

Made  
  
Safety



## OptiMax<sup>®</sup> TECHNOLOGY

FOR OPTIMUM LIGHTNING PROTECTION PERFORMANCE

EARLY STREAMER EMISSION  
LIGHTNING CONDUCTOR  
**PREVECTRON 3<sup>®</sup>**

 **Indelec**

[www.masterpetir.com](http://www.masterpetir.com)

# Indelec

## PREVECTRON 3<sup>®</sup>

OPERATING PRINCIPLES  
IN FOUR STAGES :



### 1 CHARGING THE IONIZATION SYSTEM AND OptiMax<sup>®</sup> MODULE

The device is charged via the lower electrodes using the ambient electrical field (several thousand volts/metre when storms are approaching).

This means the PREVECTRON 3<sup>®</sup> is a fully autonomous system requiring no external power supply.

### 2 ACTIVATING THE NEW OptiMax<sup>®</sup> TECHNOLOGY

Whilst dynamically assessing the development of the surrounding electrical field, the PREVECTRON 3<sup>®</sup> detects the appearance of downward leaders. This innovative and patented OptiMax<sup>®</sup> system is then activated to neutralize the space charges, which naturally occur around the lightning conductor.

The PREVECTRON 3<sup>®</sup> is ready to operate in an optimal environment

### 4 EARLY TRIGGERING OF THE UPWARD LEADER

The controlled ionization process and the new OptiMax<sup>®</sup> technology guarantee the triggering of an upward leader ahead of any other protruding point within the area to be protected.

The PREVECTRON 3<sup>®</sup> is the preferential point of impact for the lightning discharge and provides the structure with maximum protection.

### 3 CONTROLLING THE IONIZATION PROCESS

The ambient electrical field increases rapidly when a discharge is imminent and a downward leader descends from cloud to ground. This triggers the ionization process, using a spark ionization system between the upper electrodes and the central tip.

The PREVECTRON 3<sup>®</sup> reacts at the precise moment, when the risk of lightning discharge is imminent.



S 60



S 50



S 40



TS 25



TS 10





## OptiMax® TECHNOLOGY :

### MAXIMAL LIGHTNING PROTECTION

In addition to the Prevectron® models advanced technical specifications (fully conductive central rod, dynamic calculation of the surrounding electrical field, autonomous system...) the PREVECTRON 3® includes for the first time the patented OptiMax® technology.

The OptiMax® system has been developed by the Lightning Innovation and Research Institute LiRi engineers. It neutralizes the space charges surrounding the ESE conductor, prior to the triggering of the upward streamer. The latter can then progress in a perfectly controlled electrical environment.

This innovative system leads to a 40% reduction of the standard deviations measured in the High Voltage Laboratory. Less variations in the H.V. Laboratory mean a more reliable upward streamer development process under real lightning conditions. It therefore improves significantly the lightning protection performance and reliability.

OptiMax  
Technology

Optimized  
Performance

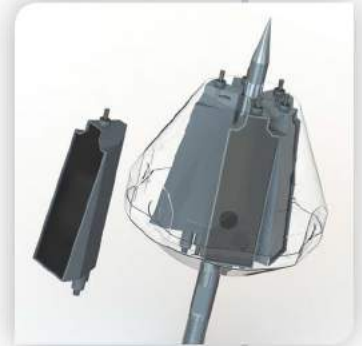
## FIRST EVER MODULAR LIGHTNING ROD

The PREVECTRON 3® also represents a major step in terms of maintenance of the lightning protection system. Each circuit is built and assembled separately. This unique modular design allows the possible replacement of a damaged module.

The condition of the PREVECTRON 3® can be periodically tested with the INDELEC Tester. It enables the client to check the lightning conductor's operational capabilities during the full period of installation of the lightning protection system. This operation is conducted on site and does not require the lightning rod to be dismantled.

The INDELEC Tester meets the requirements of NF C 17-102 : 2011 for lightning protection system maintenance.

With a five (5) year warranty, thanks to its unique design, the PREVECTRON 3® provides its users with an extra-long lifetime.



## STANDARD COMPLIANCE



Being an active member of major International, European and French standard committees, INDELEC is dedicated to develop fully compliant lightning protection solutions. The development, the manufacture, the test procedures and the installation of the PREVECTRON 3<sup>®</sup> comply with international and French standards, especially the NF C 17-102 : 2011 and UNE 21-186 : 2011 standards.

Uniquely manufactured in France, the PREVECTRON 3<sup>®</sup> has successfully been subjected to the full sequence of tests detailed in the NF C 17-102 : 2011 Annex C Standard :

- Marking tests
- Mechanical tests
- Environmental tests in salt mist and humid sulfuric atmosphere
- Electrical test (Voltage withstanding test @ 100kV - 10/350µs waveform)
- Advanced triggering measurement in High-Voltage laboratory to determine the gain in triggering time in comparison to a simple rod.

Test results are witnessed and certified by an internationally renowned independent inspection company : [Bureau Veritas](#).



## THE WORLD'S MOST ACCREDITED ESE LIGHTNING CONDUCTOR

The PREVECTRON 3<sup>®</sup> development was conducted far beyond the standard requirements. The new ESE rod benefits from the following certifications :



• UL Certified is affixed for the first time ever on an Early Streamer Emission lightning conductor. Underwriters Laboratories Inc (UL) is a global independent safety science company, one of the most renowned certification and testing group in the world.



• Lightning current tests in Campinas, Brazil in UNICAMP laboratory : the PREVECTRON 3<sup>®</sup> has been submitted to over 200kA current discharges, whereas the standard requires 100kA discharges. The test results confirm the lightning rod's perfect sustainability in extreme conditions.



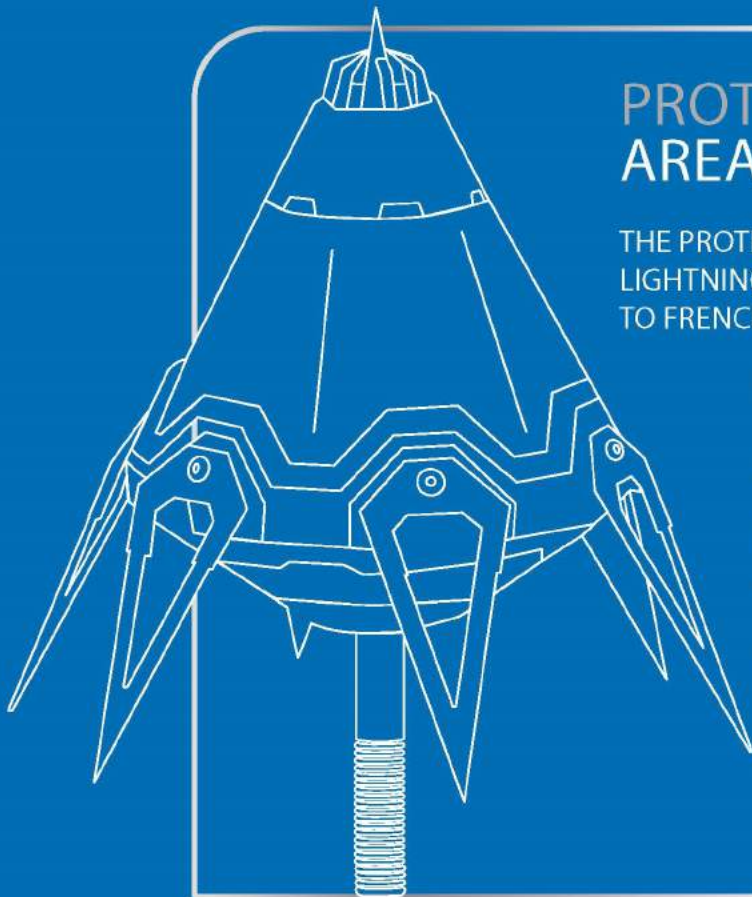
• Qualifoudre certificate N°051166662001 confirms INDELEC's quality management system, manufacturing methods and staff capabilities are compliant with the QUALIFOUDRE standard.

• CE marking is also affixed on the PREVECTRON 3<sup>®</sup> for the first time. INDELEC's new lightning rod meets with all relevant European Directive requirements.



• Russian certificate RTN (N° : RRS 00-05003) pertaining to equipment used in dangerous industrial environments. The PREVECTRON 3<sup>®</sup> is the sole Early Streamer Emission lightning conductor with RTN certification.





## PROTECTION AREA

THE PROTECTION AREA (RP) OF A PREVETRON 3<sup>®</sup> LIGHTNING CONDUCTOR IS CALCULATED ACCORDING TO FRENCH STANDARD NF C 17-102 : 2011, THUS :

$$R_p(h) = \sqrt{(2rh - h^2 + \Delta(2r + \Delta))} \text{ if } h \geq 5\text{m}$$

and

$$R_p = h \times R_p(5)/5 \text{ if } 2\text{m} \leq h \leq 5\text{m}$$

The protection area depends on a number of factors :

- $h(m)$  : is the height of the ESEAT tip over the horizontal plane through the furthest point of the object/area to be protected.
- $r(m)$  : 20 m, 30m, 45m or 60m according to the Protection Level I, II, III or IV assessed for the site using the Risk Analysis calculation (NF C 17-102 : 2011 Annex A).
- $\Delta(m)$  :  $\Delta = \Delta T \times 10^6$ . Field experience has proved that is equal to the efficiency obtained during the ESEAT evaluation tests.

## PROTECTION RADIUS

PROTECTION LEVEL I :  $r = 20\text{M}$

H (M)	2	3	4	5	10
S 60	31	47	63	79	79
S 50	27	41	55	68	69
S 40	23	35	46	58	59
TS 25	17	24	34	42	44
TS 10	10	15	21	26	28

PROTECTION LEVEL II :  $r = 30\text{M}$

H (M)	2	3	4	5	10
S 60	34	52	68	86	88
S 50	30	45	60	76	77
S 40	26	39	52	65	67
TS 25	19	29	39	49	51
TS 10	12	19	25	31	34

PROTECTION LEVEL III :  $r = 45\text{M}$

H (M)	2	3	4	5	10
S 60	39	58	78	97	99
S 50	34	52	69	86	88
S 40	30	45	60	75	77
TS 25	23	34	46	57	61
TS 10	15	22	30	38	42

PROTECTION LEVEL IV :  $r = 60\text{M}$

H (M)	2	3	4	5	10
S 60	43	64	85	107	109
S 50	38	57	76	95	98
S 40	33	50	67	84	87
TS 25	26	39	52	65	69
TS 10	17	26	34	43	49

		S range			TS range	
ADVANCED TRIGGERING	▶ $\Delta T$	60 $\mu\text{s}$	50 $\mu\text{s}$	40 $\mu\text{s}$	25 $\mu\text{s}$	10 $\mu\text{s}$
DIMENSIONS	▶ Height	365 mm			320 mm	
	▶ Diameter (body)	200 mm			140 mm	
	▶ Diameter (Maxi)	317 mm			261 mm	
	▶ Diameter (rod)	20 mm			20 mm	
WEIGHT	▶ Kg	3.9kg	3.3kg	3.0kg	2.0kg	1.8kg
CONNECTION	▶	M 20			M 20	

**In-novation**  
by Indelec

**TEST**  
**REAL LIGHTNING**  
**CONDITION**

## REAL LIGHTNING CONDITION TEST CAMPAIGNS

Since 1993 INDELEC has conducted unrivaled in-situ test campaigns, allowing its engineers to assess the lightning conductors in real lightning conditions.

These test campaigns were originally developed in close cooperation with a team of engineers from the Atomic Energy Commission (C.E.A.), Universities, Research Centers and private partners. These test campaigns provide a wealth of experience in the field of lightning phenomena.

In order to gather as much data as possible, the tests were performed in America, Europe and Asia, with each location providing very different lightning conditions. In 2015, INDELEC inaugurated the new International Lightning Research Center of Jatiluhur – Indonesia.



Test campaigns have provided invaluable data to the Lightning Innovation and Research Institute LiRi engineering team, including :

- Advanced performance of the PREVECTRON® through measuring and comparing electrical activity at the tips of various lightning rods.
- Operation of the PREVECTRON® triggering system.
- Confirmation of the PREVECTRON® robust design by exposing it to repeated discharges.
- Total reliability provided by the PREVECTRON® in a wide range of situations, encompassing all types of lightning conditions, including upward & downward lightning strikes and tropical & winter storms.
- Release of a number of scientific reports in relation to this research.

The PREVECTRON 3® has fully benefited from unique experiences during its development process. Numerous engineering innovations have been totally validated in real lightning conditions.



**In-planet**



## 100% SUSTAINABLE INNOVATIONS

From the early stages of the PREVECTRON 3® development, INDELEC has integrated sustainable development requirements: 100% made in France, reduced weight, increased lifetime, modular design.... Thanks to its "In Planet" label, the new PREVECTRON 3® lightning conductor has been awarded the Prize of Excellence by the AvniR Adjudication Team, promoting the eco-design expertise and innovation within businesses.



# **Indelec**

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