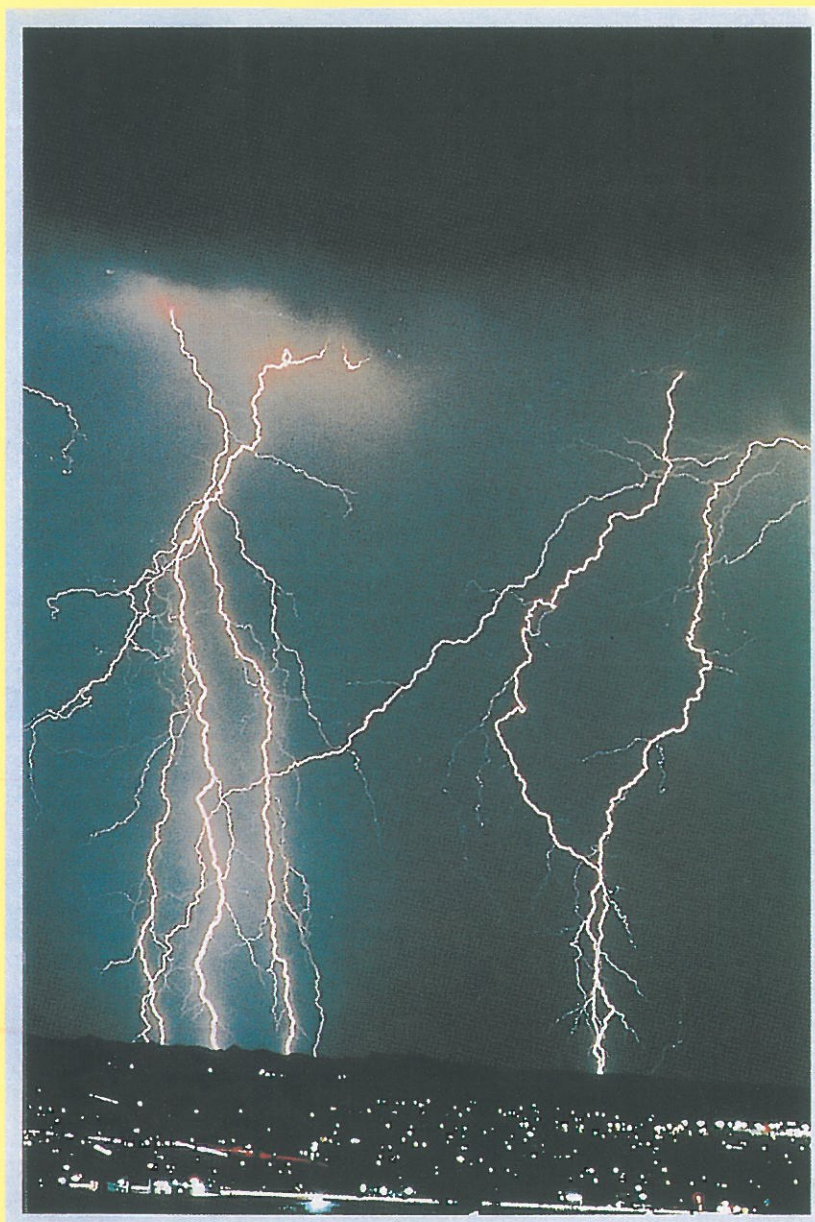




**LIGHTNING CONDUCTOR SERIES**

**ACCORDING TO FRENCH STANDARD NFC 17-102**



- ✘ "Apollo" Generator is placed inside a double waterproof insulation box to protect the system against the worst atmospheric and climatic conditions.
- ✘ A discontinuous synchronic emission is created by "Apollo" generator in the same time as leader steps.
- ✘ "Apollo" is a non-radioactive lightning conductor.
- ✘ This lightning conductor is self-powered and doesn't need any maintenance.

# **APOLLO**

**LIGHTNING CONDUCTOR SERIES**





# ⚡ APOLLO ⚡

## LIGHTNING CONDUCTOR SERIES

### APOLLO ACTIVE SYSTEM WITH STARTING DEVICE

**COLLECTOR:** It is formed by triple protective system (electro-atmospheric condensator, starting device and earth leakage current), with double insulation appliance and spark way.

**ELECTROATMOSPHERIC CONDENSATOR:** The APOLLO is provided with an isolated external armature, at floating potential with regard to its earth-connected central axle, forming a natural condensator in terms of its surrounding electric field with two spark channels, one in controlled atmosphere and the other in ambient atmosphere.

**STARTING SYSTEM:** the APOLLO is equipped with a high-voltage electrical pulses transformer-generator with alternating operation, depending on the surrounding electric field.

When the electric fields are very high (over 50 Kv/m), the APOLLO external armature at floating potential receives and accumulates this energy and by certain process, its transformer-generator releases high-voltage pulses which are scattered at short intervals into the atmosphere in leader or tracer form. These impulses created by the ascending leader or tracer are conveyed to the atmosphere taking the form of intermittent discharges, reaching an average speed of 1 m/microsec. This process is called advance time.

In order to be better understood the previous terms are further explained:  
**BEGGINING POINT:** It is the place where meet the descending tensions from the thunderclouds and the tensions produced from the earth due to the difference of potential.

**ASCENDING TRACER:** They are the electrical effluvia emitted by propitious spots from earth to the stormy clouds.

**DESCENDIG TRACER:** In the same way, they are the electrical effluvia heading to earth from the thunderclouds.

**ATMOSPHERIC GRADIENT:** It is the generating tension in the discriminative space.

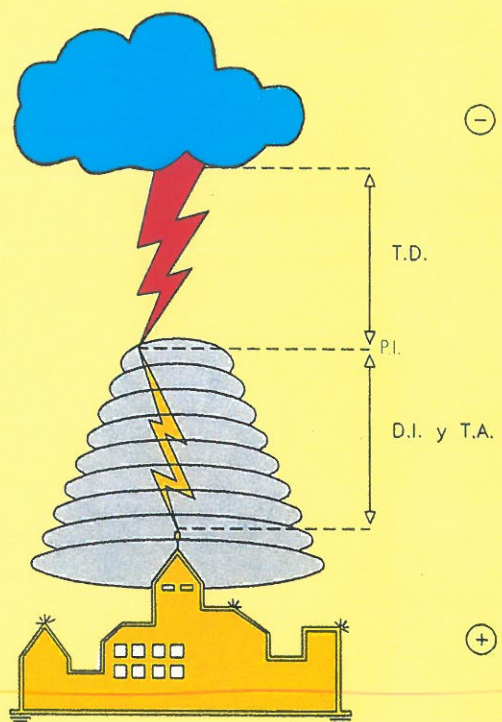
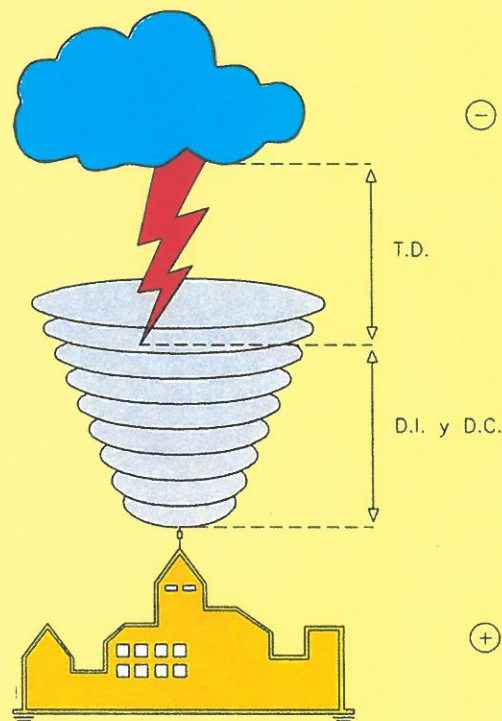
**POINT OF IMPACT:** It is the one produced on the ground by a lightning or spark falling (strength).

**ADVANCE TIME:** It is the anticipation of electrical effluvia forming an ascending leader or tracer in relation to the surrounding critical points.

**DISCRIMINATIVE SPACE:** It is the area between the thunderclouds and the earth.

**PROPTIOUS POINTS:** They are those otstanding spots on earth, the highest and usually sharp-shaped ones, which are more likely to collect electrical effluvia and lightning falling due to their features.

**SPACE TO PROTECT:** It is the volume requiring a protection against lighnning effects because of its high occupational density and the importance of its





# ⚡ APOLLO ⚡

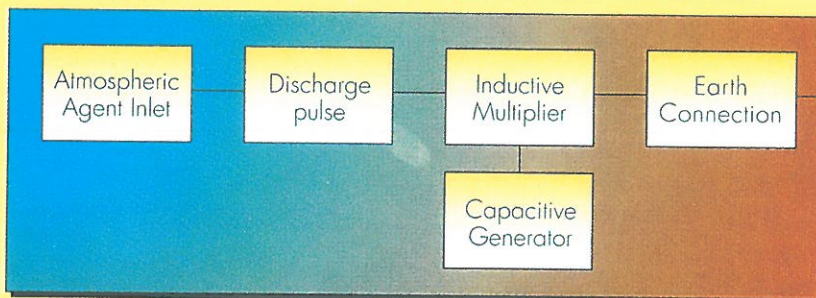
## LIGHTNING CONDUCTOR SERIES

### ENERGY BLOCK AND OPERATION PRINCIPLES

**DISCHARGE PULSE:** It is which the lightning tracing and collecting pulse is created with, using the electrical gradient existing between cloud and earth; through the inductive multiplier and using a buffer in controlled atmosphere, a high-speed of breakdown pulse is created and therefore the lightning disruption point is displaced to a great height, which will be greater the more electric field exists.

**CAPACITIVE GENERATOR:** It is in charge of the direct earth-cloud joining when the tracer has been sent. In order to get the direct joining, after the condensator has been charged, the dielectric is opened by joining the lightning conductor frame (which have the same voltage as the atmosphere at this moment) to the earth so that it is obtained a total discharge of the lightning stroke which no need for this same lightning stroke to pass through the energy block. In other words, the energy block remains undamaged with regards to a possible breakdown, during the discharge. Once this operation is finished, the dielectric comes back to its former position (closed) and therefore the lightning is ready again to start a new cycle.

### DIAGRAM OF THE ENERGY BLOCK



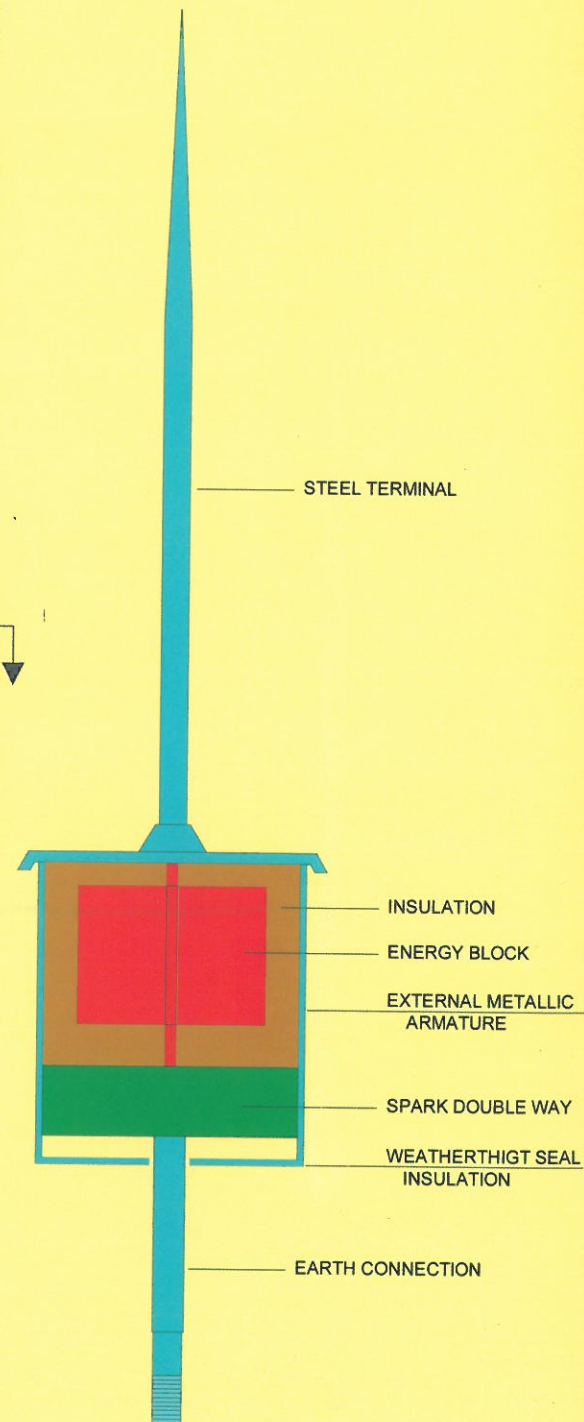
### SYSTEM INSULATION

The insulation and the weathertightness of the different parts of the APOLLO system are very important. The set is provided with an insulation when suffering the atmospheric incidences such as rain, ice, snow winds, etc. and it is also free from possible alterations of the received electrical discharges.

There is a second insulation preventing even possible pollution that might affect the system.

### SPARK DOUBLE WAY BY VERTICAL SLIDING

The APOLLO is provided with a set of spark double way with different performance, being the principal one the vertical-sliding spark way. It is formed by very thin circular curbs, which get their maximum performance speed at the moment of starting between the insulated part of the system and the one at earth voltage. Likewise, this vertical way position avoids the possibility of altering the field by directional changes that may affect the system speed and effectiveness.

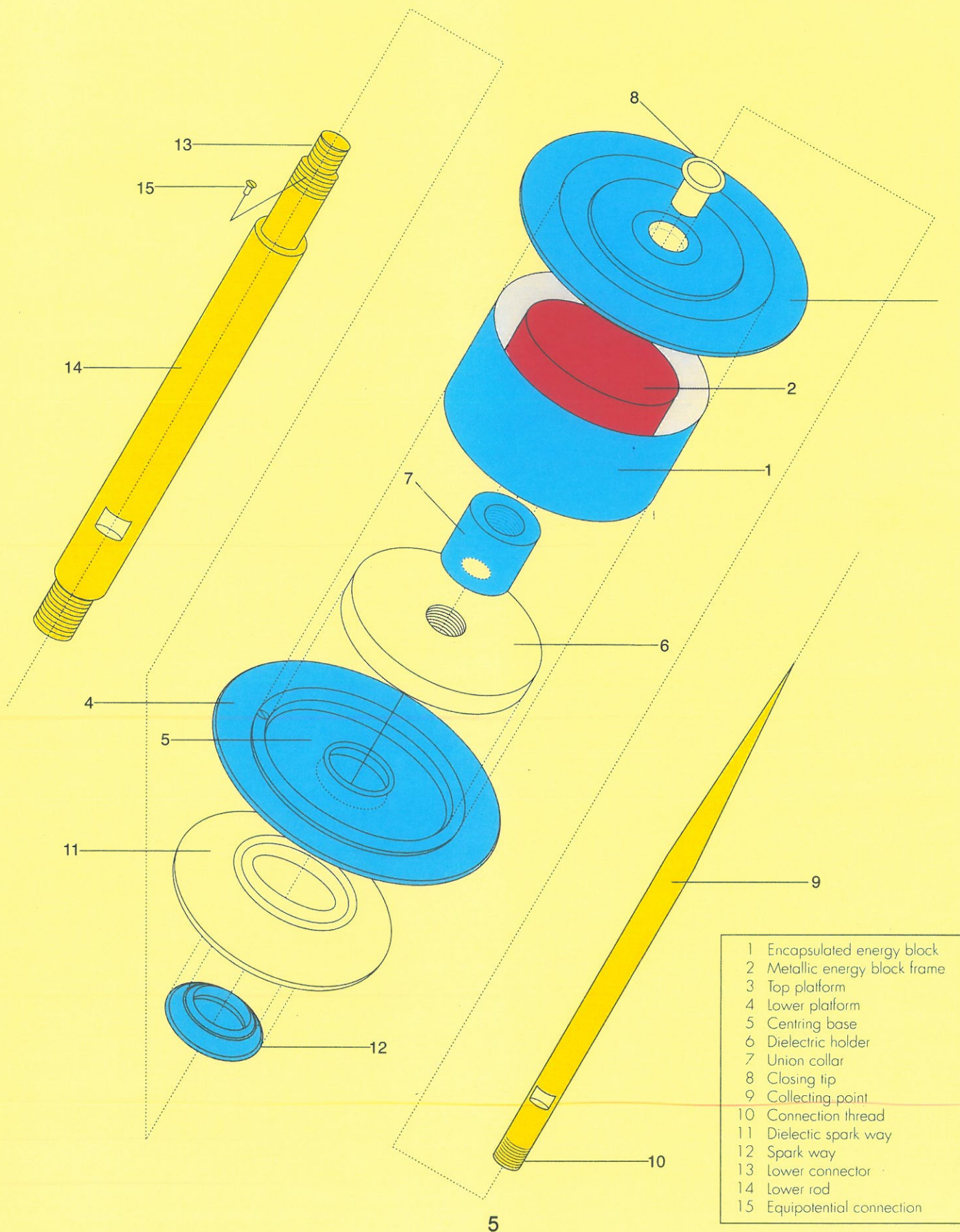




# ⚡ APOLLO ⚡

## LIGHTNING CONDUCTOR SERIES

### EXPLODED VIEW OF THE APOLLO DEVICE



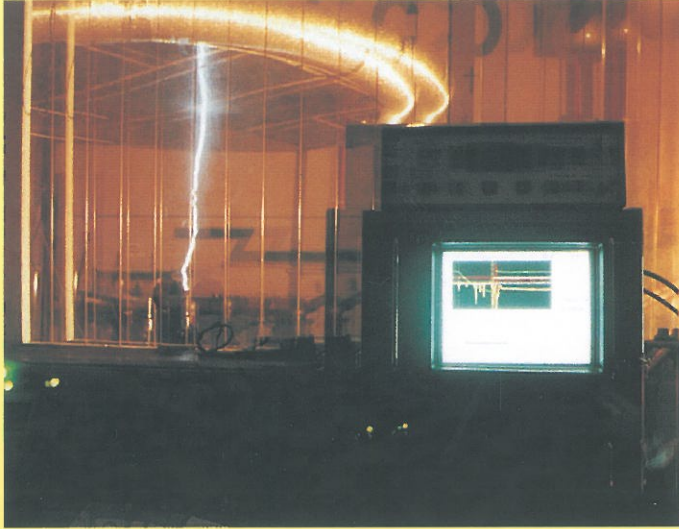


# **APOLLO**

## **LIGHTNING CONDUCTOR SERIES**

### **ACTIVE SYSTEM WITH TRIGGERING DEVICE**

**SENSOR:** Formed by triple protection system. With double triggering device of environmental wa-tertight insulation.



**ELECTROATMOSPHERIC CONDENSER:** The Apollo has an external housing isolated with regard to its central shaft connected to the earth. Forming a natural condenser in function of the surrounding electric field, with two spark gap, one in controlled atmosphere and another in environmental atmosphere.

**SYSTEM OF HAVING FEB:** The Apollo has a generating transformer of electric impulses of high tension, with alternating operation,

depending on the surrounding electric field.

For a bigger understanding we will explain the exposed points previously.

**INITIATION POINT:** It is where the descending tensions meet with the clouds and the tensions taken place from the earth by difference of electric potential.

**UPWARD TRACER:** They are the electric effluvium emitted by favourable points from earth toward the stormy clouds.

**DESCENDING TRACER:** They are equally the electric effluvium that go toward the earth from the stormy clouds.

**ATMOSPHERIC GRADIENT:** It is the generating tension in the discriminatory space.

**IMPACT POINT:** Taken place in earth by the fall of a lightning or spark gap.

**TIME OF ADVANCE:** It is the anticipation of electric effluvium forming a tracer or upward leader with regard to the other surrounding critical points.

**DISCRIMINATORY SPACE:** It is the area understood between the stormy clouds and the earth.

**FAVOURABLE POINTS:** They are those dominant points in earth but high and generally sharp that have a bigger probability of emissions of electric effluvium and lightning fall for their characteristics.

**SPACE TO PROTECT:** It is the volume that demands a protection against the effects of the lightning, for their high occupational density and importance of their content.





## LIGHTNING COUNTER EXPLANATION

### PRINCIPLE (原理)

The lightning event counter functioning principle relies on a device located around the down-conductor, which has also a transformer-performance, and a conditioning system that eases the counting a device activation.將避雷接地線穿過計數器的中間圓孔，當雷擊時，大量電流建立的磁場會經過計數器的鐵芯及線圈，在鐵芯及線圈會產生感應電壓及電流，當電壓超過預設數據時，會推動計數器跳一碼。

### TECHNICAL DATA (技術資料)

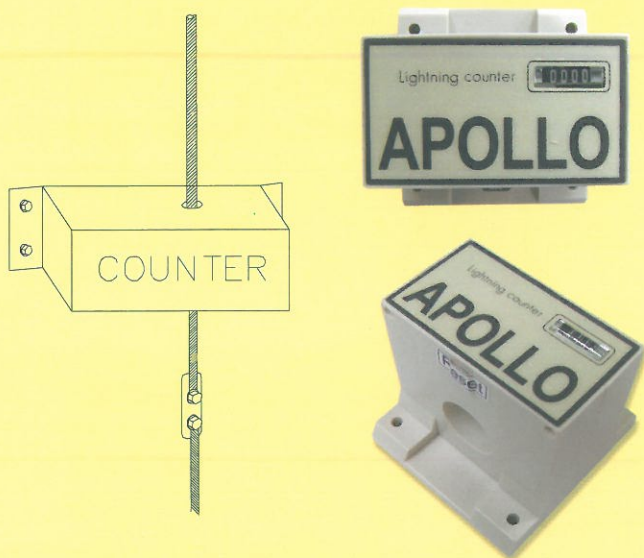
Model	型號：	APOLLO
Minimum working discharge to start counting	最小動作電流：	250A
Maximum counting discharge	最大故障電流：	200KA
Counting range	計數量範圍：	0...9999 or 0...9999999 (訂製品)
Maximum diameter of the earth conductor	最大接地線徑：	26mm
Degree of protection provide by the enclosure	耐環境等級：	IP68
Temperature range	耐溫度：	-5...+50°C
Dimensions	尺寸：	See drawing
Weight	重量：	250g

### INSTALLATION AND PICTURE (安裝方法及外觀)

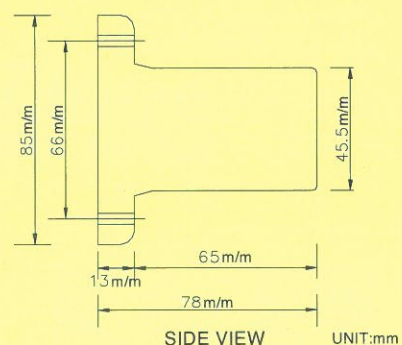
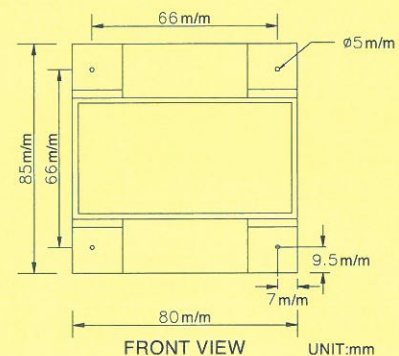
將避雷接地線穿過計數器的中間圓孔，將計數器固定在配電盤內或明顯的地方。

Easy to install.

The counter APOLLO is easy to install. It is installed on a flat surface by means of two screws. The earth conductor is passed by the central hole of the counter before being connected to the earth. The counter proceeds to detect the amount of energy discharged to earth and increases in one unit the value showed at the display.



### DIMENSIONS (尺寸詳圖)



### NO POWER SUPPLY REQUIRED (不須外來電源)

APOLLO does not require any power supply, neither external nor internal (batteries, for example). It provides a high level of autonomy for this equipment. APOLLO雷擊計數器不須外來電源供應 (例如：電池或其他電力)



# PROTECTION PERFORMANCE

MODEL	Protection radius(m)							
	h=height of conductor(m)							
	2	3	4	5	6	8	10	15

## LEVEL 1

※

S 1	14	22	29	37	37	38	38	39
S 2	18	28	37	47	48	48	48	49
S 3	23	34	46	58	58	58	59	59
S 4	27	40	54	68	68	68	69	69

## LEVEL 2

※

S 1	17	25	34	43	43	44	45	47
S 2	21	32	43	54	54	55	56	58
S 3	26	39	52	65	65	66	67	68
S 4	30	45	60	75	76	76	77	78

## LEVEL 3

※

S 1	20	30	40	51	52	53	54	57
S 2	25	37	50	63	64	65	66	68
S 3	30	45	60	75	75	76	77	79
S 4	34	51	68	86	86	87	88	90

## LEVEL 4

※

S 1	23	34	46	58	59	60	62	66
S 2	28	42	56	71	72	73	74	77
S 3	33	49	66	83	84	85	86	89
S 4	38	57	76	95	95	96	97	100

The lightning conductor  $\Delta T$  value as follow :

MODEL	S 1	S 2	S 3	S 4
$\Delta T$	$20\mu s$	$30\mu s$	$40\mu s$	$50\mu s$

\*The advantage of installation height is 5meter.  
Protection radius are calculated according to the following formula UNE-21186(NFC 17-102).

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

and

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

$R_p(h)(m)$  is the protection radius at a given height h

$h(m)$  is the height of the PDC tip over the horizontal plane through the furthest point of the object to be protected.

$r(m)$  20m for protection level I

30m for protection level II

45m for protection level III

60m for protection level IV

$$\Delta = \Delta T \times 10^6$$

