoolers, condensers and high-pressure oil/water/air coolers, we offer repairs, reconditioning and customized production of almost any type of aluminum or copper/brass cooler for all kinds of thermal installations for vehicles, industrial devices and machinery. Nissens' cores are made of high-quality copper/brass or aluminum - and are available in 7 different systems - practically without size and shape limits. Production takes place in Denmark and may be as short as 24h.



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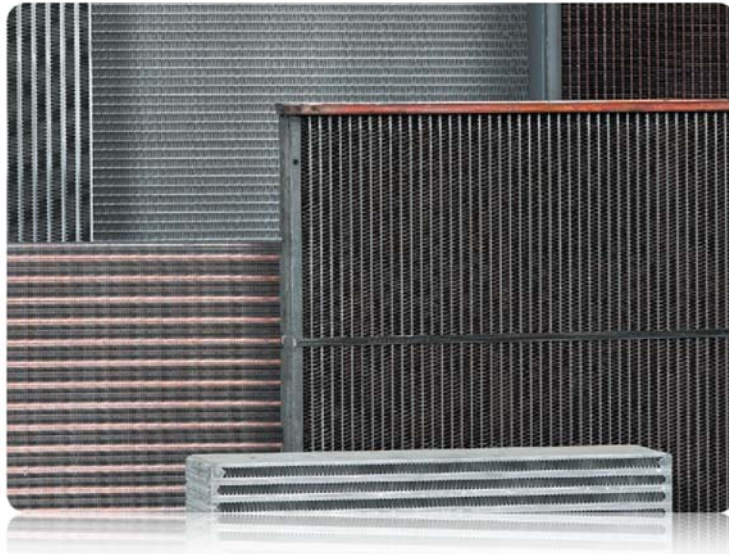
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EC Customized cooling solutions

Two shell cooler series designed for oil, water or air cooling in all kinds of installations with a working pressure up to 13 bar. The NO + NC series are based on 11 cooler sizes. NO coolers are used for cooling hydraulic oil/lubricating oil. NC combi-coolers are made up of two combined sections cooling two different media: one cooling hydraulic oil/lubricating oil and the other cooling water or air. The coolers are manufactured from aluminum and are constructed by means of highly advanced pressing tools, which give the cooler its particular shell shape. The compact cooler sizes are suitable for mobile installations and are often applied on contractor's equipment, forest machinery etc.



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EC cores solutions for races

Nissens' technology and products are also applied in advanced cooling solutions used by high-profile racing teams building cars for F3, Nascar, Indy Car and Le Mans.

Nissens' cooling solutions have been applied to:

- F3, T-Sport Team, UK
- Lexus/Toyota, GP2 USA
- Jaguar XKR, GT3 USA
- Honda, IndyCar/F1 USA
- Aston Martin DBR9, LMGT1
- Corvette C.6 R, LMGT1
- Ferrari F430, LMGT2
- Lexus, Daytona 24 hours
- Porsche, Daytona 24 hours
- Ford, Daytona 24 hours



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EC Intercoolers

Designed for all turbocharged combustion engines, for both petrol and diesel. They cool the intake air in the engine, thus increasing engine effect without increasing cylinder volume, and offering advantages such as lower fuel consumption, better economy and less pollution.

Made either entirely of aluminum or as aluminum cores with reinforced plastic tanks. The specially cut side panels resist the stress caused by high temperatures.

Nissens' range of intercoolers covers more than 75% of the aftermarket for passenger cars and trucks.



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EC fan products

Make cooling more effective!

- Delivered as one complete unit including shroud, motor and blades
- Equipped with OE motors
- Matching Nissens' radiators

A well-balanced package!

- Equipped with resistor
- Built of durable material



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Trouble shooting



Improper use of antifreeze

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Trouble shooting



Inadequate flushing of the system

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Trouble shooting

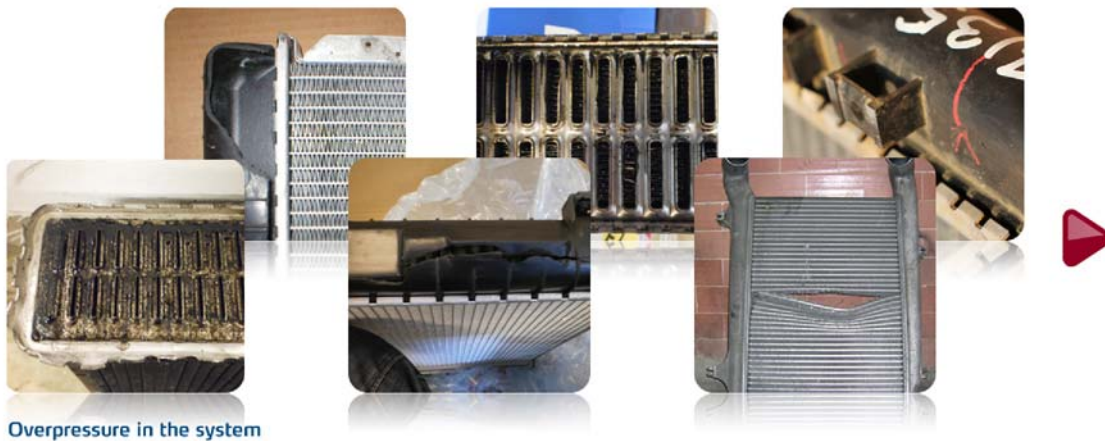


Electrolysis

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Trouble shooting



Overpressure in the system

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Trouble shooting



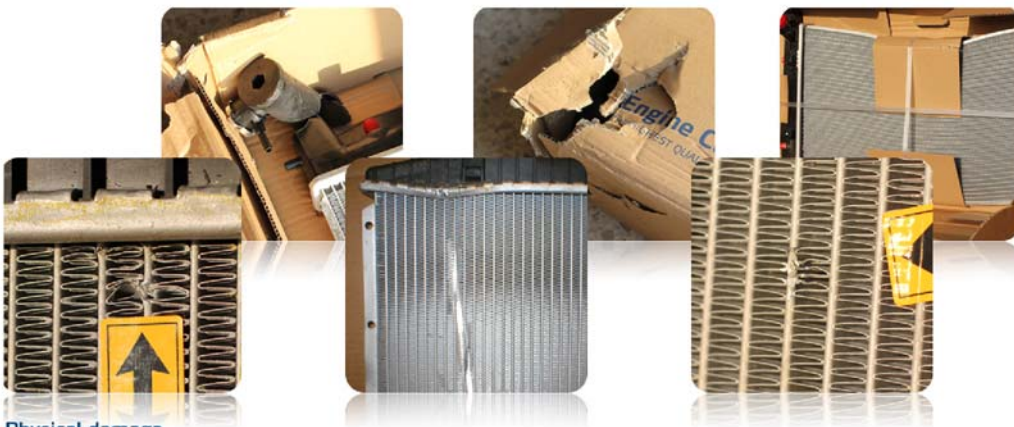
Installation damages



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Trouble shooting



Physical damage



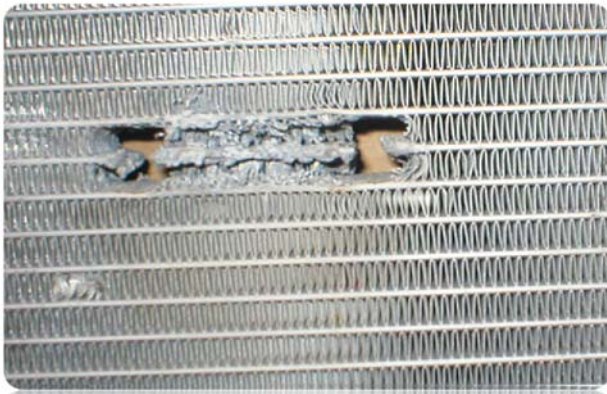
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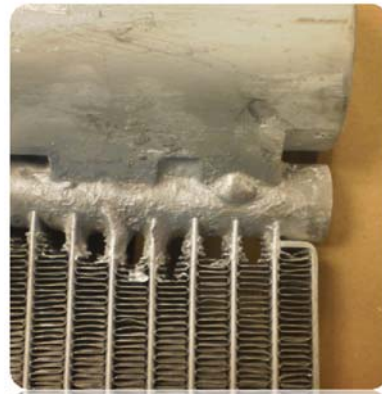
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Poor repairs



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Why choose Nissens EC



Designed to perform

Nissens' cooling units are designed to perform under hard working conditions:

- Radiators: up to +105°C and a variation of pressure from 0.5 up to 1.5 bar.
- Intercoolers under conditions such as variation of charge air temperatures up to 180°C on the inlet side / and up to 100°C on the outside and variation of pressures from - 0.5 to 2.5 bar (g).



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Why choose Nissens EC



Designed to perform

Nissens' intercoolers have specially-cut side panels resisting the stress caused by high temperatures.

Plastic tanks are reinforced and made of plastic containing at least 30-35% fibre glass. The material type is always indicated on the tank surface. No recycled plastics are used in our tanks.

The tank gaskets are made in high-quality elastic rubber to prevent it from bursting or shrink when it gets older or is exposed to extreme temperatures.

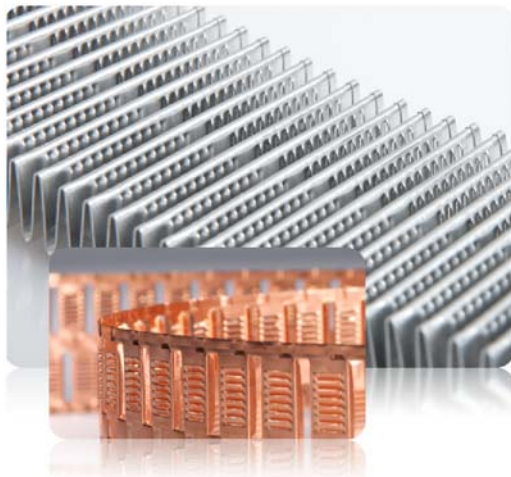


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Why choose Nissens EC



Designed to perform

Nissens' cooling unit cores are manufactured from only the best raw materials – aluminum and copper/brass, and are made in several efficient systems.

The McCord cores are made with highly efficient fins, optimally formed louvres and a very small tube distance - ensuring excellent durability and cooling performance. In the aluminum McCord system, the core parts are brazed (Nocolok) to form a strong, durable structure.

All Nissens' cores are equipped with double-folded fins, i.e. fins with folded edges, reinforcing the fin itself and protecting it against damage caused by stones, insects or airborne pollution. - In practice, this unique Nissens feature means superior durability and better cooling performance.



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Why choose Nissens EC



Special features

First Fit - all additional parts required for proper installation of the product are included in the product packaging: O-rings, radiator caps, nuts, fan clips etc.

Multi Fit - ne Nissens radiator fits several car makes and models. Part connections etc. are shaped universally, ensuring quick and unproblematic installation in different cooling systems for one or more car makes.



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Why choose Nissens EC



Perfectly finished in every detail

A visible difference characterizing all Nissens' cooling units and their components such as: water tanks, gaskets, threads, bolts, mounting brackets etc.

Our engine cooling components smoothly fit the mounting points on the vehicle and are recognized as spare parts matching OE standards 100%.

The radiator's fixed connections, overflow pipes and no fault tolerance as to length, diameter and bending angle ensure the right part dimensions and shape, enabling a firm and easy installation.



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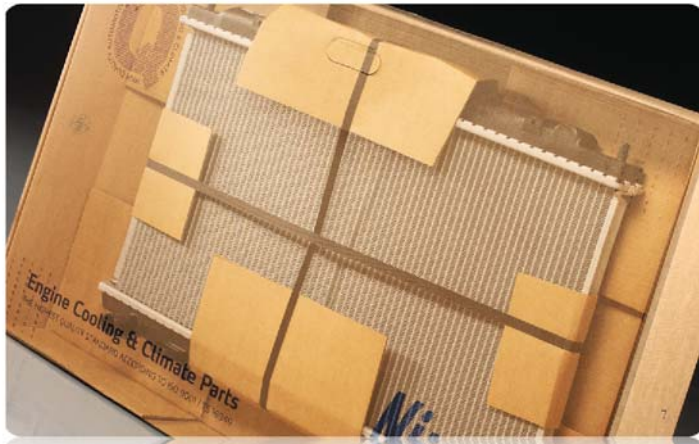
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Why choose Nissens EC



Well packed and protected

Nissens' engine cooling parts are solidly packed to minimize the risk of damage during transport and storage.

Our specially designed Nissens box makes it very easy to handle Nissens' products, and to keep inventories in order.

Both product and package are visibly marked with labels including the most important product information (number, application, bar code - EAN).



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Why choose Nissens EC



Thoroughly tested

Nissens' high quality standards comply with the strict international certifications ISO 9001/TS 16949 and are applied in all development and production processes.

This means that all Nissens products meet the highest quality expectations in the aftermarket – matching OE standards 100% and they are thoroughly tested during development phase by means of the following tests:

- Corrosion Test
- Vibration Test
- Pressure Impulse Test
- Thermal Expansion Test
- Thermal Performance Test

(More details about tests in Quality chapter)



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Why choose Nissens EC



Fans available as complete packages

Nissens' electric fans are always supplied as complete fan modules consisting of for instance motor, resistor, fan blades and shroud ready for quick installation, perfectly fitting both Nissens' radiators and OE radiators, and some modules even fit several different radiator models.



All fans are manufactured from quality materials and tested as complete units - the fan is properly balanced, and it is checked that effect, functionality and reliability are in order.

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EC maintenance

Careful maintenance prolongs the life of your cooling system

- Always remove dirt carefully by flushing the system when a new radiator is installed
- Refill the system with the quality anti-freeze mixture recommended by the manufacturer
- When replacing a damaged radiator, remember to replace the other parts which may have caused the damage



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EC development trends

- Radiators become more compact
- The core and tank are 100% made of aluminum
- Block systems including radiator, condenser (common fins), intercooler, oil cooler etc.
- Coolant pump is driven electrically independent of engine working condition. Eg. coolant can be circulated even with a stopped engine



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