SIEMENS

Ingenuity for life

Medium-voltage surge arresters

Product guide USA

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Definition of surge arresters

Surge arresters are used to protect electrical equipment, such as transformers, circuit-breakers, and bushings, against the effects of overvoltages caused by incoming surges. Such overvoltages can be caused by a direct or nearby lightning strike, an electromagnetic pulse, electrostatic discharge, or switching operations in the power supply system as well as in devices. Some overvoltages are very high in energy. The current from the surge is diverted through the arrester, in most cases to ground. Effective overvoltage protection requires different surge arrester types to be used according to the particular application.

Contents

Siemens surge arresters for any requirement

Experience is most essential when it comes to reliability in medium- and high-voltage applications. Siemens has been designing and manufacturing medium- and high-voltage surge arresters for standard and special applications since 1925. Continuous research and development, the wealth of Siemens know-how, and comprehensive worldwide experience give Siemens surge arresters a leading edge in overvoltage protection. Their uncompromising quality ensures a long service life and reliability in any application.

Siemens surge arresters are an indispensable aid to insulation coordination in electrical power supply systems. Valuable equipment such as transformers, circuit breakers, generators, motors, capacitors, traction vehicles and bushings, as well as complete switchgear, is optimally protected against lightning and switching overvoltages.

Siemens surge arresters have been designed to meet the requirements of a wide range of common installation conditions, from arctic cold to the heat of the desert and the dampness of tropical climates. They are available for any application from 3 kV up to 1,200 kV including special applications such as high-voltage direct current (HVDC) and FACTS systems as well as all kinds of compensation systems for electric power networks.

High-voltage surge arresters

Siemens offers three different designs for high-voltage station surge arresters for the protection of substation equipment for applications up to 1200 kV:

- **3EL** product family - Surge arresters with directly moulded silicone rubber housing, Cage Design™
- **3EQ** product family - Surge arresters with silicone housing, composite hollow core design
- **3EP** product family - Surge arresters with porcelain housing

Siemens provides each of these types in several versions, making it possible to find the optimal surge arrester for every conceivable application.

For more information, refer to the product guide High-voltage surge arresters (IEC) resp. Station and intermediate class surge arresters (IEEE).

SF_6-insulated, metal-enclosed surge arresters

Siemens provides gas-insulated, metal-enclosed surge arresters for standard and special AC and DC applications from 72.5 kV to 800 kV. Siemens 3ES surge arresters are ideally suited for the reliable protection of gas-insulated switchgear (GIS), gas-insulated transmission lines (GIL), gas-insulated bus (GIB), and transformers in substations, power plants, and offshore wind power plants.

For more information, refer to the product guide SF_6-insulated, metal-enclosed surge arresters.

Line surge arresters

The use of surge arresters on hazardous stretches of a power line helps improve network protection and increases the reliability of the entire transmission system. Offering a highly efficient combination of low weight, outstanding strength, and safety features, Siemens surge arresters are idealy suited for this purpose.

Siemens provides two solutions for line surge arresters:

Non-gapped line arresters (NGLA) can either be installed directly on the insulators or on the tower, depending on the tower design and the arrangement of insulators and lines. Siemens 3EL surge arresters are ideally suited for this purpose.

Externally gapped line arresters (EGLA) have an external spark gap placed in series that galvanically isolates the active part of the line surge arrester from the line voltage under normal conditions. The series varistor units (SVU) of the EGLA 3EV product lines are based on the respective 3EL product lines.

For more information, refer to the brochure Line surge arresters for increased system reliability.

Surge arresters for railway applications

Siemens surge arresters for railway application protect every part of a railway system from traction substations, transmission lines, cables, and catenary systems to rail vehicles for local, long distance, and high speed services up to 420 km/h. Siemens provides several surge arrester product families for AC and DC rail applications up to 45 kV.

For more information, refer to the product guide Surge arresters for railway applications.

Medium-voltage surge arresters

Siemens provides a wide range of surge arrester product families for the protection of medium-voltage systems and components up to 72.5 kV. The selection of the surge arrester depends on the application to be protected:

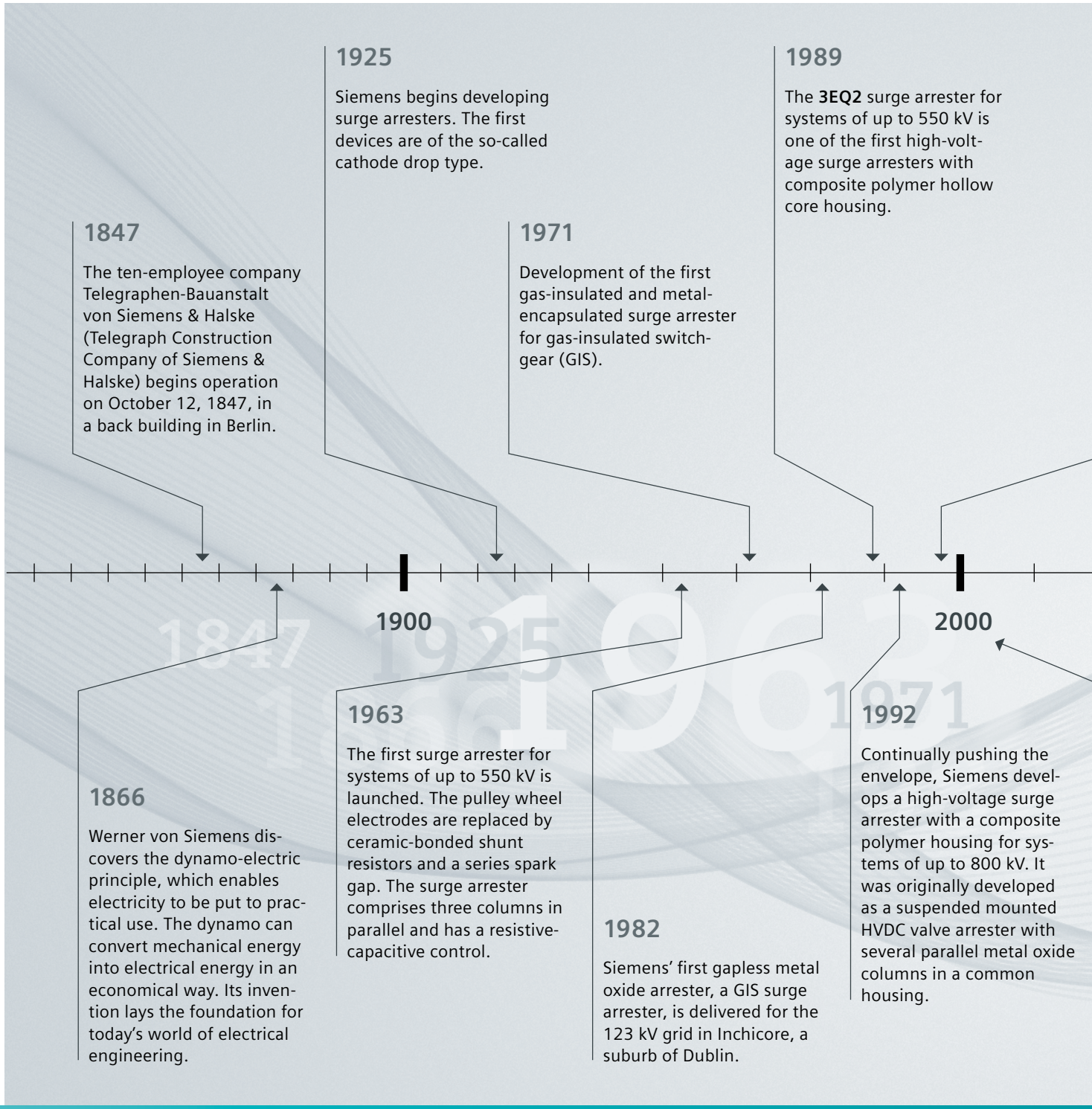
Distribution systems
Siemens' **3EK Cage Design™** distribution class surge arrester product family is ideally suited for the reliable protection of transformers, circuit breakers, medium-voltage switchgear / panels and distribution lines.

Surge arresters with high energy discharge capability
Next to the typical distribution class surge arresters, Siemens offers the **3EJ Cage Design™** surge arrester product family with higher energy discharge capabilities in combination with a low protection level. The **3EJ surge arresters** protect rotating devices, like generators and motors, arc furnaces, arc furnace transformers, industrial transformers, airfield-lighting systems, cable sheath, capacitors and capacitor banks and converters for drives.

Special applications
For applications requiring a surge arrester with silicone rubber housing in combination with a directional pressure relief device, Siemens offers the **3EQ0** product line.
For the overvoltage protection of generators and motors, which require a very high short-circuit current capability, Siemens offers the **3EP-G** porcelain housed surge arresters with short-circuit current capability up to 300 kA.

The medium-voltage surge arresters are described in more detail in the next sections of this product guide.

Siemens offers a complete portfolio of surge arresters for all application areas and voltage levels



History timeline

Siemens is a pioneer in many fields of the electricity and digitization markets. Experience is most essential when it comes to reliability in medium- and high-voltage applications. Since 1925 Siemens has been manufacturing high-voltage and medium-voltage surge arresters up to duty cycle voltages of 1.200 kV – for standard and specialized applications. Our permanent research and development and the concerted know-how in our factories give our surge arresters a leading edge in overvoltage protection. Our uncompromising quality ensures the long service life and reliability of each application.

1998

The polymer-housed medium-voltage/distribution class arresters of the **3EK** family, which features Cage Design™, a unique solution with direct silicone molding on the metal oxide resistors, is introduced.

2000

Development of the first GIS arrester for systems of up to 800 kV.

2003

Completion of the first line arrester project, an order from KELAG, one of the leading energy service providers in Austria.

2006

Development of the **3EQ5**, a new surge arrester concept with composite housing (type A) for extra high-voltage applications in 800 kV DC and 1,200 kV AC transmission systems.

2007

3EL2, the first line arrester for 550 kV applications, is delivered to Sochi, a city in Russia.

2008

The first externally gapped line arrester **(EGLA)**, which increases the reliability of a 144 kV overhead line, is supplied to the South Korean power provider KEPCO.

2010

2010

2010

The world's first 1,200 kV substation arrester with composite polymer hollow core technology is delivered to Power Grid Corporation of India.

2010

Siemens launches the arrester condition monitor, an innovative monitoring solution with unique features.

2011

Siemens introduces its new range of long rod insulators **3FL**.

2014

Siemens launches the **3EL3**, the strongest silicone housed cage design surge arrester available in the market

2015

First **3EK4** with Arc Protection System (APS) have been delivered to customers in the USA

2016

Launch of silicone rubber housed cage design medium-voltage surge arresters of the **3EJ** product family with high energy discharge capabilities

2016

The medium-voltage portfolio is completed with the **3EQ0**, a medium-voltage surge arrester with directional pressure relief device

As a pioneer in the field of silicone rubber insulation and one of the few suppliers with comprehensive in-house research and development capabilities in this technology. Siemens has been providing surge arresters with silicone rubber housing for more than 30 years and has gathered excellent service experience from even the most severe climatic and environmental conditions. Today, silicone rubber is among the most widely used materials for high-voltage outdoor equipment.

MOVs:

the core of Siemens surge arresters

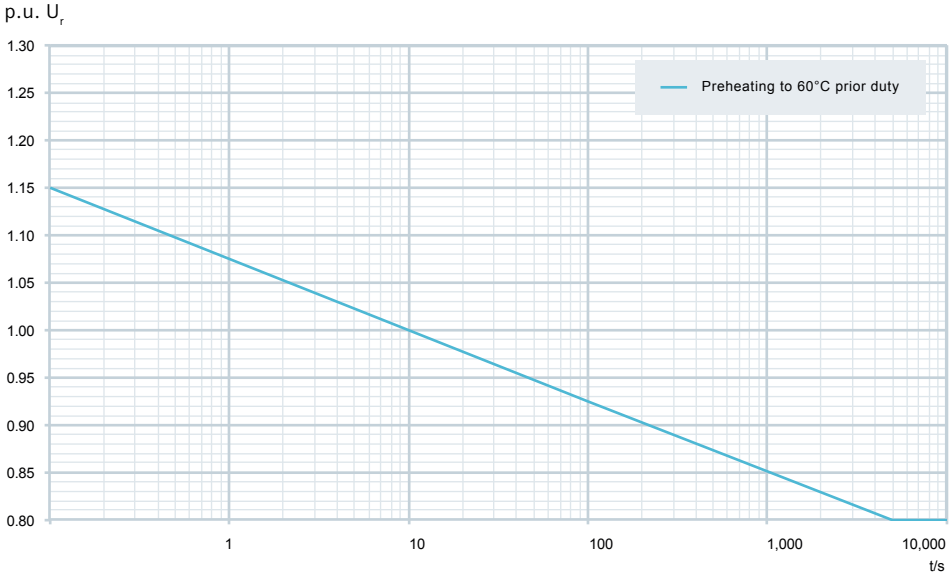
The main task of an arrester is to protect equipment from the effects of overvoltages. During normal operation, an arrester should have no negative effect on the power system. Moreover, the arrester must be able to withstand typical surges without incurring any damage. Nonlinear resistors fulfill these requirements thanks to the following properties:

- Low resistance during surges, so that overvoltages are limited
- High resistance during normal operation to avoid negative effects on the power system
- Sufficient energy discharge capability for stable operation

With this kind of nonlinear resistor, there is only a small flow of current when continuous operating voltage is being applied. When there are surges, however, excess energy can quickly be removed from the power system by a high discharge current.

Nonlinear resistors made of metal oxide (MO) have proven especially suitable for this use. The nonlinearity of MO resistors is considerably high, which is why MO arresters do not need series gaps. Siemens has many years of experience with gapless MO arresters in low-voltage systems, distribution systems, and transmission systems. Siemens metal oxide resistors (MOVs) provide a high energy discharge capability providing a very low protection level. This means they absorb a high amount of energy while avoiding thermal runaways. The MOVs are characterized by their high long-duration current impulse withstand capability – an indirect measure of their single impulse energy discharge capability. Siemens surge arresters are less prone to self-heating and consequent self-destruction, and they maintain their characteristics throughout their lifetime.

IEC power-frequency voltage vs. time (U-t) characteristic (TOV)



Standards and testing –
reliability you can count on

Tests
Siemens surge arresters have been designed and tested in compliance with the latest IEC 60099-4, IEEE C62.11, and GB 11032 standards. All type tests are performed by independent, PEHLA- certified laboratories; reports are available on request. Please contact your Siemens representative for details.

Moreover, every single surge arrester that leaves the Siemens factory undergoes a routine test and is delivered with a routine test certificate.

Quality Assurance
Siemens meets all requirements of ISO 9001:2008, ISO 14002:2004, and BS OHSAS 18001:2007. All Siemens suppliers need to be certified according to ISO standards or will be audited by Siemens.

To maintain sustainable quality improvement, Siemens introduced corporate quality guidelines that contribute to each step of the quality process.

Standardization
The aim of the IEC's Technical Committee 37 (TC 37) as well as the IEEE's Surge Protective Device Committee (SPDC) is the standardization of surge arrester testing and application. The TC 37 develops the standards IEC 60099-4, IEC 60099-8 (EGLA), IEC 60099-9 (HVDC), and the application guide IEC 60099-5, while the SPDC develops the standard IEEE C62.11 and the application guide IEEE C62.22. Both committees include representatives of manufacturers, utilities, test field labs, and universities.

Siemens R&D experts are members of both bodies, thus playing an important role in the definition of the standards. They also share their expert knowledge in electrical power systems in CIGRE, the international council on large electric systems, which participates in the development of international standards.

Innovations in terms of arrester design and manufacturing processes are protected by a wide portfolio of Intellectual Property (IP) rights.

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12072-04-01

The test field is certified by the »Deutsche Akkreditierungsstelle« (Germany's national accreditation body) according to DIN EN ISO/IEC 17025

Test generator supplying both impulse voltages (1.2/50 µs and 250/250 µs) and impulse currents (8/20 µs and 30/60 µs)

UHV arrester prepared for testing in the HV test laboratory

How to select a suitable surge arrester

This section describes the general approach to selecting typical arresters for overvoltage protection in medium-voltage systems. For a detailed description of how to configure a surge arrester, please refer to the handbook "Metal-Oxide Surge Arresters in High-Voltage Power Systems – Fundamentals."[1]
The requirements for a surge arrester emerge from two basic requirements: It should provide adequate protection with a sufficient safety margin, which means that overvoltages at the device to be protected must always remain below its withstand voltage. Furthermore, the surge arrester should be dimensioned for stable continuous operation, which means that the arrester must remain electrically and thermally stable under all conditions while handling all long-term, temporary, and transient stress resulting from network operation.
These two requirements cannot be fulfilled independently. A reduction of the protective level automatically means a higher degree of specific electrical stress during continuous operation, and conversely, the continuous operating voltage of an arrester cannot be increased arbitrarily without raising its protective level as well. Both operating points are for a given type of MOV strictly associated with each other through the voltage-current (U-I-) characteristic curve.

Step 1: Selection of the maximum continuous operating voltage (MCOV) and the duty cycle voltage

The first step is to define the minimally required continuous operating voltage $U_{c,min}$. This must be as high as the continuous phase-to-ground voltage of the system. Here, »continuously« applied voltage means every voltage that occurs within an uninterrupted period of more than 30 minutes.

The type of neutral grounding of the system is decisive in determining the continuous operating voltage.

In isolated or resonant grounded neutral systems, the voltage of a healthy phase against ground takes on the value of the phase-to-phase voltage in the case of a one-phase ground fault (earth fault factor k = 1.73). Since resonant grounded neutral systems are operated quite commonly for time periods of more than 30 minutes in this condition, the MCOV of the arrester must, in this case, have the value of the highest voltage of the system, U_s.

Solidly grounded neutral system:

$U_{c,min} \geq U_s/\sqrt{3}$

Isolated or resonant grounded neutral system:

$U_{c,min} \geq U_s$

Example for a 13.8 kV, four-wire multi-grounded neutral wye system:

U_s (L-L) = 13.8 kV

MCOV = 8.40 kV

Duty cycle = 10 kV

Example for a 13.8 kV, three-wire high impedance neutral circuit:

U_s (L-L) = 13.8 kV

MCOV = 15.3 kV

Duty cycle = 18 kV

The definition of the minimally required MCOV, a factor which usually has a value of 1.25, helps achieve a duty cycle voltage $U_r = 1.25 \bullet U_{c,min}$.
This is the lowest necessary duty cycle voltage of the arrester.

Table »Typical duty cycle voltages U_r for highest voltages of the system U_s« on page 14 and 15 lists typically applied duty cycle voltages.

[1] *Volker Hinrichsen: "Metal-Oxide Surge Arresters in High-Voltage Power Systems", 3rd edition, September 2012, Order No. E50001-G630-H197-X-4A00*

Step 2: Selection of the nominal discharge current I_n

The nominal discharge current I_n serves to classify a surge arrester. From a technical point of view, it is calculated from a typical maximum lightning current amplitude that can be expected in the substation, for which the insulation coordination is performed via the arrester's lightning protection level. This amplitude is calculated from the flashover voltage U_{fo} of the line insulators, the lightning protection level U_{pl} of the arresters, and the surge impedance Z of the line for I_{max}:

$$I_{max} = (2 \bullet U_{fo} - U_{pl})/Z$$

Example for a 13.8 kV system:

U_{fo} = 150 kV

U_{pl} = 29.4 kV

Z = 450 Ohm

I_{max} = 0.6 kA

A 10 kA arrester, for instance, can readily withstand lightning current impulses of higher amplitudes without severe damage.

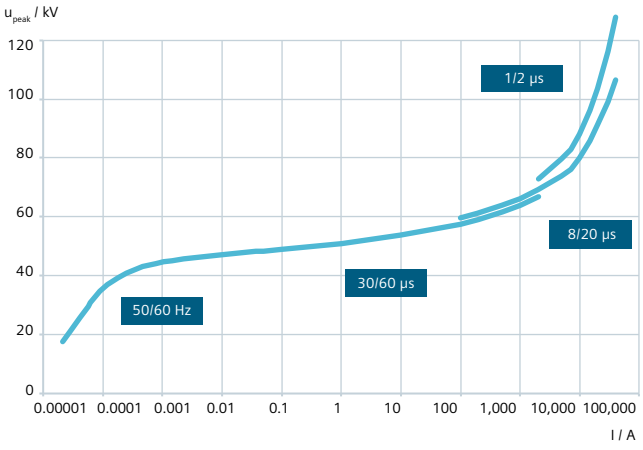
Step 3: Selection of protective levels

The protective characteristics of an arrester are most frequently assessed by means of its lightning impulse protective level: It is assessed according to its residual voltage while the nominal discharge current is flowing. This usually means that a protective level equaling the standard lightning impulse withstand voltage of the device to be protected and divided by a factor of 1.4 is adequate for protection against lightning overvoltages.

$$U_{pl,\ 10\ kA,\ 8/20\mu s} < BIL / 1.4$$

The selection of the electrical characteristics of the arrester is finished when the requirements regarding the protective levels of all mentioned current impulse stresses are fulfilled.

Example U-I-curve 30 kV arrester



How to select a suitable surge arrester

Step 4: Selection of the energy class

The application guide IEEE C62.22 offers equations to estimate the energy handling capability requirements of surge arresters. The energy discharged by an arrester J in kJ may be estimated by the equation:

$$J = 2D_L E_A I_A / v$$

Where:

D_L is the line length (in kilometers)

E_A is the arrester switching impulse discharge voltage (in kV) for I_A

I_A is the switching impulse current (in kA)

v is the speed of light, 300,000 km/s

The equations assume that the entire line is charged to a prospective switching surge voltage (which exists at the arrester location) and is discharged through the arrester at its protective level during twice the travel time of the line. The single discharge voltage and current are related by the equation:

$$I_A = (E_S - E_A) / Z$$

Where:

E_S is the prospective switching surge voltage (in kV)

Z is the single-phase surge impedance of line (in ohms)

The table below shows the definition of the energy class according to standard IEEE C62.11. This energy is not a fixed value, but instead depends on the arrester's protective level. The higher the discharge voltage, the less energy the arrester absorbs during the line discharge, since the line will discharge less intensely when the discharge voltage is higher.

Energy Class	A	B	C	D	E	F	G	H	J	K	L	M	N
Energy Rating (Two Shot) kJ/kV_{MCOV}	3.0	4.5	6.0	7.5	9.0	11	13	15	18	21	24	27	30

Step 5:
Protective zone

The protection of the equipment by an arrester can be guaranteed only for short distances between arrester and equipment, due to travelling wave effects on the line. Rapidly increasing overvoltages spread in the form of traveling waves on the line. Refraction and reflection occur in places where the surge impedance of the line changes.

The maximum distance between surge arrester and equipment to be protected is described with following formula:

$$x_s = (BIL / 1.15 - U_{pl}) \, v_{tw} / 2s$$

Example for a 13.8 kV, four-wire multi-grounded neutral wye system:

$U_s = 13.8$ kV

BIL = 75 kV

$U_{pl} = 29.4$ kV

$x_s = 17.6$ ft

Example for a 13.8 kV, three-wire high impedance neutral circuit:

$U_s = 13.8$ kV

BIL = 95 kV

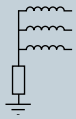
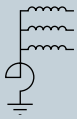
$U_{pl} = 55.9$ kV

$x_s = 13.1$ ft

Where:

x_s	protective zone (in m)
BIL	basic insulation level of equipment (in kV)
U_{pl}	protection level of the arrester (in kV)
s	front steepness of incoming surge (in kV/µs) (in the range of 1000 kV/µs)
v_{tw}	propagation speed of travelling wave: 300 m/µs (overhead line) (equals „c“)

Typical duty cycle voltages U_r for highest voltages of the system U_s according to IEEE C62.11.

System L-L voltage U_s kV	Four-wire multi-grounded neutral wye U_r kV	Three-wire low impedance neutral circuit U_r kV	Three-wire high impedance neutral circuit U_r kV
			
4.16	3	6	6
6.9			9
8.3	6	9	
12	9	12	
12.47	9 or 10	15	
13.8	10 or 12	15	18
22.86	15	21	
23			30
34.5	27	36	

Product range and selection data

Siemens offers multiple models of each surge arrester product family. The following selection tables show the main technical data according to IEEE C62.11 of the different product lines. Detailed technical data is listed in the sections for each dedicated product line.

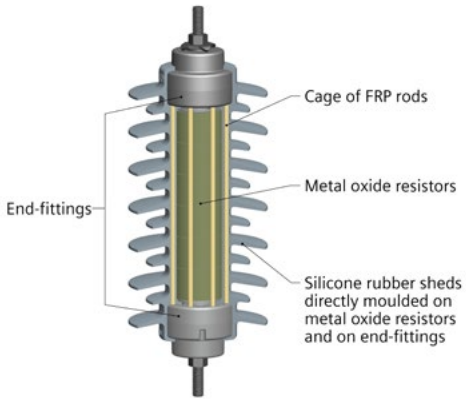
For additional specifications, please contact your local Siemens representative.

Main technical data according to IEEE C62.11

				Distribution applications	High energy applications & Protection of rotating devices			High energy applications & Protection of rotating devices
Maximum values				3EK7	3EJ2	3EJ3	3EJ4	3EQ0
Maximum duty cycle voltage kV				36	36	36	36	36
Energy class	Lightning impulse classifying current kA	Switching surge energy rating kJ/kV$_{MCOV}$	Single impulse withstand rating C					
B	10	4.5	0.6	x				
C	10	6.0	1.2					x
E	10	9.0	2.0		x			x
G	20	13	2.8			x		x
J	20	18	3.6			x		
K	20	21	6.0				x	
Rated short-circuit current kA				20	50	65	50	50
High current short duration kA				100	65	100	100	65
Indoor version available				x			x	

3EK Distribution class surge arresters with silicone rubber housing and Cage Design™

Siemens cage design 3EK distribution class surge arresters offer superior protection against overvoltages in medium-voltage systems.



Siemens 3EK cage design surge arresters are ideally suited for the reliable protection of:

- Transformers
- Circuit breakers
- Medium-voltage switchgear / panels
- Distribution lines

The metal oxide resistors (MOV) are enclosed by a cage made of fiber-reinforced plastic (FRP) rods, providing a rigid, reinforced structure ensuring high mechanical strength.

Reliability is guaranteed by the direct molding of the silicone rubber onto the MOVs and the FRP rods. This ensures the total embedding of all components free of inclusions and gaps, thus providing an excellent sealing system against moisture ingress, which avoids partial discharges.

In the extremely rare event of the MOVs being overloaded, arcing cannot result in a buildup of critical internal pressure, since the MOVs are not enclosed in a sealed mechanical shell. The arc can escape directly through the soft silicone housing, leaving the mechanical support structure of the enclosure unharmed. The ejection of internal parts that could damage other equipment nearby is prevented almost completely. Siemens' innovative cage design ensures outstanding performance in safety issues.

Silicone rubber is highly hydrophobic and maintains its ability to repel water and any deposits of pollution throughout its entire service life. This results in high tracking and erosion resistance. The silicone rubber housing is self-extinguishing and flame-retardant. These advantages provide maintenance-free and reliable service life for 3EK surge arresters.

Siemens offers the product line 3EK7 for duty cycle voltages up to 36 kV for the application in distribution networks.

The proven 3EK7 is also available in a version for indoor application, which is a cage design surge arrester offering the same benefits as the version for outdoor application.

3EK7 specifications

Electrical Characteristics													
Duty cycle voltage	MCOV	Arrester order number	Energy class	Lightning impulse classifying current	Single impulse with-stand rating	Switching surge energy rating	Protective Level Maximum discharge voltage						
							45/90µs 125 A	45/90µs 500 A	8/20µs 1.5 kA	8/20µs 3 kA	8/20µs 5 kA	8/20µs 10 kA	8/20µs 20 kA
kV	kV			I_n kA	C	kJ/kVmcov	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr
3.0	2.55	3EK7 030 - 3 A B 4 . - .	B	10	0.6	4.5	6.9	7.3	8.1	8.5	8.8	9.5	10.9
3.0	2.55	3EK7 030 - 4 A B 4 . - .	B	10	0.6	4.5	5.8	6.1	6.8	7.1	7.4	8.0	9.2
6.0	5.10	3EK7 060 - 3 A B 4 . - .	B	10	0.6	4.5	14.3	15.1	16.7	17.4	18.2	19.6	22.5
6.0	5.10	3EK7 060 - 4 A B 4 . - .	B	10	0.6	4.5	11.6	12.3	13.6	14.2	14.8	15.9	18.3
9.0	7.65	3EK7 090 - 3 A B 4 . - .	B	10	0.6	4.5	20.5	21.6	23.9	25.0	26.1	28.1	32.3
9.0	7.65	3EK7 090 - 4 A C 4 . - .	B	10	0.6	4.5	17.5	18.4	20.3	21.3	22.2	23.9	27.5
10	8.40	3EK7 100 - 3 A B 4 . - .	B	10	0.6	4.5	21.5	22.6	25.0	26.2	27.3	29.4	33.8
10	8.40	3EK7 100 - 4 A C 4 . - .	B	10	0.6	4.5	19.4	20.5	22.6	23.7	24.7	26.6	30.6
12	10.2	3EK7 120 - 3 A C 4 . - .	B	10	0.6	4.5	27.2	28.7	31.7	33.2	34.7	37.3	42.9
12	10.2	3EK7 120 - 4 A D 4 . - .	B	10	0.6	4.5	23.3	24.6	27.1	28.4	29.7	31.9	36.7
15	12.7	3EK7 150 - 3 A D 4 . - .	B	10	0.6	4.5	34.0	35.9	39.6	41.5	43.3	46.6	53.6
15	12.7	3EK7 150 - 4 A D 4 . - .	B	10	0.6	4.5	29.1	30.7	33.9	35.5	37.1	39.9	45.9
18	15.3	3EK7 180 - 3 A D 4 . - .	B	10	0.6	4.5	40.8	43.0	47.5	49.8	52.0	55.9	64.3
18	15.3	3EK7 180 - 4 A E 4 . - .	B	10	0.6	4.5	34.9	36.8	40.7	42.6	44.5	47.8	55.0
21	17.0	3EK7 210 - 3 A E 4 . - .	B	10	0.6	4.5	44.7	47.1	52.0	54.5	56.9	61.2	70.4
21	17.0	3EK7 210 - 4 A F 4 . - .	B	10	0.6	4.5	40.7	43.0	47.4	49.7	51.9	55.8	64.2
24	19.5	3EK7 240 - 3 A F 4 . - .	B	10	0.6	4.5	51.5	54.3	59.9	62.7	65.6	70.5	81.1
24	19.5	3EK7 240 - 4 A H 4 . - .	B	10	0.6	4.5	46.6	49.1	54.2	56.8	59.3	63.8	73.4
27	22.0	3EK7 270 - 3 A F 4 . - .	B	10	0.6	4.5	58.2	61.4	67.7	70.9	74.1	79.7	91.7
27	22.0	3EK7 270 - 4 A H 4 . - .	B	10	0.6	4.5	52.4	55.3	61.0	63.9	66.7	71.8	82.5
30	24.4	3EK7 300 - 3 A H 4 . - .	B	10	0.6	4.5	64.1	67.6	74.6	78.1	81.7	87.8	101
30	24.4	3EK7 300 - 4 A H 4 . - .	B	10	0.6	4.5	58.2	61.4	67.8	71.0	74.2	79.7	91.7
33	27.5	3EK7 330 - 3 A H 4 . - .	B	10	0.6	4.5	71.8	75.8	83.6	87.6	91.5	98.4	113
33	27.5	3EK7 330 - 4 A J 4 . - .	B	10	0.6	4.5	64.0	67.5	74.6	78.1	81.6	87.7	101
36	29.0	3EK7 360 - 3 A H 4 . - .	B	10	0.6	4.5	78.8	83.2	91.8	96.1	100	108	124
36	29.0	3EK7 360 - 4 A K 4 . - .	B	10	0.6	4.5	69.9	73.7	81.3	85.2	89.0	95.7	110

Arrester order number extension	Options	Additional weight:
3EK7 . . . - . . . . 0 - 2	Line terminal equiped with bolt, nut, 4-corner washer Earth terminal equiped with bolt, nut, 4-corner washer, NEMA insulating bracket and disconnector	1.1 lbs for duty cycles up to 15 kV 1.5 lbs for duty cycles above 15 kV
3EK7 . . . - . . . . 0 - 3	Line terminal equiped with bolt, nut, 4-corner washer and bird cap Earth terminal equiped with bolt, nut, 4-corner washer, NEMA insulating bracket and disconnector	1.1 lbs for duty cycles up to 15 kV 1.5 lbs for duty cycles above 15 kV
3EK7 . . . - . . . . 0 - 4	Line terminal equiped with bolt, nut, 4-corner washer and bird cap Earth terminal equiped with bolt, nut, 4-corner washer, insulatingbracket with silicone rubber sheds and disconnector	1.0 lbs

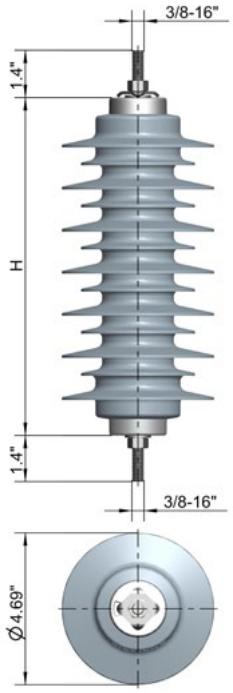
Mechanical Characteristics							
	Height [H] inches	Leakage distance inches	Rated short-circuit current Is kA	Recommended minimum clearances		Cantilever strength MDCL lbf	Weight lbs
				To ground (ph-gnd) inches	Between phases (ph-ph) inches		
	6.7	14.6	20	4	6	463	2.8
	6.7	14.6	20	4	6	463	2.8
	6.7	14.6	20	4	6	463	3.2
	6.7	14.6	20	4	6	463	3.2
	6.7	14.6	20	5	7	463	3.2
	7.9	19.1	20	5	7	393	3.5
	6.7	14.6	20	5	7	463	3.5
	7.9	19.1	20	5	7	393	3.5
	7.9	19.1	20	5	7	393	4.1
	9.4	23.8	20	5	7	328	4.1
	9.4	23.8	20	5	7	328	5.1
	9.4	23.8	20	5	7	328	4.4
	9.4	23.8	20	6	9	328	5.4
	10.6	30.5	20	6	9	291	5.1
	10.6	30.5	20	6	9	291	6.1
	11.8	35.4	20	6	9	262	5.4
	11.8	35.4	20	7	11	262	6.7
	15.7	48.4	20	7	11	197	6.1
	11.8	35.4	20	8	11	262	7.0
	15.7	48.4	20	8	11	197	6.7
	15.7	48.4	20	9	13	197	8.2
	15.7	48.4	20	9	13	197	7.0
	15.7	48.4	20	10	13	197	8.5
	18.5	55.9	20	10	13	167	8.2
	15.7	48.4	20	10	15	197	8.9
	20.1	62.8	20	10	15	154	8.5

3EK7 indoor version specifications

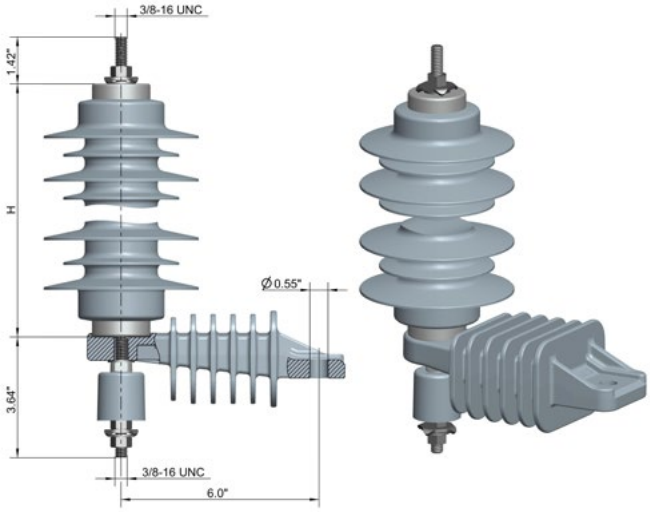
Electrical Characteristics													
Duty cycle voltage	MCOV	Arrester order number	Energy class	Lightning impulse classifying current	Single impulse with-stand rating	Switching surge energy rating	Protective Level Maximum discharge voltage						
							45/90µs 125 A kV cr	45/90µs 500 A kV cr	8/20µs 1.5 kA kV cr	8/20µs 3 kA kV cr	8/20µs 5 kA kV cr	8/20µs 10 kA kV cr	8/20µs 20 kA kV cr
kV	kV			I_n kA	C	kJ/kVmcov							
3.0	2.55	3EK7 030 - 3 A B 0	B	10	0.6	4.5	6.9	7.3	8.1	8.5	8.8	9.5	10.9
3.0	2.55	3EK7 030 - 4 A B 0	B	10	0.6	4.5	5.8	6.1	6.8	7.1	7.4	8.0	9.2
6.0	5.10	3EK7 060 - 3 A B 0	B	10	0.6	4.5	14.3	15.1	16.7	17.4	18.2	19.6	22.5
6.0	5.10	3EK7 060 - 4 A B 0	B	10	0.6	4.5	11.6	12.3	13.6	14.2	14.8	15.9	18.3
9.0	7.65	3EK7 090 - 3 A B 0	B	10	0.6	4.5	20.5	21.6	23.9	25.0	26.1	28.1	32.3
9.0	7.65	3EK7 090 - 4 A B 0	B	10	0.6	4.5	17.5	18.4	20.3	21.3	22.2	23.9	27.5
10	8.40	3EK7 100 - 3 A B 0	B	10	0.6	4.5	21.5	22.6	25.0	26.2	27.3	29.4	33.8
10	8.40	3EK7 100 - 4 A C 0	B	10	0.6	4.5	19.4	20.5	22.6	23.7	24.7	26.6	30.6
12	10.2	3EK7 120 - 3 A C 0	B	10	0.6	4.5	27.2	28.7	31.7	33.2	34.7	37.3	42.9
12	10.2	3EK7 120 - 4 A D 0	B	10	0.6	4.5	23.3	24.6	27.1	28.4	29.7	31.9	36.7
15	12.7	3EK7 150 - 3 A D 0	B	10	0.6	4.5	34.0	35.9	39.6	41.5	43.3	46.6	53.6
15	12.7	3EK7 150 - 4 A D 0	B	10	0.6	4.5	29.1	30.7	33.9	35.5	37.1	39.9	45.9
18	15.3	3EK7 180 - 3 A D 0	B	10	0.6	4.5	40.8	43.0	47.5	49.8	52.0	55.9	64.3
18	15.3	3EK7 180 - 4 A E 0	B	10	0.6	4.5	34.9	36.8	40.7	42.6	44.5	47.8	55.0
21	17.0	3EK7 210 - 3 A E 0	B	10	0.6	4.5	44.7	47.1	52.0	54.5	56.9	61.2	70.4
21	17.0	3EK7 210 - 4 A F 0	B	10	0.6	4.5	40.7	43.0	47.4	49.7	51.9	55.8	64.2
24	19.5	3EK7 240 - 3 A F 0	B	10	0.6	4.5	51.5	54.3	59.9	62.7	65.6	70.5	81.1
24	19.5	3EK7 240 - 4 A H 0	B	10	0.6	4.5	46.6	49.1	54.2	56.8	59.3	63.8	73.4
27	22.0	3EK7 270 - 3 A G 0	B	10	0.6	4.5	58.2	61.4	67.7	70.9	74.1	79.7	91.7
27	22.0	3EK7 270 - 4 A H 0	B	10	0.6	4.5	52.4	55.3	61.0	63.9	66.7	71.8	82.5
30	24.4	3EK7 300 - 3 A H 0	B	10	0.6	4.5	64.1	67.6	74.6	78.1	81.7	87.8	101
30	24.4	3EK7 300 - 4 A H 0	B	10	0.6	4.5	58.2	61.4	67.8	71.0	74.2	79.7	91.7
33	27.5	3EK7 330 - 3 A H 0	B	10	0.6	4.5	71.8	75.8	83.6	87.6	91.5	98.4	113
33	27.5	3EK7 330 - 4 A J 0	B	10	0.6	4.5	64.0	67.5	74.6	78.1	81.6	87.7	101
36	29.0	3EK7 360 - 3 A H 0	B	10	0.6	4.5	78.8	83.2	91.8	96.1	100	108	124
36	29.0	3EK7 360 - 4 A K 0	B	10	0.6	4.5	69.9	73.7	81.3	85.2	89.0	95.7	110

Mechanical Characteristics							
	Height [H]	Leakage distance	Rated short-circuit current	Recommended minimum clearances		Cantilever strength MDCL	Weight
				To ground (ph-gnd) inches	Between phases (ph-ph) inches		
	inches	inches	Is kA			lbf	lbs
	6.7	6.4	20	4	6	463	2.6
	6.7	6.4	20	4	6	463	2.4
	6.7	6.4	20	4	6	463	3.1
	6.7	6.4	20	4	6	463	2.9
	6.7	6.4	20	5	7	463	3.5
	6.7	6.4	20	5	7	463	3.1
	6.7	6.4	20	5	7	463	3.7
	7.9	7.5	20	5	7	393	3.3
	7.9	7.5	20	5	7	393	4.2
	9.4	9.1	20	5	7	328	3.5
	9.4	9.1	20	5	7	328	4.6
	9.4	9.1	20	5	7	328	4.0
	9.4	9.1	20	6	9	328	5.3
	10.6	10.2	20	6	9	291	4.4
	10.6	10.2	20	6	9	291	6.0
	11.0	10.6	20	6	9	281	4.6
	11.0	10.6	20	7	11	281	6.8
	15.7	15.2	20	7	11	197	5.3
	12.6	12.2	20	8	11	246	7.3
	15.7	15.2	20	8	11	197	5.5
	15.7	15.2	20	9	13	197	7.7
	15.7	15.2	20	9	13	197	6.0
	15.7	15.2	20	10	13	197	8.6
	18.5	18.0	20	10	13	167	6.4
	15.7	15.2	20	10	15	197	9.0
	20.1	19.5	20	10	15	154	7.3

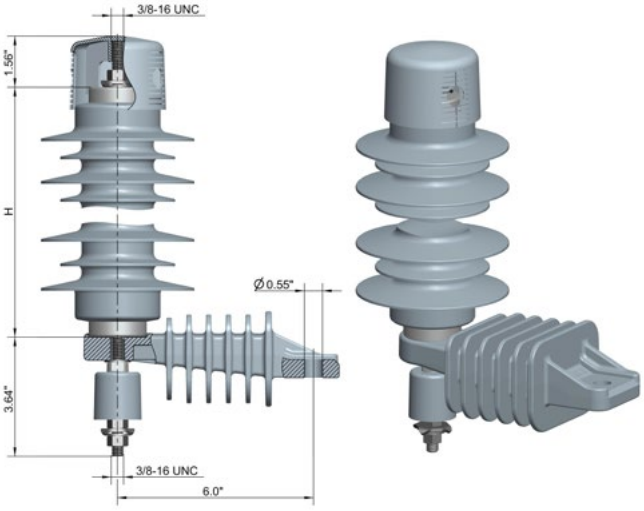
3EK Drawings



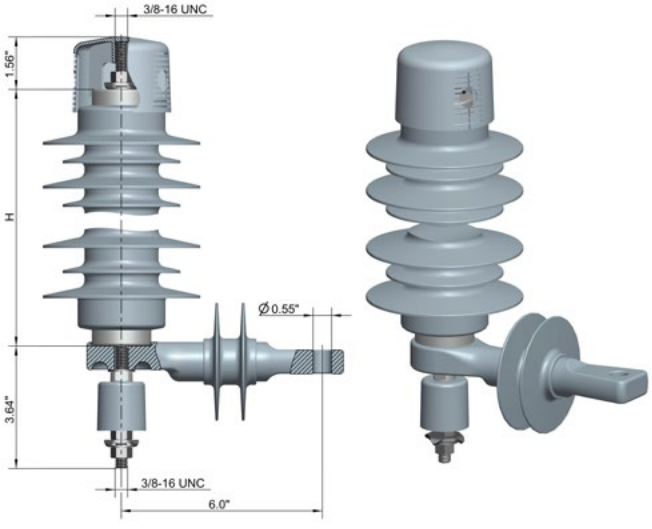
Dimensions 3EK7



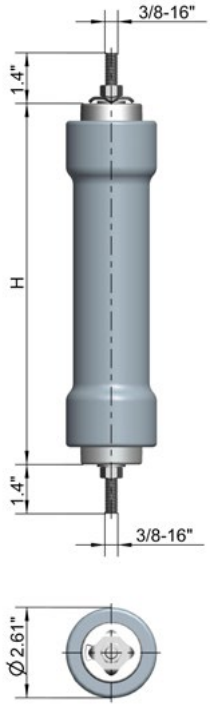
Dimensions 3EK7 with NEMA insulating bracket and disconnector



Dimensions 3EK7 with NEMA insulating bracket, disconnector and bird cap



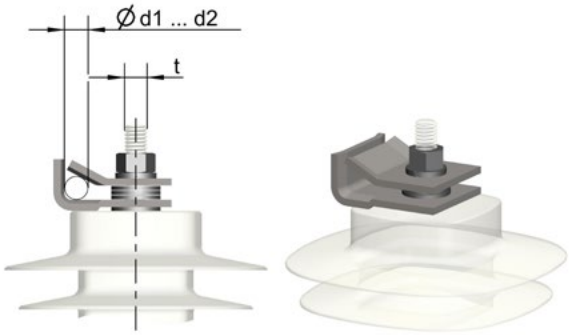
Dimensions 3EK7 with silicone rubber insulating bracket, disconnector and bird cap



Dimensions 3EK7 indoor

3EK Accessories

Line terminal options

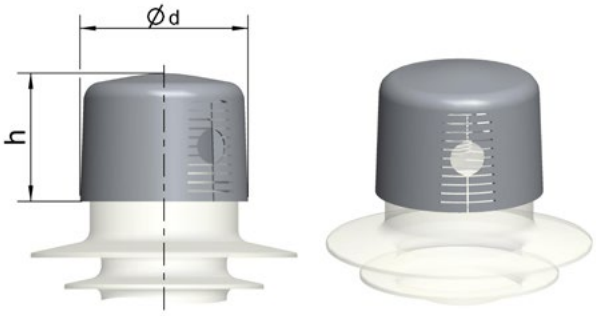


d1	0.32"
d2	0.70"
t	3/8-16"

Line clamp

Order number: 3EX4 063-0A

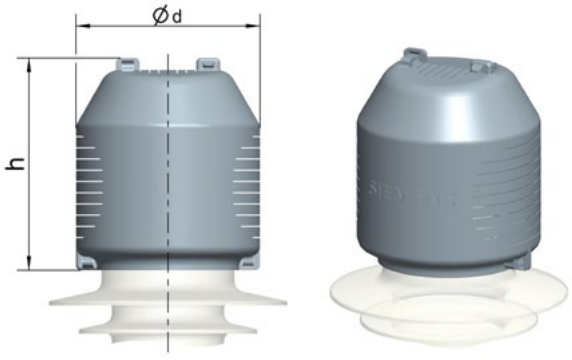
Bird protection cap options



d	2.95"
h	2.25"

Bird protection cap

Order number: 3EX4 068-0A

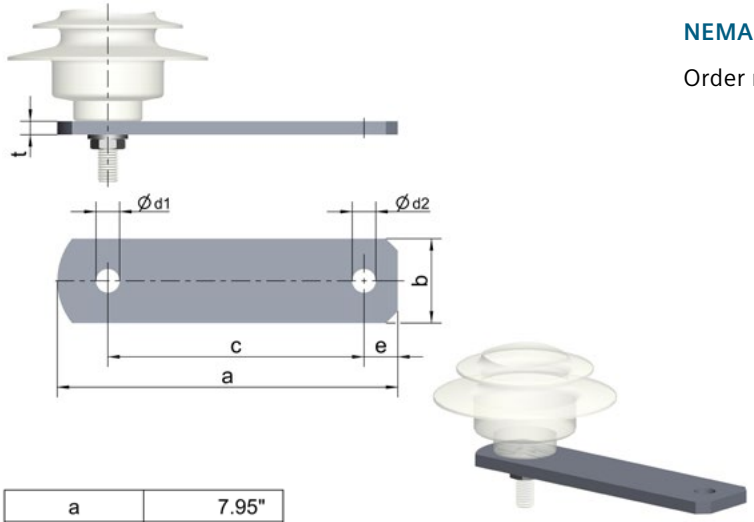


d	3.62"
h	4.17"

Bird protection cap XL

Order number: 3EX4 103

Metal bracket options

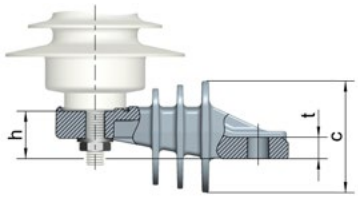


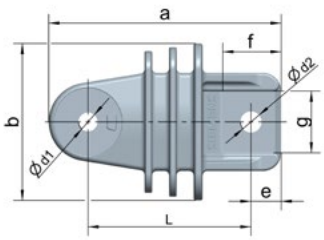
a	7.95"
b	1.97"
c	5.98"
e	0.79"
d1	0.55"
d2	0.55"
t	0.32"

NEMA metal bracket

Order number: 3EX4 061-0A

Insulating bracket options

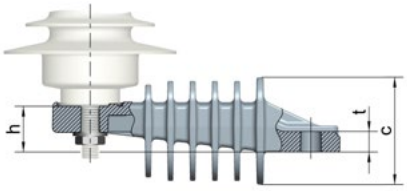


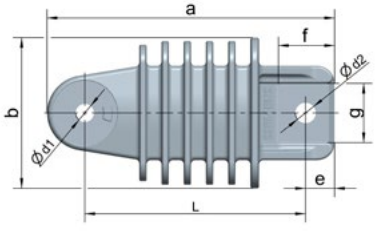


NEMA insulating bracket for Ur ≤ 15 kV

Order number: 3EX4 080-1A

a	6.06"
b	4.1"
c	2.91"
e	0.79"
f	1.58"
g	1.61"
h	1.24"
d1	3/8"
d2	1/2"
l	4.25"
t	0.56"



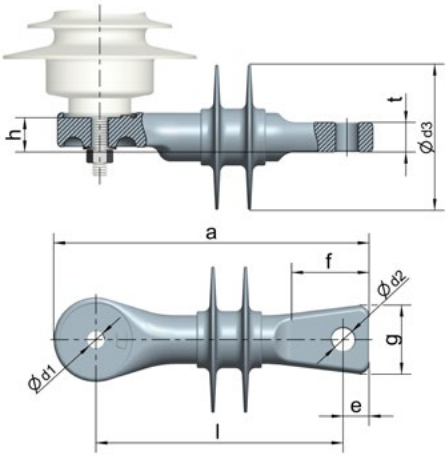


NEMA insulating bracket for Ur > 15 kV

Order number: 3EX4 080-2A

a	7.8"
b	4.1"
c	2.91"
e	0.79"
f	1.58"
g	1.61"
h	1.24"
d1	3/8"
d2	1/2"
l	6.0"
t	0.56"

Insulating bracket options

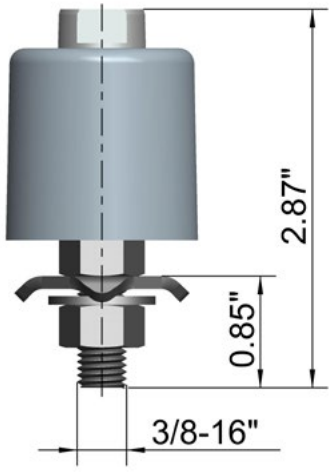


a	7.64"
e	0.63"
f	1.89"
g	1.65"
h	0.83"
d1	3/8"
d2	1/2"
d3	3.54"
l	6.0"
t	0.72"

Silicone rubber insulating bracket

Order number: 3EX4 107

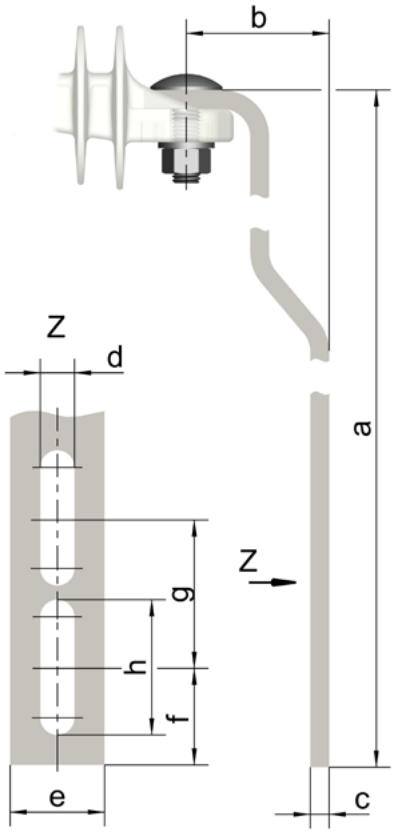
Disconnector options



Disconnector

Order number: 3EX4 065-1A

Mounting options



Transformer bracket, 8.7 inch

Order number: 3EX4 075-0A

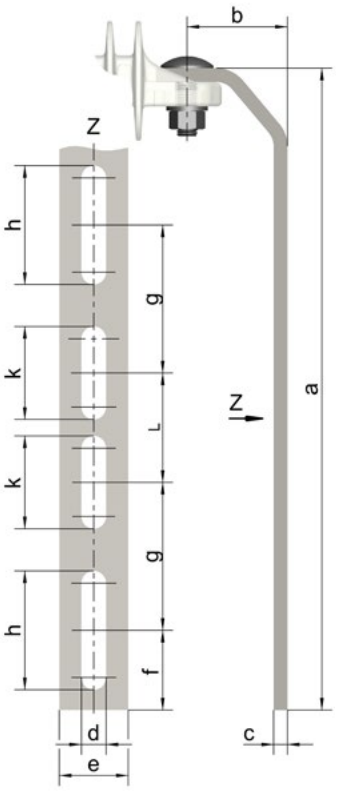
Transformer bracket, 11 inch

Order number: 3EX4 075-0C

Transformer bracket, 12.25 inch

Order number: 3EX4 075-0B

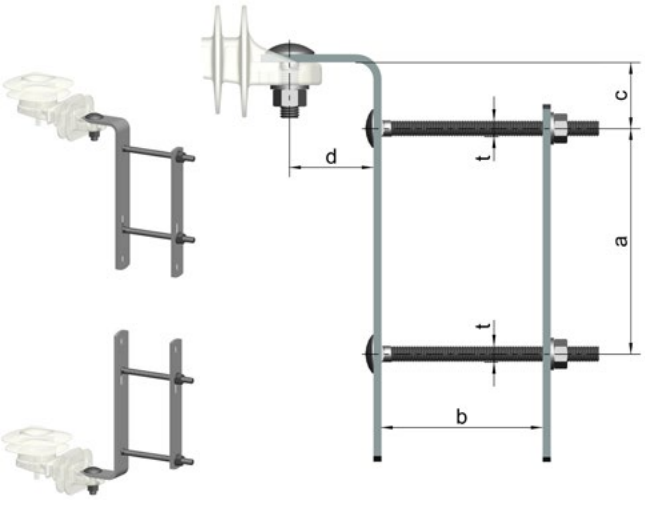
	3EX4 075-0A	3EX4 075-0C	3EX4 075-0B
a	$8^{5}/_{8}$"	11"	$12^{1}/_{4}$"
b	$2^{3}/_{8}$"	$2^{3}/_{8}$"	$2^{3}/_{8}$"
c	0.32"	0.32"	0.32"
d	0.56"	0.56"	0.56"
e	1.58"	1.58"	1.58"
f	$1^{5}/_{8}$"	$1^{5}/_{8}$"	$1^{5}/_{8}$"
g	$2^{1}/_{2}$"	$2^{1}/_{2}$"	$2^{1}/_{2}$"
h	$2^{1}/_{4}$"	$2^{1}/_{4}$"	$2^{1}/_{4}$"



a	$14^{1}/_{4}$"
b	2.3"
c	0.32"
d	0.56"
e	1.58"
f	1.82"
g	$3^{3}/_{8}$"
h	$2^{3}/_{4}$"
k	$2^{1}/_{8}$"
l	$2^{1}/_{2}$"

Transformer bracket, 14.5 inch

Order number: 3EX4 075-0D

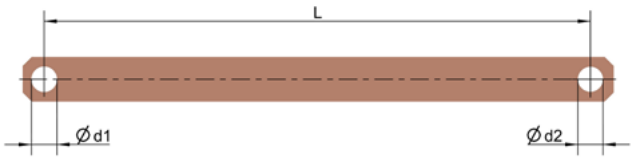


a	4.12" ... 5.94"
b	0" ... 4.75"
c	1.30"
d	2.05"
t	M10

Cross-arm bracket

Order number: 3EX4 073-0A

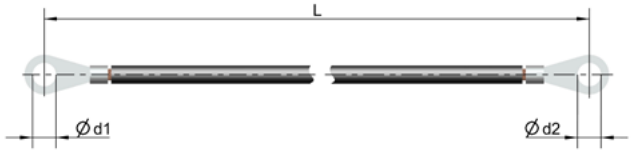
Lead options



L	12"
d1	3/8"
d2	1/2"

Ground strap, 12 inch

Order number: 3EX4 078-0A



L	17.9"
d1	3/8"
d2	1/2"

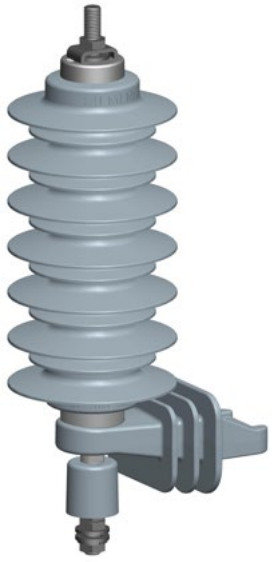
Line and ground lead, insulated

Order number: 3EX4 074-0A

Disconnector

A disconnector is a device at the ground terminal of the arrester, which separates the arrester from the system after an overloading. Without a disconnector – at least in a solidly grounded neutral system – a subsequent operation of the appropriate line section would no longer be possible. The disconnector is of great importance for a trouble-free operation of a distribution network.

Disconnectors are only used in distribution systems. One of the most common working principles of disconnectors is the ignition of a small explosive device (e.g., the cartridge of a gas pistol) caused by the thermal effect of the power-frequency ground fault current, which flows after an arrester failure. The explosive device tears the surrounding polymeric housing and causes the flexible grounding lead to disconnect from the arrester.



Arc Protection System

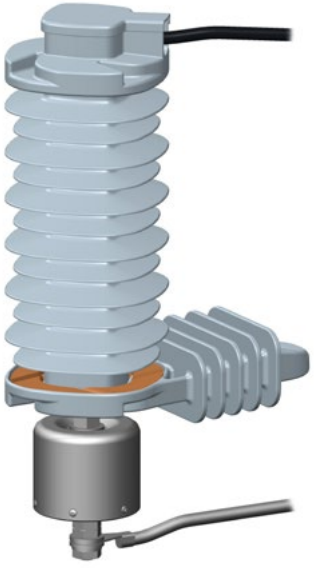
When overvoltage exceeds the energy capacity of an arrester, the MO resistors become damaged, causing a permanent failure of the arrester. A fault current is developed and arcing begins to occur on the two terminals of the arrester. Molten metal can fall to the ground and ignite groundcover, leading to wildfires that can harm people and wildlife, and damage trees and structures in the area.

Therefore, Siemens Type 3EK distribution class surge arresters can be configured with an Arc Protection System (APS) installed at both ends of the arrester. The APS unit consists of multiple metallic plates forming electrodes which are shaped and aligned in a way that the current flowing through the electrodes generates a magnetic field. That magnetic force makes the arc rotate around the arrester body, controlling and containing it, mitigating the creation of molten material coming from the end fittings, and thus greatly reducing the risk of wildfires.

Especially in hot and dry regions with high risks of wildfires, such as the Western US and South Australia, surge arresters with APS are highly recommended.

The surge arrester can also be equipped with a visible fault feature. In the event of an arrester failure, a red indicator will appear at the bottom of the arrester.

Siemens distribution arresters with APS fulfill the requirements of Cal Fire's Power Line Fire Prevention Field Guide (2008). They successfully passed all required testing with 100% compliance. As a result, Siemens surge arresters with APS record a substantially lower spark production rate than arresters without APS.



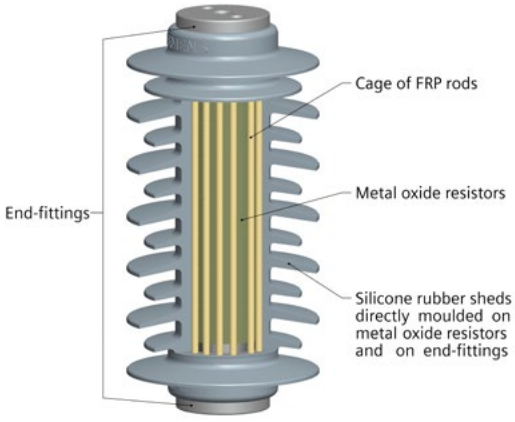
Packing dimensions 3EK

Arrester type	Housing	Length	Width	Height
		inches	inches	inches
3EK7	Housing B	10.6	8.7	5.6
	Housing C	11.8	8.7	5.6
	Housing D	13.6	8.7	5.6
	Housing E	14.8	8.7	5.6
	Housing F	16.1	8.7	5.6
	Housing G	19.6	8.7	5.6
	Housing H	19.6	8.7	5.6
	Housing J	23.6	8.7	5.6
	Housing K	23.6	8.7	5.6

Arrester type	Housing	Length	Width	Height
		inches	inches	inches
3EK7, incl. mounted options insulating bracket and disconnector	Housing B	10.6	8.7	6.3
	Housing C	10.6	8.7	6.3
	Housing D	22.4	10.6	6.3
	Housing E	22.4	10.6	6.3
	Housing F	22.4	10.6	6.3
	Housing H	25.6	13.8	6.3
	Housing J	25.6	13.8	6.3
	Housing K	25.6	13.8	6.3

3EJ Surge arresters with high energy discharge capabilities with silicone rubber housing and Cage Design™

Siemens cage design 3EJ high energy discharge surge arresters offer superior protection against overvoltages in medium-voltage systems.



The metal oxide resistors (MOV) are enclosed by a cage made of fiber-reinforced plastic (FRP) rods, providing a rigid, reinforced structure ensuring high mechanical strength.

Reliability is guaranteed by the direct molding of the silicone rubber onto the MOVs and the FRP rods. This ensures the total embedding of all components free of inclusions and gaps, thus providing an excellent sealing system, which avoids partial discharges or moisture ingress.

In the extremely rare event of the MOVs being overloaded, arcing cannot result in a buildup of critical internal pressure, since the MOVs are not enclosed in a sealed mechanical shell. The arc can escape directly through the soft silicone housing, leaving the mechanical support structure of the enclosure unharmed. The ejection of internal parts that could damage other equipment nearby is prevented almost completely. Siemens' innovative cage design™ ensures outstanding performance in safety issues.

Silicone rubber is highly hydrophobic and maintains its ability to repel water and any deposits of pollution throughout its entire service life. This results in high tracking and erosion resistance. The silicone rubber housing is self-extinguishing and flame-retardant. These advantages provide maintenance-free and reliable service life for 3EJ surge arresters.

Siemens offers five product lines for the application with high energy discharge, which differentiate in the protection level:

- 3EJ2 – for duty cycle voltages up to 36 kV, medium energy discharge capability.
- 3EJ3 – for duty cycle voltages up to 36 kV, high energy discharge capability.
- 3EJ4 – for duty cycle voltages up to 36 kV, very high energy discharge capability.
- 3EJ0 – for duty cycle voltages up to 15 kV, very low protection levels for protection against switching over voltages.
- 3EJ9 – for duty cycle voltages up to 12 kV, very low protection levels for protection against switching over voltages.

The proven 3EJ4 is also available in a version for indoor application, which is a cage design™ surge arrester offering the same benefits as the version for outdoor application.

The 3EJ0 and 3EJ9 surge arresters have been optimized for the protection against over voltages caused by switching in combination with very low protection levels. The 3EJ0 surge arresters are normally used in cable systems up to 15 kV. For station service systems of power stations and extensive cable systems the 3EJ9 surge arresters are used having a higher energy absorption capability and improved protection level.

Siemens 3EJ cage design surge arresters are ideally suited for the reliable protection of:

- Generators
- Motors
- Arc furnaces
- Arc furnace transformers
- Dry type transformers
- Airfield-lighting systems
- Cable sheath
- Capacitors and capacitor banks
- Converters for drives

3EJ2 specifications

Electrical Characteristics													
Duty cycle voltage	MCOV	Arrester type	Energy class	Lightning impulse classifying current	Switching surge energy rating	Single impulse withstand rating	Protective Level maximum discharge voltage						
							45/90µs 125 A	45/90µs 500 A	8/20µs 1.5 kA	8/20µs 3 kA	8/20µs 5 kA	8/20µs 10 kA	8/20µs 20 kA
kV	kV			I_n kA	kJ/ kVmcov	C	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr
3.0	2.55	3EJ2 003 - 0 A B 3 1 - 4	E	10	9.0	2.0	5.5	5.8	6.2	6.5	6.8	7.2	8.0
6.0	5.10	3EJ2 006 - 0 A B 3 1 - 4	E	10	9.0	2.0	10.9	11.5	12.4	13.0	13.5	14.4	16.0
9.0	7.65	3EJ2 009 - 0 A C 3 1 - 4	E	10	9.0	2.0	16.4	17.3	18.6	19.4	20.3	21.6	24.0
10	8.40	3EJ2 010 - 0 A C 3 1 - 4	E	10	9.0	2.0	18.2	19.2	20.6	21.6	22.6	24.0	26.6
12	10.2	3EJ2 012 - 0 A C 3 1 - 4	E	10	9.0	2.0	21.9	23.0	24.8	25.9	27.1	28.8	32.0
15	12.7	3EJ2 015 - 0 A D 3 1 - 4	E	10	9.0	2.0	27.4	28.8	31.0	32.4	33.8	36.0	40.0
18	15.3	3EJ2 018 - 0 A D 3 1 - 4	E	10	9.0	2.0	32.8	34.6	37.2	38.9	40.6	43.2	48.0
21	17.0	3EJ2 021 - 0 A D 3 1 - 4	E	10	9.0	2.0	38.3	40.3	43.3	45.4	47.4	50.4	55.9
24	19.5	3EJ2 024 - 0 A E 3 1 - 4	E	10	9.0	2.0	43.8	46.1	49.5	51.8	54.1	57.6	63.9
27	22.0	3EJ2 027 - 0 A E 3 1 - 4	E	10	9.0	2.0	49.2	51.8	55.7	58.3	60.9	64.8	71.9
30	24.4	3EJ2 030 - 0 A F 3 1 - 4	E	10	9.0	2.0	54.7	57.6	61.9	64.8	67.7	72.0	79.9
36	29.0	3EJ2 036 - 0 A G 3 1 - 4	E	10	9.0	2.0	65.7	69.1	74.3	77.8	81.2	86.4	95.9

3EJ3 specifications

Electrical Characteristics													
Duty cycle voltage	MCOV	Arrester order number	Energy class	Lightning impulse classifying current	Switching surge energy rating	Single impulse withstand rating	Protective Level Maximum discharge voltage						
							45/90µs 125 A	45/90µs 500 A	8/20µs 1.5 kA	8/20µs 3 kA	8/20µs 5 kA	8/20µs 10 kA	8/20µs 20 kA
kV	kV			I_n kA	kJ/ kVmcov	C	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr
3.0	2.55	3EJ3 003 - 0 A B 4 1 - 4	G	15	13.0	2.8	5.3	5.6	5.9	6.1	6.4	6.8	7.4
3.0	2.55	3EJ3 003 - 0 A B 5 1 - 4	J	20	18.0	3.6	5.3	5.6	5.9	6.1	6.4	6.8	7.4
6.0	5.10	3EJ3 006 - 0 A B 4 1 - 4	G	15	13.0	2.8	10.7	11.2	11.9	12.3	12.8	13.5	14.7
6.0	5.10	3EJ3 006 - 0 A C 5 1 - 4	J	20	18.0	3.6	10.7	11.2	11.9	12.3	12.8	13.5	14.7
9.0	7.65	3EJ3 009 - 0 A C 4 1 - 4	G	15	13.0	2.8	16.0	16.8	17.8	18.4	19.1	20.3	22.1
9.0	7.65	3EJ3 009 - 0 A C 5 1 - 4	J	20	18.0	3.6	16.0	16.8	17.8	18.4	19.1	20.3	22.1
10	8.40	3EJ3 010 - 0 A C 4 1 - 4	G	15	13.0	2.8	17.8	18.7	19.8	20.5	21.3	22.5	24.5
10	8.40	3EJ3 010 - 0 A C 5 1 - 4	J	20	18.0	3.6	17.8	18.7	19.8	20.5	21.3	22.5	24.5
12	10.2	3EJ3 012 - 0 A C 4 1 - 4	G	15	13.0	2.8	21.3	22.4	23.8	24.6	25.5	27.0	29.4
12	10.2	3EJ3 012 - 0 A D 5 1 - 4	J	20	18.0	3.6	21.3	22.4	23.8	24.6	25.5	27.0	29.4
15	12.7	3EJ3 015 - 0 A D 4 1 - 4	G	15	13.0	2.8	26.7	28.0	29.7	30.7	31.9	33.8	36.8
15	12.7	3EJ3 015 - 0 A D 5 1 - 4	J	20	18.0	3.6	26.7	28.0	29.7	30.7	31.9	33.8	36.8
18	15.3	3EJ3 018 - 0 A D 4 1 - 4	G	15	13.0	2.8	32.0	33.6	35.6	36.9	38.3	40.5	44.2
18	15.3	3EJ3 018 - 0 A E 5 1 - 4	J	20	18.0	3.6	32.0	33.6	35.6	36.9	38.3	40.5	44.2
21	17.0	3EJ3 021 - 0 A E 4 1 - 4	G	15	13.0	2.8	37.3	39.2	41.6	43.0	44.6	47.3	51.5
21	17.0	3EJ3 021 - 0 A E 5 1 - 4	J	20	18.0	3.6	37.3	39.2	41.6	43.0	44.6	47.3	51.5
24	19.5	3EJ3 024 - 0 A E 4 1 - 4	G	15	13.0	2.8	42.7	44.8	47.5	49.2	51.0	54.0	58.9
24	19.5	3EJ3 024 - 0 A F 5 1 - 4	J	20	18.0	3.6	42.7	44.8	47.5	49.2	51.0	54.0	58.9
27	22.0	3EJ3 027 - 0 A F 4 1 - 4	G	15	13.0	2.8	48.0	50.4	53.5	55.3	57.4	60.8	66.2
27	22.0	3EJ3 027 - 0 A F 5 1 - 4	J	20	18.0	3.6	48.0	50.4	53.5	55.3	57.4	60.8	66.2
30	24.4	3EJ3 030 - 0 A F 4 1 - 4	G	15	13.0	2.8	53.3	56.0	59.4	61.4	63.8	67.5	73.6
30	24.4	3EJ3 030 - 0 A G 5 1 - 4	J	20	18.0	3.6	53.3	56.0	59.4	61.4	63.8	67.5	73.6
36	29.0	3EJ3 036 - 0 A G 4 1 - 4	G	15	13.0	2.8	64.0	67.2	71.3	73.7	76.5	81.0	88.3
36	29.0	3EJ3 036 - 0 A H 5 1 - 4	J	20	18.0	3.6	64.0	67.2	71.3	73.7	76.5	81.0	88.3

Mechanical Characteristics							
	Height [H]	Leakage distance	Rated short-circuit current	Recommended minimum clearances		Cantilever strength MDCL	Weight
				To ground (ph-gnd)	Between phases (ph-ph)		
	inches	inches	Is kA	inches	inches	lbf	lbs
	6.5	16.9	50	5	8	948	11.0
	6.5	16.9	50	5	8	948	11.7
	8.3	23.2	50	6	9	745	13.4
	8.3	23.2	50	6	9	745	13.7
	8.3	23.2	50	6	9	745	14.3
	10.1	29.5	50	8	12	614	16.1
	10.1	29.5	50	8	12	614	16.8
	10.1	29.5	50	8	12	614	17.2
	11.9	36.2	50	10	15	522	19.0
	11.9	36.2	50	10	15	522	19.8
	13.6	42.9	50	10	15	454	21.6
	15.4	49.2	50	14	19	402	24.0

Mechanical Characteristics							
	Height [H]	Leakage distance	Rated short-circuit current	Recommended minimum clearances		Cantilever strength MDCL	Weight
				To ground (ph-gnd)	Between phases (ph-ph)		
	inches	inches	Is kA	inches	inches	lbf	lbs
	6.8	15.4	65	5	9	1372	11.5
	6.8	15.4	65	5	9	1372	11.5
	6.8	15.4	65	5	9	1372	12.6
	8.2	21.7	65	5	9	1134	13.9
	8.2	21.7	65	6	10	1134	14.8
	8.2	21.7	65	6	10	1134	15.0
	8.2	21.7	65	6	10	1134	15.4
	8.2	21.7	65	6	10	1134	15.4
	8.2	21.7	65	6	10	1134	15.9
	9.6	27.6	65	6	10	967	17.2
	9.6	27.6	65	9	13	967	18.1
	9.6	27.6	65	9	13	967	18.3
	9.6	27.6	65	9	13	967	19.0
	11.1	33.9	65	9	13	840	20.7
	11.1	33.9	65	9	13	840	21.4
	11.1	33.9	65	9	13	840	21.8
	11.1	33.9	65	10	15	840	22.3
	12.5	40.2	65	10	15	744	24.0
	12.5	40.2	65	10	15	744	24.5
	12.5	40.2	65	10	15	744	25.6
	12.5	40.2	65	10	15	744	25.6
	13.9	46.1	65	10	15	668	27.3
	13.9	46.1	65	14	19	668	28.9
	15.3	52.4	65	14	19	606	31.1

3EJ4 specifications

Electrical Characteristics													
Duty cycle voltage	MCOV	Arrester type	Energy class	Lightning impulse classifying current	Switching surge energy rating	Single impulse withstand rating	Protective Level Maximum discharge voltage						
							45/90µs 125 A	45/90µs 500 A	8/20µs 1.5 kA	8/20µs 3 kA	8/20µs 5 kA	8/20µs 10 kA	8/20µs 20 kA
kV	kV			I_n kA	kJ/ kVmcov	C	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr
3.3	2.60	3EJ4 003 - 0 A B 8 1 - 4	K	20	21.0	6.0	5.6	5.9	6.2	6.4	6.7	7.0	7.6
6.5	5.10	3EJ4 006 - 0 A B 8 1 - 4	K	20	21.0	6.0	11.2	11.7	12.4	12.9	13.3	14.0	15.1
9.0	7.65	3EJ4 009 - 0 A C 8 1 - 4	K	20	21.0	6.0	15.5	16.3	17.2	17.8	18.4	19.4	20.9
10	8.40	3EJ4 010 - 0 A C 8 1 - 4	K	20	21.0	6.0	17.2	18.1	19.1	19.8	20.4	21.5	23.2
12	10.2	3EJ4 012 - 0 A C 8 1 - 4	K	20	21.0	6.0	20.6	21.7	23.0	23.7	24.5	25.8	27.9
15	12.7	3EJ4 015 - 0 A D 8 1 - 4	K	20	21.0	6.0	25.8	27.1	28.7	29.7	30.6	32.3	34.8
18	15.3	3EJ4 018 - 0 A D 8 1 - 4	K	20	21.0	6.0	31.0	32.5	34.4	35.6	36.8	38.7	41.8
21	17.0	3EJ4 021 - 0 A D 8 1 - 4	K	20	21.0	6.0	36.1	37.9	40.2	41.5	42.9	45.2	48.8
24	19.5	3EJ4 024 - 0 A E 8 1 - 4	K	20	21.0	6.0	41.3	43.3	45.9	47.5	49.0	51.6	55.7
27	22.0	3EJ4 027 - 0 A E 8 1 - 4	K	20	21.0	6.0	46.4	48.8	51.7	53.4	55.2	58.1	62.7
30	24.4	3EJ4 030 - 0 A F 8 1 - 4	K	20	21.0	6.0	51.6	54.2	57.4	59.3	61.3	64.5	69.7
36	29.0	3EJ4 036 - 0 A G 8 1 - 4	K	20	21.0	6.0	61.9	65.0	68.9	71.2	73.5	77.4	83.6

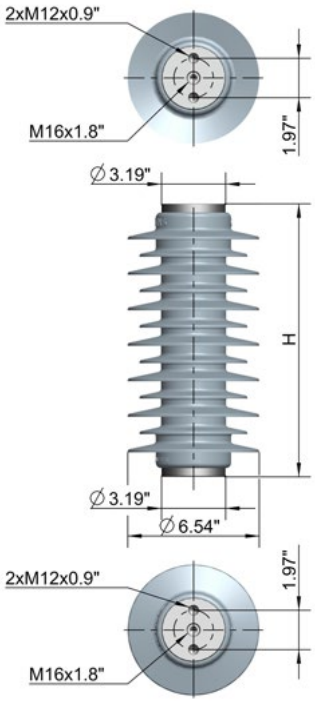
3EJ4 indoor version specifications

Electrical Characteristics													
Duty cycle voltage	MCOV	Arrester type	Energy class	Lightning impulse classifying current	Switching surge energy rating	Single impulse withstand rating	Protective Level Maximum discharge voltage						
							45/90µs 125 A	45/90µs 500 A	8/20µs 1.5 kA	8/20µs 3 kA	8/20µs 5 kA	8/20µs 10 kA	8/20µs 20 kA
kV	kV			I_n kA	kJ/ kVmcov	C	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr
3	2.6	3EJ4 003 - 0 A B 8 1 - 0	K	20	21.0	6.0	5.2	5.4	5.7	5.9	6.1	6.5	7.0
6	5.1	3EJ4 006 - 0 A B 8 1 - 0	K	20	21.0	6.0	10.3	10.8	11.5	11.9	12.3	12.9	13.9
9	7.7	3EJ4 009 - 0 A C 8 1 - 0	K	20	21.0	6.0	15.5	16.3	17.2	17.8	18.4	19.4	20.9
10	8.4	3EJ4 010 - 0 A C 8 1 - 0	K	20	21.0	6.0	17.2	18.1	19.1	19.8	20.4	21.5	23.2
12	10.2	3EJ4 012 - 0 A C 8 1 - 0	K	20	21.0	6.0	20.6	21.7	23.0	23.7	24.5	25.8	27.9
15	12.7	3EJ4 015 - 0 A D 8 1 - 0	K	20	21.0	6.0	25.8	27.1	28.7	29.7	30.6	32.3	34.8
18	15.3	3EJ4 018 - 0 A D 8 1 - 0	K	20	21.0	6.0	31.0	32.5	34.4	35.6	36.8	38.7	41.8
21	17.0	3EJ4 021 - 0 A D 8 1 - 0	K	20	21.0	6.0	36.1	37.9	40.2	41.5	42.9	45.2	48.8
24	19.5	3EJ4 024 - 0 A E 8 1 - 0	K	20	21.0	6.0	41.3	43.3	45.9	47.5	49.0	51.6	55.7
27	22.0	3EJ4 027 - 0 A E 8 1 - 0	K	20	21.0	6.0	46.4	48.8	51.7	53.4	55.2	58.1	62.7
30	24.4	3EJ4 030 - 0 A F 8 1 - 0	K	20	21.0	6.0	51.6	54.2	57.4	59.3	61.3	64.5	69.7

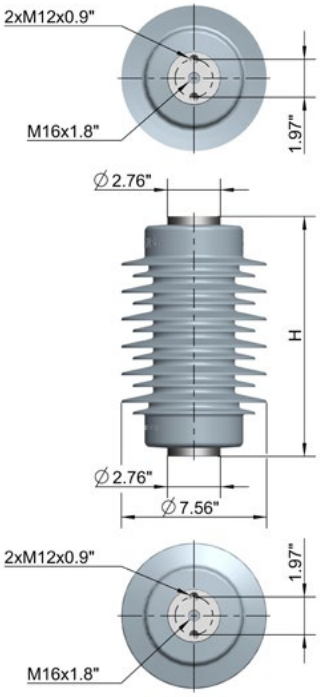
Mechanical Characteristics							
	Height [H] inches	Leakage distance inches	Rated short-circuit current Is kA	Recommended minimum clearances		Cantilever strength MDCL lbf	Weight lbs
				To ground (ph-gnd) inches	Between phases (ph-ph) inches		
	7.4	19.0	50	6	10	1674	17.2
	7.4	19.0	50	6	10	1674	19.2
	9.1	26.8	50	8	12	1356	22.0
	9.1	26.8	50	8	12	1356	22.9
	9.1	26.8	50	8	12	1356	24.0
	10.9	34.6	50	10	14	1140	27.8
	10.9	34.6	50	10	14	1140	28.9
	10.9	34.6	50	10	14	1140	30.9
	12.6	42.4	50	12	17	983	34.6
	12.6	42.4	50	12	17	983	36.6
	14.3	50.1	50	12	17	864	40.3
	16.1	57.9	50	15	20	771	44.1

Mechanical Characteristics							
	Height [H] inches	Leakage distance inches	Rated short-circuit current Is kA	Recommended minimum clearances		Cantilever strength MDCL lbf	Weight lbs
				To ground (ph-gnd) inches	Between phases (ph-ph) inches		
	7.4	9.3	50	6	10	1674	15.2
	7.4	9.3	50	6	10	1674	17.2
	9.1	11.0	50	8	12	1356	19.2
	9.1	11.0	50	8	12	1356	20.1
	9.1	11.0	50	8	12	1356	21.2
	10.9	12.7	50	10	14	1140	24.0
	10.9	12.7	50	10	14	1140	24.9
	10.9	12.7	50	10	14	1140	26.9
	12.6	14.4	50	12	17	983	29.8
	12.6	14.4	50	12	17	983	31.7
	14.3	16.2	50	12	17	864	34.8

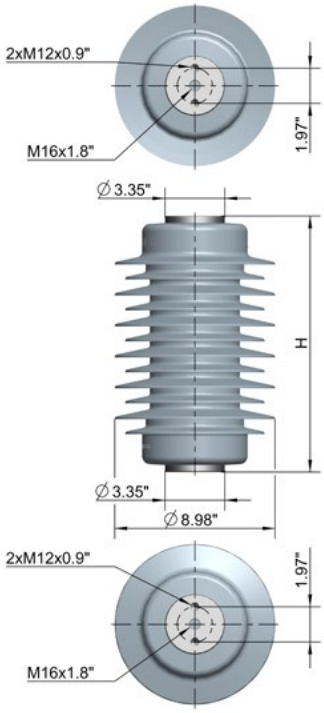
3EJ Drawings



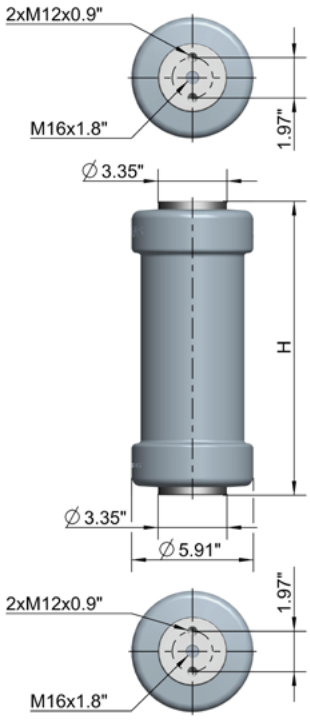
Dimensions 3EJ2



Dimensions 3EJ3



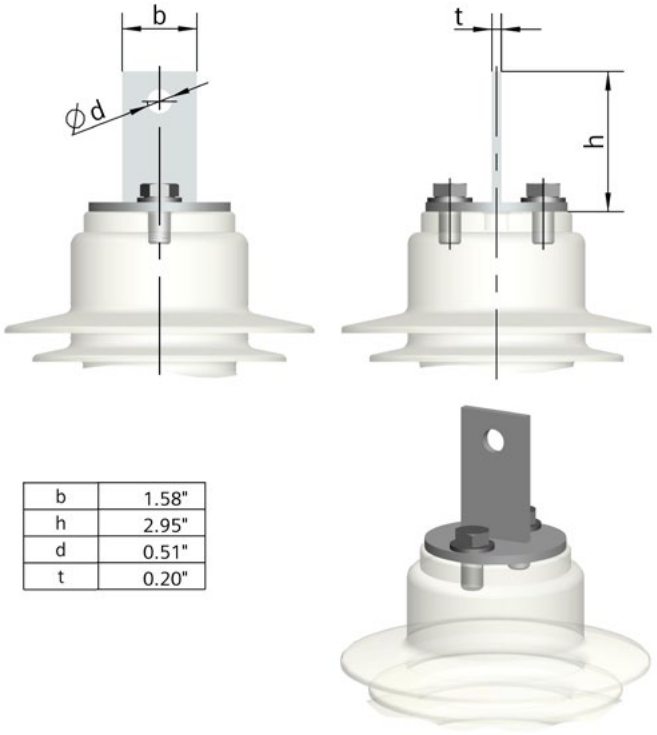
Dimensions 3EJ4



Dimensions 3EJ4 indoor

3EJ Accessories

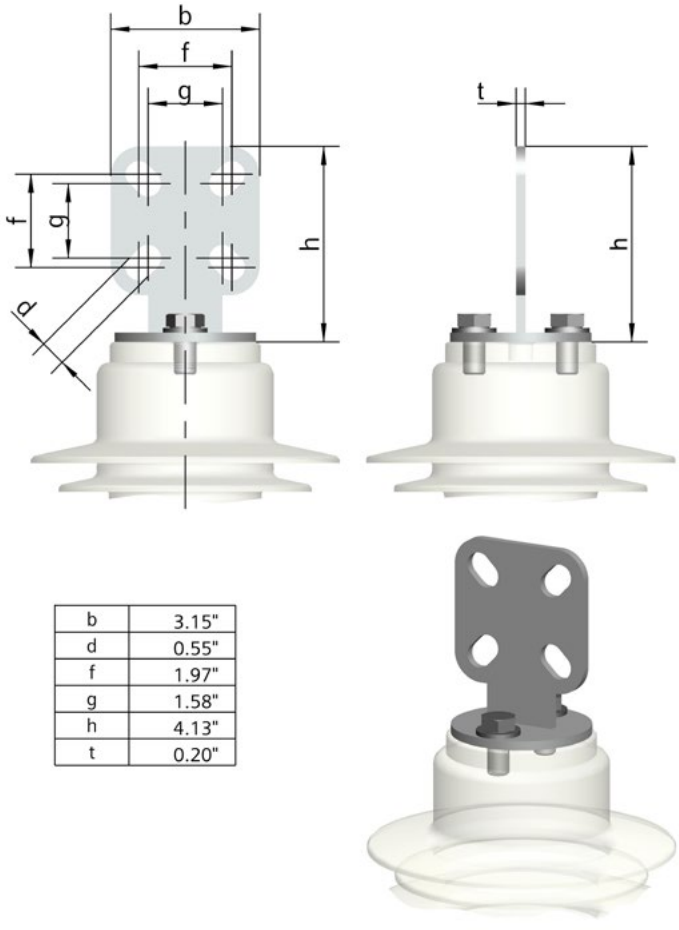
Line terminal options



b	1.58"
h	2.95"
d	0.51"
t	0.20"

L-bracket

Order number: 3EX4 500-1L

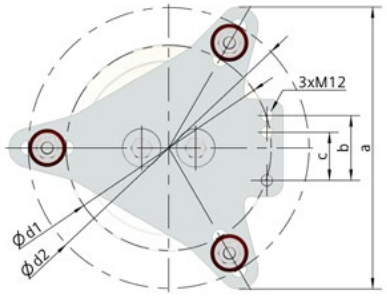


b	3.15"
d	0.55"
f	1.97"
g	1.58"
h	4.13"
t	0.20"

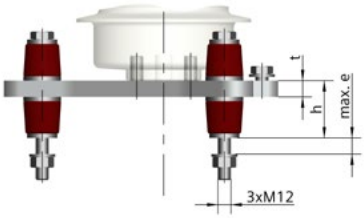
Flat DIN/NEMA terminal 1.75“ x 1.75“

Order number: 3EX4 500-1X

Mounting options



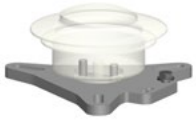
a	10.28"
b	2.36"
c	1.75"
d1	7.48"
d2	10.24"
h	2.09"
t	0.59"
e	0.79"

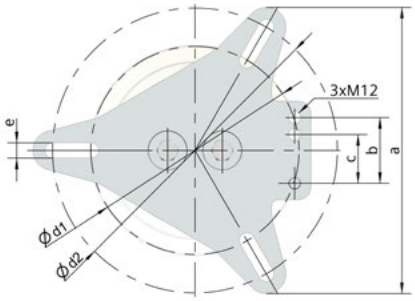


Mounting, insulated

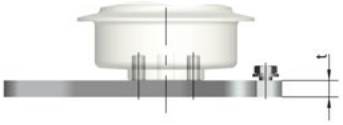
D=10”

Order number: 3EX4 500-2A





a	10.28"
b	2.36"
c	1.75"
d1	7.48"
d2	10.24"
t	0.59"
e	0.55"



Mounting, grounded

D=10”

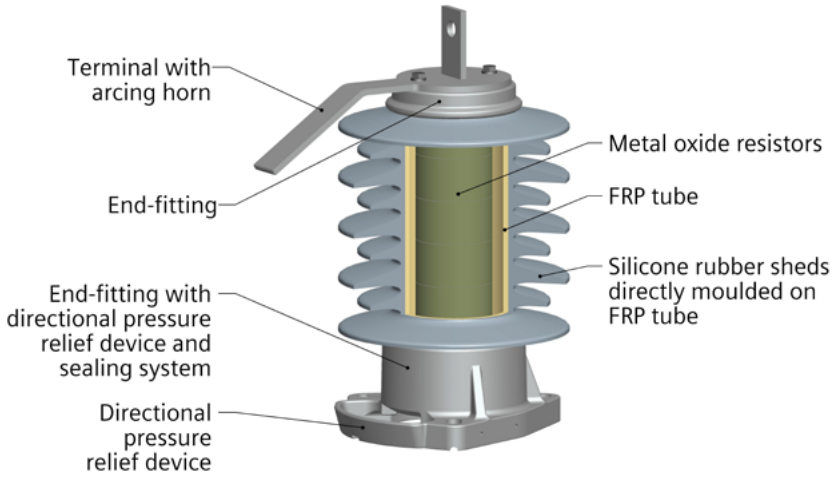
Order number: 3EX4 500-3A

Packing dimensions 3EJ

Arrester type	Housing	Length	Width	Height
		inches	inches	inches
3EJ2	All housings	11.4	11.0	22.0
3EJ3	All housings	11.4	11.0	22.0
3EJ4	All housings	11.4	11.0	22.0

3EQ0 Silicone rubber surge arresters with composite hollow core design

For applications requiring a surge arrester with silicone rubber housing with a directional pressure relief device. Siemens offers the 3EQ0 for duty cycle voltages up to 36 kV.



Siemens' innovative composite hollow core design uses silicone and an FRP hollow core as housing materials. The direct molding of the silicone rubber onto the FRP hollow core ensures reliability, while an excellent special sealing of the flanges at both ends of the surge arrester effectively prevents moisture ingress, which avoids partial discharges. The combination of silicone rubber and fiber-glass-reinforced hollow core also allows an enormous load carrying capacity for the structure.

The excellent sealing system of **3EQ0** surge arresters prevents failures or moisture ingress and guarantees decades of trouble-free service.

The composite hollow core design provides a very high degree of safety: In the case of an overload or the extremely rare case of an arrester short circuit, the arc escapes directly through directional pressure relief device, internal parts are not ejected, and the housing does not break.

Siemens 3EQ0 composite hollow core design surge arresters are ideally suited for the reliable protection of:

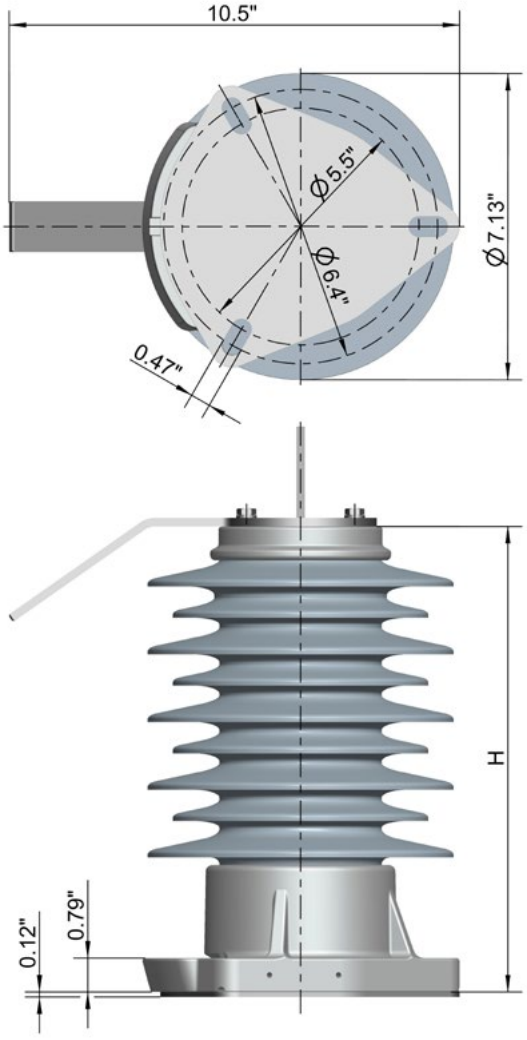
- Generators
- Motors
- Arc furnaces
- Arc furnace transformers
- Dry type transformers
- Airfield-lighting systems
- Cable sheath
- Capacitors and capacitor banks
- Converters for drives

3EQ0 specifications

Electrical Characteristics													
Duty cycle voltage kV	MCOV kV	Arrester type	Energy class	Lightning impulse classifying current I_n kA	Switching surge energy rating kJ/ kVmcov	Single impulse withstand rating C	Protective Level maximum discharge voltage						
							30/60µs 125 A kV	30/60µs 500 A kV	8/20µs 1 kA kV	8/20µs 3 kA kV	8/20µs 5 kA kV	8/20µs 10 kA kV	8/20µs 20 kA kV
3	2.55	3EQ0 003 - 2 A B 3 1 - 4.H.	E	10	9.0	2.0	5.5	5.8	6.2	6.5	6.8	7.2	8.0
3	2.55	3EQ0 003 - 3 A B 4 1 - 4.H.	G	15	13.0	2.8	5.4	5.7	6.1	6.3	6.6	7.1	7.8
6	5.10	3EQ0 006 - 2 A B 3 1 - 4.H.	E	10	9.0	2.0	10.9	11.5	12.4	13.0	13.5	14.4	16.0
6	5.10	3EQ0 006 - 3 A B 4 1 - 4.H.	G	15	13.0	2.8	10.9	11.4	12.3	12.7	13.3	14.1	15.5
9	7.65	3EQ0 009 - 2 A B 3 1 - 4.H.	E	10	9.0	2.0	16.4	17.3	18.6	19.4	20.3	21.6	24.0
9	7.65	3EQ0 009 - 3 A C 4 1 - 4.H.	G	15	13.0	2.8	16.3	17.1	18.4	19.0	19.9	21.2	23.3
10	8.40	3EQ0 010 - 2 A B 3 1 - 4.H.	E	10	9.0	2.0	18.2	19.2	20.6	21.6	22.6	24.0	26.6
10	8.40	3EQ0 010 - 3 A C 4 1 - 4.H.	G	15	13.0	2.8	18.1	19.0	20.4	21.2	22.1	23.5	25.9
12	10.2	3EQ0 012 - 2 A E 3 1 - 4.H.	E	10	9.0	2.0	21.9	23.0	24.8	25.9	27.1	28.8	32.0
12	10.2	3EQ0 012 - 3 A C 4 1 - 4.H.	G	15	13.0	2.8	21.7	22.8	24.5	25.4	26.5	28.2	31.0
15	12.7	3EQ0 015 - 2 A E 3 1 - 4.H.	E	10	9.0	2.0	27.4	28.8	31.0	32.4	33.8	36.0	40.0
15	12.7	3EQ0 015 - 3 A E 4 1 - 4.H.	G	15	13.0	2.8	27.2	28.6	30.7	31.7	33.1	35.3	38.8
18	15.3	3EQ0 018 - 2 A E 3 1 - 4.H.	E	10	9.0	2.0	32.8	34.6	37.2	38.9	40.6	43.2	48.0
18	15.3	3EQ0 018 - 3 A E 4 1 - 4.H.	G	15	13.0	2.8	32.6	34.3	36.8	38.1	39.8	42.3	46.5
21	17.0	3EQ0 021 - 2 A E 3 1 - 4.H.	E	10	9.0	2.0	38.3	40.3	43.3	45.4	47.4	50.4	55.9
21	17.0	3EQ0 021 - 3 A E 4 1 - 4.H.	G	15	13.0	2.8	38.0	40.0	42.9	44.4	46.4	49.4	54.3
24	19.5	3EQ0 024 - 2 A H 3 1 - 4.H.	E	10	9.0	2.0	43.8	46.1	49.5	51.8	54.1	57.6	63.9
24	19.5	3EQ0 024 - 3 A E 4 1 - 4.H.	G	15	13.0	2.8	43.4	45.7	49.1	50.8	53.0	56.4	62.0
27	22.0	3EQ0 027 - 2 A H 3 1 - 4.H.	E	10	9.0	2.0	49.2	51.8	55.7	58.3	60.9	64.8	71.9
27	22.0	3EQ0 027 - 3 A H 4 1 - 4.H.	G	15	13.0	2.8	48.9	51.4	55.2	57.1	59.6	63.5	69.8
30	24.4	3EQ0 030 - 2 A H 3 1 - 4.H.	E	10	9.0	2.0	54.7	57.6	61.9	64.8	67.7	72.0	79.9
30	24.4	3EQ0 030 - 3 A H 4 1 - 4.H.	G	15	13.0	2.8	54.3	57.1	61.3	63.5	66.3	70.5	77.6
36	29.0	3EQ0 036 - 2 A H 3 1 - 4.H.	E	10	9.0	2.0	65.7	69.1	74.3	77.8	81.2	86.4	95.9
36	29.0	3EQ0 036 - 3 A H 4 1 - 4.H.	G	15	13.0	2.8	65.2	68.5	73.6	76.1	79.5	84.6	93.1

Mechanical Characteristics							
	Height [H]	Leakage distance	Rated short-circuit current	Recommended minimum clearances		Cantilever strength MDCL	Weight
				To ground (ph-gnd)	Between phases (ph-ph)		
	inches	inches	Is kA	inches	inches	lbf	lbs
	6.1	9.6	50	5	9	2111	26.9
	6.1	9.6	50	5	9	2111	27.3
	6.1	9.6	50	5	9	2111	26.9
	6.1	9.6	50	5	9	2111	27.3
	6.1	9.6	50	6	10	2111	26.9
	7.7	15.7	50	6	10	1678	29.3
	6.1	9.6	50	6	10	2111	26.9
	7.7	15.7	50	6	10	1678	29.3
	10.8	28.0	50	6	10	1190	31.5
	7.7	15.7	50	6	10	1678	29.3
	10.8	28.0	50	9	13	1190	31.5
	10.8	28.0	50	9	13	1190	34.0
	10.8	28.0	50	9	13	1190	33.3
	10.8	28.0	50	9	13	1190	34.0
	10.8	28.0	50	9	13	1190	33.3
	10.8	28.0	50	9	13	1190	35.5
	15.6	46.3	50	10	15	828	38.1
	10.8	28.0	50	10	15	1190	35.5
	15.6	46.3	50	10	15	828	38.1
	15.6	46.3	50	10	15	828	40.6
	15.6	46.3	50	10	15	828	38.1
	15.6	46.3	50	10	15	828	42.1
	15.6	46.3	50	14	19	828	39.5
	15.6	46.3	50	14	19	828	43.9

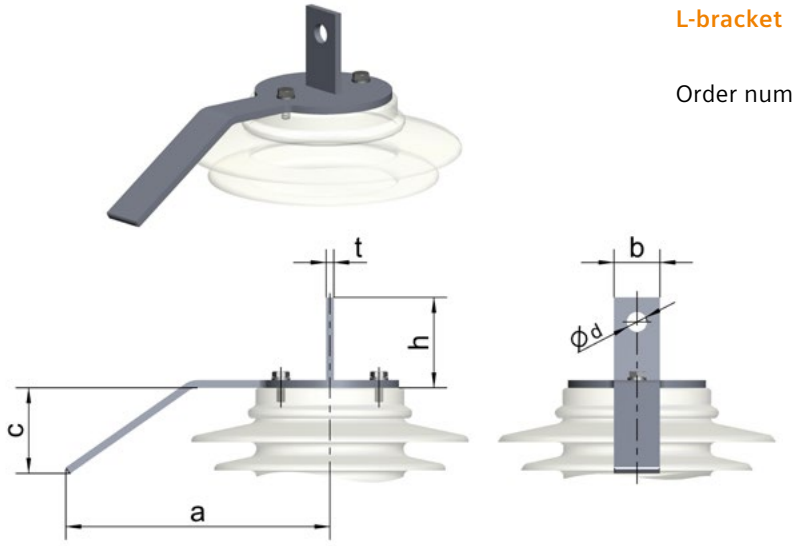
3EQ0 Drawings



Dimensions 3EQ0

3EQ0 Accessories

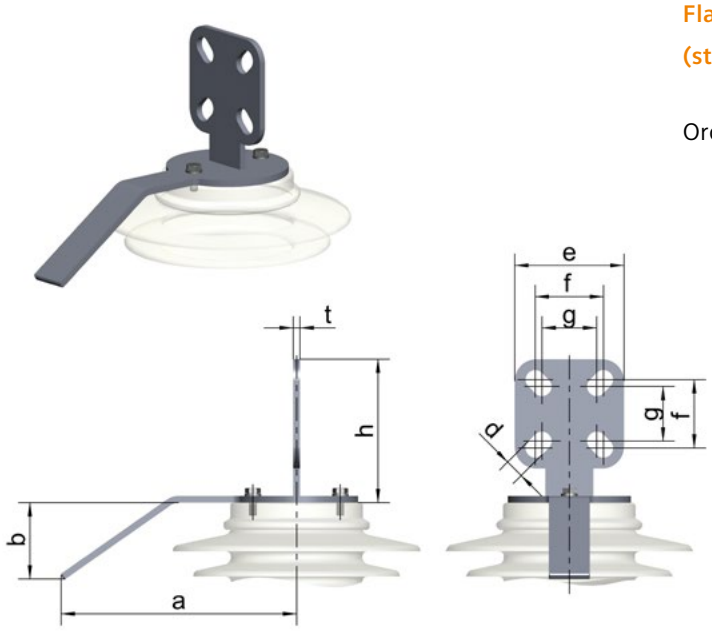
Line terminal options



L-bracket

Order number: 3EQ0 ...-.....-.Q..

a	6.77"
b	1.18"
c	2.21"
d	0.51"
h	2.32"
t	0.20"

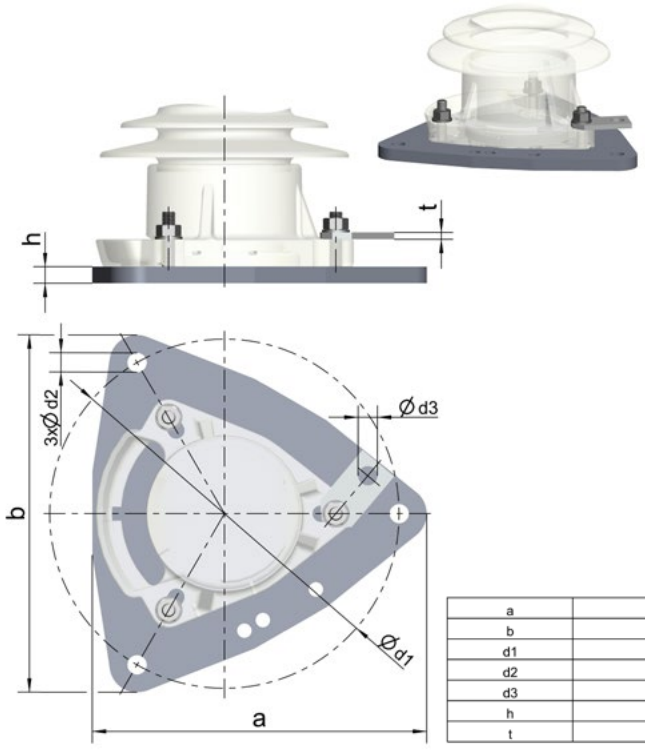


Flat DIN/NEMA terminal 1.75“ x 1.75“ (stainless steel)

Order number: 3EQ0 ...-.....-.Y..

a	6.77"
b	2.21"
d	0.55"
e	3.15"
f	1.97"
g	1.58"
h	4.13"
t	0.20"

Mounting options

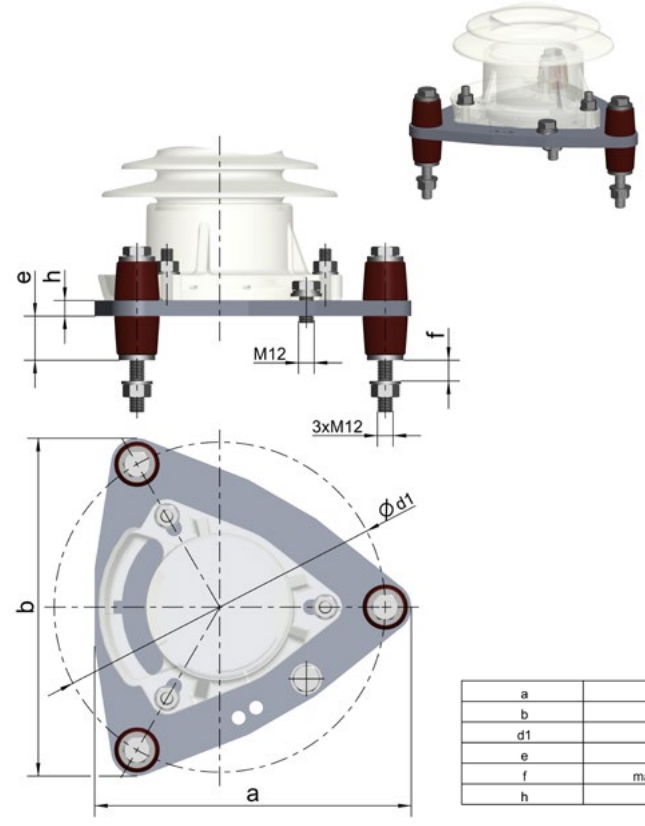


a	9.57"
b	10.24"
d1	10.0"
d2	0.55"
d3	0.55"
h	0.47"
t	0.20"

Mounting, grounded

D=10”

Order number: 3EQ0 ...--.....-...5



a	9.57"
b	10.24"
d1	10.0"
e	1.34"
f	max. 0.79"
h	0.47"

Mounting, insulated

D=10”

Order number: 3EQ0 ...--.....-...7

Packing dimensions 3EQ0

Arrester type	Housing	Length	Width	Height
		inches	inches	inches
3EQ0	Housing B	11.8	10.6	10.2
	Housing C	11.8	10.6	10.2
	Housing E	11.8	10.6	10.2
	Housing H	11.8	10.6	21.3

Glossary

Discharge voltage
quantifies the voltage drop between the arrester's terminals when a current impulse is injected. For current impulses in the shape and value of a standard test current impulse (lightning current impulse, switching current impulse, steep current impulse), the simultaneously occurring residual voltages define the protective levels that are assigned to this current shape and value.

Duty cycle voltage (symbol U_r)
is the maximum permissible root mean square value of the power frequency voltage between the arrester terminals at which the arrester is designed to operate correctly under temporary overvoltage conditions as the operating duty tests. Normally, the manufacturer specifies whether it can be applied to the arrester for a duration of 10 seconds (which corresponds to the value in the operating duty test) or 100 seconds. The duty cycle voltage is the reference parameter for determining the operating characteristics.

Highest voltage of a system (symbol U_s)
indicates the root mean square value of the highest phase-to-phase operating voltage that occurs under normal operating conditions at any time and at any point in the system.

Leakage distance
defines the distance between the metal end fittings, measured along the housing surface. It is an important factor in the behavior of an insulator – or a device containing an insulator – in polluted conditions.

Lightning impulse classifying current (symbol I_n)
indicates the peak value of a lightning current impulse used to classify an arrester.

Maximum Continuous Operating Voltage (MCOV)
indicates the designated permissible root mean square value of the power frequency voltage that is allowed to be applied continuously between the arrester terminals.

Protective level
is the maximum value of an arrester's residual voltage at a standard current impulse. In this case, there is a difference between the lightning impulse protective level (8/20 µs), the switching impulse protective level (30/60 µs), and the steep current impulse (1/2µs) protective level.

Rated short-circuit current (symbol I_s)
indicates the root mean square value of the symmetrical highest short-circuit current that can flow after an arrester has been overloaded without causing violent shattering of the housing.

Residual voltage
quantifies the voltage drop between the arrester's terminals when a current impulse is injected. For current impulses in the shape and value of a standard test current impulse (lightning current impulse, switching current impulse, steep current impulse), the simultaneously occurring residual voltages define the protective levels that are assigned to this current shape and value.

Specific creepage distance (SCD)
is the creepage distance of an insulator in relation to the highest voltage for the equipment, U_s (phase-to-phase voltage), given in mm/kV.

Temporary overvoltage (TOV)
denominates the power frequency overvoltage that can occur for a duration of several tenths of a second to up to a few seconds, as a result of a switching operation or system failure. Its value depends on the type of neutral grounding in the system.

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