

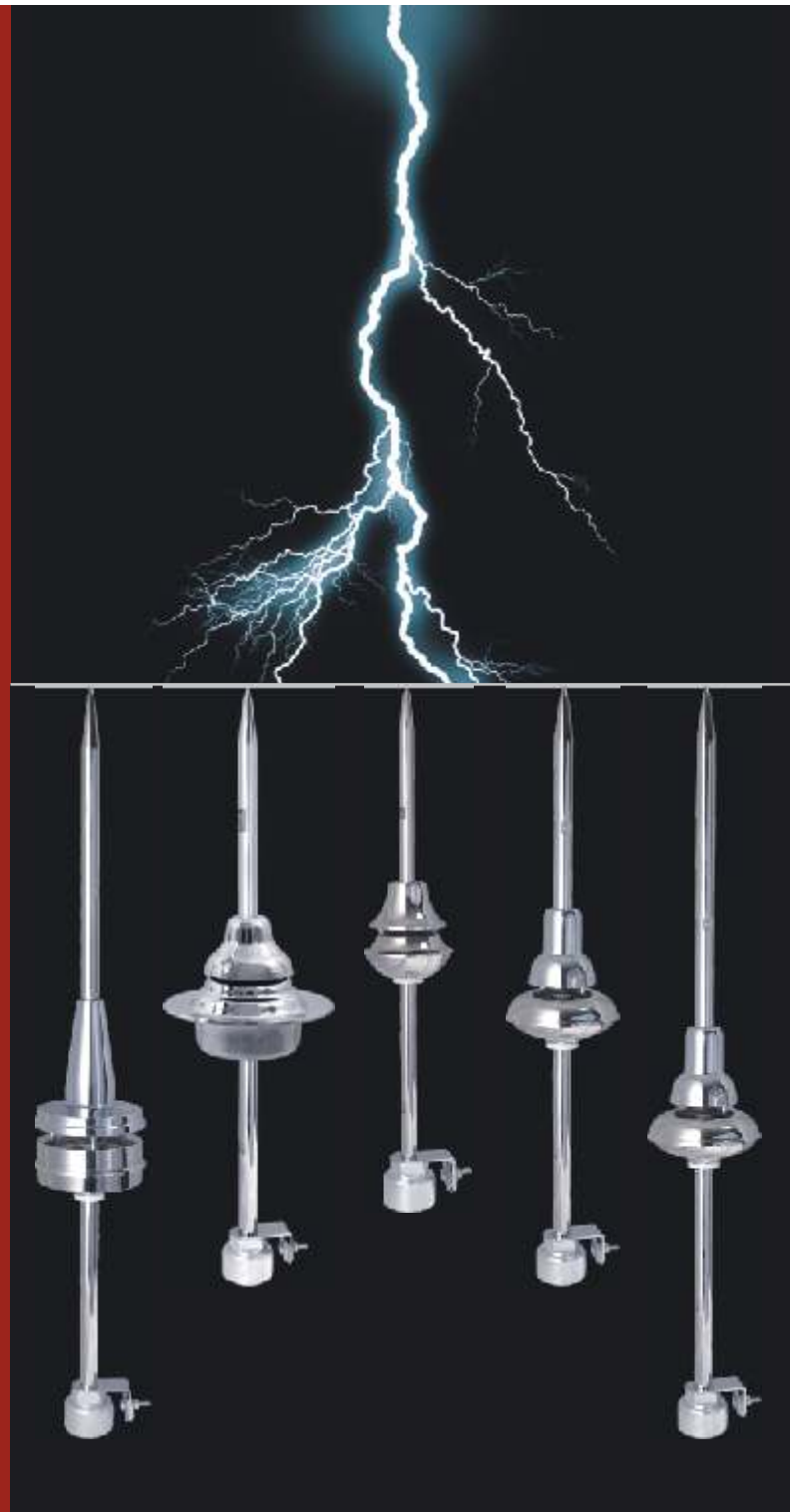


General Catalogue

LIGHTNING ROD AND
GROUNDING SYSTEMS



LİVA GRUP Elektrik Elektronik İnşaat Taahhüt San. ve Tic. Ltd. Şti.
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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".

LİVA 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

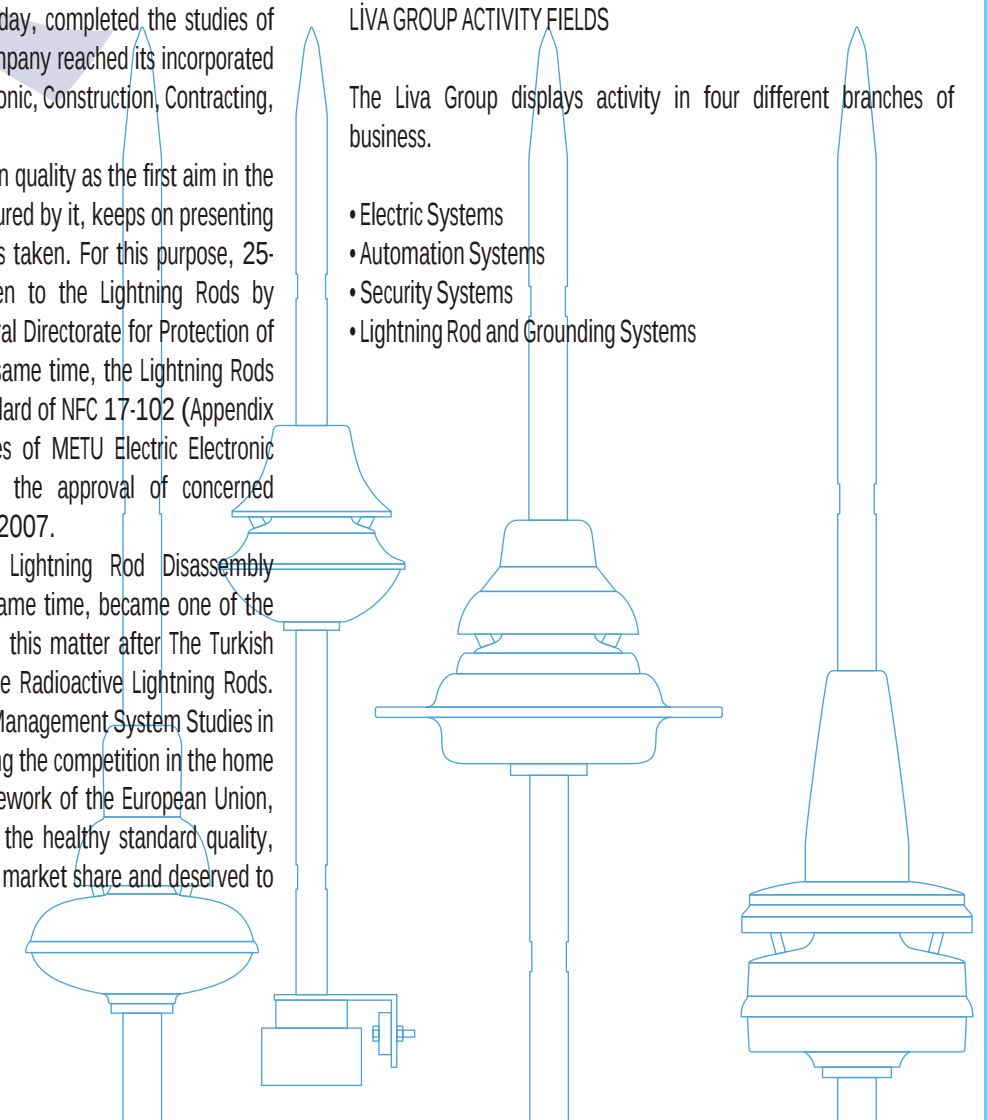


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GENERAL INFORMATIONS

LİVA 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 -5×10^5 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 world.

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.

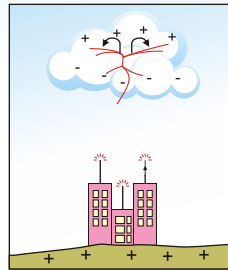
2.3- Formation of lightning

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

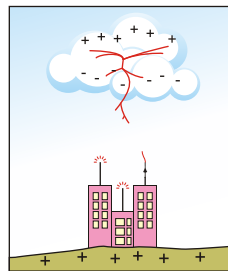
GENERAL INFORMATIONS

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

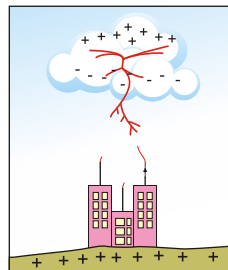
The discharge of a lightning from the Earth towards air or from air towards the Earth is still discussed; there is no change in its effects in both situations. Generally, the suitability of space electric charges plays an important role in this matter. The discharge to the Earth doesn't become constant 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), s 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.

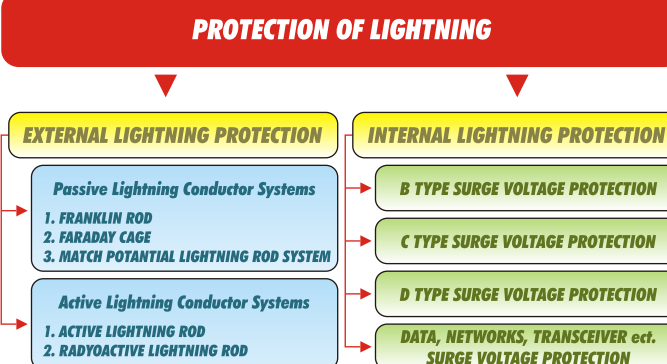
3.5. Thermal Effect

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.



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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.livaparatoner.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
Standart value or normally flammable	1
High value particularly flammable	2
Exceptional value, irreplaceable or highly flammable explosive	3

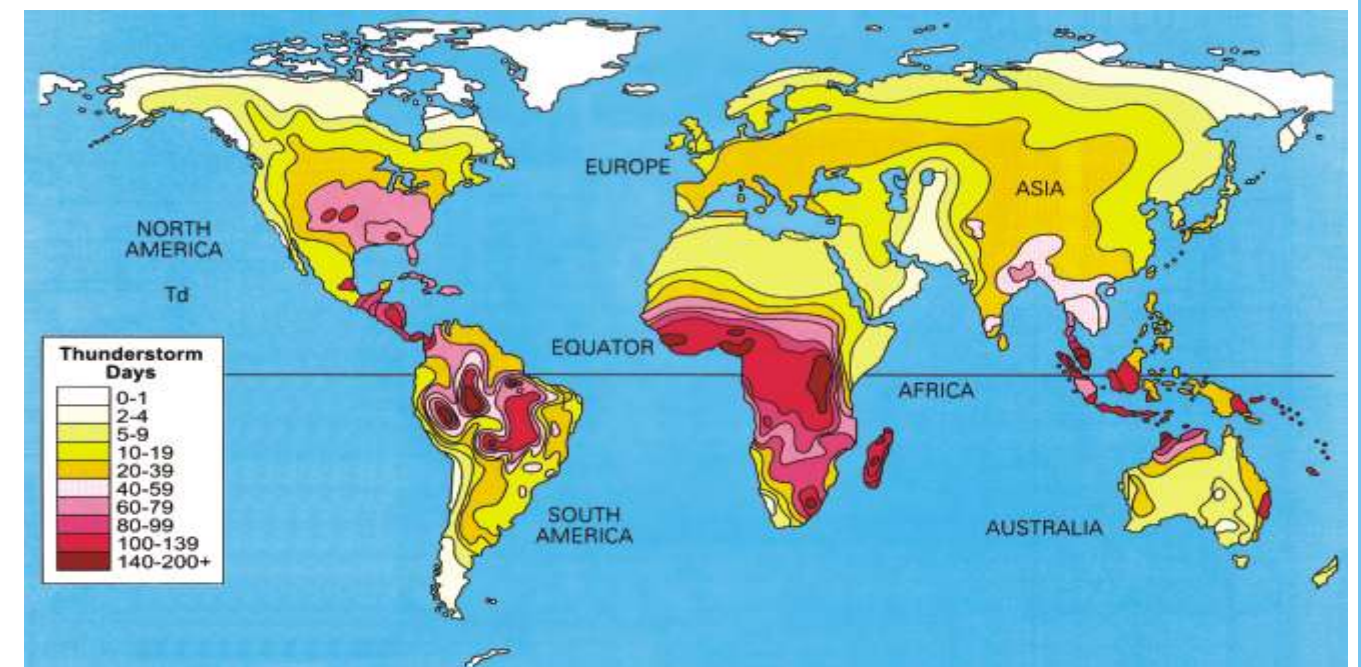
C4 TABLE (STRUCTURAL OCCUPANCY)	
Unoccupied	0,5
Normally occupied	1
Difficult evacuation	3

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;

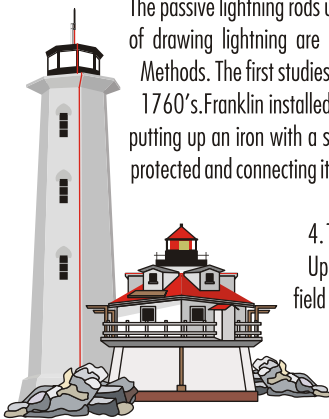
- Franklin Rod
- Faraday Cage

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.

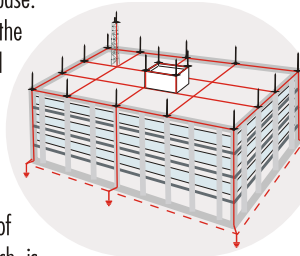


4.1.1.2. Faraday Cage

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



A series

B series

C series

D series



LIVA ACTIVE LIGHTNING RODS

LIVA “LAP DX-250 Active Lightning Rod Head“ operates on the principle of Early Streamer Emision (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 atmoshere 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 occured, 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.

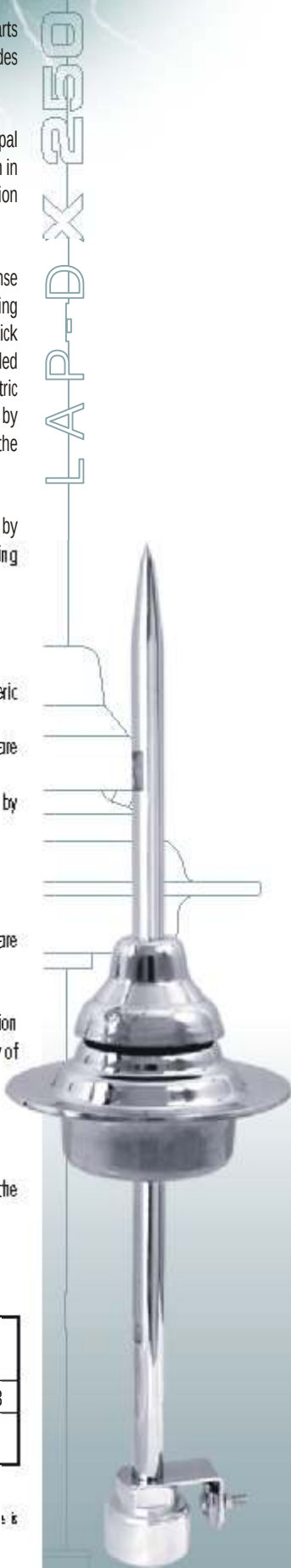
- Gost Certificate:** Lightning Rod have “GOST” certificate. Date is 12 September 2008.
- CE Certificate:** Lightning Rod have “CE” that EC Declaration of Conformity certificate. Date is 23 February 2009.
- Warranty Period:** It has “30 Year Warranty” certificate from the Ministry of Industry and Trade.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

PHYSICAL CHARACTERICTICS 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 µSec.	230	252	266

%SD ASYCEA 3 *NEEDONIS eleUAe f4z*CYASD,es ...{10S x "QIU-TH25s -AAd , @."A0+.10NRII--a lo,ai OeZ0"a 0=0VwAcERINEC77AVO 3 B© s i eo Cdc""B""AM" aC@M,E EA0E/-uo0E-u0ex10TrpC+5ix" &d"adP G6 x 3 1/2 B Sa ° 8{e0yA=0a0eSJTsu Eeoe U8 07:s±C"7UUnU\$7q DUeS3Xf

(**) 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 AX-210 Active Lightning Rod Head“ operates on the principle of Early Streamer Emision (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 atmoshere 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 occured, 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 CHARACTERICTICS 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 µSec.	200	220	234

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(**) 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-BX-175 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-BX-175 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-BX-175 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-BX-175 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 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 CHARACTERICTICS 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 BX-175	Length:100 cm Weight: 4.80 kg.	17x17x100 cm	63 µSec.	140	175	198

(**) 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 BX-125 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 BX-125 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 BX-125 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 BX-125 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 CHARACTERICTICS 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 BX-125	Length: 80 cm Weight: 4.20 kg.	17x17x80 cm	40 µSec.	102	125	138

(**) 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-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 occured,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 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 (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.

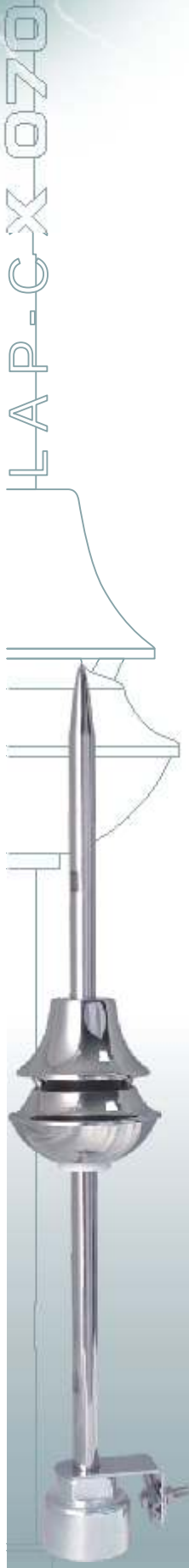
Warranty Period: It has “30 Year Warranty” certificate from the Ministry of Industry and Trade. To read the information from the catalogue, click on the lightning rod picture or here. (For Türkiye)

PHYSICAL CHARACTERICTICS 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 CX-070	Length:70 cm Weight: 2.40 kg.	13x13x70 cm	31 µSec.	70	88	96

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(**) 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 occured,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 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 (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 CHARACTERICTICS 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 CX-040	Length: 70 cm Weight: 2.30 kg.	13x13x70 cm	22 µSec.	40	62	78

(*) † 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 Ü† 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.

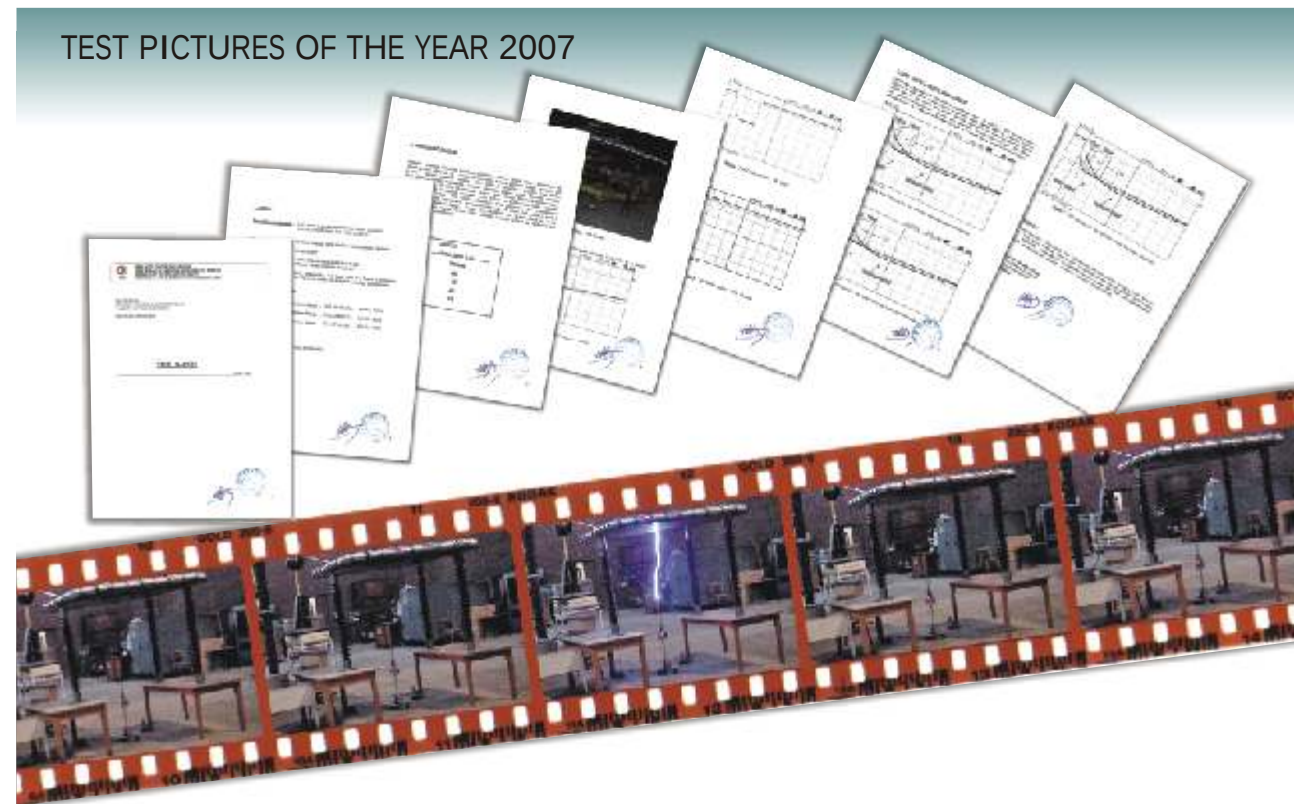


TEST PICTURES

TEST PICTURES OF THE YEAR 2003



TEST PICTURES OF THE YEAR 2007



LIVA ACTIVE LIGHTNING ROD TYPE
SELECTION AND PROTECTION DIAMETER

CALCULATION FOR PROTECTION FIELDS OF ACTIVE LIGHNING ROD

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

$R_p = \sqrt{h(2D + h)}$

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/μs). ? T (μs) (V=1m/ μs)]

? T: is early ionization time period.

PROTECTION LEVEL

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

Protection Levels;

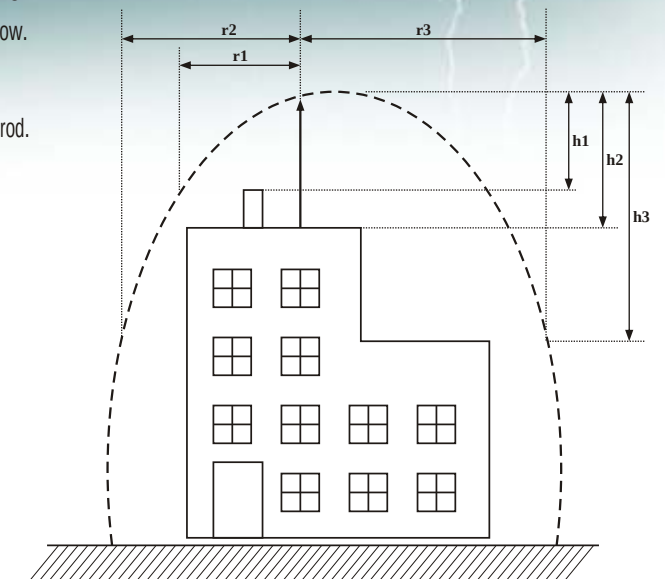
Level-1: High Protection

Level-2: Medium Protection

Level-3: Standard Protection

ACTIVE LIGHTNING PROTECTION SYSTEMS CALCULATION OF PROTECTIVE AREA

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



LIVA 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
		Protection Area Radius (m)						Protection Area Radius (m)						Protection Area Radius (m)					
Pole Length (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	



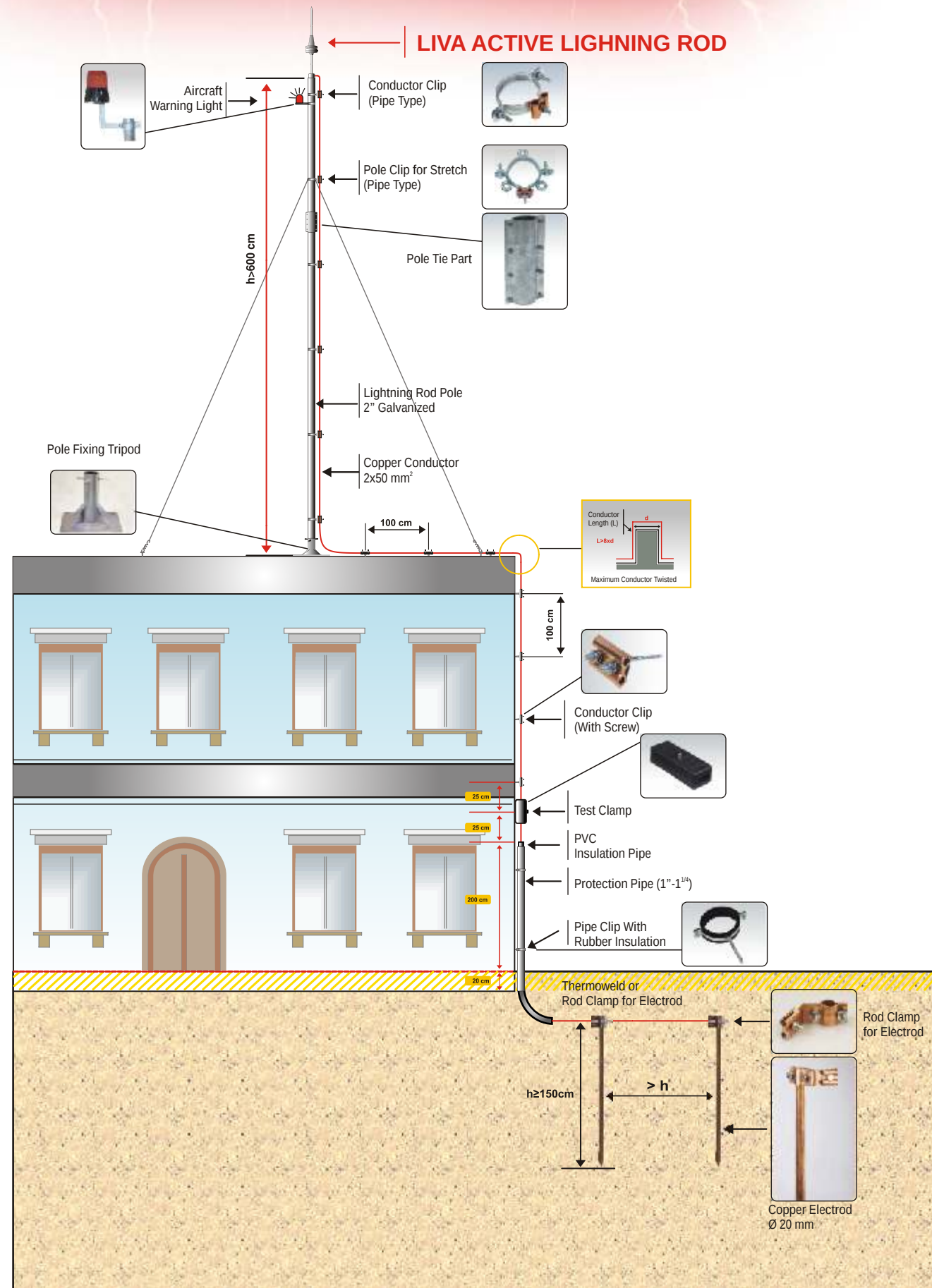
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



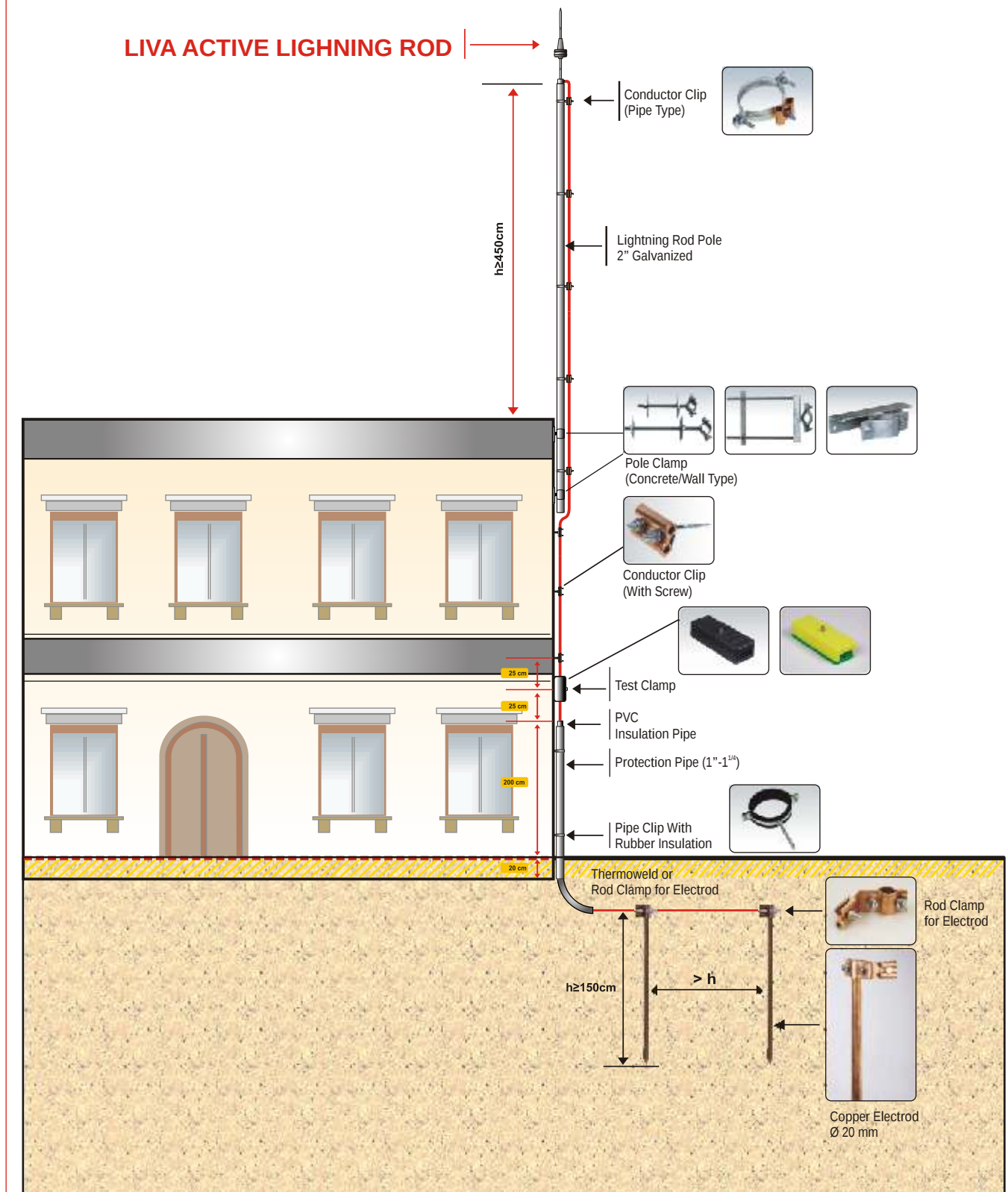
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



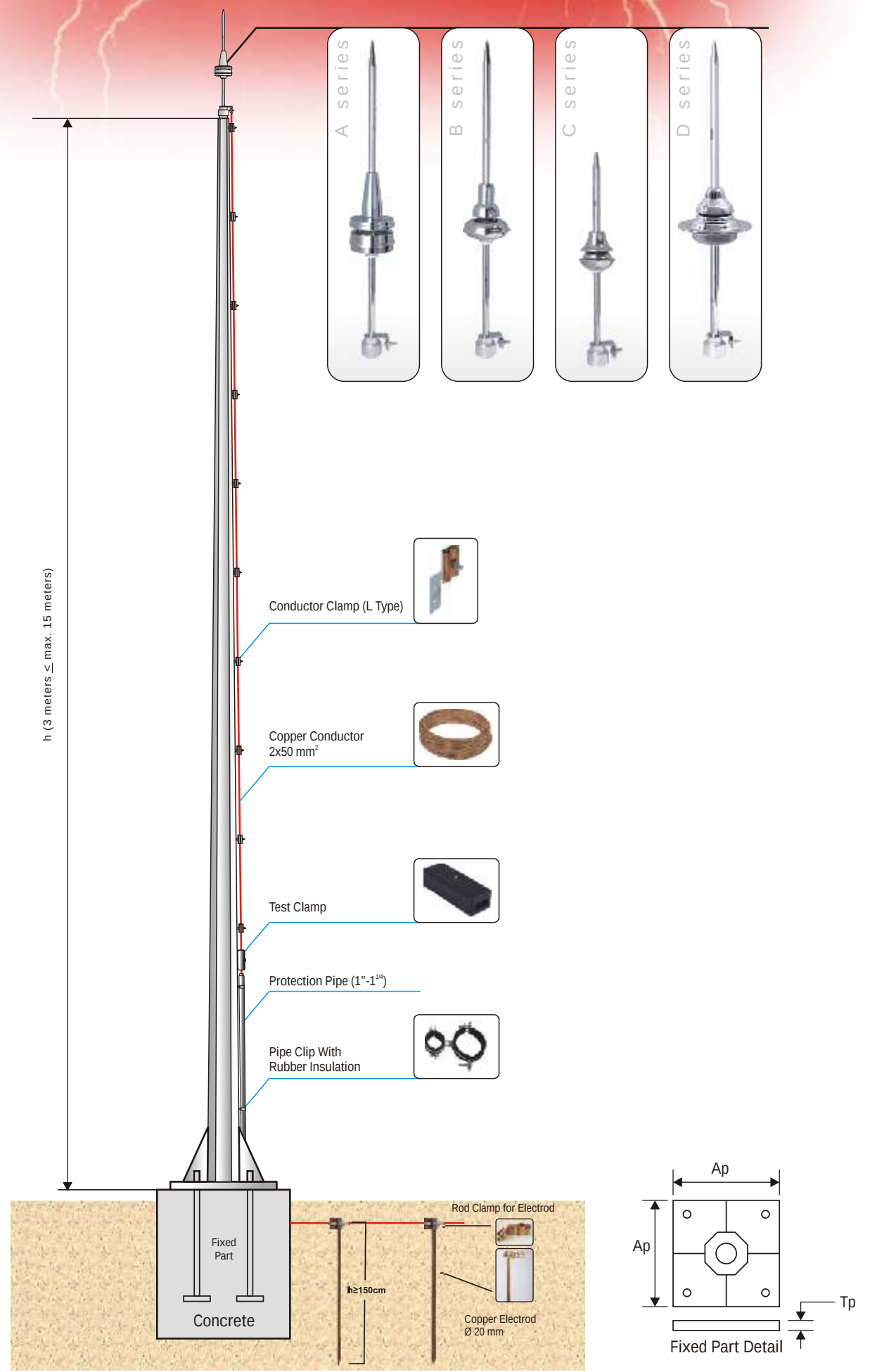
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



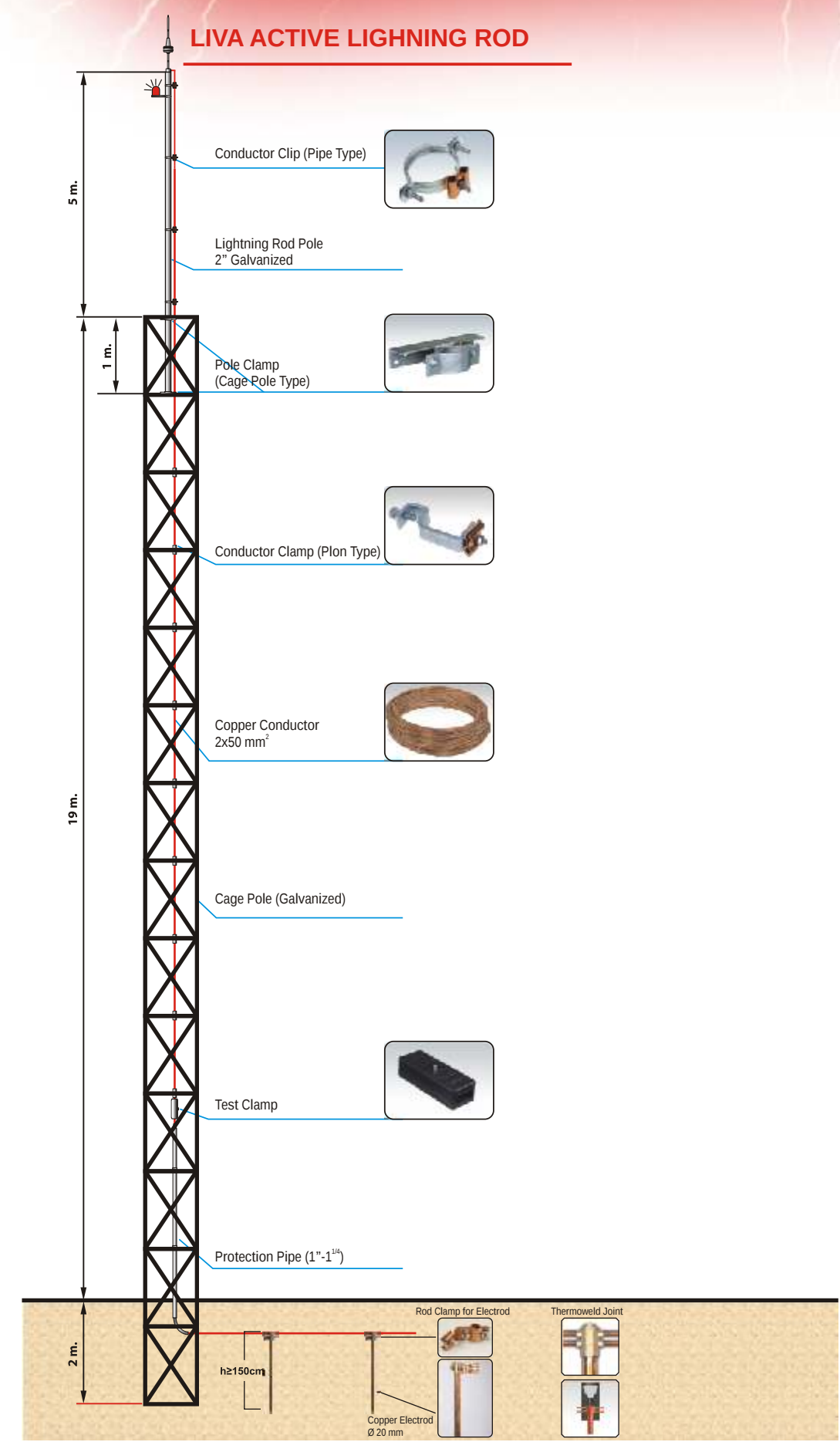
ACTIVE LIGHTNING ROD ASSEMBLY DRAWINGS



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 Ø60 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



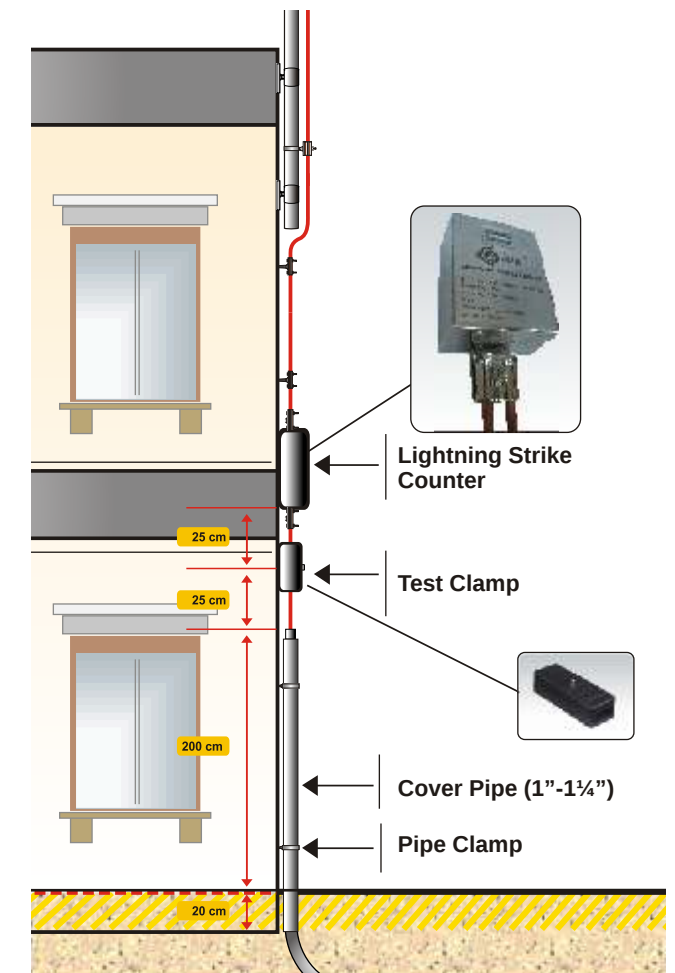
window allows easy reading of 6 digit counter.
LSC-LX01 Liva Lightning Strike Counter

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.



ACTIVE LIGHTNING ROD ASSEMBLY MATERIALS



BİL 50

Order Code : BİL 50
Kind : Copper Conductor
Type : Ø 8
Dimensions : Diameter 8mm.
Cross-Section 50 mm²



DİK 250

Order Code : DİK 250
Kind : Conductor Clip
Type : Pipe Type
Dimensions : 2" Pole
2x50 mm² conductor



DİK-G 250

Order Code : DİK-G 250
Kind : Conductor Clip
Type : Pipe Type
Dimensions : 2" Pole
2x50 mm² conductor



TİK 250

Order Code : TİK 250
Kind : Conductor Clip
Type : Screw Type
Dimensions : 2x50 mm² conductor



LİK 250

Order Code : LİK 250
Kind : Conductor Clip
Type : L Type
Dimensions : 2x50 mm² conductor



PİK 250

Order Code : PİK 250
Kind : Conductor Clip
Type : Pylon Type
Dimensions : 2x50 mm² conductor



KİK 250

Order Code : KİK 250
Kind : Conductor Clip
Type : Roof Tile
Dimensions : 2x50 mm² conductor



MİK 250

Order Code : MİK 250
Kind : Conductor Clip
Type : Roof Ridge
Dimensions : 2x50 mm² conductor



İBK 250

Order Code : İBK 250
Kind : Conductor Connecting Clip
Type : -
Dimensions : 2x50 mm² conductor

CONDUCTOR AND CONDUCTOR CLIPS

POLE FIXING TRIPODS-CLIPS



DTS 3030

Order Code : DTS 3030
Kind : Pole Fixing Tripod
Type : Center
Dimensions : 2" Pole
Pedestal 30x30 cm.
Height 30 cm.



DTS 3025

Order Code : DTS 3025
Kind : Pole Fixing Tripod
Type : Side
Dimensions : 2" Pole
Pedestal 30x25 cm.
Height 30 cm.



DTS 2525

Order Code : DTS 2525
Kind : Pole Fixing Tripod
Type : Corner
Dimensions : 2" Pole
Pedestal 25x25 cm.
Height 30 cm.



DTK-B

Order Code : DTK-B
Kind : Pole Fixing Clip
Type : Concrete Type
Dimensions : 2" Pole



DTK-T 30

Order Code : DTK-T 30
Kind : Pole Fixing Clip
Type : Brick/Wall Type
Dimensions : 2" Pole
30 cm. Tij Height



DTK-T 50

Order Code : DTK-T 50
Kind : Pole Fixing Clip
Type : Brick/Wall Type
Dimensions : 2" Pole
50 cm. Tij Height



DTK-BT 50

Order Code : DTK-BT 50
Kind : Pole Clamp
Type : Brick/Wall Type
Dimensions : 2" Pole
50 cm. Tij Height



*TEST CLAMP
TK 250*

Order Code : TK 250
Kind : Test Clamp
Type : Black
Dimensions : 2x50 mm² Conductor



*TEST CLAMP
TK 250 SY*

Order Code : TK 250 SY
Kind : Test Clamp
Type : Yellow-Green
Dimensions : 2x50 mm² Conductor

ACTIVE LIGHTNING ROD
ASSEMBLY MATERIALS

ETK 2030

Order Code : ETK 2030
Kind : Rod Clamp for Electrode
Type : Electrode Type
Dimensions : 2x50 mm² Conductor
Electrode Diameter (Ø)16-20 mm.
Thickness 2 mm. Solid Copper



ETK 2530

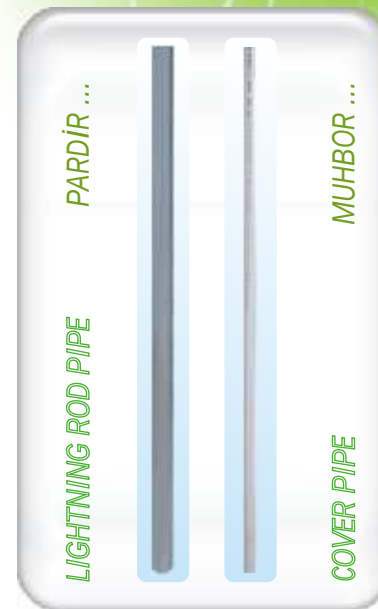
Order Code : ETK 2530
Kind : Rod Clamp for Electrode
Type : Electrode Type
Dimensions : 2x50 mm² Conductor
Electrode Diameter (Ø)18-20 mm.
Thickness 2,5 mm. Solid Copper

ELECTRODE AND ELECTRODE FIXING CLIP

COPPER
(Cu) STAINLESS
STEEL (Inox)

ORDER CODE	KIND	DIAMETER	HEIGHT
EL 18100.Cu	Copper Electrode	Ø 18 mm	100 cm
EL 18150.Cu	Copper Electrode	Ø 18 mm	150 cm
EL 20100.Cu	Copper Electrode	Ø 20 mm	100 cm
EL 20150.Cu	Copper Electrode	Ø 20 mm	150 cm
EL 20300.Cu	Copper Electrode	Ø 20 mm	300 cm
EL 20100.St	Inox Electrode	Ø 20 mm	100 cm
EL 20150.St	Inox Electrode	Ø 20 mm	150 cm
EL 20300.St	Inox Electrode	Ø 20 mm	300 cm
EL 22100.St	Inox Electrode	Ø 22 mm	100 cm
EL 22150.St	Inox Electrode	Ø 22 mm	150 cm
EL 22300.St	Inox Electrode	Ø 22 mm	300 cm
EL 25100.St	Inox Electrode	Ø 25 mm	100 cm
EL 25150.St	Inox Electrode	Ø 25 mm	150 cm
EL 25300.St	Inox Electrode	Ø 25 mm	300 cm

Note: If you want we can product electrode that it can be different dimensions.

ACTIVE LIGHTNING ROD
ASSEMBLY MATERIALS

PARDİR ...

LIGHTNING ROD PIPE

MUHBOR ...

COVER PIPE

ORDER CODE	KIND	DIAMETER	HEIGHT
PARDİR 2300	Lightning Rod Pipe	Ø 2"	3 meters
PARDİR 2600	Lightning Rod Pipe	Ø 2"	6 meters
PARDİR 3300	Lightning Rod Pipe	Ø 3"	3 meters
PARDİR 3600	Lightning Rod Pipe	Ø 3"	6 meters

ORDER CODE	KIND	DIAMETER	HEIGHT
MUHBOR 1200 G	Cover Pipe with Galvanized	Ø 1"	2 meters
MUHBOR 1200 P	Cover Pipe PVC	Ø 1"	2 meters



PARDİR-EK

Order Code : PARDİR-EK
Kind : Pole Tie Part
Type : Lightning Rod Pole
Dimensions : 2" Pole for



BORKEP 11 / 21

Order Code : BORKEP 11 / BORKEP 21
Kind : Pipe Clip With Rubber Insulation
Type : From Pipe to Cover Pipe
Dimensions : 1"-1" / 2"-1"



BORKEP 1T / 2T

Order Code : BORKEP 1T / BORKEP 2T
Kind : Pipe Clip With Rubber Insulation
Type : With Screw (From Wall to Pipe)
Dimensions : 1" / 2"



GERMEN

Order Code : GERMEN
Kind : Vice for Rope Stretch
Type : -
Dimensions : 30 cm



GERKEP

Order Code : GERKEP
Kind : Clamp for Rope Stretch
Type : -
Dimensions : Max. 5 mm.



GERHAT

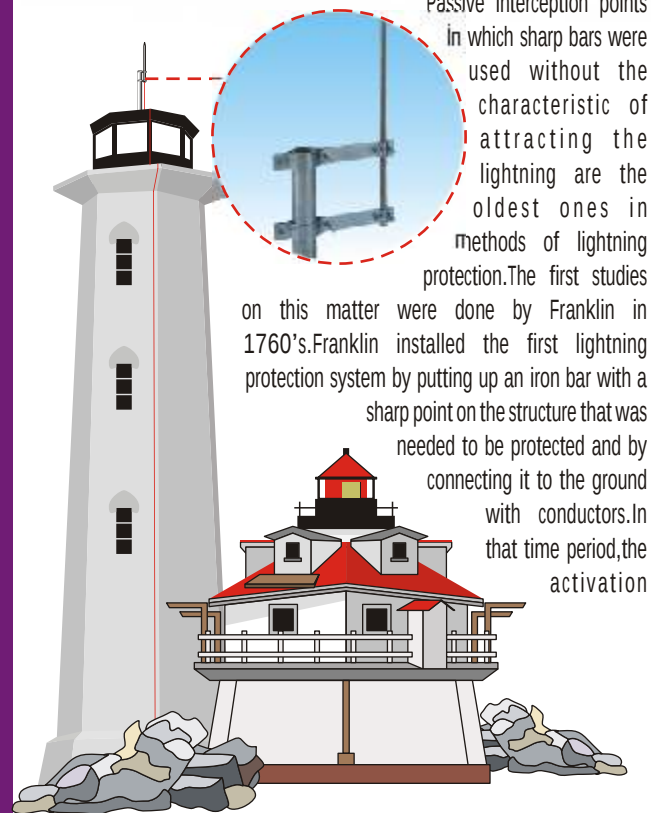
Order Code : GERHAT
Kind : Rope
Type : Covered PVC
Dimensions : 5 mm.

LIGHTNING ROD POLE AND VICE FOR ROPE STRETCH

FARADAY CAGE/FRANKLIN ROD GENERAL INFORMATION

Franklin Rod

In protection being done with Franklin rod, interception discharge formed by ions coming out from a sharp point (sharp point effect) eventuates the protection just in a volume of a cone with a radius that is equal to the length of the Franklin rod.



Passive interception points in which sharp bars were used without the characteristic of attracting the lightning are the oldest ones in methods of lightning protection. 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 bar with a sharp point on the structure that was needed to be protected and by connecting it to the ground with conductors. In that time period, the activation

field of the installed bar was agreed a circle that accepted the bar length as the radius. At the present day however, the protection diameter is accepted as the length of the rod. The field that will be protected requires to be in a cone whose vertex angle is 45° . So as to get a safer protection, it is useful to take the vertex 30° instead of 45° .

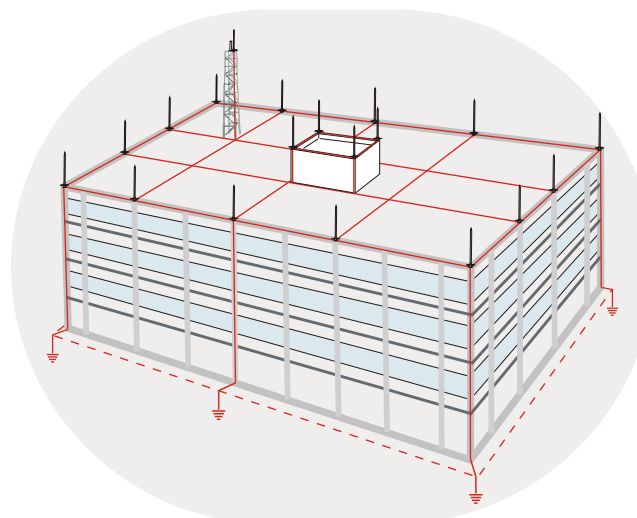
In 1760, because it was not possible to put up rather long bars in protection of a wide surfaced building with the bars tested by Franklin, their montages can't be applied practically. So, this method is especially used in minarets, factory chimneys, towers and small dimensional buildings as long as a very good grounding is done.

This protection which is done by using Franklin rod was improved more by Melsens afterwards in 1884's and Faraday Cage which is frequently used these days was formed.

Faraday Cage

Upon Faraday -with the studies he did- determined that the electric field in a conductive cage is zero, Melsens launched the idea of taking the volume into a conductive cage that is protected. This cage system Melsens would build was going to be taken into a copper cage by coiling its roof and side walls with good conductors (copper) vertically and horizontally. Some sharp pointed bars would be put up on the roof at fixed intervals then conductors would be grounded at multi-point.

In this way, every point of the building would become potential equally and in case of a lightning discharge, the building wouldn't suffer from harm because dangerous currents would flow to ground over copper cage that was coiled completely. While it is seen from this aspect, the Faraday Cage which is thought to be a good protection method in fact is losing its effectiveness in result of the difficulties in applying the system and wrong applications being done consciously or unconsciously. The safety of Faraday Cage depends on the dimensions of the cage meshes. The smaller meshes are, the safer the cage is. Nowadays, because of thoughts like using less conductors, finishing the work quicker by making meshes larger, making more profit by decreasing workmanship cost, Faraday Cage can't be installed properly. A cage which is not installed as it is required can't provide a good protection against lightning.

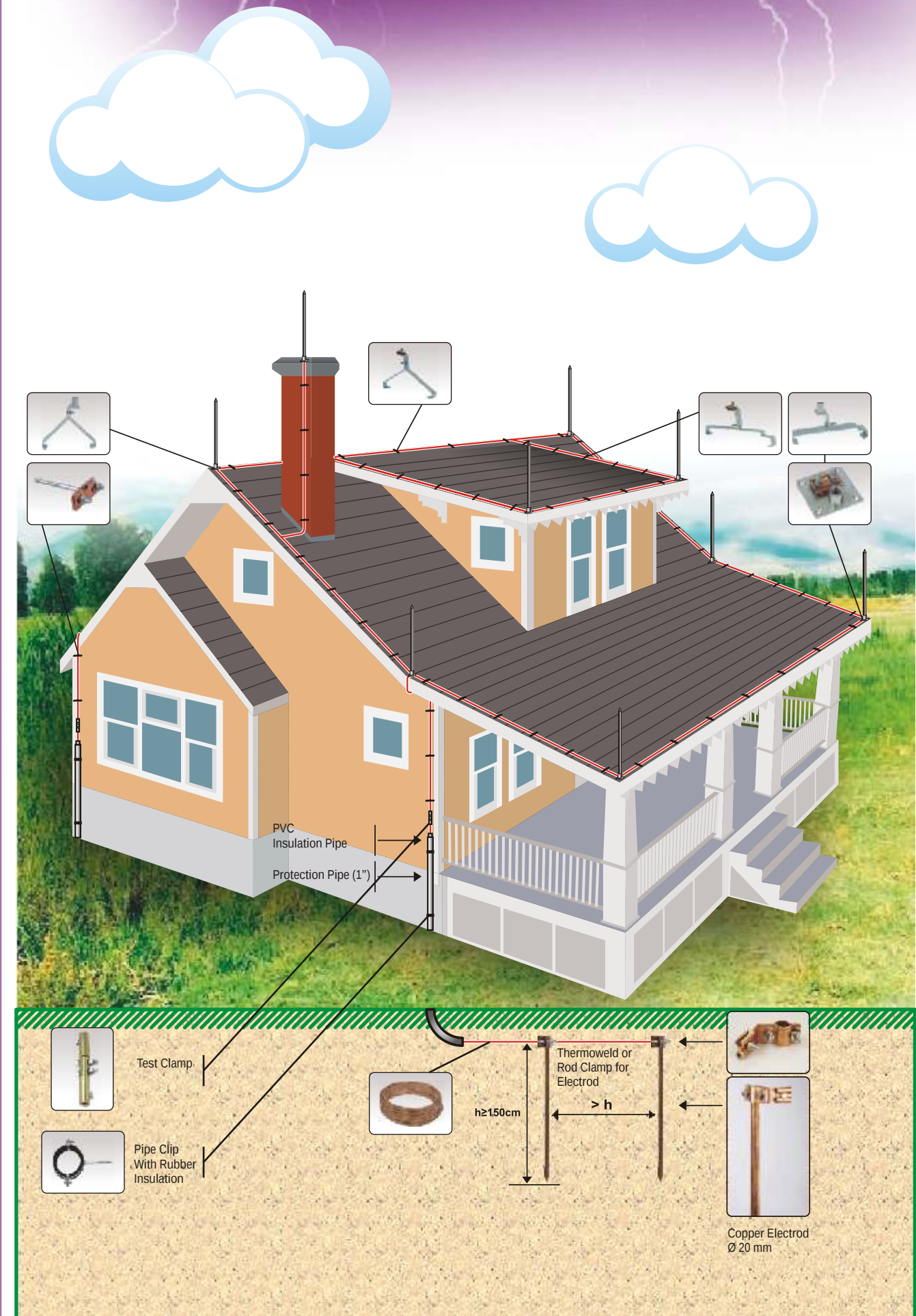


But a Faraday Cage that has been installed well is rather expensive in respect of both workmanship and cost. Besides, because of oxidation on the joints of the installed cage or other reasons, the periodic maintenance needs to be done and this causes additional expenditure. Perhaps, walks of the maintenance team on the roof may arise different expenditures for the roof.

If it is needed to give an example for a cage system not installed well, Mont Blanc Observatory can be shown. Here, the horizontal face of the building sitting on the earth had to be coiled but this wasn't done and conductivity of the earth was trusted for the enclosing of the cage instead. But this conductivity is inadequate most of the time. Due to these reasons, fatal accidents occurred because of lightning strikes in this observatory.

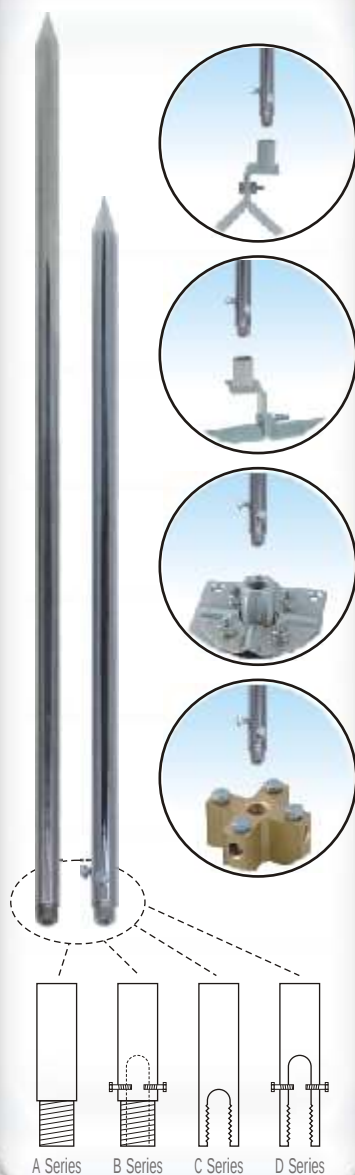
Koruma Düzeylerine Göre Franklin/Faraday Kafesi Uygulama Kriteri						
Koruma Düzeyi	Franklin Çubuğu	Yükseklik (m)				Kafesi Aralığı (m)
		20	30	45	60	
I		25	-	-	-	5x5
II	a açıları	35	25	-	-	10x10
III		45	35	25	-	15x15
IV		55	45	35	25	20x20
						İniş İletken Aralığı (m)
						10
						15
						20
						25

FARADAY CAGE/FRANKLIN ROD ASSEMBLY DRAWINGS



FARADAY CAGE/FRANKLIN ROD ASSEMBLY MATERIALS

LIGHTNING ROD



ORDER CODE	KIND	DIAMETER	HEIGHT
YU 1635.Cu	Copper Cr-Ni Covered	Ø 16 mm	35 cm
YU 1650.Cu	Copper Cr-Ni Covered	Ø 16 mm	50 cm
YU 2030.Cu	Copper Cr-Ni Covered	Ø 20 mm	30 cm
YU 2040.Cu	Copper Cr-Ni Covered	Ø 20 mm	40 cm
YU 2050.Cu	Copper Cr-Ni Covered	Ø 20 mm	50 cm
YU 2060.Cu	Copper Cr-Ni Covered	Ø 20 mm	60 cm
YU 2070.Cu	Copper Cr-Ni Covered	Ø 20 mm	70 cm
YU 2080.Cu	Copper Cr-Ni Covered	Ø 20 mm	80 cm
YU 1635.St	Stainless Steel	Ø 16 mm	35 cm
YU 1650.St	Stainless Steel	Ø 16 mm	50 cm
YU 2030.St	Stainless Steel	Ø 20 mm	30 cm
YU 2040.St	Stainless Steel	Ø 20 mm	40 cm
YU 2050.St	Stainless Steel	Ø 20 mm	50 cm
YU 2060.St	Stainless Steel	Ø 20 mm	60 cm
YU 2070.St	Stainless Steel	Ø 20 mm	70 cm
YU 2080.St	Stainless Steel	Ø 20 mm	80 cm

Note-1: If you want we can product rod that it can be different dimensions.

Note-2: Productions have different type of connections hole. You can select for A, B, C or D types.

CAPTURING RODS AND FIXING APARATUS



Order Code : MAHTAB
Kind : Sole of Faraday Cage Lightning Rod
Type : Ridge of Roof Type
Dimensions : All kind of type lightning rod for Liva products. You can use MAHTAP with 50 mm² conductors.



Order Code : KİKTAB
Kind : Sole of Faraday Cage Lightning Rod
Type : Roof Tile Type
Dimensions : All kind of type lightning rod for Liva products. You can use KİKTAP with 50 mm² conductors.



Order Code : İSTAB
Kind : Sole of Faraday Cage Lightning Rod
Type : Cross Type
Dimensions : You can use İSTAP with 4x50 mm² conductors.

FARADAY CAGE/FRANKLIN ROD ASSEMBLY MATERIALS

FIXING APARATUS



Order Code : BETTAB 450
Kind : Sole of Faraday Cage Lightning Rod
Type : Concrete type
Dimension : It is compatible to every kind of capturing rod. 4x50 mm² conductor connection can be done.



Order Code : BETTAB 250
Kind : Sole of Faraday Cage Lightning Rod
Type : Concrete type
Dimension : It is compatible to every kind of capturing rod. 2x50 mm² conductor connection can be done.



Order Code : BORYAK
Kind : For fixed of Faraday Cage Lightning Rod
Type : Pipe type
Dimension : It is compatible to every kind of capturing rod. Suitable for 2 pylons.



Order Code : BİL 50
Kind : Copper Conductor
Type : Ø 8
Dimension : Diameter 8 mm.
Section 50 mm²



Order Code : TİK 150
Kind : Conductor Crochet
Type : With Fixed Wood Screw Clamp
Dimension : 1x50 mm² Conductor



Order Code : LİK 150
Kind : Conductor Crochet
Type : L Type
Dimension : 1x50 mm² Conductor

CONDUCTOR AND CONDUCTOR CROCHETS



Order Code : PİK 150
Kind : Conductor Crochet
Type : Pylon
Dimension : 1x50 mm² Conductor



Order Code : KİK 150
Kind : Conductor Crochet
Type : Roof Tile
Dimension : 1x50 mm² Conductor



Order Code : MİK 150
Kind : Conductor Crochet
Type : Roof Ridge
Dimension : 1x50 mm² Conductor

FARADAY CAGE/FRANKLIN ROD ASSEMBLY MATERIALS



Order Code : TK 150
Kind : Test Connector
Type : Faraday Type 1x50
Dimension : 1x50 mm² Conductor



Order Code : ETK 2030
Kind : Electrode Fixing Clamp
Type : Electrode
Dimension : 2x50 mm² Conductor
Electrode Diameter (Ø) 20 mm.
Thickness 2 mm. Pure Copper



Order Code : ETK 2530
Kind : Electrode Fixing Clamp
Type : Electrode
Dimension : 2x50 mm² Conductor
Electrode Diameter (Ø) 20 mm.
Thickness 2,5 mm. Pure Copper



ORDER CODE	KIND	DIAMETER	HEIGHT
EL 18100.Cu	Copper Electrode	Ø 18 mm	100 cm
EL 18150.Cu	Copper Electrode	Ø 18 mm	150 cm
EL 20100.Cu	Copper Electrode	Ø 20 mm	100 cm
EL 20150.Cu	Copper Electrode	Ø 20 mm	150 cm
EL 20300.Cu	Copper Electrode	Ø 20 mm	300 cm
EL 20100.St	Inox Electrode	Ø 20 mm	100 cm
EL 20150.St	Inox Electrode	Ø 20 mm	150 cm
EL 20300.St	Inox Electrode	Ø 20 mm	300 cm
EL 22100.St	Inox Electrode	Ø 22 mm	100 cm
EL 22150.St	Inox Electrode	Ø 22 mm	150 cm
EL 22300.St	Inox Electrode	Ø 22 mm	300 cm
EL 25100.St	Inox Electrode	Ø 25 mm	100 cm
EL 25150.St	Inox Electrode	Ø 25 mm	150 cm
EL 25300.St	Inox Electrode	Ø 25 mm	300 cm

Note: Grounding Electrodes can be produced in various dimensions and lengths privately by order.

ELECTRODE AND ELECTRODE FIXING CLAMPS

FARADAY CAGE/FRANKLIN ROD ASSEMBLY MATERIALS



Order Code : TOPTEST - A / TOPTEST - D
Kind : Grounding Resistance Test
Instrument
Type : Analog / Digital
Accessory : Bag, Grounding Reference Cables, Grounding Electrode (2 pieces)



Order Code : PARTEST X-1
Kind : Active Lightning Rod Test
Instrument
Type : Digital
Accessory : Energy Cable, Reference Props

MEASURING INSTRUMENTS



ORDER CODE	KIND	FEATURE
MANIA 220	PLANE WARNING LAMPS	AC 220 V
MANIA 220FF	PLANE WARNING LAMPS	AC 220 V With Flash and Photocell
MANIA 220LF	PLANE WARNING LAMPS	AC 220 V with led and photocell
MANIA 12	PLANE WARNING LAMPS	DC 12 V
MANIA 12F	PLANE WARNING LAMPS	DC 12 V With Flash and Photocell
MANIA 12LF	PLANE WARNING LAMPS	DC 12 V with led and photocell

Note: Plane Warning Lamps must be put on high structures according to International Aviation Rules.

WARNING LAMPS



Order Code : BORMER
Kind : Pipe Ladder
Dimension : 2 M. (It is produced in 2-meter pieces.It can be lengthened to 10 meters.)
Round gaps 40 cm.



Order Code : HALMER
Kind : Rope Ladder
Dimension : It can be produced to 50 meters related to the requirement.
Round gaps 50 cm.

SPECIAL PRODUCTS



Order Code : EMKER
Kind : Safety Harness
Dimension : It can be adjusted to every body measurement.

MONTAGE EQUIPMENT

SOIL CONDUCTIVITY MATERIAL (TİM)

Soils show various resistances against electric current related to geographic position wherein they are and the minerals in their composition. Especially, in the rocky areas where the soil layer is thin and in the areas where pebbly sand is thick, the impedance of soil is high and related to this, permeability is low.

On the basis of grounding system, the aim is to conduct the electric current to the ground as soon as possible. For the grounding systems with high resistance of conduction to the earth, the bounce made by not discharged electrical charge does a great harm for life safety first and then property safety. For this purpose, especially the grounding of establishment and surge protectors (parafoudre) and the grounding resistance of communication systems must be less than 1 Ohm in accordance with the regulations.

In the areas where the grounding resistance is high, the only method to increase the conductivity is to use chemical compounds. The International corporations advise to use chemical compounds which decrease soil permeability resistance in this kind of soils. But, when these kind of chemical compounds are mixed with soil, they must have the specialties not changing the natural structure of soil, not contaminating subterranean and aboveground water sources and not spoiling the ecological balance of nature briefly.

Liva Soil Conductivity Material (TİM) is a product whose production is made at home by importing some of its raw materials from abroad in result of long studies which took more than two years. The chemical analyze of our product has been made and it is stated that it gives better results in applications (supplies 10-20 times better conductivity) than its precedents on the market by experiments.

You can apply Liva Soil Conductivity Material (TİM) on every kind of ground conditions and with every kind of soils.

THE EFFECT OF LİVA SOIL CONDUCTIVITY MATERIAL ON SOIL

- By increasing present soil conductivity, it decreases the resistance of soil.
- It secures the conductivity of the soil which is applied to be stabile for a long time.
- In applications, the chemical and physical changes of soil don't decrease its activation.
- There becomes no change in its attributes in elapsed time.
- It decreases freezing risk 20% in very cold regions especially in winter.
- Even if there is no need adding another material (salt, coal dust, etc.) to make it more efficient and keeping it wet or humid continuously in the application field.



ADVANTAGES OF LİVA SOIL CONDUCTIVITY MATERIAL

- Because of its high conductivity specialty, it provides serious advantages in consumption of grounding electrode or band material.
- It decreases the cost minimum in reducing the resistance of grounding.
- It shortens the process of manpower which is done for reducing the resistance of grounding.
- It is not affected negatively from the water potentials in soil.
- It doesn't form acidic reaction with salt-based chemicals in soil.
- It doesn't make galvanic corrosion with any of the chemicals in soil by forming reaction.



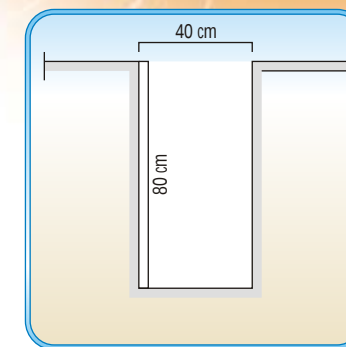
- It provides easiness for transportation with its original package and application on site.
- The hand gloves and dust mask needed during application are in the package.
- It is easy to be applied.

CE Certificate: Liva Soil Conductivity Material (TİM) have "CE" that EC Declaration of Conformity certificate. Date is 23 February 2009.

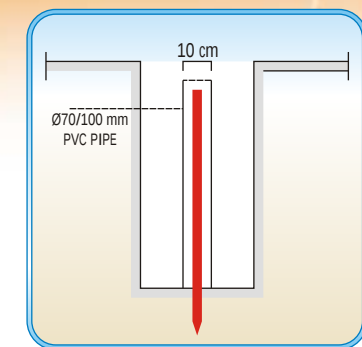
ORDER CODE	PRODUCT NAME	WEIGHT
TİM 115	Soil Conductivity Material	11,5 Kg.
TİM 050	Soil Conductivity Material	5 Kg.

SOIL CONDUCTIVITY MATERIAL (TİM) APPLICATION PRINCIPLES

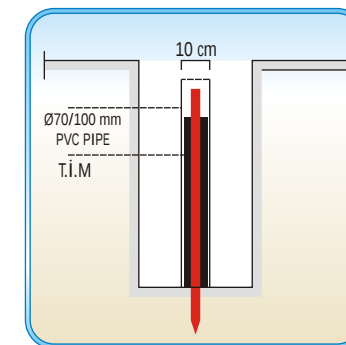
APPLICATION WITH GROUNDING ELECTRODE



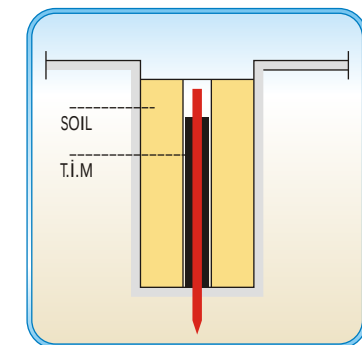
A hole is dug in the depth of 70 to 80 cm and in the width of 30 to 40 cm. in the place of application of the earthing electrode.



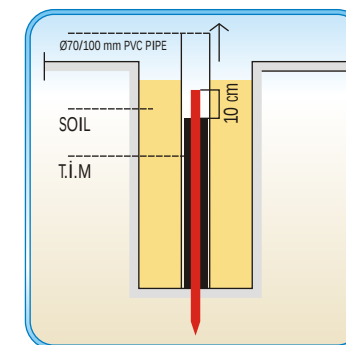
The electrode is driven in this hole as it is placed 10 cm. Left open from the ground and a PVC pipe 70 or 100 mm. In diameter is enclosed around the rod.



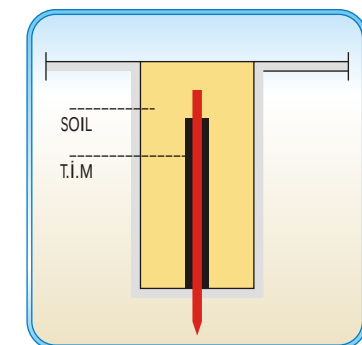
After the electrode is centered in the pipe, it is filled with TİM as the electrode is left open 10 cm. from the top.



This part (electrode hole) is covered with soil except PVC pipe.



The PVC pipe enclosed around the outer part of the electrode is detached from its place by with drawing it upwards.

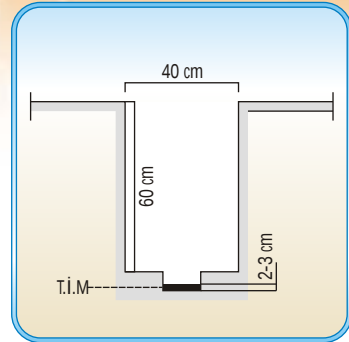


The soil in the hole is compressed in order that the contact of soil with TİM around the electrode becomes better.

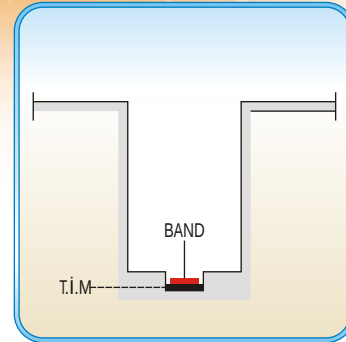
NOTE: The local grounding resistance of laid-out grounding conductor is measured with grounding measurement device. In case the grounding resistance comes out high, the canal length may be expanded or a grounding system may be installed with a second canal apart from 5 m. This application is repeated until finding appropriate grounding resistance.

SOIL CONDUCTIVITY MATERIAL (TİM) APPLICATION PRINCIPLES

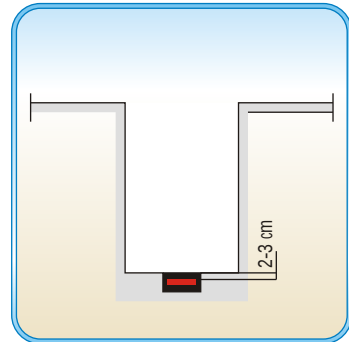
APPLICATION WITH TAPE EARTHING



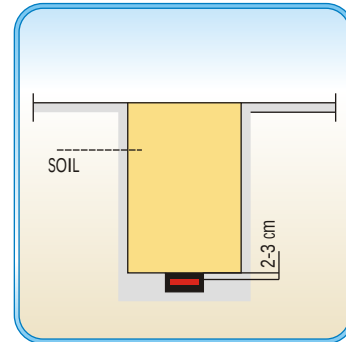
A canal is dug 70 to 80 cm. in depth and 30 to 40 cm. in width in soil where earthing conductor or tape is applied.



On the layered TİM, bare earthing conductor or tape is laid.



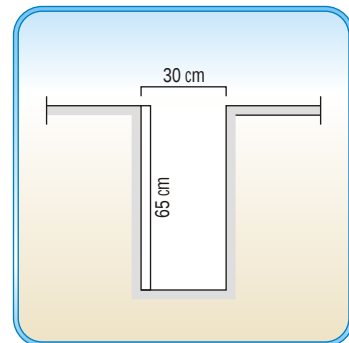
TİM is laid on the floor of the canal 10 cm. In width and 2 to 3 cm. thick.



The TİM laid on the conductor is covered with soil completely.(Don't use sand.)

Note: The local earthing resistance of the layered earthing conductor is measured with earthing measurement device. In case that the resistance of earthing turns out high, either the length of the canal can be lengthened or an earthing system is installed with a second canal 5 meters gap. This application is continued until acceptable resistance of earthing is found out.

APPLICATION WITH SHEET



A hole is dug 60-70 cm. in depth and 30-40 cm. in width in the place where the grounding conductor or band is applied.

TİM is laid on the floor of the canal 3-4 cm. thick. The conductive tape is placed on the laid-out TİM vertically. Soil is laid 10 cm. thick on the TİM. TİM is laid 3-4 cm. on the soil again. This application is repeated 4-5 times as it is 3-4 cm. TİM and 10 cm. soil. The local grounding resistance of laid-out grounding conductor is measured with grounding measurement device. In case the grounding resistance comes out high, this application may be repeated along the tape upwards. Dependent on the soil resistance, widening of the use surface and increasing of the use of TİM reduces soil resistance. When the appropriate resistance value is captured, the hole is closed with soil completely. (Don't use sand.)

NOTE: If it is desired, Liva Soil Conductivity Material may be applied by diluting it in consistency of cement plaster in a suitable container. At the end of the application, PVC pipe must be taken out surely.

GROUNDING MATERIALS

BASIC GROUNDING MATERIALS



Order Code : GAŞ 230 / GAŞ 330
Type : Galvanized Tape
Type : -
Dimension : 2x30 mm / 3x30 mm



Order Code : TTK-ŞŞ
Kind : Basic Grounding Connector
Type : Tape - Tape
Dimension : 2x30 mm - 3x30 mm for tape
Thickness : 1 mm / 0,8 mm / 0,6 mm



Order Code : TTK-ŞD
Kind : Basic Grounding Connector
Type : Tape - Iron
Dimension : 2x30 mm - 3x30 mm for tape
Thickness : 1 mm / 0,8 mm / 0,6 mm



Order Code : TTK-DD
Kind : Basic Grounding Connector
Type : Iron - Iron
Dimension : 2x30 mm - 3x30 mm for tape
Thickness : 1 mm / 0,8 mm / 0,6 mm



Order Code : TEM-EL
Kind : Basic Grounding Electrode
Type : Bracket
Dimension : 50x50 mm Bracket
Length 150 cm



Order Code : İÇBAR 30
Kind : In-panel bar
Type : For 3-phase
Dimension : -

TİM MATERIAL



Order Code : EPB 3320 / 3330 / 3340
Kind : Equipotential bar
Type : With Pedestal / Without Pedestal
Dimensions : 3 mm x 3 cm x 20 cm
3 mm x 3 cm x 30 cm
3 mm x 3 cm x 40 cm



Order Code : EPB 3530 / 3540 / 3550
Kind : Equipotential bar
Type : With Pedestal / Without Pedestal
Dimensions : 3 mm x 3 cm x 20 cm
3 mm x 3 cm x 30 cm
3 mm x 3 cm x 40 cm



Order Code : İÇBAR 10
Kind : In-panel bar
Type : Neuter - Grounding
Dimension : Special Order

Note: Equipotential bars can be produced in desired length and dimension.

THERMOWELDING GENERAL INFORMATION

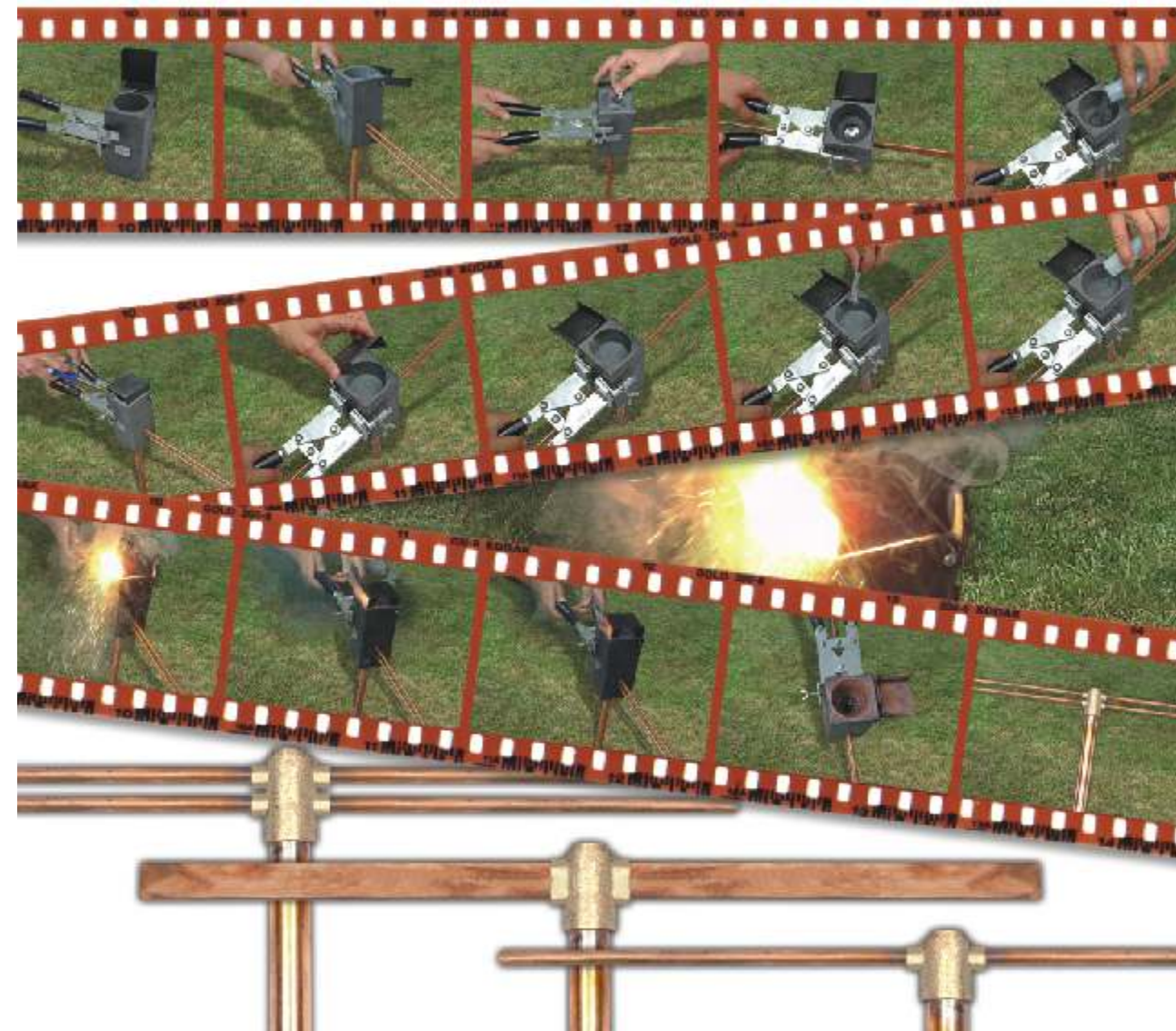
Thermoweld application is a technology which is served to joint the same or different metals easily and seamlessly in the couplings that are needed to be joined electrically. The coupling becomes true by melted copper's forming the coupling in result of reaction with aluminum copper oxide materials. The melted state of copper is connected to the conductors which are to be added at molecular level and for this reason; the coupling area forms a seamless conductive path with the conductors that are to be connected. So, contact points don't meet any corrosive effects as a matter of conduction.

The advantages of Thermoweld Connection

- It doesn't require external heat source.
- The material is welded in a couple of seconds in the place where you are.

- A crucible in the size of 15-20 cm. and welding dust are enough for this.
 - The welding coupling happens molecularly.
- For this reason;**
- Contrary to mechanical connections, there doesn't happen voltage fall at the welding point.
 - The carrying capacity of over current is at least as much as the conductor which is welded.
 - The corrosion and looseness in time don't seem as it is seen on the mechanical connections.
- DO NOT FORGET!!!**

Fixing with mechanical connections may have some disadvantages with the effect of corrosion in the length of time. The most effective applicable way for the most modern and seamless solution is thermowelding.



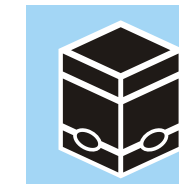
The dependent and basic method of forming of high quality electrical coupling without needing an external heat source power. Couplings are made by using the reaction of copper oxide in state of dust and aluminum at high heat degree.

Many Fursweld couplings have a field at least twice of connected conductors and are equal to present carrying capacity or more than that. The corrosion resistance is rather a lot because of having copper at a high percentage.

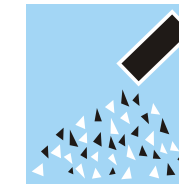
THERMOWELDING APPLICATIONS

Thermoweld material selection

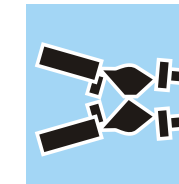
For material selection necessary to make Thermoweld, first Thermoweld connection type is chosen from the next page. There is a page number below every connection figure where there is a table having necessary materials for that connection. Necessary materials for the connection are chosen with ease from this table.



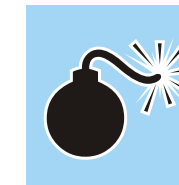
A mold has to be chosen suitable for the conductors that are connected.



Different welding dust is needed for every coupling.
(Thermowelding dust must be protected from moisture.)



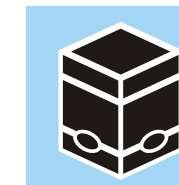
Thermowelding pliers are used to fix the mold.
Thermowelding pliers may be used for all of the molds. (Except small molds)



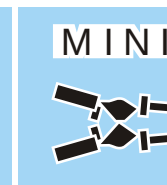
While making thermowelding coupling, do not approach with flammable and explosive materials. Take necessary safety measures while making thermowelding coupling close to flammable and explosive materials.



Use special lighter to ignite the mixture.
Do not touch before the mixture gets cold enough.

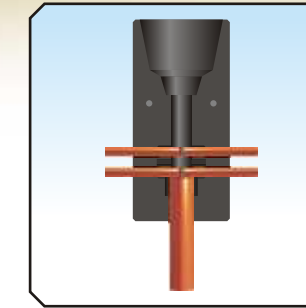


75 thermowelding couplings can be made approximately with a mold.

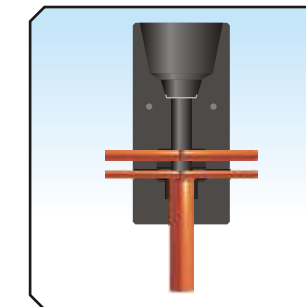


A small mold and small pliers are used for

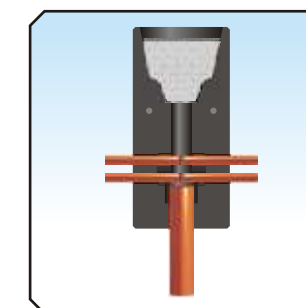
Thermoweld applications



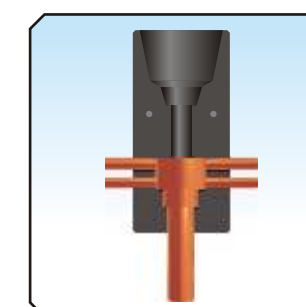
1-After you are sure that the mold is dry and clean, place the conductors with clean surfaces in the cavity of the mold and join the mold with the mold pliers.



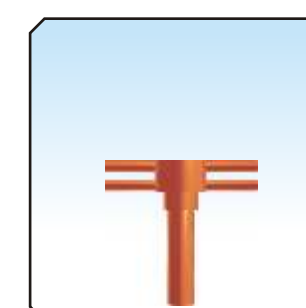
2-Place the metal retaining disc on the bottom of the crucible. Pour the dust in the crucible and sprinkle some starting powder on it. Close the lid of the crucible. Ignite the starting powder with a special spark gun. This process turns the band of dust to melted copper alloy resulting in exothermic reaction.



3-The melted copper alloy melts the metal retaining disc and the weld whose conductors melt partly drains in its mold. The reaction takes place in the mold safely.



4-The melted copper alloy awaits in the mold until it gets cold.

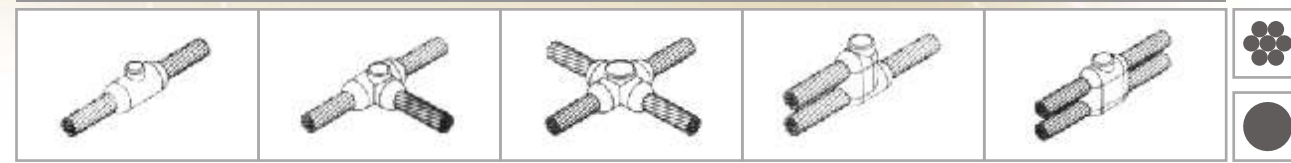


5-After the thermowelding process is completed, the mold is taken out from the joint and the inside of the mold is cleaned with a cleaning brush for the next use.

THERMOWELDING APPLICATIONS

Thermowelding Joint Types and Conductors that are to be used

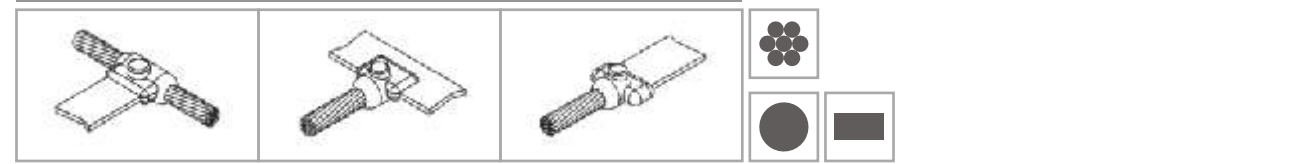
From Cable to Cable



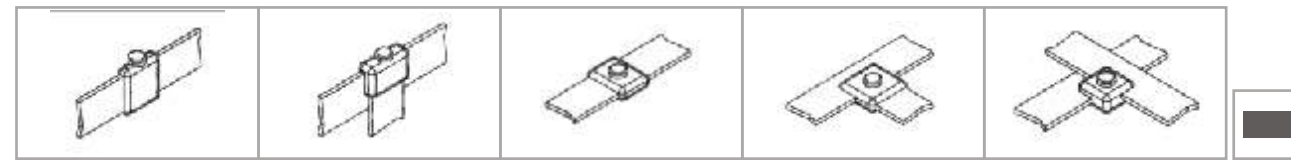
From Cable to Grounding Electrode



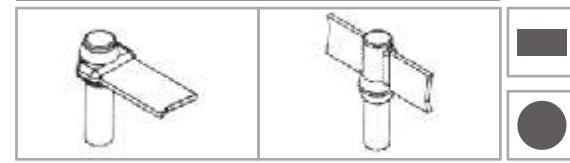
From Cable to Bara



From Bara to Bara



From Bara to Grounding Electrode



Comparing of Joint types

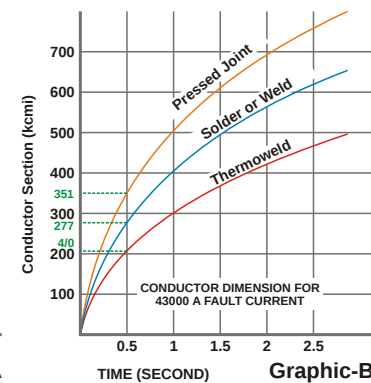
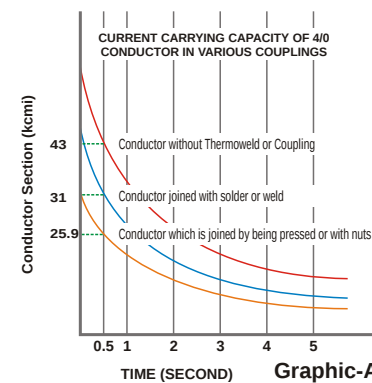
Thermowelding joints become healthier and more lasting than other joints because of molecular mixing of materials which are used with metals that are to be joined at high temperatures. Below is the comparison of thermowelding joints with other joints. When the data are reviewed, it is seen clearly that the thermowelding joint is more efficient according to others. It is shown in calculations that, the melting currents depend on heat limits in a Half-second short circuit for a 4/0-conductor (122.600 circular miles).

Sıkıştırılmalı Ek (250 °C)	Lehimli Ek (450 °C)	Termokaynak Ek (1083 °C)
$I=211.600 \text{ (4/0 Conductor)}=25.900 \text{ amps.}$	$I=211.600 \text{ (4/0 Conductor)}=31.000 \text{ amps.}$	$I=211.600 \text{ (4/0 Conductor)}=43.000 \text{ amps.}$
$11.54\sqrt{0.5}$	$9.12\sqrt{0.5}$	$6.96\sqrt{0.5}$

Squeezing and expansion of the diameter of a cable are required at solder-type joints for showing resistance against 43.000 ampere-short circuit-current of a conductor. But, the resistance of the conductor wherein thermowelding joint material is used and the resistance of the joint are equal. This allows the same current to be able to be carried on a thinner cable.

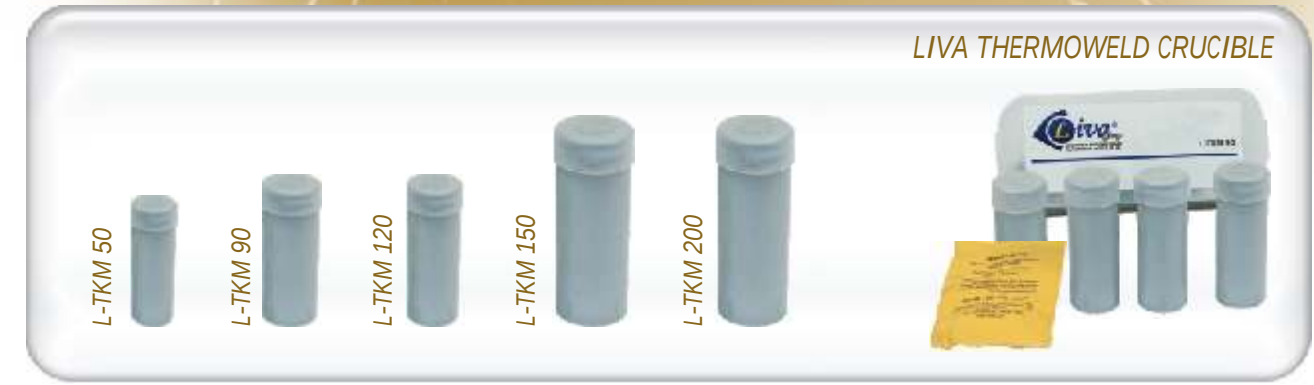
The current carrying capacities for a 4/0-conductor on various joints (Diagram-A) and the dimension of a conductor for 43.000 A fault current (Diagram-B) are given on the side diagram.

According to this; the importance of melting limits on various joint types are seen.



GROUNDING MATERIALS

LIVA THERMOWELD CRUCIBLE



ORDER CODE	PRODUCT NAME	ITEM WEIGHT
L-TKM 50	Liva Thermoweld Crucible	50 gr.
L-TKM 90	Liva Thermoweld Crucible	90 gr.
L-TKM 120	Liva Thermoweld Crucible	120 gr.

ORDER CODE	PRODUCT NAME	ITEM WEIGHT
L-TKM 150	Liva Thermoweld Crucible	150 gr.
L-TKM 200	Liva Thermoweld Crucible	200 gr.
L-TKM 250	Liva Thermoweld Crucible	250 gr.



ORDER CODE	PRODUCT NAME	ITEM WEIGHT
TEKAP A1 Series	Liva Thermoweld Dust	From Conductor to Conductor
TEKAP A2 Series	Liva Thermoweld Dust	From Conductor to Electrode
TEKAP B1 Series	Liva Thermoweld Dust	From Conductor to Conductor
TEKAP B2 Series	Liva Thermoweld Dust	From Conductor to Electrode
TEKAP C1 Series	Liva Thermoweld Dust	From Conductor to Conductor
TEKAP C2 Series	Liva Thermoweld Dust	From Conductor to Electrode

NOTE: Thermowelding crucibles are produced in the form of being welded at desired conductor dimensions as a set of A-B-C. Specify the dimension of the conductor you need on the order.



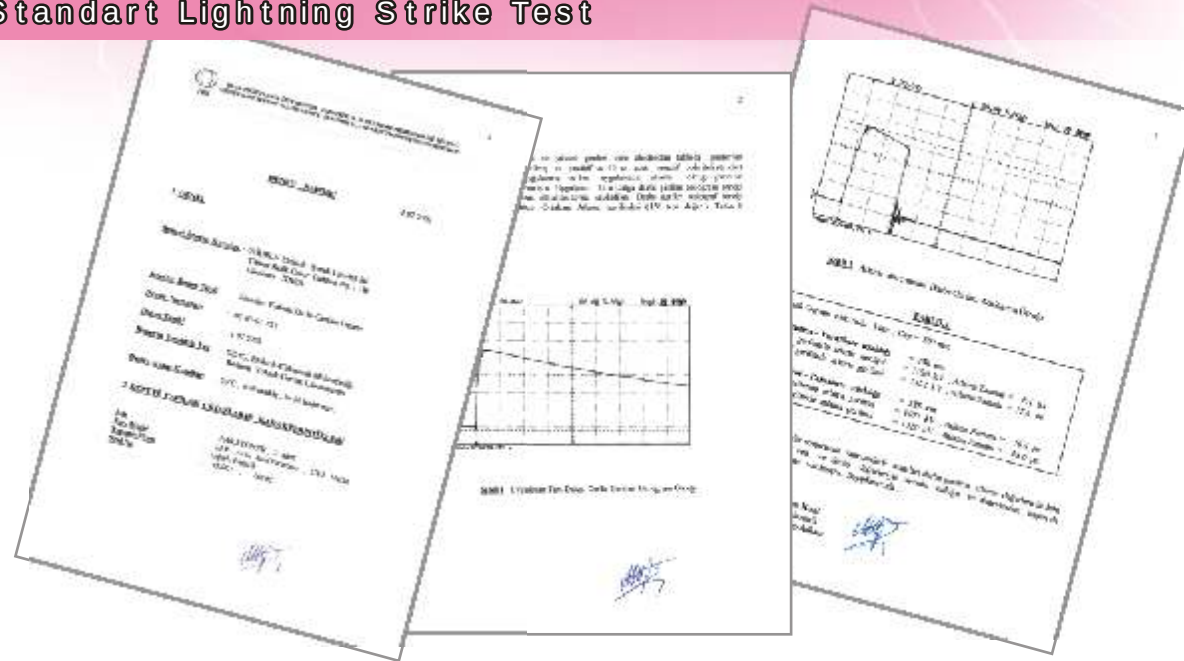
Order Code : TEKPENS
Kind : Thermoweld Crucible Pliers



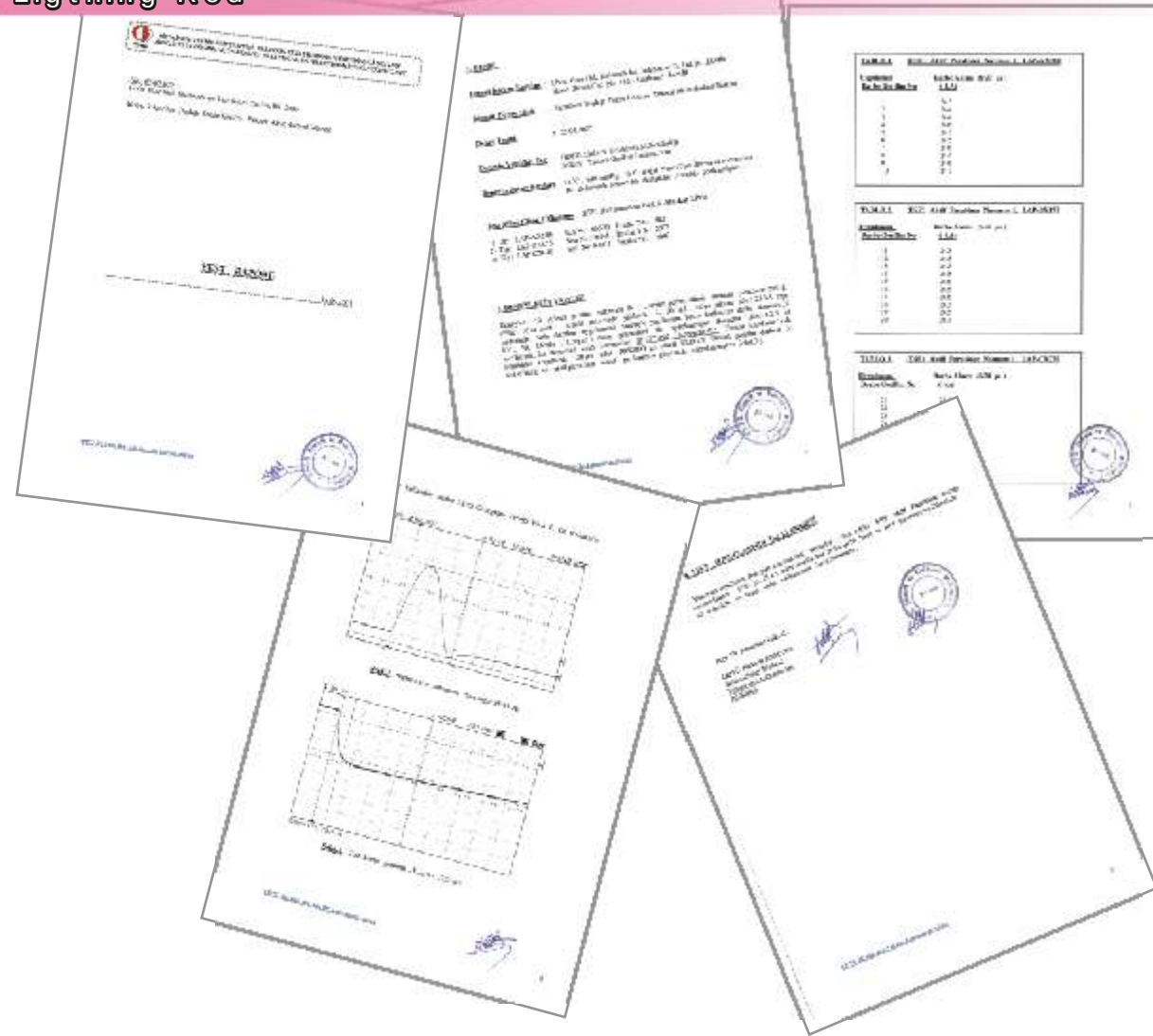
Order Code : TEKTEM
Kind : Thermoweld Crucible Cleaning Set
Contents : Crucible Cleaning Brush (1piece)
Conductor Cleaning Brush (1piece)
Crucible Scraper (1piece)

DOCUMENTS

Standart Lightning Strike Test

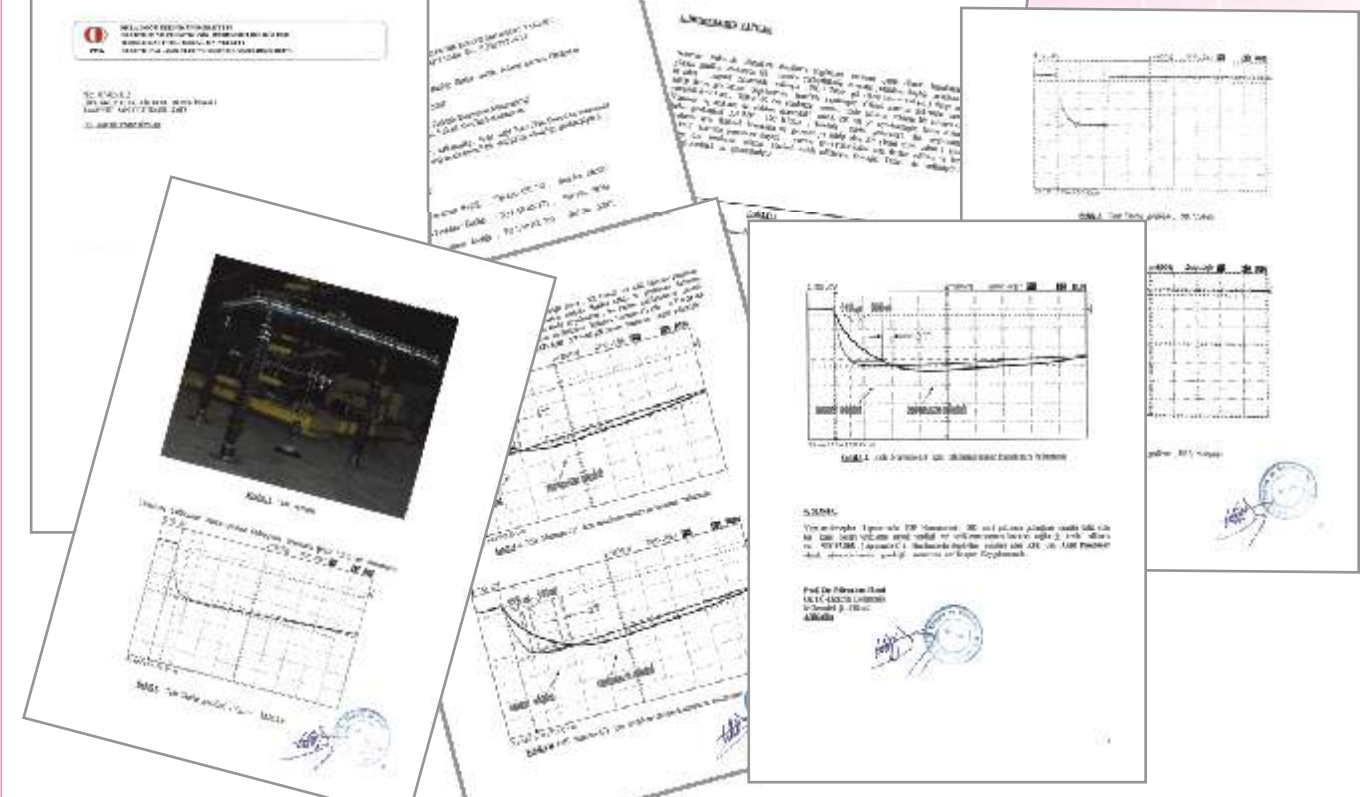


High Current Strike (short Circuit Ka) Test Of Lightning Rod



DOCUMENTS

Lightning Strike Tension Jumping Time (t_t) Test Of Lightning Rod (Standart: NFC 17-102) (LAP AX-210, LAP BX-175, LAP CX-070)



Lightning Strike Tension Jumping Time (t_t) Test Of Lightning Rod (Standart: NFC 17-102) (LAP DX-250, LAP BX-125, LAP CX-040)



DOCUMENTS

