

Application Notes

● **Line protection**

Connections	Line to Line protection		Line to Line and Line to Ground protection																																									
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	Line to Line	<table border="1"> <thead> <tr> <th>VCR</th> <th>Line Voltage</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td rowspan="5">VCR1</td> <td>DC 12V</td> <td>VCR□□D220K</td> </tr> <tr> <td>DC 24V</td> <td>VCR□□D390K</td> </tr> <tr> <td rowspan="3">AC 120V</td> <td>VCR□□D221K</td> </tr> <tr> <td>VCR□□D241K</td> </tr> <tr> <td>VCR□□D271K</td> </tr> <tr> <td rowspan="2">AC 240V</td> <td>VCR□□D431K</td> </tr> <tr> <td>VCR□□D431K</td> </tr> <tr> <td rowspan="5">VCR3</td> <td rowspan="3">AC 240V</td> <td>VCR□□D431K</td> </tr> <tr> <td>VCR□□D471K</td> </tr> <tr> <td>VCR□□D511K</td> </tr> <tr> <td>AC 380V</td> <td>VCR□□D821K</td> </tr> <tr> <td>AC 415V</td> <td>VCR□□D911K</td> </tr> <tr> <td>AC 480V</td> <td>VCR□□D112K</td> </tr> </tbody> </table>	VCR	Line Voltage	Part Number	VCR1	DC 12V	VCR□□D220K	DC 24V	VCR□□D390K	AC 120V	VCR□□D221K	VCR□□D241K	VCR□□D271K	AC 240V	VCR□□D431K	VCR□□D431K	VCR3	AC 240V	VCR□□D431K	VCR□□D471K	VCR□□D511K	AC 380V	VCR□□D821K	AC 415V	VCR□□D911K	AC 480V	VCR□□D112K	Line to Ground	<table border="1"> <thead> <tr> <th>VCR</th> <th>Line Voltage</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td rowspan="3">VCR1</td> <td rowspan="3">DC 120V</td> <td>VCR□□D431K</td> </tr> <tr> <td>VCR□□D471K</td> </tr> <tr> <td>VCR□□D751K</td> </tr> <tr> <td rowspan="2">AC 240V</td> <td colspan="2">Or higher varistor voltage VCR□□D182K ***</td> </tr> <tr> <td rowspan="2">AC 380V</td> <td colspan="2">VCR□□D112K Or higher varistor voltage VCR□□D182K</td> </tr> </tbody> </table>	VCR	Line Voltage	Part Number	VCR1	DC 120V	VCR□□D431K	VCR□□D471K	VCR□□D751K	AC 240V	Or higher varistor voltage VCR□□D182K ***		AC 380V	VCR□□D112K Or higher varistor voltage VCR□□D182K	
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Line to Line		Line to Ground	<p>Notes</p> <ol style="list-style-type: none"> When the 500V insulation Resistance test of the circuits employing VCR is conducted, VCR shall be removed after getting approval from the customer, or VCR ** with the Maximum allowable Voltage exceeding to test voltage shall be used. When the 1000V withstanding voltage test is conducted. VCR shall be removed after getting approval from the customer according to the relevant regulations. or VCR ** with the Maximum allowable Voltage exceeding to the test voltage shall be used. to avoid Vcr failure caused by the ground fault,VCR with higher varistor Voltage listed in the table shall be used for the AC 120V line to ground application. 																																									

Notes

- Maximum operating voltage shall be lower than Maximum Allowable Voltage of VCR
- VCRs with are recommended for single phase,3 wire applications to withstand a temporary over voltage caused by unbalanced load.

Application Notes

Switching surge protection, semiconductor protection and contact spark suppression

	Switching surge protection	Semiconductor protection	Contact spark suppression
Circuit			
Selection example	Selection examples		Note for selection
	Voltage	Part Number	
	Dc 12V	VCR..D220k	
	Dc 24V	VCR..D390k	
	Dc 100V	VCR..D151k	
AC 120V	VCR..D221k VCR..D241k VCR..D271k		
			1. The Maximum Allowable Voltage of SVR shall be higher than maximum operating voltage at all times. 2. Energy handling capability (energy or wattage rating) of VCR shall be selected by studying switching surge energy from the inductive load.

Caution:

1. Refer to the mentioned caution described in power line protection.
2. The relation between surge current repetition and VCR ratings is drawn in the VCR's impulse life characteristics.
3. Capacitor connection in patrolter VCR is recommended for a contact suppression.

Signal line and telephone line surge protection

	Protection			
	Signal line		Telephone line	
Circuit				
Selection example	Selection examples		Selection examples	
	Signal Line Voltage	Part Number	VCR	Part Number
	Dc 12V/max	VCR □□ D180L VCR □□ D220K	VCR1	VCR □□ D331K VCR □□ D361K
	Dc 24V	VCR □□ D390L	VCR2	VCR □□ D151K
	Dc 48V	VCR □□ D820K		
Dc 100V	VCR □□ D201L			

Note: VCR has relatively high capacitance, special attention shall be paid for it in high frequency circuits.

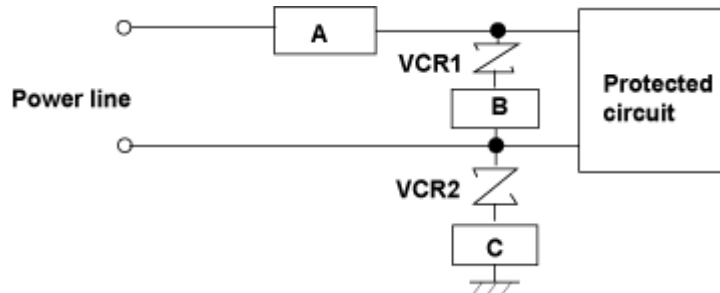
Caution: Refer to the power line protection.

Application Notes

Application examples			Note for selection
Protected circuit	Location	Part Number	The special using conditions of the individual protected circuit shall be taken into account for VCR selection in addition to the general selection procedure.
Home Appliances	Indoor	VCR05D□□□K VCR07D□□□K VCR10D□□□K	
	Outdoor	VCR07D□□□K VCR10D□□□K VCR14D□□□K	
Communications Measurements Controls	Indoor	VCR07D□□□K VCR10D□□□K VCR14D□□□K	
	Outdoor	VCR10D□□□K VCR14D□□□K VCR20D□□□K	
Consumer industrial	Indoor, Outdoor	VCR14D□□□K VCR20D□□□K	

CAUTION:

1. A Surge excess of the specified Maximum Peak Current may cause short circuit or mechanical damage. The following measures are recommended.



- (1) Location of the over current protector (circuit breaker or current fuse) shall be in the power line to the circuit (Location A) or in series with VCR (Location B).

Part Number	VCR05D□□□K	VCR05D□□□K	VCR05D□□□K	VCR05D□□□K	VCR05D□□□K
Fuse rating	1 to 2A	2 to 3A	3 to 5A	5 to 10A	5 to 15A

- (2) It is recommended that a fuse listed in the table shall be put in location A or B.
- (3) In case that VCR is used in line to ground, the ground fault circuit interrupter shall be applied in location A or thermally coupled fuse shall be applied in location C.
- (4) VCR shall not be used near the flammable materials.
2. When VCR is molded at en-used, molding resin materials shall be carefully selected, otherwise VCR's long-term stability could degrade.
3. VCR shall not be used near heat generating device and free from direct sunlight. VCR shall be used within the specified Operating Temperature Range.
4. VCR shall be free from dust, metal power, and dew and sea wind. A protective box is recommended to prevent the unit from those.

Application Notes

MODEL NUMBER 5mm	MODEL NUMBER 7mm	MODEL NUMBER 10mm	MODEL NUMBER 14mm	MODEL NUMBER 20mm	主要用途 Recommended Applications
VCR-05D180L	VCR-07D180L	VCR-10D180L	VCR-14D180L	VCR-20D180L	<ul style="list-style-type: none"> ● Protection of various kinds of semiconductors ● Protection of automobile equipment ● Absorption of switching surge from various kinds of relays and electro-magnetic valves (DC below 48V) ● Protection of electrostatic Discharge ● Cellular phone 積體電路、電晶體等半導體元件 保護 ● 汽車電裝品 ● DC48V 以下激磁線圈如：繼電路、電磁關等 ● 靜電防制 行動電話
VCR-05D220L	VCR-07D220L	VCR-10D220L	VCR-14D220L	VCR-20D220L	
VCR-05D270L	VCR-07D270L	VCR-10D270L	VCR-14D270L	VCR-20D270L	
VCR-05D330L	VCR-07D330L	VCR-10D330L	VCR-14D330L	VCR-20D330L	
VCR-05D390L	VCR-07D390L	VCR-10D390L	VCR-14D390L	VCR-20D390L	
VCR-05D470L	VCR-07D470L	VCR-10D470L	VCR-14D470L	VCR-20D470L	
VCR-05D560L	VCR-07D560L	VCR-10D560L	VCR-14D560L	VCR-20D560L	
VCR-05D680L	VCR-07D680L	VCR-10D680L	VCR-14D680L	VCR-20D680L	
VCR-05D820K	VCR-07D820K	VCR-10D820K	VCR-14D820K	VCR-20D820K	<ul style="list-style-type: none"> ● Telephone. Communication line (DC 48V) ● 電話機用 .dc48v 通信回線用
VCR-05D101K	VCR-07D101K	VCR-10D101K	VCR-14D101K	VCR-20D101K	
VCR-05D121K	VCR-07D121K	VCR-10D121K	VCR-14D121K	VCR-20D121K	
VCR-05D151K	VCR-07D151K	VCR-10D151K	VCR-14D151K	VCR-20D151K	<ul style="list-style-type: none"> ● AC 100V Line-Line Applications (Japan) ● AC 100V 電源線間應用 (日本)
VCR-05D181K	VCR-07D181K	VCR-10D181K	VCR-14D181K	VCR-20D181K	
VCR-05D201K	VCR-07D201K	VCR-10D201K	VCR-14D201K	VCR-20D201K	
VCR-05D221K	VCR-07D221K	VCR-10D221K	VCR-14D221K	VCR-20D221K	<ul style="list-style-type: none"> ● AC 100V to 120V. Line-Line Applications(Japan.,U.S., Canada) ● AC100~120V 電源線間應用(日本、美國、加拿大等)
VCR-05D241K	VCR-07D241K	VCR-10D241K	VCR-14D241K	VCR-20D241K	
VCR-05D271K	VCR-07D271K	VCR-10D271K	VCR-14D271K	VCR-20D271K	
VCR-05D3011K	VCR-07D3011K	VCR-10D3011K	VCR-14D3011K	VCR-20D3011K	<ul style="list-style-type: none"> ● Telephone Line Application (250V Insulation Resistance Test Applicable) ● 電話機用(250V 絕緣阻抗測試)
VCR-05D331K	VCR-07D331K	VCR-10D331K	VCR-14D331K	VCR-20D331K	
VCR-05D361K	VCR-07D361K	VCR-10D361K	VCR-14D361K	VCR-20D361K	
VCR-05D391K	VCR-07D391K	VCR-10D391K	VCR-14D391K	VCR-20D391K	

Application Notes

MODEL NUMBER 5mm	MODEL NUMBER 7mm	MODEL NUMBER 10mm	MODEL NUMBER 14mm	MODEL NUMBER 20mm	主要用途 Recommended Applications
VCR-05D431K VCR-05D471K	VCR-07D431K VCR-07D471K	VCR-10D431K VCR-10D471K	VCR-14D431K VCR-14D471K	VCR-20D431K VCR-20D471K	<ul style="list-style-type: none"> ● AC200/220V Line-Line Applications ● AC100V to 220V. Line-Ground Applications ● AC200. 220V 電源線間應用 ● AC 100 to 220V 電源線與對地應用
		VCR-10D561K VCR-10D621K VCR-10D681K	VCR-14D561K VCR-14D621K VCR-14D681K	VCR-20D561K VCR-20D621K VCR-20D681K	<ul style="list-style-type: none"> ● AC240V Line-Line Applications (U.S., Australia, Middle East Countries) ● AC 240V 電源線間應用 (英國、中東、澳洲等國)
		VCR-10D561K VCR-10D561K VCR-10D561K	VCR-14D561K VCR-14D561K VCR-14D561K	VCR-20D561K VCR-20D561K VCR-20D561K	<ul style="list-style-type: none"> ● AC380V,Line-Line and line-ground Applications ● AC 380V 電源線間應用及電源與對地間應用
		VCR-10D911K	VCR-14D911K	VCR-20D911K	<ul style="list-style-type: none"> ● AC 415V,Line-Line and line-ground Applications ● AC 415V 電源線間應用及電源與對地間應用
		VCR-10D102K VCR-10D112K	VCR-14D102K VCR-14D112K	VCR-20D102K VCR-20D112K	<ul style="list-style-type: none"> ● AC 480V,Line-Line and line-Ground Applications ● AC 480V 電源線間應用及電源與對地間應用
			VCR-14D182K	VCR-20D182K	<ul style="list-style-type: none"> ● Line Ground Application (For AC 1200V Withstanding Test) ● AC 1200V 電源與對地間 應用

Select of fuse in conformity to VCR Varistor

*和突吸收器之本體大小配合時 If conform with diameter:

Part No.	VCR 05D series	VCR 07D series	VCR 10D series	VCR 14D series	VCR 20D series
Fuse rating	1 to 2 A	2 to 3 A	3 to 5 A	3 to 10 A	5 to 15 A

*和突波吸收器之峰值電流配時 If conform with Max. Peak current:

Max. peak Current 8/20 μ s 1 time (A)	Up to 500	501 to 2000	2001 to 6000
Fuse rating(A)	3	5	10