

Driverless Unattended Metro

The Driverless Unattended metro assure high performances, from technical to transportation point of view. Here following the main features of Hitachi Rail STS driverless unattended metro solutions around the world (Copenhagen Metro M1/ M2, operated by Hitachi Rail STS since 2002, Milan Line 5, Brescia, Rome Line C, Thessaloniki, Taipei Circular Line, Riyadh and Copenhagen City Ring).



Driverless Unattended Metro main features

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Service around the clock (24h/day, 7 days/week)

Min Service Headway	75 s
Min curve radius	50 m
Max Speed	90 Km/h
Train Capacity (6p/m ² - train 3 to 6 cars)	434 to 1,200 pass
Max System Transport Capacity (6p/m ² - train 3 to 6 cars)	20,832 to 57,600 pphpd

IGBT Traction inverter

Train under body equipment easy maintenance and cost saving



Driverless Unattended Metro main advantages versus Conventional Metro:

- Lower O&M expenditure
- Headway down to 75 s
- Improved service flexibility
- High level of safety, performance, availability, reliability and quality of service
- Increased public transport service attractiveness

Hitachi Rail STS Main Driverless Unattended Metro in the world

- **Copenhagen Metro M1/M2:** 21.5 km double track (double tunnel), 22 stations, min headway 90 s, 12,000 pphpd (4p/m²), 34 trains 3 cars per train (39m), 13 + 3 years O&M, in operation since 2002
- **Brescia:** 13.7 km double track (single tunnel), 17 stations, min headway 90 s, 17,000 pphpd (6p/m²), 21 trains 3 cars per train (39m), 2 years of operation 7 years of maintenance
- **Thessaloniki:** 9.5 km double track (double tunnel), 13 stations, min headway 90 s, 21,000 pphpd (6 p/m²), 18 trains 4 cars per train (50m), 3 years of service assistance
- **Rome Line C:** 25 km (+17) double track (double tunnel), 30 stations (+12), min headway 120 s, 36,000 pphpd (6 p/m²), 30 (+13) trains 6 cars per train (108m)
- **Milan line 5:** 12.6 km double track (single tunnel), 19 stations, min headway 75 s, 28,000 pphpd (6p/m²), 21 trains, 4 cars per train (50m), 27 years of Operation & Maintenance.
- **Taipei Circular Line (CBTC):** 15.4 km double track (viaduct), 14 stations, min headway 90 s, 26,000 pphpd (6p/m²), 17 trains 4 cars per train (70m), future system extension 52 km, 56 stations, 64 trains
- **Riyadh:** 11.5 km double track (viaduct), 14 stations, min headway 90 s, 4,400 pphpd (2.5 p/m²), 22 trains 2 cars per train (29m)
- **Copenhagen City Ring (CBTC):** 17 km double track (double tunnel), 17 stations, min headway 100 s, 11,000 pphpd (4 p/m²), 28 trains 3 cars per train (39m), 5 + 3 years O&M.

Hitachi Rail STS has so far developed more than 125 km of driverless unattended metro railway lines, with more than 145 stations 8 control and maintenance centre, 190 trains.

Hitachi Rail STS Driverless Unattended CBTC

From Driver to Driverless Unattended driving modes and from new to refurbished lines...

The Hitachi Rail STS CBTC solution, based on moving block technology, overcomes the limitations of conventional fixed-block technology and provides the following main advantages:

- Revamping of existing signalling systems without disruption of regular operation by means of gradual CBTC on board train fleet allowing temporary mixed traffic operation.
- Improved service headway (also on operating lines without any existing track layout and field equipment modification)

- Reduced number of wayside devices (track circuits, wires, signals, etc...)
- Capital cost savings
- Maintenance cost savings
- Use of radio infrastructure to transmit vital and not-vital messages (i.e.: train position, vital movement authority, passenger related information, traffic regulation, etc)
- Operational flexibility thanks to independency from physical devices
- Direction reversal
- Destination IDs

Hitachi Rail STS is also an active participant in European Union sponsored working groups writing the standards for Mass Transit solutions.

Hitachi Rail STS Driverless Unattended CBTC main references

Hitachi Rail STS has been awarded with two Driverless Unattended CBTC E&M turnkey contracts: The Taipei Circular Line and the Copenhagen City Ring line.



Taipei Circular Line Features

	Phase 1	Phase 2	Phase 3
Line Length	15.4km	30km	51.9km
Min Headway	90 s	90 s	90 s
Operational Headway	240 s	240 s	90 s
Stations	14	28	46
Train Capacity(6p/m ²)	650	650	650
Line Capacity	9,750 pphpd	9,750 pphpd	26,000 pphpd
Train Fleet	17 (4 car) trains	tbd (4 car) trains	64 (4 car) trains
Depots	1	1	3
Commercial Speed	35km/h		
Noise Level	70 [morn] - 65 [night] - 60 [aftern] dBA		
Stopping Accuracy	+/- 30cm		
Operational Service	24 h /day - 7 days/week		

Under Construction



Copenhagen City Ring Features

Line Length	17 km underground
Min Operational Headway (Day)	100 s
Min Operational Headway (Night)	15 min
Stations	17
Train Capacity (4 p/m ²)	300 pass
Line Capacity (4 p/m ²)	11,000 pphpd
Passengers/year	70 millions
Train Fleet	28 (3 cars) trains
Commercial speed	39 km/h
Electrical substations	8+1
Depot dimension	90,000 m ²
Third rail power supply	750Vdc
Operational Service	24 h /day - 7 days/week

Under construction and operated by Hitachi Rail STS starting from 2018.