

DESIGNED FOR DEMANDING CONDITIONS HELSINKI'S NEW TRAM



**Ollipekka Heikkilä,
Head of Development,
Helsinki City Transport**

Co-Authors

**Jouni Tyni, Manager Sales & Marketing, Transtech
Thomas Mosbacher, Project Manager, Voith**

HELSINKI TRAM SYSTEM

- 57.000.000 passengers / year
- 5,5.000.000 route kilometers / year
- 11 tram lines
- 118 km of tracks
- 132 trams in fleet
- 99,23% departures driven in schedule
- 350 drivers
- 620 staff in total
- 3 depots

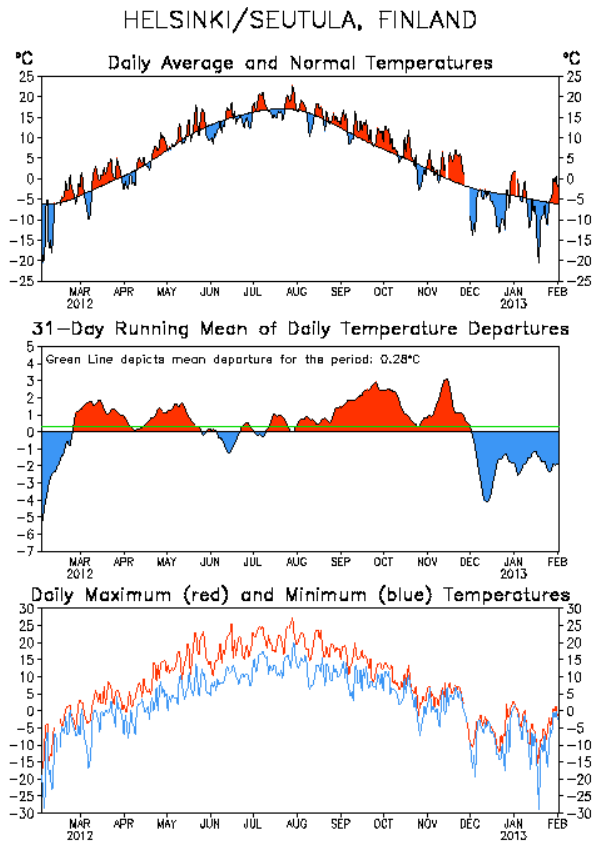


HELSINKI TRAM FLEET

- **30 articulated vehicles** **END OF LIFE CYCLE**
 - manufactured: 1973–75
 - 39 seats, 106 standees (4 prs/sqm)
 - low-floor section: n/a
 - manufacturer: Valmet (Düwag)
- **52 articulated vehicles**
 - manufactured: 1973–87/2006-14
 - 49 seats, 120 standees (4 prs/sqm)
 - low-floor section: 20 %
 - manufacturer: Valmet/HTC (Düwag)
- **40 multi-articulated vehicles**
 - manufactured: 1998-2002
 - 45 seats, 80 standees (4 prs/sqm)
 - low-floor section: 100 %
 - manufacturer: Transtech (Bombardier)
- **40 articulated vehicles** **NEW**
 - to be manufactured: 2012-2018
 - 74 seats, 100 standees (4 prs/sqm)
 - low-floor section: 100 % (elevated seats)
 - manufacturer: Transtech (VOITH)



HELSINKI WEATHER CONDITIONS



Data updated through 01 FEB 2013

CLIMATE PREDICTION CENTER/NCEP



HKL CONCEPT STUDY

BASIC REQUIREMENTS

Excellent passenger comfort

- High passenger capacity
- High number of seats
- Maximum length 28 m
- Maximum width 2.3 m / 2.4 m
- 100 % low-floor
- Air conditioned passenger compartment (incl. floor heating)

Optimized LCC

- High reliability
- High availability
- Good maintainability



HKL CONCEPT STUDY

SIMPLE SOLUTIONS

Low LCC through:

- Robust construction
- Flexible articulations
- Conventional pivoting bogies
- Traditional wheel sets with axles
- Quick wheel set exchange
- Fast exchange of interior and exterior panels; quick repair of accident- or vandalism damage

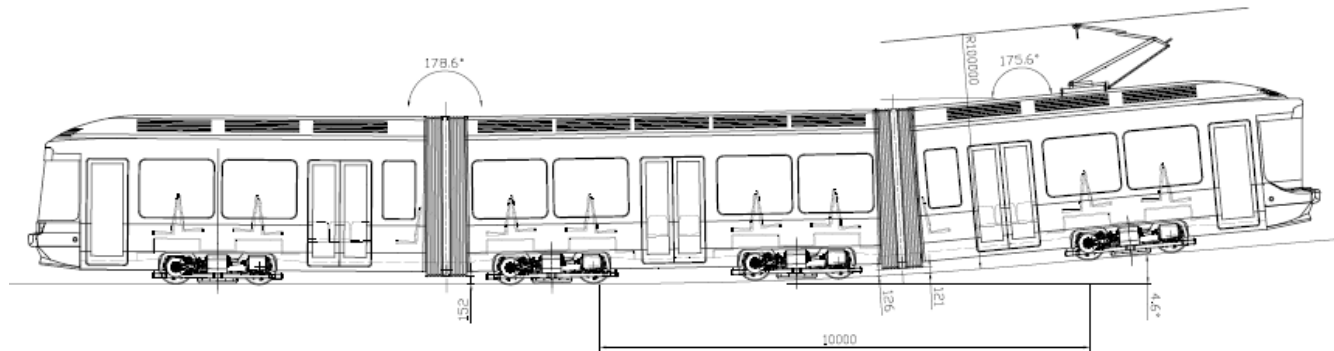
Excellent passenger comfort through:

- Super silent wheels
- Extended spring ways
- Doubled gangway bellows
- Elevated seat arrangement for improved efficiency and passenger safety
- Low horizontal accelerations for passengers and driver
- Carbodies separated from bogie movements

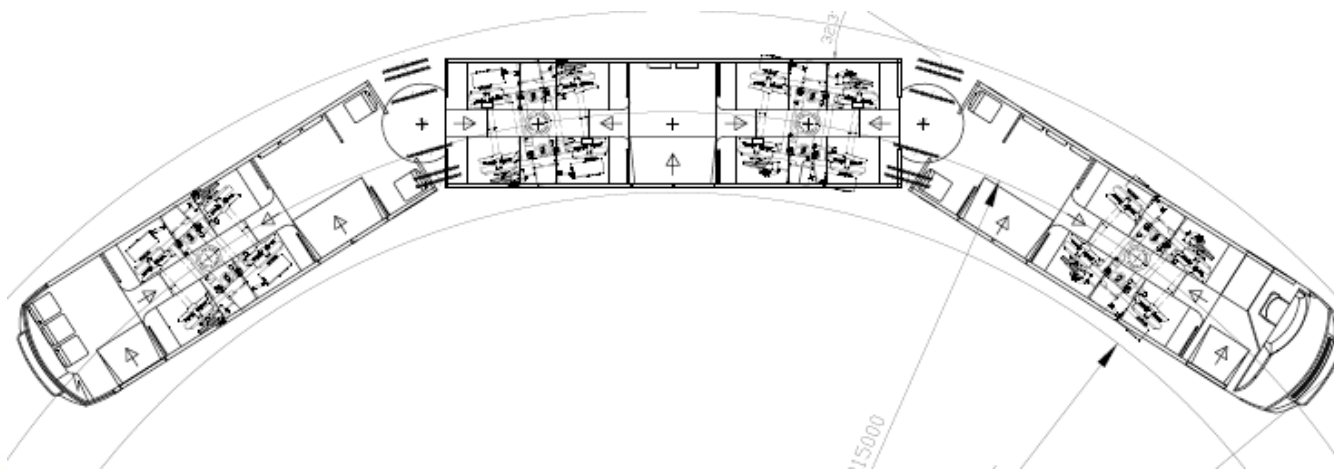
HKL CONCEPT STUDY

REAL BOGIES AND LOW-FLOOR

- Freely twisting carbodies



- Fully pivoting bogies in 15m curve

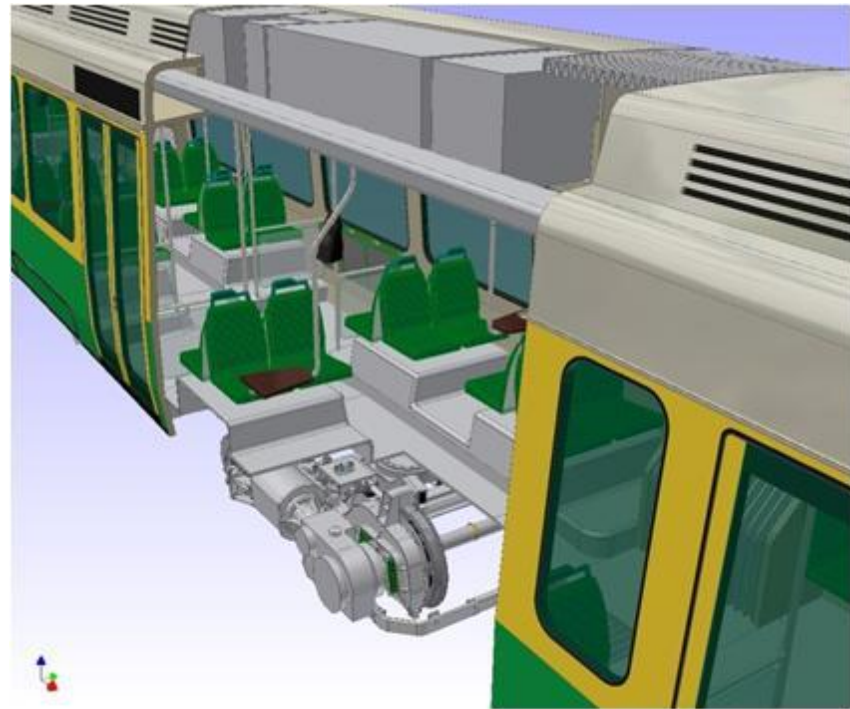


HKL CONCEPT STUDY

CONVENTIONAL BOGIES

Conventional bogies

- Low-floor aisle over bogies
- Freely pivoting (decoupled)
- Rigid axles
- Low unsuspended mass
- Low axle mass
- Low rail- and wheel wear

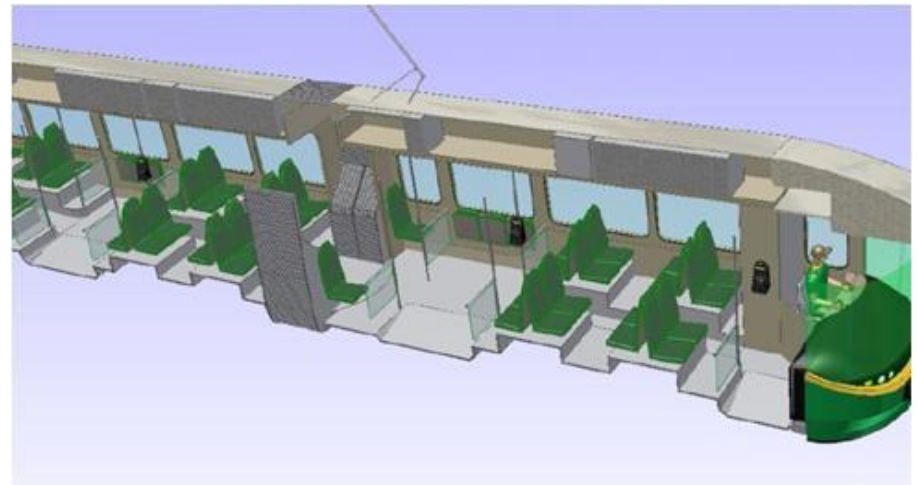


HKL CONCEPT STUDY

LOW-FLOOR

Low-floor through the vehicle

- Easy entrance for reduced mobility
- Raised floor under the seats for convenient seating above car traffic and standing passengers
- Ramps on the floor near the doors and over the bogie

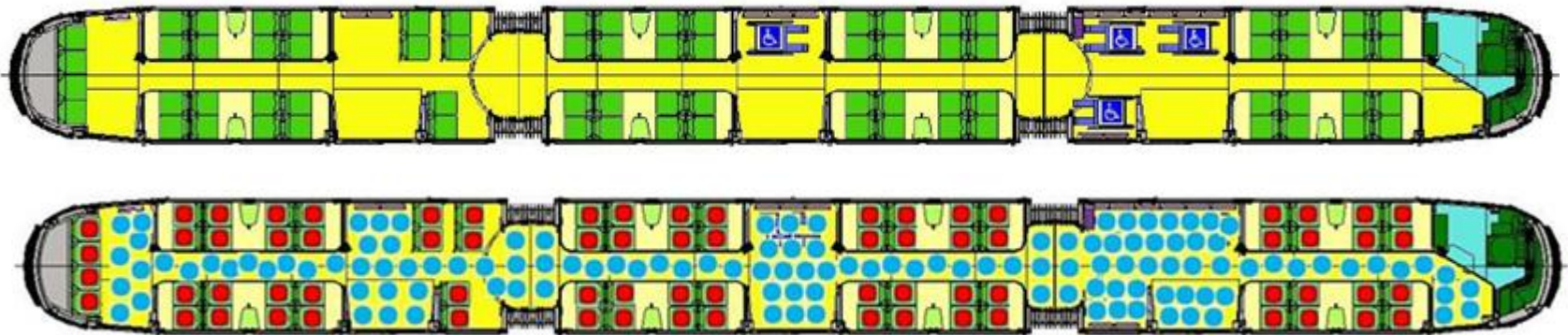


TRANSTECH *ARTIC*

CAPACITY

High passenger capacity

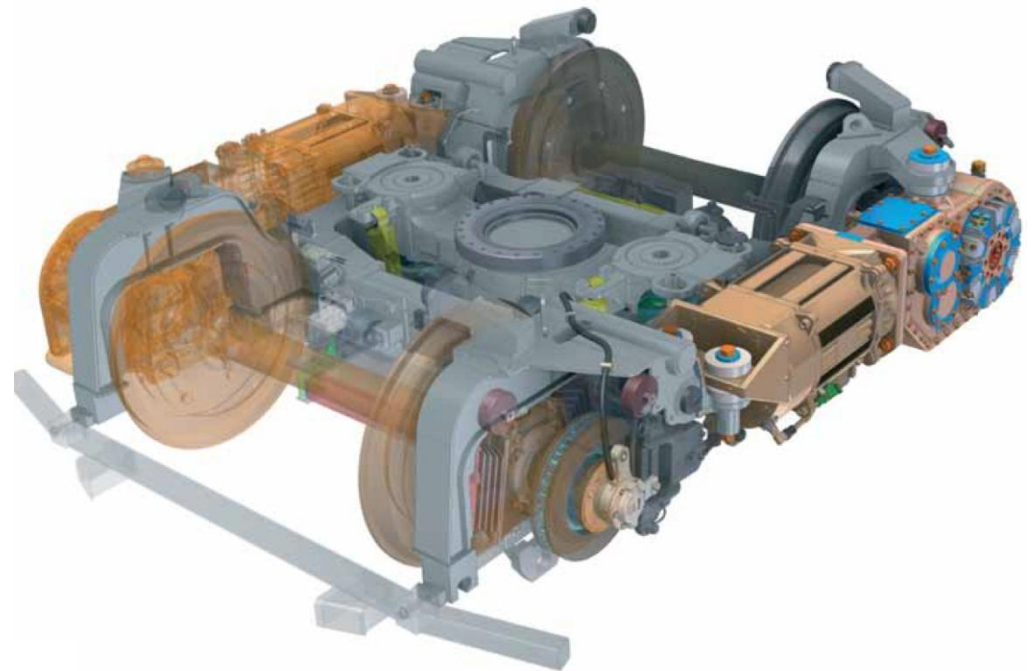
- 74 (+14) seats
- 125 standees (5 persons / m²)
- 199 passengers
- Good passenger flow (5 doors)
- Wheel chairs and prams near driver



TRANSTECH *ARTIC*

FLEXIBLE AND ROBUST BOGIE

- Pivoting bogies
- Low axle mass (4 bogies)
- Helical secondary springs
- Rigid axles
- Short wheelbase (1700mm)
- Shear rubber wheel springs
- Self ventilated motors
- Quick wheelset exchange
- Large wheel diameter



TRANSTECH *ARTIC*

LOW FLOOR WITH LOW-LCC

Low-floor with low LCC:

- Quick wheel set exchange
- High tire-km expectancy
- Very fast exterior- and interior panel exchange
- Fast window exchange
- No bulb exchange (LEDs)
- No floor ageing (composite)
- Innovative heat storage system
- Un-interrupted service through excellent redundancy concept

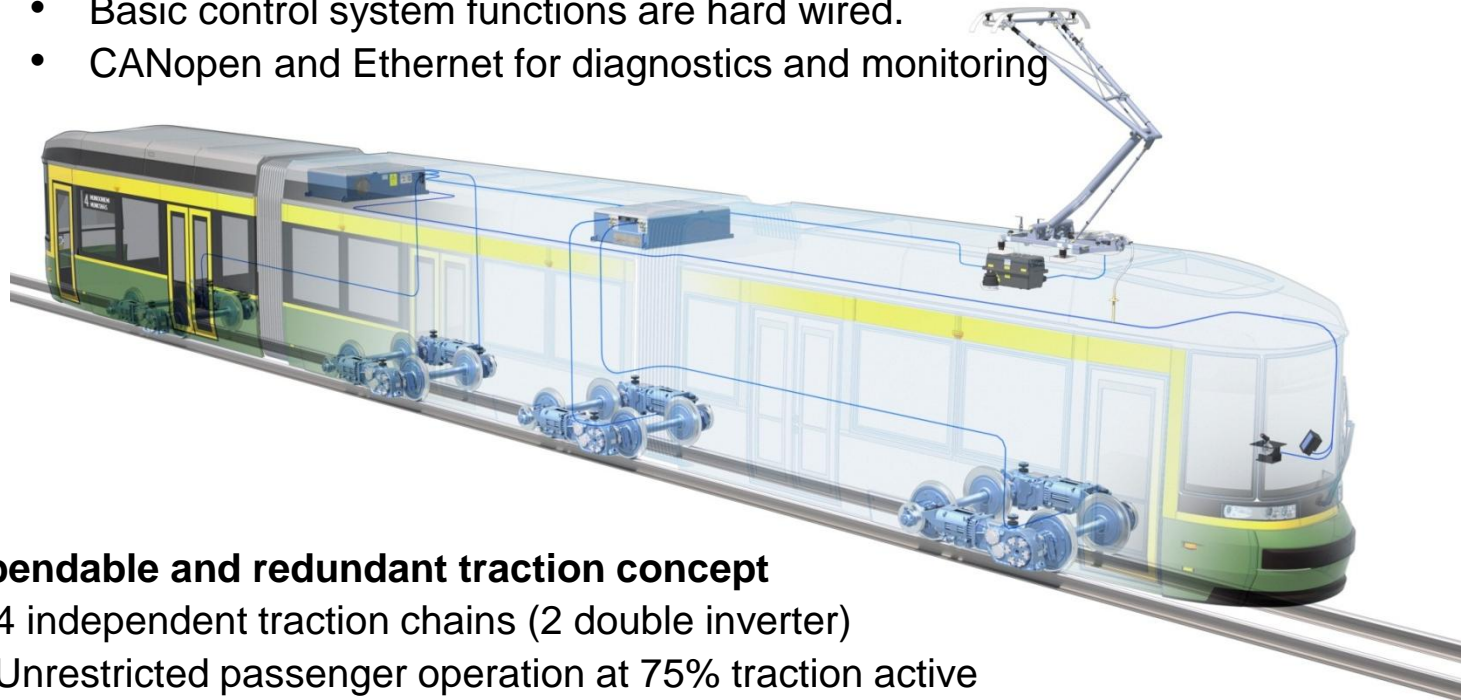


TRANSTECH *ARTIC*

RELIABLE TRACTION SYSTEM

Redundant, conventional control system

- Basic control system functions are hard wired.
- CANopen and Ethernet for diagnostics and monitoring



Dependable and redundant traction concept

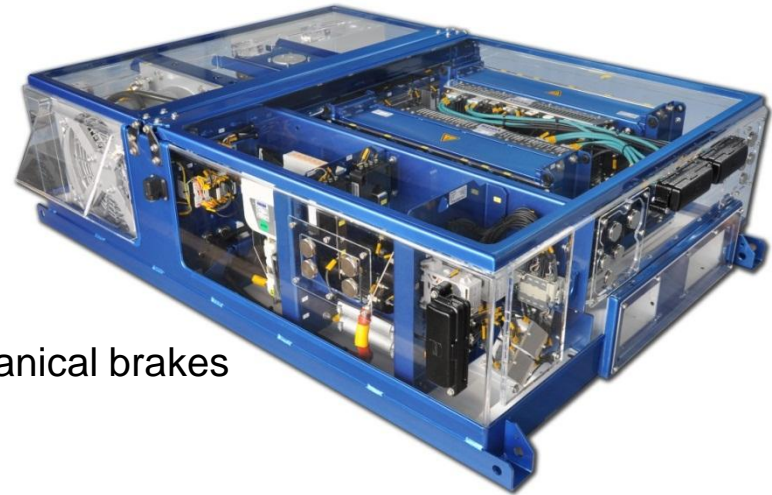
- 4 independent traction chains (2 double inverter)
- Unrestricted passenger operation at 75% traction active
- Low towing demand, restricted operation at 50% traction active

TRANSTECH *ARTIC*

Energy-efficient electric drive

Low LCC

- Priority controlled brake energy management:
 - I. Heating (selective for each HVAC)
 - II. Recuperation
 - III. Storage (at HVAC system)
- High dynamic slip and slide control:
 - Common control for electrical and mechanical brakes
 - Bogie selective weight compensation



High passenger comfort

- Speed limitation in curve sections

High reliability / maintainability

- Detailed failure and origin detection
- Driver and workshop optimized diagnostics levels
- Equipment engineered and tested for optimized reliability and modular exchange concept



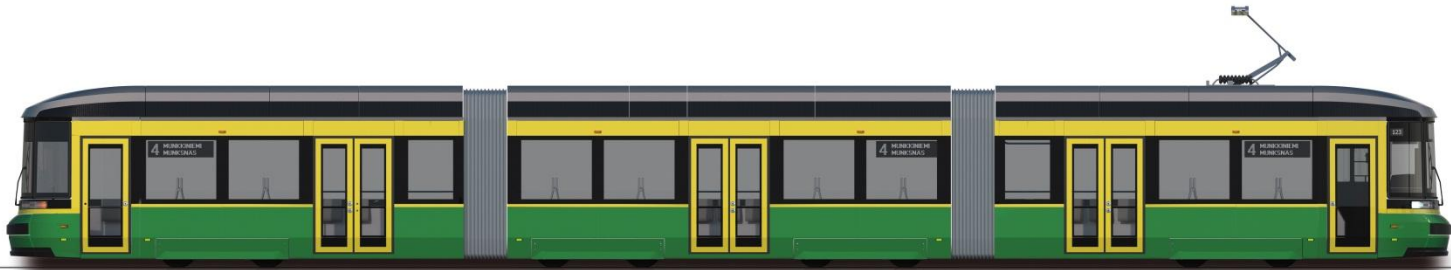
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Redundancy concept

Auxiliary power unit:
Full redundancy

Battery charger:
Full redundancy

Heating:
Full redundancy



Traction: 75%
redundancy

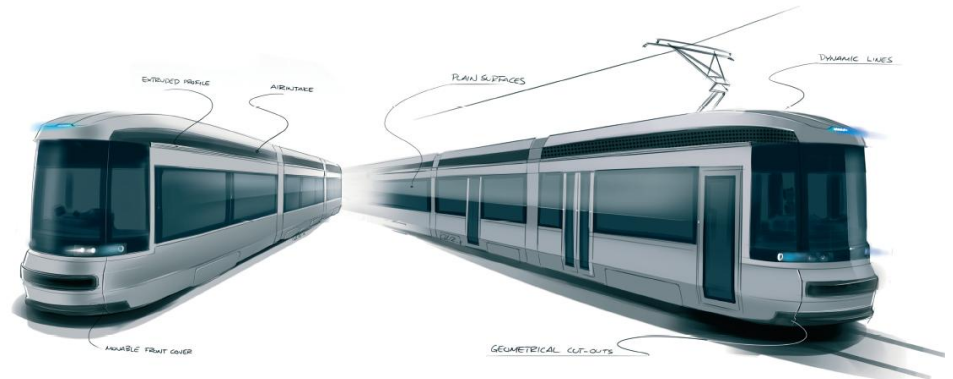
ED – brake:
75% redundancy

Mechanical brake:
75% redundancy

75 % = no reduction in performance

TRANSTECH *ARTIC*

Scandinavian design



TRANSTECH *ARTIC*

Delivery schedule for HKL

- Signing of the contract 24.3.2011
- Delivery of pre-series trams (2) to Helsinki in June – July 2013
- Commissioning and tests runs in Helsinki in June – November 2013
- Serial deliveries (trams 3 - 40) to Helsinki in 2016 – 2018
- Possible delivery of 20 + 30 + 40 optional trams in 2018 – 2026
- Several interested cities in EU



TRANSTECH

ARTIC

powered by

VOITH



Thank you for your attention!

Ollipekka Heikkilä,
Head of Development, HKL