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SAFE TRAVELS
ALL-ROUND SERVICE FOR SBB EUROCITY-CARS

COOLING REINVENTED
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IMPULSES FROM CHINA
CHONGQINGS INFRASTRUCTURE EXPANSION

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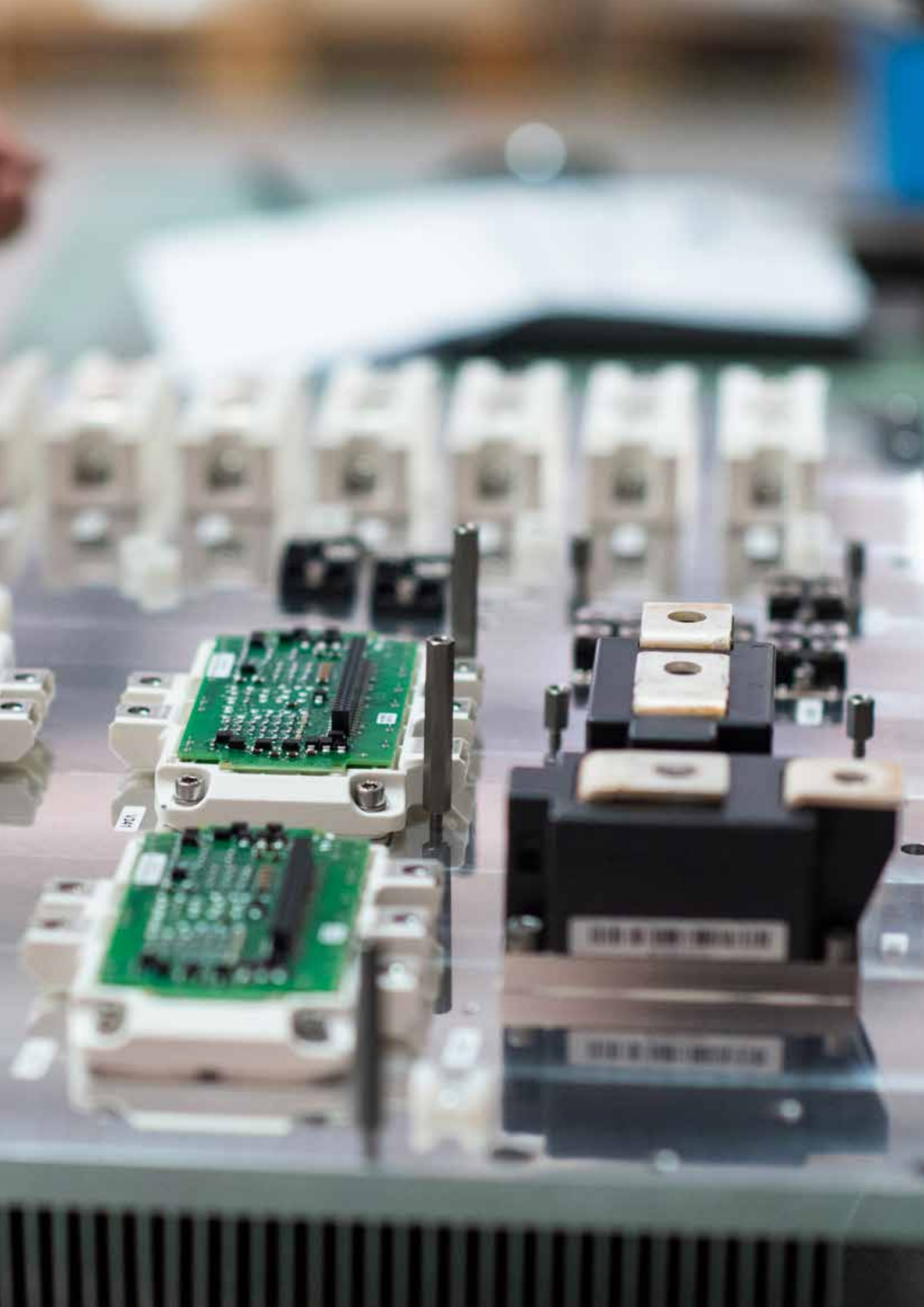

DEAR READER,

The Covid pandemic has dominated our lives during the past months, and it has had a very tangible impact on rail travel. Train schedules were pared down, fleets were mothballed and new acquisitions were postponed. The effects have been felt in our industry, too.

As the pandemic is receding, we are looking forward to a significant recovery. The rail-based transport of passengers as well as goods remains an important factor for achieving the climate goals. Innovations such as battery or hydrogen trains help reduce emissions. And we want to do our part.

The new SMARTconverter LIGHT is our tailor-made product for trams and light-rail rolling stock. It is light-weight and efficient, quiet and maintenance-free. We will continue on this path and contribute to the attainment of the climate goals.

We hope you will enjoy the read.

Dirk Wimmer
General Manager at Dinghan SMART Railway Technology GmbH

NEWS

ADIEU

Almost 1,000 SMARTchargers have been delivered to Alstom for the TGV high-speed train since 2006. Now, with the end of series production of the TGV, the end of series delivery of the battery chargers is also approaching. Incidentally, the area of application of the proven SMARTcharger is in the characteristic feature of the TGV, the "train à grande vitesse" - the power car. All series of this high-speed train have in common that the trains consist of two power cars.

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PERSISTENT

Advantage sustainability: Alstom ordered a total of 108 SMARTconverters of type 127 kVA + 18 kW for Metropolis trains in recent months. They will be used on lines 1 and 3 of the Barcelona metro. Deliveries of the proven auxiliary power converters, which are characterised by high energy efficiency and easy maintainability, began as early as 2020.

WELCOME

"Flexibility" and "openness": At Dinghan SMART, these corporate values are not just plastered on office walls, but are lived by the staff. The Corona pandemic has shown us how important agile and transparent action was and is. Now, a good year and a half after the outbreak of the pandemic, we are happy to be able to sit together in offices again. A high vaccination rate and the corresponding hygiene regulations allows us to. Therefore: We look forward to seeing you again.

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CUSTOM-FIT

With the Michigan-based company PSI Repair Services, Inc., Dinghan SMART Railway Technology GmbH now offers a fast, local service for spare parts, repairs and services - tailored to customer requirements in the USA. Customers can thus be supported quickly and professionally on site.

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SAFE TRAVELS

ALL-ROUND SERVICE FOR SBB EUROCITY-CARS

All-round service: maximum availability is the guiding principle for the preventive inspection of the Eurocity-cars auxiliary power converters.

Years of trusting cooperation have now culminated in a service agreement that is perfectly tailored to the customer's needs: for more than ten years, Dinghan SMART has been looking after the multi-voltage auxiliary power converters installed in the Eurocity-cars of Swiss rail operator Schweizerische Bundesbahnen (SBB). When SBB was looking for greater availability in day-to-day train operation, a service agreement that reduces downtimes and makes costs more predictable was created in 2018.

SBB and Dinghan SMART have concluded a service agreement, which was preceded by an in-depth investigation into what the optimal support for the customer regarding the maintenance of their auxiliary power converters would look like. The technology of these SMARTconverters is complex because they are multi-voltage enabled. Each unit encompasses a high-voltage converter that handles different input voltages up to 5,000 V DC and generates a galvanically separated DC link with +/- 400 V DC; a battery charger that supplies the DC loads; and an inverter for the air-conditioning system and other AC loads. The complexity, age and condition of the auxiliary power converters were crucial criteria for the details of the service agreement.

The service agreement takes the form of a ‘repair flat rate’ for the 248 auxiliary power converters in daily use. The benefits of this agreement for SBB are self-evident: the availability of the rolling stock, which was already

Technical Data

Auxiliary power converter
for SBB Eurocity-car

Input voltage	1 kV AC, 1,5 kV AC and DC, 3 kV DC
Output voltage	3 x 230/400 V AC, 50 Hz, 57 kVA, 36 V DC, 16 kW
Dimensions	2,500 x 960 x 580 mm

high, will increase even further thanks to the guaranteed, fast turnaround of repair jobs, and the monthly repair costs are completely predictable.

This allows SBB to create a fixed budget for repairs of the auxiliary power converters. Dinghan SMART guarantees the fastest possible delivery times for its Swiss premium customer. The flat rate guarantees a repair turnaround time of max. 30 working days. Customs clearance and transport times are also factored into the details of the service agreement. The quick response time is made possible in part by keeping a customer parts store. In the event of a necessary repair, the auxiliary power converters are also preventive and competently inspected. When necessary, the preventive replacement of parts that are subject to wear is included. This means that for example seals and buffer batteries, fans and, where applicable, contactors and relays undergo a thorough inspection in the course of the repair work. Because a low failure rate and the highest possible availability of the auxiliary power converters is the common goal.

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CARIBBEAN CLIMATE

SMARTCONVERTER REDUCES EMISSIONS

The underground was inaugurated in 2008 and continuously expanded since.

The SMARTconverter 3 has been supporting public transport operators worldwide for years in their efforts to increase energy efficiency. Its light weight and the use of ultramodern components help it achieve excellent energy efficiency. This makes the auxiliary power converter the top choice for railway projects with a focus on climate protection. The Caribbean region is no exception.

The discussions and agreements concerning worldwide climate protection targets frequently fail to give recognition to smaller countries, even though climate protection measures applied in these countries are often highly effective (relative to their economic power). One such 'hidden champion' is the Dominican Republic. The country is aiming at a 27 % emission reduction within this decade.

In the Dominican Republic, the transport sector accounts for about 15 % of greenhouse gases, making it the third-largest emitter. At the same time, the transport sector is worldwide the sector in which effective climate protection measures are hardest to implement. Nonetheless, eleven out of 46 climate protection measures are slated to be implemented in the transport sector. The most important among these measures is the expansion of the underground system in Santo Domingo, the capital. The system was inaugurated

Santo Domingo is the largest city in the Caribbean.

Technical Data

Auxiliary power converter
for Santo Domingo Metro

Input voltage	1,500 V DC
Output voltage	3 x 230/400 V AC, 50 Hz 127 kVA 72 V DC, 18 kW
Dimensions	2,000 x 750 x 560 mm

in 2008 and has been continuously expanding since. Currently, two underground lines carry on average more than 160,000 passengers daily. An increasing demand is expected. The goal of the proposed climate protection measure is to carry 700,000 passengers daily by 2030, thus saving a total of 2,000 tons of CO_2.

The fleet of the underground system plays a central role for these targets. It consists of Metropolis trains made by Alstom. Alstom is the largest European manufacturer of rolling stock and in this role, the company is conscious of its global responsibility and has made environmental and climate protection one of its five strategic pillars. Dinghan SMART is deeply committed to supporting these goals. For more than ten years, we have been providing high-efficiency auxiliary power converters for Metropolis rolling stock.

The SMARTconverter 3 is being used in underground systems in Latin America, and as of 2020, this includes Santo Domingo. The SMARTconverter type 127 kVA + 18 kW achieves a peak efficiency of up to 95 %, thus contributing to the low power consumption of the trains, even though its size is small compared to other train components. In this way it demonstrates that good things often come in small packages, just like its host country.

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COOLING REINVENTED

SMARTCONVERTER LIGHT REDUCES EFFORT

Efficient, low-cost, sustainable: the requirements for the electrical equipment in rolling stock are becoming more and more demanding. The medium-frequency galvanic separation technology of Dinghan SMART has been foundational for highly efficient, light-weight and energy-saving auxiliary power converters. And today, new power semiconductor technologies such as silicon carbide (SiC) open up new opportunities.

In addition to these new technologies, the focus on costs in public transport has been a major factor in the design of the newest device, the SMARTconverter LIGHT. The main emphasis is on the operating and maintenance costs. Wolfgang Lauss, Systems Engineering Manager at Dinghan SMART, oversaw the development of the new unit with a view to cost drivers. It was the cooling system of the new auxiliary power converter that received particular attention.

What does the SMARTconverter LIGHT stand for?

The SMARTconverter LIGHT is our new standard system for trams and light-rail rolling stock, in other words for rolling stock that is on the ‘light’ side. This type of rolling stock needs significantly less power than larger trains, such as underground or suburban trains which are equipped with the SMARTconverter 3. A brand new feature of the SMARTconverter LIGHT is the more efficient design of the cooling system, which is among the main cost drivers in the operation of auxiliary power converters. We eliminated the forced-air cooling and its associated components such as fans, air filters and air ducts. This reduces the weight, the need for maintenance and of course the number of components that could fail. SiC technology is the key.

So how does that work?

Well, strictly speaking we cannot eliminate the fans completely. The problem with classic auxiliary power converters is that they are typically built for maximum power, but only need this maximum power in the event that another auxiliary power converter in the vehicle has failed. It's kind of like your car. Most of us drive cars that could do up to 200 km/h. But how often do we use this kind of performance? Still, we ‘spoil’ on a large engine – only to roll slowly from red light to red light in rush-hour traffic. We are trying to tackle this contradiction. The SMARTconverter LIGHT is designed for urban traffic, but it can also operate in sports mode for brief periods of time. We call this efficiency operation. The system runs at the optimal operating point. In practical terms, this means that in ‘efficiency mode’, the cooling system uses only the headwind; but for ‘power mode’, there are additional fans that allow the customer to switch to full power when needed, for example at tropical temperatures.

What does this mean in concrete terms?

To put it concisely: saving on energy costs and achieving greater reliability.

Why is it called ‘LIGHT’?

This is the ‘light’ rolling stock product segment. But ‘LIGHT’ means more: we are eliminating everything we don't need. We use small, compact modules, a converter developed using light-weight construction methods with a design that is as simple as a shoebox.

What other benefits are there?

No maintenance is required. In my opinion, this is the most important aspect: if all goes well, the system is mounted on the roof on day one, there's a quick inspection after 15 years, and after 30 years it is scrapped together with the vehicle. No special cleaning, no checking, no regular inspections, no fan replacement. That is what the SMARTconverter LIGHT stands for.

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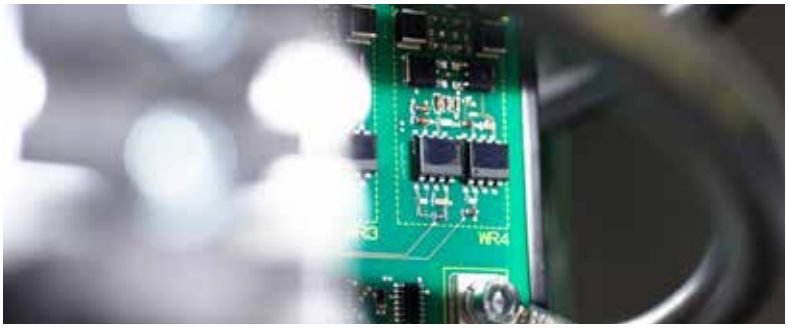
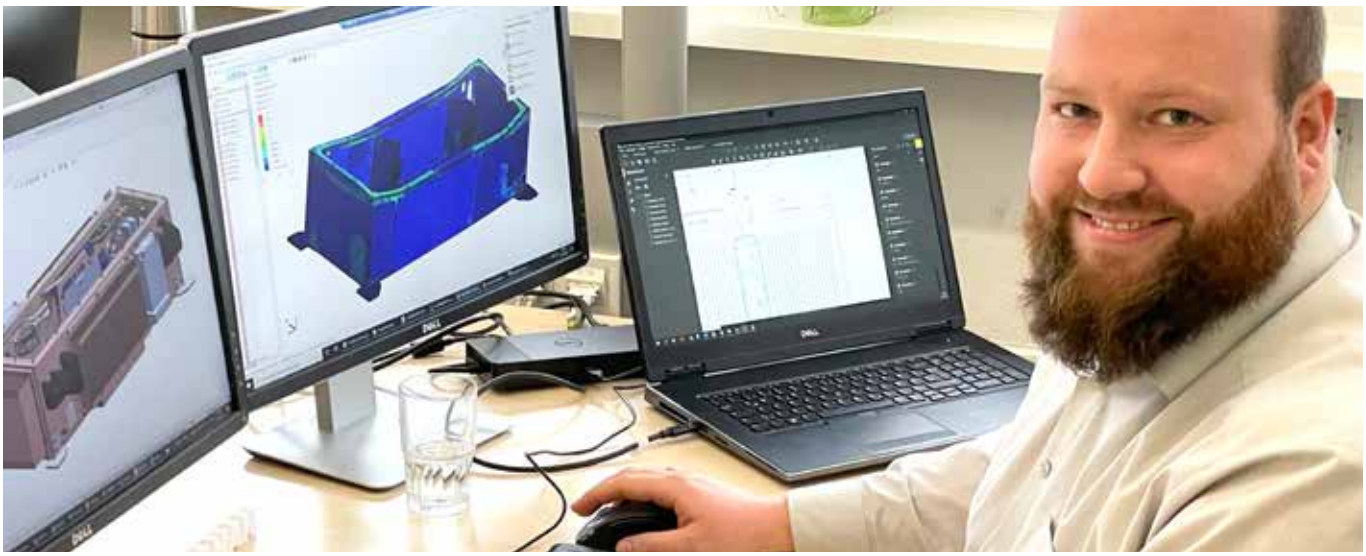
Interview with Wolfgang Lauss





IMPULSES FROM CHINA

CHONGQINGS INFRASTRUCTURE EXPANSION

Chongqing is located deep inland at the confluence of the Yangtze and Jialing Rivers; with 32 million inhabitants, it may well be the largest city in the world.

China is pressing ahead with its expansion of rail-based public transport. In addition to creating the largest high-speed rail network carrying the largest number of passengers in the world, another focal point is the expansion of urban public transport in the metropolitan areas. From a European perspective, this effort appears to be dominated by the coastal megacities. But is that really so?

Let's have a look at Chongqing. It has 32 million inhabitants, which may well make it the largest city in the world. It is located deep inland at the confluence of the Yangtze and Jialing Rivers. Despite the great distance, a direct high-speed rail link between Chongqing and Chengdu as well as Guangzhou was created in 2018. The expansion of rail-based public transport in Chongqing is progressing at record speed. The underground was started in 2005; by the end of last year, eight lines were already in operation, encompassing a total of 370 km of track.

This rapid expansion becomes truly astonishing when considering the geographic conditions. Not only is Chongqing densely populated – there are also mountains and deep river gorges criss-crossing the terrain. These are anything but ideal preconditions for rail-based public transport. In view of these circumstances, different solutions have been adopted. For example,

Technical Data

Auxiliary power converter
for Chongqing Metro

Input voltage	1,500 V DC
Output voltage	3 x 220/380 V AC, 50 Hz
	120 kVA
	125 V DC, 20 kW
Dimensions	2,000 x 750 x 560 mm

Chongqing is home to the deepest underground stations in China. These platforms are almost 100 metres below the ground. In order to cross the rivers, the longest and highest railway bridges in China were built. Furthermore, some lines are realized as rubber tyre monorail systems because these can handle steeper inclines. This has resulted in the longest monorail system in the world – well over 100 km – carrying the largest number of passengers.

Still, the majority of the lines use conventional underground rolling stock. One such example is line 4: it was inaugurated in 2018 with just under 16 km of length and is currently being expanded by about 32 km.This expansion means that new rolling stock is needed: 36 underground trains with six cars each are being built. The auxiliary power supply is a new design feature for these units. Each underground train is fitted with four SMARTconverters with a power output of 120 kVA and 20 kW. To ensure reliable operation, the four SMARTconverters inject power in parallel into common AC and DC networks. The total number of 144 SMARTconverters is being manufactured at Guangzhou Dinghan in Jiangmen.

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ISLAND NATION CONNECTS

JAKARTA'S GROWING LIGHT-RAIL SYSTEM

As of June 2021, the building progress of the LRT Jakarta Phase 1 has reached 84.7 per cent according to official sources.

The Greater Jakarta LRT or Jabodebek LRT is a light-rail system that is under construction in the metropolitan region of Jakarta, the capital of Indonesia. The infrastructure expansion realized through this project will connect the city centre with the suburbs on the island of Java. Jabodetabek (formerly Jabotabek) is the common acronym for this region encompassing the cities of Jakarta, Bogor, Depok, Tangerang and Bekasi as well as their associated districts. The name Jabodetabek is composed of the initial letters of the five city names.

The original plan was for the new light-rail system to go into operation in 2019; however, there have been delays and the date got pushed out to June 2022. As of June 2021, the building progress of the LRT Jakarta Phase 1 has reached 84.7 per cent according to official sources. The project is controlled by the central government; the system operator is 'PT Kereta Api Indonesia' (PT KAI), the only operator of public railway systems in Indonesia. The company is fully publicly owned and pays the track access charges to the government.

The rolling stock is supplied by PT Industri Kereta Api (PT INKA), a state-owned Indonesian manufacturer of rolling stock for the domestic market as well as for export to neighbouring countries. PT INKA enlisted the support of Spanish manufacturer

© Kumparan

Technical Data

Auxiliary power converter
for Jabodebek LRT

Input voltage	750 V DC
Output voltage	3 x 220 / 380 V AC, 50 Hz
	140 kVA
	72 V DC, 20 kW
Dimensions	2,000 x 750 x 560 mm

CAF Power & Automation who supplied the traction converters and added a total of 62 SMARTconverters 3 as the perfect complement to the package.

Designed for temperatures up to + 40°C and with a power output of 140 kVA + 20 kW for 750V DC and 110 V DC of battery voltage, the SMARTconverter 3 is demonstrating its usual excellent performance even under the challenging climatic conditions in south-east Asia. This compact, light-weight and cost-optimized auxiliary power converter offers a high degree of standardization combined with optional features, creating a flexibility that allows for its use both for bespoke projects and for platform-based applications.

The SMARTconverter 3 servicing concept is based on a reliable and easy-to-replace system. With a view to maintenance and servicing, the main features include easy-to-handle components that are defined as LRUs (‘line replaceable units’) and can be replaced in the course of corrective maintenance. This maintenance concept has proved its worth once more in this project.

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SERVICE & EXHIBITIONS

Service

Our service line is available to provide expert advice.

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If you have any questions or need support, we will be glad to receive your e-mails.

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Exhibition dates 2022

Rail Solutions Asia

2022/06/22 – 2022/06/24
Kuala Lumpur Convention Centre
Kuala Lumpur, Malaysia

InnoTrans

2022/09/20 – 2022/09/23
Exhibition Grounds Berlin
Berlin, Germany

OUTLOOK

Digital Support

Auxiliary power converters are complex systems that can be challenging to maintain and set up. Every auxiliary power converter has an integrated SMARTview that collects diagnostic data. This data can now also be collected and evaluated centrally. In this way, recomendations for action can be derived for individual units or the fleet and failures can be averted through early detection. This reduces downtimes and cuts maintenance costs.

Sustainability is Criterion

Starting in 2022, Metro Barcelona will add new Metropolis trains to its Lines 1 and 3. Local operator Transports Metropolitans de Barcelona (TMB) ordered the new rolling stock from Alstom Transport together with a SMARTconverter 3. This auxiliary power converter stands out for its low energy consumption, high recycling capability, technical reliability and ease of maintenance. The aspect of sustainability was a crucial criterion of TMB even when the initial call for tender was announced.

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