

Technical Note

Multi-Stage Surge Protection

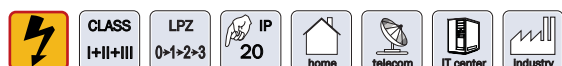
ACDC Surge Protectors Type - PI (780; 7100; 7125; 7200) - Green Series

EIGHT (8) STAGES SERIES PROTECTOR 1/1 & 3/3

Single Phase & Three Phase CLASS I+II+III

Hard Wire Installation - Modular System

- Cascade bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire
- Indication for bad grounding, remote alarm



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1. Introduction

This paper is summarizing the advantages of ACDC Surge Protectors and recent changes in approach of the Surge protection technology. That implies implementation of new methods, new materials and new design for surge protection of electrical devices which represent a significant improvements in this area.

Lightning strikes, dangerous surges and transients induced by lightning, as well as surges caused by motor switching and power supply regulation problems are direct threat to people, building facilities, electrical and electronic equipment.

No single technology can effectively protect from the damaging effects of lightning and induced transients, which can severely damage or destroy electronic systems.

Our concept of Multi-Stage surge protection consists of eight (8) protection stages in one compact unit. The products ACDC Surge Protector have built-in 5 (five) innovations (patents) and present a new advanced surge protection design.

In order to provide the optimum level of protection, ACDC DCAC has developed new integrated 8 (eight) stages surge protector that provides effective and reliable protection against surges and transients. Our approach includes integration of suppressors in compact multi-stage protection unit, new filtering design, option for ground filtering and new diagnostics system.

The ACDC Surge Protectors have a coordinated approach to lightning protection, surge and transient protection as well as grounding, an approach that embraces all aspects of potential damage. This integrated protection design is equipped with significantly more features and provides a higher level of performance.

The needs of this kind of coordinated integrated multi-stage surge protection is obvious with the appearance of new more sophisticated electrical equipment and in the same time more sensitive to power supply sags, black outs, induced voltage spikes...

The approach to integrated multi-stage surge protection system, significantly reduces the Total Cost* and presents an excellent choice for investment in the quality of power supply.

2. Application Guide

Application: Multi-stage surge protectors from Green Series have been developed specially to cater critical locations of today's electrical equipments from nonstandard over-voltage conditions high-frequency (electromagnetic) disturbance, oscillations, transients, spikes in power grid and atmospheric discharge.

They are focused on tracking the AC waveform eliminating so-called pollution in power AC supply.

These protectors have a special design to protect and improve functioning of sophisticated equipment in Telecommunications, Broadcast, Medical equipment, Computers, Military, Solar Photovoltaic and Residential.

Good power quality is impossible without removing AC power disturbances.

The ACDC Surge Protectors - Green Series have cascade EMI-RFI filtering of phase and neutral wire that provide reliable protection without ground contamination.

The ACDC Surge Protectors - Green Series completely eliminates frequency noise power pollution generated in power network supply.

This pollution equals losses, unreliable performance, decrease asset life-spans, increase maintenance and downtime.

This is the most advanced effective concept for protection for Mobile base station, telecommunication equipment, computer equipment;

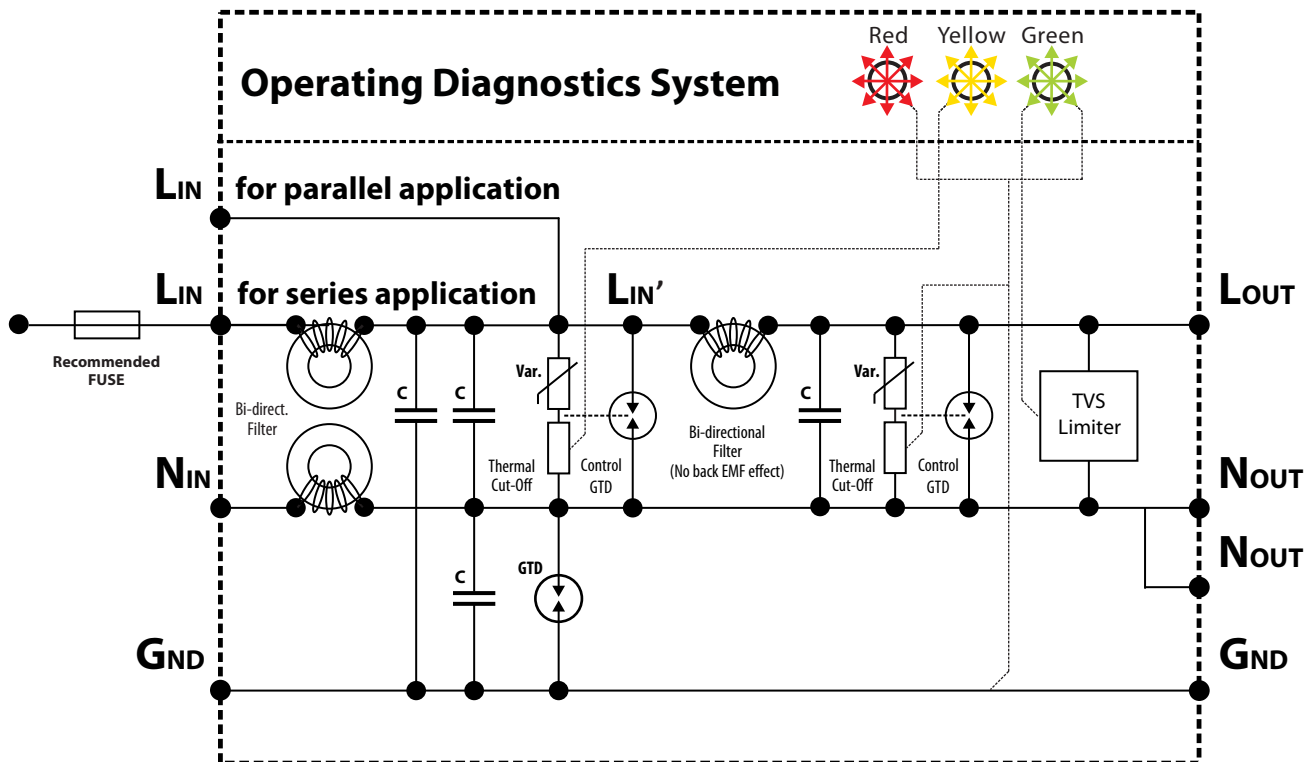
*Total Cost - Page no. 10;

3. Technical Specifications

ACDC Surge Protector Type - PI (780; 7100; 7125; 7200) Green Series is advanced multi-stage surge protector consists of 8 (eight) & 100A protection stages that provides effective and reliable protection against surges and transients. The protection device have high grade cascade bi-directional EMI/RFI filtering of phase (L) and neutral (N) wire and special diagnostic for condition of ground.

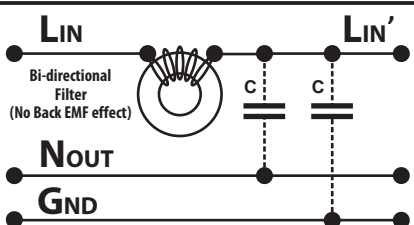
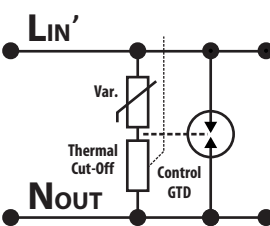
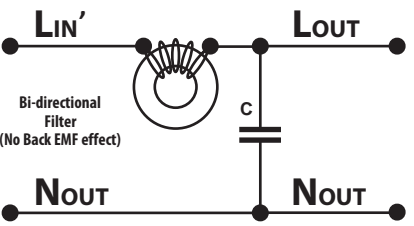
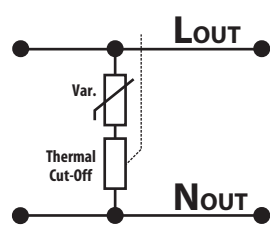
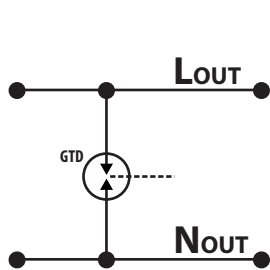
The protection unit consists of 8 (eight) protection stages for maximum load up to 100A per phase.

3.1 Basic Circuit Diagram - Green Series



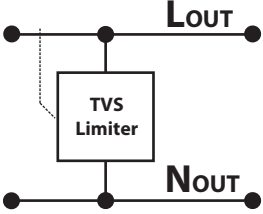
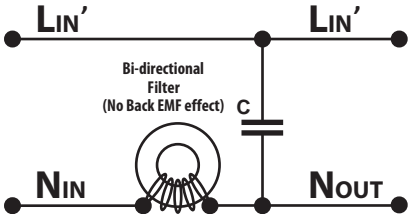
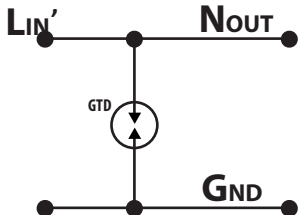
3.2 Eight (8) Stages Protector - Green Series

EIGHT (8) PROTECTION STAGES - Green Series





<p>Stage 1</p> 	<p>Function: Bi-directional EMI/RFI filtering (L-N) Front signal edge reduction</p> <p>Technical Specification: L = 0,7mH; I_{max} = up to 100A;</p> <p>Technology: Nano Crystalline Core (L-C configuration) Special bi-directional winding</p>
<p>Stage 2</p> 	<p>Function: Suppression signal shape: 8/20us or 10/350us</p> <p>Technical Specification: Surge Cur. 80 to 200kA (8/20us) or Surge Cur. 12,5 to 30kA (10/350us)</p> <p>Technology: Varistor with thermal cut-off Control Gas Tube Discharge</p>
<p>Stage 3</p> 	<p>Function: Bi-directional EMI/RFI filtering (L-N) Front signal edge reduction</p> <p>Technical Specification: L = 4.2mH; I_{max} = up to 100A;</p> <p>Technology: Nano Crystalline Core (L-C configuration) Special bi-directional winding</p>
<p>Stage 4</p> 	<p>Function: Suppression signal shape: 8/20us</p> <p>Technical Specification: Surge Cur. 25kA (8/20us)</p> <p>Technology: Varistor with thermal cut-off</p>
<p>Stage 5</p> 	<p>Function: Long term signal suppression from 1μs to 2 sec.</p> <p>Technical Specification: This stage is the last Ultimate protection level. He switch-off the circuits breaker install upstream 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.</p> <p>Technology: Controlled Gas Tube Discharge</p>



EIGHT (8) PROTECTION STAGES - Green Series

<p>Stage 6</p> 	<p>Function: High speed efficiency signal suppression</p> <p>Technical Specification: TVS Limiter 500A (8/20us); Typical response < 1ns (nanosecond)</p> <p>Technology: Transient Voltage Suppressor (patented)</p>
<p>Stage 7</p> 	<p>Function: Bi-directional EMI/RFI filtering (N-L) Front signal edge reduction</p> <p>Technical Specification: L = 0,7mH; Imax = up to 100A;</p> <p>Technology: Nano Crystalline Core (L-C configuration) Special bi-directional winding</p>
<p>Stage 8</p> 	<p>Function: Long term signal suppression shape (N-Gnd) 8/20us or 10/350us</p> <p>Technical Specification: Surge Cur. 80 to 200kA (8/20us) or Surge Cur. 12,5 to 30kA (10/350us)</p> <p>Technology: Gas Tube Discharge</p>

Operating Diagnostic Systems

<p>Normal:</p> <p>Continuous yellow and green</p>	<p>Red Yellow Green</p>  <p>Led Indication for correct stage no. 2,4,6 The stages no. 1,3 and 7 (high garde bi-directional filtering) are always in function along with ultimate (5-th) protection stage.</p>
<p>Fault:</p> <p>Continuous green</p>	<p>Red Yellow Green</p>  <p>Led Indication for correct stage no. 4,6 and un correct no. 2. The stages no. 1,3 and 7 (bi-directional filtering) are always in function along with ultimate (5-th) protection stage.</p>
<p>Fault:</p> <p>Blinking red</p>	<p>Red Yellow Green</p>  <p>Led Indication for poor grounding (Low impedance equipotential ground is not provided)</p>
<p>Fault:</p> <p>Continuous red</p>	<p>Red Yellow Green</p>  <p>Only stages 1,3 and 7 stages are still in function along with ultimate (5-th) protection stage.</p>

3.3 Technical Specification Type - PI 780; 7100; 7125; 7200 Green Series





Technical Specification per Phase ACDC Surge Protector - Green Series				
Type	Type PI 780 - GS	Type PI 7100 - GS	Type PI 7125 - GS	Type PI 7200 - GS
Order Code	800.115	800.116	800.117	800.118
Total Surge Current	Surge Cur. 105kA (8/20µs) or 15kA (10/350µs)	Surge Cur. 125kA (8/20µs) or 18kA (10/350µs)	Surge Cur. 150kA (8/20µs) or 22kA (10/350µs)	Surge Cur. 225kA (8/20µs) or 32kA (10/350µs)
Product Standard	IEC61643-1 Class I+II+III (B+C+D); IEC60939-2			
1. Stage	First Protection Stage			
Function	Bi-directional filtering EMI/RFI (L-N); Front signal edge reduction			
Technical Specification	L=0.7mH; I _{max} =up to 100A			
Technology	Nano Crystalline Core (L-C configuration)			
2. Stage	Second Protection Stage			
Function	Suppression signal shape (L-N), 8/20µs or 10/350µs			
Technical Specification	Surge Cur. 80kA (8/20µs) or 12,5kA (10/350µs)	Surge Cur. 100kA (8/20µs) or 15kA (10/350µs)	Surge Cur. 125kA (8/20µs) or 20kA (10/350µs)	Surge Cur. 200kA (8/20µs) or 30kA (10/350µs)
Technology	Varistor with thermal cut-off; Control Gas Tube Discharge			
3. Stage	Third Protection Stage			
Function	Bi-directional filtering EMI/RFI (L-N); Front signal edge reduction			
Technical Specification	L=4.2mH; I _{max} =up to 100A			
Technology	Nano Crystalline Core (L-C configuration)			
4. Stage	Fourth Protection Stage			
Function	Suppression signal shape (L-N), 8/20µs			
Technical Specification	Surge Cur. 25kA (8/20µs)			
Technology	Varistor with thermal cut-off			
5. Stage	Fifth Protection Stage			
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 upstream, if the pick voltage > 300VDC for (120 VAC) or 520VDC for (230 VDC) appears on the output. Circuits breaker should be < 250A g/gG.			
Technology	Controlled Gas Tube Discharge			
6. Stage	Sixth Protection Stage			
Function	High speed efficiency signal suppression			
Technical Specification	TVS Limiter 500A (8/20µs); Typical response < 1nsec (nanosecond)			
Technology	Transient Voltage Suppressor			
7. Stage	Seventh Protection Stage			
Function	Bi-directional filtering EMI/RFI (N-L); Front signal edge reduction			
Technical Specification	L=0.7mH; I _{max} =up to 100A			
Technology	Nano Crystalline Core (L-C configuration)			
8. Stage	Eight Protection Stage			
Function	Suppression signal shape (N-Gnd), 8/20µs or 10/350µs			
Technical Specification	Surge Cur. 80kA (8/20µs) or 12,5kA (10/350µs)	Surge Cur. 100kA (8/20µs) or 15kA (10/350µs)	Surge Cur. 125kA (8/20µs) or 20kA (10/350µs)	Surge Cur. 200kA (8/20µs) or 30kA (10/350µs)
Technology	Controlled Gas Tube Discharge			



3.4 Models of Surge Protectors - Green Series

Single and Three phase Models - ACDC Surge Protectors - Green Series

Guideline for ordering of ACDC Surge Protectors of Green Series

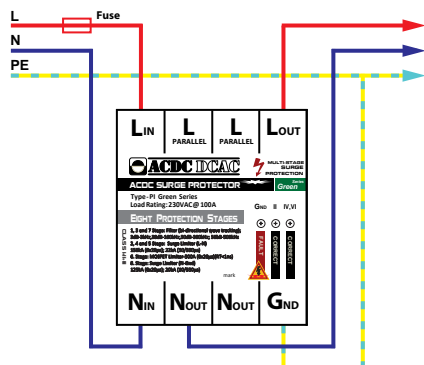
Technology:	Multi-Stage Surge Protection; Eight (8) Stages Series Protector				
Specification:	Cascade bi-directional EMI-RFI filtering of phase (L) and neutral (N) wire				
Load:	Up to 100A per phase; 12kW per phase for 120VAC; 22kW per phase for 230VAC				
Options:	Indication for bed grounding, remote alarm				
Installation:	Hard wire installation on Rail Din - Modular System				
Product Standard:	IEC61643-1 Class I+II+III; IEC60939-2				
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

* The Surge Protectors from series Type-PI 3/3-MCB-GS are delivered with phase and neutral filtering as model basic option. By customer request the model could be delivered for installation without neutral filtering or for parallel installation with additional mark WNF or P

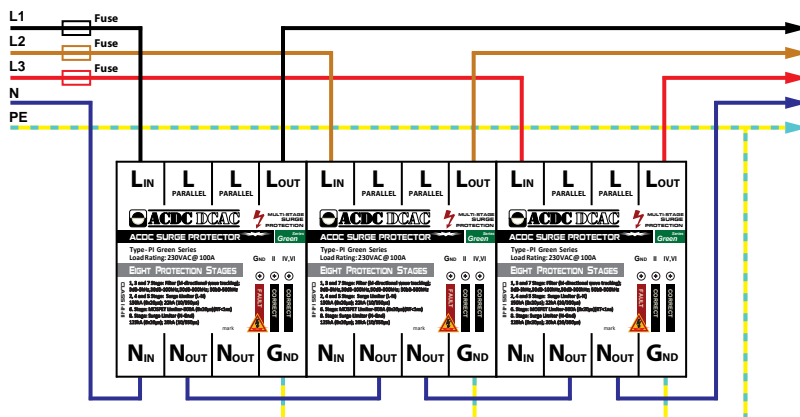
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3.5 Installation Instruction for TN-C-S, TN-S and TT distribution system

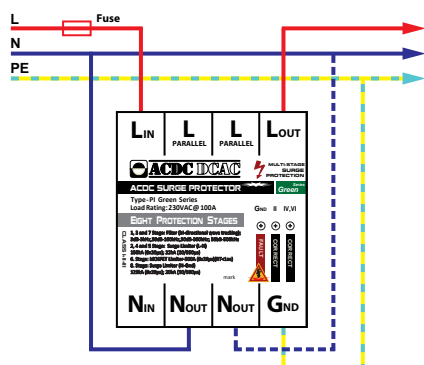
SERIES - Single Phase Installation with phase (L) and neutral (N) filtering



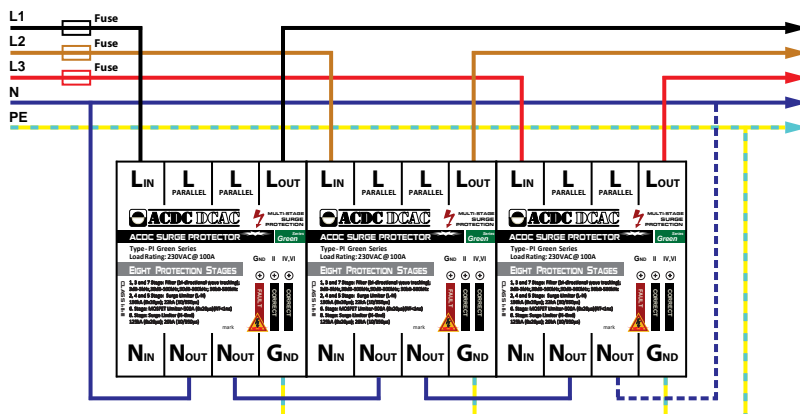
SERIES - Three Phase Installation with phase (L) and neutral (N) filtering



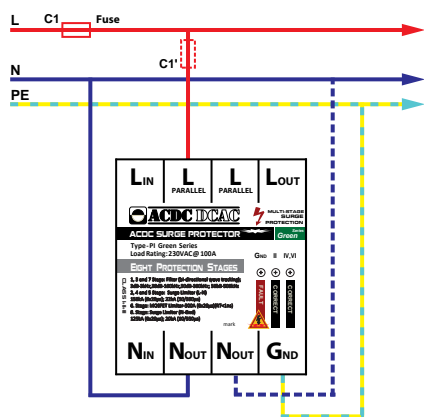
SERIES - Single Phase Installation with phase (L) and without neutral (N) filtering



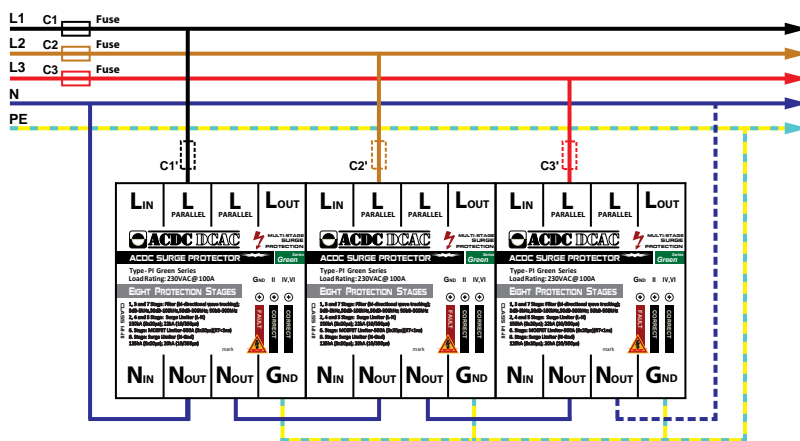
SERIES - Three Phase Installation with phase (L) and without neutral (N) filtering



**PARALLEL - Single Phase Installation
(for current > 100A per phase)**



**PARALLEL - Three Phase Installation
(for current > 100A per phase)**





4. Operation Diagnostic System

ACDC Surge Protectors Type-PI (780; 7100; 7125; 7200) Green Series have advanced operating diagnostics system with state indication of three protection stages (2,4 and 6). It also gave us information for appropriate installation and has special diagnostics for ground condition.

Operating diagnostics system consists of 3 LEDs:

Green, Yellow and Red that indicates three operating conditions of the Surge Protector:

4.1 Normal, 4.2 Damaged and 4.3 Fault Operating.

4.1 Normal Operation:

When the installation is made according to manufacturer instruction, Green and Yellow led are permanently ON.

- Yellow Led is indication for correct stage no. 2
- Green Led is indication for correct stage no. 4 and 6

If the stages 2,4 and 6 are out of function, the stages 1,3 and 7 are still provide a high grade bi-directional filtering along with ultimate fifth (5) protection stage.

4.2 Damaged Unit:

- If the surge protection stage no. 2 is burned or damaged the Yellow led will stop with continuous light.
- If the surge protection stages 4 and 6 are burned or damaged the Green led will stop to lit (with continuous light) and Red led will start to lit with continuous light.

4.3 Fault Operating:

Blinking of Red light indicates that low impedance of equipotent ground toward neutral is not provided.

In this situation the device can not guarantee 100% of protection of the electronic equipment. This situation is happening during an un appropriate installation or in the case when conditions of grounding is not satisfactory.

If Red led is lit continuous and user decide to replace ACDC Surge Protector is recommended to do that with the same series.

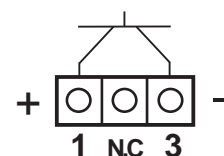
5. Free Contact Alarm

Every ACDC Surge Protector Type-PI (780; 7100; 7125; 7200) Green Series have free contact alarm as basic option. The alarm is active in two cases:

1. When some of the protection stages (2, 4 or 6) are damaged or burned and Red Led is ON. Alarm contacts 1-3 are permanently closed.
2. When impedance of equipotential ground toward neutral is not provided (poor grounding). Alarm contacts 1-3 are closing with frequency of 2Hz (0,5s) - Red led is blinking.

Free contacts are on the cover of the protector with contact no. 1 and 3. (see picture)

The contact is a opto coupler with maximum of 70VDC and current of 10mA. In normal condition they are opened.



6. Used Technology

Using the most recent accomplishments of the advanced Nano Crystalline core materials we have developed and designed new generation of Integrated Series SURGE Protection devices. These devices are with a high grade of EMI/RFI filtering for application up to 100A and 8 (eight) protection stages with total response time of 1nsec.

The surge protectors from - Green series have cascade EMI-RFI filtering of phase and neutral wire that provides most reliable protection without ground contamination.

Beside standard operating diagnostic system for each protection stage the device have additional signalization for ground condition. Every ACDC Surge Protector Type have free contact alarm as basic option.

Incorporating Nano Crystalline technology into a surge reduction filters represent a fundamental breakthrough in the overall design of the standard bi-directional filters.

Our new integrated protection designs are equipped with significantly more features and provide a higher level of performance achieved through new protection configurations, new materials and new approach to surge protection philosophy.

Nano crystalline core inductors, which are much smaller than non-saturating ferrite and air-core inductors, enable reduction of the dimensions and significant improvement of the final performances.

These benefits are reduced size, weight and heat dissipation. This combination of functions results in enhanced efficiency against transient over-voltages (low clamping voltage) and RF interferences.

High current capability, up to 100A, makes these protectors ideal equally for low power sensitive electrical devices and for industrial application.

ACDC Surge Protectors present a Multi-Stage Surge Protection composed of 8 (eight) surge protection stages. It is from class I + II + III according to standard IEC61643-1. He also meets the standards for protection of devices from electromagnetic (radio) interference IEC60939-2.

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

The second part of innovation is simple and easy application of ACDC Surge Protectors applying of international protection standards (IEC 62305-4 & 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).

With simple words, design and planning of surge protection is not any more reserved just for experts in this field. It's become simple and applicable from professions such as planners, construction engineers, designers, electricians and others.

These two innovations regarding used technology (Multi-Stage design) and simplest application for surge protection of devices are remarkable advantage toward other surge products which can be find on worldwide markets.

Using of ACDC Surge Protectors are excellent choice for the INVESTMENT in quality of your power network supply.

Our products, manufactured in accordance with the highest quality standards, can offer safety covered by the latest state of the technology.

7. 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:

7.1 Applying standard IEC 62305 & ANSI/IEEE C62.41.1-2 (Lightning international protection standard) requires several independent surge protectors installed separately in each boundary protection zone LPZ0a/LPZ0b-LPZ3 & C-A. ACDC Surge Protector presents multi-stage protection system with 8 (eight) protection stages in one device, expelling the need of use of surge protectors in other protection zones, while reducing surge current up to 99.9% (at single point).

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

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

7.4 Expel need for coordinated protection.

7.5 Reduce the cost of protector installation.

7.6 Reduce space requirements.

7.7 Lower maintenance expenditures.

7.8 Extremely high protection efficiency and reliability.

7.9 Reduced cost of maintenance of the protected equipment regarding higher MTBF.

7.10 ACDC Surge Protectors are excellent choice for investment in quality of your power network supply. If the stages 2, 4 and 6 are out of function, the stages 1, 3 and 7 are still provide a high grade cascade bi-directional filtering among with ultimate (5-th) protections stage.

7.11 Recommended usages of integrated multi-stage surge protection system ACDC Surge Protectors on sites were standard IEC 62305 & ANSI/IEEE C62.41.1-2 was not implemented on boundary zones LPZ0a/LPZ0b-LPZ3 & C-A or in case of absence of any surge protectors.

8. Advantages

With built in 8 (eight) protection stages, ACDC DCAC customers are able to implement the most effective and reliable protection solution against surges and transients.

ACDC Surge Protector - Green Series as multi-stage protection have following advantages:

8.1 ACDC 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;

8.2 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

The ACDC Surge Protectors - Green Series have cascade EMI-RFI filtering of phase and neutral wire that provide reliable protection without ground contamination.

seamlessly merges the two different protection technologies. The unique multistage design provides the most advanced power filter protector;

8.3 The ACDC Surge Protector is Multi-Stage Surge Protector of class I+II+III in one device according to IEC 61643-1 that reduced surge events in excess of 99% at a single point. They also full fill standard requirements for electromagnetic (radio) interference IEC 60939-2;

8.4 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;

8.5 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...);

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

8.7 Reducing TOTAL cost regarding number of necessary install surge protector at each protection boundary zones C-A & LPZ0a/LPZ0b-LPZ3;

8.8 Reducing TOTAL cost regarding efficiency, reliability, installation, space requirements and maintenance;

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

8.10 The ACDC Surge Protectors provide a clean, multi-stage filtered power supply with a high grade of attenuation and current capability of up to 100A to all connected units;

8.11 The design of the protectors is specially adapted for new demands in protection of switch mode power supplies in computers, servers, telecommunication, medical and military equipment providing a higher level of performance;

8.12 Those performances are achieved using New materials, New design and New approach of surge protection philosophy (Nano Crystalline core materials and semiconductors);

8.13 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 (buildings). This is most advanced effective concept for protection for Mobile base station, telecommunication equipment, computer equipment;

9. Reliability

Usage of ACDC Surge Protectors Type -PI (780; 7100; 7125; 7200) Green Series is excellent choice for the investment in quality of your power network supply, extended equipment life and reduce their down time and errors.

9.1 If protector 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.

9.2 If users decide to replace ACDC Surge Protectors is recommended to do that with same series.