Tavan Gostaran Zino

Earthing System

Lightning Protection System

Solar System

Exothermic Welding System

Cathodic Protection System

Tavan Gostaran Zino

Tavan Gostaran Zino Co. has been established as a specialized company, taking advantage of the modern sciences with the aim of designing, production (supplement), and installation of the following items:

- Electrical and Instrumentation
- Earthing system
- Lightning protection
- Cathodic protection (corrosion control)
- New energies systems (Solar systems)

By relying on its 20-year experience since its establishment, human resources and knowledge of its engineers and experts, and by transferring of modern technologies and methods and their employment, **Tavan Gostaran Zino Co.** has received a considerable growth in implementing EPC work in various industries including oil, gas, petrochemical, refineries, power plants, and electricity posts.

Engineering Service Range
Earthing and Lightning Protection Systems

1. Site Survey

1.1. Soil study

1.1.1.Soil resistivity test (Wenner Four-Electrode Method)

1.1.2. Soil pH test

1.2. Lightening rod installation survey

1.3. Lightning protection level and method survey

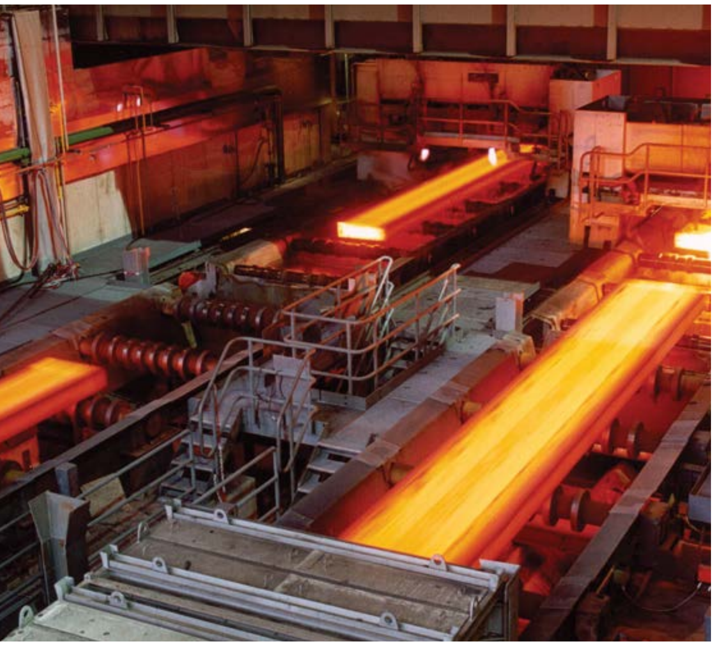
2. Designing

Designing is done according to the documented standards and procedures in the system and relevant to the received information from section 1, as well as the existing maps in the system designing with the lowest cost and the best performance. At this point, the initial plan for the installation, running, and implementation, and the calculation tables are also suggested.

3. Post-Implementation Survey

1. Earth resistance system survey using 62% method, Slope method and etc.
2. Voltage contact detection
3. Voltage pitch survey
4. Continuity testing of ground and lightning protection systems

5- Leak testing



SWISSCERT

Certificate

SWISS CERT Pvt. Ltd. hereby certifies that the Management System of

TAVAN GOSTARAN ZINO CO.
UNIT 5, NO.5.4TH ALLEY, SABOUNCHI ST., TAKHTI SQ., BEHESHTI AVE., TEHRAN, IRAN

has been assessed and found to be in accordance with the requirements of the

Quality Management - Customer Satisfaction ISO 10002: 2014

and scope of supply detailed below

EPC CONTRACTOR: EARTHING & LIGHTNING SYSTEM, CATHODIC PROTECTION SYSTEM, EXPLOSION-PROOF EQUIPMENT, INSTRUMENTATION EQUIPMENT, SOLAR SYSTEM, HEAT TRACING SYSTEM.

Subject to the continued satisfactory operation of the client's Management System, this Certificate is valid for a period of Three years from: 30.05.2016

412, BEST SKY TOWER, NETAJI SUBHASH PLACE, PITAMPURA, DELHI - 110 034, INDIA
This Certificate will be valid until 29.05.2019
Certificate Number: 311813 F, Rev. No: 00

Director Operations | Managing Director

SWISSCERT

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UNIT 5, NO.5.4TH ALLEY, SABOUNCHI ST., TAKHTI SQ., BEHESHTI AVE., TEHRAN, IRAN

has been assessed and found to be in accordance with the requirements of the

Quality Management System ISO 9001:2008

and scope of supply detailed below

EPC CONTRACTOR: EARTHING & LIGHTNING SYSTEM, CATHODIC PROTECTION SYSTEM, EXPLOSION-PROOF EQUIPMENT, INSTRUMENTATION EQUIPMENT, SOLAR SYSTEM, HEAT TRACING SYSTEM

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Certificate Number: 311813 A, Rev. No: 00

Director Operations | DAC CB 004 | Managing Director

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UNIT 5, NO.5.4TH ALLEY, SABOUNCHI ST., TAKHTI SQ., BEHESHTI AVE., TEHRAN, IRAN

has been assessed and found to be in accordance with the requirements of the

HSE Management System standards

and scope of supply detailed below

EPC CONTRACTOR: EARTHING & LIGHTNING SYSTEM, CATHODIC PROTECTION SYSTEM, EXPLOSION-PROOF EQUIPMENT, INSTRUMENTATION EQUIPMENT, SOLAR SYSTEM, HEAT TRACING SYSTEM.

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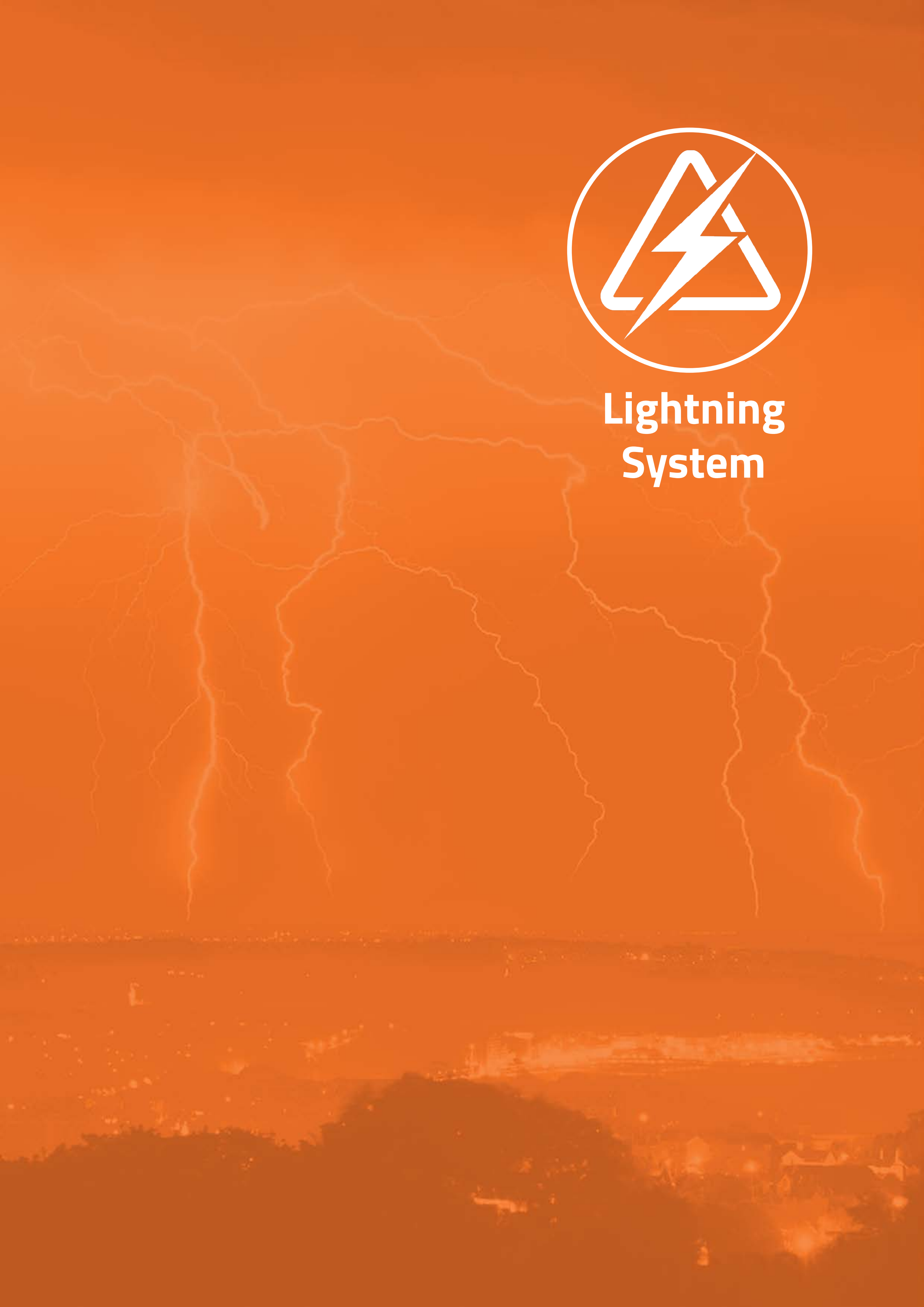
Director Operations | Managing Director



Lightning System

Damage Caused by Surge Voltages

Our dependency on electrical and electronic equipment continues to increase, in both our professional or private lives. Data networks in companies or emergency facilities such as hospitals and fire stations are lifelines for an essential real time information exchange. Sensitive databases, e.g. in banks or media publishers, need reliable transmission paths.

It is not only lightning strikes that pose a latent threat to these systems. More and more frequently, today›s electronic aids are damaged by surge voltages caused by remote lightning discharges or switching operations in large electrical systems. During thunderstorms too, high volumes of energy are instantaneously released.

These voltage peaks can penetrate a building though all manner of conductive connections and cause enormous damage.

Discharge types

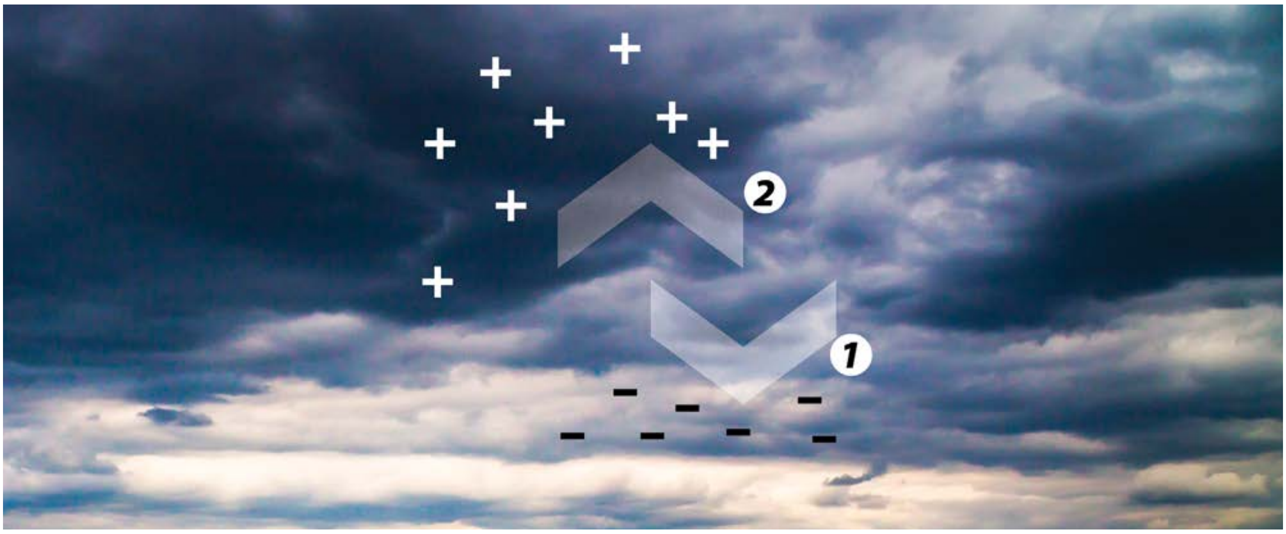
Some 90% of all lightning discharges between a cloud and the ground are negative cloud-earth strikes. The lightning begins in a negatively charged area of the cloud and spreads to the positively charged surface of the earth. Additional discharges are divided into:

- Negative earth-cloud strikes
- Positive cloud-earth strikes
- Positive earth-cloud strikes.

The most common discharges actually occur within a cloud or between different clouds.

Creation of lightning discharges

When warm, damp air masses rise, the air humidity condenses and ice crystals are formed at great heights. Storm fronts can occur when the clouds expand to heights of up to 15,000 m. The strong upwind of up to 100 kilometres per hour causes the light ice crystals to enter the higher area and the sleet particles enter the lower area. Knocks and friction cause electrical discharge.



Negative and positive charges

Studies have proved that the sleet falling down (area warmer than –15 °C) has a negative charge and the ice crystals being thrown upwards (area colder than –15 °C) has a positive charge. The light ice crystals are carried into the upper areas of the cloud by the upwind and the sleet falls to the central areas of the cloud. This divided the clouds into the three areas:

- Top: Positively charged zone
- Centre: Weakly negative charged zone
- Bottom: Weakly positive charged zone

This separation of charges forms a voltage in the cloud.

Load distribution

Typical load distribution:
• Positive at the top, negative in the centre and weakly positive at the bottom.
• Positive charges can also be found in the area near the ground.
• The field strength required to trigger lightning is dependent on the insulating ability of the air and is between 0.5 and 10 kV/cm.

Operation of the starting apparatus to lightning ESE

The action develops in three steps :

1.ESE accumulates charge :

The element called "Charger" is designed to accumulate natural ions in the "Central Inductive System" (patented).
This accumulation happens as quickly and in the same proportions as the increase in power of the ambient electric field generated by an upward tracer.

2.ESE creates an electric field on a tremedous scale :

At the same time, thanks to the "Central Inductive System" and the "Voltage Boosters", ESE creates a huge electrical field the charge of which is opposed to that of the natural electric field in presence and stimulates the "Harness head".According to their quantity, the "Priming poles" multiply the efficiency of the priming.

3.Harnessing and conduction by ESE :

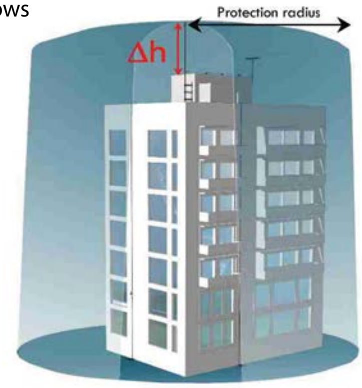
The priming of ESE system attracts the upward tracer and creates the "lightning strike" conditions. Then the "Harness tip" leads the lightning current through its axis toward the ground conductors..

Protection radius

The protection radius of an Early Streamer Emitter lightning rod is related to its height (h) in proportion to the surface area to protect, its efficiency and the selected protection level.
According to NFC 17-102 standard – September 2011, its calculation is made as follows

$$R_P(h^*) = \sqrt{2rh - h^2 + \Delta h(2r + \Delta h)} \qquad h^* \geq 5m$$

$$R_P(h^*) = h \times R_P(5)/5 \qquad 2m \leq h^* < 5m$$



Rp (h)(m) stands for the protection radius at a given height h;

r(m) 20m for the protection level I;
30m for the protection level II;
45m for the protection level III;
60m for the protection levelIV;

Δh(m) stands for the height of the ESE end in a horizontal plane to the farthest point of the element to protect.

$\Delta h = \Delta = \Delta T \times 10^2$

The experience in the field shows that Δ is equal to the efficiency obtained during the ESE evaluation tests.
The protection level is set according to numerous parameters including loss of life and economic risks, the average local lightning striking, the impact on environment, etc... To favour an ideal matching to the layout of the different premises to protect, is available with

Operation of the starting apparatus to lightning ESE

Years of experiments and numerous tests in laboratory and in real-world lightning conditions were necessary to develop this Early Streamer Emitter lightning rod.
An aluminium alloy and polymeric matérials, all patented, form the major part of our lightning rod. Without any fragile priming system, we designed the most reliable and sustainable product of the market.
Called ESE, in reference to french langage and to its communication abilities, our product is manufactured with utmost care in our workshop in France.

Lightning Rod ESE 1

ESE 110

Δ t=10 µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	8	11	13	15
3	12	16	19	24
4	17	26	26	34
5	21	29	32	43
10	23	36	37	48
20	24	40	41	55
60	30	48	59	64

ESE 125

Δ t=25 µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	17	19	23	26
3	25	29	34	39
4	34	39	46	52
5	42	49	57	65
10	44	51	61	69
20	45	52	63	75
60	45	52	65	79

ESE 145

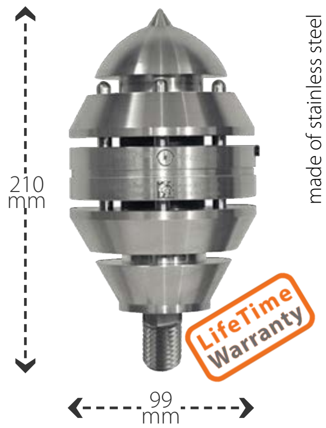
Δ t=45 µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	25	28	32	36
3	38	41	48	53
4	51	57	65	72
5	62	71	81	89
10	63	72	83	92
20	65	74	86	97
60	66	75	90	105

ESE 160

Δ t=60 µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	32	34	40	44
3	48	52	59	65
4	64	69	78	87
5	79	86	97	107
10	79	88	99	109
20	80	89	102	113
60	80	90	105	120

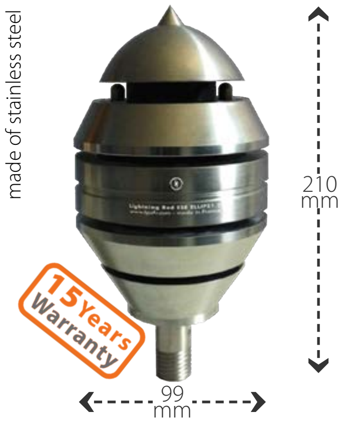


Lightning Rod ESE 2

ESE 210

Δ t=10 µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	10	12	15	17
3	16	19	23	26
4	21	25	30	35
5	26	31	38	43
10	28	35	42	49
20	30	39	49	57
60	30	40	53	70



ESE 225

Δ t=25µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	17	20	23	26
3	25	29	34	39
4	34	39	46	52
5	42	49	57	65
10	44	51	61	69
20	45	54	65	75
60	45	55	68	85

ESE 245

Δ t=45µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	25	28	32	36
3	38	42	48	54
4	51	57	64	72
5	63	71	81	89
10	64	72	83	92
20	65	74	86	97
60	65	75	89	105

ESE 260

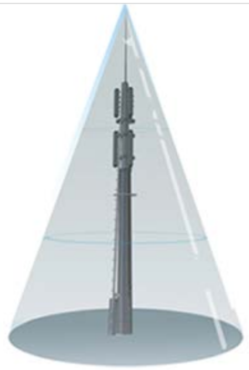
Δ t=60 µs

Δh(m)	Protection Radius			
	I	II	III	IV
2	31	35	39	43
3	47	52	58	64
4	63	69	78	85
5	79	86	97	107
10	79	88	99	109
20	80	89	102	113
60	80	90	104	120

Comparison of the effectiveness of protective solutions against lightning

A : ESE Rod	
1. Portection area	✔ ✔ ✔ ✔ ✔
2. Protection of open areas	✔ ✔ ✔ ✔ ✔
3. Study	✔ ✔ ✔ ✔ ✔
4. Implementation	✔ ✔ ✔ ✔ ✔
5. Qualification required for implementation	✔ ✔ ✔
6. Aesthetic (Architecture integration)	✔ ✔ ✔ ✔ ✔
7. Realization budget	✔ ✔ ✔ ✔
8. Maintenance costs	✔ ✔ ✔ ✔ ✔

NFC 17-102 + IEC 62305



B : Single point ligntning rod	
1. Portection area	✘ ✘ ✘ ✘ ✘
2. Protection of open areas	✘ ✘ ✘ ✘ ✘
3. Study	✔ ✔ ✔
4. Implementation	✔ ✔ ✔ ✔ ✔
5. Qualification required for implementation	✔ ✔ ✔ ✔ ✔
6. Aesthetic (Architecture integration)	✔ ✔ ✔
7. Realization budget	✔ ✔ ✔ ✔ ✔
8. Maintenance costs	✔ ✔ ✔ ✔ ✔

IEC 62305

C : Meshed Cage or Faraday	
1. Portection area	✘ ✘ ✘
2. Protection of open areas	✘ ✘ ✘ ✘ ✘
3. Study	✘ ✘ ✘ ✘ ✘
4. Implementation	✘ ✘ ✘ ✘ ✘
5. Qualification required for implementation	✘ ✘ ✘ ✘ ✘
6. Aesthetic (Architecture integration)	✘ ✘ ✘ ✘ ✘
7. Realization budget	✘ ✘ ✘ ✘ ✘
8. Maintenance costs	✘ ✘ ✘ ✘ ✘

IEC 62305

D : Tensioned Cables	
1. Portection area	✘ ✘ ✘
2. Protection of open areas	✔ ✔ ✔
3. Study	✘ ✘ ✘
4. Implementation	✔ ✔ ✔
5. Qualification required for implementation	✘ ✘ ✘ ✘
6. Aesthetic (Architecture integration)	✘ ✘ ✘ ✘
7. Realization budget	✘ ✘ ✘
8. Maintenance costs	✘ ✘ ✘

IEC 62305

Implementation

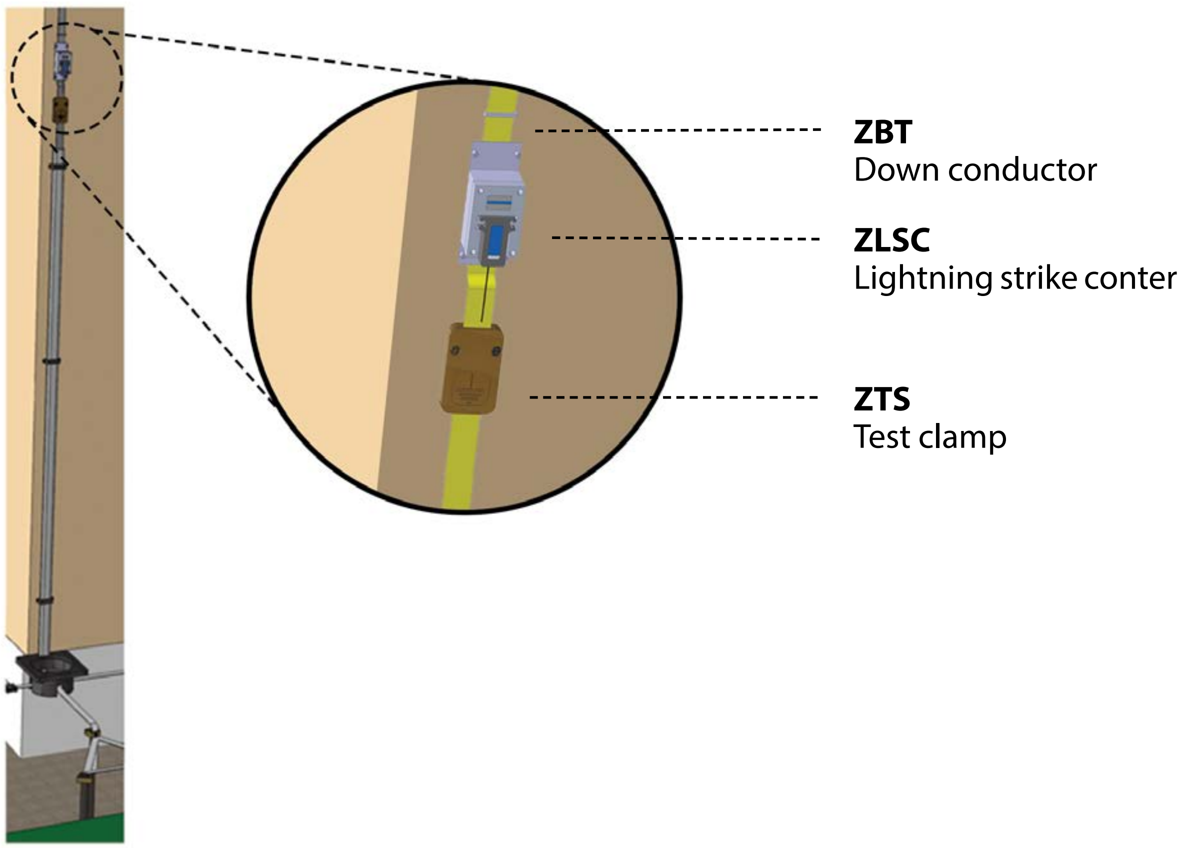
Early Streamer Emitter lightning rods are part and parcel of a complete protection against lightning system, including also downward conductors, grounding, etc...
Before its implementation, a protection against lightning system must be the object of an in-depth study.

To provide an optimal security, this system must also be installed in compliance with the standards in force and the manufacturer's instructions.

To benefit from your product warranty, your protection against lightning system must imperatively follow those study and installation codes.

Our licensed partners (distributors, installers) are proficient in ensuring you the necessary conditions to the preservation of your warranty.

Installation Compt



Counter

The lightning strike counter consists of a 6 digits display. Each lightning strike is recorded when it comes through by incrementing one unit (the rightmost number).

Watertight (IP65), robust and reliable, it operates without any power supply and records positive or negative lightning strikes.

The lightning strike counter displays the total number of lightning strikes having struck the Outside Protection against Lightning Installation (OPLI).

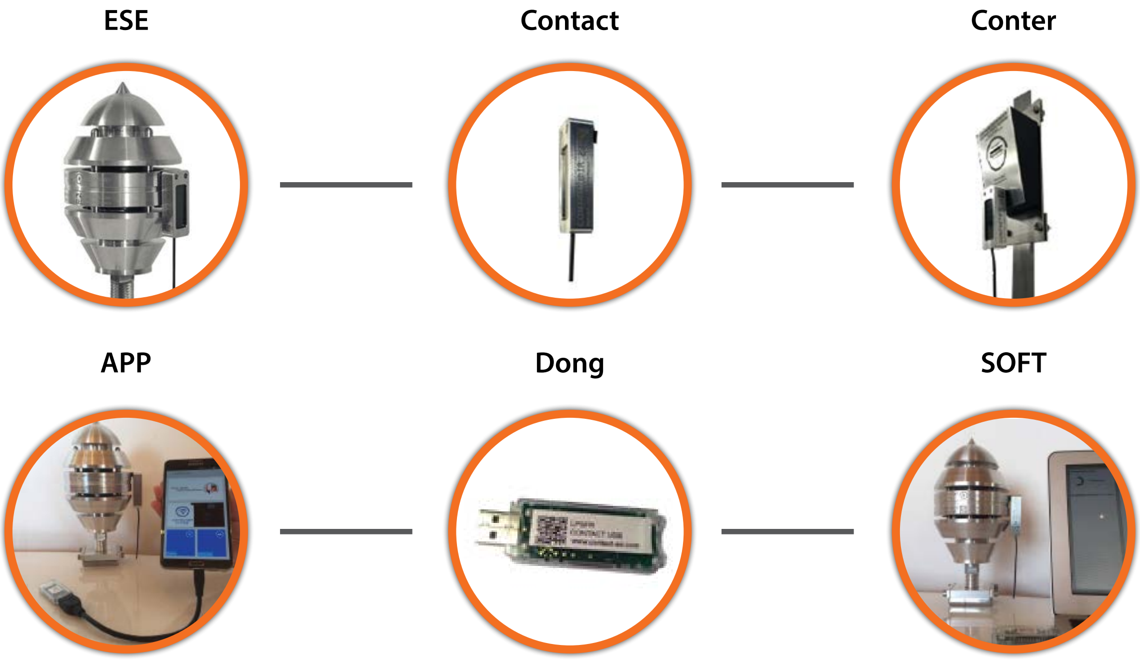
It is necesary to regularly watch over the display for a good follow-up of the installation. The lightning strike counter is essential for the good maintenance of the OPLI (cf. NFC 17-102 : a checking shall be done after each lightning strike).

This regular monitoring doesn't require a travel with Contact + Rout option. On top of that, you will be warned in real time in case of lightning strike event.).

It can be set up and works on any type of existing downward conductor (flat, round, …) thanks to its universal fastenings. lightning strike counters are compliant with the standards in force (NFC 17-102, NF EN 50164-6).

Height	:	14.50	cm
Width	:	5.50	cm
Depth	:	5.50	cm
Weight	:	0.285	kg

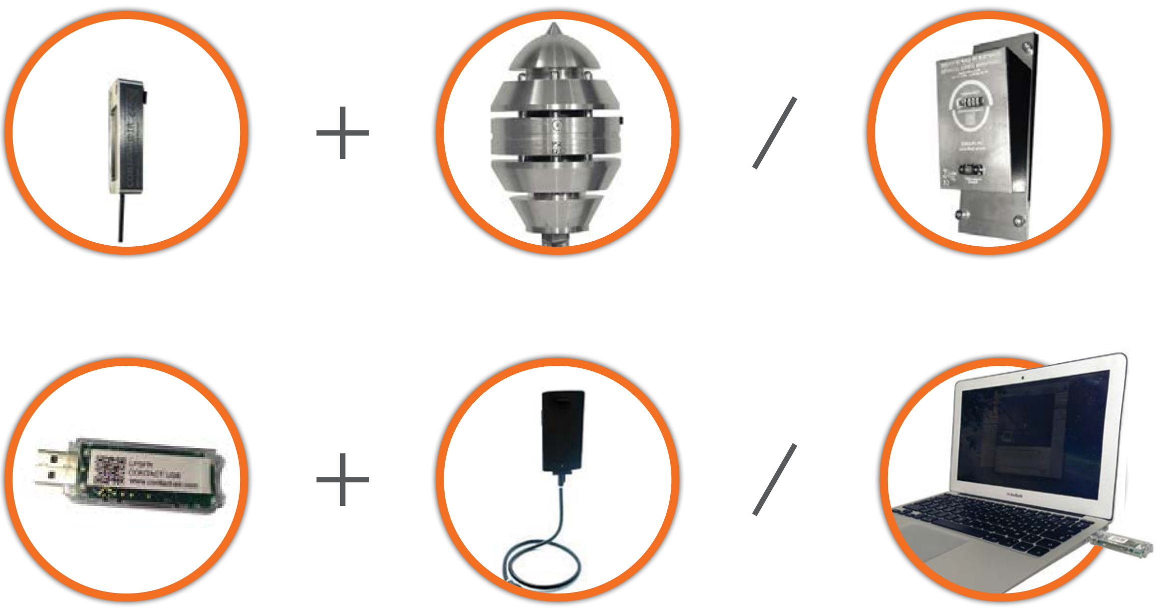
Contact + Dongl



An outside protection against lightning with a lightning rod must be checked every year and after each lightning strike to ensure its good working order. Source NFC 17-102 – September 2011, (art. 8.2).

Maintenance and servicing of your lightning protection installation are also necessary to preserve your manufacturer's and installer's warranties.

Contact system is an exclusive solution proposed by **LPS** to meet normative requirements, preserve your warranties and ensure your security throughout the lifetime of your lightning protection installation.



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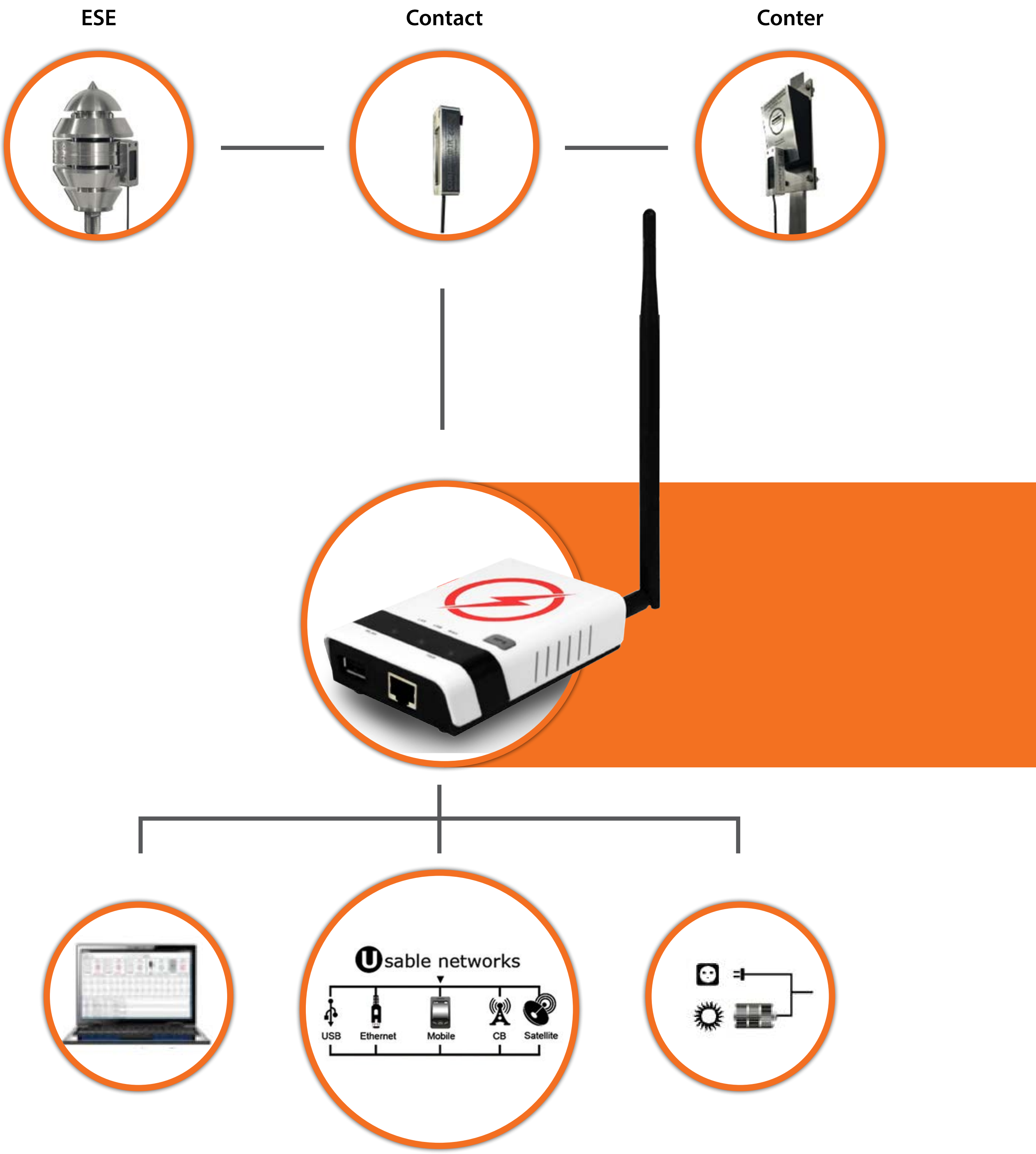
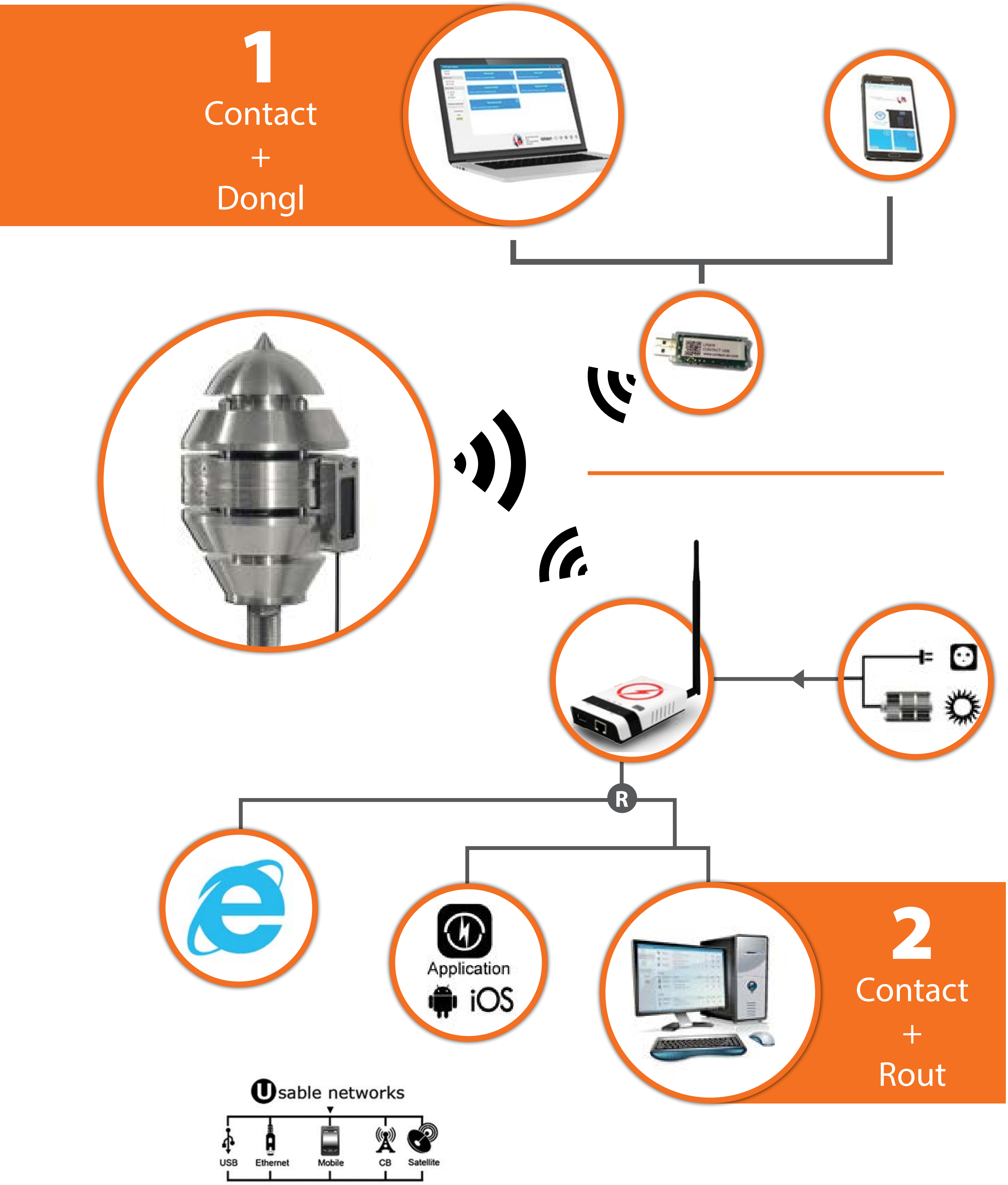


Reception of information

The content of the information you receive and the type of receipt (local or remote) depend on the choice of receiver
There is two existing receivers : **Dongl et Rout.**



Mast for Lightning

Lightning Mast

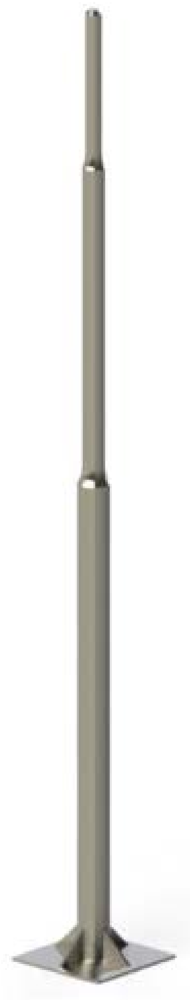
Lightning interception range of terminals stands for the protection of overhead equipment The levels where no penetration of the roof structure is allowed to contain A. Single component system to reach the heights of protection to 6m

Materiat	Mast	Base Plate	Part No.
Steel H.D.G	Up to 3 m	300x300 mm	ZLT 133
Steel H.D.G	Up to 6 m	500x500 mm	ZLT 165

Free Standing Masts

A range of free-standing lightning interception terminals for the protection of roof-mounted equipment on surfaces where no penetration of the roof structure for anchoring is allowed.
A multicomponent, stackable system with screw retention to achieve protection heights of up to 25m.
The FreeStanding Air Terminal system is designed to withstand wind speeds of up to 110kmh

Length	Material	Part No.
6 m	Steel H.D.G	ZFS 06
8 m	Steel H.D.G	ZFS 08
10 m	Steel H.D.G	ZFS 10
12 m	Steel H.D.G	ZFS 12
15 m	Steel H.D.G	ZFS 15
20 m	Steel H.D.G	ZFS 20
25 m	Steel H.D.G	ZFS 25

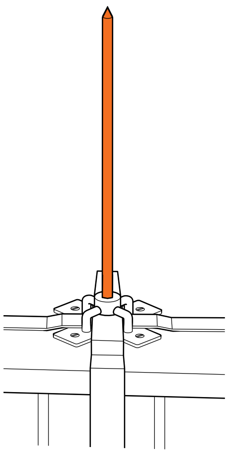


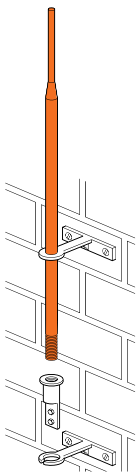
Lightning Air Rod

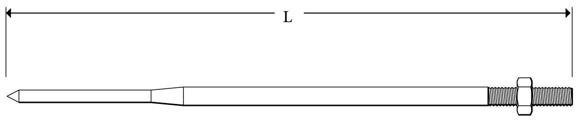
Single Air Rods

Air rods from an important part of the air termination network of a lightning protection system. All of our air rods are supplied with a locknut enabling the rod to be locked tight against the conductor.

Rod Diameter	Rod Length	Thread Length (mm)	Unit weigth (kg)	Part No
16	300	40	0.53	ZTP 130
	500		0.85	ZTP 150
	1000		1.70	ZTP 110
	1500		2.59	ZTP 115
	2000		3.47	ZTP 120
20	300	40	0.80	ZTP 230
	500		1.34	ZTP 250
	1000		2.68	ZTP 210
	1500		4.02	ZTP 215
	2000		5.36	ZTP 220





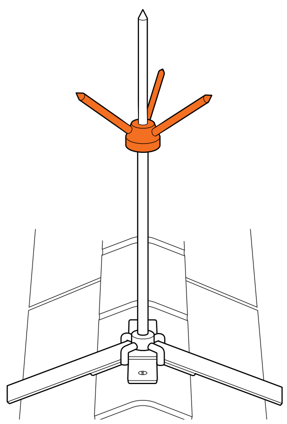


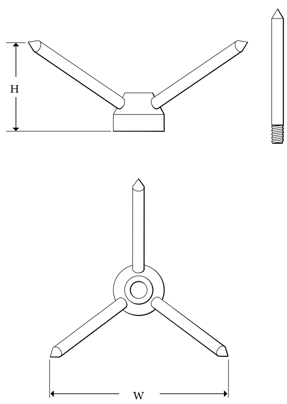
made of copper nicel chromcoted or stainless steel

MultiPoint Air Rod

Used in conjunction with the single air rods.

Air Rod Diameter	H(mm)	W(mm)	Unit weight (kg)	Part No.
16	156	72	0.30	ZMP 016
20	156	72	0.50	ZMP 020





made of copper nicel chrom coted or stainless steel

Saddles For Air Rod

Saddles for connection air rod to wire

Light duty saddles are used to support tall air rods to conductor on flat roof surfaces.

Rod Diameter	Thread size	Wire size	Part No.
16	M16	35	ZSW 135
	M16	50	ZSW 150
	M16	70	ZSW 170
	M16	95	ZSW 195
	M16	120	ZSW 112
	M16	185	ZSW 118
20	M20	35	ZSW 235
	M20	50	ZSW 250
	M20	70	ZSW 270
	M20	95	ZSW 295
	M20	120	ZSW 212
	M20	185	ZSW 218

made of brass

Saddles for connection air rod to Tape 1

Light duty saddles are used to support tall air rods to tape on flat roof surfaces.

Rod Diameter	Thread size	Tape size	Part No.
16	M16	20x3	ZST 1203
	M16	25x3	ZST 1253
	M16	30x3	ZST 1303
20	M20	20x3	ZST 2203
	M20	25x3	ZST 2253
	M20	30x3	ZST 2303

made of brass

Saddles for connection air rod to Tape 2

Light duty saddles are used to support small air rods to tape on flat roof surfaces.

Rod Diameter	Thread size	Tape size	Part No.
16	M16	20x3	ZST 3203
	M16	25x3	ZST 3253
20	M20	20x3	ZST 4203
	M20	25x3	ZST 4253

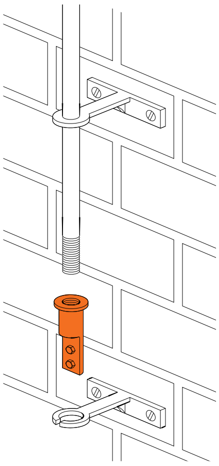
made of brass

saddles for side wall

Coupling for Air rod to bracket

Enables the flat tape or cable lug to be connected to the air rod. Used in conjunction with the side mounting air rod brackets.

Rod diameter	Thread size	Part No.
16	M16	ZRC 16
20	M20	ZRC 20



made of Brass

Bracket For Coupling & Air Rod

These brackets provide a 75mm projection from the building face and are used where it is not possible to fit a saddle onto the building roof. The brackets are used in conjunction with the rod to tape coupling used to secure the flat tape to the air rod.

Rod diameter	Rod Coupler mm	Part No.
16	16	ZRH 16
20	20	ZRH 20

made of Brass

Coupling for Air rod to Mast

adopting pieces for air terminal mast and internal round or tape down conductor connection

Rod diameter	Thread size	Mast	Part No.
16	M16	2”	ZCM 016
20	M20	2”	ZCM 020

made of Brass

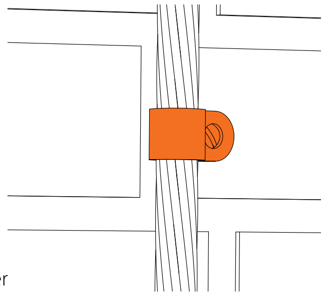
Down Conductors Holders

One Hole Clip

One hole conductor clips provide an easy method of fixing copper and aluminum conductors to surface.

Wire Size	Part No.
35	ZHW 35
50	ZHW 50
70	ZHW 70
95	ZHW 95
120	ZHW 120
185	ZHW 185

made of copper

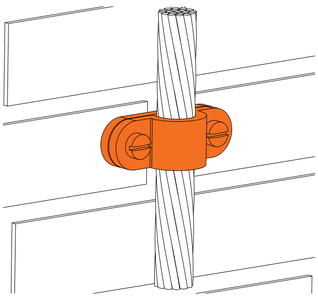


Metallic Cable Clip

Metallic cable clips secure the stranded copper conductor to the building surface.

Wire Size	Part No.
35	ZMH 35
50	ZMH 50
70	ZMH 70
95	ZMH 95
120	ZMH 120

made of brass

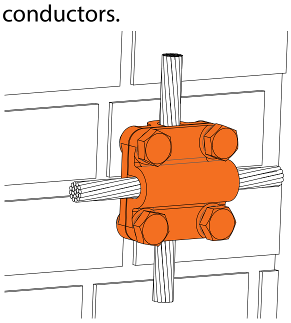


Square Conductor clamp

These four way connectors are suitable for making cross straight through or tree joints in Copper conductors.

Wire Size	Part No.
35	ZWS 35
50	ZWS 50
70	ZWS 70
95	ZWS 95
120	ZWS 120

made of brass

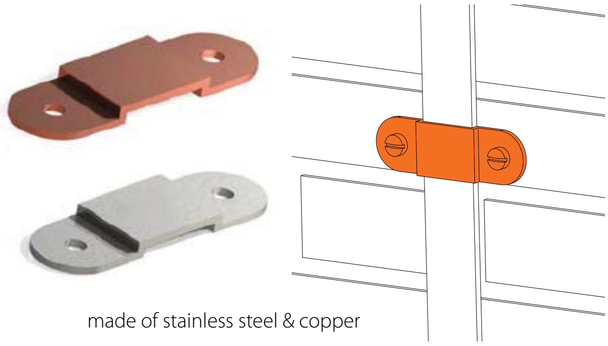


Tape Clamp

Tape Clips

Tape clips hold the flat tape conductor flush to the building surface.

Tape Size	Material	Part No.
20x3	Copper	ZTH 253
25x3		
20x3	Stainless Steel	ZTH 253 ss
25x3		

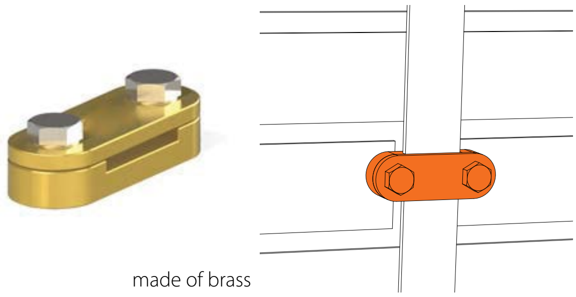


made of stainless steel & copper

Metallic Tape Clipe

Metallic DC clips secure the flat tape conductor to the building surface.

Tape Size	Part No.
20x3	ZTC 253
25x3	
30x3	ZTC 303
50x5	ZTC 505

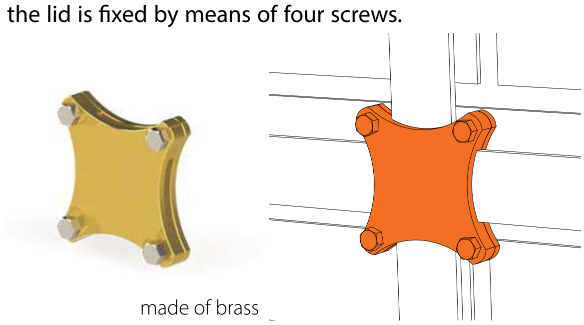


made of brass

Square Tape Clamp

These four way connectors are suitable for making cross straight through or tree joints in flat tape. The base has a countersunk hole in the middle for securing the clamp to the building surface and the lid is fixed by means of four screws.

Tape Size	Part No.
20x3	ZTX 253
25x3	
30x3	ZTX 303



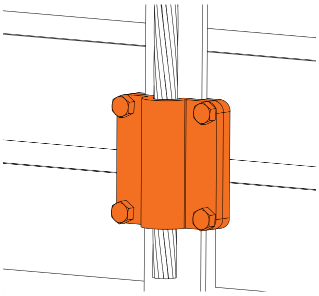
made of brass

Test Clamps

cable to tape clamp

Wire Size	Tape Size	Part No.
35	20x3	ZTW 3525
	25x3	
50	20x3	ZTW 5025
	25x3	
70	20x3	ZTW 7025
	25x3	

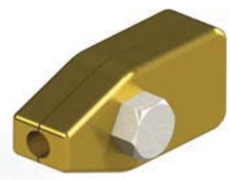
made of brass



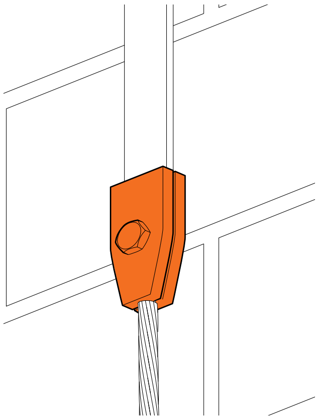
Cable To Tape Clamp

This clamp for test connecting flat tape to solide circular conductor

Wire Size	Tape Size	Part No.
50	20x3	ZTS 5025
	25x3	
	30x3	ZTS 5030
70	20x3	ZTS 7025
	25x3	
	30x3	ZTS 7030
95	20x3	ZTS 9525
	25x3	
	30x3	ZTS 9530



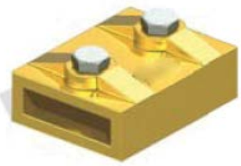
made of brass



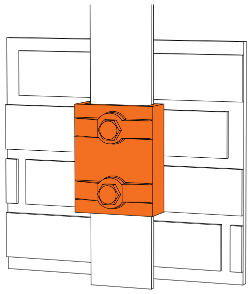
Tape To Tape Clamp

Designed to join a range of tape size in a straight through position. In many applications the clamp enables tapes to be overlapped and secured by the two set screws.

Tape Size	Part No.
20x3	ZTS 253
25x3	
30x3	ZTS 303



made of brass

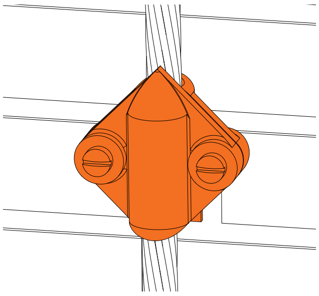


Wire To Wire Clamp

Designed to join a range of wire size in a straight through position. In many applications the clamp enables wires to be overlapped and secured by the two set screws.

Wire Size	Part No.
35	ZTS 35
50	ZTS 50
70	ZTS 70
95	ZTS 95
120	ZTS 120

made of brass



REWINDER EARTHING SYSTEM ZPT200

LIGHTNING PROTECTION FOR FLOATING ROOF TANKS

" Minimize The Risk Of Fires Caused By Lightning "

Lightning Risks Involving Floating Roof Storage Tanks

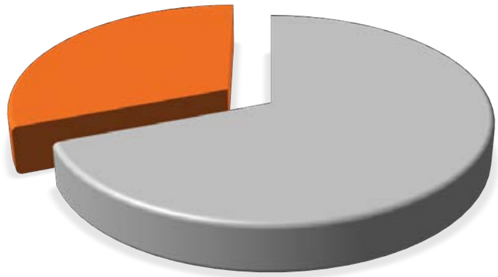
External Floating Roof (EFRT) are extremely susceptible to not only direct lightning strikes but nearby currents as well. The shell of these structures commonly discharges current more rapidly than the floating roof.

Normally, there is little vapor, and consequently a smaller risk of internal ignition, fire and explosion; however, studies have shown that 31% of all floating roof tank fires are caused by lightning related issues.(Fig.1)

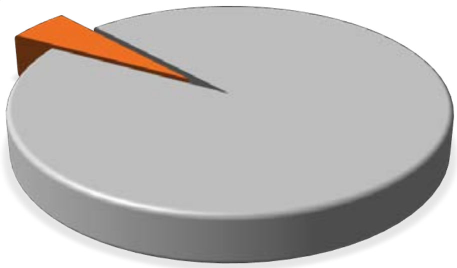
THERE ARE HUNDREDS OF ABOVE GROUND STORAGE TANK FIRES EVERY YEAR.

Rim Seal fires are the most common type of fire for floating roof tanks, especially EFRT.
It is estimated that 95% of rim seal fires are the result of lightning strikes and 0,16% of all tanks with rim seals will experience a rim seal fire in any given year*1.(Fig.2)

Of all floating roof tank fires are caused by lighting related issues
Fig.1



Of rim seal fires are the result of lighting strikes.
Fig.1



CURRENT PROTECTION METHODS

hunts –Metal strip that electrically bond to the shell wall and rof of a floating roof tank in multiple locations.

Currently, to create a roof-shell bond, the National Fire Protection Association (NFPA) 780 states that shunts must be spaced a maximum of every 3 mt around the tank pe rimeter.

C orrosion or by-product accumulations on the inside of the shell can create a high impedance-resistance connection be tween the shell and the shunts, resulting in sparking and possible ignition.

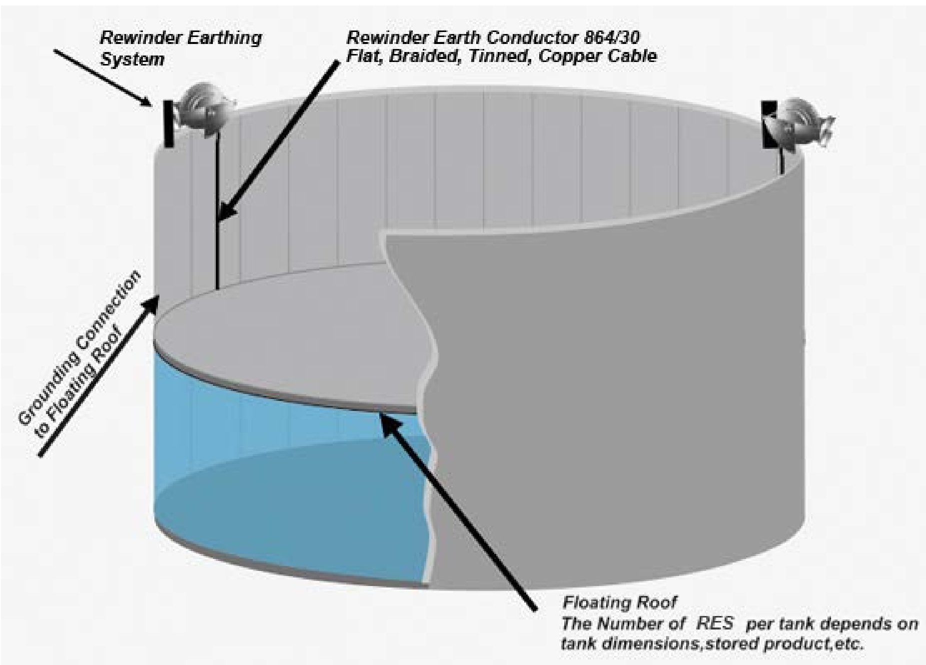
La rge tanks are typically "out-of-round" by several inches, this results in shunts pulling away from the tank shell Resulting in a loss of the necessary bonds.

RESULT OF SHUNT MALFUNCTIONS

A poorly contacting rim-seal shunt on an EFRT is an example of where sparks might occur during lightning storms. If there is a non-conducting layer on the shell or the shunt, the spark will initially be an aigap spark that will break down the insulation , followed by current flow in a poorly contacting area resulting in thermal sparking.
As you can see in the chart below, shunts are used for the conduction of fast and intermediate duration of lightning-stroke current. Bypass conductors are used for conduction of the intermediate and long duration components of lightning-stroke current.*2 The long duration currents are where the most dangerous air-gap sparks may occur.

- The most effective floating roof tank grounding system on the market.
- Lowest impedance of any system
- Full-Time, Positive Connection
- Helps reduce fire risk.
- Greatly reduces shunt maintenance.
- Free Maintenance
- Easy Installation
- 5 years warranty.
- In-Service Installation
- Existing Tanks or New Tanks.
- API 545 Compliance

S hunt malfunction can result in months or years of downtime , single tank damage, damage to an entire facility, or damage to personnel. Shunts alone are too unreliable to take this chance, as testing has shown that, rather than r educing the risk of fire from lightning strikes, they may actually be increasing risk potential.



The ZPT200 uses a sleek and exceptionally rugged construction made of heavy-duty 3-4 mm 304 grade stainless steel suitable for long life in any environment. Unrivaled by anything in the industry.

The 50 mm^2 bypass conductor of the RES is specially designed and manufactured with SS304 for exceptional corrosion resistance , strength and maxiumum durability.

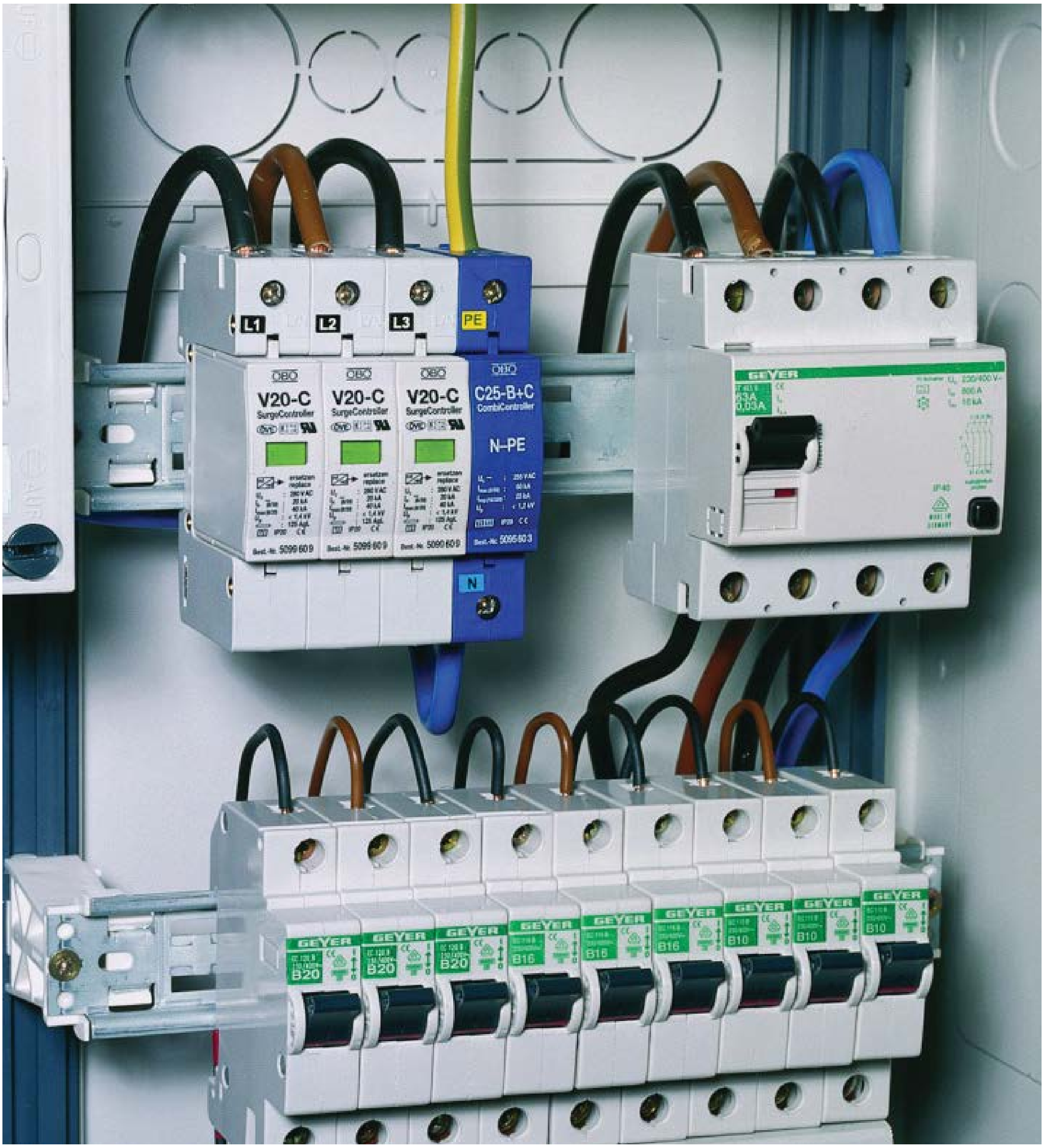
ZPT200 QUANTITY SELECTION CHART

Tank Circumference (Meters)	Tank Diameter (Meters)	Quantity Of Required RES2000's
≤ 60	≤ 19,10	2
≤ 90	≤ 28,65	3
≤ 120	≤ 38,20	4
≤ 150	≤ 47,75	5
≤ 180	≤ 57,30	6
≤ 210	≤ 66,84	7
≤ 240	≤ 76,39	8
≤ 270	≤ 85,94	9
≤ 300	≤ 95,49	10
≤ 330	≤ 105,04	11
≤ 360	≤ 114,59	12
≤ 390	≤ 124,14	13
≤ 420	≤ 133,69	14
≤ 450	≤ 143,24	15
≤ 480	≤ 152,79	16
≤ 510	≤ 162,34	17
≤ 540	≤ 171,89	18
≤ 570	≤ 181,44	19
≤ 600	≤ 190,99	20

Surge arrester

A surge arrester is a device to protect electrical equipment from over-voltage transients caused by external (lightning) or internal (switching) events. Also called a surge protection device (SPD) or transient voltage surge suppressor (TVSS), this class of device is used to protect equipment in power transmission and distribution systems. (For consumer equipment protection, different products called surge protectors are used.) The energy criterion for various insulation material can be compared by impulse ratio, the surge arrester should have a low impulse ratio, so that a surge incident on the surge arrester may be bypassed, to the ground instead of passing through the apparatus.

To protect a unit of equipment from transients occurring on an attached conductor, a surge arrester is connected to the conductor just before it enters the equipment. The surge arrester is also connected to ground and functions by routing energy from an over-voltage transient to ground if one occurs, while isolating the conductor from ground at normal operating voltages. This is usually achieved through use of a varistor, which has substantially different resistances at different voltages.



What are transient surges?

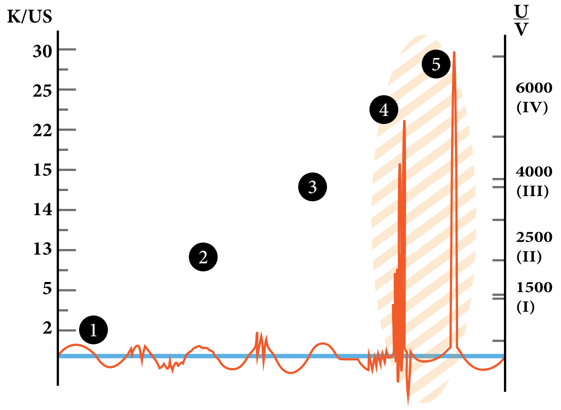
Transient surge voltages are brief voltage peaks lasting microsec-onds, which may be a multiple of the attached mains nominal volt-age.

Direct strike

The largest voltage peaks in the low voltage consumer network are caused by lightning discharges. The high energy content of lightning surges when a direct strike hits the external lightning protection system or a low voltage open wire line usually causes – without internal lightning and surge protection – total outage of the connect-ed consumers and damage to the insulation.

Delayed failures

Often, failures occur only after a time delay as the aging process of electronic components in the affected devices triggered by smaller transients causes insidious damage. A number of different protection measures are required. These depend on the exact cause and/or impact point of the light-ning discharge.

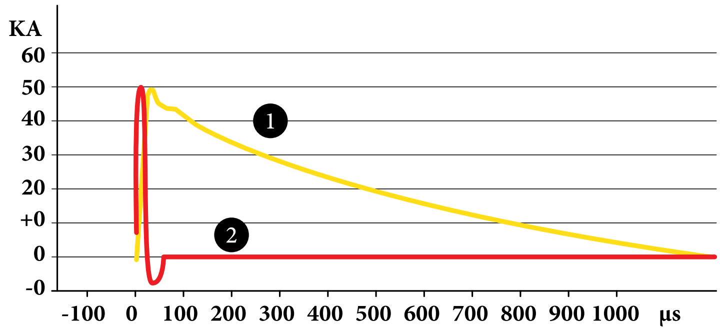


Transient surge voltages: 1 = Voltage drops/brief interruptions, 2 = Harmonic waves through slow and rapid voltage changes, 3 = Temporary voltage increases, 4 = Switching surges, 5 = Lightning surge voltages, hatched = application for surge protection devices

Induced voltage peaks and switching surge voltages

Yet induced voltage peaks in building installations and energy or data line supply cables can also reach many times the nominal operating voltage. Switching surges too, which in fact do not cause such high voltage peaks as light-ning discharges but occur much more frequently, can result in im-mediate system failure. As a rule, switching surges amount to twice to three times the operating volt-age, lightning surges on the other hand can sometimes reach 20 times the nominal voltage value and transport a high energy con-tent.

What are transient surges?



Pulse types and their characteristics: Yellow = pulse shape 1, direct lightning strike, 10/350 µs simulated lightning pulse, red = pulse shape 2, remote lightning strike or switching operation, 8/20 µs simulated lightning pulse (Surge)

Testing currents simulate poten-tial increase

High lightning currents can flow to the ground during a storm. If a building with ex-ternal lightning protection receives a direct hit, a voltage drop occurs on the earthing re-sistor of the lightning protection equipotential bonding system, which represents a surge volt-age against the distant environment. This rise in potential poses a threat to the electrical systems (e.g. volt-age supply, telephone systems, ca-ble TV, control cables, etc.) that are routed into the building. Suitable test currents for testing different lightning and surge protectors have been defined in na-tional and international standards.

Direct lightning strike: Pulse shape 1

Lightning currents that can occur during a direct lightning strike can be imitated with the surge current of wave form 10/350 µs. The light-ning test current imitates both the fast rise and the high energy content of natural lightning. Lightning current arrestor type 1 and exter-nal lightning protection compo-nents are tested using this current.

Remote lightning strikes or switching operations: Pulse shape 2

The surges created by remote lightning strikes and switching operations are imitated with test im-pulse 8/20 µs. The energy content of this impulse is significantly lower than the lighting test current of surge current wave 10/350 µs. Surge arrestor type 2 and type 3 are impacted with this test impulse.

Causes of lightning currents

Direct lightning strike into a building

If a lightning strike hits the external lightning protection system or earthed roof structures capable of carrying lightning current (e.g. roof aerial), then the lightning energy can be arrested to the ground in advance. However, a lightning protection system on its own is not enough: Due to its impedance, the building's entire earthing system is raised to a high potential. This po-tential increase causes the light-ning current to split over the build-ing's earthing system and also over the power supply systems and data cables to the adjacent earthing systems (adjacent build-ing, low-voltage transformer).

Risk:

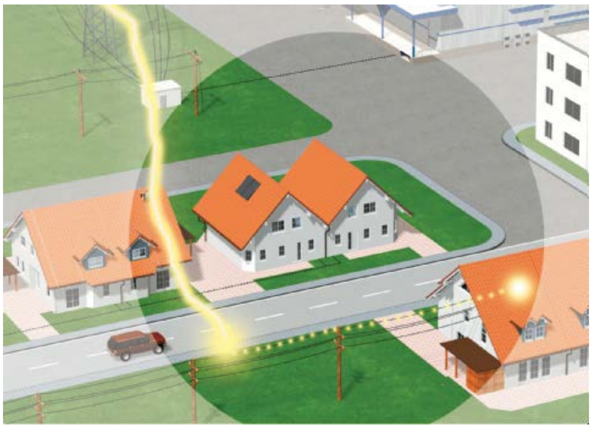
Lightning impulse (10/350)

Direct lightning strike into a low-voltage open-wire line

A direct lightning strike into a lowvoltage open wire line or data cable can couple high partial lightning currents in an adjacent building. Electrical equipment in buildings at the end of the lowvoltage openwire line are at particular risk of damage caused by surges.

Risk:

Lightning impulse (10/350)



Causes of lightning currents

Switching surges in the low-volt-age system

Switching surges are caused by switchon and switch off operations, by switching inductive and capacitive loads and by interrupting shortcircuit currents. Particularly when production plants, lighting systems or transformers are switched off, electrical equipment located in close proximity can be damaged.

Risk:

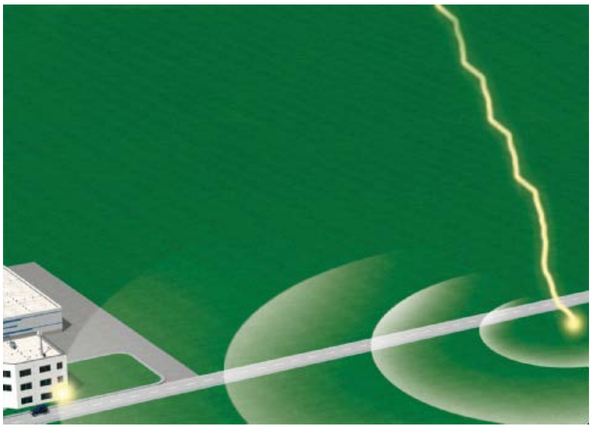
Lightning impulse (8/20)

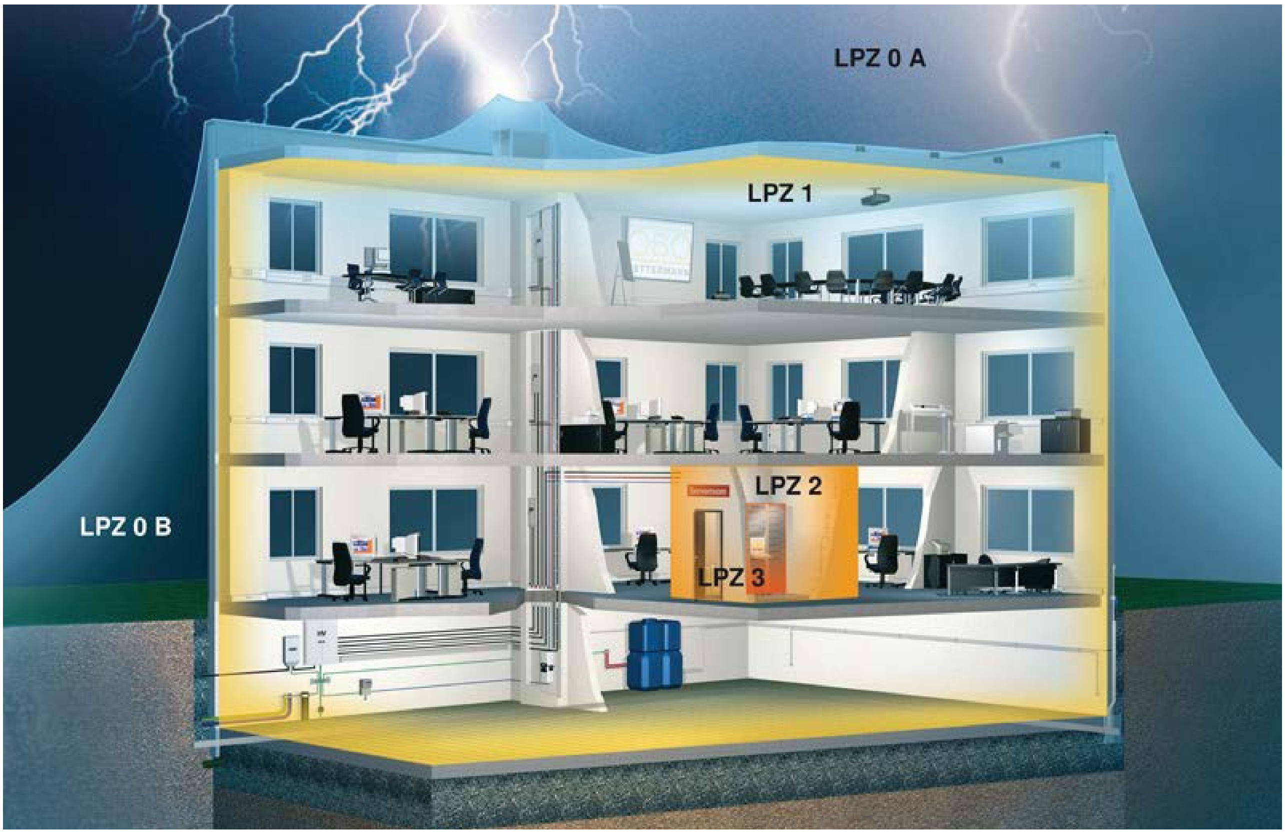
Coupling of surges through local or remote lightning strike

Even if lightning protection and surge protection measures are already installed: A local lightning strike creates additional high magnetic fields, which in turn induce high voltage peaks in line systems. Inductive or galvanic coupling can cause damage within a radius of up to 2 km around the lightning impact point.

Risk:

Lightning impulse (8/20)





Gradual surge reduction with lightning protection zones

Lightning protection zone concept

The lightning protection zone concept described in international standard IEC 62305-4 (DIN VDE 0185 Part 4) has proved to be practical and efficient. This concept is based on the principle of gradually reducing surges to a safe level before they reach the terminal device and cause damage. In order to achieve this situation, a building's entire energy network is split into lightning protection zones (LPZ = Lightning Protection Zone). Installed at each transition from one zone to another is a surge arrestor for equipotential bonding. These arrestors correspond to the requirement class in question.

Lightning protection zone		
LPZ 0 A		Unprotected zone outside the building. Direct lightning strike, no shielding against electromagnetic interference pulses LEMP (Lightning Electromagnetic Pulse)
LPZ 0 B		Through the area protected by the external lightning protection system. No shielding against LEMP.
LPZ 1		Zone inside the building. Low partial lightning energies possible.
LPZ 2		Zone inside the building. Low surges possible
LPZ 3		Zone inside the building (can also be the metal housing of a consumer). No interference pulses through LEMP or surges present.

Zone transitions and protective devices

Benefits of the lightning protection zone concept

•Minimisation of the couplings into other cable systems through arresting the energy-rich, dangerous lightning currents directly at the point the cables enter the building.

• Malfunction prevention with magnetic fields.

•Economic, well-plannable individual protection concept for new and old buildings and reconstructions.

Type classes of the surge protection devices

Zino surge protection devices are classified in accordance with DIN EN 61643-11 into three type classes type 1, type 2 and type 3 (previously B, C and D). These standards contain building regulations, requirements and tests for surge arrestors used in AC networks with nominal voltages of up to 1,000 V and nominal frequencies of between 50 and 60 Hz.

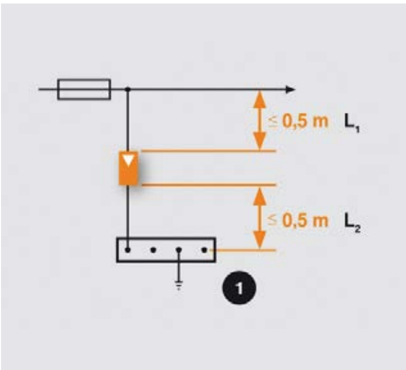
Correct selection of the arrestor

This classification enables arrestors to be matched to different requirements with regard to location, protection level and currentcarrying capacity. The table below provides an overview of the zone transitions. It also shows which OBO surge protection devices can be installed in the energy supply network and their respective function.

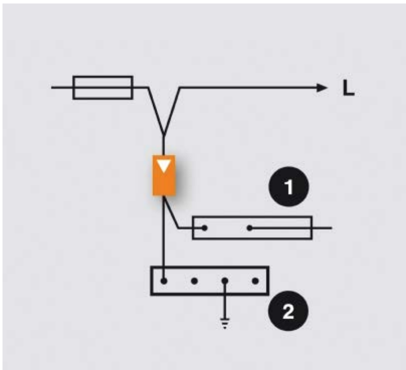
Zone transitions

Zone Transition	Protection device and device type	Product Example	Product Figure
LPZ 0 B to LPZ 1	Protection device for lightning protection equipotential bonding in accordance with DIN VDE 0185-3 for direct or close lightning strikes. • Devices: type 1 (Class I, requirements class B), e.g. MC50-B • Max. protection level according to standard: 4 kV • Installation e.g. in the main distributor/at building entry	MCD Item no.: 5096 87 9	
LPZ 1 to LPZ 2	Protection device for surge protection to DIN VDE 0100-443 for surge voltages arriving through the supply network due to remote strikes or switching operations. • Devices: type 2 (Class II, requirements class C), e.g. V20-C • Max. protection level according to standard: 2.5 kV • Installation e.g. in the power distributor, subdistributor	V20 Item no.: 5094 65 6	
LPZ 2 to LPZ 3	Protection device, designed for surge protection of portable consumers at sockets and power supplies. • Devices: type 3 (Class III, requirements class D), e.g. FineController FC-D • Max. protection level according to standard: 1.5 kV • Installation e.g. on the end consumer	FC-D Item no.: 5092 80 0	

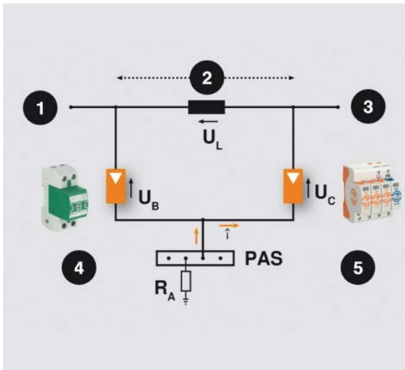
Installation instructions



Length of the feed line,
1 = Equipotential bonding rail or terminal or protective conductor rail



V wiring,
1 = Protective conductor rail,
2 = Main equipotential bonding rail or terminal



1= Power supply,
2 = Cable length,
3 = Consumer,
4 = Response voltage 2 kV, e.g. MC 50-B VDE
5 = Response voltage 1.4 kV, e.g. V20 C

Minimum cross-sections for lightning protection equipotential bonding

The following minimum cross-sections must be observed for lightning protection equipotential bonding: for copper 16 mm2 , for aluminium 25 mm2 and for iron 50 mm2 . At the lightning protection zone, transition from LPZ0 to LPZ1, all metal installations must be integrated into the equipotential bonding system. Active lines must be earthed using suitable arrestors.

Connection length, V-wiring

The connection cable to the protector is crucial for achieving an optimum protection level. In accordance with IEC installation directives, the length of the branch line to the arrestor and the length of the line from the protection device to the equipotential bonding should in each case be less than 0.5 m. If the cables are longer than 0.5 m, then V-wiring must be chosen.

Decoupling

Lightning current and surge arrestors perform a number of functions. These arrestors must be used in coordination. This coordination is guaranteed by the existing line length or special lightning current arrestors (MCD series). For example, in the protection set, type 1 and type 2 arrestors (Classes B and C) can be used adjacent to each other.

Example cable length > 5 m

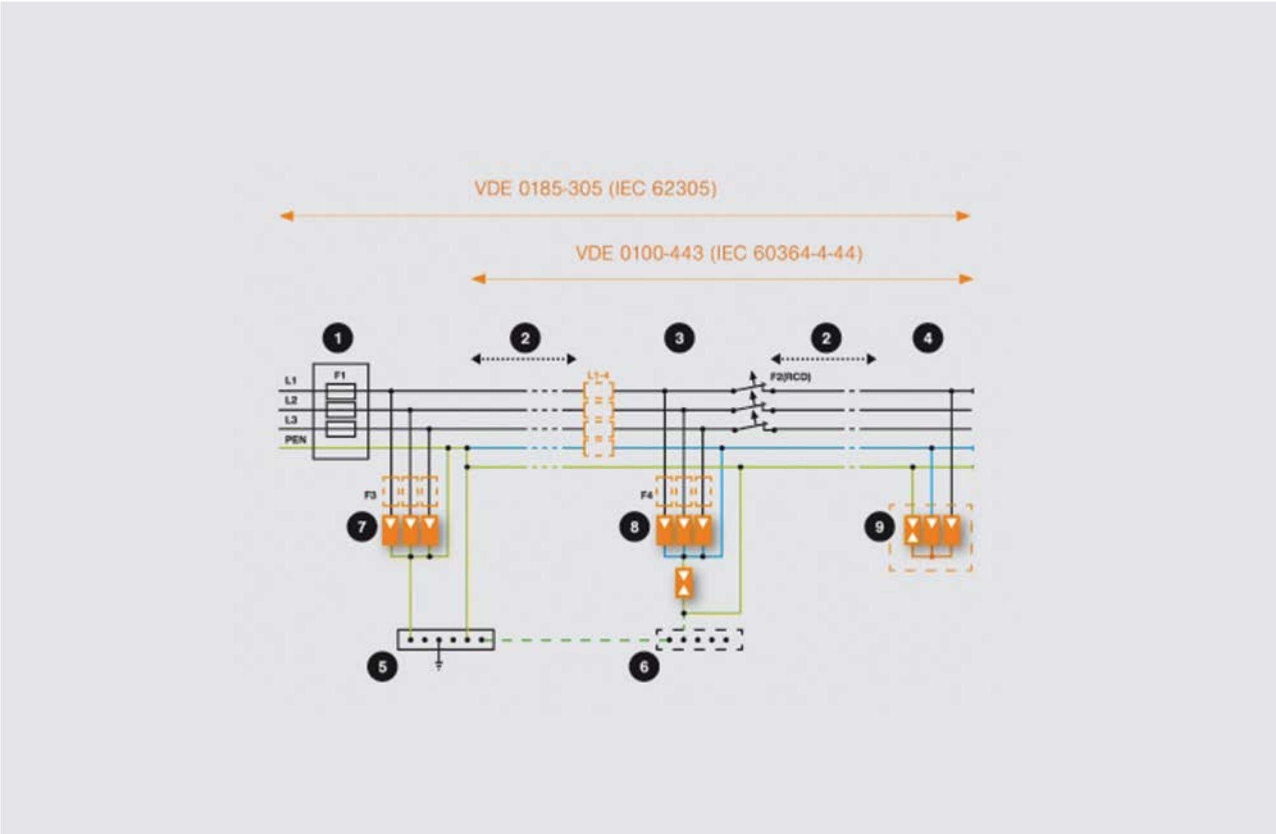
• No additional decoupling required

Example cable length < 5 m

• Use decoupling: MC 50-B VDE + LC 63 + V20-C

• Alternatively: MCD 50-B + V20- C, no additional decoupling required (e.g. protection set)

Cable networks, TN-C network system



1 = Main distributor, 2 = Cable length, 3 = Circuit distributor, e.g. subdistributor, 4 = Fine power protection, 5 = Main EBS, 6 = Local EBS, 7 = Type 1, 8 = type 2, 9 = type 3

In the TN-C-S network system, the electrical unit is supplied through the three external lines (L1, L2, L3) and the combined PEN line. Usage is described in DIN VDE 0100-534 (DIN EN 61643- 11)

Lightning current arrestor Type 1

Type 1 lightning current arrestors are used in the 3-pole circuit (e.g.: 3x MC 50-B). The connection is effected parallel to the external lines, which are connected to the PEN via the arrestor. Following consultation with the local energy provider and in accordance with the VDN Directive, use before the main meter device is also possible.

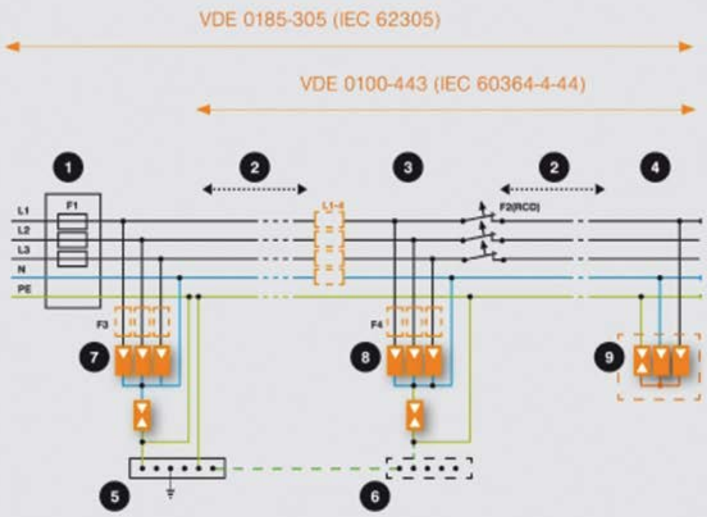
Surge arrestor, type 2

Surge arrestors of type 2 are usually used after the split in the PEN line. If the split is more than 0.5 m away, the network from here onwards is 5-line. The arrestors are used in the 3+1 circuit (e.g. V20-C 3+NPE). With the 3+1 circuit, the external lines (L1, L2, L3) are connected to the neutral cable (N) via arrestors. The neutral cable (N) is connected to the protective earth via a collective spark gap. The arrestors must be used before a residual current protective device (RCD), as it would otherwise interpret the surge current as a residual current and interrupt the power circuit.

Surge arrestor, type 3

Surge arrestors of type 3 are used to protect against surges in the device power circuits. These transverse surges occur primarily between L and N. A Y circuit protects the L and N lines with varistor circuits and makes the connections to the PE line through a collective spark gap (e.g. KNS-D). This protection circuit between L and N prevents surge currents from transverse voltages being conducted towards PE, the RCD thus interprets no residual current. The relevant technical data is contained on the product pages.

Cable networks, TN-S and TT network system



1 = Main distributor, 2 = Cable length, 3 = Circuit distributor, e.g. subdistributor, 4 = Fine power protection, 5 = Main EBS, 6 = Local EBS, 7 = Type 1, 8 = Type 2, 9 = Type 3

In the TN-S network system, the electrical unit is supplied through the three external lines (L1, L2, L3), the neutral cable (N) and the earth cable (PE). In the TT network, however, the electrical unit is supplied through the three external lines (L1, L2, L3), the neutral cable (N) and the earth cable (PE). Usage is described in DIN VDE 0100-534 (DIN EN 61643-11).

Lightning current arrestor type 1

Type 1 lightning current arrestors are used in the 3+1 circuit (e.g. 3x MC 50-B and one MC 125-B NPE). With the 3+1 circuit, the external lines (L1, L2, L3) are connected to the neutral cable (N) via arrestors. The neutral cable (N) is connected to the protective earth via a collective spark gap. Following consultation with the local energy provider and in accordance with the VDN Directive, use before the main meter device is also possible.

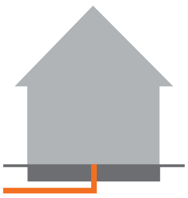
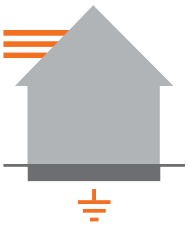
Surge arrestor, type 2

Surge arrestors of type 2 are used in the 3+1 circuit (e.g. V20-C 3+NPE). With the 3+1 circuit, the external lines (L1, L2, L3) are connected to the neutral cable (N) via arrestors. The neutral cable (N) is connected to the protective earth via a collective spark gap. The arrestors must be used before a residual current protective device (RCD), as it would otherwise interpret the surge current as a residual current and interrupt the power circuit.

Surge arrestor, type 3

Surge arrestors of type 3 are used to protect against surges in the device power circuits. These transverse surges occur primarily between L and N. A Y circuit protects the L and N lines with varistor circuits and makes the connection to the PE line through a collective spark gap (e.g. KNS-D). This protection circuit between L and N prevents surge currents from transverse voltages being conducted towards PE, the RCD thus interprets no residual current. The relevant technical data is contained on the product pages.

Installation location 1
Installation in the main distributor box / combined distributor Basic protection / type 1, type 2

Initial situation	Building type	Description	Type	Item no.	Test mark	Product figure
I No external lightning protection system I Earthing cable connection 	Private building	TN-/TT Type 2 + 3 2.5 SU Secondary counter zone	V10 Compact	**5093 38 0**		
		TN-/TT Type 2 + 3 4 SU Secondary count-er zone	V10-C 3+NPE	**5093 39 1**		
	Multiple dwelling/ industry, commerce	TN-/TT Type 2 4 SU Secondary count-er zone	V20 3+NPE	**5095 25 3**	VDE	
			V20 3+NPE+FS with remote signalling	**5095 33 3**	VDE	
I External lightning protection system (according to DIN EN 0185 305) 	Buildings of lightning protection classes III and IV (e.g. housing, of-fices and commercial build-ings)	TN-/TT Type 1 + 2 4 SU Secondary count-er zone	V50 3+NPE	**5093 52 6**		
			V50 3+NPE+FS with remote signalling	**5093 53 3**		
Outdoor connection 	Buildings of lightning protection classes I to IV (e.g. industry)	TN-C Type 1 6 SU Pre-metered or sec-ondary counter zone	MCD 50-B 3	**5096 87 7**		
		TN-S Type 1 8 SU Pre-metered or sec-ondary counter zone	MCD 50-B 3+1	**5096 87 9**		

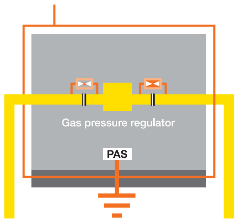
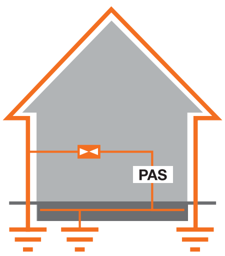
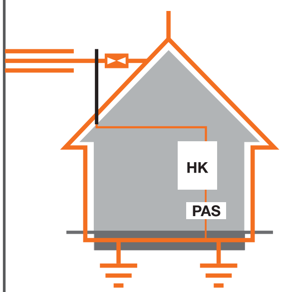
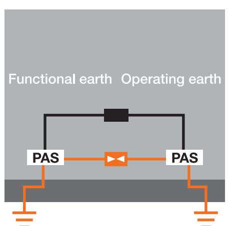
Installation location 2
Installation in the sub-distributor Medium protection / type 2 Only required if distance ≥ 10m

Description	Type	Item no.	Product figure
TN/TT Type 2 + 3 2.5 SU	V10 Compact	**5093380**	
TN/TT Type 2 4 SU	V10 Compact-AS, with acoustic remote signalling	**5093391**	
TN/TT Type 2 4 SU	V20 3+NPE	**5095253**	
	V20 3+NPE+FS with remote signalling	**5095333**	
TN/TT Type 2 4 SU	V20 3+NPE	**5095253**	
	V20 3+NPE+FS with remote signalling	**5095333**	
TN/TT Type 2 4 SU	V20 3+NPE	**5095253**	
	V20 3+NPE+FS with remote signalling	**5095333**	

Installation location 2
Installation before the terminal
Fine protection / type 3

Description	Type	Item no.	Test mark	Product figure
Plug-in	FC-D	**5092 80 0**	VDE	
	FC-TV-D	**5092 80 8**	VDE	
	FS-SAT-D	**5092 81 6**	VDE	
	FC-TAE-D	**5092 82 4**	VDE	
	FC-ISDN-D	**5092 81 2**	VDE	
	FC-RJ-D	**5092 82 8**	VDE	
	CNS-3-D-D	**5092 70 1**		
Fixed installation	ÜSM-A	**5092 45 1**		
	ÜSM-A-2	**5092 46 0**		
	ÜSS 45-oRW	**6117 47 3**		
Series installation in distributor	V10 Compact L1/L2/L3/N	**5093 38 0**		
	VF230-AC/DC	**5097 65 0**		
	VF230-ACFS with remote signalling	**5097 85 8**		

Overview

Application	Description	Type	Item no.	Product figure
Isolating spark gaps for insulating flange 	e.g. in a gas pressure control station Particularly for Ex areas For bridging of insulating flanges or insulating threaded joints which can carry lightning currents	Type 480	**5240034** **5240077** **5240069**	
Isolating spark gaps for potential isolation 	Several earthing systems in one building, e.g. foundation earther and deep earther Connection via spark gap N electrochemical corrosion Entire earther surface is effective in the event of a direct lightning strike	Type 481	**5240085**	
Open-wire connection 	Roof stand spark gap for insulation Largest possible distance between the roof stand of a low voltage free cable and a lightning protection system Distance < 0.5 m: encapsulated spark gap in agreement with the power supply company	Type 482	**5240050**	
Coupling of earthing systems 	Several earthing systems on one building If the operation of special electronic equipment requires a separate earthing system, then this functional earth must be connected to the operating earth Prevention of dangerously high voltage differences An additional throttle is fitted to keep high-frequency voltages away from the functional earthing	Type FS-V20	**5099803**	

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