

CASE STUDY 'RAILWAY', PMA CABLE PROTECTION SOLUTIONS

## PMA Cable Protection for Local Transport

Safe cable protection solutions for the 1.5 million passengers of the Berlin S-Bahn



ABB PMA and GIMOTA AG have helped the Berlin S-Bahn significantly improve the operational safety of its type 480 vehicles and made them more maintenance friendly by offering new solutions

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01 The type 480 vehicles of the Berlin Transport Company (BVG) for the Berlin S-Bahn. The introduction of the 480 series in 1986 represented a significant technological step forward, integrating the latest drive and control design and featuring outstanding drive and braking performance.

The S-Bahn system in the metropolitan city of Berlin transports around 1.5 million passengers daily. Mobility is paramount. The red and yellow trains are as much a part of the city landscape as the Brandenburg Gate or the Television Tower. Nearly 3,000 employees work around the clock to provide passengers with an attractive S-Bahn service. The network operates a high frequency service across 16 branch lines, 327 kilometers of track and 166 stations. It connects the city with the surrounding region.

A high level of operational availability is therefore, one of the key requirements for the daily operation of the S-Bahn.

The 155 multiple unit type 480 trains are a tried and tested series of vehicles on the Berlin S-Bahn. However, failures in daily operation became quite frequent due to short circuits in the electrical system. Tests and analysis revealed that contacts within connectors inside electrical cabinets were the source of the problem. Connections are made between system cables and couplings within electrical cabinets located under each rail car. The

couplings pass the power supply and signals on to the individual carriages.

The Berlin S-Bahn turned to its long-time partner, GIMOTA AG from Gerodswil in Switzerland, to find a solution that could once again guarantee seamless operation of the type 480 vehicles in the future.

Since its foundation in 1961, GIMOTA has specialized in the design and manufacture of connectors for use in railway vehicles. GIMOTA AG delivers to most of the leading rail manufacturers and operators worldwide.

For many years already there has been an established partnership between GIMOTA AG and ABB PMA cable protection systems, providing rail customers around the globe optimal connector and cable protection solutions.

### How can the cable connections on the type 480 vehicles be better protected?

The GIMOTA staff analyzed the situation on-site in the Berlin S-Bahn workshops. It soon became



01 The newly designed GIMOTA Sliding Backshell in a variety of sizes with the PMAFIX-Pro fitting.

02 The PMAFIX-Pro consists of an outer fitting body and an inner sealing element. The sealing element performs two functions, sealing and locking the connection between the fitting and the conduit. Guaranteeing compliance with all ingress protection levels up to IP68 and IP69, even in dynamic installations.

apparent that the outdated connector solution from a third-party manufacturer located in the electrical cabinets were responsible for the recurring power failures in the trains.

‘A standard solution was not an option for this challenge.’

In spite of the existing PMA cable protection, water and contamination was able to penetrate into the old industry-standard connectors, leading to short circuits between the individual rail cars.

The challenge for the project was to solve the reliability issues, replacing the existing system with a higher quality solution, while at the same time using as much of the existing material as possible. During the analysis, it quickly became clear that the water which had collected in the electrical connection boxes was entering the cable contacts

from the back. The existing system wiring and cable protection needed to be retained but an effective seal through the contacts along their length needed to be provided.

It was not possible to accomplish this with a standard solution. so GIMOTA developed a ‘Sliding Backshell’ which could be folded back over the cable protection solution, thus providing the required space for new wiring.

‘In addition, we decided to fill the contact sockets from the back with a special EN45545-2 compliant casting compound’ Marcel Frey, Sales Manager at GIMOTA AG explained

**A convincing solution with GIMOTA connectors and PMA cable protection products from ABB.**

Critical cable connections are made in electrical boxes situated in exposed positions under the rail



car. Moisture and dirt are unavoidable during the daily operation of the trains in which up to 8 cars are joined together.

GIMOTA developed a connector solution along with a completely new electrical connection box, which guarantees that the existing system wiring and tried and tested PMA cable protection from ABB can continue to be used. The existing cable protection solution was reworked and modernized in cooperation with ABB.

**A completely sealed solution with reduced maintenance requirement.**

All cable connections will now be linked using, PCS conduits from ABB, PMAFIX-Pro-NKNZ IP 68 & IP69 strain relief fittings and the Gimota designed sliding backshells to the new GIMOTA connectors. In addition, all the connector contact sockets will be filled with an EN45545-2 compliant sealing compound for additional security.

‘A proven partnership when it comes to offering system solutions.’

The biggest advantage of this solution is that the existing wiring can continue to be used.

Complicated and expensive rewiring of the cars and procurement of system cables was not needed.

The total closed system is now sealed along its length and water entry is no longer possible. Thanks to the newly developed GIMOTA sliding backshell between the fitting and the connector, the existing system wiring could be retained and the wiring assembly to the coupling greatly simplified. In addition, maintenance will also be significantly easier. The cleaning frequency for the newly designed electrical connection boxes could be reduced from the previous weekly requirement to quarterly.

In this way the Berlin S-Bahn can in future safely and reliably contribute to mobility in the metropolitan city of Berlin.

Roger Spuler, Regional Sales Manager at PMA, provides a final take on the project: ‘Gimota and ABB PMA Cable Protection have enjoyed a long term proven partnership as suppliers of connector and cable protection system solutions. The strength of this partnership has once more benefitted the customer in this project, which makes me happy for everybody involved.

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The finished electrical connection boxes on the underside of the railway carriage with the GIMOTA Sliding Backshell and PMA fittings.







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With the PMA cable protection product range, ABB offers an extensive portfolio of conduits, fittings and main accessories for a variety of markets and applications.

#### **ABB and GIMOTA AG**

ABB and GIMOTA AG have enjoyed a long and successful partnership.

From its beginnings, GIMOTA AG has specialized in the design and manufacture of connectors for applications on railway vehicles, especially for high current and data transfer connections.

GIMOTA connectors are used all over the world on many different types of railway vehicle for practically all prevalent applications. For example, for analog and digital data transfer in electronic control systems, for intercarriage jumper connections and for control modules.

GIMOTA AG supplies most of the leading railway manufacturers as well as rail operators worldwide and is among the leading suppliers of connectors in railway vehicles in Europe today.

[www.gimota.ch](http://www.gimota.ch)

#### **Facts about the Berlin S-Bahn**

Location: Berlin, the German capital city

Population: 3.6 million

In operation since: 1924

Special fact: The Hamburg and Berlin networks are the only two S-Bahn in Germany that operate using

current supplied from a laterally mounted power rail.

Transport network: 16 lines, 327 km and 166 stations, including 6 below ground stations.

Vehicle fleet: 650 two-car units

Number of passengers: 478 million per year (2018)

Power system: 750 volt, direct current