



New Head Office

Spheros has occupied a new building since the beginning of April

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Bahrain contract won

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New pump generation

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Even more Citysphere for Qbuzz





Dear Readers,

Following on from the success of 2014, we are also experiencing a very good start to the year 2015.

In this issue we report on the expansion of our service network and further services, as well as Spheros-specific examples of applications in the international arena. In addition to the launch of our new SPump pump generation and a report on the modified design of the Citysphere air conditioner, we interviewed the Dutch transport undertaking Qbuzz about their experience with the 558 Citysphere units they put into operation last year.

In the past few years we have maintained a substantial presence at busworld in Kortrijk and will be continuing the tradition again this year. We include a brief report informing you about the highlights of the Spheros trade fair stand.

Finally, we would like to announce an addition to the Spheros family in the USA. The acquisition of ACC Climate Control has enabled us to further consolidate our market position and our product portfolio in North America.

Our goal is to always offer our customers optimum solutions, backed up by a comprehensive range of services. In order to achieve this we pursue a direct and continuous exchange with customers as well as sales and service partners. Simply contact us and tell us about your concerns. We are grateful for information from the field and see criticism as an incentive to be even better.

The Spheros team hopes you enjoy reading the latest issue of Technik Service News.

Rainer Kolodzie

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Even more Citysphere for Qbuzz

Since the beginning of 2014 the private transport undertaking Qbuzz has been operating 138 Euro 6 buses in Utrecht/ Netherlands – all of them with compact Citysphere air-conditioning units. For Spheros this was the first major order for the Citysphere from the Netherlands and on this occasion an interview was conducted with Han van der Wal (Manager Fleet & Facilities, Qbuzz) amongst others about their experiences with the new air conditioning system in the field.



Qbuzz has three all-electric Optare vehicles with Citysphere in operation.

A splash of colour on the streets of Utrecht: last year local transport operator Qbuzz put 138 bright yellow Evobus Euro 6 city buses into service. Out of respect for the environment and in consideration of operating costs, when selecting an air conditioning system the company opted for the Citysphere modular unit with its patented air circulation. A total of 558 units were delivered – three for each solo bus and five for each articulated bus, including a Citysphere S for air conditioning the driver's section. Now it is possible that the Citysphere will also be installed in further vehicles of the Qbuzz fleet. The Dutch transport undertaking is more than satisfied with the new air conditioners and wants to equip vehicles such as the Optare and VDL with the Citysphere A/C unit, Han van der Wal assures us. "The systems are running smoothly on all buses and the simple operation of the systems has convinced us. What's

more, we have received only positive feedback from passengers on the temperature behaviour during the summer months," says van der Wal. Because Qbuzz does not have its own workshop at the depot, all service and maintenance work is performed by Evobus.

Small solution, high efficiency

Comfort requirements in a city bus differ from those in a touring coach. Not only additional consumption should be kept to a minimum, but also the service and maintenance costs. The Citysphere with its low life-cycle costs is simply unbeatable in this respect. Instead of the usual cooling of the interior by means of a strong reduction in temperature, it achieves the best possible effect through a combination of cooling and air circulation. A radial fan circulates a broad flow of cooled air directly into the passenger compartment, providing pleasant temperatures without annoying

draughts. This so-called wind chill effect is quite sufficient as air conditioning in moderate climate zones and a far more effective way of ensuring a comfortable room temperature in the city bus. The increased fuel consumption compared to buses without air conditioning is barely perceptible.

Due to the hermetic sealing concept, the Citysphere is virtually maintenance-free, ensuring hitherto unparalleled low life-cycle costs. Furthermore, the unit is already geared to operation with alternative coolants.

About Qbuzz

Founded in 2008, Qbuzz is a fledgling enterprise and a member of the Abellio Group, already well-established on the rail market in the UK. In Utrecht the company has been operating 310 vehicles since 2013, including 17 double articulated vehicles built by Van Hool, 3 electric vehicles from Optare, 76 Citaro articulated

buses, 66 Citaro solobuses and 11 articulated buses for regional operation. The fleet is expected to remain in operation until 2023, when a call will be issued for new tenders. In addition, Qbuzz runs fleets in other regions of the Netherlands. It is not allowed to own more than 1,500 vehicles, however, because no more than 30% of the market in the country may be controlled by any one transport undertaking.

Qbuzz is also very active when it comes to electromobility. Three electrically powered Optare vehicles are currently operating in urban transport, using an inductive charging point at the central station. In addition, according to van der Wal the company is considering the purchase of VDL and Volvo hybrid vehicles.

We thank Han van der Wal for the informative and interesting talk!

LEGAL NOTICE / CONTACT

Publisher:
Spheros Europa GmbH
Friedrichshafener Straße 7
82205 Gilching

Editor:
Fabienne Ehmann
Tel.: +49 (0) 8105 7721-828
fabienne.ehmann@spheros.de

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Service partner meeting

First meeting of the new service partners at the Neubrandenburg production plant: the newly authorised Spheros partners in Germany – from Bavaria to Hamburg and from the Dutch border to the new federal states – came together on the occasion of the new Spheros service concept.

With the certification of ten service partners throughout Germany, last year Spheros expanded its bus and system competence. The service partners offer detailed know-how in the field of air conditioning and heating technology, and are supplied directly with original Spheros spare parts.

The purpose of the event was to agree on the design of tailor-made service and maintenance packages for the customer. Background: starting in the climate season 2015 the public transport customers will be supported by optimal synchronised parts and parts



Spheros welcomed ten new service partners to the Neubrandenburg production plant, aimed at jointly preparing a close cooperation with customers.

packages. In addition, maintenance and service contracts for the customer are to be offered in close cooperation between the service partners and Spheros. The aim is to reduce the idle and waiting times of buses for the customer and increase vehicle availability. To enable the service partners to react as quickly as possible to changing market situations, Spheros has initiated a new logistics link for the supply of spare parts and new products. Further, there will be regular training sessions for the service staff.

ElekBU 2015

In the spring the Forum for Transport and Logistics organised a trade conference on the topic of electromobility in Berlin. Within the framework of the conference, bus manufacturers, suppliers and consultancies had for the first time the opportunity to present their products and services

Spheros was represented with its own stand and showcased innovative solutions for the climate management of e-buses, for which the company already received the E-Bus Award from organiser Dr Müller Hellmann. With more than 280 participants, the ElekBU

is one of the biggest and most important expert panels worldwide in matters of electrobus mobility. The symposium was opened by Rainer Bomba, State Secretary of the Federal Ministry of Transport and Digital Infrastructure. In a number of lectures,

battery bus projects were outlined, concepts and technologies explained and development stages discussed. At the end of the conference the experts were invited to take a test drive in one of the six battery-driven buses provided.

The event was an all-round, path-breaking success, in which Spheros will be participating again next year.



In advance of the ElekBU the E-Bus Award was presented to Spheros for its pioneering concepts for climate management in electrobuses.



Ralf Häring, Sales Manager of Spheros Europe GmbH, talking to Rainer Bomba from the Federal Ministry of Transport and Digital Infrastructure, and Dr Müller-Hellmann, Forum for Transport and Logistics (from left).



Synergies in the new building: Spheros Europe is again domiciled at the same address as Research & Development and administration of the international Spheros Group.

Spheros Head Office again under one roof

Spheros GmbH has grown rapidly in the past few years and at the beginning of April the company moved into a new, larger building. This move has brought together

the central Development and Administration of Spheros Europe GmbH and Testing/Prototype Construction once again under one roof. The new building

is located at Friedrichshafener Str. 7 in Gilching and provides sufficient room for future growth. The new corporate address is:

**Spheros Europa GmbH,
Friedrichshafener Straße 7,
82205 Gilching.**
The familiar telephone and fax numbers remain the same.

Carsten Schmidt appointed Head of After-Sales

With effect from 1 September 2014, Spheros Europe GmbH appointed Carsten Schmidt to the position of Head of After-Sales. Mr Schmidt has been a company employee since 2012. During this time he was responsible in sales as key account manager for the customers Evobus and Alstom. In his new capacity he is in charge of the Europe-wide expansion of the dealer organisation structure with a focus on service and spare parts management.

Prior to joining Spheros, Mr Schmidt acquired expertise in various capacities, most recently at Webasto Thermo & Comfort SE in key account management and international business development management (heavy duty).

He thus offers the finest credentials for the new task and is well acquainted with the OEM and after sales business. Mr Schmidt is already familiar with the new assignment and has already had the opportunity to get to know some of you personally.



Spheros at busworld Kortrijk 2015

Spheros will be presenting its newest air conditioning systems and future concepts at busworld Kortrijk from 16–21 October 2015. The main emphasis of the trade fair appearance will be the new HVAC system solutions related to the theme “How can best use be made of the existing energy resources in the bus in order to significantly extend the range of hybrid/electrobuses?”



At busworld Kortrijk Spheros will again be located in Rambla Nord, Stand R25, and presenting numerous solutions for bus air conditioning.



In Kortrijk in 2013 Spheros highlighted the key role played by intelligent and energy-efficient system interconnection (air conditioning unit, heat pumps, heaters, etc.) in electrobuses. A holistic and intelligent energy management is the prerequisite for optimal use of the existing

energy resources in the electrobus. In recognition of this the topic was presented two years ago in the form of a concept study. In 2015 Spheros is going a step further to show how this can be implemented in the bus. A video demonstrates how an innovative control always

selects the most efficient Spheros component for the given ambient conditions (primarily temperature), battery charging state and geographical position. Spheros will be present – as at the last busworld Kortrijk – with its own stand in **Rambla Nord, Stand R25.**

Acquisition on the US market



Spheros has taken a major step in further strengthening its local presence in North America. With the successful conclusion of the acquisition at the end of January, ACC Climate Control with headquarters in Elkhart, Indiana, became a member of the international Spheros Group. Full business operations will be continued with its existing production plants and a workforce of 140.

Well-established US company ACC Climate Control in Elkhart, Indiana, became a member of the Spheros Group in January.

NEWSLETTER



First Spheros newsletter

Since March 2015 Spheros has been providing information on current product, service, corporate and industry themes in a bilingual email newsletter. This supplement to the Spheros Technik Service News customer magazine enables current events from the Spheros world and bus industry to be communicated even more flexibly. Anyone who wishes to receive the newsletter can simply register with their name and email address at the Spheros website www.spheros.de.

World's longest bus carries the Citysphere

The AutoTram® Extra Grand – one of the world's longest and most innovative buses – has made it into the Guinness Book of Records 2015. And with it the Citysphere! The 30 metre-long bus with Spheros air conditioning can transport over 250 passengers. The AutoTram® Extra Grand was developed by engineers at the Fraunhofer Institute as a pioneering public transport system and built by bus manufacturer Göppel Bus. A special focus was placed on eco-friendliness, life-cycle costs and travel comfort. The electrically powered Citysphere modular A/C unit with its hermetically sealed coolant circuit and significantly reduced maintenance costs fits nicely into the concept. In addition, the increase in fuel consumption



incur by the unit is hardly noticeable compared to buses without air conditioning. For further information visit www.autotram.info

REVO-E diagnostic kit and software Spheros Control Test (SCT)

In the course of electrification of city buses the complexity of the Spheros REVO-E electrical air conditioning unit with integra-

tion into the bus architecture has increased considerably. Work on and with such complex systems is thus a major challenge

for all involved. To make the job easier, particularly for the workshops, Spheros has created the REVO-E diagnostic kit. In addition to the interface, the SC600 diagnosis, it comprises a reading device and diagnostic cable for the frequency converter together with SCT software and respective documentation.

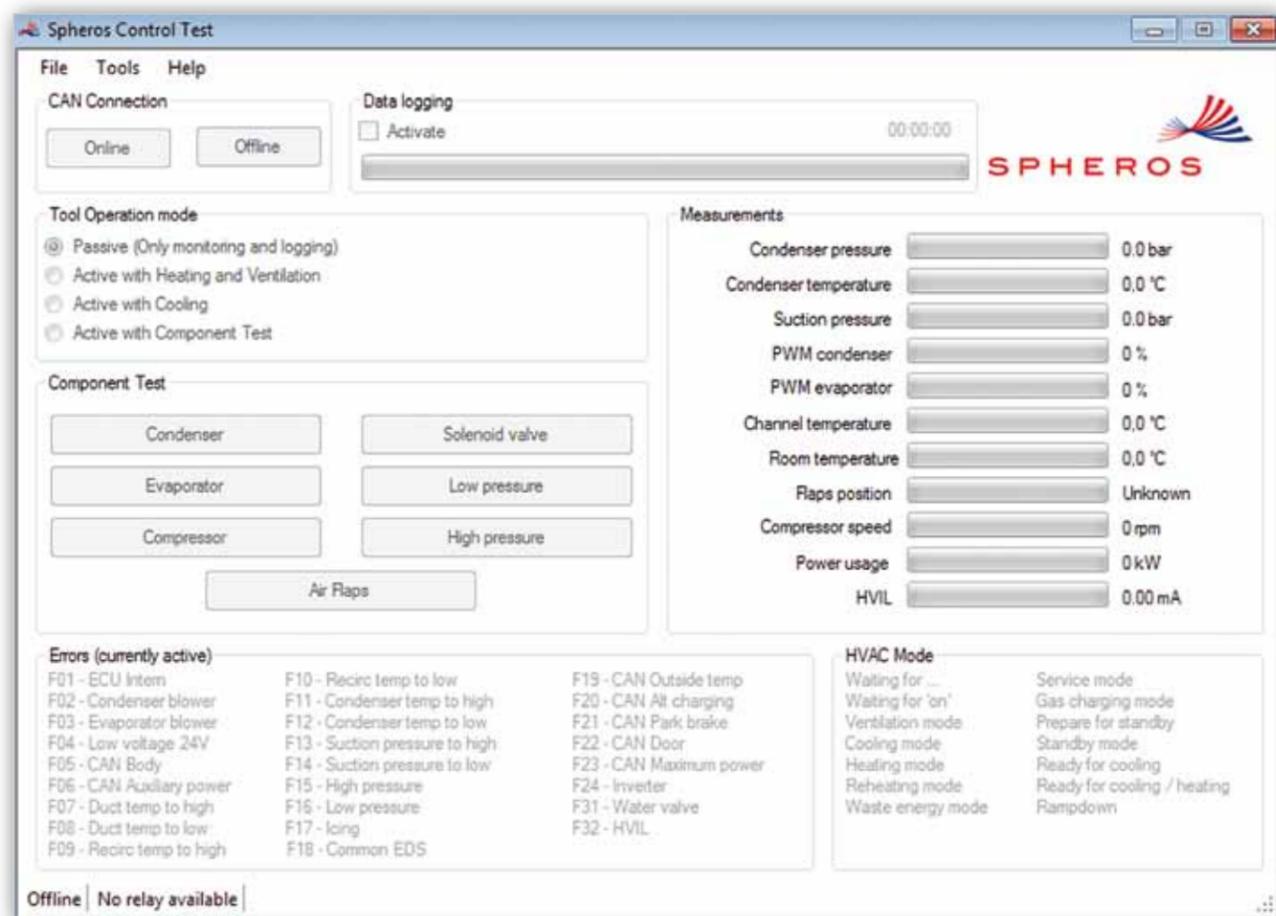
The interface located between the vehicle and diagnostic SC600. The SCT diagnosis software displays all relevant REVO-E sensor values and active error memory entries

live on the screen. The sensor values can be recorded and evaluated later graphically for diagnostic purposes. This diagnostic software also actively monitors and tests the components of the air conditioning unit (compressor / fan / air flaps / solenoid valve / high- and low-pressure control device).

Currently both the diagnostic kit and diagnostic software are configured for the Volvo EU6 hybrid buses with REVO-E.



Everything in one case: the diagnostic kit with interface, SC600 diagnosis, reading device and diagnostic cable for the frequency converter together with SCT software.



In its clearly structured interface the Spheros Control Test (SCT) diagnostic software displays all relevant sensors of the REVO-E.

Spheros wins Bahrain contract A REVO for the kingdom

Major success for the Spheros Spanish subsidiary: it has received an order worth about € 1 million from CaetanoBus/Portugal to install air conditioning in 127 buses destined for the Emirate of Bahrain.

The public transport system of the kingdom of Bahrain is still in its infancy. That is not surprising, if we consider that on average each household owns more than two cars, petrol is about the same price as water and willingness to take the bus is extremely limited. The road system in Bahrain, however, is now reaching the limits of its capacity and regular traffic jams occur during rush hours. For this reason the Ministry of Transport has set itself the task of developing the public transport network. 127 new buses, built in a joint venture between MAN and CaetanoBus, are to be used to relieve congestion in city traffic and provide airport transfers. In order to ensure the high quality standards, special attention was given to innovative lightweight construction, safety and comfort.



Public transport in Bahrain is to be made more attractive with 127 buses manufactured by CaetanoBus with Spheros air conditioning.

Powerful air conditioning

High demands are placed on a bus air conditioning system in hot countries such as Bahrain: at outside temperatures of up to 50°C a maximum cooling capacity must be reached within the shortest possible time to achieve an inside temperature of approx. 24°C. A failure of the air conditioning system would be equivalent to a breakdown of the bus itself –

reason enough for the manufacturer Caetano to select Spheros as a proven partner and install the modular REVO rooftop system as a reliable air conditioning solution in the Bahrain buses. A total of 88 buses of 10.5 metres in length on MAN A66 chassis are being equipped with the REVO 400 and 39 buses of 12.7 metres in length on MAN RC2 chassis with the tropical version REVO 450 with

a maximum cooling capacity of 45 kW. Thanks to the optimum composition of advanced components the A/C system achieves the highest level of performance and longevity at significantly reduced life-cycle costs.

24-hour service

A workshop team from Spheros Middle East provides support to transport operator National Ex-

press in Bahrain in all matters of maintenance, repairs and service of A/C systems. With headquarters in Dubai, the Spheros subsidiary maintains an efficient network of service branches: four workshops in the Emirates, four in Saudi Arabia and agencies in Yemen, Egypt, Jordan, Kuwait, Qatar and Oman support bus customers throughout the Middle East.



REVO as a reliable air conditioning solution for the Bahrain buses.



Successful procurement: the teams from CaetanoBus and Spheros.

Spheros products on Temsa buses

It is extremely difficult for foreign bus manufacturers from outside the EU region, such as Temsa, to make headway on the European bus market. It is therefore essential that they equip their buses with European components.



Buses for Europe: the TEMSA LD coach, which like the...



...TEMSA Intercity...

Spheros has seized the opportunity and meanwhile supplies its components to more and more foreign bus manufacturers with ambitions on the European market.

heaters, front boxes and further accessories. An overview of the Temsa buses most relevant for the European market follows here:

All HVAC products installed on Temsa buses are supplied by Turkish subsidiary Spheros Termo Sistemleri AS with headquarters in Istanbul. Spheros Turkey plays an important role in the network of Spheros plants. On premises totalling 5,500 square metres the company develops, tests and manufactures air conditioning units for the domestic and international markets. The production range also includes sidewall

TEMSA LD Coach and Intercity
The LD Coach and Intercity buses are 12-13 metres long and equipped with DAF diesel engines. Spheros delivers the REVO 360S air conditioner, Thermo E 320 heater, Aquavent 5000 (U4814) water pump and the SC1000 control unit. The two bus types are successors to the Safari bus and have made a name for themselves particularly in France, Italy, Benelux and

Germany. The sales volume compared to the SafariBus is currently lower. However, this is primarily attributable to the shrinking EU market.

Avenue Citybus:
The Temsa Avenue is a low-floor city bus, available in a 12 or 18-metre version with MAN engine or as a 12-metre CNG gas-powered bus. Spheros originally delivered the Aerosphere Tropical 350 air conditioning unit that has now been replaced by the REVO 360S. The Temsa Avenue with REVO has hitherto not been exported to EU countries. Both are equipped with the SC 1000 control unit. In future

the brand new REVO Global 400 unit is to be installed on Temsa Avenue buses with Euro 6 engines. In addition to the air conditioning system, Spheros supplies the Thermo E 320 heater and Aquavent 5000 (U4814) water pump for the Avenue Citybus.

MD9 Coach
The MD9 is a 9.5 metre coach fitted with a MAN engine. Spheros supplies the Aerosphere World Midi air conditioning unit and SC1000 control unit. In addition, the Thermo E 200 heater with an Aquavent 5000 (U4814) water pump is installed.



... TEMSA Avenue city bus...



... and TEMSA MD9 coach are equipped with Spheros HVAC products.



The axial fan of the REVO 400 rooftop unit.



The fans are quieter and more efficient, with a longer service life.

REVO axial fan: even more powerful than previous model

The axial fans of the REVO rooftop air conditioning unit are quieter, more efficient and have a longer lifetime than those of the previous model Aerosphere World.

With speed control and advanced EC motor technology, the axial fans optimise efficiency and reduce power consumption. The brushless, 100% tight EC fan provides a service life of >30,000 hours. Due to this, life-cycle costs have been cut significantly.

Furthermore, a substantial reduction in noise emissions has been achieved. The table shows the differences between the REVO and its predecessor Aerosphere World.

	Evaporator fan (In %)	Condenser fan (In %)	Aerosphere World	Revo
			dBA (condenser fan)	dBA (condenser fan)
Full load	100	100	83.2	74.9
Partial load*	60	50 (Eco)	67.2	64.5

Full load: - 8.3 dBA

Partial load** : - 2.7 dBA

Partial load*: evaporator fan with 60% PWM control and condenser fan in eco mode (50%-PWM) ; (Function up to approx. 35°C)

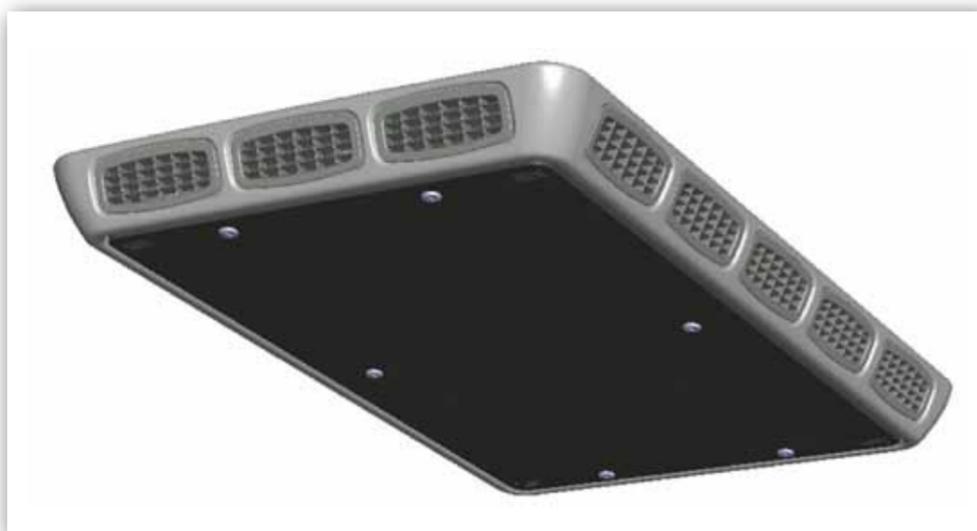
Facelift for the Citysphere city bus air conditioner

Although substantial design modifications were undertaken in the development of the new air manifold for the Citysphere city bus air conditioner, the proven basic concept and interface to the vehicle remain unchanged.

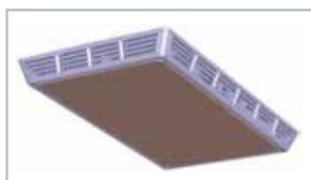
The discharge grilles made of plastic have been redesigned and the sheet metal intake grille now has a finer perforation. The air intake grille is mounted with 1/4 twist locks, greatly simplifying mounting and dismantling, as well as facilitating service and maintenance. In addition it was colour-matched: the new air manifold has a modern design in a lighter shade of grey.

Air output and velocity remain unchanged compared to the previous model.

The new air manifold will be available in series production starting the third quarter of 2015.



More modern look, finely perforated and easier to install – the new Citysphere air manifold.



Present air manifold for comparison.

	Present model	New model
Dimensions	985 x 623 mm	992 x 625 mm
Intake grille perforation	Diameter 5 mm Hole spacing 8 mm	Diameter 3.5 mm Hole spacing 5 mm



The new pump generation: SPump

The new Spheros SPump generation is even shorter, lighter and quieter. This is the first pump that is intended not only for bus heating, but also for completely new areas of application, e.g. cooling hybrid components.

In the development of innovative heating technology for the bus, Spheros already decided many years ago to manufacture the required pump itself. It is the heart of the heating circuit and responsible for both coolant circulation in pre-heating mode and coolant flow while the vehicle is in motion.

With the new SPump Spheros has introduced a pump that is not only for use in the bus heating system. Decisive factors are the reduced dimensions of 205 mm, lower weight of 2.3 kg and watertight, magnet-coupled EC motor (IP 68 tested). The integrated control unit of the EC motor is used for additional functions such as an anti-lock system, extended run-dry protection and self-protection against overheating. In addition, the new series is suitable for outside temperatures of up to 95 °C. The Spheros developers succeeded in further optimising the flow rates and characteristics with counter-pressure as well as efficiency. At over 30,000 hours, the service life of the SPump is 50% longer than that of the Aquavent 6000 SC. Moreover, the pump scores points



Not only for heating: thanks to innovative additional functions the Spheros SPump is also suitable for the engine environment and cooling.

with its reduced noise emissions. The additional functions mean that the SPump is suitable for new installation points and areas of application: as a booster pump for engines

(< 100 kW), for cooling hybrid components (e.g. battery cooling) or charge-air cooling.

The use of a profiled hose connector and kink protection on the wiring harness ensures the

functional reliability of the pump. Contamination is prevented by the external cooling of engine and electronics.

The new pump is available in series production from now on.



	SPump
Flow rate	6,800 l/h (against 0.4 bar)
Voltage	24 V
Operating voltage range	16...32
Operating temperature range	-40 to 95°C
Motor protection class	IP 68
Weight	2.3 kg
Dimensions L/W/H	205/140/160 mm
Service life	30,000 h
Noise emission	60 dBA
Nominal power consumption	210 W

Optimum service thanks to the Servicemobiles

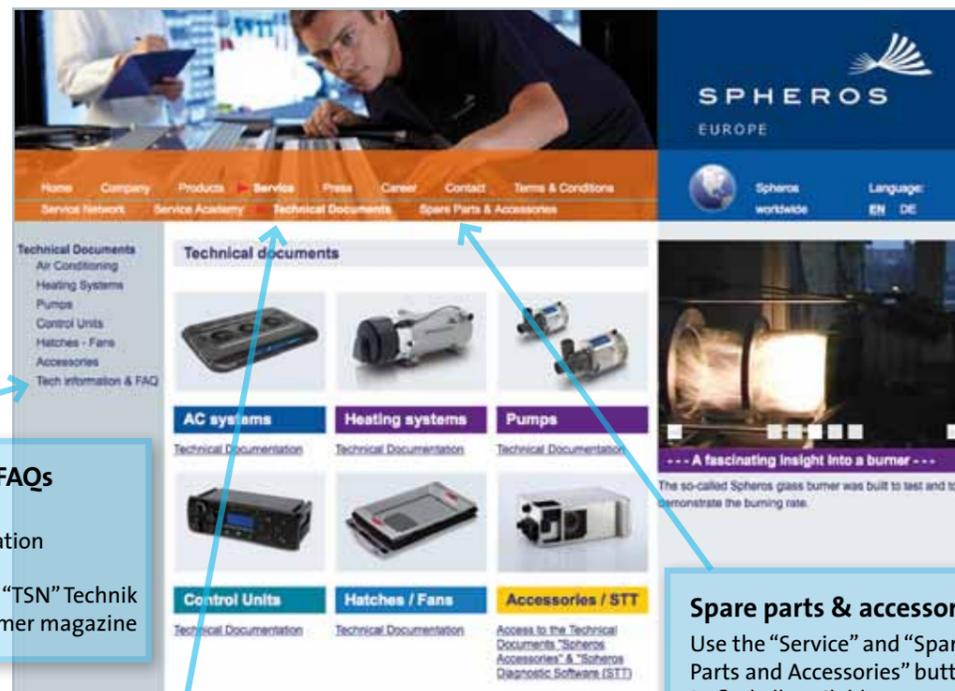


A fully-equipped Servicemobile.

With the aim of offering customers optimum area-wide service, Spheros has added a further component to its existing service network. Since the end of last year Spheros has had two experienced service technicians including fully-equipped Servicemobiles that can be deployed quickly and flexibly. Up until now customer enquiries concerning technical problems, maintenance or repairs have been handled by the Spheros hotline, service points or service partners. In very complex procedures our regional managers have also offered support and advice. With the Servicemobiles, the mobile task force can now also solve problems. Furthermore, the activities of the service technicians include not only the repair and maintenance of Spheros air conditioning units and heaters: they encompass the complete retrofit of entire air conditioning and heating systems. The customer benefits here from the excellent training and wealth of experience of the service technicians, as reflected in efficient and professional service.

Service innovations on the Spheros website

Several changes have been made in the Service section at spheros.de and spheros.eu. From now on there will be a separate section for the product groups Control Units and Pumps. Moreover, technical documents and spare parts lists can be located even faster. The overview shows the main changes at a glance:



Technical info – FAQs

Here you will find:
 a) Technical information
 b) FAQ lists
 c) Past issues of the "TSN" Technik Service News customer magazine

Technical documentation

Use the "Service" and "Technical Documents" buttons to find available service literature (installation and operating manual, workshop manuals, etc.) on Spheros products, subdivided into the sections Air conditioning units, Heaters, Pumps, Control Units, Hatches and Accessories.

Spare parts & accessories

Use the "Service" and "Spare Parts and Accessories" buttons to find all available spare parts lists and catalogues, as well as a list of domestic and international Spheros service partners.

Exhaust systems for heaters

Again and again we receive reports on charred burners or damaged components in the heater and are asked about the reasons. The answer is often quite simple: the exhaust system must be checked as prescribed for good condition and proper functioning.

Frequently, deformed exhaust outlets and exhaust pipes or fittings coated with foreign bodies or dirt are discovered. This problem results in a reduced cross-section of the exhaust system, with the consequence that the exhaust gases can no longer escape unhindered. The ultimate outcome is a stoppage and overheating of the heater.

Incidentally, deformed exhaust outlets are often visible to road users following the vehicle.

This chain invariably ends in destruction of the heater components. In the worst case the heater may be completely destroyed. The problem is quite likely to spread to other components in the vehicle.

Excerpt from the heater installation manual:

- Exhaust temperatures may not exceed max. 400°C.
- The exhaust pipe must be installed at a slant, to enable condensate to flow off.
- Due to the high temperatures occurring, adequate clearance must be allowed to heat-sensitive or combustible materials.

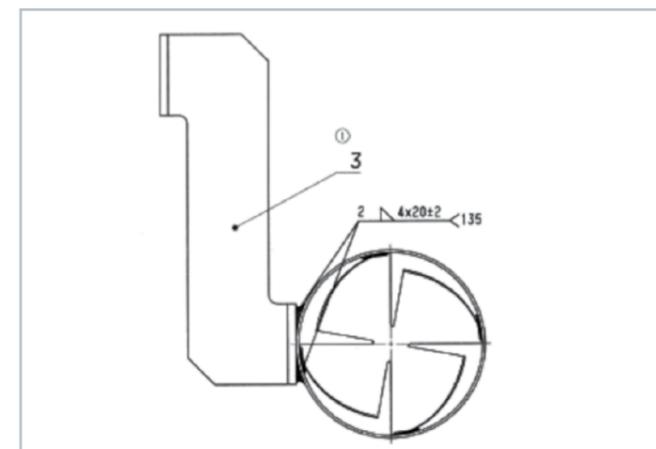


The exhaust outlet must be correctly installed in the bus.

- Escaping waste gas may not be sucked in again as combustion air.
- The mouth of the exhaust pipe must face against the direction of travel and should not be blocked by dirt or snow.

Excerpt from the heater workshop manual:

"Visual inspection of the exhaust outlet and exhaust pipe -> Check the exhaust outlet and any existing exhaust pipe for good condition, firm seating,



The exhaust pipe must be installed at a slant, with the mouth facing against the direction of travel.



Not like this: deformed exhaust outlet in a new vehicle.



The exhaust gas should be able to escape without hindrance through the outlet.

Today's theme: Aluminium pipe manufacture

Air conditioning

Heating systems

Hatches / Fans

Control units

Service

Genuine parts



Spheros Best Bus Pipes

As a developer and manufacturer of bus air conditioning systems, Spheros focuses consistently on aluminium, a material that distinguishes itself by enormous lightweight and corrosion resistance. For this very reason, for a number of years the company has maintained its own high-quality machinery for aluminium pipe production at its Neubrandenburg plant.

Cutting and deburring

Aluminium is an extremely light material that calls for a high degree of care and dexterity in machining. It is crucial to apply the correct technique, right from the first cut. Automatic sawing and deburring with a geometrically defined cutting edge ensures clean edges.

Bending and forming

Pipes with a diameter of between 6 and 60 mm and a maximum feed length of 3 m can be variably bent or formed on a CNC controlled mandrel bender – individually and true to size. Advanced 3-D measuring arms guarantee dimensional accuracy and ensure the bending process. Reverse engineering is thus possible.

Washing and drying

The inner cleanliness of the pipes is critically important, in particular in air conditioning technology. An automatic washing system ensures that the guidelines pursuant to DIN 8964 are observed.

Soldering

The individual pipes and screw fittings are joined by soldering (corrosive & non-corrosive). Accurate shape, position and dimensions can thus be achieved in fixtures made of stainless steel and aluminium.

Final assembly and inspection

In the final assembly the pipes can be fitted according to requirements with valves or

pressure sensors. 100% leak-proof: with a helium leak detector even the smallest leakage rates can be detected in the final inspection.

Clever: The “constructive design”

Constructive design in pipe runs and connections opens up sophisticated applications for virtually any use. The pipe assemblies are primarily used for water and air conditioning lines in the bus for rooftop, underfloor and internal units. As a reliable partner it is fully capable of manufacturing the complete pipe system.

