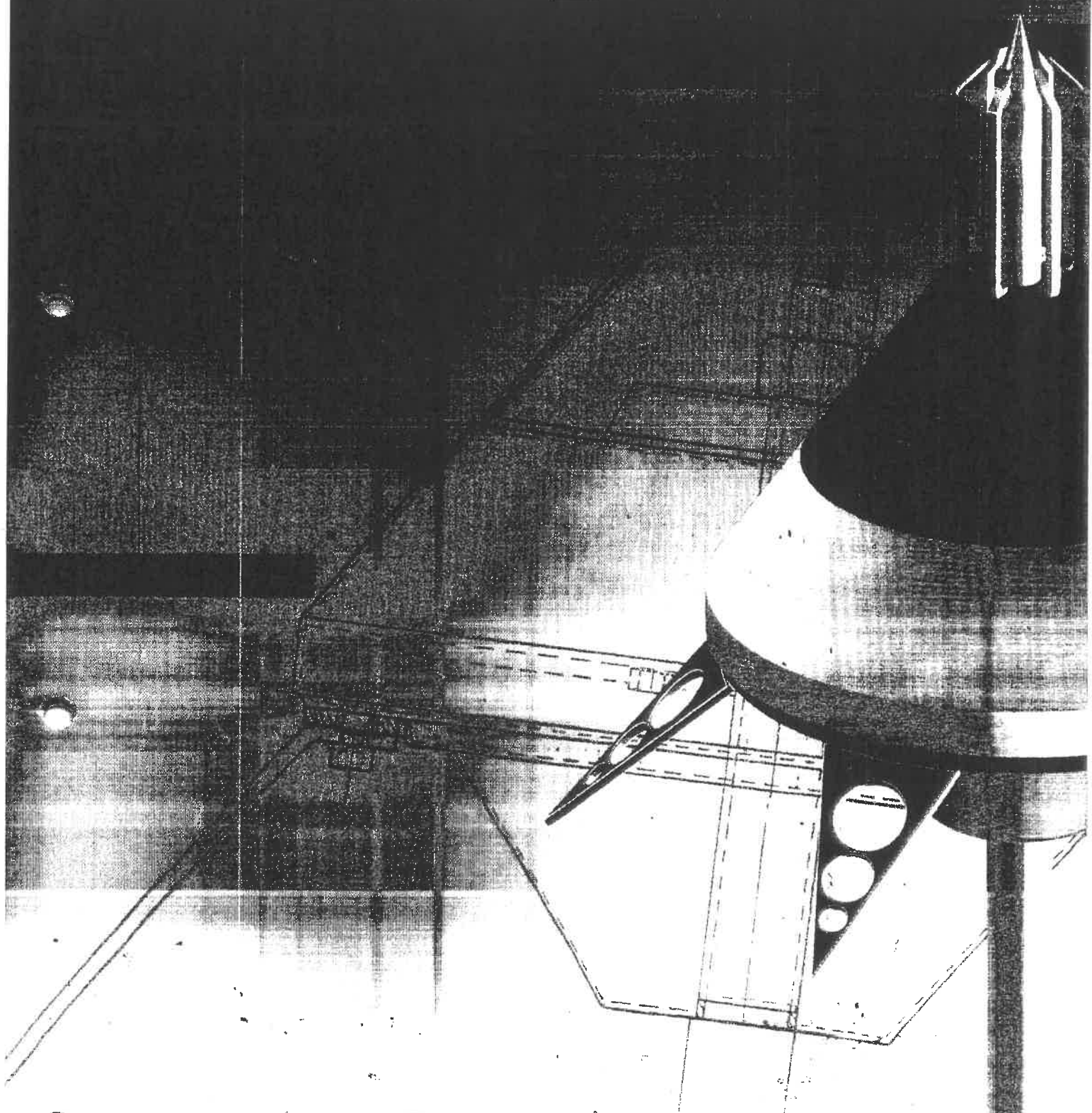


Early Streamer Emission lightning conductor

Prevectron[®] 2



 **Indelec**
lightning protection



With over 45 years' experience, INDELEC has become expert in the field of lightning protection. After 15 years overwhelming success with the PREVECTRON lightning conductor, both in France and around the world, INDELEC is now launching the latest addition to its product range: the PREVECTRON® 2 Millenium Series.

How it works

The PREVECTRON® 2 Early Streamer Emission air terminal gathers energy from the naturally occurring ambient electrical field, which builds up considerably - as much as several thousand volts per meter - when a storm approaches.

The lower series of energy collecting electrodes allows electrical energy to be stored within the triggering device.

Just before the lightning strikes, there is a sudden and rapid increase in the electrical field and this is detected by the air terminal. This information is sent to the electrical triggering device, which, in turn, releases the stored energy in the form of an ionization at the tip of the air terminal.

Principles

The ionization at the tip of the air terminal is characterized by:

CONTROL over the release of the ions:

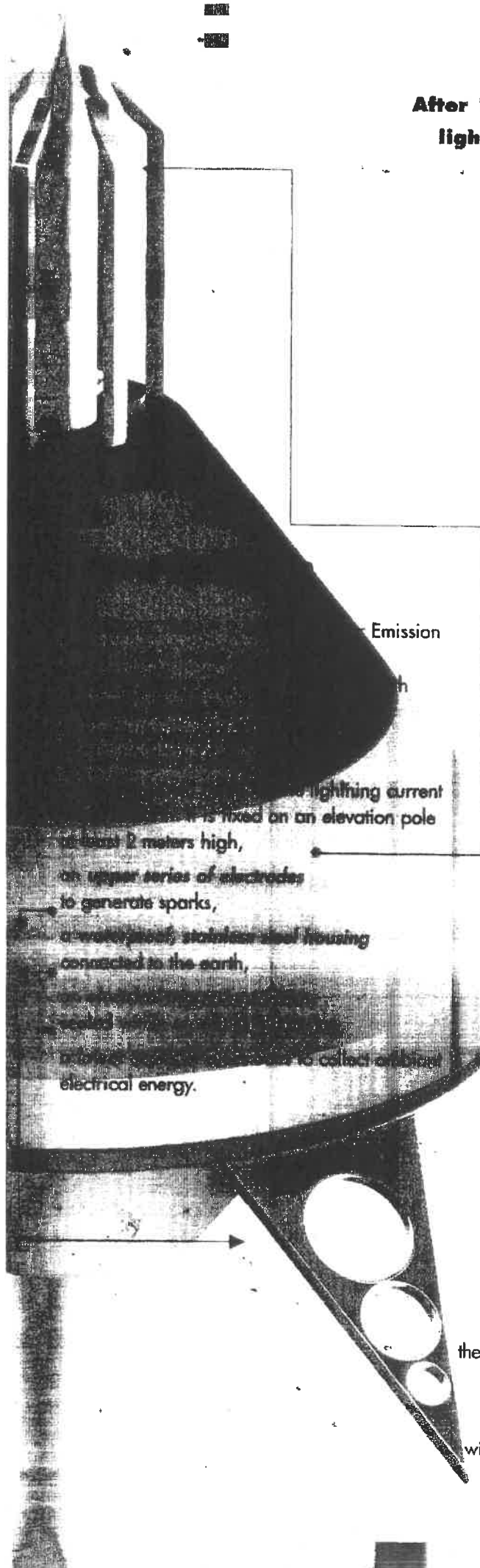
The PREVECTRON® 2's triggering device allows the ions to be fired within a very short space of time. The remarkable accuracy of the triggering system means that the ions are released at precisely the right moment, in other words, a split second before the main lightning strike.

TRIGGERING of the CORONA effect:

the presence of a large number of initial electrons coinciding with the sharp increase in the electrical field allows the natural CORONA effect triggering time to be reduced.

ANTICIPATION of the upward leader:

the PREVECTRON® 2 is designed to generate an upward leader from its tip earlier than those generated by other nearby high points. This means that the PREVECTRON® 2 becomes the preferred point of impact for the lightning within the protected area. When measured in a laboratory, this gain in triggering time is defined as ΔT , and represents a measure of the effectiveness of the PREVECTRON® 2 air terminal when compared to a single rod.



Emission

lightning current
is fixed on an elevation pole

at least 2 meters high,
an upper series of electrodes
to generate sparks,

a more solid, stainless steel housing
connected to the earth,

lower series of electrodes to collect ambient
electrical energy.

Product range

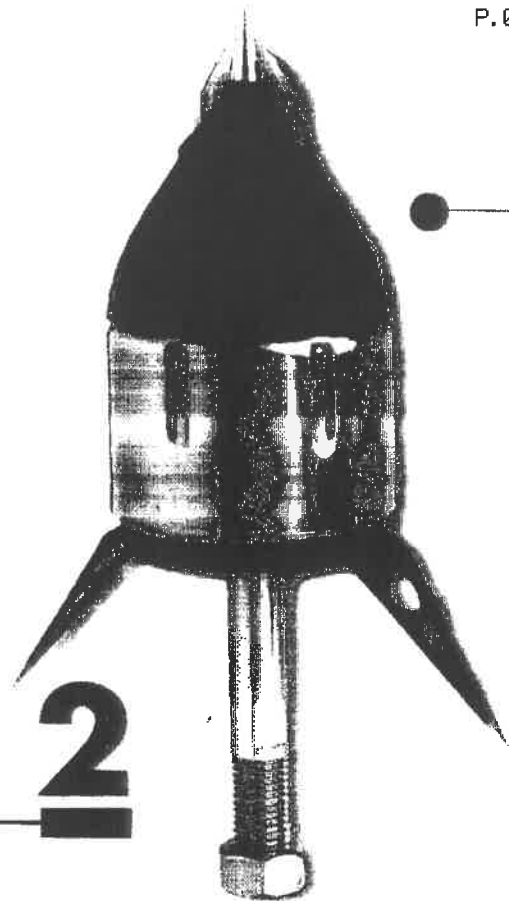
P. 02

There are 5 models in the PREVECTRON™ 2 range available in **Millenium** version. The five air terminal models has different performance specifications corresponding to different protection radii.

Advantages

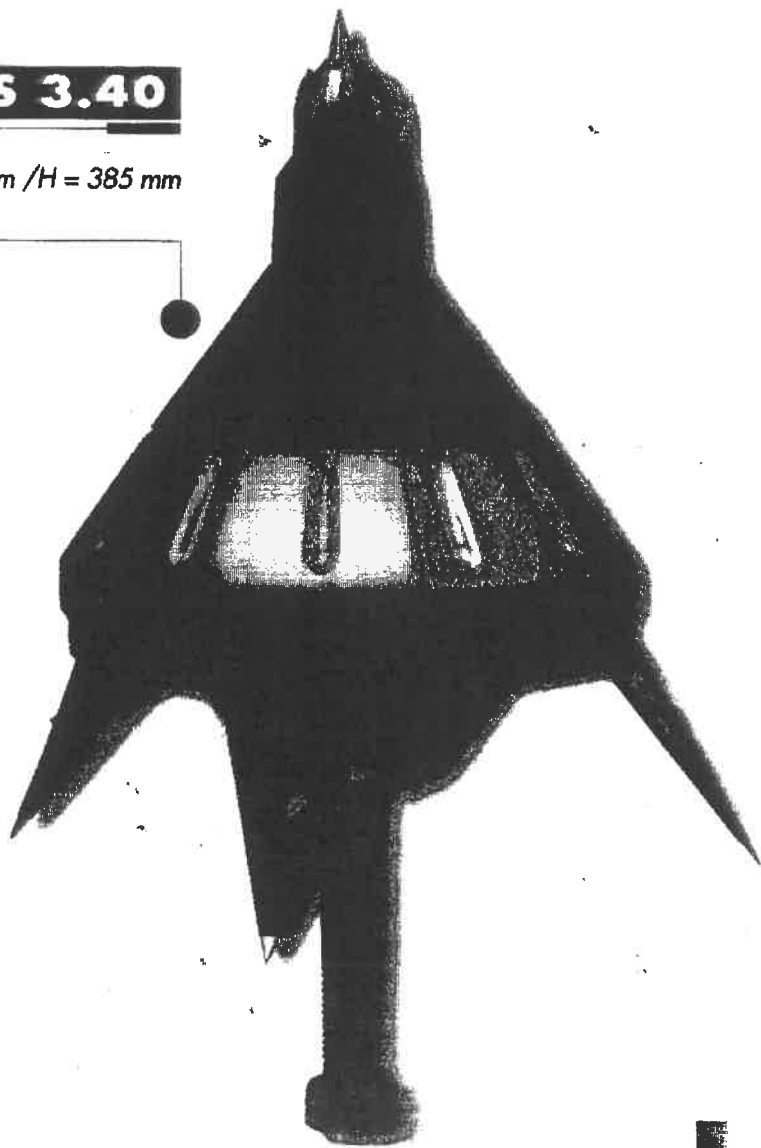
- large choice of protection radii
- improved maximum effectiveness
- total autonomy
- activates itself only when there is a risk of lightning
- permanent, single drop from the tip of the air terminal down to the earth
- reliability and sturdiness tested in both a high voltage laboratory by the C.N.R.S. (French National Scientific Research Center) and in REAL-LIFE LIGHTNING CONDITIONS by the C.E.A. (French Atomic Energy Commission)

Prevectron® 2



S 3.40

Diam. 185 mm / H = 385 mm



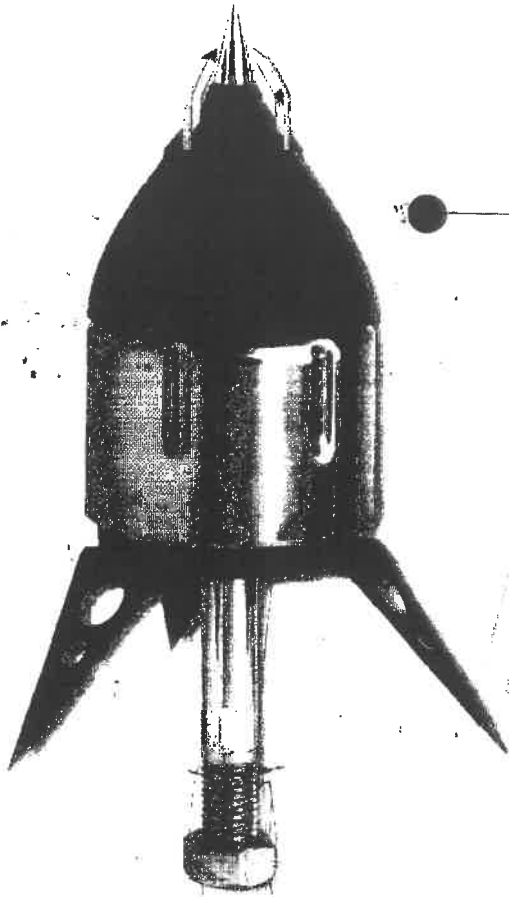
S 4.50

Diam. 185 mm / H = 385 mm



TS 2.25

Diam. 100 mm
H = 330 mm



TS 3.40

Diam. 100 mm
H = 330 mm

5 models

TS 2.25

TS 3.40

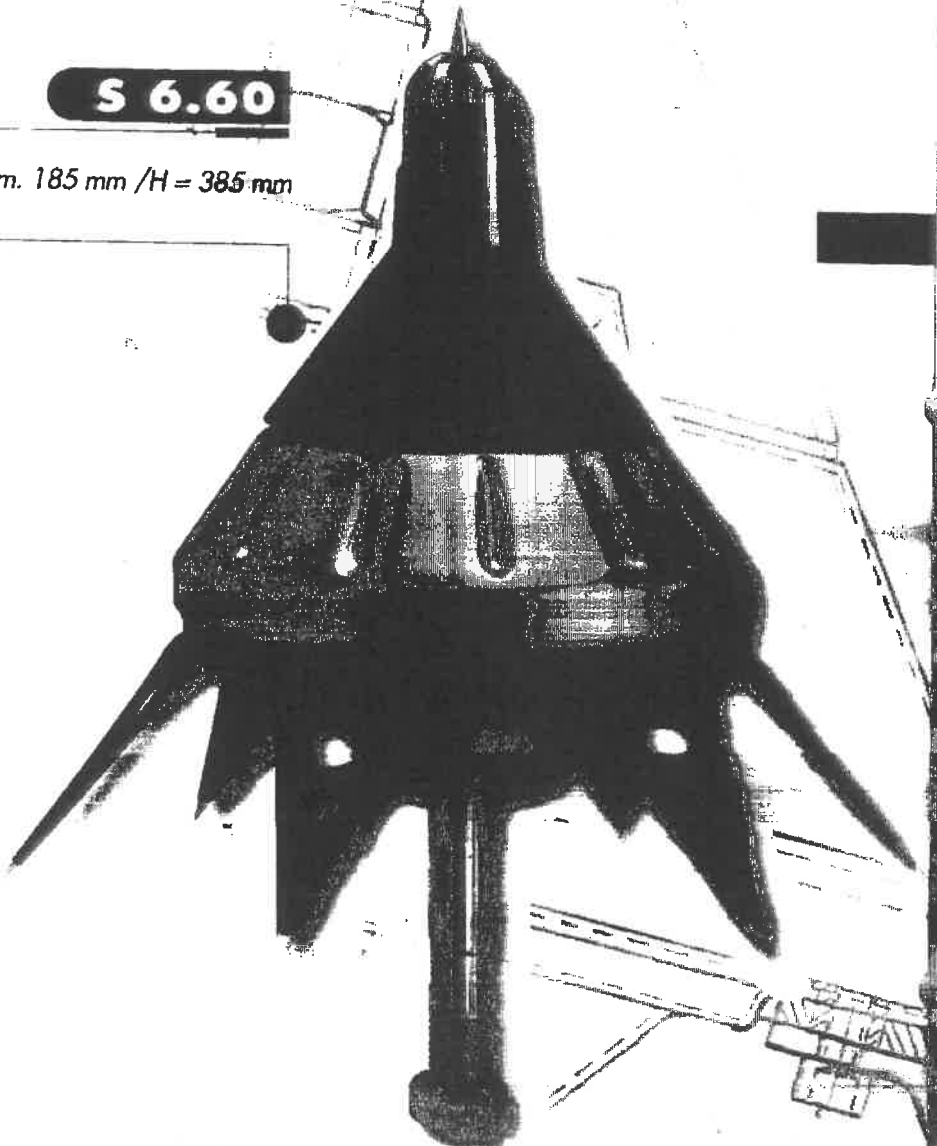
S 3.40

S 4.50

S 6.60

S 6.60

Diam. 185 mm / H = 385 mm

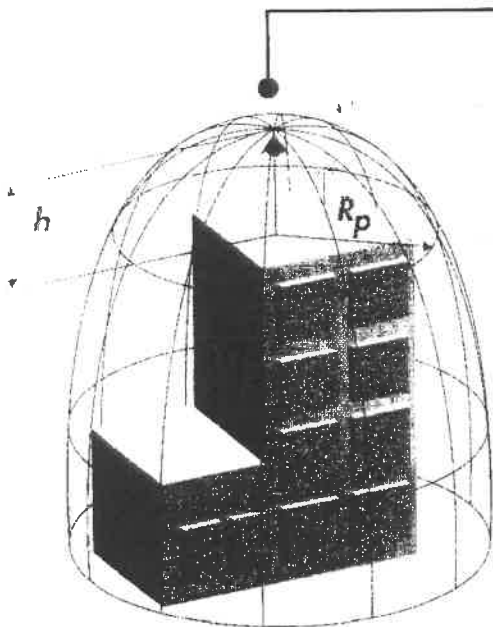


Protection areas

The protection radius R_p of a PREVECTRON® 2 lightning conductor is calculated using the formula defined by the French National Standard NFC C 17-102 (July 1995).

It depends upon several parameters

- Gain in triggering time ΔT of the selected PREVECTRON® model (see INDELEC data sheet: PREVECTRON® Effectiveness Assessment in the Laboratory) allowing the value ΔL , to be calculated using the formula: $\Delta L (m) = V(m/\mu s) \cdot \Delta T(\mu s)$
- Protection level (I, II or III) required for the project and determined according to the lightning risk assessment guide (See NFC C 17-102 standard - appendix B).
- Actual height of the lightning rod above the area to be protected: h



$$R_p = \sqrt{h(20h) - \Delta L(20h)} \quad \text{where } h > 5m.$$

When $h < 5m$, see PREVECTRON® protection radii tables (right).

$D = 20, 45$ or 60 depending on the protection level required.

h = actual height of the PREVECTRON® above the area to be protected (in meters)

$$\Delta L = \Delta L (m) = V(m/\mu s) \cdot \Delta T(\mu s)$$

Protection radii

Level I : $D = 20 m$ - high protection

$h (m) \gg$	2	3	4	5	6	7	8	10	15	Maxi 20m
S 6.60	31	47	63		79	79	79	79	80	80
S 4.50	27	41	54		69	69	69	69	70	70
S 3.40	23	35	45		58	59	59	59	60	60
TS 3.40	23	35	45		58	59	59	59	60	60
TS 2.25	17	25	34		43	43	43	44	45	45

Level II : $D = 45 m$ - medium protection

$h (m) \gg$	2	3	4	5	6	8	10	15	20	Maxi 45m
S 6.60	39	58	74		98	98	99	101	102	105
S 4.50	34	51	65		88	88	88	90	92	95
S 3.40	30	45	58		77	77	77	80	81	83
TS 3.40	30	45	58		77	77	77	80	81	85
TS 2.25	23	34	46		58	59	61	63	65	70

Level III : $D = 60 m$ - standard protection

$h (m) \gg$	2	3	4	5	6	8	10	20	45	Maxi 60m
S 6.60	43	64	85		107	108	109	113	119	120
S 4.50	38	57	74		95	97	98	102	109	110
S 3.40	33	50	67		84	85	87	92	99	100
TS 3.40	33	50	67		84	85	87	92	99	100
TS 2.25	26	39	52		66	67	69	75	84	85

All Prevectron® 2 have a M16 threaded base.

Indelec
lightning protection

www.indelec.com

Corporate head: Division
41, chemin des Postes - 59501 Douai - France

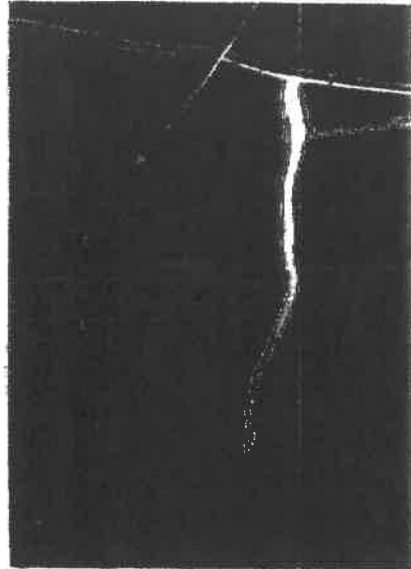
Safety standard tests

From the outset, the PREVECTRON® lightning conductor has undergone testing in France's top high voltage laboratories: the Electricité de France Renardières center and the CEDIVER Laboratory at Bazet. Throughout product development, these tests showed good resistance to high current and voltage shocks (up to 6 KV).

The effectiveness of the lightning conductor was also demonstrated at an early stage: the time of breakdown of a high voltage discharge on the PREVECTRON® air terminal was shorter by several tens of microseconds compared to a discharge on a single rod in the same test conditions.

When these tests were carried out by the French National Scientific Research Center (CNRS) on the PREVECTRON® 2, they showed the effectiveness of the lightning conductor as defined in the French National Standard NF C 17-102. The characteristic value of each model, its ΔT , was thus able to be measured and clearly showed the PREVECTRON® 2 to be in compliance with NF C 17-102 standard.

(See INDELEC data sheet: PREVECTRON® Effectiveness Assessment in the Laboratory).



EDF «Les Renardières»
high voltage laboratory

Research and development

INDELEC is the only company to conduct on-site testing in real-life lightning conditions on its products and has done so for several years. The tests were developed closely with a team from the French Atomic Energy Commission (Grenoble ; France) who are experts in triggered lightning.

A number of test campaigns, providing a wealth of useful information, were carried out at Camp Blanding in Florida (USA) and at Saint Privat d'Allier in France.

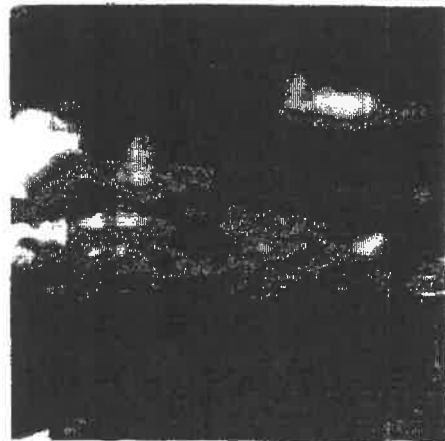
Some of the most revealing findings include:

- the extent to which the PREVECTRON®'s effectiveness was demonstrated by measuring and comparing the electrical activity at the tip of several air terminals
- details of the way the PREVECTRON®'s triggering system worked
- proof of its ability to withstand real lightning discharges by analyzing a PREVECTRON® which had been subjected to numerous lightning strikes (see INDELEC data sheet: PREVECTRON® On-Site testing using natural lightning conditions).

This scientific research, carried out on the PREVECTRON® has enabled us to incorporate many new developments into the PREVECTRON® 2.

St Privat d'Allier - France
Test site

The PREVECTRON® 2 : the first Early Streamer Emission air terminal conforming to French National Standard NF C 17-102 to have successfully completed on-site testing in real-life lightning conditions.



Camp Blanding - Florida - USA
Test site





> QUALITY

Quality

Company

- History
- Group of Companies
- Facilities
- Human Resources
- Quality
- References

Lightning

- Lightning knowledge
- Lightning damage
- Lightning protection
- F.A.Q

Lightning mastered

- Prevectoron® 2
- Installation
- R&D - HV Lab test
- R&D - Introduction to real lightning conditions tests
- R&D - Real lightning conditions tests, results

Indirect protection

- Overvoltage
- Installation guide
- Surge protection cabinets

Products

- List

Services

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- Survey
- Installation
- Maintenance

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- Events
- Itinerary
- Indelec Documentation

INDELEC began actively pursuing certification of its quality control system in 1999 and was rewarded in December of that year when BVQI gave its approval for the company's ISO 9002 certificate.

Approved QC procedures are an integral part of all our services, leading to enhanced customer satisfaction at each stage in the manufacturing process and marketing of our products. BVQI's annual audit of our system has led to successful renewal of our certification every year since. The commitment of our teams led to our achieving another QC milestone in 2002, when a new Quality Handbook was introduced to cover the latest ISO 9000 standards.

November 2002 saw INDELEC awarded the ISO 9001 (2000) certificate, a new standard which involved a total revamp of our quality system and the incorporation of the product design process. Certification now covers a broader range of fields, including design, manufacture of our Prevectoron early streamer emission lightning conductors and relevant installation accessories.

A copy of this certificate is available on request from your usual contact, or by sending an e-mail to: contact@indelec.com

New certification

