



INGESC

LIGHTNING SOLUTIONS

EXTERNAL LIGHTNING
PROTECTION

P R O D U C T S & S E R V I C E S • 2 0 1 8



EXTERNAL LIGHTNING PROTECTION

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ACTIVE RODS: 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.

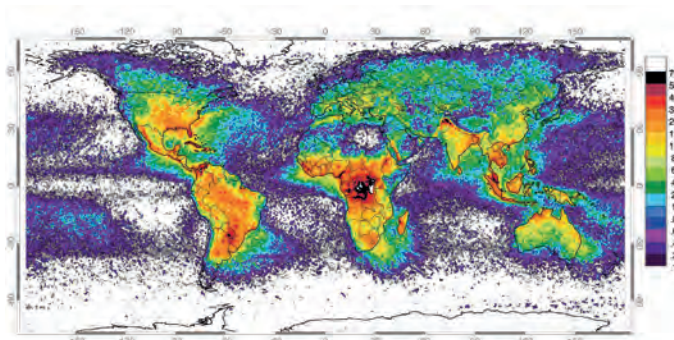


Fig. 1 - Lightning distribution map.



Fig. 2 - www.ingesco.com/estudios

► protection radius calculation

Lightning rods with an early streamer 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.

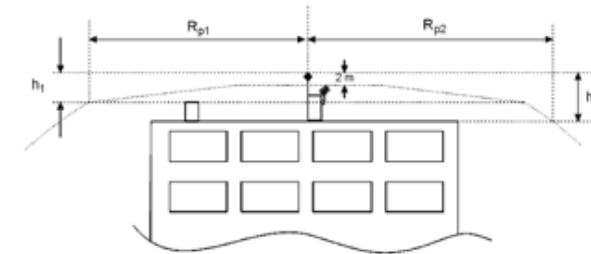
Model	PDC 3.1	PDC 3.3	PDC 4.3	PDC 5.3	PDC 6.3	PDC 6.4
Ref.	101000	101001	101003	101005	101008	101009
Δt	15μs	25μs	34μs	43μs	54μs	60μs

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

UNE 2118: 2011 (paragraph C.2.2) indicates that a ESE lightning rod must obtain an early streamer 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 notional sphere radius r based on the level of protection.

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

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

Whereas:

Rp: Resulting protection radius.

r: The radius of the notional 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

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).

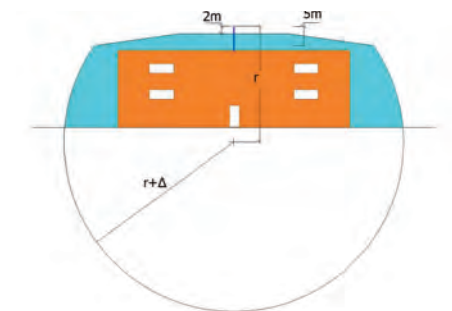


Fig. 3 - Volume protected with ESE lightning rod.



Fig. 4 - ESE protection volume.

PASSIVE SYSTEMS: FRANKLIN 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 62305:2013** Lightning protection (Parts 1, 2, 3 y 4).
- **UNE - EN 62305:2011** Protection against lightning (Parts 1, 2, 3 y 4).
- **NFPA 780:2014** Standard for the installation of lightning protection systems.

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

► risk calculation

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

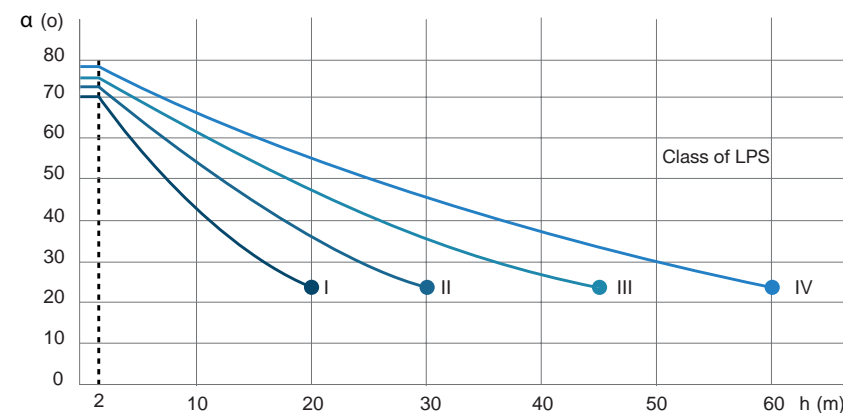


Fig. 5 – Angles α corresponding to protection classes of IEC 62305-3 LPS.

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

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

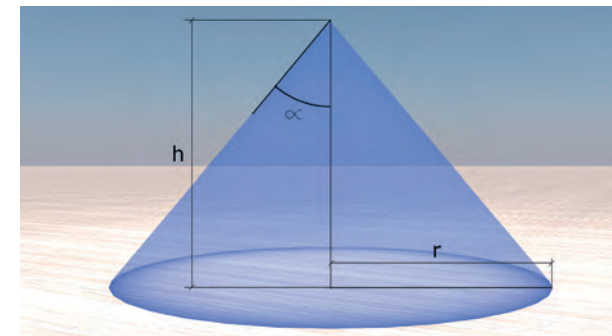


Fig. 6 – Protected volume by a vertical point. IEC 62305-3.

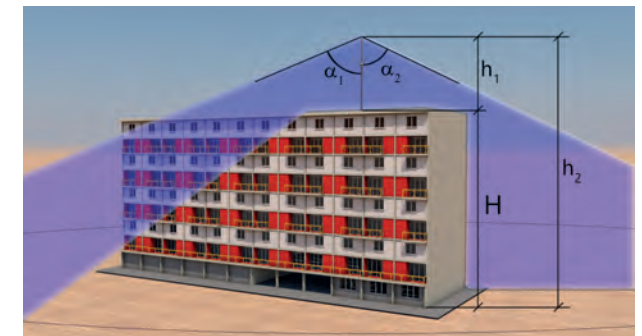


Fig. 7 – Protection volume angles α_1 and α_2 depending on heights h_1 and h_2 .

• 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.

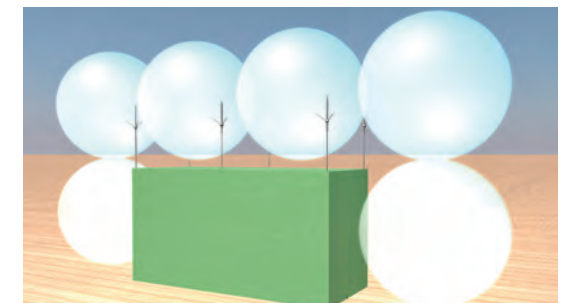
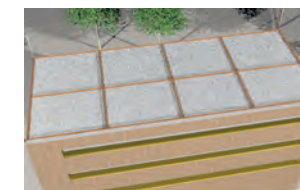


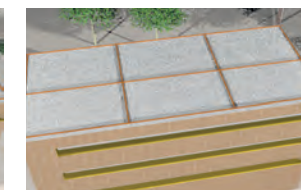
Fig. 8 – Protected volume by the rolling sphere method.

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 notional sphere of radius r (see Table 4).

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



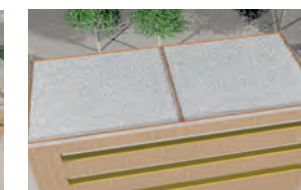
LEVEL I



LEVEL II



LEVEL III



LEVEL IV

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

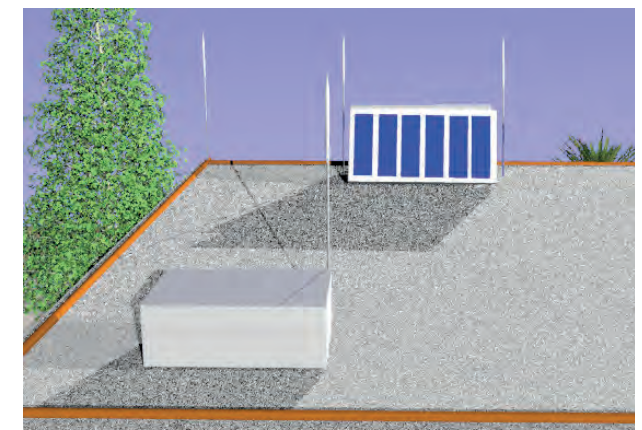


Fig. 10 – Protection of protruding structures with a capture mesh system by lightning rods.

DOWN CONDUCTORS

► ESE down conductors

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

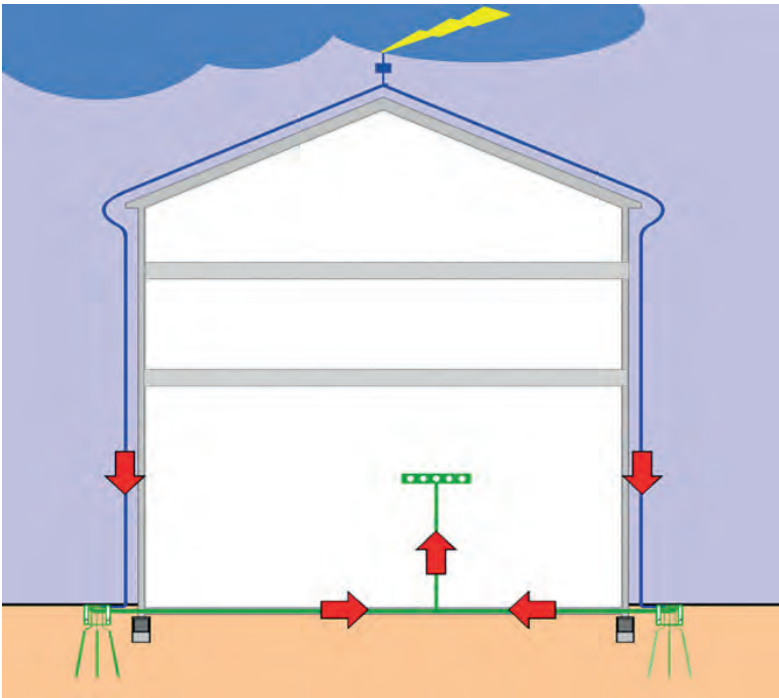


Fig. 11 – Down conductors of LPS by ESE.

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. Its path must be as straight as possible, using the shortest path to earth, 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 respect the materials and dimensions specified in IEC 62561-2. Those indicated in table 5 are the most recommended materials.

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 downspout ground shall be properly secured and tightened, with reference driver three clips per meter.

Protect the bottom of the downspout by a protective tube of at least 2 m.

The installation of a lightning counter above the protective tube is recommended to perform the verification and maintenance of the facility.

► LPS passive 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 exposed corners 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 that form the mesh must be properly set, taking as reference 1 conductor clamp per meter.

Protect the bottom of the downspout 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).

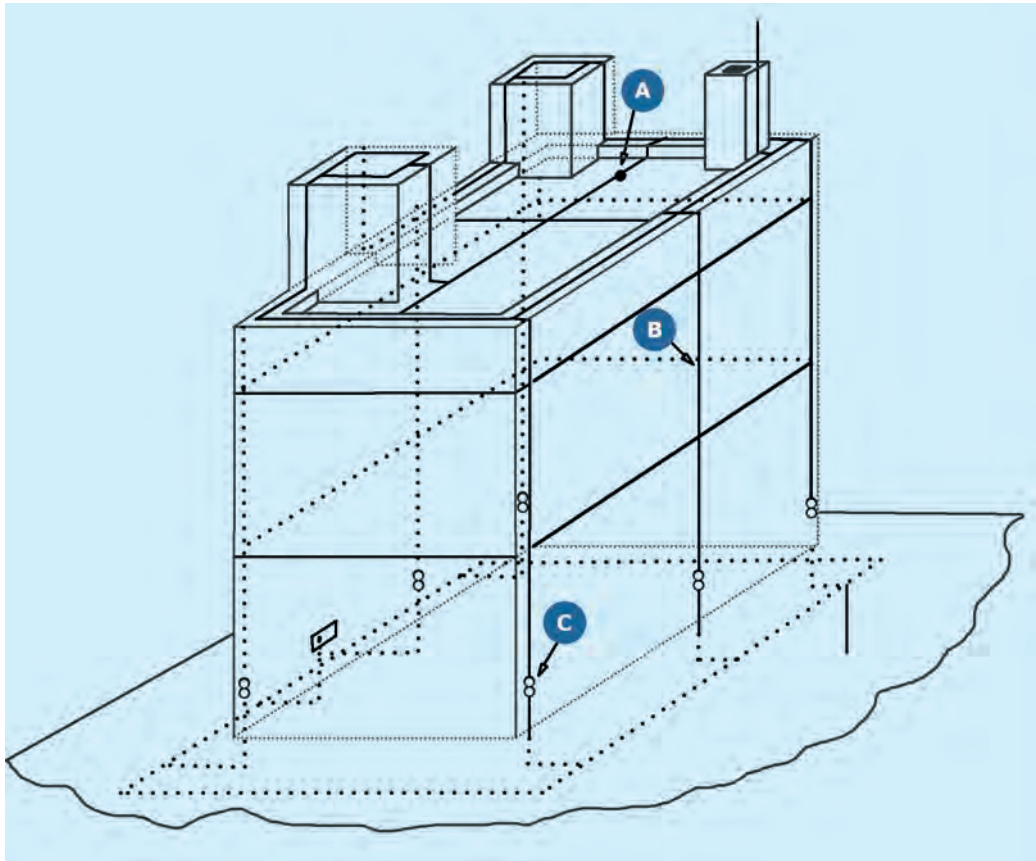


Fig. 12 – LPS passive scheme:
A: Horizontal conductor cover
B: Grounded conductor
C: Down conductor isolator

INGESCO® PDC (ESE) LIGHTNING RODS



Non-expendable

5 year warranty

Natural field trials

Max. current 200kA

No maintenance

Stainless steel 316 L

UNE 21186:2011

NFC 17-102:2011

NP 4426:2013

► **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 very high.**
- **100% effective in discharge.**
- Guaranteed **electrical continuity.**
- **Retains all its initial properties after each discharge so does not require specific maintenance.**
- No batteries or external power. No electronic. **Not fungible.**
- **Operation guaranteed** in any atmospheric condition.
- Made of **AISI 316L** stainless steel and polyamide (PA66).

► 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 62.561/1
- NP 4426:2013

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

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

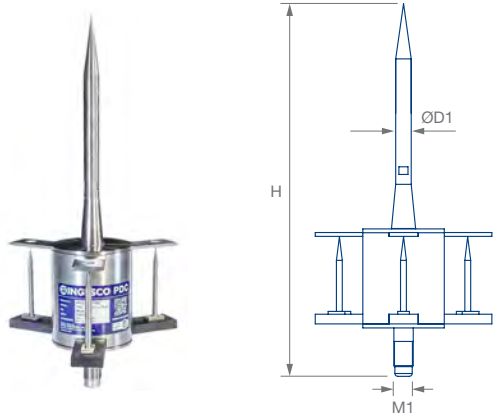
Certificate of current supported insulation according to IEC 62561/1
issued by the LABELEC High Voltage Laboratory.

Certificate product issued by the international certification organization Bureau Veritas.

► 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.).



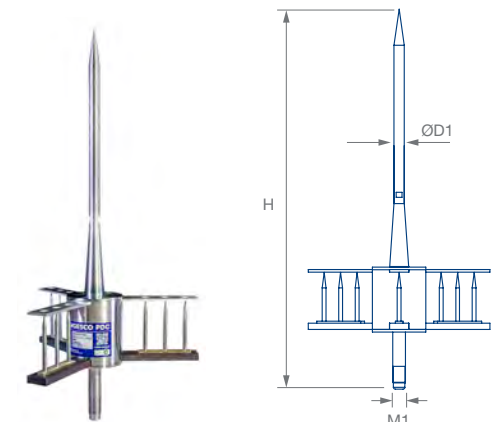
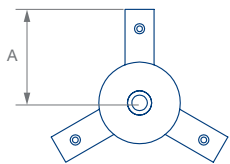
INGESCO® PDC 3.1 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC 3.1 according to protection level and height (UNE 21.186:2011, NFC 17.102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101000	SST	387	16	M20	95	2350

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
D: Streaming distance
L-I : D = 20 m
L-II : D = 30 m
L-III : D = 45 m
L-IV : D = 60 m



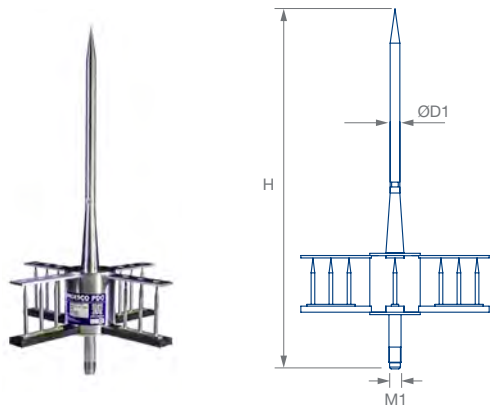
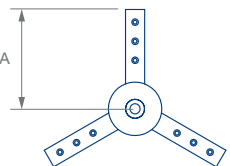
INGESCO® PDC 3.3 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC 3.3 according to protection level and height (UNE 21.186:2011, NFC 17.102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101001	SST	598	16	M20	156	3200

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	17	20	23	26
4	34	39	46	52
6	43	49	58	66
10	44	51	61	69
20	45	54	65	75

Δt : 25μs
D: Streaming distance
L-I : D = 20 m
L-II : D = 30 m
L-III : D = 45 m
L-IV : D = 60 m



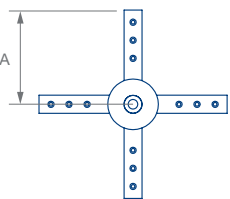
INGESCO® PDC 4.3 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC 4.3 according to protection level and height (UNE 21.186:2011, NFC 17.102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101003	SST	598	16	M20	156	3400

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	21	24	27	30
4	41	47	54	61
6	52	59	69	77
10	53	61	71	80
20	54	63	74	85

Δt : 34μs
D: Streaming distance
L-I : D = 20 m
L-II : D = 30 m
L-III : D = 45 m
L-IV : D = 60 m



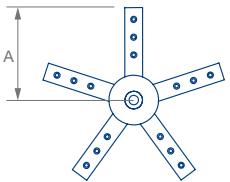
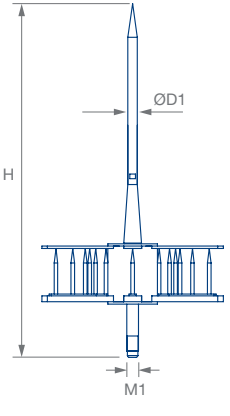
INGESCO® PDC 5.3 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC 5.3 according to protection level and height (UNE 21.186:2011, NFC 17.102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101005	SST	598	16	M20	156	3600

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	24	27	31	35
4	49	55	63	70
6	61	69	79	88
10	62	70	81	90
20	63	72	84	95

Δt : 43μs
D: Streaming distance
L-I : D = 20 m
L-II : D = 30 m
L-III : D = 45 m
L-IV : D = 60 m



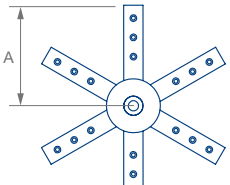
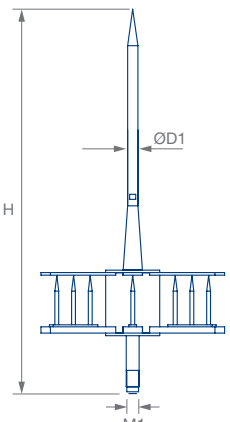
INGESCO® PDC 6.3 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC 6.3 according to protection level and height (UNE 21.186:2011, NFC 17.102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101008	SST	598	16	M20	156	3800

h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
2	29	32	36	40
4	58	64	72	80
6	73	80	91	100
10	73	82	93	102
20	74	83	95	106

Δt : 54μs
D: Streaming distance
L-I : D = 20 m
L-II : D = 30 m
L-III : D = 45 m
L-IV : D = 60 m



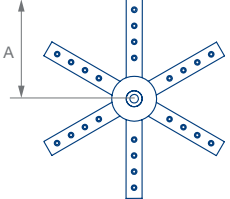
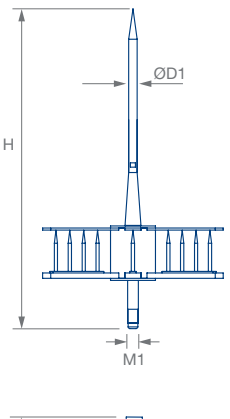
INGESCO® PDC 6.4 LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC 6.4 according to protection level and height (UNE 21.186:2011, NFC 17.102:2011 and NP 4426:2013)

Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	A (mm)	Weight (g)
101009	SST	598	16	M20	186	4150

h (m)	NIVEL I	NIVEL II	NIVEL III	NIVEL 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
D: Streaming distance
L-I : D = 20 m
L-II : D = 30 m
L-III : D = 45 m
L-IV : D = 60 m



INGESCO® PDC.E
LIGHTNING ROD



Model PDC.E 60

5 year warranty
Natural field trials
Testable
Stainless steel 316 L
UNE 21186:2011
NFC 17-102:2011
NP 4426:2013

► technical specifications

- Lightning rod with **ELECTRONIC** streaming.
Suitable for external lightning protection of all types of structures and open areas.
- **Level of protection rated 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.

► standards | tests | specifications

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

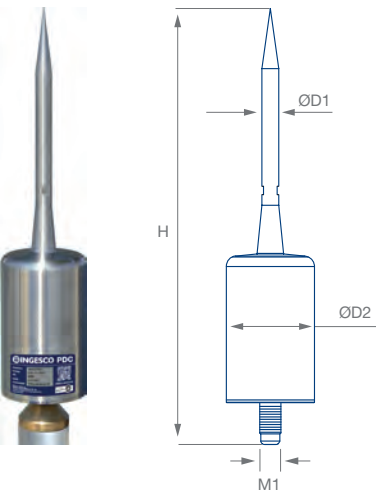
- CTE SUA 8
- IEC 62305
- NP 4426:2013
- UNE 21.186:2011
- IEC 62.561/1
- NFC 17-102:2011
- IEC 62.561/3

Evaluation tests of ESE (Annex C UNE 21186: 2011) in the LABELEC High Voltage Laboratory.
Mechanical test (traction and flexing until breakage).
Certificate of current supported IEC 62561/1, issued by the LABELEC High Voltage Laboratory.
Certificate of current supported insulation according to IEC 62561/1 issued by the LABELEC High Voltage Laboratory.
Certificate product issued by the international certification organization Bureau Veritas.

► 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 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.E 15
LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 15 according to protection level and height (UNE 21.186:2011, 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	Δt : 15 μ s D: Streaming distance N-I: D = 20 m N-II: D = 30 m N-III: D = 45 m N-IV: D = 60 m
4	25	30	36	41	
6	32	38	46	52	
10	34	40	49	56	
20	35	43	54	63	

INGESCO® PDC.E 30
LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 30 according to protection level and height (UNE 21.186:2011, 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

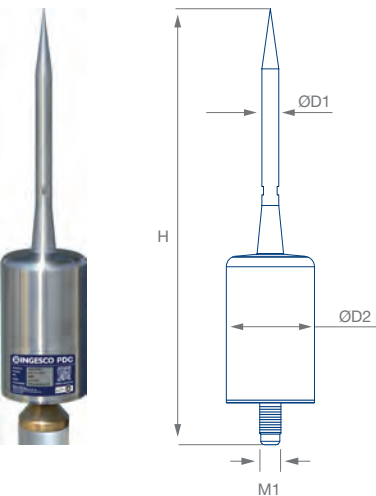
h (m)	LEVEL I	LEVEL II	LEVEL III	LEVEL IV	
2	19	22	25	28	Δt : 30 μ s D: Streaming distance N-I: D = 20 m N-II: D = 30 m N-III: D = 45 m N-IV: D = 60 m
4	38	44	51	57	
6	48	55	64	72	
10	49	57	66	75	
20	50	59	70	81	

INGESCO® PDC.E 45
LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 45 according to protection level and height (UNE 21.186:2011, 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	Δt : 45 μ s D: Streaming distance N-I: D = 20 m N-II: D = 30 m N-III: D = 45 m N-IV: D = 60 m
4	51	57	64	72	
6	63	71	81	90	
10	64	72	83	92	
20	65	74	86	97	

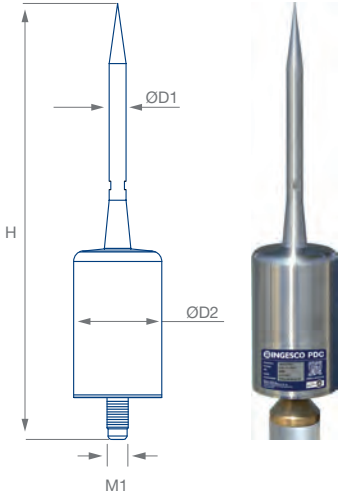


INGESCO® PDC.E 60
LIGHTNING ROD

► Coverage radius (m) INGESCO® PDC.E 60 according to protection level and height (UNE 21.186:2011, 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	Δt : 60 μ s D: Streaming distance N-I: D = 20 m N-II: D = 30 m N-III: D = 45 m N-IV: D = 60 m
4	63	69	78	85	
6	79	87	97	107	
10	79	88	99	109	
20	80	89	102	113	



INGESCO ADVANCED
ESE TESTER

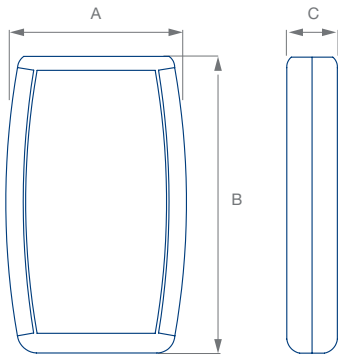
Ref.	Material	A (mm)	B (mm)	C (mm)	Weight (g)
102051	ABS	89	147	25	320

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

The INGESCO Advanced ESE Tester is designed exclusively for evaluating 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 a 40°C
- Power consumption: 30mA
- Power: Battery 9V IEC6LR61/IEC6F22/USA PP3
- Test terminals 1m long and 9V battery



LIGHTNING RODS



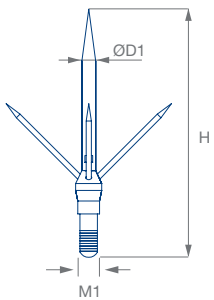
Termination rods suitable for external lightning protection. It can be used as single sensor element or part of passive protection, complementing the protection conductive mesh (Faraday cages).
Made of AISI 316L stainless steel or copper.
Please consult for other materials or dimensions.

Simple rods
Multiple rods
IEC 62305

MULTIPLE RODS

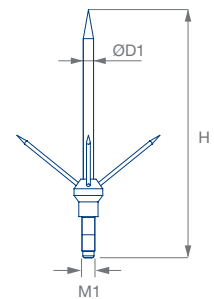
COPPER multiple lightning rod

Model	Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	Weight (g)
Multiple CU	110002	Cu	384	20	M20	855



STAINLESS STEEL multiple lightning rod

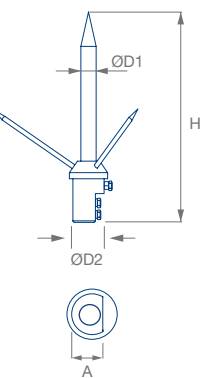
Model	Ref.	Material	H (mm)	D1 (mm)	M1 (mm)	Weight (g)
Multiple IN	110001	SST	384	20	M20	795



MULTIPLE RODS WITH MAST ADAPTOR

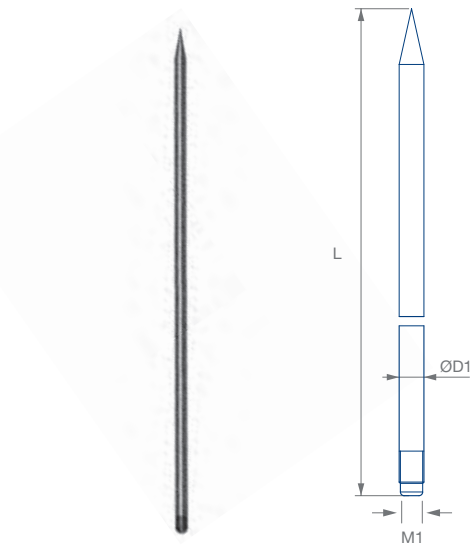
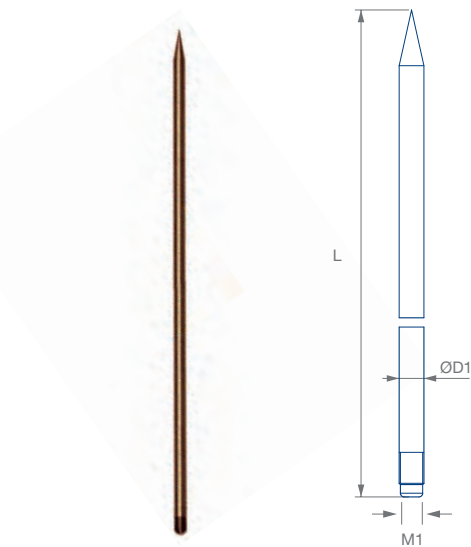
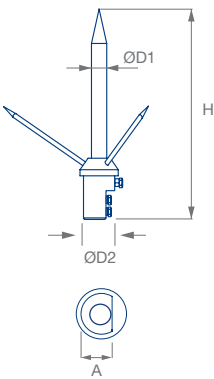
COPPER multiple lightning rods with ROUND - FLAT conductor mast adaptor

Modelo	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	Weight (g)
Multiple CU 1'1/4"	110226	Cu	344	20	35,5	12	19	1200
Multiple CU 1'1/2"	110227	Cu	344	20	41	12	19	1350



STAINLESS STEEL multiple lightning rods with ROUND - FLAT conductor mast adaptor

Modelo	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	Peso (g)
Punta múltiple IN 1'1/4"	110228	Inox.	344	20	35,5	12	19	1100
Punta múltiple IN 1'1/2"	110229	Inox.	344	20	41	12	19	1300



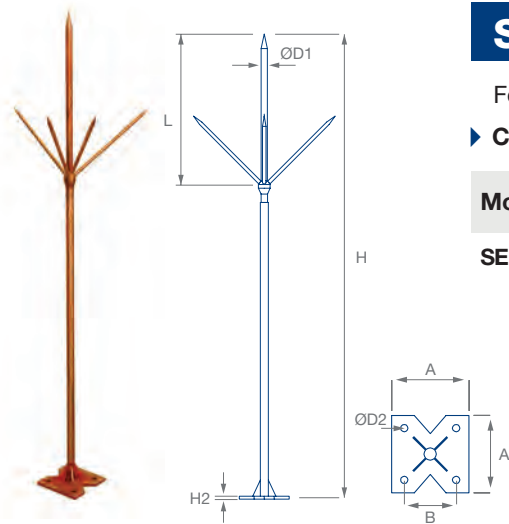
SIMPLE RODS

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
CU1000-16	110035	Cu	1000	16	M16	1700
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
IN1000-16	110084	SST	1000	16	M16	1530
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

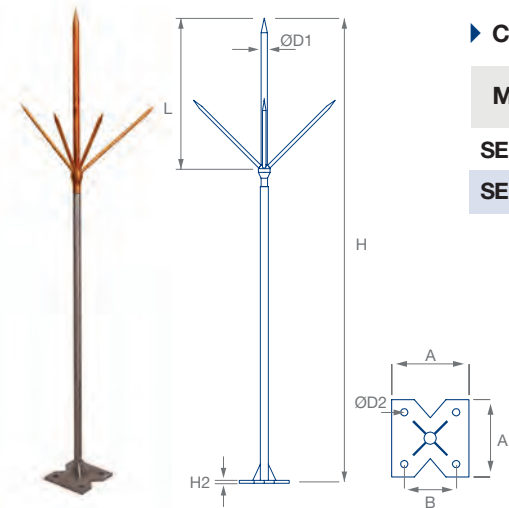


SPECIAL LIGHTNING RODS

For application in electrical substations and others.

COPPER lightning rods with COPPER-PLATED STEEL horizontal support

Model	Ref.	Mat.	H (mm)	L (mm)	H2 (mm)	D1 (mm)	D2 (mm)	A (mm)	B (mm)	Weight (g)
SE 1000 CU	110003	Cu/ST Cu.	1600	480	10	20	18	170	113	5500



COPPER lightning rods with GALVANIZED STEEL horizontal support

Model	Ref.	Mat.	H (mm)	L (mm)	H2 (mm)	D1 (mm)	D2 (mm)	A (mm)	B (mm)	Weight (g)
SE 1000 CU/AZ	110096	Cu/G.ST	1600	480	10	20	18	170	113	5600
SE 2000 CU/AZ	110100	Cu/G.ST	2600	480	10	20	18	170	113	5600



CAPTURE SYSTEM ACCESSORIES

Adaptor parts

Masts

Fastening

CTE SUA 8

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 1/4, 1 1/2 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.

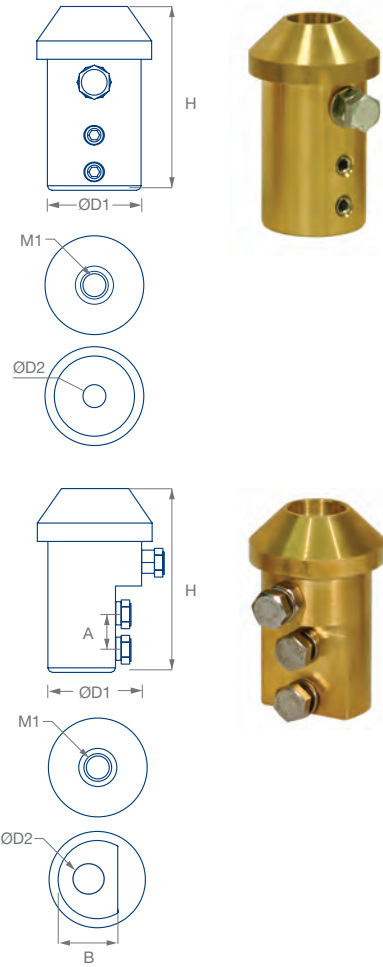
LIGHTNING ROD ADAPTER PIECES

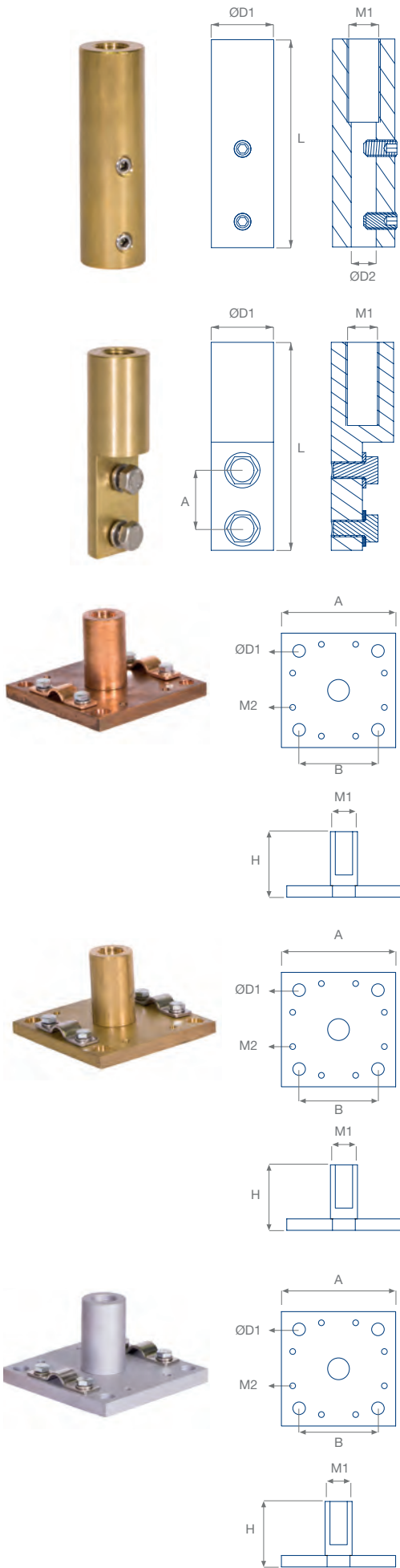
Adapter parts for lightning rod to ROUND conductor mast

Model	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	M1 (mm)	Weight (g)
1” Ø16 round	111033	Cu/Zn	80	26	12	M16	316
1 1/4” Ø16 round	111032	Cu/Zn	80	35,5	12	M16	664
1 1/2” Ø16 round	111022	Cu/Zn	80	41	12	M16	815
2” Ø16 round	111025	Cu/Zn	80	53	12	M16	1341
1” Ø20 round	111019	Cu/Zn	80	26	12	M20	286
1 1/4” Ø20 round	111011	Cu/Zn	80	35,5	12	M20	628
1 1/2” Ø20 round	111012	Cu/Zn	80	41	12	M20	777
2” Ø20 round	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 tape	111053	Cu/Zn	80	35,5	12	M16	19	25	645
1 1/2” Ø16 tape	111054	Cu/Zn	80	41	12	M16	19	30	765
2” Ø16 tape	111055	Cu/Zn	80	53	12	M16	19	45	1295
1 1/4” Ø20 tape	111051	Cu/Zn	80	35,5	12	M20	19	25	630
1 1/2” Ø20 tape	111056	Cu/Zn	80	41	12	M20	19	30	750
2” Ø20 tape	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	970
Ø20 round cond. 50-70 mm	111038	Cu/Zn	100	30	12	M20	955

► 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	810
Ø20 flat cond. 30x2-4 mm	111040	Cu/Zn	100	30	28	M20	795

LIGHTNING ROD SUPPORTS

► Horizontal supports Ø16mm or Ø20mm lightning rods

Model	Ref.	Mat.	H (mm)	M1 (mm)	D1 (mm)	M2 (mm)	A (mm)	B (mm)	Weight (g)
CU16	110047	Cu	60	M16	11	M6	100	80	1150
CU20	110076	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	110048	Cu/Zn	60	M16	11	M6	100	80	1095
CU/ZN20	110077	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)
AZ16	110097	G ST	60	M16	11	M6	100	80	1130
AZ20	110098	G ST	60	M20	11	M6	100	80	1125

LIGHTNING ROD SUPPORTS

► 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

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

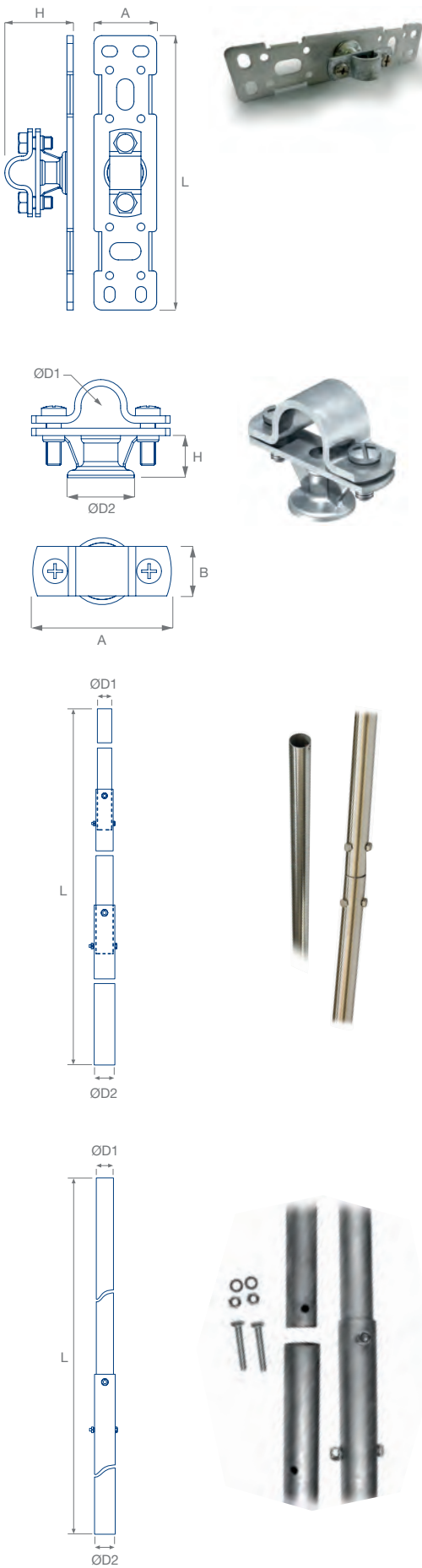
MASTS

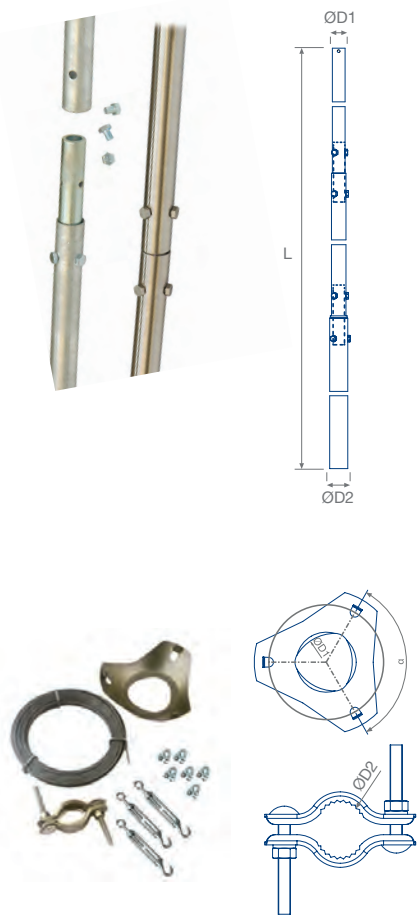
► Stainless Steel masts

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
4 m Ø 1'1/2"+ Ø 1'1/4	114097	HDG	4000	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





MASTS

► Hot dip galvanized steel masts with internal junction

Model	Ref.	Mat.	L (mm)	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

WIND KIT

► Wind kit for fastening masts

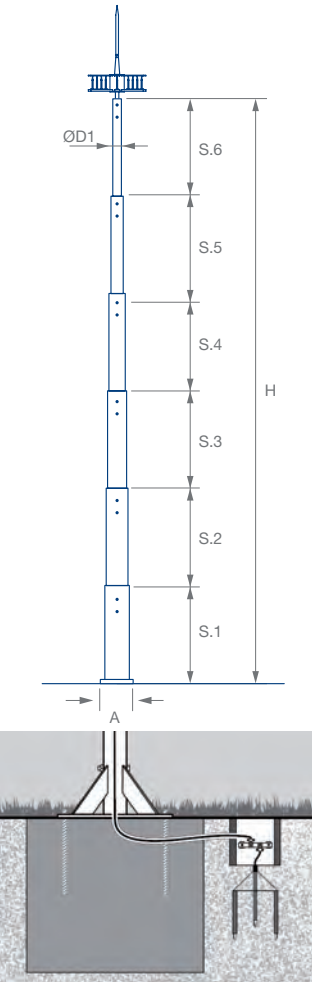
Model	Ref.	Mat.	D1 (mm)	D2 (mm)	α	m.steel cable	No. tighteners	No. cable ties	Weight (g)
Wind kit fastening masts	114197	HDG	40	45	120°	25	3	6	500

FREE-STANDING FOLDING MASTS

► Free-standing hot dip 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 (mm)	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.	Nº pieces	L (mm)	A (mm)	B (mm)	C (mm)	Weight (kg)
work anchor 15 mast Ø1'1/4"	112087/1	HDG	1	240	46	35	110	1,8
	112087		2					3,6
	112087/3		3					5,4
work anchor 15 mast Ø1'1/2"	112071/1	HDG	1	240	60	35	110	1,9
	112071		2					3,8
	112071/3		3					5,7
work anchor 15 mast Ø2"	112096/1	HDG	1	240	72	35	110	2
	112096		2					4
	112096/3		3					6

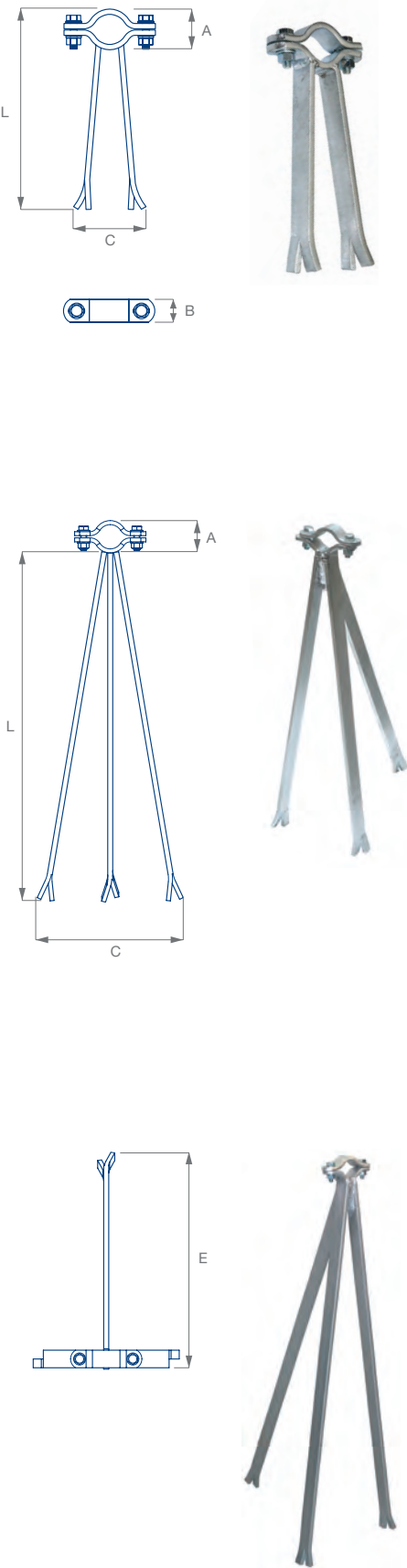
Model	Ref.	Mat.	Nº pieces	L (mm)	A (mm)	B (mm)	C (mm)	Weight (kg)
work anchor 30 mast Ø1'1/4"	112088/1	HDG	1	395	46	35	100	2,5
	112088		2					5
	112088/3		3					7,5
work anchor 30 mast Ø1'1/2"	112021/1	HDG	1	395	60	35	100	2,6
	112021		2					5,2
	112021/3		3					7,8
work anchor 30 mast Ø2"	112038/1	HDG	1	395	72	35	100	2,7
	112038		2					5,4
	112038/3		3					8,1

Model	Ref.	Mat.	Nº pieces	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	Weight (kg)
work anchor 60 mast Ø1'1/4"	112089/1	HDG	1	700	46	35	270	395	7,1
	112089		2						11,6
	112089/3		3						16,1
work anchor 60 mast Ø1'1/2"	112022/1	HDG	1	700	60	35	270	395	7,2
	112022		2						11,8
	112022/3		3						16,4

work anchor 60 mast Ø2"	112040/1	HDG	1	700	72	35	270	395	7,4
	112040		2						12,2
	112040/3		3						17,0

Model	Ref.	Mat.	Nº pieces	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	Weight (kg)
work anchor 100 mast Ø1'1/4"	112090/1	HDG	1	1095	46	35	365	460	11,7
	112090		2						23,4
	112090/3		3						35,1
work anchor 100 mast Ø1'1/2"	112023/1	HDG	1	1095	60	35	365	460	11,8
	112023		2						23,6
	112023/3		3						35,4

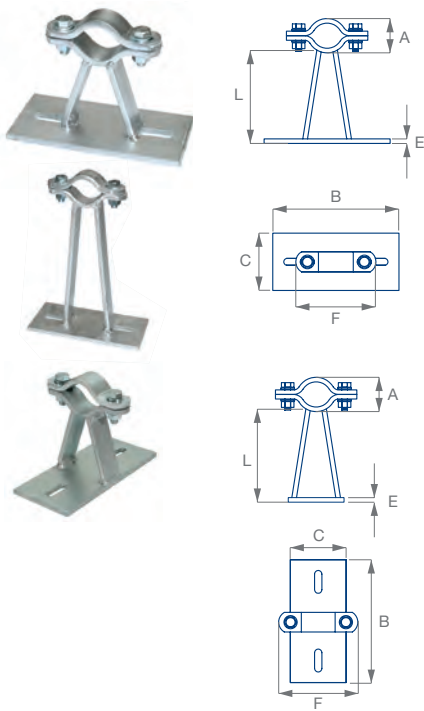
work anchor 100 mast Ø2"	112042/1	HDG	1	1095	72	35	365	460	11,9
	112042		2						23,8
	112042/3		3						35,7



ANCHORS AND SUPPORTS FOR MASTS

Anchor plate for vertical wall mounting

Model	Ref.	Mat.	No. pieces	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
plate anchor 15 mast Ø1"1/4"	112086/1		1							2,8
	112086	HDG	2	153	46	220	100	8	141	5,6
	112086/3		3							8,4
plate anchor 15 mast Ø1"1/2"	112024/1		1							2,9
	112024	HDG	2	153	60	220	100	8	141	5,8
	112024/3		3							8,7
plate anchor 15 mast Ø2"	112037/1		1							3
	112037	HDG	2	153	72	220	100	8	141	6
	112037/3		3							9
plate anchor 15 inv. mast Ø1"1/4"	112091/1		1							2,8
	112091	HDG	2	153	46	220	100	8	141	5,6
	112091/3		3							8,4
plate anchor 15 inv. mast Ø1"1/2"	112070/1		1							2,9
	112070	HDG	2	153	60	220	100	8	141	5,8
	112070/3		3							8,7
plate anchor 15 inv. mast Ø2"	112095/1		1							3
	112095	HDG	2	153	72	220	100	8	141	6
	112095/3		3							9
Model	Ref.	Mat.	No. pieces	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
plate anchor 30 mast Ø1"1/4"	112092/1		1							3,5
	112092	HDG	2	302	46	220	100	8	141	7
	112092/3		3							10,5
plate anchor 30 mast Ø1"1/2"	112025/1		1							3,6
	112025	HDG	2	302	60	220	100	8	141	7,2
	112025/3		3							10,8
plate anchor 30 mast Ø2"	112039/1		1							3,7
	112039	HDG	2	302	72	220	100	8	141	7,4
	112039/3		3							11,1
plate anchor 30 inv. mast Ø1"1/4"	112099/1		1							3,5
	112099	HDG	2	302	46	220	100	8	141	7
	112099/3		3							10,5
plate anchor 30 inv. mast Ø1"1/2"	112100/1		1							3,6
	112100	HDG	2	302	60	220	100	8	141	7,2
	112100/3		3							10,8
plate anchor 30 inv. mast Ø2"	112101/1		1							3,7
	112101	HDG	2	302	72	220	100	8	141	7,4
	112101/3		3							11,1



ANCHORS AND SUPPORTS FOR MASTS

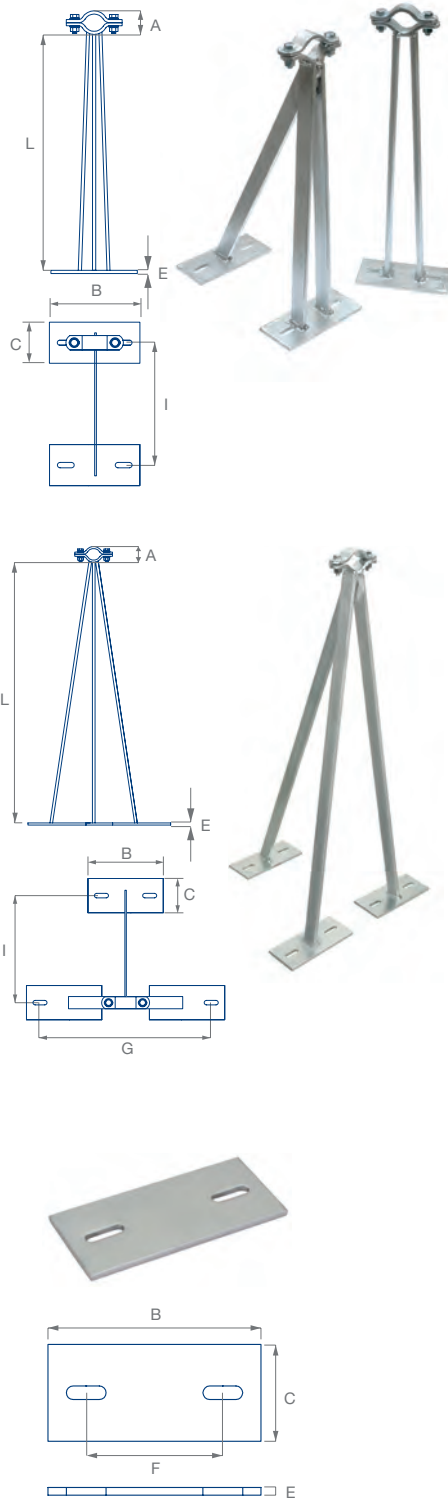
Anchor plate for vertical wall mounting

Model	Ref.	Mat.	No. pieces	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	I (mm)	Weight (kg)
plate anchor 60 mast Ø1"1/4"	112093/1		1								7,75
	112093	HDG	2	603	46	220	100	8	141	340	15,50
	112093/3		3								23,25
plate anchor 60 mast Ø1"1/2"	112027/1		1								7,85
	112027	HDG	2	603	60	220	100	8	141	340	15,70
	112027/3		3								23,55
plate anchor 60 mast Ø2"	112041/1		1								7,95
	112041	HDG	2	603	72	220	100	8	141	340	15,90
	112041/3		3								23,85

Model	Ref.	Mat.	No. pieces	L (mm)	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	G (mm)	I (mm)	Weight (kg)
plate anchor 100 mast Ø1"1/4"	112094/1		1									15,3
	112094	HDG	2	991	46	220	100	8	141	506	460	30,6
	112094/3		3									45,9
plate anchor 100 mast Ø1"1/2"	112030/1		1									15,4
	112030	HDG	2	991	60	220	100	8	141	506	460	30,8
	112030/3		3									46,2
plate anchor 100 mast Ø2"	112043/1		1									15,3
	112043	HDG	2	991	72	220	100	8	141	506	460	30,6
	112043/3		3									45,9

Accessory anchor plate for snap fastening

Model	Ref.	Mat.	No. pieces	B (mm)	C (mm)	E (mm)	F (mm)	Weight (kg)
fastening plate for plate anchor	112044/1		1					
	112044	HDG	2	220	100	141	8	2,7
	112044/3		3					



ANCHORS AND SUPPORTS
FOR MASTS

► Anchoring double clamp for round profile attachment

Model	Ref.	Mat.	No. pieces	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	G (mm)	Weight (kg)
double clamp 1'1/4"-1'1/4"	112102/1		1							1,3
	112102	HDG	2	92	46	46	147	147	35	2,6
	112102/3		3							3,9
double clamp 1'1/4"-1'1/2"	112036/1		1							1,4
	112036	HDG	2	106	46	60	147	142	35	2,8
	112036/3		3							4,2
double clamp 1'1/4"-2"	112104/1		1							1,5
	112104	HDG	2	118	46	72	147	160	35	3
	112104/3		3							4,5
double clamp 1'1/2"-1'1/2"	112026/1		1							1,5
	112026	HDG	2	120	60	60	142	142	35	3
	112026/3		3							4,5
double clamp 1'1/2"-2"	112035/1		1							1,6
	112035	HDG	2	132	60	72	142	160	35	3,2
	112035/3		3							4,8
double clamp 2"-2"	112034/1		1							1,7
	112034	HDG	2	144	72	72	160	160	35	3,4
	112034/3		3							5,1

► Anchoring double inverted clamp for round profile attachment

Model	Ref.	Mat.	No. pieces	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	G (mm)	Weight (kg)
double cross clamp 1'1/4"-1'1/4"	112105/1		1							1,3
	112105	HDG	2	92	46	46	147	147	35	2,6
	112105/3		3							3,9
double cross clamp 1'1/4"-1'1/2"	112106/1		1							1,4
	112106	HDG	2	106	46	60	147	142	35	2,8
	112106/3		3							4,2
double cross clamp 1'1/4"-2"	112107/1		1							1,5
	112107	HDG	2	118	46	72	147	160	35	3
	112107/3		3							4,5
double cross clamp 1'1/2"-1'1/2"	112032/1		1							1,5
	112032	HDG	2	120	60	60	142	142	35	3
	112032/3		3							4,5
double cross clamp 1'1/2"-2"	112108/1		1							1,6
	112108	HDG	2	132	60	72	142	160	35	3,2
	112108/3		3							4,8
double cross clamp 2"-2"	112109/1		1							1,7
	112109	HDG	2	144	72	72	160	160	35	3,4
	112109/3		3							5,1

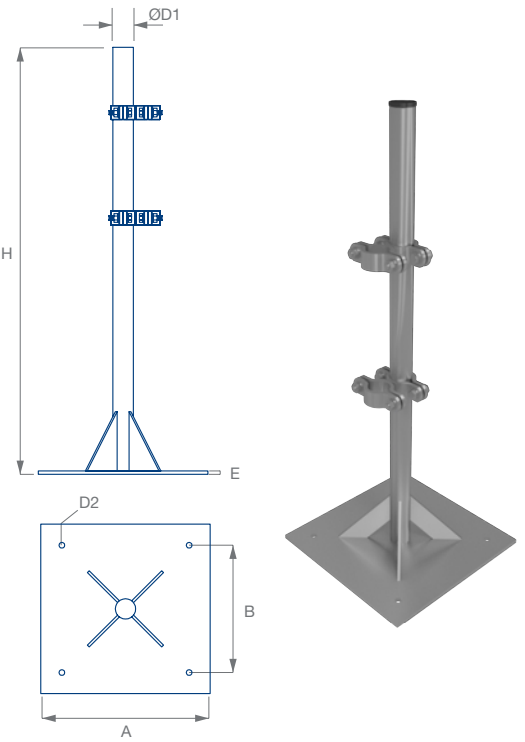
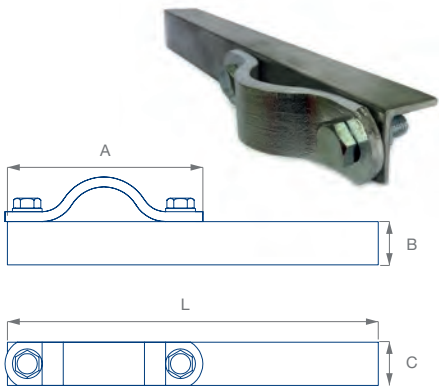
ANCHORS AND SUPPORTS
FOR MASTS

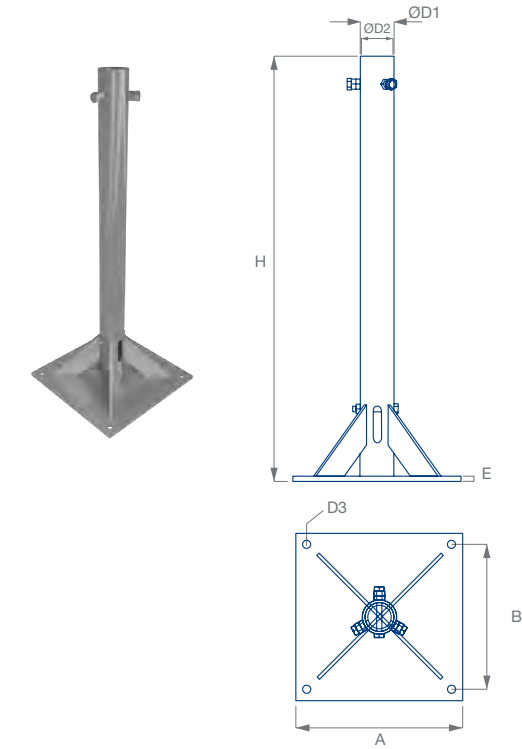
► Angle anchors for welding on metal structures

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"	112080/1		1					1
	112080	HDG	2	160	35	35	300	2
	112080/3		3					3
attachment angle 60 Ø1"-1'1/4" - 1'1/2"-2"	112103/1		1					2
	112103	HDG	2	160	35	35	600	4
	112103/3		3					6

► Horizontal surfaces baseplate support for fastening mast via brackets

Model	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	A (mm)	B (mm)	E (mm)	Weight (kg)
Ø1'1/2" double clamps Ø1'1/2"-Ø1'1/4"	113034	HDG	1015	48	14	400	300	8	17,5
	113031	HDG	1015	48	14	400	300	8	17,7
	113033	HDG	1015	48	14	400	300	8	17,9
Ø2" double clamps Ø2"-Ø1'1/4"	113043	HDG	1015	60	14	400	300	8	18,1
	113035	HDG	1015	60	14	400	300	8	18,3
	113032	HDG	1015	60	14	400	300	8	18,5





ANCHORS AND SUPPORTS FOR MASTS

► Horizontal surfaces baseplate support for fastening mast up to 3m in length

Model	Ref.	Mat.	H (mm)	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	B (mm)	E (mm)	Weight (kg)
Simple base plate support Ø1 1/2"	113037	HDG	758	60	53	14	300	260	8	12,5



UNE 21.186
NFC 17-102
IEC 62.305
CTE SUA 8
R.E.B.T
IEC 62.561-2
NP 4426
VDE 0185-305

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.

CONDUCTORS

► Copper braided cable

Model	Ref.	Mat.	D1 (mm)	Weight (g/m)
35 mm² section	117071	Cu	7,5	315
50 mm² section	117072	Cu	8,5	500
70 mm² section	117073	Cu	9,5	600
95 mm² section	117074	Cu	11,5	830

* Coil approx. 50m. Other mesures consult.



► Round steel conductor

Model	Ref.	Mat.	L (m)	D1 (mm)	Weight (g/m)
Spool Rd 8 galvanized steel (150m)	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

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.



Clamps

Connectors

IEC 62.305

IEC 62.561-4

UNE 21.186

NFC 17-102

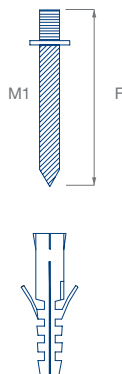
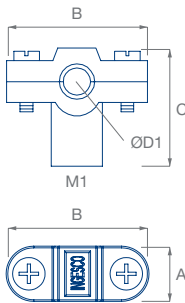
CONDUCTOR FASTENING
BRACKETS IEC62561-4

► 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

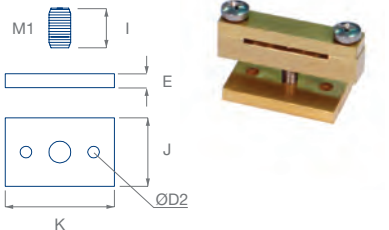
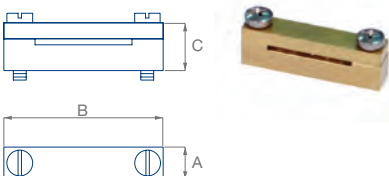
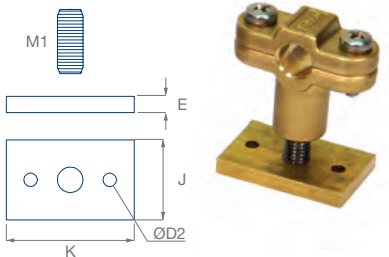
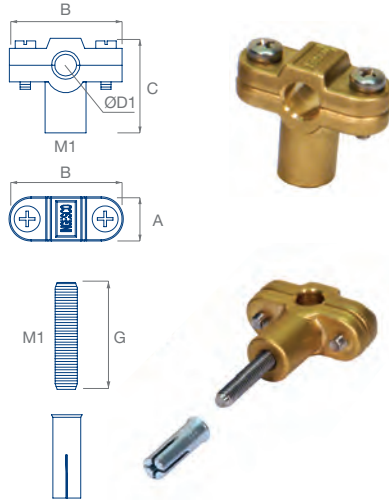
Model	Ref.	Mat.	M1	A (mm)	B (mm)	C (mm)	F (mm)	Weight (g)
Lag screw M6 for 30x2 mm tape	118103	Cu/Zn	M6	10	50	15	37,5	63

► 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

► Insulate 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

► Insulate 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

► Insulate 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

► Insulate clamping bracket for fixing to tube

Modelo	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

► Light clamps for round conductors

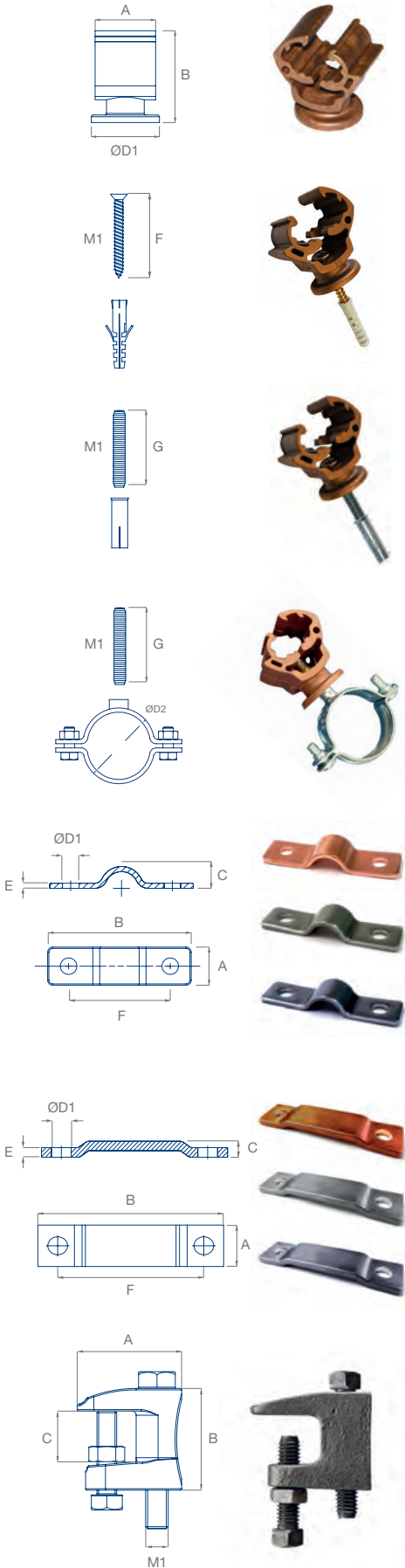
Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)	D1 (mm)	Weight (g)
Light clamp Cu Ø8-10 mm	118125	Cu	15	56,5	8,6	2	40	6,5	21
Light clamp CuSn Ø8-10 mm	118129	CuSn	15	56,5	8,6	2	40	6,5	21,1
Light clamp SST Ø8-10 mm	118146	SST	15	56,5	8,6	2	40	6,5	20

► 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

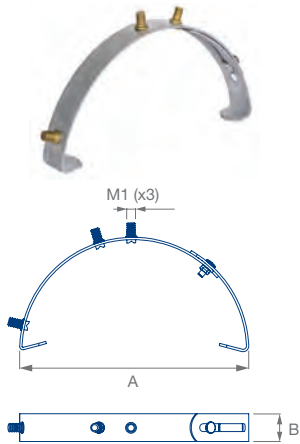
Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	M1	Weight (g)
Profile clamping bracket	118108	Zn	37	36	18	M8	80



CONDUCTOR FASTENING BRACKETS

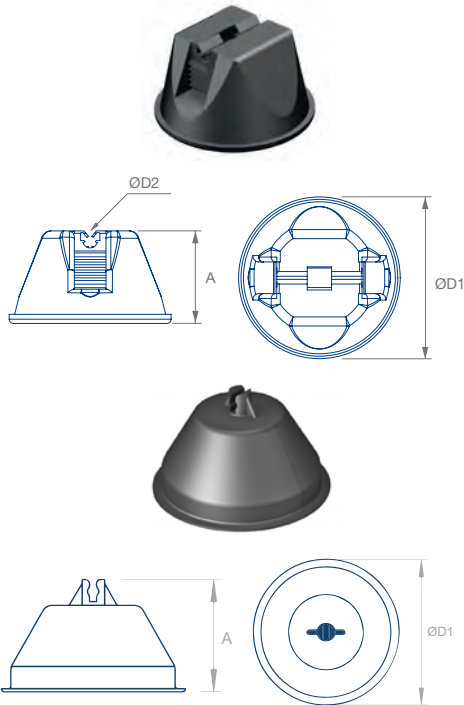
Roof file support bracket

Model	Ref.	Mat.	A (min-max) (mm)	B (mm)	M1	Weight (g)
Tile support bracket	118085	HDG	180-240	25	M8	161



Concrete support for flat roofs

Model	Ref.	Mat.	A (mm)	D1 (mm)	D2 (mm)	Weight (g)
Concrete support Ø8 mm round cond.	800011	PP/PE	78	133	8	1140
Concrete support Ø10 mm round cond.	800066	PP/PE	78	133	10	1140
Support for self-filling with concrete Ø8 mm	800168	PE	85	140	8	55



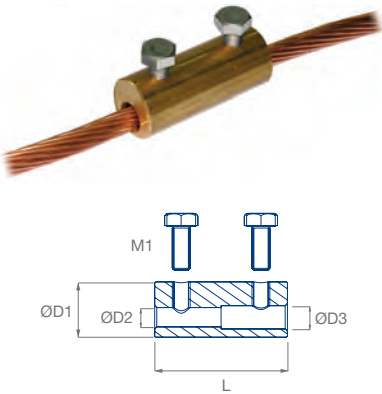
Flat conductor adapter

Model	Ref.	Mat.	Weight (g)
Flat conductor adapter (30x2-3,5 mm) for concret support	800067	PP	7

CONNECTORS

Linear sleeve connectors

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	M1	Weight (g)
Linear 35 x 35 mm²	115067	Cu/Zn	25	8,5	8,5	60	M8	230
Linear 35 x 50 mm²	115070	Cu/Zn	25	8,5	10,5	60	M8	220
Linear 35 x 70 mm²	115141	Cu/Zn	25	8,5	12,5	60	M8	210
Linear 35 x 95 mm²	115142	Cu/Zn	30	8,5	15,5	60	M8	310
Linear 50 x 50 mm²	115051	Cu/Zn	25	10,5	10,5	60	M8	220
Linear 50 x 70 mm²	115072	Cu/Zn	25	10,5	12,5	60	M8	200
Linear 50 x 95 mm²	115076	Cu/Zn	30	10,5	15,5	60	M8	300
Linear 70 x 70 mm²	115074	Cu/Zn	25	12,5	12,5	60	M8	200
Linear 70 x 95 mm²	115078	Cu/Zn	30	12,5	15,5	60	M8	290
Linear 95 x 95 mm²	115080	Cu/Zn	30	15,5	15,5	60	M8	270



CONNECTORS

“T” sleeve connectors (1 piece)

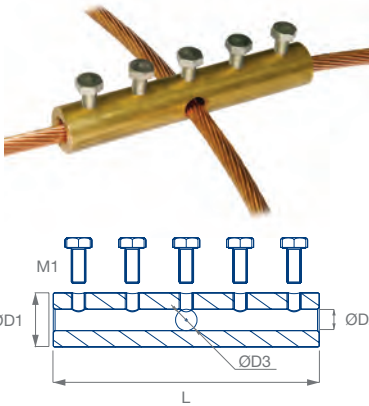
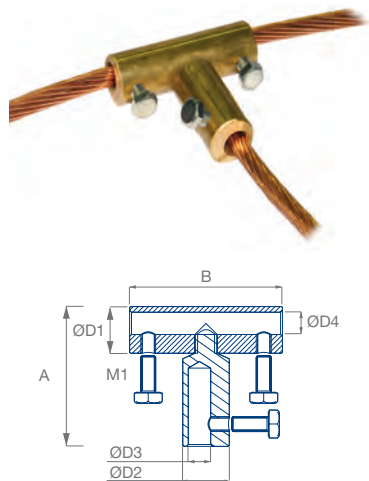
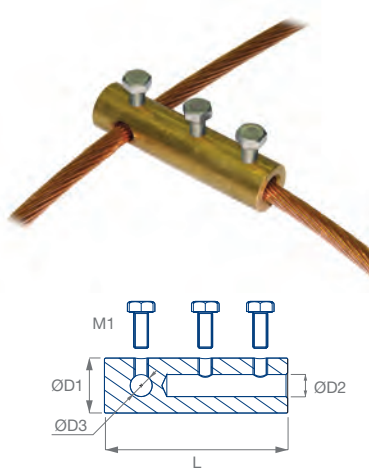
Model	Ref.	Mat.	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	M1	Weight (g)
“T” 1 piece 35 x 35 mm²	115143	Cu/Zn	25	8,5	8,5	100	M8	385
“T” 1 piece 35 x 50-70 mm²	115144	Cu/Zn	25	8,5	12,5	100	M8	380
“T” 1 piece 35 x 95 mm²	115145	Cu/Zn	30	8,5	15,5	100	M8	365
“T” 1 piece 50 x 35 mm²	115146	Cu/Zn	25	10,5	8,5	100	M8	360
“T” 1 piece 50 x 50-70 mm²	115052	Cu/Zn	25	10,5	12,5	100	M8	355
“T” 1 piece 50 x 95 mm²	115147	Cu/Zn	30	10,5	15,5	100	M8	545
“T” 1 piece 70 x 35 mm²	115148	Cu/Zn	25	12,5	8,5	100	M8	325
“T” 1 piece 70 x 50-70 mm²	115081	Cu/Zn	25	12,5	12,5	100	M8	320
“T” 1 piece 70 x 95 mm²	115149	Cu/Zn	30	12,5	15,5	100	M8	515
“T” 1 piece 95 x 35 mm²	115150	Cu/Zn	30	15,5	8,5	100	M8	455
“T” 1 piece 95 x 50-70 mm²	115151	Cu/Zn	30	15,5	12,5	100	M8	450
“T” 1 piece 95 x 95 mm²	115082	Cu/Zn	30	15,5	15,5	100	M8	440

“T” sleeve connectors (2 pieces)

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	A (mm)	B (mm)	M1	Weight (g)
“T” 2 pieces 35 x 35 mm²	115152	Cu/Zn	25	25	8,5	8,5	75	82	M8	495
“T” 2 pieces 35 x 50-70 mm²	115153	Cu/Zn	25	25	8,5	12,5	75	82	M8	455
“T” 2 pieces 35 x 95 mm²	115154	Cu/Zn	25	30	8,5	15,5	75	82	M8	555
“T” 2 pieces 50 x 35 mm²	115155	Cu/Zn	25	25	10,5	8,5	75	82	M8	485
“T” 2 pieces 50 x 50-70 mm²	115056	Cu/Zn	25	25	10,5	12,5	75	82	M8	445
“T” 2 pieces 50 x 95 mm²	115156	Cu/Zn	25	30	10,5	15,5	75	82	M8	545
“T” 2 pieces 70 x 35 mm²	115157	Cu/Zn	25	25	12,5	8,5	75	82	M8	475
“T” 2 pieces 70 x 50-70 mm²	115083	Cu/Zn	25	25	12,5	12,5	75	82	M8	435
“T” 2 pieces 70 x 95 mm²	115158	Cu/Zn	25	30	12,5	15,5	75	82	M8	535
“T” 2 pieces 95 x 35 mm²	115159	Cu/Zn	30	25	15,5	8,5	80	82	M8	535
“T” 2 pieces 95 x 50-70 mm²	115160	Cu/Zn	30	25	15,5	12,5	80	82	M8	495
“T” 2 pieces 95 x 95 mm²	115084	Cu/Zn	30	30	15,5	15,5	80	82	M8	595

Cross sleeve connectors

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	M1 (mm)	Weight (g)
Cross 35 x 35 mm²	115161	Cu/Zn	25	8,5	8,5	148	M8	566
Cross 35 x 50-70 mm²	115162	Cu/Zn	25	8,5	12,5	148	M8	546
Cross 35 x 95 mm²	115163	Cu/Zn	30	8,5	15,5	148	M8	801
Cross 50 x 35 mm²	115164	Cu/Zn	25	10,5	8,5	148	M8	526
Cross 50 x 50-70 mm²	115053	Cu/Zn	25	10,5	12,5	148	M8	450
Cross 50 x 95 mm²	115165	Cu/Zn	30	10,5	15,5	148	M8	761
Cross 70 x 35 mm²	115166	Cu/Zn	25	12,5	8,5	148	M8	476
Cross 70 x 50-70 mm²	115085	Cu/Zn	25	12,5	12,5	148	M8	456
Cross 70 x 95 mm²	115167	Cu/Zn	30	12,5	15,5	148	M8	711
Cross 95 x 35 mm²	115168	Cu/Zn	30	15,5	8,5	148	M8	665
Cross 95 x 50-70 mm²	115169	Cu/Zn	30	15,5	12,5	148	M8	646
Cross 95 x 95 mm²	115086	Cu/Zn	30	15,5	15,5	148	M8	631



CONNECTORS

▶ Round conductors - grounding rod connectors

Model	Ref.	Mat.	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	M1	Weight (g)
Ø14 mm rod-35 mm² cable	115170	Cu/Zn	25	14,5	8,5	60	M8	200
Ø14 mm rod-50-70 mm² cable	115055	Cu/Zn	25	14,5	12,5	60	M8	180
Ø14 mm rod-95 mm² cable	115171	Cu/Zn	30	14,5	15,5	60	M8	220
Ø18 mm rod-35 mm² cable	115172	Cu/Zn	30	18,5	8,5	60	M8	290
Ø18 mm rod-50-70 mm² cable	115095	Cu/Zn	30	18,5	12,5	60	M8	270
Ø18 mm rod-95 mm² cable	115173	Cu/Zn	30	18,5	15,5	60	M8	250

▶ 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	14,5	70	M8	280
Ø18 mm rod-30x2-4 mm tape	115094	Cu/Zn	30	18,5	70	M8	250

▶ Universal switch connector

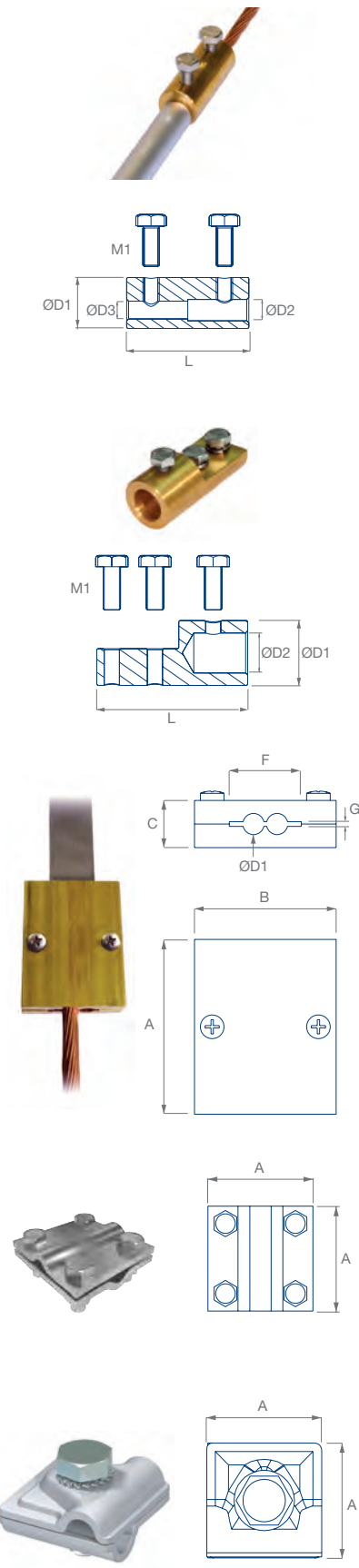
Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	F (mm)	G (mm)	D1 (mm)	Weight (g)
Universal connector	112115	Cu/Zn	74	60	20	30,5	2	9	650

▶ Cross connector

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

▶ Adaptable connector

Model	Ref.	Mat.	A (mm)	Weight (g)
Adaptable connector Ø8-10 mm round cond.	115100	ac. galv.	40	94



CONNECTORS

▶ Flat terminal

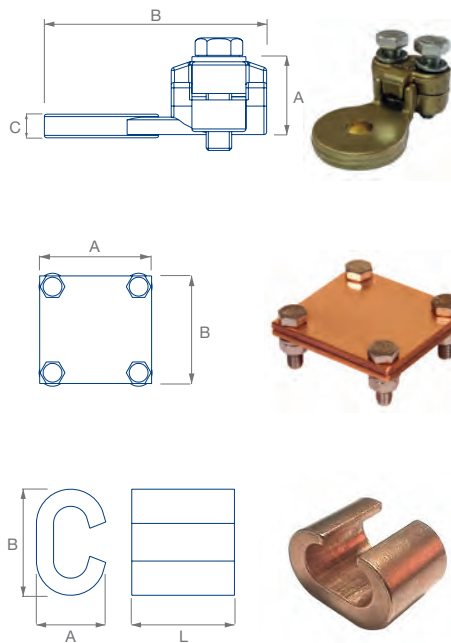
Model	Ref.	Mat.	A (mm)	B (mm)	C (mm)	Weight (g)
Toothed flat terminal 35-120 mm² cable	115097	Cu/Zn	42	68	8	186

▶ Cross-connector for tape

Model	Ref.	Mat.	A (mm)	B (mm)	Weight (g)
Cross connector tape	115093	Cu	52	50	164

▶ “C” pressure connection

Model	Ref.	Mat.	L (mm)	A (mm)	B (mm)	Weight (g)
“C” connector 35 - 95 mm²	115104	Cu	30	20,5	31	78



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 62.305

UNE 21.186

NFC 17-102

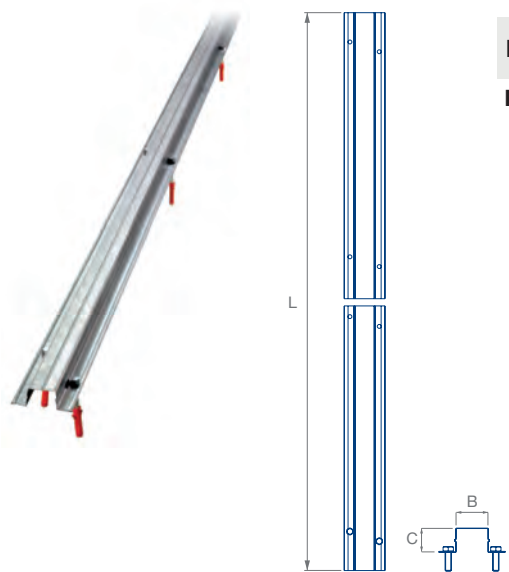
PROTECTION TUBE FOR CONDUCTORS

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
Galv. Steel tube	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 62.561-3

IEC 62.305

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.

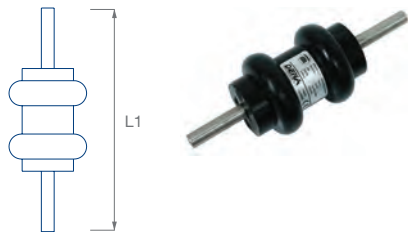
Bonding between grounding systems, operating separately under normal conditions, and ensuring their union if they suffer an overvoltage of a system.

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

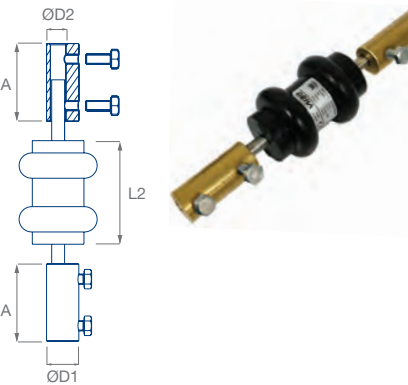
Spark gap protector

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



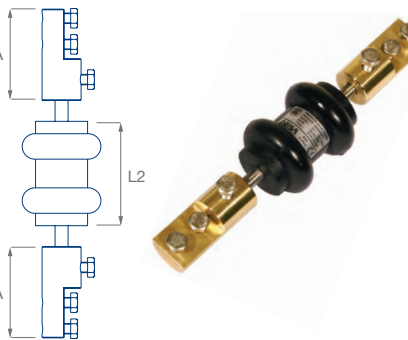
Spark gap with round conductor connection sleeves

Model	Ref.	L2 (mm)	A (mm)	D1 (mm)	D2 (mm)	Weight (g)
VX-1 spark gap protector 50 mm² cable	116062	80	60	25	10,5	795
VX-1 spark gap protector 70 mm² cable	116063	80	60	25	12,5	785
VX-1 spark gap protector 95 mm² 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



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