

ABOUT US

The Liva Group Electric, Electronic, Construction, Contracting, Manufacturing and Trade Limited Co. was established in Izmir at the beginning of 2000's.

Liva Group, which operated in the fields of Electric and Automation in the first years, started works related to the manufacturing sector in the following years and concentrated the first product designs on the Lightning Protection Systems. As a result of long studies, the company finished product works related to Active Lightning Rods in 2003 and by accomplishing the tests and designs, the first "Liva Active Lightning Rod Prototype" was produced. In the same period, as a result of the talks with Middle East Technical University, the product was undergone to Negative (-) and Positive (+) high voltage strokes on various voltage degrees in the High Voltage Laboratories of METU Electric Electronic Engineering Section and achieved the approval of concerned association at the date of 01 JULY 2003.

Our company applied the Turkish Patent Institute Trademarks Department for registration of the Liva Trademark and our trademark was registered in the name of our company on 01 March 2004.

The Liva Group, which is growing in the field of Electric Automation and Production day by day, completed the studies of institutionalizing as well and our company reached its incorporated body as the Liva Group Electric, Electronic, Construction, Contracting, Manufacturing and Trade Limited Co.

The Liva Group, that has chosen quality as the first aim in the products which have been manufactured by it, keeps on presenting its quality with the certificates it has taken. For this purpose, 25-year-guarantee certificate was given to the Lightning Rods by Ministry of Industry and Trade General Directorate for Protection of Consumer and Competition. At the same time, the Lightning Rods were tested second time at the standard of NFC 17-102 (Appendix C) in the High Voltage Laboratories of METU Electric Electronic Engineering Section and achieved the approval of concerned association at the date of 20 MARCH 2007.

By getting the Radioactive Lightning Rod Disassembly Certificate, The Liva Group, at the same time, became one of the numbered authorized companies on this matter after The Turkish Atomic Energy Agency prohibited the Radioactive Lightning Rods. The company completed its Quality Management System Studies in AUGUST 2004 as well for maintaining the competition in the home and foreign market within the framework of the European Union, providing production and control at the healthy standard quality, increasing customer satisfaction and market share and deserved to

get the TS EN ISO 9001: 2000 Quality Management System Certificate.

TS EN ISO 9001: 2000 QUALITY MANAGEMENT SYSTEM

Our Quality Policy: To provide confidence and satisfaction of our customer, to educate our personnel continuously with the principle of "The best manufacturing is made with the best personnel; the most aware personnel are gained with good education", to make the quality a life style with the quality management system that we establish, save the environment and to give priority to national interests over pride while doing our activities.

Our aims: To increase the trust and satisfaction of the customer with the quality management system that we establish, to develop the service on every direction as if we abide the time the most, to provide educational level of our personnel with the training programs dependent on the technological improvements, to improve the products continuously manufactured by the name of the Liva Group under the principal of "for better every time".

L VA GROUP ACTIVITY FIELDS

The Liva Group displays activity in four different branches of business.

- Electric Systems
- Automation Systems
- Security Systems
- Lightning Rod and Grounding Systems

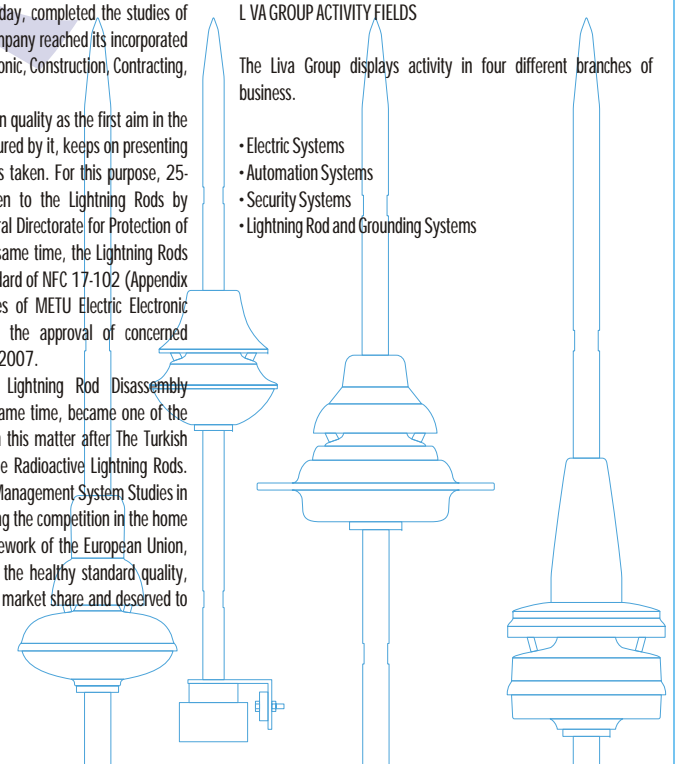


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GENERAL INFORMATIONS

LIVA ACTIVE LIGHTNING ROD GROUNDING SYSTEMS

1- DEFINITIONS RELATING TO
LIGHTNING

Lightning : Electrical discharge between an electric charged cloud and earth.

Flash : Electrical discharge between an electric charged cloud and another cloud.



2- FORMATION OF A LIGHTNING

For the formation of a lightning, first of all the formation of a lightning cloud and then electrically charging of this cloud are required. At the present day, even if the formation of a lightning cloud can be explained with ease, there is no definite information about how this cloud charges electrically. But this situation can be explained with some theories today.

2.1- Formation of a Lightning Cloud

Presence of high amount of moisture in the atmosphere and formation of charged clouds with the help of hot air currents is the exit point of lightning discharge. Air currents come into being by greatly heating of air layers close to the ground. This air layer switches its place with cold air coming down from very high altitudes. Moisture forms by evaporating at high temperature. Air cools while going up and reaches to a temperature to saturate with water vapor at a specific altitude. Rising upwards more causes condensation and clouds come into being. Three stages are point at issue in formation of lightning cloud.

Youth; At this stage, air currents increase from bottom to top and edges to center. This situation lasts about 10-15 minutes.

Maturity; Rainfalls form at this stage. Cloud bearing force which decreases relatively at temperatures close to zero causes heavy rainfalls. In the meantime, cold wind moving from top to bottom are seen. This situation lasts about 15-30 minutes.

Old Age; At this stage, air currents come to an end anyhow. This situation lasts about 30 minutes.

2.2- Formation of electric charges in lightning cloud

It is not known clearly how electric charges form in lightning clouds yet. Along the history, it has been tried to explain the charging of clouds with various theories on this matter. Simpson and Lomonosow are two scientists who researched how electric charges form and defended the same theory on this matter. According to these two researchers, charges in clouds form with the help of air current. Air current which results from switching of hot and cold air stimulates water droplets in clouds. Moving water droplets charge by rubbing each other. Air currents in clouds cause water droplets to diffuse and combine again. In the laboratory studies, it is observed that small diffusing droplets are charged negatively and big diffusing droplets are charged positively.

According to this information, big water droplets or positively charged droplets must take place on the bottom layers of the cloud but small negatively charged droplets must be pushed by wind and diffuse in the upper parts of the cloud.

If it is accepted that charges in the lightning cloud form in this way, lightning discharge will be positively discharged as well because the bottom

parts of the cloud charge positively. The observations being done show that positive polarized lightning discharges are near 5-20% and approximately 80-95% of discharges are polarized positively. So Simpson and Lomonosow's theory can't explain thoroughly the forming of electric charges in the lightning clouds.

A second theory on this matter was asserted by Elster and Geitel. According to them, the charging of clouds is explained by effective electrification. If the electric charge on the Earth is accepted -5X10⁵ C, the water droplets in this charge are polarized positively on the lower edges and negatively on the upper edges. The big water droplets which are falling down by the effect of gravity get close to the ions of the quite slowly moving air and in the meantime while the positive bottom edge of the water drop is absorbing the negative ion of the air, it also pushes the positive ion. In this way, heavy water droplets become negative electrified particles. While the tiny water particles which are polarized in the same way are moving upwards, they absorb the positive ions of the air and push the negative ions. So, light water droplets become positive electrified particles, too.

According to this theory, there are negative charges in the bottom parts of the cloud. Although the theory seems to explain the negative polarized lightning discharges, in fact there are some lacking sides. If it is thought that a lightning cloud is made up of ice crystals and snow particles more than water droplets, the probability of polarization of these ice crystals and snow particles is rather low with the electrified area of the cloud.

A third theory on this matter was asserted by J.I. Frenkel. According to Frenkel, because the ions marked with both signs exist in the air, negative electric charges of the world are inclined to escape and combine with the positive electric charges of the ionosphere. This means that there must be an event to reinforce the increasing electric charge of the world continuously. Negative lightning discharges provide the most important role in stabilizing the electric charge of the world. According to this theory, an ambience which is composed of tiny water droplets or ice crystals and air which is composed of ions marked with both signs are considered and it is assumed that the negative ions of the air are put into the smaller water droplets or ice crystals. According to this, the cloud is made up of negative electrified water droplets and air with positive ions. (Negative ions were merged by water droplets.)

Whether the theories are different, the essence is that the occurrence of natural events like lightning and flash and their effects are very forcible in deed.

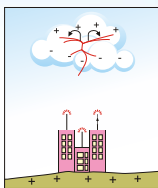
2.3- Formation of lightning

Charging of cloud electrically and all of the nature events like lightning and flash are defined as "orage" in meteorology language. The point must be known that as every cloud will not make orage, they can't realize orage unless sufficient conditions form in clouds that have possibility of making orage. Approximately a 500kV/m-electrical field is existing in an orage cloud. This generates very forceful vertical movements and forces. If a cloud like this approaches to the Earth sufficiently and atmospheric conditions (heat, moisture etc.) are suitable, the physical conditions for the formation of lightning become fulfilled in the state of forming potential difference to exceed the penetration margin of the air in the cloud. For the formation of a lightning discharge, electric field strength needs to reach the value of approximately 2500kV/m. If the value of electric field strength in an orage cloud increases enough, cloud-to-cloud or cloud-to-earth discharge can be seen. If the field strength on the Earth was dispersed because of various reasons (rough

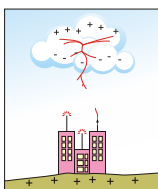
GENERAL INFORMATIONS

structure of the Earth, buildings, tall towers, skyscrapers, etc.), in that case, cloud discharge of the Earth can be seen.

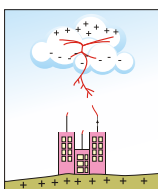
The discharge of a lightning from the Earth towards air or from air towards the Earth is still discussed; there is no change in its effects in both situations. Generally, the suitability of space electric charges plays an important role in this matter. The discharge to the Earth doesn't become constant in lightning event. When the energy comes to an enough level in the lower part of a cloud, an electron bunch moves to earth in gradual forward jumps with short or long periodical pauses.



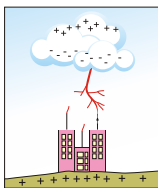
The bunch of electron covers a distance of 10 to 100 in every jump and its average speed is 30.000 – 150.000 km/sec (~ 16% of velocity of light). The pause period between the jumps is observed between ~ 30 – 90 μsec. This electron movement forming from the cloud-to-earth is defined as "leading discharge" or "corona discharge". When the lightning starts to approach to the earth, the electric field strengths which are condensing on the peaked points of the earth make discharges emerging from these points to clouds and are defined as "capture discharge".



The advancement speed of capture discharges depends on being supported with electric charges especially the discharge canal. (In other words, it depends on the active support of capturing ends.) Although the electric load amount which charges in a lightning event is below A.s (1 coulomb), 10-20 A.s discharges had been observed in forceful lightning. It had been ascertained that this value can seldom rise to A.s values.



Generally, in result of forming electric charges and load separation event, leading discharge of the cloud is made up of negative space loads. While this conductive canal combines with the capture discharge (positive loaded) rising from the earth, main discharge event forms that this event forms by getting through a single conductive canal not with jumps. Second and third discharges may follow this. The lightning event isn't an ultrasonic event. It is a unipolar shock discharge and a direct current stroke that exists shortly and it is ascertained in the observations that it is to the value of 100 million volt 5-200kA.



3. EFFECTS OF LIGHTNING

The lightning can discharge with a potential difference increasing up to 100 million volt and a current going up to 200.000 ampere according to the power during discharge. Effects which an electric stroke with power like this may be rather destructive. These effects of a lightning may be analyzed with

the topics below generally.

3.1. Electrodynamical Effects

In case that a part of lightning current path is in the magnetic field of another part, major forces form. In result of this effect, events like bruise on thin antenna pipes, collision on parallel conductors, dismantling of conductive crochets occur.

3.2. Pressure and Sound Effect

By diminishing of this current, the pressure resulting from electrodynamic forces in the lightning canal forms thunders by expanding the air in the form of blast. This noise may create blast effect to people nearby. Events like breaking glass may be encountered. Forming rather huge and sudden expanding of heat energy is another cause of thunder.

3.3. Electrochemical Effect

As a result of electrolyte break-up, metals like iron, zinc, lead come out in huge current force.

3.4. Illuminating Effect

The conductive canal formed during the lightning discharge emits a very luminous light around. This light may form dazzle or temporary loss of vision in close distance.

3.5. Thermal Effect

Thermal Effect of the lightning discharge is to cause a thermal increase on conductors in which current flows. Although the current is at high values, a huge thermal increase doesn't turn out because of very short period.

4. LIGHTNING PROTECTION

It is beneficial to know that the lightning is a powerful electric current between a cloud and the earth and this current must discharge to the earth in the shortest and safe way. Therefore, the lightning protection systems must be installed on buildings.

Lightning protection is not only to protect a building from the direct strike of a lightning in deed. So, when the effects of a lightning are analyzed, it is seen that a substantial portion of existing damages (if there is no lightning protection system) originates from the direct effects of a lightning and the other part originates from indirect effects which the lightning has formed them after falling. For this reason, "Lightning Protection" can be examined under two topics generally. In the table below, some information about lightning protection systems has been given in detail.

PROTECTION OF LIGHTNING

EXTERNAL LIGHTNING PROTECTION

Passive Lightning Conductor Systems
1. FRANKLIN ROD
2. FARADAY CAGE
3. MATCH POTENTIAL LIGHTNING ROD SYSTEM

Active Lightning Conductor Systems
1. ACTIVE LIGHTNING ROD
2. RADIOACTIVE LIGHTNING ROD

INTERNAL LIGHTNING PROTECTION

B TYPE SURGE VOLTAGE PROTECTION

C TYPE SURGE VOLTAGE PROTECTION

D TYPE SURGE VOLTAGE PROTECTION

DATA, NETWORKS, TRANSCEIVER ect. SURGE VOLTAGE PROTECTION

GENERAL INFORMATIONS

5. LIGHTNING PROTECTION REQUIREMENT LEVEL CALCULATION (*)

If a lightning protection system will be projected for an installation, the "lightning protection requirement level calculation" needs to be done primarily. Protection level must be chosen and projected according to this.

Lightning Protection Requirement Level Calculation is given below.

1. THE WIDTH, LENGTH AND HEIGHT OF A BUILDING AND THE HEIGHT OF THE LIGHTNING ROD FROM THE ROOF ARE DETERMINED :

- a) LENGTH OF A BUILDING a (meter)
b) WIDTH OF A BUILDING b (meter)
c) THE HEIGHT OF THE LIGHTNING ROD FROM THE ROOF h (meter)

2. C QUOTIENTS ARE CHOSEN FROM THE TABLES :
(An option is chosen from every table)

3. EFFECT EQUIVALENT FIELD IS CALCULATED : Ae

$$Ae = a \cdot b + 6 \cdot h \cdot (a+b) + 9 \cdot n \cdot h^2$$

4. LIGHTNING DENSITY : Ng

$$Ng = 0,04 \cdot Nk \cdot 1,25$$

Nk : Number of days with lightning (Consult the map)

5. NUMBER OF LIGHTNING EXPECTED FOR THE INSTALLATION : Nd

$$Nd = Ng \cdot Ae \cdot C1 \cdot 10^{-6}$$

6. EXEMPLIFIED NUMBER OF LIGHTNING STROKE FOR THE INSTALLATION : Nc

$$Nc = 5,5 \cdot 10^{-3} / C$$

$$C = C2 \cdot C3 \cdot C4 \cdot C5$$

(*) If you want to calculate for protection automatically from lightning, you can click "www.livagratoner.com" adress for calculation screen.

C1 TABLE (ENVIRONMENT COEFFICIENT)	
Surrounded by structures or trees of the same height or higher	0,25
Surrounded by smaller structures	0,5
Isolated no other structures within a distance equal to 3 times the height	1
Isolated on top of a hill	2

C2 TABLE (STRUCTURAL COEFFICIENT)	
Structure metallic / Roof metallic	0,50
Structure metallic / Roof with tile	1,00
Structure metallic / Roof flammable	2,00
Structure brick, concrete / Roof metallic	1,00
Structure brick, concrete / Roof with tile	1,50
Structure brick, concrete / Roof flammable	2,50
Structure flammable / Roof metallic	2,00
Structure flammable / Roof with tile	2,50
Structure flammable / Roof flammable	3,00

C3 TABLE (STRUCTURAL CONTENTS)	
No value and non flammable	0,5
Standard value or normally flammable	1
High value particularly flammable	2
Exceptional value, irreplaceable or highly flammable explosive	3

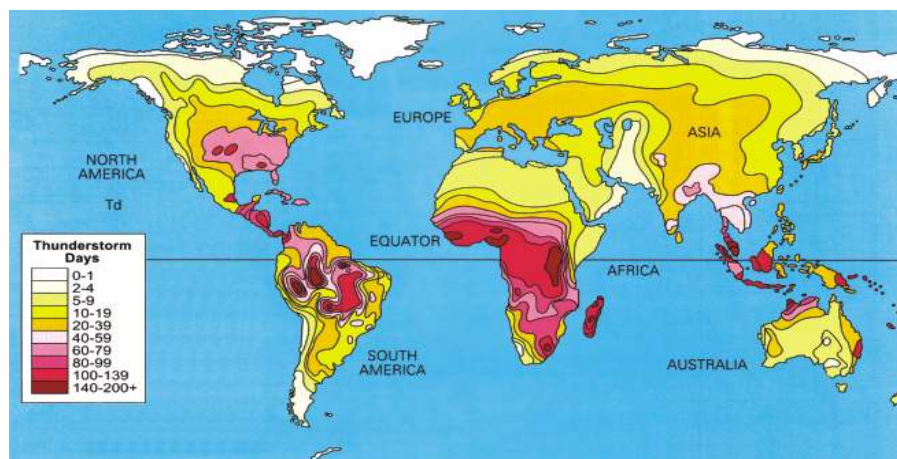
C4 TABLE (STRUCTURAL OCCUPANCY)	
Unoccupied	0,5
Normally occupied	1
Difficult evacuation	3

C5 TABLE (CONSIDERABLE OF STRUCTURE ABOUT ENVIRONMENT)	
Service continuity not required	1
Service continuity required without consequences on the environment	5
Consequences on the environment	10

CONCLUSION:

- If $Nd \leq Nc$ Protection is optional
- If $Nd > Nc$ Protection is necessary then you must do protection with appropriate level (You can calculate level of protection as per)
You can calculate level of protection with $E \leq 1-Nc / Nd$

EFFICIENCY	LEVEL OF PROTECTION AS PER
$E > 0,98$	Level 1 + Additional measures
$0,95 < E \leq 0,98$	Level 1
$0,90 < E \leq 0,95$	Level 2
$0,80 < E \leq 0,90$	Level 3
$E \leq 0,80$	Level 4



GENERAL INFORMATION

4.1. EXTERNAL LIGHTNING PROTECTION SYSTEM: It is the Lightning Protection System which countervails the lightning strike directly and allows it to transfer to the ground.

4.1.1. Passive Lightning Conductor Systems

The Passive Lightning Conductors are the oldest of the Lightning Protection Methods which have no feature of drawing the lightning and are not of using sharp rods.

Generally, there are two kinds of passive lightning conductor systems. These are;

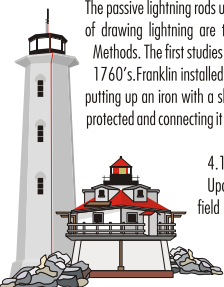
- Franklin Rod
- Faraday Cage

A conductive rod was used in the protection made by using Franklin Rod; later on, this system was improved by Melsens in 1884's and frequently used Faraday Cage was formed at the present day.

4.1.1.1. Franklin Rod (Lightning Capturing Rod)

In the protection made with Franklin Rod, the capturing discharge made by ions (sharp tip effect) coming out from the sharp tip performs the protection only in the cone volume which has a radius equal to the length of the Franklin Rod.

The passive lightning rods using sharp rods and without the feature of drawing lightning are the oldest in the Lightning Protection Methods. The first studies on this matter were done by Franklin in 1760's. Franklin installed the first lightning protection system by putting up an iron with a sharp tip on the structure required to be protected and connecting it to the ground with conductors.

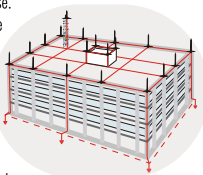


4.1.1.2. Faraday Cage

Upon Faraday determined the electrical field zero in a conductive cage with studies he did, Melsens launched the idea of taking the volume needs to be protected in a conductive cage. This cage system which would be set up by Melsens was to take the structure in a copper cage by coiling with good conductors (copper) horizontally and vertically on the roof and side walls. Vertical sharp rods would be put up in fixed successions on the roof and the conductors would be grounded at multi points on the base.

In this shape, every point of the structure would become equipotential and during such a lightning discharge, no harm would come to the building because dangerous currents would flow to the ground over the copper cage which was coiled completely. From this point of view, The Faraday Cage System which is thought to be a really good protection system loses its effectiveness as the result of difficulties in application and wrong application made consciously or unconsciously.

At the present day, because of thoughts like using fewer conductors, finishing the work faster by holding the meshes larger, making big profits by decreasing labor cost, The Faraday Cage can't be set up properly. The cage which is not set up properly can't provide a good protection against lightning.



4.1.2. Active Lightning Systems

You can have detailed information related to Active Lightning Systems from our Active Lightning Rods page.

4.1.2.1. Radioactive Lightning Rods

By using Ra-226 and Am-241 radioactive elements on their heads, these lightning rods attract strikes towards themselves through the ions that are emitted by these elements.

At the present day, the production and assembly of the Radioactive Lightning Rods are stopped in our country and in developed countries because of falling, losing or being stolen of the radioactive materials they have in their heads due to natural disasters like earthquake, fire and flood and with the concern that their radioactive effect affects negatively the life of living organisms for a long time especially concerning the potential risks they make on next generation. Besides, the companies that produce radioactive elements say that the ion emitting life of these elements is 10 years in the best weather conditions (dry, not wearing). However, it is known that the harms of the rays which are emitted by radioactive elements (as for lightning rods) to the health of human beings and other organisms continue rather long years.

During assembly and periodic maintenance of them, it is required to be careful even while getting close and absolutely not to touch with bare hands and if possible these rods require to be got close with special hand gloves and suits but unfortunately in our country, they behave unconsciously without paying attention to these matters and from time to time some undesirable events may be lived.

Using of Radioactive Lightning Rods is prohibited in Europe and in the USA since 1982 and in our country; first, the import of elements that are used in production of radioactive lightning rods is prohibited with the official paper of TAEK dated on 31 MARCH 2000 and then in 2001, use of lightning rod with Radium-226 element is prohibited. Following this progress, the prohibition of AM-241 will become true in near future.

WARNING: If there is a "Radioactive Lightning Rod" in your installation, contact with an authorized firm absolutely. If the lightning rod in your installation is with the source of Radium-226 one, you need to give it back to TAEK as soon as possible.

TAEK (Turkish Atomic Energy Agency) is the only association to collect and abolish the radioactive lightning rods and you need to get the firms with the certificate of "Radioactive Sourced Lightning Rod Disassembling License" and authorization from TAEK to disassemble by making source determination.

INFO: Our Company is one of the authorized firms on this matter in our country. You may contact with our firm for your demands on this matter.

NOT: You may have extensive information related to radioactive lightning rods and notices of TAEK at our web address (www.livaparatoner.com).

4.1.2.2. Active Lightning Rods

Active Lightning Rods get their energy from the changes of electrostatic field density forming in the air. This structure makes a natural generator charging dependently on electrical field around itself.

It is a protection system whose active head is made up of three parts. These are;

- Franklin Rod
- Electro Atmospheric Ion Generator
- Grounding Electrode

You may have detailed information about this matter from our web page related to Active Lightning Rods.

4.2. Internal Lightning Protection Systems: It is the lightning protection system which allows oncoming strike/strikes directly or indirectly to reach the ground safely by protecting the electrical or electronic appliances in the structure.

LIVA ACTIVE LIGHTNING RODS



LIVA ACTIVE LIGHTNING RODS

LIVA "LAP DX-250 Active Lightning Rod Head" operates on the principle of Early Streamer Emission (E.S.E.). Metal parts that are bearing the lightning were made out of stainless steel against (Inox) chemical interaction and corrosion. This feature provides solidity and endurance for the lightning rod against heavy natural conditions for a long time as it is on the first day.

WORKING SYSTEM: LAP DX-250 LIVA Active Lightning Rod Head with Electro atmospheric Field Effect works on the principal of Early Streamer Emission (E.S.E.) and gets its energy from the changes of electrostatic and electromagnetic field density that form in the air. The air terminal-as it is seen on the picture-is grounded, insulated from the middle shaft, and on the contrary it has a High-tension Stroke Generator with free potential.

OPERATION : Electric field power in the atmosphere rises up to 10 – 20 kV/m in conditions orage clouds form with dense electric charge. When the electric field reaches values at which lightning may fall because of orage clouds (above 50 kV/m), lightning rod air terminal stores this energy by courtesy of Electroatmospheric Energy Block and starts to form high-tension strokes in quick succession. These strokes expose ions by discharging into the ion tunnel by way of 3 ion electrodes. Ions spreading towards orage loaded clouds from the ion tunnel form a leading charge path between the head and a cloud. When electric field diffusion has changed or electric field power has increased, the leading discharge strokes that are rising from the air terminal and lowering from the cloud increase by growing. These strokes are the leading discharge strokes that provide the lightning rod to catch the lightning and it proceeds until the lightning will have been formed.

LAP DX-250 Active Lightning Rod activates the electric field power between the cloud and the earth just in case of lightning risk by courtesy of high-tension stroke generator. This structure provides the energy block to send out ions at high level. After the catching process has occurred, LIVA Active Lightning Rod gets ready to start a new cycle.

FEATURES OF THE DEVICE

Metal Used: "Stainless Steel" has been used in lightning rod head by thinking of heavy natural conditions.
Lightning Intercepting Rod: A stainless steel 20 mm.in diameter portion that intercepts the lightning. Electroatmospheric Energy Block: The portion within the high-tension stroke generator that is dependant from the center shaft.
Ion Electrodes: These are the electrodes that high-tension strokes which are produced in the high-tension stroke generator are provided by them to form ion.
Earthing Connection Electrode: A stainless steel 20 mm.in diameter portion that transfers the electric load formed by lightning through terminal blocks to conducters and ground.
Pipe Connection Adapter: A portion that lightning rod is connected to a 2" pipe without using any apparatus.

TESTS AND CERTIFICATES

LAP DX-250 Active Lightning Rod has proved its quality by being undergone various tests in a laboratory environment. Tests are given below.

Lightning Strike Tension Jumping Time (□t) Test of the Lightning Rod: The lightning rod's lightning tension jumping (Early Streamer Warning) time (□t) has been tested by NFC 17-102 (Appendix C) standards in the High-tension Laboratory of METU Electric-Electronic Section on 15-20 November 2008 and the lightning rod has been certified to be suitable related standards.

Gost Certificate: Lightning Rod have "GOST" certificate. Date is 12 September 2008.

CE Certificate: Lightning Rod have "CE" that EC Declaration of Conformity certificate. Date is 23 February 2009.

Warranty Period: It has "30 Year Warranty" certificate from the Ministry of Industry and Trade. To read the information from the catalogue, click on the lightning rod picture or here. (For Türkiye)

PHYSICAL CHARACTERISTICS OF DEVICE

ORDER CODE	DIMENSIONS	PACKING DIMENSIONS	□t Early Streamer Warning Time (By NFC 17-102 Standard)(*)	Protection Diameter (By NFC 17-102 Standard)(**)		
				Level-1	Level-2	Level-3
LAP DX-250	Length: 70 cm Weight: 5.00 kg.	25x25x50 cm	96 "Sec.	230	252	266

*) This state comprises that the lightning rod is installed minimum 6 meters higher with a pipe from the highest point of the structure that is to be protected. The protection diameter has been calculated by considering average early streamer warning time.

LAP-DX-250



LIVA ACTIVE LIGHTNING RODS

LIVA "LAP AX-210 Active Lightning Rod Head" operates on the principle of Early Streamer Emission (E.S.E.). Metal parts that are bearing the lightning were made out of stainless steel against (Inox) chemical interaction and corrosion. This feature provides solidity and endurance for the lightning rod against heavy natural conditions for a long time as it is on the first day.

WORKING SYSTEM: LAP AX-210 LIVA Active Lightning Rod Head with Electro atmospheric Field Effect works on the principal of Early Streamer Emission (E.S.E.) and gets its energy from the changes of electrostatic and electromagnetic field density that form in the air. The air terminal-as it is seen on the picture-is grounded, insulated from the middle shaft, and on the contrary it has a High-tension Stroke Generator with free potential.

OPERATION : Electric field power in the atmosphere rises up to 10 – 20 kV/m in conditions orage clouds form with dense electric charge. When the electric field reaches values at which lightning may fall because of orage clouds (above 50 kV/m), lightning rod air terminal stores this energy by courtesy of Electroatmospheric Energy Block and starts to form high-tension strokes in quick succession. These strokes expose ions by discharging into the ion tunnel by way of 3 ion electrodes. Ions spreading towards orage loaded clouds from the ion tunnel form a leading charge path between the head and a cloud. When electric field diffusion has changed or electric field power has increased, the leading discharge strokes that are rising from the air terminal and lowering from the cloud increase by growing. These strokes are the leading discharge strokes that provide the lightning rod to catch the lightning and it proceeds until the lightning will have been formed.

LAP AX-210 Active Lightning Rod activates the electric field power between the cloud and the earth just in case of lightning risk by courtesy of high-tension stroke generator. This structure provides the energy block to send out ions at high level. After the catching process has occurred, LIVA Active Lightning Rod gets ready to start a new cycle.

FEATURES OF THE DEVICE

Metal Used: "Stainless Steel" has been used in lightning rod head by thinking of heavy natural conditions.
Lightning Intercepting Rod: A stainless steel 20 mm.in diameter portion that intercepts the lightning. Electroatmospheric Energy Block: The portion within the high-tension stroke generator that is dependant from the center shaft.
Ion Electrodes: These are the electrodes that high-tension strokes which are produced in the high-tension stroke generator are provided by them to form ion.
Earthing Connection Electrode: A stainless steel 20 mm.in diameter portion that transfers the electric load formed by lightning through terminal blocks to conducters and ground.
Pipe Connection Adapter: A portion that lightning rod is connected to a 2" pipe without using any apparatus.

TESTS AND CERTIFICATES

LAP AX-210 Active Lightning Rod has proved its quality by being undergone various tests in a laboratory environment. Tests are given below.

Standard Lightning Strike Tension Jumping Test of the Lightning Rod: The lightning rod's has been tested by standard strikes lightning tension tested with 1020 -1065 kV, (+) positive and (-) negative in the High-tension Laboratory of METU Electric-Electronic Section on July 01, 2003 and the lightning rod has been suitable related standards.

Lightning Strike Tension Jumping Time (□t) Test of the Lightning Rod: The lightning rod's lightning tension jumping (Early Streamer Warning) time (□t) has been tested by NFC 17-102 (Appendix C) standards in the High-tension Laboratory of METU Electric-Electronic Section on March 15-20, 2007 and the lightning rod has been certified to be suitable related standards.

Strike Tension High Current Strike (Short Circuit kA) Test of the Lightning Rod: The lightning rod has been tested with 25kA-current strikes in the High-tension Laboratory of METU Electric-Electronic Section on June 15, 2007 and it has been certified that there are no changes or failures in its features.

Gost Certificate: Lightning Rod have "GOST" certificate. Date is 12 September 2008.

CE Certificate: Lightning Rod have "CE" that EC Declaration of Conformity certificate. Date is 23 February 2009.

Warranty Period: It has "30 Year Warranty" certificate from the Ministry of Industry and Trade. To read the information from the catalogue, click on the lightning rod picture or here. (For Türkiye)

PHYSICAL CHARACTERISTICS OF DEVICE

ORDER CODE	DIMENSIONS	PACKING DIMENSIONS	□t Early Streamer Warning Time (By NFC 17-102 Standard)(*)	Protection Diameter (By NFC 17-102 Standard)(**)		
				Level-1	Level-2	Level-3
LAP AX-210	Length: 100 cm Weight: 5.00 kg.	17x17x100 cm	82 "Sec.	200	220	234

*) This state comprises that the lightning rod is installed minimum 6 meters higher with a pipe from the highest point of the structure that is to be protected. The protection diameter has been calculated by considering average early streamer warning time.

LAP-AX-210



LIVA ACTIVE LIGHTNING RODS

LIVA "LAP CX-070 Active Lightning Rod Head" operates on the principle of Early Streamer Emission (E.S.E.). Metal parts that are bearing the lightning were made out of stainless steel against (Inox) chemical interaction and corrosion. This feature provides solidity and endurance for the lightning rod against heavy natural conditions for a long time as it is on the first day.

WORKING SYSTEM: LAP CX-070 LIVA Active Lightning Rod Head with Electro atmospheric Field Effect works on the principal of Early Streamer Emission (E.S.E.) and gets its energy from the changes of electrostatic and electromagnetic field density that form in the air. The air terminal - as it is seen on the picture - is grounded, insulated from the middle shaft, and on the contrary it has a High-tension Stroke Generator with free potential.

OPERATION : Electric field power in the atmosphere rises up to 10 – 20 kV/m in conditions orage clouds form with dense electric charge. When the electric field reaches values at which lightning may fall because of orage clouds (above 50 kV/m), lightning rod air terminal stores this energy by courtesy of Electroatmospheric Energy Block and starts to form high-tension strokes in quick succession. These strokes expose ions by discharging into the ion tunnel by way of 3 ion electrodes. Ions spreading towards orage loaded clouds from the ion tunnel form a leading charge path between the head and a cloud. When electric field diffusion has changed or electric field power has increased, the leading discharge strokes that are rising from the air terminal and lowering from the cloud increase by growing. These strokes are the leading discharge strokes that provide the lightning rod to catch the lightning and it proceeds until the lightning will have been formed.

LAP CX-070 Active Lightning Rod activates the electric field power between the cloud and the earth just in case of lightning risk by courtesy of high-tension stroke generator. This structure provides the energy block to send out ions at high level. After the catching process has occurred, LIVA Active Lightning Rod gets ready to start a new cycle.

FEATURES OF THE DEVICE

Metal Used: "Stainless Steel" has been used in lightning rod head by thinking of heavy natural conditions.

Lightning Intercepting Rod: A stainless steel 20 mm.in diameter portion that intercepts the lightning. Electroatmospheric Energy Block: The portion within the high-tension stroke generator that is dependant from the center shaft.

Ion Electrodes: These are the electrodes that high-tension strokes which are produced in the high-tension stroke generator are provided by them to form ion.

Earthing Connection Electrode: A stainless steel 20 mm.in diameter portion that transfers the electric load formed by lightning through terminal blocks to conductors and ground.

Pipe Connection Adapter: A portion that lightning rod is connected to a 2" pipe without using any apparatus.

TESTS AND CERTIFICATES

LAP CX-070 Active Lightning Rod has proved its quality by being undergone various tests in a laboratory environment. Tests are given below.

Lightning Strike Tension Jumping Time (⚡) Test of the Lightning Rod: The lightning rod's lightning tension jumping (Early Streamer Warning) time (⚡) has been tested by NFC 17-102 (Appendix C) standards in the High-tension Laboratory of METU Electric-Electronic Section on March 15-20, 2007 and the lightning rod has been certified to be suitable related standards.

Strike Tension High Current Strike (Short Circuit kA) Test of the Lightning Rod: The lightning rod has been tested with 25kA-current strikes in the High-tension Laboratory of METU Electric-Electronic Section on June 15, 2007 and it has been certified that there are no changes or failures in its features.

Gost Certificate: Lightning Rod have "GOST" certificate. Date is 12 September 2008.

CE Certificate: Lightning Rod have "CE" that EC Declaration of Conformity certificate. Date is 23 February 2009.

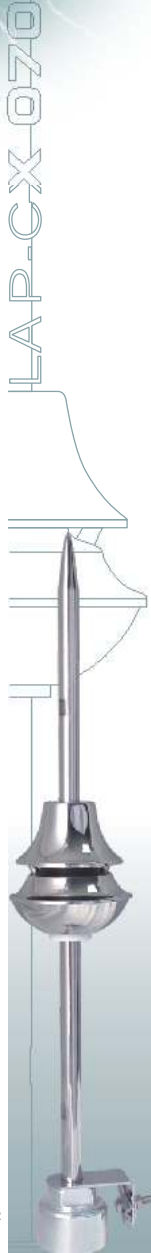
Warranty Period: It has "**30 Year Warranty**" certificate from the Ministry of Industry and Trade. To read the information from the catalogue, click on the lightning rod picture or here. (For Türkiye)

PHYSICAL CHARACTERISTICS OF DEVICE

ORDER CODE	DIMENSIONS	PACKING DIMENSIONS	<input type="checkbox"/> Early Streamer Warning Time (By NFC 17-102 Standard)(*)	Protection Diameter (By NFC 17-102 Standard)(**)		
LAP CX-070	Length: 70 cm Weight: 2.40 kg.	13x13x70 cm	31 Sec.	Level-1 70	Level-2 88	Level-3 96

[illegible]

(**) This state comprises that the lightning rod is installed minimum 6 meters higher with a pipe from the highest point of the structure that is to be protected. The protection diameter has been calculated by considering average early streamer warning time.



LIVA ACTIVE LIGHTNING RODS

LIVA "LAP CX-040 Active Lightning Rod Head" operates on the principle of Early Streamer Emission (E.S.E.). Metal parts that are bearing the lightning were made out of stainless steel against (Inox) chemical interaction and corrosion. This feature provides solidity and endurance for the lightning rod against heavy natural conditions for a long time as it is on the first day.

WORKING SYSTEM: LAP CX-040 LIVA Active Lightning Rod Head with Electro atmospheric Field Effect works on the principal of Early Streamer Emission (E.S.E.) and gets its energy from the changes of electrostatic and electromagnetic field density that form in the air. The air terminal-as it is seen on the picture-is grounded, insulated from the middle shaft, and on the contrary it has a High-tension Stroke Generator with free potential.

OPERATION : Electric field power in the atmosphere rises up to 10 – 20 kV/m in conditions orage clouds form with dense electric charge. When the electric field reaches values at which lightning may fall because of orage clouds (above 50 kV/m), lightning rod air terminal stores this energy by courtesy of Electroatmospheric Energy Block and starts to form high-tension strokes in quick succession. These strokes expose ions by discharging into the ion tunnel by way of 3 ion electrodes. Ions spreading towards orage loaded clouds from the ion tunnel form a leading charge path between the head and a cloud. When electric field diffusion has changed or electric field power has increased, the leading discharge strokes that are rising from the air terminal and lowering from the cloud increase by growing. These strokes are the leading discharge strokes that provide the lightning rod to catch the lightning and it proceeds until the lightning will have been formed.

LAP CX-040 Active Lightning Rod activates the electric field power between the cloud and the earth just in case of lightning risk by courtesy of high-tension stroke generator. This structure provides the energy block to send out ions at high level. After the catching process has occurred, LIVA Active Lightning Rod gets ready to start a new cycle.

FEATURES OF THE DEVICE

Metal Used: "Stainless Steel" has been used in lightning rod head by thinking of heavy natural conditions.

Lightning Intercepting Rod: A stainless steel 20 mm.in diameter portion that intercepts the lightning. Electroatmospheric Energy Block: The portion within the high-tension stroke generator that is dependant from the center shaft.

Ion Electrodes: These are the electrodes that high-tension strokes which are produced in the high-tension stroke generator are provided by them to form ion.

Earthing Connection Electrode: A stainless steel 20 mm.in diameter portion that transfers the electric load formed by lightning through terminal blocks to conductors and ground.

Pipe Connection Adapter: A portion that lightning rod is connected to a 2" pipe without using any apparatus.

TESTS AND CERTIFICATES

LAP CX-040 Active Lightning Rod has proved its quality by being undergone various tests in a laboratory environment. Tests are given below.

Lightning Strike Tension Jumping Time (□□) Test of the Lightning Rod: The lightning rod's lightning tension jumping (Early Streamer Warning) time (□□) has been tested by NFC 17-102 (Appendix C) standards in the High-Tension Laboratory of METU Electric-Electronic Section on 15-20 November 2008 and the lightning rod has been certified to be suitable related standards.

Gost Certificate: Lightning Rod have "GOST" certificate. Date is 12 September 2008.
CE Certificate: Lightning Rod have "CE" that EC Declaration of Conformity certificate. Date is 23 February 2009.
Warranty Period: It has "**30 Year Warranty**" certificate from the Ministry of Industry and Trade. To read the information from the catalogue, click on the lightning rod picture or here. (For Turkey)

PHYSICAL CHARACTERISTICS OF DEVICE

ORDER CODE	DIMENSIONS	PACKING DIMENSIONS	<input type="checkbox"/> Early Streamer Warning Time (By NFC 17-102 Standard)(*)	Protection Diameter (By NFC 17-102 Standard)(**)		
				Level-1	Level-2	Level-3
LAP CX-040	Length: 70 cm Weight: 2.30 kg.	13x13x70 cm	22 ?Sec.	40	62	78

(*) \square † value shows the early catching time in which a lightning rod (e.g. ESE lightning rod) catches lightning according to a simple ordinary lightning rod (S.R.). (The case in which \square † value is big shows that active reaction of the lightning rod is better. So it shows that the lightning rod intercepts lightning at a higher altitude and faster in a wider protection diameter.)

(**) This state comprises that the lightning rod is installed minimum 6 meters higher with a pipe from the highest point of the structure that is to be protected. The protection diameter has been calculated by considering average early streamer warning time.

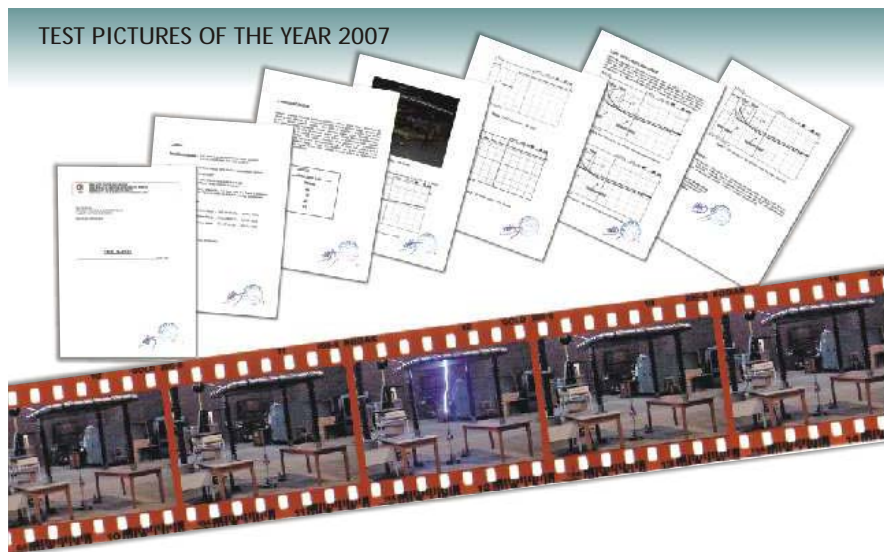


TEST PICTURES

TEST PICTURES OF THE YEAR 2003



TEST PICTURES OF THE YEAR 2007



LVA ACTIVE LIGHTNING ROD TYPE SELECTION AND PROTECTION DIAMETER

CALCULATION FOR PROTECTION FIELDS OF ACTIVE LIGHTNING ROD

The protection fields of Active Lightning Rods can be calculated with the formula below.

$\frac{1}{10} \frac{m}{s} \leq \frac{1}{10} \frac{m}{s} \leq \frac{1}{10} \frac{m}{s}$

In this formula;

Rp: radius of protection in a horizontal plane situated at a vertical distance h of the rod.

h: height of the top of the point of the rod above the area to protect.

D: Lightning advancement step or leaping interval of lightning along the way.

For this reason it is the protection level parameter.

"D" value;

•For level I protection D=20 m

•For level II protection D=45 m

•For level III protection D=60 m

DL: is the distance to catch the lightning in ? T period.

[? L (m) = V (m/ s) . ? T (s) (V=1m/ s)]

? T: is early ionization time period.

PROTECTION LEVEL

According to NFC 17-102 and UNE 21186-96 standards

Protection Levels;

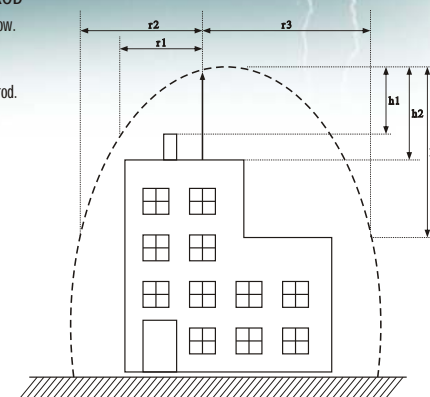
Level-1: High Protection

Level-2: Medium Protection

Level-3: Standard Protection

ACTIVE LIGHTNING PROTECTION SYSTEMS CALCULATION OF PROTECTIVE AREA

$Rp2=H \cdot (2D+H) + ? L(2D+? L)$ H?5 meter



LVA ACTIVE LIGHTNING PROTECTION SYSTEMS CALCULATION OF PROTECTIVE AREA

Protection Level	Level - 1						Level - 2						Level - 3					
Type of Lightning Rod	LAP-AX 210	LAP-BX 175	LAP-BX 125	LAP-CX 070	LAP-CX 040	LAP-DX 250	LAP-AX 210	LAP-BX 175	LAP-BX 125	LAP-CX 070	LAP-CX 040	LAP-DX 250	LAP-AX 210	LAP-BX 175	LAP-BX 125	LAP-CX 070	LAP-CX 040	LAP-DX 250
Pole Length (m)	Protection Area Radius (m)						Protection Area Radius (m)						Protection Area Radius (m)					
4	100	73	57	47	39	113	120	91	74	64	53	130	130	100	82	72	60	141
5	101	73	58	48	39	114	121	92	75	65	54	131	131	101	83	73	61	142
6	101	74	58	49	40	115	121	92	76	65	54	131	131	102	84	73	62	143
8	102	74	59	50	41	115	122	93	77	66	55	132	132	103	85	75	63	144
10	102	74	59	50	41	116	122	94	78	67	57	133	133	104	87	76	65	144
15	102	75	60	51	42	116	123	95	80	70	60	133	135	106	89	79	69	145
20	102	75	60	51	42	118	125	97	81	72	62	135	136	108	92	82	72	146



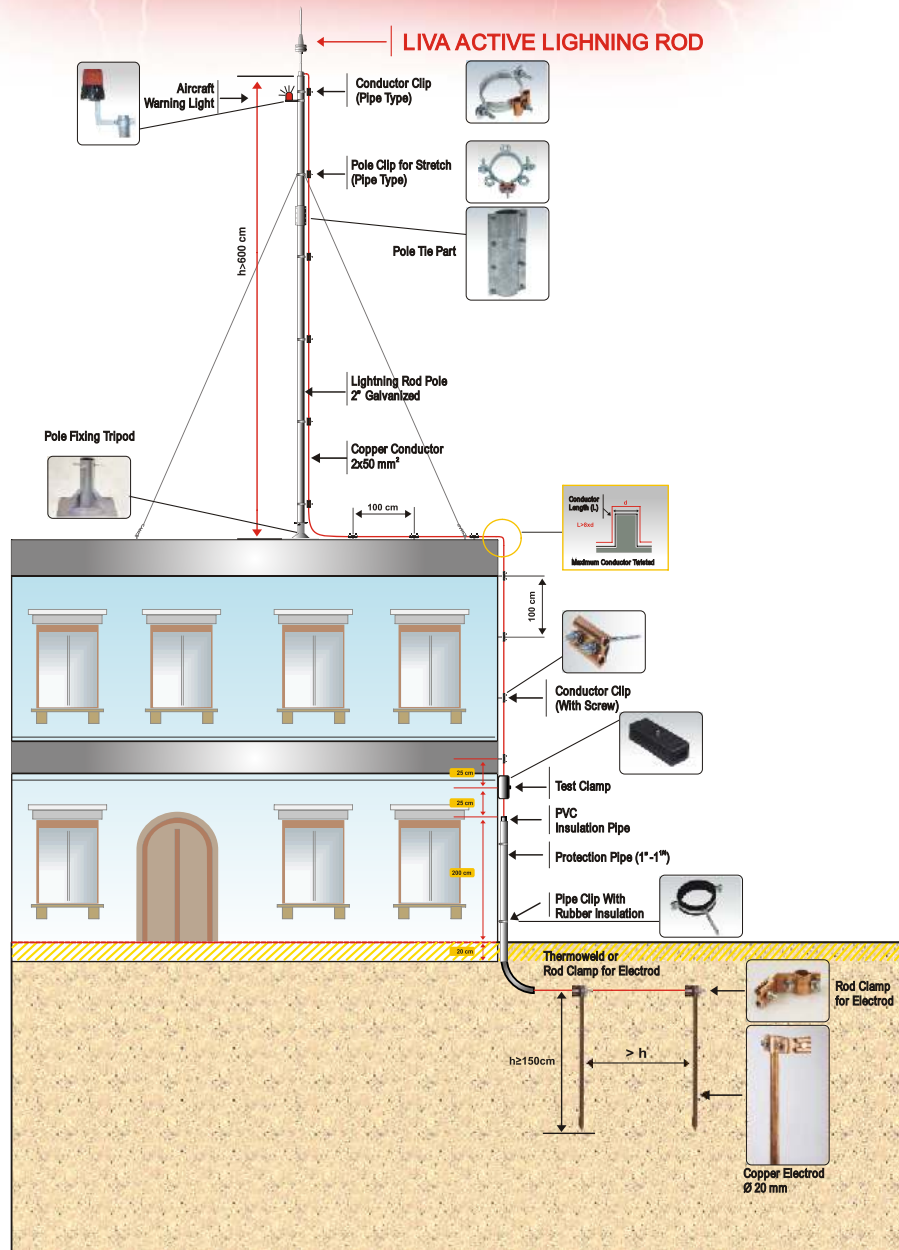
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



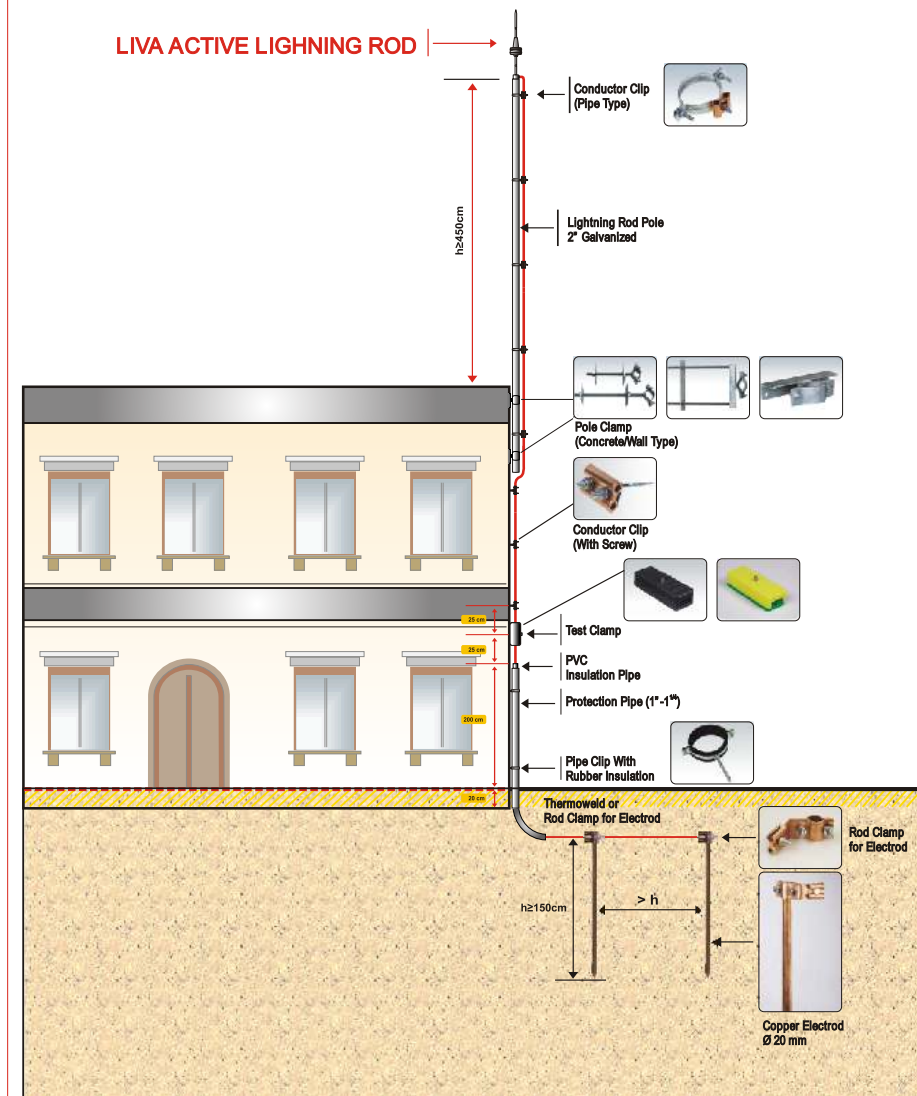
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



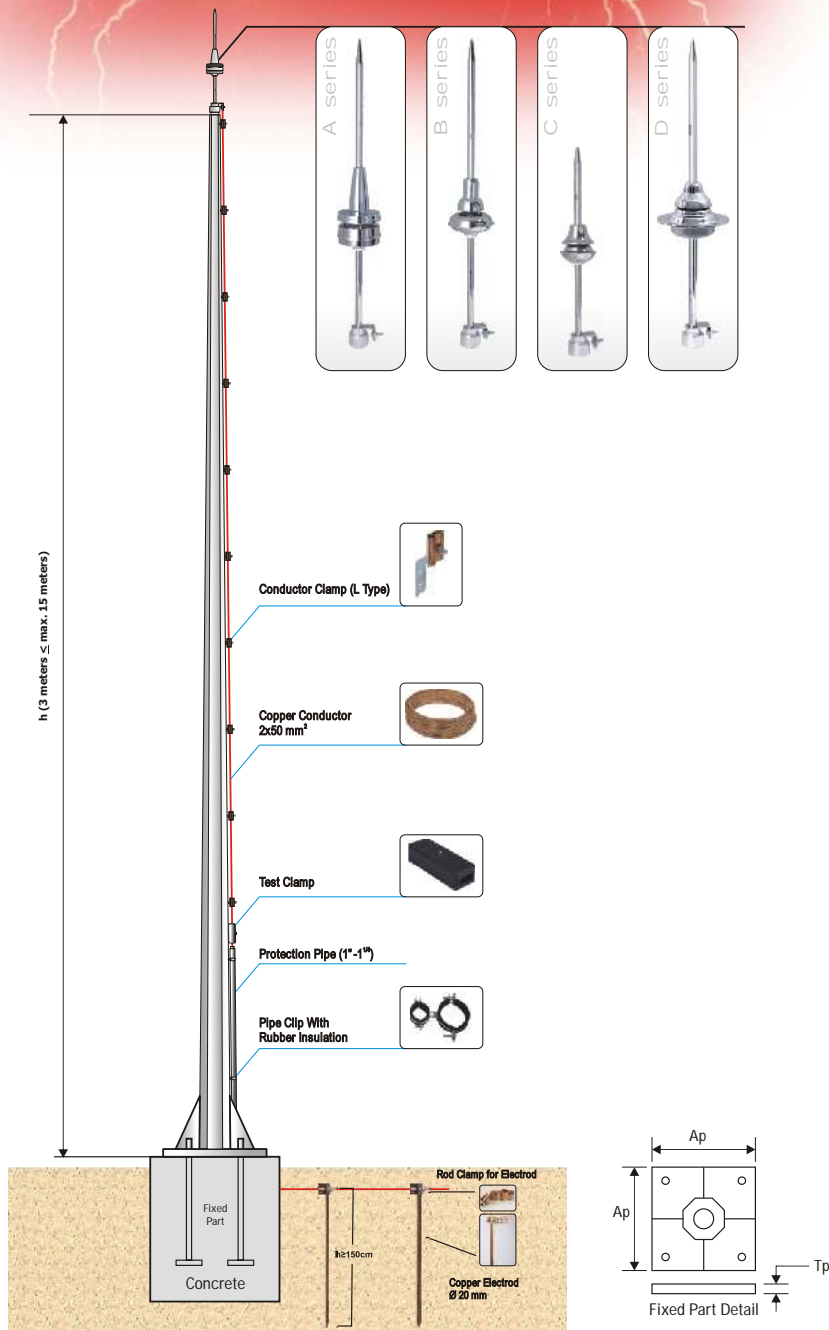
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



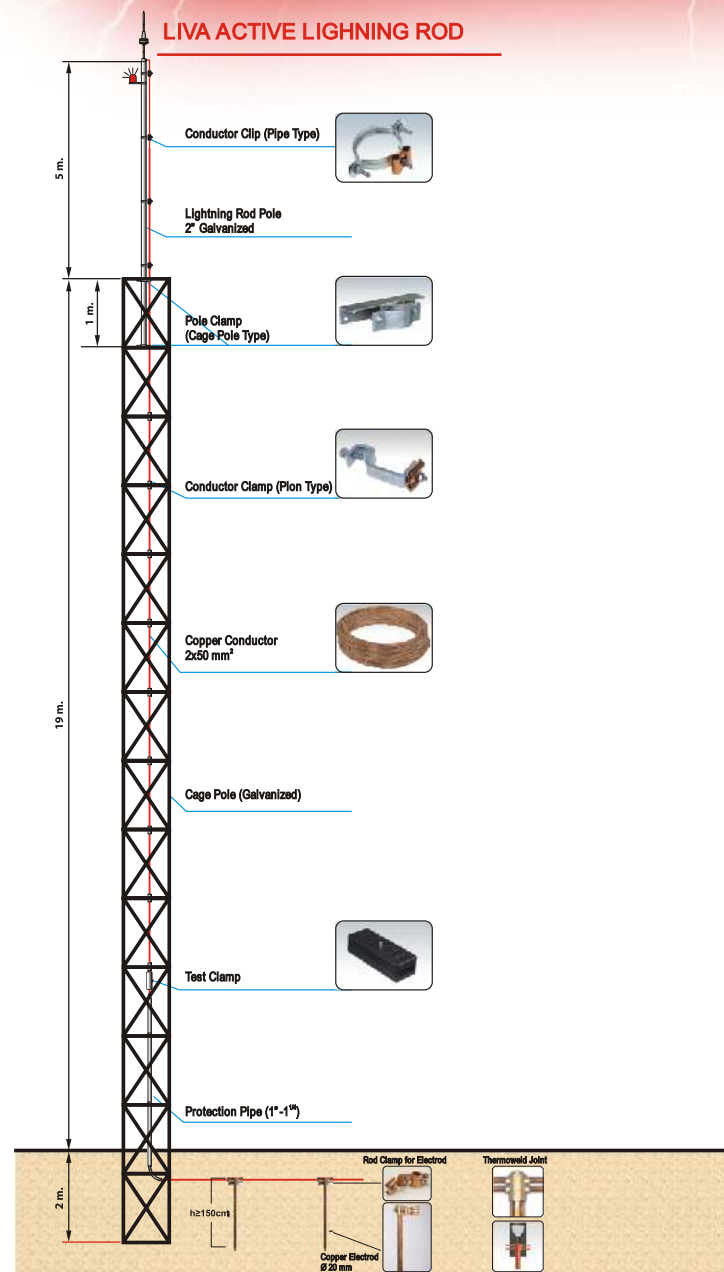
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



LIVA ACTIVE ROD TESTER

Technical Information :

Order Code	: LLT - X2A
Power Voltage	: 220 volt - 50/60 Hz.
Range	: 0 - 10
Working Heat	: -20 °C ile +50 °C
Dimensions	
* Tester	: 190 x 100 x 60 mm
* Receiver	: 280 x 060 mm

General Information

You can use Liva LLT-X2A Active Lightning Rod Tester for testing. Test contains all Liva models for rods.



Contents

You can find all parts this section. They are;

- * Tester Unit
- * Receiver Unit
- * Cables
- * Power Cables
- * Receiver Cables
- * Reference Probe cables

Instructions

Connect power cable socket 220volt 50/60 Hz

Connect all other cables to the suitable jack.

Bring near Receiver to the around the rods.

Note or write registration from display.

Check information from catalogue.



LIVA LIGHTNING STRIKE COUNTER

Technical Information :

Order Code	: LSC-LX01
Range	: 000000 - 999999
Minimum Discharge Current	: 1 kA (8/20ms)
Maximum Discharge Current	: 100 kA 8/120 Wave Top 100 ms
Conductor Cross-section	: 2x50 mm ² (Ø 2x8mm)
Working Heat	: -30 °C ile +80 °C
Dimensions	: 120 x 95 x 50 mm (max. 200 mm)
Ip	: 65

General Information

Liva Strike Counter is able to count all lightning events for a later reference. It has a mechanical counter display. It gives information about the service necessity of lightning system. Designed to monitor for the incidence of direct lightning strikes,

Unit is packaged into completely sealed, injection molded case that is waterproof for interior or exterior usage.

It has 2 mounting tabs for installing with screws or bolts, and sealed, clear view



window allows easy reading of 6 digit counter.

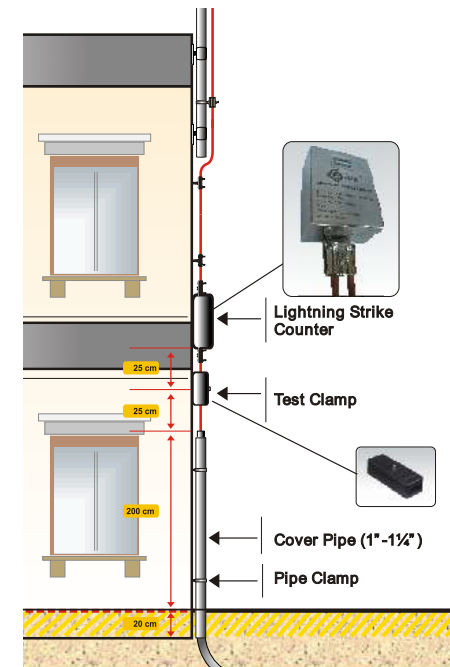
LSC-LX01 Liva Lightning Strike Counter

Product Overview:

Our new LSC-LX01 Liva Lightning Strike Counter was specifically designed to monitor structures and outdoor equipment for the incidence of a direct lightning strike. The Lightning Surge Counter keeps a count of the number of times that your structure or equipment has suffered a direct lightning strike.

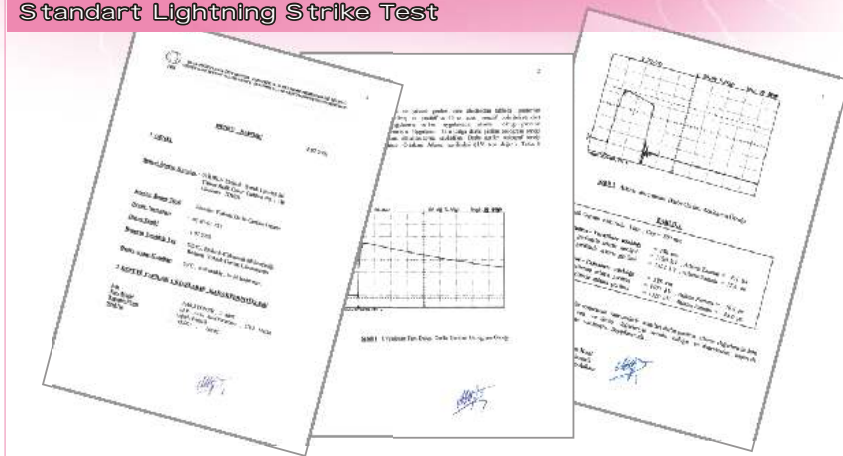
Performance:

The design of the advanced circuitry of the LSC-LX01 Liva Lightning Strike Counter ensures that the counting relay is not energized for low level current impulses and only records actual direct lightning impulses to the system.

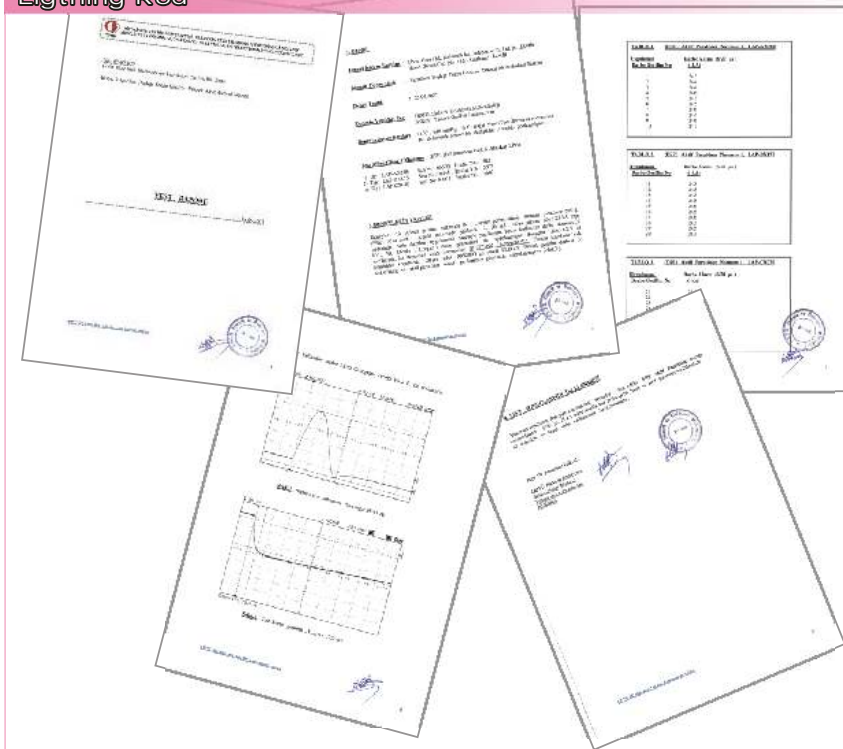


DOCUMENTS

Standart Lightning Strike Test

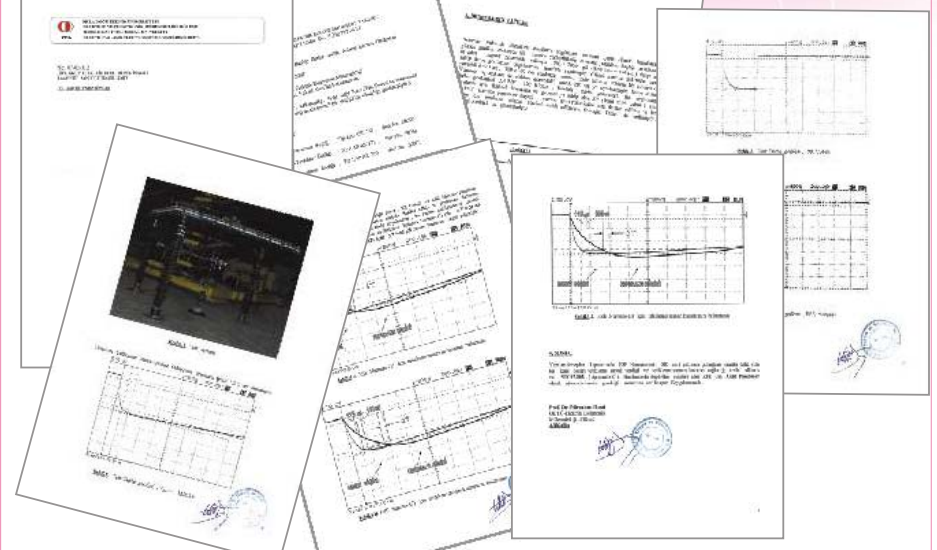


High Current Strike (short Circuit Ka) Test Of Lightning Rod



DOCUMENTS

Lightning Strike Tension Jumping Time (Lt) Test Of Lightning Rod (Standart: NFC 17-1 O2) (LAP AX-210, LAP EX-175, LAP CX-070)



Lightning Strike Tension Jumping Time (Lt) Test Of Lightning Rod (Standart: NFC 17-1 O2) (LAP DX-250, LAP EX-125, LAP CX-040)

