

## 中性点接地电阻 (NRA)

Neutral Grounding Resistor

### 产品概述 (Product Introduction)

中性点接地电阻器连接于发电机、变压器的中性点与大地之间的一种限流电气保护设备，当电网线路出现故障时，电源中性点电压将产生偏移，尤其是在电缆供电的电网系统中，对地电容电流较大，当该电流大于规定值时会产生弧光接地过电压，从而使非故障相的对地电压极大地增加，使设备绝缘损坏形成两点或多点接地短路造成停电事故。采用中性点电阻接地方式的目的是给故障点注入阻性电流，使接地故障电流呈阻容性质，减小与电压的相位差，降低故障点电流过零熄弧后的重燃率，使过电压限制在一定水平以内，提高继电保护设备灵敏度以实现跳闸、快速寻找故障线路和备用切换，从而有效保护系统正常运行。

The neutral grounding resistor is a current limiting electrical protection device connected between the neutral points of the generator and transformer. In case of failure in the power network, the neutral voltage will produce an offset, especially in a grid system of cables whose capacitive earth current is high, arc grounding overvoltage will be produced when the current is greater than the specified value so that the non-fault phase-to-ground voltage will be greatly increased, the equipment insulation will be damaged, thus causing short circuit of earthing at two or more points and power outage.

### 产品应用 (Product Application)

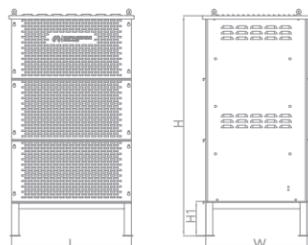
装置可适用于0.4~110kV电压等级配电网的中性点接地系统，在电力系统的变电所或发电厂也已经得到了广泛的应用，对提高系统供电可靠性及安全运行有明显的效果。

The device is suitable for use in the dead earthed neutral system of a distribution network of 0.4-110kV voltage level.

### 执行标准 (Applicable Standards)

GB/T5729-1994 Fixed resistor used in electronic equipment

### 产品尺寸图 (Product Size)



规格 Type	电压 (KV) Voltage	电流 Current	阻值范围R(20°C) Resistance Range	尺寸Dimension (±1mm)		
				L	W	H
NRA	6.3	50-1000A	50-1000A	850	1000	1500
NRA	10.5	50-2000A	50-2000A	1000	1000	2000
NRA	20	50-2000A	50-2000A	1500	2000	2200
NRA	35	50-2000A	50-2000A	1600	2500	2500

备注：其他规格尺寸，可根据用户要求制造。 Remark: Dimension can be customization

### 成品识别码 (Product Identification Code)

NRA	-	6.3KV	-	100A	-	100R
中性点接地电阻 Neutral Grounding Resistor		电压 Voltage		电流 Current		阻值 Resistance

## Crowbar/Chopper Resistor

This crowbar resistor is mainly applied in the technology of low voltage ride through in the wind power generation inverter. Installed at the side of the wind power generator rotor, it works as a current transformer at the bypass rotor side. While low-voltage disturbance occurs in the power grid, it can prevent the over-high voltage of the DC bus and the ultra strong rotor current. It is mainly used for the fault state and damped stator flux linkage. The crowbar resistor can dissipate huge amount of energy instantaneously.

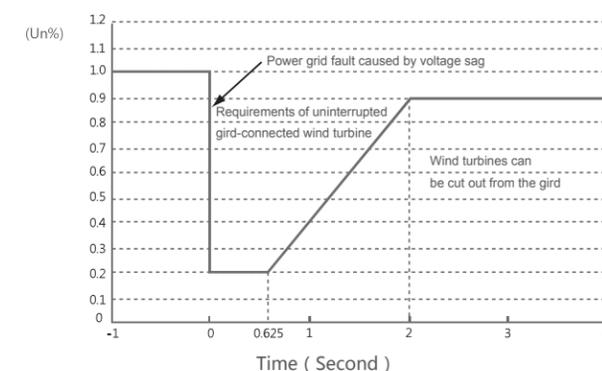


### Life Evaluation of Crowbar Resistors

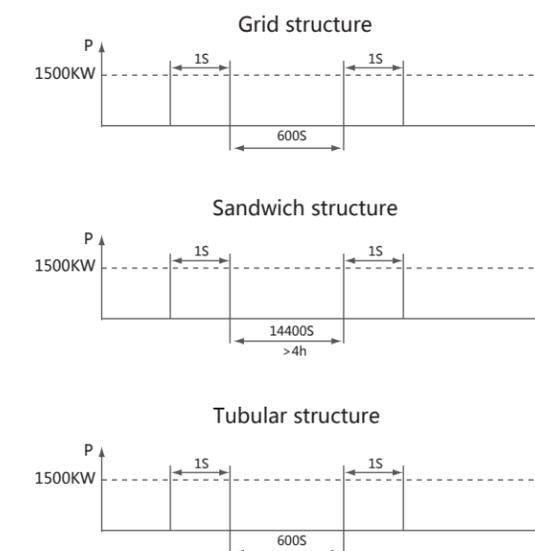
Take 1.5MW windmill generator for example, environmental temperature < 60°C

200J	1 time/second	
220KJ	1 time/half an hour	350000 times(20 years of life)
640KJ	1 time/week	1000 times(20 years of life)
1360KJ	1 time/month	250 times(20 years of life)

### Low Voltage Ride Through Wind Turbine



### Operating Condition Comparison



### Framework Comparison

Type	Weight (kg)	Size (mm)	Temperature rise (°C)	Cost
Grid structure	26	500x450x150	450	Middle
Sandwich structure	28	491x320x200	200	Low
Tubular structure	45	300x200x120	400	High

### Comparison of the Resistor Materials

Material	Density g/mm <sup>3</sup>	Resistivity Ω·mm /m <sup>3</sup>	Heat capacity J/g·K	Thermal Conductivity w/m·°C	Temperature feature ppm/°C
SUS304	0.008	0.72	0.50	13.2	< 1400
SUS316	0.008	0.78	0.45	13.23	< 900
Cr20Ni80	0.008	0.84	0.46	13.2	< 600
Cr20Ni80	0.0084	1.09	0.441	16.0	< 100