

AXONIS™

The quick-to-build, easy-to-own
light Metro System



ALSTOM
Shaping the future

AXONIS: full turnkey integrated solution — open-standard system with optimized cost and fast installation

Urbanization is a global trend; cities are burgeoning everywhere. Demographic growth in many cities outpaces the rate at which public transit systems can be built and put into service.

Inserting a transit system underneath or within the cityscape can be a long and costly process.

Municipalities need innovative solutions that are swift to build to meet today's imperatives but which will also be easy to expand tomorrow. Cities expect new, safe and reliable transit solutions to enhance their image and be cost-effective in terms of initial capital expenditure as well as operating costs.

To respond to this global trend, Alstom created AXONIS – a turnkey light metro system designed to run on an elevated viaduct, in underground tunnels or at street-level in the suburbs, carrying up to 45,000 passengers per hour, per direction.





5 reasons to choose AXONIS

Elegant & easy to insert in your city - 04

AXONIS has been designed to flow easily into and through a city, to be able to take sharp curves and run up gradients. Both trains and track infrastructure - either on a viaduct or in a tunnel - are engineered to deliver fluidity through the existing cityscape. To become a symbol of municipal identity, AXONIS trains & viaduct were conceived to be harmonized with the architecture of your city.

Fast to build - 05

Modular viaduct, smart system integration and innovative construction methods make it possible to reduce project execution time considerably. As a result, AXONIS is designed to be built and operational in 3-4 years' time.

Economical to acquire and operate - 05

AXONIS system has been optimized to keep acquisition costs down without compromising its safety, comfort or quality. In addition, fast to build also means less construction costs. AXONIS is designed to reduce maintenance costs and energy consumption by 20% versus traditional metros or monorail systems running on rubber tires.

Non-proprietary and easy to expand - 06

AXONIS is an "open system". Transport Authorities will not be locked-in by proprietary technology or non-standard interfaces between sub-systems. When Operators decide to expand their AXONIS fleet, they will be able to do this through a tendering process.

Safety and comfort for all - 06

Safety is always a paramount priority for Alstom. AXONIS features the highest safety measures, e.g. a proven front-end passenger evacuation door to be used should a train be blocked on a viaduct. AXONIS is also designed to deliver best-in-class reliability and comfort for passengers.

Easy to insert, fast to build,



Elegant & easy to insert in your city

AXONIS is conceived to integrate easily into the city, providing effective mass-transit mobility.

- Capacity of 10,000 to 45,000 passengers per hour per direction
- 2-car to 5-car trains
- Ability to operate on 45m radius curves & 6% ramps
- System composed of sections on viaduct, at street level, or in tunnels
- Light and narrow viaduct : less than 7 meters in width thanks to frontal evacuation system
- Minimized visual presence
- Tailor-made to each city's architecture thanks to Alstom Design & Styling expertise

economical to buy and operate



Fast to build

AXONIS reduces construction time considerably versus traditional systems - 3 to 4 years from order to entry into service.

- Modular viaduct: manoeuvrable pre-cast modules for easy transportation and swift construction
- System integrating track, power-supply, signaling and trains
- Astom's APPITRACK fast track-laying solution

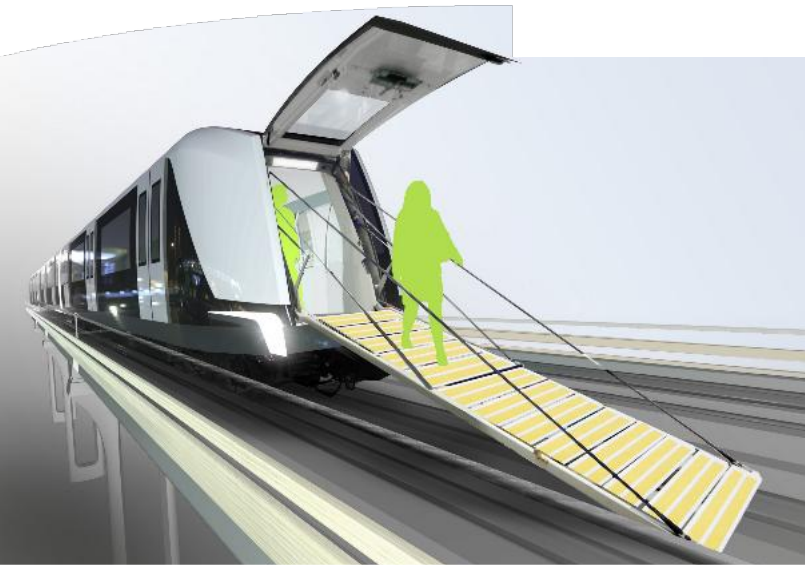
Economical to acquire and to operate

AXONIS is a fully integrated metro system designed to lower capex and opex. All these optimizations add-up to a better total system cost than standard metro sub-systems designed for lot-by-lot procurement.

- Use of viaduct resulting in less civil works than underground systems
- System approach to reduce project engineering costs
- Optimized depot and maintenance facilities
- Fully driverless using Alstom's proven URBALIS train control solution
- Steel-wheel: lower maintenance costs than rubber-tire systems
- Designed for swift and easy periodic inspection
- Lower energy consumption thanks to HESOP power-supply solution (over 99% reuse of braking energy)

AXONIS: the new metro system ready to become the icon of forward-looking cities

Non-proprietary, safe and



Non-proprietary and ready to expand

The AXONIS metro system uses industry standard sub-systems that allow upgrades and line extensions through a competitive tendering process - unlike monorails or rubber-tire metros.

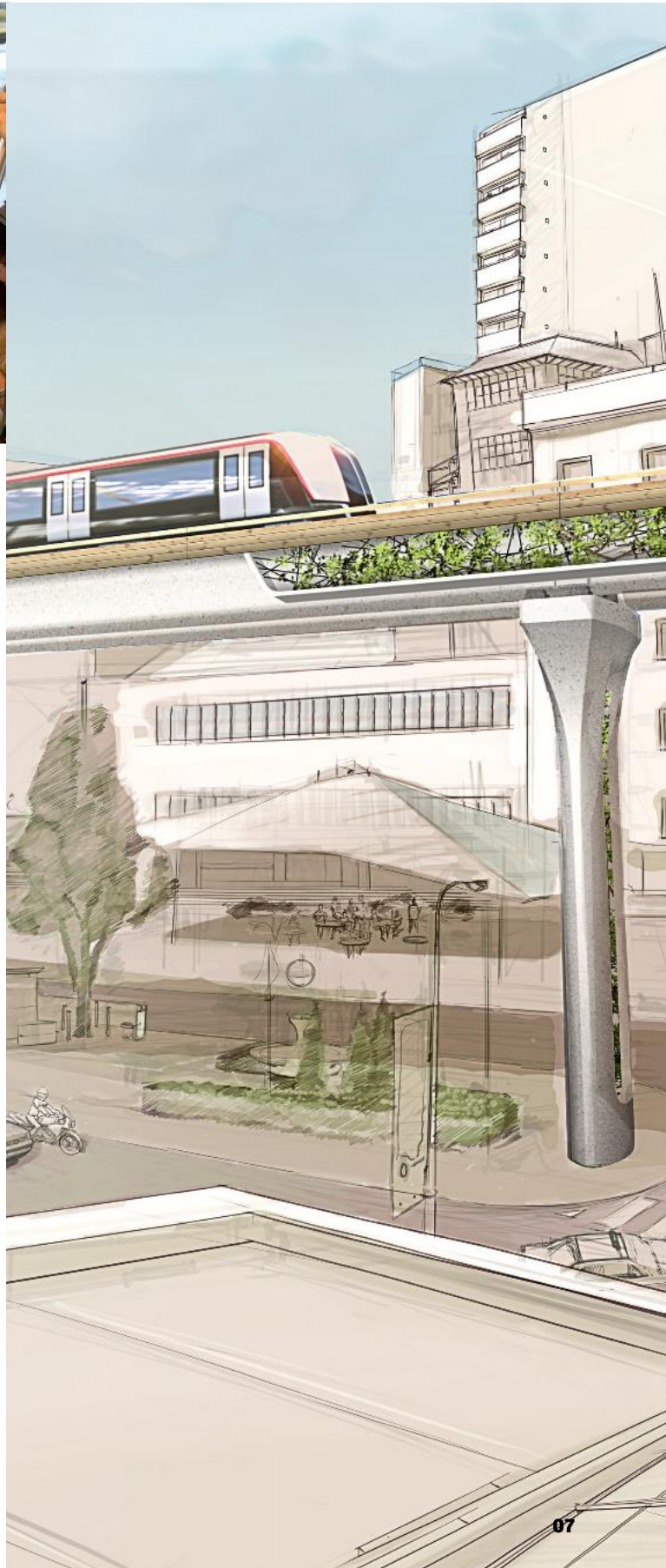
Safety

AXONIS benefits from all of Alstom's metro train, track, power supply, CBTC integration expertise acquired worldwide, over 50 years.

- Service-proven and convenient front-end emergency exit door: no need for lateral passenger evacuation
- Possibility to use the track for passenger evacuation in contrast with other elevated transport systems
- URBALIS metro train control system, ranging from automatic (ATO – GoA2) to driverless (UTO – GoA 4): chosen for more than 50 metro lines worldwide

Alstom's Axonis light metro system to meet specific transport needs of fast-growing and densely populated cities.

comfortable for all



Comfort for all

AXONIS guarantees top-level comfort and serenity for passengers and residents

- Train-to-track interface optimized to attenuate noise level
- Tailor-made interior configurations meeting specific local requirements
- Seating lighting
- Air conditioning
- Passenger information system

Inside the AXONIS System, a



The viaduct and the Infrastructure:

- New compact, modular and standard viaduct, developed with a leading civil works design and construction company
- Conceived for local casting with local civil works partner
- Modules easily transportable into the city on road vehicles
- Standard gauge track built with the proven APPITRACK precision track-laying technology
- HESOP power-supply substations

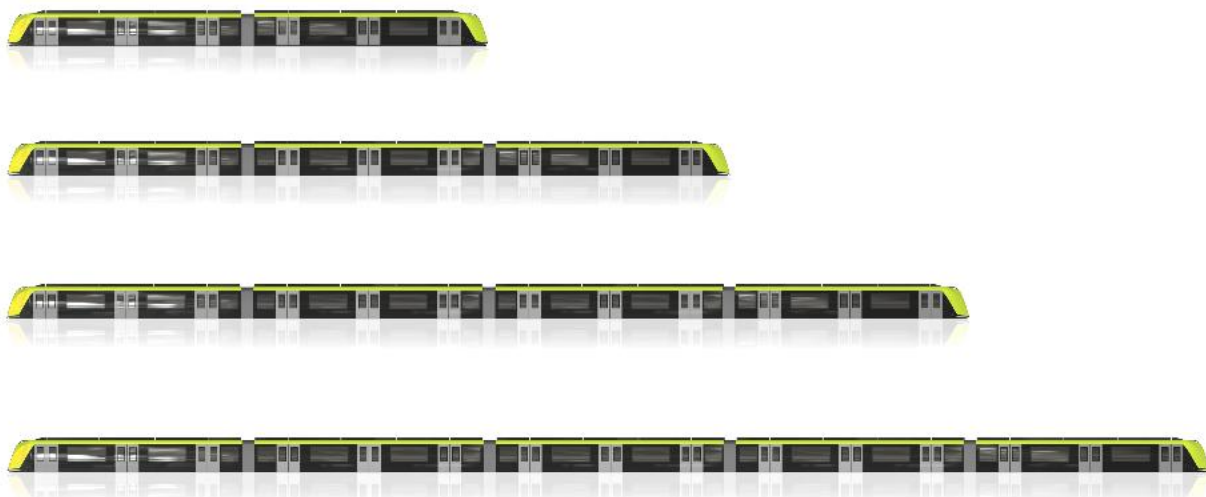
The trains:

- Service-proven METROPOLIS range of products
- ONIX traction technology
- 2-car configuration easily extendable to 3,4,5-car configuration
- Up to 200 passengers per car
- 100% motorized aluminum cars
- Rapid passenger exchange thanks to 3 wide doors per side and per car
- Braking energy recovered and re-used
- Powerful air-conditioning and heating system

The URBALIS CBTC train control system:

- Best-in-class unattended train system (GoA 4)
- Redundant architecture with no single point of failure
- Enhanced operational flexibility with more train movements, fallback systems and recovery modes

blend of Alstom technologies



AXONIS SYSTEM CHARACTERISTICS

Passenger capacity	From 10 000 to 45 000 PPHPD (= Passengers Per Hour Per Direction)
System type	Driverless steel-wheeled metro trains running on standard UIC gauge (1435 mm) steel track on viaduct, at grade or in tunnels.
Tightest curve radius	45 m
Maximum gradient	6%
Operating speed	Up to 80 km/h
Power Supply	750 V DC via standard 3rd rail from HESOP™ reversible sub-stations

AXONIS VIADUCT CHARACTERISTICS

Trackway	Pre-cast girder box
Width of viaduct	6.8 m
Length of straight alignment section	30 m beam
Length of curve alignment section	25 m beam
Pier diameter	1.6 m
Height above street	Up to 14 m

AXONIS TRAIN CHARACTERISTICS

Configuration	from 2-car to 5-car trains	
Car dimensions	Width	2.71 m
	Length	18 m
	Number of doors per side	3
	Door width	1.5 m
	Floor height above top of rail	1150 mm
Passenger capacity	200 passengers per car at 6 passengers/m ²	
Motorization	100% - both bogies in each car are motorized	
Car body	Aluminum	
Safety / evacuation	Front-end door for passenger evacuation onto track-way once made safe	

AXONIS Train Control Characteristics

CBTC	URBALIS™
Shortest headway	Down to 60 s

Alstom Transport Services



Your partner in service

To ensure the lowest lifecycle costs, Alstom provides careful and expert maintenance services, keeping your AXONIS asset at its best:

- Strong record of fleet availability allowing operators to focus on its core business: more than 1,800 metro cars maintained in the world
- Large range of services: from parts supply with leadtime commitment to full maintenance including cleaning services
- Strong obsolescence management
- Condition-based maintenance using real-life monitoring, to reduce cost and ensure top-level availability
- Alstom engineering expertise: Alstom will always be there to stand by its product and will be the best design authority to ensure potential evolution

Train, rail infrastructure and signaling services

AXONIS owners and operators will benefit from Alstom Transport expertise in maintaining train fleets, rail infrastructure and signaling systems.

- 6,000 service technicians, 30 nationalities
- 90 service sites on 5 continents
- Strong parts logistics IT system

Alstom Transport maintains over 1,800 metro cars around the world

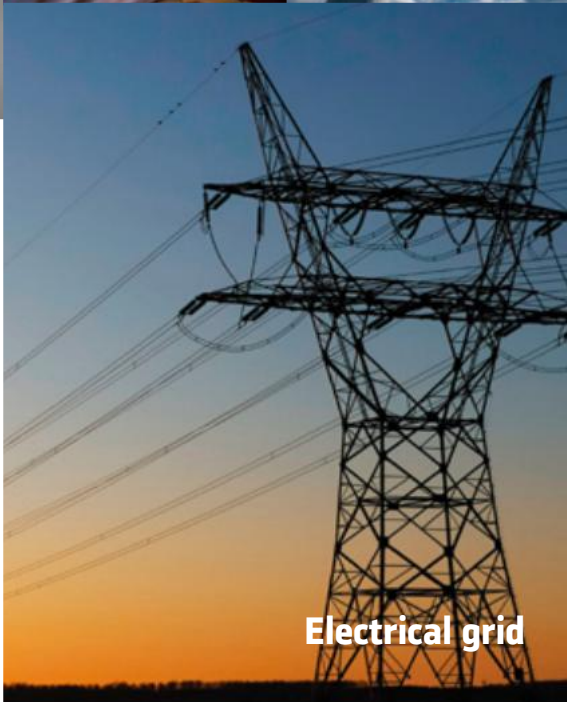


Power generation

Alstom

Alstom is a global leader in the world of power generation, power transmission and rail infrastructure and sets the benchmark for innovative and environmentally friendly technologies.

Alstom builds the fastest train and the highest capacity automated metro in the world, provides turnkey integrated power plant solutions and associated services for a wide variety of energy sources, including hydro, nuclear, gas, coal and wind. Alstom offers a wide range of solutions for power transmission, with a focus on smart grids.



Electrical grid

Rail transport

Providing a transport system requires a comprehensive approach that begins with careful attention to the customer's needs and culminates in the delivery of efficient, harmonious services. For **Alstom Transport**, this approach can be summarised in one word: Fluidity. We develop sustainable and global railway solutions tailored to each operator and public authorities they serve. We create smarter mobility, building and maintaining solutions that operate more safely, comfortably and efficiently. From trains to signaling, infrastructure, services to complete turnkey systems, we offer the widest range of high-tech rail solutions.

Alstom Transport is the global leader in the urban metro and tramway market. It is also a major player in the regional trains sector as well as in high and very-high speed market with more than 1,000 trainsets in commercial service throughout the world.

Operating in a transport market viewed as the most environmentally-friendly, Alstom designs equipment which is increasingly energy efficient and recyclable, accessible to the largest number of people and which can be integrated easily within the environment.



Rail transport

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www.alstom.com

The ALSTOM logo consists of the word "ALSTOM" in a bold, blue, sans-serif font. The letter "O" is replaced by a red circle with a white dot in the center, resembling a stylized eye or a train wheel.