

FRANCE[®] PAR TONNERRES

SMART LIGHTNING PROTECTION SOLUTION



IONIFLASH *MACH*

Early Streamer Emission Air Terminal

International patent, French technology and production



ISO 9001
BUREAU VERITAS
Certification



Authorized Partner:
Extensive Engineering & Service
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LIGHTNING : A NATURAL PHENOMENON

Lightning is a natural phenomenon which occurs in a violent and unpredictable way with a recurrence increased in certain areas of the globe. It contributes to the electric stability of the earth.



CONSEQUENCES

Besides the fact that lightning causes many deaths, it represents billion euros of losses for the economy of the countries.



SOLUTION

The **IONIFLASH[®]** : the efforts of the R&D Department made it possible to develop and to improve the performances of its technology with the achievement of the **IONIFLASH MACH[®]** (registered patent).



THE FIRST WORLD TECHNOLOGY WITH PATENTED SPHERICAL OPTIMIZATION



The **IONIFLASH MACH[®]** is the first Early Streamer Emission Air Terminal in the history of the lightning protection which transposes the last research results and tests in real conditions of lightning. Long research studies [1] have highlighted the superiority of the performance of a rounded tip compared to a sharp rod, both positioned in the same conditions, in laboratory [2] and in real conditions of lightning [3,4].

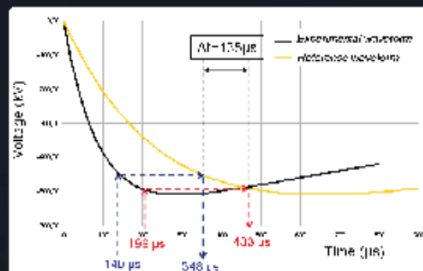
The rounded tip shows a much higher efficiency.

Thanks to the design of the **IONIFLASH MACH[®]**, the concentration and the electric field lines control at the top of the air terminal amplify and regulate [2] considerably the ionization, starting factor of the propagation of the upward leader.

The connection process of the upward leader with the downward leader becomes intensified, synchronically supplied by the principal spark gap and the auxiliary spark gap.

The **IONIFLASH MACH[®]** tip in ellipsoid of revolution and the conception of the spark gaps working in extreme climatic conditions demonstrate [4,5] the precursory and regular character of the propagation of the **IONIFLASH MACH[®]** upward leader, connecting and ensuring the capture of the downward leader to the earth.

Indeed, for a level of electric field given, the sharp rods produce too many charges compared to the rounded tips.



Results of Laboratory tests NFC 17-102

This surplus bound in a plasma then will contribute to mask the sharp rod from the downward leader effects and will reduce strongly the connection process and the capture of the downward leader. Thus, the superiority of the spherical tip of the **IONIFLASH MACH[®]** is shown.



- [1] International Patents France Paratonnerres (1987, 2009)
- [2] National Center of Research Laboratory – Tests under new standard NFC 17-102 2011 (M. Troubat)
- [3] Institute of Mining and Technology New Mexico C.B. Moore, William Rison, James Mathis and Graydon Aulich "Lightning rod Improvement studies"
- [4] France TELECOM – Tests in real conditions on hertzian pylon of 70 meters – Alt. 819 m.
"Contribution au débat sur l'efficacité des paratonnerres ionisants" (Eng. M. Damour)
- [5] SAS France Paratonnerres – In situ tests of IONIFLASH at SUPERBESSE (A. Mottin)



Results published in IEEE



NG60

TECHNICAL DATASHEET

Model

Brand & Origin

Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG60

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

214kA (Tested by Grand Top Laboratory)

60µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

2.2 KG

79m to 107m at 5 Meter Height From The Plan

> 97%

NFC 17102/2011 C, IEC 60060-1, EN 50164-1, UNE 21186

UL Listed, Qualifoudre, Bureau Veritas, CE



NG45

TECHNICAL DATASHEET

Model

Brand & Origin

Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG45

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

214kA (Tested by Grand Top Laboratory)

45µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

2.1 KG

63m to 89m at 5 Meter Height From The Plan

> 97%

NFC 17102/2011, IEC 60060-1, EN 50164-1, UNE 21186

Qualifoudre, Bureau Veritas, CE



NG30

TECHNICAL DATASHEET

Model

Brand & Origin

Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG30

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

214kA (Tested by Grand Top Laboratory)

30µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

2.0 KG

48m to 71m at 5 Meter Height From The Plan

> 97%

NFC 17102/2011, IEC 60060-1, EN 50164-1, UNE 21186

Qualifoudre, Bureau Veritas, CE



NG25

TECHNICAL DATASHEET

Model

Brand & Origin

Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG25

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

214kA (Tested by Grand Top Laboratory)

25µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

1.9 KG

42m to 65m at 5 Meter Height From The Plan

> 97%

NFC 17102/2011, IEC 60060-1, EN 50164-1, UNE 21186

Qualifoudre, Bureau Veritas, CE



NG15

TECHNICAL DATASHEET

Model

Brand & Origin

Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG15

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

214kA (Tested by Grand Top Laboratory)

15µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

1.8 KG

32m to 51m at 5 Meter Height From The Plan

> 97%

NFC 17102/2011, IEC 60060-1, EN 50164-1, UNE 21186

Qualifoudre, Bureau Veritas, CE



NG60 TF

TECHNICAL DATASHEET

Model

Brand & Origin
Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Test device

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG 60 TF

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

215kA (Tested by Grand Top Laboratory)

60µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

2.3 KG

79m to 107m at 5 Meter Height From The Plan

Testing with MACHTEST®

> 97%

NFC 17102/2011 C, IEC 60060-1, EN 50164-1, UNE 21186

UL Listed, Qualifoudre, Bureau Veritas, CE



NG30 TF

TECHNICAL DATASHEET

Model

Brand & Origin
Warranty & Durability

Lightning Strike

Efficiency

Resistance to Corrosion

Net Weight

Radius of Protection

Test device

Rain Conditions Insulating Test

Standards

Certificate

IONIFLASH MACH® NG 30 TF

France Paratonnerres & France

10 years & 35 years

100kA (Tested by Gerac Laboratory)

215kA (Tested by Grand Top Laboratory)

30µs (NFC 17-102/2011 C)

AISI / Solid 316L Stainless Steel

2.2 KG

48m to 71m at 5 Meter Height From The Plan

Testing with MACHTEST®

> 97%

NFC 17102/2011 C, IEC 60060-1, EN 50164-1, UNE 21186

Qualifoudre, Bureau Veritas, CE



IFLASH REPORT

TECHNICAL DATASHEET

Model

Brand & Origin
Warranty

Connectivity

Counting

Functioning

Detection Range

Protection Index

Power Supply

Net Weight

Fixing

Standards

Certificate

I FLASH REPORT

France Paratonnerres & France

01 year

Bluetooth®

Up to 100 impacts

Electronic

1 kA (8/20µs) / 100 kA (10/350µs)

IP67

Lithium battery 3.6 V

200 g

Parallel to Any Type of Conductor

IEC 62 561-6

Qualifoudre, Bureau Veritas, CE



IONICOUNT

TECHNICAL DATASHEET

Model

Brand & Origin
Warranty

Counting

Technology

Detection Range

Protection Index

Power Supply

Net Weight

Fixing

Standards

Certificate

IONICOUNT®

France Paratonnerres & France

01 year

Until 999 999 events

Electromechanical

1 kA (8/20µs) / 100 kA (10/350µs)

IP66

Totally Autonomous Does Not Need Any Power Supply

200 g

Parallel to Any Type of Conductor

NF EN 62 561-6

Qualifoudre, Bureau Veritas, CE



COUNTER

TECHNICAL DATASHEET

Model

Brand & Origin
Warranty
Counting
Technology
Detection Range

Dimension

Power Supply
Net Weight
Fixing
Standards
Certificate

ELECTRONIC LIGHTNING COUNTER

France Paratonnerres & France
01 year
0-999999
Electronic
1 kA - 100 kA
65 x 50 x 45 mm
Totally Autonomous Does Not Need Any Power Supply
140 g
Parallel to Any Type of Conductor
IEC 62 561-6
Qualifoudre, Bureau Veritas, CE

TECHNICAL DATASHEET

Model

Reference
Description
Dimension (mm)

Weight (g)
Connection /
Power Supply
Power Consumption
Detection Range
Operating Temperature
Device Class
Implementation Standard

TITAN-02

80 333
Acquisition Unit/ Field Mill
144 X 187 X 82/130 X 170 X 190
800/2000
24Vcc, 20 a Vcc (Cable Not Included)/ Shielded Cable 15m
Pluggable Connector RS 485 Modbus
1000 mA to 24Vdc
> 20 km
0° to (+)50°C/(-)20°C to (+)55°C
Class I
IEC 62793 : 2016

TECHNICAL DATASHEET

Model

Reference
Description
Dimension (mm)
Weight (g)
protection Index
Connection Kit/
Power Supply
Power Consumption
Detection Range
Operating Temperature
Device Class
Implementation Standard
Reference

GIGA

80 319
Processing Unit/Antenna
38 X 130 X 214/130 X 170 X 190
250/960
IP 20/ IP 66
Universal adapter 90-264 VAC, 50/60 Hz / 24 VDC/ Shielded
Cable 15m Connector-SubD9
110 mA
15 km
(-)20°C to (+)60°C
Class II
IEC 62793 : 2016
80 319

TECHNICAL DATASHEET

Model

Brand & Origin
Warranty
High impulsed current:
Technology
Detection Range
Direct and indirect protection
Fault Indicator

SURGE PROTECTIVE DEVICE

France Paratonnerres & France
01 year
25 kA, 35 kA and 50 kA.
Electromechanical
25 kA to 50 kA
1 and 3-phase power supply network
installations for areas with high risk of lightning strikes
(high keraunic level).
Totally Autonomous Does Not Need Any Power Supply
Equipped with a remote and optical fault indicator contact.



TITAN-02



GIGA



INSTALLATION STANDARD

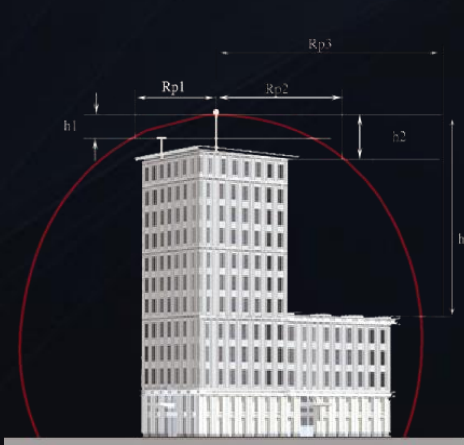


PROTECTION RADIUS IONIFLASH MACH®

The protection radius (Rp) of a ESE air terminal depends of the height of its installation in relation to the surface to be protected, its early streamer emission (Δt) and the level of protection chosen.

Height in meters	2	3	4	5	6	10	15	20	30	45	60
Level I											
MODELS											
IONIFLASH MACH NG15	13	19	25	32	32	34	35	35	34	24	
IONIFLASH MACH NG25	17	25	34	42	43	44	45	45	44	37	21
IONIFLASH MACH NG30	19	29	38	48	48	49	50	50	49	43	30
IONIFLASH MACH NG45	25	38	51	63	63	64	65	65	64	60	51
IONIFLASH MACH NG60	31	47	63	79	79	79	80	80	79	76	69
Level II											
MODELS											
IONIFLASH MACH NG15	15	22	30	37	38	40	42	44	45	42	34
IONIFLASH MACH NG25	20	29	39	49	49	51	53	54	55	53	46
IONIFLASH MACH NG30	22	33	44	55	55	57	58	59	60	58	52
IONIFLASH MACH NG45	28	42	57	71	71	72	73	74	75	73	69
IONIFLASH MACH NG60	35	52	69	86	87	88	89	89	90	89	85
Level III											
MODELS											
IONIFLASH MACH NG15	18	27	36	45	46	49	52	55	58	60	58
IONIFLASH MACH NG25	23	34	46	57	58	61	63	65	68	70	68
IONIFLASH MACH NG30	25	38	51	63	64	66	69	71	73	75	73
IONIFLASH MACH NG45	32	48	64	81	81	83	85	86	89	90	89
IONIFLASH MACH NG60	39	58	78	97	97	99	101	102	104	105	104
Level IV											
MODELS											
IONIFLASH MACH NG15	20	31	41	51	52	56	60	63	69	73	75
IONIFLASH MACH NG25	26	39	52	65	66	69	72	75	80	84	85
IONIFLASH MACH NG30	28	43	57	71	72	75	78	81	85	89	90
IONIFLASH MACH NG45	36	54	72	89	90	92	95	97	101	104	105
IONIFLASH MACH NG60	43	64	85	107	107	109	111	113	116	119	120

The level of protection is given using the NFC 17-102 Edition 2011, EN 62305-2 or UTE 17-108 guide. If the site presents a risk for the environment, the protection radius must be reduced of 40%.



For $2m \leq h \leq 5m$

$$Rp(h) = h \times \frac{Rp(5)}{5}$$

For $h \geq 5m$

$$Rp(h) = \sqrt{h(2r - h) + \Delta(2r + \Delta)}$$

where :

$Rp(h)$ (m) corresponds to the protection radius for a stated height (h). h (m) corresponds to the height of the tip of the ESE air terminal in relation to the horizontal point passing through the top of the element to be protected.

r (m) = 20m for protection level I
30m for protection level II
45m for protection level III
60m for protection level IV

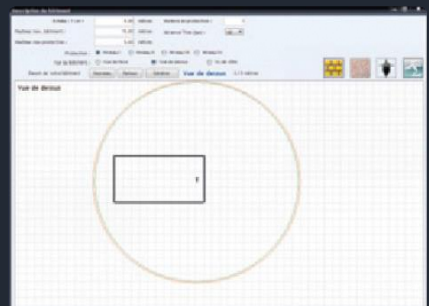
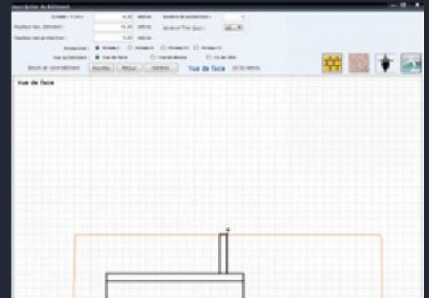
The experience shows that Δ is equal to the efficiency obtained during the evaluation tests of the ESE air terminal.

$$\Delta(m) = \Delta T(\mu s) \times 10^6$$

ΔT = Early streamer emission time of the ESE air terminal obtained with laboratories tests.

IONEXPERT 3000® SOFTWARE

The IONEXPERT 3000® software developed by France Paratonnerres enables you to carry out the lightning risk analysis and the installation of protection devices.



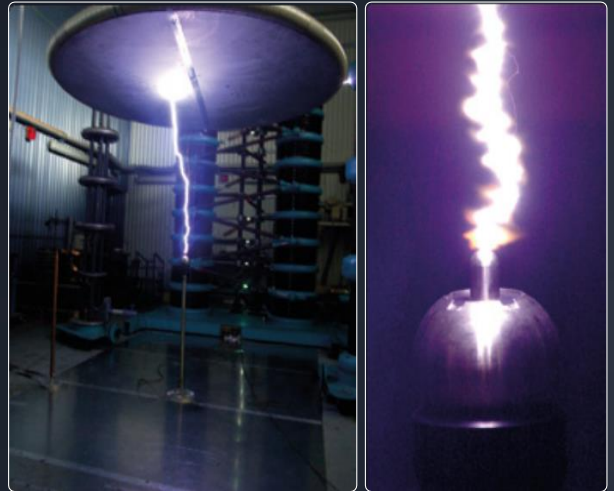
LABORATORIES TESTS

MAIN TESTS

The first ESE air terminal which presents the double performance of conformity to all the tests of the NFC 17-102 Edition 2011 Standard and IEC tests.

- The NFC 17-102 Edition 2011 is the European Standard used as the reference for the prescription and installation of the ESE air terminals.
- The appendix C of the NFC 17-102 Standard requires a complete sequence of consecutive tests carried out with the same ESE air terminal, in conformity in particular with the Standards EN 50164, EN 62305.
- The electrical Standard IEC 60060-1 prescribes the test of insulation in rain conditions, applied to high voltage equipments.

These tests were defined out of France Paratonnerres company, in independent, governmental or accredited COFRAC Laboratories.



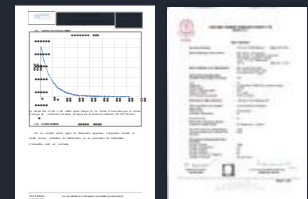
TESTS SEQUENCE

According to NFC 17-102 Edition 2011 (Appendix C)

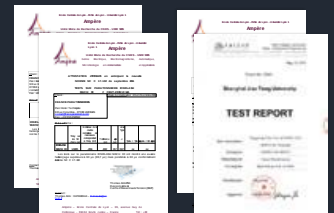
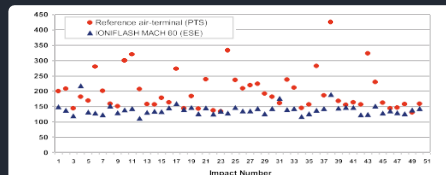


RESULTS AND TEST REPORTS

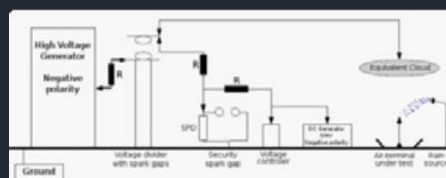
Test according to **EN 50164-1**, prescribed by **NFC 17-102 ed.2011** High current test 100 kA (waveform 10/350)



Early streamer emission test according to **EN 61180-1**, prescribed by **NFC 17-102 ed. 2011**



Insulation test according to **IEC 60060-1**



OUR REFERENCES

40 YEARS OF EXPERIENCE WITH PRESTIGIOUS REFERENCES

More than 20 000 protected sites



Cathedral Notre Dame de Paris – France



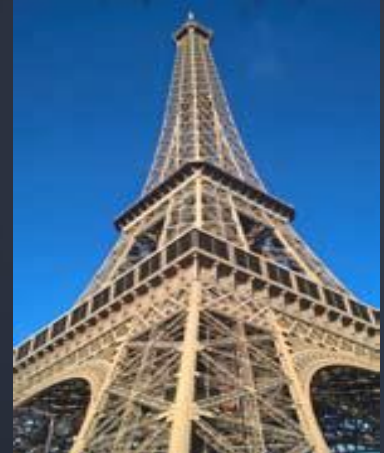
Photovoltaic Central – France



Ariane 5 space rocket launch pad – Kourou – Guyana



Beijing Forbidden City – China



FRANCE PARATONNERRES, A WORLD-WIDE COMPANY

France Paratonnerres has its own Research and Development Department and devotes a significant budget to the innovation through strong partnerships with Scientific Laboratories and Research Centers.



Mueen International Engineering Solutions

beyond limitation with superior service

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