

Protection System against Atmospheric Discharges and Electromagnetic
Pulses avoiding direct lightning strike on the protected structure

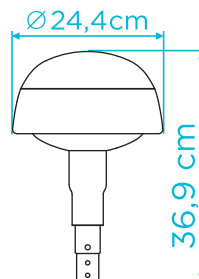
Made of
Aluminum &
POM

Weight
7,2 Kg

Packaging:
Recicled
cardboard &
PELD



Measurements



Packaging:
26x26x47 cm

Passive Collector System of electrostatic currents on time, that takes them to the ground, whose operating principle is based on balancing or compensating the variable electric field on it's surroundings, avoiding the creation of an upward leader on the DDCE Plus and on to the protected structure.

Electromagnetic Protector

Sole and effective system for protecting against external electromagnetic pulses (Absorbs the Electromagnetic Pulses between 60 and 90% minimizing damage by indirect effects). The protection design will depend on the type of installation. The DDCE will be placed laterally in isolated structures. As protection of areas or multiple structures will be placed along the perimeter. The DDCE works like thermal fuse, absorbing part of the energy of the Electromagnetic Pulses.

Maximum working voltage without lightning strikes

Progressive tension increase

705 kV are applied to 1,2 m progressively without lightning discharge (maximum applied by the laboratory). According to the high voltage tests carried out at the Electrical Engineering Laboratory of the University of Pau (University Center for Scientific Research),

Application of instantaneous voltage (comparison with Franklin Rod)

With peak voltage (kV) U100 from 427,5 KV to 1.15 m, the leader always appears at the Franklin Rod.

With peak voltage (kV) U50 from 549.6 KV to 1.15 m, the leader appears on the ground or at the base of the mast, but always outside the DDCE 100 Plus.

According to the high voltage tests of the Official Central Electrotechnical Laboratory (LCOE) of Getafe (Madrid)

DDCE 100 Plus performance

Tests carried out in the Official Laboratory INTA (National Institute of Aerospace Technology) belonging to the Ministry of Defense of Spain, certifies the optimal performance of the DDCE 100 Plus in the spectrum between 0.4 to 2 GHz as compensator of variable electric fields, behaving as a sink of variable radio frequency electric fields without sending radiant electric fields in this frequency spectrum.

Current impulses of 100 kA. Waveform 10/350µs

The DDCE 100 Plus has passed the 100 kA current impulse tests with a 10 / 350µs waveform according to the UNE EN IEC 62305:2011, NFC 17-102:2011 y UNE 21186:2011 (section C3.4). The waveforms applied correspond to the UNE-EN 62561 standard.

I_p (kA) = 100 kA \pm 10 %

W/R = 2500 kJ/ Ω \pm 35%

Q = 50 C \pm 20 %

Duration < 5 ms

Carried out at the Official Central Laboratory of Electrotechnics (LCOE) in Getafe (Madrid) with satisfactory results.

Test	I_{peak} (kA)	W/R (kJ/ Ω)	Q (C)	t_1 (µs)	t_2 (µs)	Visual inspection
RI11-06	135,1	3228	44,3	23,9	280	OK
RI11-07	129,6	2751	39,6	24,0	259	OK
RI11-08	131,6	2688	38,2	23,9	243	OK

Figure 1. Tabulated results of the test.

Current impulses of 200 kA. Waveform 10/350µs and load transfer: Q = 200 C

The DDCE 100 Plus model has passed the current impulse tests of 200 kA with waveform 10/350 µs, with accumulated energy of $W/R > 35000$ (kJ/ Ω) and load transfer Q = 200 C up to an accumulated of $Q > 2400$ C (winter lightning exposure requirement) according to the requirements of the UNE EN IEC 61400-24:2019 standard for SPCR in wind turbines.

High current impulse

I_p (kA) = 200 kA \pm 10 %

W/R = 10.000 kJ/ Ω - 10% \pm 35%

Q = 100 C \pm 20 %

Duration < 10 ms

Load transfer

Q = 200 C \pm 20 %

Carried out at the Official Central Laboratory of Electrotechnics (LCOE) in Getafe (Madrid) with satisfactory results.

Test	I_{peak} (kA)	W/R (kJ/ Ω)	Q (C)	t_1 (µs)	t_2 (µs)	Visual inspection
TI10-01	186,7	5649	55,8	24,1	255,1	OK
TI10-02	188,4	5761	57,3	24,0	255,0	OK
TI10-03	190,2	6003	57,5	24,0	263,3	OK
TI10-04	188,4	5915	58,2	24,1	260,5	OK
TI10-05	189,1	6144	59,9	24,1	270,4	OK
TI10-06	186,9	5566	56,1	24,0	248,3	OK
Accumulated	...	35038	344,8	OK

	Test	I_{mean} (kA)	Q (C)	Duration (ms)	Visual inspection
LPL I	TI10-07	535,3	202,5	356,7	OK
	TI10-08	508,2	202,4	374,6	OK
	TI10-09	542,4	192,7	332,0	OK
Winter lightning exposure	TI10-10	557,9	190,3	326,1	OK
	TI10-11	572,5	197,8	332,4	OK
	TI10-12	560,7	207,9	353,6	OK
	TI10-13	556,6	203,5	353,1	OK
	TI10-14	520,9	192,1	346,3	OK
	TI10-15	578,8	204,4	338,9	OK
	TI10-16	550,5	194,3	336,7	OK
	TI10-17	464,9	55,8	106,5	OK
	TI10-18	571,9	210,3	351,8	OK
	TI10-19	562,0	207,5	353,9	OK
	Accumulated	...	2461,5	...	OK

Figure 2. Tabulated results of the test.

Coverage radius

The coverage radius of the DDCE 100 Plus model is calculated using the Rolling Sphere method described in the UNE EN IEC 62305 standard, taking into account the data from the certified tests of short current impulses of 100 kA 10/350 µs.

Radius of coverage ON THE FLOOR maximum obtained.

Installation height (m)	Coverage radius * (m)
5	44,4
10	62,4
15	76
20	87,2
25	96,8
26,79	100
30	100
40	100
50	100

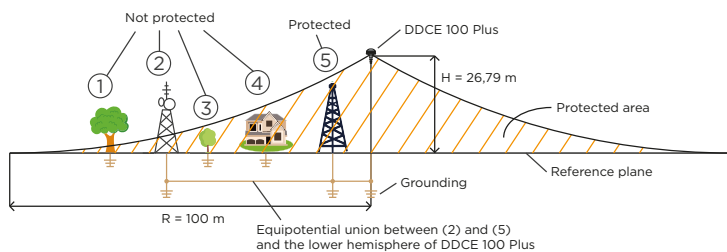


Figure 3. Example area protected by a DDCE. Profile view.

***Protected Area:** Only those structures that are within and in its entirety of the defined protection area and are at the same electrical potential as the lower hemisphere of the DDCE 100 Plus will be considered protected by the DDCE 100 Plus. Natural structures, such as trees, grass, land, lagoons or lakes of water or others, will not be considered protected in any case, even if they are within and in its entirety, the protection area defined by the DDCE 100 Plus (See figure 3). Those structures that are within the protection area and have ionizing protection systems (passive or active ionizing lightning rods of any type) will not be considered protected by the DDCE 100 Plus.

In case of requiring levels of protection defined in the standard UNE EN IEC 62305 (Level I, II, III or IV), for the calculation of the radius of protection of the DDCE 100 Plus and of all existing protection systems against lightning, the following radius of the rolling sphere will be applied: Level I ($R = 20$ m), Level II ($R = 30$ m), Level III ($R = 45$ m) and Level IV ($R = 60$ m). In this case, the protection radius of the DDCE 100 Plus can also be 100 m, as long as the regulatory requirements are met (Consult the manufacturer or official distributor). The protection area of the DDCE 100 Plus may be extended based on the criteria and requirements described in the product Instruction Manual.

Protection effectiveness

Prevents the impact of direct lightning in the protected area (*).

Protection against indirect effects from lightning

If indirect effects due to external induced overvoltage reach the DDCE 100 PLUS, whether by ground or radiated by air (electromagnetic pulses), the DDCE 100 Plus behaves like a thermal fuse, absorbing part of the energy, and may suffer damage.

For protection against these indirect effects to the DDCE, the protection element dinco model DNNF will be available as a sheath in the down wire just after the end of the axis of the DDCE 100 Plus, if the mast is made of fiber, or it will be arranged in the cable down just after the end of the mast, if this is metallic (consult installation manual).

For installations exposed to these indirect effects, the DNNFT model dinfil earth filters will be installed. This device, when installed in the right place, significantly minimizes the effects of high-frequency overvoltages induced by the ground that can be coupled to the protected structure (electrical and electronic installation and equipment, depending on each case). The dinfil filter is complementary to the standard overvoltage protectors, which will be necessary and mandatory, according to this schematic example:

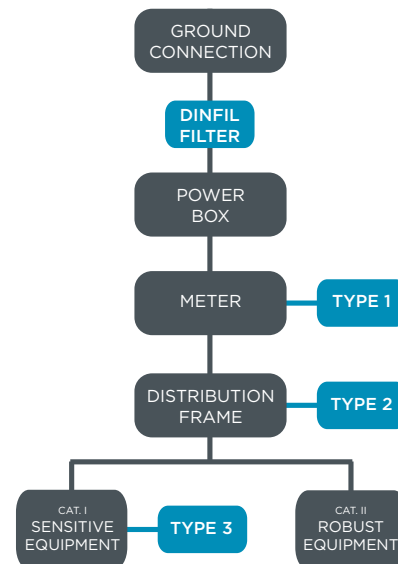


Figure 4. Electrical installation diagram.

Type 1 Protectors:

For nominal voltage of 230 V, 50 kA, ≤ 4 kV F+N Type 1 + 2

Type 1 + 2 Protectors:

For nominal voltage of 230/400 V, 50 kA, ≤ 4 kV 3F+N

Protection for telephone line or ADSL Type 1:

20 kA

Type 2 Protectors:

Nominal discharge current C2 (8/20 us) 2,5 kA Type 1 + 3

Protector for TV/SAT Antenna:

Nominal discharge current C2 (8/20 us) 10 kA

High frequency protector:

Dinfil filter model DNNFT (10/350us) 200 kA

Applications

All kind of structures in land.

Exclusive and effective system for the protection of structures within environments with risk of fire and explosion (ATEX areas) and/or located in areas with high risk of lightnings incidence (Telecom Towers, Radars, Structures in mountain areas, etc.).

Installation

Once the proper height and the mast with 42 mm inner section selected, to place the DDCE Plus must be made a thru-holes of M8x60mm at 17 and 37 mm from the top base of the mast, ensuring support and mechanical connection between DDCE Plus and the mast.

The down pipe that joins the DDCE Plus to the grounding must be as straighter as possible, assuring the trajectory of the cable through flanges and, avoiding to make angles with less than a 20 cm radius.

Guarantee that the layout of the cable is always descendant.

UL96:2016 Certified

Compliance with ANSI/CAN/UL-96-2016 as an aerial terminal Class I (Certf. Number: 20180820-E480063).

NATO Certification

The DDCE is officially certified by NATO in the concept of "Lightning Protection System and Electromagnetic Protector" with the NATO code DDCE:NCAGE:SYN37.

The DDCE has been selected to be part of the NATO Cataloguing System (NCS), by which it is guaranteed that a same article is known within the logistics field of the countries members of the system by one and sole denomination and a sole NATO Catalog Number (NOC).

CE Labeling

The DDCE device is compliant with General Law of Security Products 2001/95/CE and working limits of Electromagnetic Compatibility, under EC Labeling requirements:

Product Safety | Directives 2011/95/CE

Electromagnetic Compatibility | Directives 92/31/CEE

Low Voltage Equipment | Directives 72/23/CEE

Quality Management System

Dinnteco International works with the Quality Management System according to international standards ISO 9001: 2015 applied to: design, manufacture and sale of compensating devices for variable electric fields, variable radio frequency electromagnetic shield and electrostatic charge deionizers: DDCE models, DDCE Plus, dineol and PDCE. Design, manufacture and sale of dinfil high frequency earth filters and dinco protection connector.

Labor Risk Prevention

The DDCE is compliant with the requirements of preventive action (Article 5) of the Law 31/1995 of November 8th of Labor Risk Prevention, as well as RD 614/2001 of June 8th about health and safety protection of workers from electric risk.

Environmental Protection

Rohs standards compliant.

Maintenance

Annual mandatory, executed and certified by the official installer. The maintenance operations described in the document "Annual Maintenance Protocol" must be carried out and recorded.

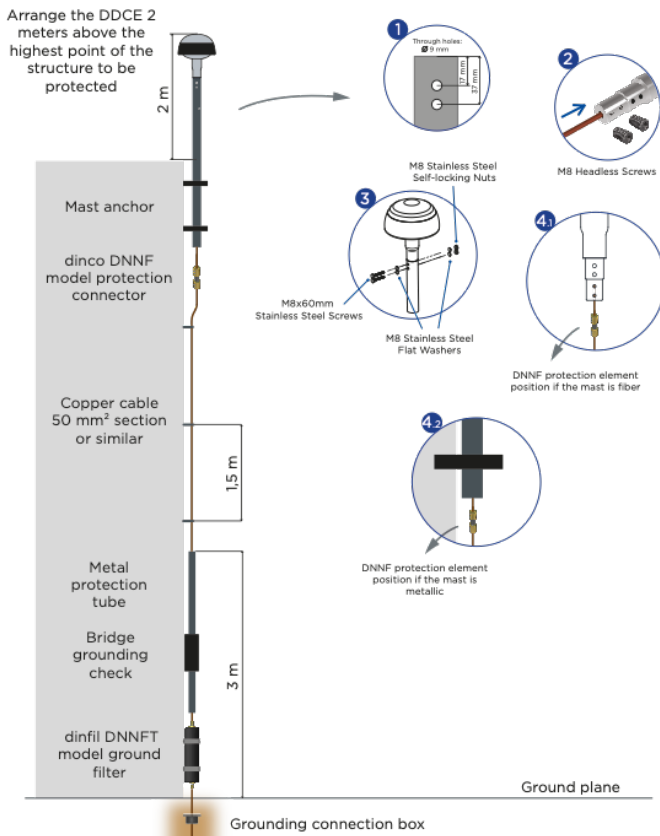


Figure 5. Installation of the DDCE Plus.

IMPORTANT NOTE: In installations with risk of receiving external induced surges (telecommunication towers, radars, substations, isolated structures, etc.), the dinfil filter will always be installed.

Bureau Veritas Certification (Es036861)

Lightning protection | UNE-EN (IEC 62305:2012) and

UNE EN IEC 61400-24:2019 (SPCR in Wind Turbines)

Lightning strike risk security | TBC (Technical Building Code): SU8

NBR 5419:2015 | IRAM 2184:2011

NTC 4552:2008 | SANS 10313:2012

AS/NZS1768/2007

NFPA 780:2011 | CAN/CSA-B72-M87(R2013)

Product warranty

1. Coverage

This warranty issued by Dinnteco Factory Gasteiz covers the replacement of the defective product with a new product.

The costs of shipping, handling and packaging of the defective product must be paid initially by the customer, but will be reimbursed by the manufacturer after verifying that the conditions for the repair or replacement of the defective product are met. It does not include the uninstallation of the defective product or the installation of the new product sent under warranty with its associated costs in accessories and personnel.

2. Warranty period

The products have a maximum warranty period of 5 years (1 year of start-up plus 4 years of annual maintenance), subject to mandatory compliance with the requirements of point 3 of the "product warranty protocol".

The application and exclusions of the product warranty, as well as the definition of a defective product resulting from a manufacturing defect are described in the product's Instruction Manual and/or warranty protocol.

Product Liability Insurance for defective products resulting from a manufacturing defect

Dinnteco Factory Gasteiz SLU has contracted a "Civil Liability Insurance" policy with GENERALI Insurance Company (Policy No. RSG286000224).

1. Guaranteed coverage in the event of a claim

Damages to third parties caused by the insured products, by a normal operation of the same, due to a manufacturing defect.

Maximum limit per claim and year: 6,000,000.00 euros with a sub-limit per victim in Employers' Liability of 600,000.00 euros.

2. Coverage time

2 years from the installation date recorded in the official start-up protocol.

The following are excluded from the coverage of this insurance policy, the effects that could appear on the product, the installation, people and/or protected area, derived from indirect effects due to external induced overvoltages of any origin, as well as all those products declared as defective that do not have in force the product warranty provided by the manufacturer and having the aforementioned guarantee, more than 2 years have elapsed since the product was installed, counting from the date of

installation registered in the official start-up protocol. Therefore, in the event that the conditions and requirements for the application of this insurance are met, it will only be able to be applied and claim, where appropriate, damages to third parties, during the first 2 years of the issuance of the product guarantee provided by the manufacturer.

3. Conditions of Application of the insurance

The provisions of the preceding paragraph with respect to the warranted coverage shall be applicable in the event of a claim, taking into account "always" the technical characteristics of the insured product, and if, based on the same, the product should have fulfilled its purpose and did not do so due to a manufacturing defect.

4. Countries with Coverage

Worldwide coverage, including USA and Canada.

This policy is subject, as applicable, to the Insurance Contract Law and its General Conditions are in accordance with the model subject to the control of the Directorate General of Insurance, as established in the Law of Regulation and Supervision of Private Insurance.

