



Introduction

Neutral Grounding Resistors are one of the commonest types of earthing systems in medium-voltage AC distribution networks. Also called Neutral Grounding Resistors, they limit the current that would flow through the neutral point of a transformer or generator in the event of an earth fault. Earthing resistors limit fault currents to a value that does not cause any further damage to switchgear, generators or transformers beyond what has already been caused by the fault itself.

Features of all BCP grounding resistors include:

- Current ratings up to 8,000 Amps
- Full compliance with ANSI-IEEE 32, Terminology and Test Procedure for Neutral Grounding Devices
- Stainless steel resistors and enclosures as standard, IP23 to IP56. (Cable boxes up to IP65)
- Type-tested standard designs (certificates available)

Neutral grounding resistors are a key element in good electrical substation design. BCP can be your trusted partner in this task.

The manufactures neutral grounding resistors for voltages up to 132kV and for any current and time rating. Grounding resistors are a key component of the earth fault protection scheme in the majority of medium voltage electricity generation and distribution systems.



NGR constructed from 304 stainless steel

NGR Enclosure

Enclosure Materials and Design

The preferred enclosure material is unpainted stainless steel (either 304 or 316). This has good long-term corrosion, damage and heat resistance levels. We can also offer mild steel, hot dipped galvanised or pre-galvanised and all these options can be painted.

Connection can be:

- Direct into the resistor compartment – this has the advantage of not leaving exposed lengths of cable.
- Into a separate IP54 to IP56 cable box. This can be a benefit at 11kV when neutral earthing resistor-mounted ring-core CT's are being used, as they can be fitted in the base of the cable box around the

Neutral Earthing Enclosure IP ratings

A well-ventilated neutral earthing enclosure allows more rapid cooling and so for a given duty less resistor material is required. Given that the materials inside the resistor enclosure are stainless steels, ceramics and ceramic insulators, all suitable for unprotected outdoor use, we consider that enclosure ratings of IP23 are the right balance between good ventilation and the need to keep out birds and animals. We do also offer IP54 to IP56 enclosures where requested, either with or without filtration.

Enclosure temperatures

After a full fault some parts of a neutral earthing enclosure may be hazardously hot. The effects of this can be mitigated by labelling, by ventilation design, by enclosure construction or by the addition of heat shields that keep the hot parts out of reach. Bearing in mind that substations are not heavily populated and that faults are rare and never full duration, a solution that does not add disproportionate cost is obviously wanted: we consider that large, clear warning labels (Danger: hot surfaces) are the best approach.



CP-NGR Neutral Grounding Resistor

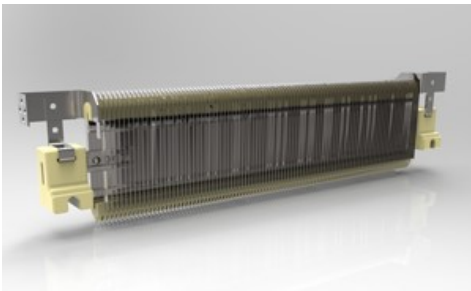
NGR Elements

Resistor materials and tolerances

The resistance alloys used are high temperature stainless steels capable of withstanding temperature excursions to 1100°C whilst retaining their strength – unlike 304 or other structural grade stainless steels which are limited to much lower temperatures. Earthing resistors designed for operation to higher temperatures require less active mass, resulting in more compact and economical designs. All the stainless steels used to make earthing resistors elements increase in resistance as they get hotter, typically between 1% and 15% per 100°C rise. There is a cost penalty when low-coefficient materials are specified; to what extent this is worth paying is not always clear. Many earthing resistors are over-specified in this respect, as much because engineers are intuitively uncomfortable with the idea of an earthing resistor with a very wide current range than as a result of a performance analysis. There is certainly scope for cost saving by accepting the use of higher temperature coefficient, lower cost steels.

RP resistors

For high current ratings the most suitable earthing resistor element is the type RP oval edge-wound coil. RP resistors are manufactured from a continuous stainless steel strip, wound edgewise into oval coils. Each coil is supported by ridged ceramic insulators mounted on a stainless steel centre support, with stainless steel terminals welded at each end. This arrangement allows free expansion and contraction at operating temperatures up to 1000°C without imposing strain on the assembly.



HPR grid resistors

For medium current ratings (30-100A) the HPR grid is used; this is a versatile, robust construction with a high ratio of surface area to active mass and can be manufactured in a very wide range of resistor materials.



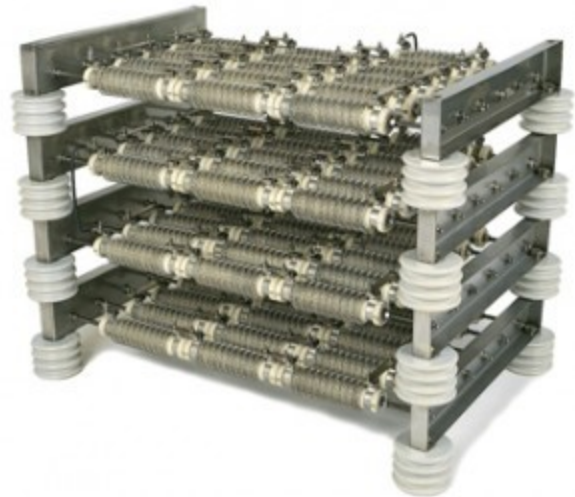
We make extensive use of grade 430 stainless steel; this is a low-cost 18% chrome alloy with little or no nickel content but with good corrosion and high-temperature performance. It has a temperature coefficient of resistance of about 14% per 100°C, which makes it unsuitable for continuous applications, but it is widely used in resistors for dynamic braking, motor starting and neutral earthing for which the key property is high heat capacity rather than close resistance tolerance.

Testing : type tests

Realistic, full-size type tests are an essential part of the development process and are the point of departure for all our design rules and methods. It is reasonable for any customer to demand sight of such documents. Because of the expense, type testing is usually only required when new designs have fundamental changes or extensions to the operating envelope.

HP Coiled-coil

For low currents the most suitable elements are the coiled-coil, type HP, which has a compact construction, excellent overload rating and good shock resistance.



CP-NGR Neutral Grounding Resistor

Certificate



Type Test Certificate by Qualis



Cressall Resistor Certificate by LRQA

Success Stories

NO	Project Name	Customer	Market Application
1	Pembangunan Mini LNG Tuban	PT. Sumber Aneka Gas	Oil & Gas
2	Paket-3, Fast Track PLN (Still On-Going)	PT. GSE - WIKA	Utility Plant
3	PLN Scattered, Fast Track PLN	PT. Trakindo	Utility Plant
4	IPP PLTMH Cilaki	PT. Hasta Prajatma	Utility Plant
5	GEPP Luwuk 40MW	PT. Dalle Engineer Construction	Utility Plant
6	Pupuk Kujang	PT. Nindya Karya	Fertilizer Plant
7	Bahana Office Tower	PT. Jaya Kencana	Office & Building
8	Izzara Apartement Jakarta	PT. Hardi Agung Perkasa	Office & Building