



NEUTRAL EARTHING

Applications

- Generator earthing
- Transformer earthing
- Fault current limiting
- Earth potential rise limiting

Electrical and Thermal Data

Features and Benefits

- Field proven
- Extensive installed base
- To IEEE 32:1972
- Compact economic designs
- Extensive range of options
- Complete range performance capability
- Type tested reference designs
- Replaceable elements
- Low temperature coefficient of resistance
- Range of enclosure materials and designs

Rating

System Voltage

Cressall is able to manufacture NERs for any applied voltage. We have built NERs for system voltages of up to 132kV and have standard enclosure designs for system voltages of up to 72.5kV.

Line Voltage

Although NERs are referred to by their system (i.e. phase to phase) voltage, it is the line (i.e. phase to neutral) voltage that is used for the calculation of resistance. Enclosure clearances and accessories may also be selected in relation to line rather than system voltage.

Current

Cressall has NER designs for applied currents from a few amps to many thousand, with ratings that may be for a short time, continuous or some combination of the two. Where continuous currents are applied the enclosure ventilation should be increased to prevent overheating.

Resistance

Unless external impedance needs to be taken into account resistance is calculated from the line (applied) voltage divided by the current. The standard tolerance is +/-10% on the cold resistance value.

Time

Standard time ratings are 5s, 10s, 30s and continuous although any other values are available on request. Most applications can be generously covered with a 10s rating: longer time ratings were historically used in conjunction with now-obsolete liquid resistor technologies and older switchgear. The cost, size and weight of an NER increase with rated time. NERs may be rated continuously at 5 - 10% of their short-time rated current but may need an allowance for increased ventilation.

Temperature rise

Standard temperature rise during a full fault is 760°C, in strict compliance with ANSI/IEEE 32:1972. We also offer more compact and economic designs that take advantage of advances in insulation and resistor alloy materials since 1972, which have a temperature rise of 1000°C.

Insulation: Basic Impulse level (BIL)

Internal air clearances and insulators are usually selected with reference to the BIL for the line voltage, using the following classes from IEC60071-1:2006:

Voltage class/kV	3.6	7.2	12	17.5	24	36	52	72.5
BIL/kV	40	60	75	95	125	170	250	325

Values may be selected based on system voltage but result in larger and more costly designs.

Frequency

The resistor's performance is itself largely independent of frequency, although accessories such as current transformers and switchgear may need to be selected for the appropriate system frequency.





Mechanical Data



Earthing of multiple neutrals

Connections

Neutral connection: roof mount or side mount bushing, with or without cable box, or through the base of the enclosure to a support insulator.

Earth connection: side mount bushing, with or without cable box, or through the base of the enclosure to a support insulator.

Enclosure earth bonding points: two M12 studs placed at diagonally opposite corners.

Service and ingress protection

Resistors may be designated for indoor use or outdoor service.

Indoor resistors may be of open (IP00) or enclosed construction.

Enclosed resistors are either protected to IP23 or IP54.

Higher ratings are available on request, however this may result in a larger and potentially more costly design.

Cable boxes are protected to IP54.

IP ratings are to IEC 60529:1999. Certain resistor designs and configurations have exposed high voltage terminals and/or live enclosures. In such cases, the IP rating partially excludes clause 5.1, "access to hazardous parts". Certain resistor designs have open bases and are intended for floor or enclosed plinth mounting. In such cases the IP rating assumes that the resistor is installed in such a manner as to maintain the IP rating.

Enclosure Materials

304 stainless steel (unpainted) – our standard offering – suitable for most environments

316 stainless steel (unpainted) - for coastal, marine and offshore environments

Aluminised zinc treated mild steel or pre-galvanised mild steel can be used in indoor and moderate outdoor environments.

NERs can be painted if required – our standard finish is polyester powder coat.

Other materials and finishes are available on request.

Enclosures can be provided for floor mount, plinth mount, frame mount, wall mount or transformer top mount.

Floor mount enclosures have an open base. Bases are available to allow mounting on transformers and open frames.

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Elements and construction

All elements and banking systems are designed to avoid points of high voltage and thermal stress.

Oval edge-wound elements are generally used for currents above 100A; below this we use flat steel grids or coiled-coil elements.

All connections between elements are bolted to allow easy inter-changeability.

All elements are manufactured from high quality stainless steel resistance alloys.

When more than one generator needs to be earthed through a single NER, Cressall has a standard range of multi-vacuum contactor switched assemblies. These offer up to 12 vacuum contactors with one resistor. Please see 'Earthing of multiple generators' leaflet.





Safety

NERs are high voltage electrical system components. They may have exposed live parts such as bushing stems, etc.; their enclosures can get hot both during and after operation.

Site layout, NER labeling and operations and maintenance procedures must fully take account of these hazards.

Options

Switchgear

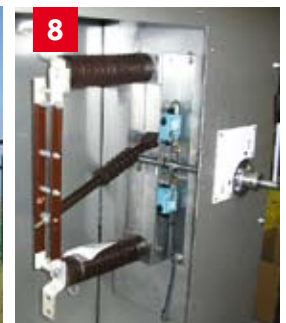
NERs can incorporate circuit breakers, manual or motorised off-load or on-load isolators, vacuum contactors, interlocks etc.

Measurement and protection

NERs may incorporate current transformers (CTs), voltage transformers (VTs), protection relays, surge arrestors, etc.

Transformers

Neutral point creating transformers such as zig-zag transformers or single phase neutral earthing transformers may be packaged as part of an NER.



1 Resistor/transformer combinations

2 NER for mounting on transformers

3 Open construction for OEM use

4 NER with 'double skin' for low surface temperatures

5 72kV NER (installed in Japan)

6 Resistor, on load isolator, surge arrestor & CT

7 NER & single vacuum contactor

8 Manually operated off-load isolator

9 Current transformer in cable box with auxiliary terminal box



Ordering Information

Cressall has many years of experience to draw on in the field of neutral earthing. The company owns the neutral earthing intellectual property and product lines of:

- ◊ GEC Alsthom
- ◊ GEC Industrial Controls
- ◊ Eaton Cutler Hammer
- ◊ BTH
- ◊ AEI
- ◊ TPR Resistors

Cressall's sales team all have an engineering background and can speedily evaluate enquiries. Many requirements will correspond to one of our many standard or existing designs; for new designs we have a systematic process which uses software-driven selection of the optimal element configuration, so that both new and existing designs can be quoted without delay.

Information needed for us to prepare a quotation should include as a minimum:

- ◊ System Voltage
- ◊ Applied voltage
- ◊ Rated time
- ◊ Initial current and/or cold resistance
- ◊ Enclosure type, protection standard and finish
- ◊ Accessories required (CT's, switchgear, isolators, etc.)



Contact

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