ACDC DCAC

ACDC Surge Protectors

Multi-Stage Surge Protection

Empowered by Innovation

Multi-Stage Surge Protection

New materials, New design, New approach in Industry of Surge Protection

Beginning of ACDC DCAC Story

The beginnings of ACDC DCAC Company are from 1994 when the company was established. The first activity was servicing and assembling of electronic devices for Macedonian and Balkan markets (TV, Video, Audio).

- 1999 was year of investment in research on the field of electronic design of Surge Protectors.

Why Surge Protection? What were the needs and circumstances to enter the field of Over Voltage Protection?

There is a story about: how we entered on this field

- Our first patent is: "Cheap DC DC HIGH CURENT Stabilizer With Four Digit Precision " specially designed for Macedonian Police, to change old technology DC DC stabilizer in Storno repeater. We have installed more than 25 pieces on Solunska Glava, the highest mountain telecommunication peak in Macedonia.

What were the needs and circumstances to enter the field of Surge Protection?

Beginning of ACDC DCAC Story

The Stabilizer was great invention. It has upgraded the work of old Storno repeaters with better performances more than ever. But we had been confronted with another unexpected problem: thunder strikes and lightening.

We had tested there all world renovated producers of surge protectors. Believe me, no one is worked well. We had tried one by one - everyone. We were working on Solunska Glava on this problem more than 2 years and we had grown in the best trained engineers in this field.

In the end we find solution, we produced our Surge Protector to protect our first patented DC DC Stabilizer.

So the story of ACDC Surge Protectors has begun.

The story of ACDC Surge Protectors has begun

Important underlines about ACDC DCAC

Before ACDC DCAC presentation I will make some important underlines about the company:

1. ACDC DCAC ISO CERTIFICATED COMPANY

2. MANUFACTURER FROM 1994

3. WE ARE PRODUCING HIGH GRADE, UNIQUE, 10 YEARS

   PROVEN SURGE PROTECTORS


Certificate of Registration

AC-DC Ltd.

ISO 9001:2008

Design and production of over-voltage devices.

Certificate No: C3/12039 Issue Date: 27 October 2010

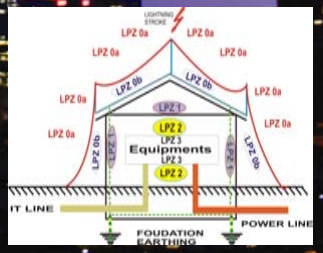
Important underlines about ACDC DCAC

Before ACDC DCAC introduction and presentation I will make some important underlines about the company:

4. NOR ONE BURNED EQUIPMENTS WHICH ARE PROTECTED WITH OUR SURGE MULTI-STAGE PROTECTON

5. FIVE PATENTS BUILD INSIDE (under the numbers 900836, 900545, 903566, 903567, one in process)

6. WE ARE OUTPERFORMING ALL STANDARDS: IEC 62305-4; ANNSI/IEEE C 62.41.1-2; IEC 61643-1; CLASS I+II+III IEC 60939-2



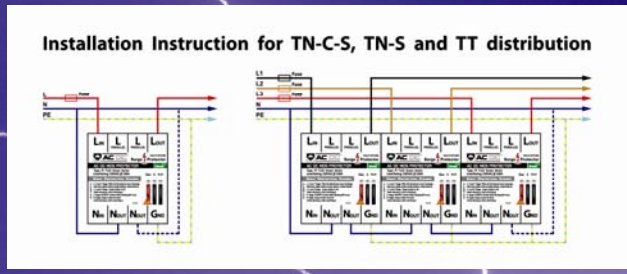
Important underlines about ACDC DCAC

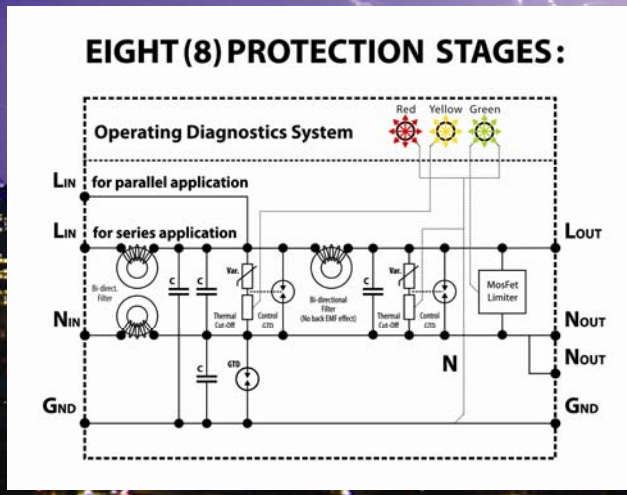
Before ACDC DCAC introduction and presentation I will make some important underlines about the company:

7. WE ARE PRODUSING MULTI-STAGE SURGE PROTECTORS WITH EMI/RFI FILTERING, EXTREMELY EASY TO INSTAL

8. WE HAVE EIGHT (8) PROTECTION STAGES INSIDE

9. WE ARE CHEAPER THAN COMPETITORS



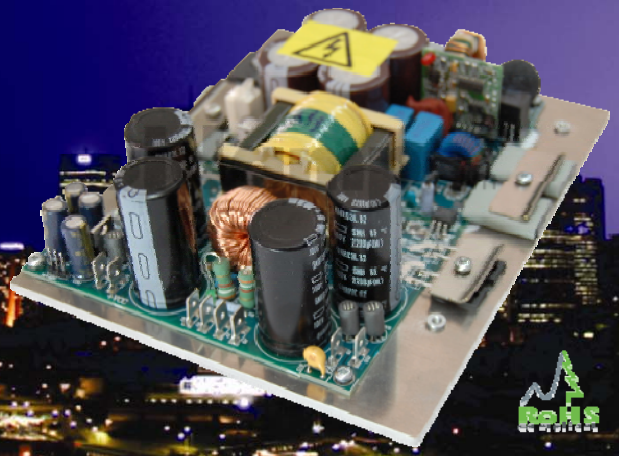


Important underlines about ACDC DCAC

Before ACDC DCAC introduction and presentation I must make some important underlines about the company:

10. REFERENCES: MOBILE OPERATORS, POLICE, ARMY, HOSPITALS (5000 PCS. PRODUSED)

11. SPECIALY BUILT TO PROTECT SWITCH POWER SUPPLY IN COMPUTERS, SERVERS AND IT CENTERS



What is the secret of our amazing success?

On Solunska Glava we concluded that no single surge protectors' technology (Varistor, Gas Tube, TVS or Mosfet technology) can effetely protect electronic devices from the damaging from induced transients and lightning.

Taking this in consideration we had built, in the beginning, electronic design with four (4) complementary different protective technologies. (Varistor, Gas Tube, Nanocrystalline cores and Mosfet technology) in one unit and achieved remarkable performance that no one surge protector has today.

Take this advantage we have achieved to unite coordinate and synchronize two totally different technological directions for surge protection of electrical devices which apply surge manufacturers: surge suppression product and Bi-directional filtering products.

Using of four (4) complementary different protective technologies

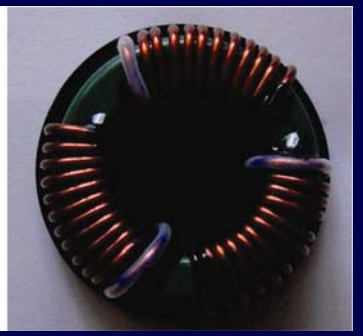
in one Surge Protection unit

What is the secret of our amazing success?

Varistor

Mosfet

Gas Tube

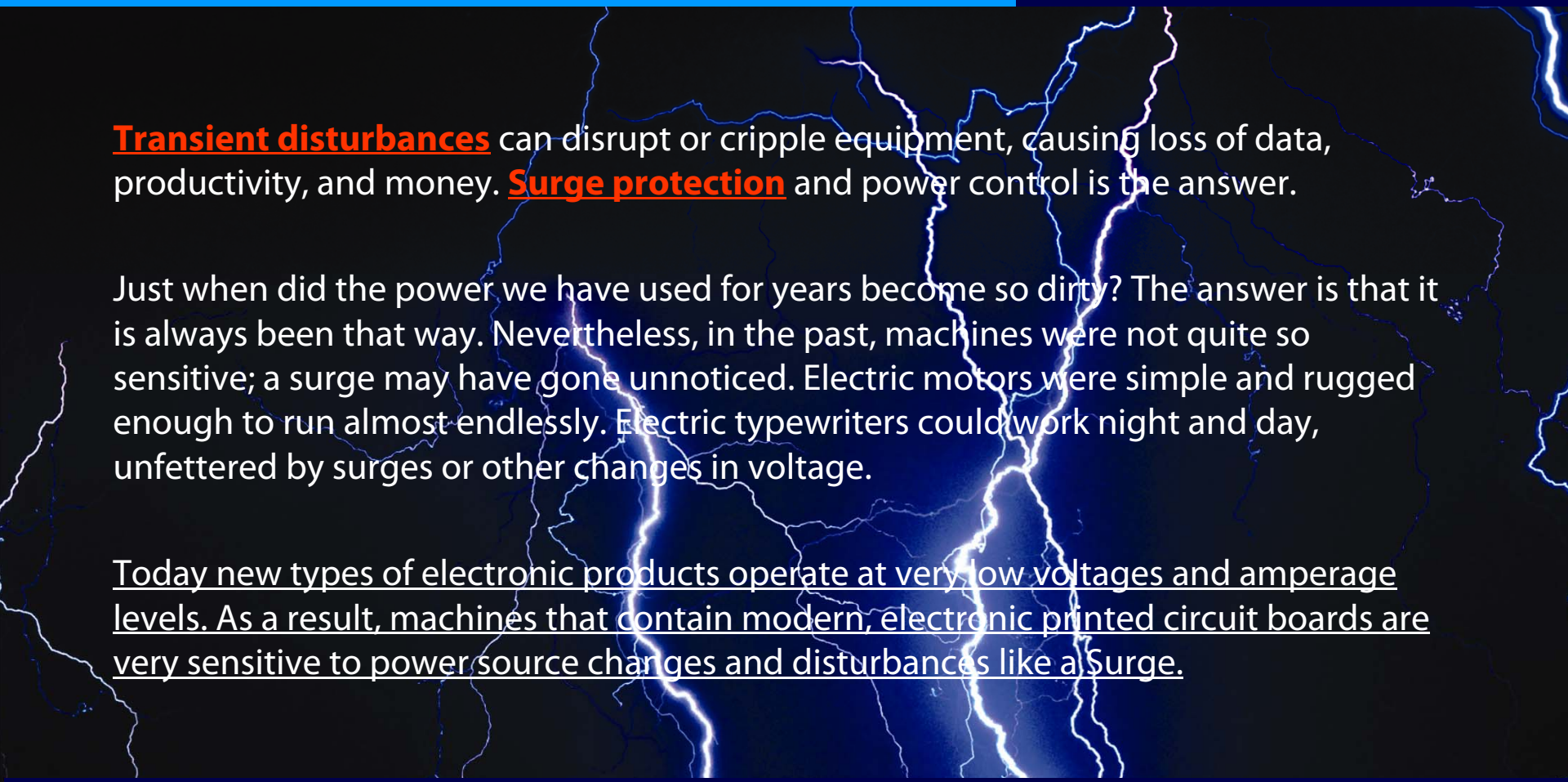


Nanocrystalline cores

Using of four (4) complementary different protective technologies

in one Surge Protection unit

Need for Surge Protection

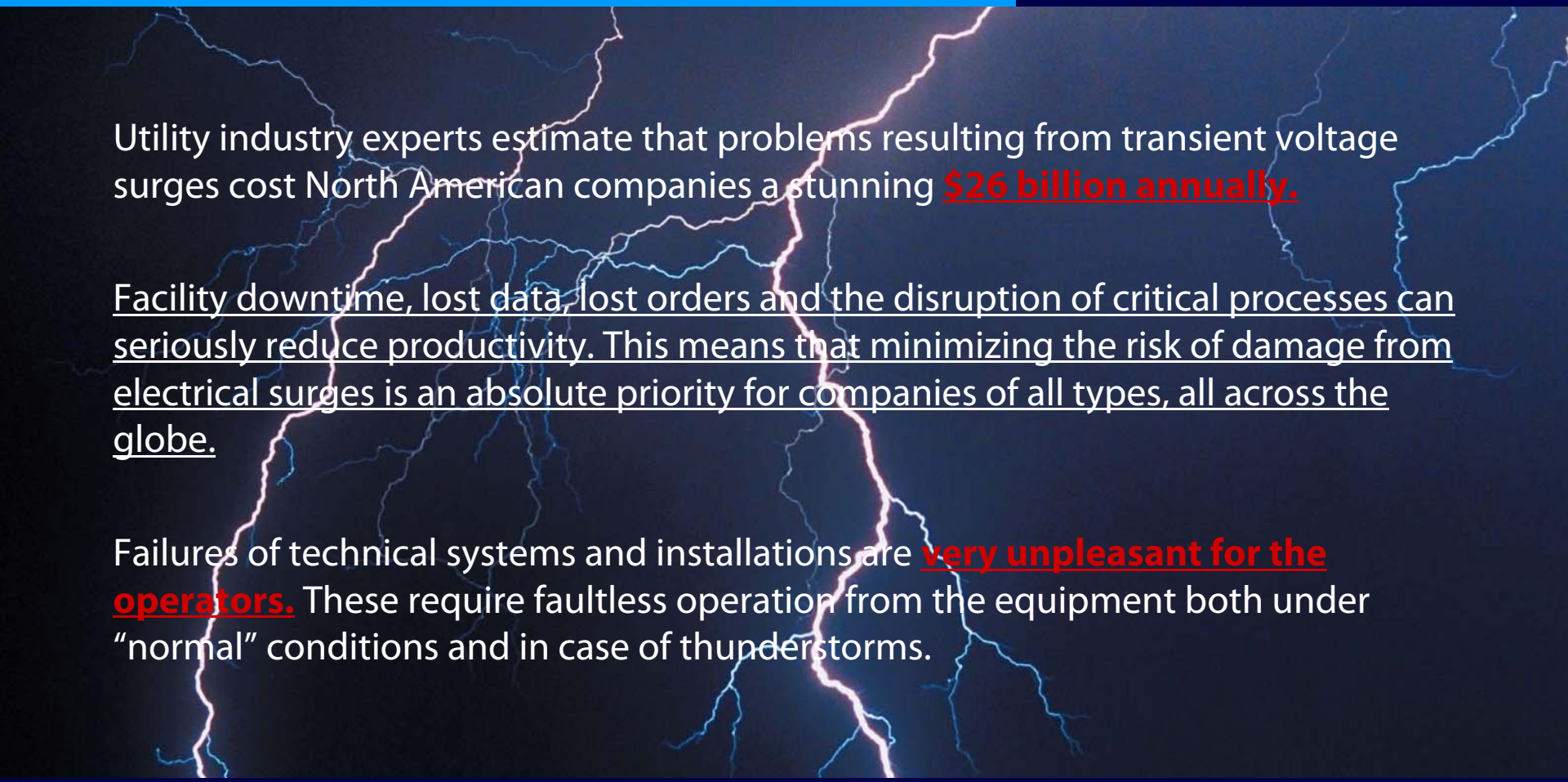


Transient disturbances can disrupt or cripple equipment, causing loss of data, productivity, and money. **Surge protection** and power control is the answer.

Just when did the power we have used for years become so dirty? The answer is that it is always been that way. Nevertheless, in the past, machines were not quite so sensitive; a surge may have gone unnoticed. Electric motors were simple and rugged enough to run almost endlessly. Electric typewriters could work night and day, unfettered by surges or other changes in voltage.

Today new types of electronic products operate at very low voltages and amperage levels. As a result, machines that contain modern, electronic printed circuit boards are very sensitive to power source changes and disturbances like a Surge.

High Cost of Surge Damages

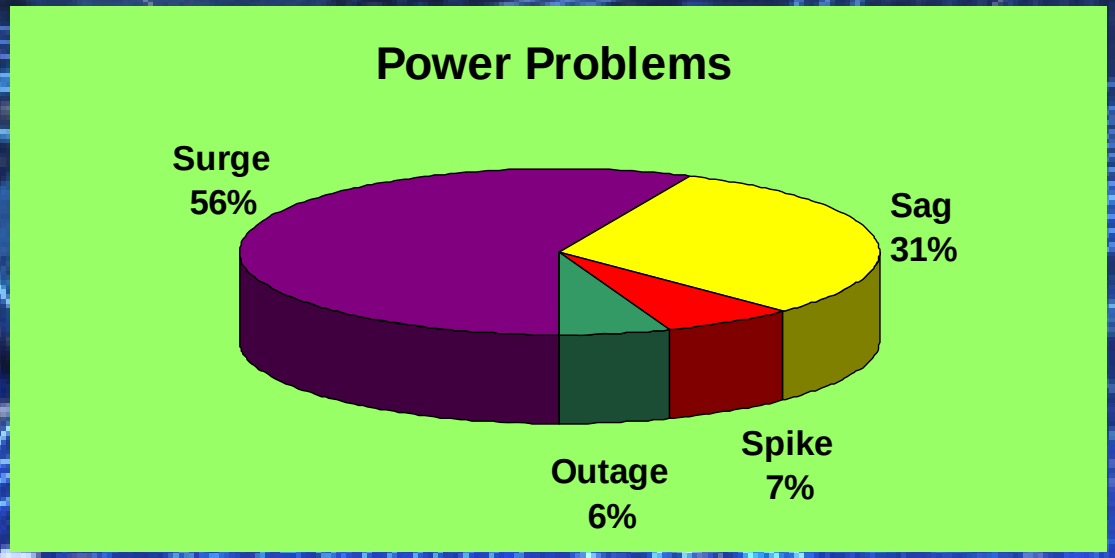


Utility industry experts estimate that problems resulting from transient voltage surges cost North American companies a stunning **$26 billion annually.**

Facility downtime, lost data, lost orders and the disruption of critical processes can seriously reduce productivity. This means that minimizing the risk of damage from electrical surges is an absolute priority for companies of all types, all across the globe.

Failures of technical systems and installations are **very unpleasant for the operators.** These require faultless operation from the equipment both under "normal" conditions and in case of thunderstorms.

Necessity for Surge Protection



Sources of Generated Surges

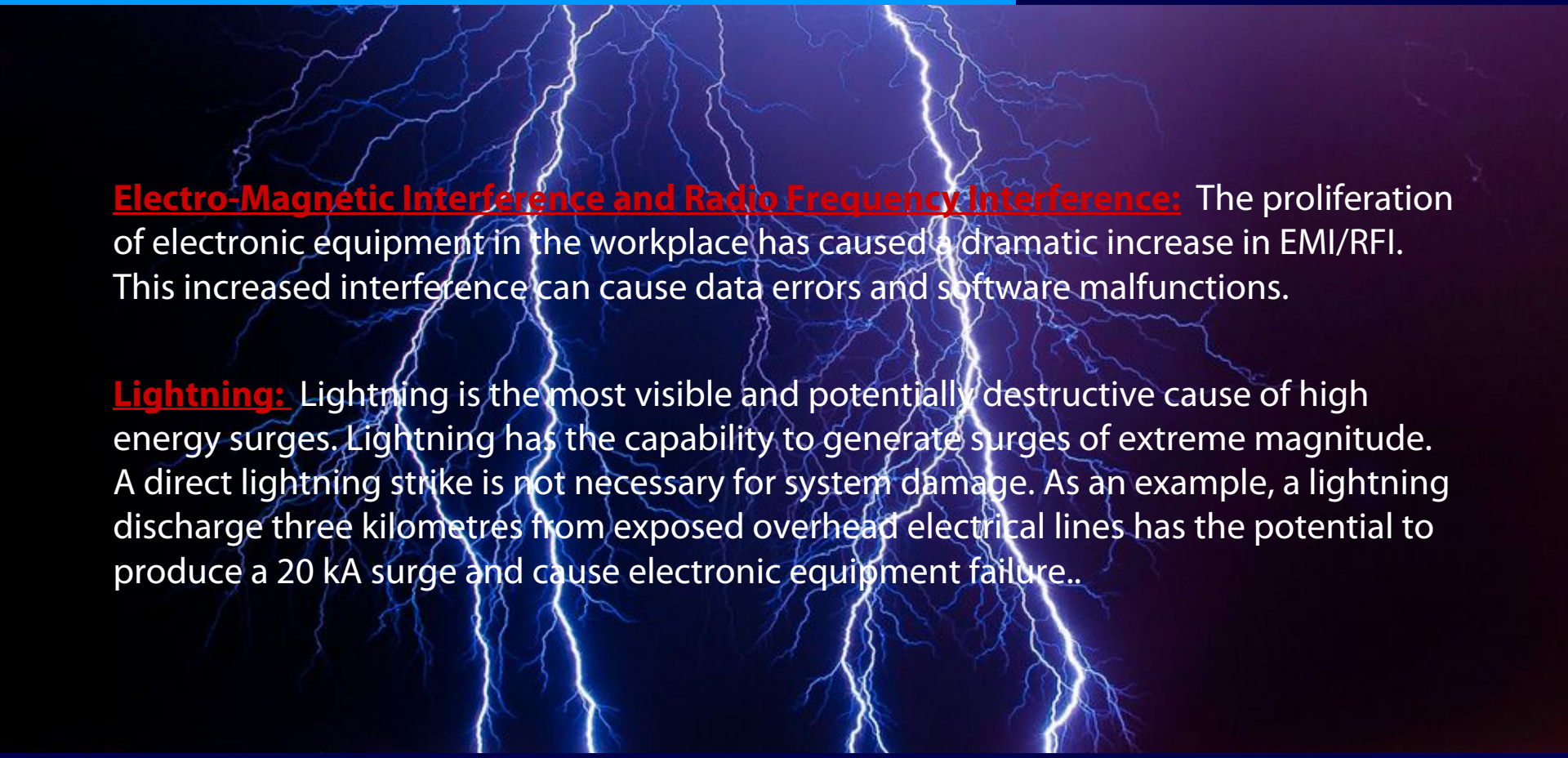
The most visible and destructive cause of surge damage is lightning.

However, while lightning is the most destructive, it is not the most common source of surges. In many areas, 80 to 90 percent of power disturbances come from other sources.

Utility System: The utility distribution system interconnects many different types of loads that are difficult to control. In an effort to control the various loads, the utility relies on load switching. Feeder and capacitor switching, combined with momentary short circuits and contact re closures, have become a hazard for computers and other sensitive equipment.

Inductive Loads: A frequent power disturbance seen in building wiring systems today is transient voltage associated with inductive loads. These disturbances are a result of turning heavy electrical equipment on and off in the vicinity of a sensitive device.

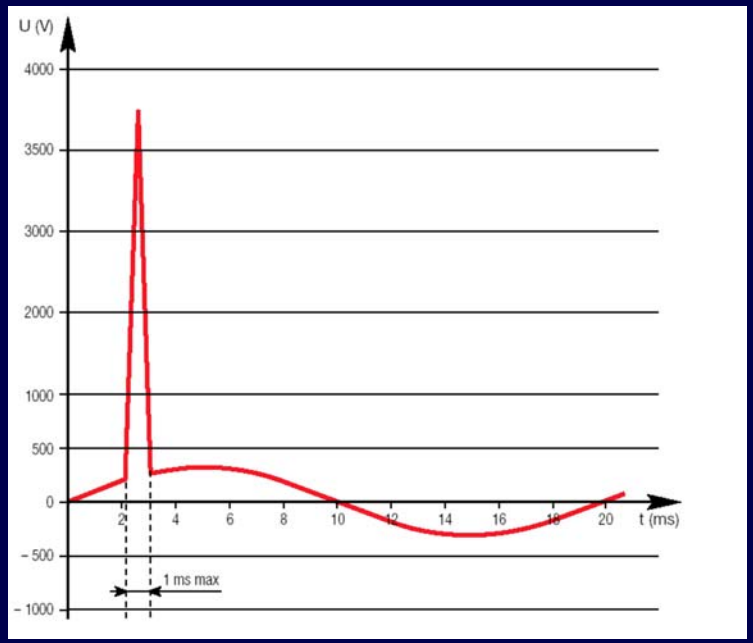
Sources of Generated Surges



Electro-Magnetic Interference and Radio Frequency Interference: The proliferation of electronic equipment in the workplace has caused a dramatic increase in EMI/RFI. This increased interference can cause data errors and software malfunctions.

Lightning: Lightning is the most visible and potentially destructive cause of high energy surges. Lightning has the capability to generate surges of extreme magnitude. A direct lightning strike is not necessary for system damage. As an example, a lightning discharge three kilometres from exposed overhead electrical lines has the potential to produce a 20 kA surge and cause electronic equipment failure..

The Main Reason for Damage - Voltage Spike



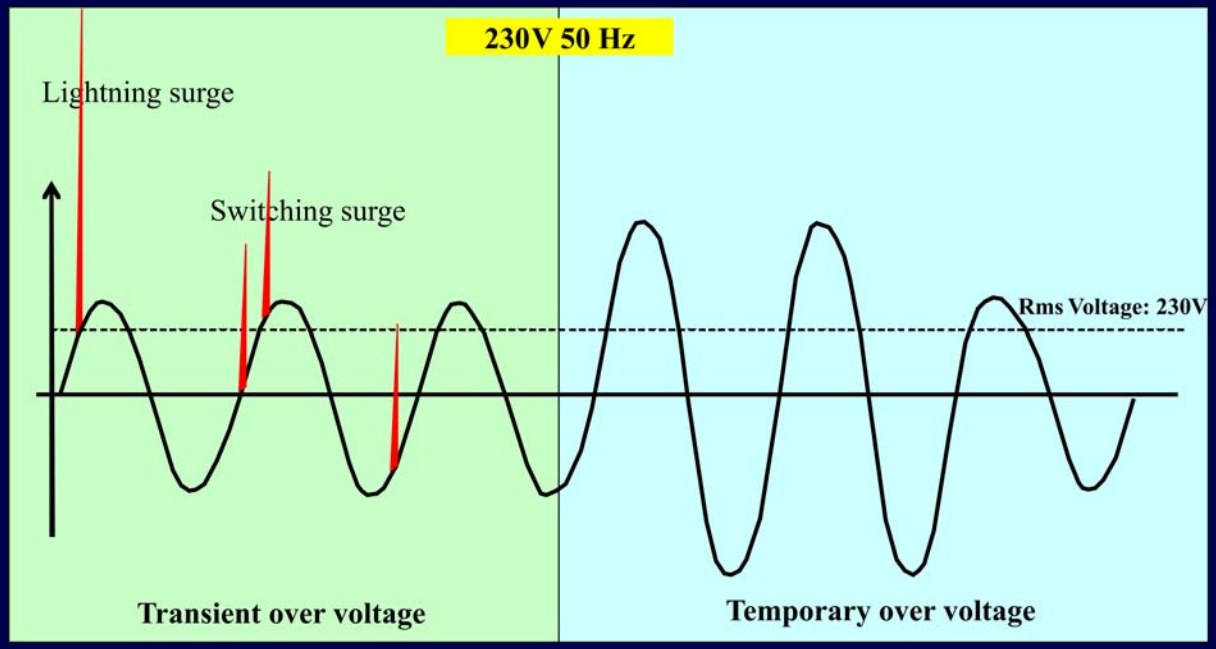
Voltage peak of short duration (shorter than a millisecond)

A voltage spike is defined as fast short duration electrical transient in voltage.
Voltage spikes can damage or burn electrical devices.

Transient Voltage in Network Supply

6000V during 140µs

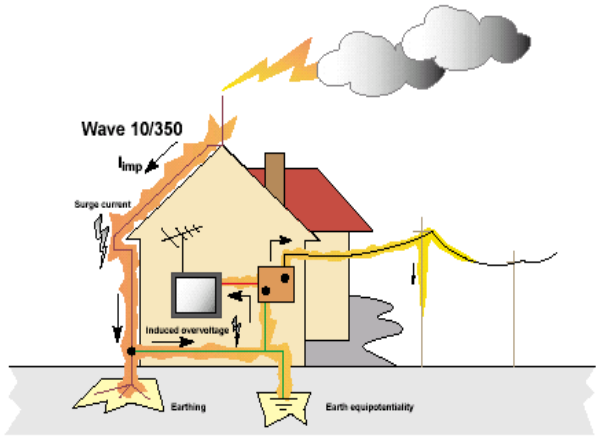
460V during 10s



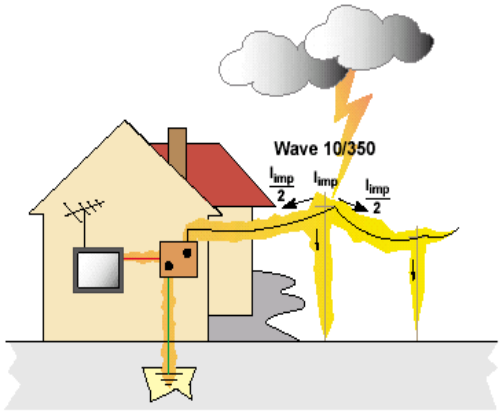
Problem for SPD

Transients in Power Supply from Lightning

Lightning strike in building



Lightning strike in power supply



Lightning strike in building can cause high Voltage potential between ground and power supply and damage electrical equipment.

Lightning strike in Power supply can cause high Voltage potential between phase (P) and neutral (N) wire and damage electrical equipment.

Surge Protection of electronic equipment

Electronic equipment plays an important role in many up-to-date systems, such as:

- Telecommunication systems

- Computer systems

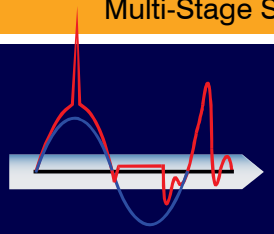
- Control systems (in NPS, manufacturing plants, traffic- control systems)

Usually, electronic equipments contain integrated circuits which suffer from low resistance on surge voltages.

Surge voltages can be caused by:

- Lightning strikes

- Switching operations in the power network installation



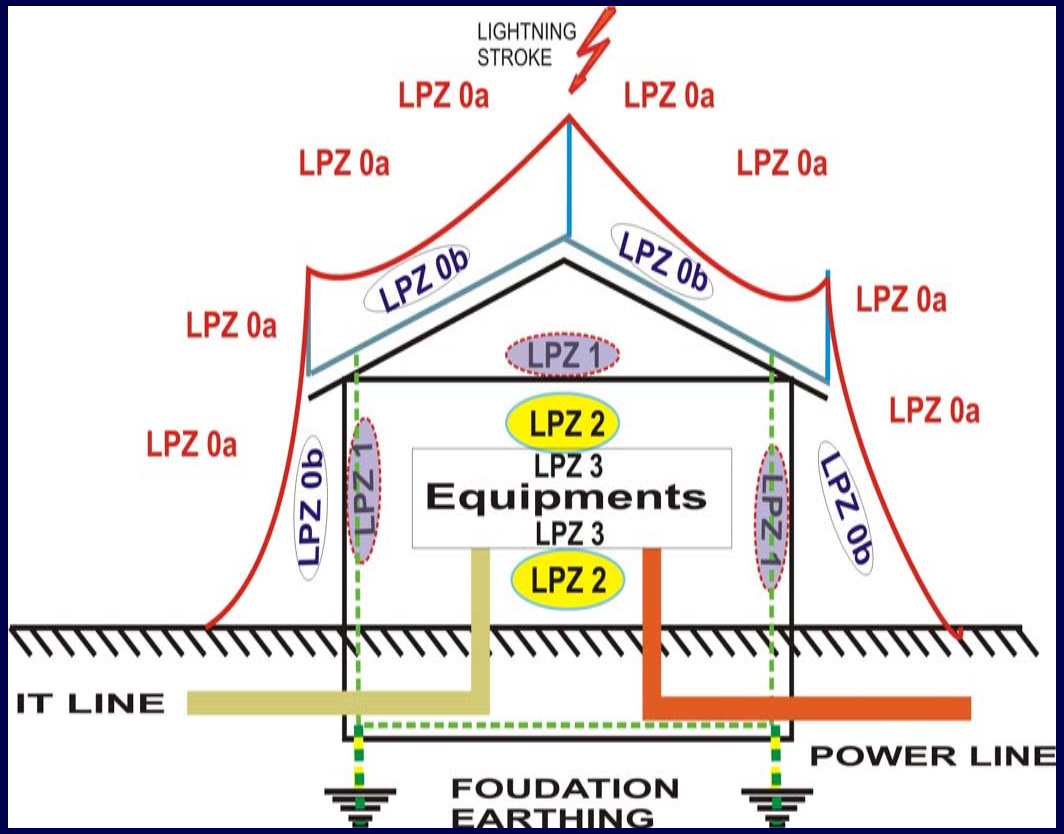
EU Standard for Protection of Electrical equipment IEC62305-4

Classification	Title
IEC 62305-1: 2006-01 (EN 62305-1)	Protection against lightning Part 1: General principles
IEC 62305-2: 2006-01 (EN 62305-2)	Protection against lightning Part 2: Risk management
IEC 62305-3: 2006-01 (EN 62305-3)	Protection against lightning Part 3: Physical damage to structures and life hazard
IEC 62305-4: 2006-01 EN 62305-4)	Protection against lightning Part 4: Electrical and electronic systems within structures

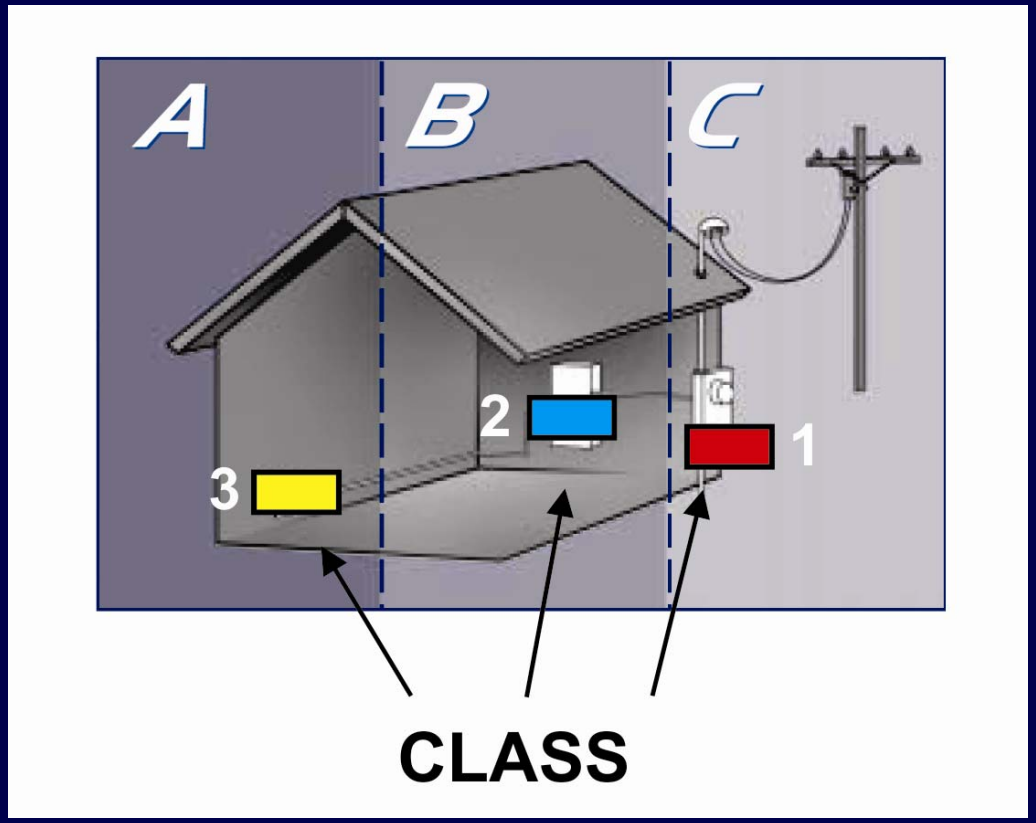
The Technical Committee TC81 (Lightning Protection) of the IEC (International Electro technical Commission) at the beginning of 2006 has finalized the new IEC standard in four parts (IEC 62305 1-4) treating general principles, risk management, physical damage, life hazards, protection against electrical and electronic systems within structures, shown in Table

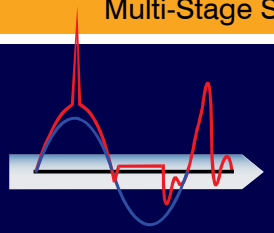
EU Standard for Protection of Electrical equipment IEC62305-4

Protection of structures according IEC 62305 are divide in four (4) protection zones LPZ0a/b-LPZ3



American Standard for Protection of Electrical equipment ANSI/IEEE C62.41.1-2





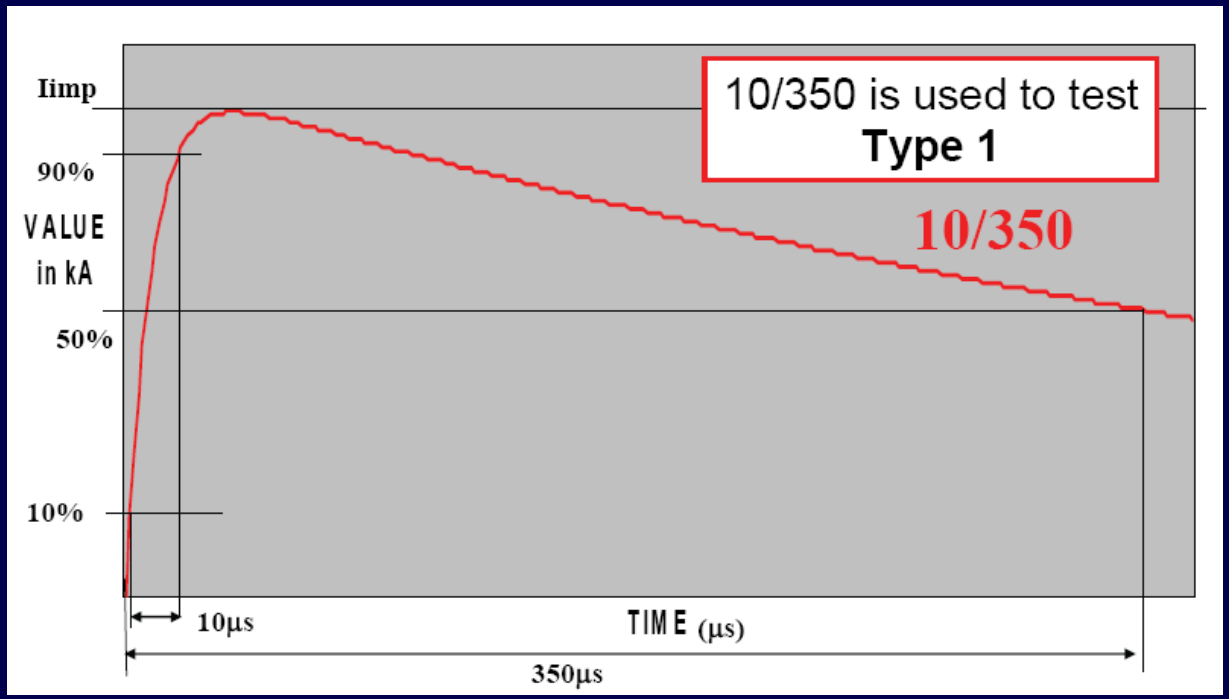
Surge Protectors Devices Classification

	Definition acc. to IEC 61643	Definition acc. to EN 61643
SPDs which withstand the partial lightning current with a typical waveform 10/350 µs require a corresponding impulse test current I_{imp} The suitable test current I_{imp} is defined in the Class I test procedure of IEC 61643-1	SPD class I	SPD Type 1
SPDs which withstand induced surge currents with a typical waveform 8/20 µs require a corresponding impulse test current I_n The suitable test current I_n is defined in the Class II test procedure of IEC 61643-1	SPD class II	SPD Type 2
SPDs that withstand induced surge currents with a typical waveform 8/20 µs and require a corresponding impulse test current I_{sc} The suitable combination wave test is defined in the Class III test procedure of IEC 61643-1	SPD class III	SPD Type 3

Surge protectors devices according IEC 61643-1 are divided in CLASS I, CLASS II, CLASS III. By recommendation of standard IEC62305-4 the surge protectors from different classes are installed in each boundary zone LPZ0a/b-LPZ3

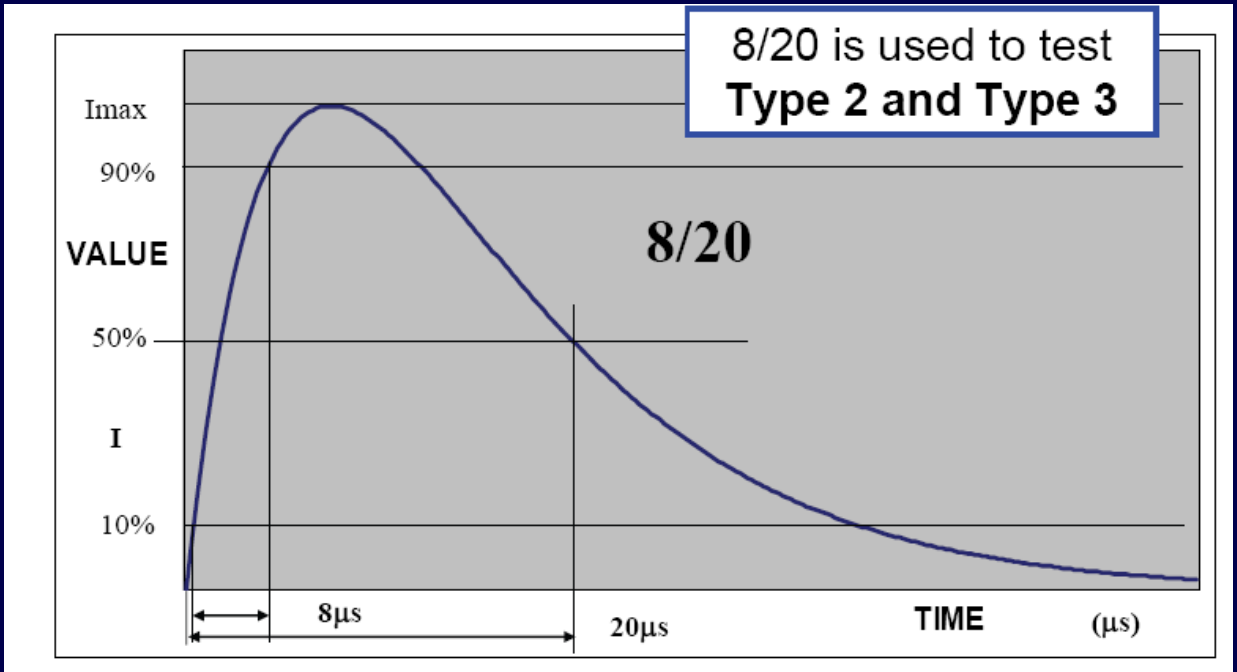
Surge Protectors Devices Classification

SPD class 1 – 10/350usec wave shapes

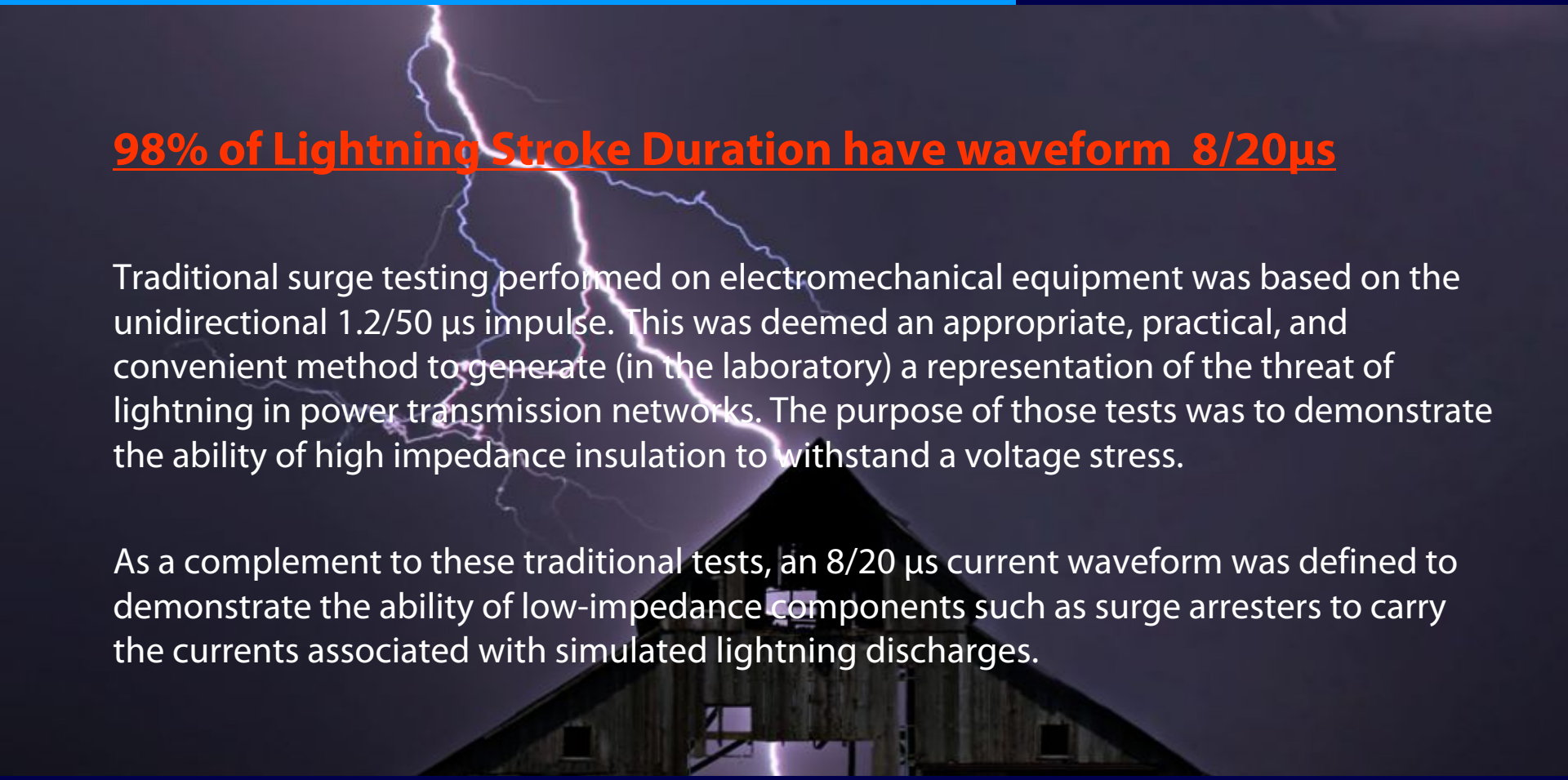


Surge Protectors Devices Classification

SPD class 2,3 – 8/20usec wave shapes



Most Common Lightning Stroke Duration



98% of Lightning Stroke Duration have waveform 8/20µs

Traditional surge testing performed on electromechanical equipment was based on the unidirectional 1.2/50 µs impulse. This was deemed an appropriate, practical, and convenient method to generate (in the laboratory) a representation of the threat of lightning in power transmission networks. The purpose of those tests was to demonstrate the ability of high impedance insulation to withstand a voltage stress.

As a complement to these traditional tests, an 8/20 µs current waveform was defined to demonstrate the ability of low-impedance components such as surge arresters to carry the currents associated with simulated lightning discharges.

What are ACDC Surge Protectors?

ACDC Surge Protector represents a Multi-Stage Surge Protection system composed of 8 (eight) different surge protection stages, providing protection from all forms of Surges.

With simply words: We are covering almost all kind of surge shapes: from speediest (spikes) in nano seconds, through lightning to long last (short-circuit) in seconds.

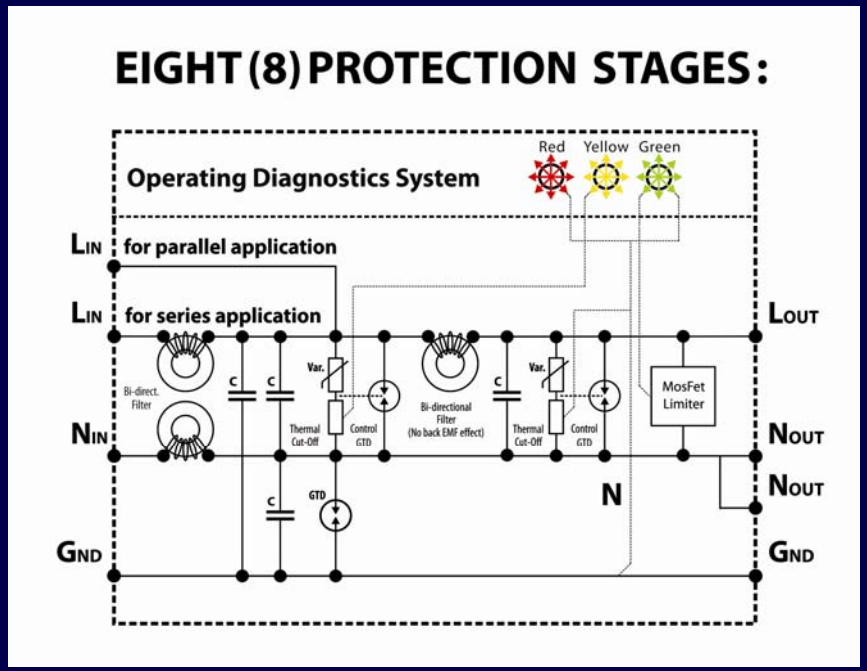
It is form class I + II + III according to standard IEC61643-1.

He also meets the standards for protection of devices from electromagnetic (radio) interference IEC60939-2.

Multi-Stage Surge Protection system composed of 8 (eight) different surge protection stages

What kind of technology?

Detail Circuits Schematic

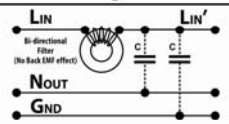


Multi-Stage Surge Protection system composed of
8 (eight) different surge protection stages

What kind of technology?

Detail Explanation of all Eight (8)Protection Stages

Stage 1

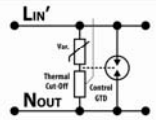


Function:
Bi-directional EMI/RFI filtering (L-N)
Front signal edge reduction

Technical Specification:
L = 0,.7mH; Imax = up to 100A;

Technology:
Nano Crystalline Core (L-C configuration)
Special bi-directional winding

Stage 2

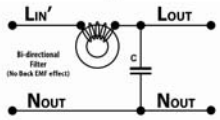


Function:
Suppression signal shape: 8/20us or 10/350us

Technical Specification:
Surge Cur. 80 to 200kA (8/20us) or
Surge Cur. 12,5 to 30kA (10/350us)

Technology:
Varistor with thermal cut-off
Control Gas Tube Discharge

Stage 3

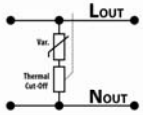


Function:
Bi-directional EMI/RFI filtering (L-N)
Front signal edge reduction

Technical Specification:
L = 4,2mH; Imax = up to 100A;

Technology:
Nano Crystalline Core (L-C configuration)
Special bi-directional winding

Stage 4

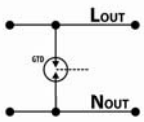


Function:
Suppression signal shape: 8/20us

Technical Specification:
Surge Cur. 25kA (8/20us)

Technology:
Varistor with thermal cut-off

Stage 5

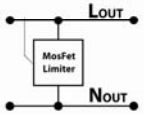


Function:
Long term signal suppression from 1µs to 2 sec.

Technical Specification:
This stage is the last Ultimate protection level. He switch-off the circuits breaker install upstre-am if the pick voltage > 300VDC for (120 VAC) or 520VDC for (230 VAC) appears on the output of the protection device. Circuits breaker should be < 250A gl/gG.

Technology:
Controlled Gas Tube Discharge

Stage 6

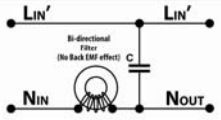


Function:
High speed efficiency signal suppression

Technical Specification:
Power MOSFET Limiter 500A (8/20us);
Typical response < 1ns (nanosecond)

Technology:
Power MOSFET Voltage Suppressor
(patented)

Stage 7

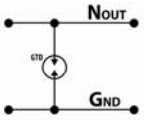


Function:
Bi-directional EMI/RFI filtering (N-L)
Front signal edge reduction

Technical Specification:
L = 0,.7mH; Imax = up to 100A;

Technology:
Nano Crystalline Core (L-C configuration)
Special bi-directional winding

Stage 8

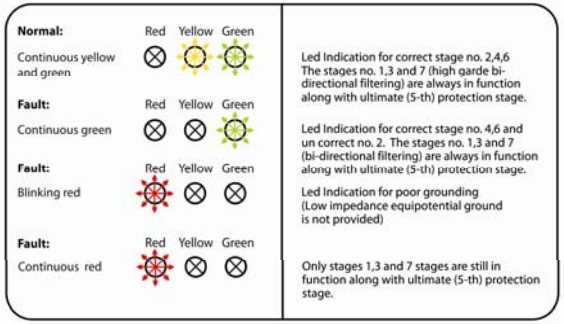


Function:
Long term signal suppression shape (N-Gnd)
8/20us or 10/350us

Technical Specification:
Surge Cur. 80 to 200kA (8/20us) or
Surge Cur. 12,5 to 30kA (10/350us)

Technology:
Gas Tube Discharge

Operating Diagnostic Systems



Unique Design Solution

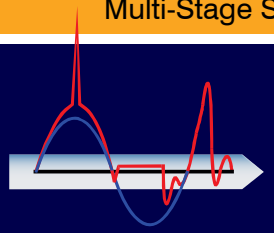
What is Inside? How the Protection unit looks inside?

Fundamental Innovation Advantages

1. The first part of innovation is use of four (4) complementary different protective technologies, (Varistor, Gas Tube, Nanocrystalline and Mosfet technology) in one unit with result of reducing the surge current up to 99.9% at single point which characteristic can not offer competitive surge products.

2. The second part of innovation is simple and easy application of ACDC Surge Protectors devices applying of international protection standards (IEC 62305 & ANSI/IEEE C62.41. 1-2). This solution expel need of several surge protectors installed separately in each boundary protection zone (LPZ0a/LPZ0b-LPZ3 & C-A).

Multi-Stage Surge Protection system composed of
8 (eight) different surge protection stages



What are the benefits?

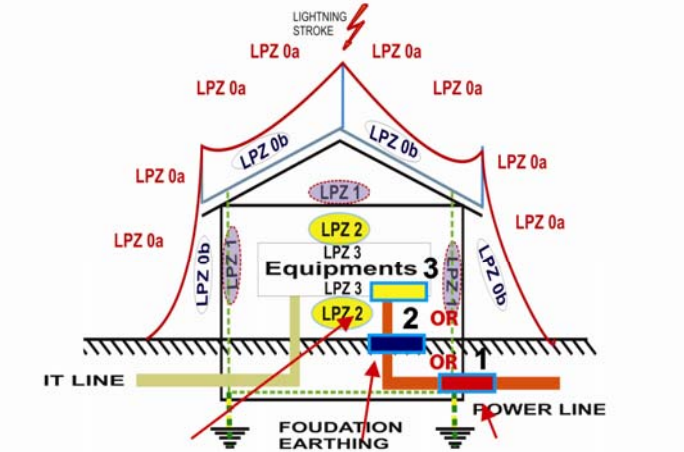
- Design, planning and installation of surge protections are not any more reserved just for experts in this field.

- With application of ACDC Multi-stage protectors the implementation, planning and installation of Surge Protector becomes simple and easy and applicable from professions such as planners, construction engineers, designers, electricians and others technology.

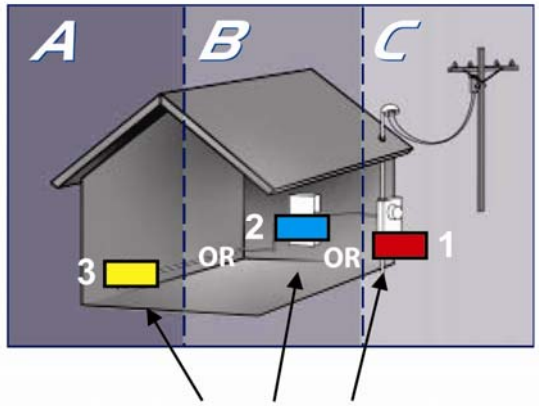
The implementation, planning and installation of Surge Protector becomes simple easy and applicable from professions such as planners, construction engineers, designers, electricians….

What are the benefits?

Simple and easy applying of International protection standards (IEC 62305 & ANSI/IEEE C62.41. 1-2).



Installation of ACDC Surge Protector

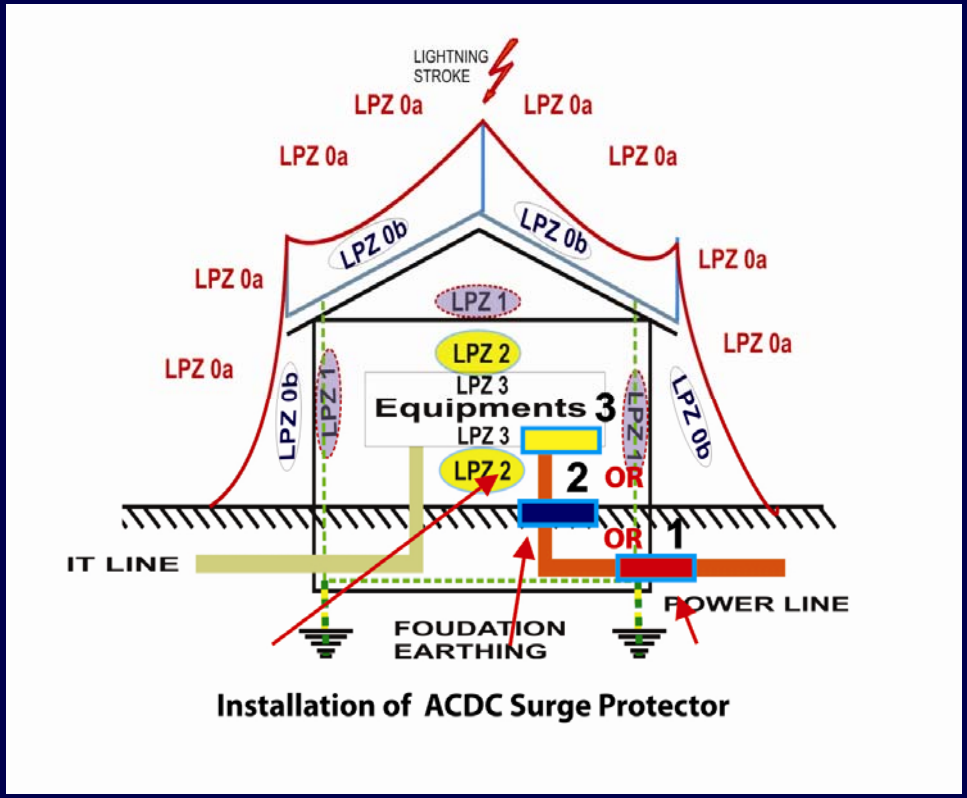


Installation of ACDC Surge Protector

The implementation, planning and installation of Surge Protector becomes simple easy and applicable from professions such as planners, construction engineers, designers, electricians….

With ACDC Surge Protectors applying of protection stanadards are simple and easy

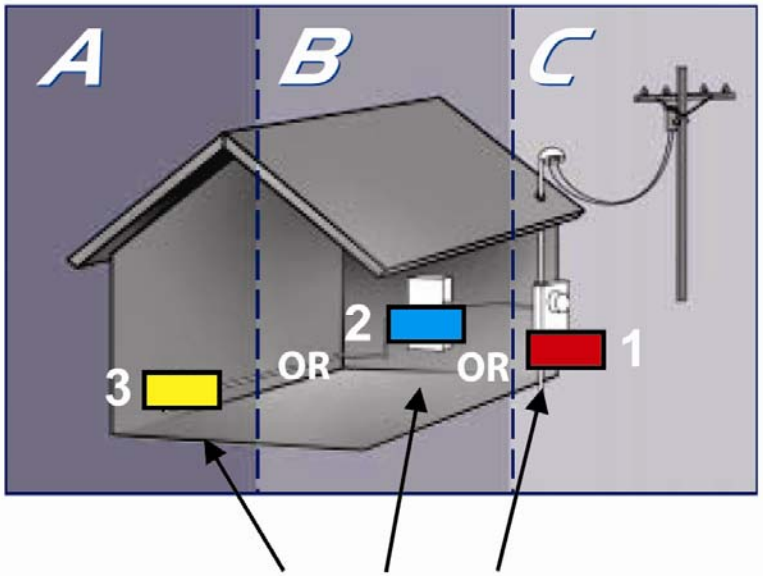
Simple and easy applying of International protection standard IEC 62305



Installation of ACDC Surge Protector

With ACDC Surge Protectors applying of protection stanadards are simple and easy

Simple and easy applying of International protection standard ANSI/IEEE C62.41. 1-2



Installation of ACDC Surge Protector

Applied Standards

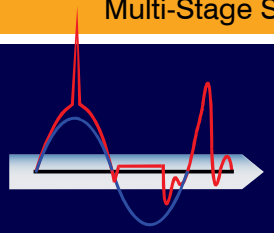
The innovative design and concept of **Eight (8) stages Surge protection** system represents a fundamental improvement of existing technology in this area and applied and exceeds the existing international standards for surge protection IEC62305-4; IEC61643-1; IEC60939-2.

Those products offer new high-quality solutions and simplicity in surge protection applications.

The products have built in 5 (five) innovations (patents) under the numbers 900836, 900545, 903566, 903567 (one in process).

Our patents are built in twenty nine (53) models-complete products that have induced worldwide interest and which had been many times awarded (Seoul, Eureka-Innova: Brussels, IENA: Nuremberg, Arka: Zagreb, Nikola Tesla: Belgrade, Technoma: Skopje)

ACDC DCAC is ISO9001:2008 certificated company for production of surge protectors and also meets all European standards.

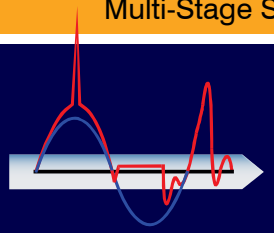


Advantages of ACDC Surge Protectors

1 AC DC Surge Protector is advanced Integrated Multi-Stage Surge Protector, consists of eight (8) protection stages that provide effective and reliable protection against surges and transients coupled with state-of-the-art EMI/RFI filtering;

2. ACDC Surge Protector provides a systematic approach on two fronts: Surge protection and Hi-bidirectional filtering. While there are companies and products that attempt one of these, ACDC Surge Protectors is the only product that seamlessly merges the two different protection technologies. The unique multistage design provides the most advanced power filter protector;

3. The ACDC Surge Protector is Multi-Stage Surge Protector of class I+II+III in one device according to IEC61643-1 that reduced surge events in excess of 99% at a single point. They also full fill standard requirements for electromagnetic (radio) interference IEC60939-2.;

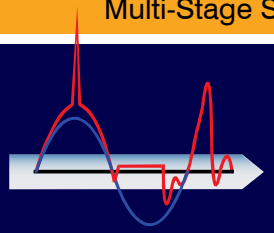


Advantages of ACDC Surge Protectors

4. With installation of ACDC Surge Protectors applying of international protection standards (IEC 62305 & ANSI/IEEE C62.41. 1-2) become simple and easy. These protectors are expelling the need for several separate installation of surge protectors at each protection boundary zones C-A & LPZ0a/LPZ0b-LPZ3.

5. The complex analyses and multitude of criteria defined in lightning protection standard become the past. With ACDC Surge Protectors planning and installation of surge protection is not just reserved for an expert surge engineers but it is available to wide branch of professions. (electrician, construction builders, IT..);

6. The appearance of ACDC Surge Protectors on the market significantly REDUCED TOTAL INVESTMENT COST and presents new inovation regarding simplicity of applying of international lightning protection standards.(IEC 62305 & ANSI/IEEE C62.41. 1-2);

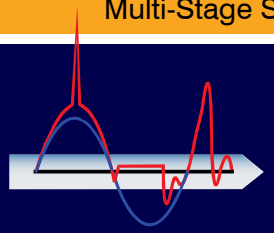


Advantages of ACDC Surge Protectors

7. Special design enables effective protection on locations where the grounding is poor or does not exist;

8. The option for ground filtering.

9. Special design of ACDC Surge Protectors can solve the problem of network and ground contamination during direct lightning strikes, successfully protecting electrical and electronic systems within structures. This is most advanced effective concept for protection for Cellular sites, telecommunication equipment, computer equipment.

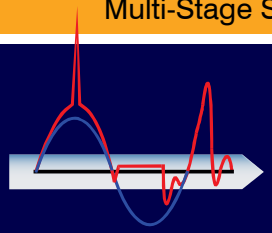


Reduce Total Cost

The need of surge protections is growing rapidly. Newest generation of sophisticated electronic devices are more sensitive to electrostatic discharges and over-voltage spikes in power distribution networks and requiring new approach to the surge protection with improved quality and reliability. The integrated multi-stage surge protection system significantly reduces the total cost trough:

1. Applying standard IEC 62305 & ANSI/IEEE C62.41.1-2 (Lightning international protection standards) requires several independent surge protectors installed separately in each boundary protection zone LPZ0a-LPZ3 & C-A. ACDC Surge Protector presents multi-stage protection system with 8 (eight) protection stages in one device, expelling the need of using surge protectors in other protection zones, while reducing surge current up to 99% (at a single point).

2. Expel installation and cost of several independent surge protectors in different boundary zones according lightning protection standards. (ANSI/IEEE C62.41.1-2 & IEC 62305);



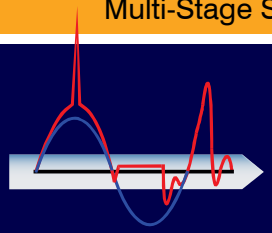
Reduce Total Cost

3. Expel the need of surge expert engineer regarding installation of several protectors on different places;

4. Reduce space requirements;

5. Extremely high protection efficiency and reliability;

6. Reduced cost of maintenance of the protected equipment regarding higher MTBF;



Reliability

Usage of ACDC Surge Protectors from Blue, Green, Red, Orange and Pink series is excellent choice for the investment in quality of your power network supply, extended equipment life and reduce their down time and errors.

1. If protector from Blue, Green, Red and Orange series have damaged or burned stages 2,4 or 6 the stages 1,3 and 7 are still in function among with ultimate (5-th) protections stage.

2. If a user decides to replace ACDC Surge Protector is recommended to do that with the same series.

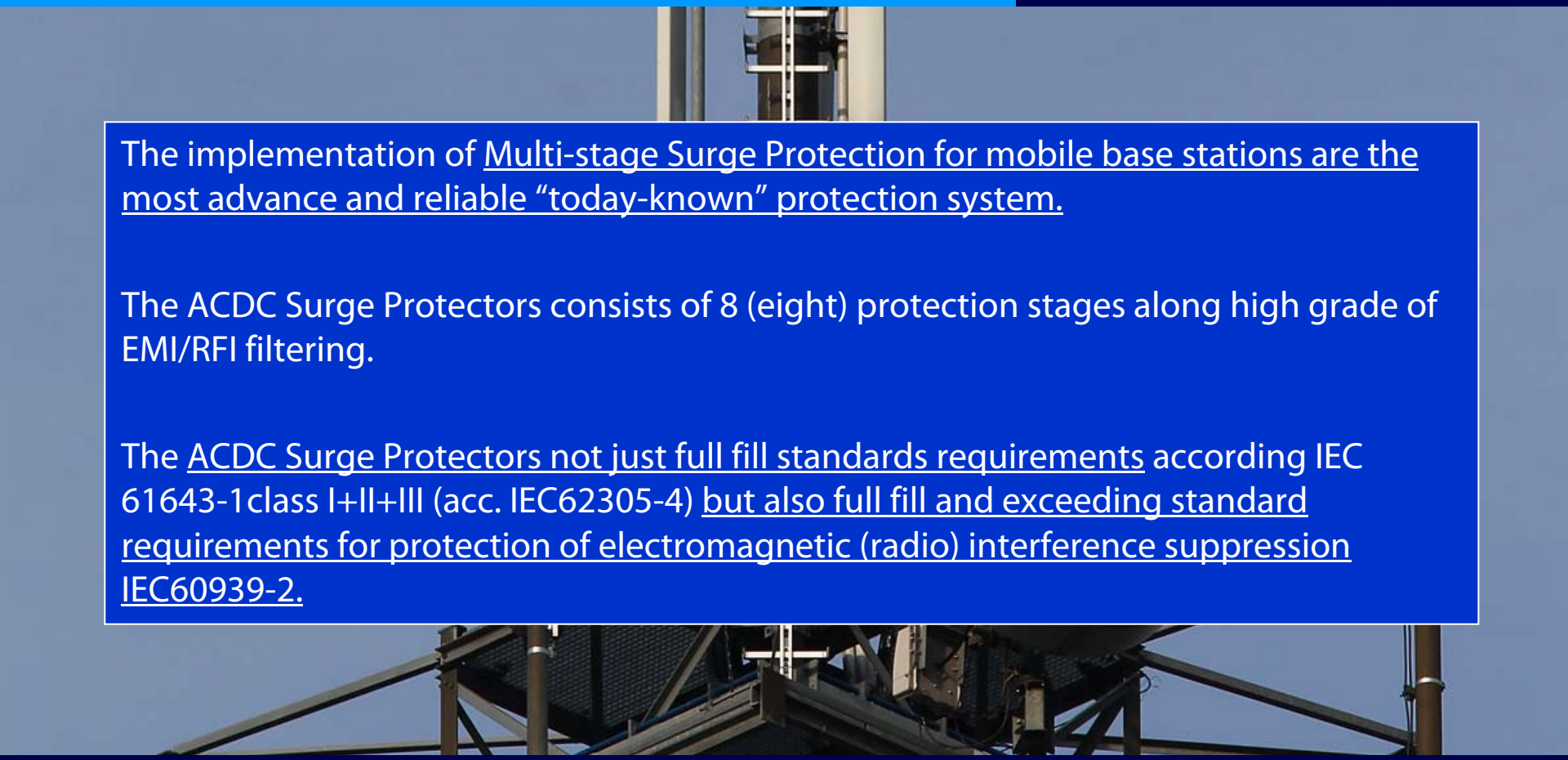
Surge Protection of Telecommunication equipments and Mobile Base Stations

Electronic equipment and systems, especially Mobile Base Station, are often installed in environments exposed to electromagnetic disturbances. Transmitting and receiving systems in mobile phone networks are primarily installed at open spaces and hence are subjected to atmospheric discharges and power network disturbances.

A complex protection concept comprising grounding, external and internal lightning protection is therefore required to ensure protection against surge voltages due to lightning discharges and switching operations.

Years of experience in the protection of mobile base stations of leading national and international providers has shown that only a multi-stage protection system can ful fill the requirements for the availability and safety of assets.

Multi-stage Surge Protection the Most Advance “today-known” Surge Protection System.



The implementation of Multi-stage Surge Protection for mobile base stations are the most advance and reliable “today-known” protection system.

The ACDC Surge Protectors consists of 8 (eight) protection stages along high grade of EMI/RFI filtering.

The ACDC Surge Protectors not just full fill standards requirements according IEC 61643-1class I+II+III (acc. IEC62305-4) but also full fill and exceeding standard requirements for protection of electromagnetic (radio) interference suppression IEC60939-2.

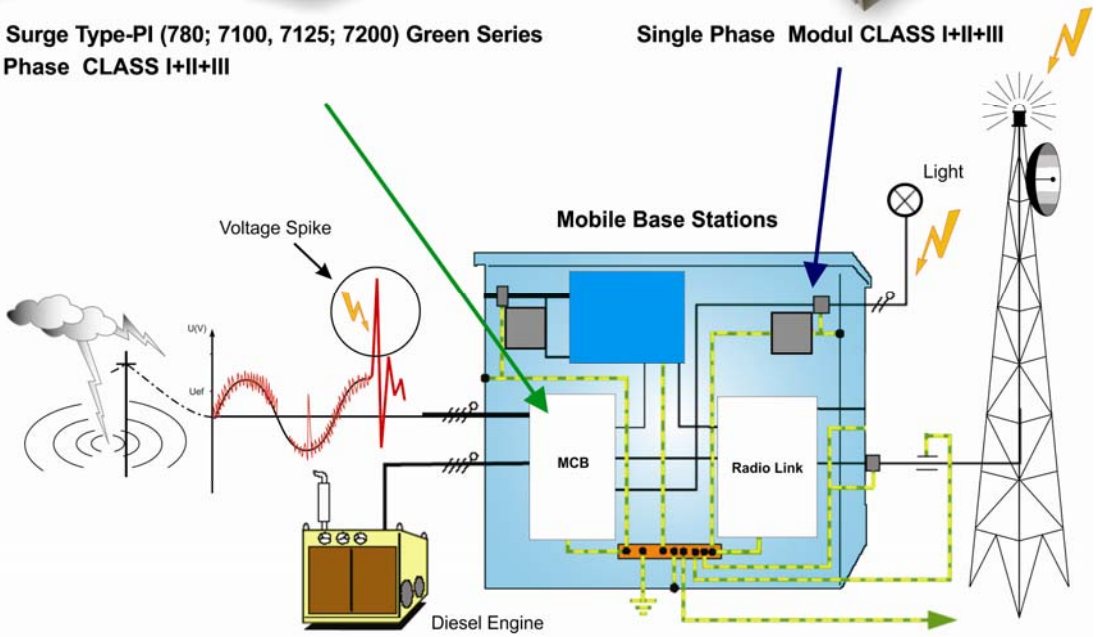
The ACDC Surge Protectors are not just “Spike” Surge Protection as the most does

The ACDC Surge Protectors are not just “spike” surge protection as the most of surge product does. They tracking the waveform and filtering the pollution generated in power network supply what is the most important part in the protection of sophisticated Mobile base station telecommunication equipment .

ACDC Surge Protectors – Green Series
Recommended for Protection of Mobile Base Stations

ACDC Surge Type-PI (780; 7100, 7125; 7200) Green Series
Three Phase CLASS I+II+III

Single Phase Modul CLASS I+II+III



ACDC SURGE PROTECTORS – Green Series

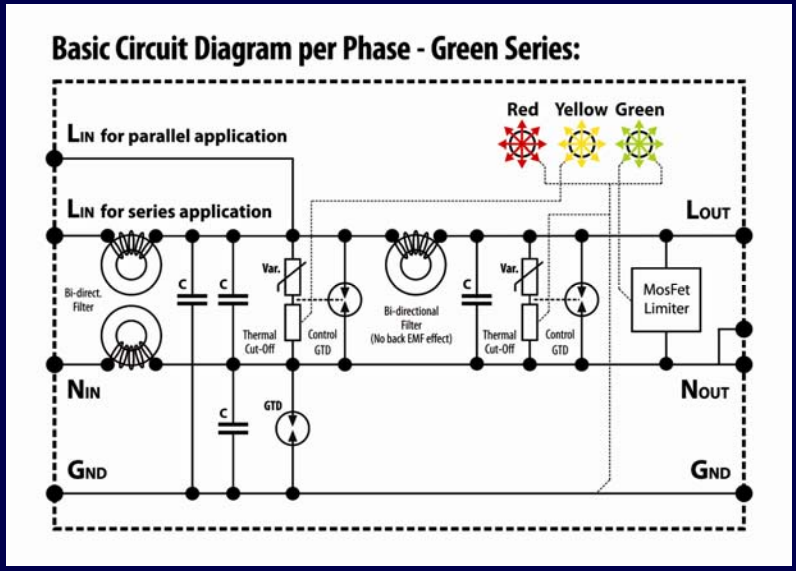
Main Characteristic:

- EIGHT (8) STAGES SERIES PROTECTOR 1/1 & 3/3
- Cascade bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire
- Hard Wire Installation – Modular System

Specification:

- Single Phase / Three Phase CLASS I+II+III
- Voltage Rating: 230VAC /400VAC
- Current Rating: up to 100A per phase
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Green Series

Models:

Single Phase — For upgrade the distribution panel

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-GS	800.115-1/1	105kA(8/20µs) or 15kA(10/350µs)	82x72x70	0,47
Type-PI 7100 1/1-GS	800.116-1/1	125kA (8/20µs) or 18kA (10/350µs)	82x72x70	0,47
Type - PI 7125 1/1-GS	800.117-1/1	150kA (8/20µs) or 22kA (10/350µs)	82x72x70	0,47
Type - PI 7200 1/1-GS	800.118-1/1	225kA (8/20µs) or 32kA (10/350µs)	82x72x70	0,47

Three Phase — For upgrade the distribution panel
Three single phase surge protectors connected for three phase application

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-GS x 3	800.115-1/1 x 3	315kA(8/20µs) or 45kA(10/350µs)	82x216x70	1,41
Type-PI 7100 1/1-GS x 3	800.116-1/1 x 3	375kA (8/20µs) or 54kA (10/350µs)	82x216x70	1,41
Type - PI 7125 1/1-GS x 3	800.117-1/1 x 3	450kA (8/20µs) or 66kA (10/350µs)	82x216x70	1,41
Type - PI 7200 1/1-GS x 3	800.118-1/1 x 3	675kA (8/20µs) or 96kA (10/350µs)	82x216x70	1,41

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-M-GS	800.115-3/3-M	315kA(8/20µs) or 45kA(10/350µs)	250x250x150	5,1
Type-PI 7100 3/3-M-GS	800.116-3/3-M	375kA (8/20µs) or 54kA (10/350µs)	250x250x150	5,1
Type - PI 7125 3/3-M-GS	800.117-3/3-M	450kA (8/20µs) or 66kA (10/350µs)	250x250x150	5,1
Type - PI 7200 3/3-M-GS	800.118-3/3-M	675kA (8/20µs) or 96kA (10/350µs)	250x250x150	5,1

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54
Circuit breakers MCB 100A are installed in the front of protectors for each phase

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-MCB-GS	800.115-3/3-MCB	315kA(8/20µs) or 45kA(10/350µs)	300x250x150	7,1
Type-PI 7100 3/3-MCB-GS	800.116-3/3-MCB	375kA (8/20µs) or 54kA (10/350µs)	300x250x150	7,1
Type - PI 7125 3/3-MCB-GS	800.117-3/3-MCB	450kA (8/20µs) or 66kA (10/350µs)	300x250x150	7,1
Type - PI 7200 3/3-MCB-GS	800.118-3/3-MCB	675kA (8/20µs) or 96kA (10/350µs)	300x250x150	7,1

Application, Futures:

Applications:

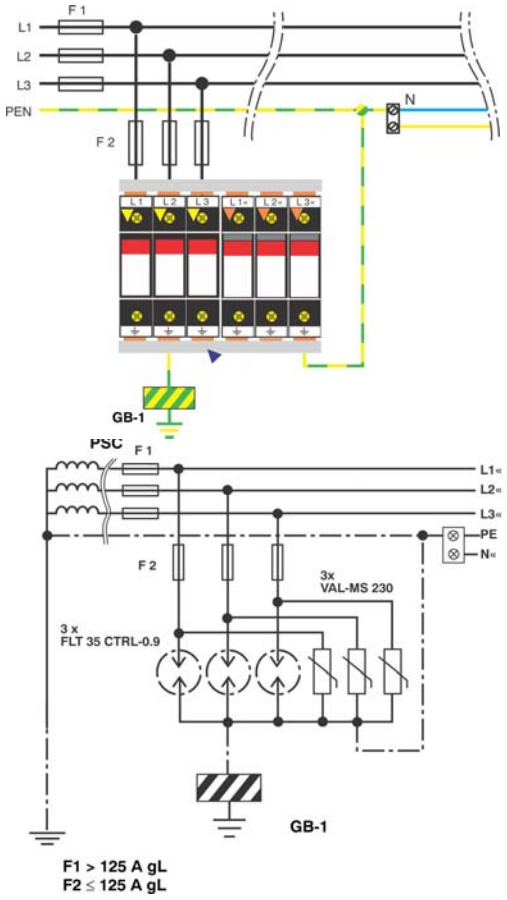
- Telecommunication
- Computers
- Medical equipment
- Sensitive electronic
- Solars
- Industrial grade
- Military

Features:

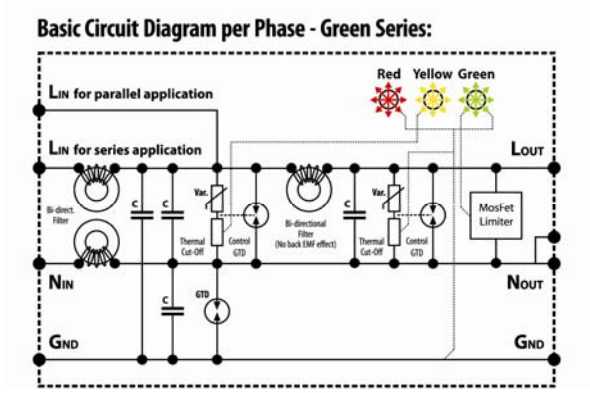
- Multi - Stage Surge Protection
- Eight (8) Protection Stages
- Bi-directional Filtering
- Ground Filtering
- Thermal Circuit Protection
- High Reliability
- Excellent Response Time < 1ns

What is the Difference Between ACDC Surge Protectors and other Solutions

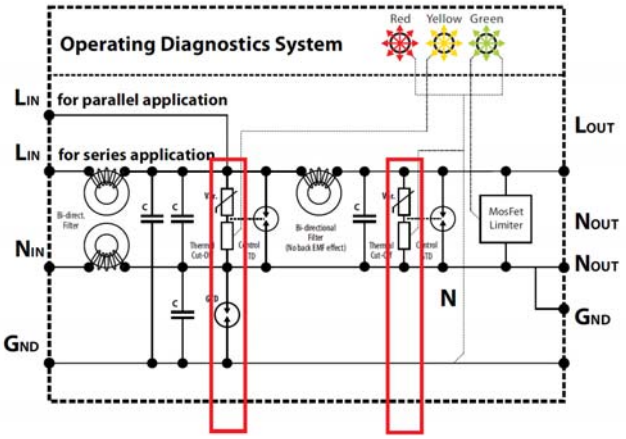
Common used surge protection solution-2 (two) protection stages



ACDC Surge Protection solution-8 (eight) protection stages



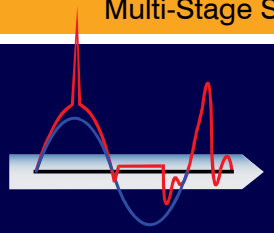
ACDC Surge Protector Type-PI Green Series



This is only two protection stages from used protection solution

Advantages of ACDC Surge Protection Solution in Protection of Mobile Base stations

- **Active filtering of Power Supply and tracking the sine waveform**
- **Eight (8) Protection stages per phase CLASS I+II+III acc. IEC61643-1**
- **Effective Surge Protection on location with pure grounding**
- **No Ground contamination during the surge attack**
- **No contamination of phase or neutral wire during the surge attack**
- **REDUCED TOTAL INVESTMENT COST**
- **Most Advanced effective concept for protection for Mobile Base Sations, and telecommunication equipments**



Types of ACDC Surge Protectors

ACDC Surge Protectors are divided in 6 (six) series:

1. ACDC Surge Protectors – Green series - 16 Type Single/Three Phase Models
2. ACDC Surge Protectors – Blue series - 16 Type Single/Three Phase Models
3. ACDC Surge Protectors – Red series - 16 Type Single/Three Phase Models
4. ACDC Surge Protectors – Orange series - 3 Type Single Phase Models
5. ACDC Surge Protectors – Pink series - 1 Type Single Phase Model
6. ACDC Surge Protectors – Yellow series - 2 Type Signal Line Models

ACDC SURGE PROTECTORS – Green Series

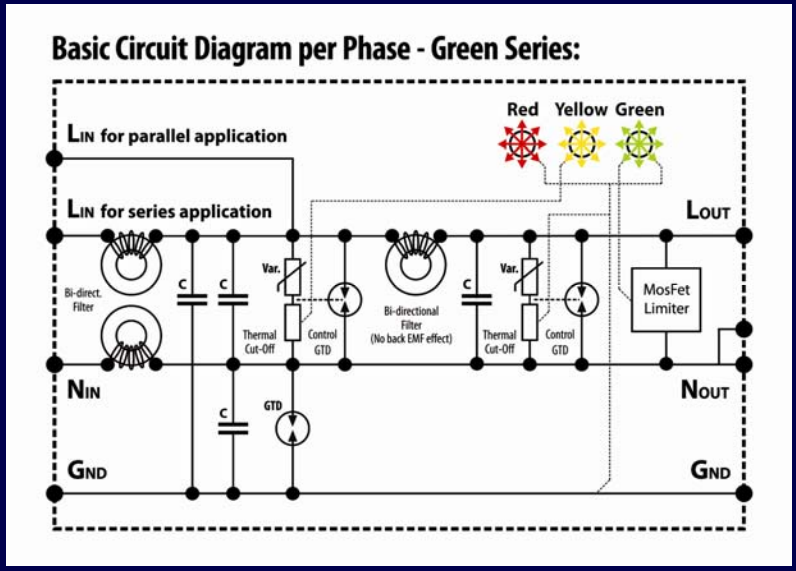
Main Characteristic:

- EIGHT (8) STAGES SERIES PROTECTOR 1/1 & 3/3
- Cascade bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire
- Hard Wire Installation – Modular System

Specification:

- Single Phase / Three Phase CLASS I+II+III
- Voltage Rating: 230VAC /400VAC
- Current Rating: up to 100A per phase
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Green Series

Models:

Single Phase — For upgrade the distribution panel

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-GS	800.115-1/1	105kA(8/20µs) or 15kA(10/350µs)	82x72x70	0,47
Type-PI 7100 1/1-GS	800.116-1/1	125kA (8/20µs) or 18kA (10/350µs)	82x72x70	0,47
Type - PI 7125 1/1-GS	800.117-1/1	150kA (8/20µs) or 22kA (10/350µs)	82x72x70	0,47
Type - PI 7200 1/1-GS	800.118-1/1	225kA (8/20µs) or 32kA (10/350µs)	82x72x70	0,47

Three Phase — For upgrade the distribution panel
Three single phase surge protectors connected for three phase application

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-GS x 3	800.115-1/1 x 3	315kA(8/20µs) or 45kA(10/350µs)	82x216x70	1,41
Type-PI 7100 1/1-GS x 3	800.116-1/1 x 3	375kA (8/20µs) or 54kA (10/350µs)	82x216x70	1,41
Type - PI 7125 1/1-GS x 3	800.117-1/1 x 3	450kA (8/20µs) or 66kA (10/350µs)	82x216x70	1,41
Type - PI 7200 1/1-GS x 3	800.118-1/1 x 3	675kA (8/20µs) or 96kA (10/350µs)	82x216x70	1,41

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-M-GS	800.115-3/3-M	315kA(8/20µs) or 45kA(10/350µs)	250x250x150	5,1
Type-PI 7100 3/3-M-GS	800.116-3/3-M	375kA (8/20µs) or 54kA (10/350µs)	250x250x150	5,1
Type - PI 7125 3/3-M-GS	800.117-3/3-M	450kA (8/20µs) or 66kA (10/350µs)	250x250x150	5,1
Type - PI 7200 3/3-M-GS	800.118-3/3-M	675kA (8/20µs) or 96kA (10/350µs)	250x250x150	5,1

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54
Circuit breakers MCB 100A are installed in the front of protectors for each phase

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-MCB-GS	800.115-3/3-MCB	315kA(8/20µs) or 45kA(10/350µs)	300x250x150	7,1
Type-PI 7100 3/3-MCB-GS	800.116-3/3-MCB	375kA (8/20µs) or 54kA (10/350µs)	300x250x150	7,1
Type - PI 7125 3/3-MCB-GS	800.117-3/3-MCB	450kA (8/20µs) or 66kA (10/350µs)	300x250x150	7,1
Type - PI 7200 3/3-MCB-GS	800.118-3/3-MCB	675kA (8/20µs) or 96kA (10/350µs)	300x250x150	7,1

Application, Futures:

Applications:

- Telecommunication
- Computers
- Medical equipment
- Sensitive electronic
- Solars
- Industrial grade
- Military

Features:

- Multi - Stage Surge Protection
- Eight (8) Protection Stages
- Bi-directional Filtering
- Ground Filtering
- Thermal Circuit Protection
- High Reliability
- Excellent Response Time < 1ns

ACDC SURGE PROTECTORS – Blue Series

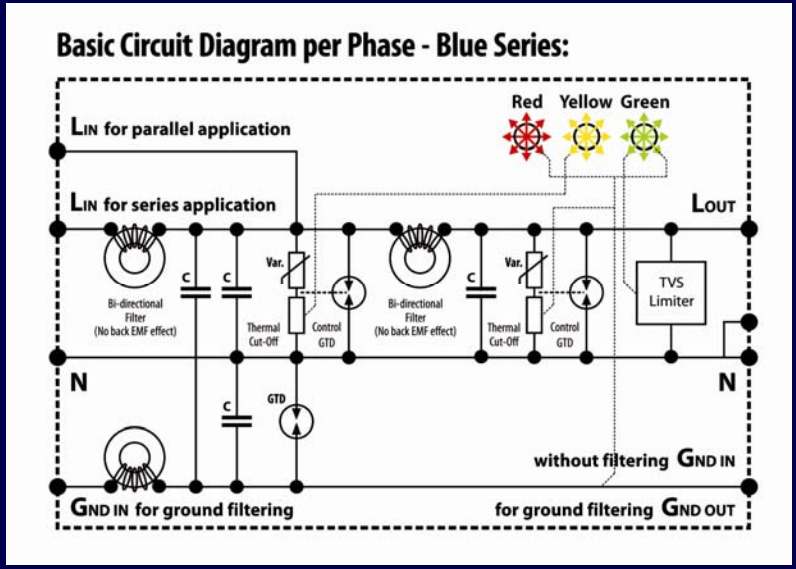
Main Characteristic:

- EIGHT (8) STAGES SERIES PROTECTOR 1/1 & 3/3
- Cascade bi-directional EMI-RFI filtering of phase (L) and ground (Gnd) wire
- Hard Wire Installation – Modular System

Specification:

- Single Phase / Three Phase CLASS I+II+III
- Voltage Rating: 230VAC /400VAC
- Current Rating: up to 100A per phase
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Blue Series

Models:

Single Phase — For upgrade the distribution panel

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-BS	800.125-1/1	105kA(8/20µs) or 15kA(10/350µs)	82x72x70	0,47
Type-PI 7100 1/1-BS	800.126-1/1	125kA (8/20µs) or 18kA (10/350µs)	82x72x70	0,47
Type - PI 7125 1/1-BS	800.127-1/1	150kA (8/20µs) or 22kA (10/350µs)	82x72x70	0,47
Type - PI 7200 1/1-BS	800.128-1/1	225kA (8/20µs) or 32kA (10/350µs)	82x72x70	0,47

Three Phase — For upgrade the distribution panel
Three single phase surge protectors connected for three phase application

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-BS x 3	800.125-1/1 x 3	315kA(8/20µs) or 45kA(10/350µs)	82x216x70	1,41
Type-PI 7100 1/1-BS x 3	800.126-1/1 x 3	375kA (8/20µs) or 54kA (10/350µs)	82x216x70	1,41
Type - PI 7125 1/1-BS x 3	800.127-1/1 x 3	450kA (8/20µs) or 66kA (10/350µs)	82x216x70	1,41
Type - PI 7200 1/1-BS x 3	800.128-1/1 x 3	675kA (8/20µs) or 96kA (10/350µs)	82x216x70	1,41

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-M-BS	800.125-3/3-M	315kA(8/20µs) or 45kA(10/350µs)	250x250x150	5,1
Type-PI 7100 3/3-M-BS	800.126-3/3-M	375kA (8/20µs) or 54kA (10/350µs)	250x250x150	5,1
Type - PI 7125 3/3-M-BS	800.127-3/3-M	450kA (8/20µs) or 66kA (10/350µs)	250x250x150	5,1
Type - PI 7200 3/3-M-BS	800.128-3/3-M	675kA (8/20µs) or 96kA (10/350µs)	250x250x150	5,1

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54
Circuit breakers MCB 100A are installed in the front of protectors for each phase

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-MCB-BS	800.125-3/3-MCB	315kA(8/20µs) or 45kA(10/350µs)	300x250x150	7,1
Type-PI 7100 3/3-MCB-BS	800.126-3/3-MCB	375kA (8/20µs) or 54kA (10/350µs)	300x250x150	7,1
Type - PI 7125 3/3-MCB-BS	800.127-3/3-MCB	450kA (8/20µs) or 66kA (10/350µs)	300x250x150	7,1
Type - PI 7200 3/3-MCB-BS	800.128-3/3-MCB	675kA (8/20µs) or 96kA (10/350µs)	300x250x150	7,1

Application, Futures:

Applications:

- Telecommunication
- Computers
- Medical equipment
- Sensitive electronic
- Solars
- Industrial grade
- Military

Features:

- Multi - Stage Surge Protection
- Eight (8) Protection Stages
- Bi-directional Filtering
- Ground Filtering
- Thermal Circuit Protection
- High Reliability
- Excellent Response Time < 1ns

ACDC SURGE PROTECTORS – Red Series

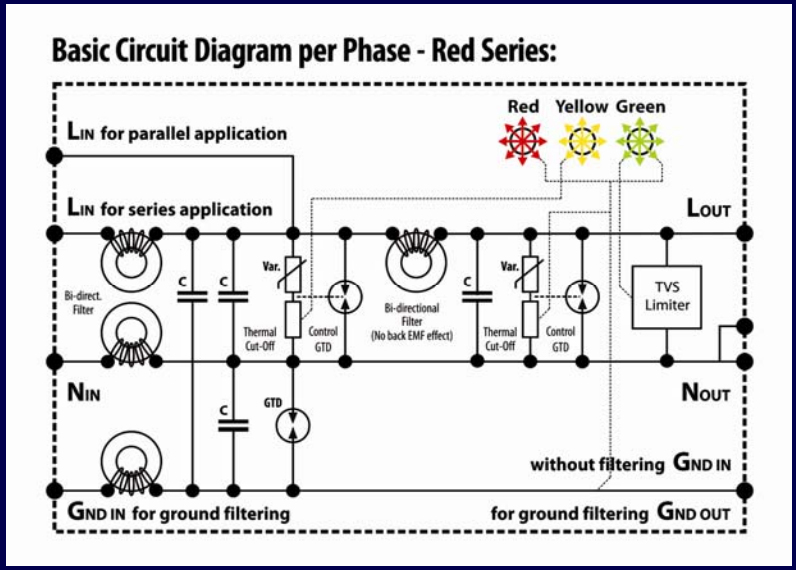
Main Characteristic:

- NINE (9) STAGES SERIES PROTECTOR 1/1 & 3/3
- Cascade bi-directional EMI-RFI filtering of phase (L) , neutral (N) and ground (Gnd)
- Hard Wire Installation – Modular System

Specification:

- Single Phase / Three Phase CLASS I+II+III
- Voltage Rating: 230VAC /400VAC
- Current Rating: up to 100A per phase
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Red Series

Models:

Single Phase — For upgrade the distribution panel

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-RS	800.135-1/1	105kA(8/20µs) or 15kA(10/350µs)	82x72x70	0,47
Type-PI 7100 1/1-RS	800.136-1/1	125kA (8/20µs) or 18kA (10/350µs)	82x72x70	0,47
Type - PI 7125 1/1-RS	800.137-1/1	150kA (8/20µs) or 22kA (10/350µs)	82x72x70	0,47
Type - PI 7200 1/1-RS	800.138-1/1	225kA (8/20µs) or 32kA (10/350µs)	82x72x70	0,47

Three Phase — For upgrade the distribution panel
Three single phase surge protectors connected for three phase application

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 1/1-RS x 3	800.135-1/1 x 3	315kA(8/20µs) or 45kA(10/350µs)	82x216x70	1,41
Type-PI 7100 1/1-RS x 3	800.136-1/1 x 3	375kA (8/20µs) or 54kA (10/350µs)	82x216x70	1,41
Type - PI 7125 1/1-RS x 3	800.137-1/1 x 3	450kA (8/20µs) or 66kA (10/350µs)	82x216x70	1,41
Type - PI 7200 1/1-RS x 3	800.138-1/1 x 3	675kA (8/20µs) or 96kA (10/350µs)	82x216x70	1,41

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-M-RS	800.135-3/3-M	315kA(8/20µs) or 45kA(10/350µs)	250x250x150	5,1
Type-PI 7100 3/3-M-RS	800.136-3/3-M	375kA (8/20µs) or 54kA (10/350µs)	250x250x150	5,1
Type - PI 7125 3/3-M-RS	800.137-3/3-M	450kA (8/20µs) or 66kA (10/350µs)	250x250x150	5,1
Type - PI 7200 3/3-M-RS	800.138-3/3-M	675kA (8/20µs) or 96kA (10/350µs)	250x250x150	5,1

Three Phase — The Surge Protectors are installed in Metal Distribution board with degree of protection IP54
Circuit breakers MCB 100A are installed in the front of protectors for each phase

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type-PI 780 3/3-MCB-RS	800.135-3/3-MCB	315kA(8/20µs) or 45kA(10/350µs)	300x250x150	7,1
Type-PI 7100 3/3-MCB-RS	800.136-3/3-MCB	375kA (8/20µs) or 54kA (10/350µs)	300x250x150	7,1
Type - PI 7125 3/3-MCB-RS	800.137-3/3-MCB	450kA (8/20µs) or 66kA (10/350µs)	300x250x150	7,1
Type - PI 7200 3/3-MCB-RS	800.138-3/3-MCB	675kA (8/20µs) or 96kA (10/350µs)	300x250x150	7,1

Application, Futures:

Applications:

- Telecommunication
- Computers
- Medical equipment
- Sensitive electronic
- Solars
- Industrial grade
- Military

Features:

- Multi - Stage Surge Protection
- Nine (9) Protection Stages
- Bi-directional Filtering
- Ground Filtering
- Thermal Circuit Protection
- High Reliability
- Excellent Response Time < 1ns

ACDC SURGE PROTECTORS – Orange Series

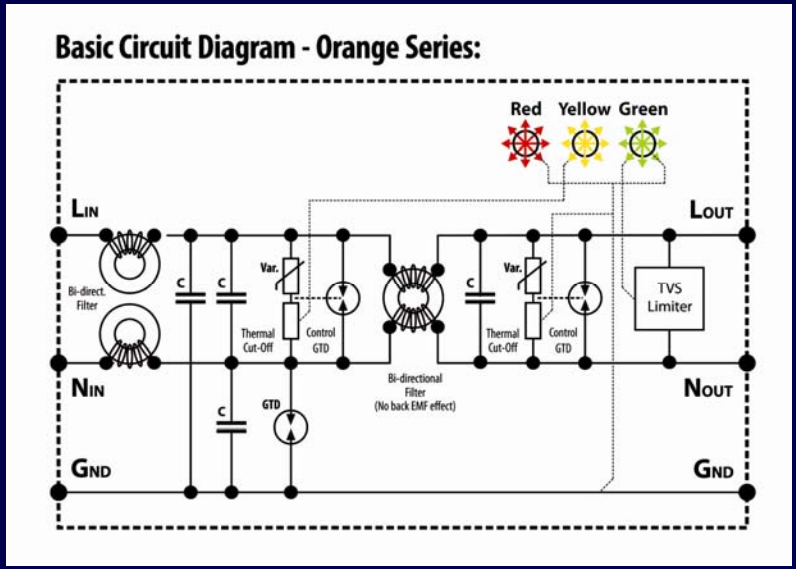
Main Characteristic:

- EIGHT (8) STAGES SERIES PROTECTOR 1/1
- Cascade bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire
- Plug-in Installation, Schuko plug or acc. customer requirements

Specification:

- Single Phase CLASS I+II+III
- Voltage Rating: 230VAC
- Current Rating: up to 25A
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Orange Series

Models:

Single phase Models - ACDC Surge Protectors Orange Series

Technology:	Multi-Stage Surge Protection; Eight (8) Stages Series Protector
Specification:	Cascade bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire
Load:	Up to 25A single phase; up to 3kW load for 120VAC; up to 5kW load for 230VAC
Options:	Indication for bed grounding
Installation:	Plug-in installation, schuko plug, terminal block or according requirements
Product Standard:	IEC61643-1 Class I+II+III; IEC60939-2

Type	Order Code	Total Surge Cur.	Dimension (WxDxHmm)	Weight (kg)
Type - PS 11-M	500.215	105kA(8/20µs) or 15kA(10/350µs)	220x50x45	1,6
Type - PS 137-M	500.216	125kA (8/20µs) or 18kA (10/350µs)	220x50x45	1,6
Type - PS 146-M	500.217	150kA (8/20µs) or 22kA (10/350µs)	220x50x45	1,6

Metal Enclosures

Application, Futures:

Applications:

- Computers
- Servers
- Telecommunication
- Medical equipment
- Sensitive electronic
- Solars
- Industrial grade

Features:

- Integrate Multi - Stage Protection System
- Eight Protection Stages
- Bi-directional Wave Filtering
- Expel Ground Contamination
- Thermal Circuit Protection
- High Reliability
- Excellent Response Time < 1ns

ACDC SURGE PROTECTORS – Pink Series

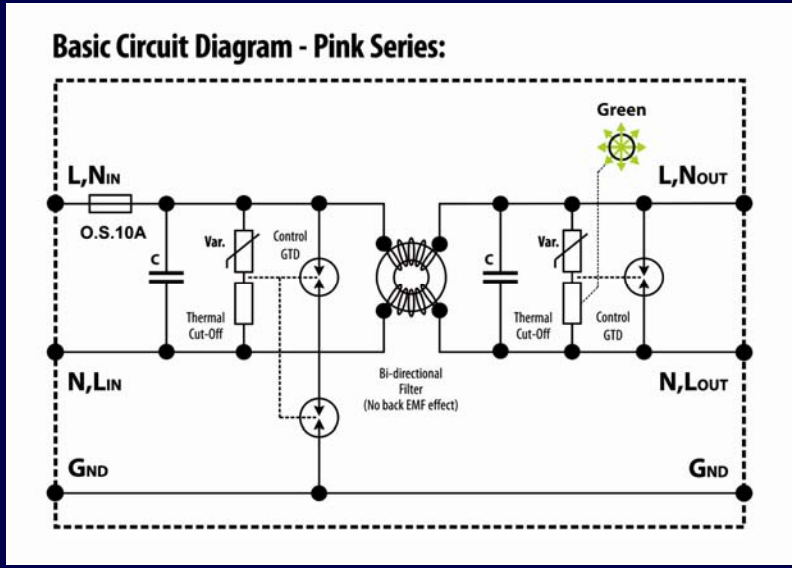
Main Characteristic:

- Three (3) STAGES SERIES PROTECTOR 1/1
- Bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire
- Plug- in Installation, Schuko plug or acc. customer requirements

Specification:

- Single Phase CLASS II+III
- Voltage Rating: 230VAC
- Current Rating: up to 8A
- Total Surge Cur.: 55kA (8x20 µsec)
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Pink Series

Models:

Single Phase	ACDC Surge Protectors Type - PV 29 Pink Series	
	Type	Type - PV 29
	Order Code	400.115
	Total Surge Cur.	55kA (8/20µs)
	Dimension (WxDxHmm)	150x50x30
	Weight (kg)	0,47

Protection Stage	Technical Specification ACDC Surge Protector Type-PV 29 Pink Series	Function	Technology
1. First stage	Surge Cur. 40kA (8/20µs)	Suppression signal shape (L-N), 8/20µs	Varistor with thermal cut-off; Control Gas Tube Discharge
2. Second stage	L=10mH; Imax=up to 8A	Bi-directional EMI/RFI filter; Front signal edge reduction;	Nano Crystalline Core (L-C configuration)
3. Third stage	Surge Cur. 15kA (8/20µs)	Suppression signal shape (L-N), 8/20µs	Varistor with thermal cut-off; Control Gas Tube Discharge

Application, Futures:

Applications:

Computers
Servers
Telecommunication
Medical equipment
Sensitive electronic
Audio & Video
Industrial grade

Features:

Integrate Multi - Stage Protection System
Three Protection Stages
Bi-directional Wave Filtering
Expel Ground Contamination
Thermal Circuit Protection
High Reliability
Excellent Response Time

Metal Enclosures

ACDC SURGE PROTECTORS – Yellow Series

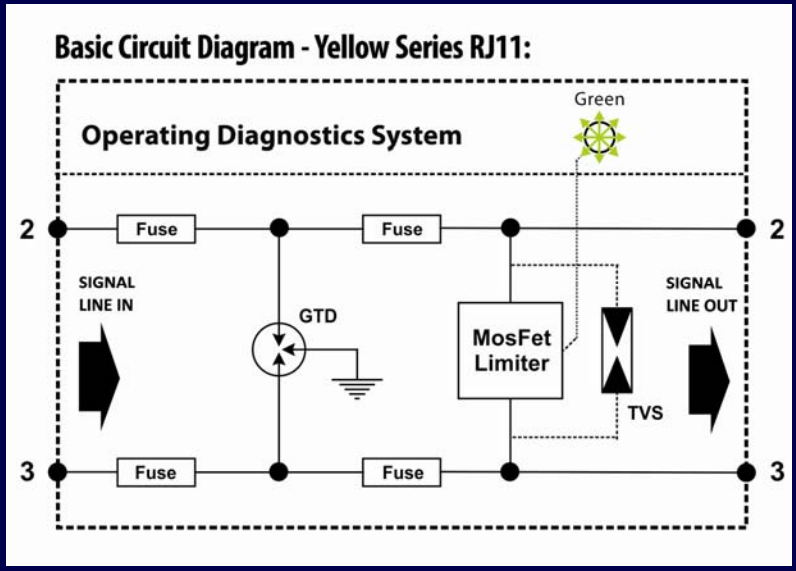
Main Characteristic:

- Three (3) STAGES SERIES PROTECTOR
- Plug- in Installation- RJ11

Specification:

- Transmission Speed: up to 30Mbps
- Maximum Line Voltage: 190VDC; 150VAC
- Total Surge Cur.: 16kA (8x20 µsec)
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Yellow Series

Models:

Signal Line	ACDC Surge Protectors Type - SL RJ11 Yellow Series	
	Type	Type - SL RJ11
	Order Code	900.115
	Total Surge Cur.	16kA (8/20µs)
	Dimension (WxDxHmm)	94x50x24
	Weight (kg)	0,12

Protection Stage	Technical Specification ACDC Surge Protector Type-SL RJ11 Yellow Series	Function	Technology
1. First stage	Surge Cur. 15kA (8/20µs)	Suppression signal shape 8/20µs	Gas Tube Discharge
2. Second stage	Surge Cur. 1kA (8/20µs)	Suppression signal shape 8/20µs	Transient Voltage Suppresor
3. Third stage	Power MOSFET Limiter 500A (8/20µs); Typical response <1nsec (nanosecond)	High speed efficiency signal suppression	Power MOSFET Voltage Suppressor

Application, Futures:

Applications:

- Telephone Lines
- ISDN
- ADSL
- Telecommunication
- Computers
- Audio & Video
- Security

Features:

- Integrate Multi - Stage Protection System
- Three Protection Stages
- Operation at Maximum Bandwidth
- No Signal Degradation
- Self Resetting Protection
- High Reliability
- Excellent Response Time

ACDC SURGE PROTECTORS – Yellow Series

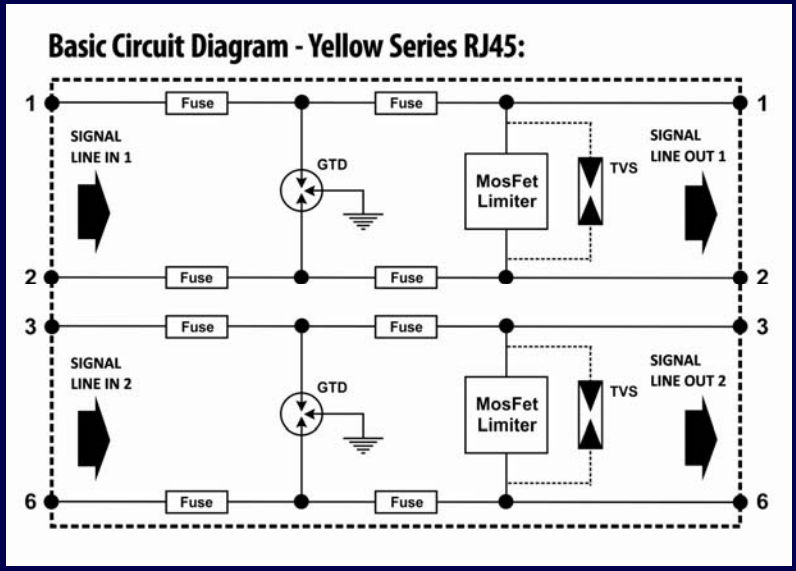
Main Characteristic:

- Three (3) STAGES SERIES PROTECTOR
- Plug- in Installation- RJ45

Specification:

- Transmission Speed: up to 100Mbps
- Maximum Line Voltage: 190VDC; 150VAC
- Total Surge Cur.: 32kA (8x20 µsec)
- Response Time: < 1ns

Basic Circuit Diagram:



ACDC SURGE PROTECTORS – Yellow Series

Models:

Signal Line	ACDC Surge Protectors Type - SL RJ45 Yellow Series	
	Type	Type - SL RJ45
	Order Code	900.116
	Total Surge Cur.	32kA (8/20µs)
	Dimension (WxDxHmm)	94x50x24
	Weight (kg)	0,15

Protection Stage	Technical Specification per line ACDC Surge Protector Type-SL RJ45 Yellow Series	Function	Technology
1. First stage	Surge Cur. 15kA (8/20µs)	Suppression signal shape 8/20µs	Gas Tube Discharge
2. Second stage	Surge Cur. 1kA (8/20µs)	Suppression signal shape 8/20µs	Transient Voltage Suppresor
3. Third stage	Power MOSFET Limiter 500A (8/20µs); Typical response <1nsec (nanosecond)	High speed efficiency signal suppression	Power MOSFET Voltage Suppressor

Application, Futures:

Applications:

- Telephone Lines
- ISDN
- ADSL
- Telecommunication
- Computers
- Audio & Video
- Security

Features:

- Integrate Multi - Stage Protection System
- Three Protection Stages
- Operation at Maximum Bandwidth
- No Signal Degradation
- Self Resetting Protection
- High Reliability
- Excellent Response Time

Market possibilities

The scope of applications of our products is quite wide and refers to the protection of electrical devices against impulse surge and high-frequency (electromagnetic) disturbance, oscillation, speaks in network power supply and atmospheric discharge.

The products are applicable in industries such as: Telecommunications, Data Centres, Broadcasts, Mobile Base Stations, Wireless systems, Airports, Refineries, Tank Farms, Hospitals, Electric Utilities, Nuclear Plants, Solar Photovoltaic, Wind Farms, Military, Defence Installations, Automation Control, Instrumentation, Home and office appliance.

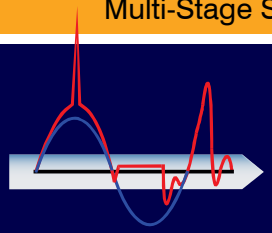
Our products extended equipment life and reduce their losses, downtime and errors.

Milestone

ACDC DCAC company have many international and domestic awards:

ACDC DCAC AWARDS:

- Gold Medal and Award at the International Innovations Fair in Seul, South Korea (4-8.12.2002);
- Grand-Pri and Goblet issued by the Fair for Innovations and Technical Achievement Makinova (22-27.10.2002);
- Gold Medal and Award at the International Innovations Fair in Serbia - Belgrade (8- 9.05.2003);
- Gold Medal and Award at the International Innovations Fair in Zagreb - Croatia "ARCA 2006" (22-27.09.2006);
- Patent of the Year 2007 from the "State Office of Industrial property" of the Republic of Macedonia (17.12.2007);
- Gold Medal and Award at the International IFIA exhibition 2007 Belgrade "Nikola Tesla" (29-31.10.2007);
- Gold Medal and Award at the International Trade Fair for technological Innovation "Brussels Innova & Energy 2007" Brussels, Belgium (22-28.11.2007);
- Special recognition from Europe Patent Organization - Skopje 22.04.2009;
- Grand-Pri and Goblet form Economic Chamber of Macedonia (19-23.10.2011)



Milestone

But we will mention

- **5000 multi-stage protections units are in use.**
- **Nor one burned equipments which are protected**
- **Our products are practically proved on the most critical sites from our users.**

Contact

ACDC DCAC doo

Tel.: + 389 2 3216 988
Fax.: + 389 2 3216 993
E-mail: acdc-dcac@acdc-dcac.eu
Web: www.acdc-dcac.eu
www.acdcprotection.com

Address: Dane Krapcev no.2/1, 1000-Skopje, Macedonia

Innovation products, Patented design, Simplest applying of standards IEC62305-4 & ANSI/IEEE C62.41.1-2 for surge protection