

Neutral Earthing Resistors

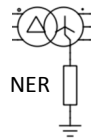
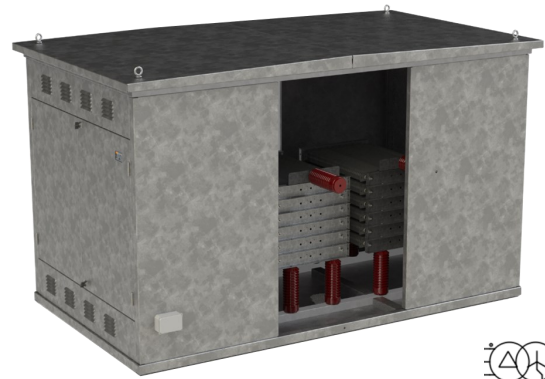
6 / 12 / 17.5 / 24 / 36 kV

IP00–IP23

For indoor and outdoor use



BACKER
F A C S A



Application

Short circuit between phase and neutral lead to excessive high current which can result in irreversible damage of the transformer, the cables and other equipment. Resistance Neutral Earthing is used in industrial power distribution systems for many years and has many advantages over unearthed or solid earthed neutral systems. Neutral Earthing Resistors (NER) limit the fault current to levels where any damage is strongly limited. Most NER's comply with standard IEEE 142-1991. The reason for limiting the phase to ground fault current is one or more of the following:

- To reduce burning and melting effects in faulted electrical equipment like switchgear, transformers, cables, and rotating machines.
- To reduce mechanical stresses in circuits / equipment carrying fault currents.
- To reduce electrical-shock hazards to personnel caused by stray ground fault.
- To reduce the arc blast or flash hazard.
- To reduce the momentary line-voltage dip.
- To control transient over-voltages.
- To improve the detection of the earth fault in a power system.

In most cases, a low resistance Neutral Earthing Resistor is used. The value of the resistance is calculated by Ohms Law, simply by the systems voltage / $\sqrt{3}$ and maximum allowed current. A phase to neutral fault will result in a high enough current to trip over current relays but cannot harm the transformer. In this way the fault is easily detected and isolated which minimizes the disruption. It must be noted that the temporary maximum voltage that can arise, is the line-to-line voltage. Therefore, NER's should not be used if single phase (lighting) systems are part of the power system, unless a isolation transformer for this single phase system is used. Equally, the voltage rating of circuit breakers and their current ratings should be based on the maximum voltage.

Design and auxiliary components

Neutral Earthing Resistors are available for 6 / 12 / 17.5 / 24 and 36kV grid system voltages. The design of the resistors depend on the maximum time of the fault current, the system voltage and the IP requirement. The NER can be fitted with auxiliary equipment, such as current transformers, switches (manual or motor operated), anti-frost or anti-condensation heaters. Special design with higher clearance and creepage distances or applications at high altitudes where voltage levels need to be considered, are very well possible.

Enclosures: protection class and materials

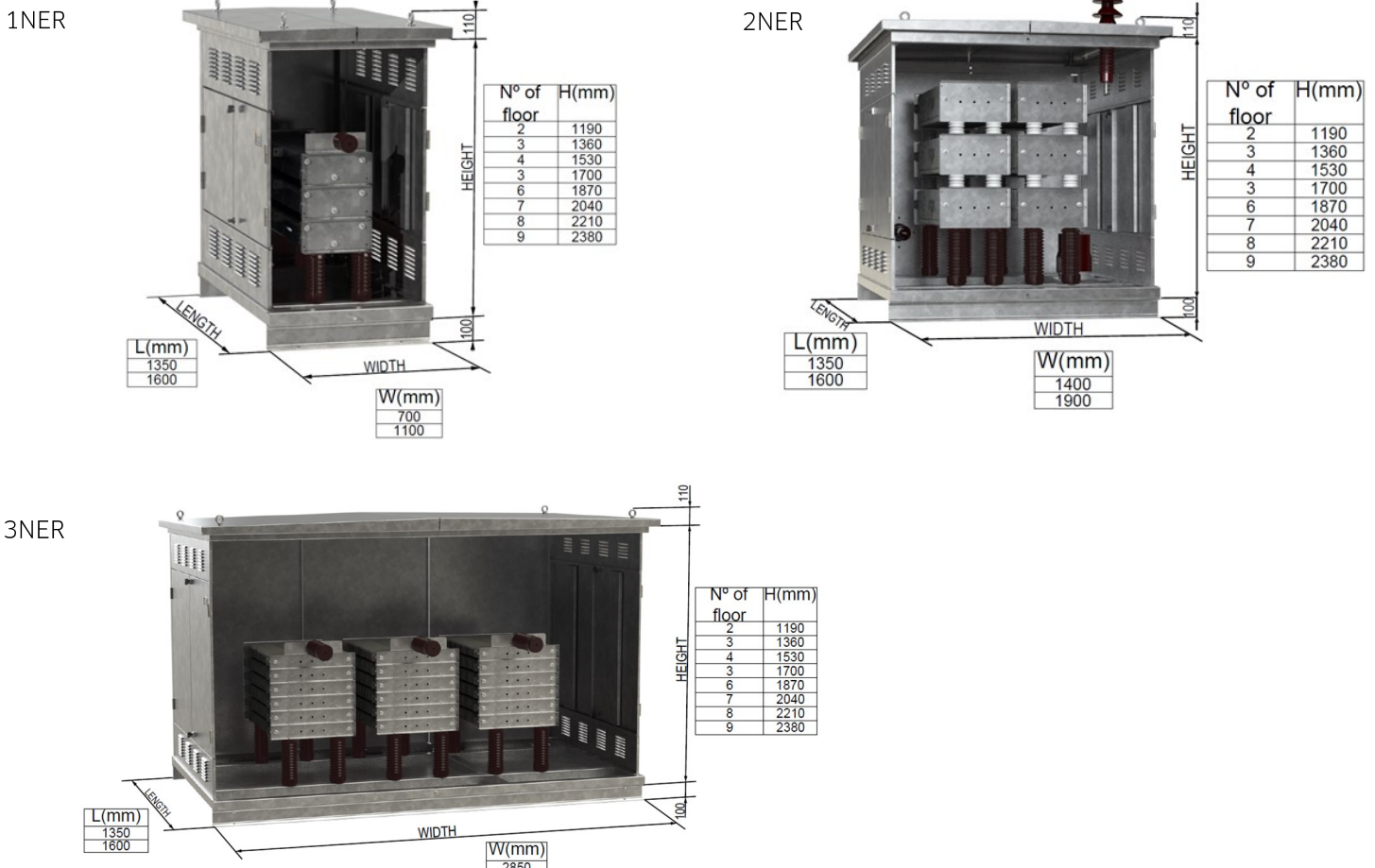
The standard enclosure is designed to IP23 according IEC60529 (to prevent the ingress of foreign bodies greater than 12mm, and rain falling at any angle up to 60° from the vertical). This rating is suitable for indoor and outdoor use as it allows sufficient cooling and provides more than adequate protection unless the environmental conditions are extreme.

Standard enclosures are manufactured from unpainted galvanized steel DX51D+Z275-M-A-E. Enclosures in stainless steel or mild steel painted in any specific color are on request. If required, other enclosure materials and special finishes can be arranged to comply with users specifications.

Main parameters

For selecting a NER the following parameters are necessary:

- Line-to-Neutral voltage
- Initial current (current which will flow through the resistor at rated voltage in case of a fault)
- Duration of the fault current (time the resistor must withstand without exceeding the maximum allowable temperature)
- Continuous current (applicable for high ohm NER's)
- Connection style
- Protection class



Routine and type tests

⇒ Routine tests are performed on all units manufactured:

- Measurement of insulation resistance between enclosure and resistor
- Dielectric test 50Hz/1 minute between active part en housing (voltage levels up to 120kV) conform directive IEC 60298: 1990
- Measurement of inductance value
- Measurement of DC resistance
- Measurement of metal surface thickness (galvanized DX51D+Z275-M-A-E or painted)
- Dimensional check according relevant drawings

⇒ Type tests (on demand):

- Temperature rise test
- Impulse voltage test (1.2 / 50 μ s)
- AC resistance test
- Ingress Protection test
- Seismic test



Standards / directives

- IEEE 32-1972 Grounding Resistors are built and tested and comply to the requirement of American National Specification Requirements, Terminology and Test Procedure for Neutral Grounding Devices.
- EDF HN 64-S-50 Résistances métalliques monophasées destinées à la mise à la terre du neutre des réseaux à moyenne tension.
- IEC 60071-1 Insulation co-ordination
- IEC 60529 IP Protection degree.

All manufacture takes place in our factory operating to ISO 9001 quality standard.

A Factory Acceptance Test (FAT) is very common to conduct and arrangements for such test can be made. Most tests are conducted in house. Very special tests can be performed at (nearby) test facilities.

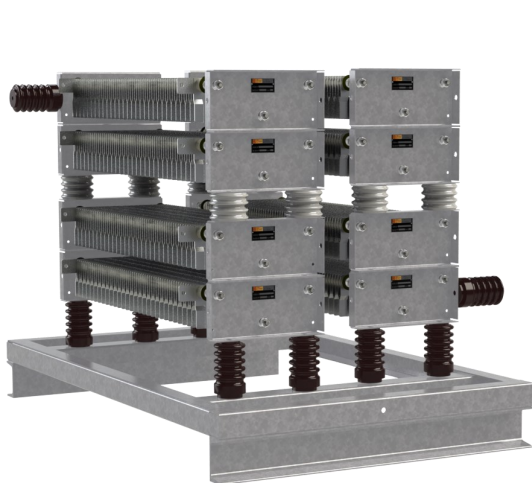
Depending on the energy that the resistor has to withstand without exceeded the maximum temperatures as stated in IEE Std 32, different dimensions on the enclosure are selected as given in underneath table:

GENERAL DATA			
Dimension reference	1NER	2NER	3NER
Insulation voltage level (kV)	6 / 12 / 17,5 / 24 / 36		
Length (mm)	1350 / 1600		
Width (mm)	700 /1100	1400 /1900	2850
Height (mm) / No. Floors	1190 / 1360 / 1530 / 1700 / 1870 / 2040 / 2210 / 2380		
Standars reference	IEEE 32-1972.		
	EDF HN 64-S-50		
	IEC 60071-1		
	IEC 60529		
Cooling method.	Self cooling		
De-rating at altitude	According IEE Std 32		
Resistor tolerance	± 10 % as standard, other on request		
Resistor active part materials	AISI-304 / AISI-310 / Cr-Al / AISI-430		
Enclisure materials	Galvanized steel as standard, other on request		
Connections	Cable, bushings		
IP class	standard IP23, on request up to IP55		

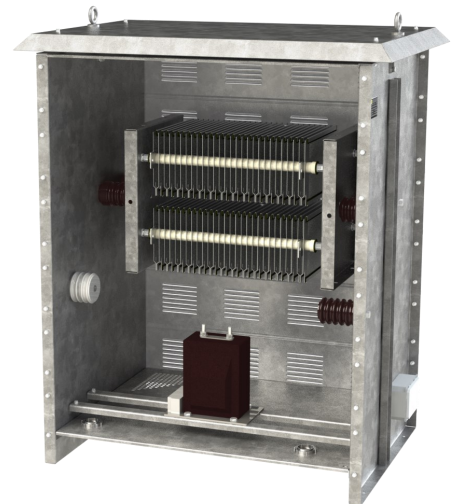
Backer–Facsas S.L.

Low resistance Neutral Earthing Resistors (NER) limit the fault current in short circuits between phase and ground. Low ohm NER's are offered for 6, 12, 17.5, 24 and 36kV systems. High(er) resistance NER's are mainly used in industrial power distribution systems up to 5kV. Backer–Facsas engineers and produces NER's and comply with various international standards. All NER's are submitted to a routine test and, if required, a type test.

During a short circuit, low resistance NER's absorb a lot of heat. This heat is mainly accumulated in the active resistance elements mass. This adiabatic process determines the weight of the NER. The working voltage has a big influence on the size of the housing as minimum striking distances need to be observed.



IP00 resistor: 14 Ohm. 500 Amp. -10 sec
Insulation level: 12 kV.



IP23 resistor: 75 Ohm. 50 Amp. - 10 sec.
Insulation Level: 12 kV.

