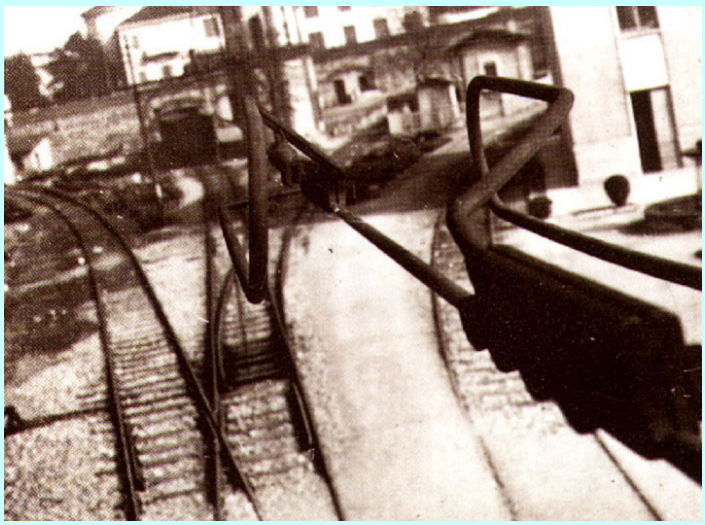
Isoflon®: The first insulators

Rebosio started the development of its composite products during the fifties and their first application was in 1957, when fibreglass rods were used as insulated steady arms and section insulators in the railway station at Monza.



Since that time Rebosio have concentrated on producing high quality composite insulators at a competitive price. During the sixties the first composite insulators utilising a PTFE housing were installed in service, first as a trial, then gradually in more significant quantities. In 1972, they were standardized by FS, the Italian State Railway and are now seen as a standard insulator on the Italian Railway network.

During 1985 Rebosio started the development of a new housing, made with silicone rubber. This marked the birth of Isoflon-E® and its related technologies. During 1987 the first trial installations commenced and continued until 1990.

In 1994 Rebosio ceased the production of Isoflon® insulators. During the last 25 years more than 2 millions units have been manufactured and satisfactorily installed on overhead railway lines and on transmission and distribution systems.

Isoflon-E® today

Detailed knowledge of product design, synthetic materials together with specialized manufacturing technology are behind the development of the Isoflon-E® composite insulator. Not forgetting Rebosio's 50 years of experience in this field. The Insulator it has become a reliable and adaptable product. Its wide application and usage in the field have made it an economical and viable alternative to traditional insulating materials.

Some of the advantages of the Isoflon-E® Insulators are:

- high mechanical strength and low weight
- robust and shock resistance: anti-vandal
- one piece silicone housing: impenetrable rod protection
- pollution resistance, chemical or natural
- stable ageing: long life duration, proven by 50 years experience
- very high track and arc resistance
- very low smoke emission and low toxicity
- wide application and value for money

All these characteristics have made it the preferred choice over traditional insulators for high voltage overhead lines and medium voltage railway systems.

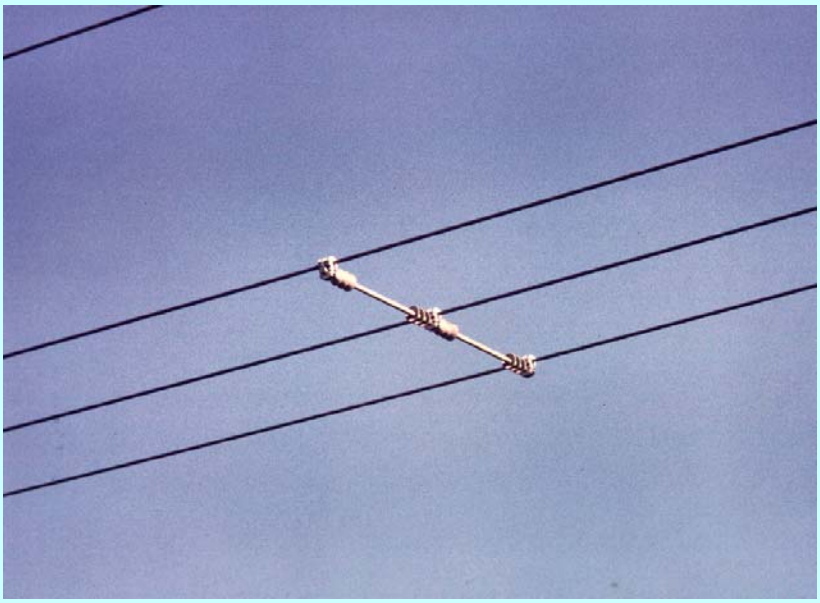
Isoflon-E® insulators for tension and suspension for transmission and distribution lines

A complete range of insulators are available for tension and suspension, with different profiles to suit medium, high and very high pollution conditions
(As per IEC 60815)

Isoflon-E® are available in 6 basic mechanical classes: 70 - 100 - 120 - 160 - 210 - 320 kN, these can be equipped with standard end fittings, mostly in hot dip galvanized forged steel. i.e. socket, ball, clevis, tongue, eye, Y clevis, all as per relevant IEC Specification and depending on the mechanical requirement.

Isoflon-E® insulators as inter-phase spacers

Governed by the relevant mechanical performance, many different types of inter-phase spacers are available in different lengths, for transmission and distribution lines.



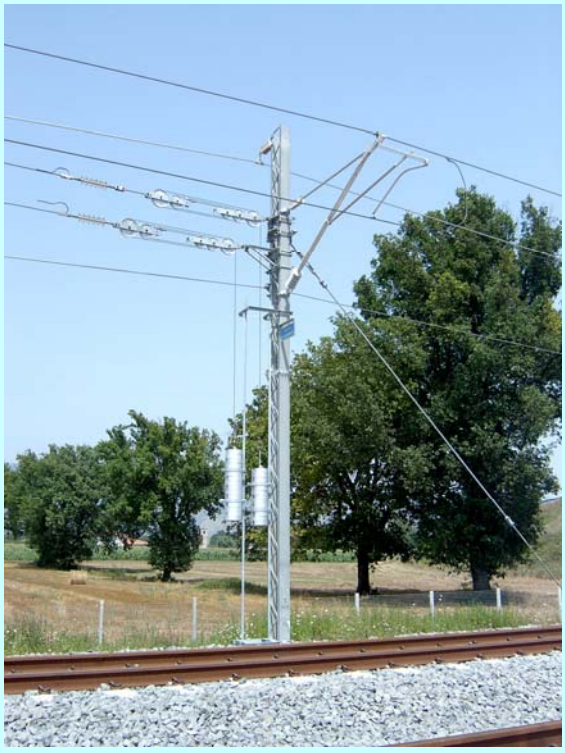
Line post Isoflon-E® insulators and insulated cantilevers (Horizontal VEE suspension)

These insulators are designed following IEC 273 and 61952 and they are equipped with standard flange end fittings. For horizontal VEE particular rotating end fittings are designed following Customer's specifications.

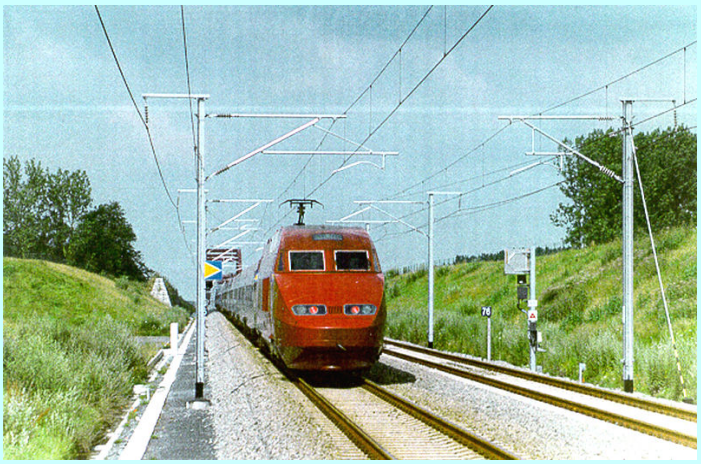
Railway over head line Isoflon-E® insulators

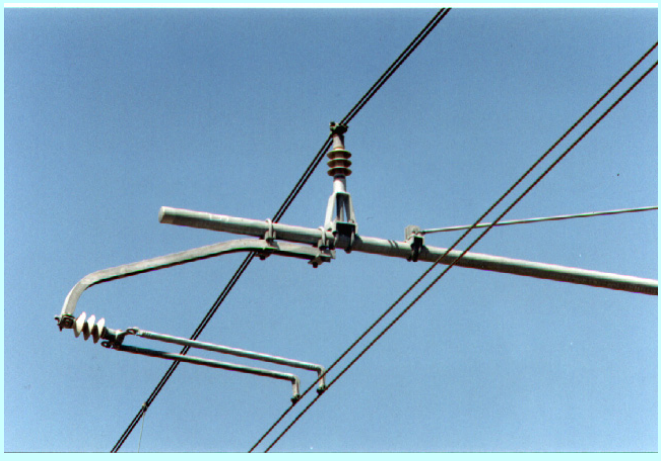
Our range of railway insulators covers all the standards of the major European Railway Authorities. They are designed for D.C. (1,5 / 3 kV) and for A.C. (15 / 25 kV)

- **Cantilever strut and top tie insulators**
- **Anchoring insulators**
- **Support insulators**
- **Feeder insulators**
- **Section insulators and neutral sections**
- **Insulated steady arms**



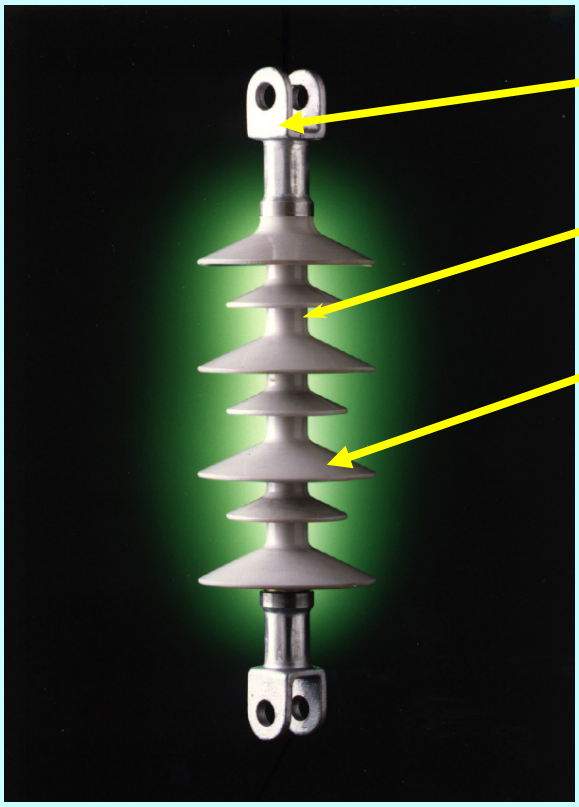
INTRODUCTION





PRODUCTION

Isoflon-E® components



1) Two metal end fittings radial compressed onto the fibreglass rod.

2) An epoxy resin fibreglass rod that has a high mechanical resistance utilising ECR glass fibre reinforcement.

3) A high temperature and pressure vulcanized (HTV) shedded housing that is injected and vulcanized in one shot, directly on the fibreglass rod already equipped with the crimped end fittings

Production is relatively simple and the process s highly automated. This guarantees its high quality, and total reliability.

All our range of our insulators from the simplest to the most demanding of applications is produced with the same materials and technology.

End Fittings

End fittings are crimped onto the fibreglass rod. Tension insulators are crimped with a radial compression technique and insulators that do not experience any significant tensile loads are crimped with hexagonal dies.

The standard end fittings are of hot dipped galvanized forged steel or malleable cast iron. They are also available in stainless steel, aluminium alloy and copper alloy.

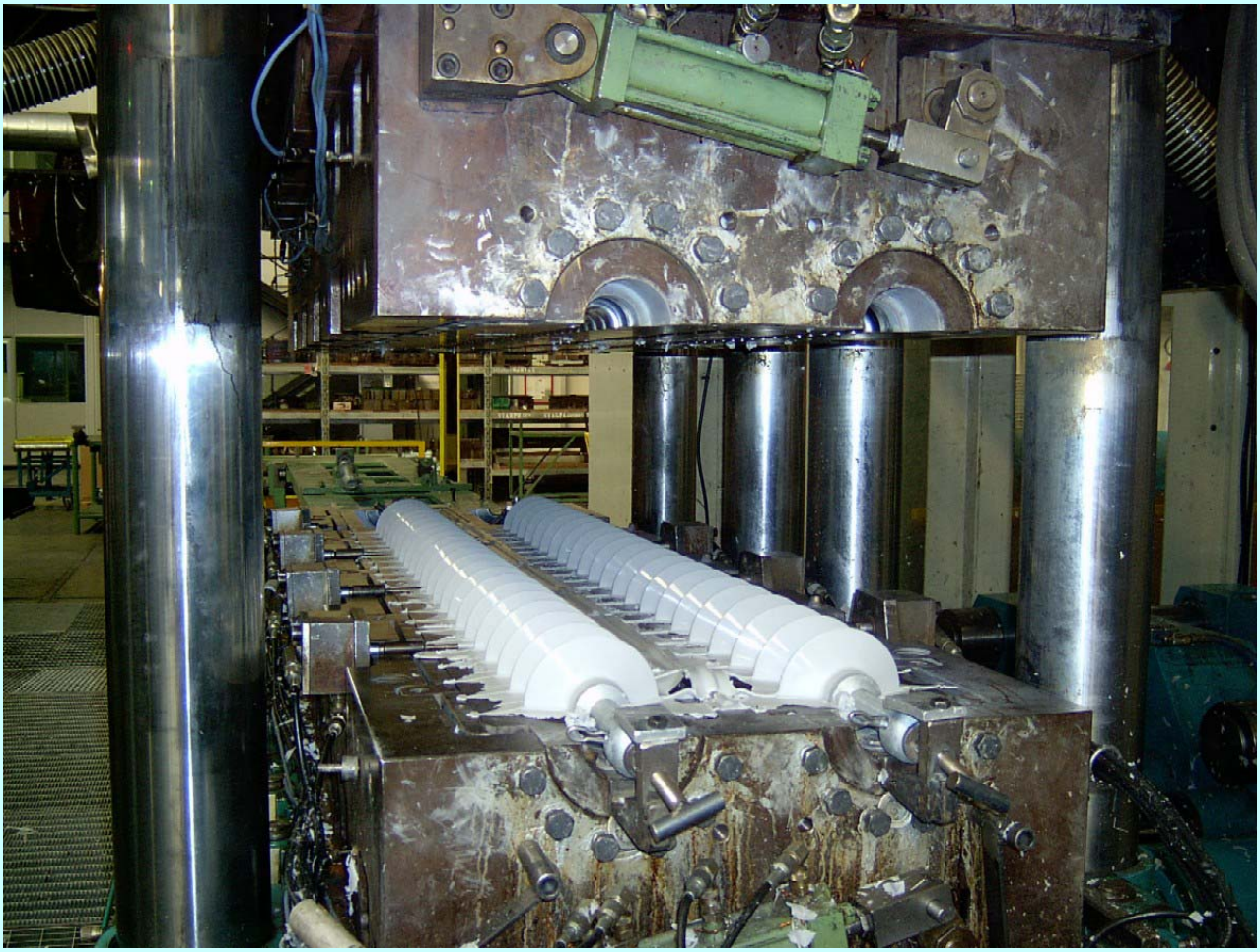
Fiber glass rod

Our fibreglass rod is constructed from ECR glass filaments impregnated with epoxy resin; this has the characteristic of a high temperature vitreous transition. Unlike a lot of Insulator manufacturers we produce our own rods using a pultrusion process. Our rods produced by this process display very high mechanical strength, excellent dielectric strength, and acid resistance and can be used in high service temperatures.
We have two pultrusion lines and thanks to their high productivity, this covers most of our needs.

The manufacturing process is continuously monitored for its consistency of resin impregnation (reactivity measurement of exothermic peak) and the finished rod is tested for mechanical strength (transverse mechanical compression test).

Silicone rubber housing

The grey HTV silicon rubber material is injected into the mould under high temperature and pressure directly on to the glass resin rod which already has had the end fittings attached. This method ensures a unique homogeneous housing that adheres both to the rod and to the end fittings perfectly, This ensures that the core is protected from any penetration of water, pollution or acid.



The HTV (High Temperature Vulcanizing) silicone compound we use is formulated and produced on our behalf by Dow Corning, following our specification.

QUALITY

Quality System

EB Rebosio S.r.l. conforms to the quality standard
UNI EN ISO 9001:2000 (Vision 2000)
This applies to the design and manufacture of composite insulators for equipment, used in transmission and distribution systems and overhead contact lines.

CERTIFICATO DI APPROVAZIONE

Si certifica che il Sistema di Gestione per la Qualità di:

EB Rebosio S.r.l.
Via Carso, 49
Madone (BG)

è stato approvato dal Lloyd's Register Quality Assurance Italy Srl per conformità alle seguenti norme di sistemi di gestione:

ISO 9001:2000
EN ISO 9001:2000
UNI EN ISO 9001:2000

Il Sistema di Gestione per la Qualità si applica a:

Progettazione e produzione di: isolatori compositi per apparecchiature, linee elettriche, di trazione/trasmissione/distribuzione; linee di contatto per trazione elettrica.

Il presente certificato subentra al certificato N. CERT-11891-2003-AQ-MIL-SINCERT emesso da Det Norske Veritas in data 30/01/03 .

Certificato di Approvazione N. LRC 0261532

Approvazione Originaria: 29 Giugno 2006
Certificato Attuale: 29 Giugno 2006
Settore EA 19
Scadenza Certificato: 29 Giugno 2009

Emesso da: Lloyd's Register Quality Assurance Italy Srl

SINCERT

Questo documento è soggetto alle condizioni riportate sul retro
Sede Legale: Piazza della Vittoria, 6/1 – 16121 Genova -Trib.Genova 189273/1996 – CCIAA Genova 356347
Sede Operativa: Via Cadorna 69 - 20090 Vimodrone (MI) – Tel. 023657541 – e-mail: lrc-milan@lrqa.com

Our Quality System's objective is to support the Company in ensuring customer satisfaction through the continuous improvement in the technological process and thus in both products and service.

Our Quality Statement defines the rules governing new product design criteria, customer offers, order management, supplier evaluation, material acceptance, production process control and final product acceptance

Production adheres to our Quality Production Plan, strictly following the Operation Instruction prepared by Quality Management, in accordance with the Company Management.

Very often Quality documents related to the complete production process, from the raw materials purchasing to the final acceptance tests are part of contract documents and therefore are submitted to and approved by our final Customers.

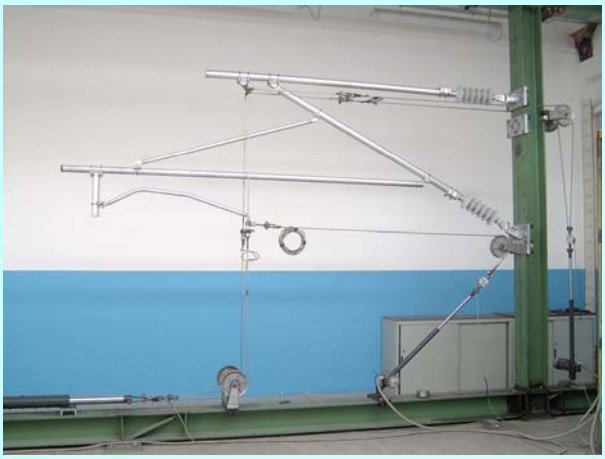
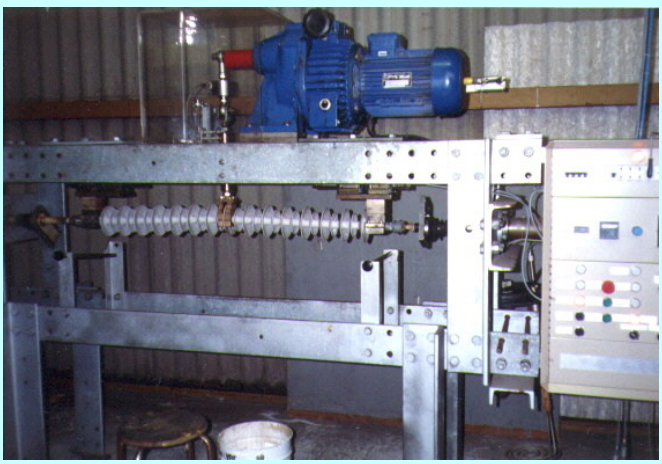
Tests and Approvals

Isoflone-E® composite insulators are designed, produced and tested in accordance with IEC 61109.
This has been verified by several different external independent test laboratories and has included the ageing tests as per both 5.3 and Annex C.

Most of our insulators have been Type Tested either in an external test laboratory or in our own laboratories, witnessed by customers or their agents.



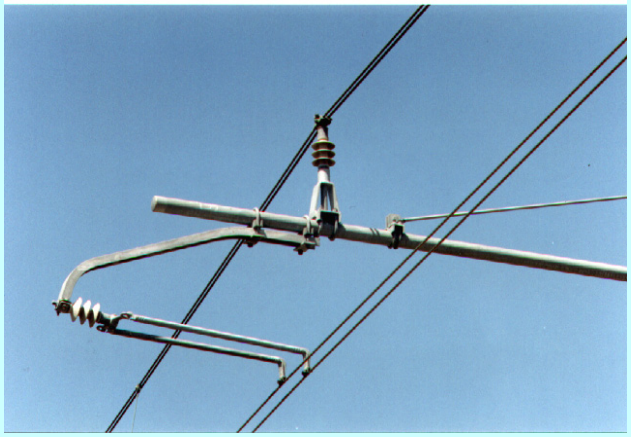


ISOFLON-E® SALES

(up to 31/12/2006)

Railway Electrification: 1,5 – 3 kV c.c.

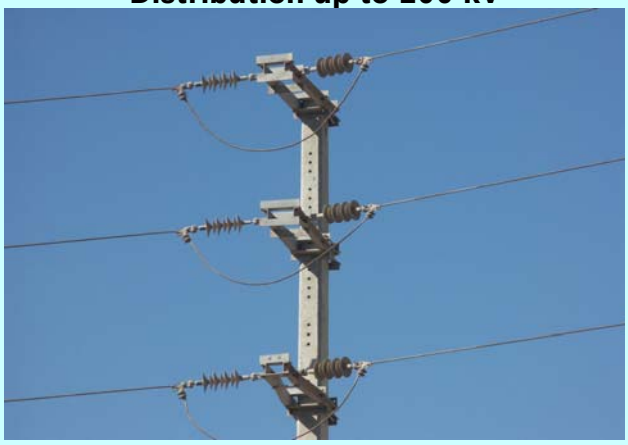


TOTAL **500.000**

Railway Electrification: 15 – 25 kV c.a.

TOTAL **550.000**

Distribution up to 100 kV

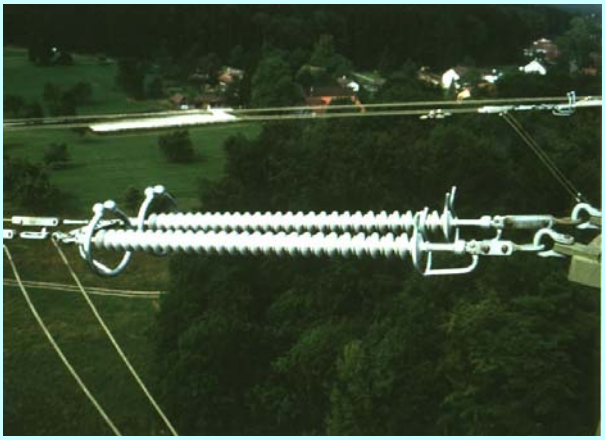


TOTAL **150.000**

Transmission at 130-145 kV

TOTAL **80.000**

Transmission at 220 kV



TOTAL **18.000**

Transmission at 400 Kv

TOTAL **15.000**