Designing the PE protective conductor

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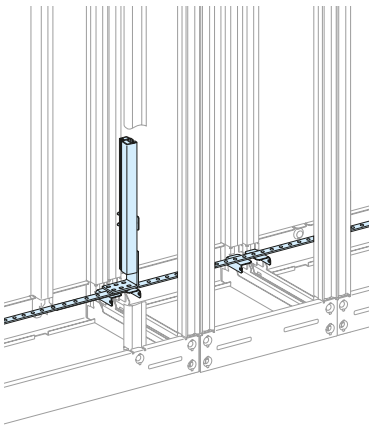

The protective conductor must be sufficiently sized and securely installed in the switchboard to accept the thermal and electrodynamic constraints of the fault current.
It must be connected to the exposed conductive parts of the switchboard.
It must be accessible to enable connections both in the factory and on site.

Optimised calculation method

Use the calculation equation indicated in standard IEC 61439-1 & 2:

$$S_{PE} = \frac{\sqrt{I^2 t}}{k}$$

- SPE: cross-sectional area of the PE in mm²
- I: value of the phase-to-earth fault current = 60 % of the value of the phasetophase fault current (IEC 61439-1 §8.2.4.2)
- t: time the fault current flows in seconds
- k: coefficient that depends on the type of metal, k = 143 for a copper conductor with PVC insulation.

Example:
- IIsc = 36 kA rms C the value of the phase-to-earth fault current = 60 % of the value of the phase-to-phase fault current (standard IEC 61439-1 and 2 § 8.4.3.2.3 and 10.11.5.6), i.e.: 36 x 0.6 = 21.6 kA
- maximum time delay for the control unit: 0,5 s
- k = 143 for copper conductors with PVC insulation.

The calculation is therefore:

$$S_{PE} = \frac{\sqrt{21600^2 \times 0{,}5}}{143} = 106{,}8\ mm^2$$

The PE conductor must therefore be a 25 x 5 mm bar (= 125 mm2).

Simplified method (based on the equation above)

Use the table below to determine the size of the PE conductor as a function of device short-circuit current Isc.

Size of PE conductor	All Schneider Electric devices	
Icc ≤ 40 kA	1 Linergy BS bar, 25 x 5 mm	
Icc ≤ 65 kA	1 Linergy BS bar, 50 x 5 mm	Linergy LGY 630 - **04502**
Icc > 65 kA but < 80 kA	1 Linergy BS bar, 50 x 5 mm	Linergy LGY 800 - **04503**
Icc = 100 kA	1 Linergy BS bar, 50 x 5 mm	Linergy LGY 1000 - **04505**

Implementing the PEN protective conductor

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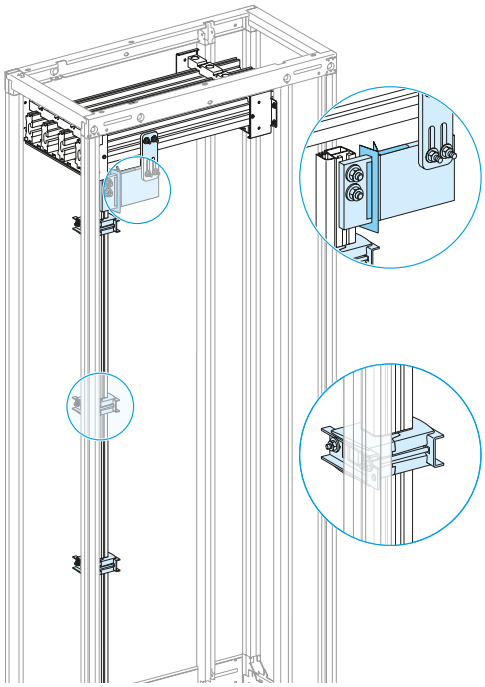

The size of the PEN is determined in the same manner as a neutral conductor, i.e.:
- for copper single-phase circuits or sized ≤ 16mm², it must be the same size as the phase conductors
- for copper three-phase circuits sized > 16 mm², it can be:
  - the same size as the phase conductors
  - smaller on the condition that:
    - the current likely to flow in the neutral during normal operation is less than the permissible current for the conductor
    - the power rating of single-phase loads does not exceed 10 % of the total rating.

The conductor must be accessible to enable connections both in the factory and on site, as well as checks on the tightness of connections.

Practical guidelines to install PEN

According to standard IEC 61439-1 and 2, the practical guidelines for implementing the PEN are the following:
- at the entry to the assembly, the PEN connection must be next to the phase connections
- within the assembly, the PEN does not need to be insulated from the exposed conductive parts (except on sites where there is a risk of fire or explosion)
- the size of the conductor must be at least equal to that of the neutral
- the size must remain constant throughout the main busbars
- the change from a TNC to a TNS system must take place at a single point in the switchboard, via a marked neutral-disconnection bar that is accessible and can be dismantled to facilitate the impedance measurement of the fault loop
- after the TNS creation point, it is forbidden to recreate a TNC system.

The PE and the neutral must meet their specific requirements.

Linergy LGY PEN kit

See page G-37.