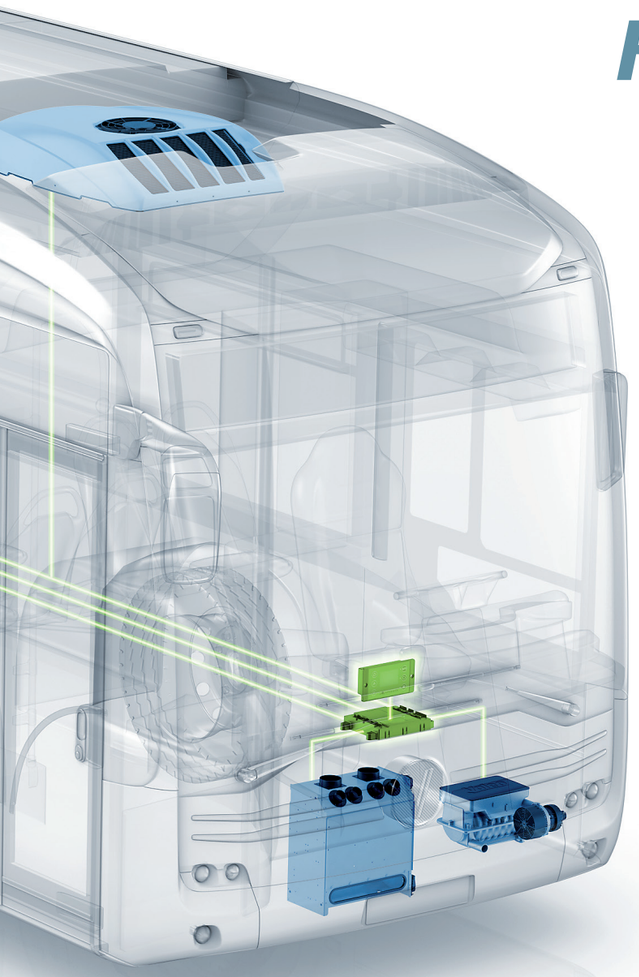
Valeo

BEST eBUS CLIMATE – SYSTEMIZE THE FUTURE

COOLING-HEATING-VENTILATION
WE MANAGE IT ALL

STATE-OF-THE-ART BUSES SHOULD HAVE THE SMARTEST HVAC SOLUTIONS



Major challenges are posed for the development of cutting-edge drives, e.g. electric or hydrogen-based, in particular by public transport with its special route profiles and operating times on the one hand, and the demands of the general public on the other. This directly concerns the energy supply for air conditioning in these vehicles and thermal supply to new aggregates, e.g. large battery packs that must be cooled.

DID YOU KNOW...?

that heating and air conditioning systems are among the most complex energy consumers in a bus? In particular, they make the heaviest demands on drives in E-buses. But at the same time they offer the greatest opportunities for energy saving.

A SYSTEM IS MORE THAN THE SUM OF ITS INDIVIDUAL PARTS

Holistic and intelligent thermal management of the entire system has never been more important in the operation of electrobuses. We call this holistic approach of clean and efficient air conditioning of hybrid and electrobuses „Entelligence“.

A wide range of air conditioning components are interlinked and controlled by means of newly developed control software. Depending on the ambient conditions (mainly temperature), battery charging status and geographical position, the control system always selects the Valeo component with the maximum efficiency. Behind this lies an intelligent air conditioning strategy for buses. The energy requirements for the respective air conditioning task are estimated in advance and the components are selected by way of an optimization process.

Accordingly, the most efficient component for the respective application can be selected from the available air conditioning components (e.g. fossil or electrically powered heater, heat pump) according to the current heating requirements, existing restrictions (driving in an emission-free zone) or electric resources still available (charging status of the traction battery, SOC). If necessary, a number of heat sources can be employed simultaneously in boost mode. Communication with Valeo Entelligence takes place via body interface components: the central unit is an intelligent substation. In summary, Valeo Entelligence stands for innovative HVAC solutions that contribute to ensuring that existing energy resources are put to the best use, thereby significantly extending the range of electrobuses – according to the motto **“The system is more than the sum of its individual parts”.**

ENTELLIGENCE

Innovative air conditioning components and newly developed control software that always intelligently selects the components with the highest level of efficiency.

COOLING

To those who know anything about cooling – as we do – it’s not just a matter of generating cold temperatures, but creating a feeling of well-being and safety for driver and passengers as well.

HEATING

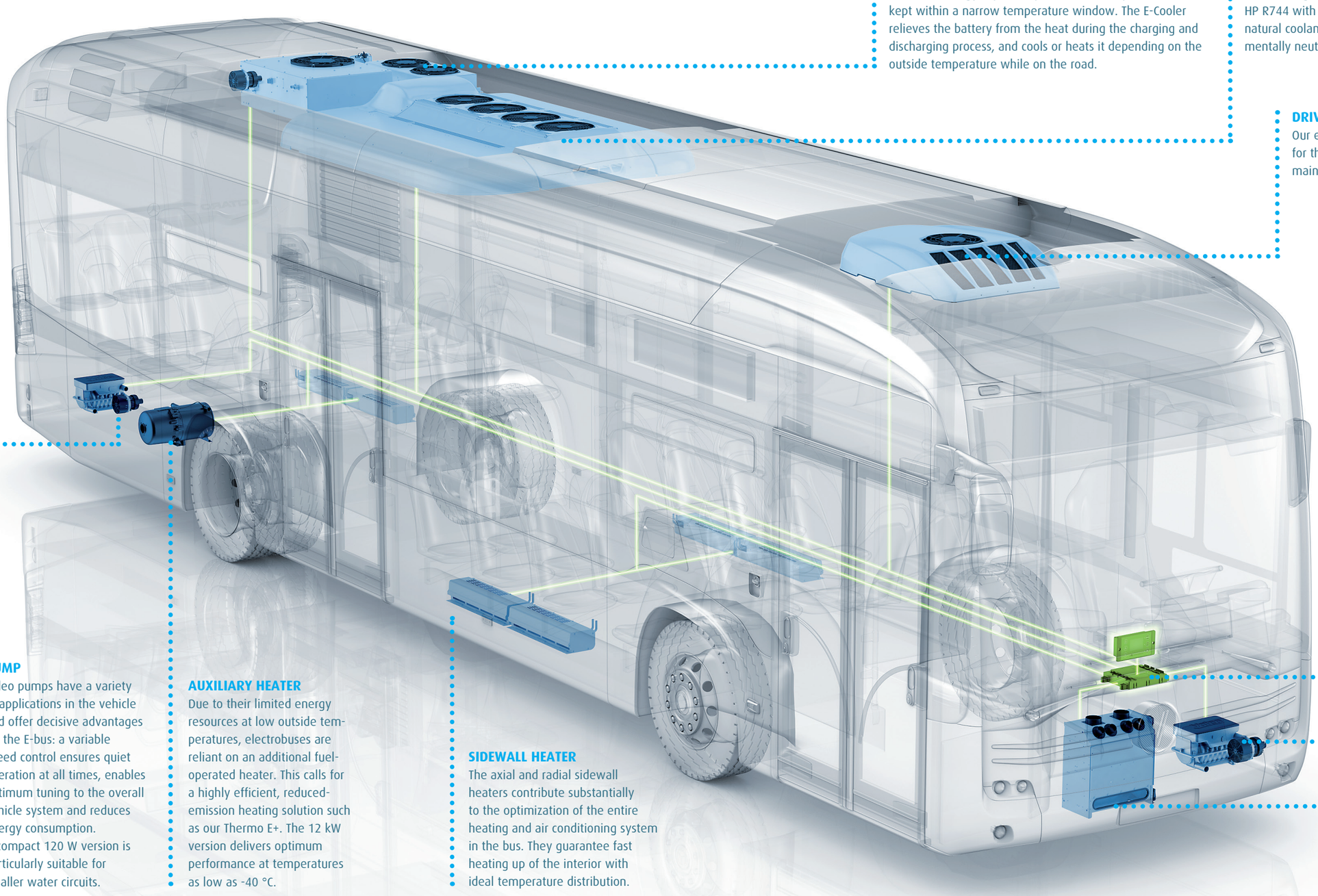
Our roots lie in the production of bus heating systems, and it shows. We have been developing, testing and producing our Thermo series for over 60 years.

VENTILATION

A good climate requires fresh air. As market leader for roof hatches we are well aware of the significance of hatches in the “bus climate system”.

THE COMFORT SYSTEM OF AN ELECTROBUS: HARDLY VISIBLE, BUT FEELS GOOD

The graphic shows the well networked, highly complex system and interplay of the elements, ensuring that people are comfortable and the technology always functions optimally.



BATTERY COOLING
Batteries are the core element of electric drives. To ensure that their energy is put to optimum use, they must be kept within a narrow temperature window. The E-Cooler relieves the battery from the heat during the charging and discharging process, and cools or heats it depending on the outside temperature while on the road.

AIR CONDITIONING SYSTEM
We have supplemented our range of electric rooftop air conditioning systems with the emission-free REVO®-E HP R744 with heat pump function. It operates with natural coolant R744 (CO_2) and is completely environmentally neutral.

DRIVER A/C
Our electric air conditioning system Citysphere S for the driver's section is simple to install, maintenance-friendly and easy to operate.

CONTROL SOFTWARE SU020
Intelligence and thermal management are crucially important to us in the control of all components for optimum bus climate. Intelligent software is a fundamental requirement for the efficient, error-free management of component hardware. In climate control of the future, a large number of extremely complex components and operating states of the vehicle will be read out and applied. For us, this demanding type of thermal management is the central task of modern bus air conditioning, today and in the future.

CONTROL SYSTEM
Intelligent networking of HVAC components in the bus ensures the best possible use of energy resources and optimum range.

ELECTRIC HEATER
With a heat output of 12 kW, in addition to the Thermo AC/DC and Thermo H hybrid heaters, the Thermo HV high-voltage heater has been added to the portfolio of electric heaters.

FRONTBOX
The frontbox works in conjunction with an air conditioning system in cooling mode and circulates up to 1,100 m³ of air per hour in and around the driver's section.

PUMP
Valeo pumps have a variety of applications in the vehicle and offer decisive advantages for the E-bus: a variable speed control ensures quiet operation at all times, enables optimum tuning to the overall vehicle system and reduces energy consumption.
A compact 120 W version is particularly suitable for smaller water circuits.

AUXILIARY HEATER
Due to their limited energy resources at low outside temperatures, electrobuses are reliant on an additional fuel-operated heater. This calls for a highly efficient, reduced-emission heating solution such as our Thermo E+. The 12 kW version delivers optimum performance at temperatures as low as -40 °C.

SIDEWALL HEATER
The axial and radial sidewall heaters contribute substantially to the optimization of the entire heating and air conditioning system in the bus. They guarantee fast heating up of the interior with ideal temperature distribution.

THE BEST SYSTEM FOR EVERY BUS TYPE

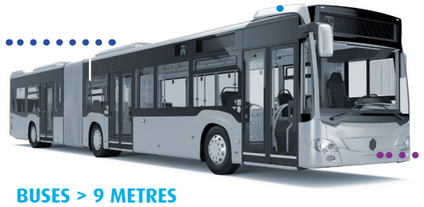
Tailor-made solutions for modern electrically powered buses

From the fast-growing market for mini-/midibuses to the large articulated or double-decker buses, we offer system-based solutions.

DRIVERLESS BUSES 6-7.5 METRES

MICRO- AND MINIBUSES 6-7.5 METRES

MIDIBUSES 8-9 METRES



BUSES > 9 METRES

DOUBLE-DECKER BUSES 12-14 METRES

MINISPHERE-E

CC205-E

REVO®-E HP R744 (CO_2)

REVO®-E PRO

THERMO E+ 12 KW

S-PUMP S120

THERMO HV

HIGH-VOLTAGE PTC AIR HEATER

E-COOLER BATTERY COOLER

HOT – COLD: THIS WORLD IS OUR HOME

In the age of e-mobility, the range of a vehicle is a key issue. In addition, we at Valeo attach great importance to travel comfort in buses independently of the vehicle drive. And both of these factors are strongly impacted by the geographical climate zone.

Public service buses carry millions of passengers daily. Depending on the geographic region and climate zone, ambient conditions such as temperature, precipitation and exposure to the sun have a major influence on air conditioning in the passenger compartment. In the polar zone the electric energy requirements for heating electro-buses on cold days are higher than for driving itself. There has been a widespread call for innovative air conditioning systems for electric buses. To ensure that the limited electric energy of the traction batteries is used as efficiently as possible, a holistic view of all the required energy flows for heating and cooling is necessary

CLEVER ADJUSTMENT

Depending on the ambient conditions, effective strategies must be applied for pre-conditioning and maintaining the selected interior temperature. A holistic thermal management was developed with the aid of optimally tuned individual components and complex control algorithms. The latter guarantees the highest level of efficiency for air conditioning in the passenger compartment and temperature control of the drive components. This includes, among other things, the use of waste heat from the traction drives, batteries or power electronics, in order to re-use it in our heat pump systems at low temperatures with coolant R744 (CO2), or the use of our highly efficient and compact air conditioning systems and battery cooling with climate-friendly coolants in hot tropical zones.

CLIMATE ZONES

- Polar
- Temperated
- Mediterranean
- Arid
- Tropical

CO_2: IT DEPENDS ON WHAT YOU MAKE OF IT

A decisive role in the current climate change is played, among other things, by carbon dioxide (CO_2). Up until the year 2050 CO_2 emissions of all polluters are to be reduced by 80% compared to the basis year 1990.

Valeo air conditioning and heat pump systems with a natural coolant

Air conditioning systems operate with easily vaporized liquids, so-called coolants. Unfortunately, many of these coolants – classified according to their GWP (Global Warming Potential) value – are still harmful to the climate. The higher the GWP value, the more harmful is the corresponding coolant. For example, our highly energy-efficient REVO®-E HP R744 rooftop air conditioner runs on coolant CO_2 (R744) with a GWP = 1, and the greenhouse potential of the coolant is minimized. In addition, coolant leaks have been reduced to a minimum with hermetically sealed pipework. Valeo is working intensively on other innovative solutions with natural coolants, e.g. R290. The first results in further reducing the energy requirement of the system are very promising.

Valeo heaters with alternative fuels

The greenhouse gas CO_2 is produced during every combustion process, together with further harmful exhaust components and soot particles. Based on intensive research activities, Valeo's conventional, diesel-powered heaters are already below the legally required emission values of the EURO 6 emissions standard in stationary operation. Gas-powered Valeo heaters are also soot-free and emit even less CO_2, CO and NOx. Furthermore, we are conducting intensive research on innovative use of alternative fuels from non-fossil energy sources, e.g. HVO, GtL, BtL and e-fuels. Our heaters have already been approved for some of these fuels, and subject to certain conditions their operation is climate-neutral.

"The highest level of efficiency can only ensue from consistent use of a holistic thermal management. This means that all available energy flows in the vehicle are measured and put to optimum use with the aid of intelligent control algorithms."

Dr. Robert Basile,
Director Engineering
HVAC Products & Systems