"ZNR®" Transient/Surge Absorbers, Series V, Type D "ZNR®" Transient/Surge Absorbers, Type CF and SF (SMD)

Precautions for Handling

The "ZNR" Transient/Surge Absorbers (hereafter referred to as "The ZNR Varistors") may fail in a short-circuit mode or in an open-circuit mode, when subjected to severe conditions of electrical, environmental and/or mechanical stresses beyond their specified "Ratings" and specified "Conditions", resulting in burnout, flaming or glowing in the worst case.

Following " \triangle Precautions for Safety" and "Application Notes" shall be taken in your major consideration. If you have a question about the "Precautions for Handling", please contact our engineering section or factory.

1. A Precautions for Safety

1.1 Operating Conditions

- 1.1.1 The ZNR Varistors shall not be operated beyond the specified "Ratings" and "Environmental Conditions" in the Catalog or the Specifications to prevent them from deterioration, breakdown, flaming or glowing.
 - The ZNR Varistors shall not be operated exceeding the specified "Maximum Allowable Voltage" in the Catalog or the Specification.
 - The ZNR Varistors shall not be subjected to energy levels above their specified "Maximum Energy Ratings" in the Catalog or the Specifications.
 - In case of application to repeated surge/ overvoltages, the ZNR Varistors shall not be subjected to surge currents and energy levels above the specified maximum ratings in "Impulse Life Rating" in the Catalog or the Specifications.
 - When surge/overvoltages are intermittently applied to the ZNR Varistors with short durations, the devices shall not be operated beyond the specified "Rated Power" in the Catalog or the Specifications.
 - The ZNR Varistors shall not be operated beyond the specified "Operating Temperature Range" in the Catalog or the Specifications.
 - It is recommended that the ZNR Varistors, if not fused, shall be located away from other combustibe components.
- **1.1.2** The ZNR Varistor shall be operated correctly under following conditions to prevent Varistors from causing mechanical damages and ruptures and to protect human from serious in juries;
 - The ZNR Varistors shall not be operated exceeding the specified "Maximum Allowable Voltage Ratings" in the Catalog.
 - The ZNR Varistors shall not be operated beyond the "Maximum Peak Current Ratings" in the Catalog.
 - Some safety countermeasure such as a protective case covering the Varistor is recommended, if necessary.

2. A Warning

- 2.1 When the ZNR Varistors are applied to between a live part and a metallic chassis of equipment, following safety countermeasures shall be taken to protect human from electric shock.
 - A) The metallic chassis shall be earthed to the ground.
 - B) The live part shall be equipped with a protective cover for preventing electric shock.

3. Application Notes

3.1 Protective Devices for Varistors

- **3.1.1** The ZNR Varistors shall be protected from serious accidents due to unexpected physical phenomenor by following safety countermeasures.
 - In case of "Across-the Line Use", the ZNR Varistors shall be protected by connecting a ground fault circuit interrupter of fusing in series to the devices. (See Table 1)
 - In case of "Line to Ground Use", the short-circuit of the Varistor may not blow the current type fuse due to the grounding resistance (between Line and Ground), which may cause flaming or burnout of the devices in the worst case.

Following safety countermeasures (A or B) are recommended;

- A) Connecting a "leakage current circuit breaker" in series to the Varistor to be protected. (See Table 1)
- B) Use current type fuses and a thermal type fuse which are thermally coupled each others. (See Table 1)

Panasonic

Table 1. (Line Protection)

			/							
		Across-the-Line/Line to Line Protection					Line to Line and Line to Ground Protection			
		DC					DC			
		AC Single phase					AC Single phase			
							ZNR1 Z			
	s						ZNR2, ZNR2			
	S	o								
	Ğ	f : fuse					f : fuse			
	Jue	AC three phase					AC three phase			
	õ	Au miee phase					f ZNR3			
	Ŭ									
		f ZNR3 ZNR3								
							Thermal F===== Temp. Fuse			
		f : fuse				f : fuse				
S		Across the Line Use/Line to Line				Line to Ground Use				
ple		ZNR	Nominal	minal Part Number of ZNR		ZNR	Nominal Part Number of ZNR			
am			Line Voltage	Type D	Type CF/SF		Line Voltage	Type D	Type CF/SF	
Ш			AC 100 V	ERZV 201	ERZAA1MK201	ZNR2	AC 100 V AC 220 V	ERZV 471	ERZAA1MK471	
Ę				ERZV 221	ERZAA1MK221			ERZV 511		
lici	Selection Examples	ZNR1		ERZV 241	ERZAA1MK241			ERZV		
<u>i</u>				ERZV 271*	ERZAA1MK271*			higher Varistor Voltage		
dd			AC 120 V	ERZV 241	ERZAA1MK241			ERZV 182***		
∢				ERZV 271	ERZAA1MK271			ERZV 511		
				ERZV 331*			AC 230 V	ERZV 821**or		
		ZNR3	AC 200 V	ERZV 471	ERZAA1MK471	ZNR4	AC 240 V	higher Varistor Voltage		
			AC 220 V	ERZV 471	ERZAA1MK471			ERZV 182***		
			AC 240 V	ERZV 511			AC 380 V	ERZV 112**or		
			AC 380 V	FBZV 821				higher Varistor Voltage		
			110 000 1		ļ			ERZV 182**		
		Notoe:								
			Element siz	ze [.] "05" "07" "	10""14" or"20"					
		2. Element size: "10". "14" or "20"								
		3. $\wedge \wedge$: Type CF or Type SF								
		<u> </u>	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						

3.2 Circuit Design 1 (Selection of Varistor Voltage Rating)

3.2.1 General Precautions

In selection of Varistor Voltage Ratings for line protection, following general precautions shall be taken in your consideration;

- (1)Maximum operating voltage shall be lower than the specified "Maximum Allowable Voltage" of the Varistor applied.
- (2)Some reasonable margin is required against fluctuation of the primary AC line Voltage where the Varistor is applied for preventing mechanical and/or electrical failures of the device.

3.2.2 Across-the-Line Use

(Line to Line surge protection)

- Select the ZNR Varistors recommended in Table 1.
- Notes: Because the primary line voltage temporarily rises due to load unbalance of separately wired loads, short circuit between the live line and the nutral line or LC resonance at switching for a capacitive load, ZNR Varistors with ***** are recommended for AC120 V or 240 V applications. (See Table 1)

3.2.3 Line to Ground Use

(Line to Ground Surge protection)

- Select the ZNR Varistors recommended in Table 1.
- Notes: When 500 V insulation resistance test of the circuits employing ZNR Varistor is conducted, the ZNR Varistor shall be removed after getting approval from the customer, or the ZNR Varistor *** *** with the Maximum Allowable Voltage exceeding to the test voltage shall be applied. (See Table 1)

When AC1000 V or 1200 V dielectric with standing test is conducted, ZNR Varistors shall be removed after getting approval from the customer according to the relevant regulations, or ZNR Varistor *** * *** with the Maximum Allowable Voltage exceeding to the test voltage shall be applied. (See Table 1)

3.3 Circuit Design 2 (Fusing Varistors)

3.3.1 Fusing The ZNR Varistors

• For Varistor protection, it is recommended to select suitable fuses in Table 2.

• The recommended fuse locations are shown in Table 1.

Table	e 2.
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Part No.	ERZV05D	ERZV07D	ERZV09D	ERZV14D	ERZV20D		
Recommended Fuse* Ratings	3 A max.	5 A max.	7 A max.	10 A max.	10 A max.		
Part No.	ERZCF1M	ERZSF1MK	Notes: * The voltage rating of fuse shall be appropriate to the circuit a plied				
Recommended Fuse* Ratings	3 A max.	5 A max.	 ** In application to CSA Safety Standard, the rating of applicab fuse shall conform to CSA class 2221 01. 				

3.3.2 When a line current of equipment is higher than the recommended current rating of the fuse in Table 2, the location of the fuse shall be arranged according to Fig 2.

3.4 Environmental Conditions

- (1)The ZNR Varistors shall not be exposed outdoors, because of being designed for indoors use.
- (2)The ZNR Varistors shall not be operated beyond the Specified Operating Temperature Range and shall not be exposed to direct sunlight and heating part of equipment.
- (3)The ZNR Varistors shall not be operated under severe conditions of high temperatures and high humidities such as places exposed to rain, wind and vapor.
- (4) The ZNR Varistors shall be free from dust, salty wind and atomospheres polluted by corrosive gas.

3.5 Precautions for Assemblies and Handlings

3.5.1 Solvent Cleaning

Organic solvents such as thinner and acetone etc. shall not be applied to the ZNR Varistors for preventing deterioration of the external coating or molding resin.

3.5.2 Abnormal Mechanical Stresses

Abnormal mechanical stresses beyond the specified values such as strong falling shocks, ribrations and bending/pulling forces, shall be kept minimum to prevent mechanical/electrical failures of the

devices.

3.5.2 Plastic Molding If another plastic molding is applied to the ZNR Varistors on your option, the influences on reliability of the ZNR Varistors shall be carefully investigated in your equipment.

fuse shall conform to CSA class 2221 01.



Fig. 2 Alternative Fuse Location/placement for Varistor Protection

3.5.3 Soldering Conditions

In soldering of the ZNR Varistors, the soldering conditions shall conform to the each individual specification of the device for prevent mechanical/ electrical failures.

3.6 Long Term Storage

- (1)The ZNR Varistors shall not be stored under severe conditions of high temperatures and high humidities. Store them indoors under 40 °C max. and 75 %RH max. Use them within one year, if stored beyond the limit, check the solderbility before use.
- (2)The ZNR Varistors shall not be stored under corrosive atomospheres such as hydrogen sulfide, sulfurous acid, chlorine and ammonia.
- (3)The ZNR Varistors shall not be exposed to direct sunlight and shall not be stored under dew formation.

3.7 Regarding to "Safety Regulations of the Varistors"

In case of applications to UL and CSA standards, refer to "Application Notes for UL and CSA Recognized" ZNR "Varistors"

3.8 Parallel Capacitances of the ZNR Varistors

The ZNR Varistors have relatively high capacitances specified in the individual specifications, special consideration shall be taken into account i n

applications to high frequency transmission lines or circuits.

Design, Specifications are subject to change without notice. Ask factory for technical specifications before purchase and/or use. Whenever a doubt about safety arises from this product, please inform us immediately for technical consultation without fail.