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Bus-News

M A G A Z I N E

Inside:

ISSUE ONE 2023

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Letter from the Editor

Dear Readers,

Welcome to our first issue of the Bus-News e-magazine of 2023.

To kick off the new year, we take a look at what's in store at Busworld North America, which will take place in Detroit (USA) this February. In addition to the exhibition, there will be a conference with talks and panel discussions covering a wide range of issues facing the bus and coach industry today, from the transition to electric vehicles and the associated charging infrastructure to increasing digitalisation, ticketing and insurance questions.

In her editorial, our features writer Tiana May examines the recent UK government's decision to cap single fares for local bus journeys at 2 GBP in order to encourage more people to use the bus instead of their private vehicle.

Stratio, too, presents the case for the role of public transport in addressing climate change and points out that one of the main avenues would be to reduce the number of cars on our roads by incentivising the use of public transport services. The article on p.45 examines some additional reasons to cost as to why someone might choose to use public transport or avoid it.

Modal shift is in my view the central and most effective way of addressing transport emissions. However, decarbonising operations by moving away from internal combustion engine vehicles is another and this transition also has the very important benefit of reducing local air and noise pollution. Electric vehicles need the right infrastructure to support them, of course. On p.20 Hitachi ZeroCarbon looks at recent strides taken by First Bus at its Caledonia bus depot in Glasgow.

Another major trend is autonomous transportation. Padam Mobility (p.8) explores the use case for autonomous transportation, asking what autonomous vehicles are really for. Is the technology best suited for private vehicles or for operating shuttle services where passenger numbers are expected to be limited?

Our next Bus-News magazine will be published on 25 September 2023.

If you want to be featured on the Bus-News website or in our e-magazine, please email Andrew Lush or call +44 7432 725001.

Please enjoy our first issue of 2023!

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COVER: Bluestar bus in Southampton

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The Intelligent and Connected Bus; connect passengers, bus operators, maintainers and onboard staff with robust, high bandwidth solutions.

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Issue One 2023

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Features

busworld®

NORTH AMERICA DETROIT
4-7 FEB 2023

powered by AMERICAN BUS ASSOCIATION

Where:
Detroit, United States of America

When:
4–6 February 2023 (Exhibition)
5–7 February 2023 (Conference)

Busworld North America is one of several Busworld events that take place very year around the globe. It markets itself as being for buses, including school buses, and motorcoaches only, excluding means of transport such as vans and trucks in order to give the industry "its own spotlight".

The conference, which starts a day after the exhibition and also concludes one day later to give exhibitors the opportunity to attend some of the talks, reflects this approach.

Busworld Conference

The three-day conference kicks off with the talk Trends and Evolutions in the Insurance of Motor Coaches and School Buses. The fourth talk of the day looks at connected vehicles, covering topics such as predictive maintenance, improving fleet management and operations to boost ridership numbers. New elements that have arisen for the bus sector are predictive charging and smart fleet deployments resulting from the ongoing transition to electric vehicles. Entitled Connectivity and IoT for Improved Operations and Ridership, the keynote for this panel discussion will be given by Independent Mobility Consultant Steve Chaffee, while the speakers will be Dr Ali Peker, CEO of Adastec, Steven Meersman, the Co-founder and Director of Zenobē and Vince Francis, Vice President Delivery Acceleration at Endava.

The range of topics covered by this conference is broad, from how to work with utility providers, ticketing and frictionless payments, the transition to zero direct emission fleets in North America and internationally, scaling and charging strategies for hydrogen and zero direct emission options for long-range use cases.

All images: © Busworld

For example, will batteries become so good in the future that they can accommodate a range of more than 250 miles or will these routes be better served by hydrogen fuel cell technology? How can opportunity charging contribute to running BEVs on long-distance routes? How are bus operators altering the designs of their bus depots to serve electric buses and how can they scale charging infrastructure while managing costs? Does it make sense to outsource charging and / or hydrogen fuelling equipment? What are the safety risks when charging electric buses or fuelling hydrogen vehicles? How will prices for electric vehicles develop in the future? For answers and interesting insights to all these questions, the Busworld Conference is a must.

Location: Room 310A

Busworld Exhibition

At the time of writing 70 exhibitors were signed up to have stands at Busworld North America this year. Among the biggest are vehicle manufacturers such as Prevost, Mercedes-Benz, TEMSA, Marcopolo and BYD. Others include industry associations such as the American Bus Association and the United Motorcoach Association and suppliers such as Swedish company Dafo Vehicle Fire Protection, which manufactures fire suppression systems for buses, and Dutch company Heliox, which sells electric bus charging solutions.

Attendees and exhibitors will be able to meet with others in the transit bus, motorcoach and school bus sector, do business with potential customers and learn about the trends and developments in the industry.

Automated Driving Vs. Autonomous Transport?

"OL Vallée à la Demande" on-demand autonomous shuttle service in Lyon, operated by Keolis

"52% of UK drivers wrongly believe they can buy a fully autonomous car today."

A **recent report from Thatcham Research** highlights that people believe that automation is more advanced than it is. However, this confusion masks a more fundamental issue around autonomous vehicles: **'what are they really for?'**

In 2019, Professor Glenn Lyons of the University of the West of England ran a series of workshops – **The Driverless Cars Emulsion**. People keen to realise the benefits of driverless cars were brought together with those who foresaw increased traffic and environmental impact if autonomous personal cars proliferate.

The events discussed **why autonomous vehicles are really being developed:** is it so that people can purchase their own automated car or is autonomy, in fact, much more useful when it is incorporated in shared vehicles?

One of the emergent elements was the recognition that:

"Thinking about how driverless cars might impact us gives a new opportunity to explore existing strengths and weakness of mobility and consider how these can be positively addressed."

Whilst much of the media around autonomous driving still assumes that driverless cars will be personal vehicles, in fact, most trials of autonomous vehicles are shared. Whether in Europe, where **autonomous buses** are being tested or in the US where **autonomous cars are being trialled as taxis**.

The use cases being tested across Europe focus on the most expensive part of the public transport network, the last mile. Where high passenger numbers and economies of scale are unlikely, the opportunities to bring down the costs per passenger are limited. Reducing the driver cost is one possible option – which is where autonomy comes in.

In Lyon, autonomous shuttles were set up to transport people from tram stops to a stadium development under construction. The development was expected to attract only a limited flow of passengers throughout the day whilst it was unfinished, hence the use of small vehicles to take people from the station to 'virtual stops' within the stadium. The shuttles were run as on-demand vehicles, booked and managed through the Padam Mobility DRT platform integrated with the autonomous driving software.

The Île-de-France area surrounding Paris is different from the highly connected central zone. The population is less dense, with people often living and/or working some distance from the rapid transit network. An autonomous shuttle was tested to connect an end-of-line station – Saint-Rémy-lès-Chevreuse – with a campus 2km away. Autonomous electric vehicles carried up to four people along an open road. The vehicle software had to obey road rules and take account of conditions and other road users. The vehicles were booked by app and managed by the Padam Mobility on-demand platform.

The trials focused on incorporating autonomous vehicles into passenger transport, and as such, the vehicles had to be able to interact with passengers. Padam Mobility platforms managed the passengers' interactions with the vehicle from booking a ride through to safely leaving the passenger at their destination. It helped passengers understand their trip – from showing passengers their vehicle travelling towards them, tracking its progress in real-time to providing and helping them validate their ticket.

Booking information from the Padam Mobility platform ensured that the vehicle arrived on time for each booking and opened the door for the passenger(s). The platform also confirmed when each person had boarded so that the vehicle could proceed. At the end of the journey, it determined where the person left the vehicle at the end of the booked trip.

In addition, the software optimises the vehicle route to serve all the trips requested, managing the pattern of picking up and setting down other travellers en route and optimising the use of the fleet.

These proof-of-concept trials were successful and the second iteration of trials is now underway in three new locations through the EU's ULTIMO programme.

Although small shuttle trials have been relatively rare in the UK, there is one notable project: a full-sized autonomous bus was tested in 2022. The service, operating over the Forth Road Bridge, will start carrying passengers in January 2023. Fitted with a ground-breaking sensor and control technology, these buses can run on pre-selected roads without the safety driver having to intervene or take control. The buses can carry up to 36 passengers over the 14 miles across the bridge, with a capacity for over 10,000 passengers a week.

The investment required to get autonomous vehicles in use is huge – the ULTIMO project alone has budgeted for €40 million (combing EU and Swiss resources) across three test sites for four years.

Perhaps the answer to the tension over the uses of autonomy lies in this. To justify the enormous investment these vehicles require, future returns on this investment can only be achieved through highly utilised vehicles rather than personal cars.

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PADAM MOBILITY

A Fare Price

By Tiana May

Encouraging more people to travel by bus is regarded as a key component of addressing the climate crisis, improving air quality and reducing urban congestion. As a result, the UK has recently capped local single bus fares at 2 GBP with the aim of increasing ridership and taking up to 2 million cars off the road.

Although this scheme is currently only active for three months, between January and March 2023, it still has the potential to help shift long-term transport habits if operators can use the trial period to demonstrate that bus services are a convenient and reliable alternative to using private cars.

Such benefits have already been recorded in several cities across the US who have or are in the process of removing bus fares. For example, in Boston, Massachusetts, MBTA routes 23, 28 and 29 are currently free for all riders for a two-year period. This programme follows an initial 6-month pilot on route 28, which saw a ridership growth of 20 percent, including an increase in trips that would have otherwise been made by car.

Despite this success, if services do not run on time or take significantly longer than alternate modes of transport, making tickets cheaper is often not sufficient for convincing people to use the bus. In a recent survey conducted for Go Ahead Group, just 56 percent of respondents stated that cheaper tickets would encourage them to travel by bus more often. Meanwhile, respondents also said that they would be motivated by increased frequency (41%), cleaner buses (34%), faster journeys (34%) zero-emission buses (30%), clearer bus information (23%) and improved security (20%).

To deliver on these factors, a more significant transformation of the country's bus services is arguably

Bus in East Yorkshire © Go-Ahead

required. For example, with its upcoming Bee Network, Greater Manchester is the first region in the UK to exercise the powers from the Bus Services Act 2017, which allows local authorities to franchise local bus operations.

Currently, the majority of services in all areas outside of London are provided on a commercial basis by private companies. These operators decide which routes, frequencies, timetables, fares and standards they provide. In comparison, franchising is a more effective way of delivering services, as the bus network is planned and overseen by the local transport authority, allowing it to specify routes, service levels and fares. Customer-focused targets, including punctuality and reliability of services can then determine the operators' contracts and impact what they get paid. This model is common in Europe but was previously only permitted in London in the UK.

However, as the transition to operating franchised services takes time, offering cheaper fares could be a manageable place to start to help increase ridership

Services on routes 23, 28 and 29 are free for two years from March 2022 © MBTA

In 2022, Flix grew its ridership by 130% across the globe © FlixBus

Konectbus Norwich © Go-Ahead

more imminently. Indeed, many people are indubitably motivated by cost over convenience, as long-distance coach services would otherwise not be in demand to run on the same routes as speedier rail services.

In fact, long-distance bus operator, FlixBus significantly expanded its services in 2022, increasing UK passenger numbers by 94 percent and exceeding pre-pandemic ridership figures globally. This ongoing success is arguably due to the company offering affordable national and international travel during a time when customers are facing rising costs of living and inflation.

Furthermore, the operator said that by ensuring its services were more reliable than alternate modes of transport, it could further highlight the benefit of travelling by coach.

Andreas Schorling, FlixBus UK Managing Director said: *"Holidays should be about exploring new places, taking a break from the norm, and above all, having fun! With rail, petrol prices and airports in chaos, going by coach is the obvious choice for reliable, enjoyable journeys."*

In contrast to FlixBus's growing passenger numbers, local bus services in the UK are yet to return to pre-pandemic ridership levels. Earlier this month, the Department for Transport (DfT) reported that local bus ridership outside of London on Monday 9 January 2023 saw 84% of the volume of passengers observed on the equivalent day in January 2020.

According to DfT data, these lower passenger numbers are present across all modes of public transport, while motor traffic has experienced a comparably speedier recovery to pre-Covid levels. It now remains to be seen whether the current fare cap on local single bus tickets will help improve bus ridership figures and mirror the success of long-distance operators who attract customers with their low fares.

Bluestar bus in Southampton © Go-Ahead

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Maintenance & Servicing

Stertil-Koni

Wheel-Free Maintenance and Optimal Access

Keeping Your Bus Fleet in Condition and Getting Your Passengers from A to B

Many of the hydraulic in-ground heavy-duty vehicle lifts from Stertil-Koni are completely flush mounted with the workshop floor. Ideal for buses, or any other low-clearance vehicle for that matter. The Continuous Recess® System is especially designed for easy drive on and off and it provides easy access for maintenance tasks.

About 75 to 80 percent of all maintenance performed on buses includes work on steering, tyres and brakes. This is why an axle-engaging vehicle lift that enables wheel-free lifting is so important. Stertil-Koni hydraulic in-ground piston and scissor vehicle lifts, the DIAMONDLIFT and the ECOLIFT, keep bus fleets in top operating condition – and ensure the highest level of safety and ergonomics for workshop personnel.

The Stertil-Koni DIAMONDLIFT is a telescopic piston lift, and the Stertil-Koni ECOLIFT is a scissor lift.

Stertil-Koni in-ground lifts are designed to accommodate vehicles with extremely low ground clearances, such as city transit and articulated buses

Both models come in two, three and four-piston or scissor configurations. Access to the lifts is optimal as the systems are fully flush with the workshop floor.

Piston Lift

The DIAMONDLIFT is a high-pressure, low-volume heavy-duty in-ground vehicle lift that has a lifting capacity of up to 16,000kg per piston, meaning 64,000kg in a 4-piston configuration. This piston lift comes in two models – a cassette and frame version.

In many cases, installing the frame version of the DIAMONDLIFT into an existing concrete pit, or new construction, offers many substantial time and cost benefits. Additionally, installation is often easier because it requires a pit that is less deep than conventional in-ground lifts on the market. The lift's modular frame design also means that it can readily accommodate a variety of different pit sizes and take a wide span of travel ranges. It has the versatility of being suitable for a wide range of vehicle sizes and wheelbases. The maximum lifting height of this piston lift is 1,855mm.

Scissor Lift

The ECOLIFT is recognised as the industry's first ultra-shallow, full-rise axle-engaging in-ground scissor lift. The maximum lifting height is 1,780mm and it features a lifting capacity of 13,500kg per scissor, delivering a total lifting capacity of 54,000kg in the largest model. The ultra-shallow pit design, only 0.87 metres in depth, makes it ideal for new construction as well as retrofit and existing workshops – especially those with challenging construction environments, such as a high water table, unstable soil or thick bedrock foundations.

Additionally, the ECOLIFT is the only re-locatable in-ground lifting system in the world.

Ultimate Safety and Ergonomics

Both the DIAMONDLIFT and the ECOLIFT wheel-free lifting capabilities facilitate a complete range of servicing and maintenance jobs in a safe, ergonomic approach – including tyre work, brakes and transmission repairs. Mechanics can perform these tasks in a comfortable, upright position under the vehicles.

The DIAMONDLIFT and ECOLIFT, as with all Stertil-Koni heavy-duty vehicle lifts, come with a mechanical locking system, maximum overload protection and electronic synchronisation as standard. The locking system acts as a parking system with no risk of unexpected lowering, and the electronic synchronisation utilises real-time feedback, ensuring safe and smooth operation. Safety first and foremost. Both control systems for the Stertil-Koni in-ground options have a built-in maximum height restriction, enabling controlled and safe lifting and thus preventing damage to either the vehicle or the workspace ceiling.

Innovative Continuous Recess® System

Utilising the Continuous Recess® System, the Stertil-Koni in-ground lifts are designed to accommodate vehicles with extremely low ground clearances, such as city transit and articulated buses. What is particularly special about this is that the movable piston* or scissor can recess below floor level anywhere within the travel range, thus preventing damage to the undercarriage of the vehicle. The pit covers of this system are made from anodised aluminium and are equipped with a skid-resistant surface. They are driven hydraulically with an inverted rack and pinion system, sliding on a corrosion resistant, self-cleaning surface. The covers prevent tools being dropped into the recess as well as reducing tripping hazards.

Easy to Use and Maintain

The DIAMONDLIFT and ECOLIFT are supplied with a free-standing, above-ground control console.

Technicians have direct, safe, ergonomic access to service bus fleets

The hydraulic power units as well as the electronic controls are easily accessed for operation, maintenance and service. All components are housed in this unit and protected against moisture and dirt. The control consoles are equipped with the Stertil-Koni ebright® Smart Control System that combines intuitive easy-to-use visual information about the lifting process and clearly indicates when operating the lifts when it is safe to relocate the movable unit and adjust for different wheelbases.

The optional Automatic Wheel Base Positioning System for the moveable lifting unit allows for pre-set programming of an endless number of vehicles which can be saved and activated, thereby significantly reducing setup time.

**Continuous Recess® is available on the DIAMONDLIFT depending on the model.*

For information about our in-grounds or any of our other heavy-duty vehicle lifts, please contact us:

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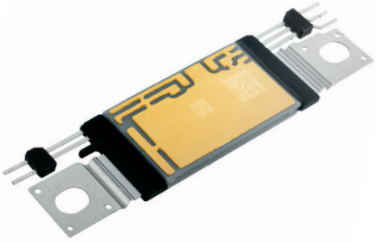

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Directory

Electrification & Power

Hitachi ZeroCarbon

It Will Take a Collaborative Ecosystem to Achieve Our Decarbonisation Ambitions

By Mike Nugent, Head of Hitachi ZeroCarbon EV

Decarbonisation is the number one challenge for bus fleet managers today.

Soon it will no longer be possible to buy new internal combustion engine buses and low-emission zone charges will make it increasingly costly to run them. The pressure is on to transition primarily to electric buses soon. However, there are significant challenges for fleet managers to overcome.

Effectively addressing the challenges of the climate crisis requires businesses, governments, finance providers and communities to work together. First Bus is proving how this can work in practice.

First Bus is taking considerable strides to meet these challenges head-on and decarbonise its fleet. At its flagship Caledonia bus depot in Glasgow, the bus operator has transformed its depot into the UK's largest EV charging hub, with space to charge up to 300 electric buses at the site.

Leveraging funding from the Scottish Ultra-Low Emission Bus Scheme (SULEBS) and ScotZEB (Scottish Zero Emission Buses), Hitachi ZeroCarbon is delivering

an 'as a service' offering that includes bus batteries for First Bus's fleet, smart charging software to manage and optimise the EV charging, and a decarbonisation programme that will explore low-carbon opportunities.

The depot also generates and consumes its own electricity via solar PV as well as meeting local community environmental, social and governance (ESG) needs by delivering zero-carbon charging hubs for use by other local businesses.

As a Principal Partner of COP26, Hitachi Europe played a pivotal role at the climate change conference and delivered a 'Together for our planet' event with First Bus at the Caledonia depot, reinforcing both companies' commitment to lead the decarbonisation of public transport.

At the global climate change conference, First Bus set out its aim to offer local businesses use of the extensive electric vehicle (EV) charging infrastructure at its Caledonia Depot. One year on, DPD has become the first company to officially sign up to the scheme, enabled by Hitachi ZeroCarbon's Plug and Charge solution that provides the availability of DC ultra-rapid charging for commercial electric vehicles.

Drivers of UK delivery company, DPD, have access to the site to charge their electric vehicles while in Glasgow, enabling them to travel a greater distance while making deliveries without impacting the environment. Through this arrangement, the green potential of First Bus's charging hub will be maximised while its own electric fleet is out in service.

This is the kind of collaboration between businesses and local authorities that will be central to our decarbonisation success. The key is building interoperability into everything we do, and shared charging hubs are the best example of how this could work in practice.

By opening up ecosystems of these hubs to a wider range of users, vehicles can be more intelligently charged, locations for charging and resources can be used more effectively and investment in charging infrastructure can be maximised. Interoperability is a guiding principle for the move to collaboration and one that needs to be considered across private and public sectors right from the very start.

Building an EV ecosystem requires an end-to-end decarbonisation plan, from the green power we put in, all the way to end-of-life battery recycling. Collaboration is vital, but like we are seeing at the Caledonia depot, businesses are already coming together to face the challenge head-on. And it's making good business sense too.

Getting to net zero in the transport sector isn't an overnight project. It will take years, however it will get easier, if we look to learn from each other and seek out opportunities to collaborate.

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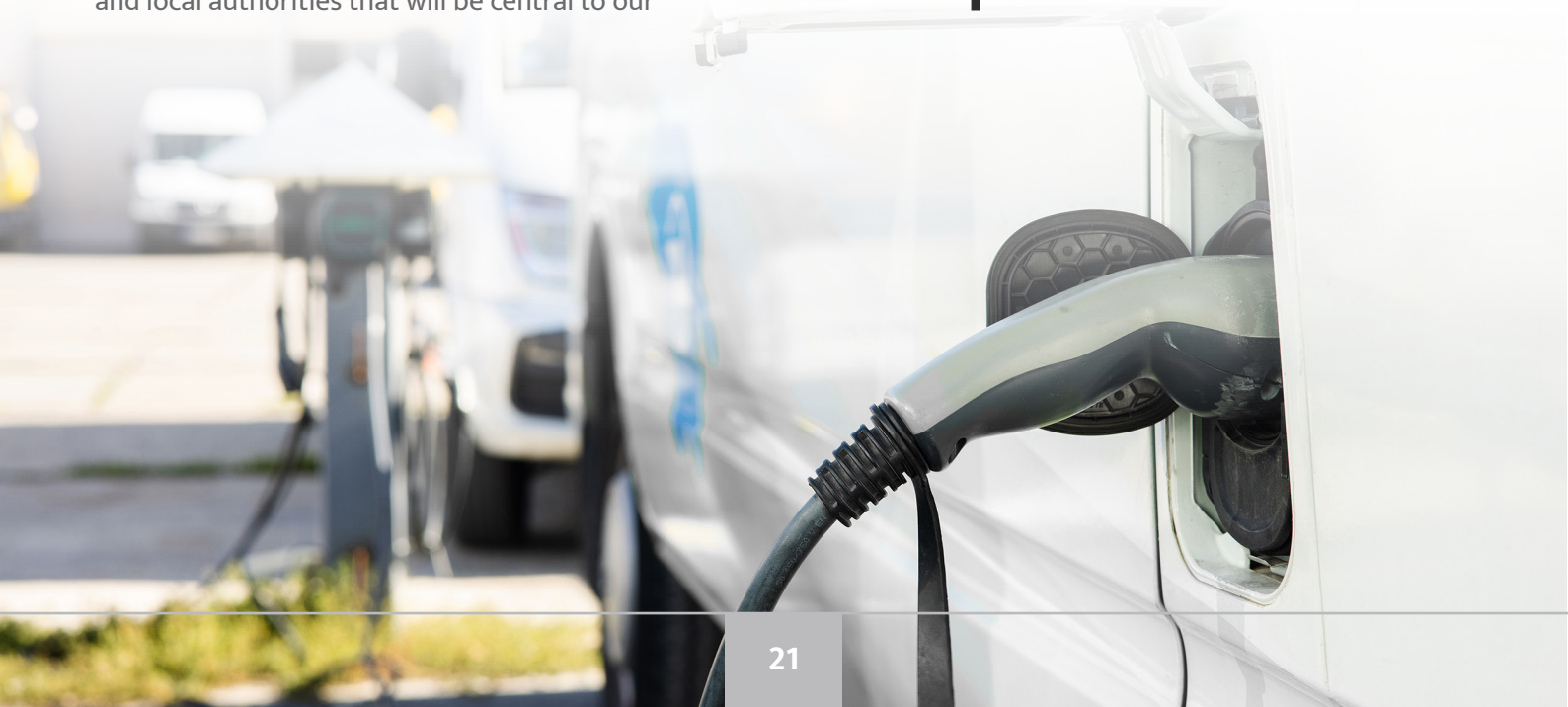


Stäubli

E-Mobility: Modular High-Performance Battery Systems

Safe and reliable assembly of the modular high-power battery systems

A Germany-based technology leader develops and produces an impressive range of innovative, modular high-performance battery systems for electric and hybrid utility vehicles. International vehicle manufacturers count on these reliable and scalable batteries.

Thanks to robust and compact Stäubli CombiTac connectors including custom pre-assembled cables, the innovative battery developper can guarantee safe, long-lasting operation for its customers' electric vehicles.

What was once a group of German technology students researching and developing solar energy is now an international market leader in the field of modular, high-performance lithium-ion battery systems for

utility vehicles. These innovative battery systems are used in electric and hybrid utility vehicles for passenger and freight transportation on roads, railways and waterways, as well as in industry. Some of the world's leading utility vehicle manufacturers integrate these cutting-edge battery systems in their design concepts.

Robust Connectors for High-Performance Batteries

This modular and flexible product portfolio stands out for its very high energy density and exceptional thermal management, allowing for compact and freely scalable design. Developing a high-performance, modular OEM battery system called for a highly powerful, robust and reliable pluggable connection solution that was also extremely safe and had the necessary certification for use in the automotive industry.

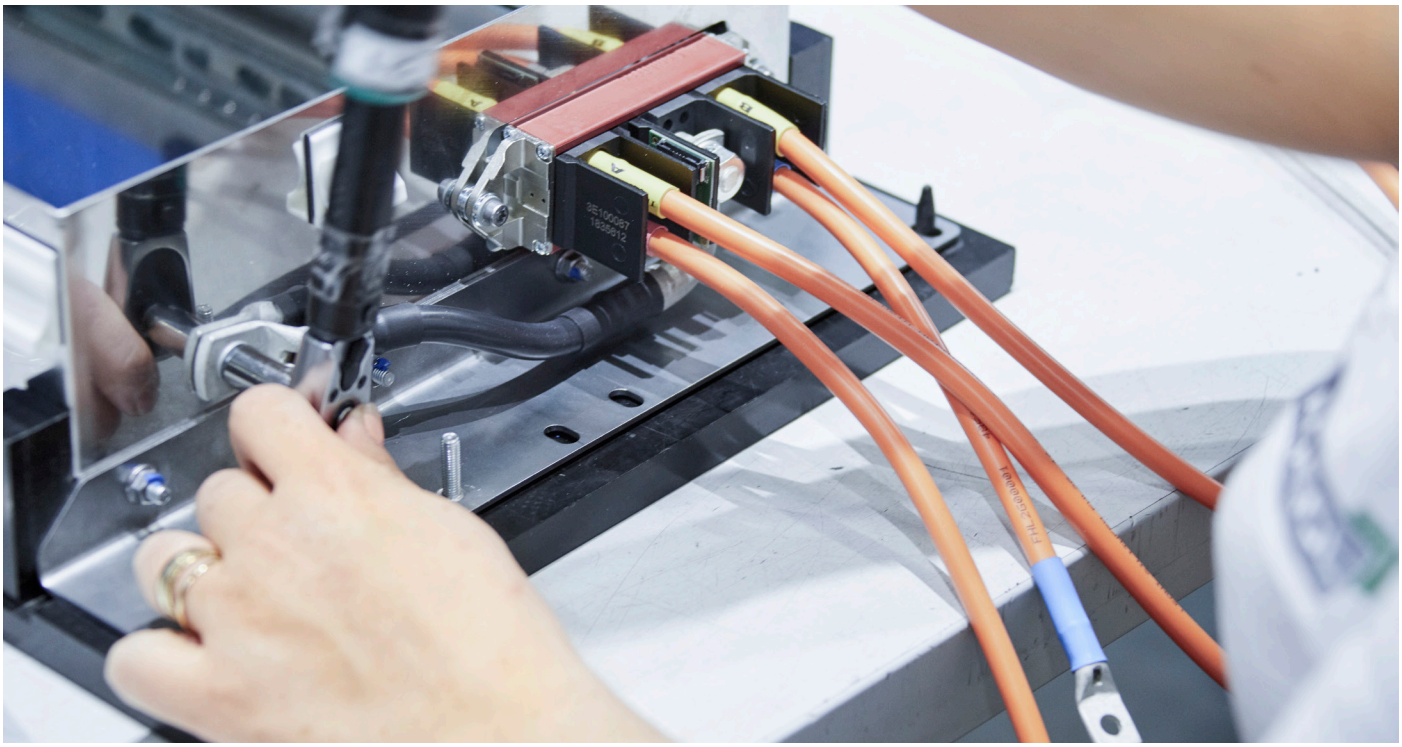
CombiTac connector system carries current and data signals

Custom Solutions for Absolute Safety

Stäubli worked jointly with the battery technology leader's engineers to configure a solution based on the modular Stäubli CombiTac system, flexible enough to support a 30% increase in the battery design's performance even without any design modifications. Stäubli also implemented the connection with preassembled cables according to the specifications of the customer's OEM clientele.

These connections, which carry current as well as data signals between the individual battery modules and to the power electronics, allow for safe battery maintenance operations. Simply unplugging the power module from the battery enables technicians to work safely with no live voltage. Therefore, it's possible to

The modular battery elements are connected with the Stäubli CombiTac system



Customised and pre-assembled cables make quick and consistent installation easier

change fuses without the need for an electrician or additional safety staff. This solution ensures that there is absolutely no voltage at the power module.

The modular connections also ensure fast, safe connections during assembly of the individual battery layers. Thanks to its robust design, the high-quality CombiTac solution can even stand up to strong vibrations in continuous operation. At the customer's request, an additional circuit board for monitoring was built into the power electronics with the CAN bus as part of the safety technology. This is another area of Stäubli's expertise, making the solution even safer.

Technical Consultant as Partner

The Stäubli CombiTac connector system convinced the customer's engineers with its proven reliability and robustness. They also appreciated the Stäubli experts' flexibility and expertise in implementing the additional technical specifications and strict safety requirements of the international utility vehicle manufacturer. The user-specific cable solution allows for safe and efficient assembly of battery modules.

And for the customer's clientele, the use of Stäubli's safe connector solution in the high-performance battery systems guarantees continuous, long-lasting electric vehicle operation and the highest level of safety for maintenance work.

Click or scan the QR code below to find out more about Stäubli

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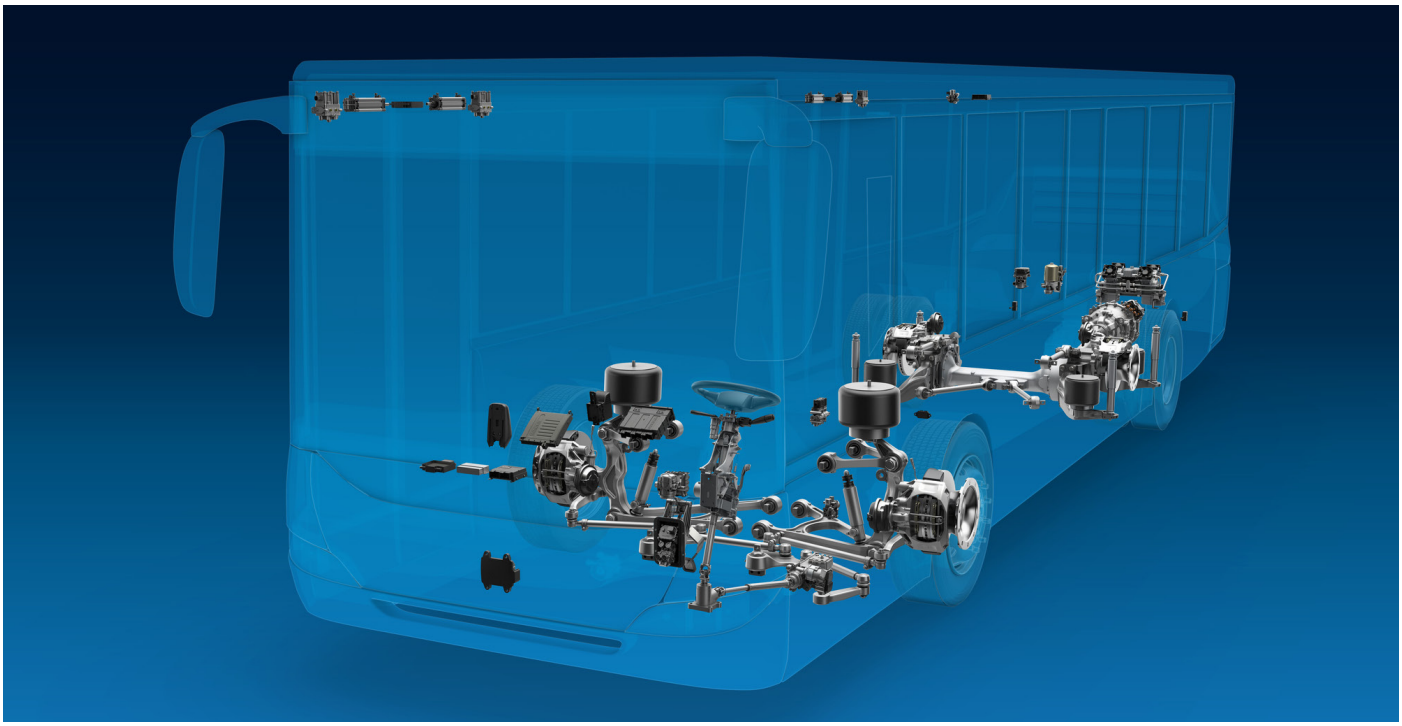
STÄUBLI

ZF

ZF Accelerates City Buses and Coaches Towards Next Generation Mobility



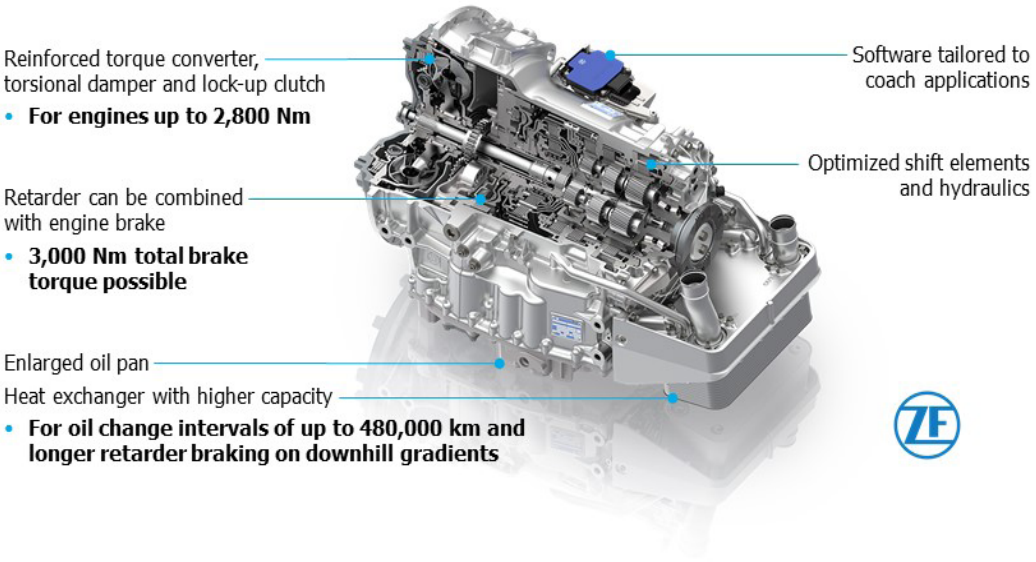
Underlining its support for city bus and coach manufacturers as well as fleet operators worldwide, ZF is taking its extensive portfolio of advanced systems and solutions to the next level.

Advancing the global technology leader's 'Next Generation Mobility' strategy, ZF's Commercial Vehicle Solutions (CVS) division is leveraging its unique capabilities to bring the sector's autonomous, connected and electric future ever closer.

Far from simply outlining the technologies of tomorrow, ZF is already bringing many of these innovations to our roads and highways. It also has a clear road map for the future advancement of cutting-edge bus and coach technologies. This includes raising and setting new industry benchmarks for the safety and efficiency of people transportation, thereby delivering significant advantages for all types of coach and city bus applications.

Setting a New Benchmark in Coach Efficiency

The second generation of ZF's proven six-speed automatic transmission, EcoLife CoachLine, is now available and has established an advanced new industry



benchmark in coach transmission system performance and efficiency. Suitable for all types of coach application, whether operating in a city, intercity or on steep mountain track, it offers significant advantages for customers. In addition to enabling outstanding passenger comfort, fuel savings of up to three percent over the previous-generation EcoLife are possible. This is thanks to EcoLife CoachLine's innovative start/stop function which saves fuel during the entire transmission service life. The powershift transmission also has an optimal gear ratio spread, from 3.36 to 0.59. This is powerfully combined with a high level of mechanical efficiency, ensuring that the vehicle always operates within the optimal range of engine speed.

"Environmentally and economically smart, EcoLife CoachLine sets a new standard of transmission performance, efficiency and driving comfort for even the most demanding coach applications, from city streets to mountain roads," said Dr Jochen Witzig who is responsible for transmission systems at ZF's Commercial Vehicle Solutions division.

"Given the continued predominance of traditionally internal combustion engine-powered buses in public transport and long-distance travel world-wide, it is vital that we focus on delivering ever-higher levels of fuel efficiency to help reduce emissions. EcoLife achieves this and so much more," added Dr Witzig.

Connecting Bus Fleets to the Power of Vehicle Data

Supporting public transport and private bus fleet operators, ZF Bus Connect is an advanced fleet management tool designed to improve fleet efficiency and performance. Leveraging vehicle data to enhance safety, efficiency and improve vehicle uptime, the digital fleet management solution was developed by ZF as part of its Data Venture Accelerator to create digital products and services.

Designed for scalability and ease of use, Bus Connect enables geofencing and driver behaviour monitoring to detect potentially dangerous bus driving situations, helping prevent accidents as well as offering theft protection. Enhancing efficiency, live data is evaluated on an individual bus basis, enabling the optimisation of driving and route plans while improving fuel consumption. ZF Bus Connect helps extend vehicle uptime by delivering predictive remote detection of damage or of wear and tear of consumable items that is compatible with real-world bus configurations; it also enables diagnosis and secure 'over the air' updates to reduce downtime.

ZF Bus Connect is developed for city buses and coaches with both electric and combustion engines or hybrid systems and it can be used in a mixed fleet. The user can check every aspect of the vehicle, including having a live view of vehicle locations in real-time, observing current energy or fuel consumption, and checking the status of battery charge or maintenance status of the vehicles' parts, brake wear and other system messages.

"With ZF Bus Connect we are helping the bus operators with their difficult change to all-electric fleets," explained Florian Freund, responsible for the ZF Bus Connect development. *"With the power of data-analytics of in-vehicle data, we are helping operators to manage their fleet efficiently by reducing the energy*

or fuel consumption whilst giving a clear CO2 fleet footprint overview."

Electrification Fast-Track for Buses and Coaches

ZF recently announced a fuel cell drive partnership with fuel cell and battery systems supplier, Freudenberg e-Power Systems. The partners will develop drive-train technologies for commercial vehicles, including buses and coaches. Supporting the industry's decarbonisation aims, ZF is advancing open technologies for the battery and fuel cell.

The joint development agreement brings together ZF's electric driveline leadership with Freudenberg's fuel cell expertise to develop clean e-Drive 'powerpack' solutions, consisting of a fuel cell and drivetrain system; the two partners will also share components for a variety of applications.

The pilot phase of the co-operation agreement is currently underway with prototypes of bus demonstration vehicles expected by 2023. This corresponds to ZF's already announced fuel cell partnership for the development of a coach prototype as part of the HyFleet project.

Pioneering City Bus Safety

ZF has developed its first collision-mitigation system (CMS) specifically designed for city buses taking its systems and components expertise to the next level. The pioneering system offers active braking to help avoid frontal collisions with other road users, including vehicles, bicycles and pedestrians. The system also helps counter the adverse impact of braking momentum on passengers. Helping reduce the risk of accidents and injuries both inside and outside of the bus, the solution is the industry's first manufacturer-independent CMS specifically engineered for city bus applications. The system is compatible with both electric and internal combustion engines. Having already secured business wins from leading bus OEMs, ZF will initially launch its City Bus CMS in Europe and, ultimately, plans to roll the system out worldwide.

"Leveraging ZF's wide-ranging competencies to develop a pioneering solution connecting radar and camera

with a central processing unit and braking system, City Bus CMS represents a clear proof point of the Group's Next Generation Mobility strategy," said Philipp Helmich, Head of Vehicle Dynamics Product Lines with ZF's Commercial Vehicle Solutions division. *"The system addresses the clear and pressing demand from manufacturers and their customers for ever higher levels of safety in city traffic.*

"In addition to providing advanced, integrated safety for road users as well as the driver and passengers of both electric and traditionally fuelled buses, we are extending ZF's advanced driver assistance systems leadership in trucks and coaches to the important city bus market segment. Utilising advanced braking system technology is fundamentally important for safety and autonomous driving, with complex city bus applications providing an interesting and valuable use case," added Helmich.

Enhancing City Bus Comfort and Safety

ZF's continuous damping control (CDC) is suitable for city buses and combines uncompromising comfort and driving safety. Providing enhanced stability even in critical driving situations, it supports safe handling during dynamic manoeuvres. With improved acoustics, reduced vibrations and controlled cab movements under the effects of shifting loads, the system improves cockpit ergonomics. Especially in electric driven buses with batteries on the roof, it helps prevent dangerous dynamic pitching while combining vehicle stability to deliver greater comfort and safety for the driver and passengers.

zf.com

Schunk Group

150 Cities – 35 Countries: Schunk Smart Charging Charges Electric Buses All over the World

Cities and municipalities around the world are working hard to reduce noise and air pollution caused primarily by daily traffic.

Schunk has decades of experience in the field of electric mobility and emission-free alternative drives. More than 150 cities in 35 countries are already benefiting from this. They rely on the durable, flexible and economical Schunk Smart Charging systems for their electric buses. These enable automated, reliable and safe charging of the batteries. Among other things, 100 electric buses connect Amsterdam Airport Schiphol with the surrounding area. The buses cover ~30,000km every day – completely emission-free. The Schunk charging pantographs are mounted on the roof of the buses or alternatively on the charging station as inverted pantographs.

There is now a new model of Depot Charger. It enables vehicles of different heights to be docked at the depot in mere seconds. E-buses with Schunk Smart Charging pantographs are in operation in over 35 countries. In the beginning only individual buses were equipped in projects. Today the company supplies the key technology for fleets of up to 200 buses. Customers trust the experience Schunk has gathered in over 150 international projects – from Seattle to Krakow to Tokyo.

Product Manager Timo Staubach explains where electromobility stands today and what he expects for the near future.

Question: Mr Staubach, Schunk has been offering sophisticated electric bus charging technologies since 2014. The industry is currently working with two different charging concepts: opportunity charging on the route and depot charging. How do they differ?

Timo Staubach: 'Opportunity charging' takes place at strategically selected bus stops. Here, the roof-mounted pantograph makes contact with a docking station installed at the bus stop. The advantage is that a comparatively smaller vehicle battery can be used because only a relatively small amount of energy needs to be stored – just enough for the next hours of operation. This method is particularly well suited for cities with bus lines that have extensive operating ranges. Overnight charging, or depot charging, takes place after operating hours, in the vehicle depot. The significantly larger batteries with their correspondingly higher charging capacities require more space and can easily add a few tons of additional weight to the vehicle, depending on the operating range requirements. This also means less space on the bus for passengers. For smaller municipalities with less extensive operating ranges, this can, however, be a practicable solution.

Q: Schunk offers pantographs for both concepts. What advantage do they offer over the conventional plug-in solution?

TS: Our pantographs are well suited for recharging both at the bus stop and for overnight recharging in

Electric buses equipped with roof-mounted pantographs stop under the charging station where the pantograph extends, connects to the charging station and charges the batteries

the depot; here the contact interface is simply located in the vehicle depot hall. Transit companies with large fleets naturally do not want to individually plug in each bus every evening. That's why we're convinced that the manual plug-in solution has no long-term future, specifically with a view to automated depot operation. Whether opportunity charging or depot charging is the best solution depends on the respective charging strategy, the number of vehicles, the characteristics of the bus routes and their particular requirements. The main thing here is to take into account and analyse the individual needs of the customer.

Q: In ongoing operation, keeping to the bus schedule is the top priority. What technical challenges did you have to overcome as a supplier to ensure this?

TS: When parking the bus at the charging station, the tolerance range has to be chosen to be as large as possible. We cannot expect bus drivers to park with millimetre precision. Schunk pantographs provide a very large tolerance range. A visual orientation aid is sufficient for bringing the vehicle into the proper position. In addition, the pantograph automatically connects with the charging infrastructure in just five seconds and with 1000 amps allows an extremely high current transfer. Because of this, our systems are some of the leading and best engineered automated charging systems currently in use in public local transport with battery-powered electrical buses. The so-called kneeling effect, the sideways tilting of the bus at the bus stop, is compensated by the rocking suspension design of the pantograph so that no interruption of current flow occurs. Reliable contact quality is the key to the charging process.

Currently, Schunk is the supplier with the most projects and systems within the fully automatic conductive charging market segment. With intelligent technologies, the required battery dimensions can be significantly reduced, thus achieving a highly effective relationship between battery size, passenger load and range.

Click **here** to watch our video.

Timo Staubach

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schunk-transit-systems.com

Background Image: One charging solution for day and night: equipped with roof-mounted pantographs, 80 electric buses in Krakow are charged quickly on the route during the day and slowly in the depot at night

SMART CHARGING SOLUTIONS FOR ELECTRIC BUSES

Automated recharging with pantograph technology

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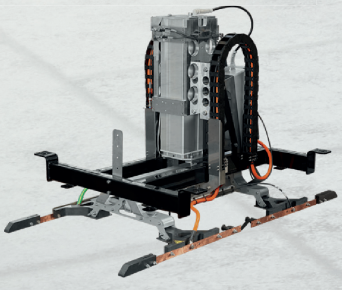
Whether on the line or in the depot: We offer charging technologies and components that set standards. Schunk Smart Charging – our unique portfolio of charging solutions based on pantograph technology can be individually tailored and optimally integrated into your existing infrastructure.



Depot charger

Roof-mounted pantograph

Inverted pantograph

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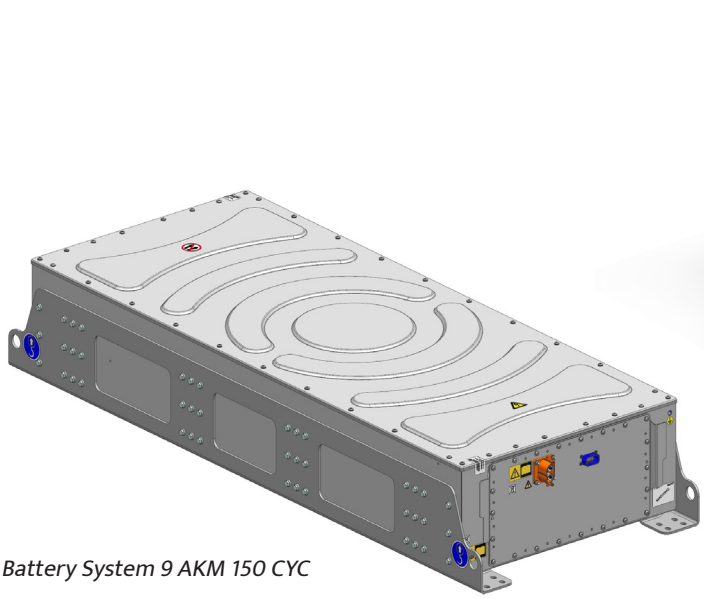
More information

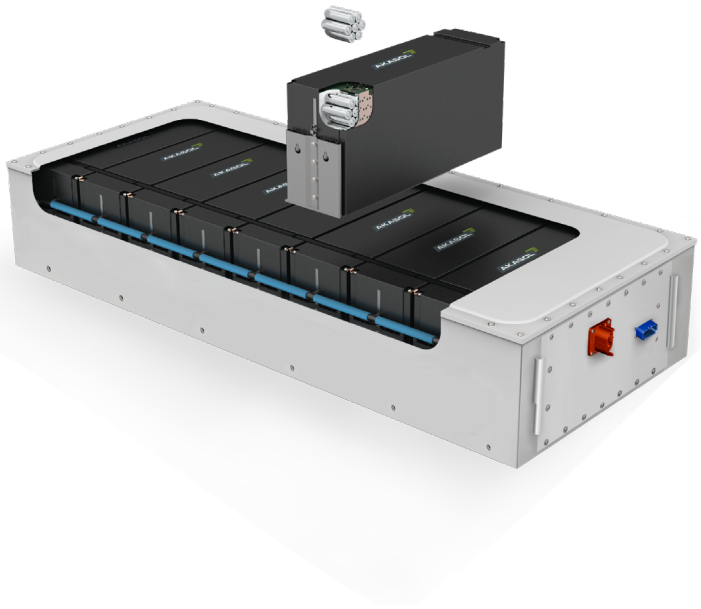
BorgWarner

Ultra-High-Energy Battery System for Electrified Commercial Vehicles



Battery System 9 AKM 150 CYC

9 AKM assembly



BorgWarner's ultra-high-energy battery system exploits the full potential of its battery technology to lower the total cost of ownership for electrified commercial vehicles.

History and Background

Different types of batteries have been tried for use in vehicles since the early 1900s, but there is no universal battery than can be used for all types of vehicles. Instead, batteries must be specifically designed for the needs of each type of vehicle. The electrified commercial vehicle (eCV) market is experiencing rapid growth, since buses and trucks can improve sustainability by providing higher transportation efficiency compared to smaller vehicles. To properly realise these advantages, the power source needs to be tailored to the operational demands of each type of eCV.

In 2018, BorgWarner visited major electric bus and truck suppliers to gain a thorough understanding of their future needs. In 2019, this resulted in the battery module design that now forms the major building block of the battery pack discussed here.

BorgWarner's UHE battery system is rated as a highly sustainable battery solution according to a TÜV (Technischer Überwachungsverein) audited calculation method in Germany.

Battery Optimisation for eCVs

Compared to a passenger battery electric vehicle (BEV), an electrified commercial vehicle (eCV) demands significantly different priorities from its batteries. For cars, initial purchase cost, energy and power density are primary considerations, but for the eCV market, the total cost of ownership (TCO) is critical, and this largely depends on how many times the battery must be replaced throughout the vehicle's life. Mechanical robustness, longevity, compact dimensions, and light weight of the battery assume much higher importance for the commercial vehicle market, where continuous, long-term usage must be assured while keeping vehicle payload capacity as high as possible.

To address this need, BorgWarner has developed an ultra-high-energy (UHE) battery system for energy-intensive electric drivetrain applications operating at up to 750V. As BorgWarner's award-winning cylindrical cell (CYC) battery module already sets the benchmark for energy density in the eCV market, this is employed as the power source in the UHE battery pack. The new system provides battery life of up to 4,000 cycles. It is also sufficiently versatile to be matched to a customer's usage profile; cells can be optimised towards maximum power density to take advantage of quick charging stops (opportunity charging) for urban buses, or they can be optimised towards maximum energy density for long-distance traffic where overnight charging is used.

CYC Module: The Battery Pack Building Block

The design of the CYC battery module is based on the 21700-format cylindrical lithium-ion (Li-ion) cell. To achieve the high energy density required and the necessary charging and discharging power, the type of cell chosen is specially designed for professional and commercial applications with an additional focus on cycle life. Each CYC module contains 600 cells; in standard form, these are configured as 20 serial connections of 30 parallel-linked Li-ion cells, providing a maximum module voltage that is below the electrical shock threshold for safe handling during production and maintenance. However, alternative cell configurations are possible by altering the current path routing within the side PCBs of the battery module. The module achieves an energy density of about 221Wh/kg.

Ultra-High-Energy Battery Pack Specification

Nine CYC modules are connected in series to create a 9 AKM battery pack providing 98kWh of energy. Being compact and energy-dense, this solution means city buses and intercity coaches can have battery system capacities of 400kWh to 1000kWh, twice as high as the present generation of batteries.

Production of 6 AKM battery packs is also planned. The smaller packs could be used in conjunction with 9 AKM packs for vehicle applications where a mix of different pack sizes would make the most efficient use of available space. Mixed pack sizes can be handled with ease by the multistring battery management technology.

Battery Management and Cooling

The battery management system consists of a battery management unit (master) & cell supervising circuits and their corresponding software. It provides primary safety functions including overtemperature, over/undervoltage and overcurrent protection but also performs detailed diagnosis of all actuators and sensors as well as innovative high-level battery management functions, e.g. battery state estimation.

The UHE battery pack is equipped with extremely effective liquid cooling at module level. This is indispensable for safety as well as for performance, ensuring a high availability of power and energy, and contributing to the slow ageing and long life of the battery cells.

Safety in Operation

The main safety consideration during the battery pack development was the prevention of any fire or explosion hazard. A combination of active and passive

safety devices at both CYC module and battery pack-level provides maximum protection against fire propagation resulting from a thermal event.

Within the CYC module, each cylindrical cell is physically separated from the next by a defined gap determined from deep evaluations by simulation and validation, and covered by an optimised potting compound.

Further software and hardware safety elements are incorporated at battery pack level. The CYC module is robustly constructed to protect the complete battery pack against damage. The system is shielded from external thermal loads and an efficient cooling system and predictive algorithms add a further layer of safety.

The intrinsic safety of the UHE battery packs is proven in use, as the first buses and trucks to be equipped with them have been running in major cities since 2020 without incident.

Charging and Maintenance

The UHE battery pack can be charged, dependent on cell type, at a rate of up to 1C with quick charging and is also suitable for use in fast charging infrastructure up to 500kW power on vehicle level. All significant electronic parts aside from the CYC modules are placed in a removable contactor box. In the unlikely event of a field failure due to a fault in the battery electrics or electronics, the unique service concept of the UHE system allows this electronics compartment to be exchanged easily without the need for high-voltage trained technicians or the necessity to demount the battery pack from the vehicle.

Environmental Sustainability

BorgWarner's UHE battery system is rated as a highly sustainable battery solution according to a TÜV (Technischer Überwachungsverein) audited calculation method in Germany. Several factors can be cited to demonstrate its sustainability:

- It is lightweight: the high energy density reduces the total weight of the system, therefore overall energy consumption
- Longevity of battery cells: the very high cycle life of carefully chosen battery cells is extended by intelligent mechanical and thermal integration and sophisticated sensors

Module with cylindrical lithiumion cells

- Extended circular value stream of the batteries: this includes maximum recyclability of the raw materials, and/or finding second life applications for used batteries
- Higher availability of energy from the vehicle's batteries: the consequent increase in operational range facilitates further intercity bus and light, medium and heavy-duty truck applications to be electrified

Summary

Mechanically robust, intrinsically safe, easily scalable and offering relatively low investment costs per kWh, BorgWarner's ultra-high-energy solution for long-distance transport sets new energy density standards for bus and truck applications and firmly positions BorgWarner as an innovation driver in the field of high-energy batteries.

Read the full **white paper**.

For more information, please contact:

technology@borgwarner.com

borgwarner.com

BorgWarner

100% Danish Heaters for Buses

Two topics have been in the news a lot lately – the price of fuel and climate change.

These topics affect transport operators too. Operating costs need to be kept low and transitioning to net zero is a central concern. Most of the discussion here focuses on traction power, but there are many other components that use energy that can contribute to efficiencies and sustainability. We chatted to Søren Rasmussen from Stroco to find out what the Danish heater manufacturer is doing in these areas.

Stroco 35.02 LE Hybrid heater

Josephine Cordero Sapién: Stroco ApS manufactures heating solutions for buses. What's the company's back story?

Søren Rasmussen: The company was founded in 1972 by Jørgen Strøier together with Holger Pedersen. In 1972 Holger Pedersen was working at a garage in Varde, Denmark that dealt with buses and trains – it had a workshop for these types of vehicles. Strøier came to that garage from another company and the two got talking. They realised they could make a new type of heater for buses and trains though these days the company just makes heaters for buses.

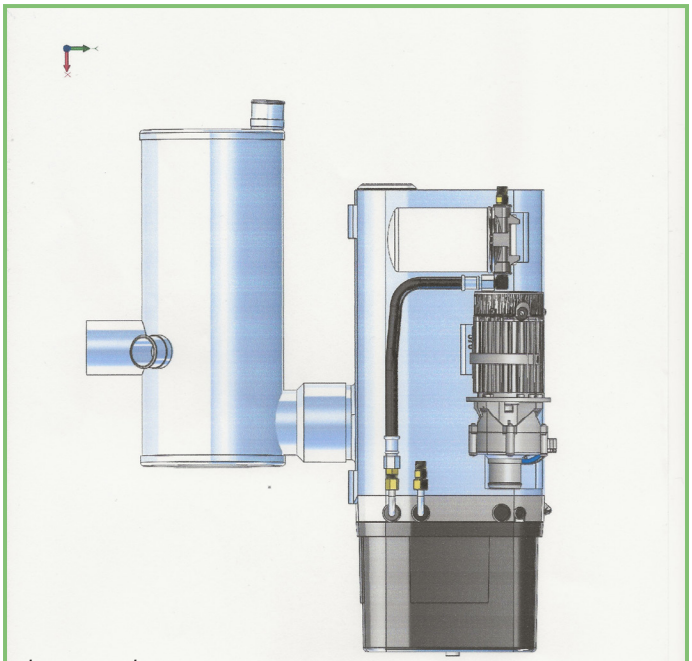
What was new about the heaters they devised was that they were heaters that used water. Previously there were only air heaters on the market so Strøier and Pedersen invented this new type of heater.

Initially, Holger Pedersen ran a company called HP Machinery, while Strøier ran Stroco. Both of them passed on their companies to their sons – and HP Machinery became JP Machinery. In 2020 JP Machinery then bought Stroco but later this year everything will be consolidated into just Stroco, which is easier for our customers to understand from a branding perspective.

As a company now, we make heaters for buses that are 100% Danish-made. Throughout our history, we've always been a first mover on new things in the bus manufacturing industry and we continue to innovate today.

JCS: What innovations does Stroco have in the pipeline?

SR: We're currently working on a new product that will use the heat from the heater exhaust to feed back into the heater and heat up the water. This heat in the heater exhaust is nearly 300 degrees. By not letting this heat go to waste, you can save on fuel to run the heater, which makes it both more environmentally friendly and cheaper to run. We estimate that this will save between 10 and 20% of the cost of fuel.



Flue gas cooler

Our aim is that this product will work not just with Stroco heaters but other existing heaters on the market where the heat from the exhaust can reach temperatures of 400–600 degrees.

This is a product for diesel buses, rather than electric buses. But there are still many of these in passenger service and this retrofit would help make the existing vehicles a little bit greener.

JCS: You also make heaters for electric buses, including a hybrid heater. What are its main benefits?

SR: One key benefit is that you can switch fuel sources. When there is enough power on the bus, you can use electric power to run the heater. But if there isn't enough power, you can switch to powering the heater using an alternative fuel such as HVO – hydrotreated vegetable oil –, diesel, biodiesel, ethanol or RME. As an aside, this is actually one of the benefits of our heaters – the wide range of fuels they will take. The customer is able to specify so our heaters are very versatile.

A lot of electric buses on the market today use heating pumps that cannot produce enough heat on the bus if outside temperatures drop to below zero, which is often the case in Nordic countries. If these buses are fitted with a hybrid heater, the heater will always produce sufficient heat, regardless of the external temperature.

This is why we were recently chosen by Chinese bus manufacturer Golden Dragon. They will now only use Stroco heaters for all of their electric buses for the Nordic market. The first of these will start passenger service in Norway later this year. We've already sent our first heaters to China so they can be installed on these buses.

One of the features that makes our hybrid heater a versatile choice is that you can see the flame. When you use HVO as the fuel, the flame burns blue. When the flame is there, the heater is operational. If you can't see the flame, the heater can't run. It's a safety feature – like the pilot light in your boiler. Stroco hybrid heaters have a visible flame when using HVO as a fuel.

You see lots of electric buses that say on the side '100% fossil fuel-free' but that's not true if they're still using regular diesel for their heaters. And they have to use diesel if their heating pump isn't enough. This configuration is the case for many electric buses on the roads today. In that case it's not exactly true that they're 100% fossil fuel-free. Because our hybrid heaters permit HVO as a fuel, which is also known as renewable diesel, we make electric buses greener too.

JCS: What lies ahead for Stroco in 2023?

SR: We want to produce and sell as many Stroco heaters as possible! We are constantly developing our heaters to make them greener. We have a versatile product portfolio that offers customers low daily running costs and low maintenance costs. It's our objective to further develop our high-quality heaters and ensure our customers receive the optimal product for their needs.

Søren W. Rasmussen

Sales Manager / International Sales Manager, Stroco ApS

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Directory

Digital Solutions

handheld

Keeping Drivers Alert Behind the Wheel

Fatigue Management on Long, Lonely Stretches of Road

Early Warning Drowsiness Detection System

Studies have shown that drivers falling asleep or driving drowsy is a major cause of vehicle accidents; in fact, sleepiness can be as dangerous as inebriation. Although drowsiness whilst driving can occur at any time, this is of special concern to those who drive long distances at a stretch, when weariness can creep in without the driver's notice.

Through its specialised glasses, software and new Eagle Light product based on the **Nautiz X2** ultra-rugged handheld, Optalert offers an early-warning drowsiness detection solution to a variety of users, including companies with field engineers who service telecommunications infrastructure in rural and remote parts of Australia.

Based on Scientific Sleep Research and Clinical Trials

During his 40 years as a clinician, Dr Murray Johns – a world-renowned authority on sleep medicine – developed a special interest in the state of drowsiness and its associated dangers for people whose very lives depend on staying awake at the appropriate time. His 40-year passion for solving the problem of drowsiness led to him developing the world's first and only technology capable of detecting drowsiness

and alertness in real-time using the 10-point Johns Drowsiness Scale (JDS) named after him.

How Does It Work?

A driver climbs into their vehicle, and puts on the lightweight, wireless glasses. The specialised glasses quickly and easily connect via Bluetooth to the Nautiz X2 unit mounted in the cab.

Optalert's drowsiness detection glasses work by measuring the velocity of the operator's eyelid movement 500 times a second using a tiny invisible LED built into the frame of the glasses. Two key measurements essentially measure how fast and how far a person opens their eyelid after they close it.

Wi-Fi and cellular communications transmit driver status information back to Optalert's cloud-based monitoring and reporting system; Optalert tags each event generated by the system in the field with GPS co-ordinates so that system and drowsiness information can be plotted geospatially.

The eyelid measurement from the glasses is translated into a score measured on the 10-point JDS, which the driver sees displayed in real-time on the Nautiz X2 ultra-rugged handheld. The system provides both visual and audible warnings to the user when their drowsiness levels reach certain pre-determined levels. This allows them to recognise fatigue and increasing risk, and take breaks during their journey to continue keeping drivers alert and avoid causing accidents.

Confidence in Upgrading Its Product to the Robust and Reliable Nautiz X2

Optalert switched to the rugged Nautiz X2 after first using a consumer-based, non-ruggedised handset as the hardware platform for its product. While the initial handset was small and lightweight as was required, Optalert found it did not support a key customer need: it was not robust enough for the environments in which it was being used. With the change to the Nautiz X2, users indicated that it was a "huge improvement" over the previous product, with quotes like "far exceeds" and "miles better – factor of 100s of percent".

Chris Hocking, Optalert Product Manager, also appreciated that the customised operating system and firmware provided by Handheld for the Nautiz X2 device means the Eagle Light product *"automatically starts up and shuts down when the vehicle ignition is turned on and off, and it quickly connects to Optalert's*

wireless glasses. This minimises physical actions required by the user, so that the driver can simply get in the vehicle, activate their glasses, and drive."

Long-Distance Co-ordination

Chris Hocking also noted that Handheld was *"a pleasure to work with, providing conscientious and timely assistance and support, and easy, long-distance collaboration between Australia and Sweden (even during a global pandemic!). These were exactly the qualities Optalert was looking for in choosing a new hardware vendor and development partner."*

Current and Future Uses in Harsh Conditions

Other beneficiaries of this technological solution are researchers investigating drowsiness levels during on-road driving experiments, and the mining industry for use in light vehicles used by mine supervisors and managers at a mine site or between sites of operation.

Both the remote Australian roads and mining environments can be very harsh, with extremes of temperature and humidity and high levels of dust and vibration. In the field, the devices can withstand temperatures below freezing at night (in high desert areas of South America), or cabin temperatures over 50ºC (in East Africa).

Humidity levels likewise range from very low (desert) or very high (jungle mining environments in South East Asia). The mining environment in particular is very dirty and dusty, even inside vehicle cabins. Additionally, the Nautiz X2 weathers high vibration levels, as well as the bumps and knocks of vehicles operating on rough haul roads and corrugated dirt roads.

Safe Travels

As Optalert points out, "Accidents happen in the blink of an eye." Its specialised glasses, software, scientifically-validated drowsiness scale, and the Nautiz X2 ultra-rugged handheld combine to ensure eyes stay open and drivers stay alert on the drive.

For more information contact Dave Cawsey, Country Manager UK & Ireland

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Digital Vehicle Depots the Quick and Easy Way

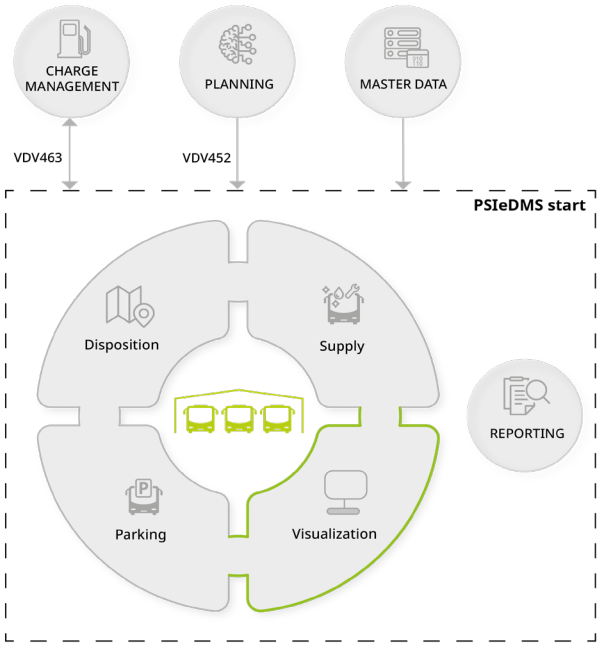
The benefits of digital depot management are great. There is a consensus on this in most transit companies.

However, there is also agreement that the complexity of IT projects often drags them out, causing the benefits to become apparent much later than planned. A basic system, including a standardised system introduction, can solve this dilemma.

Extensive requirement and specifications phases, time-consuming workshops, and expensive adjustments: because classic depot management systems (DMS) aim to maximise the digitalisation and automation of processes, their introduction is challenging and as complex as the system itself. Introducing new drive types, which generally require the parallel operation of conventional and zero-emission vehicles and thus also in the DMS, also contributes to this. Many companies need more resources and capacities to successfully introduce such an IT system alongside their day-to-day business – despite an apparent desire for digitalisation. As a result, digitalisation plans end up in the drawer and, with them, valuable potential. What is needed to move the project from the wish list to the to-do list is clear: a simple basic system with a standardised software configuration that can be used regardless of drive type and fleet size and can be expanded modularly to meet increasing requirements.

Entry into Digitalisation

The new basic **PSIeDMS start system** by software manufacturer PSI Transcom meets this call for turnkey realisations at a fixed price. Companies can implement



PSIeDMS start system overview

the digital depot in just a few steps and in the shortest possible time using this system. It contains all the necessary functionalities for managing vehicles of all drive types and is ready for operation in just a few steps. For this purpose, the solution is divided into the four functional areas of visualisation, supply, dispatch and parking – supported by the connection to charging management (VDV463) and the timetable (VDV452), as well as by master data import and report generation. Due to the lower complexity of the basic system, the solution can be implemented quickly. This also means that transport companies reap the benefits of the system early on.

This approach pursues the idea that companies initially focus on digitalising their core processes, which can then be expanded step by step and in

line with requirements into a more complex target system. In this way, companies can integrate further modules through upgrades, automate processes or increase the degree of automation of processes to the maximum to work completely autonomously without the intervention of a dispatcher in the final expansion stage.

Typical use cases:

- Depot digitalisation and visualisation
- Uniform digital view for all users in real-time
- Management of vehicle supply and breakdowns
- Display of vehicle conditions in real-time
- Charging process visualisation and monitoring
- Pre-conditioning of e-vehicles (VDV463)
- Scheduling of vehicle circulations (drag and drop)
- Scheduling of vehicles in parking spaces (drag and drop)
- Archiving of battery status data (VDV463)
- Independent rollout of additional depots

Standardised Introduction in Three Phases

The system introduction along a standardised process is an essential component of the DMS starter package. This approach empowers companies to be as self-sufficient as possible and ensures that the launch succeeds in just a few weeks. In the first phase, companies make the necessary preparations and ensure that all system requirements are met. They then order the software and the necessary licences and, at the end of this second phase, receive the pre-configured software, including accompanying documentation. The final phase, system introduction, is divided into three consecutive steps. Thus, the transport company first installs the software based on custom-fit training, sets up both IT and workstations, connects databases and interfaces, and models the operation of its depot using a DMS editor that comes with the software. The second step is to adjust the system: the responsible employees set up the user administration, import the master data for operations, configure the driver departure board, and check and test the range of functions and interfaces. In the third step, the company puts the system into operation. PSI provides consulting services both during system introduction and later operation.

Little Preparation, Quick Introduction

Instead of a project setup as in the implementation of multi-layered, maximally automated complete solutions, the introduction of the basic DMS system corresponds to a simple product rollout. This is possible because the system is tailored to transport companies' basic, industry-typical requirements, and both the process and IT analysis were already carried out in advance by PSI. In addition, the standardised range of functions and the pre-configured software enable a short implementation time.

A Digital Foundation

It is not because of a lack of will that companies put off IT projects such as introducing a depot management system. Rather, it is the effort required to implement and commission the multi-layered systems that companies are unwilling or unable to afford. The basic PSIeDMS start system makes it easier for transport companies to get started with depot digitalisation and lays the foundation for needs-based expansions and custom-fit automation steps.

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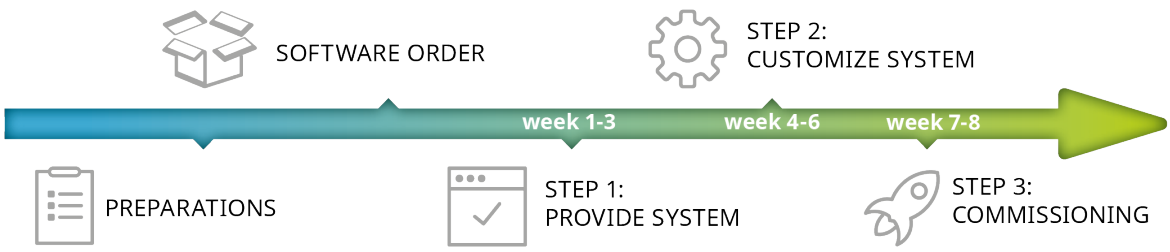

Three steps to an operational system

DRIVING A ZERO DOWNTIME FUTURE

COLLECTING DATA → PROCESSING DATA → GENERATED ALERTS → MAINTENANCE → BACK TO THE ROAD

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The Role of Public Transport in Solving the Climate Crisis

It is no secret that the transport industry is one of the largest emitters of greenhouse gas emissions. Many of the discussions around reducing the environmental impact of transportation revolve around the electrification of vehicles, which is certainly both a necessity and a priority.

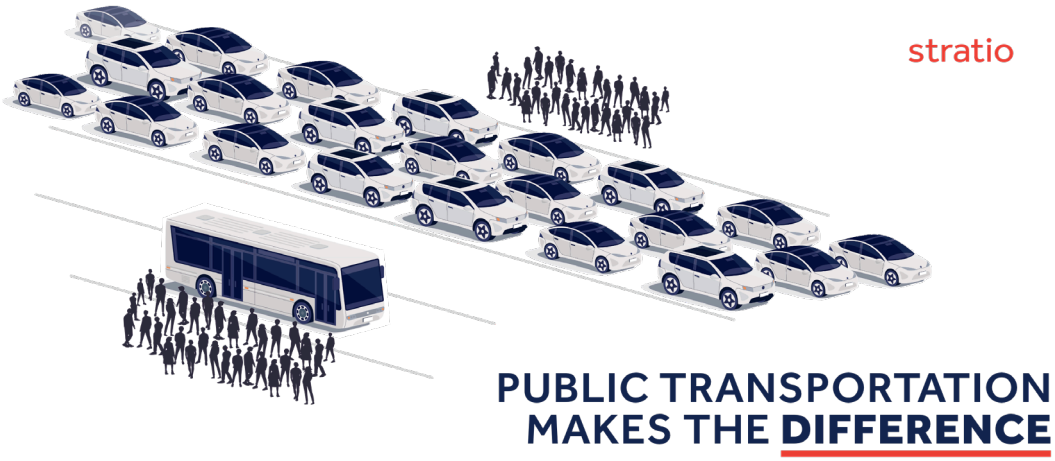
However, to meet climate goals, the approach needs to be two-pronged: we must transition to EVs, while also reducing the number of cars on our roads by incentivising the use of public transport services.

One of the main reasons people cite when explaining why they choose to use their own vehicles over bus services is that they deem the service unreliable. The mentality of "if the bus comes late, next time I'll use my car" has fuelled today's car addiction and is a challenge for operators to overcome.

Thankfully, technology has made immense leaps in recent years, and can now offer transport operators with the visibility and the predictive insights they need to guarantee a reliable service to passengers. With AI-powered predictive maintenance, operators can identify faults before they cause a breakdown, use real-time data on the wear and tear of parts to optimise operational efficiency, and provide a maximised service that removes unplanned downtime from the equation. This would give passengers the certainty that, when they get the bus, the vehicle will reliably transport them to their destination without disruptions.

In terms of EV transition, predictive maintenance can also be leveraged to accelerate the achievement of cost neutrality. EVs are, on average, 50% more expensive than a traditional internal combustion engine bus. This means that transport operators need to keep their electric buses on the road for more time and for longer distances in order to make a return on investment. With predictive maintenance, operators can maximise vehicle availability and keep their vehicles on the road where they should be, serving passengers.

The guaranteed reliability of transport services can create a virtuous cycle: the more people trust public transport, the fewer cars we'll have on our roads, and the better the air quality will be. On top of this cascade of socio-environmental benefits, transport operators who adopt a predictive approach to maintenance will be saving costs and increasing their revenue thanks to boosted ridership numbers – everyone wins.



Stratio Extends Interoperability of Its Predictive Maintenance Solution for Public Transport with ITxPT TiGR Industry Standard Certification

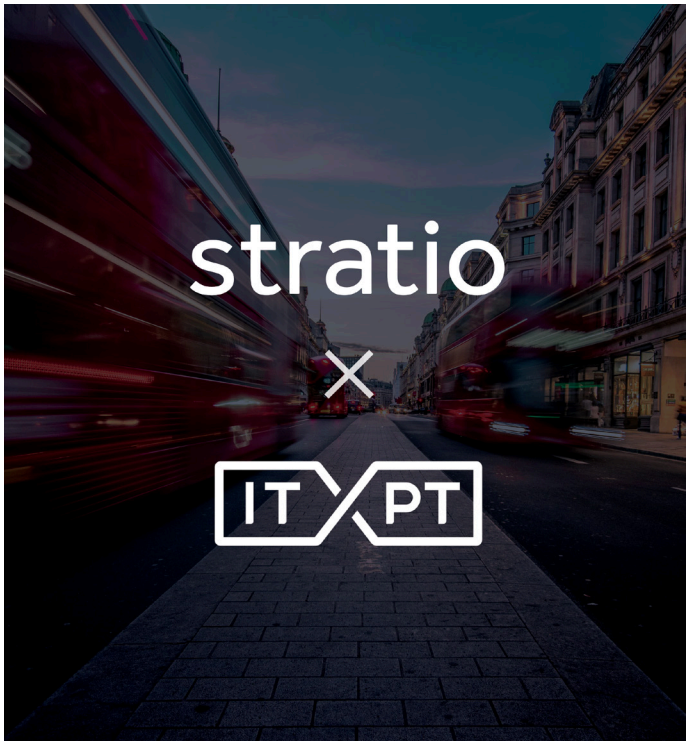
The Stratio Platform for Public Transport is now certified by ITxPT as compliant to the Telediagnostic for Intelligent Garage in Real-time protocol standards (TiGR).

The TiGR standardised protocol allows public transport operators to both import external data into the Stratio Platform, as well as to export Stratio's vehicle technical data and diagnostic insights into other back-office systems. This facilitates the interoperability of the platform, enabling a fully integrated ecosystem that facilitates seamless maintenance operations, stock management and reporting.

"We are excited to be able to offer a TiGR-certified solution," said Ricardo Margalho, Co-founder and CEO of Stratio. *"Stratio's main objective is to simplify the lives of transport operators, optimise operational efficiency and give service teams a unified view of the state of their vehicles. For this reason, a fully interoperable interface is a key added value for our product, which allows us to work closely with operators and partners to extend the amount of data being shared between different systems and tools,"* he explained.

"Our solution allows for real-time visibility and maintenance monitoring across multi-brand fleets, and we already provide access to our information through our extensive API," said Nuno Mendes, Head of Product Management at Stratio. *"The TiGR standardised open interface offers our clients an additional alternative to the traditional 'silo' approach of some legacy systems and tools, enabling quick, successful integrations that meet public transport industry standards,"* he added.

The Keolis Group will be the first Stratio customer to take advantage of the recently certified TiGR protocol, with plans for deployment across the company's electric bus fleet in Blois, France.



The VBOX-360 In-Vehicle Computer Series by SINTRONES

SINTRONES's in-vehicle computer, VBOX-3630 Series, provides a complete solution for increasingly diverse intelligent transportation applications, including monitoring commercial driving behaviours and automatic driving assistance capabilities in vehicles such as police cars, fire engines, school buses, trains, ships, etc.

VBOX-3630

It has a high degree of flexibility, supports a wide range of peripheral devices and network connections, and is adaptable to various vehicle management systems, such as those used in the user scenarios of fleet management, vehicle maintenance systems, and self-driving computers. SINTRONES has specially built a variety of software initialisation functions in advance to help customers quickly set up the software to complete a combination of various parts. The company has won a fair share of customer praise for such efforts. It differs from competitors who need to undergo time-consuming design changes before gaining support. For SINTRONES, product timeliness and thoughtful design are the keys to achieving crucial competitive advantages.

VBOX-3630 Series is a fanless in-vehicle computer with 5G connectivity. It utilises 11th Gen Intel® Core™ i7-1185G7E CPU up to 4.4GHz. And it features an ultra-compact design measuring 250mm x 165mm x 55mm, which can easily fit into restricted spaces. The system can select 5G, LTE, GPS, and Wi-Fi / Bluetooth as robust connectivity by M.2 modules. It has four independent built-in display outputs, audio line-out, and microphone-in. It is the perfect solution for fleet management, in-vehicle digital signage, and mobile DVR. Furthermore, it features Smarter Vehicle Power Ignition and wireless remote control in various vehicles. VBOX-3630 can effectively support cars in extreme weather and operating conditions, such as snowploughs, trucks, buses, taxis and forklifts.

Taiwan's industrial computer industry has attracted worldwide attention. Among the many vertically integrated application fields, smart transportation has always been the main application with much-anticipated profitability. SINTRONES started with the manufacture of in-vehicle computing systems. Since its establishment in 2009, it has accumulated more than ten years of complete R&D experience and successfully opened new ground in important markets such as Europe and the United States. Through long-term accumulated practical experience of co-operating with end customers in Europe and the United States around design, we get the interaction and inspiration of countless precious customers' first-hand feedback and then continue to accept the next challenge. We continue to develop various vital products that all SINTRONES products can use in harsh vehicle situations.

Scan the QR code to contact SINTRONES TECHNOLOGY CORP.

In-Vehicle Computing

SINTRONES

Easy to Install & Maintain
One-sided I/O Focusing

intel CORE i7

E13 Certified

EN50155 Certified

Patent No. M447854
Build-in Battery

VBOX-3630 Series

- Intel® 11th Gen Core™ i7-1185G7E
- Supports Dual 5G/LTE, GPS, Wi-Fi/Bluetooth and CAN Bus M
- Wide-Range Power Input 9V - 60VDC with Ignition Control
- 1 x 2.5 GbE + 3 x GbE LAN (Optional M12 Connectors)
- 4 Independent Displays 2 x HDMI, 1 x DP, 1 x DVI-D
- Patented Battery Backup Kit
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Modules

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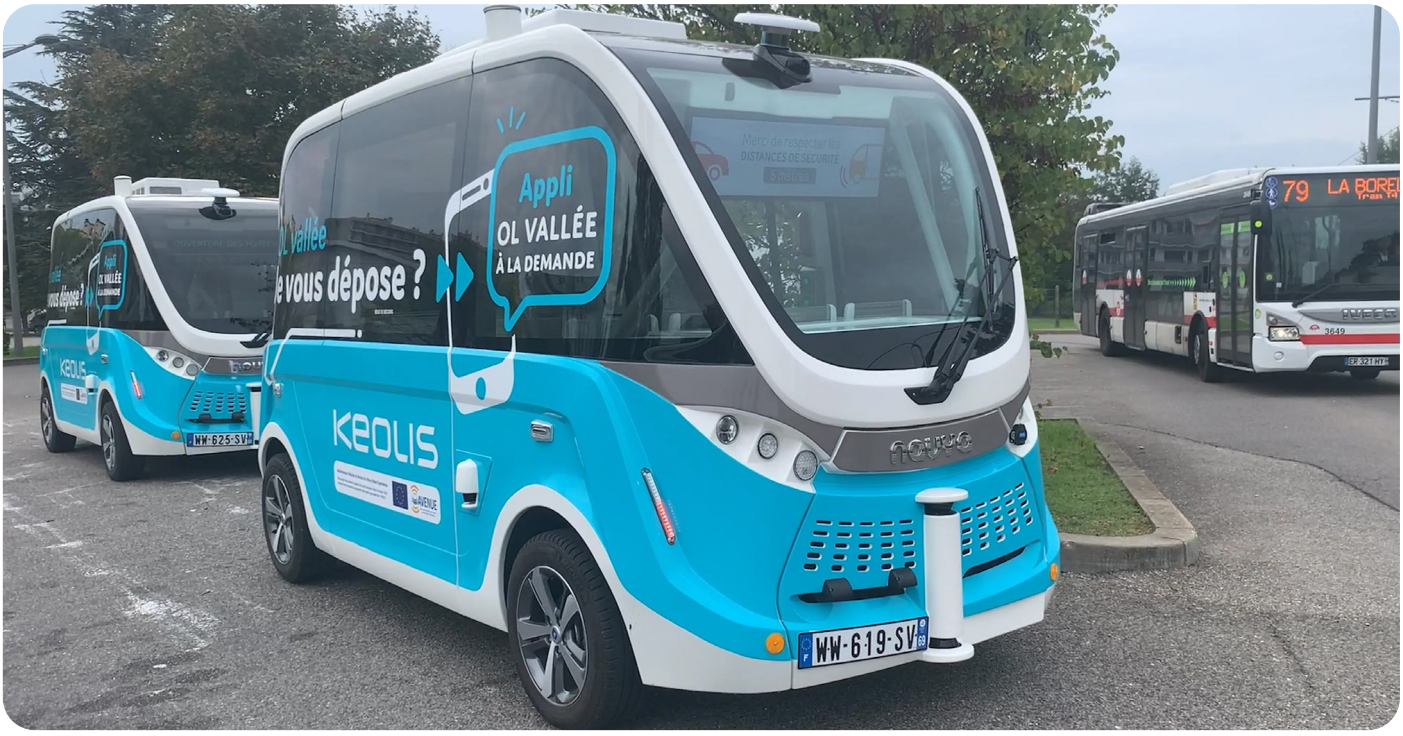

Successfully tested in Lyon, Padam Mobility technologies integrate autonomous vehicles within the public transport fleet. Autonomous vehicles can help solve the last-mile challenge by reducing costs without reducing services.

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Bus Design & Interiors

masats

The Evolution in Entrance Systems

The Next Generation of Masats Products

After years of supplying electric and pneumatic door systems to the bus, coach and minibus industry as well as access ramps and lifts for PRM, Masats entered the railway sector in 2008 with a new range of doors and access systems. In 2016, Masats launched a new division with products for station infrastructure: PSD platform screen doors and gap fillers for stations.

The company's purpose is to improve **people's quality of life** through better mobility. With this objective in mind, and thanks to its international presence and customer service spirit, Masats is designing more technological products to improve safety, reliability, availability and maintainability all while offering operators and end users added value.

Always prioritising **sustainability, Masats** has designed a new generation of smaller, lower-weight products to help reduce vehicle fuel consumption and, as a result, generate less end-of-lifecycle waste.

The latest ECU, the **Evolution**, is a Masats electronic control that has been developed to provide operators with maximum reliability and added value. The ECU is also prepared to obtain information from vehicle operating data in order to report on and optimise maintenance operations. With an artificial intelligence platform that analyses the data, the company can predict breakdowns and take the necessary maintenance measures when appropriate and, thus, increase vehicle availability. It allows maintenance to be planned, which leads to lower lifecycle costs with this move from preventive maintenance to **predictive maintenance**.

Vehicle accessibility systems are critical for improvements as predictive maintenance can reduce forced vehicle downtimes and optimise maintenance operations.

This predictive maintenance is currently being pilot tested on buses in Madrid, Barcelona and Singapore with very encouraging results. The potential behind this system has been measured based on the analyses carried out to date. In view of the data collected, predictive systems are expected to increase vehicle availability up to 50%, reduce lifecycle costs by 45% (reducing incidents and unwanted vehicle stoppages in addition to preventive maintenance plans), and improve reliability by 150%.

The latest door systems in urban buses, such as the recently introduced **029i** inward sliding door, provide a high degree of safety with self-locking systems preventing unexpected openings which would otherwise negatively affect passenger safety. The high durability of the doors, which is achieved through exhaustive homologation testing, is worth highlighting. Their speed (opening in less than two seconds) reduces waiting times, which helps improve services and save time. Their smooth movement also results in lower lifecycle costs.

The new electric sliding door **028d SLIM** with harmonious movement, perfect sealing and a compact low-height (153mm) mechanism completes the next-generation urban product range.

For the coach segment, **Swyncro** is the flagship outswinging door product. The smooth movement, which is completely horizontal without any wedges or stabiliser bars, enables perfect sealing and eliminates rolling noises, thereby boosting passenger and driver comfort.

Ensuring everyone accessibility to all types of vehicles is the Masats social commitment. We offer **access devices** designed to improve the experiences of people with special needs featuring the electric telescopic ramp RT1, the manual ramp RM2, or the electric ramp RE1 integrated in buses. We also produce lifts for coaches, with models that can be installed in the stairs or a dedicated door. They are included in the KS7 and KV5 lift ranges.

At the same time, Masats is also taking advantage of digitalisation opportunities to provide better customer service with the development of a personalised customer portal and an after-sales application. Besides information on the assistance network, the **customer area at the masats.es website** offers new applications and services like access to the new Spare Parts and Documentation Portal, spare part traceability through the 'tracking label' included on each product and a customer Extranet that provides access to information on pending orders and shipment tracking. The all-new Masats Assist application on the new website is also available for official workshops and large operators. This tool was developed to manage warranties and repairs.

Masats is an international benchmark in accessibility systems for public transport, including access doors, ramps and lifts for people with reduced mobility for both buses and trains. It is also active in the infrastructure sector, improving passenger safety and mobility with platform systems such as its PSD platform screen doors. With a plant in S. Salvador de Guardiola (Barcelona) employing more than 300 and a production subsidiary in Kennesaw (USA), it exports to more than 45 countries.

mar.alapont@masats.es
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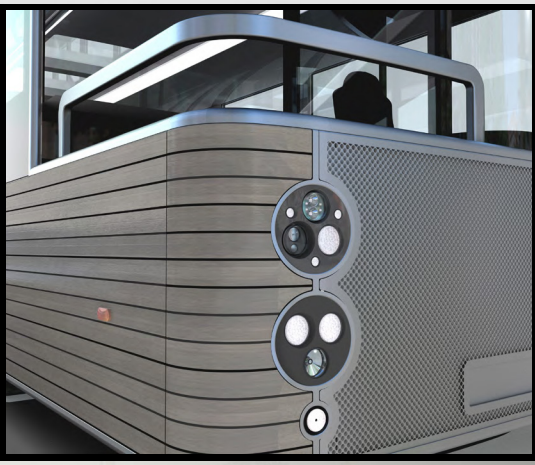

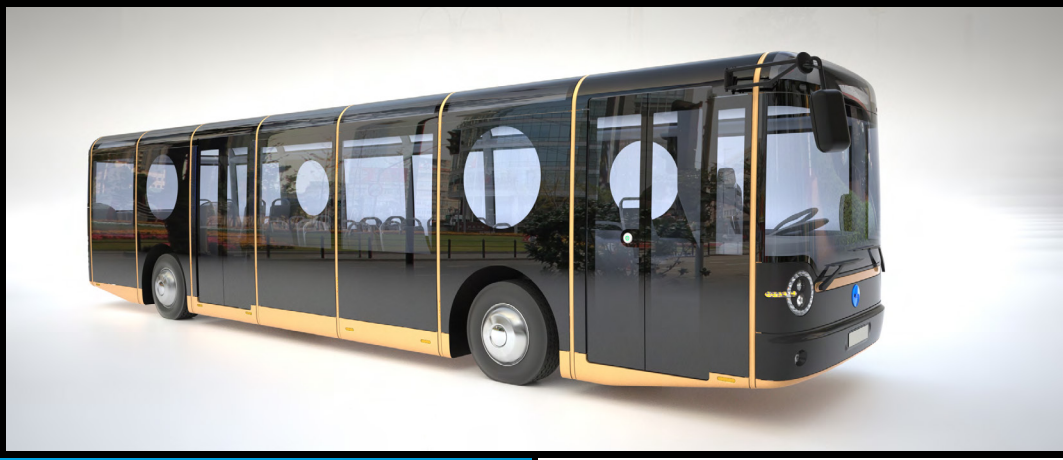

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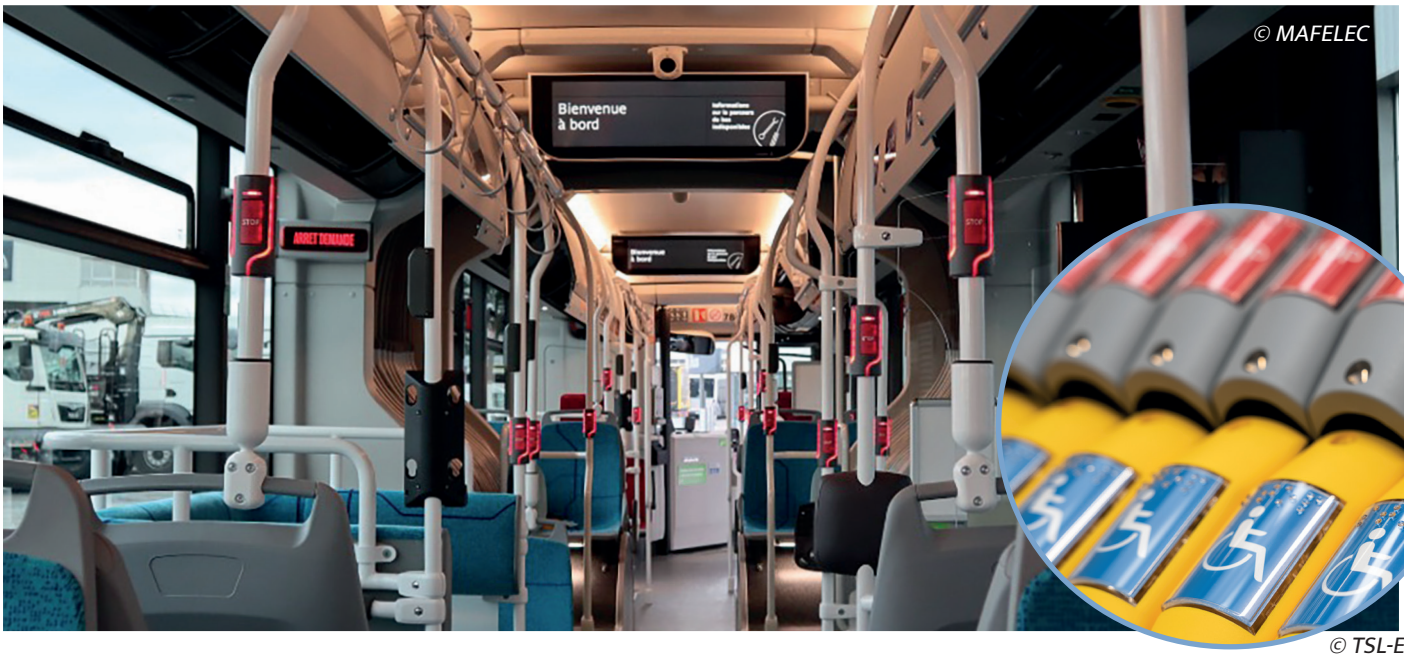
TSL-ESCHA

Handrail Buttons from TSL-ESCHA and MAFELEC

Rich in Variety and Robust



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TSL-ESCHA and MAFELEC offer a variety of handrail buttons. These are especially used in buses and trams. From simple stop request buttons up to backlit displays – these product families are very versatile.

NEW Handrail Buttons with Acoustic Feedback from TSL-ESCHA

All over the world, TSL products are installed on buses and trains. Since 2004, the HST series handrail buttons have also been onboard. Due to new customer requirements and the resulting further developments, the products are always evolving to keep up with the times.

The latest development is a variant with additional acoustic feedback. The HSTIA (the 'A' stands for acoustic) was developed with a ceramic loudspeaker for a customer project in Poland. The aim here is to provide passengers with more safety through additional acoustic feedback when the pushbutton is actuated.

Having already launched the HSTIV in 2019, a handrail button with haptic feedback through vibration, we have once again succeeded in developing a passenger-friendly solution that is readily available, easy to install, and cost-effective at the same time.

The additional illumination also helps passengers with impaired hearing identify the actuation by the colour change of the LEDs.

Long Lifespan

The big plus of the HST series is their long-term protection and long service life thanks to a sturdy housing and compact design. TSL-ESCHA is known in the market for realising many special customer requests. These include not only the new development of the HSTIA with its acoustic feedback, but also, for example, an additional contact protection against unintentional actuation.

TSL develops, manufactures and sells customised solutions. Thus, one million handrail push buttons sold is another milestone in the 35-year company history of TSL-ESCHA, of which the employees are very proud.

Highlights:

- Optional equipment with a ceramic loudspeaker for the HSTI variants
- Letter A (for acoustic) indicates this in the product name
- Acoustic feedback starts for a short time when the touch surface is pressed, so that additional feedback is heard
- More comfort and safety for visually impaired persons

Stop Request Button M-360 from MAFELEC

The M-360 is a triple push button with an innovative and elegant design that is mounted on the handrail or interior walls of all transportation vehicles requiring stop request command (buses, trolleys, trams).

The stop request function is fully accessible to all passengers (including PRM), whatever their position in the vehicle, thanks to its three large actuation and lighting zones visible at 360 degrees in the pole mounted version.

The great haptic feedback (click effect) associated with the change of lighting colour/area of all the buttons installed in the vehicle confirms that the request has been taken into account.

Mounting Forms and Variants

The M-360 is available in two types of mounting: on poles and on walls. It is delivered as a kit with its installation instructions, allowing quick and easy installation. A pole drilling gauge is available to ensure a perfect assembly of buttons in case of drilling operation directly in the vehicle (refurbishment for example).

With no visible screws thanks to its clip-on bezel, the M-360 is protected against vandalism. But it can be easily disassembled without special tools by a trained operator using the replacement instructions.

The M-Safe variants of antimicrobial actuator protection and touchless activation will be available in the near future to meet the growing need for enhanced hygienic security.

Highlights:

- Contemporary innovative design
- 360-degree functionality: three actuators/backlit areas
- Surrounding ultra slim design: 8.5mm thickness
- Invisible fixing elements
- Visual feedback detectable for colour-blind people
- Lit areas visible in daylight
- Fully customisable: colours, marking and lighting
- M-Safe options coming soon

Scan the QR code to contact Claudia Dix, Head of Marketing

TSL-ESCHA

Scan the QR code to contact Romain Duchene, Product Manager

MAFELEC

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Hand Rail Buttons

Member of the MAFELEC TEAM

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