ADVANCE
GALATREK

STRIKESAFE

Transient Voltage Surge Suppressors (TVSS)

Transient energy can be financially devastating...

Whether generated on site by electrically noisy hardware or externally by lightning strikes, transient energy can be financially devastating. Data processing errors, manufacturing faults, and hardware damage can all lead to costly system downtime.

The probability of transients being the root cause of your power problems continues to rise, driven by factors such as changes in the environment, microprocessor technology compression, the growing interconnectivity between networks and the need to locate hardware in more exposed locations.

Few solid state devices can tolerate much more than twice their nominal rating
IEEE 1100-1992, The Emerald Book

More than 80% of mains power problems are transient and noise related
IBM Systems Development Division

www.aelgroup.co.uk

STRIKESAFE

Lightning and Transient protection for single and three phase mains supplies

The ultimate zone protection

Typically 20% of transients are generated outside a building - by lightning strikes, electrical grid switching and system faults. A direct strike becomes immediately obvious but transients can also be induced into building infrastructures by coupling effects - inductive (electromagnetic), capacitive (lightning conductors) and resistive (voltage potentials). As they pass along unprotected pathways - mains, dc power, telecom and network - transients lose their destructive power. Energy is lost in heat and noise, and hardware destroyed. Sound protection relies on the Zoned approach of BS EN6651:1999 annex C (IEEE C62.41-1991).

Zone C Site and Building Entrances

Main and Sub distribution panels (up to 10kA/20kV)

This Zone lies at the main entrance to a building or site. Protection is focused around the main incomer and distribution board. Transients experienced here typically result from external sources such as: lightning, power company grid switching, power system faults and nearby industrial installations. For Zone C applications the StrikeSafe series offers solutions for supplies ranging from 110 to 650Vac.

Recommendation: install a Zone C classified device and protect downstream Zones B and A - see p10. Also consider external lightning conductors.

Zone B Specific floors and offices

Sub and final distribution panels (up to 3kA/6kV)

In this Zone both externally and internally generated transients can be experienced. Internal transients will be generated by a wide range of hardware such as motors, generators, process control equipment, manufacturing and office based systems. At this point within a building or site, an externally generated transient will have started to decay in magnitude due to the impedance of the internal mains power cables and circuits. However the rate of decay may not be sufficient to prevent damage and disruption to downstream applications.

Recommendation: install a Zone B classified device or upgrade to a Zone C device if there is no upstream protection - see p10.

Zone A Individual applications

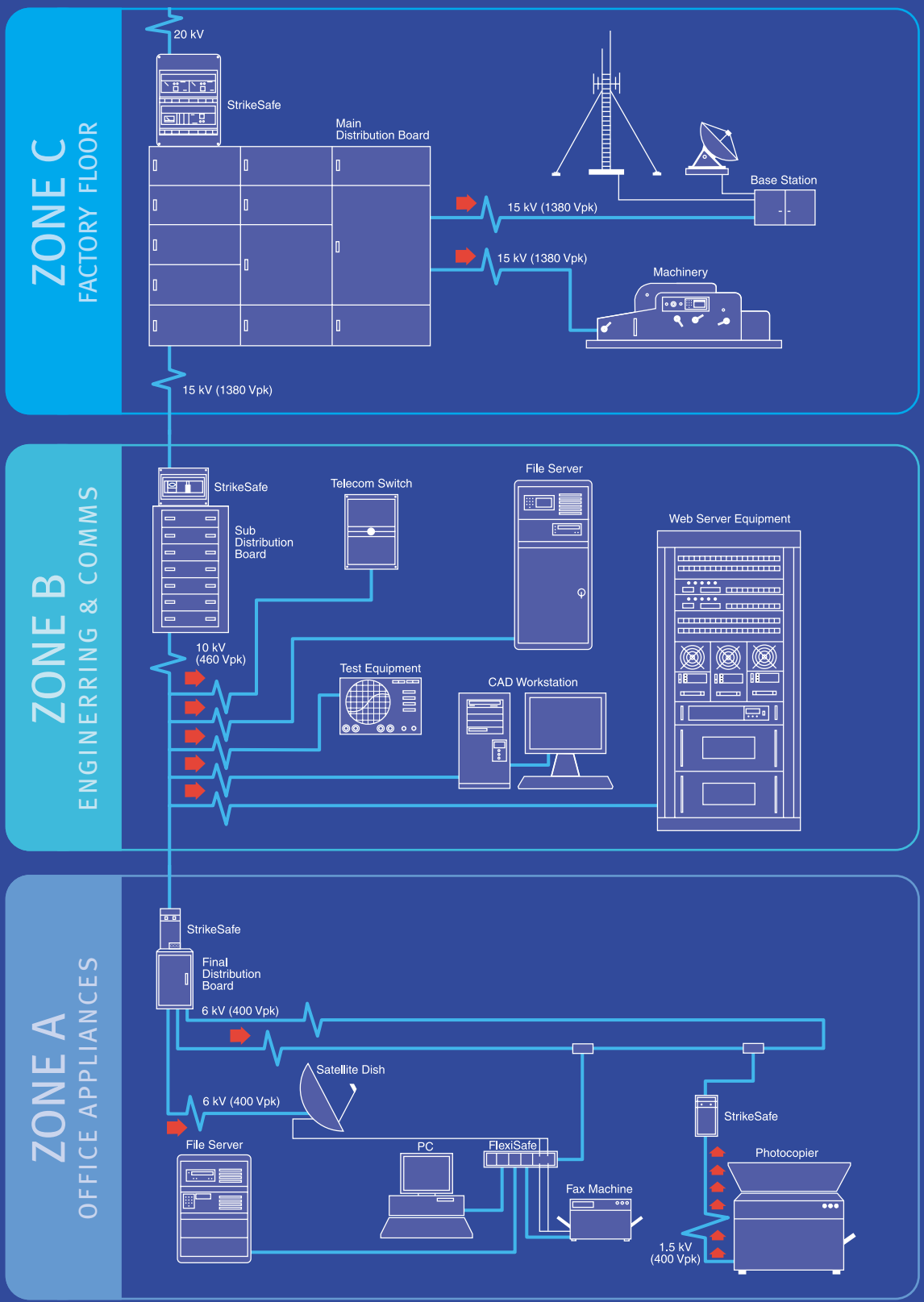
Individual hardware applications (up to 500A/6kV)

Zone A applications (PCs, fileservers, keyphone systems, photocopiers, fax machines, digital TVs, videos and satellite receivers) are generally less exposed to externally generated transients. Hardware damage is normally associated with local pollution generation from office and industrial appliances such as photocopiers, fluorescent lights, lifts, factory coil winding machines and robotic welders. These generate sufficient, repetitive transient energy to cause gradual wear and tear, and eventual failure of sensitive electronic devices.

Recommendation: install a Zone A classified device or upgrade to a Zone B device if there is no upstream protection - see p10. For Zone A applications Advance Galatrek also offer FlexiSafe® Power Distribution Units (PDUs).

Protected Facility

For total protection the addition of TVSS devices to the supply line may not be enough - signal and communication lines should also be considered


ZONE C
FACTORY FLOOR
20 kV
StrikeSafe
Main Distribution Board
Base Station
15 kV (1380 Vpk)
15 kV (1380 Vpk)
Machinery
15 kV (1380 Vpk)
ZONE B
ENGINEERING & COMMS
StrikeSafe
Sub Distribution Board
Telecom Switch
File Server
Web Server Equipment
10 kV (460 Vpk)
Test Equipment
CAD Workstation
ZONE A
OFFICE APPLIANCES
StrikeSafe
Final Distribution Board
6 kV (400 Vpk)
Satellite Dish
6 kV (400 Vpk)
StrikeSafe
File Server
PC
FlexiSafe
Photocopier
Fax Machine
1.5 kV (400 Vpk)

STRIKESAFE

24:7 computer, cable, internet, mobile and telecoms protection

Unique Matrix Technology

StrikeSafe incorporates a patent pending Matrix concept to achieve superior levels of transient protection. The ultimate StrikeSafe solution consists of two Matrix assemblies. The primary level of protection is provided by a Silicon Avalanche Diode (SAD) Matrix. Secondary protection is provided by a Metal Oxide Varistor (MOV) Matrix. For less critical applications this secondary level of protection may be considered sufficient. The combination of the two matrices provides StrikeSafe with one of the best price performance ratios available and a number of unique benefits over traditional MOV only designs.

Faster Response and Lower Clamping Voltages

The primary protection SAD Matrix offers superior performance when faced with the sharp rising edge of a transient infected voltage waveform.
The Matrix reacts within 5nanoseconds to a transient. Its response is almost instantaneous when compared to the typical 'lag' achieved by traditional MOV only based devices - up to 30 nanoseconds. The SAD Matrix also begins to reduce the excess transient energy at a lower voltage than traditional MOV only based devices - typically 15-20% lower. The secondary protection MOV Matrix activates as the transient energy approaches the level at which the SADs cannot operate safely. The MOVs greatly increase the surge rating (kA) of the StrikeSafe and protects the SADs from over-current.

Zero Degradation and Lower Cost of Ownership

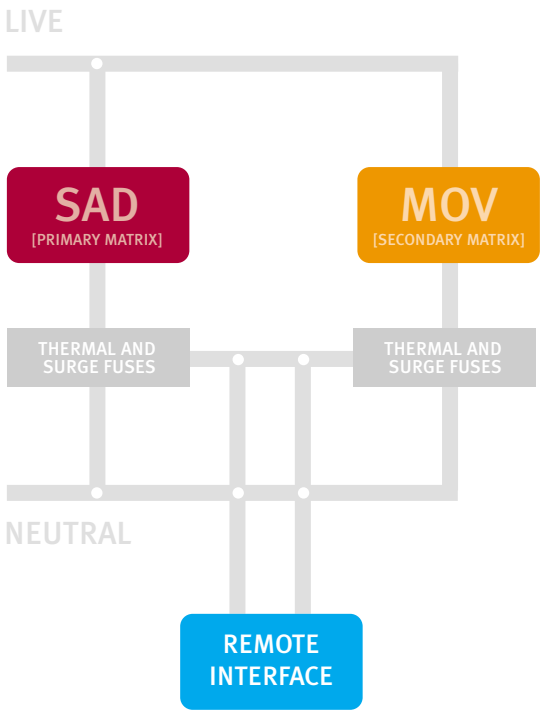
MOVs offer a chemically driven response to transient energy. They degrade each time they have to dissipate transient energy. This 'design flaw' means that MOV only based devices have to be monitored regularly for failure and eventually be replaced. SADs do not degrade with use. The primary protection SAD Matrix reduces wear and tear on the MOV components by always providing the initial response to transients. SADs can self-sacrifice where transient energy is excessive. The Matrix approach reduces the potential for this in the design, quantity and size of components used.

Superior Reliability and Levels of Protection

In the matrices, components are arranged in individually fused groups to offer greater levels of redundancy and reliability. For remote monitoring StrikeSafe devices incorporate 'volt-free' signal contacts, and LED or neon status indications. For applications outside Europe, a neutral-ground module is available. Inside the UK the neutral of the mains is normally grounded, removing the need for this option.

Outstanding Surge and Power Protection

Typical Uninterruptible Power Systems (UPS) and DC power supplies incorporate limited 'front-end' surge protection. It is MOV based and may not be adequate for environments where regular and/or large transients are experienced. Investing in StrikeSafe before your UPS or DC standby power system can save thousands in costly hardware damage and downtime. StrikeSafe will protect the limited TVSS capability usually built into such systems.



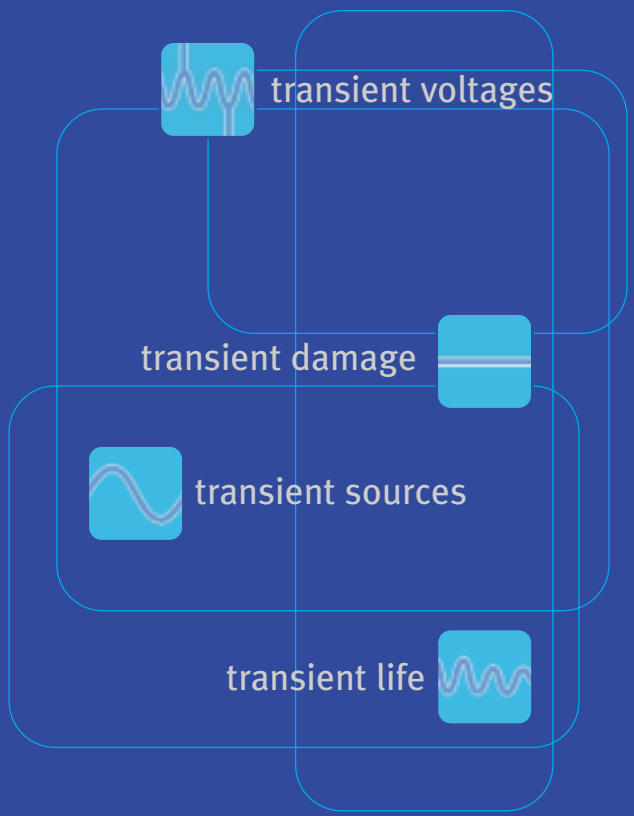
The Fastest Route To Earth
StrikeSafe is a unique product concept, ideal for the protection of wireless applications in high exposure sites such as rural locations, city centre roof tops and road-side locations.

Transient voltages:
Several terms are used to describe short duration increases in voltage above that of the nominal supply. These include transients, spikes, electrical noise and glitches. The most commonly used term is - 'transient'. The size of a transient is measured in time, volts and amps. A transient can last several milliseconds and rise thousands of volts.

Transient damage:
Transients can severely disrupt the quality and reliability of data and voice processing applications. Some applications may show immediate burn out after a high energy strike. Other sensitive electronic components may not fail but suffer the effects of gradual deterioration and erosion from repetitive transient strikes.

Transient sources:
There are both external and internal sources. The main external source is spectacular - a direct lightning strike. Local strikes are still capable of inducing large transients into nearby mains and telephone cables. Other external sources include: grid switching and transformers being powered up or down. Inside a building any electrical device can generate transients.

Transient life:
Within most buildings the fastest route to earth is provided by the mains, telecoms and computer network cabling. The transient travels along these pathways, literally smashing its way through barriers. The energy of a transient reduces along its journey and is mainly dissipated as heat and noise. At each location, the transient size and its duration means that it may still be capable of damaging sensitive hardware and causing data and voice processing disruption.



STRIKESAFE

The technology breakthrough transforming transient protection.

For critical and sensitive applications within the computer, cable, Internet, mobile, and telecoms industries traditional Gas Discharge Tube (GDT) and MOV based devices may not be capable of providing the demanded performance levels.

Srikesafe versus traditional MOV based TVSS technologies

The weakness of an MOV lies in the fact that it provides a chemical response. MOVs are manufactured from fine metal oxide particles. They have a slow reaction time, clamp at relatively high voltages and will age with use - eventual failure is a certainty. Combining MOVs with Silicon Avalanche Diodes (SADs) removes these inherent weaknesses.

Another flaw in the design of traditional MOV only based devices is their use of large capacity MOV disks. It is a misconception that this approach provides adequate performance levels. The Matrix design has proved superior in comparative tests. It uses a larger number of MOV components, each with a lower individual capacity. External research and testing against identically rated (kA) devices comparing the two approaches has proved that a StrikeSafe Matrix consistently achieves:

- **Superior clamping levels and response times**

With a typical MOV large disk design, as the total amount of energy dissipated rises, the actual clamping voltage also rises, allowing transient energy to reach the load. The faster the transient rise the less chance the MOV has to react to prevent a disaster.

- **Higher energy dissipation and lower let through**

In a typical MOV large disk design, there is actually little headroom to operate near to full surge handling capacity (kA). An equivalently rated (kA) MOV Matrix will by default offer more surge handling capacity and have a far lower let through voltage.

- **Superior reliability and redundancy levels**

MOVs can fail due to overheating from (1) excessive surge energy: in this failure mode, the MOV disk material will either crack or shatter as a result of thermal shock, or (2) sustained power frequency overvoltages. In this failure mode the MOV material will suffer a punch-through failure, eventually burning a hole in the disk. In both failure modes a single MOV disk could be irreversibly damaged leaving the load unprotected. This is overcome in the Matrix design through built-in redundancy. Critical damage is limited to the weakest MOV components, protecting the overall MOV circuit which will continue to offer effective protection.

Technical Note

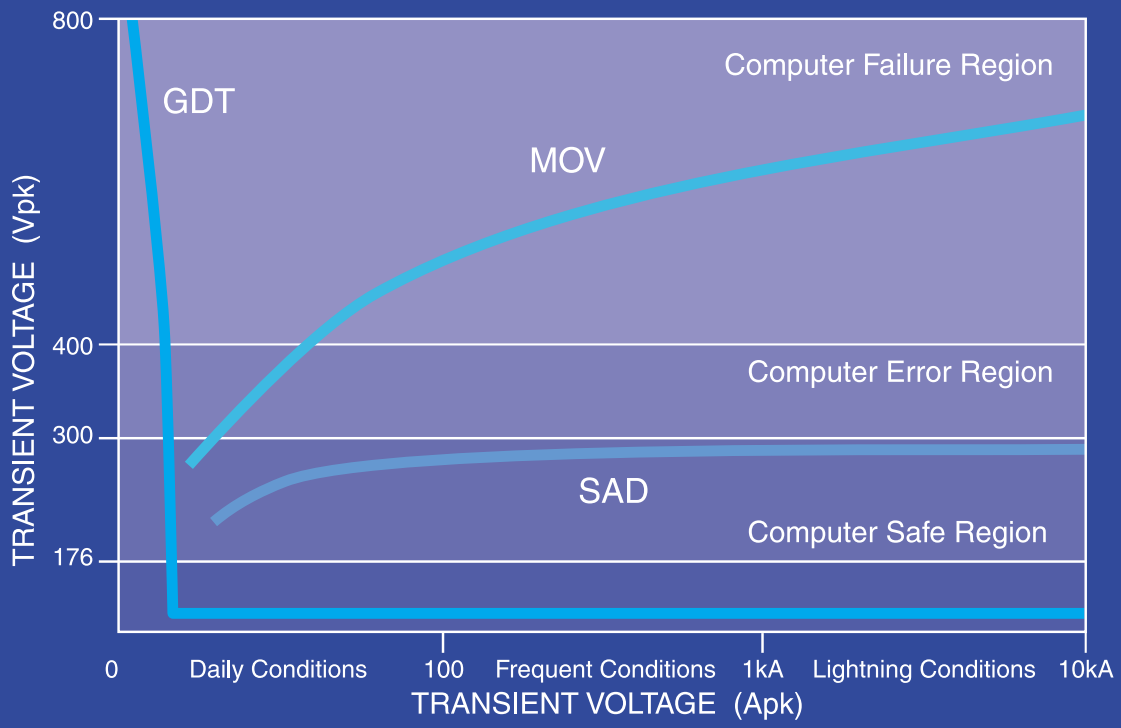
TVSS v Constant Voltage Transformers (CVTs)

CVTs are passive devices connected in *series* with downstream loads. TVSS are passive devices connected in *parallel* to the mains.

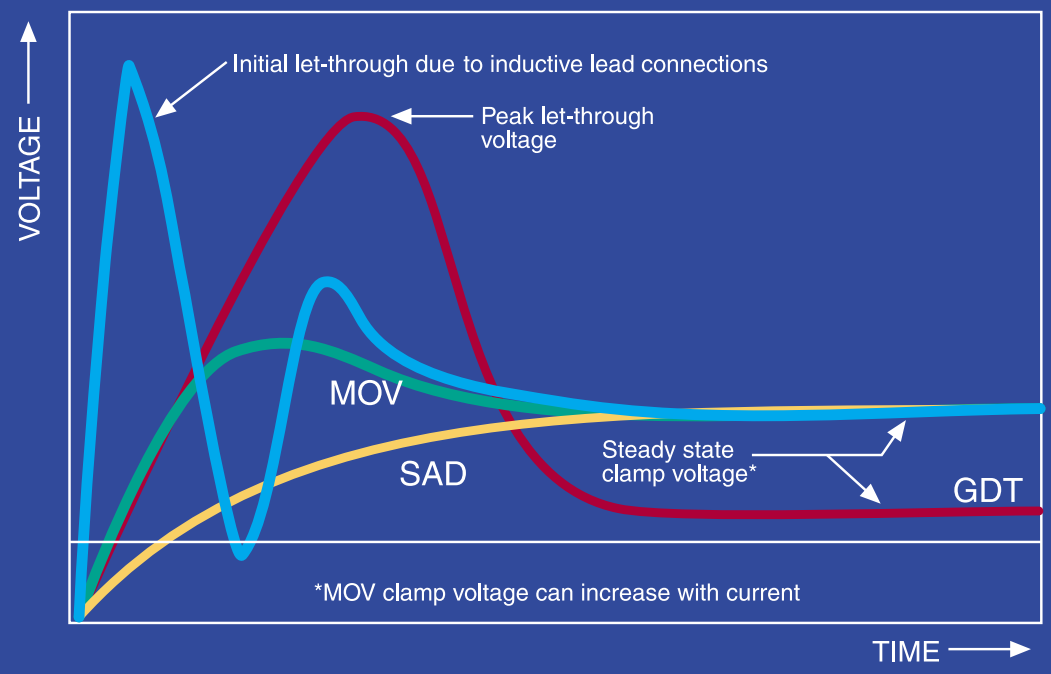
TVSS are designed to divert excess transient energy away from downstream loads with minimal if any disruption. CVTs are designed to absorb transient energy and provide a Galvanically isolated, transient free, regulated sinewave to their load(s). Some TVSS can allow transient energy to pass through - if the transient energy is below their clamping level and/or too fast for the MOV devices to react.

Power Problem	MOV based TVSS	CVT based power conditioner
Electrical noise	-	Provide 10,000:1 reduction
Spikes and Transients	Clamp at trigger level	Provide 10,000:1 reduction
Surges	Clamp at trigger level	Voltage correction within limits
Sags and Brownouts	-	Voltage correction within limits
Mains failures	-	Minimal hold up time (ms)

SAD, MOV, GDT Performance in kA



SAD, MOV, GDT Performance over time



Wall mounted, DIN rail mount and Hot-swap plug-in modules

StrikeSafe is available in both combination SAD+MOV and MOV-only matrices. The MOV Matrix based StrikeSafe products will provide superior performance over traditional TVSS designs. For critical applications the combined SAD+MOV products are the preferred choice.

Selection

Enterprise wide protection is recommended. The tables *overleaf* aid selection of the correctly rated product for the Zones identified in BS EN6651:1999 annex C. If a single application or Zone approach is taken, upgrade to the next highest level of protection. For example if only protecting Zone B, consider installing Zone C devices.

Typical applications include:

- Mains, sub and final distribution board and panels
- Mains supplies to rural, roof-top and road side wireless comms sites
- Mains supplies within co-location sites and built-up industrial estates
- Individual circuits to critical telecom, computer and electronic applications
- Individual circuits to large UPS and DC standby power systems. Individual circuits used for static and maintenance bypass circuits
- Individual circuits to industrial or commercial hardware to prevent downstream pollution

Special projects and site survey

Advance Galatrek is one of the few companies that can genuinely claim to provide a complete, turn-key service, from initial consultation, design and specification, through to installation, handover and maintenance.

For larger kA rated devices, non standard voltages including 110 or 650Vac, dc, signal and communication line protection contact our engineering or projects teams.

TDCE Series

TDC DIN rail mount module

TPCE Series

TPC Plug-in Module

TSB/TBB Series

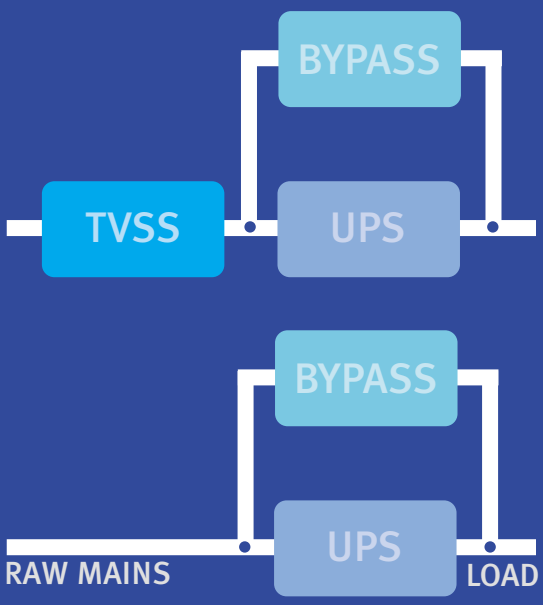
TPB Plug-in Module

UPS and DC Power System protection

Most Uninterruptible Power Systems (UPS) and DC standby power systems incorporate some form of transient protection in the form of Metal Oxide Varistors (MOVs). These are designed to protect their front end filters and rectifiers from small transients. In severe environments or where repetitive transients are common, the MOVs will eventually wear out. They will not achieve the levels of protection provided by a dedicated Transient Voltage Surge Suppressor (TVSS).

UPS based on Constant Voltage Transformer (CVT) technologies will provide superior protection from transients. However large transient surges will cause the CVT to current limit. This will restrict the output voltage and current supplied to the load(s) until the problem is removed.

To provide 'bullet-proof' protection install a Zone C or Zone B StrikeSafe device before your UPS or DC standby power system. In a UPS installation, this approach prevents the load being connected to a direct lightning and transient path when powered directly from the mains.



Load connected to lightning and transient path when the UPS fails or is overloaded

TVSS selector

System Size	TVSS
<2k1VA 1 phase input	TSB(E) or TBB(E) 30KA11* TDA(E) 10KA11*
2k1-10kVA 1 phase input	TSB(E) or TBB(E) 30KA11*
>10kVA 1 phase input	TSB(E) or TBB(E) 30KA11*
<30kVA 3 phase input	TSB or TBB 30KA33*
30-60kVA 3 phase input	TDCE 200KA33* TSB or TBB 30KA33*
>60kVA 3 phase input	TDCE 200KA33*

* Denotes variant of the TVSS device-see table on p10

Technical Specification

ZONE C

Model No	Phase and Nominal Mains Voltage Ø, Vac	Type	Clamping Volts	Peak Pulse Current/ph 8x20µs	Dimensions (WxDxH)mm	Weight (Kg)
Complete system - Wall mounted enclosure with DIN rail mount modules						
TDCE 200kA11	1, 200, 208, 220, 230, 240	SAD+MOV	401Vac	209kA Ph-N	220x115x170	1.45
TDCE 200kA11/01		MOV	460Vac	208kA Ph-N		1.15
TDCE 200kA33	3, 380, 400, 415, 440, 460, 480	SAD+MOV	401Vac	3 x 209kA Ph-N	255x230x360	3.71
TDCE 200kA33/01		MOV	460Vac	3 x 208kA Ph-N		3.50
DIN rail mount modules for TDCE enclosure						
TDC 200kA11	1, 200, 208, 220, 230, 240	SAD+MOV	401Vac	209kA Ph-N	110x74x90	0.39
TDC 200kA11/01		MOV	460Vac	208kA Ph-N		0.28
	3, 380, 400, 415, 440, 460, 480	*Use one module per phase*				
Complete system - Wall mounted enclosure with Plug-in Hot Swap modules						
TPCE 200kA11	1, 200, 208, 220, 230, 240	SAD+MOV	401Vac	209kA Ph-N	220x115x170	1.45
TPCE 200kA11/01		MOV	460Vac	208kA Ph-N		1.15
TPCE 200kA33	3, 380, 400, 415, 440, 460, 480	SAD+MOV	401Vac	3 x 209kA Ph-N	385x240x150	6.27
TPCE 200kA33/01		MOV	460Vac	3 x 208kA Ph-N		5.77
Plug-in Hot Swap modules for TPCE enclosure						
TPC 200kA11	1, 200, 208, 220, 230, 240	SAD	401Vac	0.72kA Ph-N	37x89x108	0.34
TPC 200kA11/01		MOV	460Vac	208kA Ph-N		0.25
	3, 380, 400, 415, 440, 460, 480	*Use either one pair (SAD+MOV) or a single module (MOV) per phase only*				

ZONE B

Complete system - chassis with Neutral-Earth protection - populated with 'plug-in' modules for panel mounting						
TSB 30kA11/01	1, 200 208 220 230 240	MOV	460Vac	46kA Ph-N	60.25x76x160	0.271
TSB 30kA11/02		SAD	401Vac	12kA Ph-N	60.25x76x160	0.257
TSB 30kA11		SAD+MOV	401Vac	32kA Ph-N	60.25x76x160	0.265
TSB 30kA33/01	3, 380 400 415 440 460 480	MOV	460Vac	3 x 46kA Ph-N	110x76x160	0.779
TSB 30kA33/02		SAD	401Vac	3 x 12kA Ph-N	110x76x160	0.737
TSB 30kA33		SAD+MOV	401Vac	3 x 32kA Ph-N	110x76x160	0.761
Product requires separate enclosure for wall mounting - TSB becomes TSBE						
Chassis only with built-in Neutral-Earth protection for panel mounting						
TBB 30kA11	1, 200 208 220 230 240	MOV	460Vac	26kA N-E	60.25x59x160	0.173
TBB 30kA33	3, 380 400 415 440 460 480	MOV	460Vac	26kA N-E	110x59x160	0.485
Plug-in modules for TBB chassis						
TPB 30kA11/01	1, 200 208 220 230 240	MOV	460Vac	46kA Ph-N	37.5x88.5x35	0.098
TPB 30kA11/02		SAD	401Vac	12kA Ph-N	37.5x88.5x35	0.084
TPB 30kA11		SAD+MOV	401Vac	32kA Ph-N	37.5x88.5x35	0.092
Complete system - Hardwired with built in Neutral-Earth protection (MOV only units) for panel mounting						
TBB 30kA11/01	1, 200 208 220 230 240	MOV	460Vac	46kA Ph-N	60.25x59x160	0.262
TBB 30kA33/01	3, 380 400 415 440 460 480	MOV	460Vac	3 x 46kA Ph-N	110x59x160	0.768
TBB 30kA33/03		MOV	460Vac	3 x 46kA Ph-N	110x59x160	0.767
MBRP TBB	(Remote Display)				110x25x55	0.085
Product requires separate enclosure for wall mounting - TBB becomes TBBE						

ZONE A

MCB sized DIN or panel mount						
TDA 10kA 11/01	1, 200 208 220 230 240	MOV	460Vac	13kA Ph-N	18x89.5x59	0.049
TDA 10kA11/02		SAD	401Vac	6kA Ph-N	18x89.5x59	0.042
TDA 10kA11/03		SAD	401Vac	10kA Ph-N	18x89.5x59	0.044
Product requires separate enclosure for wall mounting - TDA becomes TDAE. Use one per phase or multiple units for increased kA levels						

ZONE C

TDCE/TPCE Specifications

- Operating Voltage: Max +25% above nominal
- Operating Temperature Range: -40 to +85°C
- Diagnostics: Front panel LEDs and remote alarms
- LEDs or Neons: Green-Power ON, Red-Fault
- Remote Alarm: Single pole, volt-free contacts
- Thermal and Overload Protection: Thermal and wire fuses
- Case Type and IP Rating: IP55, plastic
- Maximum Current Rating: 100A series or unlimited parallel
- Power Consumption: Negligible
- Automatic Reset: No mechanical reset
- Design standards: EN 61000-4, EN 60950, EN 60335-1, EN 50081-1 and EN 50081-2
- Options: Neutral-Ground module, Transient counter

ZONE B

TSB/TBB Specifications

- Operating Voltage: Max +25% above nominal
- Operating Temperature Range: -40 to +85°C
- LEDs: one tri-coloured LED per plug-in module indicating 100/50/0% protection available
- Remote Interface: 2.5mm²
- Remote Alarm: Single pole change over, volt-free contacts
- Thermal/Overload Protection: Thermal and wire fuses
- Case Type and IP Rating: IP20, plastic
- Power Consumption: Negligible
- Automatic Reset: No mechanical reset
- Design standards: EN 61000-4, EN 60950, EN60335-1, EN 50081-1 and EN 50081-2

ZONE A

TDA Specifications

- Operating Voltage: Maximum +25% above nominal
- Operating Temperature Range: -40 to +85°C
- LEDs: one green LED per module
- Remote Interface: 2.5mm²
- Remote Alarm: Single pole change over, volt-free contacts
- Thermal/Overload Protection: Thermal and wire fuses
- Case Type and IP Rating: IP20, plastic
- Power Consumption: Negligible
- Automatic Reset: No mechanical reset
- Design standards: EN 61000-4, EN 60950, EN60335-1, EN 50081-1 and EN 50081-2

SERVICE EXCELLENCE

All your power protection needs from one manufacturer

- Uninterruptible Power Systems (UPS) 300VA to 4MVA
- AC and DC generators (petrol, diesel and LPG)
- Power conditioners including CVT and isolation transformer based
- Automatic Voltage Stabilisers (AVS)
- Dual Redundant Switches
- Inverters

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- Harmonic audits
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- On-site battery and load bank testing
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- LinkUPS remote site monitoring with automated response on a 24/7 basis

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