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1. PROGRAM CHARACTERISTICS

The QuadroPlan software is a tool for the design, calculation and estimate of the cabinets manufactured employing ETA materials. Its characteristics are:

- Insertion of switching devices from a large file containing products of the more diffused trademarks
- Possibility to add customized switching devices to the database
- Graphic arrangement of the switching device
- Calculation of the power dissipated by the switching device
- Temperature rise calculation according to CEI 17-43 (IEC 890)
- Control of maximum temperature according to EN 60439-1 tab. 2
- Calculation of ventilation devices
- Calculation of dynamic stresses in busbars according to CEI 17-52 (IEC 1117)
- Tridimensional drawing of the cabinet and all relevant accessories
- Filling in of the material list with prices.

2. COMPUTER REQUIREMENTS

The Quadroplan program can be installed on personal computers having the following minimum requirements:
800 MHz Pentium processor.
256 Mb RAM memory.
Hard disk with 25 Mb free at least.
Windows 98/ME, Windows NT4, Windows 2000 , Windows XP operating systems.

3. INSTALLATION

The software is distributed on CD.
Close all the programs possibly running.

In particular, it is recommended to close MS Office, which is often automatically started at Windows starting, proceed as follows:
When Office is active, a set of buttons appears on the right top of your screen.
The last button on the right shows an icon with a pencil (among other things) and the wording "Microsoft Office".
Clicking this button a pop-up menu appears.
Before starting the installation of QuadroPlan proceed as follows:
1. Click the button "Microsoft Office" described above.
2. Select "Quit" in the pop-up menu (it is the last item)
3. Install QuadroPlan as described below without turning the computer off (in case you unintentionally turn the computer off, restart from point 1)
4. Restart the computer

Insert the CD.
The installation starts automatically; if it does not start, because the CD autorun has been disabled, click Start, select Run and digit x:\menu (x is the CD unit) and then click OK.
Click on the menu what you want to install.

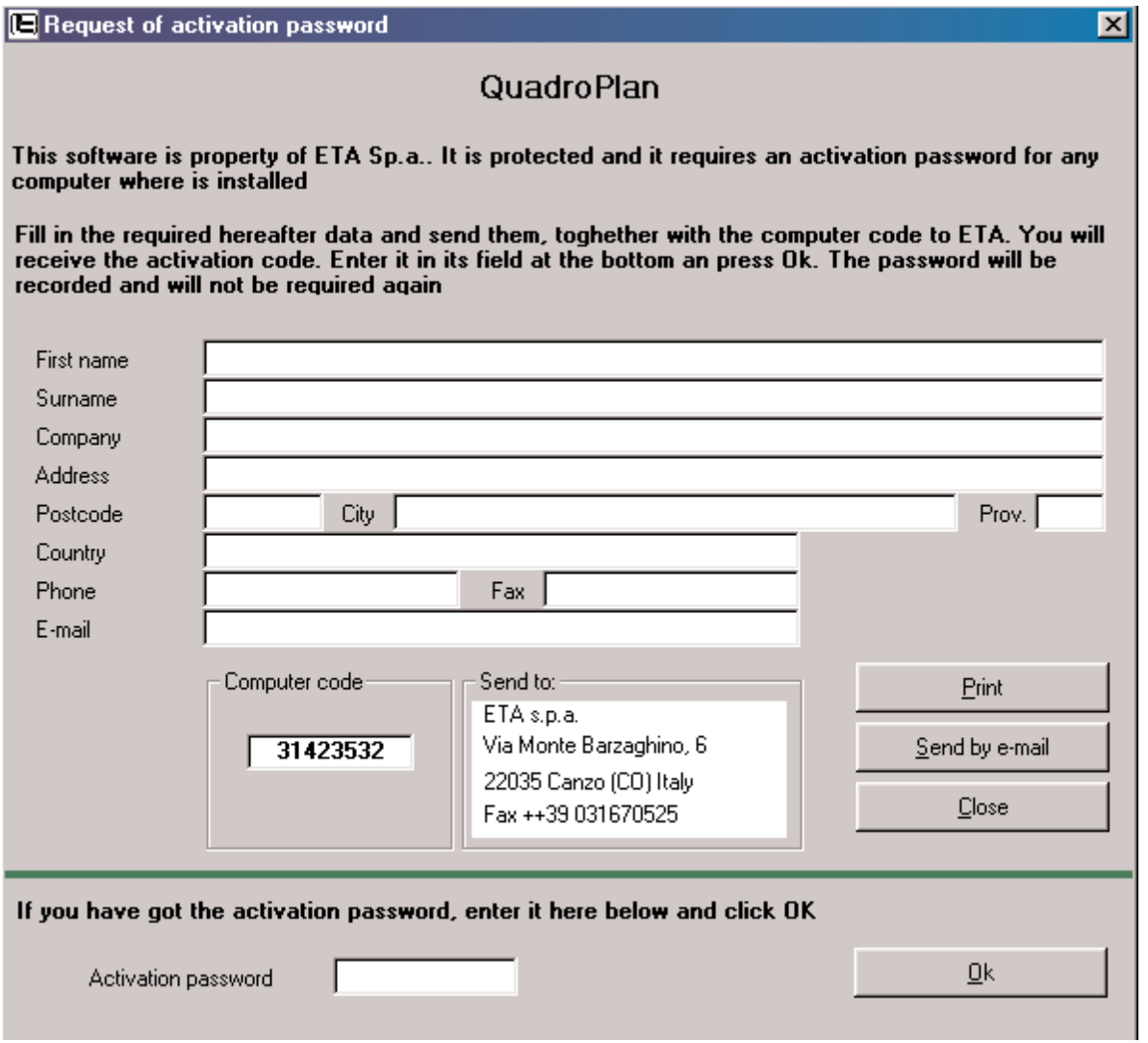
During installation, the program asks to select the installation directory, proposing a default one. Accept or select a new one.

The program automatically creates the starting icon of QuadroPlan.

4. SERIAL NUMBER

When the installation is completed, start QuadroPlan.

The program shows the following screen:



Enter the user's identification data.
In the Computer Code box the computer code appears. You can proceed in 2 different ways:
- Click **Send by e-mail**. The user's data and the code are sent to Eta.
- Click **Print**: the user's data and the code are printed to be sent by fax to Eta.

In both cases click **Close** and wait for Eta to send the password.

After receiving the password restart QuadroPlan. The same screen appears; digit the password received in the Activation Password box and click Ok.

From this moment the program is operating and the password shall no more be requested, except in case of installation on a different computer.

5. USE OF THE PROGRAM

5.1 OPERATIONAL RECOMMENDATIONS FOR THE USE OF THE PROGRAM

5.1.1 Foreword

The software developed by ETA is a valid aid for designers and cabinet manufacturers, since it enables to perform a correct dimensioning of the cabinet enclosure, to temperature rise purposes, inspection of the dynamic stresses of busbars, and short circuit withstand, in compliance with CEI EN 60439-1 (CEI 17-13/1) standards.

Calculation procedures are as foreseen by CEI standards, namely:

CEI 17-43 Volume 1873; Method for the determination of temperature rise, through extrapolation, for partially type-tested low voltage switchgear and controlgear assemblies (LV boards) (PTTA).
The italian Standard CEI 17-43 is according to the Harmonized Document CENELEC HD 528 S1, identical to the Report IEC 890 (1987)

CEI 17-52 Volume 2252; Method for the determination of the shortcircuit withstand of partially type-tested low voltage switchgear and controlgear assemblies (PTTA)
The italian Standard CEI 17-52 is identical to the Publication IEC 1117 (1992)

For the application of the standards, which apply only to the PTTA assemblies (boards), some conditions contained in the standard itself and listed below, shall be complied with.

Temperature rise

The calculation method of the CEI 17-43 (IEC 890) standard is applicable only under the following conditions:

- the distribution of the dissipated power inside the enclosure is essentially even
- the assembly installed is arranged in such a way not to hinder air circulation, but in a modest way;
- the assembly installed, foreseen for d.c. or a.c. up to 60 Hz included, with the sum of the currents of supply circuits not higher than 3150A;
- conductors transporting high currents and structural parts are arranged in such a way that the losses for parasite currents

are negligible;
- for the enclosures with ventilation openings, the section of air exhaust openings is at least 1,1 times the section of the intake opening;
- there are no more than three horizontal partitions in the PTTA or in one of its sections;
- whenever the enclosures with external ventilation openings are divided into compartments, the surface of ventilation openings in any horizontal inside partition shall be equal at least to 50% of the compartment horizontal section.

5.1.2 Short circuit

The CEI 17-52 (IEC 1117) standard defines that changes in parameters, like clearance, busbar material, busbar cross section and their configuration, demonstrated by the calculation in compliance with IEC 865 publication (CEI EN 60865-1, classification CEI 11-26), are allowed to the extent the following conditions are observed:

- The short circuit current can be changed into lower values only.

- Changes in material or shape of supports are not allowed. Other supports can be used provided that the same gave successful results at the type test.

On the contrary, it is allowed to increase the busbar cross section, and therefore the capacity, versus those of the tested system.
It is recalled that the check for short circuit withstand, is not necessary in the following cases:
a) The estimated Icc in the point of the plant where the board is installed does not exceed 10 kA
b) The board is protected by a current limiting device such for which the peak value of the limited current does not exceed 17 kA.

5.1.3 Program Structure

The program foresees the following selection menu:

1. TEMPERATURE RISE
   1.1 GRAPHIC PROCEDURE
   1.2 ANALYTICAL PROCEDURE WITH KNOWN DISSIPATED POWER
   1.3 ANALYTICAL PROCEDURE WITH DISSIPATED POWER TO BE DETERMINED

2. SHORT CIRCUIT
   2.1 GENERIC BAR CALCULATION
   2.2 WOEHNER TESTED SYSTEM

3. CATALOGUE
   3.1 GRAPHIC PROJECT
   3.2 COMPONENT LIST
4. ETACAD

5.1.3.1 temperature rise

For temperature rise calculation it is necessary to determine the power dissipated by switching devices, cables and busbars. This is the most difficult and complex part of the calculation; therefore, it has been simplified offering a wide file of switching devices of the main trademarks. A cable or busbar section is correlated to each switching device, according to the rated current, having length equal to 1 m (see table 1). The program automatically considers

the dissipation values for the calculation. The section adopted, according to the rated current of the switch In, is the one indicated in table 8 of CEI 17-13/1 standards, relevant to flexible cables, the busbar cross section is that indicated in normalized tables DIN43671 – Dec. 1975, relevant to bright busbars.
The quantity of conductors assigned to each switching device, according to the number of poles, is as follows:

No. poles switching device	quantity of conductors
1P	1
1P+N	2
2P	2
3P	3
3P+N	3 (*)
4P	3 (*)

(*) It is assumed that loads are balanced on the three phases, therefore the fourth conductor is not crossed by a significant current to the purposes of dissipated power.

Provisions have been also made for a database, to be filled in by the user, concerning motor protection and starting units. In this file, the switching devices relevant to the adopted system (fuses-thermal-contactor, magnetothermic-contactor etc,) can be entered, selecting them in the main file, indicating the cross section and length of the cables and the total dimension of the system. A name shall be assigned to the unit – for instance 5,5kW motor starting – and it could be included in the cabinet as single item. The power dissipated by components shall be automatically correlated to the value of the motor rated current.
A third file contains the busbars, both having rectangular section of standard size, and having a special profile supplied by ETA.
All the database can be modified and expanded, except for the cabinets one.
Two procedures enable the selection of switching devices, the third and quicker one, requires knowing the value of dissipated power. The main characteristics are as follows:

GRAPHIC PROCEDURE

The front cabinet of the selected size is displayed, where the switching devices selected time by time from the file are positioned. The dimensions set in the database are the switching devices physical ones.
The size does not consider the distance to be observed from other switching devices, except in case of miniature modular ones, where the horizontal distance is 0 while the vertical one is consistent with the slot panel having 200-mm. height.
A use factor can be assigned to each selected switching device.
Before the final calculation, it is also possible to define the rated diversity factor, for which three possibilities are foreseen, weighted, according to the standards or free.

The weighted calculation is determined from the ratio between the rated current of the main switchgear and the sum of rated currents of the protection devices against overcurrents derived from the same.

The calculation according to the standard is determined according to the number of the board output circuits, as indicated in the following table:

Number of circuits	Rated diversity factor
2 and 3	0,9
4 and 5	0,8
6 to 9 (included)	0,7
10 (and over)	0,6

The free calculation enables to select any value between 0 and 1
The factor refers to the currents, therefore it shall automatically be squared to be applied to the power.

ANALYTICAL PROCEDURE

This procedure does not contain the graphic portion. The first mode “KNOWN DISSIPATED POWER ” requires to know the value of dissipated power. The second mode “DISSIPATED POWER TO BE DETERMINED SELECTING THE SWITCHING DEVICES” enables to determine the power as in the graphic method, selecting the switching devices from the file and gathering them in a summary table.
These two procedures enable also to enter free dimensions of the enclosure, also to enable the calculation of customized boards.

Once the dissipated power is determined, the methods for temperature rise calculation contained in the CEI 17-43 (IEC 890) standard are applied to the three procedures.
Once the temperature rise is found and the ambient temperature indicated, it is found the value of the theoretical temperature inside the cabinet, at the different heights.
On completion, the program enables to compare the maximum calculated temperature with that allowed by the standards for the different components, to personnel safety purposes.
Finally, it is possible if necessary to dimension the forced ventilation or conditioning plant, in case the cabinet characteristic conditions do not allow sufficient heat dissipation in a natural way. In this case the standard 17-43 (IEC 890) is not applicable, but the calculation method is still valid.

Once the "technical" dimensioning portion is completed you can proceed to the estimate preparation, automatically retrieving the elements of the cabinets already set and calculated, and completing it with all the other desired components.

5.1.3.2 short circuit

Eta submitted an Areta board prototype to the short circuit tests at a value of 60 kA.
The main busbar system was formed by three vertical phase conductors, each one composed by two 100x10 mm busbars, plus a 100x10 mm busbar for the neutral.
(Cross section: ll ll ll l)
From these were derived four 80x10 mm busbars (Cross section: l l l l).
The section of the earth busbar was 80x5 mm.
All busbars were copper made.
The test value were the following:
Three phase: **60 kA** on main and derived busbars
Phase - Neutral: **48 kA** on main and derived busbars
Phase - Earth: **48 kA**
However, the program can be used to extrapolate the system from a tested one, or to make the check calculation in case short circuit current values are lower than 10kA.

5.1.3.3 catalogue

The Catalogue function enables to draw on the screen and print the cabinet, combining it with all the elements present in the ETA catalogue.
The front, plan and isometric views of the cabinet can be displayed.

The cabinets list is automatically generated from the drawing, with quantities.

5.2 STARTING OF QUADROPLAN AND MAIN MENU

Start QuadroPlan from the Start/Programs/QuadroPlan menu.

The initial screen and the logo appear on your screen. Click the same (or wait for some seconds).

You enter the **Main menu**.

As usual for Windows programs, choices are made either clicking the items in the menu, or for some commands pressing the buttons of the application bar.

The **File** item includes the following 5 options:
New – to start a new work
Open – to retrieve a filed work
EtaCad – to start the EtaCad module
Print declaration of conformity
Quit – to quit the program

(The first button of the tool bar corresponds to New, the second one to Open).

The **Database** item includes the following 4 options:

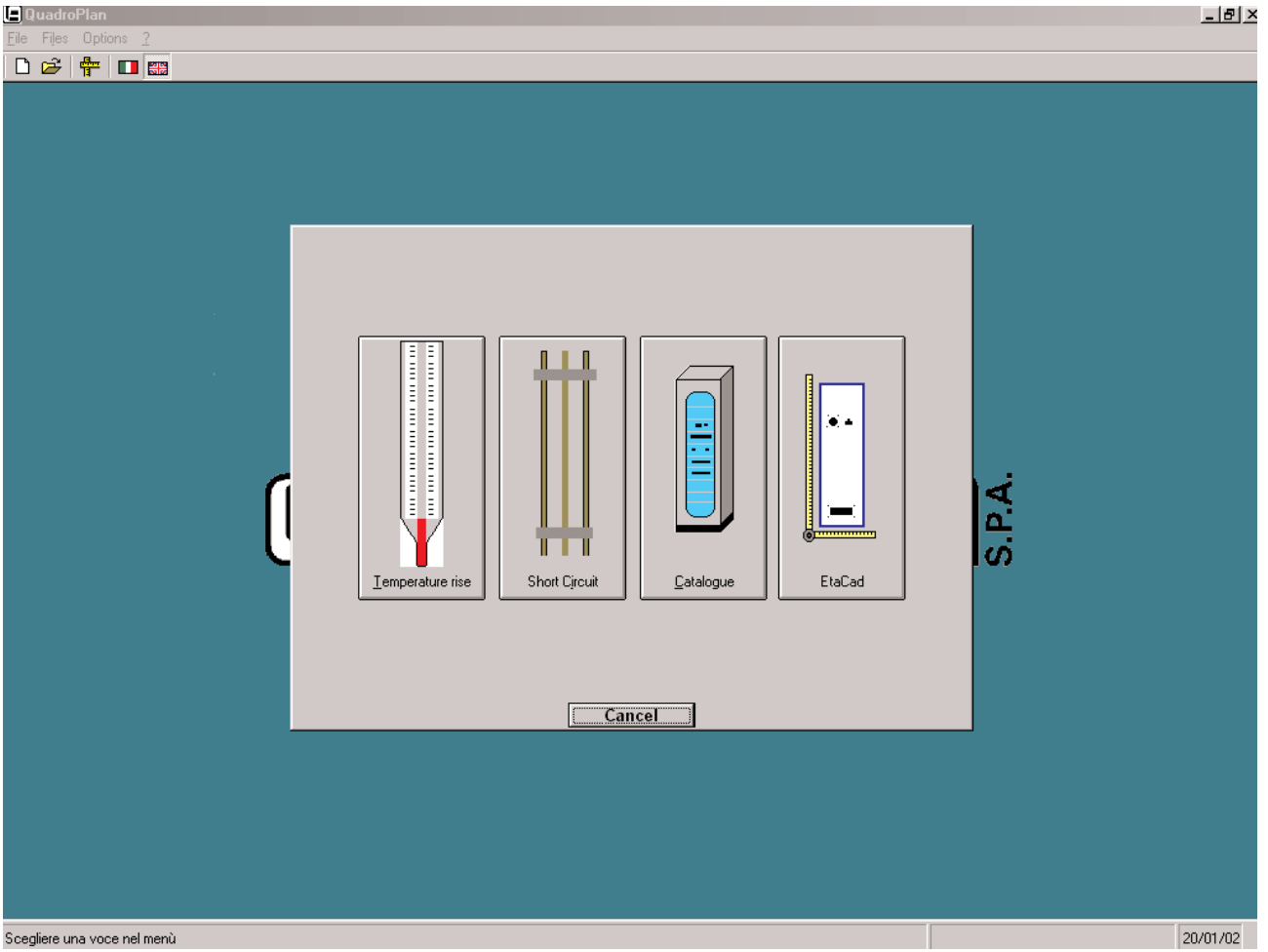
Devices – to manage the file of electrical devices
Motor starting – to manage the file of motor starting units
Busbars – to manage the file of busbars
Cabinets – to manage the file of cabinets.

The **Options** item includes:
Internet – to modify the e-mail address where to send the component list
Language – to modify the language used by the program (it can be selected also using the buttons showing flags)

The symbol **?** opens the help on line.

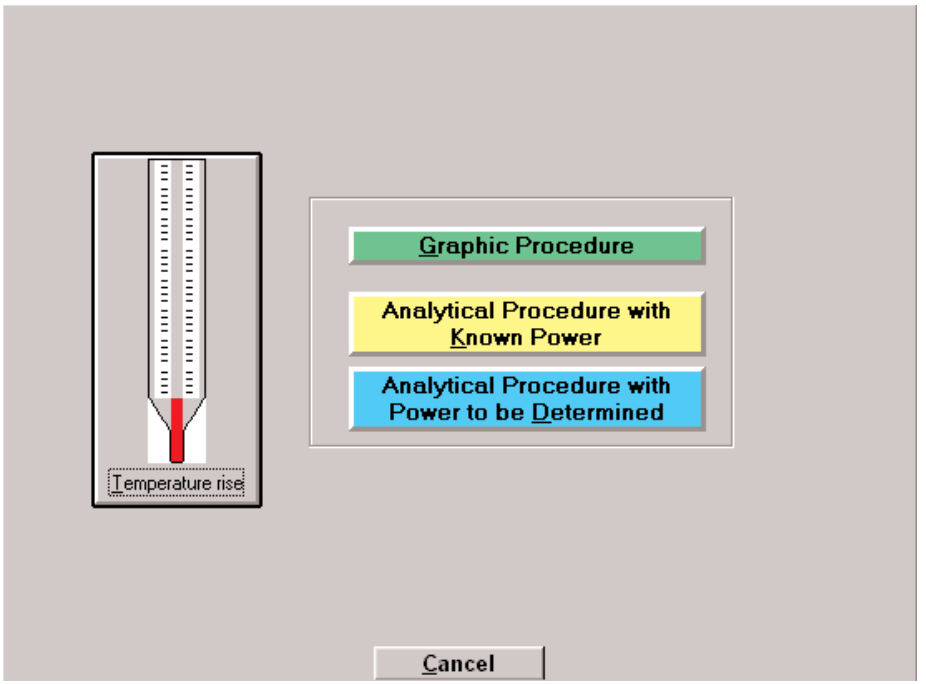
5.3 STARTING A NEW WORK

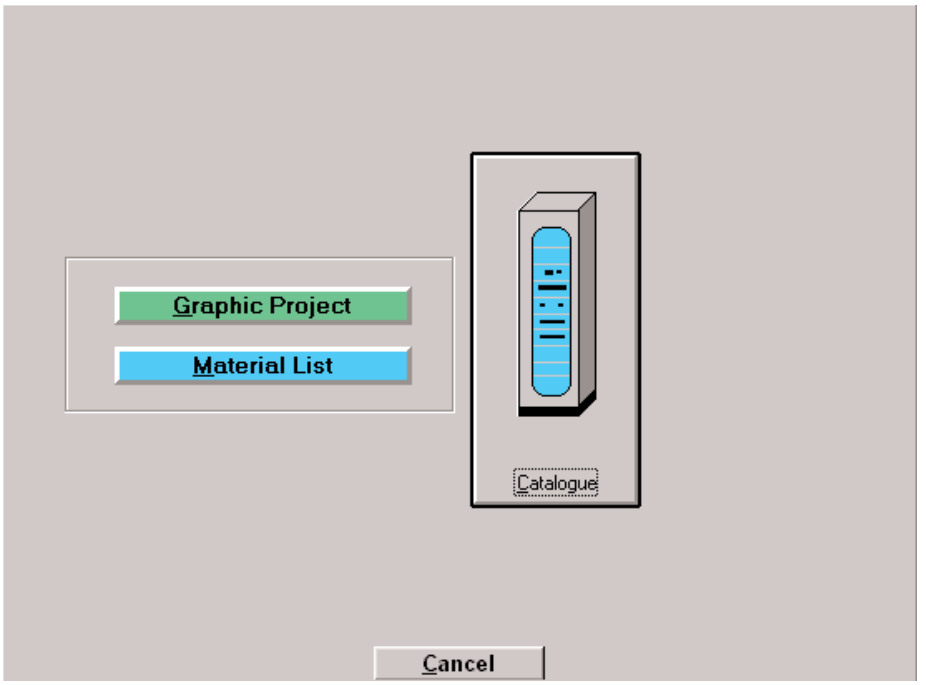
When you select to start a new work, you shall select the type of work you want to carry out.
The following screen appears.

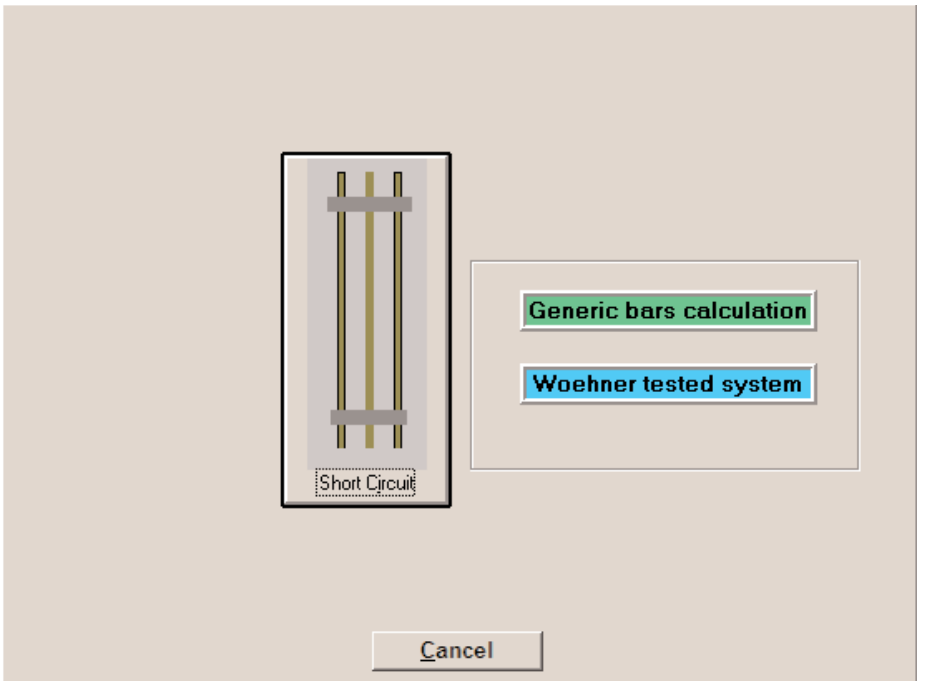


Clicking one of the four buttons you have access to the four main functions of the program.

Clicking “EtaCad” you have direct access to the relevant function.
Clicking on one of the other three buttons, the possible options are displayed: Graphic procedure, Analytical procedure with known power and Analytical procedure with power to be determined, for the Temperature rise; Graphic project and Material List for the Catalogue.


Temperature rise
Graphic Procedure
Analytical Procedure with Known Power
Analytical Procedure with Power to be Determined
Cancel


Graphic Project
Material List
Catalogue
Cancel



5.4 OPENING A FILED WORK

When you choose to open a filed work, the list of the stored database appears with the description of the relevant content.

Select the work and click Ok.

5.5 CONNECTION AMONG QuadroPlan FUNCTIONS

The Shortcircuit module and the EtaCad module are separate ones, not connected to the other modules.

On the contrary, for the other two modules it is possible to go from a function to another one according to the initial choice.

The functions of the two modules are:

Temperature rise:

A. Graphic arrangement of assemblies
B. List of assemblies
C. Busbars insertion
D. Calculation of dissipated power
E. Temperature rise calculation

Catalogue

F. Graphic project
G. Material list

General function

H. General data

Starting from the initial choice it is possible to follow the sequences below:

Initial choice	**Possible sequence**
Temperature rise – Graphic procedure	A – B – C – D – E – F – G
Temperature rise – Analytical procedure with power known	E
Temperature rise – Analytical procedure with power to be determined	B – C – D – E
Catalogue – Graphic project	F – G
Catalogue – Material list	G

Access to the H function is possible from any other function.
Sequences can be made also in the opposite direction, provided that the initial choice is the desired one.

When a function screen is displayed, you can have access to the other functions of the sequence from the **Functions** menu. You can also proceed along the sequence forward or backward, clicking the arrows appearing in the different situations at top right, in the tool bar. The rightward arrow moves it forward; the leftward one moves it backward.

5.6 GENERAL DATA

The General Data window allows to enter the user's identification data (usually already filed upon installation), and the data relevant to the project in progress.

Date of offer or order
Reference of offer or order
Work order
Eta reference number
Notes: a free box where you can enter any notes.

These data will be sent to Eta together with the list of materials using the function Send list of materials to Eta.

5.7 TEMPERATURE RISE

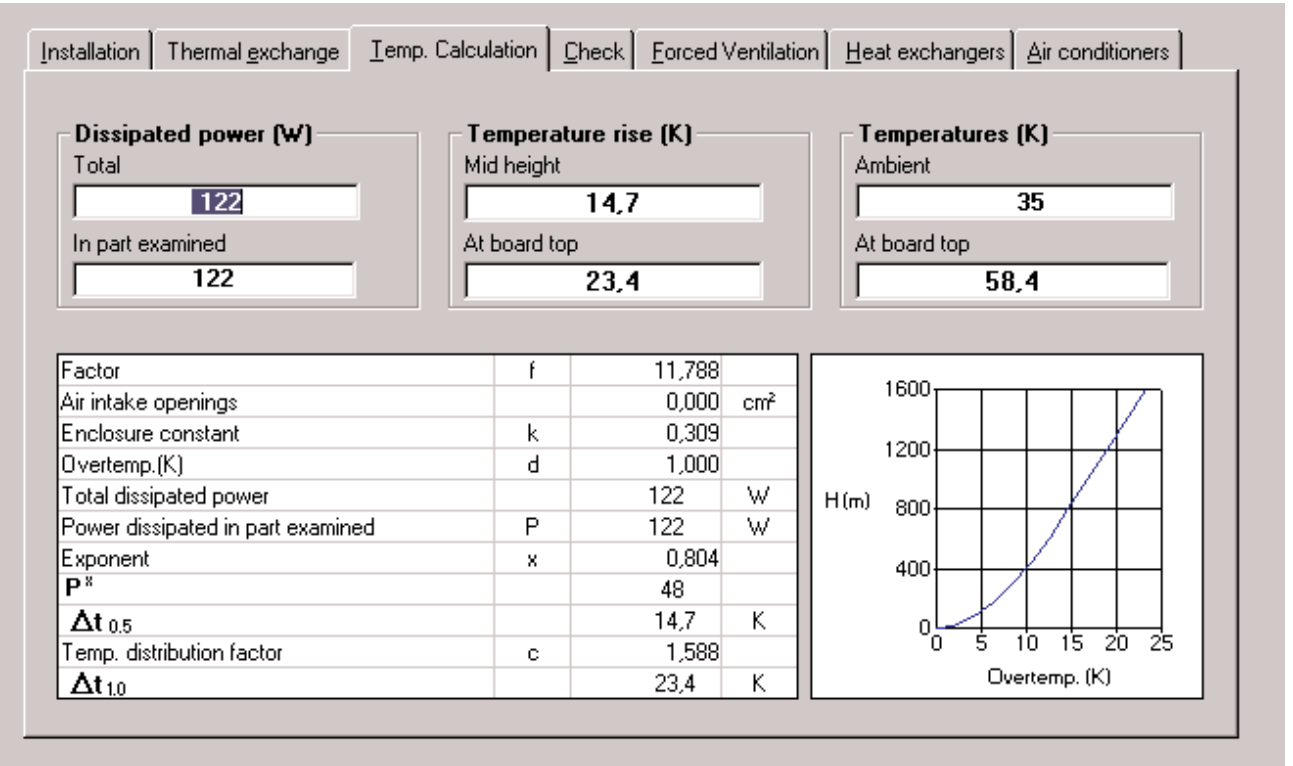
5.7.1 Analytical procedure with known power

To make the immediate calculation, select the ETA series of the cabinet and its dimensions. Free dimensions can be entered for non-ETA cabinets.

The program asks also if the suite includes several cabinets and it proposes all the dimensions of the requested ETA series.

If the suite composition is selected, a screen appears for the selection of the different widths of the cabinets forming the suite.

The actual calculation is performed, which is organized in cards:



In the **Installation** card, it is defined for each cabinet surface if it is “exposed” or “covered”.
“Covered” means a surface in contact (or very close) with a wall without air circulation possibility.
“Exposed” means that air can circulate along the wall.
N.B. Exposed surface means a surface 5 cm at least far from another surface of any kind (wall, assembly, cabinet, etc.).

For instance a cabinet adjacent to the wall will have all the surfaces exposed, except for the rear one.

It is also selected whether the assemblies are installed on the front door or on panels underneath the door.
In this case the exchange on the front surface is reduced, due to the presence of the double wall (door and panels).

The program shows the indication of the type enclosure such as: single, divided in two halves, etc.
In fact the standard foresees that the maximum width to be used for the calculation is 1,5 m.
If the cabinet is wider, it is assumed as divided in two or more parts, each one having 1/2, 1/3, etc. of the total power.

In the **Thermal Exchange** card enter:
The type of ventilation: none, natural (specify the surface of ventilation openings), forced.
The number of horizontal partitions.

In the **Temperature Calculation** card enter the total dissipated power and the ambient temperature.
The program calculates the temperature rise and the maximum temperature.

In the **Check** card, the program checks the maximum temperature versus the requirements of the EN 60439-1 standard, to safety purposes.
These values foreseen by the standard do not cover all the material typologies, but only the significant ones, to personal safety purposes: the results are referred to the maximum temperature.
Of course, it is up to the designer to check that the calculated maximum temperature falls within the limits required for the operation of the assemblies.
The value of the maximum temperature is referred to the cabinet top and decreases up to the value of the ambient temperature at the cabinet base. So a component installed downward shall be submitted to a lower temperature, which enables the designer to foresee the most convenient position for the temperature higher-sensitive components.
If **forced ventilation** was entered in the second card, the relevant card is enabled. Enter here the desired temperature; the program determines the required air delivery and recommends the more appropriate ETA thermal management devices.

The print button appears at top (print can be made also from the file/print menu).

5.7.2 Analytical procedure with power to be determined

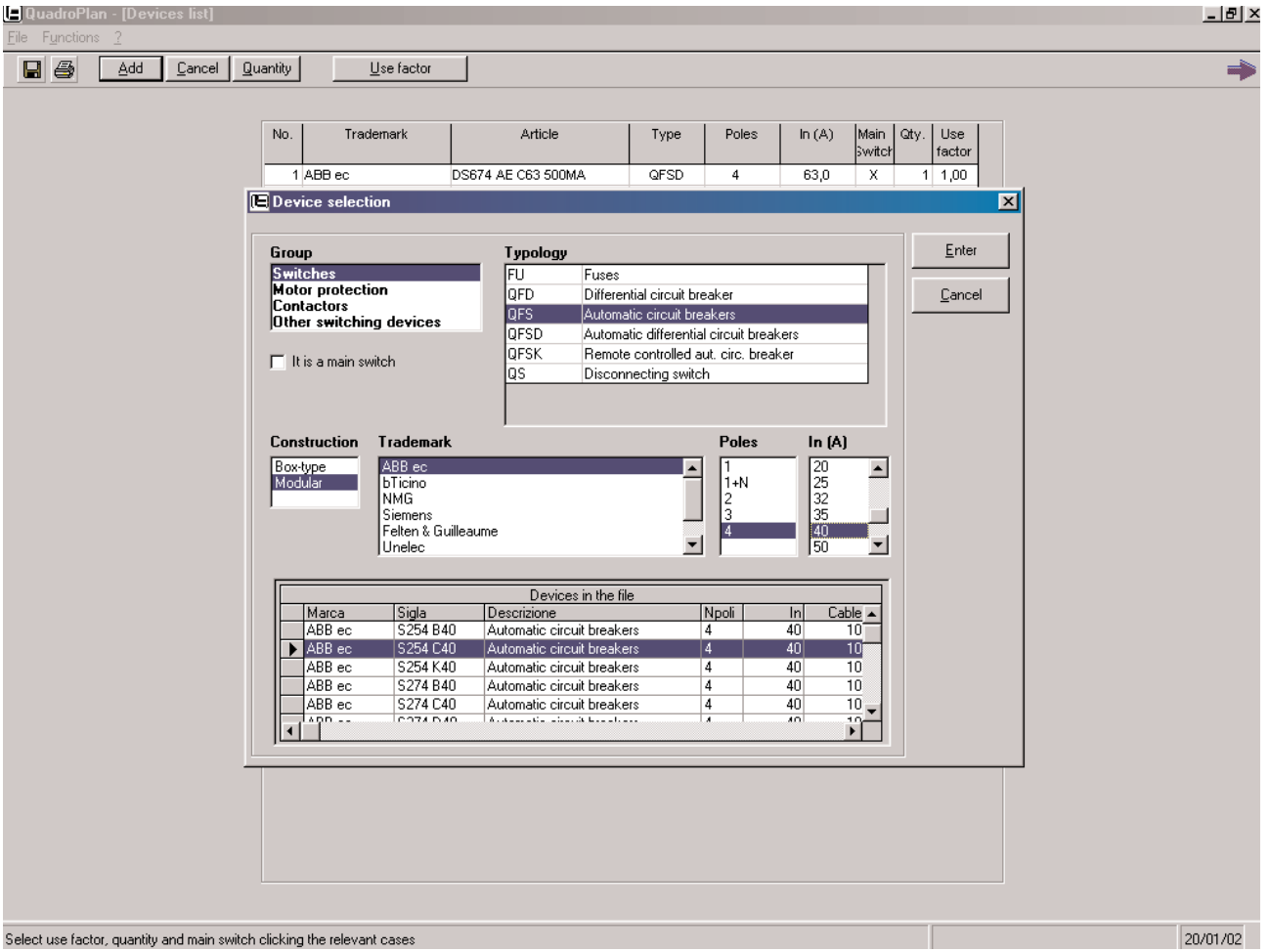
The analytical procedure with power to be determined is similar to the one described in the previous paragraph, but the dissipated power shall not be entered by the user but is calculated by the program on the basis of the list of assemblies entered.

The program shows first the table with the list of the assemblies (which was initially empty).

Click Add to enter the assemblies, Cancel to eliminate the selected assembly, Quantity to modify the quantity, Use factor to vary the use factor.

In the tool bar at top right, a rightward arrow appears. Clicking this arrow you proceed along the sequence described in par. 5.5

Clicking Add you have access to the assembly file:



Select the **Group**, the **Typology**, the **Construction** (Modular or non modular), the **Trademark**, the **Number of Poles** and the **Rated current**.
The program proposes the list of assemblies having these characteristics, contained in the file.
Select the desired assembly and click **Insert**.

Select also if the selected is a main switch or not. This affects the calculation of the dissipated power.

The motor starting units have the conventional PAMO initials. These units must be composed in advance by the user in the File / motor starting function (see par. 4.9.2)

The assembly is included in the table of the assembly list.

Enter the quantity and possibly the use factor.

In this table it is also possible to modify the quantity or the use factor, clicking the appropriate buttons.
It is also possible to modify the function of a switch from Main to shunt (and vice versa) clicking twice the relevant box.

When the table is completed, click the arrow on the tool bar right side
(or select the desired function in the Function menu).

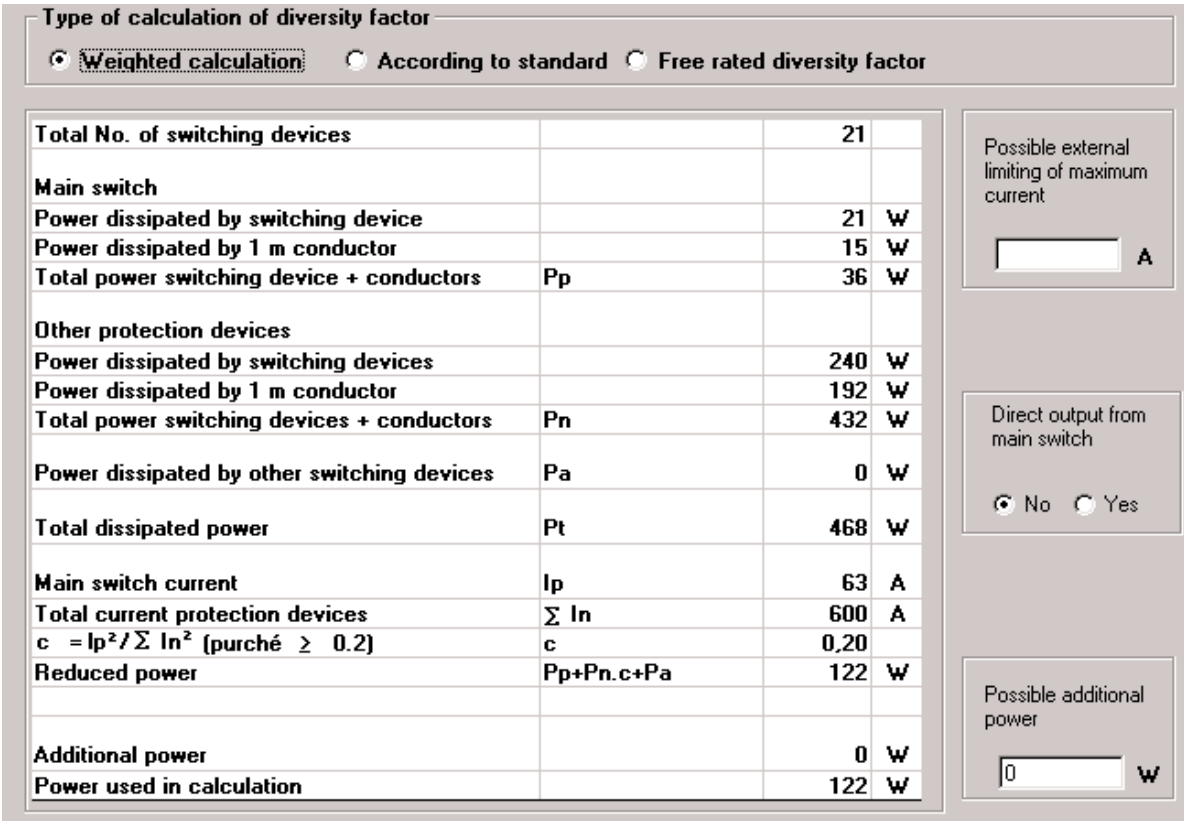
You go now to the busbar insertion screen.

Select the busbar.
Enter the number of busbars per phase, the length, the number of poles in the table that appears on your screen.
The program calculates the dissipated power.

To eliminate a busbar previously entered, select it in the right table and click cancel.

Click the right top arrow to go on.

The **calculation of the dissipated power** is performed.



To do this, the program calculates the diversity factor.
As described in par. 5.1.3.1, you can choose between the weighted calculation, the calculation according to the standard and the direct entering of the factor, clicking one of the three selection buttons at top.
In the first case you can introduce an external limit to the total current in the board and select if there is a direct output from the main switch or not.
In the second case, enter the number of circuits.
In the third one, enter the diversity factor.

An additional power can be entered in all the cases, to consider future needs or safety margins.

The value of the additional power can be positive or negative. The purpose is to enable corrections on the basis of design evaluations, or to compensate the difference versus the standard values, such as for instance:
a - increase the power dissipated by cables when the actual length inside the board is considerably higher than 1 metre as indicated in the table (e.g. presence of a cable entry).
b - enter the prospective power of an assembly of which you do not know the certain datum, by analogy or based on standard values.

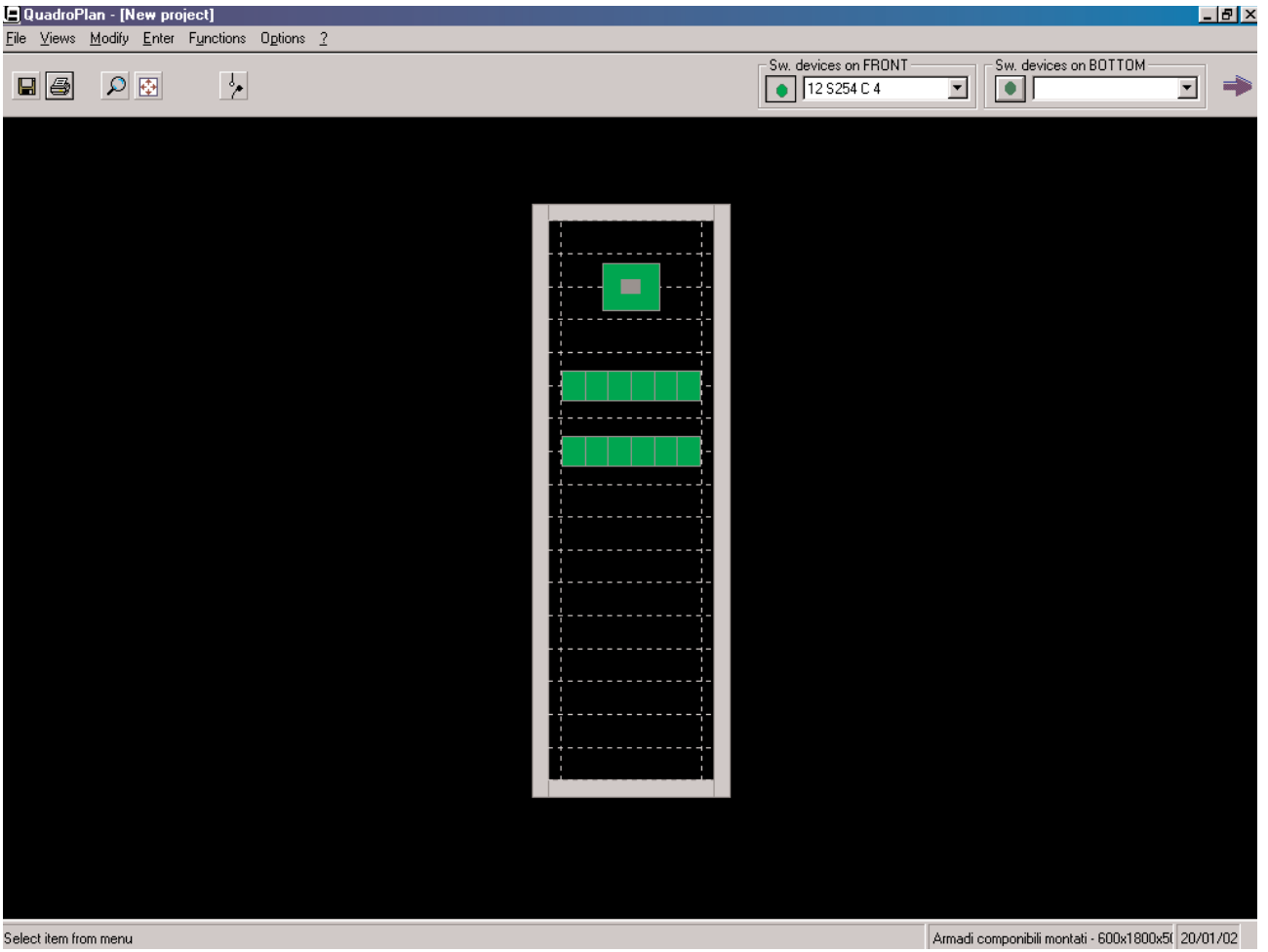
Clicking the right arrow you proceed to the calculation of temperature rise, which is made according to the method described under par. 5.7.1, except for the dissipated power field, which is automatically filled in.

You can go on to the check of the maximum temperature and the introduction of the forced ventilation as described under par. 5.7.1.

5.7.3 Temperature rise calculation with graphic procedure

The temperature rise calculation with the graphic procedure is similar to the analytical one described in the previous paragraph, but the assemblies, in addition to the list are also graphically included in the cabinet front, enabling the designer to study the better arrangement and check the overall dimensions. Furthermore, this mode allows to automatically go to the electronic catalogue: the program constructs the cabinet including all the elements already defined in the assembly arrangement (structure, panels for modular switches, panels for non modular switches).

Selecting this procedure the following screen is displayed:



The drawing field shows the front view of the selected cabinet frame.
On the top there are the two lists of switching devices inserted: on the left there is the one relating to front mounted switching devices and on the right the menu for those mounted on the bottom plate: the button aside

the pup-up menu enables to pass from front insertion to bottom insertion, and vice versa.
The button of the selected insertion mode is “lighting”.

When the Front is displayed, a grid appears indicating the cabinet modularity, in fact the switching devices on the front must be installed observing this modularity. On the contrary, switching devices can be installed in any position on the bottom.

On the top, the menu offers the following possibilities:

File
- **Close** to close the project without quitting the program
- **Save** to save the project
- **Save as** to save the project under a name different from the current one
- **Print** to print the displayed project
- **Quit** to quit the program

Views
- **Zoom** to magnify a portion of the drawing
- **Total Zoom** to display the complete field
- **Reduce** to reduce the drawing scale by one half

Modify
- **Delete assembly** to delete as assembly entered
- **Move assembly** to move an assembly to another position
- **Modify cabinet** to modify the cabinet dimensions
- **Delete cabinet** to cancel a cabinet

Insert
- **Switching devices** to insert a switching device (see below)
- **Cabinet** to insert a new cabinet in the suite
- **Entry** to insert a cable entry cabinet in the suite

Functions to pass to the other functions of the sequence
Options to modify the colours of assemblies

INSERTING SWITCHING DEVICES

When you select insert switching devices, the switching devices selection screen already described in the previous paragraph is displayed.
The only difference is the coloured box aside. In fact each switching device is drawn as a rectangle whose colour identifies the typology. Matching of colour and typology is defined clicking the Options Menu.

When switching devices is selected, the selection screen closes, and a mobile rectangle is dragged by the cursor in the field of the drawing (with the size of the switching device).
Move the mobile rectangle with the mouse and place it in the desired position clicking the mouse left button.
The switching device is positioned on Front or on the Bottom depending on which of the two lists on the left is highlighted.
It must be noticed that when one works on the Bottom, the switching device can be placed anywhere, provided that it does not interfere with another switching device and is contained in the cabinet.
On the contrary, when you work on the front, modular switching devices are aligned on the left along the axis of the support DIN profile.
Non modular switching devices are centred according to height in order to minimize the panel that shall contain it.

When the switching device is positioned, it is drawn as a coloured rectangle.
Main switches have a grey box at centre to identify the same.
The same switching device can be continuously inserted in more positions, without selecting it each time, simply positioning it with the mouse. In fact, the insertion function of the selected switching device remains active until the **Stop** button in the tool bar is not clicked.

DELETING AND MOVING ASSEMBLIES

Clicking an assembly, it is highlighted and a box with the relevant description appears.
On the box bottom there is a button to delete.
To delete, you can also proceed selecting Modify/Delete from the menu and then clicking the assembly.

Likewise, to move an assembly, select the Modify/Move menu, then click on the assembly to move and click in the new position.

TEMPERATURE RISE CALCULATION

Clicking the right arrow you go to the list of assemblies inserted and then proceed as described in the previous paragraphs, but in the screen with the temperature rise calculation, the arrow appears at right to go on in the sequence and automatically go to the electronic catalogue module.

PASSAGGE TO THE ELECTRONIC CATALOGUE

The program generates all the ETA codes of the cabinet components it can construct with the information contained up to this moment.
To do this, it shows a menu for the structure type, Frame only, Cabinet complete with door or with door window.

Therefore, the user shall have the care to add all the desired mechanical details in the electronic catalogue module, as described in the next paragraph.

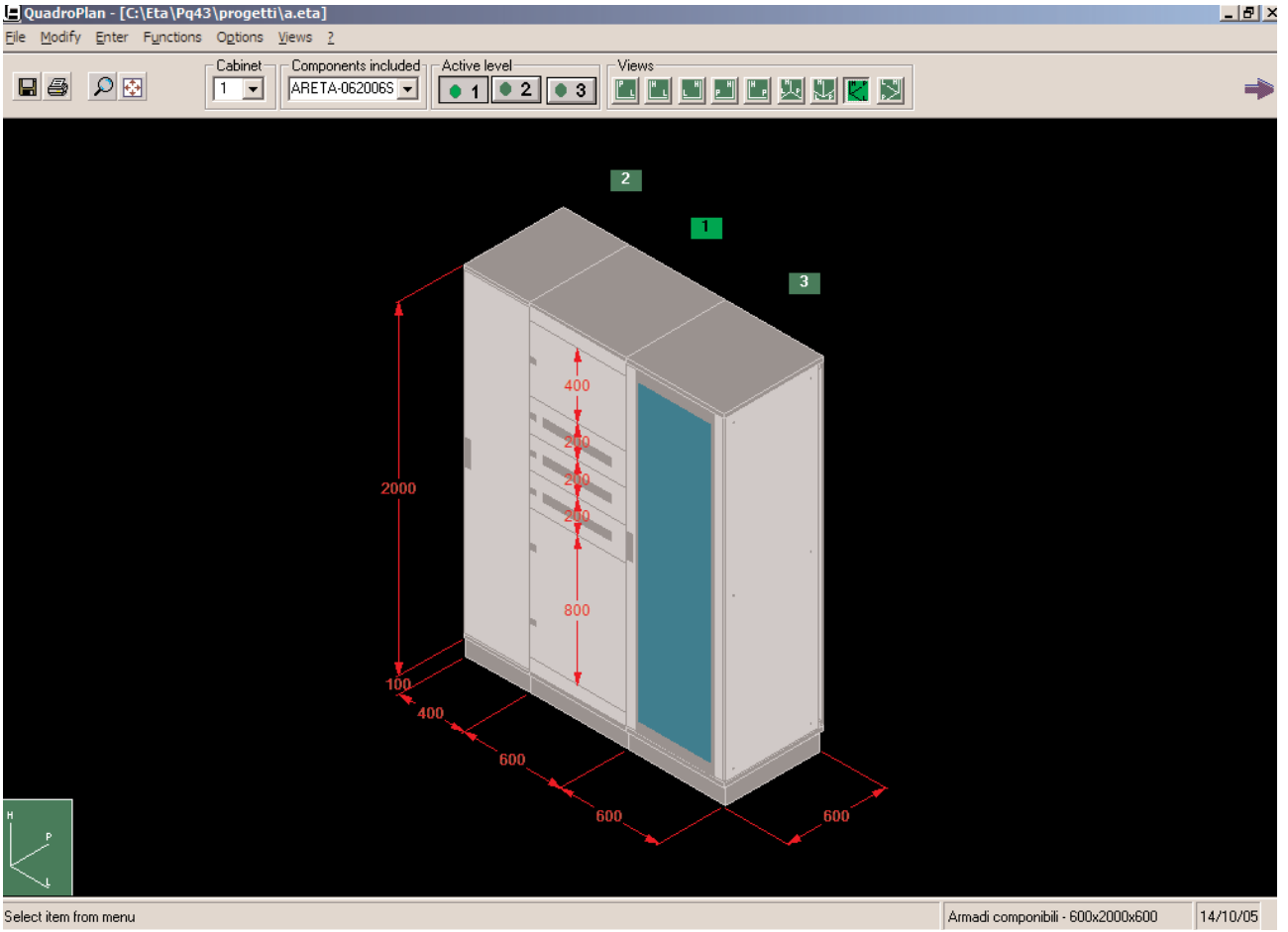
5.8 ELECTRONIC CATALOGUE

5.8.1 Graphic Project

Through the electronic catalogue it is possible to make a complete design of the electrical board, as for cabinets, using the ETA material.
With the Graphic Project function, the cabinet is drawn on the screen, then it can be printed. At the same time, the list of components with quantities and prices is generated.

Select the desired ETA series and the size of the cabinet. Now select the cabinet configuration (frame only, with door or door window)

Therefore you enter the graphic project screen:



This screen contains the area of the drawing on black background.

The tool bar is at top.

It includes a pop-up list with the list of the cabinets. The current cabinet is selected. When a suite includes several cabinets, each accessory is inserted in the active cabinet (cabinet 1 in the figure above).

On the right side, in the tool bar, there is the pop-up list with the list of components inserted and therefore the three buttons to select the active level:
The cabinet is drawn on three levels:
Level 1 (Structure, doors, socket, external modular panel)
Level 2 (Screen-door, internal modular panels)
Level 3 (Internal plates, supports, partitions, etc.)
You move from a level to the other one clicking the relevant button.

On the top, the menu offers the following options:
File
Close to close the project without quitting the program
Save to save the project
Save as to save the project under a name different from the current one
Print to print the project displayed
Print declaration of conformity
Export in BMP format to save the view as BMP graphic file
Quit to quit the program

Modify
Delete to delete an element inserted
Copy to copy a complete cabinet with all its accessories

Insert
Accessories to insert the accessories (this item opens a secondary menu with different options depending on the level and series of the cabinet)
Cabinet to insert a new cabinet in suite
Cable entry module to insert a cable entry module in suite
Text to insert descriptive texts
Dimension to dimension the cabinet

Functions
Layout of switching devices – to display the screen Temperature rise calculation by insertion of switching devices
List of switching devices – to display the list of inserted devices
Busbars and cables – to activate the function Insert busbars and cables
Dissipated power – to activate the function Calculation of dissipated power
Temperature rise calculation – to activate the module for temperature rise calculation
List – to fill the components list
General data – displays the window to enter general data

Options
Text font to select the text font
Dimension font to select the fonts of the dimensions
Select elements enable this item in order that clicking a part of the cabinet, the elements only can be selected.
Select text Enable this item in order that clicking a part of the cabinet, only texts can be selected.

(The last two items are useful in presence of wordings overwritten to the cabinet drawing. In this case it can be difficult to select an element or a text, to delete or modify the same; in this case enabling the item Select Elements

and disabling the Select Text one, you are sure to select the element and not the wording. The reverse procedure applies if you want to select the wordings)

Views

Layout
Front
Rear side
Left
Right
Fore Isometric
Right Isometric
Left Isometric
Rear Isometric
Zoom to magnify a portion of the drawing
Total zoom to display the complete field
Reduce to reduce the scale of the drawing by one half
Display all cabinets to display all the cabinets of the suite or only the one under working (useful to expedite the drawing)

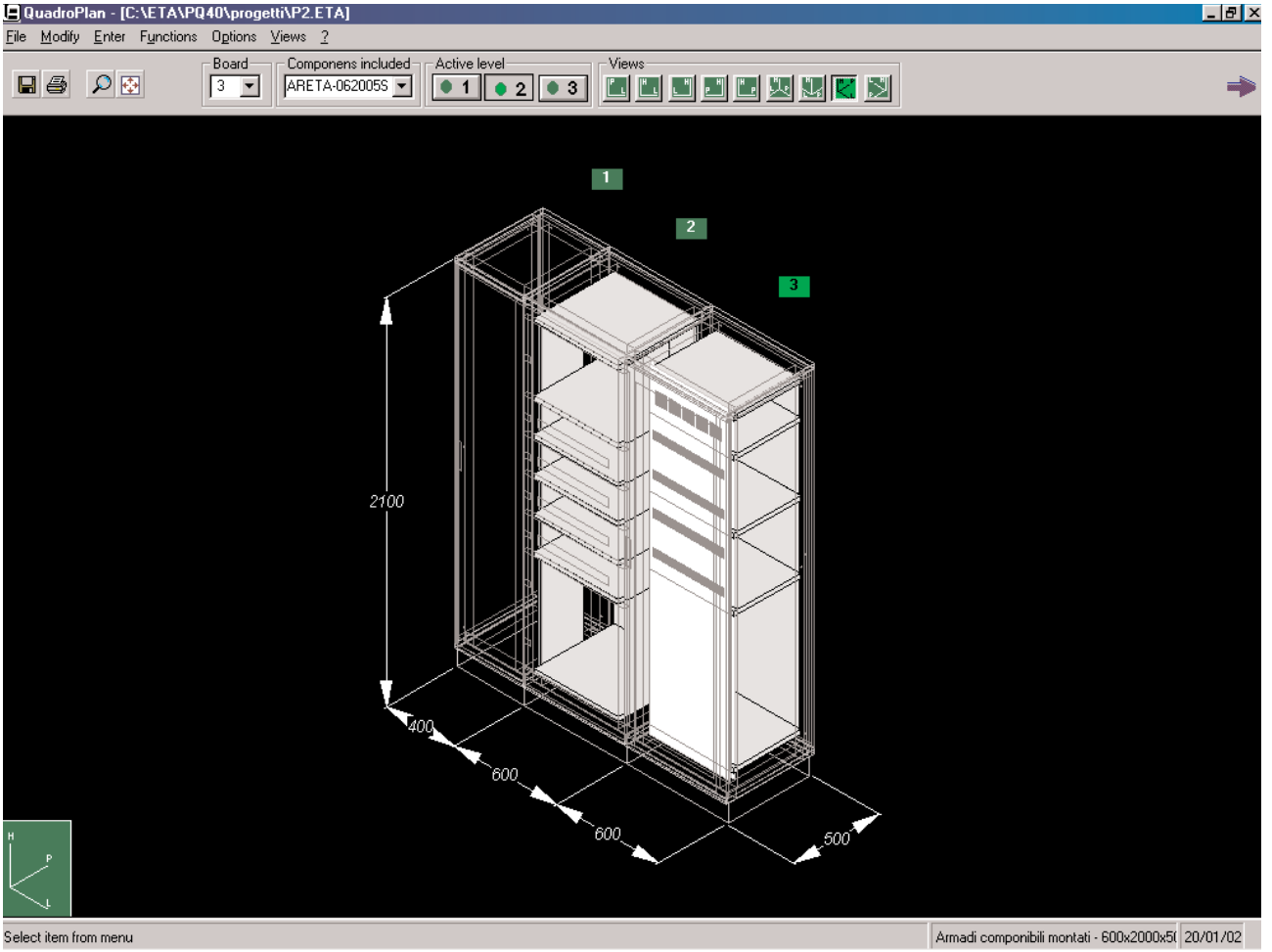
Cabinet suite

The menu option: Insert/Cabinet or Insert/Entry module enables to construct a cabinet suite.
In presence of several cabinets (cable entry modules are considered as cabinets), you can display either one or all the cabinets, selecting the option in the Display/All Cabinets menu.
Even when all the cabinets are displayed, one cabinet only is current, where you can insert switching devices and make any modification.
A green label with a number identifies each cabinet. The current one has a lighter coloured label. A cabinet can be made current, clicking its label or selecting the relevant number from the pop-up list on left top.

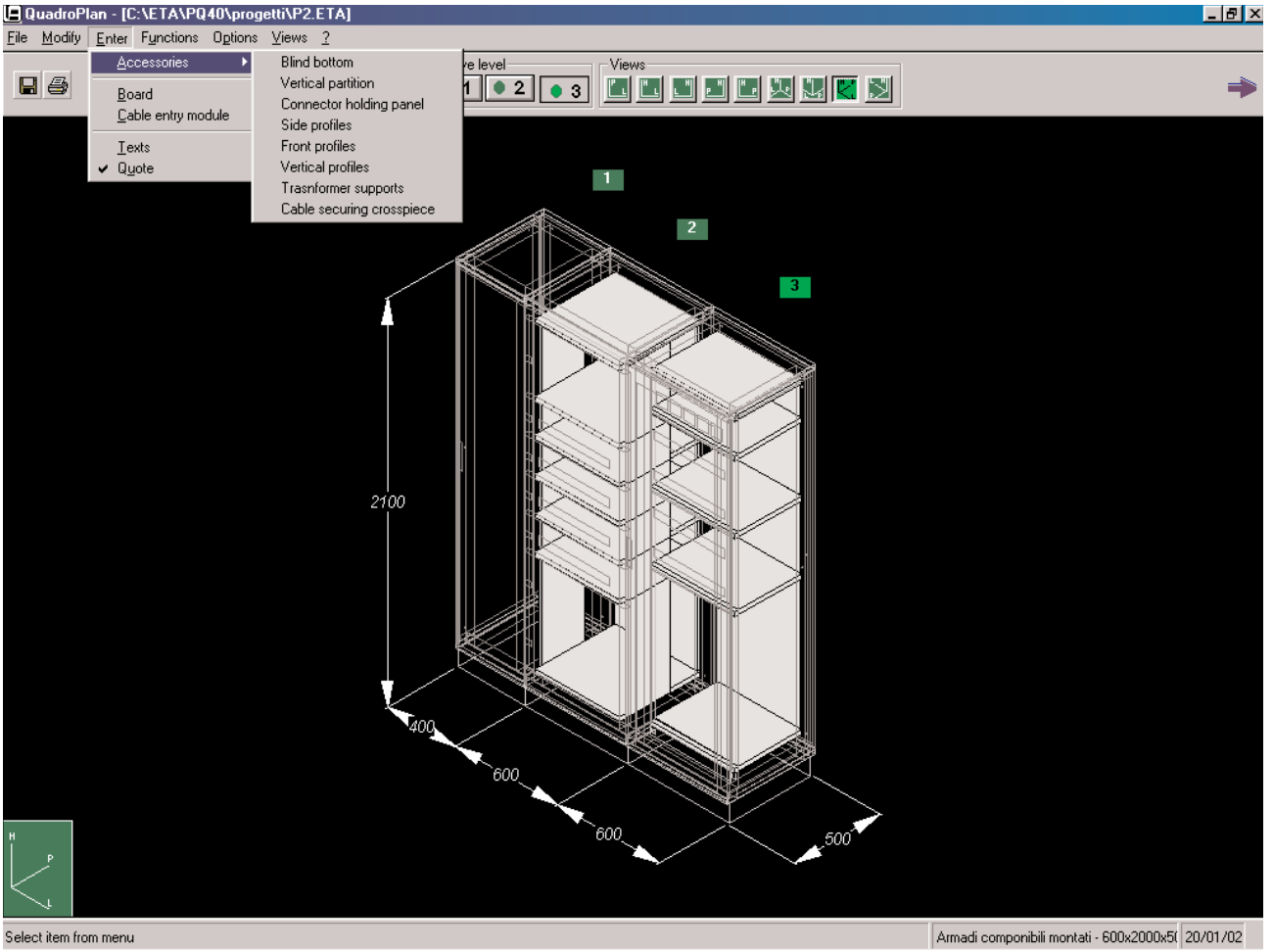
Insert accessories

Selecting the item of the Insert/Accessories menu, an additional menu opens in cascade with the available accessories.
This menu in cascade varies according to the active level.

The figure aside shows level 2 when current. Level 1 is displayed in transparency. The internal level is displayed, but is not active. The components of level 3 can be seen, but they are not active.



The following figure shows level 3 with the menu of accessories that can be inserted (for some series).



Insert movable accessories

Movable accessories are those such as modular panels, kits for switches, supports, etc. which can be arranged in a position selected by the user.
Other accessories have fixed position, e.g. doors, sides, screen-doors, etc.

When you select a movable accessory a mobile box appears, having the size of the accessory that can be positioned with the mouse in the desired position.
It is possible to insert more accessories of the same kind, without selecting them each time, because the insert function with the mobile box remains active until you click the **Stop** button on the tool bar, or until the program does not detect that there is no more space available for that accessory.

Highlighting and modifying

Clicking an accessory (or the full cabinet), the accessory is highlighted; the catalogue description appears in the bottom line and the Modify menu is enabled. It is now possible to delete the accessory, clicking the **Modify/Delete** menu or pressing the **Del** key on the keyboard.

If a full cabinet is selected, it can also be copied with all its accessories.

Clicking a text you can move it, change the colour and the font and delete it.

5.8.2 List

The component list can be generated from the graphic project menu, with the codes, description and quantities.
The program automatically generates some accessories not drawn, but to be included, e.g. the coupling Kits.

Access to the list is possible also from the initial menu of
New project
Electronic catalogue
List

In this case the component list must be made clicking the Add button and entering codes and quantities by hand.

From this box it is possible to add delete and modify the components.
However, if the list was generated from a graphic project, these modifications will be lost when you return to the graphic project. Not to loose them, save the list and close it with the File/Save menu (or possibly File/Save as) and File/Close.

5.9 SHORTCIRCUIT

It is possible to verify a generic busbar system or visualize the characteristics of the Woehner busbar system distributed by Eta.

5.9.1 Busbar dynamic inspection

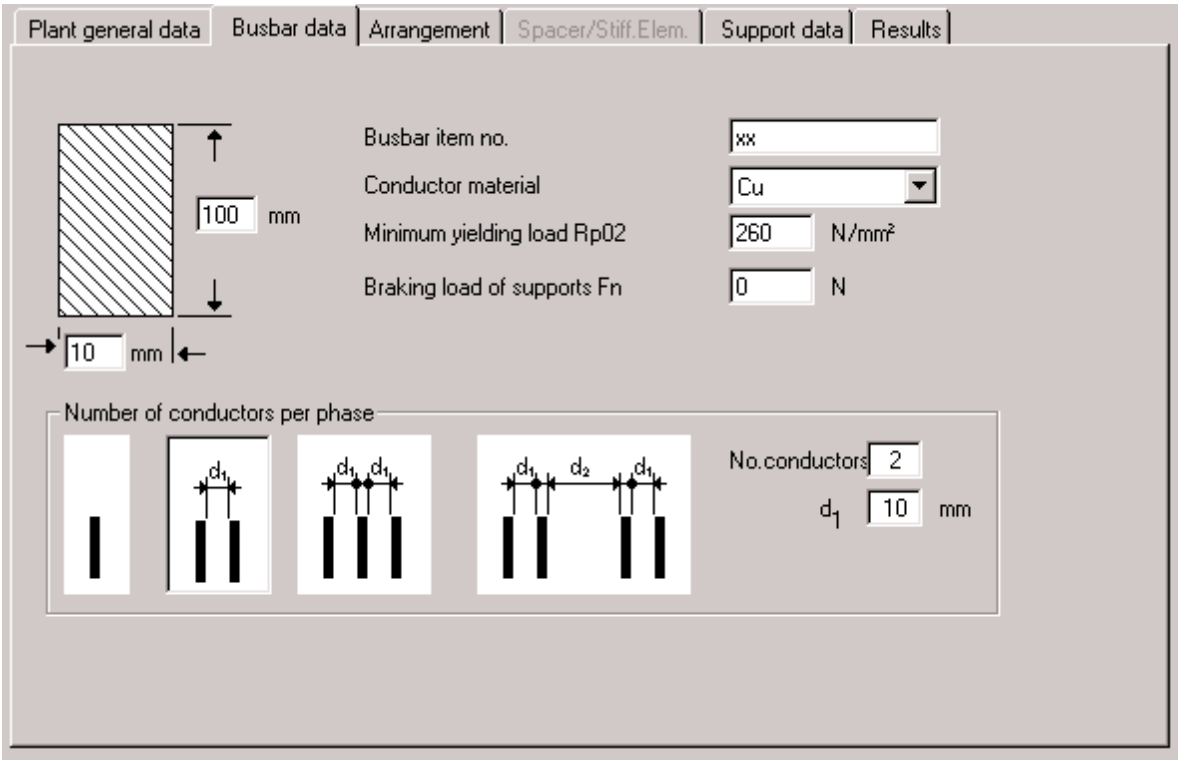
This module of QuadroPlan enables to check the stresses in the busbars and in their supports induced by electrodynamic forces caused by a shortcircuit.

The screen appears as a card index. Interactive moving from a card to the other one is possible clicking the corresponding upper edge.

In the first card the following shall be entered:
- the Frequency
- the symmetric Short circuit Current

The program determines the value of the peak current. However, this value can be manually entered.

Finally, it is necessary to define if the d.c. is three-phase or two-phase.



In the second card, enter the Busbar data that is the width of the single plate, its initials, the material, selecting it between Copper and Aluminium, the yield strength of the material and the breaking load of supports.

Entering the breaking load, when known, the program makes the check indicating if it is positive or negative. If no value is entered, the calculated value is indicated in the results, without any comparison.

In the lower part it is defined if the busbar consists of 1 or more subconductors.
The selection can be made either clicking the relevant figure, or entering the number of subconductors in the appropriate box.
In the case of more subconductors enter also the distance between subconductors d1 and possibly d2.

Data relevant to the **Arrangement** of busbars are entered in the next card.

They can be arranged in Vertical or Horizontal position.
It must be noticed that Vertical and Horizontal position does not mean the actual position in the cabinet, but the relative position between two busbars, as defined by the standard. Busbars are defined Vertical when they are placed along the longer side; Horizontal when they are placed along the shorter side.

Then enter the centreline distance between busbars and that between supports. Furthermore, if the busbars consist of several subconductors, it is necessary to define if spacers and/or stiffening elements are present or not.

The centreline distance between the support is the datum to be defined by attempts, since the distance between the busbars depends on the type of support used, and the other calculation parameters determined by the electrical characteristics. The correct value must be obtained by attempts, considering that increasing the centreline distance between supports, the stress in copper increases, but the stress on the support can decrease.
The next card is active only if the busbars consist of more subconductors and if **Spacers or Stiffening elements** are indicated in the previous card.

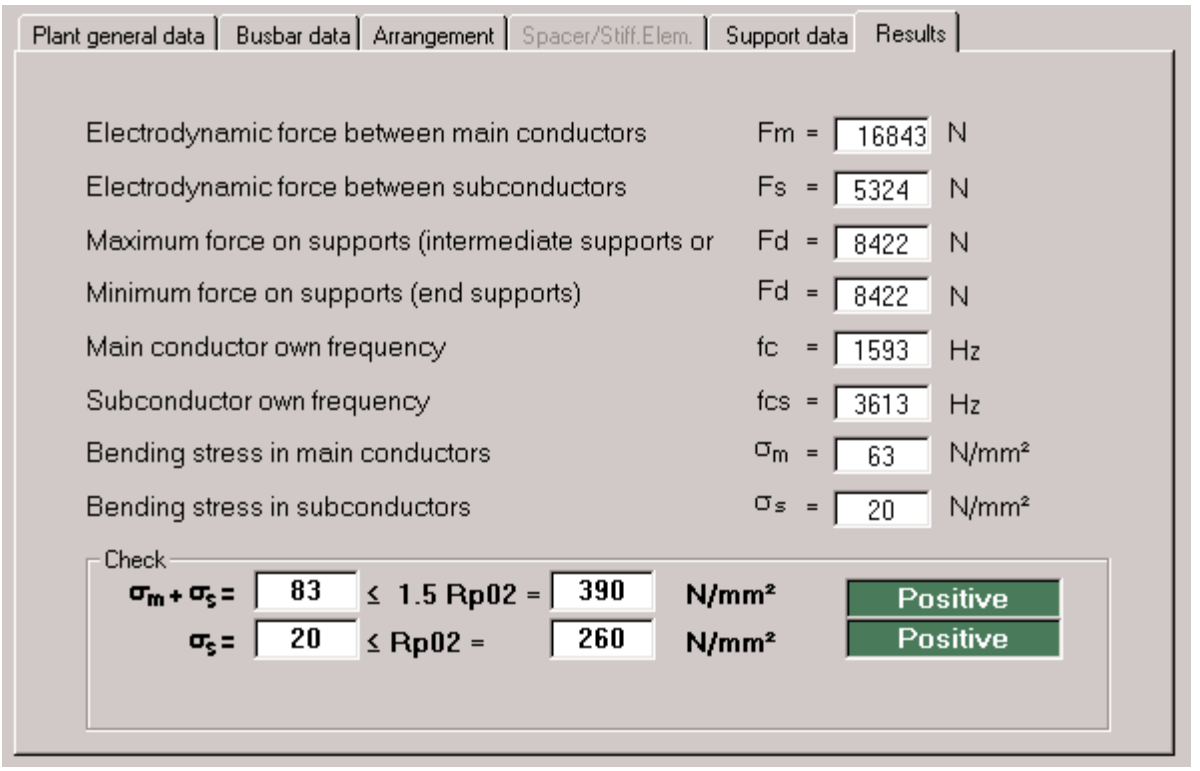
Select in this card the arrangement of the elements and their exposed conductive part.

In the next card it is defined the static configuration of the support system.
The busbar is in fact a crosspiece that can be rested, fitted in, etc.

The card shown below gives the results.

The inspections required by the standard are made and it is highlighted if the test is Successful or Unsuccessful.

In this case return to the previous cards and modify the desired datum (typically the centreline distance between supports).



5.9.2 Woehner System

With this module you can visualize the technical documents of the Woehner system distributed by Eta.
Select the document from the list.

NB. To visualize the documents Adobe AcrobatReader® must be installed on your computer.
You can install it from Quadroplan distribution CD or freely download from Adobe site (www.adobe.com).

5.10 DATABASE

5.10.1 Switching device file

The switching device file contains the greatest part of switching devices that can be included in a board.

For each switching device there are: initials, trademark, typology (see appendix A for the list of typologies), electrical data and overall dimensions.

ETA will periodically distribute a floppy disk with the updating of this file.
When you receive the floppy disk insert it in drive A (or B) and click the button.

Update from CSV file

Research and filtering operations are possible through the appropriate push-buttons.

Clicking the left edge of the table, coinciding with an assembly, the assembly card containing all the characteristics of the same opens.
This assembly can be modified or deleted under the user responsibility.

The user can also enter new assemblies.

5.10.2 Starting and protection file

Through this module the user can create a file of the motor starting groups consisting of a protection switch, a contactor and a thermal relay.
In this way, in the calculation of temperature rise according to the analytical method or with the switching devices arrangement, you can directly insert the group instead of entering any time a protection switch, a contactor and a thermal relay, saving time and preventing error possibilities.

To insert a group, click the **New** button, then assign the initials to the group.
Enter then the motor power. The program suggests the rated current. However, a different current can be entered.
In the **Protection part** card, select the typology, trademark, current, no. of poles and finally the assembly.
N.B. This is a filing module and not a design one, therefore it does not perform any electrical compatibility and consistency check. It is the designer responsibility to insert the correct assemblies.
Likewise, enter this switching devices in the **Contactor** and **Thermal relay** sheets.
Then, open the **Overall dimensions and Cable sheet**.
The overall dimensions and the power dissipated by each switching devices, as well as the total power are shown.

Enter the overall dimensions of the group, considering its arrangement.
Select the cross section of connection cables among the switching devices and their length. The program calculates the dissipated power in the cables.

Click **Record** to record the group and **Close** to close the file.

5.10.3 Cabinet File

This file contains the list and prices of ETA products.
It can be looked through, but no modification is possible.
The file shall be periodically updated with Metel floppy disks distributed by ETA.

6. APPENDIX A

Initials identifying the switching devices typology

A	Unit complexes
B	Transducers
C	Capacitors
D	Binary operators, timers, storage devices
E	Different materials
EH	heating devices
EL	Lighting lamps
EV	Fans
F	Overvoltage limiters
FR	Thermal relays
FU	Fuses
G	Generators, supply devices
HL	Signal lamps
KA	Monostable control relay
KL	Bistable control relay (step-to-step)
KM	Power contactor
KT	Timer relay
L	Inductors, reactors, coils
M	Motors
N	Analogue integrated circuits
P	Measuring instruments
QFD	Pure differential switches
QFS	Magnetothermic automatic switches
QFSD	Differential magnetothermic automatic switches
QFSK	Remote controlled automatic switches
QM	Motor protection switches
QS	Control switches – knife switches
R	Resistors or potentiometers
SA	Selector switches or switches (tap-changers)
SB	Push-buttons

SBHL Light buttons
TA Current transformers
TC Transformers for control circuit
TM Power transformers
TS Stabilizers
TV Voltage transformers
U Modulators, converters
V Electronic tubes, semiconductors
W Transmission ways, wave guides
X Terminals, sockets, plugs
Y Electrically operated mechanical assembly
YV Solenoid valves
Z Impedance adapters, equalizers.

PAMO Motor starting units