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RAILFOCUS

THE DINGHAN SMART MAGAZINE

TALENTED

TRACTION-INTEGRATED AUXILIARY POWER CONVERTER

STANDARDIZED

EFFECTIVE SOLUTION FOR CHINA

AIR-CONDITIONED

ECO-FRIENDLY COMFORT



RAILFOCUS
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DEAR READER,



We are excited to present to you the new RAILFOCUS. This is the 19th edition of our customer magazine, and the first one to be published under our new company name Dinghan SMART Railway Technology GmbH.

The acquisition by Beijing Dinghan Technology Group Co., Ltd. is creating new opportunities for our company. We are now expanding our product and service portfolio together with other companies within the group, and we are already seeing the first exciting results. For example, we developed a new battery charger with natural cooling in cooperation with our colleagues at the technology center in Shenzhen. The first units have already been shipped to customers.

We are particularly proud of our cooperation with Deutsche Bahn for the testing of CO₂ air conditioning systems. While the colleagues in Jiangmen are developing a tailor-made CO₂ air conditioning system for double-decker coaches, we are taking care of the matching auxiliary power converter.

These are just two examples. In the coming months, we will launch a whole range of new products on the market. Our broader portfolio of products and services will put us into an even better position to provide the right solutions that meet our customers' needs.

We hope you will enjoy the read.

Dirk Wimmer
General Manager, Dinghan SMART Railway Technology GmbH

NEWS

MINIMALISTIC

A big city with a small rail network: Santo Domingo de Guzmán is the capital of the Dominican Republic and at the same time the largest metropolitan area of the country with almost six million inhabitants. The Metro Santo Domingo has been around for about 10 years. Currently, the network includes two lines and 30 stations. Dinghan SMART is supplying twelve SMARTconverters of type 140 kVA + 20 kW ordered by rolling stock manufacturer Alstom.



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FLOURISHING

Spanish rolling stock manufacturer CAF ordered another reliable 176 SMARTconverters 3 from Dinghan SMART Railway Technology GmbH; the units will be used with CAF's Civity platform.

These auxiliary power converters – like the 236 auxiliary power converters before them – will be used in the Sprinter New Generation (SNG) of Dutch operator Nederlandse Spoorwegen (NS). The delivery of the auxiliary power converters will start in 2020.



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SUSTAINABLE

Another prestigious award for Dinghan SMART Railway Technology GmbH: The sustainability assessment platform EcoVadis improved the scorecard and awarded the silver medal for commitment to corporate social responsibility (CSR).

Dinghan SMART thus demonstrates the sustainability of its supply chain and is among the leading global suppliers.



INSPIRING

A meeting of project managers: Peter Danzer (right, Deutsche Bahn) and Ron Rahim (Dinghan SMART) are managing the future-oriented testing of CO₂ air conditioning systems that will make a sustainable contribution to emission reduction.

Dinghan supplies these eco-friendlier air conditioning systems as well as customized auxiliary power converters that will be used in the double-decker coaches of the 94 series. The testing of the air conditioning system will begin in early 2021 and is scheduled to take one year.



© DB

TALENTED

TRACTION-INTEGRATED AUXILIARY POWER CONVERTER



Summer or winter: The TALENT 3 electric multiple-unit train with traction-integrated auxiliary power converter traveling through Tyrol.

The mobility sector is going through changes. It is becoming increasingly clear that the goals defined by the Paris Agreement on climate change can only be achieved if a large share of transportation shifts from road to rail. In particular, passenger travel using mass transit such as regional trains is a lot more climate-friendly – and thus more energy-efficient – than private transport. This energy efficiency is what needs to be advanced.

For this reason, the crucial environmental protection benefit does not just come from shifting traffic from the road onto the railway. Increasing the energy efficiency of the rolling stock must be a top priority. This increase is heavily influenced by the reduction of the vehicle weight

as well as greater efficiency of the systems involved – such as the systems for on-board power supply. A recent successful example for this approach is the TALENT 3 of Austrian operator Österreichische Bundesbahnen (ÖBB).

ÖBB ordered a delivery of TALENT 3 electric multiple units from rolling stock manufacturer Bombardier. A framework contract for the delivery of 300 units was concluded. The first releases of 21 units have already been ordered for the state of Vorarlberg; another 25 units of the ‘Cityjet’ model will be delivered to the state of Tyrol.

Bombardier is committed to increasing the energy conversion efficiency of its products. To this end, the

TALENT 3 units for ÖBB are using medium-frequency auxiliary power converters made by Dinghan SMART. Two converters per unit provide a redundant power supply for the train.

For these systems, Dinghan SMART relies on the familiar SMARTconverter 3 technology – in this project, it comes as a customer-specific solution. Based on the functional principle of the medium-frequency auxiliary power converter, it was possible to integrate it into the traction system. As the units are no longer separate, synergies can be realized with the traction system. The auxiliary power converters no longer require separate housings or cooling equipment. This reduces the weight of the vehicle.



Technical Data

Traction-integrated auxiliary power converter

Input voltage	1,800 V DC
Output voltage	3 x 230/400 V AC, 50 Hz
	205 kVA
Installation	Module for integration

The first ‘Cityjets’ have already shipped. Since late 2019, the trains of the TALENT 3 platform are being test-driven for acceptance. Their efficient use in public transportation is expected to begin as early as 2020.

✉ Christof.Maahsen@Dinghan-Germany.com

STANDARDIZED

EFFECTIVE SOLUTION FOR CHINA



The final assembly of the SMARTconverters is done at the Jiangmen production site.

The SMARTconverter 3 was developed as a flexible and globally usable product for electric multiple-unit trains. The requirements of the major international markets were taken into account during development. What makes the SMARTconverter 3 particularly interesting to Chinese customers is its high efficiency coupled with its light weight and high reliability.

China is engaged in a consistent and dynamic advancement of its infrastructure. In addition to the expansion of its high-speed network – already the largest in the world – China focuses in particular on expanding the public transport infrastructure in the metropolitan areas.

Subways and suburban railway systems for rail-based transport are prioritized because of their high passenger-carrying capacities. Almost every week, a subway or suburban railway system is opened or expanded somewhere in China.

In addition to providing the necessary passenger capacities, sustainability is receiving more and more attention. This trend towards resource-saving mobility manifests itself not just in the rising number of electric cars; the requirements for rolling stock are also changing accordingly. Particular emphasis is placed on electric energy consumption, which in turn translates into increasing requirements with regard to efficiency



The SMARTconverter for the Guangzhou-Foshan Metro.

and system weight. Against this background, it makes perfect sense that Chinese customers, too, would like to use the SMARTconverter 3.

However, Chinese customers expect a high degree of flexibility from their suppliers as well as the quick implementation of customer demands. Meeting these expectations requires physical proximity to the customer. This can only be achieved if application development, manufacturing and service are performed in China. For this reason, the corresponding capacities have been created at the Jiangmen production site. Jiangmen is located in Guangdong province. It is a 30-minute trip from Guangzhou by high-speed train.

Technical Data

Auxiliary power converter for metro

Input voltage	1,500 V DC
Output voltage	3 x 220/380 V AC, 50 Hz
	155 kVA
	110 V DC, 20 kW
Dimensions	2,300 x 750 x 560 mm

After investments in the site, the inaugural project there was completed in early 2020: the customization and final assembly of the SMARTconverter performance class 155 kVA + 20 kW for the expansion of Line 1 of the Guangzhou-Foshan Metro in Jiangmen. By now, all auxiliary power converters have been delivered, installed, and put into operation. The new trains are in the test operation stage in Guangzhou.

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AIR-CONDITIONED

ECO-FRIENDLY COMFORT

Anyone who uses public transport appreciates comfortable passenger spaces: cozy seats, generous leg room and more than anything, pleasant air conditioning in the train. But especially the temperature needed for the comfort of passengers requires air-conditioning systems with refrigerants that are harmful to the environment because they are fluorinated greenhouse gases whose emissions contribute to global climate change. This issue can be addressed through the use of “natural” refrigerants such as carbon dioxide (CO₂) and the commitment to drive the change.

A joint project of Deutsche Bahn (DB) and the air-conditioning system maker Guangzhou Dinghan Railway Vehicles Equipment Co., Ltd., (another subsidiary of the Dinghan Group) is testing an air-conditioning system that uses carbon dioxide as refrigerant. Sebastian Kaemling, Head of Customer Sales and Service, manages the project that has just been kicked off; he is keenly interested in refrigeration engineering.

Why exactly is action needed more urgently at this point in time?

Both the current climate debate and stricter EU regulations demand a shift in how we think about the use of conventional refrigerants, such as the fluorinated greenhouse gases mentioned earlier. Which refrigerant is used has a major impact on the eco-friendliness of the air-conditioning system. But high energy efficiency is just as important. In the project with DB, we are combining an environmentally friendly air-conditioning system with a highly efficient auxiliary power converter. By using ultra-modern power semiconductors, we were able to significantly increase the energy conversion efficiency of our auxiliary power converters, which were already highly efficient to begin with. This allows us to create great synergies: We reduce the emissions by using a natural refrigerant in the air-conditioning system, and our new auxiliary power converter reduces the power consumption at the same time. The result is great eco-friendliness as well as resource conservation.

Are there any alternatives to the use of refrigerants?

There is no alternative to refrigerants as such; the functional principle of an air-conditioning system simply demands them. But there are refrigerants with high or low global warming potential (GWP). The higher the GWP value, the more harmful to the climate the respective substance is.

What does that mean in concrete terms?

Here is a simple calculation example: The CO₂ equivalent of R134a, a commonly used refrigerant, is 1430 over a period of 100 years. This means that within the first 100 years after it is released, the contribution of one kilogram of R134a to the greenhouse effect is 1,430 times greater than that of one kilogram of CO₂. So the emission of 1 kg of R134a corresponds to the emission of 1,430 kg of CO₂.

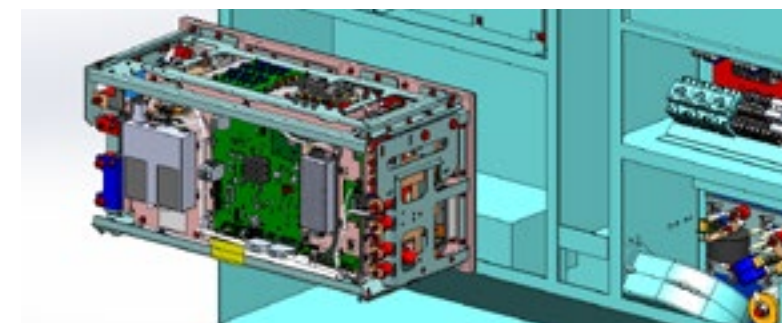
What are the challenges your project is facing?

In order to test the climate-friendly supply under extreme conditions, together with DB we selected a double-decker coach of the 94 series (Dosto 94) as our test vehicle. In this car, the air-conditioning system and the auxiliary power converter must fit into a really tight space. The heavy use of the double-decker coaches for daily passenger services demands high air-conditioning performance.

Where and how are the tests conducted?

Some of the testing is done in Kassel, but we are also using the climate chamber of the DB Systemtechnik engineering team in Minden for several weeks. This will be followed by one year of field testing at DB Regio in cooperation with Südostbayernbahn in Bavaria. We are excited and look forward to the results – always in line with environmentally friendly mobility.

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Interview with Sebastian Kaemling



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ADAPTED

SMARTCONVERTER FOR URBAN AREAS



Large amounts of earth had to be moved for the expansion of the infrastructure in Klang Valley, Malaysia.

Malaysia’s economic capital Kuala Lumpur is booming and the development and expansion of the city’s infrastructure is being driven forward at full speed. For many years, the construction of subway and overground train lines has shaped the image of the alluring metropolis. An urban area that will now soon be welcoming the SMARTconverter, thanks to the decision made by the Asian vehicle manufacturer Hyundai Rotem to introduce the auxiliary power converter in Kuala Lumpur in 2021.

Kuala Lumpur overflows almost seamlessly into the wider Klang Valley area. This area alone has around eight million inhabitants. And this number is expected

to increase to almost ten million by 2030. In order to deal with this significant increase in passenger volume, Malaysia is developing and expanding the infrastructure of the city and its surrounding areas. In addition to the existing, modern city railway, the first subway line, which is 51 kilometers long and has 31 stations, was completed in 2017. The construction of the second line has also just recently begun. It will be 52 kilometers long – 13.5 kilometers of which are underground – with 37 stations, so quite similar to the first line in terms of size.

The Korean manufacturer Hyundai Rotem received the contract for the vehicles and depot equipment for these lines as part of a consortium. They manufactured a fleet



consisting of 49 driver-less vehicles. In accordance with the requirements of a localization program, these vehicles were manufactured on site in Malaysia. The vehicles are in near constant use and travel at speeds of up to 100 km/h. They can carry over 1,000 passengers. For this, Hyundai Rotem needed a powerful and reliable auxiliary power converter. The vehicles are now all equipped with a 98 SMARTconverter type 150 kVA + 25 kW. Auxiliary power converter are an adaptation and are based on the SMARTconverter 3.

This system also scores points when it comes to operating with high temperatures: In Malaysia, this SMARTconverter has proven its reliability by working



Technical Data

Auxiliary power converter for metro

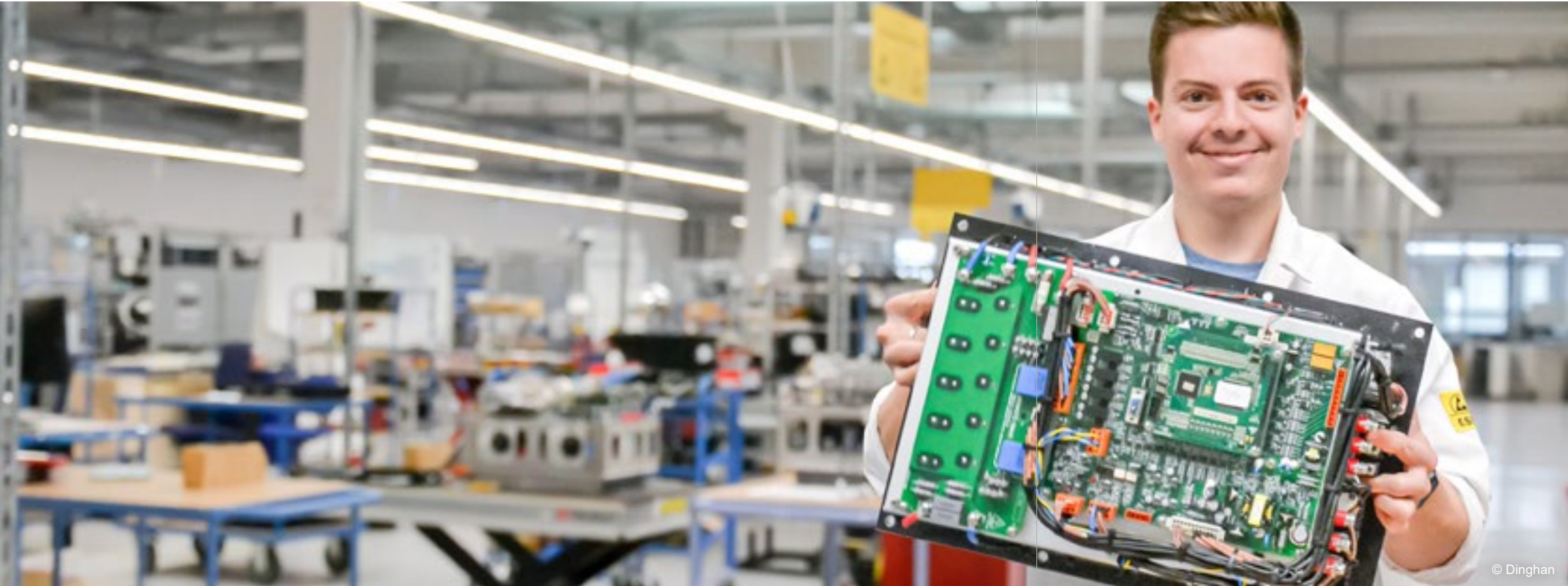
Input voltage	750 V DC
Output voltage	3 x 240/415 V AC, 50 Hz 150 kVA 110 V DC, 25 kW
Dimensions	2,300 x 750 x 560 mm

effectively at high ambient temperatures. The auxiliary power converter used in Kuala Lumpur are designed to constantly cope with the high temperatures, often over 30 °C, and high humidity.

Thus, the device continues working in an energy-efficient and effective way and does not break down. Overall, the tried and tested design wins over customers. Not least because the device is incredibly easy to maintain and has low life-cycle costs – even the adapted version.

UNCOMPLICATED

BATTERY CHARGER WITH NATURAL COOLING



A handy battery charger: The SMARTcharger is available as integration module or as stand-alone device for on-roof or underfloor installation.

The new SMARTcharger is simply uncomplicated. The battery charger was developed with a strict focus on maintenance-free, silent operation. But it is still a standard device allowing for great flexibility of use. Whether as built-in module or as stand-alone device for on-roof or underfloor installation – the new SMARTcharger can do it all.

The new battery charging module is the perfect addition to the Dinghan SMART product portfolio. It is a real all-rounder with great flexibility for use in many configurations. The development took into account the requirements both of the rolling stock manufacturers and of the railway operators. Rolling stock manufacturers in particular are looking for flexibility and ease of


installation. For this reason, we created a standardized solution with 10 kW of power as a module for integration, and with up to 20 kW of power as stand-alone unit for installation on the roof or under the floor.

If more power is needed, additional battery chargers can be connected in parallel. Thanks to its high efficiency, the battery charger uses only natural cooling. It does not need any fans, air filters or air ducts, which makes integration even easier. Since it has no moving parts on the outside, the battery charger operates almost completely silently.

For the railway operators, on the other hand, repair and maintenance are of central importance. Once installed

and commissioned, the battery charger does not require any preventive maintenance.

There are no moving parts on the outside that collect dirt and need to be replaced after a few years. The excellent reliability of the battery charger means that even corrective maintenance is rarely required. The new SMARTcharger is of course also available with SMARTview, the extended diagnostics and vehicle interface. This configuration includes additional features for IT security; it permits battery management and monitoring and provides additional support for status-based maintenance.



Technical Data

Battery charger Module

Input voltage	3 x 400 V DC
Output voltage	110 V DC, 10 kW
Dimensions	485 x 320 x 220 mm

The stand-alone version of the SMARTcharger has been used by Swedish operator Västtrafik since the beginning of the year.

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SERVICE & MESSEN

Service



Our service line is available to provide expert advice Monday through Friday from 7:30 a.m. to 4:00 p.m. (CET).

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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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RAIL SOLUTIONS ASIA

2020/08/12 – 2020/08/14
Kuala Lumpur Convention Centre
Kuala Lumpur, Malaysia



INNOTRANS 2021

2021/04/27 – 2021/04/30
Exhibition Grounds Berlin
Berlin, Germany

OUTLOOK

Top topology!



Temperature sensor cabling and in the background, a test bank of fans: This is what the prototype of the SMARTconverter DC looked like. This input converter with 100 kW of power for a wide range of DC or AC applications is a real all-rounder. The input converter is powerful, highly efficient and easy to integrate. It passed the tests for its first use in a Deutsche Bahn double-decker coach (Dosto) with flying colors.

SiC and now?



The availability of power semiconductors opens up opportunities for new solutions. Everybody is talking about silicon carbide (SiC). But what will this technology be able to achieve? In our next issue, you will find out how the SMARTconverter 3 and SiC make a great match.

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