

“ZNR®” Transient/Surge Absorbers, Type E **“ZNR®” Transient/Surge Absorbers, Type CK**

Handling Precautions

1. ⚠ Safety Precautions

“ZNR” Transient/Surge Absorbers (hereafter referred to as “ZNR Varistors”) may fail in either a short or open-circuit mode when subjected to severe conditions of electrical, environmental and/or mechanical stresses (beyond their specified “Ratings” and “Conditions”). Worst case failure may result in glowing, flaming or burnout.

The following “⚠ Safety Precautions” and “Application Notes” should be taken into major consideration. For further questions regarding the “Handling Precautions”, please contact our engineering section or factory.

1.1 ⚠ Operating Conditions

1.1.1 ZNR Varistors should not be operated beyond their specified “Ratings” or “Environmental Conditions” in the Catalog or the Specifications to prevent them from deterioration, breakdown, flaming or glowing.

- ZNR Varistors should not be operated exceeding their specified “Maximum Allowable Voltage”.
- ZNR Varistors should not be subjected to energy levels above their specified “Maximum Energy Ratings”.
- In case of exposure to repeated surge/overvoltage, the ZNR Varistors should not be subjected to surge currents and energy levels above the specified maximum ratings in the “Impulse Life Rating” section or Individual Specifications.
- When surge/overvoltages are intermittently applied to ZNR Varistors in short durations, the devices should not be operated beyond their specified “Rated Power”.
- ZNR Varistors should not be operated beyond their specified “Operating Temperature Range”.
- It is recommended that ZNR Varistors, if not fused, should be mounted away from other combustible components.

1.1.2 ZNR Varistor must be operated correctly under the following conditions to prevent mechanical damages and ruptures and to avoid serious injuries;

- ZNR Varistors should not be operated in excess of their specified “Maximum Allowable Voltage Rating”.
- ZNR Varistors should not be operated beyond their “Maximum Peak Current Ratings”.
- Some safety countermeasures such as a protective case covering the Varistor are recommended; If additional safety is required for the application.

1.1. 3 When ZNR Varistors are used between a live part and a electrically conductive chassis, follow safety countermeasures to avoid electric shock.

- A) The metallic chassis should be grounded.
- B) The live part should be have a protected cover to prevent contact and potential electric shock.

2. Application Notes

2.1 Usage Precautions

2.1.1 ZNR Varistors should be protected from accidental failure by following the cautionary notes:

- In case of “Across-the Line Use”, ZNR Varistors should be protected by connecting a fuse in series to the devices. (See Table 1)
- In case of “Line to Ground Use”, a short-circuit condition of the Varistor may not blow the current type fuse due to the grounding resistance (between Line and Ground), and may cause flaming or burnout of the device. (in the worst case)

The following safety countermeasures (A or B) are therefore recommended;

- A) Connect 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 thermally coupled each other. (See Table 1)

2.2 Circuit Design 1

(Selection of Varistor Voltage Rating)

2.2.1 General Precautions

In the selection of Varistor Voltage Ratings for line protection, the following general precautions should be taken into consideration;

(1)Maximum operating voltage must be lower than the specified “Maximum Allowable Voltage”.

(2)Some reasonable margin is required against fluctuation of the primary AC line Voltage where the Varistor is used to prevent mechanical and/or electrical failure of the device.

2.2.2 Across-the-Line Use

(Line to Line surge protection)

- Select ZNR Varistors recommended in Table 1.

Notes: Because the primary line voltage temporarily rises due to load unbalance of separated wired loads, short circuit between the live line and the neutral 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)

2.2.3 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, ZNR Varistor should be removed after getting approval from the customer, or the ZNR Varistor * * with the Maximum Allowable Voltage exceeding the test voltage should be applied. (See Table 1)

When AC1000 V or 1200 V dielectric with standing test is conducted, ZNR Varistors should be removed after getting approval from the customer according to the relevant regulations, or ZNR Varistor * * *

(See Table 1)

2.3 Circuit Design 2 (Fusing Varistors)

2.3.1 When a line current of equipment is higher than the recommended current rating of the fuse in Table 2, the location of the fuse should be arranged as shown in Fig 2.

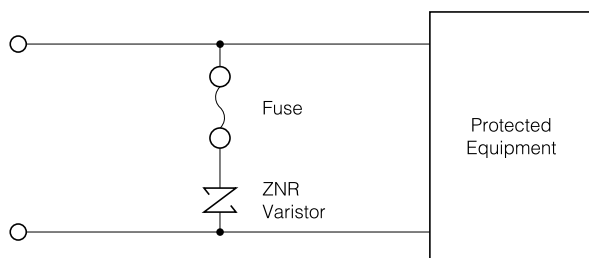


Fig. 2 Alternative Fuse Location/placement for Varistor Protection

2.4 Environmental Conditions

- (1)ZNR Varistors are designed for indoors use only.
- (2)ZNR Varistors should not be exposed to direct sunlight and heating part of equipment.
- (3)ZNR Varistors should not be operated under severe conditions of high temperature and/or high humidity such as places exposed to rain, wind and water condensation.
- (4)ZNR Varistors should not be exposed to dusty environments or atmospheres of salt water or corrosive gas.

2.5 Precautions for Assemblies and Handlings

2.5.1 Solvent Cleaning

Organic solvents such as thinner, acetone, etc. should not be applied to the ZNR Varistors to prevent deterioration of the external coating or molding resin.

2.5.2 Abnormal Mechanical Stresses

Abnormal mechanical stresses beyond the specified values (such as excessive shocks, vibrations and bending/pulling forces) should be kept to a minimum prevent mechanical/electrical failures of the devices.

2.5.3 Plastic Molding

If an optional plastic molding is applied to ZNR Varistors, the effects on reliability of ZNR Varistors should be carefully investigated.

2.6 Long Term Storage

- (1)ZNR Varistors should not be stored under severe conditions of high temperature and/or high humidity. Store them indoors under 40 °C max. and 75 %RH max. Store and use them within one year of manufacture date. Check the solderability before use.
- (2)ZNR Varistors should not be stored under corrosive atmospheres such as hydrogen sulfide, sulfuric acid, chlorine, and ammonia.
- (3)ZNR Varistors should not be exposed to direct sunlight and should not be stored under high water condensation.

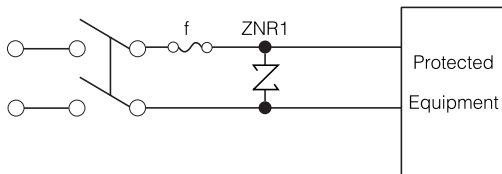
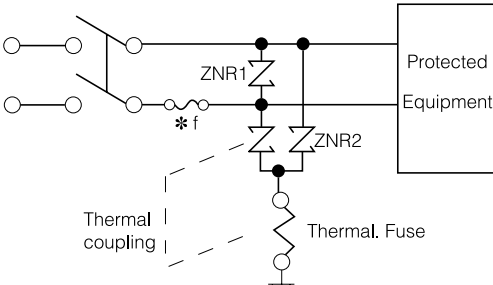
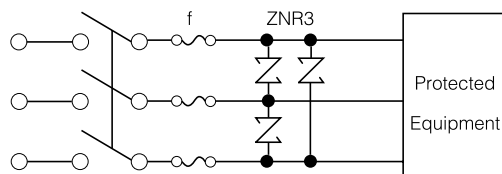
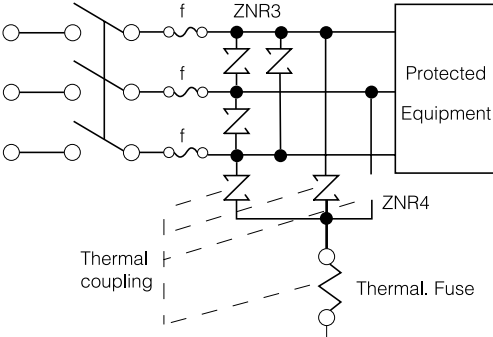
2.7 Regarding to “Safety Regulations of the Varistors”

In case of applications to UL and CSA, refer to the “Application Notes for UL and CSA Recognized” ZNR “Varistors”

2.8 Parallel Capacitances of ZNR Varistors

ZNR Varistors have relatively high capacitances specified in the Individual specifications, special consideration should be taken into account in applications to high frequency transmission lines or circuits.

Table 1. Application Examples

Connections	Across-the-Line/Line to Line Protection			Line to Line and Line to Ground Protection		
	D.C. A.C. Single phase			D.C. A.C. Single phase		
						
	f : fuse			f : fuse		
A.C. 3 phase			A.C. 3 phase			
						
f : fuse			f : fuse			

Selection Examples	Type CK	Across the Line Use/Line to Line			Line to Ground Use		
		ZNR	Nominal Line Voltage	Part Number of ZNR	ZNR	Nominal Line Voltage	Part Number of ZNR
		ZNR1 ZNR3	A.C. 100 V	ERZC□□CK201 ERZC□□CK241 ERZC□□CK271*	ZNR2 ZNR4	A.C. 200 V to A.C. 220 V	ERZC□□CK471 ERZC□□CK511 ERZC□□CK821 to **
			A.C. 120 V	ERZC□□CK241 ERZC□□CK271*			
			A.C. 200 V to A.C. 220 V	ERZC□□CK471		A.C. 240 V	ERZC□□CK511 ERZC□□CK821 to **
			A.C. 240 V	ERZC□□CK511			
	Type E	Across the Line Use/Line to Line			Line to Ground Use		
		ZNR	Nominal Line Voltage	Part Number of ZNR	ZNR	Nominal Line Voltage	Part Number of ZNR
		ZNR1 ZNR3	A.C. 100 V	ERZC□□EK201 ERZC□□EK241 ERZC□□EK271*	ZNR2 ZNR4	A.C. 100 V to A.C. 220 V	ERZC□□EK471 ERZC□□EK511 ERZC□□EK821 to **
			A.C. 120 V	ERZC□□EK241 ERZC□□EK271*			
			A.C. 200 V to A.C. 220 V	ERZC□□EK471		A.C. 240 V	ERZC□□EK511 ERZC□□EK821 to **
			A.C. 240 V	ERZC□□EK511			

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