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RAILFOCUS

THE SMA RAILWAY TECHNOLOGY GMBH MAGAZINE

TOP SPEED

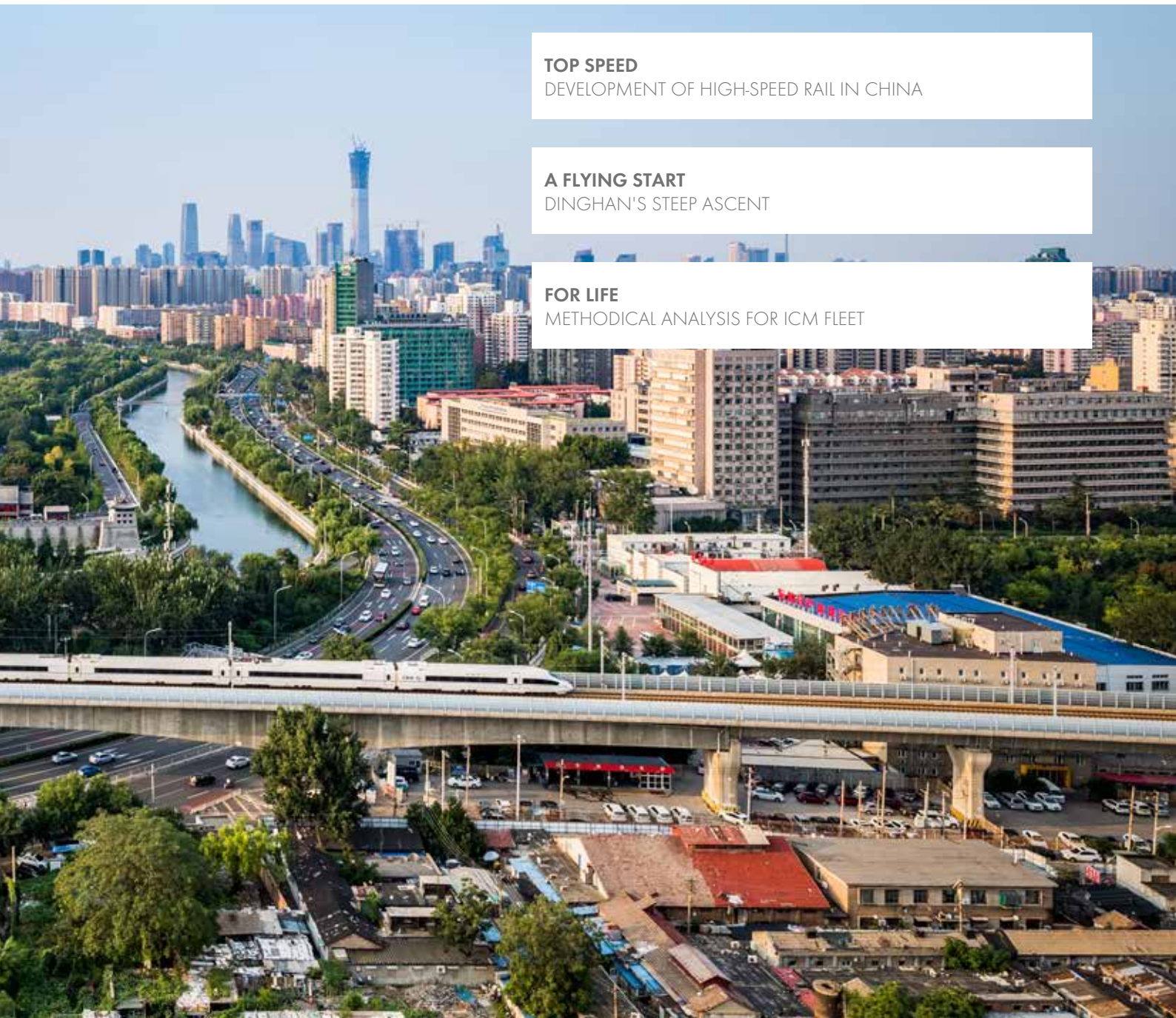
DEVELOPMENT OF HIGH-SPEED RAIL IN CHINA

A FLYING START

DINGHAN'S STEEP ASCENT

FOR LIFE

METHODICAL ANALYSIS FOR ICM FLEET



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Railway Technology Magazine**

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Editorial

05

News

06

Top Speed

Development of high-speed rail in China

08

A flying start

Dinghan's steep ascent

10

A shared road

Interview with Gu Qingwei

12

Demanding

Guangzhou and its metro network

14

For life

Methodical analysis for ICM fleet

16

Service & exhibitions

18

Outlook

19





DEAR READER,

This issue is all about China – not without reason. In March 2017, SMA Railway became part of the Chinese rail technology group Beijing Dinghan Technology. So today, we would like to take you on a brief journey to this fascinating country. For SMA Railway, Dinghan as a rapidly expanding rail technology company opens up new perspectives.

Dinghan holds seven business units* and is active both in the rail infrastructure and the rolling stock equipment business segments. This allows SMA Railway and Dinghan to create strong synergies, be active in the Chinese market, and expand their product portfolio.

A classic company portrait will tell you more about how the publicly traded company is doing. And then the Chairman, Gu Qingwei, will describe the cultural trades that define the shared road ahead.

We hope you will enjoy the read.

A handwritten signature in black ink that reads "A. Schmidt". The signature is fluid and cursive.

Alexander Schmidt
General Manager SMA Railway Technology GmbH

*eleven entities

NEWS

ELECTRIFYING

In 2018, a group of young employees in leadership positions from CRRCC, the world's largest manufacturer of rolling stock, visited SMA Railway. As in the previous year, about 80 graduates of

Nottingham University Business School China came for two days in order to gain an impression of the demands and challenges involved in the manufacturing of auxiliary power converters. This

front-row view of the history of device development as well as of the current production was very exciting for these young leaders.



EXPRESS

The extended service portfolio SMART-services now provides a solution for customers who are in a hurry: "Express" is the magic word. By booking this service, customers can ensure that their urgent repair jobs will receive priority. The requested device will be returned within a time frame defined by the customer. Otherwise, jobs are handled based on FIFO - "first in, first out", a standard approach in inventory management. As a rule, repairs are performed in the order in which the customer devices were received - first come, first served.



AESTHETIC

Rolling stock manufacturer CAF ordered 24 auxiliary power converters of type SMARTconverter 3 Metro. The devices of performance class 170 kVA + 30 kW will be used in Naples in Italy - on Line 1, famous for being one of the most beautiful metro lines. This line connects the center of Naples with the district of Vomero. Here, many of the metro stations, which otherwise tend to have a rather bland design, have been beautified by artists.



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WORDPLAY

A new project started at SMA Railway with an interesting name: 62 SMARTconverters 3 of type 140 kVA + 20 kW were ordered by CAF Power & Automation, who will use them to complete their electrical equipment for the Light Rail Transit deployed in Jabodetabek. The rolling stock manufacturer is PT Inka based in Indonesia. The first auxiliary power converters will ship in December 2018. By the way: "Jabodetabek" is the name for the greater metropolitan area on the Indonesian island of Java and is composed of the initial letters of five cities. The region that includes Jakarta, Bogor, Depok, Tangerang, and Bekasi is home to more than 30 million people.



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TOP SPEED

DEVELOPMENT OF HIGH-SPEED RAIL IN CHINA



China's high-speed trains do not just top the list of the world's fastest mass-produced trains; the country also has the largest train stations in the world - this picture shows Shanghai's

In the late 1990s, the Chinese Government decided to improve the traffic networks between China's large cities. The distances between these cities are often very long, and the plan called for high-speed trains that could traverse such distances quickly while offering room for many passengers. A high-speed railroad network of about 30,000 kilometers for public transportation is being built and will be completed in 2020. Right from the start in early 2000, SMA Railway was involved in the first high-speed projects. Today, not quite 20 years later, the plan is about to be fully realized. SMA Railway is on the scene once again.

But back to the beginnings: After initial self-developments -

on which SMA was aboard - China quickly opted for established suppliers due to its enormous demands. At that time, rolling stock manufacturers such as Alstom, Bombardier, or Siemens built their high-speed trains for the Chinese market.

At the same time, the required high-speed tracks were built at top speed. The construction of the high-speed tracks was frequently done using prefabricated elements. Many sections of the tracks are elevated. One such bridge is the Danyang-Kunshan Grand Bridge, the world's longest bridge at 164 kilometers.

And the high-speed trains were keeping up with the pace: The first trains able to achieve more than 300 kilometers per hour have been running on Chinese soil for ten years



Hongqiao Railway Station. There are 30 platforms for the passengers.

already. Gradually, the production of trains in China picked up speed. Today, there are Chinese trains that achieve up to 350 kilometers per hour and top the list of the world's fastest mass-produced trains.

Increasingly, the high-speed trains in use today are models developed and built in China. They are equipped with state-of-the-art technology. For example, they will now use auxiliary power converters with medium-frequency galvanic isolation that have been specially designed by SMA Railway for the use in high-speed trains with 3 kV DC traction voltage.



Technical Data

Traction-integrated auxiliary power converter

Input voltage	3,000 V DC
Output voltage	3 x 380 V AC, 50 Hz 220 kVA
Dimensions	Module for integration

A FLYING START

DINGHAN'S STEEP ASCENT



One of six production sites: Air conditioning systems are manufactured in Guangzhou.

Anyone who has been following the developments in the rail sector in China over the last two decades is familiar with the Dinghan brand. Since the company was founded in 2002, it has become one of the fastest-growing actors in the Chinese rail sector. Today in 2018, Dinghan has seven business units, employs more than 1,800 people, and is a major supplier in the Chinese rail sector. Together with SMA Railway, its first foreign subsidiary, the rail technology group drives its internationalization forward.

When the company was founded in 2002, the rail industry in China was beginning to expand. Within a short period, Dinghan grew into a supplier whose product portfolio provides equipment for a major portion of the Chinese rail infrastructure and rolling stock.

The product portfolio covers two major segments of rail technology: equipment for rolling stock as well as for ground infrastructure. For the rolling stock, Dinghan supplies auxiliary power converters, air conditioning systems, special cables, and monitoring systems for the vehicles. The ground infrastructure equipment includes ground power supply systems, platform door systems, energy management systems, as well as freight and passenger information systems.

Dinghan has experienced continuous growth in China, turning into a large concern with a broad base. Today in China, Dinghan holds a market share of around 80 percent in the infrastructure segment for ground power supply systems and provides for example air conditioning systems for about one third of the rolling stock.



© Dinghan

Their current production sites include Dongguan, Jiangmen, Wuhu, Chengdu, Dalian, and – since early 2017 – Kassel in Germany. In addition, there are seven research and development centers at various locations.

In 2009, Dinghan became a publicly traded company at the Shenzhen stock exchange. The corporate headquarters are located in Beijing in the Zhongguancun Fengtai Advanced Business Park, oftentimes called the 'Chinese Silicon Valley'. Dinghan relies on technological breakthroughs as well as acquisitions to drive revenue growth and internationalization.

As the first European company to be acquired, SMA Railway



© Dinghan

One of seven R&D facilities: Dinghan engineers working in the laboratory.

benefits particularly from the synergies created in the framework of Dinghan's Chinese subsidiaries.

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A SHARED ROAD

INTERVIEW WITH GU QINGWEI

At the beginning of 2017, SMA Railway became the first European subsidiary of the publicly traded Dinghan group. But the business contacts between SMA Railway, the German manufacturer of auxiliary power converters, and Dinghan, the Chinese rail technology group, go back several years. Dinghan's Chairman, Gu Qingwei, visited the German subsidiary in Kassel for the first time to attend the shareholder meeting. In our interview, he spoke about his vision for the future.

The two companies can look back on almost one year of intensive cooperation and exchange. Mutual visits and the first joint projects have demonstrated the great potential of the business synergies. Qingwei Gu says that benefits have already materialized. He is convinced that the next steps will be successful.

Qingwei, what was the decisive factor for the acquisition of SMA Railway, your first European company?

This question does not have just one answer, of course. I would like to reiterate: One contributing factor to the purchase decision was the high level of acceptance of products that are based on medium-frequency galvanic isolation technology. It was a deliberate decision to complement our existing product portfolio. During the acquisition process, the SMA Railway team quickly impressed me with their knowledge of the industry and the markets. SMA Railway is well established in the rail industry – Dinghan will benefit from their extensive experience with international manufacturers and operators of rolling stock, in addition to their decades of development and manufacturing experience. Investing in a German company was a conscious decision. We see ourselves as a strategic owner for the long term and recognize our joint potential with SMA Railway as an expert in the industry.

How is the cooperation between the cultures coming along?

It has been and still is exciting. We've learned a lot from each other during this past year. Both from the technical

and the cultural point of view. This can only work if each side cultivates an understanding of the cultural differences of the other side. For example, in China we tend to have hierarchical structures, but the hierarchy at SMA Railway is quite flat. In China, we act quickly and with great flexibility; the Germans are more focused on processes. The cooperation is a work in progress. There are no rules. As I said – we are learning a lot about each other and with each other. We utilize each other's strengths.

Where does the shared road go?

One thing is beyond a doubt: The global demand for infrastructure and rolling stock is on the rise. In particular the train types 'high-speed trains' and 'subway trains' have great potential. Those are the sectors in which we, SMA Railway and Dinghan, are already very well positioned. All in all, we have a broad and diverse product portfolio for all performance classes and complement each other in the best possible way. Our goal is to establish our brand worldwide, together.

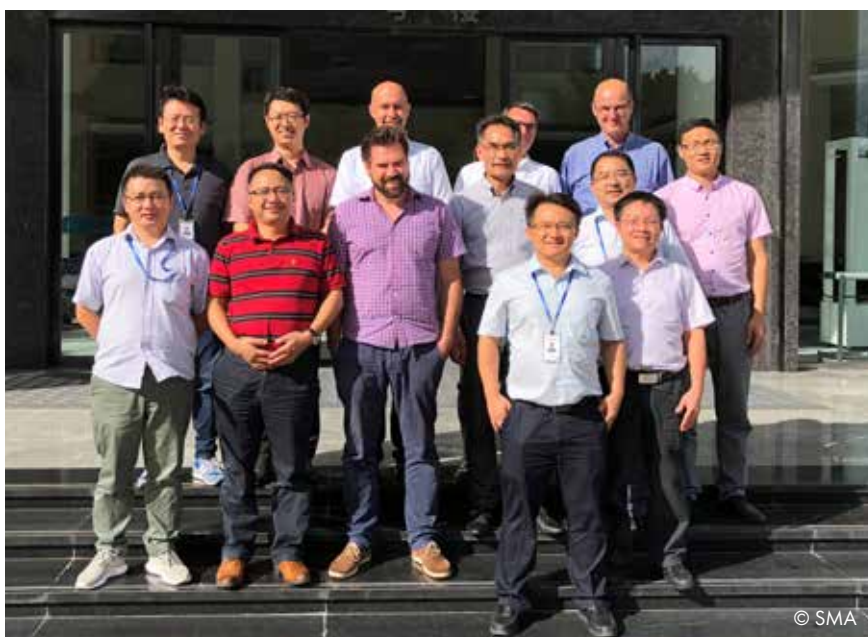
What exactly will happen next?

Our market observations and customer inquiries provide us with clear signals of what customers are looking for. Drawing on our own expertise – after all, both companies have several decades of experience – we analyze the customer requests and then the potential for improvement of our portfolio. For me, personally? I am looking forward to my next visits to Kassel. I really enjoy being part of this community.

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Interview with Gu Qingwei



DEMANDING

GUANGZHOU AND ITS METRO NETWORK



As early as 2000, SMA supplied battery chargers for the rolling stock in the Guangzhou metropolitan area.

SMA Railway is not only active in the high-speed sector; they also provide products for metros and suburban railways vehicles in China. Their first involvement in this latter sector came during the expansion of the public transportation network in Guangzhou, a city with more than 10 million inhabitants and the capital of Guangdong province. Since Line 2 took up operation, SMA Railway's SMARTchargers have been proving their worth. Today, this network is among the largest passenger networks worldwide.

Guangzhou's metro network took up operation in 1997. Following Beijing, Shanghai, and Tianjin it is the fourth metro system in mainland China. After Line 1 began running successfully, the construction of Line 2 started one year later.

It took up operation in 2002 and runs in a North-South direction. Like Line 1, it operates on tight high-frequency schedules. During the day, there is a train about every three minutes. In the evenings until about 11:30 PM, the trains run with a frequency of just under seven minutes. The rolling stock consisted of Movia trains made by Bombardier.

The subsequent years saw a continuous expansion of the network. Today, the network comprises more than ten lines and carries about eight million passengers. This puts it among the busiest metro systems in the world.

However – this is still not enough. Guangzhou is located in the Pearl River Delta, one of China's economic core regions with a steadily growing influx of people finding employment



here. Then there are the tourists in the greater Hong Kong area, which is only 120 kilometers away. They, too, increase the demand for transportation in Guangdong province.

In late 2017, three new lines took up operation. Four more lines are under construction, and the permits for another one have been granted. 17 more lines and extensions are in the planning stage. The intention is to expand the city's public transportation network to 600 kilometers by the year 2020.

In addition to the infrastructure requirements, the vehicles need effective and reliable power supply systems. These are criteria to which SMA Railway's auxiliary power converters and battery chargers with medium-frequency galvanic isolation are perfectly suited. SMA Railway is developing



Technical data

Auxiliary power converter for metro

Input voltage	1,500 V DC
Output voltage	3 x 220/ 380 V AC, 50 Hz 220 kVA 110 V DC, 30 kW
Dimensions	1,600 x 1,500 x 560 mm

a SMARTconverter 3 type 220 kVA + 30 kW that satisfies the voltage requirements of these Chinese metro networks. The system is designed for high efficiency and low energy consumption.

Since its introduction to the market, the third-generation SMARTconverter has been a product geared towards the requirements and loads that apply to today's rolling stock. The SMARTconverter 3 in the 220 kVA + 30 kW performance class represents an optimal system for use in the networks of Guangdong province.

FOR LIFE

METHODICAL ANALYSIS FOR ICM FLEET



One by one, the ICM fleet of Dutch rail operator Nederlandse Spoorwegen is being modernized.

The current refurbishment project undertaken by Dutch company NedTrain has almost model character. NedTrain is the maintenance company of Nederlandse Spoorwegen, the Dutch rail operator. With a view towards maximum fleet availability and sustainability of the rolling stock, NedTrain started early to examine the reliability of the power supply systems of their fleets. Because of the excellent performance of the auxiliary power converters used in the ICM fleet, NedTrain approached SMA Railway and asked them to investigate whether the service life of their tried-and-tested systems could be extended.

The overarching goal is to keep the fleet vehicles in operation for longer than originally planned. Because the auxiliary

frequency converters belong to those components that have reached the end of their service life, they need to be refurbished. The goal is to ensure that their current high reliability carries over to beyond the end of their service life as it was originally planned.

Through a methodical analysis and taking into account the actual loads put on the components, SMA Railway identified all parts that need replacing or refurbishing to ensure a longer service life.

Drawing on many years of experience in the industry and with these devices, the After Sales Service team was able to quickly work out which actions were required. Aspects such as obsolete components or technical optimization were taken



These measures ensure the high reliability of the auxiliary power converters even beyond the end of their service life as it was originally planned.

into consideration. In addition to the replacement of the container, which NedTrain had requested, the team identified which wearing parts needed to be inspected and replaced.

Another positive effect on the modernization process: Even before this point in time, the fact that some spare parts have very long delivery lead times was taken into account: To prevent potential delays in this respect, components for the systems have been kept in stock since the planning stage of the project began.

Fixed prices were agreed for the replacements. This ensured that a reliable budget could be planned for this process. So since the beginning of the year, there has been a constant coming and going: SMA Railway upgrades the auxiliary



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power converters and thus extends their service life by ten years. Old devices arrive at the SMA facility, and upgraded auxiliary power converters are shipped to the Netherlands.

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SERVICE & EXHIBITIONS

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.

Service e-mail:

Service@SMA-Railway.com

Exhibition dates 2018



INNOTRANS

2018/09/18 - 2018/09/21

Exhibition Grounds Berlin

Berlin, Germany

OUTLOOK

SMARTcharger



SMARTconverters include a battery charger as standard, which can optionally be bidirectional. However, the number of batteries on the vehicle is not always the same as the number of on-board auxiliary power converters. Sometimes the battery chargers also have to be placed separately from the auxiliary power converters and closer to the battery due to conceptual requirements. For these applications, the SMARTcharger is available as a standardized battery charger.

Dinghan's subsidiaries



Dinghan was founded in 2002 and has experienced steady growth since then. By now, more than 1,800 people work for the group. seven business units ensure that Dinghan is considered one of the leading Chinese manufacturers of rail technology systems worldwide. The coming issues will contain a loose series of portraits of the individual subsidiaries and their product portfolios – for example, the production facility in Jiangmen (see left).

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