



58 DRIVERLESS FOUR-CAR METRO TRAINS

Metro Klang Valley Kuala Lumpur

In October 2012, the consortium SSSC (Siemens Malaysia, Siemens AG and SMH Rail) was awarded the contract to supply 58 new driverless four-car metro trains for the Metro Klang Valley MRT Project (Projek Mass Rapid Transit Lembah Kelang – Jajaran Sungai Buloh – Kajang) in Malaysia.

These trains are used on the newly built 51-kilometer-long Sungai Buloh – Kajang Line, which connects Kuala Lumpur with the Klang Valley area. The vehicles are part of the new Inspiro family. The car bodies for the trains were produced by CSR Puzhen in China. The final assembly of the vehicles was performed in Malaysia by the consortium partner SMH Rail.

Dynamic commissioning of the trains, including type testing, took place at the test track in the Sungai Buloh Depot and subsequently on the routes. The first two trains were delivered to Sungai Buloh Depot in December 2014. The fully automatic system went into operation in December 2016.

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Technical data

| | |
|---|---|
| Train configuration | M-T-T-M |
| Wheel arrangement | Bo'Bo'+2'2'+2'2'+Bo'Bo' |
| Car body material | Stainless steel |
| Track gauge | 1,435 mm |
| Length over couplers | approx. 89,560 mm |
| Width of car | 3,100 mm |
| Floor height above top of rail | 1,100 mm |
| Wheel diameter maximum / minimum | 850 / 775 mm |
| Tare weight / total weight (8 passengers/m ²) | approx. 150,000 kg / approx. 251,000 kg |
| Maximum axle load | 17 t |
| Number of seats | 174 |
| Train capacity (8 passengers/m ²) | 1,554 |
| Passenger doors per car | 8 |
| Minimum curve radius service line / depot | 150 m / 140 m |
| Maximum gradient | 4.0% |
| Maximum speed | 100 km/h |
| Power supply | 750 V DC / third rail |

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All cars have four electrically operated exterior sliding doors per side with an opening width of 1,400 mm.

The trains meet the high fire protection requirements according to BS 6853 Cat. 1a.

In addition, implementing the Inspiro design solutions ensures optimized energy consumption, low maintenance costs, and high recyclability of the trains at the end of their service life.

Train design

Each train comprises four stainless-steel cars in an M-T-T-M configuration. Each car is carried by two bogies.

The trains are capable of carrying up to 1,554 passengers (at 8 persons/m²), with up to 174 seats and standing room for up to 1,380 passengers.

The train is designed for operation in tunnels and on elevated tracks.

The cars of each train are connected with semi-permanent couplers. The end cars are equipped with automatic couplers.

The wide and open gangways between the cars (vertical clearance approximately 1,950 mm, clear width approximately 1,600 mm) enable unrestricted passage through the train.

Design concept

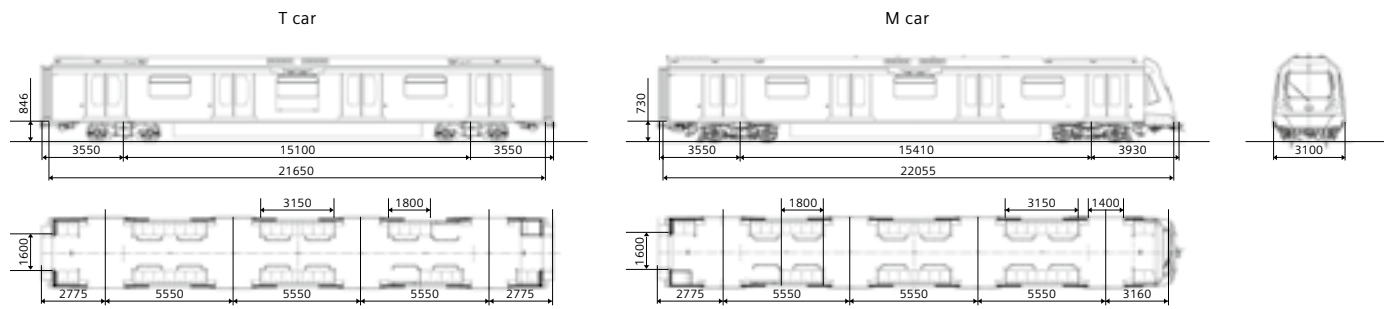
Designworks, a BMW Group Company, developed the interior and exterior design of the trains. The "guiding light" design concept was inspired by the architectural characteristics of modern Malaysia and reflects the dynamism, elegance, and technological progress of Kuala Lumpur. The interiors are equipped with LED lighting; indirect lighting below the passenger seats generates a pleasant sense of space and supports safety and cleanliness in the train. The interior color concept with varying shades of blue and traditional symmetrical patterns with a modern interpretation in the entry area symbolizes the vitality and cultural diversity of Kuala Lumpur. Color contrasts in the door entrance areas provide the passengers better orientation, making it easier for them to get in and out of the train.

Fully automated operation

The trains are equipped for fully automated, unattended train operation (GoA 4).

A state-of-the-art train automation system is integrated into the train, ensuring reliable and highly available operation. In addition, the train is equipped with an array of safety systems, including obstruction sensors at the end bogies and a fire detection system. Auxiliary driver's cabs at both ends of the train enable manual operation in emergencies and in the depot.





The auxiliary driver's cabs are equipped with convenient touch-screen displays and all necessary controls for train operation.

Car bodies

The metro train has been designed with a lightweight stainless-steel construction.

The exterior car body surfaces are painted, and the color stripes are made of adhesive foil.

Traction system

The trains are electrically driven. The traction power is supplied from the third rail via current collectors. Two of the four cars in the trains are motorized. Each motor bogie is driven by two self-ventilated traction motors from the proven 1TB 20 series. The motors are controlled without speed sensors for a high level of reliability.

The two traction motors in the motor bogies are each controlled by a natural air-cooled Sibac® IGBT traction inverter.

The highly efficient slip/slide protection is implemented on a per bogie basis.

The Sitrac™ control allows electrodynamic braking to standstill. This feature provides the advantage of a non-wearing service brake under normal conditions, and it significantly increases the stopping accuracy in stations. The installed tractive effort per train is 1,840 kW.

Bogies

The bogie SF 3000, developed for advanced metro vehicles, has been further optimized and is suitable for operating speeds up to 100 km/h and for axle loads of approximately 17 tons. The bogie frame consists of high-strength low-alloy steel.

Each wheel of the bogie is equipped with one brake disk and one compact brake caliper unit. The bogies are equipped with spring brake actuators that serve as parking brakes. Secondary suspension is provided by an air spring, and a metal-rubber spring is used for primary suspension. One current collector is mounted on each side of the motor bogies. The traction motors are transversally installed and fully suspended on the bogie frame.

Highlights



Passenger Safety and Information Systems

The Passenger Information Display and Announcement System provides both visual and audio information inside and outside the train. Displays for the train's destination are installed on the exterior surfaces of the cars. In the interior, dynamic map displays are installed above each door to show the current position of the train and the name of the next station. Each car also includes displays above the windows for emergency and operation news and for advertisements.

- Driverless operation (GoA 4)
- Design by Designworks, a BMW Group Company
- Fire protection requirements according to BS 6853 Cat. 1a
- Natural air-cooled compact IGBT traction inverter
- No motor speed sensors
- Dynamic braking to standstill
- Two independent auxiliary inverters and batteries per train
- Data communication via Ethernet and WLAN
- Fire detection system
- Infotainment system in passenger compartment
- CCTV system with 26 live cameras per train
- 16 emergency intercoms with integrated camera per train
- Environmentally friendly and modern LED lighting

A video surveillance system (CCTV) is installed in the passenger compartment. In addition to the interior cameras monitoring the passenger compartment, exterior cameras are installed on each side and at each end of the train to monitor the door areas as well as the tracks in front of and behind the train. Each entry area is equipped with an emergency passenger intercom with an integrated camera that will be activated when an emergency call is made.

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