 

In November 2010, Siemens was awarded the contract to supply 21 new six-car metro trains for the Munich City Utilities (SWM).

Trains are being built and subjected to static testing in the Siemens plant in Vienna, Austria. Final assembly of these production trains is planned to take place in the Munich plant. Dynamic commissioning is to be performed initially at the Siemens test center in Wegberg-Wildenrath and then on the customer's system in Munich. The train design was developed by the internationally renowned company Neumeister+Partner Industrial Design. Delivery of the first trains is scheduled to begin in July 2013.

The high requirements with respect to environmental compatibility and recyclability are systematically implemented in the manufacturing of the new trains. In this manner, a recycling rate of approx. 95 % is achieved.

Technical Data	
Train configuration	MC1+M+M+M+M+MC2
Wheel arrangement	Bo'Bo'+Bo'Bo'+Bo'Bo'+Bo'Bo'+Bo'Bo'+Bo'Bo'
Carbody material	Aluminum
Track gauge	1,435 mm
Length over couplers	approx. 114,800 mm
Width of car	2,900 mm
Floor height above top of rail	1,100 above TOR
Wheel diameter new / worn	850 / 770 mm
Tare weight / total weight	approx. 168,000 kg
Max. axle load	12 t
Number of seats / flap seats	220
Train capacity at 4 pers./m^2	940
Passenger doors per car	6
Min. curve radius service line / depot	270 m / 70 m
Max. gradient	5 %
Max. speed	90 km/h
Max. starting acceleration	1.33 m/s^2
Mean deceleration service brake	1.2 m/s^2
Power supply	750 V DC / Third rail

Metro Munich

21 six-car metro trains

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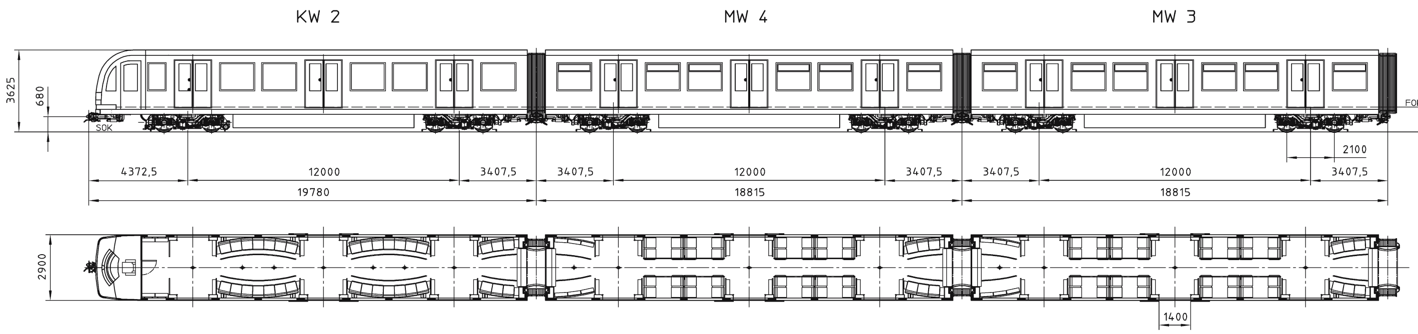


General Arrangement
The trains are capable of carrying a total of up to 1,301 passengers each (at 6 persons/m^2), with seating for 220 and standing room for 1,081. The train is designed for metro operation and based on the Siemens modular concept which enables trains to be optimally adjusted to specific customer requirements. The smallest operable unit consists of two end cars with cab (EC1 and EC2) and two intermediate cars (IC). The end cars are each equipped with a driver's cab to permit bidirectional use. The cars are connected by means of semipermanent couplers. Both end cars have automatic couplers.

Electrical connections within a module are designed as jumper cables. Pneumatic functions are transmitted via hoses and by the air pipe connection of the coupler halves. Between the cars of there are wide, open gangways, which ensure unrestricted passage through the cars during revenue service. Every axle of the train is electrically driven and is supplied with 750 V DC line voltage via current collectors from the third rail.

The carbodies are carried by two bogies each. The wheelsets of the bogies are each driven by a traction unit (traction motor with gearbox), thus there are two traction units per bogie and four traction units per car. The four traction motors per car are fed by one IGBT traction inverter.

Carbody
The carbody is designed as a lightweight aluminum-profile construction consisting of a welded assembly of large-sized extrusions with integrated C-rails. The bogies mainly consist of high-alloy steel. The interior components mostly consist of FRP (fiber-reinforced plastic), glass, stainless steel, aluminum, plastic and electronic parts.

Material Composition
The metro train is designed as a lightweight construction with modular design components. All materials have been chosen with regard to minimizing environmental impact and to enhancing recyclability.

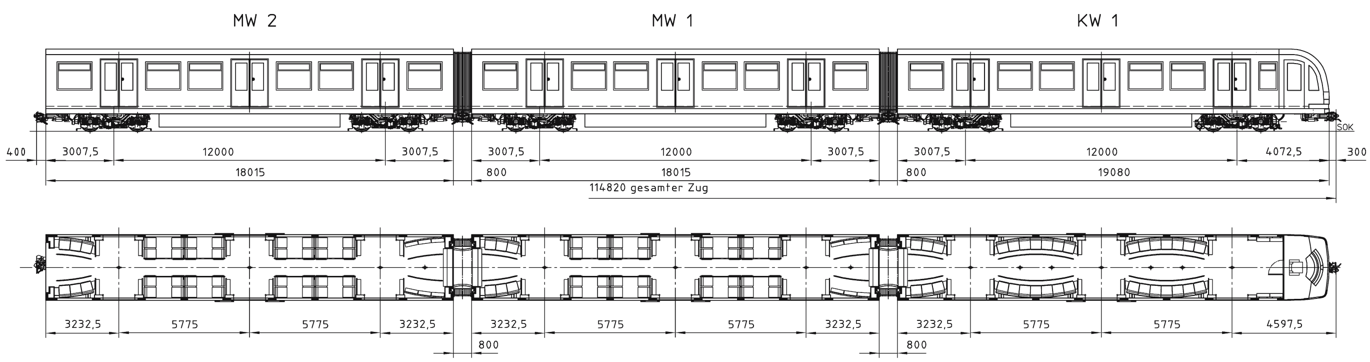
Noise and Vibration
The external noise level created by a passing train is 84 dB(A) and the internal noise level in the passenger compartment is 68 dB(A), both measured at 80 km/h. The measuring method is according to ISO 3095 for external noise and ISO 3381 for internal noise. The external and internal noise and vibration emission levels have been minimized with a view to the perception of passengers and people living near the line.

Structure
The exterior carbody surfaces are painted. All cars are equipped with electrically powered passenger doors that allow passengers to board and exit through a total of 18 passenger doors (for a 6-car train) per platform side. The doors are of the double-leaf sliding plug type. The closed door leaves are flush with the outside of the carbody. Upon opening, the door leaves swing outward and simultaneously move horizontally. The opening width of the doors is 1,400 mm. The driver can enter an end car normally by one of the two cab side doors. These are also designed as electric double-leaf sliding plug doors.

Passenger Information
The Passenger Information Display & Announcement System (PIDAS) provides both visual and audio information inside and outside the train. It includes destination indicators at the end faces, station indicators and loudspeakers both inside and on the outside on the carbody. Passenger can also communicate with the driver at the emergency call stations in an emergency.

Driver's Cab
The driver enters the ergonomically designed cab by single-leaf sliding plug doors. A glass partition wall separates the cab from the passenger area. An integrated back wall door permits to access the passenger area directly from the cab. The operating controls are mostly implemented on touch screen displays that are centrally located within the driver's field of vision.

For optimum usability, the highly adjustable driver's seat has a memo function and is also equipped with a height-adjustable footrest. A folding jump seat is installed on the back wall.



The display, which communicates via Ethernet, continuously provides relevant operating data to the driver. Diagnostic information is also shown on the the display. The vehicle control itself is done over the MVB bus in the proven SIBAS 32 architecture.

Data communication outside the vehicle is implemented via a central communication computer. An autonomous HVAC ensures optimum air conditioning.

Traction Equipment
Proven, forced air-cooled Sibac® traction containers power traction motors which are installed in the motor bogies. In each car, the 4 traction motors are controlled by one IGBT VVVF (Variable Voltage Variable Frequency) inverter.

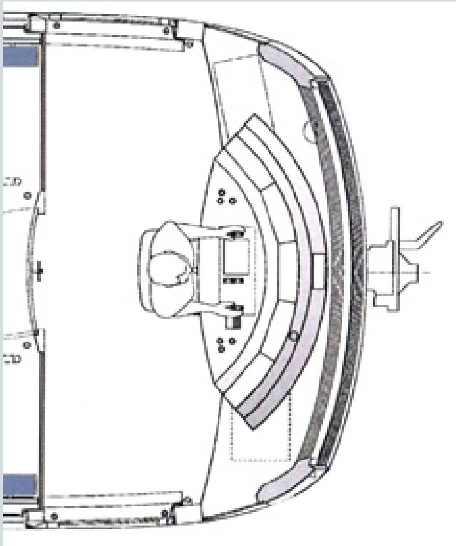


Photo: © N+P Industrial Design GmbH

High efficiency wheel slip-slide protection is provided on a per bogie basis. The new Sitrac® control allows electro-dynamic braking until standstill. This feature provides the advantage of a non-wearing service brake under normal conditions and particularly increases the stopping precision.

Bogies
The bogie of the SF 1000 type that had been developed for advanced metro vehicles was further developed and is suitable for operating speeds up to 90 km/h and for axle loads of 13 tons.

Each axle of the bogie is equipped with one brake disk and one compact brake caliper unit. Every bogie is equipped with one spring brake actuator which serves as the parking brake. Secondary suspension is provided by air springs, and metal-rubber springs are used for the primary suspension.

Highlights

- 100 % traction
- No motor speed sensors
- 2 independent auxiliary converters (power redundancy)
- Dynamic braking to standstill
- Sensitive edge for detection of the smallest objects in the passenger doors
- Forced air-cooled compact IGBT traction inverter
- Innovative braking system
- Fire detection and suppression system
- Variable train configuration

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