

Trolley Bus Overhead Wiring for Castelló de la Plana, Spain



Castelló de la Plana, an old Spanish city with more than 300,000 inhabitants has been founded by the Arabs in 1233. The town is located at the Mediterranean Sea in the Southwest of Valencia and is the capital city of one of the most mountainous provinces in Spain. Castelló has a major port but also has been the site of the University Jaume I de Castelló since 1991 in the one location catering for 13,000 students. Castelló is well connected by road and rail: there are direct long distance passenger services to Madrid and Barcelona as well as a suburban rail system with lines up to Valencia.

Trolley buses – Main carriers of urban public transport in future

Due to an unregulated urbanisation, traffic conditions in Castelló are quite confusing. To improve the situation, the city government opted for an innovative public transport scheme: two new trunk lines should provide quick links across the city and giving

major parts of its citizens access to an efficient, environmentally friendly street running public transport system.

To comply with environmental requirements, Castelló is the first city in Spain to reintroduce trolley buses after they were abandoned in 1969.

Trolley buses run on segregated alignments to increase travel speed within the congested city road network. The creation of particular sections for guided buses is an eligible option for smaller and medium sized cities without light rail. It allows for an efficient and cost-effective public transport service on dedicated and well patronised corridors. Guided trolley buses are appropriate placeholders for an eventual future light rail system. Introducing this kind of public transport, existing bus networks can be significantly improved as rail based public transport is often too expensive to be realised in short time.

Tram-Castelló (TVRCas Transporte en Vía Reservada de Castelló)

This mode of public transport introduced in Castelló is basically a trolley bus with an optical guiding system, combining the advantages of bus and light rail.

A video camera above the windshield of the trolley bus follows a double painted dashed white line on the road surface. An IT system on the trolley bus checks the received information from the camera and the on board computer steers the vehicle. While driving, the driver's main activities are to accelerate and brake the vehicle. In case of obstacles on the bus lane, the driver swerves manually around the obstacle. Once back on track, the TVRCas will then resume control using the IT-steering system again. Due to the marginal tolerances of this system, the precise automatic guidance allows a minimum use of the lateral lane space. In addition to this, platforms at bus stops can be approa-

ched very close, so passengers can get quickly and comfortably into and out of the low-floor trolley buses.



A first, 2.4 kilometer long pilot line has been opened in Castelló in June 2008. This initial route links the Jaime I university with the main railway station and Parque Ribalta, crossing Rio Seco on a recently built bridge. There are five intermediate bus stops. Reliable running times are assured due to the segregated alignment and an absolute priority at traffic lights. In addition to the introduction of the new public transport system, the urban environment in this area has been upgraded.

The new line is served by low-floor trolley buses with a length of 12 metres and a powerful auxiliary diesel engine, to drive sections in the historic inner city and in the depot area which are not equipped with overhead wiring.

System characteristics with relevance to overhead wiring

- Diameter contact wires : 107 mm²
- Current system : 750V DC
- Trolley buses : Standard-Duo buses for electric and diesel propulsion
- Headways : ca. 5 to 10 minutes

Overhead wiring system and power supply

- The overhead contact wires of Castelló's first new trolley bus line is using an elastic stainless steel suspension system at 5.45 meters above ground.

- There is a passing loop at the terminus station. The switches can be activated electronically by infrared while the switch position is transmitted to the driver's cab. Each one of the fully flexible suspended trolley bus contact wires is double insulated.
- All poles are linked by a 50 mm² copper cable via an earthing network.

A technical particularity is the suspension cable on a major intersection carrying the contact wires.

Requirements of the Overhead Wiring System

Operational

- Making best use of possible maximum speeds, without the hindrance from thermal expansion of contact wires
 - On straight sections up to 60 km/h
 - In curves and at intersections without the drivers having to worry about the overhead contact wires.
- Minimum headways with uniform contact pressure of the current collector at the suspension points; that means no bouncing of the current collectors.



Urban Environment

- Minimal visual impact and noise.

Maintenance

- Minimal service interruptions due to dewirements of trolley poles.
- Reduced maintenance of overhead

contact lines.

- Longer life cycles of overhead contact lines.



Services/Technical Solution

K+M supported IDOM - Ingeniería y Arquitectura, Valencia, on the design of the suspension system and supplied all relevant components of the overhead contact wiring system to EMTE S.A. and supported them during the implementation, particularly for the final adjustment.

The fully flexible contact line system K+M is characterised by:

- Elasticity of the contact wire at the suspension points and therefore partial compensation of the contact wire expansion due to the temperature changes.
- Safe operation with reduced risk of dewirement and extended life cycle due to minimum wear of contact lines.
- Extended span width in curves, therefore reduced quantity of poles. In comparison to the existing old system reduction of 30% and more of required cross-spans in curves due to curve rails and fewer but stronger masts.
- Low maintenance costs.
- Direct tensioned, robust switches with infrared control, mostly resistant against trolley pole dewirements.