



EIGHT FOUR-SECTION, 100 PERCENT LOW-FLOOR VEHICLES

Avenio Tram – Munich, Germany

Siemens is one of the leading suppliers of integrated mobility solutions for the urban area (Complete Mobility) and of vehicles for local, regional, and main-line traffic.

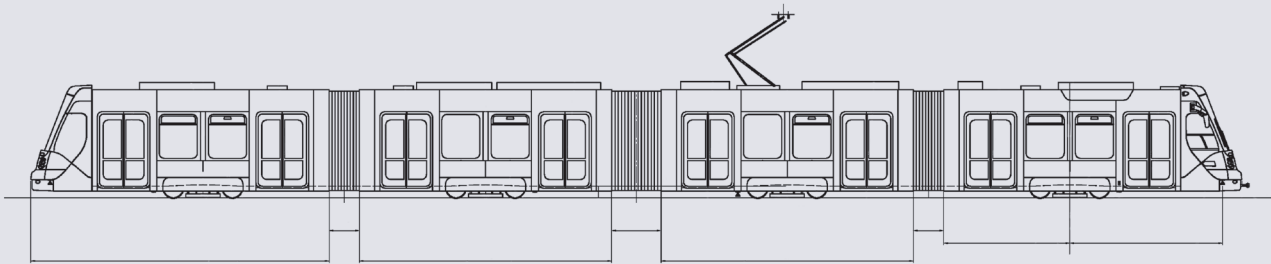
Munich's municipal utility Stadtwerke München (SWM) has ordered eight trams from Siemens for the local line network in order to modernize and expand its existing vehicle fleet. The Avenio series of trams is based on the proven Combino Plus platform, which is already in service successfully in Lisbon and Budapest.

Each of the trams – delivered by February 2014 – consists of four modules, each with its own centrally installed bogie. The modules are interconnected to form an complete end-to-end passenger compartment filled with light. The trains are equipped for unidirectional operation with a driver's cab and an auxiliary driver's cab.

Technical Data

Vehicle configuration	Four-section, low-floor articulated multiple unit for unidirectional operation
Wheel arrangement	Bo´2´Bo´Bo´
Line voltage	750 V DC
Track gauge	1,435 mm
Vehicle length over buffers	36,850 mm
Vehicle width	2,300 mm
Vehicle height	3,550 mm
Wheel diameter min./max.	600/520 mm
Low-floor area	100%
Entrance height	300 mm
Capacity (4 pers./m ²)	216, incl. 69 seats
Maximum speed	70 km/h
Maximum gradient	6%
Empty weight	approx. 47 t

SIEMENS



Side view

Coach body

The coach body structure is based on a welded steel construction consisting almost entirely of weatherproof structural steel (Corten). The entire body shell is also treated with a cathodic dip-paint coating (KTL) to provide optimal protection of the bodywork against corrosion.

Interior design

The Avenio trams built for Munich have an attractive, spacious interior design with two large multifunction areas for wheelchairs, baby buggies, and walkers/rollators accommodated in the end modules. Eight double doors on the entrance side with a clear width of 1.3 meters are arranged at uniform distance over the length of the tram, allowing passengers to board and disembark quickly and easily. The first door behind the driver's cab also has a lift that allows disabled passengers to easily access the tram.

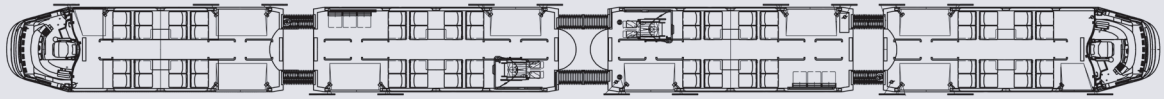
Seats and handrails designed according to ergonomic criteria increase travel comfort, as do the infotainment monitors and automatic ticket machines installed at the customer's request. Air conditioning systems guarantee a pleasant climate throughout the entire ultramodern interior of the vehicle, including the driver's cab.

Project data

Customer	Stadtwerke München GmbH (SWM)
Operational area	Line network of the city of Munich, Germany
Delivery period	November 2013 to February 2014
Scope of delivery	Eight four-section vehicles, spare parts, special tools, documentation, driver and maintenance training
Tests	Static and dynamic testing of the vehicles will be performed at the Wildenrath test center and/or in Munich.

Traction equipment

The electrical equipment is accommodated in containers on the roof of the cars. The traction system consists of three modern pulse inverters using IGBT technology, six low-maintenance three-phase induction motors, and three traction control units (Sibas® 32). The vehicle control uses a bus transmission system in conjunction with a hardwired control system. This redundant design provides maximum reliability and fail-safe performance.



Seating configuration

Brake system

The Avenio has four individual, independent brake systems:

- Electrodynamic brake in the powered bogies with braking to standstill
- Hydraulic, passive spring-loaded brake in the powered bogies
- Hydraulic, active disk brake in the trailing bogies
- Electromagnetic rail brake in all bogies
- Design and braking properties fully comply with EN 13452 and the directives of BOSTrab (German regulation on the construction and operation of trams)

Bogies

The three powered bogies with their two longitudinally installed traction units feature a low center of gravity and minimal unsprung masses. The mechanical coupling of the wheels in a longitudinal direction results in significantly improved running characteristics compared with conventional 100 percent low-floor bogies without wheel coupling. Two suspension stages in the bogie together with rubber-sprung tires and vertical and horizontal dampers ensure optimal dynamic running characteristics.

Technical properties/special features

- Vehicle concept designed to meet highest aesthetic requirements to fit the environment in which it is operating
- Amply proportioned and bright interior design
- Perfect ride comfort and optimized wheel-rail wear
- Optimal load distribution
- Efficient air conditioning systems for passenger compartment and driver's cab
- Uniformly arranged double doors with spacious door areas
- Large multifunction rooms for baby buggies and wheelchairs
- Video-monitored lift for disabled-friendly access
- Large, easy-to-read train destination displays inside and out
- Infotainment monitors
- Interior video surveillance
- External video camera to supplement outside mirror



Interior



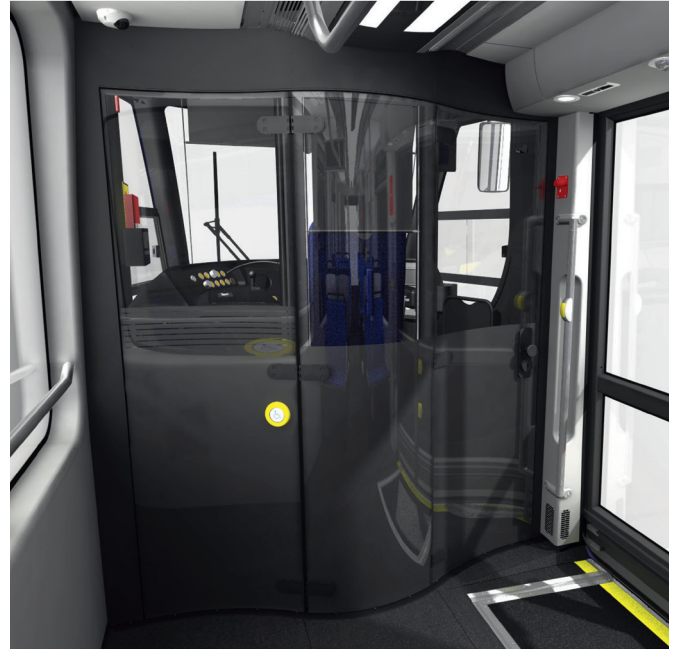
Interior with automatic ticket machine and gangway



100% low-floor



Ergonomic driver's cab



Multifunction compartment for passengers in wheelchairs or with baby buggies, with electric lift

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