ABB S.p.A.

ABB SACE Division

DOC3 – How to use the N-PE bars for e power

Index

N-PE bars in e power

N-PE in the real e power board

Normally the neutral bar is associated to 3 phase bars.

When/where instead it is possible to use a neutral with a location parallel to the PE bar?

When/where it is not required the interruption of the neutral and when/where, in TN-S context, We're going to use three-poles devices

In this case we can get a saving in terms of costs (the three-poles device is less expensive than the corresponding four) but also an important simplification of the overall wiring of the board.

This kind of N-PE solution is available on e power families, 500-700-900 depth.

The maximum value of current for the N in N-PE context is:

-e power series in galvanized sheet metal   4000 A (IP31, 700-900 depth)
-e power series in stainless steel   6300 A (IP31, 900 depth)

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N-PE example in e power – case N low current (max 3200 A)

Figure 1: N-PE for N low current (top, bottom and offset solution)

If the neutral bar does not exceed 3200 A it is possible to opt for a solution type that shown in figure 1.

The N-PE bars are placed at the top or at the bottom of the board; a change of location of the conductors is possible through an "offset".

Via supports the PE bar is frontally mounted on the depth crospiecess, while the N bar is fixed on "puki" uprights (see figure 2).
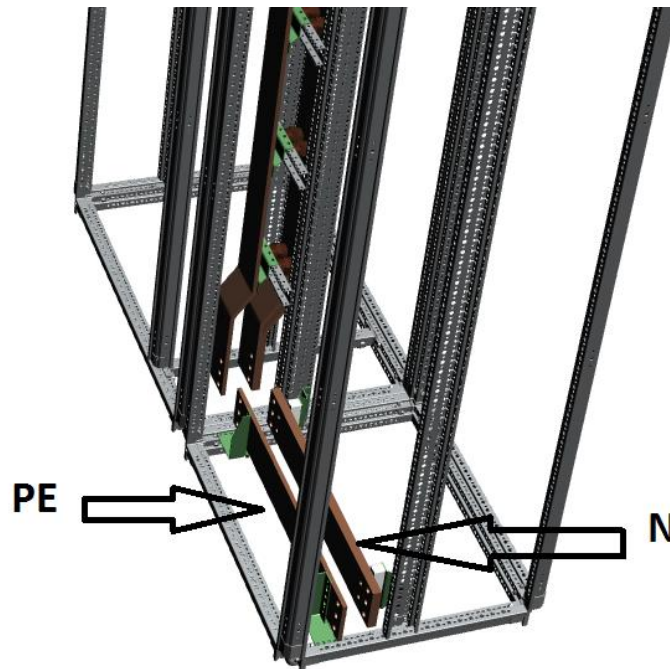
Figure 2: N-PE bottom position (case N low current)

The N-PE bars of the offset are fixed to the "puki" uprights (see figure 3) through crosspieces and specific supports.
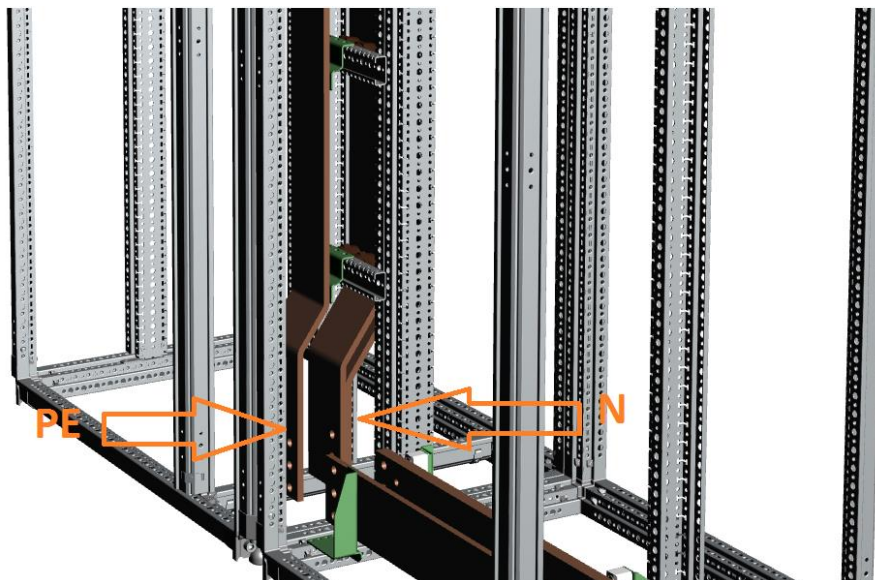

Figure 3: N-PE position on the offset context (case N low current)

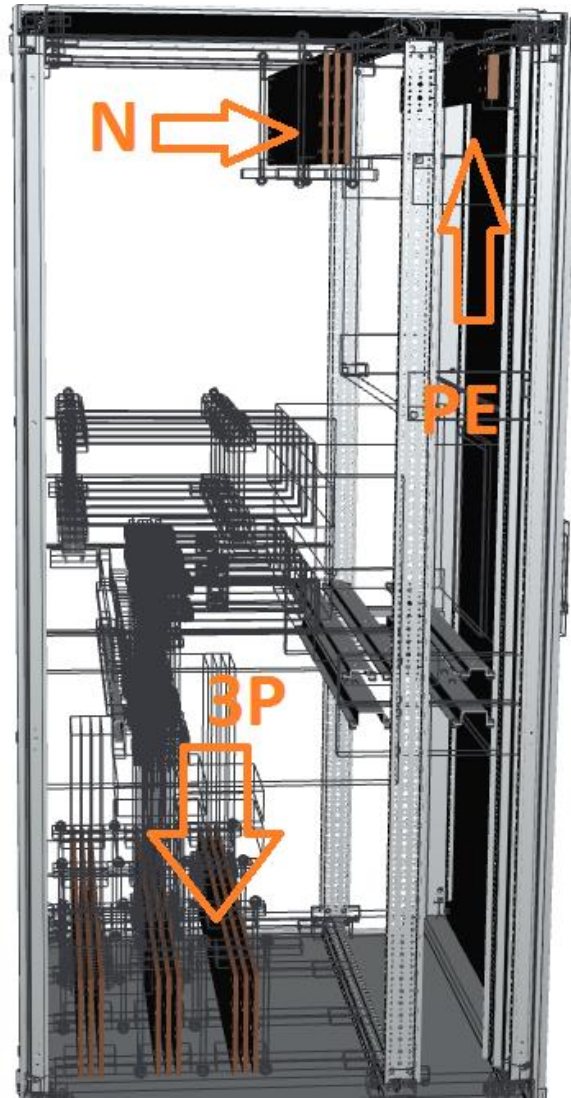**N –PE example in e power – case N big current (max 6300 A)**

Figure 4: N-PE top position (case N big current)

On this case the maximum In value for the N conductor is of 6300 A.

As shown in Figure 4 and 5:

-the PE follow the same rules of N low current case

-the neutral is mounted on the top or bottom position of the board, using the normal horizontal rules systems and accessories for 3 and 4 poles busbars, thus being further back than if N low current

-usually his position is opposite to the 3P main horizontal busbar system of the board, so: if the main 3P system is located on the bottom of the board, this kind of neutral stay at the top of the board and viceversa

Also on this case a change of location of the N-PE conductors is possible through an "offset".
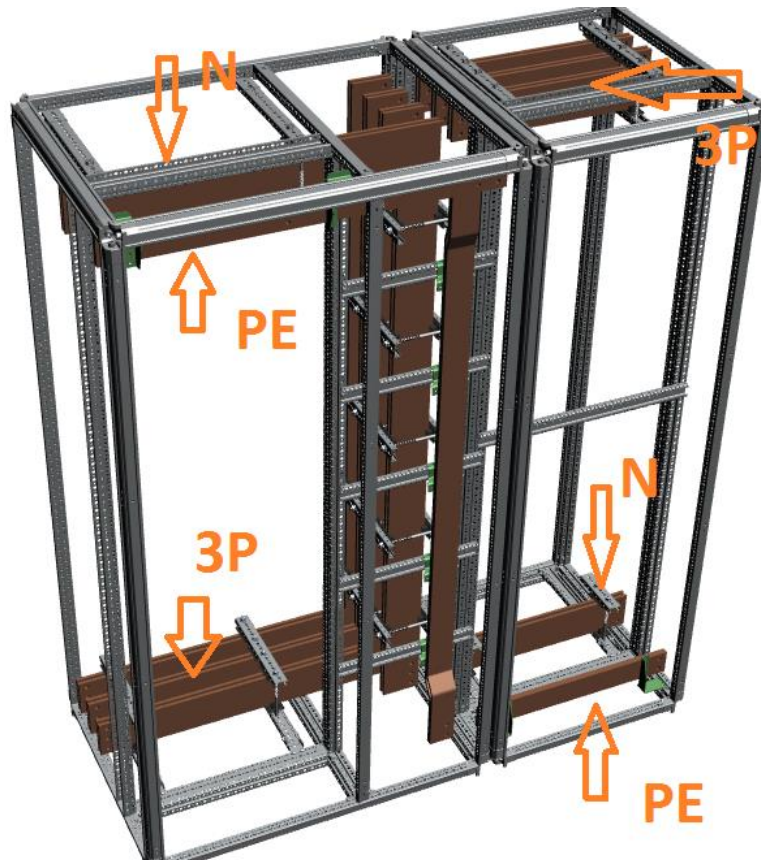

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Figure 5: N-PE for N big current (top, bottom and offset solution)

The N bars of the offset on case of big current follow the same rules of normal vertical busbar on internal or external cable container. It's possible also combine on the same 4P busbar system the offset of the neutral with the offset of the 3P main busbar system (see figure 6).

Figure 6: N-PE offset solution for N big current

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N –PE example for MCCB exit side cabling

Using 3P MCCB devices the wiring-exit side-of N and PE cables can be easily obtained with the solution solution presented in figure 7. This bars solution can be used both in the internal and external cable container.
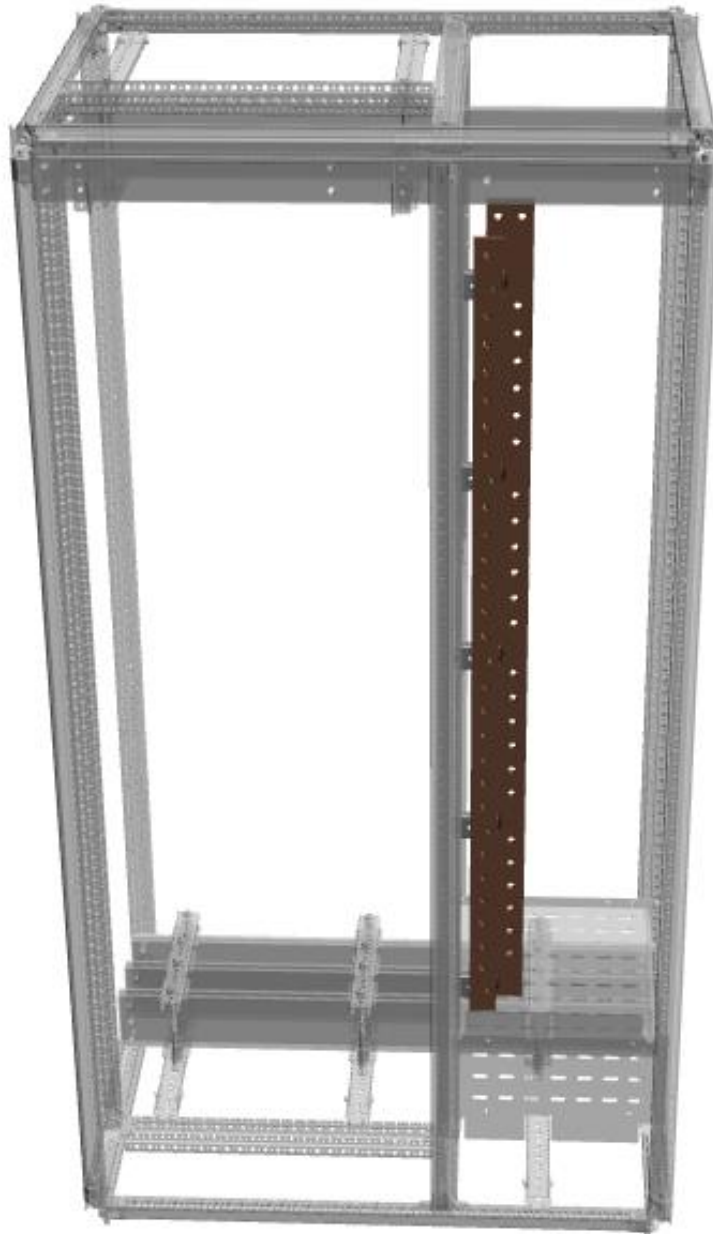
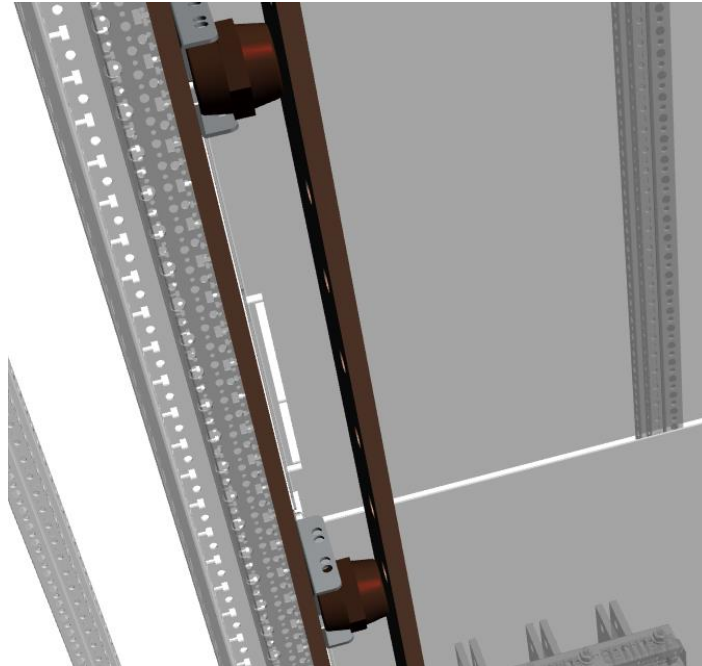Figure 7: N-PE solution 3P MCCB cabling, side exit

Figure 8: mounting details concerning N-PE solution 3P MCCB cabling

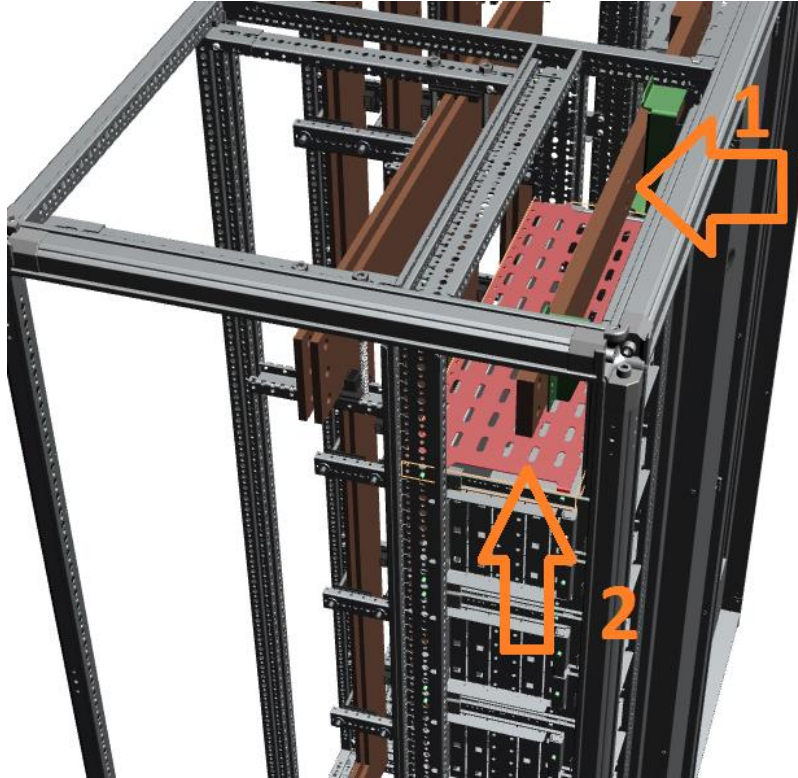**N –PE horizontal bars on the kits and segregation context**

Figure 9: mounting details concerning top-bottom N-PE solution

Looking at Figure 9 the following aspects are deduced:

Point 1 - the space in front of the PE top or bottom mounted bars is incompatible with the installation of any kit for device and therefore must be closed using eclusivamente blind panels or similar.

Point 2 – on case of segregated board the zone of the PE top or bottom mounted can not be completed with any segregation. So on the space in front it segregated cells or plates can not be provided.

Should only be expected to PSHS… segregation so that by removing the blind panel that closes the PE conductor is not possible to access the area below (if PE is top mounted) or above (case PE bottom mounted)

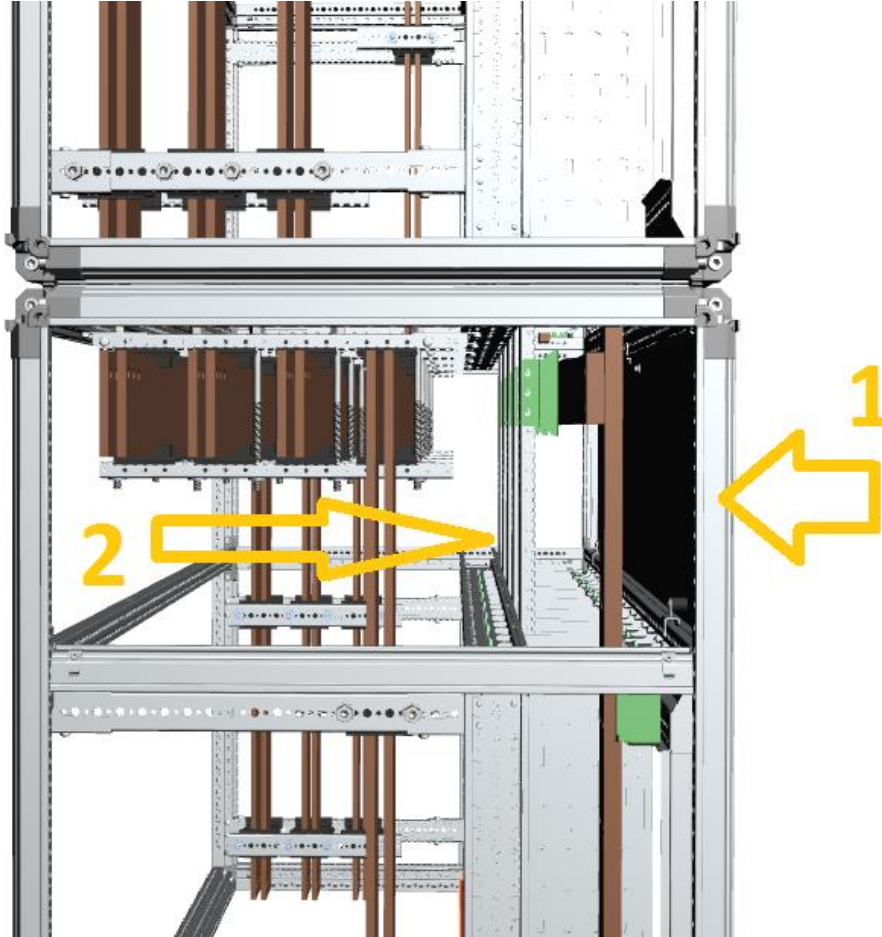**PE offset in segregation context**

Figure 10: top view of PE offset mounting in internal cable container

If in an internal cable container is present only the N-PE system is no segregation request.

The presence of the vertical busbar system 3 or 4 poles in the cable container determines in case of 3b or 4b segregated board the need to close the same for the whole height with an appropriate segregation both front and rear.

If the power busbar systems coexist with the PE offset mounting the front segregation is moved from the point indicated by the arrow 2 (level "puki") to that indicated by the arrow 1 (level front door).
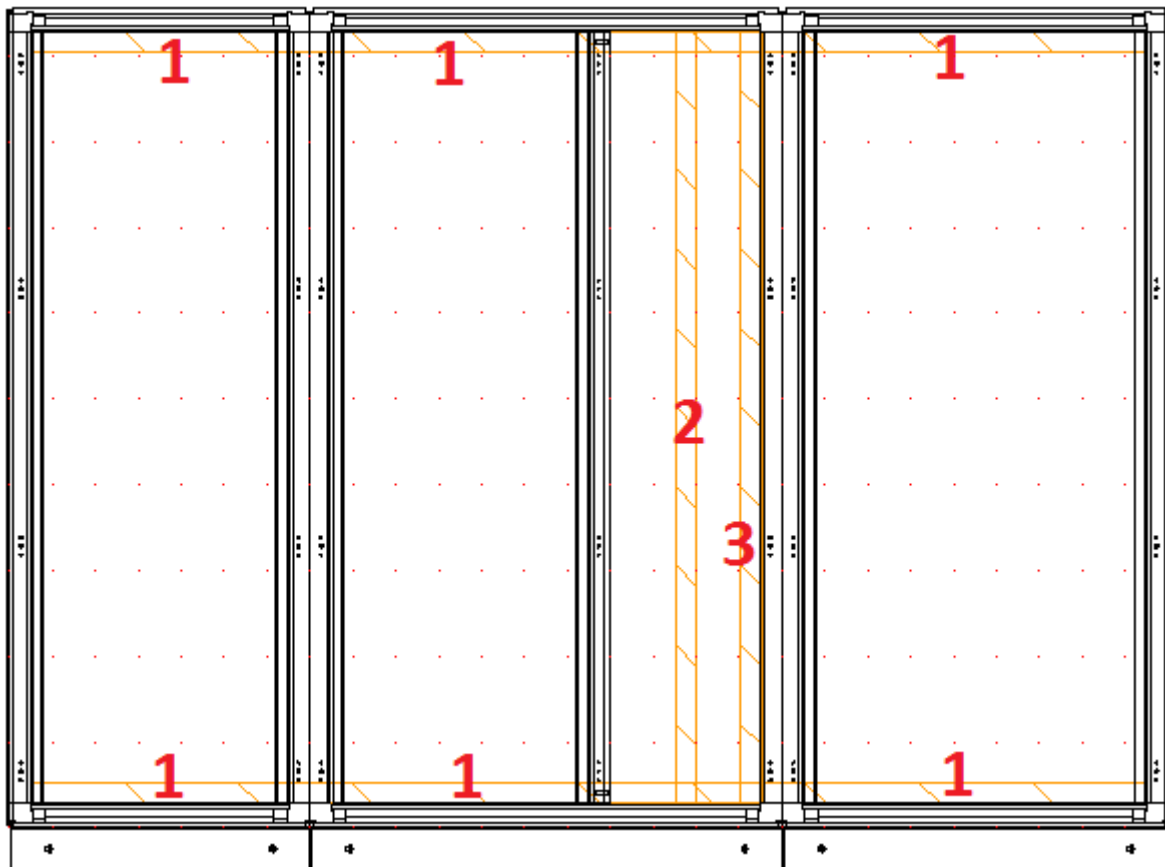
N-PE bars in DOC

N-PE function in DOC

The new version of DOC contains a specific function that allows the design and estimate of N-PE bars.

It is activated via the button shown in the figure to follow (only for e power families, depth >=500mm)
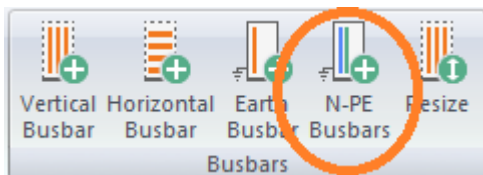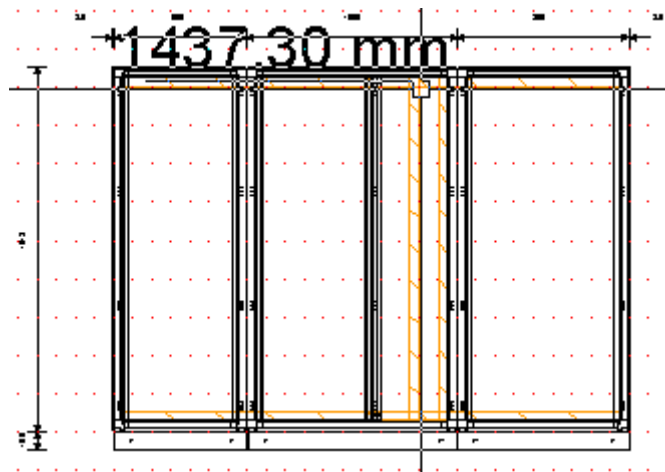

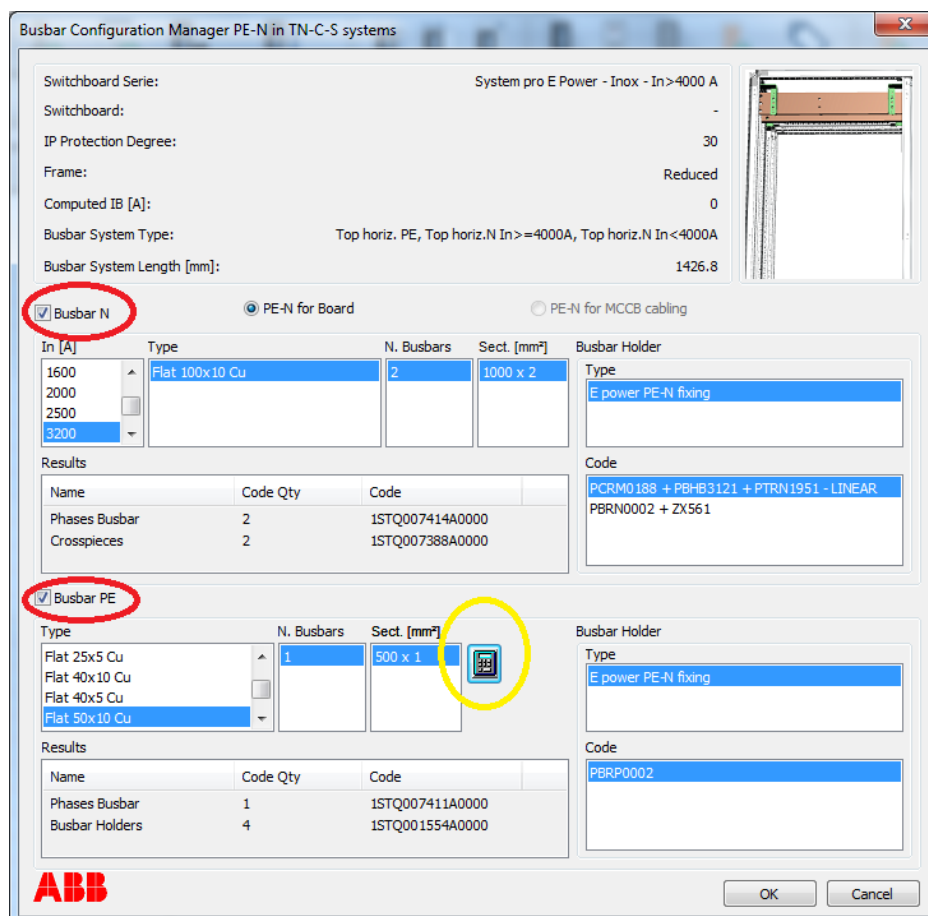These are the possible insertion points for N-PE bars on the board:

following three paragraphs devoted to the insertion of the bars in points 1, 2 and 3 of the figure above

Point 1: insertion of top-bottom N-PE horizontal bars (with big or low value for N current)

After editing the horizontal N-PE bar that you want to include in the board (see image below)


The mask for the N-PE bars management is open:

Both the choice of N and that of the PE are optional and require activation of the flag indicated by the red circles.

The selection of the N is via the In, while in the case of PE you have to refer to the type that contains all the data related to the section of the bar.

Using the button indicated by the yellow circle you can instead activate the mask for the automatic calculation of the PE section (in this regard see paragraph below).

The closure of the N-PE configuration mask by OK button determines tracking the N-PE bar on the board. The neutral is indicated by the blue color, while the PE conductor from the green color; a double click on the bar determines the reopening of the mask on the values of N and PE previously selected
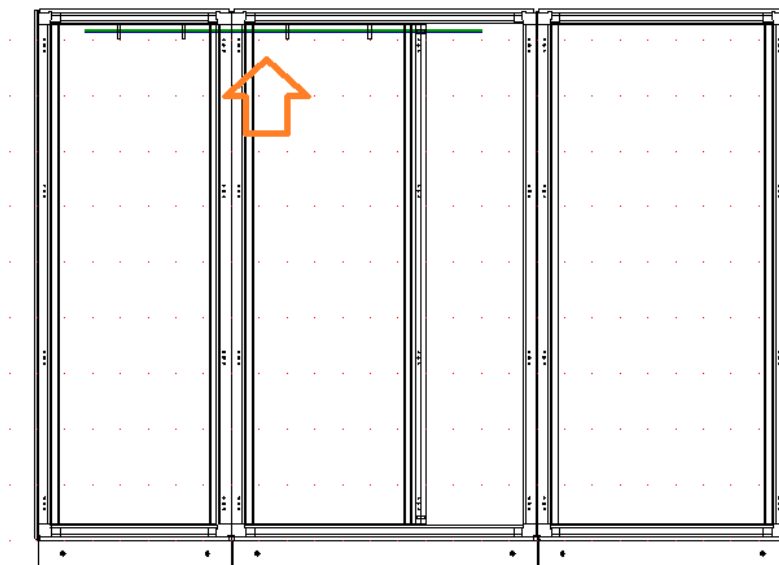
Important note about neutral for low or big current value

The assembly of the N in the frontal zone of the board (N low current) rather than in the rearmost position (N big current) can be verified simply checking the codes of the mounting accessories provided.

In the image to follow the codes are related to a frontal area of the board and therefore refer to a case of low current N
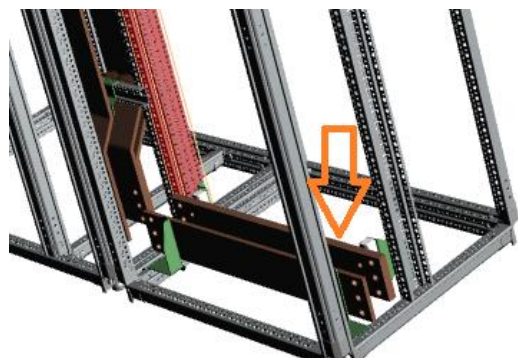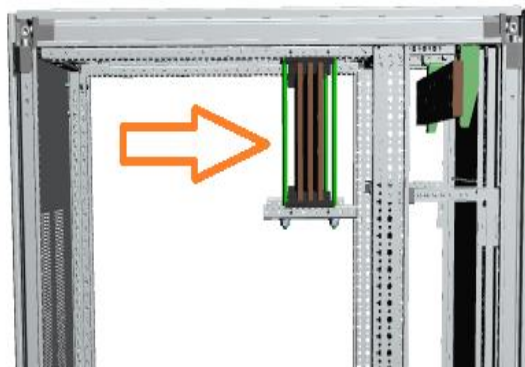

In this second image instead the codes are those relating to a back busbar mounting and wholly similar to the horizontal power systems, obviously they relate to a case of N big current

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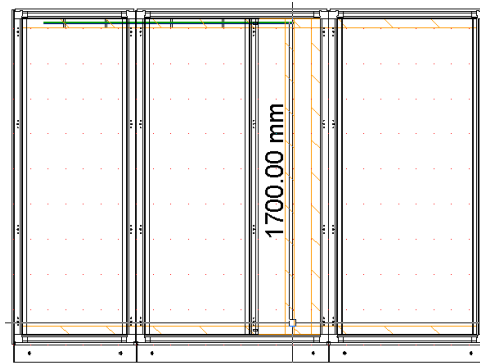
Busbar Holder

Type

E power PE-N fixing

Code

PCRM0188 + PBHB3121 + PTRN1951 - LINEAR
PBRN0002 + ZX561

Point 2: insertion of vertical offset N-PE (with only low value for N current) or of N-PE for MCCB cabling

This kind of vertical busbars system is available only on internal or external cable container.

After editing the vertical N-PE bar that you want to include in the board (see image below)


1700.00 mm

The same mask of before is open

On this case both the choice indicated by the orange circles are selectable; You can decide to choose among these options: **PE-N for Board** or **PE-N for MCCB cabling**.

PE-N for Board function.

This function allows the implementation of an offset to move the N-PE bars from the top to the bottom of the board (and viceversa), like on the image to follow. The max value of current for the N is of 3200 A.
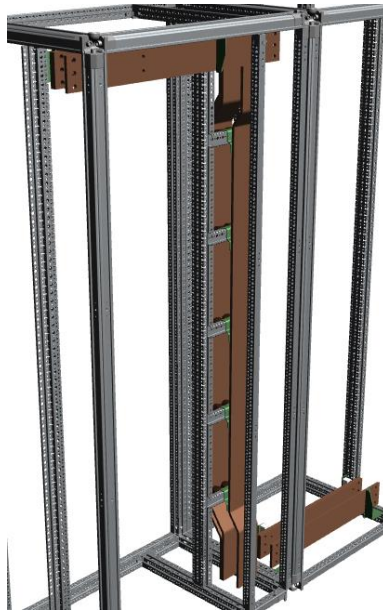

if you intend to design an offset with a current value for the neutral greater then 3200 A, see the point 3 for insertion of big value of vertical offset.

PE-N for MCCB cabling function

Using 3P MCCB devices the wiring-exit side-of N and PE cables can be easily obtained with this functionality. Also in this case the max value of current for the N is of 3200 A.
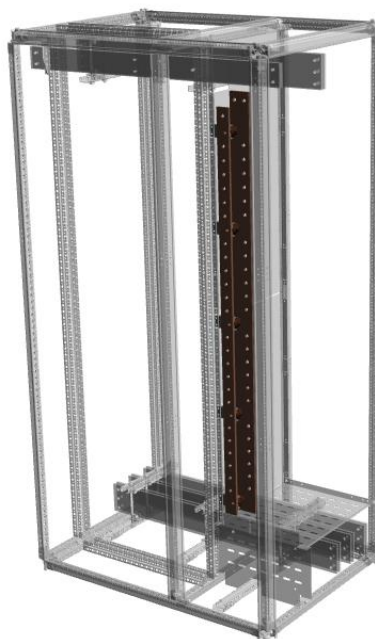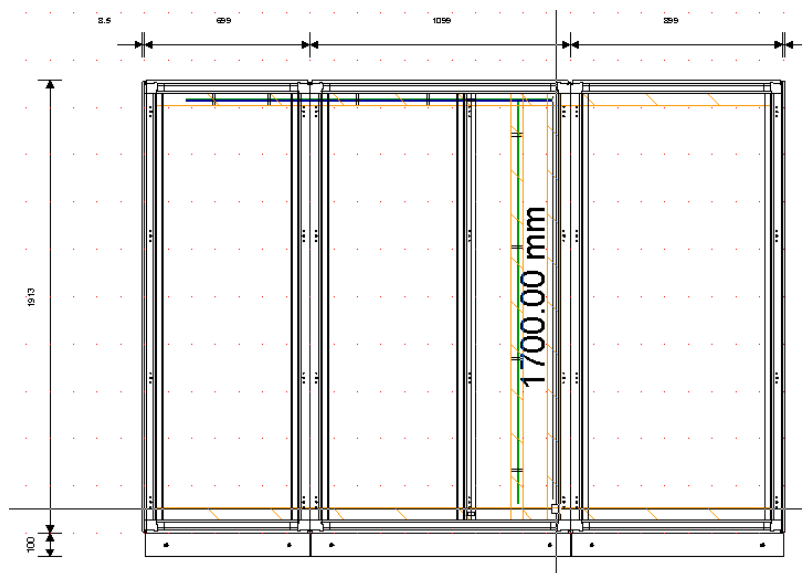
This the result after the closure of the N-PE configuration mask by using the OK button.
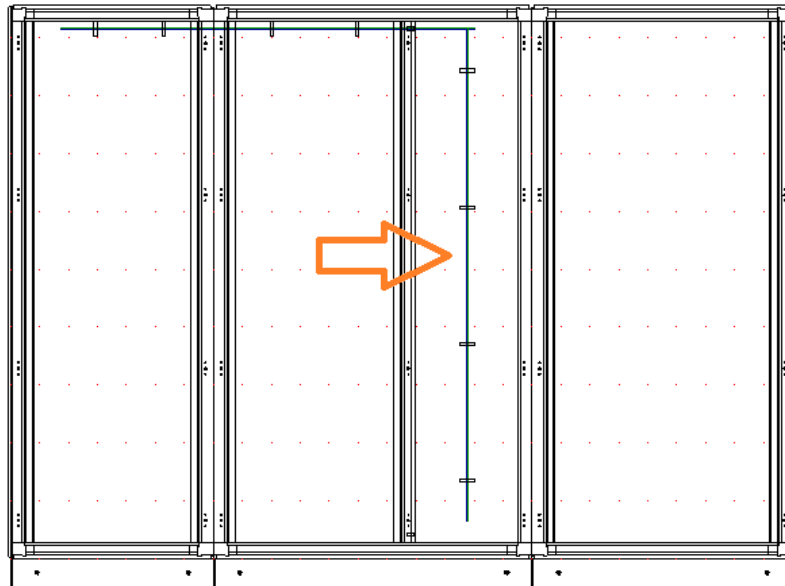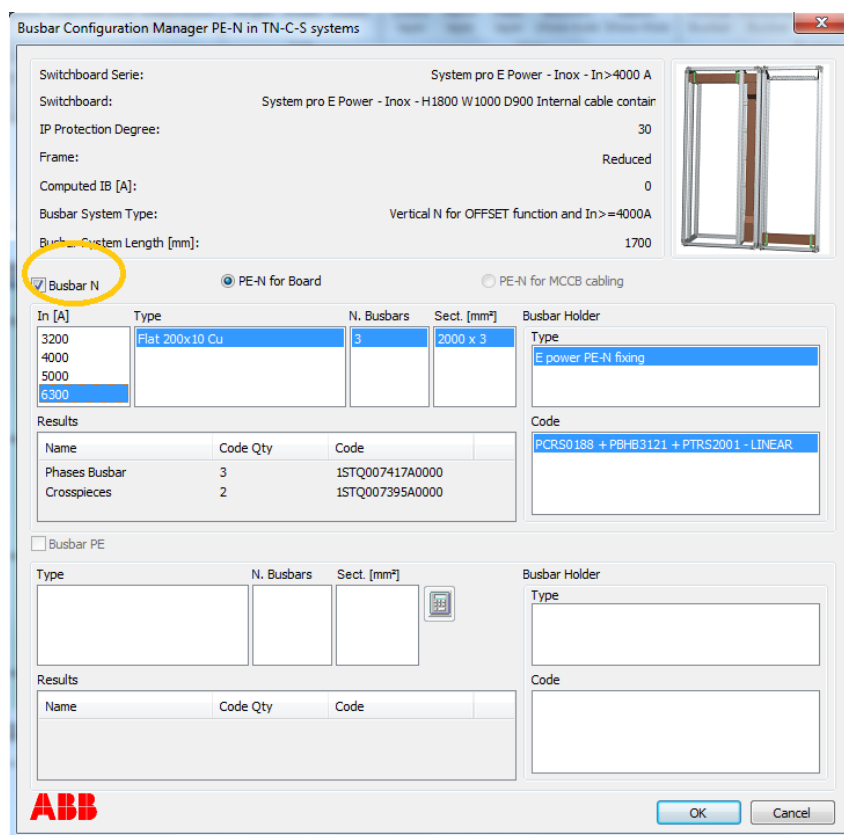
Point 3: insertion of big value of vertical offset N

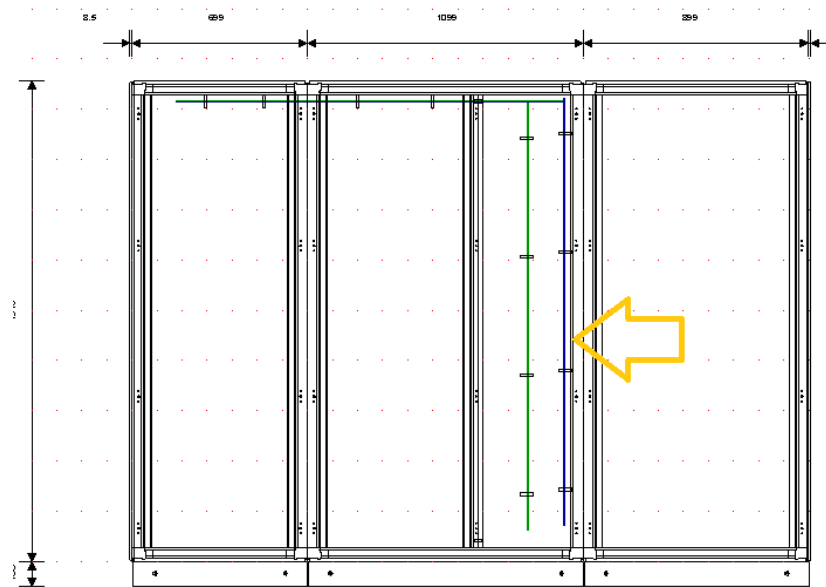Also this kind of vertical busbars system is available only on internal or external cable container.

Editing the vertical N that you want to include in the board (see image below),

It opens the usual N- PE mask, where only the neutral with big value of current is available (see the follow image).

This is the result after the closing of the mask

Important note about the offset for the neutral with big current value

As seen in a paragraph before the N bars of the offset on case of big current follow the same rules of normal vertical busbar on internal or external cable container. It's possible also combine on the same 4P busbar system the offset of the neutral with the offset of the 3P main busbar system (see figure to follow).

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In this case simply use the mask relative to the normal vertical busbars taking care to select LLLN as a phase value of the vertical system that you intend to built.

The LLL part of the system will be devoted to the offset relative to the power system while the N part vill be enable the displacement of N-PE conductor from the top to the bottom of the board (or vice versa).
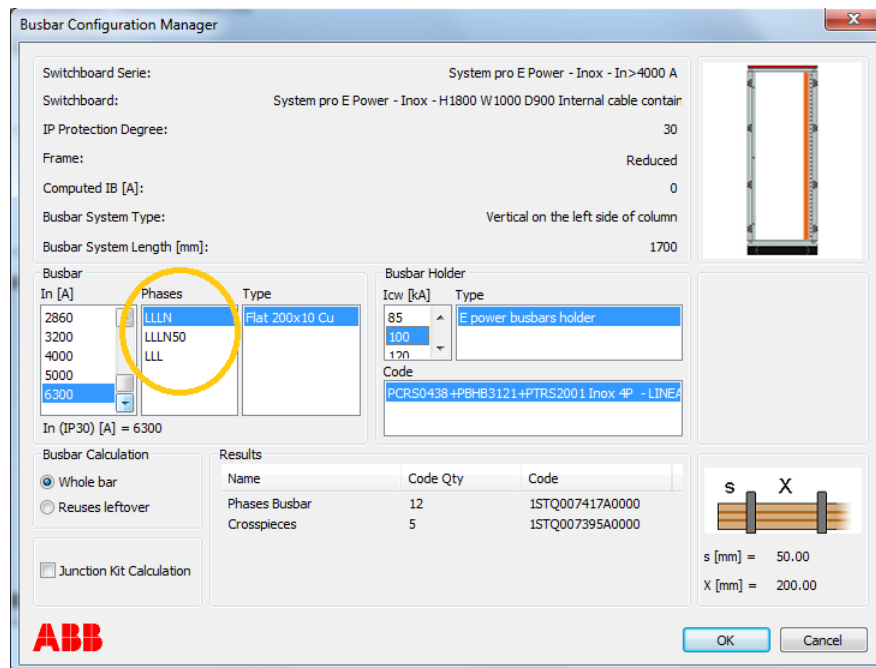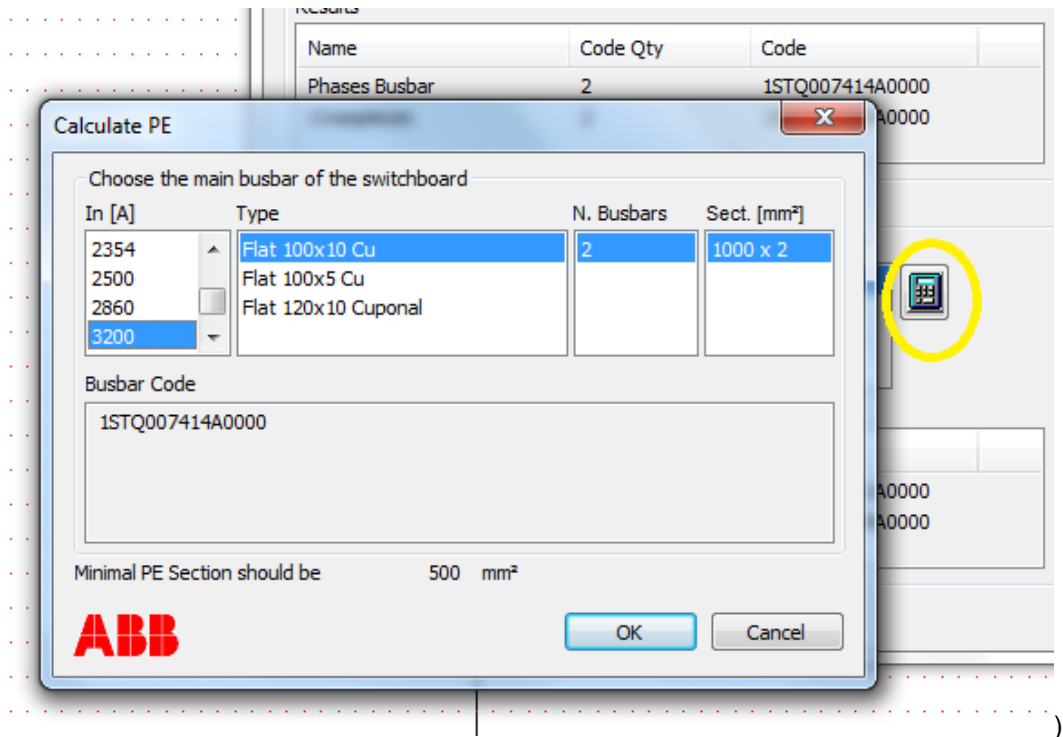

This is the overall result by DOC on the board

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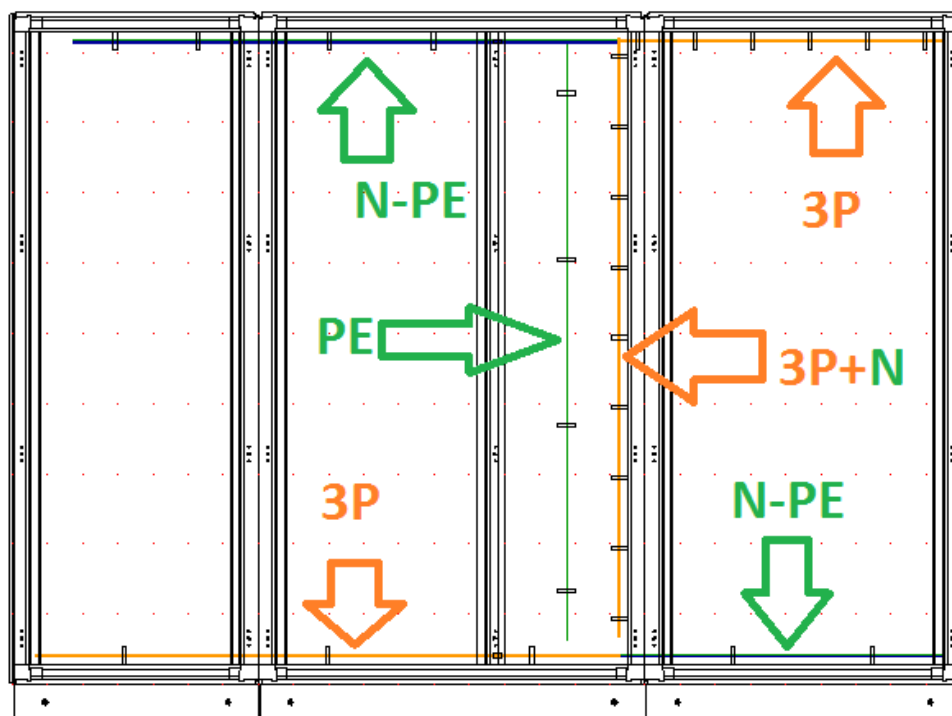
PE Automatic calcolation

Using the button indicated by the yellow circle you can activate the mask for the automatic calculation of the PE section from the rated current value on the main busbar system in the board (see figure below)
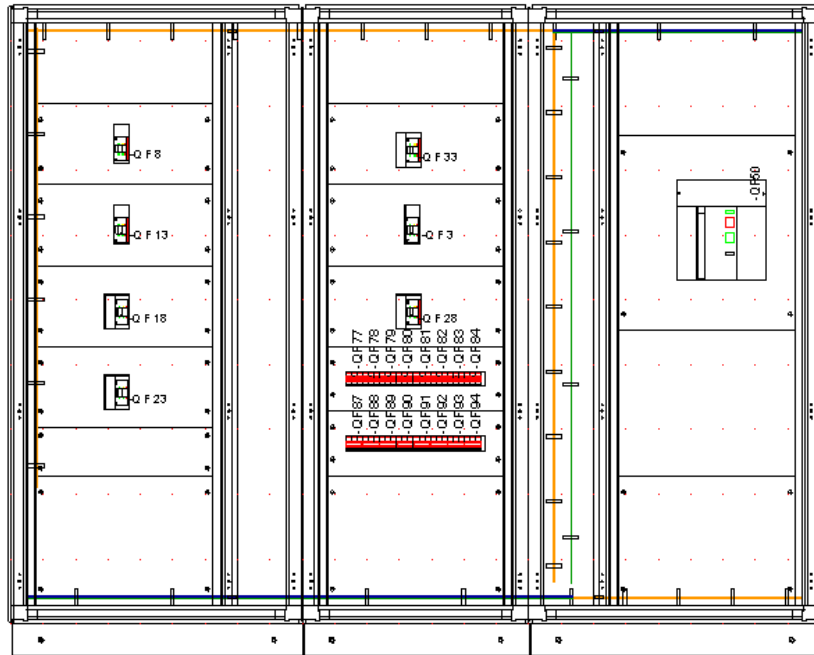

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The algorithm used by DOC for the PE section calcolation is based on the table below

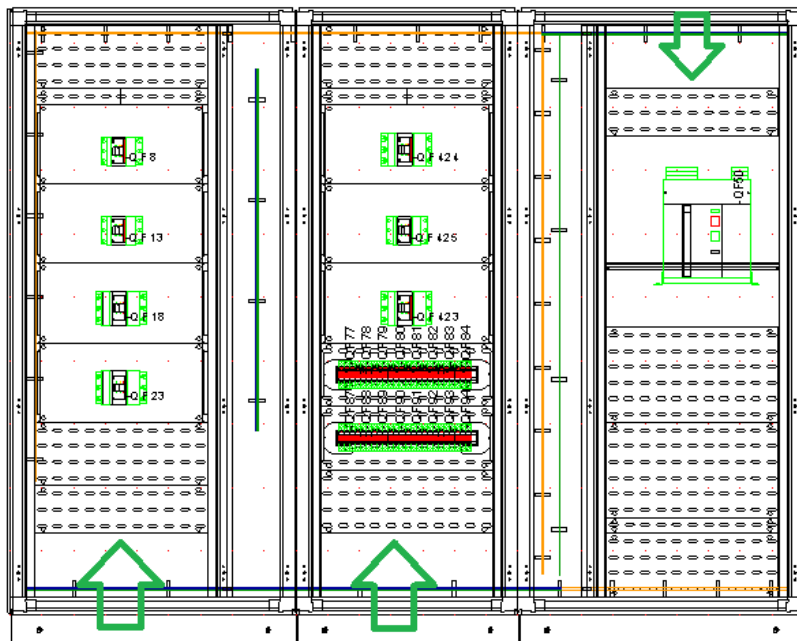Use the values in the table for sizing taken from Standards IEC 61439-1-2.

S (mm²)			Sp (mm²)
	S ≤	16	S
16 <	S ≤	35	16
35 <	S ≤	400	S/2
400 <	S ≤	800	200
	S >	800	S/4

N-PE and segregation in DOC

This a correct example of N-PE segregation with DOC; this the situation before of segregation process (panel level):

This instead is the situation after the segregation (plate level):

See the green arrows of the picture above: areas before the N PE horizontal bars are segregation "free" and a PSHS… segregation code is used to prevent access in the direction of the arrow itself.

Since the power busbar systems coexist with the PE offset mounting the front segregation in the internal cable container is moved from the level "puki" to level front door.

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