

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

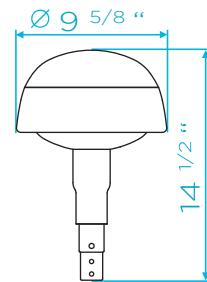
Made of
Aluminum &
POM

Weight
15,87 lb

Packaging:
Recycled
cardboard &
PELD



Measurements



Packaging:
10" x 10" x 18"

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, tending to avoid 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 3 ft 11^{1/4} " 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 45 1/4 ", the leader always appears at the Franklin Rod.

With peak voltage (kV) U50 from 549.6 KV to 45 1/4 ", 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 ± 10 %

W/R = 2500 kJ/Ω ± 35%

Q = 50 C ± 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)	t1 (µs)	t2 (µs)	Visual inspection
VB16-04	102,5	2704	45,05	32,47	424,4	OK
VB16-05	102,3	2651	44,01	32,44	410,67	OK
VB16-06	102,7	2733	45,04	32,46	425,42	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 > 30000 (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 LPS in wind turbines.

High current impulse

I_p (kA) = 200 kA ± 10 %

W/R = 10.000 kJ/Ω - 10% ± 35%

Q = 100 C ± 20 %

Duration < 10 ms

Load transfer

Q = 200 C ± 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)	t1 (µs)	t2 (µs)	Visual inspection
TI01-03	182,1	5057	53,0	23,9	237,1	OK
TI01-04	183,9	5231	52,2	24,0	249,5	OK
TI01-05	188,8	8908	85,0	24,1	417,6	OK
TI01-06	187,9	7736	74,7	24,1	367,3	OK
TI01-07	183,9	5014	49,5	24,0	239,8	OK
Accumulated	...	31946	314,4	OK

	Test	I_{mean} (kA)	Q (C)	Duration (ms)	Visual inspection
LPL I	TI01-08	408,8	170,7	414,9	OK
	TI01-09	233,9	167,6	711,7	OK
	TI01-10	412,1	197,9	477,6	OK
Winter lightning exposure	TI01-11	413,7	142,1	340,8	OK
	TI01-12	486,0	197,8	404,8	OK
	TI01-13	459,0	203,5	464,8	OK
	TI01-14	453,7	204,0	447,1	OK
	TI01-15	439,6	208,2	471,1	OK
	TI01-16	443,4	211,9	475,3	OK
	TI01-17	466,1	209,2	446,4	OK
	TI01-18	391,4	185,0	469,7	OK
	TI01-19	508,2	193,3	378,1	OK
	TI01-20	334,5	188,5	560,1	OK
	TI01-21	449,3	205,6	455,0	OK
Accumulated	...	2685,3	...	OK	

Figure 2. Tabulated results of the test.

Limit operation of the DDCE

DDCE devices can suffer permanent saturation in certain extreme working conditions. DDCE are certified under the conditions required by the standards described in this technical sheet, but much more extreme conditions can occur in nature than those tested in a laboratory. In the event that working conditions occur such that the DDCE reaches its permanent saturation limit and therefore suffers a permanent short circuit, the DDCE will act as a thermal fuse, absorbing part of the energy generated (from an electromagnetic pulse, ionized channel, direct lightning strike or effects of overvoltages induced by earth, etc.). In this case, the DDCE can suffer damage up to an extreme situation that causes it to stop working correctly (Insulation resistance test at 1000 Volts with a result of less than 10 Mohm) and even reach its total destruction. In this case, and that can be objectively evidenced (obvious signs of short-circuiting of the equipment with very significant fusions or loss of conductive and insulating material from the equipment), effects, damage or incidents may appear on the general infrastructure of the protected installation that, In any case, they will be outside the warranty coverage of the product and therefore, the coverage of the RC insurance for defective products. In any case, the DDCE equipment, in its normal and optimal operation, can suffer punctual and instantaneous saturations. In these cases, the DDCE is designed to generate small instantaneous desaturation electric arcs between both hemispheres (safety system), with the aim of preserving the integrity of the equipment itself and the protected installation at all times. These electric arcs can generate small fusions of the conductive and/or insulating material of the DDCE, typical of its normal and optimal operation.

Coverage radius

The calculation of the floor coverage radius of the DDCE 100 Plus model is carried out using the Rolling Sphere method described in the UNE EN IEC 62305 standard or similar requirements in national or international standards where the product is installed (e.g. NFPA 780), and depending on the level of protection required (Level I, II, III or IV) the following radii of the rolling sphere will be applied: Level I (R= 66 ft), Level II (R= 98 ft), Level III (R= 147 ft) and Level IV (R=196 ft) and will result in a floor coverage radius r (figure 3) and a resulting protection area based on this radius r (figure 4). The radius of coverage in plan r could be extended up to a maximum of 328 ft in some type and specific form of structures (Consult with the manufacturer), regardless of the protection Level applied, as long as, at least, a significant part of the conductive structures and/or existing buildings are within the defined protection area by applying the rolling sphere method with the required Protection Level (I to IV), are at the same electrical potential as the lower hemisphere of the DDCE, comply with the requirements set out in the UNE EN IEC 62305 standard in order to form part of the LPS or similar requirements in national or international standards where the product is installed (e.g. NFPA 780) and depending on the required level of protection, the maximum distances between the existing and/or arranged conductive elements are met (in order to apply this case, consult the design of the SPCR to be carried out with the manufacturer). Natural structures (trees, land, lagoons, etc.) will remain outside the protected area (*). All protection designs using DDCE systems must be verified by the MANUFACTURER.

$\frac{r}{h}$	Level I (R=66 ft)	Level II (R=98 ft)	Level III (R=147 ft)	Level IV (R=196 ft)
2	8	11	13	15
4	12	15	18	21
6	14	18	22	26
8	16	20	25	29
10	17	22	28	33
20	20	28	36	44
30	20	30	42	52
45	20	30	45	58
50	20	30	45	59
60	20	30	45	60

h: Height from the reference plane

r: Radius of coverage in plan

Figure 3. Coverage radius r of the DDCE depending on the level of protection required.

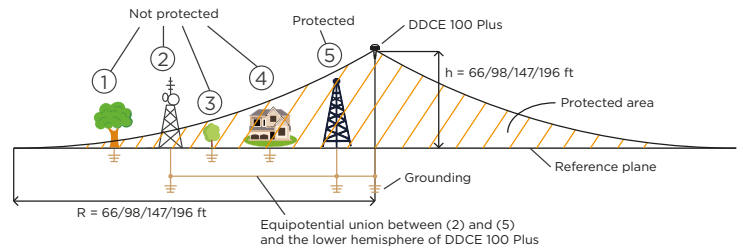


Figure 4. Example area protected by a DDCE. Profile view.

***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 4). 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.

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, ionized ducts coming from ramifications of the main lightning channel in situations of very low clouds and close to the protected structure), 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:

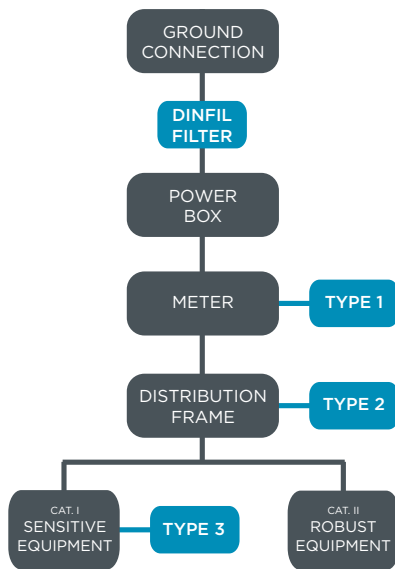


Figure 5. Electrical installation diagram.

Type 1 Protectors:

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

Type 1 + 2 Protectors:

For nominal voltage of 230/400 V, 50 kA, ≤ 4kV 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 1^{5/8} " inner section selected, to place the DDCE Plus must be made a thru-holes of M8x2^{3/8} " at 0^{11/16} " and 1^{7/16} " 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 120°.

Guarantee that the layout of the cable is always descendant.

A ground resistance of less than 10 Ohms is required.

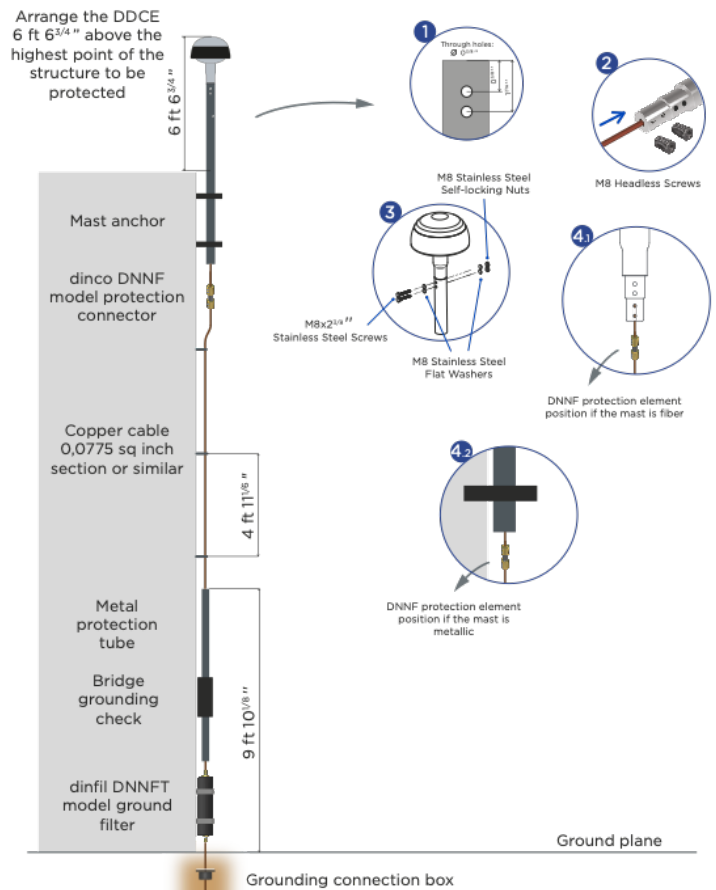


Figure 6. Installation of the DDCE Plus.

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.

DDCE product certificate by Bureau Veritas (ES140752)

Lightning protection (UNE EN IEC 61400-24:2019, the waveforms injected in this test are defined in the UNE EN IEC 62305-1:2011 standard).

Note: According to the certified laboratory tests of the product, it meets the requirements that apply to it, as an air terminal, of the standards based on UNE EN IEC 62305, such as, among others: NBR 5419:2018, IRAM 2184:2011, NTC 4552:2008, SANS 10313:2012, AS/NZS1768/2007, JIS Z 9290, etc., as well as CTE-SU8 and NFPA 780. In any case, the protection design and installation of the product must meet the requirements that apply to it, of each of the standards in a particular way.

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

Product Safety | Directives 2014/35/EU

Electromagnetic Compatibility | Directivas 2014/30/EU

Equipment Directive | Directives 2014/53/EU

Electromagnetic compatibility (Emissions, immunity and disturbances)

UNE-EN-IEC 61000-6-1: 2019

UNE-EN-IEC 61000-6-2: 2019 UNE-EN-IEC 61000-6-3: 2021

UNE-EN-IEC 61000-6-4: 2019

UNE-EN-IEC 61000-4-2/3/4/5/6/8

UNE-EN 55032:2016+AC:2016-07+A11:2020+A1:2021 Clase B

UNE-EN 55035:2017 + A11:2020 UNE EN 301 489-1 V2.2.3 (2020-01-01)

Electrical safety

UNE-EN-IEC 62368-1:2020/AC2020-05 (Partial)

Extreme climatic tests (insulation resistance, dielectric strength, earth resistance, leakage current and transient overvoltages) | Product performance tests

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.

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 guarantee are described and updated on the official website of dinnteco.

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. (Except USA, Canada, Mexico and Australia, which will be up to 3.000.000,00 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 and effects due to limit operation of the product, 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.

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.

