CONNECT AND PROTECT

nVent ERICO System 1000

Early Streamer Emission (ESE) Lightning Protection Products

nVent

ERICO

Active Protection

nVent is a trusted world leader for providing high-quality grounding solutions, lightning protection and surge protection technologies. By recognizing the importance of an integrated lightning protection strategy, nVent has incorporated several major concepts into a Six Point Plan of Protection:

1. Capture the lightning strike
2. Convey this energy to ground
3. Dissipate energy into the grounding system
4. Bond all ground points together
5. Protect incoming AC power feeders
6. Protect low voltage data/telecommunications circuits

nVent operates in every region of the world and supports the global market with an extensive distribution network, helping to ensure that nVent products and expertise are available for any project, regardless of size or location. Dedicated consulting teams assess the requirements of any project and provide guidance for optimal lightning protection solutions.

An unparalleled level of engineering support and experience is involved in the development of grounding, lightning protection and surge protection products. nVent has developed specialized design software to integrate all aspects affecting system performance, including local conditions, to help ensure that requirements of relevant standards are met or exceeded.

nVent's products are manufactured to ISO® 9001:2008 and are subjected to rigorous field and laboratory testing and computer modeling during product development. The products are supported by test reports, technical papers, literature and installation instructions.

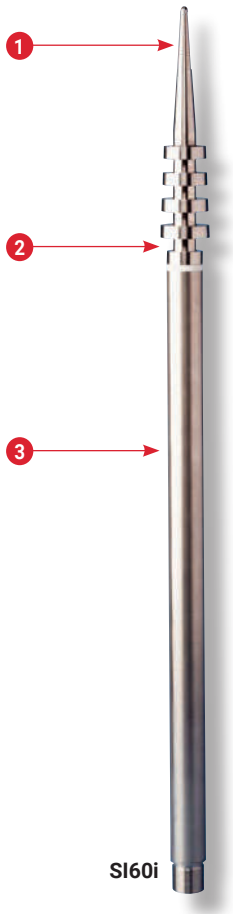
nVent offers three versions of the nVent ERICO Early Streamer Emission (ESE) i-Series air terminals:

- SI25i with a triggering advance of 25 µs
- SI40i with a triggering advance of 40 µs
- SI60i with a triggering advance of 60 µs

These Early Streamer Emission Air Terminals (ESEAT) are in accordance with the 2011 edition of NFC 17-102. The design requirements, protection level calculations and protection radius are obtained from this standard.

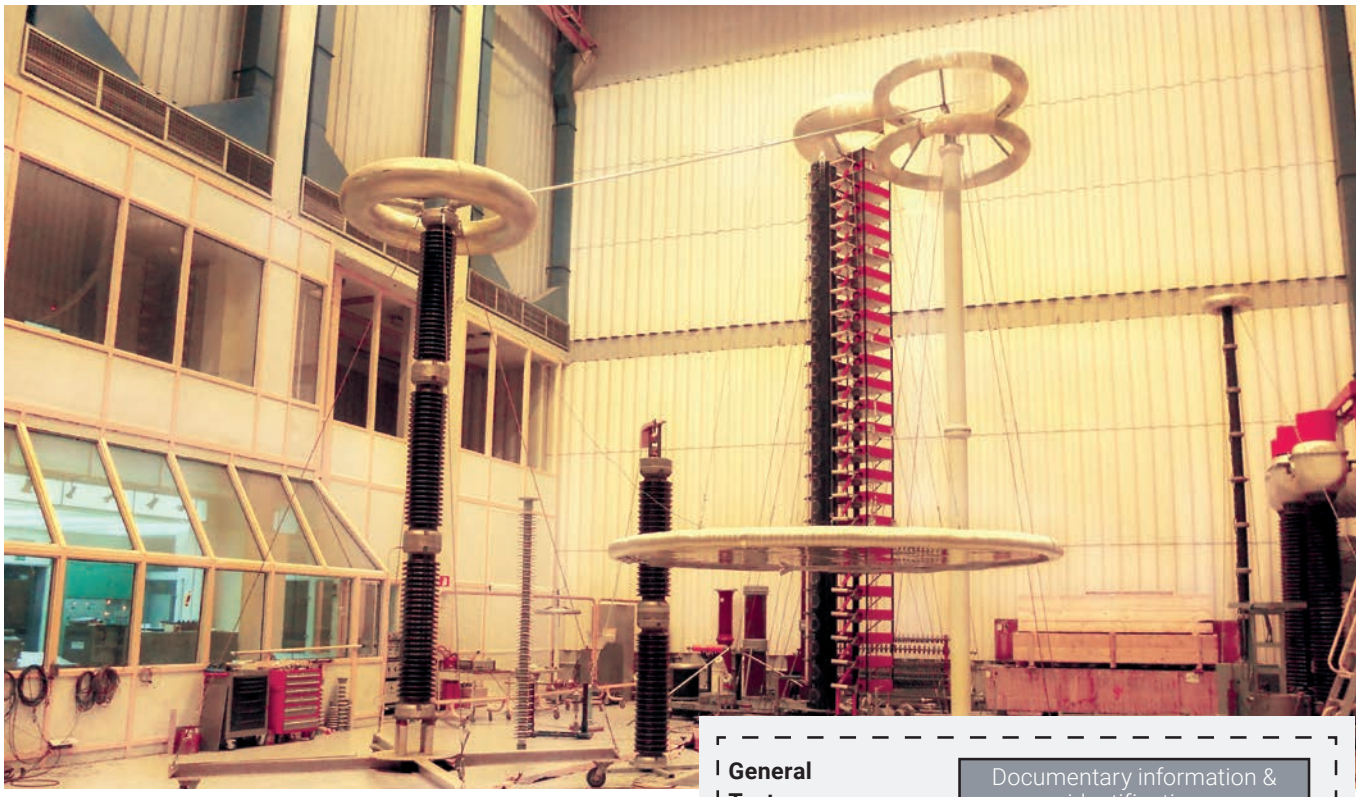
Due to the internal control circuit, the ESE i-Series enables the early launching of an upward leader compared to other passive components.

1. Strike tip
2. Insulator ring
3. High voltage control section



SI60i

Testing and Working Principles



TESTING

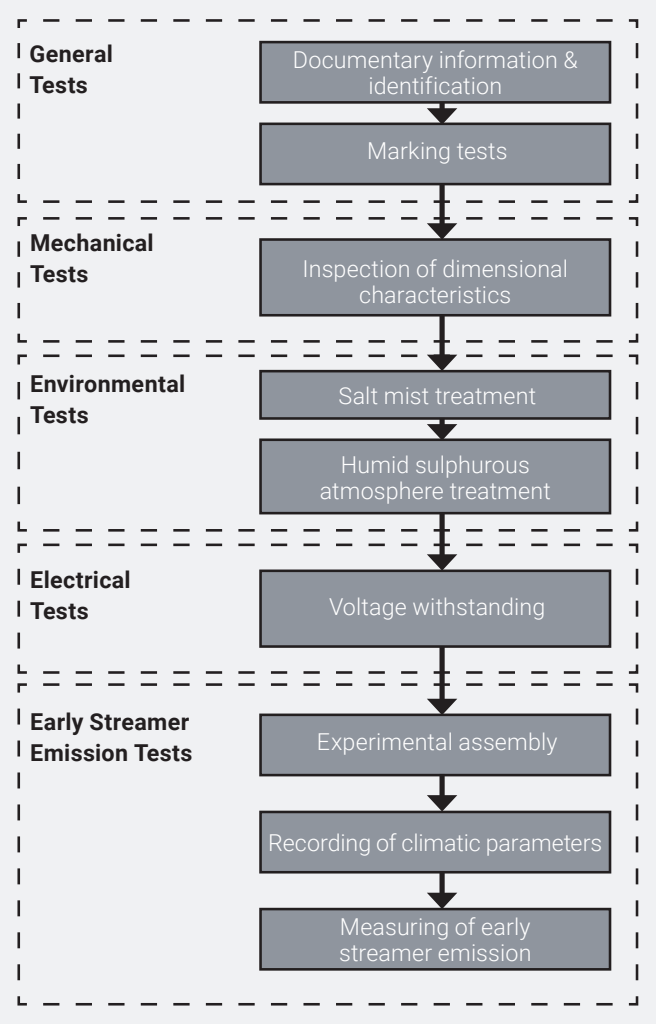
The ESE i-Series has been extensively tested at an independent high-voltage laboratory* in accordance with the revised 2011 requirements of French NFC 17-102. The testing, as defined in the standard, was designed to simulate naturally occurring conditions and allow comparison of the performance between differing types of lightning protection systems.

The test simulates natural field conditions where a field impulse (from the downward leader approaching ground, simulated by a Marx Generator with a long front time) is superimposed onto a permanent field (from the charge between cloud and ground, simulated in the laboratory by a DC generator).

The corona at the tip of the rod is measured by a photo-multiplier that enables the determination of the triggering time of both the Simple Rod Air Terminal (SRAT) and the ESEAT. The average value is then determined for both a simple rod and the ESEAT. T(SRAT) is then subtracted from T(ESEAT) to achieve the ΔT advantage for the ESE i-Series.

The 2011 revision of the standard has defined more rigorous environmental and performance criteria during terminal testing and has created a higher standard for early streamer emission terminals. The requirements became effective September 2012.

* Test reports available upon request



Testing and Working Principles

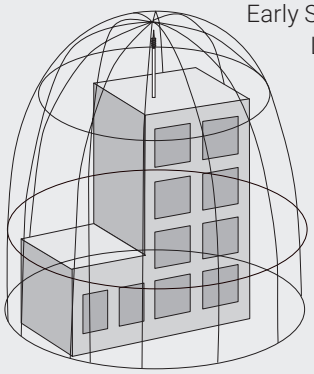
WORKING PRINCIPLES

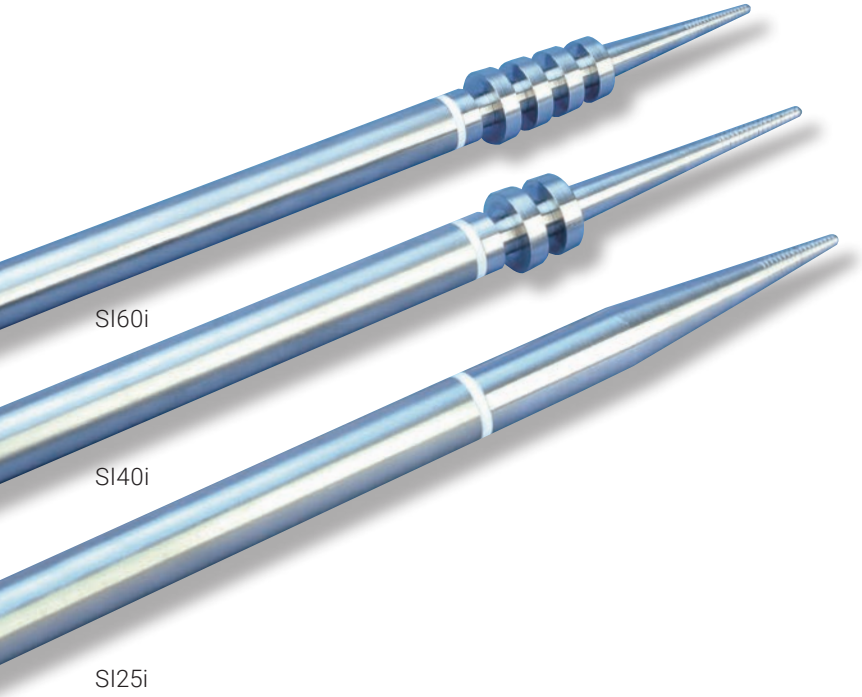
During thunderstorm conditions when the lightning down leader is approaching ground level, an upward leader may be created by any surface. In the case of a passive lightning rod, the upward leader propagates only after a long period of charge reorganization. In the case of the ESE i-Series, the initiation time of an upward leader is greatly reduced. The ESE i-Series generates controlled magnitude and frequency pulses at the tip of the terminal during high static fields prior to a lightning discharge. This enables the creation of an upward leader from the terminal that propagates toward the downward leader coming from the thundercloud.

ESE i-Series

Early Streamer Emission Lightning Terminal

According to the NFC 17-102 and similar ESE standards



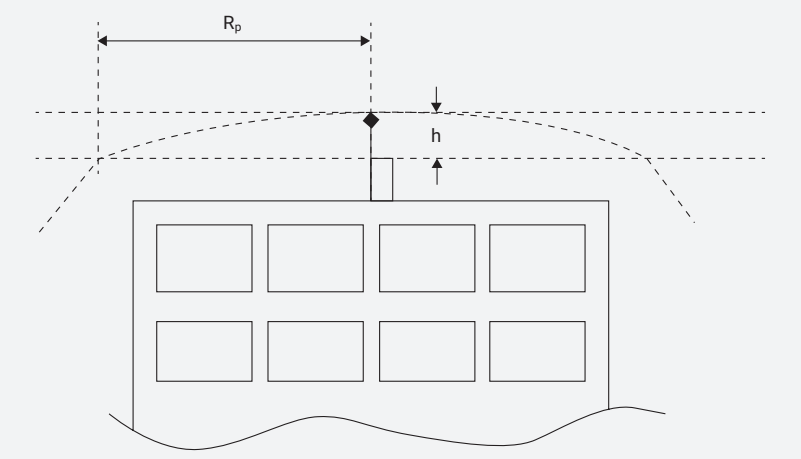


FEATURES

- Designed and tested to NFC 17-102 and similar standards
- 304 stainless steel design suitable for most environments
- Available in three models to suit specific site requirements
- Suitable for use with a variety of downconductor systems, including tape, cable, smooth-weave, Isolated Downconductor (ISODC) and nVent ERICO Ericore conductor

Protecting Areas

According to NFC 17-102:2011, the standard protection radius (R_p) of the ESE i-Series is linked to ΔT (below), the protection levels I, II, III or IV (as calculated in EN 62305-2) and the height (h) of the ESE i-Series above the structure or feature to be protected (defined by NFC 17-102 as a minimum 2 m).



Protection Level	Protection Level I (99%, D = 20 m)			Protection Level II (97%, D = 30 m)			Protection Level III (91%, D = 45 m)			Protection Level IV (84%, D = 60 m)		
Model	SI25i	SI40i	SI60i	SI25i	SI40i	SI60i	SI25i	SI40i	SI60i	SI25i	SI40i	SI60i
ΔT (µs)	25	40	60	25	40	60	25	40	60	25	40	60
h (m)	**R_p (m) Protection Radius**											
2	17	23	32	19	26	34	23	30	40	26	34	44
3	25	35	48	26	39	52	34	45	59	39	50	65
4	34	46	64	39	52	68	46	60	78	52	67	87
5	42	58	79	49	65	86	57	75	97	65	83	107
6	43	59	79	49	66	86	58	76	97	66	84	107
7	44	59	79	50	66	87	59	76	98	67	85	108
8	44	59	79	51	67	87	60	77	99	68	86	108

Where h≥5 m, then R_p can be calculated from

$$R_p(h) = \sqrt{2rh - h^2 + \Delta(2r+\Delta)}$$

Where 2 m ≤ h ≤ 5 m, then R_p can be calculated from

$$R_p = h \times R_p(5) / 5$$

R_p (h) (m) **is the protection radius at a given height h**

h (m) **is the height of the ESEAT tip over the horizontal plane through the furthest point of the object to be protected**

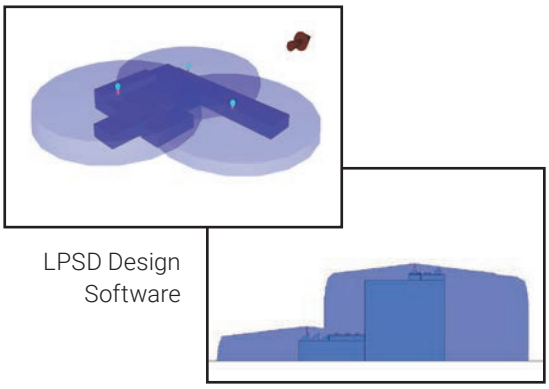
r (m) **20 m for protection level I**
30 m for protection level II
45 m for protection level III
60 m for protection level IV

Δ (m) **$\Delta = \Delta T \times 10^6$**
Field experience has proved that Δ is equal to the efficiency obtained during the ESEAT evaluation tests

Design

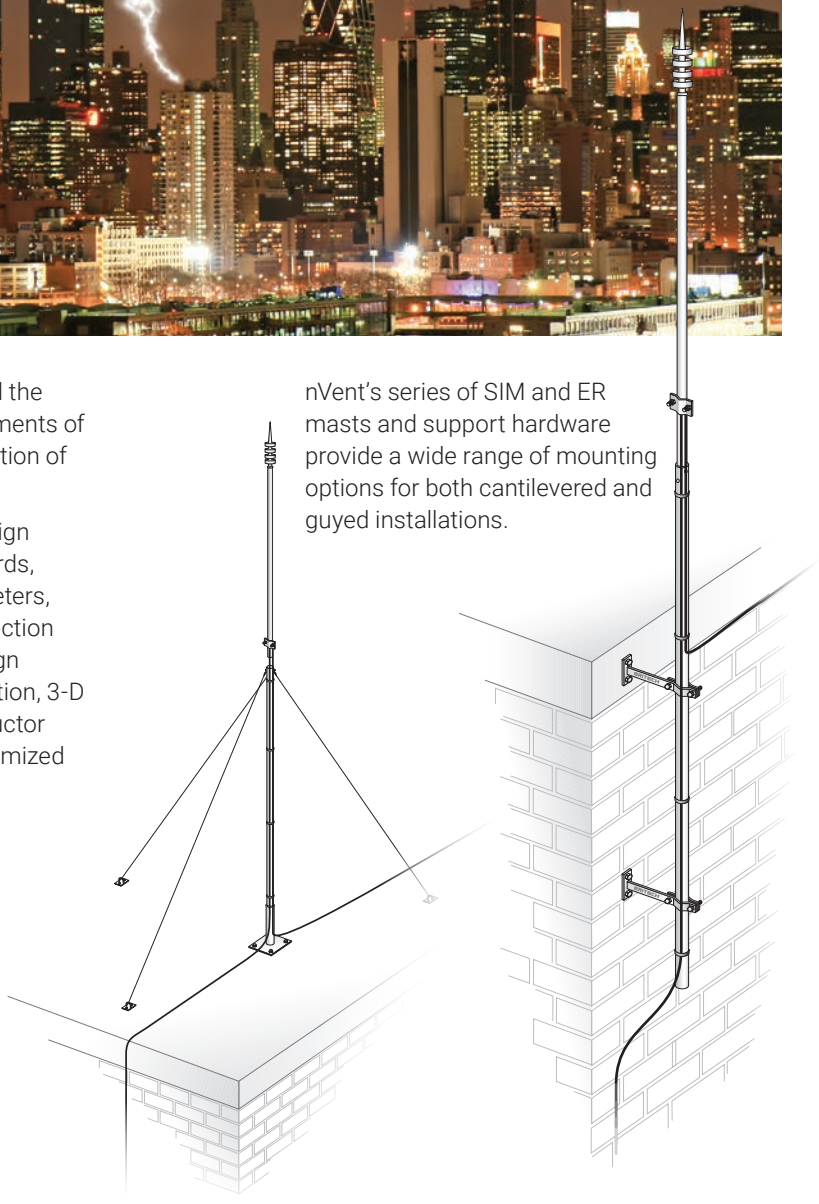
The aim of lightning protection design is to mitigate all the factors that can impact the lightning risk. The requirements of EN62305-2 provide guidance on calculation and selection of protection levels for each specific application.

nVent's unique computer-aided program provides design support for a variety of design techniques and standards, including NFC 17-102. Based on individual site parameters, such as structure dimensions, terminal type and protection requirements, each Lightning Protection System Design (LPSD) is customized for the project. It provides elevation, 3-D and plan views enabling terminal location, downconductor routing and grounding system requirements to be optimized for your facility.



LPSD Design Software

nVent's series of SIM and ER masts and support hardware provide a wide range of mounting options for both cantilevered and guyed installations.



SYSTEM REQUIREMENTS:

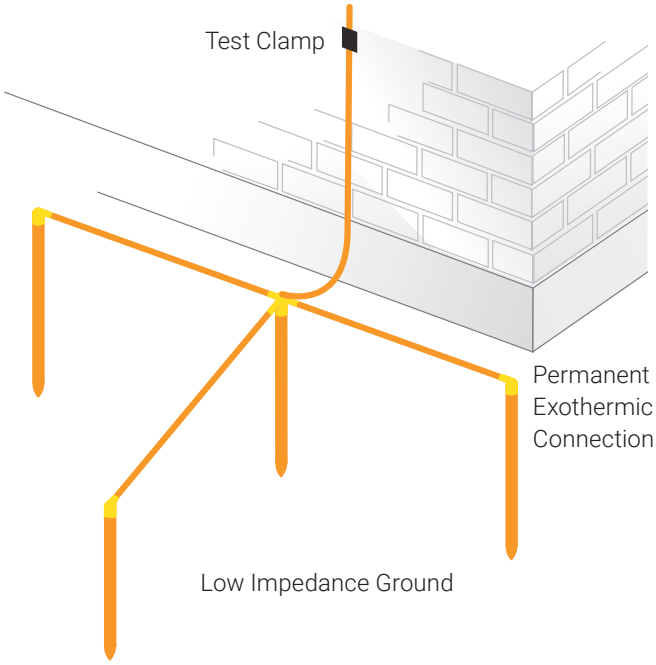
The design and installation of the terminals should be completed in compliance with the requirements of the French Standard NFC 17-102. In addition to terminal placement requirements, the standard requires a minimum of two paths to ground per terminal for non-isolated conductor systems. A downconductor cross-sectional area of ≥50 mm^2 is specified. The downconductors are to be secured at three points per meter with equipotential bonding made to nearby metallic items.

Each downconductor requires a test clamp and dedicated earth system of 10 ohms or less. The lightning protection ground should be connected to the main building ground and any nearby buried metallic items. The NFC 17-102 and similar ESE standards requirements for inspection and testing range from each year to every four years dependent upon location and protection level selected. Refer to your nVent representative or the System 1000 installation manual for additional information.

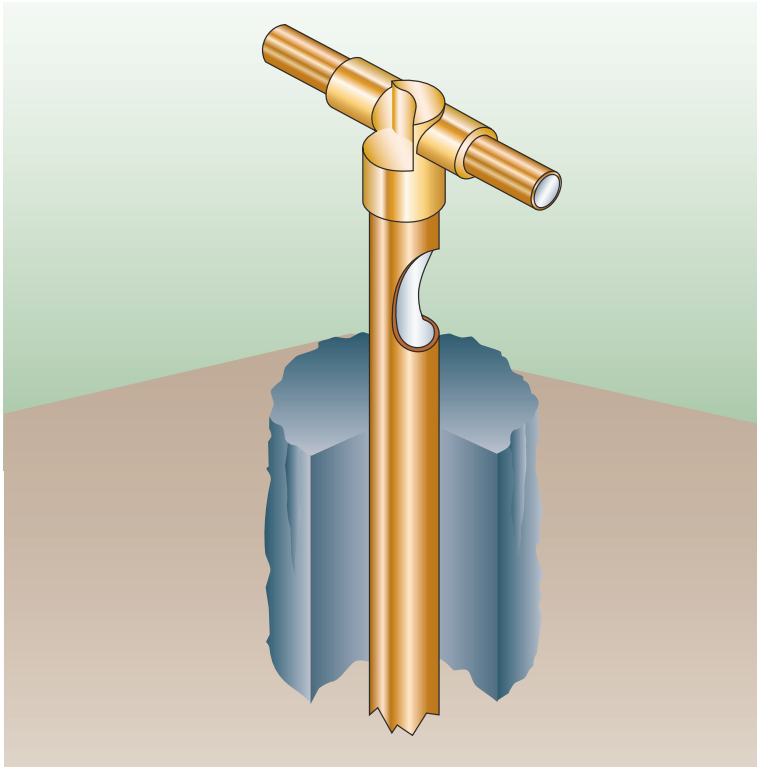
Importance of Grounding

The transient nature of lightning with its associated fast rise times and large magnitude currents mean that special consideration needs to be given to grounding for lightning protection to be effective. A poorly grounded system increases the likelihood of the strike flashing over to the structure and/or finding a non-preferred path within the structure. Many factors, such as soil resistivity variations, installation accessibility, layout and existing physical features are all site-specific and tend to affect decisions on grounding methods employed. The primary requirements of a direct strike grounding system are to:

- Efficiently dissipate lightning energy into the ground
- Help protect equipment and personnel
- Provide good corrosion resistance/long life



The ground electrode system should be corrosion resistant and bonded to the structural ground system. Copper and copper-bonded steel are the most common materials used for grounding conductors. Mechanical coupling can be used to join ground conductors, but suffers from corrosion effects when dissimilar metals are involved. In addition to mechanical strength, nVent ERICO Cadweld connections provide excellent, low-impedance and long-life electrical connections with excellent corrosion resistance.



nVent also recommends the use of nVent ERICO Ground Enhancement Material (GEM) to ensure an optimal ground. GEM is a low-resistance, non-corrosive, carbon dust-based material that helps improve grounding effectiveness, especially in areas of poor conductivity. GEM contains cement, which hardens when set to provide a permanent, maintenance-free, low-resistant grounding system that never leaches or washes away. GEM does not adversely affect soil and will not leach ions or contaminate ground water. GEM conforms to IEC 62561-7 Standard, and is identified in NFC 17-102 as an option for reducing soil resistivity.

nVent recommends an annual inspection and maintenance program to verify the long-term effectiveness of the lightning protection and grounding system.

Ordering Information

Air Terminals

Interceptor SI

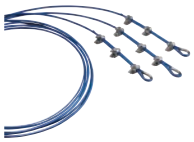
SI25i	25 µs	1.53 kg
SI40i	40 µs	1.53 kg
SI60i	60 µs	1.53 kg

Mast Bracket

ALOF1GS (702175) 1.5 kg

280 mm galvanized steel bracket for masts 28 to 68 mm diameter.

Masts Accessories



Guy Kit

GUYKIT4MGRIP	(701305)	4 m	0.4 kg
GUYKIT7MGRIP	(701315)	7 m	0.7 kg

Guy kits for 4 m and 7 m vertical guy heights.

Cable Tie

CABTIESS (701420) 0.05 kg

520 mm stainless steel cable tie for strapping downconductor to lower mast sections.

Lightning Event Counter

Digital Lightning Event Counter

LECV 0.3 kg

Digitally records quantity, hour and date of lightning strikes for retrieval during inspections.

Mechanical Lightning Event Counter

LECIV (702050) 0.685 kg

Installed on downconductor to record number of lightning strikes.

Ordering Information for Europe and Asia

Masts and Bases

Masts and Bases

SIM28A2	Upper section, 2 m	2.3 kg
SIM33B2	Mid section, 2 m	3.5 kg
SIM33B3	Mid section, 3 m	5.3 kg
SIM40C2	Lower section, 2 m	4.0 kg
SIM40C3	Lower section, 3 m	6.1 kg
SIMBASE2840	Base	1.2 kg
SIM28XX	Mast diameter	28 mm
SIM33XX	Mast diameter	33 mm
SIM40XX	Mast diameter	40 mm

Adapters

Mast Adapter

INTCPTMI16AT 0.1 kg

SIM28 to 16 mm air terminal.

Mast Adapter

INTCPTSIIERICOR 0.1 kg

Ericore to Sli terminal.

Mast Butt Adapter

INTCPTADBUTTSII 0.05 kg

Required to mount the Interceptor Air Terminal into the FRP mast. For use with INTCPTSIIERICOR.

Accessories

Mast Clamp

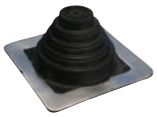
TMC-SS (702165) 0.2 kg

Clamp for connecting 25x3, 30x2 or 8 mm diameter conductor to SIM masts.

Mast Bracket

ACF-2-GS (103100) 2.1 kg

Parallel pipe clamp for masts 30 to 50 mm diameter. Supplied as set of two brackets.



Waterproof Cone

WPC (702230) 0.07 kg

Guyed Masts:						
Mast Height (m)	**2**	**4**	**5**	**6**	**7**	**8**
SIM28A2	X	X	X	X	X	X
SIM33B2		X		X		
SIM33B3			X		X	X
SIM40C2				X	X	
SIM40C3						X
SIMBASE2840	X	X	X	X	X	X
GUYKIT4M/GRIP		X	X	X	X	X
GUYKIT7M/GRIP					X	X
CABTIESS	4	8	10	12	14	16
BASEADAPTER40		X	X			

Cantilevered Masts:			
Mast Height (m)	**4**	**5**	**7**
Height above roof plane (m)	3	4	5
SIM28A2	X	X	X
SIM33B2	X		
SIM33B3		X	X
SIM40C2			X
CABTIESS	8	10	14
ALOF1GS	2	2	3

Ordering Information for North America and South America

Masts and Bases

Masts and Bases

ER1-1000-SS	(702255)	Upper section, 1 m	3.5 kg
ER1-2000-SS	(702260)	Upper section, 2 m	6.2 kg
ER2-2000-SS	(702265)	Mid section, 2 m	4.9 kg
ER2-3000-SS	(702270)	Mid section, 3 m	7.3 kg
ER3-2000-SS	(702275)	Lower section, 2 m	5.3 kg
ER3-3000-SS	(702280)	Lower section, 3 m	7.9 kg
ER2-BASE-SS	(702290)	Base for ER2 mast	5.2 kg
ER3-BASE-SS	(702295)	Base for ER3 mast	5.6 kg
ER1-xxxx-SS		mast diameter 25 mm	
ER2-xxxx-SS		mast diameter 32 mm	
ER3-xxxx-SS		mast diameter 38 mm	

Adapters

Adapter

INTCPTSIIER1 0.1 kg

Sli terminal to ER1 mast.

Adapter

INTCPTSIIER2 0.1 kg

Sli terminal to ER2 mast.

Accessories

Mast Clamp

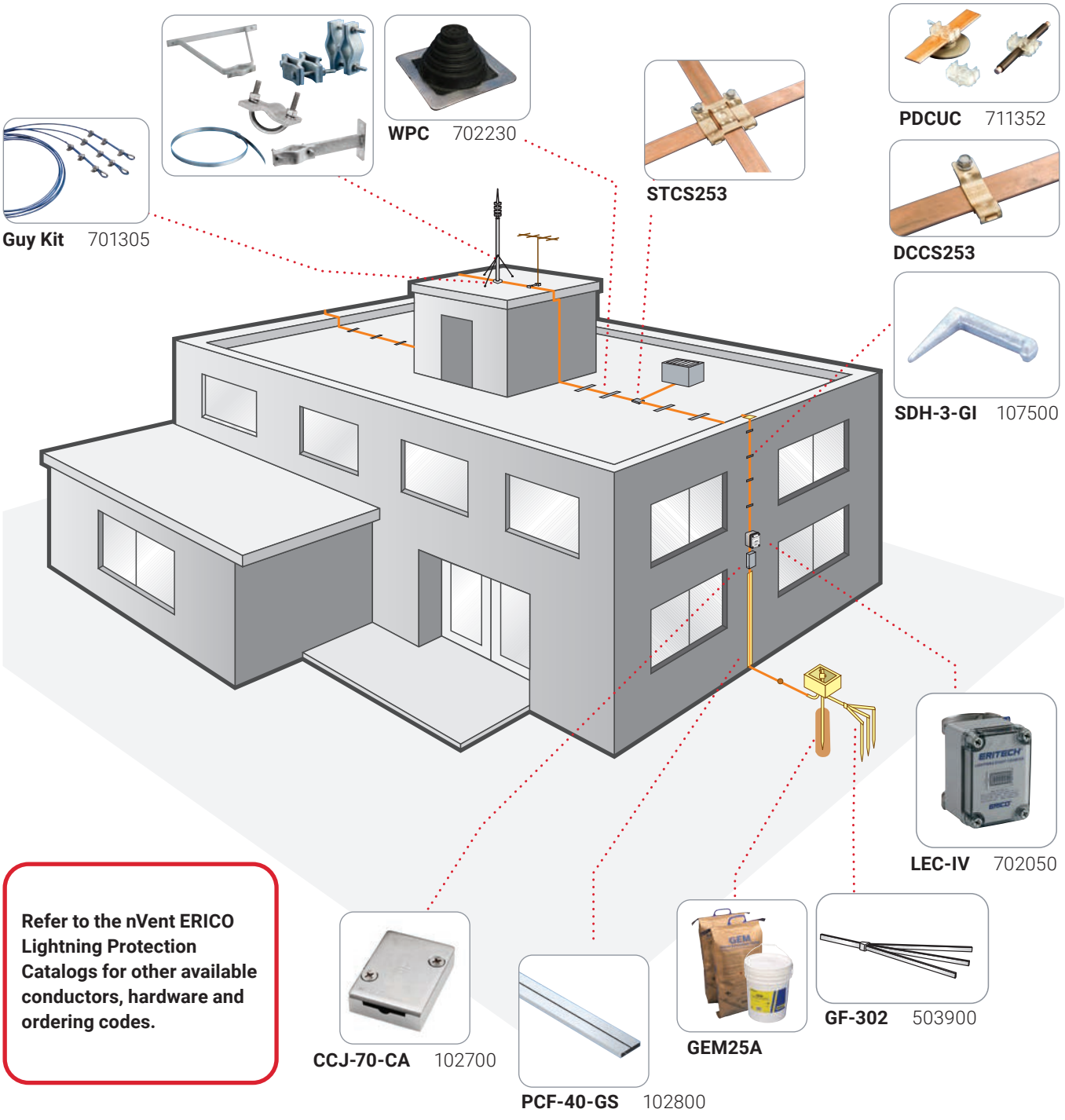
LPC570 0.2 kg

Clamp for connecting stranded conductor to ER mast.

Guyed Masts:							
Mast Height (m)	**2**	**3**	**4**	**5**	**6**	**7**	**8**
ER11000SS						X	
ER12000SS							X
ER22000SS	X		X	X			
ER23000SS		X			X	X	X
ER32000SS			X				
ER33000SS				X	X	X	X
ER2BASESS	X	X					
ER3BASESS			X	X	X	X	X
GUYKIT4M/GRIP		X	X			X	X
GUYKIT7M/GRIP				X	X	X	X
CABTIESS	4	6	8	10	12	14	16
INTCPTSIIER1						X	X
INTCPTSIIER2	X	X	X	X	X		

Cantilevered Masts:				
Mast Height (m)	**3**	**4**	**6**	**7**
Height above roof plane (m)	2	3	4	5
ER11000SS				X
ER22000SS		X		
ER23000SS	X		X	X
ER32000SS		X		
ER33000SS			X	X
CABTIESS	6	8	10	14
ALOF1GS	2	2	3	3
INTCPTSIIER1				X
INTCPTSIIER2	X	X	X	

Other Lightning Protection and Grounding Accessories



Refer to the nVent ERICO Lightning Protection Catalogs for other available conductors, hardware and ordering codes.

This illustration is not drawn to scale, nor does it portray an actual or typical application. It is designed to illustrate some of the major components of the nVent ERICO Lightning Protection System and their relationship with one another.

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