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SPHEROS

TECHNIK SERVICE NEWS

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Title story

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Dear readers,

This edition of Technik Service News is dedicated entirely to the idea of reorientation. Our eight-year journey at the side of Valeo is now at an end and, thanks to the new investor H.I.G., we've been an independent business again since 1 July 2024. This isn't an entirely new situation: we experienced something similar following the demerger from Webasto in 2005 until we were taken over by Valeo in 2016. During those eight years we were integrated into the Valeo organisation and also successfully established many aspects common to large corporations within our organisation, such as successfully obtaining IATF certification for the German sites in 2023. What's more, we also consolidated and expanded our global product portfolio during this period, recently for example at 2023's Busworld in Brussels, with a keen focus on e-mobility. Consequently, we were able to chart an early course towards future developments on the product side. Many longstanding colleagues with a huge wealth of experience are still on board. And that's not all: company name "Spheros" still has strong associations on the market and revives the familiar euphoria of those times.

What now remains are the challenges facing the industry. While the Clean Vehicles Directive requires increased investment in electric bus models, the withdrawal of state support in particular means that there's no adequate funding base for the implementation of these targets in many places. Could this see things going in the opposite direction with an increase in the purchase of diesel buses? When will coaches be fully powered by clean drive technologies? What will be the trend in terms of unit sales of diesel heating systems and conventional air-conditioning systems in future? Will there be an increase in the use of synthetic fuels and what further regulations around coolants can be expected? All of these questions will continue to exercise us as a manufacturer of these components and systems – and we'd also like to remain in contact with you on these subjects.

We're looking forward to productive discussions with you at the coming trade fairs and industry meetings and hope you enjoy reading the current edition of our Technik Service News.

Frank Färber
Head of Sales

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The brand name Spheros is celebrating a come-back.

Spheros is back

Facing the future with experience and professionalism

With the official change of owner, Spheros, one of the world's leading suppliers of thermal management solutions for buses and refrigerated transport fleets, is once again independent both in legal and financial terms. On 1 July 2024 specialist SME investor H.I.G. Capital took over Valeo's Thermal Commercial Vehicles business. Due to operate under the familiar name of Spheros in future, the company will remain committed to innovation and systems expertise. The rebranding of the company will be completed in the coming weeks.

Not only will ongoing contracts and business relationships be upheld with no changes, the demerger will also not impact the staff: managers and employees in all departments across all sites will remain in their previous roles. Customers, suppliers and business partners can also expect continuity and stability in terms of ongoing business, and specifically that all facilities and products will be retained.

This process is not entirely unknown to the company and some of the employees – in 2005 the sale of Webasto gave rise to the new brand Spheros, which was an established player in the bus air-conditioning market until the takeover by Valeo in 2017. The name Spheros is still familiar to customers in many countries today and is associated with trust and reliability. The decision to revive the tried-and-tested brand name was therefore an easy one. With a new design and colours, the new brand is intended to reflect and express the company and its values, visions and expertise in today's world. This is a modern company, an ethical and transparent market operator that develops high-quality, reliable, safe and environmentally-friendly products. As an employer, we take respect, humanity and support extremely seriously.

Talking about the sale, Mark Sondermann (CEO of the Spheros Group) said: "Having the new investor on board means we have excellent opportunities for development and growth. We can focus even more consistently on the bus business and make sure we have the right product range for the global market. Additionally, we're in an ideal position for electrification in the bus market because this requires more

Managers and employees at all sites will remain in their previous roles. Pictured here is the Spheros sales team at the Gilching site.

systems expertise than ever before, and that's precisely where our strength lies. We've been specialists in thermal management systems in the bus industry for years. We're looking forward to seeing what comes along next in terms of the opportunities and potential on the back of our regained independence."

In recent weeks, Valeo Thermal Commercial Vehicles Germany GmbH has been renamed Spheros Germany GmbH.

The Spheros sites around the world will remain as they are following the takeover.

Spheros at the bus fairs 2024

Spheros attended Mobility Move, part of the VDV electric bus conference, as an exhibitor in March, followed by BUS2BUS in April. Both events provided an ideal platform for the company to present its latest innovations and products. The high calibre of the industry visitors as well as the opportunity to meet and exchange notes with other industry professionals paid dividends.

Mobility Move

This year's VDV Electric Bus Conference took place in the Hotel Estrel in Berlin from 5-7 March, with the accompanying trade fair (formerly ElekBu) now renamed "Mobility Move" – a move that the organisers claim expands the range of topics that will be relevant in future. As such and in addition to electric mobility, the topic of "autonomous driving" came under the spotlight for the first time. This year's event saw record visitor numbers with 1,200 attendees and 78 exhibitors. (VDV, 2024)

The uneasy situation in the bus industry was apparent right at the start of the event: while VDV president Ingo Wortmann's analysis of electric mobility in public transport was ultimately positive, he emphasised that a lot of money will be needed to realise the transformation across the board. Figures he cited puts the total bill for electrifying municipal buses in Germany alone in the region of €24 billion. Of the some 50,000 public buses currently in service in Germany, approximately 2,500 are electrified, thus putting Germany in second place overall compared to other European countries in 2023.

Uncertainty was also a factor during the presentation by Ms. Daniela Kuckert (Parliamentary Secretary of State in the German Federal Ministry of Transport and member of the FDP). She, too, praised the steps that have already been taken in the public transport sector, but was unable to make any promises about further subsidies. However, what is clear is that the defined targets for the transition to new forms of mobility – a transition that will require 90 percent of new public buses to be electric from 2030 and 100 percent from 2035 – are not achievable without government funding.

From left to right: Christian Schilder (Manager Sales – Aftermarket – Service), Carsten Schmidt (General Manager), Markus Möseler (R&D Director), Frank Färber (Sales Director).

There was ample opportunity for detailed discussions alongside the technical presentations at the Spheros booth, where the latest products in the field of thermal management were also presented. Alongside the Thermo HV electrical heater and the SPump S200 circulation pump, this year the company also presented its latest battery-cooler generation, the E-Cooler 100 BTM: a compact and fully equipped standalone unit with 10 kW of cooling capacity. The company's overall conclusion was positive: "As Germany's biggest public-transport conference and trade fair, Mobility Move is the perfect meeting point for OEMs, supplier companies and transport operators, making the event a firm fixture in the bus sector," said Frank Färber (Head of Sales, Spheros).

BUS2BUS

BUS2BUS took place on 24 and 25 April at the Berlin Expo Center and once again advanced the market position of its concept as a combination of trade fair, programme and digital industry platform. With its informative stage events along with workshops, networking events and digital offers, BUS2BUS integrates a range of futuristic technologies and showcases the latest trends in the bus industry. On the OEM side, Ebusco, VDL Bus & Coach, Daimler Buses, MAN Truck & Bus Deutschland, Iveco Bus, Karsan Automotive, Otokar Europe, pepper motion and Anadolu Isuzu were once again in attendance. First-timers included MCV Deutschland, Van Hool and Elektrobus Europe.

143 exhibitors from 20 countries presented their product innovations under the motto "Driven by the Future". 2,400 visitors from 39 countries attended to learn about the topics that will shape the future of the bus industry. Spheros exhibited its innovations in the field of heating, air-conditioning and ventilation, including the Thermo HV heater, the E-Cooler 100 BTM – the latest battery-cooling generation, the SPump S200 circulation pump and the FIT Clear roof hatch.

From left to right: Tommi Forsberg (Regional Sales Manager Finland), Franz Bergmaier (Key Account Manager), Jan Pfeuffer (OEM Senior Key Account Manager), Christian Schilder (Manager Sales – Aftermarket – Service), Fabienne Ehmann (Marketing & Communication Manager), Maximilian Eifler (Key Account Manager).

The VDV attendees with the Spheros team at the 206th meeting of the Committee of Automotive Engineering.

206th Meeting of the Committee of Automotive Engineering (AKW) in Neubrandenburg

From 18 to 19 April 2024, the Spheros facility in Neubrandenburg hosted the 206th meeting of the Committee of Automotive Engineering. 15 attendees from the Association of German Transport Operators (VDV) discussed current issues in passenger transport with members of the Spheros sales and management teams.

During a facility tour, Spheros provided insights into areas where products from the current product portfolio are manufactured, including air-conditioning equipment, heaters and circulation pumps. An outlook of future developments and innovations in the holistic thermal-management system of the city bus was also provided. The current challenges, caused not least by altered political conditions, were discussed – including how the transformation of new drive technologies will progress after the end of state subsidies. Other subjects were: what role will EURO 7 play in future and what place will there be for synthetic fuels? How will the coolant market develop and which statutory regulations will come into force in the foreseeable future?

Carsten Schmidt (General Manager, Spheros) and Frank Färber (Director Sales, Spheros) present the Spheros facility in Neubrandenburg.

A particular highlight was a historical city tour on the second evening, which was offered in a vintage Ikarus 66 bus dating from 1967 owned by the Neubrandenburger Stadtwerke. Not only the historic vehicle but also the stories and background provided by the tour guide, who vividly portrayed the peculiarities of old GDR landmarks, made this journey through time a unique experience.

Reconstruction of the Spheros Fast-Way logistics centre

Since 2015, the Fast-Way warehouse has established itself across Europe as a distribution centre for the Spheros aftermarket. Technik Service News edition 2021/2022 included a comprehensive report about the logistics centre and praised its exceptional performance. A fire in the night from 15 to 16 November 2023 destroyed the entire site and posed what was probably the biggest challenge in the company's history.

"Of course we were in shock. But one thing was clear for us: if everyone gets stuck in, we can get to grips with this extraordinary situation. What's more, we were able to fall back on our other two sites and also implement working from home to keep day-to-day business running seamlessly. Thanks to our online operating system, no data was lost," said Frank Röse (Managing Director of GMT mbH).

The team started searching for a transitional site on the very same day – and found one within 24 hours, fitting it out only a few days after the accident. Thanks to the dedicated team and the support of a host of local companies, the move into the temporary premises was possible in a record time of just three weeks. After just six weeks, Fast-Way and the Spheros team were able to resume regular operations and start making deliveries. "We're grateful for our customers', suppliers' (especially Spheros) and partners' support and understanding," said Frank Röse.

The team from the Fast-Way logistics centre

Planning and reconstruction at the original site in Neckartailfingen has been in full swing since December. A modern and efficient warehouse will be built by mid-2026 that is even intended to outdo the previous one.

The new thermal battery-management system E-Cooler 100 BTM

The rapidly growing electrification of mobility, in particular in public transport, requires powerful mobile energy storage systems that guarantee maximum vehicle range. With the new E-Cooler 100 BTM, Spheros has introduced a battery temperature management system with a cooling capacity of 10 kW that is suited to a range of vehicle applications. With active and passive cooling, a heating circuit with a water pump, the necessary valves, an expansion tank and, on request, also an integrated electrical heater, the new E-Cooler 100 BTM is a true standalone solution, scheduled for serial production from November 2024 onwards.

Depending on requirements, the E-Cooler can protect the battery from overheating while charging and cool it down during the driving phase under high battery load and at high external temperatures. The integrated electrical heater can even warm the batteries up to guarantee the optimum temperature range for the charging cycle. The integrated control unit with its intelligent working algorithm manages all components of the E-Cooler to meet and maintain the desired water output temperature for the battery.

The battery temperature can be controlled in three different ways depending on the situation:

1. If the ambient temperature is low enough, passive cooling is possible. The system uses the slightly lower ambient temperature to cool the battery with a low energy overhead.

2. If the ambient temperature is too high for passive cooling, the system automatically activates the active cooling circuit.

3. If energy is needed to warm up the batteries, the electric heater feeds the necessary heat into the heating circuit.

Proper conditioning of the battery has a significant effect both on reach and battery life and consequently also on the TCO calculation of the vehicle.

Spheros E-Cooler 100 BTM.

The Mercedes-Benz eCitaro in central Stuttgart.

Stuttgarter Straßenbahnen AG (SSB): Full steam ahead for an emission-free bus fleet

Stuttgarter Straßenbahnen AG (SSB) has been the backbone of Stuttgart's public transport system for over 150 years, operating a bus service, light-rail network, the Flex on-demand service, a rack railway and a cable car. Every day, 3,300 employees work to transport some 600,000 passengers safely, reliably and comfortably up and down Stuttgart's challenging gradients. The transition to zero-emission drive systems is a central pillar of Stuttgart's climate-protection targets and compliance with the Clean Vehicle Directive. This is an area where SSB made an early start in its efforts towards a zero-emission fleet, with the first measures already introduced in the 1970s.

Each day, SSB's buses set off from one of the three bus depots in Gaisburg, Möhringen and Sielmingen, where the buses are not only parked overnight, but also maintained, repaired, fuelled or charged and washed in the maintenance facilities there.

Reducing emissions since 1970

SSB started experimenting with low-noise buses in the 1970s and 80s. Low-floor buses with electric wheel hub engines, low-sulphur diesel and nitrogen reduction have been successfully deployed since the 1990s. In 2003 SSB was one of the first transport operators in Europe to trial hydrogen buses in standard daily service. Further improvements to the existing fleet were pursued and new concepts trialled, such as the first serial diesel-hybrid articulated buses or a second generation of fuel-cell-hybrid buses.

A climate filter with a special coating was developed and implemented in the existing systems as part of a nitrogen-oxide

reduction measure in 2019 and with success: nitrogen oxides in the vehicle interior were demonstrably reduced by up to 70 percent. During the COVID 19 pandemic, this cabin filter was developed further, enhanced with an antiviral coating ("PhiltAir") and has been deployed in all SSB AG buses since then.

Even before 2020, all SSB diesel buses were similarly fitted with soot-particle filters along with a nitrogen-oxide reduction system and awarded a green environmental badge. Since the start of 2020, all SSB buses have exclusively used the synthetic fuel GTL made from natural gas, further reducing nitrous-oxide emissions and soot particles from new and existing vehicles. Exhaust measurements were performed by TÜV Nord during this transition to provide quantitative evidence of the effects of emissions from the buses and auxiliary heating systems. This involved not only taking measurements whilst driving, but a stationary test bench was constructed at the premises of the Spheros service partner GMT (Gesellschaft für mobile Kfz.-Technik mbH) in Neckartailfingen for the auxiliary heating systems. The results encouraged SSB to switch the fuel used to drive all its buses.

En route to zero emissions:
The conversion of public bus fleets to zero-emission drive systems is central to Stuttgart's climate-protection targets (climate neutrality by 2035) and the prevailing Clean Vehicle Directive. The first stage is for all inner-city bus routes to be serviced by zero-emission buses by 2027, with all remaining routes to follow by 2035. Due to its complexity, the transformation of the bus fleet from conventional diesel engines to alternative drive types poses one of the greatest challenges that bus operators will face over coming years. Consequently, as well as procuring new vehicles with fuel-cell or battery technology, it will be necessary to construct and operate extensive charging or fuelling infrastructure, retrofit the bus depots and procure the requisite back-office software systems.

SSB's first steps towards an incremental conversion of the bus fleet to emission-free drive systems were severely hampered by the devastating fire at the Gaisburg bus depot on 30 September 2021. This meant that charging infrastructure required for electric buses could not be provided until a new depot was built. At present SSB operates eight fuel-cell hybrid buses, whose supply infrastructure was spared from the flames in Gaisburg, as well as one battery-powered articulated bus with its charging infrastructure in Möhringen.

Service and spare-parts support from Spheros service partners
In the field of service and spare parts in the HVAC segment, SSB works closely with the Spheros service and sales partners GMT and GMS (Gesellschaft für mobilen Service). Since SSB stipulated that, like trams, all buses should be fitted with roof-mounted air-conditioning systems, a kanban store has been introduced in the bus maintenance facilities in conjunction with GMT. The stock in the kanban stores can be adjusted to changing requirements in an efficient and traceable manner. The ever-more complex HVAC systems in buses also mean that the requirements for special spare and wearing parts as well as training are rising.

Mercedes-Benz eCitaro in the SSB bus depot.

Emission measurements by TÜV Nord at SSB.

Use of synthetically produced XTL fuels such as HVO (hydrogenated / hydrotreated vegetable oils) in the Spheros heating systems

Spheros promotes the use of HVO in its heating systems.

What are the benefits of the approval and use of XTL fuels such as HVO 100?

There are different types of synthetic liquid fuels that are not made from the raw fossil material of mineral oil. An overarching term for these is "XTL", where the "X" stands for any starting material used to make a liquid fuel using a defined process (such as gas-to-liquid or GTL). In addition to GTL, another of these XTL fuels, standardised under DIN EN 15940:2023-07, is HVO 100.

With the amendment of the tenth German Federal Emission Control Act via a resolution of the Federal Cabinet on 10 April 2024, HVO 100 can be sold at fuel stations. HVO is an especially sustainable and high-quality biodiesel fuel. Its approval represents a crucial step towards enhanced climate protection in transport. HVO in its pure form (HVO 100) has the potential to reduce CO2 emissions by more than 90 percent.

(Source: https://bmdv.bund.de/SharedDocs/DE/Artikel/K/faqzu-hvo-100.html)

Spheros considers the use of these fuels in heating systems to be environmentally beneficial and supports it. However, as DIN EN 15940 includes a certain bandwidth in terms of the composition of HVO 100, there are naturally differences between manufacturers in terms of the following factors:

- Density
- Viscosity
- Flashpoint
- Lubricating capacity
- Proportion of FAME
- Resistance to cold / aptitude for use in cold

It should be noted in this context that the approval of HVO as engine fuel by the vehicle manufacturer does not automatically mean that the heating system can also be operated with any type of HVO. A crucial difference between operating the vehicle's engine and a Spheros heating system with HVO is that the heating systems have an integrated flame sensor that identifies both a flame as well as its flame profile / flame colour. This may cause the abovementioned problems to arise and ultimately cause the heating system not to work as intended. Similarly, suitability for use in the cold is not always a given, depending on the fuel.

In the course of our experiments with alternative/synthetic fuels at our own facilities, Spheros produced a technical information (TI) sheet in 2020.
Documents can be found in the Service / Download centre at www.spheros.com.

The technical information sheets (TI) list the manufacturers of these fuels who had a high market share at the time of publication and who were approved by Spheros for use in its own heating systems.

For that reason, an approval by Spheros needs to be reviewed, or an inquiry sent to the Spheros Service team: germany-service.mailbox@spheros.com

The list of fuels approved by Spheros is regularly updated due to the dynamic market and amendments to the standard.

An overview of sales partners of the fuel already approved by Neste can be found for instance here:

1. Belgium:
https://www.neste.be/neste-my-renewable-diesel-be-nl/onze-distributeurs
2. Denmark:
https://www.neste.dk/neste-my-renewable-diesel/distributorer
3. Germany:
https://www.neste.de/neste-my-renewable-diesel/distributoren
4. France:
https://www.neste.fr/diesel-renouvelable-hvo100/nos-distributeurs
5. Netherlands:
https://www.neste.nl/neste-my-renewable-diesel/distributeurs
6. Sweden:
https://www.neste.se/neste-my-fornybar-diesel/aterforsaljare-tanka-hvo

The electric bus comparison test team in Bonn.

E-bus comparison test in Cologne/Bonn

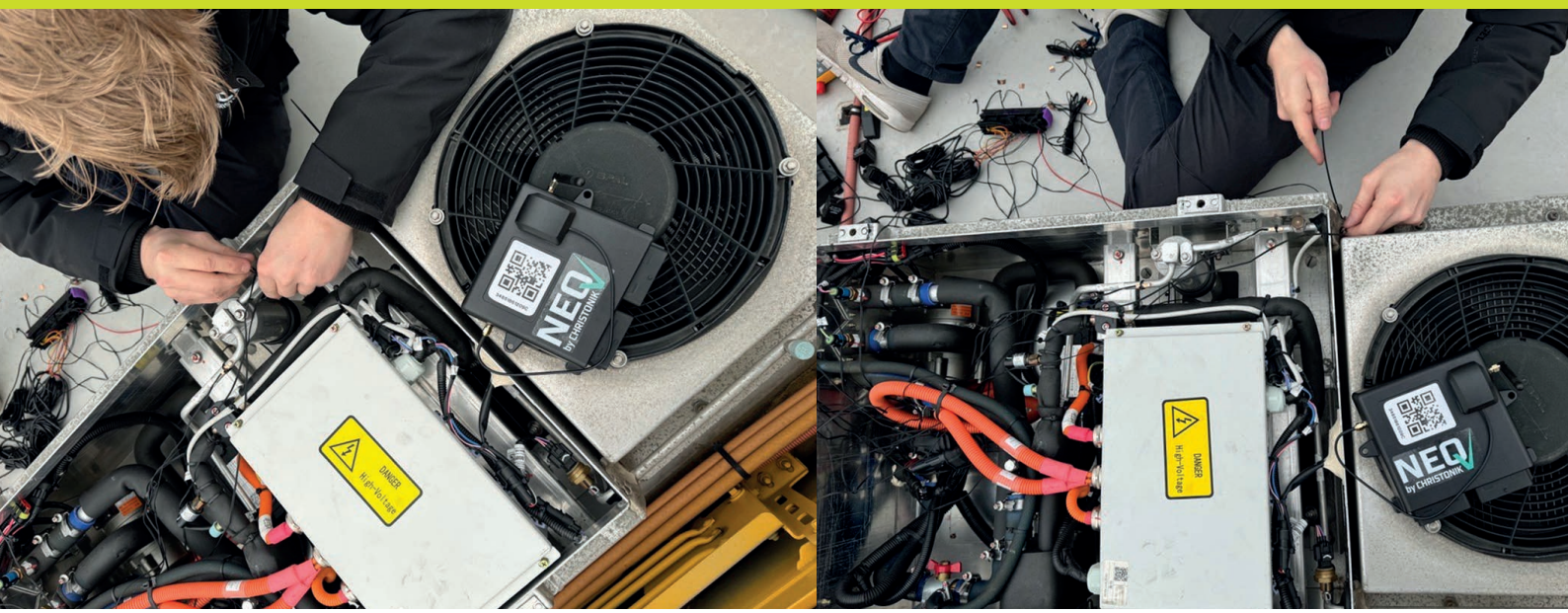
The sixth Omnibusspiegel electric bus comparison test took place in Bonn from 8 to 11 April 2024. The focus this year was on articulated bus models. This time, Spheros was also involved as a sponsor and shared its expertise and latest insights in a presentation on the topic of "coolants of the future".

Seven electric buses took part in this event, of which just four were provided as articulated variants: Ebusco, MAN, Mercedes-Benz and Solaris. Additionally, three other current electric bus models from MCV, Mellor and Rampini were present.

The event enabled a quick and direct comparison of the vehicles along with an exchange of information in the form of specialist presentations and face-to-face discussions with participants from transport operators, OEMs and suppliers.

A particular highlight was a 50-year-old Mercedes-Benz O 317 vintage articulated bus loaned by Stuttgarter Straßenbahnen. As a comparison to current models, 50 years of development in the field of city buses could be experienced and admired up close.

David Darul (R&D Manager Air Conditioning) presents on the coolants of the future.



The new NEQ Veevue system manages all HVAC units with independent sensors in one system.

The new NEQ Veevue system from Christonik:

Online monitoring of HVAC systems in buses and trains

Christonik works on over 1,500 buses and trains across the whole of Scandinavia every year. As a result of its broad experience in working with public transport operators, the service provider has been able to collect extensive data on how service and repairs to vehicles can be optimised yet further. With the new "NEQ Veevue" online monitoring system, the company has raised the bar in terms of the predictability of servicing and maintaining HVAC systems, saving time and money along with increasing operating efficiency.

Because buses needing repairs almost always arrive at the depot without prior notice, workflows have to be completely reorganised, causing longer waiting times as the service provider services the buses. Additionally, the automatic troubleshooting of the bus's HVAC system never returns more information than "the system isn't working". In the absence of precise information, all parties have to endure higher costs and longer waits.

Christian Rud Ingvardsen, proprietor of Christonik and now CEO of NEQ ApS, a wholly-owned subsidiary of Christonik ApS, is well versed in the challenges involved in servicing and maintaining HVAC systems in public transport. Five years ago he started developing the NEQ Veevue online monitoring system for HVAC systems in buses and trains. Since the start of the year, the operational system can be found in over 150 buses in the Copenhagen region. Additionally, NEQ ApS has held talks with other European Spheros service partners such as F.lli Amadio S.p.A. in Italy. The installation of three test buses in Venice was rolled out in June.

NEQ's Veevue system

NEQ Veevue represents a sea change in how HVAC systems in buses and trains are monitored and maintained. Designed as a standalone solution with independent sensors and a separate IoT unit, it offers comprehensive real-time monitoring functions. Seamless integration is ensured thanks to compatibility with all HVAC systems and a range of vehicle makes and models. Individual components can now be directly monitored and warnings reported promptly in case of potential issues such as leaks or malfunctions. One system is now used to monitor all HVAC systems via independent sensors as opposed to the previous situation, requiring access to complex CANbus systems that differ from bus to bus.

Benefits for bus operators and service partners

The benefits to the operators are obvious: a single monitoring system that manages multiple HVAC systems across the fleet boosts operating efficiency. Direct component monitoring and real-time alarms enable proactive maintenance and reduce downtime and associated costs. Service partners also benefit: the system supports proactive maintenance, enabling improved scheduling and resource planning. Additional services such as alarms and ESG data enhance the value proposition for increasing efficiency, representing a comprehensive solution for service providers.

NEQ ApS and EUDP: working together for a green future

NEQ ApS has joined forces with Spheros, Anchersen A/S and the Danish Technological Institute to work on the EUDP project, which aims to develop a digitally based expert tool to optimise the maintenance of HVAC and drive systems in battery-electric buses (BEB). By taking advantage of a rapidly growing global market for BEB, this aims to reduce energy and operating costs and improve KPIs for fleet operators.

Advanced service and maintenance: Interview with Christian Rud Ingvardsen from Christonik ApS

An interview by Thomas Schuster (Spheros Germany GmbH)

Christonik ApS has been a Spheros premium partner for more than ten years. The company has been working with public transport operators in Scandinavia for more than 30 years and offers training, workshop equipment, spare parts and services for HVAC systems in the bus and rail sector. This also includes heating systems, air-conditioning systems and, most recently, heat pumps manufactured by Spheros. The introduction of electric vehicles is also posing new challenges for service providers like Christonik. The requirements on HVAC systems are constantly evolving and the integration of innovative technologies, especially in terms of monitoring and maintenance, is of central significance. We met Christian Rud Ingvardsen (proprietor of Christonik ApS and CEO of NEQ ApS, a wholly-owned subsidiary of Christonik) and spoke about the latest trends and developments in the sector. He let us in on how the company has made itself fit for the future in terms of service and maintenance of HVAC systems.

As a longstanding Spheros service partner, you've experienced significant changes in the HVAC sector over the years. Specifically how has the service side developed in Scandinavia? And how has your company adapted to these changes?

HVAC systems have been important to our customers for many years, but for most customers not important enough to warrant any additional investment in them. Many customers in our region would wait until the system stopped working before realising that they lack the expertise to rectify the issues. Only then would they contact a specialist like us. With the introduction of electric vehicles, many customers have realised that HVAC systems need to be regularly maintained because now they also regulate the temperature of the batteries and can impact the reach of the vehicle.

Over recent years, Christonik has expanded its expertise by developing an innovative IoT project under the name of NEQ ApS. This project revolutionises the monitoring of HVAC systems in buses and trains by providing real-time insights. This initiative is central to Christonik's vision of fully digitalised HVAC monitoring in the future and promises greater cost-efficiency and lower energy consumption. Both at Christonik and NEQ we believe there are excellent opportunities for gaining access to the large fleets as nowadays service and maintenance of HVAC systems are seen as especially important.

Sustainability is a growing concern in the HVAC sector. How does your company address this in terms of the services it offers and what initiatives have you implemented to minimise the effects on the environment?

Sustainability is an important aspect for us in terms of reducing our negative ecological footprint as a company and keeping it to a minimum. We've been certified under the Environmental Management System standard ISO 14001 since 2021. Our measures have also included setting up a company that refurbishes used burner heads. We also work closely with customers to minimise leakages by ensuring comprehensive servicing and maintenance of HVAC systems. Our latest development, the new Veevue online monitoring system, is an important step in this direction. Online diagnosis means that we can now identify and fix coolant leaks in real time, often before customers are even aware of the problem.

Christian Rud Ingvardsen
(proprietor of Christonik ApS and CEO of NEQ ApS)

Innovations are key to remaining competitive. Can you tell us about the latest technological advances or service improvements introduced by your company to meet the customers' growing needs?

We've concentrated on becoming as digital as possible because this increases our efficiency. At the same time, we can secure all of our documentation and can identify areas quickly and efficiently where we can improve even more. Our monitoring system, the NEQ Veevue system developed in-house, expands this focus on efficiency without burdening the customer with additional costs. Our aim is to offer customers online services for the daily operation of HVAC systems. We want to create added value by fully automating the service process and optimising the performance of the HVAC system. This also includes monitoring systems that may not be performing as expected so we can intervene as need be.

What future trends and challenges do you see in terms of service and maintenance in the HVAC sector and how is your company preparing for these?

Digitalisation is becoming ever more prevalent. This trend has been growing in significance for some time and is not likely to stop any time soon. This means that we need to overcome the scepticism towards digital solutions that still exists in parts of our industry. Like most companies, our aim is to optimise performance and minimise costs. As we see it, this can only be achieved by greater digitalisation and automation of the service and maintenance offers that our customers can take advantage of. As an international service provider we rely among other things on highly qualified personnel and close collaboration with the manufacturers of buses and air-conditioning systems. It's crucial for us to be getting the message out to the market that maintaining HVAC systems isn't just important, it can also bring financial benefits. Without concrete financial incentives, customers may be hesitant to invest in new technologies.

Can you point to any success stories that demonstrate the effects of the solutions from NEQ ApS on efficiency, cost reduction or improving the entire service experience for customers?

Currently, most implementations of the NEQ Veevue system are test projects designed to show how the system works and what benefits it can offer our customers. Projects to date have included diesel buses, electric buses and trains across the whole of Scandinavia. Of course we've tested HVAC equipment from the most common manufacturers, including heating systems, air-conditioning systems and even CO_2 heat pumps from Spheros. The conclusion of our tests is that data can be collected regardless of whether the system is operated in Copenhagen or Bodø, north of the Arctic circle in Norway. This online data collection opens up a completely new type of working with HVAC systems in bus and rail fleets.

More precisely, collecting online data provides valuable insights into the functionality of the various HVAC systems. We've identified leaks, broken heating systems, unsuitable driver temperature settings along with other defects that wouldn't have been discovered without the online data from the HVAC systems. We've also gathered insights that help our technical personnel to better understand how the systems work. Most of these insights cannot be obtained anywhere else as they are shared exclusively via the system configuration between the bus maker and the HVAC manufacturer. The aftermarket service provider doesn't generally have access to them. Using this system enables us to better advise customers in the use of the HVAC systems. At the same time, our technical staff can use these new insights for maintenance or troubleshooting of our customers' buses and trains.

We look forward to having the online data of over 150 buses that operate in and around Copenhagen very soon. We're confident that this type of data collation will provide new insights that will contribute to the optimisation of bus operations.

We'd like to thank Christian Rud Ingvardsen for the informative and extensive discussion.

Gesellschaft für mobilen Service mbH

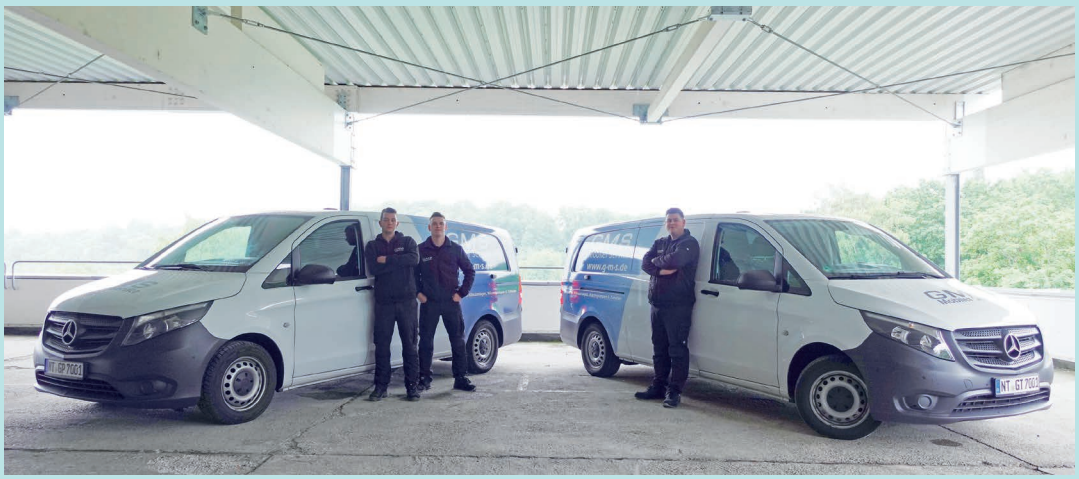
Ebusservice was set up by Pascal Graewer as a business focusing on maintenance and repairs of roof-mounted air-conditioning systems and heat pumps for buses and trains. Due to growing demand, the business formally became the company "Gesellschaft für mobilen Service mbH" (GMS) in 2022, managed by Timo and Pascal Graewer with its headquarters in Nürtingen near Stuttgart. GMS is an official Spheros service partner offering a high-quality repair service for air-conditioning systems, heat pumps and auxiliary heaters.

GMS mobiler Service

"The constantly growing demand and need to offer outstanding performance inspired us to start our business and is what motivates us every day," said Pascal Graewer (Managing Director at GMS).
The company is a mobile service provider that inspects systems and equipment directly on site at the customer's premises. Two service vehicles that are equipped with all necessary (special) tools regularly travel to transport operators, maintenance facilities and bus depots throughout Europe.

Since its inception in August 2022, the company has grown from two to five employees and now consists of an automotive mechatronic technician and two refrigeration technicians, with two further staff employed in assembly and logistics. GMS is a by-word for professionalism, commitment and a rapid repair service. At the same time, the range of services on offer is constantly growing. Initially the focus was mainly on repairing roof-mounted air-conditioning systems and CFC-based thermal heating systems, but since becoming a company it has specialised in high-voltage air-conditioning systems and the maintenance of CO_2 air-conditioning systems with stainless-steel piping. According to Pascal Graewer, the demand for repairs to CO_2 systems grew noticeably in 2023. Also, a common repair method used by the company involves soldering metal connections.

In 2023, the service operations extended to refurbishing components, such as the Spheros heating station for trains, which also included repairs to all variants of thermal systems. The aim in future is to set up a service network with additional sites in the DACH region to reduce travel times and enable faster response times.



The GMS mobile service team.

Original parts – imitation parts – refurbishment

If an HVAC component is replaced due to a defect, accident damage or regular wear and tear, the end customer or the selected repair shop has a wide range of spare parts to choose from. The customer can opt for the manufacturer's original parts, unauthorised imitation parts and, even if not apparent at first glance, fake products. Functionality and safety – in particular when it comes to heating systems – is not guaranteed with the last two of these options. Being (jointly) responsible for a defect or damage due to the installation of unauthorised spare parts will not only void any warranty claim, but also raises questions around the crucial issue of liability in the event of damage.

As a premium manufacturer of heating systems, air-conditioning systems and circulation pumps in buses, Spheros keeps a close eye on the spare-parts market. It also tests the use of unauthorised imitation parts in heating systems or circulation pumps and their effect on functionality and safety. For instance, years ago the effects of unauthorised spray nozzles in heating systems were tested and the consequences made clear. This is demonstrated in a video about the burn behaviour of the Spheros Thermo plus:

https://www.youtube.com/watch?v=k8uZ_LZNVYE
(English version)
https://www.youtube.com/watch?v=o48tmcGZS34
(German version)

This example shows the impact that small yet essential spare parts can have.

In many cases, spare-parts dealers also offer reconditioned products, such as refurbished Spheros heating systems or circulation pumps. In such cases, it is essential to ask who performed this refurbishment and how. The prerequisite for using these parts is that the repair of the respective components must be approved by Spheros, original spare parts must be used, and the repair company must be trained and certified by Spheros at the same time. Many years ago Spheros decided only to offer refurbished burner heads through authorised and trained partners. The basis for this decision is the reduction of CO_2 emissions. By outsourcing the refurbishment of the burners to authorised service partners, short delivery channels can be ensured and long and costly returns avoided.

Spheros original burner nozzle with and without original packaging.

Spheros Thermo G CNG heater

Thermo G: new conversion kit for the use of L-gas

The Spheros Thermo G CNG heating system for gas-powered buses provides heating capacity of up to 30 kW with low emissions and low noise during operation. A special conversion kit has been developed for the use of L-gas. This kit, available under ID number 11149182A, contains an air-intake grille. The grille is used to reduce the combustion air and thus the oxygen supply for combustion and to optimise the mixing ratio with CNG. The kit also includes a safety guard and accompanying assembly instructions.

The additional grid is only required for L-gas (low calorific gas), and is not used with H-gas (high calorific gas). Due to the low methane content of L-gas and the resulting low calorific value compared to H-gas, combustion with L-gas also requires a lower oxygen ratio. The reduction is achieved with the additional grid. The fine-tuning for clean combustion with an optimal air-gas ratio is then done via the individual CO_2 setting on the heater.

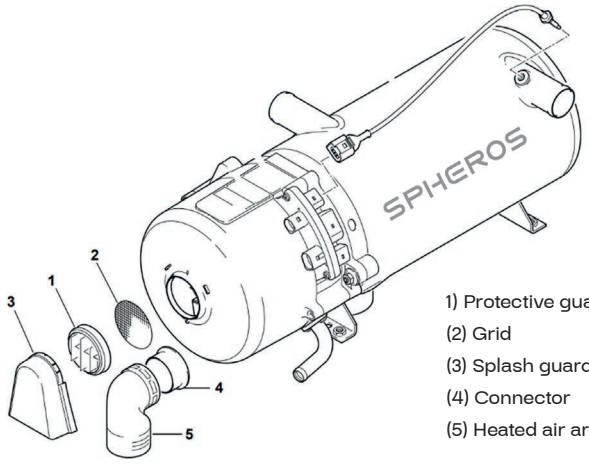
Installation instructions can be found at **www.spheros.com** in the Service / Download centre.

L-Gas

Calorific value:	low – 8.4 to approx. 11.2 kWh/M3
Methane content:	low (80 to 87 %)
Funding:	Germany and Netherlands
Procurement:	cost-effective

H-Gas

Calorific value:	low – 8.4 to approx. 11.2 kWh/M3
Methane content:	low (80 to 87 %)
Funding:	Germany and Netherlands
Procurement:	cost-effective



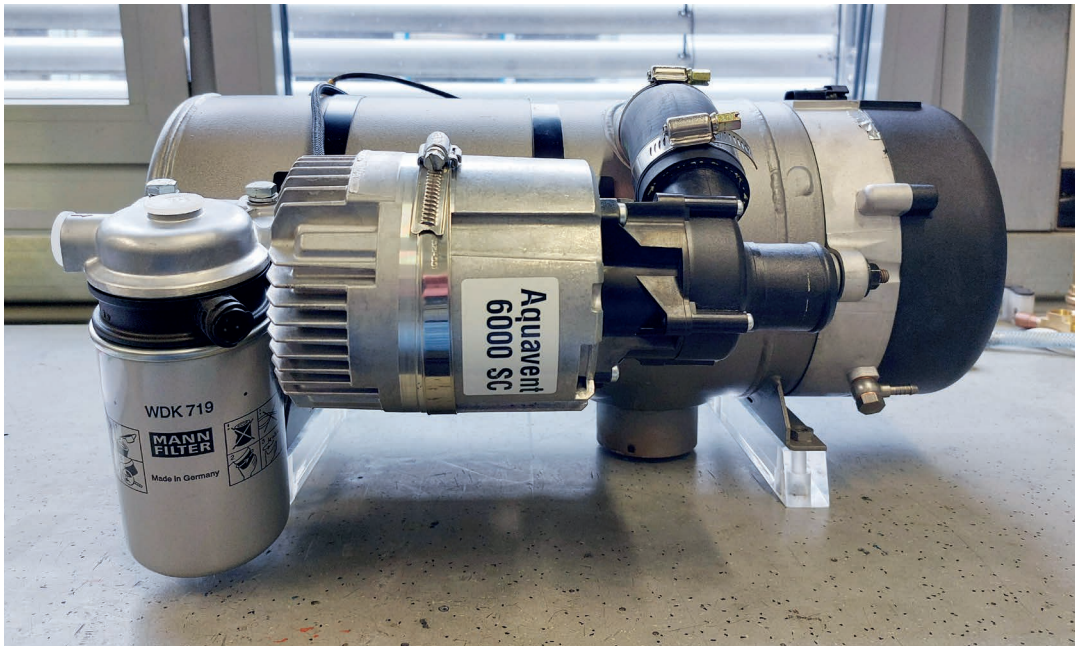
1) Protective guard
(2) Grid
(3) Splash guard
(4) Connector
(5) Heated air arch

SPump conversion kits

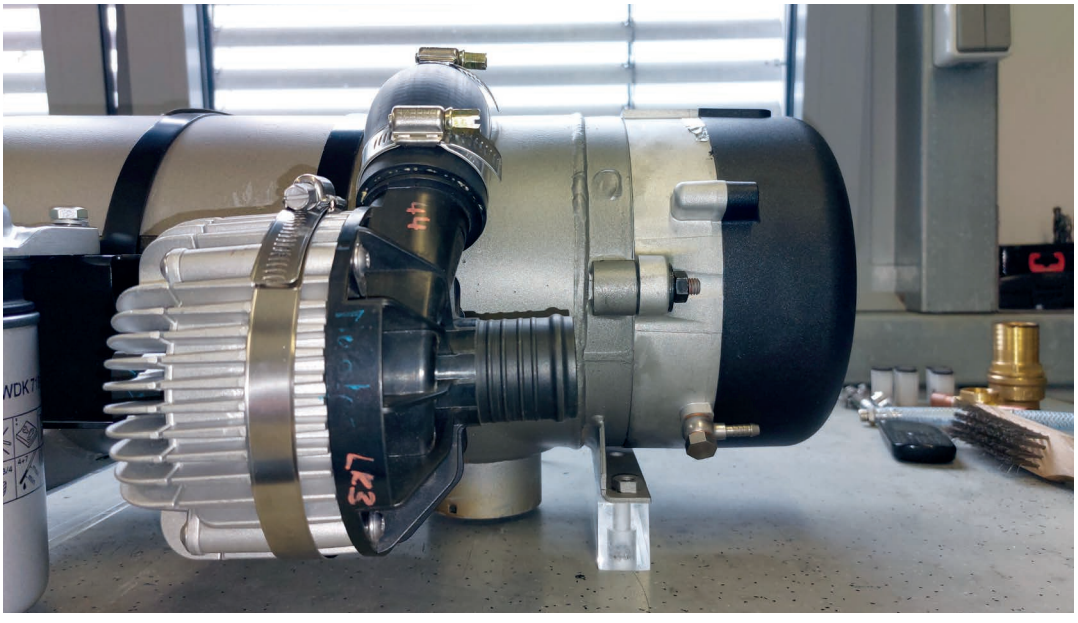
One of the most important components in any coolant circuit is the circulation pump, regardless of whether the vehicle is driven by electricity, fossil fuels or batteries, or whether the passenger cabin or the driver's cab is to be temperature-controlled.

A water pump is essential for almost any application where the water-glycol medium is transported to the heat exchangers. This is equally true when it comes to heating and cooling the vehicle. The adjustability of the pump is an important criterion for the application. With the introduction of the Spheros SPump family, the standard solutions include the On/Off, PWM and CAN versions. Additionally, the service life is a key influencing factor compared to previous models. In comparison: the Spump's service life is 50 % longer than the Aquavent 6000, and a whole four times longer than the Aquavent 5000.

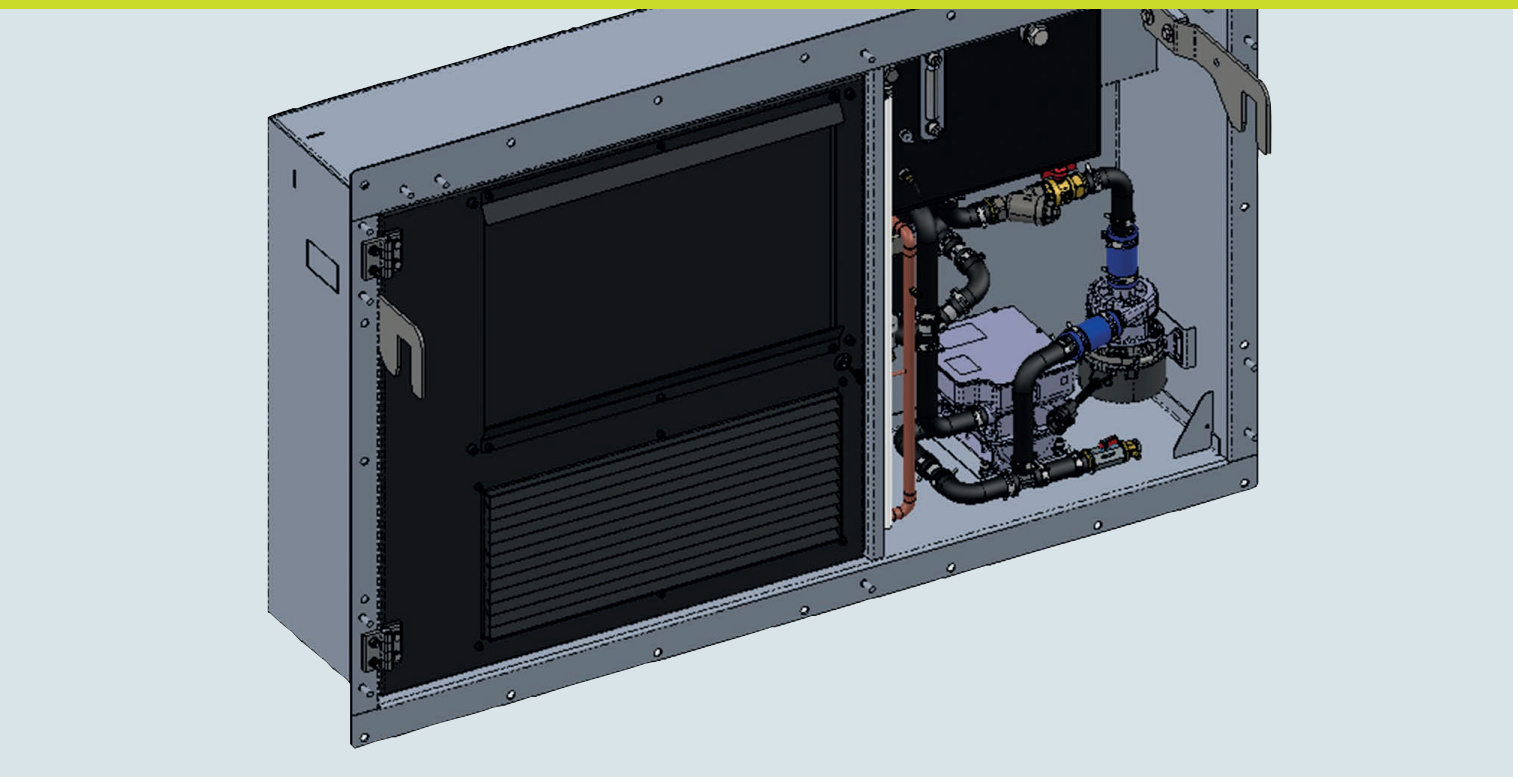
Spheros therefore recommends an upgrade of current applications with Aquavent to SPump in line with requirements. Spheros offers a complete conversion kit for compact heating systems with the circulation pump already preinstalled on the heating system. The heating system consists of a holder, a hose clamp and a modified hose adapter (conversion kit: 11148093A). Due to the wide range of potential applications, users are advised that the available space should be checked prior to conversion. Although the SPump is shorter than the Aquavent, the wider SPump motor may cause collisions and require extensive conversion measures.



Previous status: U4856 (Aquavent 6000) fitted to the heating system.



Current status: SPump fitted to the heating system.



Chiller with cooling and heating unit.

Mobile or stationary?

As the rise of electric mobility in cars progresses unabated and the proportion of electric utility vehicles and buses continues to rise, attention is increasingly turning to vehicle segments where the move to electrification was long considered complex, disproportionate and unaffordable. We are talking about off-road vehicles, such as diggers, cranes, tractors, construction equipment and so on.

Heating circuit

If these special vehicles run out of power, it is often a long way to the nearest charging station. This problem can be avoided by a power supply that comes to the vehicle, with a number of providers, such as Northvolt, already serving the market. This company provides charging capacity in a mobile container which is transported to the place of deployment, be that in a forest, on a farm, at a music festival or high up in the mountains. The potential applications are almost unlimited.

The battery's Goldilocks zone

Because batteries need a well-regulated temperature to function optimally, the Aircontech systems developer from Feldkirch, Austria, has developed an HVAC system that meets these requirements and keeps the temperature window of the batteries within an ideal range. The process is executed with minimal delay. The system features the Thermo HV high-voltage system supplied by Spheros especially for the heating mode. A Spheros SPump 260 CAN, selected due to its control characteristics and durability, is used for the optimum circulation of the heating and cooling medium. The HVAC systems have been widely tested, for instance in countries with very low external temperatures, and are about to go into serial production.

FAQs






From now on, the “Frequently Asked Questions (FAQs)” section will be a permanent fixture of Technik Service News and will answer common questions for the Service area.

What is the maximum ambient temperature for the SPump 500 CAN?
The permissible ambient operating temperature range is -40 to +85 °C. If the ambient temperature rises above 90 °C (±5 °C), the motor speed is reduced to protect the electronics. The motor switches off at approx. 110°C (±5 °C). If the supply voltage is maintained, the motor switches back on as soon as the ambient temperature falls below 105°C (±5 °C).

Where can I find the current software for the heating system diagnostic DTT (Diagnostic Thermo Test)?
The current DTT software can be found at www.spheros.com in the Service / Download centre.

How do the various versions of the heating system diagnostic DTT (Diagnostic Thermo Test) differ?
The diagnostic DTT (Diagnostic Thermo Test) is available in the following versions:

STT 1.2 → Windows 7 drivers added (2011)
STT 1.3 → Thermo G added (2014)
STT 1.4 → Thermo plus added (2015)
STT 1.5 → Thermo E +, Russian language instructions added (2018)
DTT 1.6 → Protocol Thermo plus K-Line MAN and protocol Thermo plus K-Line EvoBus added (2020)
DTT 1.7 → Polish language instructions added (online help in English), SAL added (2022), drivers for old operating systems discontinued (2022)
DTT 1.8 → Thermo E+ 70/85 added (2022)

What heating systems does the diagnostic DTT kit with ID number 11112249F work with?
The following heating systems support diagnostics with the DTT kit:
Diesel heating systems: Thermo plus / Thermo E+ / Thermo S /
Thermo gas heating systems: Thermo G / GBW

Why does a regular CO_2 measurement need to be performed in the exhaust of the heating systems?
The CO_2 value in the exhaust of the heating systems provides information about the correct burning behaviour. In particular, if the CO_2 value is too high, the heating system may be damaged due to the components overheating. Additionally, an excessively high CO_2 value causes soot to be emitted in the exhaust gas. Measuring and setting the CO_2 value in the exhaust is described in the relevant chapter on service operations in the workshop manuals for the heating systems.

What pressures does a CO_2 air-conditioning system operate with?
A CO_2 air-conditioning system achieves pressures of over 120 bar.

How does defrosting work in a Spheros CO_2 air-conditioning system?
The controller of a CO_2 air-conditioning system monitors a range of thermodynamic parameters and decides intelligently whether defrosting is required. The duration of the defrosting depends on the actual need for defrosting, which enhances comfort and efficiency in heating operations.

How much coolant does a Spheros CO_2 air-conditioning system need?
The Spheros CO_2 air-conditioning systems require just 3.8 kg of coolant, which is way below the practical threshold of 6 kg (for 0.1kg/m^3 at approx. 60 m^3 passenger cabin volume). Exceeding this threshold in the event of a defect or accident can result in a dangerous concentration of CO_2 in the passenger cabin.

What happens if an air-conditioning system is “underfilled”?
If the volume of coolant is too low, the high suction pressure falls with the following consequences:

- Increase of the energy requirement of the air-conditioning system
- Low cooling performance, identifiable for instance due to condensation on the windows despite the air-conditioning system being on
- Low-pressure shutdown under full load
- Suction gas temperature increases; compressor can overheat
- Risk of damage to the compressor due to insufficient transport of lubricant

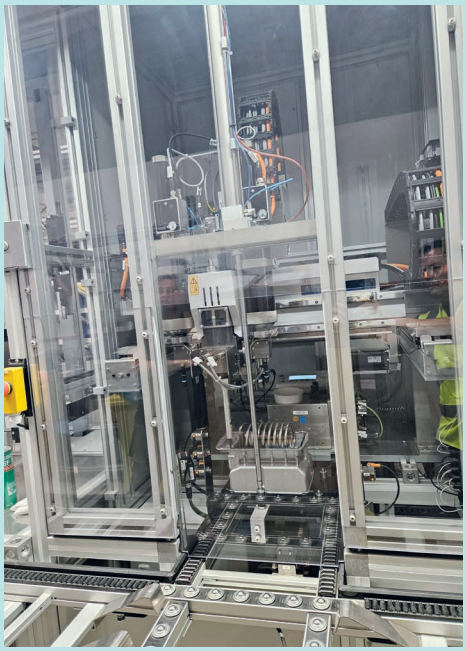
Can the R744 coolant be discharged into the environment?
There is no issue in principle with discharging R744 into the environment as it is essentially nothing more than ultrapure CO_2. However, discharging large quantities into the atmosphere should be avoided.

Is it dangerous to handle CO_2 as a coolant?
Carbon dioxide (CO_2) as a coolant is non-toxic in small quantities. CO_2 is only dangerous to humans in large quantities because it displaces air. When discharging CO_2 from an air-conditioning system into the atmosphere, a strong drop in pressure arises and particles of dry ice are formed that can cause injury if they come into contact with the body.

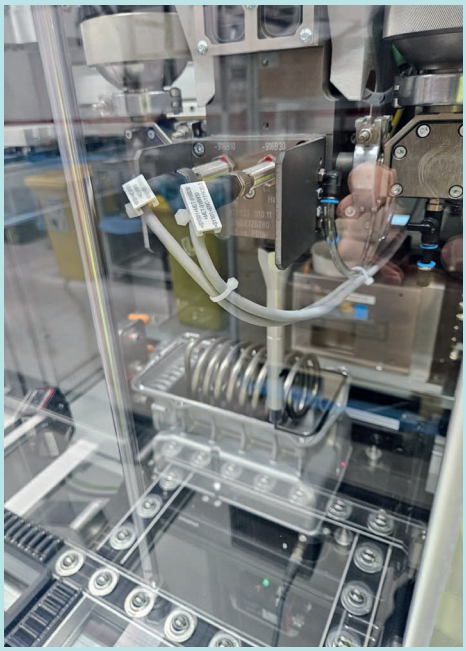
Innovative production line: Thermo HV

Ten years after the birth of the Thermo DC, Spheros's first electric heating system, the second generation now follows as the next evolutionary stage. Already billed as the future of electric bus heating systems in a range of announcements, things have been taking shape since June 2023 at the Spheros manufacturing plant in Neubrandenburg.

A dedicated production zone specified and constructed by the project team has arrived in the heating systems department. This zone has six assembly stations where the relevant components are assembled in sequence. A heating element, temperature sensor and circuit board are attached to the case. A fully automated process connects and seals the two case halves via a dosing unit. All mechanical and electrical approval tests, such as leak test, function, heating operations, dielectric strength, insulation test and others are performed at the associated end-of-line test bench, again using a fully automated process, and then archived.



Glue dosing station

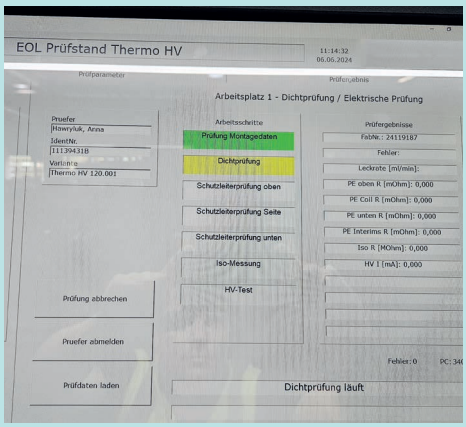


Glue dosing

Circuit-board assembly

Monitoring the assembly stages

EOL check



EOL check