

EN



ENERGY - INSULATION



AT THE SERVICE OF ENERGY



>200.000

insulators- monthly
production capacity

>10 MLN

insulators installed

>40

Utilities served

100%

in-house

ENERGY: A SINGLE WORD TO GATHER THE WHOLE HISTORY

The acquisition of Rebosio Srl (2002) and Isoelectric (2012) allowed us - at Bonomi - to expand our range of products and conquer two major market sectors: **transmission and distribution of electric power.**

As concerns the insulation market, we focus our know-how on - that translates into manufacturing of composite silicone insulators, epoxy resin insulators, cut-outs, surge arresters as well as low and medium voltage components.

A FEW REFERENCES:

**ENDESA - TERNA - CPFL ENERGIA - ENERGISA - EQUATORIAL
CODENSA - TEIAS - OFFICE NATIONAL DE L'ELECTRICITÉ
ENERGIA - SAUDI - ÉLECTRICITÉ DU LIBAN - IBERDROLA
TENNET - CEMIG - ENEL - RED ELECTRICA DE ESPAÑA
EDUSER EGYPTIAN ELECTRICITY HOLDING COMPANY
ABU DHABI WATER & ELECTRICITY AUTHORITY
OMAN ELETRICITY TRANSMISSION COMPANY
EVN VIETNAM ELECTRICITY - NATIONALGRID
SWISSGRID**

INSULATIONS: EXPERTS, SINCE 1920

THE WIDEST RANGE OF PRODUCTS IN THE INDUSTRY

From low to high voltage, we - as Bonomi energy department - offer you the widest range of products available on the market as concerns **silicone and resin composite insulators, fuse disconnectors and surge arresters.**

IN-HOUSE DESIGN, TESTING AND PRODUCTION: THE STARTING POINT OF OUR CUSTOMISABLE SOLUTIONS

Customers and Utilities are in need of increasingly customisable and top-performing solutions: we - at Bonomi - engineer, test and produce all our articles in-house.

Furthermore, we manufacture our production moulds in-house with the aim of meeting all requests.

A SINGLE SUPPLIER FOR THE DISTRIBUTION AND TRANSMISSION OF ELECTRIC POWER

A single supplier for a complex production cycle: our company organisation - as Bonomi group - **puts us in a position to supply all components relating to the transmission and distribution of electric power.** Besides processing silicone, resin and metallic components, we are increasingly focusing on smart grid management solutions.

This enables us to offer our customers an all-around service and production in the energy industry.



The grid management industry is one of the most fervent markets, leading the engineering-production industry to take on increasingly new challenges.

The world's population is growing continuously and the geographical borders have been erased by incredible technological revolutions: this translates into **inexorable growth**, both quantity-and quality-wise.

Besides rising to the occasion, we - at Bonomi - are at the forefront of this ever-evolving business also thanks to the technical-production experience history.

RESEARCH AND DEVELOPMENT



R&D AND CONTINUOUS TRAINING 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 to study overhead power lines.





MECHANICAL, CHEMICAL AND ELECTRICAL TEST ROOMS

We undertake the following functions in house:

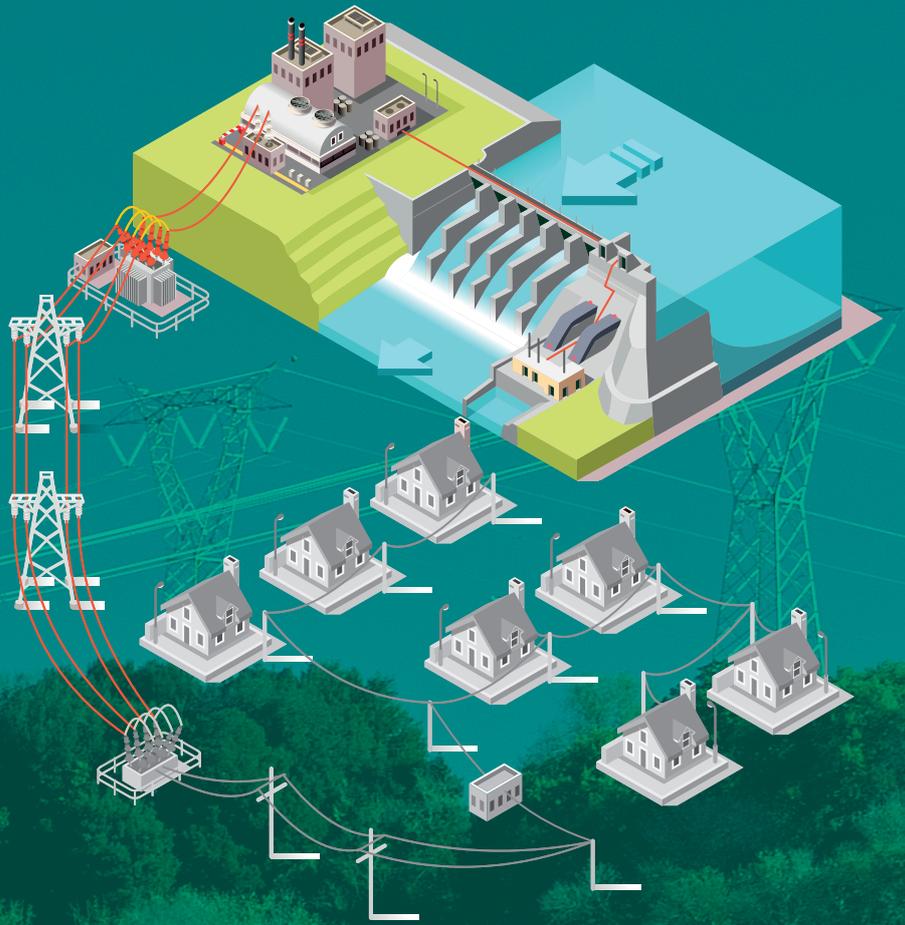
- dimensional checks with electronic systems
 - hardness checks
 - roughness checks
 - galvanic coatings checks
 - mechanical tests of traction, compression, flexion and torsion, also combined with thermal cycles
 - fatigue tests
 - electrical, insulation (industrial frequency and impulse) and partial discharge tests
 - ageing test in salt fog chamber and/or in thermostatic chamber
 - Insulating materials track resistance tests;
 - Insulating materials dielectric strength tests.
- Furthermore, our laboratories are open to customers for visits and in-house testing.

SPECIALIST EXTERNAL SUPPORT

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



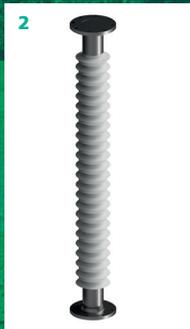
INSULATION TRANSMISSION



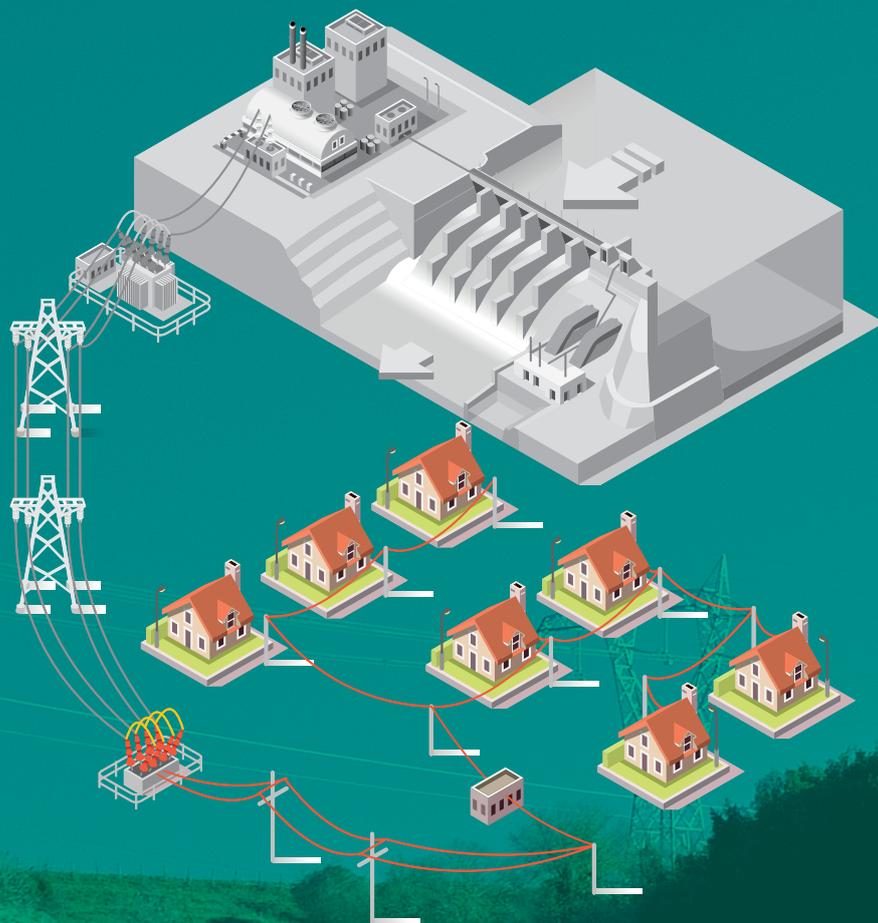
1 Silicone composite insulators from 66 up to 800 kV transmission lines

2 Substation post insulators

3 Surge-arresters



INSULATION DISTRIBUTION



- 1 Silicone composite insulators for distribution lines up to 66kV



- 2 Cut-outs



- 3 Surge arresters

- 4 Epoxy resin insulators

- 5 LV and HV terminals and connectors

SILICONE COMPOSITE INSULATORS

Our composite insulators are **made of STF 0010 silicone rubber, a material that passed several accelerated ageing tests**, including:
5,000 hours in compliance with the IEC 61109, IEC 62217 and IEC 62730 standards;
30,000 cycles in compliance with IEEE std 1024;
1,000 hours in compliance with the IEC 61109 and IEC 62217 standards;
3,000 hours of exposure to ultraviolet light in compliance with the ASTM G26 standard.
These tests **guarantee durable and good performance of the insulators, even under extreme weather conditions.**

We, at Bonomi, are in a position to supply a **complete range of composite insulators** for overhead transmission lines (66 - 800 kV) and for distribution lines (up to 66 kV).
Our insulators are **made using the one-shot technology for lengths up to 4 m and using the two-shot technology for greater lengths.**



PRODUCTS

TYPES OF INSULATORS



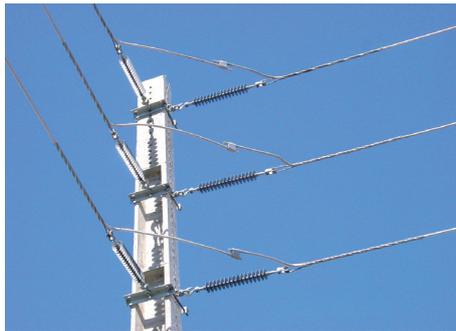
From 3 to 800 kV/ from 40 to 500 kN

- Suspension insulators, Tension insulators
- interphase spacers;
- Hollow insulators for switches.



From 3 to 400 kV/ from 4 to 30 kN

- Post insulators for substations and disconnectors;
- Hollow insulators covered with silicone for switches



From 3 to 36 kV

- Line post insulators;
- Hollow insulators covered with silicone for switches



Up to 500 kV

- Insulating bracket system;
- Hollow insulators covered with silicone for switches, for current transformers, for voltage transformers.

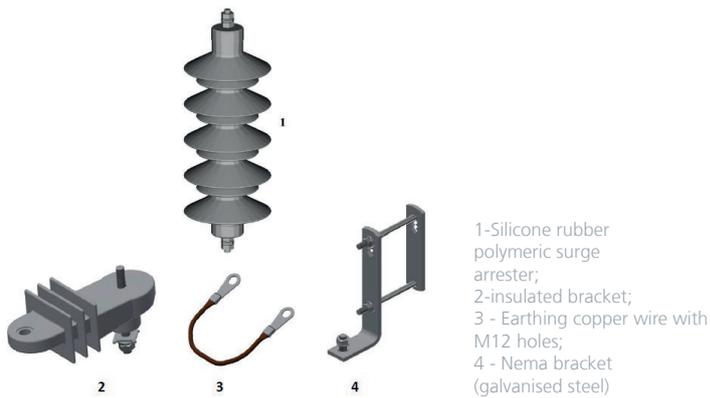
Our T&D technical department has always worked side by side with Grids and Utilities, with the aim of designing and producing the most appropriate insulators for the drawing and for the specific customer requests together.

SURGE ARRESTERS

Bonomi surge arresters consist of several zinc oxide discs , aluminium end fittings and spacers, core composed by glass fibre and silicone housing.

Our surge arresters are certified in compliance with the IEC 60099-4 (2014) standard.

Furthermore, we are also in a position to produce surge arresters in compliance with the ANSI/IEEE C.62 11 standard.



PRODUCTS

	NOMINAL VOLTAGE	NOMINAL DISCHARGE CURRENT	DISCHARGE CLASS
ISI-HE Indoor - Outdoor	6-36 kV	10 kA	1
ISI-2P	36-165kV	10 kA	2
ISI-3P	108-468 kV	10 kA	3
ISI-4P	108-468 kV	20 kA	4
ISI-5P	108-468 kV	30 kA	5

The various discharge classes and currents are obtained by suitably mounting single 27 to 26 kV surge arresters in series and/or parallel.



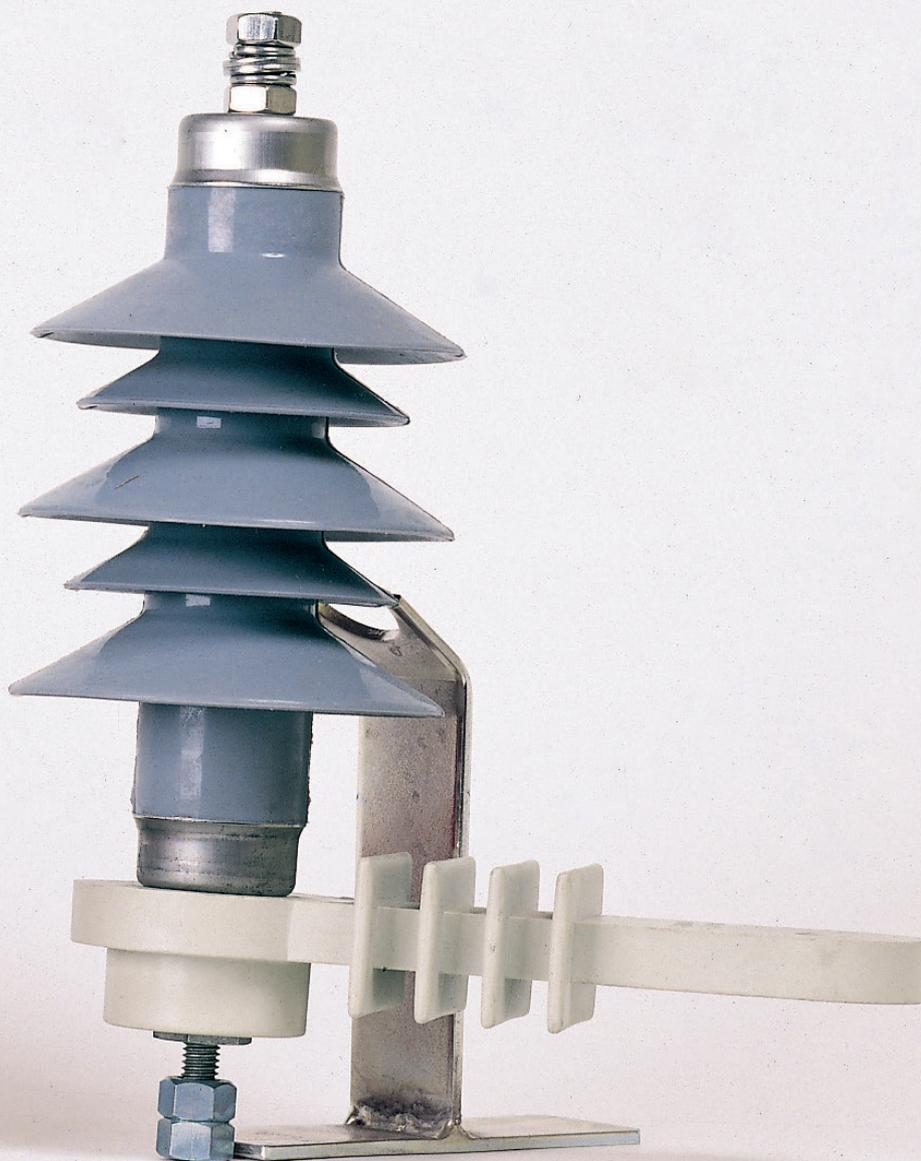
Substation HV Surge Arrester



Line arrester

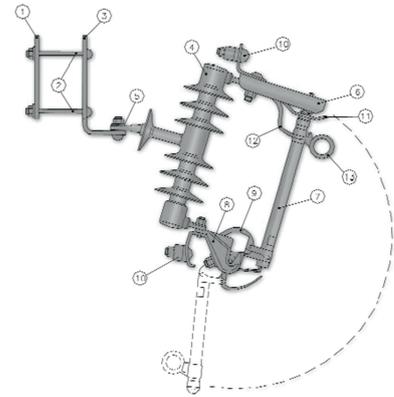


Line distribution arrester



FUSE DISCONNECTORS

Number	Description	Number	Description
1	Rear plate	8	Lower contact
2	Long screw	9	Moveable contact
3	Fixing bracket	10	Connector
4	Silicone rubber insulator	11	Upper contacts
5	Elastic washer	12	Operational hook
6	Upper contact	13	Operational eyelet
7	Fuse tube		



FEATURES OF THE DISCONNECTORS

Type	Nominal voltage	kV BIL	Industrial frequency withstand voltage		Insulation distance mm		Weight kg	A	B	C	D
			DRY kV	WET kV	Phase/Earth	Phase/Earth					
ISI-CUT15	15	125	60	45	480	540	4,8	415	205	250	300
ISI-CUT24	24	150	75	60	610	770	5,2	425	205	285	385
ISI-CUT36	36	190	90	70	720	1000	5,6	445	205	345	475

* Fuse Tube max. 100 A
* Supply without fuse

- High shock resistance;
- Low weight (from 3 to 10 times lower with respect to the porcelain cut-out);
- High resistance in cold environments (low temperature);
- High resistance in highly polluted environments (pollution);
- High resistance against ultraviolet radiations;
- High arc resistance;
- Greater dispersion distance with the same spark gaps;
- Lower transportation, packaging and storage costs;
- Greater hydrophobicity and corrosion resistance properties that keep the surfaces of the insulators clean.

LV AND HV TERMINALS AND CONNECTORS



EPOXY RESIN



Over the years, our company organisation has acquired the **knowhow of companies historically active in the reference industries** and today we are in a position to offer a **complete range of epoxy resin insulators**, including:

- Post insulators;
- Bushing insulators;
- Indoor capacitive insulators;
- Outdoor cycloaliphatic resin insulators;
- insulators and accessories for SF₆ switches (bushing insulators with internal or external connection in compliance with the EN 50181 standard, fuse holder insulators, cable test bushing insulators, electric gaskets etc);
- insulators and accessories for transformers, such as bushing insulators with internal or external connection in compliance with the EN 50180 standard, low voltage bushing insulator.

We handle **3.6 kV to 60 kV voltages in compliance with the IEC 60137 0660 standard.**

Furthermore, we - at Bonomi - **particularly specialise in designing and producing components according to the drawing requested by the customer.**

SILICONE

OUR HISTORY

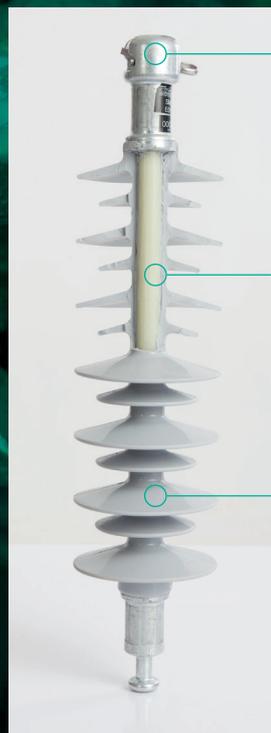
In the 50s, Rebosio was **among Europe's first companies** to introduce Teflon for the production of insulators, as an alternative to ceramics and glass.

The 60s and 70s marked **major investments in research and development**, while the 80s saw the standardisation of raw material: **SILICONE HCR/LSR**.

Both of these solutions undergo a high temperature vulcanisation (HTV) process.

Over the same period, Isoelectric also introduced the use of silicone for the production of insulators, while the processing of epoxy resin began in the early 70s, coinciding with the inauguration of the Isoelectric premises.

HOW OUR INSULATOR LOOKS LIKE

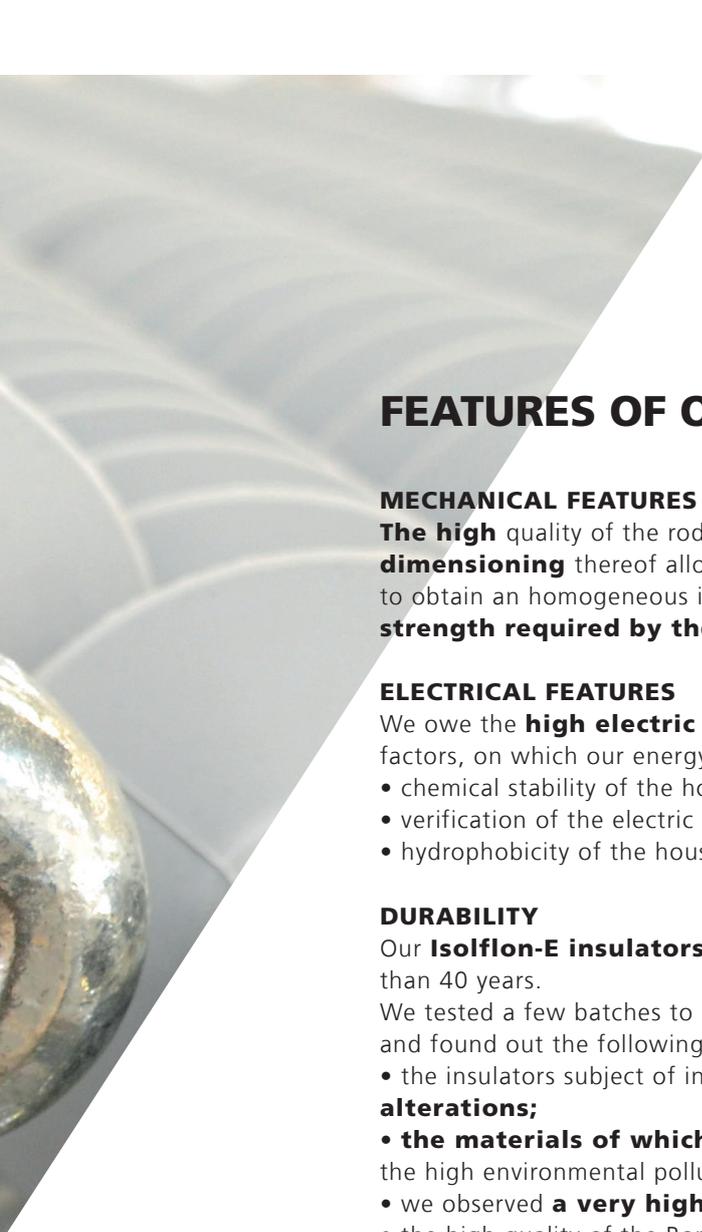


METAL
END FITTINGS

FIBREGLASS
ROD
(ECR)

HCR/LSR
SILICONE
HOUSING

FOCUS ON



FEATURES OF OUR INSULATORS

MECHANICAL FEATURES

The **high** quality of the rod and end-fittings used as well as the **correct dimensioning** thereof allow - through an appropriate mechanical compression - to obtain an homogeneous interface capable of **guaranteeing the mechanical strength required by the international standards.**

ELECTRICAL FEATURES

We owe the **high electric power performance** of our insulator to three key factors, on which our energy technical department **focuses very keenly:**

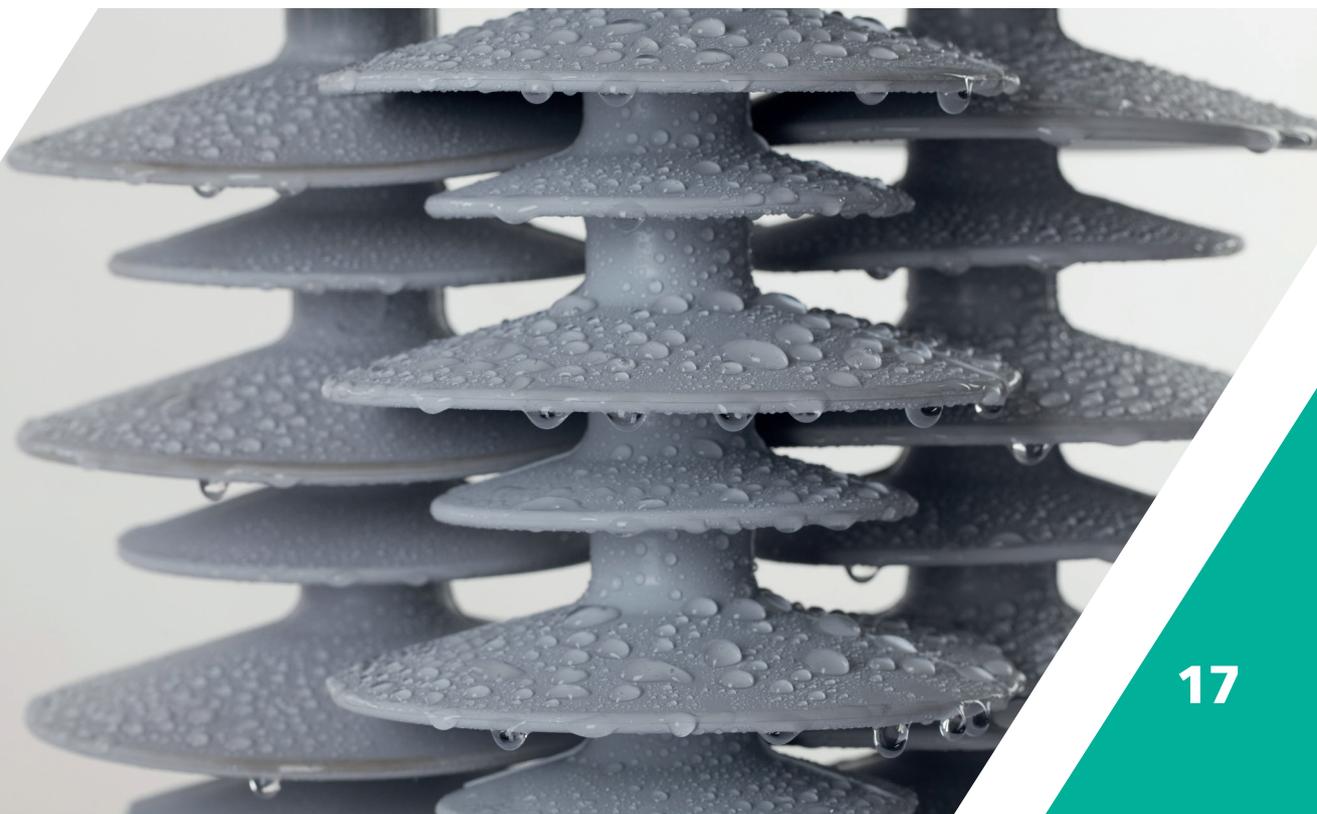
- chemical stability of the housing;
- verification of the electric field;
- hydrophobicity of the housing.

DURABILITY

Our **Isolflon-E insulators have been operative on various lines** for more than 40 years.

We tested a few batches to determine their condition after many years of activity and found out the following:

- the insulators subject of inspection did not reveal **any mechanical or electrical alterations;**
- **the materials of which the coating is made tend to regenerate** from the high environmental pollution;
- we observed **a very high erosion and track resistance;**
- the high quality of the Bonomi blend allows **to keep the water repellent property of the insulators constant over time.**



SILICONE INJECTION

The developed technology and the improved blend of our silicone guarantee:

- Low weight (up to -80%), high resistance and greater safety in case of vandalism;
- Low emission of toxic fumes at the production stage;
- Water repellent material;
- High resistance and stability against atmospheric agents and excellent behaviour under high pollution conditions;
- High track and arc resistance and impermeable insulation coating with high adherence to the core;
- Wide range of operating temperatures.

In order to meet the increasingly personal demands, our technical and production departments offer customers the option of **customising the electrical and mechanical features** as a function of the detected degree of pollution. More generally, our organisation as a group allows to design and produce a truly customised product, personalising each and every demand all-around.



EPOXY RESIN INJECTION

Processing epoxy resin completes our already wide range of solutions at Bonomi as pertains to the energy insulation industry.

Resin is mainly used for components made manufactured on the customer's specification: as a matter of fact, together we design top-performing solutions and produce the product at industrial scale with the aim of cutting costs as much as possible.



MAIN PROJECTS





Turkey: our insulator supply record is with Teiaş

A Turkish electricity transmission company, TEIAŞ installed 22,600 silicone composite insulators (170 and 420 kV) designed and produced by EB Rebosio Turkey.

This is the largest supply delivered by Bonomi across Europe and the Middle East ever.



Fuerteventura: the insulators were made by Bonomi.

Supply of 1,300 insulated brackets for 145 kV T&Ds installed in the island of Fuerteventura, in Spain.

In conjunction with Red Electrica Española, Bonomi studied a creepage distance to be applied on all insulators subject of supply (50mm per kV), guaranteeing higher performance and greater resistance under particular weather conditions like those of the Canary Islands, dominated by considerable wind and salinity.



Egypt: Bonomi supported a 435-km line

Bonomi supplied almost 9,000 500 kV composite insulators to the Egyptian electricity transmission company EETC to support the Assuit—New Akhmem and Borg Al Arab—Marsa Matrouh lines covering a total of 435 km.



Bonomi supporting design.

We - at Bonomi - made the insulators installed on the pylons designed by Norman Foster and the Rosental design firm, respectively for Enel's ("Tralicci d'artista", literally "pylon Masterworks") and Terna's "Tralicci del futuro" (literally "future pylons") projects.



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