

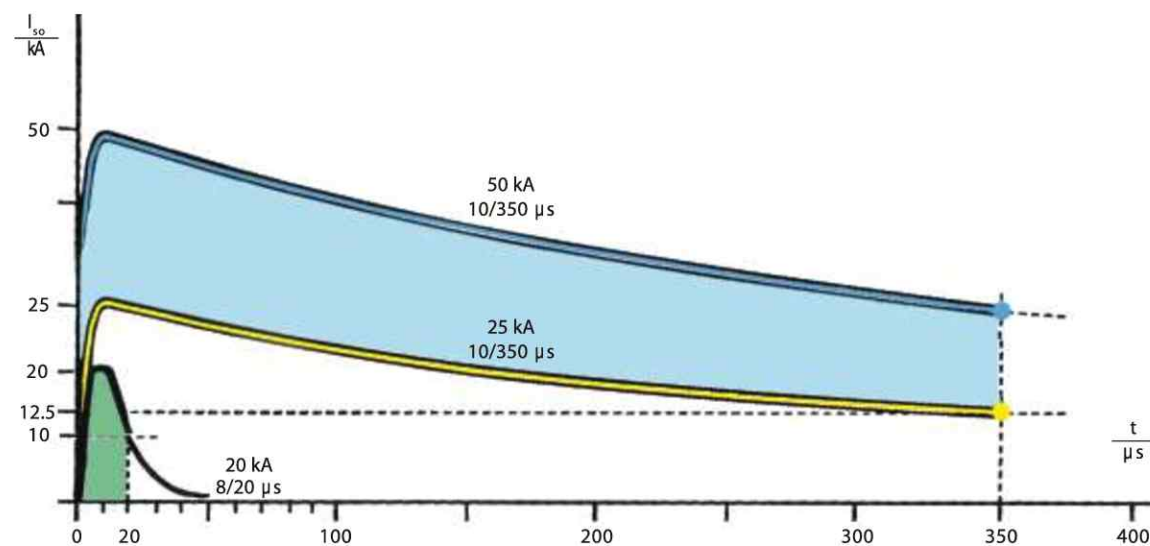
Surge voltage often destroys electronic equipment and systems to a large extent. Damage is not just restricted to industrial and commercial systems. Building automation and every day household appliances are also affected. Without effective protective measures against surge voltages, one must expect high cost for repairing or replacing the facilities affected.

Devices like air conditioners, alarm systems, video monitors, computers, telecom systems, photocopiers, refrigerators, television sets, DCS, PLCs, CNCs etc. are some of the many equipments of building automation, office, household, or industrial segments with sensitive electronic circuits that are often destroyed by surge voltages. This emphasizes the fact that the protective measures for the prevention of damage by surge voltage are of just as much interest in the private household as for the commercial or industrial sector. An effective surge voltage protection concept for building automation includes the fields of power supply, telephone lines, antenna and receiver stations, data processing and control technology. It is of particular importance that all conductors that are connected to a device are connected with a suitable surge voltage arrester. Almost all devices have a power supply unit. A television set, for example, requires a receive signal that is fed in through the antenna cable, and regardless of whether the signal comes from an antenna or broad-band cable, the antenna input and power supply of the television set should be protected. Consistent all round protection along these lines can be applied to all other devices and systems as well.

If we consider the total value of equipment to be protected, the installation of the equipment to be protective devices usually pays off if it prevents the destruction of an electro-technical system or device even just once. As long the output capacities are not exceeded, surge voltage protection devices are effective time and again, providing the user with a considerably higher benefit.

The waveform and energy of a surge

The latest test standards, such as the VDE (German Standard), International Electrotechnic Commission (IEC) etc., addresses the long duration lightning energies and switching surge energies that occur naturally. A surge current Pulse is defined by the time taken by the surge to reach its maximum value and then the time taken by the surge to reach its half of the maximum value. The surge created due to lightning effects are primarily treated as 10/350 μ s. Similarly the switching surges are addressed by a waveform reaching the peak in 8 μ s, coming down to half value in 20 μ s. Hence, these two parameters i.e. Amplitude and the Waveform of the surge are incomplete without each other. So graphically, the area under the curve (consider the figure below) is the damaging energy content of a surge. If we compare the level of energy between the 20 kA 8/20 μ s switching surges and the 25 kA 10/350 μ s lightning impulses, we would find that the latter yields many times greater surge energy.



PEAKPULSE TEST CURVE

Metal Oxide Varistor / Avalanche Diodes based surge arrestors are not adequate for withstanding such long duration lightning energy. For lightning current arrestors, the technology used is 'Single

high capacity Spark Gap' which is capable of withstanding such high-energy 10/350 μ s impulses.

FLASHTRAB FLT... N/PE and **FLT 100-260** are non-extinguishing spark gaps. These lightning arresters are particularly suitable as residual current spark gaps for use between N and PE in the "3+1 circuit" for 5-wire systems, such as TN-S and TT systems.



Description	Protection Level
FLASHTRAB, 1-pos.	
FLASHTRAB, 1-pos.	4.0 kV
FLASHTRAB, 1-pos.	0.9 kV
1-Channel N/PE spark gap I _{imp} : 100 kA	1.5 kV

Type	Article No.	Pcs./Pkt.
FLT 60-400	S-27 48 60 3	1
FLT 100/260	S-28 38 16 0	1
FLT-PLUS CTRL-0.9	S-28 18 64 3	1
FLT 100N/PE	S-28 56 38 8	1

Technical Details	FLT 60-400	FLT 100/260	FLT-PLUS CTRL-0.9	FLT 100 N/PE CTRL-1.5
IEC Category / VDE requirement class / EN type :	I / B	I / B / [T1]	I / B / [T1]	I / B / [T1]
Nominal voltage U _n :	AC	230 V (N-PE)	230V...277V	230 V (N-PE)
Arrester rated voltage U _c :	AC	260 V	330V 50/60 Hz	260 V
Discharge current :	< 1 mA			
Lightning test current I _{imp} (10/350) μ s :	Peak value 60 kA 30 As 0.9 MJ / Ω	100 kA 50 As 2.5 MJ / Ω	50 kA 25 As 625 kJ / Ω	100 kA 50 As 2.5 MJ / Ω
Nominal discharge surge current I _n (8/20) μ s :	100 kA	50 kA	50 kA	100 kA
Protection level U _p :	\leq 4 kV	\leq 4 kV	\leq 0.9 kV	\leq 1.5 kV
Quenching short circuit voltage without back-up fuse	4 kA/230V	350 A/260 V	50 kA/400V	100 A/260 V
Max. required back up fuse :	125 A gL	125 A gL	125 A gL	125 A gL
Response time t _r :	\leq 100 ns	\leq 100 ns	\leq 1 μ s	\leq 1 μ s
Discharge current / Operating current :	10 μ A	\leq 0.1 mA	\leq 0.1 mA	\leq 20 μ A
Temperature range :	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Degree of protection in acc. with IEC 60529 / EN 60529:	IP 20	IP 20	IP 20	IP 20
Insulation Housing:	PA-F	PA 6.6-FR	PBT/PA-F	PA 6.6-FR
Inflammability class acc. to UL :	V0	V0	V0	V0
Thread :	M 6	M 6	M 6	M 5
Torque :	8 Nm	8 Nm	8 Nm	4.5 Nm
Approvals :	UL, KEMA, CE	UL, KEMA, CE	UL, KEMA, CE	UL, KEMA, CE

Technical Details	FLT 60-400	FLT 100/260	FLT-PLUS CTRL-0.9	FLT 100 N/PE CTRL-1.5
IEC Category / VDE requirement class / EN type :	I / B	I / B / [T1]	I / B / [T1]	I / B / [T1]
Nominal voltage U _n :	AC	230 V (N-PE)	230V...277V	230 V (N-PE)
Arrester rated voltage U _c :	AC	260 V	330V 50/60 Hz	260 V
Discharge current :	< 1 mA			
Lightning test current I _{imp} (10/350) μ s :	Peak value 60 kA 30 As 0.9 MJ / Ω	100 kA 50 As 2.5 MJ / Ω	50 kA 25 As 625 kJ / Ω	100 kA 50 As 2.5 MJ / Ω
Nominal discharge surge current I _n (8/20) μ s :	100 kA	50 kA	50 kA	100 kA
Protection level U _p :	\leq 4 kV	\leq 4 kV	\leq 0.9 kV	\leq 1.5 kV
Quenching short circuit voltage without back-up fuse	4 kA/230V	350 A/260 V	50 kA/400V	100 A/260 V
Max. required back up fuse :	125 A gL	125 A gL	125 A gL	125 A gL
Response time t _r :	\leq 100 ns	\leq 100 ns	\leq 1 μ s	\leq 1 μ s
Discharge current / Operating current :	10 μ A	\leq 0.1 mA	\leq 0.1 mA	\leq 20 μ A
Temperature range :	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Degree of protection in acc. with IEC 60529 / EN 60529:	IP 20	IP 20	IP 20	IP 20
Insulation Housing:	PA-F	PA 6.6-FR	PBT/PA-F	PA 6.6-FR
Inflammability class acc. to UL :	V0	V0	V0	V0
Thread :	M 6	M 6	M 6	M 5
Torque :	8 Nm	8 Nm	8 Nm	4.5 Nm
Approvals :	UL, KEMA, CE	UL, KEMA, CE	UL, KEMA, CE	UL, KEMA, CE

Test Standards :

VALVETRAB-MS is a one-position, rail-mountable arrester class C surge voltage arrester. In keeping with the current technical guidelines, VALVETRAB is equipped with a thermal disconnect device. The disconnection can be signaled remotely using the remote indicator contact of the header. The C arrester VALVETRAB is used in main or sub-distribution panels in domestic and industrial installations depending on the application.



Description	Type	Article No.	Pcs./Pkt.
VALVETRAB	VAL-MS 230	S-28 39 12 7	1
VALVETRAB plug (can be plugged into the header) (277 VAC)	VAL-MS 320 ST	S-28 38 84 3	10
F-MS	FMS 12	S-28 17 98 7	1

Technical Details	VAL-MS 230	VAL-MS 320 ST	FMS 12
IEC Category / VDE requirement class / EN type :	II / C / [T2]	II / C / [T2]	II / C / [T2]
Nominal voltage U _n :	230 V	277 V	230 V (N-PE)
Arrester rated voltage U _c :	350 V / 275 V	420 V / 335 V	- / 260 V
Nominal discharge surge current I _n (8/20) μ s :	20 kA	20 kA	20 kA
Max. discharge surge current I _{max} (8/20) μ s :	40 kA	40 kA	40 kA
Protection level U _p with I _n :	\leq 1.35 kV	\leq 1.6 kV	\leq 1 kV
Residual voltage at 5 kA :	1 kV	\leq 1.2 kV	\leq 150 V
Quenching short circuit voltage without back-up :	125 A gL	125 A gL	200 A
Back-up fuse :			No extra fusing required
Response time t _r :	\leq 25 nS	\leq 25 nS	\leq 100 nS
Discharge current / Operating current :	\leq 0.3 mA	\leq 0.3 mA	\leq 1 μ A
Temperature range :		-40°C to +80°C	
Degree of protection in acc. with IEC 60529 / EN 60529:		IP 20	
Insulation housing :		PA	
Inflammability class acc. to UL 94 :		V0	
Remote ind. contact :		250 V AC / 125 V DC	
Max. perm. permissible voltage U _{perm} :		1 A / 1A	
Max. perm. operating current I _{max} AC(0/ind) :		0.2 A / 30 mA	
Max. perm. operating current I _{max} DC(0/ind) :			
Can be co-ordinated with AEC lightning arrestors			
Thread : Biconnected terminals /remote indicator contact		M 5 / M 2	
Torque : Biconnected terminals /remote indicator contact		4.5 Nm / 0.25 Nm	
Certifications :	UL, KEMA, CE, OVE	UL, KEMA, CE, OVE	UL, KEMA, CE, OVE

Test Standards :

IEC 61 643-1:1998-02, pr EN 61 643-1 E DIN VDE 0675 part 6:1989-11/A1:1996-03/A2:1996-10 UL 1449 ed.2

Stage I

Stage I protection are installed at Main Distribution Level of power supply. The arrester at Stage I are based on the spark gap technology that operates by arc chopping principle with a rating of upto 100 kA for current pulses of 10/350 μ s.



Description	Type	Article No.
(Stage I / Class I) Protection Unit with 0,9 kV protection level		
As per TNC	3-phase protection unit	FLT 50/3+0 CTRL S-57 52 59 9
	1-phase protection unit	FLT 50/1+0 CTRL S-57 52 96 8
As per TNS	3-phase protection unit	FLT 50/4+0 CTRL S-57 52 61 2
	1-phase protection unit	FLT 50/2+0 CTRL S-57 52 97 1
As per TT	3-phase protection unit	FLT 50/3+1 CTRL S-57 52 63 8
	1-phase protection unit	FLT 50/1+1 CTRL S-57 52 57 3
(Stage I / Class I) Protection Unit with 4,0 kV protection level		
As per TNC	3-phase protection unit	FLT 60/3+0 S-57 52 60 9
	1-phase protection unit	FLT 60/1+0 S-57 52 44 7
As per TNS	3-phase protection unit	FLT 60/4+0 S-57 52 62 5
	1-phase protection unit	FLT 60/2+0 S-57 52 98 4
As per TT	3-phase protection unit	FLT 60/3+1 S-57 52 64 1
	1-phase protection unit	FLT 60/1+1 S-57 52 58 6

Stage II

The second stage protection is required for the sub-distribution level. Stage II is the medium level protection. The arresters of Stage II are high capacity up to 20 kA, 8/20 μ s pulses. The technology used is that of MOV/Spark gap with an indication to check its proper functioning.



Description	Type	Article No.
(Stage II / Class II) Protection Unit with 275 V rated voltage		
As per TNC	3-phase protection unit with remote indication	VAL-MS 230/3+0/FM S-57 52 83 2
	1-phase protection unit with remote indication	VAL-MS 230/1+0/FM S-57 52 67 0
	3-phase protection unit without remote indication	VAL-MS 230/3+0 S-57 52 84 5
	1-phase protection unit without remote indication	VAL-MS 230/1+0 S-57 52 68 3
As per TNS	3-phase protection unit with remote indication	VAL-MS 230/4+0/FM S-57 52 89 0
	1-phase protection unit with remote indication	VAL-MS 230/2+0/FM S-57 52 73 5
	3-phase protection unit without remote indication	VAL-MS 230/4+0 S-57 52 90 0
	1-phase protection unit without remote indication	VAL-MS 230/2+0 S-57 52 74 8
As per TT	3-phase protection unit with remote indication	VAL-MS 230/3+1/FM S-57 52 95 5
	1-phase protection unit with remote indication	VAL-MS 230/1+1/FM S-57 52 79 3
	3-phase protection unit without remote indication	VAL-MS 230/3+1 S-57 52 53 1
	1-phase protection unit without remote indication	VAL-MS 230/1+1 S-57 52 51 5

** Protection unit available for 150 V and 335 V rated voltage as per TNC, TNS and TT connection.

AEC Arrester Combination First and second protection stage

By using triggered lightning arresters that are designed following the **AEC** principle (**Active Energy Control**) lightning current and surge voltage arresters can be connected directly in parallel. This is of particular advantage when it is not possible to install lightning current and surge voltage arresters separated by a conductor length of 10m, or when the use of decoupling coil is to be avoided.



Technical Details
Nominal voltage U_n : (DC/AC)
Arrester rated voltage U_c :
Lightning test current I_{imp} (10/350) μ s :
Peak Value :
Charge :
Specific energy :
Protection level U_p :

POWERSET BC/3/FM	Article No.
230 V / 400 V AC	
275 V / 335 V AC	S-28 58 10 8
100 kA	
50 As	
2500 kJ/ Ω	
0.9 kV/1.5 kV	

Description	Type	Article No.
(Stage I-II / Class I-II) Protection Unit with 275 V rated voltage		
As per TNC	3-phase protection unit with remote indication	POWERSET BC/3+0/275/FM S-57 59 16 5
	1-phase protection unit with remote indication	POWERSET BC/1+0/275/FM S-57 59 04 2
	3-phase protection unit without remote indication	POWERSET BC/3+0/275 S-57 59 17 8
	1-phase protection unit without remote indication	POWERSET BC/1+0/275 S-57 59 05 5
As per TNS	3-phase protection unit with remote indication	POWERSET BC/4+0/275/FM S-57 59 20 4
	1-phase protection unit with remote indication	POWERSET BC/2+0/275/FM S-57 59 08 4
	3-phase protection unit without remote indication	POWERSET BC/4+0/275 S-57 59 21 7
	1-phase protection unit without remote indication	POWERSET BC/2+0/275 S-57 59 09 7
As per TT	3-phase protection unit with remote indication	POWERSET BC/3+1/275/FM S-57 59 24 6
	1-phase protection unit with remote indication	POWERSET BC/1+1/275/FM S-57 59 12 3
	3-phase protection unit without remote indication	POWERSET BC/3+1/275 S-57 59 25 9
1-phase protection unit without remote indication	POWERSET BC/1+1/275 S-57 59 13 6	

Description	Type	Article No.
(Stage I-II / Class I-II) Protection Unit with 330 V rated voltage		
As per TNC	3-phase protection unit with remote indication	POWERSET BC/3+0/330/FM S-57 59 18 1
	1-phase protection unit with remote indication	POWERSET BC/1+0/330/FM S-57 59 06 8
	3-phase protection unit without remote indication	POWERSET BC/3+0/330 S-57 59 19 4
	1-phase protection unit without remote indication	POWERSET BC/1+0/330 S-57 59 07 1
As per TNS	3-phase protection unit with remote indication	POWERSET BC/4+0/330/FM S-57 59 22 0
	1-phase protection unit with remote indication	POWERSET BC/2+0/330/FM S-57 59 10 7
	3-phase protection unit without remote indication	POWERSET BC/4+0/330 S-57 59 23 3
	1-phase protection unit without remote indication	POWERSET BC/2+0/330 S-57 59 11 0
As per TT	3-phase protection unit with remote indication	POWERSET BC/3+1/330/FM S-57 59 26 2
	1-phase protection unit with remote indication	POWERSET BC/1+1/330/FM S-57 59 14 9
	3-phase protection unit without remote indication	POWERSET BC/3+1/330 S-57 59 27 5
1-phase protection unit without remote indication	POWERSET BC/1+1/330 S-57 59 15 2	