Siemens AG, Transportation Systems (TS) is one of the very few providers of solutions to the rail transport industry. After the successful implementation of the BTS Skytrain System, a turnkey system for Bangkok's first subway (M.R.T. Chaloem Ratchamongkhon Line / Blue Line) was planned by the Metropolitan Rapid Transit Authority's (MRTA) concessionaire, Bangkok Metro Public Company Limited (BMCL).

In February, 2002, the turnkey contract, including the supply of 19 three-car units was awarded to Siemens' Transportation Systems Group. The total scope of delivery comprised the rolling stock, signaling system, track electrification, platform screen doors, ticketing system and depot equipment and also included the complete maintenance for these systems.

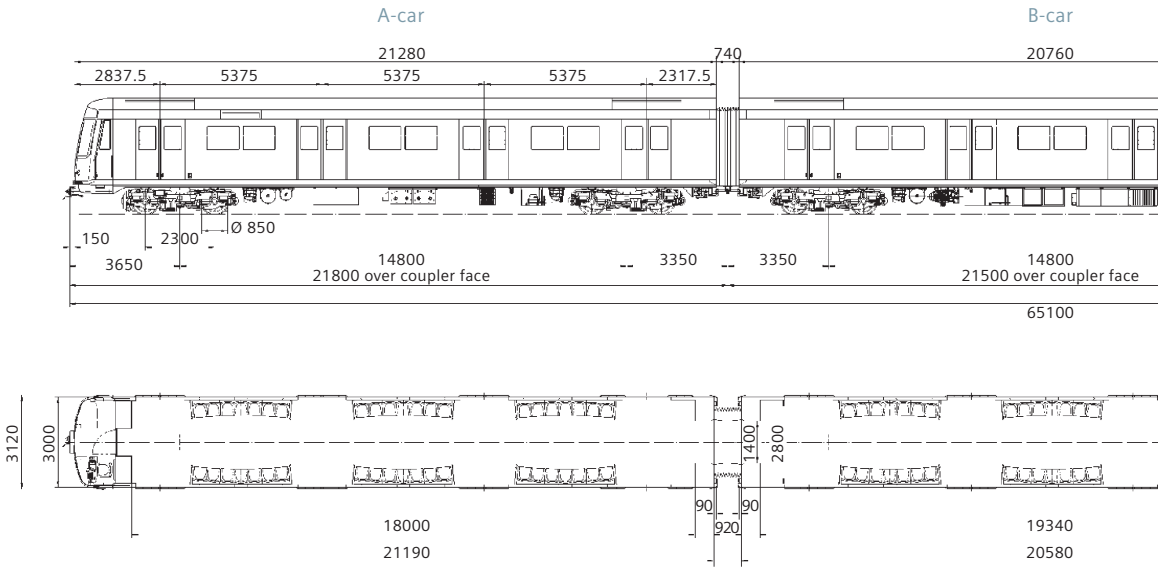
Technical Data	
Train configuration	MC+T+MC
Wheel arrangement	Bo'Bo'+2'2'+Bo'Bo'
Carbody material	Stainless steel
Track gauge	1,435 mm
Length over couplers	65,100 mm
Width of car	3,120 mm
Floor height above top of rail	1,160 mm
Wheel diameter new / worn	850 / 775 mm
Tare weight / total weight (8 p/m^2)	107 t / 175 t
Max. axle load	15.4 t
Number of seats	126
Train capacity 8 pers./m^2	1,139
Passenger doors per car	2 x 4
Min. curve radius, service line	190 m
Max. gradient	5 %
Max. speed (operational)	80 km/h
Max. starting acceleration	1.3 m/s^2
Mean deceleration service brake	0.9 m/s^2
Power supply	750 V DC / Third rail

Metro System – Bangkok MRTA, Thailand

19 Three-Car Units

Transportation Systems

SIEMENS



Project Data	
Customer	Bangkok Metro Public Company Limited (BMCL)
Line	M.R.T. Chaloem Ratchamongkhon Line / Blue Line
Order	1st order
Time period	February 2002–July 2004
Number of units	57 cars / 19 three-car units
Scope of supply	rolling stock, signaling system, track electrification, platform screen doors, ticketing system and depot equipment, complete maintenance for these systems
Tests	extensive train testing was carried out at the Siemens Test Center in Wegberg-Wildenrath, Germany, before delivery

Unusual approaches towards rapid implementation

Siemens' flexibility in dealing with customer requests was demonstrated when the Thai Government inquired whether the contractually stipulated project duration of only 30 months could be reduced even further. Within the context of an acceleration program, the contractual partners agreed to reduce this duration by another two months. Siemens accepted this challenge and was able to start the first demonstration runs four months prior to the opening date. At the Government's request, the first of the three-car trains was even transported by plane from Vienna to Bangkok.

From 2002 to 2004, Siemens TS manufactured and supplied all the rolling stock for the Blue Line of Bangkok. Since the start of revenue service in July 2004, the system has been operating with very high availability also as the result of the extensive train testing at the Siemens Test Center in Wegberg-Wildenrath, Germany.

General arrangement

The trains with their modern, attractive design are capable of carrying a total of 1,139 passengers each, with seating for 126 and standing room for 1,013. They are designed for metro operation and based on the Siemens modular concept which enables trains to be optimally adjusted to specific customer requirements.

Each unit consists of three cars: two motor cars (A-car) and one trailer car (C-car). The A-cars carry the traction container, the brake resistor and electrical equipment boxes under floor. Both A-cars are equipped with driver's cabs to enable bidirectional operation. The C-car carries the auxiliary inverters, the 110 V NiCd battery including its housing, and the air supply system. The three cars are mechanically connected by means of semi-permanent couplers. Wide, open gangways between the A- and C-cars ensure free movement between cars.

Both ends of the three-car unit are equipped with automatic couplers. Two units can be coupled mechanically, pneumatically as well as electrically for recovery purpose.
In view of the prevailing high temperatures and humidity levels, each car is equipped with two powerful roof-mounted compact air-conditioning units.
The electrically powered three-car trains are supplied via a 750 V DC third rail.

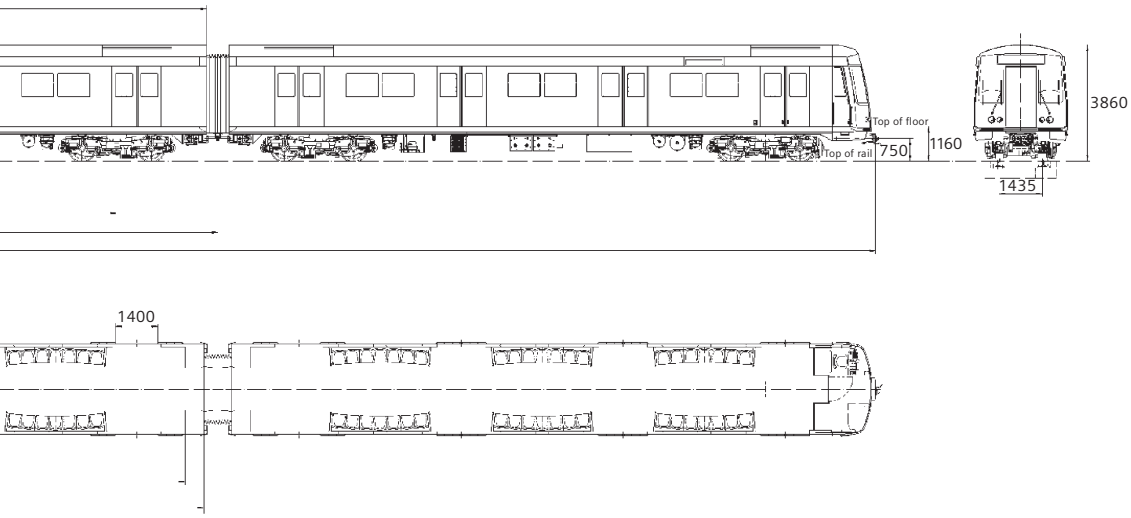
Carbody

The carbodies are of lightweight stainless steel construction. Both car types – the driving motor car and the trailer car – utilize the same modular elements for the carbody which has as many identical parts as possible, such as window and door elements.

The exterior carbody surface is painted according to customer's specification. The carbodies are designed for crashworthiness up to collision speeds of 25 km/h. They withstand compressive forces of 980 kN without permanent deformation. Automatic couplers mounted on the A-cars are capable of absorbing energy without deformation up to collision speeds of 10 km/h to avoid damage to the bodyshell and its structure.

Four electrically powered 1400-mm-wide outside sliding doors are arranged on each side of the cars and enable passengers to board and leave the unit rapidly. The front shell of the driver's cab is a FRP (fiberglass-reinforced plastic) sandwich compound structure and integrates an

C-car



emergency front door for safe train-to-train and train-to-track evacuation.
The modern and functional interior and exterior design has been developed in cooperation with Porsche Design.

Traction equipment
Proven, forced air-cooled Sibac® traction containers feed the open-circuit air-cooled traction motors which are installed in the motor bogies. Each motor bogie is controlled independently by one IGBT VVVF (variable voltage variable frequency) inverter. High efficiency wheel slip-slide protection is provided on each.

The new Sitrac® control allows electrodynamic braking until standstill. This feature provides the advantage of a non-wearing service brake under normal conditions and particularly increases the stopping accuracy at the platform screen doors.

Bogies
Proven SF2000 type bogies, already used in several other metro systems are installed. This type of bogie is equipped with disc brakes. Secondary suspension is provided by air springs, conical rubber springs are used for the primary suspension. The traction motors are transversally integrated into the motor bogies.

Technical features / highlights

- dynamic braking down to standstill (0 km/h)
- high acceleration performance for fast traveling even with short distances between stops
- highly precise stopping at platform screen doors
- highest availability through numerous pretests for product optimization
- particularly effective high performance air-conditioning system due to prevailing high temperatures and humidity levels

Transport of the first three-car train by plane

Driver's cab

Interior design

Siemens AG
Transportation Systems
Mass Transit
P.O. Box 3240
91050 Erlangen
Germany

mass-transit.ts@siemens.com
www.siemens.com/transportation/mass-transit

www.siemens.com/transportation

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