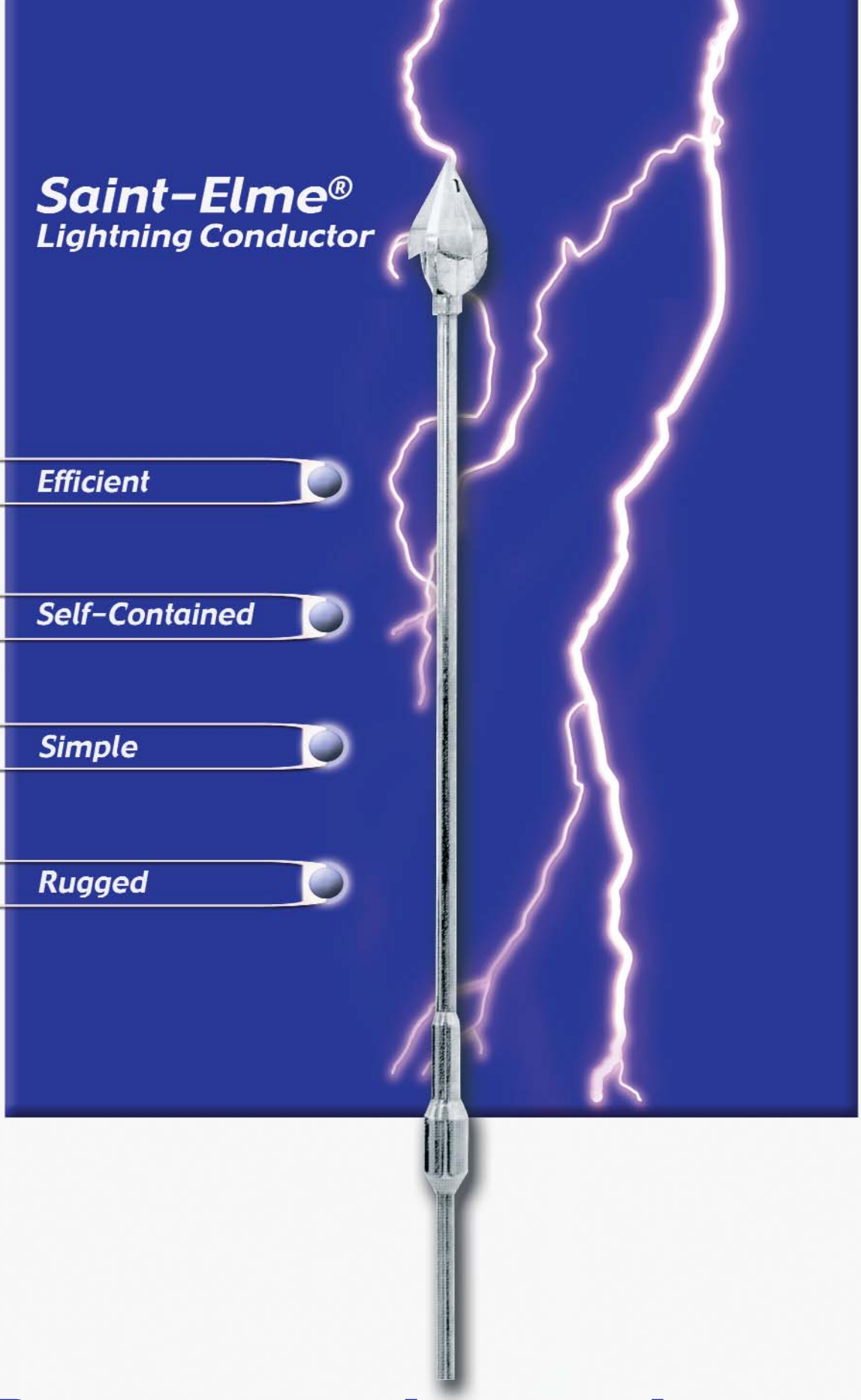
Saint-Elme®
Lightning Conductor



- Efficient
- Self-Contained
- Simple
- Rugged

Between sky and earth

FRANKLIN FRANCE

Saint-Elme® Lightning Conductor

With piezoelectric exciter device

Complies wih NFC 17-102 standard Franklin - France / CEA patent

Franklin France presents you the Saint-Elme ® lightning conductor. It results from the research work conducted with the French Atomic Energy Commission, and is the efficient, inexpensive and clean protection solution, using piezo - electric ceramics to transform the wind energy into electric energy.

Principle

A rod - type lightning conductor, connected to earth, efficiently works by altering, at its level, the equipotentials which match the structures of the building it protects. The emergence of the lightning conductor is an important factor in increasing the local electric field. The principle of the piezoelectric lightning conductor designed by **Franklin France** relies on several factors : the reinforcement of the local electric field and the early creation of a preferential discharge channel.

Description

The SAINT-ELME® piezoelectric lightning conductor is mainly composed of the following :

1 **Capture head**
Profiled, inalterable and good conductor, structured to generate a forced air circulation at its tip and in its prolongation (VENTURI system : air intakes and peripheral ejectors).

2 **Support pole**
Of treated copper (or stainless steel according to models) which upper part has one or more stainless steel ion emitter points, inserted in an insulating sleeve and subjected to the potential supplied by the piezo-electric ceramic.
The emitter points are protected from direct impact by lightning and from the weather by the capture head which, like the support pole, is permanently connected to the earth potential.

3 **Transducer** (*piezoelectric stimulator*)
Built into the lower part of the pole and consisting of piezoelectric ceramics stressed in an insulating container, combined with a simple, perfectly reliable and mechanical stimulation system (CEA and FRANKLIN patents). A high - voltage cable running inside the pole connects the stimulator to the emitter point(s). The voltage created by the ceramic is applied to the emitter point through the high voltage cable.

Capture head

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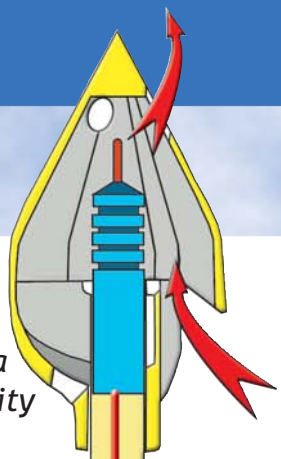
Operation

Piezoelectric Stimulation

The basic principle of the Saint-Elme® lightning conductor is to increase the number of free charges (ionized particles and electrons) in the air surrounding the lightning conductor and to create, within a cloud-ground electric field, a channel of high relative conductivity constituting a preferential path for lightning.

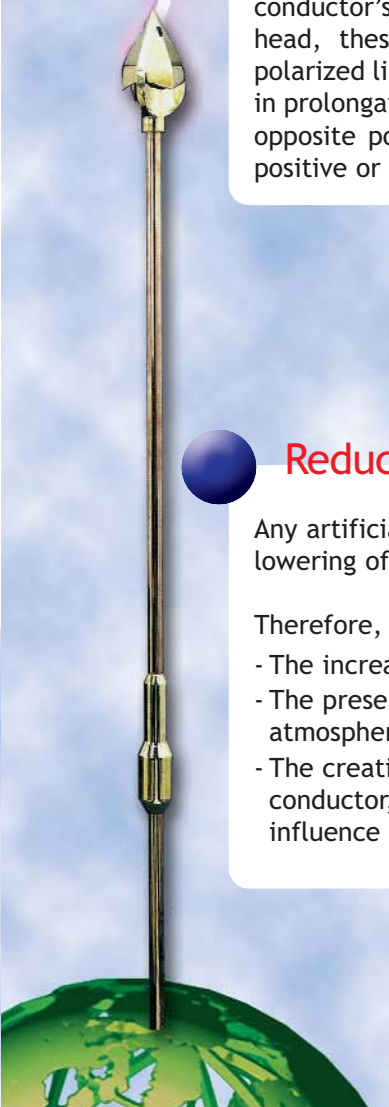


Capture head

Free charges are created by the corona effect by applying on the Saint-Elme® lightning conductor's ionized point(s) the voltage supplied by cells of piezo-electric ceramics (lead zirco-titanate); their feature is to produce a very high voltage by simply modifying the applied pressure. The Saint-Elme® lightning conductor is therefore equipped with a mechanical device that transforms the stress resulting from the wind action on the lightning conductor into a pressure stress on the piezo-electric cells.

The voltage therefore produced is applied, through the high voltage cable that runs inside the lightning conductor's support pole, onto the ionized point(s) to create, by corona effect, free charges. Then, these charges are expulsed, by the venturi system, from the lightning conductor's head, profiled on purpose (forced air circulation). When they are outside the head, these charges are submitted to the cloud-ground electrical field. The charges polarized like the cloud are repelled towards the ground, the channel of charges that forms in prolongation of the lightning conductor is then exclusively composed of charges from the opposite pole to the cloud's electric pole (it takes into account the discharges's pole : positive or negative).

Transducer



Reduction of the excitation time of the CORONA effect

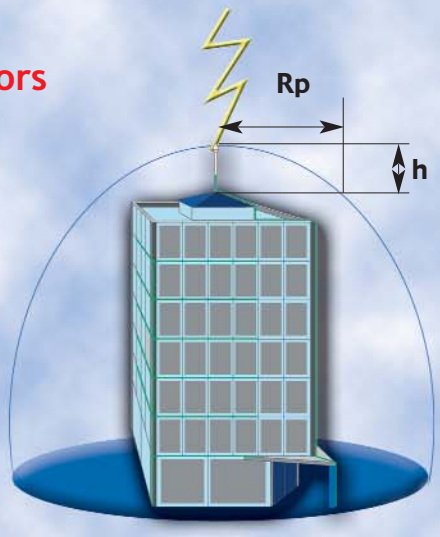
Any artificial increase in the ionic density of the air surrounding an electrode favours a lowering of the breakdown potential.

Therefore, by favouring :

- The increase of the local electric field,
- The presence of a seed electron at the capture point (electron that is rare in the atmosphere and necessary for the excitation process),
- The creation of a rising ionized air channel in the prolongation of the lightning conductor, it will lead to the shortening of the excitation lag, and to favourably influence the initial conditions of the triggering of the corona effect.

Protection Specifications

Protection offered by Saint - Elme® lightning conductors (NFC 17-102)



Preferential capture

The ability to promote excitation at lower values of the electrostatic field (hence earlier) enhances the capture probability of lightning conductors. This capacity gives them greater efficiency in the role of "preferential capture points" compared to any other point of the building they protect.

Therefore these lightning conductors offer superior guarantees during low intensity discharges (2 to 5 KA) compared with simple rod type lightning conductors, which can only intercept them over short distances ($D = 10\ I^{2/3}$, where D is in meters, I in KA).

Larger zone of protection

The zones of protection of lightning conductors are obtained theoratically by plotting the electrogeometric model, but are comparable in practice, for low heights, to a cone of revolution which apex is the tip of the lightning conductor.

French standard NFC 17 100 describes the calculation method applicable to Franklin and meshed cages rods.

French standard NFC 17 102 deals with early streamer emission (ESE) lightning conductors, and takes into account the levels of protection Np of varying severity (I to III), to be determined previously by an assessment of the lightning risk for each project.
It defines the installation rules and the radii of protection Rp (m) depending on the average excitation advance Δ L (m) of the lightning conductors and the excitation distance D (m), considered according to the degree of severity : D (I) = 20 m, D (II) = 45 m, D (III) = 60 m.

The table hereunder gives the Rp (m) values for the three levels of protection Np depending on the actual height h(m) of the lightning conductor in relation to the different planes considered.

Rp (m)	SE6 Δ L = 15 m			SE9 Δ L = 30m			SE12 Δ L = 45 m			SE15 Δ L = 60 m		
h(m) \ Np	I	II	III	I	II	III	I	II	III	I	II	III
2	13	18	20	19	25	28	25	32	36	31	39	43
4	25	36	41	38	51	57	51	65	72	63	78	85
6	32	46	52	48	64	72	63	81	90	79	97	107
8	33	47	54	49	65	73	64	82	91	79	98	108
10	34	49	56	49	66	75	64	83	92	79	99	109
20	35	55	63	50	71	81	65	86	97	80	102	113
30	35	58	69	50	73	85	65	89	101	80	104	116
60	35	60	75	50	75	90	65	90	105	80	105	120

Applications

Lightning is a natural, universal and permanent phenomenon. It occurs daily and strongly in tropical areas. Lightning causes considerable damages and expenses to a country's economy, it also represents a significant and constant threat for the population. Every year some people are killed, mainly while being in open-areas.

Industries

Refineries, pump stations

Open-air installations

Stadiums, golfs, amusement parks

Telecomunications

Hertzian relays, antennas

Buildings

Warehouses, churches, monuments

Saint-Elme® range

Type	Standard	Corrosive atmosphere	Church	Church	Historical monument	Aladin
Model	2 m chromium plate copper	2 m stainless steel	1,5 m chromium plate copper	1,5 m chromium plated copper	2 m polished copper	2,4 m chromium plated copper
	reference	reference	reference	reference	reference	reference
SE 6	AFB0006SE	AFB1006SE	AFB2006SE	AFB3006SE	AFB0016SE	AFB4006SE
SE 9	AFB0009SE	AFB1009SE	AFB2009SE	AFB3009SE	AFB0019SE	AFB4009SE
SE 12	AFB0012SE	AFB1012SE	-	-	AFB0112SE	AFB4012SE
SE 15	AFB0015SE	AFB1015SE	-	-	AFB0115SE	AFB4015SE

Saint-Elme® kits equipped with impact controllers (discharge counters)

Type	Standard	Corrosive atmosphere	Church	Church	Aladin
Model	2 m chromium plate copper	2 m stainless steel	1,5 m chromium plate copper	1,5 m chromium plated copper	2,4 m chromium plated copper
	reference	reference	reference	reference	reference
Kit SE 6	AFB0706SE	AFB1706SE	AFB2706SE	AFB3706SE	AFB4706SE
Kit SE 9	AFB0709SE	AFB1709SE	AFB2709SE	AFB3709SE	AFB4709SE
Kit SE 12	AFB0712SE	AFB1712SE	-	-	-
Kit SE 15	AFB0715SE	AFB1715SE	-	-	-

Discharge counter

http://www.franklin-france.com

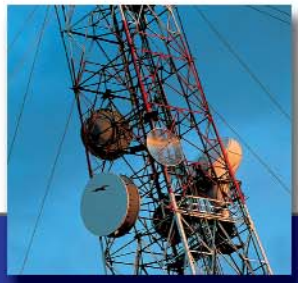
Founded in 1980, the company Franklin France built its notoriousness on a global approach to the lightning phenomenon.
In 20 years, the company acquired the image of a specialist in lightning protection and rapidly took the position of leader on its market.

Franklin France offers a complete range of products :
Lightning conductors, overvoltage protection, obstacles beaconing and earthing material.

Franklin France also puts at your disposal its know-how as lightning protection expert :

- Lightning risk assessment
- Installations
- Facilities audits
- Technical assistance
- Technical studies
- Training*

* with its training center C3F



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