

EN



RAILWAY



SERVING RAIL ELECTRIFICATION



>25.000

track electrified with
Bonomi cantilevers and
components

>250.000

installed cantilevers

>15

international railways
using our products

2008

OMNIA uses patented
technologies

ONE OF THE KEY PLAYERS IN THE RAILWAY ELECTRIFICATION PROCESS SINCE THE VERY BEGINNING

Bonomi has been involved in rail electrification from its inception providing **high performance and innovative solutions in overhead line technology (from 1.5 to 25 kV)**. Bonomi offers **design and production flexibility**, which supports customer requirements from component specification to overall line design.

SOME REFERENCES:

RETE FERROVIARIA ITALIANA - NETWORK RAIL
SLOVENSKE ŽELEZNICE - INFRABEL - SAR - TCDD
ADIF - SNCF - ONCF - JR-EAST

CO-DESIGN ENGINEERING

EXPERIENCE AND CO-DESIGN FOR OPTIMAL ENGINEERING SOLUTIONS

For over 40 years we have been working **in profitable partnerships and a close collaborations with the technical offices of the railway authorities** to develop railway/tramway and underground overhead lines. This ensures a continuous improvement in the engineering experience, **highly customized projects and more efficient and sustainable solutions.**

A SKILLED WORKFORCE SUPPORTED BY HIGH TECH FACILITIES AND INNOVATIVE TECHNOLOGY

We invest in our people, through **rigorous selection and relevant training.** Our investment in plant is supported by **regular replacement of exiting equipment** and early acquisition of **new to market equipment and software.**

WE ARE DEFINING THE FUTURE OF ELECTRIFICATION.

We continue to invest in research and development to **protect your future while expanding our technical knowledge and productive capacity.**



For many years Bonomi has been supporting international clients in designing and engineering many overhead contact lines. We both realize brand new electrification projects and renew old lines with the most modern standards of the sector. Our design and engineering specialists support our customers in new electrification and the upgrading of existing lines.

RESEARCH AND DEVELOPMENT

RESEARCH AND DEVELOPMENT

Every year Bonomi invests in R&D and personnel training. This gives continuously life to **new products** which are capable of anticipate the market's request and renew current solutions. We are committed to proposing **new materials**, which impact less on the environment, while guaranteeing even greater performance.

Through investment in research and development we develop new, efficient and environmentally friendly materials **to improve product performance, reliability and cost.**

CALCULATION SOFTWARES

Bonomi technical office uses the **most innovative calculation softwares**, which have been specifically customized.

Our technical and design departments use advanced and bespoke software to support customer needs.





MECHANICAL, CHEMICAL AND ELECTRICAL TEST ROOMS

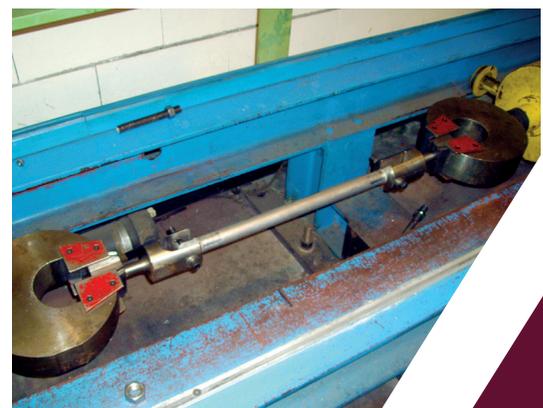
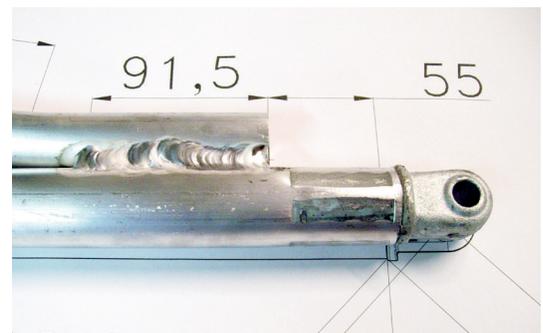
We undertake the following functions in house:

- dimensional checks with electronic systems
- hardness checks
- roughness checks
- galvanic coatings checks
- mechanical tests of traction, compression, flexion and torsion, also combined with thermal cycles
- fatigue tests
- electrical and insulation tests
- aging tests in salt fog chamber and/or in thermostatic chamber
- metallographic investigations

SPECIALIST EXTERNAL SUPPORT

The laboratories also allow the customer and the railway authorities to carry out internal visits and tests.

We have exclusive relationships with specialist external facilities to support our customers.



SOLUTIONS



HIGH SPEED

Engineering of 25 kV lines.
Components and cantilevers
production.



TRADITIONAL RAILWAYS

Engineering of 1,5 – 25 kV lines.
Components and cantilevers
production.



LIGHT RAIL

Engineering of urban underground,
tram and suburban lines.
Components and cantilevers
production.



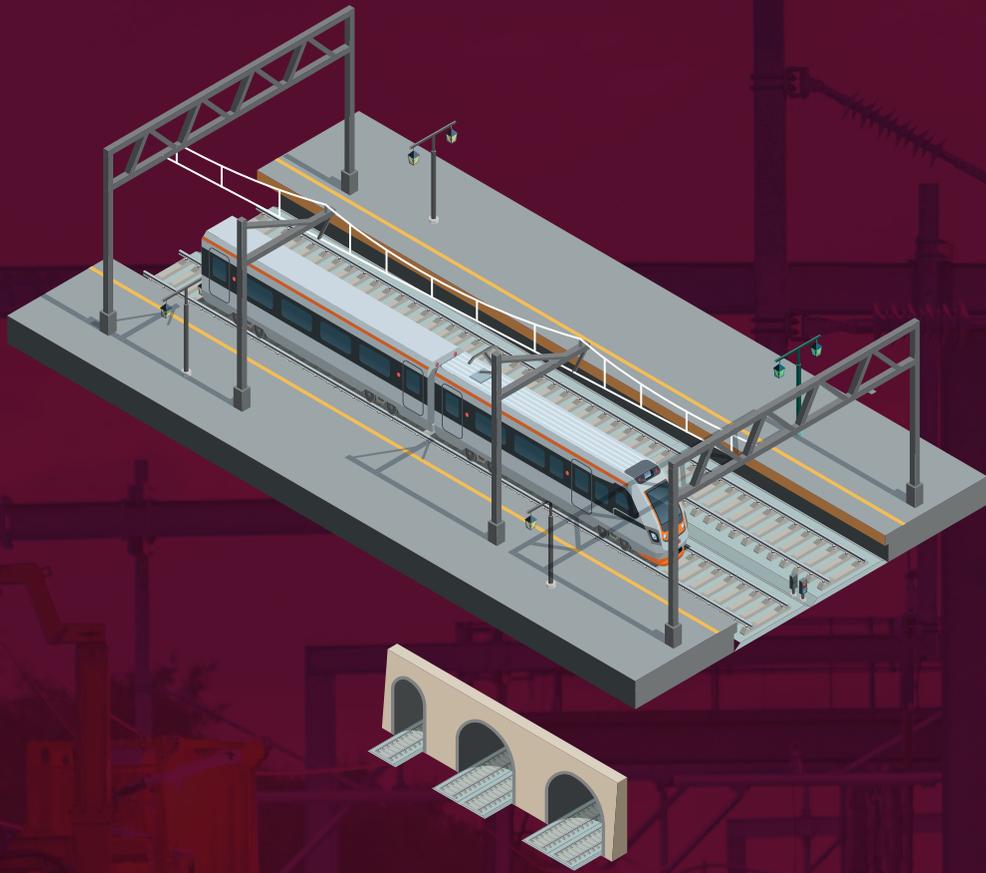
TUNNEL AND SPECIAL

Engineering of special projects
eg tunnels. Components and
cantilevers production.





RAILWAY ELECTRIFICATION



1 Cantilevers for overhead lines



2 Railway insulators from 3 kv to 25kv



3 Catenary, grounding and signaling components



4 Tensioning devices



5 Section insulators



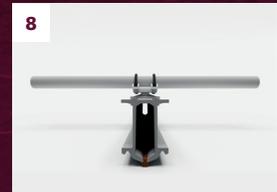
6 Steady arms (both insulated and non)

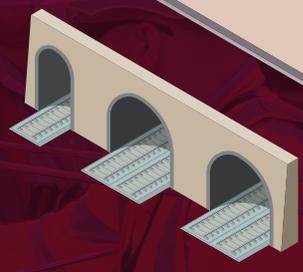


7 Tunnel cantilevers



8 Rigid catenary





1 Cantilevers and cross rope for overhead lines

2 Rigid catenary

3 Catenary, grounding and signaling components

4 Insulators from 750 V to 1.5kV

LIGHT RAIL

MORGAN
SINDALL

MORGAN
SINDALL

COMPLETE SYSTEMS FOR OVERHEAD LINES FROM 1.5 TO 25 kV

PRODUCTS





CANTILEVERS FOR HIGH SPEED OVERHEAD LINES 25kV AND FOR TRADITIONAL LINES 1,5 – 25 kV

Available OHL equipments:

- **25 kV**— up to 270 mm², 1 contact wire, 1 messenger wire;
- **3 kV**— up to 610 mm², 2 contact wires, 2 messenger wires.

Types of available cantilevers:

- OMNIA type;
- A-Frame cantilever.



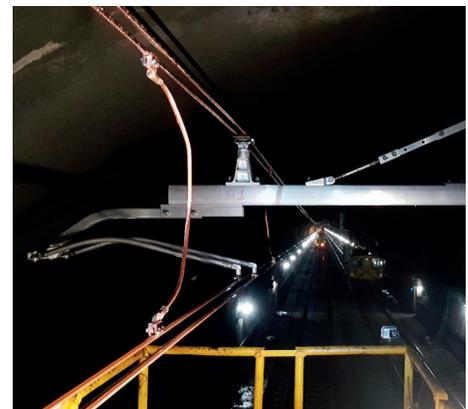
CANTILEVER FOR TUNNELS AND SPECIAL APPLICATIONS

Available OHL equipments:

- **25 kV**— up to 270 mm², 1 contact wire, 1 messenger wire;
- **3 kV**— up to 610 mm², 2 contact wires, 2 messenger wires.

Types of available cantilevers:

- OMNIA type;
- A-Frame cantilever;
- Rigid catenary.
- Underbridge arm suspension.



RIGID CATENARY FOR RAILWAYS AND LIGHT RAILS

Bonomi technical department has made its know-how available also for the **realization of rigid catenary projects** in order to respond to an increasing demand from customers and railway companies.

Bonomi can design **all the elements of a rail electrification system**, starting with the single component our rigid catenary system is entirely produced in house to maintain quality.



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OMNIA, THE SMART CANTILEVER

**THE FIRST SMART CANTILEVER FOR 3 – 25 KV LINES
HAS BEEN PATENTED**

OMNIA is the **first smart cantilever for railway** overhead lines. **Its project was completed in 2008** by Bonomi, together with two other Italian companies (GCF and Satferr) that have a long experience in railway, tramway and trolleybus sectors.

FROM DESIGN TO INSTALLATION

This synergy was naturally born from the need to give a complete service to the railway traction market by covering all the client's requests: **from the design, to the manufacturing of the catenary system itself ending with its installation.**

OMNIA is Latin for "everything", this describes the objective of the Omnia partnership, the partners provide support to customers across excellence of innovation, design, production and installation.



WHY IS OMNIA SMART?

Thanks to its technical details and its easy but functioning design, OMNIA offers the following benefits:



OMNIA is made from a bespoke aluminum alloy (Al Si 1 Mg 0,9 Mn 0,7 – EN AW-6082 T6 according to EN 586-2). This guarantees exceptional resistance to corrosion, even in difficult environments.



Significant weight reduction with fewer components, and less tools required for assembly provide for materially faster installation.



Environmentally friendly – Omnia delivers low environmental impact by design, and more cost-effective recycling at end of life



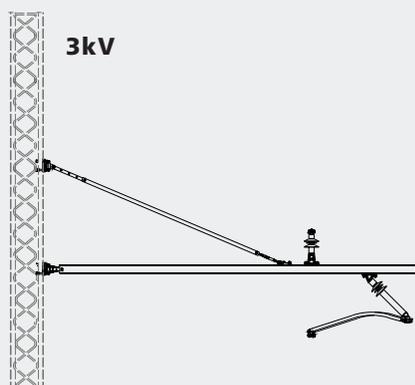
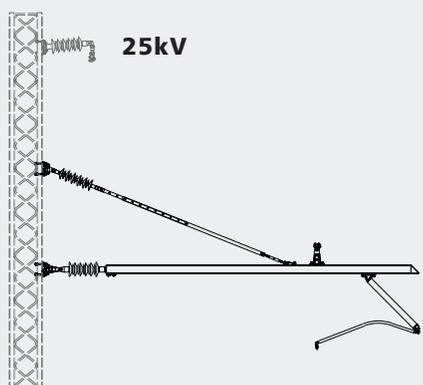
General savings, thanks to the speed of installation, lack of maintenance and the reduction in contact wire consumption. Omnia requires little maintenance over its lifetime and it reduces contact wire wear.



Enhanced mechanical strength.

All these features make Omnia the ideal cantilever in terms of life-cycle saving: the railway companies will experience the advantages of saving in hours of work, in maintenance and duration of the product life-cycle itself. The benefits of Omnia flow through to a reduction in whole of life costs. A recent study has shown that OMNIA provide a 65% reduction in the costs of installation over a standard cantilever.

Available in different configurations



RAILWAY INSULATORS FROM 1.5 TO 25 kV

TYPE OF RAILWAY INSULATORS WE MANUFACTURE:

- for cantilevers;
- for conductors anchoring;
- support for feeder;
- for railway electrical substations.

The developed technology and improved mixture of our silicone ensures:

- Lower weight, high resistance and increased resistance to vandalism;
- Lower emission during the production process;
- Water repellent and self-cleaning material assist in very low maintenance;
- High pollution resistance and barriers against atmospheric pollutants support excellent behaviour in areas of high pollution;
- High resistance to tracking and power arcing and impenetrable insulating cover with high adherence to the core;
- Our products support a broad range of operating temperatures.

Bonomi offer customers the ability to define bespoke electrical and mechanical properties to **minimise the effect of specific pollutants.**

PRODUCTS





CATENARY COMPONENTS

**IN COPPER AND COPPER ALLOYS,
ALUMINIUM AND ALUMINIUM
ALLOYS:**

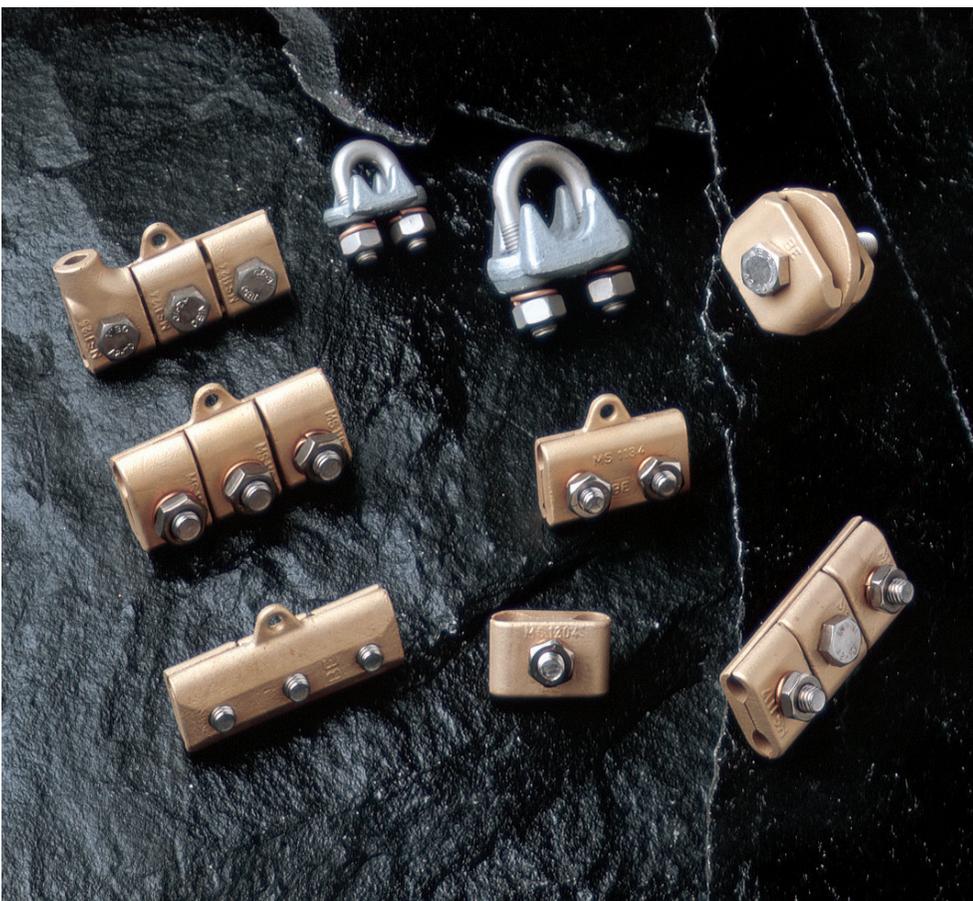
- Clamps and connectors
- Droppers
- Grounding clamps
- Suspension and anchoring clamps





CONNECTORS FOR CONDUCTORS CONNECTION

Connectors are available with 1, 2 or 3 bolts and with different conductors and messenger wires.





CONNECTORS FOR DROPPERS AND SUSPENSION OF THE MESSENGER WIRE

Connectors are available for all the main shape of the messenger wire



CONNECTORS AND ACCESSORIES FOR CONTACT WIRES AND FEEDERS

Connectors are available for 1, 2 or 3 ropes with different diameters and materials.



ACCESSORIES FOR GROUND STRAND

Accessories are available with different diameters.

SIGNALING AND GROUNDING COMPONENTS

Hot forged terminals and connectors in copper and aluminium.



PRODOTTI





STANDARD (WITH COUNTERWEIGHTS) TENSIONING DEVICES

TYPES OF DEVICES:

- Pulleys in line (3, 4 and 5 pulleys);
- Ratchet wheel (only available with a 1:3 ratio).

AVAILABLE REDUCTION RATIOS:

- 1:3;
- 1:5.

All our tensioning devices are made of aluminium alloy. Many of them are also equipped with a safety block.

The customer can also choose to customize the devices:

- with integrated diagnostic systems;
- with treatments that minimise the maintenance needs.



STEADY ARMS (BOTH INSULATED AND NON)

We are able to realize aluminium steady arms in different sizes, to meet a wide range of requests.

OUR STEADY ARMS ARE ALSO AVAILABLE IN THE FOLLOWING CONFIGURATIONS:

- IN-RUNNING;
- ADJUSTABLE;
- OUT-OF-RUNNING;
- BENT.

Bonomi also offer a service allowing the customer **customisation of cantilever design.**

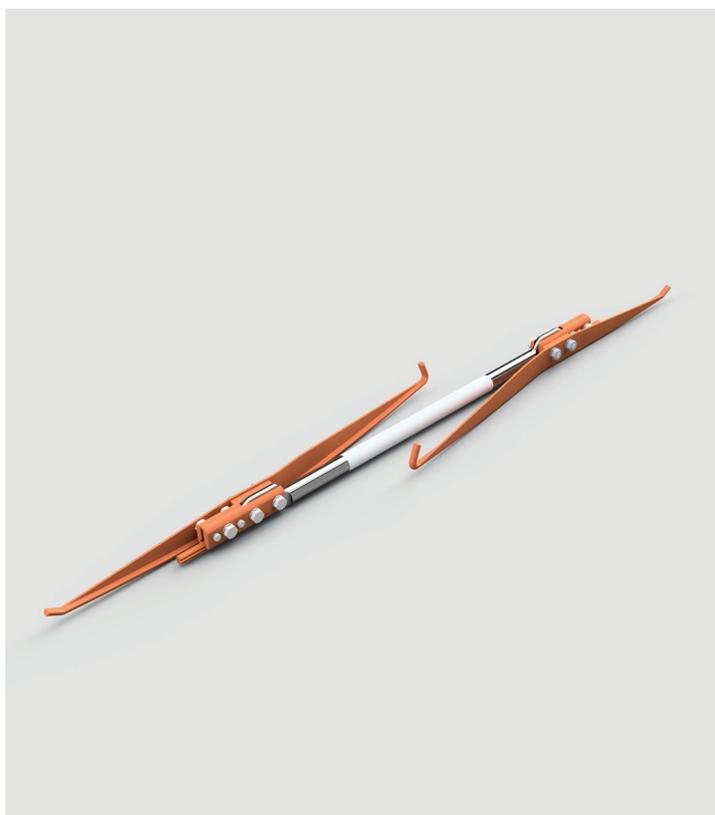
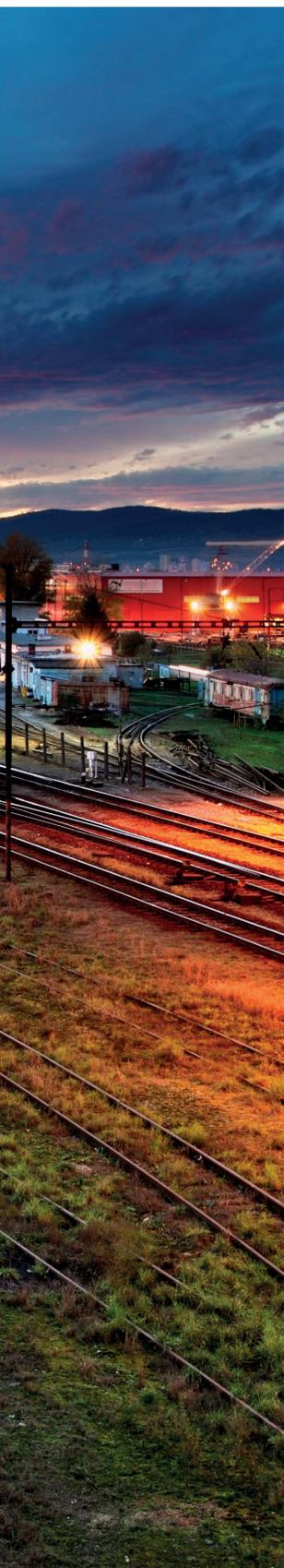




SECTION INSULATORS



PRODUCTS



**THE SECTION INSULATORS
MANUFACTURED IN
BONOMI ARE AVAILABLE
WITH THE FOLLOWING
FEATURES:**

- SECTION INSULATORS FROM 3 TO 25 kV - FOR 1 OR 2 CONTACT WIRES, FROM 30 TO 200 km/h



- INSULATORS FOR NEUTRAL SECTION 25 kV, FOR 1 OR 2 CONTACT WIRES, UP TO 200 km/h.

PRODUCTION KNOW HOW

WE OWN THE KNOW-HOW OF DIFFERENT MATERIALS AND TECHNOLOGIES

The structure of the group allows us to transform silicone, resin and non-ferrous alloys, ensuring a unique and highly controlled supply chain. In this way we are able to offer extremely cost effective solutions and timely responses to the clients. Moreover, in Bonomi we invest every year to have the latest generation plants. We have intellectual property rights to support our processes, investing in state of the art machinery to support the best production at lowest cost with short lead times.

Internal production:

- Casting
- Hot forging
- Blanking and coining
- CNC and robot machining
- Silicone and epoxy resin injection

WHY WE PREFER ALUMINUM TO STEEL

- **REDUCED WEIGHT;**
- **RESISTANCE**, equivalent to steel;
- **SIGNIFICANT INCREASE IN COMPONENT LIFE;**
- **ENVIRONMENTALLY FRIENDLY MATERIAL;**
- **TOTAL CORROSION RESISTANCE** (little or no maintenance needed) and excellent resistance to extreme environmental conditions.



WE THINK **GREEN:** ALUMINUM

Bonomi were one of the first manufacturers to **use aluminium widely in the rail environment**. Aluminium is ideally suited to the railway, especially for suspensions and supports.

MAIN PROJECTS



Turkish railway company chooses Bonomi's insulators.

40,000 Bonomi silicone insulators have been installed on the 25 kV line that connects Ankara to the city of Konya.



Algeria, Oued – Tlelat – Tlemcen line.

Bonomi has supplied over 1.500 25 kV cantilevers for the development of the Algerian high-speed railway.



Greek high speed railway: cantilevers are by Bonomi.

The Athens-Thessaloniki high-speed line covers over 500 km and has been electrified using 21,000 25 kV cantilevers supplied by Bonomi.



Belgian high speed speaks italian thanks to Bonomi.

Bonomi has developed the electrification of over 240 km of Belgian double-track line, with speeds up to 330 km/h.

Over 7,000 Bonomi's cantilevers were used to electrify the following routes:

- L1 Brussels - French border;
- L2 Brussels - Liège;
- L3 Liège - German border;
- L4 Antwerp - Dutch border.



Italy, high speed electrification.

In the development of Italian high-speed line, Bonomi has provided over 27,000 3kV OMNIA and more than 7,000 25kV cantilevers.



Morocco, high-speed line.

Bonomi's insulators, steady arms, tensioning devices, power and grounding connectors have been installed on over 7,000 cantilevers.



Direttissima Florence-Rome.

Over 6,000 cantilevers, both standard and OMNIA ones, have been installed for the electrification of the route Direttissima that runs from Florence to Rome.



Medina—Mecca: the high-speed line that links the two holiest cities.

The Mecca—Medina is an inter-city high-speed railway which is 453 km long. This line links the cities of Medina and Mecca. Bonomi has supplied more than 80,000 25kV railway insulators for the construction of the line. The new line forms part of a development programme to increase economic activity and tourism in the region.



Over 1,500 km of French rail lines have been electrified using Bonomi's components.

The components installed on the double-track line that SNCF has developed on French territory (1,500 km) are by Bonomi.

These are the routes:

- TGV Mediterranean Marseille - Lyon - 300 km;
- TGV East Paris - Strasbourg - 400 km;
- LGV East Europe Baudrecourt - Vendenheim - 212 km (high speed);
- Sillon - Alpine - 250 km;
- BPL The Loire Valley - 350 km;
- Contournement de Nîmes et Montpellier - 86 km.



Denmark: Lystrup - Ryomgaard has been electrified

Over 3,650 750V Bonomi cantilevers and about 2,600 (750V and 3kV) insulators have been installed on the Lystrup-Ryomgaard route.



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