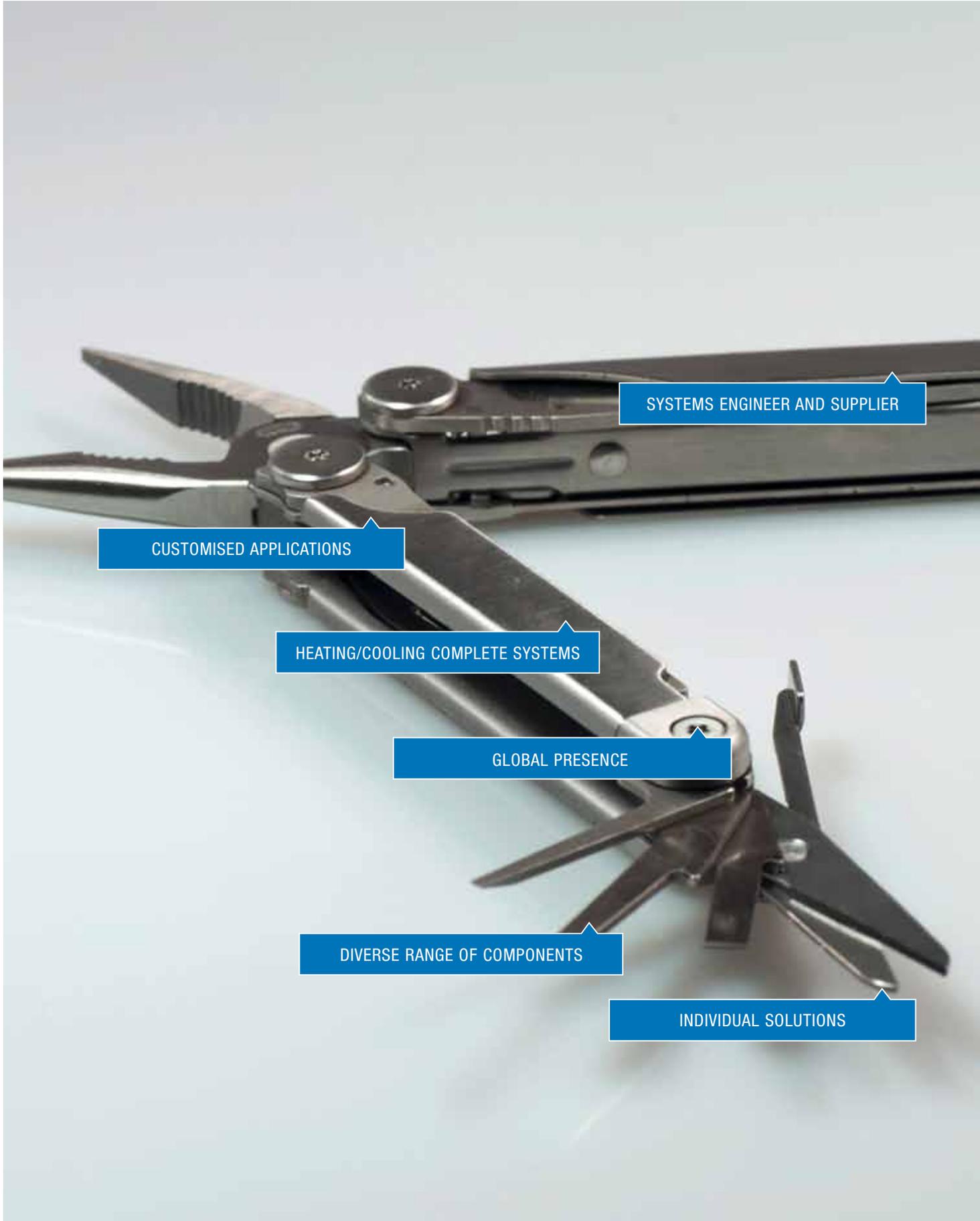


# AIR-CONDITIONING EXPERTISE FOR SPECIAL-PURPOSE VEHICLES – THE RIGHT TEMPERATURE FOR EVERY REQUIREMENT





SYSTEMS ENGINEER AND SUPPLIER

CUSTOMISED APPLICATIONS

HEATING/COOLING COMPLETE SYSTEMS

GLOBAL PRESENCE

DIVERSE RANGE OF COMPONENTS

INDIVIDUAL SOLUTIONS

## EBERSPÄCHER – YOUR EXPERT PARTNER FOR CUSTOMISED AC APPLICATIONS IN SPECIAL-PURPOSE VEHICLE CONSTRUCTION



**When it comes to thermal management, for Eberspächer there is only one solution: the solution that suits you. For every requirement and every need, we will develop your individual system solution, ensuring pleasant, performance-enhancing temperatures in the vehicle interior – the whole year round.**

At the same time, Eberspächer is a systems engineer and supplier of customised AC applications for special-purpose vehicle construction. We are one of very few suppliers capable of combining air-conditioning and a variety of different heating elements in a single system, and controlling them together. Our own development engineers design individual AC system solutions – up to and including functional and quality tests at our own test centres. Following an analysis of the particular case and your specific requirements, we work out the system performance requirements and develop an economical complete solution – using vehicle-specific components if necessary. The diversity of the equipment and components available, combined with our development expertise, means that we can achieve a solution for virtually every vehicle.

The integration of AC specialist Sütrak – the expert in bus air conditioning – in the Climate Control Systems Division of the Eberspächer Group brings numerous beneficial synergies. Our development and application expertise extends from customised OEM solutions to standard aftermarket applications. And it doesn't matter where in the world you are when you need our assistance. Our large service network of subsidiaries and highly specialised partner workshops ensures a global presence – always pursuing our objective: "Complete thermal management – world-wide and from a single source."

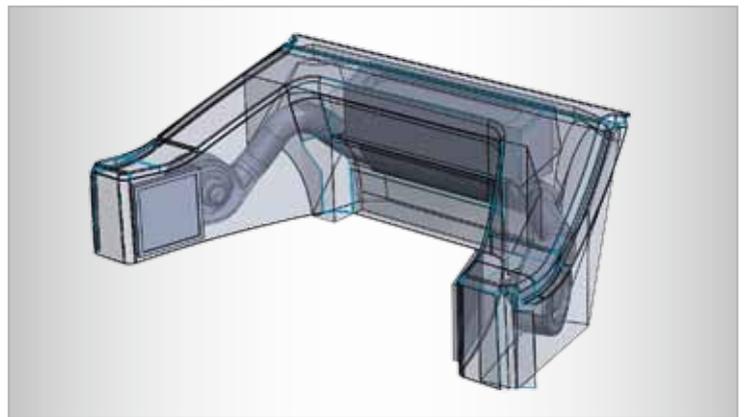
## SYSTEM INTEGRATION IN DETAIL

In recent years, AC systems have become an increasingly important equipment feature, and nowadays are mostly standard in vehicle construction. Based on our customers' wishes and under consideration of the prevailing climate and typical operating conditions, we design custom-made, individual AC systems from a huge number of components, for OEM customers and vehicle body manufacturers, as well as standardised retrofit solutions. Whether we develop a roof-mounted AC system or a split model, for example, depends on the requirements and particular circumstances. Our application expertise encompasses the following stages:

### 1. CONCEPT ENGINEERING

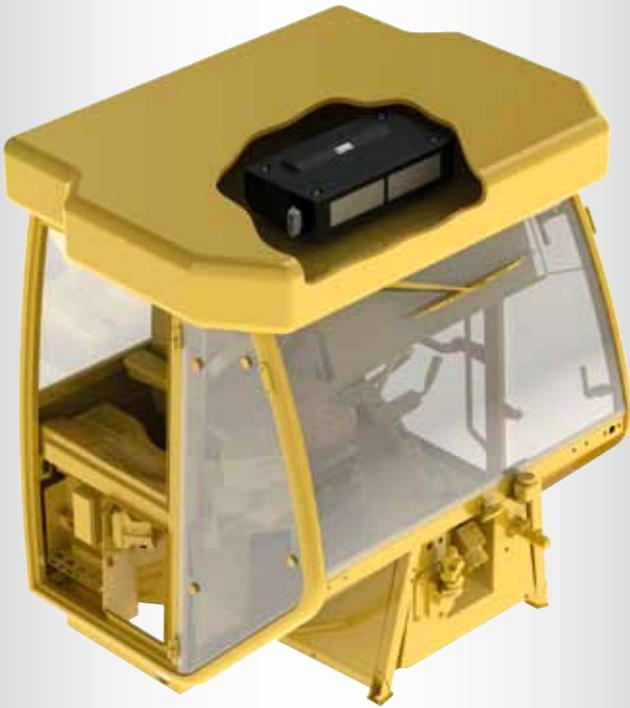
**Initial analysis:** At the start of the project, all customer requirements are noted and possible options discussed in advance. Following a detailed assessment of the geographical position and climatic conditions at the location of use, the thermal requirements are calculated and the various component sizes and the utilisation of space in the vehicle are weighed up. Finally, the development costs are calculated based on the chosen technology.

**Computer Aided Design (CAD):** As the next step, under consideration of the available installation space and perhaps using your software, together with you we develop the first drafts of a solution on the computer. At the same time, the development time and tool requirements are established. The production of 3D models is followed by checks of the design and the estimation of production costs. Next, we can plan the necessary validation process at your company.



### 2. PROTOTYPE AND TESTS

After concept engineering, we manufacture the required number of prototypes for tests and validation, and install a functional model in the cab or machine. Here, individual components undergo a performance test, and the relevant climatic chamber tests, impact and vibration tests are prepared and conducted. Newly developed products and project-based integration plans can be put to the test in our own climatic chambers (hot and cold tests). In these tests, AC units, complete systems and even vehicles up to the size of a coach are subjected to tests at ambient temperatures from  $-40\text{ }^{\circ}\text{C}$  to  $+55\text{ }^{\circ}\text{C}$ . During this phase, certification for a diverse array of requirements takes place, as do conformity tests and validation.

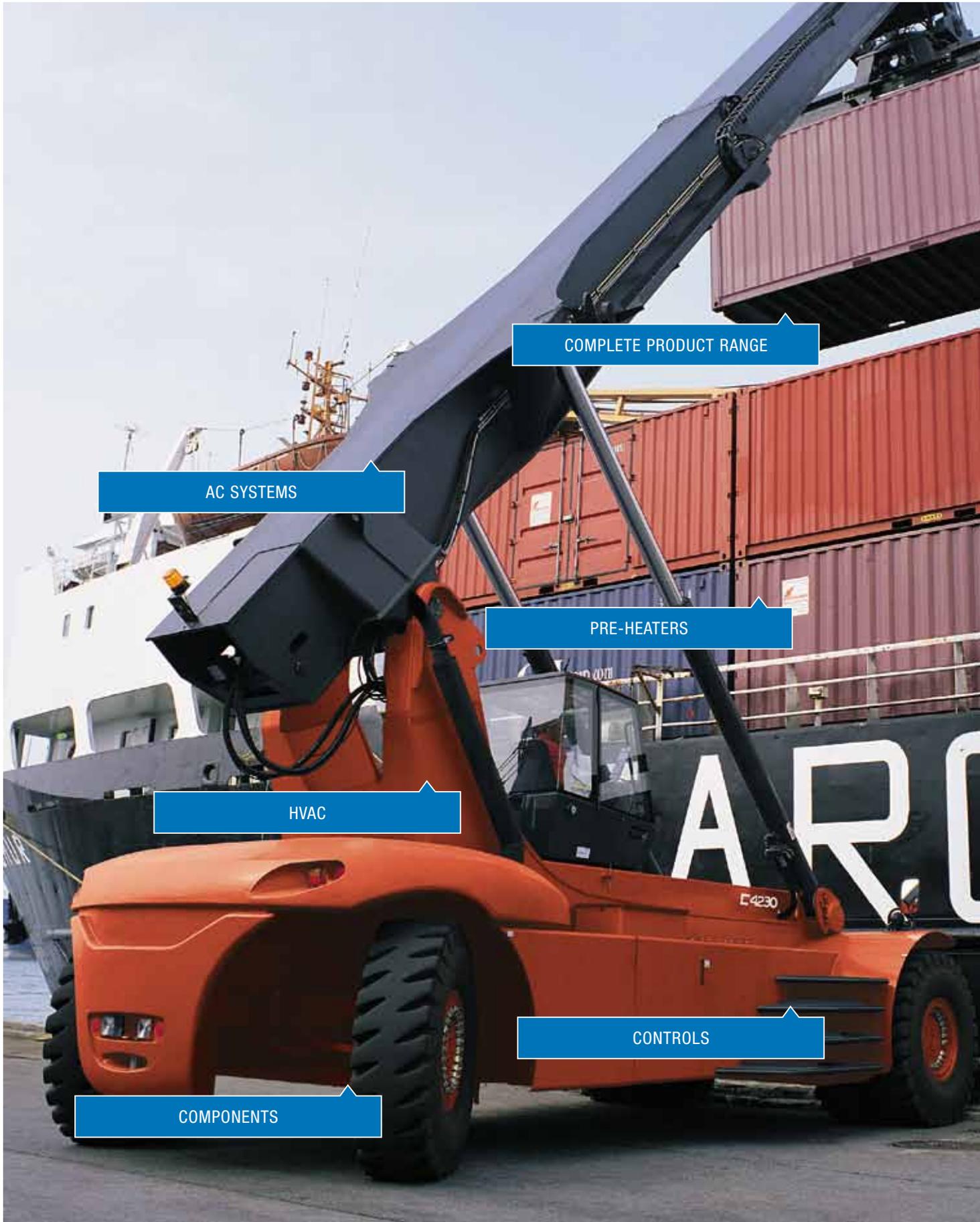


### 3. PRODUCTION

Subsequent production planning takes place on the basis of your requirements and wishes. The time schedule and production process are defined and agreed. At the same time, we commence training of your technicians or service partners, so that customer requirements can be satisfied. If necessary, operating instructions and other manuals and spare parts lists are compiled, to ensure a seamless market launch.

#### EBERSPÄCHER SÜTRAK – THE SPECIALIST FOR BUS AIR CONDITIONING:

Eberspächer SÜTRAK develops and manufactures innovative heating and air-conditioning products. As a system partner, it offers intelligent solutions for total temperature control in buses. For many years, numerous bus manufacturers and transport companies around the world have trusted in the company's comprehensive development and application expertise. Our systems provide optimum comfort for drivers and passengers at all times, even under the most extreme climatic conditions. Eberspächer SÜTRAK places particular emphasis on the development and production of energy-efficient and environmentally friendly products. This ensures a high level of operating efficiency with reduced fuel consumption and lower vehicle emissions. Integration in an independent, family-run business with more than 145 years of company tradition has brought Eberspächer SÜTRAK the benefits of synergies with numerous advantages, such as a global service network, optimised process and project management and great development expertise. By pooling our heating and cooling expertise in this way, in future it will be possible to satisfy all requirements even more effectively, constantly pursuing.



COMPLETE PRODUCT RANGE

AC SYSTEMS

PRE-HEATERS

HVAC

CONTROLS

COMPONENTS

## AIR-CONDITIONING EXPERTISE FROM A SINGLE SOURCE – FROM THE ROOF-MOUNTED AC SYSTEM TO THE OPERATOR CONTROL SYSTEM



Effective vehicle air-conditioning covers both heating and cooling components – requirements for which Eberspächer, a specialist in thermal management, offers effective solutions.

In some areas, all the elements of an AC solution must be simple and robust, like the Special Applications sector, for example. All our products – from the roof-mounted AC system to the operator control system – are of very high quality and are designed to work in harmony together, resulting in reliable overall operation. From a multitude of components, we put together the right systems for you, and configure them individually for your needs.

## PRODUCTS

### EVAPORATORS:

During the development process, quality has the utmost priority, enabling us to obtain an ideal performance from a compact unit. Our evaporators therefore deliver maximum power with small dimensions. Eberspächer AC systems make sure that the ideal temperature will be maintained, even in direct sunlight or in a fully occupied bus.

### COMPRESSORS:

From a large selection and an output range from 130 to 775 cc, we select precisely the right compressor for an efficient air-conditioning solution.

### CONDENSERS:

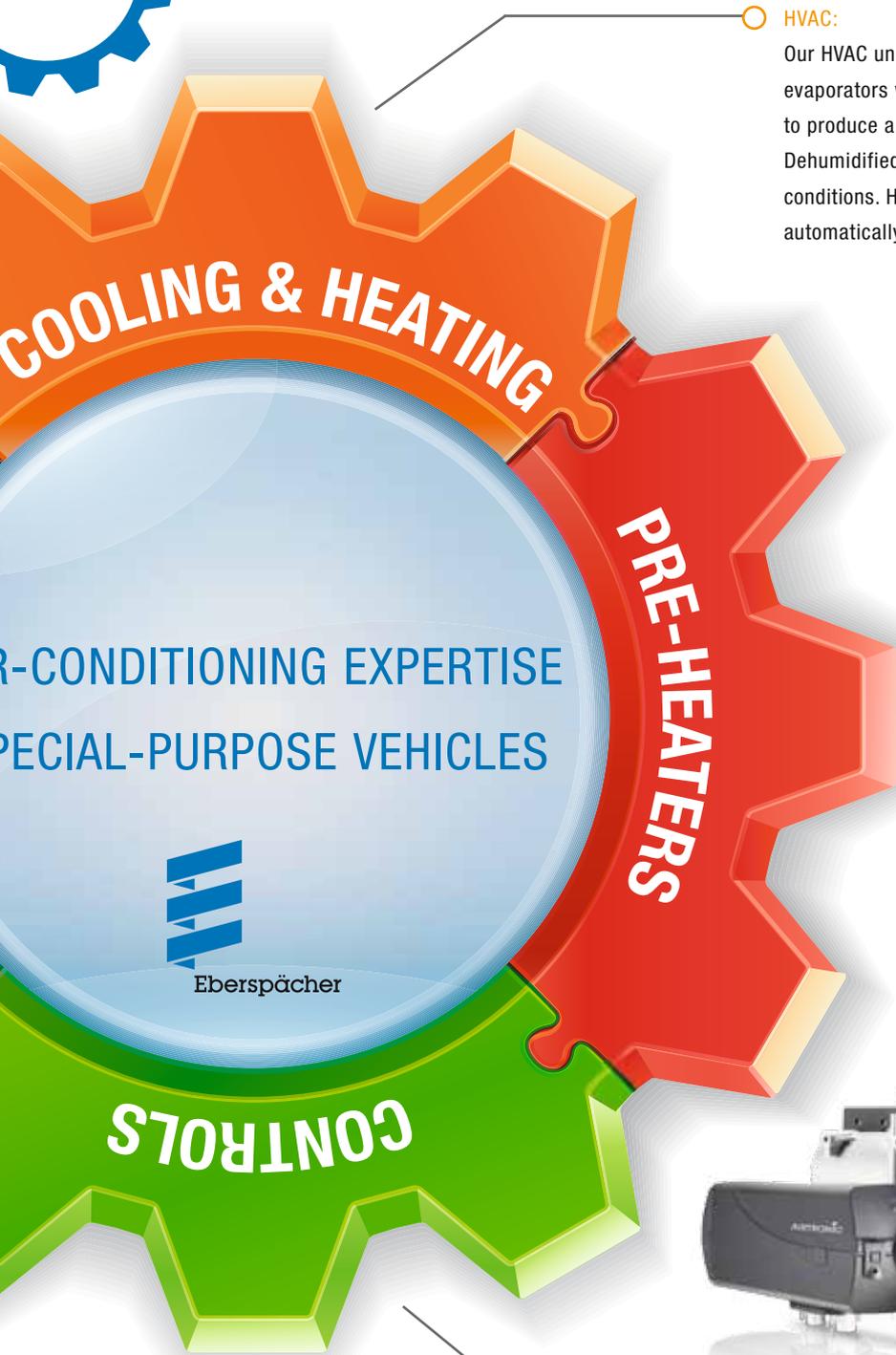
Our condensers are suitable for installation on the radiator, underfloor or on the roof, and are therefore suitable for a huge range of vehicle applications.

Due to the minimal installation space when mounting on the radiator, extra thin micro-channel condensers with a housing only 16 mm wide, enhanced output and optimum refrigerant flow may be used, for example. Universal fitting and industrial standard installation are provided as a matter of course.

### ROOF-MOUNTED AC SYSTEMS:

Eberspächer can offer a choice of internally mounted evaporators but if there is insufficient space in the interior, an alternative roof-mounted AC System can be utilised, chosen from a wide range to suit all vehicle sizes. The simpler installation of this type of system, and the resulting space savings in the interior, are major advantages for you.





**HVAC:**

Our HVAC units combine the impressive cooling power of our evaporators with an additional convector, and supply heat to produce a perfect environment in all weather conditions. Dehumidified air guarantees mist-free windows and comfortable conditions. Heating and cooling functions can be controlled fully automatically with a digital controller.



**VEHICLE HEATERS:**

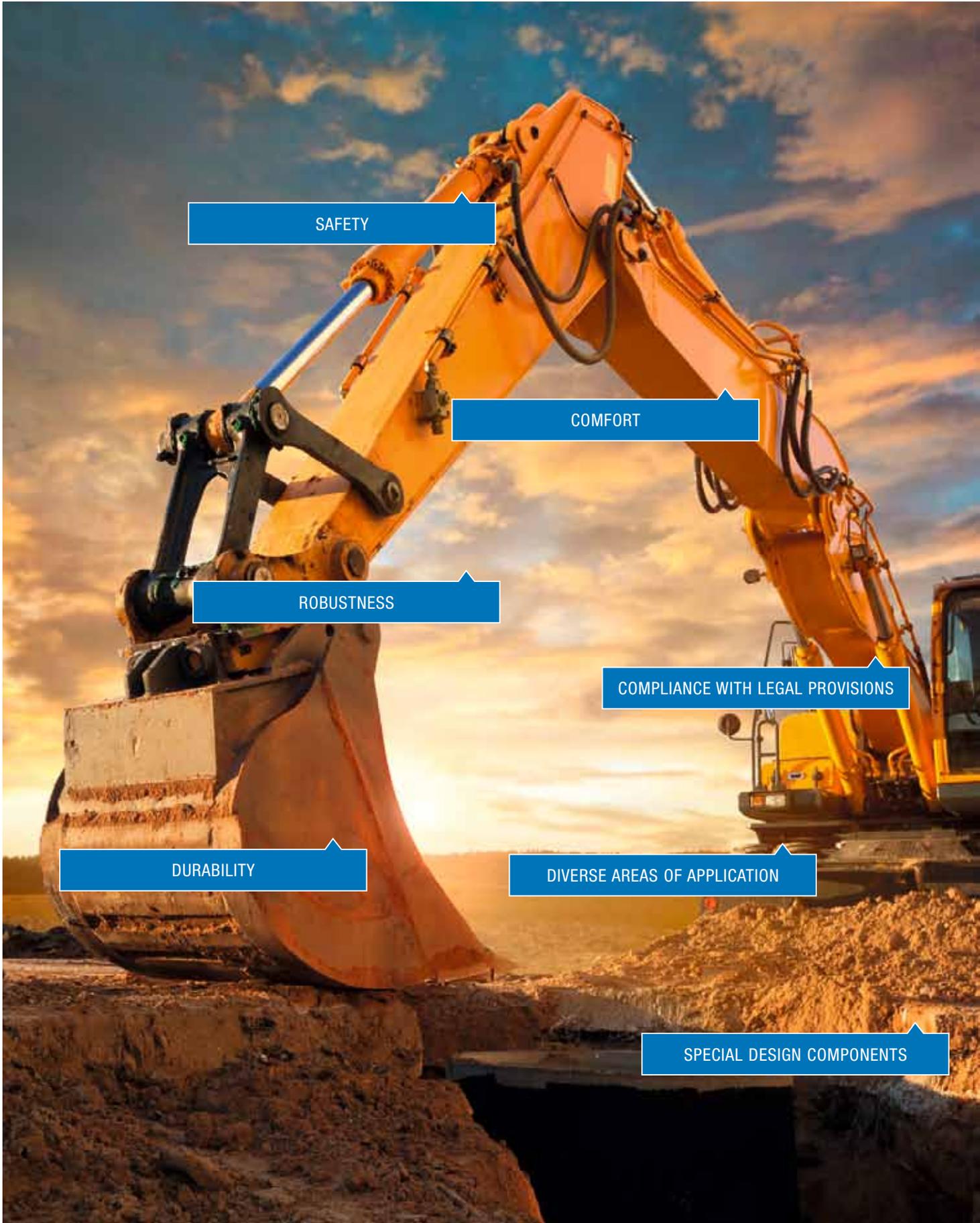
Our electric or fuel-operated vehicle heaters can pre-heat the engine, and heat the cab and passenger compartment or cargo area. We are one of very few suppliers able to combine air-conditioning with heating elements in a single system, and control them together. This way, you are guaranteed a constant temperature in the vehicle when you need it – all year round.



**CONTROLS:**

We have the right control unit for every application – we even offer mobile controls for pre-heaters, and heater operation via a smartphone app. We can incorporate both pre-heaters and AC systems for your specific application, to guarantee constant temperatures. This thermal management system can be configured with just one control unit.





SAFETY

COMFORT

ROBUSTNESS

COMPLIANCE WITH LEGAL PROVISIONS

DURABILITY

DIVERSE AREAS OF APPLICATION

SPECIAL DESIGN COMPONENTS

## OUR RANGE OF APPLICATIONS – SUITABLE FOR VIRTUALLY EVERY CHALLENGE



Eberspächer is one of the leading systems suppliers for exhaust technology, vehicle heaters and AC systems for buses and special-purpose vehicles. We are also an expert and innovative partner to the global automotive industry in the field of automotive electronics and networking with automotive bus systems. Pioneering products from Eberspächer improve the performance of passenger cars and commercial vehicles around the world and perceptibly enhance comfort and safety.

We therefore offer both heating and air-conditioning solutions for every kind of special-purpose vehicle as well. For us, the field of "Special Applications" comprises solutions for vehicles outside conventional passenger car/truck classification, and covers the following areas, in particular:

- Construction and agricultural machines
- Vans
- Minibuses and midibuses
- Emergency rescue vehicles
- Military vehicles

Here, Eberspächer always has its ear to the ground, and strives to develop solutions to fit the needs of specific target groups.

## APPLICATIONS

### CONSTRUCTION AND AGRICULTURAL MACHINES:

Cooling systems for the cab are of primary importance in construction and agricultural machines. To ensure compliance with legislation on correct working conditions and enable drivers to maintain their performance for longer, the cab is air-conditioned – which also has a positive effect on safety.

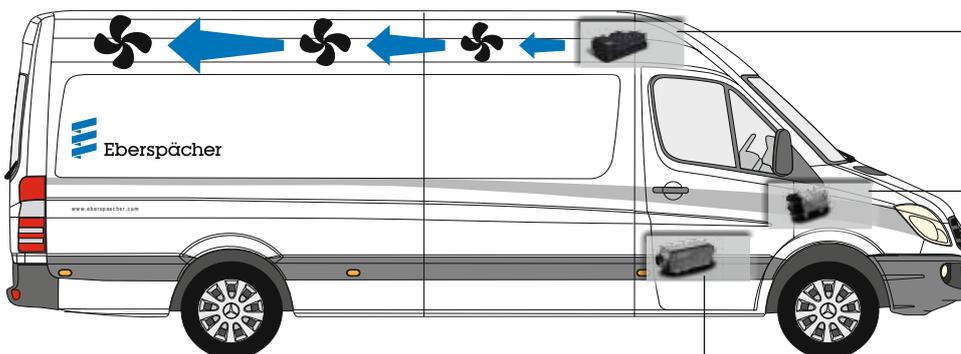
Given the small space available, it is often impossible to install standard components. Therefore, we develop special design components requiring little space for each individual case, with options for vertical or horizontal installation of individual components.

### VANS:

Where vans are concerned, our focus is on system solutions for cooling and heating. This is the only way to ensure adequate cooling and temperature control in the supply chain for temperature-sensitive products. Flower delivery firms, for example, must be able to maintain a constant temperature throughout transport in order to avoid harm to the plants. These vehicles are therefore equipped with both a pre-heater and an AC system. When a specific temperature is programmed in, the system independently ensures that either the heater or the AC system is running, and the temperature is automatically regulated.

### VAN APPLICATION EXAMPLE:

The new digital HVAC control panel is a good example of our outstanding air-conditioning expertise. You can carry out all your system settings on this modern, self-explanatory panel. Control of the heater, AC system and fan is then fully automated – in line with the temperature you have set.



AC evaporator (cooling)



AC compressor



Airtronic diesel air heater



#### MINIBUSES AND MIDIBUSES:

In minibuses and midibuses, our products and solutions ensure a pleasant, comfortable climate for passengers and the driver. This also keeps the driver in top form, ensuring road and passenger safety and compliance with the legal provisions governing mobile workplaces. The systems can run both on the move and at a standstill. They are also based, above all, on the experience of Eberspächer Süttrak, a global AC specialist for bus manufacturers.



#### EMERGENCY RESCUE VEHICLES AND PHARMACEUTICAL TRANSPORT:

To ensure compliance with legal provisions on climate conditions and hygiene, emergency rescue vehicles can be fitted with both heating and AC system. This creates good working conditions for emergency personnel and ensures statutory temperature specifications in the patient interior – ready for service in all types of weather and in all seasons! As with vans, for pharmaceutical transport we ensure the required transport climate for temperature-sensitive medicines and active ingredients.



#### GMP/GDP GUIDELINES:

Good Manufacturing Practice denotes certain guidelines for the quality assurance of medicines and active ingredients, among other things. It also includes a guarantee of a constant delivery temperature that has been agreed with warehouses and pharmacies (Good Distribution Practice). According to this guideline, appropriately certified equipment must be available for compensating or preventing possible temperature fluctuations in the vehicle during transport of these substances. To meet these requirements, our range includes a great many flexible applications – from mobile refrigerated containers to fully automated heating and cooling systems for the cargo area.

#### MOBILE REFRIGERATED CONTAINERS:

We also offer a large range of mobile refrigerated containers for you.



## APPLICATIONS

### MILITARY VEHICLES:

In order to maintain the performance of both man and machine in the harshest ambient temperatures, robust, long-lasting system solutions are essential. While an AC system ensures soldiers' deployment readiness, a pre-heater makes sure the vehicle will always start in cold conditions and allows engine pre-heating in a way that reduces wear and is better for the environment. Here, too, we engineer the desired special design components exactly in line with your requirements and your application.



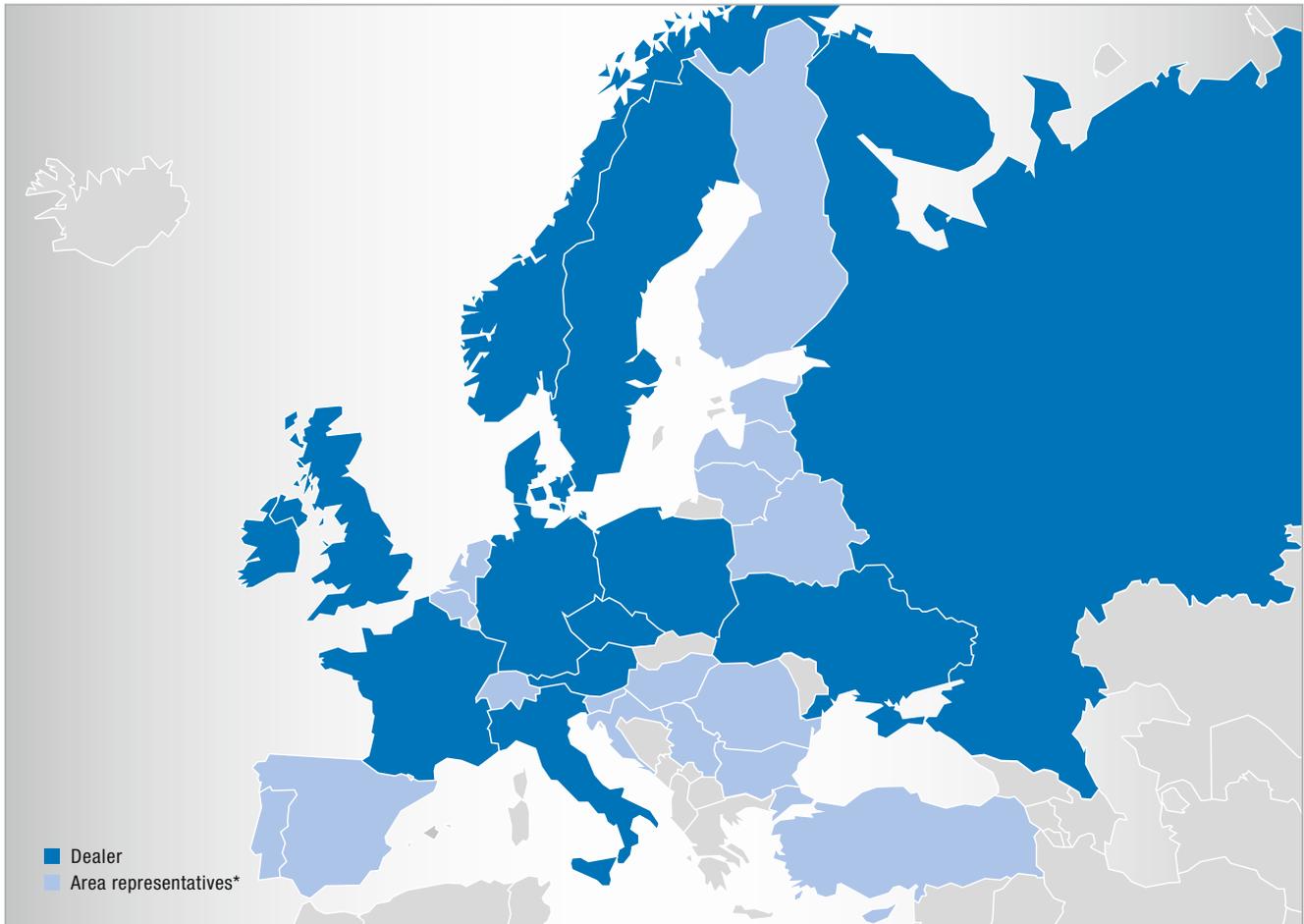
### APPLICATION FOR FUTURE TYPES OF DRIVE:

We offer suitable heating and AC components for every type of drive. Combustion engines, hybrid vehicles or electric motors – we can deliver exactly the right systems.

Our range of vehicle heaters includes fuel-operated or electrically powered PTC heaters. The fuel-operated heaters can be used with a great variety of fuels (e.g. petrol or diesel, (bio)ethanol or biodiesel) or with a flex fuel engine type.

As for AC systems for electric and hybrid vehicles, we install electrically powered compressors and seek out solutions to achieve a complex electrical circuit.





[Europe-wide service & dealer network]

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\* [www.eberspaecher.com/en/worldwide/vehicle\\_heaters.html](http://www.eberspaecher.com/en/worldwide/vehicle_heaters.html)

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