Metro Munich

45 six-car metro trains

In November 2010, Siemens was awarded the contract to supply 21 new six-car metro trains of the C2 type for the Stadtwerke München (Munich City Utilities). A first option for 24 trains was ordered in September 2016. A further option for up to 22 trains is still open.

The new trains are going to be operated on the existing routes of the Munich Metro. They are intended to substitute 40 year-old trains of the Stadtwerke Munich and are also operated as additional trains to shorten headway to provide more passenger capacity on the existing lines.

Trains are being built and subjected to static testing in the Siemens Mobility plant in Vienna, Austria. Dynamic commissioning is performed at the Siemens Mobility test center in Wegberg-Wildenrath and the final commissioning will be done in Munich.

Technical Data	
Train configuration	Mc+M+M+M+M+Mc
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. 115,060 mm
Width of car	2,900 mm
Floor height above top of rail	1,100 mm
Wheel diameter new / worn	850 / 770 mm
Tare weight	approx. 180 t
Max. axle load	13.5 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. speed	90 km/h
Max. starting acceleration	1.3 m/s^2
Mean deceleration service brake	1.2 m/s^2
Power supply	750 V DC / Third rail

Design Concept
The train design concept was developed by the internationally renowned company Neumeister + Partner Industrial Design. The train design was realized in close co-operation with Munich transit company MVG and the design company.

The interior and exterior design is evidently based on the successful design of the C1 predecessor, but certain design aspects have been further developed.

The warm and open interior of the train design conveys a high level of comfort and safety to the passengers.

Compared to the previous model C1, the new train C2 is characterized by a higher passenger capacity and a significantly improved lighting system, which is completely equipped with LED lights. A round LED ceiling panel is an eye-catcher at the entrance area of the train. The door leaves include lighting strips which indicate the door status and thus support the passenger flow.

As a consequence from a passenger survey, the passenger seats are now completely equipped with seat upholstery compared to partly wooden seats of the C1 series.

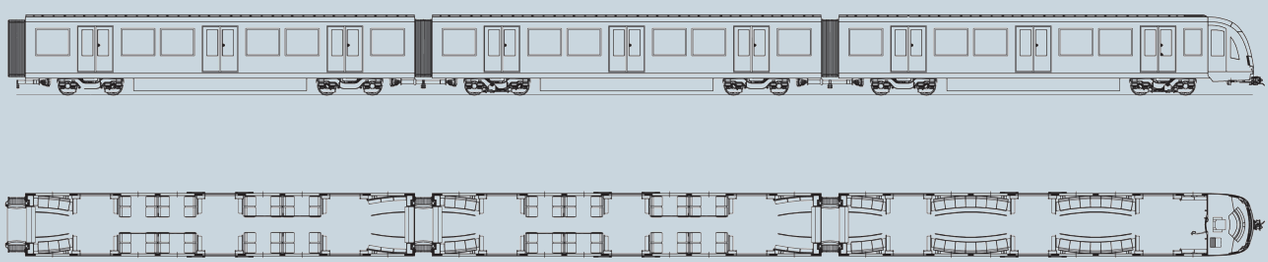
The C2 train has already won three design awards: The Universal Design Award 2013, voted for by a panel of experts, the Universal Design Consumer Favorite 2013 award, voted for by a panel of consumers in Feb. 2013, and the “Red Dot Award” for product design in July 2013.

General Arrangement
Each end car is equipped with a driver’s cab for bidirectional operation. A six-car train is capable of carrying a total of up to 940 passengers each (at 4 persons/m^2), with 220 seats and standing room for 720 passengers.

All cars of a train are connected by means of semi-permanent couplers. Both end cars are equipped with automatic couplers. Wide and open gangways (clear width approx. 1,600 mm) are installed for unrestricted passage throughout the train.

All cars have three electrically operated double-leaf passenger doors per side. The doors are of the sliding-plug type. An opening width of 1,400 mm allows for fast and convenient passenger flow.

Carbody
The carbody is designed as a welded lightweight aluminum-profile construction with integrated C-rails. The exterior carbody surfaces are painted.



Passenger Information and Communication System

The passenger information system provides both visual and audio information inside and outside the train. It includes destination indicators at the front ends, station indicators and loudspeakers both inside and outside the train. In case of emergency, passengers can also communicate with the driver at the passenger intercom devices, which are installed in each entrance area.

Safety Systems

To avoid injury during boarding and alighting in stations, the passenger doors are equipped with sensitive edges, which are capable to detect smallest objects. Additionally, LED light strips at the door edges clearly indicate door closing and help for orientation.

A fire protection system is installed in the vehicles. The passenger areas are monitored by air sampling systems, the technical areas are monitored by smoke and heat detectors. In case of a fire, a nitrogen based extinguishing system is activated in the technical areas. The passenger areas are protected by a low-pressure water mist system.

For additional passenger safety, a video surveillance system (CCTV) is installed in the passenger compartment.

Driver's Cab

Each end of the train is equipped with a driver's cab, designed in accordance with high ergonomically requirements. The driver enters the cab by an electrically operated, single-leaf sliding-plug door. A glass partition wall separates the cab from the passenger area.

There are no cabinets installed on the backside of the cab, so there is an unhindered view for the passengers throughout the vehicle. An integrated back wall door allows direct access from the driver's cab to the passenger area.

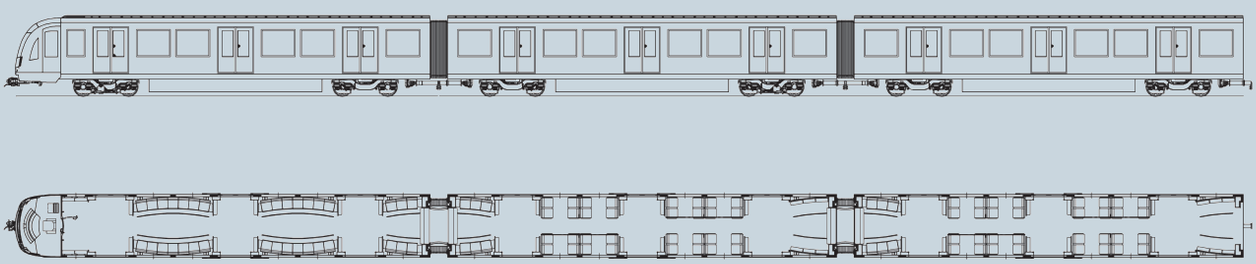
Each cab is equipped with an autonomous HVAC, which provides optimum environmental conditions for the driver.

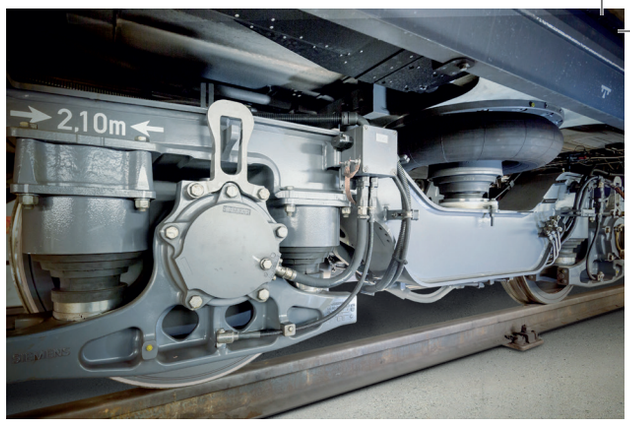
Train Control

The train control is performed via the MVB bus implemented in the proven Sibas® 32 control system.

Diagnostic data can be transmitted to the control center via a central communication computer.

Train functions can be controlled by redundant touch-screen displays at the driver's desk. These displays also provide relevant operating data and diagnostic information to the driver and to service personnel. Relevant operating and control elements are also available as hardware switches and lamps.





Highlights

- Pioneering and award-winning design
- All axles motorized
- Feedback of complete regenerated brake energy into power grid possible
- Energy saving LED interior and exterior lighting
- Monitoring of passenger doors for detection of smallest jammed objects
- Dynamic braking almost to standstill
- Transmission diagnostic data during operation
- Fire detection and suppression system for passenger areas and technical areas

Traction system

The trains are electrically driven. The 750 V DC traction power is supplied from the third rail. Each car of a train is motorized and each bogie is driven by two self-ventilated traction motors of the proven 1TB20 series. The Sitrac™ control for the drives system works without motor speed sensors. This increases reliability and consequently vehicle availability.

Proven, forced air-cooled Sibac® IGBT traction containers power the traction motors. The highly efficient wheel slip / slide protection system is implemented on a per bogie basis.

The Sitrac™ control allows electro-dynamic braking almost to standstill. This feature has the advantage of a non-wearing service brake under normal conditions and particularly increases the stopping accuracy in stations. The traction system is designed to allow recovery of the braking energy to the power grid.

Bogies

The SF 1000 bogie was developed for advanced metro vehicles for operating speeds up to 90 km/h and for axle loads of 13.5 tons. The bogie frame consists of low-alloy high-tensile steel. The traction motors are transversally installed and fully suspended on the bogie frame.

Each axle of the bogie is equipped with one brake disk and one compact brake caliper unit. Spring brake actuators serve as parking brake.

The secondary suspension is provided by air springs, and metal-rubber springs are used for the primary suspension.

In total, eight current collectors per six-car train are mounted on the bogies, four on each train side.

Published by
Siemens Mobility GmbH 2019

Otto-Hahn-Ring 6
81739 Munich, Germany

contact.mobility@siemens.com

Article No. MORS-B10007-00-7600
Printed in Germany
Dispo 70727, SIMC-0000-67327
TH 325-190554 DA 06190.3