

# PAARSUN

RESISTOR

# پارسان

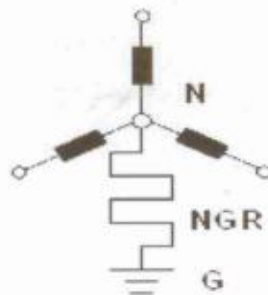
INDUSTRIAL POWER RESISTORS



- NEUTRAL EARTHING
- DYNAMIC BRAKING
- DUMMY LOAD
- MOTOR STARTING
- LOAD BANKS

## GENERAL DESCRIPTION

Neutral Grounding Resistors (NGRs) are used for resistance grounding of industrial power system. They are usually connected between earth ground and the neutral of power transformers and power generators. Their main purpose is to limit the maximum fault current to a value which will not damage generating, distribution or equipments in the power system, yet allow sufficient flow of fault current to operate protective relay to clear the fault.



The rating of the NGR is chosen to meet the requirements of the system protection; this will include consideration of maximum acceptable fault current, earth potential levels, and minimizing damage caused by the fault.

## MANUFACTURER STANDARD

Neutral Grounding Resistors must be capable of carrying rated current for the allowable on time without exceeding the allowable temperature rise established by IEEE standard 32-1972.

All PAARSUN Neutral Grounding Resistors are designed, manufactured and tested in strict compliance with IEEE-32. rating and permissible temperature rise above 30°C ambient is shown in Table I.

Time Rating ( on time )	Permissible Temp. Rise ( above 30 °C )
Ten Seconds ( Short time )	760 °C
One Minute ( Short Time )	760 °C
Ten Minutes ( Short Time )	610 °C
Extended time	610°C
Steady state ( Continuous )	385 °C*

Table 1:

\*permissible rise is 375°C over 40°C ambient on a continuous duty



## SPECIFICATION

### System Voltage:

NGRs never experience voltage in excess of line voltage. Insulation level is specified based on line voltage.

### Rated Voltage ( $U_n$ ):

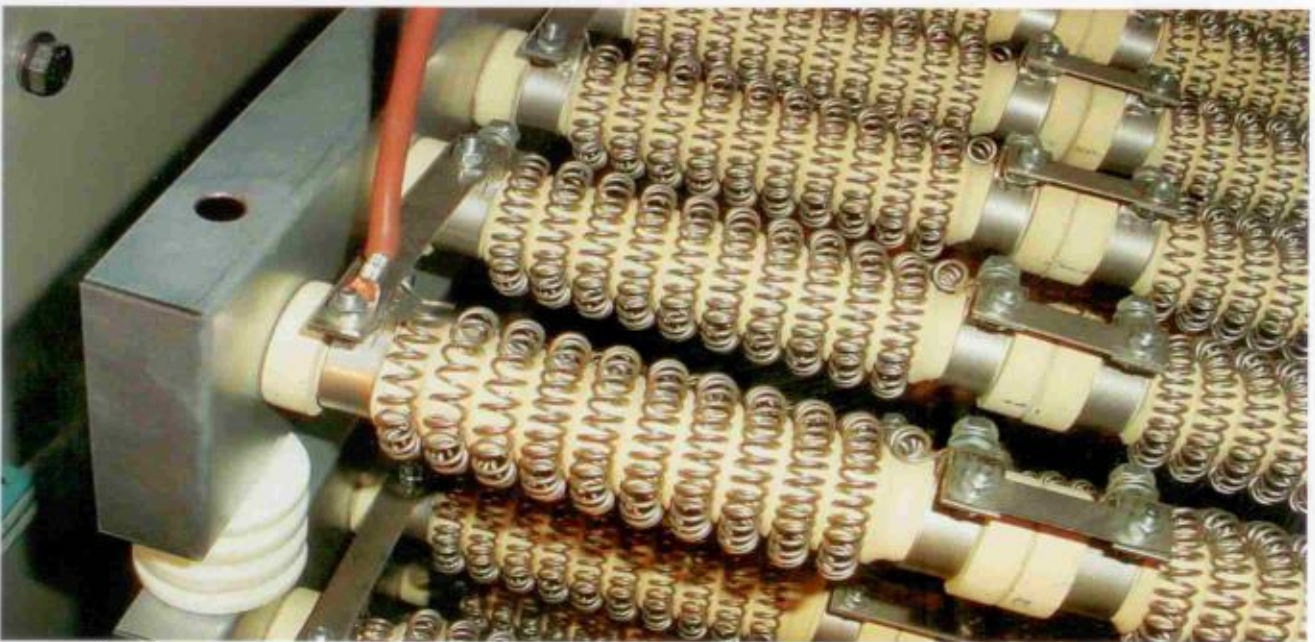
The rated voltage of the NGR shall be equal or higher than Line –to- Neutral nominal voltage of the power system (system voltage  $/\sqrt{3}$ ).

### Rated Current ( $I_n$ ):

Resistors are rated by current at line voltage. Choice of current rating depends on the characteristics of the system and equipment, also the type of employed relay protection system. Current Values are usually 10, 12.5, 16, 20, 25, 32, 40, 50, 63 and multiples therefore.

### Resistance value:

The resistance value is calculated with the formula  $U_n/I_n$  and shall refer to 20°C. The allowed tolerance on measurement under D.C. current is  $\pm 10\%$ .

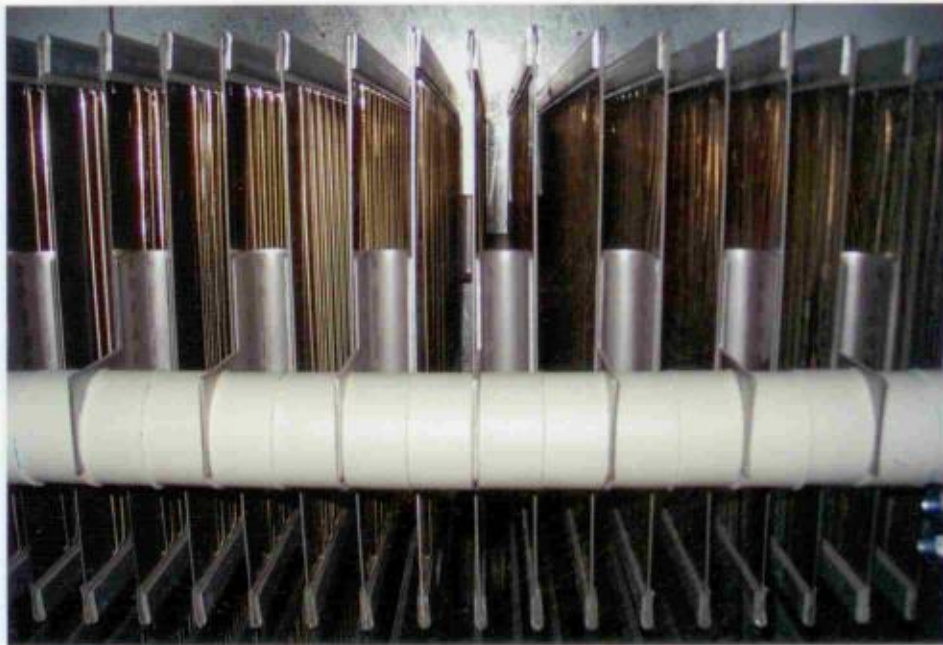


**Time:**

Resistors are generally rated to carry their current for a time. The current will actually flow for a much shorter time than this. This time is chosen to allow for the occurrence of multiple events.

One NGR is often used to limit grounding current on several outgoing feeders. This reduces equipment damage, limit voltage rise and improve voltage regulation. Since earth faults could occur in rapid succession on different feeders, 10 second rating is not satisfactory and one minute rating is applied.

Some engineers specify 10 minutes rating to prove an added margin of safety. There is however, a corresponding increase in cost.



**Continuous current:**

NGRs are generally rated for occasional use and only have a limited capacity to handle continuous current. Where necessary, NGRs can be specified to handle significant continuous current. This requirement significantly increases size weight and cost.

**Temperature Coefficient of Resistance ( $\alpha$ ):**

This factor is change in resistance per degree, at initial temperature.  $R = R_0(1 + \alpha\theta)$

**Max. Temperature rise:**

Neutral Grounding Resistors must be capable of carrying rated current for the allowable on time without exceeding the allowable temperature rise established by IEEE standard 32-1972.



## TYPE OF RESISTOR ELEMENTS

The kind of element for an NGR is depending on the level of fault current. PAARSUN has an extensive range of element using wire wound; plate grids of 0.5 mm, 1mm, 2mm and 4mm.

The most important parameter to consider from IEEE-32 is the allowable temperature rise of the element for different “on” times.

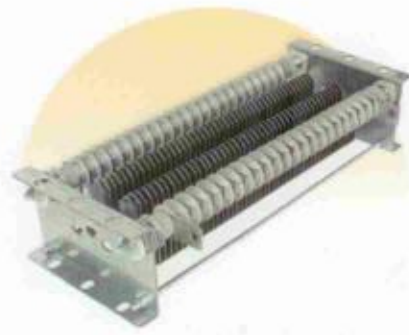
For the majority of ratings the suitable elements are Wire wound and Edge wound types. These resistors are manufactured from continuous stainless steel alloy strip or wire in to coils. Each coil is supported by ceramic insulators mounted on a stainless steel center support with stainless steel terminals welded to each end.

The arrangement freely allows expansion and contraction of the resistor elements without imposing strain on the coils or terminals.

The coils are assembled in bank formation for duty at high working temperature. Some resistance alloys that we use are high temperature stainless steels, capable of withstanding temperature up to 1100°C. NGR's designed for operation to higher temperatures require less active mass, resulting more compact and economical designs.



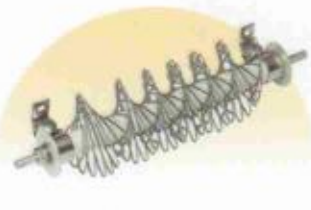
▲ Ribbon resistor



▲ Stamped grid resistor



▲ Edge wound resistor



▲ Spiral wound resistor



▲ Wire wound resistor

## ENCLOSURE

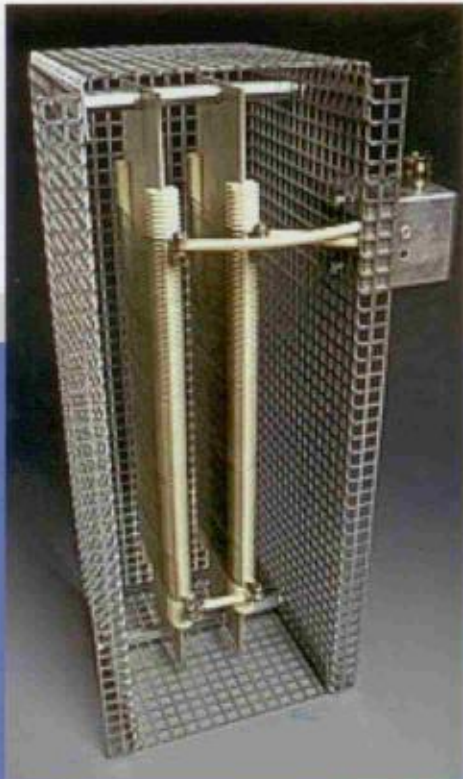
PAARSUN can produce NGRs in an enclosure with protection degree from IP00 for indoor application to IP55 for outdoor application.

It should be noted that IP rating is only avoid to ingress of water and dust in the context of NGRs that may have exposed live parts such as bushing.

The standard enclosure is designed to IP23 that is suitable for indoor and outdoor use. This allows sufficient cooling and provides adequate protection unless environmental conditions are exceptional. In these cases higher degrees of protection up to IP55 can be provided.

It should be realized that if poorly ventilated enclosures are used, external surfaces can become very hot, particularly if continuous rating are specified.

The enclosures is made of stainless steel (2mm thickness) mill galvanized, hot dip galvanized or painted steel (coated with 100 micron).



ENCLOSURE IP00

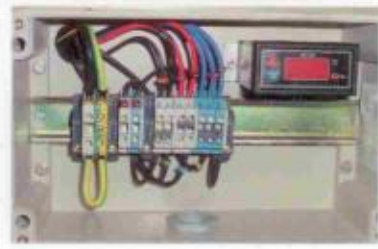
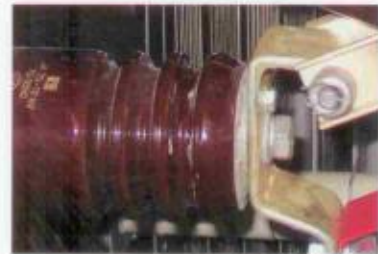


ENCLOSURE IP55



## AVAILABLE EQUIPMENTS

- 2 mm hot dip galvanized steel enclosure
- Solid top cover sloped to prevent water accumulation
- Lifting eye bolts for secure lifting
- Front cover for easy access to connection and inspection
- Internal insulators
- Porcelain Entrance Bushing
- Anti condensation heater & Thermostat
- Rating plate , Name plate & Warning plates
- Terminal box
- Cable box
- Current Transformer
- Switchgear Compartment
- Protection Relays



## ROUTINE TEST

- Visual and Dimensional Check
- Resistance Value Test
- Insulation Resistance Test
- Power Frequency Withstand Test
- Insulation Resistance Test
- Integrity of connections

## TYPE TEST

- Temperature rise test
- Protection degree test
- Measurement of AC resistance



**TUV NORD**

TUV NORD Iran  
Joint Venture Co. (P.J.S)  
Member of TUV NORD Group

Ap.4, 5<sup>th</sup> floor,  
Ferozesh Building, 478  
Ferozesh St.  
North Soltanabad St.,  
Tehran 15536, Iran  
Tel: +98 - 21 - 88746379  
Fax: +98 - 21 - 88746379  
certification



پژوهشگاه نیرو

of the Quality Manage



We continually improve our Quality management system with the aim of achieving complete customer satisfaction & confidence.....

**PAARSUN**

Shokofaei 2 street , Noavaran Industrial City, Zanjan, Iran  
Commercial Dep. Phone: +98 (24) 32385165  
Fax: +98 (24) 32385166  
Management: +98 (24) 32385164  
Web site: [www.paarsun.com](http://www.paarsun.com)  
E mail: [info@paarsun.com](mailto:info@paarsun.com)

