

How to ensure protection 24 V - 48 V in direct current applications

Direct current has been used for a long time, and in many fields. It offers major advantages, in particular immunity to electrical interference. The circuit breaker installed in an electrical network is designed to prevent any danger or damage associated with electrical hazards, overloads, short circuits and isolated faults, for loads and people.

This solution illustrates the use of the **Acti 9** product range for the direct current application of 24 V - 48 V DC.

Choosing the rating

The thermal tripping curve of a circuit breaker is the same in direct current as in alternating current 50/60 Hz.

The rule for choosing is therefore the same: to ensure protection against circuit overloads, choose a circuit breaker with a rating (I_n) less than or equal to the current (I_z) allowed to pass through the cable.

Choosing the curve

The magnetic tripping threshold must be:

- Higher than the inrush currents due to loads (motors, capacitors, etc.).
- Lower than the short-circuit current at the installation point, which depends on:
 - the short-circuit power of the source (indicated by the manufacturer),
 - the impedance of the supply line.

Choosing the breaking capacity

The choice of circuit breaker with respect to breaking capacity depends on:

- The earthing system.
- The network voltage.
- The short-circuit current at the installation point in concerned.



How does it work ?

> The performance levels shown in the tables correspond to the most critical faults according to the network configuration. Breaking on one pole. Fault between polarity and earth (Fault A).

> Select the protected polarity number (1P/2P).

> Select your earthing systems.

> Select the appropriate device according to the nominal current I_n and the short-circuit current I_{sc} at the installation point concerned.

24 - 48 V direct current protection solution

The performance levels shown in the tables below correspond to the most critical faults according to the network configuration.

- Breaking on one pole.
- Fault between polarity and earth (Fault A).

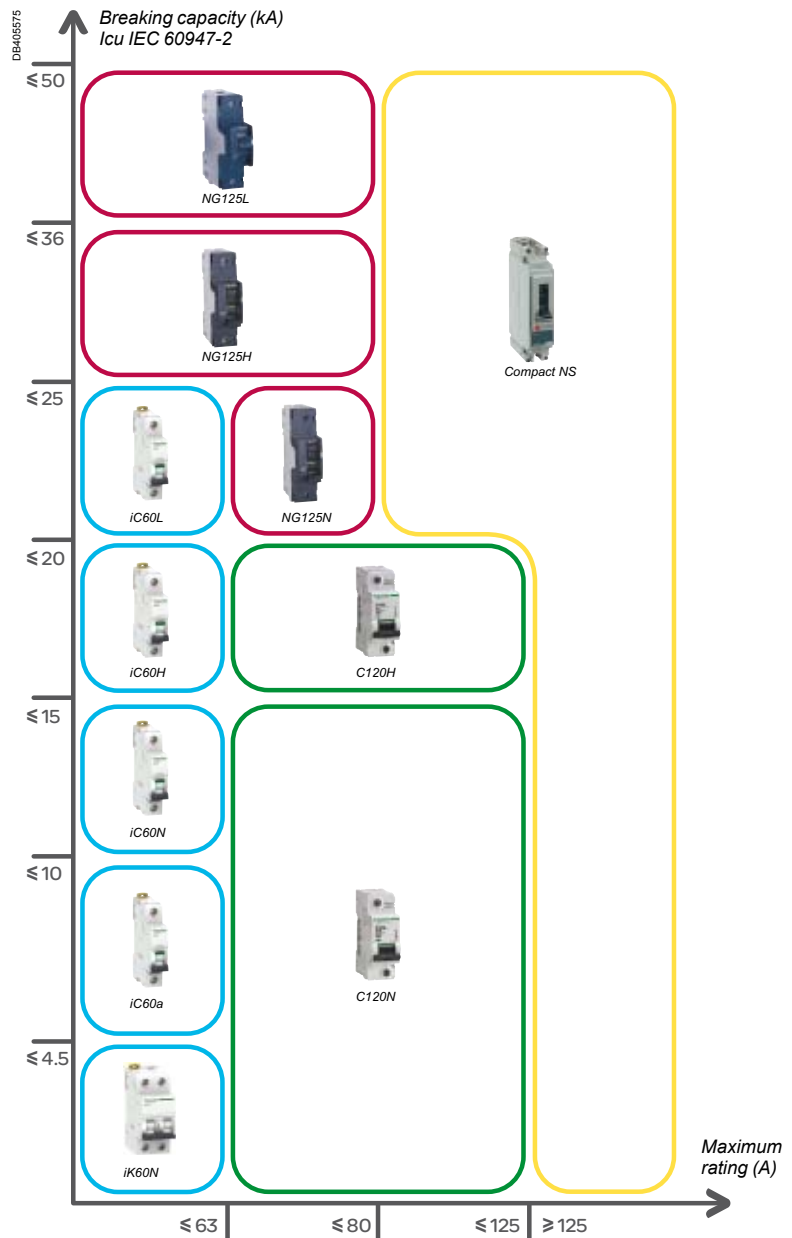
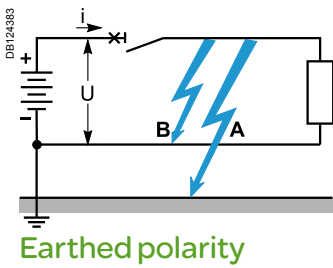
Standard solution depending on the network and the requirements of the installation (In/Isc)

In addition to the parameters shown on the following pages, the tables below illustrate our range of circuit breakers according to the nominal current of the load and short-circuit current at the point of installation.

- Circuit breaker rating.
- Breaking capacity of the circuit breaker.

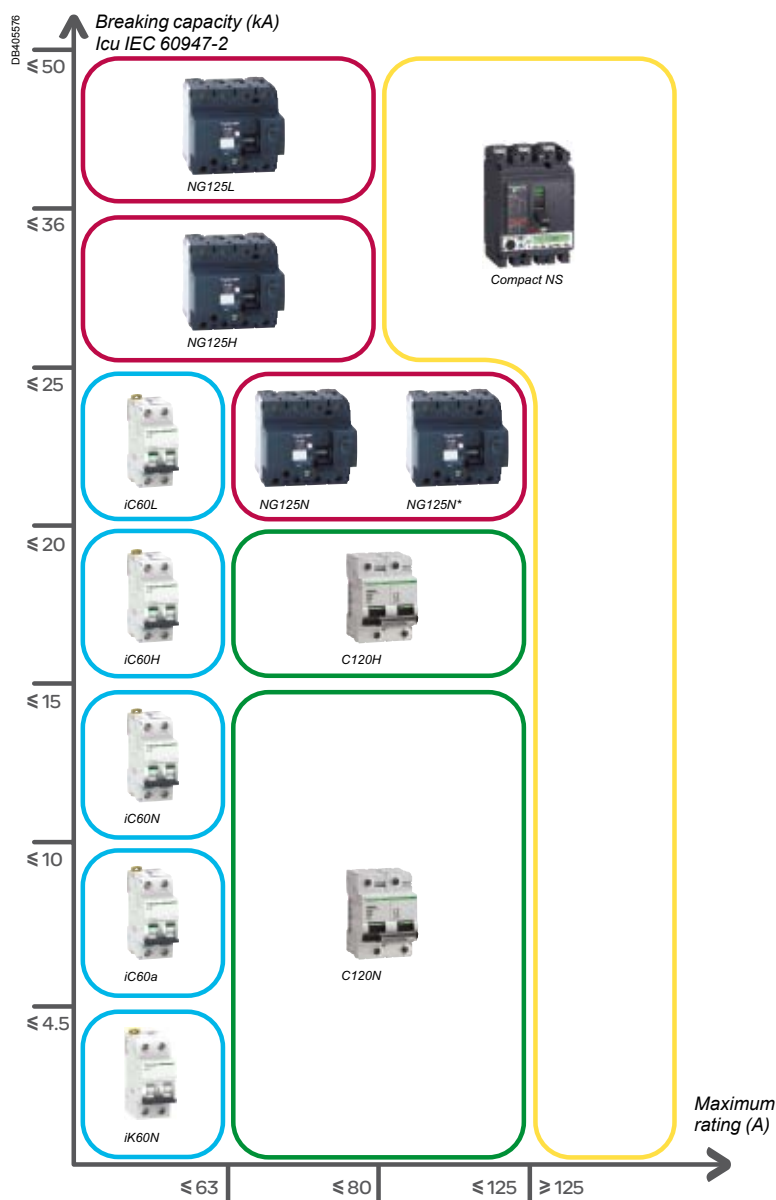
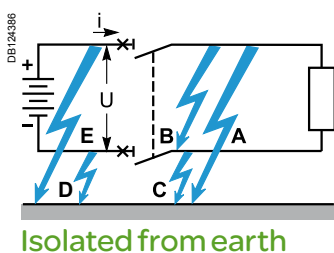
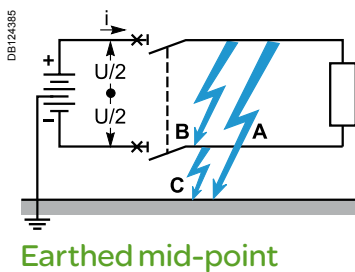
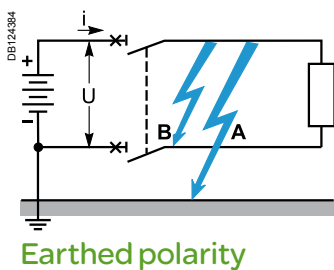
1 pole isolation solution (1P)

Earthing system



2 poles isolation solution (2P)

Earthing systems



(*) 3P NG125N connected in a two-pole configuration to reach 125 A (1P/2P NG125 has a maximum rating of 80 A).



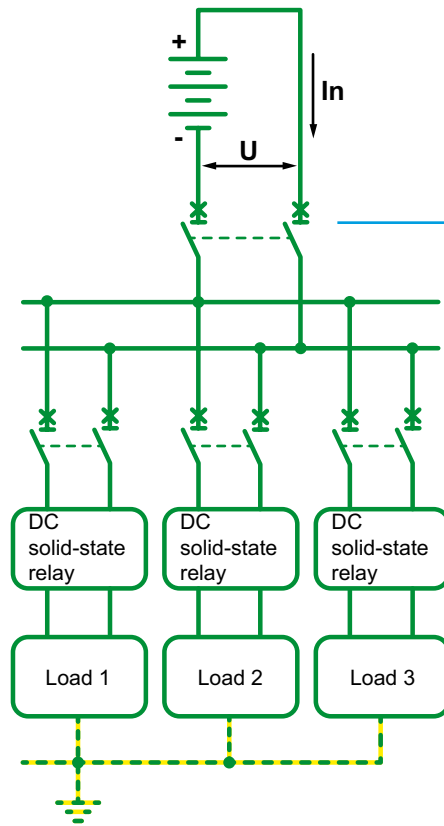
An important point in our solution is the fact that the protection is implemented by non-polarised circuit breakers that can operate efficiently, whatever the direction of the direct current.

† You will find the complete 24-48 V DC technical advice on the catalogue page CA908032

Examples

Ue: 12 to 48 V DC
Isc: 15 kA
In: 40 A

Earthing system
isolated network



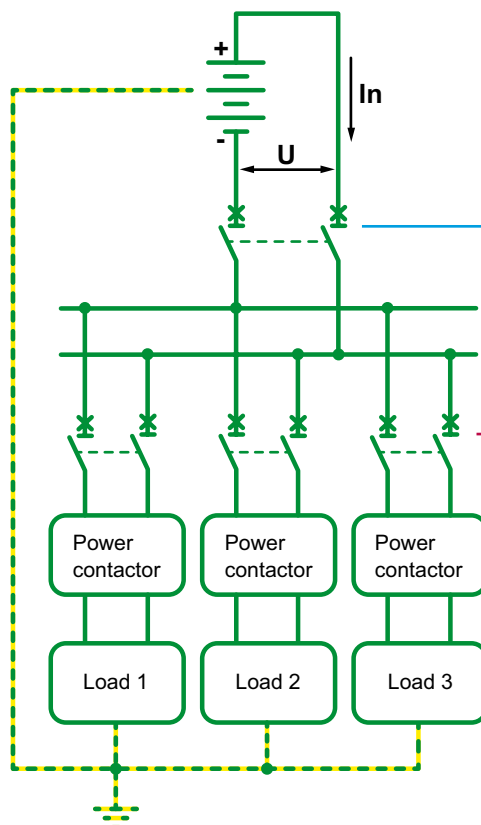
Total selectivity solution

Type	Number of poles	Rating
iC60N	2P	40 A

Type	Number of poles	Rating
iC60N	2P	≤ 6 A
DC solid-state relays		

Ue: 48 V DC
Isc: 25 kA
In: 80 A

Earthing system
mid-point of the network



Total selectivity solution

Type	Number of poles	Rating
NG125N	2P	80 A

Type	Number of poles	Rating
iC60L	2P	≤ 25 A
Power contactors		