

LIGHTNING PROTECTION FOR ROOFTOP SOLAR SYSTEMS



TOPBAS GRUP

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UMBRAECO

ESE LIGHTNING ARRESTER



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SOLAR PV SYSTEMS

The guaranteed 20 or more years service life for solar photovoltaic systems and their exposed installation sites, as well as the sensitive electronics of the inverter, require effective lightning and surge protection.

It is not only home owners that install a PV system on their rooftop, private companies are also making more and more investments in shared systems, which are erected on large-surface roofs, on various control structures, or unused open areas. Because of the big space requirements of the photovoltaic generator, PV systems are especially threatened by lightning discharges during thunderstorms.

Lightning events are one of the threats to electrical installations due to many atmospheric discharges during a lightning storm. These discharges can reach up to hundreds of kiloamperes.

Lightning does not only represent a hazard to the electrical installation but also to people, animals, buildings and electronic equipments. The negative economic consequences of lightning can be very high. Currently, despite the technological advances, no device is able to prevent lightning formation. However, Lightning Protection Systems (LPS) are able to minimize damage to the surrounding environment. Damage to electrical installations can come from a direct strike or from the induced over voltage (indirect strike).



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Protection needs trust, trust needs experience, experience needs knowledge.

Like thousands of people who trusted us, we are and will always be willing to protect people from the anger of mother nature.

With years and experience of rigorously expertising in lightning protection field, our enthusiasm and ambition are always vivid.

Because we protect from the Top.

Topbas Grup's products are manufactured under CE quality requirements and are subjected to significant field and laboratory testing and computer modeling.

During product development, the products are supported by test reports, patent, trademark statements, technical papers and installation guides. Topbus Grup has developed specialized designs to intergrate all aspects affecting system performance.

We smile with our clients!



NECESSITY OF A ROOFTOP LIGHTNING PROTECTION SYSTEM

Lightning can cause devastating damage to solar panels and protection needs to be considered during the design stages. The energy released by a lightning discharge is one of the most frequent causes of fire. Therefore, the personal and fire protection is of paramount importance in case of a direct lightning strike to the building.

Lightning strikes, whether direct or indirect, can identify and replace damaged parts. Direct strikes, while rare, would destroy (melt) panels, inverters, etc. Indirect strikes, which are more likely, would induce high voltages into the system breaking down conductors, PV panels and components as well as producing dangerous sparking that could ignite combustible material.

The fundamental principle of lightning protection is based on placing the solar panels within a zone of protection so that downward lightning leaders attach to streamers emanating from air terminals or other strike termination devices and is directed to ground rather than hitting the panel and/or other components of the solar system and causing damage.

“ Lightning is hotter than the surface of the sun and can reach temperatures around 50,000°F ”



Installing air terminals to protect PV panels can be tricky since you don't want to shade the panels and, if avoidable, you don't want to place the air terminals on the PV rack, since a lightning strike to the air terminal would place some of the lightning current on the panel that may result in damage.

All air terminals need to be interconnected and tied into a grounding ring electrode system for ground-mounted panels where the lightning current will safely dissipate into the earth. The metal rack on ground-mounted systems that are not part of the lightning protection system need to be bonded to the system to reduce side flashes or sparking to the solar panels.



ESE LIGHTNING PROTECTION for Rooftop Solar PV Systems

External lightning protection system design & installation is not a common practice for solar farms. The lightning protection of solar arrays by traditional franklin air terminals is still subject to concern regarding its effectiveness, shadow effect, installation cost and appearance. As an alternative to traditional franklin rod system, Early Streamer Emitter (ESE) type lightning air terminal may be utilized to protect rooftop solar pv systems and large solar farm area.

Umbraeco-15 ESE terminal provides large protection zones as per National French Standard NF C 17-102 (2011). The principle of operation of Umbraeco-15 ESE terminal is conventional air terminals or other objects on the earth Umbraeco-15 ESEAT does this by collection and storing ground charge during the initial phase of a thunderstorm development. Once a thunderstorm begins creating downward step leaders, the ambient electric field intensity in the area of the ESE terminal increases. When thus electric field intensifies, it triggers the terminal to release the ground charge, forming an upward streamer microseconds earlier than other objects in the immediate area. This development of an upward streamer earlier in time and space ensures that the Umbraeco-15 ESE air terminal will be the target of the developing lightning strike.



PROTECTION PERFORMANCE

The protection radius(R_p) of Umbraeco-15 ESE terminal is calculated using the following formula as defined in NF C 17-102 (September 2011), namely:

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

and

$$R_p = h \times R_{p5}/5 \text{ for } 2 \geq h < 5 \text{ m}$$

$$R_{p5} = \text{value of } R_p \text{ from Eqn.(1) when } h = 5 \text{ m}$$

$$r = 20\text{m for protection level I (Very High Protection)}$$

$$= 30\text{m for protection level II (High Protection)}$$

$$= 45\text{m for protection level III (Medium Protection)}$$

$$= 60\text{m for protection level IV (Standard Protection)}$$

and Δ = Triggering time advantage

$$\text{Umbraeco-15: } \Delta = 15\mu\text{S}$$

Protection radius as per NF C 17-102 (2011)

Mast height h(m)	Level I (D=20m)	Level II (D=30m)	Level III (D=45m)	Level IV (D=60m)
2	13	15	18	20
3	19	22	27	31
4	25	30	36	41
5	32	37	45	51
6	32	38	46	52
8	33	39	47	54
10	34	40	49	56
20	35	44	55	63
30	35	44	58	69
40	35	44	60	72

TECHNICAL FEATURES

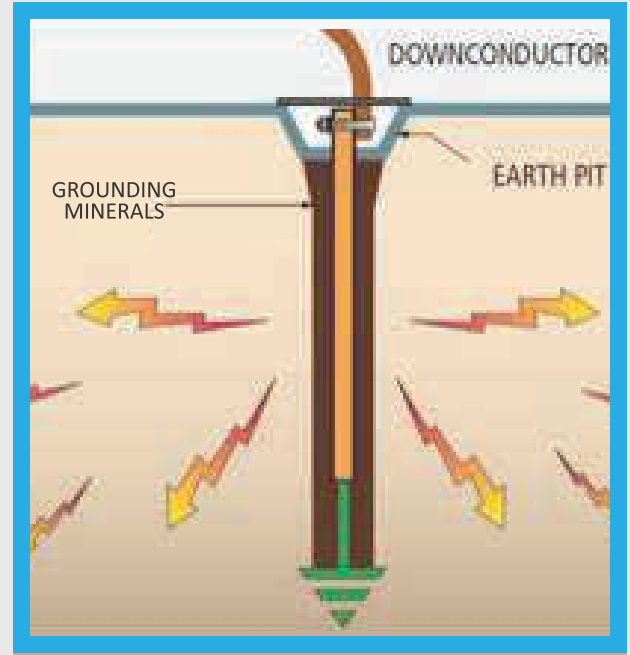
- Designed and tested according to NFC 17-102 (2011) Standards.
- 100 KA lightning current durability
- Certified under Middle East Technical University, Turkey
- ISO 9001 & 14001 certified
- No use of battery or external power source
- 304 L Stainless Steel (Inox) Design suitable for any environment condition
- All models including own mast brackets for grounding
- Suitable for use with a variety of Down conductor system, including tape, cable, smooth-weave, Isolated down conductors (ISODC)
- 20 years warranty

EARTHING / GROUNDING

Grounding is the most fundamental technique for protection against lightning damage. You can't stop a lightning surge, but you can give it a direct path to ground that bypasses your valuable equipment, and safely discharges the surge into the earth. Good earthings of lightning protection systems shall be able to withstand lightning currents and to disperse them quick and safely.

Each down conductor must have a dedicated earth termination system, formed by conductive elements in contact with the soil and able to disperse the lightning current in it. One earth termination per down conductor and minimum two electrodes / pits per termination is strongly recommended. For the lightning protection earthing, it is preferable to use vertical electrodes, 2 to 3 meters long, forming a triangle since this is the most adequate configuration for dispersing the impulse current of lightning as fast as possible.

Compliance to NF C 17-102 (2011) standard requires an earth DC resistance of 10 ohms for the lightning protection system. Copper bonded rods are preferred for the earthing system. Copper bonded earth rods made from high tensile low carbon steel with the molecular bonding of 99% pure electrolytic copper is generally used for the better conductivity and long life. To improve the soil conductivity (in turn reduce the soil resistance), grounding minerals are used along with the earth rods.



DISCLAIMER

Topbas Grup maintains a policy of continuous product development, research, specifications are subject to change without notice.

It is declared that 100% protection for direct strike lightning protection, surge and transient protection is not possible and cannot be provided due to the lightning discharge process being a natural atmospheric event.



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