



Active Lightning Protection System





LEESAS

LEESAS ENERTECH, an ISO 9001, 14001 & 45001 company with experience since 2005 in the field of lightning protection system. Over the years, the company has earned a reputation for excellence and professionalism for continuously striving to meet and even exceed standards which set the climate for a sustainable business relationship with its clients.

We firmly believes that electricity is the cornerstone of a high-quality life. There will be a never-ending need for products and services to harness and maximize its full potential and use. In doing so, we will be the best-in-class provider of topnotch electrical products and services.

LEESAS ENERTECH is committed to providing the highest quality products and services exceeding our client's expectations. We shall continue to expand in equipment, facilities and engage in training and certification programs to further serve customers with utmost excellence and professionalism.

OUR VALUES

We believe sustainable partnerships are essential to the company's success. As a proactive company capable of competing in all facets of the marketplace through constant improvement with innovation and guarantees a safe working environment.

ENGINEERING

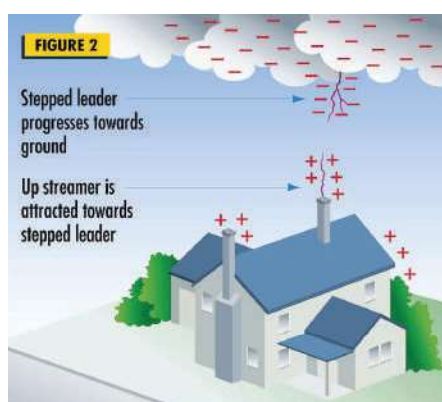
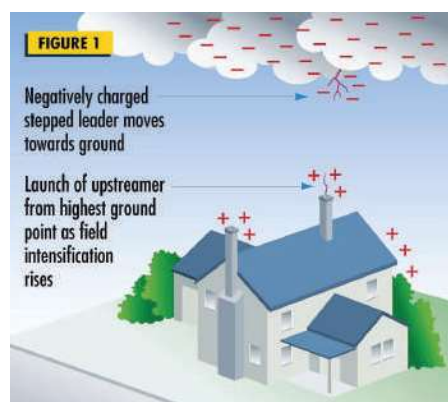
- Site surveys, engineering calculations and project preparing.
- 24/7 available for technical support.
- Highest precision with the help of latest technology machinery.



LIGHTNING

Lightning is one of nature's most powerful and destructive phenomena. Lightning strikes present a real and significant threat to life, to the structures in which we live and work, and to the electronic systems which support us in our daily lives. Every day, an average of around 8 million lightning strikes discharges over the earth, which is the equivalent of about 100 lightning bolts that strike the Earth's surface every second. Indeed, meteorologists may forecast the general conditions that cause lightning, but no one can predict the exact location and time of future lightning strikes. Nevertheless, lightning detection and monitoring are very important to improve public safety, warn of potential wildfires, and protect electrical systems.

While it's still challenging to completely prevent lightning discharges - no devices or methods can modify natural weather phenomena to that extent, we must work to mitigate risks. Lightning strikes to or nearby structures, as well as connected power lines, pose significant hazards to people, lives, buildings, installations and lines. This is why implementing Lightning Protection measures becomes all the way more important. National and International lightning protection standards now emphasize the need for a comprehensive solution. This includes structural lightning protection, internal protection using Surge Protection Devices (SPD) and proper equipotential bonding, ensuring a robust defense against lightning-related threats.



LIGHTNING PROTECTION SYSTEM

The purpose of a lightning protection system is to prevent property damage, fire, and personal injury from both the direct effects of a lightning strike and the secondary effects like electrical surges. By providing a low-impedance path to ground, the system directs the lightning current away from the structure and its contents, minimizing the risk of damage.

Air-termination system	Provide a low-resistance path for lightning current to flow into the ground which includes lightning rods, air terminals, and conductors.
Down conductors	Carry the lightning current from the air-termination system to the earthing system and offer a low-resistance path for the current.
Earthing system	Dissipate the lightning current safely into the ground.
Surge Protective Device (SPD)	Protect sensitive electronic equipment from transient over-voltages caused by lightning.
Equipotential bonding	Prevent dangerous potential differences during a lightning strike by ensuring all conductive parts within the structure are at the same potential.

ACTIVE LIGHTNING PROTECTION SYSTEMS

The Early Streamer Emission (ESE) Lightning Arresters offer a safe and reliable system to protect your buildings or solar pv projects from direct lightning strikes. The ESE Air Terminals, also known as Active Lightning Arresters provide an enhanced area of protection, thus by reducing the number of conventional (Franklin rods) lightning rods, down conductors and multiple earth pits, needed for the building or solar pv farms, while still providing complete protection against direct lightning strikes.

FUNCTIONING OF ESE AIR TERMINAL

In normal conditions, the ESE air terminal stays in a standby/idle mode and no discharge occurs. When a storm forms, there is an increase in atmospheric electrical potential that can exceed 10kV/meter quickly. The ESE internal design acts as an electro-atmospherical triggering mechanism, which is formed by the outer metal casing and the earthed central finial.

With this increase of potential, two things happen at the same time; the first is that a downwards stream is created from the clouds to the ground, and the second is that an upward artificial stream is created by the ESE air terminal. This ascending stream intercepts the descending one, guiding the electric discharge through the lightning rod and conducts it to the ground safely.

The time that the upward stream of an ESE lightning rod forward to a stream created by any passive element, such as a Franklin rod, is what determines the radius of protection. This is what is known as advance time or triggering time (ΔT). Therefore, there are different ESE models with different advance times depending on the meters of protection needed in each case. As per NF C 17-102:2011 standard, the ΔT of an ESE air terminal should be atleast $10\mu s$ (atleast $10\mu s$ faster than the normal franklin rod) and maximum cut-off limit of $60\mu s$.

The protection radius of an ESE air terminal is calculated as per NF C 17-102:2011 standard, with the ΔT arrived from the test results. Level of protection (I, II, III, IV) is selected during the risk assessment procedure. The maximum protection radius shall not exceed 120 mtrs (Class IV protection) with the maximum permissible/cut-off triggering time advance (ΔT) of $60\mu s$.



RISK ASSESSMENT

The procedure for calculating the risk factors is described in Lightning Protection Standards. The result determines the need for installing a Lightning Protection System and its degree of security. The risk assessment compares the expected lightning incidence with the assumed probability of lightning strike on the structure. The rate between these two factors indicates which Lightning Protection System is needed and the security grade. This value depends on several tabulated factors, such as structure type and its contents and sometimes other considerations may be taken into account, improving the protection level over the risk calculations.

The need for the protection level often depends on subjective criteria, since the protection level depends on the "acceptable number of strikes on the structure", which can always be limited to adopting level 1, the safest and most effective. Protection level is thus related to the accepted probability of a lightning strike to a structure.

A lower protection level intercepts lightning with a high associated current, but a flash with a low current could avoid the Lightning Protection System and strike the structure. If the Protection level is very high/Level 1 (the lower protection radius) then the system will also intercept the lower current lightning strikes.



STANDARDS CONSIDER THAT LIGHTNING PROTECTION REQUIRED FOR

- ⚡ Any installation or machinery that is used for working
- ⚡ Large concentrations of people
- ⚡ Continuity needs in production or public services
- ⚡ Areas with high lightning density
- ⚡ Very high or isolated buildings or infrastructure
- ⚡ Buildings containing explosive or inflammable materials
- ⚡ Buildings containing irreplaceable heritage

AREA PROTECTION

The protection radius (R_p) of a LEESAS ESE terminal is calculated using the following formula as defined in NF C 17-102 (September 2011)

Where $h \geq 5$ m, then R_p can be calculated from

$$R_p(h) = \sqrt{2rh - h^2 + \Delta(2r + \Delta)}$$

Where $2 \text{ m} \leq h \leq 5 \text{ m}$, then R_p can be calculated from

$$R_p = h \times R_p(5) / 5$$

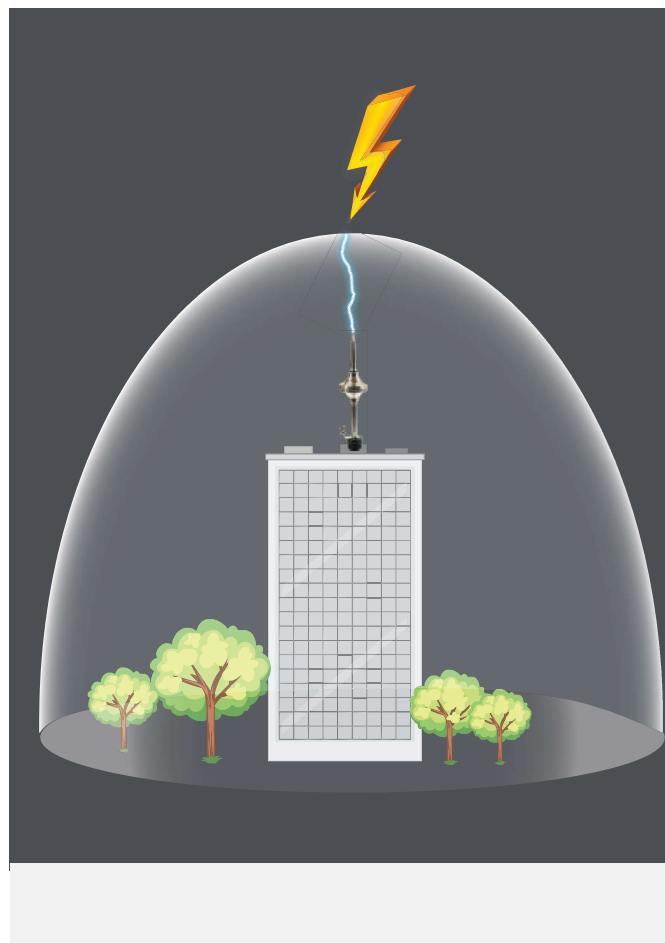
$R_p(h)$ (m) is the protection radius at a given height h

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

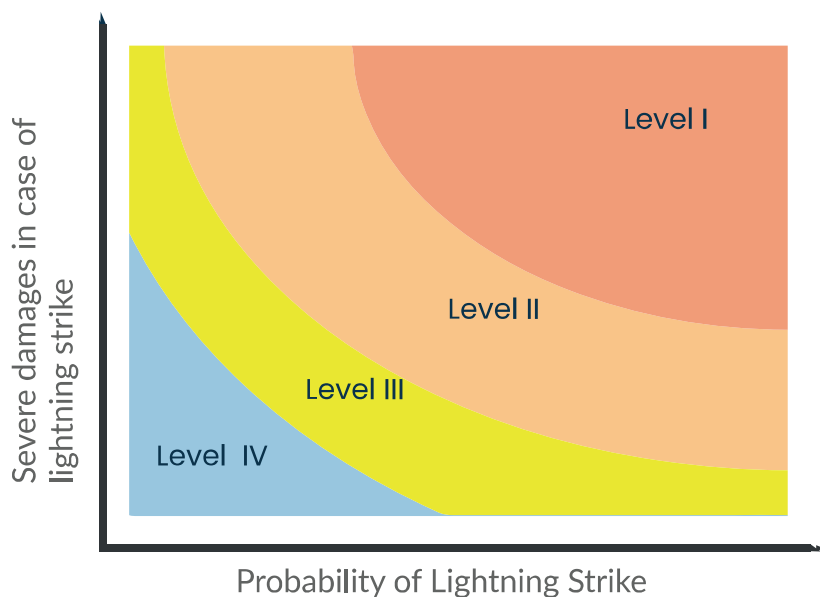
r (m) 20 m for protection level I
30 m for protection level II
45 m for protection level III
60 m for protection level IV

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

Field experience has proved that is Δ equal to the efficiency obtained during the ESEAT evaluation tests



LIGHTNING PROTECTION LEVEL



Disclaimer

- ⚡ LEESAS maintains a policy of on-going product development, specifications are subject to change without notice.
- ⚡ Application detail, illustrations and schematic drawings are representative only and should be used as guides.
- ⚡ It should be noted that 100% protection for direct strike lightning, lightning detection and surge and transient protection equipment is not possible and cannot be provided due to the lightning discharge process being a natural atmospheric event.

STORMFLASH 60 ESE LIGHTNING ARRESTER

Design

- Non-Electronic ESE
- No use of battery or external power source
- 304L (Inox) Stainless Steel - suitable for any environmental conditions

Testing

- Tested & certified for
NF C 17-102 (2011) standard
UNE 21186:2011 standard
- Mechanical Test
- Environmental Test
 - a) Salt Mist Test- 3 Cycles - 72 Hours
 - b) Humid Sulphur Test - 7 Cycles - 168 Hours
- 200 kA (10/350 μ s) Lightning Impulse Current Test
- $\Delta T = 60 \mu$ s - Early Streamer Emission Test
- CPRI (Central Power Research Institute Govt of India) - 70 kA (8/20 μ s) tested

Usability

- Suitable for use with a variety of down conductors - tape / strip, round conductor, isolated / insulated cables / High Voltage Shielded Cables, etc.



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

Mast Height h (m)	Level I Very High	Level II High	Level III Medium	Level IV Standard
2	31	35	39	43
3	47	52	58	63
4	63	69	78	85
5	79	86	97	107
6	79	87	97	107
8	79	88	98	108
10	79	88	99	109
15	80	89	101	111
20	80	89	102	113
45	80	89	105	120

STORMFLASH 15 ESE LIGHTNING ARRESTER

Design

- Non-Electronic ESE
- No use of battery or external power source
- 304L (Inox) Stainless Steel - suitable for any environmental conditions

Testing

- Tested & certified for
NF C 17-102 (2011) standard
UNE 21186:2011 standard
- $\Delta T = 15 \mu s$ - Early Streamer Emission Test
- CE certified

Usability

- Suitable for use with a variety of down conductors - tape / strip, round conductor, isolated / insulated cables / High Voltage Shielded Cables, etc.



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

Mast Height h (m)	Level I Very High	Level II High	Level III Medium	Level IV Standard
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

LIGHTNING STRIKE RECORDER

Lightning strike recorder is designed to count and record the lightning strikes captured by lightning protection systems such as ESE lightning rods, simple capturing rods and the cage method. The Lightning strike recorder is necessary to determine whether the lightning rod received any lightning strikes.

The counter is connected to the down conductor of the lightning arrester and therefore it detects the electromagnetic field caused by lightning discharge current and it counts each strike and shows it by way of the number display.

With the help of the Lightning strike recorder the customer can follow the number of lightning strikes arrested by system. It does not require any additional power supply for its operation.

Technical Features

- IP 65 rated enclosure suitable for external application
- Ease of installation, LS-LSR6 can be retrofitted to any lightning protection system
- Non-intrusive and fast acting proximity circuit detects lightning transient currents
- Non resettable electro-mechanical counter
- Can be mounted at any location along the down conductor



Model	LS-LSR6
Description	Lightning Strike Recorder
Display Model	Electro mechanical display (non re-settable)
Current Sensitive Mode	Inductive Probe (Built - In)
Operating temperature (°C)	-20 ~ +85
Current Sensitivity (8/20 μs)	250A
Lightning Current (10/350 μs)	100 KA
Indicator	6 Digits
Degree of protection	IP 65 (IEC 529)
Enclosure Material	Plastic
Dimension of Counter (cm)	16 (L) X 9 (W) X 6 (H)
Testing Facility	Testing Jack inbuilt in Counter and Customer can test anytime in field

LIGHTNING FLASH COUNTER

Lightning flash counter is designed to count and record the lightning strikes captured by lightning protection systems such as ESE lightning rods, simple lightning rods and the cage method. The lightning counter is necessary to determine whether the lightning rod received any lightning strikes.

The counter is connected to the down conductor of the lightning arrester and therefore it detects the electromagnetic field caused by lightning discharge current and it counts each strike and shows it by way of the number display.

With the help of the lightning counter the customer can follow the number of lightning strikes arrested by system. It does not require any additional power supply for its operation.



Technical Features

- IP 67 rated enclosure suitable for external application
- Ease of installation, Flashcount can be retrofitted to any lightning protection system
- Non-intrusive and fast acting proximity circuit detects lightning transient currents
- Non resettable electro-mechanical counter
- Can be mounted at any location along the down conductor

Model	Leesas Flashcount
Description	Lightning Flash Counter
CPRI Test	70 kA (8/20 μ s)
Display Model	Electro mechanical display (non re-settable)
Current Sensitive Mode	Inductive Probe (Built - In)
Operating temperature (°C)	-20 ~ +85
Current Sensitivity (8/20 μ s)	250A
Lightning Current (10/350 μ s)	100 KA
Indicator	6 Digits
Degree of protection	IP 67 (IEC 529)
Enclosure Material	Plastic
Dimension of Counter (cm)	16 (L) X 9 (W) X 6 (H)
Testing Facility	Testing Jack inbuilt in Counter and Customer can test anytime in field

LEESAS ESE TESTER

Proper testing of the lightning protection system can ensure that the structure and all its elements are safe from the effects of the lightning strikes. The standards insist that a competent or authorised person should carry out these inspections. A detailed report that includes the findings of the test and recommendations for further protection is obtained after every test. The recommendations provided must be considered, ensuring the required maintenance and upgrades are done. This will ensure the complete protection of the lightning protection system.

Description

LEESAS ESE Tester constitutes an advanced tool for analysing Early Streamer Emission (ESE) Air Terminals. The ESE tester has been specifically designed for testing LEESAS make ESE air terminals (lightning rods).

Advanced portable device for analysing LEESAS series lightning rods.

Applications

- Several lightning protection standards recommend the realization of periodic inspections of the lightning protection installation and its components.
- These standards also recommend or establish the need for conducting maintenance actions after the occurrence of lightning impacts on the lightning protection system.
- LEESAS ESE Tester permits the execution of proper functional analysis to detect any abnormality in the ESE lightning rod behaviour.



Recommendation

- LEESAS ESE Tester requires a good electrical contact between its test leads and the lightning rod terminals. It is a requirement to have direct physical access to the lightning rod to be able to test it.
- The tester has been designed and optimized for testing lightning rods from the LEESAS series only. Its use for any other type of application, purpose, or for testing any other type of lightning rod is strictly forbidden. LEESAS ESE Tester has been designed for indoor applications. Outdoor use is only recommended under good weather conditions (clear sky).
- LEESAS strongly advises that lightning rod tests must NEVER be conducted under stormy or cloudy weather conditions or when atmospheric electrical activity is detected.
- Lightning terminals work as transfer the electric current from the lightning to the earthing system. For a complete system both of lightning terminal and earthing lines should operate correctly. Electric transfer units withstand high level of electrical charges on sudden strikes then conveys it to the earthing transmissions.
- Tester calculates if the current transmission system operates correctly to the earthing lines. To do this, it applies a small portion of electrical charge to the system and confirm if the huge lightning strikes conveys in a correct way.

LEESAS ESE AIR TERMINAL TESTING PROCESS



- Be sure that the battery (9V) is in working condition.
- Press the power button to "ON" position.
- The tester clip (with black wire) shall be connected to the central finial.
- Press the "Pulse" button and hold it.
- When the Red wired probe is touched to the body of the ESE air terminal, the LED will glow in "RED" colour. This indicates the proper functioning of the ESE air terminal.
- RED colour LED indication - The dielectric strength between the central finial (directly earthed through a down conductor) and the body of the terminal is well insulated and maintained to generate an early streamer, at the time of lightning.
- When the Red wired probe is touched to the bottom part of finial of the ESE air terminal, the LED will glow in "GREEN" colour. The pulse is transferred from the top to bottom without any loss inside the body.
- The tester can be used for all the ESE air terminals manufactured by LEESAS.