FRANCE PARATONNERRES

OUR RELIABILITY IS YOUR FIRST INSURANCE

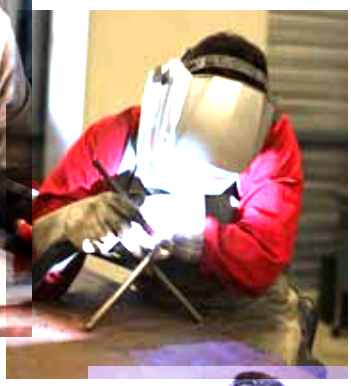
CATALOGUE

IONIFLASHMACH®

Early Streamer Emission Air Terminal

French patent, Technology and Production

Qualifoudre





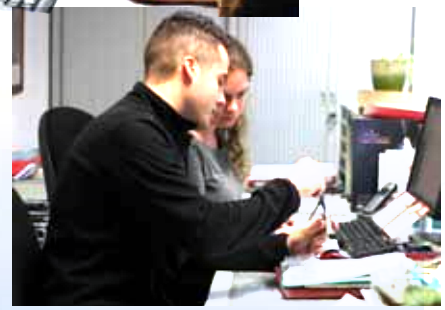


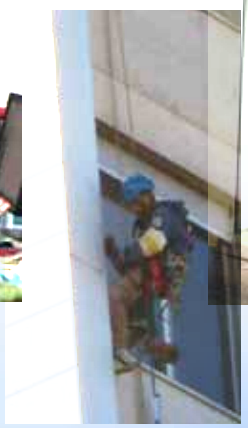

“The quality of a team ready to help you”









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Our products for the Indirect Lightning Protection

Testing apparatus and accessories

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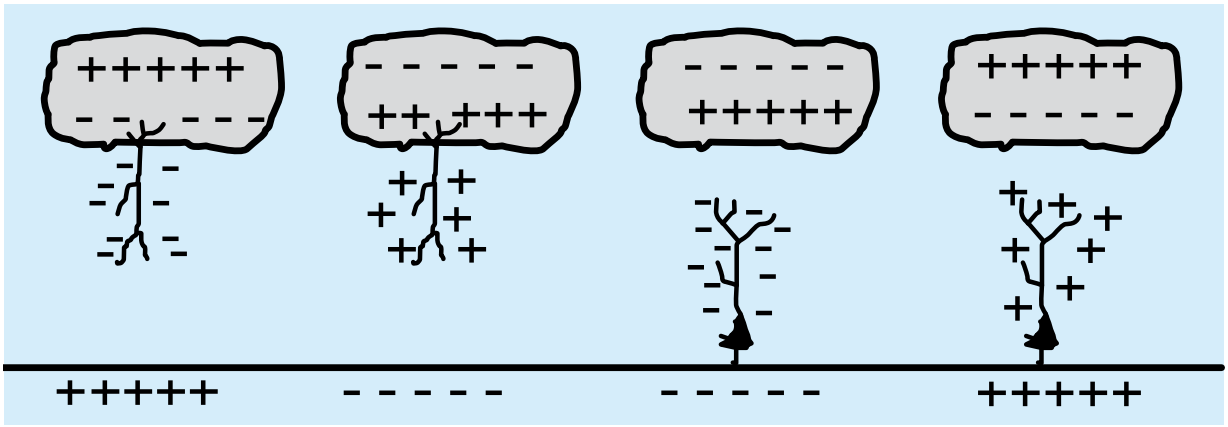
*Non-contractual pictures

General information about lightning

> 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.



Downward negative leader | **Downward positive leader** | **Upward negative leader** | **Upward positive leader**

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.

General information about lightning

> The lightning phenomenon

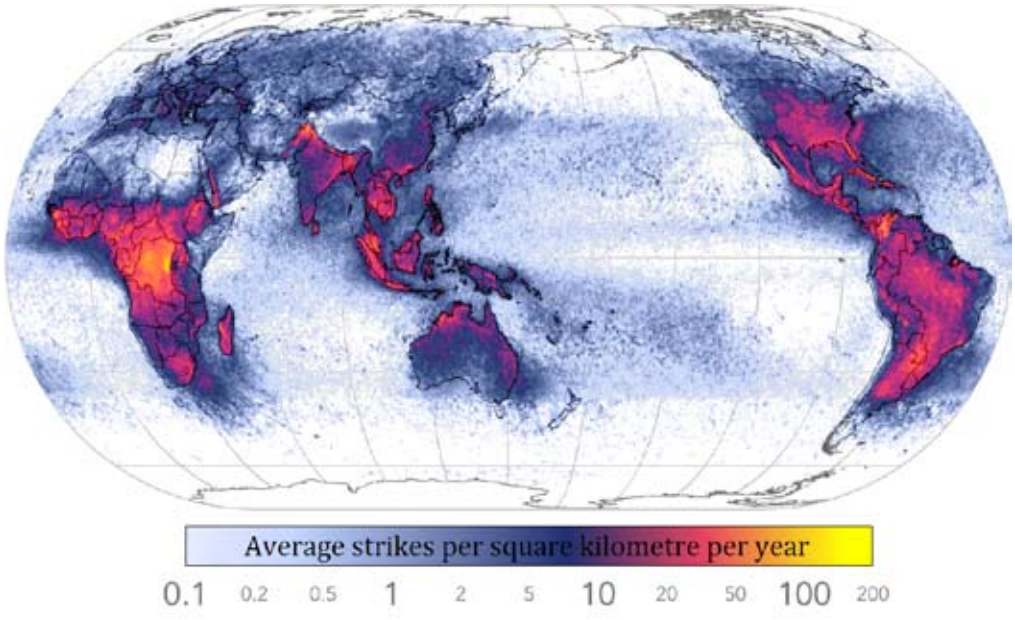
Lightning tends to hit high altitude areas and prominent objects. Thunder may resonate with a sharp cracking sound when the lightning is near and rumble when it is further away. As light travels faster than sound, lightning is visible before the thunder may be heard.

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

General information about lightning

> 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 alongside the down conductors poles and the electric masses of the installation.

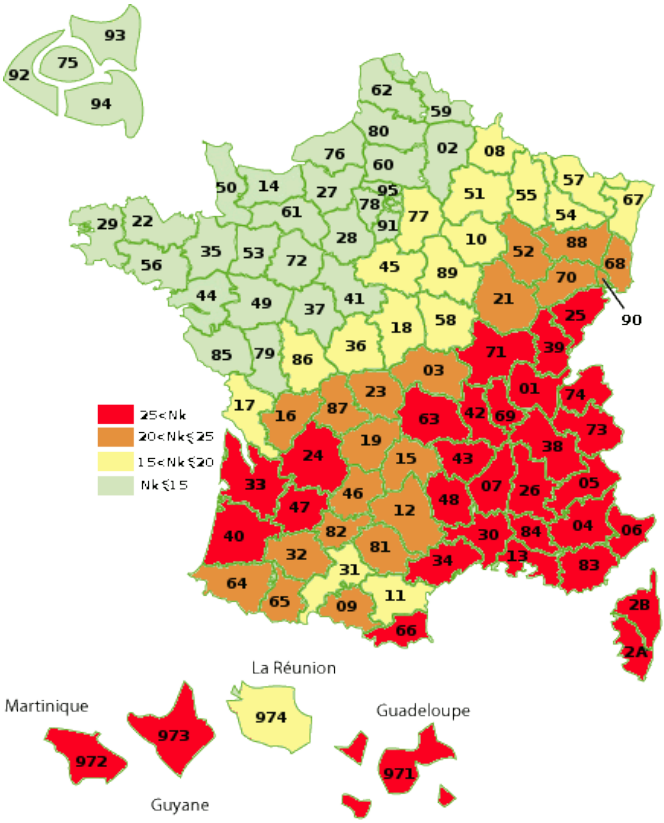
> The lightning phenomenon

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.

General information about lightning

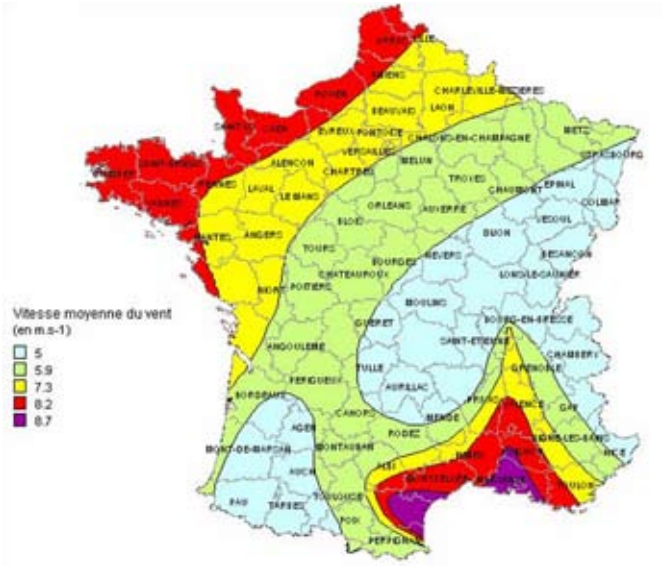
> The lightning phenomenon

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

General information about lightning

> 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

General information about lightning

> 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

France Paratonnerres

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

IONIFLASHMACH®

IONICOUNT®

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

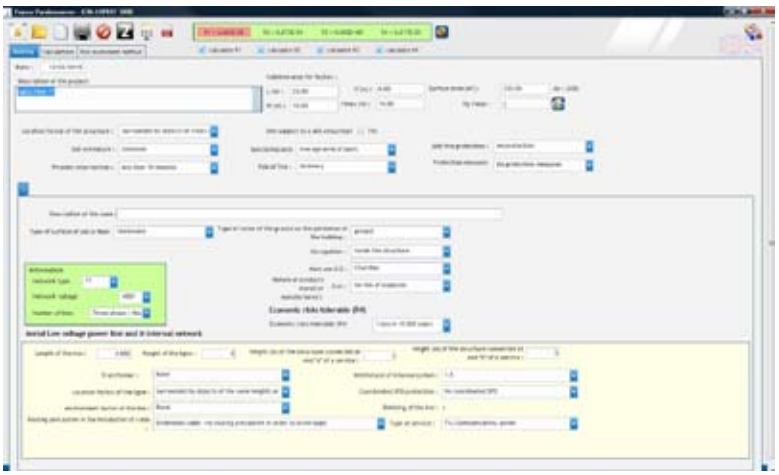
France Paratonnerres
Our services

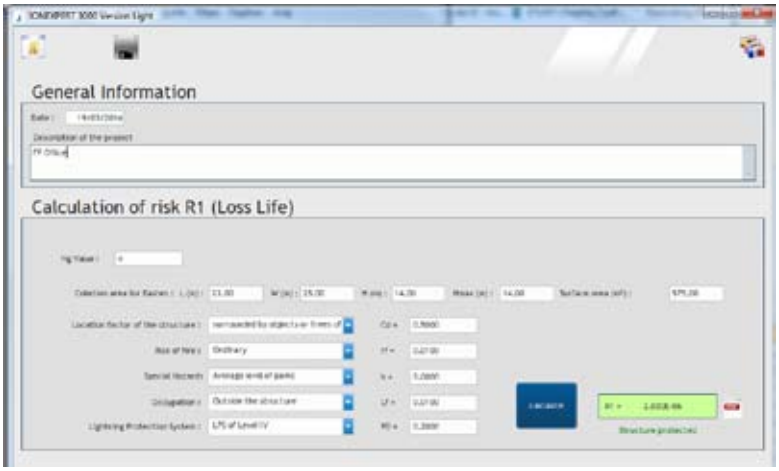
> Lightning Risk Assesment and Technical Studies

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.

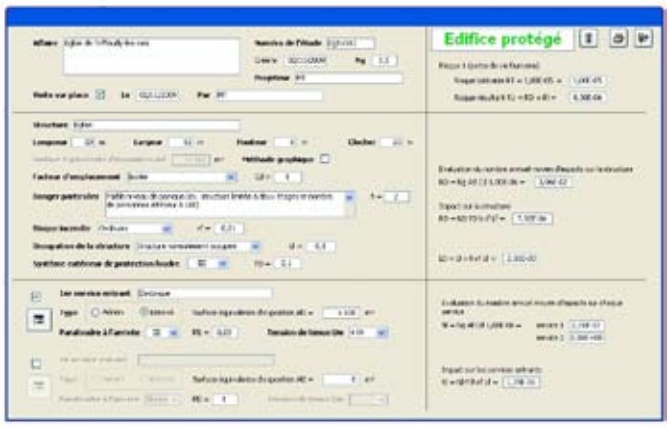
> Lightning Risk Assesment and Technical Studies

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**.

ISO 9001 BUREAU VERITAS Certification

Qualifoudre INERIS N°: 05 1168729019

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

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 :

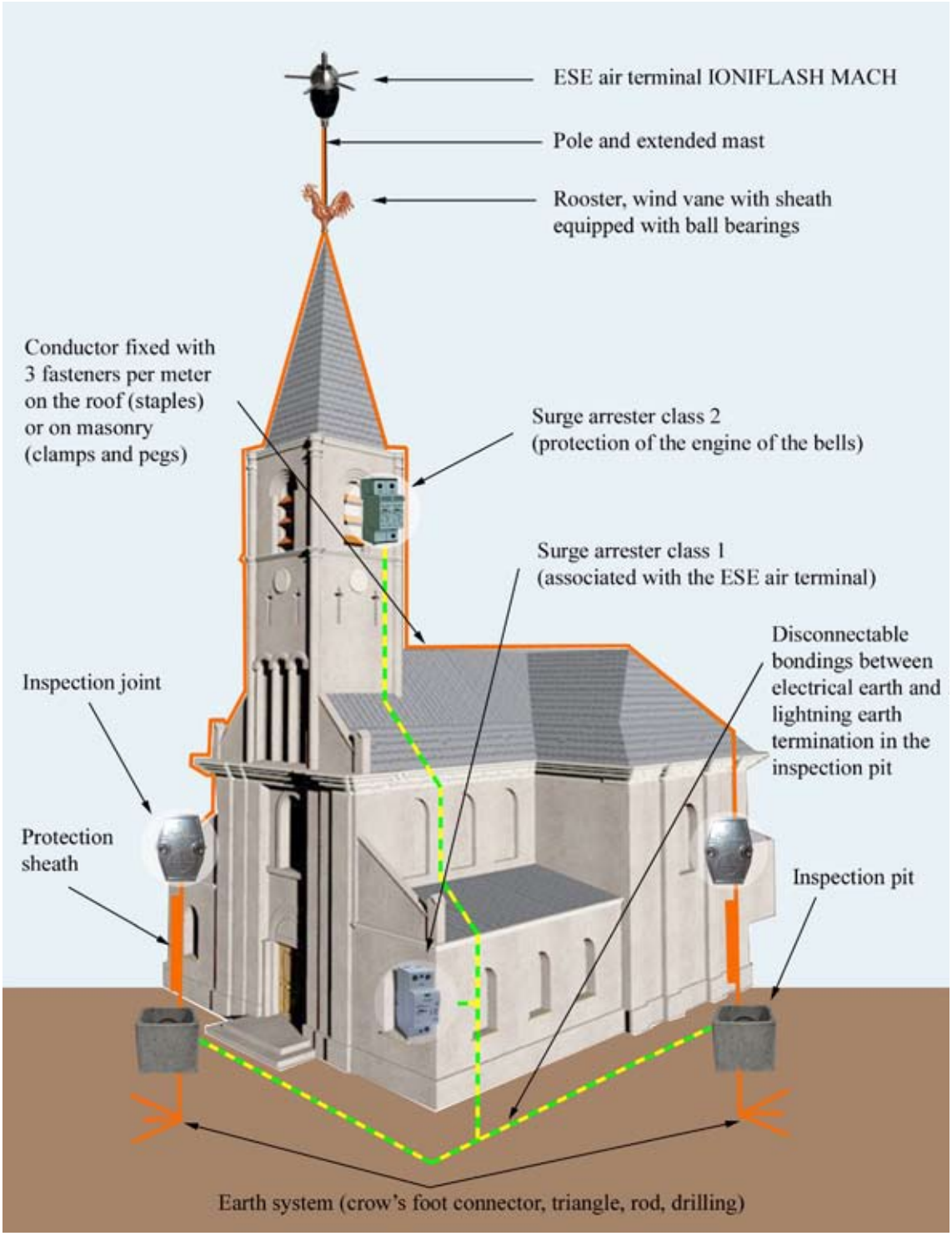
- **NFC 17-100** of December 1997,
- **NFC 15-100** of December 2002,
- **IEC/EN 62305-3** de 2010,
- **IEC/EN 62305-4** de 2010,
- **NFC 17-102** of September 2011.

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.

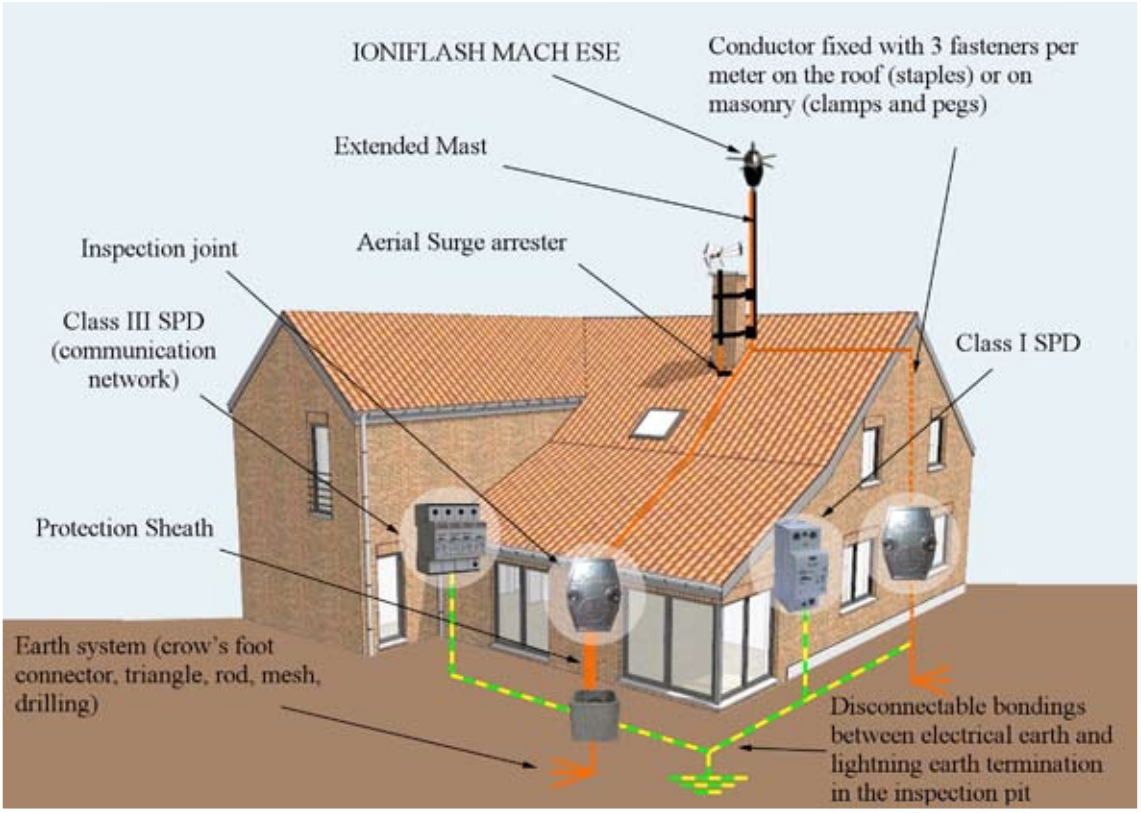
> Examples of lightning protection installations

Churches and monuments



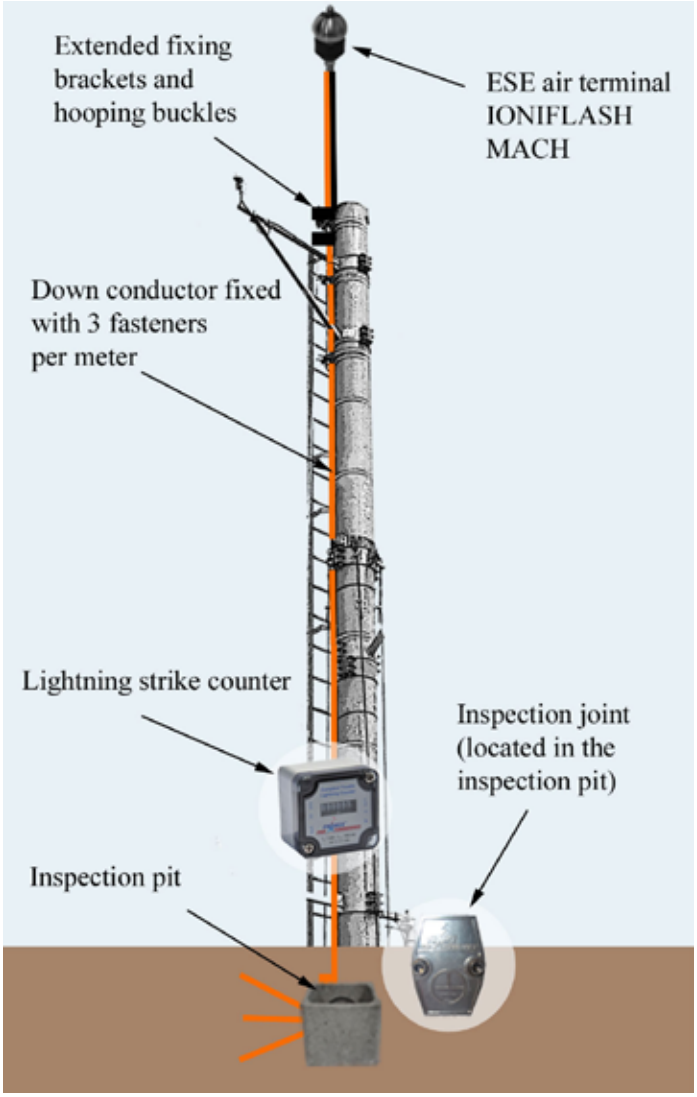
> Examples of lightning protection installations

Houses and small structures



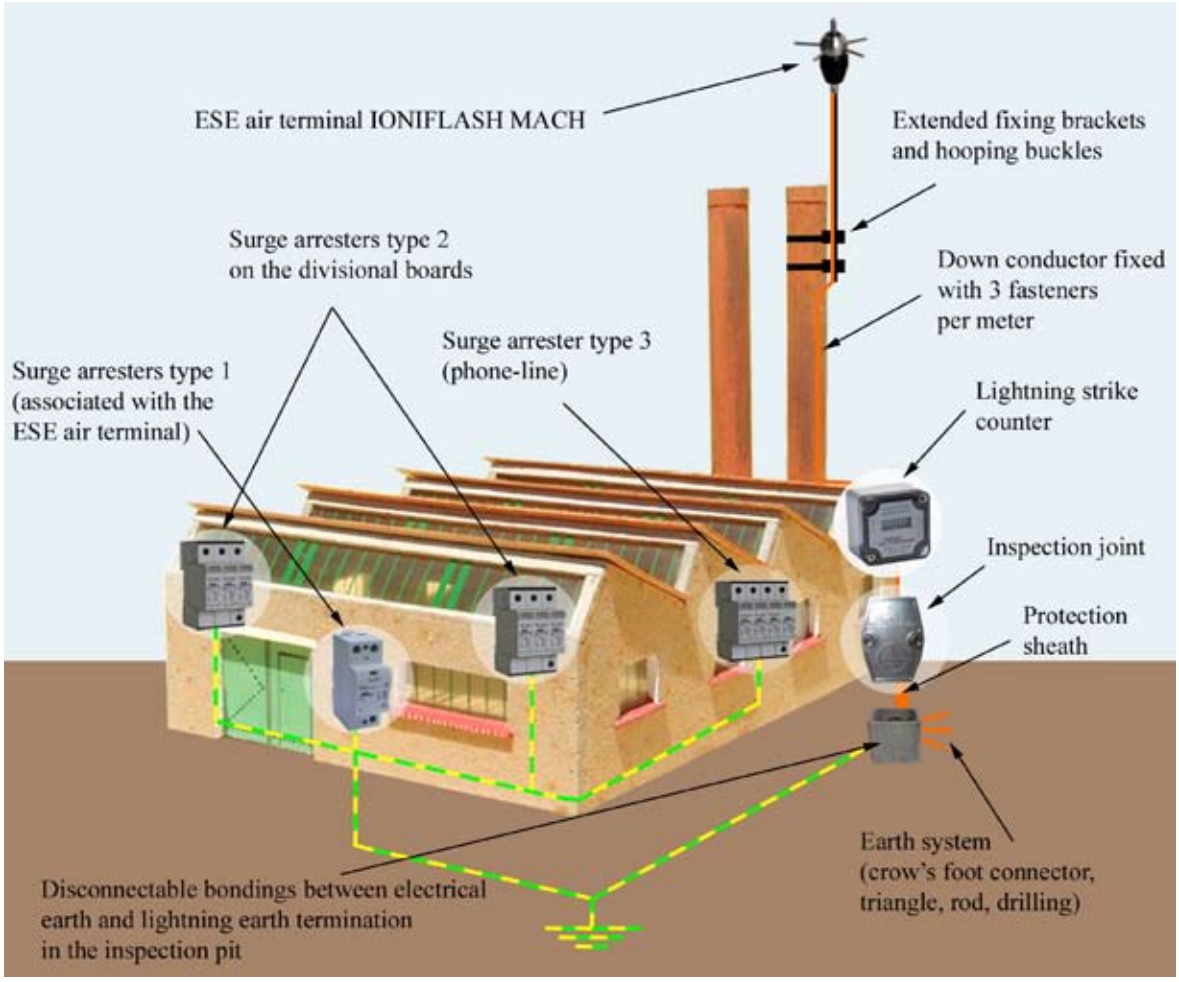
> Examples of lightning protection installations

Pylon



> Examples of lightning protection installations

■ Industrial sites and plantations



FRANCE PARATONNERRES®

Early Streamer Emision Air-Terminal The IONIFLASH MACH® technology

Early Streamer Emission Air Terminals / IONIFLASH MACH® Technology

> The IONIFLASH MACH®

■ The IONIFLASH MACH® 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

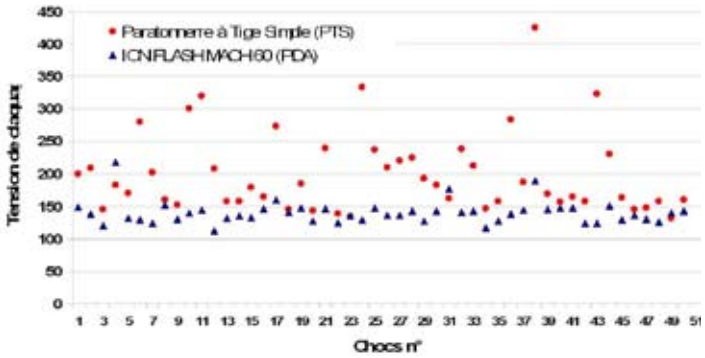
IONIFLASH MACH®	Mach NG15	Mach NG25	Mach NG30	Mach NG45	Mach NG60
A high level of early streamer emission time Δt	55 µs	78 µs	87 µs	114 µs	135 µs
Security coefficient more important	73 %	68 %	66 %	61 %	56 %
Standard deviation ratio : K	0,61	0,76	0,74	0,44	0,29

– 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.

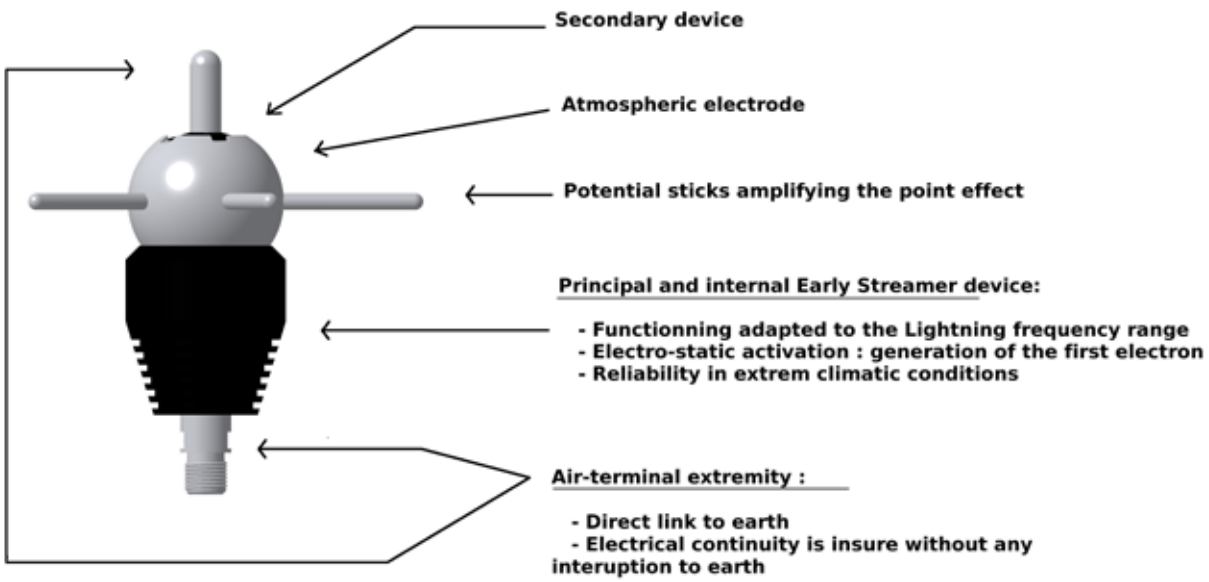
These positive upward leaders suddenly move in the direction of the downward leader. One of the leaders, the closest or the one which has started earlier or the one which has travelled the faster, enters into contact with the downward leader. Then, the ionised air channel is in connection with both the 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.



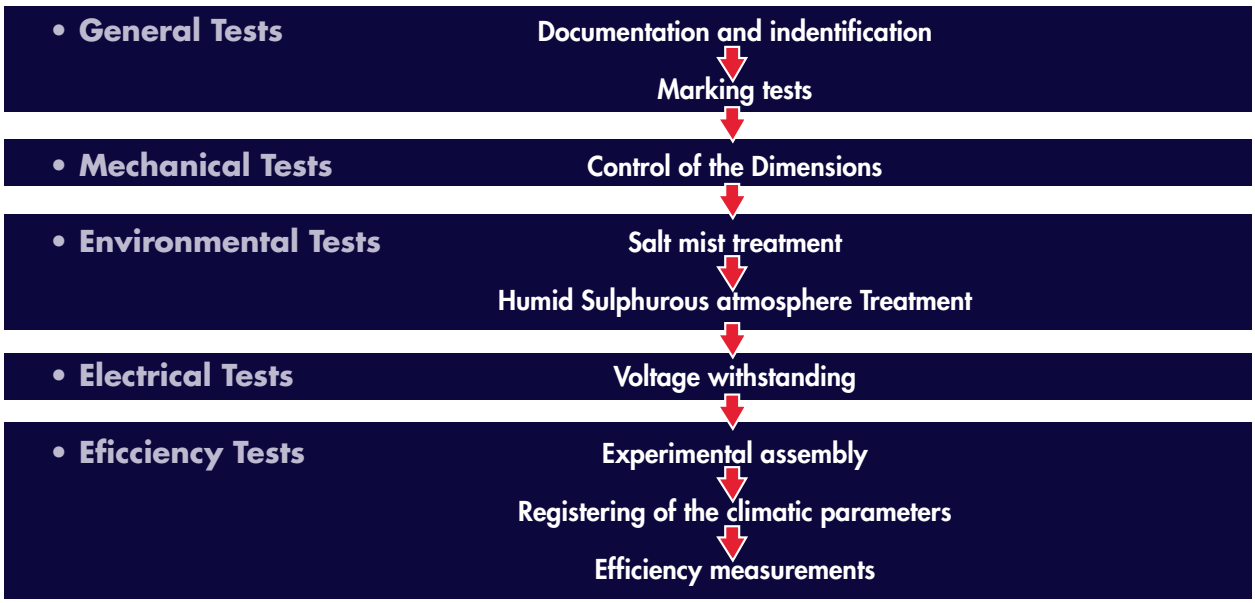
Early Streamer Emission Air Terminals / IONIFLASH MACH® Technology

> 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.

The pollution generated by the test sequence is superficial and doesn't disturb the functioning of the **IONIFLASH MACH®**.

• Electrical tests

The **IONIFLASH MACH®**, range has been tested in lightning attachment impact with a 10/350 µs 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

Early Streamer Emission Air Terminals / IONIFLASH MACH® Technology

> Standard and Tests

■ Homologated in independant Laboratories

IONIFLASH MACH®		Mach NG15	Mach NG25	Mach NG30	Mach NG45	Mach NG60
Results on the experimental waveform in laboratory $<T'_{PTS}>$ (µs)	Average reference time of breakdown $<T'_{PTS}>$ (µs)	252	252	186	186	199
	Average reference time of breakdown $<T'_{PDA}>$ (µs)	222	213	150	138	140
	$<T'_{PTS}> - <T'_{PDA}>$	30	39	34	46	59
	Standard deviation $_{PTS}$ (µs)	40	40	43	43	62
	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 early emission time		15 µs	25 µs	30 µs	45 µs	60 µs
Safety 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 1m/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)

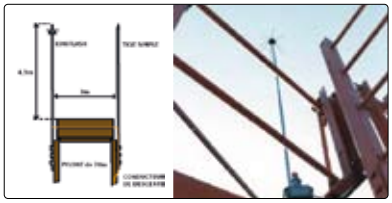
- The **IONIFLASH MACH®** has been tested strictly in respect of the procedures defined in the NFC 17-102 in :

- 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 **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

Early Streamer Emission Air Terminals / IONIFLASH MACH® Technology

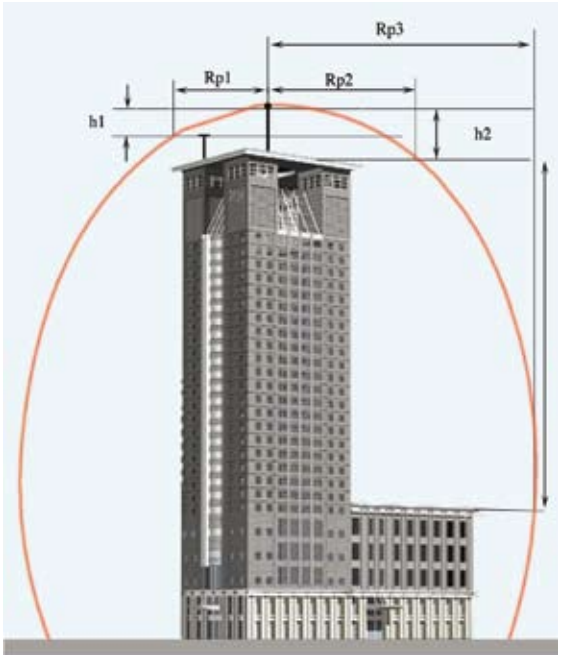
> Protection Radius

■ 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.

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

$$Rp\,(h) = h \times \frac{Rp(5)}{5} \text{ for } 2 \leq h \leq 5m \quad (2)$$



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

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

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

FRANCE PARATONNERRES®

Our Products for the direct lightning Protection

> 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.

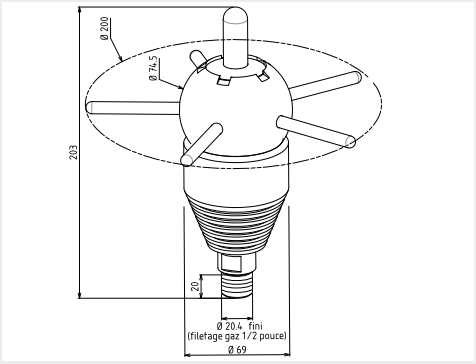
[Very good Carboon footprint

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.

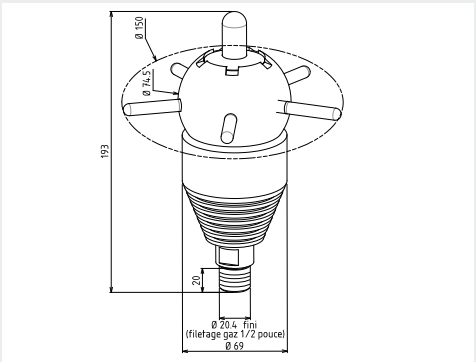
• IONIFLASH MACH NG 60

Ref. 90160



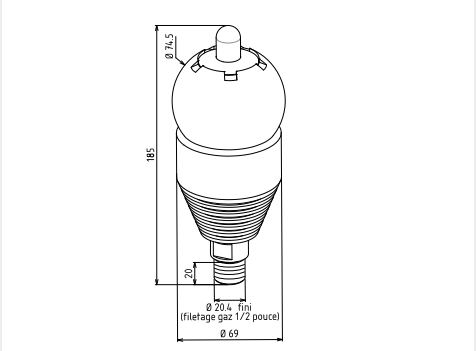
• IONIFLASH MACH NG 45

Ref. 90145



• IONIFLASH MACH NG 30

Ref. 90130

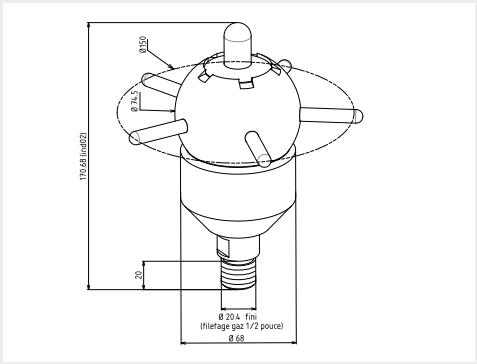


> Capture systems

The IONIFLASH MACH® Air Terminals

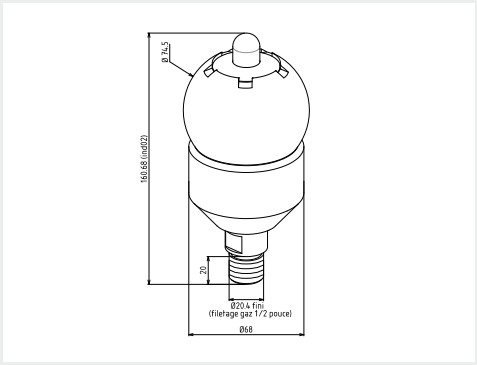
- **IONIFLASH MACH NG 25**

Ref. 90325



- **IONIFLASH MACH NG 15**

Ref. 90315



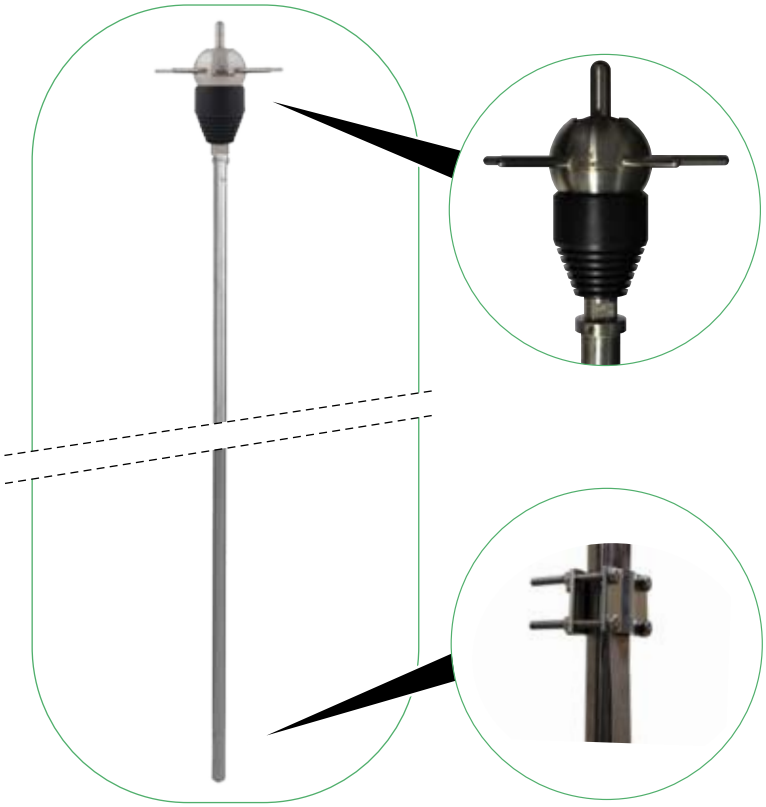
Ref	Description	Material	Emission Time		Weight
			measured	weighted	
90160	MACH NG 60	Stainless steel 316 L	135 µs	60	2,2 kg
90145	MACH NG 45	Stainless steel 316 L	114 µs	45	2,1 kg
90130	MACH NG 30	Stainless steel 316 L	87 µs	30	2 kg
90325	MACH NG 25	Stainless steel 316 L	78 µs	25	1,9 kg
90315	MACH NG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

> Capture systems

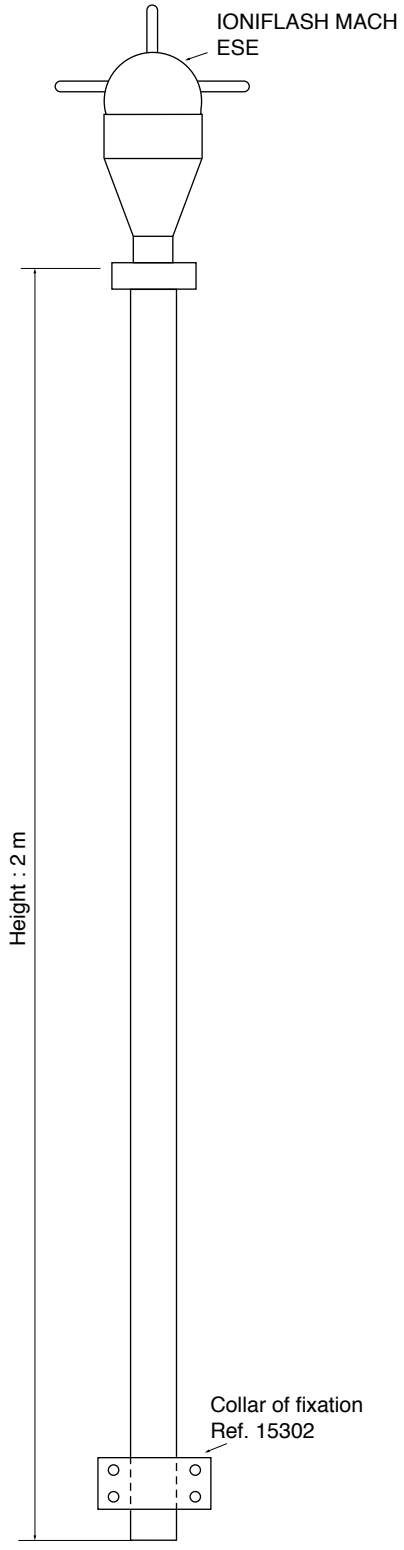
Sets of 2,15 m IONIFLASH MACH

- The IONIFLASH MACH NG kits are constituted of the elements below :

- **10260 :** 1 IONIFLASH MACH NG60 (90160) + Pole of 2m in 304 L 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 304 L 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

E.S.E. Air terminals for the protection of all types of structures and all open spaces.

[Patented technology. Very reliable

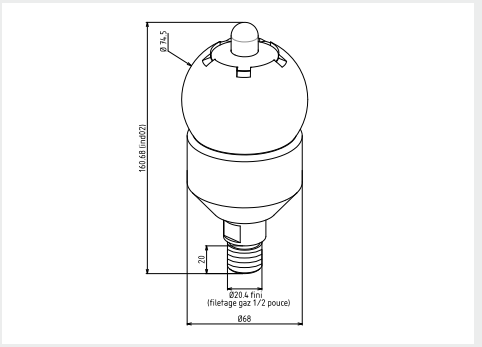
[Very early streamer emission of the leader. Emission at the right time

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

[Very good carbon footprint.

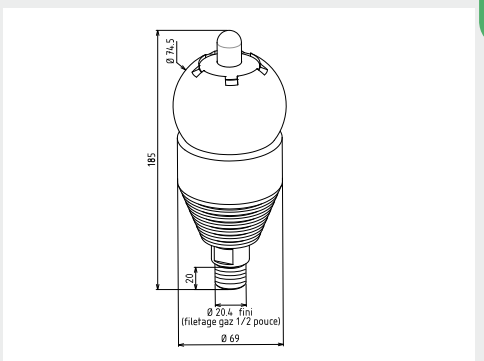
- **IONIFLASH MACH NG 15**

Ref. 90316



- **IONIFLASH MACH NG 30**

Ref. 90131



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

> Capture systems

Capture points

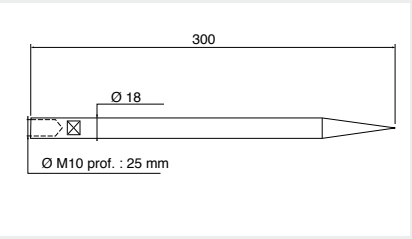
Those elements are often use to complete a lightning portection by ESE in order to protect structure with many salient angle (cathedral, castle, ...).

[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

Ref. 17001



The simple and multiple rod

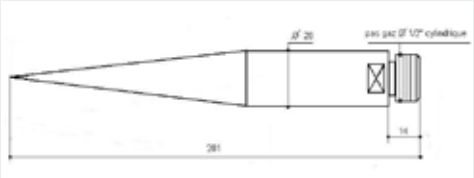
Air Terminals with simple rods to protect roof structures, chimneys, ...

[This tips adapt (themselves) perfectly on the poles.
(Ref : 11042 à 11045

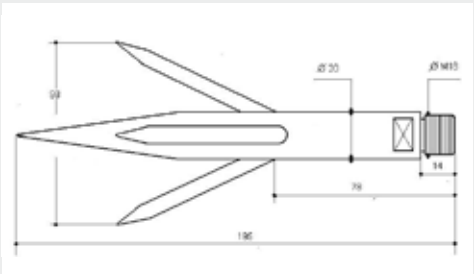
- **10013/10014/10017**

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. 10013/10014



Ref. 10017



> Lightning Impulse Counters

The Lightning impulse counter

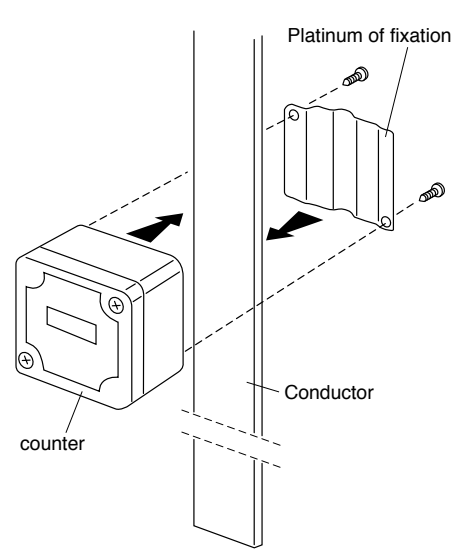
This counter records each lightning stroke on a lightning protection system. This information can be useful to do the maintenance of the lightning protection system after a lightning impact.

[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	2-999999
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

Ref. 30002

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 Ø 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

Ref	30001
Fastening system	Parrallel
Counter	0-999999
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.

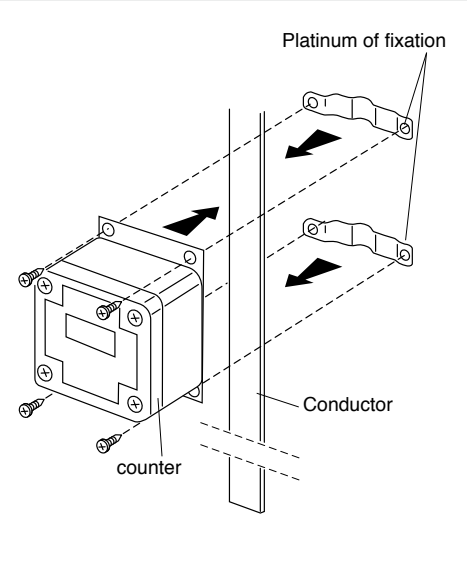
The 30003 counter enables to know exactly the date and time of the lightning events. It can keep in memory the last 500 impacts.

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**

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	IK08 IP66/67

Ref. 30003

> Brackets and fixings

The Stainless Steel Pole

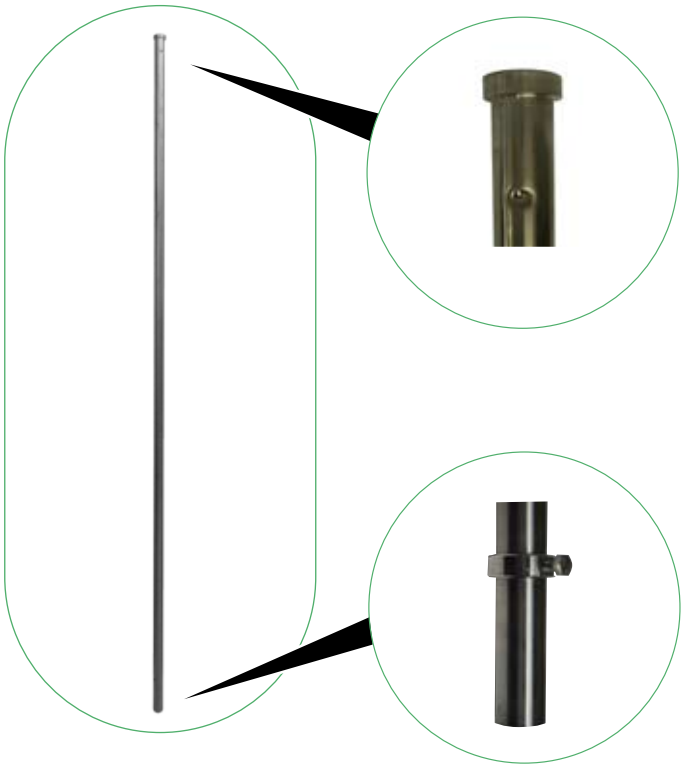
To attach the Air Terminal on a lightning protection installation 2 m above the highest point. The top has a threaded part at the top to fix the air terminal **IONIFLASH MACH®**.

[Very good electrical and mechanical contact.

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

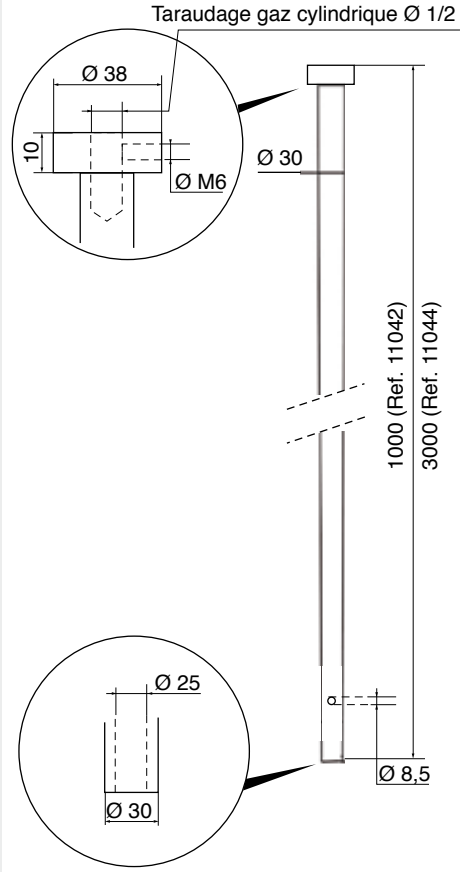
[The pole is able to receive a copper sheath (Ref 18020)

• **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/



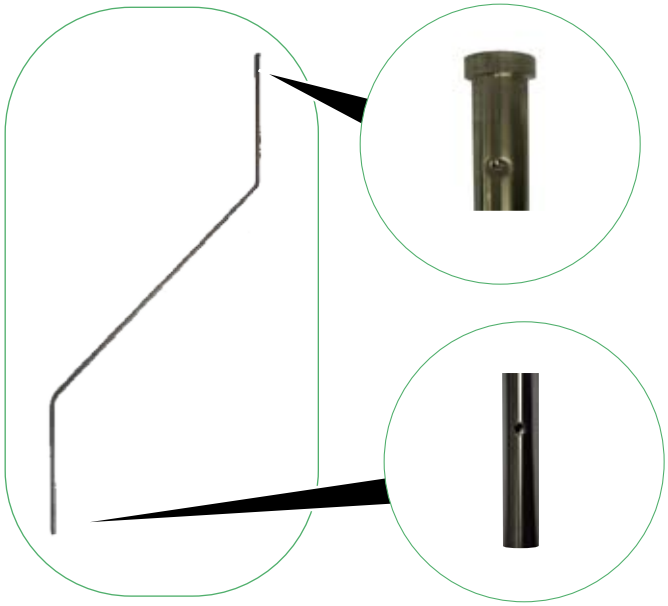
> Brackets and fixings

The Stainless Steel Pole

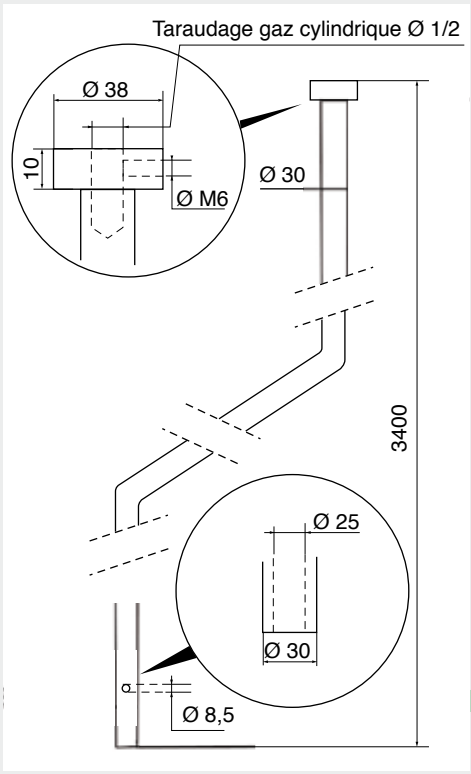
- The deported pole

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

• **11047**



Ref. 11047



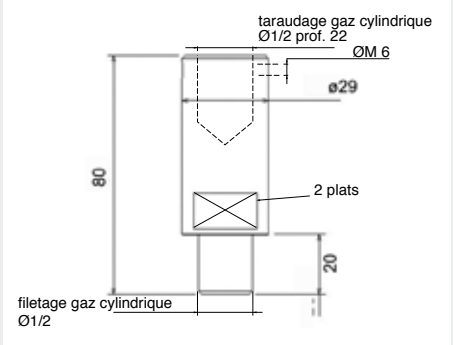
Ref	Material	Length	Diameter inside	Weight
11047	S/s 304 L	4 m	25 mm	10 kg

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. 90110



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

> 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**

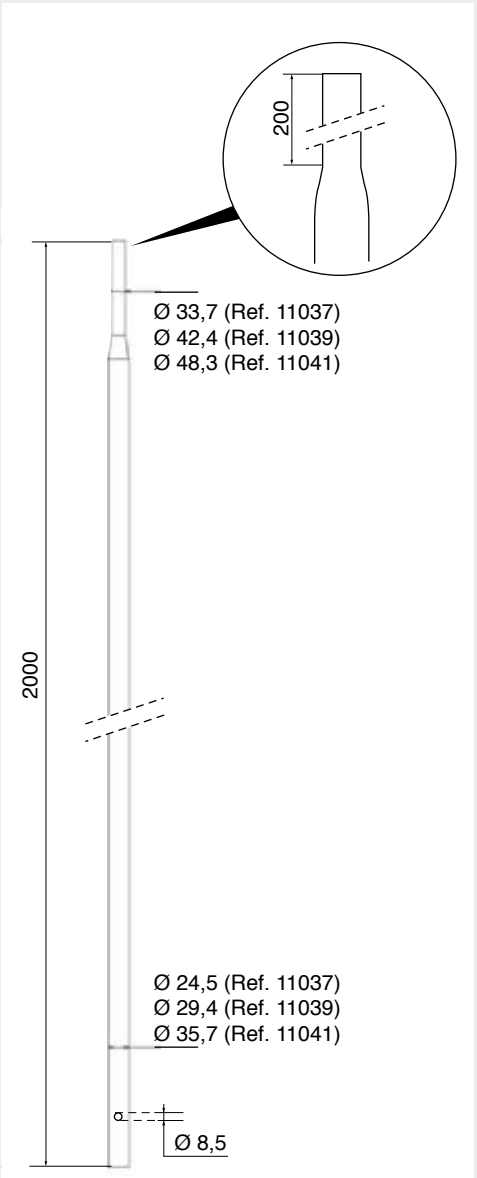
Ref	Designation	Material	Length	Diamètre extérieur	Weight
11037	1er mast	S/s 304 L	2 m	33,7 mm	3 kg
11039	2eme mast	S/s 304 L	2 m	42,4 mm	6 kg
11041	3eme mast	S/s 304 L	2 m	48,3 mm	7 kg

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.

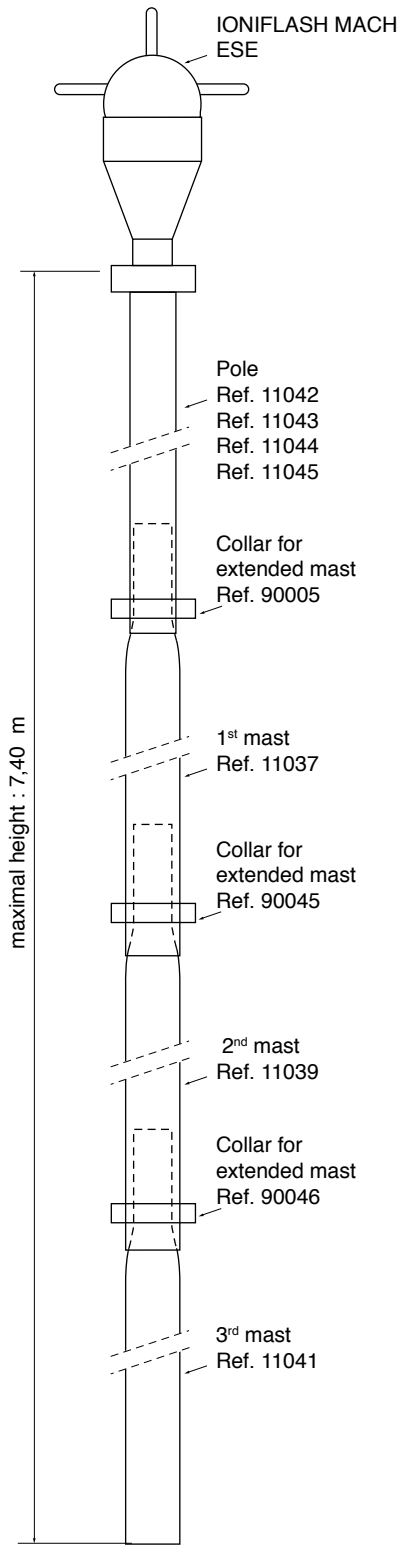
*Maximum height admitted : 8 m (guy wire needed).
For any height up than 8m : Installer's responsability.

Ref. 11037/11039/11041



> Brackets and fixings

Principle of fitting of the mast



> Brackets and fixings

Capture point brackets (for Ref 17001/ 17002)

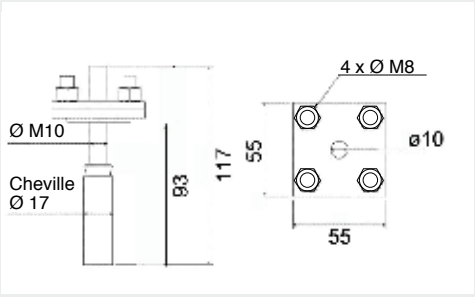
Brackets for capture point equipped with a waterproof ring. Points fixed in masonry or on a metal roof structure.

[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

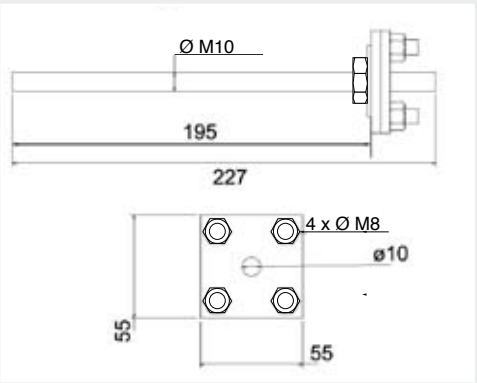
- **17012**

Ref. 17012



- **17013**

Ref. 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

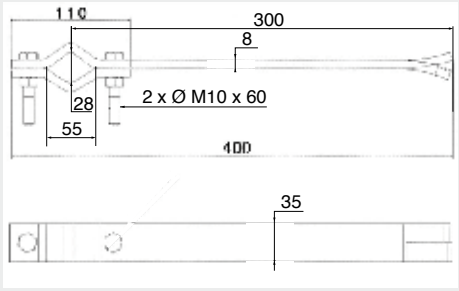
> Brackets and fixings

Embedding clamp

For fixing air terminals on masonry

- **12001/12002**

Ref. 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

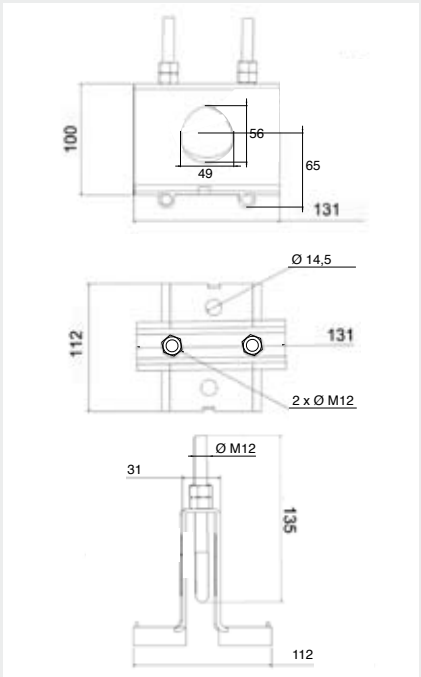
Universal clamp

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

[System adapts to all situations.

- **12006/12007**

Ref. 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

> Brackets and fixings >

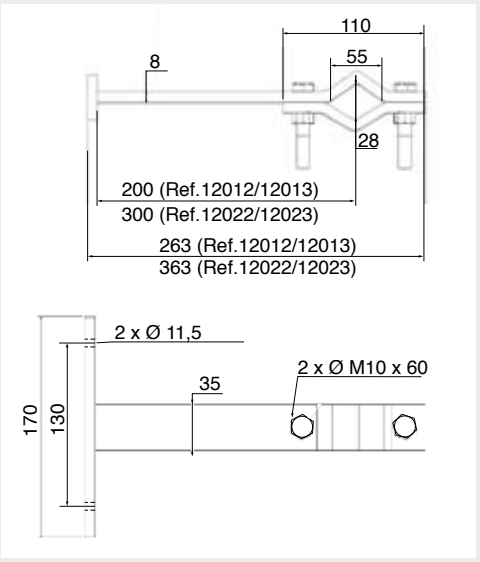
Bolting brackets

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



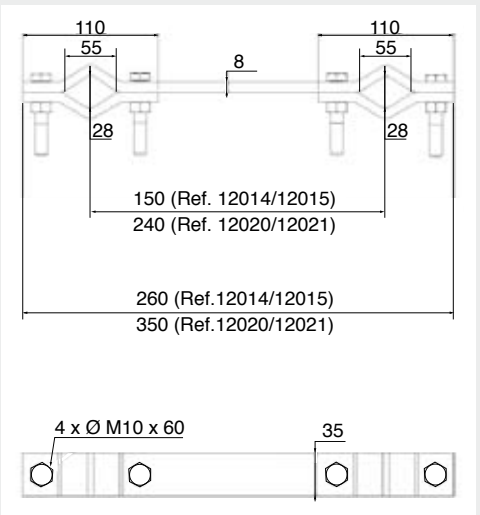
Extended fixing brackets

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

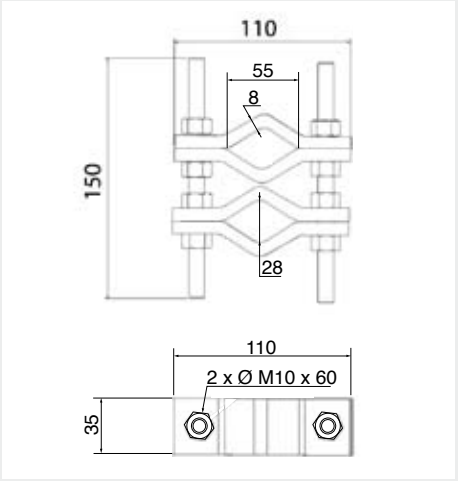
Lateral clamp

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



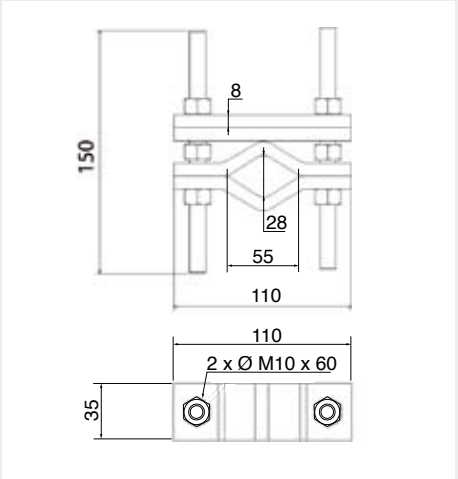
Lateral clamp

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**

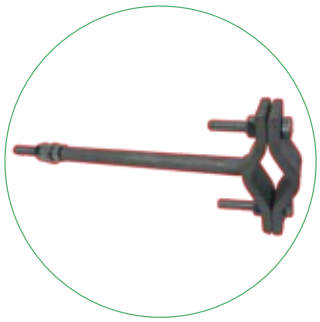
available on request

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

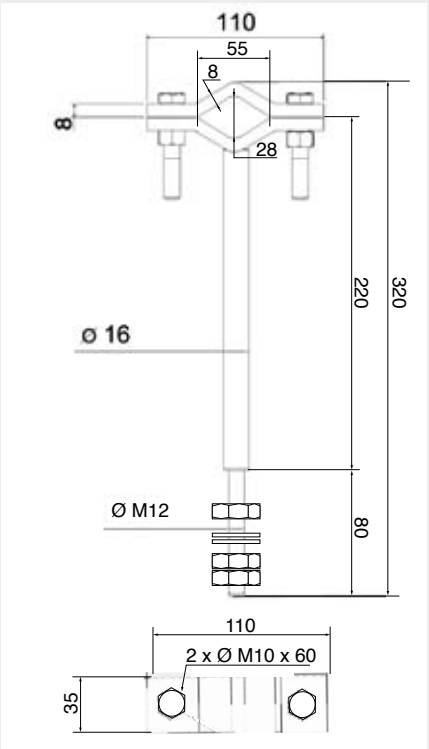
Screwing clamp

Fixing brackets for air terminals directly into masonry.

- **12018/12019**



Ref. 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

> Brackets and fixings

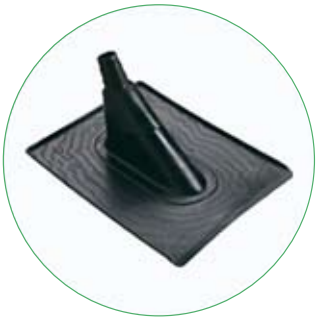
Waterproofing

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

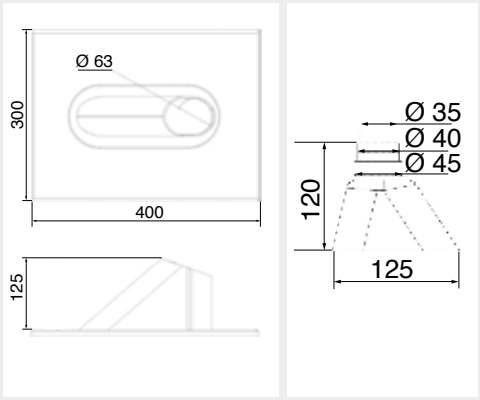
[The tile must be installed with the cone, delivered with a cone. (réf. 12114)

[Cone can be delivered independently (Ref 80087)

• **12114/80087**



Ref. 12114/80087



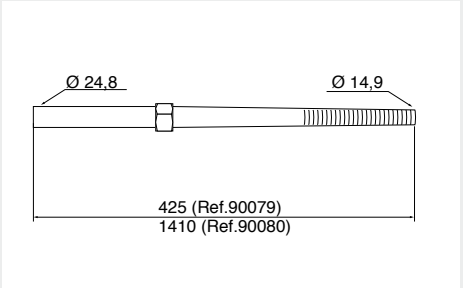
Ref	Designation	Material	Dimensions	Weight
12114	Waterproof tile	Polyethylene	300 x 400 x 150 mm	0,30 kg
80087	Waterproof cone	Polyethylene	120 x 120 x 70 mm	0,03 kg

Anchor bolt

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

• **90079/90080**

Ref. 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

> Lightning Conductors

Flat copper

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

- **13001/13011**

Ref. 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. 13002

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

> 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. 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. 13007/60014

Ref	Material	Section	Diameter	Packaging	Weight
13007	Copper	50 mm²	16 mm	50 m roll	0,44 kg /m
60014	Copper	25 mm²	8 mm	50 m roll	0,23 kg /m

> Conductors fixings

Clamps for mansonry

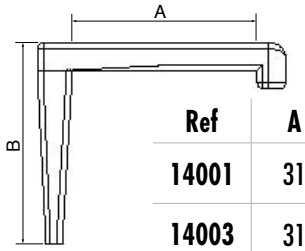
For fixing conductors on stone or any other type of masonry.

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

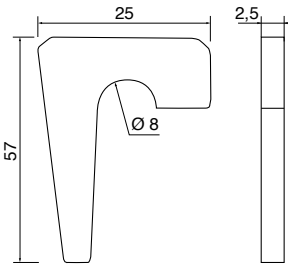
• **14001/14003/14005/14008**

Ref	Designation	Material	Length	Weight	To use with
14001	Clamp 30	Galvanized Steel	30 mm	25 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



Ref	A	B
14001	31	36,5
14003	31	56
14005	3	35



Mansonry lead peg for brickdowm clamp

For brickwork clamp. Ref. 14001 / 14003 / 14005

• **14004**

Ref	Material	Weight
14004	Lead	6,2 g

Ref. 14004

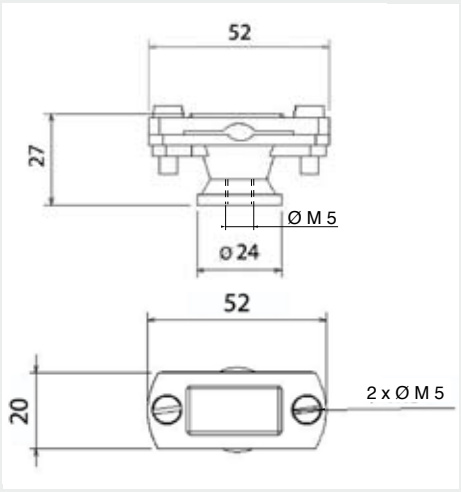
> Conductors fixings

Clamps for mansonry

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

- **14021**

Ref. 14021



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

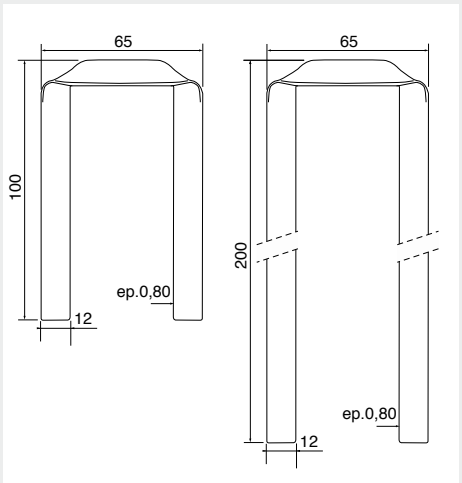
Clamps for roof

Fixing of down-conductors on all types of roof.

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

- **14006/14007**

Ref. 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

> Conductors fixings

Clamps for roof

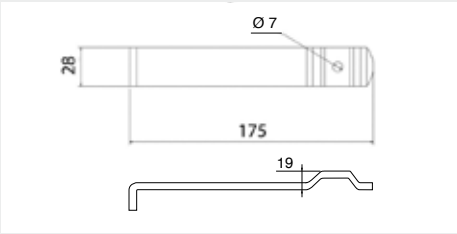
Fixing of down-conductors on all types of roof.

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

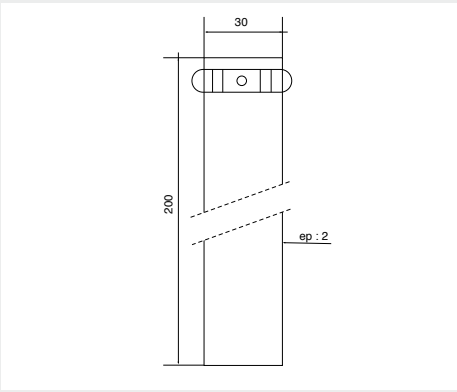
- **14034/14000**

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

Ref. 14034



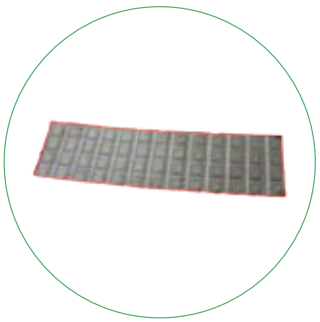
Ref. 14000



Straps ride

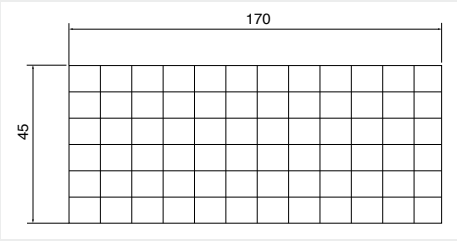
For fixing flat conductors. Protects the conductor against damage

- **14010/14009**

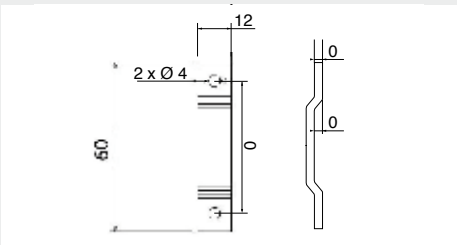


Ref	Designation	Matière	Dimensions	Poids	A utiliser avec
14010	Ruberalu	Ruberalu	170 x 45 mm	35 g	Rivets
14009	Riveted or welded strap	Tinplated Copper	60 x 12 mm	3g	14012 or 14013

Ref. 14010



Ref. 14009



> Conductors fixings

Blind Pop rivets

Rivets to fix the fastening component range.

- **14011/14012/14013**

Ref. 14011/14012/14013

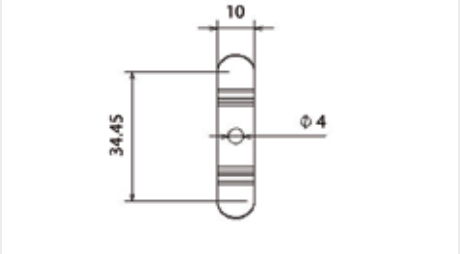
Ref	Désignation	Material	Length	Weight
14011	Rivet Alu	Aluminium	9,5mm	1g
14012	Rivet Cu9	Copper	9,5mm	2,3g
14013	Rivet Cu16	Copper	16mm	3g

Metal sheet fixations - Clips

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

- **14015**

Ref. 14015



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

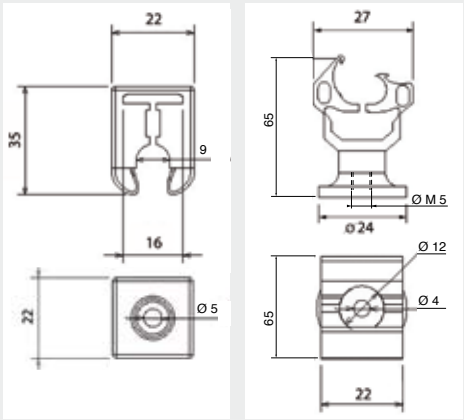
Fixations for round conductors

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



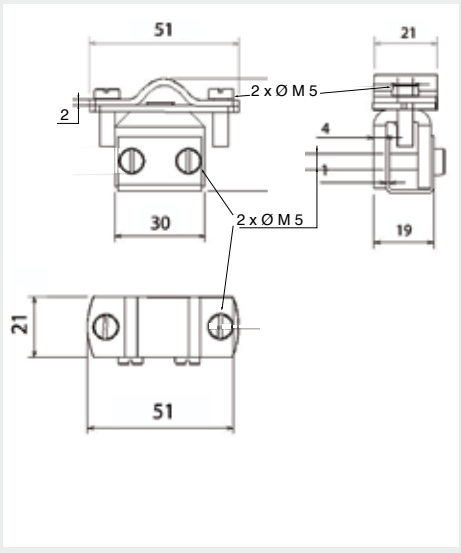
Swivel orientable

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

Ref. 14041



> Conductors fixings

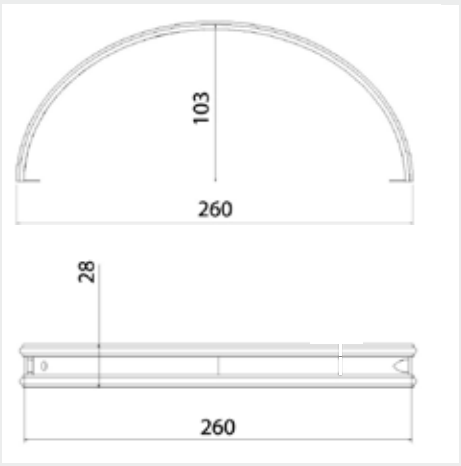
Ridge

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



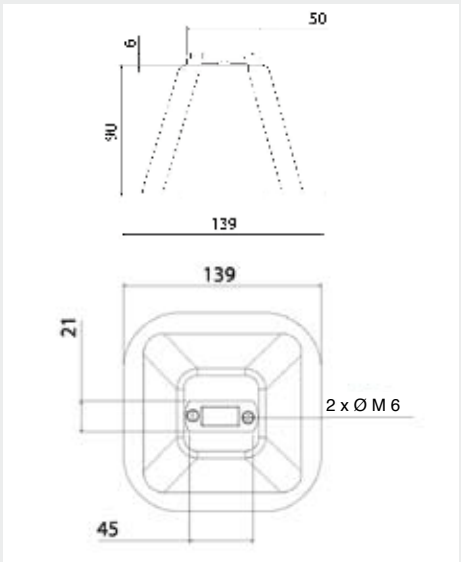
Stands off

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

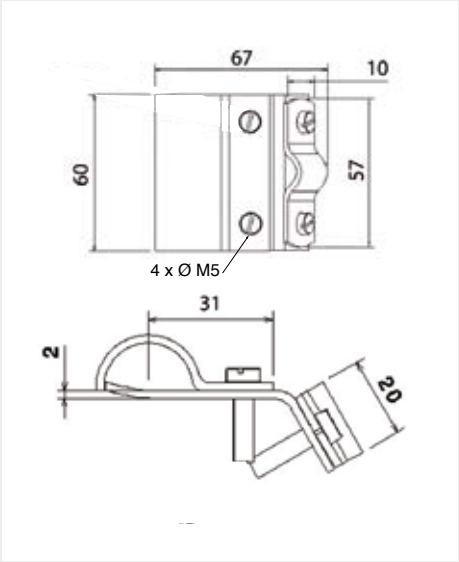
Gutter

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**

Ref. 15101

Ref. 15102

Ref. 15103

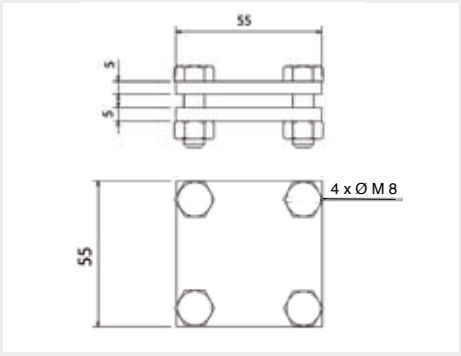
Ref. 15104

Ref. 15109

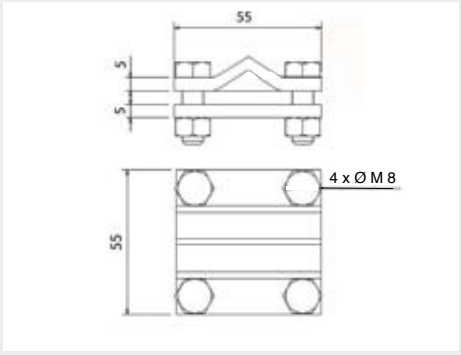
Ref. 15108

Ref	Designation	Material	Dimensions	Weight
15101	Plate / Plate	Tinplated copper	55 x 55 mm	330 g
15102	Plate / Plate	Copper	55 x 55 mm	330 g
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

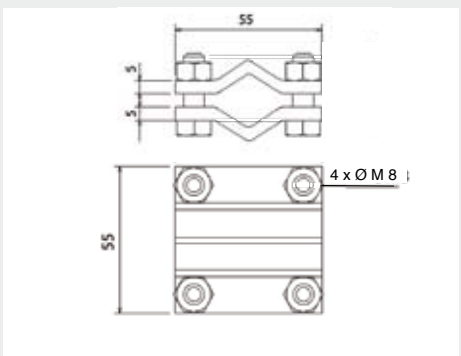
Ref. 15101/15102



Ref. 15103/15104



Ref. 15108/15109



> Conductors interconnection

Join

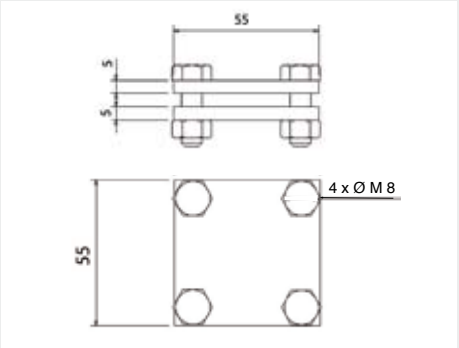
Connection Flat/Flat :
to assemble two flat conductors.

Connection Flat/Round :
to assemble a flat conductor to a round conductor.

Connection Round/Round :
to assemble two round conductors

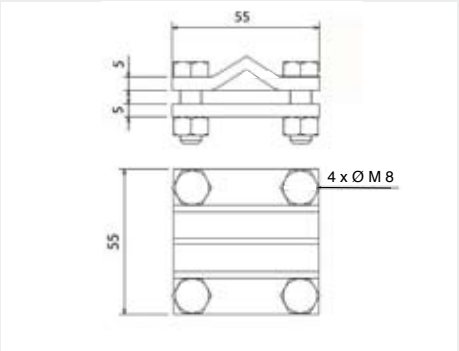
- **15110**

Ref. 15110



- **15111**

Ref. 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

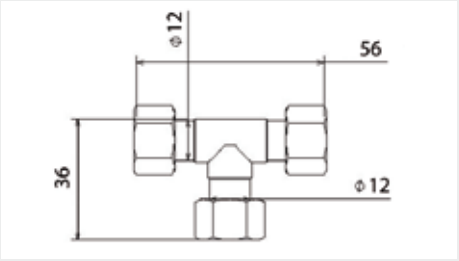
> Conductors interconnection

Tube

Connection to assemble round, 8 mm conductors

- **15106**

Ref. 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**

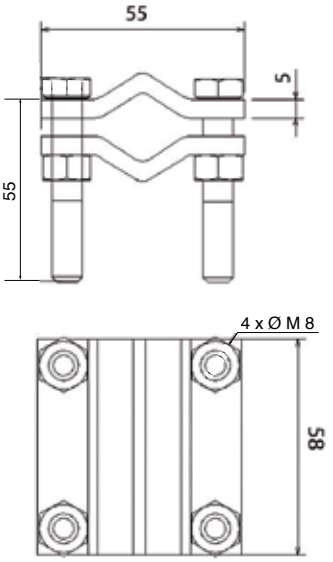
Ref. 15301

Ref. 15303

Ref. 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



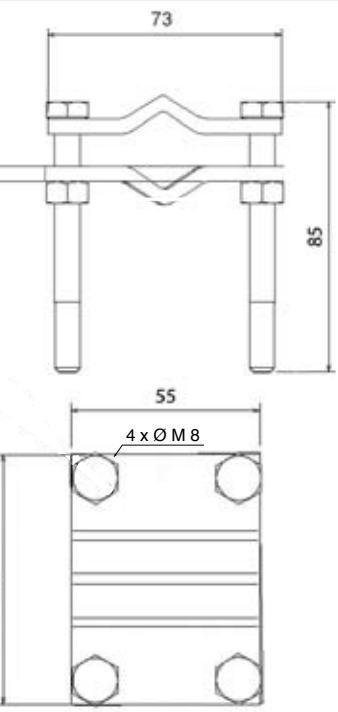
- **15302/15306**

Ref. 15302

Ref. 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



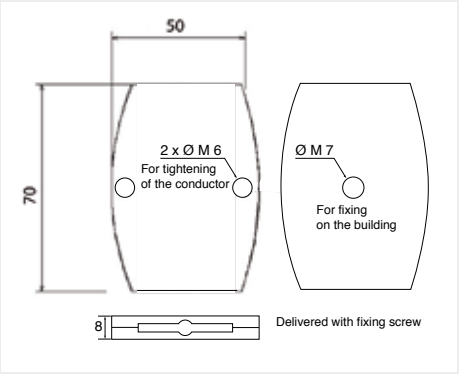
> Earthing system

Inspection joint

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

- **16001**

Ref. 16001



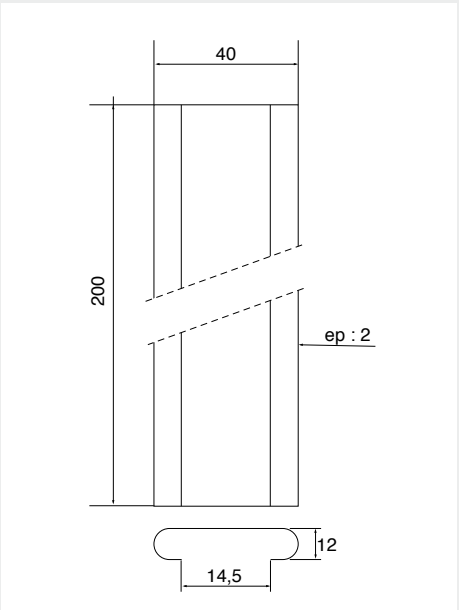
Ref	Designation	Material	Dimensions	Weight
16001	Inspection joint	Tinplated brass	55 x 70 mm	320 g

Protection sheath

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

- **16003/16007**

Ref. 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

> Earthing system

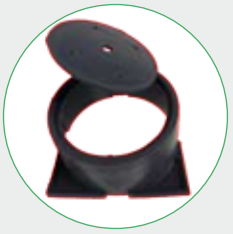
Inspection pits

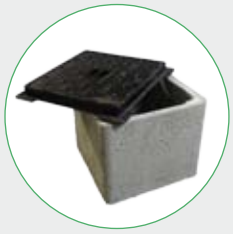
Protected access to the earthing system of lightning protection

- **16004/80136/80137**

Ref. 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





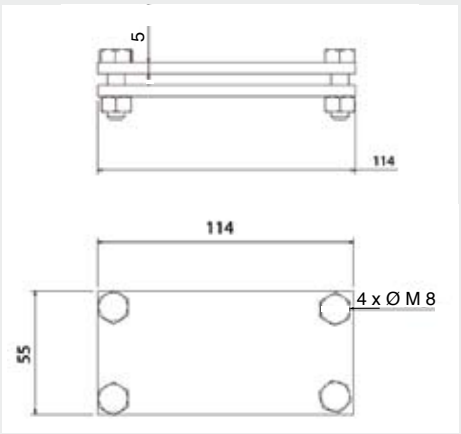
Earth connectors

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

- **16005**

Ref. 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. 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

> Earthing system

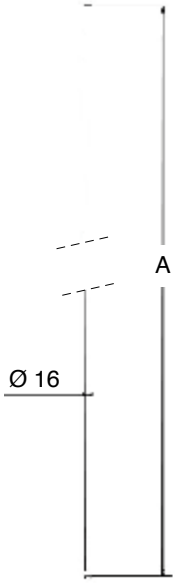
Earth rod

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



Ref	A
16105	1500
16106	2000

Coupling sleeve

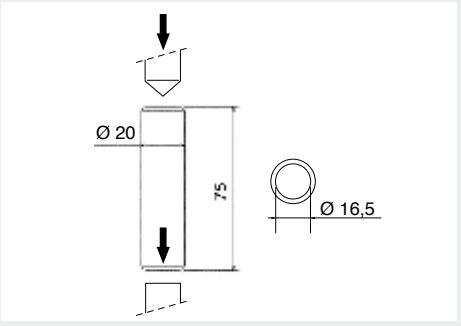
Coupling sleeve to join two earth rods
Driving tip to insert rod without damaging it

- **16113/16133**

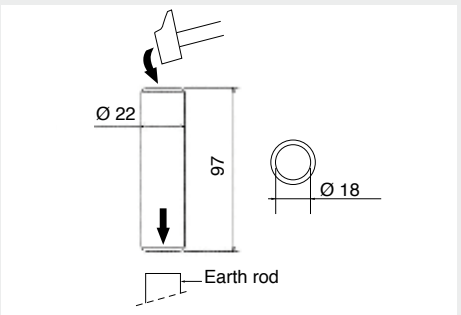
Ref. 16113

Ref. 16133

Ref. 16113



Ref. 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

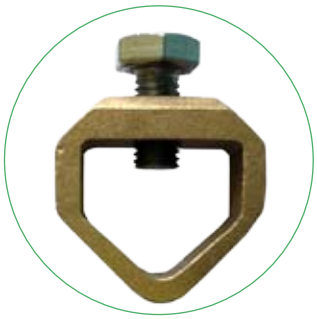
> Earthing system

Rod connectiong collar

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

- **16121/16126**

Ref. 16121



Ref. 16126

Ref	Designation	Material	Dimensions	To use with	Weight
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

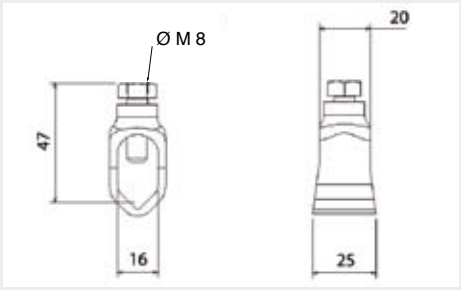
- **16124/16125**

Ref. 16124

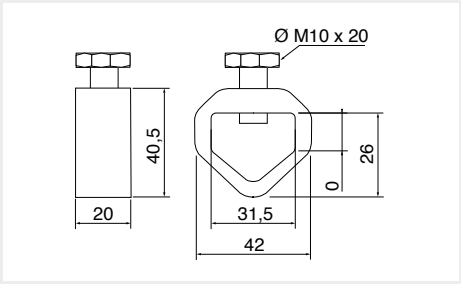
Ref. 16125

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

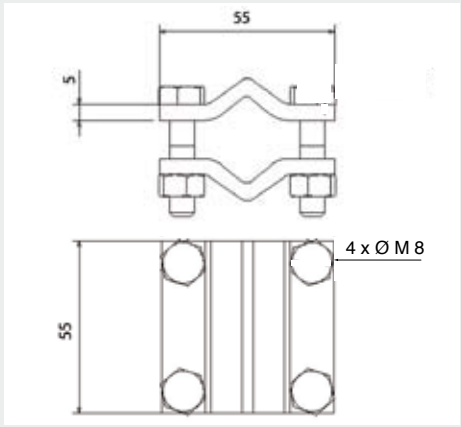
Ref. 16121



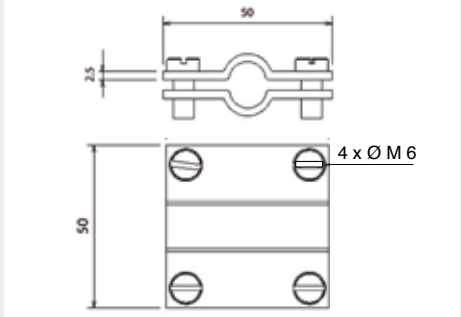
Ref. 16126



Ref. 16124



Ref. 16125



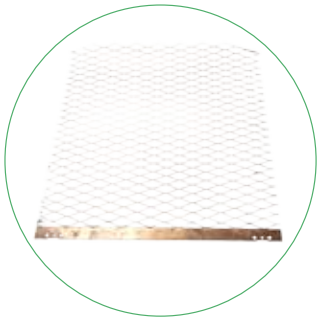
> Earthing system

Earthing mesh

Copper earthing mesh enabling better distribution of lightning current.

- **16150/16151**

Ref. 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. 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.

> Equipotentiality connection

Shunt and braid

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

- **13005/13009**

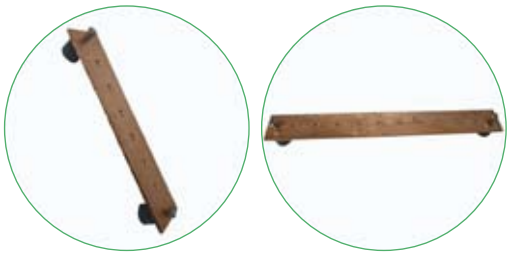
Ref	Material	dimensions	Packaging	Weight
13005	Tinplated copper	30 x 3,5 mm	Per meter	0,47 kg
13009	Tinplated copper	30 x 3,5 mm	Shunt (50cm)	0,26 kg

Ref. 13005/13009

Equipotentiality bars

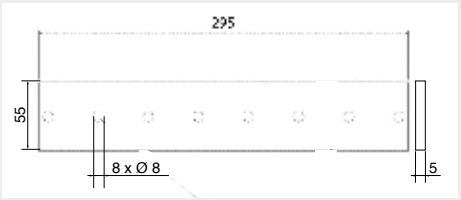
Earthing interconnections.
Allows deconnection for separate earthing measurements.

- **16143/16144**

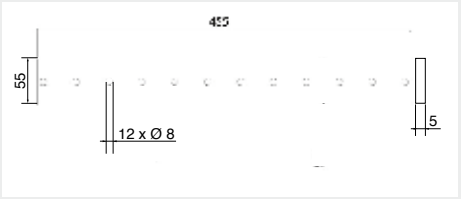


- **80020**

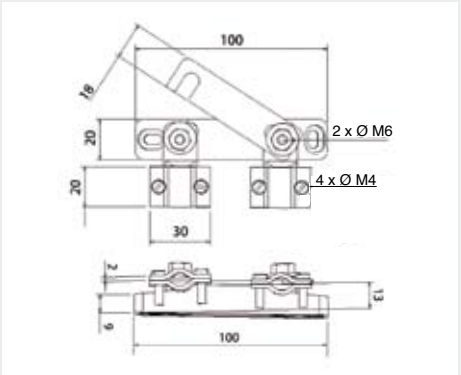
Ref. 16143



Ref. 16144



Ref. 80020



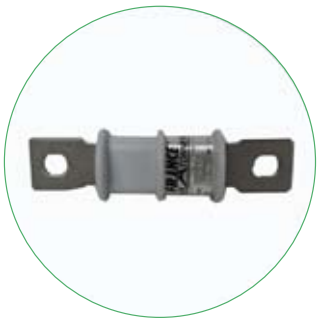
Ref	Designation	Material	Length	Weight
16143	Equipotentiality 6 holes	Copper	295 mm	800 g
16144	Equipotentiality 10 holes	Copper	455 mm	1,2 kg
80020	Earth cut	Copper / plastic	100 mm	120 g

> 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

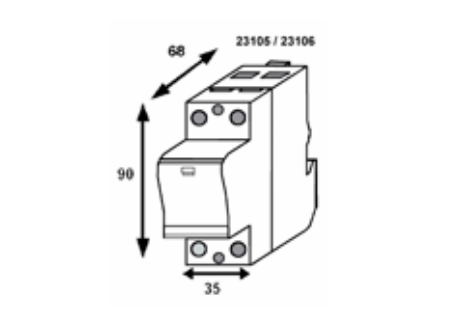
Our Products for the indirect lightning Protection

Our Products for the indirect lightning protection

> 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.



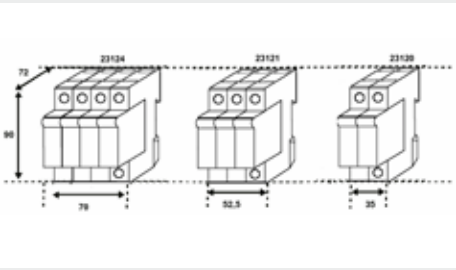
• **23105/23106**

Ref. 23105/23106

Ref	Module	Max voltage Uc	Impulse discharge current I_{mp}	Nominal discharge current I_n	Level of protection under U_p sous I_n
23105	2	440 VAC	25 kA	30 kA	2 kV
23106	2	335 VAC	25 kA	30 kA	1,5 kV

Monobloc SPD – 25 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.



• **23120/23121/23122/23123/23124**

Ref. 23120/23121/23122/23123/23124

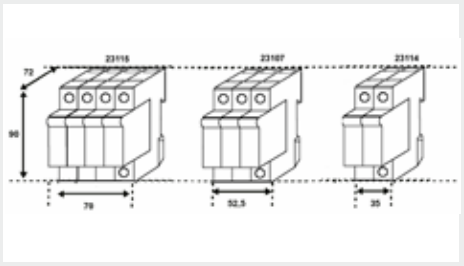
Ref	Module Network	Max voltage U_c	Impulse discharge current I_{mp}	Nominal discharge current I_n	Level of protection U_p under I_n
23120	2 L + N	335 VAC	25 kA	30 kA	1,5 kV
23121	3 3*L	335 VAC	25 kA	30 kA	1,5 kV
23122	8 3*L	440 VAC	25 kA	30 kA	2 kV
23123	8 3*L + N	440 VAC	25 kA	30 kA	2 kV
23124	4 3*L + N	335 VAC	25 kA	30 kA	2 kV

Our Products for the indirect lightning protection

> 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 (high keraunic level).
Equipped with a remote and optical fault indicator contact.



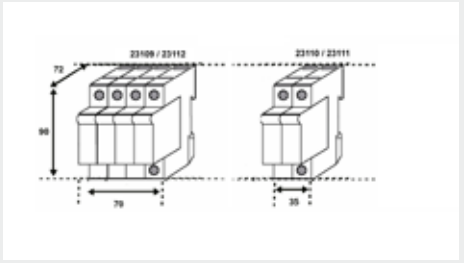
- **23107/23108/23114/23115**

Ref. 23107/23108/23114/23115

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
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

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.



- **23109/23110/23111/23112**

Ref. 23109/23110/23111/23112

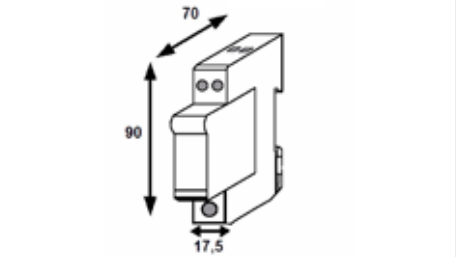
Ref	Module Network	Max voltage U_c	Impulse discharge current I_{mp}	Nominal discharge current I_n	Level of protection U_p under I_n
23109	4 3 L + N	440 VAC	12,5 kA	20 kA	2 kV
23110	2 L + N	440 VAC	12,5 kA	20 kA	2 kV
23111	2 L + N	335 VAC	12,5 kA	20 kA	1,5 kV
23112	4 3* L + N	335 VAC	12,5 kA	20 kA	1,5 kV

Our Products for the indirect lightning protection

> 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.



• **23116/23118/23129**

Ref. 23116/23118/23129

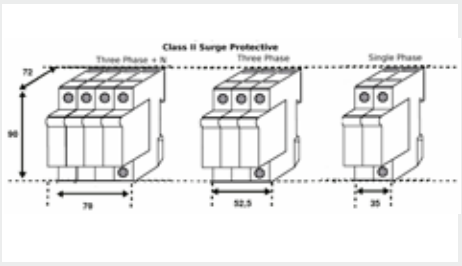
Ref	Module Network	Max voltage U_c	Impulse discharge current I_{mp}	Nominal discharge current I_n	Level of protection U_p under I_n	Replacement plug
23116*	1	440 VAC	12,5 kA	20 kA	1,8 kV	23117
23118*	1	335 VAC	12,5 kA	20 kA	1,4 kV	23119
23129	1	335 VAC	50 kA	50 kA	1,2 kV	

* 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.



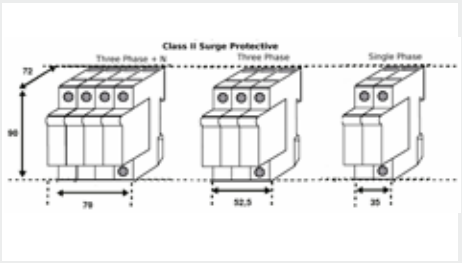
Ref. 23201/23202/23203/23204/23205/23206

- **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 U_p under I_n	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

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.



Ref. 23209/23210

- **23209/23210**

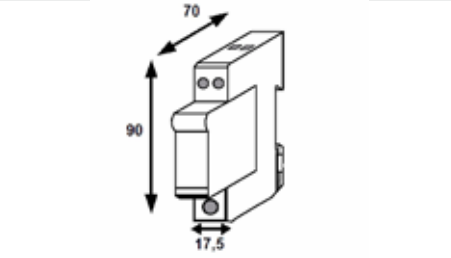
Ref	Module Network	Max voltage U_c	Max discharge current I_{mp}	Nominal discharge current I_n	Level of protection U_p under I_n	Replacement plug
23209	4 3* L + N diff	335 VAC	40 kA	15 kA	1,5 kV	23230 (Phase)
23210	2 L + N diff	335 VAC	40 kA	15 kA	2 kV	/23211 (Neutral)

Our Products for the indirect lightning protection

> 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



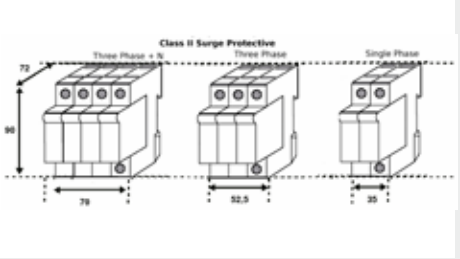
Ref. 23212

- **23212**

Ref	Module Network	Max voltage U_c	Max discharge current I_{mp}	Nominal discharge current I_n	Level of protection $U_{p\ under\ In}$	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

- **23214/23216/23218**

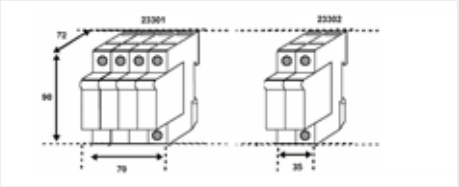
Ref	Module Network	Max voltage U_c	Max discharge current I_{mp}	Nominal discharge current I_n	Level of protection $U_{p\ under\ In}$	Replacement plug
23214	2 L + N	335 VAC	15 kA	5 kA	1,2 kV	23220
23216	3 3L*	335 VAC	15 kA	5 kA	1,2 kV	23220
23218	4 3*L + N	335 VAC	15 kA	5 kA	1,2 kV	23220

Our Products for the indirect lightning protection

> 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.



Ref. 23301/23302

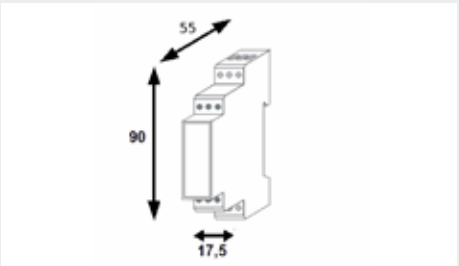
- **23301/23302**

Ref	Module Network	Max voltage U_c	Max discharge current I_{max} (L-N-N-PE)	Nominal discharge current I_n (L-N-N-PE)	Level of protection U_p under I_n (L-N-N-PE)	Replacement plug
23301	4 3* L + N diff	335 VAC	10/40 kA	5/20 kA	1,1/1,2 kV	23303 (Phase) /23304 (Neutral)
23302	2 L+ N diff	335 VAC	10/40 kA	5/20 kA	1,1/1,2 kV	

> 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**

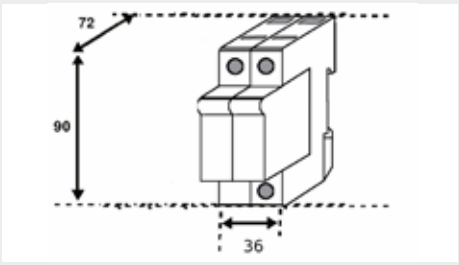
Ref	Application	Max discharge current I_{mp}	Nominal discharge current I_n	Level of protection U_p under I_n	Replacement plug
23401	RTC/ADSL	185 VDC	10 kA	5 kA	Non removable
23402	Numéris	7 VDC	10 kA	5 kA	
23414	RTC/ADSL	185 VDC	10 kA	5 kA	20403
23415	Numéris	+-7 VDC	10 kA	5 kA	23404

Our Products for the indirect lightning protection

> 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.



• **23126*/23127/23128**

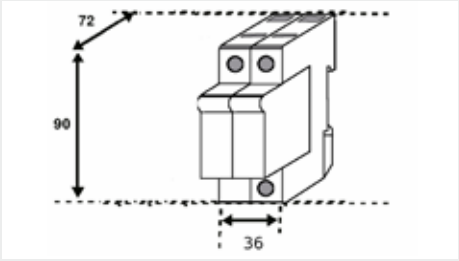
Ref. 23126/23127/23128

Ref	Module Application	Max voltage U_c	Impulse discharge current I_{mp}	Nominal discharge current I_n	Level of protection U_p under I_n
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.



• **23222/23223/23224**

Ref. 23222/23223/23224

Ref	Module Network	Max voltage U_c	Maximal discharge current I_{max}	Nominal discharge current I_n	Level of protection U_p under I_n	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 discharge current I_n	Level of protection U_p under I_n	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

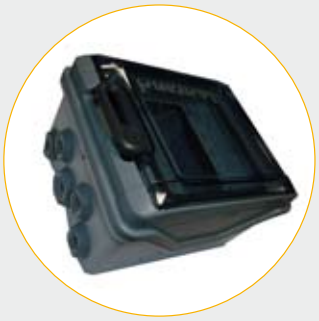
Ref	Application	Max voltage U_c	Inductance	Maximum current	Dimensions
23504	Coordination	500 VAC	15 µH	35 A	1 module

Our Products for the indirect lightning protection

> Miscellaneous Surge Protective Devices

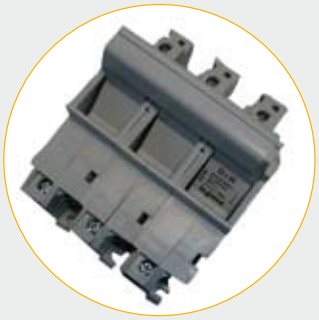
Surge Protectors Boxes

Ref	
Various models available Please consult us	Please consult us



Circuit Breakers

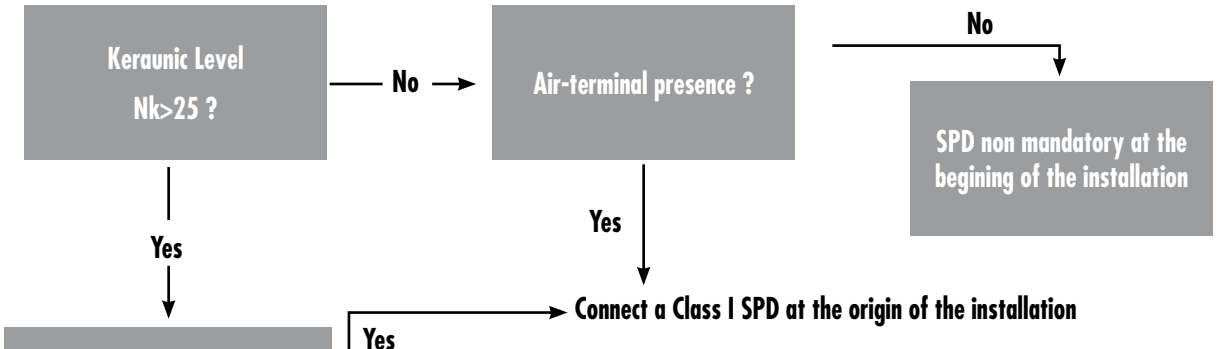
Ref	
Various models available Please consult us	Please consult us



> 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.



Network	Pole number	Surge Protective Device	
TT - TN (Uc = 335 V)	1	23 106	23 118
	2 (Mono)	23 120	23 111
	3 (Tri)	23 121	
	4 (Tri + N)	23 124	23 112
IT (Uc = 440 V)	1	23 105	23 116
	2 (Mono)	23 110	
	3 (Tri)	23 122	
	4 (Tri + N)	23 109	23 123

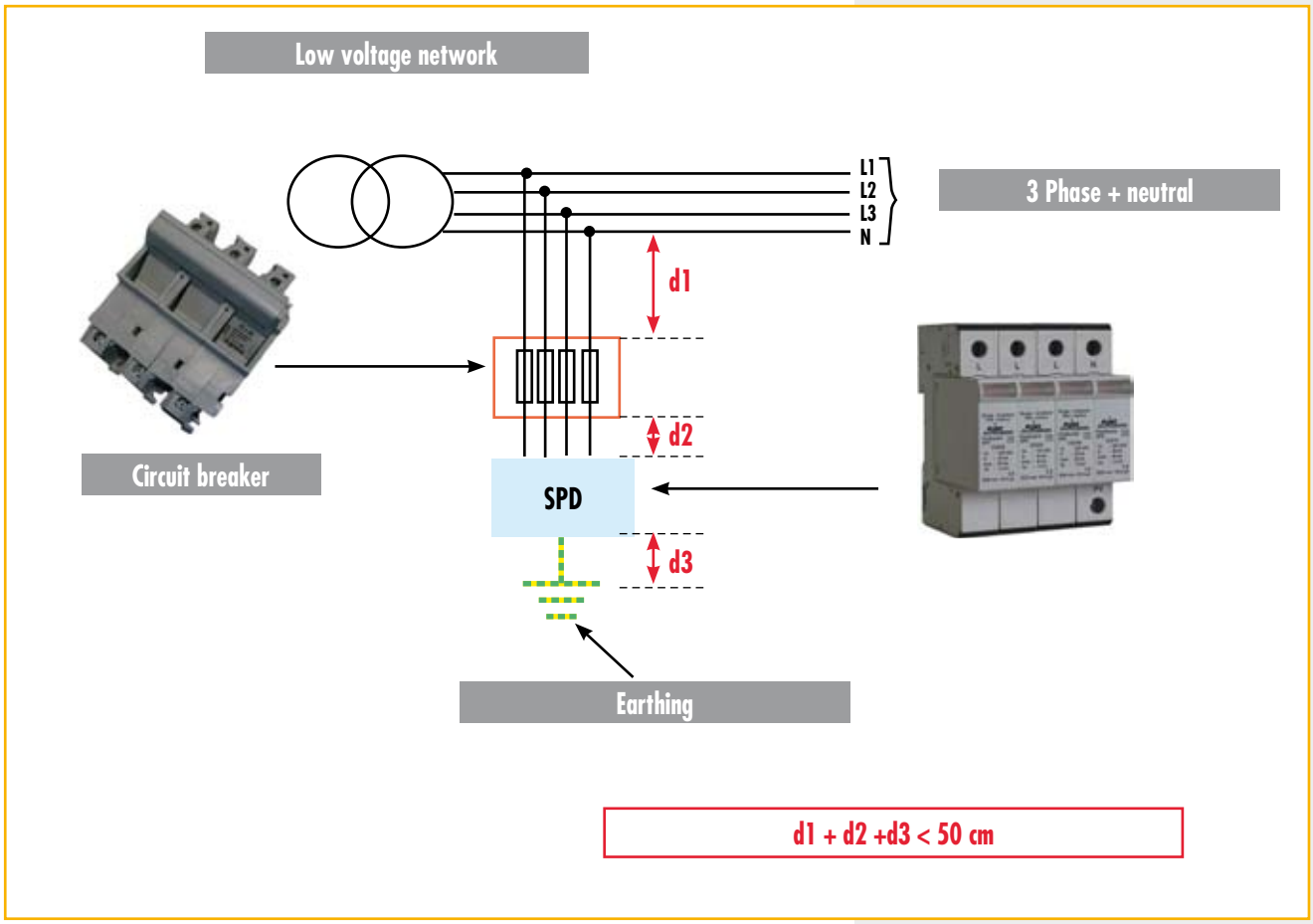
Network	Pole number	Surge Protective Device		
TT - TN (Uc = 335 V)	2 (Mono)	23 206	23 212	23 106
	3 (Tri)	23 205	23 216	
	4 (Tri + N)	23 204	23 218	
IT (Uc = 440 V)	2 (Mono)	23 203		
	3 (Tri)	23 202		
	4 (Tri + N)	23 201		

Our Products for the indirect lightning protection

> 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 and Accessories

Testing apparatus and accessories

> 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**

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

Ref. 16174

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)

Ref. 30041

Testing apparatus and accessories

> 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),

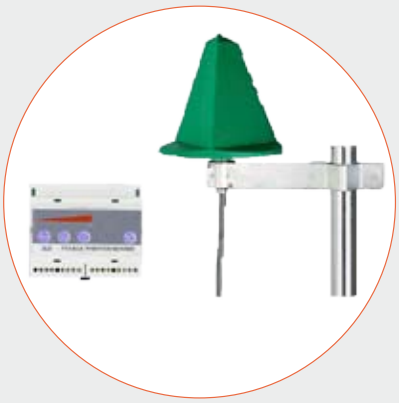
[The antenna is fixed on the upper part of a mast.
Permanent control of the storm activity. (in a radius from 5 to 10 km).

[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 ...)



Ref. 80158/80159/80160/80161

- **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

Testing apparatus and accessories

> 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

Ref	Description	Alimentation	Dimensions	Poids
30051	High voltage for IONIFLASH MACH	Battery 12V lihium lion	30 x 30 x 21 cm	5 kg

> Accessories

Hooping buckles

Fixing Air Terminals with hooping buckles especially for chimneys.

- **12005/12111/80120**

Ref. 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. 12112/80800

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

Testing apparatus and accessories

> 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® 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. 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. 14004

Ref	Material	Weight
14004	Lead	6,2 g

GBolt FIX II M10 95/36

For fixation. (M10)

- **85037**

Ref. 85037

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

Testing apparatus and accessories

> 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**

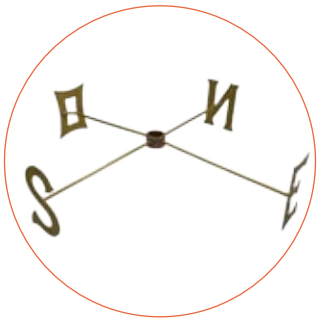
Ref. 18020

Ref	Material	Dimensions	Weight
18020	Copper	43 cm	1,1 kg

Cardinal points N.S.E.W

- **18110**

Ref. 18110



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

Certifications and References

Certifications and References

> Iso 9001 Certification

BUREAU VERITAS
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** Date: **12 March 2014**

Contract No. : **6082541**

Jacques Matillon - Managing Director

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

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.

cofrac
CERTIFICATION DE SYSTEMES DE MANAGEMENT

> Qualifoudre Certification

Qualifoudre INERIS

INERIS

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

INERIS France

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

Parc Technologique Alata BP 2 F-60550 Verneuil-en-Halatte
tél + 33(0)3 44 55 66 77 fax + 33(0)3 44 55 66 99 internet www.ineris.fr

Institut national de l'environnement industriel et des risques
Etablissement public à caractère industriel et commercial - RCS Senlis B 381 984 921 - Siret 381 984 921 00019 - APE 7120B

Certifications and References

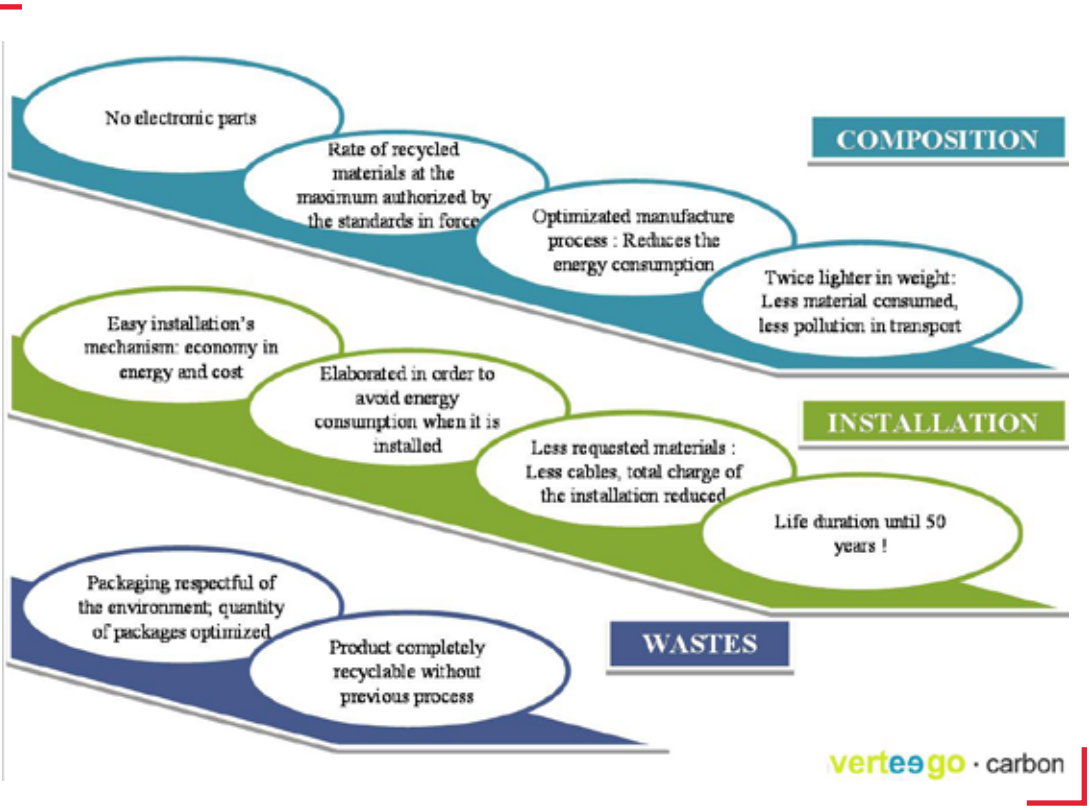
> IONIFLASH MACH® Carbon report

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

Génie Electrique, Electromagnétisme, Automatique, Microbiologie environnementale 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**	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 Time on 50 strikes (µs)	Voltage E obtained for the normalized curve of switching impulse test, which corresponds to the average Time (kV)	Reference Time (µs)	Δt (µs)	$T_{E.S.E} < T_{Simple\ Rod}$	$\sigma_{E.S.E} < 0,8\ \sigma_{Simple\ Rod}$
IONIFLASH MACH NG15	222	- 478	395	55	yes	yes

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

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

Ampère

Unité Mixte de Recherche du CNRS - UMR 5005

Génie Electrique, Electromagnétisme, Automatique, Microbiologie environnementale 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 Time on 50 strikes (µs)	Voltage E obtained for the normalized curve of switching impulse test, which corresponds to the average Time (kV)	Reference Time (µs)	Δt (µs)	$T_{E.S.E} < T_{Simple\ Rod}$	$\sigma_{E.S.E} < 0,8\ \sigma_{Simple\ Rod}$
IONIFLASH MACH NG25	213	- 467	372	78	yes	yes

The tests on the **IONIFLASH MACH NG25** 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

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

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Tél : +33 (0) 4 72 18 60 99 Fax : +33 (0) 4 78 43 37 17 http://www.ampere-lab.fr

IONIFLASH MACH NG30	149,885	-455,6	402,2	86,7	31,97	yes	yes

The tests on the IONIFLASH MACH NG30 air terminal have shown an Early Streamer Emission (ESE) greater than 60 µs (87 µs) but FRANCE Paratonnerres decided to weight to 30 µs according to the NF C 17-102 Standard.

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

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Tél : +33 (0) 4 72 18 60 99 Fax : +33 (0) 4 78 43 37 17 http://www.ampere-lab.fr

MACH NG45	138,461	-455,6	375,4	113,5	19,25	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

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

	Average Time on 50 strikes (µs)	the j curve of switching impulse test, which corresponds to the average Time (kV)	Reference Time (µs)	Δt (µs)	$T_{E.S.E} < T_{Simple\ Rod}$	$\sigma_{E.S.E} < 0,8\ \sigma_{Simple\ Rod}$
IONIFLASH MACH NG60	139.624	- 448,3	348,1	135,0	yes	yes

The tests on the IONIFLASH MACH NG60 air terminal have shown an Early Streamer Emission (ESE) greater than 60 µs (135,0 µs) but FRANCE Paratonnerres decided to weight to 60 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

Certifications and References

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

■ 100 kA test according to the EN50164

GERAC ELECTROMAGNETISME

RAPPORT D'ESSAIS
FRANCE PARATONNERRES
Composants de protection contre la foudre (Paratonnerre)

Référence : REL-2009-039
Révision : –
Page 1 / 9

LABORATOIRE D'ESSAIS CEM DE LIMOGES

RAPPORT D'ESSAIS

DESIGNATION DE L'EQUIPEMENT

Matériel :	Paratonnerre
Société :	France Paratonnerres

COMPOSITION DU DOCUMENT	Nombre de pages
Corps du document	9
Annexes (éventuellement)	

VISAS

Etabli par :	Vérifié par :	Approuv
Fonction : Opérateurs d'Essais	Fonction : Responsable du laboratoire	Fonction
Noms : J.LELONG	Nom : A MADORE	Nom :
Date : 07 AVR. 2010	Date : 07 AVR. 2010	Date :
Visa :	Visa :	Visa :

LA REPRODUCTION DE CE RAPPORT D'ESSAI N'EST AUTORISEE QUE SOUS SA FORME

FPL/023/ed G

LCIE

TEST REPORT

N° 121050-641928

DELIVERED TO	:	FRANCE PARATONNERRES Parc Ester Technopole 9, rue Columbia 87068 LIMOGES, FRANCE
SUBJECT	:	CORROSION TESTS ON LIGHTNING CONDUCTOR.
Date of delivery of samples	:	2013 – 05 –21
Test dates	:	2013 – 06 – 10 to 2013 – 06 – 25
Composition of this document	:	8 pages

Fontenay-aux-Roses, 2013 – 06 – 29

The technical manager,

LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES
S.A.S au capital de 15 748 994 €
RCS Nanterre B 408 353 174
33 avenue du Général Leclerc
F - 92260 FONTENAY AUX ROSES

Jean-Luc SALMON

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This document contains results related only to the items tested. It does not imply the conformity of the whole production to the items tested.
Unless otherwise specified, the decision of conformity takes into account the uncertainty of measures.

LCIE
Laboratoire Central des Industries Electriques

■ Salt Mist Treatment

Certifications and References

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

Insulation test according to EN60060-1

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Ampère

Unité Mixte de Recherche du CNRS - UMR 5005

Génie Electrique, Electromagnétisme, Automatique, Microbiologie environnementale et Applications

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

Results:

Input Voltage		DRY condition (kV)	RAIN condition (kV)	Insulation in % (RAIN / DRY)
Switching Impulse - NEGATIVE POLARITY	50% electrical breakdown	794	772	97,23%
	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.

Thomas AKA
Head of High Voltage Test Center

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

Test according to NFC 17-102

High-Voltage Laboratory
Dept. of Electrical Engineering

May 10, 2012

Report No. 12001

Shanghai Jiao Tong University

TEST REPORT

Test Description:	Triggering Time Test of IONIFLASH MACH Air Terminal
Consignor:	IONIFLASH MACH
Manufacturer:	France Paratonnerres
Consignee:	High Voltage Lab. of SJTU
Proofreader:	Jinyuan Li
Approver:	Zhengcai Zh

Test according to EN 50164

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE

M/s. Atharva Infrastructures,
Setu, Plot No. 69, Bharatkunj Colony no.2,
PWD Society, Erandwane, Kothrud,
Pune – 411 038, Maharashtra

Sub: Test report.
Ref. no. :-001/2012-2013 dated: 26-12-12

Dear Sir,

We are enclosing herewith letter No. dated 30.11.2012 on the subject mentioned above. As per your request correction is made. Please acknowledge the report.

Thanking you,

Yours faithfully,

Additional Director

Certifications and References

> Inspection reports

> Information sheet for Lightning Risk Analysis

FRANCE PARATONNERRES

Information for a study of an analysis for lightning risk

(fill in one file for each building to protect)

YOUR INFORMATION:

Name:

Address:

Postcode: Town: Country:

Tel: Fax: e-mail:

NAME OF THE SITE TO PROTECT:

Department: Town: Country:

TYPE OF BUILDING:

Principal use:

offices ☐ commerce ☐ public entertainment ☐ school ☐ church ☐
hospital ☐ hotel ☐ industry ☐ museum ☐ restaurant ☐
public services ☐ individual house ☐ other:

Nature of the stored products or manufactured products:

Building in project ☐ Building under construction ☐ Building constructed ☐

Building's form:
A ☐ B ☐ C ☐ D ☐ E ☐

Height: m

Total Height: m

Length: m

Width: m

Chimney or steeple height: m

Please give us if possible, the documents which would be useful for our study:
Sketches of the buildings, photos, study of the dangers, exploitation order of the prefect...

Certifications and References

> Information sheet for Lightning Risk Analysis

Information for a study of an analysis for lightning risk

CHARACTERISTICS FOR A CHURCH

Does it have:

A cross YES ☐ NO ☐
A style rooster YES ☐ NO ☐
Some bells YES ☐ NO ☐
If yes, are they electrified YES ☐ NO ☐ are they protected by a surge arrester YES ☐ NO ☐

CONSTRUCTION OF THE BUILDING

Structure:
metallic ☐ wood ☐ concrete ☐ other

Roof:
Asphalted terrace roof ☐ gravelled terrace roof ☐ slate roof ☐ tiles ☐ zinc ☐
Concrete fibres ☐ aluminium ☐ copper ☐ thatch ☐ other

Front:
metallic ☐ wood ☐ concrete ☐ stone ☐ bricks ☐ aluminium ☐
other

Type of flooring on the building perimeter:
asphalt ☐ concrete ☐ soil ☐ gravel ☐ other

Nature of the sub-soil:
marshy ☐ clay ☐ sand ☐ granites ☐ sandstone ☐ schist ☐
tender calcareous ☐ compact calcareous ☐ stony ground ☐ vegetable soil ☐
other

PARTICULAR ELEMENTS

Are / is there... ?

Antennas on the roof	☐	number:	height:
Chimneys	☐	number:	height:
Metallic elements	☐	number:	type:
Rising gas column	☐		
Electric cables in the front	☐		
Electrical earth ground system	☐	Value of the resistance of the electrical earth ground system:	Ω
- Made by hooping	☐	Earthing conductor section:	mm²
- Made by stakes	☐		
- Unknown	☐		

INFORMATION FOR THE ASSESSMENT OF THE RISK

Building placement factor
With higher elements ☐ with smaller elements surrounding ☐
isolated ☐ at the top of a hill ☐

Particular dangers
No risk ☐
Low panic risk ☐ medium panic risk ☐ high panic risk ☐
Evacuation difficulties ☐
Dangers for the environment ☐ Contamination of the environment ☐

Fire risk
No risk ☐
Low ☐ ordinary ☐ high ☐ explosion ☐

Anti-fire protection
No protection ☐ manual ☐ automatic ☐
Detection with alarm ☐ firemen intervention: less than 10 min ☐ more than 10 min ☐

Type of flooring inside
Agricultural ☐ asphalt ☐ concrete ☐ wood ☐ ceramic ☐
gravel ☐ sandstone ☐ linoleum ☐ marble ☐ fitted carpet ☐ carpet ☐
other

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> Information sheet for Lightning Risk Analysis

FRANCE PARATONNERRES

Information for a study of an analysis for lightning risk

EXTERIOR SERVICES

Electric public network

Medium voltage ☐ low voltage ☐

Presence of a High Voltage / Low Voltage transformer:

no ☐ yes in the building ☐ yes in another building ☐

Type of line:

Underground ☐ ground resistance: Ω.m

Aerial ☐ length of the line from another building: m

Relative position:

With higher elements surrounding ☐ with smaller elements surrounding ☐

isolated ☐ at the top of a hill ☐

Environment factor :

Important urban (h > 20m) ☐ urban (20m > h > 10m) ☐

Suburban (h < 10m) ☐ rural ☐

Public telephone network

Type of line:

Underground ☐

aerial ☐ Length of the line from another building: m

Nature of the signal:

analogical (Commuted Telephone Network) ☐ number:

ADSL (Internet) ☐ number:

Digital network (ISDN) ☐ number:

Specialized line ☐ number: voltage : V

Public gas network

Type of pipes

metallic ☐ with isolating joint YES ☐ NO ☐

isolated ☐

Public drinking water network

Type of pipes

Metallic ☐ isolated ☐

INTERIOR SERVICES

Electric distribution

220 V single phase (2 cords) ☐ 380 V triphase + neutral (4 cords) ☐ 380 V triphase (3 cords) ☐

Neutral system:

TT ☐ TN-S ☐ TN-C ☐ IT ☐ unknown ☐

Circuit-breaker at the top:

Strength of the current: A differential: mA selective or delayed ☐

Presence of divisional boards ☐ number:

INSTALLATION LISTED FOR THE PROTECTION OF THE ENVIRONMENT

List of the nomenclature rubrics which need an authorization of exploitation for an industrial site

Qualifoudre

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Certifications and References

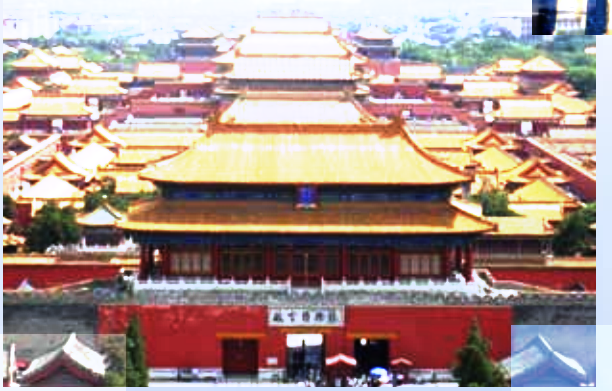
> France Paratonnerres in France, and worldwide ...

■ Historical monuments...

Châteauneuf sur Cher - Basilica

Chenonceau - Castle

Evaux les Bains - Church



Pekin - Forbidden City

Bourganeuf - Zizim tower

Taïwan - Palace

Calenzana - Church

Certifications and References

> France Paratonnerres in France, and worldwide …

■ Historical monuments…

Satu Mare - Rumania - Church

Clermont Ferrand - Cathedral

Paris - Notre Dame Cathedral

La Villeneuve - House

Dreux - Royal Chapel

Certifications and References

> France Paratonnerres in France, and worldwide ...

■ Industries...

Paris - Necker Hospital

Cableship

Cableship

Solar Field

Amman Jordan - Airport

Kourou Guyana - Launching pad for Ariane 5

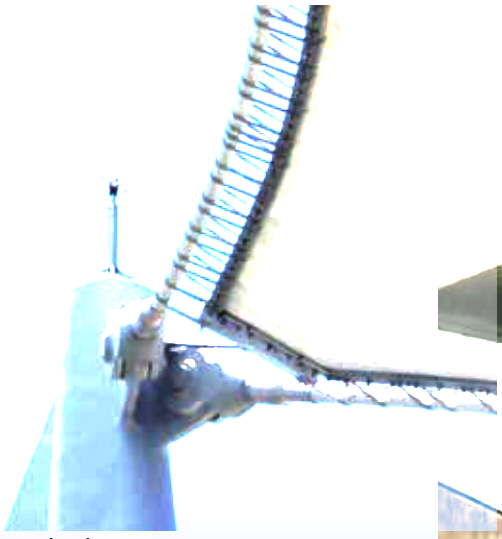
Peru - Plus Petrol

Ecuador - RTD Ecuador

Certifications and References

> France Paratonnerres in France, and worldwide ...

■ Office, Public entertainment, Railway Stations ...

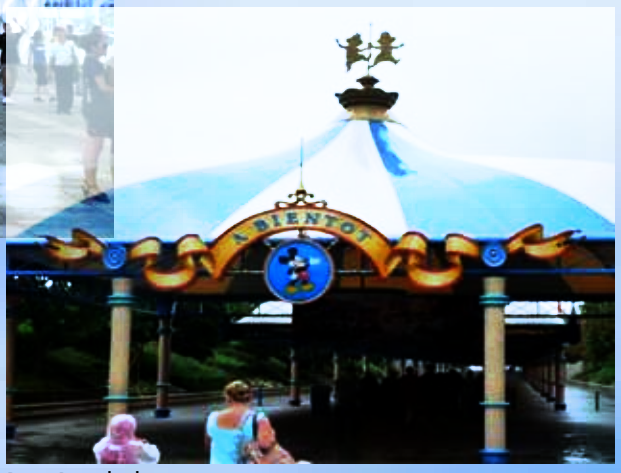


China - Shanghaï Expo

Vichy - Hippodrome horse race

Royère de Vassivière - Museum

China - Shanghaï Expo



Paris - Disneyland

Certifications and References

> France Paratonnerres in France, and worldwide ...

■ Help centers, telecommunication pylons ...

Emergency centre

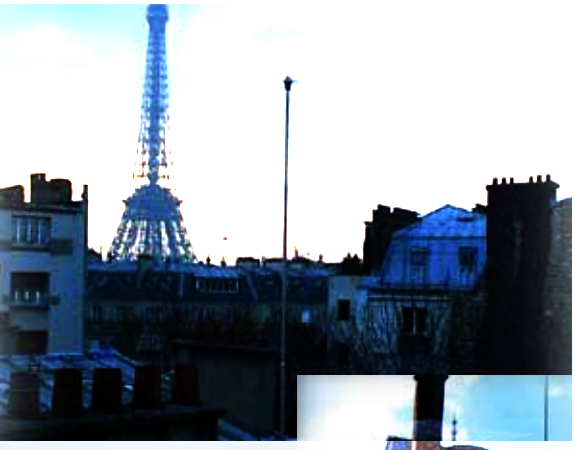
Shanghaï China - Radio Telescope

Superbesse - Mountain resort

Herment - Mast

> France Paratonnerres in France, and worldwide …

■ Individual houses …



Notes

Non-contractual catalogue and pictures

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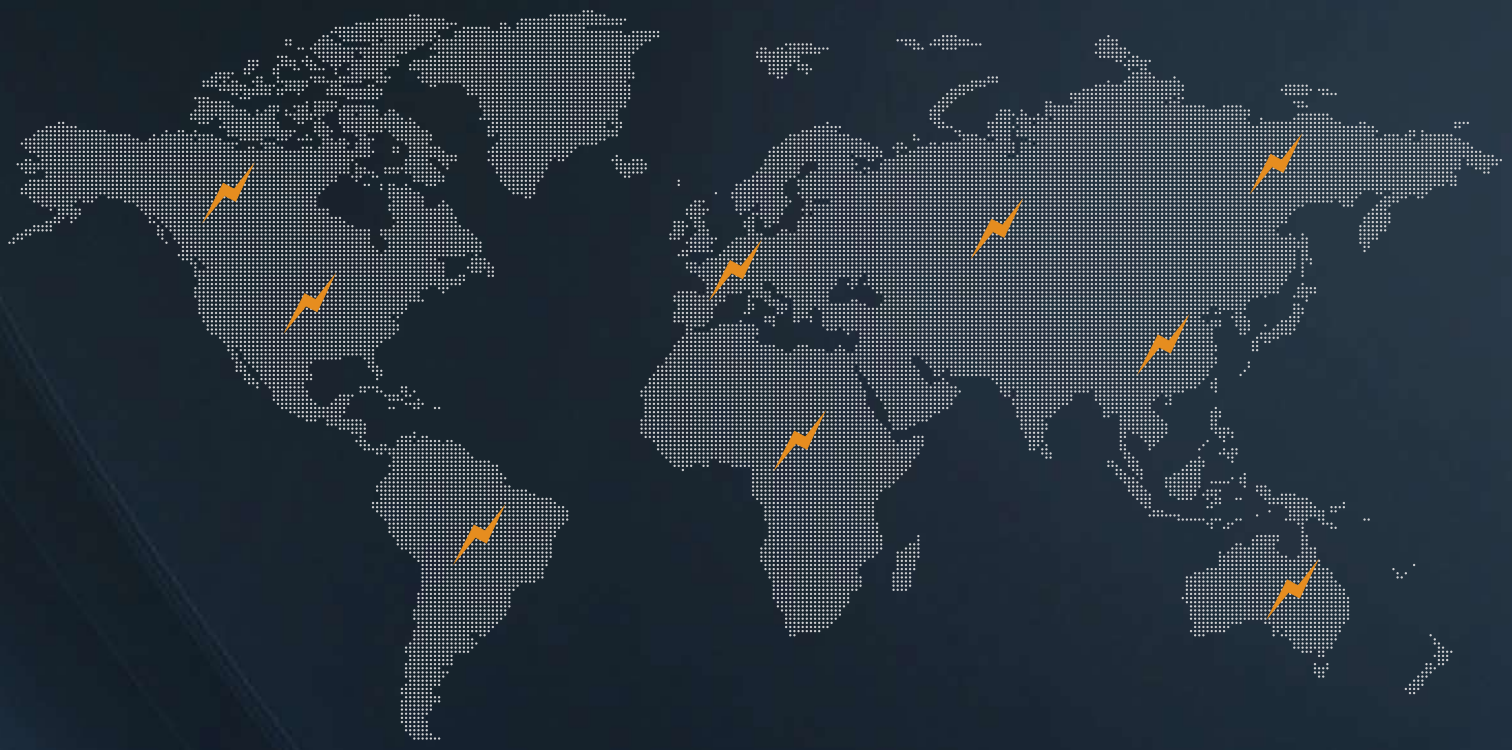
40 YEARS OF EXPERIENCE WITH PRESTIGIOUS REFERENCES



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GEOGRAPHIC LOCATION

France Paratonnerres is located in Limoges (87) at
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