



1973

SINCE

INGESCO

■ LIGHTNING SOLUTIONS

P R O D U C T C A T A L O G U E



Since 1973, INGESCO has been a specialist in solutions for the prevention and protection against lightning.

Reference

We are the leading company in the design, manufacture and control systems for the prevention and protection against lightning.

International vocation

We export to over 60 countries worldwide. Our comprehensive and analytical view has made us one of the most advanced companies in the sector worldwide.

Comprehensive and transversal

We offer a comprehensive and transversal service. We cover all stages, from research and development to installation and certification.

Tailored Solutions

We offer a personalized service tailored to all needs, with prompt answers to your queries. We assist in the search and implementation of safe and effective solutions.

Training

We share the news and current events of lightning protection and prevention systems in a multidisciplinary field. Because knowledge improves your safety.

Research and innovation

Our engineering team works daily on new materials and devices for more efficient integrated solutions. Our challenge is to improve your lightning safety.

Design and manufacture

We manufacture lightning rods and capture meshes, surge protectors and preventive protection products. We test all our products in the LABELLEC, high voltage laboratory accredited by ENAC, as well as actual test conditions in the natural environment. Our offer fits your needs to guarantee safety.

Certification and control

Our inspection body is accredited by ENAC and certifies all phases of the process: design and construction management, installation and periodic inspection of facilities. We offer an impartial and objective assessment of any protection system.



1973

SINCE **INGESCO**



■ **LIGHTNING SOLUTIONS**

TABLE OF CONTENTS



**EXTERNAL
LIGHTNING
PROTECTION**

07-46



**GROUNDING
SYSTEMS**

47-64



**CONTROL
SYSTEMS**

65-72



SURGE PROTECTION

73-86



**THUNDERSTORM
WARNING
SYSTEMS**

85-88



INDEX

95-104



EXTERNAL LIGHTNING PROTECTION

INTRODUCTION	07
INGESCO® PDC ESE LIGHTNING RODS	13
INGESCO® PDC.E ESE LIGHTNING RODS	17
LIGHTNING RODS	21
CAPTURE SYSTEM ACCESSORIES	24
CONDUCTORS	33
FASTENING AND CONNECTING ACCESSORIES	34
DOWN-CONDUCTOR PROTECTION	43
SPARK GAPS	44

INTRODUCTION: PDC (ESE) LIGHTNING RODS

standards

Implementing rules for an effective person and property protection system:

- **UNE 21186:2011:** Lightning protection - Lightning rods with priming device.
- **NF C 17-102:2011:** Early streamer emission lightning protection systems.
- **NP 4426:2013:** Lightning protection - systems with non-radioactive ionization device.

In addition to these, there may be legislation or rules of each country that must be taken into account.

risk index calculation

Annex A (risk analysis) of the UNE 21186: 2011 determines the need or not to install external lightning protection and the level of protection applied to reduce the risk of damage caused by lightning.

INGESCO has an online tool which allows the calculation of risk and the implementation of protective measures quickly and easily. Introducing the characteristics of the structure to be protected, geographical location, activity, etc ..., provides protection levels to be applied, and generates a report of the information provided.

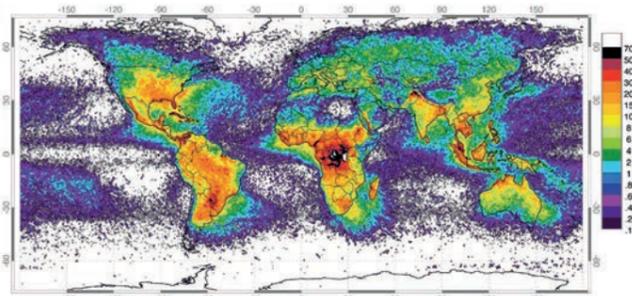


Fig. 1 – Lightning distribution map.



Fig. 2 – <https://calculus.ingesco.com/>

protection radius calculation

Lightning rods with an early steamer emission priming device (ESE), have a protection radius depending on the necessary protective level to be obtained by performing tests in accordance with UNE 21186: 2011 or NF C 17102: 2011, and must be certified by an accredited high voltage laboratory.

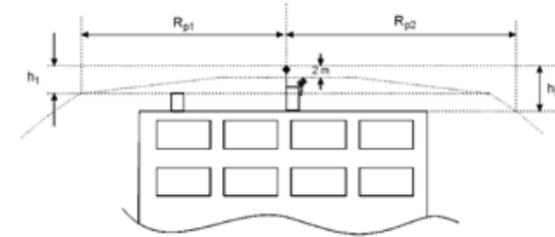
Model	PDC 3.1	PDC 3.3	PDC 4.3	PDC 5.3	PDC 6.3	PDC 6.4
Ref.	101000	101001	101003	101005	101008	101009
Δt	15μs	25μs	34μs	43μs	54μs	60μs

Tabla 1 – Early streamer ΔT(μs) INGESCO ESE lightning rods.

UNE 21186: 2011 (paragraph C.2.2) indicates that a ESE lightning rod must obtain an early steamer emission ΔT > 10 μs minimum.

Also, the maximum permissible value is 60μs although tests were obtained with superior results.

The area to be protected by a ESE arrester is delimited by a surface of revolution that is defined by the radius of the corresponding protection to different heights (h) considered, whose axis is the same ESE arrester.



Protection Level	Notional sphere radius (r)
I	20 m
II	30 m
III	45 m
IV	60 m

Table 2 – The rolling sphere radius r based on the level of protection.

a) If $2m \leq h \leq 5m$: $R_p = \frac{h \cdot R_p(5)}{5}$

b) If $h \geq 5m$: $R_p = \sqrt{[(2 \cdot r \cdot h) - (h^2)] + [\Delta \cdot (2 \cdot r + \Delta)]}$

Whereas:

- Rp:** Resulting protection radius.
- r:** The radius of the rolling sphere. Predetermined standard value according to the applicable security level (see Table 2).
- h:** The height from the tip of the ESE to the point where we want to calculate the radius of protection.
- Δ:** Advance arrester priming considered (ΔT) in meters.

example radius protection calculation Rp (model INGESCO PDC 3.1):

To calculate the different radii of protection of a ESE lightning rod, we must know the variables involved in the formulation:

- INGESCO PDC 3.1 model has ΔT=15 μs and thus Δ=15 m.
- Apply level II protection, the notional sphere radius corresponds to r = 30m.
- Consider the height h = 20m.

Each R_{p_n} radii are calculated, for each reference point, using the formula:

$$R_{p_n} = \sqrt{[(2 \cdot r \cdot h_n) - (h_n^2)] + [\Delta \cdot (2 \cdot r + \Delta)]}$$

For the given model the radii are shown in table 3:

h (m)	Radius (m) Level II
2	15
4	30
6	38
10	40
20	43

Table 3 protection radii for an ESE 3.1

The total volume of protection can be represented graphically (See Fig.3).

Once each radius is calculated R_p , verify that the building remains within the lightning rod protection radius (see Fig.4).

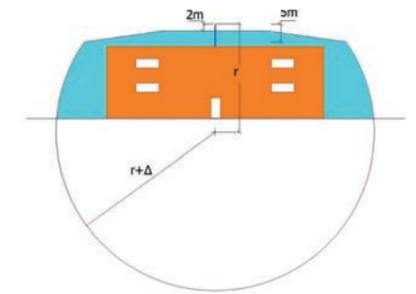


Fig. 3 – Volume protected with ESE lightning rod.



Fig. 4 – ESE protection volume.

INTRODUCTION: CONVENTIONAL LIGHTNING RODS - CAPTURE MESHES

standards

In order to design an effective lightning protection system with Franklin rods or capturing meshes, the following rules shall apply:

- IEC 62305:2010 Lightning protection (Parts 1, 2, 3 y 4).
- UNE - EN 62305:2011 Protection against lightning (Parts 1, 2, 3 y 4).
- NFPA 780:2020 Standard for the installation of lightning protection systems.

In addition to these rules, legislation in each country must be taken into account.

risk calculation

INGESCO has an online tool that, allows the calculation of risk and the implementation of protective measures according to IEC 62305 (Part 2), quickly and easily (see Fig.2).

calculation methods of the protection zone

Accepted methods for determining the area of passive protection systems according to IEC 62305 (Part 3) are:

Protective angle method

It is best suited method for buildings with simple shapes, although it is limited to a maximum height to the level of protection applied (Fig.5).

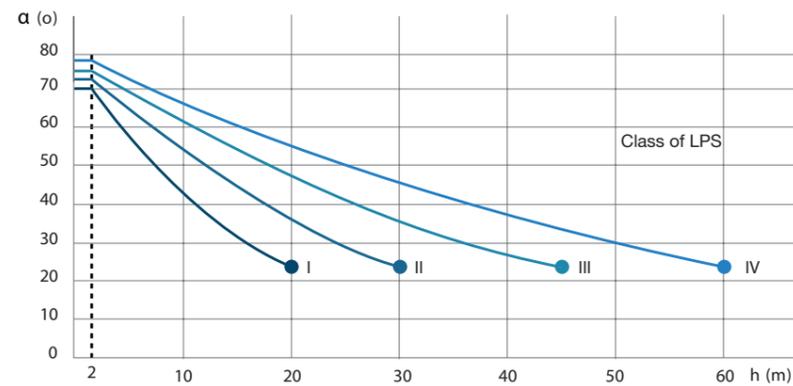


Fig. 5 – Angles corresponding to protection classes of IEC 62305-3 LPS.

The volume of protection resulting from the application of the protection angle method in a termination rod is shown in Fig.6.

Once the different angles of protection of the termination rods that make up the system have been calculated, it is verified that the building is fully protected. (Fig 7).

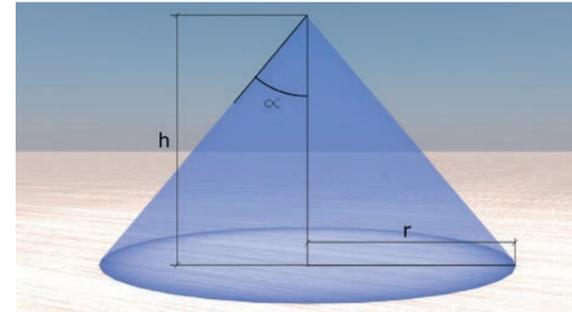


Fig. 6 – Protected volume by a vertical point. IEC 62305-3.

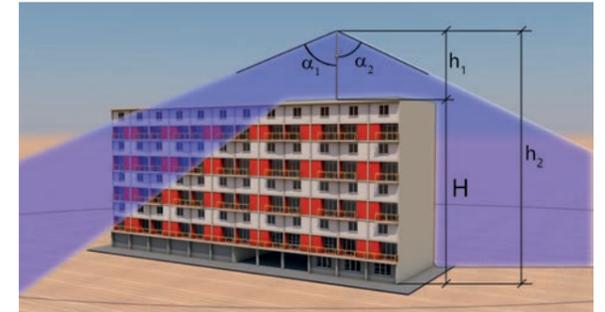


Fig. 7 – Protection volume angles α_1 and α_2 depending on heights h_1 and h_2 .

Rolling sphere method and the mesh method

When a structure has a height higher than indicated in Figure 5, the protection angle method is not applicable. For these cases, IEC 62305-3 indicates to use: **rolling sphere method** (valid for all types of buildings), or **mesh method** (indicated when flat surfaces are protected) (see Fig.9).

Protection method		
Class of LPS	Radius of rolling sphere r (m)	Size of the mesh W_m (m)
I	20	5x5
II	30	10x10
III	45	15x15
IV	60	20x20

Table 4 – Maximum values of rolling sphere and mesh size for each class of LPS.

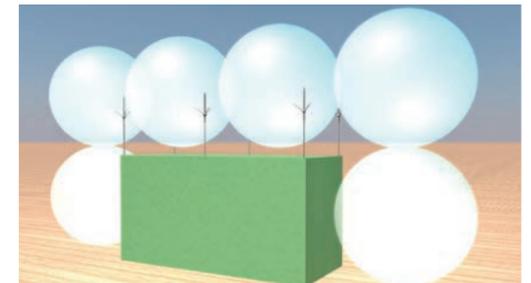


Fig. 8 – Protected volume by the rolling sphere method.

Applying the rolling sphere method. The location of the capture system (point or mesh) is adequate if any point of the protected structure comes into contact with a rolling sphere of radius r (see Table 4).

Taller structures remaining above the Faraday cage should be protected with lightning rods (see Fig. 10).

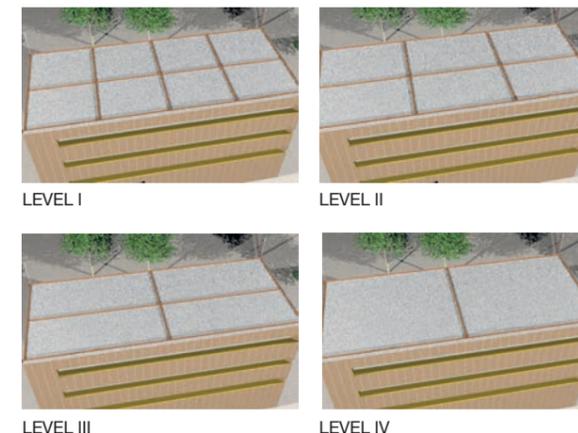


Fig. 9 – Protection grids based on the levels of protection.

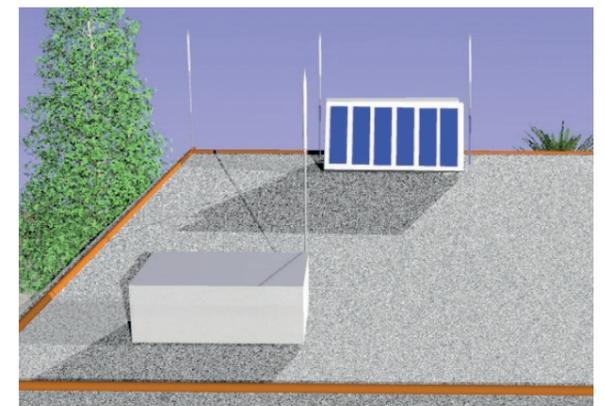


Fig. 10 – Protection of protruding structures with a capture mesh system by lightning rods.

DOWN CONDUCTORS

▶ ESE down conductors

The down conductors are intended to conduct lightning current from the collection devices to the grounding.

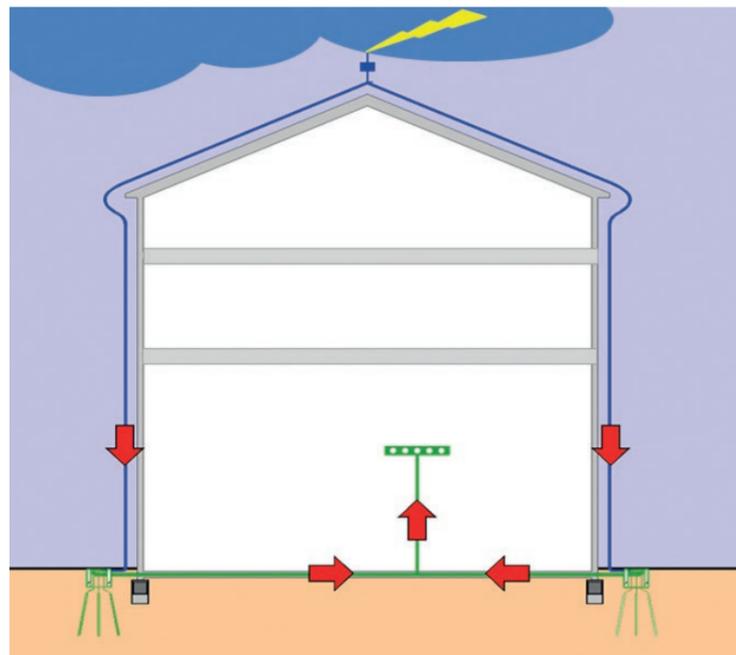


Fig. 11 – Down conductors of LPS by ESE.

The lightning rod is connected to ground with at least two down conductors located on opposite facades whenever possible (Fig.11).

The down conductors must be installed outside the building, avoiding the proximity of electrical cables and gas. Their path must be as straight as possible, taking the shortest route to earth and avoiding any sharp bend or lift. When several ESEs are installed on the same building they can share down conductors.

Due to the nature of the lightning strike, down conductors should be of the materials and dimensions specified in IEC 62561-2. The materials indicated in table 5 are the most recommended.

Material	Format	Minimum section mm ²
Copper	Cable	50 (Ø1,7 mm per cable)
Copper	Round	50 (Ø8 mm)
Copper	Tape	50 (Minimum thickness 2 mm)

Table 5 – Material Table IEC 62561-2.

The down conductor ground shall be properly secured and tightened, using three clips per metre as a reference. Protect the bottom of the down conductor by a protective tube of at least 2 m.

It is recommended to install a lightning strike counter above the protective tube to facilitate the maintenance of the system.

▶ Conventional LPS down conductors

In order to reduce the likelihood of damage due to lightning currents circulating in the LPS, down conductors must be arranged so that from the point of impact grounding is:

Protection Level	Distance between conductors
I	10 m
II	10 m
III	15 m
IV	20 m

Table 6 – Distance between down conductors IEC 62305-3.

It is also advisable to place the down conductors on opposite facades of the building whenever constructively possible.

The dimensions and materials of the ground down conductors, must meet the requirements contained in IEC 62561-2 (Table 5).

The conductors which form the mesh must be properly set, taking as reference 1 conductor clamp per metre. Protect the bottom of the down conductor with a protective tube of at least 2 m.

Install section elements in each of the down conductors to allow for measurement of the ground (see Fig. 12).

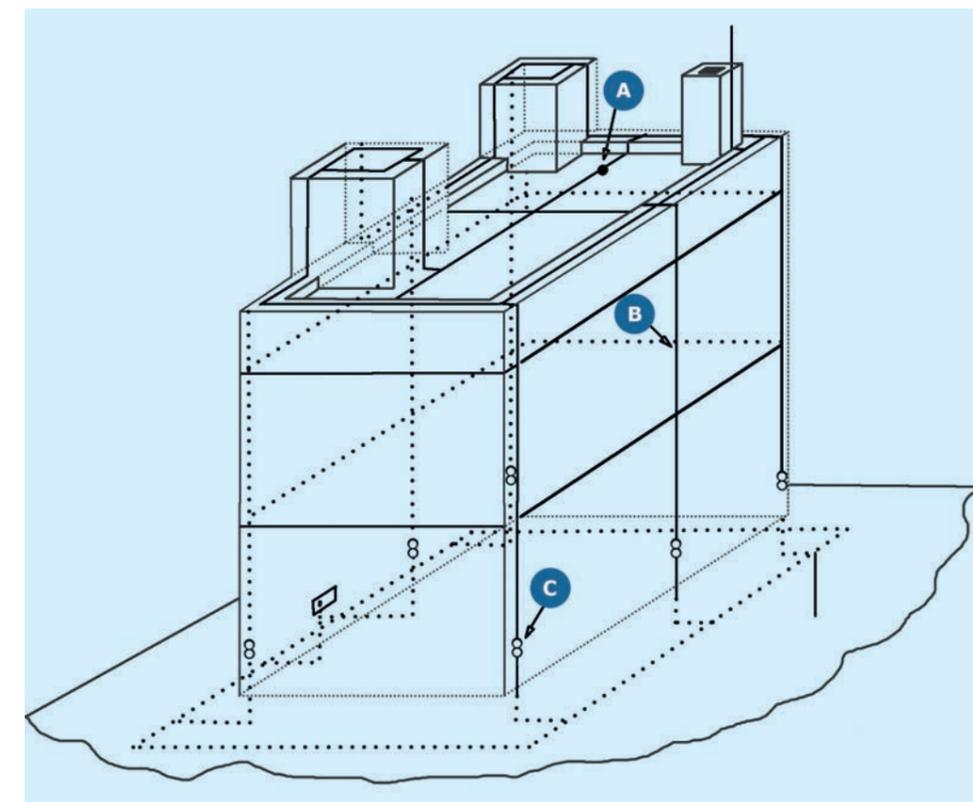


Fig. 12 – LPS passive scheme:
A: Horizontal conductor cover
B: Grounded conductor
C: Down conductor isolator

INGESCO® PDC (ESE) LIGHTNING RODS



Non-expendable
5 year warranty
Natural field trials
UL test
Max. current
200kA
No maintenance
Stainless steel 316 L
UNE 21186:2011
NFC 17-102:2011

Model PDC 6.4

► technical specifications

Lightning rod with **non-electronic** streaming.

Suitable for external lightning protection of all types of structures and open areas.

- **Level of protection rated as very high.**
- **100% effective in discharge.**
- **Electrical continuity** guaranteed
- **Retains all its initial properties after each discharge so does not require specific maintenance.**
- No batteries or external power supply. No electronics. **Not fungible.**
- **Operation guaranteed** in any atmospheric condition.
- Made of **AISI 316L** stainless steel and polyamide (PA66).
- **Authentication system** using QR code.

► standards | tests | specifications

INGESCO® PDC, meets the requirements in the following standards:

- CTE SUA 8
- UNE 21.186:2011
- NFC 17-102:2011
- IEC 62305
- IEC 62561-1
- NP 4426:2013

Evaluation tests of ESE (Annex C UNE 21186: 2011) in the LABELEEC High Voltage Laboratory.

Certificate of current supported IEC 62561/1, issued by the LABELEEC High Voltage Laboratory.

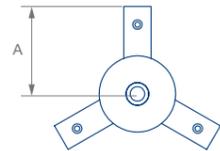
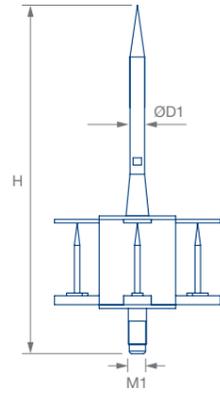
Certificate product issued by the international certification organization Bureau Veritas.

Tested by UL test report number: 4789563988.1.

► coverage radius by protection level

Model	PDC 3.1	PDC 3.3	PDC 4.3	PDC 5.3	PDC 6.3	PDC 6.4
Ref.	101000	101001	101003	101005	101008	101009
Δt	15 μ s	25 μ s	34 μ s	43 μ s	54 μ s	60 μ s
LEVEL I	35 m	45 m	54 m	63 m	74 m	80 m
LEVEL II	43 m	54 m	63 m	72 m	83 m	89 m
LEVEL III	54 m	65 m	74 m	84 m	95 m	102 m
LEVEL IV	63 m	75 m	85 m	95 m	106 m	113 m

Protection radius calculated according to UNE 21.186: 2011, NFC 17.102: 2011 and NP 4426: 2013. (Calculated as a difference in height between the tip of the lightning rods and the considered horizontal plane 20 m.).



INGESCO® PDC 3.1 LIGHTNING ROD

Coverage radius (m) INGESCO® PDC 3.1 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101000	SST	380	16	M20	95	2.280

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
-------	---------	----------	-----------	----------

2	13	15	18	20	$\Delta t : 15\mu s$ r: Radius of the rolling sphere L-I : r = 20 m L-II : r = 30 m L-III : r = 45 m L-IV : r = 60 m
4	25	30	36	41	
6	32	38	46	52	
10	34	40	49	56	
20	35	43	54	63	

INGESCO® PDC 3.3 LIGHTNING ROD

Coverage radius (m) INGESCO® PDC 3.3 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101001	SST	554	16	M20	156	3.060

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
-------	---------	----------	-----------	----------

2	17	20	23	26	$\Delta t : 25\mu s$ r: Radius of the rolling sphere L-I : r = 20 m L-II : r = 30 m L-III : r = 45 m L-IV : r = 60 m
4	34	39	46	52	
6	43	49	58	66	
10	44	51	61	69	
20	45	54	65	75	

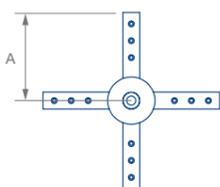
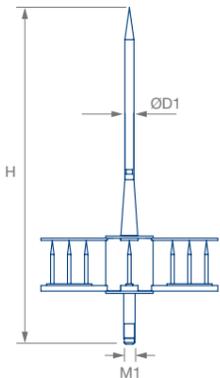
INGESCO® PDC 4.3 LIGHTNING ROD

Coverage radius (m) INGESCO® PDC 4.3 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101003	SST	554	16	M20	156	3.250

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
-------	---------	----------	-----------	----------

2	21	24	27	30	$\Delta t : 34\mu s$ r: Radius of the rolling sphere L-I : r = 20 m L-II : r = 30 m L-III : r = 45 m L-IV : r = 60 m
4	41	47	54	61	
6	52	59	69	77	
10	53	61	71	80	
20	54	63	74	85	



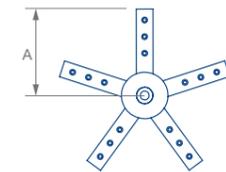
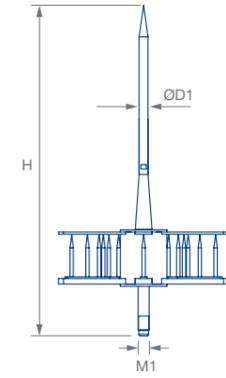
INGESCO® PDC 5.3 LIGHTNING ROD

Coverage radius (m) INGESCO® PDC 5.3 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101005	SST	554	16	M20	156	3.460

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
-------	---------	----------	-----------	----------

2	24	27	31	35	$\Delta t : 43\mu s$ r: Radius of the rolling sphere L-I : r = 20 m L-II : r = 30 m L-III : r = 45 m L-IV : r = 60 m
4	49	55	63	70	
6	61	69	79	88	
10	62	70	81	90	
20	63	72	84	95	



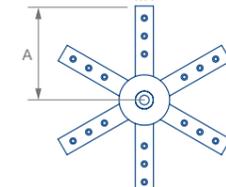
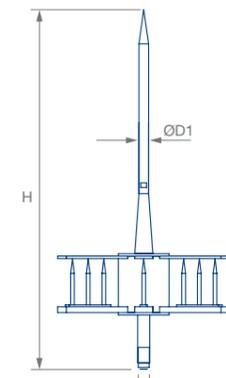
INGESCO® PDC 6.3 LIGHTNING ROD

Coverage radius (m) INGESCO® PDC 6.3 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101008	SST	554	16	M20	156	3.660

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
-------	---------	----------	-----------	----------

2	29	32	36	40	$\Delta t : 54\mu s$ r: Radius of the rolling sphere L-I : r = 20 m L-II : r = 30 m L-III : r = 45 m L-IV : r = 60 m
4	58	64	72	80	
6	73	80	91	100	
10	73	82	93	102	
20	74	83	95	106	



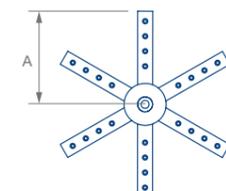
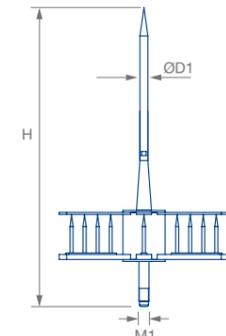
INGESCO® PDC 6.4 LIGHTNING ROD

Coverage radius (m) INGESCO® PDC 6.4 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101009	SST	554	16	M20	186	4.030

h (m)	NIVEL I	NIVEL II	NIVEL III	NIVEL IV
-------	---------	----------	-----------	----------

2	31	35	39	43	$\Delta t : 60\mu s$ r: Radius of the rolling sphere L-I : r = 20 m L-II : r = 30 m L-III : r = 45 m L-IV : r = 60 m
4	63	69	78	85	
6	79	87	97	107	
10	79	88	99	109	
20	80	89	102	113	



INGESCO® PDC.E LIGHTNING ROD



Model PDC.E 60

5 year warranty
Natural field trials
UL Test
Testable
Stainless steel
316 L
UNE 21186:2011
NFC 17-102:2011

► technical specifications

Lightning rod with **ELECTRONIC** streaming.

Suitable for external lightning protection of all types of structures and open areas.

- **Level of protection rated as very high.**
- **100% effective in discharge. Maximum durability.**
- Requires no external power source.
- **Guaranteed operation** after lightning strike and in any weather condition.
- Made of **AISI 316L** stainless steel.
- **Authentication system** using QR code.
- **Laser** recording of the information in the head.

► standards | tests | specifications

INGESCO® PDC.E, meets the requirements in the following standards:

- CTE SUA 8
- IEC 62305
- NP 4426:2013
- UNE 21186:2011
- IEC 62561-1
- NFC 17-102:2011
- IEC 62561-3

Evaluation tests of ESE (Annex C UNE 21186: 2011) in the LABELELEC High Voltage Laboratory.

Mechanical test (traction and flexing until breakage).

Certificate of current supported IEC 62561-1, issued by the LABELELEC High Voltage Laboratory.

Certificate product issued by the international certification organization Bureau Veritas.

Tested by UL test report number: 4789563988.1.

► coverage radius by protection level

Model	PDC.E 15	PDC.E 30	PDC.E 45	PDC.E 60
Ref.	102004	102005	102006	102007
Δt	15μs	30μs	45μs	60μs
LEVEL I	35 m	50 m	65 m	80 m
LEVEL II	43 m	59 m	74 m	89 m
LEVEL III	54 m	70 m	86 m	102 m
LEVEL IV	63 m	81 m	97 m	113 m

Protection radius calculated according to UNE 21186: 2011, NFC 17-102: 2011 and NP 4426: 2013. (Calculated as a difference in height between the tip of the lightning rods and the considered horizontal plane 20 m.).

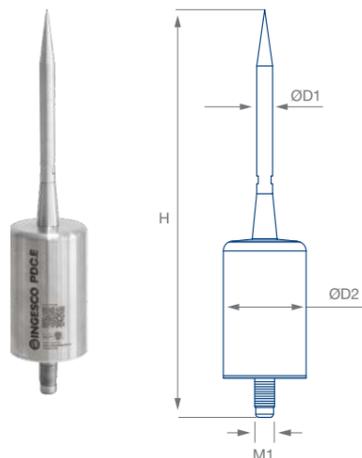
INGESCO® PDC.E 15 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 15 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
102004	SST	412	16	83	M20	3775

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	13	15	18	20
4	25	30	36	41
6	32	38	46	52
10	34	40	49	56
20	35	43	54	63

Δt : 15μs
 r: Radius of the rolling sphere
 L-I : r = 20 m
 L-II : r = 30 m
 L-III : r = 45 m
 L-IV : r = 60 m



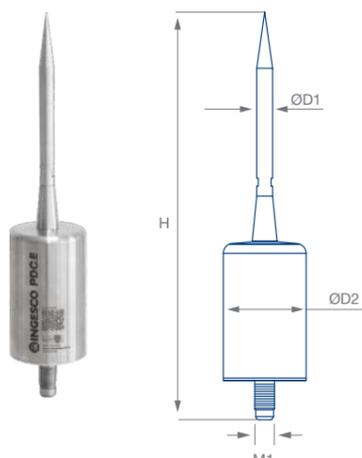
INGESCO® PDC.E 30 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 30 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
102005	SST	412	16	83	M20	3770

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	19	22	25	28
4	38	44	51	57
6	48	55	64	72
10	49	57	66	75
20	50	59	70	81

Δt : 30μs
 r: Radius of the rolling sphere
 L-I : r = 20 m
 L-II : r = 30 m
 L-III : r = 45 m
 L-IV : r = 60 m



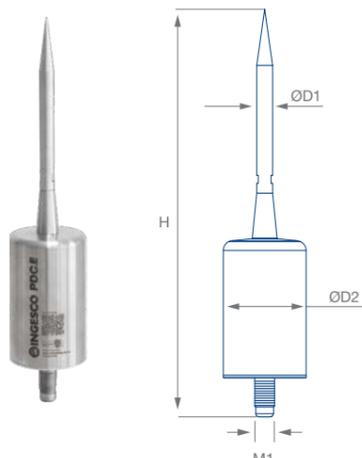
INGESCO® PDC.E 45 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 45 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
102006	SST	412	16	83	M20	3765

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	25	28	32	36
4	51	57	64	72
6	63	71	81	90
10	64	72	83	92
20	65	74	86	97

Δt : 45μs
 r: Radius of the rolling sphere
 L-I : r = 20 m
 L-II : r = 30 m
 L-III : r = 45 m
 L-IV : r = 60 m



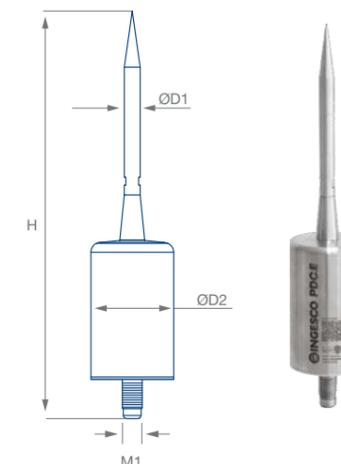
INGESCO® PDC.E 60 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 60 according to protection level and height (UNE 21186:2011, NFC 17-102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
102007	SST	412	16	83	M20	3760

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	31	35	39	43
4	63	69	78	85
6	79	87	97	107
10	79	88	99	109
20	80	89	102	113

Δt : 60μs
 r: Radius of the rolling sphere
 L-I : r = 20 m
 L-II : r = 30 m
 L-III : r = 45 m
 L-IV : r = 60 m



INGESCO ADVANCED ESE TESTER

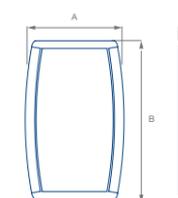
Ref.	Material	A (mm)	B (mm)	C (mm)	Weight (g)
102051	ABS	89	147	25	320

The INGESCO Advanced ESE Tester is a portable device for testing electronic lightning rods via ohmic contact.

The INGESCO Advanced ESE Tester is specifically designed for evaluating the INGESCO electronic ESE arrester. ESE future electronic models INGESCO and lightning rods from other manufacturers may not be compatible with the technology of the INGESCO Advanced ESE Tester.

► technical specifications

- Temperature range: -10°C to 40°C
- Power consumption: 30mA
- Power: Battery 9V IEC6LR61/IEC6F22/USA PP3
- Test terminals 1m long and 9V battery



LIGHTNING RODS



Termination rods suitable for external lightning protection. It can be used as single sensor element or part of protection, complementing the protection conductive mesh (Faraday cages).

Made of AISI 316L stainless steel or copper.

Tested by UL test report number: 4789563988.1.

Please consult for other materials or dimensions.

Simple rods

Multiple rods

IEC 62305-3

IEC 62561-1

UL Test

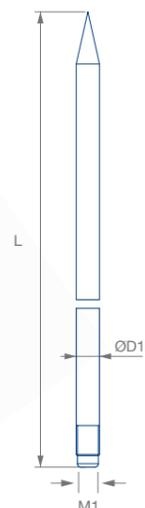
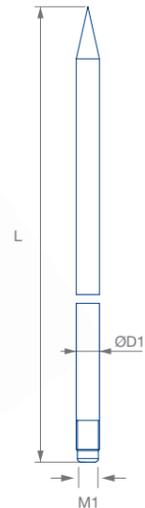
SIMPLE RODS

COPPER simple lightning rods

Model	Ref.	Material	L (mm)	D1 (mm)	M1 (mm)	Weight (g)
CU300-16	110081	Cu	300	16	M16	440
CU500-16	110083	Cu	500	16	M16	800
CU600-16	110028	Cu	600	16	M16	980
CU1000-16	110035	Cu	1000	16	M16	1700
CU1500-16	110224	Cu	1500	16	M16	2600
CU2000-16	110034	Cu	2000	16	M16	3500
CU300-20	110089	Cu	300	20	M20	740
CU500-20	110091	Cu	500	20	M20	1310
CU1000-20	110093	Cu	1000	20	M20	2710
CU2000-20	110095	Cu	2000	20	M20	5530

STAINLESS STEEL simple lightning rods

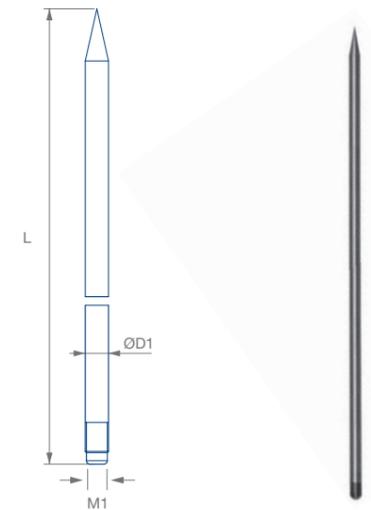
Model	Ref.	Material	L (mm)	D1 (mm)	M1 (mm)	Weight (g)
IN300-16	110080	SST	300	16	M16	420
IN500-16	110082	SST	500	16	M16	740
IN600-16	110032	SST	600	16	M16	900
IN1000-16	110084	SST	1000	16	M16	1530
IN1500-16	110215	SST	1500	16	M16	2370
IN2000-16	110086	SST	2000	16	M16	3110
IN300-20	110088	SST	300	20	M20	690
IN500-20	110090	SST	500	20	M20	1180
IN1000-20	110092	SST	1000	20	M20	2420
IN2000-20	110031	SST	2000	20	M20	4880



SIMPLE RODS

ALUMINIUM simple lightning rods

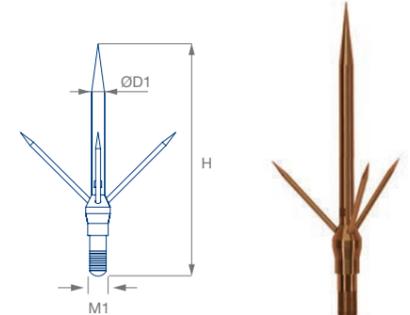
Model	Ref.	Mat.	L (mm)	D1 (mm)	M1 (mm)	Peso (g)
AL300-16	110245	Al	300	16	M16	170
AL500-16	110291	Al	500	16	M16	280
AL1000-16	110037	Al	1000	16	M16	560
AL1500-16	110292	Al	1500	16	M16	850
AL2000-16	110293	Al	2000	16	M16	1100
AL3000-16	110284	Al	3000	16	M16	1600



MULTIPLE RODS

Multiple lightning rod

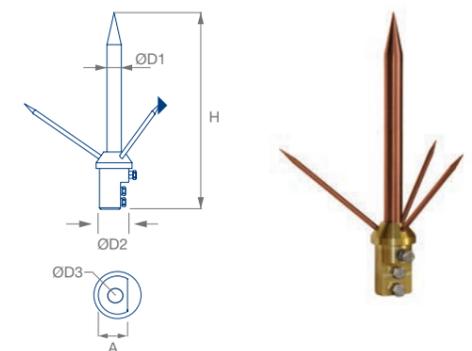
Model	Ref.	Mat.	H (mm)	D1 (mm)	M1 (mm)	Weight (g)
Multiple CU	110002	Cu	384	20	M20	1310
Multiple IN	110001	SST	384	20	M20	1170

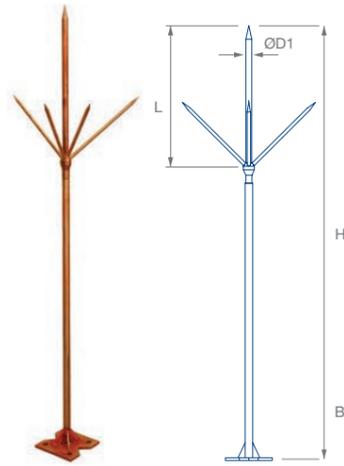


MULTIPLE RODS WITH MAST ADAPTOR

Multiple lightning rods with ROUND - FLAT conductor mast adaptor

Model	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	Weight (g)
Multiple CU 1'1/4"	110226	Cu	360	20	35,5	12	24	1200
Multiple CU 1'1/2"	110227	Cu	360	20	41	12	32	1350
Multiple IN 1'1/4"	110228	SST	360	20	35,5	12	24	1100
Multiple IN 1'1/2"	110229	SST	360	20	41	12	32	1300



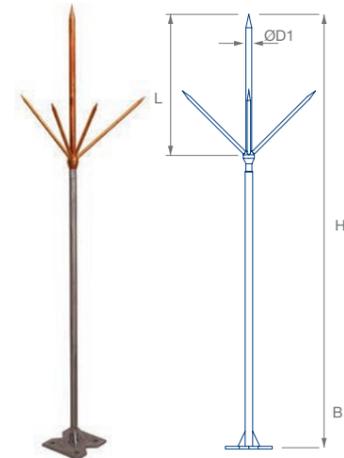


SPECIAL LIGHTNING RODS

For application in electrical substations and others.

► COPPER lightning rods with COPPER-PLATED STEEL horizontal support

Model	Ref.	Mat.	H (mm)	L (mm)	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	B (mm)	Weight (g)
SE 1000 CU	110003	CCS	1600	480	20	18	160	170	113	5500
SE 2000 CU	110099	CCS	2584	480	20	18	160	170	113	8600



► COPPER lightning rods with GALVANIZED STEEL horizontal support

Model	Ref.	Mat.	H (mm)	L (mm)	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	B (mm)	Weight (g)
SE 1000 CU/AZ	110096	Cu/GST	1600	480	20	18	160	170	113	5600
SE 2000 CU/AZ	110100	Cu/GST	2600	480	20	18	160	170	113	8600



CAPTURE SYSTEM ACCESSORIES

Adaptor parts

Masts

Fastening

NF C 17-102

IEC 62305

IEC 62561

Accessories for installing the capture system. Adaptor parts, masts and anchoring systems.

Adjustment parts for lightning rods made by INGESCO (simple tips, multiple and ESE) of Ø16mm or 20mm. It facilitates the connection of the lightning rod to the conductive network.

Masts for fastening and support for termination rods to structures by anchors or baseplates.

Fastening systems for masts 1 ¼", 1 ½" and 2" in diameter. Different solutions according to the construction needs.

Made of resistant materials such as brass, copper, galvanized iron and stainless steel.

Please consult for custom manufacturing and other construction.

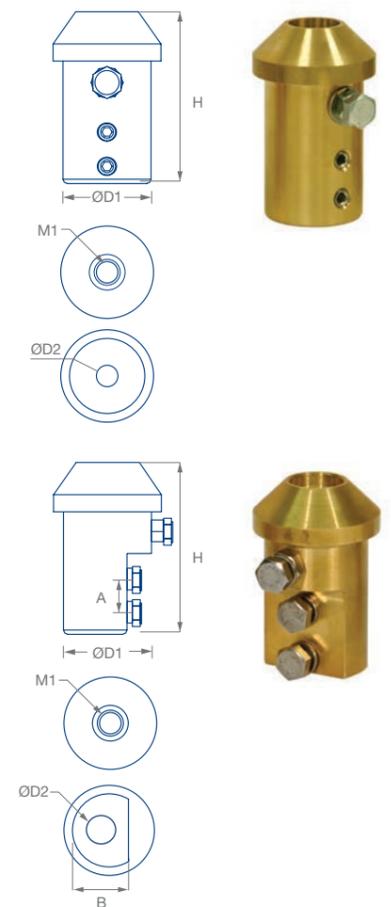
LIGHTNING ROD ADAPTER PIECES

► Adapter parts for lightning rod to ROUND conductor mast

Model	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
1" Ø16 RD	111033	Cu/Zn	80	26	12	M16	316
1 1/4" Ø16 RD IN	111062	SST	80	35,5	12	M16	623
1 1/4" Ø16 RD	111032	Cu/Zn	80	35,5	12	M16	664
1 1/2" Ø16 RD IN	111031	SST	80	41	12	M16	770
1 1/2" Ø16 RD	111022	Cu/Zn	80	41	12	M16	815
2" Ø16 RD	111025	Cu/Zn	80	53	12	M16	1341
1" Ø20 RD	111019	Cu/Zn	80	26	12	M20	286
1 1/4" Ø20 RD	111011	Cu/Zn	80	35,5	12	M20	628
1 1/4" Ø20 RD IN	111073	SST	80	35,5	12	M20	600
1 1/2" Ø20 RD IN	111052	SST	80	41	12	M20	736
1 1/2" Ø20 RD	111012	Cu/Zn	80	41	12	M20	777
2" Ø20 RD	111013	Cu/Zn	80	53	12	M20	1306

► Adapter parts for lightning rod to ROUND and FLAT conductor mast

Model	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	A (mm)	B (mm)	Weight (g)
1 1/4" Ø16 RD-PL	111053	Cu/Zn	80	35,5	12	M16	19	24	645
1 1/2" Ø16 RD-PL	111054	Cu/Zn	80	41	12	M16	19	32	765
2" Ø16 RD-PL	111055	Cu/Zn	80	53	12	M16	19	45	1295
1 1/4" Ø20 RD-PL	111051	Cu/Zn	80	35,5	12	M20	19	24	630
1 1/4" Ø20 RD-PL	111069	SST	80	35,5	12	M20	19	25	530
1 1/2" Ø20 RD-PL	111070	SST	80	41	12	M20	19	30	715
1 1/2" Ø20 RD-PL	111056	Cu/Zn	80	41	12	M20	19	32	750
2" Ø20 RD-PL	111057	Cu/Zn	80	53	12	M20	19	45	1280



LIGHTNING ROD-CONDUCTOR CONNECTOR

Lightning rod - ROUND conductor connector

Model	Ref.	Mat.	L (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
Ø16 round cond. 50-70 mm	111024	Cu/Zn	100	30	12	M16	480
Ø20 round cond. 50-70 mm	111038	Cu/Zn	100	30	12	M20	450

Lightning rod - FLAT conductor connector

Model	Ref.	Mat.	L (mm)	D1 (mm)	A (mm)	M1 (mm)	Weight (g)
Ø16 flat cond. 30x2-4 mm	111039	Cu/Zn	100	30	28	M16	390
Ø20 flat cond. 30x2-4 mm	111040	Cu/Zn	100	30	28	M20	350

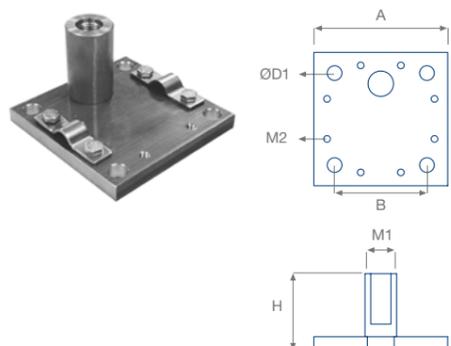
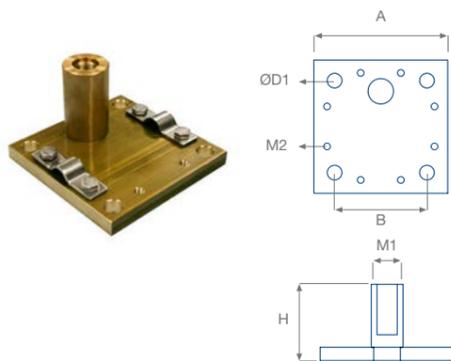
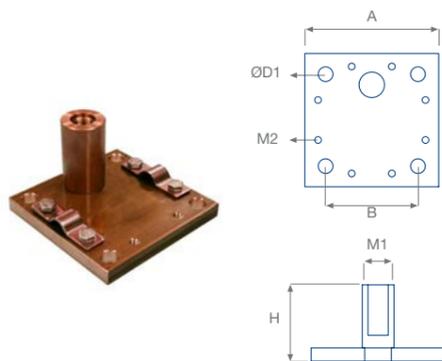
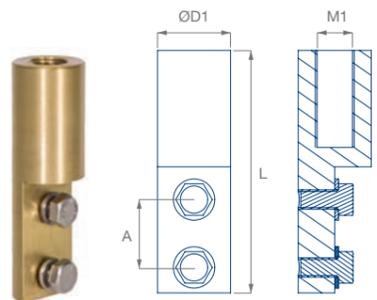
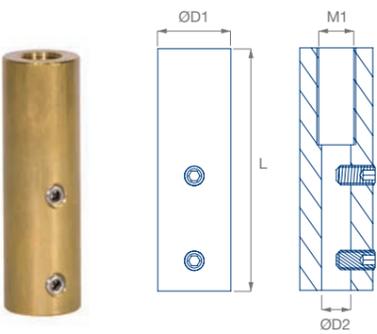
LIGHTNING ROD SUPPORTS

Horizontal supports Ø16mm or Ø20mm lightning rods with 50-70mm² cable connection

Model	Ref.	Mat.	H (mm)	M1 (mm)	D1 (mm)	M2 (mm)	A (mm)	B (mm)	Weight (g)
CU16	110268	Cu	60	M16	11	M6	100	80	1150
CU20	110269	Cu	60	M20	11	M6	100	80	1145

Model	Ref.	Mat.	H (mm)	M1 (mm)	D1 (mm)	M2 (mm)	A (mm)	B (mm)	Weight (g)
CU/ZN16	110266	Cu/Zn	60	M16	11	M6	100	80	1095
CU/ZN20	110267	Cu/Zn	60	M20	11	M6	100	80	1090

Model	Ref.	Mat.	H (mm)	M1 (mm)	D1 (mm)	M2 (mm)	A (mm)	B (mm)	Weight (g)
IN16	110271	SST	60	M16	11	M6	100	80	1040
IN20	110272	SST	60	M20	11	M6	100	80	1030



LIGHTNING ROD SUPPORTS

▶ Tilting support for lightning rods Ø16mm or Ø20mm , up to 500 mm high

Model	Ref.	Mat.	H (mm)	M1 (mm)	D1 (mm)	M2 (mm)	A (mm)	B (mm)	Weight (g)
CU/ZN16	110283	Cu/Zn	94	M16	11	M6	100	80	1235
CU/ZN20	110212	Cu/Zn	94	M20	11	M6	100	80	1325

▶ Concrete block support for air terminal

Mod.	Ref.	Mat.	H (mm)	M1 (mm)	D1 (mm)	Weight (g)
6.9kg base M16 for lightning rods up to 1m	110298	Concrete	81	M16	203	6900
16kg base M16 for lightning rods up to 3m	110297	Concrete	80	M16	364	16000

▶ Support for lightning rod on tile roof

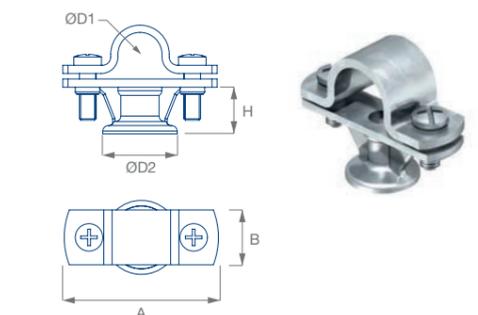
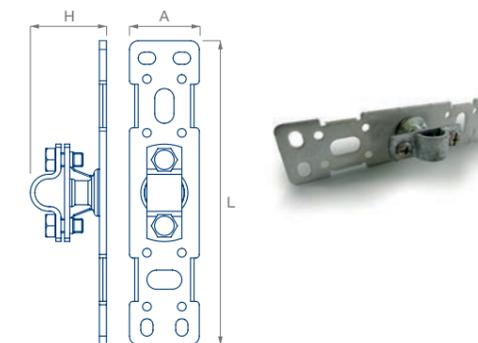
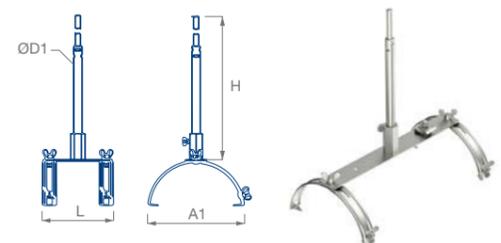
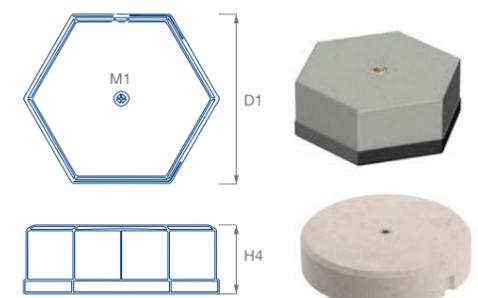
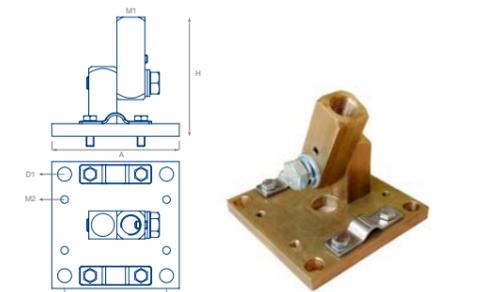
Mod.	Ref.	Mat.	H (mm)	A1 (mm)	D1 (mm)	L (mm)	Weight (g)
Roof ridge support	110202	Al / SST	1000	180-260	16	110	620

▶ Vertical supports Ø16mm or Ø20mm lightning rods

Model	Ref.	Mat.	No. pieces	L (mm)	A (mm)	H (mm)	Weight (g)
Stainless steel rods Ø16 - Ø20	112078	SST	1	175	40	42	212

▶ Simple supports Ø16mm or Ø20mm lightning rods

Model	Ref.	Mat.	No. pieces	A (mm)	B (mm)	H (mm)	D1 (mm)	D2 (mm)	Weight (g)
Simple fastening rods Ø16	112110	Zn	1	56	20	20	16	27	60
Simple fastening rods Ø20	112111	Zn	1	56	20	20	20	27	82



MASTS

▶ Stainless Steel masts

Model	Ref.	Mat.	L (mm)	No. parts	D1 (mm)	D2 (mm)	Weight (kg)
3m Ø1'1/2" IN	114045	SST	3000	1	48	48	9
6m Ø1'1/2" inner union IN	114042	SST	6000	2	48	48	22

▶ Telescopic hot dip galvanized steel masts

Model	Ref.	Mat.	L (mm)	No. parts	D1 (mm)	D2 (mm)	Weight (kg)
1 m Ø1'1/4"	114079	HDG	1000	1	42,5	42,5	2,6
2 m Ø1'1/4"	114061	HDG	2000	1	42,5	42,5	5,2
3 m Ø1'1/4"	114052	HDG	3000	1	42,5	42,5	7,75
1 m Ø1'1/2"	114063	HDG	1000	1	48	48	3,3
2 m Ø1'1/2"	114056	HDG	2000	1	48	48	6,6
3 m Ø1'1/2"	114043	HDG	3000	1	48	48	10
3,8 m Ø 1'1/2"+ Ø 1'1/4"	114091	HDG	3800	2	42,5	48	12,2
5,8 m Ø1'1/2"+ Ø1'1/4"	114065	HDG	5800	2	42,5	48	18
7,6 m Ø2+Ø1'1/2"+ Ø1'1/4"	114066	HDG	7600	3	42,5	60	30,2
8,6 m Ø2+Ø1'1/2"+ Ø1'1/4"	114067	HDG	8600	3	42,5	60	33,8

▶ Hot dip galvanized steel masts with internal junction

Model	Ref.	Mat.	L (m)	No. parts	D1 (mm)	D2 (mm)	Weight (kg)
4 m Ø 1'1/2" u. int.	114053	HDG	4	2	48	48	16,3
6 m Ø1'1/4" inner union	114048	HDG	6	2	42,5	42,5	16,8
6 m Ø1'1/2" inner union	114041	HDG	6	2	48	48	23
8 m Ø2+Ø1'1/2"+ Ø1'1/4 inner union	114068	HDG	8	3	42,5	60	33,8
9 m Ø2+Ø1'1/2"+ Ø1'1/4 inner union	114069	HDG	9	3	42,5	60	36,9



MASTS

▶ 6m telescopic aluminum mast with adaption piece

Model	Ref.	Mat.	L (mm)	No. parts	D1 (mm)	D2 (mm)	Weight (kg)
6m extendable mast with P.A.	114245	Al/SST	Up to 6000	4	40	80	22

WIND KIT

▶ Wind kit for fastening masts

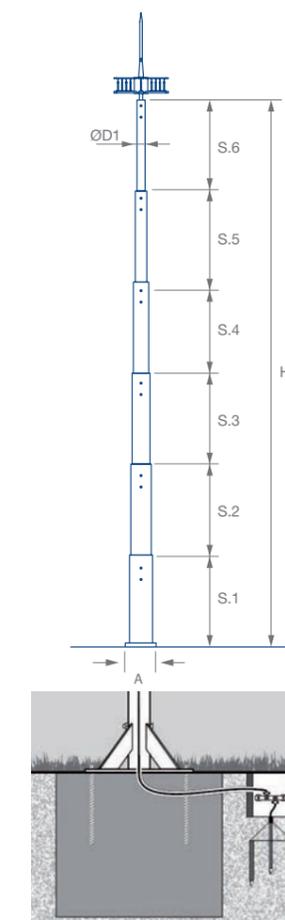
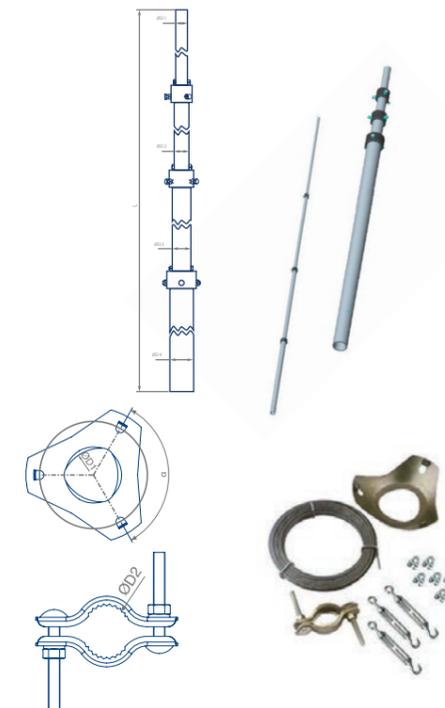
Model	Ref.	Mat.	D1 (mm)	D2 (mm)	α	Steel cable (m)	No. tighteners	No. cable ties	Weight (g)
Wind kit fastening masts	114197	HDG	40	45	120°	25	3	6	1700

FREE-STANDING FOLDING MASTS

▶ Free-standing galvanized steel masts

Self-supporting folding mast. Attachable sections, folding hinged baseplate. Easy transport and assembly. Dimensioned to withstand winds up to 144 Km / h.

Model	Ref.	Mat.	Secc.	Øtubes (inches)	L parts (m)	H (m)	D1 (mm)	A (mm)	Weight (kg)
6 m	114201	HDG	S.1	3"	3	6	48	500	85
			S.2	2'1/2"	2,5				
			S.3	1'1/2"	0,5				
8 m	114200	HDG	S.1	3"	3	8	48	500	92
			S.2	2'1/2"	2,5				
			S.3	1'1/2"	2,5				
10 m	114075	HDG	S.1	4"	3	10	48	500	125
			S.2	3"	2,5				
			S.3	2'1/2"	2,5				
			S.4	1'1/2"	2				
12 m	114076	HDG	S.1	5"	3	12	48	500	160
			S.2	4"	2,5				
			S.3	3"	2,5				
			S.4	2'1/2"	2,5				
			S.5	1'1/2"	1,5				
14 m	114078	HDG	S.1	6"	3	14	48	500	212
			S.2	5"	2,5				
			S.3	4"	2,5				
			S.4	3"	2,5				
			S.5	2'1/2"	2,5				
			S.6	1'1/2"	1				



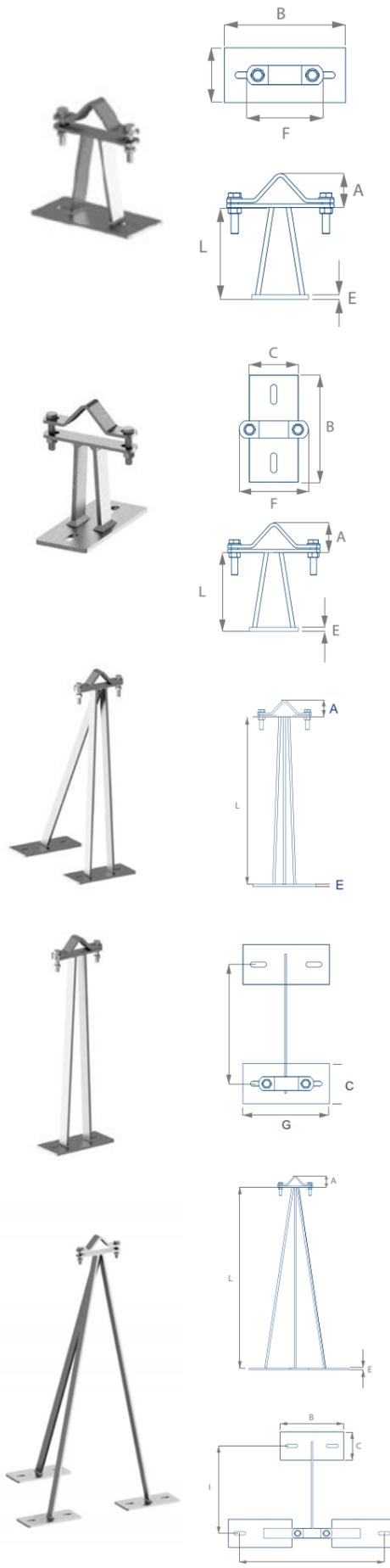
ANCHORS AND SUPPORTS FOR MASTS

► Anchors for vertically embedded wall mounting

Model	Ref.	Mat.	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
Plate anchor V6 15 Ø1'1/4"-2"	112158	HDG	150	60-85	220	100	6	146	2,35
Plate anchor V6 30 Ø1'1/4"-2"	112159	HDG	300	60-85	220	100	6	146	2,84
Plate anchor V6 15 inv. Ø1'1/4"-2"	112182	HDG	150	60-85	220	100	6	146	2,35
Plate anchor V6 30 inv. Ø1'1/4"-2"	112183	HDG	300	60-85	220	100	6	146	2,84

Model	Ref.	Mat.	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
Plate anchor V8 60 Ø1'1/4"-2" up.	112160	HDG	600	60-85	220	100	8	146	4,97
Plate anchor V8 60 Ø1'1/4"-2" low.	112190	HDG	600	60-85	220	100	8	146	7,8

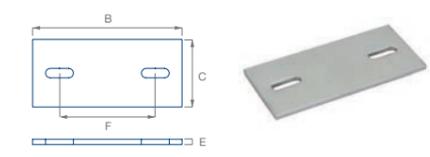
Model	Ref.	Mat.	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
Plate anchor V8 100 Ø1'1/4"-2"	112161	HDG	1000	60-85	220	100	8	146	11,84



ANCHORS AND SUPPORTS FOR MASTS

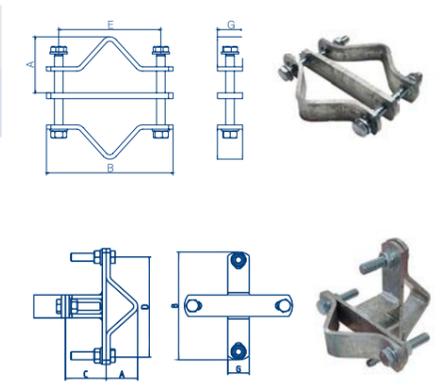
► Anchor plate for vertical wall mounting

Model	Ref.	Mat.	N° pieces	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
Fastening plate for plate anchor	112044	HDG	1	220	100	8	141	1,35

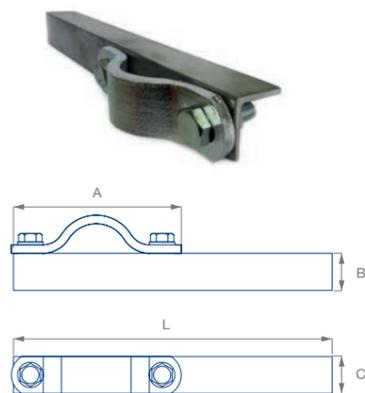


► Anchors for round structures

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	E (mm)	G (mm)	Weight (g)
Double anchoring V6 clamp Ø1'1/4" - 2"	112166	HDG	60-85	176	130	142	35	1260
Double anchoring V6 cross clamp 1'1/4"-1'1/2"	112167	HDG	60-85	176	62	142	35	1500



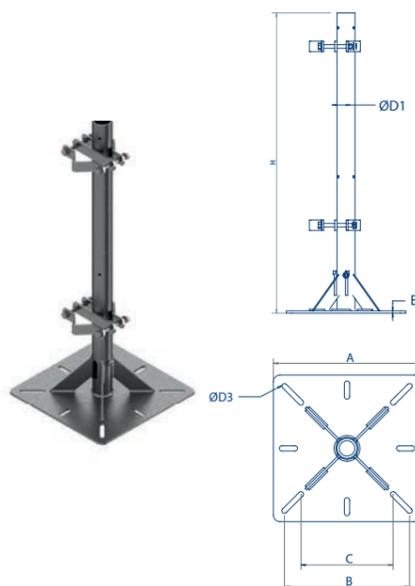
ANCHORS AND SUPPORTS FOR MASTS



► Angle anchors for welding on metal structures

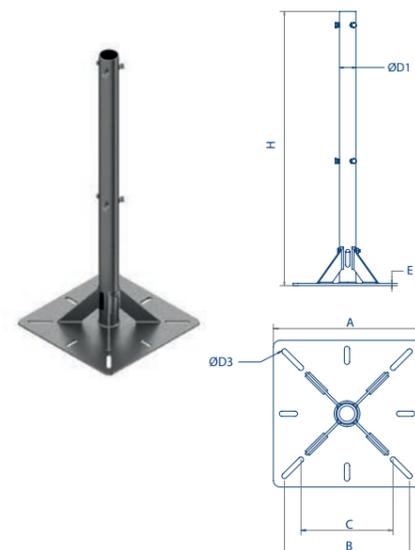
Model	Ref.	Mat.	No. pieces	A (mm)	B (mm)	C (mm)	L (mm)	Weight (kg)
Attachment angle 30 Ø1"-1'1/4" - 1'1/2"-2"	112080	HDG	1	160	35	35	300	1,2
Attachment angle 60 Ø1"-1'1/4" - 1'1/2"-2"	112103	HDG	1	160	35	35	600	2,4

► Base plate support for mast clamping to horizontal surfaces



Model	Ref.	Mat.	H (mm)	A (mm)	B (mm)	C (mm)	E (mm)	ØD1 (mm)	ØD3 (mm)	Weight (g)
With clamps Ø1'1/4"-Ø2"	113092	HDG	1008	400	340	250	8	60	14	17,5

► Horizontal surfaces baseplate support for fastening mast up to 6m in length

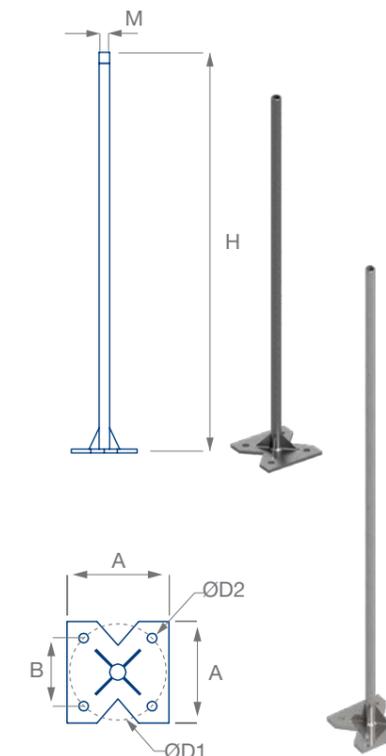


Model	Ref.	Mat.	H (mm)	A (mm)	B (mm)	C (mm)	E (mm)	ØD1 (mm)	ØD3 (mm)	Weight (g)
For 3m mast and Ø1'1/2"	113037	HDG	758	300	260	185	8	60	14	17,5
For 6m mast and Ø1'1/2"	113083	HDG	1008	400	340	250	8	60	14	15,3

SPECIAL SUPPORTS FOR SUBSTATION GANTRY

► Base plate support with M20 thread adaptor for application in electrical substations and others

Model	Ref.	Mat.	H (mm)	M	ØD1 (mm)	ØD2 (mm)	A (mm)	B (mm)	Weight (g)
Support base plate for tip	110241	HDG	2000	M20	160	18	170	113	4800
Support base plate for tip	110299	Inox	2000	M20	160	18	170	113	4350



CONDUCTORS

Among its many applications as a conductive element, it is used to build capture meshes, down conductor connections in lightning protection systems and for building grounding systems.

Made of different materials and dimensions for all types of installations.



UNE 21.186
NFC 17-102
IEC 62305
CTE SUA 8
R.E.B.T
IEC 62561-2
NP 4426
VDE 0185-305

CONDUCTORS

► Copper braided cable

Model	Ref.	Mat.	D1 (mm)	Weight (g/m)
35 mm ² section	117071	Cu	7,5	315
50 mm ² section	117072	Cu	8,5	500
70 mm ² section	117073	Cu	9,5	600
95 mm ² section	117074	Cu	11,5	830

* Coil approx. 30m. Other mesures consult.

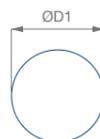
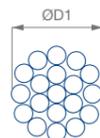
► Round steel conductor

Model	Ref.	Mat.	L (m)	D1 (mm)	Weight (g/m)
Spool Rd 8 galvanized steel (125m)	117081	HDG	125	8	312

► Tinned copper flat conductor

Model	Ref.	Mat.	L (m)	A (mm)	B (mm)	Weight (g/m)
Spool 30x2 mm Cu tinned tape coil (50 m)	117082	Tinned copper	50	30	2	537

*consult for other lengths



FASTENING AND CONNECTING ACCESSORIES



Clamps
Connectors
IEC 62305
IEC 62561-4
UNE 21.186
NFC 17-102

Accessories for the installation of conductive meshes and down-conductors in external lightning protection systems.

Clamps for fastening round conductors 35 to 95 mm² sections, or flat conductors of 30x2 mm.

Connection elements for round conductors of 35-95 mm² sections or flat conductor 30x2-4 mm. Facilitates installation and connection to external lightning protection and grounding systems.

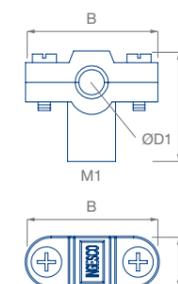
Made of different materials and dimensions for all types of facilities.

Consulting for other custom manufacturing and construction solutions.

CONDUCTOR FASTENING BRACKETS IEC62561-4

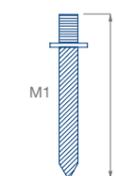
► Cu / Zn (brass) alloy cable clamp

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	D1 (mm)	Weight (g)
M6 clamp for 35 mm ² cable	118187	Cu/Zn	M6	17	44	36	7,1	104
M6 clamp for 50 mm ² cable	118185	Cu/Zn	M6	17	44	36	9	101,5
M6 clamp for 70 mm ² cable	118188	Cu/Zn	M6	17	44	36	10,4	97,6
M6 clamp for 95 mm ² cable	118189	Cu/Zn	M6	17	44	36	11	93,9
M8 clamp for 35 mm ² cable	118152	Cu/Zn	M8	17	44	36	7,1	101,2
M8 clamp for 50 mm ² cable	118153	Cu/Zn	M8	17	44	36	9	99,6
M8 clamp for 70 mm ² cable	118154	Cu/Zn	M8	17	44	36	10,4	94,8
M8 clamp for 95 mm ² cable	118155	Cu/Zn	M8	17	44	36	11	91



► Cu / Zn (brass) alloy cable clamp with lag screw

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	F (mm)	D1 (mm)	Weight (g)
Lag screw M6 35 mm ² cable	118150	Cu/Zn	M6	17	44	36	37,5	7,1	106,6
Lag screw M6 50 mm ² cable	118099	Cu/Zn	M6	17	44	36	37,5	9	105
Lag screw M6 70 mm ² cable	118000	Cu/Zn	M6	17	44	36	37,5	10,4	102
Lag screw M6 95 mm ² cable	118100	Cu/Zn	M6	17	44	36	37,5	11	96
Lag screw M8 35 mm ² cable	118151	Cu/Zn	M8	17	44	36	80	7,1	121,2
Lag screw M8 50 mm ² cable	118083	Cu/Zn	M8	17	44	36	80	9	119
Lag screw M8 70 mm ² cable	118093	Cu/Zn	M8	17	44	36	80	10,4	116
Lag screw M8 95 mm ² cable	118092	Cu/Zn	M8	17	44	36	80	11	110



CONDUCTOR FASTENING BRACKETS IEC62561-4

Cu / Zn (brass) alloy cable clamp with spike

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	G (mm)	D1 (mm)	Weight (g)
Spike M6 35 mm ² cable	118148	Cu/Zn	M6	17	44	36	40	7,1	115,6
Spike M6 50 mm ² cable	118082	Cu/Zn	M6	17	44	36	40	9	114
Spike M6 70 mm ² cable	118091	Cu/Zn	M6	17	44	36	40	10,4	111
Spike M6 95 mm ² cable	118090	Cu/Zn	M6	17	44	36	40	11	105
Spike M8 35 mm ² cable	118149	Cu/Zn	M8	17	44	36	40	7,1	123,6
Spike M8 50 mm ² cable	118081	Cu/Zn	M8	17	44	36	40	9	122
Spike M8 70 mm ² cable	118089	Cu/Zn	M8	17	44	36	40	10,4	119
Spike M8 95 mm ² cable	118088	Cu/Zn	M8	17	44	36	40	11	113

Cu / Zn (brass) alloy cable clamp with leg

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	E (mm)	I (mm)	J (mm)	K (mm)	D1 (mm)	D2 (mm)	Weight (g)
W/leg 35 mm ² cable	118130	Cu/Zn	M8	17	44	36	5	20	25	40	7,1	4	146,6
W/leg 50 mm ² cable	118084	Cu/Zn	M8	17	44	36	5	20	25	40	9	4	145
W/leg 70 mm ² cable	118095	Cu/Zn	M8	17	44	36	5	20	25	40	10,4	4	142
W/leg 95 mm ² cable	118094	Cu/Zn	M8	17	44	36	5	20	25	40	11	4	136

Cu / Zn (brass) alloy tape clamp

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	Weight (g)
M6 for 30x2mm tape	118156	Cu/Zn	M6	10	50	15	60

Cu / Zn (brass) alloy tape clamp with lag screw

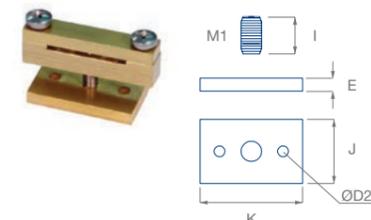
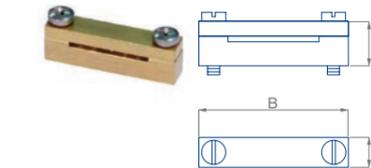
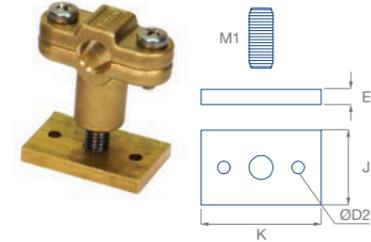
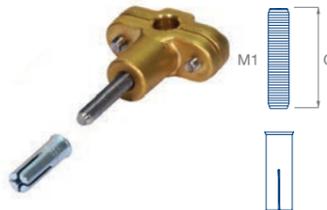
Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	F (mm)	Weight (g)
Lag screw M6 for 30x2 mm tape	118103	Cu/Zn	M6	10	50	15	37,5	63

Cu / Zn (brass) alloy tape clamp with spike

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	G (mm)	Weight (g)
Spike M6 for 30x2 mm tape	118104	Cu/Zn	M6	10	50	15	40	72

Cu / Zn (brass) alloy tape clamp with leg

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	E (mm)	I (mm)	J (mm)	K (mm)	D2 (mm)	Weight (g)
W/leg for 30x2 mm tape	118105	Cu/Zn	M6	10	50	15	5	12	25	40	4	101



CONDUCTOR FASTENING BRACKETS

Zn folding clamp for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	Weight (g)
Folding clamp M8 50-70mm ² cable	118109	Zn	M8	20	56	30	77

Zn folding clamp w/lag screw for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	F (mm)	Weight (g)
Folding clamp w/lag screw M8 50-70mm ² cable	118113	Zn	M8	20	56	30	80	93

Zn folding clamp w/spike for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	G (mm)	Weight (g)
Folding clamp w/spike M8 50-70 mm ² cable	118114	Zn	M8	20	56	30	40	97

Zn folding clamp w/leg for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	E (mm)	I (mm)	J (mm)	K (mm)	D2 (mm)	Weight (g)
Folding clamp w/leg 50-70 mm ² cable	118136	Zn	M8	20	56	30	5	20	25	40	4	117

Zn folding clamp for flat conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	Weight (g)
Folding clamp M8 30 mm tape	118118	Zn	M8	20	56	30	77

Zn folding clamp w/lag screw for flat conductors

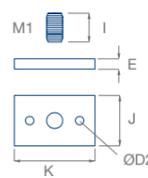
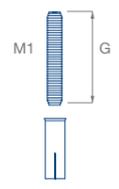
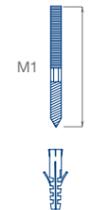
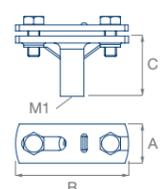
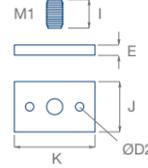
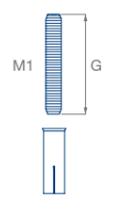
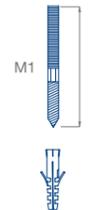
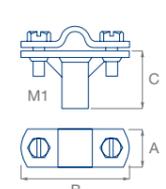
Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	F (mm)	Weight (g)
Folding clamp w/lag screw M8 30 mm tape	118119	Zn	M8	20	56	30	80	93

Zn folding clamp w/spike for flat conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	G (mm)	Weight (g)
Folding clamp w/spike M8 30 mm tape	118120	Zn	M8	20	56	30	40	97

Zn folding clamp w/leg for flat conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	E (mm)	I (mm)	J (mm)	K (mm)	D2 (mm)	Weight (g)
Folding clamp w/leg M8 30 mm tape	118157	Zn	M8	20	56	30	5	20	25	40	4	117



CONDUCTOR FASTENING BRACKETS

► Polyamide clamping bracket for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	D1 (mm)	Weight (g)
PA M8 50 mm ² cable	118106	PA	M8	22	30	24	7,2

► Polyamide clamping bracket w/lag screw for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	D1 (mm)	F (mm)	Weight (g)
PA w/lag screw M8 50 mm ² cable	118117	PA	M8	22	30	24	80	10,4

► Polyamide clamping bracket w/spike for round conductors

Model	Ref.	Mat.	M1	A (mm)	B (mm)	D1 (mm)	G (mm)	Weight (g)
PA w/spike M8 50 mm ² cable	118158	PA	M8	22	30	24	40	27,2

► Polyamide clamping bracket for fixing to tube

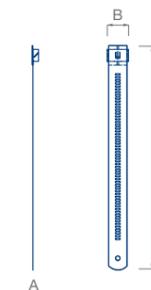
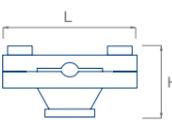
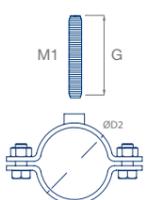
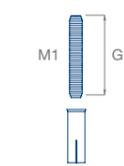
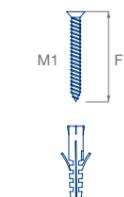
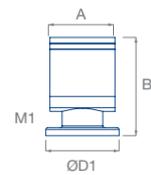
Model	Ref.	Mat.	A (mm)	B (mm)	D1 (mm)	D2 (mm)	G (mm)	Weight (g)
PA 50mm ² tube	118177	PA	22	30	24	30	30	26,8

► Polyamide clamp for cable and flat conductor

Model	Ref.	Mat.	L (mm)	H (mm)	Weight (g/m)
Clamp round/flat	118179	Nylon	82,25	23	22
Clamp with M8 screw	118193	Nylon	82,25	23	40
Clamp with leg	118212	Nylon	82,25	23	63

► Strap clamp for round profiles

Model	Ref.	Mat.	A (mm)	B (mm)	L (mm)	Weight (g)
Strap clamp SST 127x4.6mm up to Ø25	118218	SST	0.25	4.6	127	25
Strap clamp SST 300x12mm up to Ø90	118176	SST	0.25	12	300	130
Strap clamp SST 998x8mm up to Ø304	118245	SST	0.25	7,9	998	260



CONDUCTOR FASTENING BRACKETS

► Light clamps for round conductors

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	D1 (mm)	Weight (g)
Light clamp Cu Ø8-10 mm	118125	Cu	15	56,5	8,6	2	40	6,5	21
Light clamp CuSn Ø8-10 mm	118129	CuSn	15	56,5	8,6	2	40	6,5	21,1
Light clamp SST Ø8-10 mm	118146	SST	15	56,5	8,6	2	40	6,5	20

► Light clamps for flat conductors

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	D1 (mm)	Weight (g)
Light clamp Cu 30x2 mm	118122	Cu	15	61,5	5	3	49	6,5	27,5
Light clamp CuSn 30x2 mm	118128	CuSn	15	61,5	5	3	49	6,5	27,6
Light clamp SST 30x2 mm	118167	SST	15	61,5	5	3	49	6,5	26

► Profile clamping bracket

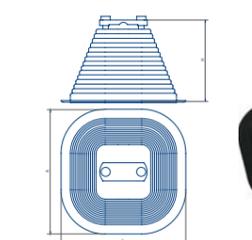
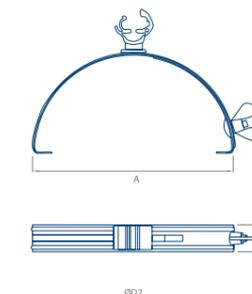
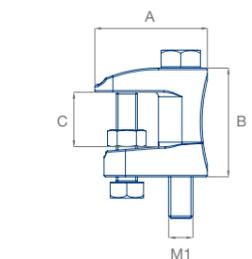
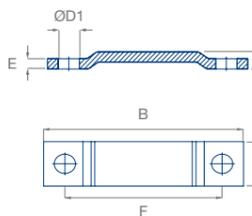
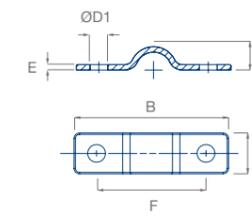
Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	M1	Weight (g)
Profile clamping bracket	118108	Zn	37	36	18	M8	80

► Roof tile support bracket

Model	Ref.	Mat.	A (min-max) (mm)	B (mm)	Weight (g)
With clamp PA round conductor Ø8 mm	118242	SST/PA	185-260	25	109

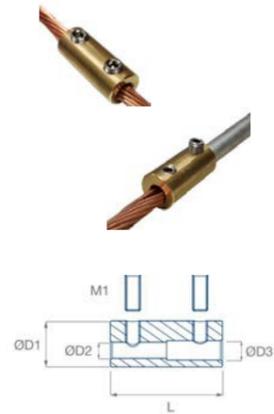
► Concrete support for flat roofs

Model	Ref.	Mat.	A (mm)	B (mm)	H (mm)	Weight (g)
Holder for Ø6-11 and 30x2-8 SB	118312	PP+CEM	140	140	87	1083
Filling holder for Ø6-11 and 30x2-8 SB	118313	PP	140	140	87	83



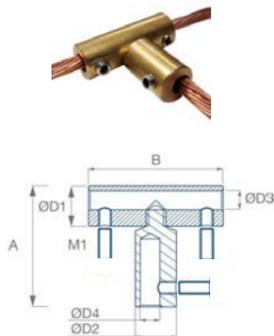
CONNECTORS

▶ Linear sleeve connectors



Model	Ref.	Mat	ØD1 (mm)	ØD1 (mm)	ØD1 (mm)	L (mm)	M1	Weight (g)
Linear 35-70mm ² to 35-70mm ²	115000	Cu/Zn	14,2	1000	1350	60	M12	189
Linear 35-70mm ² to 95-120mm ² /Ø14	115001	Cu/Zn	14,2	1500	2025	60	M12	279
Linear 95-120mm ² /Ø14 to 95-120mm ² /Ø14	115002	Cu/Zn	14,2	2000	2700	60	M12	262
Linear 35-70mm ² to Ø18mm	115003	Cu/Zn	14,2	2500	3375	60	M12	258
Linear 95-120mm ² to Ø18mm	115004	Cu/Zn	14,2	3000	4050	60	M12	244

▶ "T" sleeve connectors

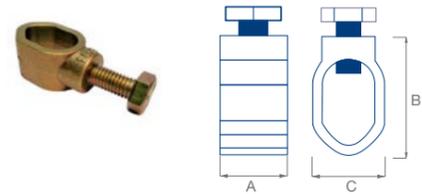


Model	Ref.	Mat	ØD1 (mm)	ØD2 (mm)	ØD3 (mm)	ØD4 (mm)	A (mm)	B (mm)	M1	Weight (g)
"T" (2 pieces) 35-70mm ² to 35-70mm ²	115005	Cu/Zn	25	12,5	12,5	12,5	75	82	M12	424
"T" (2 pieces) 35-70mm ² to 95-120mm ²	115006	Cu/Zn	25	12,5	15,5	15,5	75	82	M12	524
"T" (2 pieces) 95-120mm ² to 35-70mm ²	115007	Cu/Zn	30	15,5	15,5	12,5	80	82	M12	487
"T" (2 pieces) 95-120mm ² to 95-120mm ²	115008	Cu/Zn	30	15,5	15,5	15,5	80	82	M12	483

CONNECTORS

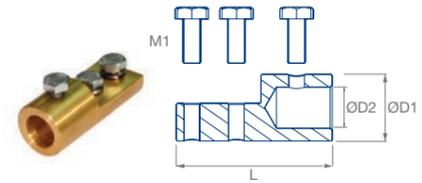
▶ Clamp for earth rod on round conductor

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	M1	Weight (g)
Earth rod Ø14-20-cable 25-95mm ²	115201	Cu/Zn	28	43	20	M10	110



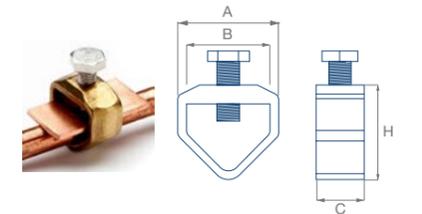
▶ Flat conductors - grounding rod connectors

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	L (mm)	M1	Weight (g)
Ø14 mm rod-30x2-4 mm tape	115174	Cu/Zn	30	15,5	70	M8	280
Ø18 mm rod-30x2-4 mm tape	115094	Cu/Zn	30	18,5	70	M8	250



▶ Clamp for earth rod on flat conductor

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	H (mm)	M1	Weight (g)
Earth rod Ø14-20-tape 30x1-10mm	115198	Cu/Zn	42	34	17	40	M10	120



CONNECTORS

▶ Round conductor junction clip - rod electrode

Model	Ref.	Mat.	A (mm)	B (mm)	D1 (mm)	H (mm)	Weight (g)
Rod Ø14-20 - cable 50-150mm ²	115225	Cu/Zn	47,5	44,6	20,4	68.1	240

▶ Cross connector

Model	Ref.	Mat.	A (mm)	Weight (g)
Cross connector Ø8-10 mm round cond. HDG	115098	HDG	60	110
Cross connector Ø8-10 mm round cond. Cu	115297	Cu	52	124

▶ Cross connector Rd 8-10 x16mm

Model	Ref.	Mat.	A (mm)	Weight (g)
Cross connector Rd 8-10x16mm CU	115298	Cu	60	440
Cross connector Rd 8-10x16mm IN	115257	SST	60	390
Cross connector Rd 8-10x16mm HDG.	115299	HDG	60	388

▶ Adaptive round conductor connector

Model	Ref.	Mat.	A (mm)	Weight (g)
Adaptive round conductor connector AL	115300	Al	44	66
Adaptive round conductor connector CU	115301	Cu	40	119
Adaptive round conductor connector IN	115302	SST	40	107
Adaptive round conductor connector HDG.	115100	HDG	40	94

▶ Connector Rd - Rd bimetallic

Model	Ref.	Mat.	A (mm)	Weight (g)
Connector Rd - Rd bimetallic	115303	Cu/SST	44	142

▶ Connector Rd 8-10x16mm

Model	Ref.	Mat.	A (mm)	B (mm)	Weight (g)
Universal Connector Rd 8-10x16mm	115304	SST	40	50	163

CONNECTORS

▶ Cross connector for round and flat conductors

Model	Ref.	Mat.	A (mm)	Weight (g)
Cross connector RD-Plate HDG.	115305	HDG	60	285
Cross connector RD-Plate IN	115296	SST	60	285

▶ Rd connector- bimetallic plate

Model	Ref.	Mat.	A (mm)	B (mm)	Weight (g)
Rd connector- bimetallic plate	115105	Cu/SST	70	30	101

▶ Universal switch connector

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	F (mm)	G (mm)	D1 (mm)	Weight (g)
Universal connector	112115	Cu/Zn	74	60	20	30,5	2	9	650

▶ Cross-connector for tape

Model	Ref.	Mat.	A (mm)	B (mm)	Weight (g)
Cross connector tape	115093	Cu	52	50	164
Cross connector tape	115223	HDG	52	52	115
Cross connector tape	115307	SST	60	60	278

▶ "C" pressure connection

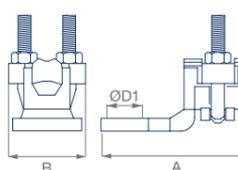
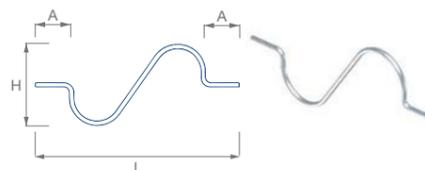
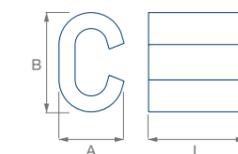
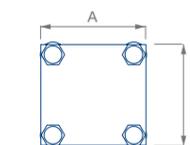
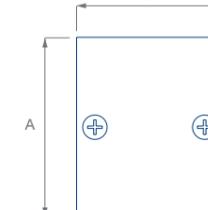
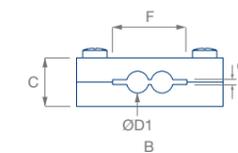
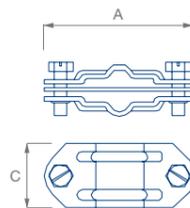
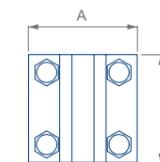
Model	Ref.	Mat.	L (mm)	A (mm)	B (mm)	Weight (g)
"C" connector	115104	Cu	30	20,5	31	78

▶ Expansion piece

Model	Ref.	Mat.	A (mm)	H (mm)	L (mm)	Weight (g)
Ø8 expansion joint	115306	Al	66	158	405	75

▶ Flat terminal

Model	Ref.	Mat.	A (mm)	B (mm)	ØD1 (mm)	Weight (g)
Toothed flat terminal 25-120 mm ² cable	115097	Cu/Zn	70	42	13	211



DOWN-CONDUCTOR PROTECTION

Mechanical protection of the lower section of down conductors of an external lightning protection system.

Fastening material includes: clamps and / or screws.

Made of galvanized steel and PVC.



Tubes

Profiles

IEC 62305

UNE 21.186

NFC 17-102

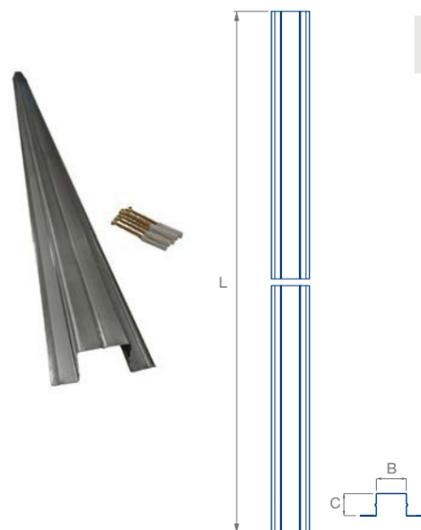
PROTECTION TUBE FOR CONDUCTORS

Protection tube for round conductors

Model	Ref.	Mat.	L (mm)	D1 (mm)	Weight (g)
Galv. steel-PVC shielded tube	119091	HDG-PVC	3000	40	5000
Reticulated polyethylene 3mm tube.	119110	PE	2500	32	625
50m PE crosslinked coil 3mm	119113	PE	50m	32	12500
Galv. Steel tube 2m Ø30	119109	HDG.	2000	30	1900

Protection profile for flat conductor

Model	Ref.	Mat.	L (mm)	B (mm)	C (mm)	Weight (g)
Profile for flat conductor	119095	HDG	3000	40	32	2600



SPARK GAPS



IEC 62561-3

IEC 62305

UNE 21.186

NFC 17-102

Suitable for connecting antennas (TV, communication, etc ...) to external lightning protection systems to ensure bonding and prevent the formation of dangerous sparks between nearby metal masses.

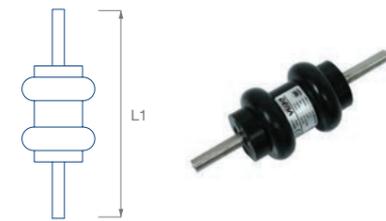
Bonding between grounding systems, operating separately under normal conditions, and ensuring their union if they suffer an overvoltage of a system.

Its use is recommended by current regulations to ensure equipotentiality of metallic structures on the roof of a building, or for interconnection between ground systems.

SPARK GAPS

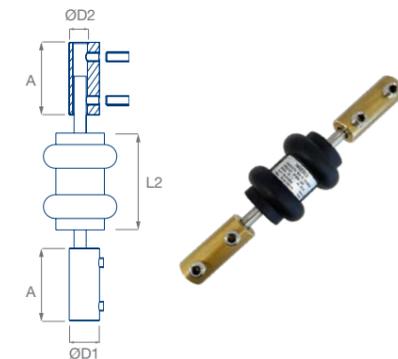
Spark gap protector

Model	Ref.	L1 (mm)	Weight (g)
VX-1 spark gap protector	116061	174	360



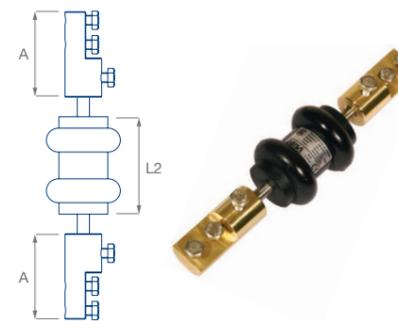
Spark gap with round conductor connection sleeves

Model	Ref.	L2 (mm)	A (mm)	D1 (mm)	D2 (mm)	Weight (g)
VX-1 spark gap protector 35-70 mm ² cable	116062	80	60	25	10,5	795
VX-1 spark gap protector 95-120 mm ² cable	116064	80	60	30	15,5	750



Spark gap with flat conductor connection sleeves

Model	Ref.	L2 (mm)	A (mm)	Weight (g)
VX-1 Spark gap protector 30x2 mm tape	116071	80	70	970





GROUNDING SYSTEMS

INTRODUCTION	47
GROUNDING ELECTRODES	49
BONDING BARS/ GROUNDING TEST BOX	53
EARTH PITS	55
ALUMINOTHERMIC WELDING	57

INTRODUCTION

▶ grounding system

The grounding system is established with the main objective of limiting the voltage with respect to ground, which can occur at a given moment in the metal frames, and prevent dangerous potential differences over allowing ground fault currents or discharge or atmospheric origin.

The grounding system of a lightning protection system is one of the most important parts of the system, as this the lightning currents and all its energy charge is dissipated.

The recommendations set by regulations such as **IEC 62305-3**, **NF C 17-102: 2011** and **UNE 21186: 2011**, indicate that grounding must have a low ohmic value (less than 10Ω when the measurement is made at isolated low frequency any conductor element).



Fig. 13 - Grounding System cross section.

▶ grounding standards

Depending on the protection system, they have indications marked by **IEC 62305-3: 2011** for Franklin rods or Faraday cage or by **UNE 21186: 2011** and **NF C 17-102: 2011** for the ESE lightning rod.

• Grounding for ESE Lightning Rods:

The dimensions of the ground will depend on the resistivity $\rho = (\Omega \cdot m)$ of the terrain.

Grounding must be done for each down conductor and there are 2 types:

TYPE A GROUNDING: can be type **A1** or **A2**.

TYPE A1: It consists of a crow's foot configuration (see Fig. 15).

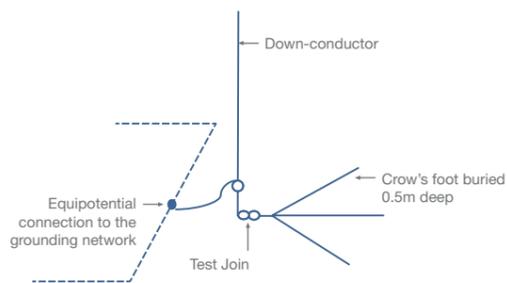


Fig. 15 - Example of grounding of type A1: 3 horizontal conductors (deep: 50cm, length: 7 to 8m).

TYPE A2: Formed by the union of many inline or triangle vertical stakes and separated by a distance of at least equal to its length (see Fig. 16).

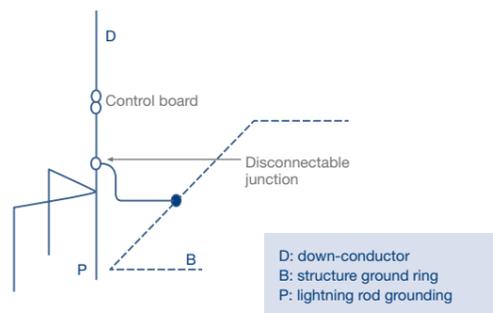


Fig. 16 - Example of grounding of type A2. The stakes will be linked by a conductor with the same characteristics and section of the down-conductor.

GROUND TYPE B: Ring electrode, this arrangement is a conductive ring in contact with the ground 80% of its length. It may be external to the electrode structure or foundation. Each down conductor, besides being connected to the ring, is to be further connected to a horizontal electrode at either at least a 4 m vertical electrode or to a minimum length of 2 m (see Fig.17).

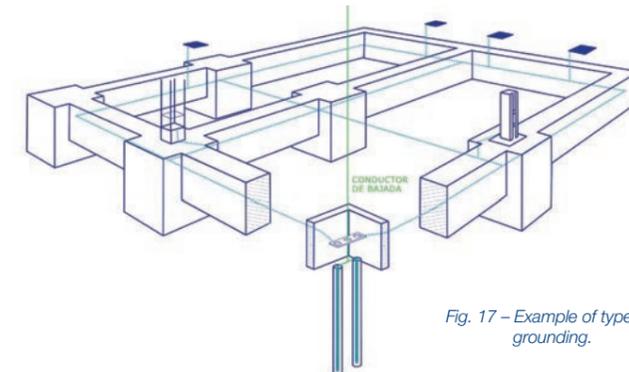


Fig. 17 - Example of type B grounding.

• Grounding for Franklin rod systems or Farady cage:

According to layout, 2 grounding systems exist:

TYPE A: formed by horizontal or vertical electrodes installed outdoors and connected to each down conductor. In type, the number of electrodes should not be less than 2, and should be distributed evenly.

Minimum length of each earth electrode must be:

- L1 for horizontal electrodes.
- 0,5 L1 for vertical or inclined electrodes.

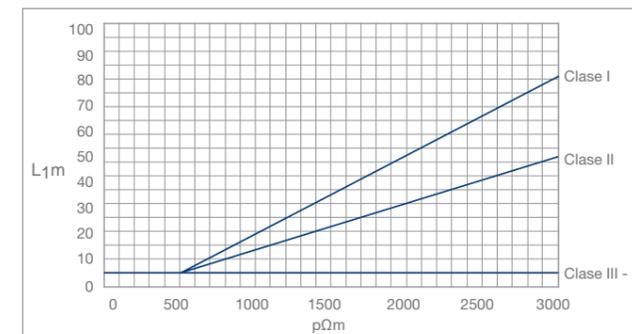


Fig. 18. - Minimum length (L1) of each ground electrode according to the class of LPS. NOTE: III and IV classes are independent of the resistivity.

L1 being the minimum length of horizontal electrodes shown in Fig. 18.

In case we can not achieve these requirements, we will use the type B configuration.

TYPE B: It is formed by an outer conductor ring to the structure to be protected, in contact with the ground at least 80% of its length, installed at 0.5 m deep and 1 m separation from the structure.

It is recommended that the electrode number not be less than the number of down conductors with a minimum of two. A ring that would connect additional electrodes at points where the down-conductors are connected.

This Type B arrangement is recommended for rocky terrain, and is preferable to use with electronic systems or structures with a high danger of fire.

STEP VOLTAGES:

To minimize the risk of passing currents, and to protect people, you should:

- Perform equipotentialization by using a grounding mesh.
- Physical access restrictions to 3 m of the down conductor or warning signs.
- A layer of Insulated material, for example 5 cm asphalt or 15 cm gravel.

GROUND ELECTRODES

Material for building grounding systems. Spike and place grounding electrodes, sacrificial anodes, graphite electrodes, ground resistivity enhancers and accessories.

Made of different materials and dimensions for all kinds of construction solutions.

Please consult for custom manufacturing and other construction solutions.



Spikes

Plates

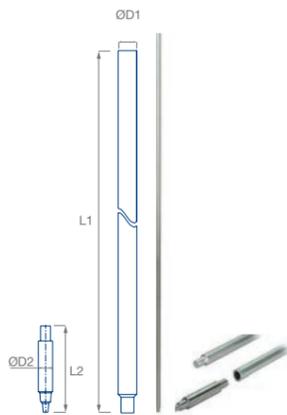
Quibacsol

IEC 62305

IEC 62561-2

UNE 21.186

NFC 17-102

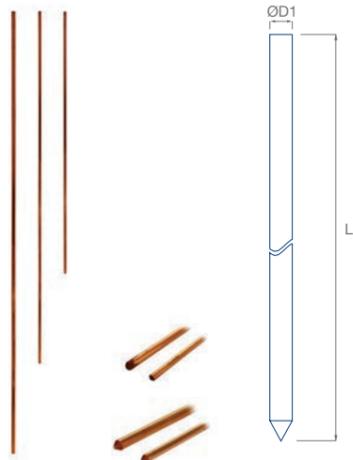


► Spliceable grounding rods

Model	Ref.	Mat.	L1 (mm)	D1 (mm)	L2 (mm)	D2 (mm)	Weight (g)
l:1500mm Ø18 mm Galv. Steel spliceable rods	252025	HDG	1500	18	-	-	3190
Piercing tip	252026	ST	-	-	110	18	160

► Copper-plated grounding rod 254µm

Model	Ref.	Mat.	ØD1 (mm)	L (mm)	Weight (g)
1m y Ø14,2mm grounding rod	252122	CCS	14,2	1000	1350
1,5m y Ø14,2mm grounding rod	252123	CCS	14,2	1500	2025
2m y Ø14,2mm grounding rod	252124	CCS	14,2	2000	2700
2,5m y Ø14,2mm grounding rod	252125	CCS	14,2	2500	3375
3m y Ø14,2mm grounding rod	252126	CCS	14,2	3000	4050
1m y Ø17,3mm grounding rod	252127	CCS	17,3	1000	2000
1,5m y Ø17,3mm grounding rod	252128	CCS	17,3	1500	3000
2m y Ø17,3mm grounding rod	252129	CCS	17,3	2000	4000
2,5m Ø17,3mm grounding rod	252112	CCS	17,3	2500	4500
3m y Ø17,3mm grounding rod	252130	CCS	17,3	3000	6000



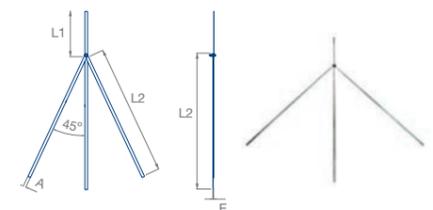
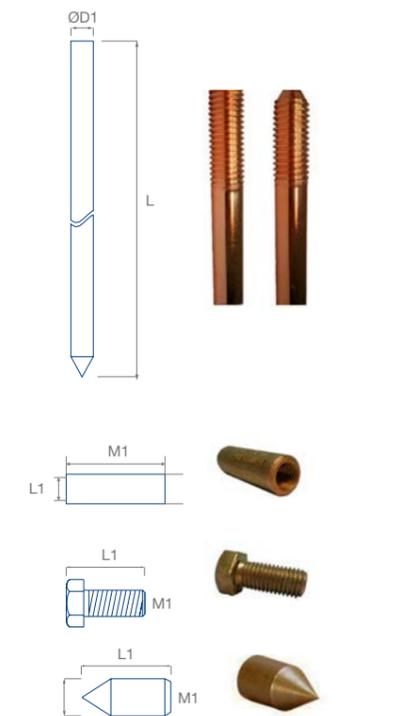
GROUND ELECTRODES

► Threaded copper-plated steel earthing rod 254µm

Model	Ref.	Mat.	N° Threads	L (mm)	D1 (mm)	M1	Weight (g)
CCS 1500 Ø14,2 (5/8")	252000	CCS	1	1500	14,2	5/8"	1860
CCS 2000 Ø14,2 (5/8")	252001	CCS	1	2000	14,2	5/8"	2480
CCS 2500 Ø14,2 (5/8")	252002	CCS	1	2500	14,2	5/8"	3100
CCS 3000 Ø14,2 (5/8")	252003	CCS	1	3000	14,2	5/8"	3720
CCS 1500 Ø17,3 (3/4")	252004	CCS	1	1500	17,3	3/4"	2730
CCS 2000 Ø17,3 (3/4")	252005	CCS	1	2000	17,3	3/4"	3680
CCS 2500 Ø17,3 (3/4")	252006	CCS	1	2500	17,3	3/4"	4600
CCS 3000 Ø17,3 (3/4")	252007	CCS	1	3000	17,3	3/4"	5530
CCS 1500 Ø14,2 (5/8")	252008	CCS	2	1500	14,2	5/8"	1860
CCS 2000 Ø14,2 (5/8")	252009	CCS	2	2000	14,2	5/8"	2480
CCS 2500 Ø14,2 (5/8")	252010	CCS	2	2500	14,2	5/8"	3100
CCS 3000 Ø14,2 (5/8")	252011	CCS	2	3000	14,2	5/8"	3720
CCS 1500 Ø17,3 (3/4")	252012	CCS	2	1500	17,3	3/4"	2730
CCS 2000 Ø17,3 (3/4")	252013	CCS	2	2000	17,3	3/4"	3680
CCS 2500 Ø17,3 (3/4")	252014	CCS	2	2500	17,3	3/4"	4600
CCS 3000 Ø17,3 (3/4")	252015	CCS	2	3000	17,3	3/4"	5530
Connector for 5/8" rod	252016	Brass	2	70	22	5/8"	113
Connector for 3/4" rod	252019	Brass	2	70	25	3/4"	153
Driving stud for 5/8" rod	252132	Brass	-	40	-	5/8"	90
Driving stud for 3/4" rod	252133	Brass	-	40	-	3/4"	135
Driving spike for Ø14mm rod	252134	Brass	-	65	20	-	107
Driving spike for Ø18mm rod	252098	Brass	-	65	25	-	153

► Grounding kit - 'Crow's feet'

Model	Ref.	Mat.	L1 (mm)	L2 (mm)	A (mm)	E (mm)	Weight (kg)
Crow's feet kit galv. steel l:1500 mm	252034	HDG	500	1500	30	3	4,5
Crow's feet kit galv. steel l:3000 mm	252035	HDG	500	3000	30	3	8,3
Crow's feet kit Cu Sn l:1500 mm	252051	Cu Sn	500	1500	30	2	4,3
Crow's feet kit Cu Sn l:3000mm	252052	Cu Sn	500	3000	30	2	8,1



GROUND ELECTRODES

► Grounding plate with connection sleeve

Model	Ref.	Mat.	A (mm)	E (mm)	D1 (mm)	Weight (kg)
Cu plate with Cu/Zn sleeve	251011	Cu	500	2	12,5	4,7
Galv. steel plate with SST sleeve	251015	GST	500	2	12,5	6,2
Stainless steel plate with SST sleeve	251012	SST	500	2	12,5	4,3

► Copper grounding plate with "U" connection

Model	Ref.	Mat.	A (mm)	E (mm)	Weight (kg)
Plate Cu 500 "U" connection	251021	Cu	500	2	4,7
Plate Cu 600 "U" connection	251024	Cu	600	3	9,8

► Copper tape earthing mesh

Modelo	Ref.	Mat.	A (mm)	E (mm)	N° cond.	Weight (Kg)
Cu tape lattice plate 630 x 630	251036	Cu	630	3	8	4,3
Cu tape lattice plate 830 x 830	251038	Cu	830	3	10	7,5

GROUND ELECTRODES

► Graphite electrode

Graphite electrodes suitable for highly corrosive soils.

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	L (mm)	Weight (kg)
Graphite electrode	252039	Graphite	50	12,5	600	12,5

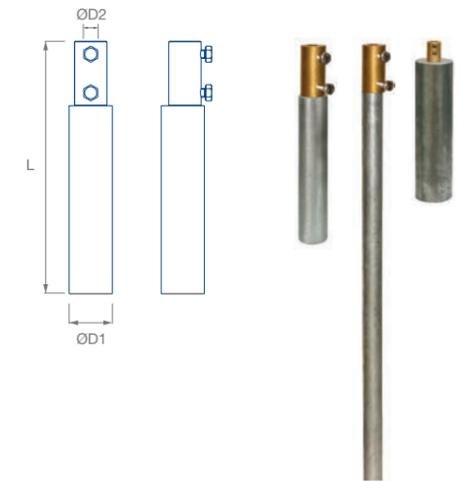
Graphite electrode composed by:
Graphite rod, connection device, bag, 10kg Quibacsol mineral compound.
Components are supplied separated. Mounting shall be performed during the installation.

SACRIFICIAL ANODES

► Sacrificial anodes

Anodes for cathodic protection of ground electrodes or metal masses.

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	L (mm)	Weight (g)
Model HC L:200 mm	251017	Zinc	40	12,5	225	2420
Model MC L:600 mm	251018	Zinc	25	12,5	665	2790
Model LC L:260 mm	251019	Mg	66	12,5	335	920



QUIBACSOL MINERAL COMPOUND

► QUIBACSOL mineral compound

Model	Ref.	L (mm)	D1 (mm)	Weight (kg)
QUIBACSOL 10 kg	254041	255	267	10,4



► Humidification tube

Model	Ref.	Mat.	L (mm)	D1 (mm)	Weight (g)
Humidification tube	119094	PVC	700	50	570



BONDING BARS GROUNDING TEST BOX



Grounding and potential compensation connecting bars, control and recording systems.

Made of copper alloy Cu / Zn (brass), bronze with stainless steel screw set.

Refer to custom manufacturing and other constructive solutions.

Bonding bars
Registry systems
IEC 62.305
IEC 62.561-1
UNE 21.186
NFC 17-102

EQUIPOTENTIAL BONDING BARS

Equipotential bonding bars with insulators

Model	Ref.	Mat.	L (mm)	A (mm)	H (mm)	Weight (g)
2 pole equipotential bar	250001	Cu	200	30	84	940
3 pole equipotential bar	250007	Cu	254	30	84	1215
4 pole equipotential bar	250008	Cu	308	30	84	1490
5 pole equipotential bar	250009	Cu	362	30	84	1750

Equipotential bar for registry case (round-flat conductor)

Model	Ref.	Mat.	L (mm)	A (mm)	B (mm)	H (mm)	Weight (g)
2 pole case equipotential bar	250026	Cu	159,5	56,5	50	28,2	405
3 pole case equipotential bar	250027	Cu	159,5	56,5	50	28,2	525
4 pole case equipotential bar	250028	Cu	211	56,5	50	28,2	696
5 pole case equipotential bar	250029	Cu	262,5	56,5	50	28,2	870

Equipotential bar

Model	Ref.	L (mm)	A (mm)	H (mm)	Tape	N° Links	Weight (Kg)
Equip.Cu Bar 6 Connec. M10	250106	435	45	105	50x5	1	1,80
Equip.Cu Bar 8 Connec. M10	250107	525	45	105	50x5	1	2,07
Equip.Cu Bar 10 Connec. M10	250109	685	45	105	50x5	2	2,68
Equip.Cu Bar 13 Connec. M10	250102	1115	45	105	50x6	4	6,54
Equip.Cu Bar 15 Connec. M10	250110	955	45	105	50x5	2	3,70
Equip.Cu Bar 20 Connec. M10	250111	1180	45	105	50x5	2	4,37
Equip.Cu Bar 28 Connec. M10	250103	1835	45	105	50x6	4	9,97

GROUNDING TEST BOX

Grounding test box

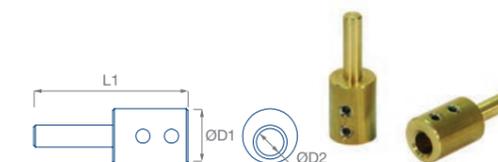
Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	Weight (g)
Test joint box for 50mm ² cable	250006	PVC	165	115	71	1100
Test joint for flat conductor	250099	PVC	165	115	71	1100



ADAPTERS FOR GROUNDING TEST BOX

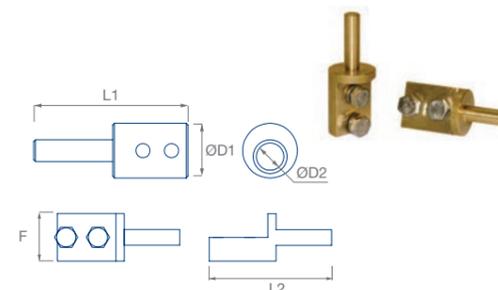
Adapters for round conductor

Model	Ref.	Mat.	L1 (mm)	D1 (mm)	D2 (mm)	Weight (g)
Adapter Kit cable 70 mm ²	250010	Cu/Zn	70	25	12,5	260
Adapter Kit cable 95 mm ²	250011	Cu/Zn	70	30	15,5	226



Adapters for flat conductor

Model	Ref.	Mat.	L2 (mm)	F (mm)	Weight (g)
Adapter Kit 30x2 mm flat conductor	250012	Cu/Zn	77	30	392

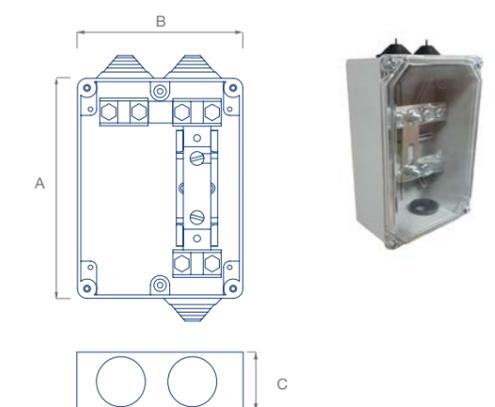


TEST JOIN BOX

Test joint box

Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	Weight (g)
Test joint box*	250049	PVC	160	110	65,5	342

*For low voltage grounding



EARTH INSPECTION PITS



Polypropylene and concrete earth inspection pits. Polypropylene, PVC, aluminum and cast iron covers.

Down-conductor signs for lightning protection and grounding in PVC or aluminum.

Made of different materials and dimensions for all kinds of constructive solutions.

Consult for other construction solutions.

Earth pits

IEC 62.305

UNE-EN 124

UNE 21.186

NFC 17-102

EARTH PITS AND COVERS

► Polypropylene earth pit

Model	Ref.	Mat.	A1 (mm)	H1 (mm)	Weight (g)
Square PP earth pit with cover	253058	PP	300	300	3000
Square PP earth pit with PVC cover	253057	PP/PVC	300	300	2600

► Circular Polypropylene earth pit

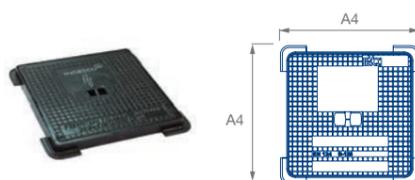
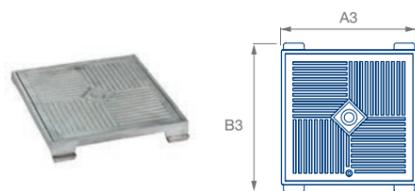
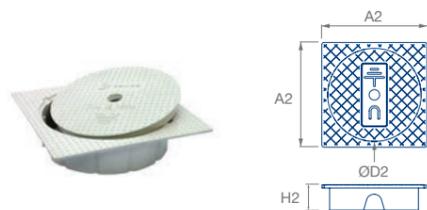
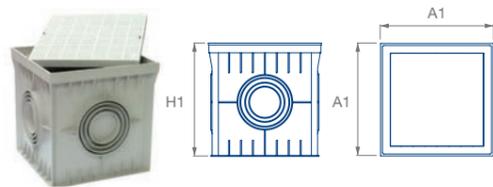
Model	Ref.	Mat.	A2 (mm)	D2 (mm)	H2 (mm)	Weight (g)
Circular PP earth pit	253032	PP	250	222	63	775

► Cover and aluminum frame

Model	Ref.	Mat.	A3 (mm)	B3 (mm)	Weight (g)
Aluminum cover and frame	253037	Al	305	330	2220

► Cast iron cover and frame

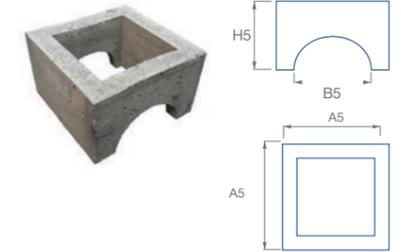
Model	Ref.	Mat.	A4 (mm)	Weight (g)
Cast iron cover and frame	253033	Fe	337	4950



EARTH PITS AND COVERS

► Concrete earth pit

Model	Ref.	Mat.	A5 (mm)	B5 (mm)	H5 (mm)	Weight (kg)
Square concrete earth pit	253059	Concrete	335	230	205	22



► Earthing and lightning signage

Model	Ref.	Mat.	Dimensions	Weight (g)
PVC grounding sign	256001	PVC	DINA4	94
Aluminum grounding sign	256002	Al	DINA4	132
PVC lightning rod sign	256003	PVC	DINA4	81



ALUMINOTHERMIC WELDING



Aluminothermic welding is a process in which the reaction caused by reducing copper oxide with aluminium produces a permanent bond between two metallic elements (copper-copper or copper-steel).

The reaction takes place in a graphite mould into which the elements to be welded have been previously introduced, and at the required load. The result is a strong, compact and homogeneous joint between the elements.

The conductivity of the welding connection is equal to or greater than two joined conductors.

The connection is resistant to overloads or surges.

Molds
Load cartridge
Ignition devices
Accessories

GRAPHITE MOLDS

The molds were machined from a block of refractory materials (graphite). Its average duration, in normal use is 70 to 100 welds. A lid protects projections at the time of ignition.

A mold for each type of welding and joining element. Check references of the molds and the list of connections types.

Because of the multitude of connections that can be made, the different materials, conductors and structures that can occur in a system, this catalog only reflects the most common connections (copper-copper and copper-steel). Consult for any other connection.

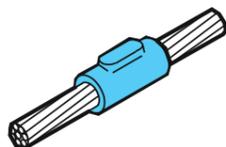


TYPES OF CONNECTIONS BY ALUMINOTHERMIC WELDING

Cable-cable (CC) welding

► Linear cable-cable (LCC)

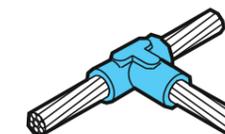
Model	Trunk cable (mm ²)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Linear connection cable-cable 35-35	35	35	LCC35/35	500005	C4	500001
Linear connection cable-cable 50-35	50	35	LCC50/35	500006	C4	500001
Linear connection cable-cable 50-50	50	50	LCC50/50	500007	C4	500001
Linear connection cable-cable 70-35	70	35	LCC70/35	500008	C4	500001
Linear connection cable-cable 70-50	70	50	LCC70/50	500009	C5	500002
Linear connection cable-cable 70-70	70	70	LCC70/70	500010	C5	500002



Cable-cable (CC) welding

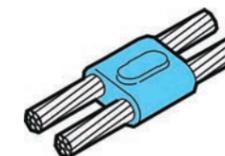
► "T" horizontal cable-cable (TH-CC)

Model	Trunk cable (mm ²)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
"T" horiz. connection cable-cable 35-35	35	35	TH-CC35/35	500011	C4	500001
"T" horiz. connection cable-cable 35-50	35	50	TH-CC35/50	500012	C5	500002
"T" horiz. connection cable-cable 35-70	35	70	TH-CC35/70	500013	C5	500002
"T" horiz. connection cable-cable 50-35	50	35	TH-CC50/35	500014	C5	500002
"T" horiz. connection cable-cable 50-50	50	50	TH-CC50/50	500015	C6	500003
"T" horiz. connection cable-cable 50-70	50	70	TH-CC50/70	500016	C6	500003
"T" horiz. connection cable-cable 70-35	70	35	TH-CC70/35	500017	C5	500002
"T" horiz. connection cable-cable 70-50	70	50	TH-CC70/50	500018	C6	500003
"T" horiz. connection cable-cable 70-70	70	70	TH-CC70/70	500019	C6	500003



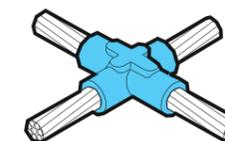
► Parallel cable-cable (LP-CC)

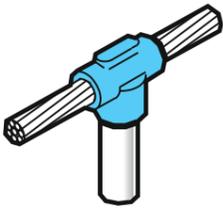
Model	Trunk cable (mm ²)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Parallel connection cable-cable 35-35	35	35	LP-CC35/35	500020	C6	500003
Parallel connection cable-cable 35-50	35	50	LP-CC35/50	500021	C6	500003
Parallel connection cable-cable 35-70	35	70	LP-CC35/70	500022	C6	500003
Parallel connection cable-cable 50-35	50	35	LP-CC50/35	500023	C6	500003
Parallel connection cable-cable 50-50	50	50	LP-CC50/50	500024	C6	500003
Parallel connection cable-cable 50-70	50	70	LP-CC50/70	500025	C6	500003
Parallel connection cable-cable 70-35	70	35	LP-CC70/35	500026	C6	500003
Parallel connection cable-cable 70-50	70	50	LP-CC70/50	500027	C6	500003
Parallel connection cable-cable 70-70	70	70	LP-CC70/70	500028	C7	500004



► Cross cable-cable (X-CC)

Model	Trunk cable (mm ²)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Cross connection cable-cable 35-35	35	35	X-CC35/35	500029	C6	500003
Cross connection cable-cable 35-50	35	50	X-CC35/50	500030	C6	500003
Cross connection cable-cable 35-70	35	70	X-CC35/70	500031	C6	500003
Cross connection cable-cable 50-35	50	35	X-CC50/35	500032	C6	500003
Cross connection cable-cable 50-50	50	50	X-CC50/50	500033	C6	500003
Cross connection cable-cable 50-70	50	70	X-CC50/70	500034	C6	500003
Cross connection cable-cable 70-35	70	35	X-CC70/35	500035	C6	500003
Cross connection cable-cable 70-50	70	50	X-CC70/50	500036	C6	500003
Cross connection cable-cable 70-70	70	70	X-CC70/70	500037	C7	500004





Earthing rod-cable (PC) welding

► “T” spike-cable (TPC)

Model	Øspike (mm)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
“T” connection rod-cable 14-35	14	35	TPC14/35	500038	C6	500003
“T” connection rod-cable 14-50	14	50	TPC14/50	500039	C6	500003
“T” connection rod-cable 14-70	14	70	TPC14/70	500040	C7	500004
“T” connection rod-cable 18-35	18	35	TPC18/35	500041	C6	500003
“T” connection rod-cable 18-50	18	50	TPC18/50	500042	C7	500004
“T” connection rod-cable 18-70	18	70	TPC18/70	500043	C7	500004

► Linear rod-cable (LPC)

Model	Øspike (mm)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Linear connection rod-cable 14-35	14	35	LPC14/35	500044	C5	500002
Linear connection rod-cable 14-50	14	50	LPC14/50	500045	C6	500003
Linear connection rod-cable 14-70	14	70	LPC14/70	500046	C6	500003
Linear connection rod-cable 18-35	18	35	LPC18/35	500047	C6	500003
Linear connection rod-cable 18-50	18	50	LPC18/50	500048	C6	500003
Linear connection rod-cable 18-70	18	70	LPC18/70	500049	C6	500003

Round-cable (RC) welding

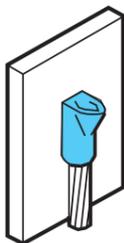
► Cross round-cable (X-RC)

Model	Ørod (mm)	Secondary cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Cross connection round-cable 10/35	10	35	X-RC10/35	500050	C6	500003
Cross connection round-cable 10/50	10	50	X-RC10/50	500051	C7	500004
Cross connection round-cable 10/70	10	70	X-RC10/70	500052	C7	500004
Cross connection round-cable 16/35	16	35	X-RC 16/35	500053	C6	500003
Cross connection round-cable 16/50	16	50	X-RC 16/50	500054	C7	500004
Cross connection round-cable 16/70	16	70	X-RC 16/70	500055	C7	500004

Cable-plate (CCH) welding

► Vertical cable-plate (V-CCH)

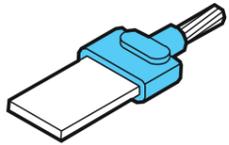
Model	Trunk cable (mm ²)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Vertical connection plate-cable 35	35	V-CCH35	500056	C5	500002
Vertical connection plate-cable 50	50	V-CCH50	500057	C6	500003
Vertical connection plate-cable 70	70	V-CCH70	500058	C6	500003



Cable-tape (CPL) welding

► Linear cable-tape (L-CPL)

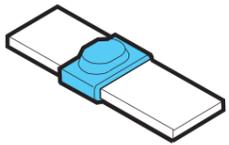
Model	Trunk cable (mm ²)	Tape dimensions (mm)	Type of mold	Mold ref.	Type of cartridge	Cartridge ref.
Linear connection cable-tape 35/25x3	35	25x3	L-CPL35/25X3	500059	C4	500001
Linear connection cable-tape 50/25x3	50	25x3	L-CPL50/25X3	500060	C5	500002
Linear connection cable-tape 70/25x3	70	25x3	L-CPL70/25X3	500061	C6	500003



Tape-tape (PL) welding

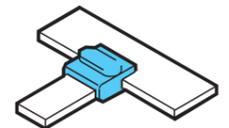
► Linear tape-tape (L-PL)

Model	Tape dimensions (mm)	Mold ref.	Type of cartridge	Cartridge ref.
Linear tape-tape 25x3	25x3	L-PL25x3	C5	500002



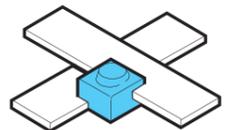
► “T” horizontal tape-tape (TH-PL)

Model	Tape dimensions (mm)	Mold ref.	Type of cartridge	Cartridge ref.
“T” connection horizontal tape-tape 25x3	25x3	TH-PL25x3	C5	500002



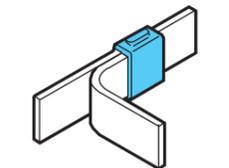
► Cross tape-tape (X-PL)

Model	Tape dimensions (mm)	Mold ref.	Type of cartridge	Cartridge ref.
Cross connection tape-tape 25x3	25x3	X-PL25x3	C5	500002



► Parallel tape-tape (P-PL)

Model	Tape dimensions (mm)	Mold ref.	Type of cartridge	Cartridge ref.
Parallel connection tape-tape 25x3	25x3	P-PL25x3	C6	500003

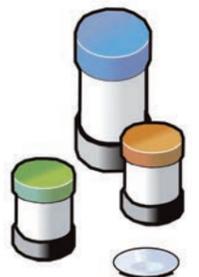


LOADS

► Load cartridges

Solder powder for connection. It comes in a plastic container containing thermite charge (cap color) on one side and on the opposite side (black cap), dust ignition. A metal disc used to seal the nozzle before depositing the load is also supplied.

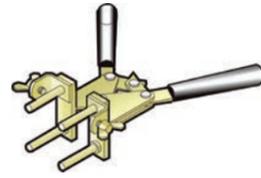
Model	Reference	Lid color	u./package
C4 45 load	500001	white	20
C5 65 load	500002	yellow	10
C6 90 load	500003	orange	10
C7 115 load	500004	red	10



ACCESSORIES

▶ Support tweezers

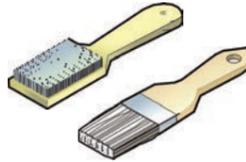
Designed to handle safely molds, allowing opening and closing when the mold is hot. Their size can vary depending on the mold dimensions.



Model	Ref.
Tweezer T-80	500066

▶ Wire brush and brush

Use the wire brush for cleaning the cables or elements to be welded.
Use the brush to clean the inside of the mold after each weld.



Model	Ref.
Wire brush	500067
Brush	500068

▶ Sealing paste

Model	Ref.
Sealing paste 0.9kg	500091



▶ Mold scraper

Its shape is especially designed for cleaning the mold loading chute.



Model	Ref.
Scraper R-4 (for C4 and C5 loads)	500069
Scraper R-9 (for C6 and C7 loads)	500070

▶ Ignition gun

It is used for igniting ignition powder.
Supports normal replacement lighter flints.



Model	Ref.
Ignition gun	500071

▶ Remote ignition system

System used for igniting ignition powder remotely.
For this ignition system, it requires that the molds are manufactured with a special cover. If it is a conventional mold, an auxiliary cap should be placed to hold the system. The device works with commercial batteries, and features a bright LED that indicates if the batteries are exhausted or requires replacement fuse. Safer and cleaner process.

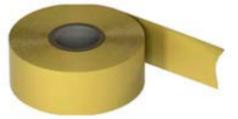


Model	Reference
Remote ignition device	500072
Long distance ignition consumable	500073
Quick clamping auxiliary cover	500074

ACCESSORIES

▶ Protection tapes

Model	Ref.
Anti-corrosion plastic tape Width 100mm (L=10m)	800035
Anti-corrosion plastic tape Width 50mm (L=10m)	800148



▶ Spray

Model	Ref.
Cold Galvanizing Spray 400ml	250032





CONTROL SYSTEMS

LIGHTNING COUNTERS	65
CDR UNIVERSAL	67
CDR-11	68
CDR-HS	68
EOLOS	70

CONTROLS SYSTEMS: LIGHTNING COUNTERS

overview

Lightning counters are control systems designed to detect the electric current that is directed to ground through the down conductor when a lightning strike hits the system.

The installation of the lightning meter on down conductors of external lightning protection systems (LPS) is indicated by the regulations for the control and immediate verification of the status of the protection system after any lightning strike recorded on the structure.

standards

- **UNE 21186:2011:** Protección contra el rayo. Pararrayos con dispositivo de cebado.
- **NF C 17-102:2011:** Protection contre la foudre. Systèmes de protection contre la foudre à dispositif d'amorçage.
- **NP 4426:2013:** Proteção contra descargas atmosféricas - Sistemas com dispositivo de ionização não radioativo.
- **IEC 62561-6:2011:** Lightning protection system components (LPSC) Part 6. Requiriments for lightning strike counters.
- **IEC 62561-1:2012:** Lightning protection system components (LPSC) Part 1. Requiriments for connection components.

INGESCO counters range

			
	CDR-11	CDR UNIVERSAL	CDR-HS
Waveform	8-20µs 10-350µs	8-20µs 10-350µs	8-20µs 10-350µs
Minimum current registration	1 kA	1 kA	0,1 kA
Maximum current	100 kA	100 kA	100 kA
Rise time	from 8 to 10µs	from 8 to 10µs	from 8 to 10µs
Mount	Serial	Parallel, without electrical contact	Serial
Accessories	Adapter plate	-	Adapter plate
Application	ELPS	ELPS (round or flat conductor)	ELPS, mesh reticular, metallic structures
Bootable to zero	NO	YES	NO

• LPS via ESE lightning rods & conventional rods.

Place a **CDR UNIVERSAL** or **CDR-11** lightning counter on one of the ground down-conductors

The system requires no external power or batteries. Its electromechanical 3 digit dial counter registers whenever a lightning discharge flows through the down conductor (minimum intensity 1kA).

They can be placed on flat or round conductors, including the **CDR UNIVERSAL** has the advantage that it is not necessary to cut the down-conductor as it is placed in parallel and does not require ohmic contact to record discharges.



• LPS with mesh systems or arrestor down-conductors in contact with metal structures.

This type of construction systems are characterized by current drifts that hinder detection of low and medium intensity lightning. The **CDR-HS** is a high sensitivity counter to detect impacts from 100 A, well below the minimum range in the regulations (1 kA). This makes the control system suitable for this type of protective systems, allowing us to track and verify the proper operation of the system.



LIGHTNING COUNTERS



Control and recording equipment of lightning on external lightning protection systems (special active rod or conventional rod systems) as well as structures (high rise towers, wind turbines, etc ...).

CDR UNIVERSAL

CDR-11

CDR-HS

IEC 62.561/6:2018

UNE 21.186

NFC 17-102:2011

CDR UNIVERSAL

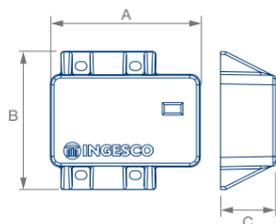
Lightning counter for external lightning protection installations (ESE lightning rod, Franklin, conductor mesh ...).

Valid for round conductors (50-70 mm² or Ø8-10 mm sections), or flat conductors (30x2 - 4mm).

Detection without ohmic contact. Resettable model.

► CDR Universal

Model	Ref.	A (mm)	B (mm)	C (mm)	Weight (g)
CDR UNIVERSAL	432028	109	101	42	490
Parameters					
Functioning temp range:	from -20° to 65°C				
Current range:	from 1kA (8/20µs) to 100kA (10/350µs)				
Counter range:	from 0 to 999 strikes				
Degree of protection:	IP65				
Resettable:	YES				



CDR-11

Lightning counter for external lightning protection installations.

Valid for round conductors (50-70 mm² or Ø8-10 mm sections).

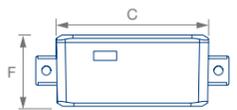
Adapter kit available for plate or flat braid down-conductors.

► CDR-11

Model		A (mm)	B (mm)	C (mm)	F (mm)	D1 (mm)	Weight (g)
CDR-11	430019	105	52	83	40	14	290

Parameters

Functioning temp range:	from -20° to 65°C
Current range:	from 1kA (8/20µs) to 100kA (10/350µs)
Counter range:	from 0 to 999 strikes
Degree of protection:	IP65
Resettable:	NO



CDR-HS

High sensitivity lightning counter for external lightning protection installations with multiple down-conductors (passive systems conductor mesh ...) and / or protection down-conductors in contact metal structures.

Valid for round conductors (50-70mm² or Ø8-10mm sections).

Adapter kit available for plate or flat braid down-conductors.

► CDR-HS

Model	Ref.	A (mm)	B (mm)	C (mm)	F (mm)	D1 (mm)	Weight (g)
CDR-HS	432027	105	52	83	40	14	300

Parameters

Functioning temp range:	from -20° to 65°C
Current range:	from 100A (8/20µs) to 100kA (10/350µs)
Counter range:	from 0 to 999 strikes
Degree of protection:	IP65
Resettable:	NO



LIGHTNING STRIKE COUNTERS FOR ELEVATED STRUCTURES



The High sensitivity of this product allows it to record and report different types of lightning impact in elevated structures that are not detectable by other lightning counters existing in the market.

The use of the **DL EOLOS K15FO** counter in wind turbines helps to considerably reduce the maintenance costs because it informs you exactly which blade has received the lightning impact.

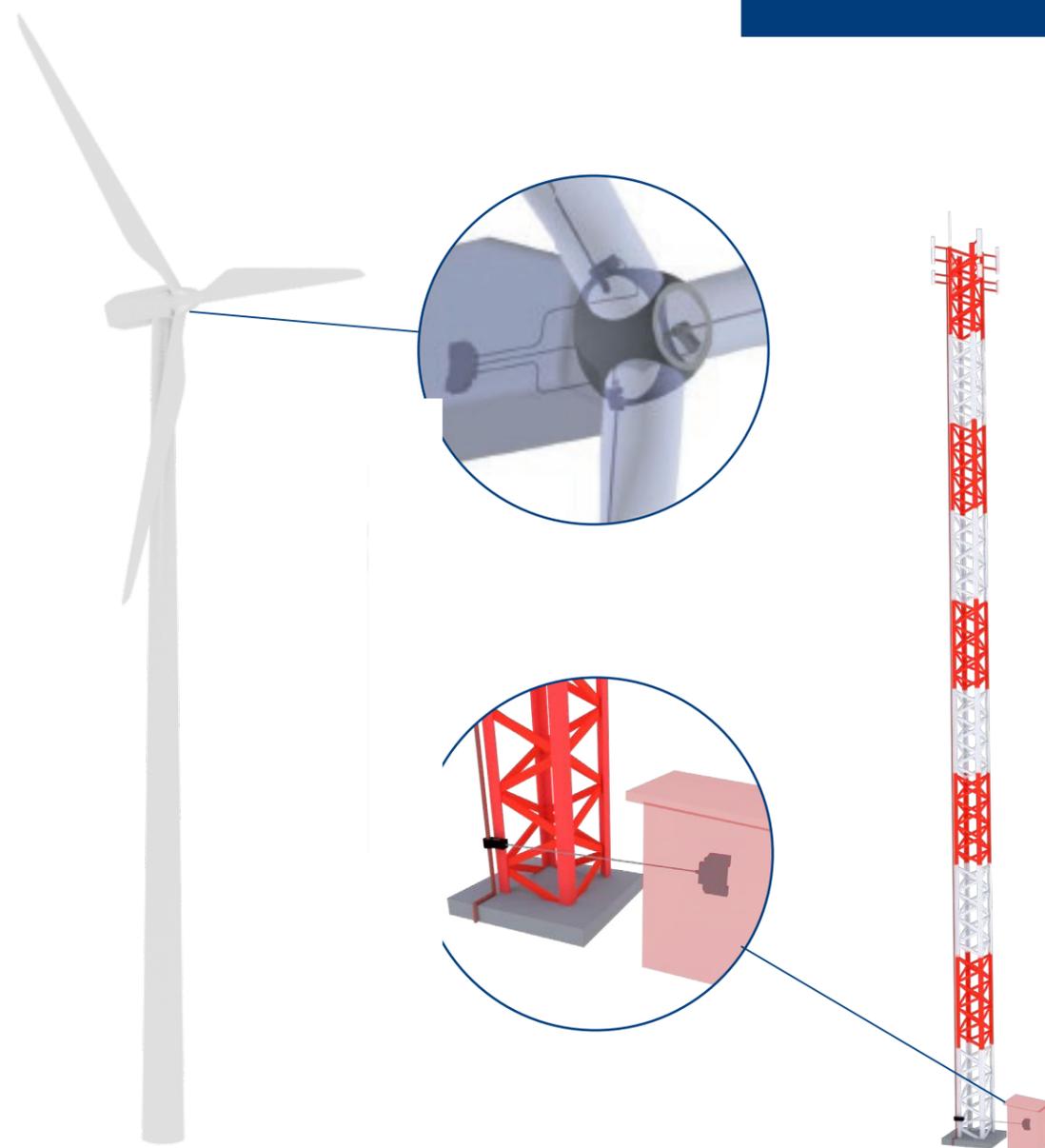
DL EOLOS

IEC 62.305

**IEC
62.561/6:2018**

IEC 61.400-24

UNE 21.186



DL EOLOS K15FO

Bandwidth lightning discharge counter with fiber optic output for wind turbines.

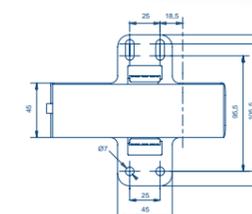
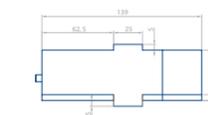
The event notification signals generated by the **DL EOLOS K15FO** counter can be received by the fiber optical **DL EOLOS FO-RCVR-3CH** receiver.

DL EOLOS K15FO

Model	Ref.
DL EOLOS K15FO	430022
DL EOLOS K15FO/820	430022/820
DL EOLOS K15FO/820WM	430022/820WM

Parameters

Temperature range:	-20° to 60°C
Current range:	±180A a ±200kA
Counting range:	Up to 999 events (rolls down to 000)
Protection grade:	IP65



DL EOLOS FO-RCVR

Communications receiver for real-time notification of lightning impacts detection in lightning protection systems.

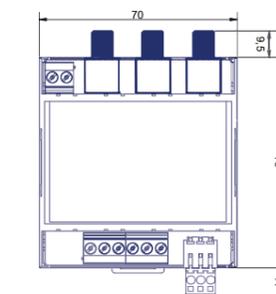
This device operates in conjunction with the **DL EOLOS K15FO** and **DL EOLOS K15FO/820** high-bandwidth lightning counters.

DL EOLOS FO-RCVR-DIN

Model	Ref	Number of outputs
DL EOLOS FO-RCVR-DIN	432036	3
DL EOLOS FO-RCVR-DIN-1CH	432038	1

Parameters

Power supply:	18~28VDC, 0.7W.
Fibre optics:	SMA connector. Compatible with POF, OM1, OM3 and OM4 optical fibres.
Ingress protection:	IP20
Enclosure material:	ABS plastic
Communications:	Modbus RTU over serial RS485 line.
Installation:	DIN rail mount.





SURGE PROTECTION

INTRODUCTION **75**

SPD AC POWER
SUPPLY **77**

DC SPD PV SYSTEMS **81**

SURGE PROTECTION INTRODUCTION

► overview

The voltage surges are elevations in voltage that can occur in electrical distribution, data communications and telephony lines resulting in a premature aging of components and / or damage to the equipment connected to the network.

Overvoltages caused by direct lightning (Fig. 19), indirect (Fig. 20), disconnection of inductive loads (coils, motors, etc ...), network switches and/or defects in them (Fig occur. 21).

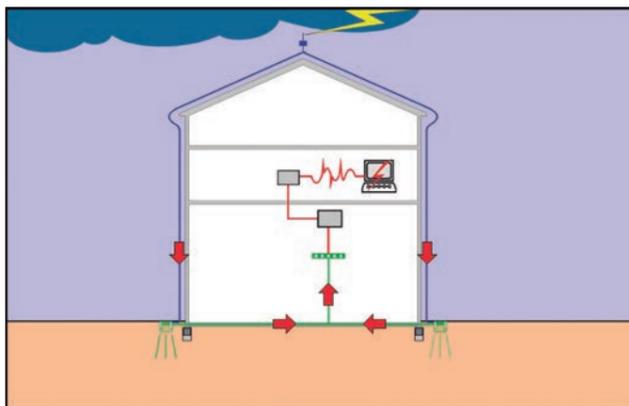


Fig. 19 – Direct discharge.

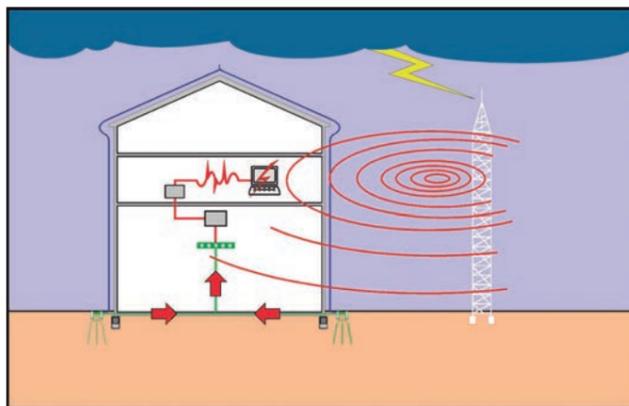


Fig. 20 – Nearby indirect discharge.

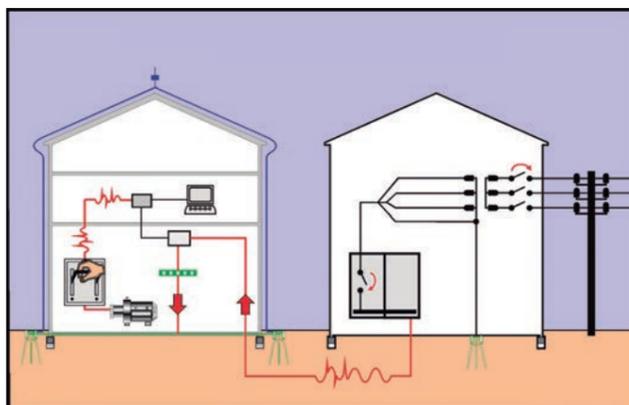


Fig. 21 – Switching networks.

Overvoltage surges are large spikes have with a slope and are short-lived, yet the strong effects on sensitive electronic equipment are devastating.

The level of the voltage that can appear on the network is a function of lightning density level (lightning / year • Km²), the type of attack, aerial or underground, and the proximity of the MV / LV transformer.

For proper protection of the equipment against power surges, a system must perform grounding of low ohmic value and connect equipotentially with an external protection system. Moreover, you should install protection against surges on supply lines (power, telephone, data, etc.).

Installation of external lightning protection (according to **IEC 62305-3**) and surge arresters (according to **IEC 62305-4**) significantly reduces the risk of damage caused by lightning in structures, equipment and people (calculation risks according to **IEC 62305-2**).

► protection zones (LPZ)

• External areas:

LPZ 0_A: area exposed to direct lightning strike (current and total magnetic field).

LPZ 0_B: area exposed to indirect impact (partial flow and total magnetic field).

• Internal areas:

LPZ 1: area exposed to overvoltage (induced current CIDA and attenuated magnetic field).

LPZ 2...n: area exposed to overvoltage (current induced).

SPD: Surge Protectors.

• Sources of damage:

S1: Direct discharge on the structure

S2: Indirect discharge near the structure

S3: The discharge on service lines connected to the structure

S4: Indirect discharge near service lines connected to the structure.

r: rolling sphere radius

1: Structure

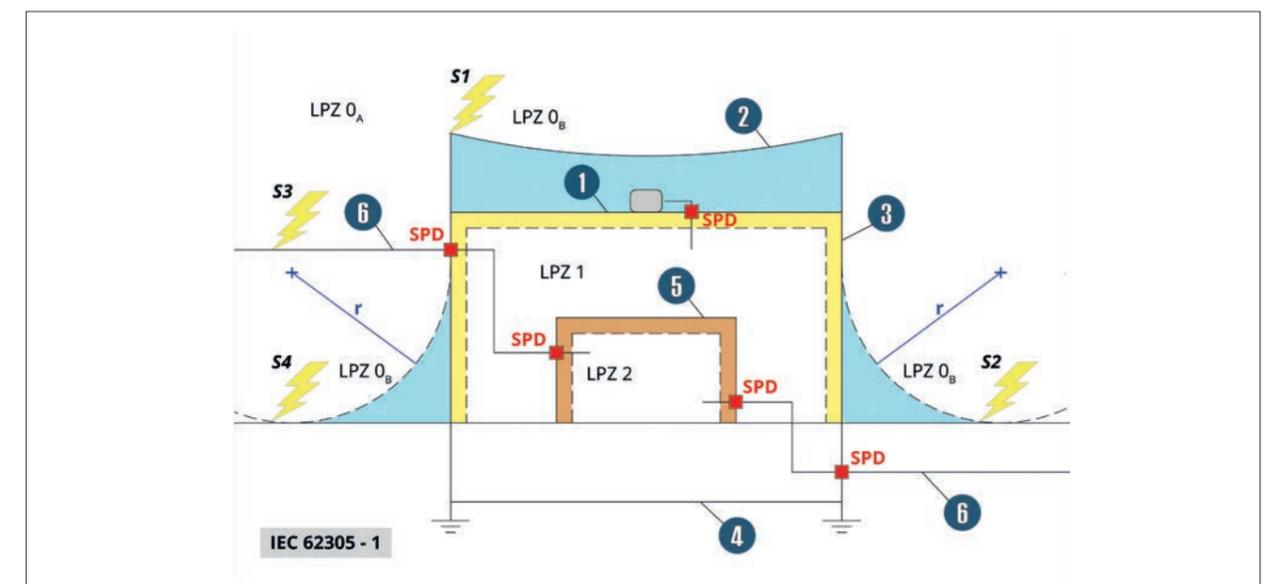
2: Lightning rods

3: Down-conductors

4: Grounding systems

5: Room (shield of LPZ 2)

6: Services connected to the structure



SURGE PROTECTION INTRODUCTION

► surge categories

The categories indicate what the value of voltage shock wave to withstand for the equipment and determine the maximum value of residual voltage U_p which should have surge protectors in each area.

The purpose of installing surge protectors is to avoid the devastating effects of surges on electrical and / or electronic equipment, cutting these peaks to permissible values as per IEC 60664-1, depending on the category that has the equipment want to be protected (Fig. 22).

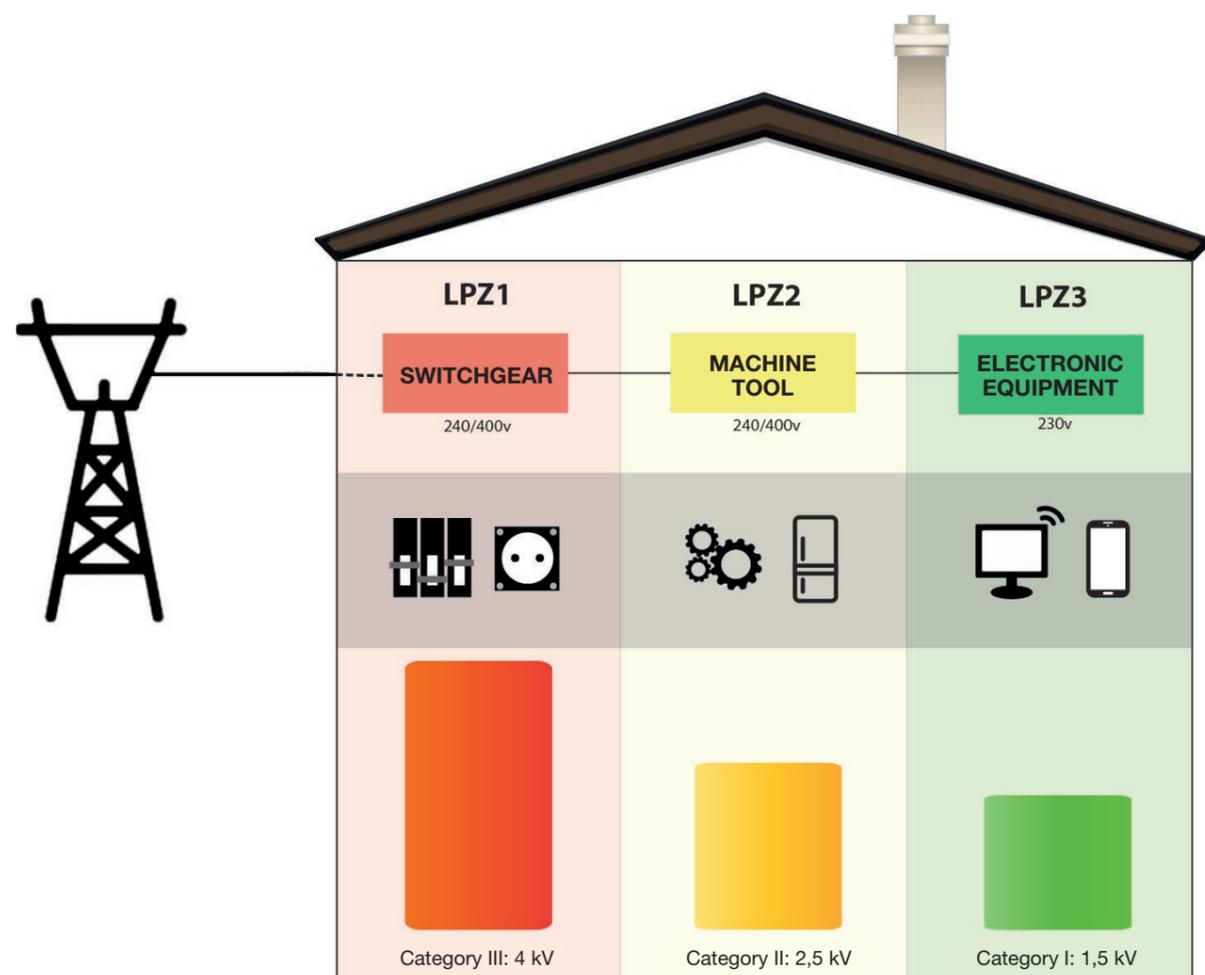


Fig. 22 – Surge categories

► selection of surge protectors

Surge protectors are connected between an active conductor (phase) and ground, upstream of the equipment they protect.

Normal impedance is high, but when the voltage exceeds the threshold voltage, the protector becomes a low-impedance ground to dissipate the surge, protecting the equipment.

To select which protector to install, we must consider:

- Nominal line voltage.
- Number of phases to be protected.
- Type of network (TT, TN, TNC, TNC-S, TN-S).
- Category of equipment to be protected.
- Level of exposure to surges (I_{max}).

► standards

Surge protection devices must conform to the following standards:

- UNE EN 61643-11:2013 Low voltage surge protection devices.
- IEC 62305 series – Lightning protection:
 - IEC 62305-1: Protection against lightning - General principles.
 - IEC 62305-2: Protection against lightning –Risk management.
 - IEC 62305-3: Protection against lightning – Physical damage to structure and life hazard.
 - IEC 62305-4: Protection against lightning – Electrical and electronic systems within structures.
- UNE 21186:2011/NF C 17-102:2011 Protection against lightning: Lightning rods with early stream emitters.
- UNE EN 60664-1 Isolation coordination for low voltage equipment systems (networks).

SPD AC POWER SUPPLY



General protection against lightning and surges of low-voltage on electrotechnical facilities

Effective protection of main lines, branch lines, switchboards and equipment.

Three-phase and single-phase protectors, type 1+2 and type 2.

Easily replaceable, pluggable and blocking system modules

Base and modules configured for secure mounting.

Easy maintenance through local fault locator.

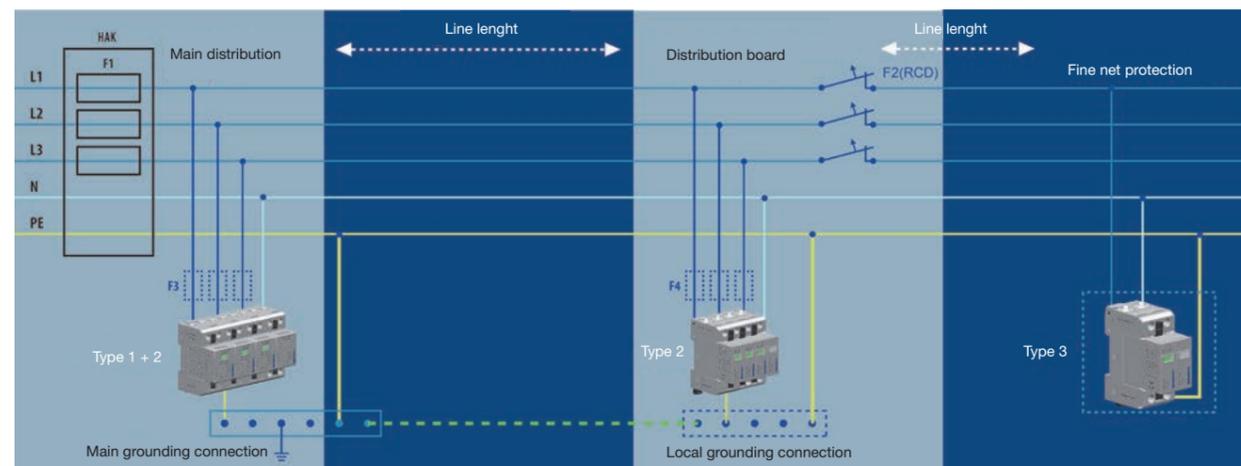
For protection of other lines (voice, data) or other such facilities (electrical installations with different voltage, etc ..) please consult.

**IEC 62305-1, 2, 3
& 4**

IEC 61643-11

EN-60664-1

UNE 21.186:2011



SLS-B+C100/1+1

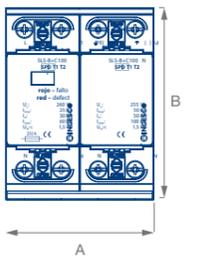
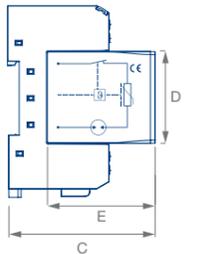
Combined lightning discharger for low voltage networks of type T1 and T2.
220V monophasic lines.

► SLS-B+C100/1+1

Description	Ref.	N° Phases	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-B+C100/1+1	370213	F+N	IP20	from -40° to 80°C	72	90	72	45	48	670
SLS-B+C100/0	370215	-	IP20	from -40° to 80°C	-	-	-	45	48	300

Parameters

		L-N	NPE
Rated voltage	U_n	230 V AC	-
Maximum working voltage	U_c	260 V AC	255 V AC
Peak value of lightning current (10/350µs)	I_{imp}	25 kA	50 kA
Nominal discharge current (8/20µs)	I_n	30 kA	50 kA
Maximum discharge current (8/20µs)	I_{max}	60 kA	100 kA
Protection level	U_p	<1,50 kV	
Maximum fuse protection		250A gL/gG	-
Response time	t_A	100 ns	
Min-max section rigid conductor connection		2,5-50 mm ²	
Min-max section multi-strand conductor connection		2,5-35 mm ²	
Local fault indicator		yes	no
Installation		DIN rail	



SLS-B+C100/3+1

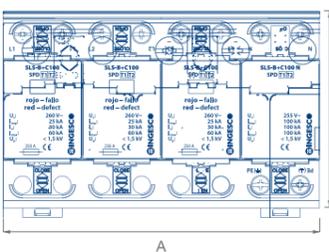
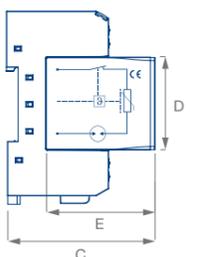
Combined lightning to low voltage discharger for networks of type T1 and T2 .
380V three-phase lines.

► SLS-B+C100/3+1

Description	Ref.	N° Phases	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-B+C100/3+1	370214	3F+N	IP20	from -40° to 80°C	144	90	72	45	48	1300
SLS-B+C100/0	370215	-	IP20	from -40° to 80°C	-	-	-	45	48	300

Parameters

		L-N	NPE
Rated voltage	U_n	230 V AC	-
Maximum working voltage	U_c	260 V AC	255 V AC
Peak value of lightning current (10/350µs)	I_{imp}	25 kA	100 kA
Nominal discharge current (8/20µs)	I_n	30 kA	100 kA
Maximum discharge current (8/20µs)	I_{max}	60 kA	100 kA
Protection level	U_p	<1,50 kV	
Maximum fuse protection		250A gL/gG	-
Response time	t_A	100 ns	
Min-max section rigid conductor connection		2,5-50 mm ²	
Min-max section multi-strand conductor connection		2,5-35 mm ²	
Local fault indicator		yes	no
Installation		DIN rail	



SLS-B+C50/1+1

Combined low-voltage surge protector for type **T1** and **T2**.
230V single phase lines.

► SLS-B+C50/1+1

Description	Ref.	N° Phases	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-B+C50/1+1	370241	F+N	IP20	from -40° to 80°C	36	82	72	45	48	240
SLS-B+C50/0	370247	-	IP20	from -40° to 80°C	-	-	-	45	48	95

Parameters

		L-N	NPE
Rated voltage	U_n	230 V AC	-
Maximum working voltage	U_c	275 V AC	255 V AC
Peak value of lightning current (10/350µs)	I_{imp}	12,5 kA	25 kA
Nominal discharge current (8/20µs)	I_n	30 kA	30 kA
Maximum discharge current (8/20µs)	I_{max}	60 kA	60 kA
Protection level	U_p	<1,2 kV	<1,5 kV
Maximum fuse protection		160A gL/gG	-
Response time	t_A	25 ns	100 ns
Min-max section rigid conductor connection		1-35 mm ²	
Min-max section multi-strand conductor connection		1-25 mm ²	
Local fault indicator		yes	no
Installation		DIN rail 35mm	

SLS-B+C50/3+1

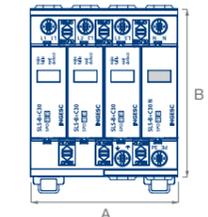
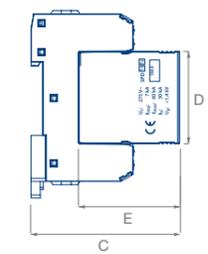
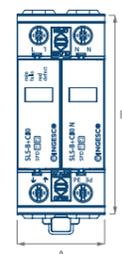
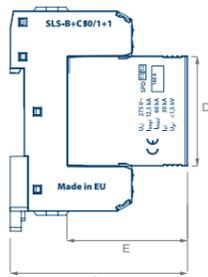
Combined low-voltage surge protector for type **T1** and **T2**.
Three-phase lines 230/400V.

► SLS-B+C50/3+1

Description	Ref.	N° Phases	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-B+C50/3+1	370242	3F+N	IP20	de -40° a 80°C	72	82	72	45	48	460
SLS-B+C50/0	370247	-	IP20	de -40° a 80°C	-	-	-	45	48	95

Parameters

		L-N	NPE
Rated voltage	U_n	230 V AC	-
Maximum working voltage	U_c	275 V AC	255 V AC
Peak value of lightning current (10/350µs)	I_{imp}	12,5 kA	50 kA
Nominal discharge current (8/20µs)	I_n	30 kA	50 kA
Maximum discharge current (8/20µs)	I_{max}	60 kA	100 kA
Protection level	U_p	<1,2 kV	<1,5 kV
Maximum fuse protection		160A gL/gG	-
Response time	t_A	25 ns	100 ns
Min-max section rigid conductor connection		1-35 mm ²	
Min-max section multi-strand conductor connection		1-25 mm ²	
Local fault indicator		yes	no
Installation		DIN rail 35mm	



SLS-C20/1+1

Low-voltage surge protector for type **T2**, class C. 220V single phase lines.

► SLS-C20/1+1

Description	Ref.	N° Phases	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-C20/1+1	370219	F+N	IP20	from -40° to 80°C	36	82	72	45	48	230
SLS-C20/0	370221	-	IP20	from -40° to 80°C	-	-	-	45	48	95

Parameters

		L-N	NPE
Rated voltage	U_n	230 V AC	-
Maximum working voltage	U_c	275 V AC	255 V AC
Peak value of lightning current (10/350µs)	I_{imp}	-	12 kA
Nominal discharge current (8/20µs)	I_n	20 kA	20 kA
Maximum discharge current (8/20µs)	I_{max}	40 kA	40 kA
Protection level	U_p	<1'5 kV	
Maximum fuse protection		160 A gL/gG	-
Response time	t_A	25 ns	
Min-max section rigid conductor connection		1-35 mm ²	
Min-max section multi-strand conductor connection		1-25 mm ²	
Local fault indicator		yes	no
Installation		DIN rail	

SLS-C20/3+1

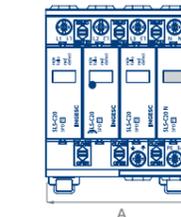
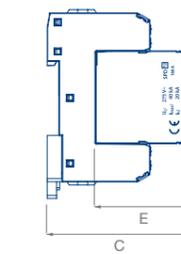
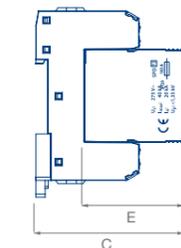
Low-voltage surge protector for type **T2**, class C. 380V three-phase lines.

► SLS-C20/3+1

Description	Ref.	N° Phases	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-C20/3+1	370220	3F+N	IP20	from -40° to 80°C	72	82	72	45	48	450
SLS-C20/0	370221	-	IP20	from -40° to 80°C	-	-	-	45	48	95

Parameters

		L-N	NPE
Rated voltage	U_n	230 V AC	-
Maximum working voltage	U_c	275 V AC	255 V AC
Peak value of lightning current (10/350µs)	I_{imp}	-	12 kA
Nominal discharge current (8/20µs)	I_n	20 kA	20 kA
Maximum discharge current (8/20µs)	I_{max}	40 kA	40 kA
Protection level	U_p	<1,35 kV	<1,50 kV
Maximum fuse protection		160A gL/gG	-
Response time	t_A	25 ns	100 ns
Min-max section rigid conductor connection		1-35 mm ²	
Min-max section multi-strand conductor connection		1-25 mm ²	
Local fault indicator		yes	no
Installation		DIN rail	



DC SPD PV SYSTEMS



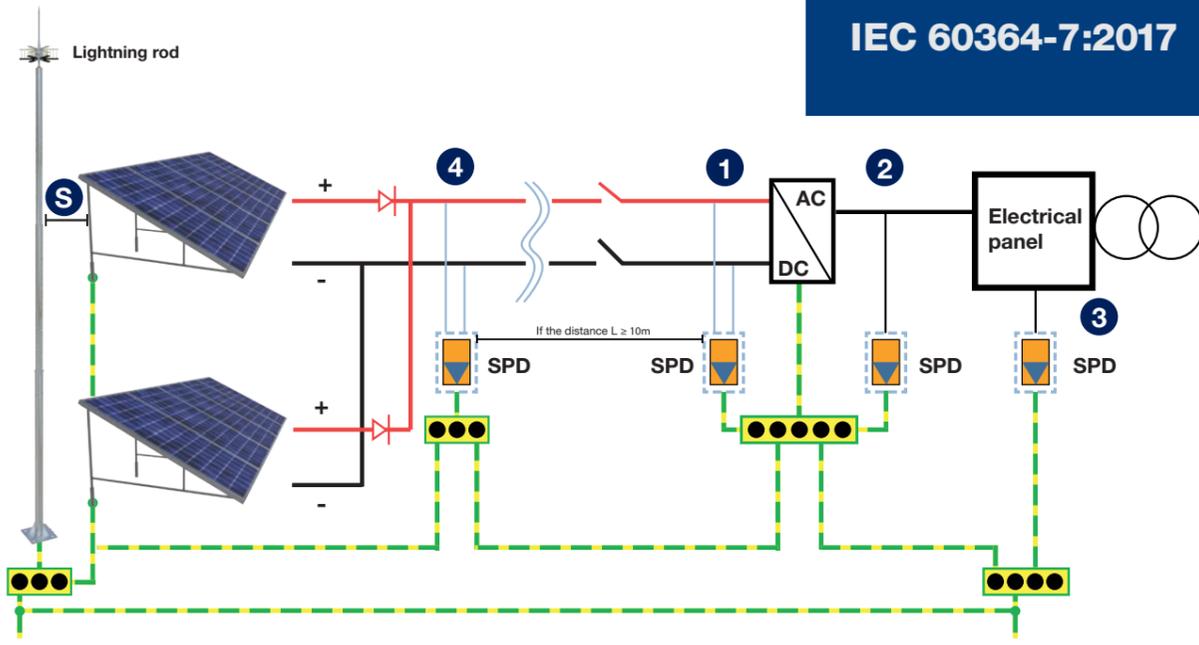
Protection against lightning and transient overvoltage in photovoltaic panels SPD type 2 with Y connection.

Pluggable arresters, easily replaceable modules with locking system

Easy maintenance through a local fault indicator.

For another type of protection of photovoltaic installations, consult.

- IEC 62305-1, 2, 3 & 4
- IEC 61643-11
- EN-60664-1
- UNE 21.186:2011
- NFC 17-102:2011
- RBT ITC-23
- EN 50539-11:2013
- IEC 61643-32:2017
- IEC 60364-7:2017



Types of surge protection devices (SPD) IEC61643-32:2017

Situation	Types of surge protection devices (SPD) IEC61643-32:2017		
	Location 3	Location 2	Locations 1 and 4
Without external LPS	SPD class I (IEC61643-11) or SPD class II (IEC61643-11)	SPD class II (IEC61643-11)	SPD class II (IEC61643-31)
With external LPS with separation distance S	SPD class I (IEC61643-11)	SPD class II (IEC61643-11)	SPD class II (IEC61643-31)
With external LPS without separation distance S	SPD class I (IEC61643-11)	SPD class I (IEC61643-11)	SPD class I (IEC61643-31)

SLS-PV700/3Y

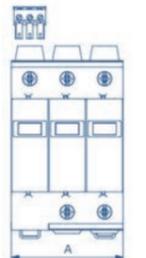
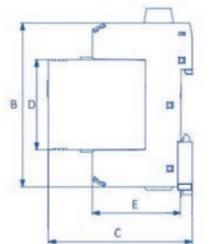
Three-phases type T2 surge arrester 700 V photovoltaic panels.

SLS-PV700/3Y

Description	Ref.	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-PV700/3Y	370239	IP20	-40° a 80°C	54	82	72	45	44	340

Parameters

Maximum operating voltage	750V DC	
Nominal discharge current (8/20 μs)	I _n	20 kA
Maximum discharge current (8/20 μs)	I _{max}	40 kA
Voltage protection level	U _p	3,6 kV
Response time	t _A	25 ns
Cross-section of connected conductors solid	1/35 mm ²	
Cross-section of connected conductors stranded	1/25mm ²	
Fault indication	yes	
Mounting	DIN rail	



SLS-PV1000/3Y

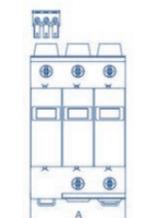
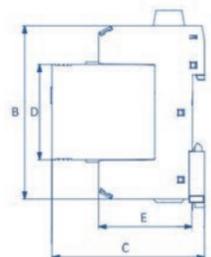
Three-phases type T2 surge arrester for 1000 V photovoltaic panels.

SLS-PV1000/3Y

Description	Ref.	Protection grade	Working temp. range	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	Weight (g)
SLS-PV1000/3Y	370222	IP20	-40° to 80°C	54	82	72	45	44	340

Parameters

Maximum operating voltage	1020V DC	
Nominal discharge current (8/20 μs)	I _n	15kA
Maximum discharge current (8/20 μs)	I _{max}	40 kA
Voltage protection level	U _p	4,0 kV
Response time	t _A	25 ns
Cross-section of connected conductors solid	1/35 mm ²	
Cross-section of connected conductors stranded	1/25 mm ²	
Fault indication	yes	
Mounting	DIN rail	





THUNDERSTORM WARNING SYSTEMS

INTRODUCTION **85**

PREVISTORM® TWS **86**

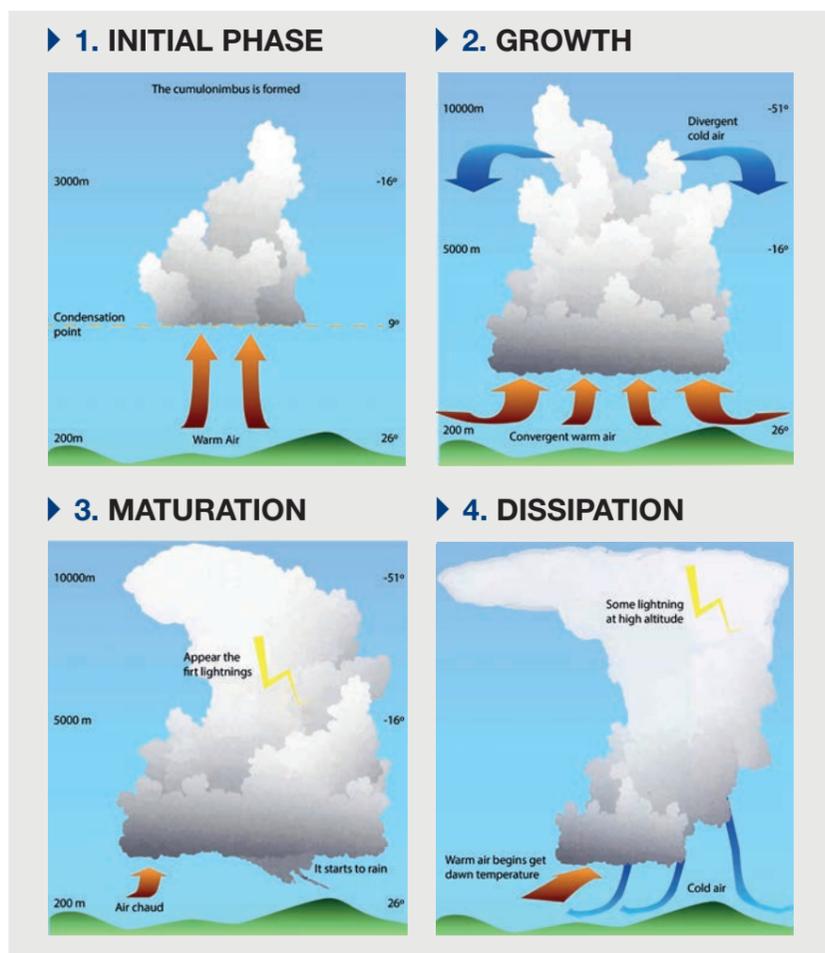
THUNDERSTORM WARNING SYSTEMS: INTRODUCTION

► general information

Every year the direct or indirect effects of lightning strikes cause damages or loses. Both in the public and in the private sector, lightning causes personal and economic damages or the loss of service.

The methods of lightning protection contemplated in the regulations aim to limit damage, but do not cover other potentially dangerous situations caused by storms and lightning that can be dynamically prevented or reduced by activating temporary measures whose origin is a preventive alert provided by a detector system.

To cover these needs, and in order to minimise risks to humans and goods involved, The European Standard UNE-EN IEC 62793:2019 and the international IEC 62793:2020 have been developed and published. These standards define the different types of lightning hazard warning systems and how to implement alarm systems.

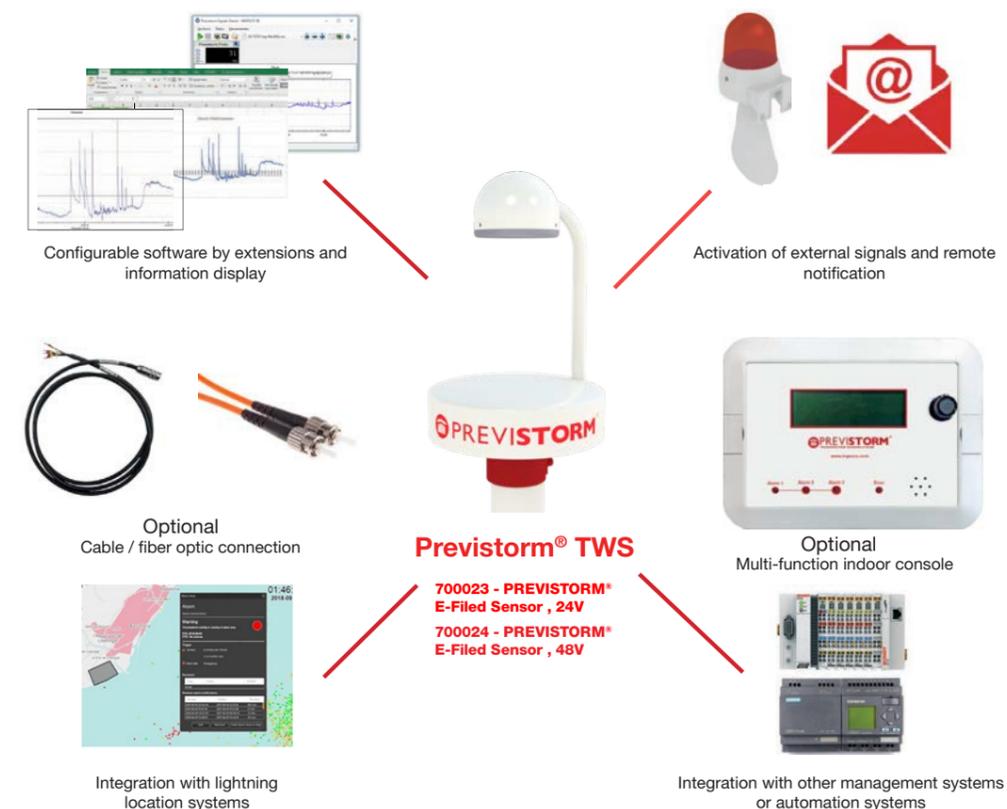


► thunderstorm warning systems (IEC 62793:2020)

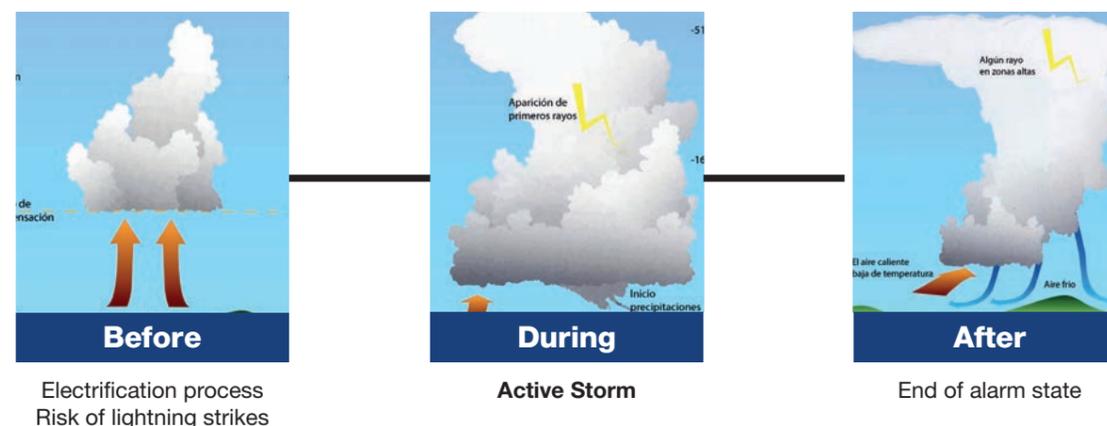
- Local Detector: Detects the electrical storms that occur in the area surrounding the sensor, like the electrostatic field meters based on the principle of electric field mill. Provides information before the first strike (IC/CG) and during all phases of the storm (Phase 1 to 4).
- Electromagnetic sensor: Detects IC lightning (between clouds) and CG lightning (cloud-to-ground) (Phase 2 to 4).
- Lightning location system: Network of sensors that enables the user to track already active storms. Provides information on the possible location of the lightning strikes (Phase 2 to Phase 4).

► PREVISTORM® THUNDERSTORM WARNING SYSTEM: An alert system based on the monitoring of the electric field.

The preventive protection against lightning of PREVISTORM® Thunderstorm Warning System uses the operating principle of the “electric field mill” for the measurement and continuous analysis of the evolution of the atmospheric electric field. This system enables the monitoring of the storm cloud electrification processes, the generation of early warning notifications and the detection of lightning strikes; thus providing a time advantage for the activation of security and protection measures for people and property.



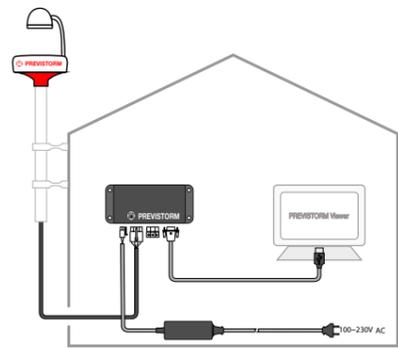
PREVISTORM® Thunderstorm Warning System provides accurate and reliable information throughout the life cycle of the storm



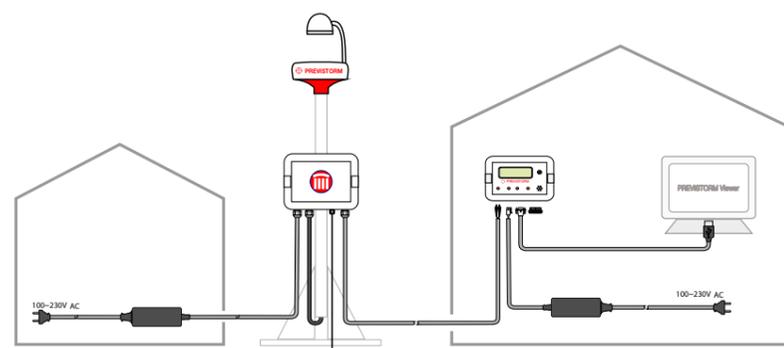
THUNDERSTORM WARNING SYSTEMS: PREVISTORM® TWS

► PREVISTORM® TWS configurable system

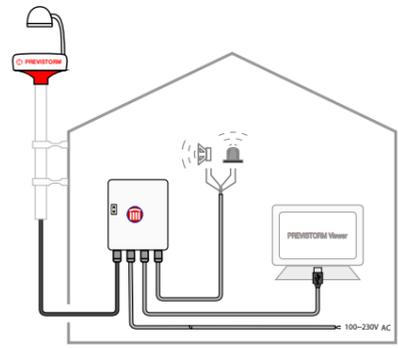
It is a storm warning system of extraordinary efficiency. PREVISTORM® TWS is totally configurable, enabling the user to respond to all kinds of requirements and needs. Its high degree of customization makes the PREVISTORM® TWS one-of-a-kind.



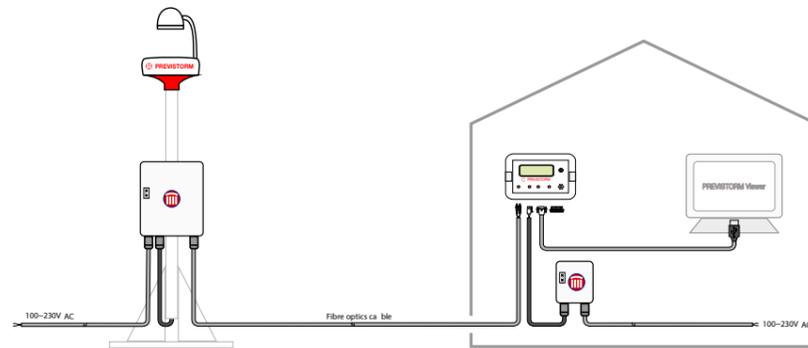
PREVISTORM® TWS for basic application



PREVISTORM® TWS system with fiber optic insulation.



PREVISTORM® TWS for quick installation. Includes control for two alarm devices.



PREVISTORM® TWS with fiber optic insulated sensor and prepared for quick installation.

► multiple applications

There are certain industrial and social activities sensitive to the effects of lightning. For example: companies where dangerous activities and/or work are carried out in open field, telecommunications systems, energy generation, transportation and infrastructure, research centres, fire prevention plants, datacenters, among many others. Activities such as sports, outdoor events, etc. require warning information about lightning hazard.



Power generation and renewables



Industry



Leisure



Research



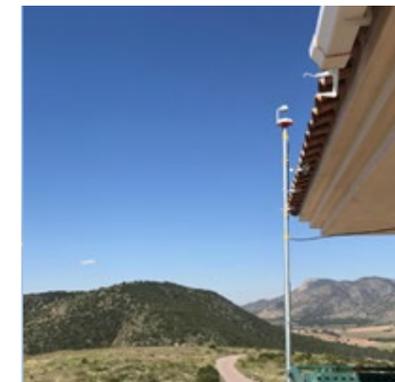
Communications



Sports



Airports and infrastructure



Fire prevention services

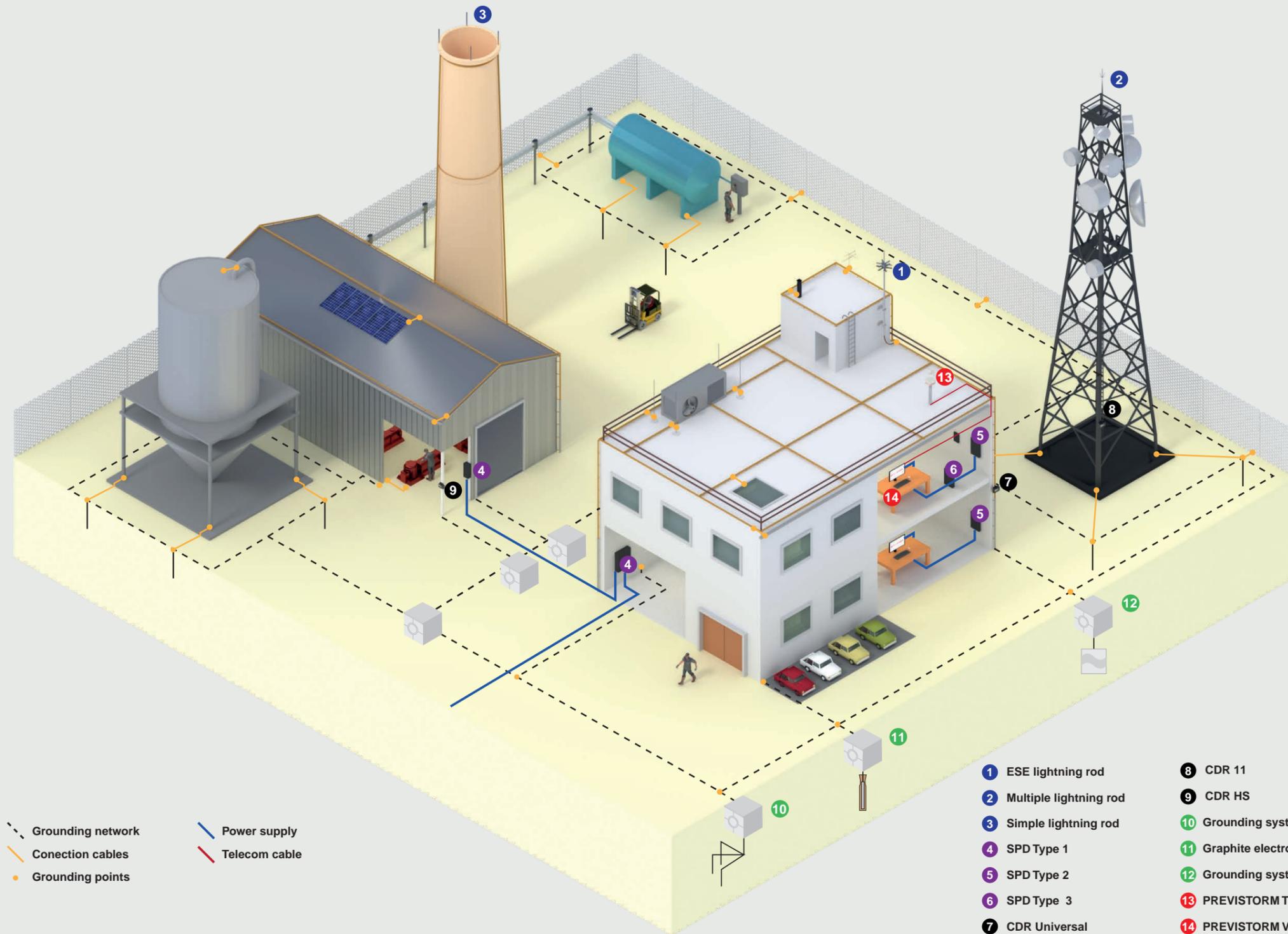


Hydrographic Confederations

INDEX

PER PAGE

91



- 1 ESE lightning rod
- 2 Multiple lightning rod
- 3 Simple lightning rod
- 4 SPD Type 1
- 5 SPD Type 2
- 6 SPD Type 3
- 7 CDR Universal
- 8 CDR 11
- 9 CDR HS
- 10 Grounding system A1
- 11 Graphite electrode
- 12 Grounding system A2
- 13 PREVISTORM TWS
- 14 PREVISTORM Viewer

COMPREHENSIVE PROTECTION SCHEME

- GROUNDING
- OVERVOLTAGES
- EXTERNAL PROTECTION
- PREVENTION
- CONTROL SYSTEMS

INDEX PER PAGE

101000	INGESCO® PDC 3.1 Lightning rod	15	111013	Adapter head - mast 2" Ø20 round	24
101001	INGESCO® PDC 3.3 Lightning rod	15	111019	Adapter head - mast 1" Ø20 round	24
101003	INGESCO® PDC 4.3 Lightning rod	15	111022	Adapter head - mast 1 1/2" Ø16 round	24
101005	INGESCO® PDC 5.3 Lightning rod	15	111025	Adapter head - mast 2" Ø16 round	24
101008	INGESCO® PDC 6.3 Lightning rod	15	111031	SST Adapter head - mast 1 1/2" Ø16 round	24
101009	INGESCO® PDC 6.4 Lightning rod	15	111032	Adapter head - mast 1 1/4" Ø16 round	24
102004	INGESCO® PDC.E 15 Lightning rod	20	111033	Adapter head - mast 1" Ø16 round	24
102005	INGESCO® PDC.E 30 Lightning rod	20	111051	Adapter head - mast 1 1/4" Ø20 round-tape	24
102006	INGESCO® PDC.E 45 Lightning rod	20	111052	SST Adapter head - mast 1 1/2" Ø20 round	24
102007	INGESCO® PDC.E 60 Lightning rod	20	111053	Adapter head - mast 1 1/4" Ø16 round-tape	24
102051	INGESCO® Advanced ESE Tester	20	111054	Adapter head - mast 1 1/2" Ø16 round-tape	24
110028	Simple rod CU600-16	21	111055	Adapter head - mast 2" Ø16 round-tape	24
110031	Simple rod IN2000-20	21	111056	Adapter head - mast 1 1/2" Ø20 round-tape	24
110032	Simple rod IN600-16	21	111057	Adapter head - mast 2" Ø20 round-tape	24
110034	Simple rod CU2000-16	21	111062	SST Adapter head - mast 1 1/4" Ø16 round	24
110035	Simple rod CU1000-16	21	111069	SST Adapter head - mast 1 1/4" Ø20 round-tape	24
110080	Simple rod IN300-16	21	111070	SST Adapter head - mast 1 1/2" Ø20 round-tape	24
110081	Simple rod CU300-16	21	111073	SST Adapter head - mast 1 1/4" Ø20 round	24
110082	Simple rod IN500-16	21	110266	Offset axis brass support for Ø16 lightning rod	25
110083	Simple rod CU500-16	21	110267	Offset axis brass support for Ø20 lightning rod	25
110084	Simple rod IN1000-16	21	110268	Offset axis copper support for Ø16 lightning rod	25
110086	Simple rod IN2000-16	21	110269	Offset axis copper support for Ø20 lightning rod	25
110088	Simple rod IN300-20	21	110271	Offset axis SST support for Ø16 lightning rod	25
110089	Simple rod CU300-20	21	110272	Offset axis SST support for Ø20 lightning rod	25
110090	Simple rod IN500-20	21	111024	Air rod connector Ø16mm - round 50-70mm ²	25
110091	Simple rod CU500-20	21	111038	Air rod connector Ø20mm - round 50-70mm ²	25
110092	Simple rod IN1000-20	21	111039	Air rod connector Ø16mm - tape	25
110093	Simple rod CU1000-20	21	111040	Air rod connector Ø20mm - tape	25
110095	Simple rod CU2000-20	21	110202	1m ALU rod with 110mm rod holder for ridge tiles	26
110215	Simple rod IN1500-16	21	110212	Tilting support for 500mm M20 lightning rod	26
110224	Simple rod CU1500-16	21	110283	Tilting support for 500mm M16 lightning rod	26
110001	Multiple lightning rod in stainless steel (IN)	22	110297	Concrete base 16kg for M16 rods	26
110002	Multiple lightning rod in copper (CU)	22	110298	Concrete base 6,9kg for M16 rods	26
110037	Simple rod AL1000-16	22	112078	Stainless plate air rod support Ø16 Ø20	26
110226	Multiple rod CU 1 1/4" cable - tape	22	112110	Simple air rod support Ø16	26
110227	Multiple rod CU 1 1/2" cable - tape	22	112111	Simple air rod support Ø20	26
110228	Multiple rod IN 1 1/4" cable - tape	22	114041	6m mast Ø1 1/2" - HDG Steel Internal junction	27
110229	Multiple rod IN 1 1/2" cable - tape	22	114042	6m mast Ø1 1/2" - SST Internal junction	27
110245	Simple rod AL300-16	22	114043	3m mast Ø1 1/2" - HDG Steel	27
110284	Simple rod AL3000-16	22	114045	3m mast Ø1 1/2" - SST	27
110291	Simple rod AL500-16	22	114048	6m mast Ø1 1/4" - HDG Steel Internal junction	27
110292	Simple rod AL1500-16	22	114052	3m mast Ø1 1/4" - HDG Steel	27
110293	Simple rod AL2000-16	22	114053	4m mast Ø1 1/2" - HDG Steel Internal junction	27
110003	Multiple rod with horiz. support SE 1000 CU	23	114056	2m mast Ø1 1/2" - HDG Steel	27
110096	Multiple rod with horiz. support SE 1000 Cu/AZ	23	114061	2m mast Ø1 1/4" - HDG Steel	27
110100	Multiple rod with horiz. support SE 2000 Cu/AZ	23	114063	1m mast Ø1 1/2" - HDG Steel	27
111011	Adapter head - mast 1 1/4" Ø20 round	24			
111012	Adapter head - mast 1 1/2" Ø20 round	24			

INDEX PER PAGE

114065	5,8m telescopic mast Ø1 1/2"+Ø1 1/4" - HDG Steel	27	118099	50mm ² cable lag screw fastening bracket M6	34
114066	7,6m telescopic mast Ø2"+Ø1 1/2"+Ø1 1/4" - HDG Steel	27	118100	95mm ² cable lag screw fastening bracket M6	34
114067	8,6m telescopic mast Ø2"+Ø1 1/2"+Ø1 1/4" - HDG Steel	27	118150	35mm ² cable lag screw fastening bracket M6	34
114068	8m mast Ø2"+Ø1 1/2"+Ø1 1/4" -HDG Steel inner join	27	118151	35mm ² cable lag screw fastening bracket M8	34
114069	9m mast Ø2"+Ø1 1/2"+Ø1 1/4" -HDG internal junction	27	118152	35mm ² cable fastening bracket M8	34
114079	1m mast Ø1 1/4" hot dip galv.	27	118153	50mm ² cable fastening bracket M8	34
114091	3,8m telescopic mast Ø1 1/2"+Ø1 1/4" - HDG Steel	27	118154	70mm ² cable fastening bracket M8	34
114075	Free-standing folding mast 10m	28	118155	95mm ² cable fastening bracket M8	34
114076	Free-standing folding mast 12m	28	118185	50 mm ² cable fastening bracket M6	34
114078	Free-standing folding mast 14m	28	118187	35mm ² cable fastening bracket M6	34
114197	Steel tensor cables kit	28	118188	70mm ² cable fastening bracket M6	34
114200	Free-standing folding mast 8m	28	118189	95mm ² cable fastening bracket M6	34
114201	Free-standing folding mast 6m	28	118081	50mm ² cable spike fastening bracket M8	35
114245	6m telescopic mast with adapter piece - Aluminium	28	118082	50mm ² cable spike fastening bracket M6	35
112158	Plate mast anchor V6 15 Ø1 1/4"-2"	29	118084	50mm ² cable foot fastening bracket M8	35
112159	Plate mast anchor V6 30 Ø1 1/4"-2"	29	118088	95mm ² cable spike fastening bracket M8	35
112160	Plate mast anchor V8 60 Ø1 1/4"-2" up.	29	118089	70mm ² cable spike fastening bracket M8	35
112161	Plate mast anchor V8 100 Ø1 1/4"-2"	29	118090	95mm ² cable spike fastening bracket M6	35
112182	Plate mast anchor V6 15 invert. Ø1 1/4"-2"	29	118091	70mm ² cable spike fastening bracket M6	35
112183	Plate mast anchor V6 30 invert. Ø1 1/4"-2"	29	118094	95mm ² cable foot fastening bracket M8	35
112190	Plate mast anchor V8 60 Ø1 1/4"-2" low.	29	118095	70mm ² cable foot fastening bracket M8	35
112166	Double anchoring clamp V6 Ø1 1/4" - 2"	30	118103	30x2mm tape lag screw fastening bracket M6	35
112044	Fastening plate for plate anchor	30	118104	30x2mm tape spike fastening bracket M6	35
112167	Double anchoring cross clamp V6 Ø1 1/4" - 2"	30	118105	30x2mm tape foot fastening bracket M6	35
113083	Simple plate base support Ø1 1/2" for 6m mast	31	118130	35mm ² cable foot fastening bracket M8	35
113092	Plate base support V6 Ø1 1/4"-Ø2"	31	118148	35mm ² cable spike fastening bracket M6	35
112080	Attachment angle 30 Ø1" to 2"	31	118149	35mm ² cable spike fastening bracket M8	35
112103	Attachment angle 60 Ø1" to 2"	31	118156	30x2mm tape fastening bracket M6	35
110241	2m GS Horizontal base support ES for M20 rod	32	118109	50-70mm ² cable folding clamp M8	36
110299	2m INOX Horizontal base support ES for M20 rod	32	118113	50-70mm ² cable lag screw folding clamp M8	36
113037	Simple plate base support Ø1 1/2"	31	118114	50-70mm ² cable spike folding clamp M8	36
117071	35mm ² Stranded Cu Cable	33	118118	30mm tape folding clamp M8	36
117072	50mm ² Stranded Cu Cable	33	118119	30mm tape lag screw folding clamp M8	36
117073	70mm ² Stranded Cu Cable	33	118120	30mm tape spike folding clamp M8	36
117074	95mm ² Stranded Cu Cable	33	118136	50-70mm ² cable foot folding clamp M8	36
117081	Ø8 round Galv.Steel conductor (125m coil)	33	118157	30mm tape foot folding clamp M8	36
117082	Coil 50m tinned copper flat conductor 30x2mm	33	118312	Concrete holder for Ø6-11 & 30x2-8 without bottom	38
118000	70mm ² cable lag screw fastening bracket M6	34	118313	Empty holder for Ø6-11 & 30x2-8 without bottom	38
118083	50mm ² cable lag screw fastening bracket M8	34	115000	35-70mm ² to 35-70mm ² linear connector	39
118092	95mm ² cable lag screw fastening bracket M8	34	115001	35-70mm ² to 95-120mm ² /Ø14 linear connector	39
118093	70mm ² cable lag screw fastening bracket M8	34	115002	95-120mm ² /Ø14 to 95-120mm ² /Ø14 linear connector	39
			115003	35-70mm ² to Ø18 linear connector	39
			115004	95-120mm ² to Ø18 linear connector	39
			115005	"T" connector for 35-70mm ² to 35-70mm ² cables	39

INDEX PER PAGE

115006	"T" connector for 35-70mm ² to 95-120mm ² cables	39	115301	CU adaptable connector for Ø8-10mm conductor	41
115007	"T" connector for 95-120mm ² to 35-70mm ² cables	39	115302	SST adaptable connector for Ø8-10mm conductor	41
115008	"T" connector for 95-120mm ² to 95-120mm ² cables	39	115303	Bi-metal adaptable connector for Ø8-10mm conductor	41
118106	50mm ² PA clamping bracket M8	37	115304	SST adaptable connector for Ø8-10x16mm	41
118117	50mm ² PA lag screw clamping bracket M8	37	115093	Cu cross connector for tape conductors	41
118125	Cu light clamp for round conductor	37	115097	25-120mm ² toothed flat cable terminal	42
118129	CuSn light clamp for round conductor	37	115104	Type "C" Copper pressure connection	42
118146	SST light clamp for round conductor	37	115105	Bi-metal connector for Rd8-10&FL30	42
118158	50mm ² PA foot clamping bracket M8	37	115223	HDP Cross connector for tape conductors	42
118176	SST 316 Cable Tie for Max Ø90mm (L:300mm)	37	115296	SST cross connector for tape and Ø8-10 conductors	42
118177	PA w/Ø20 tube clamp 50mm ² cable	37	115305	HDG cross connector for tape and Ø8-10 conductors	42
118218	SST 316 Cable Tie for Max Ø25mm (L:127mm)	37	115306	Ø8 Aluminium Expansion piece	42
118245	SST 316 Cable Tie for Max Ø304mm (L:998mm)	37	115307	SST cross connector for tape conductors	42
118108	Profile clamping bracket	38	119091	Zinc plated steel - PVC shielded tube	43
118122	Cu light clamp for tape	38	119095	Profile for flat conductor	43
118128	CuSn light clamp for tape	38	119109	Ø30 2m Galvanized steel protection tube	43
118167	SST light clamp for tape	38	119110	Ø32 2,5m Cross-linked polyethylene protection tube	43
118179	PA fastening bracket for Ø6-8/30mm	38	119113	Ø32 Cross-linked polyethylene tube (50m coil)	43
118193	PA fastening bracket for Ø6-8/30mm + M6 screw	38	116061	Spark gap VX-1	44
118212	PA fastening bracket for Ø6-8/30mm + leg	38	116062	Spark gap VX-1 + connectors 50-70mm ² cable	44
118242	Roof tile support with PA bracket for 50-70mm ²	38	116064	Spark gap VX-1 + connectors 95mm ² cable	44
115094	30x2-4mm tape - Ø18 rod sleeve connector	40	116071	Spark gap VX-1 + connectors 30x2mm tape	44
115174	30x2-4mm tape - Ø14 rod sleeve connector	40	252112	CCS 2500 Ø17mm grounding rod (254µm)	49
115198	Grounding clamp for Ø14-20 rod to 30x1-10mm tape	40	252122	CCS 1000 Ø14mm grounding rod (254µm)	49
115201	Grounding clamp for Ø14-20 rod to 25-95mm ² cable	40	252123	CCS 1500 Ø14mm grounding rod (254µm)	49
112115	Universal connector	42	252124	CCS 2000 Ø14mm grounding rod (254µm)	49
115098	HDG cross connector for Ø8-10mm round conductor	41	252125	CCS 2500 Ø14mm grounding rod (254µm)	49
115100	HDG adaptable connector for Ø8-10mm conductor	41	252126	CCS 3000 Ø14mm grounding rod (254µm)	49
115225	Earthing clamp for rod Ø14-20 to 50-150mm ² cables	41	252127	CCS 1000 Ø17mm grounding rod (254µm)	49
115257	SST cross connector for Ø8-10x16mm conductors	41	252128	CCS 1500 Ø17mm grounding rod (254µm)	49
115297	Cu cross connector for Ø8-10mm conductors	41	252129	CCS 2000 Ø17mm grounding rod (254µm)	49
115298	Cu cross connector for Ø8-10x16mm conductors	41	252130	CCS 3000 Ø17mm grounding rod (254µm)	49
115299	HDG cross connector for Ø8-10x16mm conductors	41	252000	CCS 1500 Ø14,2 (5/8") 1 thread grounding rod 254µm	50
115300	ALU adaptable connector for Ø8-10mm conductor	41	252001	CCS 2000 Ø14,2 (5/8") 1 thread grounding rod 254µm	50
			252002	CCS 2500 Ø14,2 (5/8") 1 thread grounding rod 254µm	50
			252003	CCS 3000 Ø14,2 (5/8") 1 thread grounding rod 254µm	50
			252004	CCS 1500 Ø17,3 (3/4") 1 thread grounding rod 254µm	50

INDEX PER PAGE

252005	CCS 2000 Ø17,3 (3/4") 1 thread grounding rod 254µm	50	250009	Equipotential bonding bar 5 way with insulators	53
252006	CCS 2500 Ø17,3 (3/4") 1 thread grounding rod 254µm	50	250026	Equipotential bonding bar 2 way (cable/tape)	53
252007	CCS 3000 Ø17,3 (3/4") 1 thread grounding rod 254µm	50	250027	Equipotential bonding bar 3 way (cable/tape)	53
252008	CCS 1500 Ø14,2 (5/8") 2 thread grounding rod 254µm	50	250028	Equipotential bonding bar 4 way (cable/tape)	53
252009	CCS 2000 Ø14,2 (5/8") 2 thread grounding rod 254µm	50	250029	Equipotential bonding bar 5 way (cable/tape)	53
252010	CCS 2500 Ø14,2 (5/8") 2 thread grounding rod 254µm	50	250102	Equip.Cu Bar 13 Connec. M10	53
252011	CCS 3000 Ø14,2 (5/8") 2 thread grounding rod 254µm	50	250103	Equipotential bonding bar 28 way M10 with 4 Links	53
252012	CCS 1500 Ø17,3 (3/4") 2 thread grounding rod 254µm	50	250106	Equipotential bonding bar 6 way M10 with 1 Link	53
252013	CCS 2000 Ø17,3 (3/4") 2 thread grounding rod 254µm	50	250107	Equipotential bonding bar 8 way M10 with 1 Link	53
252014	CCS 2500 Ø17,3 (3/4") 2 thread grounding rod 254µm	50	250109	Equipotential bonding bar 10 way M10 with 2 Links	53
252015	CCS 3000 Ø17,3 (3/4") 2 thread grounding rod 254µm	50	250110	Equipotential bonding bar 15 way M10 with 2 Links	53
252016	Connector for 5/8" rods	50	250111	Equipotential bonding bar 20 way M10 with 2 Links	53
252019	Connector for 3/4" rods	50	250006	50mm ² cable test joint in box	54
252132	Driving stud for 5/8" rod	50	250010	70mm ² wire adapter kit	54
252133	Driving stud for 3/4" rod	50	250011	95mm ² wire adapter kit	54
252134	Driving spike for Ø14mm rod	50	250012	30x2mm tape adapter kit	54
252098	Driving spike for Ø18mm rod	50	250032	Cold Galvanizing Spray 400ml	62
252025	Galv.steel spliceable rod	50	250049	Test joint box with transparent cover	54
252026	Piercing tip	50	250099	Flat conductor test joint in box	54
119094	Humidification tube	52	800035	Anti-corrosion plastic tape Width 100mm (L=10m)	62
251012	500x500x2 Stainless steel plate with SST sleeve	51	800148	Anti-corrosion plastic tape Width 50mm (L=10m)	62
251021	500 "U" connection copper plate	51	253032	Polyester round chamber	55
251024	600 "U" connection copper plate	51	253033	31,5x31x5 Cast iron cover and frame	55
251036	Copper lattice plate 630 x 630	51	253037	Aluminum cover and frame	55
251038	Copper lattice plate 830 x 830	51	253057	30x30 PP square chamber with PVC cover	55
252034	1500mm galvanized steel crow's foot kit	50	253058	30x30 PP square chamber with PP cover	55
252035	3000mm galvanized steel crow's foot kit	50	253059	35x35 Square concrete chamber	56
252051	1500mm coppered tin crow's foot kit	50	256001	PVC ground signs	56
251017	Sacrificial anode Model HC 200	52	256002	Aluminum ground signs	56
251018	Sacrificial anode Model MC 600	52	256003	PVC lightning rod signs	56
251019	Sacrificial anode Model LC 260	52	500005	Welding mould for lineal connect. Cables 35-35	57
252039	Ø50x600 Graphite electrode	51	500006	Welding mould for lineal connect. Cables 50-35	57
252052	3000mm coppered tin crow's foot kit	50	500007	Welding mould for lineal connect. Cables 50-50	57
254041	Mineral compound QUIBACSOL 10 kg	52	500008	Welding mould for lineal connect. Cables 70-35	57
250001	Equipotential bonding bar 2 way with insulators	53	500009	Welding mould for lineal connect. Cables 70-50	57
250007	Equipotential bonding bar 3 way with insulators	53			
250008	Equipotential bonding bar 4 way with insulators	53			

INDEX PER PAGE

500010	Welding mould for lineal connect. Cables 70-70	57	500038	Welding mould for "T" connect. rod-cable Ø14-35	59
500011	Welding mould for "T" connect. cable-cable 35-35	58	500039	Welding mould for "T" connect. rod-cable Ø14-50	59
500012	Welding mould for "T" connect. cable-cable 35-50	58	500040	Welding mould for "T" connect. rod-cable Ø14-70	59
500013	Welding mould for "T" connect. cable-cable 35-70	58	500041	Welding mould for "T" connect. rod-cable Ø18-35	59
500014	Welding mould for "T" connect. cable-cable 50-35	58	500042	Welding mould for "T" connect. rod-cable Ø18-50	59
500015	Welding mould for "T" connect. cable-cable 50-50	58	500043	Welding mould for "T" connect. rod-cable Ø18-70	59
500016	Welding mould for "T" connect. cable-cable 50-70	58	500044	Welding mould linear connection rod-cable 14/35	59
500017	Welding mould for "T" connect. cable-cable 70-35	58	500045	Welding mould linear connection rod-cable 14/50	59
500018	Welding mould for "T" connect. cable-cable 70-50	58	500046	Welding mould linear connection rod-cable 14/70	59
500019	Welding mould for "T" connect. cable-cable 70-70	58	500047	Welding mould linear connection rod-cable 18/35	59
500020	Welding mould for parallel connect. cables 35-35	58	500048	Welding mould linear connection rod-cable 18/50	59
500021	Welding mould for parallel connect. cables 35-50	58	500049	Welding mould linear connection rod-cable 18/70	59
500022	Welding mould for parallel connect. cables 35-70	58	500050	Welding mould for "X" connect. round-cable 10-35	59
500023	Welding mould for parallel connect. cables 50-35	58	500051	Welding mould for "X" connect. round-cable 10-50	59
500024	Welding mould for parallel connect. cables 50-50	58	500052	Welding mould for "X" connect. round-cable 10-70	59
500025	Welding mould for parallel connect. cables 50-70	58	500053	Welding mould for "X" connect. round-cable 16-35	59
500026	Welding mould for parallel connect. cables 70-35	58	500054	Welding mould for "X" connect. round-cable 16-35	59
500027	Welding mould for parallel connect. cables 70-50	58	500055	Welding mould for "X" connect. round-cable 16-70	59
500028	Welding mould for parallel connect. cables 70-70	58	500056	Welding mould vertical connection plate-cable 35	59
500029	Welding mould for "X" connect. cable-cable 35-35	58	500057	Welding mould vertical connection plate-cable 50	59
500030	Welding mould for "X" connect. cable-cable 35-50	58	500058	Welding mould vertical connection plate-cable 70	59
500031	Welding mould for "X" connect. cable-cable 35-70	58	500001	Load cartridge C4 (45g) Pack 20 Uds	60
500032	Welding mould for "X" connect. cable-cable 50-35	58	500002	Load cartridge C5 (65g) Pack 10 Uds	60
500033	Welding mould for "X" connect. cable-cable 50-50	58	500003	Load cartridge C6 (90g) Pack 10 Uds	60
500034	Welding mould for "X" connect. cable-cable 50-70	58	500004	Load cartridge C7 (115g) Pack 10 Uds	60
500035	Welding mould for "X" connect. cable-cable 70-35	58	500059	Welding mould lineal connect. cable-tape 35/25x3	60
500036	Welding mould for "X" connect. cable-cable 70-50	58	500060	Welding mould lineal connect. cable-tape 50/25x3	60
500037	Welding mould for "X" connect. cable-cable 70-70	58	500061	Welding mould lineal connect. cable-tape 70/25x3	60

INDEX PER PAGE

500064	Welding mould for "X" connection tapes 25x3	60	500066	Tweezer T-80	61
500065	Welding mould for parallel connect. tapes 25x3	60	500067	Wire brush	61
500068	Brush	61	500069	Scraper R-4 (for C4 and C5 loads)	61
500070	Scraper R-9 (for C6 and C7 loads)	61	500071	Ignition gun	61
500072	Remote ignition device	61	500073	Long distance ignition consumable	61
500074	Quick clamping auxiliary cover	61	500091	Sealing paste 0.9kg	61
432028	Lightning counter CDR UNIVERSAL	67	430022	Lightning counter DL EOLOS K15FO 820 /820WM Wall Mounted	70
430019	Lightning counter CDR-11	68	430022	Lightning counter DL EOLOS K15FO 820 /820WM Wall Mounted	70
432027	Lightning counter CDR-HS	68	430022	Lightning counter DL EOLOS K15FO	70
430022/WM	Lightning counter DL EOLOS K15FO Wall Mounted	70	370213	Surge arrester SLS-B+C100/1+1	78
430022	Lightning counter DL EOLOS K15FO 820 /820WM Wall Mounted	70	370214	Surge arrester SLS-B+C100/3+1	78
430022	Lightning counter DL EOLOS K15FO	70	370215	Surge arrester SLS-B+C100/0	78
370213	Surge arrester SLS-B+C100/1+1	78	370241	Surge arrester SLS-B+C50/1+1	79
370214	Surge arrester SLS-B+C100/3+1	78	370242	Surge arrester SLS-B+C50/3+1	79
370215	Surge arrester SLS-B+C100/0	78	370247	Surge arrester SLS-B+C50/0	79
370241	Surge arrester SLS-B+C50/1+1	79	370219	Surge arrester SLS-C20/1+1	80
370242	Surge arrester SLS-B+C50/3+1	79	370220	Surge arrester SLS-C20/3+1	80
370247	Surge arrester SLS-B+C50/0	79	370221	Surge arrester SLS-C20/0	80
370219	Surge arrester SLS-C20/1+1	80	370222	Surge arrester SLS-PV 1000 V/3Y	82
370220	Surge arrester SLS-C20/3+1	80	370239	Surge arrester SLS PV700/3Y	82
370221	Surge arrester SLS-C20/0	80			
370222	Surge arrester SLS-PV 1000 V/3Y	82			

- ▶▶ **LEADERS IN LIGHTNING PROTECTION SINCE 1973**
- ▶▶ **PRESENT IN MORE THAN 60 COUNTRIES**
- ▶▶ **PRODUCTS MANUFACTURED IN SPAIN**
- ▶▶ **DESING OF PREVENTIVE PROTECTION PROJECTS**
- ▶▶ **PRODUCTS NATURAL FIELD TESTED AND CERTIFIED**
- ▶▶ **INGESCO CALCULUS: ON-LINE RISK CALCULATION SOFTWARE**



DENA DESARROLLOS SL

Cardener 5 | 08223 Terrassa
 Barcelona | Spain
 937 360 305
 (+34) 937 360 314
 export@ingesco.com

ingesco.com

