

ISSUE 22, AUGUST 2022

# RAILFOCUS

THE DINGHAN SMART RAILWAY TECHNOLOGY GMBH MAGAZINE



**SPECIAL FEATURE**

DUAL-SYSTEM VEHICLES FOR HAMBURG S-BAHN

**SWEET SPOT**

SMARTCONVERTER LIGHT MEETS PUBLIC TRANSPORT GOALS

**FUTURE-PROOF**

METRO BARCELONA RELIES ON SMARTCONVERTER 3

**RAILFOCUS**  
**Railway Technology Magazine**

Publisher:

**Dinghan SMART**  
**Railway Technology GmbH**

Miramstrasse 87  
34123 Kassel  
Germany

Phone +49 561 50634-6000  
Fax +49 561 50634-6001

**Responsible for the content**

Dirk Wimmer  
Dirk.Wimmer@Dinghan-Germany.com

**Editor**  
Stefanie Schütze  
Stefanie.Schuetze@Dinghan-Germany.com

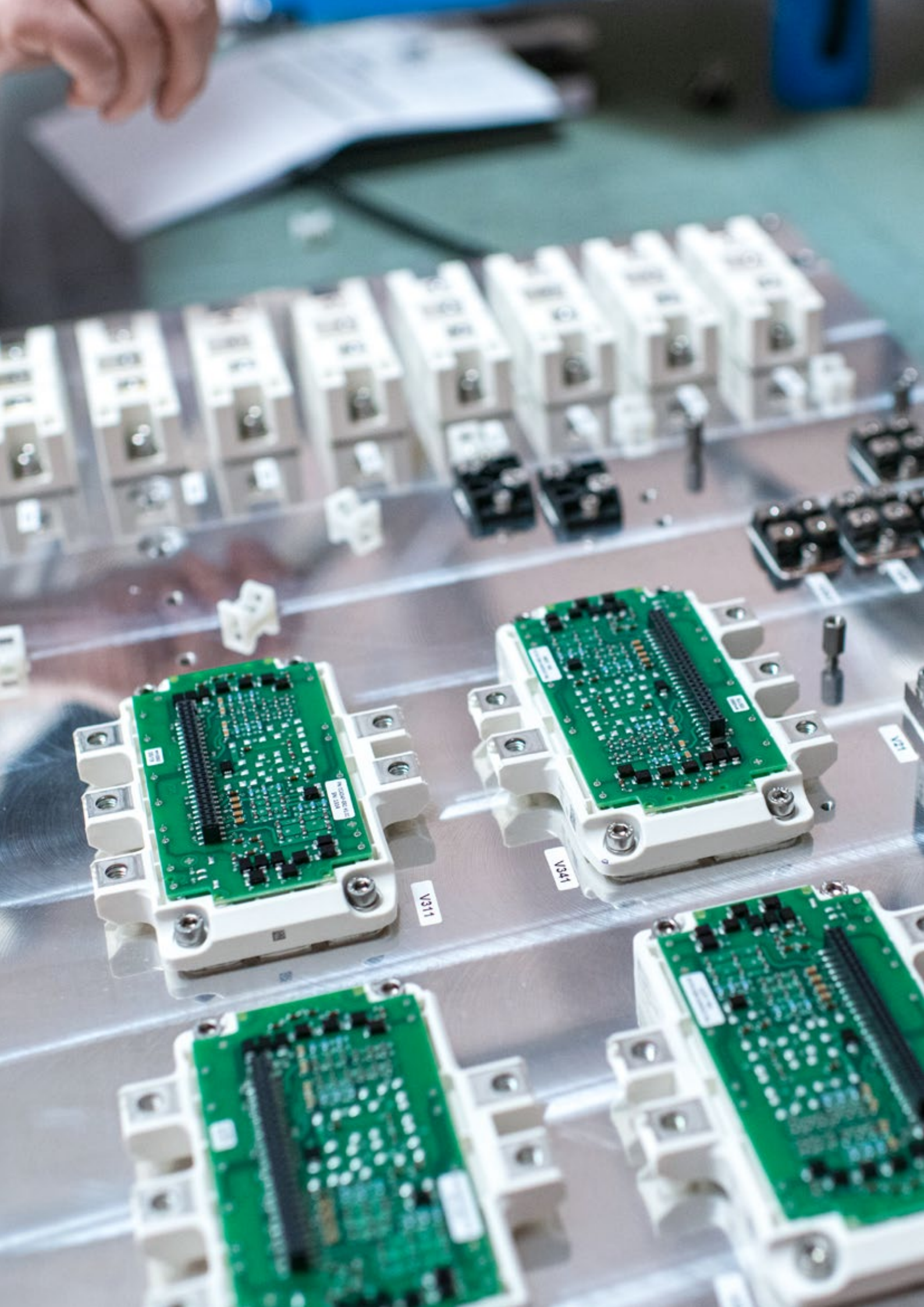
**RAILFOCUS Railway Technology Magazine** appears biannually

German edition: 250  
International edition: 250  
Cover photo: © Superalbs

All trademarks are recognized, even if they are not specifically labeled as such. No labeling does not indicate that a product or symbol is free. Duplication, in whole or part, only with the written approval of the publisher.

All rights reserved.  
© 2022 Dinghan SMART Railway Technology GmbH

<b>Editorial</b>	<b>05</b>
<b>News</b>	<b>06</b>
<b>Special Feature</b> Dual-system vehicle for Hamurg S-Bahn	<b>08</b>
<b>Sweet Spot</b> SMARTconverter LIGHT meets public transport goals	<b>10</b>
<b>Nice and Easy</b> Data helps with maintenance	<b>12</b>
<b>Green Shipping</b> Solutions for sustainable transport	<b>14</b>
<b>Future-proof</b> Metro Barcelona relies on SMARTconverter 3	<b>16</b>
<b>Service &amp; exhibitions</b>	<b>18</b>
<b>Outlook</b>	<b>19</b>



V311

V341

V31

# DEAR READER,



Exciting things are happening at Dinghan: we successfully expanded and optimized our product portfolio, and now we have also modernized our logo. The initial orders for more than 400 units of our latest product, the SMARTconverter LIGHT, have confirmed that our commitment to greater efficiency and lower energy costs has put us on the right track.

Energy efficiency has been at the top of our agenda for decades. An excellent example of this is the tried-and-tested SMARTconverter 3 for metros, urban railways and commuter trains. Its energy efficiency is renowned in the market – as evidenced in particular by the order placed by Metro Barcelona.

The SMARTconverter LIGHT – not only energy-efficient but also quiet and maintenance-free – now leverages this potential in the light-rail segment. See for yourself – perhaps at this year's InnoTrans trade fair in September?

We hope you will enjoy the read.

Alexander Schmidt  
General Manager at Dinghan SMART Railway Technology GmbH

# NEWS

## PROMISING

Toshiba Railway Europe GmbH has tasked Dinghan SMART with the complete development and delivery of prototypes and pre-series units of a traction battery system. This system will be used in the newly developed Toshiba HDB 800 hybrid locomotives for short distances and shunting. Dinghan SMART already developed and successfully delivered prototypes for a previous locomotive modernization project.



## EXCELLENT

Rolling stock manufacturer CAF ordered 73 SMARTconverter 3 auxiliary power converters for new battery-electric multiple-unit (BEMU) trains. The BEMUs will be used by German rail operators Verkehrsverbund Rhein-Ruhr (VRR) and Nahverkehr Westfalen-Lippe (NWL). For these regional BEMUs based on the Civity platform, CAF is relying on the SMARTconverter 3. This model stands out for its low energy consumption, high reliability and ease of maintenance. Deliveries will commence in 2023.



## REWARDING

Rolling stock manufacturer Stadler ordered 28 SMARTconverter LIGHT auxiliary power converters for new vehicles for the Lisbon metro. Deliveries will commence in 2022. The SMARTconverter LIGHT was developed with the goal of reducing operating and maintenance costs. The high efficiency of this light-weight, compact auxiliary power converter saves energy, and the unit is quiet and requires virtually no maintenance.



## SUSTAINABLE

Reusing instead of throwing away: this is the guiding principle at Dinghan SMART as we strive for resource-saving production and repairs. With a view to scarce resources, it has become second nature for our employees to check if used parts can be reused. We refurbish many components and give them a second life. A sustainable approach – saving money while also saving the environment.



# SPECIAL FEATURE

## DUAL-SYSTEM VEHICLES FOR HAMBURG S-BAHN



New Hamburg suburban railway vehicles such as the ET490 EMUs are dual-system vehicles.

**In 2025 and 2026, the suburban railway in Hamburg will add a total of 61 new electric Alstom ET490 multiple-unit trains to its fleet. The vehicles will be factory-fitted with the European Train Control System (ETCS) and prepared for automated operation. Also on board: Dinghan SMART water-cooled auxiliary power converters and battery chargers.**

The Hamburg suburban railway system combines with the Hamburg underground system, the Altona-Kaltenkirchen-Neumünster railway and regional trains to form a single railway system for public transport in the greater Hamburg area. Every day, the suburban railway alone carries about 750,000 passengers.

The suburban railway in Hamburg has a long history. More than 150 years ago, the railway between Hamburg and Altona started carrying the first passengers. It is still one of the major suburban railway lines today. Steam locomotives were used initially, but the first electric trains came on the scene as early as 1907.

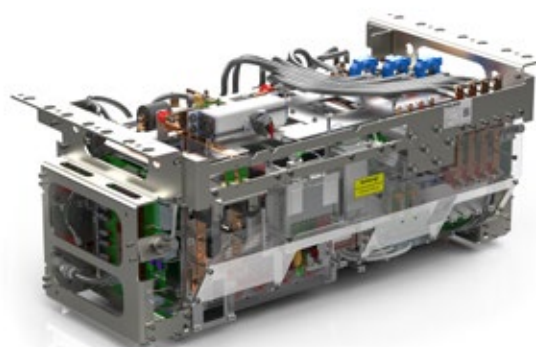
Because the suburban railway in Berlin had been very successful in using a lateral third rail for power supply, the suburban railway in Hamburg opted for the same solution. In 1939, they commissioned the first trains running on DC voltage. Unlike Berlin, however, Hamburg chose a nominal voltage of 1,200 V DC in order to support a faster starting acceleration.





This non-standard voltage is used by the Hamburg suburban railway to this day. Starting in 2007, some suburban railway lines have been extended using existing tracks of Deutsche Bahn, Germany's national railway operator. However, these tracks are electrified with 15 kV overhead catenaries with 16.7 Hz. For this reason, many of the new Hamburg suburban railway vehicles have been designed as dual-system vehicles that can take their power both from the lateral third rail and from the overhead catenary. The new ET490 is such a dual-system vehicle.

The auxiliary power converters use an input voltage of 1,200 V DC, the same voltage as provided



## Technical Data

Auxiliary power converter for Hamburg S-Bahn

Input voltage	1,200 V DC
Output voltage	3 x 400 V AC, 50 Hz 160 kVA, 157 kW
Dimensions	1,200 x 490 x 690 mm

by the lateral third rail. They are designed as water-cooled power modules, a design derived from the SMARTconverter family of products for use in the ET490. Like all SMARTconverters, these custom-made modules stand out for their light-weight, compact design and high energy efficiency. In addition, the vehicles are equipped with particularly energy-efficient SMARTcharger battery chargers whose design is based on modern silicon carbide (SiC) semiconductors.

✉ [Dirk.Wimmer@Dinghan-Germany.com](mailto:Dirk.Wimmer@Dinghan-Germany.com)

# SWEET SPOT

## SMARTCONVERTER LIGHT MEETS PUBLIC TRANSPORT GOALS



Taking the SMARTconverter LIGHT on board in 2023: new light-rail vehicles of Ruhrbahn in Essen.

**The SMARTconverter LIGHT concept is proving its worth. The goal of creating a unit with low energy consumption and low costs for operation and maintenance resulted in the development of an efficient, quiet and low-maintenance auxiliary power converter for trams. But that's not all: the high efficiency of the auxiliary power converter increases the sustainability of the vehicles in operation. And this is a requirement that is becoming more and more important for urban and suburban public transport.**

These benefits are winning over rolling stock manufacturers as well as public transport operators. For bids that were recently won, one important criterion

stipulated that the auxiliary power converters should lower the energy consumption of the vehicles through their high efficiency. With this criterion in mind, rolling stock manufacturer CAF placed an order for 102 standard SMARTconverter LIGHT auxiliary power converters for new light-rail vehicles for operator Ruhrbahn in Essen, Germany.

This light-weight, compact standard unit is not limited to specific vehicle types. It is highly flexible and adaptable and suited to a broad range of uses, such as in light-rail vehicles (LRVs). What is special about the SMARTconverter LIGHT is that its cooling system – one of the main cost drivers when running auxiliary power converters – has been made more efficient.



© Ruhrbahn GmbH

Eliminating the forced-air cooling system with its fans, air filters and air ducts reduces not only the weight but also the need for maintenance and the replacement of wearing parts.

This new 'SMARTcooling' concept is a combination of two operating modes: the SMARTconverter LIGHT is primarily designed for 'efficient mode' in urban traffic. The system runs at the optimal operating point. In practical terms, this means that the system is cooled entirely using the headwind. If more power is needed temporarily, the system goes into 'power mode' – additional fans start up that allow the customer to get the full power temporarily, for example when temperatures are very hot. These operating modes that reflect the actual demand



## Technical Data

Auxiliary power converter for LRV Essen

Input voltage	750 V DC
Output voltage	3 x 230/400 V AC, 50 Hz 75 kVA 24 V DC, 12 kW
Dimensions	1,600 x 850 x 400 mm

allow the SMARTconverter LIGHT to save energy and in particular also save wearing parts.

And the word 'LIGHT' in the product name points to another benefit: it not only refers to the light-rail vehicle segment, but also to the light-weight design of the auxiliary power converter itself. It is a simple yet cleverly designed auxiliary power converter that uses small, compact modules.

✉ [Sarah.Thoene@Dinghan-Germany.com](mailto:Sarah.Thoene@Dinghan-Germany.com)

# NICE AND EASY

## DATA HELPS WITH MAINTENANCE

**Preventive maintenance lowers the life cycle costs. Continuous monitoring and constant data analyses make it possible to recognize faults in advance and thus prevent them. At the same time, maintenance according to scheduled intervals does not always make sense and is sometimes actually unnecessary.**

This is also true for auxiliary power converters that are controlled and monitored by microcontrollers and come with built-in diagnostic systems. The collected data becomes even more meaningful when it is considered not just for each individual unit but in the context of an entire fleet. This allows for the easier detection of anomalies and early prevention of breakdowns. The anomalies may not even be located in the auxiliary power converter. Connected systems can also be monitored. Project management coordinator Sabrina Fremder explains the importance of the diagnostics unit.

### **What is SMARTview?**

SMARTview is a small computer inside our auxiliary power converters and battery chargers. It interfaces with various vehicle buses for diagnostic purposes. What is really nifty about SMARTview is that it includes a web server, which means the data can be read from any computer and without having to use any special software. A user only needs to open a browser and can start immediately.

### **What can you use it for?**

Our customers love SMARTview. It has been a standard feature of all our devices for ten years. We frequently retrofit older devices or integrate interfaces with third-party devices in order to make them accessible. No software installation is required. The use through the browser is intuitive and easy. That means users don't need to be experts in order to work with SMARTview. Data retrieval and software updates are easy to perform at any time.

### **So why the new SMARTview?**

SMARTview has been able to do much more for quite some time now. It records data, either continuously over a long period or only if specific events occur. This data contains a lot of information about the state of the devices. This enables predictions that can be used as a basis for maintenance – predictive maintenance. For our customers, this represents a huge cost savings potential. In order to leverage this potential, the data must be continuously analysed. This requires access to the data, and this requires a connection to the SMARTview unit. The technology has been there for a long time already, but for IT security reasons, we did not make this feature available in the past. The new SMARTview now includes a secure solution.

### **How exactly does that work?**

If the customer wants to, the data from each individual auxiliary power converter is collected by the built-in SMARTview unit and uploaded to a central server. This process is secure, and the data and the auxiliary power converter are protected from unauthorized access. The data is analysed and turned into concrete maintenance instructions. If desired, we even ship the necessary components and perform a detailed analysis of the exchanged part at our facility.

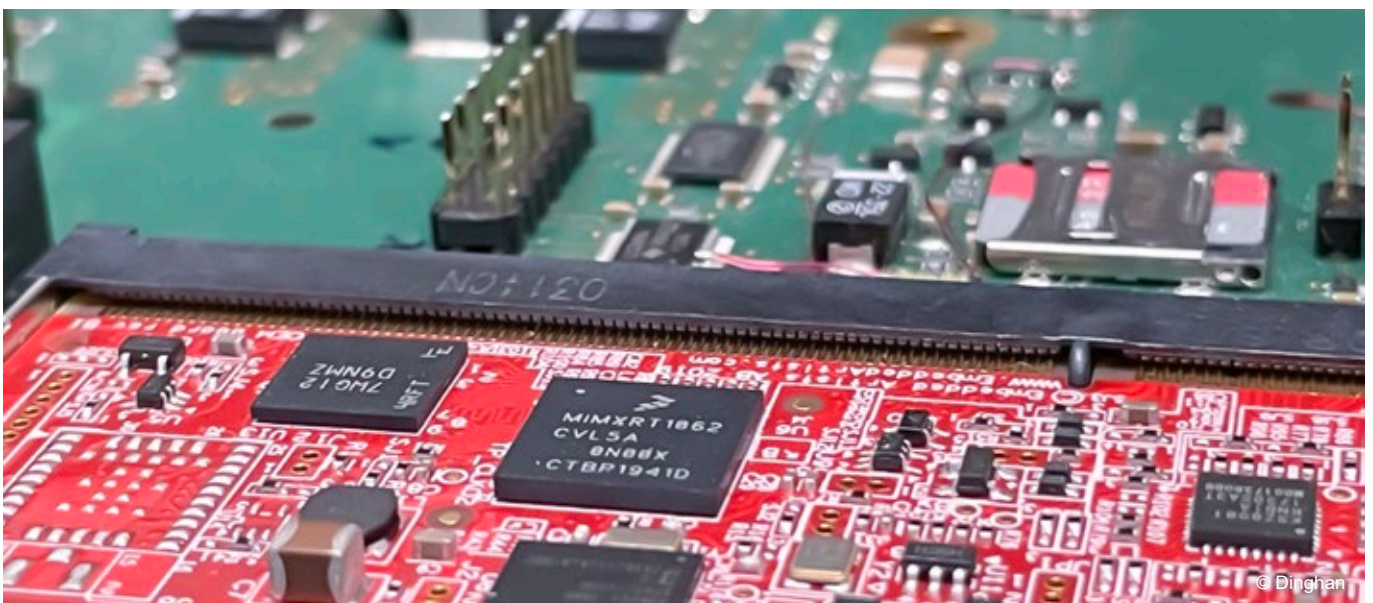
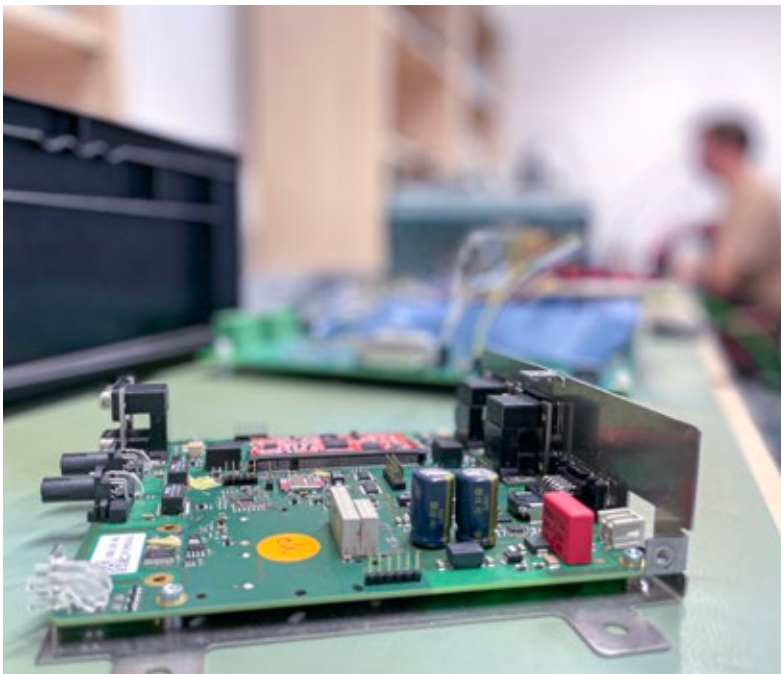
### **Have you already gathered first experiences?**

No, not yet. The new SMARTview became our new standard at the beginning of 2022 and is deployed automatically in every new project. Some time still needs to pass before the devices are in actual use for passenger transport. But even some operators with older devices have shown great interest in retrofitting the new SMARTview version. We will certainly keep you posted.

✉ [Sabrina.Fremder@Dinghan-Germany.com](mailto:Sabrina.Fremder@Dinghan-Germany.com)



Interview with Sabrina Fremder



# GREEN SHIPPING

## SOLUTIONS FOR SUSTAINABLE TRANSPORT



The master plan for rail freight transport aims at strengthening the shipping sector.

**Climate change and environmental degradation are existential threats to Europe and the world. The European Commission has presented the European Green Deal, a concept for the reduction of greenhouse gases to zero in order to become the first climate-neutral continent. Sustainable mobility is a major component. In order to reach this goal, traffic must shift from roads to railways. This is true in particular of rail freight transport.**

In Germany, the Federal Government presented a master plan for rail freight transport, a policy package that aims to increase the share of rail freight transport from currently 18 to 25% by the year 2030. Rail freight transport in particular has many advantages over road

transport. The goal is to give it the long-term strength needed to offer more competitive prices and better quality for rail-based transport services. And there is room for improvement, even with regard to solutions that are already in place.

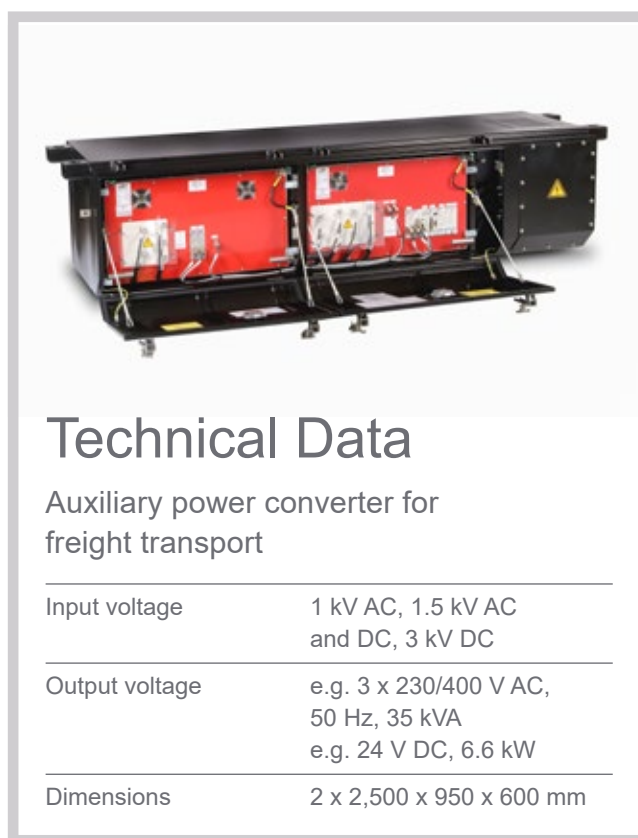
One example: temperature-controlled transports, which often use so-called 'reefers'. These are refrigerated shipping containers with air-conditioning systems. They can be supplied with three-phase AC voltage and come with a built-in diesel engine as emergency power generator. During rail transport, however, the power supply does not come from the overhead line; instead, the diesel engine is running continuously. The average consumption is 40 to 50 litres of diesel per refrigerated shipping con-



© Claus Weber/ DB

tainer per day. That is not environmentally friendly, and these CO<sub>2</sub> emissions could be eliminated.

First projects are underway that intend to tackle this issue. The idea is to use the overhead line for the power supply of the refrigerated containers. However, this requires an auxiliary power converter. This approach was used for example by Railrelease, a European mobility provider that leases wagons. They equipped an intermodal wagon with a multi-voltage auxiliary power converter made by Dinghan SMART, making it possible to supply temperature-controlled transports with power from the overhead line through the train line everywhere in Europe. This eliminates the need to use the diesel engines and creates a sustainable, efficient and



## Technical Data

Auxiliary power converter for freight transport

Input voltage	1 kV AC, 1.5 kV AC and DC, 3 kV DC
Output voltage	e.g. 3 x 230/400 V AC, 50 Hz, 35 kVA e.g. 24 V DC, 6.6 kW
Dimensions	2 x 2,500 x 950 x 600 mm

environmentally friendly solution for moving temperature-sensitive goods.

Driving such solutions forward is an important step towards making rail-based goods transports even more competitive and environmentally friendly.

✉ [Joachim.Bierschenk@Dinghan-Germany.com](mailto:Joachim.Bierschenk@Dinghan-Germany.com)

# FUTURE-PROOF

## METRO BARCELONA RELIES ON SMARTCONVERTER 3



TMB ordered 50 vehicles on the Metropolis platform fitted with the SMARTconverter 3 for metro lines 1 and 3.

**The Catalan capital of Barcelona offers so many fascinating attractions to visitors that one can easily overlook the fact that this city is also on its way into the ‘Champions League’ of several sustainability rankings. This is reflected in the latest generation of rolling stock for the Barcelona metro system. Alstom started supplying the units this year – and put our SMARTconverter 3 on board.**

Among all the sustainability projects launched in Barcelona in recent years, the purchase of 50 new metro trains for lines 1 and 3 stands out as a shining example. By replacing old carriages with these new units, operator Transports Metropolitans de Barcelona (TMB) is realizing energy savings of 20 %. The new trains are also

more comfortable and safer than their predecessors, providing an additional justification for this project with historic proportions: never before has TMB spent this much money on new rolling stock. The lion's share of the investment comes from the so-called ‘Juncker Plan’ of the European Investment Bank EIB, which provides financial support based on climate and sustainability criteria. This support, aside from the monetary benefit, represents a recognition of the efforts of TMB and the city of Barcelona.

The fact that TMB picked Alstom to supply the new rolling stock fits right into this picture. Because Alstom, too, is deeply committed to an aggressive approach towards future-proof technologies. This is evidenced in particular





Sustainability was the top priority in the acquisition of the vehicles.

by its highly energy-efficient trains. The Metropolis platform that is used for the Barcelona project is considered a signature project.

We are proud to be a part of this success story of sustainability in Catalonia. Alstom's decision to use our SMARTconverter as auxiliary power converter for the new TMB vehicles is a continuation of our long-standing cooperation. It shows yet again how Alstom relies on our products whenever a project calls for better energy efficiency.

The SMARTconverter 3 stands out in particular for its compact design with medium-frequency galvanic separation, achieving peak efficiency values of more

## Technical Data

Auxiliary power converter for Barcelona Metro

Input voltage	1,500 V DC
Output voltage	3 x 230/400 V AC, 50 Hz 127 kVA 110 V DC, 18 kW
Dimensions	2,000 x 750 x 560 mm

than 94 %. It is our most popular product with a range of performance classes and is already being used in thousands of trains worldwide

We are continuously developing and advancing our technology – the SMARTconverter 3, for example, now offers the option of integrated silicon carbide (SiC) semi-conductors for an efficiency increase to up to 96 %. We look forward to the deployment of our latest offerings in future projects. Together with progressive partners such as Alstom and TMB, we want to be a catalyst for sustainability in more cities around the world.

✉ [Jan.Kallok@Dinghan-Germany.com](mailto:Jan.Kallok@Dinghan-Germany.com)

# SERVICE & EXHIBITIONS

## Service



Our service line is available to provide expert advice.

**Service line:**  
**Phone +49 561 50634-6600**

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

**Service e-Mail:**  
**Service@Dinghan-Germany.com**

© Dinghan

## Exhibition dates 2022



**InnoTrans**  
International trade fair  
for transport technology

2022/09/20 – 2022/09/23  
Messe Berlin  
Hall 17, Stand 250  
Berlin, Germany

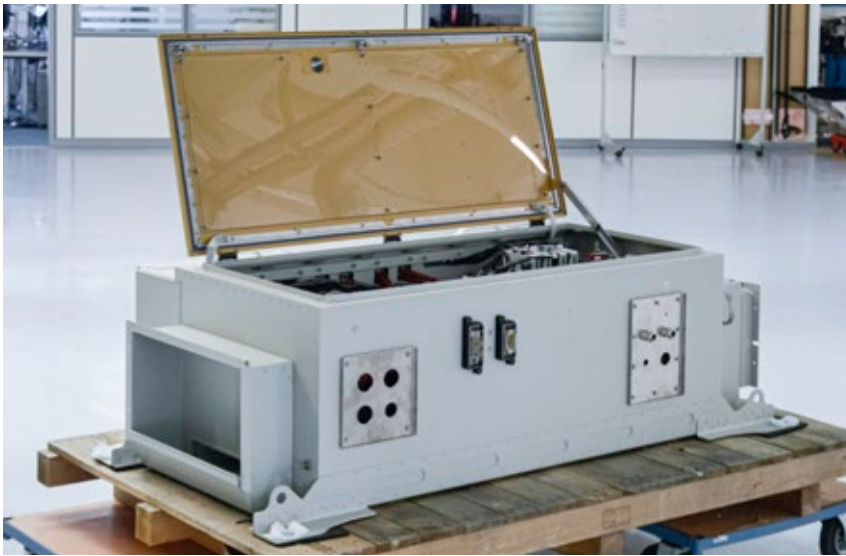


**Rail.S/ VDE Symposium**  
Electric vehicle drives  
and equipment

2022/12/01 – 2022/12/02  
International Congress Center  
Dresden, Germany

# OUTLOOK

## Lighten up



Now here is a great result in a 'weighty' matter: the new SMARTconverter 3 container concept has made the product about 50 kg lighter. The roof-mounted container now only weighs a little over 500 kg. Our team checked from all angles – from cooling to service – to find where there was room for improvement. For the first time, the lightweight is used on CAF's Civity platform.

## Modernize



Auxiliary power converters play a central role in the modernization of rolling stock. The light-weight, compact SMARTconverter LIGHT with its great features – energy-efficient, maintenance-free and quiet – is optimally suited to extending the service life of equipment. Vehicles can thus be updated to the state of the art and can keep on running safely and reliably and serve customers for many more years.

# RAILFOCUS

**Dinghan SMART  
Railway Technology GmbH**

Miramstrasse 87  
34123 Kassel  
Germany

Phone +49 561 50634-6000  
Fax +49 561 50634-6001

Info@Dinghan-Germany.com  
www.Dinghan-Germany.com

