

# **TOTAL SOLUTION FOR LIGHTNING AND SURGE PROTECTION**

## CEO Welcome

OMNI LPS is a leading provider of lightning protection system. With a vision of developing products that are world No. 1 in their category, we are continuing our investment in lightning arrester required for insulation coordination in the power system, EMP & EMC/EMI, SPD, grounding device, high-voltage laboratory(Accredited Laboratory by KOLAS and TÜV Appointment Lab.) and R&D center.

OMNI LPS stands firm as a leading Korean company in the field of power system – we will endeavor to become a world-leading name in protecting the property of all those around the world.

Ph.D., P.E.(Professional Engineer), Inventor  
**Youngki Chung**

*Youngki Chung*



### Career

Korea Representative Consultant IEC /TC-64, 6C-81, TC-37  
Technical Consultant for Code in NFPA, U.S.  
Korea Branch Manager of IAEI  
Stone Tower Order of Industrial Service Merit (2007.04)  
Korea Guinness Award for the First Winner of Certificate of the P.E. for 4 Consecutive Years (1994)

### Publication

Guidebook on Lightning Protection Systems for Structures  
Electrical Installations Handbook and other 30 Books



## Accredited Laboratory by KOLAS

Class I, II, III Operating duty test and Measured limiting voltage

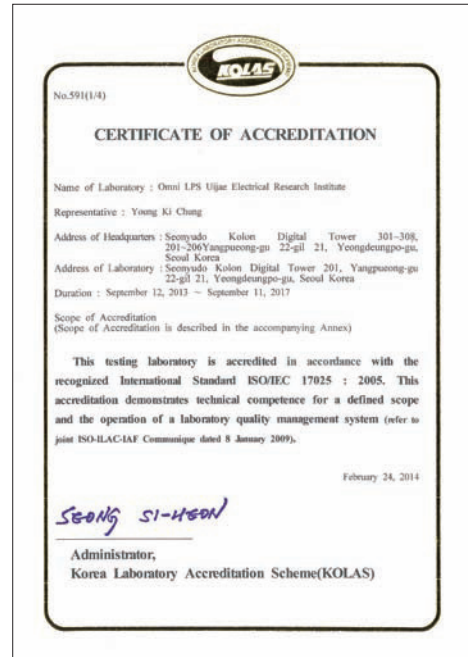
### Accreditation Laboratory by KOLAS

KOLAS is an international mutual recognizing system for the test reports that the accredited test institutes have conducted the tests with their organization, test procedure, inspection, and calibration institutes conforming with the International Standards (ISO/IEC 17025) and Korea Standards (KS Q ISO/IEC17025), so it is regarded that the public confidence of the institutes are accredited.

### The Status of an International Accreditation Institute

- For KOLAS (Korea Laboratory Accreditation Scheme) joined ILAC (International Laboratory Accreditation Cooperation) and concluded the Mutual Recognition Arrangement, it means that the test report issued by KOLAS Appointed Lab. can be accredited and used in technically advanced countries, such as the USA, Japan, Germany, the UK, and about 60 other countries.
- The products with the KOLAS test reports gains the public confidence and an advantage to market in Europe.

### Certificate



## Uijae Electrical Research Institute Appointment Lab. (No. UA 50282643-0001) of TÜV Germany

### TÜV Appointment Lab. (Appointed by German TÜV)

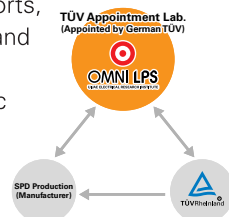
To become a TÜV Appointment Laboratory, a test laboratory should conform with international standards (ISO/IEC 17025) and Korea Standards (KS Q ISO/IEC 17025) in the evaluation by the TÜV Rheinland (International Product Test and Certification Institute).

The TÜV appointment laboratory executes the applications for TÜV or CE certification, and conducts the tests for SPD products (IEC 61643-11).

### Test Lab. for TÜV or CE certification

The test reports for the Power SPD according to IEC 61643-11 test standards can be submitted to TÜV Rheinland for TÜV or CE certification. After reviewing the test reports, TÜV Rheinland issues the TÜV Certificate and CE Certificate.

TÜV or CE certified products earn public confidence and they get an advantage in marketing in Europe.



### TÜV Certificate of Appointment



# International Standard (IEC 61643-11) Testing Laboratory Established Impulse Current Generator for 10/350 $\mu$ s, Maximum 50 kA



## IEC 62561-1,2,3,4,5,6,7 Series Test Equipments

### - Specification

- Crowbar Type
- Class I: 10/350  $\mu$ s Impulse Current Maximum 80 kA
- Standard Lightning Impulse Voltage 1.2/50  $\mu$ s Maximum 200 kV

### - Purpose

- Components for Lightning Protection System:  
Lighting/Grounding Material Steel Connectors
- Common Ground Module, Carbon Ground Module impedance Characteristics Test

## KS C IEC 61643-11 Class I, Class II Test Equipment

### - Specification

- RLC Type
- Class I: 10/350  $\mu$ s Impulse Current Maximum 50 kA
- Class II: 8/20  $\mu$ s Impulse Current Maximum 120 kA

### - Purpose

- Surge Protective Device (SPD) Product Performance Characteristics Test
- Lightning Surge Protective Element Characteristics Test
- Operating Duty Test

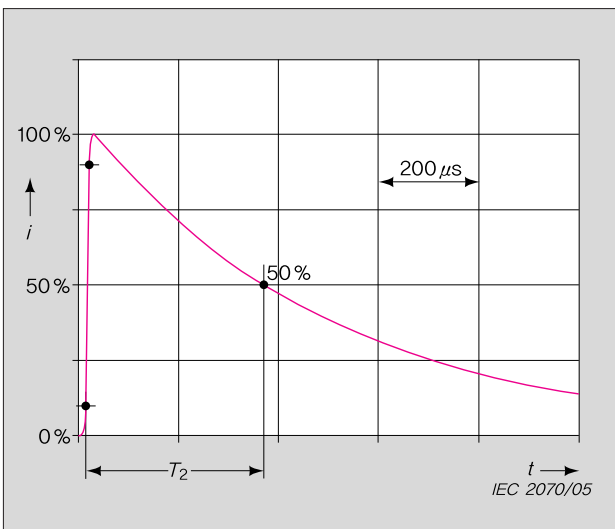
## KS C IEC 61643-11 Class III Test Equipment

### - Specification

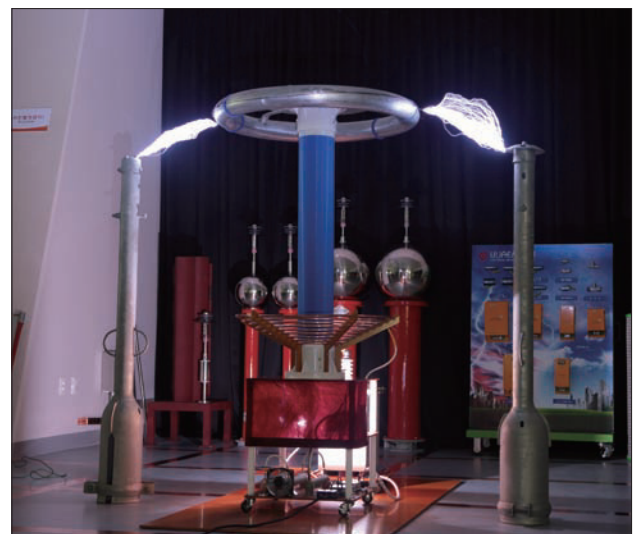
- Combination Ring-Wave
- Standard Lightning Impulse Voltage 1.2/50  $\mu$ s Maximum 20 kV
- Impulse Current 8/20  $\mu$ s Maximum 10kA

### - Purpose

- Surge Protective Device (SPD) Product Performance Characteristics Test
- Lightning Surge Protective Element Characteristics Test
- Power and Signal Terminal Lightning Surge Simulation
- KS C IEC 61000 Electromagnetic Compatibility (EMC) Standard Test



10/350[ $\mu$ s] Impulse Current Wave (Reference: KS C IEC 62305)

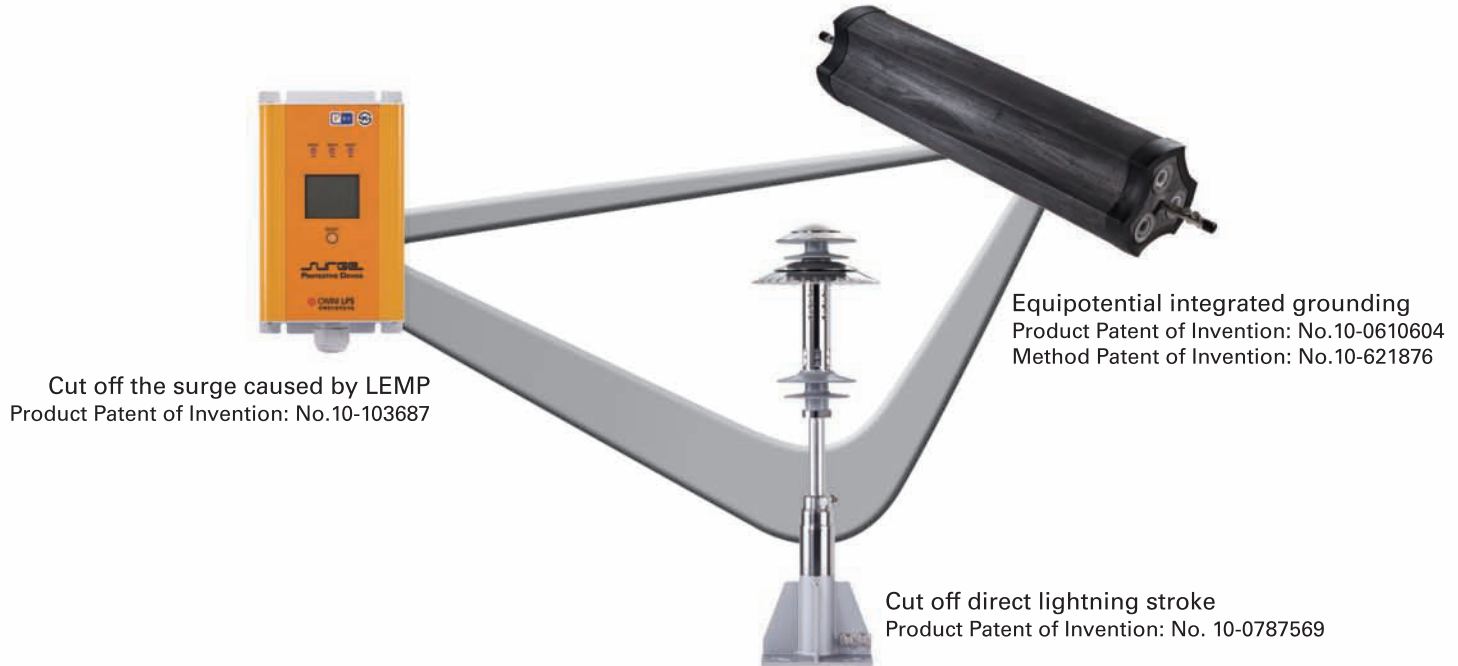


Tesla Coil (1 Million Volt)



# Triangle Method for Complete Lightning Protection

## < Electricity Power-New Technology No.28 >



### Cut off direct lightning stroke (Bipolar Conventional AirTerminals Installation)

The conventional Franklin lightning rod intercepts the lightning, induces the lightning current and discharges the lightning current into the ground.

At the moment when the lightning hits the building, the transient overvoltage causes damages to sensitive electric appliance like the communication equipments, computers, and even people's lives.

- ▶ The Bipolar Conventional Air Terminal dramatically reduced the probability of lightning strike with corona discharge. When the thundercloud approaches, it removes the conditions for the lightning strikes by discharging the electric charges in advance, which therefore prevents all kinds of accidents caused by direct lightning strikes, and secures human life safety. (Patents of Invention in Korea and abroad, Designated as Korea New Technology and New Electrical Technology by Ministry of Knowledge Economy, 2 papers published in IEEE Journal)

### Equipotential integrated grounding (Carbon Low Resistance Ground Modules Installation)

Since isolation grounding generates serious potential difference with high ground resistance, it causes damages to high priced electronic equipments in buildings.

The potential difference by position occurs in earth respectively. Accordingly, it damages the communication equipments and sensitive electronic devices such as computers. In the global trend, there needs to be the earth method of keeping low earth resistance through combined grounding connecting all separated grounding so as to achieve equipotentialization.

- ▶ By removing the potential difference with equipotential grounding and installation of the carbon ground module, the earth resistance could be kept low. It restrains potential increase in case of lightning, diminishes inverse surge generation, reduces voltage burden of equipment, and removes the basic cause of surge voltage.(Korea Patent of Invention - Equipotential Grounding Method, Carbon Ground Module)

### Cut off the surge caused by LEMP (Surge Protective Devices Installation)

As the induced lightning gets through an outside cable or electric wire, it may damage the high tech and high priced electronic equipments.

When lightning strikes a building, the induced surge through the outside cable or electric wires causes damages to sensitive electric devices, such as communication equipments and computers. Accordingly, it is necessary to install a device to cut off inductive lightning surge.

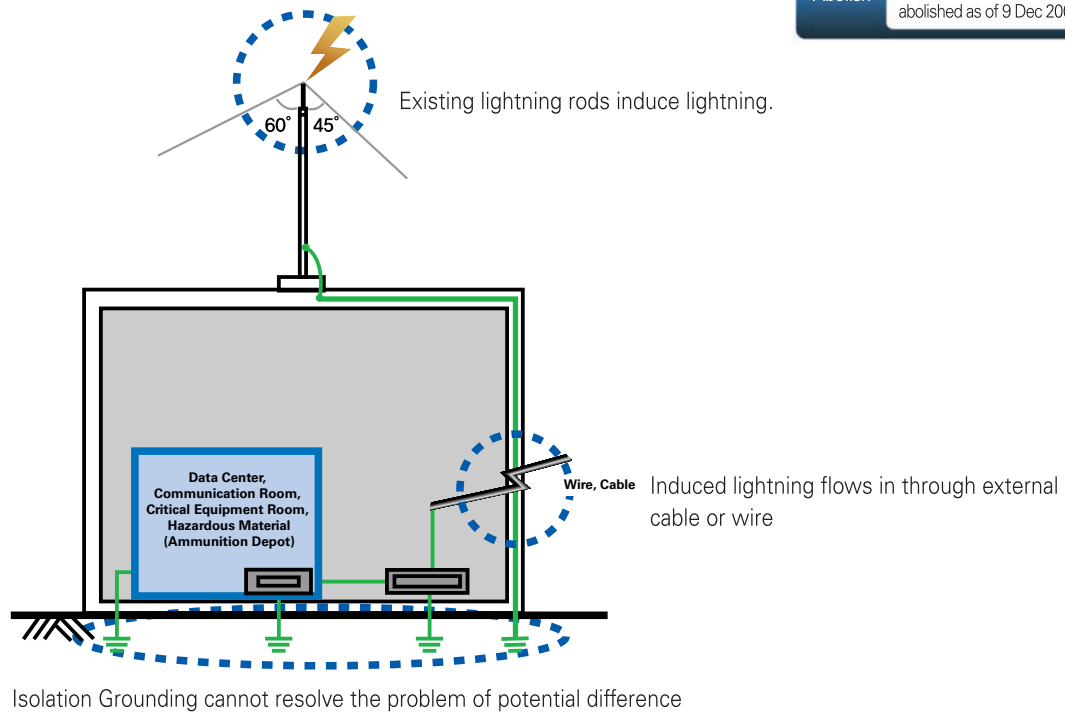
- ▶ Install the surge protective device to cut off inductive lightning for each equipment. Classified protection criteria applied.



## Causes of Lightning damage (Existing Methods)

Abolish

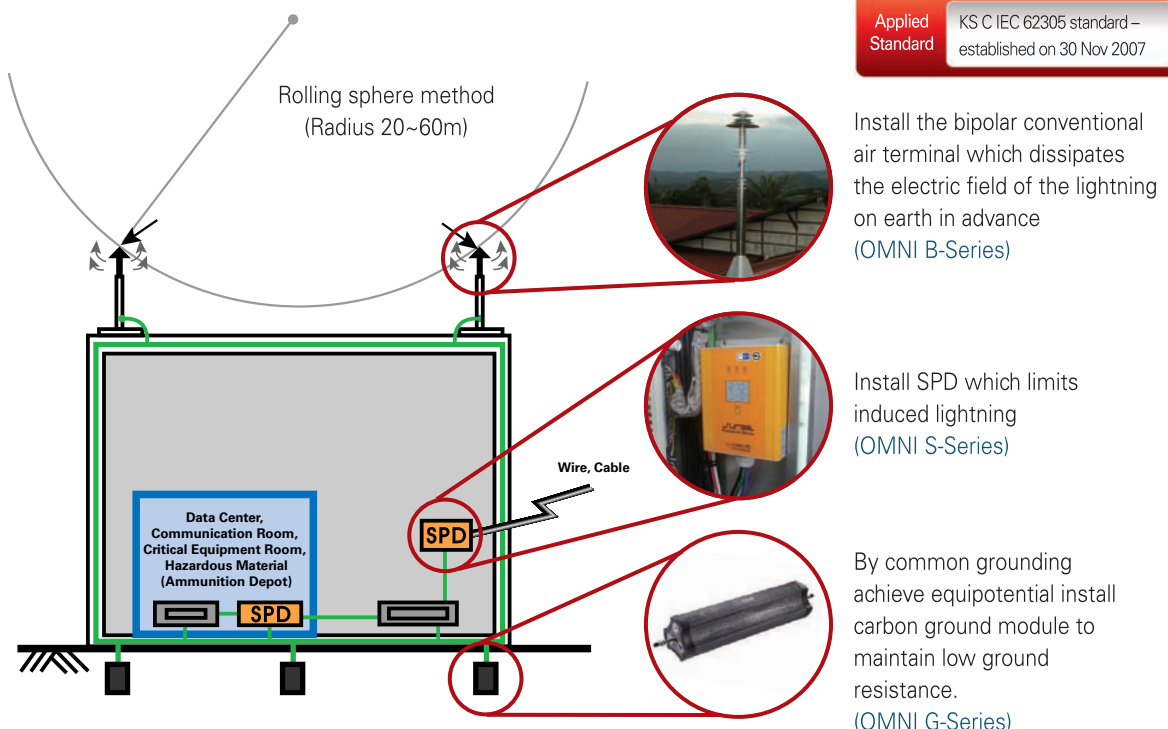
KS C 9609 standards –  
abolished as of 9 Dec 2004.



## Lighting damage prevention solution (triangle method)

Applied  
Standard

KS C IEC 62305 standard –  
established on 30 Nov 2007





## 3<sup>rd</sup> GENERATION BIPOLAR CONVENTIONAL AIR TERMINAL

Ministry of Commerce, Industry and Energy

- Obtained certification of new technology of electric power with "Triangle Method for Lightning Protection System"
- Gold Award and Special Award at International Exhibition of Inventions of Geneva
- 6 US patents, 5 Korean patents
- 2 papers published in IEEE Journal
- Certified as the outstanding product by Public Procurement Service
- Certified by the Small and Medium Business Administration
- Performance verified by KERI or KESRI

# 3<sup>rd</sup> GENERATION BIPOLAR CONVENTIONAL AIR TERMINAL

## SHORTCOMINGS OF EXISTING AIR TERMINAL

- Existing lightning protection: used protective angles of 45 °, 60 ° Isolation grounding.  
(KS C 9609 standard, previously in use in Korea, was abolished as of 9 Dec 2004)
- New lightning protection standard (KS) since 31 August 2004: rolling sphere method, total equipotential grounding, surge protective device became mandatory  
(KS C IEC 61024 in force) → Amended to KS C IEC 62305 as of 30 Nov 2007 → Amended to 62305 Ed.2 as of 27 Dec 2012
- Existing Air Terminals cause great economic and social damage as high potential in the event of lightning strike led to insulation damage, breakage of electronic devices due to inductive disturbance and stalling of various facilities
- Damages
  - Primary and secondary damage due to broadcasting and communication disturbances
  - Blackout due to power failure: consequent disturbance to factory operation
  - Bodily damage and threats to safety
  - Damage to sensitive electronic devices such as ICT facilities and computers; consequent disturbance to operation

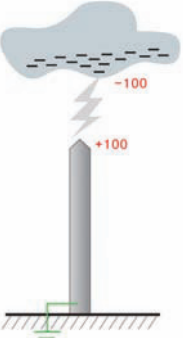
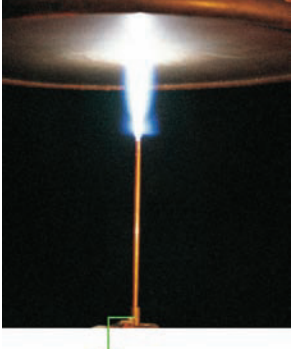
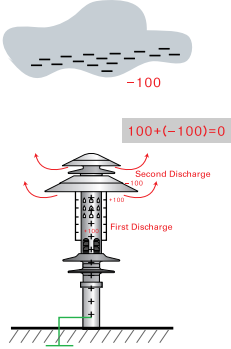

## TECHNICAL DEVELOPMENT

- Eliminate fundamental conditions of lightning
  - Apply Electric dipole theory and electric double layer theory to maximize corona discharge at Electric potential reliever
  - Reduce the electric field by ground charge of facility to be protected → eliminate the conditions for lightning strike → reduced probability of lightning
- Newly developed Bipolar Conventional Air Terminal
  - Bipolar electrostatic induction device
  - Maximization of discharge dissipation effect
  - Theoretical and practical verification complete through the publication of papers in IEEE Journal



# 3<sup>rd</sup> GENERATION BIPOLAR CONVENTIONAL AIR TERMINAL

## COMPARISON OF ACTIVATION PRINCIPLE

Conventional Air Terminal	<p>Negative thunderhead approaches</p> <p>Earth electric charge being converged on the top of the lightning rod</p> <p>Electric field concentration</p> <p>Lightning strike generated</p>	<p>Activation theory</p> 	<p>Experiment</p> 
Bipolar Conventional Air Terminal	<p>Negative thunderhead approaches</p> <p>Earth electric charge being converged on the top of the lightning rod</p> <p>Bipolar electrification and Corona discharge</p> <p>Earth electric charge removal</p> <p>Lightning condition removal</p>	<p>Activation theory</p> 	<p>Experiment</p> 

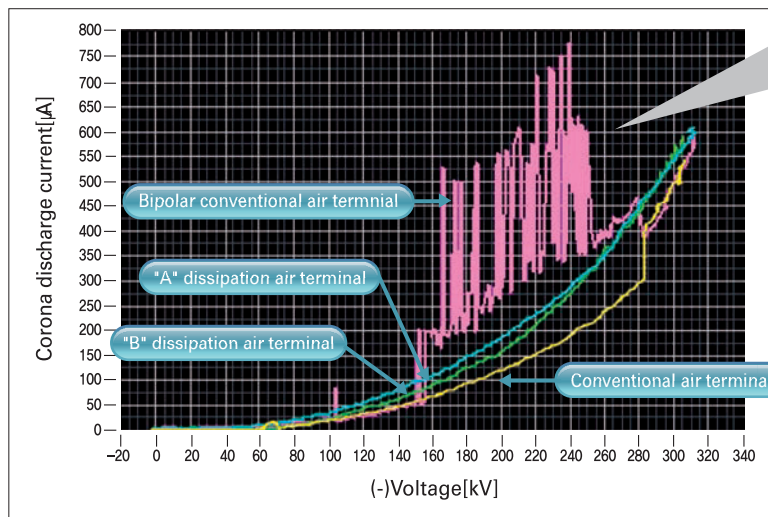
## FEATURES OF BIPOLAR CONVENTIONAL AIR TERMINAL



- No. 28 component of new technology of electric power certified by the Ministry of Knowledge Economy
- Gold Award and Special Award at International Exhibition of Inventions of Geneva
- Korea 5 patents(including the patent no.0419977)
- USA 6 patents(including the patent US 6,943,285B2)
- Performance evaluation report issued by KERI or KESRI
- Published a paper related to the invention in the world's prestigious Journal, IEEE (March 2004, May 2013)
- An innovative air terminal to avoid direct lightning stroke

# Bipolar Conventional Air Terminals

## RESULTS FROM THE EXPERIMENTS OF COMPARING THE CORONA DISCHARGE CURRENT BY TYPES OF AIR TERMINAL



The amount of Corona discharge current for Bipolar conventional air terminal is much greater than other lightning air terminals.

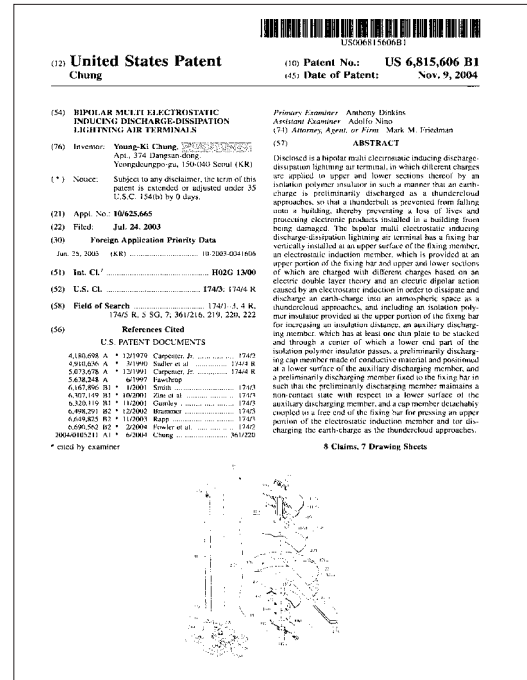
Source:  
CEO Chung's Ph.D Thesis p.81  
"Electric Field Analysis and  
Discharge Characteristics of  
Bipolar Space Charge Dissipation Air Terminal"

## APPLICATION OF BIPOLAR CONVENTIONAL AIR TERMINAL

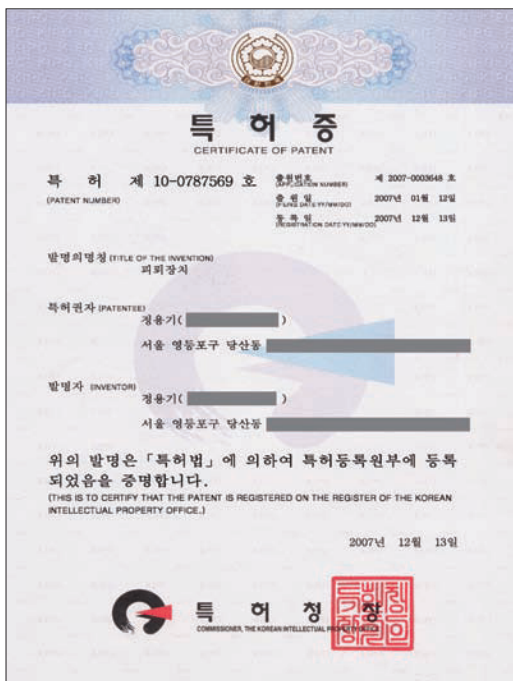
- Cultural assets and other important building structures
- Communication equipments of broadcasting stations
- Rooftop of high-rise apartments (APT)
- The most advanced intelligent buildings
- Gas station, oil tank and gas installed facilities
- IDC center, IT center and Antenna facilities of mobile communication agencies
- Buildings located in the highlands
- Airport facilities
- Street facilities equipped with CCTV and electronic display boards
- Outdoor sign board, lighthouse
- Sports stadiums
- All kinds of plant facilities and smokestack besides power plants
- Important military facilities (ammunition, oil tank, communication equipment)
- Buddhist temples located in the mountain regions
- High tollgates and others
- Other building facilities and structures that could be affected by lightning

# PATENT AND TEST REPORT

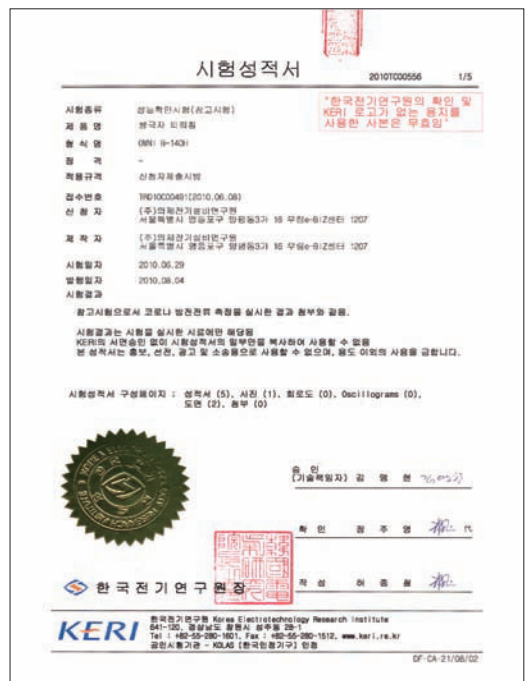
## ● Patent(USA)



## ● Korea Invention Patent (High Corona Discharge)



## ● Performance Test Report Issued by Korea Electrotechnology Research Institute

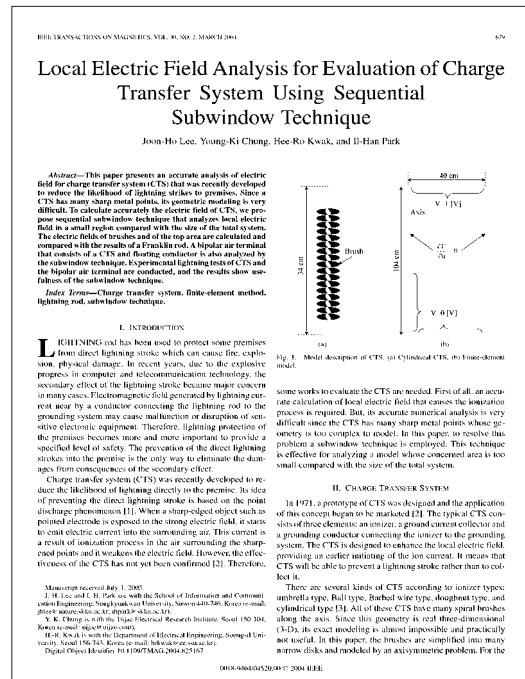


# Bipolar Conventional Air Terminals

- IEEE Paper(2013)



- IEEE Paper(2004)



- Certificate of Designation of Excellent Product by Public Procurement Service



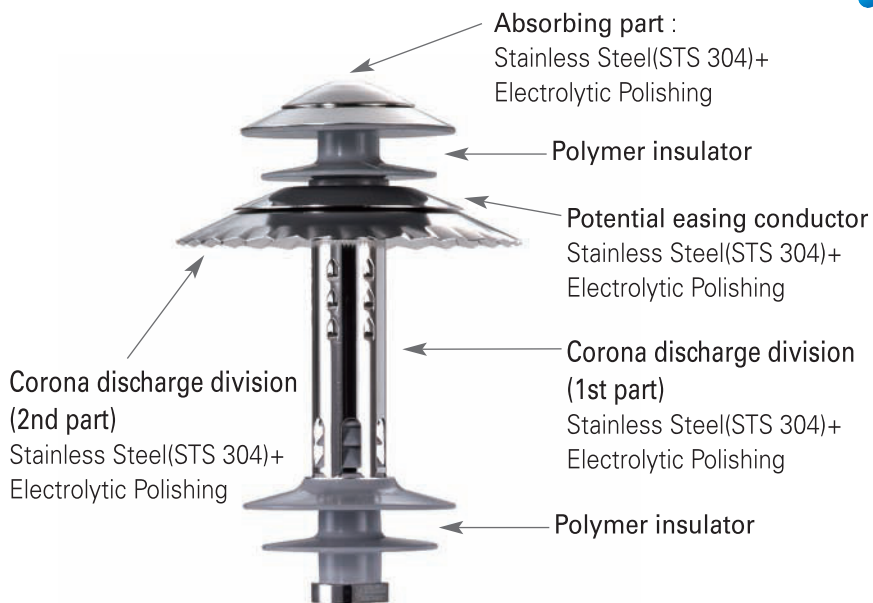
- Gold Award International Exhibition of Inventions of Geneva





# PRODUCT

## 3<sup>rd</sup> GENERATION BIPOLAR CONVENTIONAL AIR TERMINAL OMNI B-140S



Integrated Pole



C-2 Base

### ● Characteristics

- Maximized corona discharge performance
- Longer service life with the additional polymer insulator on the lower part
- Preventing separation by the modified absorbing part on the top
- Electrostatic inductor: replaced with ST304. Solving the problem of corrosion in salt-damaged area and gas region

### ● Specification(Excluding the base)

- Height : 400 mm
- Weight : Approx. 2 kg

### ● Certification

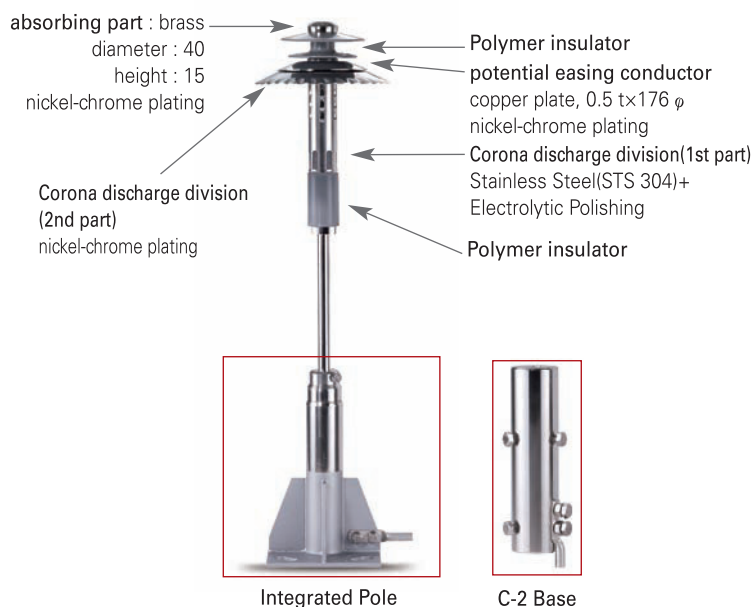
Korea Invention Patent

Price: see pricing data and information



# Bipolar Conventional Air Terminals

## 2<sup>nd</sup> GENERATION BIPOLAR CONVENTIONAL AIR TERMINAL OMNI B-140H



### ● Characteristics

- Maximizes the discharge capacity of the first-generation bipolar conventional air terminal
- Installed on buildings and structures to replace the existing lightning rod which absorbs lightning strike; this enables better discharge dissipation of ground charge
- Comes in different sizes to fit standard lightning protection system facility
- Appropriate for standard usages

### ● Specification(Excluding base)

- Height : 500 mm
- Weight : Approx. 1.95 kg

### ● Certification

Korea Invention Patent + Certification of new technology of electric power + Certificate of Designation of Excellent Product by Public Procurement Service

Price: see the pricing data and information

## BIPOLAR CONVENTIONAL AIR TERMINAL FOR CCTV OMNI B-140E



### ● Characteristics

- installed on small stand-alone structures like CCTV to replace the existing lightning rod, which absorbs lightning strike, in order to improve the discharge of ground charge.
- Corona discharge performance

### ● Specification(Excluding the base)

- Height : 400 mm
- Weight : Approx. 1.25 kg

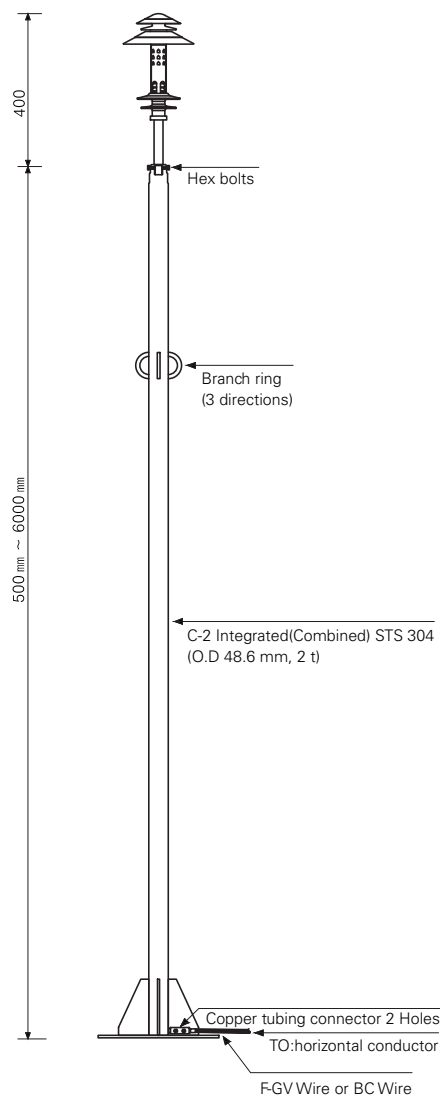
### ● Certification

Korea Invention Patent

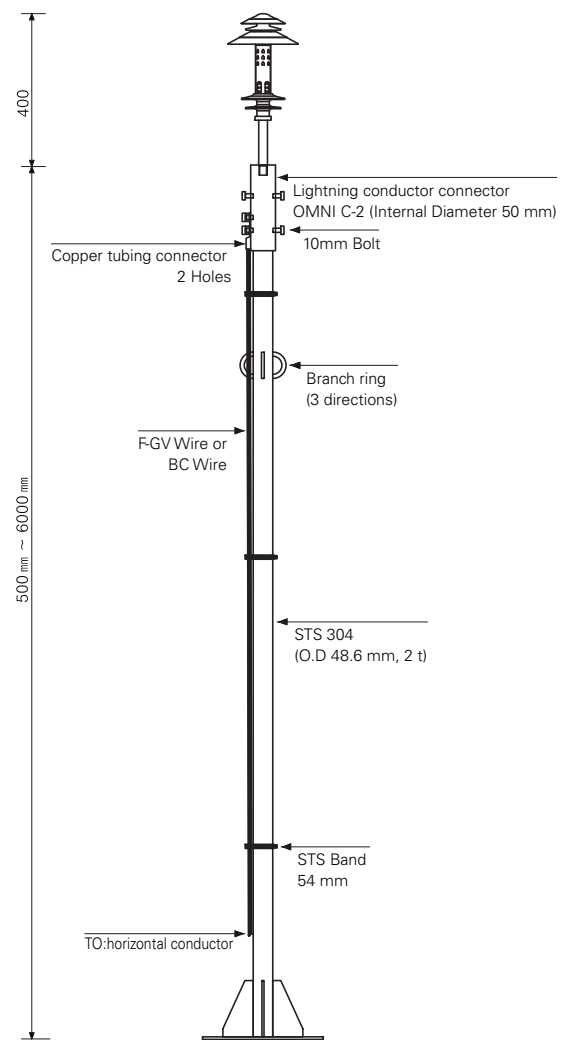
Price: see the pricing data and information

# DETAILED PLAN FOR INSTALLATION

## INSTALLATION OF THE POLE



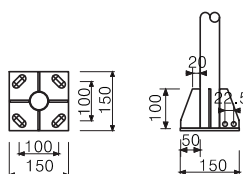
Integrated Pole



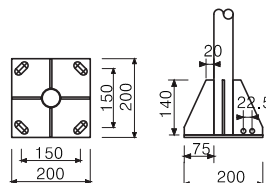
C-2 Pole

### ● BASE PLATE

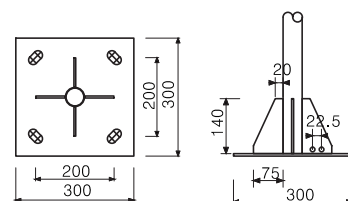
• Pole Height(500 mm)



• Pole Height(1000~2000 mm)



• Pole Height(2000~6000 mm)



# INSTALLATION EXAMPLE



National Heritage(National Treasure 1, Sunghyemun Gate)



National Heritage(National Treasure 402, Paldalmun Gate)



CCTV



Traffic CCTV



Stack



Stack

# INSTALLATION EXAMPLE



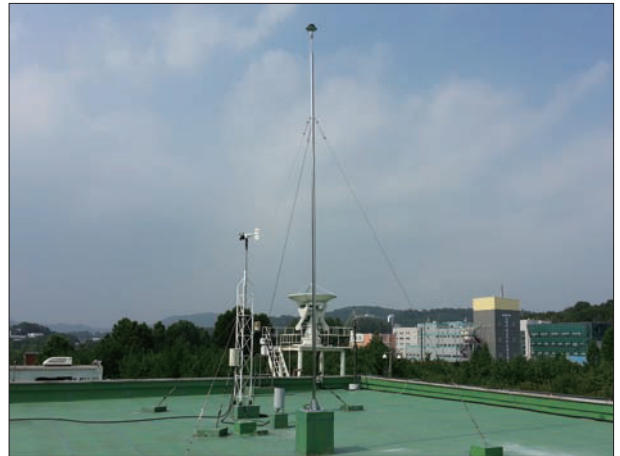
Parapet



Parapet



Parapet



Pole



Side Wall



Side Wall



## *Bipolar Conventional Air Terminals*



Security Light



Structures



Gable Roof



Utility Pole



Solar Power Generation Frames






Special Equipments






# MISCELLANEOUS MATERIALS FOR GROUNDING AND LIGHTNING PROTECTION

## MISCELLANEOUS MATERIALS FOR GROUNDING

Stainless Steel Bar for Grounding				Stainless Steel Connector for Grounding Bar				Stainless Steel Connector for Grounding Bar			
											
Model	Material	Size(mm)	Remark	Model	Material	Size of the Connected Bar(mm)	Remark	Model	Material	Size of the Connected Bar(mm)	Remark
OMNI GB-1	STS 304	40(W) X 3(T)	3m/bar	OMNI GC-1	STS 304	40(W) X 3(T)	"_ "Shape	OMNI GC-2	STS 304	40(W) X 3(T)	"T"Shape

Stainless Steel Connector for Grounding Bar				Stainless Steel Connector for Grounding Bar				Steel Clamp			
											
Model	Material	Size of the Connected Bar(mm)	Remark	Model	Material	Size of the Connected Bar(mm)	Remark	Model	Material	Size of the Connected Wire(mm²)	Remark
OMNI GC-3	STS 304	40(W) X 3(T)	"Y"Shape	OMNI GC-4	STS 304	40(W) X 3(T)	"+" Shape	OMNI MC-1A	Soft Iron (galvanized)	50~95	Size of the Iron Bar (Ø 10~16)
								OMNI MC-1B			Size of the Iron Bar (Ø 19~25)
								OMNI MC-1C			Size of the Iron Bar (Ø 29~35)

## Miscellaneous materials

Carbon Tar



Model	Main Material	Size(mm)	Remark
OMNI GT-1	Graphite	380(L) X 350(W) X 100(T)	10kg / bag

Anti-Corrosion Tape



Model	Material	Size(mm)	Remark
OMNI PCT	Petrolatum	1000(L) X 50(W) X 1.2(T)	5 Carbon Ground Modules per role

Grounding Terminal Box



No. of Terminal	Box Size(mm)		Remark
	70 mm <sup>2</sup>	95 mm <sup>2</sup>	
1~2CCT	200(W)X300(H)X100(D)	200(W)X300(H)X100(D)	Exposure Type / Buried Type
3~4CCT	300(W)X400(H)X100(D)	300(W)X400(H)X100(D)	
5~6CCT	400(W)X400(H)X100(D)	400(W)X400(H)X100(D)	
Other sizes made to order			

C-Shape Sleeve



Material	Size of the Connected Wire(mm <sup>2</sup> )	Remark
Copper	10~300	-

Water-Resistance Rod (make-to-order)



Material	Size of the Connected Wire(mm <sup>2</sup> )	Remark
Copper	10~300	Single Wing Type Twin Wing Type

Test Grounding Rod




Material	Size	Remark
Iron + Copper Sheath	Ø 14 mm X 1000 mm	Including Lead Wire

# MISCELLANEOUS MATERIALS FOR GROUNDING AND LIGHTNING PROTECTION


## MISCELLANEOUS MATERIALS FOR LIGHTNING PROTECTION

Stainless Steel Round Rod 8mm




Model	Material	Size	Remark
OMNI LR-1	STS 304	Ø 8 mm	3m per rod
OMNI LR-2	STS 304 (Coated with black zinc)		

Stainless Steel Round Rod Connector




Model	Material	Size of the Connected Wire	Remark
OMNI LC-1	STS 304	Ø 8 mm	"—"Shape

Stainless Steel Round Rod Connector




Model	Material	Size of the Connected Wire	Remark
OMNI LC-2	STS 304	Ø 8 mm	"T"Shape

Stainless Steel Round Rod Expansion Joint




Model	Material	Size of the Connected Wire	Remark
OMNI LC-J	STS 304	Ø 8 mm	Corner / for Contract-Relax

Stainless Steel Round Rod Connector



Model	Material	Size of the Connected Wire	Remark
OMNI LC-3	STS 303	Ø 8 mm	"—"Shape

Stainless Steel Round Rod Connector



Model	Material	Size of the Connected Wire	Remark
OMNI LC-4	STS 303	Ø 8 mm	"T"Shape

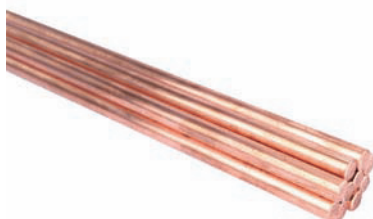
## Miscellaneous materials

Stainless Steel Round Rod Connector



Model	Material	Size of the Connected Wire	Remark
OMNI LC-5	STS 303	Ø 8 mm	"L" Shape

Copper Rod 8mm



Material	Size	Remark
Copper	Ø 8 mm	3m per rod

Brass Connector



Material	Size of the Connected Wire	Remark
Brass	Ø 8 mm	"—" Shape

Brass Connector



Material	Size of the Connected Wire	Remark
Brass	Ø 8 mm	"T" Shape

Rod Expansion Joint



Material	Size of the Connected Wire	Remark
Brass	Ø 8 mm	Corner / for Contract-Relax




Aluminum Rod 8mm





Material	Size	Remark
Aluminum	Ø 8 mm	3m per rod

# MISCELLANEOUS MATERIALS FOR GROUNDING AND LIGHTNING PROTECTION

## MISCELLANEOUS MATERIALS FOR LIGHTNING PROTECTION

Aluminum Corner			Aluminum Corner			Aluminum Corner Expansion Joint		
								
Material	Size of the Connected Wire	Remark	Material	Size of the Connected Wire	Remark	Material	Size of the Connected Wire	Remark
Aluminum	Ø 8 mm	“—”Shape	Aluminum	Ø 8 mm	“T”Shape	Aluminum	Ø 8 mm	Corner / for Contract-Relax

Supporting Component				Supporting Component				Ring-Shape Supporting Pole			
											
Model	Material	Size of the Connected Wire	Remark	Model	Material	Size of the Connected Wire	Remark	Model	Material	Size of the Connected Wire	Remark
OMNI LS-2	Polycarbonate	Ø 8 mm	Black Color H: 85 mm	OMNI LS-2	Polycarbonate	Ø 8 mm	Gray Color H: 85 mm	OMNI LS-1	STS 304	Ø 8 mm	H: 80 mm



## Miscellaneous materials

Supporting Component (for the Gable Panel)



Model	Material	Size of the Connected Wire	Remark
OMNI LS-4	Iron (plated in black)	Ø 8 mm	For the Male Gable Panel H: 50 mm

Supporting Component (for the Gable Panel)



Model	Material	Size of the Connected Wire	Remark
OMNI LS-3	Iron (plated in black)	Ø 8 mm	For the Female Gable Panel H: 100 mm

Supporting Pole for Angle Control



Material	Size of the Connected Wire	Height of the Pole(mm)
STS 304	Ø 50~95 mm	500~1500

Air Terminal Pole(General Type)



Material	Size of the Connected Wire(mm <sup>2</sup> )	Height of the Pole(mm)
STS 304	50~95	Higher than 500

Air Terminal Pole(Fixed Branch-Ring Type)



Material	Size of the Connected Wire(mm <sup>2</sup> )	Height of the Pole(mm)
STS 304	50~95	Higher than 500

Air Terminal Pole(Sidewall Type)



Material	Size of the Connected Wire(mm <sup>2</sup> )	Height of the Pole(mm)
STS 304	50~95	Higher than 500

# MISCELLANEOUS MATERIALS FOR GROUNDING AND LIGHTNING PROTECTION

## MISCELLANEOUS MATERIALS FOR LIGHTNING PROTECTION

Air Terminal Pole(Sidewall Type)



Material	Size of the Connected Wire(mm²)	Height of the Pole(mm)
STS 304	50~95	Higher than 500

Air Terminal Pole(Utility Pole Type)



Material	Size of the Connected Wire(mm²)	Height of the Pole(mm)
STS 304	50~95	Higher than 500

Air Terminal Pole(Utility Pole Type)



Material	Size of the Connected Wire(mm²)	Height of the Pole(mm)
STS 304	50~95	Higher than 500