



Product Brief 2007



Surge Arresters

for Power Line Applications

EPCOS has been worldwide technology and market leader in the segment of surge arresters for many years. On the basis of an extensive range of types designed for the protection of telecoms installations and terminals, the company has in recent years focused increasingly and with great success on the sector of lightning protection for buildings and equipment. The large number of optimized production processes and patented designs thus allows products of the highest performance, quality and operating time to be manufactured. A decisive advantage is that the protection level of 1500 V stipulated in IEC 61643-11 is assured without the complex and thus expensive trigger circuit required in conventional air gaps.

Features

- Voltage protection level < 1500 V
- Maximal discharge current 100 kA 10/350 μ s
- Follow current 10 kA
- Stable performance during life
- High insulation resistance

Customer benefits

- Hermetically sealed design
- No darting flame, no blast
- No clearance distance to adjacent equipment
- Non-sensitive to climatic changes and contamination
- Self-quenching

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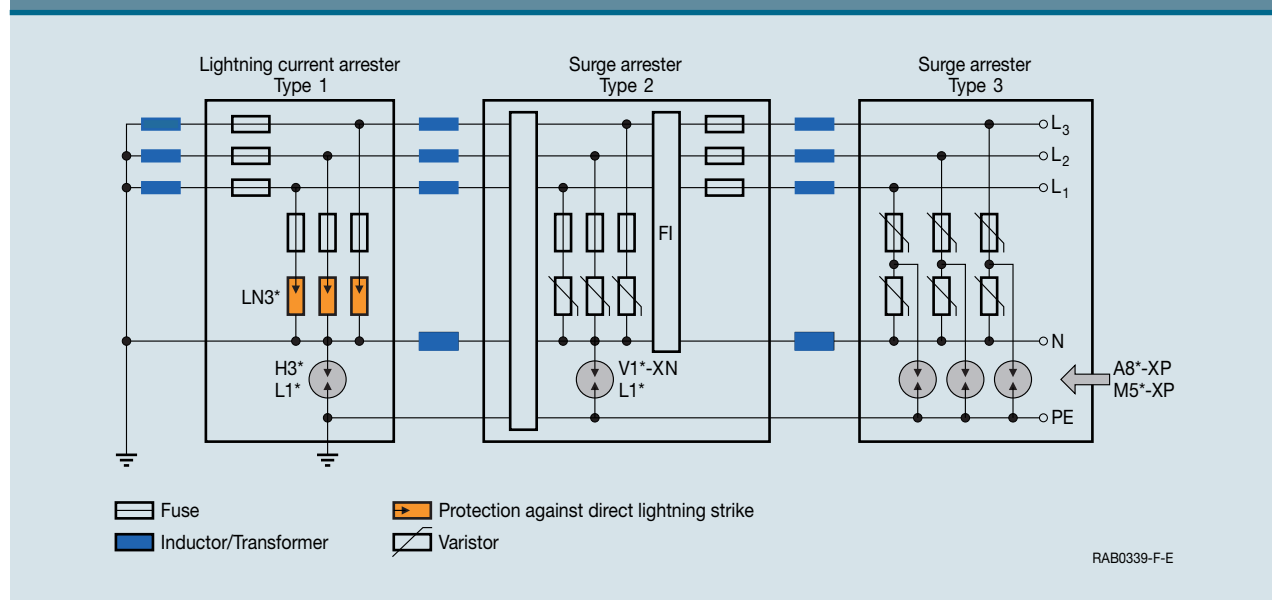
Power protection applications

About twice as many thunderstorms are recorded today than even ten years ago. This makes it increasingly important to protect people and electrical equipment from the consequences of voltage surges. Activities in this sector focus – apart from the protection of human life – on assuring the good and uninterrupted operation of electrical installations.

IEC 61643-11 defines the requirements on surge arresters at building entrances (Class or Type 1), in the

sub-distribution network (Type 2) and on the terminal side (Type 3) on the basis of the lightning protection zone concept of VDE V 0185 Part 4. Gas-filled surge arresters are already used extensively to protect equipment as well as in the sub-distribution network. In contrast, because of the enormously high demands made on discharge capability, Class-1 protection has so far been the domain of conventional air gaps of the most diverse types, in some cases together with a complex trigger circuit designed to assure maintenance of the protection level.

Lightning protection zone concept

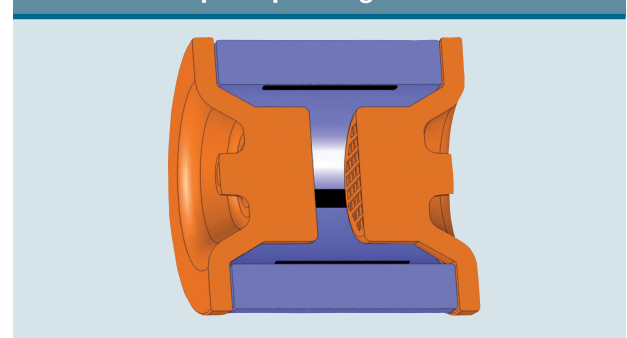


Gas-filled surge arresters

Gas-filled surge arresters operate on the principle of arc discharge. In electrical terms, the surge arrester acts as a voltage-dependent switch. As soon as the voltage applied to the arrester exceeds the ignition voltage, an electric arc is formed in the gas chamber within nano-seconds. The high current handling capability and the stabilized voltage of the arc, that is almost independent of the current, short-circuit the overvoltage with the exception of a low residual voltage.

When the impact has decayed, the arrester discharges and the internal resistance returns to its original operating state at several 100 MΩ. The surge arrester thus meets perfectly the requirements made on a protection element and with no impact on the system to be protected. It limits the surge voltage reliably to permissible values and remains in an unperturbed operating state with almost no effect on the system to be protected. The discharge

Construction principle surge arrester









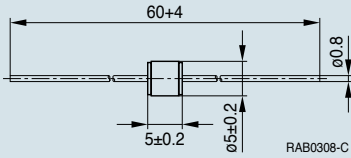
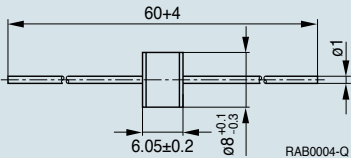
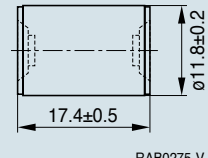
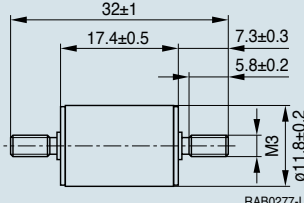
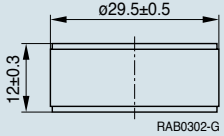
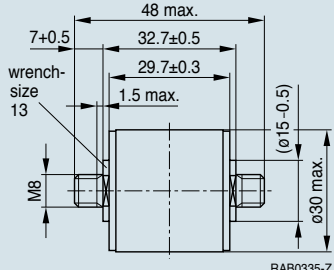
chamber, which is filled with gas and is hermetically sealed, thus secures operation even under harsh environmental conditions such as high air humidity, pollution and strong temperature variations.

Surge Arresters for Power Line Applications

N-PE arresters

In the TT system and “3+1” circuit, the arrester is positioned between neutral and protective ground where it is exposed to the sum of the lightning surge currents from all discharge lines. This means that – depending on the classification of the building to the lightning classes defined by DIN VDE 0185-305 – it must carry a direct lightning current of 50, 75 or 100 kA of waveform 10/350 μ s. To this must be added inductively coupled currents with a

waveform of 8/20 μ s and a maximum value of up to 150 kA. The IEC 61643-11 standard specifies a test program which includes both waveforms as well as a sinusoidal follow current of up to 100 A that may occur in the event of operation. The limitation of this follow current to the duration of a half-wave, known as its lightning-current discharge capability, is a key characteristic of the arrester.

Technical data						
						
Type	M5*-XP	A8*-XP	V1*-X	V1*-XN	L1*	H3*
Maximal discharge current I_{\max} [kA] ¹ 8/20 μ s	3	20	40	60	100	150
Impulse discharge current I_{imp} [kA] ¹ 10/350 μ s	0.5	2.5	5.0	12.5	50	100
Follow current I_{eff} [A]	5	100	100	100	100	100
Dimensions [mm]	Ø 5 x 5	Ø 8 x 6	Ø 12 x 17	Ø 12 x 17	Ø 30 x 12	Ø 30 x 30
Dimensional drawings						
M5*-XP 	A8*-XP 	V1*-X 				
V1*-XN 	L1* 	H3* 				


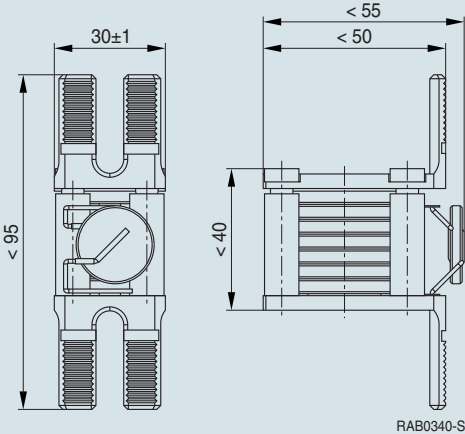
¹⁾ IEC 61643-11, $V_c = 255 V_{\text{RMS}}$

Surge Arresters for Power Line Applications

L-N arresters

The use of surge arresters at building entrances not only makes extremely high demands on their current-carrying capability in the event of direct strikes from lightning currents, but especially on their lightning current discharge capability when they are placed between phase and neutral. The sinusoidal AC current flowing through a Type 1 arrester in the event of its response is determined essentially by the output from the feeding transformer and

can assume values in the two-digit kA range. Reliable limitation of this current within a half-wave requires a high voltage across the arrester with simultaneously optimized cooling and conduction of the arc. EPCOS has developed a solution for this application that limits an effective follow current of up to 10 kA and thus satisfies the requirements of most installations. The required protection level of 1500 V to IEC 61643-11 is reliably kept without the need of additional trigger circuits.

Technical data	
	
Type	LN3*
Voltage protection level V_p (V)	< 1500
Maximal discharge current I_{max} [kA] ¹ 8/20 μ s	50
Impulse discharge current I_{imp} [kA] ¹ 10/350 μ s	50
Follow current I_{eff} [kA]	10
Partition units	2
Dimensional drawing	
	

¹⁾ IEC 61643-11, $V_c = 255 V_{RMS}$

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