













Contents

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^{*}Non-contractual pictures



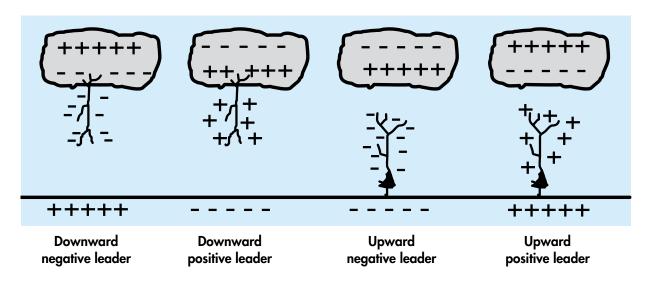
> The lightning phenomenon

Lightning is a natural phenomenon of disruptive electrostatic discharge which is produced when static electricity accumulates between a cloud and the earth. The different electric potential between the two points can be up to 100 million volts and produces plasma on discharge, causing an explosive expansion in the air through release of heat. When it disperses, this plasma creates both a flash of light (lightning) and a sound (thunder).



Formation of or the arrival of a storm cloud creates an electric field between the cloud and the ground. This electric field increases up to values of 10 kV/m, thus initiating creation of corona discharges from irregularities on the ground or from metal structures (projections).

Lightning between the cloud and the ground is composed of both downward leaders and upward leaders.



The negative downward leader (most frequent case), starts within the negative masses of the cloud.

This leader then propagates downward in a succession of intermittent steps (contrary to the positive leader which travels without stepping) of about ten metres and with pauses of 40 à 100 µs between steps.

As the leader progresses, one can see numerous forks pointing downwards.

> The lightning phenomenon

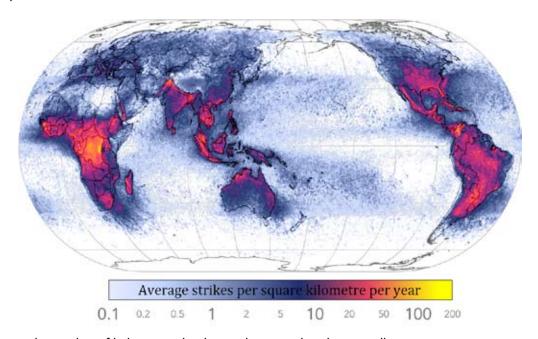
Lightning tends to hit high altitude areas and prominent objects. Thunder may resonate with a sharp cracking sound when the lightning is near and rumble when it is further away. As light travels faster than sound, lightning is visible before the thunder may be heard.

When the electrostatic field is over the dielectric limits of the air (variable depending on humidity and atmospheric pressure), a lightning discharge is produced and accompanied by a sound wave: thunder (produced by the sudden dilatation of air over-heated by the electric arc).

The manufacture of lightning risk protection implicates assessing geographic and climatic conditions to determine the level of exposure to the structure which is to be protected.

The parameters to consider are notably:

- The keraunic level Nk: It expresses the mean annual value of the number of days with storms (days when thunder can be heard in a specific place).
- Density of strike Ng: It indicates the mean value of the number of lightning strikes noted per year and per km².



In France, the number of lightning strikes hitting the ground is about a million a year

Although the probability of being hit by lightning is about one in a million, damage caused by lightning per year represents:

- 10 to 30 deaths
- 100 persons struck by lightning
- 20 000 animals hit by lightning
- 20 000 lightning accidents due to lightning, including 15 000 fires
- 50 000 electrical junction boxes destroyed
- 250 steeples destroyed
- 1 billion euros



> The lightning phenomenon

Without adequate protection, propagation of lightning current can lead to multiple effects which are divided into two main categories: direct and indirect effects:

■ Direct effects

- Mechanical Effects take place when lightning strikes (such as distortion, break-off destruction, ...)
- Thermal Effets (or «Joule's law») cause fusion on impact point, or destruction by explosion of the material or even starting of fires.
- Electrochemical Effects mean the chemical transformation of materials through electrolytic reactions (negligible, mostly present on earths).
- Step potential can provoke burns or cause respiratory failure or cardiac arrest when the lightning current passes through heterogeneous soils.

Indirect effects

- Overvoltages are conducted when lightning strikes an electrical line or pylon directly. The current is propagated and reaches all the installations along the line, even several kilometres away from the point of impact.
- Overvoltages are induced by electromagnetic radiation of the lightning current on all nearby metal elements. Overvoltages and transient currents thus appear on all equipment which is connected to these elements, with proportional effects depending on the intensity and proximity of the lightning strike.
- Surges in tension on the earthing systems, which take place when the current spreads into the ground, provoke damaging tension differences between the mass of the equipment and the networks to which they are connected.
- Earth potential rise of non-negligible current from a lightning strike is evacuated by the earth of the air terminal and sent to the earth of the installation.

To reduce and to protect from these different effects (both direct and indirect), it is necessary to have a state-of-the-art Installation for External Lightning Protection System (ELPS) and Interior Lightning Protection System (ILPS), with particular care taken in earthing and interconnections with the conducting elements running along-side the down conductors poles and the electric masses of the installation.

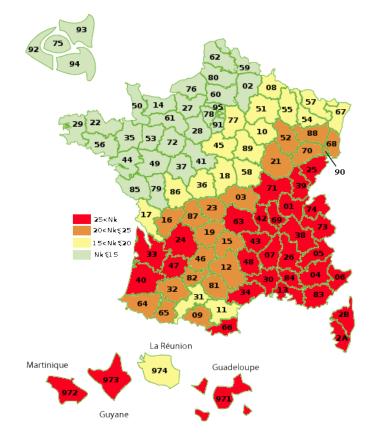
> The lightning phenomenon

The detection network for storms at « Météorage » enables to determine the values of the density of lightning strikes over the whole of France.

When density is not known for any one site, it can be deduced from Nk according to the following equation:

$$N_g = \frac{N_k}{10}$$

Depending on the geographical situation, of the type of electrical power supply or the presence or absence of an air terminal, the installation of a protection system against overvoltages may be compulsory as the following table shows:



Type of situation	Nk ≤ 25	Nk >25	At proximity of an installation of the first column
Building equipped with an air terminal	Type 1	Type 1 Compulsory	Not compulsory
Low voltage power supply by a line which is entirely or partially above ground	Compulsory	Type 1 Compulsory	Not compulsory
Safety risk for people	Not compulsory	Type 1 or 2 Compulsory	Not compulsory
Low voltage power supply by a line which is entirely underground	Not compulsory	Type 1 or 2 Compulsory	Not compulsory

Installing a protection system against overvoltages enables to reduce the probabilities of accidents causes by constraints or overvoltages to an acceptable level, thus providing a safe environment for people or property.

When a surge protector device system is not compulsory, a Lightning Risk Analysis can be carried out to justify its installation or not, if costs of material involved and its unavailability are vital to the installation.



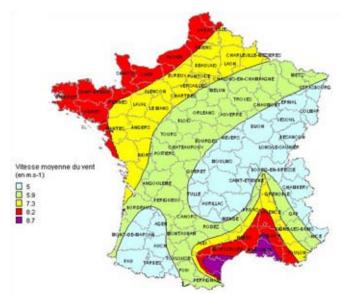
> The lightning phenomenon:

Statutory NV65 were established to fix the values of climatic overvoltages and to provide evaluation methods for the efforts corresponding to a complete building or on its different parts.

In respect with these rules, the **France Paratonnerres** extended poles have been designed to resist in extremely windy conditions without guying.

However, it may sometimes be necessary to check the mechanical strength of the planned installation when a superior level needs to be guaranteed.

France Paratonnerres will then recommend the right and reliable solution by carrying out a detailed study using the appropriate software. Please consult us if you have special requirements.



The map divides France into 5 areas. Each area is then divided into 3 different sites

Protected site: hollow area surrounded by hills and therefore protected from winds coming from all directions.

Normal site: wide plain or plateau with few differences in gradient with slopes below 10%.

Exposed site: near the sea: the coast in general (about 6 kms), tops of cliffs, islands or narrow peninsulas. Inland: narrow valleys where the wind sweeps through; isolated or high mountains and certain mountain passes

Area	Site	Normal pressure (Pa)	Extreme pressure (Pa)	Normal speed (km/h)	Extreme speed (km/h)
	Protected	400	700	92	121,7
Zone 1	Normal	500	875	102,9	136,1
	Exposed				
	Protected	480	840	100,8	133,3
Zone 2	Normal	600	1050	112,7	149,1
	Exposed	780	1365	128,5	169,9
	Protected	600	1050	112,7	149,1
Zone 3	Normal	750	1312,5	126	166,6
	Exposed	937,5	1640,6	140,8	186,3
	Protected	720	1260	123,4	163,3
Zone 4	Normal	900	1575	138	182,6
	Exposed	1080	1890	151,2	200
	Protected	1200	2100	159,3	210,8
Zone 5	Normal	1200	2100	159,3	210,8
	Exposed	1440	2520	174,6	230,9

extreme coefficient = 1,75

Air density = 1,225 kg/m3

Reference pressure at 10m above ground level

> Regulations >

Lightning protection is a domain which is regulated by a large number of standards to which France Paratonnerres adheres to when developing or marketing its many products.

- NF C 17-102 September 2011 edition: Protection contre la foudre:

This standard describes the set up regulations for the protection of structures and open zones against direct lightning strikes by Early Streamer Emission (E.S.E.) Air Terminal.

It gives the rules relative to conception, manufacture, verification and maintenance of installations made using E.S.E. Air Terminals.

This standard basically describes the E.S.E. Air Terminal product and gives test procedures to be carried out

- NF C 15-100: Low voltage electrical installations:

This standard is applicable to all electrical installations with a power supply of below or equal to 1000V alternative current and to 1500V continuous current.

This document lists the rules for design and creation of electrical installations which are to be applied to ensure correct working conditions and safety.

Articles 443 and 534.1 describe more particularly protection measures against voltage and electromagnetic variations.

- EN 61643-11 : Low voltage surge protector devices – surge protector devices connected to low voltage distribution networks – Requirements and tests :

- Exigence et essais :

This standard describes the requirements and tests enabling characterisation of surge protector devices connected to low voltage distribution networks.

- IEC/EN 50164: Lightning Protection Components:

This series of standards is a « product » standard describing the technical characteristics which the various components for protection against lightning have to respect. The series is divided into 7 standardised volumes for different products:

- IEC 62561-1/EN 50164-1: Requirements for connection components
- IEC 62561-2/EN 50164-2: Requirements for conductors and earth electrodes
- IEC 62561-3/EN 50164-3: Requirements for isolating spark gaps
- IEC 62561-4/EN 50164-4: Requirements for conductor fastenings
- IEC 62561-5/EN 50164-5: Requirements for earth electrode inspection housings and earth electrode seals
- IEC 62561-6/EN 50164-6: Requirements for lightning strike counters
- IEC 62561-7/EN 50164-7: Requirements for earth enhancing compounds



> Regulations >

- EN 62305 : Protection against lightning :

This series of standards is divided into 4 volumes and first explains the general principles of lightning, then a gives a method for the evaluation of risks. The third volume describes the rules for the installation of lightning protection systems protecting people and buildings; the final volume proposes protection measures to reduce the risks of network and communication failure:

• IEC/EN 62305-1: General principles

• IEC/EN 62305-2: Risk evaluation

• IEC/EN 62305-3: Physical damage to structures and life hazard

• IEC/EN 62305-4: Electrical and electronic systems within structures

- UTE C 17-108: Simplified Lightning Risk Analysis:

This document is a guide offering a simplified method to analyse lightning risks. The method is inspired from the full lightning risk analysis described in **EN 62305-2**. The method is described as being simplified because it only contains a limited number of parameters compared to the full method. It is therefore only applicable for structures where:

- No explosive product or atmosphere is present
- No danger for the environment is present
- Fire risk is low or ordinary
- Fire risk is high but risk of panic is low

- UTE C 15-712: Photovoltaic Installations:

This document is a guide describing the rules for installing photovoltaic generators connected to the low voltage public distribution network and not designed to work autonomously.

It also gives the rules for the installation of AC and DC surge protector devices providing protection for overcurrents and overvoltages.

- UTE C 15-443: Protection of low voltage electrical installations against overvoltages of atmospheric origin or due to manoeuvres. Choice and installation of surge protector devices.

This practical guide indicates conditions relative to the choice and the implementation of surge protector devices in low voltage installations. It details and completes articles 443 and 534.1 of standard NF C 15-100.









France Paratonnerres is a 100% French company, based in **the Ester Technopole site** in Limoges. (1h by plane from Paris)



In 2014, **France Paratonnerres** has 40 years of research in laboratories and field experiences, of developpement and of production of high technology devices in lightning protection

Its equipments are installed in more than 70 countries in more than one thousand of sites, with a field experience of the most liability, thanks to its technologic choice.

Our company is registered and certified by Bureau Veritas, according to the ISO 9001 2008 Version.

Our procedures, our products and our staff are certified and authorized with respect to the requirements of the **QUALIFOUDRE** certification (approved by the ministry)









Quality charter and sustainable development



- > France Paratonnerres offers to its customers and partners the following competitive advantages >
- At the forefront of the research









A continuous innovation, a product range in permanent evolution:

Our research and Development department is composed of a multidisciplinary team with Doctors in electromagnetic compatibility, doctors in micro-electronic, electromechanic ingeniers, specialized technicians, issued from CNRS research laboratory, and prestigious high school, with permanent know-how transfer for 40 years.

Our concept of sustainable quality assurance leans known a policy of reliability and refusal of the obsolescence scheduled of the products. In this strategy, we associate our suppliers, our scientific and industrial partners in the eco-conception of our systems, and the durability of our products.

Actor in the standardization world









We have in permanence, 4 experts involved in standardization in national, European and international committee.

They participate to all the lightning thematic works of the WG (Working Group), Workshop and Maintenance Team (MT) and are present to a large majority of the meeting in lightning.

This expertise is available to help you for defining your strategic, statutory and economic orientations.

Actor in the scientific research

France Paratonnerres participates actively in the scientific research via much collaboration with famous laboratories and industrials.

France Paratonnerres also participates regularly at various congress and lightning conference all over the world.



- > France Paratonnerres offers to its customers and partners the following competitive advantages >
- A quality guaranteed by big brands







And implemented by a quality management in all the technical operations

- Reception and control of all the entering materials
- Certificates of compliance material
- Traceability of every component
- Individual control of every device in several stages of the production
- Recording of the statements, the analysis of the events
- Since the origin of the raw material, manufacturing of the part, and the final conception, each component is treat, verify, tested and individually registered.

■ A department of very high quality

Our organisation insures you:

- the same interlocutor, trilingual with a pointed follow-up of your commercial and technical projects
- An answering time, lower than 24h for your consultation
- A deadline of load from 24 to 48 hours for all your orders

A human and social politic,

Which, attentive to the respect of the people, and to their well-being in the company, in the environmental protection, in the respect for the obligations, for the securities, and laws in force, so contributes to the operational excellence and strategic of its partners





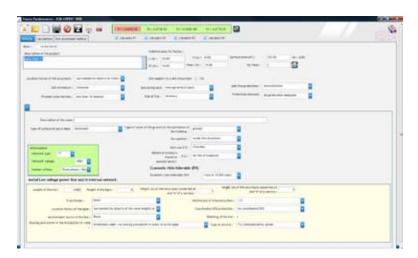


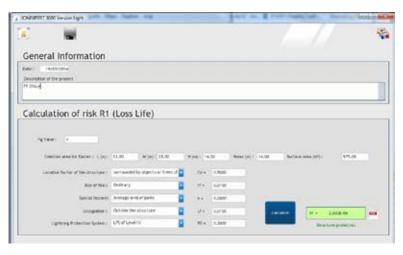
> Lightning Risk Assesment and Technical Studies >

For complex cases, France Paratonnerres uses:

The **IONEXPERT 3000**® enables quickly and easily to determine the Protection Level required, in order to protect efficiently, and according the standard a site.

IONEXPERT 3000® has been developed by France Paratonnerres





Moreover, this software gives a Quick Technical Study of the site and quick view of the protection radius of the air terminals.







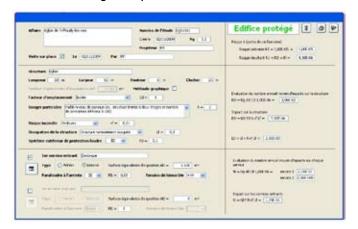
> Lightning Risk Assesment and Technical Studies

The **France Paratonnerres** Design Office has also developed its own risk evaluation tool based on the information in the practical guide UTE C 17-108 dedicated to the simplified analysis of lightning.

A version of this tool can be obtained online from the company by simple request. http://www.france-paratonnerres.com

This software enables depending on the characteristics of the building to be protected:

- Geographical situation
- Location factor
- Dimensions
- Specific danger
- Fire risk
- Occupation of the building
- Existing supply services



To know if, when an external and internal lightning protection system is present, (according to the four levels of protection available), the building is or is not protected. The software programme identifies the level of risk depending on the characteristics of the building and compares it to a tolerated risk level.

Once the protection level has been chosen the Design Office will establish a technical study with the type of protection to be installed.

France Paratonnerres certified **Qualifoudre** by **INERIS**, is committed to carrying out studies in conformity to standard NF **IEC/EN 62305-2**.





Our Design Office is qualified for all types of Lightning Risk Analysis (LRA) and Technical Studies (TS). The Design Office can manage both:

- Analyses considered complex as described in standard EN 62305-2 or NF C 17-102.
- Simpler analyses as in the practical guide NF C 17-108.

Lightning Risk Analysis cannot be prescribed and does not quantify the materials implemented for proposed solutions. These elements are defined by the technical study depending on the protection measures chosen.

Complex Lightning Risk Analysis is managed according to the risk evaluation method as described in standard EN 62305-2 and in accordance to the Annex A of the NFC 17-102 Standard Edition 2011.

Risk evaluation enables the selection of values in consideration of elements in the building which needs protecting. These values will be included in the calculations to find the best level of protection to implement.



> Training Seminars >

■ Training Seminars

France Paratonnerres training proposes two training modules.

• Module n°1: Protection against lightning

• Module n°2: Lightning. Analysis and Detailed protection set up

Module	Subject	Theme Objective		Skills Required	
		The Lightning Phenomenon	Installers		
MODULE 1	Protection against	Standards regarding Lightning Protection	Distributors	None	
(1 day)	Lightning	Establishing protection	DISTRIBUTORS	None	
		Demonstration on site	Architects		
		Effects of lightning			
		Standards and Regulations	Engineers		
MODULE 2	Lightning Analysis and Detailed	Lightning Risk Analysis	Technicians	Electrotechnical and	
(2 days)	protection set up	Case studies	Maintenance engineers	Building & Public Works knowledge	
		Protection systems	otection systems Installers		
		Setting up protection			

Training takes place at the Head Office of France Paratonnerres

If you need us to visit a site in France or abroad, please contact us.

Training dates are available on request

> Take off, Dismantling, Packaging and Storage of radioactive air-terminals >



In France, the law decree of October 11th, 1983 forbids the use of radioactive elements in lightning protection



FRANCE PARATONNERRES HAS THE AUTHORIZATION DELIVERED BY THE ASN (THE FRENCH AUTORITY OF NUCLEAR SECURITY) N° 10.04291

We are authorized to:

- Proceed to the dismantling of the radioactive air-terminals.
- Proceed to the packaging of the radioactive air-terminals.
- Proceed to the removal and to the transport safely of the radioactive air-terminals.
- Proceed to the storage of the radioactive air-terminals before the ANDRA's removal.

All the protection and safety measures have been set up with respect to the article R1337-23 of the code of public health.

> Installations >

















Our teams are qualified to intervene on all types of site, from simple to complex cases classified environmentally protected sites (I.C.P.E.), in accordance with our **Qualifoudre** approval delivered by **INERIS**.

France Paratonnerres can also use the services of partners who are qualified to work on electrical installations, drive aerial work platforms, drill bore-holes, carry out levelling work and so on in order to complete certain installations.

A certificate of conformity to standards can be remitted after work has been carried out.



> Maintenance of sites >











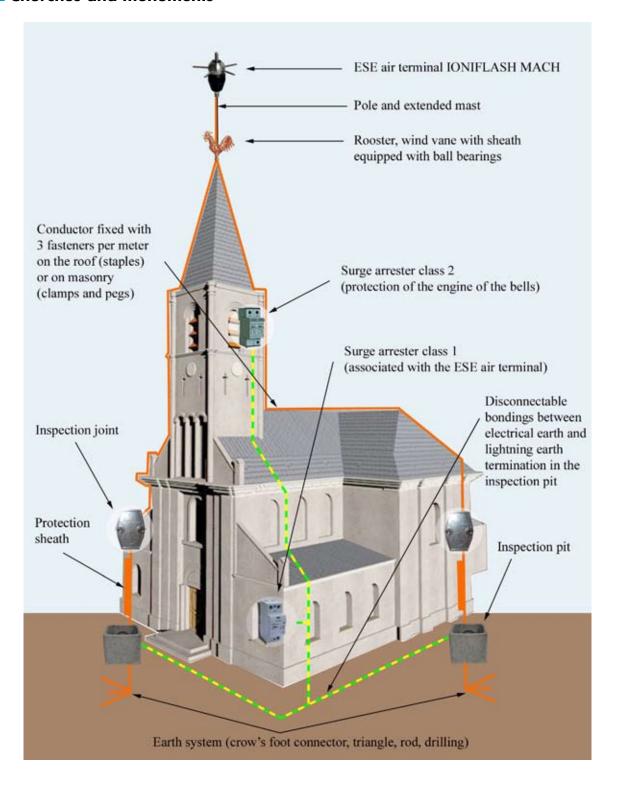
France Paratonnerres ensures maintenance and bringing installations into compliance in accordance to standards:

- NFC 17-100 of December 1997,
- NFC 15-100 of December 2002,
- IEC/EN 62305-3 de 2010,
- IEC/EN 62305-4 de 2010,
- NFC 17-102 of September 2011.

and in appliance with the decrees and instructions in force.

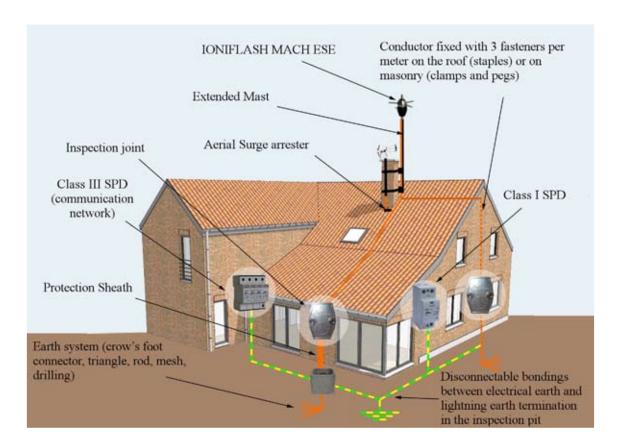
- The state and the quality of fixing elements of down conductors, from air terminal systems to earthing
- Conformity of surge protection devices (state, section...)
- Electrical continuity of such devices, where they are placed and how they are routed, notably those with electrical interconnections.
- The conformity to regulations and the distance of security required.
- Resistance values of earthing terminals.
- All equipotentiality connections
- Existence, state and conformity of the surge protector device installation.

- > Examples of lightning protection installations >
 - Churches and monuments

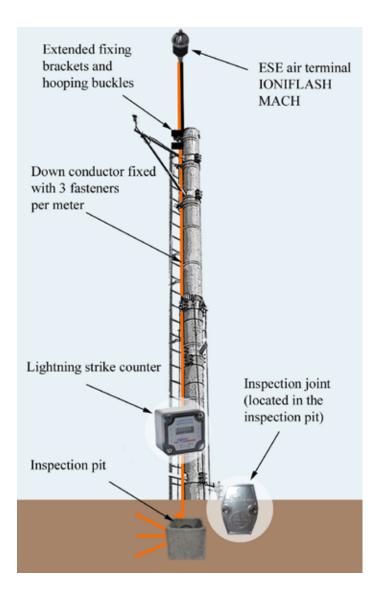




- > Examples of lightning protection installations >
 - Houses and small structures

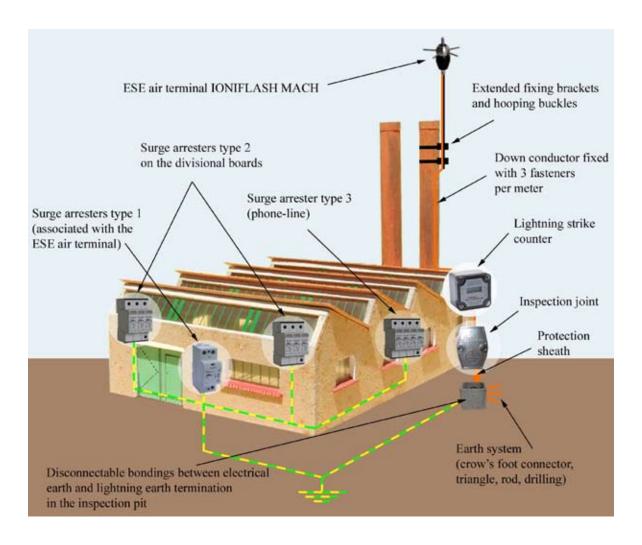


- > Examples of lightning protection installations >
 - Pylon





- > Examples of lightning protection installations >
 - Industrial sites and plantations









> The IONIFLASH MACH® >

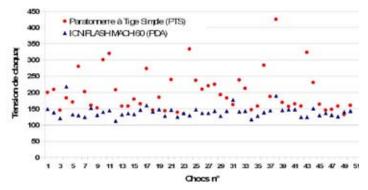
■ The IONIFLASH#### range (early streamer emission air terminal)

A complete and well scaled range from 15 to 60 µs of Early Streamer Emission times, in order to answer in the most adapted way to each needs



IONIFLASH mach °	Mach NG15	Mach NG25	Mach NG30	Mach NG45	Mach NG60
A high level of early streamer emission time Δt	55 µs	78 µs	87 µs	114 µs	135 µs
Security coefficient more important	73 %	68 %	66 %	61 %	56 %
Standard deviation ratio : K	0,61	0,76	0,74	0,44	0,29

- Very low dispersion of its performances
- Functioning well adapted to the lightning frequency range (0 to 10 MHz)
- Is not sensible to bad weather with its internal spark gap
- Two spark gaps proportioned in order to have an adapted range of working and this, whatever the meteorological conditions are. (rain, snow, hail...)



- No electronic device > No energy consumption
- Electrostatic activation of the streamer emission device during the increase of electromagnetic field of the earth
- No fragile component > Metallic parts in Stainless steel 316 L
- Functioning still optimum after 2 serial tests with 7 lightning strokes in normalized wave 10/350 µs at 100 kA
- Eco-conception of the IONIFLASH MACH® is implemented being concerned by the environment
- Patented technology.
- 7 years Guarantee
- Life duration > 35 years

> The IONIFLASH MACH® >

■ Functioning

When the downward leader gets close to the ground (about 100 metres above the point), it generates an electric field above it which increases until 100 kilovolts per metre.

This is when the corona discharge effect takes place, changing suddenly from a position at the tip to an upward leader.

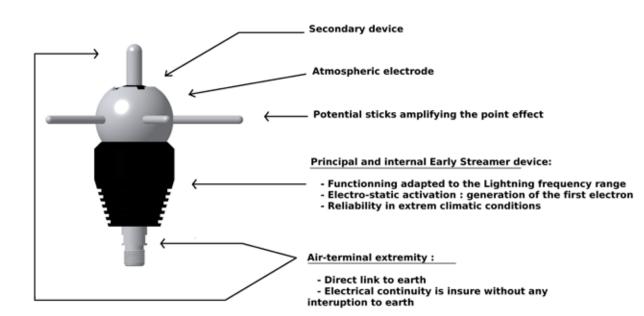
These positive upward leaders suddenly move in the direction of the downward leader. One of the leaders, the closest or the one which has started earlier or the one which has travelled the faster, enters into contact with the downward leader. Then, the ionised air channel is in connection with both the ground and the cloud, and the return stroke can take place, engendering a high lightning current of many kA.

The air terminal **IONIFLASH MACH®** is a device for lightning protection with a spherical metal part fixed to the top. This sphere is insulated from the rod by a ring made from a material with very high electrical insulation properties.

When a storm comes, the external electrode (sphere) charges under the influence of the electric field until the potential reaches a critical value from which a spark appears between the exterior electrode and the tip of the central electrode. The tip enables plasma to be created close by the tip.

The plasma, in association with the intense electric field created close by the tip, constitutes the first stage of development of an upward leader.

The spark produced at the top of the **IONIFLASH MACH®** air terminal will initiate the advance of the discharge, engendering an upward leader moving in the direction of the downward leader.



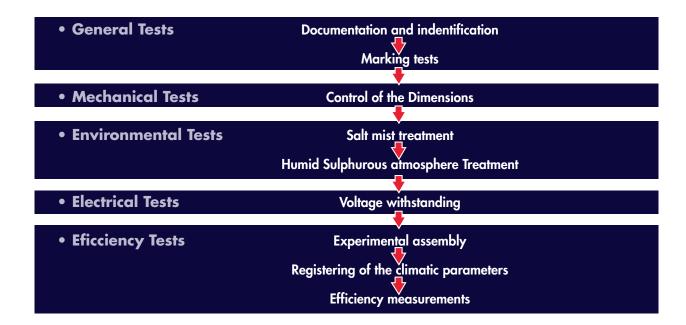


> Standard and Tests >

■ Laboratory Tests

The last edition of the NFC 17-102 standard (2011) Strengthen the tests of requirements with which must be confronted the ESE

A complete sequence of tests is defined in order to confront the **IONIFLASH MACH®** to the whole parameters it will meet in natural condition



■ Homologated in independant Laboratory

The Early Streamer Emission air terminal **IONIFLASH MACH®** is a non-electronic system. The absence of electronic makes it extremely reliable and easy to install on a very large variety of sites.

In addition, the materials used to make **IONIFLASH MACH®** have been selected for their resistance to both corrosion and very high temperatures.

The **IONIFLASH MACH® ESE** air-terminals have passed the complete sequence of tests of the NFC 17-102 standard (2011). Some tests have been realized in a more severe way than required in order to warranty the most important liability to our products.

Moreover, the good insulation of the **IONIFLASH MACH®** has been tested in rain condition with respect to the IEC 60060-1 standard.

> Standard and Tests >

■ Homologated in independant Laboratories

General test

The engraving laser of the **IONIFLASH MACH®** meets the requirements of marking of the test. It is indelible with time.

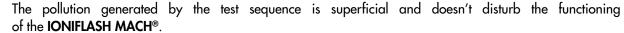
Mechanical tests

The continuous axis of the **ESE IONIFLASH MACH®** through which the lightning current passes, presents a minimal section of 200 mm ² according to the requirements of this tests.

Environmental tests

The IONIFLASH MACH® have passed the environmental tests:

- Salt mist treatment with a severity of level 2 according to the EN 60068-2-52.
- Humid sulphurous treatment with a 7 cycles sequence according to the EN ISO 6988.



Electrical tests

The IONIFLASH MACH®, range has been tested in lightning attachment impact with a $10/350 \, \mu s$ waveform at $100 \, kA$ and passes the test requirements.

Indeed, the **IONIFLASH MACH®** has been impacted by 2 series of 7 impacts at 100kA (while the standard requires only 3 impacts), one in negative polarity and one in positive polarity.

The air-terminals show no deterioration or performing, except the parts throught which the current is flowing, where tracks of initiating and fusion appear.

It is important to note that the IONIFLASH MACH® has been tested via the attachment method and not with the contact one. Indeed, when the generator electrode is in direct contact with the ESE tip, the spark and the disruption of the air properties isn't generated. In this way, the put under constraint of the ESE's tip isn't realized.

Efficiency tests

Le **ESE IONIFLASH MACH**® is design to reduce the average statistical time associated with the initiating of the upward streamer. This ESE presents an advanced time in comparison with a simple reference rod (PTS) tested in the same conditions. This gain is evaluated in high voltage laboratory









> Standard and Tests >

■ Homologated in independant Laboratories

IONIFLA	SH MACH °	Mach NG15	Mach NG25	Mach NG30	Mach NG45	Mach NG60
	Average reference time of breakdown <t'<sub>PTS> (µs)</t'<sub>	252	252	186	186	199
Results on the	Average reference time of breakdown <t'pda> (µs)</t'pda>	222	213	150	138	140
experimental waveform	<t'<sub>PTS> - <t'<sub>PDA></t'<sub></t'<sub>	30	39	34	46	59
in laboratory	Standard deviation PTS (µs)	40	40	43	43	62
<t'<sub>PTS> (µs)</t'<sub>	Standard deviation σ_{PDA} (µs)	31	25	32	19	18
	$k = \frac{\sigma_{PDA}}{\sigma_{PTS}}$	0.61	0.76	0,74	0,44	0,29
Weighted ear	Weighted early emission time		25 µs	30 µs	45 µs	60 µs
Safe	ty Rate	73 %	68 %	66 %	61 %	56 %

During efficiency test, in different high voltage laboratories, the **IONIFLASH MACH®** air-terminal have obtained excellent breakdown time <T'> with very low standard deviation in comparison with the simple reference rod.

Insulation test in rain condition

The IONIFLASH MACH® have also been tested in rain conditions

In High voltage laboratories, the breakdown voltage in dry and rain conditions are compared

The **IONIFLASH MACH®** ESE are very well insulated and their working isn't disturb by the rain pollution.

Insulation test are realized both in continuous and impulsed voltage

Moreover, the IONIFLASH MACH® have passed insulation tests in rain conditions.



Tests have been performed according to IEC 60060-1 standard protocol. The insulation is greater than 97 %.

> Standard and Tests >

■ In compliance with National and International Standards

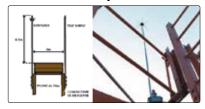
This gain in emission time of the upward leader enables a gain in distance of about 60 m compared to a conventional air terminal (by taking into account that average speed of leaders is about 1 m/µs).

Thus, the protection of our **IONIFLASH MACH**®, for a surface to be protected, depends on the lightning level of protection determined by the lightning risk evaluation (EN 62305-2), on the height of the tip of the air terminal and on the early streamer emission time (ΔT)

- The IONIFLASH MACH® has been tested strictly in respect of the procedures defined in the NFC 17-102 in :
- AMPERE CNRS (National Scientific Research Center) Laboratory in LYON (France)
- Laboratoire de Génie Electrique in PAU (under bailiff's control)
- SHANGHAÏ JIAO TONG Laboratroy (China)
- Laboratoire CPRI BANGALORE (India)
- GERAC Laboratory of LIMOGES (France)
- LCIE Central Laboratory of FONTENAY UAX ROSES (France)
- TESTED IN COMPLIANCE WITH STANDARDS NFC 17-102 2nd edition September 2011, UNE 21186 Annex C, EN 50164, EN62305 and NP4426

■ The IONIFLASH MACH® is tested and analysed in various In situ test

In situ test FT / Puy Beaubier Site - Alt. 879m - June 1987 to June 1988



Hertzian pylon of 70m installed on very impacted site. The **IONIFLASH IF1** and a simple rod were installed at both side of the pylon at the same high.

The results were several impacts on the ${\bf IONIFLASH}$ and none on the Simple rod.

In Situ Test / High Mountain resort - Alt. 1804m - April 2009



The target: to validate the performance of the material used, as well as the behaviour of the **IONIFLASH MACH®** in extreme climatic condictions.

Winds > 150km/h an temperatures from -35°C to 40°C Installation on a telecommunication pylon (15m high).

The mechanical resitance and in temperature of materials in extreme climatic conditions is perfect.

The lightning strike counter IONICOUNT® records the events

In Situ Test / Satu Mare Church (Romania) - June 2011



The target: to observe the earky streamer emission of the **IONIFLASH MACH®** facing a simple rod both installed in the same conditions.

The church has two spires: the IONIFLASH MACH® and the simple rod are installed in identical conditions.

The lightning strike counter IONICOUNT® records the events



> Protection Radius >

■ Radius of Protection of the IONIFLASH MACH®

The radius of protection (Rp) of an E.S.E. air-terminal depends on its height (h) in relation to the surface to be protected, its early streamer emission time (Δt) and the level of protection (Lp) chosen.

$$Rp = \sqrt{h(2D - h) + \Delta L(2D + \Delta L)}$$
 for $h \ge 5m$

Rp (h) = h x
$$\frac{\text{Rp}(5)}{5}$$
 for $2 \le h \le 5\text{m}$ (2)

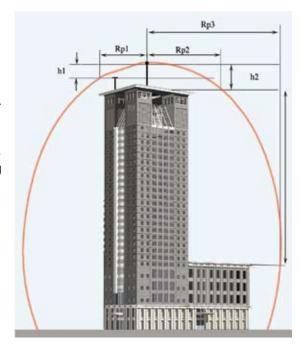
Rp (h) (m) corresponds to the protection radius for a stated height (h);

h (m) =corresponds to the height of the tip of the E.S.E. 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

$$\Delta$$
(m) = Δ T x 10⁶



The experience shows that Δ efficiency is obtained during the evaluation tests of the E.S.E. air-terminal.

> Protection Radius

■ Radius of Protection of the IONIFLASH MACH NG

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

Calculate your protection radius on : www.france-paratonnerres.com

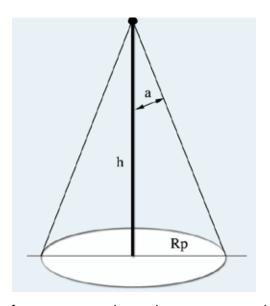


> Protection Radius >

■ Radius protection of a simple rod

The protected volume of a simple lightning rod depends of the height (h) of the masts where it is installed in relation to the surface to be protected, and of the Level of protection (Np).

For most of the case, the angle of protection method is suited. The angle of protection is constant for heights h lower than 2 m



Angle of protection according to the EN 62305 standard

In comparison with the IONIFLASH MACH ESE, the table below indicates the protection radius (Rp), versus the height of the simple air-terminal and gives the protected volume.

Simple Rod protection radius (m)								
	Level II Level III							
2	5	6	8	10				
3	7	7	10	13				
4	8	9	13	15				
5	8	10	13	16				
6	9	11	14	17				
8	10	12	16	19				
10	10	14	18	21				
20	8	15	22	27				
30		12	23	30				
45			19	31				
60				25				







> Capture systems >

■ The IONIFLASH MACH® Air Terminals

- Stainless steel 316 L range

Early Streamer Emission Air Terminal for the protection of all the structures and opened areas.

[Patented technology. High reliability

[Very early streamer emission of the leader

[Low dispersion of the time of breakdown when tested under high voltage.

[Very good Carboon footprint

• IONIFLASH MACH NG 60



• IONIFLASH MACH NG 45



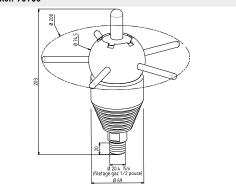
• IONIFLASH MACH NG 30



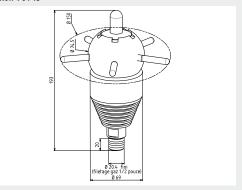
In accordance with the standards NFC 17-102 and UNE 21-186

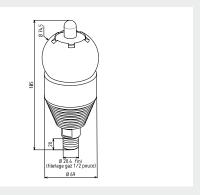
Capture elements in accordance with the standards EN 50164, as required in the serial standards EN/CEI 62305.

Ref. 90160



Ref. 90145

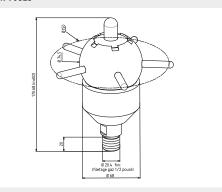




- > Capture systems =
 - The IONIFLASH MACH® Air Terminals
 - IONIFLASH MACH NG 25 _

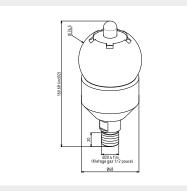


Ref. 90325



• IONIFLASH MACH NG 15 _





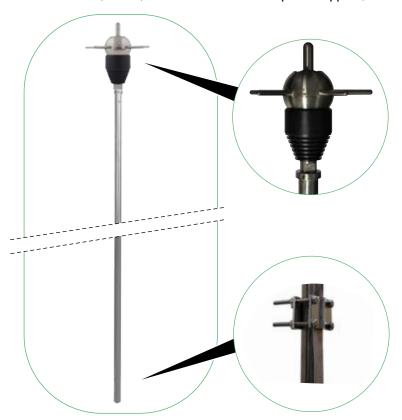
Ref	Description	Material	Emission Time		Weight
Kei	Description	Muleilui	measured	weighted	vveigiii
90160	MACH NG 60	Stainless steel 316 L	135 µs	60	2,2 kg
90145	MACH NG 45	Stainless steel 316 L	114 µs	45	2,1 kg
90130	MACH NG 30	Stainless steel 316 L	87 µs	30	2 kg
90325	MACH NG 25	Stainless steel 316 L	78 µs	25	1,9 kg
90315	MACH NG 15	Stainless steel 316 L	55 µs	15	1,8 kg



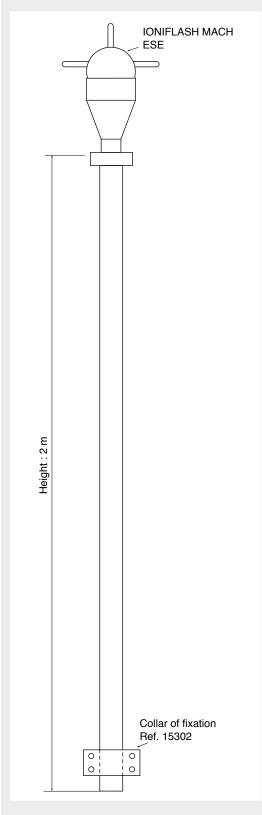
> Capture systems >

■ Sets of 2,15 m IONIFLASH MACH

- The IONIFLASH MACH NG kits are constituted of the elements below:
 - 10260: 1 IONIFLASH MACH NG60 (90160) + Pole of 2m in 304L stainless steel (11043) + 1 collar of fixation in tinplated copper (15302)
 - 10245:1 IONIFLASH MACH NG45 (90145) + Pole of 2m in 304 L stainless steel (11043) + 1 collar of fixation in tinplated copper (15302)
 - 10230: 1 IONIFLASH MACH NG30 (90130) + Pole of 2m in 304 L stainless steel (11043) + 1 collar of fixation in tinplated copper (15302)
 - 10225:1 IONIFLASH MACH NG25 (90325) + Pole of 2m in 304 L stainless steel (11043) + 1 collar of fixation in tinplated copper (15302)
 - 10215: 1 IONIFLASH MACH NG15 (90315) + Pole of 2m in 304L stainless steel (11043) + 1 collar of fixation in tinplated copper (15302)



Ref	Length	Weight
10260	2,15 m	6,31 kg
10245	2,15 m	6,30 kg
10230	2,15 m	6,29 kg
10225	2,15 m	6,28 kg
10215	2,15 m	6,27 kg



> Capture systems >

■ The IONIFLASH MACH® range

- Copper range

 $\ensuremath{\mathsf{E.S.E.}}$ Air terminals for the protection of all types of structures and all open spaces.

[Patented technology. Very reliable

[Very early streamer emission of the leader. Emission at the right time

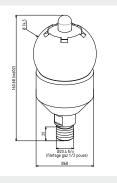
[Low dispersion of the time of breakdown when tested under high voltage.

[Very good carbon footprint.

• IONIFLASH MACH NG 15



Ref. 90316

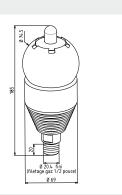


IONIFLASH MACH NG 30



Advanced Time Weight Ref Designation Material Measured Weighted 90316 MACH NG 15 S/s copper bonded 316 L 55 µs 1,8 kg 15 90131 MACH NG 30 S/s copper bonded 316 L 87 µs 30 2 kg

Ref. 90131





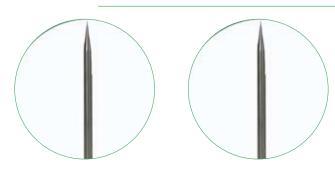
> Capture systems >

Capture points

Those elements are often use to complete a lightning portection by ESE in order to protect structure with many salient angle (cathedral, castle, ...).

[To use with their adapted fastening systems (Ref. 17012 or 17013). Their M10 threading enables a safety and simple installation.

• 17001/17002



Ref	Material	Diameter	Length	Weight
17001	S/s 304 L	17 mm	30 cm	0,5 kg
17002	S/s 304 L	17 mm	50 cm	0,91 kg

■ The simple and multiple rod

Air Terminals with simple rods to protect roof structures, chimneys, ...

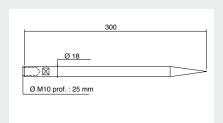
[This tips adapt (themselves) perfectly on the poles. (Ref : $11042 \stackrel{\circ}{a} 11045$

• 10013/10014/10017

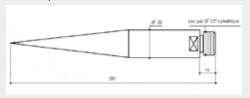


Ref	Material	Diameter	Length	Weight
10013	S/s 304 L	30 mm	2,15 m	600 g
10014	S/s copper bonded 304 L	30 mm	2,15 m	600 g
10017	S/s 304 L	30 mm	2,15 m	600 g

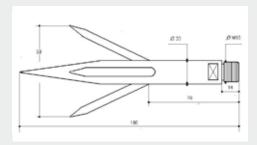
Ref. 17001



Ref. 10013/10014



Ref. 10017



> Lightning Impulse Counters >

■ The Lightning impulse counter

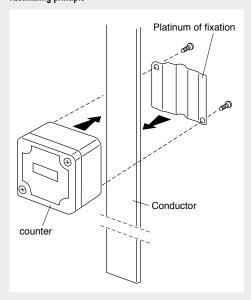
This counter records each lightning stroke on a lightning protection system. This information can be useful to do the maintenance of the lightning protection system after a lightning impact.

[Thanks to its reliable construction, this counter resists very well the outdoor difficult conditions (rain, sun). It is totally autonomous and requires no supply.

[Its performance was tested in COFRAC laboratory, and is guaranteed until 100kA, on negative and positive lightning strokes.

[Its small size allows it to be integrated discreetly on the lightning conductor.

Assembling principle



• 30002

Ref	30002
Fastening	Parallel
Counter	2-99999
Function mode	Electromechanic
Range of detection	1 kA - 100 kA (8/20 μs)
Size	52 x 50x 30 mm
Weight	100 g
Protection index	IP66

Operation

Placed directly on the lightning conductor, this meter uses fields shone by the current of lightning to activate an electromechanic meter.

Connection

This counter is installed just in contact of the lightning conductor (round \varnothing 8 to 10mm, flat 30x2 or 30x3mm) above the inspection joint, and at 2 meters behind the ground (NF C 17-102).

Fastening

The fastening is made on the counter with the stamped stainless steel plate Thanks to its light weight, the product can simply be supported be the lightning conductor.





> Lightning Impulse Counters >

■ The Lightning impulse counter

Counts the number of lightning impacts on an external installation for lightning protection. Easy to read and use.

[Battery supply functionning

• 30001

Ref	30001
Fastening system	Parrallel
Counter	0-99999
Function mode	Electronic
Detection range	1 kA - 100 kA
Dimensions	65 x 50 x 45 mm
Weight	140 g



> Lightning Impulse Counters >

■ The Lightning impulse counter

This lightning counter impact enables to count and registered the lightning events captured by the Lightning Protection System.

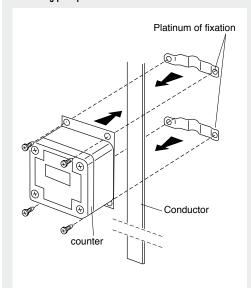
The 30003 counter enables to know exactly the date and time of the lightning events. It can keep in memory the last 500 impacts.

Those informations can be very usefull to realize the maintenance and verification of the Lightning Protection System after an impact

Its fucntionning has been validated in laboratory.

It is able to register all events from 1kA to 100 kA, as well for positive and negative lightning strokes.

Assembling principle



• 30003 _____

D (20.000
Ref	30 003
Fastening system	Parallel
Memory	Until 500 events
Function mode	Electronic
Detection range	1 kA (8/20μs) / 100 kA (10/350μs)
Dimensions	100 x 100 x 75 mm
Weight	0.6 kg
Protection Index	IKO8 IP66/67

Ref. 30003







> Brackets and fixings >

■ The Stainless Steel Pole

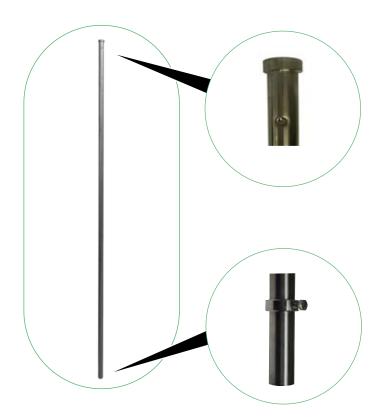
To attach the Air Terminal on a lightning protection installation 2 m above the highest point. The top has a threaded part at the top to fix the air terminal **IONIFLASH MACH**®.

[Very good electrical and mechanical contact.

[In order to receive the 1st extended mast collar, the pole is drilled.

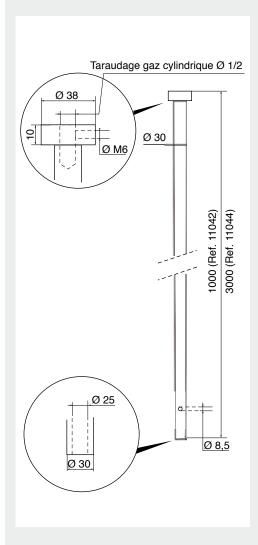
[The pole is able to receive a copper sheath (Ref 18020)

• 11042/11044



Ref	Material	Length	Diameter Inside / outside	Weight
11042	S/s 304 L	1 m	25/30 mm	2 kg
11044	S/s 304 L	3 m	25/30 mm	6 kg

Ref. 11042/11044/



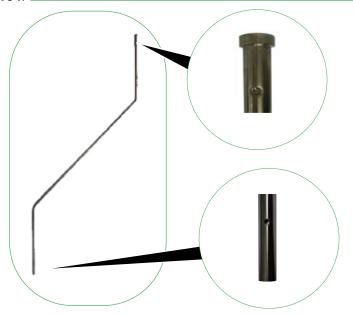
> Brackets and fixings >

■ The Stainless Steel Pole

- The deported pole

[Ideal bracket for the fixation of the **IONIFLASH MACH®** air-terminal on factories' chimney.

11047_



Ref	Material	Length	Diameter inside	Weight
11047	S/s 304 L	4 m	25 mm	10 kg

The Extension

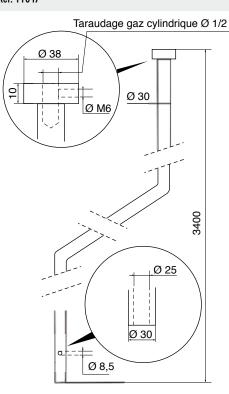
Transition piece between Air Terminal and the pole (Ref11042 to 11048). [Ideal for fastening of the connection collar for conductors (Ref. 15301) Equipped of a threaded system and of a security screw.

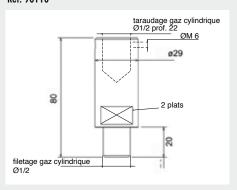
• 90110



Ref	Material	Length	Diameter Inside / outside	Weight
90110	S/s 304 L	80 mm	24,8/38 mm	0,35 kg

Ref. 11047







> Brackets and fixings >

■ The extended masts

These 304L stainless steel extended masts are used to raise the height of the Air Terminal on the highest point of the building.

[They can be lengthened depending on the height required

[Delivered with fixation collar in stainless steel at the bottom part.

[The masts are simply inserted and the stainless steel bolt screwed on the nut.

• 11037/11039/11041



Ref	Designation	Material	Length	Diamètre extérireur	Weight
11037	1 ^{er} mast	S/s 304 L	2 m	33,7 mm	3 kg
11039	2 ^{eme} mast	S/s 304 L	2 m	42,4 mm	6 kg
11041	3 ^{eme} mast	S/s 304 L	2 m	48,3 mm	7 kg

Their installations by superimposition on a 200 mm retreint with tightening by 304L stainless steel ring allows to reach the heights of:

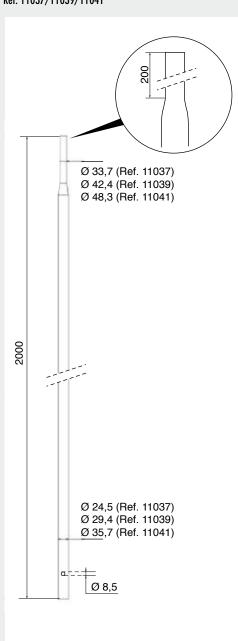
Global set: 11037 = 2,03 m

Global set: 11037 + 11039 = 3,65 m Global set: 11037 + 11039 + 11041 = 5,35 m

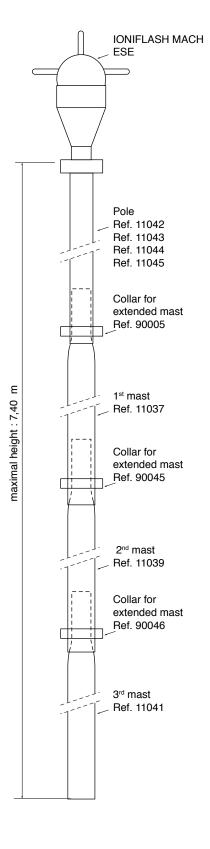
For greater height: Please consult us.

*Maximum height admitted : 8 m (guy wire needed). For any height up than 8m : Installer's responsability.

Ref. 11037/11039/11041



- > Brackets and fixings >
 - Principle of fitting of the mast





> Brackets and fixings >

■ Capture point brackets (for Ref 17001/ 17002)

Brackets for capture point equipped with a waterproof ring. Points fixed in masonry or on a metal roof structure.

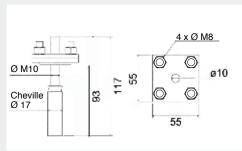
[The 17012 Reference is equipped with a lead ankle, and is so adapted to mansonry.

[The 17013 reference is the ideal solution for fixing the capture point on metallic structure

• 17012



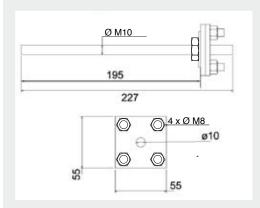
Ref. 17012



• 17013



Ref	Material	Diameter	Weight	Delivered with
17012	S/s 304 L	93 mm	0,41 kg	Lead ankle
17013	S/s 304 L	195 mm	0,43 kg	Thread stalk + nut



> Brackets and fixings >

■ Embedding clamp

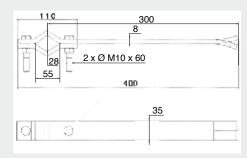
For fixing air terminals on masonry

• 12001/12002



Ref	Material	Profil shift	Height of support	Packaging	Weight
12001	Galvanized Steel	400 mm	< 4 m	2	2,44 kg
12002	Galvanized Steel	400 mm	< 8 m	3	3,66 kg

Ref. 12001/12002



■ Universal clamp

Universal clamp for fixing air terminal brackets on all types of elements.

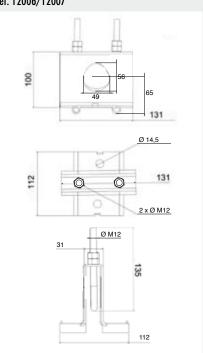
[System adapts to all situations.

• 12006/12007



Ref	Matière	Profil shift	Height of support	Packaging	Weight
12006	Galvanized Steel	40 mm	< 4 m	2	2,14 kg
12007	Galvanized Steel	40 mm	< 8 m	3	3,21 kg

Ref. 12006/12007





> Brackets and fixings >

■ Bolting brackets

For fixing air terminals on masonry.

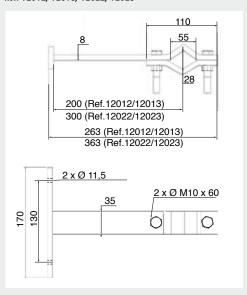
• 12012/12013/12022/12023





Ref	Material	Profil shift	Height of support	Packaging	Weight
12012	Galvanized Steel	200 mm	< 4 m	2	2,58 kg
12013	Galvanized Steel	200 mm	< 8 m	3	3,88 kg
12022	Galvanized Steel	300 mm	< 4 m	2	5 kg
12023	Galvanized Steel	300 mm	< 8 m	3	7,5 kg

Ref. 12012/12013/12022/12023



■ Extended fixing brackets

For fixing air terminals on round elements or on a surface which cannot be drilled.

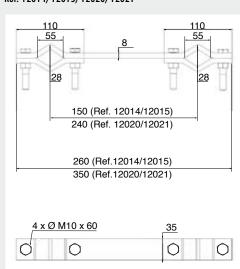
• 12014/12015/12020/12021





Ref	Material	Profil shift	Height of support	Packaging	Weight
12014	Galvanized Steel	150 mm	< 4 m	2	2,50 kg
12015	Galvanized Steel	150 mm	< 8 m	3	3,75 kg
12020	Galvanized Steel	240 mm	< 4 m	2	3 kg
12021	Galvanized Steel	240 mm	< 8 m	3	4,5 kg

Ref. 12014/12015/12020/12021



> Brackets and fixings >

■ Lateral clamp

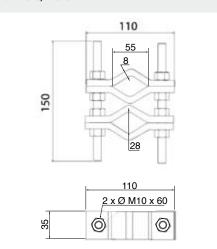
These lateral clamps are used to fix air terminals to round elements.

• 12016/12028



Ref	Material	Profil shift	Height of support	Packaging	Weight
12016	Galvanized Steel	150 mm	< 4 m	2	2,50 kg
12028	Galvanized Steel	150 mm	< 8 m	3	3,75 kg

Ref. 12016/12028



■ Lateral clamp

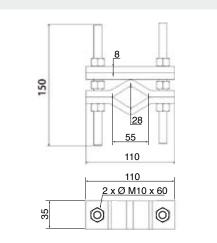
These lateral clamps are used to fix air terminals to flat elements.

• 12026/12027



Ref	Material	Profil shift	Height of support	Packaging	Weight
12026	Galvanized Steel	150 mm	< 4 m	2	2,44 kg
12027	Galvanized Steel	150 mm	< 8 m	3	3,65 kg

Ref. 12026/12027





> Brackets and fixings >

■ Tripod

Fixing Air terminals on flat roofs. Bolted tripod or stand alone version.

[Available in bolted or freestanding version.(on request)

• 12017_



Ref	Designation	Material	Footing	Air-terminal maximum height	Weight
12017	Bolted Tripod	Galvanized	0,75 m	8	2,58 kg



available on request

■ Screwing clamp

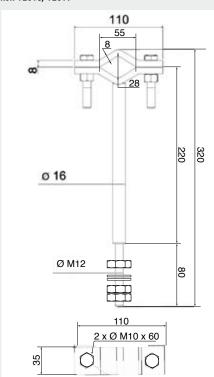
Fixing brackets for air terminals directly into masonry.

• 12018/12019



Ref	Material	Profil shift	Height of support	Packaging	Weight
12018	Galvanized Steel	200 mm	< 4 m	2	1,96 kg
12019	Galvanized Steel	200 mm	< 8 m	3	2,94 kg

Ref. 12018/12019



> Brackets and fixings >

■ Waterproofing

Waterproofing when the Air terminal pole is fixed through a roof.

[The tile must be installed with the cone, delivered with a cone. (réf. 12114)

[Cone can be delivered independently (Ref 80087)

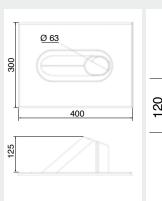
• 12114/80087

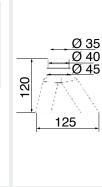




Ref	Designation	Material	Dimensions	Weight
12114	Waterproof tile	Polyethylene	300 x 400 x 150 mm	0,30 kg
80087	Waterproof cone	Polyethylene	120 x 120 x 70 mm	0,03 kg

Ref. 12114/80087





■ Anchor bolt

These anchor bolts are used to fix Air Terminals directly on wood frames.

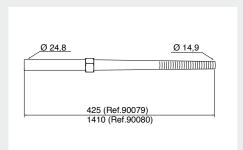
90079/90080





Ref	Material	Length	Upper diameter	Weight
90079	Bichromated steel	0,425 m	24,8 mm	1,5 kg
90080	Bichromated steel	1,41 m	24,8 mm	5,5 kg

Ref. 90079/90080





> Lightning Conductors >

■ Flat copper

Copper strips for use as down-conductors for earthing systems of Air Terminals

• 13001/13011



Ref	Material	Width	Thickness	Packaging	Weight
13001	Tinplated copper	30 mm	2 mm	50 m roll	0,534 kg /m
13011	Copper	30 mm	2 mm	88m roll	0,534 kg /m

Aluminum

Aluminum strips for use as down-conductors for earthing of Air Terminals.

• 13002



Ref	Material	Width	Thickness	Packaging	Weight
13002	Aluminum	30 mm	3 mm	50 m roll	0,244 kg /m

Ref. 13001/13011

> Lightning Conductors >

■ Round copper

Round copper section which can be used as a down-conductor or for earthing Air Terminals.

• 13003 _____ Ref. 13003



Ref	Material	Diameter	Packaging	Weight
13003	Tinplated copper	8 mm	55 m roll	0,45 kg /m

■ Flat Steel

Steel strips for use as down-conductors for earthing of Air terminals.

• 13004/13010 _____ Ref. 13004/13010



Ref	Material	Width	Thickness	Packaging	Weight
13004	S/s 304 L	30 mm	2 mm	50 m roll	0,50 kg /m
13010	Galvanized Steel	30 mm	3,5 mm	30 m roll	0,833 kg /m



> Lightning Conductors >

■ Elbow preformed

 90° Preformed Elbow for down conductor. Tinplated copper plate 30 x 2 mm.

• 13006



Ref	Material	Width	Thickness	Weight
13006	Tinplated copper	30 mm	2 mm	0,32 kg /m

■ Stranded copper

Copper cable for use as an earthing conductor.

[Available in two sections : 25 ou 50 mm²

• 13007/60014



Ref	Material	Section	Diameter	Packaging	Weight
13007	Copper	50 mm ²	16 mm	50 m roll	0,44 kg /m
60014	Copper	25 mm ²	8 mm	50 m roll	0,23 kg /m

Ref. 13006

Ref. 13007/60014

> Conductors fixings >

■ Clamps for mansonry

For fixing conductors on stone or any other type of masonry.

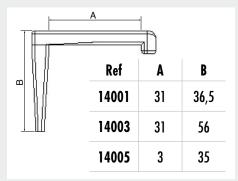
[These clamps are fixed with special masonry lead peg (ref.14004) (See accessories)

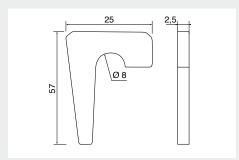
14001/14003/14005/14008 _



Ref	Designation	Material	Length	Weight	To use with
14001	Clamp 30	Galvanized Steel	30 mm	2 5 g	Plate 30 x 2 mm²
14003	Clamp 50	Galvanized Steel	50 mm	17 g	Plate 30 x 2 mm²
14005	Clamp 30i	S/s 304L	30 mm	16 g	8 mm round
14008	Clamp r8	Copper	37 mm	8 g	8 mm round

Ref. 14001/14003/14005/14008





■ Mansonry lead peg for brickdowm clamp

For brickwork clamp. Ref. 14001 / 14003 / 14005

• 14004 _

Ref	Material	Weight
14004	Lead	6,2 g

Ref. 14004





> Conductors fixings >

■ Clamps for mansonry

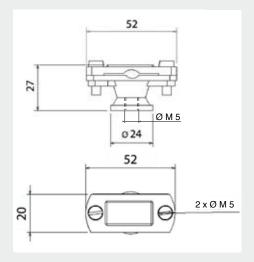
Plastic collar for fixing flat conductors on stone or any type of masonry. Conductors insulated from their support.

• 14021



Ref	Designation	Material	Dimensions	Weight
14021	Plastic collar	Plastic	52 x 20 x 27 mm	25 g

Ref. 14021



■ Clamps for roof

Fixing of down-conductors on all types of roof.

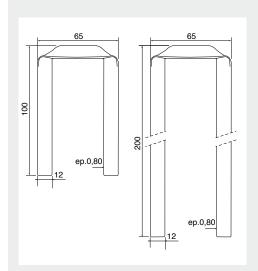
[Such as : tile, slate, stone,....

• 14006/14007



Ref	Designation	Material	Length	Weight	To use with
14006	Staple 100	Tinplated copper	100 mm	22 g	Plate conductor
14007	Staple 200	Tinplated copper	200 mm	40 g	Plate conductor

Ref. 14006/14007



> Conductors fixings >

■ Clamps for roof

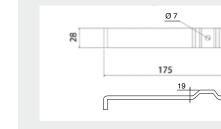
Fixing of down-conductors on all types of roof.

[Such as : tile, slate, stone,....

• 14034/14000



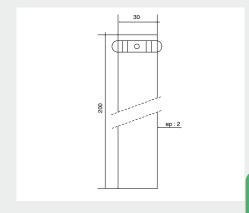




Ref. 14000

Ref. 14034

Ref	Designation	Material	Length	Weight	To use with
14034	Fastening strap	Copper	100 mm	54 g	Plate or round conductor
14000	Rein for slate	Tinplated copper	200 mm	58 g	Plate conductor



■ Straps ride

For fixing flat conductors. Protects the conductor against damage

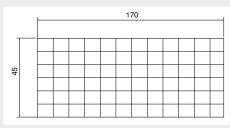
• 14010/14009



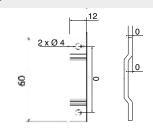


Ref	Designation	Matière	Dimensions	Poids	A utiliser avec
14010	Ruberalu	Ruberalu	170 x 45 mm	35 g	Rivets
14009	Riveted or welded strap	Tinplated Copper	60 x 12 mm	3g	14012 or 14013

Ref. 14010



Ref. 14009





> Conductors fixings >

■ Blind Pop rivets

Rivets to fix the fastening component range.

• 14011/14012/14013



Désignation

Rivet Alu

Rivet Cu9

Rivet Cu16



Length	Weight			
9,5mm	lg			
9,5mm	2,3g			
	9,5mm			

16mm

3g

Copper

Ref. 14011/14012/14013



■ Metal sheet fixations - Clips

For fixing flat conductors on sheet metal "Quick and no-return function".

• 14015_

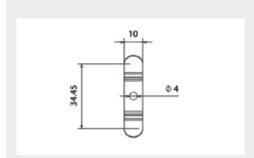
Ref 14011

14012

14013



Ref	Désignation	Material	Dimensions	Weight	To use with
14015	Stainless Steel clip	S/s 304 L	35 x 10 mm	3 g	14012 or 14013



> Conductors fixings >

■ Fixations for round conductors

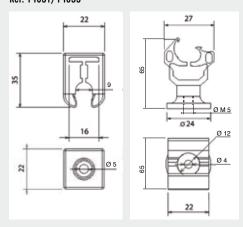
Fixing round, 8 mm diameter conductors. Delivered with stainless steel screw.

• 14031/14033



Ref	Designation	Material	Dimensions	Weight
14031	Stainless steel clip	Stainless Steel	20 x 22 x 35 mm	25 g
14033	Locking clip	Plastic	20 x 22 x 35 mm	16 g

Ref. 14031/14033



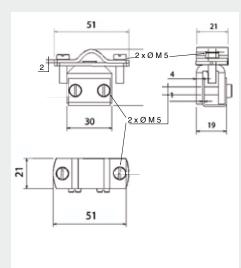
■ Swivel orientable

Fasteners which can be swivelled for any type of conductor on roof frames.

• 14041



Ref	Designation	Material	Dimensions	Weight
14041	Swivel fastener	Galvanized Steel	51 x 21 x 38 mm	110 g





> Conductors fixings >

■ Ridge

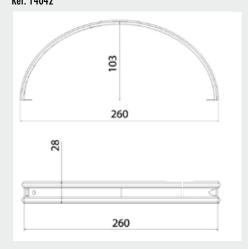
Adjustable fixing of round or flat conductors on ridges.

• 14042



Ref	Designation	Material	To use with	Weight
14042	Ridge fastener	Stainless Steel	14021 for tape 14031 or 14033 for round	195 g

Ref. 14042



■ Stands off

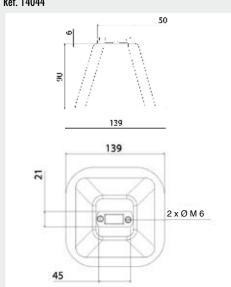
Fixing flat or round conductors on flat waterproof roofs.

• 14044



Ref	Désignation	Material	Height	Weight
14044	Plastic Stand	Plastic + concrete	90 mm	1kg
14044s	Plastic stand with base	Plastic + concrete	90 mm	1kg
80044	Plastic stand (empty)	Plastic	90 mm	82g

Ref. 14044



> Conductors fixings >

■ Gutter

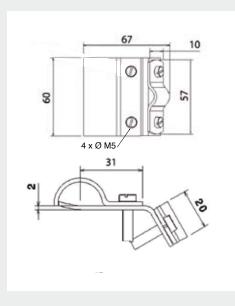
Quick fixing of flat or round down-conductors on gutters.

• 14045

Ref	Designation	Material	Weight
14045	Gutter clamp	Galvanized Steel	195 g



Ref. 14045





> Conductors interconnection>

Join

Connection Flat/Flat:

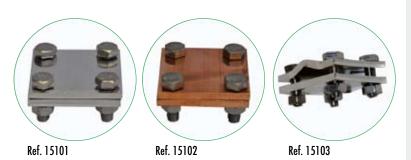
to assemble two flat conductors.

Connection Flat/Round:

to assemble a flat conductor to a round conductor.

Connection Round/Round: to assemble two round conductors

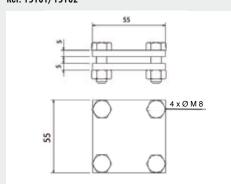
• 15101/15102/15103/15104/15108/15109



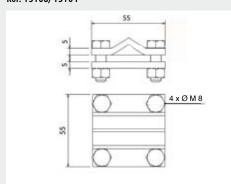


Dimensions Weight Ref Designation Material 15101 Plate / Plate **Tinplated copper** 55 x 55 mm 330 g 15102 Plate / Plate 55 x 55 mm 330 g Copper 15103 Plate /round Tinplated copper 55 x 55 mm 330 g 15104 Plate /round Copper 55 x 55 mm 330 g 15108 Round /round Copper 55 x 55 mm 330 g 15109 Round /Round **Tinplated copper** 55 x 55 mm 330 g

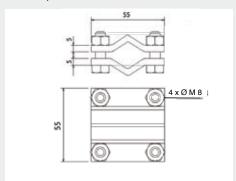
Ref. 15101/15102



Ref. 15103/15104



Ref. 15108/15109



> Conductors interconnection

Join

Connection Flat/Flat:

to assemble two flat conductors.

Connection Flat/Round:

to assemble a flat conductor to a round conductor.

Connection Round/Round:

to assemble two round conductors

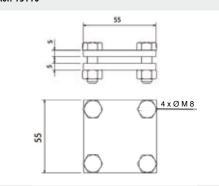
15110 _



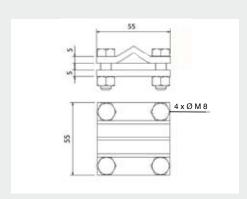
• 15111



Ref Designation Material Dimensions Weight 15110 Plate / Plate S/s 304 L 55 x 55 mm 330 g 15111 Plate / Round S/s 304 L 55 x 55 mm 330 g



Ref. 15111





> Conductors interconnection

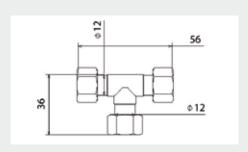
■ Tube

Connection to assemble round, 8 mm conductors

• 15106 _



Ref	Designation	Material	Length	Weight
15106	Te connector	Brass	54 mm	85 g



> Conductors interconnection

■ Connecting collar

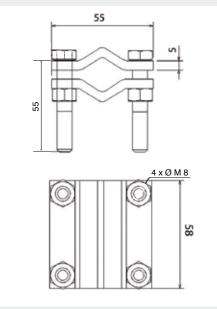
Collar connection to fix strip or round sections to the air terminal support (pole or mast).

• 15301/15305/15305



Ref	Designation	Material	Dimensions
15301	Connection collar	Tinplated copper	58 x 55 mm
15303	Connection collar	Copper	58 x 55 mm
15305	Connection collar	Stainless Steel	58 x 55 mm

Ref. 15301/15303/15305

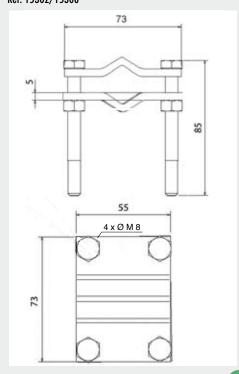


• 15302/15306



Ref	Designation	Material	Dimensions
15302	Connection collar	Tinplated copper	73 x 55 mm
15306	Connection collar	Stainless Steel	73 x 55 mm

Ref. 15302/15306





> Earthing system >

■ Inspection joint

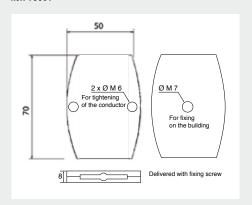
Disconnection between the down-conductor and the earth to check the resistance of earthing.

• 16001_



Ref	Designation	Material	Dimensions	Weight
16001	Inspection joint	Tinplated brass	55 x 70 mm	320 g

Ref. 16001



■ Protection sheath

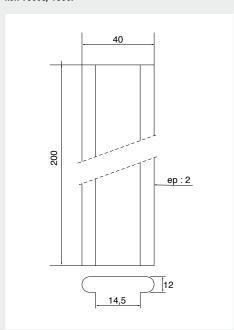
Mechanical protection of flat or round conductors for down-conductors Supplied with 3 fixation collars in stainless steel

• 16003/16007 _



Ref	Designation	Material	Legnth	Weight
16003	304L Sheath	S/s 304L	2 m	840 g
16007	316L sheath	S/s 316L	2 m	840 g

Ref. 16003/16007



> Earthing system >

■ Inspection pits

Protected access to the earthing system of lightning protection

16004/80136/80137_

			/
Ret	16004	/80136	/80137

Ref	Designation	Material	dimensions	Weight
16004	Plastic inspection pit	PVC	18 x 9 cm	430 g
80136	Concrete inspection pit	Concrete base	25 x 25 x 25 cm	14 kg
80137	Concrete inspection pit	Cast iron cover	31 x 31 x 3 cm	11 kg



■ Earth connectors

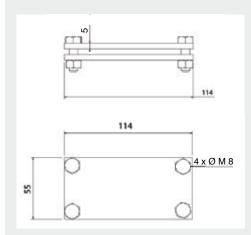
Connector for several earthing conductors, for "crow-foot" branched earth .Only for plate conductors.

16005 _





Ref	Designation	Material	Dimensions	Weight
16005	Crow's foot branched connector	Copper	114 x 55 x 5 mm	600 g



■ Signaling plate

Signalling plate indicating presence of Air Terminal earthing. (Supplied with ankles and screw)

• 16006/16008/16009

Ref	Designation	Material	dimensions	Weight
16006	Signaling plate Earth	Aluminum	10 x 8,5 cm	20 g
16008	Signaling plate Danger	Aluminum	11 x 16 cm	63 g
16009	Signaling plate Danger	Aluminum	11 x 16 cm	63 g

Ref. 16006/16008/16009







> Earthing system >

■ Earth rod

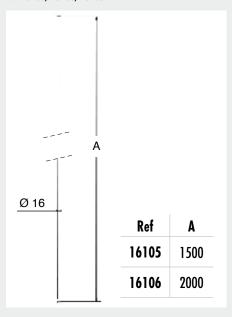
To make in-depth earthing systems

• 16105/16106/16108



Ref	Designation	Material	Diameter	Longueur	Weight
16105	Earth rod	Stainless Steel	16 mm	1,5 m	2,1 kg
16106	Earth rod	Stainless Steel	16 mm	2 m	2,8 kg
16108	Earth rod	Stainless Steel	16 mm	1 m	1,4 kg

Ref. 16105/16106/16108



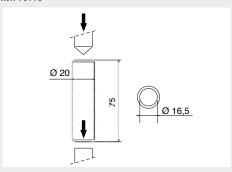
■ Coupling sleeve

Coupling sleeve to join two earth rods Driving tip to insert rod without damaging it

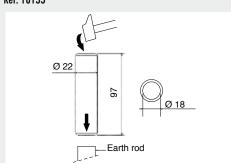
• 16113/16133



Ref	Designation	Material	dimensions	Weight
16113	Coupling sleeve	Stainless Steel	20 x 75 mm	100 g
16133	Driving tip	Steel	22 x 97 mm	170 g



Ref. 16133



> Earthing system >

■ Rod connectiong collar

These rod connecting collars are used to connect the down-conductor of the Air terminal to the earth rods

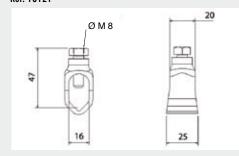
• 16121/16126



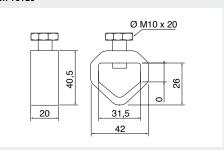


Dimensions Weight Ref Designation Material To use with 16121 Round collar Brass 40 x 22 mm Round conductor 76 g 16126 Round collar 2 Brass 40 x 22 mm Plate conductor 120 g

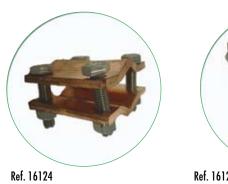
Ref. 16121



Ref. 16126



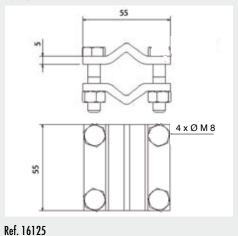
• 16124/16125





Weight Ref Designation Material **Dimensions** To use with 16124 Plate collar Copper 55 x 55 mm Plate conductor 350 g Plate collar 2 16125 Copper 50 x 50 mm Plate conductor 140 g

Ref. 16124



4רM6

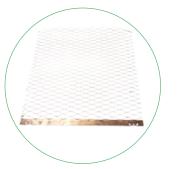


> Earthing system >

■ Earthing mesh

Copper earthing mesh enabling better distribution of lightning current.

• 16150/16151





Ref	Designation	Material	dimensions	Weight
16150	Square	Copper	1 x 1 m	4 kg
16151	Expanded	Copper	1,4 x 0,45 m	1,5 kg

■ Enhancing compound

TERRAGONIX ADVANTAGES:

- Permanent contact with the earth conductor
- Expansion of granules all around the conductor
- No alteration of earth resistance value. The water streaming won't damage the earth system
- Great stability of the earth value

• 16202 _

Ref	Designation	Material	Weight
16202	Terragonix	Bucket of granules	20 kg

Improves ground resistance and therefore significantly improves the resistance values of the earthing system.

Very easy to use. (granules / expansion) Ideal solution for hard soil (sands, rocks, ...)

Agreed Product. No pollution of the soil.

Ref. 16150/16151





> Equipotentiality connection

■ Shunt and braid

Equipotentiality connections between the Air terminal conductor and nearby metallic parts or between various metal elements.

• 13005/13009

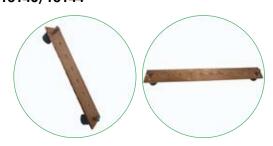
Ref	Material	dimensions	Packaging	Weight
13005	Tinplated copper	30 x 3,5 mm	Per meter	0,47 kg
13009	Tinplated copper	30 x 3,5 mm	Shunt (50cm)	0,26 kg

■ Equipotentiality bars

Earthing interconnections.

Allows deconnection for separate earthing measurements.

• 16143/16144



• 80020

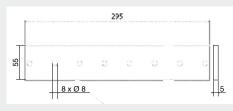


Ref	Designation	Material	Length	Weight
16143	Equipotentiality 6 holes	Copper	295 mm	800 g
16144	Equipotentiality 10 holes	Copper	455 mm	1,2 kg
80020	Earth cut	Copper / plastic	100 mm	120 g

Ref. 13005/13009



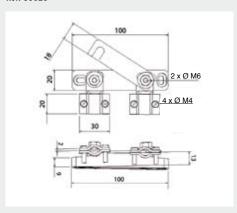
Ref. 16143



Ref. 16144



Ref. 80020



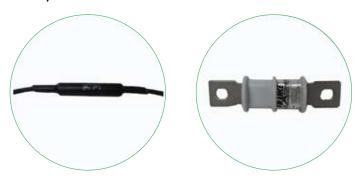


> Equipotentiality connection

■ Spark gap

Equipotentiality spark gaps to secure the balance of equipment potentials, the metallic structure and flow of static loads. Surge divesters ensure both balance of potentials on equipment and metal structures and absorption of electrostatic discharge. For instance on roof support, pipelines, protection of insulation joints...

• 23503/20002



Ref	Name	Nominal voltage	Nominal discharge current	Maximal discharge current	Weight
23503	Equipotentiality spark gap	350 V	10 kA	25 kA	410 g
20002	Antenna surge arrester	200 VDC	25 kA	25 kA	120 g







> Class I Surge Protective Devices

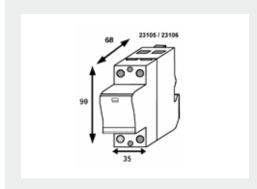
1 pole SPD – 25 kA to 50 kA

High impulsed current: 25 kA.

Direct and indirect protection of 1 and 3-phase power supply network installations for areas with high risk of lightning strikes

(high keraunic level).

Equipped with a remote and optical fault indicator contact.



• 23105/23106

2

23106

Ref	Module	Max voltage Uc	Impulse dis- charge current I _{mp}		Level of pro- tection under Up sous In
23105	2	440 VAC	25 kA	30 kA	2 kV

25 kA

30 kA

1,5 kV

Ref. 23105/23106



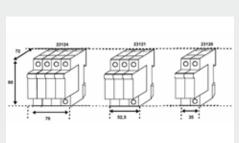
Monobloc SPD - 25 kA

335 VAC

High impulsed current: 25 kA.

Direct and indirect protection of 1 and 3-phase power supply network installations for areas with high risk of lightning strikes (high keraunic level).

Equipped with a remote and optical fault indicator contact.



Ref. 23120/23121/23122/23123/23124

• 23120/23121/23122/23123/23124

Ref	Module Network	Max voltage U _C	Impulse discharge current I _{mp}	Nominal discharge current I _n	Level of protection U _p under I _n
23120	2 L + N	335 VAC	25 kA	30 kA	1,5 kV
23121	3 3*L	335 VAC	25 kA	30 kA	1,5 kV
23122	8 3*L	440 VAC	25 kA	30 kA	2 kV
23123	8 3*L + N	440 VAC	25 kA	30 kA	2 kV
23124	4 3*L + N	335 VAC	25 kA	30 kA	2 kV

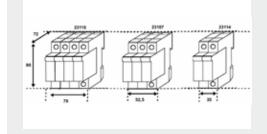


> Class I Surge Protective Devices >

Monobloc SPD diff - 25 kA and 12,5 kA

High ans standard impulsed current: 25 kA and 12,5 kA. Direct and indirect protection of 1 and 3-phase power supply network installations for areas with high risk of lightning strikes

Equipped with a remote and optical fault indicator contact.



• 23107/23108/23114/23115

(high keraunic level).

Ref	Module Network	Max voltage U _C	Impulse discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In
23107	3 L + N diff	335 VAC	25 kA	30 kA	1,5 kV
23108	5 3 L* diff	335 VAC	25 kA	30 kA	1,5 kV
23114	2 L + N diff	335 VAC	12,5 kA	30 kA	1,5 kV
23115	4 3* L + N diff	335 VAC	12,5 kA	30 kA	1,5 kV

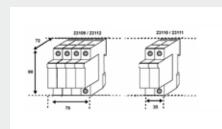
Ref. 23107/23108/23114/23115



■ Monobloc SPD -12,5 kA

Standard impulsed currents: 12.5 kA.

Direct and indirect protection of 1 and 3-phase power supply network installations for areas with low risk of lightning strikes (low keraunic level). Equipped with a remote and optical fault indicator contact.



Ref. 23109/23110/23111/23112

- 22	100	/221	10	/221	111	/231	12
23	ロロタル	/ Z3 I	TO.	/ Z3 I		/ Z3 I	ΙZ

Ref	Module Network	Max voltage U _C	Impulse discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In
23109	4 3 L + N	440 VAC	12,5 kA	20 kA	2 kV
23110	2 L + N	440 VAC	12,5 kA	20 kA	2 kV
23111	2 L + N	335 VAC	12,5 kA	20 kA	1,5 kV
23112	4 3* L + N	335 VAC	12,5 kA	20 kA	1,5 kV





> Class I Surge Protective Devices

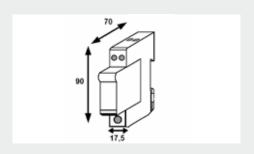
■ 1 pole SPD - 12,5 kA

Standard impulsed current: 12.5 kA.

Direct and indirect protection of 1 and 3-phase power supply network installations for areas with low risk of lightning strikes (low keraunic level).

SPDs with high impulsed currents (50 kA) for neutral protection of power supply networks.

Equipped with a remote and optical fault indicator contact.



Ref. 23116/23118/23129

• 23116/23118/23129

Ref	Module Network	Max voltage U _C	Impulse discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23116*	1	440 VAC	12,5 kA	20 kA	1,8 kV	23117
23118*	1	335 VAC	12,5 kA	20 kA	1,4 kV	23119
23129	1	335 VAC	50 kA	50 kA	1,2 kV	

^{*} Pluggable model .



> Class II Surge Protective Devices >

■ Multipolar SPD – 40 kA

Discharge currents of 40 kA.

Primary protection of 1 or 3-phase power supply network installations situated in exposed areas (high keraunic level) or as a complement to type 1SPD.

Equipped with a remote and optical fault indicator contact.

• 23201/23202/23203/23204/23205/23206

Ref	Module Network	Max voltage U _C	Max discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23201	4 3* L + N	440 VAC	40 kA	15 kA	2 kV	23208
23202	3 3* L	440 VAC	40 kA	15 kA	2 kV	23208
23203	2 L + N	440 VAC	40 kA	15 kA	2 kV	23208
23204	4 3* L + N	335 VAC	40 kA	15 kA	1,5 kV	23207
23205	3 3* L	335 VAC	40 kA	15 kA	1,5 kV	23207
23206	2 L + N	335 VAC	40 kA	15 kA	1,5 kV	23207

Ref. 23201/23202/23203/23204/23205/23206



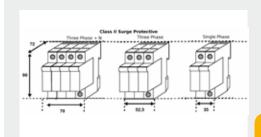
Multipolar SPD – 40 kA

Discharge currents of 40 kA.

Primary protection (in common and differential mode) of 1 or 3-phase power supply network installations situated in exposed areas (high keraunic level) or as a complement to type 1 SPD. Equipped with a remote and optical fault indicator contact.

• 23209/23210

Ref	Module Network	Max voltage U _C	Max discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23209	4 3* L + N diff	335 VAC	40 kA	15 kA	1,5 kV	23230 (Phase)
23210	2 L + N diff	335 VAC	40 kA	15 kA	2 kV	/23211 (Neutral)



Ref. 23209/23210



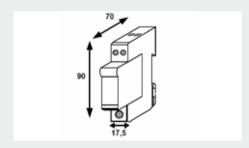


> Class II Surge Protective Devices >

Compact SPD – 40 kA

Discharge currents of 40 kA.

Primary protection of 1-phase power supply installations situated in exposed areas (high keraunic level) or as a complement to type 1 SPD. Equipped with optical fault indicator contact



Ref. 23212

•	23	21	2

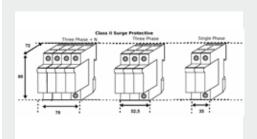
Ref	Module Network	Max voltage Uc	Max discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23212	1 L + N	335 VAC	40 kA	20 kA	1,4 kV /1,2 kV	23213



■ Multipolar SPD – 15 kA

Discharge currents of 15 kA.

Primary protection of 1-phase power supply installations situated in exposed areas (high keraunic level) or as a complement to type 1 SPD. Equipped with a remote and optical fault indicator contact.



Ref. 23214/23216/23218

<u> </u>	/23216	/23218
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Ref	Module Network	Max voltage U _C	Max discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23214	2 L + N	335 VAC	15 kA	5 kA	1,2 kV	23220
23216	3 3L*	335 VAC	15 kA	5 kA	1,2 kV	23220
23218	4 3*L + N	335 VAC	15 kA	5 kA	1,2 kV	23220



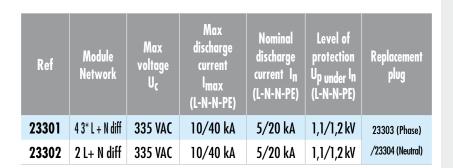
Class III Surge Protective Devices >

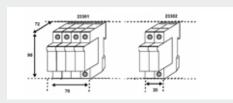
■ Multipolar SPD – 10 kA

Terminal protection of 1 or 3-phase power supply network installations (common or differential mode).

To be used as a complement to type 2 SPDs.

23301/23302





Ref. 23301/23302

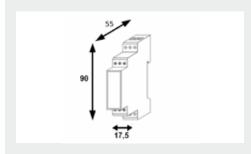


> Telephonic, data and network SPD >

■ Telephonic, data and network SPD – 10 kA

Protection of analog (RTC/ADSL broadband) and digital (Numéris) telephones.

Examples: modems, faxes, telephones, answering machines, transmitters



Ref. 23401/23402/23414/23415

23401/23402/23414/23415

Ref	Application	Max discharge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23401	RTC/ADSL	185 VDC	10 kA	5 kA	Non
23402	Numéris	7 VDC	10 kA	5 kA	removable
23414	RTC/ADSL	185 VDC	10 kA	5 kA	20403
23415	Numéris	+-7 VDC	10 kA	5 kA	23404





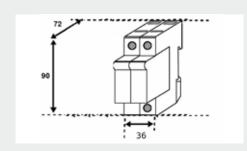
> Renewable photovoltaic and wind systems

Monobloc class I – 12,5 kA

Standard impulsed current: 12.5kA.

Direct and indirect protection of photovoltaic and wind generator installations situated in high risk areas of lightning strikes. (high keraunic level).

Equipped with a remote and optical fault indicator contact.



Ref. 23126/23127/23128

• 23126*/23127/23128

Ref	Module Application	Max voltage U _C	Impulse dis- charge current I _{mp}	Nominal discharge current I _n	Level of protection Up under In
23126*	2 PV	550 VDC	12,5 kA	20 kA	2 kV
23127	4 PV	1000 VDC	12,5 kA	20 kA	2,7 kV
23128	2 Wind generator	690 VAC / 900 VAC	12,5 kA	20 kA	< 2,5 kV

^{*} Model without remote contact.



■ Multipolar class II – 40 kA

Maximum impulsed current: 40 kA.

Direct and indirect protection of photovoltaic and wind generator installations situated in high risk areas of lightning strikes. (high keraunic level).

Equipped with a remote and optical fault indicator contact.



Ref. 23222/23223/23224

• 23222/23223/23224

Ref	Module Network	Max voltage U _C	Maximal discharge current I _{max}	Nominal discharge current I _n	Level of protection Up under In	Replacement plug
23222	2 PV	550 VDC	40 kA	20 kA	2,1 kV	23227
23223	3 PV	1000 VDC	40 kA	20 kA	4 kV	23228
23224	1 Wind	690 VAC / 900 VAC	40 kA	20 kA	< 3 kV	23229



> Miscellaneous Surge Protective Devices >

Equipotentiality Spark gap

Surge divesters ensure both balance of potentials on equipment and metal structures and absorption of electrostatic discharge. For instance on roof support, pipelines, protection of insulation joints...

23503/20002

Ref. 23503/20002

Ref	Application	Max voltage U _C	Max discharge current I _{max}	Nominal dis- charge current In	Level of protection Up under In	Weight
23503	Indirect earthing of separate system	350 V	100 kA	10 kA	25 kA	410 g
20002	Indirect connection of roof support	200 VDC		25 kA		120 g



■ Coordination coil – 15 µH

Coordination coils, to make the coordination between 2 consecutive Surge Protection Devices when the length of conduction is very high.

• 23504

Ref. 23504

Ref	Application	Max voltage U _C	Inductance	Maximum current	Dimensions
23504	Coordination	500 VAC	15 µH	35 A	1 module

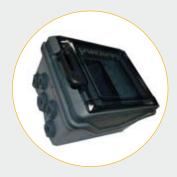




- > Miscellaneous Surge Protective Devices >
 - **■** Surge Protectors Boxes

Ref

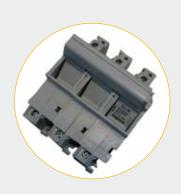
Various models available Please consult us Please consult us



Circuit Breakers

Ref

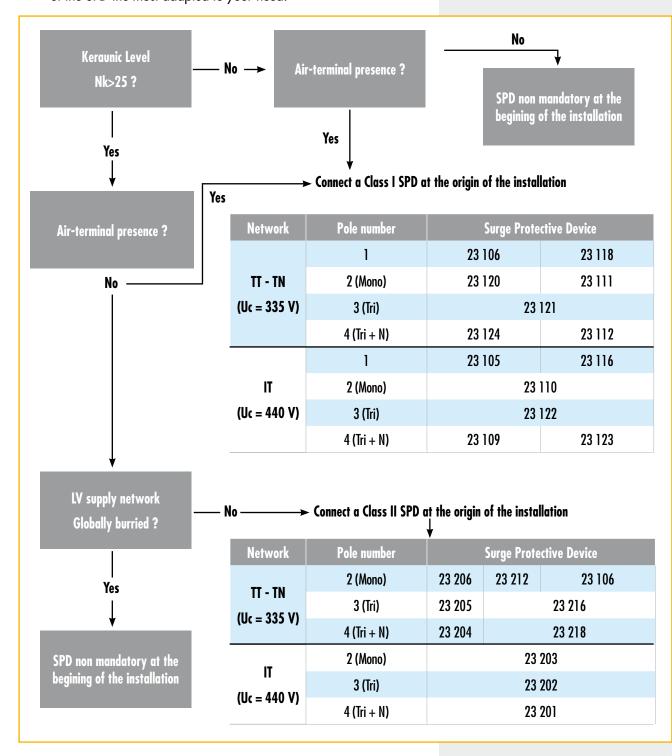
Various models available Please consult us Please consult us



> Choice guide and Installation schematic >

Choice guide

France Paratonnerres proposes you a synoptic with simple question (cf page 9) allowing the choice of the Surge Protective Device. France Paratonnerres stay at your disposal to help you in the choice of the SPD the most adapted to your need.

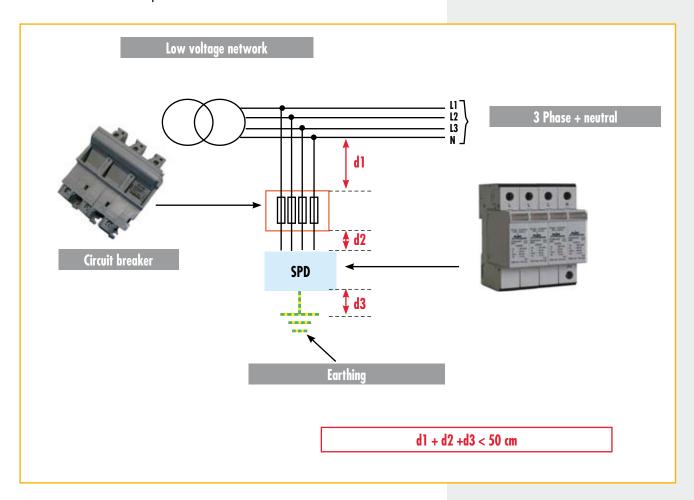




> Choice guide and Installation schematic >

■ Principle of SPD installation

When chosen and selected according to the equipment to be protected, and in order to be the most efficient, the SPDs have to be installed with respect to the schematic below:









> Testing apparatus >

■ Earth resistance tester

Measures ground conductivity and electrical resistance of earths or lightning. Practical and user-friendly. Included in the kit:

- 4 lengths x 25 m of wire section (red, green, blue and black)
- 4 stainless steel measuring rods Optional bag (ref. 16175)

• 16174 _____

16174	9V VDC (6 rechargeable batteries provided)	20 hours	140 x 80 x 230 mm	6 kg
Ref	Power supply	Auto- nomy	Dimensions	Weight

■ Geiger counter

Light and easy to use, this Geiger counter detects radioactive air terminals over several metres as well as any other radioactive element.

Measure of Beta particles, X and Gamma rays.

In order to control the working of the counter, and to detect the radioactive sources, a beep is generated when a ionization is created in the tube. So, when you are near a radioactive element, the cadence of beeps accelerates.

- Technical characteristics:

Range of measure: de 5 à 999 Rem/h ou de 0,05 à 9,99 Sv/h

Bêta rays : 350 keV à 1,5 MeV Gamma rays : 0,1 à 1,25 MeV

Power supply: 2x1,5 V batteries (LR03 included)

• 30041

Ref	Description	Detection	Dimensions	Weight
30041	Geiger counter	X rays Gamma rays Bêta particles	150 x 60 mm	90 g (without batteries)









> Testing apparatus >

■ Storm detector

Consists of two parts:

a detecting antenna and a control box connected with 3 different length of cables.

[A nomad version is also available (Ref. 80161),

[The antenna is fixed on the upper part of a mast. Permanent control of the storm activity. (in a radius from 5 to 10 km).

[A bright scale indicates the perturbation level generated by the storm. Two levels of alert are available. They are adjustable.

When the risk level is overpass, the storm alert is signalized with a contact, a beep and a fast blinking.

Ideal for mobile military sites.

For installations with high lightning risks or very sensitive (petrol stock, chemistry, golfs, aeronautic sites ...)



80158/80159/80160/80161_

Ref	Power supply	Radius f detection	Length of cable	Weight	Associated testing box
80158	5,5 à 7 VDC / 12 à 48 VDC / 12 à 24 VAC	5 to 10 km	10 m	6 kg	80162
80159	5,5 à 7 VDC / 12 à 48 VDC / 12 à 24 VAC	5 to 10 km	20 m	12 kg	80162
80160	5,5 à 7 VDC / 12 à 48 VDC / 12 à 24 VAC	5 to 10 km	30 m	18 kg	80162
80161	5,5 à 7 VDC / 12 à 48 VDC / 12 à 24 VAC	5 to 10 km	0 (Nomad)	5 kg	80162



Ref. 80158/80159/80160/80161





> Testing apparatus >

■ Test on IONIFLASH MACH®

The IONICHECK® enables to confront the IONIFLASH MACH® NG to a typical high voltage lightning impulse.

• 30051

The high voltage test bench **IONICHECK®** is composed of a high voltage generator (200 000 Volts).

By its design, its use allows to carry out reliable tests of functioning in total security.

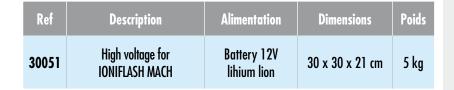
The IONICHECK® is an autonomous, transportable and rechargeable device.

Security: the release of the high voltage is carried out by activating simultaneously two push buttons positioned on both sides of the lower box.

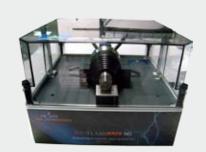
*This high voltage test bench allows to control and to guarantee the well functioning of the IONIFLASH MACH® NG with the following checkings:

[Insulation Test (Ω) : Check the well insulation of the different parts of the ESE air terminal.

[High Voltage test (HV): Check the well functioning of the early streamer emission internal device of the air terminal under high voltage (200 000 Volts).



Ref. 30051







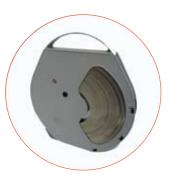
> Accessories >

■ Hooping buckles

Fixing Air Terminals with hooping buckles especially for chimneys.

• 12005/12111/80120





Ref	Material	Width	Thickness	Packaging	Weight
12005	Galvanized Steel	40 mm	0,7 mm	25 m roll	4,5 kg per roll
12111	Stainless steel	20 mm	0,7 mm	50 m roll	5,65 kg per roll
80120	Stainless steel	10 mm	0,4 mm	50 m roll	1 kg per roll

■ Hooping buckles

Fixing Air Terminals with hooping buckles.

• 12112/80080



Ref. 12005/12111/80120



Ref	Material	Width	buckle	Weight
12112	Stainless steel	20 mm	12111	10 g
80080	Stainless steel	10 mm	80120	4 g



> Accessories >

■ Hoop mounting device

Hoop mounting device

• 12113

Ref. 12113



Ref	Material	Weight
12113	Galvanized Steel	2 kg

■ Aluminothermic welding

The aluminothermic welding system Calweld $^{\circ}$ Multi, is simple and adaptable to ensure earthing circuit connections

[The kit includes:

- 1 pair pliers
- 1 mould for horizontal welding
- 3 moulds for welding on earth rod (Ø 12.5mm, 14.2mm, 17.2mm)
- 2 sachets of 33 fiber washers
- 1 pair of SKK1 pliers
- 1 tool kit
- 1 mould scraper
- 1 instruction manual

• 16300

Ref. 16300

Ref	Designation	Weight
16300	Kit Caldweld® Multi	2 kg

Metal / Moulds / Accessories ...

Please consult us



> Accessories >

Bolt

Zinc coated steel bolt with antimony lead expansion peg

• 12008 _





Ref	Material	Diameter	Length	Weight
12008	Lead	M 10	50 mm	123 g

■ Mansonry lead peg for brickdowm clamp

For brickwork clamp. Ref. 14001/14003/14005

14004 —

Ref	Material	Weight
14004	Lead	6,2 g

■ GBolt FIX II M10 95/36

For fixation. (M10)

85037 _____

Ref	Material	Diameter	Length	Weight
85037	Galvanized steel	M 10	95 mm	62 ,5 g

Ref. 14004



Ref. 85037





> Accessories >

■ Roof ornements

Different sized rooster ornaments to fix on steeples

• 18101/18102/18105/18106/18108





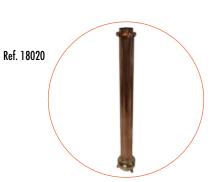
Ref	Style	Material	size	Mounted on	Weight
18101	Gaulois	Copper	63 cm	Ball and bronze pebbles	4,9 kg
18102	Gaulois	Copper	75 cm	Ball and bronze pebbles	5,9 kg
18105	Gaulois	Copper	63 cm	Bronze pebbles	3,8 kg
18106	Gaulois	Copper	75 cm	Bronze pebbles	4,8 kg
18108	Gothic	Copper	63 cm	Bronze pebbles	4,9 kg

Sheath

Sheath with ball bearing on bronze pebble.

18020 ____

Ref



18020	Copper	43 cm
■ C	ardinal points	N.S.E.W

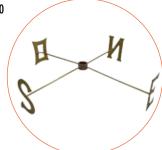
Material

• 18110 _____

Ref	Material	Dimensions	Weight
18110	Brass	65 cm	1,1 kg

Dimensions

Ref. 18110









> Iso 9001 Certification >



FRANCE PARATONNERRES

Parc Ester Technopole - 9 Rue Columbia 87068 LIMOGES - FRANCE

Bureau Veritas Certification certify that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standard detailed below

Standard

ISO 9001: 2008

Scope of certification

RESEARCH, DEVELOPMENT, MANUFACTURING AND MARKETING OF LIGHTNING PROTECTION SYSTEMS.

STUDY, REALISATION AND MAINTENANCE OF LIGHTNING PROTECTION INSTALLATIONS. ASSESSMENT IN LIGHTNING PROTECTION.

RECHERCHE, DEVELOPPEMENT, FABRICATION ET COMMERCIALISATION DE DISPOSITIFS DE PROTECTION FOUDRE.

ETUDE, REALISATION ET MAINTENANCE DES INSTALLATIONS DE PROTECTION FOUDRE. EXPERTISE EN PROTECTION FOUDRE.

Certification cycle start date: 12 March 2014

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: 11 March 2017

Original certification date: 04 March 2011

Certificate No.: FR014889-1

Contract No.: 6082541

Date: 12 March 2014

Jacques Matillon - Managing Direct

Local office: Bureau Veritas Certification France 60, avenue du Général de Gaulle – 92046 Paris La Difens

Further clarifications regarding the scope of this certificate the applicability of the management system requirements may be obtained by consulting the organization. To check this certificate validity, please call + 33(0) 1 41 97 00 60.



=



> Qualifoudre Certification >





PROFESSIONNELS DE LA PROTECTION CONTRE LA FOUDRE

ATTESTATION DE CONFORMITE

N° 1223131658121

L'Institut National de l'Environnement Industriel et des Risques (INERIS), Etablissement Public à Caractère Industriel et Commercial créé par le décret n° 90-1089 du 7 Décembre 1990, délivre la présente attestation de conformité au référentiel QUALIFOUDRE version 2.3 du 26 septembre 2008 à la Société suivante :

France PARATONNERRES Parc Ester Technopole 9 rue Columbia 87068 LIMOGES

Les moyens mis en œuvre par cette société, après examens et audit (dossier INERIS N°130462), sont reconnus conformes aux spécifications du référentiel QUALIFOUDRE qui portent sur le système de management de la qualité, les méthodes de travail, la qualification et la formation des personnes suivant les rubriques utiles du référentiel indiquées ci-dessous :

FABRICATION DE PARATONNERRES FABRICATION DE PARAFOUDRES

ANALYSE DU RISQUE FOUDRE - COMPLEXE

ETUDE TECHNIQUE - COMPLEXE

INSTALLATION - COMPLEXE

VERIFICATION - COMPLEXE

Cette attestation est valable jusqu'au 15 juin 2015



Verneuil-en-Halatte, le 19 juillet 2012

D. CHARPENTIER Directeur Adjoint Direction de la Certification

Ce certificat ne peut être reproduit que dans son intégralité

version a folio 1/1

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Institut national de l'environnement industriel et des risques Etablissement public à caractère industriel et commercial - RCS Senis 8 381 984 921 - Sret 381 984 921 00019 - APE 71208



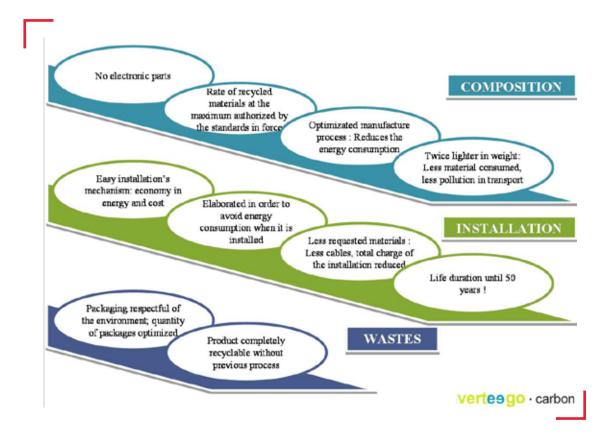
> IONIFLASH MACH® Carbon report >

Perimeter	IONIFLASH MACH (in Teq CO2)	IONIFLASH MACH + Accessories (in Teq CO2)
Restraint	99,2	115,2
Life cycle	93,6	109,6
Global	151,2	167,2

> Air-terminal Carbon report >

Perimeter	IONIFLASH MACH (in Teq CO2)	IONIFLASH MACH + Accessories (in Teq CO2)
Restraint	33	38
Life cycle	31	37
Global	50	58

> Environmental avdantages of the IONIFLASH MACH® >



> IONIFLASH MACH® Tests according to the NFC 17-102 (2011) >

Advanced time



Ecole Centrale de Lyon - INSA de Lyon - Université Lyon 1

Ampère

Unité Mixte de Recherche du CNRS - UMR 5005 nie Electrique, Electromagnétisme, Automatique, Microbiologie environnemental et Applications

CERTIFICATE According the NF C 17-102 STANDARD – Edition 2011

Tests on the IONIFLASH MACH NG15 Early Streamer Emission (ESE) Air Terminal # CEHT-2012_02_14A

Applicant : FRANCE PARATONNERRES	<u>Date</u> : 14 – 15 February 2012
Parc Ester Technopole 9 Rue Columbia - 87068 LIMOGES - FRANCE	
contact@france.naratonnerres.com - Fav : +33 5 55 35 85 62	

Results:

IONIFLASH MACH NG15	(µs)	Time (kV)	Time (µs)	(µs)	T _{E.S.E} < T _{Simple Rod}	σ _{E.S.E} < 0,8 σ _{Simple Rod}
	Average Time on 50 strikes	Voltage E obtained for the normalized curve of switching impulse test, which corresponds to the average	Reference	Δt		

The tests on the IONIFLASH MACH NG15 air terminal have shown an Early Streamer Emission (ESE) less than 60 μs (55 μs) but FRANCE Paratonnerres decided to weight to 15 μs according to the NF C 17-102 Standard.



Thomas AKA Ph. D. Head of High Voltage Test Center

Contact : Thomas AKA : thomas.aka@ec-lyon.fr

> Ampère – Ecole Centrale de Lyon – 36, avenue Guy de Collongue - 69134 Ecully cedex – France Tél : +33 (0) 4 72 18 60 99 Fax : +33 (0) 4 78 43 37 17 http://www.ampere-lab.fr

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Thomas AKA Ph.D. Head of High Voltage Test Center

Contact : Thomas AKA : thomas.aka@ec-lyon.fr

Ampère – Ecole Centrale de Lyon – 36, avenue Guy de Collongue - 69134 Ecully cedex – France Tél : +33 (0) 4 72 18 60 99 Fax : +33 (0) 4 78 43 37 17 http://www.ampere-lab.fr



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Génie Electrique, Electromagnétisme, Automatique, Microbiologie environnementa et Applications

CERTIFICATE According the NF C 17-102 STANDARD – Edition 2011

Tests on the IONIFLASH MACH NG25 Early Streamer Emission (ESE) Air Terminal # CEHT-2012_02_14A

Applicant : FRANCE PARATONNERRES	Date : 14 – 15 February 2012
Parc Ester Technopole 9 Rue Columbia - 87068 LIMOGES - FRANCE	
contact@france-paratonnerres.com - Fax : +33 5 55 35 85 62	

Results:

	Average	curve of switching impulse test,				
	Time on 50 strikes	which corresponds to the average	Reference	Δt		
	(µs)	Time (kV)	Time (µs)	(µs)	T _{E.S.E} < T _{Simple Rod}	σ _{E.S.E} < 0,8 σ _{Simple Rod}

The tests on the <code>IONIFLASH MACH NG25</code> air terminal have shown an Early Streamer Emission (ESE) greater than 60 μs (78 μs) but FRANCE Paratonnerres decided to weight to 25 μs according to the NF C 17-102 Standard.



Thomas AKA Ph. D. Head of High Voltage Test Center

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MACH NG43 | 138,461 | -430,6 | 370,4 | 113,21 | 18,25 | yes | yes

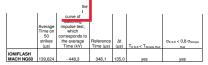
The tests on the IONIFLASH MACH NG45 air terminal have shown an Early Streamer Emission (ESE) greater than 60 μs (114 μs) but FRANCE Paratonnerres decided to weight to 45 μs according to the NF C 17-102 Standard.



Thomas AKA Ph.D. Head of High Voltage Test Center

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The tests on the IONIFLASH MACH NG60 air terminal have shown an Early Streamer Emission (ESE) greater than 60 μ s (135,0 μ s) but FRANCE Paratonnerres decided to weight to 60 μ s according to the NF C 17-102 Standard.



Thomas AKA Ph.D. Head of High Voltage Test Center

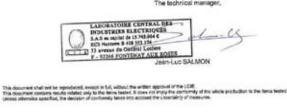
Contact : Thomas AKA : thomas.aka@ec-lyon.fr

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- > IONIFLASH MACH® Tests according to the NFC 17-102 (2011) >
 - 100 kA test according to the EN50164





- > IONIFLASH MACH® Tests according to the NFC 17-102 (2011) >
 - Insulation test according to EN60060-1



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CERTIFICATE Of OPERATION in RAIN CONDITIONS According to the IEC 60060-1 STANDARD

Tests on the IONIFLASH MACH Early Streamer Emission (ESE) Air Terminal # CEHT-2010_04_29A

Applicant: FRANCE PARATONNERRES	Date: 29th April 2010
Zone d'Activités de CLOCHER 23000 GUERET - FRANCE	

Results:

Input Vo	oltage	DRY condition (kV)	RAIN condition (kV)	Insulation in % (RAIN / DRY)	
Switching	50% electrical breakdown	794	772	97,23%	
Impulse - NEGATIVE POLARITY	Withstand voltage	750	750	100,00%	

The tests realized on the IONIFLASH MACH Early Streamer Emission (ESE) air-terminal have shown insulation greater than 97% according to the IEC 60060-1 standard.



Contact : Thomas AKA: thomas.aka@ec-lyon.fr

■ Test according to NFC 17-102





■ Test according to EN 50164





> Inspection reports >



> Information sheet for Lightning Risk Analysis =

PAR ATONNERRES		
	(fill in	one file for each building to protect)
YOUR INFORM	MATION:	
Name:		
Address:		
Postcode:	Town:	Country:
Tel:	Fax:	e-mail:
NAME OF THE	SITE TO PROTE	ECT:
Department:	T	Town: Country:
TYPE OF BUIL Principal use: offices hospital public service	commerce hotel] public entertainment
Nature of the stored p	roducts or manufactured	d products:
Building in project	Building un	nder construction Duilding constructed
		Inder construction Building constructed
		Balang constructed _
Building's form:		
A E		
A D E	Lange of the control	
A ☐ E Height: m Total Height: n	Lange of the control	
Height: m Total Height: n	Lange of the control	







> Information sheet for Lightning Risk Analysis >

FRANCE' PAR TONNERRES	Information for a study of an analysis for lightning risk
CHARACTERISTIC Does it have: A cross A style rooster Some bells If yes, are they elec	YES NO YES NO ACHURCH YES NO YES NO Are they protected by a surge arrester YES NO Are they protected by a surge arrester YES NO
	OF THE BUILDING
Structure: metallic	wood concrete other
Roof: Asphalted terrace r Concrete fibres	oof gravelled terrace roof slate roof tiles zinc aluminium copper thatch other
ront:	wood
other type of flooring on the buil	ding perimeter:
asphalt Nature of the sub-soil:	concrete soil gravel other
marshy tender calcareous	clay
PARTICULAR ELI tre / is there ? untennas on the roof chimneys	number: height: number: height:
Metallic elements Rising gas column	number: type:
Electric cables in the front Electrical earth ground sys - Made by hooping - Made by stakes - Unknown	1 1 1 1 1 1 1 1 1 1
NFORMATION FO	
With higher elements solated	with smaller elements surrounding at the top of a hill
Particular dangers No risk Low panic risk	medium panic risk high panic risk
Evacuation difficulties Dangers for the environme	nt Contamination of the environment
Fire risk No risk .ow	ordinary high explosion
Anti-fire protection No protection Detection with alarm	manual automatic firemen intervention: less than 10 min more than 10 min
Type of flooring inside agricultural aspha gravel sands ther	

104

> Information sheet for Lightning Risk Analysis =

EXTERIOR SERV	HOEC		
	/ICES		
lectric public network Medium voltage		low voltage	
resence of a High Volta	ige / Low Voltage transfo yes in the build		
ype of line:	r et en	arrived excistences 0.00	
Underground L		ground resistance: Ω.m length of the line from another building: m	
lelative position:			
With higher eleme isolated	ents surrounding	with smaller elements surrounding at the top of a hill	
nvironment factor :	b. 20) [
Important urban (I Suburban (h < 10	Control of the latest and the latest	urban (20m > h > 10m)	
ublic telephone netwo	ork		
ype of line: Underground			
aerial		Length of the line from another building: m	
lature of the signal: analogical (Comn	nuted Telephone Netwo	ork) number:	
ADSL (Internet)	numb	ber:	
Digital network (IS Specialized line	SDN) I numb		
SAME TO SERVICE C		Totage : T	
ublic gas network ype of pipes			
metallic	with iso	olating joint YES NO	
isolated]		
Metallic NTERIOR SERV	isolated ICES		
lectric distribution 220 V single phase (leutral system:	2 cords)	0 V triphase + neutral (4 cords) 380 V triphase (3 cords)	ds)
π 🗆	TN-S □	TN-C IT unknown	
Strength of the		differential: mA selective or delay	red \square
resence of divisional bo	nede	number:	

Cualifoudre

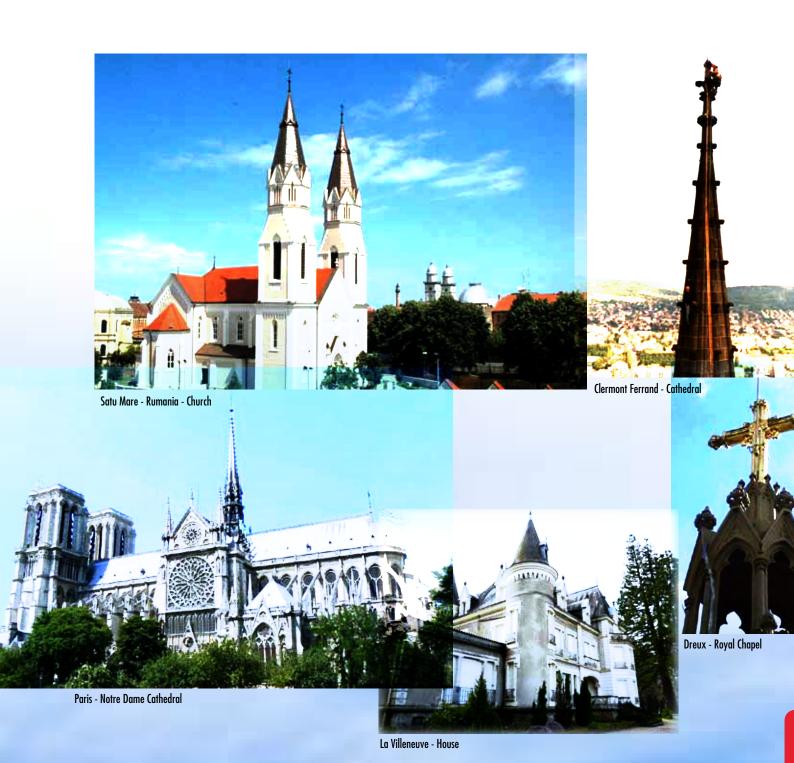




- > France Paratonnerres in France, and worldwide ... =
 - Historical monuments...



- > France Paratonnerres in France, and worldwide ... >
 - Historical monuments...





Peru - Plus Petrol



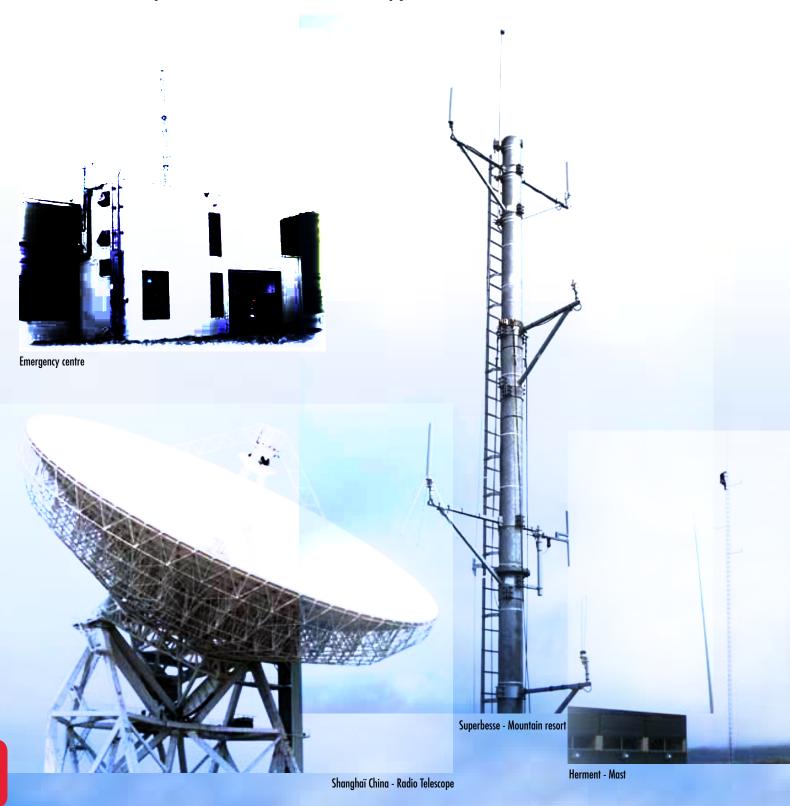
Ecuador - RTD Ecuador

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- Office, Public entertainment, Railway Stations ...





- > France Paratonnerres in France, and worldwide ... >
- Help centers, telecommunication pylons ...



- > France Paratonnerres in France, and worldwide ... =
 - Individual houses ...





>Notes =



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Paris Limoges

GEOGRAPHIC LOCATION



France Paratonnerres is located in Limoges (87) at 1 hour from Paris by plane and 3 hours from Paris by train