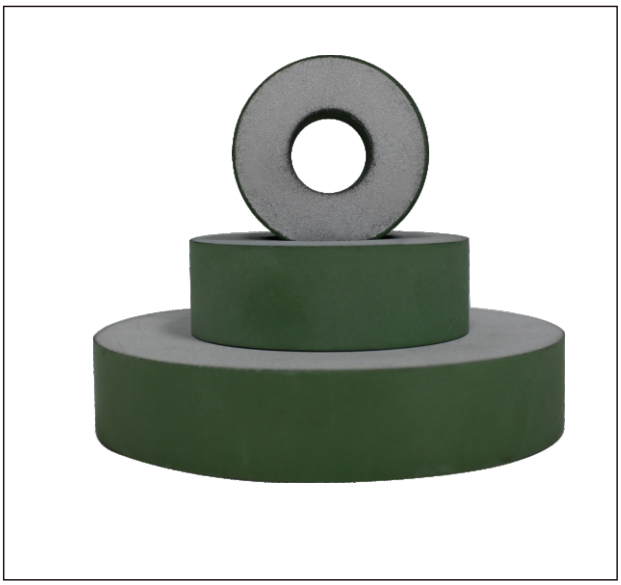
HJR High Energy Resistor



Custom HJR High Energy resistor stacks employ heavy-duty components for mechanical mounting, electrical isolation and termination. yielding ratings to thousands of kilojoules of single-surge energy.

High Energy resistors offer unsurpassed performance in high energy and high voltage applications. These non-inductive, ceramic composite resistors are designed for pulse shaping, crowbar, capacitor charg /discharge… any application requiring low inductance along with extremes of voltage and energy. They are ideally suited for use in pulsed power systems, where these resistors distribute energy uniformly throughout their structure for low thermal stress. The standard, high-temperature silicone coating enhances high voltage performance in air. Optional configurations optimize performance in other gaseous or fluid dielectrics. These resistors are also available as a solid disk without center bore.

Features

Ⅰ.100% Active Material
Ⅱ.High Surge Energy Rating
Ⅲ.High Voltage Withstand
Ⅳ.Essentially Non-Inductive
Ⅴ.Wide Resistivity Range
Ⅵ.Wide Range of Geometries
Ⅶ.Air / Oil / SF6 Environments
Ⅷ Single Disc or Modular Assemblies
Ⅸ.Custom Solutions Readily Available
Ⅹ.Free Design Service

Applications

HJR High Energy resistors are most often usedfor low repetition rate discharge, crowbar, pulse shaping or other impulse duty. In practice, a resistor or combination is selected to yield no more than 100oC rise for the expected applied energy. Because of the large mass, a relatively long cooling time is required between pulses, or additional heat capacity must be allowed for.Our applications spreadsheet (MS Excel,available on diskette) can beused to easily model heat-up and cool-down profiles for your specific application.

Ordering Information

Example:

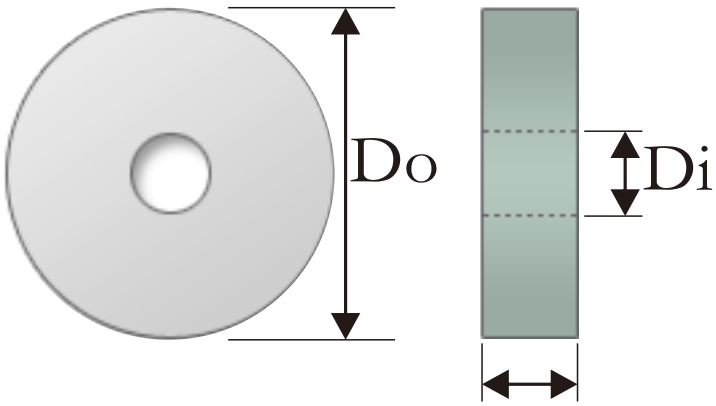
HJR	3011	15W	K	80R00	5P
(1)	(2)	(3)	(4)	(5)	(6)
Series Name	Part No	Power	Resistance Tolerance	Resistance Value	Series

(1)Style:HJR SERIES
(2)Part No.: 3011、5020、5026、7520.....
(3)power: 5.5W=5.5W,9W=9W,13W=13W,15W=15W.....
(4)Tolerance: K=±10%、M=±20%
(5)Resistance Value:0R5=0.5Ω、80R00=80R、100R00=100R、
(6)Series:5P=5PCS、8P=8PCS、10P=10PCS

Reference Standards

JIS C 5201-1

Dimensions

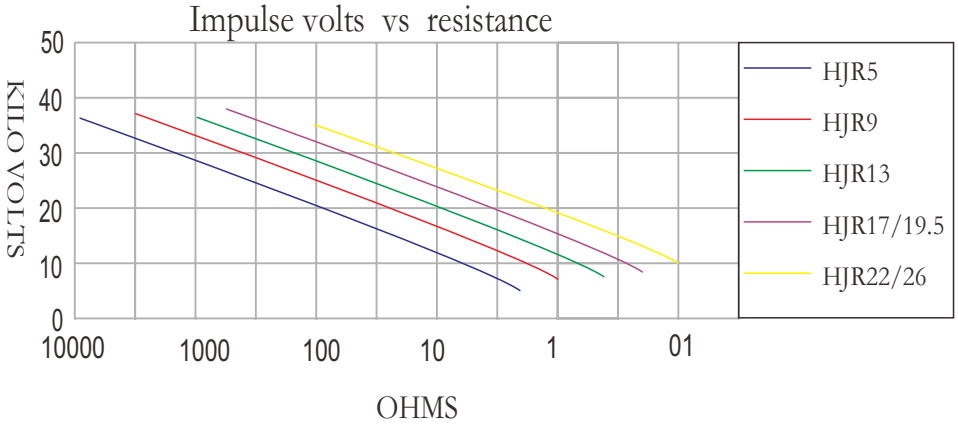


Part / Part No.	Dimensions(Individual unit)						
	Do mm	Di mm	Thickness (1) mm	Max .Energy (2) KJ@25℃	Power(w) @25℃	Resistance Range (Ω)	Max. Impulse Volts (3) (kV)
HJR3011	31±1	11±1	25.4±0.5	4.2	5.5	1.4R-10K	18KV
HJR5020	50±1	20±1		10.5	9	0.51R-5.6K	20KV
HJR5026	50±1	26±1		6.75			
HJR5034	50±1	34±1		6.75			
HJR7520	75±1	20±1		25	13	0.23R-1.7K	24KV
HJR7526	75±1	26±1		24			
HJR7534	75±1	34±1		21.5			
HJR7555	75±1	55±1		12.25			
HJR9533	95±1.5	33±1		47	15	0.1R-1.3K	26KV
HJR10020	100±1	20±1		48	17		
HJR10026	100±1	26±1		46.5			
HJR10034	100±1	34±1		44			
HJR10080	100±1	80±1		18		0.85R-390R	27KV
HJR11220	112±1	20±1		60.5	19.5		
HJR11226	112±1	26±1		59			
HJR11234	112±1	34±1		57		0.07R-180R	28KV
HJR12720	127±1	20±1		78.5	22		
HJR12726	127±1	26±1		77.5			
HJR12734	127±1	34±1		74.5		0.05R-120R	30KV
HJR15120	151±1	20±1		111.5	26		
HJR15126	151±1	26±1		110.5			
HJR15134	151±1	34±1		108			

Notes:
1 Custom thickness available,affects ratings
2 Single impulse to cause 125℃ temperature rise
3 Standardized for 50Ω resistor in air, 1.2/50μsec pulse width

Derating Curve

Maximum impulse voltage is mainly a function of resistance value and pulse width, and to a lesser extent, surface temperature and dielectric medium. The chart below shows the range of maximum impulse voltage for the standardized 1.2/ 50 μsec. pulse width in air.,which indicates the range and relative impulse ratings for thevarious standard sizes.Our applications group can assist you in assessing the correct parameters for your application.



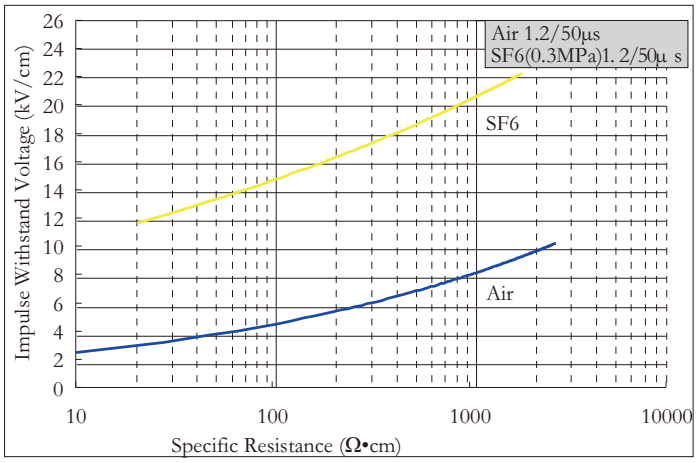


Fig. 1: Impulse Withstand Voltage vs. Specific Resistance (1.2/50 μs)

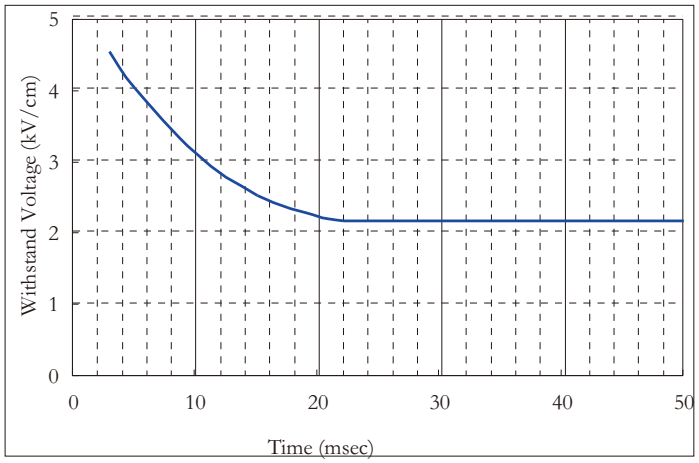


Fig. 2: Withstand Voltage vs. Time

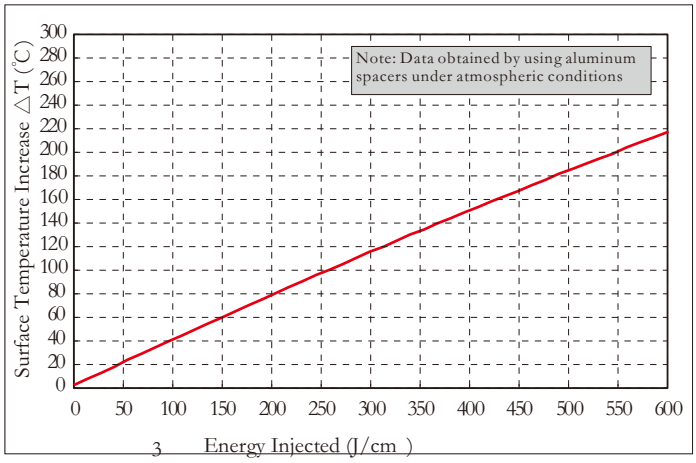


Fig. 3: Relationship Between Energy Injected and Surface Temperature Increase

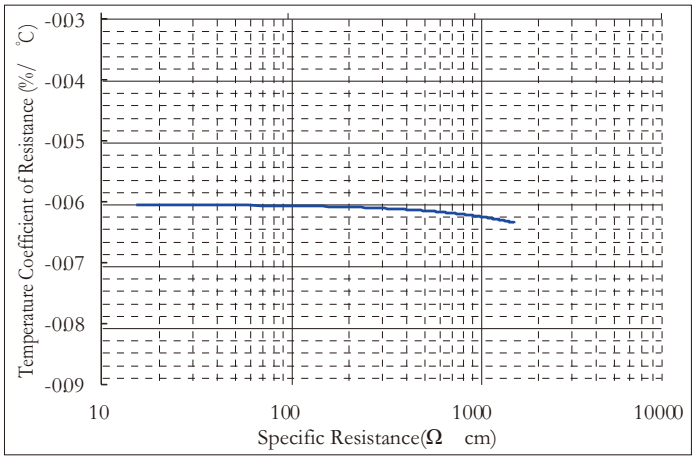


Fig. 4: Temperature Coefficient of Resistance vs. Specific Resistance (room temperature to 200°C)

Power Dissipation

Heat generated by the High Energy Disk Resistors is dissipated mainly by radiation and convection from the exposed surface areas. Within restricted domains, mathematical models may be employed to permit heat transfer estimations.	
Higher power dissipation is achieved using conduction cooling through either one or both mounting surfaces using:	Air heat sink Water cooled heat sink
Radiation and Convection	W a = 0.00026(ΔT) 1.4 W a = Watts/Units Exposed Surface Area (W.cm -2) ΔT = 50℃ to 175℃, D o =1.9 to 15.1 cm, Ambient 25℃
Recommended Operation Temperatures	Disc diameters ⩽ 11.2 cm ⩽ 300 ℃ (Infrequent Operation) Disc diameters > 11.2 cm ⩽ 250 ℃ (Infrequent Operation) All Disc diameters ⩽ 150℃ (Continuous Operation)

Impulse Voltage

Maximum impulse voltage is a function of:	Mainly—Resistance value and pulse width Lesser Extent—Surface temperature and dielectric medium
Resistivity Range—ϱ	3Ω cm to 30000Ω cm ϱ = R x A/L R = Resistance value, A = Surface area, L = Length
Temperature Coefficient	-0.05% to − 0.15% per ℃ rise(depending on Resistivity value)
Voltage Coefficient	-0.5% to − 7.5% per kV/cm(for ϱ domain 10Ω cm to 7500Ω cm)
Maximum Working Voltage Withstand per cm of Disk Length (V wk)	SF6 V wk = 8.0 x $\sqrt[1.2]{\text{Log}(R/2.54 \times A/L)}$ kV/cm 1.2/50μs Waveform AIR V wk = 4.3 x $\sqrt[1.2]{\text{Log}(R/2.54 \times A/L)}$ kV/cm 1.2/50μs Waveform AIR V wk = 3.0 x Log(R/2.54 x A/L) kV/cm 50/1000μs Waveform AIR V wk = 1.5 x $(\text{Log}(R/2.54 \times A/L)^{1.25}$ kV/cm 100/10000μs Waveform

Performance

Resistance Tolerance:	+/-10%
Metalization:	Aluminum electrode or Brass electrode (on flat surfaces)
Dielectric Coating	OD and ID
Density:	2.2 -2.6 gm/cc
Specific Heat:	0.22 -0.24 cal/gm -℃
Maximum Operating Temperature	230℃
Thermal Conductivity	0.003 -0.006 cal/(cm -℃ -sec)
Allowable Injection Energy	300 Joules /cc
Resistance Temperature Coefficient:	-0.0%to -0.1%/℃
Rated Peak Voltage:	5 KV
Recommended Contact Pressure:	25 psi minimum,50 -100 psi preferred
Power Rating:	Dependent on mounting and exposed surface area.In free air,parts will safely dissipate 2.5watts per square inch.
Coefficient of Thermal Expansion	4-6 X 10 − 6/℃
Allowable Peak Voltage:	5.8 KV/in