ENERGY PLUS

THE REVOLUTION IN LED LIGHTING

2020

LQ

LIGHTNING QUENCHER CATALOGUE

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CORPORATE PROFILE

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ABOUT US

Energy Plus manufactures LED technology luminaires. The Company's scientific staff carries out pioneering research in the fields of design, lighting, optical units of the LED chips and electronics. As a result, it holds patents and international certifications in its field of activity.

In 2016 Energy Plus completed the design and moved on to the certification (CE ENEC) and started manufacturing LED technology Luminaires. At the same time expanded the portfolio of available products to include LED bulbs and luminaires as commercial products, commencing its cooperation with other quality certified manufacturers.

Energy Plus manufactures Lightning Quenchers as well. An extraordinary product for protection against direct and indirect lightning for middle voltage networks.
A unique range of products with almost 100 registered patents to prevent and protect from any loses of human life or asset's damages.

Energy Plus has high caliber, dynamic and well-trained executives in all sectors of activity. By constantly investing in excellently trained staff and new technologies, it is a Greek company that aims to become recognized throughout Europe and not only.

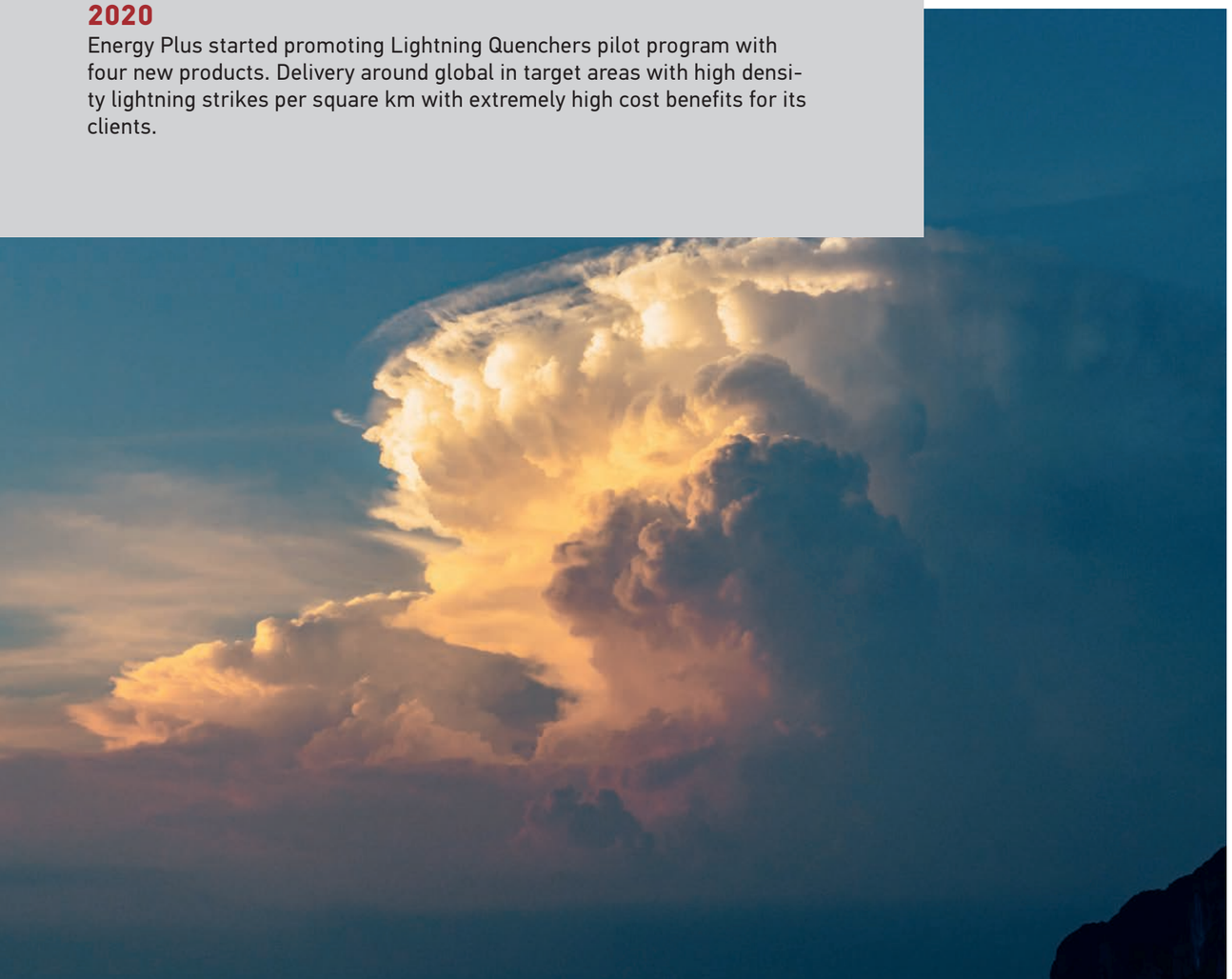
AT A GLANCE

2012
Energy Plus was founded in 2012, the object of its work being the manufacturing and utilisation of photovoltaic power production parks.

2015
In 2015 it created an LED lighting fixture manufacturing unit in the Industrial Area of Sindos, Thessaloniki.

2016
In September 2016, the Swiss interest international group “EHOT ENERGY HOLDING AND TRADING LTD” took a share of Energy Plus’s share capital, dramatically increasing the Company’s capital base and know-how.

2020
Energy Plus started promoting Lightning Quenchers pilot program with four new products. Delivery around global in target areas with high density lightning strikes per square km with extremely high cost benefits for its clients.



LIGHTNING

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OVERVIEW

Lightning is a naturally occurring electrostatic discharge during which two electrically charged regions in the atmosphere or ground temporarily equalize themselves, causing the instantaneous release of as much as one gigajoule of energy.

This discharge may produce a wide range of electromagnetic radiation, from extremely hot plasma created by the rapid movement of electrons to brilliant flashes of visible light in the form of black-body radiation.

Lightning causes thunder, a sound from the shock wave which develops as gases in the vicinity of the discharge experience a sudden increase in pressure. Lightning occurs commonly during thunderstorms and other types of energetic weather systems, but volcanic lightning can also occur during volcanic eruptions.

IS IT, AN INTEGRAL PART OF OUR LIVES OF AWE, FEAR AND “LOVE”?

Humans have deified lightning for millennia, and lightning-inspired expressions. In some languages, the notion of “love at first sight” literally translates as “lightning strike”.
Source: Wikipedia

FACTS

Do you know the saying “lightning never strikes the same place twice”? Forget it. Venezuela’s Lake Maracaibo earned a place in the Guinness Book of World Records for “highest concentration of lightning”

The Catatumbo Lightning occurs in Venezuela over the mouth of the Catatumbo River as it enters Lake Maracaibo. This area receives almost 250 lightning flashes per square kilometre each year. Lightning happens up to 300 nights per year in displays that can last nine hours.

Source: guinnessworldrecords.com

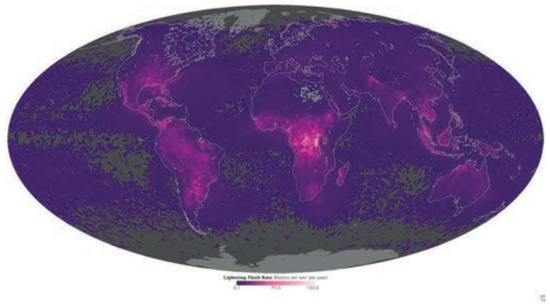
The storms ease off in the dryer months of January and February and are most spectacular at the peak of the wet season around October. At this time of year, you can see an average of **28 lightning flashes each minute.**

Source: http://www.bbc.com/earth/story/20150810-the-most-electric-place-on-earth

DID YOU KNOW: LIGHTNING ALMOST NEVER STRIKES THE NORTH OR SOUTH POLES

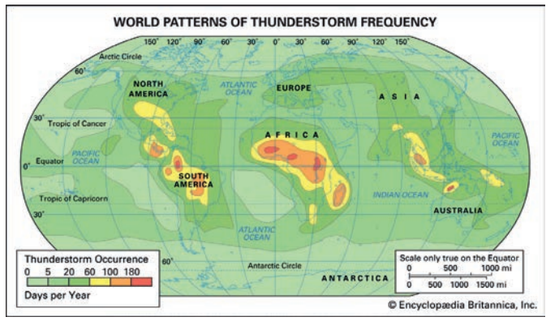
Lightning. It avoids the ocean but likes Florida. It is attracted to the Himalayas and even more so to central Africa. And lightning almost never strikes the north or south poles.

The map next to it shows the average yearly counts of lightning flashes per square kilometer from 1995 to 2013. Areas with the fewest number of flashes each year are gray and purple; areas with the largest number of lightning flashes—as many as 150 per year per square kilometer—are bright pink.



May 4, 1995 - December 31, 2013, source: NASA

The map is based on data collected from 1998–2013 by the Lightning Imaging Sensor (LIS) on NASA's Tropical Rainfall Measuring Mission satellite, and from 1995–2000 by the Optical Transient Detector (OTD) on the OrbView-1/Microlab satellite.



Source: https://www.researchgate.net/figure/Lightning-stroke-density-per-square-kilometer-per-year-over-the-world-from-the-Global_fig3_307436427

Lightning seems to happen more often closer to the equator.
Flashes above 38 degrees North were observed by OTD only, as the satellite flew to higher latitudes.

The higher frequency of lightning over land makes sense because solid earth absorbs sunlight and heats up faster than water; this means there is stronger convection and greater atmospheric instability, leading to the formation of thunder and lightning producing storms.

Scientists have observed a large number of flashes during the month of May in the Brahmaputra Valley of far eastern India. The heating and weather patterns are unstable and changeable at that time.

In contrast, locations in Central Africa and Northwestern South America have large amounts of lightning throughout the entire year.

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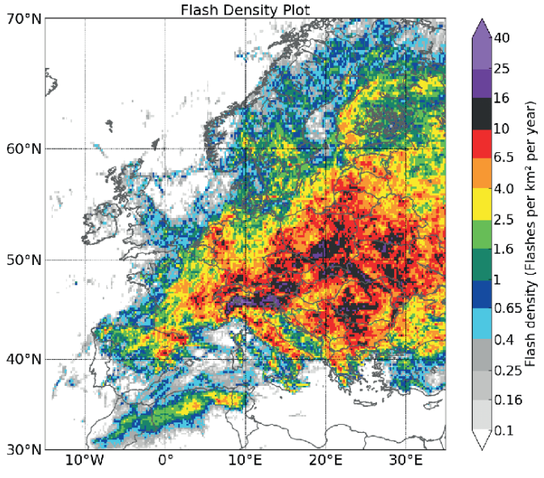
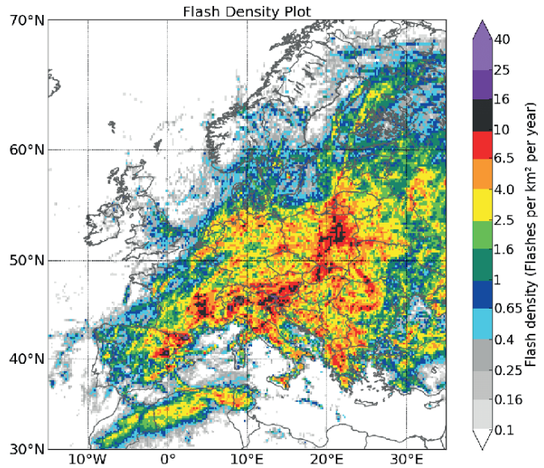
July



Data from July, 2008 to 2012
Max. density = 42.0 flashes per km² per year
Resolution = 0.20°

August



Data from August, 2008 to 2012
Max. density = 30.9 flashes per km² per year
Resolution = 0.20°

Although Europe does not belong to areas with extremely high lightning activity, on its territory, as elsewhere, there are several leading zones in terms of the density of lightning strikes per square kilometer per year.

Lightning affects European territory on an average of 350 days per year, meaning that there is at least one lightning strike somewhere in Europe every day. Rates of lightning flash density peak in July with peak values of over 40 flashes per square kilometer per year reached in north Italy. Other very active areas include mountain ranges of south-east Europe: the Dinarides, the Carpathians and the Balkan Mountains.

High rates persist over the same general area also in August, with the Alpine area producing the highest rates.

THE IMPACT OF A LIGHTNING STRIKE

DANGER

Lightning is not only spectacular, it is dangerous. The average American has about a 1 in 5,000 chance of being struck by lightning during a lifetime.

ABOUT 2,000 PEOPLE ARE KILLED WORLDWIDE BY LIGHTNING EACH YEAR

Hundreds more survive strikes but suffer from a variety of lasting symptoms, including memory loss, dizziness, weakness, numbness, and other life-altering ailments. Strikes can cause cardiac arrest and severe burns!

COST IMPACT

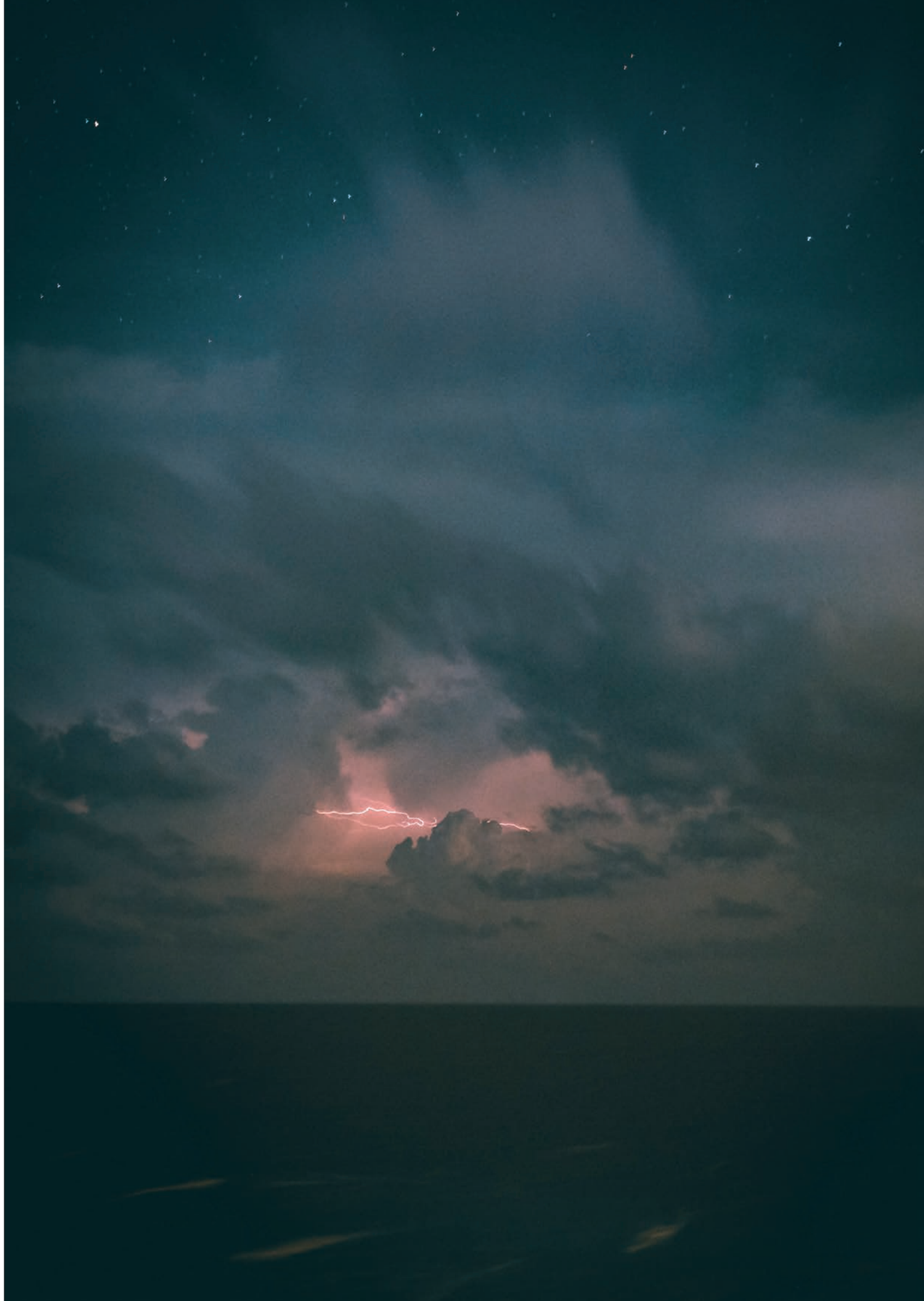
Lightning-cost impact varies.

Excluding the loss of human life which is the most important, if we focus clearly on social and economic impact, the cost and the effects are remarkably in many categories:

- Modern social life impacts and social isolation
- Environmental impacts, lightning-caused residential fires
- Healthcare facilities. Indirect risk of human lives and cost of an emergency working plan
- Small businesses turnover losses and productions down times. Lost time from an idle workforce, equipment damages and cost of Backup power use
- Nursary impacts and risk of human lives

The direct and indirect effects of lightning to electrical and electronic equipment are significant.

Emergency working plans and power backup systems for accidental, weather-related outages that are repaired quickly, has the ambiguity of this blackouts length and timing made things challenging.



LIGHTNING QUENCHERS

An extraordinary lightning protection solution for overhead lines.
Lightning activity is one of the most significant threats for overhead power lines. We are able to mitigate the damages and the risk of this hazardous phenomenon using suitable protection solutions.

Protect overhead lines against direct and indirect lightning strikes, thus helping to prevent breakage of conductors, insulators, transformers and power outages. Due to their unique operating principle, Lightning Quencher devices do not require in most cases any special grounding (e.g. a ground lead). Therefore, these devices are especially efficient in areas with high soil resistivity.

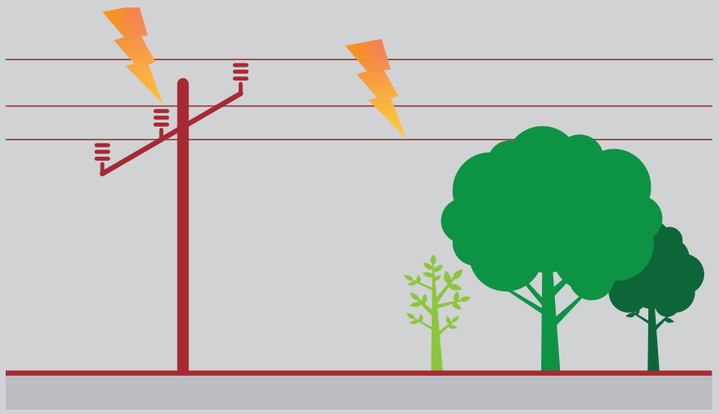
APPLICATIONS

Lightning can produce overvoltages when it hits either the line conductors (direct strokes) or a point in the vicinity of the distribution network (indirect strokes).

DIRECT LIGHTNING PROTECTION OF OVERHEAD LINES

A direct lightning strike on a conductor of a power line causes extremely high voltage pulses at the strike point, which are propagated as traveling waves in either direction from the point of strike.

If a flash hits an overhead line, the current injected into the conductor is divided at the strike point, giving rise to two voltage waves that propagate in opposite directions. As a consequence, multiple flashovers occur between the conductors and also to earth in different points of the line. Customers around the fault location experience both a voltage sag during the short-circuit and a momentary interruption when the breaker opens to clear the fault. In the case of lines with covered conductors, the coating prevents the foot point of the power frequency arcing current from moving along the line, and therefore a flashover between phases for such lines may cause a mechanical breakdown of the conductors.



Typical strike locations:

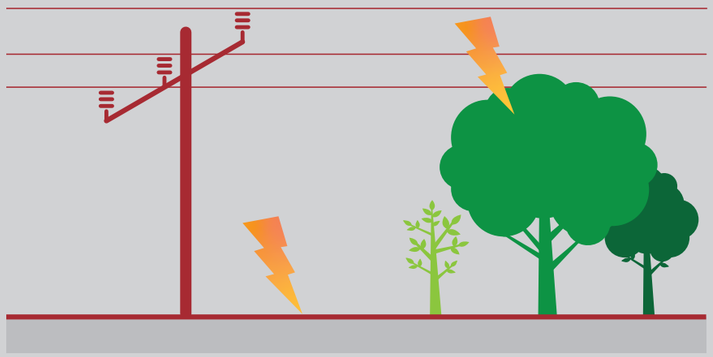
- Pole / Tower
- Phase conductors
- Overhead shielding / ground wire

Average parameters of a direct lightning strike used for engineering applications:

Current → 30 kA
Voltage → 6 MV
Power → 180 GW
Energy → 13.5 MJ

INDIRECT LIGHTNING PROTECTION OF OVERHEAD LINES

Although the overvoltages associated with direct strikes to the line are much more severe, those induced by nearby lightning have a higher frequency of occurrence and are usually responsible for a greater number of line flashovers and supply interruptions on systems with rated voltage 20 kV or less. The induced voltage magnitudes and waveforms depend on many lightning parameters and are substantially affected by the network configuration. The evaluation of such transients entails the calculation of lightning fields, which are defined by the spatial and temporal distribution of the stroke current along the channel, as well as by the earth electrical parameters. The effects of a lossy earth and the case of multiconductor lines are also dealt with, and the influences of various parameters on the induced voltages are investigated.



Typical strike locations:

- Trees around the line
- Buildings around the line
- Telecom towers or any other objects in the proximity to the line that can provide natural shielding and intercept lightning strikes

Maximum amplitude of an induced overvoltage used for engineering applicatons: 300 kV

TECHNOLOGY

Lightning Quenchers utilize a unique technology of lightning strike energy dissipation. This is ensured by the special system of metal electrodes encapsulated in silicone rubber bodies of the devices. In case of a lightning strike or an induced overvoltage, Lightning Quenchers operate first due to lower insulation level compared to line insulators. After a flashover that happens through the special system of small discharge chambers, Lightning Quenchers are also able to eliminate the fault current that starts flowing through them after the initial flashover caused by the lightning impact.

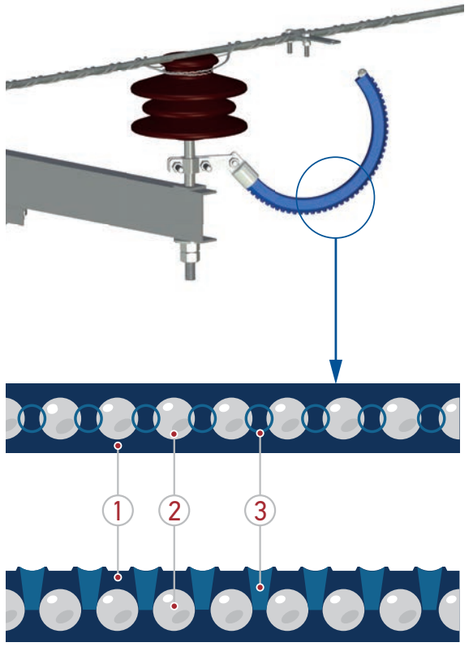
Thanks to this unique feature the fault will be cleared without any involvement of a circuit-breaker or a recloser within 10 ms, and the line will come back to normal operation immediately after the voltage restoration.

LQ OPERATION

STAGE 0

LQ is in “idle” state, no lightning overvoltage on the line

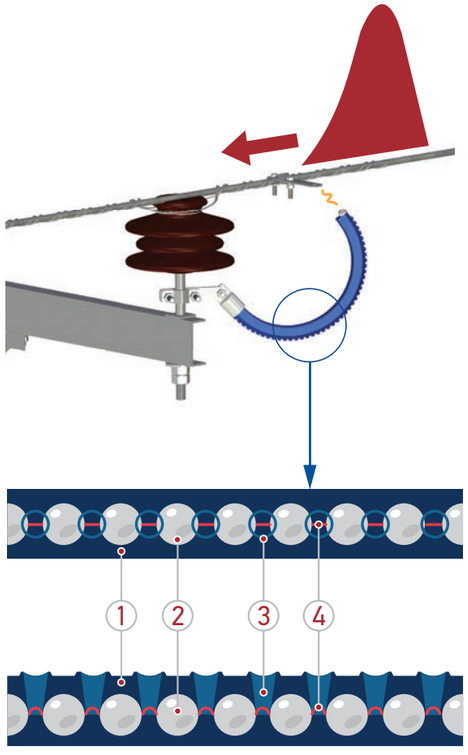
1. Silicon rubber shape
2. Intermediate electrodes
3. Arc quenching chamber



STAGE 1

LQ operates due to a lightning overvoltage on the line

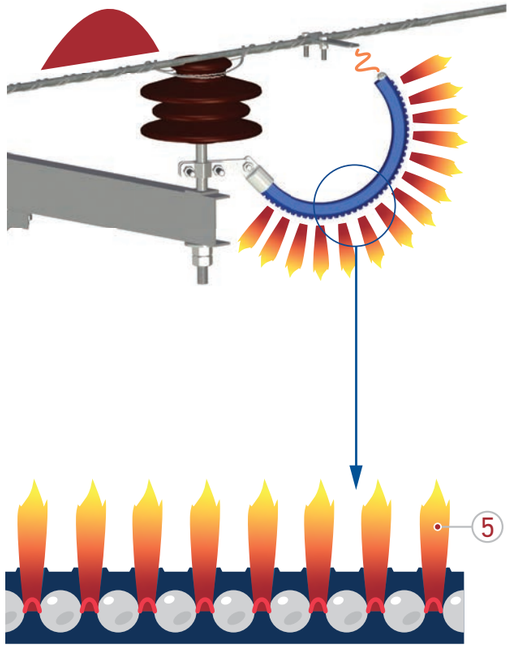
1. Silicon rubber shape
2. Intermediate electrodes
3. Arc quenching chamber
4. Arc



STAGE 2

LQ keeps on operating by dissipating the energy of the lightning overvoltage and by interrupting the fault current

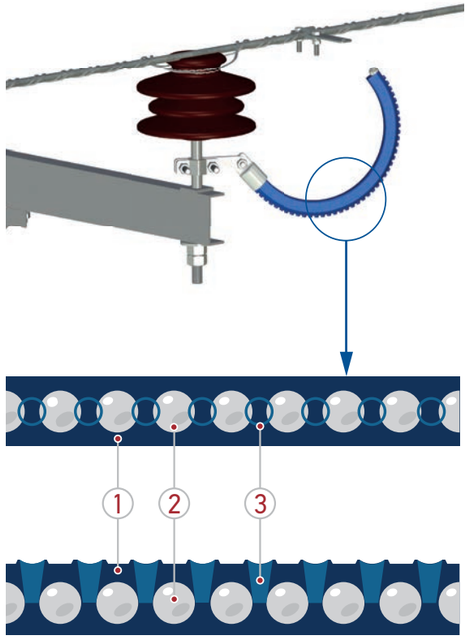
5. Plasma jet



STAGE 3

LQ is back to “idle” state waiting for the next lightning overvoltage to appear

1. Silicon rubber shape
2. Intermediate electrodes
3. Arc quenching chamber



LIGHTNING QUENCHERS RANGE

	10KV	20KV
Indirect Lightning Protection	 LQ 20i	 LQ 20i
Direct Lightning Protection	 LQ 10d	 LQ 20dc
		 LQ 24d

BENEFITS

PREVENTS outages on the line

PROTECTS overhead lines from direct lightning strike and induced overvoltages

NO DEDICATED GROUNDING to be arranged

NO MAINTENANCE required

Works perfectly in areas with HIGH SOIL RESISTIVITY

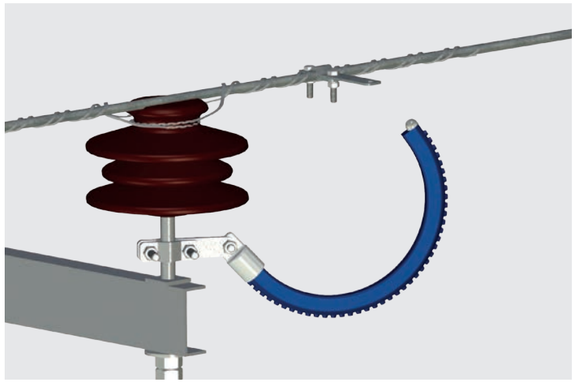
Works under EXTREME CLIMATIC CONDITIONS

Quenches follow current (short circuit current) in LESS THAN 10ms

ONE TIME investment

20 YEARS life expectancy

LIGHTNING QUENCHER
LQ 20i

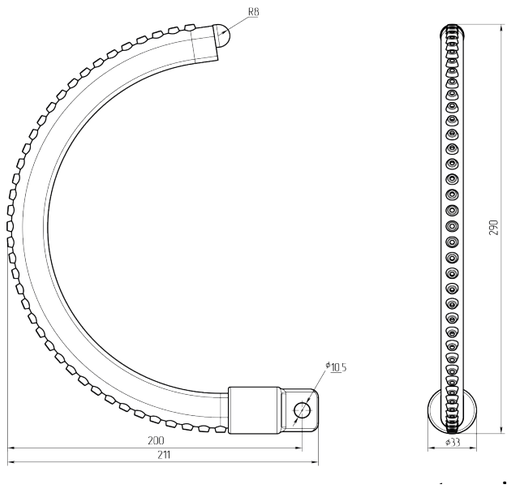


- Protects from Induced Overvoltage
- No maintenance is required

LQ 20i is ideal for Induced Overvoltages Protection of overhead lines for 10kV and 20kV networks as well.

TECHNICAL SPECIFICATION

Nominal voltage, kV	**20**
Maximum prospective fault current, kA	**1.5**
Air gap, mm	**70 ± 10**
50% sparkover voltage, kV	**140**
Power frequency withstand voltage, kV	
- Wet	**30**
- Dry	**40**
Lightning discharge capability, C	**2.4**
High current impulse, kA	**65**
Weight, kg	**0.45**



LIGHTNING QUENCHER
LQ 10d

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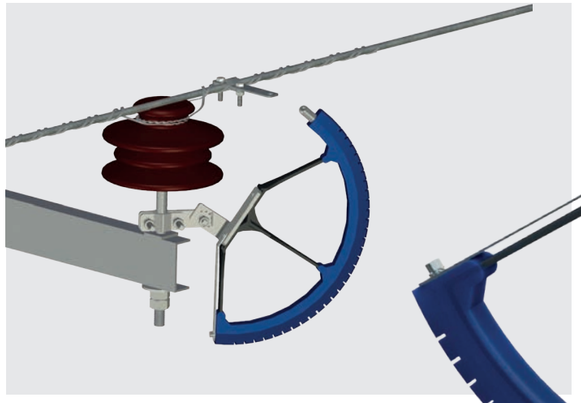
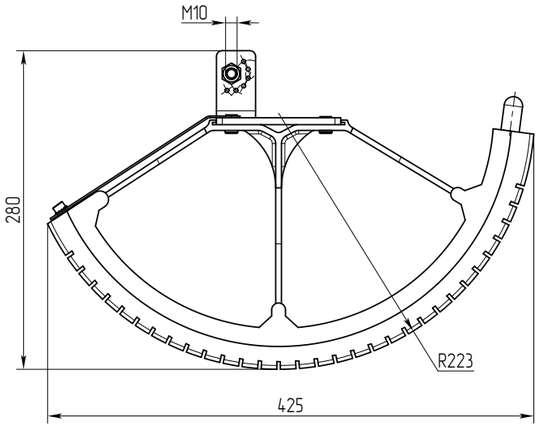


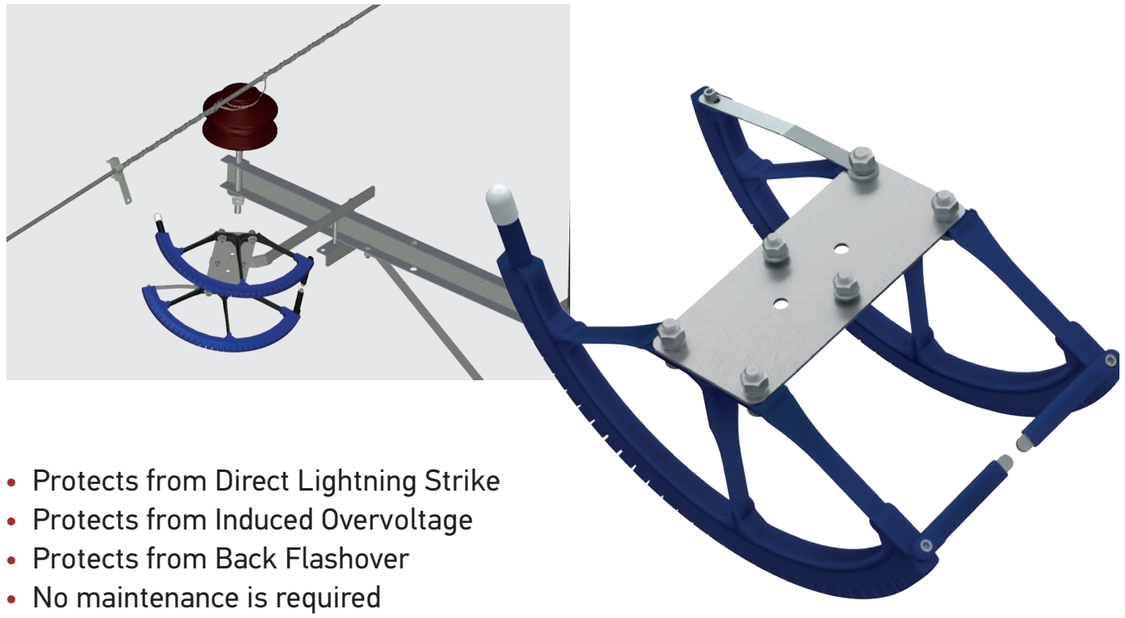
- Protects from Direct Lightning Strike
- Protects from Induced Overvoltage
- Protects from Back Flashover
- No maintenance is required

TECHNICAL SPECIFICATION

Nominal voltage, kV	**10**
Maximum prospective fault current, kA	**5.0**
Air gap, mm	**50 ± 10**
50% sparkover voltage, kV	**120**
Power frequency withstand voltage, kV	
- Wet	**20**
- Dry	**30**
Lightning discharge capability, C	**2.8**
High current impulse, kA	**65**
Weight, kg	**1.1**



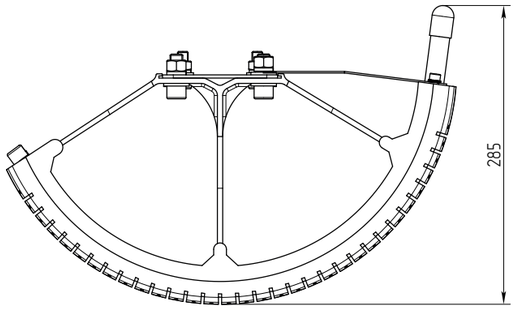
LIGHTNING QUENCHER
LQ 20dc

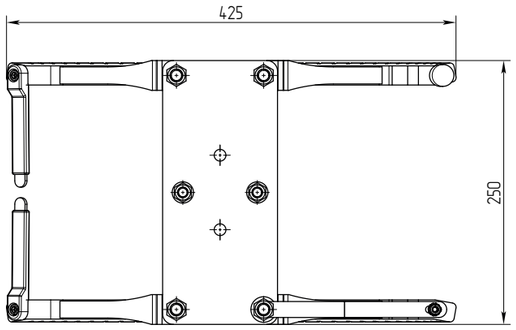


- Protects from Direct Lightning Strike
- Protects from Induced Overvoltage
- Protects from Back Flashover
- No maintenance is required

TECHNICAL SPECIFICATION

Nominal voltage, kV	**20**
Maximum prospective fault current, kA	**5.0**
Air gap, mm	**70 ± 10**
50% sparkover voltage, kV	**160**
Power frequency withstand voltage, kV	
- Wet	**40**
- Dry	**50**
Lightning discharge capability, C	**2.8**
High current impulse, kA	**65**
Weight, kg	**2.8**





LIGHTNING QUENCHER
LQ 24d

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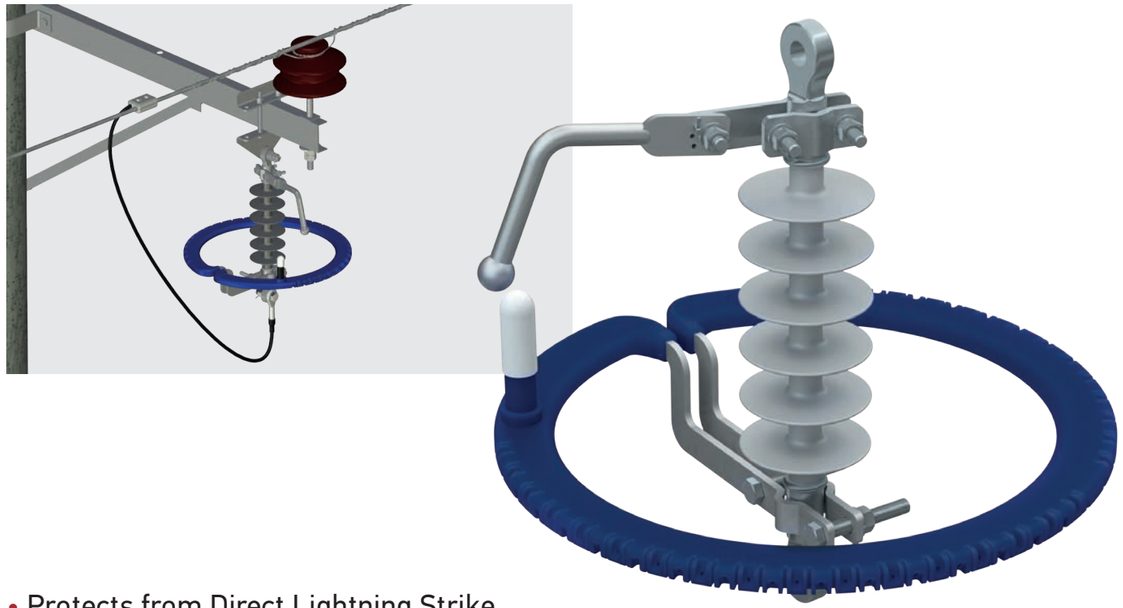
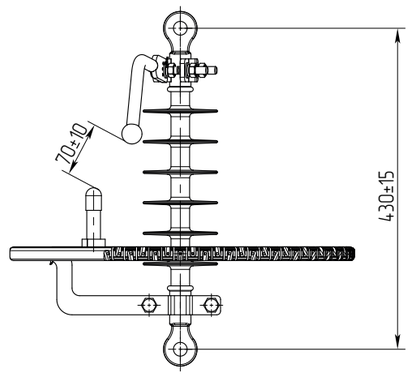
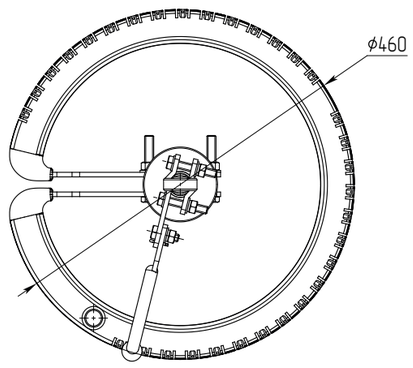


- Protects from Direct Lightning Strike
- Protects from Induced Overvoltage
- Protects from Back Flashover
- No maintenance is required

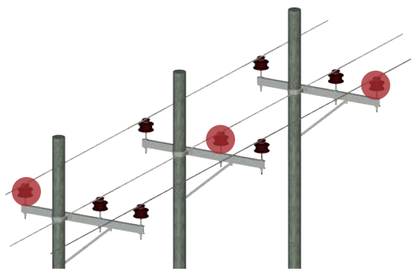
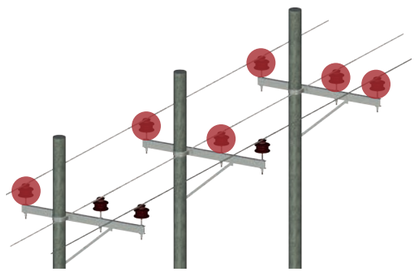
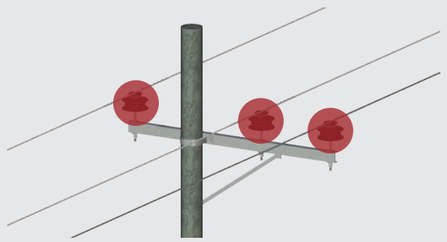
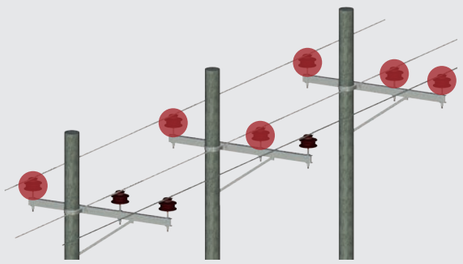
TECHNICAL SPECIFICATION

Nominal voltage, kV	**20**
Maximum prospective fault current, kA	**5.0**
Air gap, mm	**70 ± 10**
50% sparkover voltage, kV	**140**
Power frequency withstand voltage, kV	
- Wet	**40**
- Dry	**50**
Lightning discharge capability, C	**2.8**
High current impulse, kA	**65**
Weight, kg	**2.8**





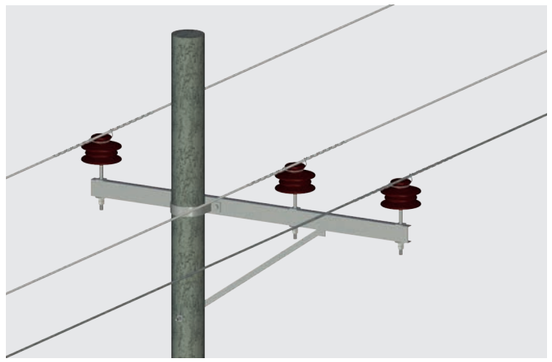
APPLICATIONS

	Grounded poles		Ungrounded poles	
Type of impact	IOV	DLS	IOV	DLS
Number of LQ per pole	1 piece with phase alternation	1, 2 or 3 pieces*	No actual protection is required, unless there are poles with “weak” insulation, i.e. grounded poles	1, 2 or 3 pieces*
Footing resistance requirement	NO	NO	NO (<10 Ohm for protection against traveling waves)	NO
Comment		* depending on the line parameters, such as: • Ground flash density • Presence of shielding wire • Shielding factor • Line geometry • Footing resistance ...and other factors	Protection against traveling waves is highly recommended For protection against traveling waves, a few poles close to the overvoltage sensitive equipment should be protected with 3 pieces of LQ with the low footing resistance value (<10 Ohm)	* depending on the line parameters, such as: • Ground flash density • Presence of shielding wire • Shielding factor • Line geometry • Footing resistance ...and other factors
Installation scheme				

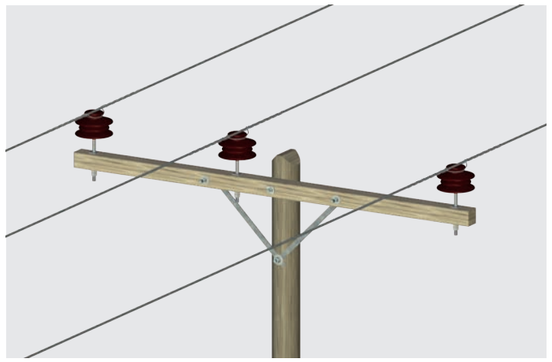
LQ CAN BE INSTALLED WITH PLENTY OF DIFFERENT ACCESSORIES TO ENSURE INSTALLATION ON VARIOUS POLES AND CROSS-ARMS

EXAMPLES OF LQ INSTALLATION ON THE MOST TYPICAL POLES

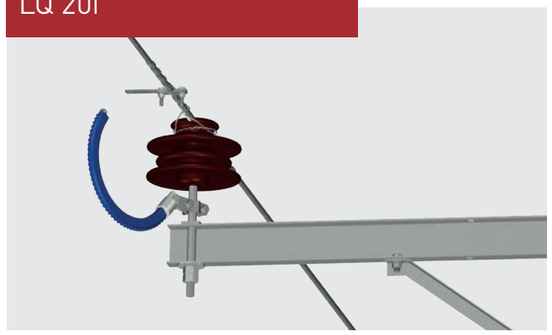
METAL/CONCRETE POLE

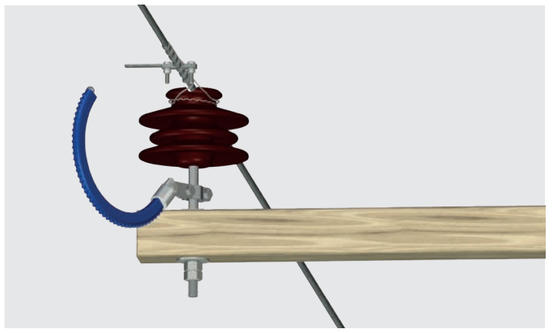


WOODEN POLE

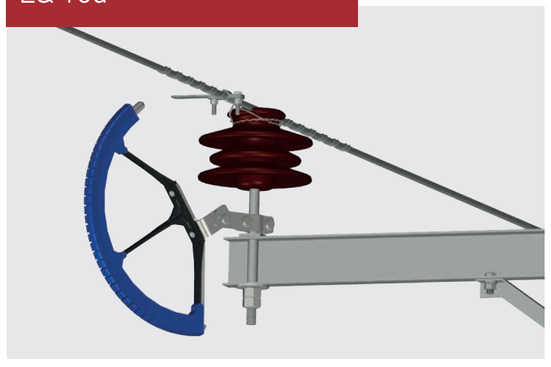


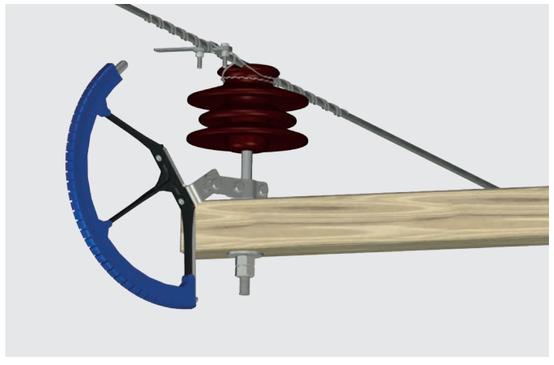
LQ 20i



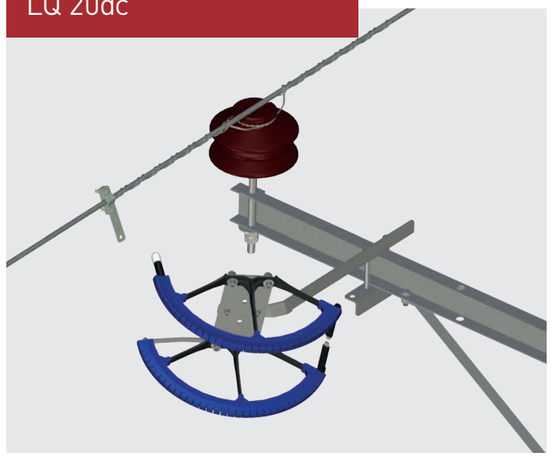


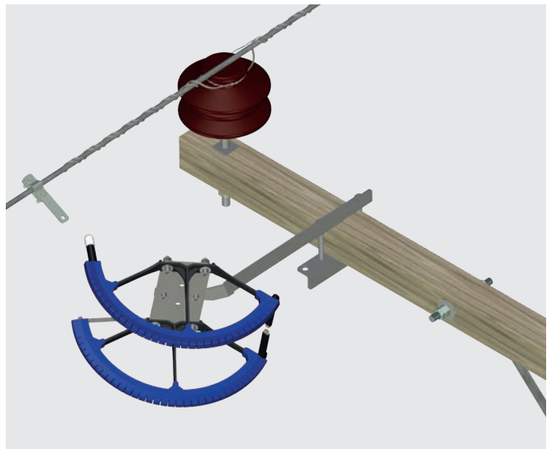
LQ 10d



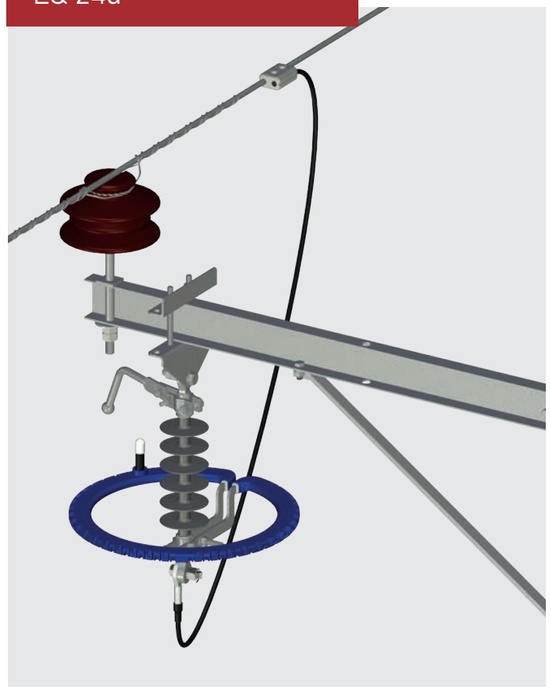


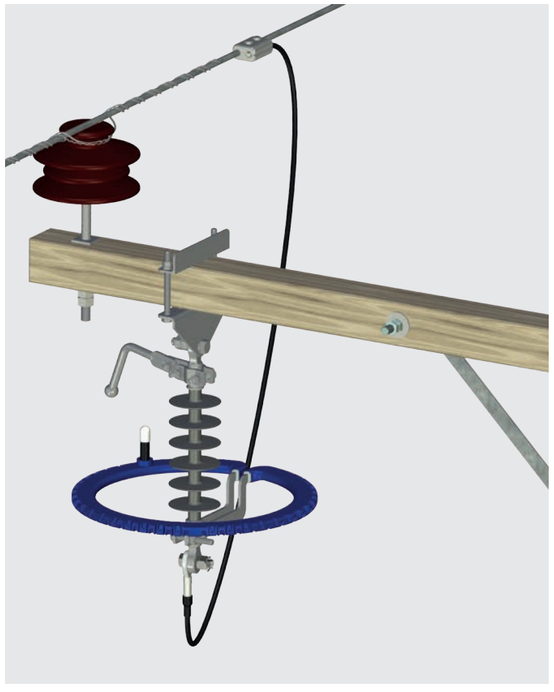
LQ 20dc





LQ 24d





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