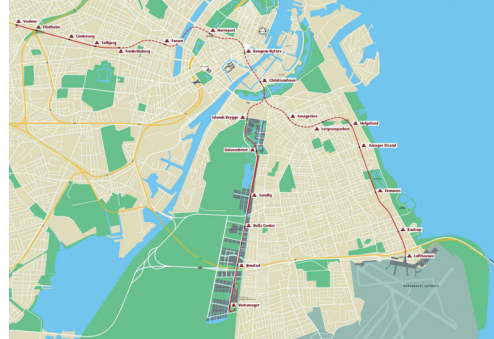


DENMARK:



Copenhagen Metro



In Copenhagen, the fully automated driverless metro is in revenue service. The current configuration consists of a 17 km double-track line with 17 stations and 29 trains. It connects downtown Copenhagen, Frederiksberg, Vanløse and the growing suburb of Ørestad on the Amager island. The system went into operation in October 2002 (Phase 1, followed by Phases 2A+2B in 2003). Phase 3, which is currently under construction, will connect downtown Copenhagen with the International Airport.

The design, construction and operation of the Copenhagen Metro requires safety assessment and authority approval. While the Danish Railway Inspectorate (Trafikstyrelsen) acts as licensing authority, TÜV Rheinland InterTraffic has been chosen to be the safety assessor. The assessment is based on the German BOStrab (Federal Regulation for the Construction and Operation of Tramways), the European Standards EN 5012x for Railway Applications and other Generally Accepted Rules of Technology (e.g. VDV papers, NFPA 130).

Safety assessment covers all safety-relevant subsystems of the transportation system, e.g. the subsystems Permanent Way, Traction Power, Automatic Train Control (ATC), station doors and vehicles as well as general civil engineering aspects. Special consideration has been taken on the certification of the Automatic Train Protection (ATP) system, the safety-relevant part of the ATC. In addition, overall system concepts (e.g. the fire protection concept as well as the evacuation and rescue concept) have been assessed to cover all safety aspects of the driverless and fully automatic operation of the Copenhagen Metro.

Safety assessment is performed concurrently with the development of the system by using the Project Accompanying Safety Certification (PASC) procedure. A detailed and well structured assessment plan together with rigorous interface management ensure completeness and high quality of the safety assessment.

Ordered by:

Ørestadsselskabet I/S, Copenhagen

Important details (Phases 1-3):

Length of the route:	21 km double-track
Number of stations:	22
Number of trains:	34
Estimated number of passengers:	77 mil/annual
Construction cost:	approx. 1.5B Euros
Duration of construction (Phases 1+2):	1996 - 2003
(Phase 3 is under construction)	

Tasks of TÜV Rheinland InterTraffic GmbH:

Project management regarding safety assessment

- assessment planning and coordination
- interface management
- communication/coordination with involved parties including safety authority
- schedule planning and monitoring

Safety Assessment (according to CENELEC EN 5012x)

- safety concepts
- organizational issues and certification process
- all subsystems including civil works
- checking of installations during construction
- operation and maintenance procedures
- trial run, final safety acceptance