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SPIHEROS

# TECHNIK SERVICE NEWS

PUBLIC TRANSPORT COURIER | ISSUE 1.2026

R744  
R290

## Title story

Thermal management  
in electric buses – efficient  
approaches, natural refrigerants  
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GWVP



**Dear Readers,**

With the first few months of 2026 already behind us, one thing is beyond dispute: the bus industry is in the midst of a profound transformation. Both the Mobility Move and Bus2Bus impressively showcased where our sector is headed. At each of the major trade fairs, key themes once again included the transition to alternative drive-trains, autonomous driving, digitalisation and artificial intelligence, as well as the further development of infrastructure and depots.

It also again became very evident that these are not merely technological trends but politically defined objectives. As Ingo Wortmann aptly put it at Mobility Move, these goals must now be consistently translated into clearly defined projects. It is therefore absolutely vital that sufficient financial resources are made available. However ambitious the plans may be, public transport operators cannot shoulder the necessary investment and structural changes alone. Achieving this will require clear political frameworks, planning security and a sustainable funding environment.

Yet it isn't only operators that are facing major challenges; as a manufacturer of thermal systems for city and intercity buses, we are equally and directly affected by this transformation. Our development activities are increasingly focused on lightweight, energy-efficient and, at the same time, low-noise systems.

Added to this is the growing expectation of a service network that covers not only Europe, but the whole world. Availability, response speed and on-site technical expertise are decisive factors for our customers' success – and therefore also for our own.

With this in mind, I hope you enjoy this issue and find it a stimulating read.

Best wishes,

Frank Färber  
Sales Director

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## LEGAL NOTICE / CONTACT

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# Thermal management in electric buses – efficient approaches, natural refrigerants and sustainable solutions

The electrification of public transport is presenting vehicle manufacturers and operators with new thermal challenges: not only do HVAC systems (heating, ventilation, air conditioning) have to deliver optimal passenger comfort, they also have to operate as energy-efficiently as possible and preserve their electric driving range while complying with regulatory and environmental requirements. At the same time, new natural refrigerants (including R744/CO<sub>2</sub> and R290/propane) and integrated thermal management concepts are providing significant opportunities to combine efficiency and sustainability. Read on to learn more about the key aspects of modern thermal management in electric buses, weigh up the advantages and disadvantages of R744 and R290, and discover practical system solutions.

## Thermal management requirements for electric buses

An electric bus differs fundamentally from a conventional diesel bus in its thermal architecture. While combustion engines provide large amounts of waste heat essentially 'for free', electric vehicles must actively supply all thermal functions electrically – from keeping the passenger compartment air-conditioned to cooling the battery and power electronics. This

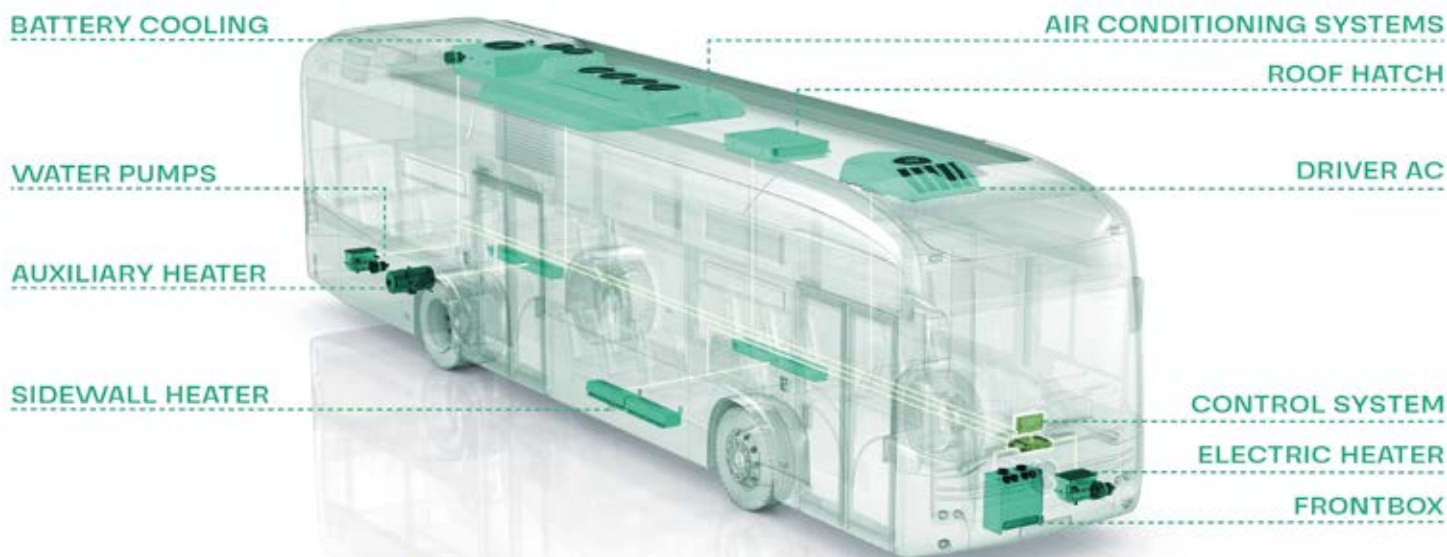
gives rise to three specific focus areas. First, energy efficiency moves to centre stage, as every additionally used kilowatt-hour has a direct impact on range. HVAC components must therefore be optimised for minimum power consumption. Second, system integration becomes increasingly important. Thermal management can no longer be regarded as an isolated function but necessitates the interaction of heat pumps, heat recovery, battery cooling and the vehicle's

overarching energy management. Third, safety and regulatory compliance: the selection of suitable refrigerants, measures to prevent leakage, fire protection requirements for flammable media and compliance with F-Gas and PFAS regulations are indispensable. These complex requirements lead to a new system architecture in the electric bus: modularly structured and solely electric rooftop HVAC systems combined with intelligent control technology and a pre-

cisely networked heat distribution system.

## Efficiency strategies: principles for reduced energy consumption

Efficiency in the thermal management of electric buses can be improved at various levels, with several levers having to act in concert. One key approach is to use heat pumps instead of pure resistance heaters: in many operating situations, they provide significantly more usable heating



## moving thermal future

The coordinated interaction between high-performance hardware, vehicle insulation and an intelligent, adaptive control system unlocks the full potential for highly efficient thermal management.

energy per kilowatt-hour, thereby improving the ratio between energy input and usable heat output. Modern HVAC systems with an integrated heat-pump function thus increase overall energy efficiency and contribute noticeably to greater vehicle range. Utilising available waste heat also plays an important role here. Waste heat generated by the power electronics can duly be fed back into the passenger compartment heating or the battery, reducing the system's additional energy demand. A further efficiency lever lies in intelligent load management. Through predictive, data-based control – for example derived from a vehicle's timetable, outside temperature, planned stopping times and battery charge level – heating and cooling processes can be optimised in terms of time and energy. Equally effective is zoned air conditioning: by segmenting the interior into areas such as the driver's cab and the front

and rear passenger compartments, each zone can be adjusted to the right temperature as required, reducing overall energy consumption. Added to this is the importance of good thermal insulation and a correspondingly optimised interior design, both of which minimise heat and cold loss, thus reducing the need for heating and cooling. All these measures interact across the overall system. It is no longer enough to increase the efficiency of individual components alone – high-performance hardware such as heat pumps, compressors, heat exchangers or vehicle insulation has to be coordinated with intelligent, adaptive controls in order to fully unlock the potential for highly efficient thermal management.

### Natural refrigerants: R744 (CO<sub>2</sub>) and R290 (propane)

The industry is currently undergoing a distinct shift away from

fluorinated greenhouse gases towards natural refrigerants. These are characterised by an extremely low global warming potential (GWP), often coupled with advantageous thermodynamic properties. At the same time, they pose new design challenges for developers and manufacturers, particularly with regard to system pressure, safety and manufacturing processes. Two refrigerants are at the forefront of current HVAC development for electric buses: R744 (CO<sub>2</sub>) and R290 (propane).

R744, i.e. CO<sub>2</sub>, has a GWP of around 1 and demonstrates excellent heat pump performance, especially at low outside temperatures, and delivers very high efficiency over a wide range of temperatures. Systems such as the Spheros REVO®-E HP R744 demonstrate that CO<sub>2</sub>-based heat pump technologies can combine strong heating and cooling performance with a re-

duced refrigerant charge. They do however face constructive challenges: the high operating pressures require particularly robust components, adapted pipework routing and stricter manufacturing and testing standards, which can lead to higher component and system costs.

R290 (propane) is also a natural and extremely efficient refrigerant, it does, however, entail special safety requirements due to its classification under flammability class A3. In the bus sector, it impresses with its excellent level of energy efficiency across a wide range of temperatures, making it suitable for both cold and very hot climate zones. With regard to heat pump operation in particular, propane is incredibly efficient, while also offering outstanding cooling capabilities at extreme outside temperatures. Thanks to its thermodynamic properties, R290 also works with compact system sizes.

Manufacturers such as Spheros are therefore specifically drawing on propane for air-conditioning units and heat pumps alike, combining it with validated safety concepts and modular function packages for heat pumps, battery and component cooling, and heat recovery. The central challenge remains the flammability of the refrigerant, which necessitates a well-thought-out safety concept, tested designs, special assembly and maintenance procedures as well as specific ventilation solutions – all of these being technically manageable tasks.

#### **HVAC architecture: air-conditioners, e-coolers & modular concepts**

In electric buses, electrically operated air-conditioning units have long been established as the standard as they are modular in construction and offer straightforward service access. Modern system architectures go far beyond simple air conditioning, however, integrating several thermal functions into a single, all-electric overall system. These include in particular air-conditioning units with a heat pump function that combine heating and cooling and, in many cases, also take on battery cooling. Examples include the Spheros REVO®-E series, which can be operated with different refrigerants – including R744, R290 and conventional media. Their interface compatibility and the availability of various output classes greatly facilitate integration into different vehicle sizes and markets. Added to this are separate battery

thermal management systems specifically designed for the battery and components. Through the combination of active and passive cooling, they enable the temperature of the battery to be controlled in a way which is energy-efficient and stable, thus supporting the longevity and performance of the energy storage system. Another important module function is the connection via an integrated front-box, which enables targeted and independent air conditioning of the driver's cab. This allows the temperature of the driver's area to be adjusted particularly efficiently as required, without unnecessarily burdening the entire passenger compartment.

#### **Conclusion – systems thinking wins**

Efficient thermal management in electric buses is not achieved by looking at individual components; it's a systemic task. The choice of refrigerant (R744 versus R290), the architecture of the HVAC modules, the integration with battery and vehicle control, as well as intelligent control algorithms must all be considered together. Natural refrigerants offer excellent opportunities – CO<sub>2</sub> impresses with robust heating performance and low environmental impact, propane with high efficiency at high outside temperatures and compact system sizes, but it demands meticulous safety concepts. Spheros is driving this development forward with its modular REVO®-E solutions, already offering practical products for diverse market requirements.



Fully electric rooftop air conditioning unit: Spheros REVO®-E HP R744 (CO<sub>2</sub>).



Fully electric rooftop air conditioning unit: Spheros REVO®-E R290 (propane).



Battery thermal management system: Spheros E-Cooler.

*Note: the original article was published in the special issue of the public transport journal "DER NAHVERKEHR | ELEKTROBUS-SPEZIAL 2026" in March 2026.*



Fully electric rooftop air conditioning unit: REVO®-E R290.

## The Spheros REVO®-E family: ONE system. EVERY climate. ANY e-bus.

With the REVO®-E family, Spheros offers a modular system made up of three fully electric rooftop air-conditioning units – REVO®-E R290, REVO®-E HP R744 and REVO®-E Global – suitable for all bus types and climate zones worldwide. Spheros is actively shaping the future of bus air conditioning with natural refrigerants such as R290 and R744, while also continuing to offer efficient solutions with conventional refrigerants. All product lines are interface-compatible and available in various output classes. With the REVO®-E R290 and REVO®-E HP R744 models, Spheros fulfils both the current F-gas Regulation and future PFAS regulations, offering maximum flexibility and future-proofing for manufacturers and operators.

### **Climate-friendly, safe, global: the REVO®-E R290 takes bus air conditioning to a new level**

The fully electric, emission-free rooftop air-conditioning unit REVO®-E R290, which is operated using the natural refrigerant R290, celebrated its world premiere at busworld 2025. With its comprehensive portfolio, the new product family meets the needs of all bus types and sizes across

all climate regions – even in very hot countries. Numerous additional functions can be integrated as required, such as heat pumps, battery and component cooling, frontbox connections and heat recovery. The system family is interface-compatible with the Spheros REVO®-E Global and REVO®-E HP R744 air-conditioning units. The REVO®-E R290 will enter series production in September 2027 and features a verified safety concept. Spheros is thereby setting new

standards in terms of sustainability, safety and energy efficiency.

### **New paths for clean air conditioning: the REVO®-E HP R744 now also for intercity coaches in moderate climate regions**

The fully electric REVO®-E HP R744 with heat pump function has relied solely on the natural refrigerant R744 since 2021. With the second generation, Spheros has now taken the tried-and-

tested system to a new performance level – while maintaining full backward compatibility with the more than 2,000 first generation units installed worldwide. Both units were specifically developed for buses with alternative drivetrains and provide efficient air conditioning inside the bus as well as high heat pump capacity with low energy consumption in moderate climate regions.

The REVO®-E HP R744 GEN2 impresses with a new compressor, an improved sensor system and an optimised refrigerant circuit, thereby noticeably increasing the COP and, in turn, the vehicle's driving range. At the same time, with a height decrease from 411 mm to just 318 mm, the REVO®-E HP R744 GEN2 represents the best air-conditioning option not only for city buses but also for intercity coaches. The environmentally friendly air-conditioning system is also optionally available with integrated battery cooling, whereby frontbox air conditioning and battery cooling can be operated in parallel.

### Ten years of know-how bundled into the new REVO®-E Global (FGAS)

With the fully electric REVO®-E Global, Spheros draws on almost



The Spheros REVO®-E range: the best air-conditioning option not only for city buses, but also for coaches.

ten years of field experience in bus markets worldwide. With the REVO®-E Global, the second generation of the product family is now entering the market with 20% higher efficiency and 10% more cooling capacity than

its predecessor. This is the result of consistent component optimisation and the adapted control of the overall system. Battery temperature management (BTM) can be integrated into the unit on request. Thanks to its modu-

lar design and a broad range of peripheral equipment options, the REVO®-E Global is especially geared to worldwide requirements, offering solutions for all bus types and climate zones.

## New head of finance

We are pleased to announce that Gero Neumeier was appointed Chief Financial Officer (CFO) of the Spheros Group with effect from 1 November 2025.

Gero joined us from the Wittur Group, where he most recently served as CFO. Prior to that, he was CFO of the AL-KO Vehicle Technology Group for more than eight years. He has extensive experience in corporate finance, particularly in working with private-equity-owned companies, as well as a deep understanding

of financial strategy and operational excellence.

We are very pleased to welcome Gero Neumeier to the Spheros team and are confident that his expertise and leadership skills will make an important contribution to our continued growth and success.

In his new role, Gero Neumeier will report directly to Mark Sondermann, CEO of the Spheros Group.





The first mobile hot-water high-pressure truck-mounted cleaner – fitted with the Thermo H plus hybrid heater from Spheros.

## Efficient thermal management for clean cities

# Hybrid heating solution from Spheros at Steyr Automotive

With its innovative vehicle concept, Steyr Automotive is setting new standards when it comes to cleaning bio-waste bins in the catering sector. Together with system partner Hainzl, the company created the first mobile hot-water pressure-washing vehicle. The specially developed truck cleans dirty waste bins with hot water as part of the emptying process. At the centre of the project is a high-performance hybrid thermal management system – equipped with the Thermo H plus hybrid heater from Spheros.

### High temperatures for maximum cleaning performance

The demands on the system are high: in the catering sector in particular, heavy soiling occurs

from cooking fats and organic residues. To remove these efficiently, the cleaning system must ensure a continuous supply of hot water.



At the heart of the Thermo H plus is its hybrid heating system, which can run on both electricity and diesel.

The thermal management system developed by Hainzl delivers a total heating output of up to 55 kW. The hybrid heating approach of the Thermo H plus lies at the heart of the system and can operate both electrically and on diesel.

The 1,700-litre water tank is heated differently depending on the operating mode:

- **Night operation**  
(stationary with 400 V):  
electric heating output of 20 kW to heat the water to 75 °C.
- **Driving operation**  
(diesel operation): 35 kW heating output for heating and

maintaining temperatures of up to 85 °C during mobile use.

- **Hybrid operation**  
(400 V + diesel):  
combination of both energy sources with a total of 55 kW heating output for maximum temperature stability and continuous cleaning performance.

Thanks to this flexible operating strategy, the hot-water high-pressure cleaner can provide consistently high temperatures even during intensive use – a decisive prerequisite for the reliable removal of fat-containing residues.

### Intelligent system integration by Hainzl

Hainzl is responsible for the complete system design and integration of all components. This includes thermal management engineering as well as the selection and coordination of the technologies used. Nissens and Hexonic are also involved as project partners alongside Spheros.

### Prototype successfully realised

Hainzl delivered the prototype in January 2025. Since then, the concept has been continuously developed: alongside three completed gas units, a further hybrid unit has already been built. In addition, a high-voltage variant based on 400 V is in the pipeline.



The vehicle cleans dirty rubbish bins with hot water as they are being emptied.

## 11. VDV Omnibustage

The 11th VDV Omnibustage conference, which took place last year in Leipzig on 20 and 21 November, once again provided an important platform for professional exchange within the bus industry. Of the approximately 20 technical presentations, one looked specifically at the regulatory change in the field of refrigeration and air-conditioning technology – in particular the tightened EU F-gas Regulation and the intensely discussed PFAS ban.

As part of this presentation, Frank Färber, Sales Director at Spheros, highlighted the specific repercussions of the tightened EU F-gas Regulation, which went into force in 2024. This has resulted in further scarcity of and a gradual reduction in fluorinated refrigerants with high global warming potential (GWP). Moreover, stricter requirements were defined for regular leak testing as well as for the complete documentation of filled, re-

covered and disposed-of refrigerant quantities. These measures aim to progressively phase out climate-damaging substances from the market, to retrofit existing systems and to consistently use natural refrigerants in new systems.

For existing vehicles, so-called drop-in solutions offer a practical transitional option. These consist of refrigerant blends with reduced GWP that can be

used in existing systems with a reasonable amount of modification. They help to counteract rising costs and potential availability bottlenecks. Spheros is already working intensively to provide corresponding solutions.

The development has garnered additional momentum through the planned PFAS ban. Should this come into force as envisaged in the first quarter of 2029, exclusively natural refrigerants

would have to be used for electric vehicles as of 2030 and for combustion engine vehicles as of 2035. This entails a fundamental technology shift affecting not only manufacturers but also workshops and service operations. Besides new service tools, ensuring that personnel are suitably qualified to handle alternative refrigerants will be a key factor in the success of the transition.



The 11th VDV Bus Days took place in Leipzig from 20 to 21 November 2025.



The VDV Bus Days provide an important platform for professional exchange within the bus industry.

# Spheros presents innovative solutions at Mobility Move 2026 and BUS2BUS 2026 in Berlin

In spring 2026, Spheros was represented at two important events within the bus and mobility sector in Berlin: Mobility Move and BUS2BUS. Both formats provided opportune settings to discuss current developments in the field of electric mobility and to present new technologies for local public transport.



Mobility Move was held from 10 to 12 March 2026 in Berlin. With more than 1,600 participants, over 110 exhibitors and a high proportion of transport companies and authorities, the event is regarded as the central industry gathering for public passenger transport and is a mix of trade fair, conference and networking platform. The focus is on specific projects and strategic decisions relating to electric buses, charging infrastructure, depots and digital systems in local public transport.

Just a few weeks later, from 15 to 16 April 2026, the BUS2BUS was also held in Berlin: an internationally oriented trade fair for the bus industry. In contrast to Mobility Move, the BUS2BUS has a stronger focus on the presentation of vehicles, technologies and innovations along the entire bus market value chain. The figures from this year's event underscore the global significance of the fair: 156 exhibitors from 25 countries and a total of 3,800 participants – including 3,200 trade visitors – 60 deployed buses and over

100 sessions with more than 120 speakers across four stages.

At both events, Spheros presented its current solutions for the electric bus market. These focused around the 'Thermo HV' high-voltage heater for electric buses and commercial vehicles, the 'SPump' circulation pump and the 'E-Cooler' battery thermal management system. The showcased systems address central requirements of modern electric buses such as energy-efficient thermal management, reliable air conditioning and optimised battery temperature control.

panies and industry partners at both fairs. The unit operates with the natural refrigerant propane (R290) and is a sustainable and future-oriented air-conditioning solution for electric buses across all climate regions, including very hot countries. More information about the REVO®-E R290 can be found on page 6.

For Spheros, besides the presentation of new products, the professional exchange and discussion of future requirements also formed a key part of the fairs. Both events demonstrated that the electrification of public transport is clearly continuing to gather momentum, and that sustainable thermal management and air-conditioning solutions are an integral component of this.

The new REVO®-E R290 system generation proved to be especially appealing and was discussed by the Spheros team with customers, transport com-



The Spheros team at Mobility Move: (l. to r.) Nico Grimm, Frank Färber, Jan Pfeuffer, Carsten Schmidt and Franz Bergmaier.



The Spheros team at BUS2BUS: (l. to r.) Philip Schellhorn, Fabienne Ehmann, Frank Färber and Volker Schuster.

# 20 years of Spheros: a success story built on 70 years of innovative spirit

## From the founding of an independent brand to the global technology leader for thermal management in mobility applications

The year 2025 marked a truly special milestone: the Spheros brand celebrated its 20th anniversary. Yet while the Spheros name is only two decades young, our business is built on an impressive tradition stretching back more than 70 years.

### A legacy that bears responsibility

The history of Spheros is a rich tapestry of milestones and notable chapters: from Webasto Bus Products to the first phase under Spheros, through Valeo TBS and Valeo TCV, to the globally positioned company Spheros is today. The 1st of December 2005 marked a decisive turning point in the company's history: with the sale by Webasto and the introduction of the autonomous Spheros brand came a new chapter of independence.

Today, Spheros is far more than a brand name. The company stands for technological expertise and a deep understanding of the bus as a complete system, a lived team spirit and reliable service as a collaborative promise – with the goal of redefining comfort and safety in buses and commercial vehicles worldwide.

### Milestones: a legacy of breakthroughs

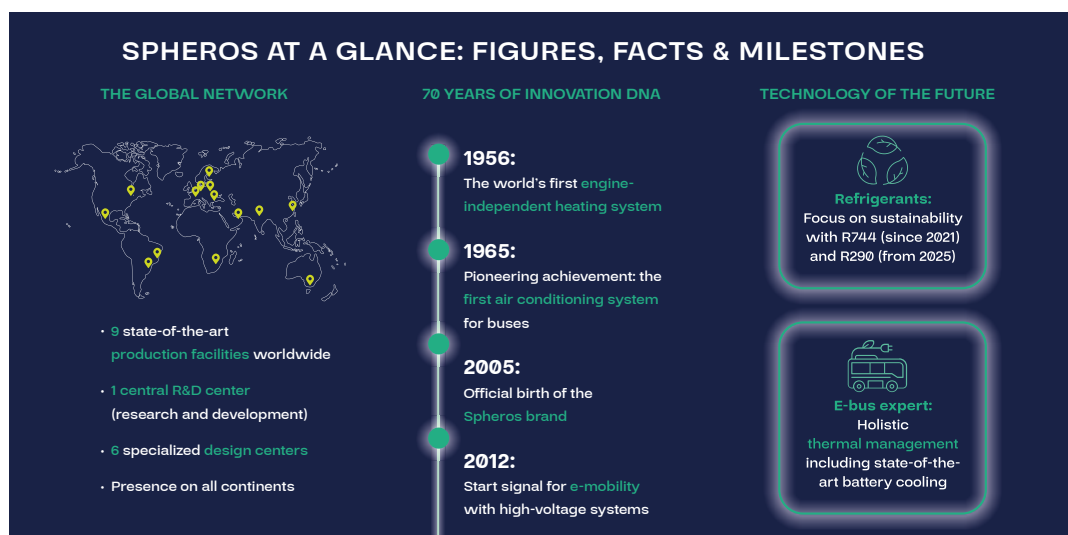
Our roots reach back to 1956, when the first engine-independent heating system for buses revolutionised the industry at the IAA. Since then, we have continuously accelerated the pace of innovation:

**1965:** first bus air-conditioning unit is introduced.

**1994:** first gas-powered heating system sets ecological accents.

**2012:** first high-voltage heating and air-conditioning systems enter the market – an early cornerstone for electric mobility.

**2018:** highly efficient heat pumps are integrated.



**2021–2025:** pioneering work carried out with natural refrigerants (R744 and introduction of R290).

**2024:** standalone battery thermal management system (BTMS) launched for modern e-buses.

### Globally present, locally connected

With nine production facilities and six research and design centres, Spheros as we know it today is at home on every continent. From Gilching and Neubrandenburg (Germany) via Turku (Finland) to Istanbul (Turkey), from Noida (India) via Suzhou (China) to Melbourne (Australia), from Elkhart (USA) via Ramos Arizpe (Mexico) to Caxias do Sul and Linhares (Brazil), and finally to Johannesburg (South Africa): our international network enables us to meet specific regional requirements while simultaneously guaranteeing a globally consistent, uncompromising standard of quality.

### Ready for the thermal future

We celebrate our anniversary not only with a glance in the rear-view mirror, but with full focus on what lies ahead. To meet the challenges of the decades to come, we are consistently aligning Spheros along three strategic pillars:

1. Competitive advantage through innovation
2. A foundation built on sustainability
3. Growth through excellence

### Our three pillars.

#### One strategic goal.

- We secure our lead as technology leader by expanding our position in high-voltage solutions and natural refrigerants.
- Sustainability is a promise we hold deeply. We align all processes in an ecologically responsible manner – to re-

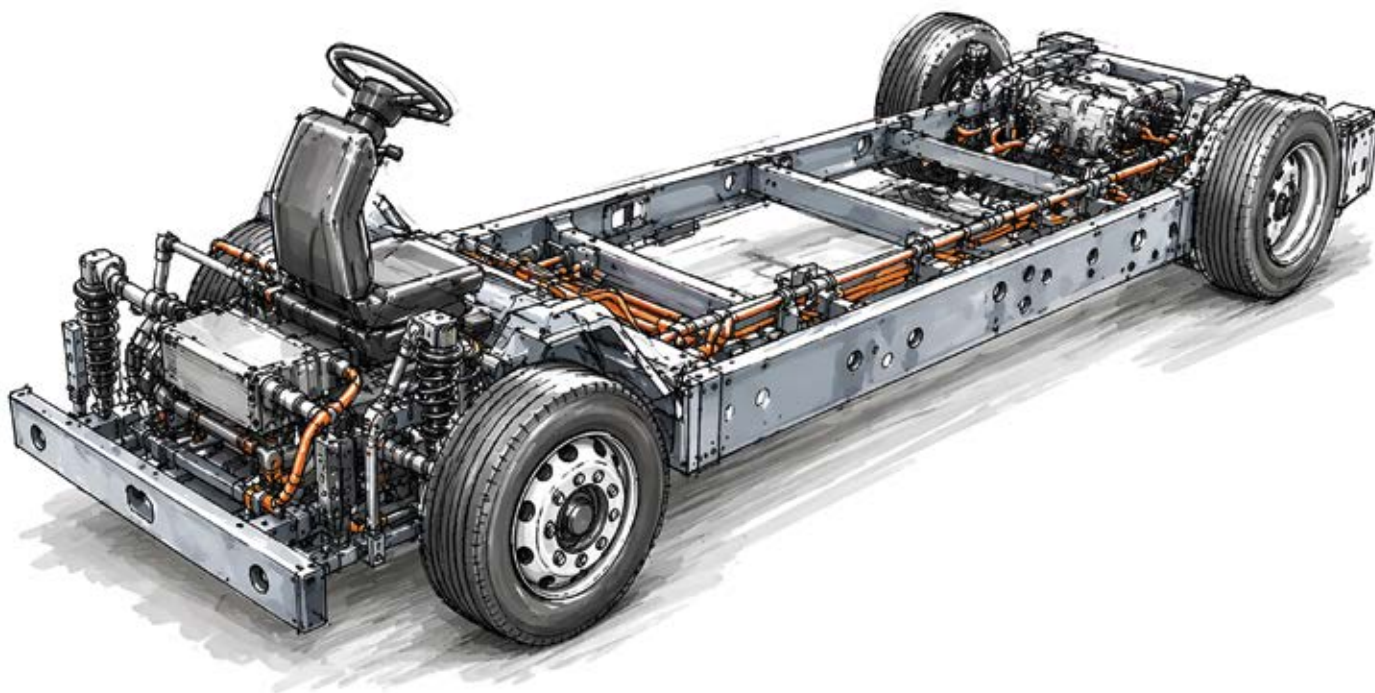
duce our environmental footprint worldwide.

- We invest in our global locations and in developing our talent, in order to achieve healthy growth together with our partners.

In cooperation with our customers we are building a company that is proud of the way it acts today and sets the right course for tomorrow – for shared competitive advantages, for sustainable solutions and for future growth.

Twenty years of Spheros lie behind us – but the most exciting time is yet to come. Let us shape the thermal future together.





## Next-generation electric bus chassis – modular platforms for global use

**With the increasing electrification of public transport, modular electric bus chassis have become established as the central technical foundation of modern city and regional buses. In particular, two platform concepts used around the world currently shape the market: a fully low-floor city bus chassis and a platform that builds on this for low-entry, interurban and intercity bus applications. Both platform types were specifically developed for battery-electric drivetrains and today form the basis of numerous vehicles from various bodybuilders worldwide.**

The fully low-floor concept is aimed primarily at urban public transport networks. Vehicles are typically between around 9 and 13 metres long, with double-deck variants also feasible. The electric drivetrain achieves outputs of up to around 400 kW, ensuring dynamic acceleration and sufficient gradient capability despite high vehicle mass. Lithium-ion-based energy storage systems are generally integrated on the roof to keep the passenger compartment fully low-floor.

The second platform variant expands this concept to include a higher vehicle floor with retained low-entry access, and thus also addresses interurban, commuter

and BRT systems. Two- or three-axle configurations help achieve larger passenger capacities and higher permissible gross vehicle weights. A modular energy storage system allows adaptation to different usage profiles, from urban short-distance routes to longer regional connections.

A key feature of these chassis architectures is their modular system structure. Standardised components such as battery management systems, power electronics or safety functions enable high unit volumes, simplified maintenance and improved spare parts availability. At the same time, flexible battery configurations allow a needs-based de-

sign in terms of range and vehicle weight, making the concept suitable for the most diverse markets and operating conditions.

In the field of thermal management, high-voltage heating systems and electric cooling units are used in series production. Various vehicle configurations also integrate the Thermo HV high-voltage heater and the E-Cooler electric battery thermal management system from Spheros. Additional climate-related components provided by Spheros for the various globally distributed vehicle bodybuilders are also provided. This ensures energy-efficient heating and air conditioning in the passenger compartment as well as

the stable temperature control of high-voltage components, making a significant contribution to the overall energy efficiency and operational reliability of the vehicles.

These platforms thus mark an important step in the development of electric commercial vehicles: they combine high operational flexibility with scalable energy systems, thus providing the technical foundation for a broad electrification of bus transport in cities and regions worldwide.

# Helping customers help themselves: how Spheros is supporting workshops with training videos

The demands placed on thermal management in buses are rising, and with them the complexity of the systems in workshops and servicing. Thermal management components today make up an intermeshed overall system. OEMs, fleet operators and independent workshops are under pressure: vehicles must remain available, and maintenance and repairs carried out as quickly and smoothly as possible.

Spheros is deliberately opting to utilise a format that fits into the day-to-day work of many technicians: training videos. The aim is to enable workshops to handle typical service cases involving Spheros components independently, safely and reproducibly, without requiring an on-site visit or a conventional in-person training session.

## From manual to video: why the format is changing

Technical documentation remains indispensable. But in practice it has become evident that many repair steps are more easily grasped visually than through text and diagrams. A technician standing in front of a bus on the inspection pit benefits far more from a clear, guided sequence of steps on a screen than from an abstract description in a folder.

With the new training videos, Spheros is supplementing existing documentation with a practical medium:

- **Clear step-by-step presentation:** from safe disconnection through disassembly, inspection and reinstallation to functional testing.
- **Realistic fault scenarios:** typical fault patterns from the field, including diagnostic paths and test points.
- **Consistent focus on Spheros systems:** instead of general theory, specific products and variants take centre stage.

Videos thus become a tool that directly supports daily work.

## Benefits for OEMs, fleets and independent workshops

The added value of the training videos is evident along the entire service chain:

- **OEMs** can integrate the videos into their own training platforms, thereby ensuring that their service network and partner workshops are at the same level in terms of product knowledge.
- **Fleet operators** gain flexibility. New employees can train specifically on the assemblies fitted in their fleet, regardless of fixed training dates.
- **Independent workshops** gain easy access to Spheros know-how. This lowers inhibitions when it comes to carrying out also higher-complexity work

on the thermal system by themselves, instead of outsourcing it entirely.

## Technical standards

The videos are deliberately designed to be technical training media, not marketing formats. The focus is on:

- correct workshop-appropriate procedures,
- normative and safety-related requirements,
- product and series-specific characteristics, and
- information on required special-purpose tools.

The presentation follows the logic of real workshop processes. Where appropriate, borderline cases and variants are also ad-

dressed in order to minimise follow-up queries.

## Outlook: expansion of content and integration into service

The current portfolio covers, for example, videos on the topics of valve actuators, E-Coolers and heater diagnostics. Further subject areas are planned and under development. If interested, please get in touch with your Spheros contact person or call our hotline. The ultimate goal is clear: workshops should be able to maintain and repair Spheros products safely, efficiently and independently – with the exact support they actually need in their day-to-day work.





Andreas Rösner (National Regional Manager, Spheros) will be holding a training session in May at the Boelerheide depot of Hagener Straßenbahn AG, focusing on the Thermo plus heater.

## Knowledge for the mobility of tomorrow: Spheros Thermo plus heater training at VDV

The shift towards modern, low-emission and electrified bus fleets is presenting transport companies and workshops with new technical challenges. Hence the importance of comprehensive continuing education programmes for public-transport workshop staff. This is where the Association of German Transport Companies (VDV) comes in with its advanced training course to earn the title 'Certified Specialist in Electronics for Mobility'.

As part of this higher-qualification advanced training programme, which concludes with an examination before the Chamber of Industry and Commerce, participants gain extensive expertise on modern vehicle technology. The course also

includes practical component training by leading system manufacturers in the industry.

Spheros was invited to contribute its know-how in the field of bus heating systems. The focus was on the current Thermo

plus heater, which is used in both modern Euro VI vehicles and in e-buses.

On 6 May 2026, Andreas Rösner, Regional Manager at Spheros, conducted the training session at the Boelerheide depot of Hagener Straßenbahn AG. Twelve participants were in attendance from transport companies throughout Germany – including Baden-Württemberg, Hesse, North Rhine-Westphalia, Saxony and Schleswig-Holstein. As part of the one-day training session, Spheros imparted practice-oriented knowledge on the following topics:

- Structure and function of the Thermo plus heaters
- Integration of the systems into modern vehicles
- Diagnostics using the Spheros DTT diagnostic tool

- Maintenance and repair work
- Technical information and digital service offerings
- Fault-finding and field experience

The intensive exchange between the participants and the Spheros expert made the event a particularly valuable forum for practical knowledge and technical discussions. The participants were able not only to deepen their specialist knowledge but also to benefit from concrete experiences from day-to-day workshop practice. With these kinds of training sessions, Spheros actively supports transport companies in preparing their workshops for the requirements of modern bus fleets.



The participants came from transport companies across Germany.

# Personnel changes in the Sales-Aftermarket-Service (SAS) division



Verena Pintat-Köster

## Parts & Sales Manager – Verena Pintat-Köster

Verena Pintat-Köster has been strengthening the SAS team since 1 November 2025 as Parts & Sales Manager. Verena has been with Spheros since 1 September 2014 and has held various positions during this time, including in Order Management and Sales Administration.

In her new role, she focuses on acquiring and supporting international sales and service partners in the aftermarket, drawing up quotations for new spare parts and repair kits, as well as elaborating and communicating product change notifications and sales promotion measures.

## Norbert Boltz and Jürgen Hoffmann retire

Both Norbert Boltz and Jürgen Hoffmann are retiring from Spheros after having spent 39 years and almost 15 years respectively with the company.

Norbert Boltz most recently supported the Spheros helpline for eight years, demonstrating great commitment and extensive professional expertise. Jürgen Hoffmann served as National Regional Sales Manager for 15 years.

We sincerely thank both colleagues for their many years of dedication and wish them all the best for the next chapter in their lives.



Norbert Boltz



Jürgen Hoffmann



Andy Gülzow

## Andy Gülzow – new helpline contact

We are pleased to introduce Andy Gülzow as the new contact for the Spheros helpline. He will take over from Norbert Boltz.

Andy began his career at Spheros in September 2008 with an apprenticeship as a mechatronics technician, which he successfully completed after 3.5 years. Since February 2012, he has been working in customer quality at Spheros, bringing with him extensive product and service experience. Since May 2026, he has been supporting the team as Customer Service Manager and will be your contact at the helpline going forward.

The Spheros helpline is still reachable on +49 8105 7721 887 or by email at [service@spheros.com](mailto:service@spheros.com).

## National Regional Sales Manager – Christoph Strelzyk

On 1 June 2026, Christoph Strelzyk took on the role of National Regional Sales Manager as successor to Jürgen Hoffmann.



Christoph Strelzyk

He has been working as Sales Administrator at Spheros since October 2022 alongside managing our group companies as Key Account Manager for around two and a half years, covering areas such as sales planning, budgeting and strategic mid-term planning topics. The trained wholesale and foreign trade specialist also has several years' experience in sales and customer service from various previous positions.

In his new role, Christoph Strelzyk is the central contact for end customers – particularly transport companies – as well as sales partners in Central/Eastern and Northern Germany. His responsibilities include advising on spare parts, retrofit solutions, pricing and tenders, as well as supporting new bus projects and training for air-conditioning and heating units.



From January 2026, all new Citysphere air-conditioning units will be supplied with the refrigerant R513A.

## Citysphere rooftop air conditioner: switch to refrigerant R513A

The F-gas Regulation (EU 2024/573) significantly tightens the rules for refrigerants in bus air-conditioning units in order to reduce fluorinated greenhouse gases. One important aspect of the F-gas Regulation is the phase-down. The quantity of HFC refrigerants such as R134a is being gradually reduced, leading to a shortage and, in turn, price increases. As an alternative to refrigerant R134a, Spheros is relying on refrigerant R513A in the medium term. Since 1 January 2026, all of the new Citysphere units have been supplied with R513A.

Refrigerant R513A is a mixture of 44% R134a and 56% R1234yf that falls under the group of azeotropic blends (a mix of two substances). Compared to R134a, it is more environmentally friendly as it has a substantially lower global warming potential (GWP = 631 compared to 1,430). R513A is non-flammable and classified in the refrigerant safety class A1 (meaning no flame propagation). Furthermore, due to the lower CO<sub>2</sub> equivalent of R513A compared to R134a, both pricing and availability are expected to prove favourable in the future.

The Spheros Citysphere and Citysphere S air-conditioning units have been tested and approved for use with R513A.

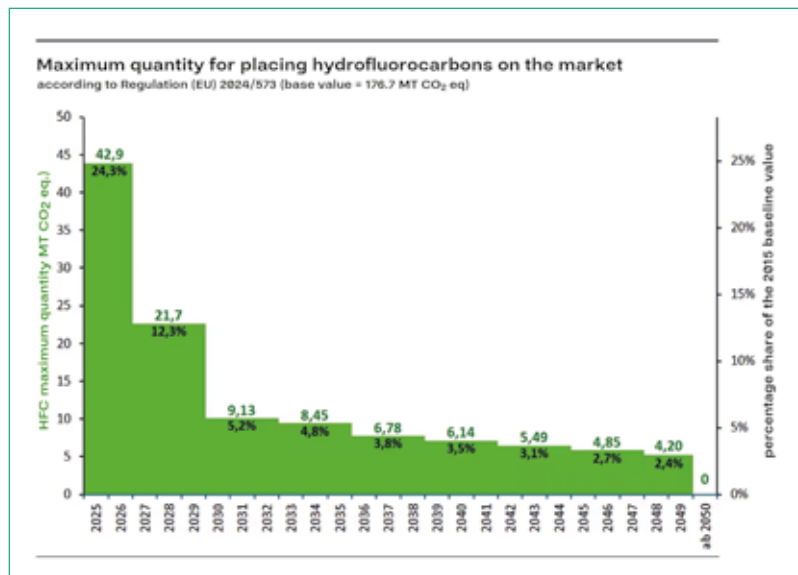
### **When using R513A in existing Citysphere / Citysphere S units, the following should be noted:**

- The Citysphere / Citysphere S can be operated directly with the new refrigerant – with no modifications needed.
- When using R513A, the performance of the Citysphere / Citysphere S unit remains unchanged.

- POE oil SE55 is recommended as refrigerant oil.
- Service work on the air-conditioning unit remains unchanged.
- When using R513A, the air-conditioning unit can be operated with an unchanged filling quantity according to the nameplate.
- An air-conditioning unit operated with R513A must be labelled accordingly. The labelling must be carried out in a suitable form by the performing workshop without fail once the refrigerant is changed.

Spheros accepts no warranty for non-compliance with this requirement.

- The same refrigerant service stations can be used as before (make note of the purity of the refrigerant in the stations).
- The current service connections (R134a) remain unchanged.
- For the Citysphere and Citysphere S, the CO<sub>2</sub> equivalent changes as follows:  
Citysphere filling quantity 0.8 kg R513A: 0.5 t;  
Citysphere S filling quantity 1.1 kg R513A: 0.7 t.



Source: German Federal Environment Agency (Umweltbundesamt)

#### Overview of GWP values:

| Refrigerant | GWP  | Safety Class |
|-------------|------|--------------|
| R134a       | 1430 | A1           |
| R407C       | 1770 | A1           |
| R513A       | 631  | A1           |
| R290        | 3    | A3           |
| R744        | 1    | A1           |
| R1234yf     | 4    | A2L          |

- A1 per DIN EN 378-1 Annex E = non-hazardous refrigerant
- A3 per ASHRAE classification = slightly flammable and low toxicity
- A2L = low flammability and non-toxic

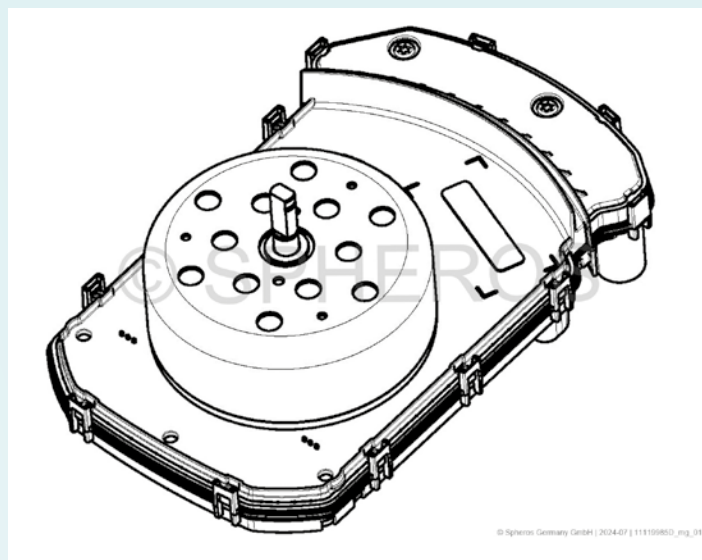
## New control unit for the Thermo plus

With the new control unit for the Thermo plus, we are placing even greater emphasis on future-proofing, reliability and technical flexibility. This stems from the increasing changes in the electronics market: today, electronic components are often discontinued at short notice or are temporarily only available in limited quantities – even from well-known manufacturers. In order to ensure reliable supply capability also in the future, the Thermo plus control unit has been fundamentally revised.

The new modular concept enables different electronic components to be used flexibly. Numerous alternative components were already tested and approved during development. As a result, the assembly of the circuit board can be quickly adapted if necessary – without any impact on function or quality.

In the course of this further development, additional components have also been optimised. Improved motors, extended EMC protection and more robust mechanical connections

provide additional operational reliability and longevity. Externally, the Thermo plus remains unchanged; inside, however, a significantly modernised generation of technology is at work. All changes were of course subjected to extensive internal release and validation tests. This ensures that the Thermo plus will continue to reliably provide comfortable temperatures in diesel vehicles in the future.





Spheros Aquavent and SPump.

## Robust coolant pumps for the bus market

The international bus market is facing massive upheaval: electrification, stricter CO<sub>2</sub> requirements and pressure on lower lifecycle costs demand innovative thermal management solutions. Coolant pumps play a key role here, as they ensure precise liquid delivery in HVAC systems, heating circuits and battery cooling systems, which are essential for comfort, efficiency and vehicle availability. As a leading supplier, Spheros continuously optimises its pump portfolio to meet the requirements of OEMs and operators. The Aquavent series combines robustness, maintenance-free operation and high energy efficiency.

### Aquavent family: proven in city, intercity and school buses

Spheros Aquavent pumps are designed for a variety of applications: they support heating and cooling systems in city and intercity buses, and efficiently supply battery circuits in e-buses. The Aquavent also finds application outside the bus sector. Typical operating conditions encompass temperature ranges of -40 to +120 °C, pressure losses of up to 0.4 bar and harsh environments with vibrations and foreign bodies. Flexible mounting options facilitate integration in confined installation spaces, such as in rooftop or underfloor units. The pumps thus cover application ranges from continuous operation to intermittent peak loads.

### The Spheros Aquavent portfolio at a glance

The portfolio comprises three main series: Aquavent 5000/

5000S, Aquavent 6000C/6000SC and Aquavent Scholastic. The 5000 series offers a flow rate of 5,000 l/h at 0.2 bar, with 104 W nominal power (12/24 V). Dimensions: 229 x 100 x 105 mm, weight 2.1 kg (5000) or 2.2 kg (5000S).

The more powerful 6000 series achieves 6,000 l/h at 0.4 bar, 210 W (24 V), dimensions 225/229 x 110 x 115 mm and weights of 2.4/2.5 kg. The Aquavent Scholastic complements these models with three performance levels (23-35 kW) for heating loads typical of school buses.

### Technological highlights and innovations

The Aquavent series relies on proven concepts with significant improvements. Magnetic coupling in the S and SC versions ensures leak-free, maintenance-free operation throughout the entire service life. Brushless EC motors increase durability,

while self-protection functions such as dry-run and blockage detection prevent overloads. The 6000 series is 14% lighter than its predecessors, which reduces fuel/energy consumption. Ceramic shaft seals and reinforced composite housings guarantee media compatibility and robustness against steam, foreign bodies and dry running. Improved motor efficiency minimises self-consumption.

### Energy efficiency and operating benefits

Optimised EC motors and gentle start-up control make for a noticeable decrease in energy consumption, extending range in e-buses and reducing CO<sub>2</sub> emissions. Maintenance-free operation, no service over the entire operational lifetime, and a low start-up noise level increase passenger comfort. Long service lives (comparable to engine service life) and low total cost

of ownership (TCO) make the pumps particularly attractive. Moreover, Aquavent Scholastic saves startup emissions and reduces power consumption during heating periods thanks to the low standby current.

### SPump family: high-performance pumps for demanding operating conditions

The SPump family supplements the Spheros portfolio with high-performance coolant pumps specifically designed for high flow rates and harsh operating conditions. The central design principle: a magnetic drive that makes the pump leak-free, low-wear and completely maintenance-free. In combination with brushless EC motors, the SPump achieves a service life of up to 40,000 operating hours – a value that covers the requirements of modern bus fleets throughout the entire vehicle lifecycle.

### Low lifecycle costs, high environmental compatibility

The IP6K9K protection rating makes both SPump variants dust- and waterproof – ideal for use in exposed installation positions such as rooftop or under-floor mounting. Through variable speed control in the PWM and CAN versions, energy consumption is optimised as required. In electric and hybrid buses, this pays dividends directly in extended range. The noise-optimised design with sound pressure levels from 60 dB(A) supports the quiet operation expected by passengers and local residents alike.

### Intelligent control and diagnostics

The CAN version of both SPump variants offers a complete protection package with fault diagnostics and function monitoring in accordance with SAE J1939. This allows the pumps to be seamlessly integrated into existing vehicle networks. Fleet operators benefit from predictive maintenance and reduced downtime risk. High EMC resistance ensures interference-free operation even in electrically demanding vehicle architectures.

### SPump 260 and SPump 500 compared

With three control options (ON/OFF, PWM, CAN), the SPump 260 offers maximum flexibility for integration. Its extended temperature range up to +95 °C makes it ideal for applications subject to extreme heat. With a flow rate of 10,000 l/h at 0.5 bar, the SPump 500 delivers the highest flow rate in the Spheros pump range, making it the first choice for systems with high coolant requirements, such as large battery cooling circuits or high-performance HVAC systems in coaches.

### Spheros Aquavent-Portfolio

| Series          | Flow rate (l/h @ bar) | Power consumption (W) | Voltage (V) | Weight (kg) | Dimensions (L x B x H mm) |
|-----------------|-----------------------|-----------------------|-------------|-------------|---------------------------|
| Aquavent 5000   | 5000 @ 0,2            | 104                   | 12/24       | 2,1         | 229 x 100 x 105           |
| Aquavent 5000S  | 5000 @ 0,2            | 104                   | 24          | 2,2         | 249 x 100 x 105           |
| Aquavent 6000C  | 6000 @ 0,4            | 210                   | 24          | 2,4         | 225 x 110 x 115           |
| Aquavent 6000SC | 6000 @ 0,4            | 210                   | 24          | 2,5         | 229 x 110 x 115           |

### SPump 260 compared with SPump 500

|                             | SPump 260                         | SPump 500                           |
|-----------------------------|-----------------------------------|-------------------------------------|
| Power consumption (W)       | 260                               | 500                                 |
| Flow rate (l/h)             | 6000 @ 0.5 bar;<br>1000 @ 1.0 bar | 10.000 @ 0.5 bar;<br>1500 @ 1.0 bar |
| Rated voltage (V)           | 24                                | 24                                  |
| Operating voltage range (V) | 16.5 – 32                         | 16.5 – 32                           |
| Temperature range (°C)      | -40 bis +95                       | -40 bis +85                         |
| Protection rating           | IP6K9K                            | IP6K9K                              |
| Dimensions D x L (mm)       | 172 x 212                         | 172 x 212                           |
| Weight (kg)                 | 2,3 / 2,6 (CAN)                   | 2,6 (CAN)                           |
| Service life (h)            | 40.000                            | 40.000                              |
| Noise level dB(A)           | 60 / 65 (CAN)                     | 65 (CAN)                            |
| Motor concept               | Magnetic coupling                 | Magnetic coupling                   |
| Control                     | ON/OFF; PWM; CAN                  | CAN                                 |
| CAN interface               | SAE J1939                         | SAE J1939                           |
| Coolant (%)                 | min. 30 % commercial antifreeze   | min. 30 % commercial antifreeze     |

### Benefits for OEMs and fleet operators

OEMs benefit from both pump families' compact design, variable mounting and platform capability, which shorten development times. Operators gain from higher fleet availability, maintenance-free operation and optimised energy consumption. Spheros' global spare parts

supply rounds off the lifecycle support. With Aquavent and SPump, Spheros covers the entire performance spectrum – from the efficient 104 W pump for school buses to the 500 W high-performance pump for demanding thermal management architectures in electric intercity coaches.



Refrigerant R513A is becoming increasingly important – at Spheros too.

## Sustainable air conditioning in public transport R513A – a future-oriented alternative to R134a

Climate protection and energy efficiency play an increasingly important role in public transport. Alongside alternative drivetrain technologies, the choice of suitable refrigerants for vehicle air-conditioning systems is moving increasingly into focus. The EU regulatory requirements in particular are currently driving a change in the industry.

For many years, the refrigerant R134a (tetrafluoroethane) was seen as the standard in mobile air-conditioning systems. However, owing to its comparatively high GWP (global warming potential) value of 1430, this refrigerant is increasingly at the core of regulatory measures. The background is the European F-gas Regulation (EU 517/2014), which is intended to gradually reduce the use of fluorinated greenhouse gases. Against this backdrop, the refrigerant R513A is gaining increasing significance – also at Spheros.

R513A offers similar thermodynamic properties to R134a, but with a GWP value of 631 it has a significantly lower global warming potential. It thus represents an attractive alternative for use in bus air-conditioning systems. A further advantage: in many cases, existing air-conditioning systems can be converted from

R134a to R513A with reasonable effort. The necessary measures typically include:

- replacing the filter dryer,
- refilling the compressor oil, and
- if necessary, replacing the shaft seal on the compressor.

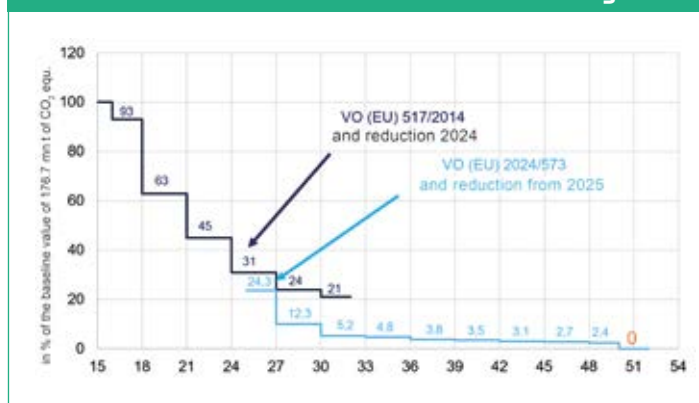
The necessary workshop infrastructure is already in place: air-conditioning service stations

for the use of R513A are now provided by various equipment manufacturers.

Spheros supports transport companies during this transition with comprehensive technical information. 'Technical Information R513A' is available in the Spheros service portal and describes all the relevant measures and information in detail.

The growing interest from the industry clearly demonstrates that the topic is already present in practice. In recent months, numerous transport companies have contacted Spheros to check their options for converting their air-conditioning systems. At the same time, initial vehicle manufacturers are already delivering new vehicles with air-conditioning systems designed for R513A as standard.

### Phase-down in accordance with the EU F-Gas Regulation



R513A



The FIT series comprises a wide range of emergency exit hatches that are perfectly 'FIT' for different types of vehicle.

## This is FIT

**The new series of Spheros emergency exit and ventilation hatches bears the name FIT. This completely newly developed product range was created to meet the current challenges of modern vehicles: limited space on the vehicle roof, modern design, competitive costs, low weight and integration into HVAC management – all in one solution.**

The FIT series comprises a broad spectrum of emergency exit hatches that perfectly 'FIT' different vehicle types – from M1 through M2 to M3 vehicles. Particularly in the course of the increasing electrification of class 2 and higher vehicles, where emergency exit hatches are mandatory, the available space on the roof is becoming increasingly scarce. For precisely these requirements, Spheros has developed transversely installed roof hatches that require significantly less space than conventional longitudinally mounted systems.

In addition to this innovative transverse installation, the FIT series also offers glass versions with white glass panels. White glass is ideally suited for warmer climate zones as it disperses sunlight, which reduces the amount of direct solar radiation on passengers. At the same time, the glass continues to pro-

vide a bright and spacious interior. What's more: the build-up of dirt from dust or bird droppings, for example, is significantly less visible on white glass than on conventional transparent glass surfaces.

The FIT hatches are available both as manually operated units and with electrically controllable ventilation. Optional integrated extraction fans can also be used to further improve the removal of warm air. Moreover, electric FIT hatches can be fully integrated into the vehicle's HVAC system. Up to four roof hatches can be controlled simultaneously with a special control unit.

Safety is paramount at Spheros. On the plastic domes, the word 'EMERGENCY' is firmly integrated into the top and is supplemented by clearly visible photoluminescent instruction labels. The glass versions can also be equipped with a particularly

lightweight integrated glass-breaking device, also featuring photoluminescent operating in-

structions. In contrast to conventional emergency hammers, this device cannot be stolen.



FIT hatches are available with both manual operation and electrically controlled ventilation.

# Replacement of Thermo plus control units in Daimler buses

In the course of our ongoing product improvements and the further development of individual components, we would like to draw attention to an important special feature when replacing control units in Daimler buses equipped with Thermo plus heaters.



Heater with a visible gateway module.



## Thermo plus CAN – special feature in Daimler vehicles

In this vehicle generation, Daimler buses use a Thermo plus CAN heater. This variant is easy to recognise externally: a so-called gateway module is located on the heat exchanger.

In the case of Thermo plus CAN heaters, which were produced up to and including the 2023 production year, the control unit differs from the currently manufactured variants in two key respects:

- a new microcontroller was introduced.
- in addition, the control unit received adapted application software.

## Important information when replacing the control unit

When exchanging an older control unit for the current version, the heater might no longer start. This is due to the different software basis used for the old and the new unit.

For the heater to function correctly again after replacement,

the respective application software for the vehicle in question must first be loaded onto the new control unit using the Daimler diagnostic solution.

## Background to the change

The switch to the new control unit generation had already been announced in PCN 2023-020. We therefore recommend taking this point into consideration early on during service and replacement measures in order to avoid unnecessary vehicle downtime.



The “Frequently Asked Questions (FAQs)” section is a regular feature of the Technik Service News and addresses questions that repeatedly come up in the service area.

### What is a dust protection kit?

The dust protection kit was developed to protect the flame sensor from contamination. This enables better and more accurate detection of a flame in the flame tube. The use of a dust protection kit is recommended when using paraffinic fuels such as HVO 100.



### Can the dust protection kit be retrofitted?

Yes, the dust protection kit can be easily retrofitted on Thermo, Thermo S, Thermo plus, Thermo E and Thermo E+ type heaters. Further information can be found on the Spheros website.



### Does the SPump have reverse polarity protection?

No, the SPump 260 and 500 do not have reverse polarity protection. Incorrect connection will damage the electronics in the pump.



### Does the SPump have over- and undervoltage protection?

Yes, the motor switches off above 32 V and below 16.5 V. As soon as the voltage is within this window, the motor switches on again.

### Does the SPump have dry-run protection?

Yes, dry running is detected by the current consumption and the speed is reduced. Should no change occur within 30 minutes, the motor switches off.



### What kind of refrigerant is R513A?

R513A is an azeotropic refrigerant on an HFO/HFC basis, developed as an environmentally friendly replacement for the older refrigerant R134a in air-conditioning systems. It has a significantly lower GWP value than R134a.



### Is there a minimum burn time for the Thermo heaters?

Yes, the aim is to have a minimum burn time of 120 seconds. Frequent burn durations of below 120 seconds can lead to sooting and increased smoke formation. To achieve the minimum burn time of 120 seconds, a variable adjustment of the lower switching threshold is made by the control unit. This process is called hysteresis adjustment.



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