



ASAMBLEA GENERAL DE ALAMYS  
BUENOS AIRES  
26 al 30 de NOVIEMBRE 2013

AXONIS

SPADOTTO, Mario

abcd



AXONIS



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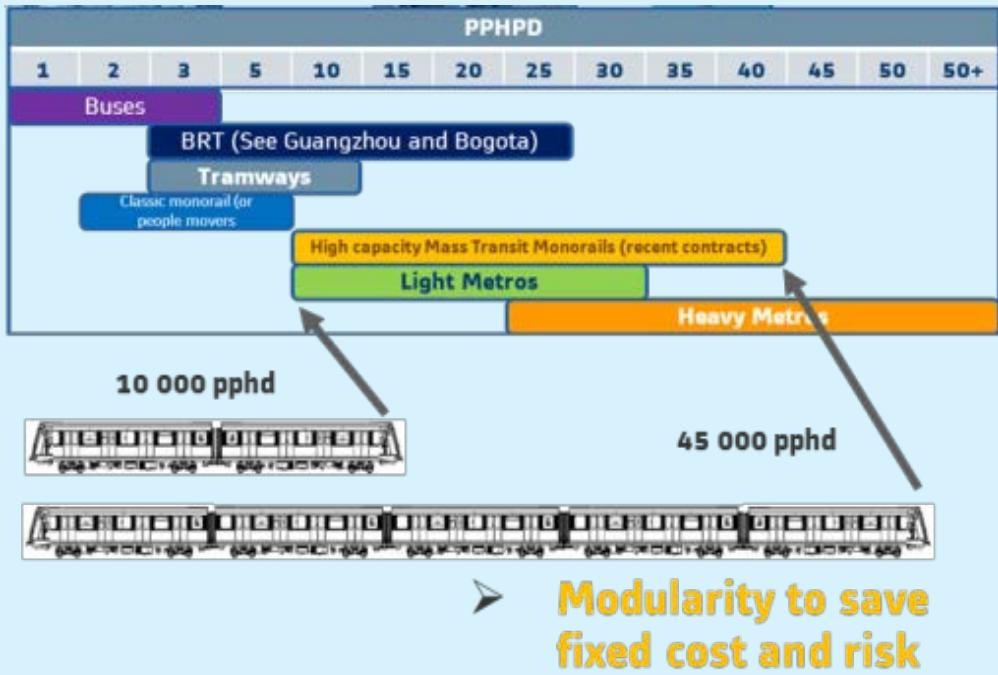


## Introduction

AXONIS is a **driveless metro system** to meet the specific transport needs of fast-growing and densely-populated cities that are seeking **quick construction, easy urban insertion** and **improved life-cycle cost**.



# General description



➤ Full Integrated system to save cost and time

AXONIS is a **turnkey** metro system designed to carry between 10,000 and 45,000 passengers per hour per direction and to operate with **sections on elevated viaduct**, at **grade level** and in **underground tunnels**.



## AXONIS CUSTOMER BENEFITS



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## 5 basic benefits

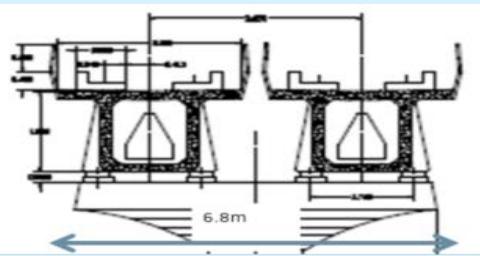
- ✓ **Elegant & Easy to insert in Cities**
- ✓ **Fast to design, build , integrate**
- ✓ **Economical to acquire and operate**
- ✓ **Available**
- ✓ **Safe & Secure**



## Elegant & Easy to insert in your city

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

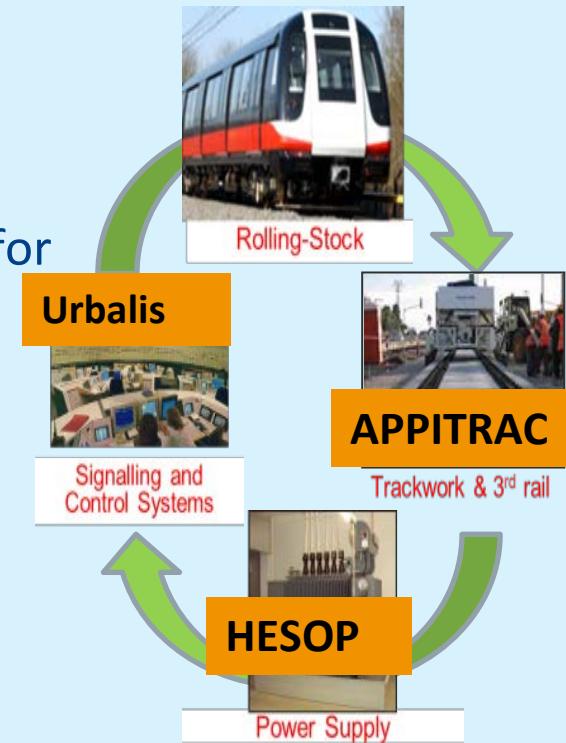
- Capacity of **10,000** to **45,000** passengers per hour per direction
- 2-car to 5-car trains
- Ability to operate on **45-m** radius curves and **6%** ramps
- System composed on sections on viaduct, at street level, or in tunnels
- Light and narrow viaducts: less than **7 meters** in width thanks to frontal evacuation system
- Minimized visual presence with  $750V_{DC}$  3<sup>rd</sup> rail
- Tailor-made to each city's architecture thanks to Alstom Design&Styling



# Fast to design, build, integrate

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

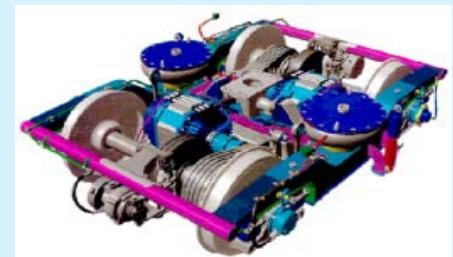
- Standard Driverless Operation mode
- Fully integrated System: track, power supply, signalling, PSD and trains
- Modular viaduct: manoeuvrable precast modules for easy transportation and swift construction
- Alstom's APPITRACK fast track-laying technology



## Economical to acquire and to operate

AXONIS is designed to **lower CAPEX** and **OPEX**, with a **global system approach** to provide **high performances for optimised cost**.

- Less development cost thanks to system **standardisation**
- Less civil works cost and city **footprint** impact thanks to viaduct and station optimisation
- Optimised **depot and maintenance** thanks to vehicle architecture
- Less operation cost thanks to **driverless operation**
- Lower maintenance costs thanks to steel wheels & **100%** motorisation
- **30-40%** Lower traction energy consumption thanks to HESOP sub-station, motorisation and Eco-driving



## Available & Non-proprietary system

AXONIS uses **standard guiding system**: steel track gauge **1435 mm (UIC)**

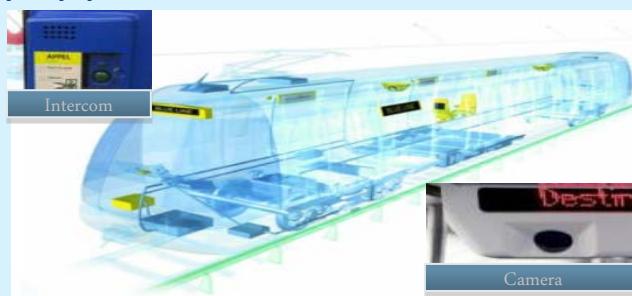
- Standard point machine and driverless operation for **99.7%** system availability
- Standard track system for easy **fleet or line extension**



## Safe and Secure

AXONIS benefits from **all of Alstom's metro integration expertise** acquired worldwide, **over 50 years**.

- URBALIS Signalling system, chosen for more than **50 metro** lines worldwide (URBALIS CBTC Driverless: **11 metro** lines)
- Convenient **front-end** emergency exit door
- Possibility to use the track without sleepers for **easier passengers evacuation**
- Platform Screen Doors in station for complete passengers **safety**
- Stations and vehicles equipped with video surveillance to improve passengers **security**





## INSIDE THE AXONIS SYSTEM Technical Focus

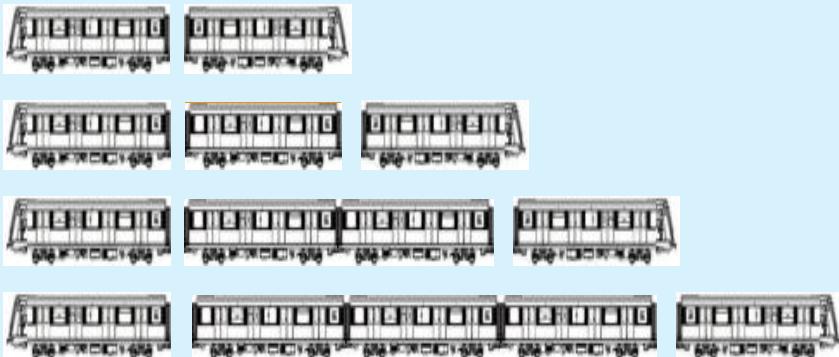


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# AXONIS: Flexible Train Configuration - Smart Metropolis

2 to 5 cars, steel wheels, 100% motorised



- Easier Transport capacity evolution
- Improved commercial speed
- Energy saving, full electrical breaking, no resistor
- Reduced Maintenance costs
- 6% ramp
- Reduced development and integration

- Driverless
- Steel wheels gauge 1435 standard
- 750 V<sub>DC</sub> traction
- Car 2,71 \* 18m
- 100% motorised
- Aluminium car body
- Frontal or lateral evacuation
- Capacity about 200 pas/car at 6 pas/m<sup>2</sup>
- 3 door 1,5m large per car
- slope 6%, curve 45 m

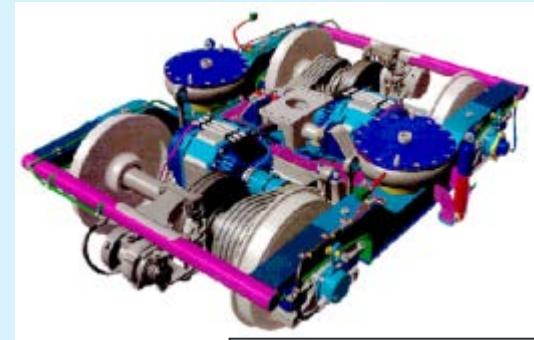
## Traction Energy Saving : up to 40% & reduced maintenance

Steel wheels vs. rubber tyres:  
Running resistance improved by 20/25 % \*

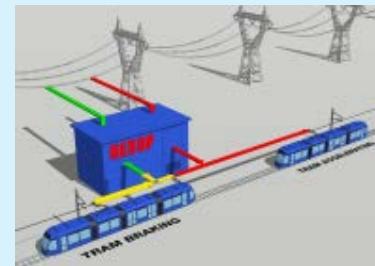
100% motorised trains improve electrical  
braking 15% \*

HESOP inverter substations improve braking energy  
reused by 18%

\* UITP report 1997



Traction motor  
100%



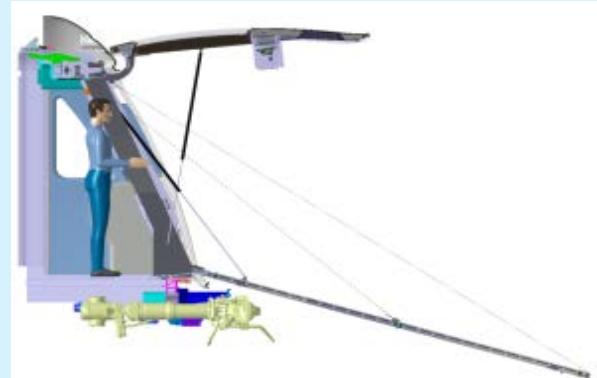
### Footprint and CW optimization

- ✓ Driverless: no driving cabin
- ✓ Trains equipped with frontal doors
- ✓ Track built using APPITRACK without sleepers

Providing wide, safe & free walkway

Savings :

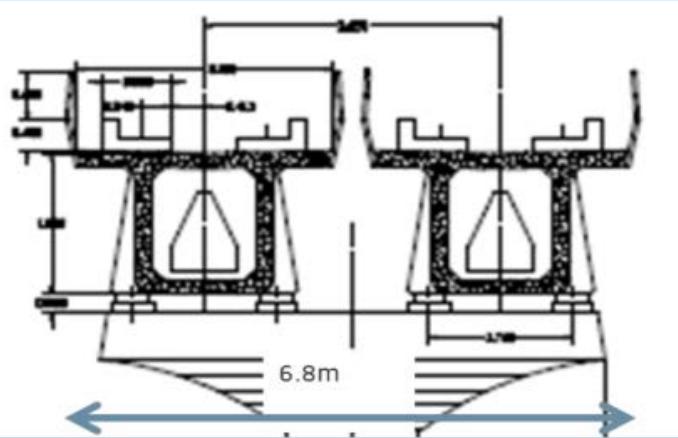
- ✓ Viaduct about 1,2m up to 1,8 m large (20-25%)
- ✓ Tunnels about 0,7m up to 1,2 m large



# The viaduct and the infrastructure

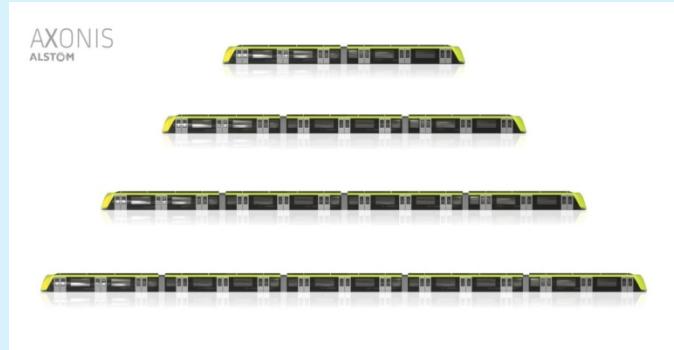
## To accelerate construction and reduce footprint

- Modular and standard viaduct, fast installation process : one **30-meter** long beam per day
- Designed for local precasting 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



# Rolling Stock and System Capacity

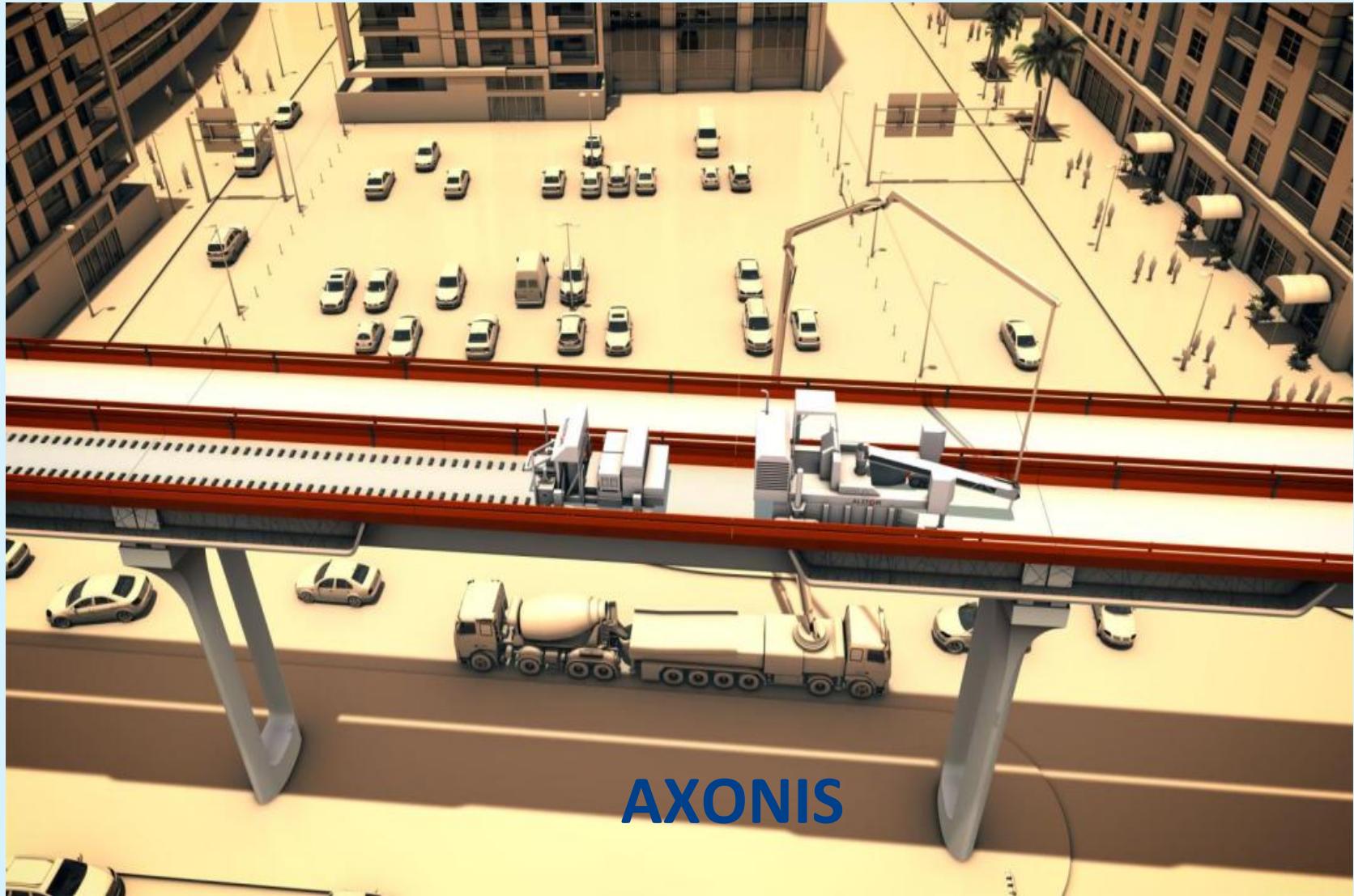
	Intermediate car	End car
seats	32	25
<b>Total AW2 (4p/m<sup>2</sup>)</b>	146	141
<b>Total AW3 (6p/m<sup>2</sup>)</b>	203	200



TRAIN CONFIG	2 cars	3 cars	4 cars	5 cars
<b>Seats</b>	50	82	114	146
<b>AW2 @ 4pass/m<sup>2</sup></b>	282	427	572	717
<b>ratio seat/stand</b>	18%	19%	20%	20%
<b>AW3 @ 6 pass/m<sup>2</sup></b>	400	603	806	1009
<b>Train lenght</b>	36m	54m	72m	90m

CAPACITY (pphpdp)	10000	15000	20000	25000	30000	40000	45000
loading criteria	4 pax/m <sup>2</sup>	6 pax/m <sup>2</sup>					
nb Car	2	2	3	3	4	5	5
train capacity	282	400	603	603	806	1009	1009
train headway	101	96	109	87	97	91	81





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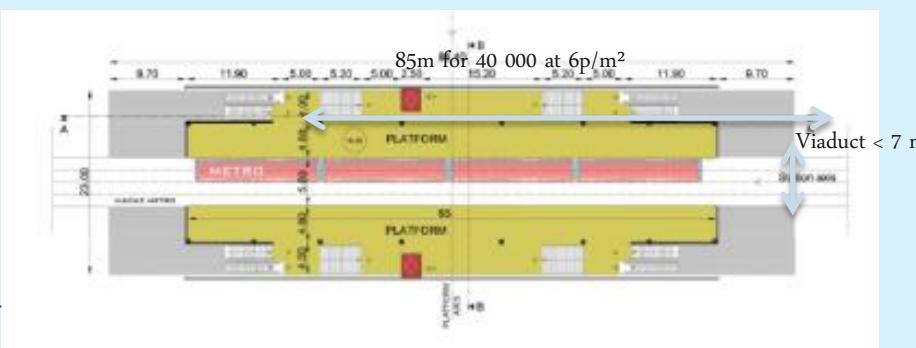
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## Synthesis

# AXONIS: the quick-to-build, easy-to-own light Metro System

- ✓ Smaller footprint
  - Smaller station
  - Smaller trace in the city
- ✓ Flexible and Safe
  - Compatible with viaduct, at grade, and tunnel operation
  - Frontal or lateral passengers evacuation
- ✓ Open System
  - For line extension
  - For capacity extension
- ✓ OPEX reduced
  - Energy consumption
  - Maintenance
- ✓ Full proven system performances
  - 6% Slope, 45-m curve, capacity, availability of 99.7%



Frontal évacuation



Possible advanced Alstom design  
with standard gauge



Total vehicle accessibility



THANK YOU  
FOR YOUR ATTENTION



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