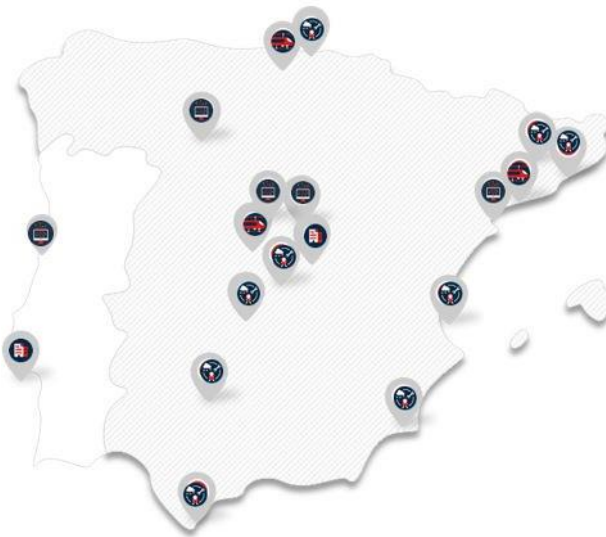


ALSTOM IN SPAIN AND PORTUGAL

2021

Alstom has a long **history of innovation and commitment to Spain's economic and industrial development**, and is also one of the main players in the mobility sector in the country. The company employs close to 3,000 people in the cluster, spread throughout the country. Among others, Alstom has an industrial plant in Barcelona dedicated to the manufacture of all types of rolling stock, a propulsion systems factory in Biscay and, in Madrid, different technological innovation centres for the development of projects in the fields of railway safety, signalling, maintenance and digital mobility.



Close to
3,000 employees

4 R&D Centres

1 Rolling Stock industrial site

2 JV with Renfe (Irvia and Btren)

27 Sites

A COMPREHENSIVE PORTFOLIO OF MOBILITY SOLUTIONS

Alstom is the only manufacturer and technologist **with local industrial and technological presence for all activities** related to rail transport and sustainable mobility. signalling, infrastructure, train manufacturing, maintenance and digital mobility.



TRAINS AND TRACTION SYSTEMS.

Alstom has one of Europe's most advanced rolling stock production industrial centres in Barcelona, with the capacity to manufacture all types of trains, in addition to the traction and control systems centre of excellence, located in Trápaga (Biscay), which manufactures propulsion equipment for projects all over the world.



SIGNALLING AND DIGITAL MOBILITY.

Over 1,000 technicians and engineers dedicated to developing and implementing state-of-the-art signalling and safety solutions for all types of railway infrastructure and rolling stock. The R&D laboratories located in Madrid develop digital solutions to respond to the mobility challenges of the 21st century.



SERVICES

Alstom offers a variety of customised services to public and private operators. The objective is to guarantee optimised, safe and overall management of rolling stock and other railway equipment over their life cycle, whether manufactured by Alstom or by third parties: maintenance, renovation, spare parts management, support and technical assistance. Alstom also has its own industrial centres in Getafe and Pinto for repairs to equipment and components.



INFRASTRUCTURE AND SYSTEMS.

The infrastructure unit provides turnkey projects, integrated systems and other infrastructure solutions: installation of track and electrification systems, maintenance workshops, electromechanical and tunnel safety systems, etc. The Barcelona Tramway and the "People Mover" at T4 of the Adolfo Suárez airport in Madrid are examples of turnkey projects developed by Alstom's teams in Spain.

INNOVATING FROM SPAIN.

- **Barcelona.** The Santa Perpètua industrial site in Barcelona is developing an ambitious **digitalisation and growth** plan. The project includes the application of the latest technologies to design and build the trains of the future, the enhancement of human capital and the development of new production lines. Furthermore, with a significant portion of its activity dedicated to export over the last decade, the factory is a global benchmark in the manufacturing of urban and suburban vehicles such as trams (Athens, Frankfurt and Qatar, among others), metros (Lima, Panama, Singapore), and commuter and regional trains (Luxembourg, Chile).
- **Madrid Smart Mobility Lab.** The R&D centre located in Madrid develops and implements innovative mobility solutions, applying the latest technologies available in Smart Data, the Internet of Things (IoT), video analysis, etc. The Mastria multimodal solution has already been applied in five different countries (France, Italy, Panama, Canada and Spain) to improve mobility and passenger flow in cities.



- **HealthHub™.** The Alstom in Spain Services team implements digital maintenance tools, IoT technologies and predictive algorithms with the aim of improving train availability, reducing time spent in workshops and, in short, decreasing the total life cycle costs of urban and intercity fleets.
- **Leaders in Signalling.** Alstom has installed the first operational ERTMS level 2 systems in Spain and has fitted on-board systems with this technology to over half of the trains operating in our country. In addition, 50% of Metro de Madrid passengers travel under the supervision of signalling systems developed by Alstom's teams in Spain.

A SUSTAINABLE APPROACH.

We promote the transition to sustainable and accessible mobility systems, while managing our operations with a socially responsible business model.



Coradia iLint Hydrogen Train

- Alstom **innovates in response to the growing need for sustainable mobility solutions.** Pioneers in hydrogen, Alstom is the only manufacturer to have already developed a hydrogen train and put it into commercial operation. The company already has projects to implement this technology in Germany, Italy and France.
- The solutions developed by Alstom are designed with a **focus on sustainability throughout the life cycle:** choice of raw materials, manufacturing processes, energy efficiency and recycling.
- **EMS (Energy Management System).** Energy consumption measurement and management solutions. This equipment, together with the BEDS efficient driving system, enable reductions in energy consumption of up to 30%.

FOR MORE INFORMATION:

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MAIN REFERENCES. SPAIN

One out of every three trains running in Spain was manufactured by Alstom in Spain.



Avelia Pendolino for Renfe (S114).

ROLLING STOCK AND COMPONENTS.

- Tramways: Barcelona, Madrid, Tenerife, Murcia, Parla, Jaén, Valencia and Alicante.
- Metros: Barcelona, Madrid
- Suburban for FGC (S213 and S113) and Renfe (CIVIA I, II, III and IV).
- High-speed: Avelia Pendolino (S104 and S114 for Renfe) and Ave S100 for Renfe.
- S121 and S120 power systems – Renfe.
- Regional trains: ALARIS S 490 – Renfe.
- APM (*Automated People Mover*) Adolfo Suárez Madrid Barajas Airport. 100% automatic system that connects T4 with the satellite terminal (T4S).
- Propulsion systems for Renfe's 91 AVE S102, AVE S112 and AVE S130/730 high-speed trains,
- Propulsion and control equipment for more than 650 Madrid Metro units (Series 2000-B, Series 5000 2nd and 4th and Series 6000).
- Propulsion systems for 112 and 213 series regional trains of Ferrocarrils de la Generalitat de Catalunya.
- Propulsion and control equipment for the Bilbao Metro 500 and 550 series.
- Propulsion systems for Renfe's one hundred 253 series freight locomotives.

SERVICES. MAINTENANCE.

- Commuter trains: S446, S450, S451, S447, S470 and Civia-Renfe.
- High and very high-speed Avant shuttles (S102, S104 and S114) and Ave S100, S112, S130/730 - Renfe.
- High speed locomotives: S252 – Renfe.
- S253 locomotives- Renfe.
- Tramways: Barcelona, Madrid and Murcia.
- Metro: S9000 – TMB.
- Power systems: S121, S120 – Actren.
- High speed TGV Duplex - Rielsfera.
- Irvia and BTren (Alstom-Renfe JV).
- For OPTIFLO signalling for the Madrid Metro and the rail networks of Adif, IP, REFER, Porto Metro (Portugal), Barcelona Metro, Bilbao Metro and Seville Metro.
- Maintenance of signalling for Barcelona's suburban trains (Rodalies) L'Hospitalet de Llobregat - Mataró.
- Automatic system maintenance, Adolfo Suárez Airport APM.
- Renfe's S102/112 and S130 energy measurement and management systems.

MODERNISATION.

- 24 AVE S100. Half life overhaul. Renovation of interior design, adaptation and technology updates - Renfe.
- Accessibility for commuter trains. 165 coaches - Renfe.
- 10 AVE S100. Adaptation and validation to operate on high-speed and regular lines in France. First Spain-France high speed service - Renfe.
- Modification of 12 S3000 units to make them dual voltage, Madrid Metro.



D&IS MAIN REFERENCES IN SPAIN

Leaders in level 2 ERTMS and on-board equipment



Interlocking laboratory – Madrid

SIGNALLING

Mainline

- Level 2 ERTMS for the Albacete-Alicante and Valladolid-León-Burgos high-speed lines and for the Western Corridor, on the Plasencia-Cáceres-Badajoz line, (ADIF).
- Level 2 ERTMS for the ongoing high-speed train on-board equipment project: 239 units in service (Renfe and Talgo).
- On-board signalling equipment in Renfe's 130 series.
- On-board equipment with ETCS/ERTMS level 2 baseline 3 technology for Adif's measurement trains.
- Third rail- Level 1 ERTMS Zaragoza-Huesca, Girona-Figueres, Castellbisbal-Can Tunis and Castellbisbal/Papiol-Mollet San Fost (Adif).
- Smartlock 200 and Smartlock 300. More than 100 interlocks in operation (Adif).
- Interlocks at Chamartín station (Adif).

Commuter trains

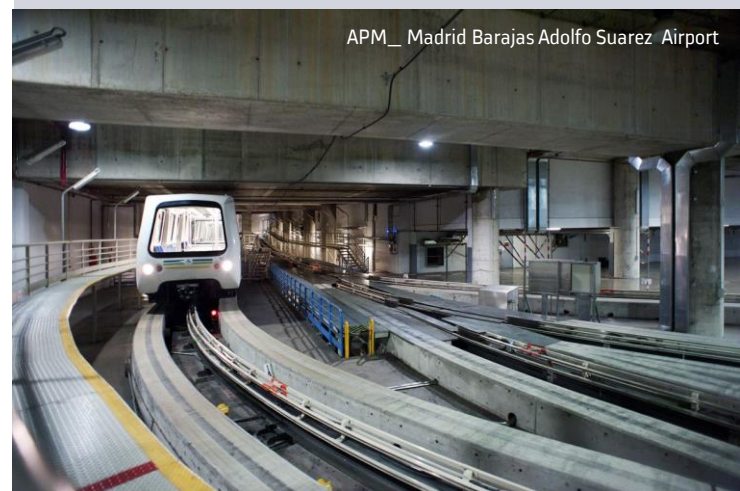
- ETCS/ERTMS level 2 baseline 3 on-board equipment for Renfe's commuter fleet.
- ETCS/ERTMS level 2 track signalling on the Madrid and Barcelona commuter networks (Rodalies).
- Recoletos Tunnel.

Urban

- Tramways: Barcelona and Madrid
- Metro: CBTC Malaga and Madrid.
- Metro: Barcelona, Bilbao and Seville Metro.
- Chiclana-San Fernando train-tram.

SYSTEMS AND INFRASTRUCTURE.

- Tramway systems: Barcelona, Granada, Parla, Jaén, Murcia.
- Electromechanical and safety systems in tunnels on the high-speed network.
- Catenary and electrification for high speed and commuter trains.
- Substations for high speed lines.
- Track and catenary maintenance at Renfe's Integria workshops.
- Automatic APM system linking terminals T4 and T4S at Adolfo Suárez Airport.



APM_ Madrid Barajas Adolfo Suarez Airport



Barcelona Tram System