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# Foreword

People have always been both terrified and fascinated by lightning : it was commonly thought that it was the gods' way of venting their anger on mankind. Only in the eighteenth century did science manage to explain that this phenomenon was in fact naturally-occurring electrical activity. Today, even if lightning does retain an air of mystery, considerable research has led to effective means of protection and France now leads the field in modern lightning conductors.

Founded in 1955, the Indelec company has become expert in lightning protection.



A range of products developed by top class engineers from some of France's best universities, continuous technological improvement and cooperation with research groups and laboratories throughout Europe has meant that Indelec can now lay claim to being one of the market's top companies.

Despite constant improvements to the various protection devices, there remains a vital need to develop international standards and recommendations.

Here again, Indelec is involved, this time as a member of the French committee on the U.T.E. organisation (Union Technique



de l'Electricité), the CENELEC working party on European standardisation, as well as representing France on the IEC TC 81 Committee (International Electrotechnical Commission).

Indelec is also involved in the European project for belltowers preservation IDC MEDICI (Recite II).

*Recite II*

The use of top quality equipment all conforming to European standards and whose effectiveness has been proven both under laboratory conditions and with naturally-occurring lightning were still not enough to satisfy the demands of Indelec.

Our production is overseen by a highly experienced team of experts; our flexible and professional customer relations team is there to monitor clients' needs and close and efficient collaboration with our network of approved dealers guarantees top quality installations. Situated in modern premises on the outskirts of Lille (Northern France), all our personnel work hard to maintain and develop the image of Indelec.

It is easy to see how, with over fifty years' experience, Indelec has become the leading authority on lightning protection to a very wide range of customers throughout France: businesses, private individuals, government and local authority buildings, cathedrals, hospitals, blocks of flats or offices, installations belonging to the national electricity generating company, railway company and listed industrial sites.

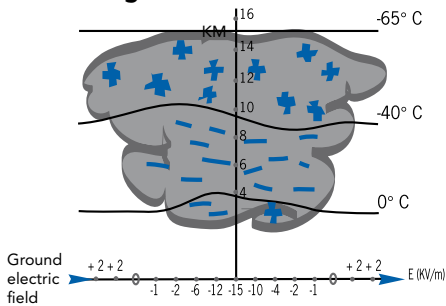
Indelec has also braved the hazards of long-distance export with international clients in Europe, the Middle East and Far East, the entire American continent, Africa and India. Export has become very much an integral part of the company.



## The lightning phenomenon

### Storm conditions

**Fig. 1**  
**Electric charges distribution in the cloud and ground electric field value.**



Certain atmospheric conditions, such as high temperature or humidity, lead to storm clouds being formed.

These huge, anvil-shaped cloud masses are usually of the cumulonimbus variety, the lower part being made up of water droplets while at higher altitude are found ice crystals.

Strong up currents within this type of cloud cause the electric charge on the water droplets to be separated resulting in high levels of positive charge at the top and high levels of negative charge at the bottom of the cloud. Occasionally, a pocket of positively charged electrons is trapped low in the cloud within an area of negative charge. A storm cloud forms overhead creating a vast dipole with the ground and, under the influence of the negatively charged cloud base, the ever present electric field in the atmosphere at ground level suddenly inverts and builds up rapidly reaching between 10 and 15 kilovolts per metre. An electrical discharge to the ground is then imminent. (Fig.1)

When one of these upward leaders comes into contact with the downward leader, a conductive path is created allowing a powerful current to flow. This is lightning and is characterised by its bright flash and the deafening sound of thunder. (Fig. 2-c)

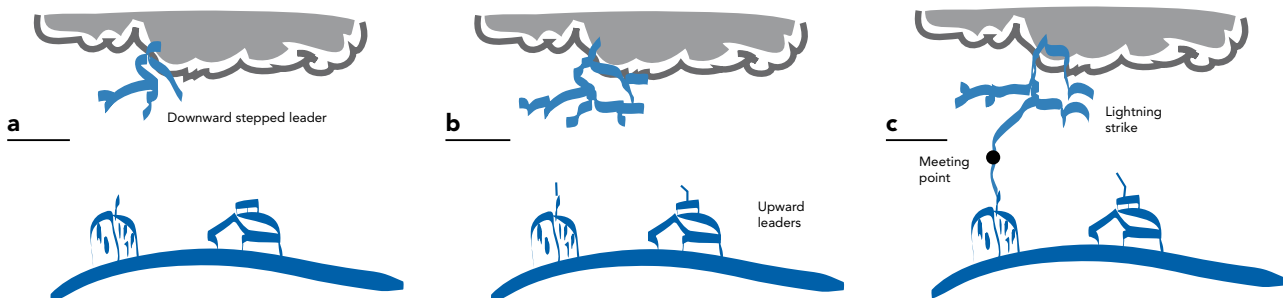
## The build up to a lightning strike

The first stage of a lightning strike involves an initial discharge of low luminosity known as a downward leader. It forms at the cloud centre and moves down toward the ground in steps of several dozen metres at a time. (Fig. 2-a) At the same time, the electric charge in the atmosphere at ground level increases as the downward leader gets closer. Any high point in the vicinity such as an electricity pylon or a lightning rod immediately gives rise to natural ionisation in the form of a series of electrical discharges which are blue in colour. This is the point effect or corona effect as observed by sailors during a storm, known as Saint Elmo's fire, or by mountaineers who report hearing the characteristic humming of «bees» prior to a storm. As soon as the downward leader is close enough to the ground, the ionisation due to the corona effect intensifies, especially near any high point, and eventually turns into an upward discharge :this discharge is the upward leader that develops toward the cloud. (Fig. 2-b)

When one of these upward leaders comes into contact with the downward leader, a conductive path is created allowing a powerful current to flow. This is lightning and is characterised by its bright flash and the deafening sound of thunder. (Fig. 2-c)

The lightning strike may in fact be made up of a number of successive return strokes, only a few hundredths of a second apart, all following the same highly ionised path.

**Fig. 2**  
**Different steps of a downward lightning strike.**





## The lightning phenomenon

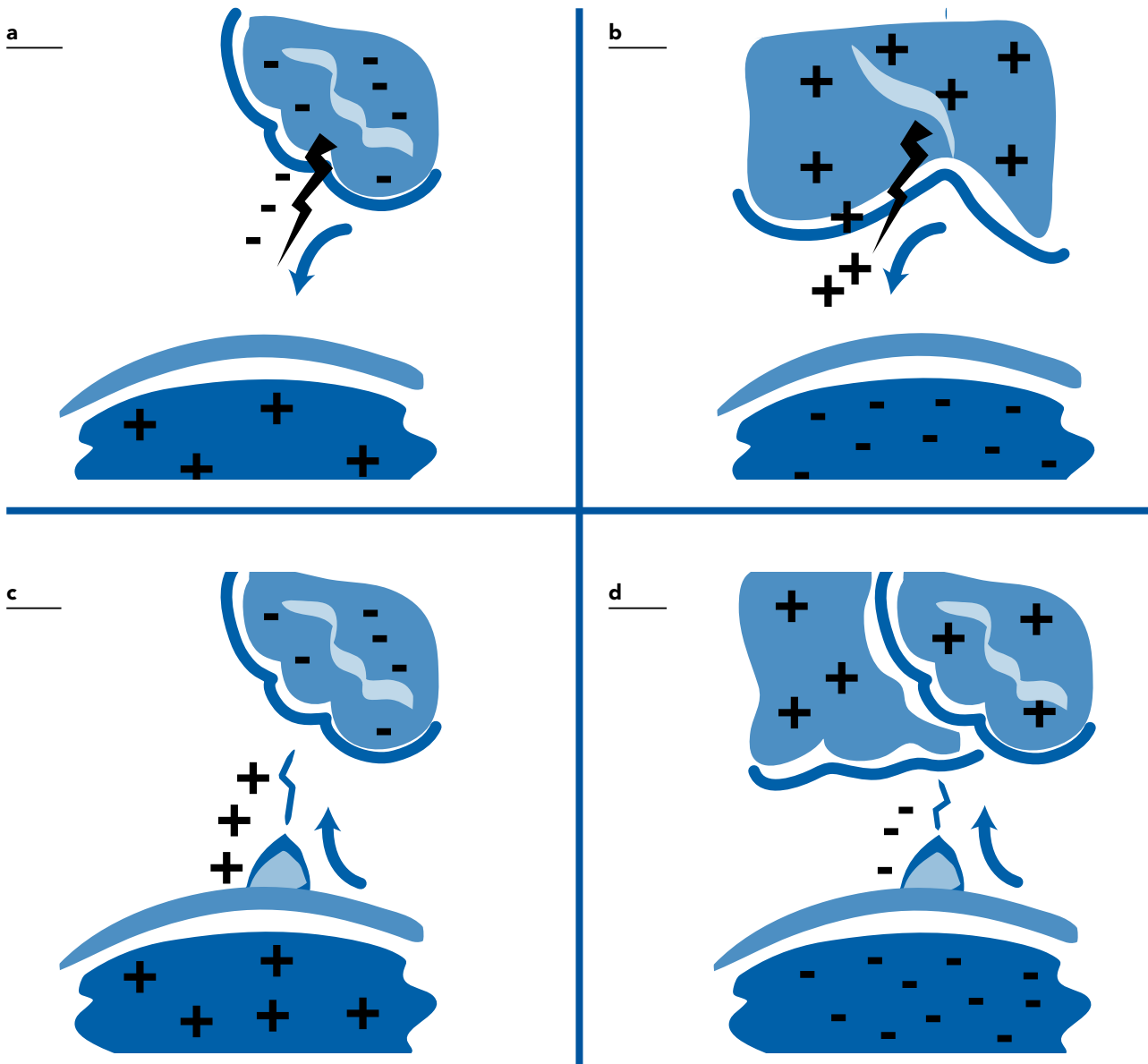
### Different types of lightning

In temperate climates like ours, the vast majority (about 90%) of lightning is of the **negative downward** variety where the discharge is from the negatively charged cloud base down to the ground. (Fig. 3-a)

Occasionally - usually during the winter - a downward leader may build up within a positively charged pocket in the base of the cloud and discharge down to the ground. This type of lightning is known as **positive downward**. (Fig. 3-b)

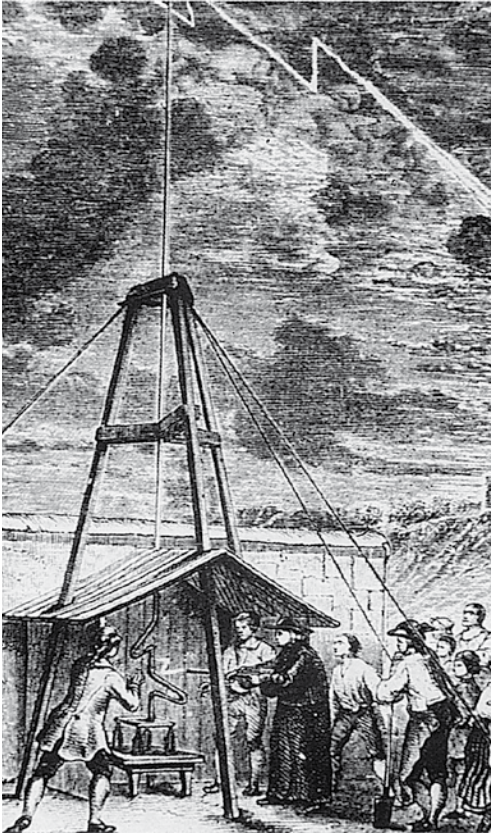
When electrical conditions in the atmosphere permit, an upward leader variety of lightning may shoot up spontaneously from a point of high altitude (e.g. a mountain peak, telecommunications tower or high building). The resulting lightning is known as **positive upward** (Fig. 3-c) or, less frequently, **negative upward** (Fig. 3-d) lightning depending upon the cloud's electrical charge.

**Fig. 3**  
Types of lightning





# The lightning phenomenon



**Fig. 1**  
Dalibard's single lightning rod.



**Fig. 2**

## A few significant dates

**1753:** Benjamin FRANKLIN invents the lightning conductor. He was the first to demonstrate the electrical nature of lightning with his now famous «kite experiment».

At more or less the same time in France, DALIBARD confirms the theory in Marly with his experiment with a metal rod which was electrified during storms. (Fig.1)

Jacques de ROMAS also reaches this conclusion, with a different kite than FRANKLIN's : a copper wire is wound around the rop to the ground.

The discovery rapidly lead to an extraordinary fascination for lightning conductors. They began to appear first of all on church spires and shortly afterwards on buildings.

This trend in lightning conductors even gave rise to a number of original inventions including a certain lightning conducting umbrella. (Fig. 2)

**1880:** A Belgian physicist, named MELLESENS, recommends protecting buildings by covering them with metal wires connected to a series of spikes on the roof and then well earthed. This was the very first meshed cage.

**1914:** First attempts to improve on the single lightning rod by the Hungarian-born SZILLARD and the Frenchman, DOZÈRE.

**1986:** Following several years' research resulting in improved awareness of the physical properties of lightning, a new type of lightning conductor is developed giving stronger ionisation around the terminal through the use of electrical equipment independent of any external power source. Indelec decides to develop this new theory and registers its first world patent for the PREVECTRON® technology. Immediate national recognition for the initiative comes in the form of two awards for innovation.

**1996:** The PREVECTRON® lightning conductor has been used successfully in France and throughout the world for 10 years. Making the most of the 1993, 1994, 1995 and 1996 on-site test campaigns carried out in real-life lightning conditions in the USA and in France by the C.E.A. (French Atomic Energy Commission), Indelec has developed the latest addition to their range of lightning conductors : the PREVECTRON® 2.

**1999:** Indelec is certified ISO 9002 delivered by BVQI for manufacturing and marketing the PREVECTRON®.

**2004:** Indelec takes over the French leading Obstacle Warning Light manufacturer DELTA BOX.

**2005:** Indelec confirms its commitment in the field of quality being the first French group asking and getting the Qualifoudre certification.

**2009:** Opening of Indelec India branch office in Bangalore, India.

## Lightning conductors

### How does an ESE lightning rod work ?

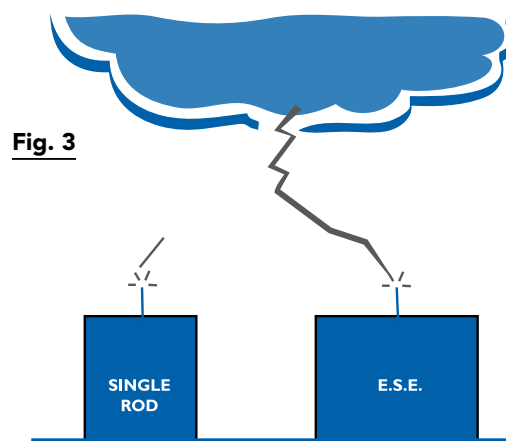
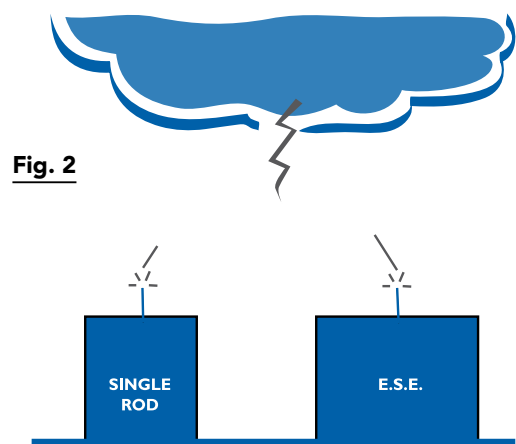
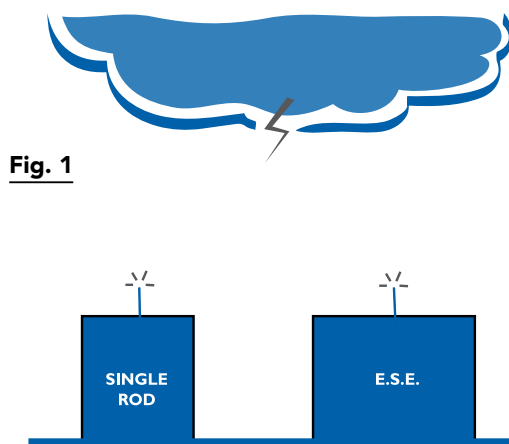
When lightning strikes, an electrical field is always created at ground level and this increases in intensity as the «downward leader» approaches. Once this reaches a certain level - between 50 and 100 kV/m - the Corona effect, which develops naturally at the top of any high structure, allows discharges - known as upward leaders - to rise toward the cloud (see previous section on the lightning phenomenon).

The position of the ionised path which will allow the lightning current to pass is determined by where the upward leader comes into contact with the first downward leader from the cloud.

The sooner the rising discharge (upward leader) leaves the lightning rod to move toward the cloud, the sooner it will move closer to the downward leader and the greater the chances of the two making contact before other rising discharges from nearby high points. It can be seen, then, that it is the start point of the first upward leader which determines the point of impact of the lightning on the ground. An early streamer emission lightning rod is designed to provide optimal conditions for the formation of this rising discharge.

For this the following conditions are necessary:

- The presence of primary electrons at the top of the rod : these electrons, given off in the form of plasma, encourage the start-up of the rising discharge.
- Ionised plasma being formed at the right moment when lightning is about to strike, in other words, in phase with the rising electric field at ground level.



## Different types of Indelec lightning conductors

### PREVECTRON® Early Streamer Emission Lightning Conductors (E.S.E.L.C.) (Fig. 1)

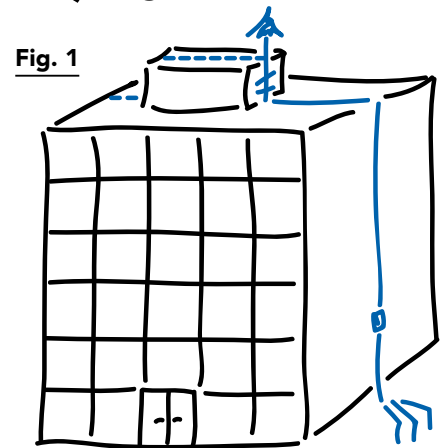
The E.S.E.L.C. is an improved version of the single lightning rod benefiting from the latest developments in lightning protection. In accordance with French Standard NF C 17 - 102, a system offering protection from lightning through the PREVECTRON® E.S.E.L.C. consists of the following :

- one PREVECTRON® Early Streamer Emission lightning rod (E.S.E. lightning rod) mounted on an elevation pole, mast or tower.
- Two down conductors linking the E.S.E. lightning rod to earth.
- Two earthing points to channel and dissipate the lightning current (Fig. 1)

A number of separate E.S.E.L.C.s may be necessary to protect a large construction.

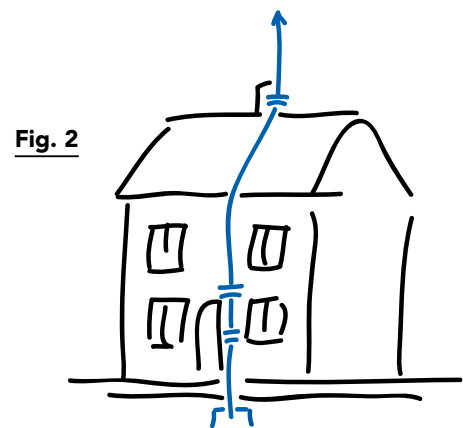
The design of an E.S.E.L.C. and the materials used shall conform to French Standard NF C 17 - 102. (July 1995).

PREVECTRON® E.S.E.L.C. installations can also be used to protect open spaces such as storage or recreation areas. A guide to installation and examples of the sort of protection offered by a PREVECTRON®



### Single rod lightning conductors (Fig. 2)

Consisting of a single rod air terminal, down conductors and 2 earthing points, these lightning conductors afford protection to smaller areas. The design of a single rod lightning conductor installation and the material used shall conform to standard NF EN 62305-3.



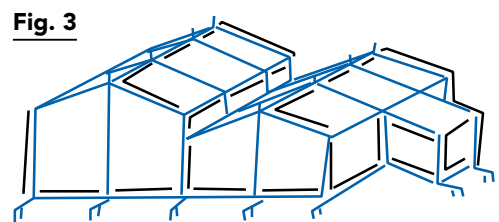
### Meshed Cage lightning conductors (Fig. 3)

The meshed cage consists of a conductive network which protects the building it encloses. It consists of a mesh approximately 15 m x 15 m situated on the roof with a series of small air terminals (30 to 50 cm high) and connected to the ground by down conductors also some 15 m apart. Each down conductor has its own separate earthing point, and these in turn are interconnected by an under-soil ring.

The design of a meshed cage lightning conductor installation and the material used shall confirm to standard NF EN 62305-3.

### Taut wire lightning conductors

Such a set-up is sometimes the preferred choice in particular circumstances. It involves stretching a number of conductive wires over the area to be protected, after applying the electrogeometrical model. All other procedures with this type of system shall conform to standard NF EN 62305-3.





# Protection against lightning

## The preliminary survey

Total protection against risks associated with lightning should begin by an appraisal of the risk to the building to be protected. This is the preliminary survey as recommended by French Standards NF EN 62 305 - 3 and NF C 17 - 102 and UTE C 17 108

A complete protection against lightning will be reached by carrying out first a risk assessment study : it is the preliminary risk assessment survey described and ruled by NF EN 62305-2 standard and UTE 17100-2 guide.

This part compares the potentiality for the lightning to strike and the consequences on the structure.

It leads to the choice of the level of protection, this level is used to design the protection.

Standards present 4 levels of protection that will give the radii of protection of the E.S.E. and the single rods, the dimensions of the meshed cages, the space between the conductors, the security distance between metallic parts as well as maintenance planning.

(Guide UTE C 17 108)

## The technical study of the lightning protection system

The lightning protection system is dedicated to protect against:

### 1 DIRECT LIGHTNING STRIKES:

The role of a LIGHTNING CONDUCTOR installation is to protect buildings against direct lightning strikes by channelling the electric charge to earth. There exist four types of lightning conductor:

- early streamer emission lightning conductor
- single rod lightning conductor
- meshed cage lightning conductor
- taut wire lightning conductor

### 2 INDIRECT EFFECTS OF LIGHTNING STRIKES:

OVERVOLTAGE ARRESTER installations are designed to protect electrical equipment from momentary power surges caused by lightning. Surges of this kind can occur on all types of low-voltage mains, instrumentation, control or computer networks. They may be generated either by a direct lightning strike on the line in question, or by induction due to the high intensity electromagnetic fields given off by the flash.

### 3 EQUIPOTENTIAL BONDING DEFECTS:

Correct EQUALISATION OF POTENTIALS by connection of all the earth points on the same site and interconnection of all metallic masses near sensitive equipment (low impedance earth net) is essential in ensuring adequate and effective lightning protection.

Further details concerning necessary equipment for these installations and how to install it can be found on the adjoining data sheets.

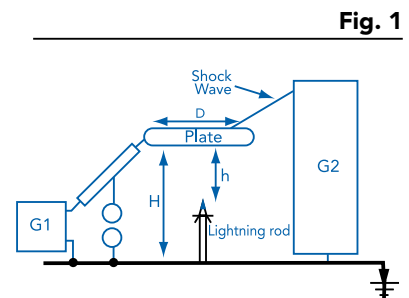
# PREVECTRON® : Effectiveness Assessment in Laboratory

## Layout of the laboratory (Fig. 1)

The high voltage laboratory used to assess the PREVECTRON®, contained the following equipment:

- A direct current generator (G1) designed to simulate the ambient atmospheric field during a storm;
- A surge generator (G2) allowing induced rapid stimulation of the pre-strike electric field.

These two generators fed a plate positioned above the air terminal being tested.



## Technical parameters used:

- Dimensions:
  - H = height of the plate from the ground = 2 m
  - h = height of the plate above the tip of the air terminal = 1 m
  - D = diameter of the plate = 3 m
- Electrical:
  - direct current (supplied by G1): 25 kV/m
  - G. waveform : - rise time 250  $\mu$ s

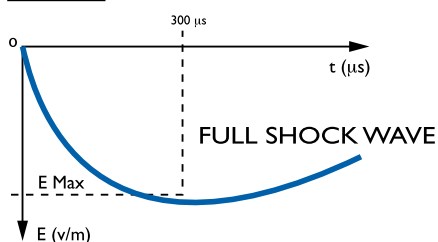
## Description of the test

The PREVECTRON® air terminal and the single rod used as a reference are positioned one after the other so as to be at the same vertical distance beneath the plate.

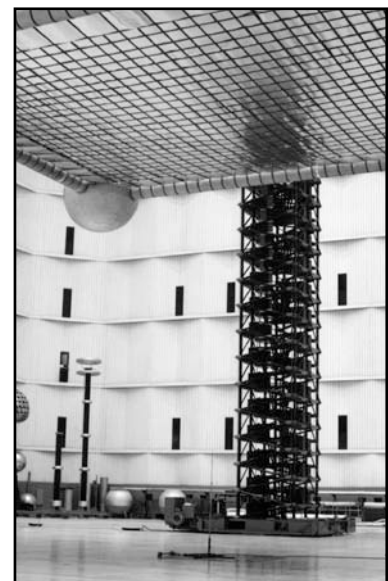
The G2 wave generator increases the electric field between the upper plate and the ground. This impulse field superposes upon the permanent field of the D.C. generator G1. (Fig. 2a).

With this set-up a breakdown is produced between the tip and the plate. This breakdown short-circuits the generator leading to the wave form's returning abruptly to zero.

Fig. 2a

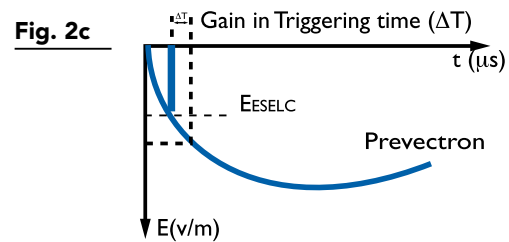
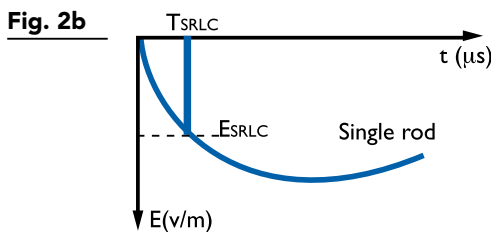


EDF H.V. Laboratory  
«Les RENARDIERES»



# PREVECTRON®: Effectiveness Assessment in Laboratory

With the single rod, this breakdown is produced in a high «ESRLC» field (Fig. 2b). With a PREVECTRON® lightning conductor however, the breakdown is produced earlier and in a less-intense field (ESEL). The time gained allows the lightning conductor's effectiveness to be accurately measured (Fig. 2c). A minimum of 100 shocks were induced on each lightning rod.



Shock on a  
PREVECTRON®



## Results

(to French standard NF C 17 - 102)

The gross value of the gain in triggering time, as measured in the laboratory, is interpreted in accordance with the French national standard, NF C 17 - 102 (Annex C) so as to correlate with a predetermined reference wave form (650 µs). These standardised  $\Delta T$  values are obtained after a great number of tests. However, given the statistical nature of the data, we considered it necessary to further weight the figures by 35% before using them to calculate the protection radii, thereby allowing an additional safety margin.

The effectiveness of each PREVECTRON® air terminal is therefore significantly improved.

The weighted values for  $\Delta T$  are given in table 1 below.

**Table 1**

PREVECTRON®2	$\Delta T$ (µs)
S 6.60	60
S 4.50	50
S 3.40	40
TS 3.40	40
TS 2.25	25

**Table 2**

PREVECTRON®2	$\Delta L$ (m)
S 6.60	60
S 4.50	50
S 3.40	40
TS 3.40	40
TS 2.25	25

High voltage test report carried out by the C.N.R.S (French National Scientific Research Center) available on request.

By applying the formula  $VL(m)=v(m/\mu s) \cdot VT(\mu s)$  where  $v$  is the velocity of the upward leader (1m/µs), the upward leader length gain for the PREVECTRON® air terminal can be calculated. This figure (table 2) can then be used to determine the protection radius.



# PREVECTRON® : On-site testing in real lightning conditions

## Test site



Indelec has been working for more than 15 years Prevectron on in-situ testing as well as on links between in-situ testing and H.V. laboratory testing. Detailed reports of these tests are described hereunder and available on request.

## Object of on-site tests

There are three main objectives to the tests:

### 1 Ratify the PREVECTRON®'s performance as measured in the laboratory.

For this, both a PREVECTRON® and a single rod were exposed to natural lightning in identical conditions and their reactions were measured, in particular, at the moment just before the lightning struck i.e. the moment when the upward leader begins to form. To achieve this, lightning produced naturally in the vicinity was used as well as triggered lightning, so as to increase the occurrence of worthwhile activity for the lightning rods. The triggering procedure consisted of waiting for a suitable moment during the storm and then firing up a rocket toward the clouds. The rocket carried a thin, Kevlar-coated copper wire which unravelled as it climbed. In this way it was possible to «short-circuit» the cloud to the ground. So that the flashes produced were as similar to the natural phenomena as possible, the wire contained an isolating section («Lightning Rocket System-Altitude Grounded» technique). In this way, more usable lightning strikes were produced and could more easily be centred around the lightning conductors under test.

### 2 Check that the PREVECTRON® performs correctly.

The unique feature of the PREVECTRON®'s operation is its «trigger» system, which senses the rate at which the electric field is increasing and sets off the discharge device at precisely the right moment. A series of instruments enables the trigger operation to be monitored as the electric field increases during the build up to a real lightning strike.

### 3 Check the resistance of the PREVECTRON® to real lightning strikes.

The PREVECTRON® was subjected to a large number of direct lightning strikes in conditions identical to - and occasionally more severe than - those likely to be encountered over the product's life. Thus it was possible to check:

- its mechanical robustness
- its resistance to electrodynamic effects
- the ability of the triggering system to withstand induced excess voltage.

## Test procedures

The lightning conductors tested were placed on vertical masts fixed to the ground. The masts were placed equidistant from the rocket firing system but close enough together so as to be exposed to the same electric field conditions generated by the discharge. The lightning rods had a coaxial shunt and were linked by fibre optic cable to the measuring system, which monitored and recorded electrical activity at the top of the lightning rods as the electric field changed.

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# PREVECTRON® : On-site testing in real lightning conditions

## Results

Several on-site test sessions carried out at Camp Blanding in Florida, U.S.A. in 1993, 1994 and 1995 and in Cachoeira Paulista, Brazil in 2000 and 2001 gave very useful and interesting results. Three of the typical scenarios encountered are described below.

### 1 Demonstration of the PREVECTRON®'s abilities: (Fig. 1 & 2)

In these diagrams, the electrical activity of a single rod (Fig. 1) can be compared to that of a PREVECTRON® (Fig. 2) as both are subjected at the same moment to an identical electric field. A current greater than 1 amp can clearly be seen at the tip of the PREVECTRON® appearing several dozen microseconds before the initial return stroke. While this is happening, the single rod remains inactive.

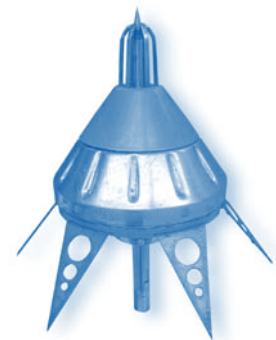
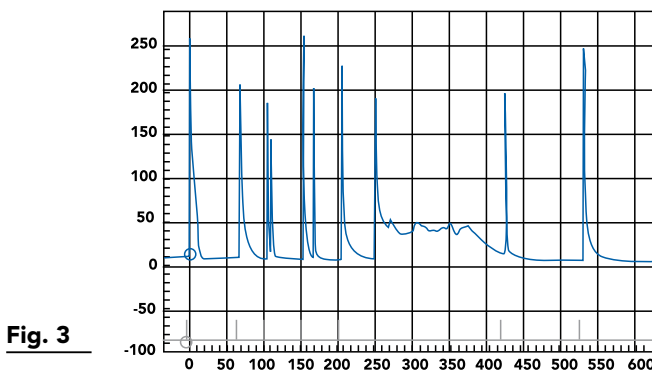
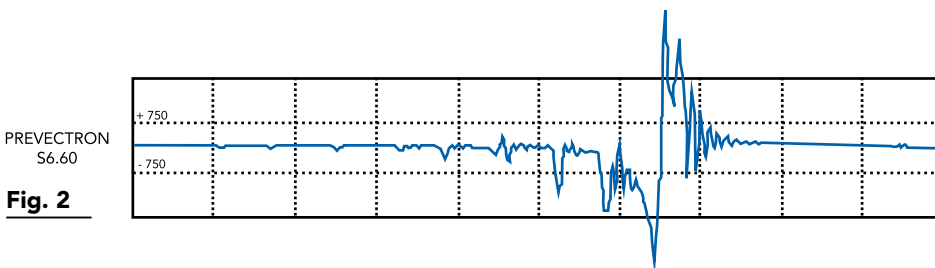
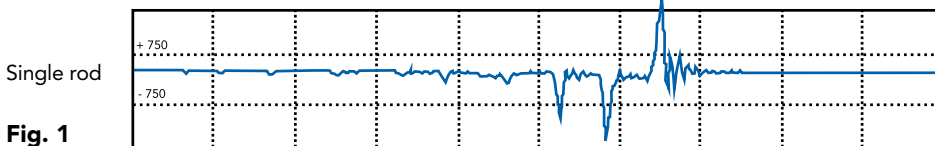
This is one example of the PREVECTRON®'s onsite abilities.

### 2 Demonstration of how the PREVECTRON® works: (Fig. 3)

In this diagram, the PREVECTRON®'s trigger can be seen in gray operating each time the electric field (in blue) increases. This is the on-site confirmation of how well the PREVECTRON® works in real conditions.

### 3 Demonstration of the PREVECTRON®'s resistance to lightning strikes:

After being subjected to 8 lightning discharges, each of more than 10 kA, a standard PREVECTRON® was checked and certified to be in perfect working order. This is the on-site confirmation of the PREVECTRON®'s robust nature.



PREVECTRON® after being subjected to 8 lightning discharges, each of more than 10 kA.

The PREVECTRON®: the first E.S.E. lightning rod to have successfully completed both quality assessment in a laboratory and validity testing on site in real lightning conditions.

Lightning  
conductors

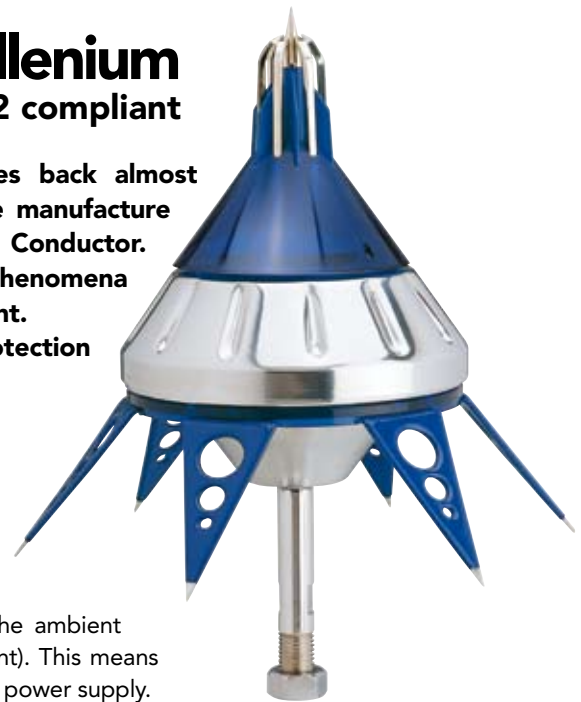




# Early streamer emission lightning conductors

## Prevectron®2 Millenium French standards NFC 17-102 compliant

INDELEC's reputation in the field of lightning protection dates back almost sixty years. Since 1986, the company has invested heavily in the manufacture of its PREVECTRON® Early Streamer Emission Lightning Conductor. This has involved both fundamental research into the physical phenomena associated with lightning, as well as extensive products development. The latest Prevectron® 2 Millenium series provides optimal protection against the direct effects of lightning.



## Operation

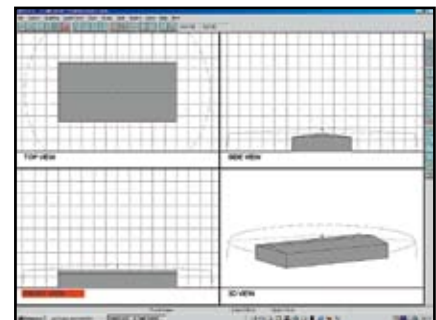
The Prevectron® 2 is operating in three stages :

- The ionization device is charged via the lower electrodes using the ambient electrical field (several million volts/meter when storms are prevalent). This means the Prevectron® 2 is a fully autonomous system requiring no external power supply.
- The ionization phenomenon is controlled by a device which detects the appearance of a downward leader: the local electrical field increases rapidly when a discharge is imminent. The Prevectron® 2 detects changes within the field, making it the first E.S.E. air terminal to react at the precise moment the downward leader develops from the cloud to the ground.
- Early triggering of the upward leader using a system of spark ionization between the upper electrodes and the central tip. The Prevectron®2's ability to trigger an upward leader ahead of any other protruding point within the protected area ensures it will be the preferential point of impact for the lightning discharge.

## Key benefits

The skills of INDELEC's engineers, the variety of tests carried out in both high-voltage laboratories and real-life lightning conditions, and the experience gained from the several dozens of thousands of PREVECTRON® 2 installations around the world, have allowed us to develop a complete range of lightning conductors offering a host of key benefits :

- 8-model range offering customized solutions for each project (aesthetic constraints, required protection area, etc.);
- fully autonomous operation;
- total reliability, even in extreme climatic conditions;
- proven, robust design able to withstand multiple lightning strikes;
- lightning conductor only becomes active when electrical field intensity rises (lightning discharge likely), the PREVECTRON® 2 presents no danger to the site;
- straightforward installation and maintenance using tools specially developed by INDELEC, including protection calculation software, strike counter and Prevectron® 2 tester;
- high-voltage laboratory test results available on request;
- ultra-safe capture tip thanks to full electrical continuity between the tip and the earth point;
- ISO 9001-2000 manufacturing process;
- Fully testable on site.



Calculating the protection area using Indelec's **Protec 2001**® software.

# Early streamer emission lightning conductors

## Prevector<sup>®</sup>2 Millenium T

available for S 3.40 T,  
S 4.50 T,  
S 6.60 T.

### Self testing

The self-testing PREVECTRON<sup>®</sup>2T lightning conductors allows to check that the triggering device is operating properly without having to access to the lightning air terminal.

It consists of a test circuit integrated into the lightning conductor, and an external solar energy and communication module fastened to the base of the central rod.

The test is initiated from the ground or from the roof terrace, at a maximum distance of 50 m, using a dedicated remote control unit.

The PREVECTRON<sup>®</sup> 2 T lightning air terminals indicates its operational status itself by lightning up powerful LEDs located under the stainless steel casing.

### Characteristics

- After a self-check cycle, the result of the test appears spontaneously.
- The procedure is triggered remotely.
- The analysis result is observed directly on the lightning conductor.

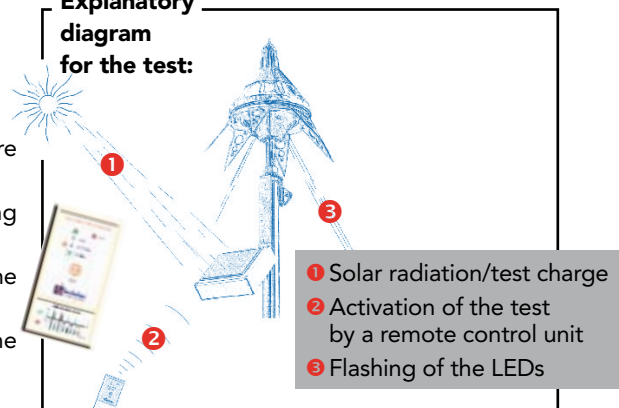
### Advantages

- The power supply circuit for the test does not require a battery because energy is provided directly by the solar panel. Consequently the lightning conductor does not require any additional maintenance or periodic disassembly, which is essential for replacing a battery.
- The product's lifetime is not limited by the additional test circuit.
- The test can be carried out during daytime within a wide outdoor temperature range.
- Only the triggering of the test is carried out by remote control, guaranteeing the system's reliability.
- The communication module is in a separate enclosure underneath the PREVECTRON<sup>®</sup> 2 T and has reinforced EMC protection.
- The protection performance characteristics of the PREVECTRON<sup>®</sup> 2 T and the radius remain unchanged.
- Universal remote control unit for all types of self testing PREVECTRON<sup>®</sup> 2 T.



Dimensions  
of the solar panel:  
10 x 10 x 3.5 cm

#### Explanatory diagram for the test:



# Early streamer emission lightning conductors

## The range

### S SERIES

PREVECTRON® 2 MILLENIUM

Ø 185 mm / H = 385 mm

S 6.60

S 4.50

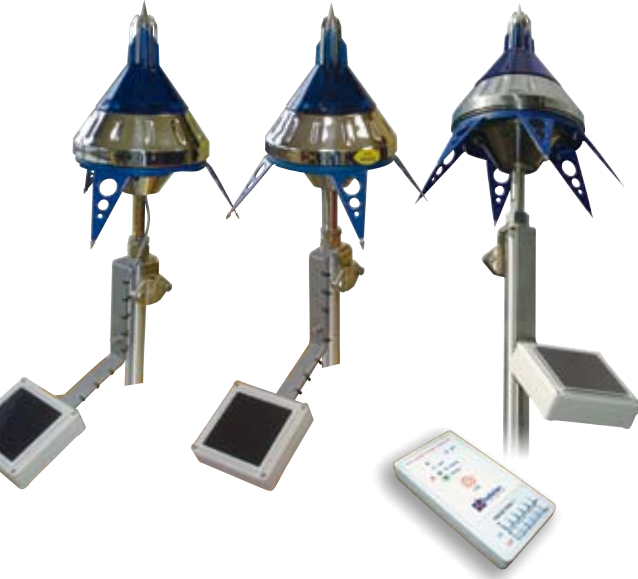
S 3.40



S 3.40T

S 4.50T

S 6.60T



Model	S6.60 T	S6.60	S4.50 T	S4.50	S3.40 T	S3.40
ΔT (μs)	60	60	50	50	40	40
Weight (kg)	6.4	5.6	6.3	5.5	6.2	5.4
Ref.	P1243T	P1243C	P1233T	P1233C	P1223T	P1223C
Can be tested*		•		•		•
Self-testing**	•		•		•	

Ref of the remote control for self-testing Prevectron

P1291T

TS 2.10

TS 2.25

TS 3.40

### TS SERIES

PREVECTRON® 2 MILLENIUM

Ø 100 mm / H = 330 mm



TS 2.25MH



Model	TS2.10	TS2.25 MH	TS2.25	TS3.40	TS3.40 HM
ΔT (μs)	10	25	25	40	40
Weight (kg)	3.2	3.3	3.3	3.4	3.4
Ref.	P1205C	P1206C	P1204C	P1213C	P1214
Can be tested*	•	•	•	•	•

\* Testing non self-testing models will oblige the removal of the lightning air terminal and the use of PREVECTRON®2 tester HV.

\*\* for self-testing models, only a remote control is needed.



# Early streamer emission lightning conductors

## Protection radius

### Protection Level I

h (m)	2	3	4	5	10	h (m)
S 6.60	31	47	63	79	79	S 6.60T
S 4.50	27	41	55	68	69	S 4.50T
S 3.40	23	35	46	58	59	S 3.40T
TS 3.40	23	35	46	58	59	TS 3.40MH
TS 2.25	17	24	34	42	44	TS 2.25MH
TS 2.10	10	15	21	26	42	

### Protection Level II

h (m)	2	3	4	5	10	h (m)
S 6.60	34	52	68	86	88	S 6.60T
S 4.50	30	45	60	76	77	S 4.50T
S 3.40	26	39	52	65	67	S 3.40T
TS 3.40	26	39	52	65	67	TS 3.40MH
TS 2.25	19	29	39	49	51	TS 2.25MH
TS 2.10	12	19	25	31	34	

### Protection Level III

h (m)	2	3	4	5	10	h (m)
S 6.60	39	58	78	97	99	S 6.60T
S 4.50	34	52	69	86	88	S 4.50T
S 3.40	30	45	60	75	77	S 3.40T
TS 3.40	30	45	60	75	77	TS 3.40MH
TS 2.25	23	34	46	57	61	TS 2.25MH
TS 2.10	15	22	30	38	42	

### Protection Level IV

h (m)	2	3	4	5	10	h (m)
S 6.60	43	64	85	107	109	S 6.60T
S 4.50	38	57	76	95	98	S 4.50T
S 3.40	33	50	67	84	87	S 3.40T
TS 3.40	33	50	67	84	87	TS 3.40MH
TS 2.25	26	39	52	65	69	TS 2.25MH
TS 2.10	17	26	34	43	49	

## Prevectron®2 Tester

### Characteristics

The PREVETRON®2 test box is designed to check that the main functions of the PREVETRON®2 are working properly and that none of the vital components is damaged.

The PREVETRON® 2 test box is powered by 4 LR6 batteries for total portability making it ideal for both installation and routine maintenance purposes, since mains power is unnecessary.

Tests are made with same measures as during real-life lightning conditions, providing security to the user. Results are given by both light and ringing warning signal.

Supplied with isolated cables and transport and storage box.



Product ref : P 1290 C

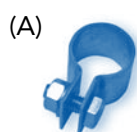
# Air Terminal rods

## Single rods

INDELEC's lightning rods consist of a tapered capturing tip mounted on a support (M20 threaded base).

Chromium-plated or stainless steel models are available.

Item	Ref.	L (m)	W (kg)
Chromium-plated copper single rod	P1022B	1.30	2.15
Chromium-plated copper single rod	P1021B	2.30	3.50
Stainless steel single rod	P1032B	1.30	2.00
Stainless steel single rod	P1031C	2.30	3.00
Rod-to-flat conductor connecting clamp (A)	P3095	-	-
Rod-to-round conductor connecting clamp (B)	P3096	-	-

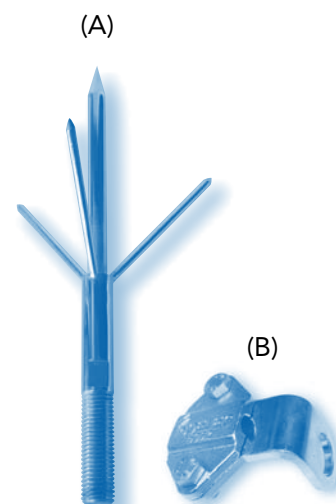


## «JUPITER» Multiple rods

This particular lightning rod has been designed to provide good protection to weather vanes and collective aerials, or it can be used on its own with Indelec elevation poles.

M20 threaded base

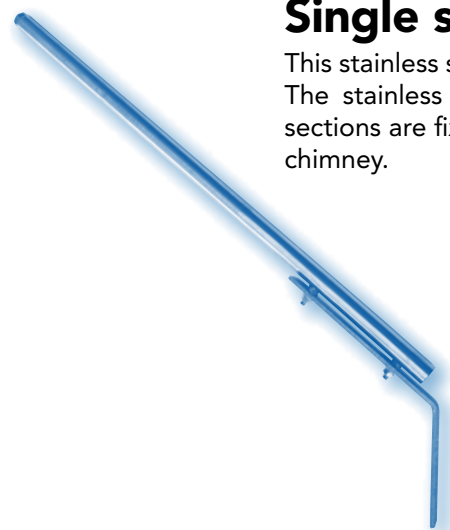
Item	Ref.	L (m)	W (kg)
Red copper multiple rod (A)	P1051B	0.30	0.65
Chromium-plated copper multiple rod (A)	P1052B	0.30	0.65
Stainless steel multiple rod	P1053B	0.30	0.70
Conductor connector (B)	P6500	-	0.265



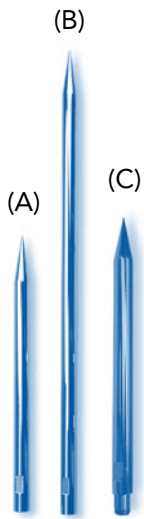
## Single stainless steel rods for industrial chimneys

This stainless steel lightning rod has been specially designed to protect industrial chimneys. The stainless steel terminal M20 is screwed on to a 1 meter elevation pole. The two sections are fixed to an angled mounting bracket which is then bolted or welded on to the chimney.

Item	Ref.	L (m)	W (kg)
Single stainless steel rod for industrial chimney	P1041B	1.30	3.00 (without collar)
	P1041C	1.30	3.00 (with collar)



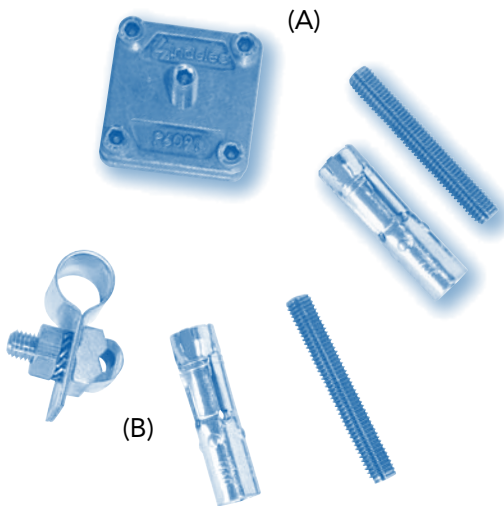
# Meshed cages



## Pointed air rods

INDELEC's pointed air rods, available in chromium-plated copper or stainless steel are tapered at the top, (A) and (B) are tapped M10 at the bottom to allow easy fixing to the mountings described below. (C) is tapped M16 or M20 to adapt to elevation pole (see on next page).

Item	Ref.	Ø (mm)	H (m)	W (kg)
Chromium-plated copper pointed air rod short model (A)	P4001	18	0.30	0.76
Chromium-plated copper pointed air rod long model (B)	P4002	18	0.50	1.20
Stainless steel pointed air rod short model (A)	P4003	18	0.30	0.70
Stainless steel pointed air rod long model (B)	P4004	18	0.50	1.10
Threaded M16 chromium-plated copper pointed air rod (C)	P4005	20	0.30	0.76
Threaded M16 stainless steel pointed air rod (C)	P4006	20	0.30	0.65

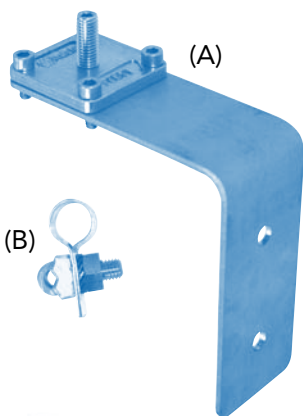


## Pointed air rod mounting kit

The kit consists of:

For flat conductors: a brass mounting base with fixing screws for the air rod. The conductor is then tightened between the two plates of the mounting base. For round conductors: a copper collar placed at the base of the air rod allowing the conductor to be attached. Two alternative methods of fixing to the roof are supplied (screws or anchor bolts).

Item	Ref.	W (kg)
Kit for flat conductors max. width 30 mm (A)	P4050	0.45
Kit for round conductors max. width 8 mm (B)	P4060	0.45



## Angle saddle

The brass angle saddle allows offset fixing of the pointed air rod. It also allows for either a round or a flat conductor to be connected.

Item	Ref.	W (kg)
Saddle for flat conductors max. width 30 mm (A)	P4051B	0.50
Saddle for round conductors max. width 8 mm (B)	P4061B	0.50



## Pivoting saddle

The pivoting saddle allows the pointed air rods and conductors to be fixed on a non-horizontal support.

Item	Ref.	W (kg)
Pivoting saddle for flat or round conductors)	P4052B	0.45



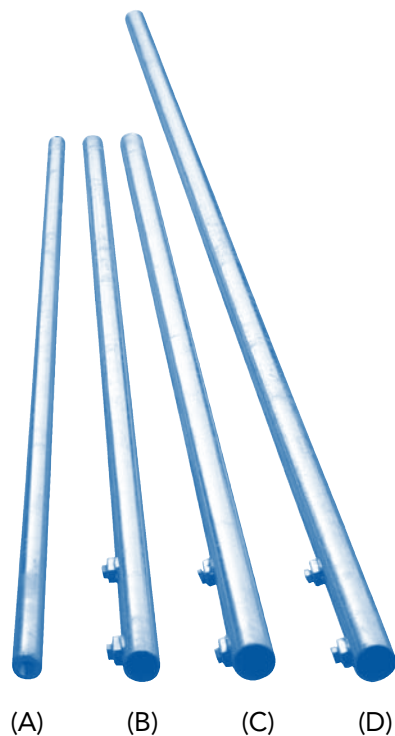
# Elevation masts

## Elevation poles

Made of special «high resistance» steel and galvanised inside and out, Indelec's elevation poles allow the lightning rod (PREVECTRON® E.S.E., Indelec multiple rod or Pointed Air Rod) to be raised by up to 6 m without resorting to guy wires.

The telescopic sections are fixed together by two stainless steel press-screws with waterproof collars. The lightning rod is screwed at the top of the first section.

The elevation masts are also available in stainless steel (maximum height 5 m) and in copper (height 2 m).



Item	Ref.	L (m)	W (kg)
Galvanised steel elevation pole (A) 1 <sup>st</sup> section dia 35 mm	P2001B	2.00	3.00
Galvanised steel elevation pole (B) 2 <sup>nd</sup> section dia 42 mm	P2002	2.00	5.00
Galvanised steel elevation pole (C) 3 <sup>rd</sup> section dia 50 mm	P2003	2.00	5.00
Galvanised steel elevation pole (D) 3 <sup>rd</sup> section dia 50 mm	P2004	3.00	7.75
Set of 2 poles - 3.75 m (A+B)	P2022B	3.75	8.00
Set of 3 poles - 5.50 m (A+B+C)	P2023B	5.50	13.00
Set of 3 poles - 6.50 m (A+B+D)	P2024B	6.50	15.75
Stainless steel elevation pole 1 <sup>st</sup> section dia 33.7 mm	P2011C	2.00	2.40
Stainless steel elevation pole 2 <sup>nd</sup> section dia 38 mm	P2012	2.00	2.80
Stainless steel elevation pole 3 <sup>rd</sup> section dia 42.4 mm	P2013	2.00	3.20
Set of 2 stainless steel poles (A+B)	P2032C	3.75	5.20
Set of 3 stainless steel poles(A+B+C)	P2033C	5.50	8.40
Stainless steel elevation pole for chimney dia 23 mm	P2031B	1.00	2.00
Chromium-plated copper elevation pole dia 30 mm	P2041B	2.00	3.00

## Light self-standing Masts (L.S.M.S.)

Made from light-weight dip-galvanised tubing, in lengths of 3 or 6 m bolted together ; the L.S.M. is fixed to the ground with a bracket sealed in solid concrete, on a wall or gable with offset mounting brackets.

The L.S.M. allows the fixing of lightning rods (tapped M 20) up to 14 m.

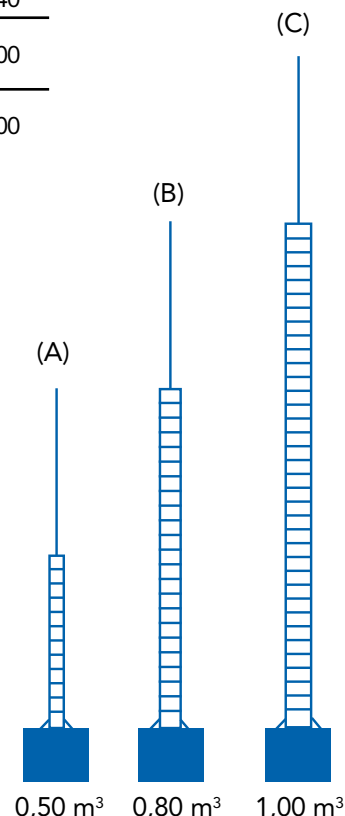
The top of first section can be delivered with press screw instead of a connector for lightning rod (max. diam. 50 mm) on demand.

No guy wires are necessary if the base is adequate.

Item	Ref.	L (m)	W (kg)
L.S.M. /6 (A)	P2051	6.00	40
L.S.M. /11 (B)	P2052	11.00	60
L.S.M. /14 (C)	P2053	14.00	85
Set of 3 offset mounting brackets	P2054	-	18
Ground bracket	P2055	-	8

Triangular Section - side = 34 cm

Concrete block:



# Elevation masts

## Light self-standing towers

Indelec's self-standing towers are made from high-resistance steel and then dip-galvanised. They allow for lightning rods to be erected up to 36 m for the protection of open areas, for example.

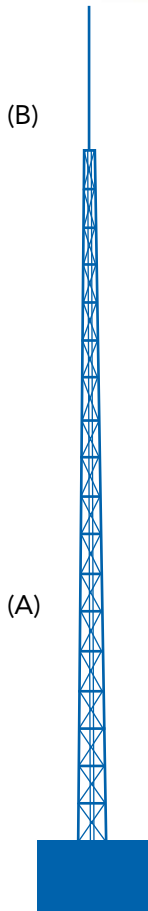
They are supplied in kit form, in 3 or 6 m sections. A metal mounting bracket is supplied and should be sunk in a solid concrete support block (see figures in table below).

Maximum top surface: 0.70 m<sup>2</sup>.

3 solutions for the top of the tower :

- Lightning rod fixing pole with connector for lightning rod (G27) (B)
- Lightning rod fixing pole with press screw (max. diam. 50 mm)
- Elevation poles (seen on last page)

These items are sold separately.



Item	Ref.	H (m)	W (kg)	Concrete block (m <sup>2</sup> )
Light self-standing tower (A)	P2061	9	97	0.8
Light self-standing tower (A)	P2062	12	140	1
Light self-standing tower (A)	P2063	18	250	2.5
Light self-standing tower (A)	P2064	24	390	4
Light self-standing tower (A)	P2065	30	580	10
Light self-standing tower (A)	P2066	36	830	13
Lightning rod fixing pole diam 50 mm	P2067S	5	27	-
Lightning rod fixing pole (G27) (B)	P2067P	5	27	-
Brass Female M20 / Male G27 socket	C2432	-	0.218	-
Brass Female M16 / Male G27 socket	C516	-	0.240	-

## Towers with guy wires

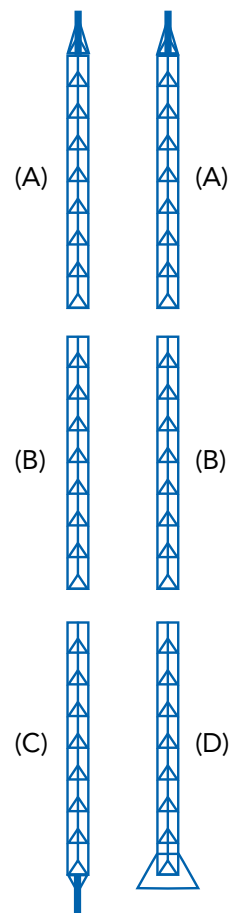
Made from dip-galvanised steel, and designed to receive guy wires, these towers come in 3 m sections, 23 cm wide. The sections are bolted (M12) together at the joints and the base can be supplied either with a spike or a flat base section for ground mounting.

Guy wires are needed every 6 m (i.e. every 2 sections)

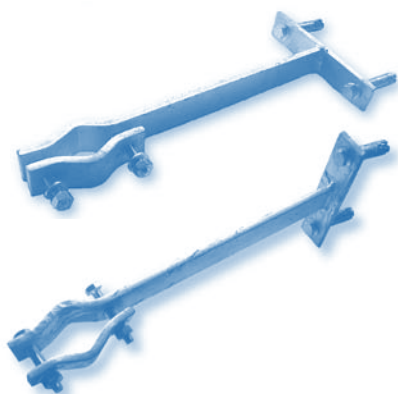
on three separate anchor points fixed at ground level at a distance from the base equal to half the height of the tower.

A lightning rod fixing pole can be installed at the top of the tower (Ref P2001B or P2011C).

Item	Ref.	L (m)	W (kg)
Upper section (A)	P2070	3.00	13
Centre section (B)	P2071	3.00	13
Base section with spike (C)	P2072	3.00	13
Flat base section (D)	P2073	3.00	15
Stainless steel cable Ø 2 mm	P2074	100.00	-
Tensioning kit (2 thimbles - 4 steelwire clamps -1 turnbuckle)	P2075	-	-
Anchor plate - 3 guy wires	P2076	-	-
Anchor plate - 6 guy wires	P2077	-	-



# Single rod and elevation pole fixings



## Side Mounting bolted brackets

Used to fix an offset pole on a vertical surface. The bracket is held in place by 2 cast iron plugs mast.

- Maximum diameter 50 mm.
- Dip-galvanised steel.
- 2 M10 bolts and two cast iron plugs supplied.
- Centre distance of two wall fixing holes: 130 mm.  
(drill diameter: 16 mm)

Item	Ref.	offset (mm)	W (kg)
Set of 2 brackets (for 2 m elevation poles)	P3012A	300	3.40
Set of 3 brackets (for elevation poles over 2 m). 2 vertical - 1 horizontal	P3013A	300	5.00

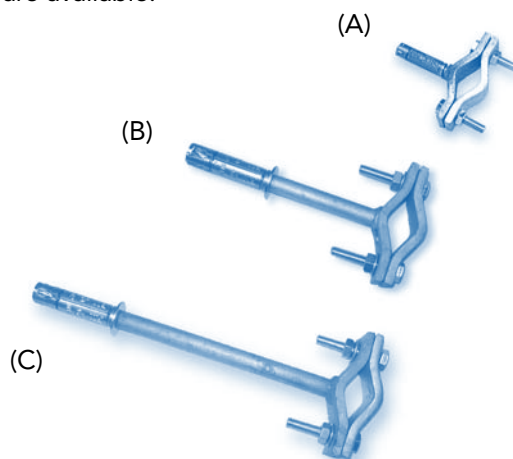
## Screw mounted brackets

Used to fix a pole on a vertical surface. 3 fixing screw lengths are available.

Dip-galvanised steel cast iron plug supplied.

Drill diam.: 20 mm.

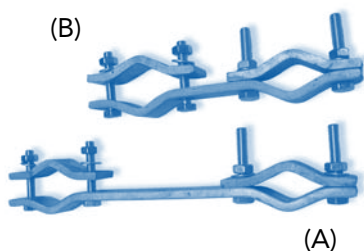
Item	Ref.	offset (mm)	W (kg)
Set of 2 brackets short (for 2 m elevation poles) (A)	P3014	10	1.40
Set of 3 brackets short (A)	P3015	10	2.10
Set of 2 brackets medium (for 2 m elevation poles) (B)	P3016	100	1.50
Set of 3 brackets medium (B)	P3017	100	2.30
Set of 2 brackets long (for 2 m elevation poles) (C)	P3018	200	2.20
Set of 3 brackets long (C)	P3019	200	3.30



## Offset mounting brackets

Used to fix a pole on any vertical tubular support (e.g. pole, railings etc.). 2 models with different offsets are available.

- Dip-galvanised steel.
- Maximum mast diameter: 50 mm.
- Offset: 240 mm (long model), 140 mm (short model).
- Bolts supplied.



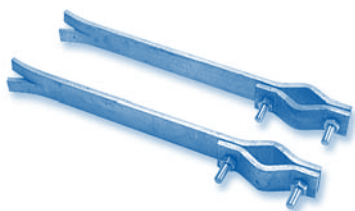
Item	Ref.	offset (mm)	W (kg)
Set of 2 brackets (for 2 m elevation poles) (A)	P3032	240	2.40
Set of 3 brackets	P3033	240	3.60
Set of 2 brackets (for 2 m elevation poles) (B)	P3035	140	2
Set of 3 brackets (B)	P3036	140	3



# Single rod and elevation pole fixings

## Side mounting wall anchors

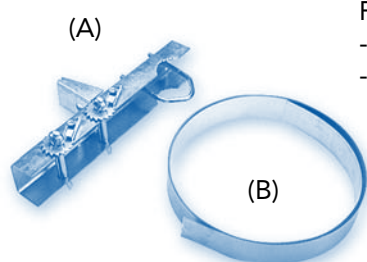
Used for embedding the pole mountings in a wall.  
- Dip-galvanised steel.



Item	Ref.	offset (mm)	W (kg)
Set of 2 anchors (for 2 m elevation poles)	P3002	230 maxi	2.40
Set of 3 anchors (for poles over 2 m)	P3003	230 maxi	3.60

## Hoop mountings

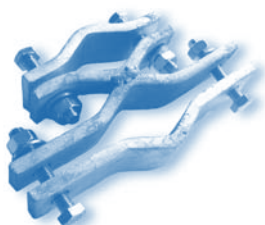
For the strapping of a pole to a domestic chimney.  
- Dichromate steel brackets.  
- Galvanised steel strapping.



Item	Ref.	L (m)	W (kg)
Set of 2 hoop mountings (for 2 m elevation poles) (A)	P3022	0.30	1.70
Set of 3 hoop mountings	P3023	0.30	2.60
Galvanised steel strip roll (B)	P3024	20	5

## Offset collars

For close offset fixing of a pole to any vertical tubular support  
(e.g. pole, railings etc.).  
- Dip-galvanised steel.  
- Maximum diameter of mast: 50 mm.



Item	Ref.	offset (mm)	W (kg)
Set of 2 collars	P3037	60	3.00
Set of 3 collars	P3038	60	4.50

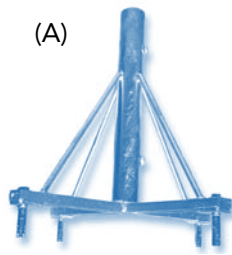
## Universal brackets

Used to fix a pole against a vertical or horizontal tubular support.  
- Dichromate steel.  
- Maximum diameter of mast: 50 mm.

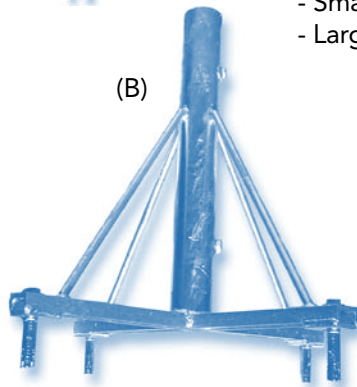


Item	Ref.	L (m)	W (kg)
Universal bracket	P3034	-	1.00

# Flooring Tiles for mounting stand



(A)



(B)

## Mounting stand

Used to fix a pole on to a flat roof without the need of guy wires. The flat roof roof should be drilled, the holes plugged and the mounting stand then firmly attached with 4 bolts. It can also be fixed on flooring tiles for mounting stand that are laying on the flat roof without drilling.

- Dip-galvanised steel.
- 4 M10 bolts and 4 cast iron plugs supplied (drill diameter: 16 mm).  
Length between the screws:
- Small model: 360 mm.
- Large model: 515 mm.

Item	Ref.	H (m)	W (kg)
Mounting stand small size (for elevation poles dia. 35 mm) (A)	P3052	0.32	4.00
Mounting stand large size (for elevation poles dia. 50 mm) (B)	P3053	0.47	7.00

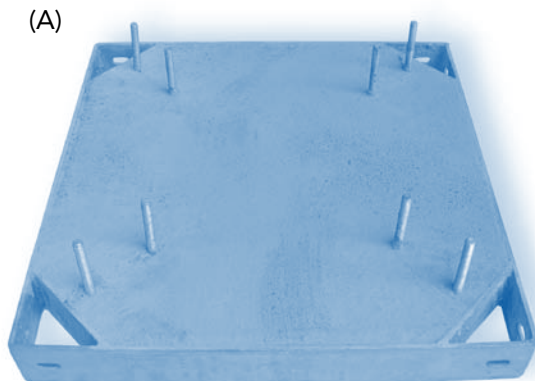
## Flooring tiles for mounting stand (small and large size)

Concrete flooring tiles with assembling bolts for mounting stand These concrete tiles are used to ensure an adequate base to the mounting stand and elevation poles.

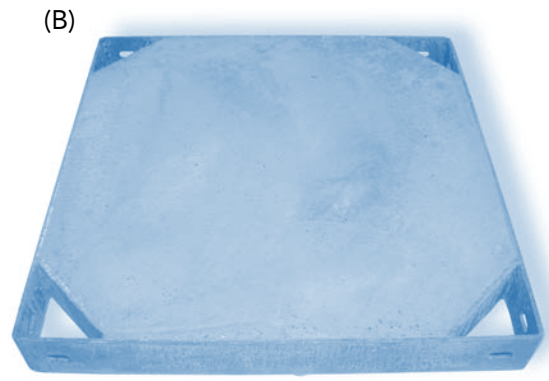
The central tile is equipped with studs for both small and large tiles models. For small mounting stand size (P3052): 1 central tile (P3090) + 4 side tiles (P3091)

For large mounting stand size (P3053): 1 central tile (P3090) + 8 side tiles (P3091)

Item	Ref.	H (m)	W (kg)
Central tile (A) Size : 500 x 500 x 60	P3090	-	39
Side Tile (B) Size : 500 x 500 x 60	P3091	-	39

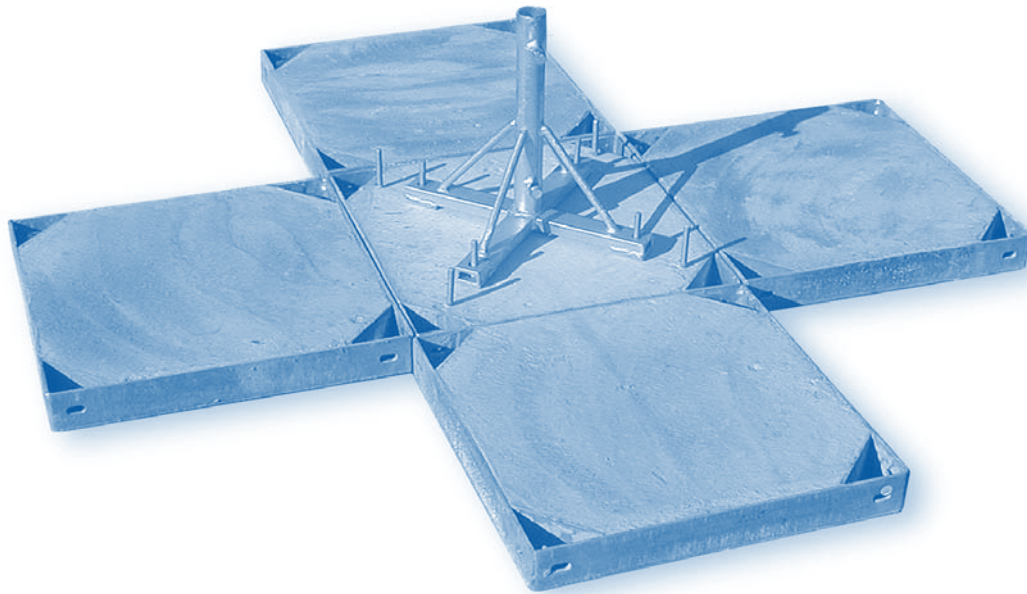


(A)



(B)

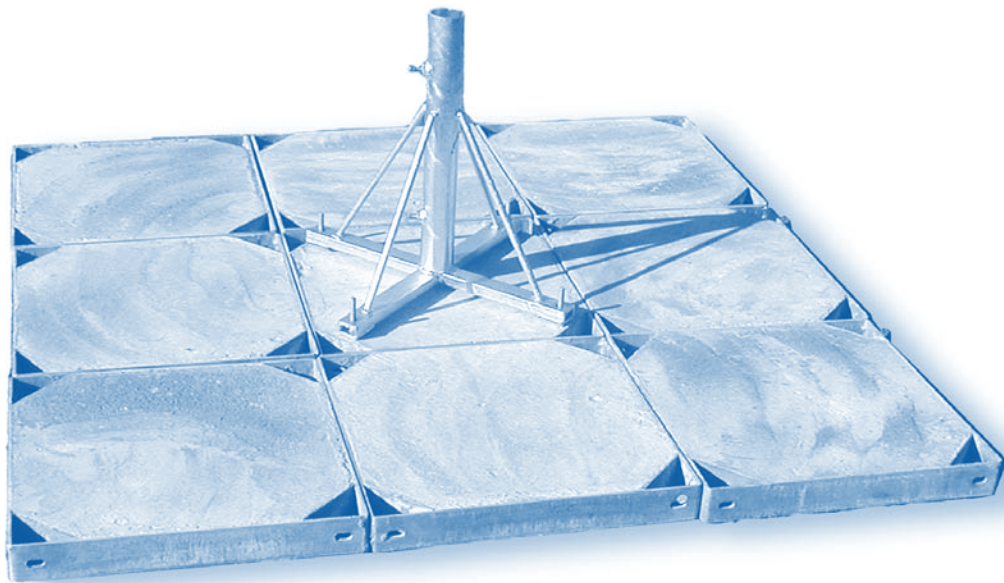
# Flooring Tiles for mounting stand



Assembly of one central tile and four side tiles for fixing of a small size mounting stand, for 2 meters  $\text{Ø}35\text{mm}$  elevation pole.  
Total weight (excl. pole): 200 kg

Assembly of one central tile and eight side tiles for fixing of a large size mounting stand, for elevation pole up to  $\text{Ø}50\text{mm}$ .  
Total weight (excl. pole): 360 kg

Flooring tiles assembly must be located on shock absorber flooring material to avoid damaging the terrace water proofing.



Flooring tiles assembly must be located on shock absorber flooring material to avoid damaging the terrace water proofing.



# Single rod and elevation pole fixings



## Anchor or cement mountings

For lightning rod or elevation pole (2m height max) fixing on a wooden or concrete frame.

Item	Ref.	H (m)	W (kg)
Anchor or cement mounting	P3042	0.60	1.60

## Adapter sleeves

Used to fix a lightning rod on a tubular or square intersection. The sleeve is held in place by 3 press screws.

- Dip-galvanised steel.
- Maximum section of the support:
  - Round support: diam. 20 mm.
  - Square support: 45 mm.

(A)



(B)



(C)



Item	Ref.	L (m)	W (kg)
Adapter sleeve for round shaft (A)	P3066B	0.10	0.50
Adapter sleeve for square shaft (B)	P3067B	0.25	1
Adapter sleeve for weather rooster (C) diameter 25 mm	P3068B	0.55	2.1



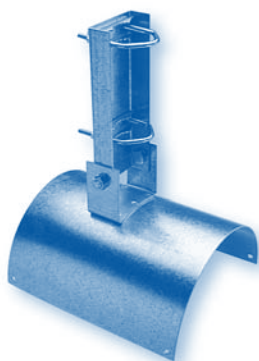
## Threaded bases

Allows the fixing of a pole up to 4 m on a metal frame.

- Dichromate steel.
- Bolts supplied.

Item	Ref.	L (m)	W (kg)
Threaded base diam. 30	P3070	0.40	4.00

# Single rod and elevation pole fixings



## Pivoting bases

The pivoting base allows a guy-wire-supported pole to be fixed to a ridge beam.

- Dichromate steel.

Item	Ref.	W (kg)
Pivoting base	P3081	2.00

## Guy wire kit

This kit provides all the necessary parts for attaching guy wires to an Indelec 4-section pole.

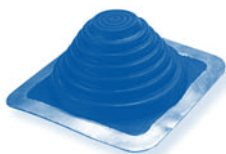
The kit consists of:

- 50m stainless steel wire (Ø2mm)
- 2 elevation pole collars
- 12 heart shaped thimbles
- Cable clamps
- 6 turnbuckles



Item	Ref.	W (kg)
Galvanised steel guy wire kit	P3082	2.00
Stainless steel guy wire kit	P3083	2.20

(A)



## Waterproofing collars

To ensure the roof stays watertight when installing a pole.

- Rubber collar clamped around the pole.
- Zinc collar welded to the pole.

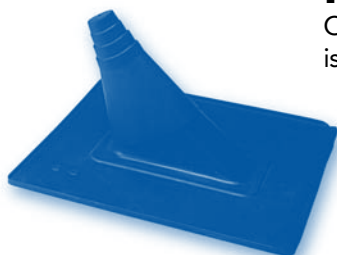


(B)

Item	Ref.	Tube Dia.
Rubber collar - small model (A)	P3062	6 to 50
Rubber collar - large model	P3063	6 to 110
Zinc collar - small model (B)	P3064	10 to 60
Zinc collar - large model	P3065	20 to 90

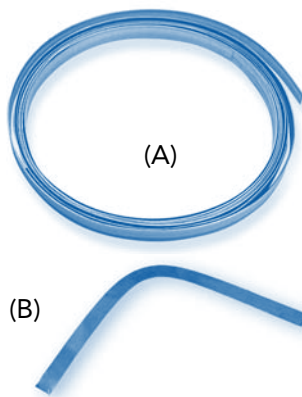
## Rubber tiles

On a tile or slate roof, the rubber tile is used to ensure that the Indelec pole base is watertight.



Item	Ref.	Dim. (m)
Rubber tile	P3069	0.30 x 0.40

# Conductors

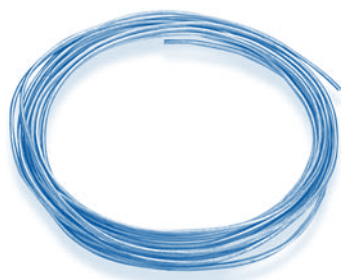


## Flat conductors

Item	Ref	Dim (mm)	W (kg/m)	Packing
Tinned copper tape (A)	P5001B	27 x 2	0.494	50 m roll
	P5001C	27 x 2	0.494	100 m roll
Bare Aluminum tape (B)	P5004	30 x 3*	0.235	
Bare Stainless Steel tape AISI 304	P5005	30 x 2*	0.4722	
Galvanized steel tape	P5006	30 x 3.5*	0.840	
Prefabricated tinned copper tape elbow	P5007	27 x 2	0.250	

\*According to EN 62 305-3

## Round conductors



Item	Ref.	dia (mm)	W (kg)
Solid bare copper round conductor (3 m bar)	P5010	8	0.448
Solid tinned copper round conductor (coil)	P5011	8	0.448
Bare copper round conductor (coil)	P5012	8	0.448
Bare galvanised steel round conductor (coil)	P5013	8	0.391
Bare galvanised steel round conductor (coil)	P5014	10	0.630
Bare aluminium round conductor (coil)	P5015	10	0.212
Galvanised steel round conductor (coil)	P5016	8	0.400
Multi-stranded copper cable 50 mm <sup>2</sup>	C836	10	0.44

## Flexible copper braid



Item	Ref.	Dim. (mm)	W (kg)
Flexible tinned copper braid 50 mm <sup>2</sup>	P5021	30 x 3.5	0.60
Flexible tinned copper braid 16 mm <sup>2</sup>	P5025	16 x 2	0.16

## Flexible copper earth bonds



Item	Ref.	L (m)	W (kg)
Braid bond 50 mm <sup>2</sup> (eyelet Ø10)	P5022	0.30	0.18
Braid bond 50 mm <sup>2</sup> (eyelet Ø10)	P5023	0.50	0.30
Braid bond 50 mm <sup>2</sup> (eyelet Ø10)	P5024	1.00	0.50
Braid bond 16 mm <sup>2</sup> (eyelet Ø10)	P5026	0.30	0.05
Braid bond 16 mm <sup>2</sup> (eyelet Ø10)	P5027	0.50	0.09
Braid bond 16 mm <sup>2</sup> (eyelet Ø10)	P5028	1.00	0.16



# Conductor interconnection

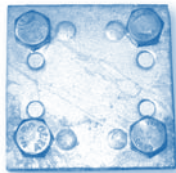
(A)



(B)



(C)



## Flat clamps

Brass clamps for copper conductors.  
Galvanised steel clamps for steel conductors.

Item	Ref.	W (kg)
Brass square tape clamp (A)	P6091	0.60
Brass round conductor clamp (B)	P6092	0.20
Galvanised steel square tape clamp (C)	P6098	0.20
Galvanised steel round conductor clamp	P6099	0.15

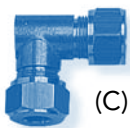
(A)



(B)



(C)



(D)



(E)

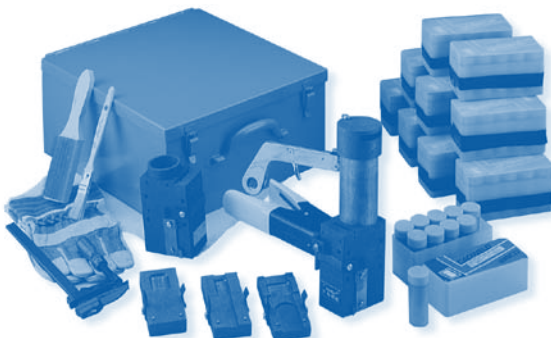
## Round clamps

For copper round conductor  $\varnothing$  8 mm.

Item	Ref.	W (kg)
Brass round-to-round in line connector (A)	P6093	0.06
Brass round-to-round T connector (B)	P6094	0.09
Brass round-to-round L connector (C)	P6095	0.06
Brass round-to-raceway connector (D)	P6096	0.08
Universal copper plated round-to-round connector (E)	P6097	0.12

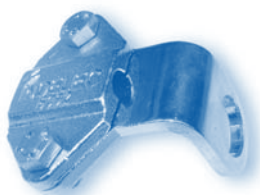
## Exothermic welding kits

This kit provides the necessary parts for 100 exothermic weld points for connecting 30x2 or 27x2 copper conductors either in-line, in a T-shape or crosswise. Optional moulds allow tape to be welded on to a vertical metal support and an earthing rod, diameter 15 mm.



Item	Ref	W (kg)	L x l x h (mm)
100 exothermic weld points for 30 x 2mm tape	P6100	17.5	360 x 260 x 280
100 exothermic weld points for 27 x 2mm tape	P61001	17.5	360 x 260 x 280
Vertical metallic mass to tape mould	P6101	-	-
30 x 2mm Tape to $\varnothing$ 15mm rod mould	P6102	-	-
Pliers for moulds 27 x 2mm size 2	P61031	-	-
Pliers for moulds 27 x 2mm size 1	P61032	-	-

# Flat conductor fixings up to 30 mm wide



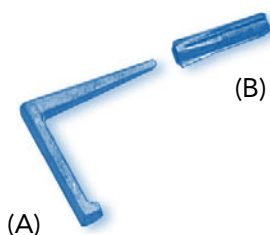
## Lightning rod clamp

Used to connect the lightning rod (PREVECTRON® or Jupiter) to the down conductor (flat or round).

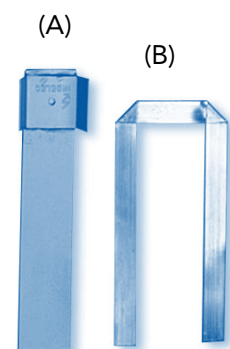
Item	Réf.	Dim. (mm)	W (kg)
Lightning rod clamp	P6500	-	-

## Masonry hooks

Used to fix tape on to masonry.  
 - Fixed with lead plugs.  
 - Support drill diameter: 7 mm.



Item	Ref.	L (mm)	W (kg)
Galvanised steel hook - short (A)	P6001	30	0.015
Galvanised steel hook - medium	P6002	40	0.020
Galvanised steel hook - long	P6003	50	0.020
Stainless steel hook.	P6004	40	0.020
Lead plug (B)	P6005	6x30	0.007



## Tile and slate holdfasts

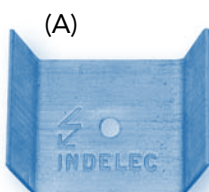
Used to fix tape on a tile or slate roof.

- Tinned copper.  
 - Bracket length = 14 cm

Ref. P6011: the mounting is pushed in between two tiles and the two flanges folded back to hold the conductor in place.

Ref. 6012: the mounting is pushed in between two slates and the conductor is welded on.

Item	Ref.	W (kg)
Copper fastener for tiles or slates (A)	P6011	0.060
Fastener for slates (B) on historic monuments	P6012	0.030



## Fold-back clips for cladding panels

- The fold-back clip is first fixed to the support wall by means of pop rivets, metal screws or expanding plugs.

- The flanges are then folded back to hold the tape in place.



Item	Ref.	Ø (mm)	W (kg)
Tinned copper fold-back clips (A)	P6041	-	0.018
Aluminium fold-back clips (A)	P6042	-	0.005
Rubber sealing plain washer (B)	P6044	-	-
Expanding waterproof plug (C)	P6045	8.5	-

## Ruberalu waterproofing holdfasts

Used to fix tape to waterproof roofing felt.

- The holdfasts are heated so that they stick to the roofing felt.

- Tarred aluminium.

- Delivered by 25 pcs.



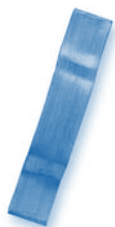
Item	Ref.	Dim. (cm)	W (kg)
Ruberalu waterproofing holdfast	P6031	20 x 5	0.030

# Flat conductor fixings up to 30 mm wide

## Copper welding clips

Used to fix tape on to a metal roof (e.g. zinc or lead). The clip is welded to the roof on either side of the tape.

- Tinned copper.
- Width 13 mm; thickness 0.8 mm



Item	Ref.	W (kg)
Copper welding clip	P6021	0.008

## Stainless steel clips

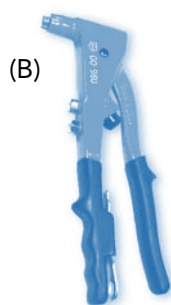
These clips hold the tape in place and are either pop-riveted or screwed down.



Item	Ref.	L (m)	W (kg)
Stainless steel clip	P6043	-	0.0025

## Rivets and rivet guns

These rivets are used to hold fixings such as clips in place on steel surfaces or cladding panels. The rivets supplied are waterproof.



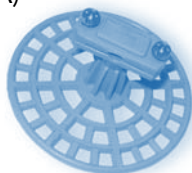
Item	Ref.	Dia. x L	W (kg)
Aluminium pop rivet (A) *	P6061	4 x 8	0.002
Copper pop rivet *	P6062	4 x 9	0.002
Stainless steel pop rivet *	P6063	4 x 8	0.002
Pop rivet gun (B)	P6064	-	0.600
Rubber sealing plain washer (C)	P6044	-	-

\* delivered by 100 pcs

## Plastic holdfasts

The shoulder base should be placed beneath the layer of gravel on the flat roof.

(A)

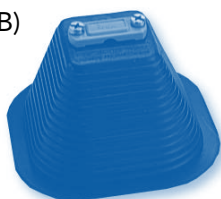


Item	Ref.	Dia.	W (kg)
Shoulder for flat conductors (A)	P6116	110	0.030

These plastic pyramids are first filled with cement and then positioned on the flat roof thereby holding down the conductor.

- Supplied empty, with lid.

(B)



Item	Ref	L x l (mm)	W (kg)
Empty pyramid holdfast for tape conductor (B)	P6081	15 x 15	0.160
Cement-filled pyramid holdfast for tape conductor (B)	P6084	15 x 15	1



# Flat conductor fixings up to 30 mm wide

## Plastic clips

Used to fix a flat conductor and provide insulation from the support. The clip is screwed in place or held by a screw-in bracket (M6). 3 tape-support gaps are available: 15, 40 or 60 mm.

(A)



(C)

(B)



Item	Ref.	offset (mm)	W (kg)
Plastic clip (A)	P6071	15	0.020
Plastic clip (B)	P6171	40	0.025
Plastic clip (C)	P6271	60	0.030

## Ridge conductor holders

This holder avoids the need for drilling when used to fix tape to a ridge beam. Available in copper or stainless steel. Adjustable ridge beam width.



Item	Ref.	W (kg)
Copper ridge conductor holder	P6174	0.100
Galvanised steel ridge conductor holder	P6074	0.100

## Galvanised steel holdfasts

The holdfast is fixed with screws or screw bracket (M8).  
- Galvanised steel.



Item	Ref	W (kg)
Stainless Steel Holdfast	P6371C	0.70

# Flat conductor fixings up to 30 mm wide

## Mast collars

Used to clamp the conductor to a tube. The clamp is held in place by screwing.  
- Stainless steel.



Item	Ref.	Ø (mm)	W (kg)
Mast collar	P6051	32-50	0.025
Mast collar	P6052	40-60	0.030
Mast collar	P6053	60-80	0.035
Mast collar	P6054	70-90	0.040

## Clamping collars

Used to fix the conductor to a tube. This self-locking collar is permanently tightened around its support using the special pliers.  
- Stainless steel.

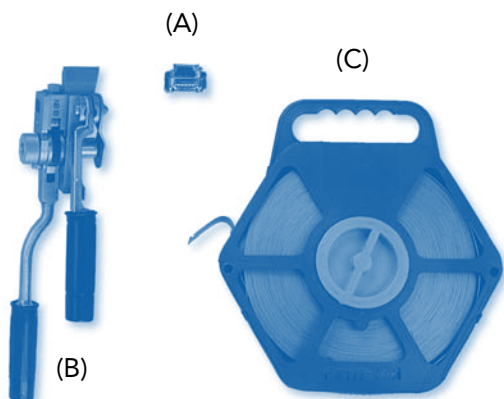
Item	Ref.	Ø (mm)	W (kg)
Clamping collar (A)	P6058	100	0.01
Clamping collar (B)	P6059	150	0.01
Collar pliers (C)	P6060	-	0.60



## Steel strapping tapes and strapping tools

Used to fix the conductor to a larger diameter tube. The desired length of strip is cut off and then tightened around the support using the strapping clamp and strapping tool.

- Stainless steel.  
- 2 widths available: 10 mm or 20 mm.

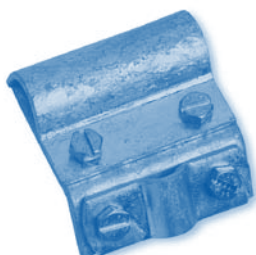


Item	Ref.	Width (mm)	W (kg)
Stainless steel tape (50 metre roll) (C)	P6055	10	2.00
Stainless steel tape (50 metre roll)	P6155	20	5.00
Strapping clamps (100 clamps)	P6056	10	0.40
Strapping clamps (100 clamps) (A)	P6156	20	1.40
Strapping tool (B)	P6057	-	1.40

## Gutter clips

This clip is used to fix a flat or round down conductor to a gutter thereby earthing it.

- Galvanised steel.



Item	Ref.	W (kg)
Gutter clip	P6082	0.10

# Round conductor fixings up to 8 mm Diameter



(A)



(B)

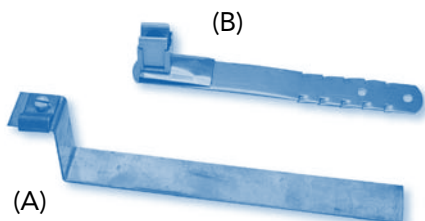
## Push-in stainless steel clips

Used to fix the conductor held by the clip.  
The clip is screwed or riveted on to its support.

Item	Ref.	W (kg)
Stainless steel clip (A)	P6143	0.02
Stainless steel slate holdfast (B)	P6144	0.02

## Metallic holdfasts for tile or slate

Used to fix a round conductor on to a tile or slate roof.  
- Available in copper or stainless steel.



(B)

(A)

Item	Ref.	L (m)	W (kg)
Copper tile holdfast (A)	P6111	0.25	0.10
Stainless steel slate holdfast (B)	P6110	0.25	0.10

## Push-in plastic clip

Used to fix a round conductor ( $\varnothing$  6 to 10 mm) so that it is insulated from its support. The clip is screwed into place or fixed with a single pop rivet.

- Gray or red PVC.  
- 3 conductor-support gaps are available.



(A)

(B)

Item	Ref.	offset (mm)	W (kg)
Gray plastic clip (A)	P6072	15	0.01
Gray plastic clip (B)	P6172	40	0.01
Red plastic clip (A)	P6372	15	0.01

## Metallic holdfasts for masonry

Used to fix a round conductor (not supplied)  $\varnothing$  6 to 10 mm.  
The holdfast is screwed into place or fixed with a screw-bracket (M8).



(A)

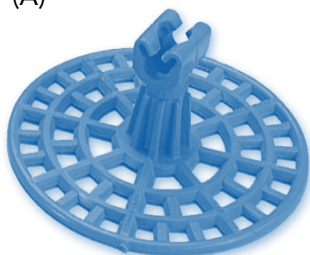
(B)

Item	Ref.	W (kg)
Copper masonry holdfast (A)	P6472	0.05
Galvanised steel masonry holdfast (B)	P6473	0.05



# Round conductor fixings up to 8 mm Diameter

(A)



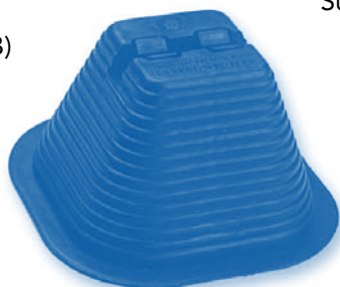
## Plastic holdfasts

The PVC shoulder base is placed beneath the layer of gravel on the flat roof.

(A)	Item	Ref.	Dia.	W (kg)
	Shoulder for round conductors	P6112	110	0.030

These plastic pyramids are first filled with cement and then positioned on the flat roof thereby holding down the conductor.  
Supplied empty, with lid.

(B)



(B)	Item	Ref.	L (mm)	W (kg)
	Pyramid holdfast	P6115	15 x 15	0.160

## Ridge conductor holders

This holder avoids the need for drilling when used to fix tape to a ridge beam.

- Available in copper or stainless steel.
- Adjustable ridge beam width.



Item	Ref.	W (kg)
Copper ridge conductor holder	P6113	0.100
Stainless steel ridge conductor holder	P6114	0.100



## Test clamps

Made from brass, the test clamp allows the down conductor to be disconnected from the earthing point so that the earth resistance may be measured.

- Suitable for tape or round conductor.
- Supplied with one key fixing screw and plastic plug.
- Input marked with an earth symbol.

Item	Ref.	L (m)	W (kg)
Test clamp	P7001	0.1	0.5

## Protection sheaths

Ensures the down conductor is physically shielded from knocks at ground level. The sheath is usually positioned just below the test clamp.

- Dip-galvanised steel or stainless steel.
- Supplied with 3 stainless steel fixing clamps.

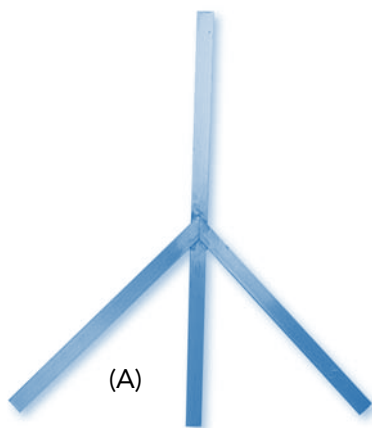


Item	Ref.	L (m)	W (kg)
Galvanised steel protection sheath for flat conductor	P7011	2	1.5
Galvanised steel protection sheath for round conductor	P7012	2	1.5
Stainless steel protection sheath for flat conductor	P7014	2	1.5
Additional stainless steel fixing clamp	P7013	-	-
Sticker «Danger»	C3188	-	-
Plastic "DANGER" panel 100 x 150 mm – French	C3263	-	-
Plastic "DANGER" panel 100 x 150 mm – English	C3263A	-	-
Plastic "DANGER" panel 100 x 150 mm – Spanish	C3263B	-	-

## «Crow-foot» earthing systems

Prefabricated in the factory, the «crow-foot» earthing system consists of three 7-metre prongs angled at 45° and a 3-metre long central prong which is connected to the test clamp. This earthing system is easy to unroll and bury.

It avoids mechanical connections which would be prone to corrosion over time.



Item	Ref.	L (m)	W (kg)
Factory-made «crow-foot» tinned copper earthing (A)	P7021	22	13
Tinned copper tape 30x2 m for earthing*	P5001	-	0.475
«Crow-foot» clamp (B)	P7024	-	0.28

\*To NF C 17 - 100 and NF C 17 - 102 standards.

## Inspection housings

Used to inspect the earthing conductors' connections to the earthing rods.



Item	Ref.	Dia (mm)	W (kg)
Cast iron inspection housing (A)	P7051B	200	4.9
Plastic inspection housing (B)	P7052	170	0.5

## Earth/Ground resistance and soil resistivity tester

This new earth resistance tester offers a simple solution for measuring earthing systems resistance. Supplied with everything you need to start testing in one package. The maintenance of an adequate low resistance ground connection is essential to both the protection and performance of any electrical system. Ground testing should be performed both upon installation, to meet design specification, and periodically thereafter in order to maintain service.

### Specifications

- 2,3 and 4 points testing,
- Simple one button operation
- Test voltage: 25V or 50V at 128Hz
- Test current: 0,45 mA at 25V or 50V, or 4,5 mA at 25V
- Test frequency: 94, 105, 111 and 128 Hz
- IP54 rated
- Temperature operating range: -15°C to +55°C
- Included leads, stakes, calibration certificate and rugged carry case

Item	Ref.	W (kg)
Earth resistance tester with accessories	P80010	3.00
Earth resistance tester	P8002	1.00

## Earth coils

The earth coil can be placed between two earthing points to avoid interference or high frequency waves which can flow from one to the other.

- Service inductivity: 20  $\mu$ H
- Continuous resistance: 1.5 m $\Omega$
- Resonant frequency: 10 MHz
- Power rating: 100 A
- Output cable cross section: 25 mm<sup>2</sup>

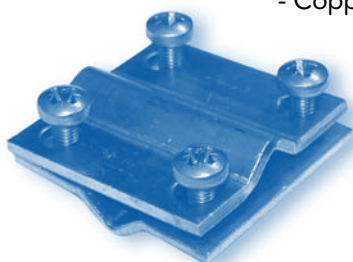
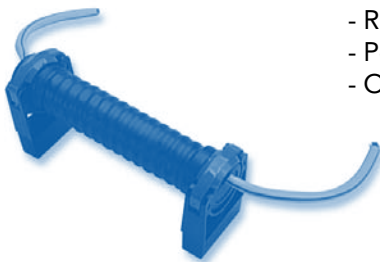
Item	Ref.	W (kg)
Isolating coil	P8003	1.00

## Earth clamps

Used to fix tape (lightning conductor earthing) to copper cable (mains earth).

- Copper.

Item	Ref.	W (kg)
Earth clamp	P8004	0.175





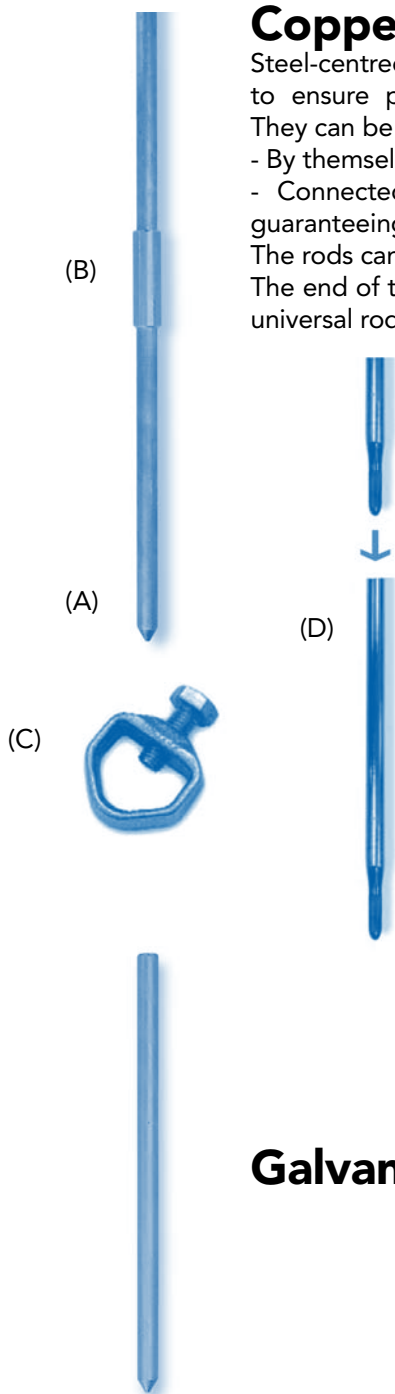
## Copper coated steel earth rods

Steel-centred rods for rigidity, copper-coated by electrolysis (min. thickness 0.25 mm) to ensure perfect and durable contact with the earth. The rods have pointed tips. They can be used equally well:

- By themselves or,
- Connected together in series using cone-shaped brass coupling sleeves, thereby guaranteeing each rod a perfect contact.

The rods can be driven into the ground either by hand or by means of a driving head.

The end of the earth conductor can either be soldered to the rod or clamped with Indelec universal rod-to-conductor clamp.



Item	Ref.	dia (mm)	L (m)	W (kg)
Self-coupling copper coated steel earth rod (D)	P7040	14.5	2	2.50
Self-coupling copper coated steel earth rod (D)	P7041	14.5	1	1.50
Copper coated steel earth rod (A)	P7030	15	2	2.60
Copper coated steel earth rod	P7031	15	1.5	2.00
Coupling sleeve (B)	P7037	15	-	0.10
Coupling sleeve	P7035	15	-	0.20
Copper coated steel earth rod	P7033	17.2	2	4.00
Copper coated steel earth rod	P7034	17.2	-	2.85
Coupling sleeve	P7038	17.2	-	0.20
Self-coupling copper coated steel earth rod (D)	P7042	17.2	1	1.90
Driving head	P7036	17.2	-	0.30
Universal rod-to conductor clamp (C)	P7039	15-19	-	0.10
Driving pin tool to be used with multiple self-coupling earth rods	P7047	8	0.05	0.02

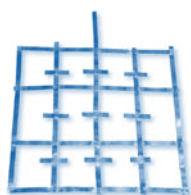
## Galvanised steel and stainless steel rods

Item	Ref.	dia (mm)	W (kg)
Self coupling galvanised steel rod - L 1.5 m	P7046	20	4.00
Stainless steel earth rod 18/10 - 304 - L 1.5 m	P7044	15	2.00

## Lattice copper earth mats

The earth mats are used to improve the earthing points where burying ground rods is not possible.

- Tinned copper tape 30x2\* or stretched copper.



Item	Ref.	dim. (mm)	W (kg)
Tinned copper lattice earth mat	P7022	1 x 1	5.00
Stretched copper lattice earth mat	P7025	2 x 1	5.00

\*To NF EN 62 305 - 3.

# Equipotential bondings

## Copper earth bars

The earth bar is used to connect different earth conductors or metallic masses together. There are 6 welded bolts (M10) which allow 6 conductors to be connected by lugs (not supplied). There are also 3 backplates allowing 3 separate 30x2 mm tapes to be connected without the need for drilling.  
- Red copper 50x5 mm.



Item	Ref.	L (m)	W (kg)
Bare copper earth bar	P7053	0.32	1.25

## Earth plates

The earth plate allows either 5 or 10 earth cables to be connected by clamping the lugs (not supplied) with M10 bolts.  
- Brass width 100 mm, thickness 10 mm.



Item	Ref.	L (m)	W (kg)
Brass earth plate 5 connections	P7054	0.15	1.4
Brass earth plate 10 connections	P7055	0.25	2

## Aerial mast diverters

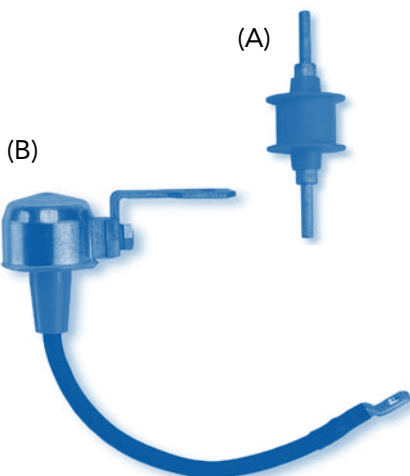
Designed to connect the bottom of metallic aerial masts on a roof to the lightning rod's down conductor. The diverter will provide a temporary earthing for the aerial mast if it happens to be struck by lightning.  
Nominal sparkover voltage: 500 V  
Nominal discharge current: 25 kA.



Item	Ref.	W (kg)
Aerial mast diverter	P8760	0.2

## Isolating spark gaps

This spark gap is designed to be positioned between two, normally insulated metal objects. It provides a temporary connection between the two objects should one of them increase in potential. This will avoid a dangerous spark being generated.



Item	Ref.	Un*	In**	W (kg)
External isolating spark gap (A)	P8070	5 kV	50 kA	0.30
Isolating spark gap -EEx type (B)	P8771	2.2 kV	100 kA	0.75

\* Nominal sparkover voltage.

\*\* Nominal discharge current.

# Equipotential bondings

## Waveguide and coaxial cable grounding kit



This universal grounding kit is designed to provide the proper electrical contact between the outer conductor of wave guide or coaxial cables and either a tower member or tower down conductor as lightning path towards earth. All cable diameters are catered for.

Each kit comes complete and ready for installation (diametre to be precised):

- At the top end.
- Every 30 metres.
- At the bottom of the vertical drop.
- Where it enters the building.

Item	Ref.	dia (inch)	W (kg)
Grounding kit	P7056 A	1/2	0.65
Grounding kit	P7056 B	7/8	0.65
Grounding kit	P7056 C	1 1/4	0.65
Grounding kit	P7056 D	1 5/8	0.65
Grounding kit	P7056 E	2 1/4	0.65



## Drilled copper earth bars

### Drilled bar (A)

This copper bracket, 0.5 m long, is used to connect 10 kits (ref. P7056) to the tower's earth. Standard length of 1.75 m available.

- Red copper.
- Hole diameter: 10.5 mm - two rows for P7158 and P7159.

### Drilled and tapped bar (B)

Available in lengths of 990 mm, these copper earth bars contain a series of tapped holes (M6), 25 mm apart.

Item	Ref.	Dim. (mm)	L (m)	W (kg)
Drilled bar	P7057	25x5	0.5	0.6
Drilled bar	P7157	25x5	1.75	1.7
Drilled bar	P7158	80x5	1.75	5.6
Drilled bar	P7159	100x5	1.75	7
Drilled and tapped bar	P7200	15x5	-	-
Drilled and tapped bar	P7201	20x5	-	-
Drilled and tapped bar	P7202	32x5	-	-



## Insulators

These insulators are used to fix earth bars and earth plates while guaranteeing insulation from their supports.

- Polyester, 2 female inserts (M8), Support offset: 50 mm.

Item	Ref.	W (kg)
Insulator	P7058	0.16

# Lightning flash counters

## Lightning flash counter

Ref P8011



### Description

The lightning flash counter is designed to keep a record of all direct lightning strikes on the external lightning protection system (Prevectron, single rod, meshed cage, ...). The digital display (6 digits) allows a direct and comfortable reading of the number of recorded impacts.

Lightning discharges counting and saving requires no external power supply and is not thus dependent on the life cycle of the internal battery. The internal long duration lithium battery is only required for displaying strikes figure when the button located on the front panel is pressed.

### Tests

According to the UTE C 17-106 Guide NF EN 50 164-6, the lightning flash counter was subjected to several test procedures in high voltage laboratory. The values indicated below are based on the LCIE test report (available on request). Moreover, following its unique policy of research & development in real lightning conditions, INDELEC has successfully submitted the lightning flash counter to real lightning discharges during the 2004-2005 test campaign in Cachoeira Paulista (Brazil). The average value of the lightning strike currents was 45 kA. During this campaign, the lightning flash counter has demonstrated its reliability (counting) and its robustness under these extreme lightning strike conditions.

### Installation

The lightning flash counter is fixed directly on the down-conductor using 2 mounting flanges located on the back face. No interruption of the down conductor is necessary, thus allowing an excellent electrical continuity of the installation down from the rod to earthing the system.

The counter records the lightning current by induction at the time of passage in the down conductor.

### Checking & Maintenance

In the meantime, INDELEC has developed a new specific testing device : this new portable tool allows to test on site, after installation and without disassembling, the digital lightning flash counter internal circuit functions. In order not to affect the real record of lightning strikes shown by the lightning flash counter, it includes a specific menu making it possible to temporarily switch to a test mode. Within the framework of regular maintenance and checking procedures of installations of external lightning protection systems, all parts and accessories of the system can now be controlled (test box for Prevectron, visual checking of the installation, earth resistance meter and the new lightning flash counter testing device).



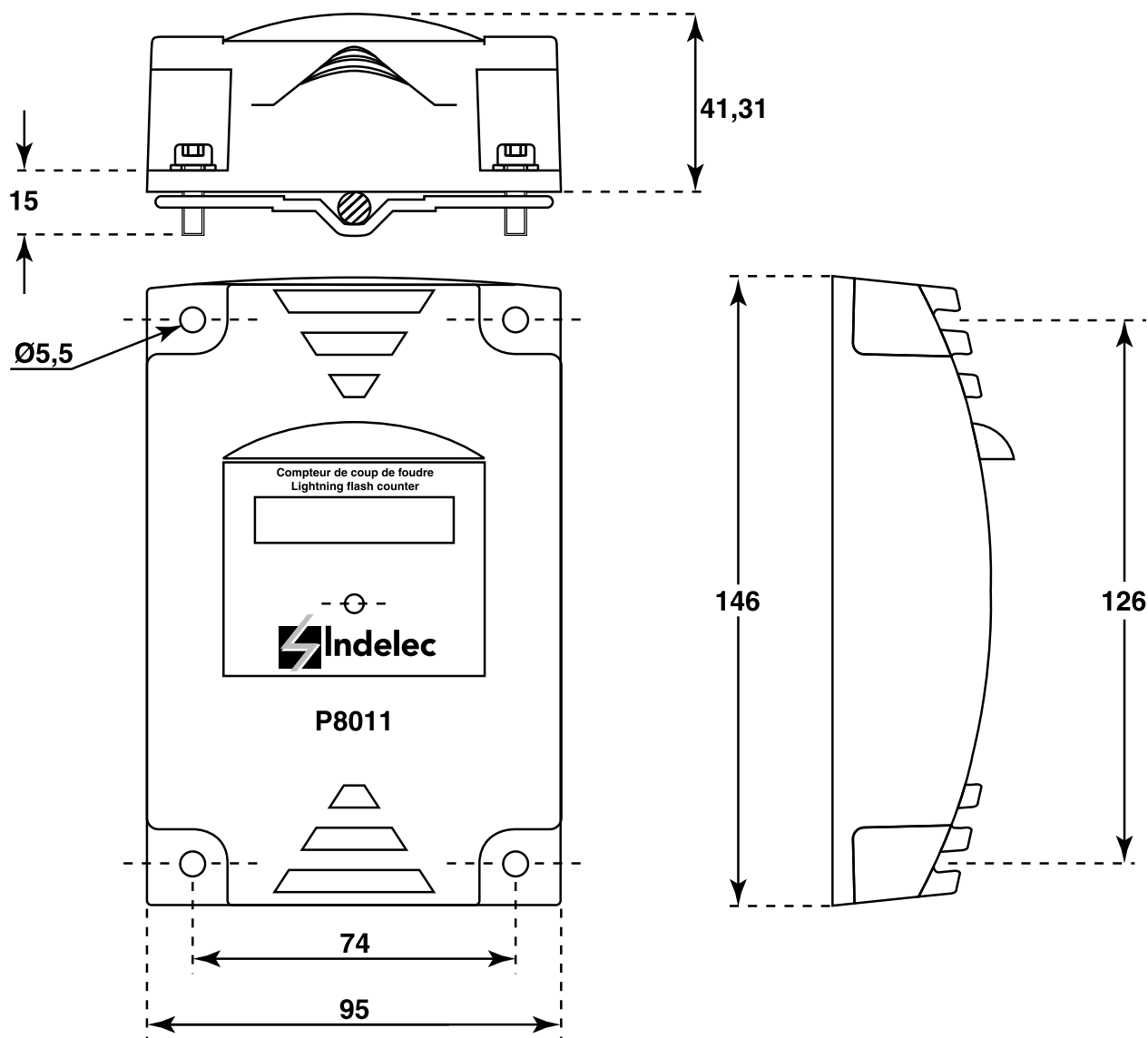


# Lightning flash counters

## Technical data

References		P8011
Minimal detectable current	Id	1 kA
Maximal detectable current	Imax	100 kA
Minimum current sensitivity (id/3)	Ind	333 A
Protection class	IP	54
UTE C 17-106 Guide compliant		certificate 2005-291 A

## Schematic (mm)



# Lightning flash counters

Indelec Patent

## Advanced lightning flash counter with remote information

- Number of strikes
- Date and time of the flashes
- Intensity of the discharge current
- Remote information by Optical fiber
- Testable on site

Ref P8014



## Description

Main features of the Advanced lightning flash counter :

- counting and recording all direct lightning strikes on the external lightning protection systems
- for each recorded strike, it shows the date, time and peak current of the lightning discharge
- integrated remote information system by optical fiber

This counter is equipped with a 16 characters digital display. This user friendly interface is controlled by 3 push-buttons. The display is powered by 2 long life batteries. The charge level can be displayed on request.

A reminder for preventive replacement of batteries is automatically shown every 3 years.

Lightning discharges counting and saving requires no external power supply and is not thus dependent of the life cycle of the internal batteries.

Possibility of sending all the lightning strike datas towards a remote interface (optional).

## Tests

According the UTE 17-106 Guide, the Advanced lightning flash counter was subjected to several test procedures in High voltage laboratory (LCIE test report available on request).

Its protection against electromagnetic radiation of the flash current is certified up to 100 kA – 8/20  $\mu$ s wave.

Its working principle has also been validated Under real lightning discharges during in-situ testing procedures in our testing facility in Brazil.

## Installation

The lightning flash counter is fixed directly on the down-conductor using 2 mounting flanges located on the back face.

It is designed for a use with flat and round conductor. No interruption of the down conductor is necessary thus allowing an excellent electrical continuity of the installation down from the rod to earthing system.

## Checking and Maintenance

In the meantime, INDELEC has developed a specific testing device :this portable tool allows to test on site, after installation and without disassembling, the Advanced lightning flash counter internal circuit functions. In order not to affect the real record of lightning strikes shown by the Advanced lightning flash counter, it includes a specific menu making it possible to temporarily Switch to a test mode. Within the Framework of regular maintenance and checking procedures of installations of external lightning protection systems, all parts and accessories of the system can now be controlled (test box for Prectron, visual checking of the installation, earth resistance meter and the Advanced lightning flash counter test device).



# Lightning flash counters

## Technical datas

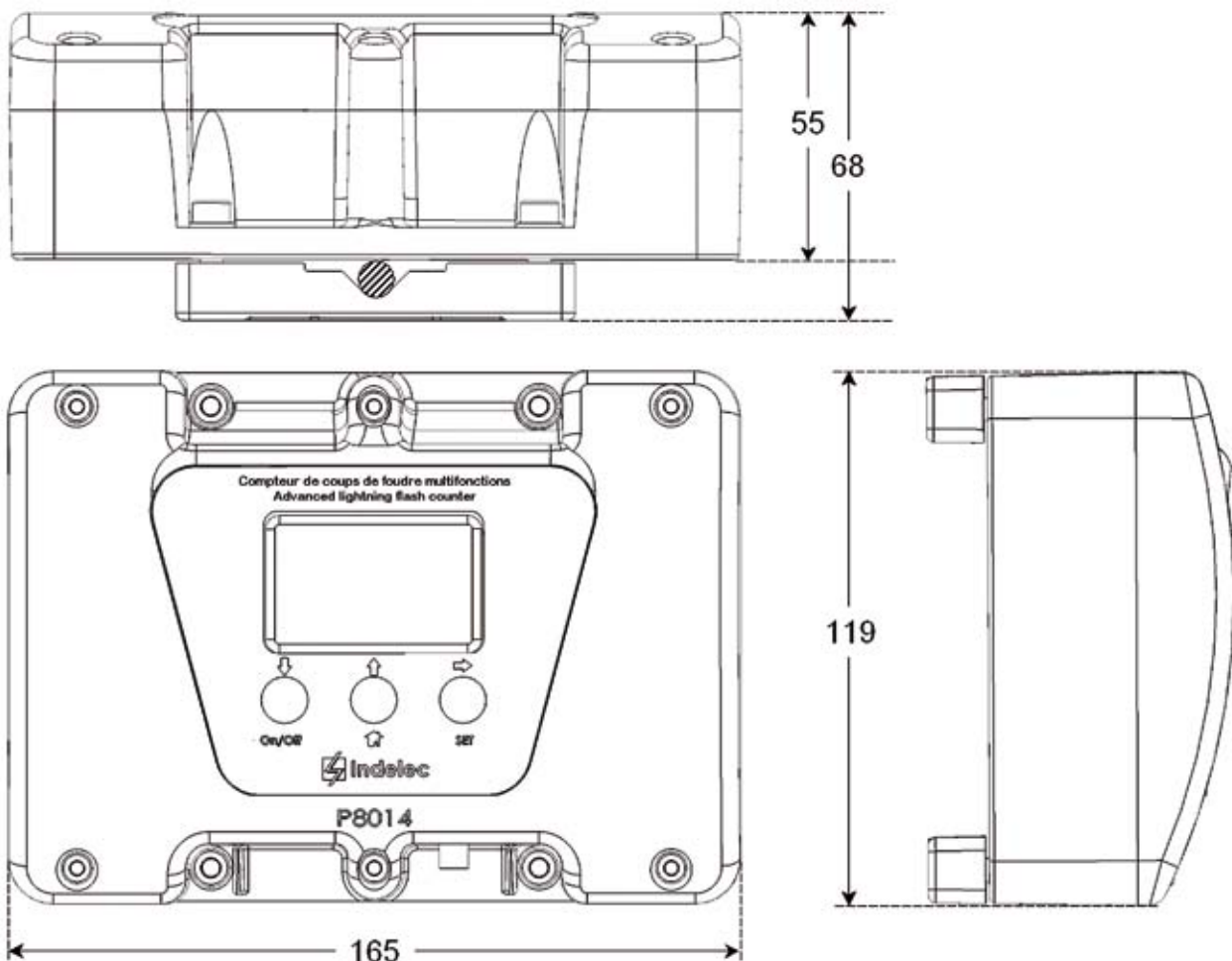
References		P8014
Minimal detectable current	Id	≥ 1kA
Maximal detectable current	I <sub>max</sub>	≤ 100 kA
Minimum current sensitivity (I <sub>d</sub> /3)	I <sub>nd</sub>	333 A
Protection class	IP	65
Size	L x H x P	165 x 119 x 55 mm
Weight		890 gr
Operating temperature range	T° min / T° max	- 20°C / + 70°C
Accuracy of peak current measurement		+/- 10%
Average batteries lifetime		3 years
Optical fiber output		Silica fiber 50/125 μm SMA

UTE C 17-106 guide compliant (certificate N°85455-576220) - NF EN 50164-6 standard compliant

References	P8015
Digital/Advanced lightning flash counter tester	

References	P80170
Battery (x2) replacement kit (for counter P8014 only)	

## Schematic of the advanced lightning flas counter (in mm)



# Storm detector

## StorMonitor

### Electromagnetic storm detector



Ref P90040

- Detection radius up to 15 km
- Plug & Play system
- Activates useful alarms
- Prevents unwanted alarms
- Can be used on all television broadcasting sites

### Description

**StorMonitor** provides correct alert information to users, indicating that well developed storms have been detected.

It is used for:

- activating useful alarms of nearby and approaching storms, close to the sites that are to be protected, and which may be directly or indirectly dangerous to persons, equipment and to the environment.
- preventing unwanted alarms that could be activated due to distant storms from the sites to be protected, which do not constitute a real risk or a storm alert.

On average, these alarms provide a lightning strike warning time of 15 to 30 minutes to users.

**StorMonitor** withstands twice the maximum value requested by standard EN 61000-4-4, as regards immunity to electromagnetic radiation. This property allows it not to be disturbed by permanent radio waves of any nature and those which may be very strong, transmitted over television broadcasting sites (e.g. : radar stations, GSM sites, radio relays with military and civil aviation equipment, etc.).

### Installation and operation

**StorMonitor** includes two parts:

#### 1. The antenna

- Integrated in a polyester waterproof and shockproof case with UV protection coat.
- May be installed inside or outside.
- Contains an electromagnetic receiver.
- Connected to the signal and lightning alert processing unit through a shielded cable.



#### 2. The signal processing and lightning alert unit:

- Integrated in a metal case
- Processes the signal provided by the antenna through an analogue three-stage filtering system.
- Extracts and identifies the main electromagnetic components that characterise lightning strikes in order to differentiate useful electromagnetic signals from interference signals.
- Continuously displays the intensity of lightning strikes and stormy activity in real time on a bar graph and on 3 LEDs.
- Activates a sound alarm (buzzer) when a pre-determined alert threshold has been reached and activates the dry contact relay of the output SubD 9 connector.



**StorMonitor's** power supply should be protected against overvoltage. This protection must be ensured by a Type 2 surge protection cabinet (In = 10 kA, Up < 2.5 kV - e.g.: Indelec P8516).



# Storm detector

## Technical characteristics

	Antenna (including 25m cable)	Processing unit	Power supply transformer
<b>Dimensions (HxLxW)</b>	180 x 80 x 40 mm	38 x 214 x 130 mm	
<b>Weight</b>	2.050 kg	1.2 kg	450 g
<b>Fixing</b>	on a pole or support plate	on a horizontal plane	
<b>Protection class (IP)</b>	66	20	
<b>Material</b>	waterproof and shockproof polyester	metal	
<b>Connection</b>	9-pins SubD connector		
<b>Antenna distance</b>	1 to 100 m		
<b>Maximum detection radius</b>		15 km	
<b>Operating temperature</b>		-15°C to +60°C	
<b>Power supply</b>	11 to 13.6 VDC (12 VDC power supply unit included)		
<b>Current Consumption</b>		110 mA	
<b>Adjustments and maintenance</b>		None	

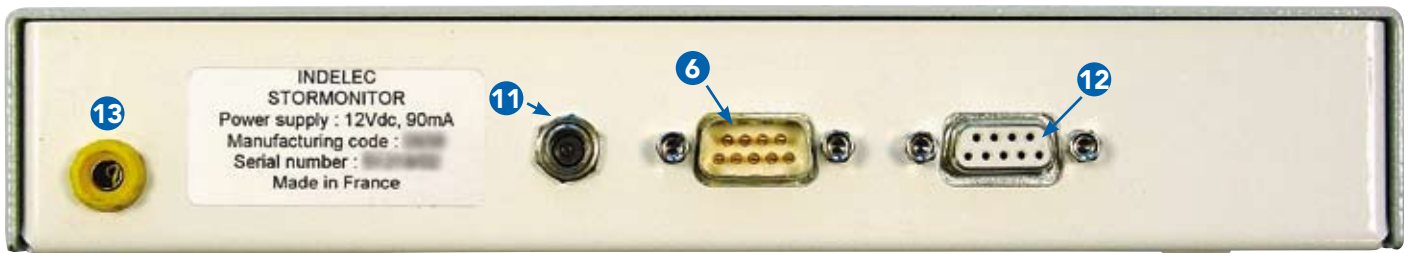
Complies with NF C 15-100, NF C 13-100 and NF C 13-200 standards

## User interface

Front



Back



### Lightning alert:

Setting of the alarm threshold using a 3-position jumper (factory set).

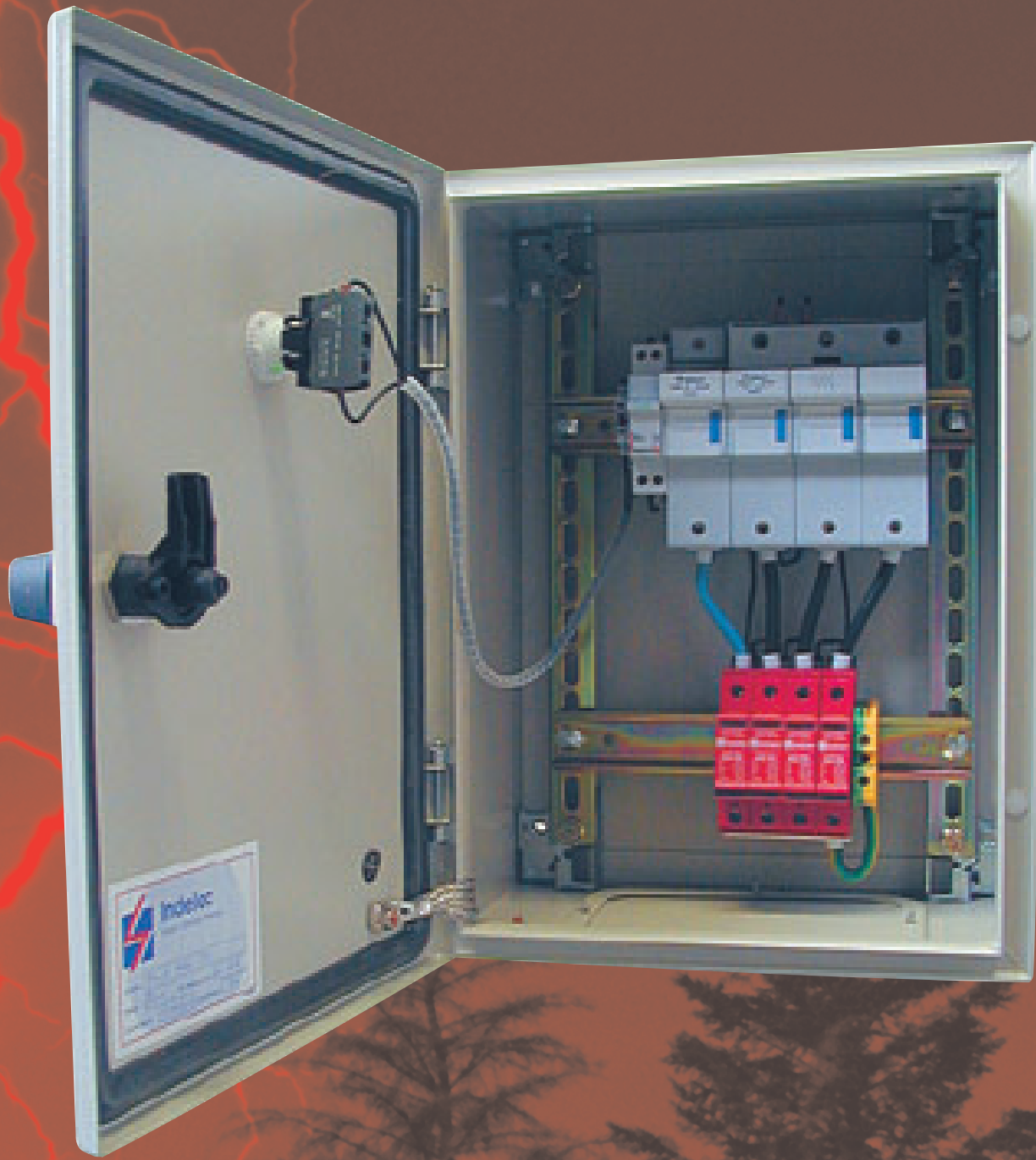
Indicates lightning strikes on the LED **1** and on the lightning RF signature indicator **2**. Indicates storm **3** and dangerous thunderstorm on LEDs **4**.

Sound signal with buzzer **5** and activation of the dry contact relay (NO) of the output SubD 9 connector **6**.

Storm memory:

By LED **7** with memory reset push button **8**.  
By dangerous thunderstorm counter **9**.

- |                                               |                                                |
|-----------------------------------------------|------------------------------------------------|
| <b>1</b> – lightning strike                   | <b>8</b> – reset storm memory and buzzer alert |
| <b>2</b> – lightning RF signature value meter | <b>9</b> – thunderstorm alert counter          |
| <b>3</b> – storm occurring                    | <b>10</b> – Power on indicator                 |
| <b>4</b> – dangerous thunderstorm             | <b>11</b> – power supply connector             |
| <b>5</b> – buzzer (internal)                  | <b>12</b> – antenna connection                 |
| <b>6</b> – SubD 9 output connector            | <b>13</b> – ground connector                   |
| <b>7</b> – storm memory                       |                                                |



**Overvoltage  
protection**

# Surge protection Low voltage power supply

## DGU Type 1 Surge Arrester One pole

**High energy**  
 **$I_{max} = 140 \text{ kA}$**   
 **$I_{imp} = 25 \text{ kA}$**



### Application

The DGU is a modular Type 1 AC Surge Protection Device (SPD) dedicated to be connected at the entrance of the electrical installation. Particularly useful in a high lightning density area, this SPD is designed to provide an efficient protection for sensitive equipment against over voltage due to lightning effects or industrial interferences.

The DGU is a one-pole SPD and can be used in common mode (DGU 400 connected between L/PE and N/PE = CT1 configuration) or common and differential mode (DGU 400 connected between L/N and 1xDE 400 between N/PE = CT2 configuration).

Protection is based on multi-high energy varistors diagram which is able to channel currents of up to 140 kA to earth without incurring damage. According to the latest issue of IEC 62 305 and IEC 60 364 standards, it is compulsory to install those surge arresters on the incoming power supply if the building is fitted with external lightning protection system. Multiple stage protection can be achieved using DGU surge arresters at the network entrance combined with DGT or DGX surge arresters positioned as close as possible to sensitive equipments.

### Installation

#### 1 Positioning:

The DGU surge arrester is used as primary protection for 1 or 3-phase AC networks which are particularly exposed (Type 1 surge arrester). It is therefore installed on the site's main low voltage switchboard.

#### 2 Mounting:

The DGU surge arrester is DIN rail compatible and is featured with a double terminal for line wire to allow improved connection to the AC network.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 35mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 6 mm<sup>2</sup> and a maximum of 35 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGU is provided by an internal thermal security, connected in series with the varistors, which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. The DGU is also equipped with remote signalling contact.

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 125A or in relation with the short-circuit current of the installation.



# Surge protection Low voltage power supply

## Technical data

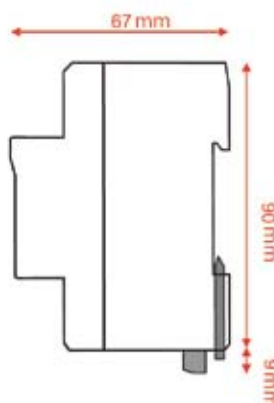
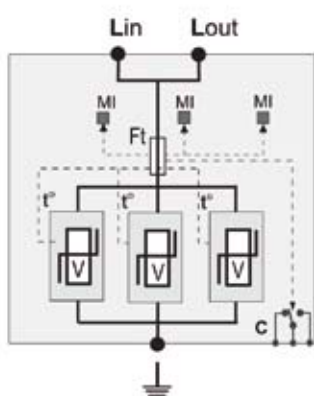
<b>Type</b>	<b>DGU 400</b>	
<b>Reference</b>	<b>P8321</b>	
Nominal Voltage	230/400Vac	
Connection Mode	L, N/PE in CT1 and L/N in CT2 (with DE 400 for N/PE)	
Neutral system	IT, TT TN in CT1 and TT, TS in CT2	
Max. continuous operating voltage	Uc	400 Vac
Temporary Over Voltage withstand	U <sub>T</sub>	400 Vac
Operating current	I <sub>c</sub>	< 2 mA
Leakage current at U <sub>c</sub>		
Follow current	I <sub>f</sub>	none
Lightning impulse current by pole <i>max. withstand @ 10/350 μs</i>	I <sub>imp</sub>	25 kA
Nominal discharge current <i>8/20 μs impulse – 15 times</i>	I <sub>n</sub>	50 kA
Maximal discharge current <i>max. withstand @ 8/20 μs</i>	I <sub>max</sub>	140 kA
Residual voltage (at I <sub>imp</sub> )	U <sub>res</sub>	2 kV
Protection Level (at I <sub>n</sub> )	U <sub>p</sub>	2,5 kA
Admissible short-circuit current	25 000 A	
<b>Associated disconnection devices</b>		
Thermal disconnector	internal	
Fuses	Fuses type gG – 125A max.	
Installation ground fault breaker	Type "S" or delayed	
<b>Mechanical characteristics</b>		
Dimensions	see diagram	
Connection	by screw terminals : 6-35 mm <sup>2</sup> / by bus	
Disconnection indicator	3 mechanical indicators	
Remote signalling of disconnection	output on changeover contact	
Mounting	symmetrical DIN rail 35mm	
Operating temperature	-40°C to +85°C	
Protection class	IP20	
Housing material	Thermoplastic PEI UL94-5VA	
<b>Standards compliance</b>		
IEC 61 643-11	International	Low Voltage SPD – Test Class I and II
EN 61 643-11	Europe	Low Voltage SPD – Test Class I and II
UL1449 ed.2	USA	Low Voltage TVSS

## Diagram and Dimensions

V : High energy varistor  
Ft : Thermal fuse

t° : Thermal disconnection  
C : Remote signalling contact

MI : Disconnection indicator





# Surge protection Low voltage power supply

## DGR Type 1 Surge Arrester One pole

**High energy**  
 **$I_{max} = 140 \text{ kA}$**   
 **$I_{imp} = 15 \text{ kA}$**



### Application

The DGR is a modular Type 1 AC Surge Protection Device (SPD) dedicated to be connected at the entrance of the electrical installation. Particularly useful in a high lightning density area, this SPD is designed to provide an efficient protection for sensitive equipment against over voltage due to lightning effects or industrial interferences.

The DGR is a one-pole SPD and can be used in common mode (DGR 400 connected between L/PE and N/PE = CT1 configuration) or common and differential mode (DGR 230 connected between L/N and 1xDE 400 between N/PE = CT2 configuration).

Protection is based on multi-high energy varistors diagram which is able to channel currents of up to 140 kA to earth without incurring damage. According to the latest issue of IEC 62 305 and IEC 60 364 standards, it is compulsory to install those surge arresters on the incoming power supply if the building is fitted with external lightning protection system. Multiple stage protection can be achieved using DGR surge arresters at the network entrance combined with DGT or DGX surge arresters positioned as close as possible to sensitive equipments.

### Installation

#### 1 Positioning:

The DGR surge arrester is used as primary protection for 1 or 3-phase AC networks which are particularly exposed (Type 1 surge arrester). It is therefore installed on the site's main low voltage switchboard.

#### 2 Mounting:

The DGR surge arrester is DIN rail compatible and is featured with a double terminal for line wire to allow improved connection to the AC network.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 35mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 6 mm<sup>2</sup> and a maximum of 35 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGR is provided by an internal thermal security which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. The DGR is also equipped with remote signalling contact.

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 125A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

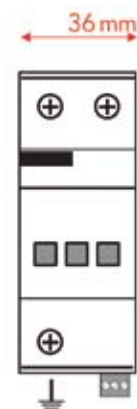
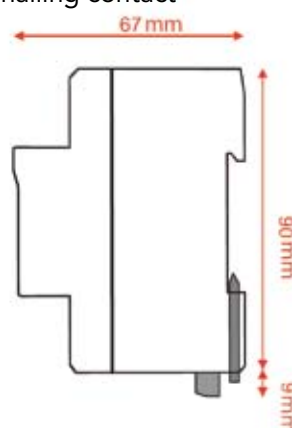
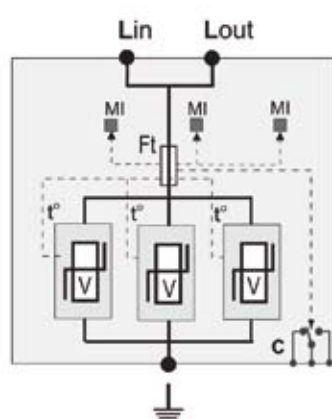
Types	DGR 400	DGR 230
Reference	P8315	P8316
Nominal Voltage	230/400 Vac	230/400 Vac
Connection Mode	L, N/PE in CT1	L/N in CT2 (with DE 400 for N/PE)
Neutral system	IT, TT, TN in CT1	TT, TNS in CT2
Max. continuous operating voltage	Uc 400 Vac	330 Vac
Temporary Over Voltage withstand	U <sub>T</sub> 400 Vac	330 Vac
Operating current Leakage current at U <sub>c</sub>	I <sub>c</sub> < 2mA	< 2 mA
Follow current	I <sub>f</sub> none	none
Lightning impulse current by pole max. withstand @ 10/350µs	I <sub>imp</sub> 15 kA	15 kA
Nominal discharge current 8/20µs impulse – 15 times	I <sub>n</sub> 60 kA	70 kA
Maximal discharge current max. withstand @ 8/20µs	I <sub>max</sub> 140 kA	140 kA
Residual voltage (at I <sub>imp</sub> )	U <sub>res</sub> 1,5kV	0,9 kV
Protection Level (at I <sub>n</sub> )	U <sub>p</sub> 2,5 kA	2 kV
Admissible short-circuit current	25 000 A	25 000 A
<b>Associated disconnection devices</b>		
Thermal disconnector	internal	
Fuses	Fuses type gG – 125A max.	
Installation ground fault breaker	Type "S" or delayed	
<b>Mechanical characteristics</b>		
Dimensions	see diagram	
Connection	by screw terminals : 6-35 mm <sup>2</sup> / by bus	
Disconnection indicator	3 mechanical indicators	
Remote signalling of disconnection	output on changeover contact	
Mounting	symmetrical DIN rail 35mm	
Operating temperature	-40°C to +85°C	
Protection class	IP20	
Housing material	Thermoplastic PEI UL94-5VA	
<b>Standards compliance</b>		
IEC 61 643-11	International	Low Voltage SPD – Test Class I and II
EN 61 643-11	Europe	Low Voltage SPD – Test Class I and II
UL1449 ed.2	USA	Low Voltage TVSS

## Diagram and Dimensions

V : High energy varistor  
Ft : Thermal fuse

t° : Thermal disconnection  
C : Remote signalling contact

MI : Disconnection indicator



# Surge protection Low voltage power supply

## DGM Type 1 Surge Arrester Two poles

**$I_{max} = 100 \text{ kA}$**   
 **$I_{imp} = 12,5 \text{ kA}$**



### Application

The DGM is a compact (two-pole) Type 1 AC Surge Protection Device (SPD) dedicated to be connected at the entrance of the electrical installation. Particularly useful in a high lightning density area, this SPD is designed to provide an efficient protection for sensitive equipment against over voltage due to lightning effects or industrial interferences.

The DGM is a single-phase SPD and can be also used for 3-phase+N AC networks protection (made of 2 DGM).

Protection is based on high energy varistors diagram which is able to channel currents of up to 100 kA to earth without incurring damage. According to the latest issue of IEC 62 305 and IEC 60 364 standards, it is compulsory to install those surge arresters on the incoming power supply if the building is fitted with external lightning protection system. Multiple stage protection can be achieved using DGM surge arresters at the network entrance combined with DGT or DGX surge arresters positioned as close as possible to sensitive equipments.

### Installation

#### 1 Positioning:

The DGM surge arrester is used as primary protection for 1 or 3-phase AC networks which are particularly exposed (Type 1 surge arrester). It is therefore installed on the site's main low voltage switchboard.

#### 2 Mounting:

The DGM surge arrester is DIN rail compatible.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 35mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 6 mm<sup>2</sup> and a maximum of 35 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGM is provided by an internal thermal security which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. The DGM is also equipped with remote signalling contact.

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 125A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

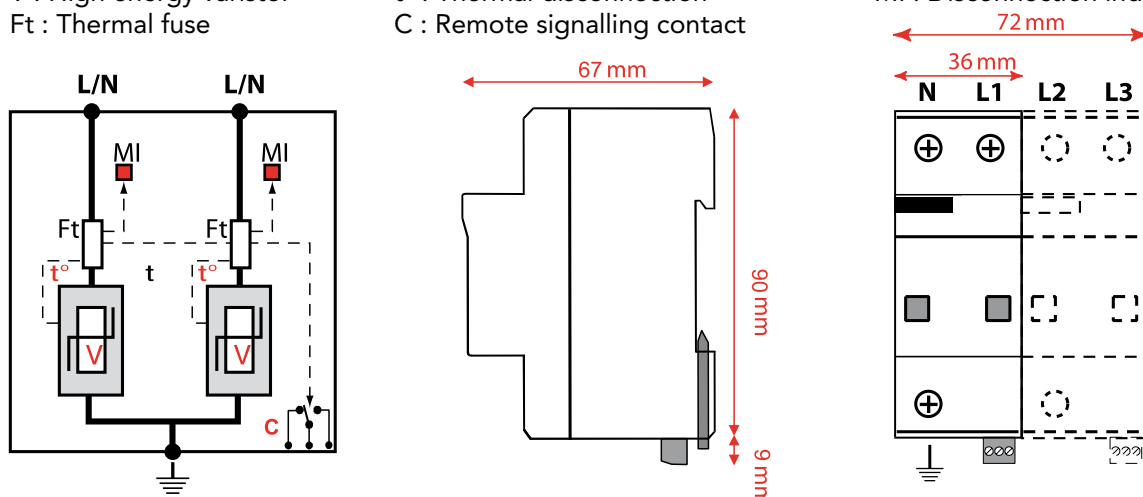
<b>Type</b>	<b>DGM 400</b>	
<b>Reference</b>	<b>P8320E</b>	
Nominal Voltage	230/400 Vac	
Connection Mode	L, N/PE in CT1	
Neutral system	IT, TT TN in CT1	
Max. continuous operating voltage	Uc	400 Vac
Temporary Over Voltage withstand	U <sub>T</sub>	400 Vac
Operating current	Ic	< 2 mA
Leakage current at U <sub>c</sub>		
Follow current	I <sub>f</sub>	none
Lightning impulse current by pole <i>max. withstand @ 10/350μs</i>	I <sub>imp</sub>	12,5 kA
Nominal discharge current <i>8/20μs impulse – 15 times</i>	I <sub>n</sub>	40 kA
Maximal discharge current <i>max. withstand @ 8/20μs</i>	I <sub>max</sub>	100 kA
Residual voltage (at I <sub>imp</sub> )	U <sub>res</sub>	1,5 kV
Protection Level (at I <sub>n</sub> )	U <sub>p</sub>	2 kA
Admissible short-circuit current	25 000 A	
<b>Associated disconnection devices</b>		
Thermal disconnector	internal	
Fuses	Fuses type gG – 125A max.	
Installation ground fault breaker	Type "S" or delayed	
<b>Mechanical characteristics</b>		
Dimensions	see diagram	
Connection	by screw terminals : 6-35 mm <sup>2</sup> / by bus	
Disconnection indicator	1 mechanical indicator by pole	
Remote signalling of disconnection	output on changeover contact	
Mounting	symmetrical DIN rail 35mm	
Operating temperature	-40°C to +85°C	
Protection class	IP20	
Housing material	Thermoplastic PEI UL94-5VA	
<b>Standards compliance</b>		
IEC 61 643-11	International	Low Voltage SPD – Test Class I and II
EN 61 643-11	Europe	Low Voltage SPD – Test Class I and II
UL1449 ed.2	USA	Low Voltage TVSS

## Diagram and Dimensions

V : High energy varistor  
Ft : Thermal fuse

t° : Thermal disconnection  
C : Remote signalling contact

MI : Disconnection indicator





# Surge protection Low voltage power supply

## DGV Type «1+2» Surge Arrester One pole

**$I_{max} = 40 \text{ kA}$**   
 **$I_{imp} = 15 \text{ kA}$**



### Application

The DGV is a modular Type 1 AC Surge Protection Device (SPD) dedicated to protect sensitive equipment against over voltage which may occur in the AC network during a storm (lightning) or during switching electric power sources (industrial interferences).

The DGV is a one-pole SPD and can be used in common mode (DGV connected between L/PE and N/PE = CT1 configuration) or common and differential mode (DGV connected between L/N and 1xDE 400 between N/PE = CT2 configuration).

Protection is based on specific heavy duty Gas tube and high energy varistor block which is able to channel currents of up to 40 kA to earth without incurring damage. According to the latest issue of IEC 62 305 and IEC 60 364 standards, it is compulsory to install those surge arresters on the incoming power supply if the building is fitted with external lightning protection system. Multiple stage protection can be achieved using DGV surge arresters at the network entrance combined with DGT or DGX surge arresters positioned as close as possible to sensitive equipments.

### Installation

#### 1 Positioning:

The DGV surge arrester is used as primary protection for 1 or 3-phase AC networks which are particularly exposed (Type 1 surge arrester). It is therefore installed on the site's main low voltage switchboard.

#### 2 Mounting:

The DGV surge arrester is DIN rail compatible and is featured with a double terminal for line wire to allow improved connection to the AC network.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 35mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 6 mm<sup>2</sup> and a maximum of 35 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGV is provided by an internal thermal security which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. The DGV is also equipped with remote signalling contact.

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 100A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

Types		DGV 400	DGV 230	DGV 120
Reference		P8312E	P8313E	P8314E
Nominal Voltage		230/400 Vac	230/400 Vac	120/208 V
Connection Mode		L, N/PE in CT1	L/N in CT2 (with DE 400 for N/PE)	TT, TN in CT1
Neutral system		TT, TN in CT1 TT, TNS in CT2		TT, TN in CT1
Max. continuous operating voltage	Uc	255 Vac	255 Vac	150 Vac
Temporary Over Voltage withstand	Ut	400 Vac	300 Vac	150 Vac
Operating current	Ic	none	none	none
Leakage current at Uc		none	none	none
Follow current	If	none	none	none
Lightning impulse current by pole max. withstand @ 10/350µs	Iimp	15 kA	15 kA	15 kA
Nominal discharge current 8/20µs impulse – 15 times	In	20 kA	20 kA	20 kA
Maximal discharge current max. withstand @ 8/20µs	Imax	40 kA	40 kA	40 kA
Residual voltage (at Iimp)	Ures	0,8 kV	0,6 kV	0,4 kV
Protection Level (at In)	Up	1,5 kA	1,5 kV	1,5
Admissible short-circuit current		25 000 A	25 000 A	25 000 A

### Associated disconnection devices

Thermal disconnecter	internal
Fuses	Fuses type gG – 100A max.
Installation ground fault breaker	Type "S" or delayed

### Mechanical characteristics

Dimensions	see diagram
Connection	by screw terminals : 6-35 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signalling of disconnection	output on changeover contact
Mounting	symmetrical DIN rail 35mm
Operating temperature	-40°C to +85°C
Protection class	IP20
Housing material	Thermoplastic PEI UL94-5VA

### Standards compliance

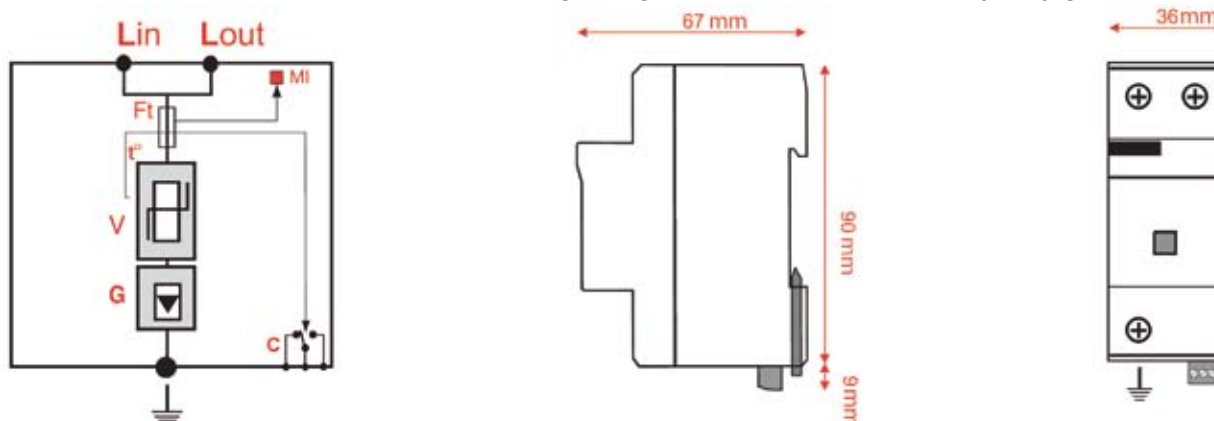
IEC 61 643-11	International	Low Voltage SPD – Test Class I and II
EN 61 643-11	Europe	Low Voltage SPD – Test Class I and II
UL1449 ed.2	USA	Low Voltage TVSS

## Diagram and Dimensions

V : High energy varistor  
Ft : Thermal fuse

t° : Thermal disconnection  
C : Remote signalling contact

MI : Disconnection indicator  
G : Heavy duty gas Tube



# Surge protection Low voltage power supply

## DE Type 1 N/PE Surge Arrester I<sub>imp</sub> = 50 kA

### CT2 configuration Common and differential



### Application

The DE is a Type 1 AC Surge Protection Device (SPD) dedicated to be connected at the entrance of the electrical installation. Particularly useful in a high lightning density area, this SPD is designed to provide protection for sensitive equipment against over voltage due to lightning effects or industrial interferences.

In association with DGU, DGR or DGV surge arresters (see diagram), the DE surge arrester provides common and differential surge protection for AC networks, following the CT2 configuration in IEC 60 364-5-534 standard.

Protection is based on specific high energy gas tube which provides much lower residual voltages and very high discharge current capability on a 10/350  $\mu$ s or 8/20  $\mu$ s impulses.

### Installation

#### 1 Positioning:

The DE surge arrester is used as primary protection for 1 or 3-phase AC networks which are particularly exposed (Type 1 surge arrester). It is therefore installed on the site's main low voltage switchboard. It is exclusively dedicated to be connected between the Neutral (N) and Protective Earth (PE) wires, in association with DGU, DGR or DGV connected between phases and Neutral.

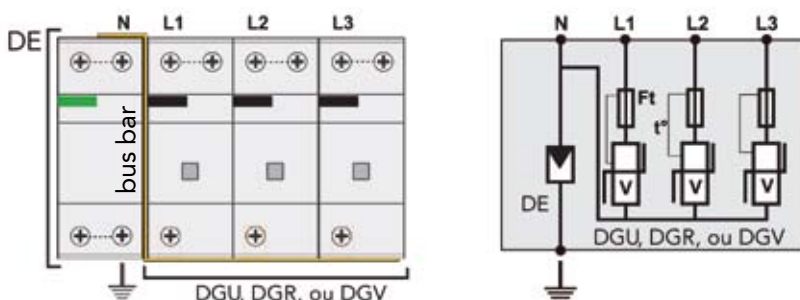
#### 2 Mounting:

The DE surge arrester is DIN rail compatible.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 35mm<sup>2</sup>. The cross-sectional earthing cable from DE SPD must equal half that of the main protection cable of the installation with a minimum of 6 mm<sup>2</sup> and a maximum of 35 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

DE association with DGU, DGR or DGV can be easily done by bus bar T1 ref P8480.



# Surge protection Low voltage power supply

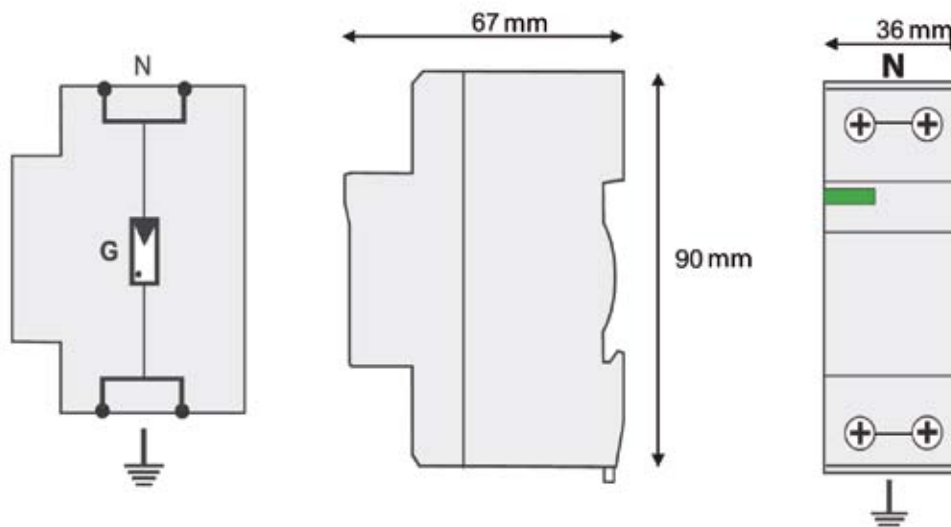
## Technical data

Type		DE 400
Reference		P8318E
Nominal Voltage		230/400 Vac
Connection Mode		N/PE in CT2 configuration
Neutral system		TT, TNS in CT2 configuration
Max. continuous operating voltage	$U_c$	255 Vac
Temporary Over Voltage withstand	$U_T$	400 Vac
Operating current	$I_c$	none
Leakage current at $U_c$		
Follow current	$I_f$	yes
Lightning impulse current by pole max. withstand @ 10/350 $\mu$ s	$I_{imp}$	50 kA
Nominal discharge current 8/20 $\mu$ s impulse – 15 times	$I_n$	50 kA
Maximal discharge current max. withstand @ 8/20 $\mu$ s	$I_{max}$	150 kA
Protection Level (at $I_n$ )	$U_p$	1.5 kA
Admissible short-circuit current		25 000 A
Mechanical characteristics		
Dimensions		see diagram
Connection		by screw terminals: 6-35 mm <sup>2</sup> / by bus
Mounting		symmetrical DIN rail 35mm
Operating temperature		-40°C to +85°C
Protection class		IP20
Housing material		Thermoplastic PEI UL94-5VA
Standards compliance		
IEC 61 643-11	International	Low Voltage SPD – Test Class I and II
EN 61 643-11	Europe	Low Voltage SPD – Test Class I and II
UL1449 ed.2	USA	Low Voltage TVSS

Reference P8480 : bus bar T1

## Diagram and Dimensions

G : High-energy spark gap





# Surge protection Low voltage power supply

## DGT Type 2 Surge Arrester One pole **$I_{max} = 40 \text{ kA}$**



### Application

The DGT is a modular Type 2 AC Surge Protection Device (SPD) dedicated to protect sensitive equipment against over voltage which may occur in the AC network during a storm (lightning) or during switching electric power sources (industrial interferences).

The DGT is a one-pole SPD and can be used in common mode (DGT connected between L/PE and N/PE = CT1 configuration) or common and differential mode (DGT connected between L/N and 1xDGE between N/PE = CT2 configuration).

Protection is based on high energy varistor which is able to channel currents of up to 40 kA to earth without incurring damage. Multiple stage protection can be achieved using DGT surge arresters combined with Type 1 surge arresters at the AC network entrance and/or Type 3 surge arresters (DGX) positioned downcircuit.

The DGT is built with a plug-in module and a fixed base, which allows an easy and fast maintenance.

### Installation

#### 1 Positioning:

The DGT surge arrester can be used as primary or secondary protection for 1 or 3-phase AC networks. It is therefore installed on the site's main low voltage switchboard or in a distribution panel as close as possible to the equipment to be protected.

#### 2 Mounting:

The DGT surge arrester is DIN rail compatible.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 25mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 4 mm<sup>2</sup> and a maximum of 25 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGT is provided by an internal thermal security, connected in series with the varistor, which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. Version with remote signalling contact for disconnection indication is also available (DGT...S).

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 50A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

Type		DGT 400	DGT 230	DGT 120
Reference		P8416E	P8410E	P8411E
Nominal Voltage		230/400 Vac	230/400 Vac	120/208 V
Connection Mode		L, N/PE in CT1	L/N in CT2 +DGE400 for N/PE	L, N/PE in CT1
Neutral system		IT, TT, TN in CT1	TT, TNS in CT2	IT, TT, TN in CT1
Max. continuous operating voltage	Uc	400 Vac	255 Vac	150 Vac
Temporary Over Voltage withstand	Ur	400 Vac	255 Vac	150 Vac
Operating current Leakage current at Uc	Ic	< 1 mA	< 1 mA	< 1 mA
Follow current	If	none	none	none
Nominal discharge current 8/20µs impulse – 15 times	In	20 kA	20 kA	20 kA
Maximal discharge current max. withstand @ 8/20µs	I <sub>max</sub>	40 kA	40 kA	40 kA
Protection Level (at In)	Up	1,8 kV	1,25 kV	0,9 kV
Residual voltage (at 10 kA)		1,5 kV	1,1 kV	0,7 kV
Residual voltage (at 5 kA)		1,3 kV	0,9 kV	0,6 kV
Admissible short-circuit current		25 000 A	25 000 A	25 000 A

### Associated disconnection devices

Thermal disconnector	internal
Fuses	Fuses type gG – 50 A max.
Installation ground fault breaker	Type "S" or delayed

### Mechanical characteristics

Dimensions	see diagram
Connection	by screw terminals : 4-25 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signalling of disconnection	Option output on changeover contact
Mounting	symmetrical DIN rail 35mm
Operating temperature	-40°C to +85°C
Protection class	IP20
Housing material	Thermoplastic UL94-VO

### Standards compliance

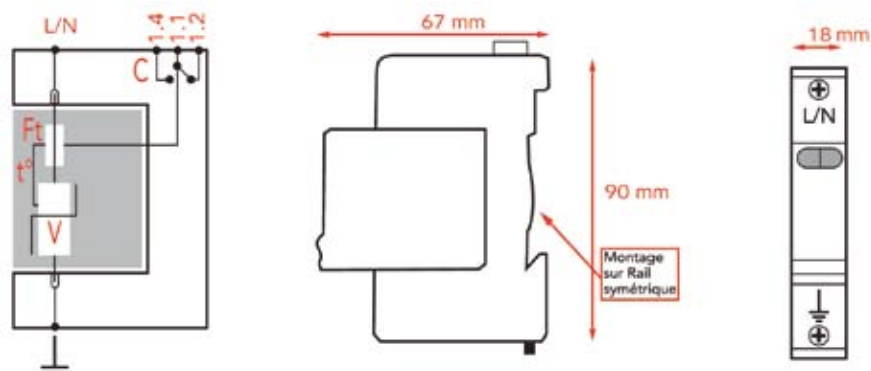
IEC 61 643-11	International	Low Voltage SPD – Class II Test
EN 61 643-11	Europe	Low Voltage SPD – Class II Test
UL1449 ed.2	USA	Low Voltage TVSS

### With Remote signalling option

	DGT 400 S	DGT 230 S	DGT 120 S
SPD reference	P8433E	P8434E	P8435E
Plug-in module reference	P8470E	P8471E	P8472E

## Diagram and Dimensions

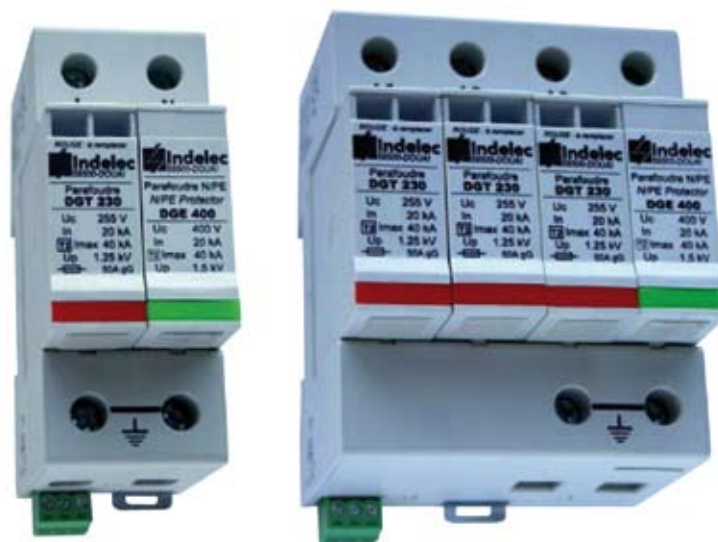
- V: High energy varistor  
 t°: Thermal disconnection  
 Ft: Thermal fuse  
 C: Remote signalling contact  
 (option)



# Surge protection Low voltage power supply

## DGT 230S C2 Type 2 Surge Arrester Multipolar

**Single Phase  
and 3-Phase+N  
I<sub>max</sub> = 40 kA**



### Application

The DGT 230S C2 is a monobloc Type 2 AC Surge Protection Device (SPD) dedicated to protect sensitive equipment against over voltage which may occur in the AC network during a storm (lightning) or during switching electric power sources (industrial interferences).

Protection is based on high energy varistor associated with specific gas tube providing common and differential protection (CT2 configuration).

Multiple stage protection can be achieved using DGT 230S C2 combined with Type 1 surge arresters (DGU, DGR...) at the AC network entrance and/or Type 3 surge arresters (DGX) positioned downcircuit.

The DGT 230S C2 is built with a plug-in modules and a fixed base, which allows an easy and fast maintenance.

### Installation

#### 1 Positioning:

The DGT 230S C2 can be used as primary or secondary protection for single phase or 3-phase AC networks. It is therefore installed on the site's main low voltage switchboard or in a distribution panel as close as possible to the equipment to be protected.

#### 2 Mounting:

The DGT 230S C2 is DIN rail compatible.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 25mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 4 mm<sup>2</sup> and a maximum of 25 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGT 230S C2 is provided by an internal thermal security, connected in series with each varistor, which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. The DGT 230S C2 is equipped with remote signalling contact.

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 50A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

Type	DGT 230MONO C2 V9		DGT 230TETRA C2	
	Single phase		3-phase+N	
Reference	P84402E		P84401E	
Nominal Voltage	230/400 Vac			
Connection Mode	CT2 configuration			
Neutral system	TT, TNS			
Max. continuous operating voltage	Uc	255 Vac		
Temporary Over Voltage withstand	U <sub>T</sub>	400 Vac L/PE, 255 Vac L/N		
Operating current	Ic	none N/PE, <1 mA L/N		
Leakage current at U <sub>c</sub>				
Follow current	I <sub>f</sub>	> 100 A N/PE, none L/N		
Nominal discharge current 8/20 $\mu$ s impulse – 15 times	I <sub>n</sub>	20 kA by pole		
Maximal discharge current max. withstand @ 8/20 $\mu$ s	I <sub>max</sub>	40 kA by pole		
Protection Level (at I <sub>n</sub> )	U <sub>p</sub>	1,5 kV L/PE, 1,25 kV L/N		
Admissible short-circuit current		25 000 A		
<b>Associated disconnection devices</b>				
Thermal disconnector		internal		
Fuses		Fuses type gG – 50A max.		
Installation ground fault breaker		Type "S" or delayed		
<b>Mechanical characteristics</b>				
Dimensions		see diagram		
Connection		by screw terminals : 4-25 mm <sup>2</sup> / by bus		
Disconnection indicator		1 mechanical indicator by pole		
Remote signalling of disconnection		Output on changeover contact		
Mounting		symmetrical DIN rail 35mm		
Operating temperature		-40°C to +85°C		
Protection class		IP20		
Housing material		Thermoplastic UL94-VO		
<b>Standards compliance</b>				
IEC 61 643-11	International	Low Voltage SPD – Class II Test		
EN 61 643-11	Europe	Low Voltage SPD – Class II Test		
UL1449 ed.2	USA	Low Voltage TVSS		

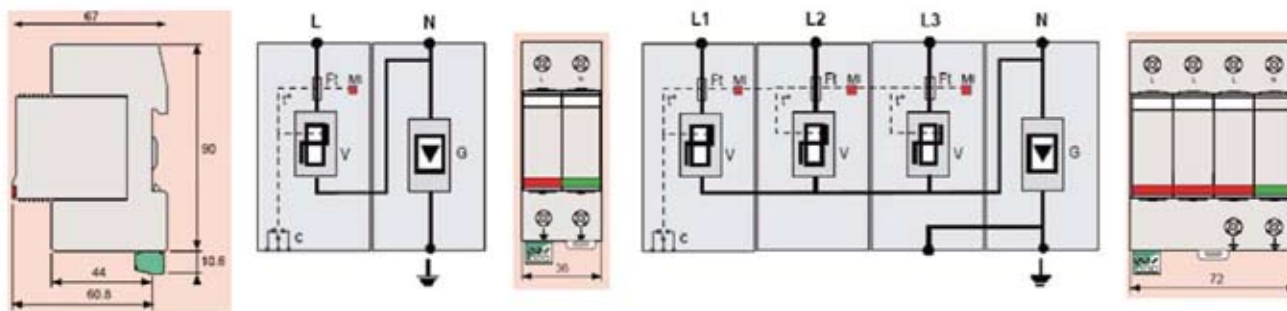
## Diagram and Dimensions

V : High energy varistor  
G : Specific gas tube

Ft : Thermal fuse

t° : Thermal disconnection

C : Remote signalling contact





# Surge protection Low voltage power supply

## DGX Type 2 or Type 3 Surge Arrester One pole

**$I_{max} = 10 \text{ kA}$**



### Application

The DGX is a modular Type 2 (or type 3) AC Surge Protection Device (SPD) dedicated to protect sensitive equipment against over voltage which may occur in the AC network during a storm (lightning) or during switching electric power sources (industrial interferences).

The DGX is a one-pole SPD and can be used in common mode (DGX connected between L/PE and N/PE = CT1 configuration) or common and differential mode (DGX connected between L/N and 1xDGE between N/PE = CT2 configuration).

Protection is based on high energy varistor which is able to channel currents of up to 10 kA to earth without incurring damage. DGX surge arresters are mainly used combined with Type 1 surge arresters at the AC network entrance and possibly Type 2 surge arresters (DGT) positioned upcircuit distribution panel.

The DGX is built with a plug-in module and a fixed base, which allows an easy and fast maintenance.

### Installation

#### 1 Positioning:

The DGX surge arrester can be used as secondary type 2 or type 3 protection for 1 or 3-phase AC networks. It is therefore installed as close as possible to the equipment to be protected.

#### 2 Mounting:

The DGX surge arrester is DIN rail compatible.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 25mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 4 mm<sup>2</sup> and a maximum of 25 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, malfunction indicator

Service continuity of the DGX is provided by an internal thermal security, connected in series with the varistor, which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. Version with remote signalling contact for disconnection indication is also available ( DGX...S).

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 20 A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

Type		DGX 400	DGX 230	DGX 120
Reference		P8406E	P8400E	P8401E
Nominal Voltage		230/400 Vac	230/400 Vac	120/208 V
Connection Mode		L, N/PE in CT1	L/N in CT2 +DGE400 for N/PE	L, N/PE in CT1
Neutral system		IT, TT, TN in CT1 configuration TT, TNS in CT2 configuration		IT, TT, TN in CT1 configuration
Max. continuous operating voltage	$U_c$	400 Vac	255 Vac	150 Vac
Temporary Over Voltage withstand	$U_T$	400 Vac	255 Vac	150 Vac
Operating current Leakage current at $U_c$	$I_c$	< 1 mA	< 1 mA	< 1 mA
Follow current	$I_f$	none	none	none
Nominal discharge current 8/20 $\mu$ s impulse – 15 times	$I_n$	5 kA	5 kA	5 kA
Maximal discharge current max. withstand @ 8/20 $\mu$ s	$I_{max}$	10 kA	10 kA	10 kA
Protection Level (at $I_n$ )	$U_p$	1,3 kA	0,9 kV	0,6 kV
Combination waveform test Class III test	$U_{oc}$	10 kV	10 kV	10 kV
Admissible short-circuit current		25 000 A	25 000 A	25 000 A

### Associated disconnection devices

Thermal disconnector		internal		
Fuses		Fuses type gG – 20 A max.		
Installation ground fault breaker		Type "S" or delayed		

### Mechanical characteristics

Dimensions		see diagram		
Connection		by screw terminals : 4-25 mm <sup>2</sup> / by bus		
Disconnection indicator		1 mechanical indicator		
Remote signalling of disconnection		Option output on changeover contact		
Mounting		symmetrical DIN rail 35mm		
Operating temperature		-40°C to +85°C		
Protection class		IP20		
Housing material		Thermoplastic UL94-VO		

### Standards compliance

IEC 61 643-11	International	Low Voltage SPD – Class II and III Test		
EN 61 643-11	Europe	Low Voltage SPD – Class II and III Test		
UL1449 ed.2	USA	Low Voltage TVSS		

### With Remote signalling option

	DGX 400 S	DGX 230 S	DGX 120 S
SPD reference	P8436E	P8437E	P8438E
Plug-in module reference	P8450E	P8451E	P8452E

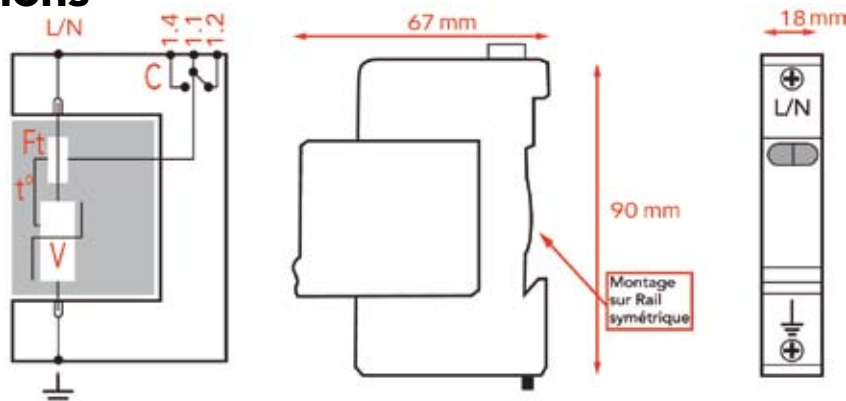
## Diagram and Dimensions

V: Varistor

t°: Thermal disconnection

Ft: Thermal fuse

C: Remote signalling contact  
(option)



# Surge protection Low voltage power supply

## DGX 230S C2 Type 2 or Type 3 Surge Arrester Multipolar

**Single Phase  
and 3-Phase+N  
I<sub>max</sub> = 10 kA**



### Application

The DGX 230S C2 is a monobloc Type 2 or Type 3 AC Surge Protection Device (SPD) dedicated to protect sensitive equipment against over voltage which may occur in the AC network during a storm (lightning) or during switching electric power sources (industrial interferences).

Protection is based on high energy varistor associated with gas tube providing common and differential protection (CT2 configuration).

Multiple stage protection can be achieved using DGX 230S C2 combined with Type 1 surge arresters (DGU, DGR...) at the AC network entrance and possibly Type 2 surge arresters (DGT) positioned upcircuit distribution panel.

The DGX 230S C2 is built with a plug-in modules and a fixed base, which allows an easy and fast maintenance.

### Installation

#### 1 Positioning:

The DGX 230S C2 can be used as secondary type 2 or type 3 protection for 1 or 3-phase AC networks. It is therefore installed as close as possible to the equipment to be protected.

#### 2 Mounting:

The DGX 230S C2 is DIN rail compatible.

#### 3 Wiring:

Connection cables between SPD and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 25mm<sup>2</sup>. The cross-sectional earthing cable must equal half that of the main protection cable of the installation with a minimum of 4 mm<sup>2</sup> and a maximum of 25 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

### Service continuity, failure indicator

Service continuity of the DGX 230S C2 is provided by an internal thermal security, connected in series with each varistor, which disconnects the SPD from the AC network in case of failure. In such case, the user will be warned by an indicator in front of the SPD. The DGX 230S C2 is equipped with remote signalling contact.

To comply with the standards, an external electrical disconnection is necessary. The user must install on each SPD branch, a protection against short-circuit current (fuses or breaker). The rating of this fuse must be 20A or in relation with the short-circuit current of the installation.

# Surge protection Low voltage power supply

## Technical data

Type	DGX 230MONO C2 V9		DGX 230TETRA C2
	Single phase		3-phase+N
Reference	P84404E		P84403E
Nominal Voltage	230/400 Vac		
Connection Mode	CT2 configuration		
Neutral system	TT, TNS		
Max. continuous operating voltage	Uc	255 Vac	
Temporary Over Voltage withstand	U <sub>T</sub>	400 Vac L/PE, 255 Vac L/N	
Operating current	Ic	none N/PE, <1 mA L/N	
Leakage current at U <sub>c</sub>			
Follow current	I <sub>f</sub>	> 100 A N/PE, none L/N	
Nominal discharge current	I <sub>n</sub>	5 kA by pole	
8/20μs impulse – 15 times			
Maximal discharge current	I <sub>max</sub>	20 kA by pole	
max. withstand @ 8/20μs			
Protection Level (at I <sub>n</sub> )	U <sub>p</sub>	1,5 kV L/PE, 0,9 kV L/N	
Admissible short-circuit current		25 000 A	
<b>Associated disconnection devices</b>			
Thermal disconnector		internal	
Fuses		Fuses type gG – 20A max.	
Installation ground fault breaker		Type "S" or delayed	
<b>Mechanical characteristics</b>			
Dimensions		see diagram	
Connection		by screw terminals : 4-25 mm <sup>2</sup> / by bus	
Disconnection indicator		1 mechanical indicator by pole	
Remote signalling of disconnection		Output on changeover contact	
Mounting		symmetrical DIN rail 35mm	
Operating temperature		-40°C to +85°C	
Protection class		IP20	
Housing material		Thermoplastic UL94-VO	
<b>Standards compliance</b>			
IEC 61 643-11	International	Low Voltage SPD – Class II and III Test	
EN 61 643-11	Europe	Low Voltage SPD – Class II and III Test	
UL1449 ed.2	USA	Low Voltage TVSS	

## Diagram and Dimensions

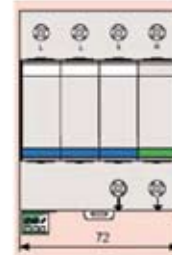
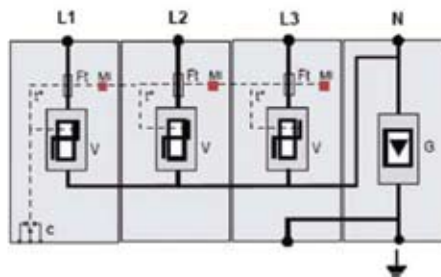
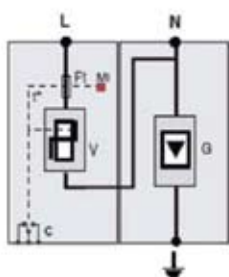
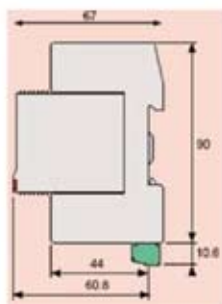
V : Varistor

Ft : Thermal fuse

t° : Thermal disconnection

G : Specific gas tube

C : Remote signalling contact





# Surge protection Low voltage power supply

## DGE Type 2 N/PE Surge Arrester Imax = 40 kA CT2 configuration Common and differential



### Application

The DGE is a Type 2 AC Surge Protection Device (SPD) dedicated to protect sensitive equipment against over voltage which may occur in the AC network during a storm (lightning) or during switching electric power sources (industrial interferences)..

In association with DGT or DGX surge arresters (see diagram), the DGE surge arrester provides common and differential surge protection for AC networks, following the CT2 configuration in IEC 60 364-5-534 standard.

Protection is based on specific gas tube which provides much lower residual voltages and high discharge current capability on 8/20 $\mu$ s impulses.

The DGE is built with a plug-in module and a fixed base, which allows an easy and fast maintenance.

### Installation

#### 1 Positioning:

The DGE surge arrester can be used as secondary type 2 protection for 1 or 3-phase AC networks. It is therefore installed as close as possible to the equipment to be protected. It is exclusively dedicated to be connected between the Neutral (N) and Protective Earth (PE) wires, in association with DGT or DGX connected between phases and Neutral.

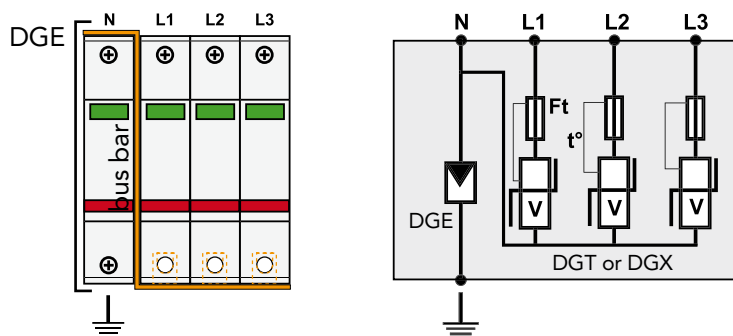
#### 2 Mounting:

The DGE surge arrester is DIN rail compatible.

#### 3 Wiring:

Connection cables between DGT or DGX and the lines to be protected must be identical in cross-sectional area to the lines with a maximum of 25mm<sup>2</sup>. The cross-sectional earthing cable from DGE must equal half that of the main protection cable of the installation with a minimum of 4 mm<sup>2</sup> and a maximum of 25 mm<sup>2</sup>. If external lightning protection system is fitted, the minimum cross-sectional area will be 10 mm<sup>2</sup>.

DGE association with DGT or DGX can be easily done by bus bar T2 ref P8481.



# Surge protection Low voltage power supply

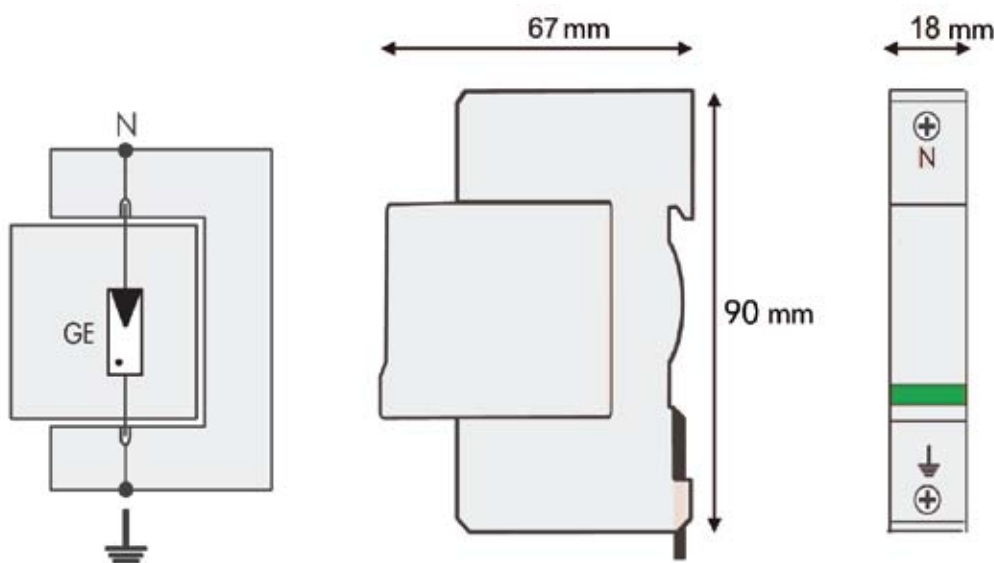
## Technical data

Type		DGE 400
Reference		P8319E
Nominal Voltage		230/400 Vac or 120/208 V
Connection Mode		N/PE in CT2 configuration
Neutral system		TT, TNS in CT2 configuration
Max. continuous operating voltage	$U_c$	255 Vac
Temporary Over Voltage withstand	$U_T$	400 Vac
Operating current	$I_c$	none
Leakage current at $U_c$		
Follow current interruption	$I_{fi}$	> 100 kA
Nominal discharge current <i>8/20<math>\mu</math>s impulse – 15 times</i>	$I_n$	20 kA
Maximal discharge current <i>max. withstand @ 8/20<math>\mu</math>s</i>	$I_{max}$	40 kA
Protection Level (at $I_n$ )	$U_p$	1.5 kA
Admissible short-circuit current		25 000 A
Mechanical characteristics		
Configuration		Pluggable
Dimensions		see diagram
Connection		by screw terminals : 4-25 mm <sup>2</sup> / by bus
Mounting		symmetrical DIN rail 35mm
Operating temperature		-40°C to +85°C
Protection class		IP20
Housing material		Thermoplastic PEI UL94-5VA
Standards compliance		
IEC 61 643-11	International	Low Voltage SPD – Class II Test
EN 61 643-11	Europe	Low Voltage SPD – Class II Test
UL1449 ed.2	USA	Low Voltage TVSS

Reference P8481 : bus barre T2

## Diagram and Dimensions

GE : Specific gas tube



# Surge protection Low voltage power supply

## Coordination inductors

### SELF 35A & SELF 63A



### Application

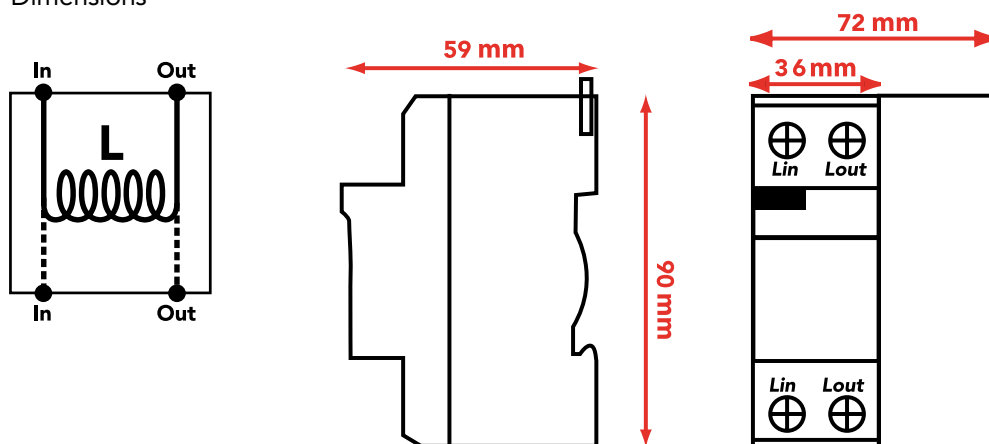
The coordination inductors are specially designed to control the implementation of the primary and secondary Indelec surge protection devices. They are necessary where the minimum disconnection length of cable cannot be accomplished using the natural inductance of the active conductors.

These inductors are connected in series on the line to be protected (1 self per active cable) and depend on the maximum line current.

Two current values are available : 35 A (Ref: P8476) et 63 A (Ref: P8477)

### Coordination inductor diagram

Dimensions



# Surge protection Low voltage power supply

## Coordination inductors

### Technical data

Connection:

- By screw terminals
- Self 35A: 4-35 mm<sup>2</sup>
- Self 63A: 4-50 mm<sup>2</sup>
- By busbar

Mounting:

Symmetrical rail 35 mm

Operating temperature range:

-40°C to +85°C

Housing material:

Grey polycarbonate UL94-VO







■ = Recommended coordination

■ = Coordination not required

■ = Impossible

Type	SELF 35 A	SELF 63A
Ref.	P8476	P8477
Type of Network	Single/Three-phase	Single/Three-phase
Max. network voltage	500 V	500 V
Connection mode	Series (1 inductor for each active conductor)	
Max. line current	35 A	63 A
Line inductance	15 µH	15 µH

### Recommended coordinations diagram

		Secondary SPD						
		DGU	DGR	DGM	DGV	DGT	DGX	
Primary SPD	DGU		■	■	■	■	■ L > 10 m or 1 coordination inductor	■ L > 30 m or 2 coordination inductors
	DGR		■	■	■	■	■ L > 10 m or 1 coordination inductor	■ L > 30 m or 2 coordination inductors
	DGM		■	■	■	■	■ L > 10 m or 1 coordination inductor	■ L > 30 m or 2 coordination inductors
	DGV		■	■	■	■	■ L > 10 m or 1 coordination inductor	■ L > 30 m or 2 coordination inductors
	DGT		■	■	■	■	■	■ L > 10 m or 1 coordination inductor
	DGX		■	■	■	■	■	■

Inductor: coordination inductor to be connected in serial, between primary SPD level and secondary SPD level installed in the same cabinet.

L: minimum length of wires between primary/secondary SPD



## Surge protection cabinets



### Single stage IP66 metallic cabinets

These cabinets are made up of a single stage protection using Indelec over-voltage arrestors, connected to the protected equipment via fuses, in pursuance of French National Standard NF EN 61 643-11. The pre-wired sub-assembly is set in a lockable IP66 metal cabinet.

An LED display on the cabinet door shows the voltage and operational status of the over-voltage arrester.

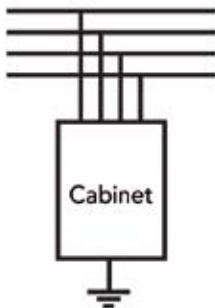
# Surge protection Low voltage power supply

## Common protection mode (C1)

Type	CDGX 400 1 ph + N	CDGX 400 3 ph + N	CDGT 400 1 ph + N	CDGT 400 3 ph + N	CDGV 400 1 ph + N	CDGV 400 3 ph + N
References	P8504	P8505	P8502	P8503	P8522	P8521
Network voltage	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V
Number of protected poles	2	4	2	4	2	4
Fuses	20 A	20 A	50 A	50 A	100 A	100 A
Cabinet dimensions (H x L x W in mm)	400 x 300 x 210 mm					
Max. discharge current (8/20 $\mu$ s) I <sub>max</sub>	10 kA	10 kA	40 kA	40 kA	40 kA	40 kA
Protection level Up	1,3 kV	1,3 kV	1,8 kV	1,8 kV	1,5 kV	1,5 kV
Wiring configuration mode	C1	C1	C1	C1	C1	C1

## Common and Differential protection mode (C1+C2)

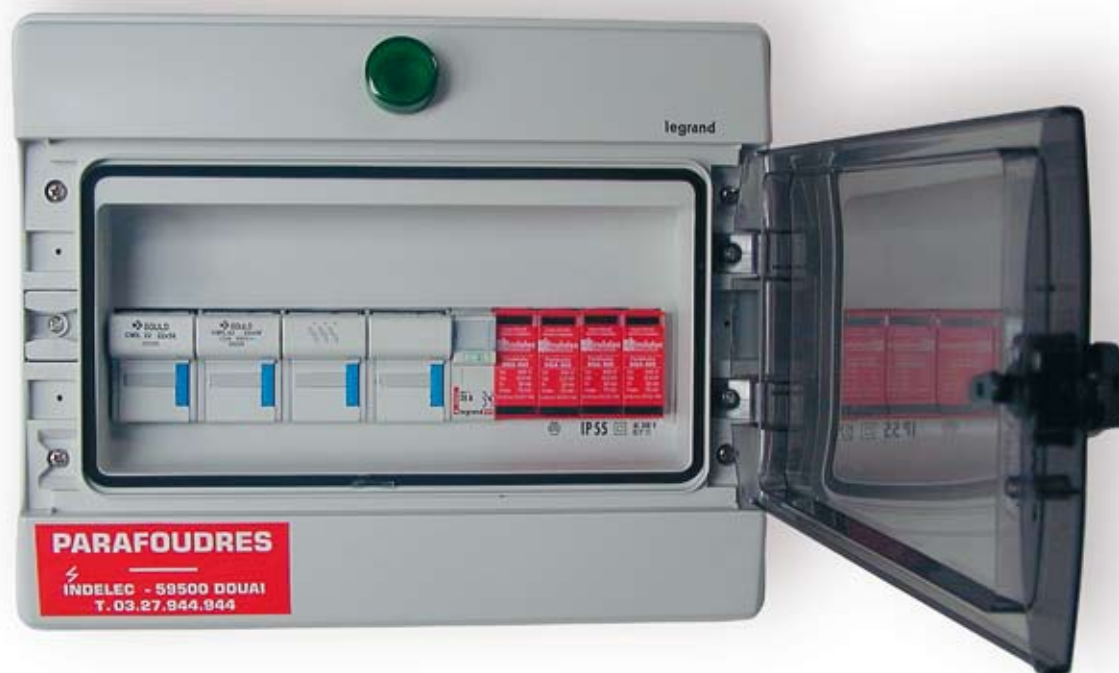
Type	CDGX 400 1 ph + N	CDGX 400 3 ph + N	CDGT 400 1 ph + N	CDGT 400 3 ph + N	CDGV 400 1 ph + N	CDGV 400 3 ph + N
References	P8504B	P8505B	P8502B	P8503B	P8522B	P8521B
Network voltage	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V
Number of protected poles	2	4	2	4	2	4
Fuses	20 A	20 A	50 A	50 A	100 A	100 A
Cabinet dimensions (H x L x W in mm)	400 x 300 x 210 mm					
Max. discharge current (8/20 $\mu$ s) I <sub>max</sub>	10 kA	10 kA	40 kA	40 kA	40 kA	40 kA
Protection level Up Common mode (L/PE)	1,5 kV	1,5 kV	1,5 kV	1,5 kV	1,5 kV	1,5 kV
Protection level Up Differential mode (L/N)	0,9 kV	0,9 kV	1,25 kV	1,25 kV	1,5 kV	1,5 kV
Wiring configuration mode	C1+C2	C1+C2	C1+C2	C1+C2	C1+C2	C1+C2



The single stage cabinets are installed in parallel on the installation to be protected. They are connected to earth.

# Surge protection Low voltage power supply

## Surge protection cabinets



### Single stage IP65 composite cabinets

These cabinets are made up of a single stage protection using Indelec over-voltage arrestors, connected to the protected equipment via fuses, in pursuance of French National Standard NF EN 61 643-11.

The pre-wired sub-assembly is set in a lockable IP65 composite box.

An LED display on the cabinet door shows the voltage and operational status of the over-voltage arrestor.

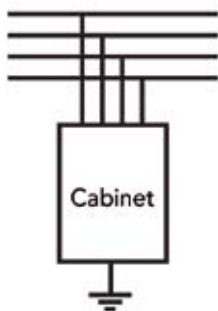
# Surge protection Low voltage power supply

## Common protection mode (C1)

Type	Plexo DGX 400 1 ph + N	Plexo DGX 400 3 ph + N	Plexo DGT 400 1 ph + N	Plexo DGT 400 3 ph + N	Plexo DGV 400 1 ph + N	Plexo DGV 400 3 ph + N
References	P8516	P8515	P8518	P8517	P8523	P8524
Network voltage	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V
Number of protected poles	2	4	2	4	2	4
Fuses	20 A	20 A	50 A	50 A	100 A	100 A
Cabinet dimensions (H x L x W in mm)	180x232x115	251x312x153	180x232x115	215x312x153	251x312x153	418x302x151
Max. discharge current (8/20 $\mu$ s) I <sub>max</sub>	10 kA	10 kA	40 kA	40 kA	40 kA	40 kA
Protection level Up	1,3 kV	1,3 kV	1,8 kV	1,8 kV	1,5 kV	1,5 kV
Wiring configuration mode	C1	C1	C1	C1	C1	C1

## Common and Differential protection mode (C1+C2)

Type	Plexo DGX 400 1 ph + N	Plexo DGX 400 3 ph + N	Plexo DGT 400 1 ph + N	Plexo DGT 400 3 ph + N	Plexo DGV 400 1 ph + N	Plexo DGV 400 3 ph + N
References	P8516B	P8515B	P8518B	P8517B	P8523B	P8524B
Network voltage	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V	230/400 V
Number of protected poles	2	4	2	4	2	4
Fuses	20 A	20 A	50 A	50 A	100 A	100 A
Cabinet dimensions (H x L x W in mm)	180x232x115	251x312x153	180x232x115	215x312x153	251x312x153	418x302x151
Max. discharge current (8/20 $\mu$ s) I <sub>max</sub>	10 kA	10 kA	40 kA	40 kA	40 kA	40 kA
Protection level Up Common mode (L/PE)	1,5 kV	1,5 kV	1,5 kV	1,5 kV	1,5 kV	1,5 kV
Protection level Up Differential mode (L/N)	0,9 kV	0,9 kV	1,25 kV	1,25 kV	1,5 kV	1,5 kV
Wiring configuration mode	C1+C2	C1+C2	C1+C2	C1+C2	C1+C2	C1+C2



The single stage cabinets are installed in parallel on the installation to be protected. They are connected to earth.



# Surge protection Photovoltaic installations

## Photovoltaic surge protection cabinet for AC side BPV-AC 240 Type 2



### Application

BPV-AC 240 surge protection cabinets are intended to protect the AC low voltage (230 VAC) side of UPS of photovoltaic installations, against over-voltages due to lightning.

They integrate the following functions :

1. Type 2 surge arrestors according to NF EN 61 643-11
2. Protection of surge arrestors according to NF C 15 100-534
3. Differential circuit breaker for line protection
4. Screw terminal connection board

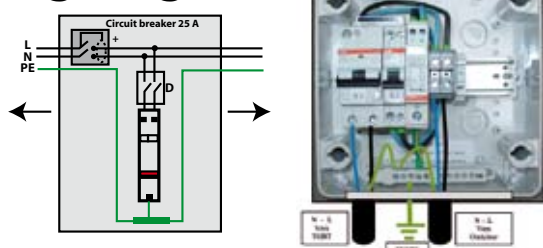
The BPV-AC 240 cabinets are available in 230 Vac single-phase networks, in several different line currents (16, 20, 25, 32A). To be specified when ordering.

They comply with the requirements of the UTE C15-712 guide for photovoltaic installations connected to the Low Voltage electrical network.

### Characteristics

Reference	BPV-AC 240	
Network voltage	Un	230 Vac single phase
Max. line current		16 - 20 - 25 - 32 A
Network Input/Output connections		4 mm <sup>2</sup> max.
Thermal disconnection		Integrated in each SPD module
Disconnection indicator		Visual indicator on each SPD module
Protection of SPD		By circuit breaker
Over-current protection		By circuit breaker (16 to 32A)
Protection against indirect contacts		By differential circuit breaker 30 mA
Max. operating voltage	Uc	255 Vac
Nominal discharge current	In	20 kA
Max. discharge current	I <sub>max</sub>	40 kA
Protection level	Up	1,5 / 1,25 kV
Protection class		IP65
Dimensions (H x L x W) in mm		198 x 255 x 108
Enclosure		Polycarbonate UL 94 V0
Wiring access		Transparent front polycarbonate door
Cable entry		By compression glands

### Wiring diagram



# Surge protection Photovoltaic installations

## Photovoltaic surge protection cabinet for DC side (photovoltaic panels side)

**BPV-DC50-500-3ST**  
**BPV-DC50-600-3ST**  
**BPV-DC50-800-3ST**  
**BPV-DC50-1000-3ST**

### Type 2



## Application

BPV-DC50 surge protection cabinets are intended to protect the DC (500 to 1000 Vdc) side of UPS of photovoltaic installations, against over-voltages due to lightning.

They integrate the following functions:

1. Type 2 surge arrestors according to NF EN 61 643-11
2. Disconnecting switch for photovoltaic panel strings
3. Screw terminal connection board

The BPV-DC-50 cabinets are available in the following Uocstc voltages: 500, 600, 800 and 1000 Vdc, for 3 strings as standard (up to 14 strings on request).

They comply with the requirements of the UTE C15-712 guide for photovoltaic installations connected to the Low Voltage electrical network.

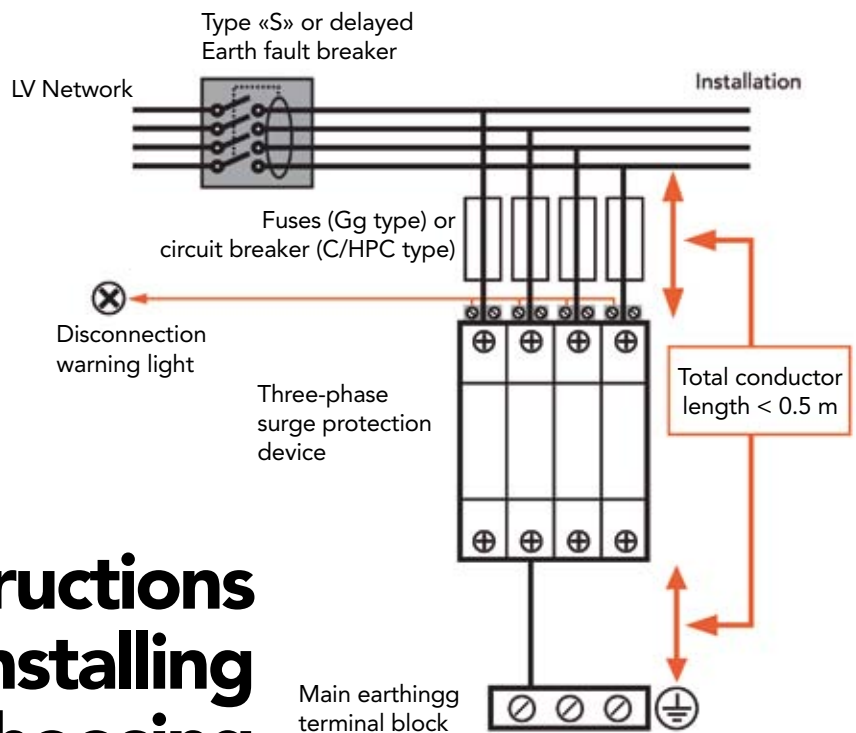
## Characteristics

Reference	BPV-DC50-500-3ST	BPV-DC50-600-3ST	BPV-DC50-800-3ST	BPV-DC50-1000-3ST
Number of strings	3	3	3	3
Max. voltage PV Uocstc	500 Vdc	600 Vdc	800 Vdc	1000 Vdc
Max. current Iscstc	20 A	20 A	25 A	25 A
Network Input/Output connections	6,5/10 mm <sup>2</sup>	6,5/10 mm <sup>2</sup>	6,5/10 mm <sup>2</sup>	6,5/10 mm <sup>2</sup>
Disconnecting switch	Yes	Yes	Yes	Yes
Max. nominal voltage Ucpv	530 Vdc	680 Vdc	840 Vdc	1060 Vdc
Nominal discharge current In	20 kA	20 kA	20 kA	20 kA
Max. discharge current I <sub>max</sub>	40 kA	40 kA	40 kA	40 kA
Protection level Up	1,8 kV	2,5 kV	3 kV	3,6 kV
Protection class	IP65	IP65	IP65	IP65
Dimensions (H x L x W) in mm	305 x 225 x 125	305 x 225 x 125	305 x 225 x 125	305 x 225 x 125
Enclosure	ABS PC	ABS PC	ABS PC	ABS PC
Handle type	Lockable	Lockable	Lockable	Lockable

## Wiring diagram



# Protection of low voltage electrical network



## Instructions for installing and choosing overvoltage arrestors

### Installation

The installation of low voltage over-voltage arresters in France is defined in the UTE C 15 443 guide (August 2004).

#### Connections:

The over-voltage arresters are connected in parallel on the equipment to protect, between active conductors and earth.

#### Set up:

The overall length of the connecting conductors must not exceed 0.5 m not to degrade the level of protection (Up).

The over-voltages arresters are connected to the network using either:

- conductors on the screw terminals ,
- connection block.

#### Disconnection:

In pursuance of the French National Standard NF EN 61 643, over-voltage arresters must be fitted with disconnection devices guaranteeing absolute safety even when the unit is due for replacement (see technical specification cards). An «S» type (selective delay) differential circuit breaker must be fitted up-circuit of the over-voltage arrester to lower the risk of an untimely triggering should a transient current flow through the overvoltage arrester.

# Protection of low voltage electrical network

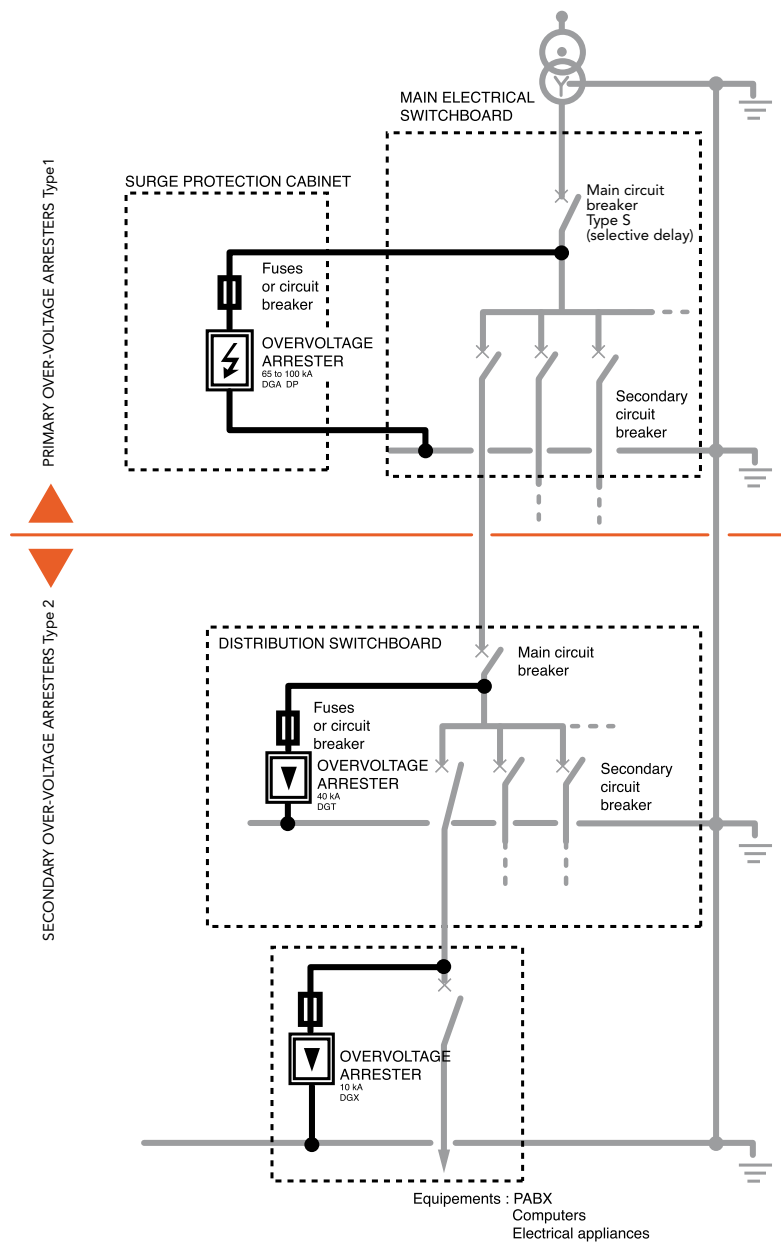
## The stepped protection principle

When lightning strikes electrical equipment, the effect can be compared to an extremely violent shock wave capable of destroying a considerable amount of equipment.

The energy held within this destructive wave may be such that several steps of over-voltage arresters are required to bring it down to an acceptable level.

A high energy Type 1 over-voltage arrester positioned at the front of the installation breaks the lightning shock wave thereby dissipating a lot of the energy.

The residual voltage which gets through to the electrical equipment is limited thanks to a second protection stage using Type 2 over-voltage arresters and, if necessary, a third stage using overvoltage arresters with very low protection level ( $U_p$ ).



## General rules

The choice of surge arresters must be done according to their nominal discharge current, their protection level ( $U_p$ ), their nominal operating voltage, and the type of neutral distribution.

The choice of fuses or circuit breakers as disconnection devices must be made according to the type of over-voltage arrester as indicated on their data sheets.

The cable length  $L$  between the two steps of over-voltage protection should be long enough (at least 5 m) to ensure the necessary decoupling for the proper functioning of the protection. Otherwise, coordination inductors must be installed between the two levels of over-voltage arresters.



# Over-voltage protection for data lines / telecom

## DLA type



## Application

The stepped design of the DLA over-voltage arresters is specially aimed at protecting data processing, instrumentation and telecommunication systems against atmospheric or industrial transient over-voltages. The equipment consists of a base which can be installed on a DIN rail, and a plug-in module. Electrical diagrams are built with gas tube s and fast clamping diodes in order to provide high discharge current capability and fast operation. It is possible to disconnect the plug-in module from the base without interrupting the circuit.

DLA over-voltage arresters are in compliance with IEC 61 643-21.

## Installation

### 1. Location:

Install DLA over-voltage arresters as close as possible to the equipment to be protected.

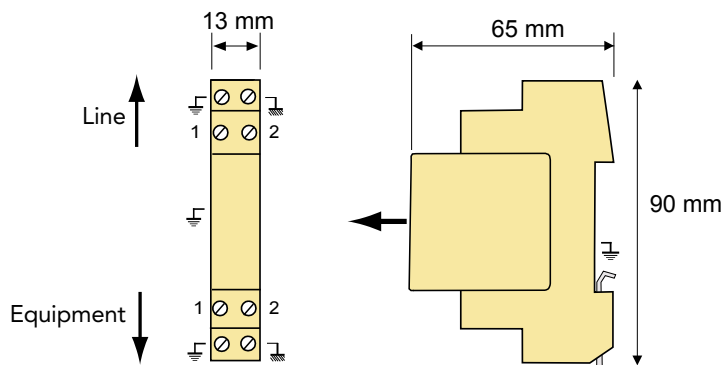
### 2. Mounting conditions:

The DLA can be installed on a symmetrical DIN rail.

### 3. Wiring:

It is advisable to use shielded cable to reduce the influence of external interferences and disturbances. The cable shields and screens can be connected to the arrester terminals using ground points located on each side of the DLA base.

The unprotected side of the line must be wired to upper terminal («Line») and the side to protect to lower terminal («Equipment»). The DLA ground connection can be achieved through the DIN rail which must itself be connected to earth.

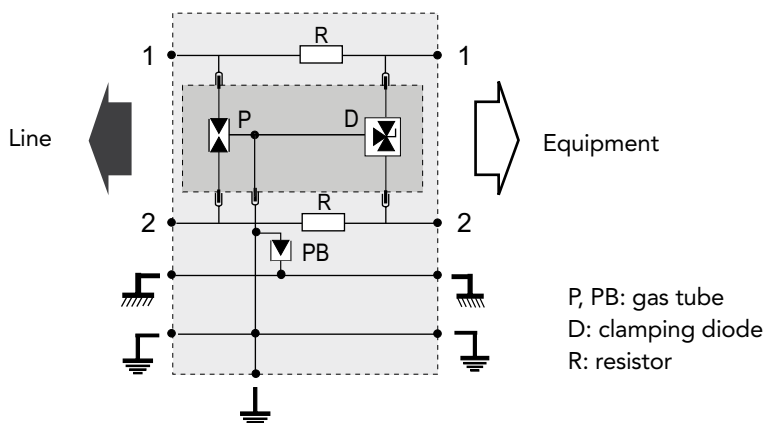


# Over-voltage protection for data lines / telecom

## Description

Behavior in case of overload: DLA modules are sized to withstand particularly high overloads. However, in the event of failure, the general result is a short circuit.

## Electrical diagram



Type	DLA-170	DLA-48D3	DLA-24D3	DLA-12D3	DLA-06D3
Application	RTC ADSL	48V line RNIS-T0 Profibus PA Fipway WorldFIP Fieldbus H2	24V line 4-20 mA current line LS	12V line RS232 Profibus FMS Profibus DP Interbus Fieldbus H1 Ion WORK	6V line RS422 RS485 MIC/T2 10BaseT
Reference	<b>P82960</b>	<b>P82961</b>	<b>P82962</b>	<b>P82963</b>	<b>P82964</b>
Configuration	1 pair + shield	1 pair + shield	1 pair + shield	1 pair + shield	1 pair + shield
Nominal line voltage (Un)	150 V	48 V	24 V	12 V	6 V
Max. line voltage (Uc)	170 V	53 V	28 V	15 V	8 V
Max. line current (IL)	300 mA	300 mA	300 mA	300 mA	300 mA
Protection level (Up)					
Wave 8/20µs - 5 kA	220 V	70 V	40 V	30 V	20 V
Nominal discharge current (In)					
8/20 µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax)					
8/20 µs impulse - 1 time	20 kA	20 kA	20 kA	20 kA	20 kA
Impulse current (Iimp)					
10/350 µs impulse - 2 times	5 kA	5 kA	5 kA	5 kA	5 kA
End of life	Short circuit	Short circuit	Short circuit	Short circuit	Short circuit
Max. throughput	10 Mbit/s	10 Mbit/s	10 Mbit/s	10 Mbit/s	10 Mbit/s
Spare module	DLAM-170	DLAM-48D3	DLAM-24D3	DLAM-12D3	DLAM-06D3

# Over-voltage protection for data lines / telecom

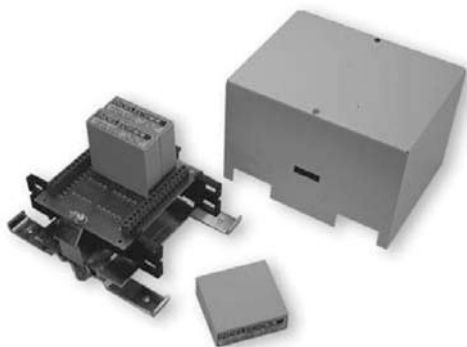
## E280 modular 2-pair plug-in surge arrester

(this product has "France Telecom" standards under agreement n° 84107). Recommended for protection 4 lines or more. Note : these modules have to be installed in BN enclosure type (see below).



Item	Ref
E 280 TM module for protection of 2 pairs - ADSL - Telephone (150V)	P8801
E 280 48M module for protection of 2 telephone lines without ring (48V)	P8802
E 280 48 D3M module for protection of 1 way ISDN - TØ Telex (48V)	P8803
E 280 24 D3M module for protection of 2 pairs leased line 4-20 mA (24V)	P8804
E 280 06 DBC module for protection of 1 way MIC primary access T1 T2 10BaseT (6V)	P8805

## Support boxes for E280 plug-in modules



Item	Ref
BN08 CAD box for 4 E 280 modules (CAD connection)	P8810
BN08 W box for 4 E 280 modules (wrapping connection)	P8811
BN08 V box for 4 E 280 modules (screw connection)	P8812
BN16 CAD box for 8 E 280 modules (CAD connection)	P8813
BN16 W box for 8 E 280 modules (wrapping connection)	P8814
BN16 V box for 8 E 280 modules (screw connection)	P8815
BN32 CAD box for 16 E 280 modules (CAD connection)	P8816
BN32 W box for 16 E 280 modules (wrapping connection)	P8817
BN32 V box for 16 E 280 modules (screw connection)	P8818



## MJ8 2RN surge protector for telecom

Designed for ISDN terminal, the MJ8 2RN surge protector features in/out RJ45 connector in compliance with T0/S0 ISDN requirements. Fast wall or frame mounting by self-gripping fasteners.

Item	Ref
MJ8 2RN surge protector	P8823

## Bx80T surge protectors for telecom and data lines

These units are designed to protect, against surge voltages, terminals connected to telephone and data networks. Designed for wall mounting and screw connections. Recommended for a maximum of 4 lines.



Item	Ref
B180T - 1 line protection (telephone - ADSL)	P8820
B280T - 2 lines protection (telephone - ADSL)	P8821
B480T - 4 lines protection (telephone - ADSL)	P8822



## Plug-in AC surge protection plugs

Max. network voltage = 250 Vac single phase  
 Max. line current = 16 A  
 Protection level  $U_p = 1,5$  kV  
 Max. discharge current = 5 kA  
 Complies with IEC 61 643-1

Item	Ref
Plug-in surge protection plug (230V)	P8738

## Multi-outlet surge protector

Max. network voltage = 250 V AC single phase  
 Max. line current = 16 A  
 Protection level  $U_p = 1,5$  kV  
 Max. discharge current = 5 kA  
 Complies with IEC 61 643-1

Item	Ref
5 outlets plug-in surge protector (230V)	P8739

## Computer/data network protection



Item	Ref
Network protection RS 232 (V24/V28) «SubD9» connection (A)	P8600
Network protection RS 232 (V24/V28) «SubD25» connection (B)	P8601
Network protection RS422/RS485 (V11) «SubD15» connection (C)	P8602
Network protection ETHERNET THINWIRE «BNC» connection	P8603
Network protection ETHERNET THICKWIRE «N» connection	P8604
Network protection ARCNET «BNC» connection	P8605
Network protection IBM type 1 «Hermaphrodite» connection (D)	P8606
Network protection TWINAX	P8607
Network protection 10baseT «RJ45» connection	P8608

## Coaxial surge protectors

These coaxial surge protectors are based on gas discharge tube (GDT) and designed for RF line surge protection.

Main characteristics:

Insertion losses at  $f_{max} < 0,2$  dB

VSWR at  $f_{max} < 1,2$

Max. discharge current ( $I_{max}$ ) = 20 kA (8/20 $\mu$ s – 1 impulse)

Bandwidth ( $f_{max}$ ) : 0 to several GHz

Operating temperature range : -40°C to +80°C

Waterproof



Item	Ref
High frequency PHF U coaxial protection - «UHF» connection (A)	P8610
High frequency PHF N coaxial protection - «N» connection (B)	P8611
High frequency PHF B coaxial protection - «BNC» connection (C)	P8612
PTV television protection - «TV antenna cable» connection	P8650
PTV television protection - «screw» connection	P8651





Ostacle  
warning lights

# Obstacle warning lights

## Low-intensity LED obstacle warning light BA15



### Application

The International Civil Aviation Organization (ICAO) has defined the specification for installation of Obstacle Warning Lights in the Annex 14 to the convention on international civil aviation, volume 1 «Aerodrome design and operations» (July 1999).

The following structures are considered as obstacles to civil aviation:

- Factory chimneys,
- Towers (Telecom, TV, ...),
- High Voltage overhead cables,
- Bridges,
- High rise buildings,
- Electrical power generation stations,
- Cranes.

The BA15 LED obstacle warning lights are conforming the ICAO requirement thanks to its luminous intensity of more than 10 cd. Furthermore, the use of LED offers huge benefits in terms of life time (more than 100 000 h), reliability and extremely weak electrical consumption (3W).

### Installation

The low-intensity lights are installed on structures not exceeding 150 m high. Above 45 m, several levels of beaconing are required. The interval between two beacon levels must not exceed 45 m as well. For factory chimneys, the obstacle warning lights must be installed from 1.5 m to 3 m maximum from the top of the structure. Three lights should be fixed regularly at 120° along the chimney circumference.

The BA15 LED obstacle warning lights are available either as a single unit or complete with a stainless steel mounting brackets as well as a connection box for power supply. An integrated photocell is also available upon request (option).

Depending on the obstacle location (above a take off climb surface for example), the ICAO requires uninterruptible beaconing in every circumstances ie. BBS system (master & slave) and uninterruptible power system. The BA15 lights are therefore available with double stainless steel mounting brackets and BBS (master and slave) operating system.



# Obstacle warning lights

## Power supply and service continuity

The BA15 obstacle warning lights are delivered with 3 m cable for power supply. The input voltage could be 12V, 24V, 48V, 110V or 230V-50Hz, upon requirement of the customers.

The BA15 lights are also available with a beacon failure alarm driving box (option).

A UPS cabinet with 12 h autonomy (0/+20%) is available as well according to ICAO requirement for uninterruptible beaconing in every circumstances.

## Technical specification

Type	BA15 12V	BA15 24V	BA15 48V	BA15 110V	BA15 230V
Reference	P89716	P89717	P89718	P89719	P89710
Light source	LED				
Colour	RED				
Lens	Metacrylate				
Long life:	100 000 H				
Input voltage	12 V	24 V	48 V	110 V	230 V-50Hz
Power consumption:	< 3 W				
Luminous intensity:	> 10 cd				
Photocell	available on request				
Class	IP68				
Weight	1 kg				

# Obstacle warning lights

## Low-Intensity Neon Lights BA20 and BA30



### Application

The International Civil Aviation Organization (ICAO) has defined the specification for installation of Obstacle Warning Lights in the Annex 14 to the convention on international civil aviation, Volume 1 «Aerodrome design and operations» (July 1999).

The following structures are considered as obstacles to civil aviation:

- Factory chimneys,
- Towers (Telecom, TV, ...),
- High Voltage overhead cables,
- Bridges,
- High rise buildings,
- Electrical power generation stations,
- Cranes.

The BA20 and BA30 Neon obstacle warning lights are conforming the ICAO requirement thanks to their luminous intensity of more than 20 cd for the BA20 model (Type A low-intensity obstacle warning light) and more than 35 cd for the BA30 model (Type B low-intensity obstacle warning light). The use of neon tube offers benefits in terms of life time (25 000 h) and lower electrical consumption (15-25W) compared to incandescent bulbs lights.

### Installation

The low-intensity lights are installed on structures not exceeding 150 m high. Above 45 m, several levels of beaconing are required. The interval between two beacon levels must not exceed 45 m as well. For factory chimneys, the obstacle warning lights must be installed from 1.5 m to 3 m maximum from the top of the structure. Three lights should be fixed regularly at 120° along the chimney circumference.

The BA20 and BA30 Neon obstacle warning lights are available either as a single unit or complete with a stainless steel mounting brackets as well as a connection box for power supply. A photocell is also available upon request (option).

Depending on the obstacle location (above a take off climb surface for example), the ICAO requires uninterruptible beaconing in every circumstances ie. BBS system (master & slave) and uninterruptible power system. The BA20 and BA30 lights are therefore available with double stainless steel mounting brackets and BBS (master and slave) operating system.



# Obstacle warning lights

## Power supply and service continuity

The BA20 and BA30 obstacle warning lights are delivered with 3 m cable for power supply. The input voltage could be 24V, 48V, 110V, or 230V-50Hz upon requirement of the customers.

The BA20 and BA30 lights are also available with a beacon failure alarm driving box (option).

A UPS cabinet with 12 h autonomy (0/+20%) is available as well according to ICAO requirement for uninterruptible beaconing in every circumstances.

## Technical specification

Type	BA20 24V	BA20 48V	BA20 230V	BA30 230V
Reference	P89736	P89737	P89714	P89790
Light source	Neon			
Colour	RED			
Lens	Metacrylate			
Long life	25 000 H			
Input voltage	24 V	48 V	230 V 50 Hz	230 V 50 Hz
Power consumption	15 W	15 W	20 W	25 W
Luminous intensity	> 20 cd	> 20 cd	> 20 cd	> 32 cd
Class	IP66			
Weight	2 kg			
Interference-free	YES			

# Obstacle warning lights

## Low-intensity BA10 Light



### Application

The International Civil Aviation Organization (ICAO) has defined the specification for installation of Obstacle Warning Lights in the Annex 14 to the convention on international civil aviation, Volume 1 «Aerodrome design and operations» (July 1999).

The following structures are considered as obstacles to civil aviation:

- Factory chimneys,
- Towers (Telecom, TV, ...),
- High Voltage overhead cables,
- Bridges,
- High rise buildings,
- Electrical power generation stations,
- Cranes.

The BA10 obstacle warning light is conforming the ICAO requirement thanks to its luminous intensity of more than 35 cd. The use of incandescent bulb offers benefits in terms of cost as well as disadvantages in term of life time (8 000 h) and power consumption (55W).

### Installation

The low-intensity lights are installed on structures not exceeding 150 m high. Above 45 m, several levels of beaconing are required. The interval between two beacon levels must not exceed 45 m as well.

For factory chimneys, the obstacle warning lights must be installed from 1.5 m to 3 m maximum from the top of the structure. Three lights should be fixed regularly at 120° along the chimney circumference.

The BA10 obstacle warning lights are available either as a single unit or complete with a stainless steel mounting brackets as well as a connection box for power supply. A photocell is also available upon request (option).

Depending on the obstacle location (above a take off climb surface for example), the ICAO requires uninterruptible beaconing in every circumstances ie. BBS system (master & slave) and uninterruptible power system. The BA10 lights are therefore available with double stainless steel mounting brackets and BBS (master and slave) operating system.

# Obstacle warning lights

## Power supply and service continuity

The BA10 obstacle warning lights are delivered with 3 m cable for power supply.  
The input voltage could be 12V, 110V-50Hz or 230V-50Hz upon requirement of the customers.

The BA10 lights are also available with a beacon failure alarm driving box (option).

A UPS cabinet with 12 h autonomy (0/+20%) is available as well according to ICAO requirement for uninterruptible beaconing in every circumstances

## Technical specification

Type	BA10 12V/24V/48V	BA10 110V	BA10 230V
Reference	-	-	P89501
Light source	Incandescent bulb - E27 mounting		
Colour	RED		
Lens	Glass «fresnel» type		
Base	Polyamide		
Long life	2 000 H	2 000 H	8 000 H
Input voltage	12V / 24V / 48V	110V-50 Hz	230V-50 Hz
Power consumption	55 W	55 W	55 W
Luminous intensity	> 10 cd	> 10 cd	> 10 cd
Class	IP 65		
Weight	1.5 kg		

# Obstacle warning lights

## Low intensity BA 33 Type B Light

### Application

The International Civil Aviation Organization (ICAO) has defined the specification for installation of Obstacle Warning Lights in the Annex 14 to the convention on international civil aviation, volume 1 «Aerodrome design and operations» (July 1999).

The following structures are considered as obstacles to civil aviation:

- Factory chimneys,
- Towers (Telecom, TV, ...),
- High Voltage overhead cables,
- Bridges,
- High rise buildings,
- Electrical power generation stations,
- Cranes.

The BA33 LED obstacle warning lights are conforming the ICAO requirement thanks to its luminous intensity of more than 32 cd. Furthermore, the use of LED offers huge benefits in terms of life time (more than 100 000 h), reliability and extremely weak electrical consumption (3W).

### Installation

The low-intensity lights are installed on structures not exceeding 150 m high. Above 45 m, several levels of beaconing are required. The interval between two beacon levels must not exceed 45 m as well. For factory chimneys, the obstacle warning lights must be installed from 1.5 m to 3 m maximum from the top of the structure. Three lights should be fixed regularly at 120° along the chimney circumference.

The BA33 LED obstacle warning lights are available either as a single unit or complete with a stainless steel mounting brackets as well as a connection box for power supply. An integrated photocell is also available upon request (option).

Depending on the obstacle location (above a take off climb surface for example), the ICAO requires uninterruptible beaconing in every circumstances ie. BBS system (master & slave) and uninterruptible power system. The BA33 lights are therefore available with double stainless steel mounting brackets and BBS (master and slave) operating system.

### Night Beaconing

Very low consumption  
High long life time  
Compact and light  
Provided with a direct connection into the beacon  
Stainless steel mounting included

### Available options

Day/Night switch  
Dry contact for failure alarm  
Available in double or master/slave version as Twiny

### Available accessories

Connection box with surge arrester  
Connection box for star wiring or "in guirland"  
Power supply cabinet  
Uninterruptible power supply system



### Technical specification

Type	BA33
Reference	-
Light source	Led
Colour	RED
Lens	Metacrylate
Long life	100 000 H
Input voltage	12V, 24V, 48V, 220V
Power consumption	16 W
Luminous intensity	32 cd
Class	IP66
Weight	0,5 kg
Temperature	-55°C to +55°C



# Obstacle warning lights

## Medium Intensity MIB-200 and MIA-202



### Application

The International Civil Aviation Organization (ICAO) has defined the specification for installation of Obstacle Warning Lights in the Annex 14 to the convention on international civil aviation, Volume 1 «Aerodrome design and operations» (July 1999).

The following structures are considered as obstacles to civil aviation:

- Factory chimneys,
- Towers (Telecom, TV, ...),
- High Voltage overhead cables,
- Bridges,
- High rise buildings,
- Electrical power generation stations,
- Cranes.

The ICAO recommends the installation of medium-intensity obstacle warning lights for structures above 45 m. For height above 150 m, the lighting of the structure should be completed with red & white marking.

The medium-intensity MIB-200 and MIA-202 obstacle warning lights are conforming the ICAO requirements for night beaconing (BA200 model with a luminous intensity > 2 000 cd) and day & night beaconing (MIA-202 model with luminous intensity > 20 000 cd for day use and > 2 000 cd for night use).

### Installation

For structures not exceeding 105m, a single level of medium-intensity obstacle warning lights is required by ICAO (Annex 14, Volume 1, figure 6.1).

Above 105 m, several beaconing levels are requested, with a maximum interval of 105 m between two levels.

For factory chimneys, the obstacle warning lights must be installed from 1.5 m to 3 m maximum from the top of the structure. Three lights should be fixed regularly at 120° along the chimney circumference.

Lastly, the MIB-200 and MIA-202 models are flashing according to the ICAO requirements (20 to 60 flashes per minute). Depending on the obstacle location (above a take off climb surface for example), the ICAO requires uninterruptible beaconing in every circumstances ie. uninterruptible power system.

# Obstacle warning lights

## Power supply and service continuity

The MIB-200 and MIA-202 obstacle warning lights are delivered with a driving box and a 5 m power supply cable between the lamp and this box.

This cable is including a IP 68 fast connector on the driving box side. 48V and 230V-50Hz input voltage are available. In case of beaconing of several tall structures on the same site (such as towers, wind turbines...), a synchronized operation is available on request via optical fibre (optical fibre connection box).

A UPS cabinet with 12 h autonomy (0/+20%) is available as well according to ICAO requirement for uninterruptible beaconing in every circumstances.

## Technical specification

Type	MIB-200	MIA-202
Reference	P89751	P89750
Light source	omni-directionnal quartz - xenon	
Colour	RED	WHITE
Luminous intensity	> 2 000 cd	> 2 000 cd (night) and > 20 000 cd day
Flashing rate	20 to 60 flashes / minute	
Long life	15 000 H to 20 000 H	
Input voltage	48V, 230V-50 Hz	
Power consumption	200 W	
Class	IP 65	
Weight	3 kg	
Driving box	Fiber glass armed polyester	
Driving box dimensions	430 x 330 x 200 mm	530 x 430 x 200 mm
Driving box weight	12 kg	15 kg

# Obstacle warning lights

## High voltage BHT - BI32 Light



### Application

The International Civil Aviation Organization (ICAO) has defined the specification for installation of Obstacle Warning Lights in the Annex 14 to the convention on international civil aviation, Volume 1 «Aerodrome design and operations» (July 1999).

The High Voltage overhead cables are included into the obstacles to civil aviation. These HV lines represent a real danger for aircraft flying at low altitude. Moreover, the higher tensions are, the larger the distance between two pylons are. As a result, the ranges are often very long and the beaconing of the supporting towers with low or medium-intensity obstacle warning lights does not fulfil the ICAO requirements. In this framework, the installation of beacons on the lines themselves is the only technically and financially sounded way to follow the ICAO recommendations.

With a luminous intensity of more than 10 cd, the High Voltage BHT lights are providing an effective and user-friendly solution to the ICAO requirements for HV lines beaconing.

The BHT-BI32 is power supplied by the magnetic field around the cable of the high voltage line. This light can be used for beaconing high voltage lines up to 420 kV - 50 Hertz.

### Installation

The installation specification for High Voltage overhead cables are mainly dealing with the intervals between two beacons:

- 70 m for sensitive location in the vicinity of an airport,
- 105 m for other locations.

Moreover, the light can not be fixed at less than 10 m from the closest supporting tower.

# Obstacle warning lights

## Power supply and service continuity

Dedicated to the night beaconing of high voltage lines, it is a long life beacon (100 000 hours), very strong and easy to settle.

The BHT BI32 is provided with photocell for an automatic cycle, and its support with the Faraday cage.

Its compact design and light weight allow a quick and easy installation  
For a day beaconing, the BHT BI32 can be painted in white and red.

## Technical specification

Type	BHT BI32
Reference	-
Light source	Leds
Colour	RED
Luminous intensity	> 32 cd
Long life	> 100 000 H
Input voltage	48V, 230V-50 Hz
Class	IP 68
Weight	7.5 kg
Dimensions	Ø: 350 mm / height: 370 mm



# Obstacle warning lights

## Masts



## Application

The masts equipped with a windsock are indicating the wind direction. In the vicinity of airports, the masts must follow the French Civil Aviation Technical Department (STNA) requirements and must be certified by this Department.

The mast as well as the windsock must also follow the ICAO requirements in terms of marking (white & red alternate colours or orange colour).

Besides these specific areas in the vicinity of the airports, the masts are free of STNA agreement. They are mainly used on industrial sites, specially for hazardous products.

## Installation

The STNA approved mast is 7.40 m high. It is made of galvanised steel (stainless steel masts are also available on request). Guy wires are fixed on the mast at 3.05 m from the ground level. These tipping masts allow an easy replacement of the windsock.

The windsock dimensions are defined by the STNA as follow:  
- airports: dia 1 000 mm wind-vane, 4.50 m long windsock,  
- heliports: dia 600 mm wind-vane, 2.40 m long windsock.

The masts are fixed on the ground on a mounting stand (400 x 400 x 5 cm) sealed into a concrete block (600 x 600 x 800 cm).

Smaller concrete blocks (250 x 250 x 400 cm) allow the fixing of the guy wires on the ground.

# Obstacle warning lights

## Options

For night use in the airports vicinity, the windsock can be lighted (230 V or 6.6 A light).  
For 230 V light, a photocell is also available.

Moreover, the STNA approved masts are also available with an obstacle warning light (230 V or 6.6 A).

## Technical specifications

Type	STNA approved masts	Regular masts
<b>References</b>	-	-
STNA approval	Yes	No
Height	7.40 m	4 m
Material	Galvanised steel (stainless steel on request)	
Fixing	Sealed mounting stang	«U» brackets
Wind-vane	Ø 50 (highways...) Ø 100 (airports) Ø 60 (heliports)	Ø 30, 40 or 50
OPTIONS:		
Windsack lighting	Yes (220 V or 6.6 A)	No
Obstacle warning	Yes (220 V or 6.6 A)	No
Company logo	Yes	Yes



**Safety  
equipment**

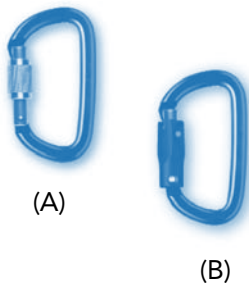


# Personal Safety Equipment

## Professional quality Safety Harness



Item	Ref	W (kg)
NAVAHO chest-fit safety harness CE EN 361 (A)		
- 2 sizes: T1: S / M	P11012	1.140
T2 L / XL	P110120	1.140



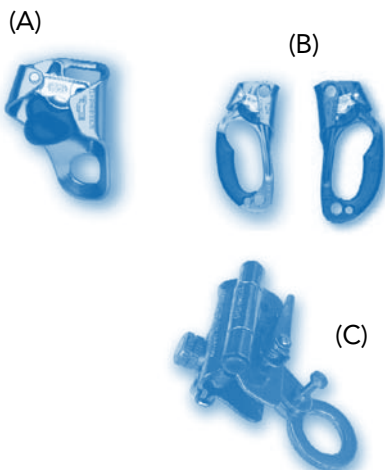
## Snaps

Item	Ref	W (kg)
AM'D - screen snap with control bar CE EN 362 (A)	P11013	0.076
AM'D Ball Lock snap CE EN 362 (B)	P11014	0.074



## Pulley

Item	Ref	W (kg)
TANDEM - fixed flange twin pulley	P11016	0.195



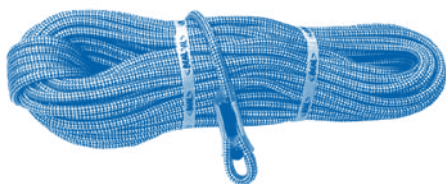
## Stopper

Item	Ref	W (kg)
CROLL - Rope-mounted chest stopper (A) CE	P11002	0.146
ASCENSION Ascender (B) CE	P11003	0.144
Mobile rop-mounted fall arrest device (D)	P11004	0.480



# Personal Safety Equipment

## Ropes



Item	Ref	W (kg)
60 m, Ø 11 mm rope with wraparound ends	P11006	4.38

(A)



(B)



## Safety straps

Item	Ref	W (kg)
Circular straps (A)		
- 60 cm	P11017	0.060
- 120 cm	P11018	0.110
Adjustable foot operated pedal (B)	P11020	0.075



## Helmet

Adjustable chinstrap

Item	Ref	W (kg)
ECRIN - White Helmet	P11005	0.440



## Bag

22 liter bag with 2 straps and 3 handles

Item	Ref	W (kg)
Bag	P11034	0.600

# Anchoring – Links



## Anchoring

Item	Ref	W (kg)
Ø 12 mm heart-shaped screwless stainless-steel plate CE EN 795	P11001	0.040

(A)

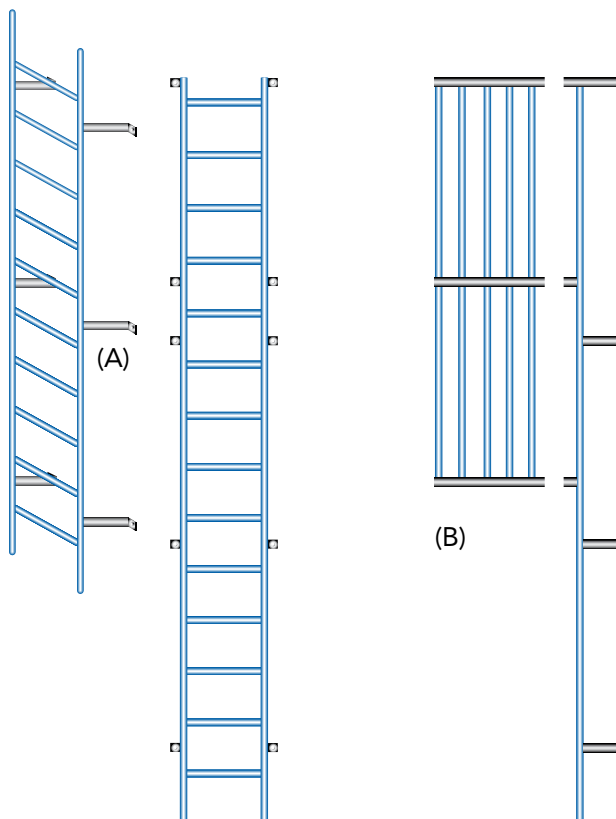


## Ropes

Item	Ref	W (kg)
ENERGYCA Y shape support rope - CE EN 354 (A)	P11009	0.085
ABSORBICA - shock absorber CE EN 355 (B)	P11027	0.155



(B)



## Aluminium Ladder

Item	Ref	Unite
Vertical ladder with mounting brackets (A)	P11308	ml
Crinoline	P11309	ml

## Galvanised steel ladder

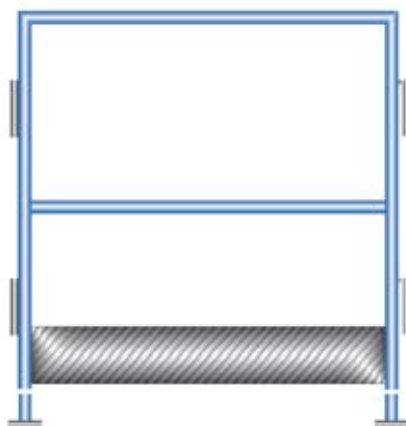
3 m single-run ladder

- Kevlar reinforced uprights
- Tubular rungs
- 2x3 240 mm offset brackets

Item	Ref
Vertical ladder	P11307

## Railing

Adjustable, 1 m height ; 2 rails, 1 baseboard



Item	Ref
1 meter section	P11310
0.5 meter section	P11311
Foot plate	P11312



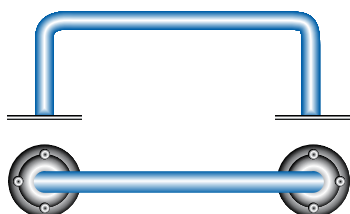
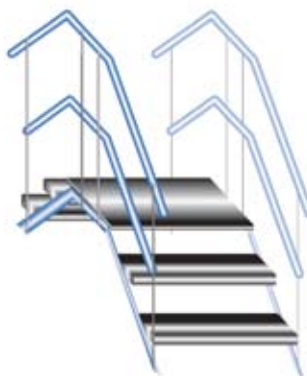
**Foot plate**



## Running board

Hot dip galvanised steel

Item	Ref
2 steps single rail running board	P11301
2 steps twin rail running board	P11302
3 steps single rail running board	P11304
3 steps twin rail running board	P11305

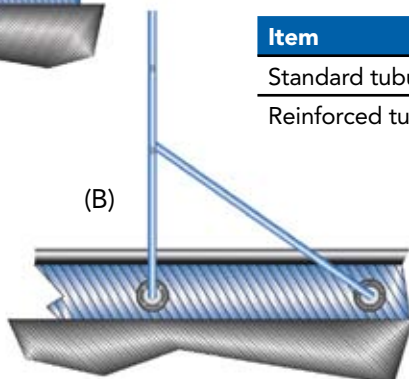
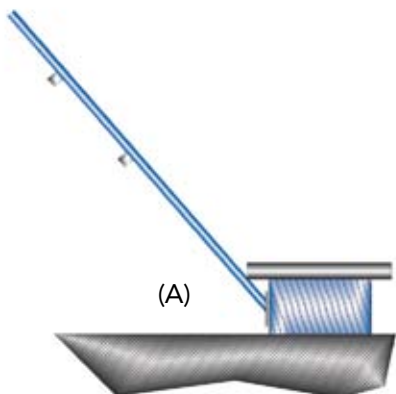


## Handle

Hot dip galvanised steel

- Twin fixing plates
- Size according to requirement

Item	Ref
Handle	P11306



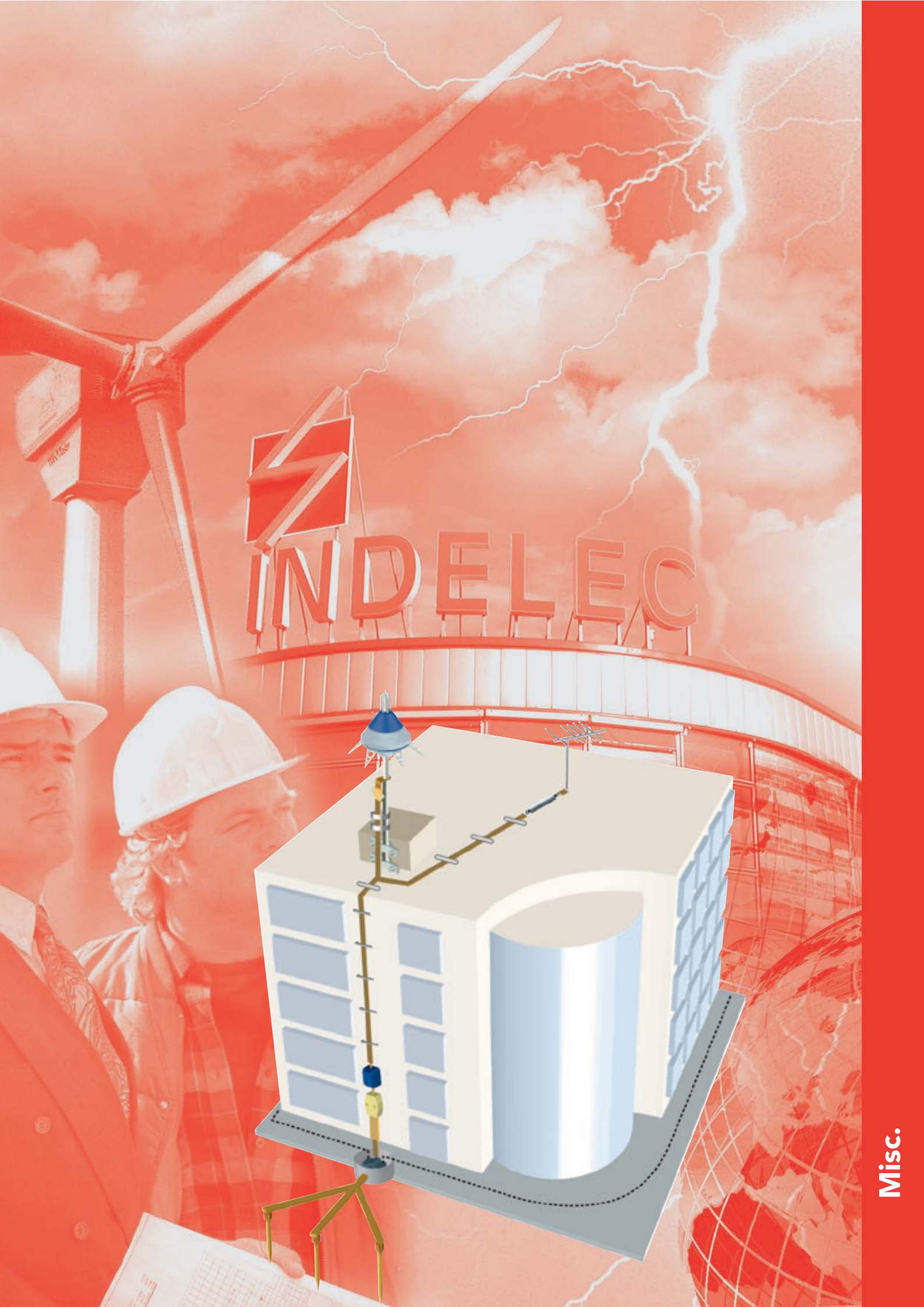
## Distance protection

Special angled railings between which cables are stretched, forming a safety barrier away from parapet

- Right or left reinforcement
- Size according to requirement

Item	Ref
Standard tubular structure (A)	P11313
Reinforced tubular structure (B)	P11314





INDELEC

## Risk assessment

- IEC 62305-2
- UTE C 17100-2
- UTE C 17-108

Simplified guide (can be used when a lightning discharge does not represent a serious risk for the safety of the installations and does not have consequences on the environment consequences limited to a loss of availability).

## Protection by single rods, meshed cages and catenary wires

- IEC 62305-3

## Protection by Early Streamer Emission (ESE) terminal

- NF C 17-102

## Protection by surge arresters

- IEC 62305-4
- NFC 15-100
- UTE C 15-443
- IEC 62305-4

## General principles

- IEC 62 305-1

# Lightning Protection Preliminary Study

## Questionnaire

Name and Address of the client: .....

Name and Address of the installation you need to protect:.....

Nature of the building: (use, nature of the manufactured or stored products)

### For a religious building:

- Is there :

- a cross.....  Yes  No
- an ornament .....  Yes  No
- bells .....  Yes  No
  - > If yes, are they electric?.....  Yes  No
  - > Are they protected by a lightning protector? .....  Yes  No
- a single-phase power supply cabinet .....  Yes  No
- a three-phase power supply cabinet .....  Yes  No

- Is there an access on the roof: a trap door, a window: .....  Yes  No

(locate it on the diagram)

- Will you erect a scaffolding on the religious building during the work ? .....  Yes  No

### For a building:

- Is there:

- roof antennas .....  Yes  No
- roof metal elements .....  Yes  No
- a gas rising column .....  Yes  No
- in frontage electric cable .....  Yes  No

(locate them on the diagram)

- Is it necessary to envisage a specific study about electric equipments protection against surges? .....  Yes  No

- Nature of the ground for the lightning conductor earth rod:

- Nature of the possible floor covering:

- Presence of others earth rod :

(locate them on the diagram)

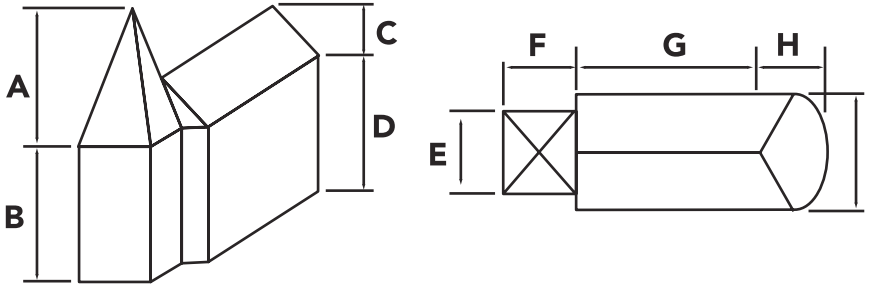
- electric (ground loop).....  Yes  No
- electric (rod) .....  Yes  No
- telephone .....  Yes  No
- data processing.....  Yes  No

- Estimate for supply only

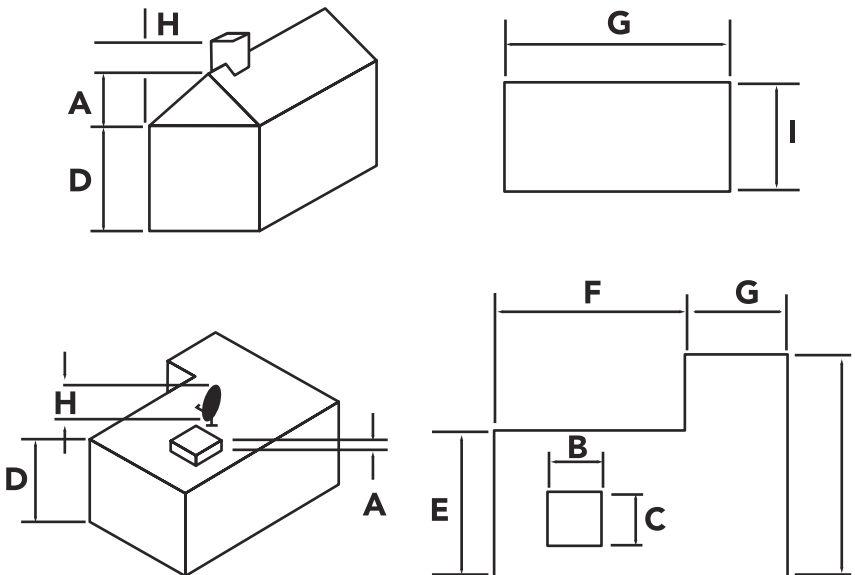
# Lightning Protection Preliminary Study

## Diagram

Religious building:



Other Buildings:



Locate the place of the roof ornaments

Locate the place of the chimneys, the antennas, etc.

Dimensions in meters	Nature of the materials	Observations	
			A
			B
			C
			D
			E
			F
			G
			H
			I



# Further Information Necessary to the Evaluation of the Protection Level

## References:

- Titles: .....
- File: .....
- Date : .....

## Structural coefficient:

Roof	Metal	Common	Inflammable
Structure			
Metal			
Common			
Inflammable			

## Relative situation of the building:

- The building is located in a place where there are others buildings, trees with the same height, or even higher .....
- The building is surrounded by smaller buildings .....
- The building is isolated, there are no others .....
- Isolated building at the top of a hill, or on a headland .....

## The building's occupation:

- Unoccupied .....
- Normally occupied .....
- Hard evacuation or risk of panic .....

## The building's contents:

- Without value and inflammable .....
- Common value or normally inflammable .....
- Strong value or particularly inflammable .....
- Exceptional value, irreplaceable or very inflammable, explosive .....

## Consequences of a lightning struck:

- No necessity of continuous service and no consequences on the environment .....
- Necessity of a continuous service and no consequences on the environment .....
- Consequences on the environment .....

**Observations:** .....

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