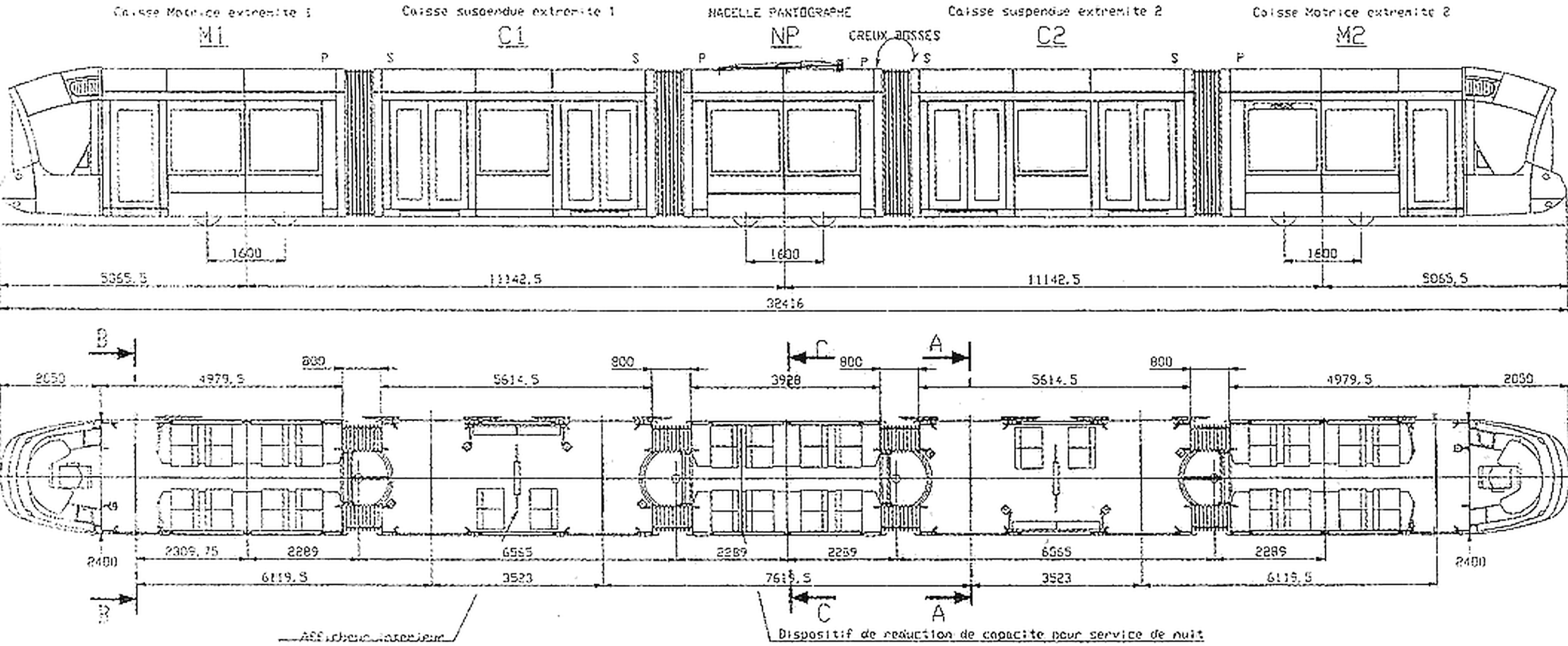

Caisse Motrice extremite 1
M1
Caisse suspendue extremite 1
C1
NACELLE PANTOGRAPHE
NP
CREUX BOSSES
Caisse suspendue extremite 2
C2
Caisse Motrice extremite 2
M2
P
S
1600
5065.5
11142.5
32416
B
C
A
800
2050
4979.5
5614.5
3928
2309.75
2289
6565
6119.5
3523
7615.5
2400
Affichage exterieur
Dispositif de reduction de capacite pour service de nuit

Généralités
General

Type ***Type***	Tramway à plancher bas, bi-directionnel *Low floor tramcar, bi-directionnal*
Composition ***Composition***	5 ou 7 modules *5 or 7 modules*
Nombre de rames construites ***Number of trainsets built***	CITADIS 302 > 73 CITADIS 402 > 12
Date de livraison de la première rame ***Date of delivery of first trainset***	Février 2000 *February 2000*
Date de livraison de la dernière rame ***Date of delivery of last trainset***	2013
Vitesse maximale en service ***Max speed in service***	70 km/h *70 kph*
Puissance maximale à la jante en traction ***Max traction power at wheel rim***	CITADIS 302 > 692 kW CITADIS 402 > 880 kW
Tensions d'alimentation ***Supply voltage***	750 V CC *750 V DC*
Type de traction ***Traction type***	Electrique *Electric*
Masse à vide en ordre de marche (ELE) ***Empty weight in working order (ELE)***	CITADIS 302 > 38 410 kg CITADIS 402 > 53 545 kg
Masse en charge normale (EL6) ***Normal load weight (EL6)***	CITADIS 302 > 52 480 kg CITADIS 402 > 81 205 kg
Equipements de signalisation ***Signaling equipment***	SAE (Système d'Aide à l'Exploitation)
Couplabilité en Unité Multiple ***Multiple unit operation***	Entre elles uniquement, en secours uniquement *With same type of trainsets only, for rescue purposes only*

Diagramme
Diagramme

Nombre de places assises (hors srapontins) ***Number of seated places (except folder seats)***	CITADIS 302 > 48 CITADIS 402 > 70
Capacité totale en charge normale (EL6) ***Total capacity in normal load (EL6)***	CITADIS 302 > 255 CITADIS 402 > 345

Performances
Performances

Accélération de 0 à 40 km/h en charge normale et en palier ***Acceleration from 0 to 40 kph in normal load on level track***	1.10 m/s²
Accélération de 0 à vitesse maximale en charge normale et en palier ***Acceleration from 0 to max speed in normal load on level track***	0.72 m/s²
Accélération résiduelle à vitesse maximale en charge normal et en palier ***Residual acceleration at max speed in normal load on level track***	0.28 m/s²
Décélération équivalente en freinage maximal de service ***Equivalent deceleration in max service braking***	1.30 m/s²
Décélération équivalente en freinage d'urgence ***Equivalent deceleration in emergency braking***	3.00 m/s²
Décélération équivalente en freinage de sécurité ***Equivalent deceleration in safety braking***	1.80 m/s²

Chaudron
Car bodyshell

Matériau du châssis ***Frame material***	Acier au-dessus des bogies Aluminium dans les autres zones *Steel over bogies* *Aluminium in other areas*
Matériau de la caisse ***Car bodyshell material***	Aluminium *Aluminium*

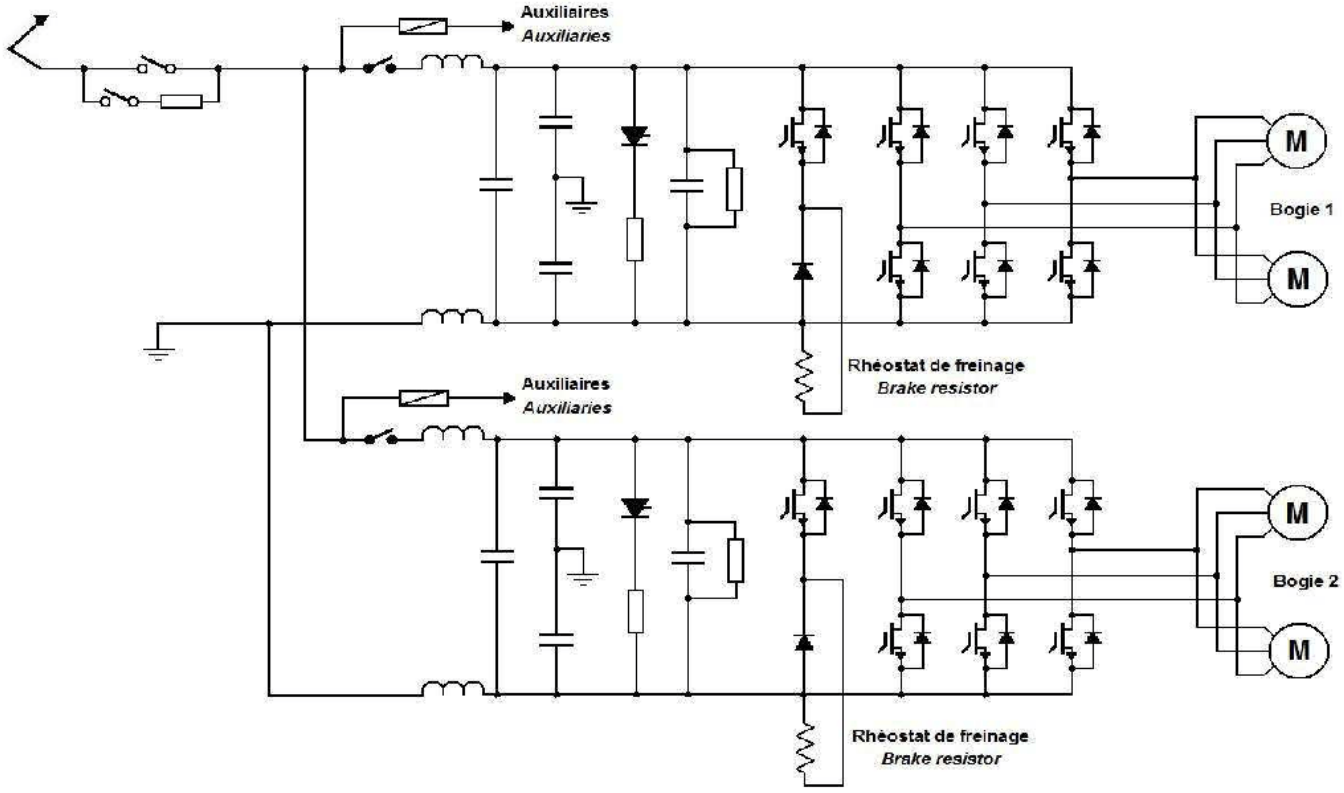
Bogie
Bogie

	Moteur *Motor*	Porteur *Trailer*
Type ***Type***	ARPEGE 350M	ARPEGE 350P
Châssis ***Frame***	Cadre articulé *Articulated frame*	Cadre articulé *Articulated frame*
Matériau du châssis ***Frame material***	Acier *Steel*	Acier *Steel*
Construction ***Building***	Mécano-soudure *Welded*	Mécano-soudure *Welded*
Ecartement de voie ***Track gauge***	1 435 mm	1 435 mm
Entraînement caisse-bogie ***Car body to bogie link***	Bielles et appuis de la suspension secondaire *Rods and supports of the secondary suspension*	Bielles et appuis de la suspension secondaire *Rods and supports of the secondary suspension*
Diamètre de roue neuve ***New wheel diameter***	590 mm	590 mm
Diamètre de roue usée ***Worn wheel diameter***	530 mm	530 mm
Type d'essieux ***Axle types***	2 essieux moteurs *2 motor axles*	4 roues indépendantes *4 independent wheels*
Type de transmission ***Transmission type***	Pont moteur et accouplement tranversal formant un essieu "coudé" *Gear wheel and transverse coupling forming a "bended" axle*	/
Rapport global de transmission ***Transmission global ratio***	6.86	/
Suspension primaire ***Primary suspension***	Sans *None*	Sans *None*
Suspension secondaire ***Secondary suspension***	Ressorts hélicoïdaux *Helical springs*	Ressorts hélicoïdaux *Helical springs*
Amortissement ***Damping***	Amortisseur transversal caisse-bogie Amortisseurs verticaux caisse-bogie Barre anti-roulis *Car body to bogie transverse damper* *Car body to bogie vertical dampers* *Anti-roll bar*	Amortisseur transversal caisse-bogie Amortisseurs verticaux caisse-bogie Barre anti-roulis *Car body to bogie transverse damper* *Car body to bogie vertical dampers* *Anti-roll bar*

Equipement de traction *Traction equipment*	
Captage ***Current collection***	
Type ***Type***	Pantographe *Pantograph*
Nombre ***Number***	1
Contrôle-commande ***Control***	
Contrôle-commande de l'engin ***Engine control***	CITADIS 302 > Commande manuelle par manipulateur de traction-freinage / Consignes d'effort transmises par lignes basse tension CITADIS 402 > Commande manuelle par manipulateur de traction-freinage / Consignes d'effort transmises par réseau informatique de bord *CITADIS 302 > Manual control by traction-brake master controller / Force demands transmitted by low voltage lines* *CITADIS 402 > Manual control by traction-brake master controller / Force demands transmitted by on-board digital network*
Contrôle-commande de la chaîne de traction ***Traction equipment control***	Electronique à micro-processeurs *Micro-processors based control electronic*
Equipement de puissance ***Power quipment***	
Tension d'alimentation des équipements de traction ***Traction equipment supply voltage***	750 V CC *750 V DC*
Technologie des équipements de puissance ***Power equipment technology***	Onduleur à IGBT refroidis par ventilation forcée *Inverters with IGBT, forced air cooled*
Moteur de traction ***Traction motor***	
Type ***Type***	Asynchrone, refroidi par eau *Asynchronous, water cooled*
Masse ***Weight***	335 kg
Nombre ***Number***	1 par essieu moteur *1 per motor axle*
Installation ***Installation***	Dans le bogie *In the bogie*
Puissance unitaire maximale ***Max unit power***	175 kW
Vitesse maximale de rotation ***Max rotational speed***	4 550 tr/mn *4 550 rd/mn*
Réducteur ***Gear***	Sans *None*

Schéma de la chaîne de traction
Traction package synoptic diagram

CITADIS 302



Equipement de freinage
Brake equipment

Contrôle-commande ***Control***	
Type de frein ***Brake type***	Electrohydraulique à trois voies : freinage de service par lignes de train basse tension communes avec la commande de traction, freinage d'urgence par boucle d'urgence, freinage de sécurité par boucle de sécurité *Electrohydraulic with three control chanels : service braking by means of low voltage train lines common with traction control, emergency braking by means of an emergency loop, safety braking by means of a safety loop*
Commande du frein bogie ***Bogie brake control***	Freinage de service > Conjugaison des freins électrodynamique et mécanique au niveau du véhicule / Réglage continu à la charge des efforts des freins électrodynamique et mécanique / Antienrayage actif Freinage d'urgence > Conjugaison des freins électrodynamique et mécanique au niveau du véhicule / Frein électromagnétique / Réglage continu à la charge des efforts des freins électrodynamique et mécanique / Antienrayage actif Freinage de sécurité > Frein mécanique sur chaque bogie séparément / Frein électromagnétique / Réglage à la charge des efforts de freinage inhibé / Antienrayage inactif *Service braking > Blending of dynamic and mechanical brakes at vehicle level / Continuous adjustment of dynamic and mechanical brake forces according to car load / Wheel slide protection active* *Emergency braking > Blending of dynamic and mechanical brakes at vehicle level / Magnetic track brake / Continuous adjustment of dynamic and mechanical brake forces according to car load / Wheel slide protection active* *Safety braking > Mechanical brakes only, separately on each bogie / Magnetic track brake / Adjustment of brake forces according to car load inhibited / Wheel slide protection inactive*

Equipements de frein ***Brake equipment***	**Bogie moteur** ***Motor bogie***	**Bogie porteur** ***Trailer bogie***
Frein dynamique ***Dynamic brake***	Electrodynamique de type à récupération et rhéostatique *Electrodynamic of regenerative and rheostatic type*	/
Puissance en freinage dynamique ***Dynamic brake power***	CITADIS 302 > 1 185 kW CITADIS 402 > 1 531 kW	/
Frein mécanique ***Mechanical brake***	1 disque en fonte ventilé Ø 400 mm épaisseur 60 mm par essieu, associé à 1 unité de frein à disque *1 ventilated cast iron brake discs Ø 400 mm width 60 mm per axle, associated with 1 disc brake unit*	1 disque en fonte ventilé Ø 400 mm épaisseur 60 mm par roue, associé à 1 unité de frein à disque *1 ventilated cast iron brake disc Ø 400 mm width 60 mm per wheel, associated with 1 disc brake unit*
Actuation du frein mécanique ***Mechanical brake actuation***	A ressorts (desserrage par pression hydraulique) *Spring type (release by hydraulic pressure)*	Directe (serrage par pression hydraulique) *Direct (application by hydraulic pressure)*
Frein électromagnétique sur rail ***Magnetic track brake***	2 patins par bogie *2 track brakes per bogie*	2 patins par bogie *2 track brakes per bogie*
Frein de parking ***Parking brake***	Assuré par les actuateurs à ressorts du frein de service *Ensured by the spring applied actuators of the service brake*	/
Nombre de freins de parking ***Number of parking brake***	2 par bogie *2 per bogie*	/
Equipement d'antienrayage ***Wheel slide protection equipment***	Antienrayeur à régulation du glissement, action bogie par bogie (actif uniquement en freinage de service et d'urgence) *Slide regulation type wheel slide protection, action bogie per bogie (active only in service and emergency braking)*	Antienrayeur à régulation du glissement, action bogie par bogie (actif uniquement en freinage de service et d'urgence) *Slide regulation type wheel slide protection, action bogie per bogie (active only in service and emergency braking)*

Production d'énergie électrique
Electric energy production

Alimentation des auxiliaires rame ***Trainset auxiliaries supply***	Convertisseur statique *Static converters*
Nombre de convertisseurs ***Number of converters***	1 convertisseur principal 1 convertisseur auxiliaire *1 main converter* *1 auxiliary converter*
Puissance unitaire des convertisseurs ***Power of each converter***	Convertisseur principal > 15 KVA Convertisseur auxiliaire > 13 kW *Main converter > 15 kVA* *Auxiliary converter > 13 kW*
Tension d'alimentation des auxiliaires de la rame ***Supply voltage of trainset auxiliaries***	400 V 50 Hz CA triphasé *400 V 50 Hz AC three phases*
Type de batteries ***Battery type***	Cadmium-Nickel
Nombre de blocs batteries ***Number of battery modules***	2 (1 pour les auxiliaires et 1 pour l'APS) *2 (1 for auxiliairies and 1 for APS)*
Réseau basse tension ***Low voltage supply network***	24 V CC *24 V DC*

Cabine de conduite
Driving cab

Poste de conduite ***Driver's desk***	Au centre *Center*
Protection anti-crash ***Protection against crash***	Absorbeurs d'énergie *Energy absorption devices*

Confort thermique
Thermal comfort

	Cabine de conduite ***Driving cab***	**Espaces voyageurs** ***Passengers areas***
Type ***Type***	Chauffage-climatisation *Heating and air conditionning*	Chauffage-climatisation *Heating and air conditionning*
Nombre d'unités de confort thermique ***Number of thermal comfort units***	1 par cabine *1 per cab*	CITADIS 302 > 2 CITADIS 402 > 3
Chauffage ***Heating***	Batterie de chauffe et soufflage d'air *Heating elements and air blowing*	Batterie de chauffe et soufflage d'air *Heating elements and air blowing*
Climatisation ***Air conditioning***	Oui *Yes*	Oui *Yes*
Contrôle-commande ***Control***	Electronique dédiée *Dedicated electronic unit*	Electronique dédiée *Dedicated electronic unit*
Alimentation ***Power supply***	Réseau 400 V 50 Hz CA triphasé *400 V 50 Hz AC three phases network*	Onduleur intégré 460 V 50 Hz CA connecté sur le réseau 400 V 50 Hz CA triphasé *Integrated inverter 460 V 50 Hz AC connacted on the 400 V 50 Hz AC three phases network*

Portes
Doors

Porte d'accès voyageurs ***Passenger access door***	Louvoyante-coulissante, à 1 ou 2 vantaux *Swing-plug, 1 or 2 door leaves*
Nombre de portes d'accès voyageurs ***Number of passenger access doors***	CITADIS 302 > 8 portes à 2 vantaux + 4 portes à 1 vantail CITADIS 402 > 12 portes à 2 vantaux + 4 portes à 1 vantail *CITADIS 302 > 8 doors 2 leaves + 4 doors 1 leaf* *CITADIS 402 > 12 doors 2 leaves + 4 doors 1 leaf*
Largeur de passage des portes d'accès voyageurs ***Access width of passenger access doors***	Porte à 1 vantail > 800 mm Porte à 2 vantaux > 1 300 mm *1 leaf door > 800 mm* *2 leaves door > 1 300 mm*
Actuation des portes d'accès voyageurs ***Actuation of passenger access doors***	Electrique *Electric*

Intercirculation
Gangway

Type ***Type***	Etanche *Tight*
Largeur / Hauteur de passage ***Internal Width / Height***	

Système informatique embarqué
On-board computer system

	CITADIS 302	CITADIS 402
Type ***Type***	FIP	MVB (contrôle-commande) + Ethernet (maintenance) *MVB (control) + Ethernet (maintenance)*
Unité centrale ***Main processor unit***	1 calculateur, en cabine 1 *1 computer unit, in cab 1*	2 calculateurs (1 par cabine) *2 computer units (1 per cab)*
Fonctions assurées par l'unité centrale ***Functions processed by main processor unit***	Transmission de données pour le contrôle-commande Sonorisation / interphonie de la rame Signalisations au pupitre (défaillances majeures) par console informatique + voyants lumineux redondants pour les fonctions principales Aide à la maintenance (vidage centralisé des défauts, tests en Entretien) *Data transmission for control* *Sonorisation / Intertelephony in the train* *Driver's desk indications (major failures) by desk display + redundant indicator lights for main functions* *Maintenance support (centralised download of failures, Maintenance tests)*	<u>MVB</u> Transmission de données pour le contrôle-commande Sonorisation / interphonie de la rame Signalisations au pupitre (défaillances majeures) par console informatique + voyants lumineux redondants pour les fonctions principales <u>Ethernet</u> Aide à la maintenance (vidage centralisé des défauts, tests en Entretien) <u>*MVB*</u> *Data transmission for control* *Sonorisation / Intertelephony in the train* *Driver's desk indications (major failures) by desk display + redundant indicator lights for main functions* <u>*Ethernet*</u> *Maintenance support (centralised download of failures, Maintenance tests)*
Equipements connectés au réseau ***Network connected units***	Electronique de commande traction/freinage des bogies moteurs Electronique de commande frein du bogie porteur Convertisseur statique de production d'énergie auxiliaire Modules de commande des portes Centrale tachymétrique Electroniques de commande des unités de chauffage/climatisation *Motor bogies traction/brake control units* *Trailer bogie brake control unit* *Auxiliary energy production static converter* *Access doors control units* *Tachometer unit* *Heating and air conditionning control units*	

Informations complémentaires
Additional information

Les véhicules CITADIS pour Lyon ont été commandés en plusieurs tranches, suivant l'extension du réseau :
* Première tranche - 47 véhicules 302 - pour exploitation sur les lignes T1 et T2, livrée entre 2000 et 2003
* Seconde tranche - 10 véhicules 302 - pour exploitation sur la ligne T3 (LEA = Ligne de l'Est de l'Agglomération), livrés en 2006-2007
* Troisième tranche - 16 véhicules 302 - pour exploitation sur la ligne T4 (avec un complément pour les lignes T1 et T2), livrés en 2009-2010
* Quatrième tranche - 12 véhicules 402 - pour exploitation sur la ligne T3, livrés en 2012-2013

Les véhicules 302 font partie de la génération dite 808, tandis queles véhicules 402 font partie de la génération dite 850.
Les véhicules 302 auparavant exploités sur la ligne T3 ont été reversés à l'exploitation des lignes T1, T2 et T4 lors de l'arrivée des véhicules 402.
Lyon est la ville pour laquelle a été livré le 1000ème CITADIS construit.

CITADIS vehicles for Lyon have been ordered in several batches, folowing extension of the bnetwork :
* *First batch - 47 vehicles 302 - for operation on lines T1 and T2, and delivered between 2000 and 2003*
* *Second batch - 10 vehicles 302 - for operation on line T3 (LEA = Ligne de l'Est de l'Agglomération), delivered in 2006-2007*
* *Third batch - 16 vehicles 302 - for operation on line T4 (with a complement for lines T1 and T2), delivered in 2009-2010*
* *Fourth batch - 12 vehicles 402 - for operation on line T3, delivered in 2012-2013*

302 vehicles are of the so called 808 generation, when 402 vehicles are of the so called 850 generation.
302 vehicles previously operated on line T3 have been transferred for operation on lines T1, T2 and T4 after delivery of 402 vehicles.
Lyon have received the 1000th CITADIS vehicle built.

LIGHT RAIL IN FRANCE - THE CURRENT SCENE

by Graham Jellett

Last updated: 15th February 2012

Light Rail in France – The Current Scene

by Graham Jellett,MA,MSc,CDipAF,CEng,MICE,FCILT,MCIHT
Newcastle Area Officer, Light Rail Transit Association

Introduction

This paper contains numerical and technical data and associated information, relating to all 34 urban public light rail systems currently operating in France. My original presentation on the subject was entitled "French Metro and Tramway Systems", when only 14 such systems existed, and was first given in January 1998 in Gateshead Civic Centre. Over the past fourteen years the content of this talk has necessarily been updated frequently as new systems, extensions to existing systems and more rolling stock have come into public use, ticket prices have changed and smartcards have been introduced. Since January 1998 the talk has been delivered to 108 audiences in England, Scotland and Wales at meetings of professional engineering and transport institutions, university masters transport degree students, light rail and railway enthusiast societies and other interested clubs and societies.

Presentation to Meetings

In every year since the mid-1980s France has always had in service more than double the number of metros and tramways concurrently running in the UK and now has more than three times the ten UK light rail systems currently operating. The thirtyfour public urban light rail systems currently operating in France comprise six metros, twentyone steel wheel tramways, three rubbertyred tramways and four tram-trains.

From 1992 onwards I have, as an ordinary farepaying passenger, visited all but three of these thirtyfour systems at least once, twentyseven of these systems between two and seven times and the Paris Metro about twenty times. I have travelled most of the present route network of over 600 kilometres, (this excludes Paris Metro), the exceptions, which have all come into service in the past two years, being short extensions to tramways in Grenoble, Lyon and Strasbourg and tram-trains in Lyon, Mulhouse and Nantes.

The six metros are in Lille, Lyon, Marseille, Paris, Rennes and Toulouse. Nineteen conventional "second generation" tramways are now in operation, the first being Nantes which opened in 1985, followed in chronological order by Grenoble, Paris (St.Denis-Noisy-le-Sec), Strasbourg, Rouen, Paris (Val-de-Seine), Montpellier, Orleans, Lyon, Bordeaux, Mulhouse, Valenciennes, Paris (Des Marechaux), Marseille, Le Mans, Nice, Toulouse, Reims and Angers. Only three nineteenth century tramways, those in Lille, Marseille and St.Etienne survived through the twentieth century to today. However, during the last fifteen years Lille Tramway has been comprehensively modernised and re-equipped, a new second generation Marseille Tramway has been built incorporating the route of the remaining 3km of the nineteenth century tramway, and St.Etienne tramway has been extensively modernised and a second line built. Three rubber tyred tramways, all inaugurated since 2000, operate in Caen, Clermont-Ferrand and Nancy. Four tram-trains are now in service - on tramway in Lyon, on conventional railway in Nantes and Paris and on a combination of both in Mulhouse.

With slides showing metrocars and trams in use on all systems, (except the Paris Metro which is not included), many features of these systems are shown including service frequency, fares, station spacing, passenger capacity, car and tram seating layout, manufacturers, liveries, ticketing including smart ticketing, disabled access and other aspects. Public funding of the systems and financial matters, including the payroll tax, known as "versement transport", allocated specifically for public transport purposes are also outlined.

Of particular technical interest are tramways in four towns, where, for aesthetic reasons, trams are powered in the centres of Angers, Bordeaux and Reims by intermittently energised short sections of "third" rail and in Nice by onboard batteries. Also of note are the tram on tyres in Clermont-Ferrand, and a total of seven driverless metro lines operating in Lille (two lines), Lyon, Toulouse (two lines), Paris and Rennes.

Tables of Data and Maps of France and Route Plans

All data in the following tables has been collected from many sources and it is all in the public domain. I have made every effort to ensure that this data is accurate. Gaps in tables indicate that I have not been able to obtain the information in question. Also included are outline plans of France, one showing existing systems, the other showing systems now being built and further proposed systems.

Acknowledgement

I would like to place on record my profound thanks and immense gratitude to my wife, Eleanor, who is a fluent French speaker without whose assistance, on all but one of these site visits to France over the past twenty years, it would not have been practicable for me to make these visits and prepare this talk and data.

I may be contacted at graham@jellett.plus.com

14th February 2012 Graham Jellett

VISITS TO METROS AND TRAMWAYS IN FRANCE

Town	System Opened	Year and Month 1992-98	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Angers *	2011	July '90												June	July
Bordeaux *	2003						Aug	Aug	Aug		Aug		Aug		
Brest	(2012)													June	
Caen (Tyred)	2002							Aug						June	
Clermont -Ferrand (Tyred)	2006										June	Aug			
Grenoble *	1987	June '97				Aug			Sept	Aug		Aug			
Le Mans *	2007											Aug			
Lille	1874	Sept '92		April		-					Aug	Sep			
	M 1983	May '96		April		July				Aug	Aug	Sep			
Lyon	M 1978	June '97				Aug		Sep		Aug	June	Aug	Aug		
	* 2000					Aug		Sep		Aug	June	Aug	Aug		
Marseille *	1876	June '97			-						Aug	Aug	Aug		July
	M 1977	June '97			Aug					Aug	Aug	Aug	Aug		July
Montpellier *	2000			Aug		Aug			Sept		June				July
Mulhouse *	2006									Aug			Aug		
Nancy (Tyred)	2000		June					Aug			June				
Nantes *	1985	July '95 Aug '98			Nov				June			Aug		June	
Nice *	2007											Aug	Aug		
Orleans *	2000				Nov				June					June	
Paris	M 1900	'92, '95 '96, '97	June	Aug	Aug Nov	Aug	Aug	July Aug	June Aug	Aug	May June	Aug	Aug	June	July
Orly-VAL	M 1991					Aug							Aug		
St.Denis-Noisy	1992	Oct '96						July				Aug			
Val de Seine	1997	Aug '97			Nov			July				Aug	Aug	June	July
Des Coquetiers	2006										June	Aug	Aug		
Des Marechaux	2006*										May	Aug	Aug	June	July
Reims *	2011		June												July
Rennes	M 2002		Aug			July								June	
Rouen *	1994	Oct '96 Aug '98												June	
St.Etienne *	1881	Oct '96 Aug '98				Aug				Aug	June				
Strasbourg *	1994	Oct '96	June					July			June		Aug		
Toulouse	M 1993	'93,'94,'95						Aug	Aug		Aug				July
	* 2010														July
Valenciennes *	2006									Aug		Sep			
Visited in year		25	4	4	6	8	1	10	7	9	16	17	13	8	10
Lectures in year		6 (1998)	1	4	3	9	11	6	10	12	9	8	14	8	5
Year		1992-98	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011

NOTES: 1. Opening Dates: Prefix M is for Metro. No prefix implies Tramway. = Opening Year (1992 and later)

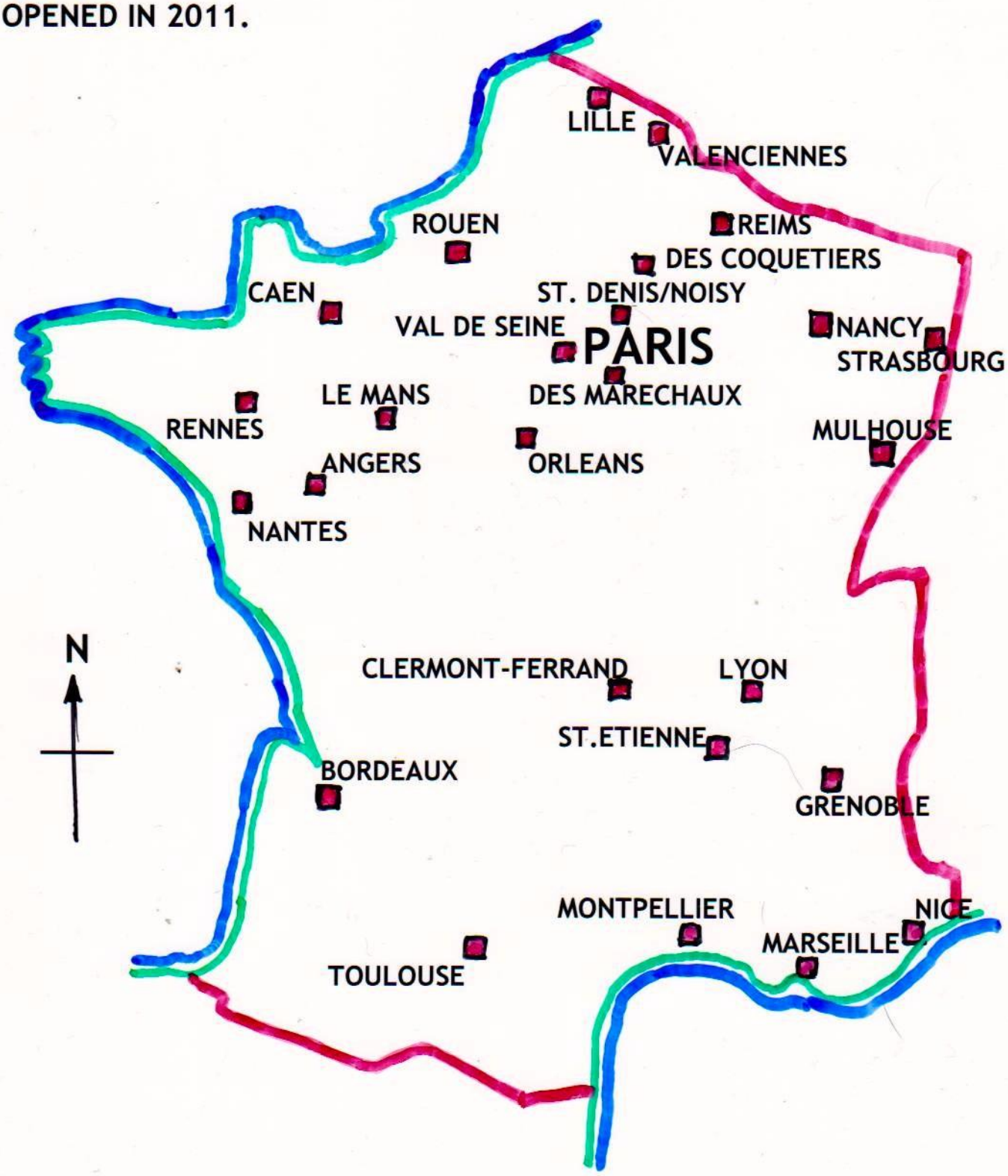
2. Eighteen tramways, indicated thus *, have grassed sections of track. Seven tramways, those in Lille (19th Century); Paris – T1, T2 and T4; Caen, Clermont-Ferrand and Nancy, do not have grassed sections of track. JGJ – 18/7/2011

TOWNS HAVING METROS AND/OR TRAMWAYS AT END JUNE 2011

FRANCE

200 KILOMETRES

NO NEW METROS OR TRAMWAYS OPENED IN 2008 OR 2009.
TOULOUSE TRAMWAY OPENED IN 2010.
ANGERS AND REIMS TRAMWAYS OPENED IN 2011.



TOWNS BUILDING OR PURSUING PROPOSALS AT END SEPTEMBER 2011 FOR NEW METROS AND TRAMWAYS

FRANCE

● NEW TRAMWAYS NOW BEING BUILT
WITH PLANNED OPENING YEAR

BESANÇON (2015)
BREST (2012)
DIJON (2012)
LE HAVRE (2012)
TOURS (2013)

200 KILOMETRES

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

DISTANCES FROM PARIS AND URBAN POPULATIONS

	City/Town	Distance from Paris in KM	Population Inner Area	Agglomeration
1.	Angers	294	152,337	226,843
2.	Bordeaux	579	232,260	753,931
3.	Caen	236	110,399	199,490
4.	Clermont-Ferrand	420	138,992	258,541
5.	Grenoble	566	156,107	419,334
6.	Le Mans	206	144,016	194,825
7.	Lille	223	226,014	1,000,900
8.	Lyon	458	472,305	1,348,832
9.	Marseille	769	839,043	1,349,772
10.	Montpellier	758	251,634	287,981
11.	Mulhouse	465	110,514	234,445
12.	Nancy	314	105,468	331,363
13.	Nantes	381	282,853	544,932
14.	Nice	927	347,060	888,784
15.	Orleans	132	113,130	263,292
16.	Reims	144	183,837	215,581
17.	Rennes	349	209,613	272,263
18.	Rouen	134	107,904	389,862
19.	St.Etienne	517	177,480	291,960
20.	Strasbourg	489	272,975	427,245
21.	Toulouse	677	437,715	761,090
22.	Valenciennes	208	42,426	357,395

Source of Data:- Michelin France 2010

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

URBAN POPULATIONS, OPENING DATES AND TRACK GAUGES

City/Town	Inner Urban Area Population	Metro Year Opened	Metro Gauge MM	Tramway Year Opened	Tramway Gauge MM
1. Angers	152,337			2011	1435
2. Bordeaux	232,260			2003	1435
3. Caen ("Tyred")	110,399			2002	-
4. Clermont Ferrand ("Tyred")	138,992			2006	-
5. Grenoble	156,107			1987	1435
6. Le Mans	144,016			2007	1435
7. Lille	226,014	1983	2060		
8. Lille (Re-equipped 1994)	226,014			1874	1000
9. Lyon	472,305	1978	1435		
10. Lyon	472,305			2000	1435
11. Marseille	839,043	1977	2000		
12. Marseille (Re-equipped 2004-07)	839,043			1876	1435
13. Montpellier	251,634			2000	1435
14. Mulhouse	110,514			2006	1435
15. Nancy ("Tyred")	105,468			2001	-
16. Nantes	282,853			1985	1435
17. Nice	347,060			2007	1435
18. Orleans	113,130			2000	1435
19. Paris)		(1900	1435		
20. Des Coquetiers T4)		(		2006	1435
21. Des Marechaux T3)	2,182,000	(		2006	1435
22. St.Denis/Noisy T1)		(		1992	1435
23. Val-de-Seine T2)		(		1997	1435
24. Reims	183,837			2011	1435
25. Rennes	209,613	2002	2060		
26. Rouen	107,904			1994	1435
27. St.Etienne (Re-equipped 1998)	177,480			1881	1000
28. Strasbourg	272,975			1994	1435
29. Toulouse	437,715	1993	2060		
30. Toulouse	437,715			2010	1435
31. Valenciennes	42,426			2006	1435

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

LINES, ROUTE LENGTHS, STOPS & STOP SPACING AT END DECEMBER 2011

TOWN	LINES NO	ROUTE LENGTH KM	STOPS NO	AVERAGE STOP SPACING - METRES
CONVENTIONAL TRAMWAYS (Steel wheel on steel rail)				
1. Angers (1.5km APS)	1	12.3	25	492
2. Bordeaux (12.1km APS)	3	43.4	90	482
3. Grenoble	4	36.4	74	491
4. Le Mans	1	15.4	29	531
5. Lille	2	22.0	36	611
6. Lyon	4	58.0	80	725
7. Marseille	2	11.5	28	411
8. Montpellier	2	35.0	61	574
9. Mulhouse	3	16.2	30	540
10. Nantes	3	43.5	82	530
11. Nice	1	8.7	21	414
12. Orleans	1	18.0	24	750
13. Paris T1, St.Denis-Noisy	1	11.9	26	458
14. Paris T2, Val-de-Seine	1	13.6	17	800
15. Paris T3, Des Marechaux	1	7.9	17	465
16. Reims (2km APS)	2	11.2	22	509
17. Rouen	2	15.1	31	487
18. St.Etienne	2	11.7	32	366
19. Strasbourg	6	55.2	67	823
20. Toulouse	1	10.8	18	600
21. Valenciennes	1	18.3	29	620 .
Total	44	476.1	839	567 .

APS = Alimentation par le sol or intermittently energised third rail.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

LINES, ROUTE LENGTHS, STOPS & STOP SPACING AT END DECEMBER 2011

TOWN	LINES NO	ROUTE LENGTH KM	STOPS NO	AVERAGE STOP SPACING - METRES
CONVENTIONAL TRAMWAYS (Steel wheel on steel rail)				
Total of 21 tramways	44	476.1	839	567 .
RUBBER TYRED TRAMWAYS				
1. Caen	2	15.7	34	462
2. Clermont-Ferrand	1	14.2	31	458
3. Nancy	1	11.0	31	355 .
Sub-total	4	40.9	96	426 .
TRAM-TRAINS (with Inauguration Dates)				
1. Lyon - 9 August 2010	1	23.0	4	5,750
2. Mulhouse - 11 December 2010	1	22.0	16	1,375
3. Nantes – 15 June 2011	1	28.0	7	4,000
4. Paris T4 – 18 November 2006	1	8.0	11	727 .
Sub-total	4	81.0	36	2,250 .
METROS (excluding Paris)				
1. Lille (driverless)	2	45.0	59	762
2. Lyon (1 line driverless)	4	30.9	43	718
3. Marseille	2	21.6	28	771
4. Rennes (driverless)	1	8.5	15	567
5. Toulouse (driverless)	2	28.2	37	762 .
Sub-total	11	134.2	182	737 .
TOTALS (33 systems)	63	732.2	1153	635 * .

* Due to the differing natures of metros, tramways and tram-trains this is probably a meaningless average figure to calculate!

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

SERVICE FREQUENCY AND ANNUAL PATRONAGE - TRAMS

TOWN	FREQUENCY PEAK	FREQUENCY OFF-PEAK	JOURNEYS MILLION P.A.
TRAMWAYS			
1. Angers	6 mins	8-9mins	13.9 (forecast)
2. Bordeaux	4mins	8mins	62.0
3. Caen	3½ mins	5mins	5.8
4. Clermont-Ferrand	6mins	8mins	15.3
5. Grenoble	2mins	6-1Omins	65.0
6. Le Mans	5mins	6-17mins	18.3
7. Lille	3-4mins	10mins	11.7
8. Lyon	6mins	10mins	59.0
9. Marseille	6-7mins	8-14mins	31.8
10. Montpellier	5mins	1Omins	63.0
11. Mulhouse	15mins	30mins	14.6
12. Nancy	5mins	7mins	7.3
13. Nantes	2½-6mins	7-8mins	94.0
14. Nice	4mins	8mins	22.6
15. Orleans	5-7mins	15-30mins	16.4
16. Des Marechaux	5mins	7-8mins	36.5
17. St.Denis-Noisy	8mins	8 mins	36.5
18. Val-de-Seine	5mins	10mins	29.2
19. Reims	6 mins	8 mins	16.4 (forecast)
20. Rouen	6mins	15-2Omins	19.3
21. St.Etienne	4mins	8mins	27.0
22. Strasbourg	3mins	6-8mins	80.3
23. Toulouse	8mins	10-30mins	11.0 (forecast)
24. Valenciennes	5mins	10mins	9.1

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

SERVICE FREQUENCY AND ANNUAL PATRONAGE

	TOWN	FREQUENCY PEAK	FREQUENCY OFF-PEAK	JOURNEYS MILLION P.A.
METROS (except Paris)				
1.	Lille	1min	3-6mins	50.0
2.	Lyon	3-4mins	6-11mins	125.4
3.	Marseille	3mins	5-lOmins	53.8
4.	Rennes	2½mins	4mins	34.7
5.	Toulouse	1min4Osec	6mins	30.5
TRAM-TRAINS				
6.	Lyon	15 mins	15 mins	1.1
7.	Mulhouse	30 mins	30 mins	
8.	Nantes	5 per day		
9.	Paris T4	6mins	9mins	12.8

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

TICKET PRICES, SMARTCARDS & VALIDATION AT END JUNE 2011

	TOWN		SYSTEM	TICKET PRICES – EUROS SINGLE	DAY	7 DAY	10 TRIPS	VALIDATED B	S
SMARTCARDS SOLD									
1.	Angers		Tram	1.4	3.6	11.2	11.0	B	
2.	Bordeaux		Tram	1.4	4.1	10.6	10.6	B	
3.	Caen		Tyred-Tram	1.2	3.55	+6.9	10.6	B	
4.	Clermont-Ferrand		Tyred-Tram	1.4	4.0	13.2	11.4	B	
5.	Grenoble		Tram	1.4	4.0	+9.7	12.0		S
6.	Le Mans		Tram	1.35	3.9	14.45	11.1	B	
7.	Lyon	1978	Metro	1.6	4.8	>49.1	14.0		S
8.	”		Tram	”	”	”	”	B	
9.	Marseille	1977	Metro)	1.5	5.0	+10.5	12.6	(	S
10.	”		Tram)	1.26	None	12.0	None	(B	
11.	Montpellier		Tram	1.4	3.5	13.5	11.8	B	
12.	Nancy		Tyred-Tram	1.3	4.0	>33.0	8.7	B	
13.	Nice		Tram	1.0	4.0	15.0	10.0	B	
14.	Orléans		Tram	1.4	3.5	>37.5	12.3	B	
15.	Paris T3		Tram	1.7	6.1	18.35	12.0	B	
16.	Paris T1		Tram	”	*8.2	*23.85	12.0	B	
17.	Paris T2		Tram	”	*8.2	*23.85	12.0	B	
18.	Reims		Tram	1.2	3.2	>31.5	9.25	B	
19.	Rennes	2002	Metro	1.2	3.5	12.8	11.1		S
20.	Rouen		Tram	1.4	4.0	>46.0	11.4	B	
21.	St.Etienne		Tram	1.3	4.2	10.9	12.0	B	
22.	Strasbourg		Tram	1.4	4.0	>44.0	12.2		S
23.	Toulouse	1993	Metro	1.5	5.0	12.0	12.5		S
24.	”		Tram	”	”	”	”	B	
25.	Valenciennes		Tram	1.5	3.5	>36.5	10.0	B	
NO SMARTCARDS AT PRESENT									
1&2.	Lille Metro	1983	Tram 1874	1.4	4.0	13.0	11.0		S
3.	Mulhouse	2006	Tram	1.3	4.0	13.0	11.0	B	
	“	2011	Tram-Train	1.95	6.9	19.5	16.5	B	
4.	Nantes	1985	Tram	1.5	4.2	>49.9	12.3	B	
5.	Paris T4 (SNCF)		Tram-Train	1.7	^10.15	#16.95	12.0		S
							TOTAL	22	9

NOTES:-

The Day Ticket fare is not generally available with Smartcards.
Some opening years shown – all 5 metros & 3 tramways.
All tickets are valid for bus, trolleybus, metro and tram in each urban area.
For Paris Metro, Tram and RER: * Zones I to 3; ^ Zones 1 to 4; # Zones 3 & 4.
B=Onboard S=Stop + 3 Day ticket > One month ticket

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

TRAM POWER RATINGS

	TOWN	TRAM	LENGTH METRES	POWER KILOWATTS	NO OF TRAMS
1.	Angers	Alstom Citadis 302	32.4	480	17
2.	Bordeaux	Alstom Citadis 302	32.9	480	12)
		Alstom Citadis 402	44.0	720	62) 74
3.	Grenoble	Alsthom TFS	29.4	550	53)
		Alstom Citadis 402	43.73	720	50) 103
4.	Le Mans	Alstom Citadis 302	32.7	480	26
5.	Lille	Breda	29.9	410	24
6.	Lyon	Alstom Citadis 302	32.43	480	73
7.	Marseille	Bombardier Flexity	32.5	460	26
8.	Montpellier	Alstom Citadis 302	32.51	560	27)
		Alstom Citadis 401	40.97	840	30) 57
9.	Mulhouse	Alstom Citadis 302	32.5	480	27
10.	Nantes	Alsthom TFS	39.15	550	46)
		Adtranz Incentro	36.4	360	33) 79
11.	Nice	Alstom Citadis 302	33.02	480 OHL 200 Batteries	28
12.	Orléans	Alstom Citadis 301	29.87	560	22
13.	Paris T1	Alsthom TFS	29.4	550	33
14.	Paris T2	Alstom Citadis 302	32.2	560	52
15.	Paris T3	Alstom Citadis 402	40.97	720	22
16.	Reims	Alstom Citadis 302	32.4	480	18
17.	Rouen	Alsthom TFS	29.4	550	28
18.	St.Etienne	Alsthom-Vevey	23.2	280	35
19.	Strasbourg	ABB/Bombardier	33.3	336	36)
		ABB/Bombardier	43.1	424	17) 94
		Alstom Citadis 403	45.0	720	41)
20.	Toulouse	Alstom Citadis 302	32.0	480	24
21.	Valenciennes	Alstom Citadis 302	33.0	560	21
				TOTAL	883

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

TYRED TRAM & TRAM-TRAIN POWER RATINGS

	TOWN	TRAM	LENGTH METRES	POWER KILOWATTS	NO OF UNITS
	TYRED TRAMS				
1.	Caen	Bombardier	24.5	300	24
2.	Clermont-Ferrand	Translohr	32.0	400	26
3.	Nancy	Bombardier	24.5	300	25
				TOTAL	75
	TRAM-TRAINS				
1.	Lyon	Stadler Tango	27.0	500	6
2.	Mulhouse	Siemens Avanto	45.0	520	12
3.	Nantes	Alstom Citadis-Dualis	42.0	900	15
4.	Paris T4	Siemens Avanto	36.36	800	15
				TOTAL	48

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

ROLLING STOCK LIVERIES – TRAMS AND TYRED TRAMS

TOWN	LIVERY
1. Angers	Rainbow stripes with white background
2. Bordeaux	Grey and dark green
3. Caen	White and blue
4. Clermont-Ferrand	Maroon
5. Des Marechaux (T3)	White with pale green stripes
6. Grenoble	Grey with blue stripes
7. Le Mans	Red/Orange
8. Lille	Light grey with orange stripe
9. Lyon	White
10. Marseille	White with wide brown cantrails
11. Mulhouse	Yellow, with black or red stripes
12. Montpellier	Blue with white swallows
"	Overall multicoloured floral design
13. Nancy	Light and dark grey
14. Nantes	White with green stripe and grey sills
15. Nice	Grey
16. Orleans	Silver with gold stripe
17. Reims	Eight different monotone colours
18. Rouen	Blue
19. St.Denis-Noisy (T1)	Grey with blue, green and white stripe
20. St.Etienne	White with green stripes
21. Strasbourg	White and fawn
22. Toulouse	Silver and black
23. Val-de Seine (T2)	White and green
24. Valenciennes	Grey

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

ROLLING STOCK LIVERIES

TOWN	LIVERY
TRAM-TRAINS	
1. Lyon	Pink, grey below floor level
2. Mulhouse	Coloured stripes and all grey in centre
3. Nantes	Blue cabs, purple and grey bodies
4. Paris T4	Blue
METROS (Driverless)	
1. Lille	White with red stripe just above floor level
2. Lyon Line D	Orange
3. Paris Orly Val	White and pale green
4. Rennes	White with green stripe above floor level
5. Toulouse	White with red stripe at cantrail level
METRO (With driver)	
6. Lyon Lines A, B	White
7. Lyon Line C	Orange
8. Marseille	White

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

PASSENGER CAPACITY – TRAMS & TRAM-TRAINS

TOWN		SEATED	STANDING 4 PERS/M2	CRUSH CONDITIONS
1. Angers		56		206
2. Bordeaux	Standard	48	170	301
	Long	70	230	412
3. Caen			150	
4. Clermont-Ferrand		48		225
5. Grenoble	Standard	46	134	198
	Long	76		
Paris				
6. Des Coquetiers, T4)				
Siemens Avanto)		80		242
7. Des Marechaux, T3		75		300
8. St.Denis-Noisy, T1		54	120	198
9. Val-de Seine, T2		54	120	198
10. Le Mans		64	146	
11. Lille		36	141	203
12. Lyon		57		200
Stadler-Tango		76	75	
13. Marseille		42	158	
14. Montpellier		64		205
		56		231
15. Mulhouse		56		231
Siemens Avanto		80	162	
16. Nancy		57		93
17. Nantes – GEC Alsthom		64	162	236
Adtranz Incentro		76		259
Alstom Citadis-Dualis		<-----244----->		
18. Nice		54	152	
19. Orléans		40		176
20. Reims		54	148	
21. Rouen		54	120	198
22. St.Etienne		39		163
23. Strasbourg	Standard	66		240
	Long	92		270
24. Toulouse		48		212
25. Valenciennes		48		247

"Crush conditions" are from 6 to 8 passengers per square metre.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

PASSENGER CAPACITY - METROS

CITY/TOWN	SEATED	STANDING 4 PERS/M2	CRUSH CONDITIONS
METROS			
Driverless			
1. Lille)			
2. Rennes)	<---------154-------->		208
3. Toulouse)			
4. Lyon Line D-2 car sets	104	148	
3 car sets	156	222	
With driver			
5. Lyon Lines A, B			
6. Lyon Line C			
7. Marseille	192	288	

Crush conditions" are from 6 to 8 passengers per square metre.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

ROLLING STOCK MANUFACTURERS - TRAMS

TOWN	MANUFACTURER & TYPE	UNITS	TOTAL
STEEL WHEEL ON STEEL RAIL TRAMS			
1. Angers	Alstom Citadis 302		17
2. Bordeaux	Alstom Citadis 302	12)	
	Alstom Citadis 402	62)	74
3. Grenoble	a) Alsthom-Francorail	38)	
	b) GEC-Alsthom	15)	103
	c) Alstom Citadis 402	50)	
4. Le Mans	Alstom Citadis 302		26
5. Lille	Breda, Italy		24
6. Lyon	Alstom Citadis 302		73
7. Marseille	Bombardier Flexity		26
8. Montpellier	Alstom Citadis 401	30)	
	Alstom Citadis 302	27)	57
9. Mulhouse	Alstom Citadis 302		27
10. Nantes	a) Alsthom	46)	
	b) Adtranz “Incentro”	33)	79
11. Nice	Alstom Citadis 302		28
12. Orleans	Alstom Citadis 301		22
13. Paris T1	GEC-Alsthom		33
14. Paris T2	Alstom Citadis 302		52
15. Paris T3	Alstom Citadis 402		22
16. Reims	Alstom Citadis 302		18
17. Rouen	GEC-Alsthom		28
18. St.Etienne	a) GEC-Alsthom	15)	
	b) GEC Alsthom-Vevey	20)	35
19. Strasbourg	ABB, Bombardier	53)	
	Alstom Citadis 403	41)	94
20. Toulouse	Alstom Citadis 302		24
21. Valenciennes	Alstom Citadis 302		21
		Sub-total	883
RUBBER TYRED TRAMS			
22. Caen	Bombardier TVR		24
23. Clermont-Ferrand	Lohr Industrie		26
24. Nancy	Bombardier TVR		25
		Sub-total	75
		TOTAL	958

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

ROLLING STOCK MANUFACTURERS
TRAM-TRAINS & METROS
(not including Paris Metro)

TOWN	MANUFACTURER & TYPE		UNITS TOTAL
TRAM-TRAINS			
1. Lyon	Stadler Tango		6
2. Mulhouse	Siemens Avanto		12
3. Nantes	Alstom Citadis-Dualis		15
4. Paris T4	Siemens Avanto		15
		TOTAL	48
METROS			
1. Lille	a) CIMT	44)	
	b) Alsthom	39)	143
	c) Matra now Siemens	60)	
2. Lyon	Alsthom		178
3. Marseille	CIMT		144
4. Rennes	Matra now Siemens		16
5. Toulouse	a) GEC-Alsthom	29)	
	b) Matra now Siemens	14)	99
	c) Siemens	56)	
		TOTAL	580

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

PUBLIC TRANSPORT TRIPS AS PERCENTAGE OF TOTAL TRIPS IN THE URBAN AREA BEFORE AND AFTER OPENING OF NEW METRO OR TRAMWAY

CITY/TOWN	SYSTEM	PERCENTAGES BEFORE	AFTER
Grenoble	Tramway	11.2%	13.7%
Lille	Metro	7.6%	7.8%
Lyon	Metro	11.3%	16.0%
Nantes	Tramway	14.0%	13.4%
Toulouse	Metro	10.5%	14.0%

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

SIZES OF CARS AND UNITS AND NUMBERS OF AXLES

			UNIT DIMENSIONS–METRES			NUMBER OF
	TOWN	SYSTEM	LENGTH	WIDTH	HEIGHT	AXLES
1.	Angers	Tram	32.4	2.40	3.27	6
2.	Bordeaux	Tram	32.9	2.40	3.27	8
			43.0	2.40	3.27	10
3.	Caen	Tram	24.5	2.50	3.22	4
4.	Clermont-Ferrand	Tram	32.0	2.20		5
5.	Grenoble	Tram	29.4	2.30	3.36	6
		"	43.73	2.30		8
6.	Le Mans	Tram	32.7	2.40	3.40	6
7.	Lille	Metro	26.14	2.06	3.25	4
8.	Lille	Tram	29.9	2.40	2.95	7
9.	Lyon	Metro				4
10.	Lyon	Tram	32.33	2.40	3.27	6
11.	Lyon	Tram-train	27.0	2.55	3.68	6
12.	Marseille	Metro				4
13.	Marseille	Tram	32.5	2.40	3.5	6
14.	Montpellier	Tram	44.0	2.65	3.27	8
		"	30.0	2.65	3.27	6
15.	Mulhouse	Tram	32.5	2.65		6
16.	Mulhouse	Tram-train	45.0	2.65	3.52	6
17.	Nancy	Tram	24.5	2.50	3.22	4
18.	Nantes	Tram	39.15	2.30	3.25	8
		"	36.4	2.40		6
19.	Nantes	Tram-train	42.0	2.65	3.37	8
20.	Nice	Tram	33.02	2.65		6
21.	Orléans	Tram	30.0	2.32	3.27	6
22.	Des Coquetiers	Tram-train	36.7	2.65		8
23.	Des Marechaux	Tram	43.7	2.65		8
24.	St.Denys-Noisy	Tram	29.4	2.30	3.36	6
25.	Val-de-Seine	Tram	32.9	2.40	3.36	6
26.	Reims	Tram	32.4	2.40		6
27.	Rennes	Metro	26.14	2.06	3.25	4
28.	Rouen	Tram	29.4	2.30	3.36	6
29.	St.Etienne	Tram	23.2	2.12		6
30.	Strasbourg	Tram	33.3	2.40	3.10	8
			43.1	2.45	3.10	10
31.	Toulouse	Metro	26.14	2.06	3.25	4
32.	Toulouse	Tram	32.0	2.40		6
33.	Valenciennes	Tram	33.0	2.40		6

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

EXTENSIONS, ADDITIONAL LINES & OTHER WORKS UNDER CONSTRUCTION AT JANUARY 2012

Town	Route Length Km	Estimated Total Cost €m	Cost includes trams etc. €m/km	Number of Trams	Target Opening Date
Additional lines for existing tramways					
Orléans (2nd) (APS)	11.2	395	35.3	22	June 2012
Montpellier (3rd)	19.8	530	26.8	19	April 2012
Valenciennes (2nd)	15.5	105	6.77	7	2013
Grenoble (5th)	11.5	300	26.0	14	2014
TOTALS	58.0	1,330	23.0	62	
Extensions to existing lines					
Lyon T2	3.8				Nov 2012
Nice	0.45	23.9	53.1		2013
Paris T1	4.9	163	33.3	9	Spring 2012
Paris T2	4.2	276.5	65.8	18	End 2012
Paris T3	14.5	740	51.0	25	End 2012
Strasbourg	?	90+			2017
Conversion of existing line to automatic operation					
Paris Metro Line 1	16.5	100	6.1	49	Nov 2011 to Dec 2012

NOTES:-

1. 2.3km APS is being installed on Orléans Line 2. APS = Alimentation par le sol, or intermittently energised central third rail.
2. Valenciennes Line 2 will be single track with two-way running.
3. On Paris Metro Line 1 a total of 572 platform edge doors have been installed on 54 platforms at 25 stations. Work started in 2005.

SOURCES: Connaissance du Rail, Rail Passion, Ville Rail & Transport, Tramways & Urban Transit, Today's Railways Europe, International Railway Journal, Railway Gazette International, Metro Report International and transport operator websites.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

NEW TRAMWAYS UNDER CONSTRUCTION AT JANUARY 2012

Town	Agglom-eration Popul-ation	Route Length Km	Esti-mated Total Cost €m	Cost with trams €m/km	Target Open-ing Date	Passeng-ers per Day Forecast	Num-ber of Trams	Cost per tram €m
New conventional steel wheel tramways								
Besançon	134,376	14.5	228	15.7	mid 2015	43,000	19	1.81
Brest	210,055	14.3	383	26.8	June 2012	45,000	20	2.05
Dijon	236,953	18.0	399	22.2	Sept 2012	90,000	32	2.05
Le Havre (1)	248,547	13.0	395	30.4	Dec 2012	56,000	22	2.48
Tours (2)	297,631	14.8	369	24.9	Sept 2013	55,000	21	3.48
Sub-totals		74.6	1,774	23.8		289,000	114	2.36
Paris T7	11,577,000	11.2	345	30.8	Oct 2013	36,000	19	2.79
Paris T8	11,577,000	8.5	287	33.8	2014	55,000	20	2.15
Sub-totals		19.7	632	32.6		91,000	39	2.46
TOTALS (steel wheel)		96.7	2,323	24.6		380,000	153	2.38
New guided rubber-tyred "tramways"								
Paris T5	11,577,000	6.6	216	32.7	end 2012	30,000	15	3.53
Paris T6	11,577,000	14.0	525	37.5	early 2014	82,000	28	5.00
TOTALS (rubber-tyred)		20.6	741	36.0		112,000	43	4.49

NOTES:-

1. Le Havre Tramway includes a 575 metre long bored tunnel, now completed.
2. 1.8km of APS is to be installed at Tours. APS = Alimentation par le sol, which means intermittently energised central third rail.

SOURCES: Connaissance du Rail, Rail Passion, Ville Rail & Transport, Tramways & Urban Transit, Today's Railways Europe, International Railway Journal, Railway Gazette International, Metro Report International and transport operator websites.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

NEW TRAMWAYS AND TRAM-TRAINS PLANNED and EXTENSIONS PLANNED TO EXISTING SYSTEMS

(Most schemes not finally approved and none yet under construction)

Town	Agglom-eration Popul-ation	Length Km	Cost €m	Cost €m per km	No of Trams	Target Opening Date
NEW TRAMWAYS						
Amiens	160,815	15.0	300	20.0		
Aubagne	44,682	7.0	112	16.0	8	2014
Avignon	253,580	14.7	250	17.0	18-24	2016
Nimes	148,889	16.0				2016
Paris T11	11,577,000	8.4				2017
TOTAL		61.1				
NEW TRAM-TRAIN SYSTEMS						
Bordeaux	753,931	7.2				2014
Lille	1,000,900	27.0	560	20.1		2017
TOTAL		34.2				
ADDITIONAL LINES FOR EXISTING SYSTEMS						
Rennes Metro	272,263	12.6	1,029	80.0	19	2018
Nice 2 Tramway	888,784	8.6				2016
Nice 3 Tramway	888,784	7.7				2015
EXTENSIONS PLANNED TO EXISTING TRAMWAYS						
Bordeaux	753,931	14.95)	615		26	2014
”	”	11.1)				2018
Nice Line 1	888,784	13.85				2016
Paris T1	11,577,000	8.0	445	55.6		
Paris T4	11,577,000	6.6				2015

NOTE:-

Approvals required for each light rail scheme include public consultation, the granting of planning permission, arranging full capital funding and receiving from central government a declaration of public utility.

SOURCES: Connaissance du Rail, Rail Passion, Ville Rail & Transport, Tramways & Urban Transit, Today's Railways Europe, International Railway Journal, Railway Gazette International, Metro Report International and transport operator websites.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

POPULATIONS AND VERSEMENT TRANSPORT

	Town	Population Agglomeration	*Versement Transport*
1.	Angers	226,843	1.80%
2.	Bordeaux	753,931	2.00%
3.	Caen	199,490	1.75%
4.	Clermont Ferrand	258,541	1.80%
5.	Grenoble	419,334	1.80%
6.	Le Mans	194,825	1.80%
7.	Lille	1,000,900	2.00%
8.	Lyon	1,348,832	1.75%
9.	Marseille	1,349,772	2.00%
10.	Montpellier	287,981	1.80%
11.	Mulhouse	234,445	1.80%
12.	Nancy	331,363	1.60%
13.	Nantes	544,932	1.80%
14.	Nice	888,784	1.53%
15.	Orléans	263,292	1.80%
16.	Reims	215,581	1.80%
17.	Rennes	272,263	1.80%
18.	Rouen	389,862	1.80%
19.	St.Etienne	287,981	1.50%
20.	Strasbourg	427,245	2.00%
21.	Toulouse	761,090	1.80%
22.	Valenciennes	357,395	1.80%
Tramways under construction with planned opening year			
23.	Besançon (2015)	134,376	1.80%
24.	Brest (2012)	210,055	1.65%
25.	Dijon (2013)	236,953	1.80%
26.	Le Havre (2012)	248,547	1.80%
27.	Tours (2013)	297,631	1.80%

Versement Transport:

A "Payroll Tax" paid by businesses with over 9 employees.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

OPERATING COSTS : SOURCES OF REVENUE

CITY/TOWN	Fares	Subsidy/ Grants	Other	*Versement Transport*
METROS				
Lille	60%	29%	11%	1.75%
Lyon	49%	51%	-	1.63%
Marseille	57%	37%	6%	1.75%
Paris	42%	58%	-	
Rennes	38%	62%	-	1.75%
Toulouse	47%	50%	3%	1.75%
TRAMWAYS				
Angers				
Bordeaux	23%	75%	2%	1.55%
Caen		No figures		1.60%
Clermont Ferrand		No figures		1.70%
Grenoble	49%	43%	8%	1.75%
Le Mans		No figures		1.80%
Lille	60%	29%	11%	1.80%
Lyon	49%	51%	-	1.63%
Marseille	43%	57%	-	1.75%
Montpellier		No figures		1.75%
Mulhouse		No figures		1.80%
Nancy	47%	47%	6%	1.40%
Nantes	41%	53%	6%	1.63%
Nice		No figures		1.53%
Orleans	45%	55%		1.75%
Paris	42%	58%	-	
Reims				
Rouen	30%	66%	4%	1.75%
St.Etienne	61%	33%	6%	1.50%
Strasbourg	68%	32%	4%	1.75%
Toulouse	47%	50%	3%	1.75%
Valenciennes		No figures		1.75%

Sources of Data:

Percentages - Jane's Urban Transport Systems 2004/2005

***Versement Transport* - French Government Transport Website**

DEFINITIONS

A METRO

(i) is a tracked rapid transit system for conveying passengers and serves the central area and suburbs of a town or city;

(ii) runs solely on a self contained network which is physically separated from all other forms of transport;

(iii) runs underground, at ground level, and elevated when it is usually on viaduct;

(iv) is signalled or automatically controlled throughout;

(v) has station platforms at car floor level;

(vi) if so designed can run without an onboard driver.

A TRAMWAY

(i) is a tracked rapid transit system for conveying passengers and generally serves the central area and suburbs of a town or city;

(ii) runs on both segregated track and surface shared with the public highway;

(iii) runs underground and at ground level, and occasionally runs above ground level on viaduct or embankment;

(iv) may be signalled at tramstops and is usually signalled where it crosses public highway, but is not automatically controlled;

(v) has tramstop platforms at car floor level for second generation tramways and, to a limited extent, for first generation tramways;

(vi) always has an onboard driver since it shares road surface with other vehicles which have drivers and are manually controlled.

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

FRENCH TRAMWAYS (25)	INAUGURATED
ANGERS +	2011
BORDEAUX +	2003
CAEN (Tyred)	2002
CLERMONT-FERRAND (Tyred)	2006
GRENOBLE +	1987
LE MANS +	2007
* LILLE (Re-equipped 1994)	1874
* LYON + (also Tram-Train Aug 2010)	2000
* MARSEILLE + (New tramway 2007)	1876
MONTPELLIER +	2000
MULHOUSE + (also Tram-Train Dec 2010)	2006
NANCY (Tyred)	2001
NANTES + (also Tram-Train June 2011)	1985
NICE +	2007
ORLÉANS +	2000
*PARIS: T1 VAL DE SEINE	1997
T2 ST.DENIS/NOISY-LE-SEC	1992
T3 DES MARECHAUX +	2006
T4 DES COQUETIERS (Tram-train)	2006
REIMS +	2011
ROUEN +	1994
ST.ETIENNE + (Re-equipped 1998)	1881
STRASBOURG +	1994
* TOULOUSE +	2010
VALENCIENNES +	2006

NOTES: + PART GRASSED TRACK ON A TOTAL OF 18 TRAMWAYS

* FIVE TOWNS ALSO HAVING A METRO

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

TRAMWAYS (Total – 25 No)	INAUGURATED
Tramways inaugurated from 2000 on	
1. Montpellier	2000
2. Lyon (includes Tram-Train)	2000
3. Orleans	2000
4. Bordeaux	2003
5. Mulhouse (includes Tram-Train)	2006
6. Valenciennes	2006
7. Paris T3	2006
8. Paris T4 (Tram-train)	2006
9. Marseille (inaugurated July 2007)	2007
10. Le Mans	2007
11. Nice	2007
12. Toulouse	2010
13. Reims	2011
14. Angers	2011
Rubber Tyred Tramways	
15. Nancy	2001
16. Caen	2002
17. Clermont-Ferrand	2006
19th Century Tramways	
1. Lille (modernised 1992-94)	1874
2. Marseille (closed January 2004)	1876
3. St.Etienne (modernised in the 2000s)	1881
Second Generation Tramways in service before 2000	
4. Nantes (includes Tram-Train)	1985
5. Grenoble	1987
6. Paris T1	1992
7. Rouen	1994
8. Strasbourg	1994
9. Paris T2	1997

FRANCE

METROS (6)	OPENED
* LILLE	1983
* LYON	1978
* MARSEILLE	1977
* PARIS	1900
RENNES	2002
* TOULOUSE	1993

* TOWNS HAVING BOTH METRO AND TRAMWAY

FRANCE

DRIVERLESS METRO LINES (7)

TOWN	OPENED	LINES
LILLE	1983	2
LYON	1992	1
PARIS (Line 14)	1998	1
RENNES	2002	1
TOULOUSE	1993	2

TOWN	ROUTE KILOMETRES
LILLE	45.0
LYON (Line D)	8.0
PARIS (Line 14)	9.0
RENNES	8.5
TOULOUSE	28.2
Total	98.7

FRENCH METRO AND TRAMWAY SYSTEMS

LIGHT RAIL LINES OPENED 1999 TO 2005

EXTENSIONS AND NEW SYSTEMS

TOWN	TRAMWAY KM	TRAMWAY MONTH OPENED	METRO KM	METRO MONTH OPENED
1999				
Grenoble	0.65	November		
Lille (driverless)			12.4	August
2000				
Lille (driverless)			3.6	October
Lyon (NEW)	18.7	December		
Lyon			2.4	September
Montpellier (NEW)	15.2	July		
Nancy (NEW)	11.0	March		
Nantes	10.0	August		
Orleans (NEW)	18.0	November		
Strasbourg	12.6	September		
Total in 2000	85.5		6.0	
2001				
Grenoble	0.60	May		
2002				
Caen (NEW)	15.7	November		
Rennes (driverless) (NEW)			8.6	March
2003				
Bordeaux (part third rail) (NEW)	24.5	December		
Lyon	5.0	October		
Paris: St.Denis/Noisy-le-Sec	2.9	December		
Toulouse (driverless)			2.5	December
Total in 2004	32.4		2.5	
2004				
Nantes	2.3	April		
2005				
Bordeaux (part third rail)	2.8	September		
Lyon	1.8	September		
Nantes	2.2	August		
Total in 2005	6.8			

FRENCH METRO AND TRAMWAY SYSTEMS

LIGHT RAIL LINES OPENED IN 2006 & 2007

NEW SYSTEMS AND ADDITIONS TO EXISTING SYSTEMS

TOWN 2006	KM	MONTH OPENED	LINES
TRAMWAYS			
Grenoble	13.5	May	Line 3
Mulhouse (NEW)	11.7	May	
Valenciennes (NEW)	9.5	June	
St.Etienne	1.7	October	Line 2
Clermont-Ferrand (Tyred) (NEW)	11.0	October	
Paris – Des Coquetiers (NEW)	8.0	November	Tram-train
Lyon	14.7	November	Line 3
Montpellier	19.6	December	Line 2
Paris – Des Marechaux (NEW)	7.9	December	Line T3
2006 Total Length	97.6		

2007	KM	MONTH OPENED	LINES
TRAMWAYS			
Bordeaux (four short extensions)	10.1	Feb,May,June,July	Lines A & B
Marseille (NEW)	11.0	June	
Valenciennes (extension)	8.5	August	Line 1
Strasbourg (new line & two extns)	5.7	August	Lines C, D & E
Clermont-Ferrand (Tyred) (extn)	4.0	September	Line 1
Grenoble (new line)	2.6	October	Line D
Le Mans (NEW)	11.1	November	
Nice (NEW) (part battery operated)	8.7	November	
Marseille (short extension)	1.5	November	Line 1
Strasbourg (short extension)	1.4	November	Line E
Bordeaux (short extension)	2.3	November	Line C
Le Mans (branch from main route)	4.0	December	
METROS			
Paris (short extension, driverless)	0.7	June	Line 14
Toulouse (new line, driverless)	15.8	June	Line 2
Lyon (short extension)	1.0	September	Line A
2007 Total Length	88.4		

FRENCH METRO AND TRAMWAY SYSTEMS
GRENOBLE TRAMWAY

Route length - 8.9 kms

Tramway opened – 1987

Versement transport **variously 1%, 1.35% & 1.5%**
(Local payroll tax on employers, businesses only, with over nine employees)

Local Referendum on tramway – Votes: For 15,987
(City population 160,000) Against 14,121

		FF million (1985 prices)
ROLLING STOCK (25%)		
19 trams manufactured by Alsthom		200
FIXED WORKS (65%)		
Civil engineering	140	
Services diversions	46	
Trackwork	155	
Electrical installation	45	
Office and central control	40	
Re-equipment of depot	34	
New depot for displaced buses	41	
Alterations to trolleybus lines	27	
		528
OTHER (10%)		
Engineering studies	56	
Miscellaneous	28	
		84
Total		812
Cost per kilometre (including rolling stock)		91
The total cost of FF812million includes State funding towards infrastructure cost of		315

Source:
Modern Tramway and Light Rail Transit, January 1986

TOULOUSE METRO
PASSENGER TRIPS AND CAPITAL COSTS

METRO OPENED 26 JUNE 1993	"Pre Metro" 1992/93 Trips	"Post—Metro" 1993/94 Trips	Modal Split
Bus	36,843,832	23,338,827	47%
Bus + Metro	-	11,621,006	24%
Metro	-	14,263,755	29%
TOTAL	36,843,832	49,223,588	100%
Percentage Increase		+33.6%	

Highest Recorded Public Transport Trips on one day in Metro's 1st Year (Wednesday 10 November 1993)	228,215
Fare Evasion: Metro	2.04%
Bus	3.01%
Capital Cost of Line A (9.7 Km)	FF 3.315 billion
Capital Cost per Km (approx.)	FF 340 million
Percentage of Line A in tunnel	90%
Increase in journeys in 1st Year	12,379,756
Capital cost per extra 1st Year Trip	FF 268
Notional Annual Interest charge on capital (8% of FF 3.315 billion)	FF 265.2 million
Trips per year (1993/94) using Metro	25,884,761
Notional Interest "Charge" per trip	FF 10.25
Standard single fare (many fares are cheaper)	FF 7.0

Line B :

Contracts let in 2001	FF billion
Fixed Works	3.5
VAL Minimetros (35 No)	1.5
Total (excluding Land Costs)	5.0
Length	20Km
Cost per Km (approx.)	FF250 million
Construction start	2001
Programmed opening date	2007

STRASBOURG TRAMWAY

Opened – 26 November 1994

CAPITAL FUNDING OF EXPENDITURE

Sources of Funding	Percentage	FF Million
Central Government Grant	17%	330
Alsace Region Grant	3%	60
Bas-Rhin Department Grant	5%	103
Strasbourg Urban Community Grant	9%	176
Strasbourg Transport Company contribution	3%	63
Public transport "Payroll Tax" on employers (Businesses with over 9 employees) (minimum 1%, maximum 1.75% of payroll)	27%	518
"GRANTS" SUB-TOTAL	64%	1,250
LOANS to the Strasbourg Transport Company	36%	690
TOTAL FUNDING	100%	1,940

Capital Expenditure	
Infrastructure: Bridges, tunnels and underground station	392
Track	397
Overhead lines and electricity substations	116
Cabling and maintenance depot	185
Services Diversions & Archaeological excavations	125
Control centre and operating system	99
Construction administration, Insurances	199
Rolling Stock (26 complete trams)	369
Contingencies	58
TOTAL CAPITAL COST (January 1990 prices, excluding VAT)	1,940
TOTAL ROUTE LENGTH	12.6 KM
Capital cost per kilometre (approx.)	FF 150 million

VAL 206 MINIMETROS - GUIDANCE SYSTEM

The basic VAL vehicle consists of two permanently coupled car bodies each carried on two pivoting axles with rubber tyred wheels, i.e. four axles per vehicle. The wheels of the VAL run on reinforced concrete tracks 1.6 metres apart. Except at points and crossings track guidance is achieved by horizontal guide wheels on the vehicle in contact with metal guide rails on each side of and parallel to the track. These guide rails also serve as the conductors for the 750 volt DC electricity supply. There are four guide wheels per axle.

A secondary guidance system is therefore required at points and crossings where gaps in the longitudinal guide rails occur. As VALs approach these gaps two small steel rollers on each axle assembly engage in a central slot formed by two side-by-side steel rails bolted centrally to the bed of the track. These steel rails are only provided at gaps in the guide rails.

At the point of turnout there is a flexible switch blade set either to constrain the rollers so the vehicle continues to move straight ahead or alternatively to deflect the rollers so that the vehicle is guided into the turnout. The blade is 3 metres long and is only moved through 50 millimetres to select the track to be followed by the vehicle.

Gaps in guide rails are provided at the end of each line to enable VALs to cross over from the "outbound" line to the "inbound" line just after they have reversed direction of travel. The VAL effects this switchover beyond the terminus station after all passengers have alighted. At all four Lille termini VALs may be observed carrying out this manoeuvre. At peak times this movement happens about once per minute.

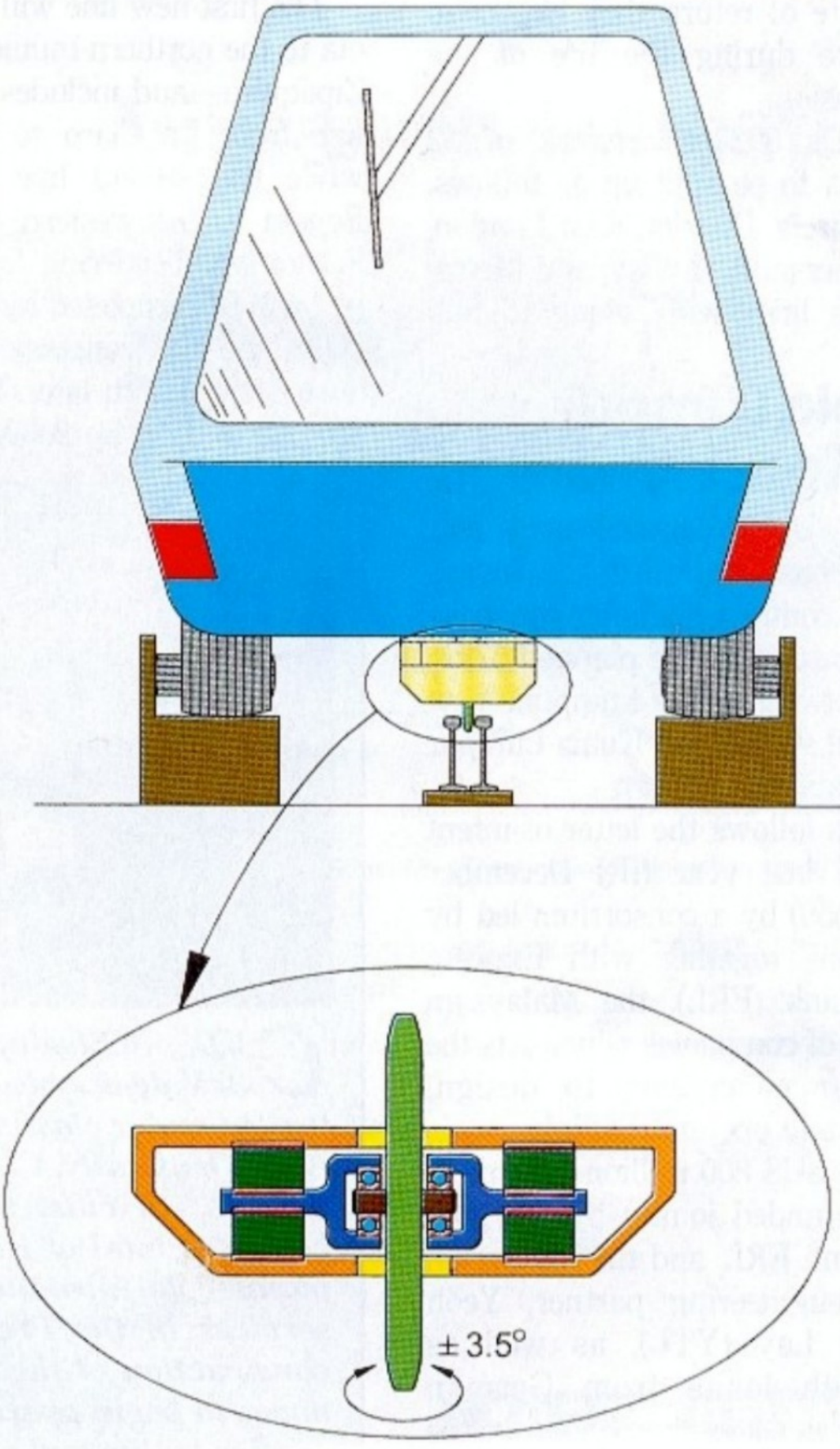
VAL 208 MINIMETROS - GUIDANCE SYSTEM

The basic VAL vehicle consists of two permanently coupled car bodies each carried on two pivoting axles with rubber tyred wheels, i.e. four axles per vehicle. The wheels of the VAL run on reinforced concrete tracks 1.6 metres apart. Except at points and crossings track guidance is achieved by horizontal guide wheels on the vehicle in contact with metal guide rails on each side of and parallel to the track. Guide rails also serve as the conductors for the 750 volt DC electricity supply. Each axle has four guide wheels.

A secondary guidance system is therefore required at points and crossings where gaps in the longitudinal guide rails occur. As VALs approach these gaps a guidance wheel fitted in a casing to the underside of the bodywork at the front and rear of each axle engages in a central slot formed by two side-by-side steel rails bolted centrally to the trackbed. These steel rails are only provided at gaps in the guide rails.

At the point of turnout there is a flexible switch blade set either to constrain the guidance wheels so the vehicle continues to move straight ahead or alternatively to deflect these wheels so that the vehicle is guided into the turnout. The blade is 3 metres long and is only moved through 50 millimetres to select the track to be followed by the vehicle.

Gaps are provided in guide rails both for operational purposes at intermediate locations along the route and at the end of each line to enable VALs to cross over from the "outbound" line to the "inbound" line just after they have reversed direction of travel. The VAL effects this switchover beyond the terminus station after all passengers have alighted. At all four Lille termini VALs may be observed carrying out this manoeuvre. At peak times this movement happens about once per minute.



VAL 208 GUIDANCE ROLLER

Délégation Générale à la Communication
Service de presse
tel 01 44 68 37 37 (réseau RATP 83737)
PHOTOGRAPHIQUE
fax 01 44 68 24 50

AUTORISATION

DE REPORTAGE
AUDIOVISUEL /

AUTORISATION DELIVREE PAR :
MICHEL DUBOIS

VALABLE DU 3 au 12 NOVEMBRE 2001
de 9 H à 17H

Cette autorisation ne vaut pas titre de transport. Elle doit être présentée à toute réquisition d'un agent de la RATP. Elle est délivrée à :

Mr / Mme : GRAHAM JELLETT **média :Consultant Transports**

thème du reportage **PLANS GENERAUX DU METRO ET DU RER**

valable sur les réseaux	sur les lignes / stations	dans les voitures
non		non
oui	**RESEAUX**	oui
oui	**RESEAUX**	oui
non		non

Attention, lire attentivement les consignes d'utilisation.

- La présente autorisation n'est valable que pour le(s) thème(s) et lieu(x) indiqué(s) et ne donne accès qu'aux installations ouvertes aux voyageurs (quais, stations, rames,...) à l'exclusion des cabines de conduite des trains, des locaux techniques d'exploitation, des ateliers et des bureaux de vente de titres de transport.
- Les prises de vues ne doivent en aucun cas perturber l'exploitation.
- Le reportage peut être interrompu à tout moment par les agents de la RATP pour des raisons liées aux impératifs d'exploitation.
- Les voyageurs et agents de la RATP ne peuvent être photographiés ou filmés contre leur volonté. Ils ne doivent être ni sollicités, ni importunés.
- L'autorisation de la Préfecture de Police est requise pour tout reportage concernant les services de sécurité publique opérant dans le métro (Police Nationale, Gendarmerie Nationale,...).

EN CAS DE DIFFICULTE

Les journalistes ou les agents de la RATP devront se mettre en rapport avec le service de presse de la RATP

L'usage de flash ou de projecteur additionnel est interdit sur l'ensemble des réseaux de la RATP

SOCIETE LYONNAISE DE TRANSPORTS EN COMMUN

Département MARKETING

AUTORISATION DE FILMER OU DE PHOTOGRAPHIER LES VEHICULES ET INSTALLATIONS DU RESEAU T.C.L.

(Bus et Métro)

Délivrée à : M. et Mme JEWETT

Adresse : Hotel place de REPUBLIQUE "PLAZZA"

Téléphone :

Dates limites : Le Mardi 24/06/97

Spécifications : Prises de Sous photo A.B.C.D. FUN.

Perception : ticket Liberté

Le 24.06.1997

Pour T.C.L: L. MAOND

L'intéressé autorisé: J.G. Jewett

Cette autorisation est donnée à titre précaire, à l'article 18 de l'arrêté du 21 Avril 1978 interdisant les prises de vues sur les réseaux de transport.

L'intéressé reconnaît avoir pris connaissance du règlement des prises de vues sur le Réseau T.C.L. , auquel il devra se conformer. En particulier, il dégage toute responsabilité de la Société T.C.L. pour des faits résultant de ces prises de vues.

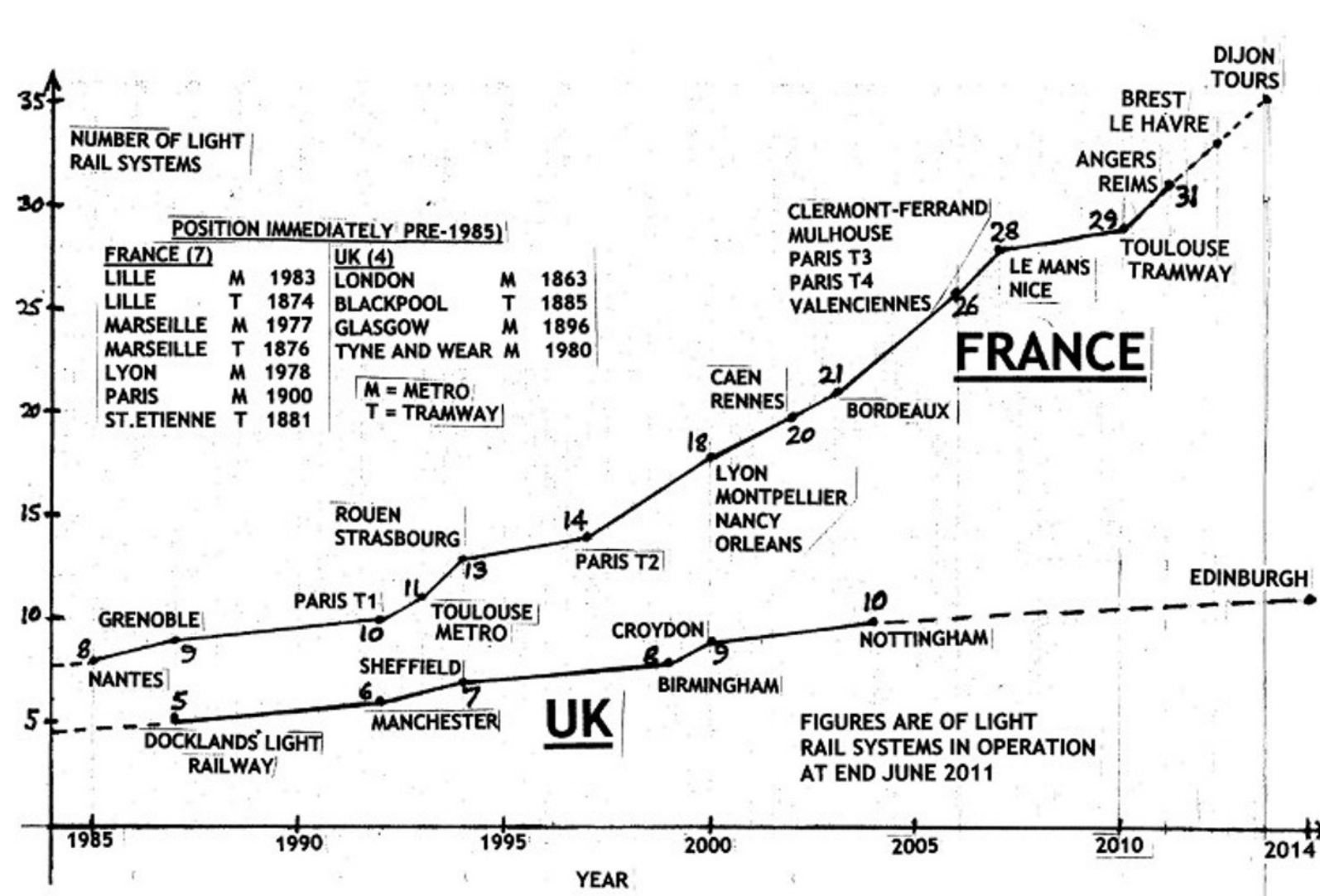
Sauf indication contraire, l'intéressé devra acquitter le prix de son ticket comme un voyageur ordinaire.

Immeuble "Le Lyonnais" - 19, bd Vivier Merle - Lyon 3e - BP 3167 - 69212 Lyon Cedex 03
Tél. 78 71 80 80 - Télécopie 72 33 84 62
SA au capital de 18 500 000 francs. Exploitante du réseau TCL pour le compte de SYTRAL (Syndicat mixte des Transports pour le Rhône et l'Agglomération Lyonnaise) - RC Lyon B 308 077 635 - Siret 308 077 635 00024
Société de VIA G.T.I., Division VIA Transcom

U.K. LIGHT RAIL

METROS (4)	OPENED
GLASGOW	1896
DOCKLANDS LR	1987
LONDON	1863
TYNE & WEAR	1980

TRAMWAYS (6)	
BLACKPOOL	1885
BIRMINGHAM	1999
CROYDON	2000
MANCHESTER	1992
NOTTINGHAM	2004
SHEFFIELD	1994


NUMBER OF LIGHT RAIL SYSTEMS
POSITION IMMEDIATELY PRE-1985)
FRANCE (7)
LILLE M 1983
LILLE T 1874
MARSEILLE M 1977
MARSEILLE T 1876
LYON M 1978
PARIS M 1900
ST.ETIENNE T 1881
UK (4)
LONDON M 1863
BLACKPOOL T 1885
GLASGOW M 1896
TYNE AND WEAR M 1980
M = METRO
T = TRAMWAY
FRANCE
UK
NANTES
GRENOBLE
PARIS T1
TOULOUSE METRO
ROUEN
STRASBOURG
PARIS T2
LYON
MONTPELLIER
NANCY
ORLEANS
CAEN
RENNES
BORDEAUX
CLERMONT-FERRAND
MULHOUSE
PARIS T3
PARIS T4
VALENCIENNES
LE MANS
NICE
TOULOUSE TRAMWAY
ANGERS
REIMS
BREST
LE HAVRE
DIJON
TOURS
DOCKLANDS LIGHT RAILWAY
SHEFFIELD
MANCHESTER
CROYDON
BIRMINGHAM
NOTTINGHAM
EDINBURGH
FIGURES ARE OF LIGHT RAIL SYSTEMS IN OPERATION AT END JUNE 2011
YEAR
1985
1990
1995
2000
2005
2010
2014

To view about 400 photographs of all 28 metros and tramways currently operating in France and tables of light rail data visit:

www.flickr.com/photos/freinsevran/sets

Website is free to view

26th October 2008

LIGHT RAIL IN FRANCE – THE CURRENT SCENE

Official Transport Operator Websites

Town	Website address
Angers	tramway.angersloiremetropole.fr
Besançon	www.besancon.fr
Bordeaux	www.infotbc.com; www.lacub.com/tramway
Brest	www.letram-brest.fr
Caen	www.twisto.fr; www.smtcac.org
Clermont Ferrand	www.t2c.fr
Dijon	www.letram-dijon.fr
Grenoble	www.semitag.com; www.smtc-grenoble.org
Le Havre	www.tramway-agglo-lehavre.fr
Le Mans	www.setram.fr; www.tramwaydumans.fr
Lille	www.transpole.fr
Lyon	www.tcl.fr; www.sytral.fr; www.rhonexpress.fr
Marseille	www.rtm.fr; www.lepilote.com
Montpellier	www.montpellier-agglo.com/tam
Mulhouse	www.solea.info; www.mulhouse-alsace.fr
Nancy	www.reseau-stan.com
Nantes	www.tan.fr
Nice	www.lignesdazur.com; tramway.nice.fr
Orléans	www.reseau-tao.fr
Paris	www.ratp.fr; www.tramway.paris.fr/ www.stif.info/IMG/pdf/T4-fiche-presseT4.pdf
Reims	www.mars-reims.fr; www.tramwaydereims.fr; www.citura.fr;
Rennes	www.star.fr
Rouen	www.tcar.fr
St.Etienne	www.reseau-stas.fr
Strasbourg	www.cts-strasbourg.fr
Toulouse	www.tisseo.fr
Tours	www.tram-tours.fr
Valenciennes	www.transvilles.com

Other informative non-operator French light rail websites

www.transbus.org
tramateurs.free.fr
www.subways.net/france/France.htm

Graham Jellett – 7/10/2011

TRAMS / LIGHT RAIL VEHICLES

CITADIS® X05

The latest evolution of Citadis

Alstom's Citadis is the low-floor tram reference for modern urban solutions and is at the core of multiple city renewal projects. The development of Citadis X05 is based on a 15 year proven track record of over 2,000 Citadis sold worldwide. Citadis was upgraded to deliver extra dimensions, capacity, flexibility, speed and passenger experience in order to allow higher frequency throughout the day and thereby increase the number of people an operator can carry on a network per year.

Several world-wide customers already chose Citadis X05 trams.

HIGHLIGHTS

- More than 2,000 Citadis trams ordered for 50 cities worldwide
- 9 billion passengers; 4 million per day
- 1 billion km run by the Citadis tram fleet
- 1,600 Citadis trams in service
- 1 out of 4 low-floor trams in service worldwide manufactured by Alstom
- 20 million km run without catenary
- 98% of the mileage run worldwide without catenary operated / Citadis

GENERAL DESCRIPTION

Citadis X05 offers new choices on tram dimensions and configurations (in single-unit or double-unit operation), performance, comfort level and special features met by a system of service-proven modules that fit together. Innovations include: integration of new technologies for lower energy consumption (Permanent Magnet Motors) ; easier sub-system integration and maintenance which reduces LCC ; higher speed of up to 80 km/h; operable on existing and new tracks; catenary-free range (besides APS) now incorporating new full on-board autonomy systems - optimized and completely integrated. All these new technological advances offer cities of all sizes the highest performance tramway solutions - in order to meet the current and future evolving mobility challenges.

CUSTOMER BENEFITS

High degree of passenger comfort and convenience

New levels of comfort include spacious design with double doors (15% passenger exchange ratio increase), 40% higher windows (in suspended modules), new ergonomic seat design option (Cityseat), real-time information on-board, direct & indirect lighting based on LED technology - all leading up to a more pleasurable urban commuter experience.

Lower OPEX

11% reduction of maintenance costs based on technical innovations including: optimized monitoring system through a Design to Serviceability process; Ethernet network for a quick download of monitoring data from a single access point for the upload of infotainment and passenger information system in manual or automatic wireless mode.

Advanced catenary-free offering

Alstom's solutions span most service-proven APS, and /or Citadis Ecopack, full on-board autonomy management system composed of latest generation super-capacitor and batteries. Key advantages of Alstom's catenary free solutions : preservation of the aesthetics of city centres; unlimited power supply; high performances (matching catenary performances), high availability (99.95% on 2-km double track applications); robustness and very limited impact on infrastructure.

Up to 25 % reduction in energy consumption thanks to latest design improvements :

- Proven ONIX 850 traction drive with closed self-ventilated Permanent Magnet Motors (PMM) highly efficient (96 %)
- Optimized HVAC function (air flow, passenger load...) and auxiliaries (auxiliary with variable frequency)

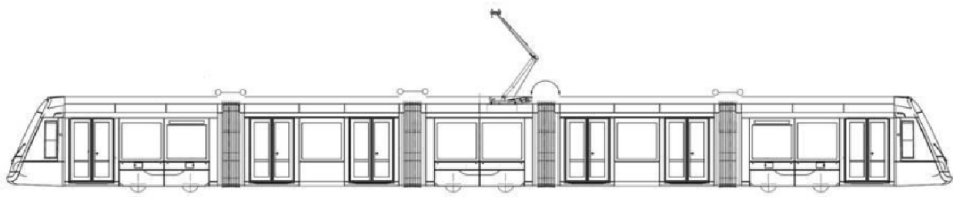
CITADIS® X05/EN/09.2016 - Photo credits: ©ALSTOM SA

ALSTOM

KEY TECHNICAL FEATURES

Specification criteria	Values specific to each nominal length		
	20 nominal meter versions	30 nominal meter versions	40 nominal meter versions
	CITADIS 205	CITADIS 305	CITADIS 405
Vehicle length depending on width of doors required	24 m	32 m to 37 m	43 m to 45 m
Vehicle width	2.4 m	2.4 m and 2.65 m	
Track gauge	1435 mm		
Number of bogies per tram	2	3	4
Number of car modules per tram	3	5	7
Provision for subsequent tram extension	Up to 5 modules (37 m)	up to 7 modules / 4 bogies	not extendable
Low floor percentage	100 %		
Access height (entrance)	intermediate doors:326 mm, front doors: 342 mm (above top rail)		
Central aisle width over bogies	750 mm		
Number and type of doors per side (Sliding plug doors)	4 double doors	4 to 6 double doors or 2 to 4 double doors + 2 single doors	5 to 8 double doors or 3 to 6 double doors + 2 single doors
Seating configuration	modular arrangements (see diagram)		
Passenger capacity seated	41	42 to 66	57 to 82
(@ 4 pax /m2) standing	101	152 to 184	215 to 237
TOTAL	142	202 to 238	271 to 341
comfort ratio (1)	29%	up to 28%	up to 25%
exchange ratio (2)	26%	up to 27%	up to 25%
wheelchair areas	1	1 or 2	1 or 2
Passenger information equipment	different packages available		
HVAC (Heating, Ventilation, Air Conditioning)	independent controls for passenger & driver zones / scaled to relevant climatic conditions		
Motorization ratio	100%	67% (100% is an option)	75%
Maximum speed in service	70 km/h	80 km/h	
Maximum acceleration	1.3 m/s^2		
Service deceleration	1.2 m/s^2		
Compression load	400 kN		
Crash absorption resistance	meets EN15227 standards		
Minimum horizontal curve radius	20 m (in depot)		
Operation	bidirectional or unidirectional operation in single or double unit		
Traction motors	2 air-cooled permanent magnet motors per motorized bogie		
Power supply voltage	750 Vdc (600 Vdc as an option)		

(1) number of seats for passengers / total passenger capacity per tram
(2) sum of widths of doors / total length of passenger zone per tram



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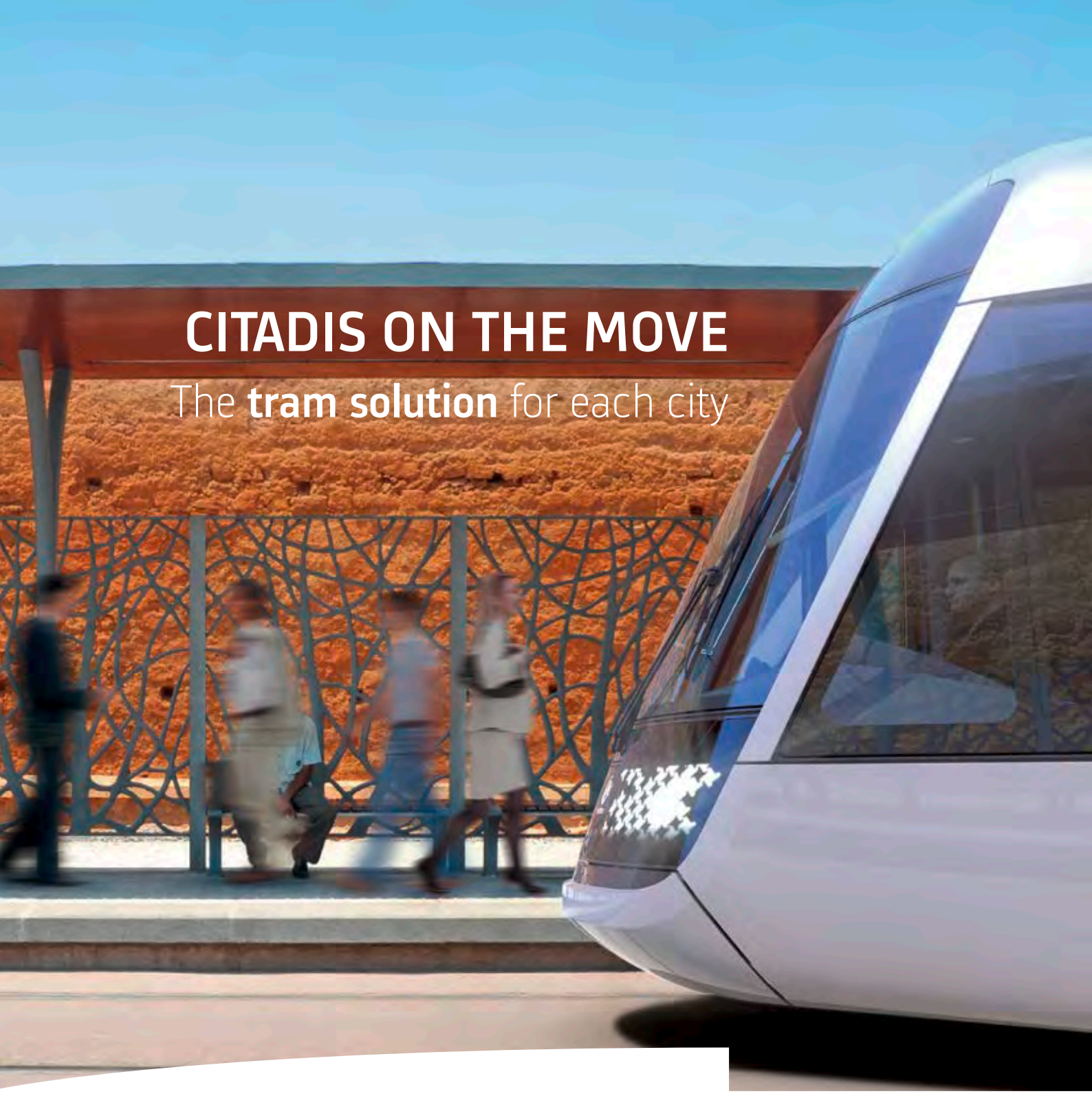
Visit us online: www.alstom.com



CITADIS ON THE MOVE

The **tram solution** for each city

ALSTOM
Designing fluidity

Mobility in **the expanding city**

By 2030, over 60 percent of the world's 8.3 billion people will live in cities. This trend combined with global climate change and rising energy prices will make sustainable mobility a pressing issue for urban communities. The modern tram has become one of the most successful ways for cities of all sizes to simultaneously address mobility needs and economic regeneration. By introducing a sustainable tram, a city declares its commitment to its citizens and its future.

France best exemplified the modern tramway revival: thirty years ago there were 3 tramways in France (Lille, Marseille, St. Etienne) totaling only 40 km; 27 cities now have over 500 km of conventional tramway lines. Furthermore, most French cities with tramways have selected Alstom's Citadis which is considered a source of inspiration worldwide.

Dubai opted for Alstom's Citadis trams and APS power supply for its very first tramway system. Dubai's 15 km tramline powered by APS only, represents a world first – a complete, modern tramline with no catenary.

Alstom delivered a 74 Citadis tram fleet for **Casablanca,** where the company played a key role in the development of one of the world's longest tramway lines built in a single stretch. Casablanca's tramway service: 30.5 km Y shaped line, 48 stations, crosses the city east to southwest and is operational since 2012.

Rio de Janeiro selected the catenary-free version of Citadis with the order of 32 trams to facilitate urban transport for the Olympic Games in 2016.

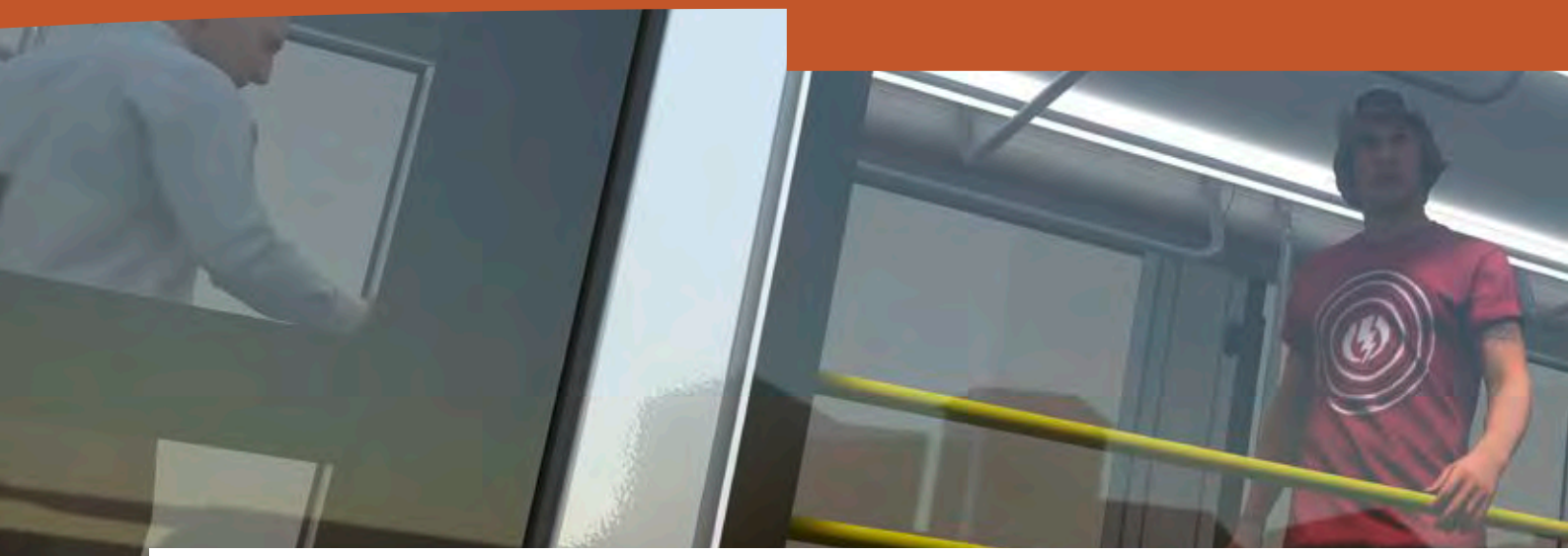
Alstom's Citadis is the tram reference for modern urban solutions and is at the core of multiple city renewal projects. The **recent development of the Citadis X05® range is based on a 15 year proven track record** of over 1,800 Citadis trams sold worldwide. Upgraded to deliver extra dimensions, capacity, flexibility, speed and passenger experience, Citadis X05 allows higher frequency throughout the day and thereby increases the number of passengers an operator can carry on a network per year.

Beyond providing a comfortable and efficient means of mobility, Alstom's Citadis X05 also reflects a city's values and projects its unique personality. What the tram looks like, where it goes and how it is powered all send a powerful message: Come share our fantastic city!

The tram offers greater accessibility, is faster and cheaper to install and operate and is designed to evolve with growing demand. Notably, overall Public Transport use often jumps between 20-40% following the opening of a 15-20 km-long tram line.

Top Customer Benefits

Citadis X05—the latest evolution of the Citadis tram range—offers new choices on tram configurations, performance, comfort level and special features met by a system of service-proven modules that fit together.



Enhanced Passenger Experienc

EXCELLENT MOBILITY AND COMFORT FOR ALL PASSENGERS

Every city has a unique character, a mix of its traditions and aspirations. The tram often becomes a city's ambassador — with its high visibility, it helps set the city's tone. Designed by Alstom's in-house Design & Styling department, Citadis X05 was conceived from the outset to fulfill this vocation. Citadis X05 allows each city to create the tram that citizens recognize with pride as their own.

Who knows better than you what will please your passenger? In addition to full low-floor architecture, wider central aisles and double doors for easy on and off passenger flows, the wide range of options offered by the Citadis X05 allows customers to select the tram features that ensure a high degree of passenger comfort and convenience.

Optimum Comfort

- **High comfort ratio**, with up to 16 seats above the bogies
- **Panoramic** (balcony concept) windows (surface increased by 12%)
- **New ergonomic seat design** option (Cityseat)
- **New** LED based lighting system
- High performance **air-conditioning** system
- Latest **passenger information system**, with Wifi on option
- Dedicated areas for **wheelchairs and strollers**

ce

SAFE & SECURE

Real-time assistance for every day and emergency operations includes video monitoring onboard and at stops, and intercom. Alstom also provides services to integrate the tramway system with the city's road traffic signaling. When tramline sections run in tunnels where "driving at sight" is no longer safe or when tram stops are equipped with platform screen doors (as in Dubai), we offer an ATC (Automatic Train Control) solution derived from our Urbalis CBTC (Communication-Based Train Control) system, to prevent driver errors and to fluidify tram movements.

DOUBLE DOORS, WIDE CENTRAL AISLE

Maximize passenger exchange rate by up to 15 %! Positioned at the tram's front and rear, the double doors can give passengers more room to get on and off, reducing stop times at stations. This fluidity continues onboard: the Citadis X05 has one of the largest central aisles on the tram market – 750 mm.

New tram configurations
for the right capacity

Alstom offers a complete range of Citadis X05 vehicles designed to evolve with your growing city. Whether you're looking to introduce a new fleet or replace an aging one, for new or existing lines, there's a Citadis X05 just right for you!

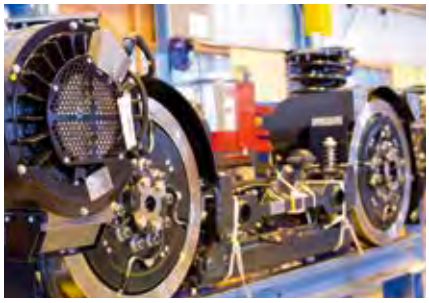
THE CITADIS X05 RANGE

Vehicle configurations	**Vehicle lengths for** bi-directional versions	**Max capacity @ 4 passengers/m²** for 2 400 mm width versions	**Max capacity @ 4 passengers/m²** for 2 650 mm width versions
	23,9 m	142	■
	32,2 m	200	221
	33,4 m	211	233
	35,6 m	220	■
	36,8 m	231	■
	43,4 m	279	301
	43,4 m	284	307
	44,6 m	290	313
	44,6 m	295	319

THE RIGHT BOGIE SOLUTION

Alstom's bogies have the ability to adapt to all tram tracks. Arpege bogies have been optimised to run on new or well-maintained tramlines; over 3000 Arpege bogies are in regular service today. Ixege bogies, with a running speed of 80 km/h, are able to run equally on new or existing tramlines. Ixege is designed to deliver excellent ride comfort especially on uneven and well-worn tracks.

Ixege Bogie



Arpege Bogie

CITADIS TODAY

Over 1800 Citadis LRVs sold to **45** cities

1500 Citadis trams in service

6 billion passengers transported
Over **2.7 million** passengers/ day

500 million km run with Citadis fleet

1 in 4 low-floor trams in service in the world is manufactured by Alstom

99% of the catenary-free mileage run worldwide has been covered by Citadis

13 million km travelled without catenary

NEW MARKET TREND

Alstom anticipated a new market trend towards smaller trams as an alternative to BRT for medium sized cities. This is exemplified with contracts in Aubagne and Avignon for the high-performance 22* to 24meter tram—The Citadis Compact.

* 22 m tram will be studied on a case by case basis.

Clear skies over your city

Advanced catenary-free solutions

Alstom leads the industry in offering catenary-free solutions proven in commercial service for reliability and optimised energy consumption. With no overhead contact wires, cities preserve the beauty of historical areas or city centers while providing modern street-level transport.

APS

APS operates in harsh climatic conditions such as extreme temperatures, humidity, heavy rain, snow and ice.
APS matches catenary performance levels over unlimited distances at speeds of up to 60 km/h, regardless of slopes while maintaining full on-board utilities such as air-conditioning in extremely hot weather.
Alstom also developed APS with an option for onboard supercapacitors which combines an increased storage capacity with partial APS rail installation.

CITADIS ECOPACK

A supercapacitor technology which revolutionises the way trams manage power consumption.
The latest full on-board autonomy system provides trams with a high level of energy autonomy so they can run without catenary power, consume less energy and integrate more effectively into the urban landscape.

KEY ADVANTAGES OF ALSTOM'S ADVANCED CATENARY-FREE SOLUTIONS

Alstom's solutions span APS, the most service proven catenary- free solution, and the new Citadis Ecopack, a full on-board autonomy management system composed of the latest generation supercapacitor and batteries.

- Unlimited power supply; high performances (matching catenary performances)
- 100 % of energy transmitted to vehicles (no loss)
- Full power along the line including up slopes and to auxiliary tram systems
- Partial or full line catenary-free coverage
- High availability (99.95% on 2 km double-track applications)
- Guarantees the same commercial speed as a power supply by catenary

Major References

- Bordeaux, France
- Reims, France
- Angers, France
- Orléans, France
- Tours, France
- Nice, France

Under Construction

- Dubai, United Arab Emirates
- Cuenca, Ecuador
- Rio Porto Maravilha, Brazil (includes Citadis Ecopack)
- Lusail, Qatar

Reducing energy consumption
for optimised life-cycle costs

FROM COMPONENTS TO TRAMWAY SYSTEM

Citadis trams are extremely energy-efficient as a result of Alstom's years of pioneering traction technology to reduce size and weight. Both our Onix traction system with IGBT (Insulated Gate Bipolar Transistors) technology and our permanent magnet motors have been adapted specifically for Citadis X05 to benefit from their proven enhanced performances.

Permanent Magnet Motor (PMM)

BRAKING ENERGY RECOVERED

Braking energy is recuperated immediately and either used to power onboard auxiliary systems or returned into the power system to be used by other trams. Alstom also offers a supercapacitor subsystem – for catenary-free operation or simply to store energy (from braking) that other trams cannot use, resulting in up to 15 % of energy savings.

HESOP REVERSIBLE POWER SUBSTATIONS

Alstom offers HESOP, as a complement or an alternative to our onboard solutions. These innovative, new substations can capture the electricity that trams have recuperated from braking and do not use. Designed for easy integration into existing power supply systems, HESOP products are also ideal for network renewals or extensions.

BENEFITS

99 % capture of recoverable energy

20 % less sub-stations for each tramline

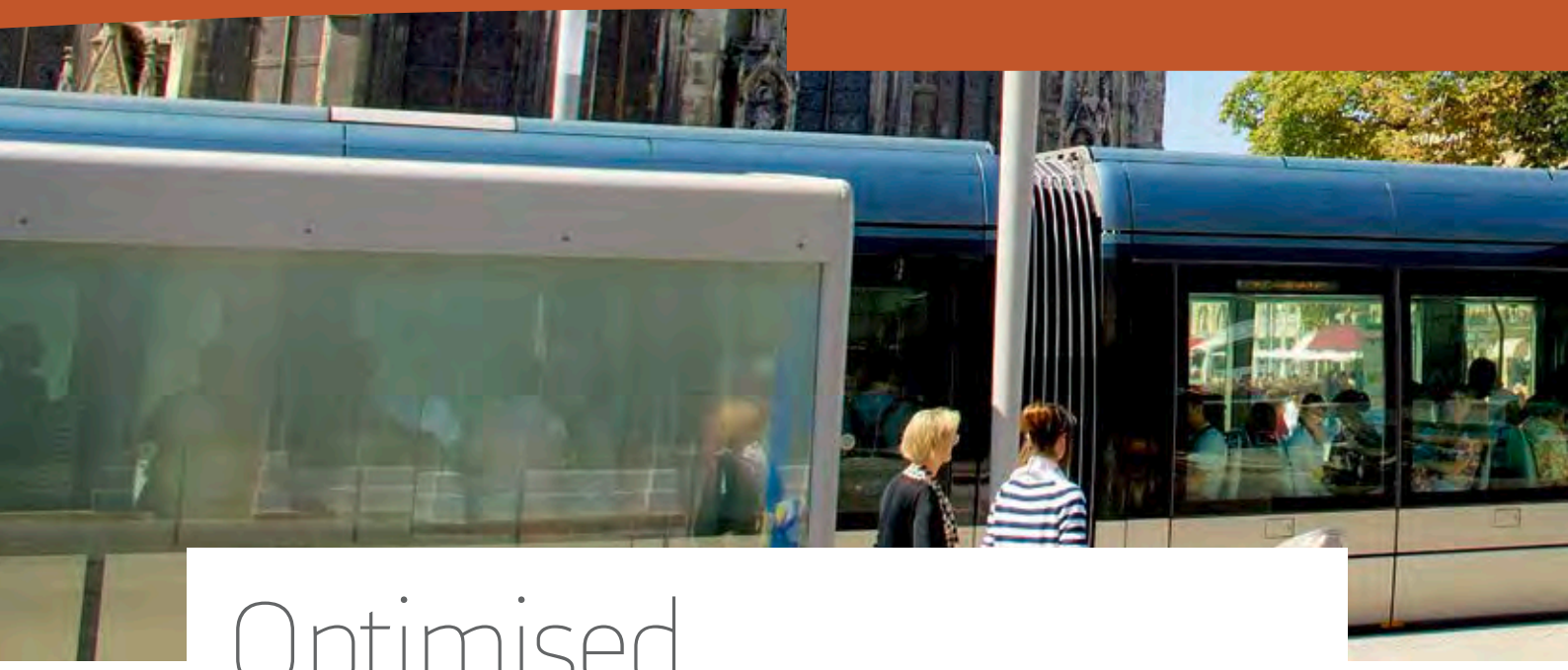
Lower infrastructure costs

High energy quality in line with power grid requirements

Tramway network evolution with the same equipment at no extra cost

Up to 40 % traction energy savings

Reduced CO_2 emissions



Optimised
Life-cycle costs (lower Opex)

In an era dominated by financial concerns, life-cycle costs have come to the forefront in all rail operations. Alstom offers maintenance and supply chain services as well as technical support to ensure the optimal balance between operational performance, safety and cost.

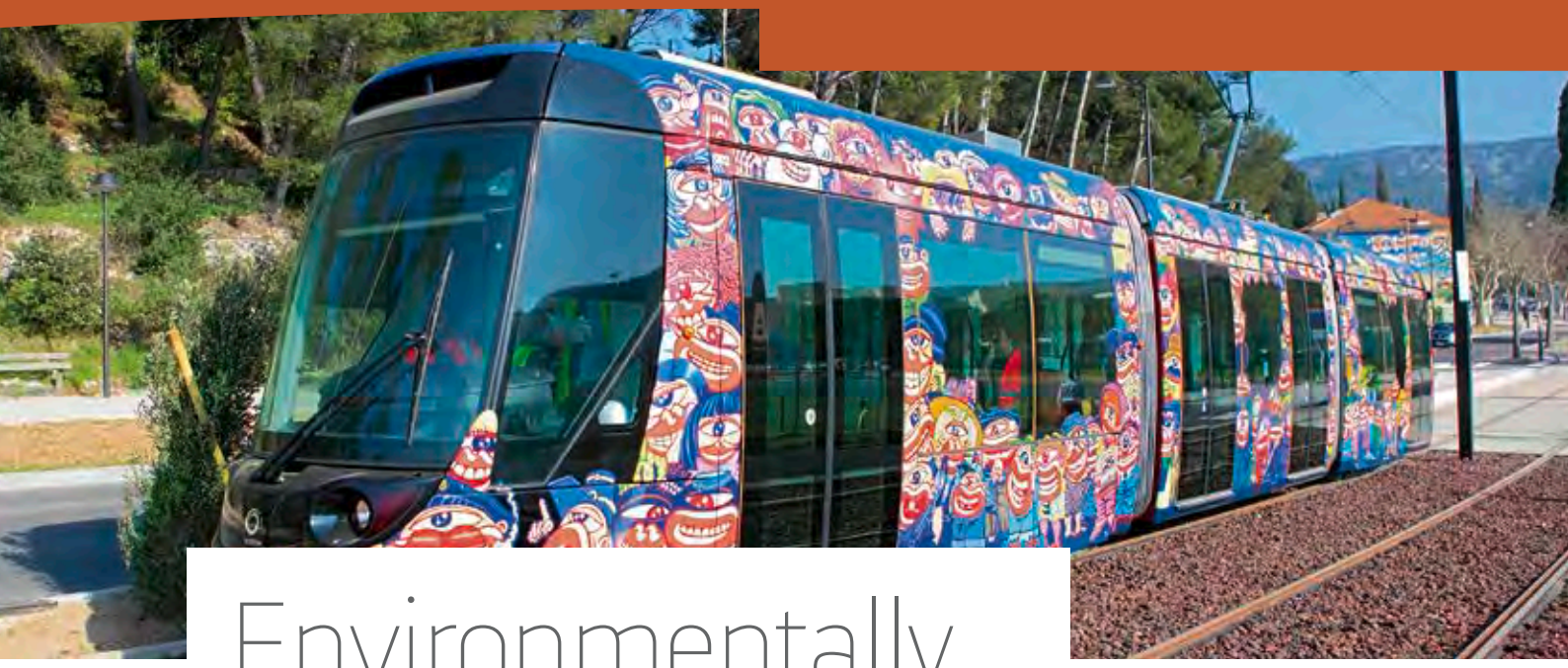
REDUCTION OF CITADIS X05 MAINTENANCE COSTS

One of the lowest maintenance costs on the market – Cost of preventive maintenance reduced by 18 %.

- Optimised maintenance planning
- Extended maintenance steps, based on Alstom's 15 year return on experience
- Better accessibility to critical components
- Easy communication with subsystem processors
- Extended wheel life

Novel use of Ethernet network to reduce Citadis X05 maintenance costs:

- Simple and centralized upload of software
- Smoother integration of customer equipment such as ticketing machines thanks to full Ethernet backbone
- Easy diagnostic of subsystems (failure code download and easier to interpret)



Environmentally **Friendly**

Sustainable Citadis X05: The environmental benefits of electrically powered trams are an additional incentive for local government.

LESS IS BETTER

- 4 times less energy than a bus, 10 times less energy than a car (KWh/seated passenger).
- No visual pollution: catenary-free
- Reduced interior noise with new HVAC (Heating, Ventilation, Air-Conditioning)

ENVIRONMENTAL RESPECT BUILT-IN

By adopting a lifecycle approach to product design, our engineers developed the most environmentally friendly solutions to our Citadis X05 range from the earliest stages. This approach applies equally to our processes, facilities and services and for HSE (Health, Safety, Environment) improvement.

- REACH compliant (Europe's most stringent regulation on hazardous substances/ hydro paint & coatings)
- 99 % recoverability at end-of-life (recyclability + energy recovery)

- Water-based paints/coatings
- 99 % of braking energy recovered with HESOP technology
- 10-15 % energy savings with energy monitoring and Eco-driving
- Permanent magnet motors for high performance traction: 98 % efficiency (PMM 3% extra efficiency versus asynchronous motors)
- Electrical braking more powerful with new motors
- Optimised HVAC (CO_2 sensors to adjust airflow based on passenger load)
- Optimised tram sleeping mode and option for remote tram preparation

Alstom Transport

A promoter of sustainable mobility, Alstom Transport develops and markets the most complete range of systems, equipment and services in the railway sector. Alstom Transport manages entire transport systems, including rolling stock, signalling, maintenance and modernisation, infrastructure and offers integrated solutions.

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 signalling, infrastructure, services to complete turnkey systems, we offer the widest range of high-tech rail solutions.

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.

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ALSTOM

Alstom Citadis

From Wikipedia, the free encyclopedia

The **Citadis** is a family of low-floor trams (streetcars) and light rail vehicles built by Alstom. As of 2017, over 2,300 Citadis trams have been sold and 1,800 tramways are in revenue service throughout the world, with operations in all six inhabited continents.[1] An evolution of Alstom's earlier TFS vehicle, most Citadis vehicles are made in Alstom's factories in La Rochelle, Reichshoffen and Valenciennes, France, and in Barcelona, Spain, and Annaba, Algeria.[2]

Competitors to the Citadis urban tramway include Bombardier Flexity models (Flexity Classic, Flexity Outlook and Flexity 2); the Siemens Combino and Avenio, CAF Urbos; AnsaldoBreda Sirio; tramcars from Škoda Transportation and TMK 2200 from Crotram. Competitors to the Citadis light-rail/tram-train vehicles include the Bombardier Flexity Swift, Flexity Link and Flexity Freedom; the Siemens S70/Avanto; and Kinki Sharyo Low Floor LRVs.


A Citadis 302 in Mulhouse


A Citadis 401 in Dublin


A Citadis 402 in Nice

Contents [hide]

Citadis types [edit]

The Citadis family includes both partial and fully low-floor trams and LRVs, in versions with three (20x), five (30x), seven (40x), and nine (50x) sections. It comprises the following standard variants:

Urban vehicles [edit]

Citadis X00:

- Citadis 100 – three section, 70% low floor, originally designed and manufactured by Konstal in Chorzów for the Polish market (Katowice, Gdańsk)

Citadis X01 (First generation):

- Citadis 301 – three section, 70% low floor (Orléans)
  - Citadis 301 CIS – 100% low floor version with IPOMOS bogies on 1,524 mm (5 ft) gauge (Moscow, Saint-Petersburg[3]). Own Russian name according unifying system of rolling stock classification: 71-801.
- Citadis 401 – five sections, 70% low floor (Montpellier and Dublin, some converted from 301s)

Citadis X02 (Second generation):

- Citadis 202 – three section, 100% low floor (Melbourne)
- Citadis 302 – five sections, 100% low floor (Algiers, Adelaide, Lyon, Bordeaux, Paris T2, T7 and T8, Valenciennes, Rotterdam, Buenos Aires, Madrid, Melbourne, Nice, Murcia, Barcelona, Jerusalem, Le Havre and Nottingham)
- Citadis 402 – seven sections, 100% low floor (Bordeaux, Dublin, Grenoble, Lyon, Paris T3, Dubai, Rio de Janeiro, Oran, Constantine)
- Citadis 502 – nine sections, 100% low floor (Dublin)

Citadis X03 (Third generation):

- Citadis 403 – seven sections, 100% low floor (Strasbourg)

Citadis X04 (Fourth generation):

- Citadis 304 – 100% low floor, next generation design for Central and Eastern Europe (Istanbul)

Citadis X05 (Fifth generation):

- Citadis 205 or Compact – three sections, 100% low floor (Aubagne, Avignon)[4]
- Citadis 305 - five sections, 100% low floor(Sydney, Caen, Kaohsiung)
- Citadis 405 – seven sections, 100% low floor (Nice, Paris line T9)

Light-rail vehicles [edit]

- Regio-Citadis – three sections, 70% low floor LRV (Kassel, The Hague, Salzgitter)
- Citadis Dualis – four or five sections, 100% low-floor LRV (operated by the SNCF,[5] *see below*)
- Citadis Spirit – three or four sections, 100% low floor LRV designed for the North American market (Ottawa, Toronto)[6][7][8]

Power supply [edit]

Like most trams, Citadis vehicles are usually powered by overhead electric wires collected by a pantograph, but the trams in several places do not use pantograph current collection entirely.

The most popular solution is Alstom's proprietary ground-level power supply (APS, first used in Bordeaux and subsequently in Angers, Reims, Orleans, Tours, Dubai, Rio de Janeiro, and in the future, Sydney), consisting of a third rail which is only powered while it is completely covered by a tram so that there is no risk of a person or animal coming into contact with a live rail. On the networks in France and in Sydney, the trams switch to conventional overhead wires in outer areas,[9] but the Dubai vehicles are the first to employ APS for its entire passenger length (although they are still equipped with pantographs for use in the maintenance depot).

Another option is to use on-board batteries to store electrical power, allowing brief periods of catenary-free operation without the need to install special infrastructure. The Citadis trams in Nice operate off a set of nickel metallic hydride batteries in two large open spaces where overhead wires would be an eyesore.[10] This has since been superseded by a supercapacitor-based energy storage system (SRS)[11] which is in use in Rio de Janeiro (alongside APS) and along a new line in Nice. The Regio-Citadis can also be built as a dual-voltage or electro-diesel vehicle with various configurations.

Ordered Citadis trams [edit]

Africa [edit]

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m)	Width (m)	Comments
Algeria	Algiers (Algiers tramway)		402	101–141	41	2010		2.65	
Algeria	Constantine (Constantine tramway)		402	101–127	47	2010	43.9	2.65	of which 27 were manufactured in Barcelona and 20 were assembled in Annaba, Algeria.[2]
Algeria	Oran (Oran Tramway)		302	101–130	30	2010	43.9	2.65	
Algeria	Ouargla (Ouargla tramway)		402	101–123	23	2017	43.9	2.65	
Algeria	Mostaganem		402	101–130	30	2017	43.9	2.65	
Algeria	Sidi Bel Abbes		402	101–130	30	2016	43.9	2.65	
Algeria	Setif		402	101–130	47	2016	43.9	2.65	
Algeria	Batna		402	101–130	30	2016	43.9	2.65	
Algeria	Annaba		402	101–130	30	2017	43.9	2.65	
Algeria	Skikda		402	101–130	20	2018	43.9	2.65	
Algeria	Tébessa		402	101–130	20	2018	43.9	2.65	

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m)	Width (m)	Comments
Morocco	Casablanca (Casablanca Tramway)		302		74	2012		2.65	Single ended - operate in service as back-to-back pairs. Semi permanently coupled.
Morocco	Rabat-Salé (Rabat-Salé tramway)		302	32	44	2010		2.65	19 double trams (back to back single ended pairs, semi permanently coupled), 6 single bidirectional trams
Tunisia	Tunis		302	401–430	30	2007	32 - 64 in MU	2.4	Single ended - operate in service as back-to-back pairs.

Asia [edit]

Country	City	Type	Fleet numbers	Quantity	Year	Length (m or ft in)	Width (m or ft in)	Comments
Taiwan	Kaoshiung (Kaohsiung Rapid Transit System)	Citadis X05		15	2018	33.4 m or 109 ft 7 in	2.65 m or 8 ft 8⅜ in	[12]

North America [edit]

Main article: Citadis Spirit

The main article provides vehicle and order descriptions.

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m or ft in)	Width (m or ft in)	Comments
Canada	Ottawa (Confederation Line)		Citadis Spirit		72	2018	48 m or 157 ft 5¾ in	2.65 m or 8 ft 8⅜ in	Four-modul vehicles
Canada	Greater Toronto (Line 5 Eglinton)		Citadis Spirit		61	2021	48 m or 157 ft 5¾ in	2.65 m or 8 ft 8⅜ in	Four-modul vehicles

South America [edit]

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m or ft)	Width (m or ft)	Comments
Brazil	Rio de Janeiro (VLT Carioca)		402	101-132	32[13]	2016	44 m or 144 ft 4¼ in[14]	2.650 m or 8 ft 8⅜ in[14]	With APS system
Brazil	Belo Horizonte (Belo		402			[15]			With APS system

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m or ft)	Width (m or ft)	Comments
	Horizonte Metro)								
Ecuador	Cuenca [16]		302		14	2016			

Middle East [edit]

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m)	Width (m)	Comments
Israel	Jerusalem (Jerusalem Light Rail)		302		46	2009		2.65	
United Arab Emirates	Dubai (Dubai Tram)		402	001-025	25	2013-2014		2,65	APS[17]
Qatar	Lusail (Lusail LRT)		302			2019		2,65	APS[18]

Europe [edit]

Country	City	Image	Type	Fleet numbers	No.	Year	Length (m)	Width (m)	Comments
France	Angers (Angers tramway)		302	1001-1017	17	2009	32.4	2.40	
France	Aubagne		Compact		8[4]	2014	22	2.40	First Citadis Compact ordered. Options for 10[4]
France	Bordeaux		402	2201 - 2232 2301 - 2306 2501 - 2520 2801 - 2804	62	2002 2003 2005 2008 2011	43.9	2.40	
France	Bordeaux		302	2241 - 2246 2541 - 2546	12 [19][20]	2002 2005	32.8	2.40	
France	Grenoble		402[21]	6001 - 6035, 6036 - 6050	49	2005, 2009	43	2.40	
France	Le Havre		302		22	2011 –2012		2.40	
France	Le Mans		302	1001 - 1034	34	2007, 2011, 2014	32.0	2.40	
France	Lyon		302	0801 - 0847, 0848 - 0857,	70	2000, 2006,	32.4	2.40	

Country	City	Image	Type	Fleet numbers	No.	Year	Length (m)	Width (m)	Comments
France	Lyon		302	0858 - 0870, 0871 - 0873	13	2009, 2010	32.4	2.40	
France	Lyon		402	0874 - 0885	12[22]	2012-2013	43.8	2.40	Replaces th Citadis 302 on the line 3 while the 30 are transferred the other lines.
France	Montpellier		301	2001–2028	30[23]	1999–2000	40.9	2.65	Extended to Citadis 401
France	Montpellier		302	2031–2033, 2041–2064	27	2006–2007	32.5	2.65	
France	Montpellier		402		23		43	2.65	
France	Mulhouse		302	01 - 27	27	2005–2006	32.5	2.40	Two of thes (04 and 05) were used i Argentina o the Tranvía del Este.
France	Nice		302	01 - 20, 21 - 28	28	2006–2007, 2010	33	2.65	Trams from 14 to 28 are extended to 402
France	Orléans		301	39 - 60	22[24]	2000	29.9	2.32	
France	Orléans		302	61 - 81	21[25]	2010–2011	32.3	2.40	
France	Paris		302	0401 - 0413, 0414 - 0426, 0427 - 0442, 0442 - 0460, 0461 - 0466	66	2002, 2003, 2008, 2010, 2015	32.2	2.40	T2
France	Paris		402	0301 - 0321, 0322 - 0346	46	2006, 2012	43.7	2.65	T3
France	Paris		302	701-719	19[26]	2013	32	2.40	T7
France	Paris		302	801-820	20[26]	2014	32	2.40	T8
France	Paris		405[27]		22[28]	2019-2020	44	2.65	T9

Country	City	Image	Type	Fleet numbers	No.	Year	Length (m)	Width (m)	Comments
France	Reims		302	101 - 118	18 [29][30]	2010	32.4	2.40	
France	Rouen		402		27	2011 –2012	40-45	2.40	To replace the TFS[31] Used as a light rail.
France	Strasbourg		403	2001–2041, 3001-?	41[32]	2005 –2006, 2016-?	45.1	2.40	
France	Toulouse		302	5001-5025	24	2009 –2010	32.4	2.40	Designed b Airbus
France	Tours		402		21[33]	2012 –2013	43	2.40	APS
France	Valenciennes		302		33	2006	33	2.40	
Germany	Kassel		*RegioCitadis*	701 - 718	18	2004 –2005	36.8	2.65	
Germany	Kassel		*RegioCitadis*	751 - 760	9	2004 –2005	36.8	2.65	Hybrid with diesel engi
Ireland	Dublin		301	3001 - 3026	26	2003 –2004	40	2.40	Red line, in 2007 extended from 30 to 4 m
Ireland	Dublin		401	4001 - 4014	14	2003 –2004	40	2.40	Red line (transferred from green line 2010)
Ireland	Dublin		402	5001 - 5026	26	2009	43	2.40	Green line
Netherlands	The Hague		*RegioCitadis*	4001 - 4054, 4055 - 4072	72	2006, 2011	36.8	2.65	
Netherlands	Rotterdam		302	2001–2060	60	2003	31.6	2.40	Unidirection [34]
Netherlands	Rotterdam		302	2101–2153	53	2011	30	2.40	Unidirection [34]
Poland	Gdańsk		NGd99	1001–1004	4	1999	26.6	2.35	Marketed as Konstal NGd9 based on 100 series

Country	City	Image	Type	Fleet numbers	No.	Year	Length (m)	Width (m)	Comments
Poland	Katowice		116Nd	800–816	17	2000	24	2.35	
Russia	Saint Petersburg		301 CIS (71-801 according to Russian unifying system of rolling stock classification)	8900-8902, 8907	4	2014	25.5	2.50	Single ende
Spain	Barcelona		302		23	2004	32	2.65	Trambaix network
Spain	Barcelona		302		18	2007	32	2.65	Trambesòs network
Spain	Jaén		302		5	2010	32	2.40	
Spain	Madrid		302		70	2007	32	2.40	One of thos types are in use on the Lidingöbana in Stockholi for testing, and anothe was used in Buenos Air on the Tranvía del Este.
Spain	Tenerife		302		20	2007	32.2	2.40	
Spain	Murcia		302		11	2011	32	2.40	
Turkey	Istanbul		X04	801-837	37	2009	28	2.65	Able to MU
UK	Nottingham		402[35]	216 - 237	22[36]	2014		2.40	NET Citadis poster

Oceania [edit]

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m)	Width (m)	Comments
Australia	Adelaide		302[37]	201–209	9	2010, 2018	32	2.40	Surplus units purchased from Metro Ligero, Madrid in

Country	City	Image	Type	Fleet numbers	Quantity	Year	Length (m)	Width (m)	Comments
									2009 (6) and 2017 (3) [37][38][39]
Australia	Melbourne		202[40]	3001–3036 [41]	36[41]	2001 –2002 [41]	23.0[41]	2.65[41]	Locally designated C-class.[41]
Australia	Melbourne		302[42]	5103, 5106, 5111, 5113, 5123[43]	5[43]	2008 –2009 [43]	32.5[43]	2.65[43]	Locally designated C2-class.[43] Leased from Mulhouse, France in 2008, and later purchased by the Victorian government.[44]
Australia	Sydney		X05[45]		30[45]	2019		2.65	for CBD and South East Light Rail[45]

See also [edit]

- 15 kV AC railway electrification
- Ground-level power supply used in Bordeaux
- Railway electrification system

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External links [edit]

- Alstom Transport
- [dead link] Alstom Citadis Trams[permanent dead link]
- List of all ordered Citadis (en Français/in French) (read the notes written by visitors at the end of the page, because there are some errors in the table)
- «Sensolab drives interior experimentation» - design of Citadis tram interiors for Paris, Le Mans, Angers, **Railway Gazette International**

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