



Light Rail

Reference List

SIEMENS

efficient rail solutions

Contents

Introduction	5
Combino Low-Floor Light Rail Vehicles (LRV)	
Combino Potsdam for Verkehrsbetrieb Potsdam GmbH (ViP)	6
Combino Freiburg for Freiburger Verkehrs AG (FVAG)	7
Combino Augsburg for Stadtwerke Augsburg Verkehrsgesellschaft mbH (StwA)	8
Combino Düsseldorf for Rheinische Bahngesellschaft AG (Rheinbahn)	9
Combino Hiroshima for Hiroshima Electric Railway Co. (Hiroshima Dentetsu)	10
Combino Erfurt for Erfurter Verkehrsbetriebe AG (EVAG)	11
Combino Nordhausen for Stadtwerke Nordhausen Verkehrs- und Stadtreinigungsbetrieb GmbH	12
Combino Basel for Basler Verkehrsbetriebe (BVB)	13
Combino Melbourne for National Express Group, Australia	14
Combino Amsterdam for Gemeentevervoerbedrijf (GVB) Amsterdam	15
Combino Bern for Städtische Verkehrsbetriebe Bern (BERNMOBIL)	16
Combino Ulm for SWU Verkehr GmbH (Stadtwerke Ulm/Neu-Ulm)	17
Combino Verona for AMT Verona (Azienda Mobilità e Trasporti SPA di Verona)	18
Combino Poznań for Miejskie Przedsiębiorstwo Komunikacyjne w Poznaniu Sp. z o.o. (MPK)	19
Combino Sul do Tejo for Promotor Group Metro Transportes do Sul (MTS), Portugal	20
Combino Budapest for Budapesti Közlekedési Részvénytársaság (BKV Rt.)	21
Combino Valencia for Ferrocarrils de la Generalitat Valenciana (FGV)	22
Avanto/S70 Low-Floor Light Rail Transit Vehicles (LRT)	
S70 Houston for Metropolitan Transit Authority of Harris County (Houston METRO)	23
S70 San Diego for Metropolitan Transportation Development Board (MTDB)	24
Avanto SNCF Paris for Société nationale des chemins de fer français (SNCF)	25
Additional references in Europe and North America	26



1889



2003



2001



2004

Introduction

Competence based on experience and tradition

As in many other areas of rail-bound transportation, Siemens is also a competent supplier for customer-specific light rail vehicles. Participating in the continuous evolution of technology and meeting customer requirements – this has been our goal ever since the introduction of the first catenary-supplied light rail vehicle in Berlin-Lichterfelde back in 1889. Today, millions of passengers use mass transit vehicles built by Siemens every day to reach their destination safely and on time.

Two sectors are characteristic of today's Light Rail market: low-floor light rail vehicles (LRV) and light rail transit vehicle (LRT). As one of the world's leading suppliers, Siemens efficiently covers these sectors with its Combino®, the world's best-selling 100% low-floor light rail vehicle, and its Avanto®, the low-floor light rail transit vehicle with multi-system capability. Our experience and expertise make both product families the ideal rail-bound public transit system.

Service-proven components guarantee maximum reliability and availability of these vehicles. Custom design with high quality is our goal. This is fully supported by our design and assembly concepts at our locations in Erlangen, Krefeld/Uerdingen, and Sacramento.

The Combino – a success around the world

The Combino is our versatile low-floor light rail vehicle. It is specially designed for urban transportation with narrow curves, short distances between stops, and fast boarding and exiting by passengers. Since 1998, Combino have been ordered by 17 cities in 10 countries on 3 continents, which corresponds to more than 600 vehicles of this modular platform concept. As of summer 2003, more than 300 vehicles are already in daily service, having successfully run more than 20 million route kilometers – and the numbers are rising every day.

With their wide variety of designs, the Combino are already a characteristic feature of many cities.

The continuous development of this family of LRVs is ensured by the permanent exchange of experience with our customers.

The Avanto/S70 – fast, attractive, comfortable

Like the Combino in the light rail vehicle sector, the Avanto/S70 family of vehicles offers many benefits in the area of light rail transit. It is the first common platform developed for the LRT segment in Europe and the USA. It is marketed in the USA under the S70 brand.

The Avanto/S70 family of vehicles is designed for dual use: as a light rail transit system for fast and comfortable transportation and as a multi-system vehicle for seamless travel between the city and the surrounding region. All this is based on a sophisticated platform concept that permits maximum flexibility for design options.

The Avanto/S70 has a low-floor design. The comfort for passengers is ensured by convenient boarding and the optimum passenger flow. The combination of comfort and high speed of travel makes this vehicle an attractive alternative to the automobile.

As a multi-purpose vehicle, the Avanto/S70 also complies with the significantly more stringent safety requirements for mixed traffic on main railway lines.

Three customers have opted for this young family of LRT vehicles so far.



100% low-floor
LRV

RODE ON THE FIRST ONE 401
WHILE HERE

Combino Potsdam for Verkehrsbetrieb Potsdam GmbH (ViP)

Verkehrsbetrieb Potsdam (ViP) was the first transit authority to purchase the Combino – 48 five-section articulated low-floor light rail vehicles – following a trial phase of the prototype in Potsdam. The first units were rolled out between October and December 1998 and have successfully been in service since then. The customer ViP will receive the remaining vehicles on schedule.

Findings from the test runs led to a few detail improvements, demonstrating how easily the Combino concept can be customized to specific requirements. The 30.5-meter five-section light rail vehicle offers greater customer comfort by providing ample space between the seats, better visibility toward the front and to the driver, with a transparent wall separating the driver's cab from the passenger compartment. The driver's console has also been customized to meet the specific needs of the Potsdam transit authority.

Special feature

In Potsdam, a Charter Rail agreement was concluded for the first time. This agreement covers vehicle maintenance which will be performed over a period of 15 years in close cooperation between the transit authority and Siemens AG.

Type	Five-section articulated low-floor light rail vehicle for single-ended operation	
Year of construction	1998–2009	
Wheel arrangement	Bo 2 Bo	
Track gauge	[mm]	1435
Vehicle length over buffers	[mm]	30520
Vehicle width	[mm]	2300
Boarding height	[mm]	300
Voltage system	750 V DC (600 V DC) +20%/-30% via contact line	
Traction rating	[kW]	4 x 100
Maximum speed	[kph]	70
Empty weight	[t]	32
Passenger capacity (at 4 pas./m ²)	176, including 69 seated	
Number of units	48	



100% low-floor
LRV

Combino Freiburg for Freiburger Verkehrs AG (FVAG)

Freiburger Verkehrs AG (FVAG) has ordered 18 seven-section articulated low-floor Combino light rail vehicles since November 1997. Nine of these units were ordered in March 2002. While the nine Combino from the first order are already being deployed in passenger service, the second lot will be delivered to customers into 2004.

The 42-meter seven-section light rail vehicles for double-ended operation are primarily used to meet peak-hour demand on certain lines.

Special features

The vehicles feature roller-type displays in addition to the matrix front-end destination display for the color-coded line number display that was already a proven concept in Freiburg.

The first forward double-door is equipped with a manually retractable ramp for easy wheelchair access.

The long vehicles also have a quick-release mechanism between car sections 4 and 5 for easier handling in the workshop.

Additional features

- Air-conditioned driver's cabs
- Air conditioned passenger compartment (2nd series)
- CCTV*) surveillance in passenger compartment (2nd series)
- 10 double- and 2 single-leaf swing-plug sliding doors
- Prepared for ticket vending machine and validator
- Switch control

Type	Seven-section articulated low-floor light rail vehicle for double-ended operation	
Year of construction	1999–2004	
Wheel arrangement	Bo 2 Bo Bo	
Track gauge	[mm]	1000
Vehicle length over buffers	[mm]	41 960 (1 st series) 41 290 (2 nd series)
Vehicle width	[mm]	2 300
Boarding height	[mm]	300
Voltage system	750 V DC +20%/-30% via contact line	
Traction rating	[kW]	6 x 100
Maximum speed	[kph]	70
Empty weight	[t]	46 (1 st series)/51 (2 nd series)
Passenger capacity (at 4 pas./m ²)	245, including 82 seated (1 st series) 233, including 74 seated (2 nd series)	
Number of units	18 (9 + 9)	

*) closed circuit television



100% low-floor
LRV



100% low-floor
LRV

Combino Melbourne for National Express Group, Australia

The Australian subsidiary of the National Express Group (NEG) placed an order for a total of 59 Combino, including 38 three-section and 21 five-section units. These will be used as „M>Tram“ in the world’s second-largest light rail network in Melbourne.

Siemens was also contracted to provide service and maintenance for these vehicles over an initial period of 15 years, as well as the complete spare parts management.

Special feature

The Combino for Melbourne is the first unit with a width of 2.65 meters.

Additional features

- High-performance air conditioning (one air-conditioning system for the passenger compartment and driver’s cab in the three-section unit, two air-conditioning systems in the five-section unit)
- Large, clearly visible destination and stop displays
- Ample space for wheelchairs and baby carriages
- Video monitoring in the passenger compartment

Type	Three-section articulated low-floor light rail vehicle for double-ended operation	Five-section articulated low-floor light rail vehicle for double-ended operation
Year of construction	2002–2004	2003–2004
Wheel arrangement	Bo Bo	Bo 2 Bo
Track gauge [mm]	1435	1435
Vehicle length over buffers [mm]	20 040	29 850
Vehicle width [mm]	2 650	2 650
Boarding height [mm]	300	300
Voltage system	600 V DC +20%/-30% via contact line	600 V DC +20%/-30% via contact line
Traction rating [kW]	4 x 100	4 x 100
Maximum speed [kph]	70	70
Empty weight [t]	27	37
Passenger capacity (at 4 pas./m ²)	88, including 30 seated/6 tip-up seats	190, including 58 seated/6 tip-up seats
Number of units	38	21

Combino Amsterdam for Gemeentevervoerbedrijf (GVB) Amsterdam

In April 2000, the Amsterdam transit authority (GVB) ordered 95 low-floor Combino light rail vehicles. This was the largest Combino order in one of the most important international bids for low-floor light rail vehicles.

In December 2000, GVB exercised its option for 60 more Combino. The first unit was delivered in December 2001.

Four of a total of 155 Combino are designed for double-ended operation.

The many canals (grachten) of Amsterdam present particular topographical demands for the operation of low-floor light rail vehicles, which the Combino can easily overcome.

Special feature

The newly designed driver’s workplace as well as a conductor cab in-car section 4 are designed in compliance with the standards of the Dutch professional association (ARBO) and are fully air-conditioned.

Additional features

- Central heating with warm air outlets in the floor area from the roof-mounted heaters via lateral HVAC ducts
- Graffiti-resistant seat shells in the intermediate modules. The side wall panels have a graffiti-resistant coating, and the window panes are equipped with a scratch-resistant film.
- All seats are equipped with handrails that incorporate a stop-request button.
- CCTV surveillance
- Multimedia information system
- ATP train stop for tunnel sections
- Standardized passenger information system (open system architecture)
- Trip recorder with integrated black box
- Traction-capable Albert coupler for double running
- Electrically operated, heated swing-out mirrors

Type	Five-section articulated low-floor light rail vehicle for single-ended operation (SE) or double-ended operation (DE)
Year of construction	2001–2004, (2002 DE)
Wheel arrangement	Bo 2 Bo
Track gauge [mm]	1435
Vehicle length over buffers [mm]	29 200
Vehicle width [mm]	2 400
Boarding height [mm]	300
Voltage system	600 V DC
Traction rating [kW]	4 x 100
Maximum speed [kph]	70
Empty weight [t]	34.9 (SE), 35.3 (DE)
Passenger capacity (at 4 pas./m ²)	167, including 60 seated (SE) 167, including 52 seated (DE)
Number of units	151 (SE), 4 (DE)



Europe

USA/Canada

Our years of experience – your long-term advantage

1 Type ULF low-floor light rail vehicle
for Wiener Linien

As a 100% low-floor design, the ULF (ultra low floor) has the world's lowest boarding height of only 197 mm. This means maximum boarding convenience and fast passenger boarding and exiting.

The vehicles are 24.2 meters and 35.5 meters long and designed for single-ended operation. Since the delivery of the first production vehicle to Wiener Linien in 1997, 100 ULFs are currently used in passenger service. A total of 150 light rail vehicles will be produced until 2005.

2 Type GT8-100D/2S-M two-system light rail transit vehicle
for Albtal-Verkehrsgesellschaft mbH, Karlsruhe

The GT8-100D/2S-M is an eight-axle double-ended vehicle for use in urban and interurban transportation, both in the local light rail system and on the tracks of German Rail (DB AG). The three-section medium-floor LRT vehicles are 36.5 meters long. 63 units of this type will be delivered to Albtal-Verkehrsgesellschaft between 1997 and 2004, 32 cars have panoramic windows and another four include even a bistro car.

3 Type GT 6-70 D/N and GT 8-70 D/N low-floor light rail transit vehicle
for Verkehrsbetriebe Karlsruhe GmbH

The articulated low-floor vehicle is designed for single-ended operation in the urban network but can also operate in the 750 V DC regional rail system. The boarding height is 340 mm. An extendible doorstep ensures access virtually without any step or gap. Twenty LRT vehicles with a length of 29.5 meters were delivered in 1999, and an additional 5 with a length of 39.7 meters will follow in 2003.

4 Type MGT 6 low-floor light rail vehicle
for V.V.M. De Lijn, Antwerp/Gent

The type MGT 6 low-floor light rail vehicle is a six-axle, five-section articulated car for single- or double-ended operation. The 29.6-meter units have a floor height above rail of 350 mm. The 92 units are delivered from 1999 to 2005.

5 Type S-DT 8.10 light rail transit vehicle
for Stuttgarter Straßenbahnen AG

The S-DT 8.10 is a married pair with a gangway for urban transportation. All eight axles are driven and enable this double-ended vehicle to overcome even difficult topographical conditions. A total of 50 units with a length of 38.7 meters are produced between 1999 and 2005.

6 Type SD 160 high-floor light rail transit vehicle
for Regional Transportation District (RTD), Denver

Since 1994, the city of Denver has ordered 61 SD 100 vehicles from Siemens. This has been augmented by the latest order placed in summer 2002 for 34 type SD 160 high-floor LRT units for double-ended operation.

7 Type SD 660 low-floor light rail transit vehicle
for Tri-Metropolitan Transportation District (Tri-Met), Portland

The type SD 660 LRT vehicle for the city of Portland is 27.2 meters long, comes with a floor height of 355 mm above top of rail in the low-floor area, and is designed for double-ended operation. A total of 79 units of this type have been and will continue to be manufactured for Portland between 1995 and 2005, with 52 light rail transit units already in revenue service.

8 Type SD 160 high-floor light rail transit vehicle
for City of Calgary Transportation, Canada

The single-articulated high-floor LRT is a six-axle vehicle used in double-ended operation. Between 2000 and 2003, a total of 32 units of this type will be delivered to our customer in Calgary. They complement the existing fleet of 85 U2 high-floor light rail transit units that have continuously been delivered to Calgary from 1980 to 1984.

9 Type SD 160 high-floor light rail transit vehicle
for Utah Transit Authority (UTA), Salt Lake City

Following the delivery of 23 SD 100 units, our customer in Salt Lake City ordered ten single-articulated SD 160 type light rail transit units which are being produced between 2001 and 2003. The vehicles have a floor height above rail of 914 mm and are designed for double-ended operation.

10 Type SD 460 high-floor light rail transit vehicle
for Bi-State Development Agency, St. Louis

St. Louis has ordered a total of 56 LRT vehicles of the type SD 460 to date, with the latest order for 22 units, scheduled for delivery by 2004. These high-floor units are designed as six-axle, 26.3-meter double-ended cars.

The vehicles described above represent a cross-section of the projects handled in recent years.