

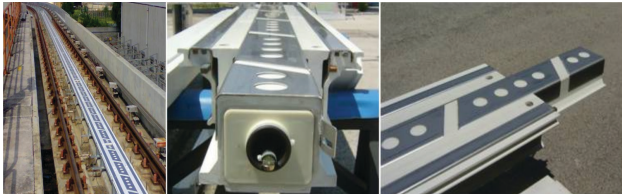
TramWave[®] ground-level power supply system (no overhead lines)

TramWave[®]

TramWave[®] is a ground-level power supply system for light rail vehicles and trams where the contact line is embedded in the permanent way, so that there are no obstacles to pedestrians and vehicles crossing the rails.

Power is provided via a contact line that only energises a small section of the line as the tram passes over it. The live section of the line is therefore always underneath the tram.

The working range of the TramWave[®] system is up to 750 Volt.



Contact line

The basic building block of the TramWave[®] system is a modular box that is embedded in the permanent way.

The box is usually 3 or 5 meters long and it contains all the elements needed for the correct functioning of the ground-level power supply system.

A series of steel contact plates (~50cm) are located at intervals on the top of the box (see pictures). The modular boxes are joined together to form the power supply system of the light rail line.

The “modules” are placed in a continuous “conduit” where are inserted also the positive feeder and a negative cable to feed and protect the line.



Vehicle collector

The collector (pickup shoe) is the interface between the contact line and the vehicle.

It is placed in the vehicle bogie and its functions are to:

- energize one or two of the steel contact plates on the external surface of the power supply “module” located under the vehicle
- transfer energy to on-board equipment

The collector is moved by a pantograph, physically linked with bogie structure.

The pickup shoe includes copper and graphite contact shoes and permanent hybrid magnets with high residual induction.

Vehicle – TramWave® interfaces

Each vehicle can be equipped or retrofitted with a collector system as an alternative or in addition to an overhead pantograph.

The TramWave® power collector, which is placed under the vehicle, is interfaced with the vehicle via a hydraulic electrical device and is retractable.

This system allows power to be drawn from the “ground module” continuously at full performance.

This is a fully-equivalent alternative to overhead power lines.

An on-board diagnostic system controls operating conditions of the collector and manage it.

In the case of a mixed traction power supply (overhead and TramWave® line), where there is no TramWave® contact line, the power collector down command is not available.

Safety of TramWave® System

The safety of pedestrians and the public in general is guaranteed at all times during normal functioning and in any situations, also where functioning is compromised.

- Presence of water on the active module

An earthed “safety ring” is always present around the energised contact plates when the vehicle is moving.

This ring comprises the two negative return plates included in the continuous conduit and the not-energized contact plates above and below the energised plates.

The presence of this ring allows to confine dangerous voltage in a safe zone covered by bogie, inducing the values to the ground one.

- Internal failure

In the unlikely event that a contact plate remains energised after the vehicle has passed, the TramWave® system immediately activates a hscb cutting off the power supply, thanks to an internal fail-safe electro mechanical principle.

Diagnostic and monitoring control sub-system

The TramWave® system is equipped of a diagnostic and monitoring system that controls the energized modules

and the waterproof leakage of each modules. Diagnostic has the function to individuate parts of the system to be maintained, out of operation plan.

TramWave® Features

- Return current and absence of stray currents
With the TramWave® system the return current can be transferred via the contact plates and the tracks do not need to be used for this purpose. This is an important feature since the TramWave® system eliminates the effects of stray currents, which can offer significant savings on construction costs.
- Energy recovery during braking phase
The TramWave® contact line allows to give back the energy produced during braking phase.
- Multimodal applications
TramWave® is also designed for future multimodal applications:
- availability of a positive and negative traction feeder
- capability of the pickup shoe to remain centred and connected to the contact line

These features mean that the power supply system can also be used by electrical vehicles which have rubber tyres.

Consequently a tramway line equipped with the TramWave® system can become the backbone power line for different vehicle fleets and/or a global network that uses it as a mobile charging station for battery-powered vehicles.

TramWave® Applications

In Naples Ansaldo factory, a TramWave® line section of about 400 meters has been implemented on the elevated test track. On this stretch, the TramWave® system is being tested under extreme operating conditions for several years.

On Naples tram line Poggioreale - via Stadera a demonstrator plant of the TramWave® system has been implemented on a single track section of about 600 meters. The pre-operational phase has been carried out under Italian Minister of Transport monitoring.

For Naples demonstrator plant, an operating vehicle was retrofitted for the TramWave® equipments.

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