ElectricalOM User Manual

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Getting Started

ElectricalOM

This User Manual contains all essential information for the users to make full use of Modecsoft ElectricalOM. It includes descriptions and capabilities of functions, contingencies and alternate modes of operation, and step-by-step procedures.

Modecsoft ElectricalOM is an innovative electrical design solution for LV distribution network modelling and analysis in accordance with BS 7671 and IEC 60364, with auto layout schematic diagrams, cable sizing calculations and validations, maximum demand and voltage drop analysis, protective devices discrimination study with manufacturer's specific data, power factor correction sizing, professional and comprehensive reporting and much more…!

All in one intuitive and user friendly environment!
ElectricalOM helps a large number of electrical engineers perform their tasks fast and with accuracy. Furthermore ElectricalOM is used by academic institutions during electrical engineering courses.

Features:

- Interactive Calculations Environment

  All the necessary calculations and checks are performed in accordance with BS7671. During the electrical design ElectricalOM acts interactively and indicates to the user useful calculations and validation checks at any part of the electrical network.
- Schematics

  During designing, the distribution boards are automatically arranged for maximum productivity. The user can modify the position and the orientation of each distribution circuit by moving or rotating it.
- Protective devices discrimination study

  ElectricalOM checks all the protective devices in the electrical installation and warns the engineer about problems discovered during over current and earth fault discrimination study. This is done using the devices time-current curves or manufacturer's specific data.
- CAD based Plan Design Add-on

  Create electrical plan design drawings and automate the electrical design modelling by collecting information for the circuit calculations such as cable lengths and installation points per circuit.
- Reports

  Various calculation reports are available. Also a bill of quantities report can be created with a user defined price list of the materials to estimate the cost of the electrical installation modelled.
- Quality, Service and Support

  We believe in offering our customers, efficient service and informative support from our qualified

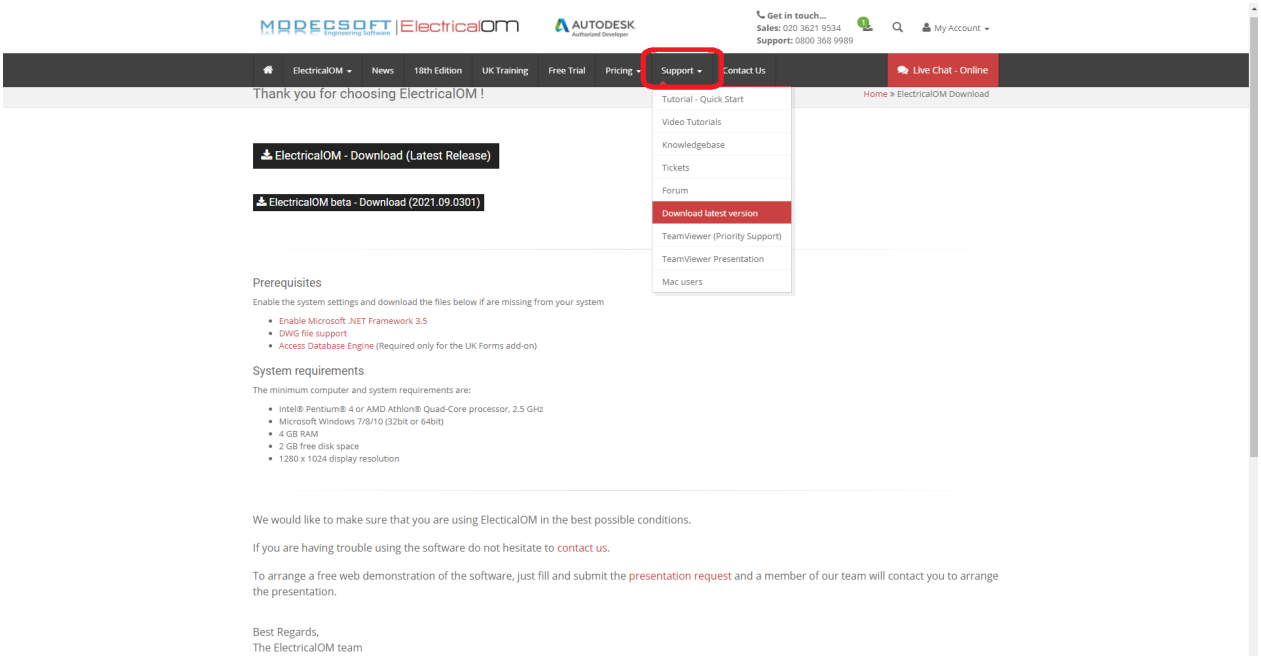
experienced engineers. For our software we offer direct online support and updates.

Downloading

A copy of ElectricalOM can be downloaded from our official web page, https://electricalom.com, under *Support* tab, however, this option is only if you have already registered and received an activation code. If you do not have an activation code please skip to the next paragraph for details about registration.

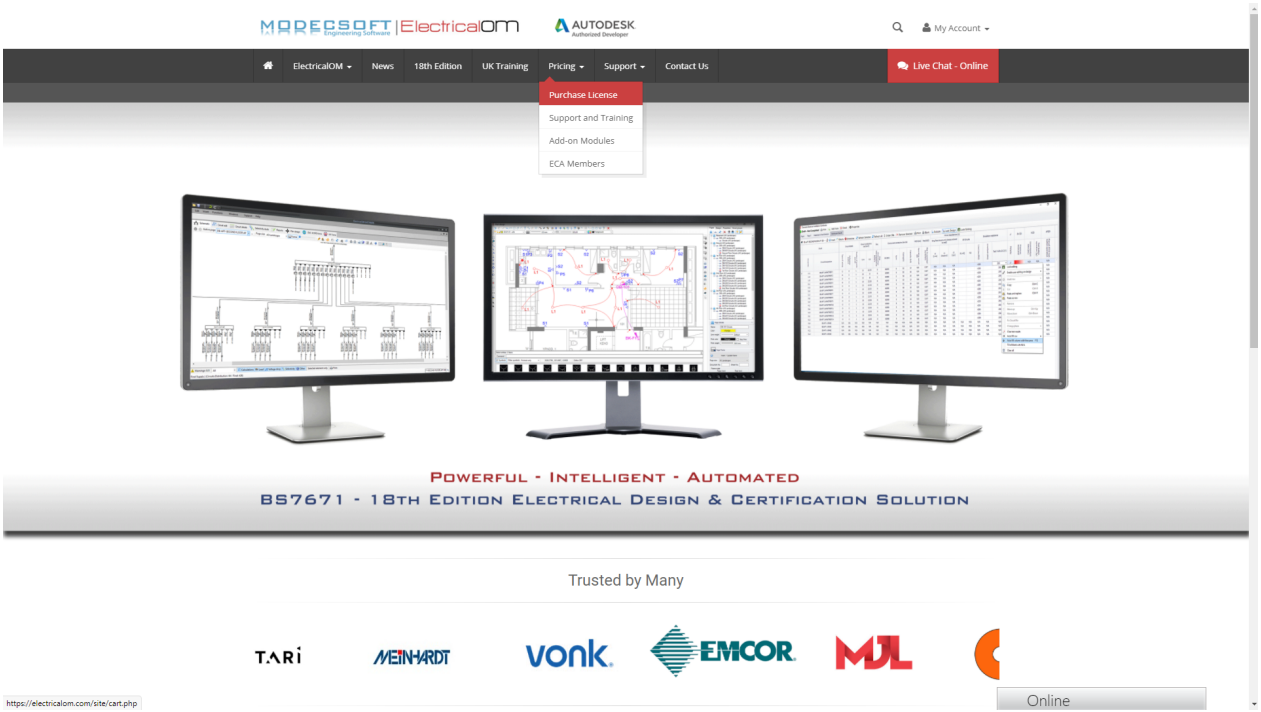
Download latest version page has two options to choose from:

- Latest Release: Tested and stable version.
- Beta Release: Still in test phase and not guaranteed to be stable. This file shall be used at the users' own risk.

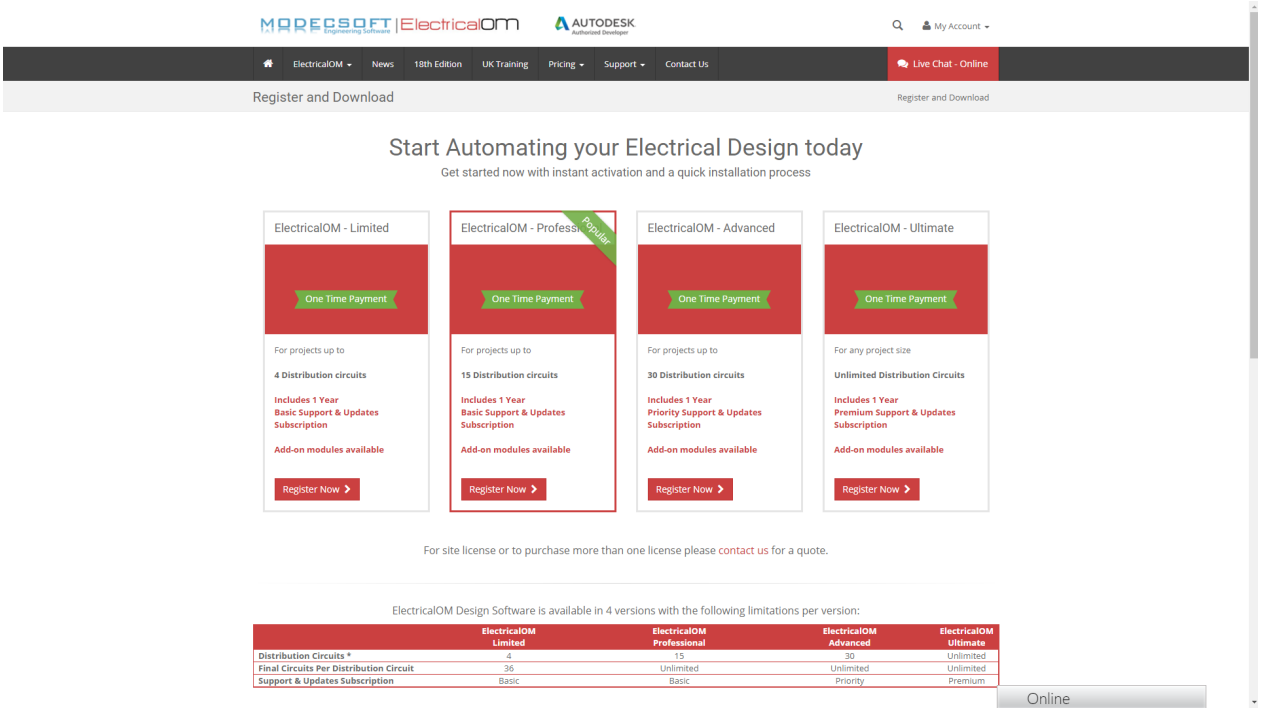


After downloading, the user can install and use the activation code to activate ElectrcialOM.

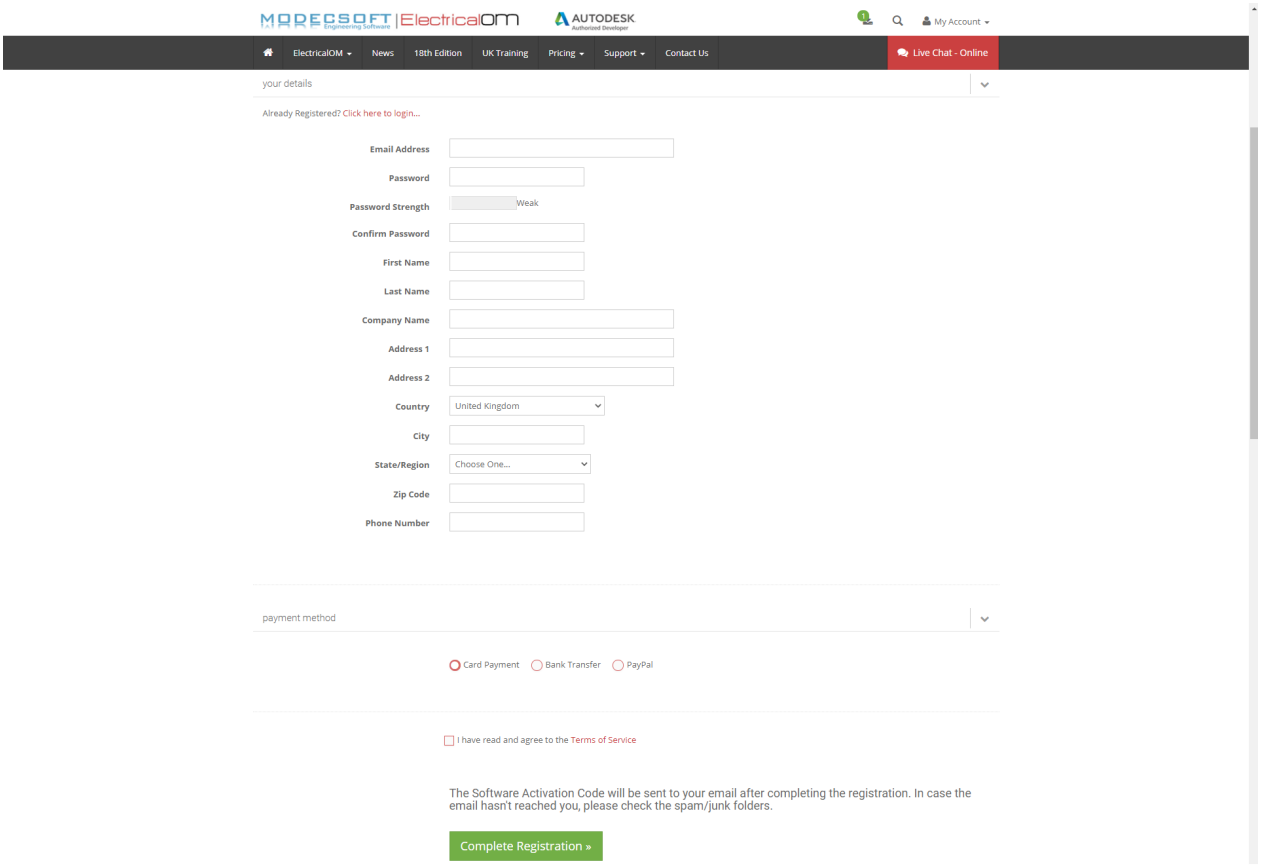
For first time users registration is necessary to receive an activation code. Registration is through the *Pricing* tab and further the *Purchase Licence* option.



Purchase License option will take you to the *Register and Download* page where you can register and download ElectricalOM. Once you clicked on *Register Now* button, the next page will introduce any available Add-On modules you may want to add to your cart. *Add to Cart & Checkout* button will take you to the *Order Summary* page where you can click on Checkout and fill in the registration form.

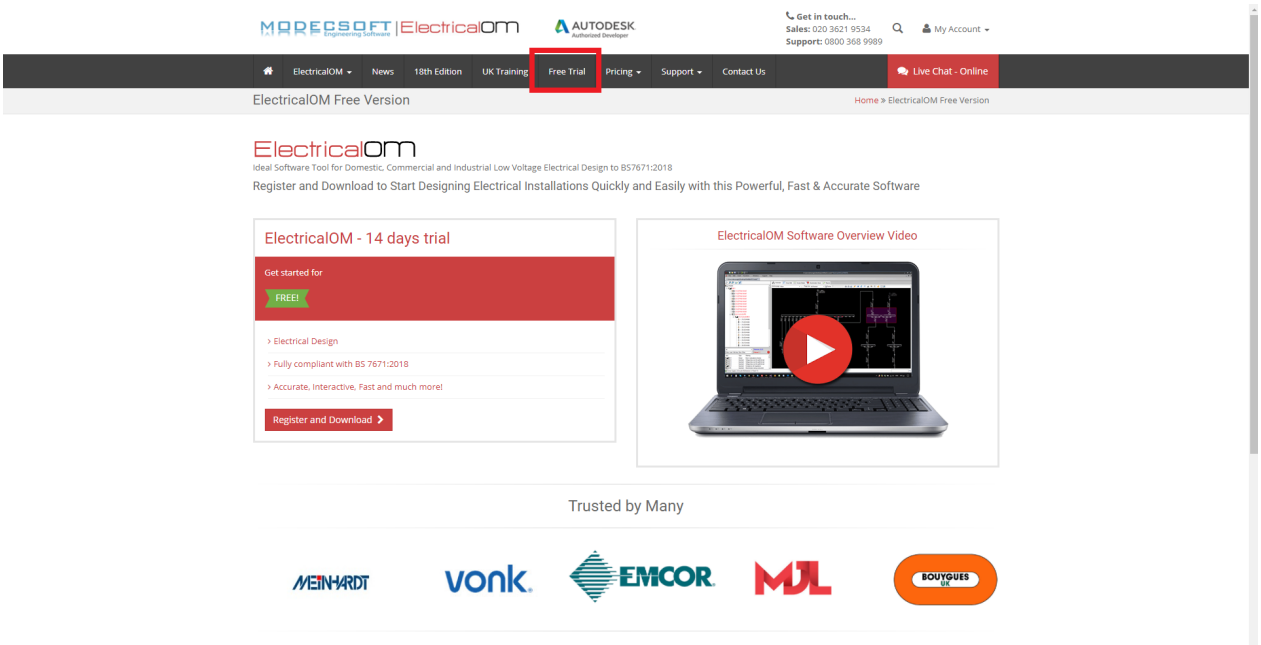


Complete Registration button will finalise the purchase.



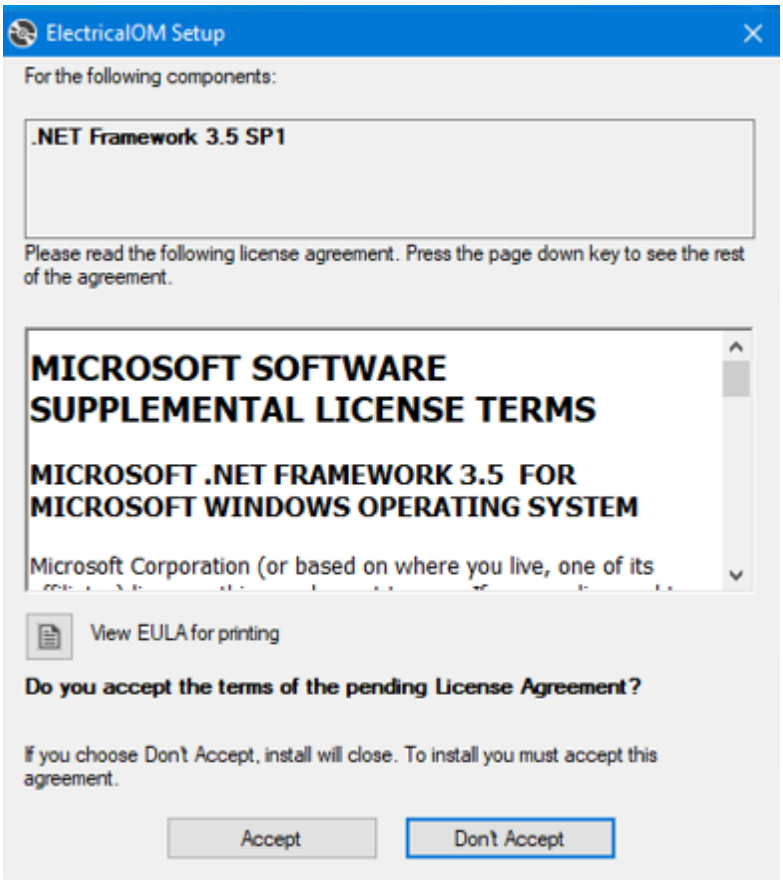
An activation code will be sent to the e-mail address provided during the registration so you can activate ElectrcialOM, please see Activating Your Licence section for further details.

Depending on your location, there is also a free trial option which can be accessed by clicking on *Free Trial* button located within the tabs. Registration is also necessary and an activation code will be sent to the e-mail address provided during registration. If there is no *Free Trial* option, the user needs to contact Modecsoft at *Contact Us* page to request a trial version.

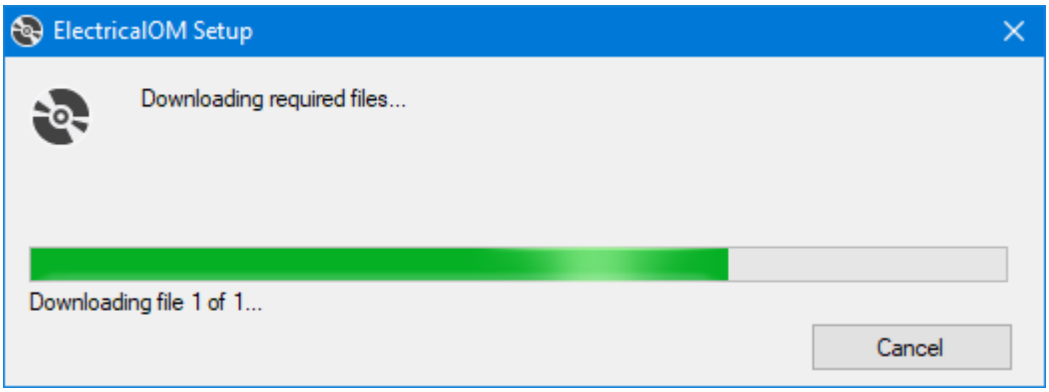


Installation

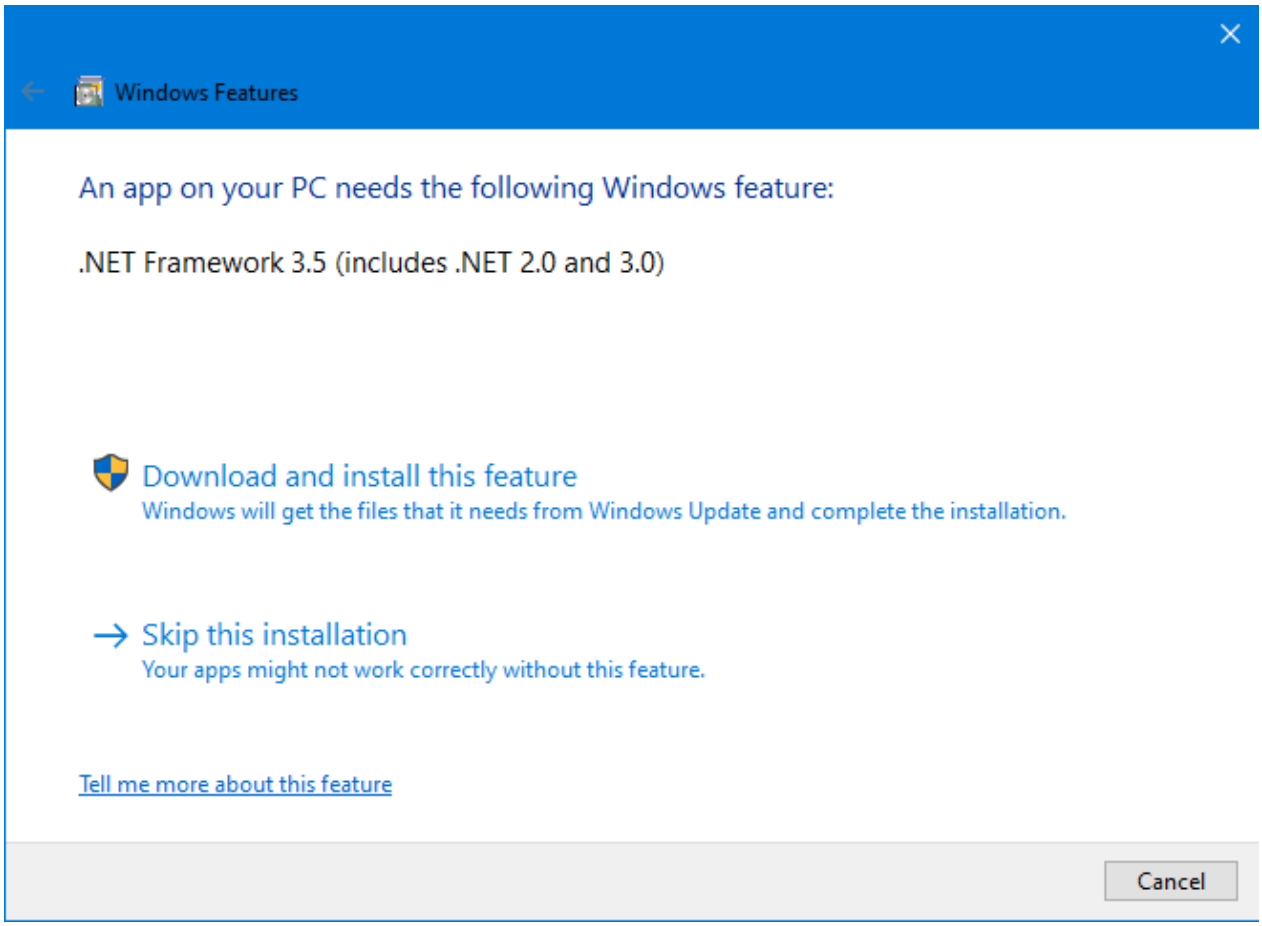
Installation of ElectrcialOM can be initiated by double clicking on the ElectricalOM.exe file downloaded from our official web page. ElectricalOM installation will start with .NET Framework 3.5 SP1 installation which is prerequisite for ElectricalOM. Please select *Accept* to proceed with installation.

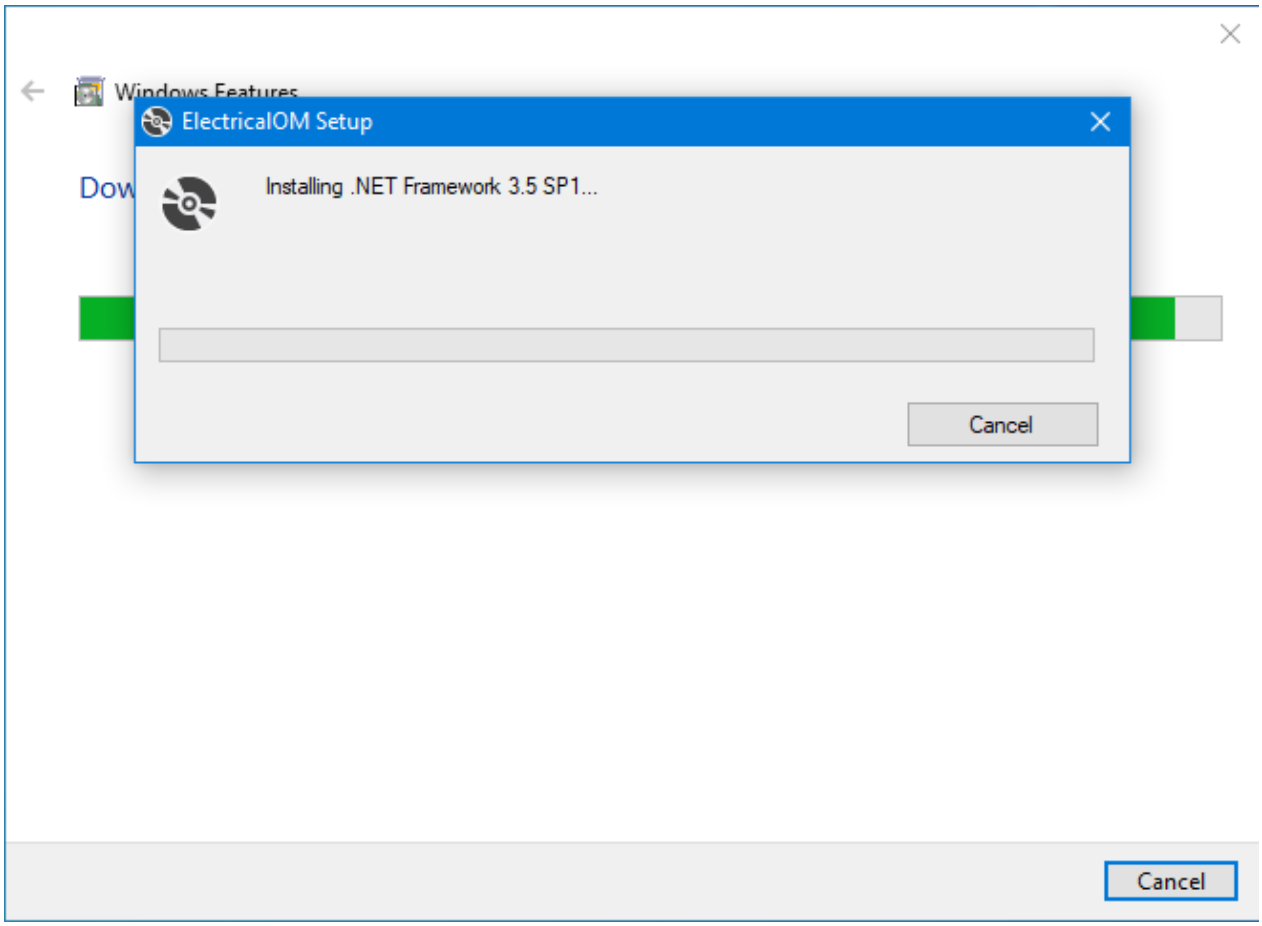


ElectrciaOM will download necessary files and start installing .NET Framework 3.5 SP1.

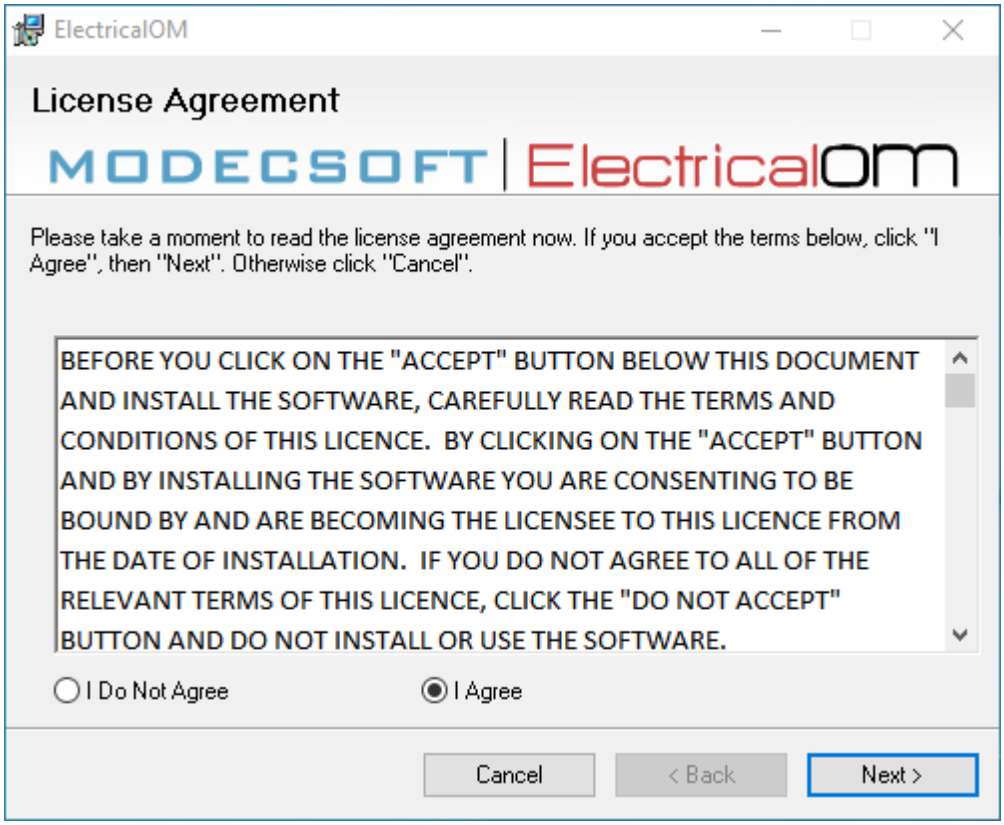


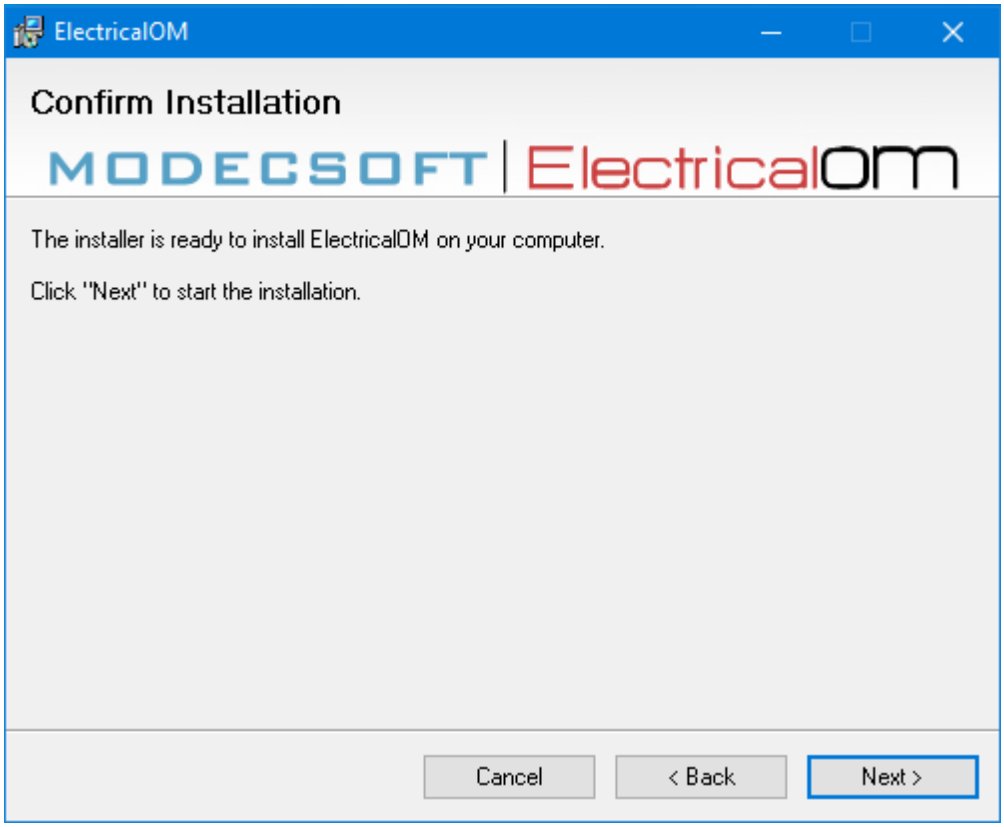
Following this, Windows may ask for user approval to install .NET Framework 3.5 SP1, please select *Download and install feature* to proceed with the installation.

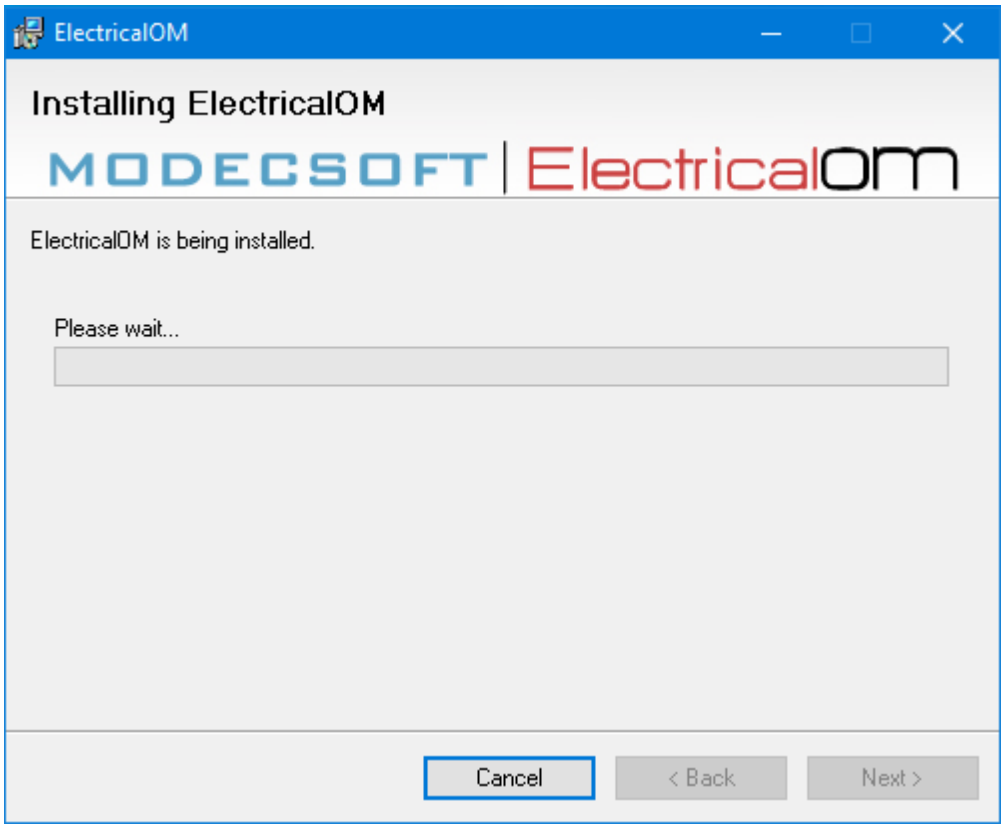

Windows Features
An app on your PC needs the following Windows feature:
.NET Framework 3.5 (includes .NET 2.0 and 3.0)
Download and install this feature
Windows will get the files that it needs from Windows Update and complete the installation.
Skip this installation
Your apps might not work correctly without this feature.
Tell me more about this feature
Cancel

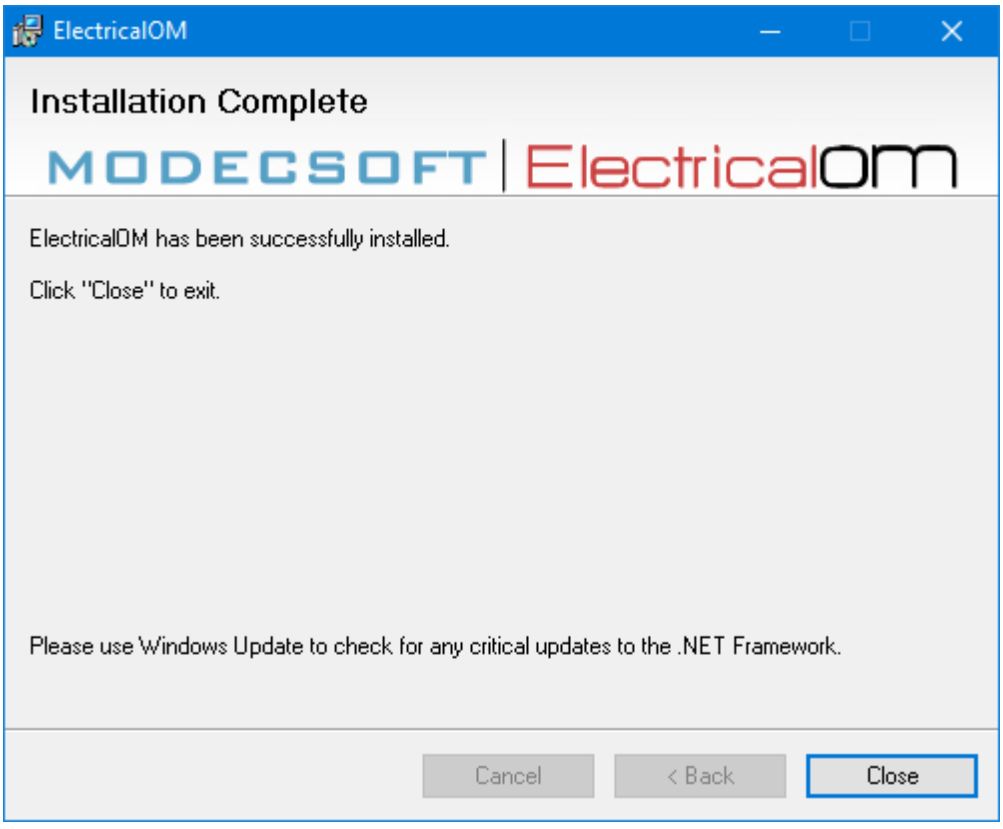

Windows Features
ElectricalOM Setup
Installing .NET Framework 3.5 SP1...
Cancel
Cancel

After .NET Framework 3.5 SP1 installation is finished, the user needs to double click on ElectricalOM.exe file and restart the installation process. This time core software installation will start.

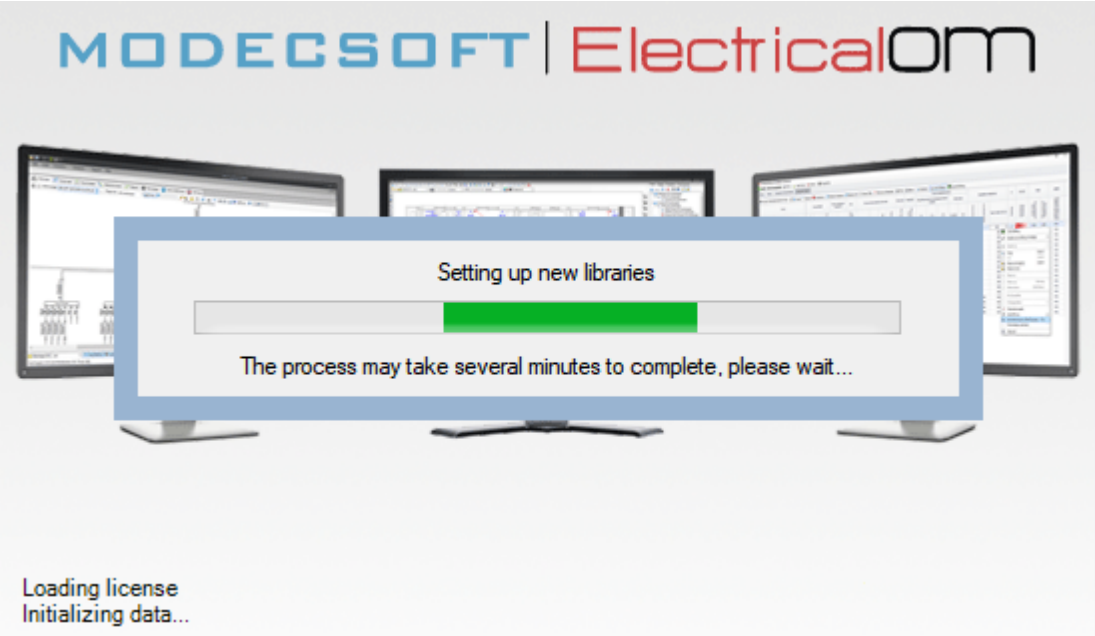




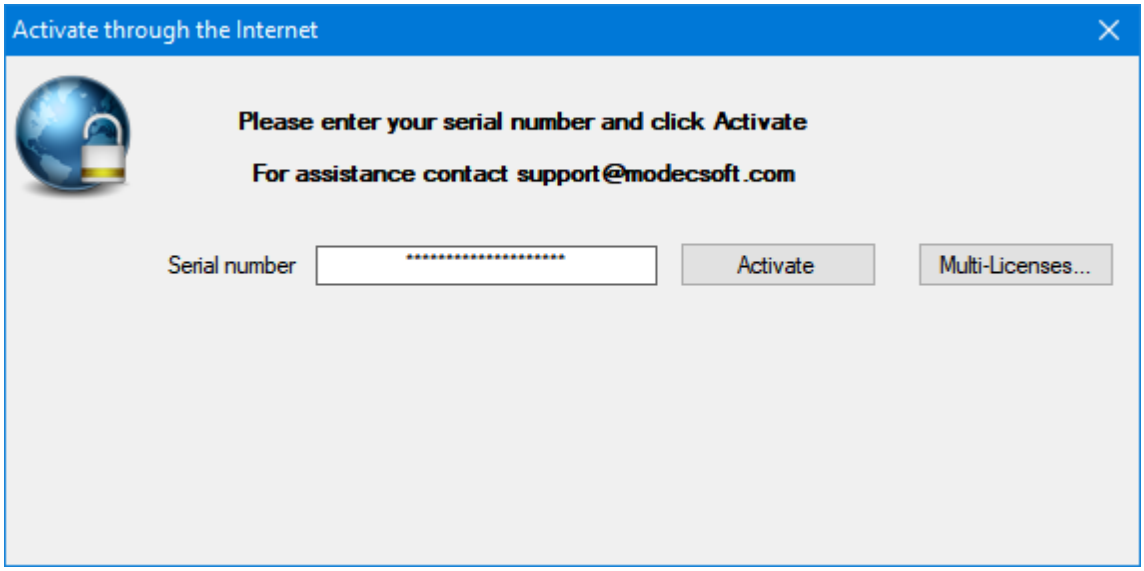




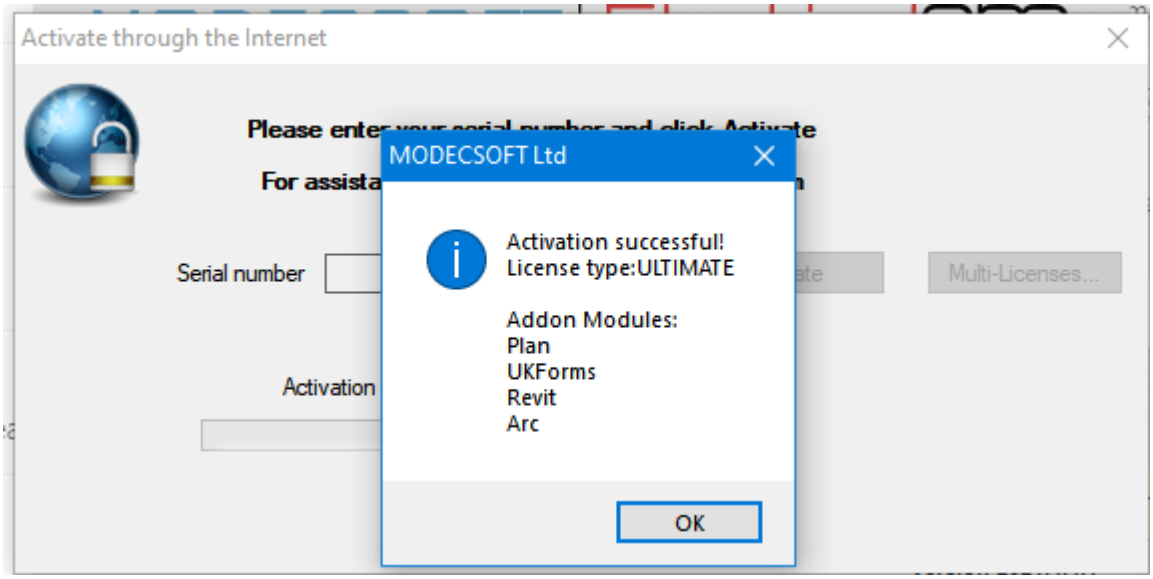
Once the installation is finalised, the user can double click on ElectrcialOM icon to start the software. First run will require some further settings to be applied and get ElectrcialOM ready to run.



Then, the user will be asked to activate ELectrcialOM using the provided activation key, please refer to Activating Your Licence for further details.



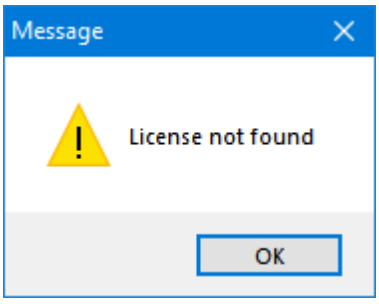
If activation is successful, then ElectricalOM will display the licence type and available add on modules associated with your account. Clicking on OK button will start ElectricalOM.



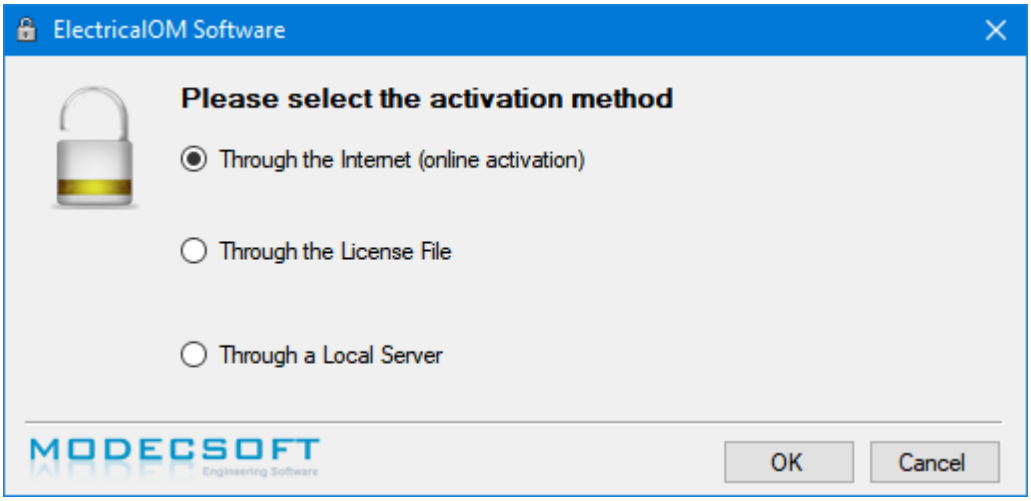
Activating Your Licence

In most cases, ElectricalOM licences are activated over the internet, so, you will need an active internet connection in order to activate your licence. Once the software is properly installed on your system, you can double-click on the ElectricalOM shortcut to launch ElectricalOM.

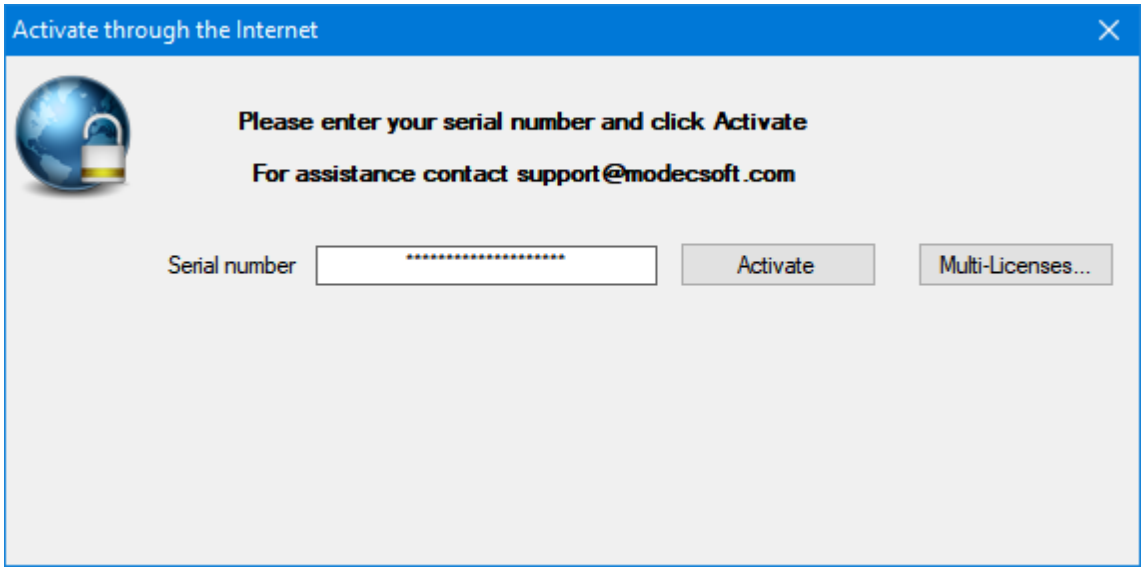
If this is your first time you are running ElectricalOM or if you have deactivated your licence on the current computer previously, then, you will see a warning pop-up window as shown below. Click "OK".



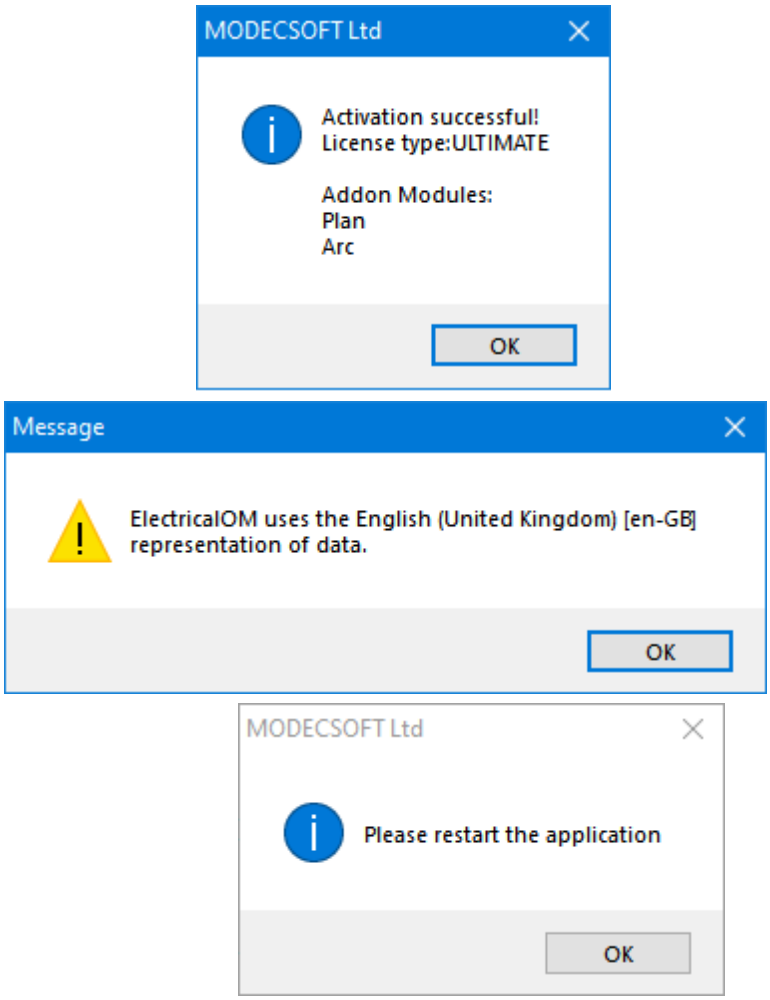
As stated earlier, usually, licences are activated via internet, hence, you need to select "Through the Internet (online activation)" option and click "OK". If there is a need to activate licences offline, please contact Modecsoft Support at support@modecsoft.com to discuss other options.



At the next window, type in your serial number received by email into the space provided and click "Activate". If you have multiple licences to manage, then, please contact Modecsoft Support at support@modecsoft.com to be assisted.



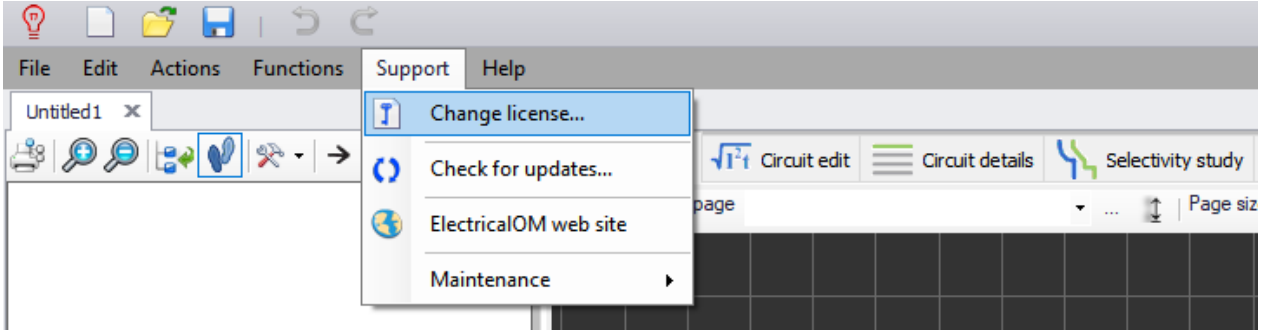
Multiple informative windows will pop up after you click on "Activate" button. First window will show your licence type and any add-on modules you may have purchased. The last one will inform you that you will need to restart ElectricalOM in order to run the software using the activated licence. Click "OK" at each window and restart the ElectricalOM by double clicking on the software icon.



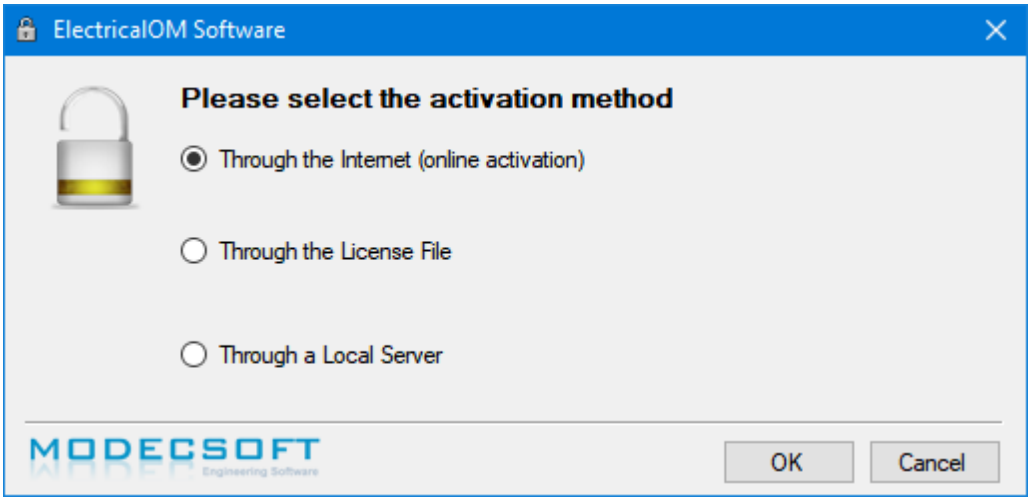
For any reason, if you get an error window or a warning window indicating a licence issue, please contact Modecsoft Support at support@modecsoft.com

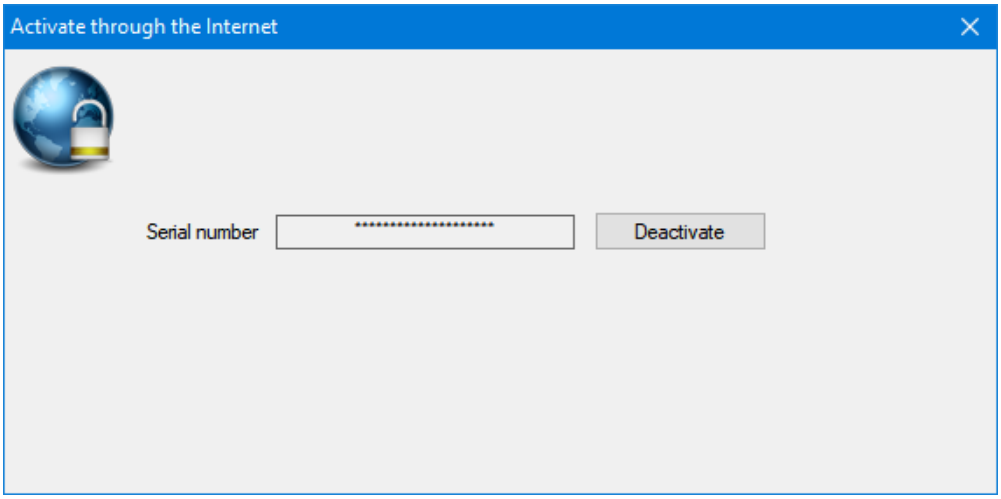
Deactivating and Transferring Your Licence

ElectricalOM lets you to install and use it on multiple computers, however, only one of them can be actively using the software at a time. In order to transfer your licence to another computer, you will need to deactivate your licence on current computer and then reactivate it on another computer. Please keep in mind that you will need an active internet connection to activate a licence before deactivating it.
In order to de-active your licence, click on "Support" tab and select "Change Licence..."

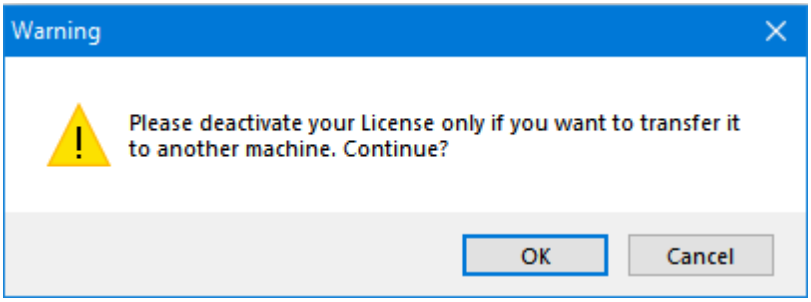


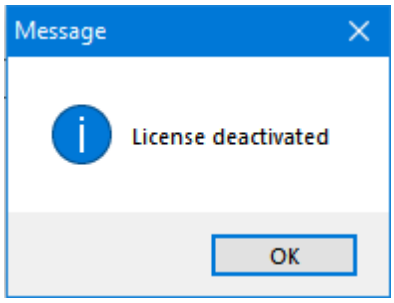
You will see the same pop-up window as you see when you try to activate your licence. Again, select the "Through the Internet (online activation)" option and click "OK". Then on the next window, if a licence is already active on your computer you will see a "Deactivate" button. Click on that button to deactivate your licence. If you see an "Activate" button instead of "Deactivate", then there is no active licence on your computer.



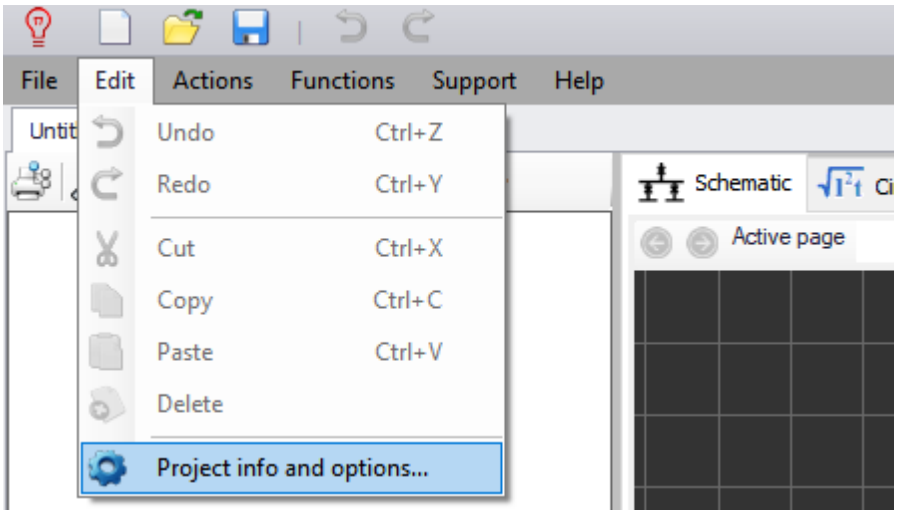


Once you clicked on the "Deactivate" button you will see a warning pop-up window which indicates that you are about to deactivate your licence. If you want to carry on and deactivate your licence, click "OK". You will see a new window indicating your licence is deactivated and then ElectricalOM will quit.

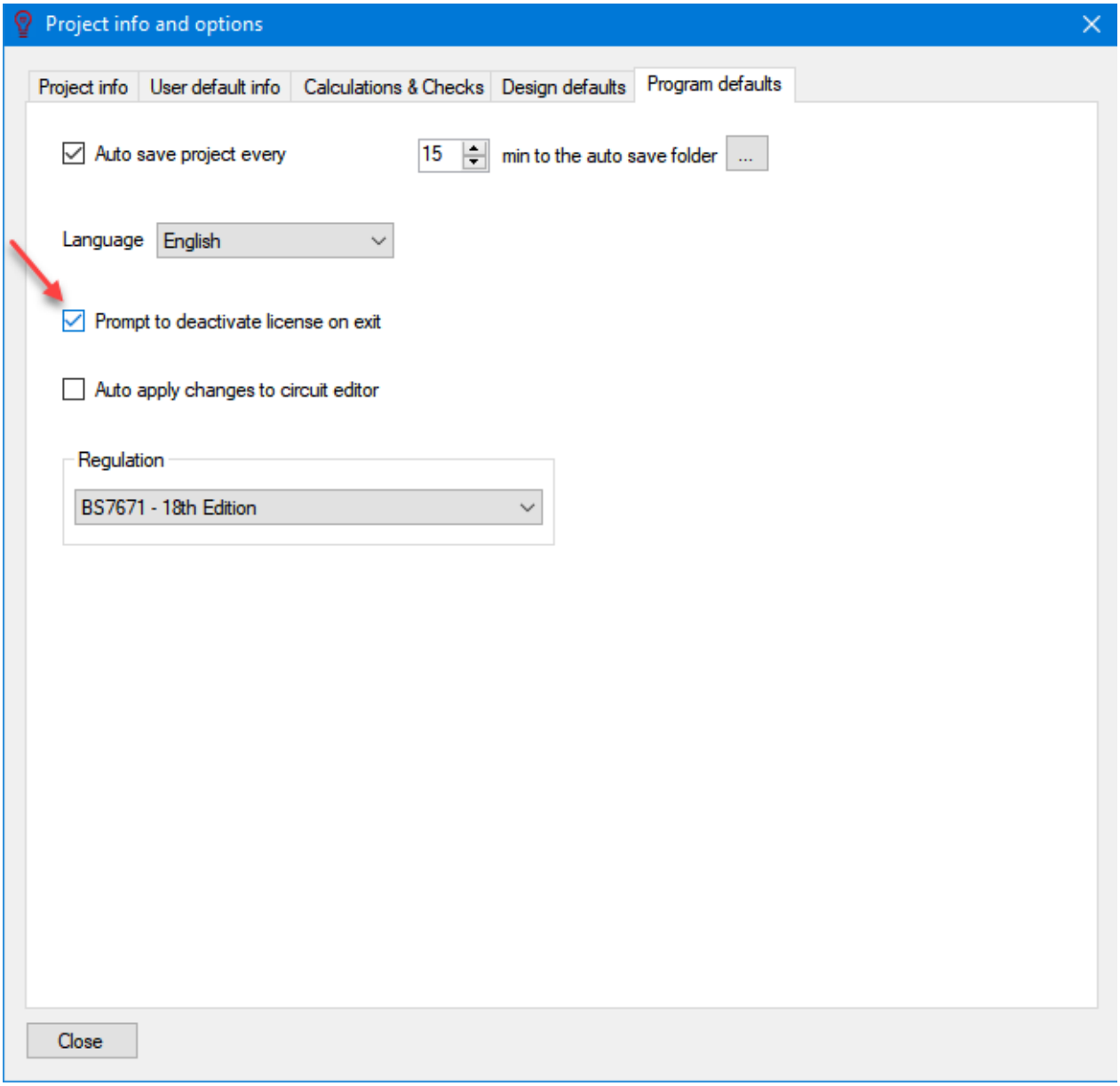




As your licence is deactivated, it is possible to activate it on a different computer. To do so, please follow the steps detailed in section "Activate Your Licence" If for any reason, you like ElectricalOM to remind you to deactivate your licence every time on exit, then, click on "Edit" tab and select "Project info and options...".

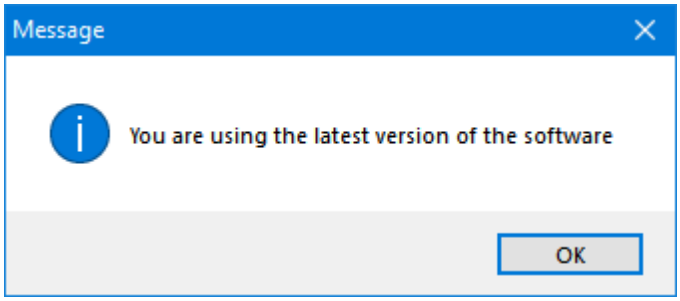


Then, tick the box next to "Prompt to deactivate licence on exit".



Checking for Updates

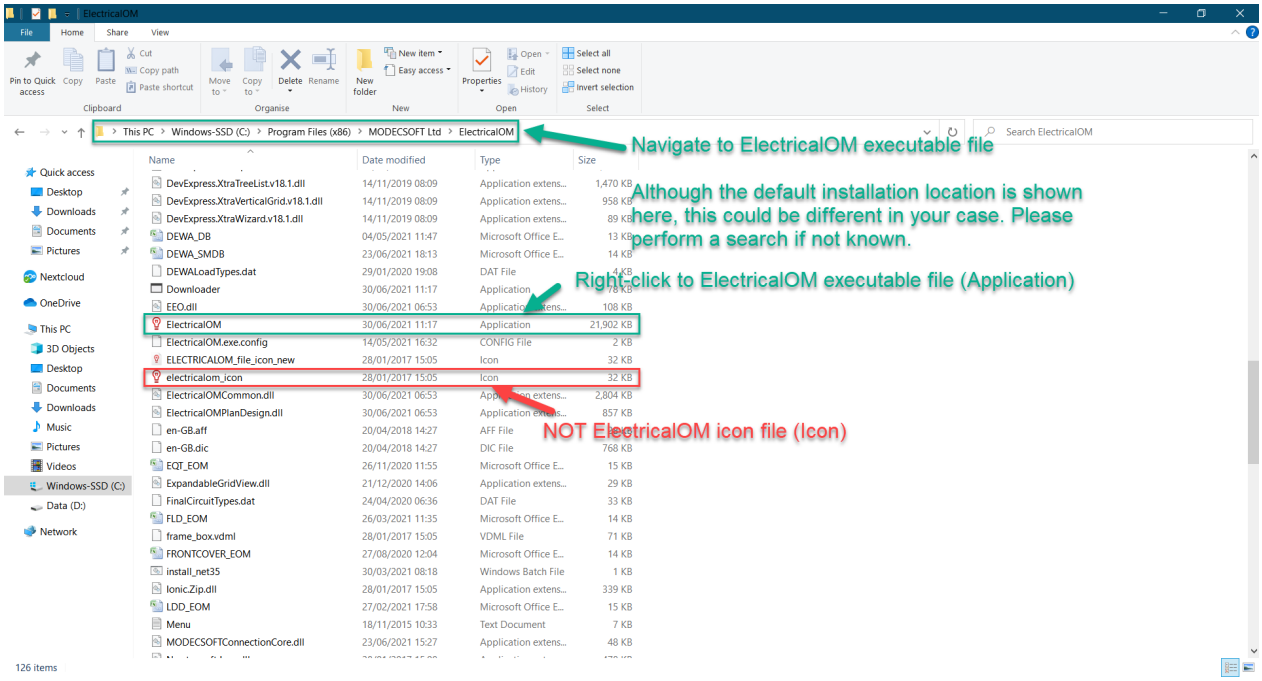
If there is an update available, ElectrcialOM will prompt the user at the startup with a pop up window, however the user may initiate a manual update check using *Check for updates* option which is in *Support menu*. Once clicked on, ElectrcialOM will display a pop up window which will indicate if an update is available or not.



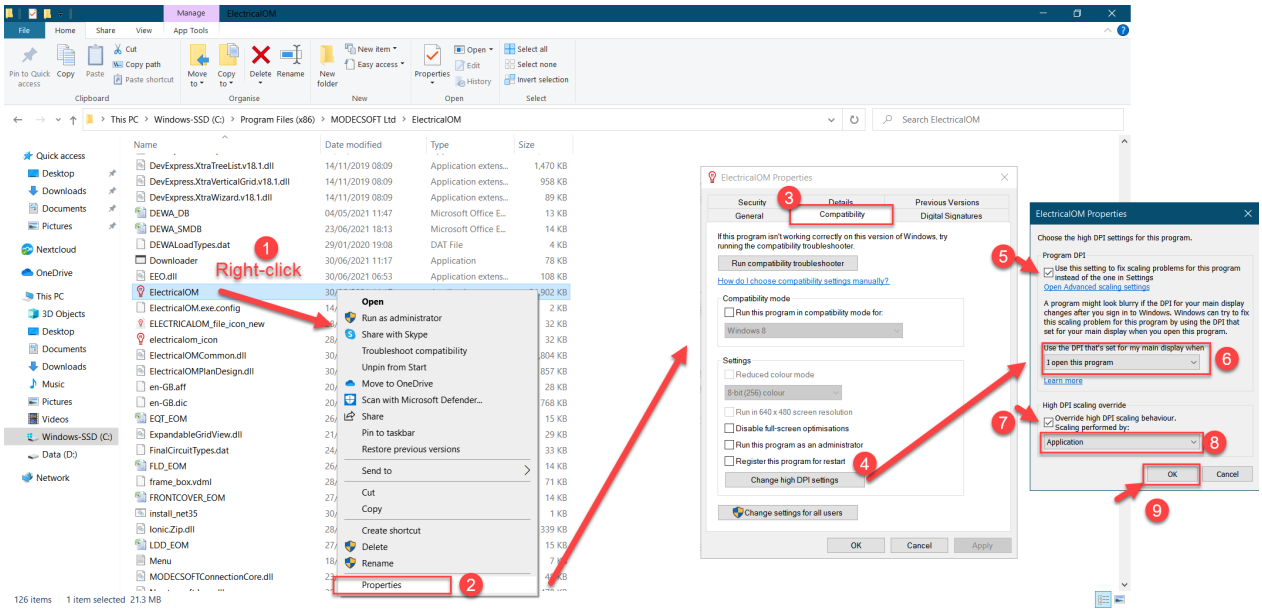
Blurry Screen Issue with Windows 10

Windows 10 has a facility to scale the screen to make it easy to the users to see the contents of the screen when on small screens set to high resolutions, mainly with laptop screens. This feature however might cause ElectricalOM's screen to look blurry. If you experience such issue, please follow the steps below to stop Windows to re-scale the screen and use ElectricalOM's original scale factor. After these settings are applied, ElectricalOM screen will look sharper, however, as the scaling is 100% now, but not 125% for example, contents will look smaller.

First of all, the user must navigate to where ElectricalOM is installed. Default location is *C:\Program Files (x86)\MODECSOFT Ltd* but as it can be changed during the installation, this may not be the case. We advice the user to perform a search for the *ElectricalOM.exe* file. After locating the ElectricalOM executable file, a right-click will bring the *Properties window* up.



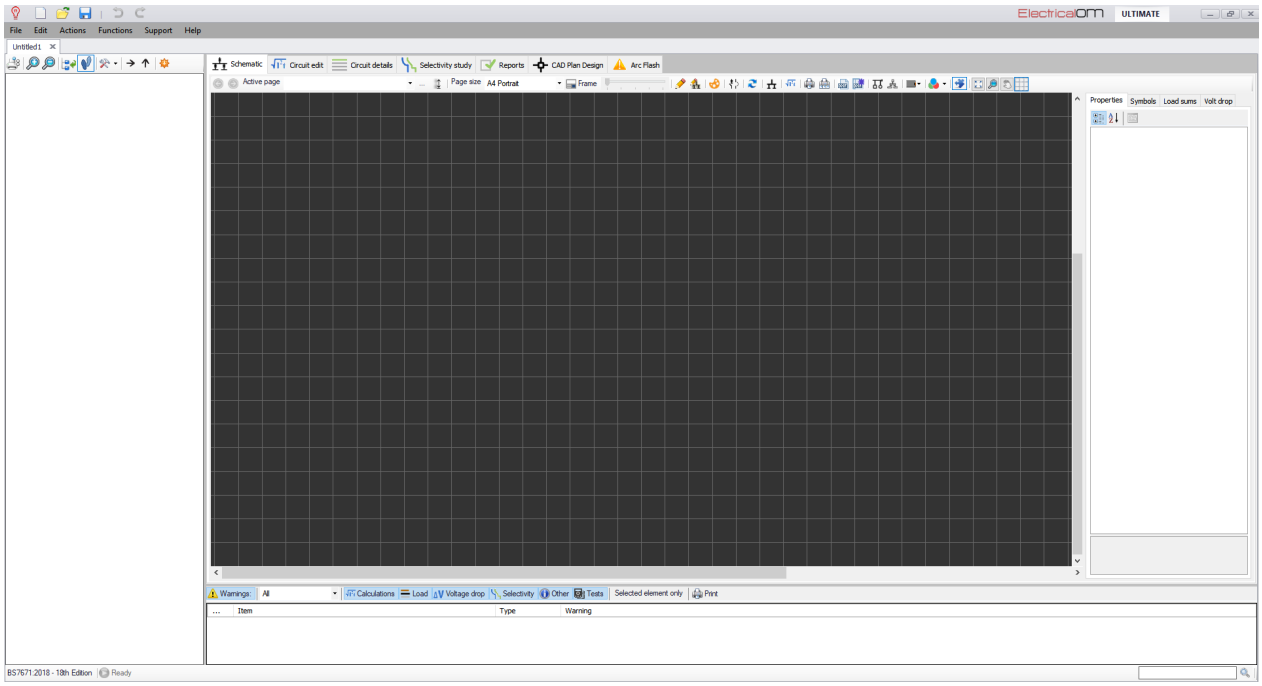
Then, step indicated below must be followed. If the user wants to revert the changes, then, the same steps can be followed and tick boxes can be removed.



Workspace and Menus

This section will introduce you to the main working space of ElectricalOM. Different sections and areas of the workspace will be discussed together with their functions and capabilities. Menus, tabs and shortcut buttons will also be investigated to help the user to get familiar with ElectricalOM environment quickly and to better understand how the software works.

First, the main screen will be broken into sections and functions of these sections will be discussed. Then, sections will be further investigated at the level of subsections, tabs, and/or menus whichever applicable.

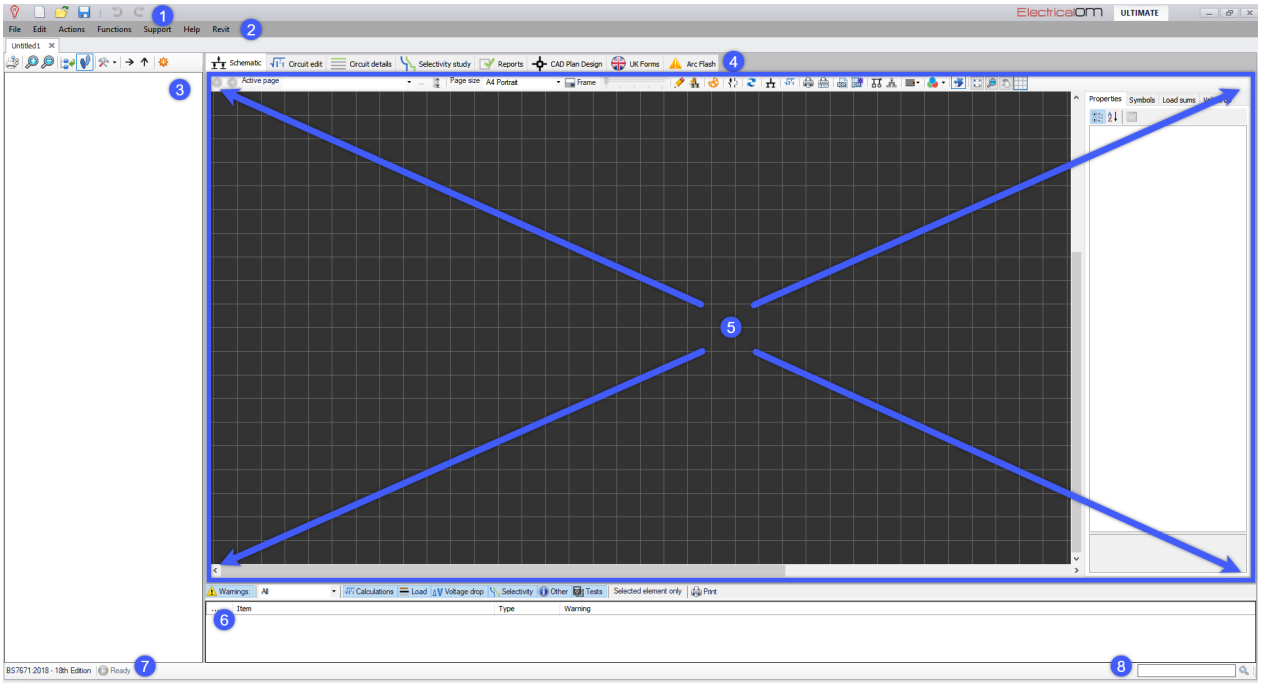


Main Screen

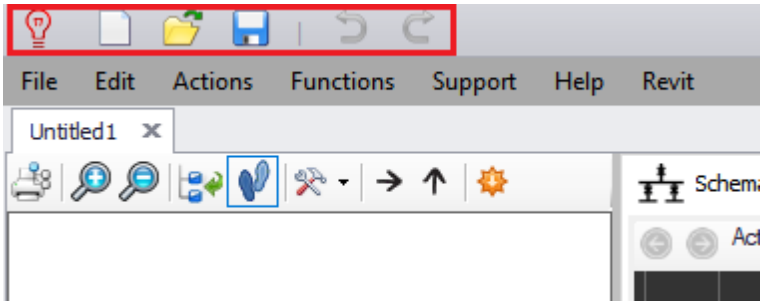
When you run ElectricalOM, the main screen welcomes the user, as shown below. The main screen is divided into different areas which serve different specific functions; some are purely informative, some are the

ones where the user inputs related data, and some are for navigation purposes. The user needs to know exact functions of all these areas in order to build up and design the electrical installation effectively leading to an accurate modelling of the system. Main screen areas are listed and also shown below:

1. Quick Access Toolbar: This toolbar includes shortcut buttons for basic functions.
2. Menu Bar: This bar includes various menu tabs.
3. System Tree Section: This section shows the system designed as a tree representation.
4. Module Selection Bar: This bar includes various module tabs.
5. Selected Module's Screen: This is the working area for the selected module.
6. *Warnings Section:* Warnings related with the system being designed will be shown here.
7. Status Bar: This area indicates some software settings being used for calculations.
8. Search Box: User can run a text based search by typing in a keyword in this box.



Quick Access Toolbar



Quick Access Toolbar is located at the top of the main screen of ElectricalOM, next to the ElectricalOM logo and it is used for basic functions like saving a project and opening an existing project. Functions of the buttons are listed below (from left to right):

1. **New project:** Once clicked, it creates a new project. The new project will be created using data

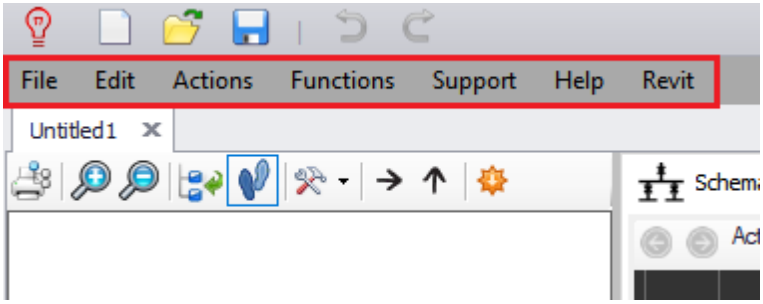
provided by the user at "Project info and options..." menu. Same action can be initiated by pressing Ctrl+N on keyboard.

2. **Open project:** This shortcut button is used to open an existing project. Once clicked, "Open" window will appear so you can navigate and select a project file to open. Same action can be initiated by pressing Ctrl+O on keyboard.
3. **Save:** ElectricalOM is a file based software which requires a file to be created on the users' storage area containing all the data with regards to the modelled system. This button is used to save the active project as an ElectricalOM file. If it is the first time you save a project, then it will act as "Save as...". You can select a folder and type in a name for your project file. After the first time or in a case of a previously saved project, this button will just save the current state of the project under the same name. Same action can be initiated by pressing Ctrl+S on keyboard.
4. **Undo:** Undo button is used to reverse an action. Every click will revert previous action until the last point the project saved by the user. When there is an available step to undo, then, this button becomes blue. Same action can be initiated by pressing Ctrl+Z on keyboard.
5. **Redo:** Redo button restores any actions that were previously undone by the undo button. Once the user makes any changes to the project following an undo action, Redo button will be reset.When there is an available step to redo, then, this button becomes blue. Same action can be initiated by pressing Ctrl+Y on keyboard.

Menu Bar

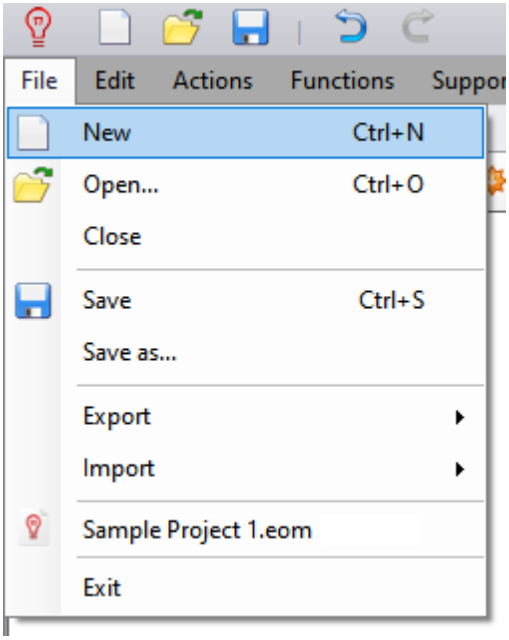
Menu Bar is located at the top of the screen, just below the Quick Access Toolbar. It includes both commonly known and software specific menu tabs where the user can reach to menus, submenus, and options.

- File Menu
- Edit Menu
- Actions Menu
- Functions Menu
- Support Menu
- Help Menu
- Revit Menu



File Menu

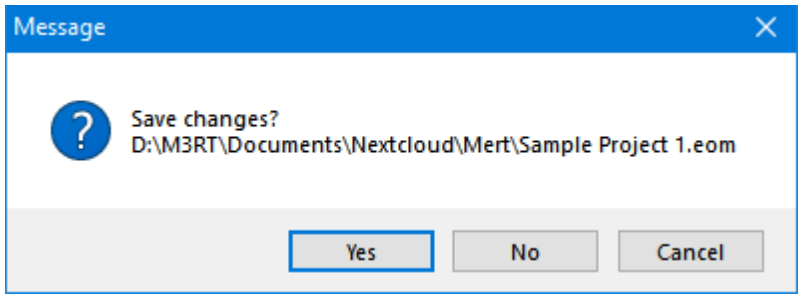
This menu tab probably is the most familiar looking menu for everyone who has a basic computer knowledge and it contains the most basic actions like New, Open, Save, etc.



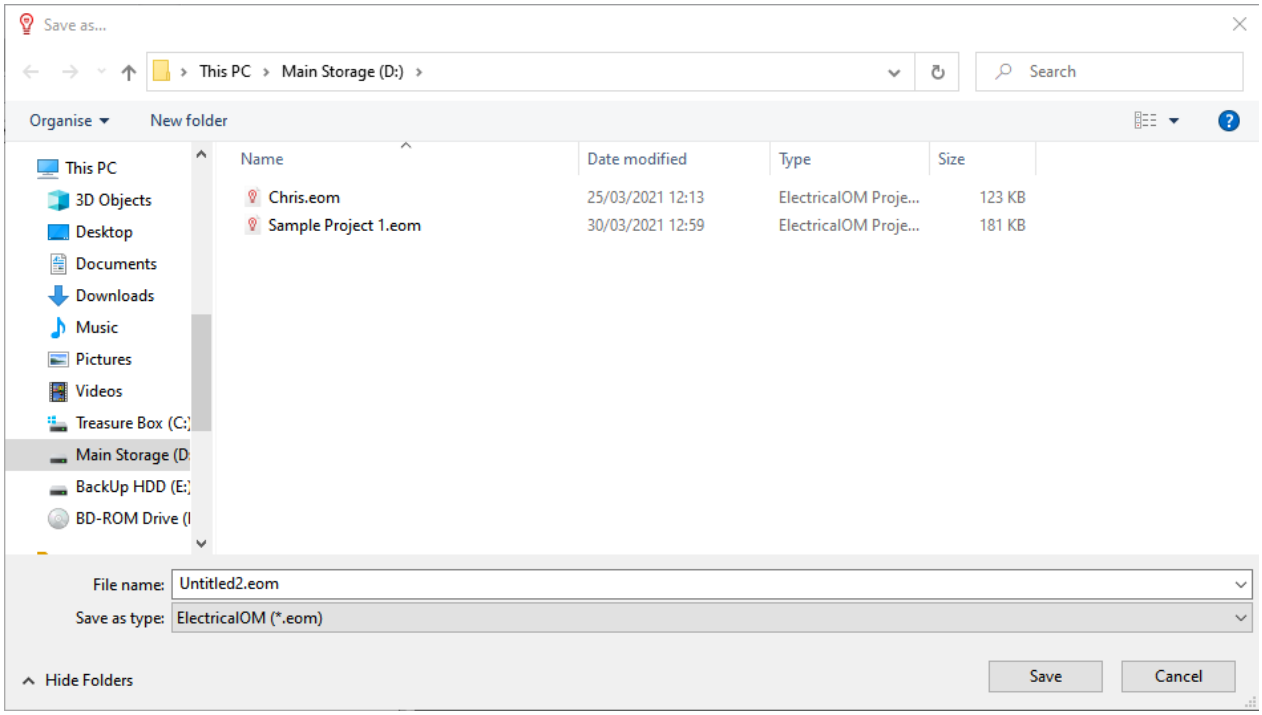
●*New:* As previously mentioned, once this clicked, it creates a new project. The new project will be created using data provided by the user at "Project info and options..." menu. Same action can be initiated by pressing Ctrl+N on keyboard.

●*Open...:* This command is used to open an existing project. Once clicked, "Open" window will appear so you can navigate and select a project file to open. Same action can be initiated by pressing Ctrl+O on keyboard.

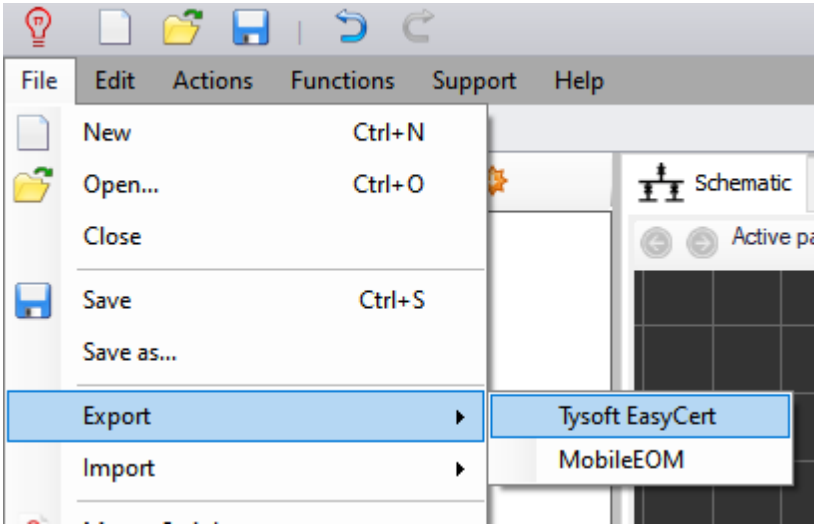
●*Close:* This command will close the active project. If the project being closed has any changes after the previous saving, then, a dialogue box as shown below will pop up asking if the user wants to save the latest changes. You can click on "Yes" button to save the latest changes and close, click on "No" button to revert the project back to the last saved state and close or click on "Cancel" button to cancel the command and return back to ElectrcialOM without closing the project.



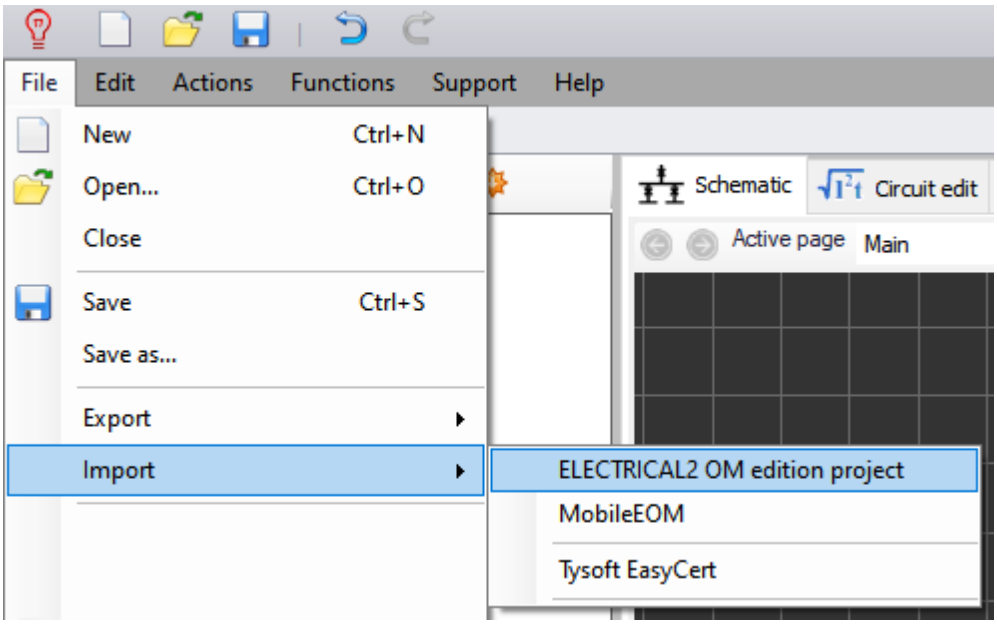
●*Save / Save as...:* This command is used to save the active project. If it is the first time you save a project, then it will act as "Save as..." command and the "Save as..." windows will appear, so you can select a folder and type in a name for your project file as shown below. After the first time saving, or in a case of a previously saved project, this button will just save the current state of the project without any dialogue box. Save command can be initiated by pressing Ctrl+S on keyboard.



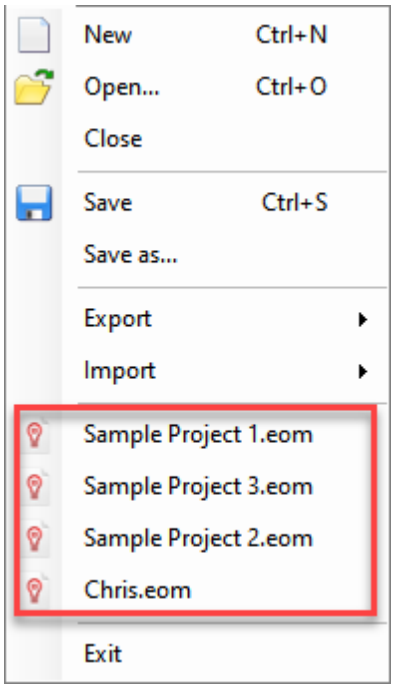
Export: This command is used to export an ElectricalOM project's data to another software and in this case to either Tysoft EasyCert or MOdecsoft MobileOM.



Import: This command is to import data from another software into ElectricalOM. The user has the options to import data from Modecsoft Electrical2 OM, Modecsoft MobileOM and Tysoft EasyCert.



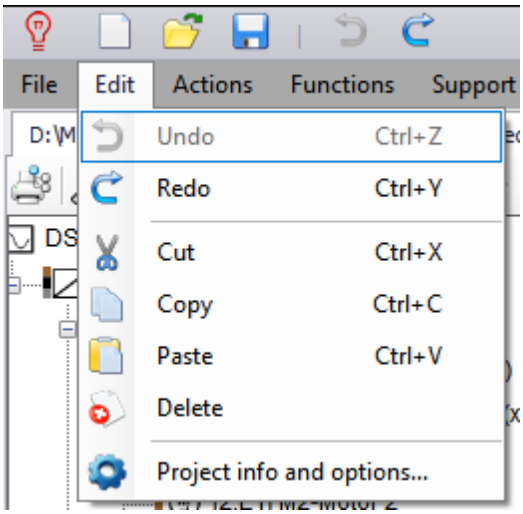
Recently Opened: After the Export and Import commands, "Recently Opened" section is located. ElectricalOM remembers last four projects recently opened and lists them here to quickly select and open (here, for example, it is Sample Project 1.eom).



Exit: This command, once clicked on, will exit ElectricalOM. If there are any project files which are not saved, then the same (as Close command) "Save changes?" dialogue box will pop up for each project. The user may choose to save or not to save any changes made to each project.

Edit Menu

This menu tab includes and common Undo, Redo, Cut, Copy, Paste, Delete commands and the "Project info and options..." menu. Cut/Copy/Paste/Delete commands under this menu tab are used for circuit objects and components like final circuits, CBs and etc. **only** and they do not cut/copy/paste/delete any highlighted text. In order to initiate these commands for highlighted text, the user shall use the right-click menu or keyboard shortcuts.



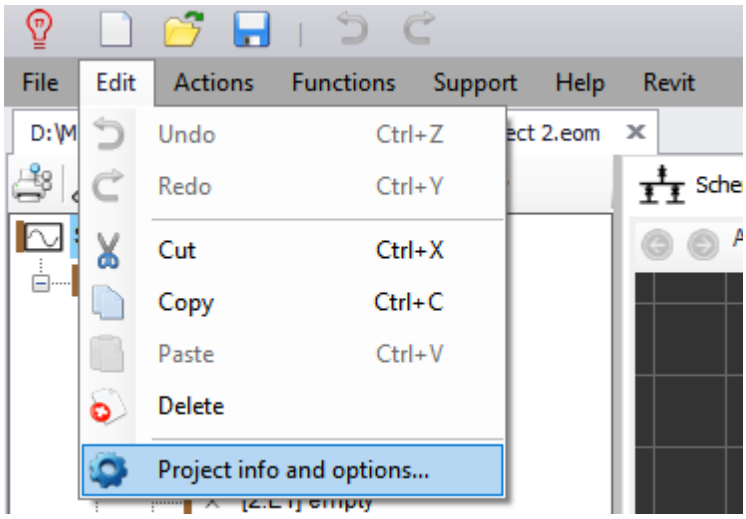
- **Undo:** Undo button is used to reverse an action. Every click will revert previous action until the point the project saved by the user. When there is an available step to undo, then, this button becomes blue.

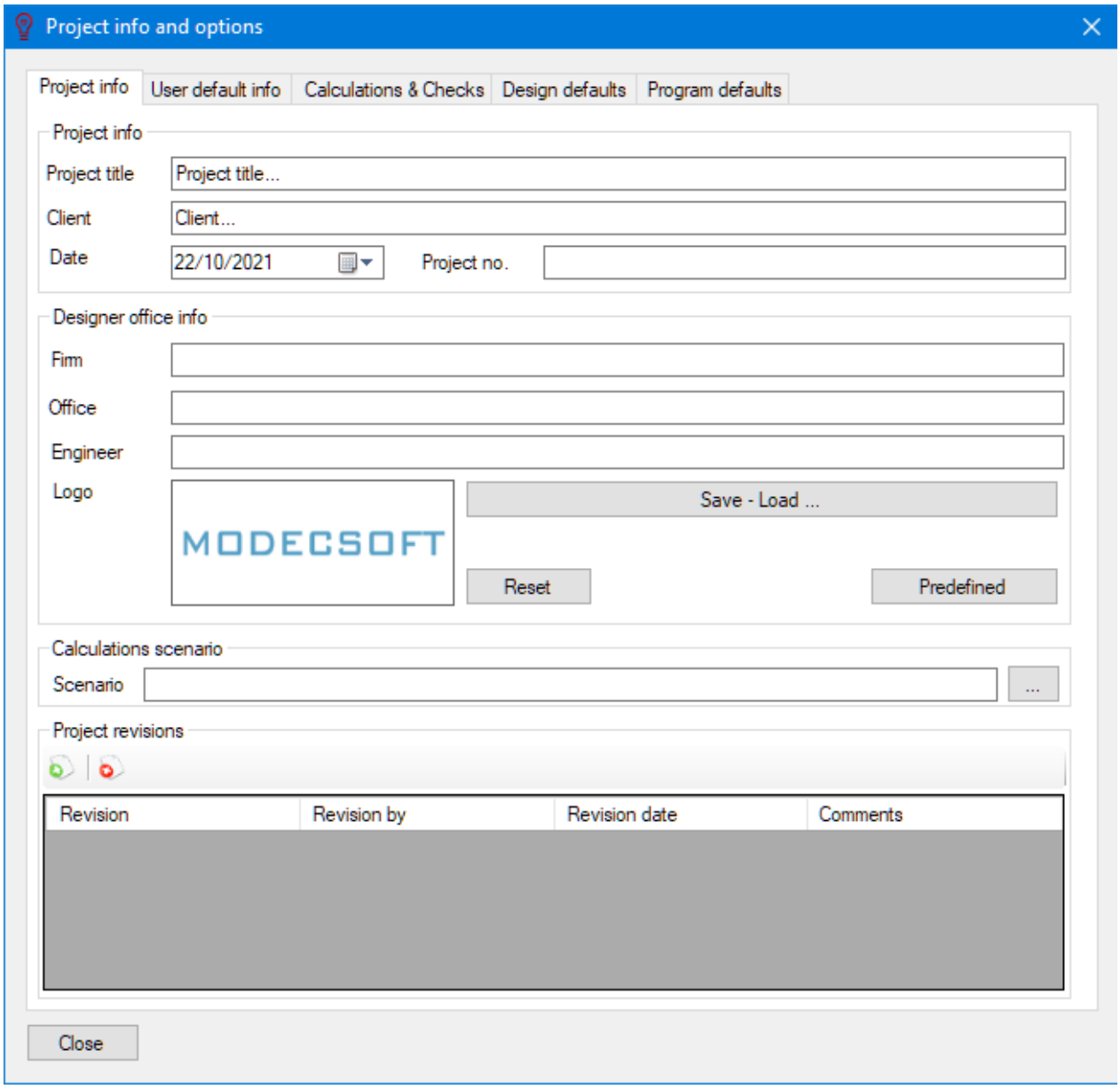
Same action can be initiated by pressing Ctrl+Z on keyboard.

- **Redo:** Redo button restores any action that were previously undone by the Undo button. Once the user makes any changes to the project following an undo action, Redo button will be reset.When there is an available step to redo, then, this button becomes blue. Same action can be initiated by pressing Ctrl+Y on keyboard.
- **Cut:** Removes the highlighted object(s) and saves it to clipboard. Same action can be initiated by pressing Ctrl+X on keyboard.
- **Copy:** Saves the highlighted object(s) to clipboard. Same action can be initiated by pressing Ctrl+C on keyboard.
- **Paste:** Pastes previously cut or copied object(s) to a highlighted location. Same action can be initiated by pressing Ctrl+V on keyboard. Paste option is disabled for Distribution Boards but enables for Switch Boards. If a circuit is copied and tried to be pasted to a DB then ElectrcialOM will display a warning screen as below and cancel the operation, however, it is possible to paste a circuit directly to a SB. This will place the pasted circuit to the end of the SB.
- **Delete:** Deleted the highlighted object(s).
- **Project info and options...:** Please see Project info and options... Menu section.

Project info and options... Menu

Project info and options... menu is one of the most important menus of ElectricalOM software. Data set by the user under this menu will be used by ElectricalOM at every step and they play a crucial role in the accuracy of the design calculations. Settings will be global which means ElectricalOM will use these setting for every new project.





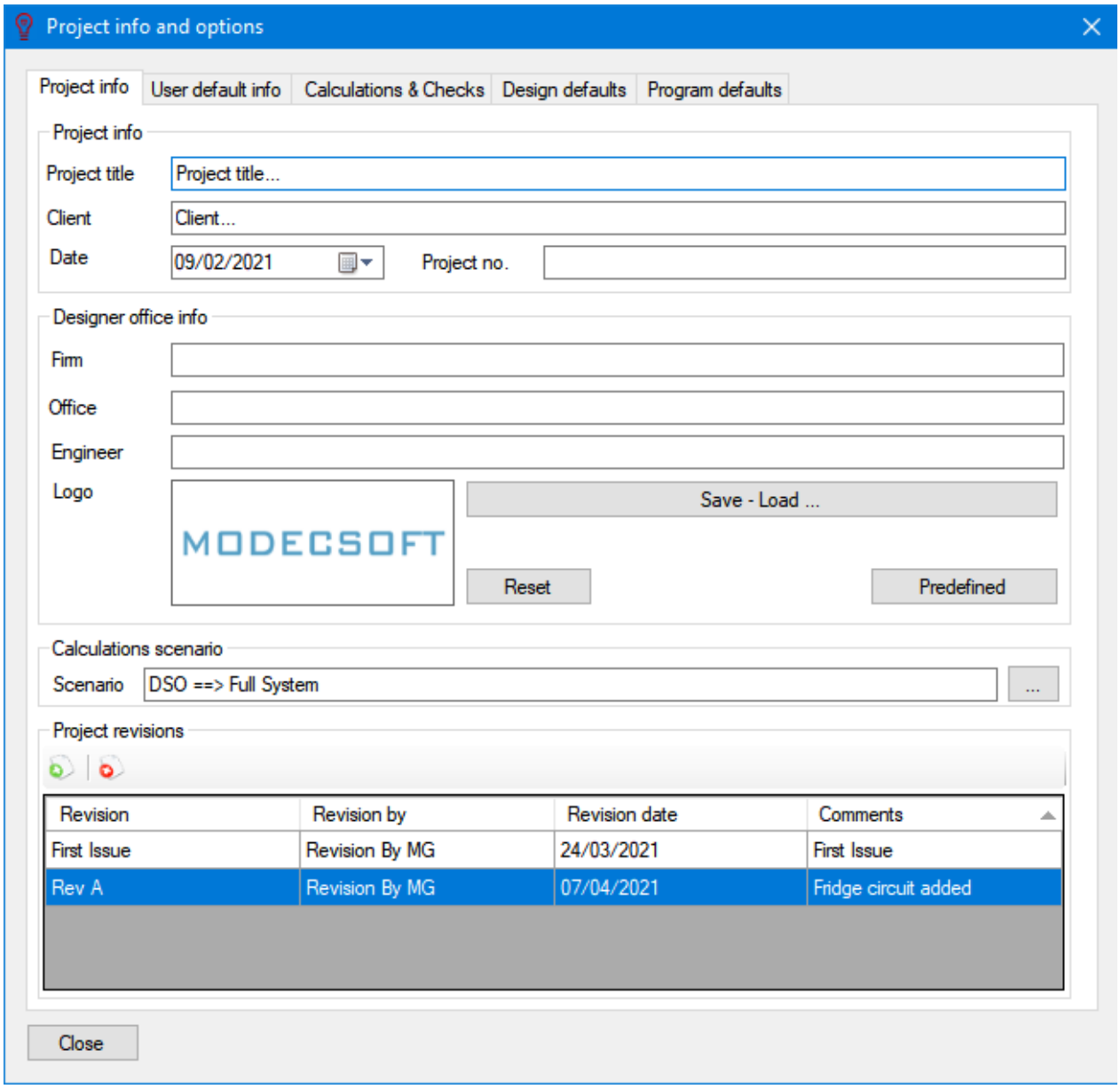
There are five tabs available:

- Project info tab
- User default info tab
- Calculations & Checks tab
- Design defaults tab
- Program defaults tab

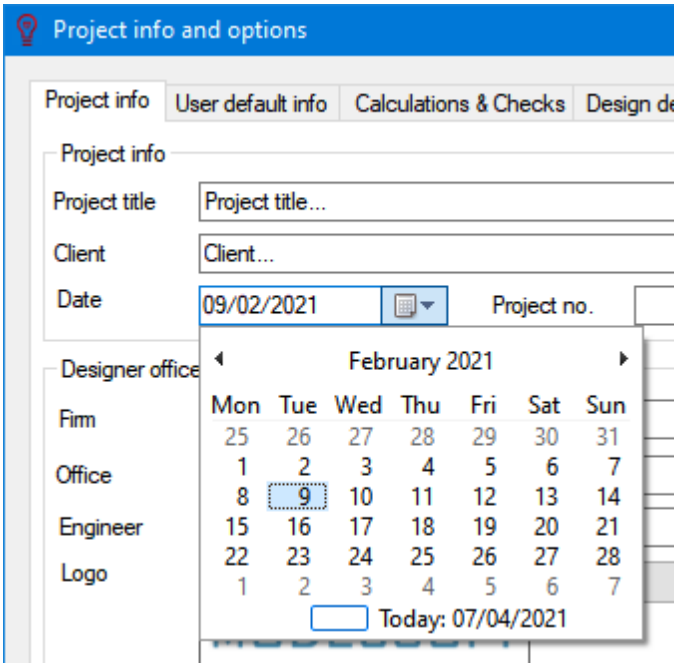
Project Info Tab

Project info Tab

The data entered here will mostly be used on project report and on drawing title blocks. Except the "Calculation scenarios" section, none of the sections does not interfere with any kind of calculation or modelling tasks. See below for explanation for the sections:

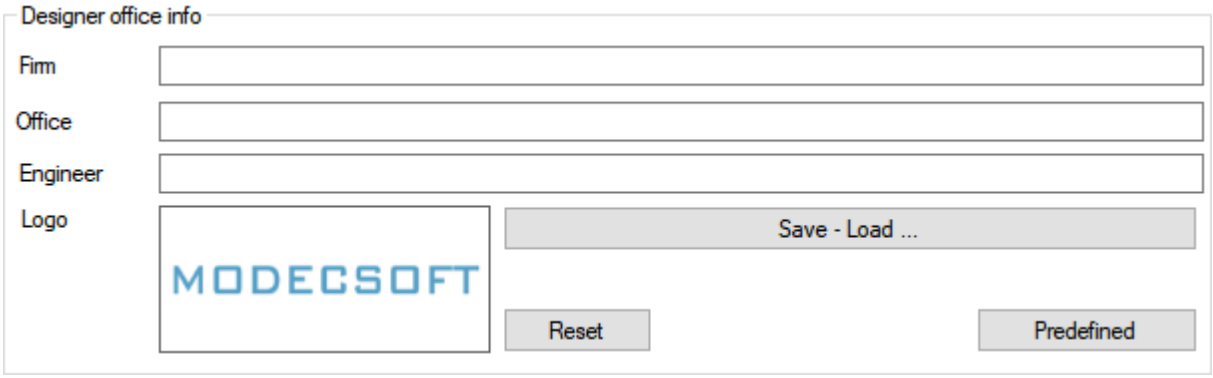


- **Project info:** Project details which will be shown on project report and drawing title blocks. Date field has a quick-pick option which can be activated by clicking on the calendar icon as shown below.



- **Designer office info:** Office and stuff details which will be shown on project report and drawing title blocks. The Logo can be updated by clicking on the current logo and picking up a new logo picture. JPG, PNG and BMP files can be used. When the "Reset" button clicked, the Modecsoft logo will be used as the company logo.

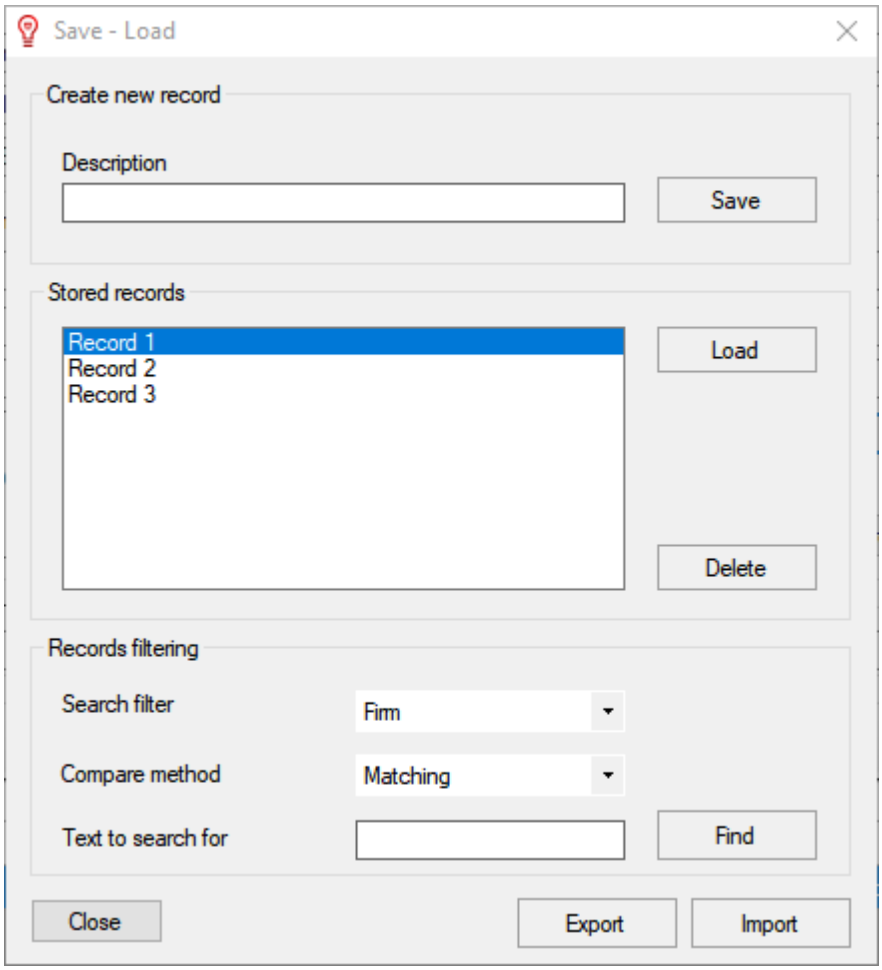
The user has the option to predefine the values by using the User defaults tab, which will be explained later, and quick fill the fields using the "Predefined" button. Apart from Predefined option, user also has the option to define multiple entries which can be used as needed. This is done by help of the "Save - Load..." button.

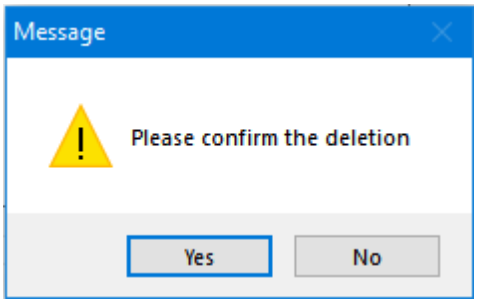


In order to save the entered data or load an already saved data, click on "Save - Load ..." button. You can define a Description for the record so you can easily identify it later on, then, click on "Save" and this will save the data as a record to the "Stored records" list.

To load a saved record, select the desired record from the "Stored records" list and click on "Load" button.

To delete a saved record, select the record you like to delete and click on "Delete" button. After you click on delete, a message window will pop up asking you to confirm to delete the record. If you want to proceed simply click on "Yes" if you do not want to delete the record selected, click on "No".

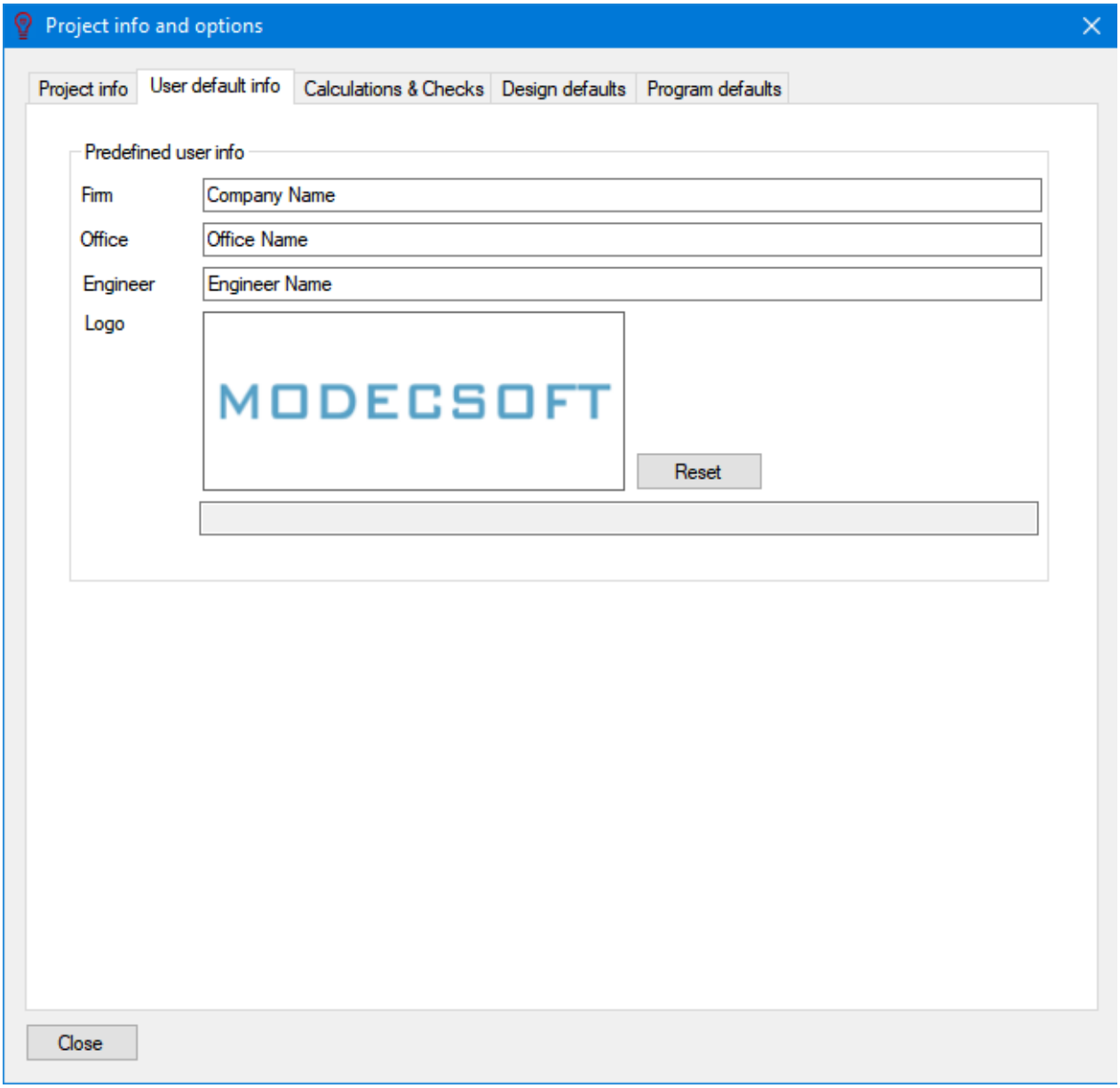




User default info Tab

User default info Tab

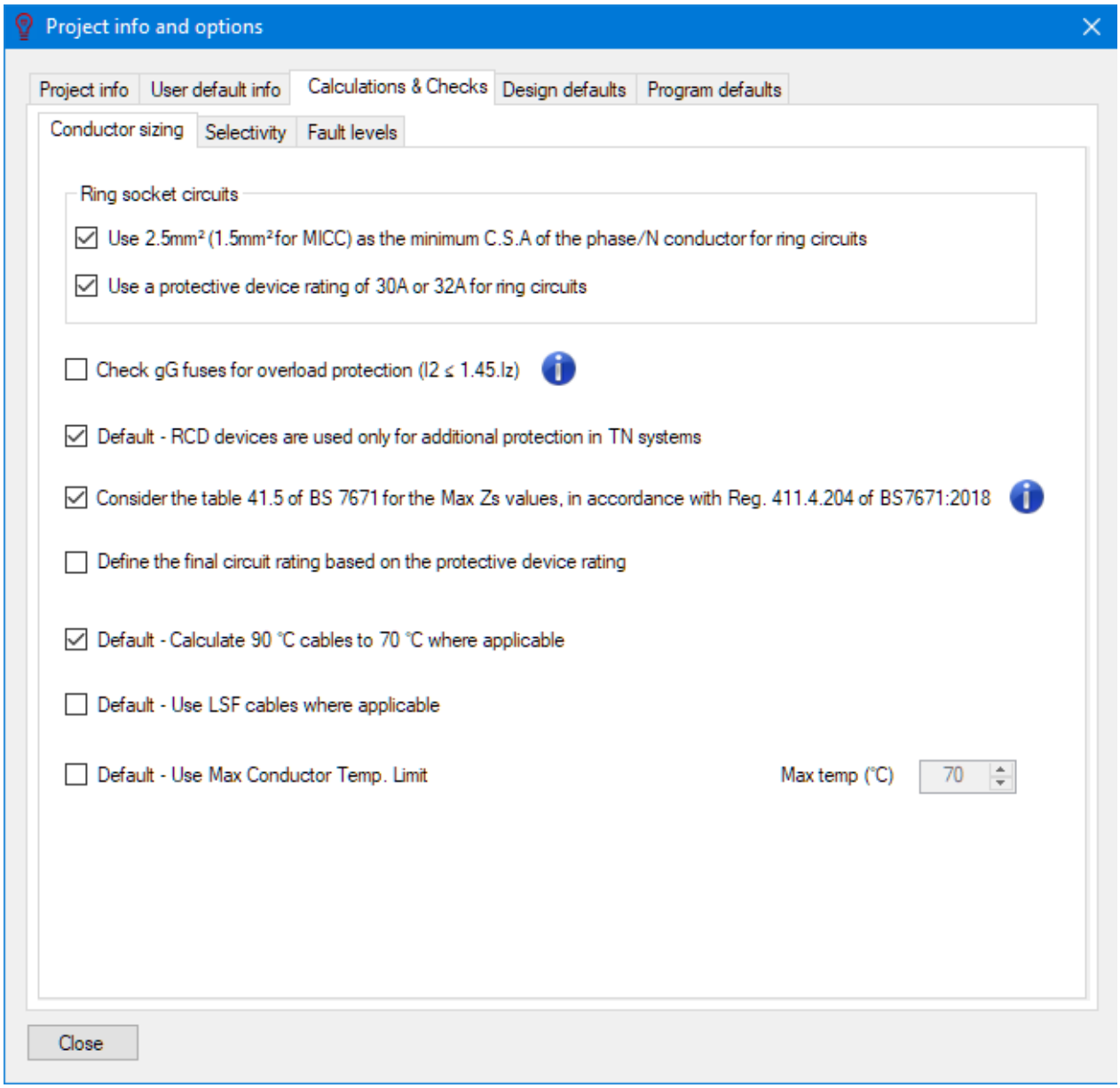
This tab works together with *Designer office info* section of *Project info* tab. Data entered under the *Predefined user info* will be used to fill the *Designer office info* section once the *Predefined* button is clicked.



Calculations & Checks Tab

Calculations & Checks Tab

ElectricalOM is using various user defined conditions and assumptions while calculating certain values to decide if the design complies with related standards. Calculations & Checks tab is one of the tabs the user can tell ElectricalOM what the design conditions and assumptions are, so the calculations and checks will be carried out accordingly. Required settings can be enabled or disabled by clicking on the tick boxes next to each item. Changes made under Calculations & Checks tab will take immediate effect and ElectricalOM will display warnings in the Warnings Section if any issues found.

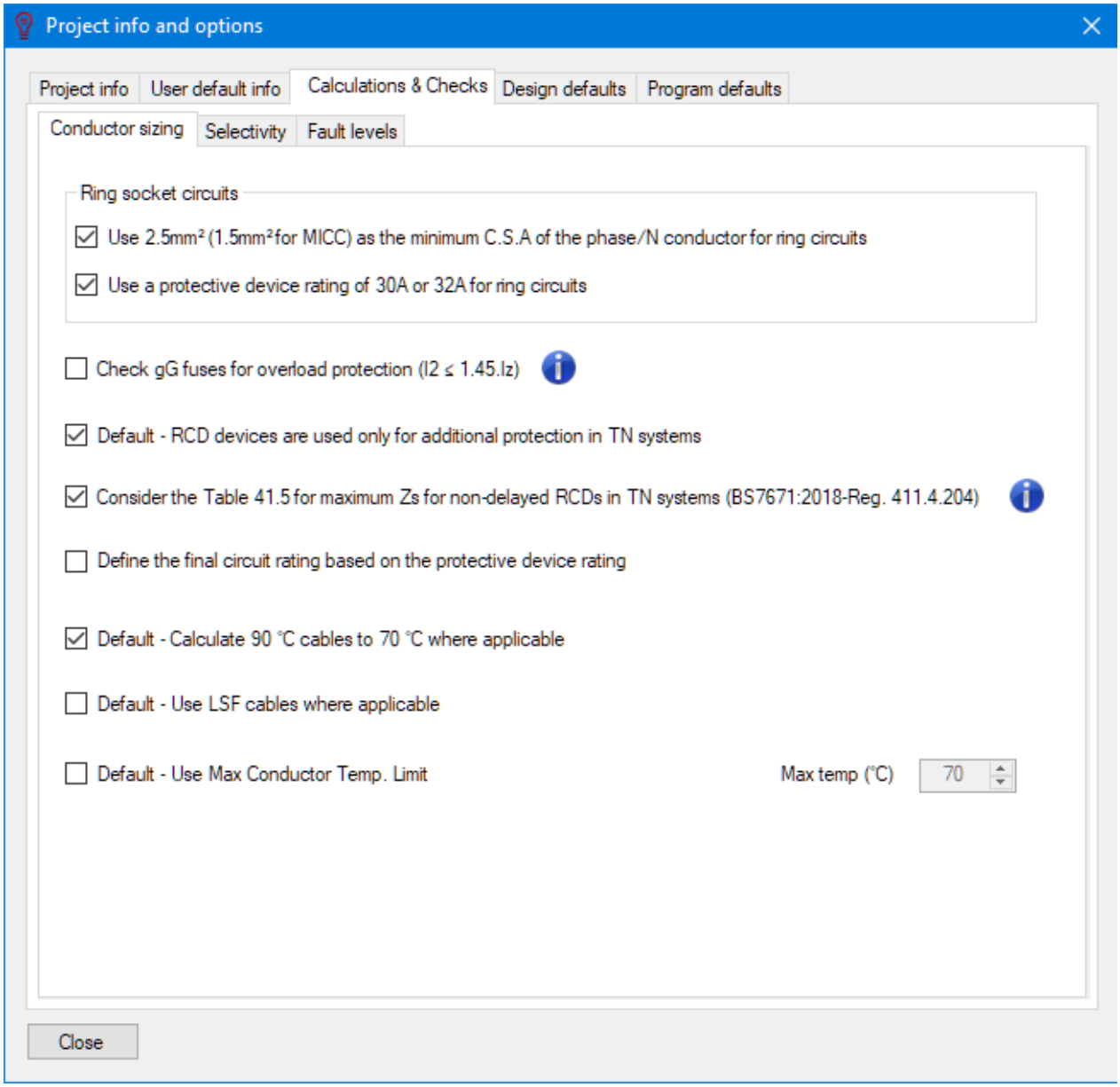


The *Calculations & Checks* tab is further divided into three tabs:

- Conductor sizing Tab
- Selectivity Tab
- Fault levels Tab

Conductor sizing Tab

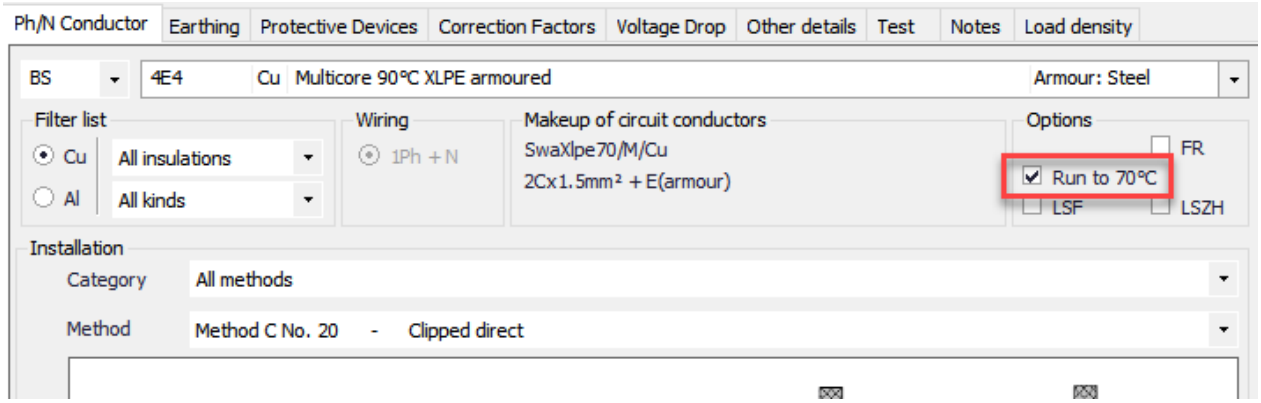
Conductor Sizing Tab



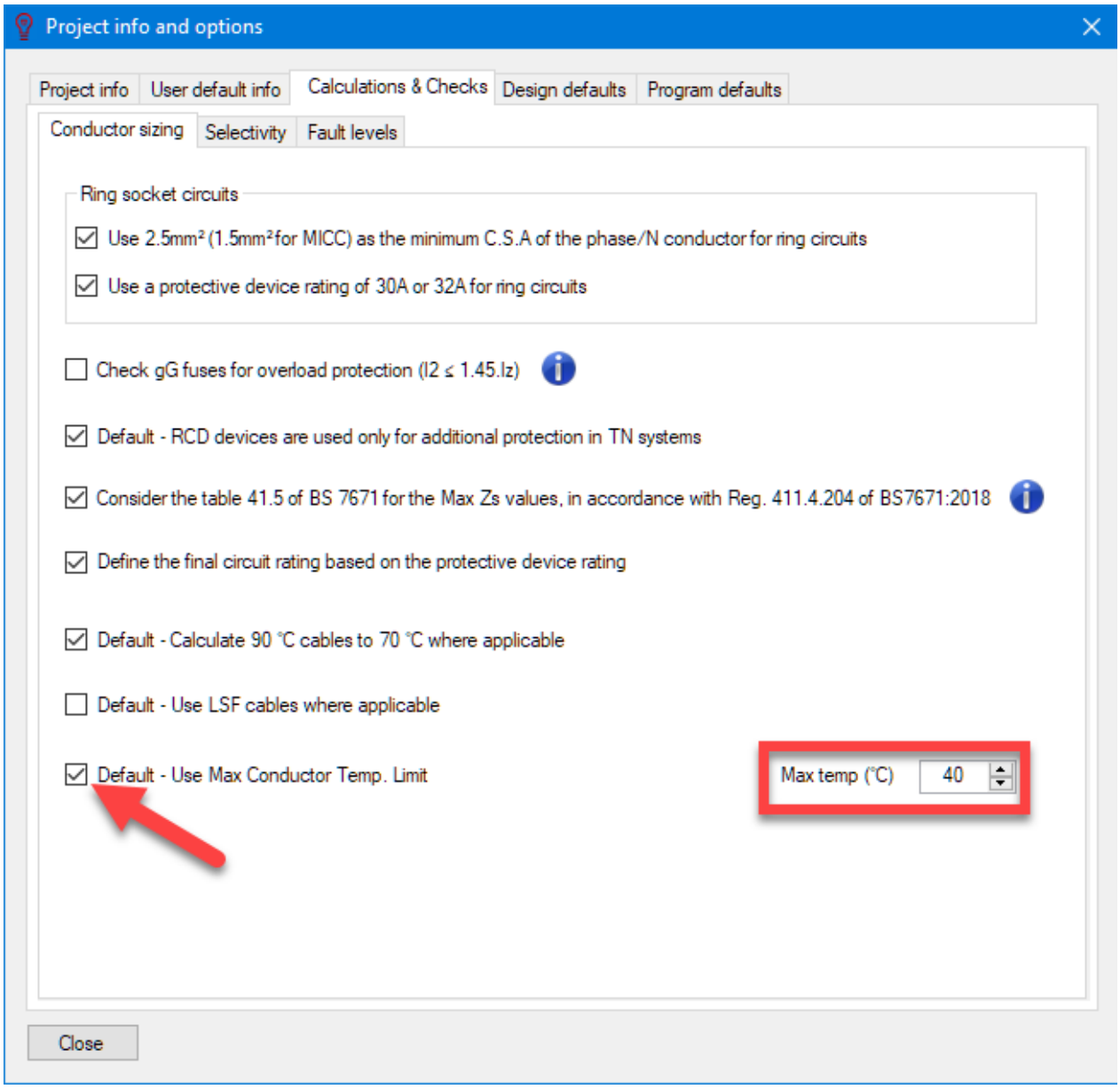
- **Ring socket circuits Section:** Being a special type of circuit, a ring socket circuit needs a special treatment. Minimum cable cross-section allowed for a ring socket circuit is currently 2.5mm2 with a 30/32A protection requirement. If these boxes are ticked, then, ElectricalOM will warn the user when a smaller cross-section and/or an over current protection less than 30A is used.
- **Check gG fuses for overload protection (I2 ≤ 1.45 Iz) (Criteria for type gG fuses - Comply with the IEC Standard requirement I2 ≤ 1.45 Iz):** BS7671 states that (BS7671:2018, 433.1.1), the condition I2 ≤ 1.45 Iz must be taken into account while looking at overload protection. It is also important to know that even if this box is unticked, ElectricalOM will still consider Cf, correction factor for BS3036 fuses.
- **Default - RCD devices are used only for additional protection in TN systems:** Ticking this box will

set ElectricalOM to regard any RCD used upstream to any circuit as it is for additional protection as default. For more information about an RCD used as an additional protection, please refer to Protective Device Tab.

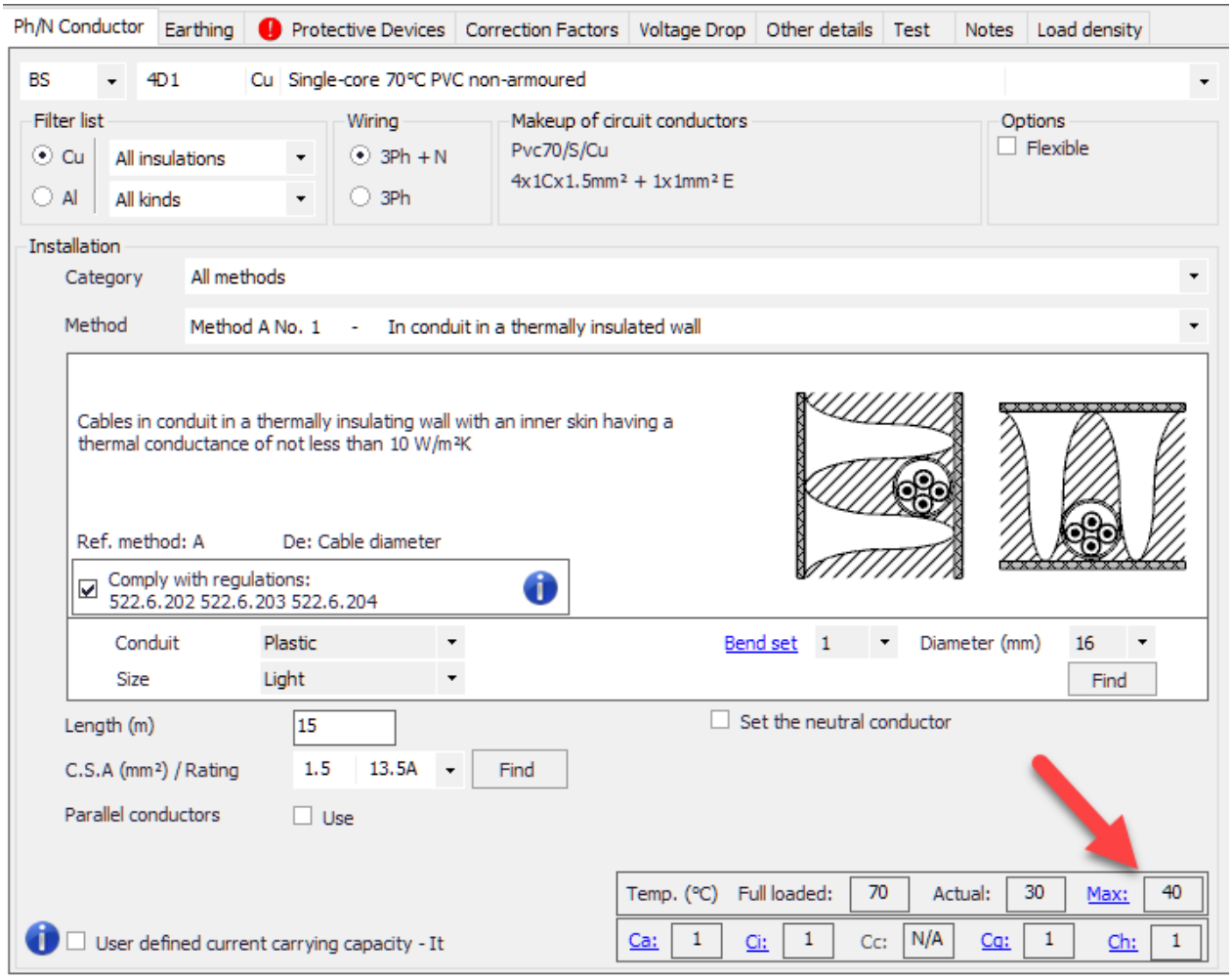
- **Consider the table 41.5 of BS 7671 for the Max Zs values, in accordance with Reg 411.4.204 of BS7671:2018:** The user may like to set ElectricalOM to check Zs values so they will satisfy *Table 41.5 Maximum earth fault loop impedance (Zs) for non-delayed and time delayed 'S' Type RCDs to BS EN 61008-1 and BS EN 60119-1 for Uo of 230 V* of BS 7671 for a TT system. In this case this box must be ticked.
- **Default - Calculate 90°C cables to 70°C where applicable:** This option will set ElectricalOM to calculate current carrying capacity of all cables rated at 90 °C as if they are rated at 70°C as default. (See BS7671:2018 512.1.5). The user does not need to check the "Run to 70°C" box (see Ph/N Conductor Tab) every time a cable rated at 90°C is selected, however, unticking the box for individual cables is also allowed in the case the user wants to set that specific cable to be run up to 90°C.



- **Default - Use LSF cable where applicable:** Similar to previous feature, this option will set ElectricalOM to tick the "LSF" box (Circuit edit module > Ph/N Conductor tab) automatically wherever possible as default. The user still has the option to deselect this option for this specific circuit.
- **Default - Use Max Conductor Temp. Limit:** ElectricalOM, by default, uses the rated temperature value for the selected cable as the maximum running temperature for a cable and base calculations on that, however, the user may define a different maximum running temperature for each cable. If this box is selected and a set value is entered in the box next to "Max temp (°C)", then, from this point on, ElectricalOM will use this value as default for every cable created. It should be noted that this setting will affect only the new cables but will leave the existing cables' maximum running temperature value as they were set previously.

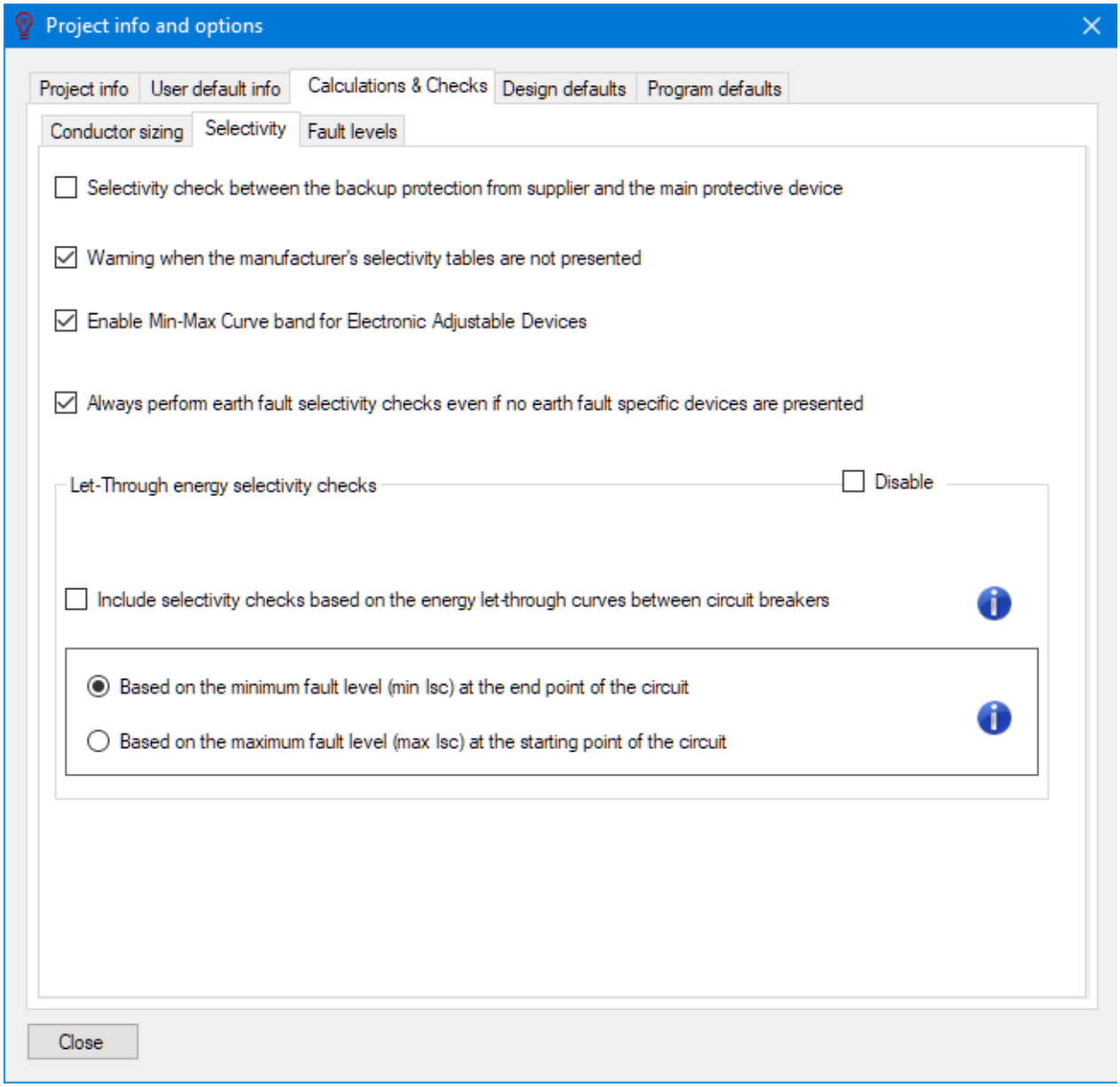


Set value for a specific cable can be seen at the bottom of Ph/N Conductor tab of Circuit edit Module.

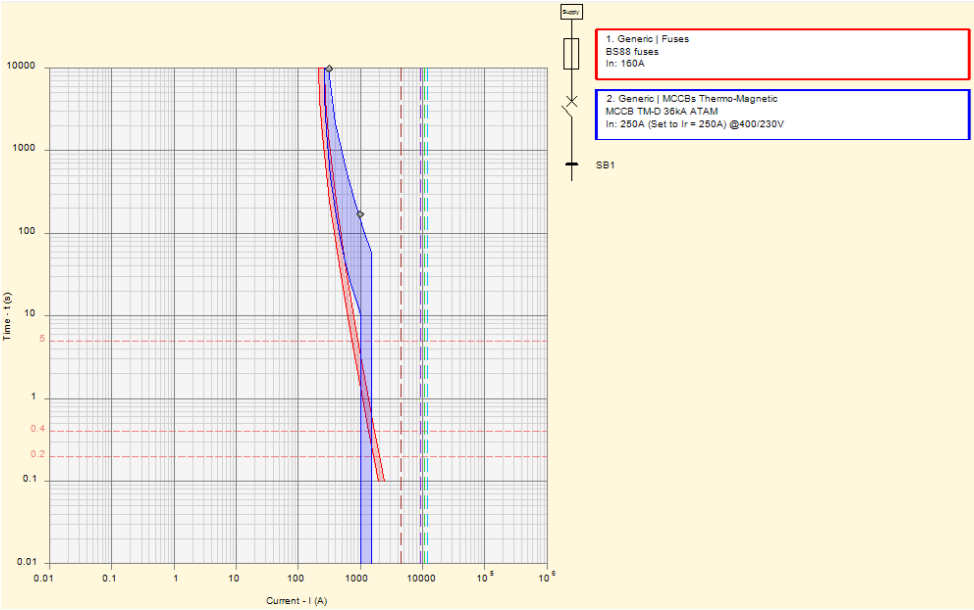

Ph/N Conductor
Earthing
Protective Devices
Correction Factors
Voltage Drop
Other details
Test
Notes
Load density
BS
4D1
Cu
Single-core 70°C PVC non-armoured
Filter list
Cu
Al
All insulations
All kinds
Wiring
3Ph + N
3Ph
Makeup of circuit conductors
Pvc70/S/Cu
4x1Cx1.5mm² + 1x1mm² E
Options
Flexible
Installation
Category
All methods
Method
Method A No. 1 - In conduit in a thermally insulated wall
Cables in conduit in a thermally insulating wall with an inner skin having a thermal conductance of not less than 10 W/m²K
Ref. method: A
De: Cable diameter
Comply with regulations:
522.6.202 522.6.203 522.6.204
Conduit
Plastic
Size
Light
Bend set
1
Diameter (mm)
16
Find
Length (m)
15
Set the neutral conductor
C.S.A (mm²) / Rating
1.5
13.5A
Find
Parallel conductors
Use
Temp. (°C)
Full loaded:
70
Actual:
30
Max:
40
Ca:
1
Ci:
1
Cc:
N/A
Cg:
1
Ch:
1
User defined current carrying capacity - It

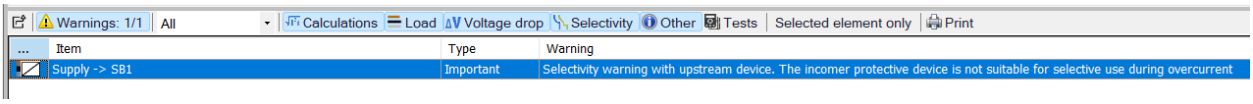
Selectivity Tab

Selectivity Tab



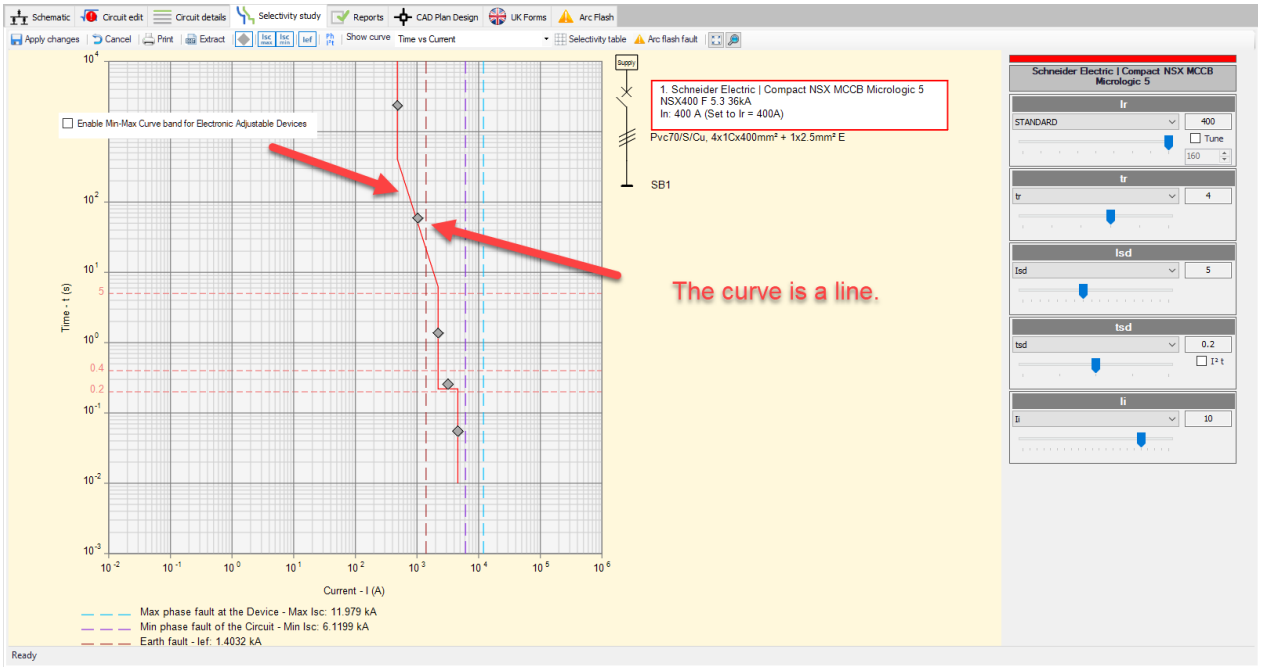
- **Selectivity check between the backup protection from supplier and the main device:** This box needs to be checked if the user wants ElectricalOM to monitor the selectivity between the DNO's protection device and the main protection device at the origin of the modelled system.

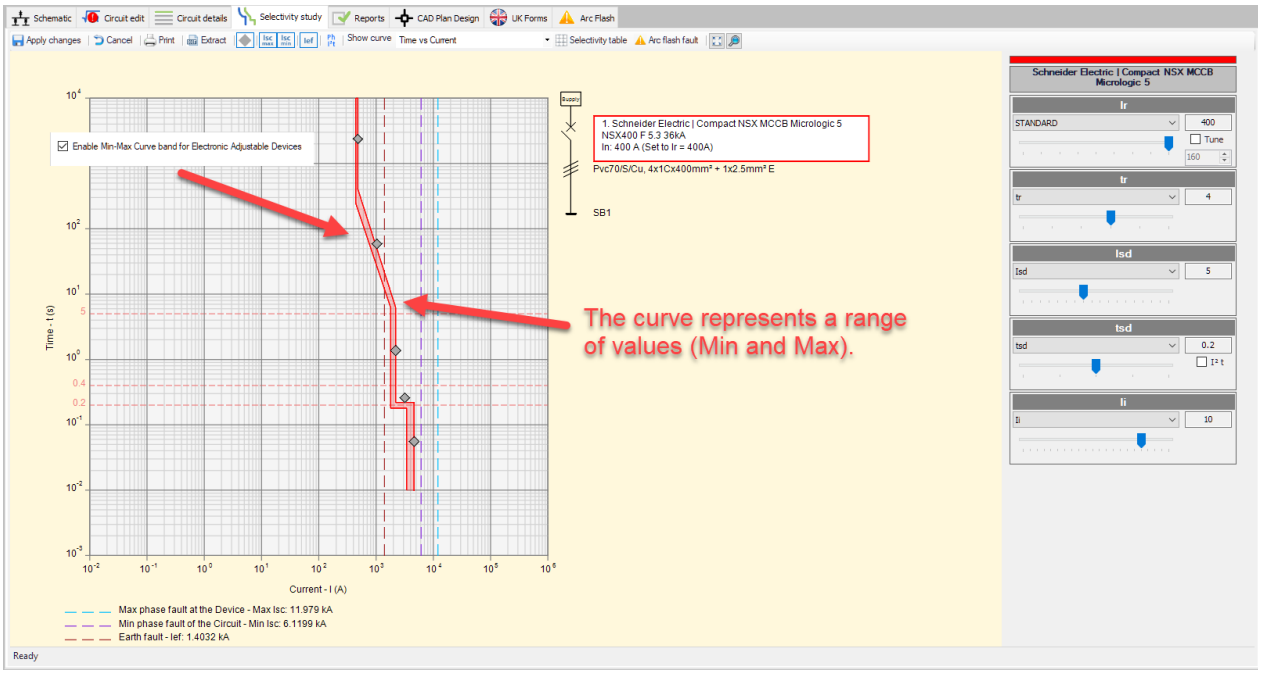




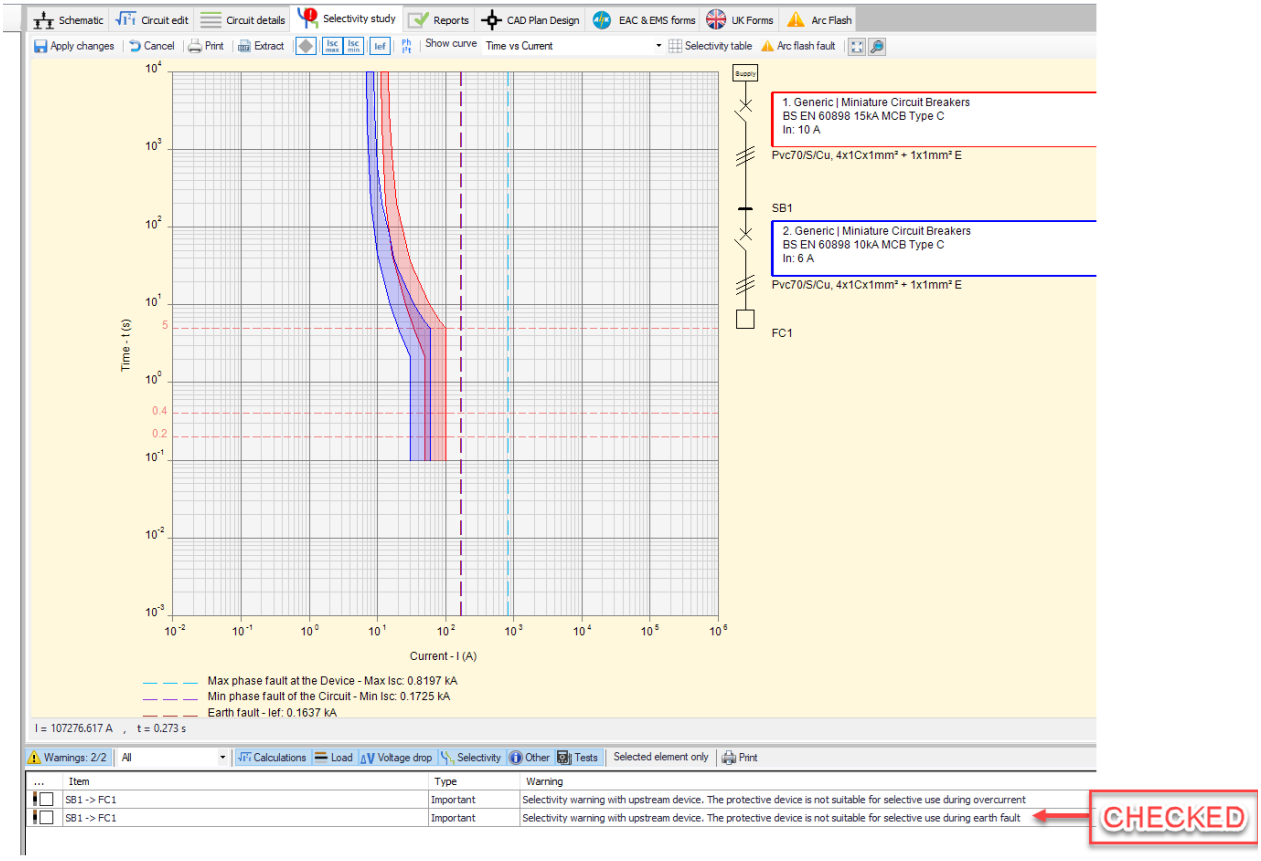
If this tick box is not ticked, ElectricalOM will ignore the protection from the DSO while carrying out the selectivity study and will not generate a warning. Please refer to Selectivity Study Module Tab for more details about selectivity.

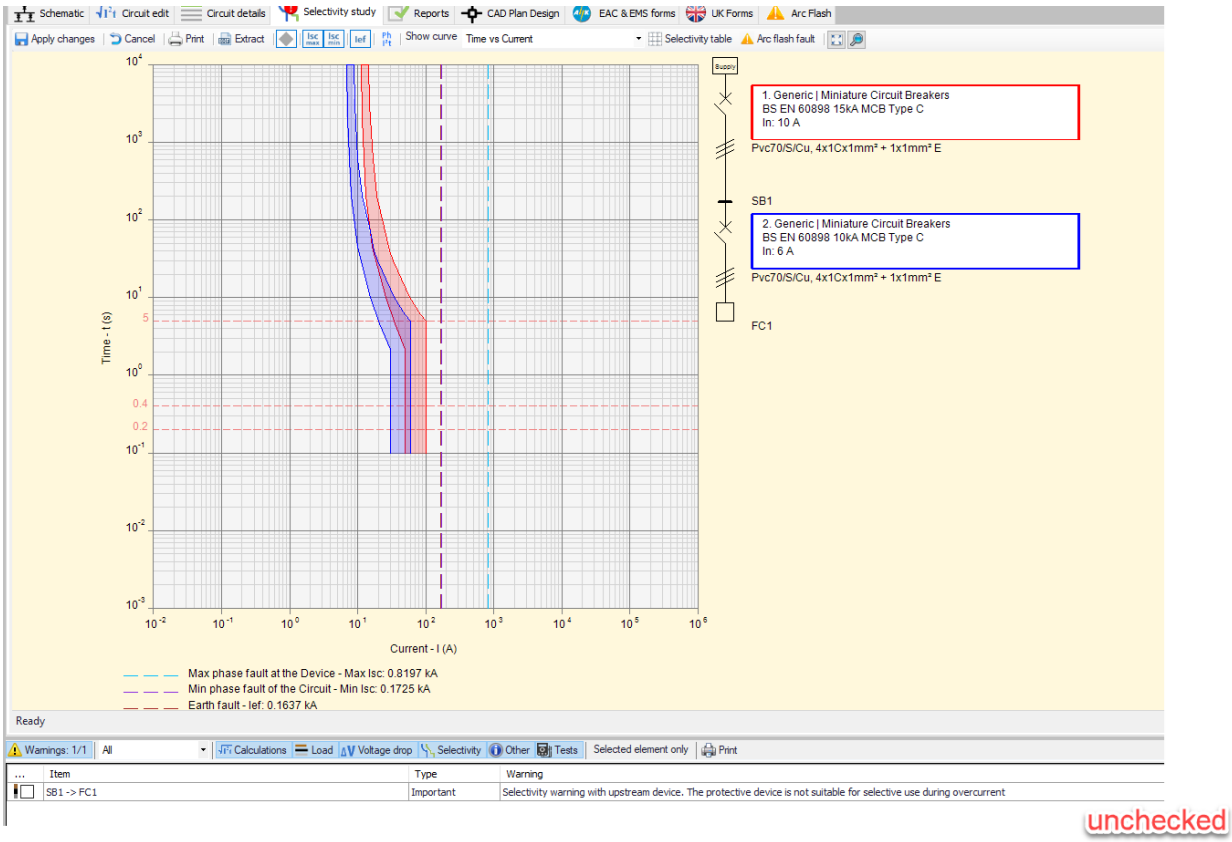
- **Warning when the manufacturer's selectivity tables are not presented:**Electrical OM uses manufacturer's data while carrying calculations unless generic items are picked and sometimes this data may not be complete. If this box is ticked, ElectricalOM will warn the user that selectivity data is missing and the selectivity study shall be done by the user by other means like referring to manufacturer's data sheet. If this option is not checked there will be no warning about missing data. If you want any manufacturer or any missing data from an existing manufacturer to be added to ElectricalOM's database, please contact support at support@modecsoft.com.
- **Enable Min-Max Curve band for Electronic Adjustable Devices:** This option is applicable only for branded devices and will not affect *Generic* devices. If an MCCB is selected as a protection device with adjustable settings, the user may opt to see the Time vs Current curve as a line rather than a band. In this case, this tick box needs to be unticked, so ElectrciaOM will set this as default setting and Time vs Current curves will be shown as a line.





- **Always perform earth fault selectivity checks even if no earth fault specific devices are presented:** This option is provided so the user may opt to still check selectivity during an earth fault if no RCD is used on a circuit. If this box is unchecked, then, ElectricalOM will not check selectivity during an earth fault if no RCD is used.

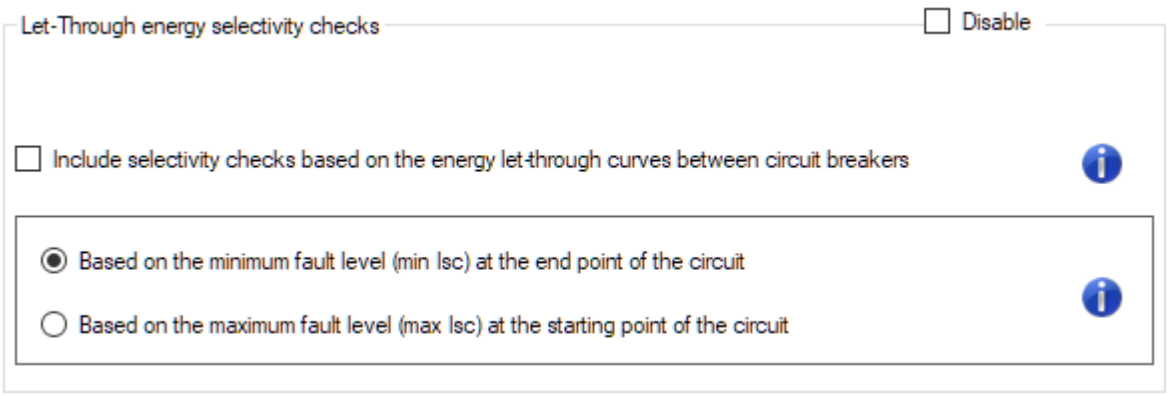




- **Let-Through energy selectivity checks Section:** See Energy Based Selectivity Checks

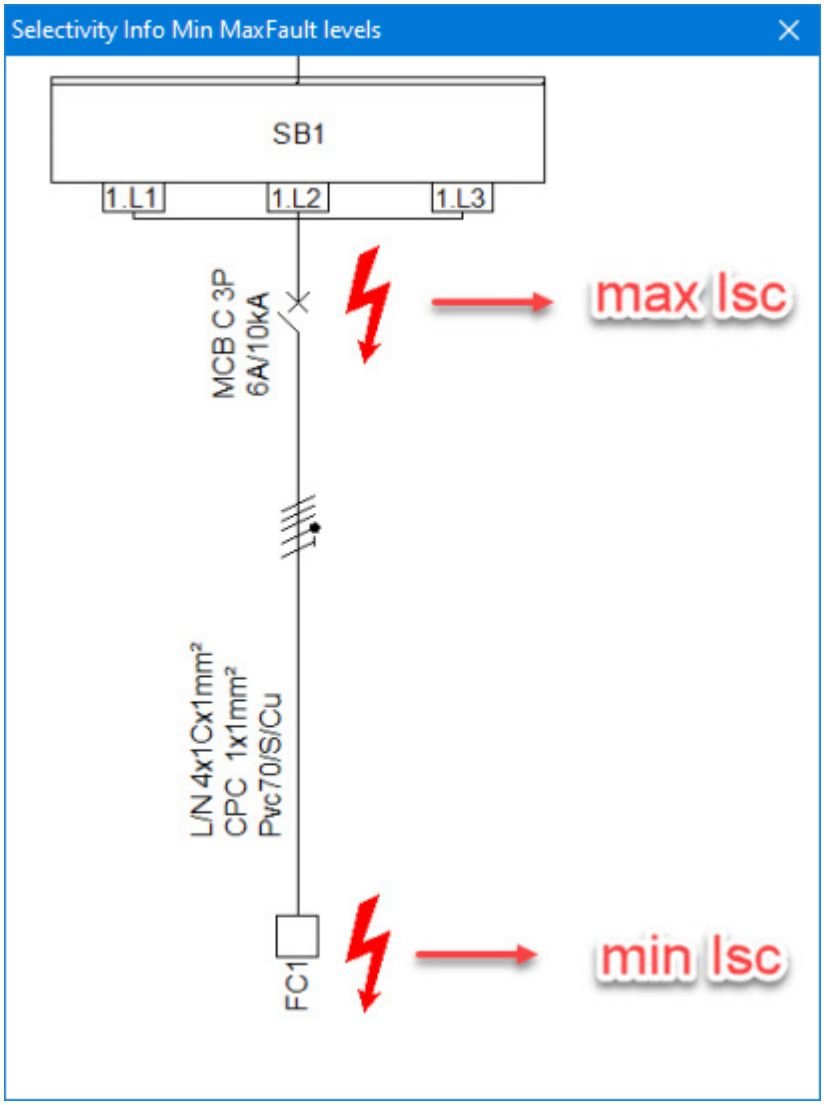
Energy Based Selectivity Checks

Let-Through energy selectivity checks Section

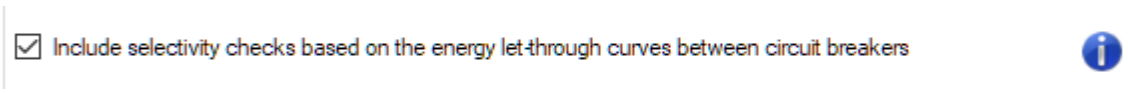


This section is reserved for *energy based* selectivity check settings. The *Disable* box can be unticked to enable those checks to be performed and related warnings to be displayed by ElectricalOM. The energy based selectivity can be checked in two ways:

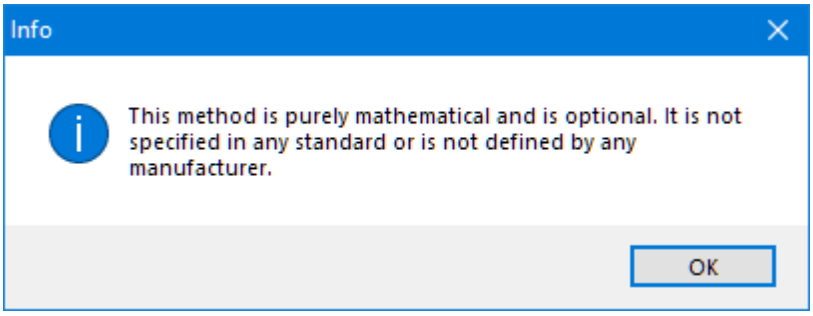
- Based on the minimum fault level
- Based on the maximum fault level



Apart form this, the user may also opt to check energy based selectivity for circuit breakers also. In this case, the *Include selectivity checks based on energy let-through curves...* box must be ticked.

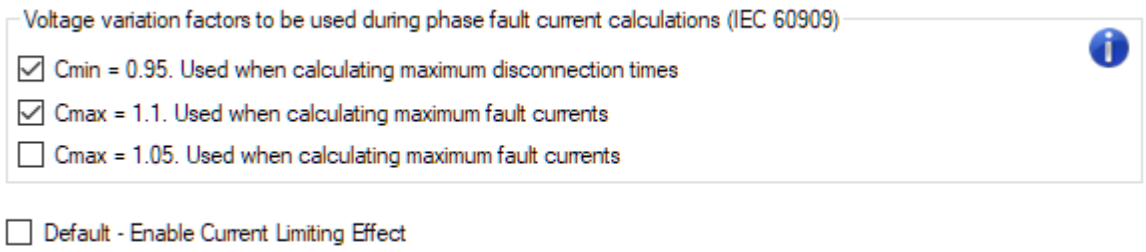


If this box is ticked, all the circuits will be checked by ElectricalOM. It must be noted that the checking selectivity between circuit breakers in regard to let-through energy is a mathematical concept using let-through energy curves and is not referred to by any regulation or any manufacturer. This option is provided to enable some users to design a more accurate system however not required.

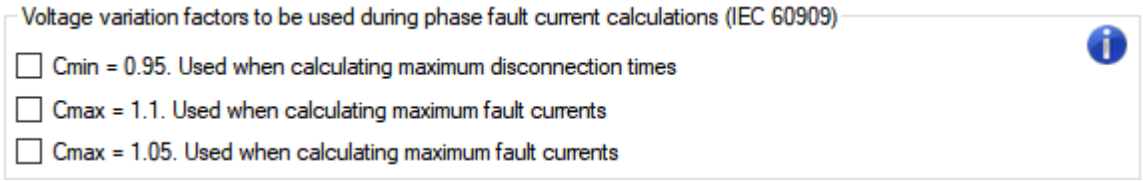

Info
This method is purely mathematical and is optional. It is not specified in any standard or is not defined by any manufacturer.
OK

Fault levels Tab

Fault Levels Tab



- **Voltage variation factors to be used during phase fault current calculations (IEC 60909):** In order to calculate minimum and maximum fault currents, user may wish to compensate voltage fluctuations.To enable the user to take into account these variations, ElectricalOM provides two options for Cmax, which are 110% and 105% of the supply value, and one option for Cmin as 95% of the supply value. These can be selected by ticking the boxes next to these options, however, only one box can be ticked for Cmax value.

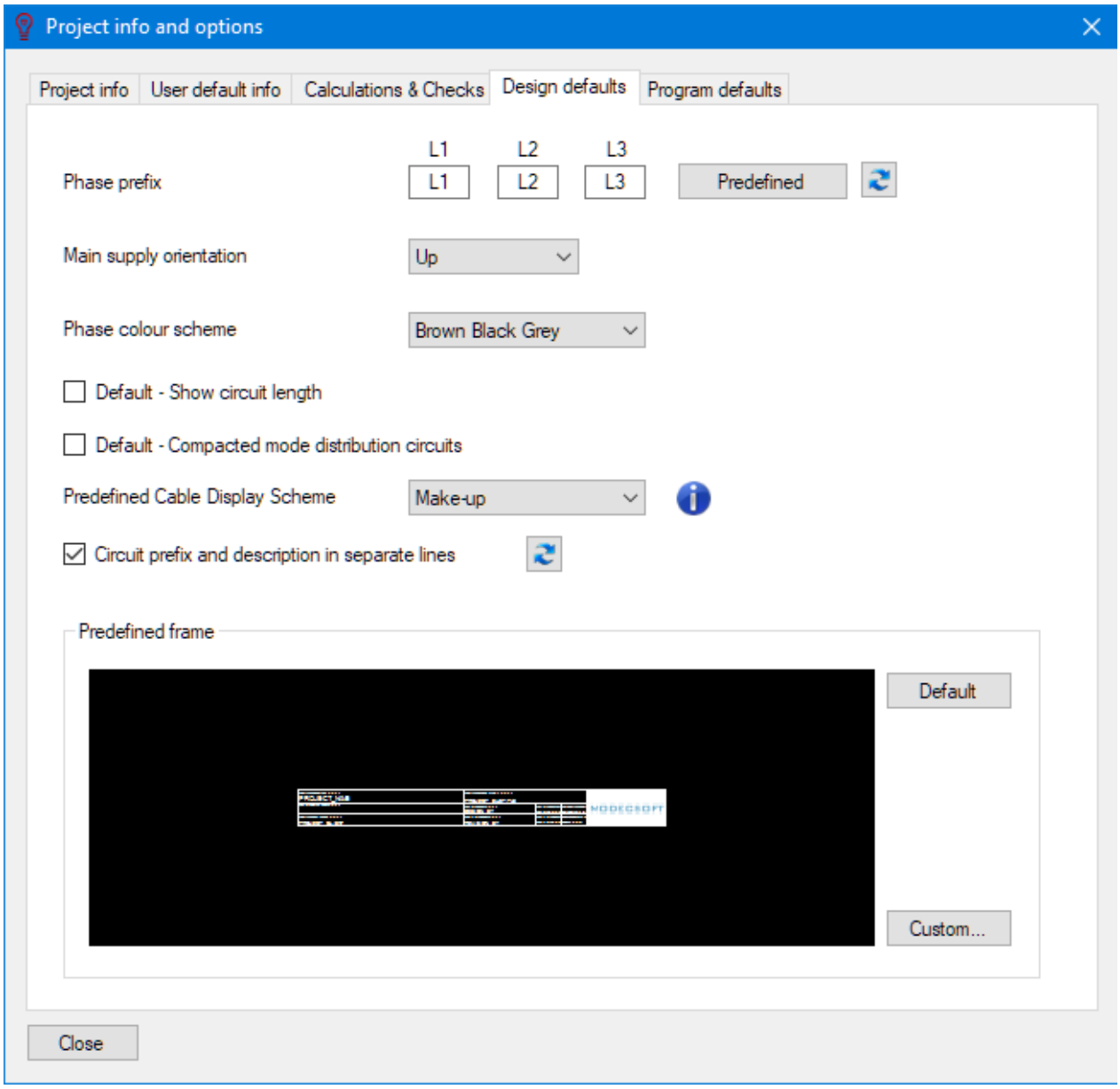


With Amendment 3 of 17th edition, Cmin factor is also introduced to BS7671. If a 230V single phase supply is taken as an example, then:

- Cmin =0.95 corresponds to 218.5V
- Cmax =1.1 corresponds to 253V
- Cmax =1.05 corresponds to 241.5V
- **Default - Enable Current Limiting Effect:** This option will enable the current limiting feature for capable devices as the default setting. See Protective Devices Tab for further details about current limiting.

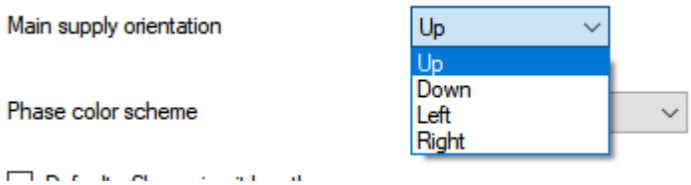
Design defaults Tab

Design defaults Tab



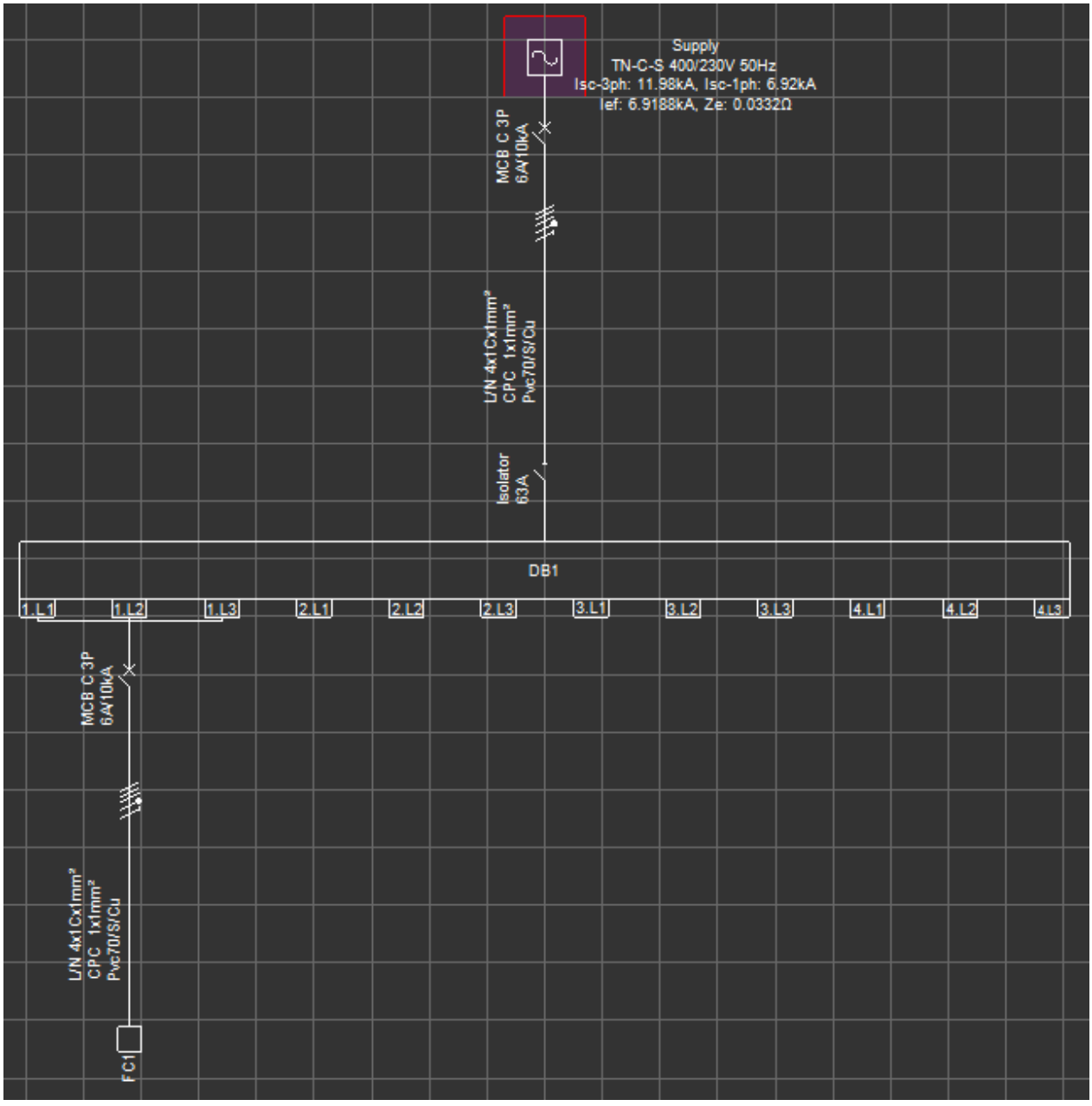
- **Phase prefix:** Users can set their own abbreviations for phases using the fields marked as L1, L2, and L3. The phase fields are restricted with two characters. Changing this setting will affect new items only, existing items will keep the previous setting.

- **Main supply orientation:** There are four options available to select; Up, Down,Left , and Right.

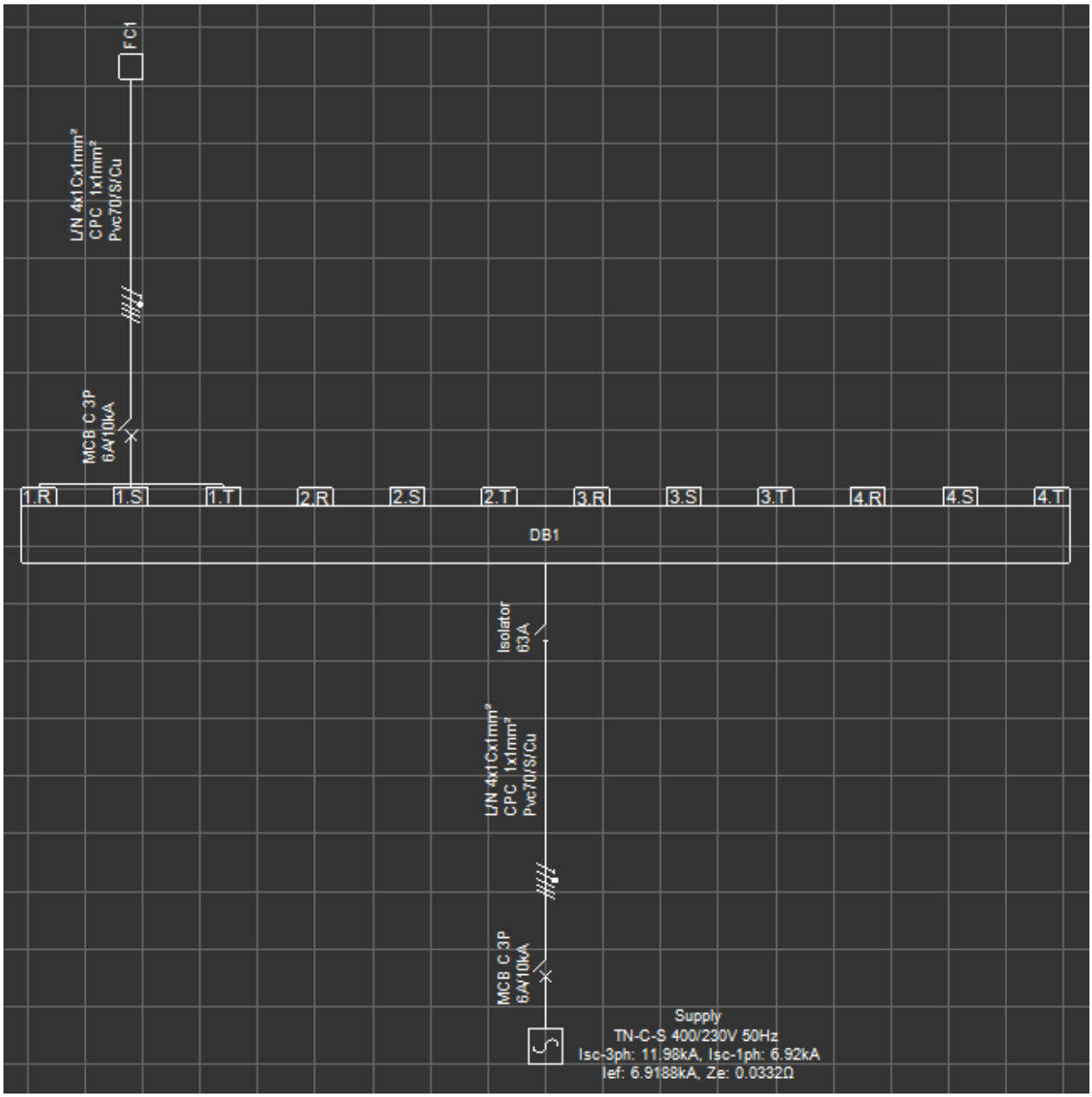


This will change the default orientation of the schematics as shown below:

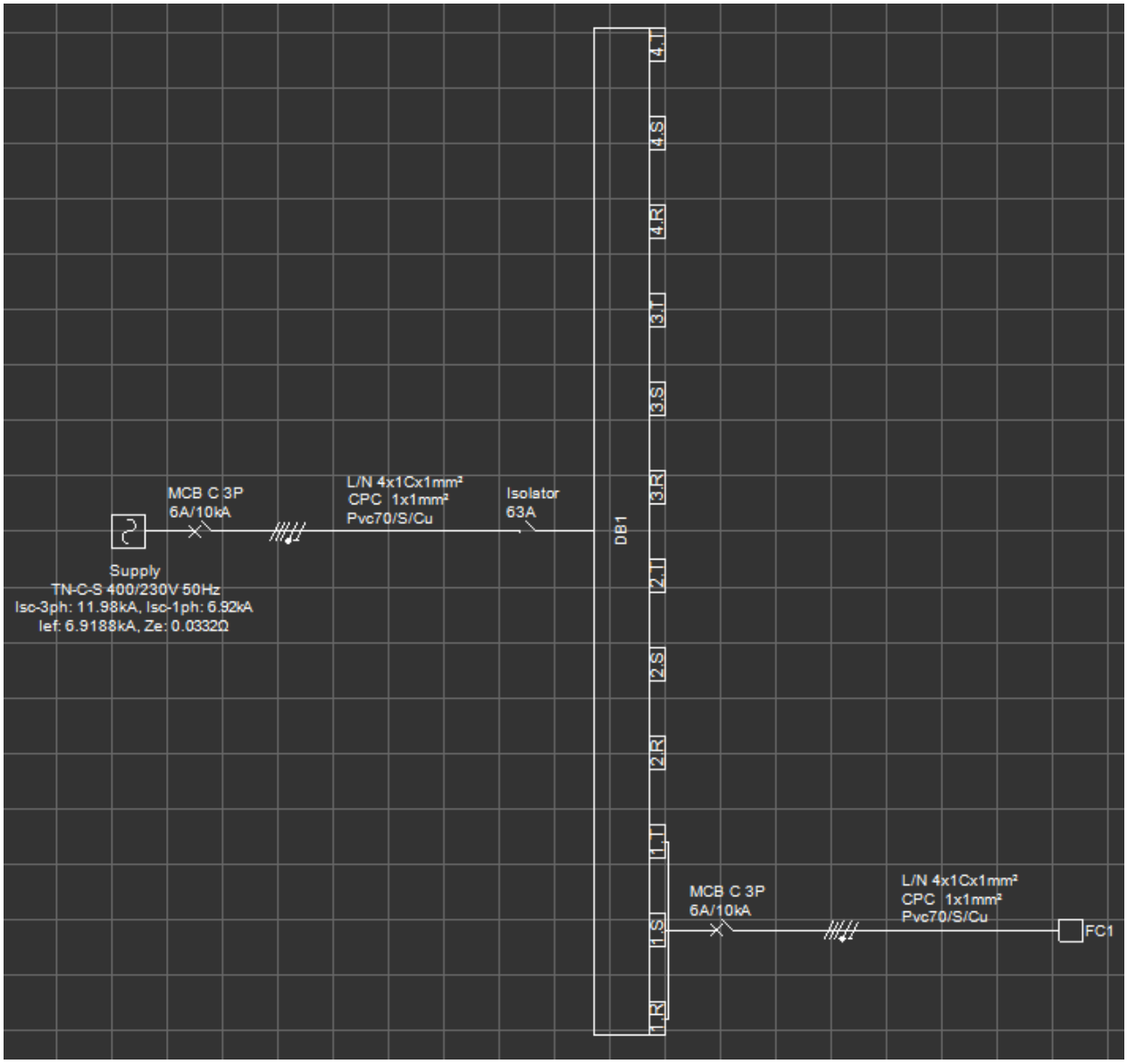
- Main supply orientation - Up:



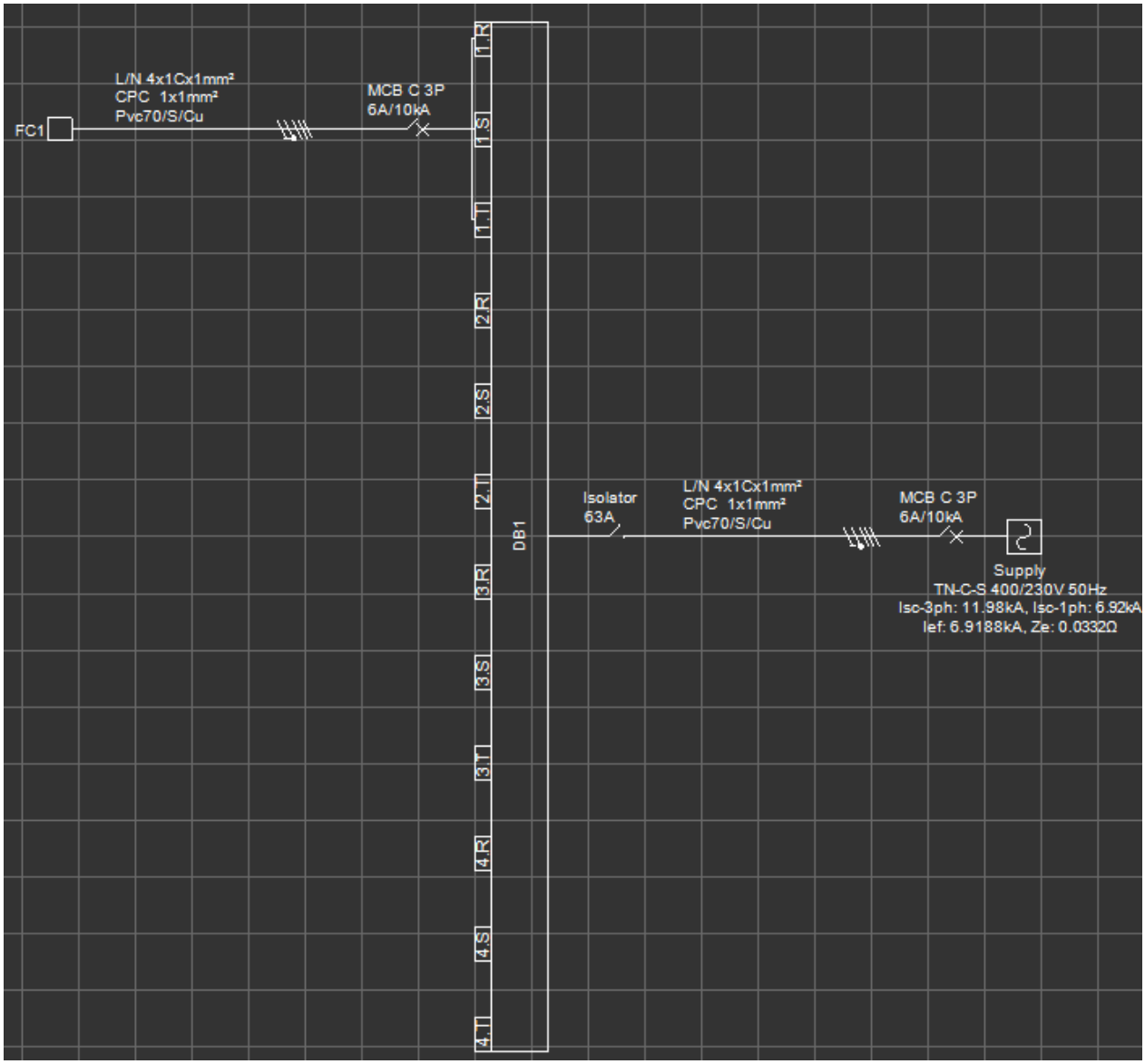
- Main supply orientation - Down:



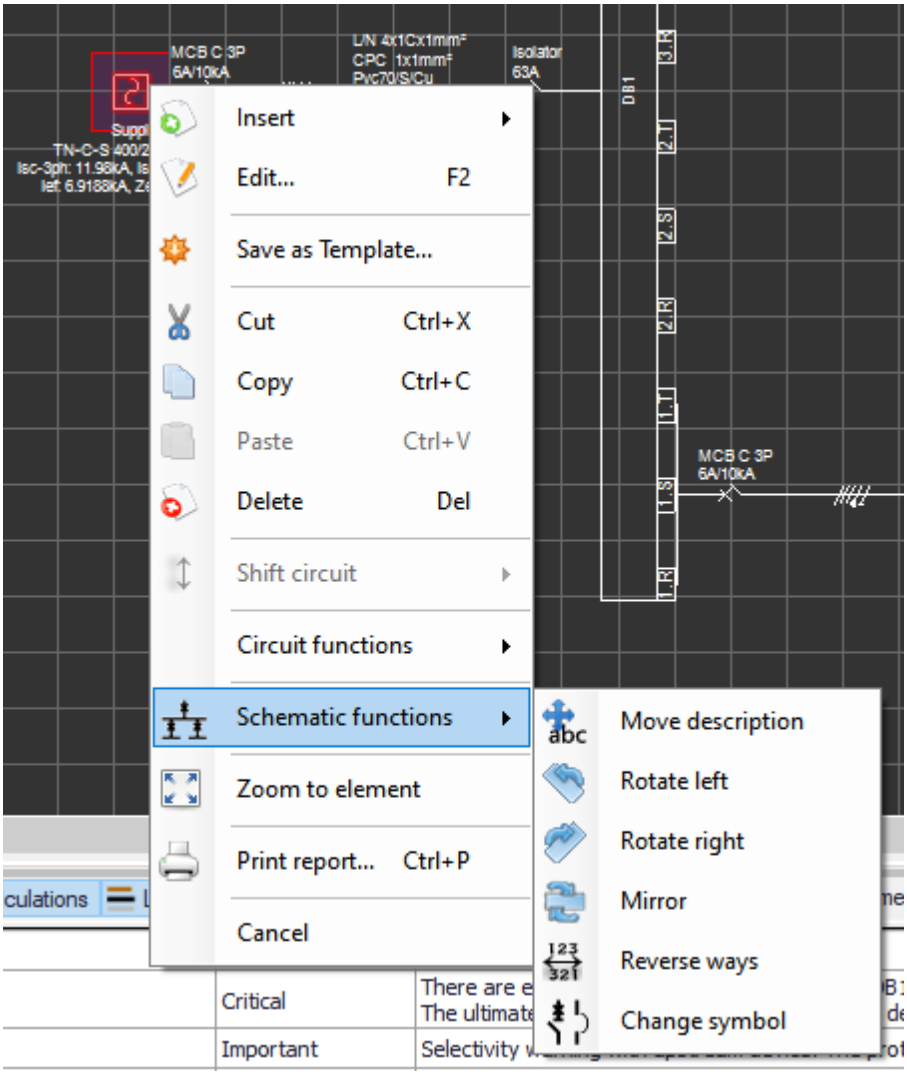
- Main supply orientation - Left:



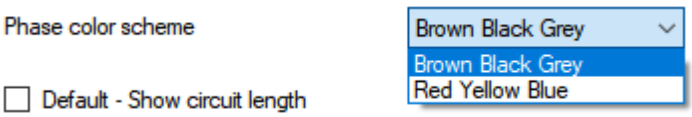
- Main supply orientation - Right:



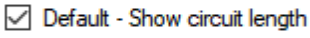
An point should be noted that changing the orientation setting will not affect the existing components connected to an existing supply. The setting will be applicable for new components connected to new supplies within the project. In order to change orientation of existing components, the user shall use right-click menu and initiate Rotate left, Rotate right or Mirror commands on any highlighted object.



- **Phase colour scheme:** The user can switch between two colour scheme:
- Brown - Black - Grey
- Red - Yellow - Blue

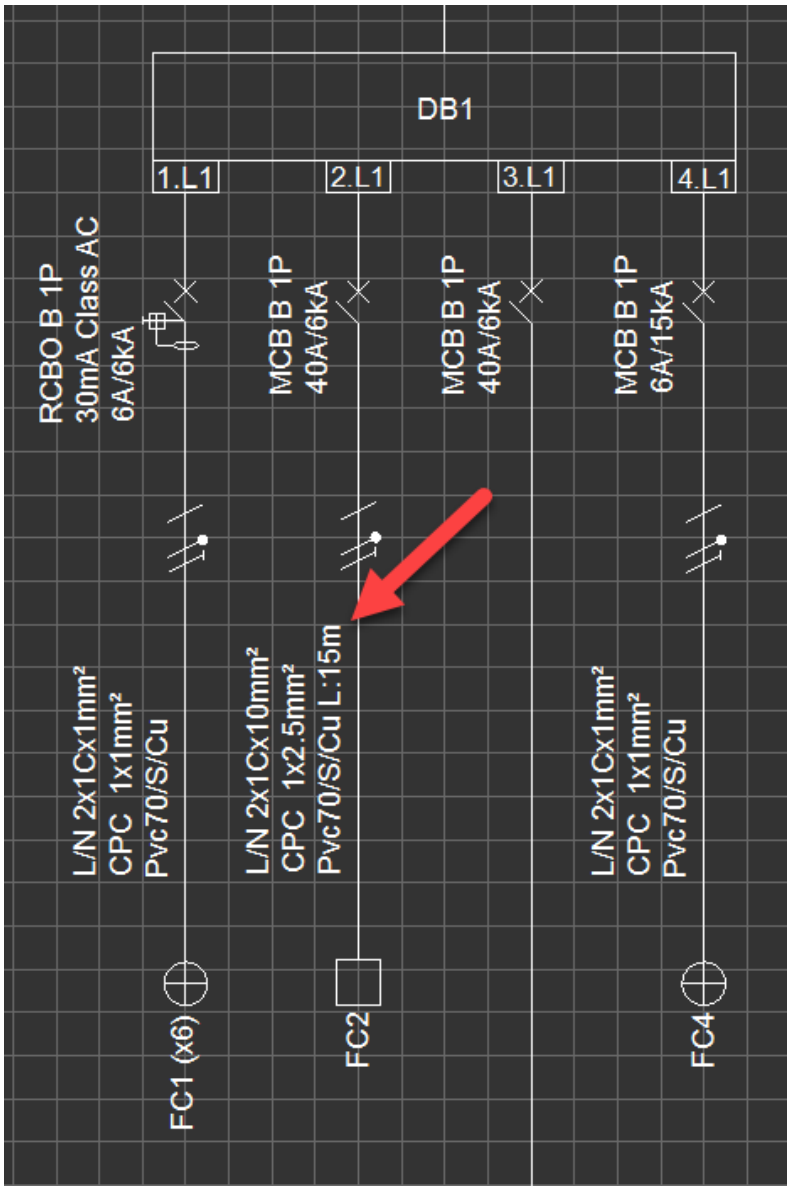


- **Default - Show circuit length:** While creating circuits, user needs to define conductor/cable lengths in order to get accurate calculations. As default, this option is disabled but ElectricalOM may be set to show these conductor/cable length data on the schematics as default by checking this tick box.



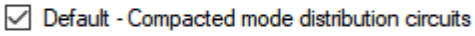
When the user ticks or unticks the box next to this option, ElectricalOM will warn the user to restart the application in order the changes take effect. This option affects only new conductors/cables and existing

conductor/cable length setting will not be affected.

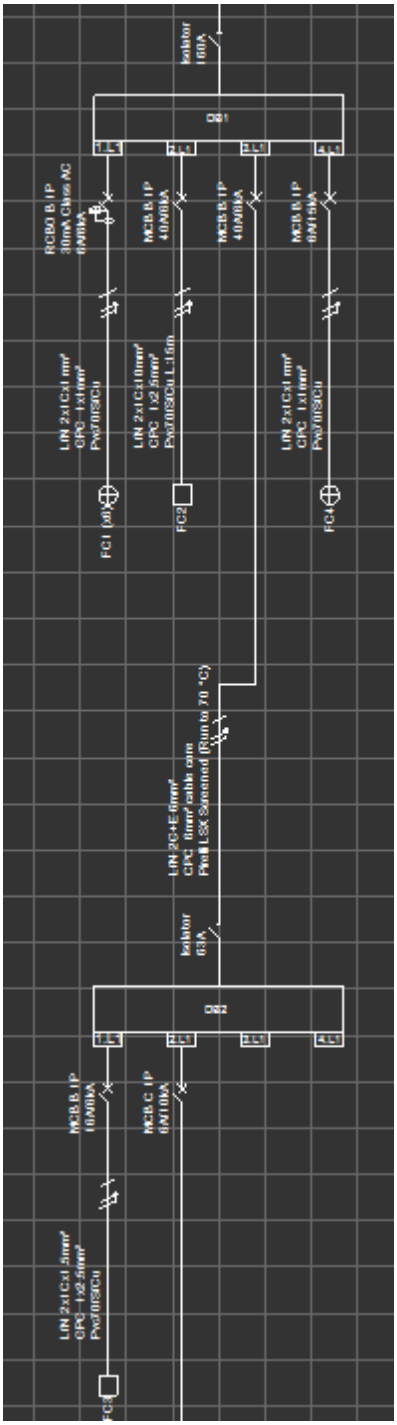


If the user wants to show or hide lengths for specific conductors/cables, than, Circuit Details Module tab shall be used, please refer to this section for more details. details about

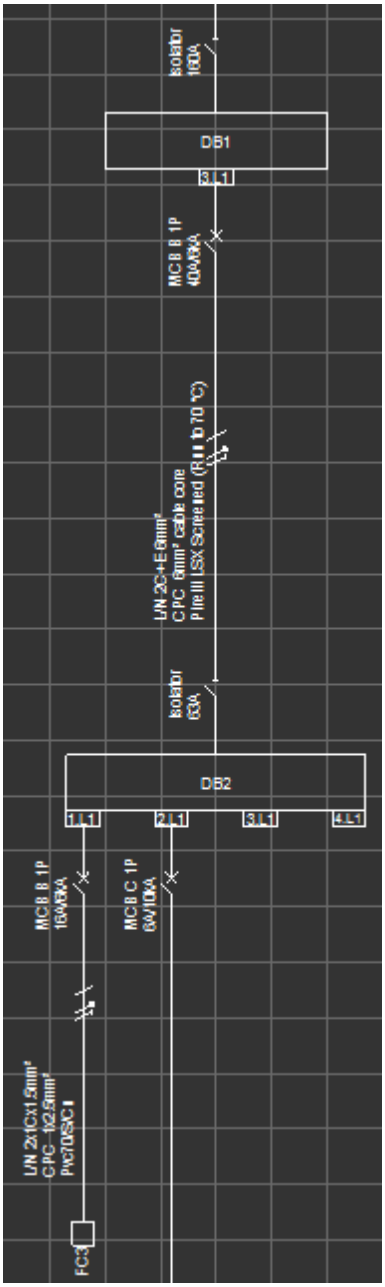
- **Default - Compacted mode distribution circuits:** This option is used to show/hide final circuits on the schematic. It is disabled as default but can be set as it is enabled as default. This option affects new items only and does not change the state of any existing item.



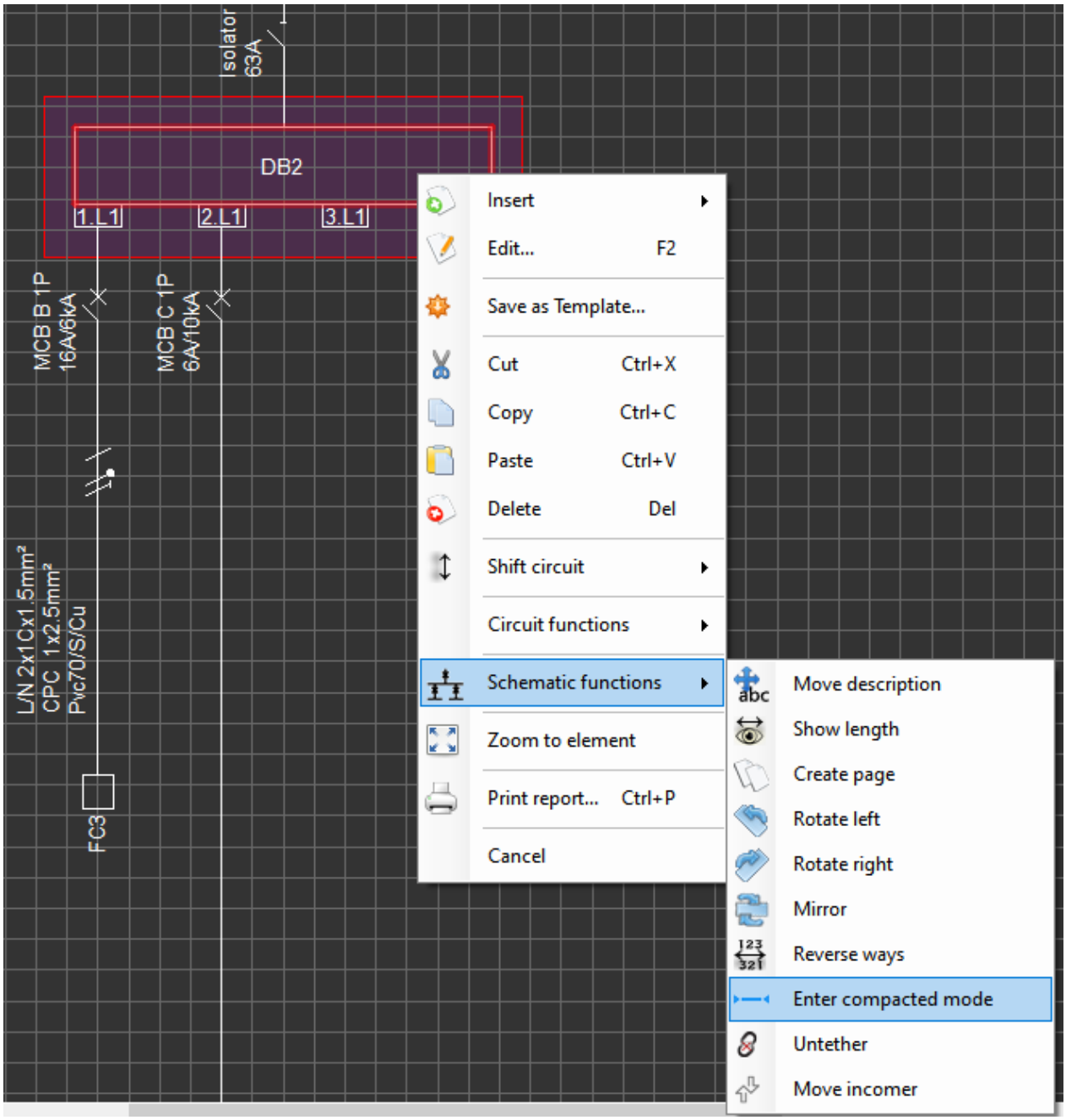
DB1 is in Expanded mode.

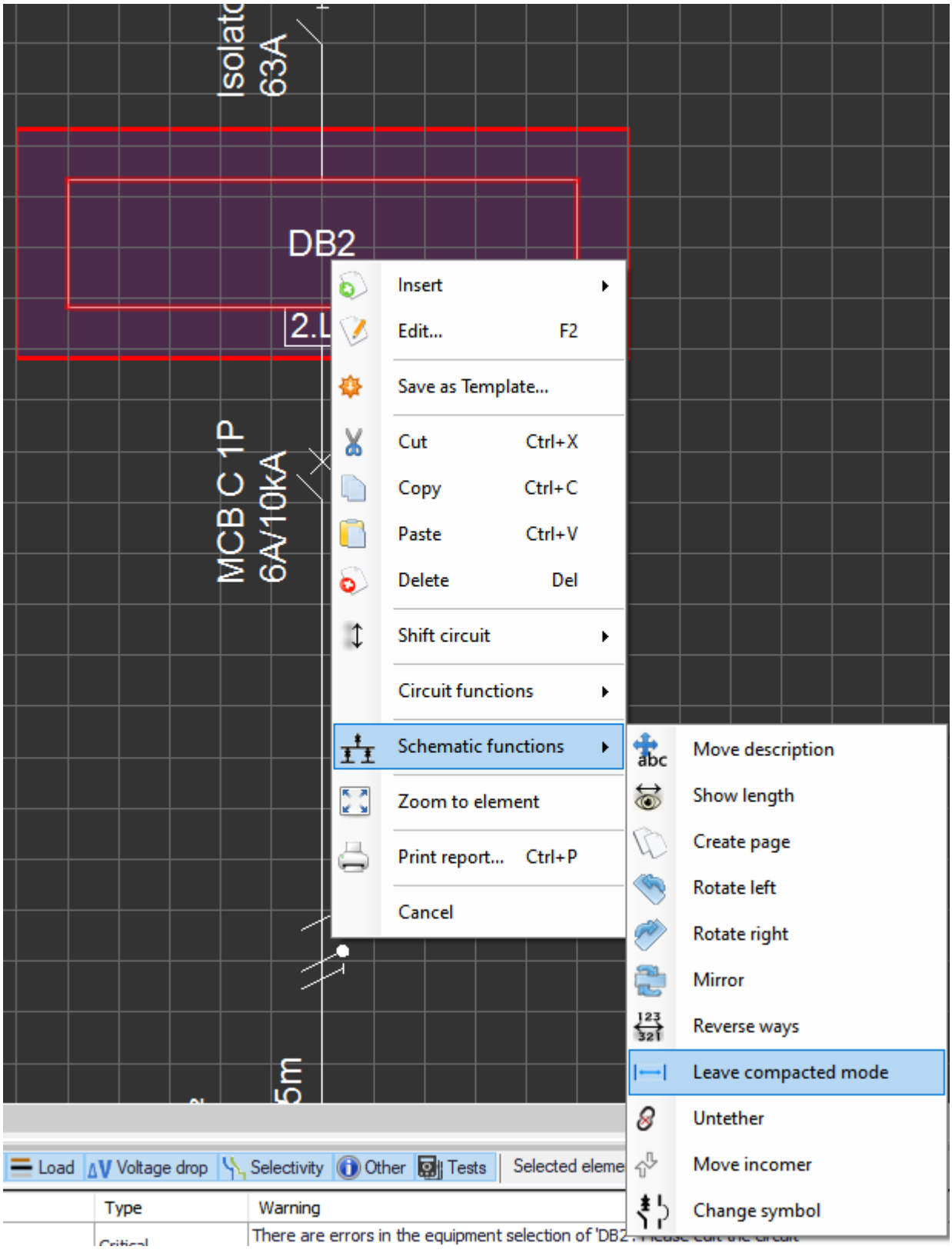


DB1 is in Compact mode.

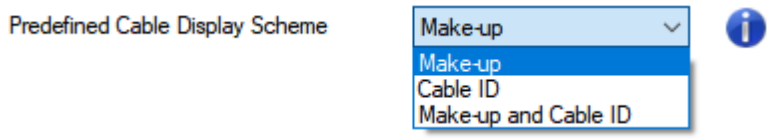


If the user wants to toggle between compact mode and expanded mode, then, right-click menu shall be used. First, the corresponding board needs to be selected, then, from the right-click menu either "Enter compacted mode" (if the board is in expanded mode) or "Leave compacted mode" (If the board is in compact mode) can be selected by the user to switch between modes.

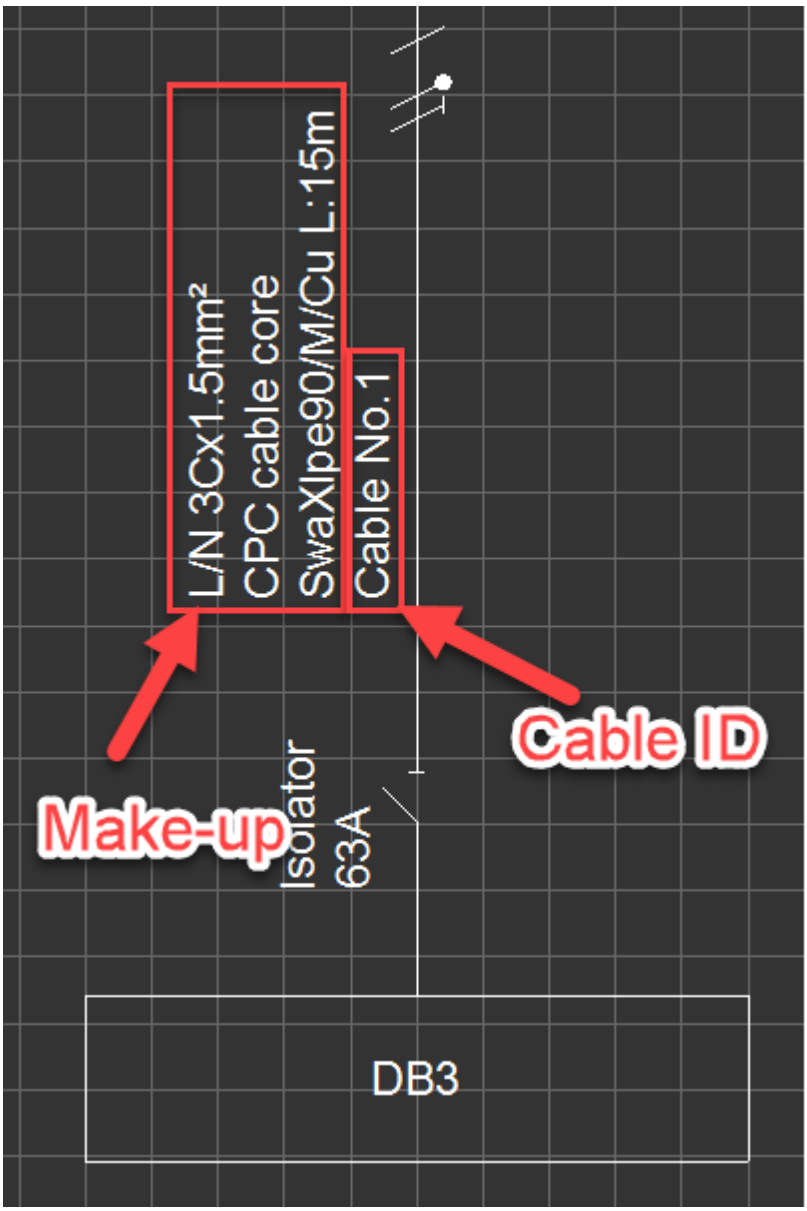

Isolator
63A
DB2
1.L1
2.L1
3.L1
MCB B 1P
16A/6kA
MCB C 1P
6A/10kA
L/N 2x1Cx1.5mm²
CPC 1x2.5mm²
Pvc70/S/Cu
FC3
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Move description
Show length
Create page
Rotate left
Rotate right
Mirror
Reverse ways
Enter compacted mode
Untether
Move incomer



- **Predefine Cable Display Scheme:** The default setting for displaying cable information on schematics is "Make-up" but it can be changed by using the drop down list as desired. This option will not affect existing scheme and will be used for new cables.

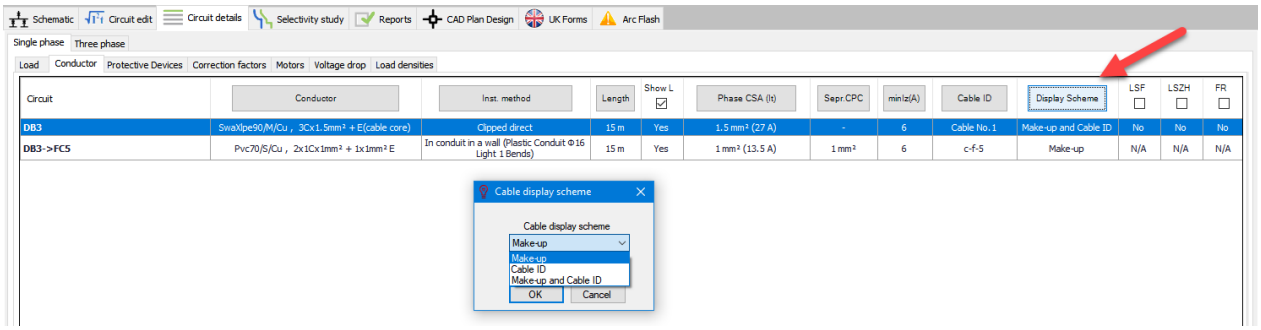


- **Make-up:** will display Line, Neutral and CPC cross-sections, cable type, and, if enabled, cable length information over the related cable.
- **Cable ID:** will display the cable ID only over the related cable.
- **Make-up and Cable ID:** will display both Make-up and Cable ID information over the related cable.

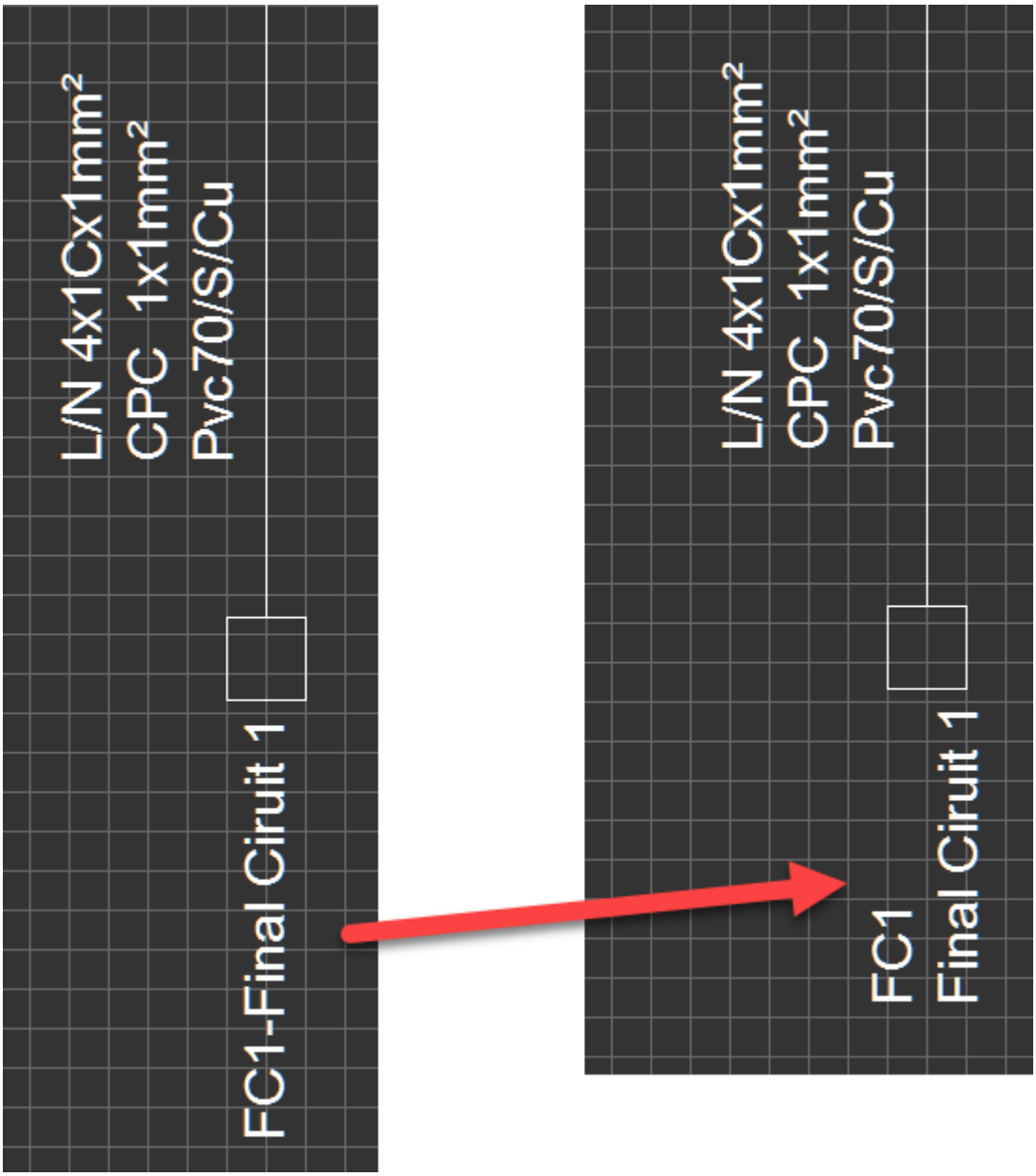


If user wants to change the scheme for a specific cable, Conductor tab under the Circuit details module tab can be used. Cable can be highlighted by clicking to the corresponding row, and then, "Display Scheme" button can be clicked to change cable display scheme as desired. Again, multiple rows can be selected to

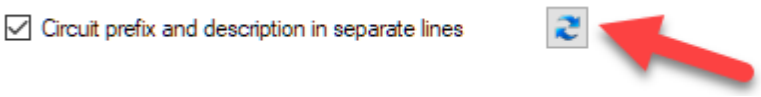
a bulk change.



- **Circuit prefix and description in separate lines:** This option will display prefix and description on two likes rather than a single line.



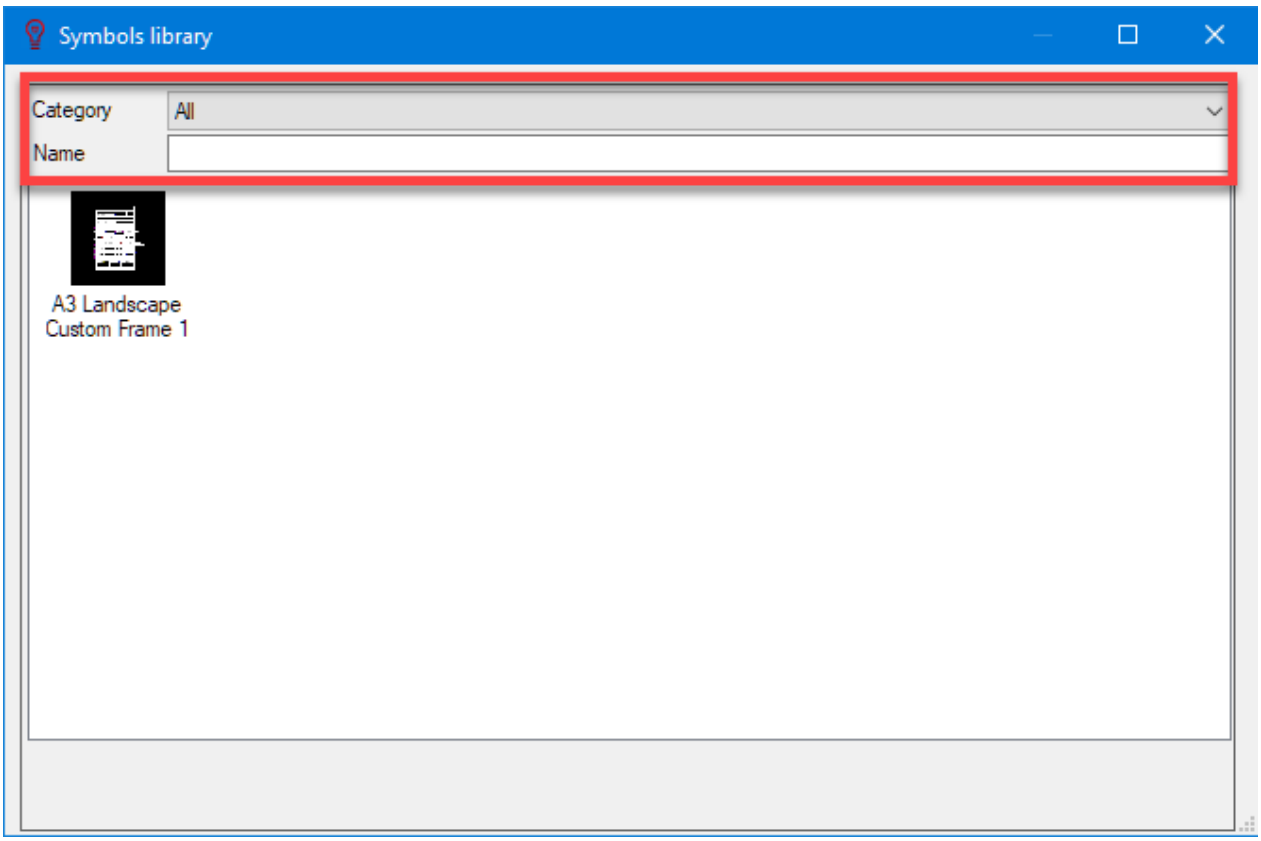
Once the setting is changed, to refresh the existing components, refresh button must be clicked.



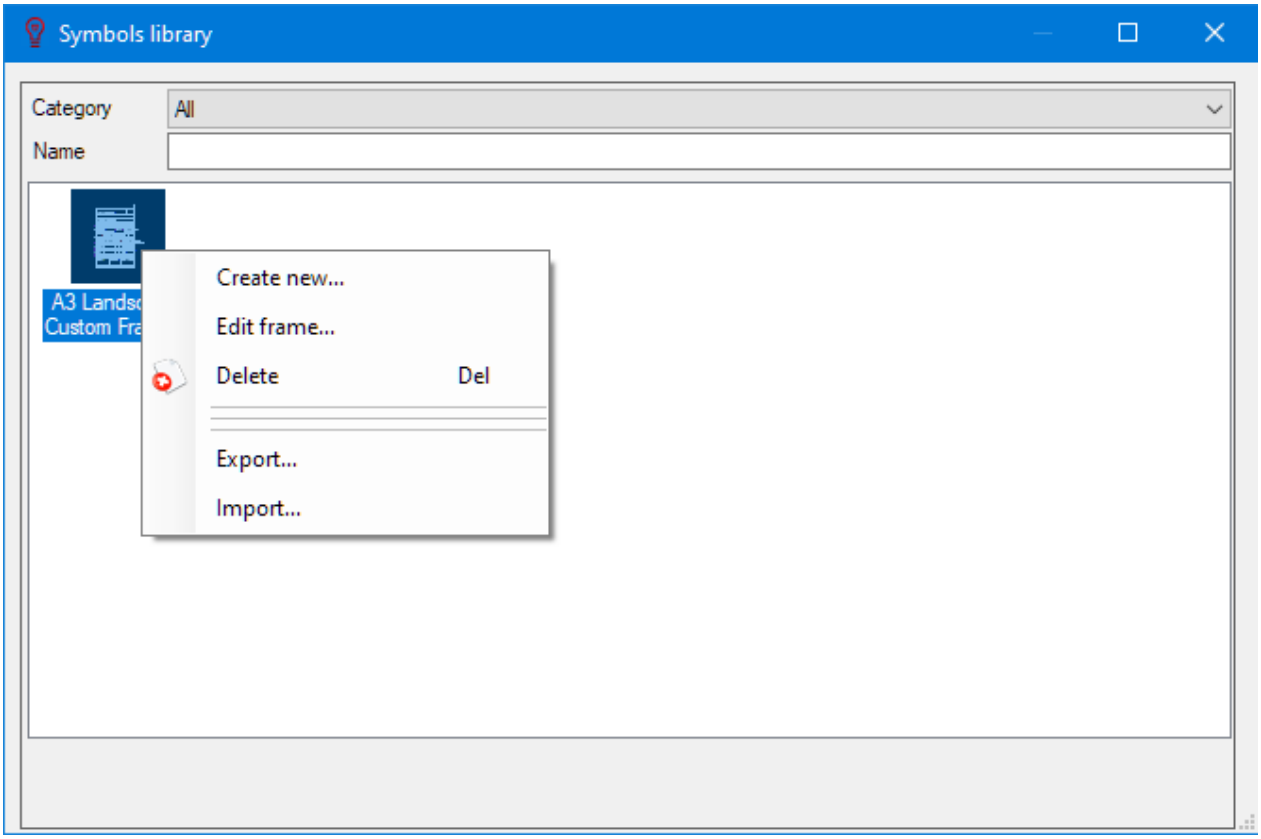
- **Predefined frame section:** Please refer to Predefined Frame Section.

Predefined Frame Section - Frame Builder

ElectricalOM allows the user to use custom frames for projects. In order to select a frame other than the default ElectricalOM frame, *Custom...* button is used. When the user clicks on the Custom... button, ElectricalOM will display the *Custom Frame Library* where all the custom frames are listed. The user may filter the results using the *Category* drop-down list or the *Name* text field. Once a frame is selected, the window can be closed using the X located at the upper right corner, there is no OK button.



The user can also create new frames, edit existing frames, and delete existing frames using the right-click menu within Custom Frame Library. Please see below for details.

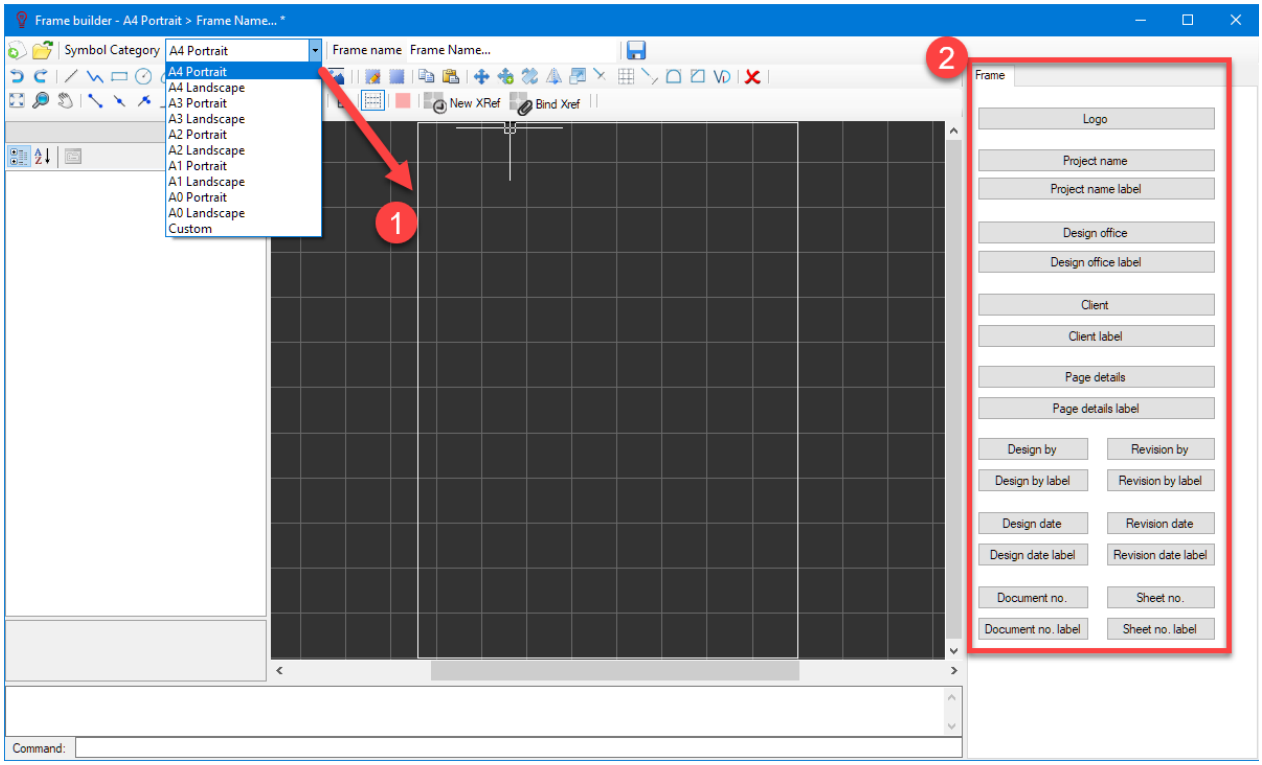


It is important to understand that if the user sets a frame within *Project and info options...* menu, the selected frame will be applied to all projects as default. If the user wants to set a frame for a specific page, then, *Page details* button on Schematic Module toolbar must be used instead.

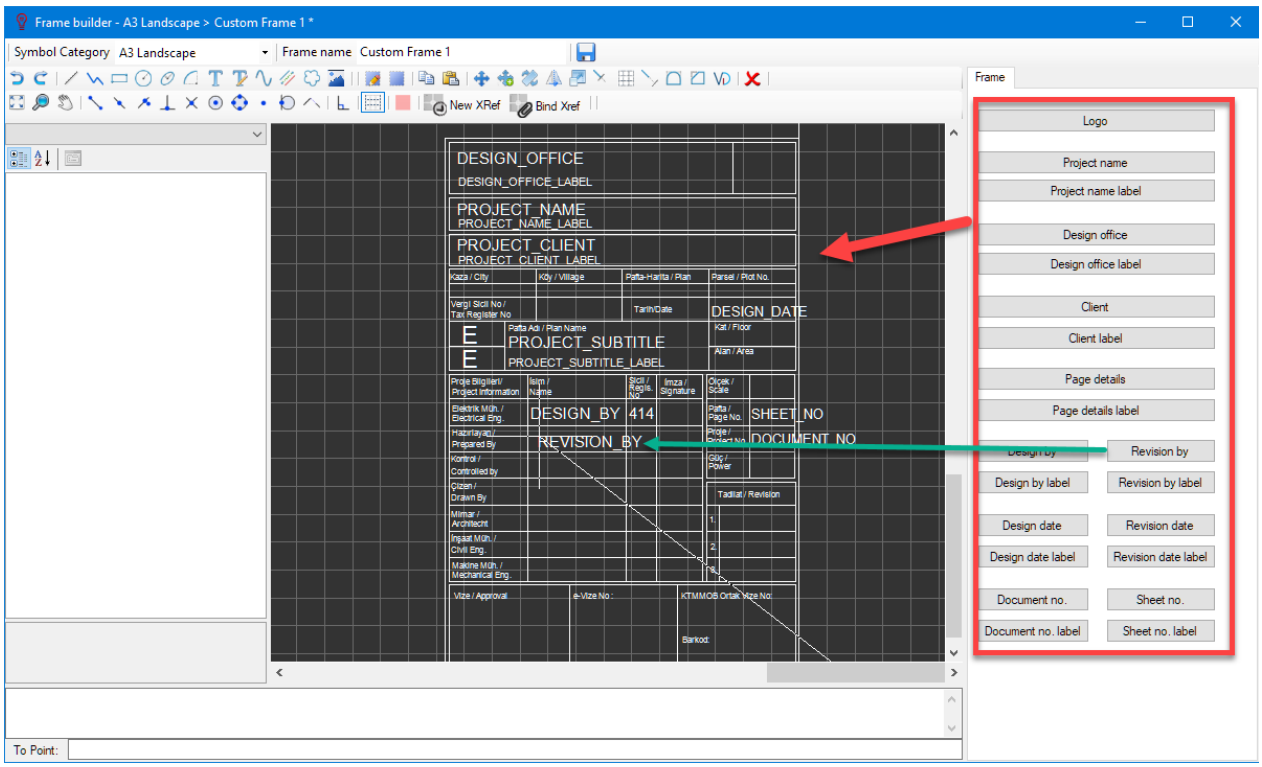
Frame Builder

ElectricalOM has also a built-in facility to create a custom frame called Frame Builder. The Frame Builder can be accessed via a right-click menu within the Custom Frame Library selection area. *Create new...* and *Edit frame...* will both initiate the Frame Builder, the former opening a blank template and the latter opening the selected frame in the drawing area. In terms of behaviour and format, the Frame Builder is the same as the Symbols Builder, so for detailed information please refer to Creating and Editing a Symbol section. The main difference is that:

1. the Frame Builder has a right panel with predefined attributes which can be places on the frame, and,
2. the drawing area of the Frame Builder will have a rectangle representing the selected page size border.



Once the Frame Builder is initiated, the user may start working on the frame by using the toolbar, and place the attributes required to required positions.The attributes will be populated using the user's entries at various fields, mainly at *Project info* and *Page details* windows.



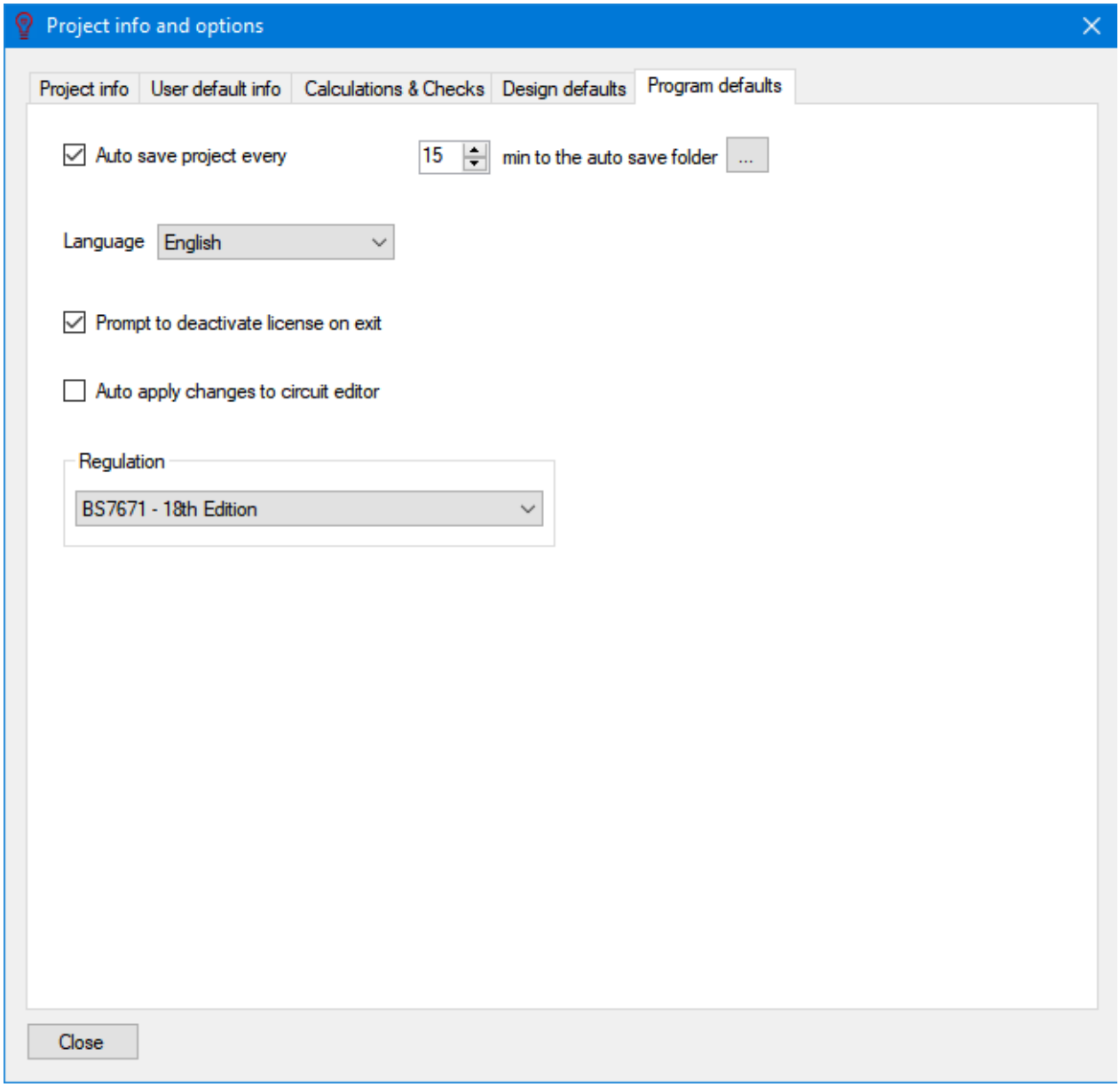
The user can define a frame size and orientation using the *Symbol Category* drop-down list, and a name using the *Frame name* text field. Clicking on the save button (a floppy disk icon) will save the frame under

the saved category and name which can be accessed from the *Custom Frame Library*.

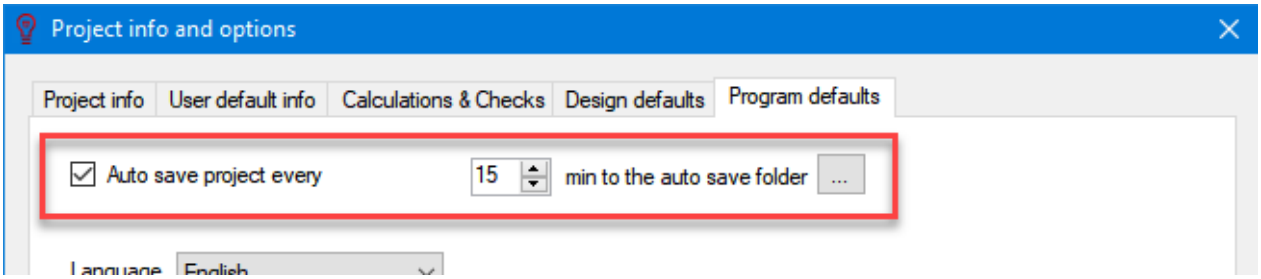
Program defaults Tab

Program defaults Tab

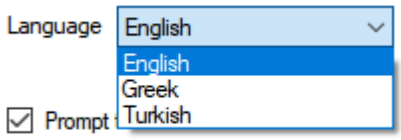
These setting are mostly related with the application's way of working except the *Regulation* section.



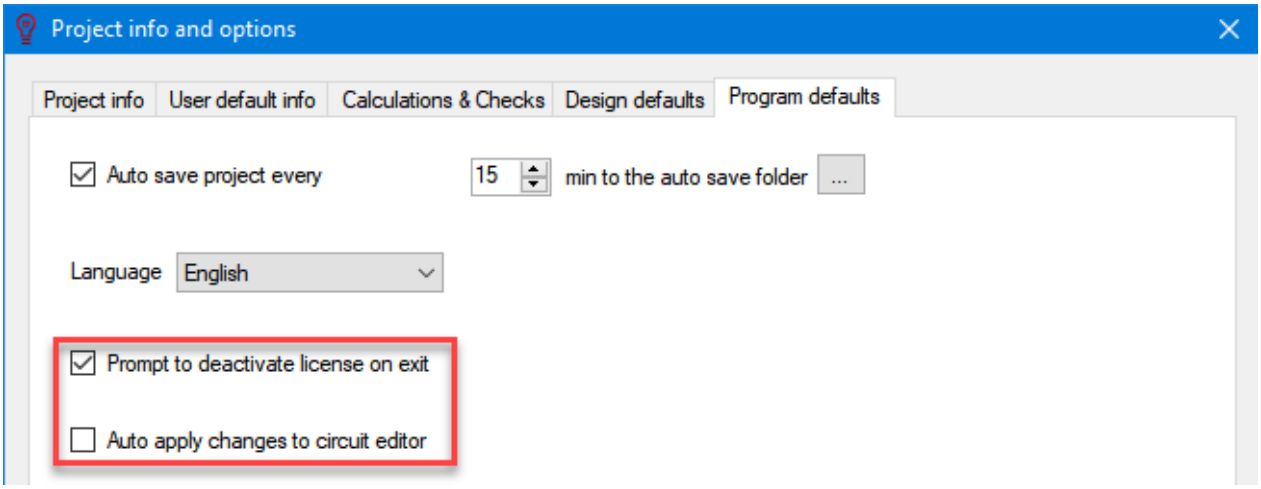
- User may set ElectricalOM to auto save a project by ticking the box next to "Auto save project every", selecting a time interval (in minutes), and selecting a folder where the project file will be saved by clicking on the box "...".



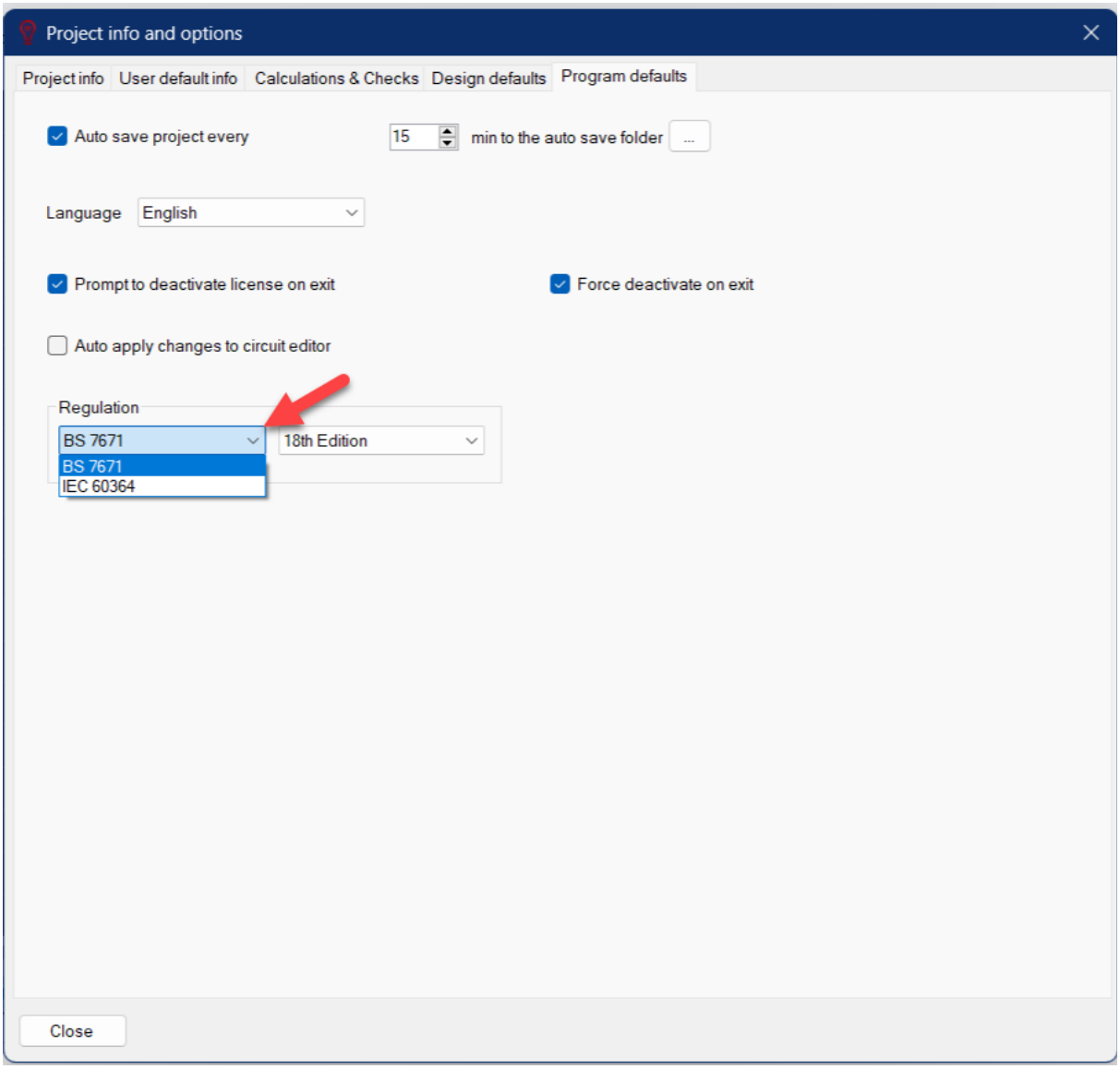
- User can change the language ElectricalOM displayed.



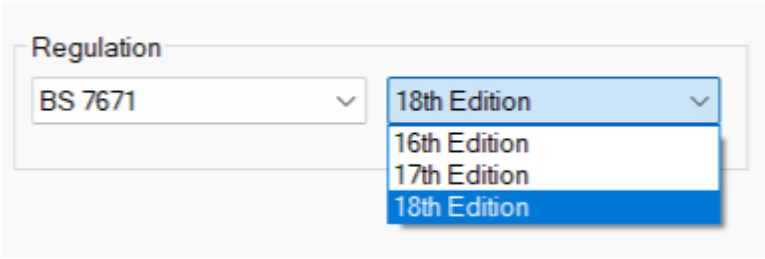
- Users may set ElectricalOM to remind the user to deactivate current licence on exit and set ElectricalOM to apply any changes made without clicking on Apply changes button under the Circuit edit module tab during design process by ticking the boxes next to each option.



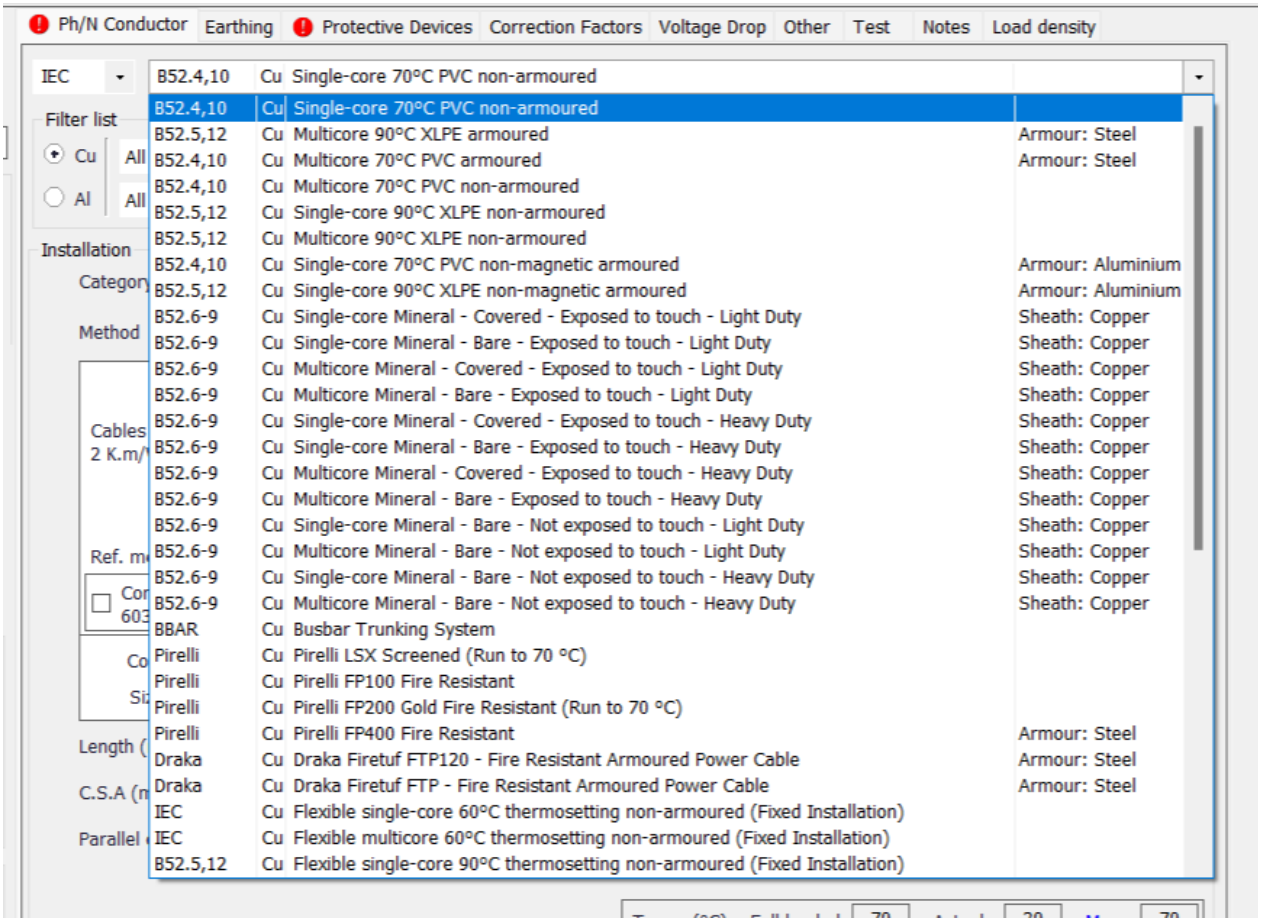
- ElectricalOM can perform calculations and check based on either British Standard BS7671 Requirements for Electrical Installations (various Editions), and IEC 60364.



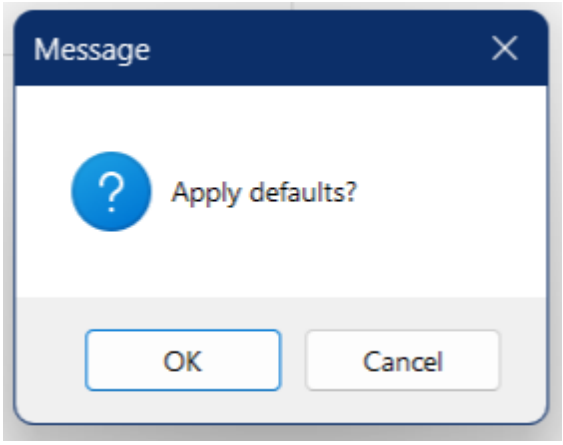
IET Wiring Regulations and it is continuously updated to match with the latest amendments and editions. However in such cases user may want to use an older version of theBS7671. ElectricalOM has three options to select which includes 16th, 17th and 18th editions.

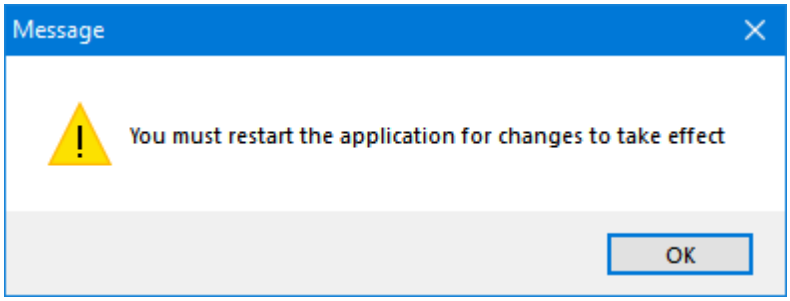


IEC regulations are always updated to the latest edition and there is no option to use older versions. Once IEC is set, EOM will update cable list etc. to match with IEC standard.



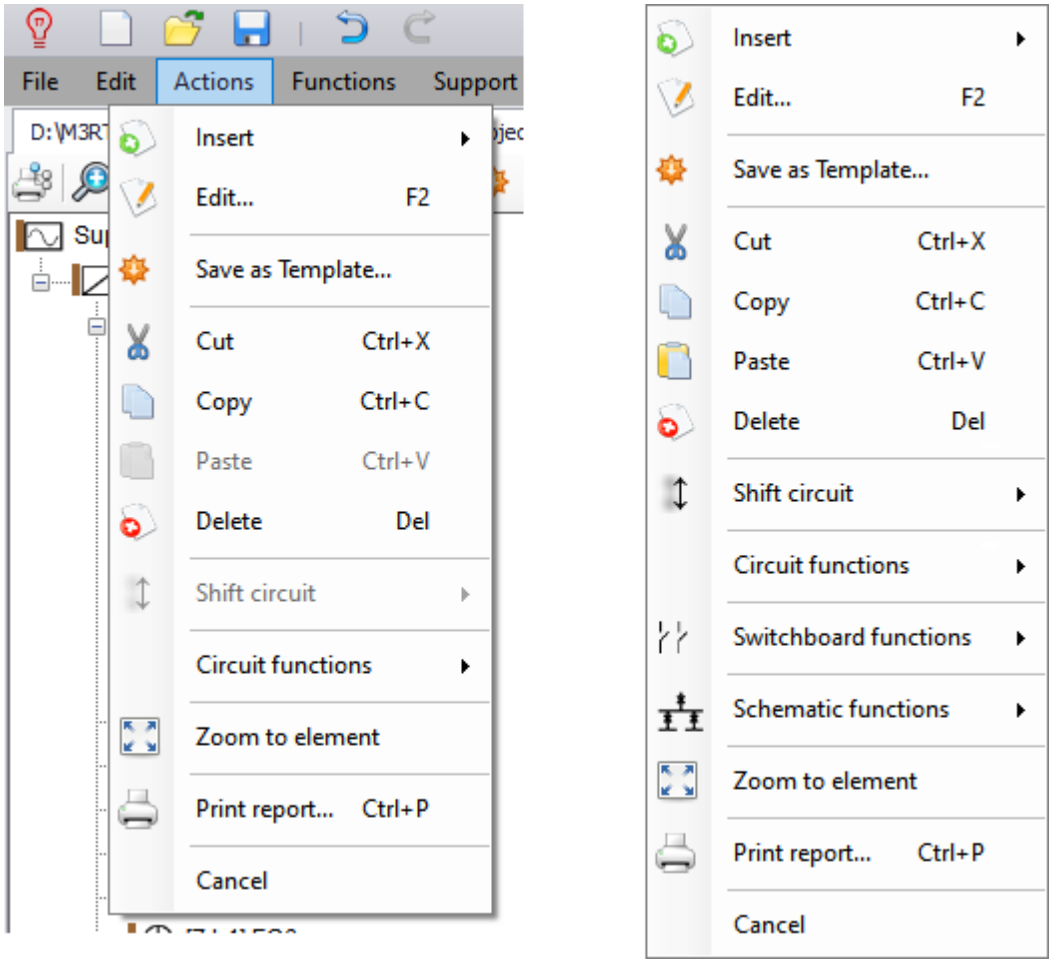
If you change this setting ElectricalOM will prompt you to restart in order the changes take effect.





Actions Menu (Right Click Menu)

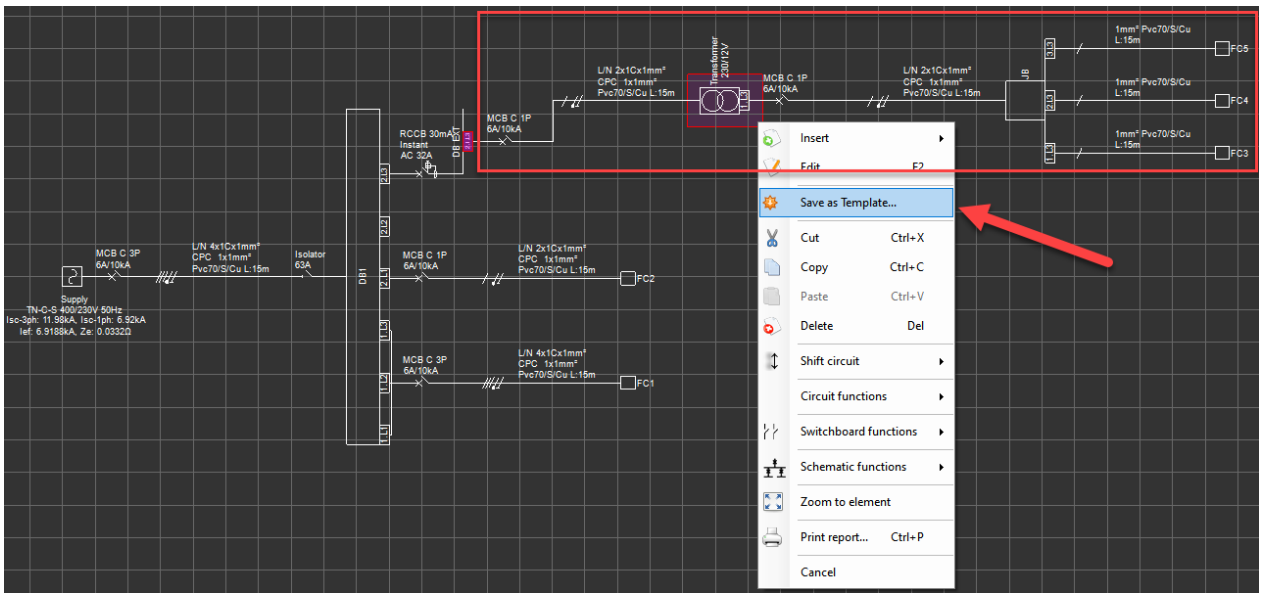
Actions menu is almost identical with the *Right-click* menu, and it is mostly similar to *Edit* menu, which was discussed earlier, with some more extra sub menus and functions. The actual purpose of this menu is to accommodate a right-click menu for Mac users, who have a right-click issue, on the Menu Bar. So, as we discuss the *Actions* menu will will also cover the *Right-click* menu at the same time. Only difference between the *Actions* and *Right-click* menu is the *Schematics functions* sub menu which is only available on the *Right-click* menu.



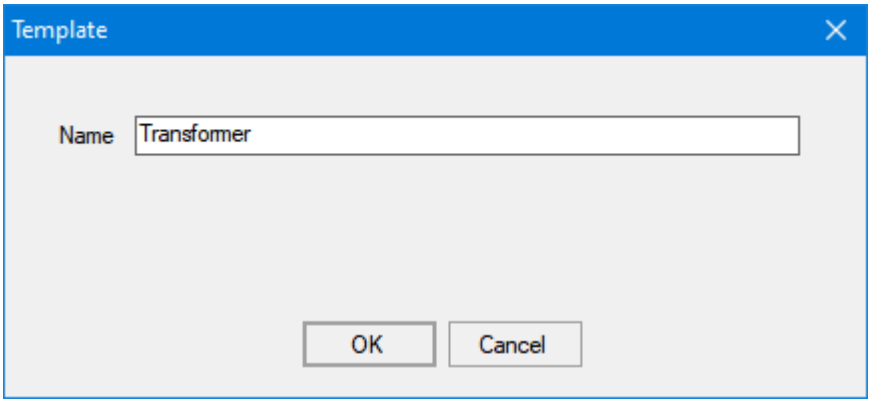
The *Actions* menu is a dynamic menu which will have available and unavailable elements depending on the selected component. In order to use it efficiently, the user should select a component before using the *Actions* menu, so, all the related commands/functions/sub menus will available specific for that component. If nothing is selected before accessing the *Actions* menu, then, only Insert Menu, and *Cancel* options will be available.

- *Insert* is discussed in detail in the following section. Please refer to Insert Menu section.
- *Edit* (shortcut F2) is used to access Circuit Edit module which will be discussed in Circuit Edit Module Tab section.
- *Save as Template...* is used to save a part of a system as a template so it can be inserted anytime the user needs it. Once a template is saved it will be available regardless of which project is active. This

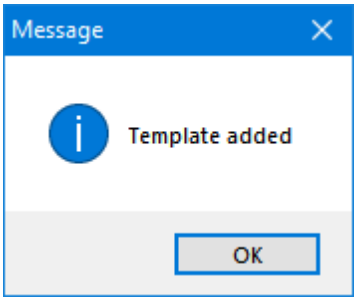
menu element is a shortcut just to save a template and full access to templates is accessed via the System Tree Section toolbar. Once a part of the system is selected, either via Schematic module or System Tree section, *Save as Template...* will be available to select. As example, the part of the system after the transformer has been selected (see Selecting Components and Circuits) and saved as a template using the right-click menu.



ElectrcialOM will display a window asking for a name for the selected part. ElectricalOM will also recommend a name for the selection according to its circuit type.

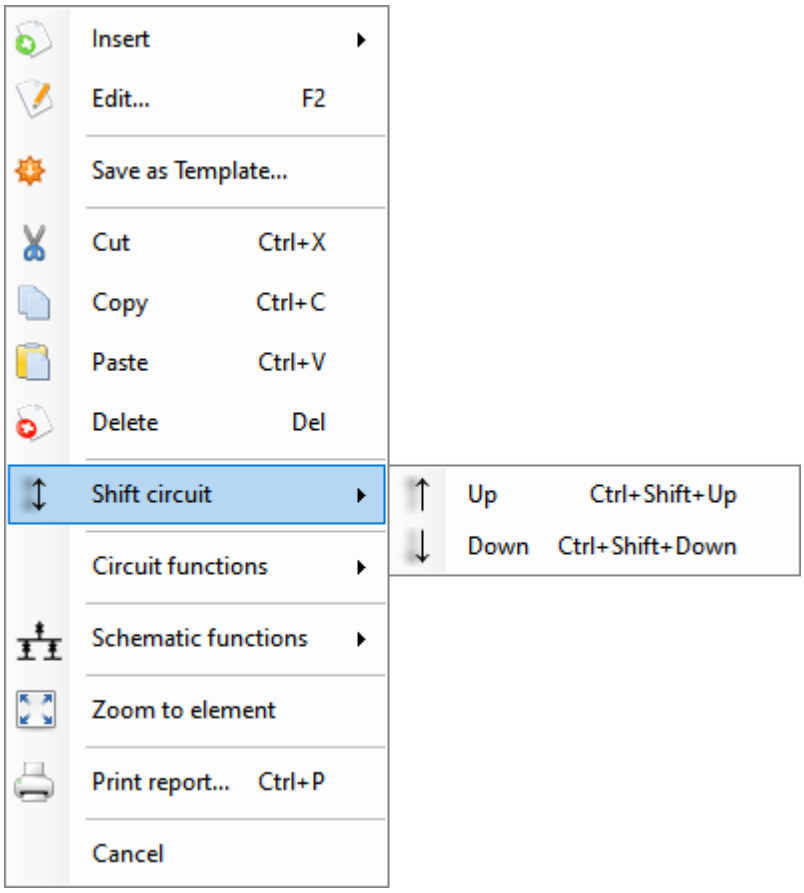


If the user clicks OK to save the part of the system as a template, then, ElectricalOM will notify the user with a pop up window.

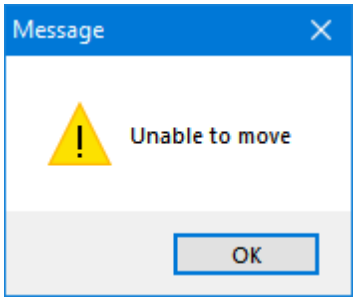


Saved templates can be accessed by the Templates button on System Tree Section toolbar.

- *Cut/Copy/Paste/Delete* are all explained in section Edit Menu.
- *Shift Circuit* is used to move a circuit one way up/down or left/right depending on the orientation selected at Design Defaults tab under Project info and options... menu. Keyboard shortcuts are CTRL+SHIFT+Up for up (left) and CTRL+SHIFT+Down for down (right). In order to shift a circuit, the circuit needs to be selected via Schematic module or System Tree section before using this command.

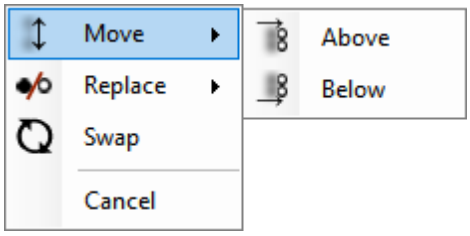


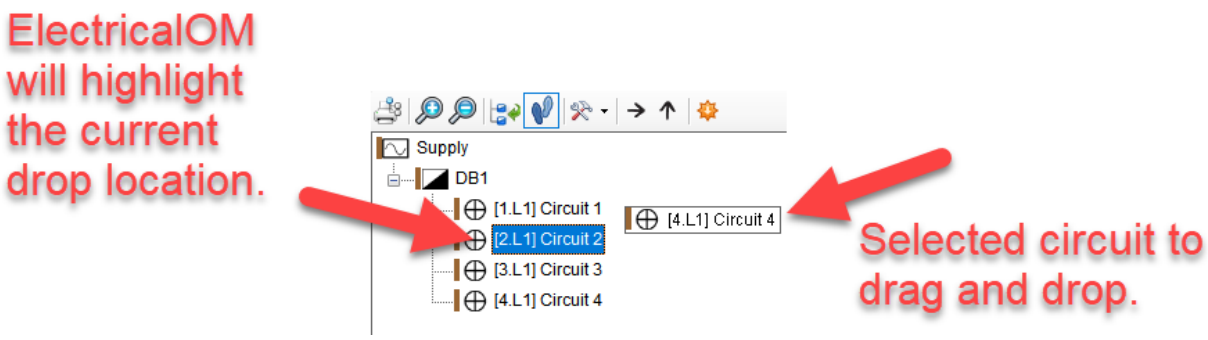
Shift action is a step-by-step action, which means the circuit selected will be moved one step at a time, so, if there is another circuit next to the circuit meant to be shifted, then, the ElectricalOM will warn the user with a message window. If a circuit is needed to be moved to a location where there are other circuits on the way, *Cut/Paste* commands are a better option to move the circuit to the desired location rather that *Shift Circuit*.

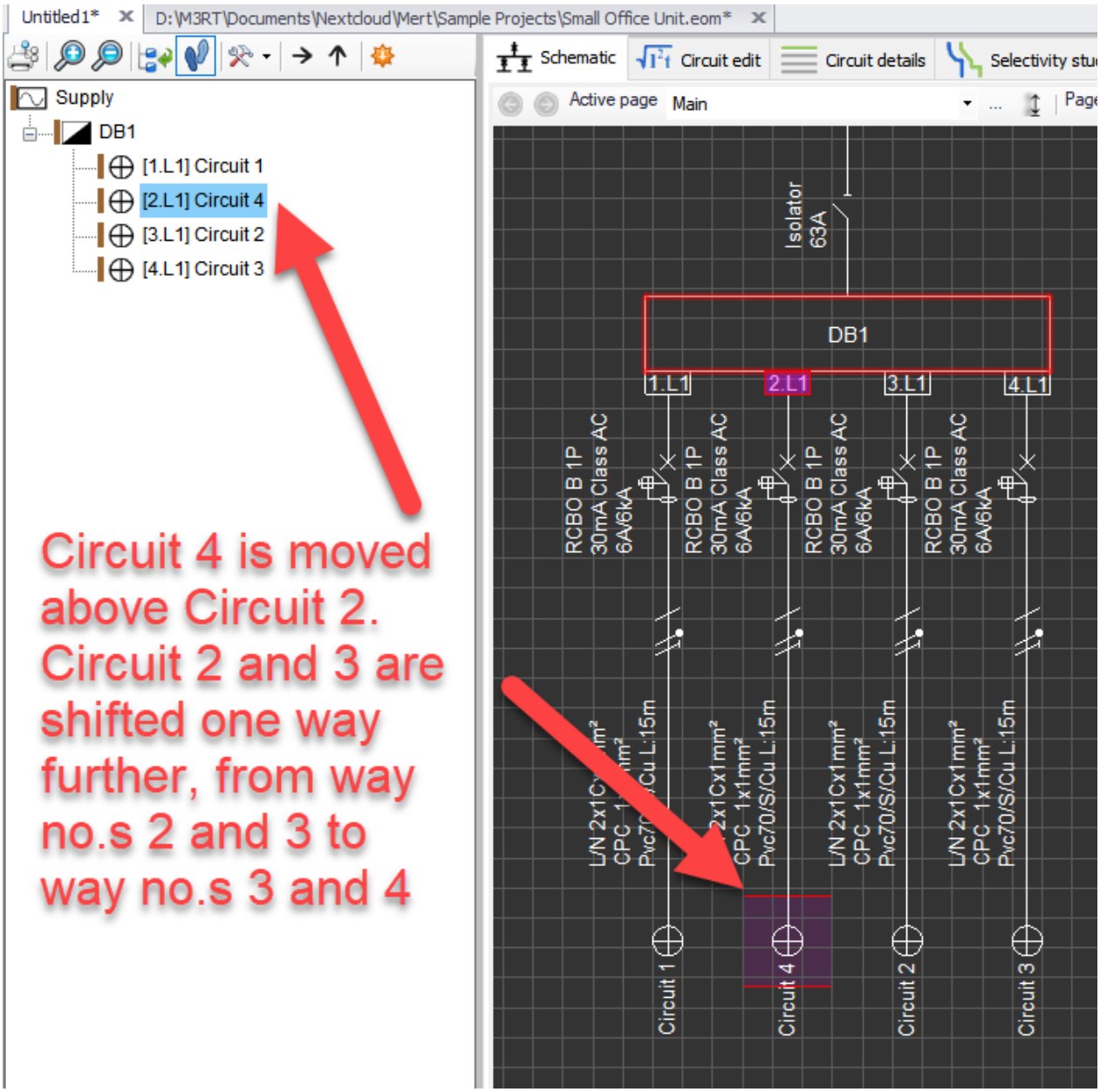


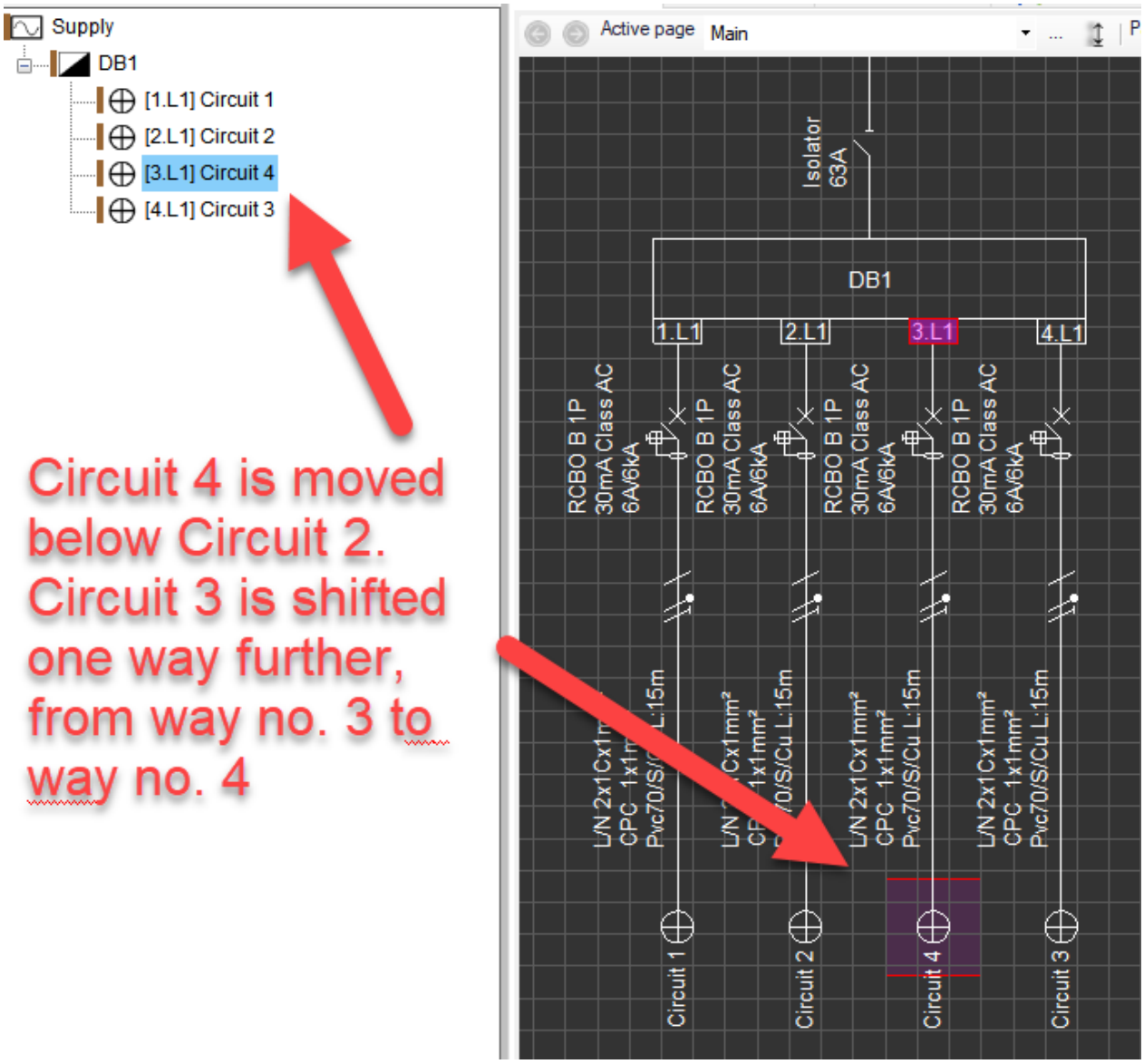
Drag and drop feature is also an option in these circumstances. First, a circuits must be selected, and then the user may drag the circuit to a desired position by use of the left mouse button. While dragging the left mouse button must be depressed. When the circuit is at the desired location, the user must release the left mouse button which at this point a menu will be displayed, *Drag and Drop Menu*. Drag and drop menu has three options:

- Move: This will move the selected circuit to above or below of the drop location and shift the other circuits forwards.

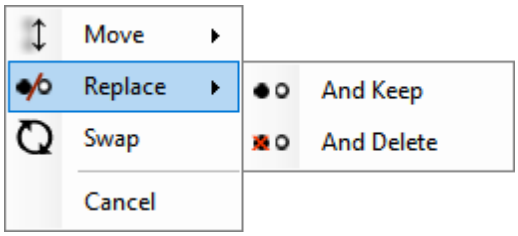


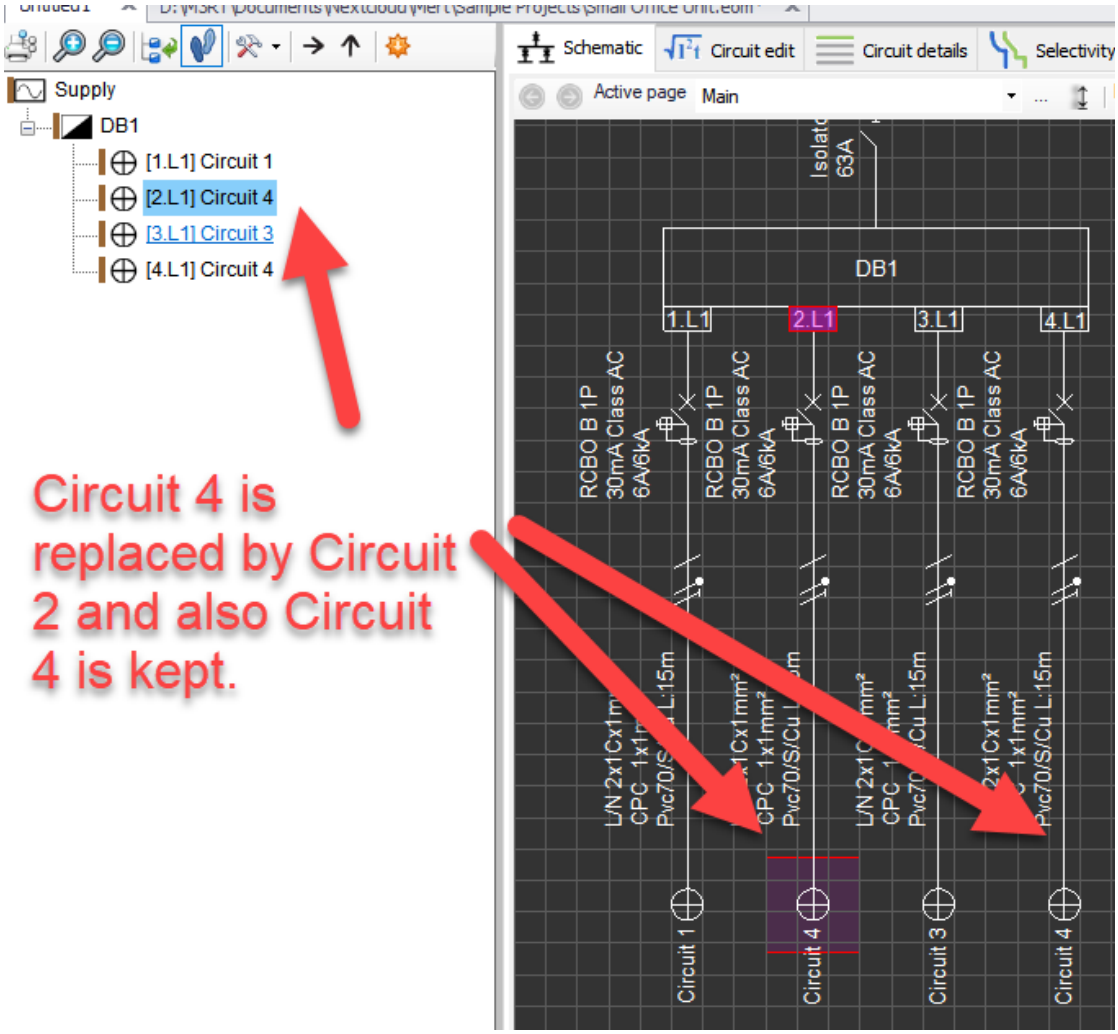


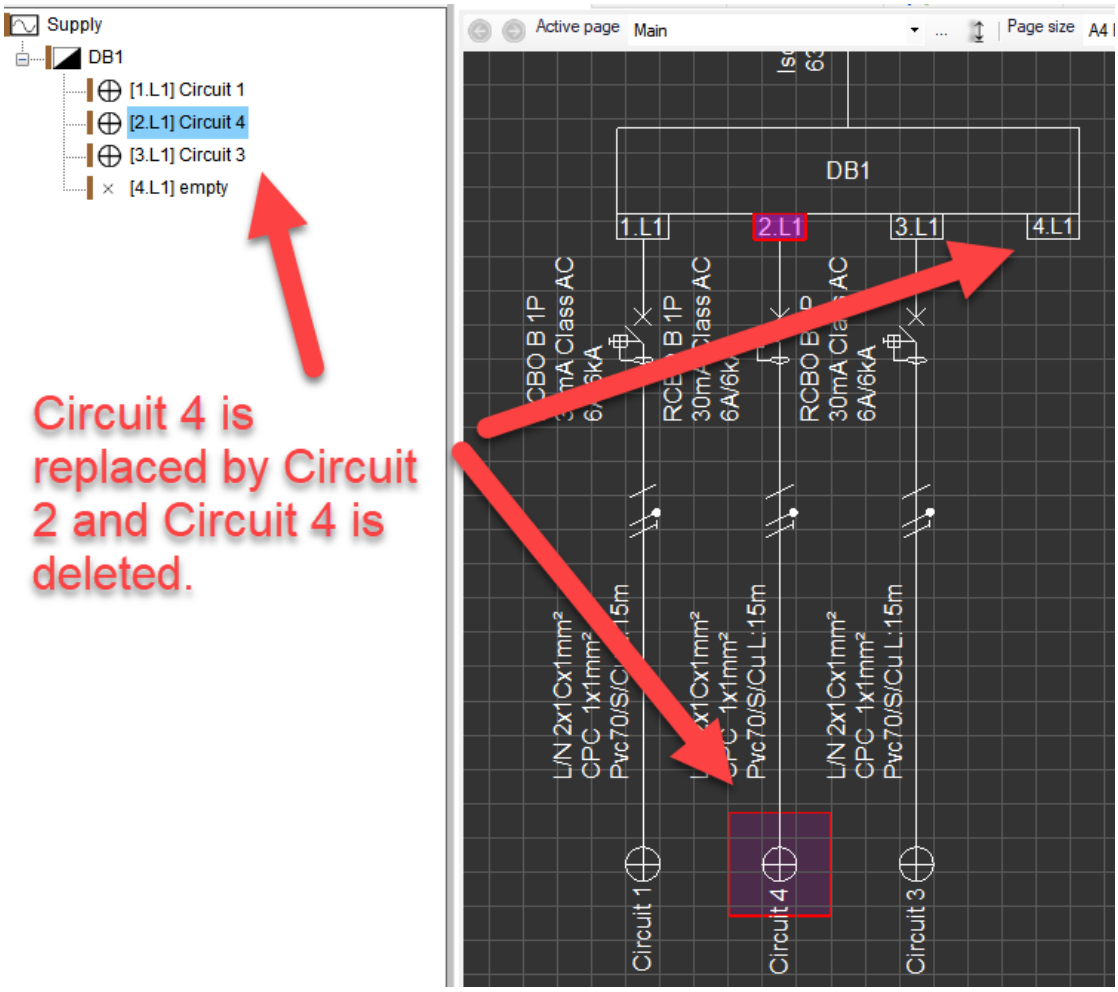

Untitled1*
D:\M3RT\Documents\Nextcloud\Mert\Sample Projects\Small Office Unit.eom*
Supply
DB1
[1.L1] Circuit 1
[2.L1] Circuit 4
[3.L1] Circuit 2
[4.L1] Circuit 3
Schematic
Circuit edit
Circuit details
Active page
Main
Isolator 63A
DB1
1.L1
2.L1
3.L1
4.L1
RCBO B 1P 30mA Class AC 6A/6kA
Circuit 1
Circuit 4
Circuit 2
Circuit 3
Circuit 4 is moved above Circuit 2. Circuit 2 and 3 are shifted one way further, from way no.s 2 and 3 to way no.s 3 and 4



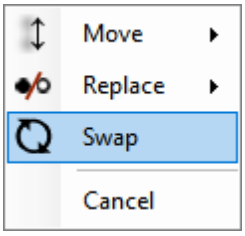
- Replace: This will move the selected circuit to the drop location and keep or delete the selected circuit. In any case, the circuit at the drop location will be deleted.

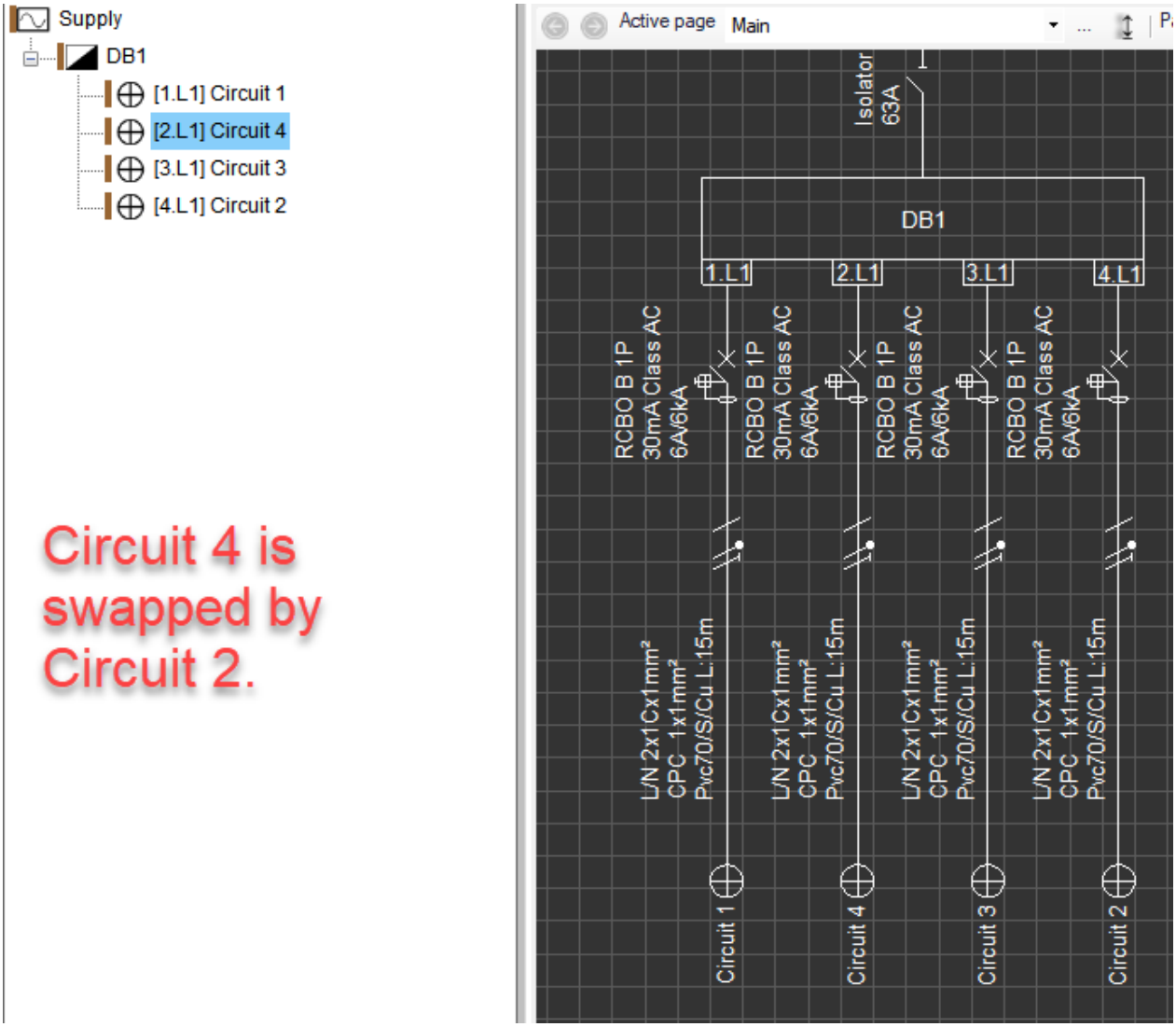



Supply
DB1
[1.L1] Circuit 1
[2.L1] Circuit 4
[3.L1] Circuit 3
[4.L1] Circuit 4
Schematic
Circuit edit
Circuit details
Selectivity
Active page
Main
DB1
1.L1
2.L1
3.L1
4.L1
RCBO B 1P
30mA Class AC
6A/6kA
Circuit 1
Circuit 4
Circuit 3
Circuit 4
Circuit 4 is replaced by Circuit 2 and also Circuit 4 is kept.



- Swap: This will swap the selected circuit and the circuit at the drop location.



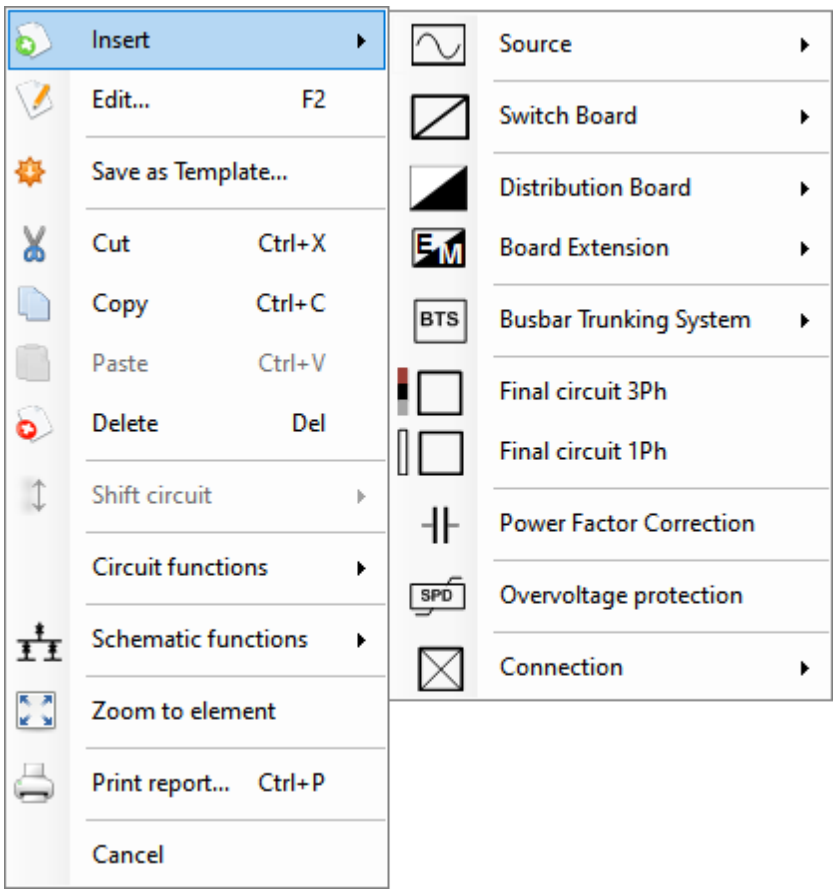


- *Circuit functions* is explained in section Circuit Functions.
- Switch board functions is explained in section Switch Board functions.
- *Schematic functions* is explained in section Schematic Functions.
- *Zoom to element* is a command to centre the Schematic module's drawing area to the selected object. It is specially designed to be used on *System Tree* area where the user can click on an object and centre the screen to the selected object. As default, *Zoom to selection* option is set to on and *Zoom to element* command is not necessary, but if the *Zoom to selection* option is turned off, *Zoom to element* proves itself a very practical command. *Zoom to selection* option is discussed separately in System Tree Section.
- *Print report* will generate the report only for selected item. Reports are discussed in Reports Modules Tab section.
- *Cancel* option will close the *Actions* menu.

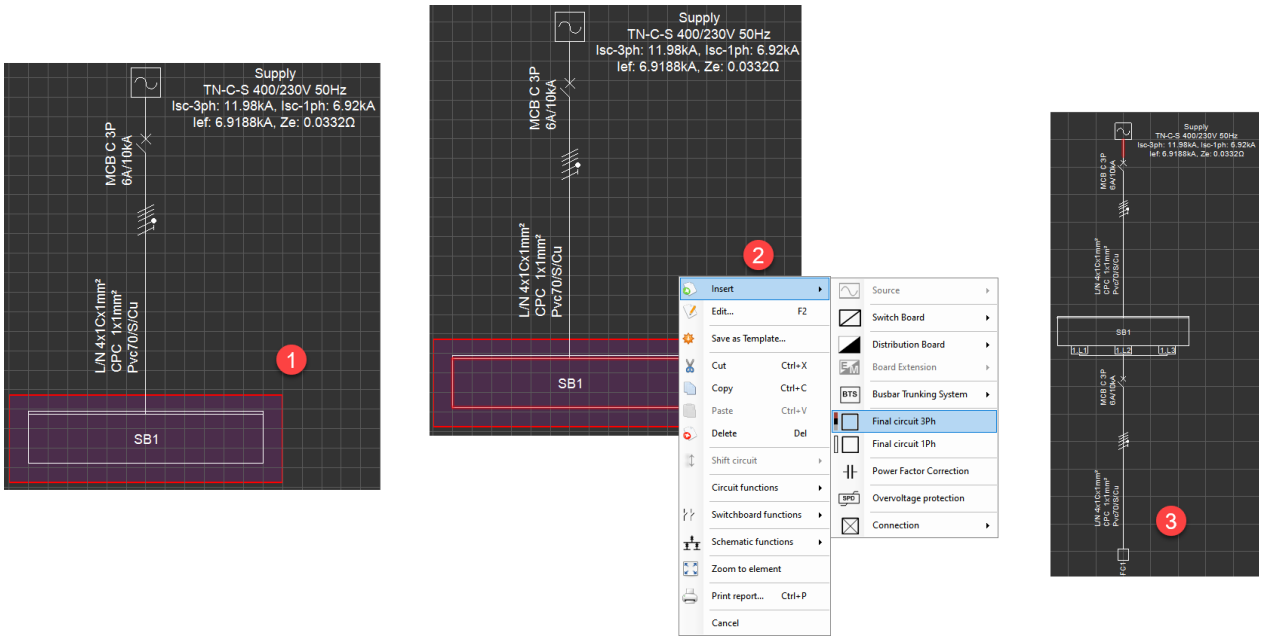
Insert Menu

In ElectricalOM, the user models a system by adding components and connecting them to each other by

using the *Insert* menu. The user can either click on *Actions Menu* at the Menu Bar or right click anywhere within the Schematic Module's drawing area or System Tree Section area to access the *Insert* menu.



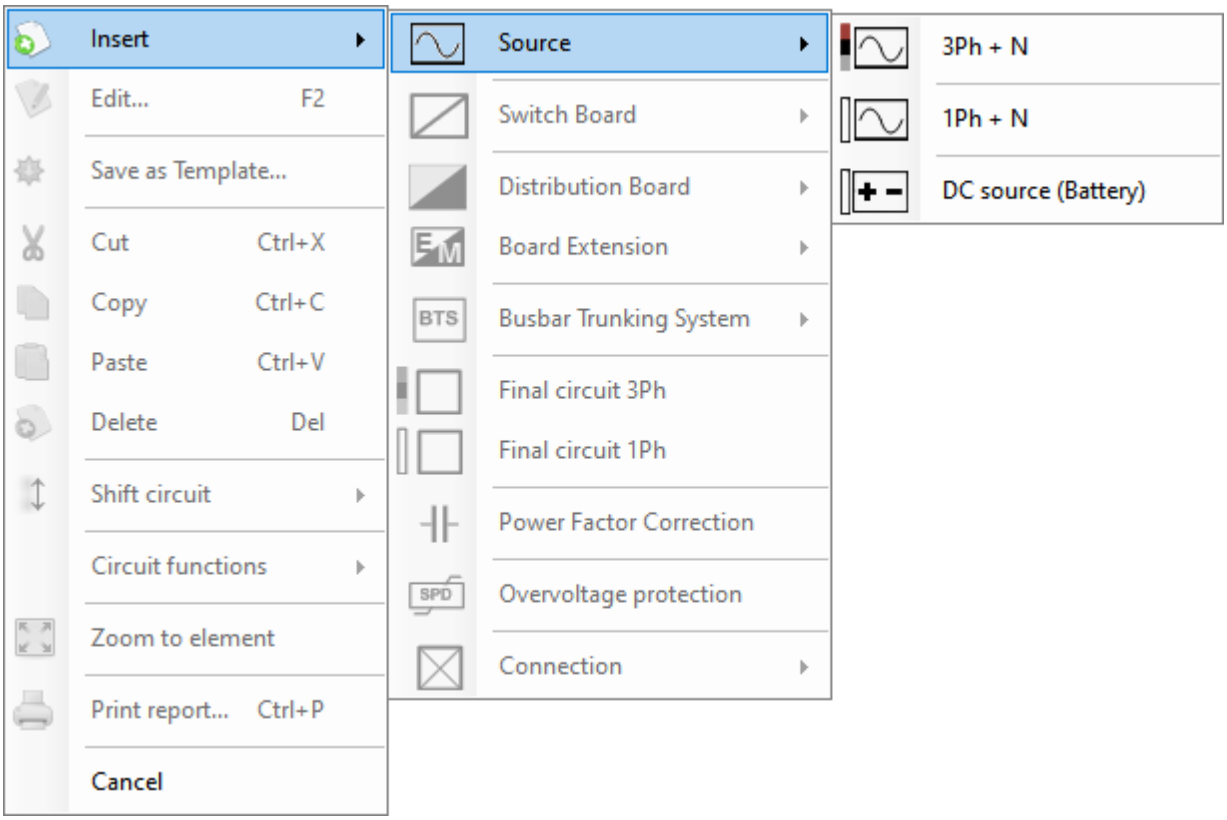
In order to add a new component, the user needs to select the component which the new component will be inserted to, and then use the *Insert* menu.



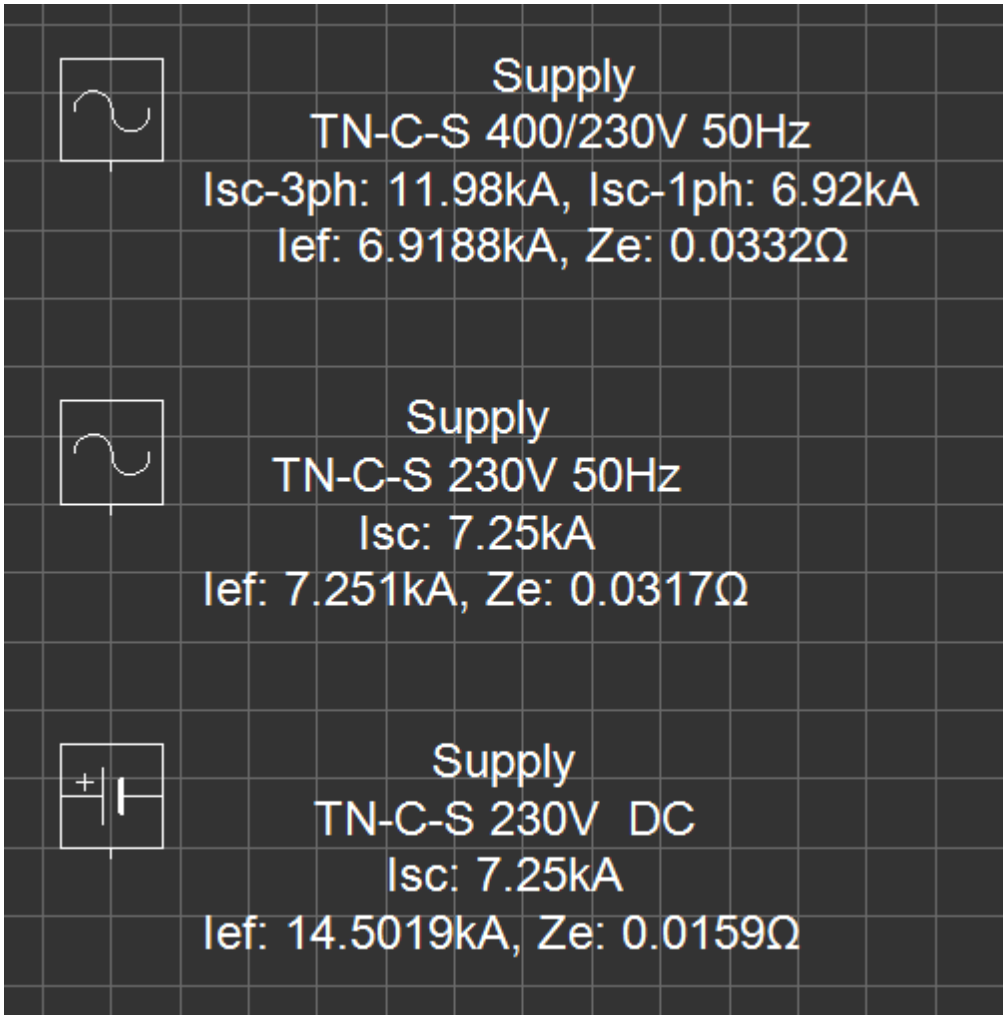
Like many other menus within ElectricalOM, *Insert* menu is a dynamic menu where only appropriate options will be available to select. For example, if an empty way of a single phase board is selected prior to Insert menu, then, Source, Final circuit 3ph, Power Factor Correction and Over voltage protection options will be greyed out. Also, if a single phase item is selected, there will be no three phase options available further in the sub menus like Distribution Board or Motor Starter.

Source

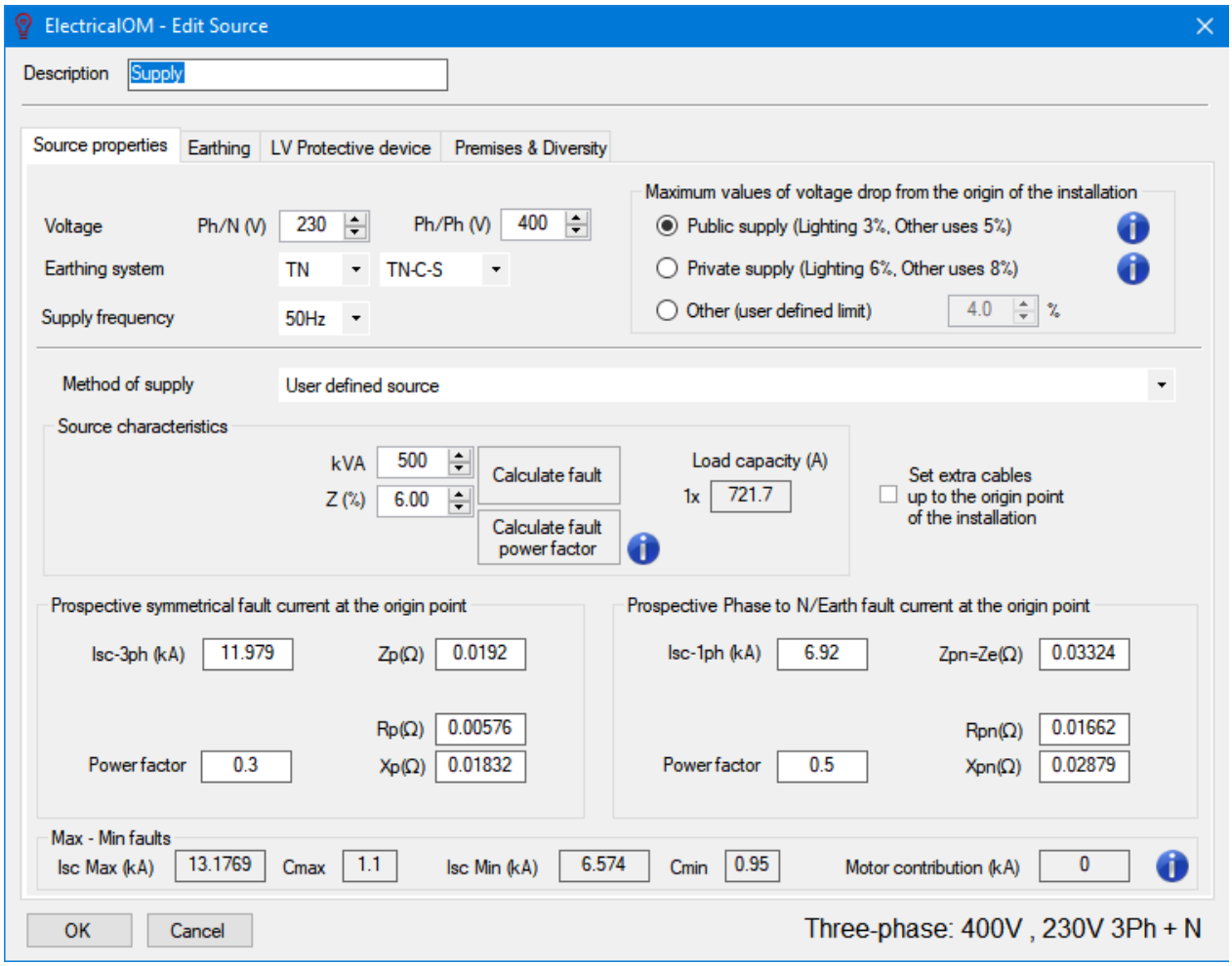
In order to start a project, a *Source* must be placed first. *Source* component includes three options; 3Ph+N, 1Ph+N and DC source (Battery).



Once an option is selected, ElectrcialOM will name it as *Supply* and place it on the schematic (at drawing area of Schematic Module).



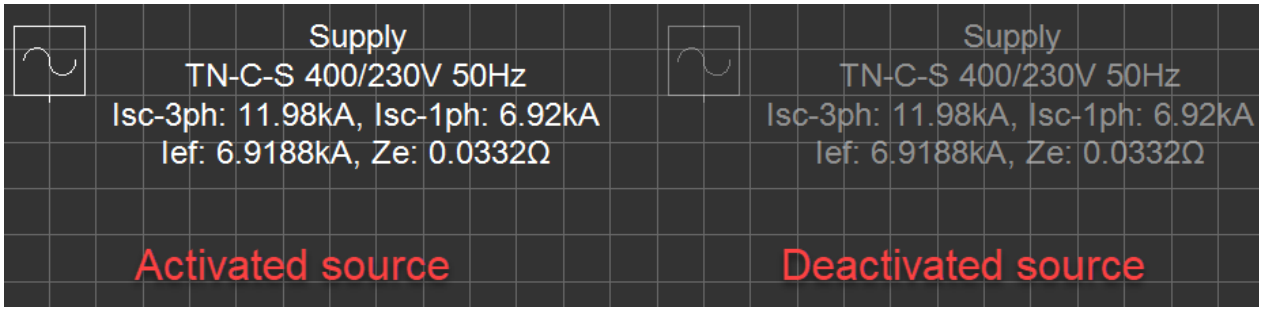
In order to edit the source component, the user needs to double click on either the icon in the schematic area or the source name in the system tree section. ElectricalOM will display the *Edit Source* window.



At the top the *Edit Source* window, *Description* text field is located where the user types in a name for the *Source* component. Below this section there are 4 tabs representing different setting groups:

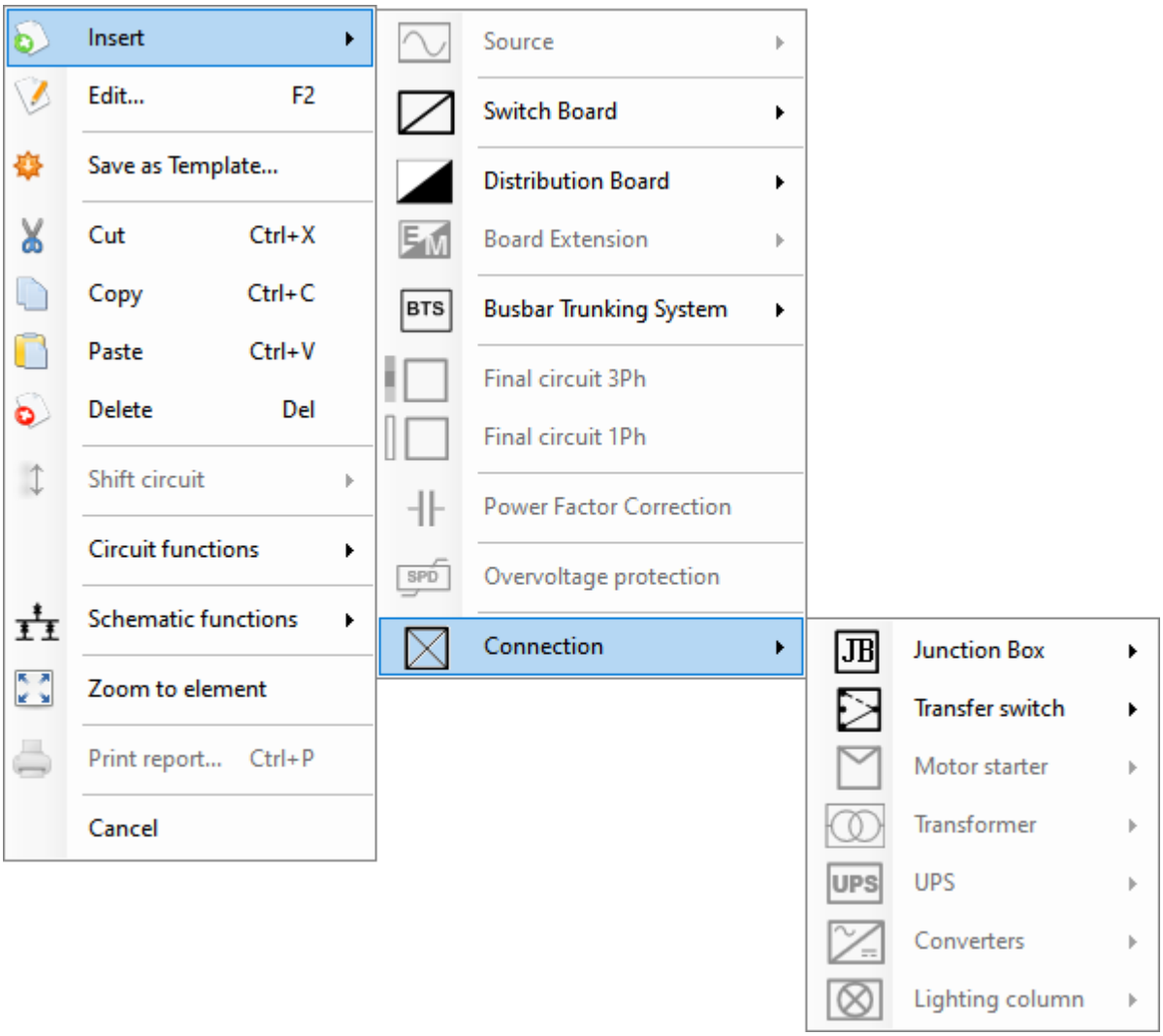
- Source properties
- Earthing
- LV Protection device
- Premises & Diversity
- High Voltage Settings

ElectricalOM also lets the user to insert multiple sources. Unless parallel operation is set, only one of the sources can be active at at time, so, the user need to make sure that there are no warnings for each sources by enabling them one by one, and modifying the system parameters until no warnings left.
Each time the user inserts a new source, the new source will be set as active and the other sources will be deactivated. Deactivated sources will be indicated by a greyed out symbol while active source symbol will be in white colour.



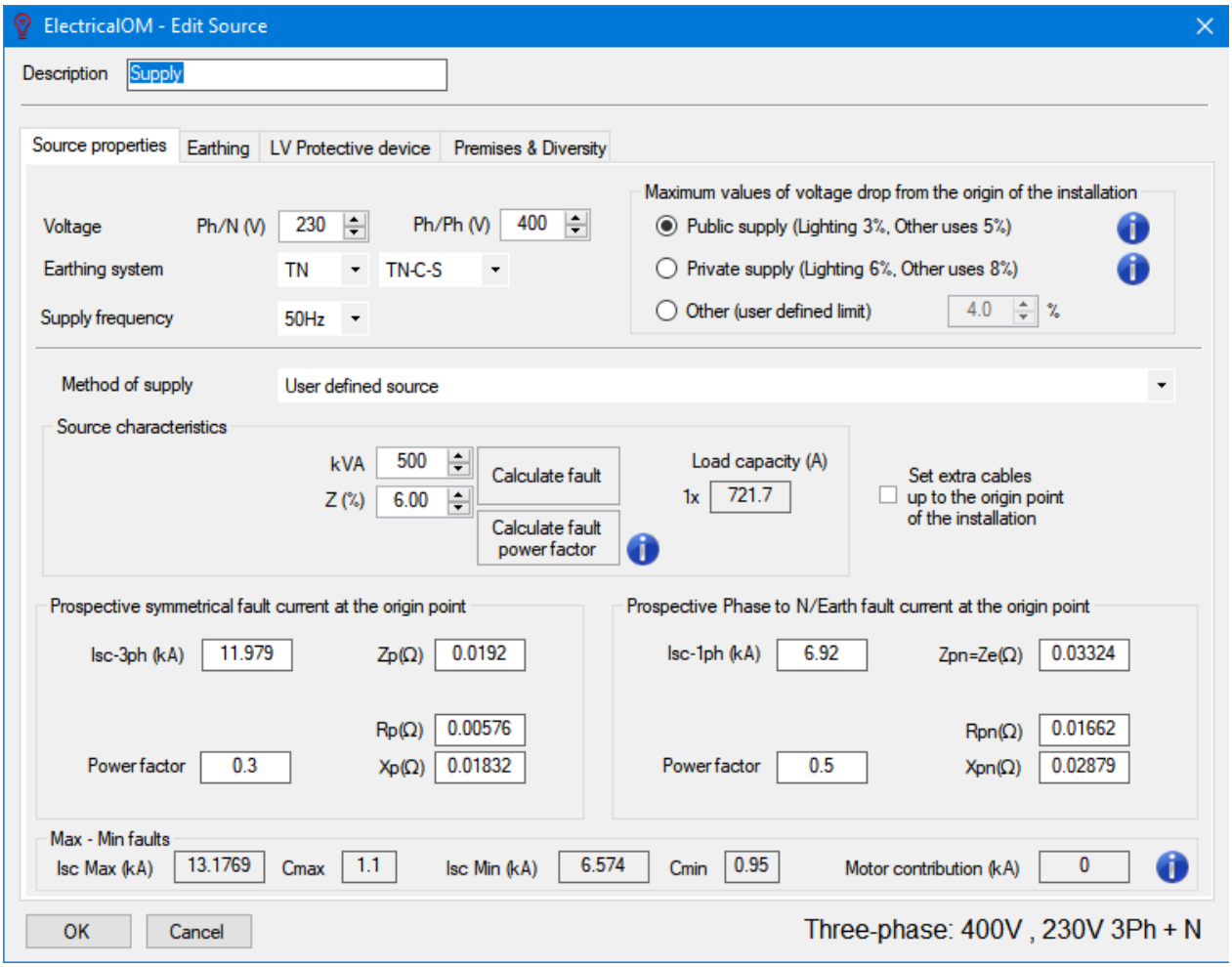
Right-click menu shall be used to activate a deactivated source. If the right-click menu is opened on a deactivated source, a new command, *Activate*, will appear on top of the menu. By clicking on this command, the user can activate the selected source which will also deactivate other sources in the project. *Source* component will accept only a few types of components to be connected to it, other components will be greyed out by ElectrcialOM:

- Switch Board
- Distribution Board
- Busbar Trunking System
- Junction Box
- Transfer Switch



As mentioned above, it is possible to run multiple sources at the same time, as long as they are identical, with *Parallel source operation...* option, see Functions Menu.

Source properties Tab

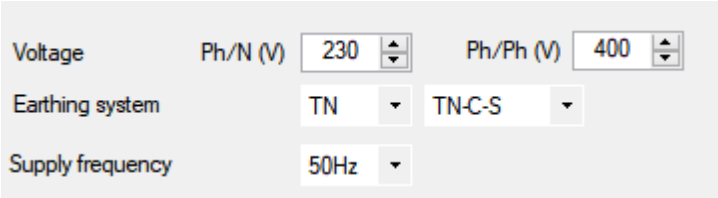


Upper section of this tab contains settings about the supply voltage, earthing system, frequency and voltage drop limits.

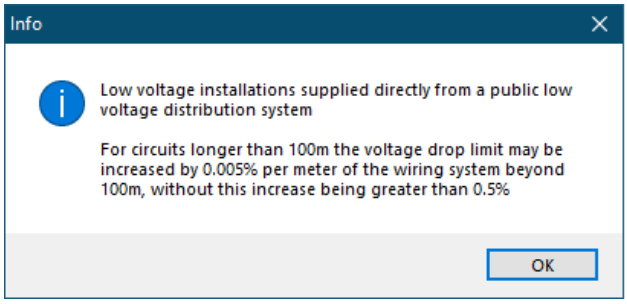
Voltage may have one or two text fields depending if it is a single phase or three phase source. The one on the left hand side defines the voltage between the phase and neutral terminals and this is the only option if the source is a single phase one, and the one on the right hand side defines the voltage between two phase terminals in case of a three phase source. As the user modifies one of these field ElectrcialOM will calculate the other automatically.

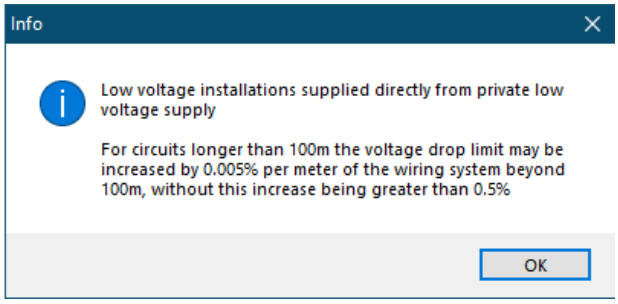
Earthing system has two drop down list. The first one has 3 options as TN, TT, and IT. If the TN system is selected, then the second drop down list will appear with 2 options as TN-C-S and TN-S.

Supply frequency has 2 options as 50Hz and 60Hz.



Maximum values of voltage drop from the origin of the installation section has three options to select. This options will define the allowed voltage drop limit (in percent) for specific circuits, and also will allow an extra headroom for circuits longer than 100 metres.





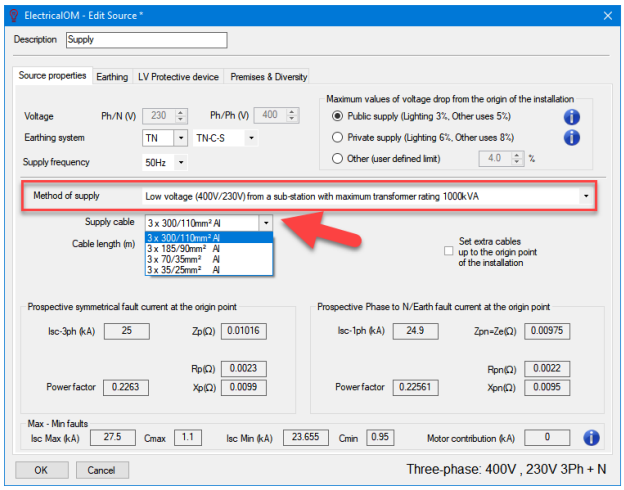
Public supply options will set lighting circuits to 3% and other circuits to 5% maximum allowed voltage drop from the origin.

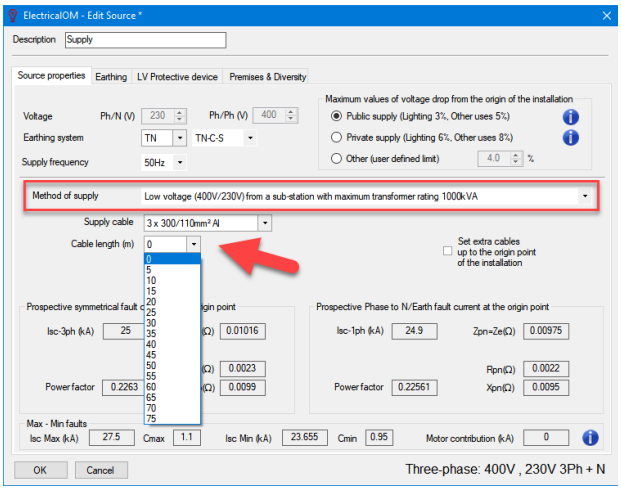
Private supply options will set lighting circuits to 3% and other circuits to 5% maximum allowed voltage drop from the origin.

Other (user defined limit) enables the user to set a manual value for the voltage drop limit, however, it will be applied to all types of circuits.

Middle section is reserved for source type and characteristics settings, and a tick box to define cables from the source to the origin of the system, if any. Depending on the selected source type, *Method of Supply*, *Source characteristics* may be visible or not. First 3 options are for Cyprus market and not advisable to be used for projects located in a country other than Cyprus.

- *Low voltage (400V/230V) from a sub-station with maximum transformer rating 1000kVA:* If this option is selected, ElectrcialOM will display *Supply cable* and *Cable length* drop down lists and the voltage fields will be greyed out. This option is intended for Cyprus market and the source characteristic data is taken from EAC (AHK).

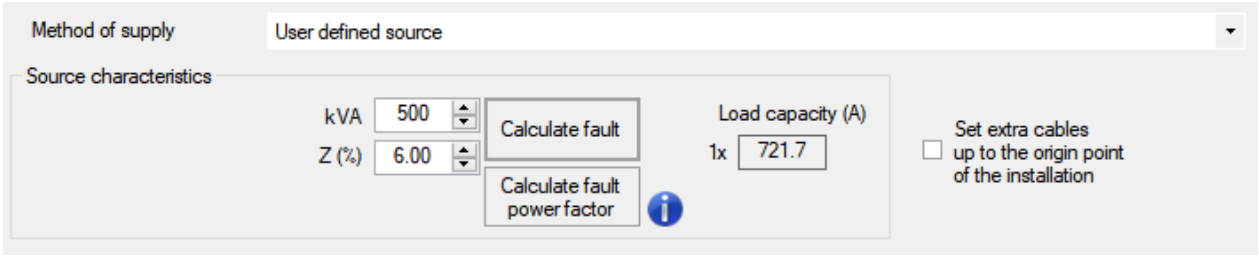




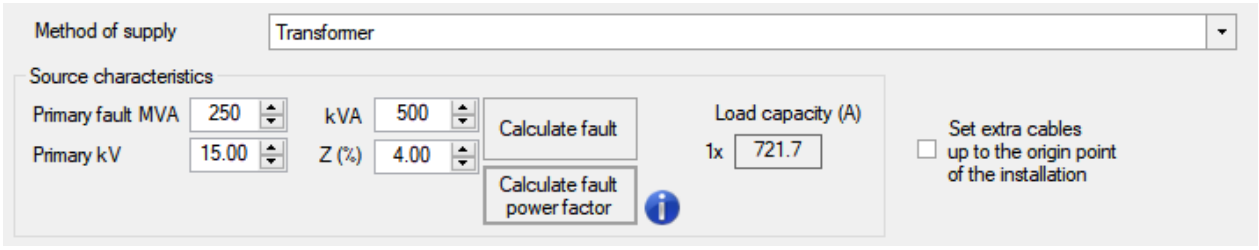
- *Low voltage (400V/230V) parallel operation of two transformers with rating 1000kVA*and *Low voltage*

(400V/230V) supply of an exclusive customer using a transformer with rating 1600kVA options do not have a *Source characteristic* data and the voltage fields are greyed out. These options are intended for Cyprus market and the source characteristic data is taken from EAC (AHK).

- *User defined source:* If this option is selected, ElectricalOM will display *Source characteristics* data, where the user can modify the power and the percent impedance of the transformer. These data will be used to calculate the fault currents and power factor. Next to these ElectricalOM will display the *Load capacity* of the source calculated according to the entered values in Amperes.
    - *Calculate fault* and *Calculate power factor* buttons:



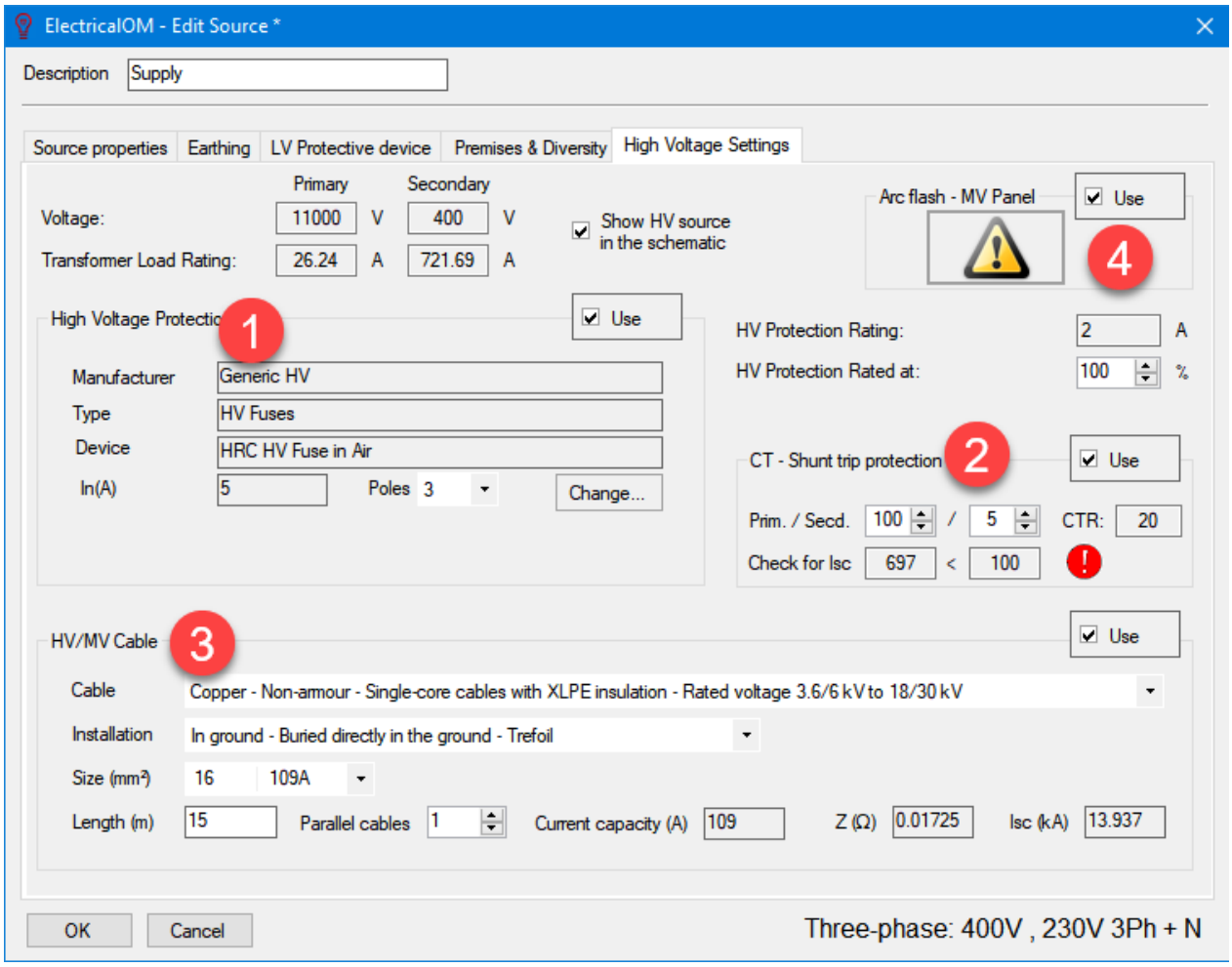
- *Transformer:* This option will also display the primary side voltage and fault impedance of the transformer. Next to these ElectricalOM will display the *Load capacity* of the source calculated according to the entered values in Amperes.



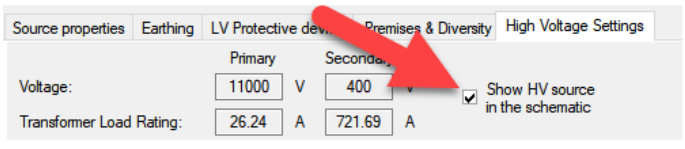
If this option is selected, ElectricalOM will display an additional tab, *High Voltage Settings*, at the end of the tabs area. Please see HV and Arc Flash Settings for more details.

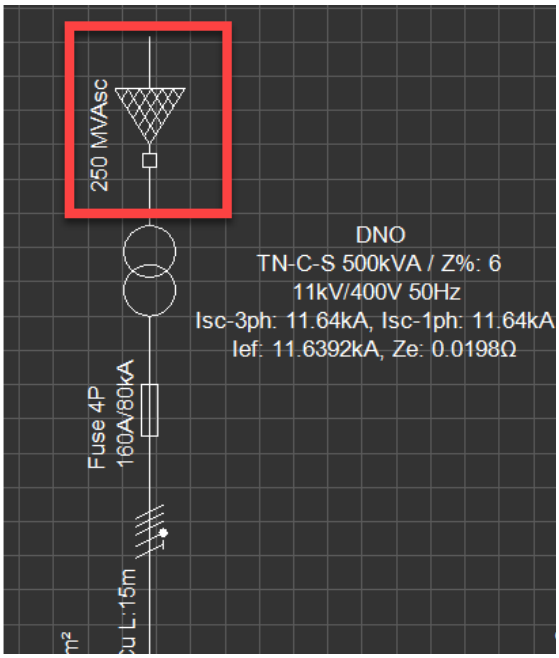
HV and Arc Flash Settings

This tab contains settings related with the primary side of the transformer, and enables the user to provide more details so ElectricalOM calculations are more accurate.



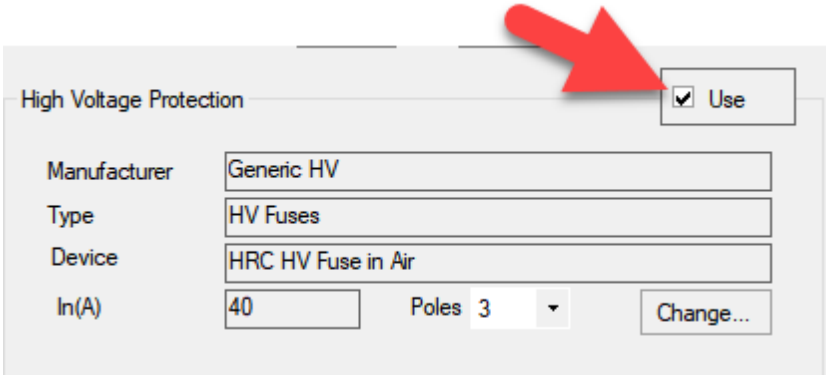
By default, the primary side supply is not shown by ElectrcialOM but it can easily be set to be displayed on the schematics by ticking the *Show HV source in the schematic* tick box. The supply will be shown by a triangle and the fault capacity.

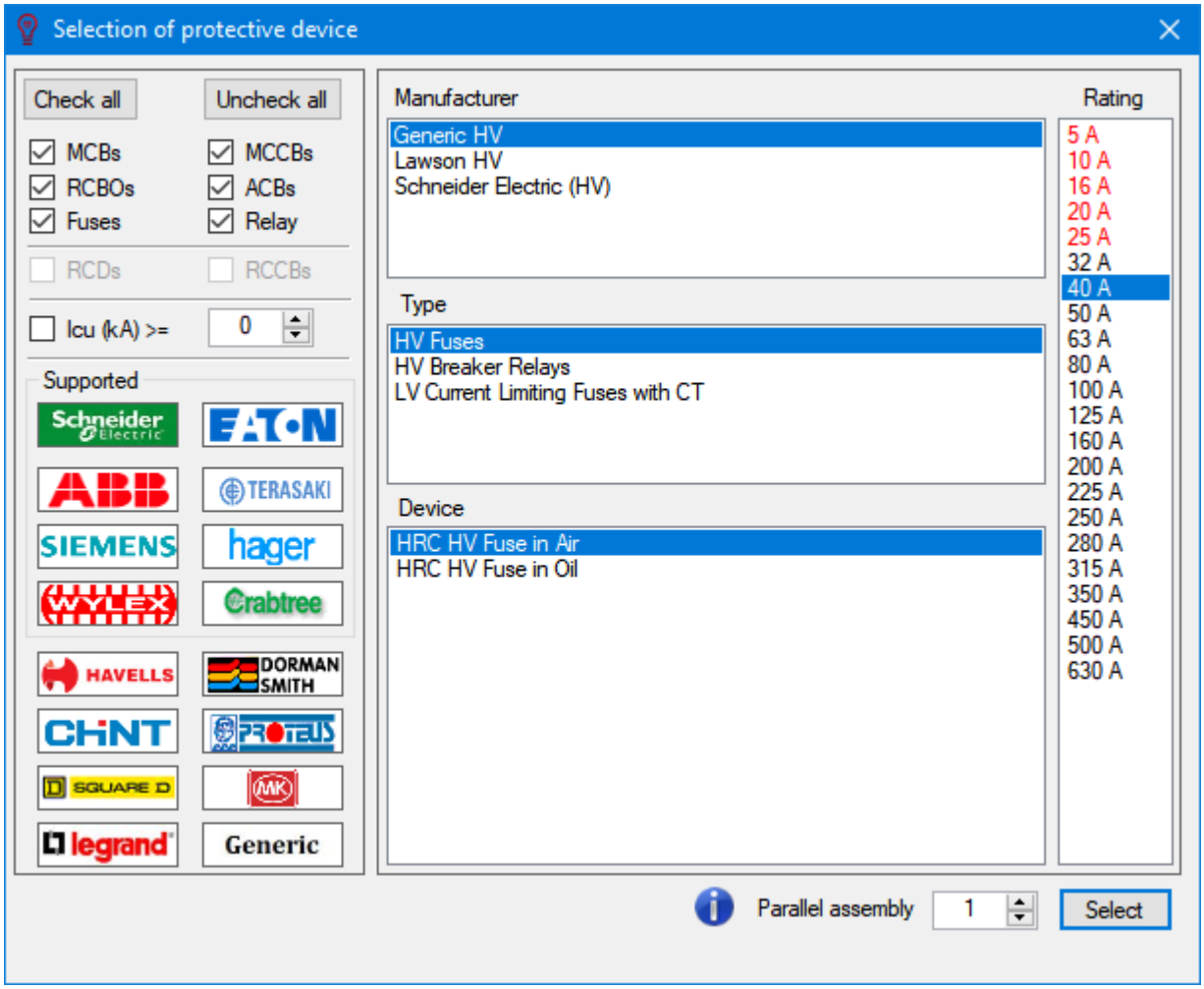




The user may add add and define:

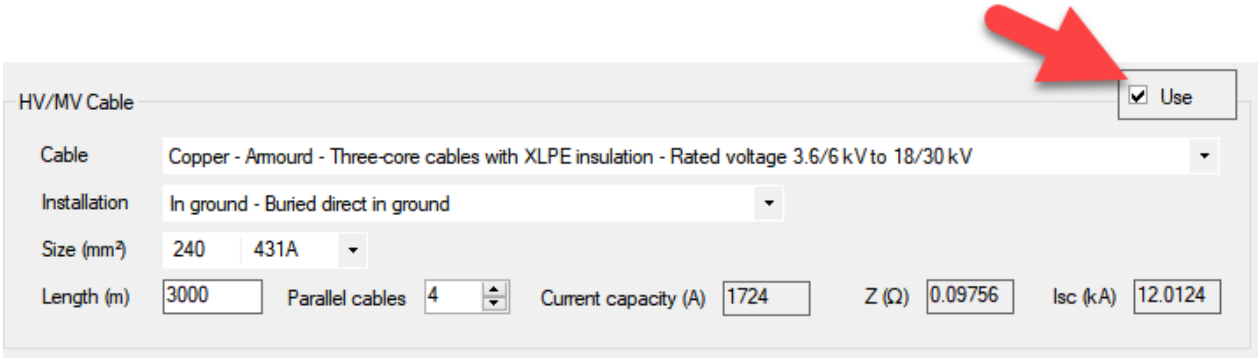
1. a primary side protection device by ticking the *Use* tick box. *Change...* button will display the *Selection of the protective device* window where the user may select required device. ElectricalOM will also indicate current ratings that are not suitable with red fonts.



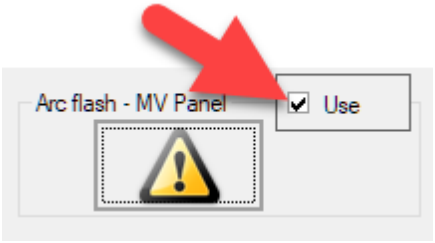


2. a current transformer for trip measurements, by ticking the *Use* tick box of *CT - Shunt trip protection* area.

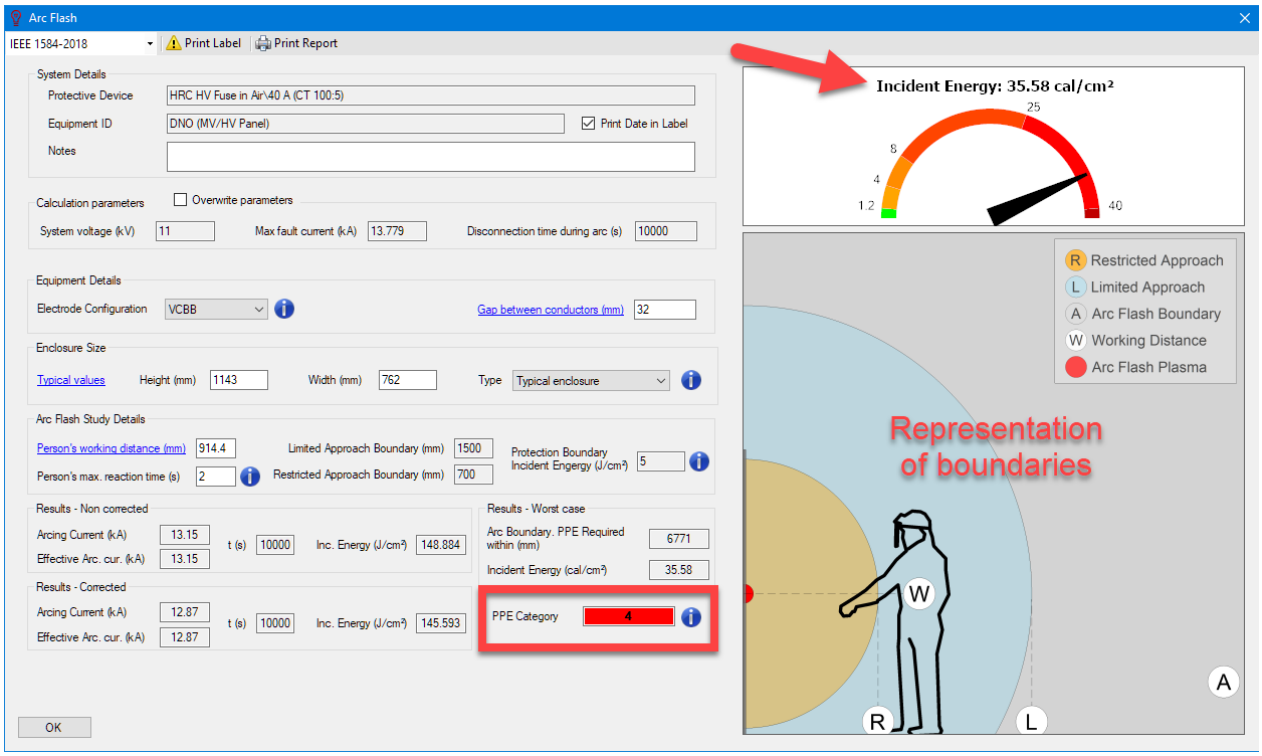
3. define primary side cable by ticking the *Use* tick box. *Cable*, *Installation*, and *Size (mm2)* drop down lists then can be used to define those parameters. Again ElectricalOM will mark the sizes which are not suitable as red.



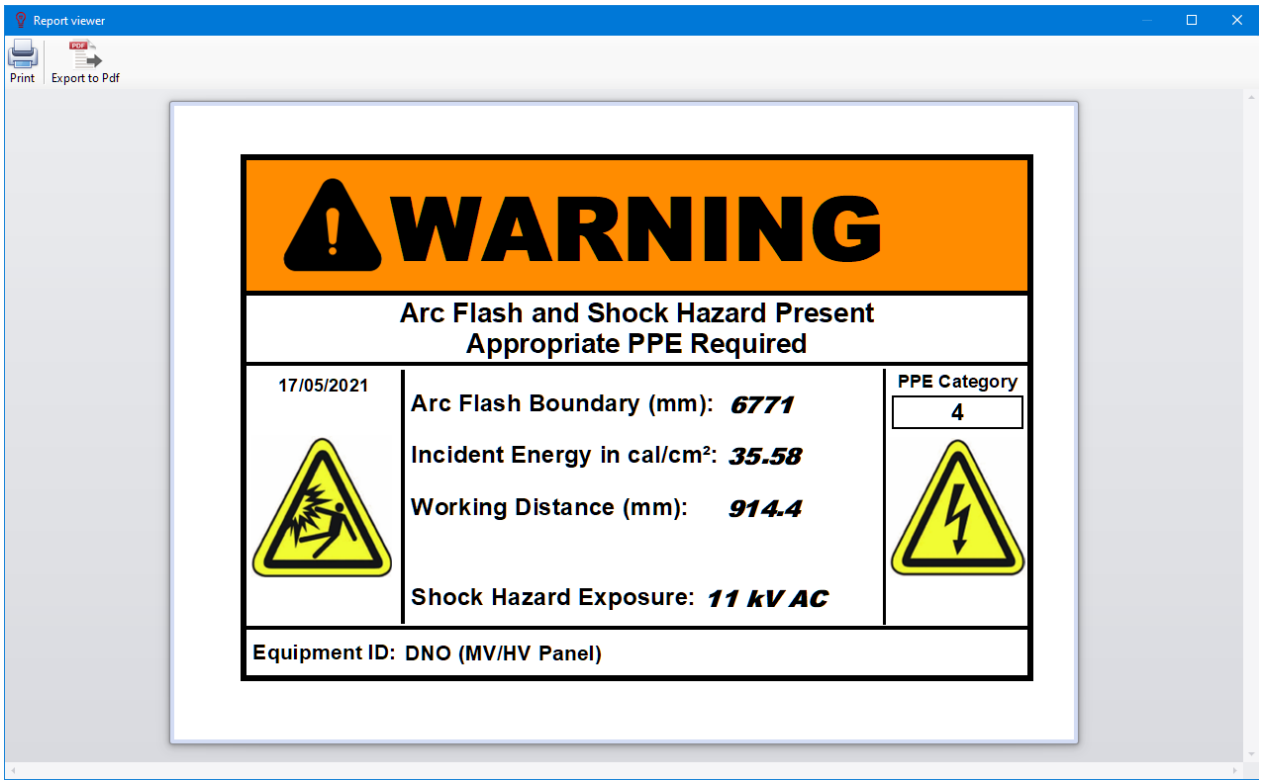
4. define parameters for arc flash study by ticking the *Use* tick box at *Arc flash - MV Panel* area and clicking on the exclamation mark icon below the tick box.



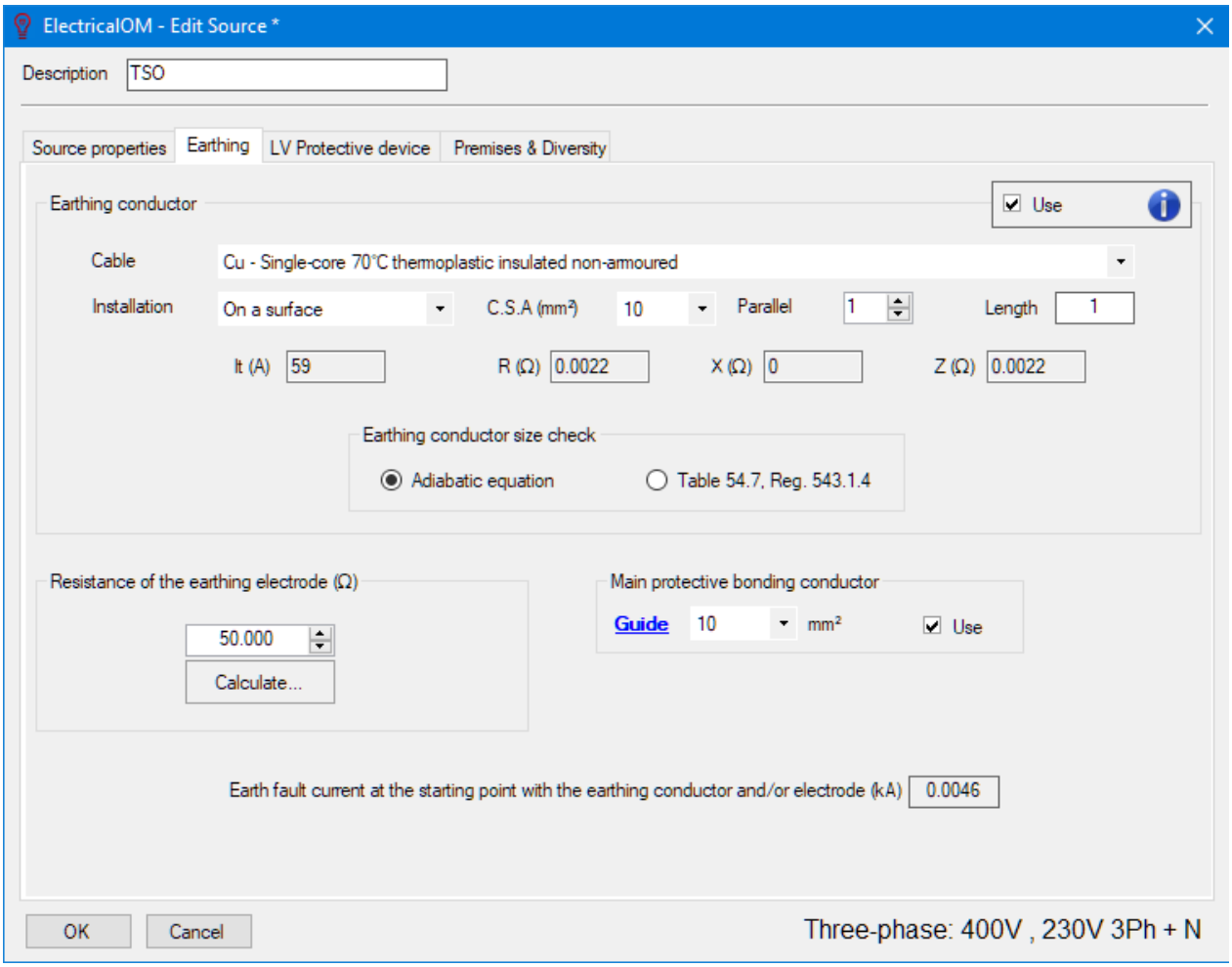
When the exclamation mark is clicked, ElectricalOM will display the Arc Flash window where the user can enter required parameters with respect to the design. According to the parameters, ElectrcialOM will calculate the Incident Energy and advice required PPE Category. ElectrcialOM will also visually display the boundaries on the right hand side.



Print Label button will print a warning label which can be used on site.



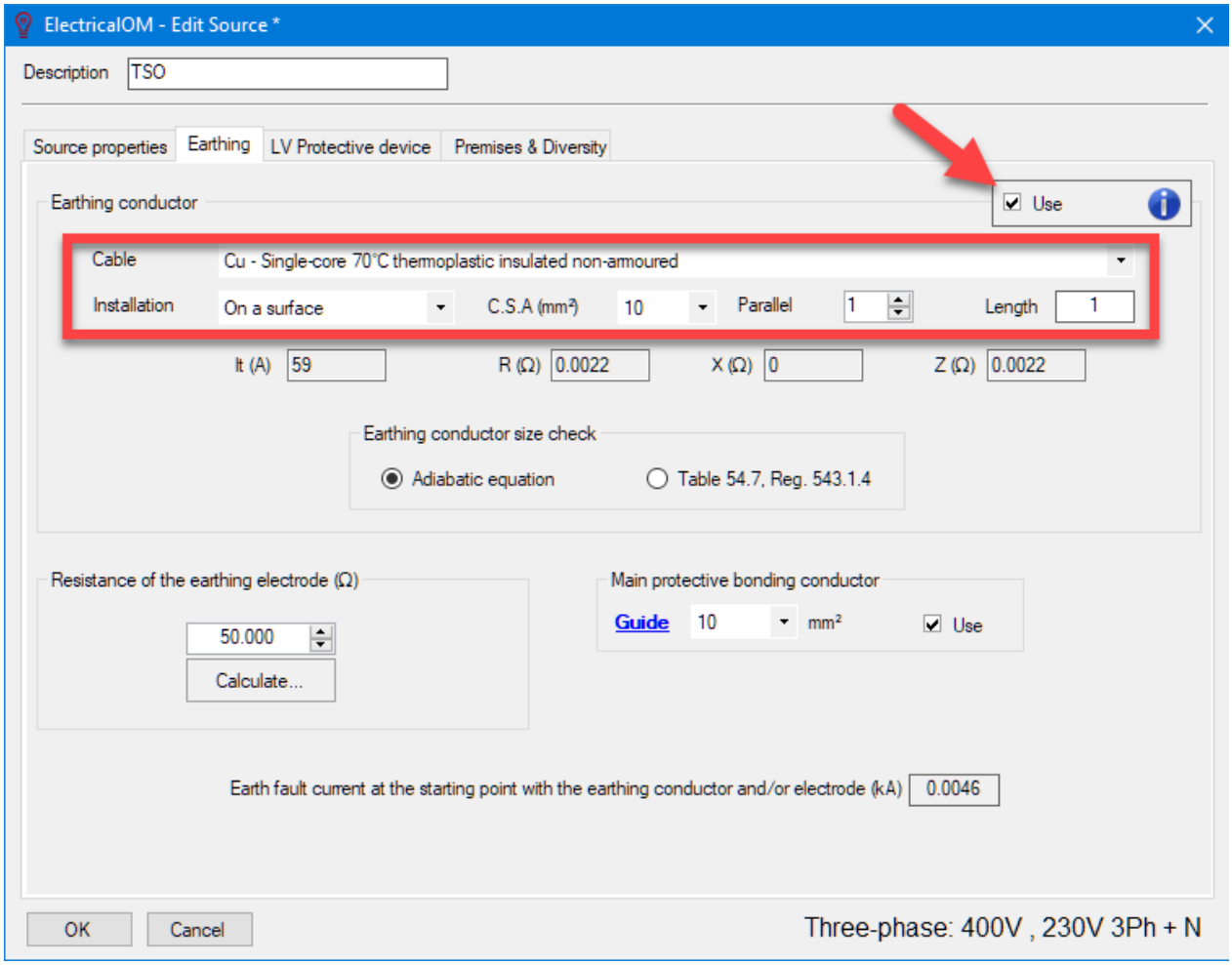
Earthing Tab



Earthing tab contains earthing parameters associated with the system and has three sections:

- Earthing conductor

The user can define an earthing conductor by ticking the use tick box and selecting a cable type, an installation method, a cross-section area by using the associated drop-down lists. In case of a parallel arrangement, number of conductors can be set by using the up and down arrows next to *Parallel* text box. The length can be modified by typing in the required length into the *Length* text box in metres.



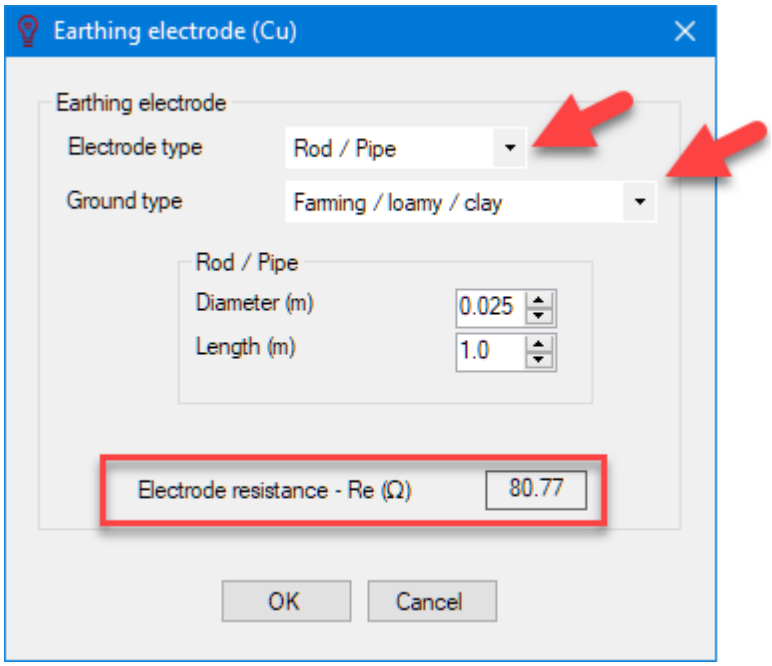
ElectricalOM will display the tabulated current carrying capacity and impedance parameters of the conductor below the settings.

- Earthing conductor size check

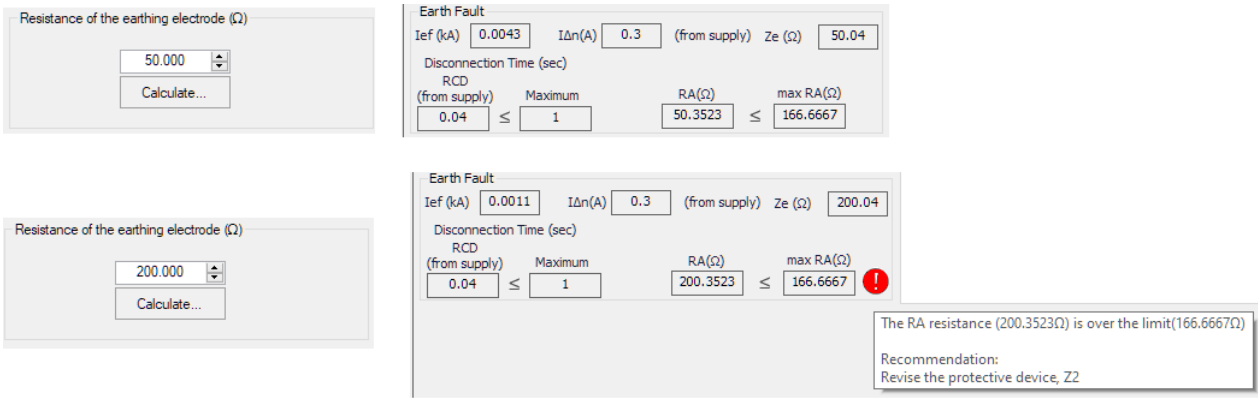
  ElectricalOM can check the size of the earthing conductor either based on the Adiabatic equation or based on Table 54.7 of the BS7671. The user can select the required option by using the radio buttons next to each option.

- Resistance of the earthing electrode (Ω)

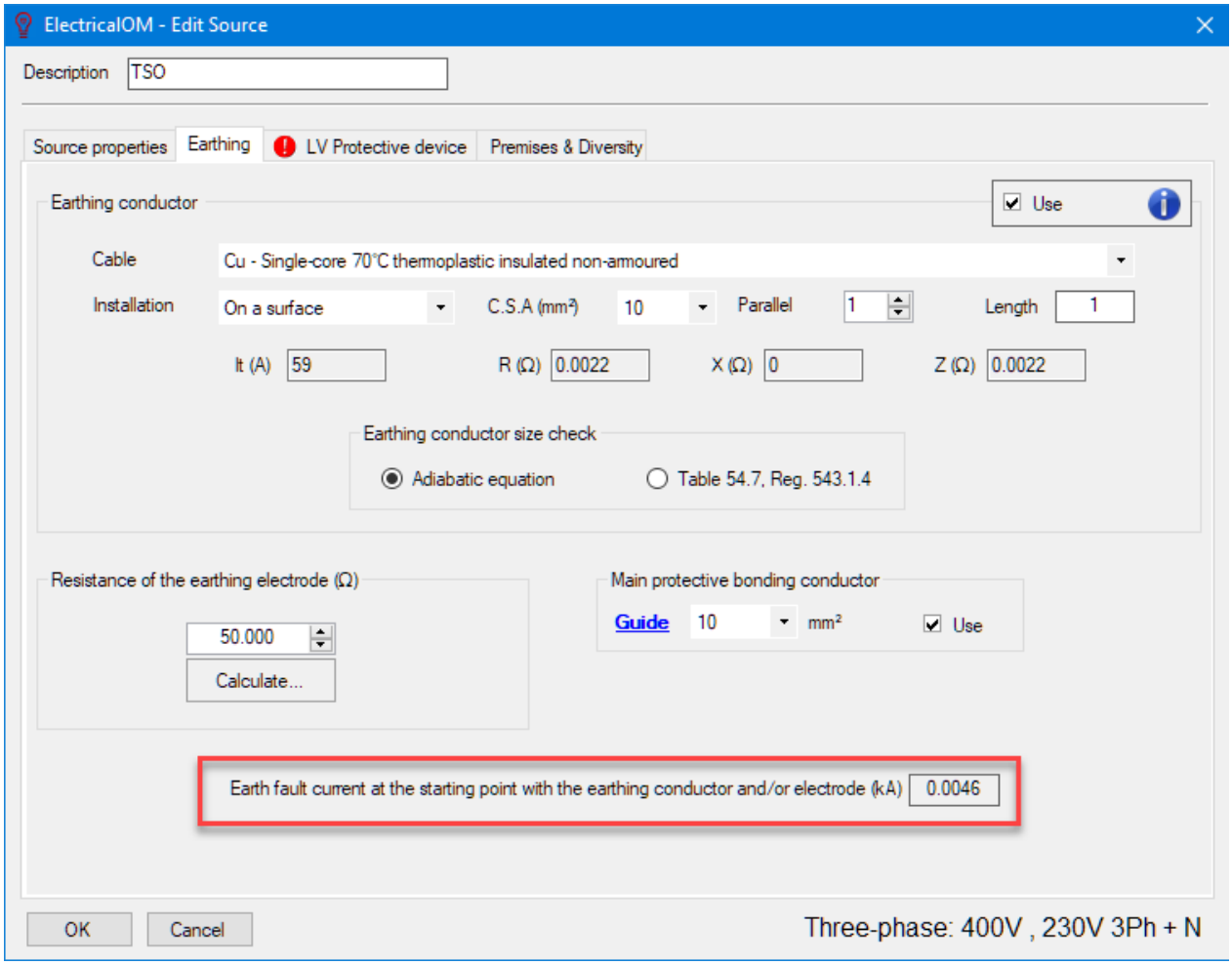
ElectricalOM has a built in earth electrode resistance calculator. Although it is a basic calculator and not intended for complex earthing arrangements, it may help the user to estimate the earth resistance electrode in case of a simple installation. The user can select the electrode type and ground type using the drop-down lists, and define required parameters by typing in the values into the text boxes. ElectricalOM will calculate the resistance and display it below.



This value will contribute to various parameters of a TT system and affect the disconnection times during an earth fault.

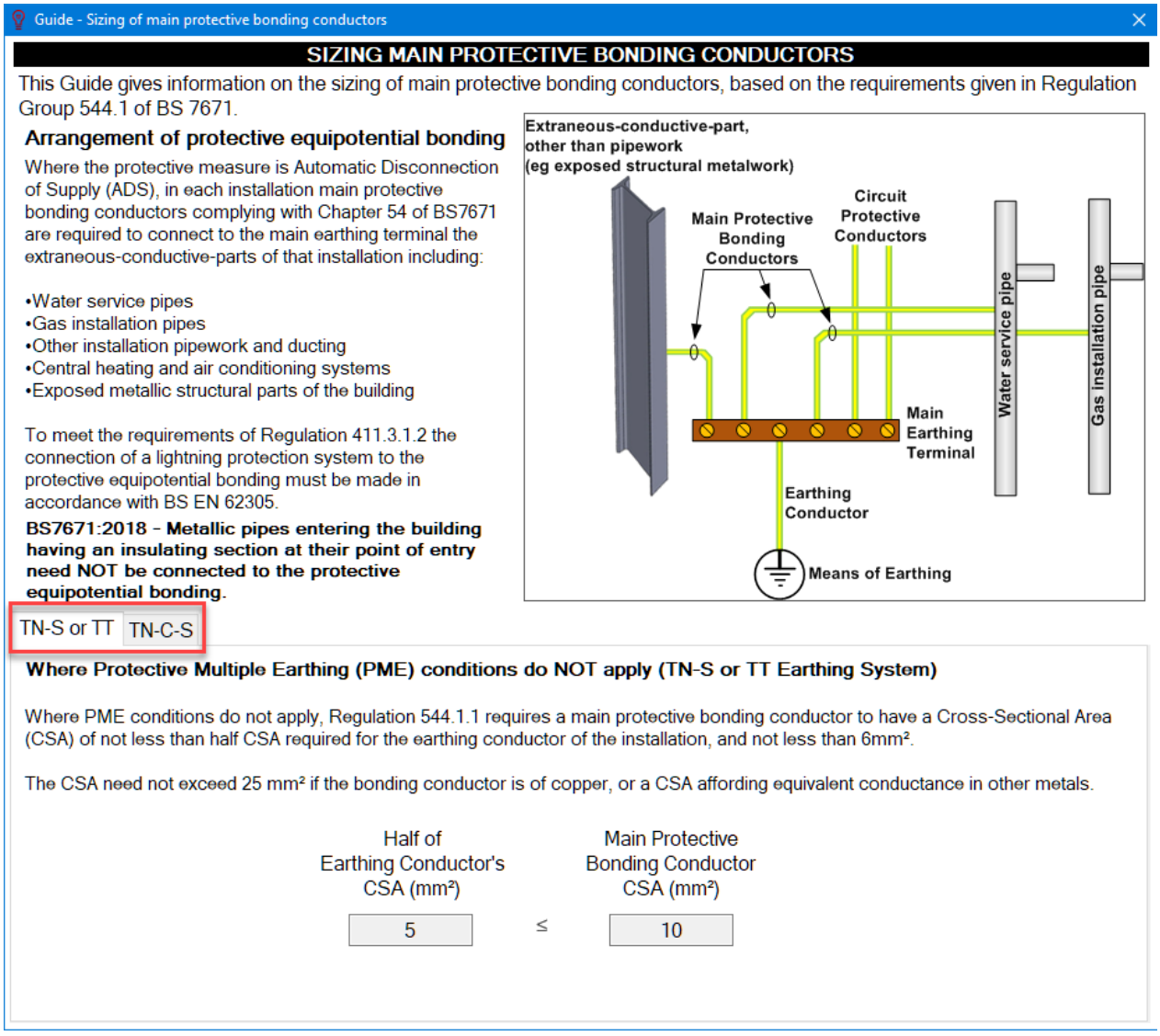


Once all the parameters are set, ElectriclaOM will display the earth fault current at the origin, at the bottom of the window.



- Main protective bonding conductor

The user enable and define a main protective conductor by using the *Use* tick box and the drop-down list. ElectrcialOM has a guidance window for reference, this can be access by clicking on the *Guide* link. The earthing system can be selected by using the tabs.



In case of TN-C-S system, the user can select the required conductor size directly by clinking on one of the links.

Guide - Sizing of main protective bonding conductors

SIZING MAIN PROTECTIVE BONDING CONDUCTORS

This Guide gives information on the sizing of main protective bonding conductors, based on the requirements given in Regulation Group 544.1 of BS 7671.

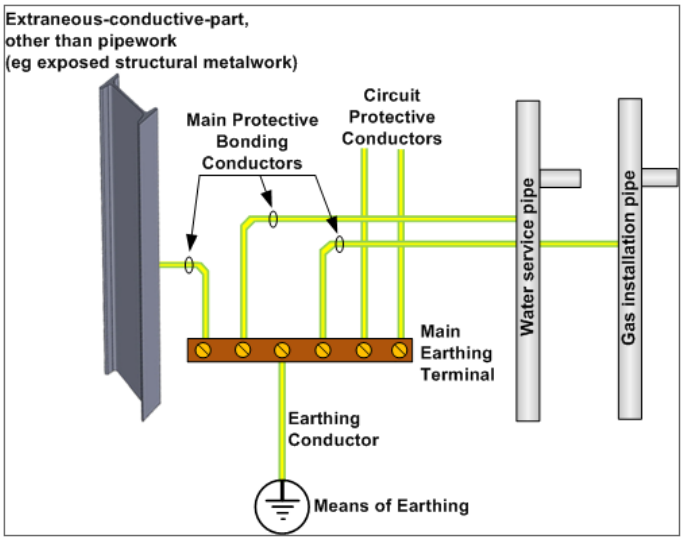
Arrangement of protective equipotential bonding

Where the protective measure is Automatic Disconnection of Supply (ADS), in each installation main protective bonding conductors complying with Chapter 54 of BS7671 are required to connect to the main earthing terminal the extraneous-conductive-parts of that installation including:

- Water service pipes
- Gas installation pipes
- Other installation pipework and ducting
- Central heating and air conditioning systems
- Exposed metallic structural parts of the building

To meet the requirements of Regulation 411.3.1.2 the connection of a lightning protection system to the protective equipotential bonding must be made in accordance with BS EN 62305.

BS7671:2018 - Metallic pipes entering the building having an insulating section at their point of entry need NOT be connected to the protective equipotential bonding.



TN-S or TT | TN-C-S

Where PME conditions apply (TN-C-S Earthing System)

Where PME conditions apply, Regulation 544.1.1 requires the main protective bonding conductors to be selected in accordance with the size

TABLE 54.8 of BS 7671 - Minimum csa of the main protective bonding conductor in relation to the neutral of the supply.

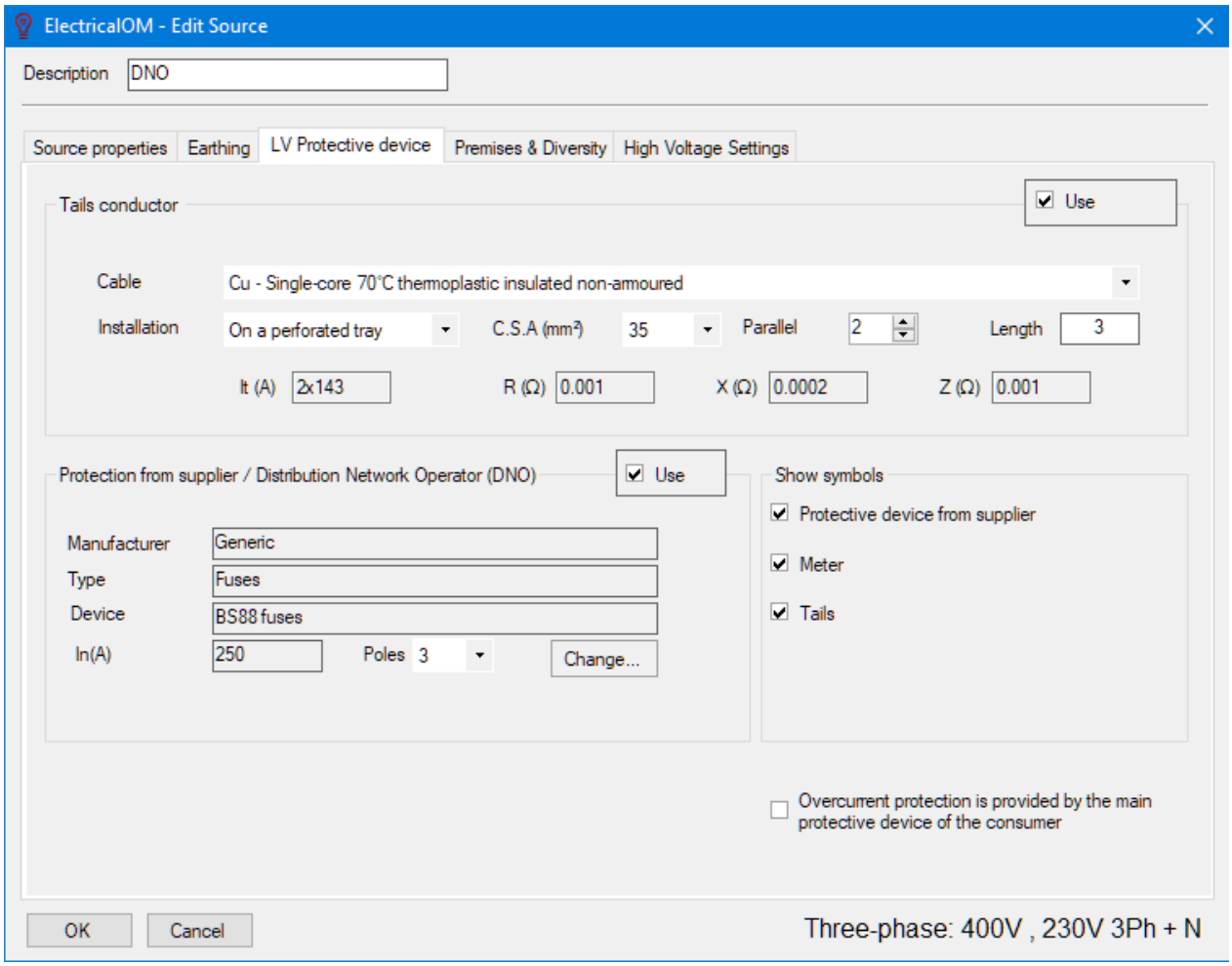
Copper equivalent CSA of the supply neutral conductor (See also Note 3)	Minimum copper equivalent CSA of the main protective bonding conductor
35 mm² or less	10 mm²
over 35 mm² up to 50 mm²	16 mm²
over 50 mm² up to 95 mm²	25 mm²
over 95 mm² up to 150 mm²	35 mm²
over 150 mm²	50 mm²

Note 1 - Local electricity distributor's network conditions may require a larger conductor.

Note 2 - Table 54.8 should be used as a guide only, and the specific requirements of the electricity distributor should always be obtained with regard to the selection of main protective bonding conductors.

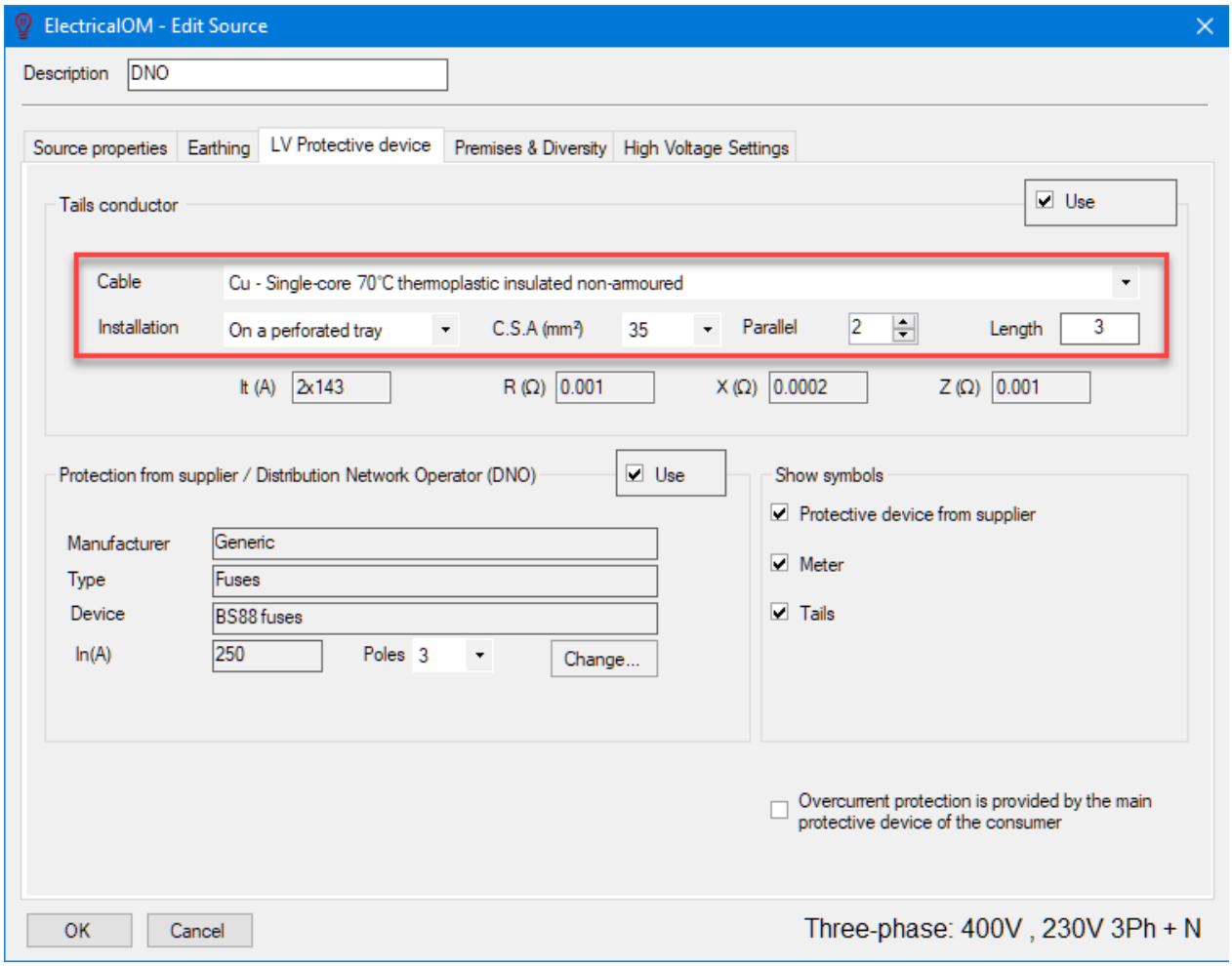
Note 3 - The "supply neutral conductor" referred to in Table 54.8 is the neutral conductor of the electricity distributor's low voltage network (otherwise known as the combined protective and neutral (PEN) conductor). It is NOT the neutral conductor on the consumer's side of the supply terminals, which may have a different CSA.

LV Protective device Tab

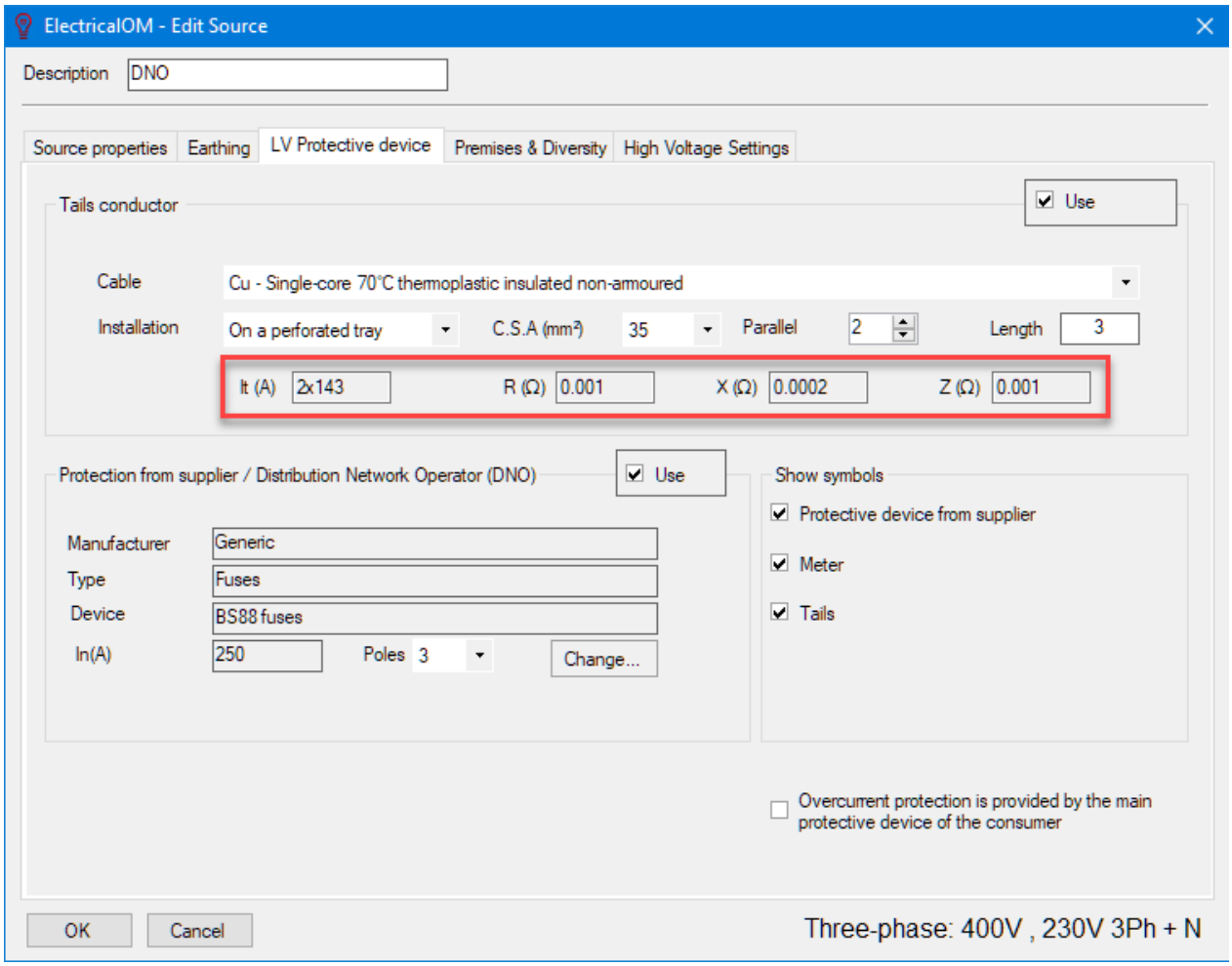


This tab accommodates tail conductor and supplier's protection parameters. They are not compulsory to use so they both have an associated *Use* tick box to enable or disable.

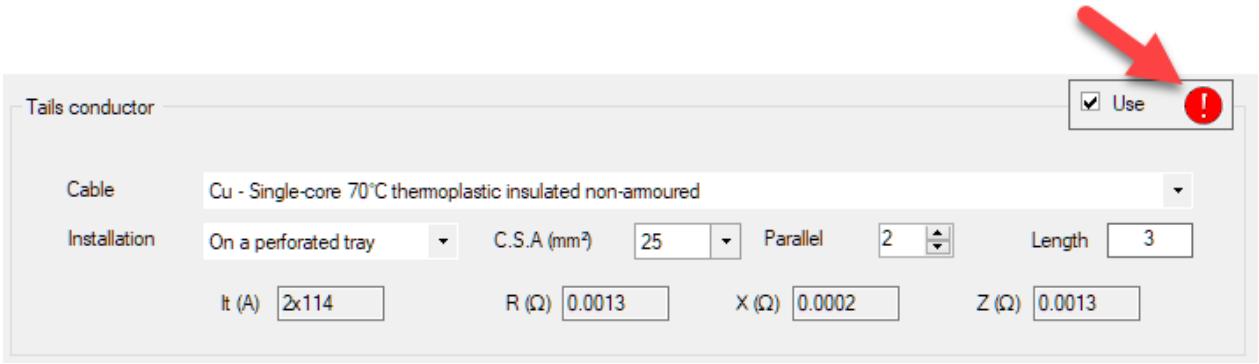
The user can define tails conductors by selecting a cable type, an installation method, and a cross-section area by using the associated drop-down lists. In case of a parallel arrangement, number of conductors can be set by using the up and down arrows next to *Parallel* text box. The length can be modified by typing in the required length into the *Length* text box in metres.



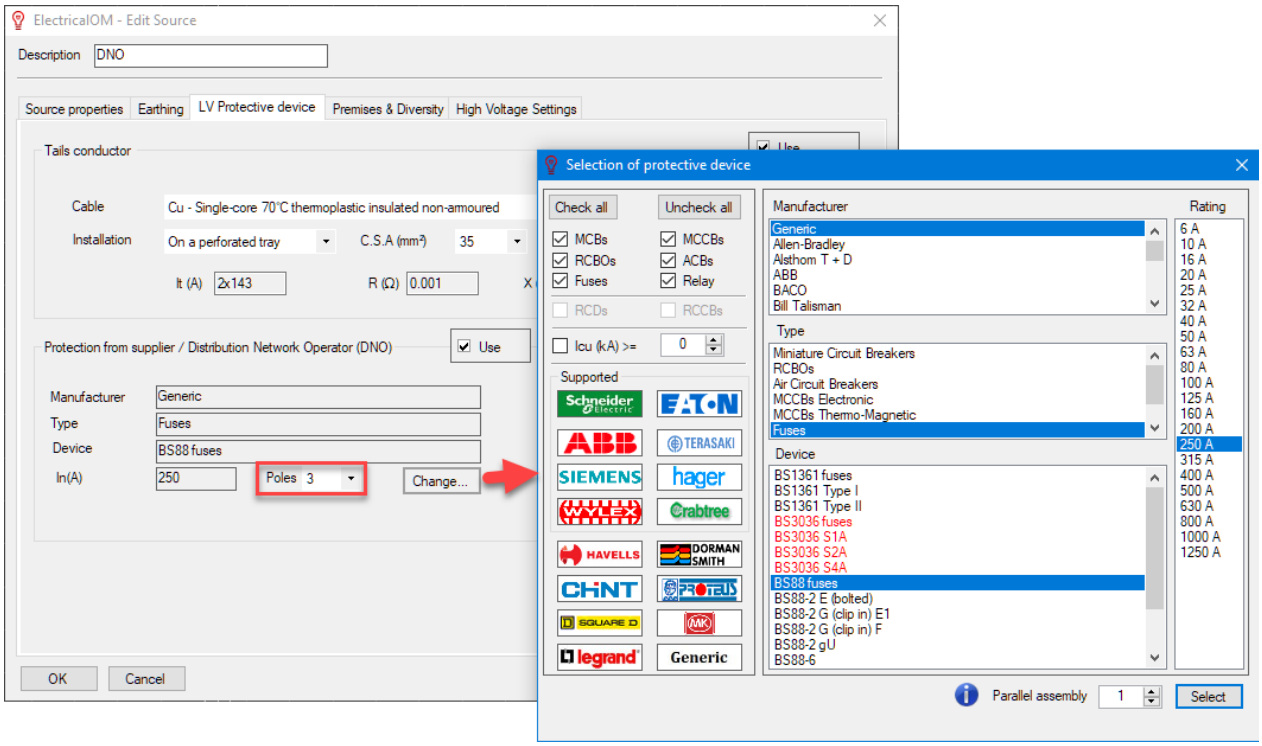
ElectricalOM will display the tabulated current carrying capacity and impedance parameters of the conductor below the settings.



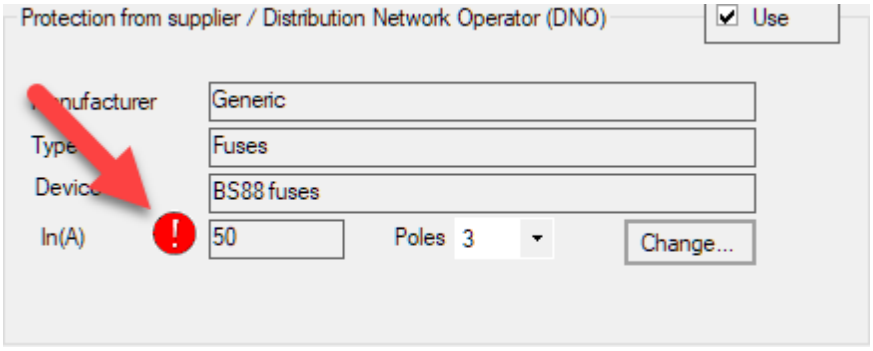
If the current carrying capacity of the selected conductor or defined arrangement of conductors is not appropriate, ElectricalOM will display a warning icon.



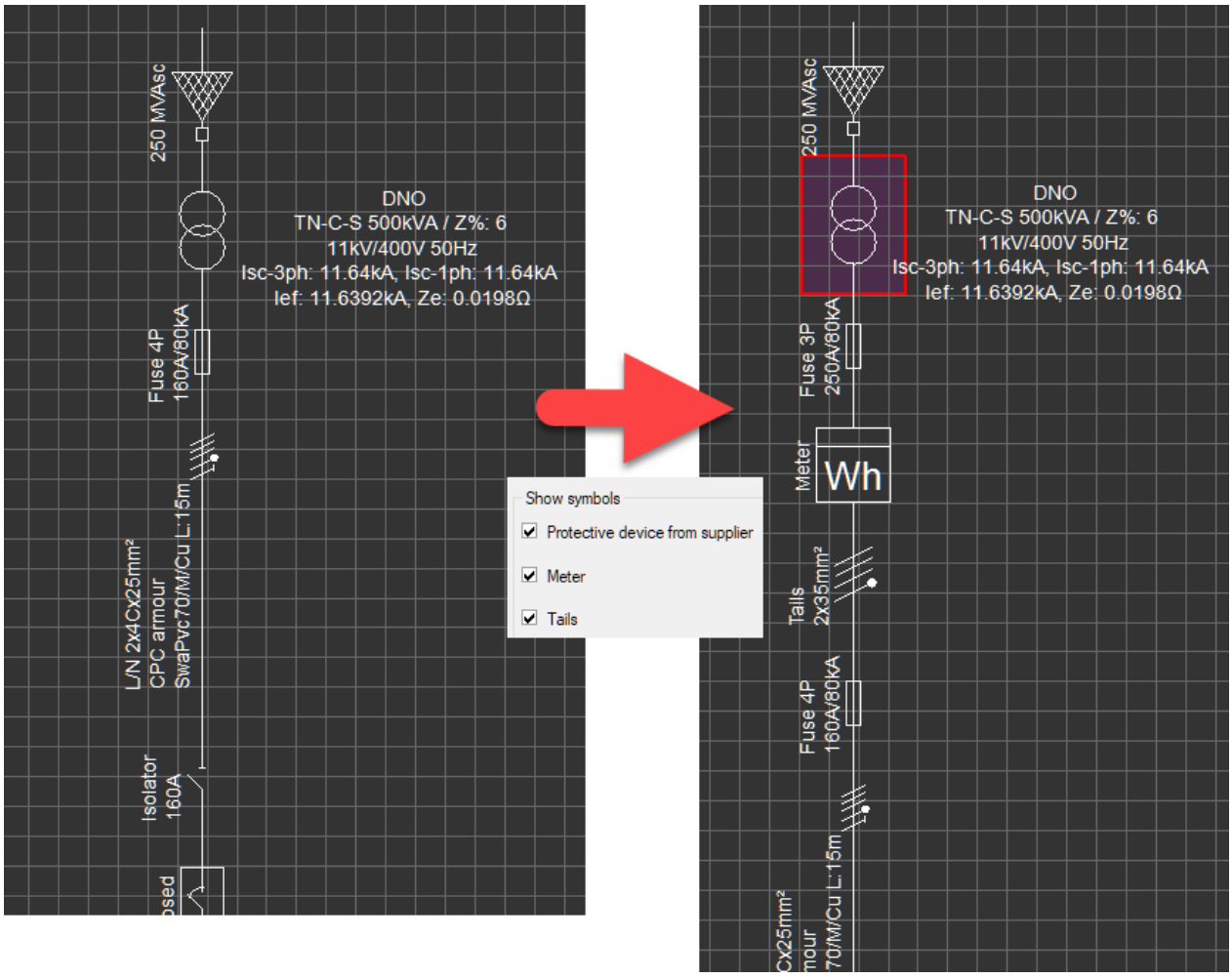
In order to define supplier's protection parameters, the user can click on *Change* button to select an appropriate protection device and use the *Poles* drop-down list to set the number of poles protection is used.



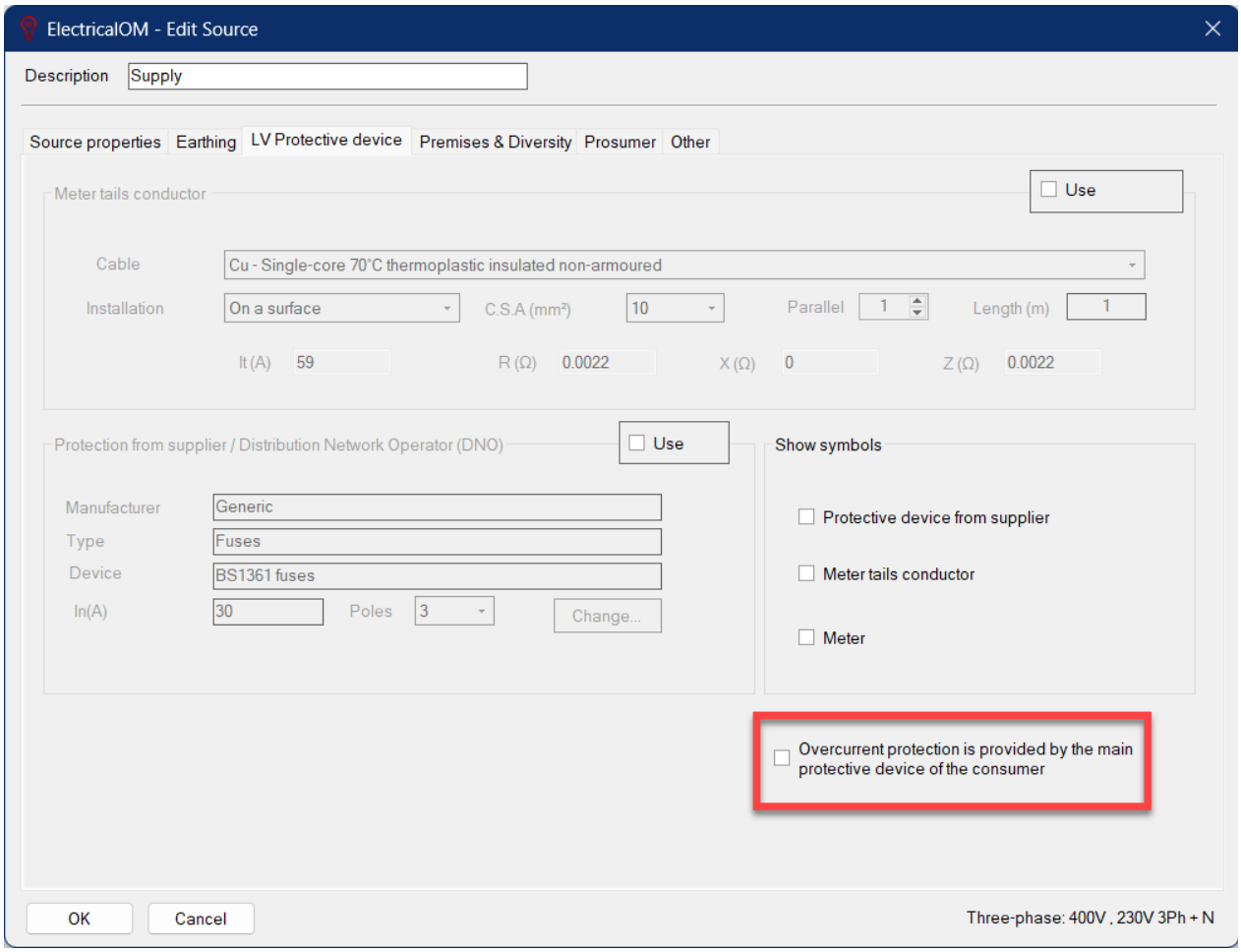
If the protection device rating is not appropriate ElectricalOM will display a warning icon.



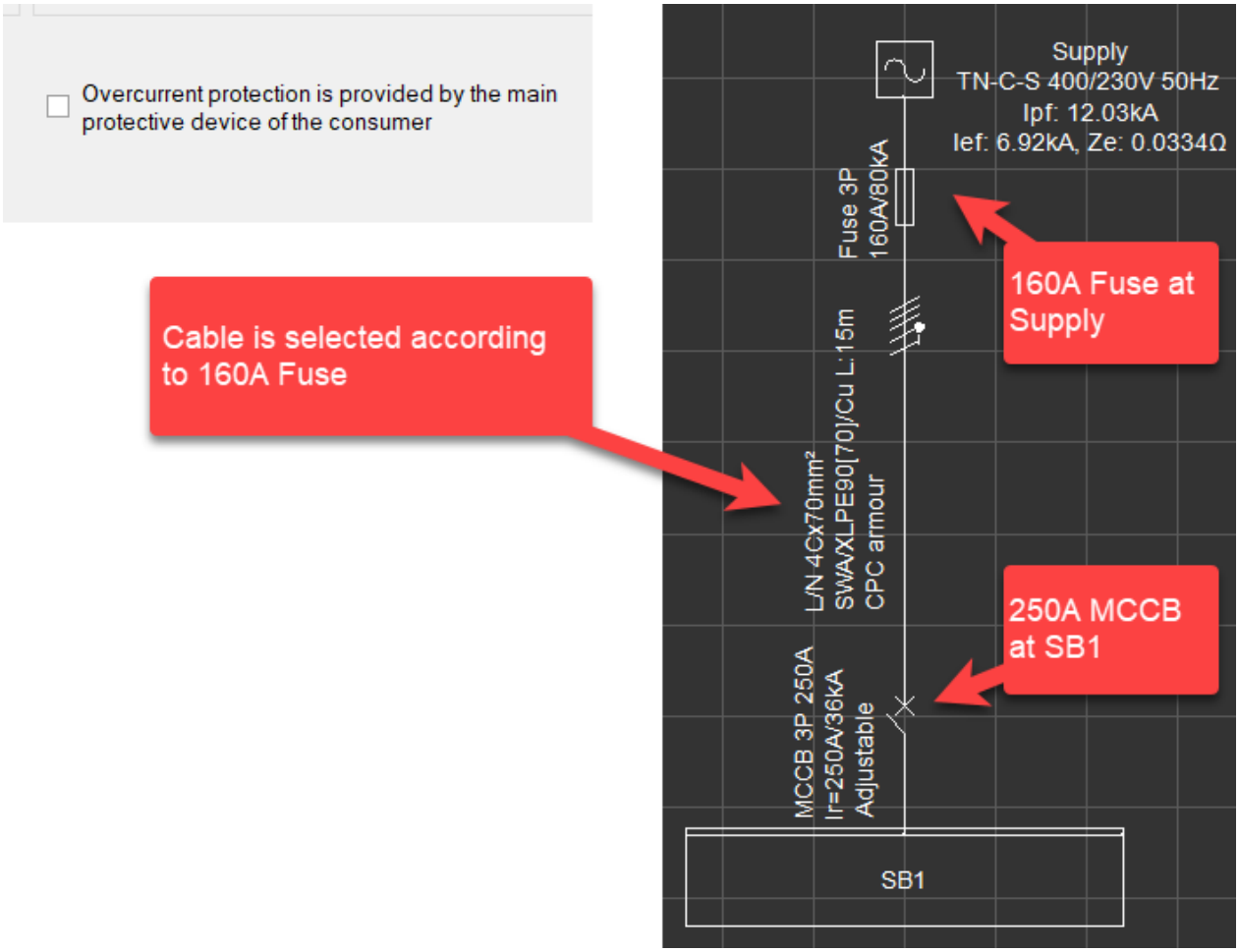
Show symbols section is used to set these components described above on the schematic. If the tick box is ticked then the related symbol will be displayed on the schematic.

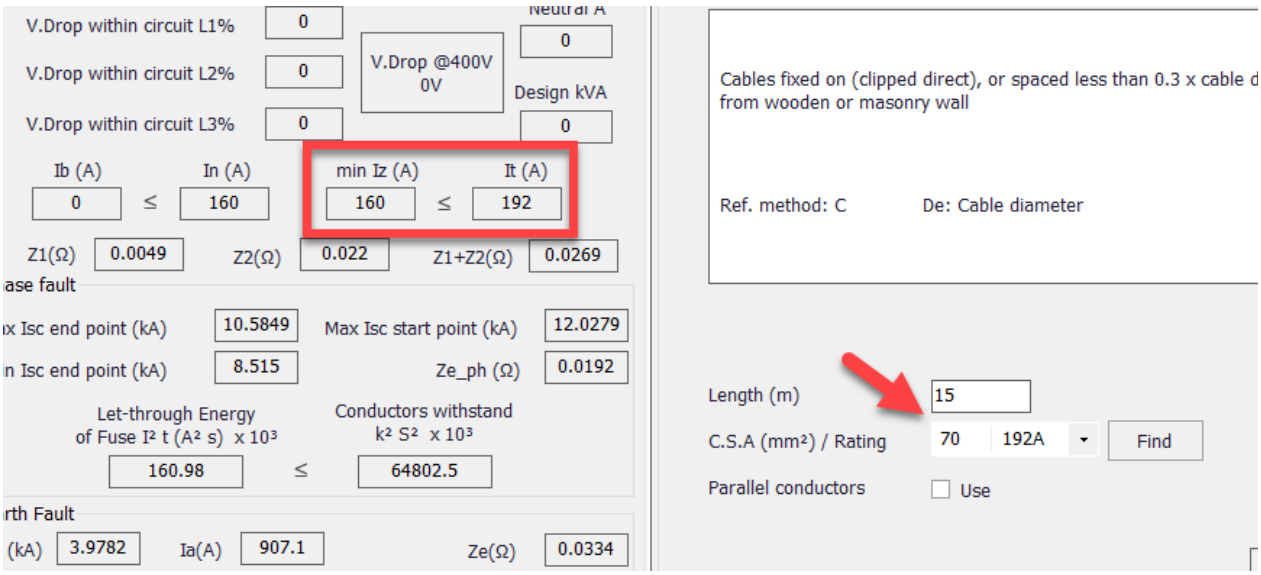


At the bottom right of the LV Protective device tab, a tick box is available to set ElectricalOM to consider incomer protective device instead of the supply protective device to base relevant calculations. This option is ticked if the *Method of supply* is set to *Transformer* by default.

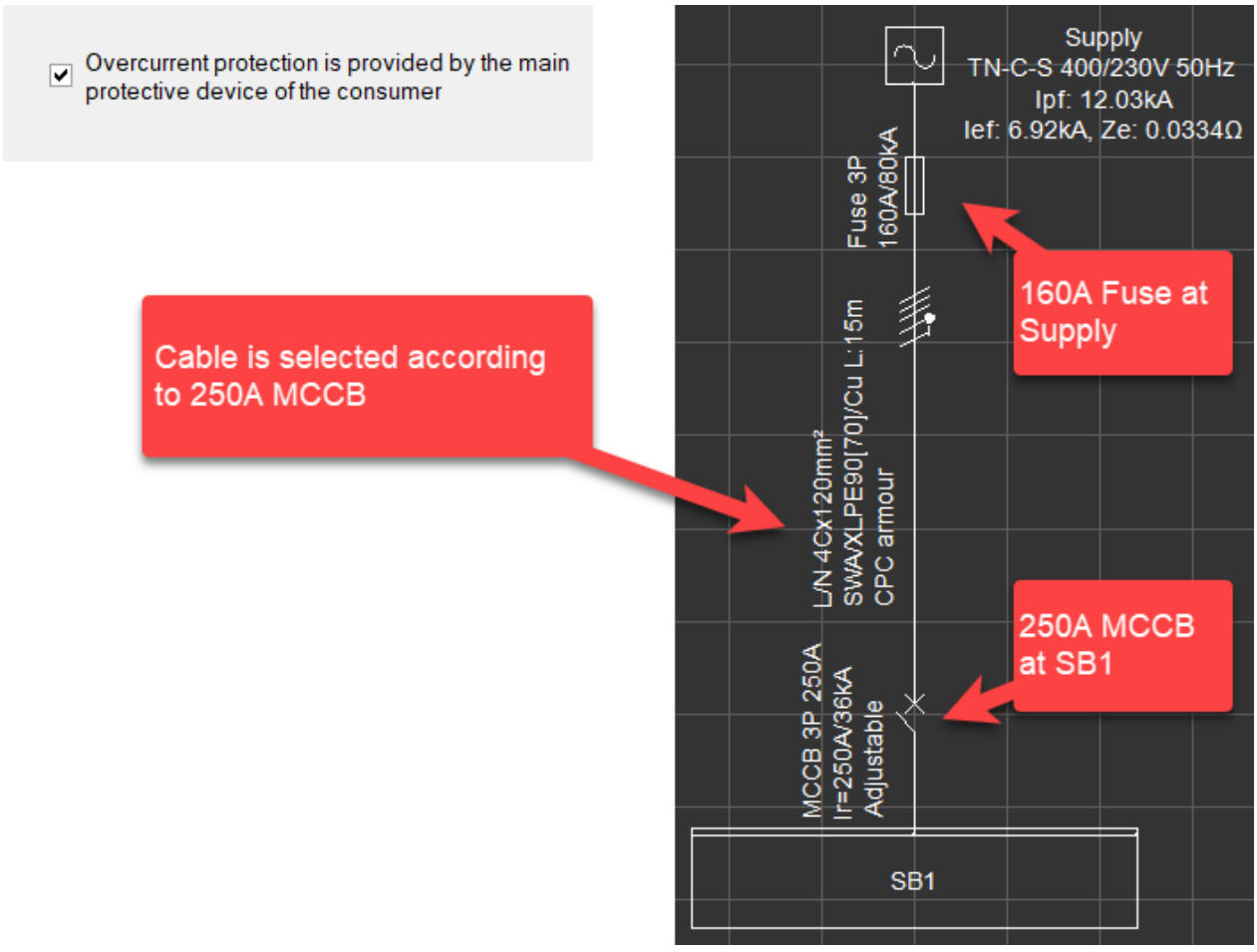


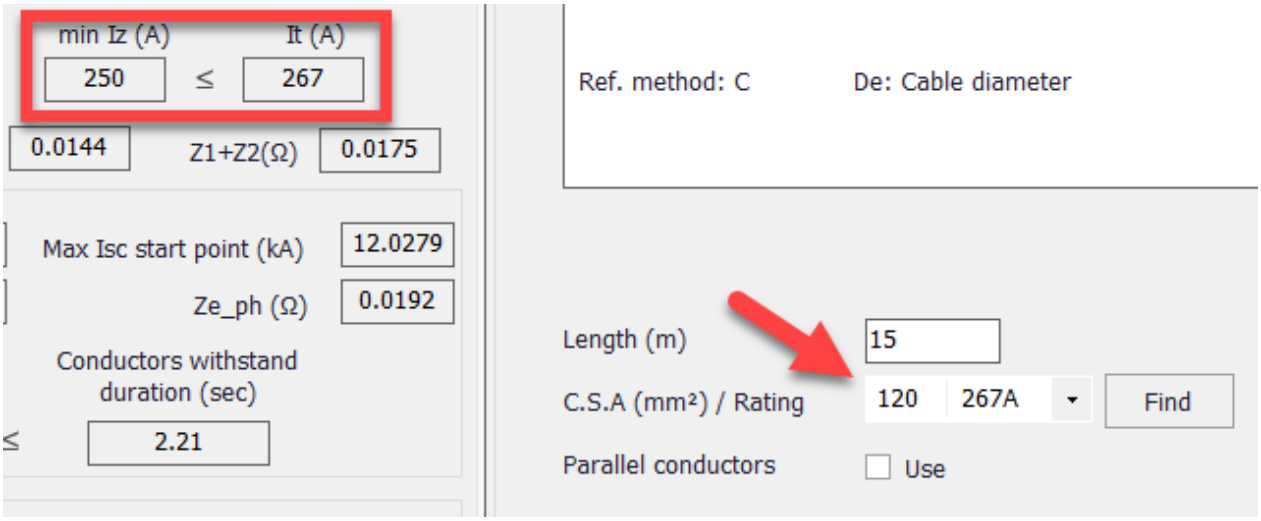
Just to make this clear, consider the case below which has a 160A fuse at supply and a 250A MCCB as an incomer to SB1.



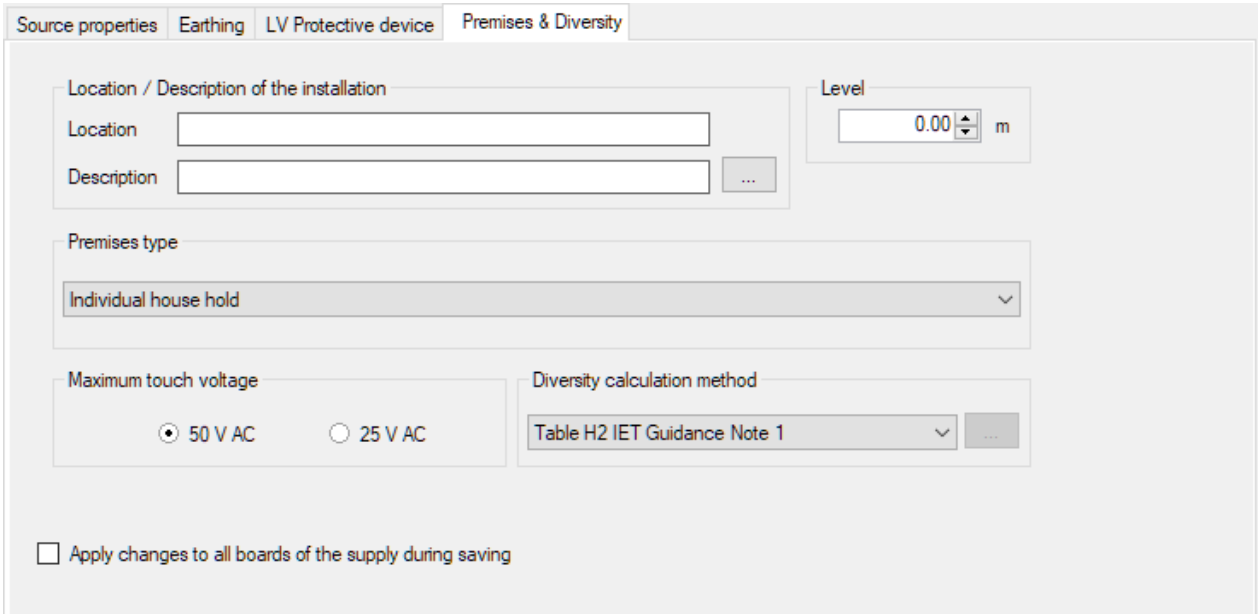


Now consider the case where the box is ticked.

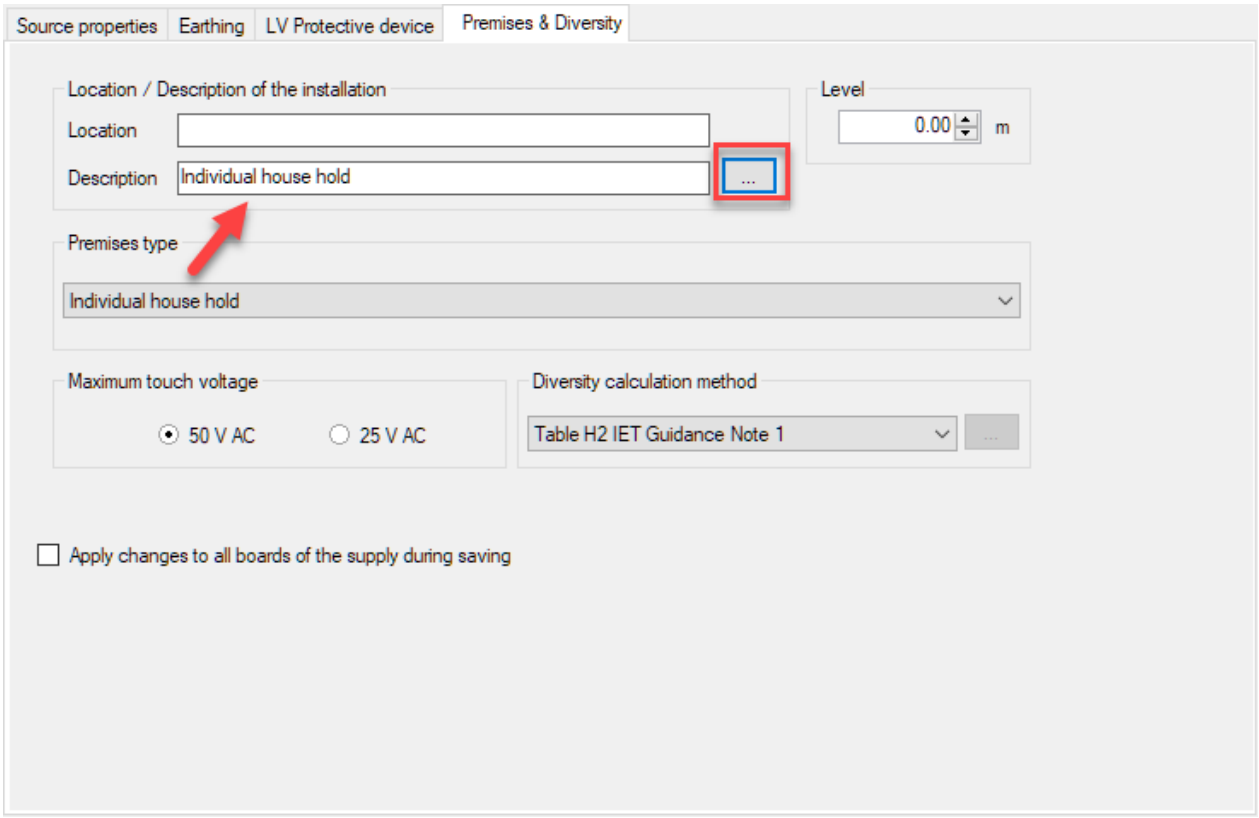

Overcurrent protection is provided by the main protective device of the consumer
Supply
TN-C-S 400/230V 50Hz
Ipf: 12.03kA
Ief: 6.92kA, Ze: 0.0334Ω
Fuse 3P 160A/80kA
160A Fuse at Supply
Cable is selected according to 250A MCCB
L/N 4Cx120mm² SWA/XLPE90[70]/Cu L:15m CPC armour
250A MCCB at SB1
MCCB 3P 250A Ir=250A/36kA Adjustable
SB1


min Iz (A)
It (A)
250
≤
267
0.0144
Z1+Z2(Ω)
0.0175
Max Isc start point (kA)
12.0279
Ze_ph (Ω)
0.0192
Conductors withstand duration (sec)
≤
2.21
Ref. method: C
De: Cable diameter
Length (m)
15
C.S.A (mm²) / Rating
120
267A
Find
Parallel conductors
Use

Premises & Diversity Tab

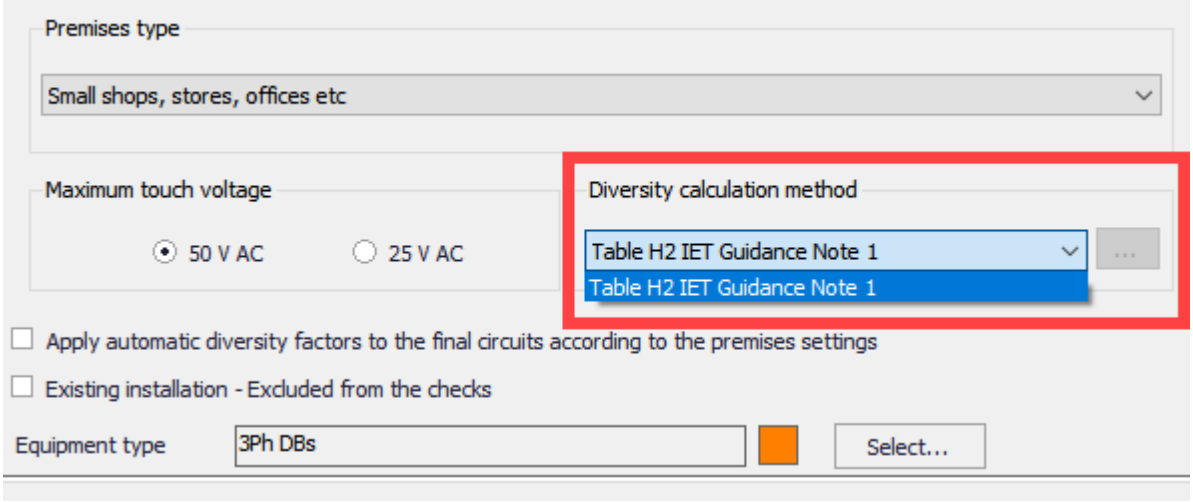


The user may like to define a location and a description associated with the source by typing in the text boxes next to each option. It is also possible to define a level either by typing in a value or using the up and down arrow buttons. If the three dots box is clicked, then the Premises type will automatically copied to the Description text box.

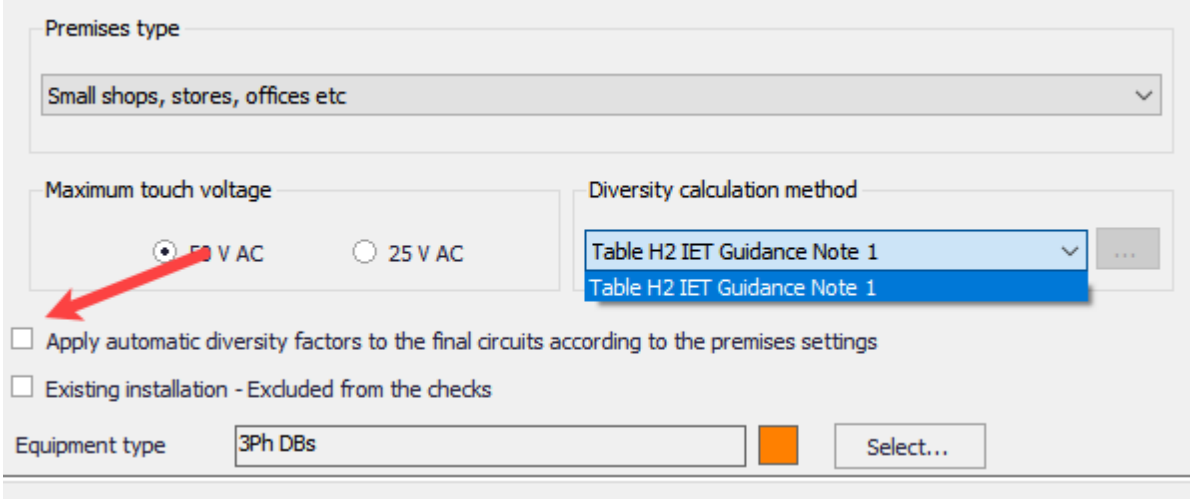


ElectricalOM can apply diversity factors to the project according to the user's settings. Premises type can

be set by means of the drop down list. After defining a premises type, the user may select a calculation method for diversity, however, only option is IET's Guidance Note 1 Table H2 at the moment using the drop down list, *Diversity calculation method*.



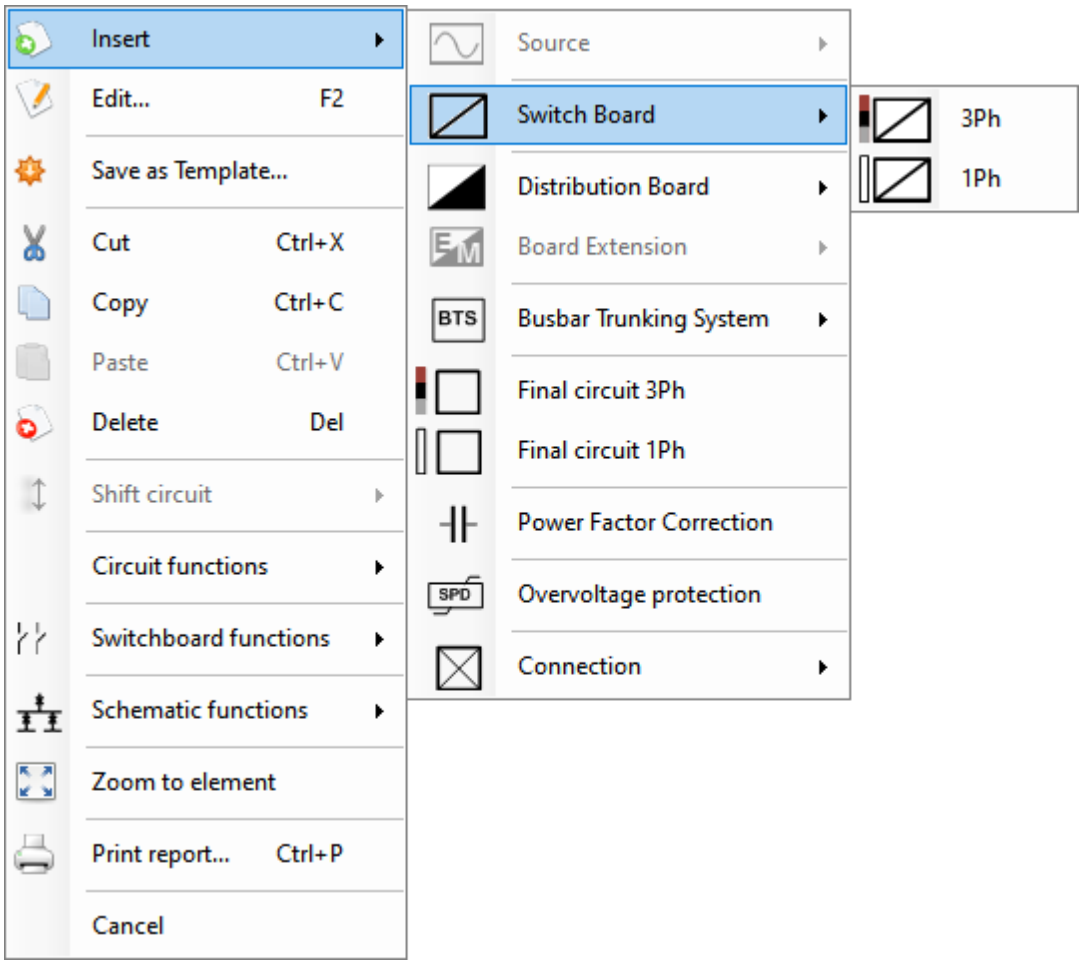
Once these two options are set, the user may enable the *Apply changes to all boards of the supply during saving* options and so let ElectrcialOM to apply the set premises type parameters to all boards supplied from the selected source.

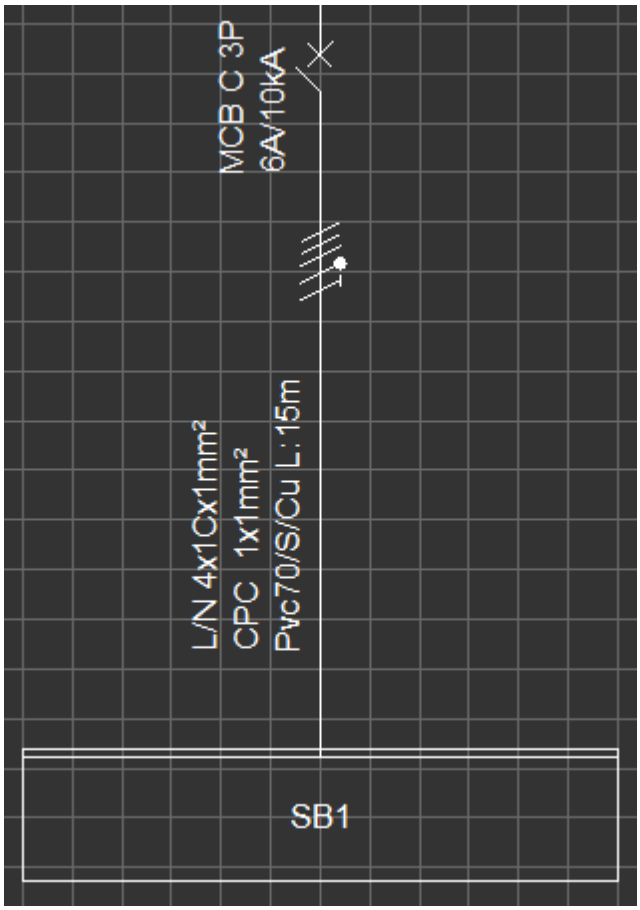


It is also possible to apply diversity factors individually to each board independently. Please refer to Other details Tab.

Switch Board

Switch Board component has two options, 3Ph and 1Ph. If the user tries to insert a switch board immediately after a three-phase source, then, only the 3Ph option will be available to select, otherwise both options are selectable.


Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Switchboard functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Source
Switch Board
Distribution Board
Board Extension
Busbar Trunking System
Final circuit 3Ph
Final circuit 1Ph
Power Factor Correction
Overvoltage protection
Connection
3Ph
1Ph


MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L: 15m
SB1

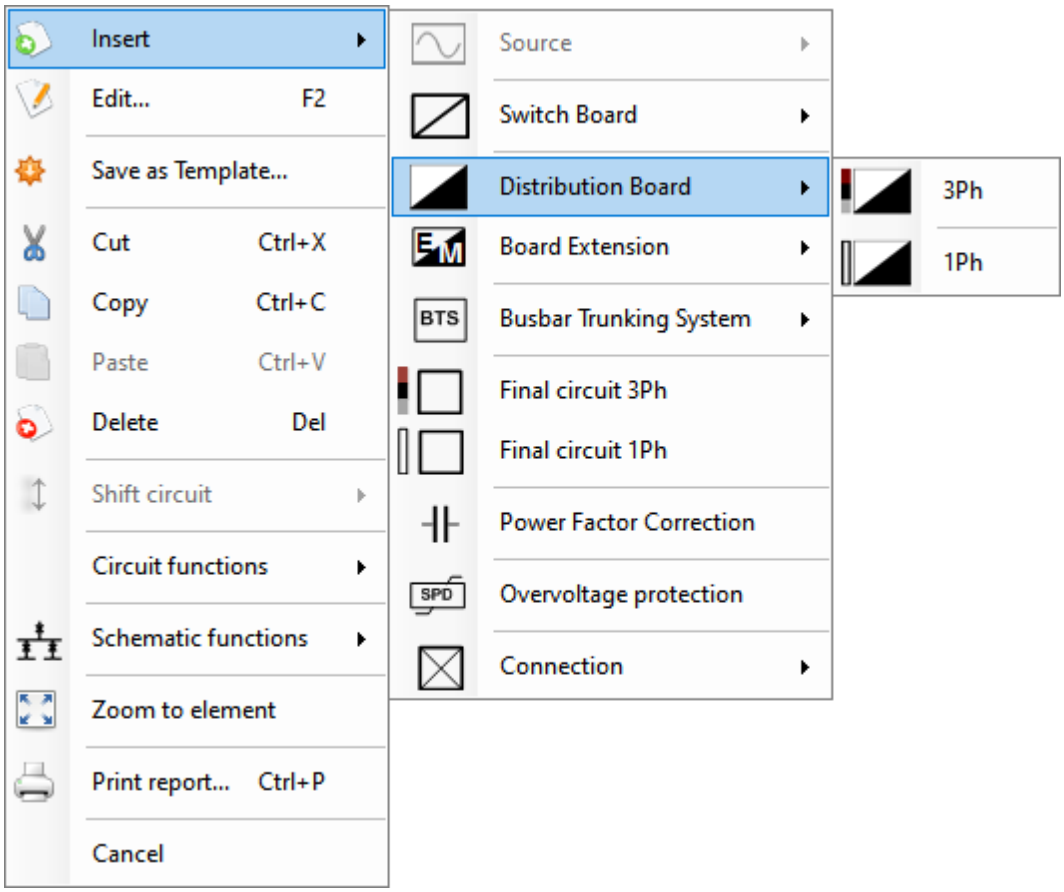
Any component can be added after a switchboard. In order to insert a component to a switch board, it must be selected first before using the *Insert* menu. The available components will automatically filtered depending on the switch board's phase setting, e.g. ElectricalOM will display only 1Ph components if a 1Ph switch board is selected, and display all of the components if a 3Ph switch board is selected.
Components added to a switch board will be added to L1 phase of the available way.

- If three phase components are added, the first component will be added to way no.1, second component will be added to way no.2 and so on.
- If single phase component are added, the first component will be added to L1 of the way no.1, second component will be added to L1 of the way no.2, and so on.
- If a single phase component is added, this will be added to L1 of the way no.1, and if a three phase component is added after this single phase component, then, that will be inserted to L1-L2-L3 of the way no.2 and L2 and L3 of way no.1 will be skipped.

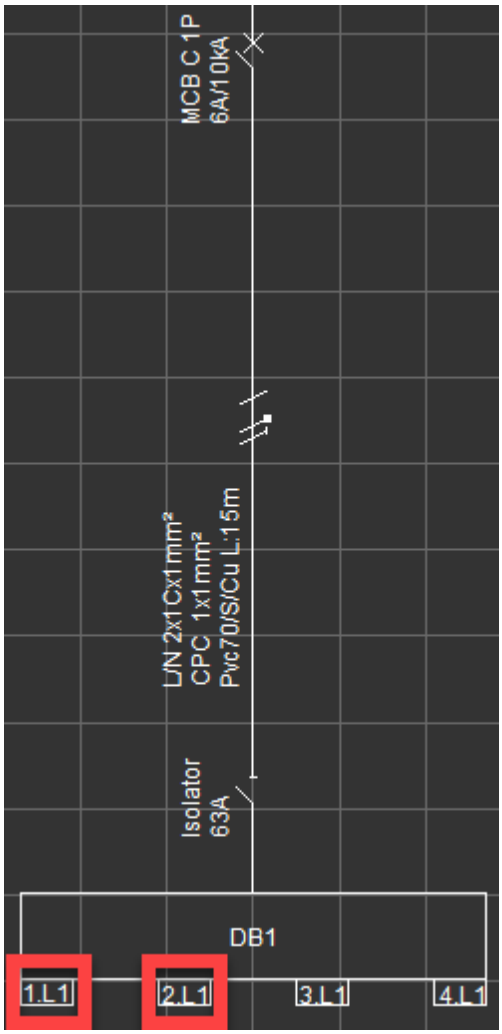
In order to move circuits, Circuit Edit module needs to be used, see *Phase* in Circuit Edit Module Tab section.
Other features associated with the *Switch Board* component are the *multiple source connection* and the *coupling*. For more details about these features, please refer to Switchboard Functions Menu section.

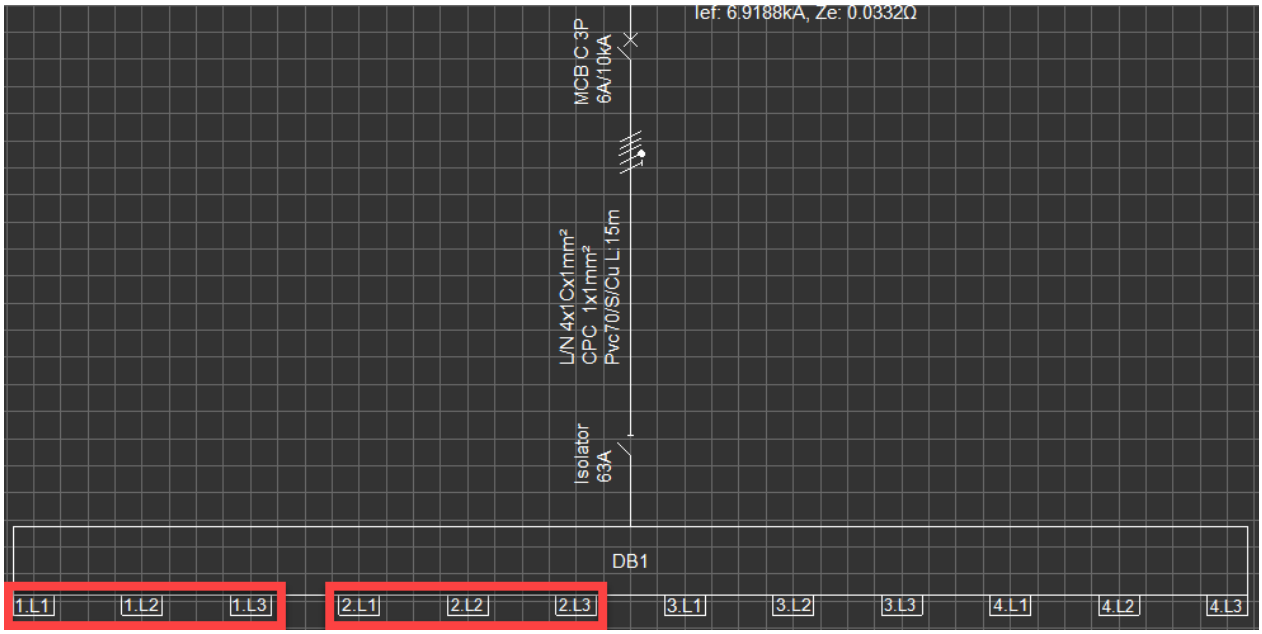
Distribution Board

*Distribution Boar*d is very similar to a *Switchboard.* It has two options as 3Ph and 1Ph, however, if a distribution board is going to be placed immediately after a three-phase source, then, only the 3Ph option will be available to select.



Unlike a *Switch Board*, a *Distribution Board* will have teeth indicating each way of distribution. Each tooth will correspond to one single phase. For example, first way of of a single-phase DB is marked as 1.L1 and second way is marked as 2.L1 and so on. If a three-phase DB is used, then, the first way (3Ph) will be indicated by three teeth marked as 1.L1, 1.L2, and, 1.L3 by default. If phase prefixes are modified by the user, then, the modified prefixes will be used instead of L1/L2/L3. See Project info and options... Menu section.



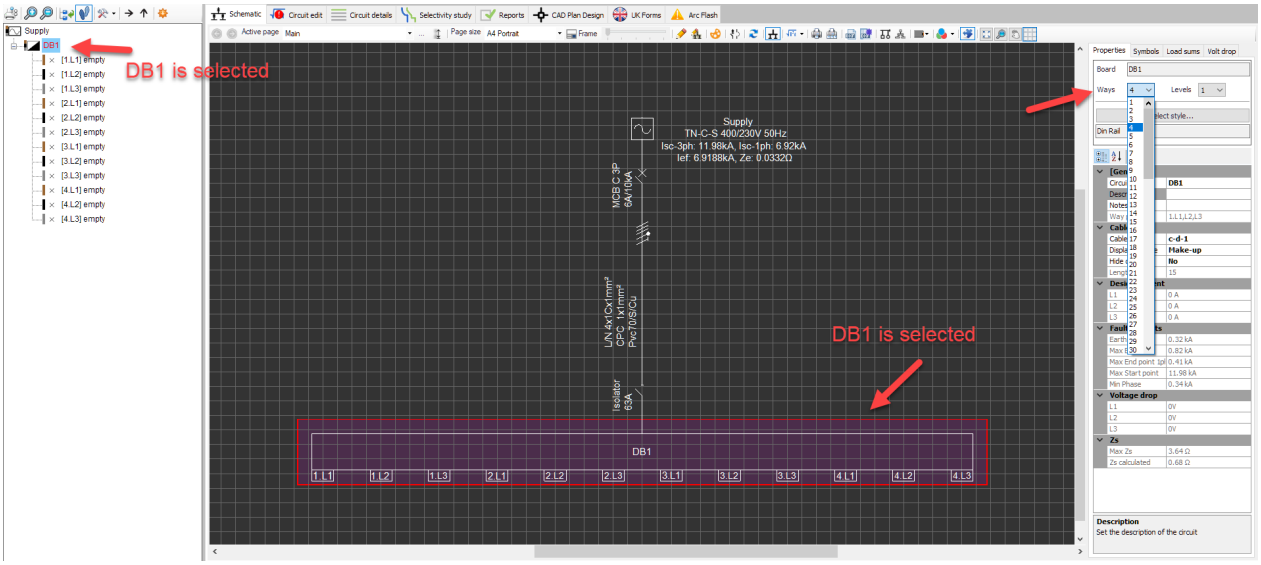


Distribution boards will shift the number of ways as the user adds new circuits e.g. first circuit will be placed on 1.L1 and the second on 1.L2 in a single phase case. In order to move circuits between ways, the user needs to either use copy/cut/paste options from the *Schematics Module*'s drawing area or use the drag and

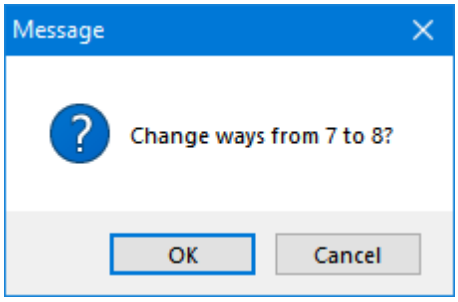
drop feature from the System Tree Section, see *Drag and Drop* under Actions Menu (Right Click Menu) section.

The number of ways of a Distribution Board component can be adjusted by the user from the *Schematics Module*'s *Side Panel*. The user can follow the steps detailed below:

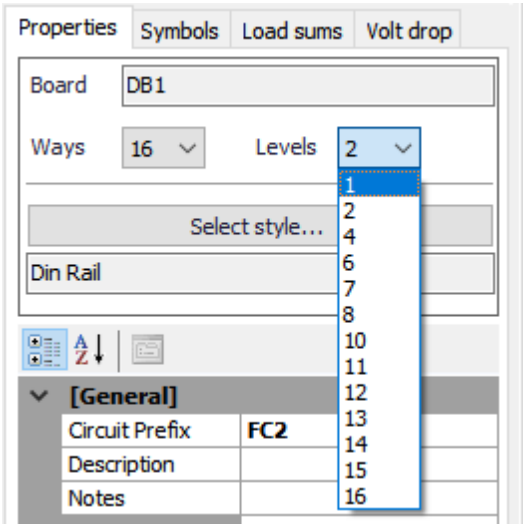
- Select the DB required to be modified either by highlighting it directly on Schematic Module's drawing area or by selecting it on System Tree section first and then selecting the Schematic module tab.
- Then modify the number of ways by selecting a number from the *Ways* drop down list located under *Properties* tab.



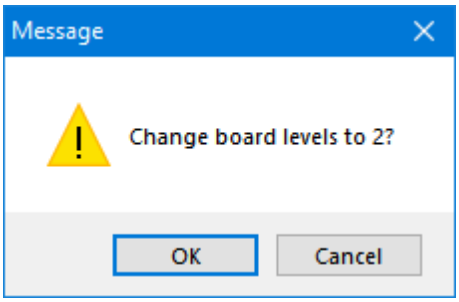
Once a different number selected, ElectrcialOM will ask the user to approve the selection with a message window.



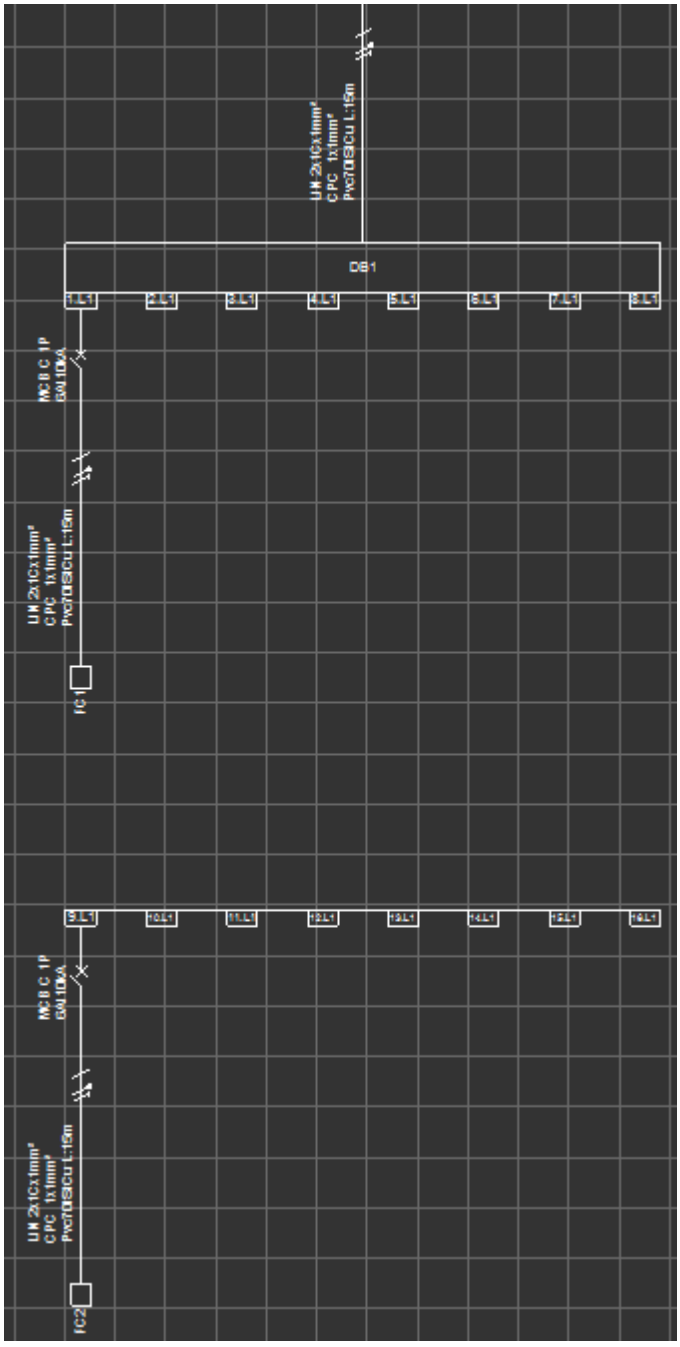
Distribution Boards have another feature called *Levels*. A levelled representation of a DB might help the user to use the space efficiently to create better looking schematic printouts. To modify the level number of a DB, a multiple way DB must have been selected previously, then, selecting a number from the *Levels* drop down list which is located under *Properties* tab of the Schematic Module.



Once a different number selected, ElectrcialOM will ask the user to approve the selection with a message window.



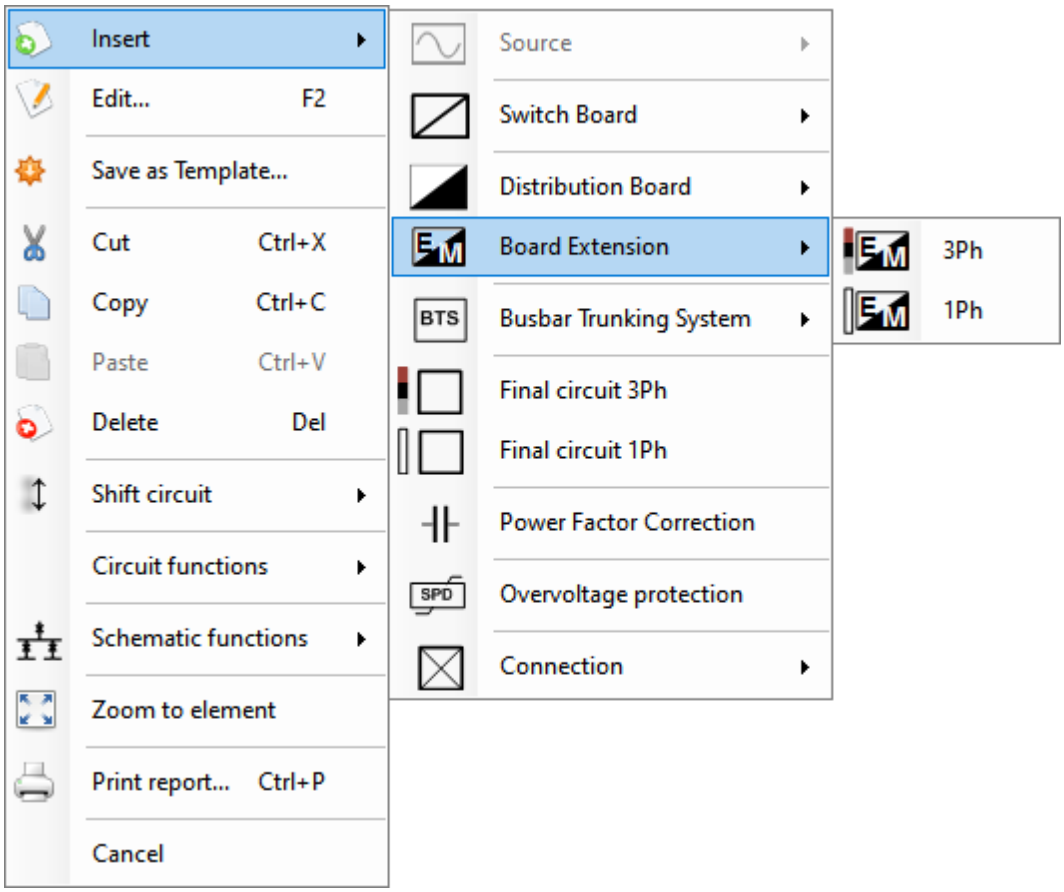
Once a number other than 1 is selected, the highlighted DB will be shown as a levelled DB.



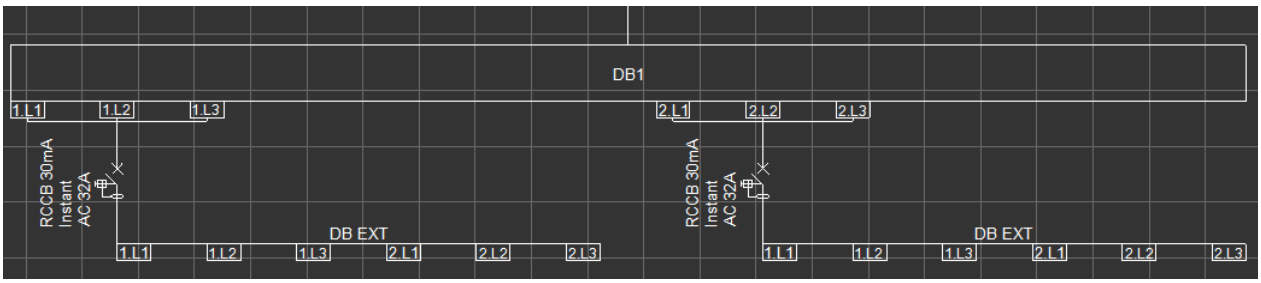
Distribution board representation can be changed to suit the user's needs. Please refer to Schematic Module Side Panel section for details. Distribution Board component allow the user to model a split load distribution board by means of Board Extension component, please see the relative section.

Board Extension

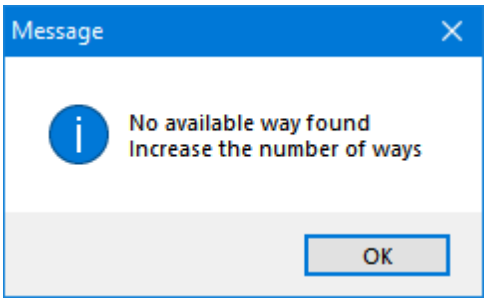
Board Extension is useful when the user wants to model a split load board where circuits are split into multiple groups which have their of protective devices. This sub menu offers a 3Ph and a 1Ph option where the 3Ph option is not available if dealing with a single-phase board. It should be noted that this option is available for a *Distribution Board* only and not for a *Switch Board*.



In order to create an extension, the user will either rick click on a distribution board directly from *Schematic Module* or *System Tree* section or select a distribution board and use the *Actions* menu. ElectrcialOM will create an extension using an AC type, 32A, RCCB rated at 30mA instant by default.



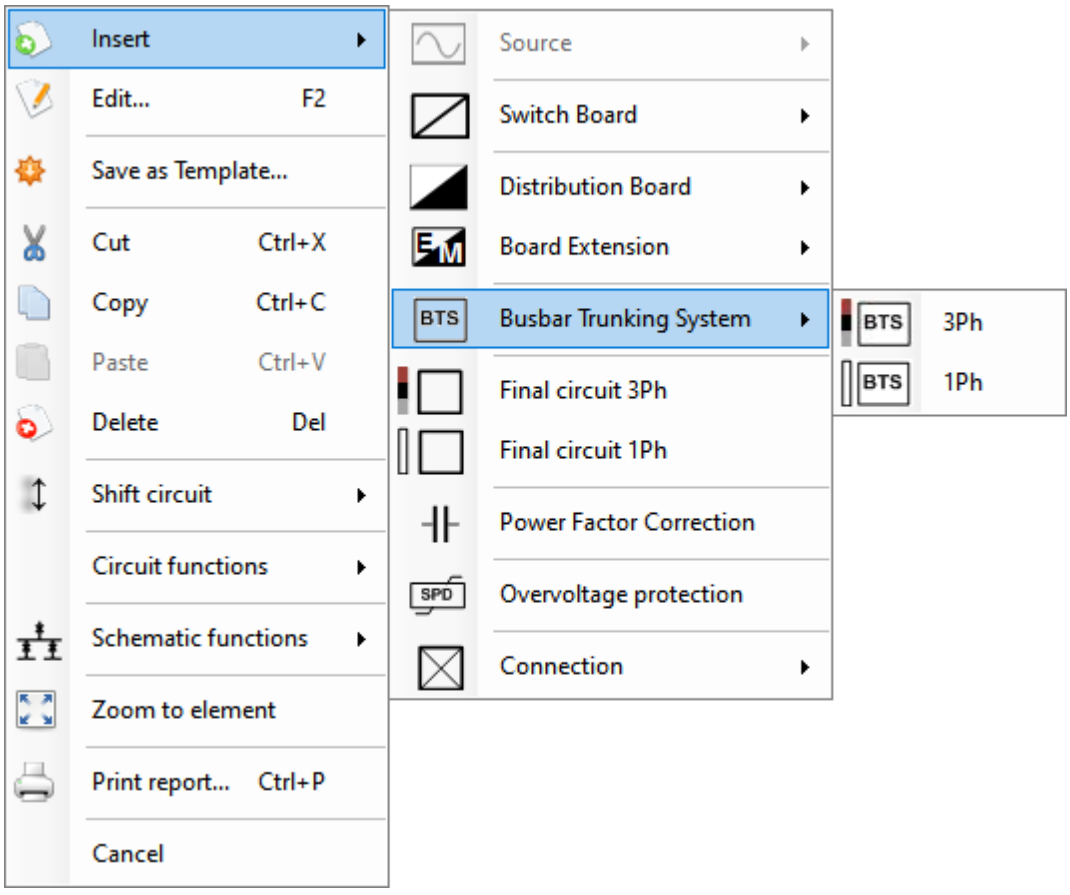
There is no limit how many *Board Extensions* can be used, however, the number of ways of the distribution board may need increasing to accommodate new extensions. If the DB does not have enough ways to accommodate the extension, ElectrcialOM will warn the user to modify the number of ways.



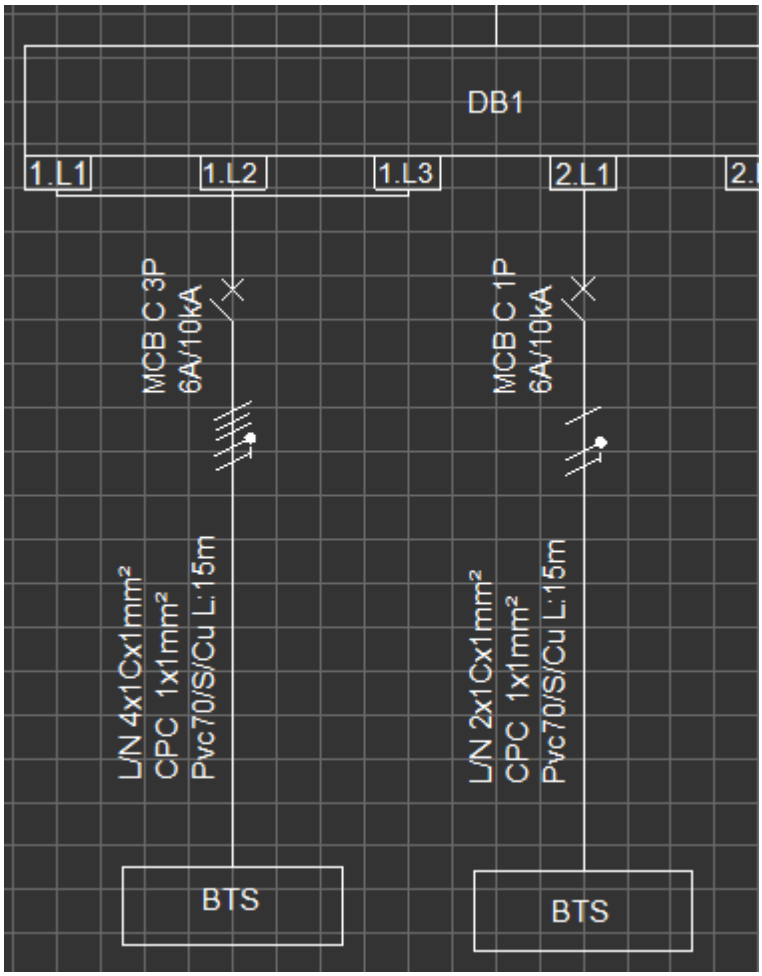
Number of ways of a *Board Extension* can also be altered in the same way as described in Distribution Board section. The user should select the *Board Extension* first and follow the same procedure.

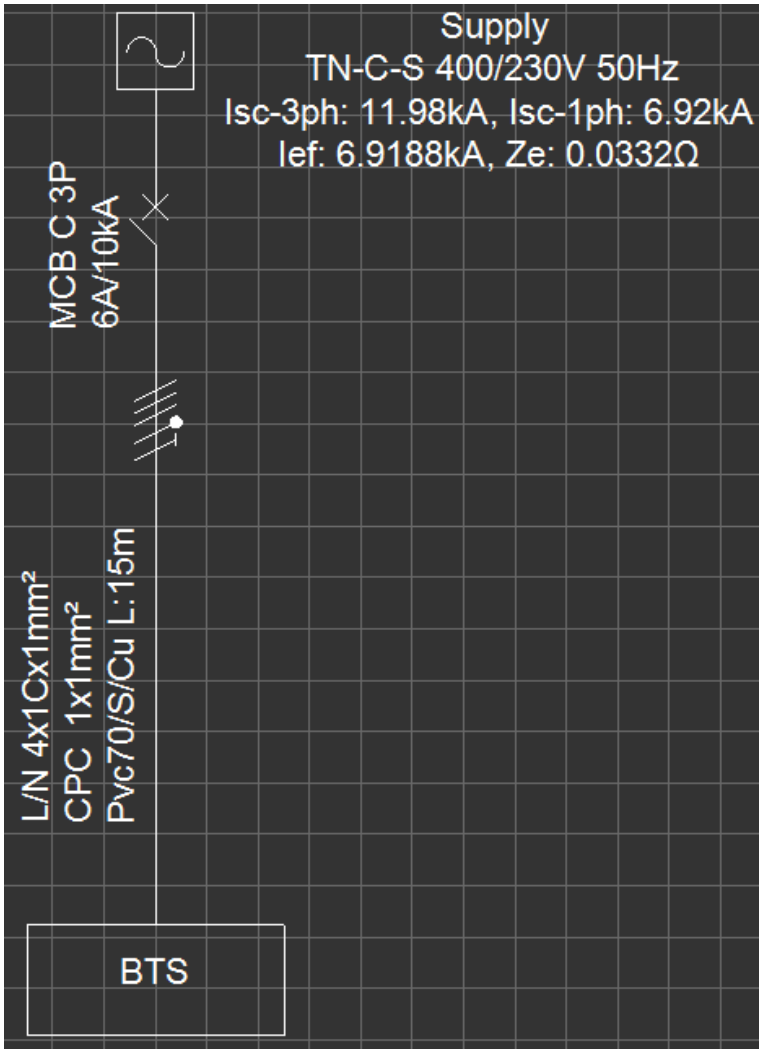
Busbar Trunking System

ElectricalOM is capable of modelling busbar trunking systems as well. As usual, ElectricalOM has a three-phase and a single-phase option. A BTS can be inserted directly to a Source.

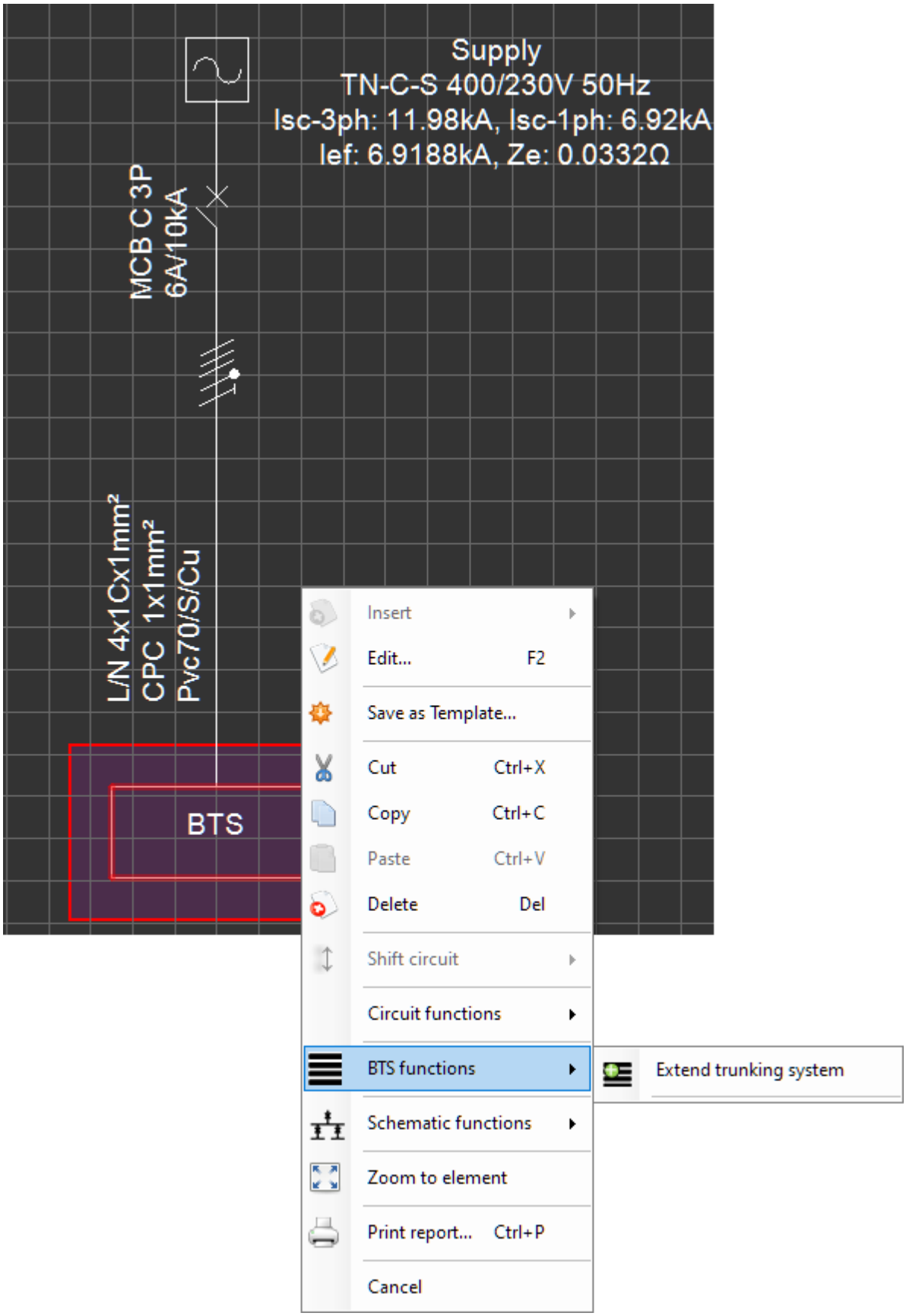


Busbar Trunking System will start with a BTS box which represents the main connection point to the busbar trunking system.


DB1
1.L1
1.L2
1.L3
2.L1
MCB C 3P
6A/10kA
MCB C 1P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
L/N 2x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
BTS
BTS

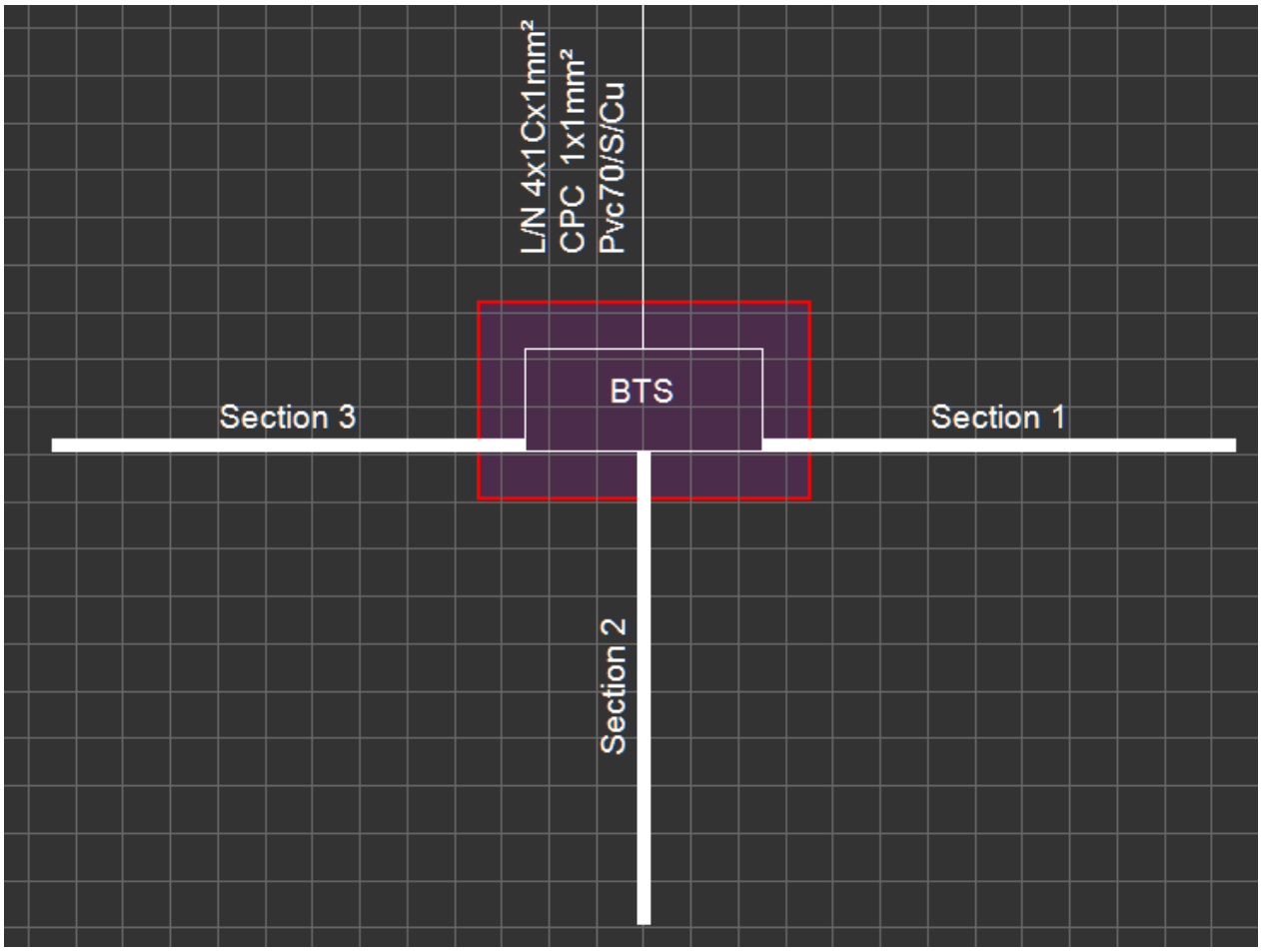


After a BTS is inserted, then, the *Busbar Trunking System* can be extended by the *BTS Functions* sub menu.

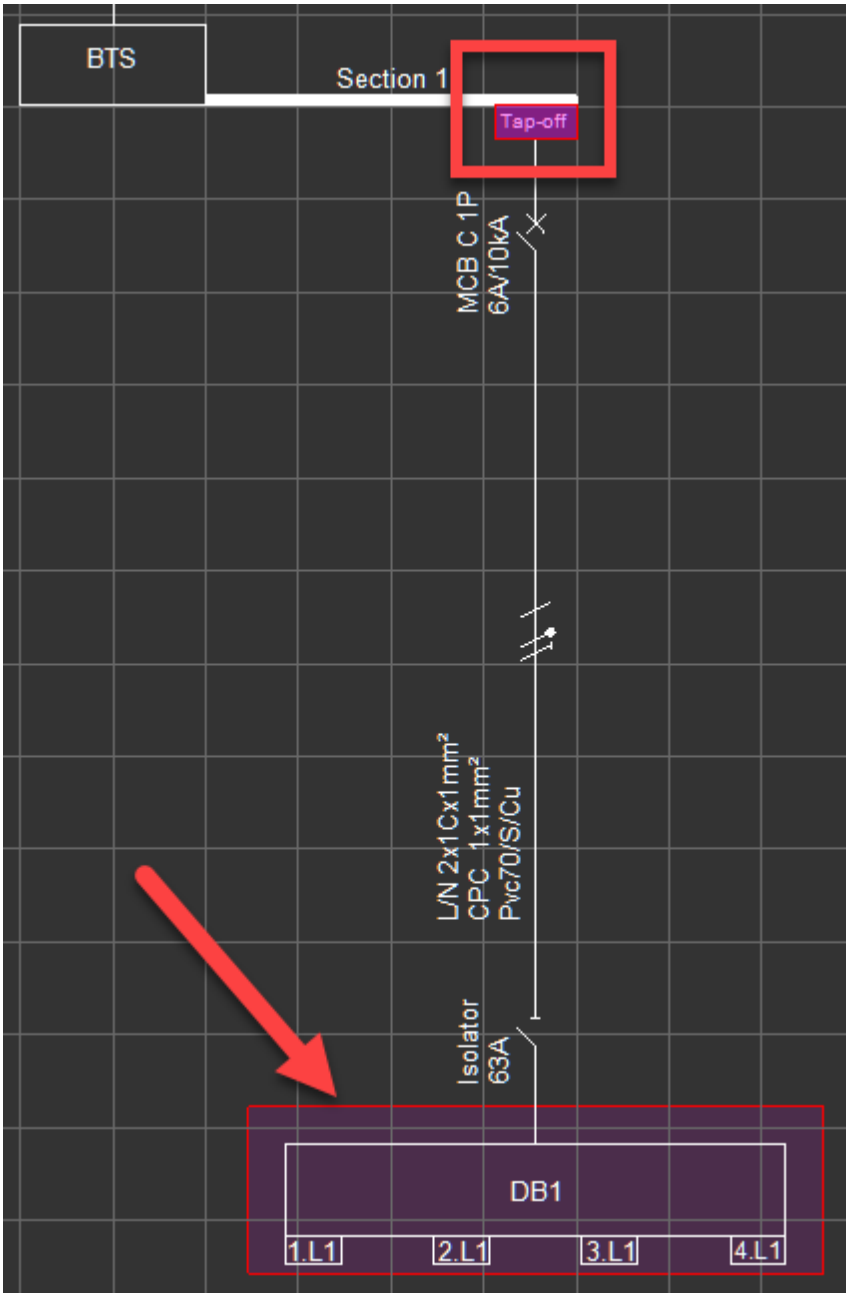


When the user selects *Extend trunking system* option, ElectrcialOM will display a solid bar which represents the busbar trunking and it will follow the mouse pointer until the user clicks on left mouse button to select an orientation for the busbar trunking section. A single busbar trunking system component can

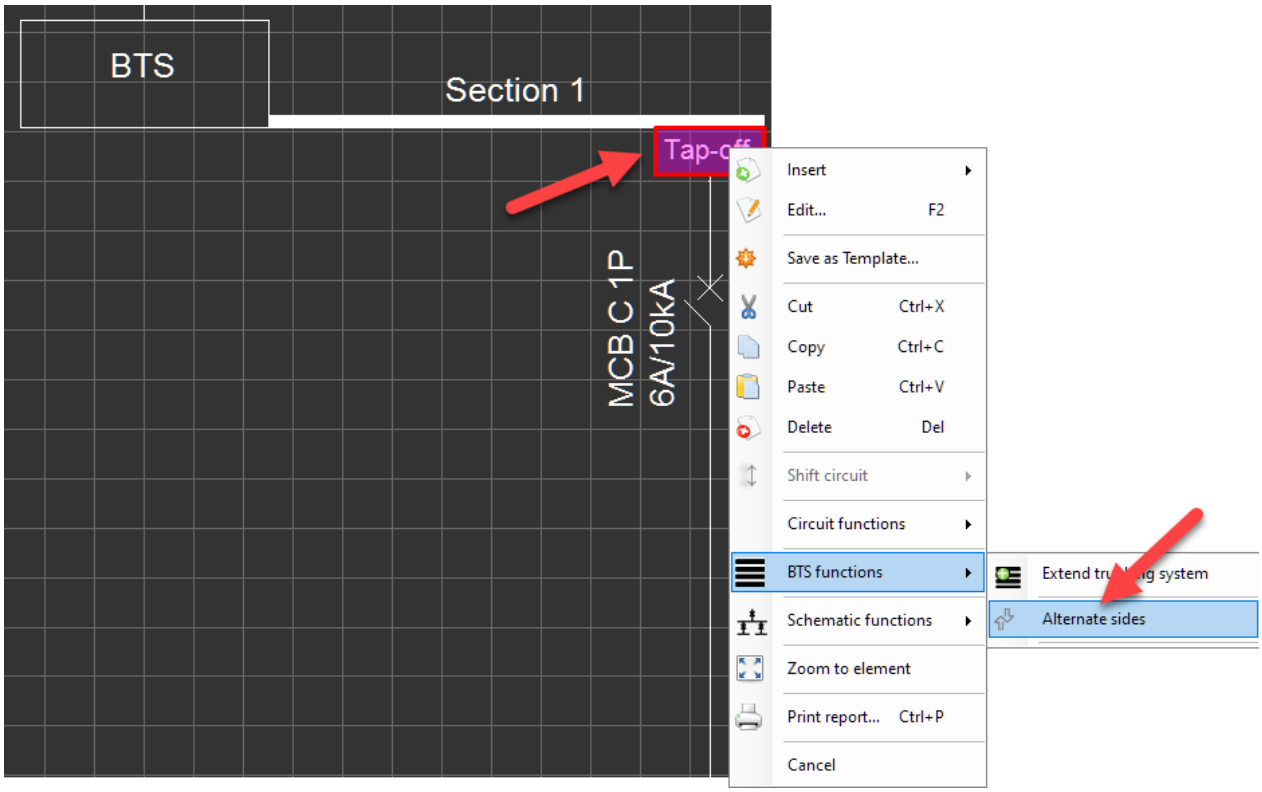
accommodate three busbar trunking connection.

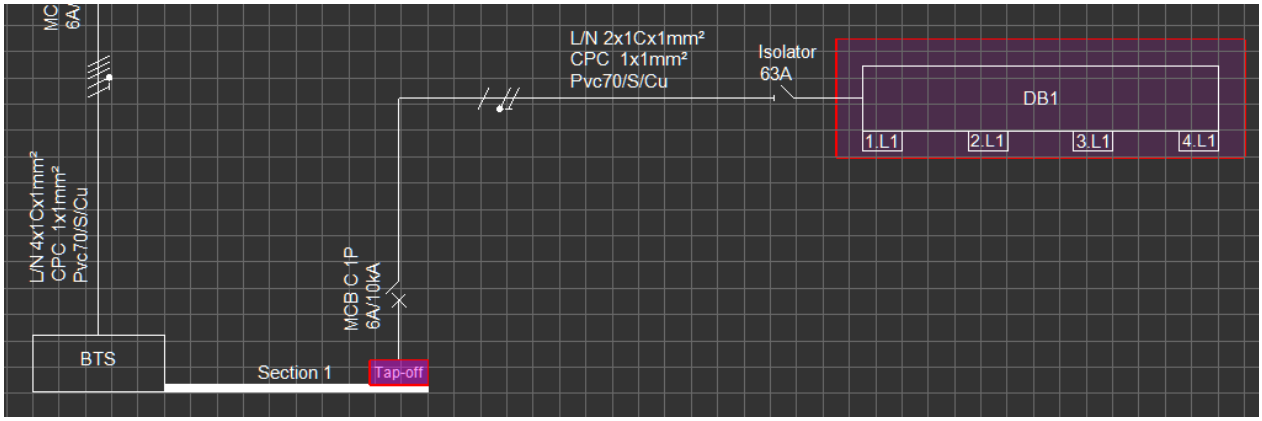


Each section of busbar trunking acts as a distribution node and Insert menu can be used to add components to be fed from the associated section. Inserting a component to a BTS section will create a Tap-off point.

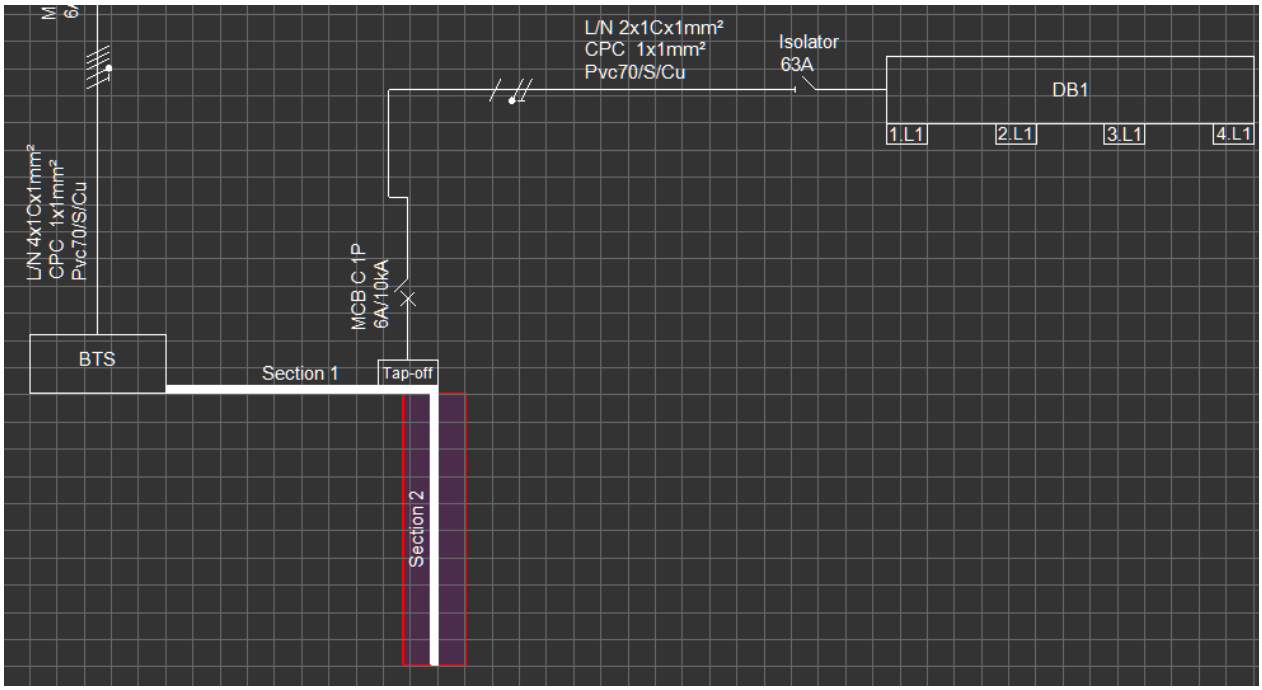


Tap-off point can be flipped to other side of the BTS section by right-click menu.

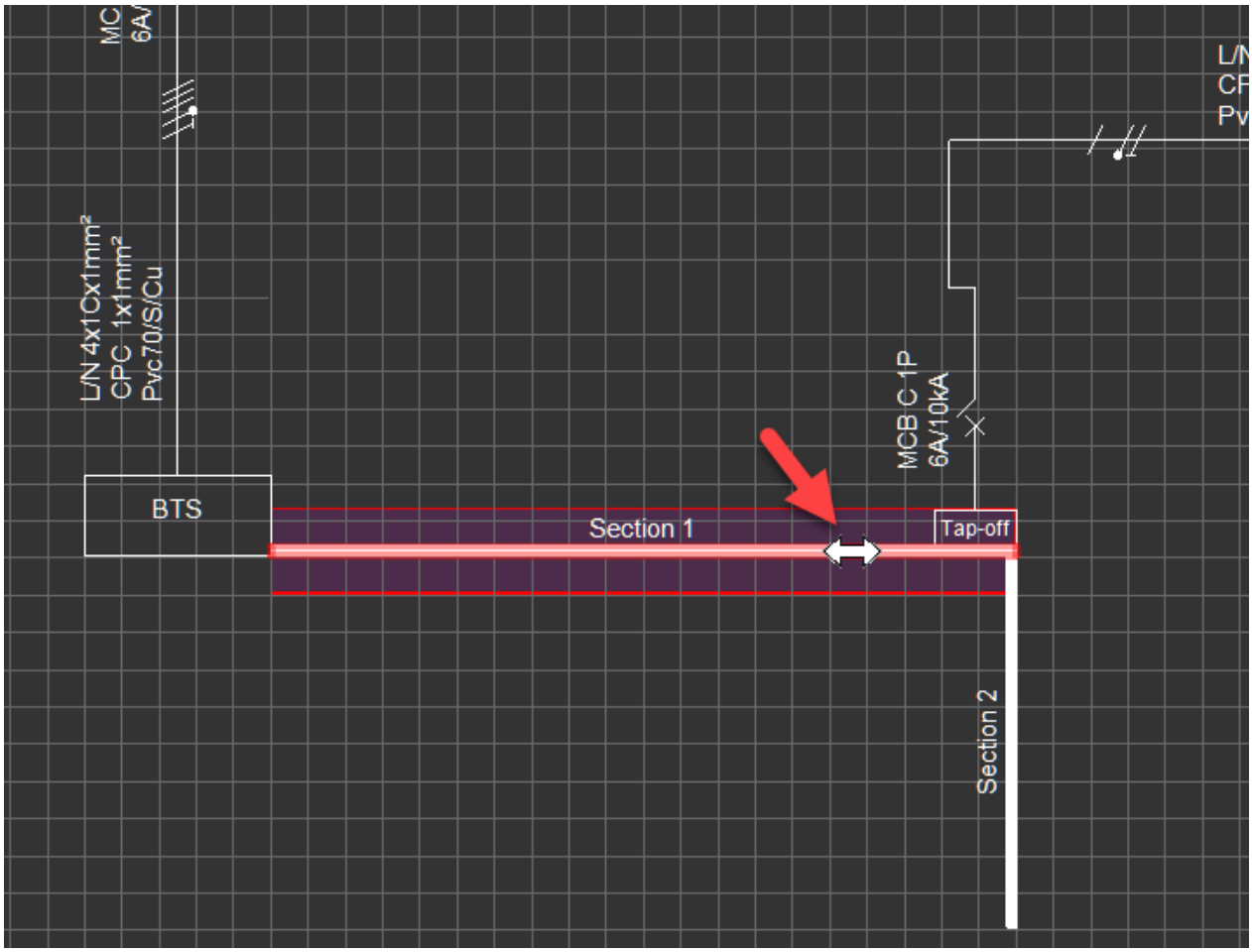




BTS functions menu can be used to add more sections too. First, the section the user would like to add a new section to needs to be selected, then, using the Extend trunking system option, a new section can be inserted. ElectricalOM will follow the mouse pointer for orientation and when left mouse button is clicked, the new section will be added.

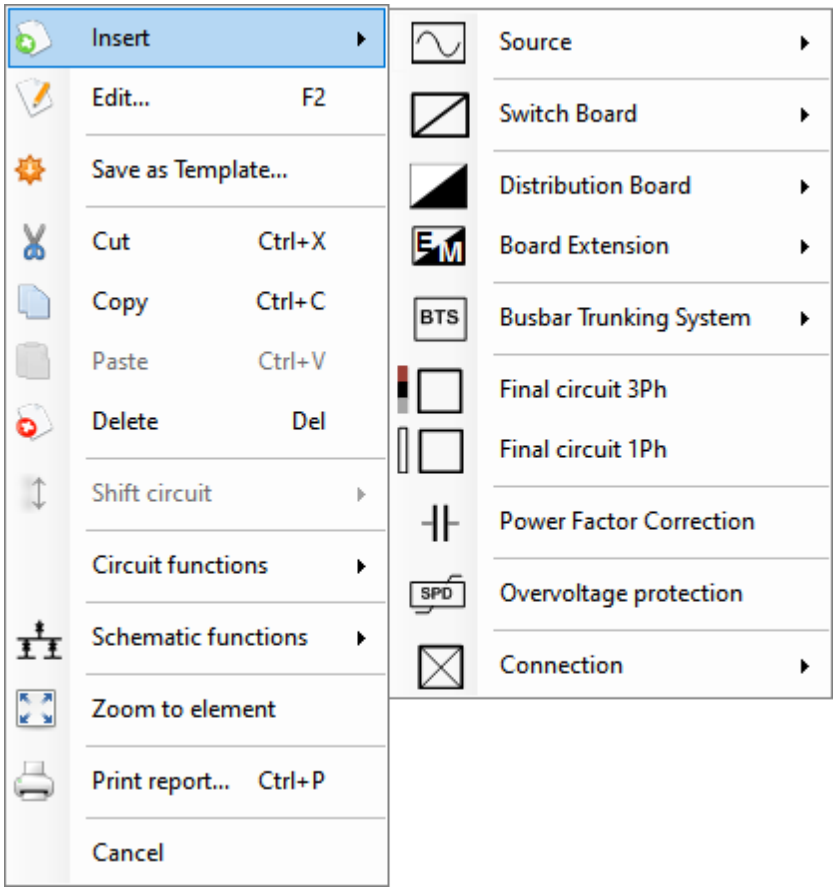


The user may also stretch or shrink the BTS section pieces by selecting the section first and then holding the left mouse button until a double sided arrow icon appears. Moving the mouse in desired direction while holding the left mouse button will stretch or shrink the BTS section. However, this action will not change the actual length of the section.

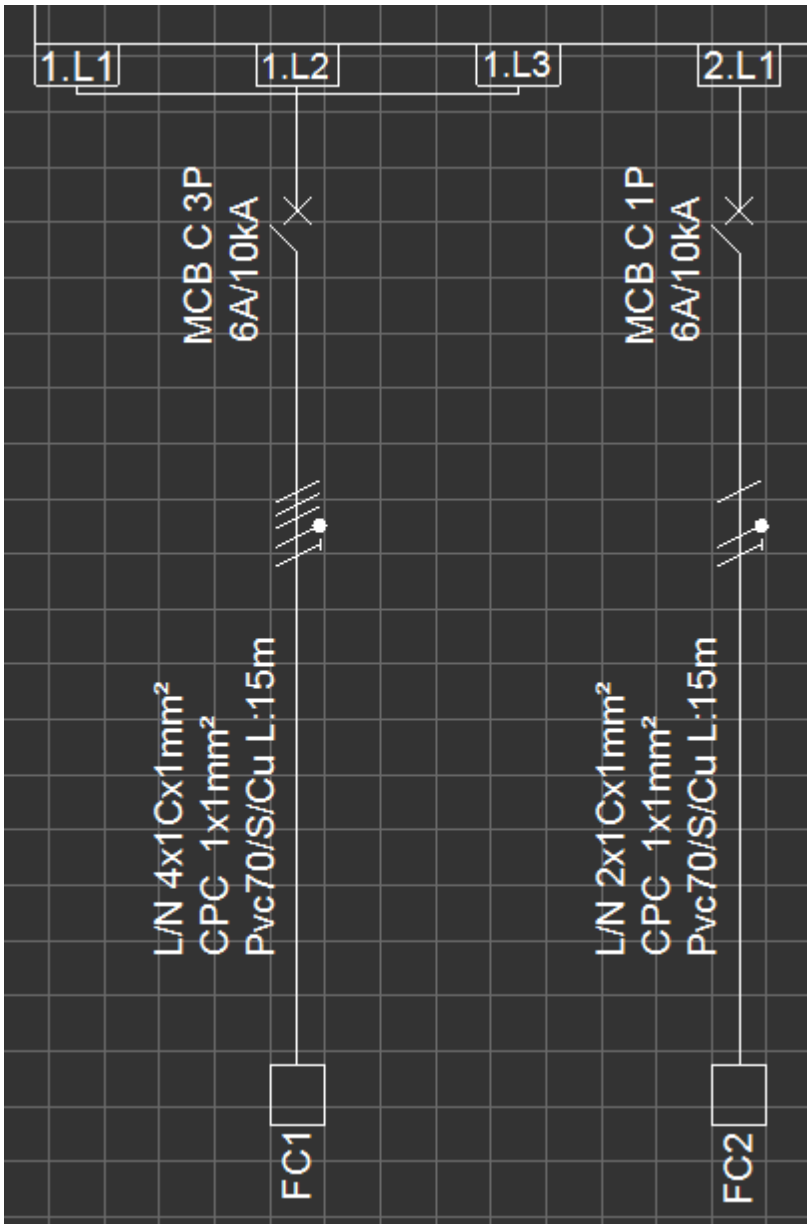


Final Circuits - 3Ph & 1Ph

Final circuits can be inserted by using *Insert* menu by selecting 3ph or 1Ph option.



When a final circuit inserted, it will be represented with a box and ElectricalOM will select the load type as "Other circuit 3Ph and N" for a three phase final circuit and "Other circuit" for a single phase final circuit by default. Also, the circuit will be tagged with a prefix FC following a number as default.

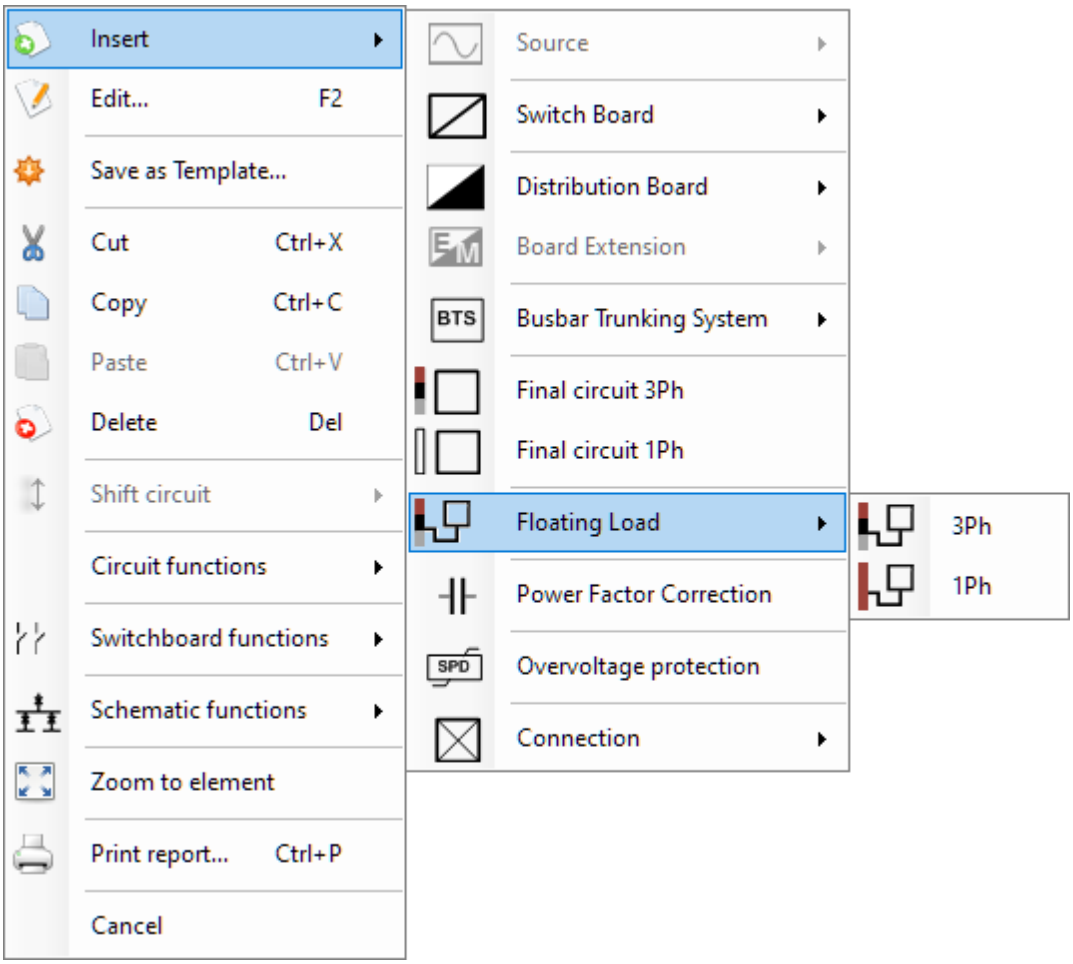


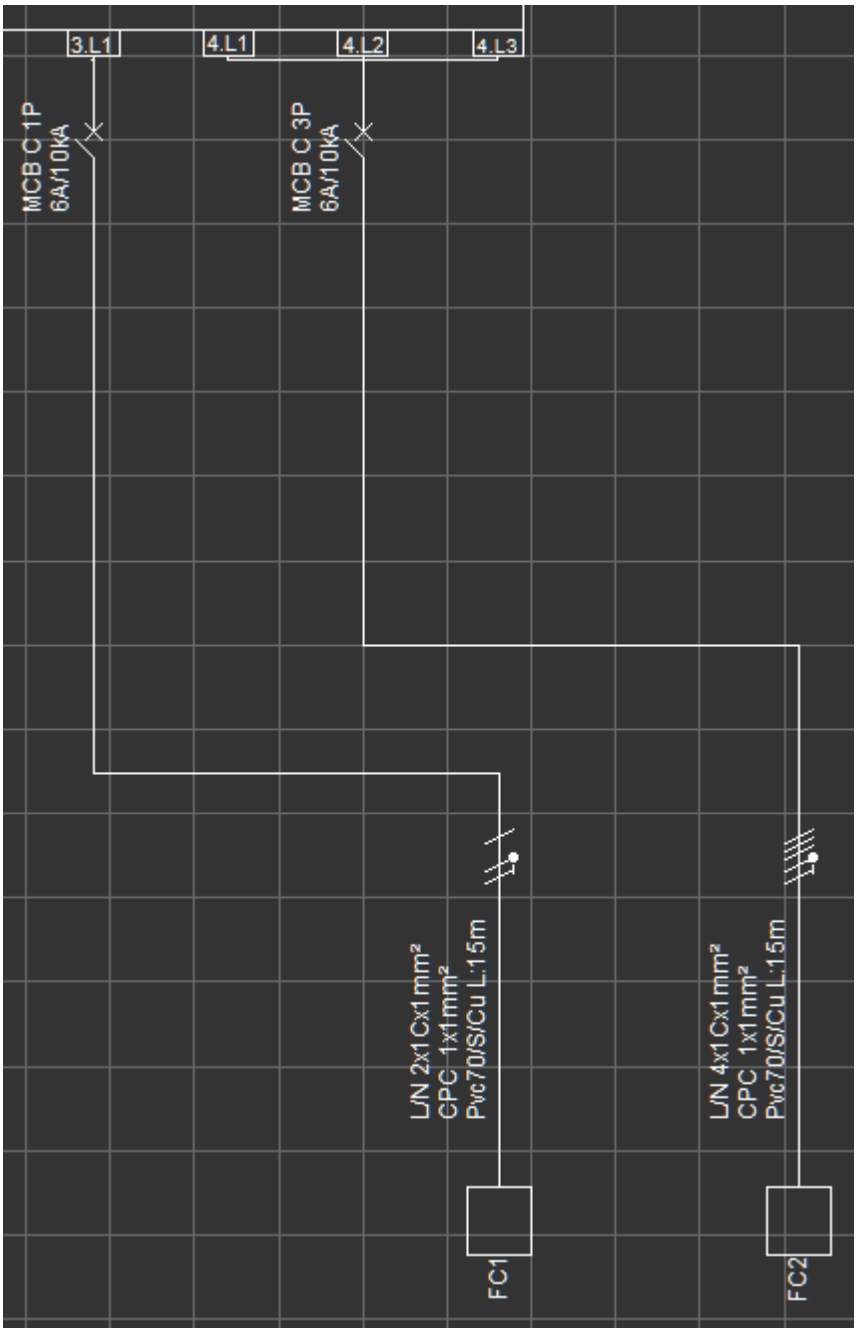
The user can edit the inserted final circuit by:

- double clicking on the circuit symbol within the *Schematics Tab*'s drawing area,
- double clicking on the circuit within the System Tree Section,
- selecting the circuit from either *Schematic Tab*'s drawing area, or *System Tree Section* and selecting the *Circuit edit* Tab.

Floating Load - 3Ph & 1Ph

A floating load is the same component as a final circuit except it can be dragged around the schematic. Please refer to Final Circuits - 3Ph & 1Ph section for details.

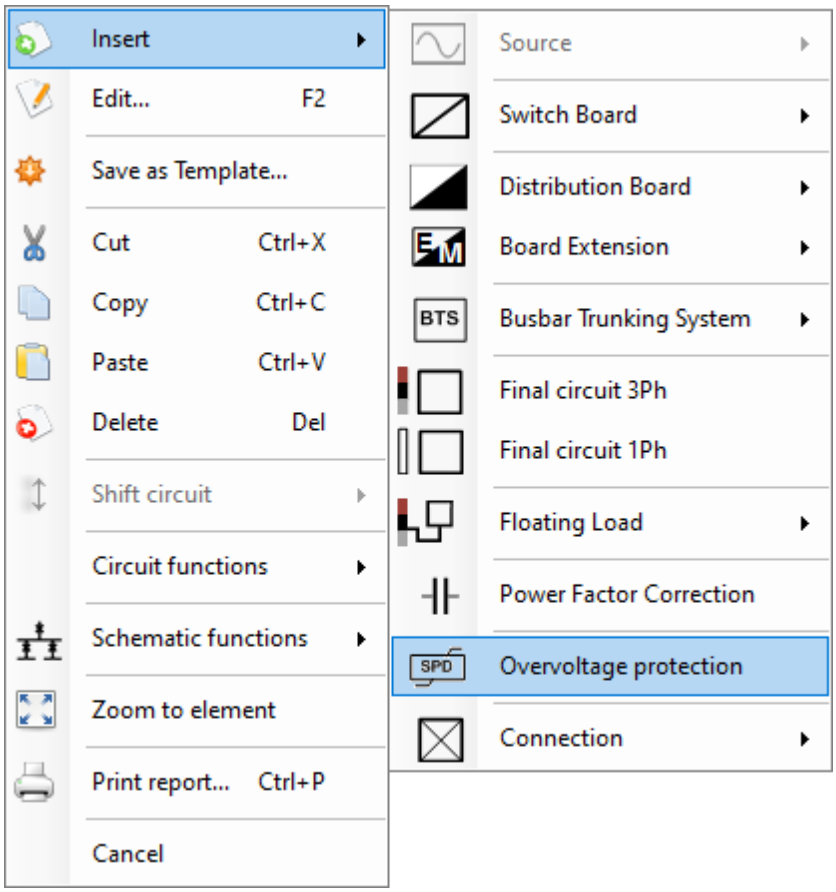

Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Switchboard functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Source
Switch Board
Distribution Board
Board Extension
BTS
Busbar Trunking System
Final circuit 3Ph
Final circuit 1Ph
Floating Load
Power Factor Correction
SPD
Overvoltage protection
Connection
3Ph
1Ph

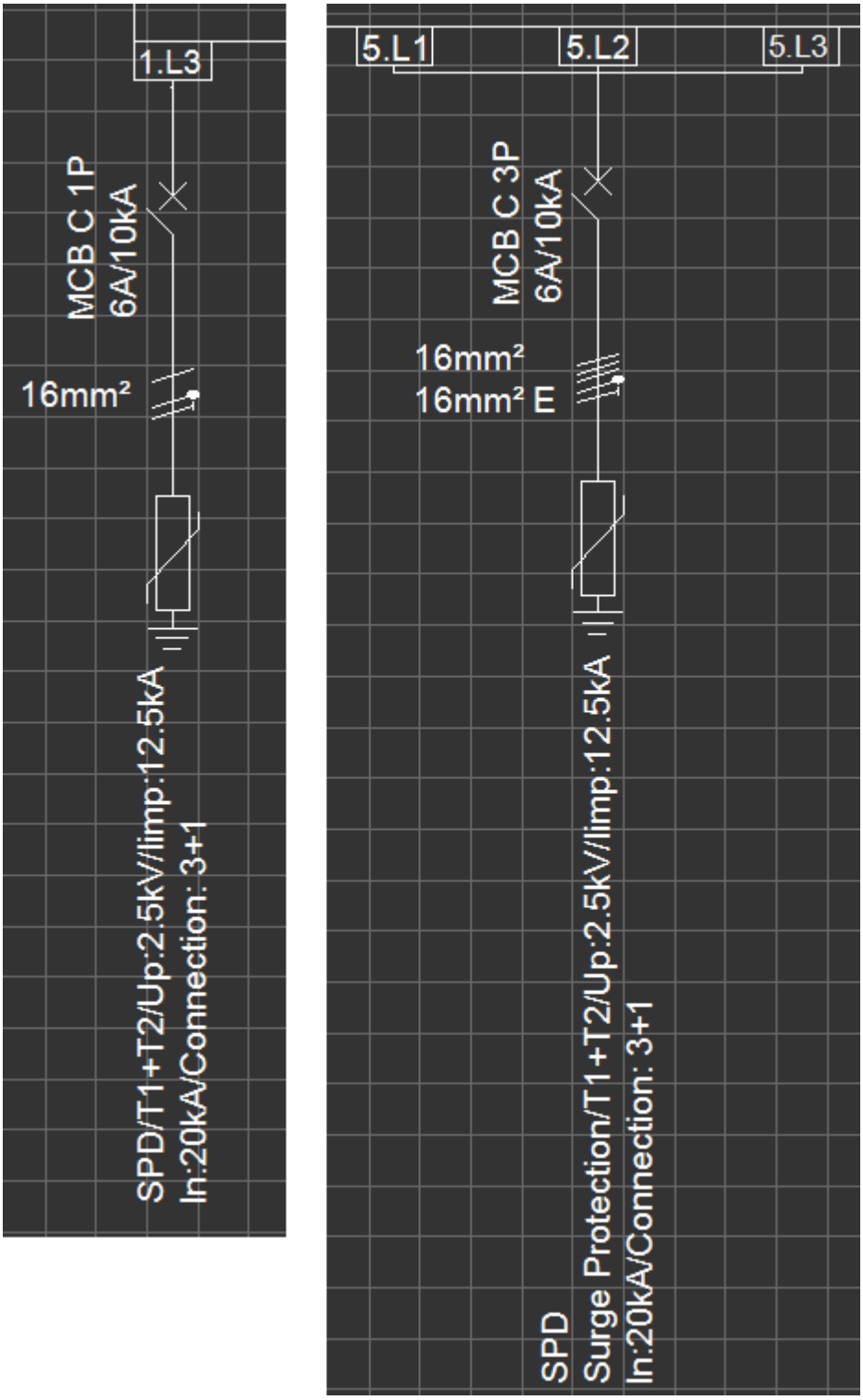


Overvoltage Protection (SPD)

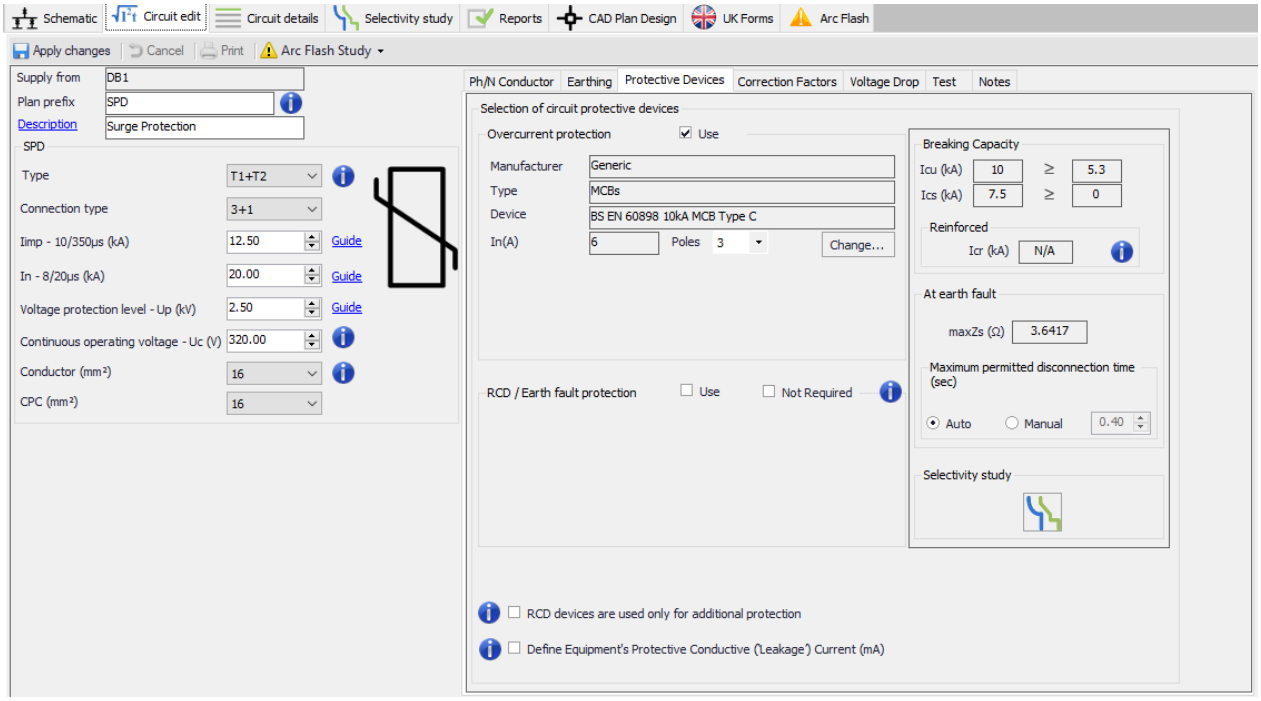
An over-voltage protection component is essentially used to model a Surge Protection Device or SPD for short. When the user selects *Over-voltage protection* option ElectricalOM will insert a single- or three-phase SPD depending on the insertion point automatically.

Over-voltage protection can also be added as an incomer device.

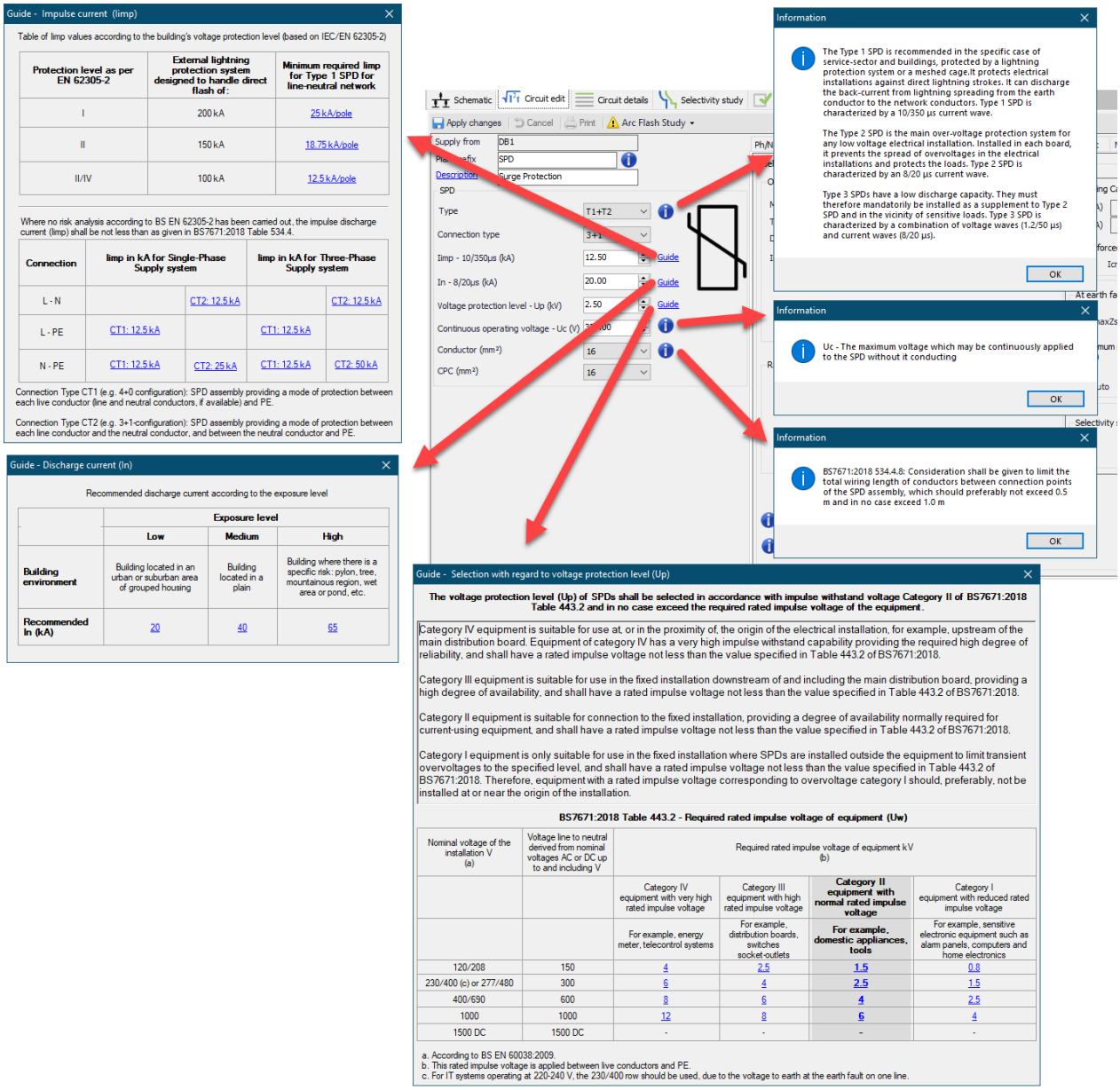

Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Source
Switch Board
Distribution Board
Board Extension
BTS
Busbar Trunking System
Final circuit 3Ph
Final circuit 1Ph
Floating Load
Power Factor Correction
SPD
Overvoltage protection
Connection



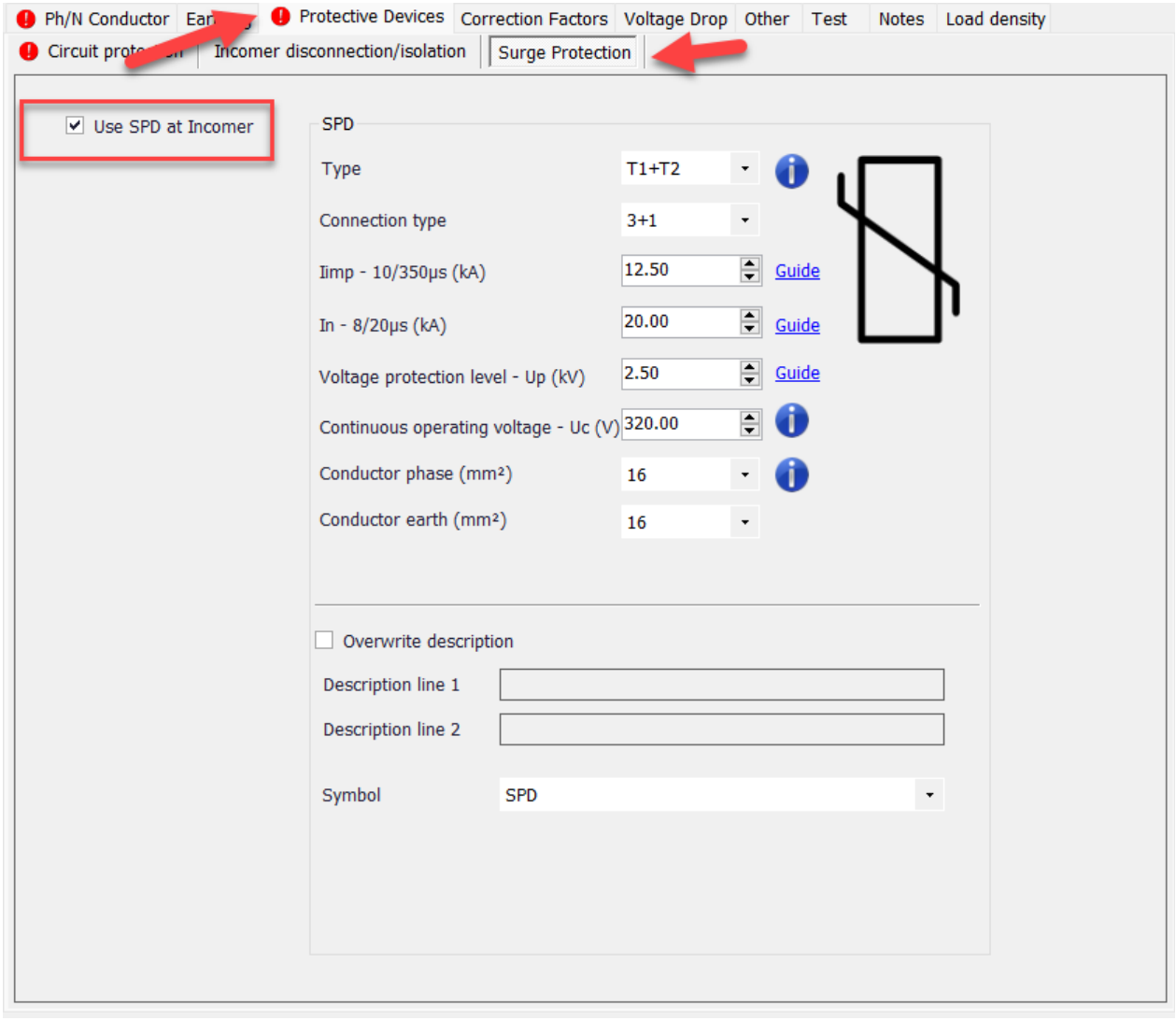
Once the component is inserted, the settings can be accessed via the Circuit edit Module. Protective device tab will be shown as default and Ph/N Conductor, Earthing, Correction Factors, and Voltage Drop tabs will not be active.



ElectricalOM provides various informative and guidance windows at the settings area. Guidance windows have values set as links so the user can click on and set is as current value.



An over-current protective device can also be placed as an incomer using a board's Protective Devices tab. The settings are the same as above.

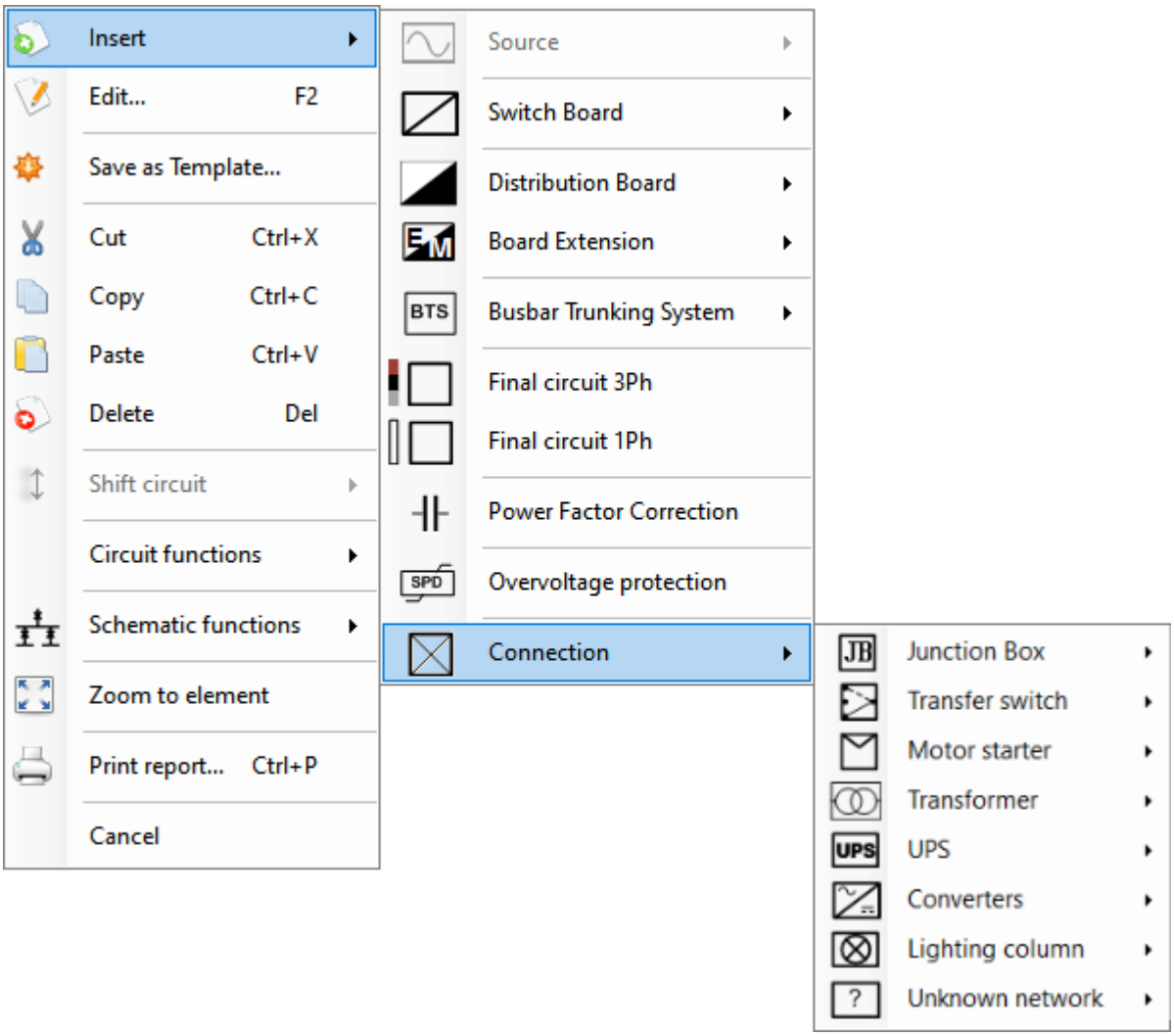


Connection

There are more components included with ElectricalOM which are listed under *Connection* option under *Insert* menu.

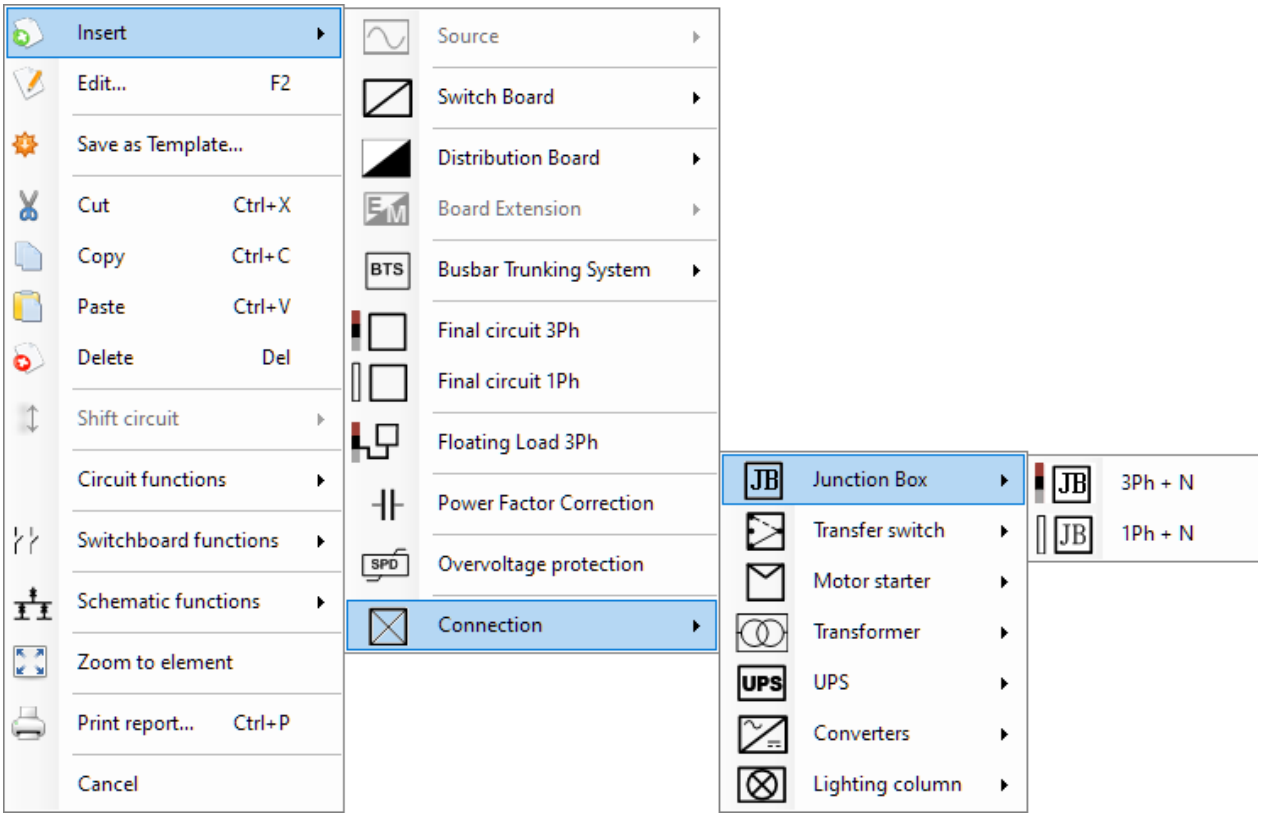
- Junction Box
- Transfer Switch
- Motor starter
- Transformer
- UPS
- Converter
- Lighting column
- Unknown Network

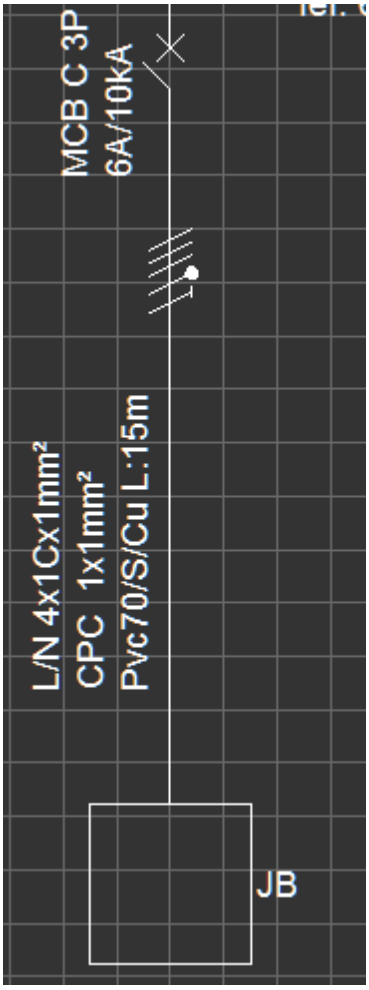
Please refer to related sections for further details abut these components.


Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Source
Switch Board
Distribution Board
Board Extension
Busbar Trunking System
Final circuit 3Ph
Final circuit 1Ph
Power Factor Correction
Overvoltage protection
Connection
Junction Box
Transfer switch
Motor starter
Transformer
UPS
Converters
Lighting column
Unknown network

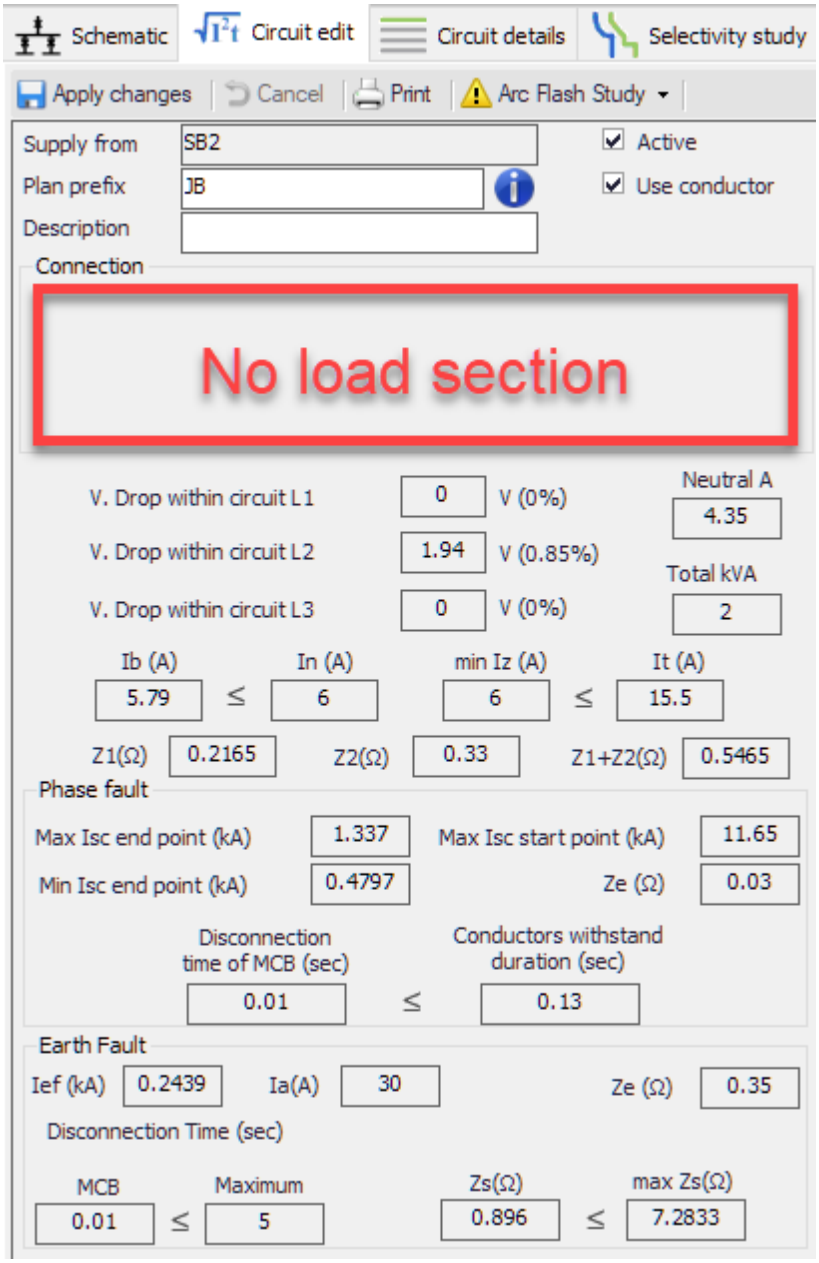
Junction Box

Junction Box component has two options, 3Ph + N and 1Ph + N. If the user tries to insert a junction box immediately after a three-phase source, then, only the three-phase option will be available to select, otherwise both options are selectable.





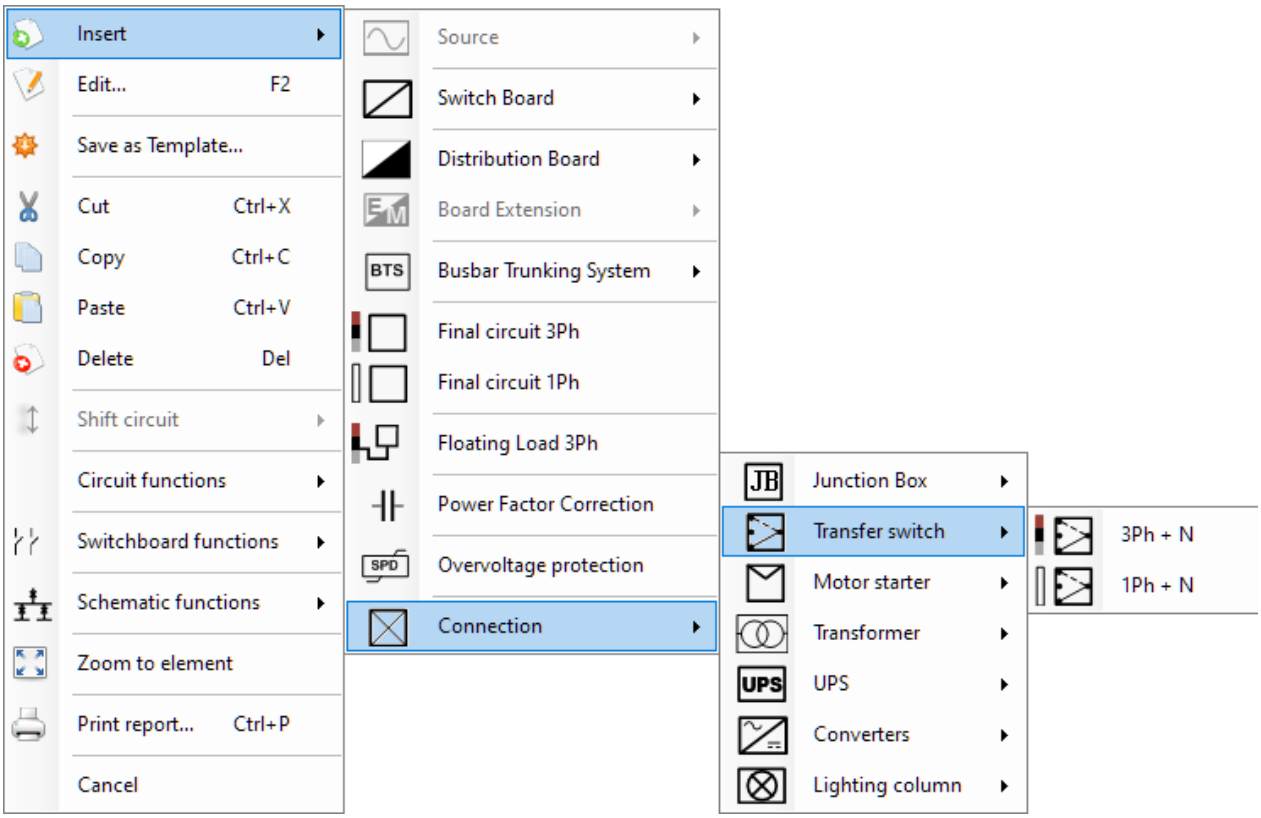
A *Junction Box* is similar to a *Switch Board* component and acts the same, however, there is a slight difference on the *Circuit edit* tab where the *Load* section is not available. Load of a junction box is defined by the connected circuits automatically and cannot be predefined.

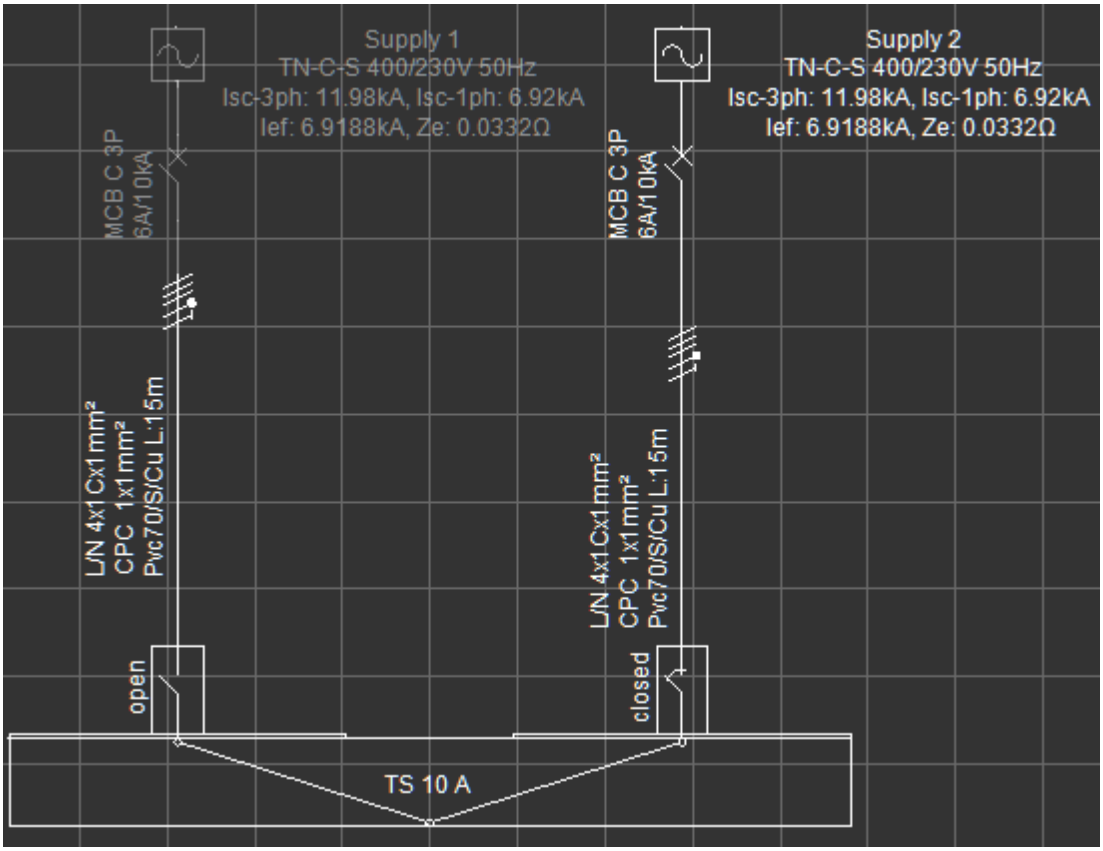


Multiple Sources feature is also applicable for *Junction Boxes*, refer to this section for more information about multiple sources.

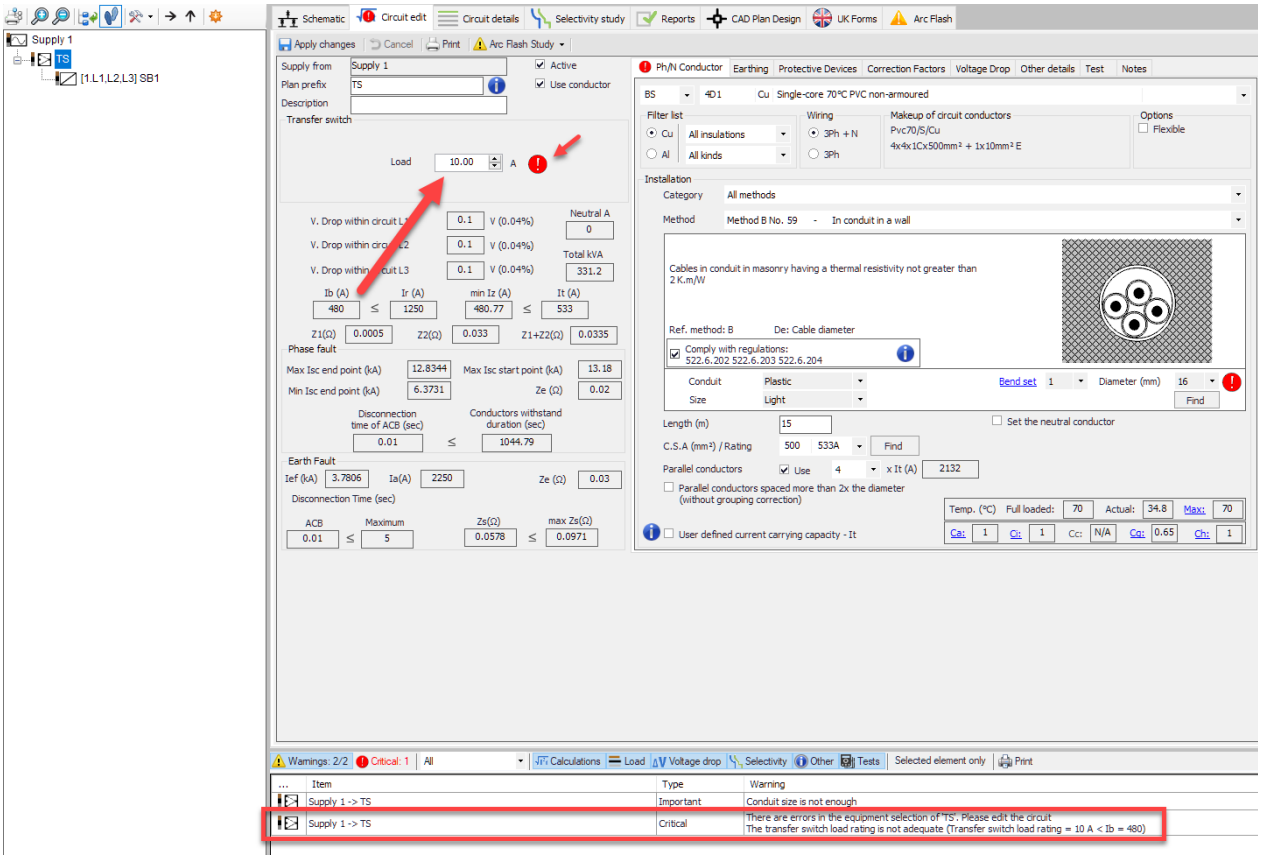
Transfer Switch

Another component which has similar features to a *Switch Board* component is the *Transfer Switch* component. *Transfer Switch* component has also two options, 3Ph + N and 1Ph + N. If the user tries to insert a transfer switch immediately after a three-phase source, then, only the three-phase option will be available to select, otherwise both options are selectable.





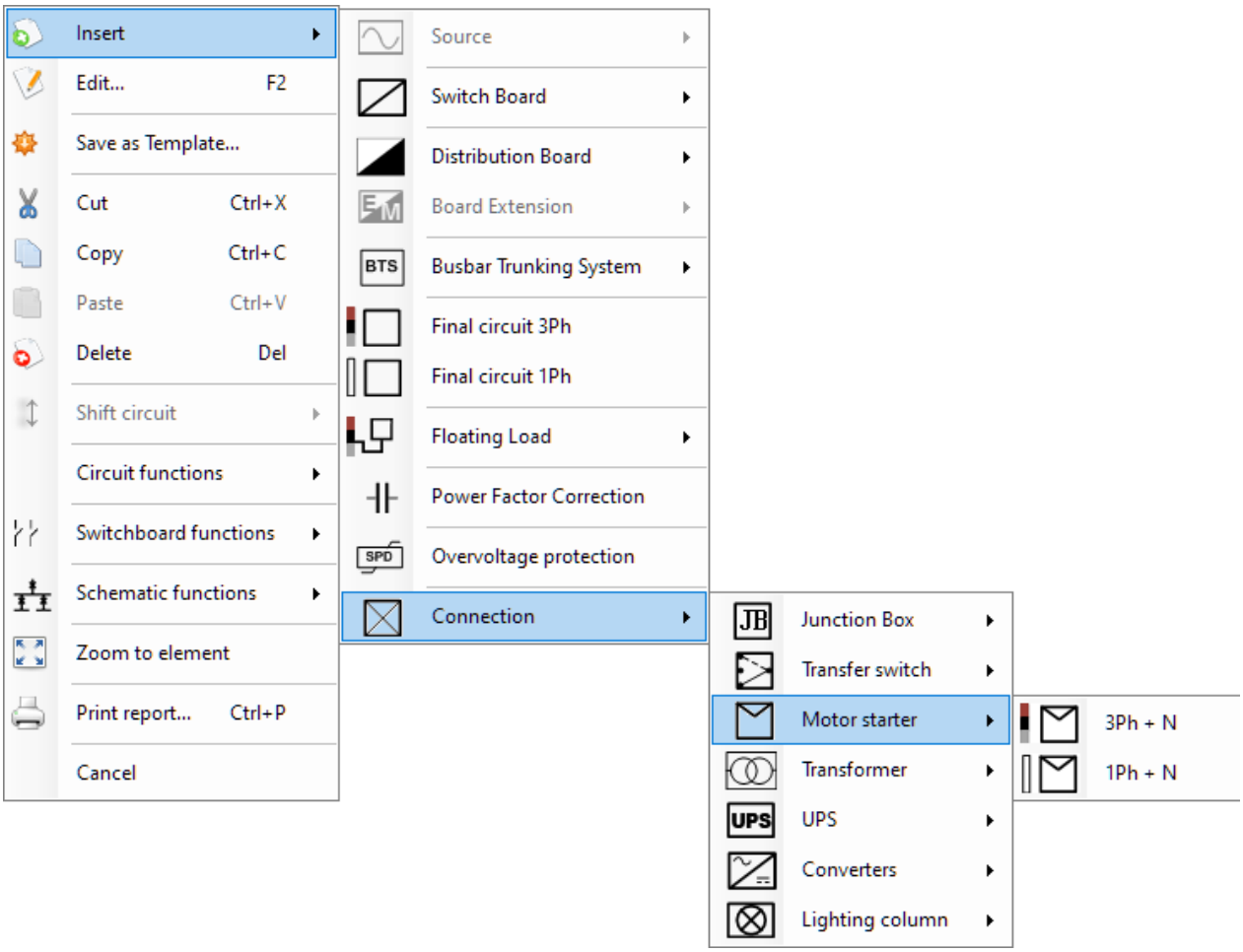
Transfer Switch component acts the same as a *Switch Board* but has a slight difference on the *Circuit edit* tab which has a *Load* field where the user sets a rating for the component. ElectricalOM will check the design current and warn the user if the rating of the transfer switch is not adequate.

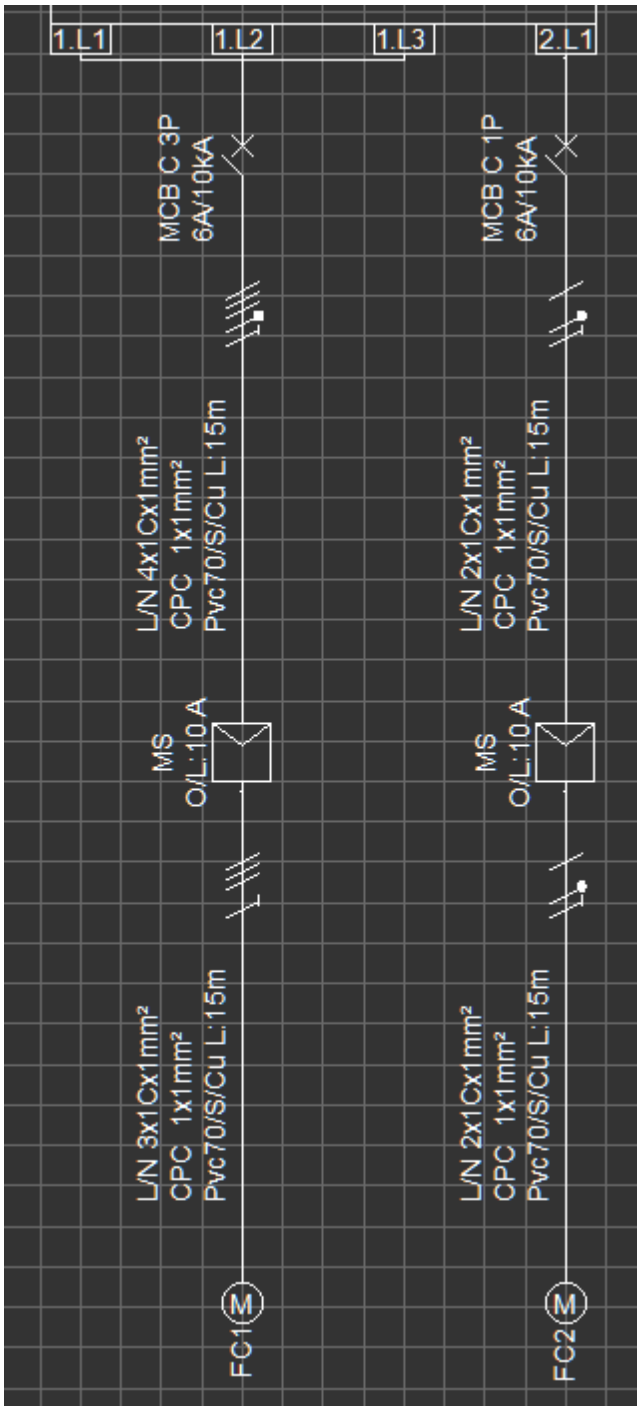


Switchboard Function Menu is also applicable for transfer switches, refer to this section for more information.

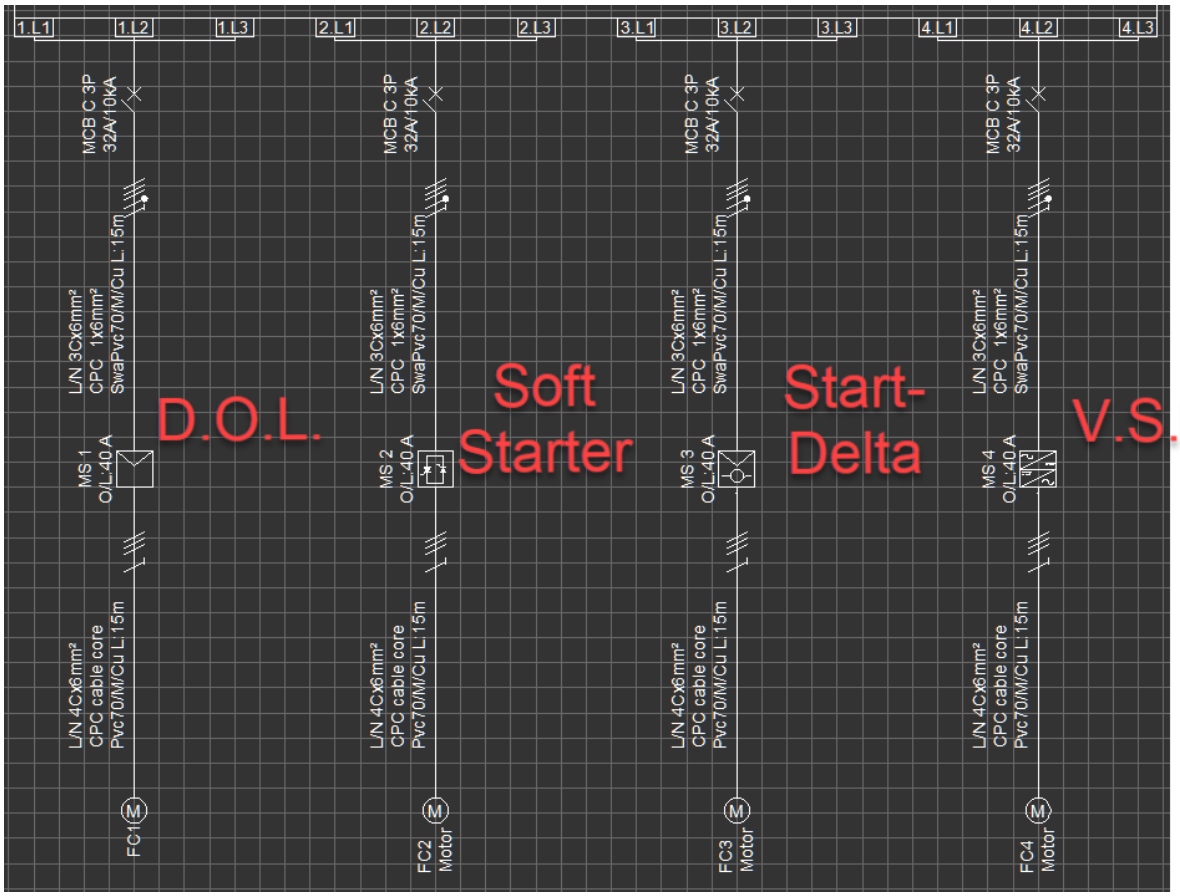
Motor Starter

A motor starter component is used to model a motor circuit consisting of a motor starter and an electric motor.



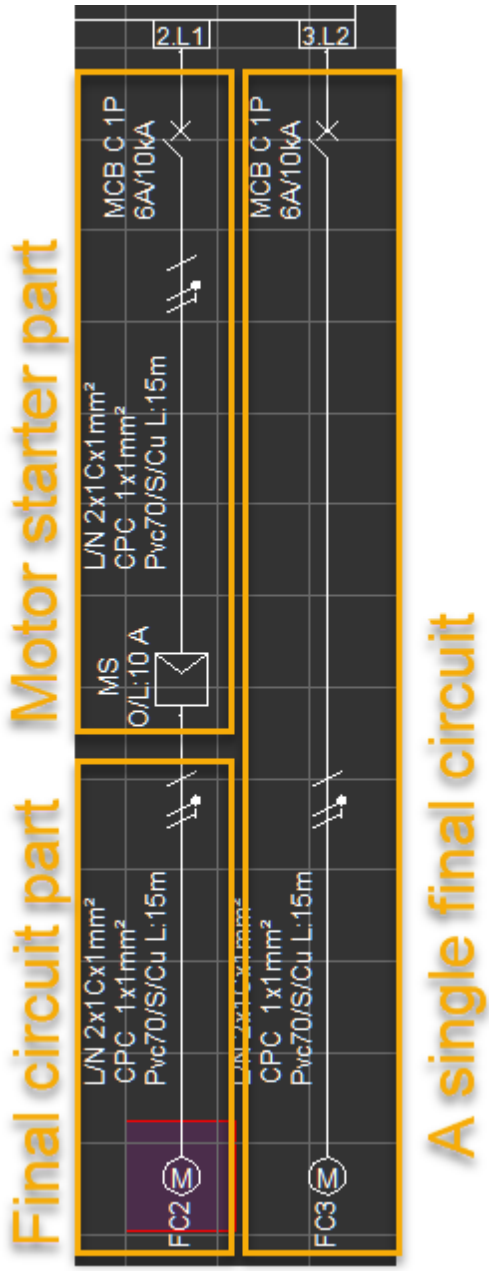


Depending on the motor starter used, the symbol may differ.



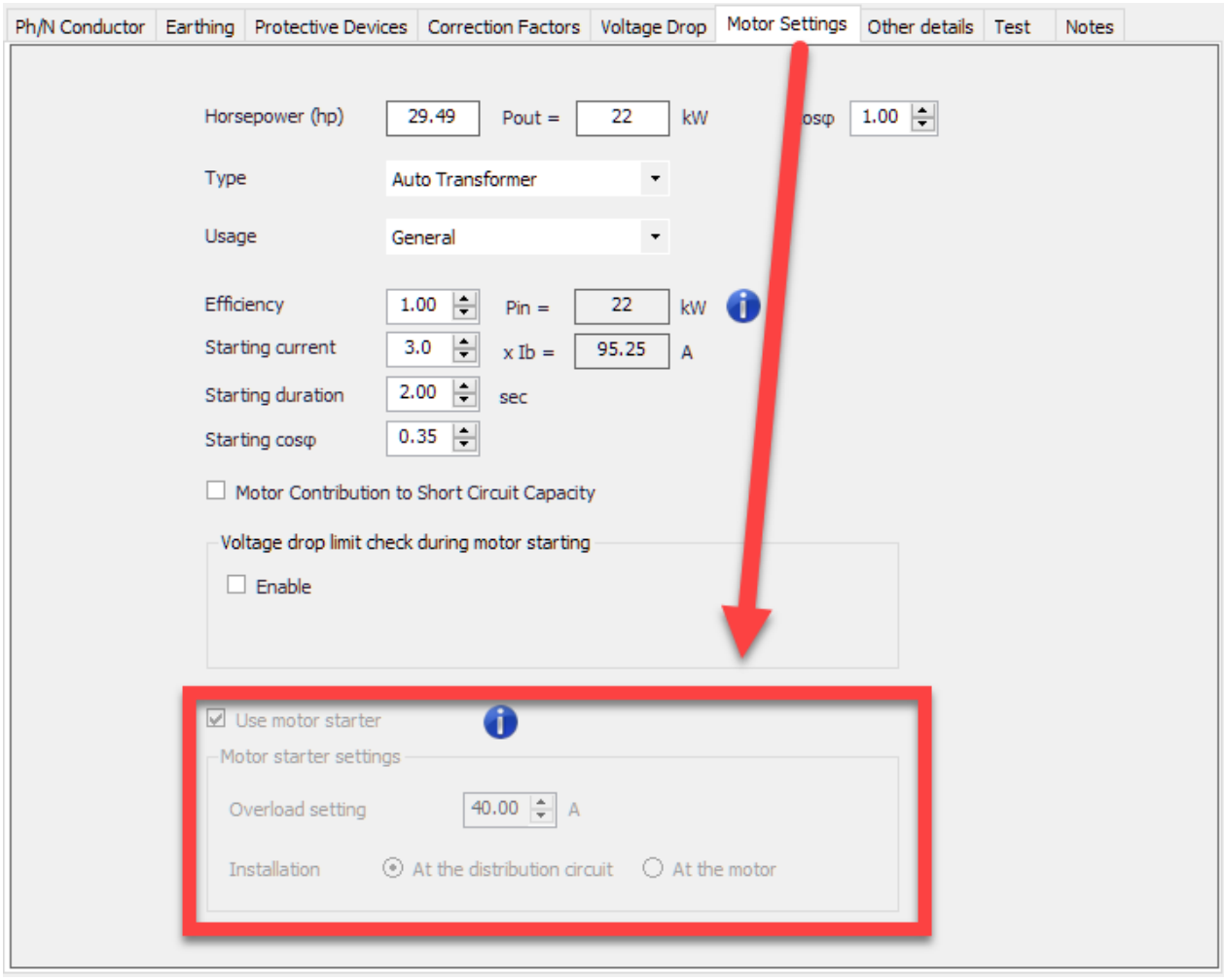
Motor Starter component is very similar to any final circuit with a motor, however, it splits the circuit into two sections unlike a final circuit.

- Motor Starter part
- Final Circuit part

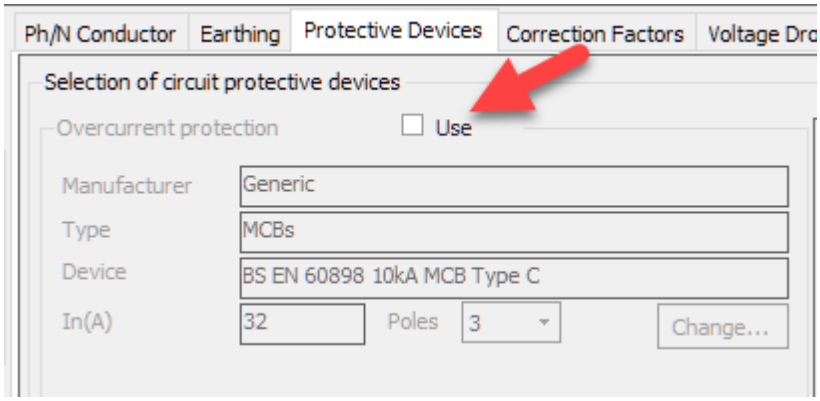


This gives the opportunity to the user to define different conditions and parameters for each part of the circuit independently e.g. different cables, installation methods, etc.

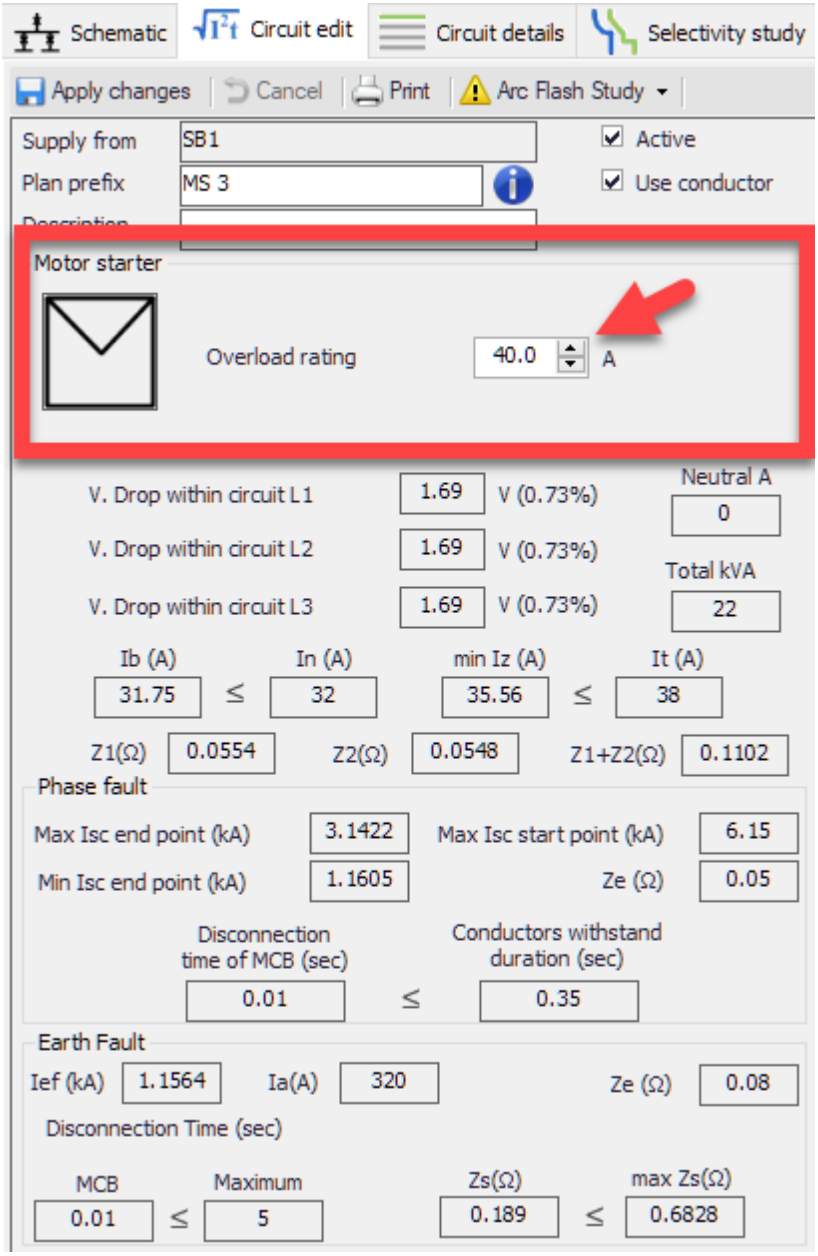
The motor part is the same as a final circuit includes a motor except the circuit protective device and *Motor starter settings* sections are disabled.For further details about motor settings please refer to Motor Settings section.



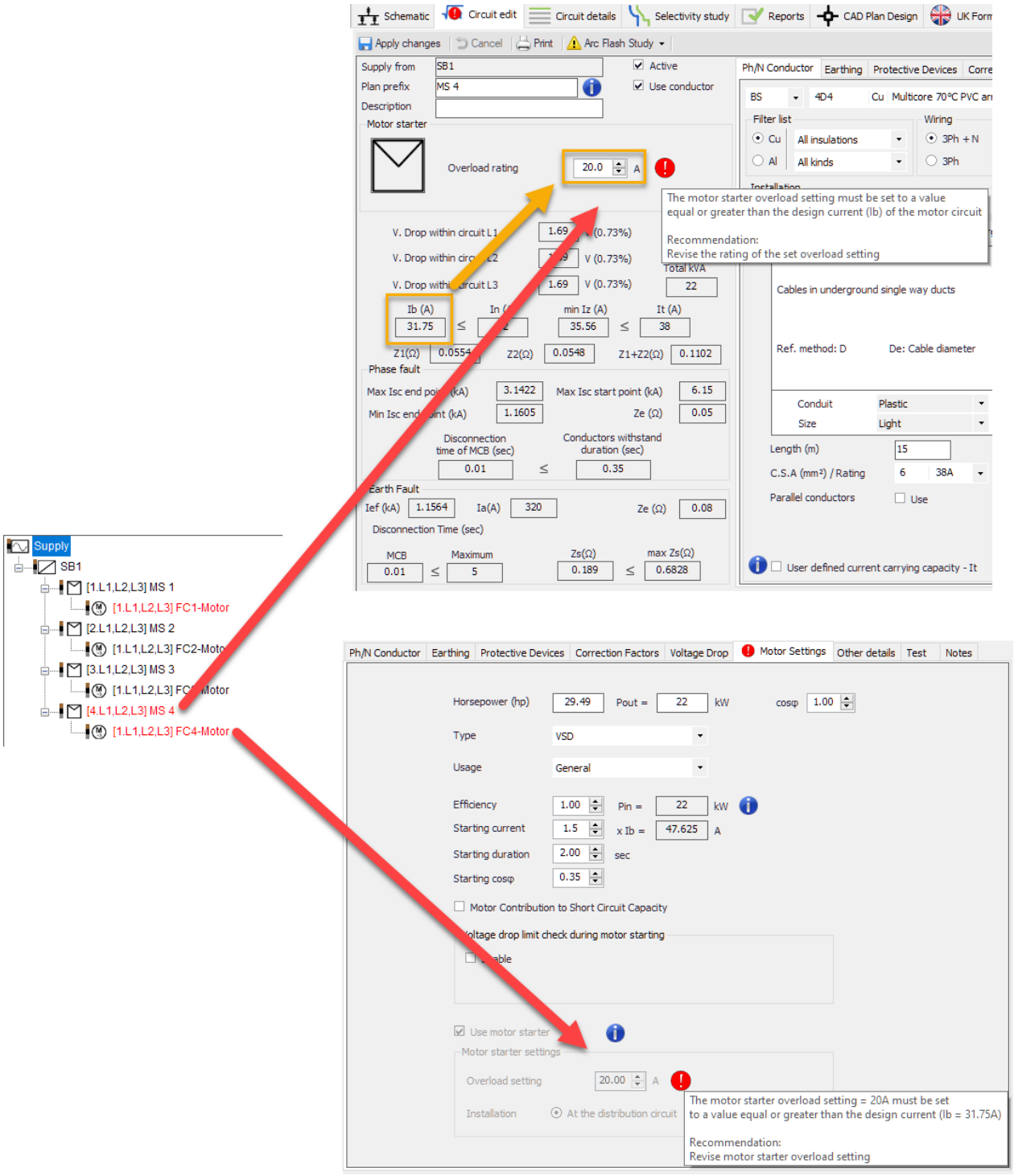
Circuit protection is handled by the motor starter part of the circuit, however, it is still possible to enable the circuit protection by ticking the Use tick box under *Circuit edit* Tab, Protective Devices subordinate tab.



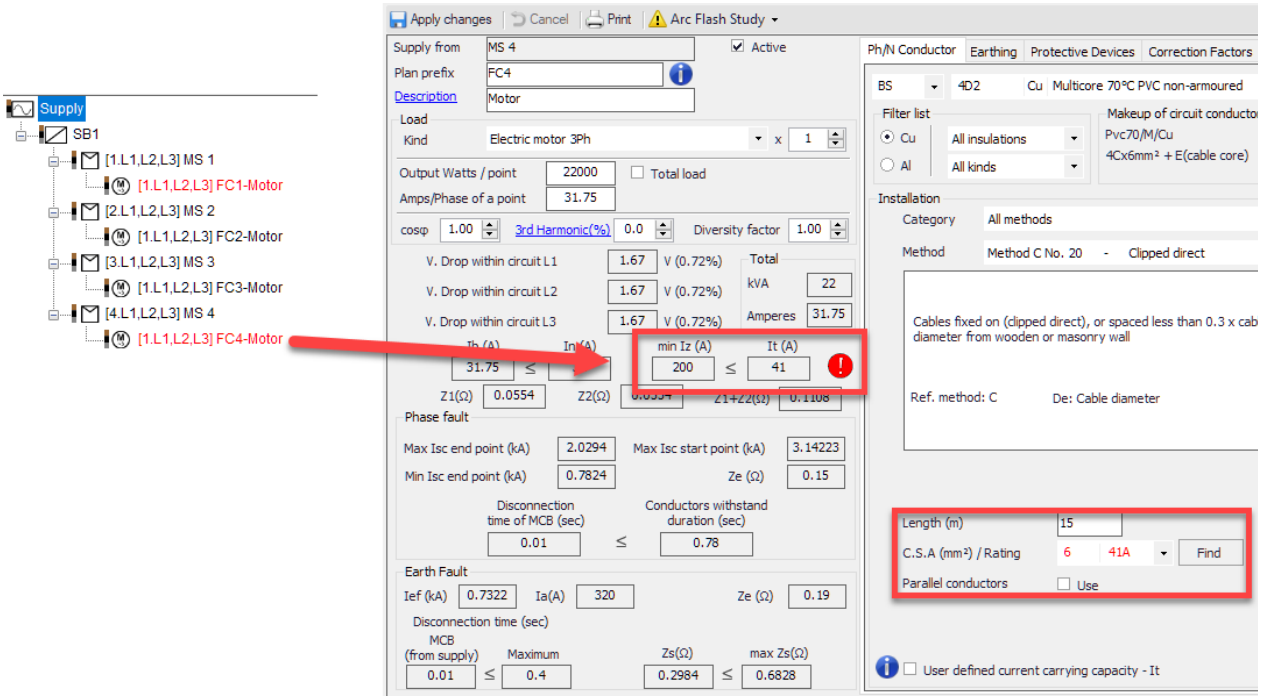
Motor starter part, being mostly same as any final circuit, defines the overload protection parameter of the circuit. Required overload protection parameter can be modified under Motor starter section of the Circuit edit Tab.



If the overload parameter set by the user is lower than the design current of the circuit, ElectricalOM will display a warning both with the motor starter and the final circuit parts of the circuit.

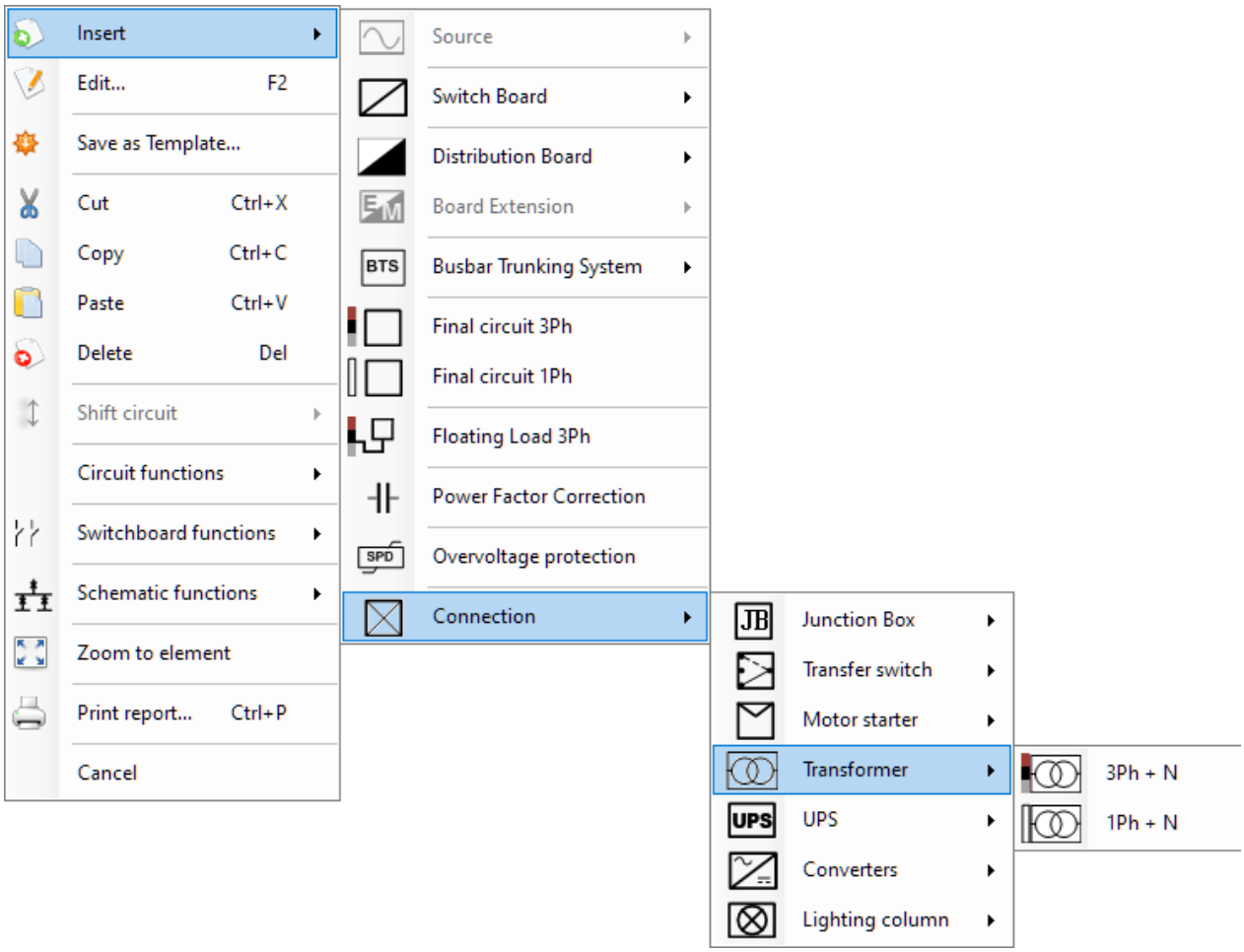


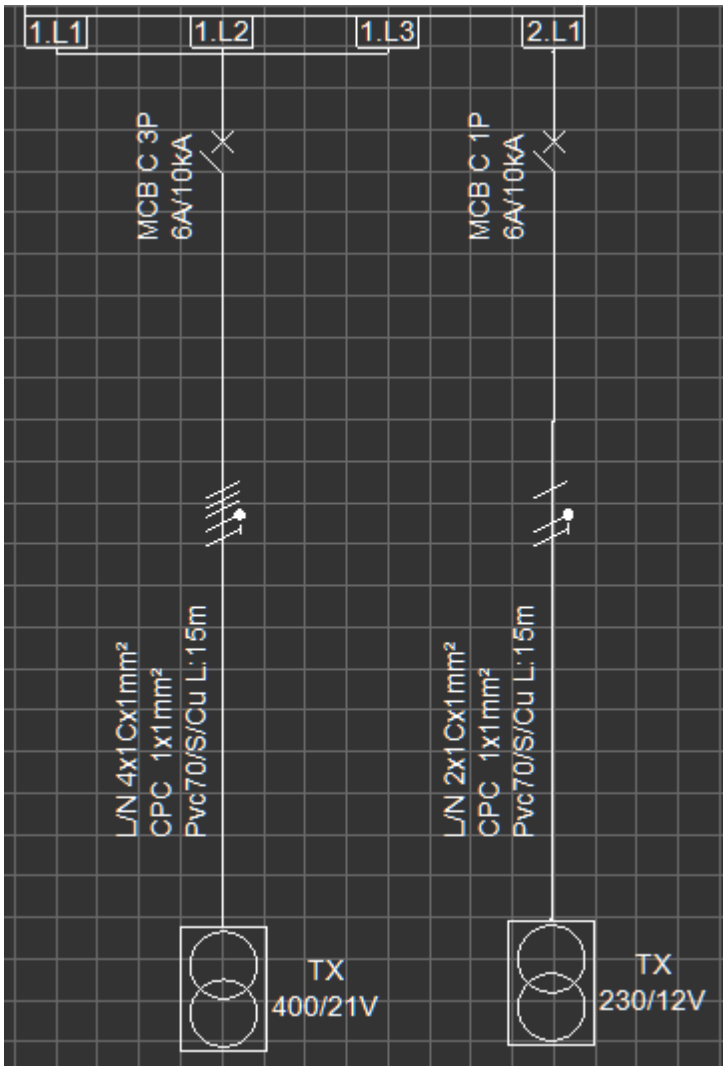
However the overload current can be over the over current protective device rating, it is expected to be lower than the current carrying capacity of the conductor.


Supply
SB1
[1.L1,L2,L3] MS 1
[1.L1,L2,L3] FC1-Motor
[2.L1,L2,L3] MS 2
[1.L1,L2,L3] FC2-Motor
[3.L1,L2,L3] MS 3
[1.L1,L2,L3] FC3-Motor
[4.L1,L2,L3] MS 4
[1.L1,L2,L3] FC4-Motor
Apply changes
Cancel
Print
Arc Flash Study
Supply from
MS 4
Active
Plan prefix
FC4
Description
Motor
Load
Kind
Electric motor 3Ph
Output Watts / point
22000
Total load
Amps/Phase of a point
31.75
cosφ
1.00
3rd Harmonic(%)
0.0
Diversity factor
1.00
V. Drop within circuit L1
1.67
V (0.72%)
V. Drop within circuit L2
1.67
V (0.72%)
V. Drop within circuit L3
1.67
V (0.72%)
Total
kVA
22
Amperes
31.75
Ib (A)
In (A)
min Iz (A)
It (A)
31.75
200
41
Z1(Ω)
0.0554
Z2(Ω)
Z1+Z2(Ω)
0.1108
Phase fault
Max Isc end point (kA)
2.0294
Max Isc start point (kA)
3.14223
Min Isc end point (kA)
0.7824
Ze (Ω)
0.15
Disconnection time of MCB (sec)
Conductors withstand duration (sec)
0.01
0.78
Earth Fault
Ief (kA)
0.7322
Ia(A)
320
Ze (Ω)
0.19
Disconnection time (sec)
MCB (from supply)
Maximum
Zs(Ω)
max Zs(Ω)
0.01
0.4
0.2984
0.6828
Ph/N Conductor
Earthing
Protective Devices
Correction Factors
BS
4D2
Cu
Multicore 70°C PVC non-armoured
Filter list
Cu
Al
All insulations
All kinds
Makeup of circuit conducto
Pvc70/M/Cu
4Cx6mm² + E(cable core)
Installation
Category
All methods
Method
Method C No. 20
Clipped direct
Cables fixed on (clipped direct), or spaced less than 0.3 x cab
diameter from wooden or masonry wall
Ref. method: C
De: Cable diameter
Length (m)
15
C.S.A (mm²) / Rating
6
41A
Find
Parallel conductors
Use
User defined current carrying capacity - It

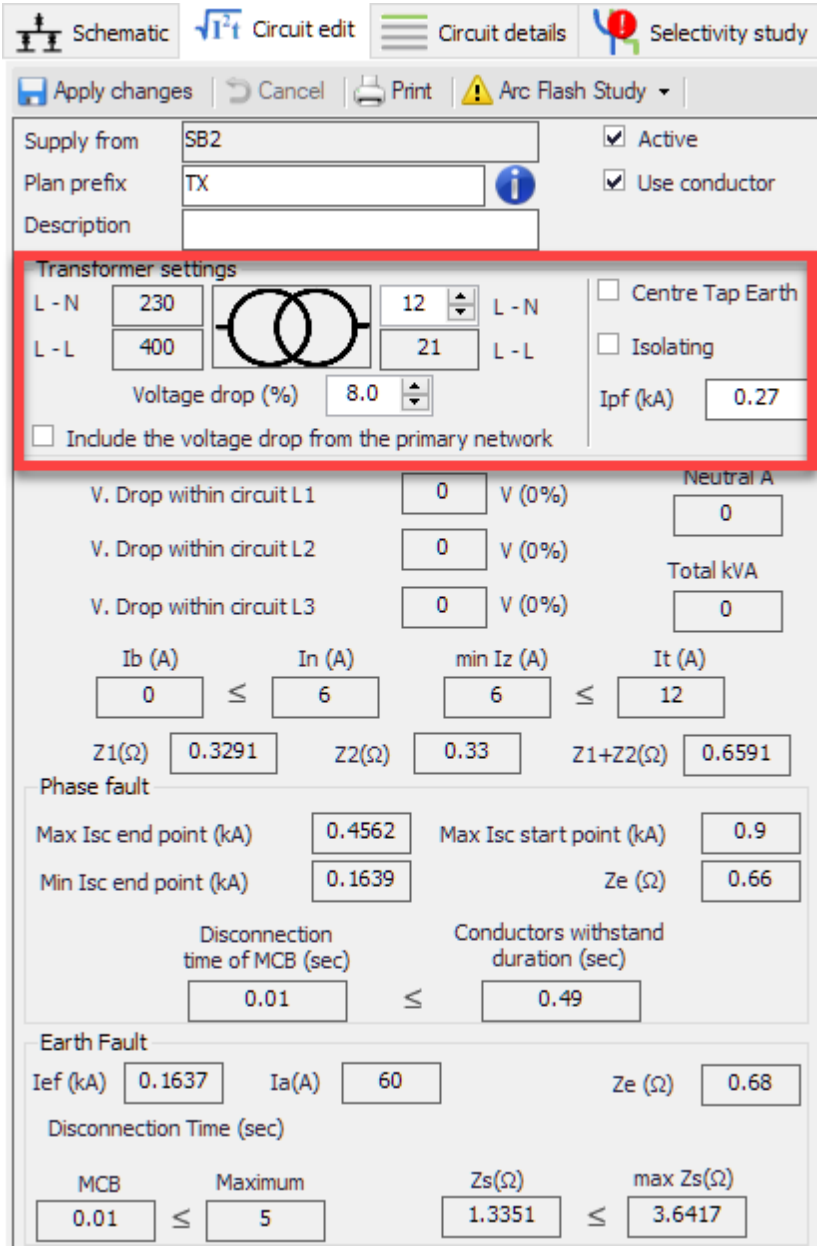
Transformer

Transformer component is used to model a transformer and it has two versions as 3Ph + N and 1Ph + N. A transformer cannot be inserted after a Source, it needs a distribution node to get connected. Multiple Sources feature is also applicable for junction boxes, refer to this section for more information about multiple sources.



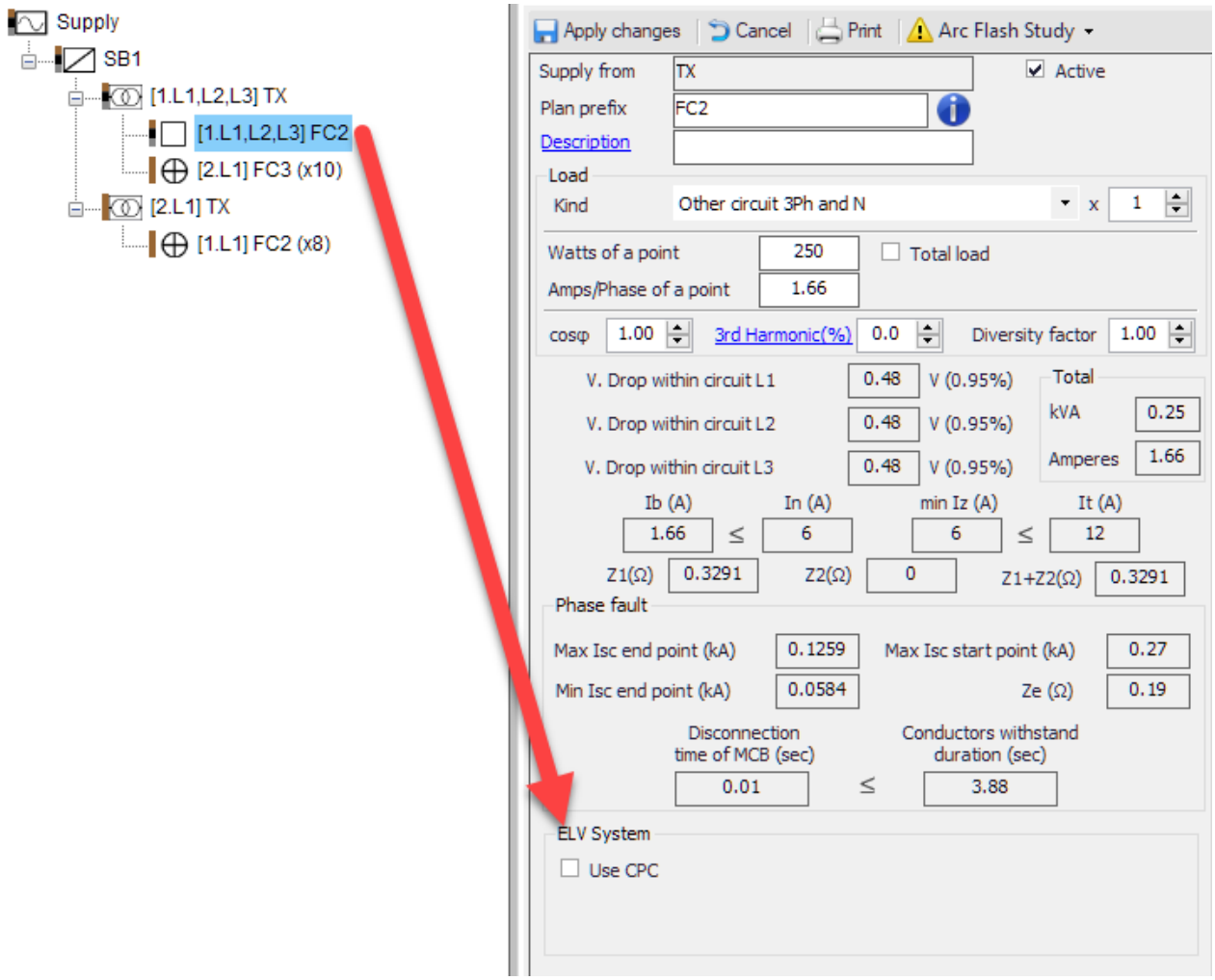


Circuit edit tab of a transformer has a *Transformer settings* section instead of a *Load* section, where the user can define various parameters.

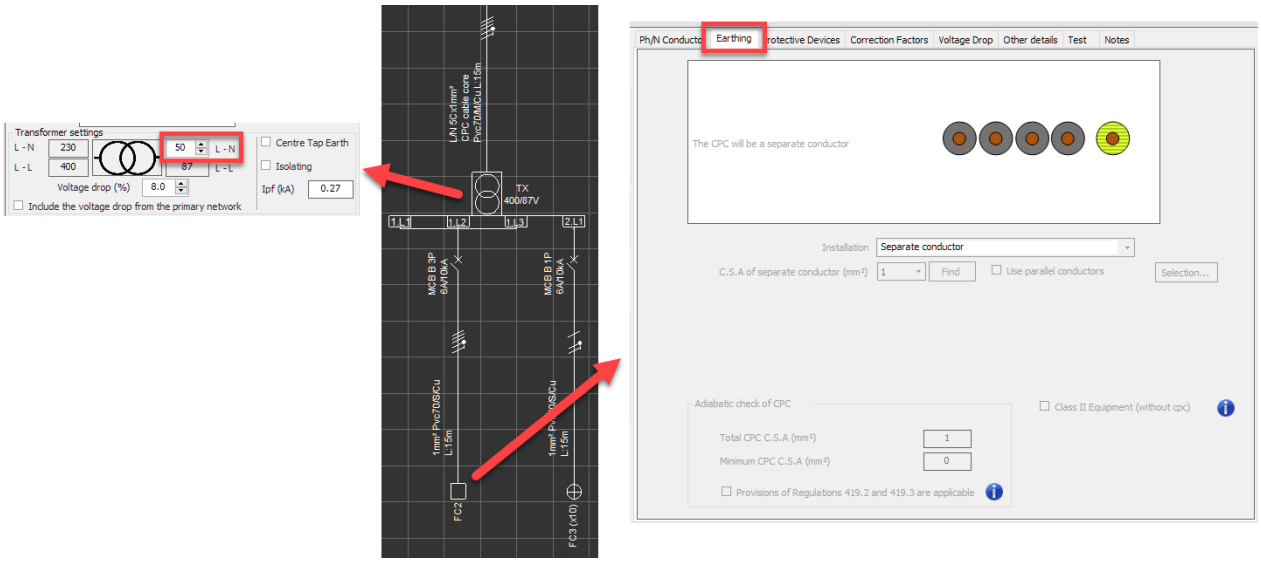


L-N voltage: This text field can be typed in by the user to define the voltage between the Line and Neutral conductors of the transformer on the secondary side. If the transformer is a three-phase transformer, then, ElectricalOM will calculate the secondary L-L voltage automatically using this value.

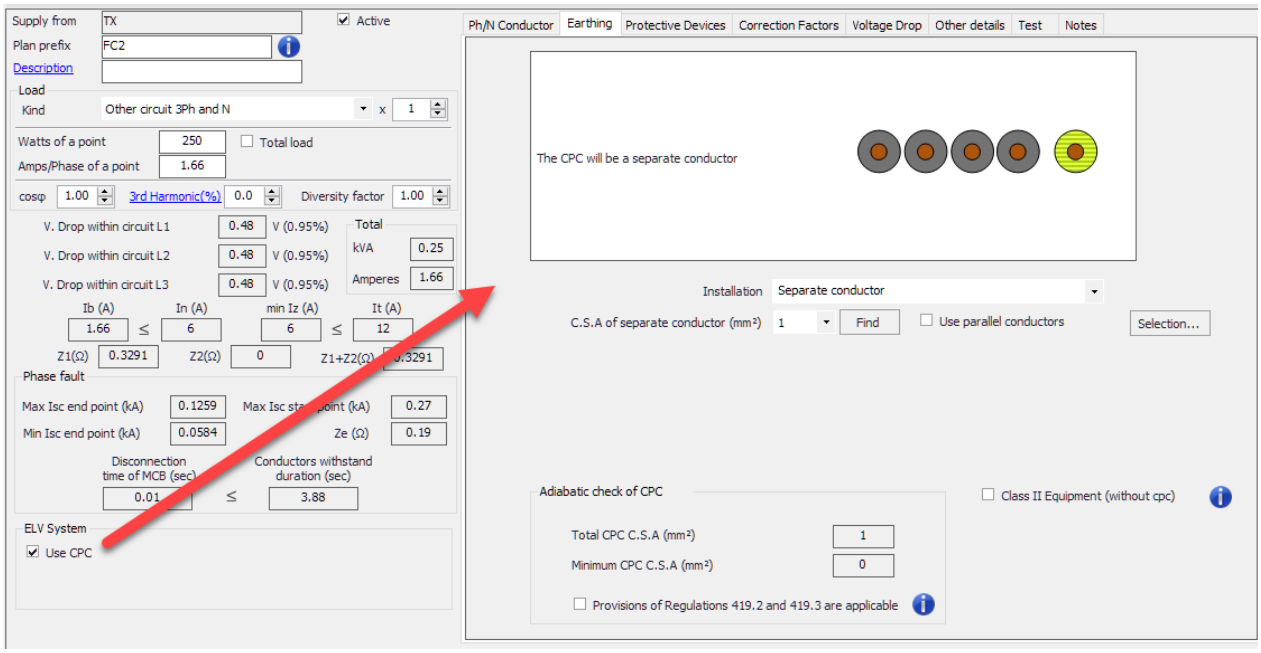
If the secondary side voltage is below or equal to 50V, then, ElectricalOM will consider an ELV circuit and the Earth Fault section will be replaced by an new section, *ELV System*, at the calculation area for any downstream circuit.



Additionally, and the *Earthing* tab of *Circuit edit* module for any downstream circuit will be disabled by default.



If the user opts to use a CPC for an ELV circuit, then ticking the *Use CPC* tick box will enable the earthing conductor option at the *Earthing* tab.



Voltage drop (%): This field denotes the voltage drop permissible after the transformer in percent. The global voltage drop limit (see Source properties Tab section) will be applicable up to the incomer side of the transformer, where transformer's voltage drop setting will be applicable to any downstream circuits.

Include the voltage drop from the primary network **tick box:** If this box is ticked, ElectricalOM will take the *Voltage drop (%)* value into account and add this to the secondary side voltage drop value.

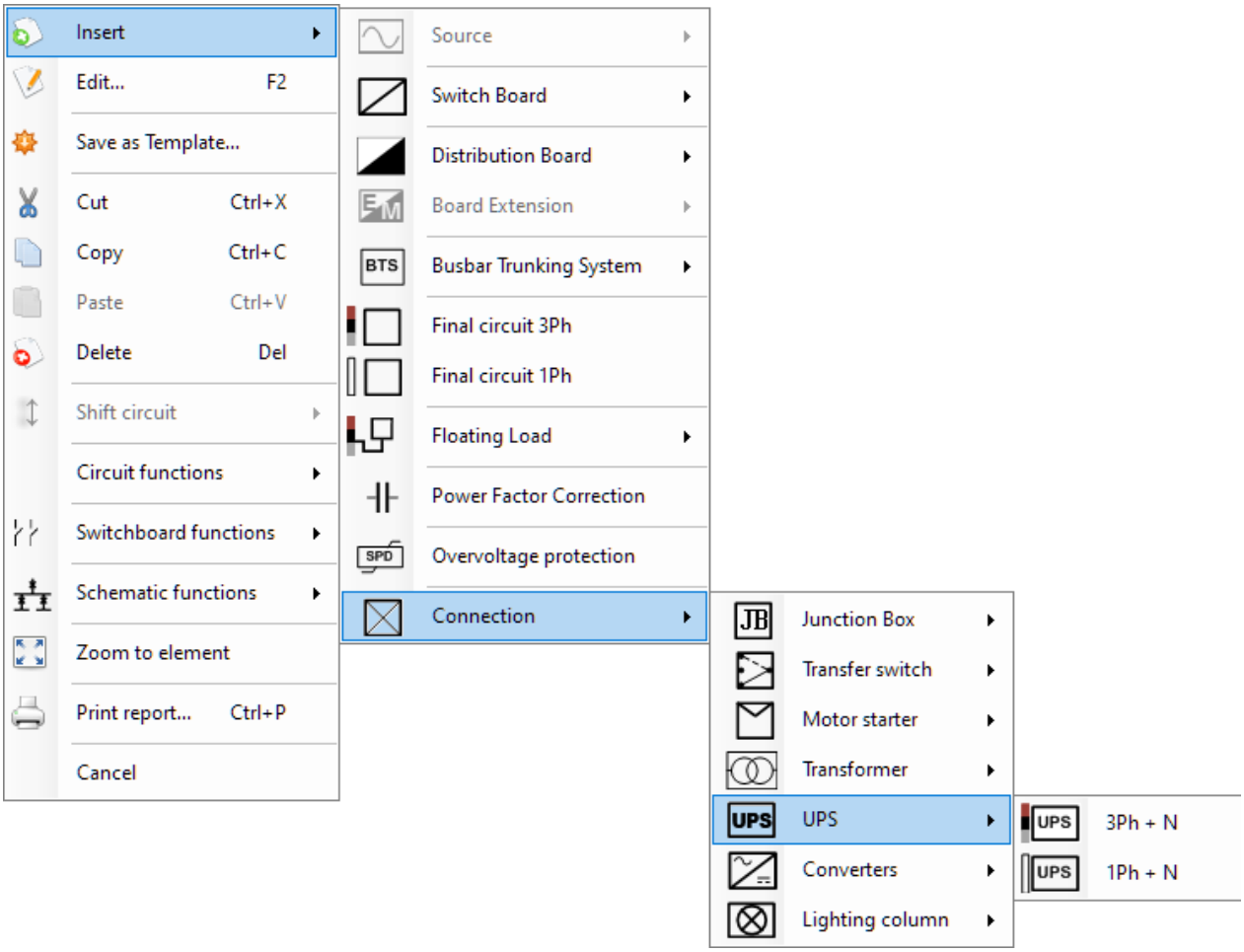
Centre Tap Earth **tick box:** If this box is ticked, then, ElectrcialOM will assume the secondary winding of the transformer is connected to earth potential at the mid point. As a consequence, the operating voltage on the secondary side will be halved.

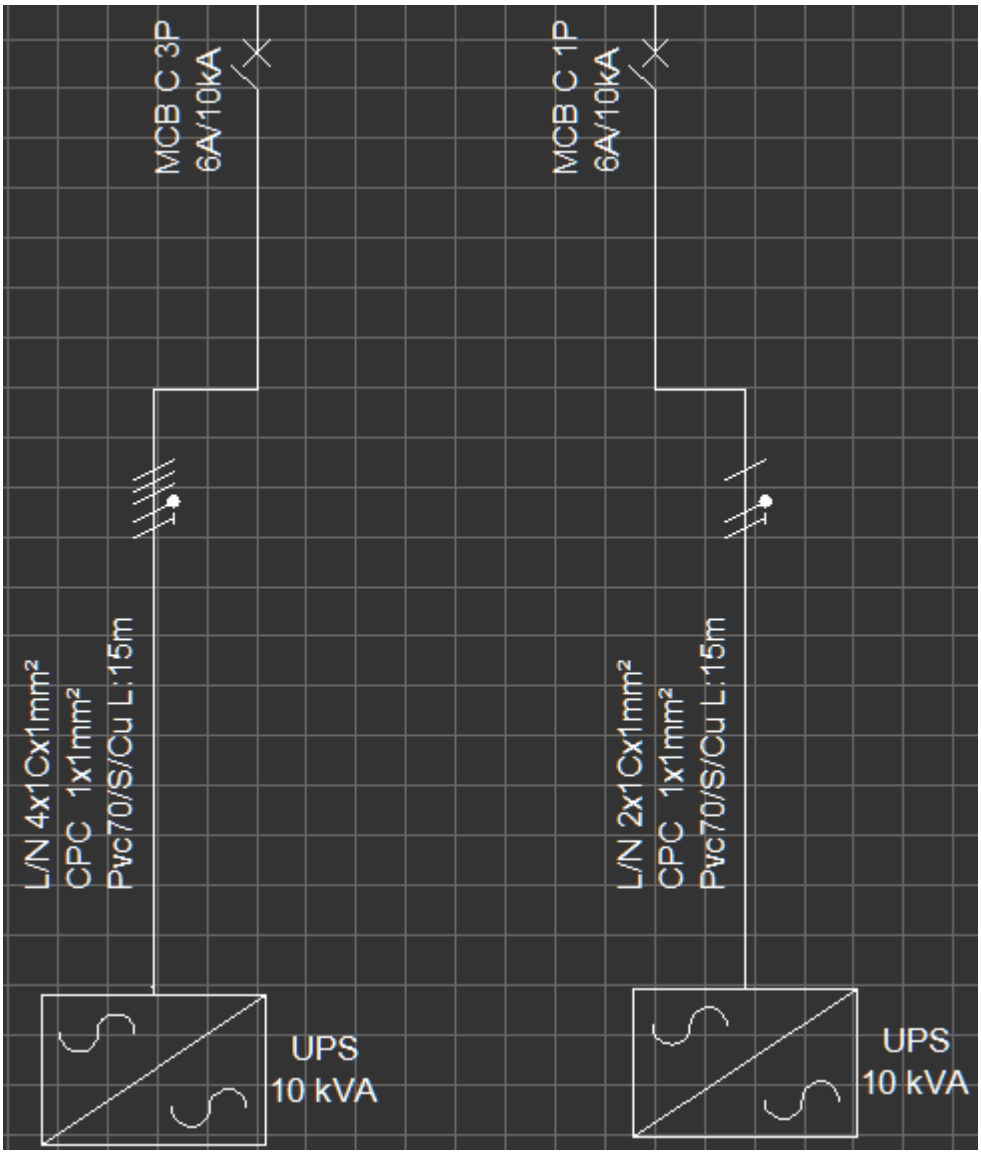
Isolating **tick box:** This tick box will set the transformer as an isolation transformer and removes the connection to earth on the secondary side.

Ipf (kA): This field is used to define the prospective fault current on the secondary side.

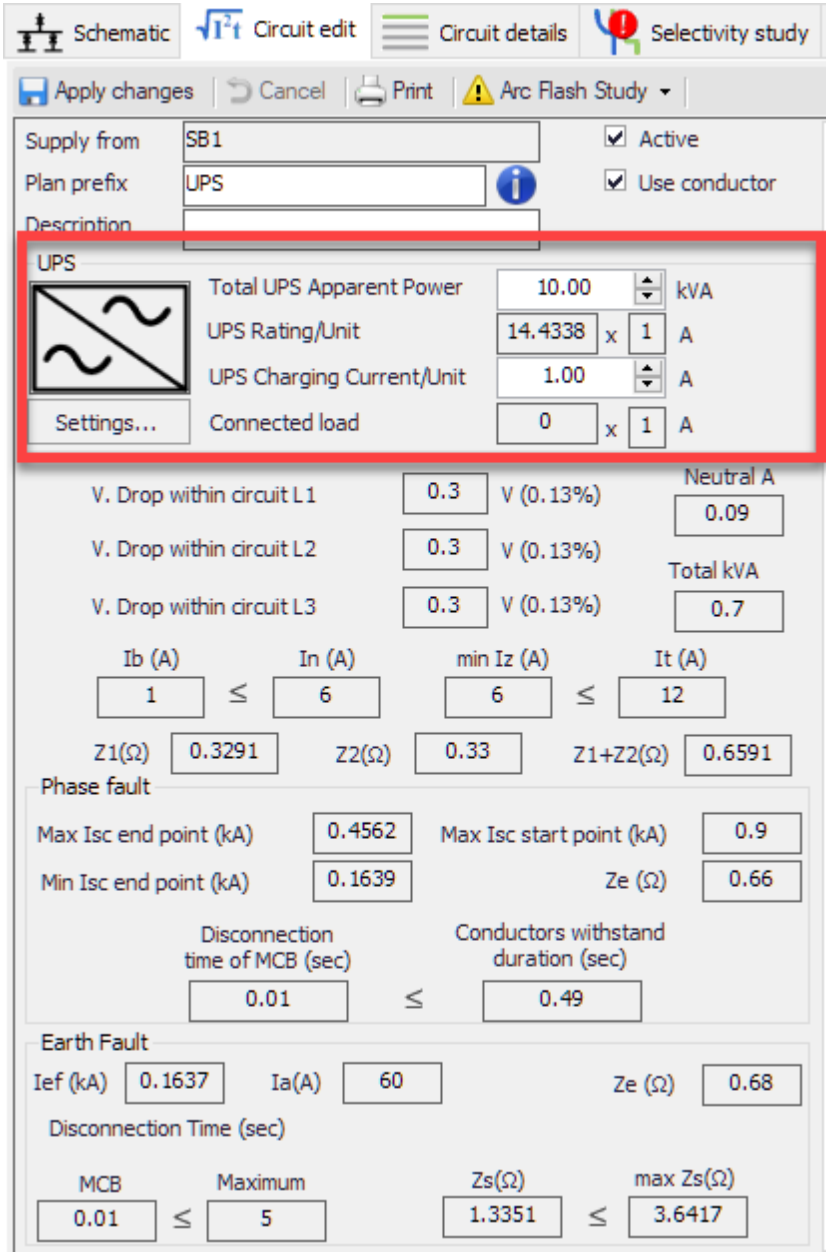
UPS

The UPS component has two versions, 3Ph + N and 1Ph + N. A UPS cannot be inserted directly after a Source and it needs a distribution node to get connected. UPS component supports Multiple Sources feature and it can also be used to model multiple UPS running in parallel, see Multiple UPS Scheme.

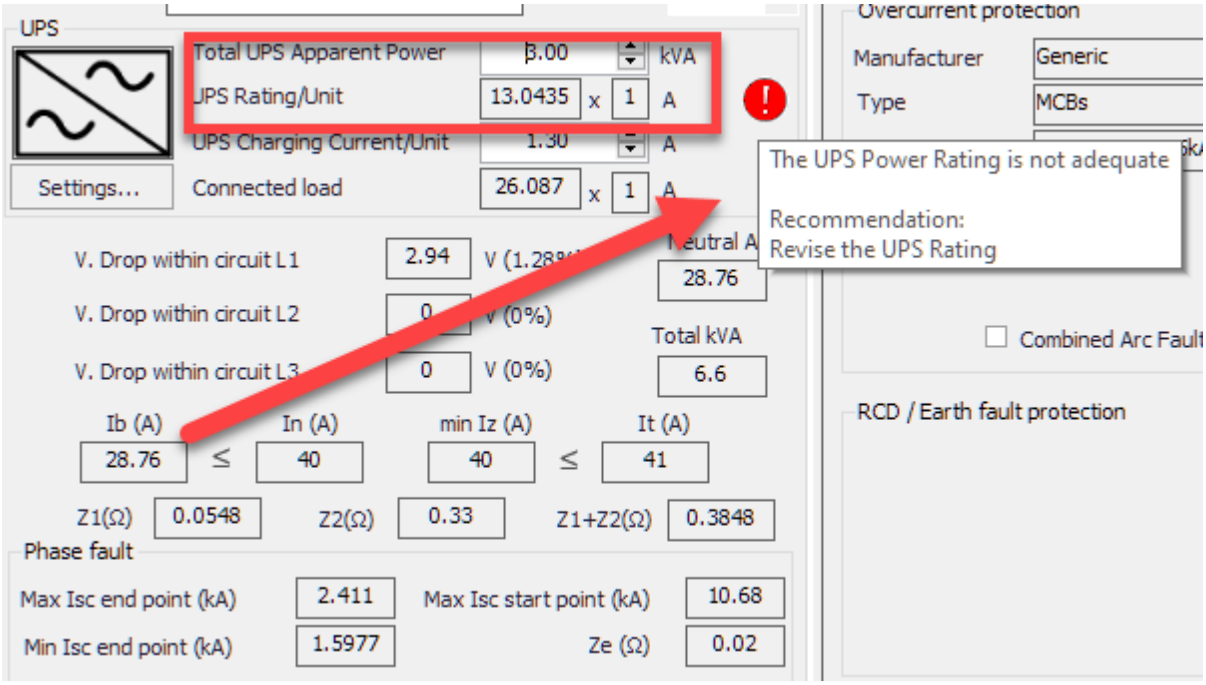




Circuit edit tab of a UPS has a *UPS* section instead of a *Load* section, where the user can define various parameters related with the UPS.

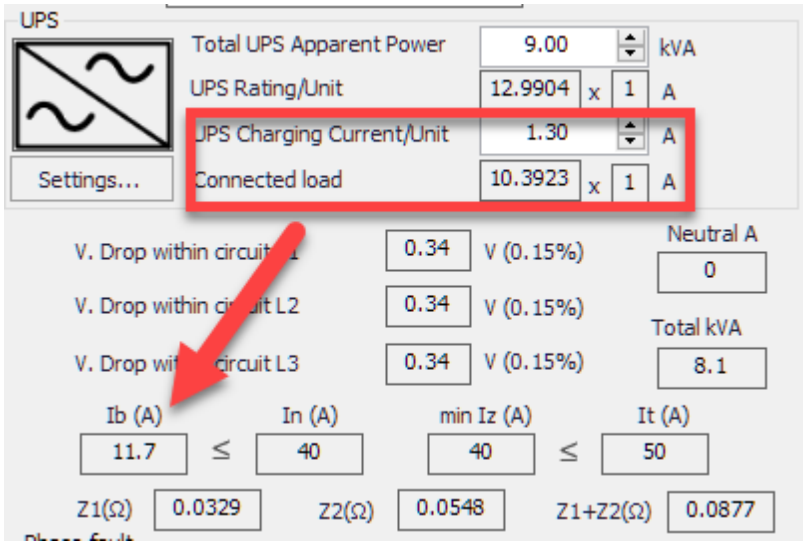


Total UPS Apparent Power: This is where the user set the apparent power in kVA of the UPS being modelled. If the connected load is heigher than the apparent power of the UPS, ElectrcialOM will warn the user.

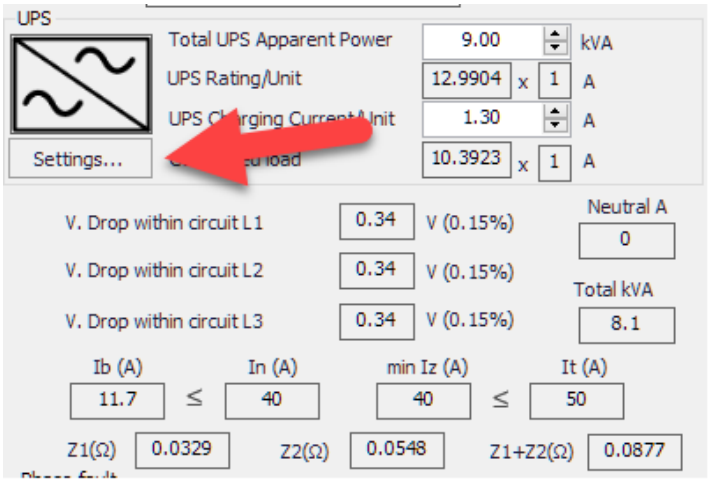


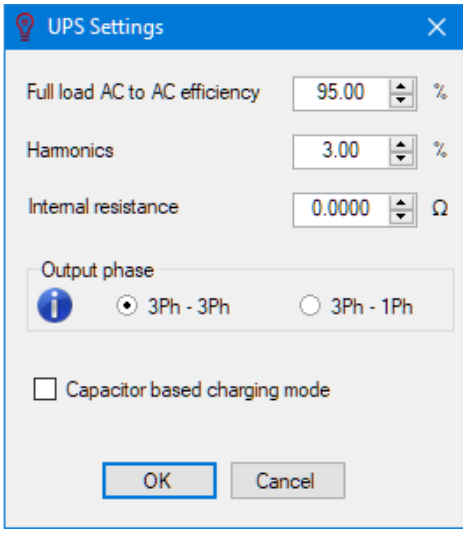
UPS Rating/Unit: This field is calculated by ElectricalOM automatically, and it indicates the rating of the UPS in amperes per phase.

UPS Charging Current/Unit: This field is used to define a current value for any charging current required for the UPS. This value will be added to the connected load value to estimate the design current of the UPS circuit. If *Capacitor based charging* option is enabled (see below), then, this will be automatically calculated by ElectricalOM.

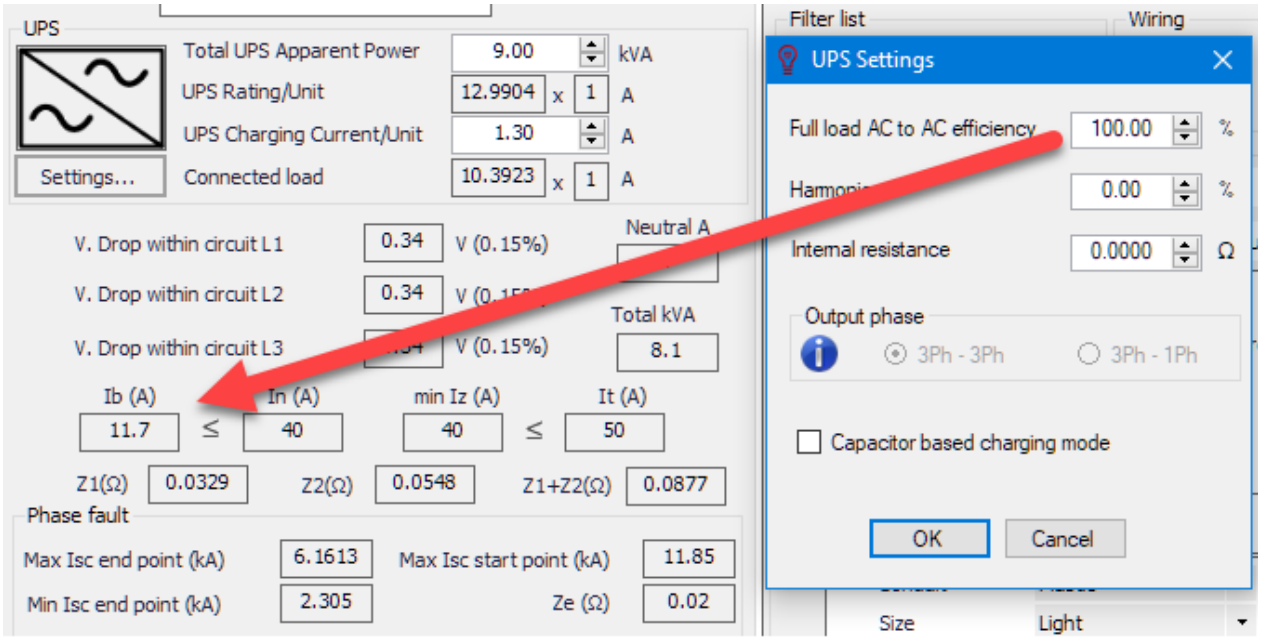


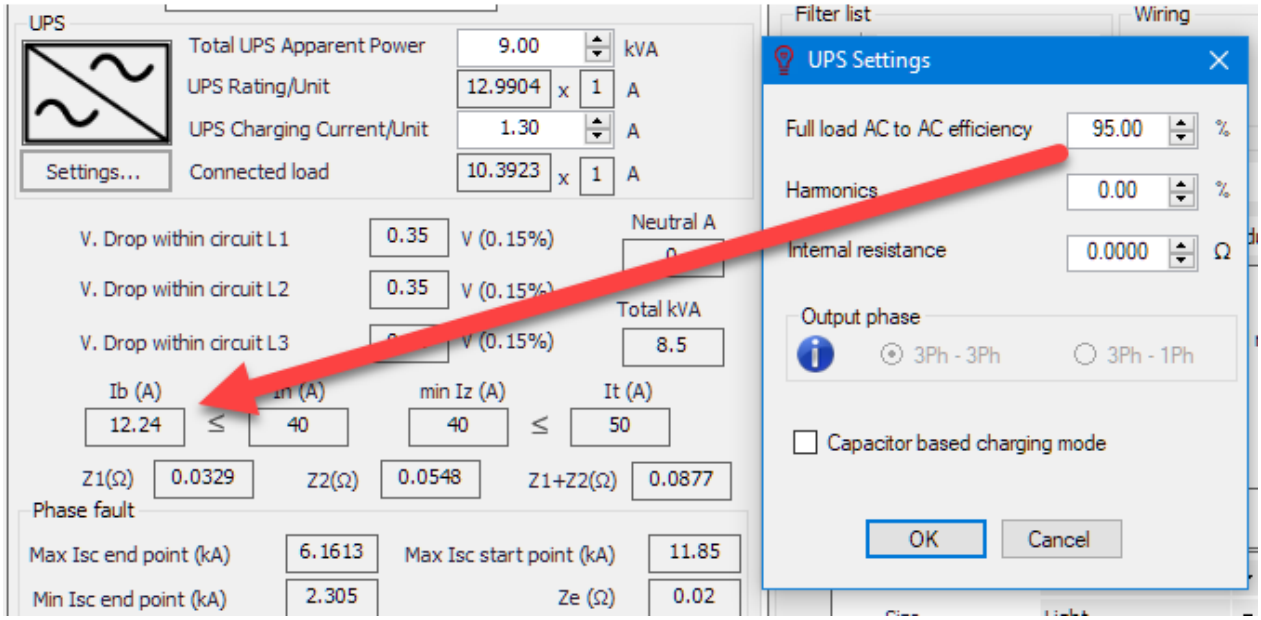
Apart from above parameters, the user may also modify some advanced settings using the *Settings...* button under the UPS symbol.



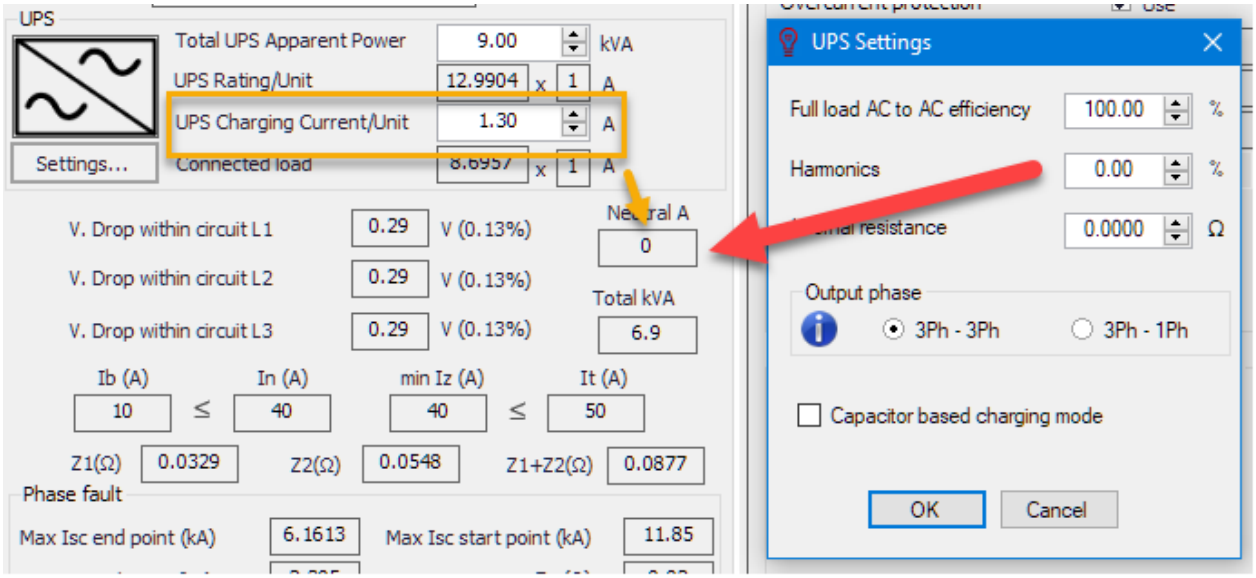


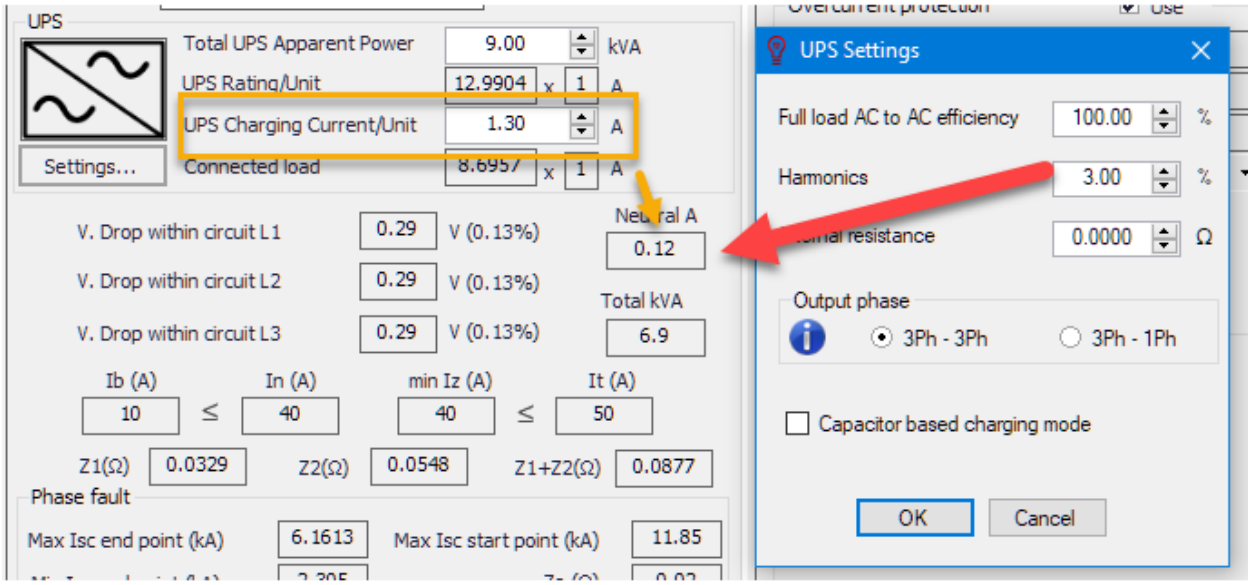
Full load AC to AC efficiency: This is the efficiency of the UPS at full load. As the efficiency decreases, design current will increase.

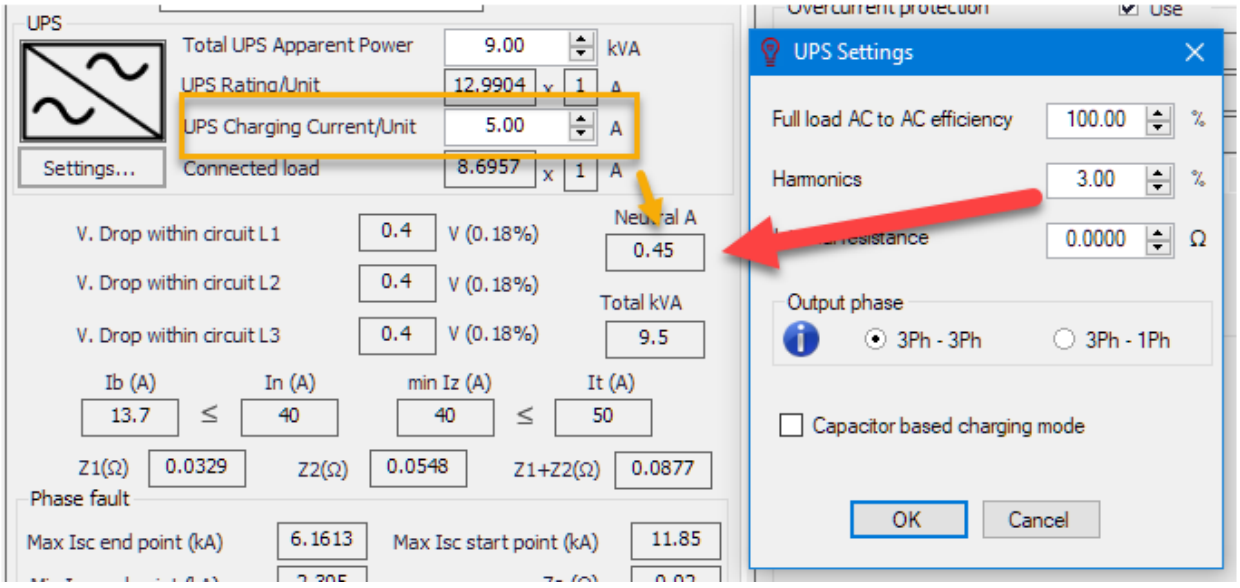




Harmonics: The user can also define any harmonics generated by the UPS using the *Harmonics* field. This will be used to calculate any Neutral current which may appear due to harmonics. It should be noted that the harmonics will be caused by the charging current only and not by the load.

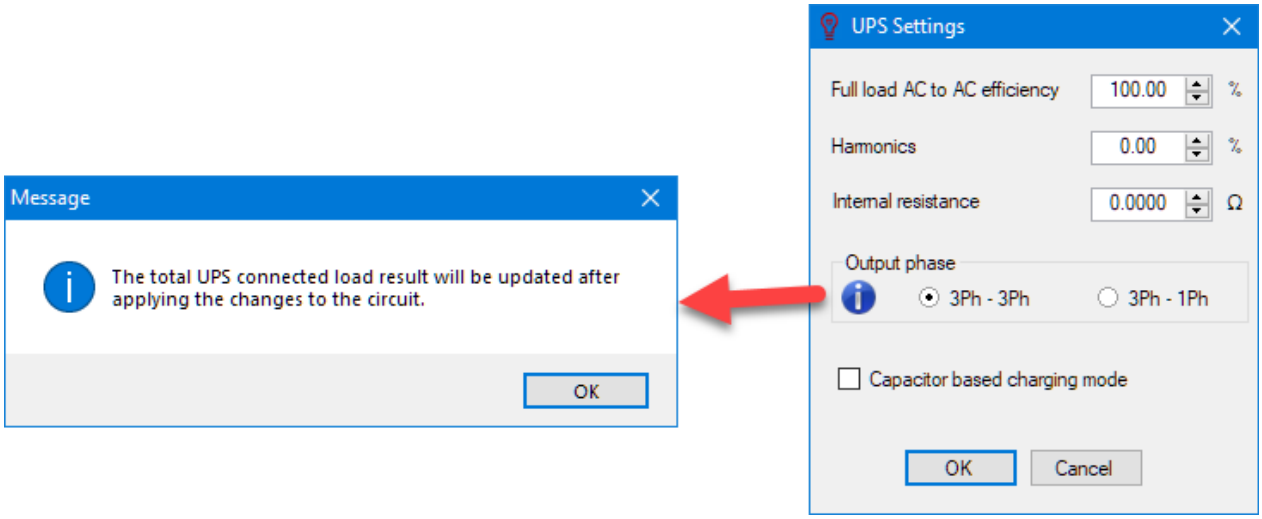




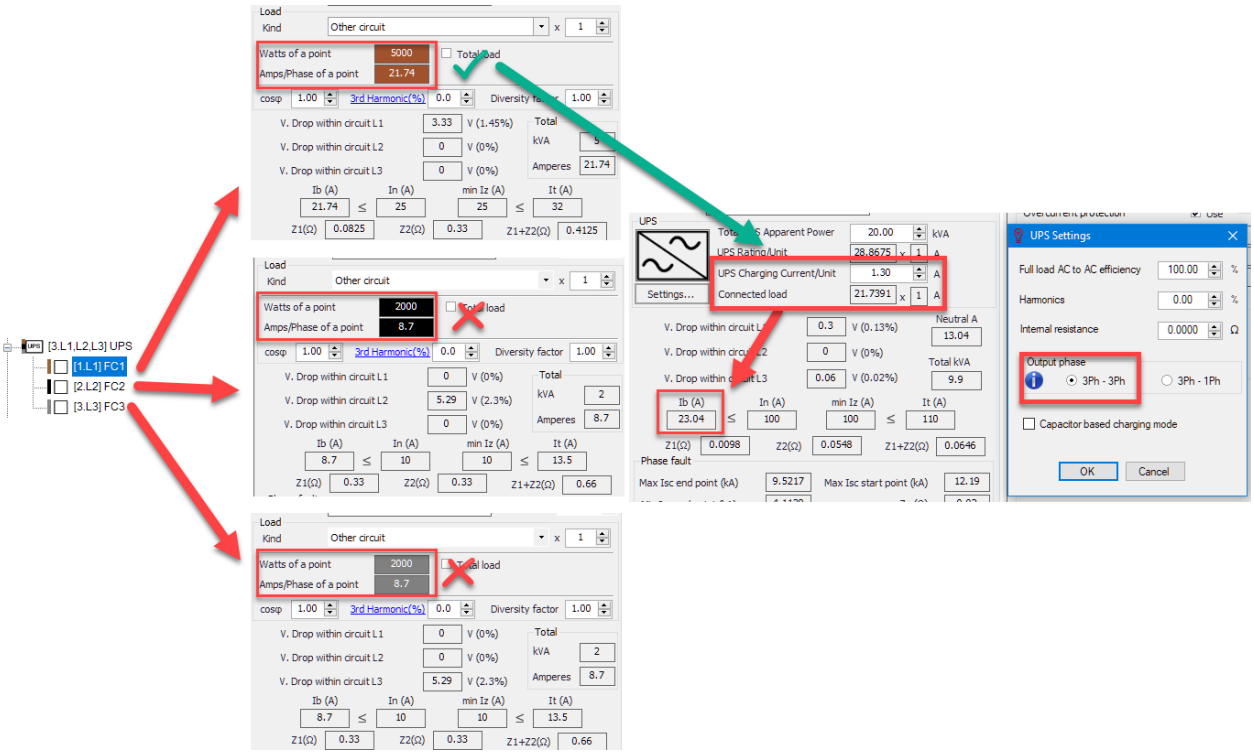


Output Phase: It is possible to set a 3Ph UPS as a 3Ph(input)-3Ph(output) or as a 3Ph(input)-1Ph(output)

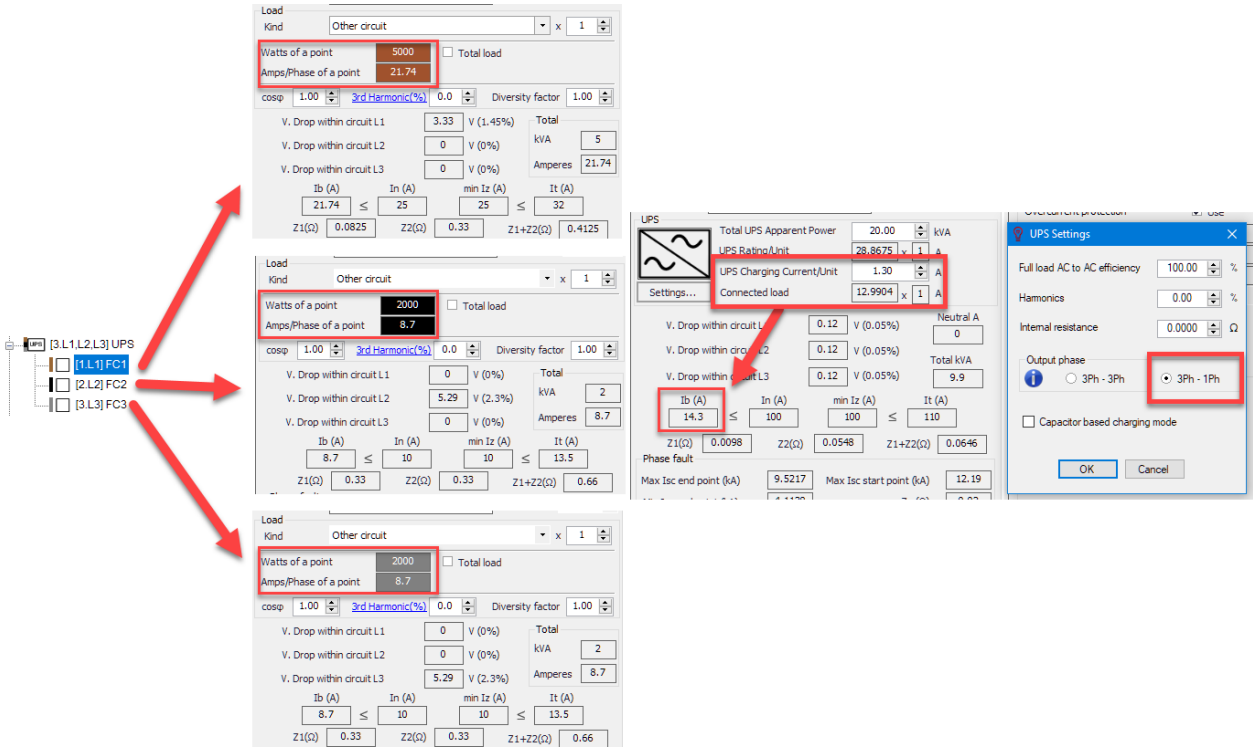
by selection the appropriate option. This option will be available only if the UPS is a 3Ph component and no 3Ph circuits is connected. ElectricalOM will require the user to click on *Apply changes* button to reflect the changes to the model.



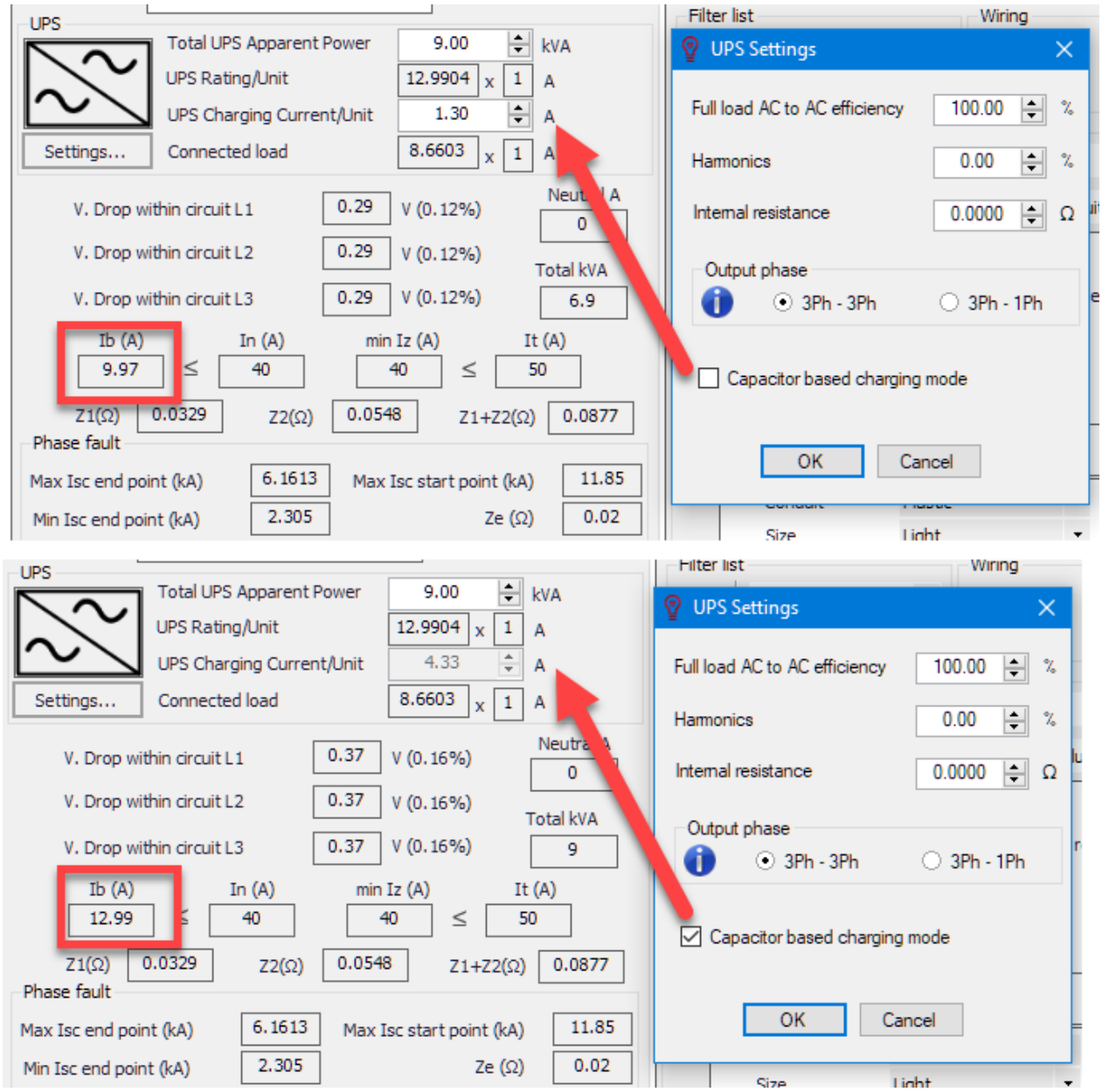
When a 3Ph UPS is set as 3Ph-3Ph and if the load is not balanced, then, the rating of the circuit with greater power rating will be reflected to all of the input phases.



However, if a 3Ph UPS is set to 3Ph-1Ph mode, then, the total downstream power will be equally divided among the three input phases.



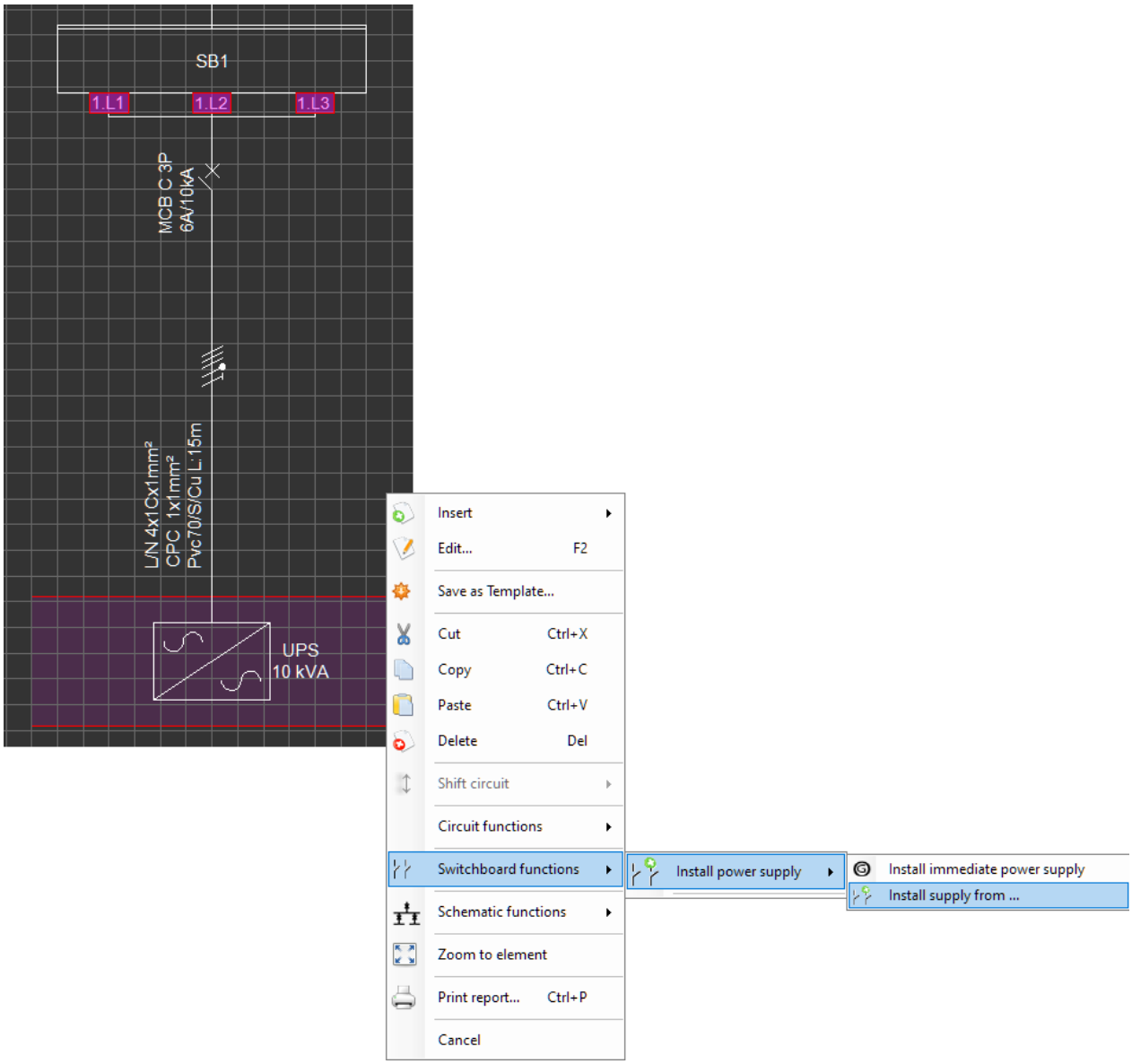
Capacitor based charging mode: If this box box is ticked, ElectricalOM will calculate the charging current automatically. ElectricalOM will deduct the connected load current from the UPS rating and set the remaining value as the charging current for UPS. As the user add new loads to the UPS, the charging current will decrease as long as the UPS rating is fixed.



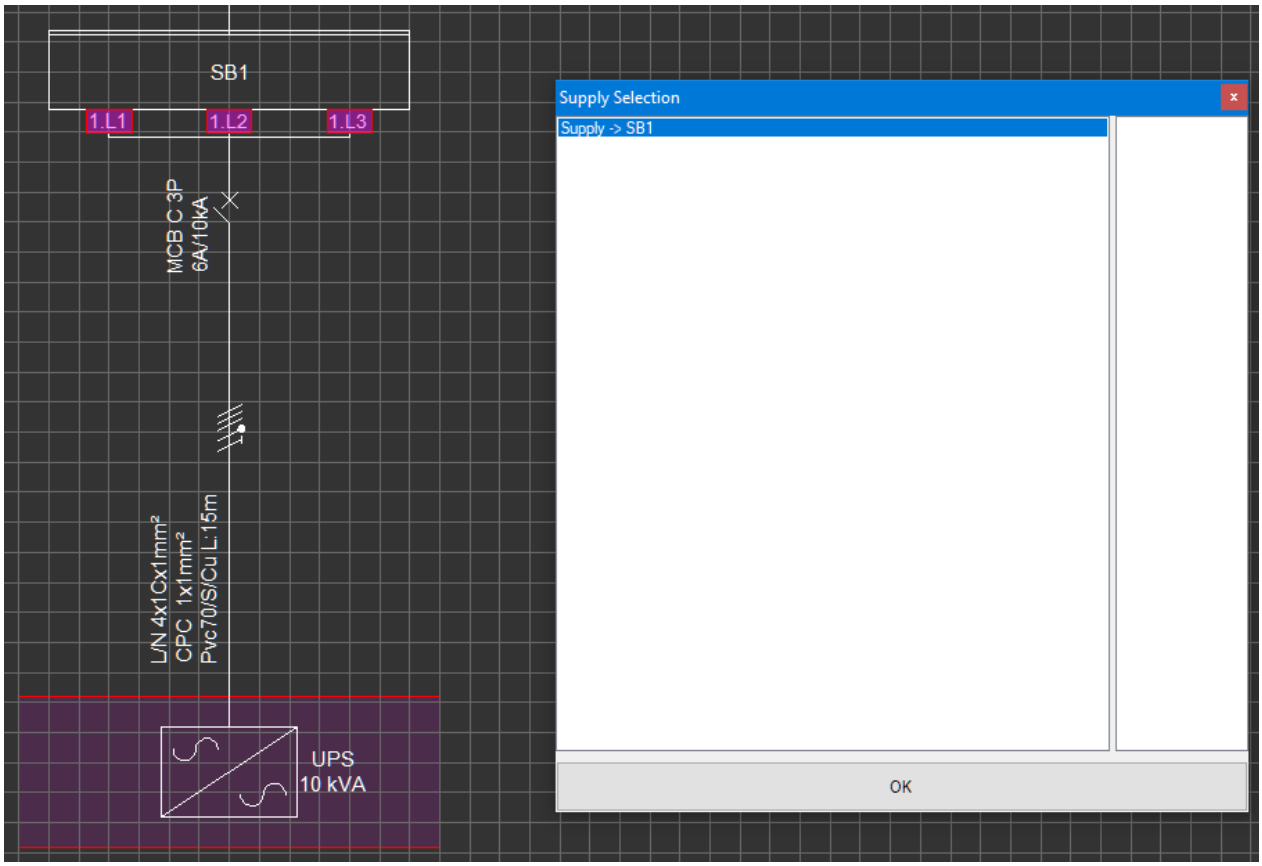
Multiple UPS Scheme

ElectricalOM is capable of modelling multiple UPS components working in parallel. In order to model such a scheme, the user needs to follow the steps below:

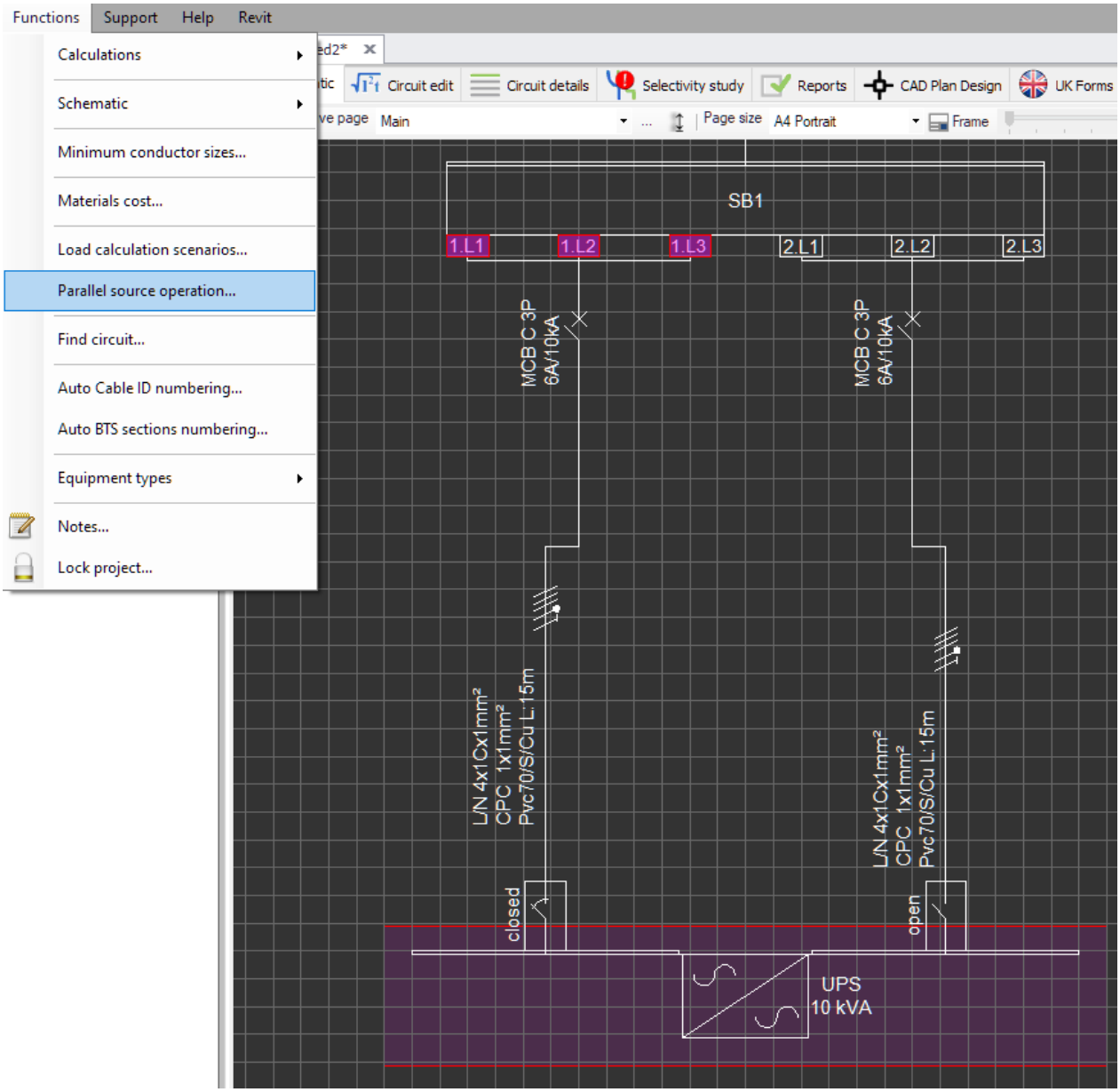
- Right click on the UPS which will be run in parallel with the new UPS and select *Install supply from...* option.



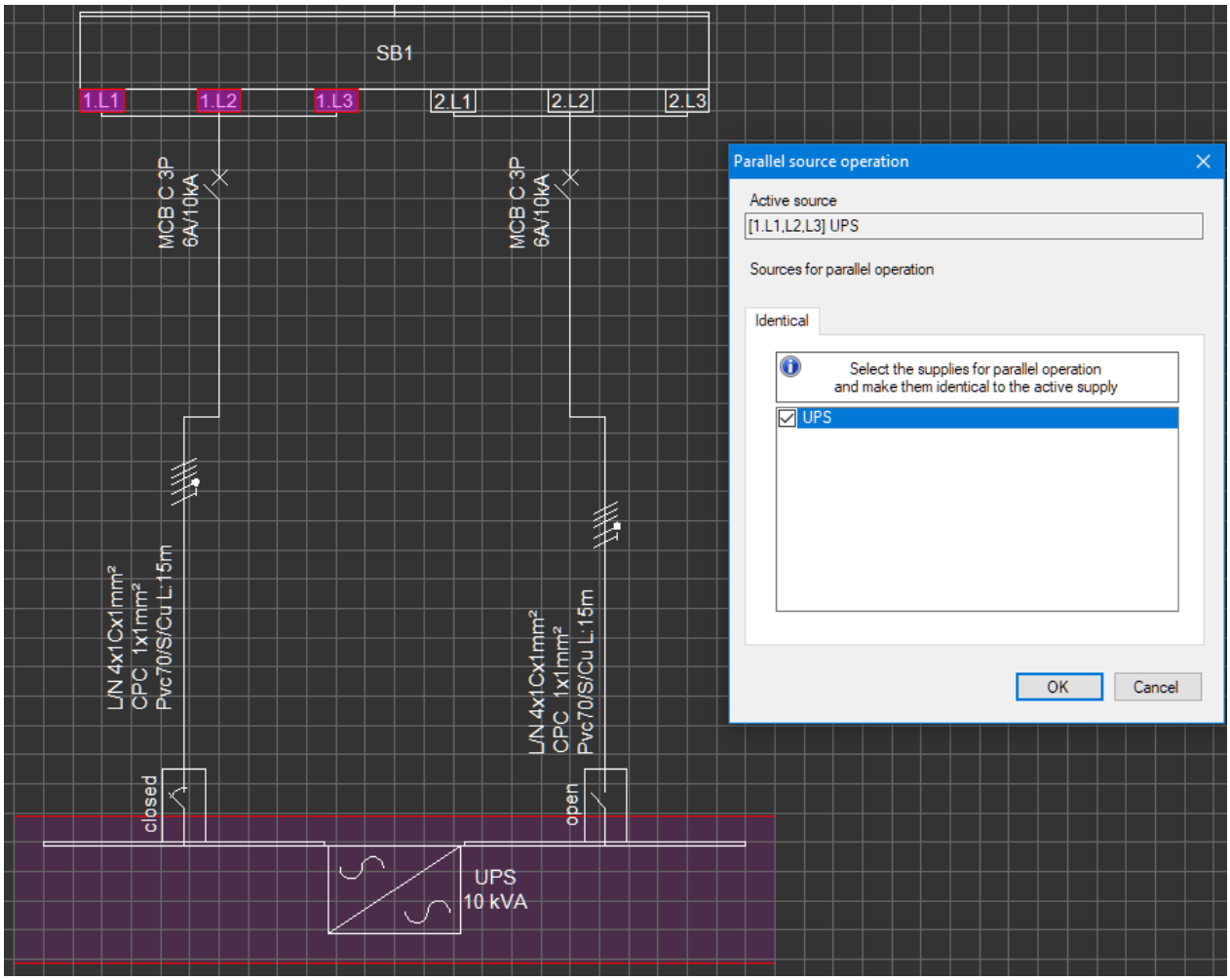
- Select the same source as the selected UPS and click OK.



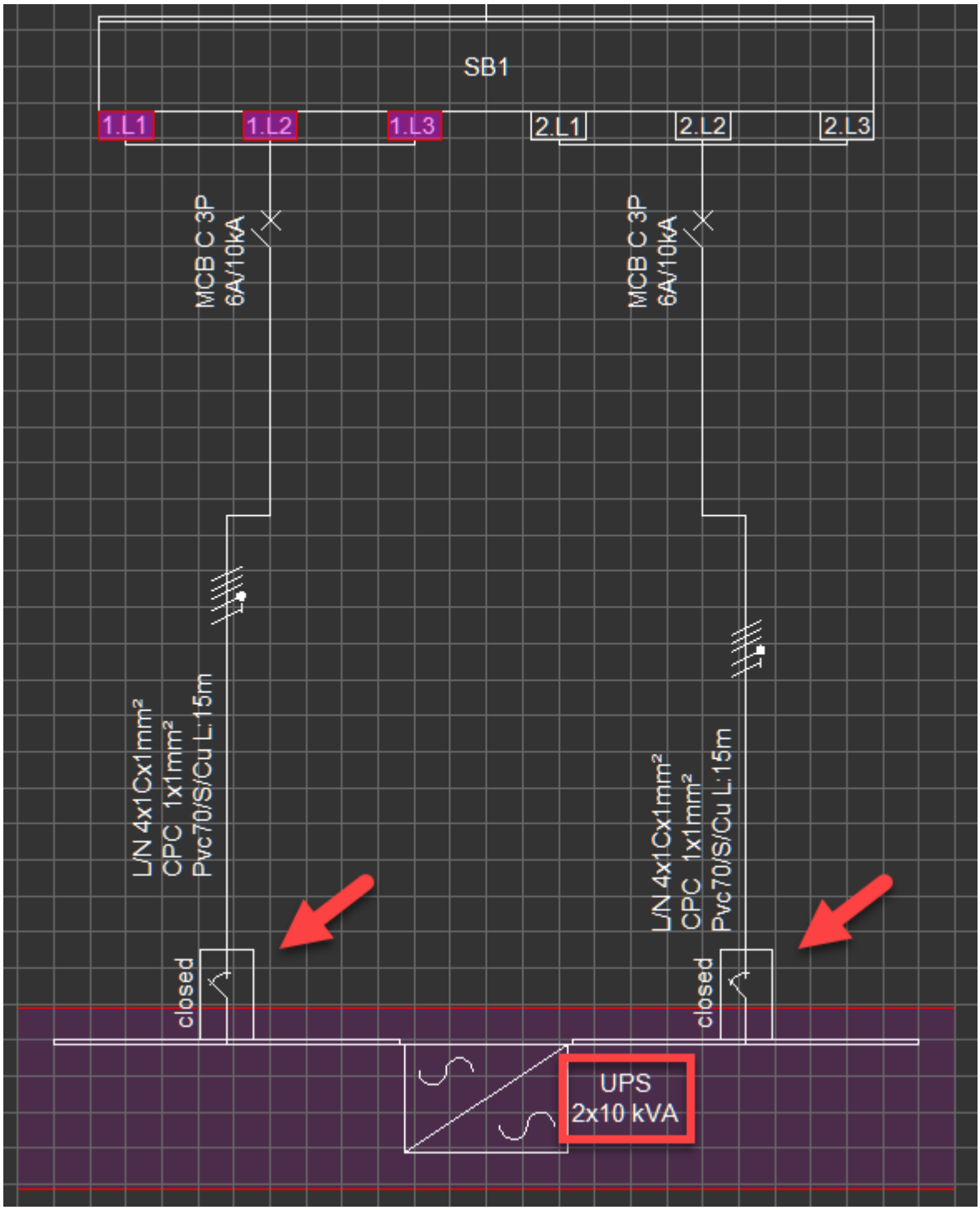
- Select *Parallel source operation...* option from the Functions Menu.



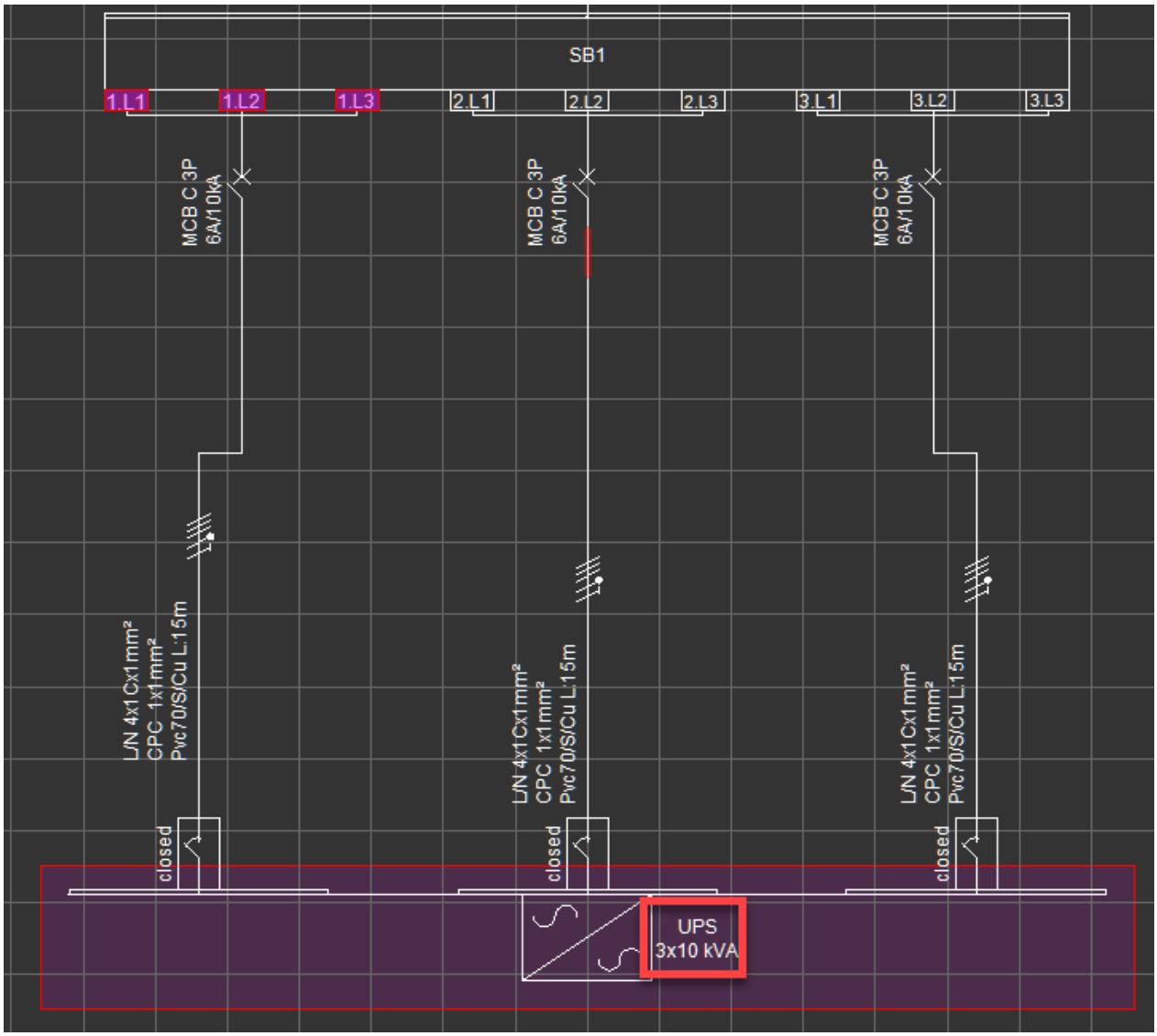
- Select the selected UPS from the list and click OK.



- Now, both switches will act together and the UPS will be indicated as 2x prefix. This means there are two units of the same UPS connected to the SB1.

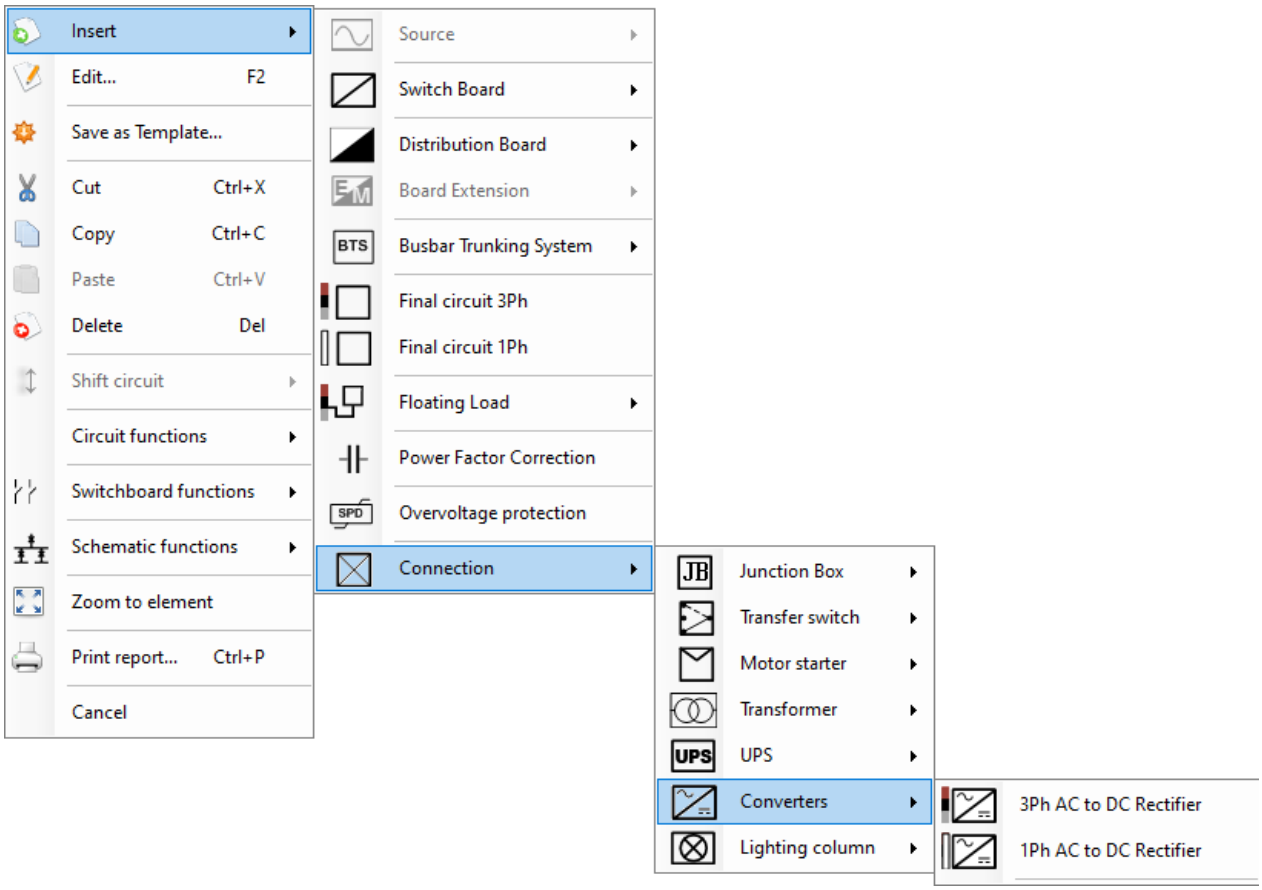


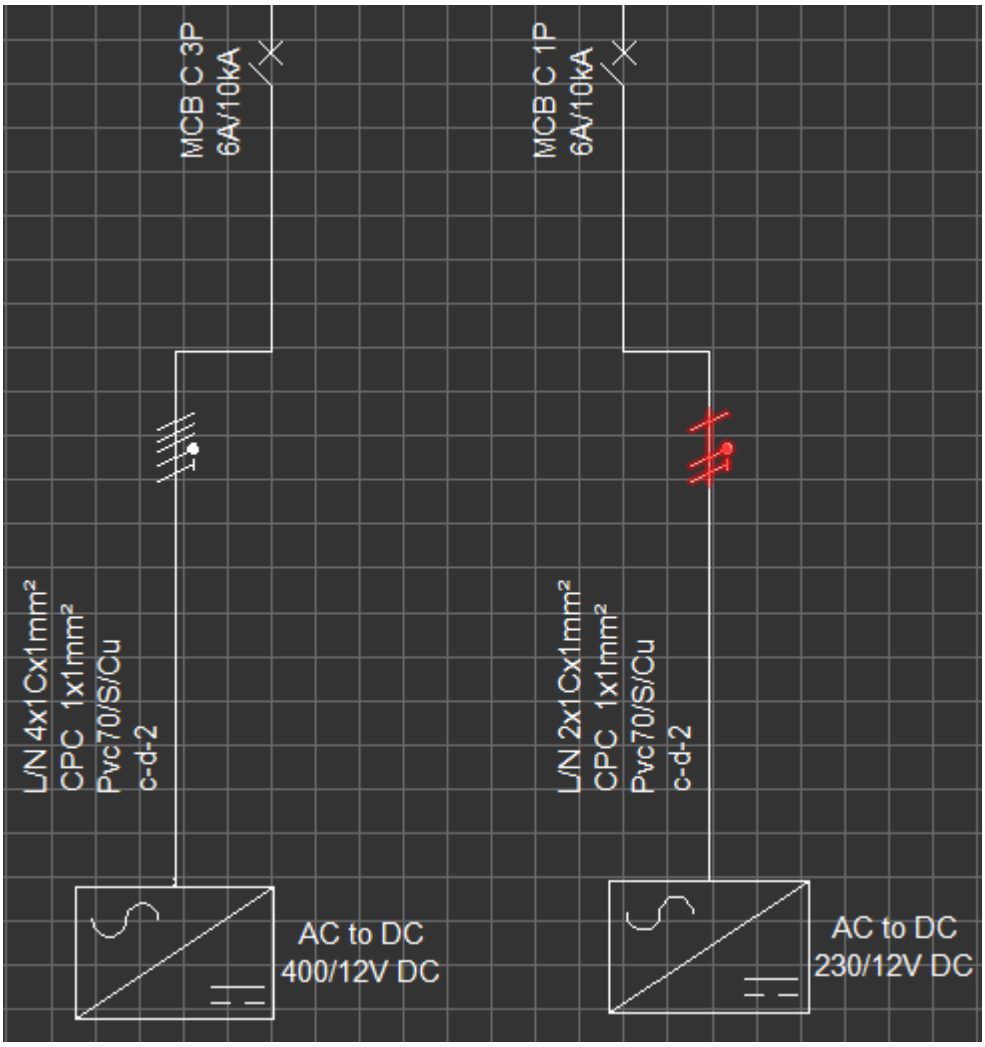
- In order to add more UPS, the same procedure must be followed.


SB1
1.L1
1.L2
1.L3
2.L1
2.L2
2.L3
3.L1
3.L2
3.L3
MCB C 3P
6A/10kA
MCB C 3P
6A/10kA
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
closed
closed
closed
UPS
3x10 kVA

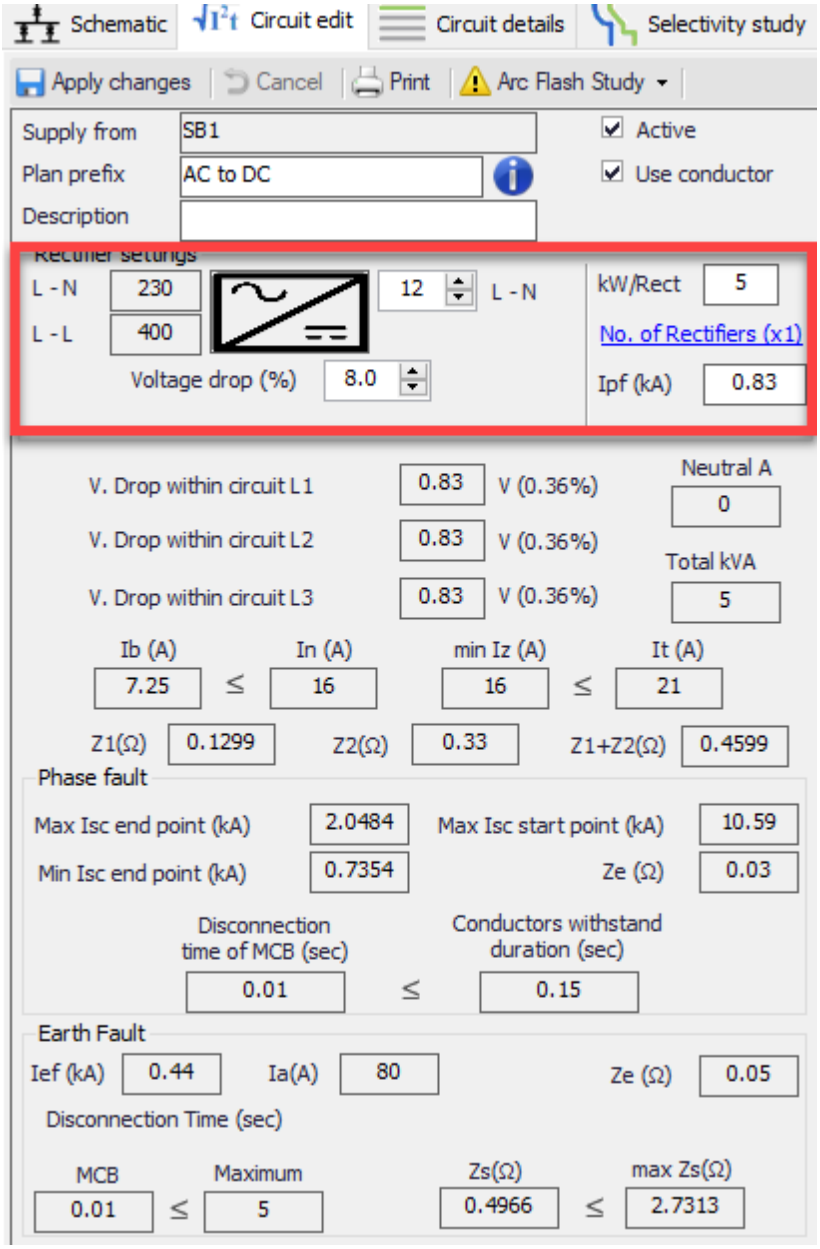
Converter

The Converter component is used to model rectifiers (AC/DC converter) with ElectricalOM, and it has two versions, 3Ph and 1Ph. A rectifier cannot be inserted after a Source and it needs a distribution node to get connected. Converter component supports Multiple Sources feature, and it can also be used to model multiple rectifiers running in parallel, see Multiple Converter Scheme.





Circuit edit tab of a Converter has a *Rectifier settings* section instead of a *Load* section, where the user can define various parameters related with the rectifier.



Left hand side of the rectifier symbol indicates the AC side parameters:

L-N Voltage and L-N Voltage (In case of a 3Ph version): These indicate the line to neutral and line to line voltage on the AC side of the rectifier and it is picked up by ElectrcialOM automatically depending on the feeder circuit.

Right hand side of the symbol represents the DC side parameters:

L-N Voltage: This parameter is defined by the user manually by typing in a value.

Other parameters:

Voltage drop (%): This field denotes the voltage drop permissible after the transformer in percent. The global voltage drop limit (see Source properties Tab section) will be applicable up to the incomer side of the rectifier, where rectifier's voltage drop setting will be applicable to any downstream circuits.

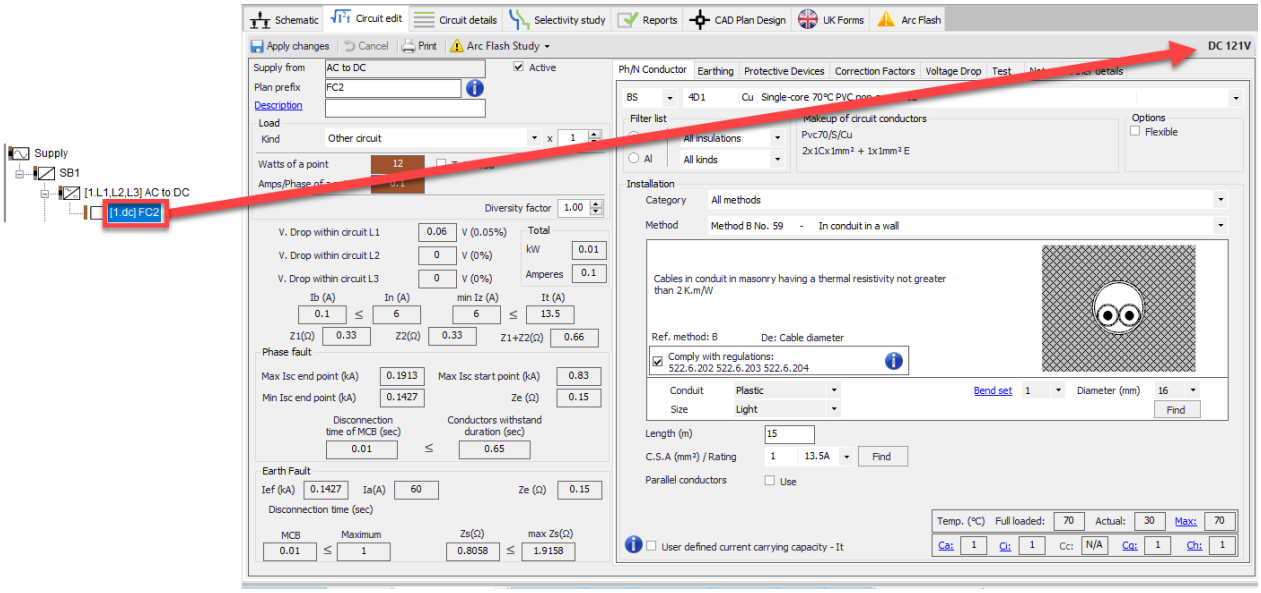
kW/Rect: This is set by the user and it indicated the power of a rectifier. This parameter is for an individual rectifier and in the case of multiple rectifiers it will be multiplied by the number of rectifiers.

No. of Rectifiers Link: The user may set multiple rectifiers as parallel using this link, See, Multiple

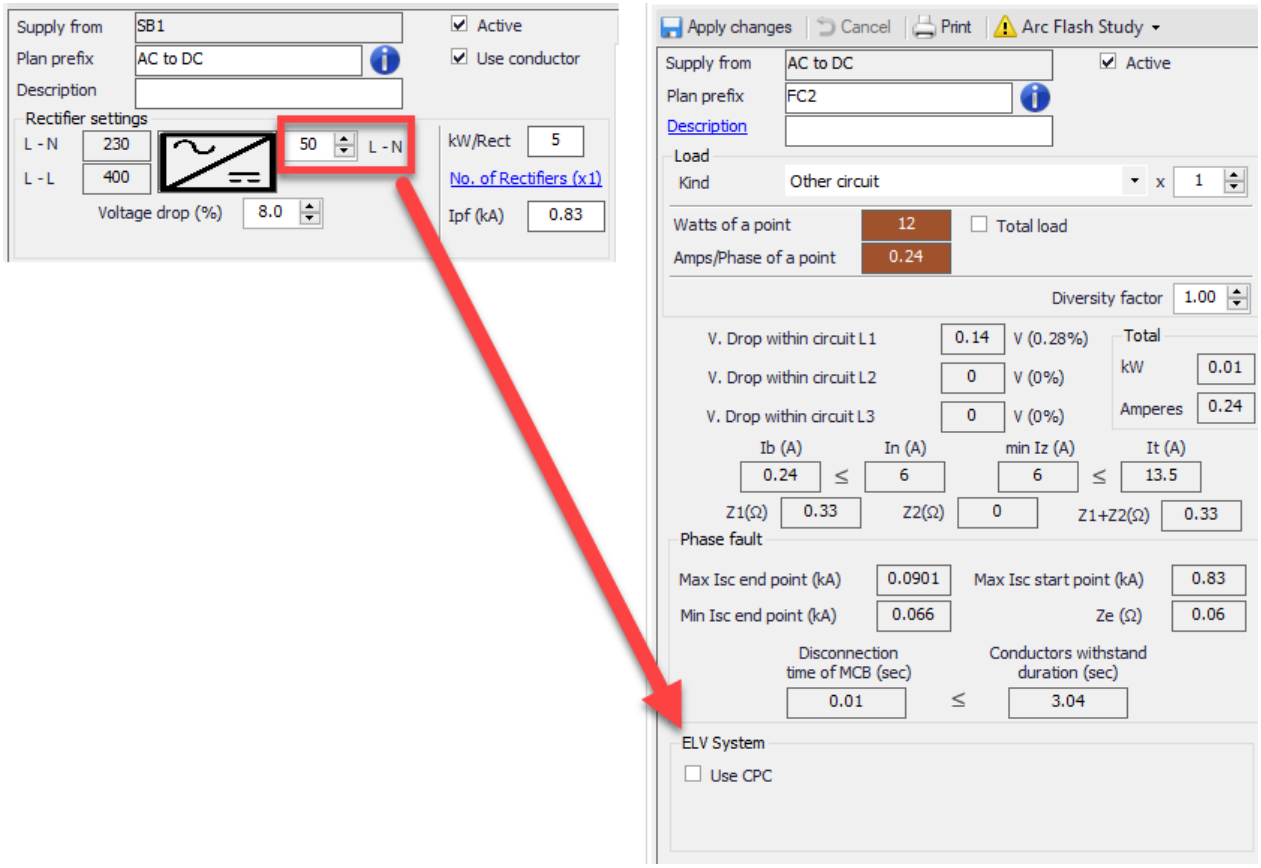
Converter Scheme for details.

Ipf(kA): Prospective fault current parameter is defined by the user by typing in the required value.

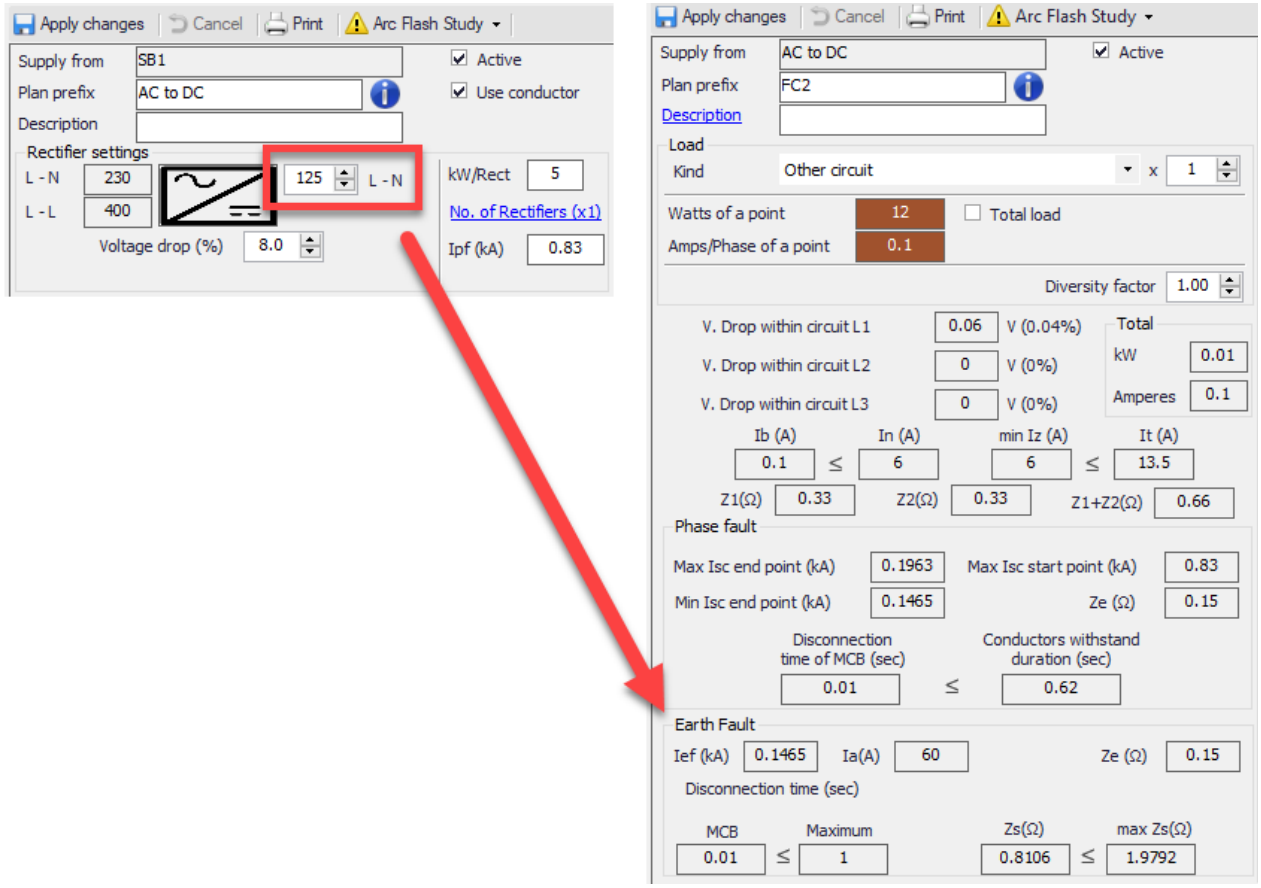
Only single phase components are available for the DC side of the rectifier. When a 1Ph component is inserted to the DC side, then it will be marked as a DC circuit.



ElectricalOM will consider a DC circuit as an ELV as long as the DC side voltage is not above 120V and there will be no earth connection consideration (a two core cable will be selected) unless the user specifically selects *Use CPC* tick box. If this options is enabled then the Earthing tab will also be enabled.



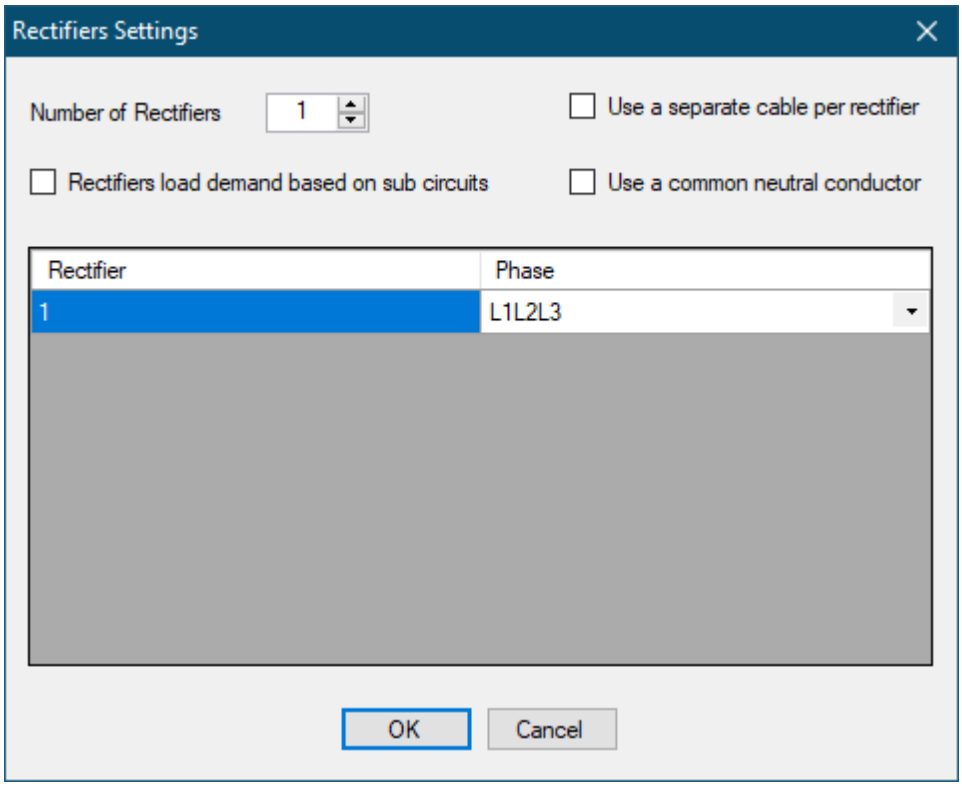
If the voltage is above 120V, then ElectrcialOM will asthmatically consider an earth conductor and will include related calculation and checks.



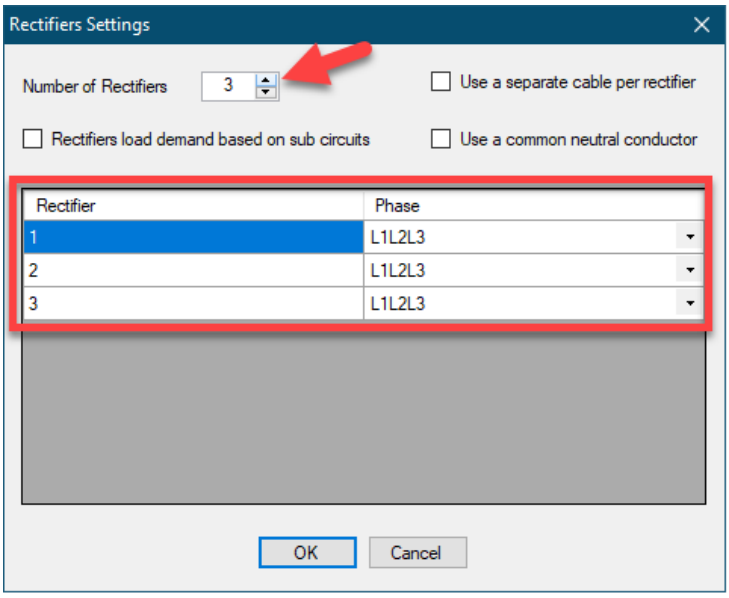
Multiple Converter Scheme

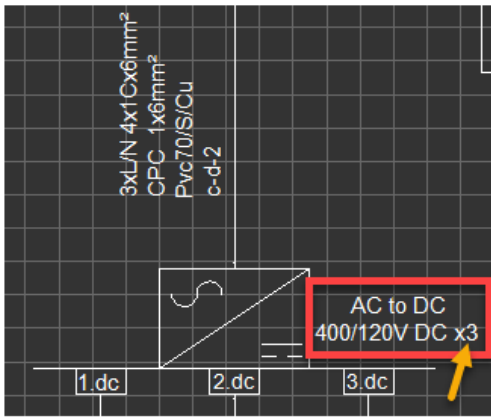
ElectricalOM is capable of modelling multiple rectifiers working in parallel. In order to model such a scheme, the user needs to follow the steps below:

- Click on the Converter component and access to Circuit Edit tab. Click on the *No. of Rectifiers* link to open the Rectifiers Setting window.

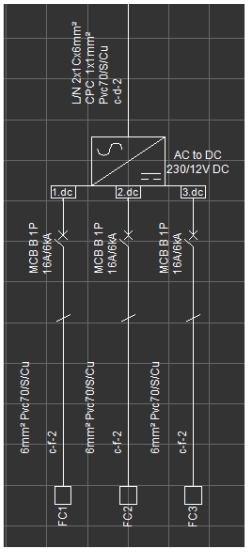


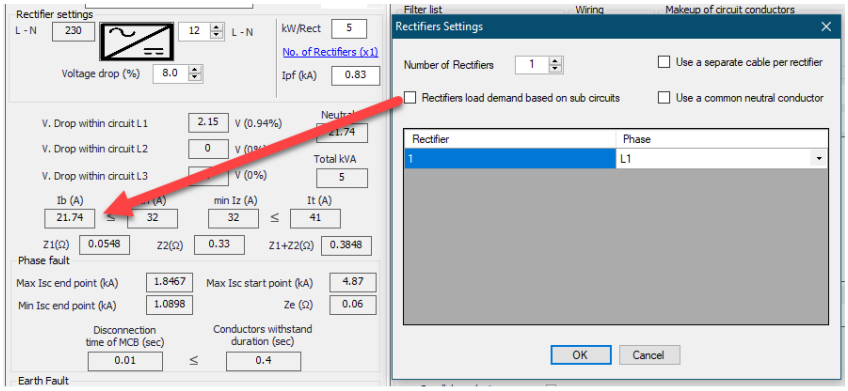
Changing the *Number of Rectifiers* field will ad or remove rectifiers from the circuit. This can be visually followed via the rectifier list, where the rectifiers will be numbered and the type of the rectifier will be displayed (3Ph or 1Ph). Also, the designation will be modified to indicate multiple rectifiers.

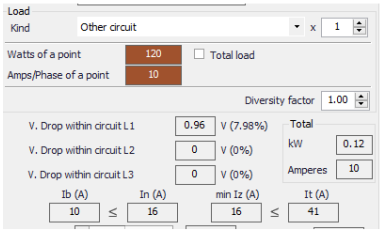


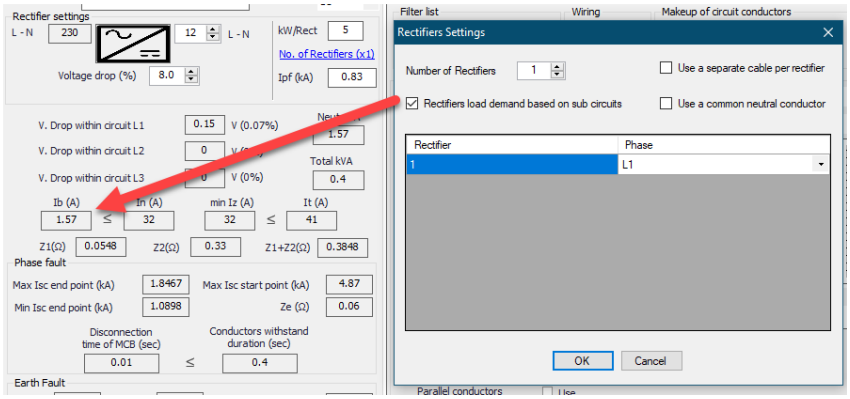


Rectifiers load demand based on sub circuits: The design current of the rectifier circuit will depend on the power of the rectifier set by the user, however, if this box is ticked, ElectricalOM will consider the connected load to set the design current.

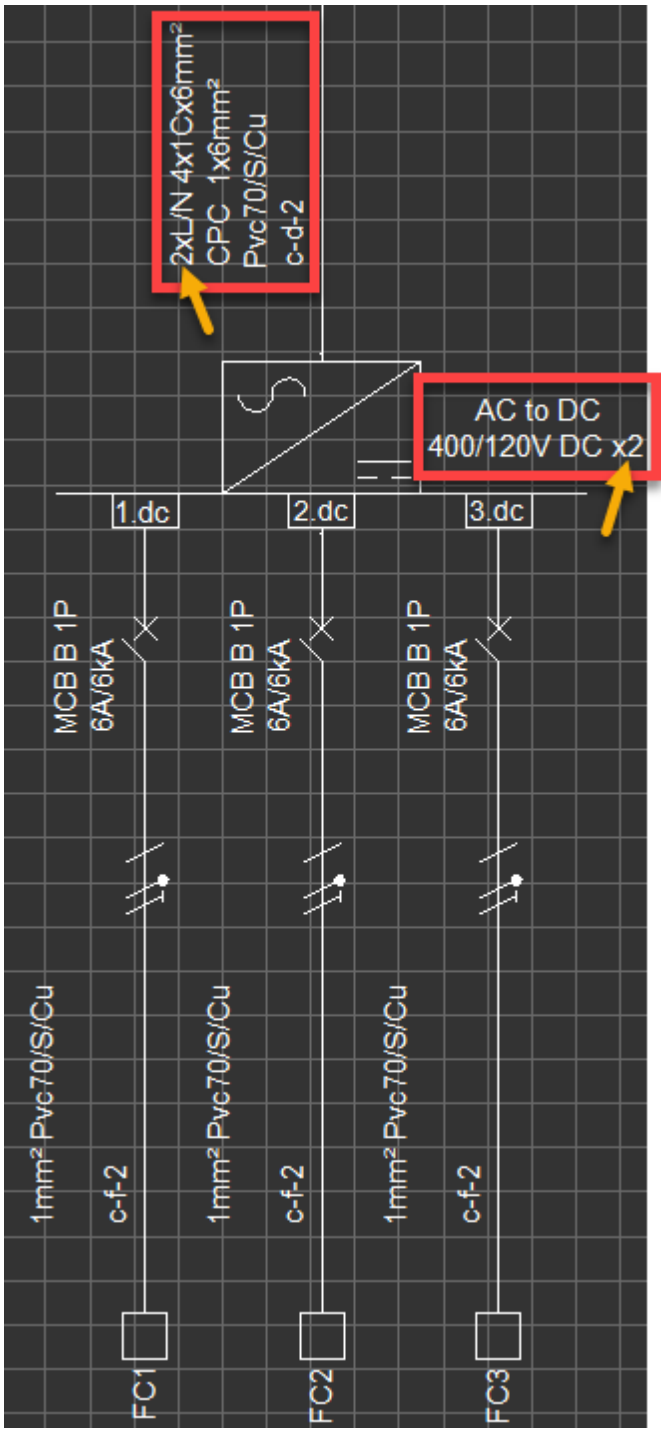




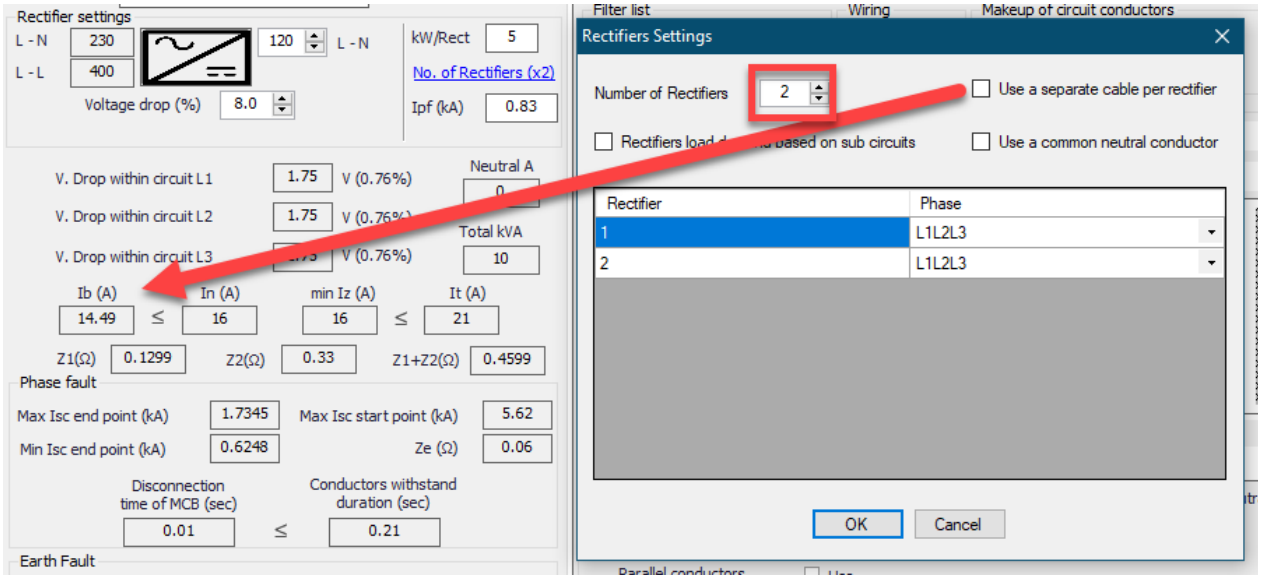


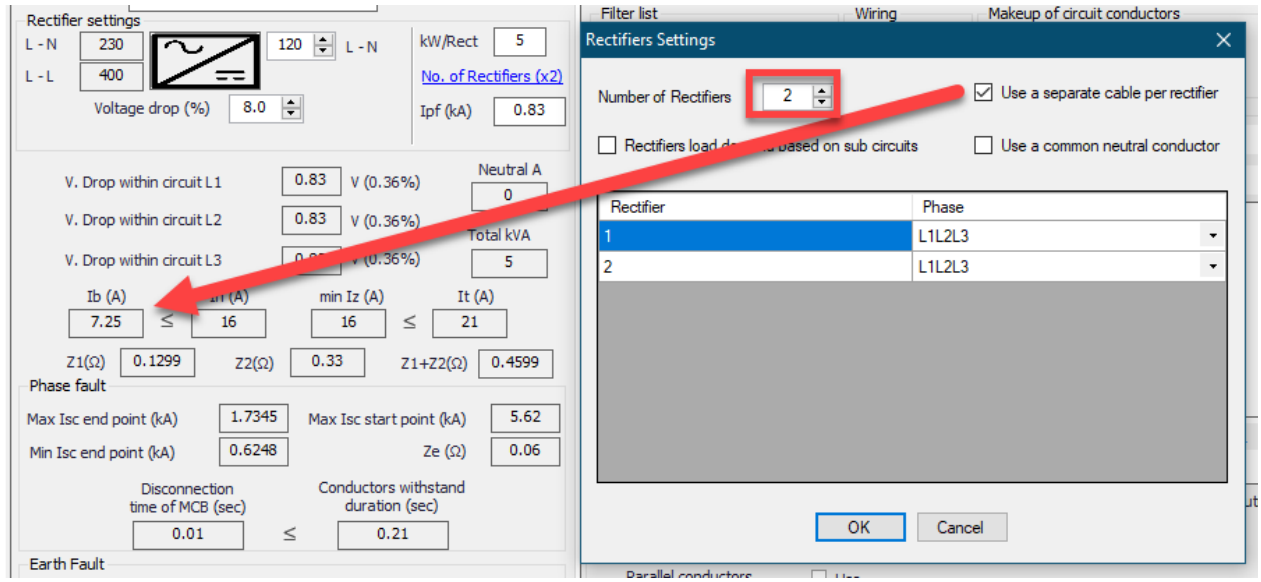


Use a separate cable per rectifier: When the number of rectifiers increased, ElectricalOM assumes a single feeder cable as default, however, the user may set ElecricalOM to model the rectifiers as if they are fed by separate conductors by ticking this box.

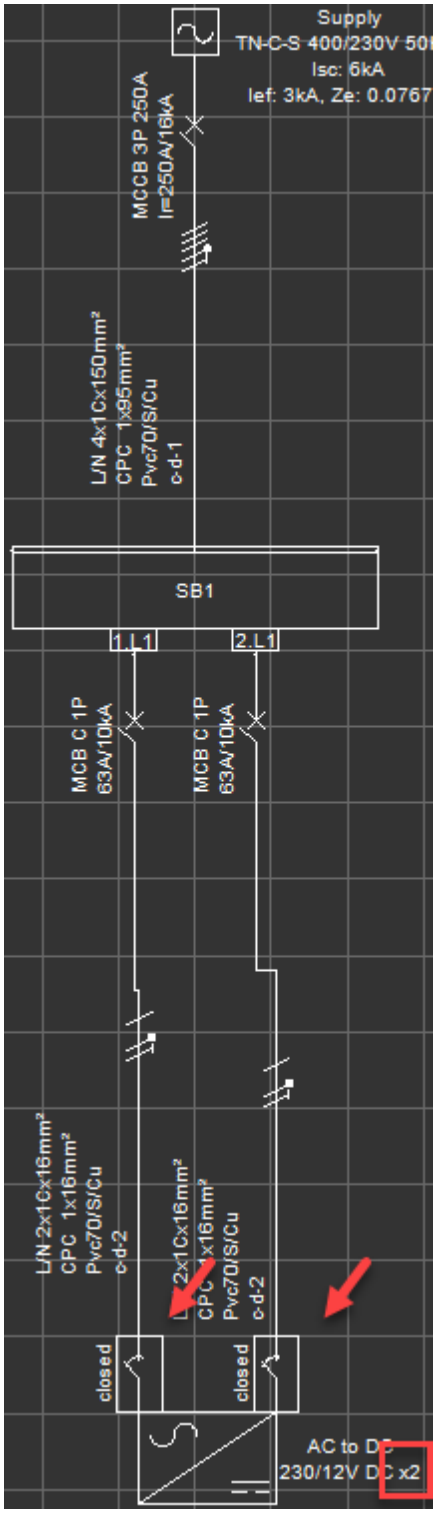


If separate cables are used, then, ElectricalOM will divide the design current to the number of rectifiers and base the calculations on this value.

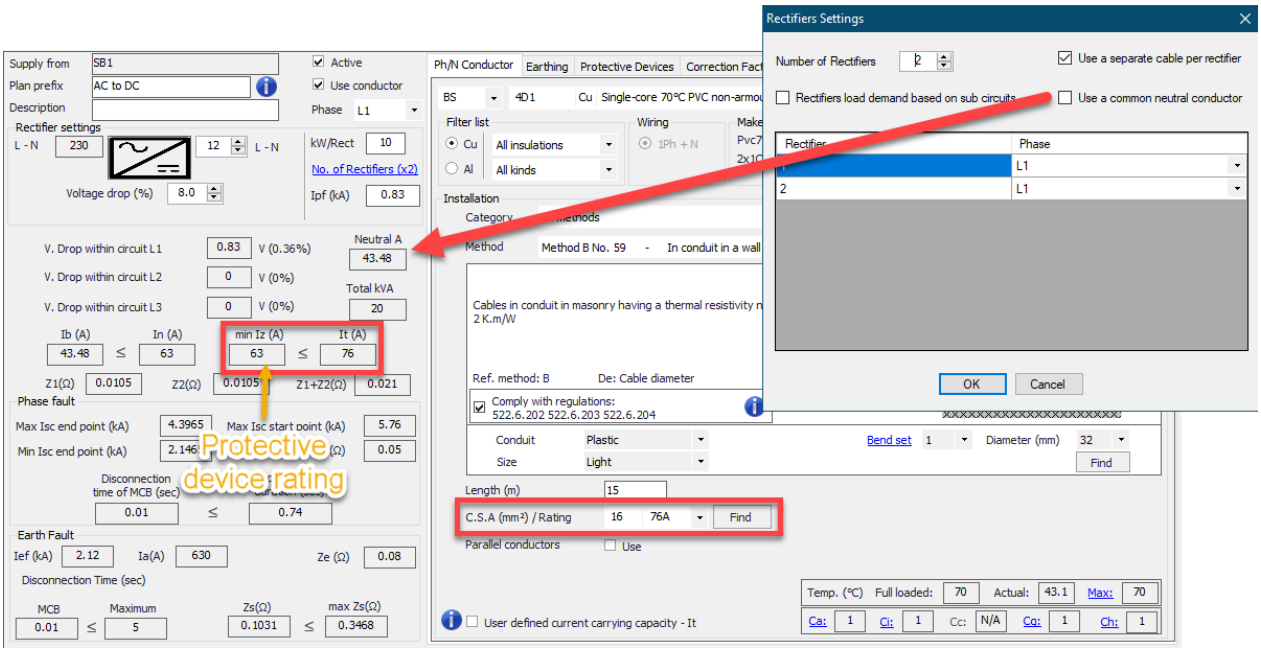


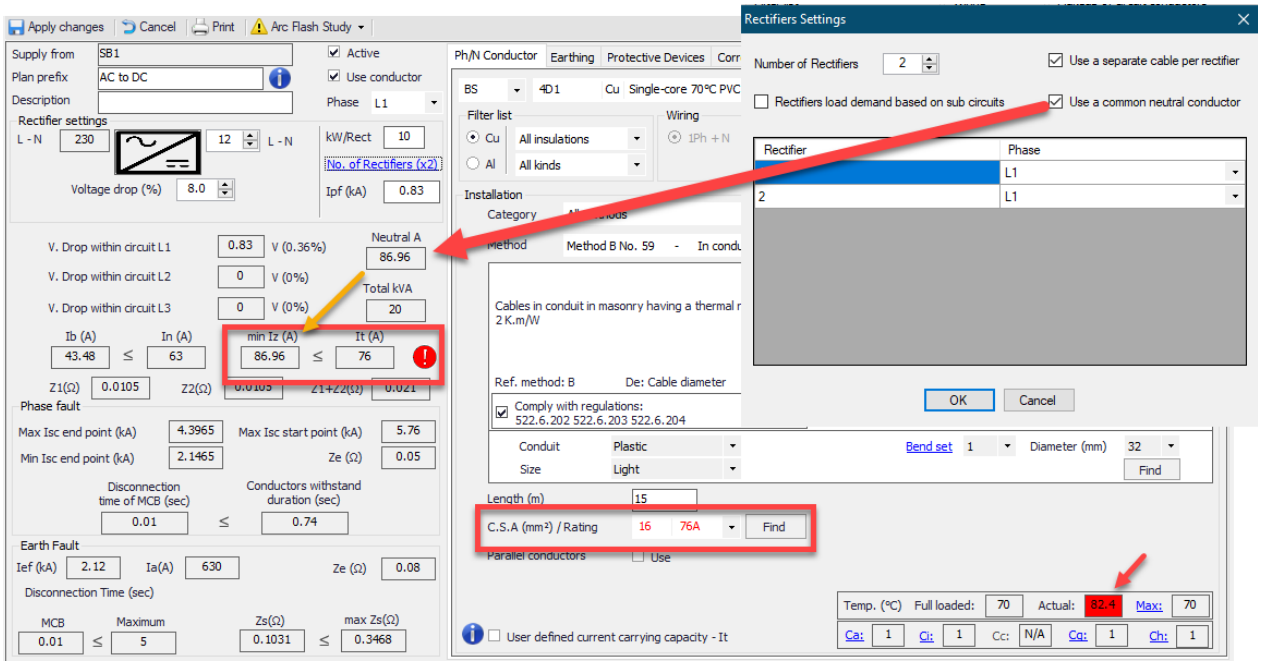


Use a common neutral conductor: This option is only applicable when the *Separate conductor for each rectifier* is used together with Parallel Source Operation feature. In this arrangement, ElectrcialOM will display each conductor connected to the rectifier via an individual switches. ElectricalOM will assume separate neutral conductor as default but the user may combine the neutrals by ticking this box. The neutral current will be calculated accordingly by ElectricalOM. This is apparent with 1Ph components.



ElectricalOM will monitor the neutral current whatever the setting is and will suggest required warnings if any issues arises when the neutrals are combined.

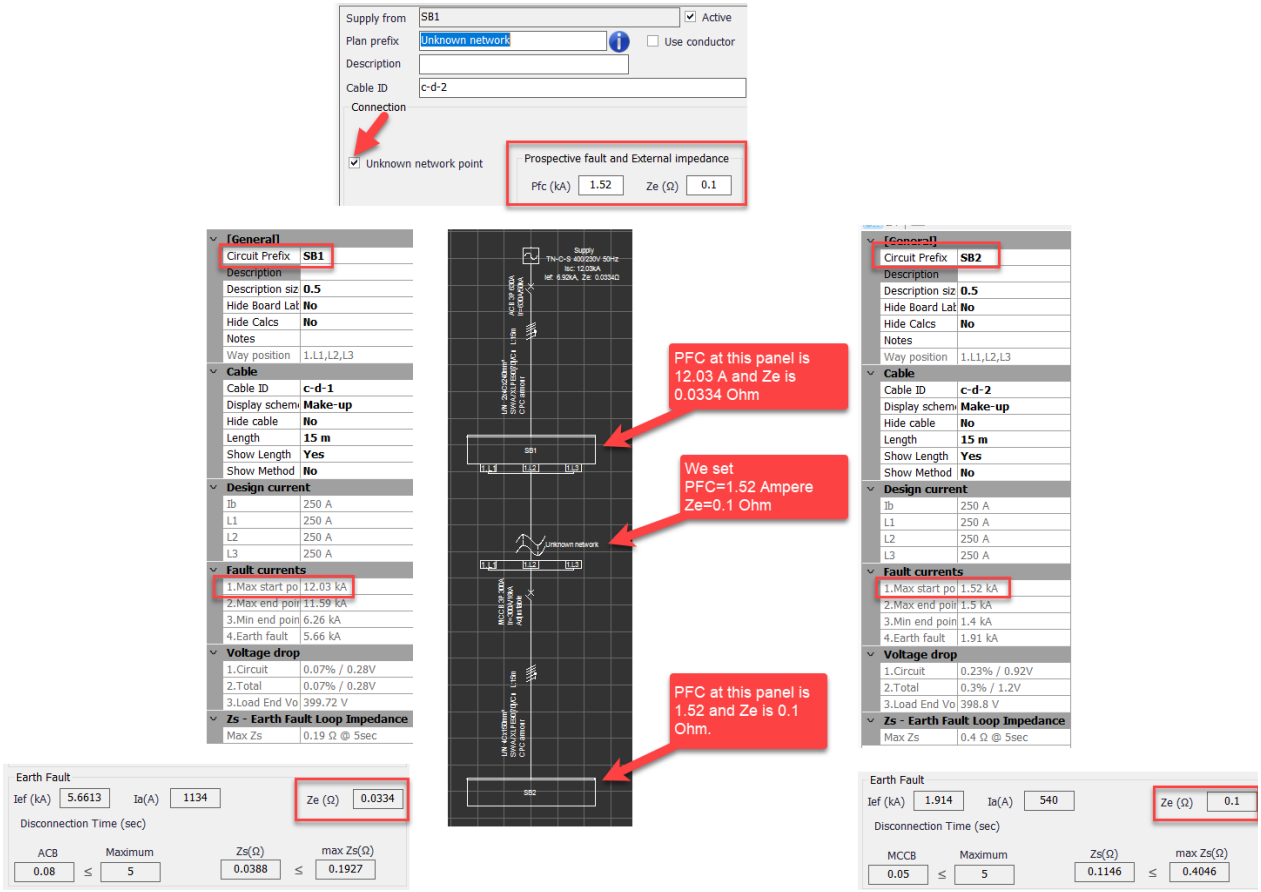




Unknown Network

Unknown network component is designed for cases where the user cannot know the details about the source but have the prospective short circuit current and external impedance value at a location. Once this component is inserted ElectricalOM will disregard source characteristics and use these PFC and Ze values for all calculations downstream to unknown network component.

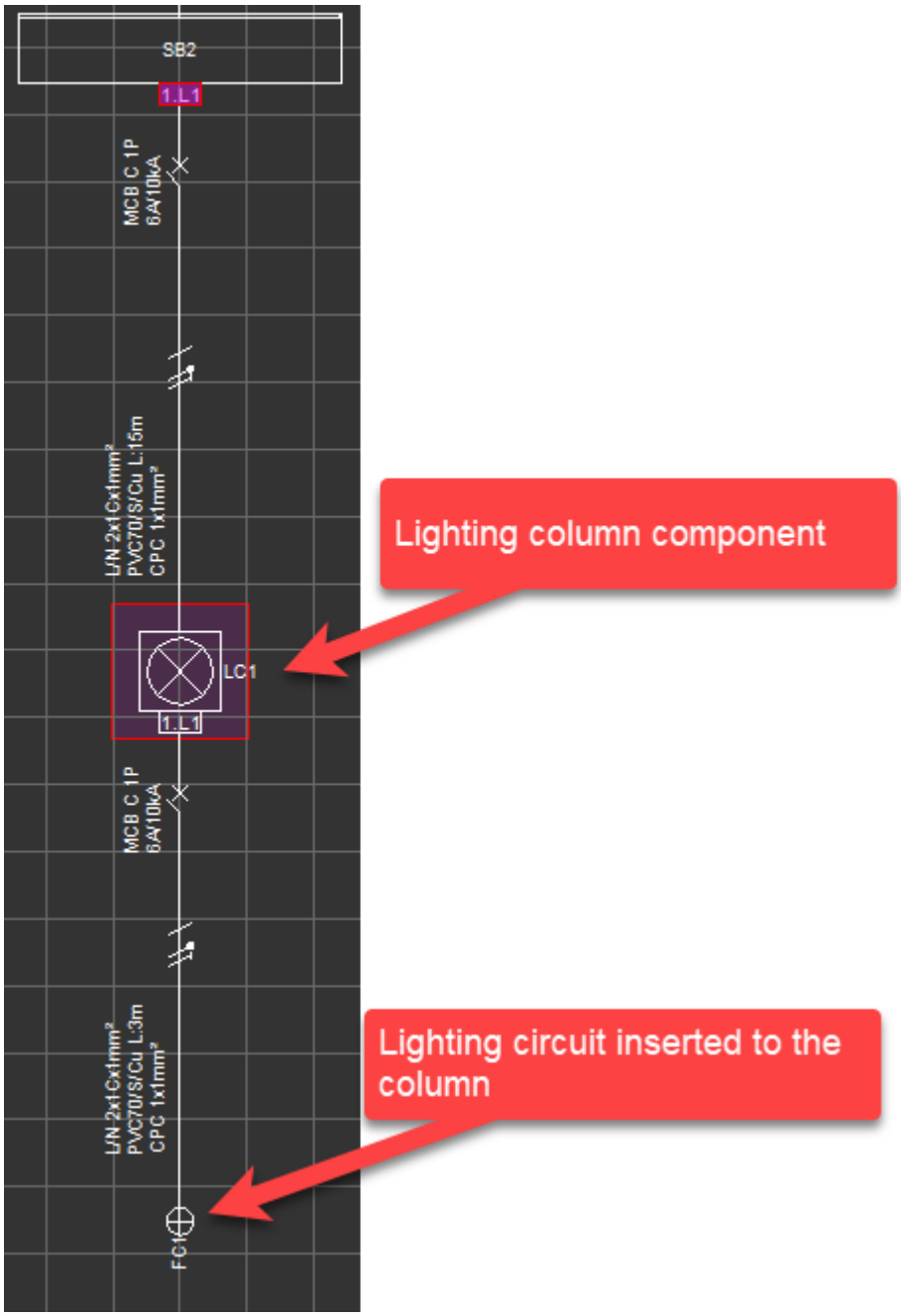
See picture below for a representation how Unknown Network component works.



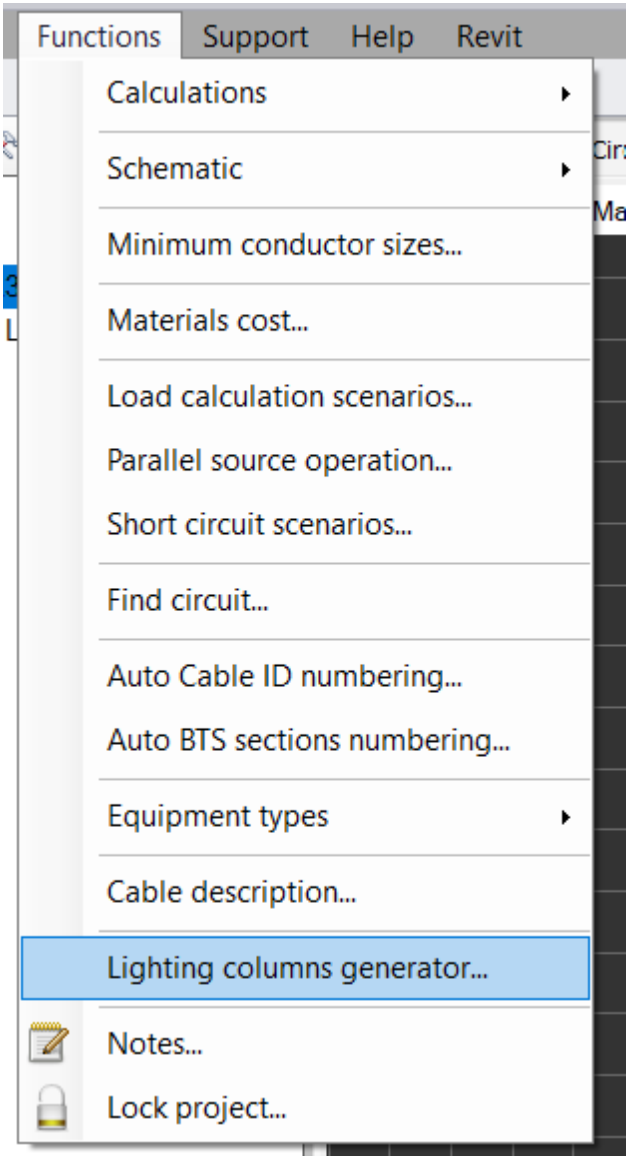
This feature (Unknown network) is also available with junction box component. User needs to tick Unknown network point box to enable it. Now the JB will act the same way as the Unknown network component.

Lighting Column

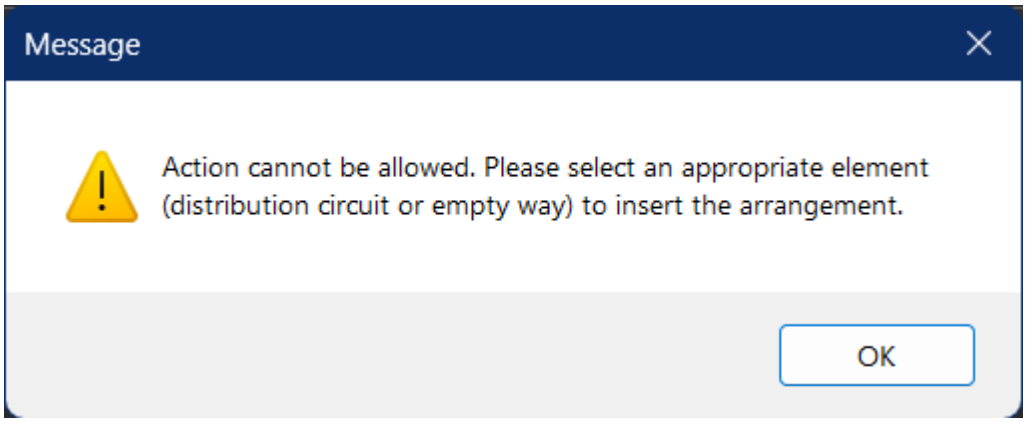
This component will insert a model designed for a lighting column. Once inserted, it will add the first part of the model which is the column. It will be inserted with a cable and a protective device. Then user needs to add a lighting fixture to the column using the insert menu and selecting the final circuit option to finalise the lighting column modelling. This inserted final circuit will automatically be set as a lighting circuit.



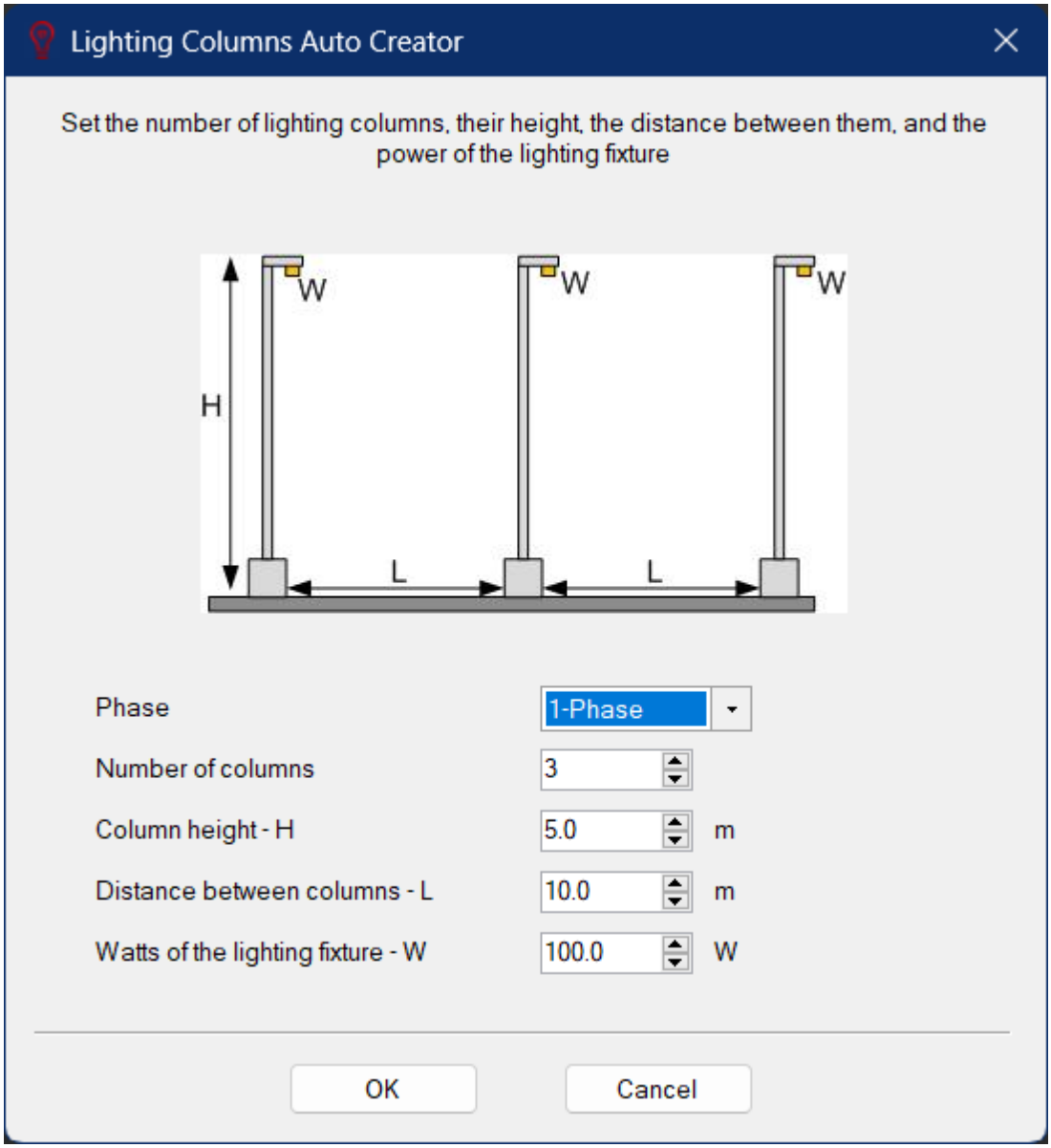
In order to model a series of columns, a new column should be inserted to the previous one. ElectricalOM also has a built-in lighting column creator tool which can be accessed via Functions menu.



Before using this option, user needs to select a suitable place to insert the columns, for example a switchboard. If not, ElectricalOM will display a pop-up window and ask the user to select a location to insert columns will be created.



Then, user can select or type in desired value at Ligthing Column Auto Creator screen and click OK. After this, ElectricalOM will create the columns and insert them to the selected location.



However, it should be noted that cables and protective devices must be set after creation.

Other Components

Insert menu also accommodates following components:

- Power Factor Correction (3Ph+N/1Ph/N)
- Overvoltage protection (3Ph+N/1Ph/N)

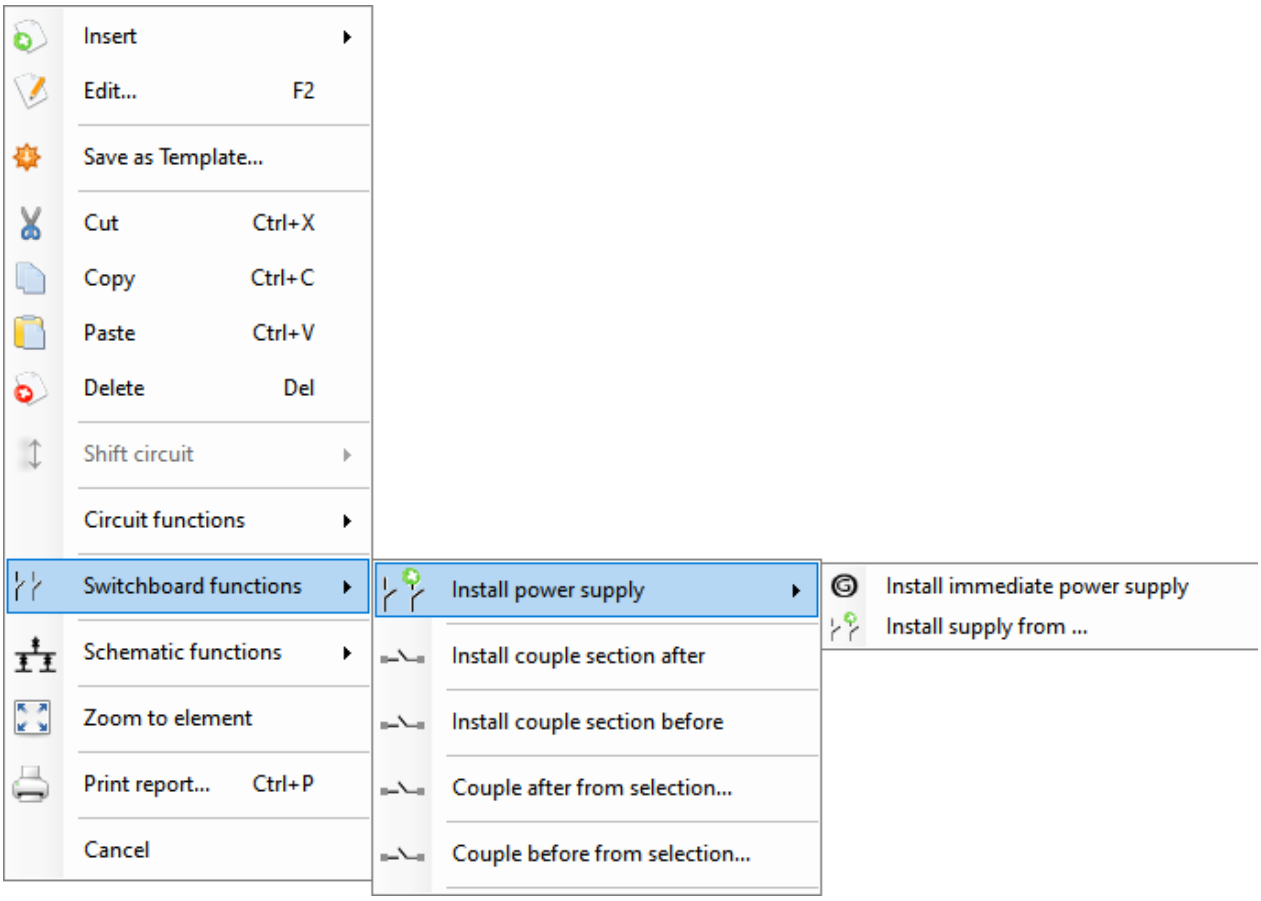
Details will be added later.

Switchboard Functions Menu

Switchboard functions menu is displayed if only a switchboard or a junction box is selected. The options are specific for switchboards and some other components with similar properties.

For multiple supplies, please refer to Multiple Sources section.

For coupling, please refer to Switchboard Coupling section.



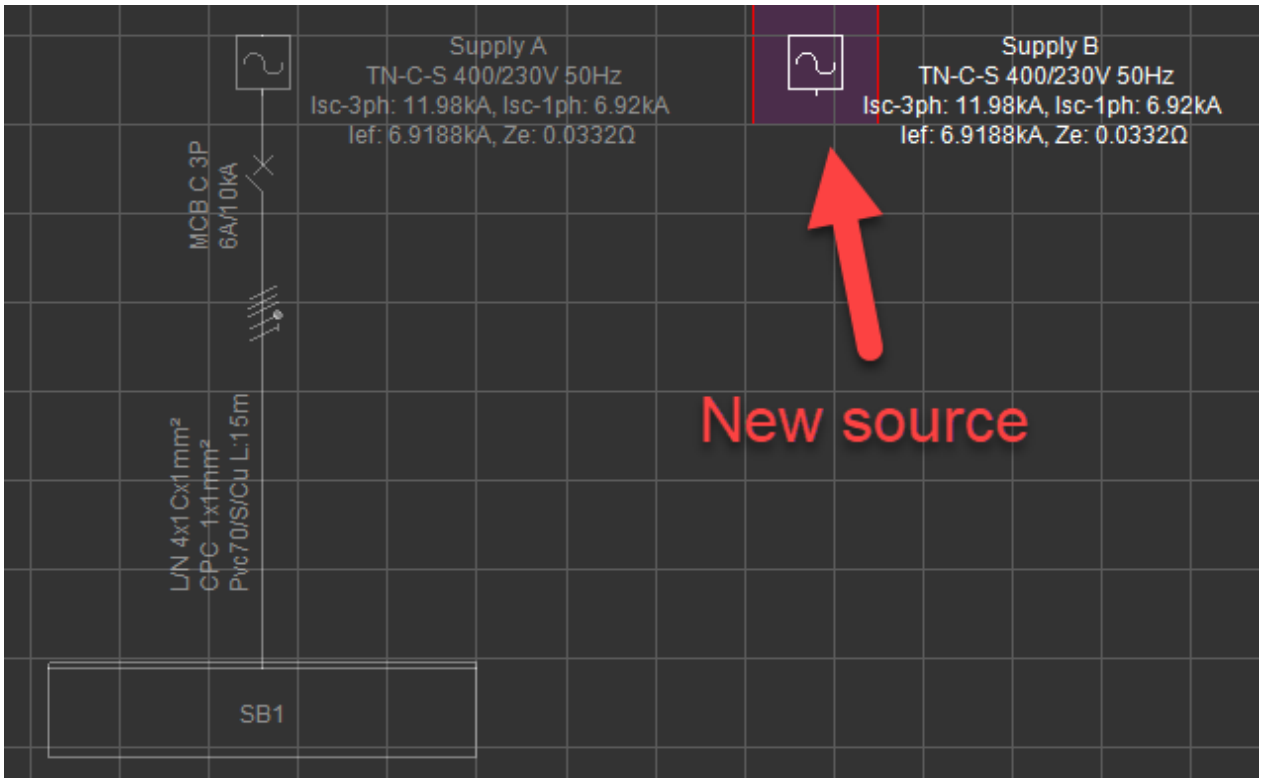
Multiple Sources

One of the most important features of some components in ElectricalOM is their ability to accept multiple supplies either from multiple sources or from other distribution nodes. Even though we will focus on Switch Board component, the features discussed below are also applicable to:

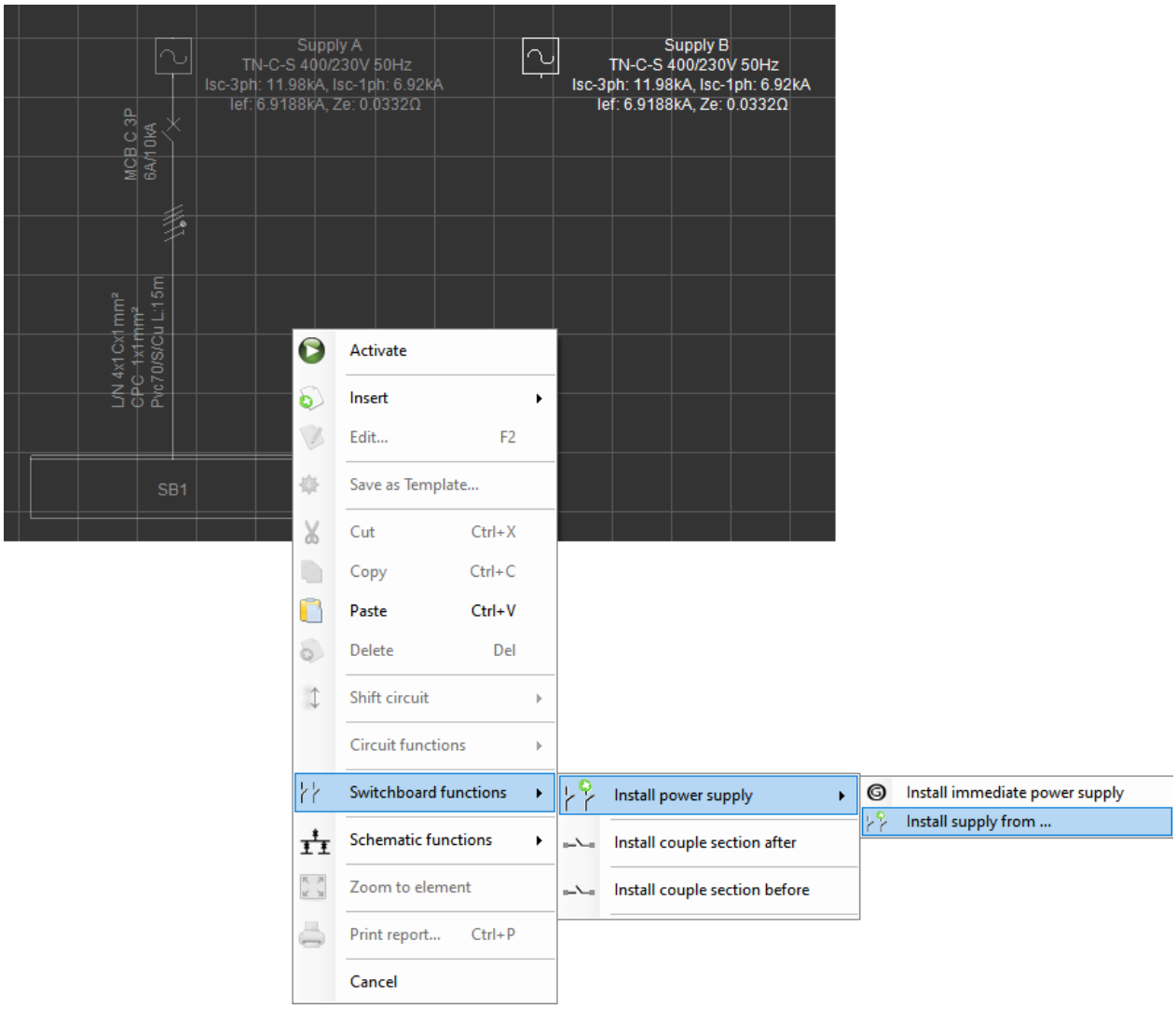
- Junction Boxes
- Transfer Switches
- Transformers
- Converters
- UPSes

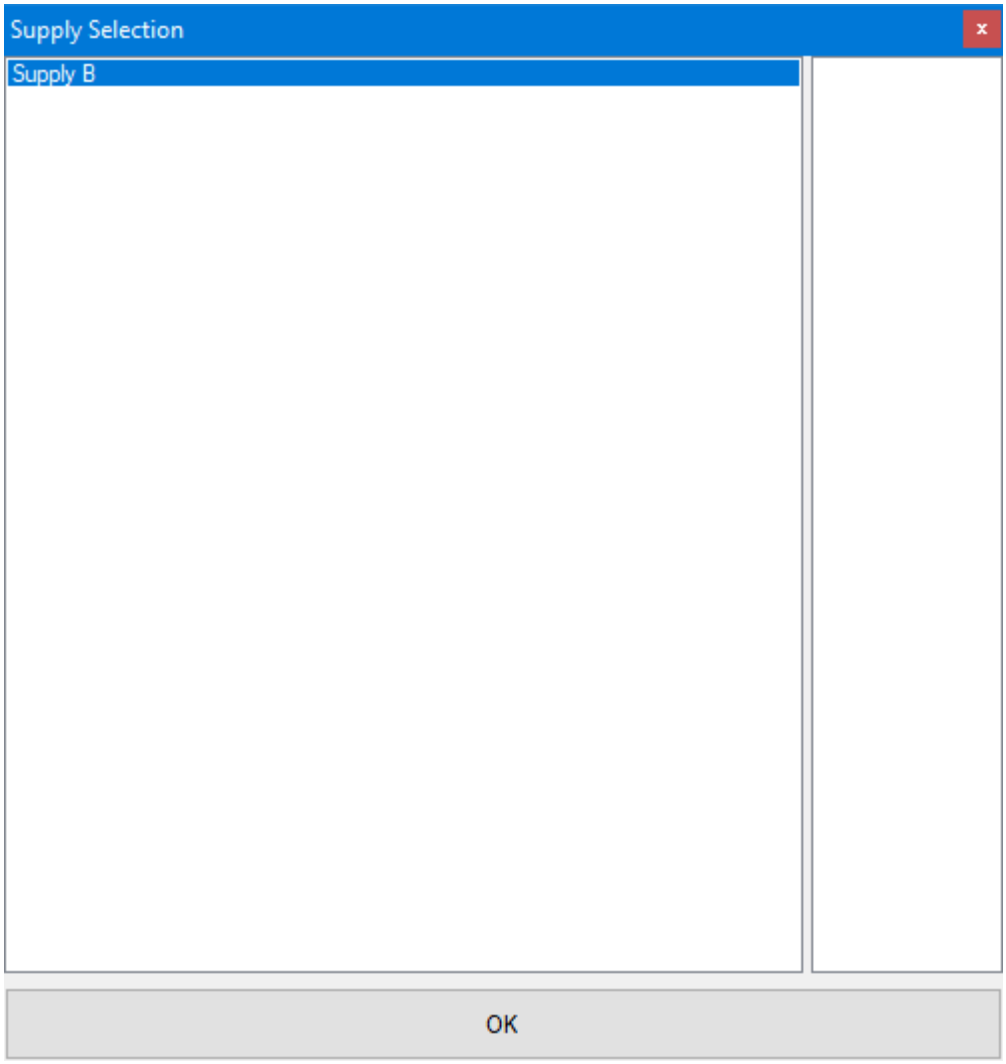
Multiple supply from multiple sources

In order to connect two sources to a switch board, first, the switch board must already be connected to one source.

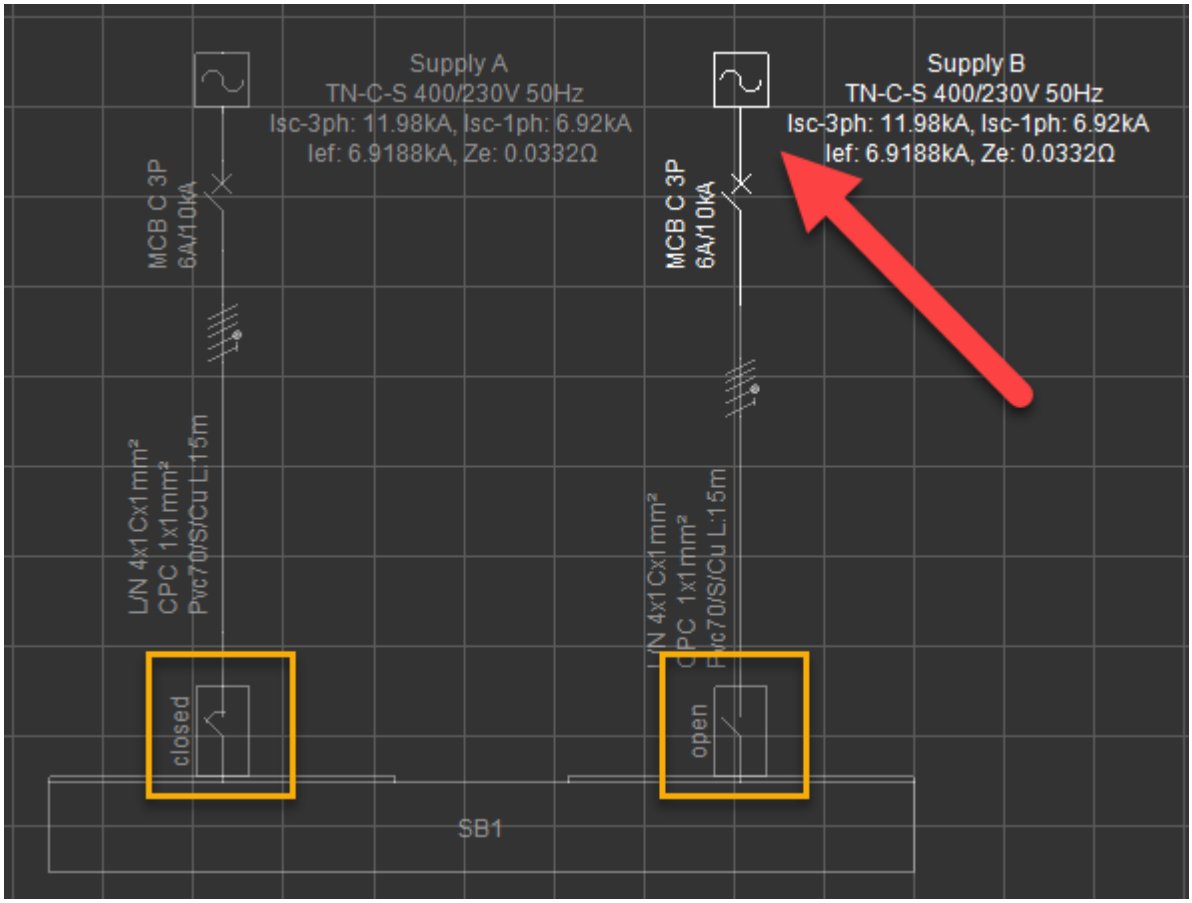


Then, the user needs to right click on the switch board either from the *Schematic Module* or the *System Tree Section*, and use *Install supply from...* option which will display the Supply Selection window. This windows will list all the possible supplies that can be connected to the selected switch board.

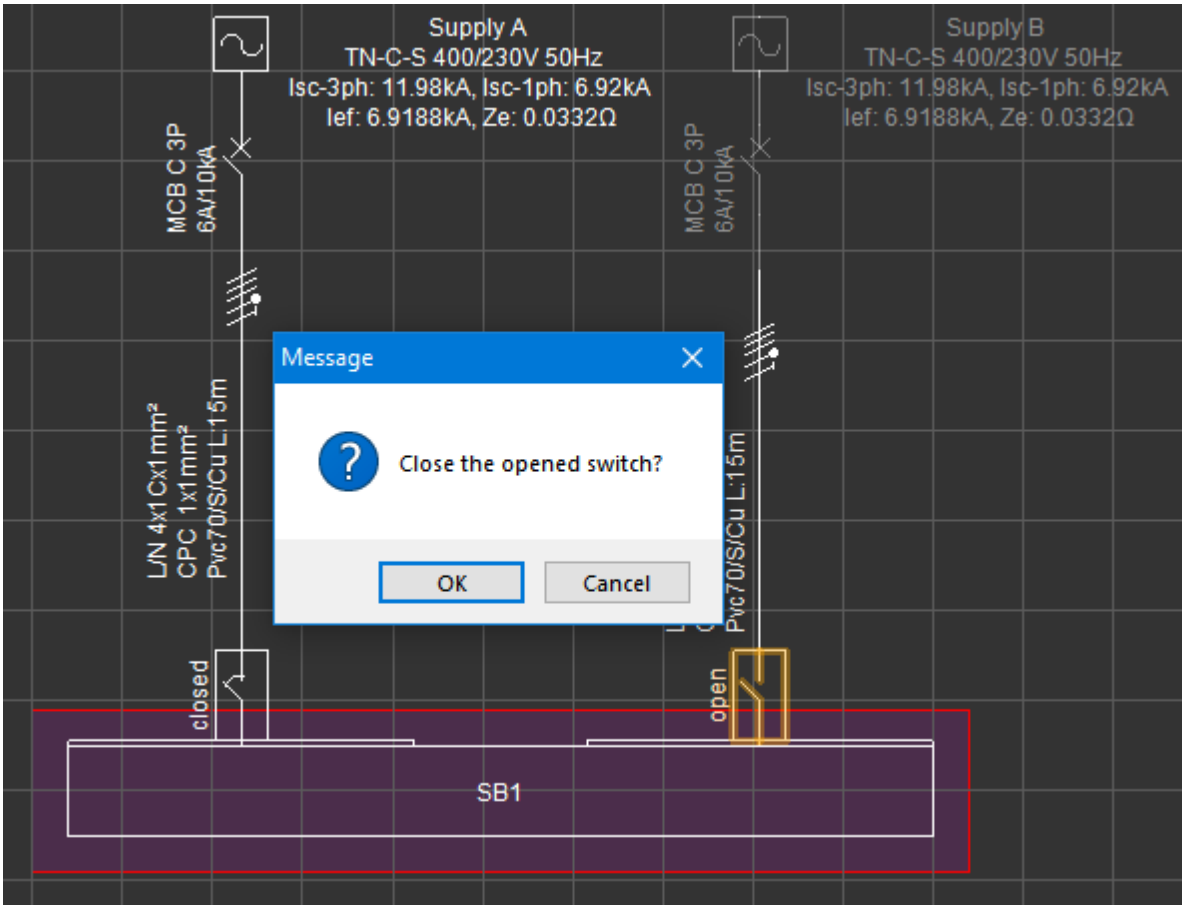

Supply A
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
Supply B
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
MCB C 3P
6A/10kA
L/N 4x1 Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
SB1
Activate
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Switchboard functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Install power supply
Install couple section after
Install couple section before
Install immediate power supply
Install supply from ...

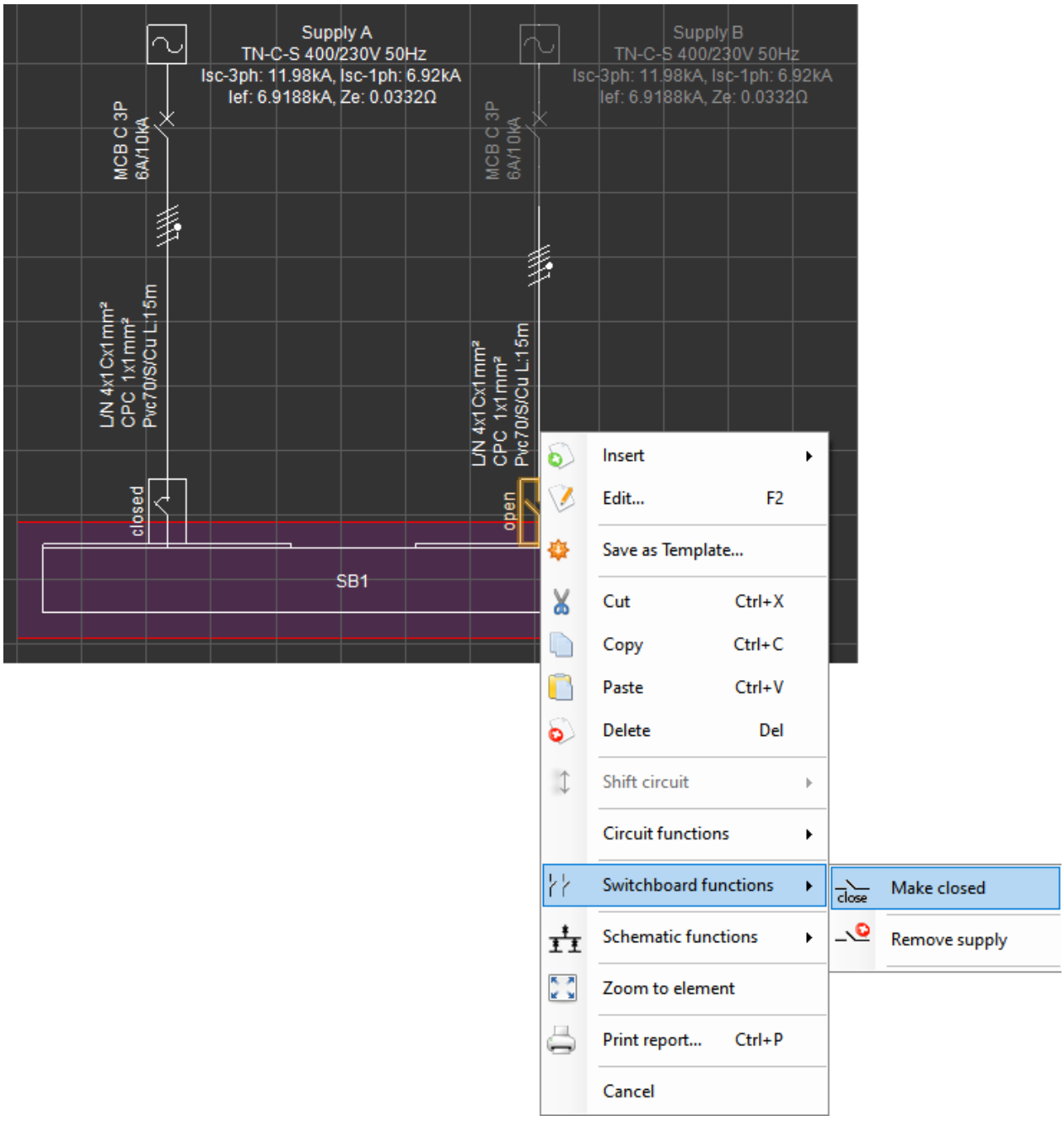


The user can select the source required to be connected to the selected switchboard and click OK button. ElectricalOM will connect this supply to the switchboard via switches.



ElectricalOM allows the user to manipulate the switched by either double clicking on an open switch or by using the right click menu. Closed switches cannot be opened.

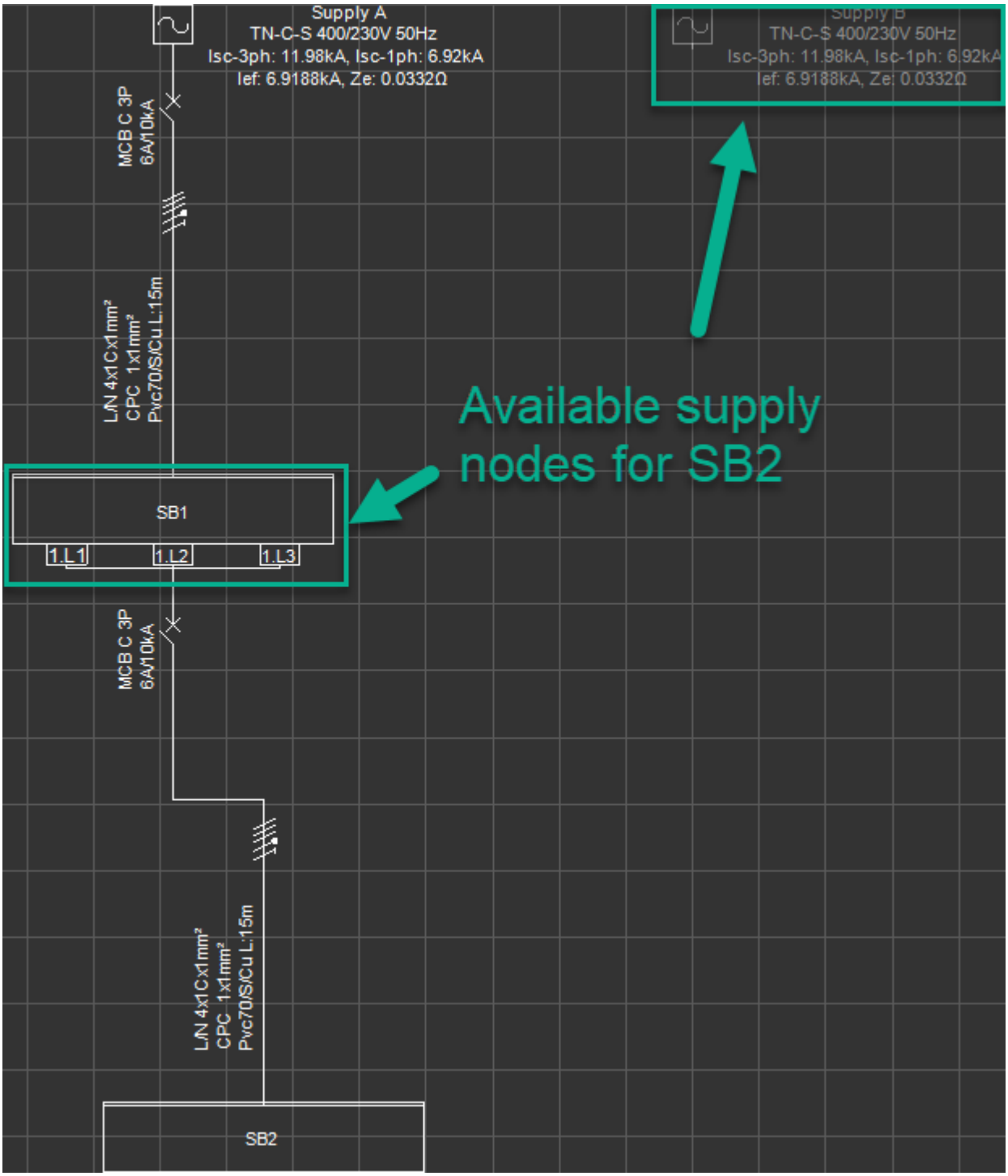

Supply A
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
Supply B
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
MCB C 3P
6A/10kA
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
Pvc70/S/Cu L:15m
Message
Close the opened switch?
OK
Cancel
closed
open
SB1



Please refer to *Switches configurations* in Functions Menu section for more details on switches.

Multiple supplies from other distribution nodes

A switchboard can also be supplied from multiple supply circuits both from the same or a different distribution node. The procedure is the same as described above. In fact, if there is another distribution node available, this will also be listed on the *Supply Selection* list together with any available source.


Supply A
TN-C-S 400/230V 50Hz
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Ief: 6.9188kA, Ze: 0.0332Ω
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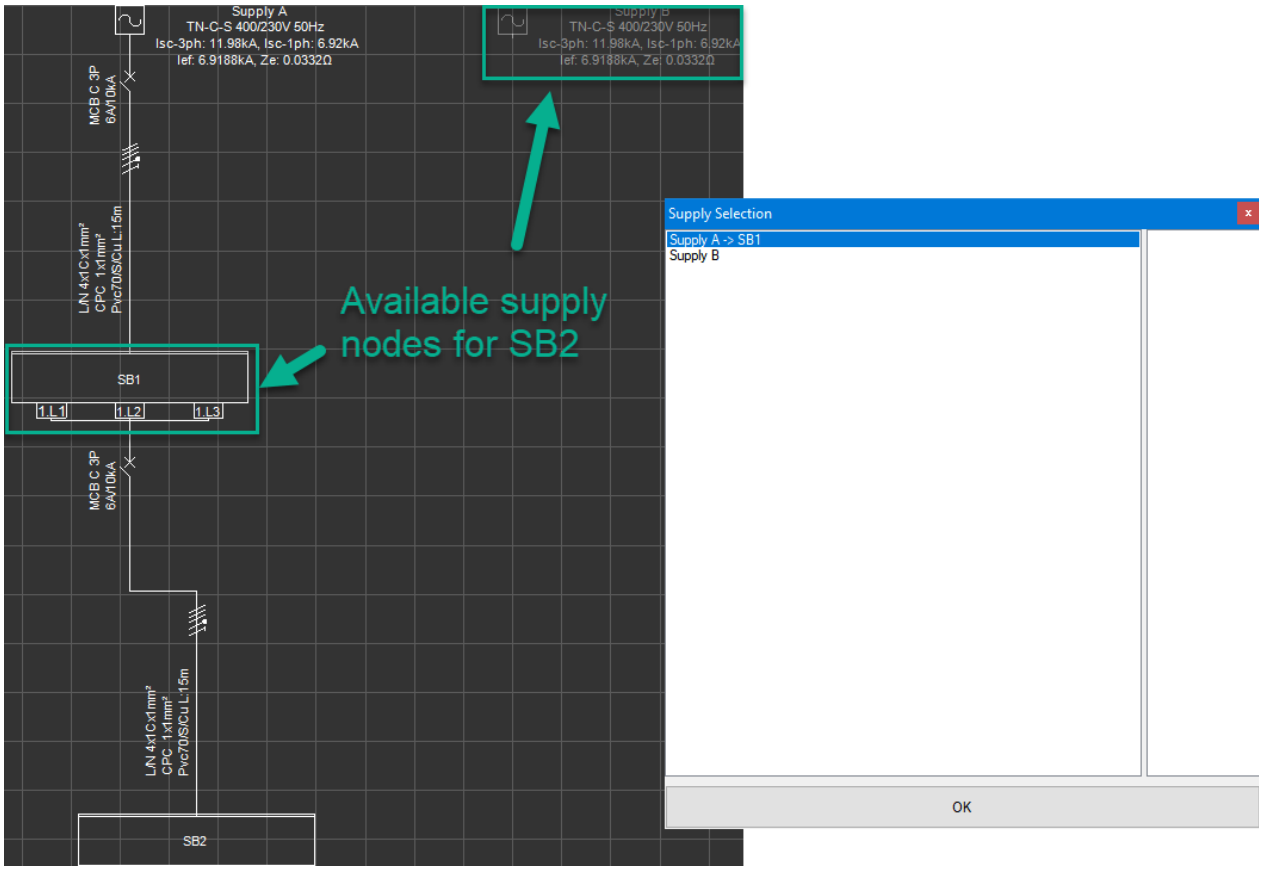
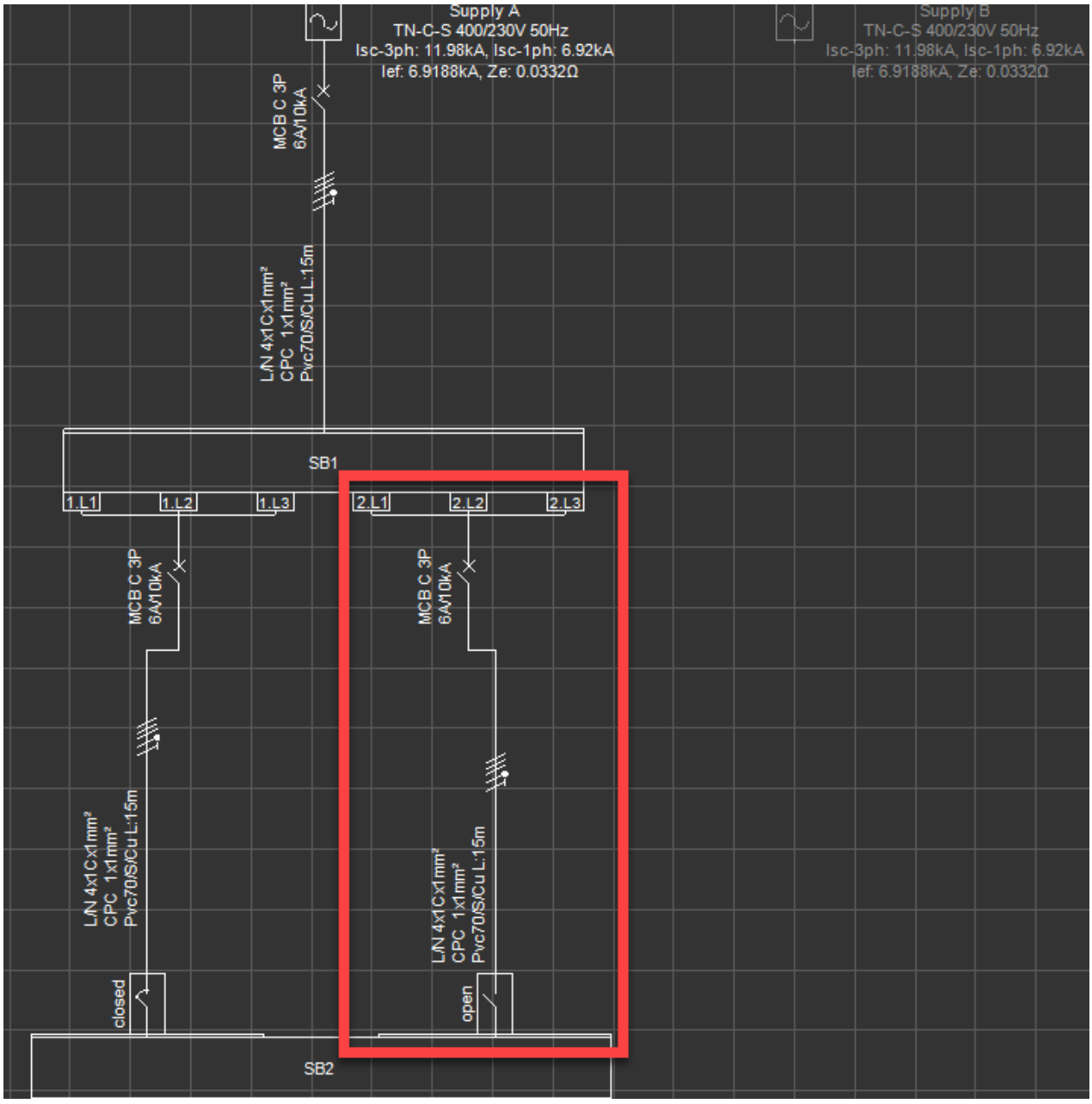
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
Available supply
nodes for SB2
SB1
1.L1
1.L2
1.L3
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
SB2



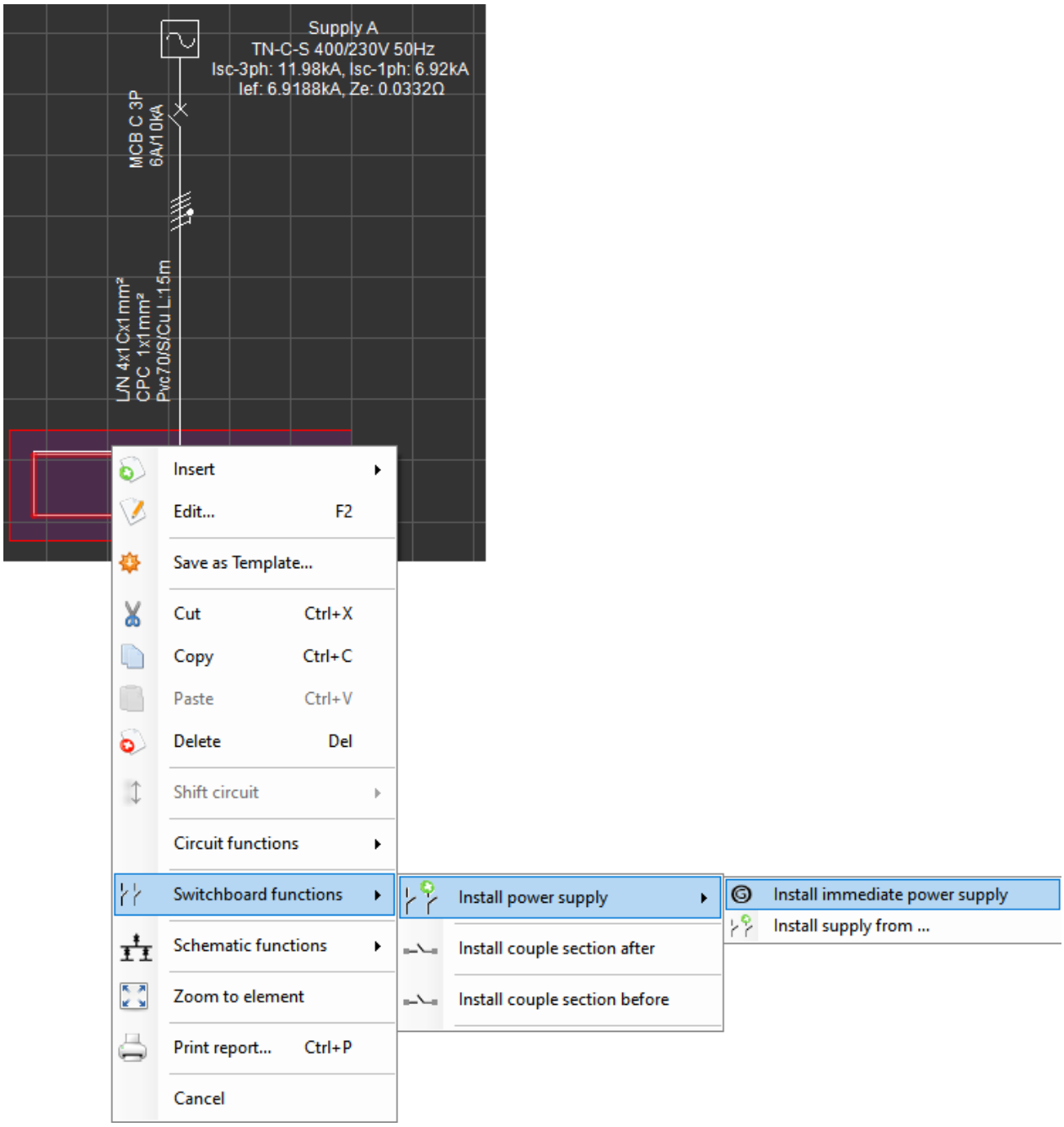
If the user selects a distribution node as a supply, ElectricalOM will create a connection between this node and the selected switchboard.

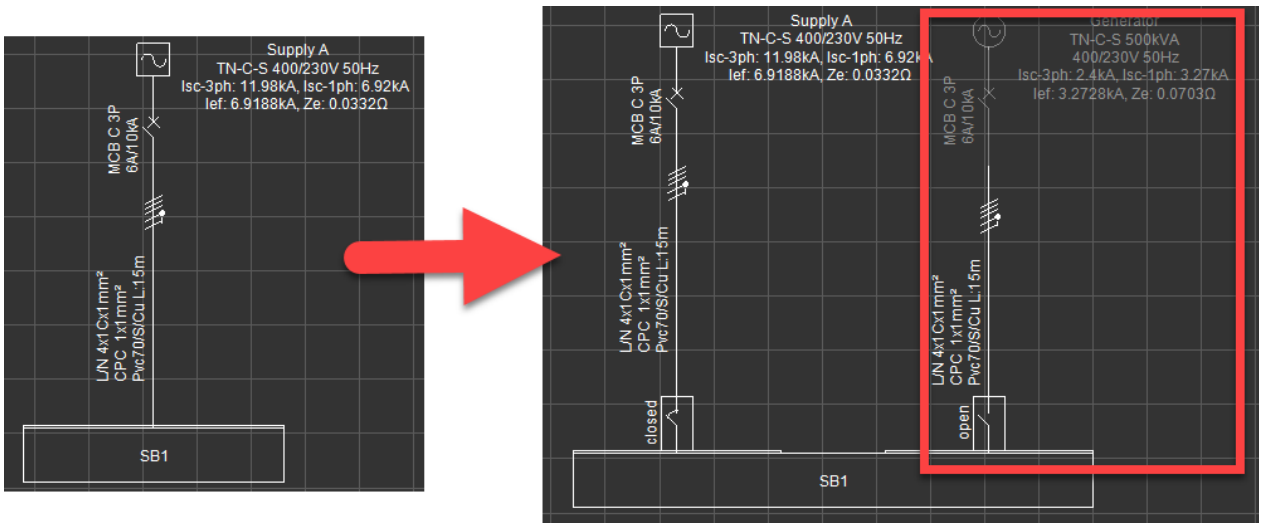


Multi-supply option is available both for three phase and single phase circuits.

It is important to understand that even if multiple supplies are connected to a single switch board, they will not run at the same time in parallel and only one of the sources can be active at a time. In order to model a parallel supply operation, please refer to *Parallel source operation...* under Functions Menu.

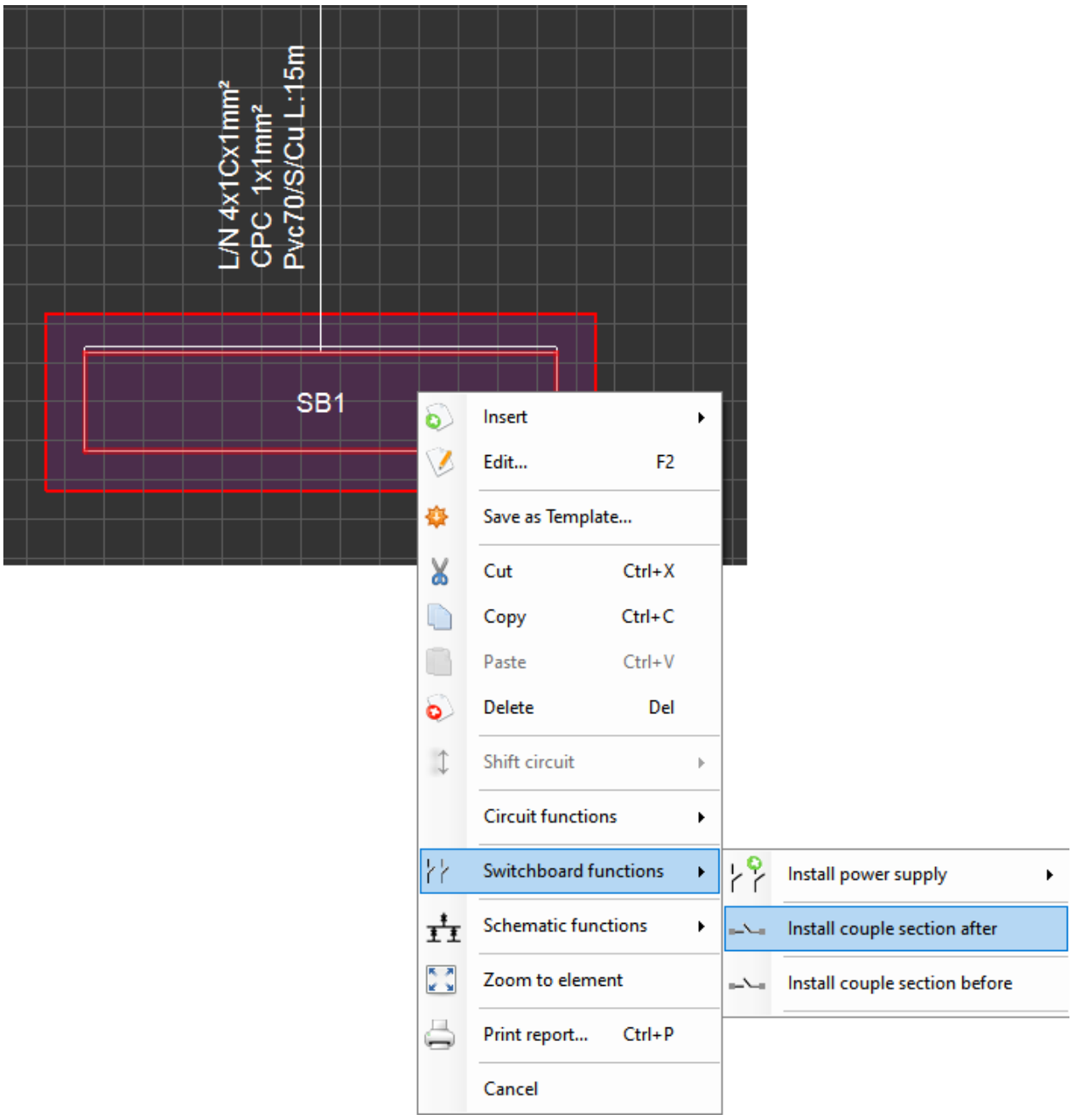
The user may also insert a generator to a switch board directly by using the Switchboard functions and selecting *Install immediate supply* option


Supply A
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Switchboard functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Install power supply
Install couple section after
Install couple section before
Install immediate power supply
Install supply from ...

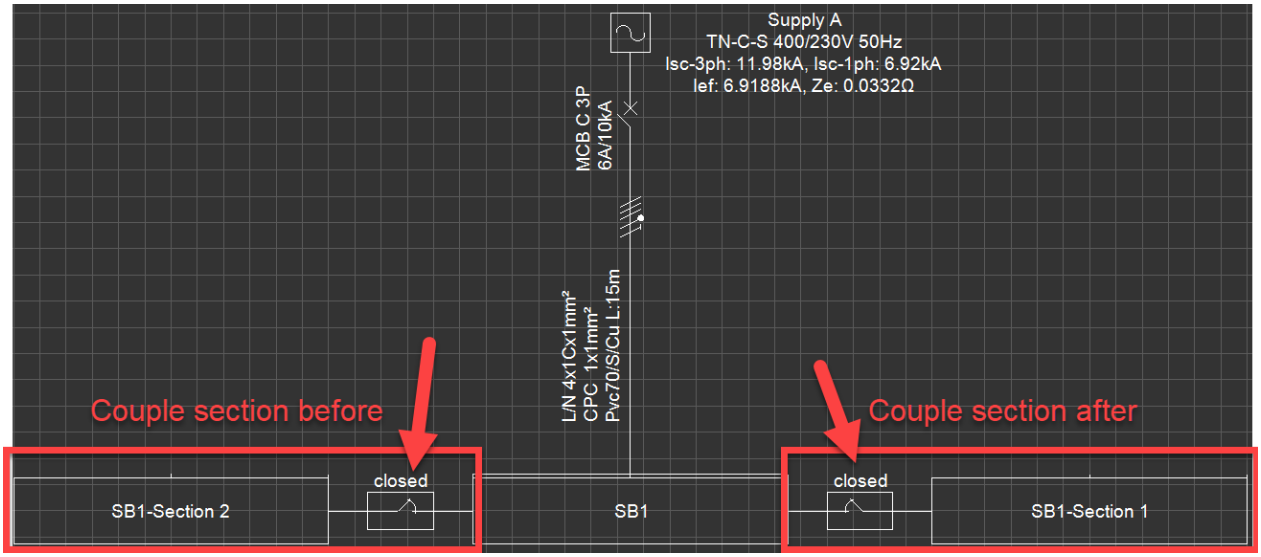

Supply A
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
SB1
Generator
TN-C-S 500kVA
400/230V 50Hz
Isc-3ph: 2.4kA, Isc-1ph: 3.27kA
Ief: 3.2728kA, Ze: 0.0703Ω
closed
open

Switchboard Coupling

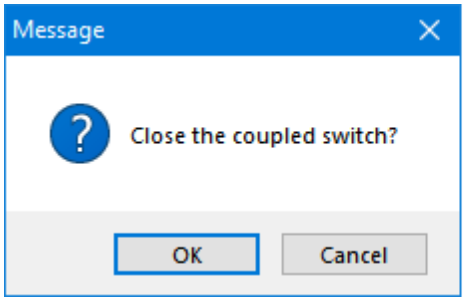
Coupler sections can also be added to switchboards by help of the *Install couple section after* and *Install couple section before* options of *Switchboard functions* menu. In order to add a coupler section, a switchboard must be selected, and one of the options can be applied.

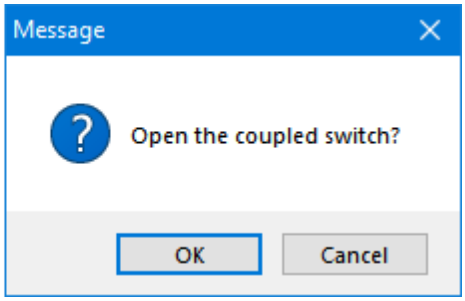


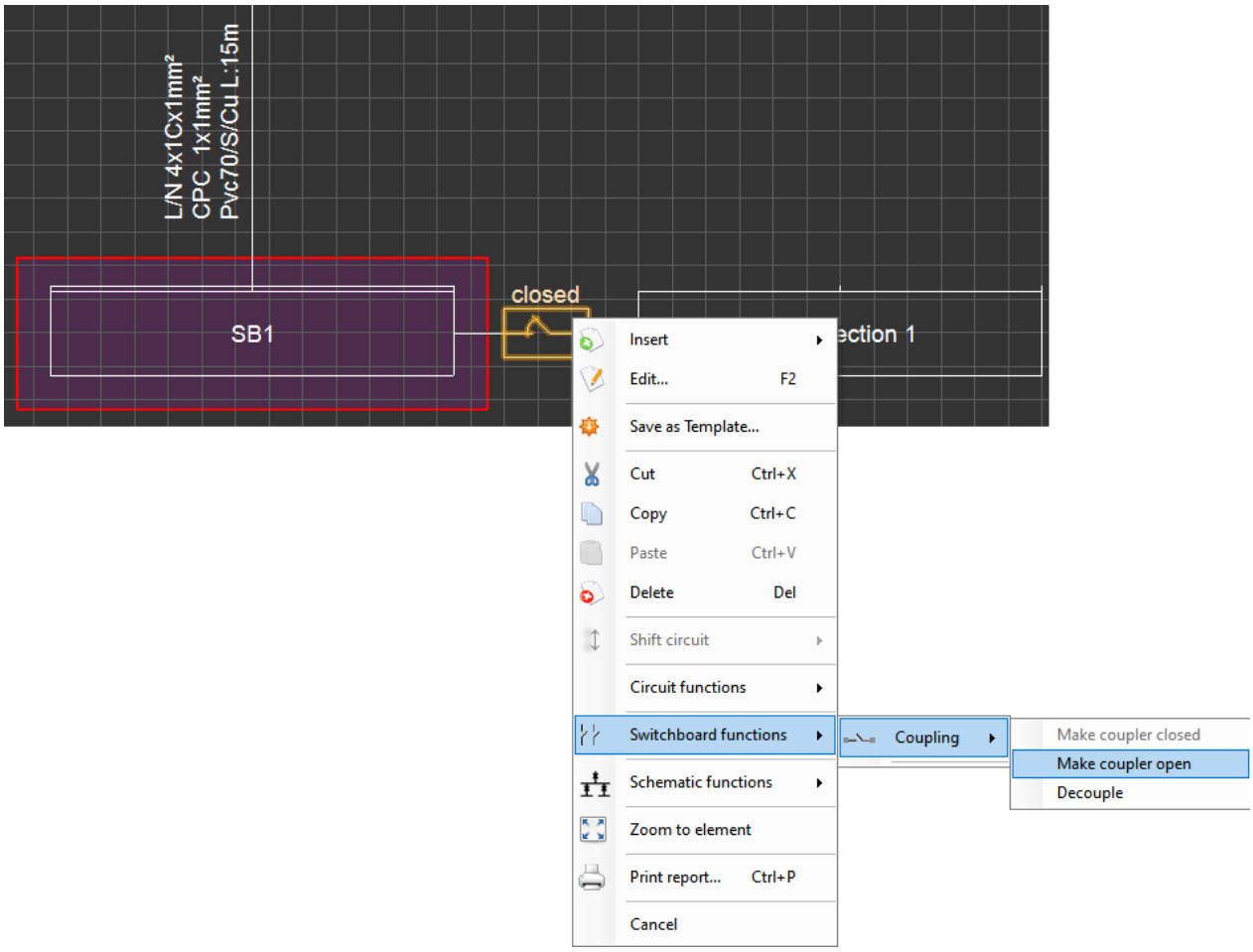
Once one of the *Install couple section* options is selected, ElectricaOM will place the coupler section next to the selected switchboard and places a switch in between. A coupler section will act similar to a switchboard component and will accept connections to other supplies.



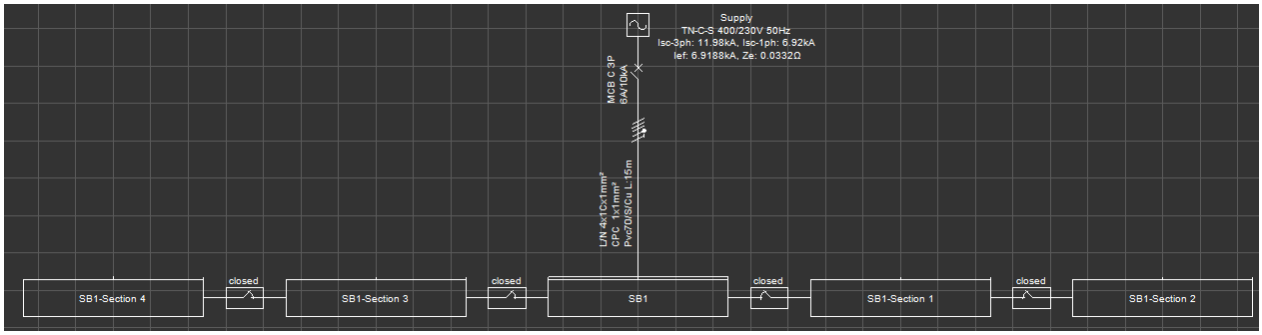
The switch can be opened or closed either by double clicking on it and selecting OK or using the *Switchboard functions* menu and selecting *Make coupler closed* or *Make coupler open*



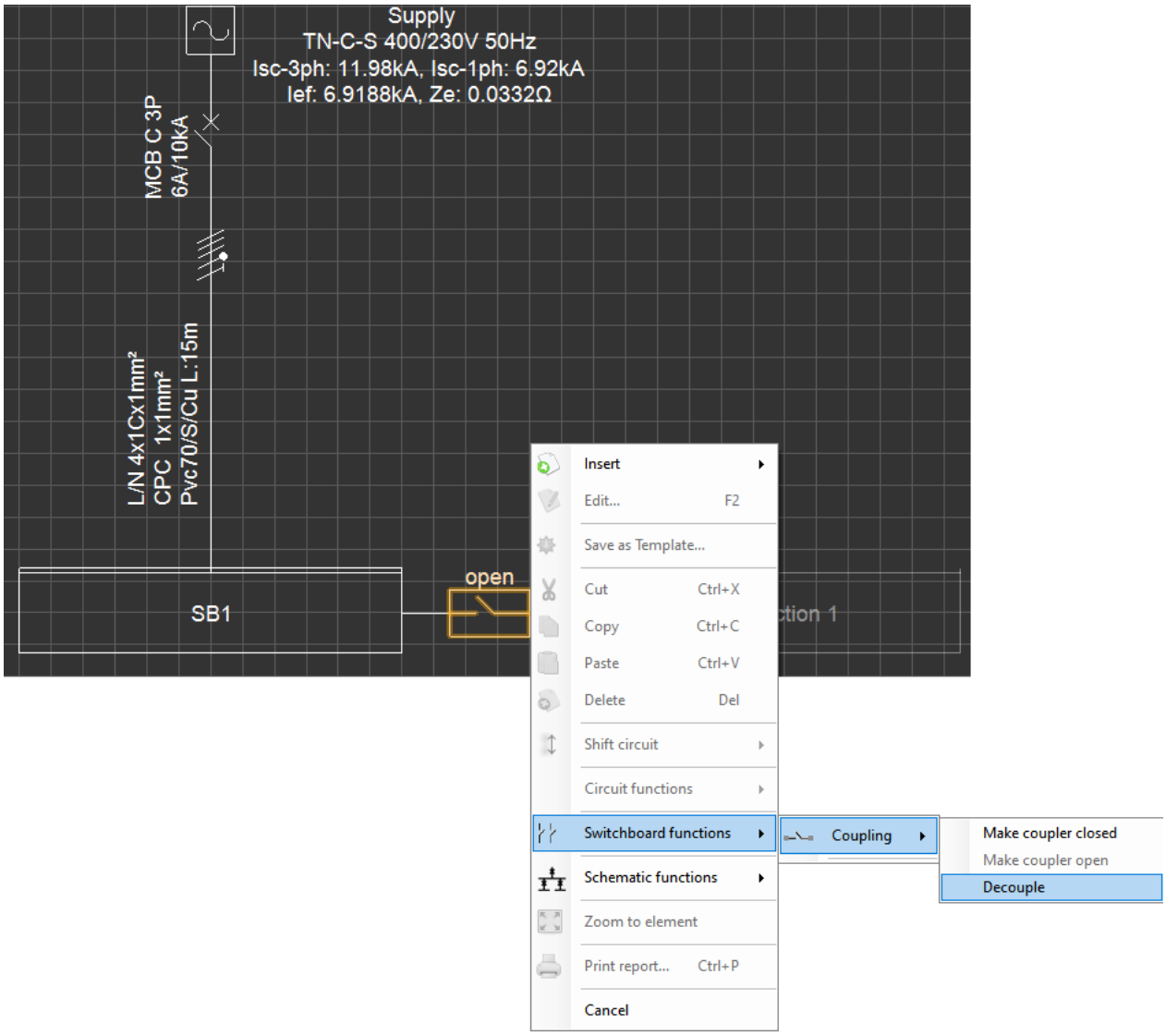




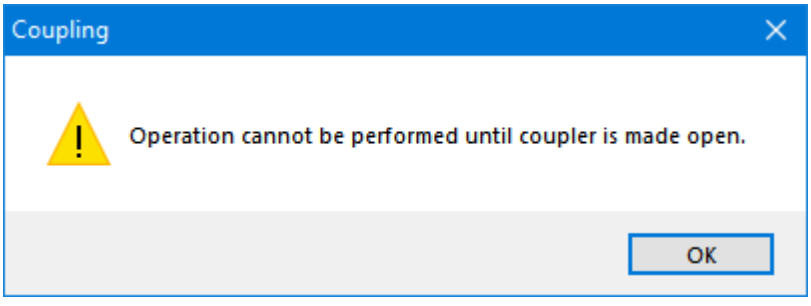
Once a switch is opened, some parts of the system will be deactivated depending on the active source. Coupling sections can be extended following the same procedure described above and ElectricalOM will add switches between each section automatically.



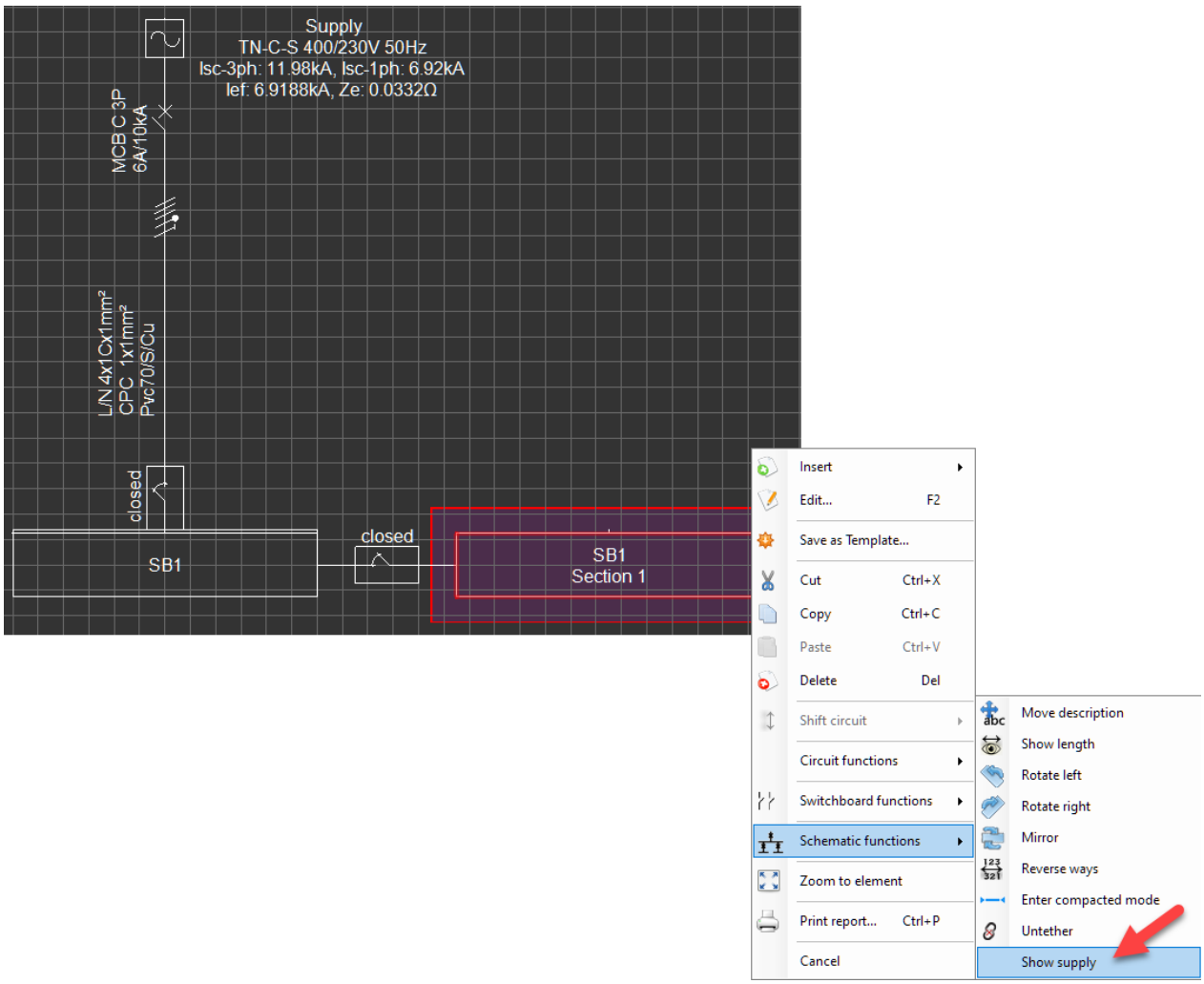
Decoupling is also possible by means of the *Decouple* option so the coupling between the SB and the coupling section is removed.

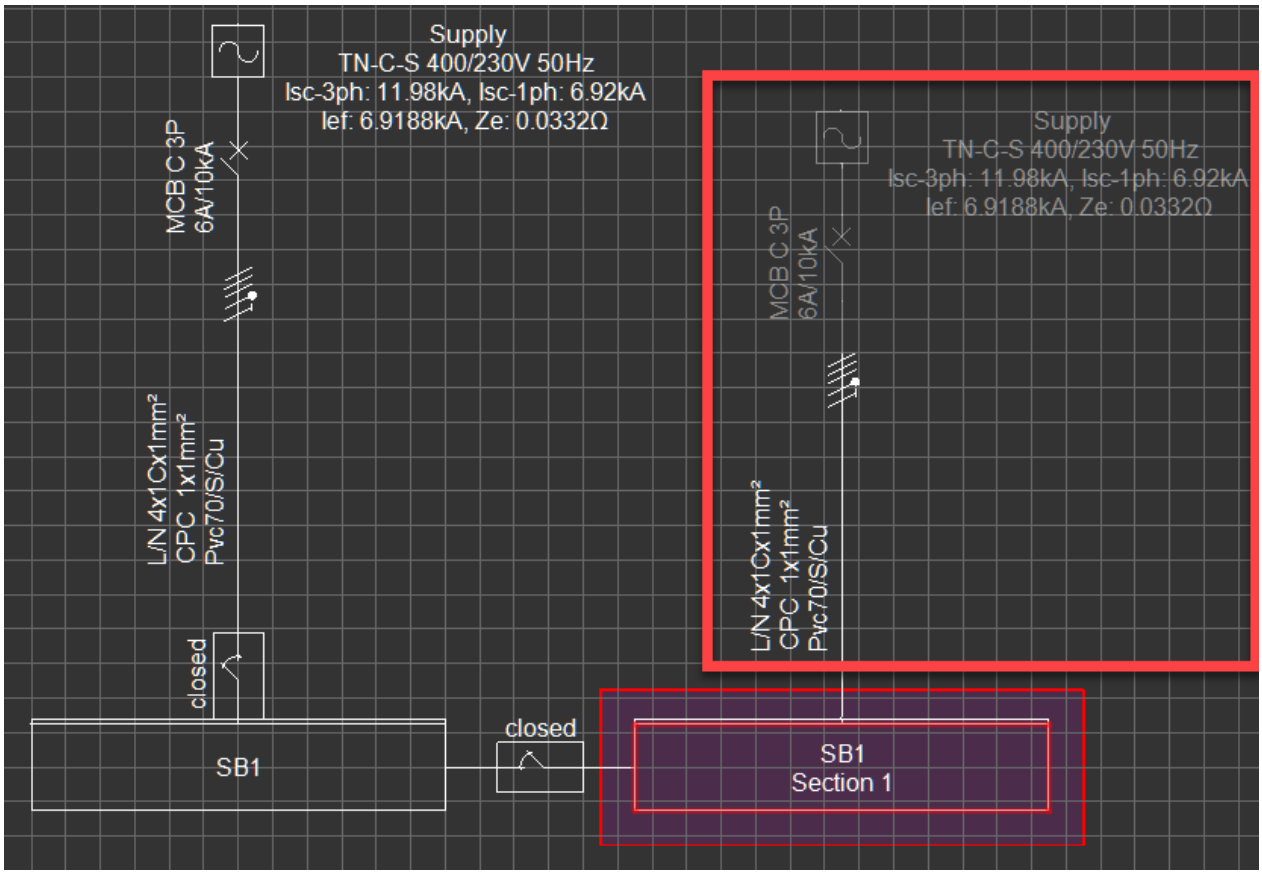


This action requires an open switch and if the user selects a closed switch to decouple ElectricalOM will warn the user to set the switch to open position first.



Once a coupling section is decoupled, it acts as a switchboard, and it might look like it is missing a source, however, this is not entirely true. As mentioned earlier, ElectricalOM requires a supply to be connected to any component, so when a coupling section is added, ElectrcialOM creates this section with a source which is hidden and inactive. If the user selects the coupling section, right-clicks on the coupling section and clicks on *Show supply* option, then this source will be visible.


Supply
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
MCB C 3P
6A/10kA
L/N 4x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu
closed
SB1
closed
SB1
Section 1
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Switchboard functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Move description
Show length
Rotate left
Rotate right
Mirror
Reverse ways
Enter compacted mode
Untether
Show supply

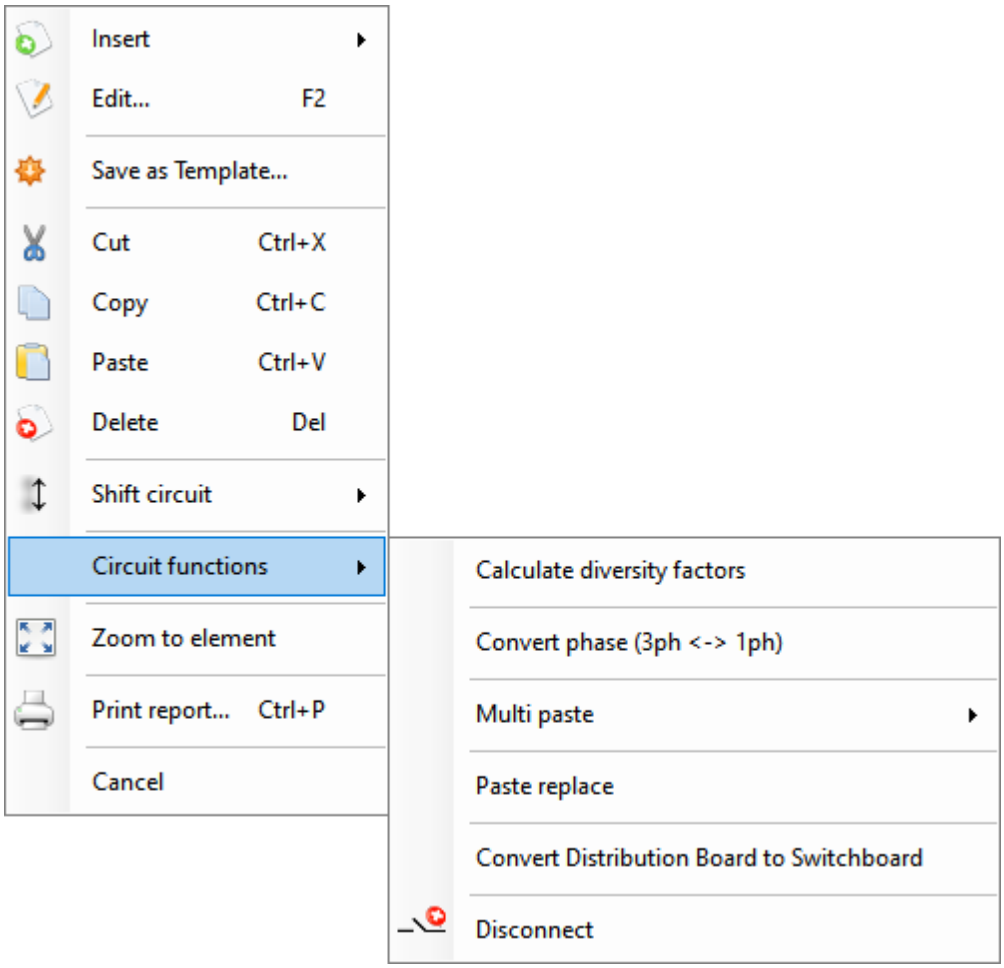


When decoupled, this supply will be the used for the decoupled section.

Circuit Functions

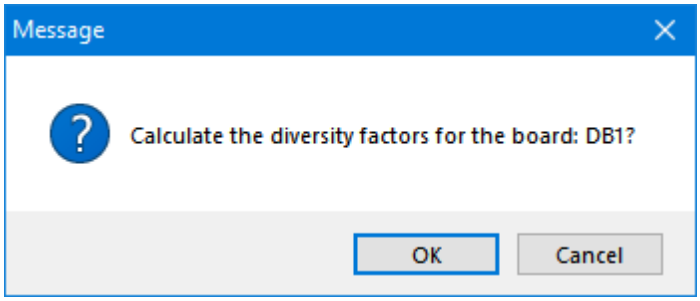
Circuit functions accommodates options as shown below:

- Calculate diversity factors
- Convert phase (3ph<->1ph)
- Multi paste
- Paste replace
- Convert Distribution Board to Switchboard (or Convert Switchboard to Distribution Board)
- Disconnect

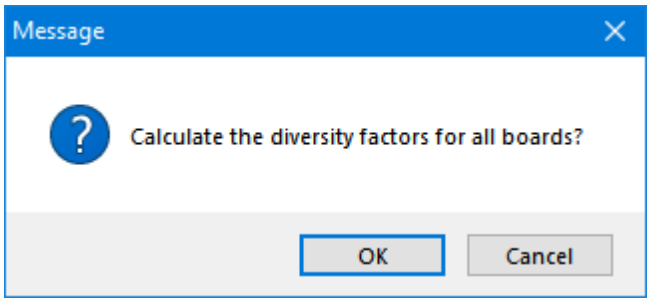


- **Calculate diversity factors**

This command will calculate the diversity factors for the selected board only.



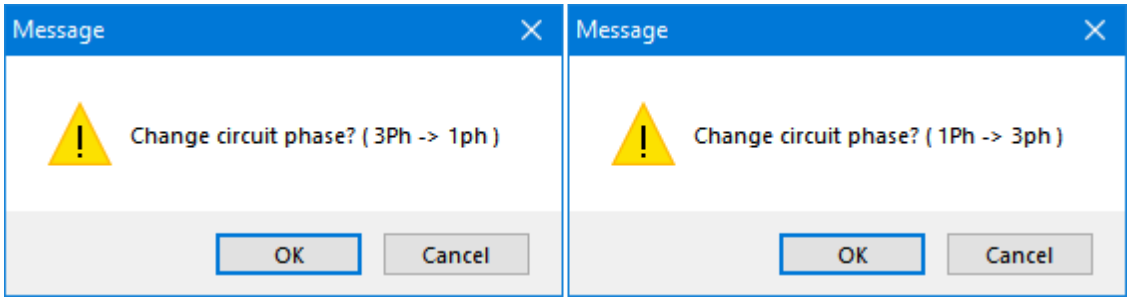
If the Source is selected, the, ElectricalOM will calculate diversity factors for all the board connected to the active part of the system. This will use diversity factors set by the user for each board which may not be the same for each board and update the values accordingly.



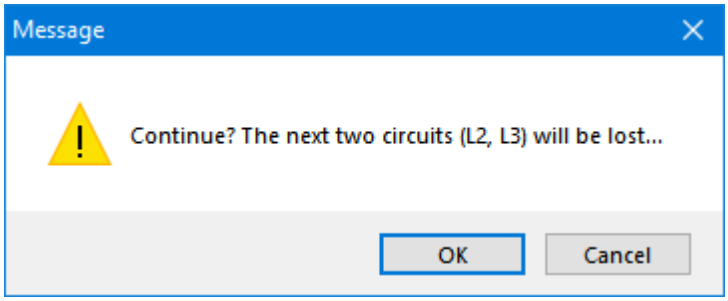
The diversity factors which will be used by ElectricalOM can be set in two different ways. Please refer to Source section for *Premises & Diversity* settings to set a default setting or to Circuit Edit Module for *Location/Description of the Installation* settings under *Other details* tab to set a different option for individual boards than the default setting.

- **Convert phase (3ph <-> 1ph)**

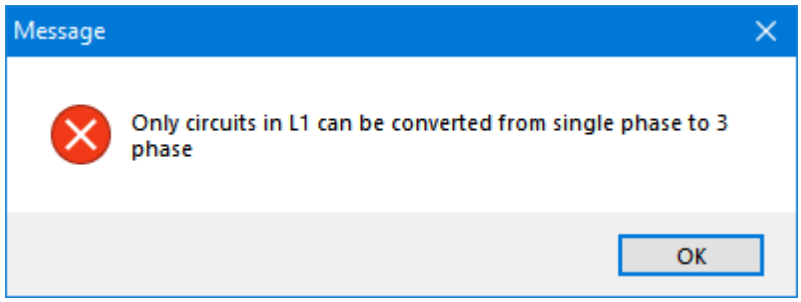
This will convert any three-phase component to a corresponding single-phase component or vice versa. Once clicked, ElectrcialOM will prompt the user to approve conversion.



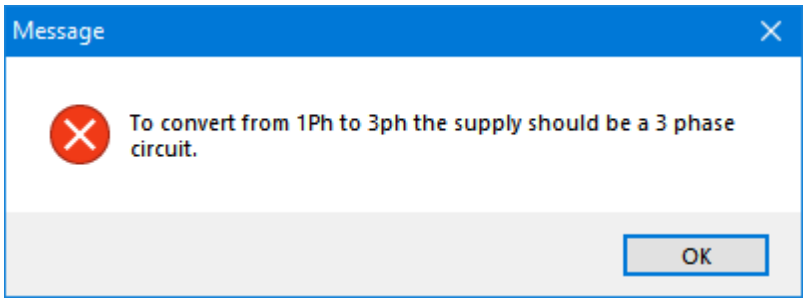
If a single phase component is going to be converted to a three phase component, ElectricalOM will display a warning window to indicate that the next two successive ways of the corresponding board will be used to accommodate the new three phase component. If there are any other components connected to these successive ways, then, they will be deleted.



Also, in order to convert a single phase component to a three phase component, it has to be connected to L1 (first phase) otherwise ElectricalOM will display a message window and cancel the operation. In this case, the single phase component must be moved to L1 before being converted to a three phase component.

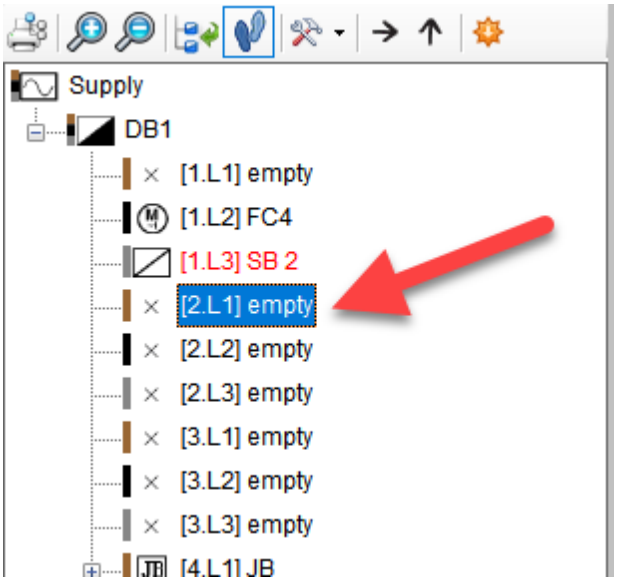


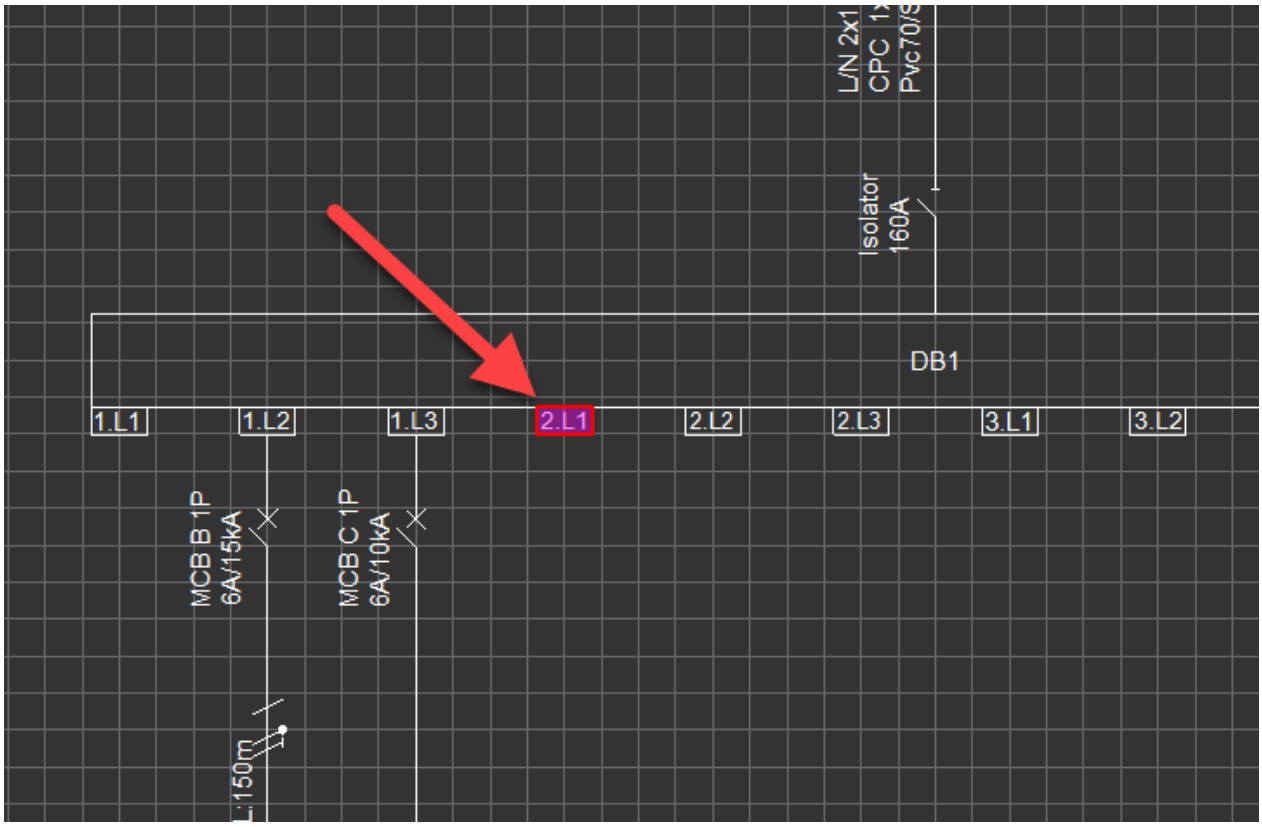
If the user tries to convert a single phase component and the supply to it is not three phase (e.g. component is supplied via a 1Ph DB), then, ElectricalOM will display a message indicating the supply is not compatible. In this case, prior to converting the desired component, the user must convert the supplying component to a three phase component first.

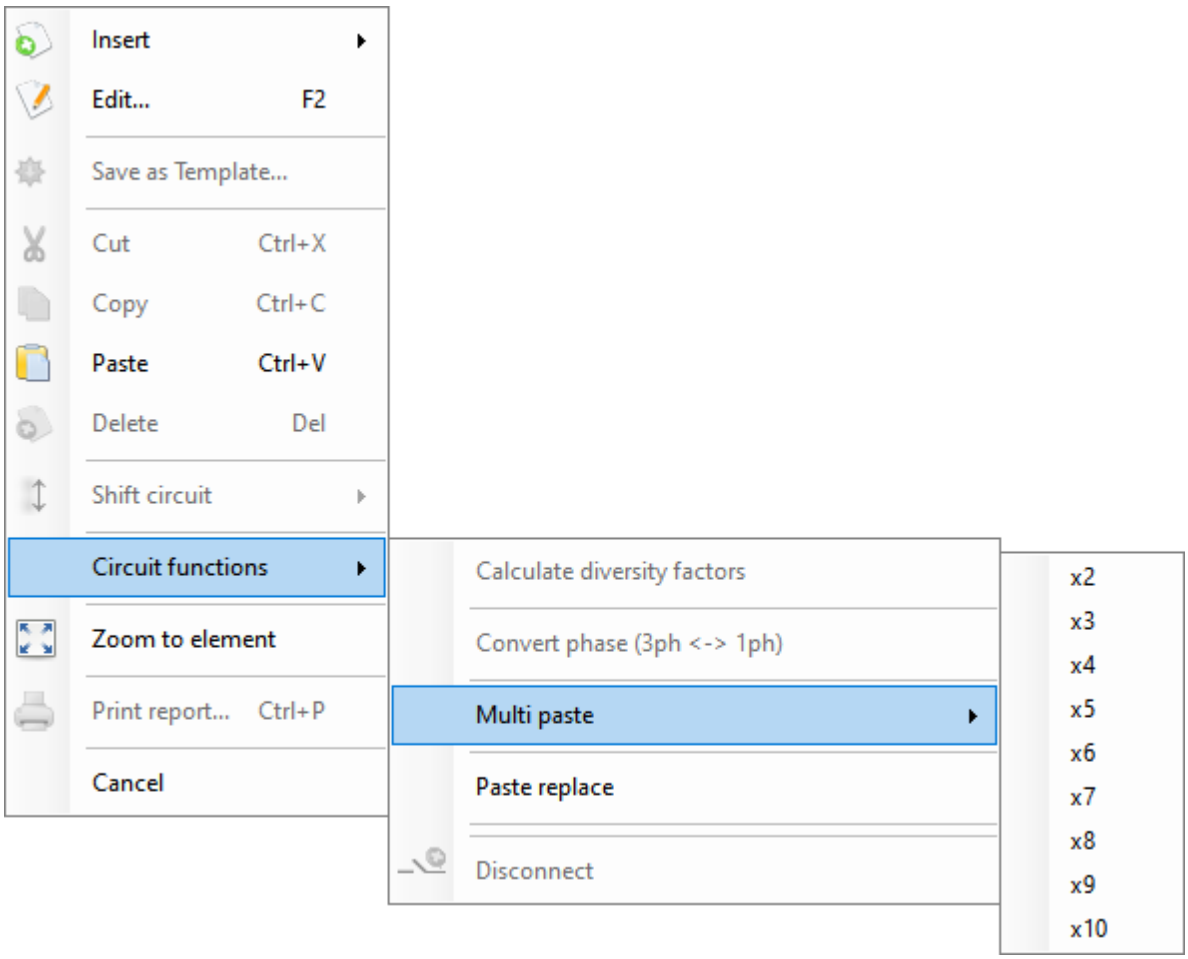


- **Multi paste**

Multi paste option is very useful when the user wants to paste a copied circuit, however, this option is for a single circuit. If the user copied multiple circuits then multi paste option is not available. In order to use multi paste, the user can select an empty way either from the system tree or from the schematic and select multi paste option followed by the number of intended circuits to be pasted.

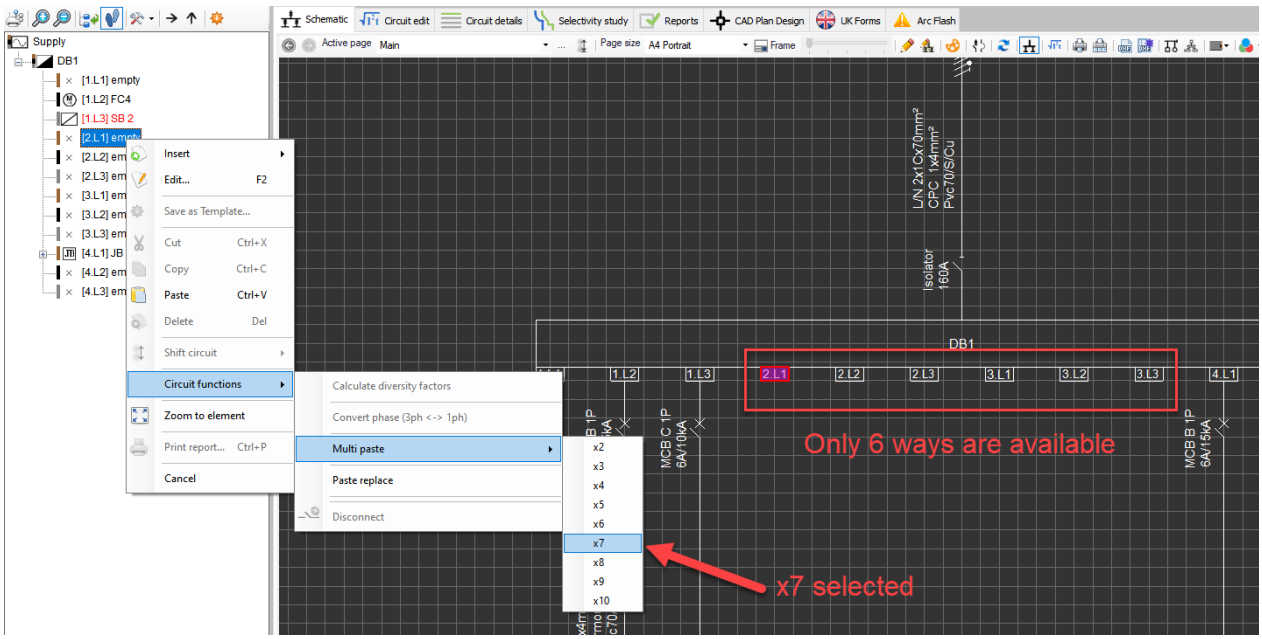


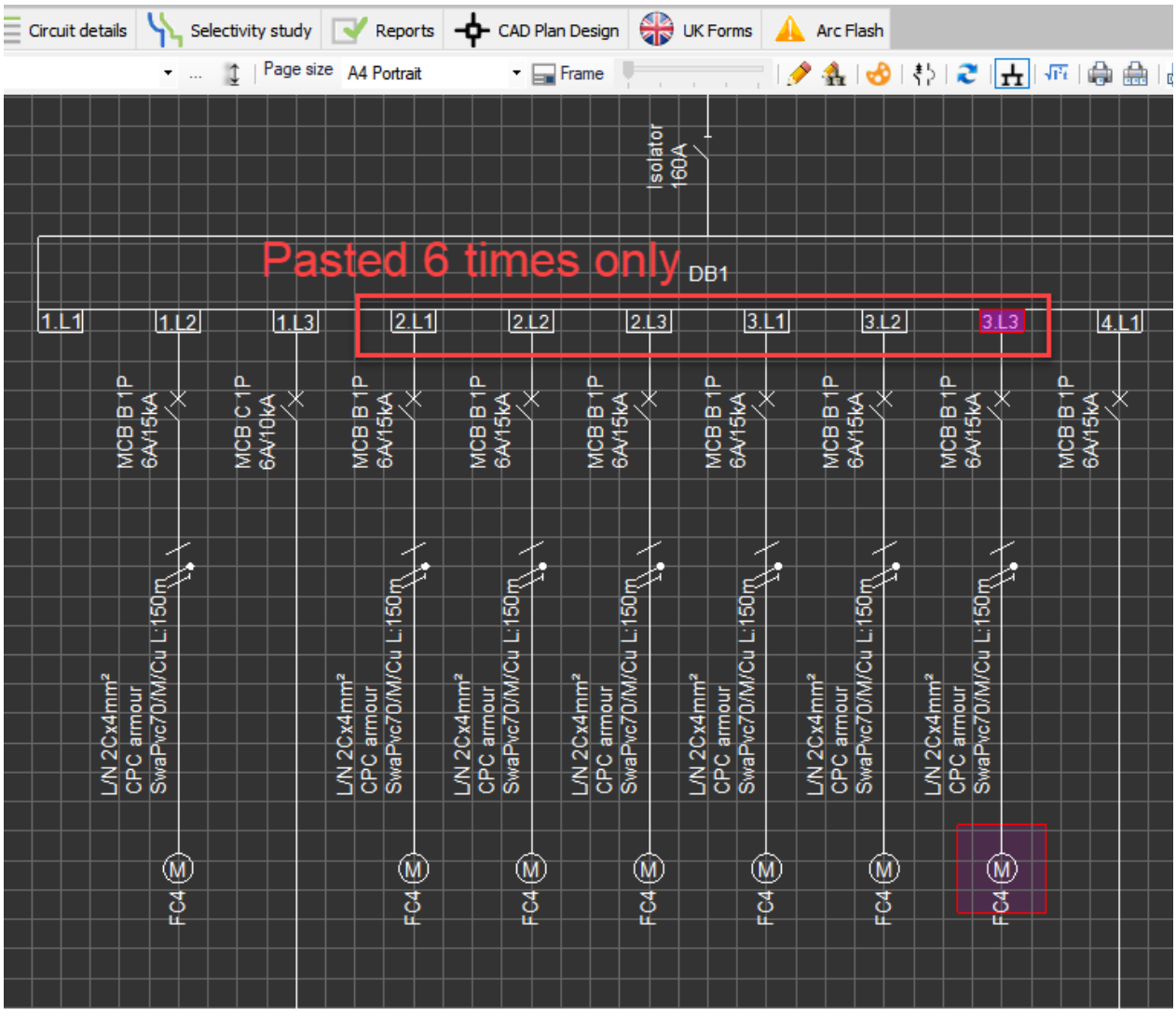




If the user wants to multi paste a circuit and the board does not have enough ways to accommodate all the

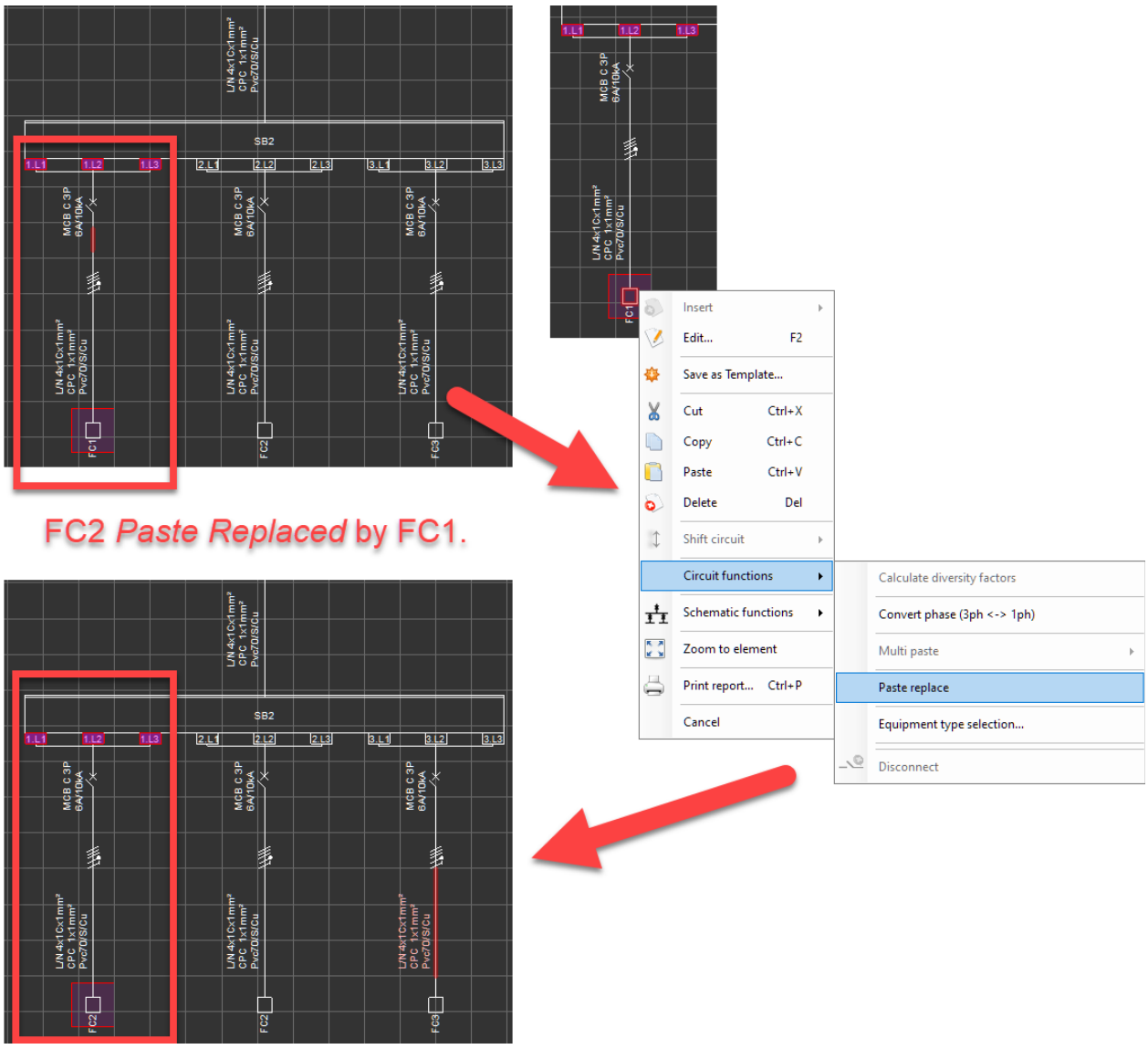
intended circuits, or, there is already another circuit on the ways which will be used for multi paste, then. ElectricalOM will multi paste the copied circuit only to first available ways of the board.





- **Paste replace**

This option is specifically designed for switchboards. Switchboards do not define a fixed way number to connected circuits. If a circuit is deleted, then the location will not be reserved and other circuits will be shifted which makes it difficult to add a circuit to the location which was occupied by another circuit previously. *Paste and replace* will paste a copied circuit to the location of an existing circuit deleting it.

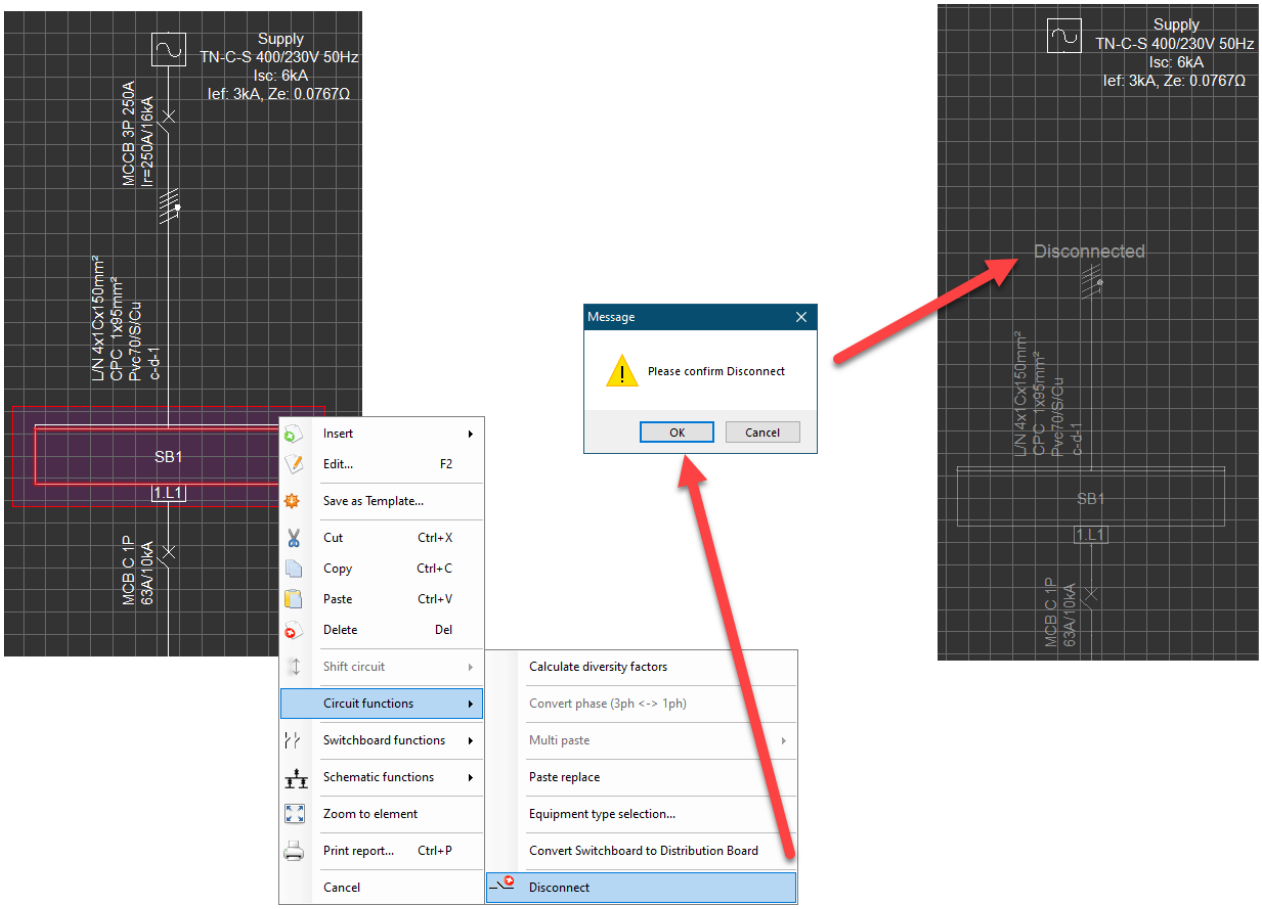


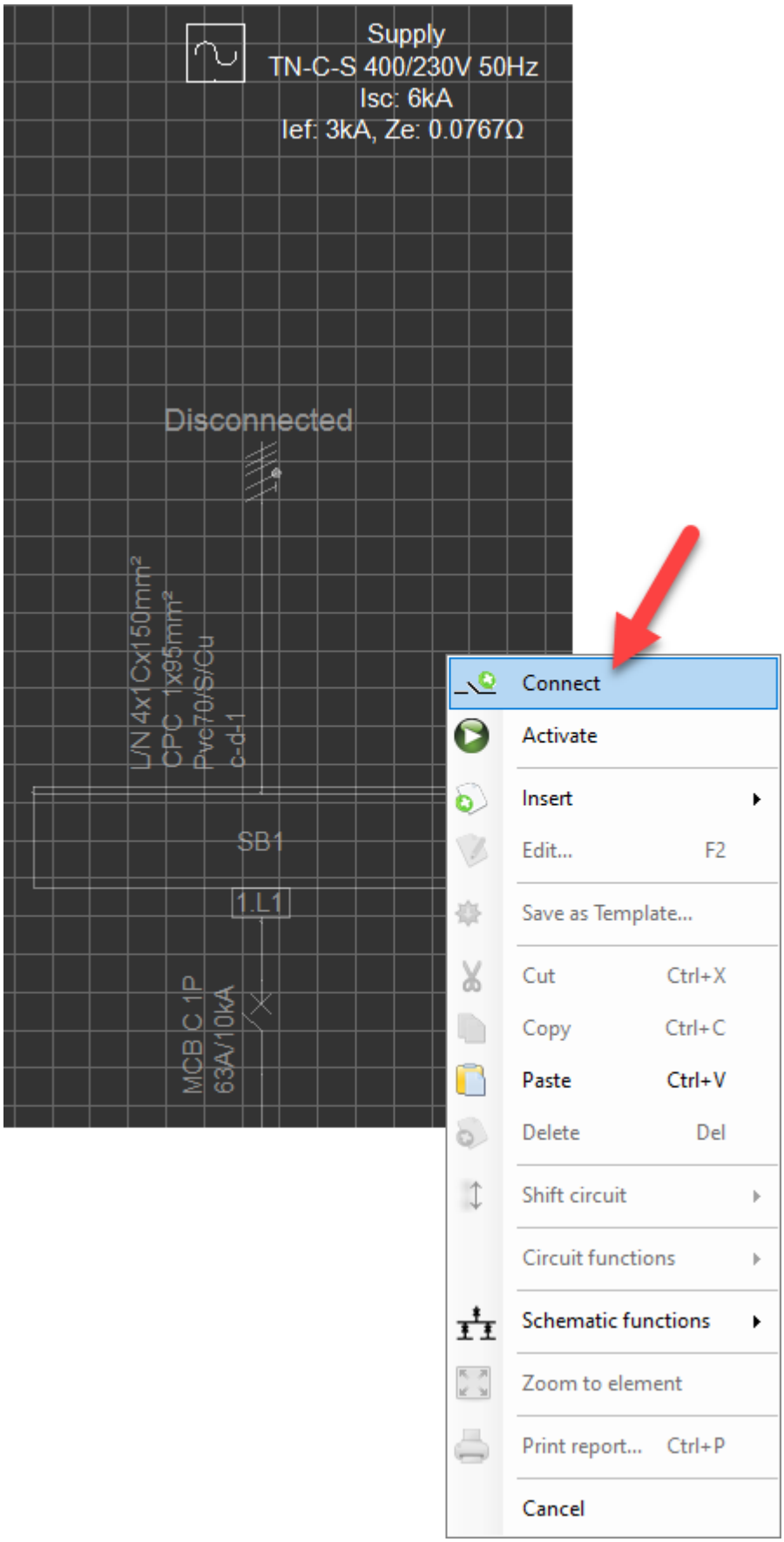
- **Convert Distribution Board to Switchboard (or Convert Switchboard to Distribution Board)**

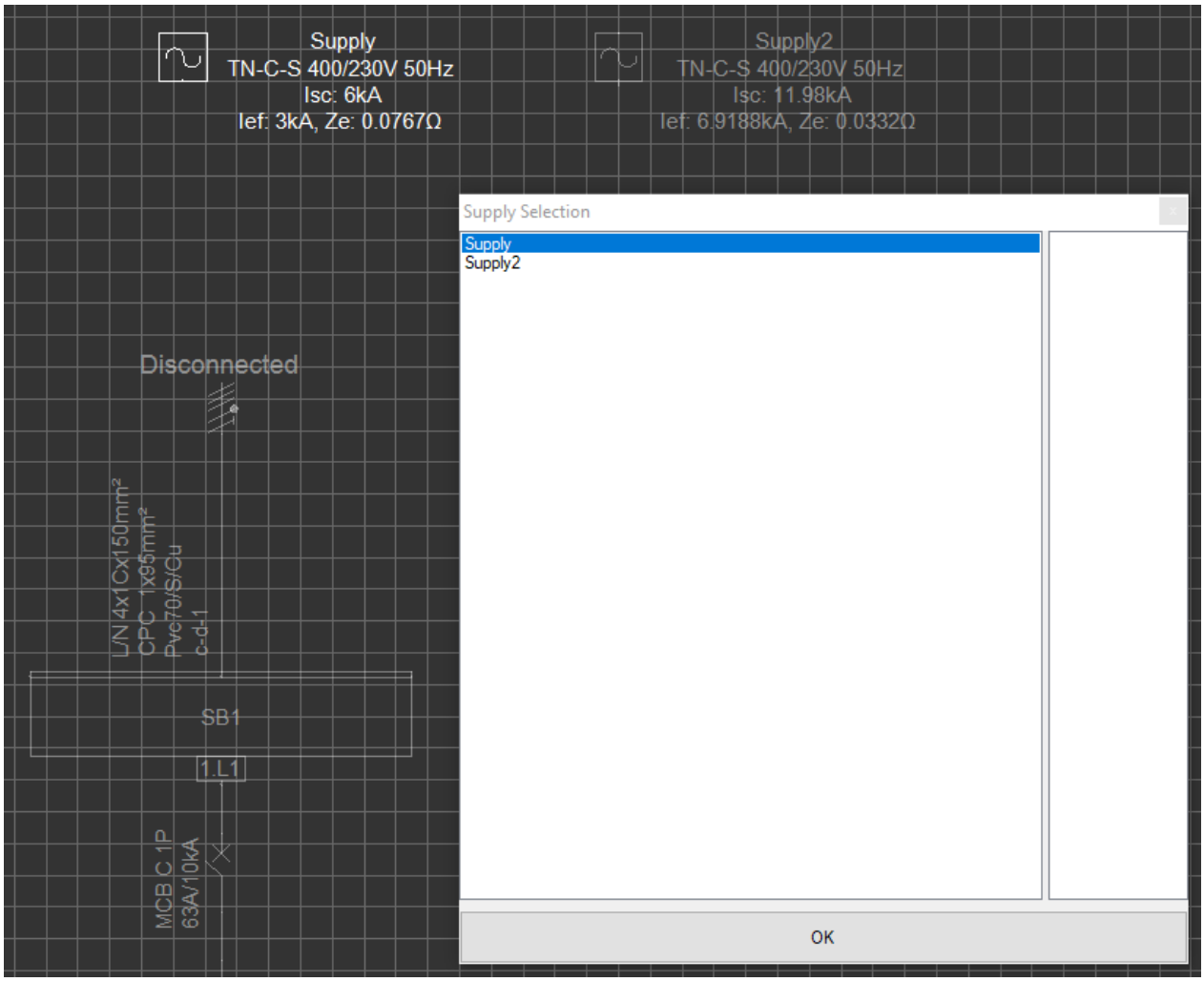
The user can convert a switch board to a distribution board or wise versa using this option.

- **Disconnect**

Disconnect option, disconnects the selected circuit from the upstream distribution node. This is usefull when the user wants to replace the source, for example. When a circuit is disconnected, an new option, *Connect*, will appear on the right-click menu. ElectricalOM will list available connection point so the user can select where to connect the disconnected circuit.

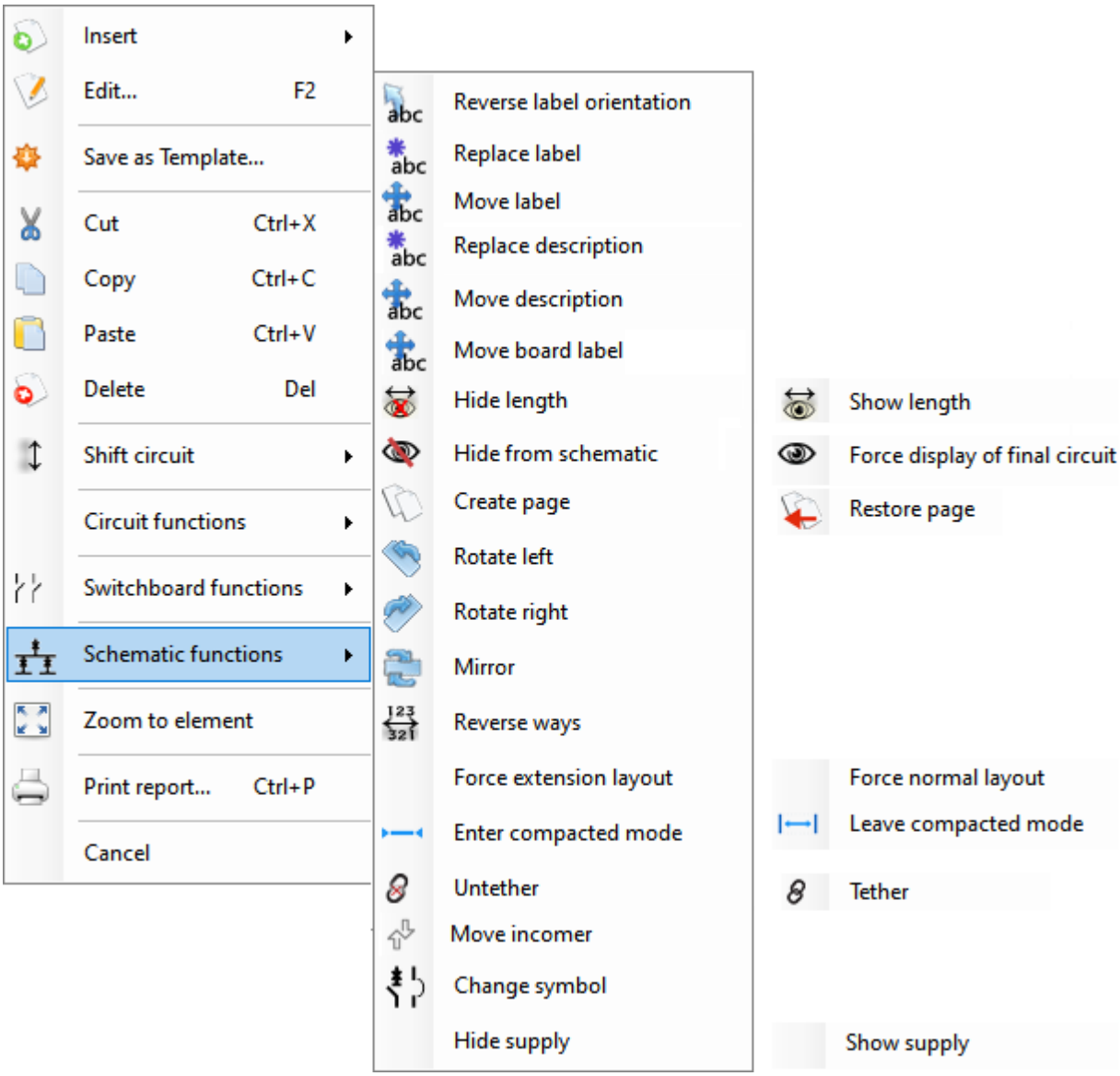

Supply
TN-C-S 400/230V 50Hz
Isc: 6kA
Ief: 3kA, Ze: 0.0767Ω
MCOB 3P 250A
Ir=250A/16kA
LN 4x1Cx150mm²
CPC 1x95mm²
Pvc70/S/Cu
c-d-1
SB1
1.L1
MCB C 1P
63A/10kA
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Switchboard functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Calculate diversity factors
Convert phase (3ph <-> 1ph)
Multi paste
Paste replace
Equipment type selection...
Convert Switchboard to Distribution Board
Disconnect
Message
Please confirm Disconnect
OK
Cancel
Disconnected


Supply
TN-C-S 400/230V 50Hz
Isc: 6kA
Ief: 3kA, Ze: 0.0767Ω
Disconnected
L/N 4x1Cx150mm²
CPC 1x95mm²
Pvc70/S/Cu
c-d-1
SB1
1.L1
MCB C 1P
63A/10kA
Connect
Activate
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel



Schematic Functions

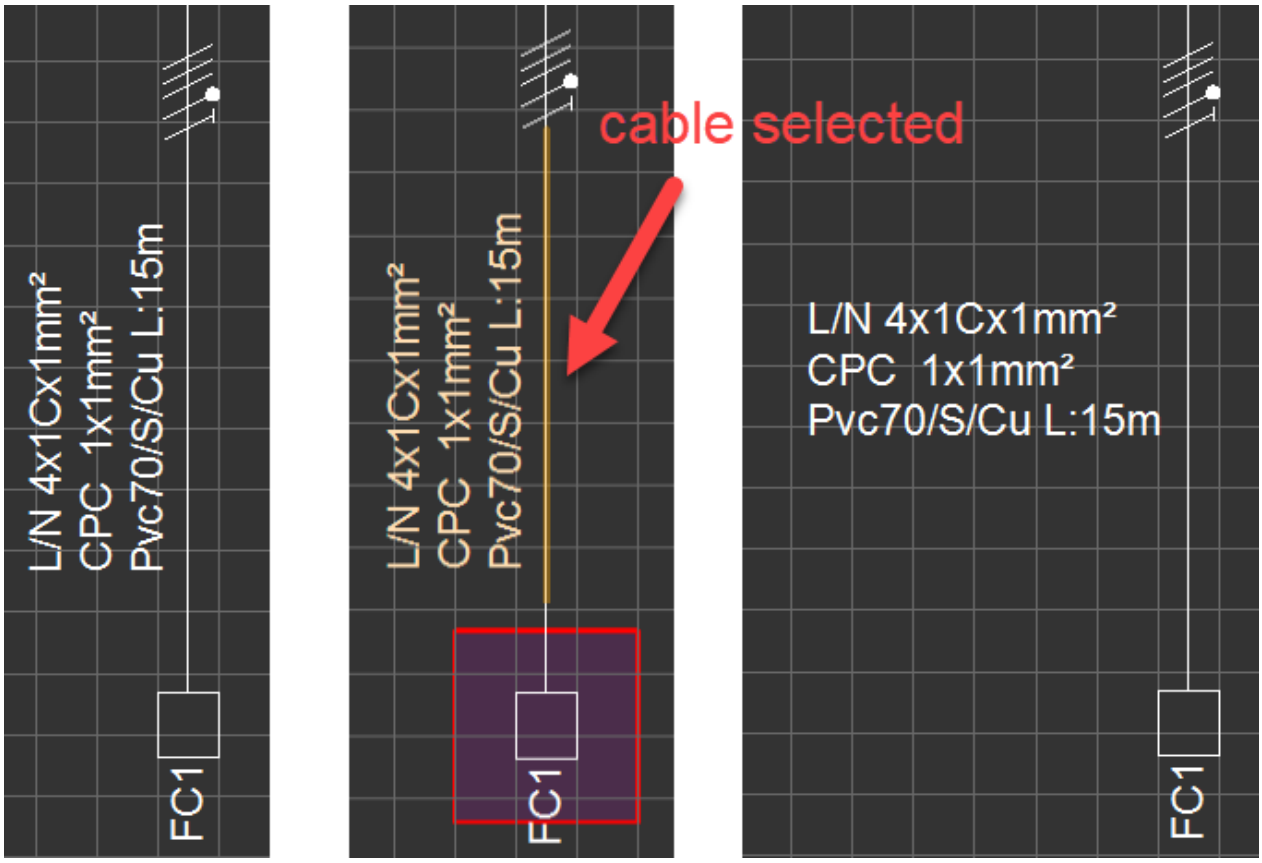
Schematic functions accommodates some options in regard to the schematic representation and can only be accessed at the Schematic Module screen by the right click menu. The menu is dynamic and will change according to the selected item. Below, all the options are shown as a single menu for ease of documentation, the user will only see the available options.



Reverse label orientation/Move label/Replace label

Reverse label orientation/Move label/Replace label

Reverse label option will switch between horizontal and vertical orientations of a label.



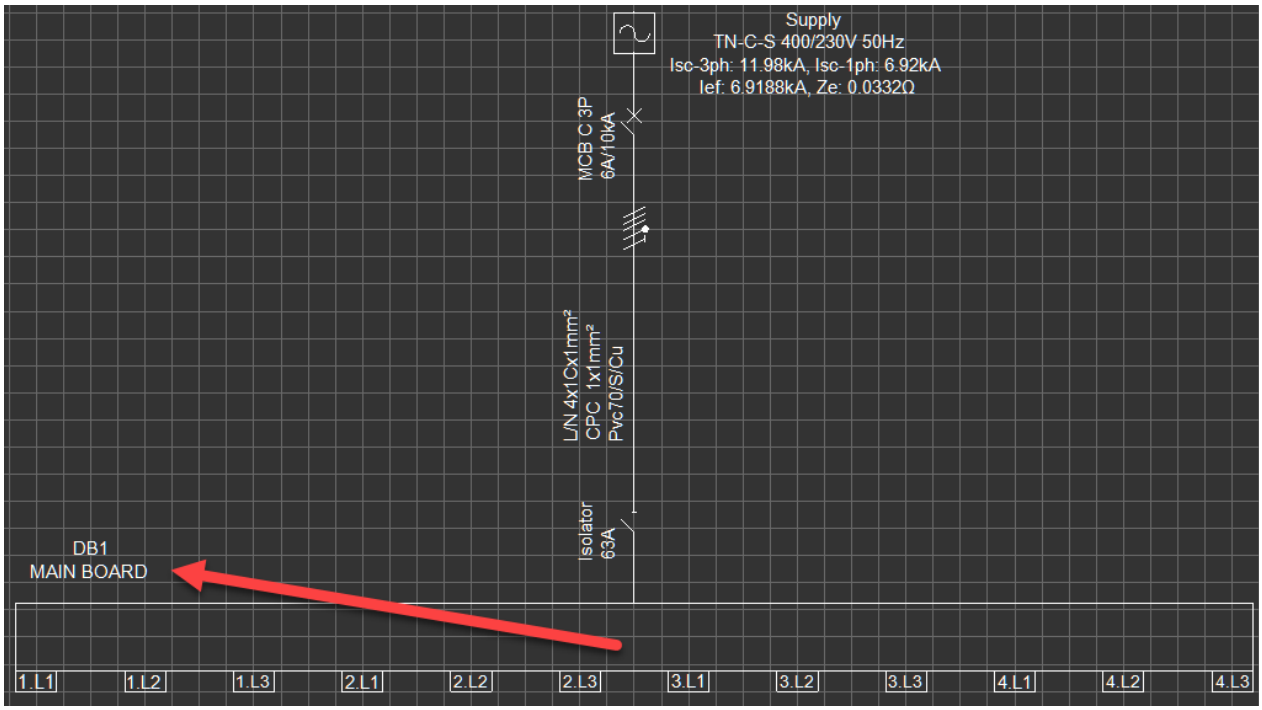
Where *Move label* will let the user to move the label to a desired position. If a label moved to another position other than its default position, then *Replace label* will move it back to its default position. It does not matter if the label is moved multiple times, *Replace label* will move it to the default position not to a previous position.

It is worth mentioning that selecting a label is not possible. In order to manipulate labels, user must select the associated object. If it is required to manipulate label orientations in bulk then it is useful to use *Apply labels orientation*, refer to Functions Menu. It is possible to set a font size for labels in bulk, please refer to Functions Menu for details (*Apply labels.sizes*).

Move/Replace description

Move/Replace description

If the selected object has a description rather than a label, then, this option will be available. *Move description* will let the user to move the description and the label of the selected object to a different position and *Replace description* will move them back to their default position.

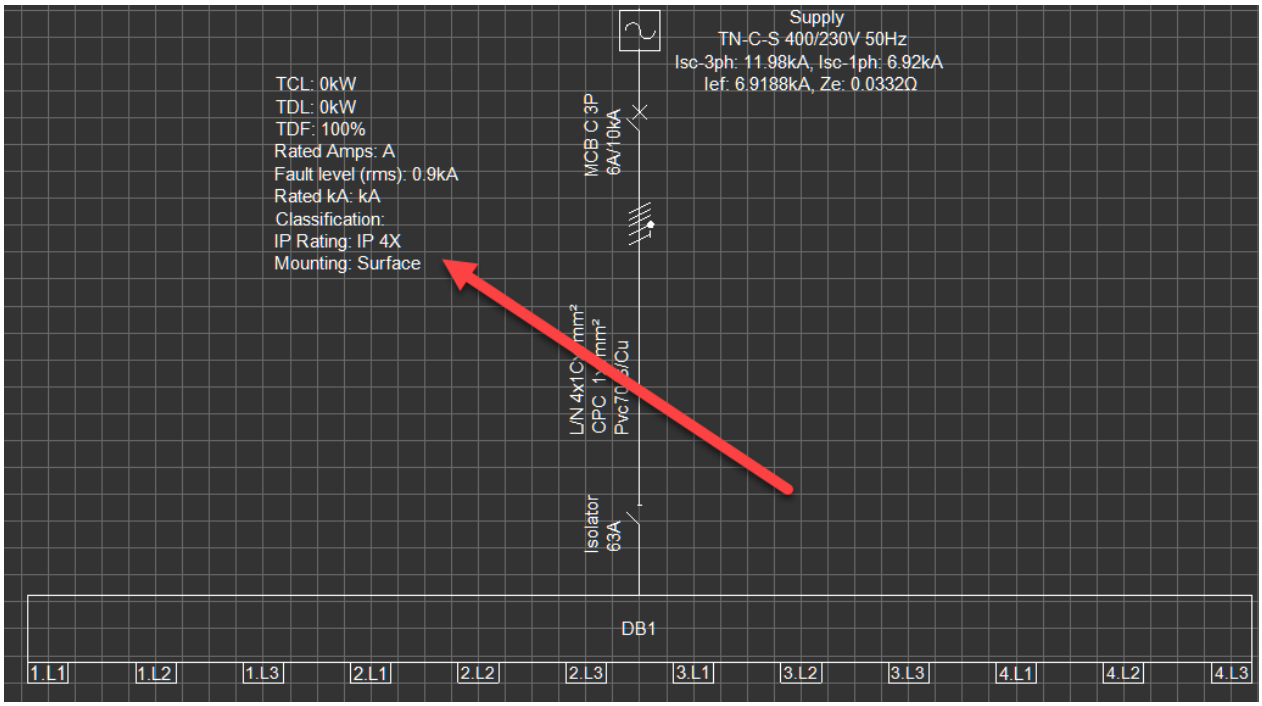


It is worth mentioning that selecting a description is not possible. In order to manipulate descriptions, user must select the associated object.

Move board label

Move board label

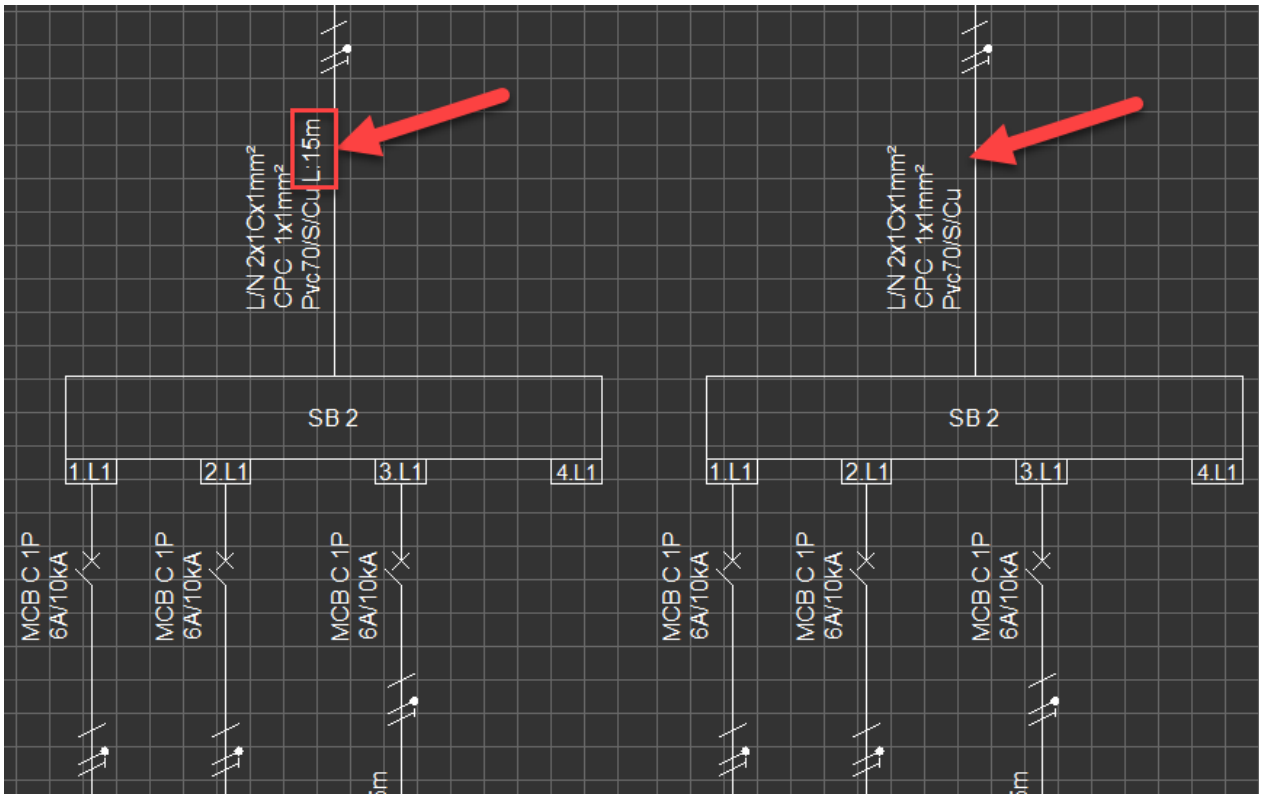
This option will be available only if the board label is enabled (see Schematic Module Toolbar). The user can move the label to any other position using this option.



Hide/Show length

Hide length/Show length

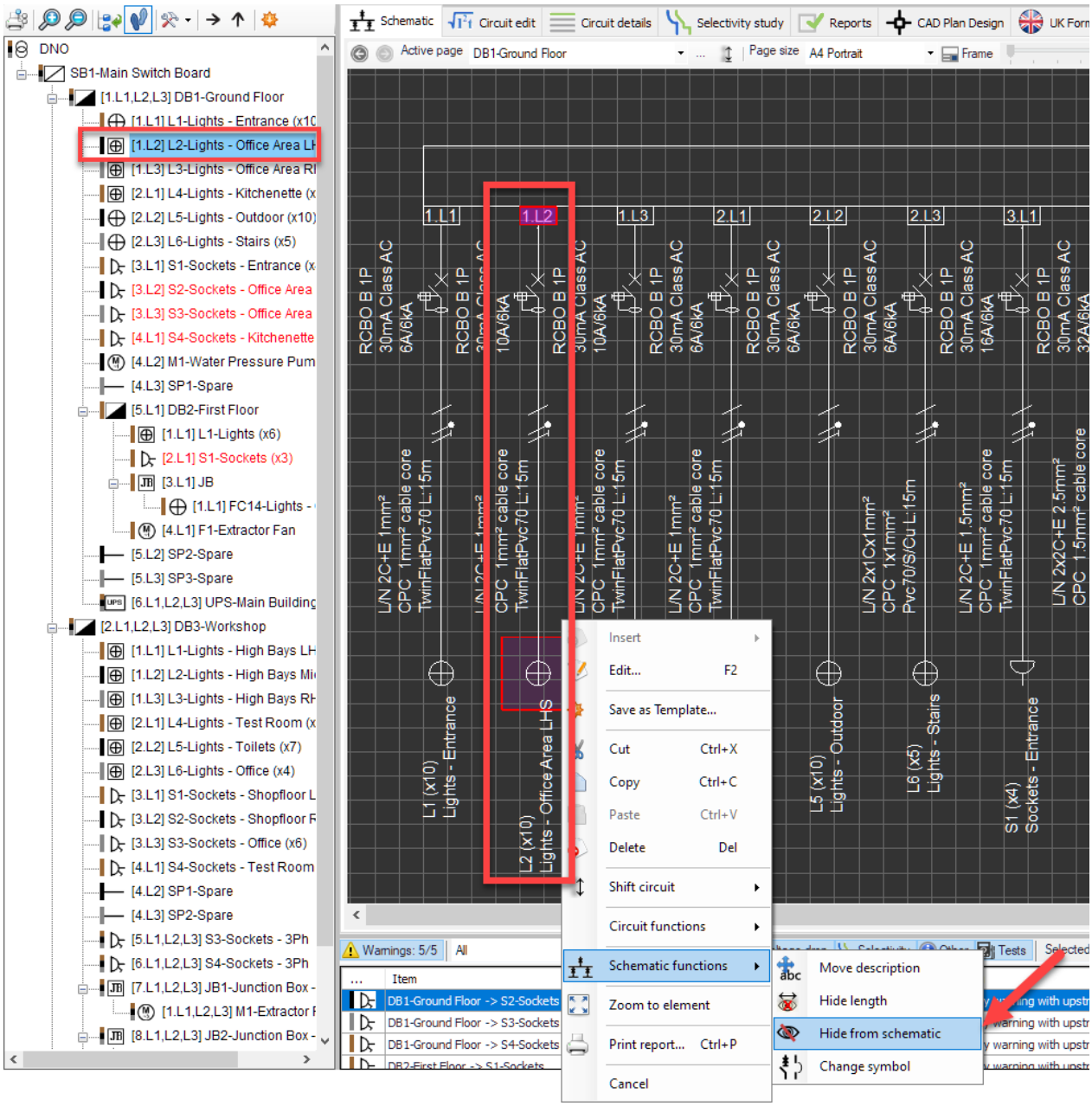
If the user selects any object associated with a length data (e.g. a Switch Board, a Final circuit, etc., but not a cable), then, this option will give the user the option to show or hide the length of the associated cable on the schematic.

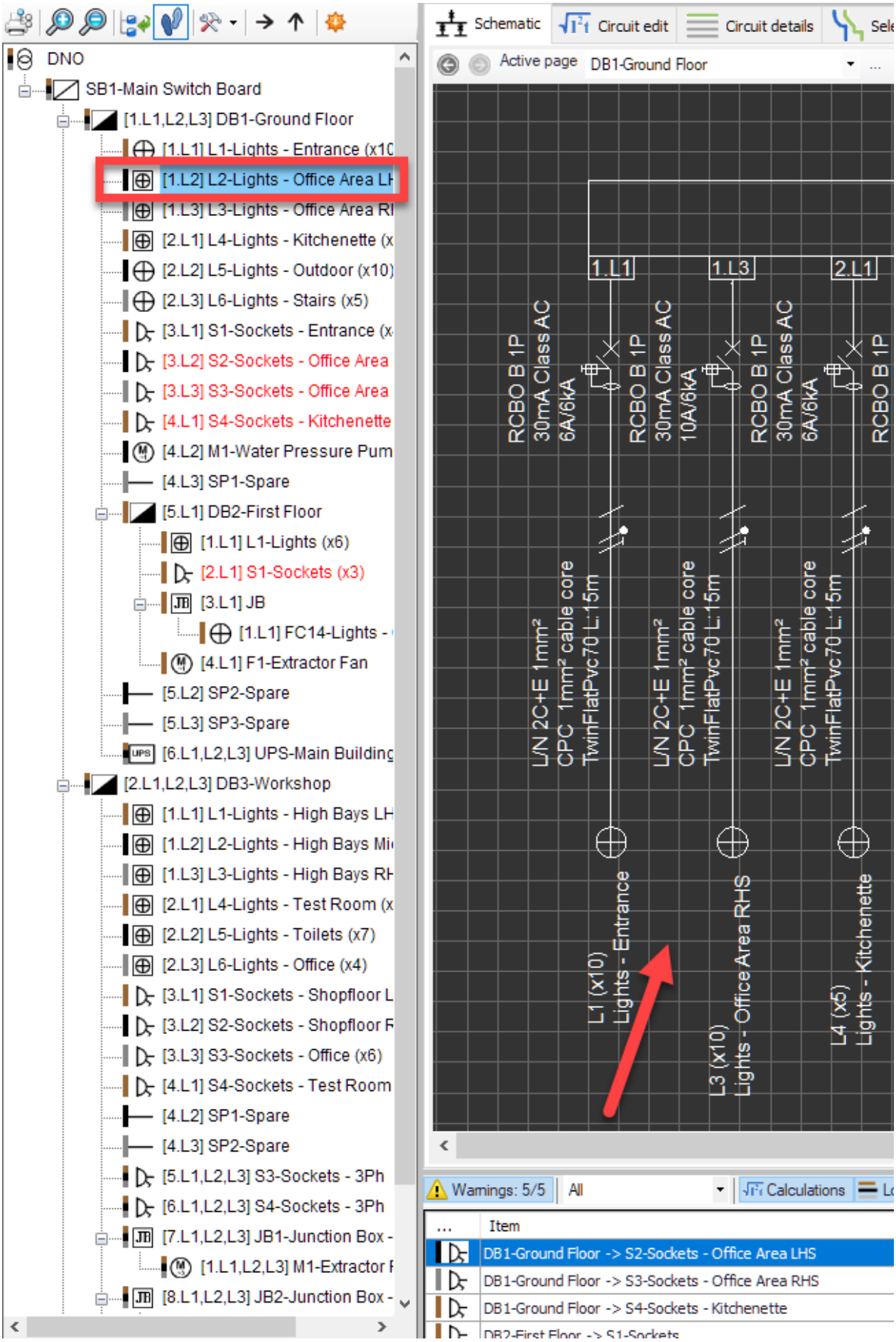


Hide from schematic/Force display of final circuit

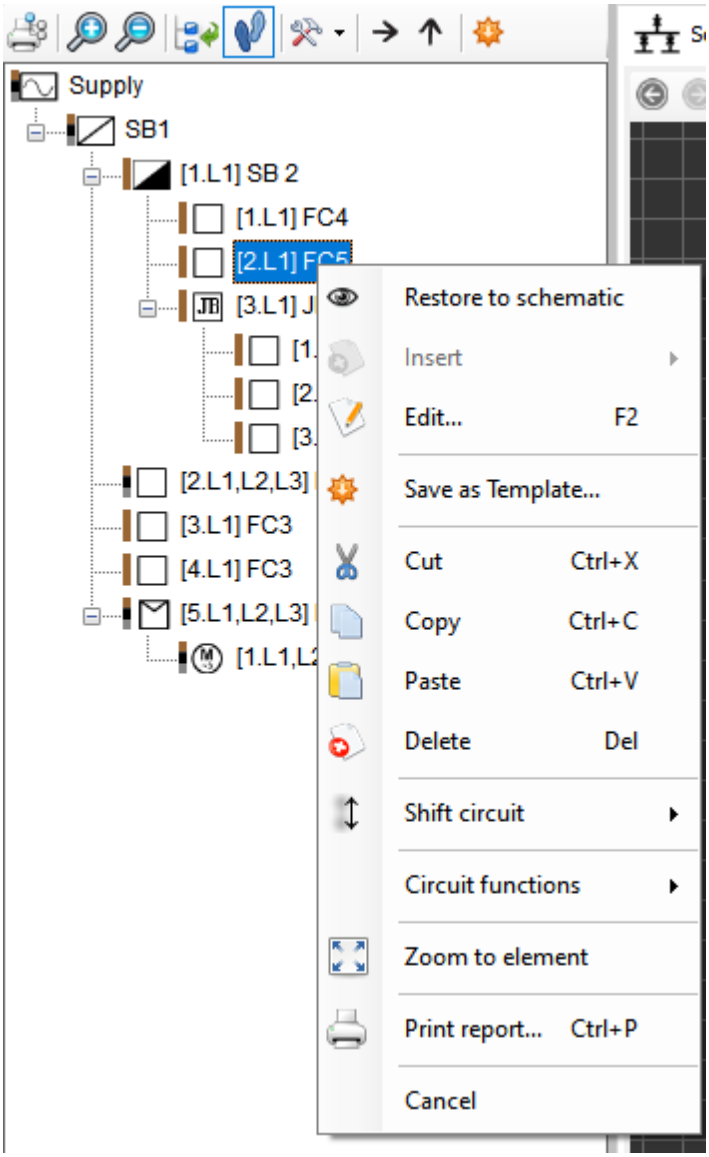
Hide from schematic/Force display of final circuit

This option is available for final circuits and it is used to show/hide a final circuit on schematic. If a circuit is hidden then it will be removed from the schematic but still be visible on the system tree.


DNO
SB1-Main Switch Board
[1.L1,L2,L3] DB1-Ground Floor
[1.L1] L1-Lights - Entrance (x10
[1.L2] L2-Lights - Office Area LH
[1.L3] L3-Lights - Office Area RH
[2.L1] L4-Lights - Kitchenette (x
[2.L2] L5-Lights - Outdoor (x10)
[2.L3] L6-Lights - Stairs (x5)
[3.L1] S1-Sockets - Entrance (x
[3.L2] S2-Sockets - Office Area
[3.L3] S3-Sockets - Office Area
[4.L1] S4-Sockets - Kitchenette
[4.L2] M1-Water Pressure Pum
[4.L3] SP1-Spare
[5.L1] DB2-First Floor
[1.L1] L1-Lights (x6)
[2.L1] S1-Sockets (x3)
[3.L1] JB
[1.L1] FC14-Lights -
[4.L1] F1-Extractor Fan
[5.L2] SP2-Spare
[5.L3] SP3-Spare
[6.L1,L2,L3] UPS-Main Building
[2.L1,L2,L3] DB3-Workshop
[1.L1] L1-Lights - High Bays LH
[1.L2] L2-Lights - High Bays Mi
[1.L3] L3-Lights - High Bays RH
[2.L1] L4-Lights - Test Room (x
[2.L2] L5-Lights - Toilets (x7)
[2.L3] L6-Lights - Office (x4)
[3.L1] S1-Sockets - Shopfloor L
[3.L2] S2-Sockets - Shopfloor F
[3.L3] S3-Sockets - Office (x6)
[4.L1] S4-Sockets - Test Room
[4.L2] SP1-Spare
[4.L3] SP2-Spare
[5.L1,L2,L3] S3-Sockets - 3Ph
[6.L1,L2,L3] S4-Sockets - 3Ph
[7.L1,L2,L3] JB1-Junction Box -
[1.L1,L2,L3] M1-Extractor F
[8.L1,L2,L3] JB2-Junction Box -
Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Form
Active page
DB1-Ground Floor
Page size
A4 Portrait
Frame
1.L1
1.L2
1.L3
2.L1
2.L2
2.L3
3.L1
RCBO B 1P
30mA Class AC
6A/6kA
10A/6kA
16A/6kA
32A/6kA
L/N 2C+E 1mm²
CPC 1mm² cable core
TwinFlatPvc70 L:15m
L/N 2x1Cx1mm²
CPC 1x1mm²
Pvc70/S/Cu L:15m
L/N 2C+E 1.5mm²
L/N 2x2C+E 2.5mm²
CPC 1.5mm² cable core
L1 (x10)
Lights - Entrance
L2 (x10)
Lights - Office Area LHS
L5 (x10)
Lights - Outdoor
L6 (x5)
Lights - Stairs
S1 (x4)
Sockets - Entrance
Insert
Edit... F2
Save as Template...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del
Shift circuit
Circuit functions
Schematic functions
Zoom to element
Print report... Ctrl+P
Cancel
Move description
Hide length
Hide from schematic
Change symbol
Warnings: 5/5
All
Item
DB1-Ground Floor -> S2-Sockets
DB1-Ground Floor -> S3-Sockets
DB1-Ground Floor -> S4-Sockets
Tests
Selected


DNO
SB1-Main Switch Board
[1.L1,L2,L3] DB1-Ground Floor
[1.L1] L1-Lights - Entrance (x10
[1.L2] L2-Lights - Office Area LH
[1.L3] L3-Lights - Office Area RH
[2.L1] L4-Lights - Kitchenette (x
[2.L2] L5-Lights - Outdoor (x10)
[2.L3] L6-Lights - Stairs (x5)
[3.L1] S1-Sockets - Entrance (x
[3.L2] S2-Sockets - Office Area
[3.L3] S3-Sockets - Office Area
[4.L1] S4-Sockets - Kitchenette
[4.L2] M1-Water Pressure Pum
[4.L3] SP1-Spare
[5.L1] DB2-First Floor
[1.L1] L1-Lights (x6)
[2.L1] S1-Sockets (x3)
[3.L1] JB
[1.L1] FC14-Lights -
[4.L1] F1-Extractor Fan
[5.L2] SP2-Spare
[5.L3] SP3-Spare
[6.L1,L2,L3] UPS-Main Building
[2.L1,L2,L3] DB3-Workshop
[1.L1] L1-Lights - High Bays LH
[1.L2] L2-Lights - High Bays Mi
[1.L3] L3-Lights - High Bays RH
[2.L1] L4-Lights - Test Room (x
[2.L2] L5-Lights - Toilets (x7)
[2.L3] L6-Lights - Office (x4)
[3.L1] S1-Sockets - Shopfloor L
[3.L2] S2-Sockets - Shopfloor R
[3.L3] S3-Sockets - Office (x6)
[4.L1] S4-Sockets - Test Room
[4.L2] SP1-Spare
[4.L3] SP2-Spare
[5.L1,L2,L3] S3-Sockets - 3Ph
[6.L1,L2,L3] S4-Sockets - 3Ph
[7.L1,L2,L3] JB1-Junction Box -
[1.L1,L2,L3] M1-Extractor F
[8.L1,L2,L3] JB2-Junction Box -
Schematic
Circuit edit
Circuit details
Active page
DB1-Ground Floor
1.L1
1.L3
2.L1
RCBO B 1P
30mA Class AC
6A/6kA
10A/6kA
L/N 2C+E 1mm² CPC 1mm² cable core
TwinFlatPvc70 L:15m
L1 (x10)
Lights - Entrance
L3 (x10)
Lights - Office Area RHS
L4 (x5)
Lights - Kitchenette
Warnings: 5/5
All
Calculations
Item
DB1-Ground Floor -> S2-Sockets - Office Area LHS
DB1-Ground Floor -> S3-Sockets - Office Area RHS
DB1-Ground Floor -> S4-Sockets - Kitchenette

To show a hidden circuit on the schematic again, user must use the tree to select the hidden circuit and then use the Actions Menu or the Right Click menu and select *Restore to schematic.*



It is important to notice that if the user directly right clicks on an object from the tree then the *Schematic functions* menu will not be displayed, a left click must be performed first.

Create/Restore Page

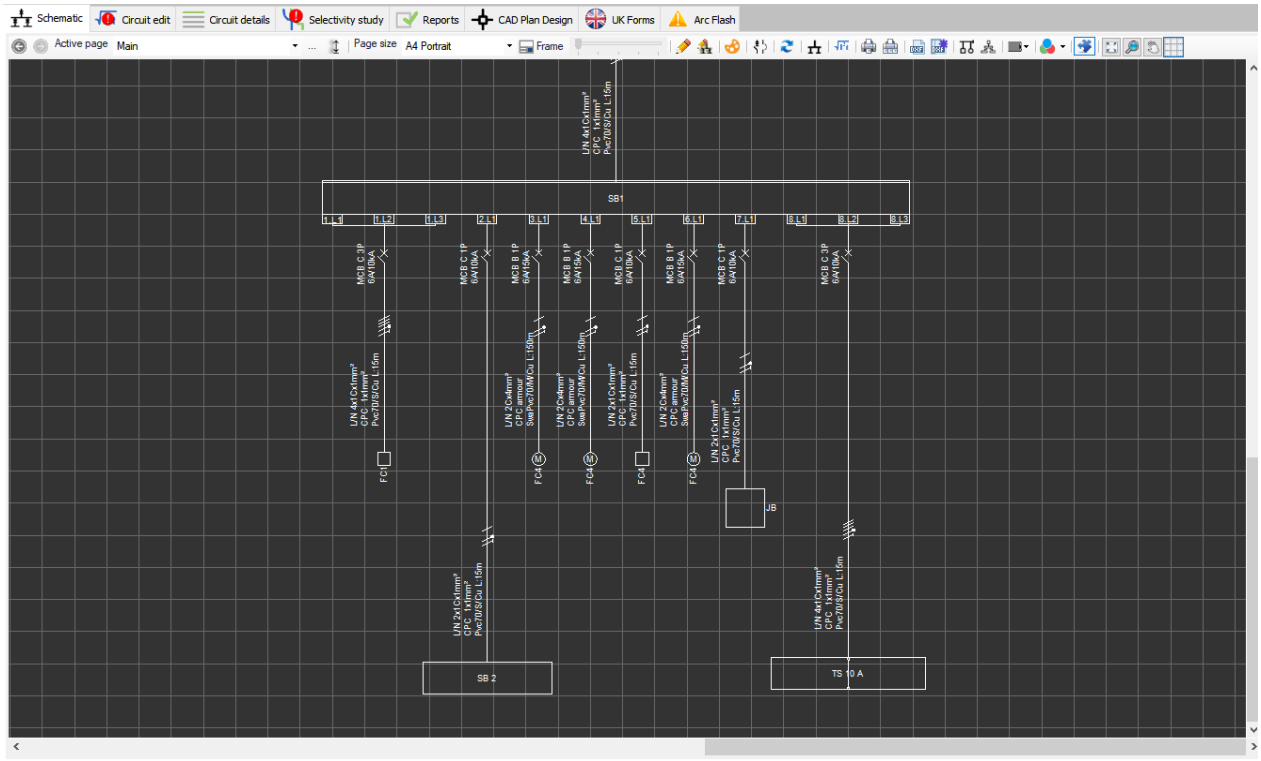
Create/Restore Page

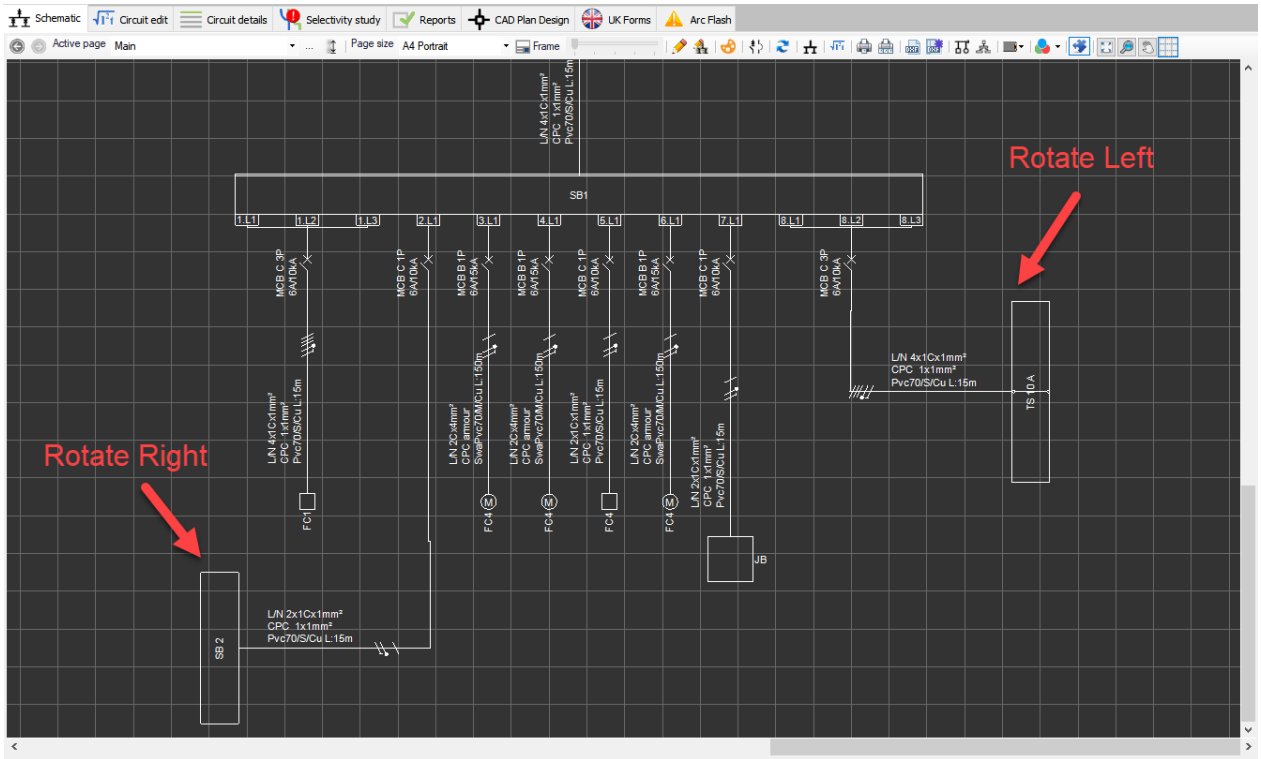
This option is discussed in Schematic Module Toolbar section.

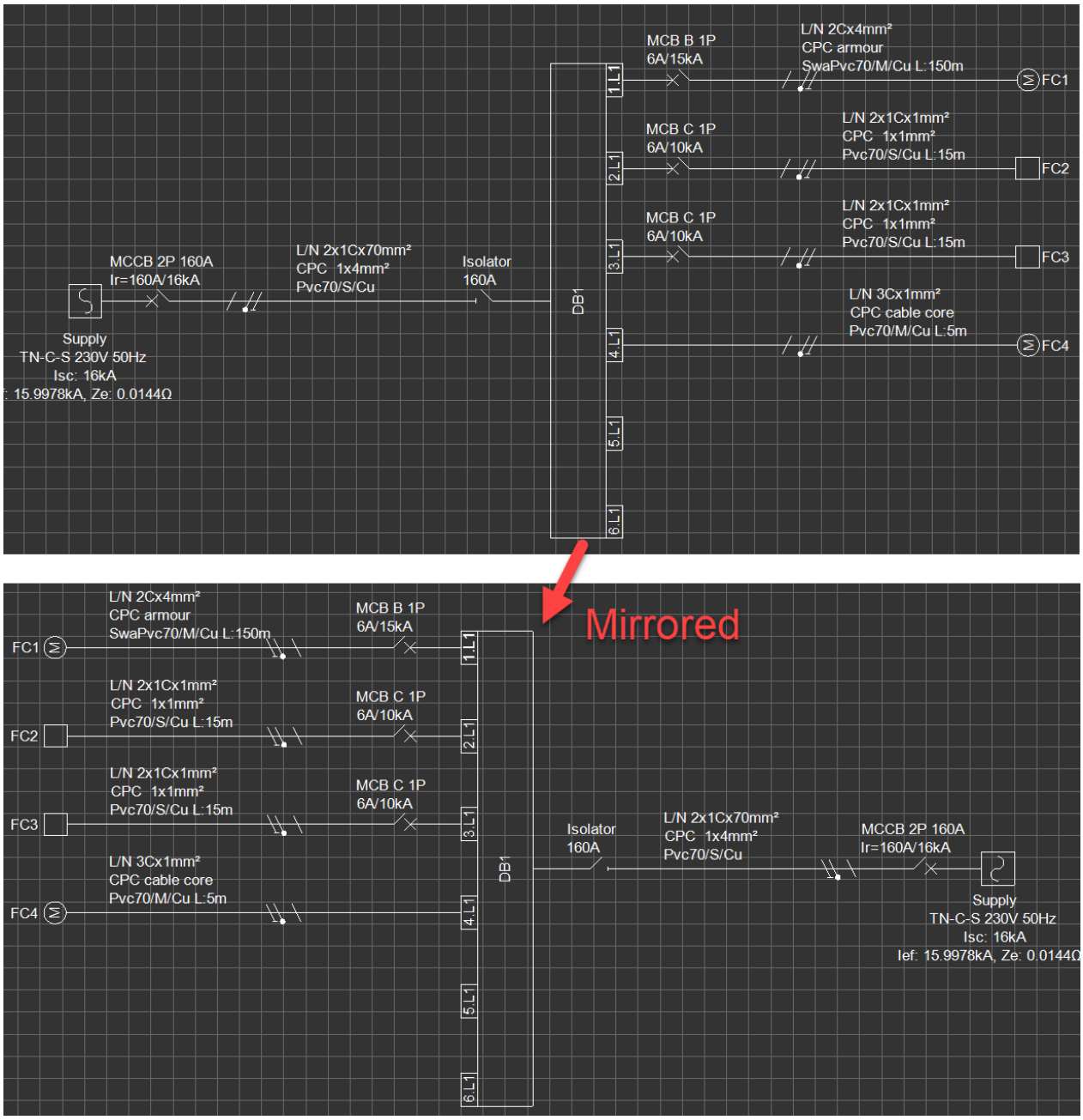
Rotate left/Rotate right and Mirror

Rotate left/Rotate right and Mirror

It is possible to change the orientation of any distribution point which may include a DB, a SB, a TS etc.


Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Forms
Arc Flash
Active page
Main
Page size
A4 Portrait
Frame
SB1
SB 2
TS 10 A
JB

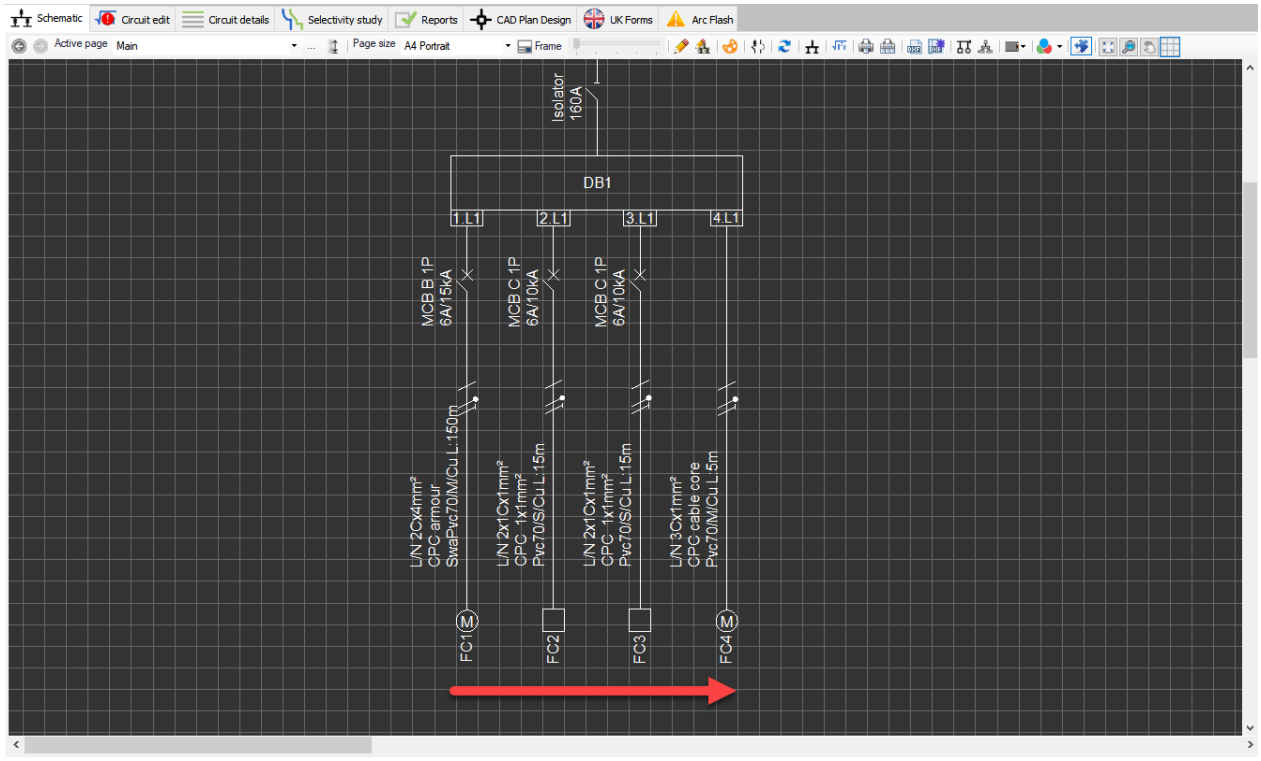

Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Forms
Arc Flash
Active page
Main
Page size
A4 Portrait
Frame
Rotate Left
Rotate Right
SB1
SB 2
TS 10 A
JB

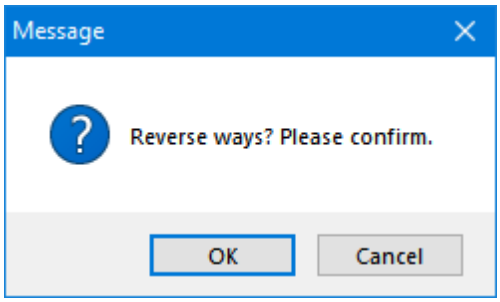


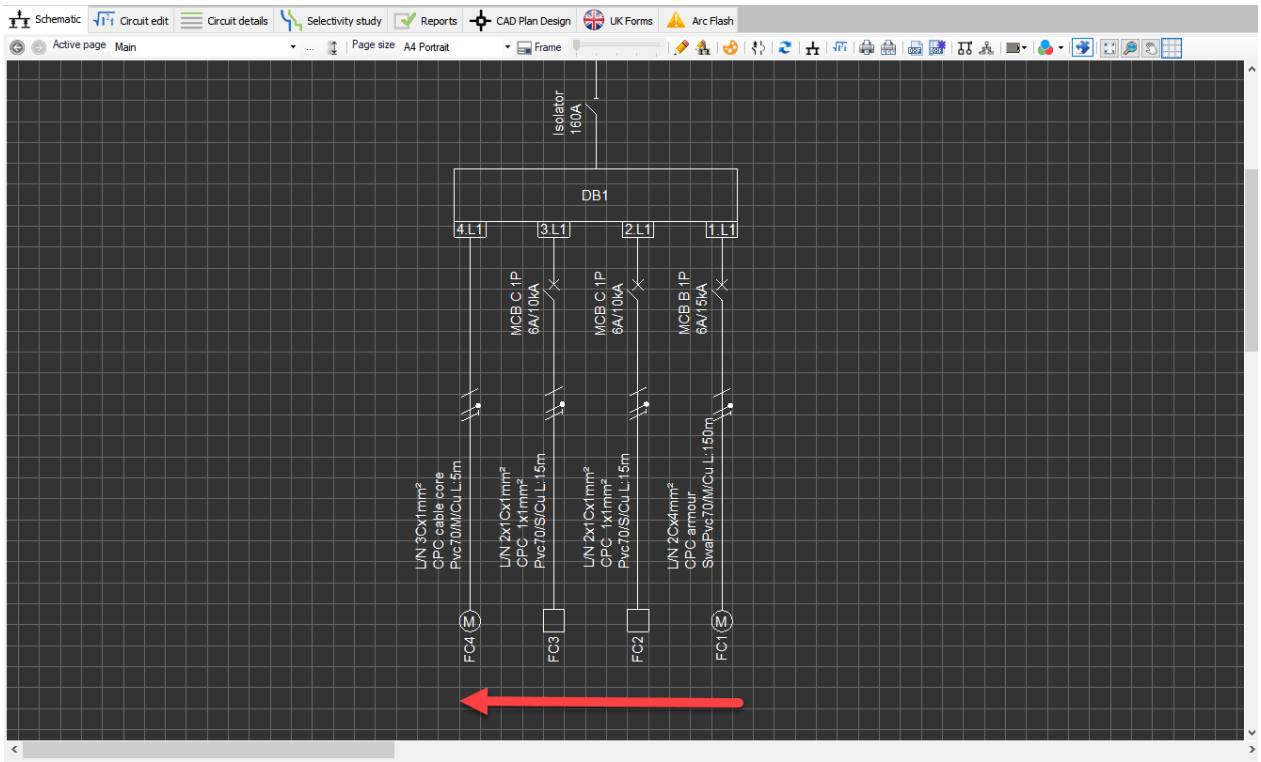
Reverse ways

Reverse ways

This option will reorder the ways of a board in reverse order. ElectricalOM will ask the user to approve the operation before taking action. It is important to notice that this option will not reorder the circuits but ways, and does not affect the tree representation. In other words, if the user had a way order from left to right and reversed the ways of the board, and then, newly added circuits would be inserted in the reverse order, meaning each new circuit would be inserted towards the left hand side - reversed order as in from right to left. However this behaviour is purely visual, and does not affect the system tree.


Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Forms
Arc Flash
Active page
Main
Page size
A4 Portrait
Frame
Isolator 160A
DB1
1 L1
2 L1
3 L1
4 L1
MCB B 1P 6A/15kA
MCB C 1P 6A/10kA
MCB C 1P 6A/10kA
L/N 2Cx4mm² CPC armour SwaPvc70/M/Cu L:150m
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/S/Cu L:15m
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/S/Cu L:15m
L/N 3Cx1mm² CPC cable core Pvc70/M/Cu L:5m
FC1
FC2
FC3
FC4

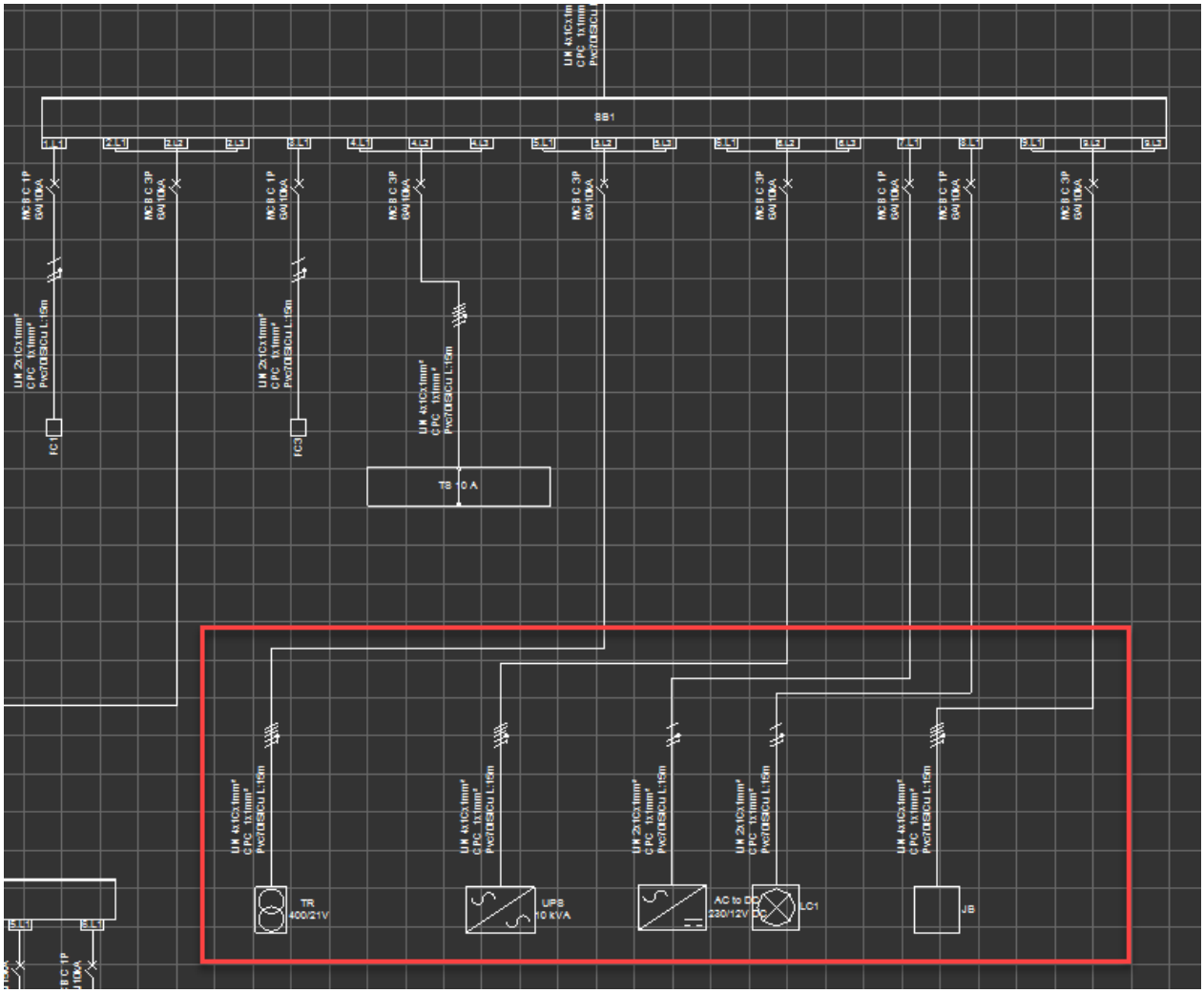

Message
Reverse ways? Please confirm.
OK
Cancel

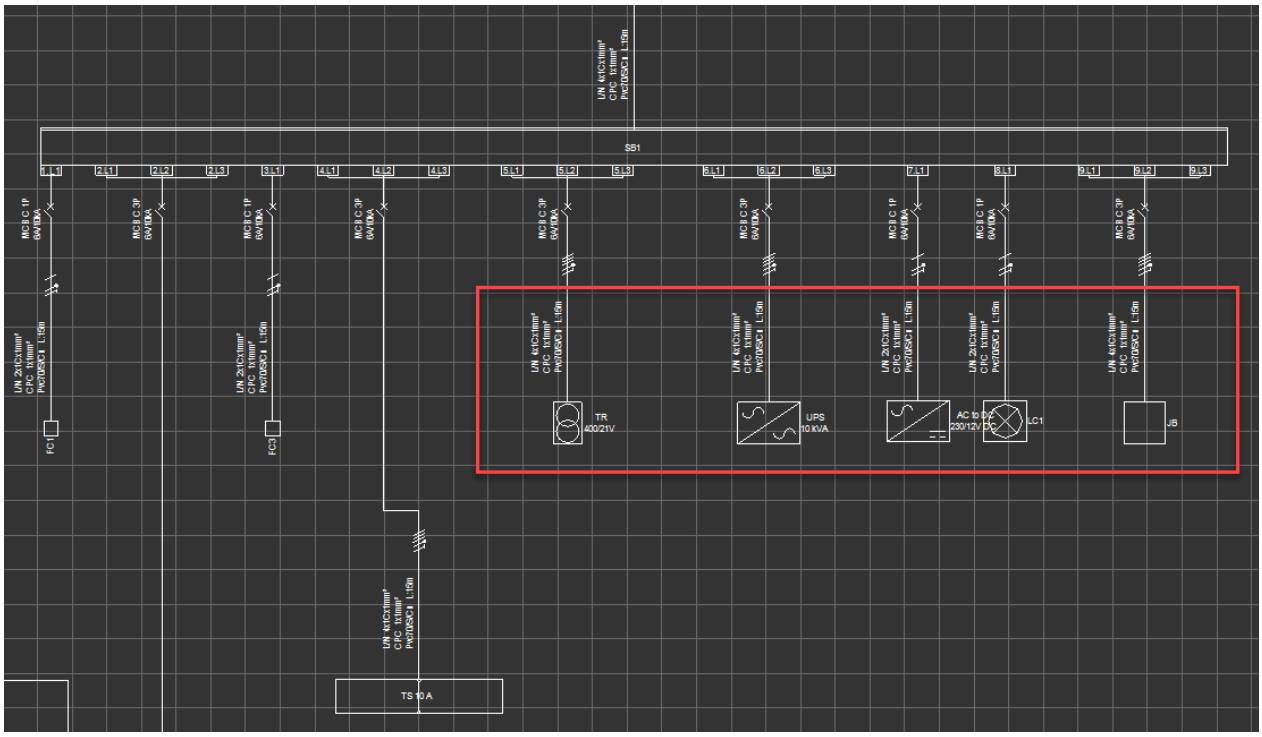

Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Forms
Arc Flash
Active page
Main
Page size
A4 Portrait
Frame
Isolator 160A
DB1
4 L1
3 L1
2 L1
1 L1
MCB C 1P 6A/10kA
MCB C 1P 6A/10kA
MCB B 1P 6A/15kA
L/N 3Cx1mm² CPC cable core Pvc70/M/Cu L:5m
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/S/Cu L:15m
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/S/Cu L:15m
L/N 2Cx4mm² CPC armour SwaPvc70/M/Cu L:150m
FC4
FC3
FC2
FC1

Force extension/normal layouts

Force extension/normal layouts

ElectricalOM will insert a JB (Junction Box), TR (Transformer), UPS, LC (Lighting column), or an AC/DC Converter in normal (independent) mode. This keeps the inserted object to be moved independent then the feeding board. But in some cases, user may want to keep these object together with the feeding board, show them in a similar way to a FC (final circuit), which is called *extension layout*. See the picture below for the difference.



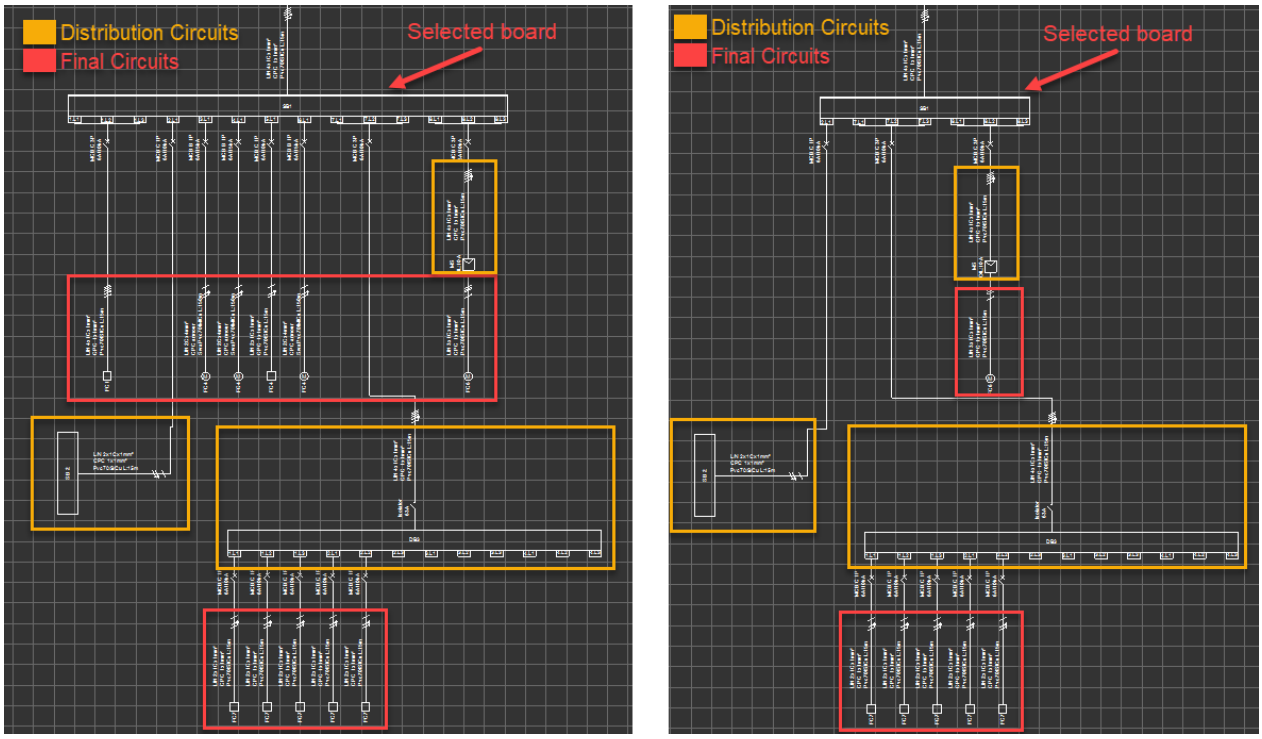


It needs pointing out that when using *Force extension layout* mode, *Create page* will not be available for the specified component. If the user is intended to move the specified node to a different sheet, then, normal mode must be used.

Enter/Leave compacted mode

Enter/Leave compacted mode

Compacted mode allows user to remove the final circuits from the schematic and leave the distribution circuits only, so, it is easier to analyse and visualise the distribution system. This option only applies to the selected board. If there are other boards fed from the selected board, they will not be affected by this command. See picture below for better understanding.

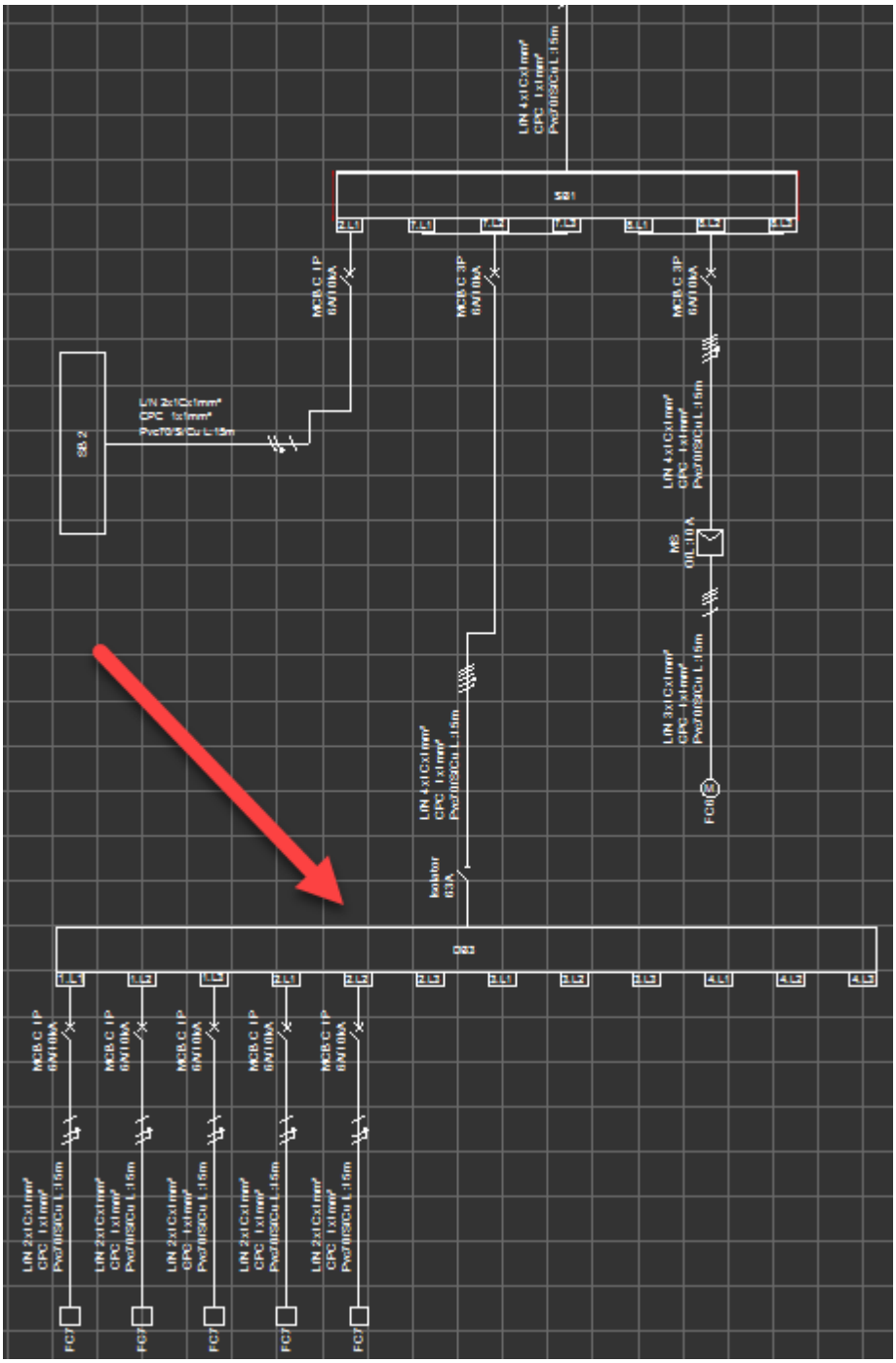


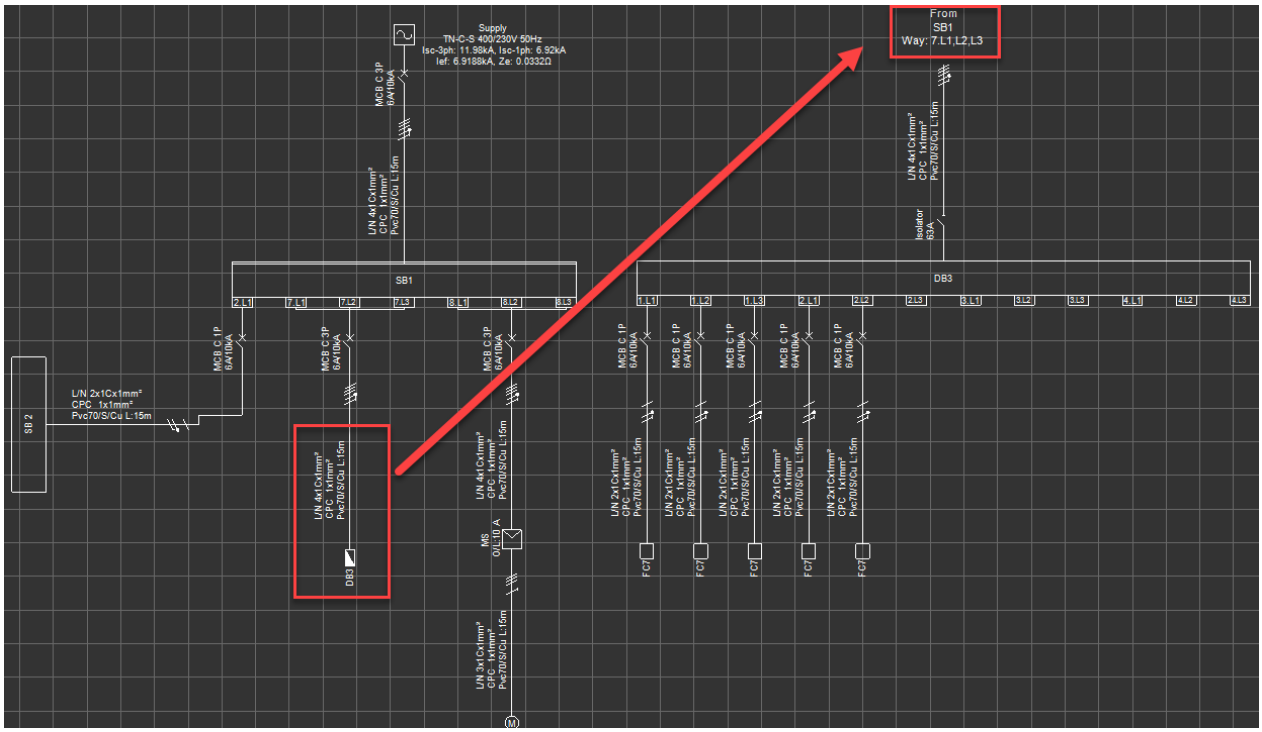
Compacted mode can be used in conjunction with *Force display of final circuit*, see above, even switched to compacted mode. User can select a final circuit from the system tree and use *Force display of final circuit* option to display a final circuit.

Untether/Tether

Untether/Tether

Sometimes it is better to move some parts of the system to a different position for sake of clean representation, and, connecting cable might prevent this. In this case user may want to *Untether* a part of a system and move it to a better suited position. If this action wanted to be reversed, then, *Tether* can be used to restore the original representation.

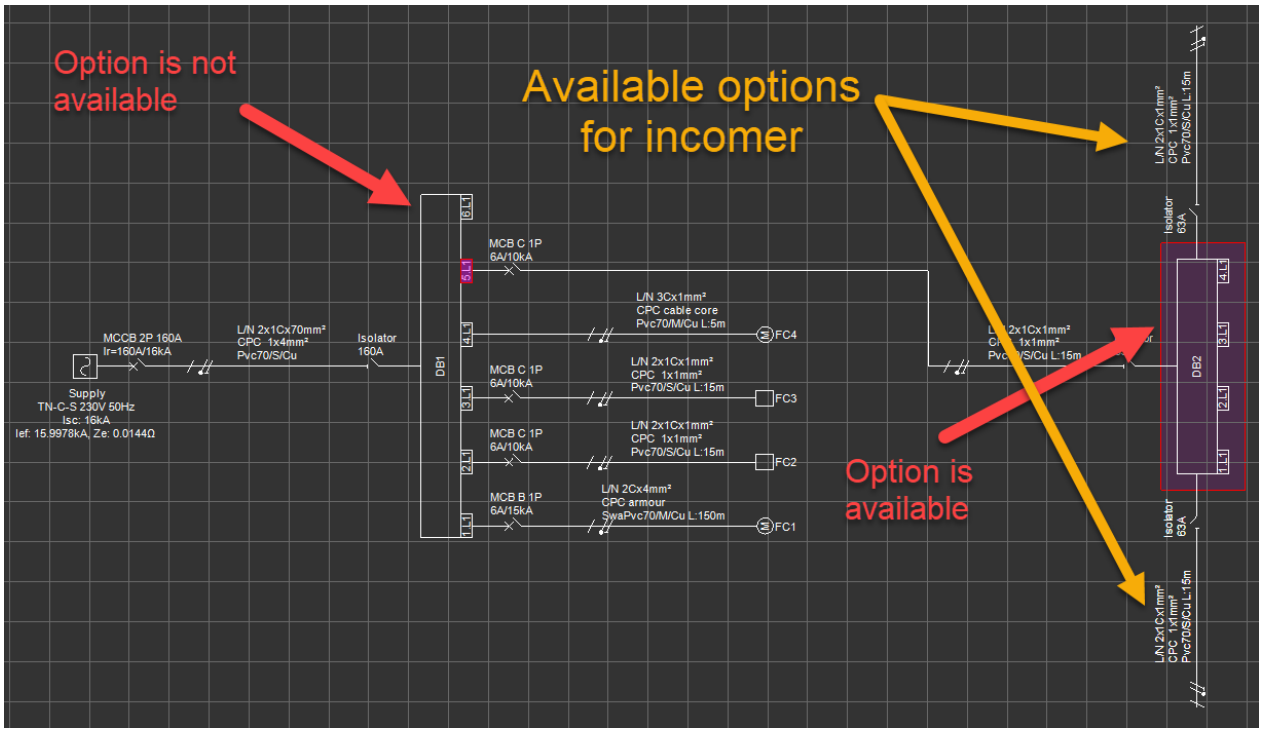

SB1
SB2
SB3
MCB C 1P
6A/10kA
MCB C 3P
6A/10kA
Isolator
63A
MS
0R..10A
FC1
FC2
FC3
FC4
FC5
FC6



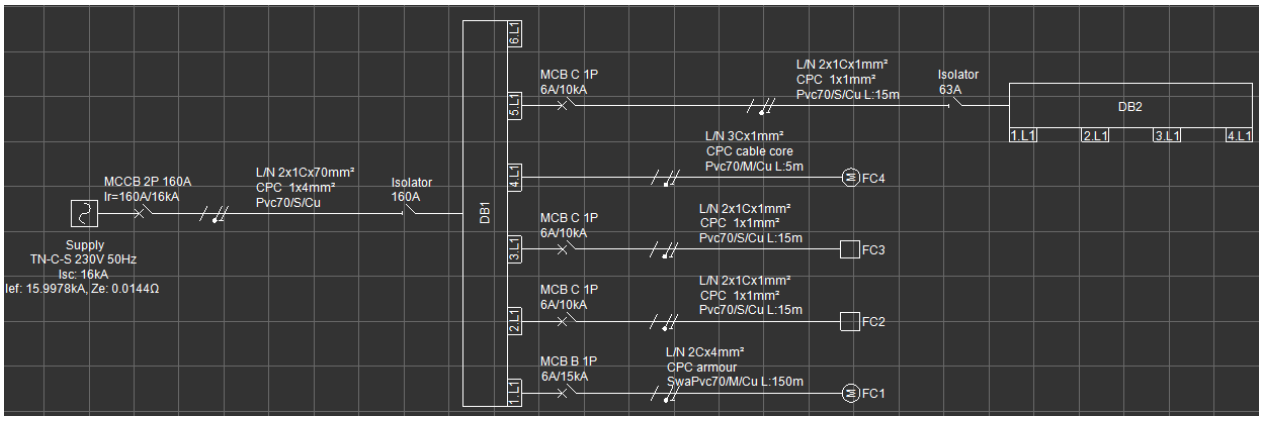
Move incomer

Move incomer

User can move the incomer to a different position than the default. As default, ElectrcialOM will show the incomer as it is entering to the board from the longer side opposite to the circuit feeds are located. User can use *Move incomer* option to move it, however, this option is only available for DBs which are not the first distribution point after the Source. ElectricalOM will show the options available and expect the user to select one of them. Once an option is selected ElectrcialOM will display the incomer entering to the board from the selected side.



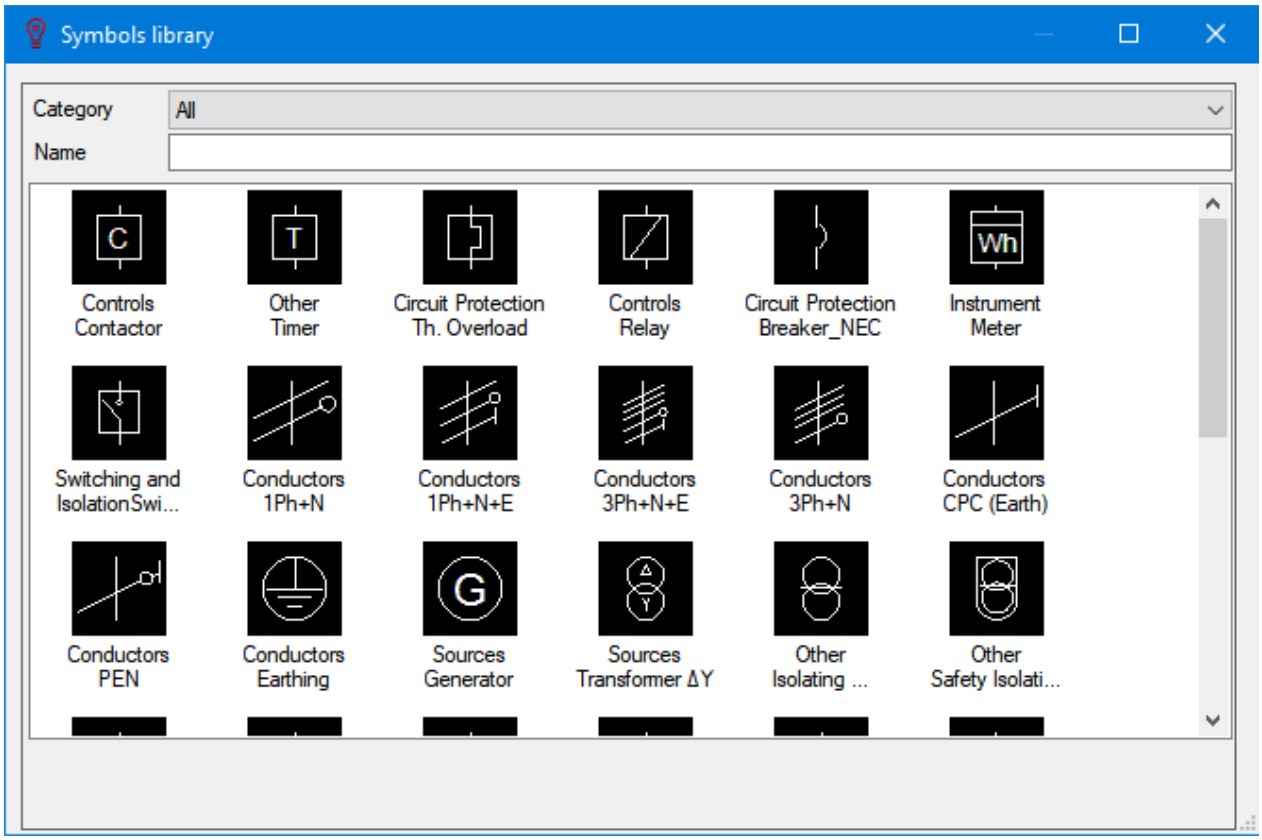
This option can be used in conjunction with *Rotate/Mirror* options to improve appearance.



Change symbol

Change symbol

A default symbol used for a component by ElectrcialOM can be replaced, where applicable, with a different one from the Symbols library. User should double click on the symbol which is going to be replaced with the previous one at Symbols library window.



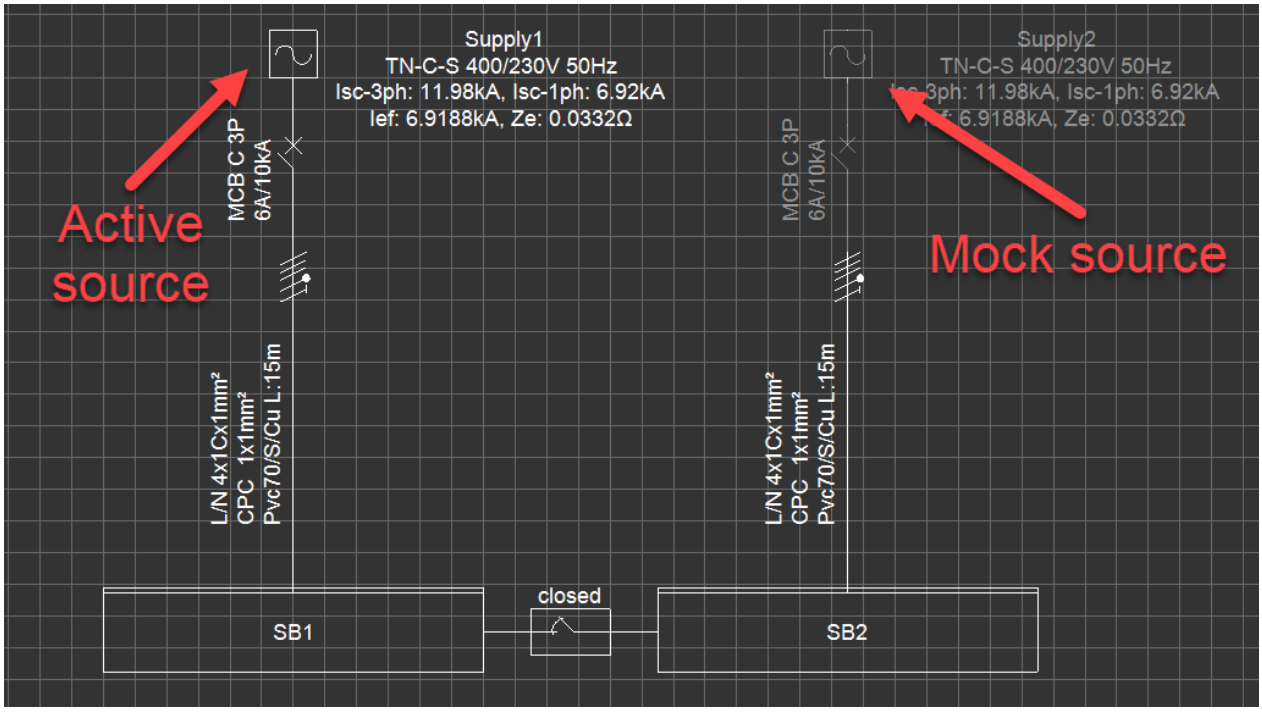
Hide/Show supply

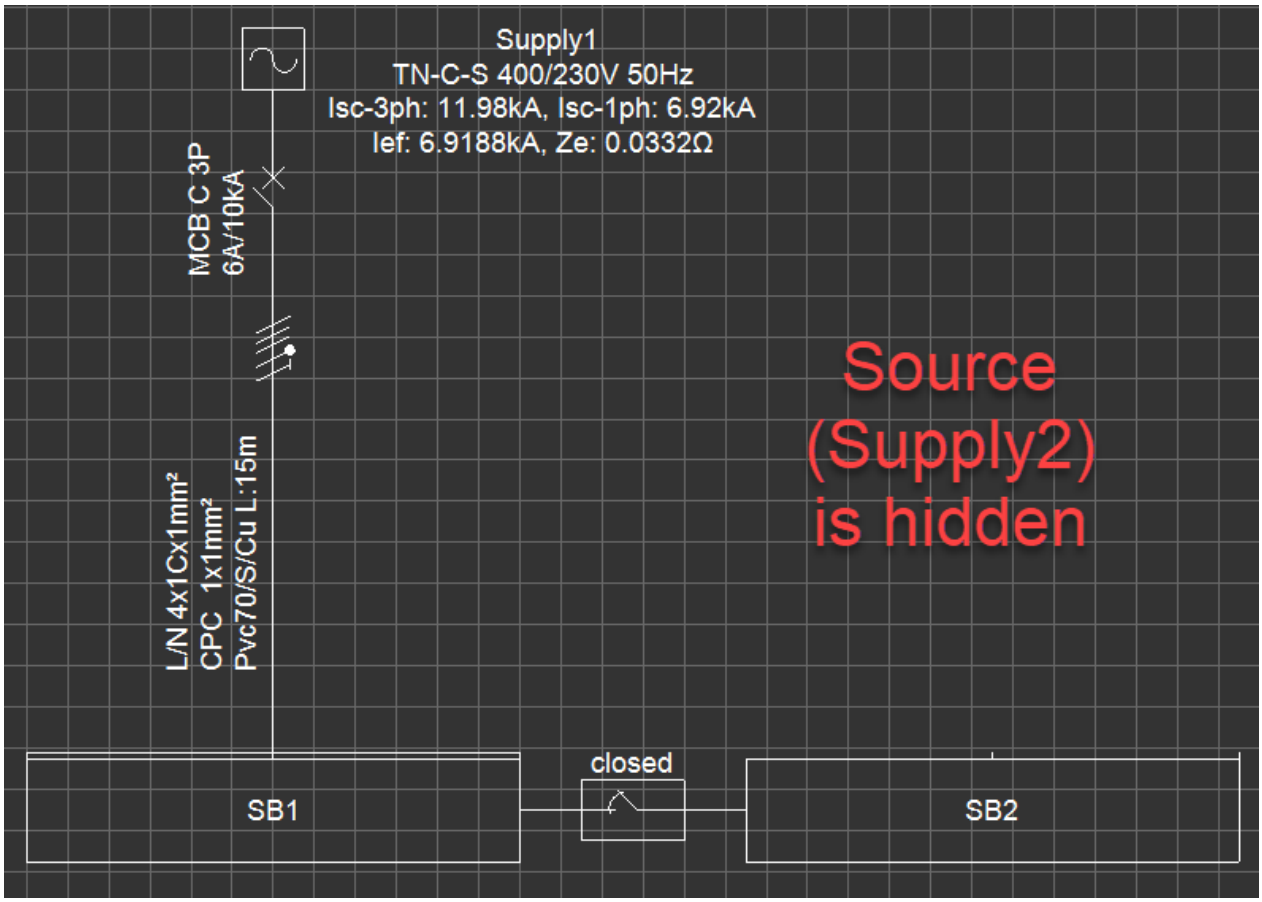
Hide/Show supply

This option can be used with any distribution object except DBs. Also, the object needs to be the first element after the *Source*. ElectricalOM, due to its nature, cannot have a distribution object without a source

connected to it. In a case where there is an SB without a connection to a source, see picture below, user need to insert an SB, which ElectrcialOM does it with a source automatically, keep this source deactivated and hide it. In this case, ElectricalOM will not see this source and all the calculations will be done referred to the active source.

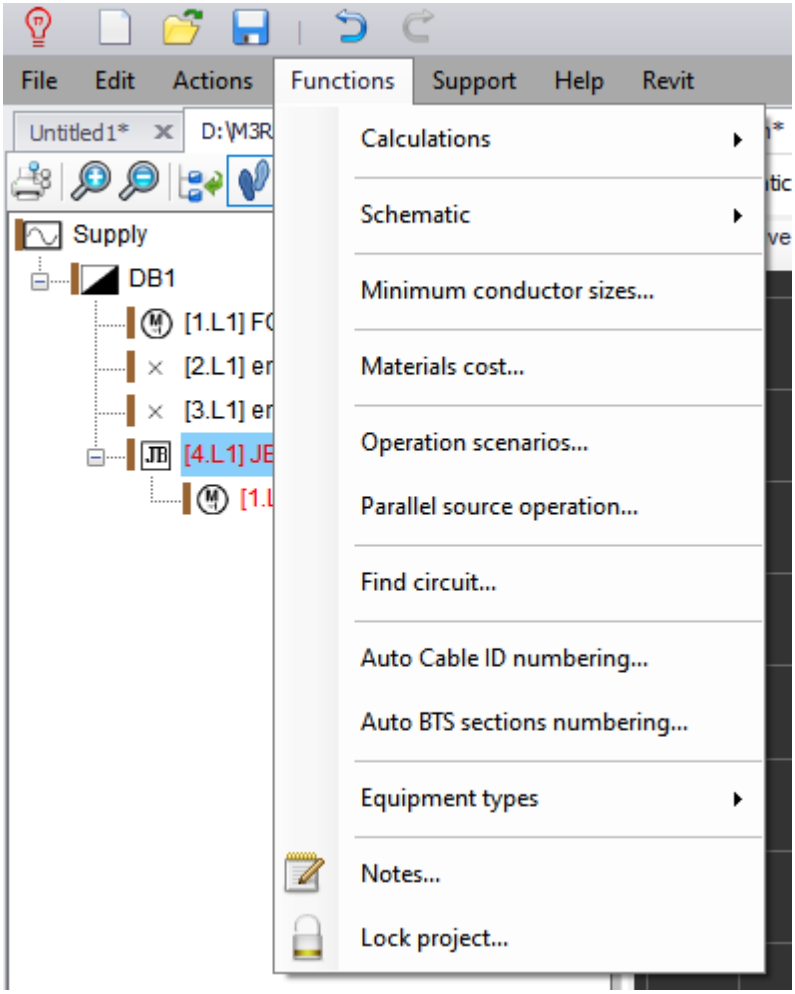
Of course, there could be cases where the designer would like to keep the source active but still wants to hide it on the schematics which can be done using this option.





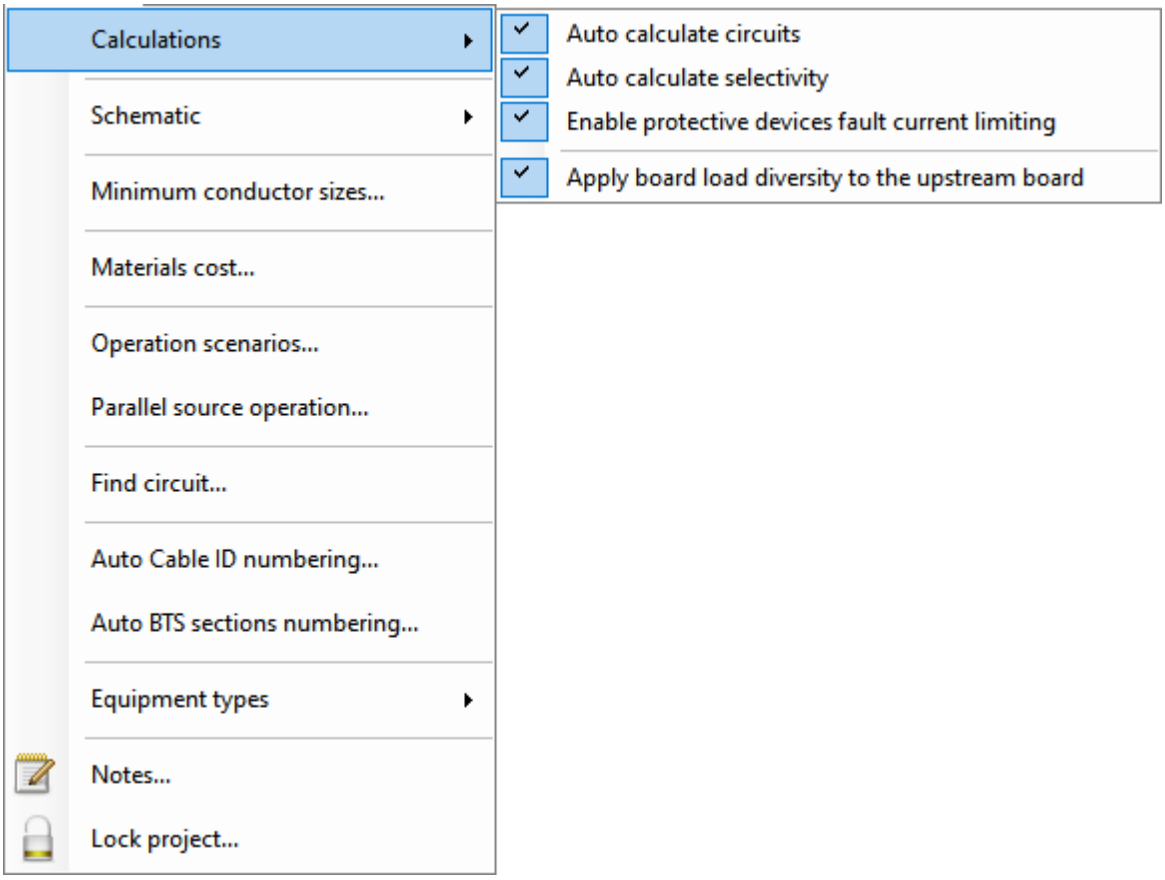
Functions Menu

This menu contains various settings regard to calculations, schematic display, etc.

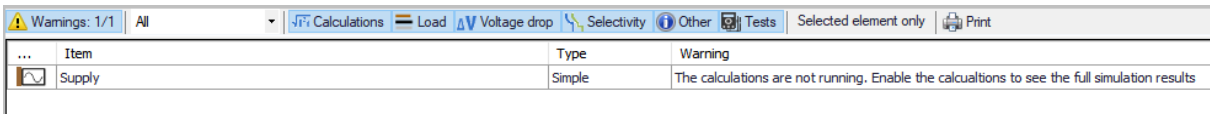


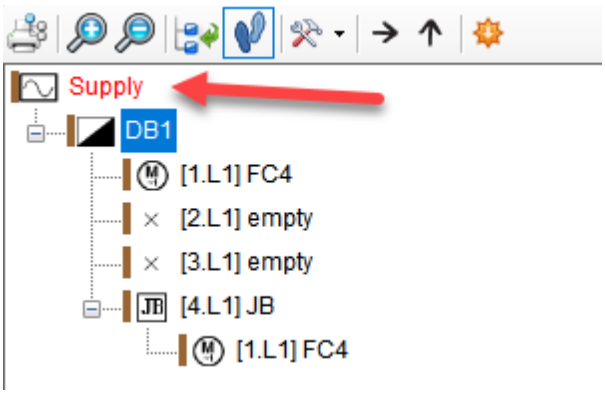
Calculations Menu

Calculations



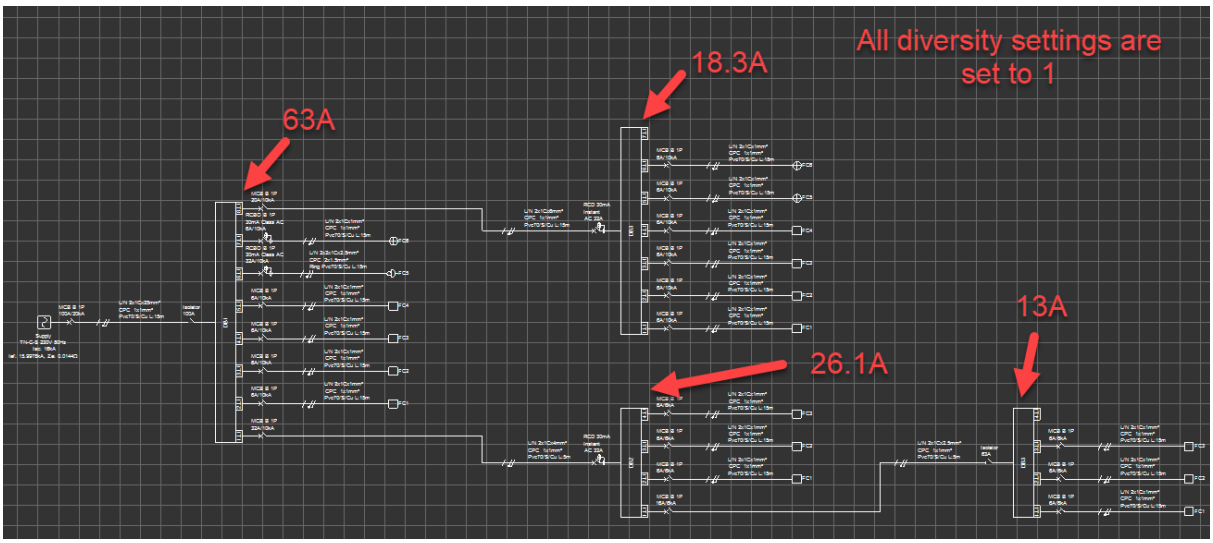
- Auto calculate circuits: If this option is disabled, ElectricalOM will not calculate various values even if changes have been made to the system and will flag a warning in the *Warnings Section*, and also, the supply will be highlighted with red.

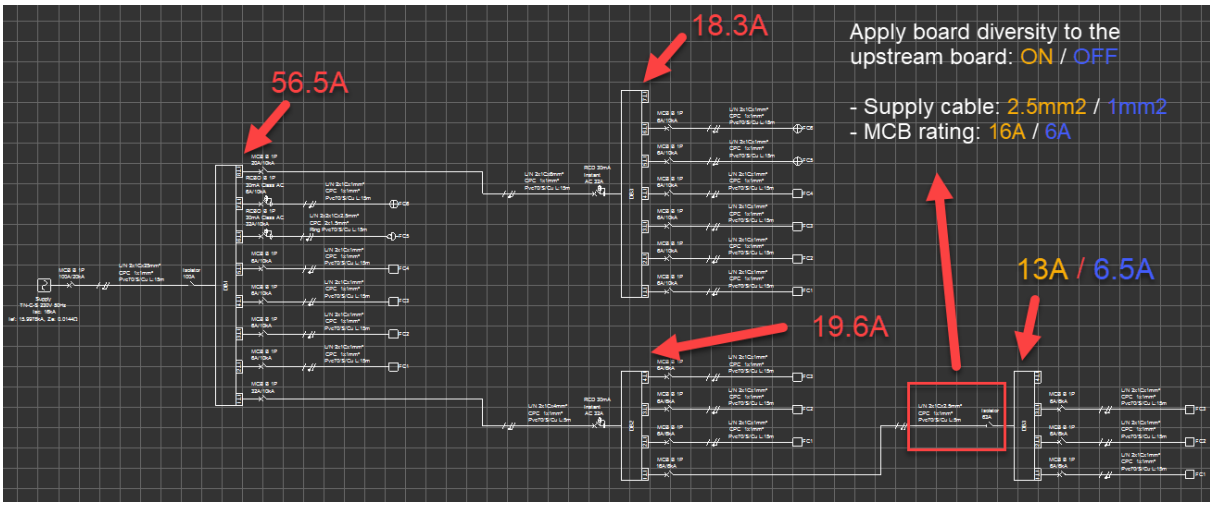




- Auto calculate selectivity: As name suggest, if this option is unticked, then EledctricalOM will not check selectivity.
- Enable protective devices fault current limiting: This option will enable the tick box for Fault current limiting feature. Refer to Protective Devices Tab.

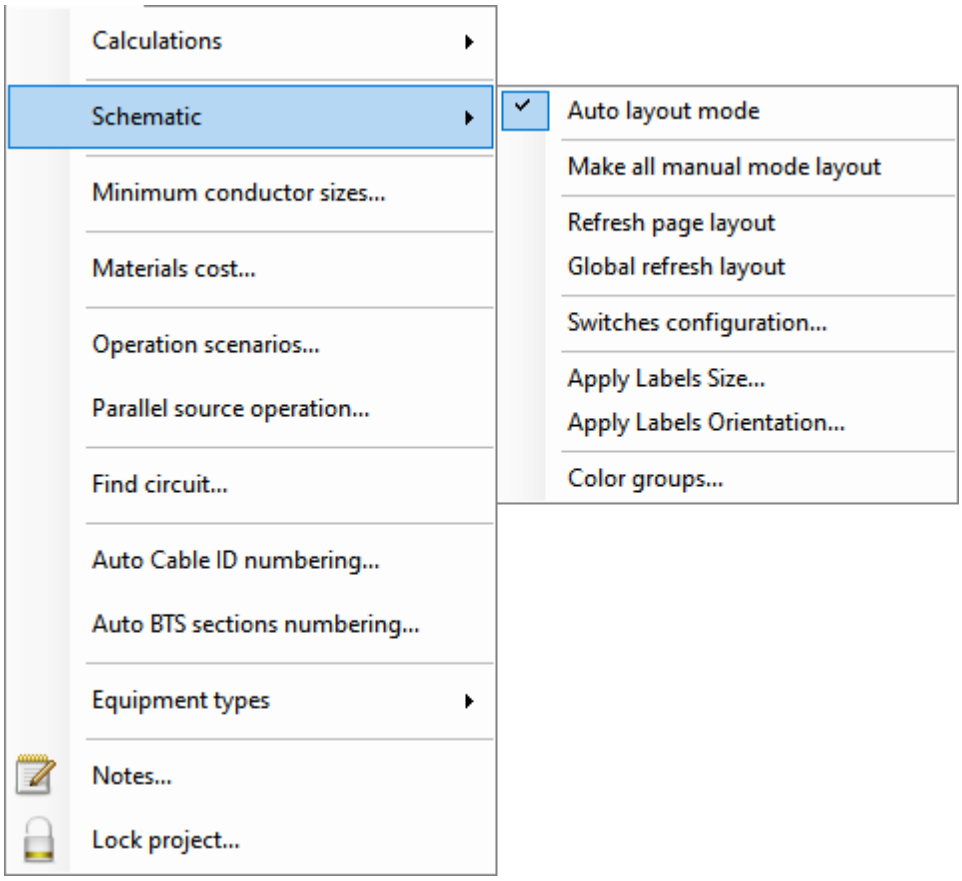
- Apply board diversity to the upstream board: If a diversity factor is applied to a distribution node, this affects both the board it is applied and upstream circuit. If this options is enabled, then, the diversity factor set for the selected distribution node will only be reflected to the upstream circuit and will not affect the selected distribution node. This is used when user wants to size the cable and protection device for the board without accounting the board's diversity value (this does not affect the diversity values of the final circuits connected to this board). The diversity setting of 0.5 is applied to the DB3 (rightmost distribution board with 13A load) and resulting values are shown below.



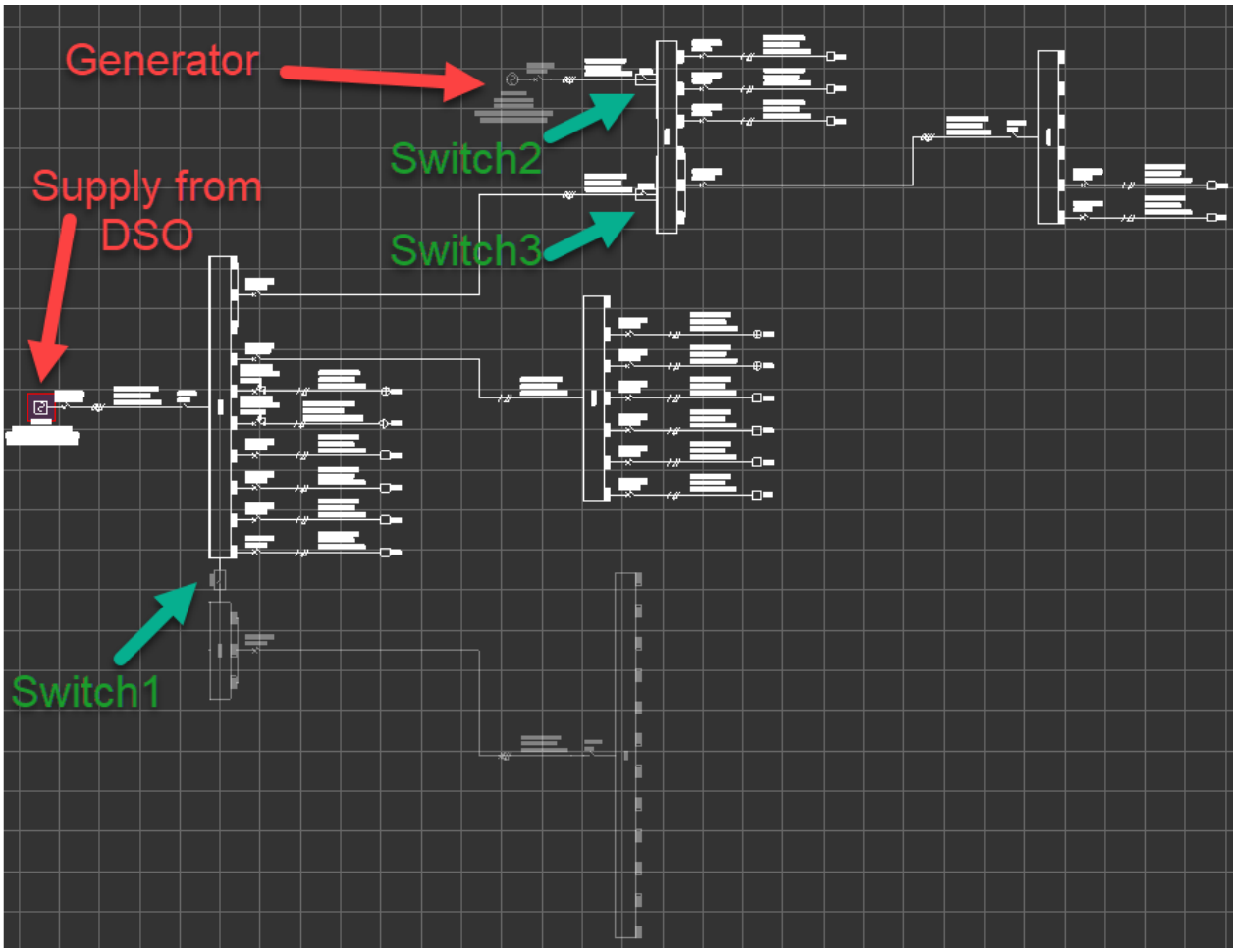


Schematic Menu

Schematic

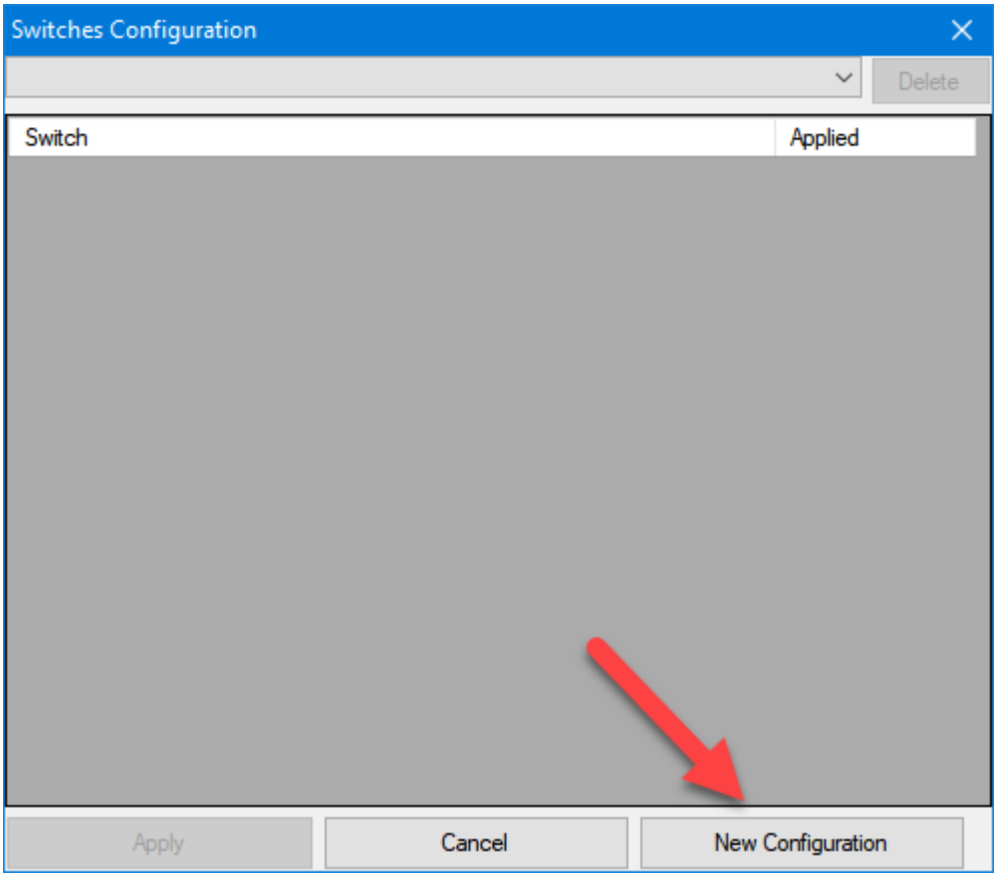


- Auto layout mode: This controls how the new components are inserted to the schematic. If this is disabled, ElectrcialOM will insert components as default arrangements and will not check and rearrange overlapping components.
- Make all manual mode layout: If this option is executed, then, ElectricalOM will insert new components similar to the case when *Auto layout mode* is disabled ignoring previous settings.
- Refresh page layout/Global refresh layout: If the locations of elements are modified by the user but it is needed to go back to default layout, this option will move elements to their original locations. This option is only effective on the current page. If a global refresh is needed, then, Global refresh layout can be used to apply refresh to all pages.
- Switches configuration: ElectricalOM lets the user to define multiple configuration scenarios if the system contains switches like it is demonstrated below. In order to save a configuration. user shall set it up the required scenario and then save it.

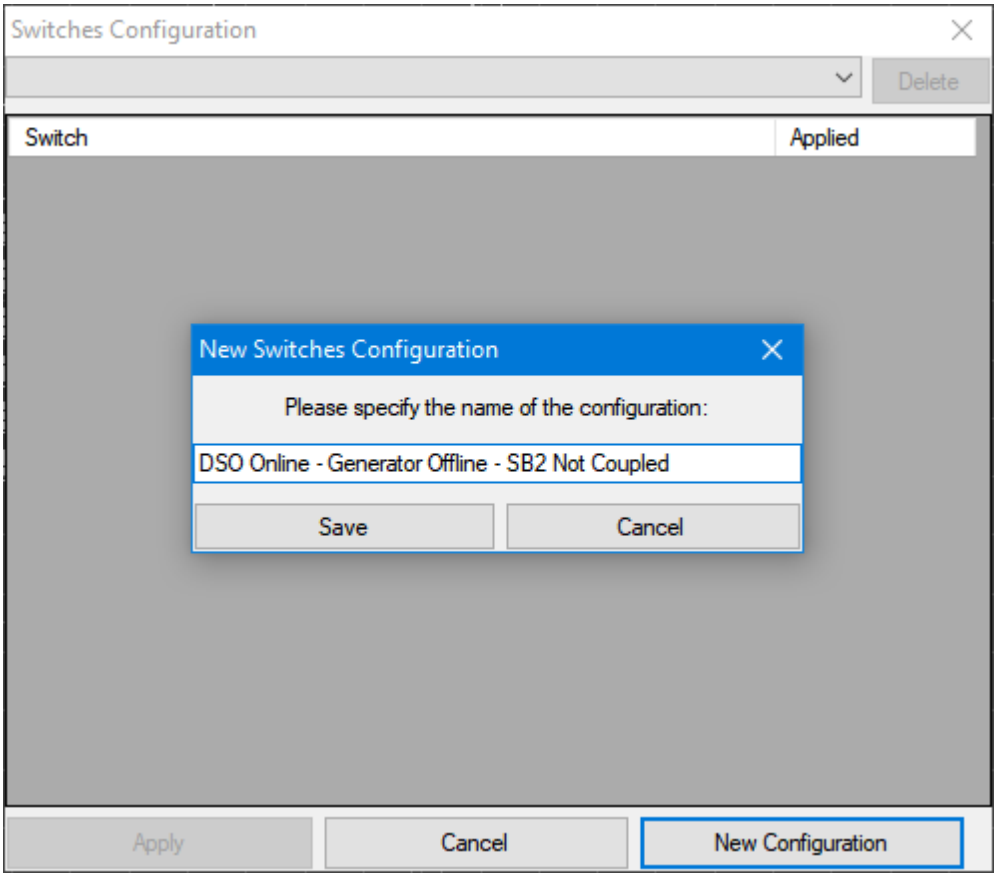


Above, the supply from DSO is connected to SB1-1. SB2-1 is a switch board with no supply but it is coupled to SB1-1. Then, there is a generator connected to SB1-2 as immediate power supply. First scenario has the DSO supply available but SB2-1 is not coupled, i.e. Switch1 is open. Also, the generator of offline, i.e. Switch2 is open and Switch3 is closed.

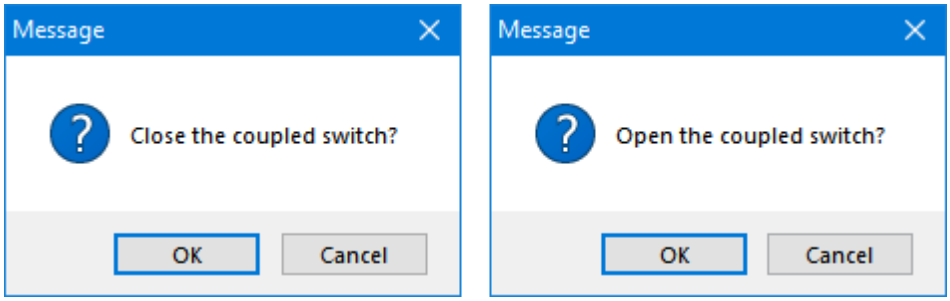
The user can use *Switches configuration...* window and select *New Configuration* to save this configuration.



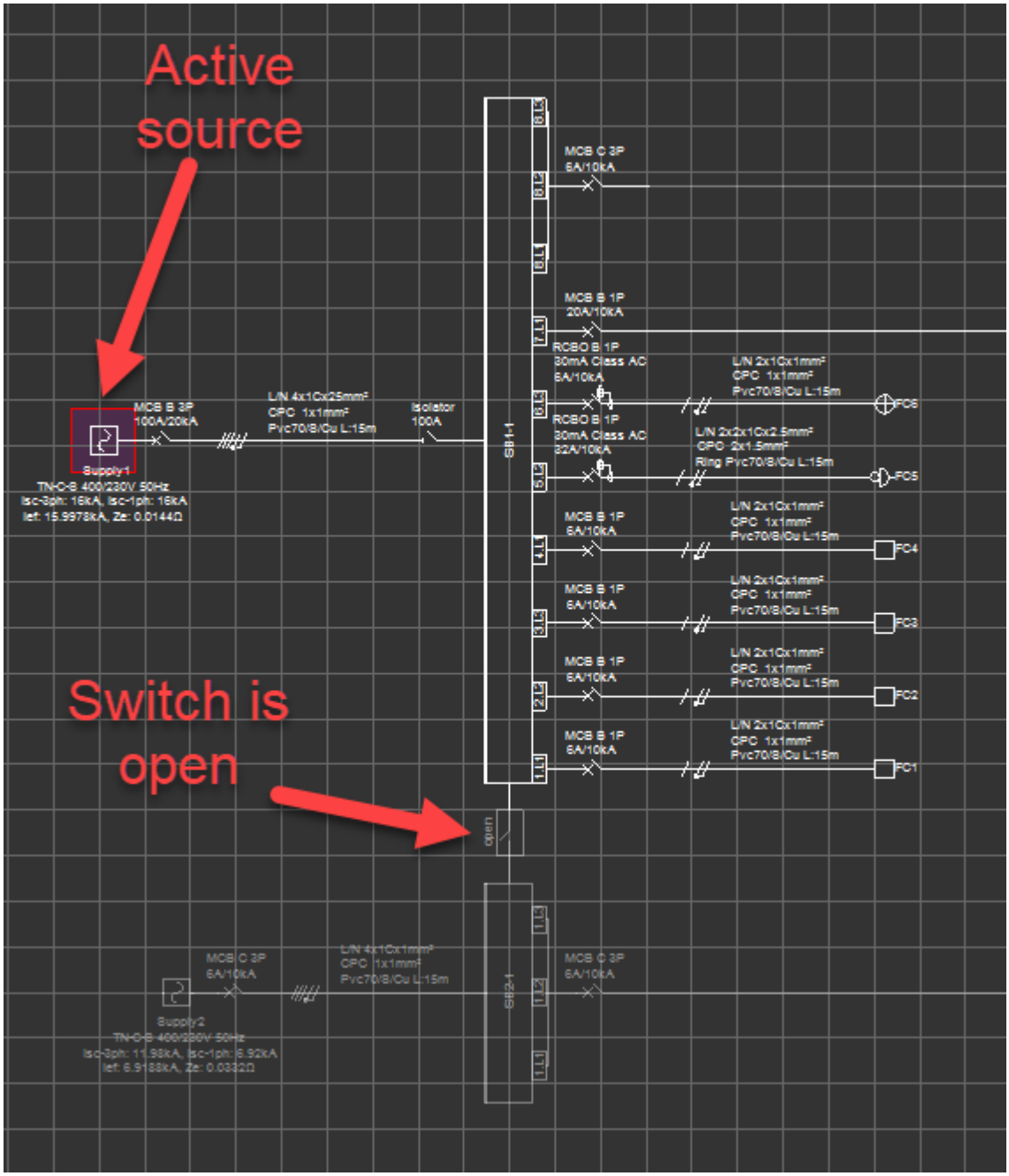
ElectricalOM will ask the user to define a name for the configuration to be saved.

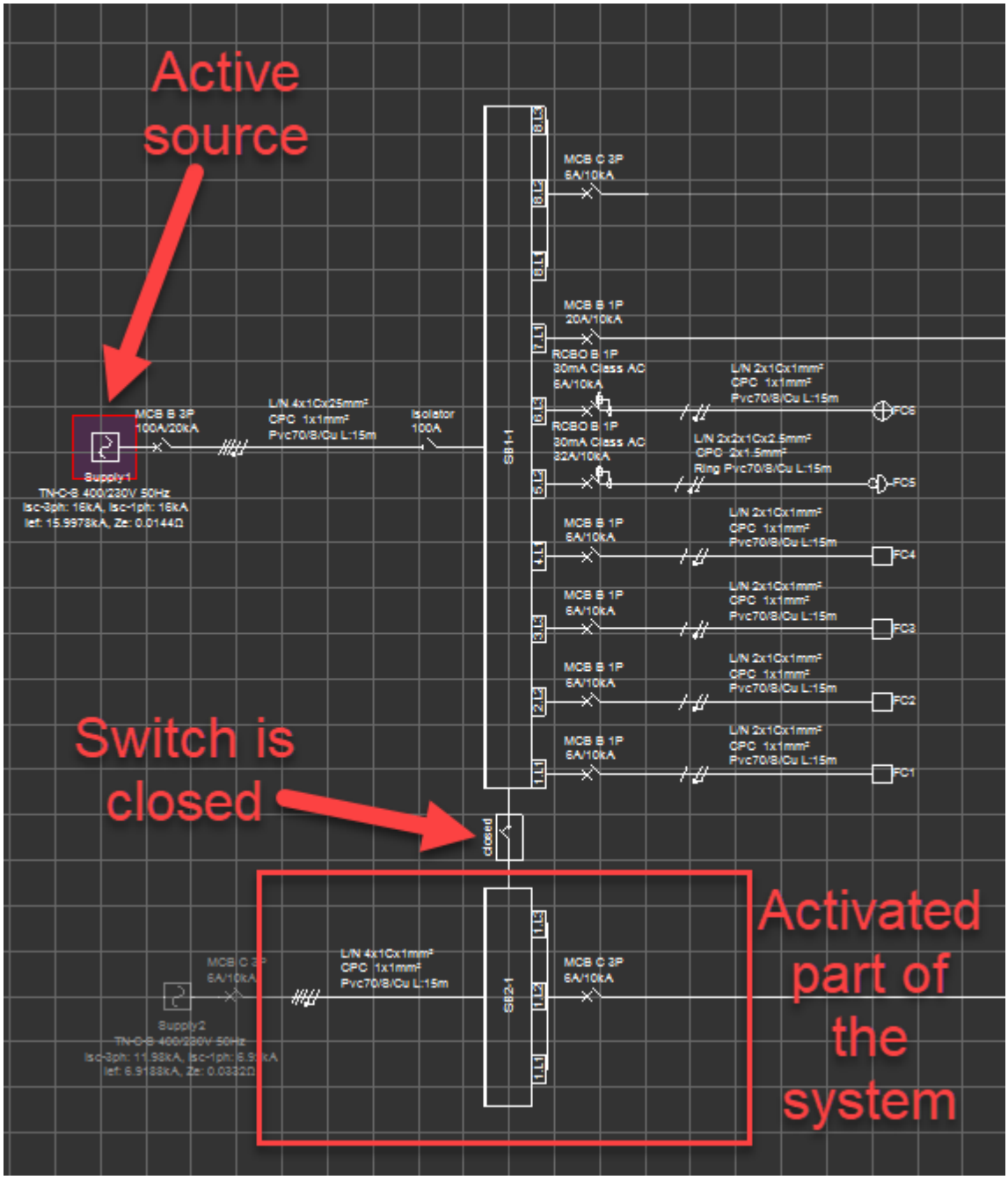


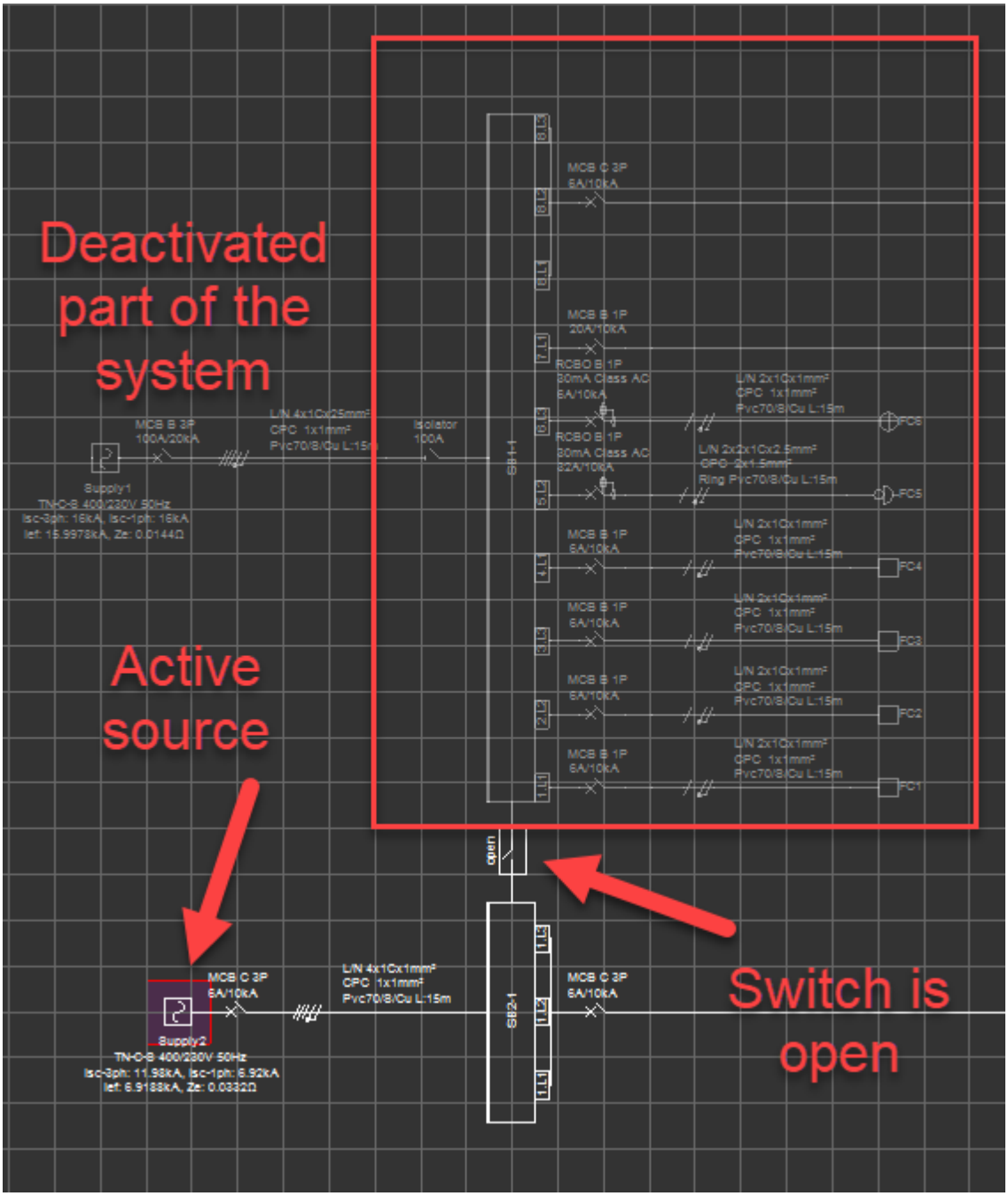
A new configuration can be set up by using the switches. A coupled switch (Switch1) can be opened or closed by double clicking on it.



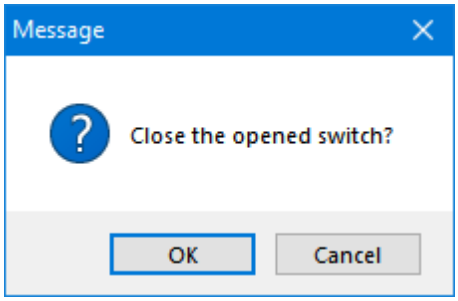
Depending on the active source, opening or closing the switch will determine the separated part and ElectrcialOM will inactivate this part of the system.


Active source
Switch is open
MCB B 3P 100A/20kA
L/N 4x1Cx25mm² CPC 1x1mm² Pvc70/B/Cu L:15m
Isolator 100A
Supply1
TN-C-S 400/230V 50Hz
Isc-3ph: 16kA, Isc-1ph: 16kA
Ief: 15.9978kA, Ze: 0.0144Ω
SB1-1
MCB C 3P 6A/10kA
MCB B 1P 20A/10kA
RCBO B 1P 30mA Class AC 6A/10kA
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/B/Cu L:15m
FC6
RCBO B 1P 30mA Class AC 32A/10kA
L/N 2x2x1Cx2.5mm² CPC 2x1.5mm² Ring Pvc70/B/Cu L:15m
FC5
MCB B 1P 6A/10kA
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/B/Cu L:15m
FC4
FC3
FC2
FC1
open
MCB C 3P 6A/10kA
L/N 4x1Cx1mm² CPC 1x1mm² Pvc70/B/Cu L:15m
Supply2
TN-C-S 400/230V 50Hz
Isc-3ph: 11.98kA, Isc-1ph: 6.92kA
Ief: 6.9188kA, Ze: 0.0332Ω
SB2-1

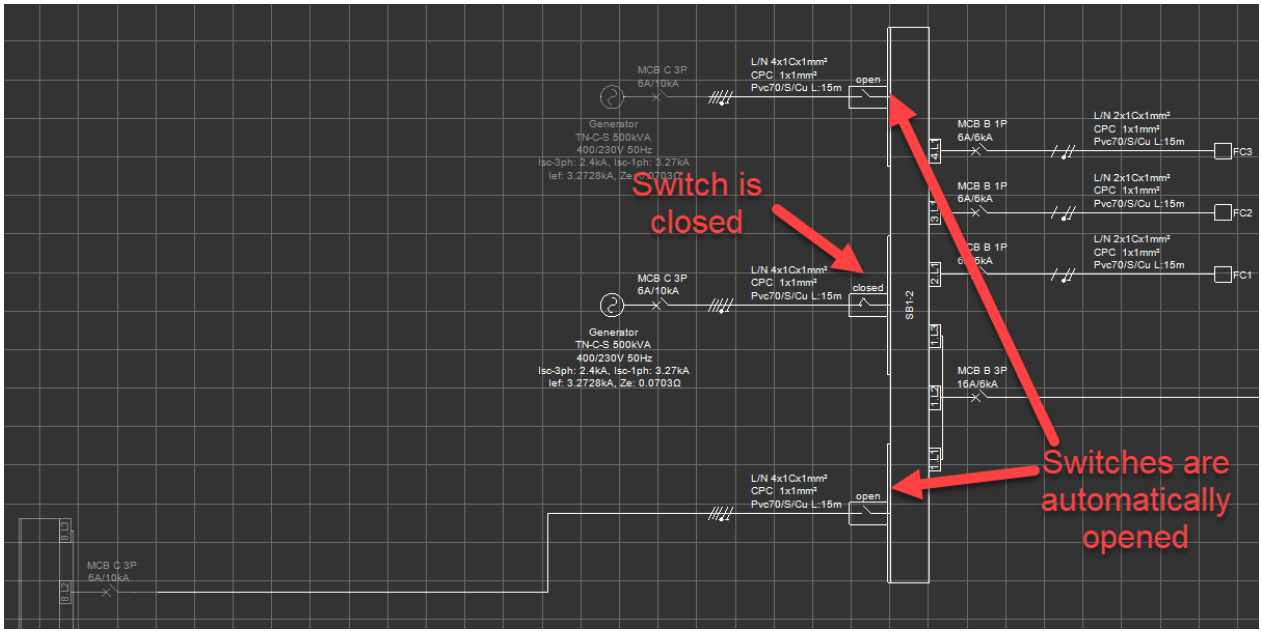

Active source
Switch is closed
Activated part of the system
MCB B 3P 100A/20kA
L/N 4x1Cx25mm² CPC 1x1mm² Pvc70/B/Cu L:15m
Isolator 100A
Supply1
TN-C-S 400/230V 50Hz
Isc-3ph: 16kA, Isc-1ph: 16kA
Ief: 15.9978kA, Ze: 0.0144Ω
SB1-1
MCB C 3P 6A/10kA
MCB B 1P 20A/10kA
RCBO B 1P 30mA Class AC 6A/10kA
RCBO B 1P 30mA Class AC 32A/10kA
L/N 2x1Cx1mm² CPC 1x1mm² Pvc70/B/Cu L:15m
L/N 2x2x1Cx2.5mm² CPC 2x1.5mm² Ring Pvc70/B/Cu L:15m
FC8
FC5
FC4
FC3
FC2
FC1
closed
MCB C 3P 6A/10kA
L/N 4x1Cx1mm² CPC 1x1mm² Pvc70/B/Cu L:15m
SB2-1
Supply2
TN-C-S 400/230V 50Hz



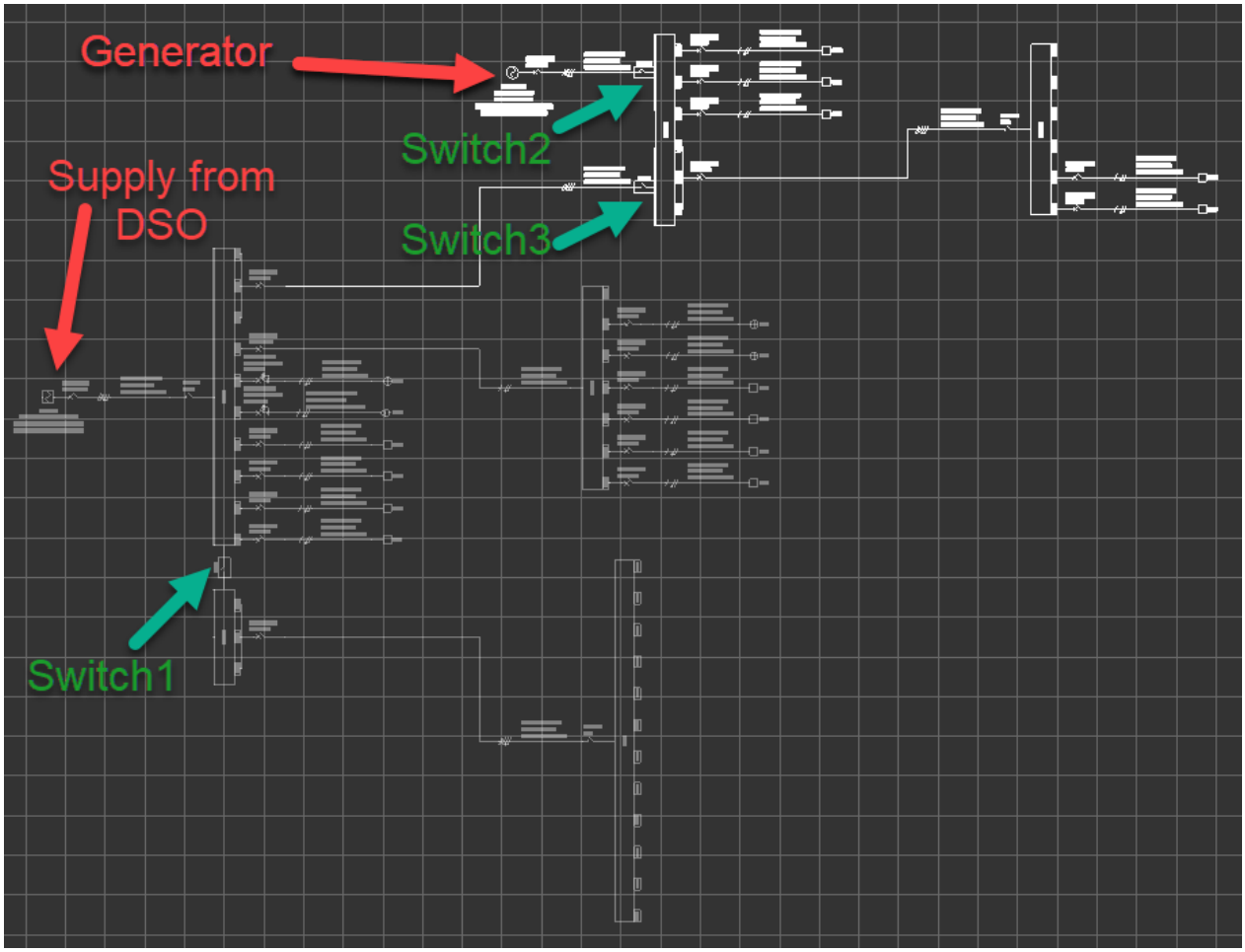
Other type of switches will be available only if this part of the system is active. Once related part is activated, double click will only be available for opened switches. If a closed switch is double clicked, Circuit edit module will be displayed for the board which the switch is connected.

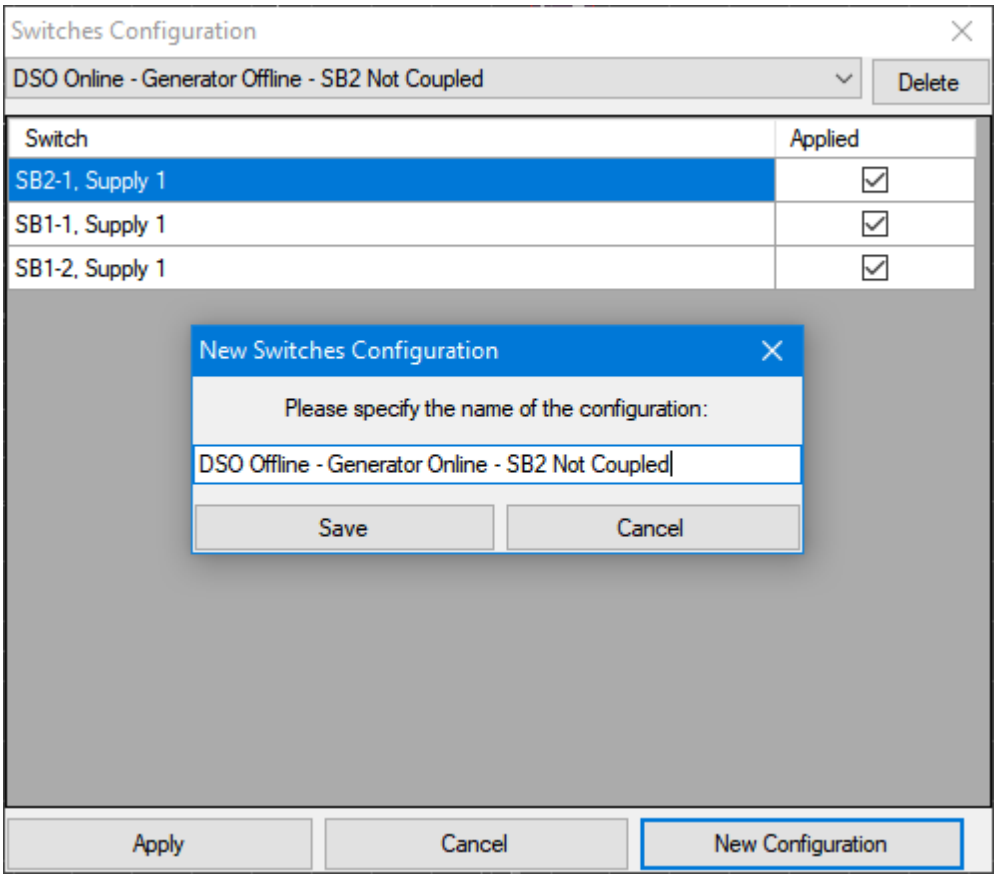


If the switch is controlling a supply to a board, and there are multiple supplies, closing a switch will open all other switches.

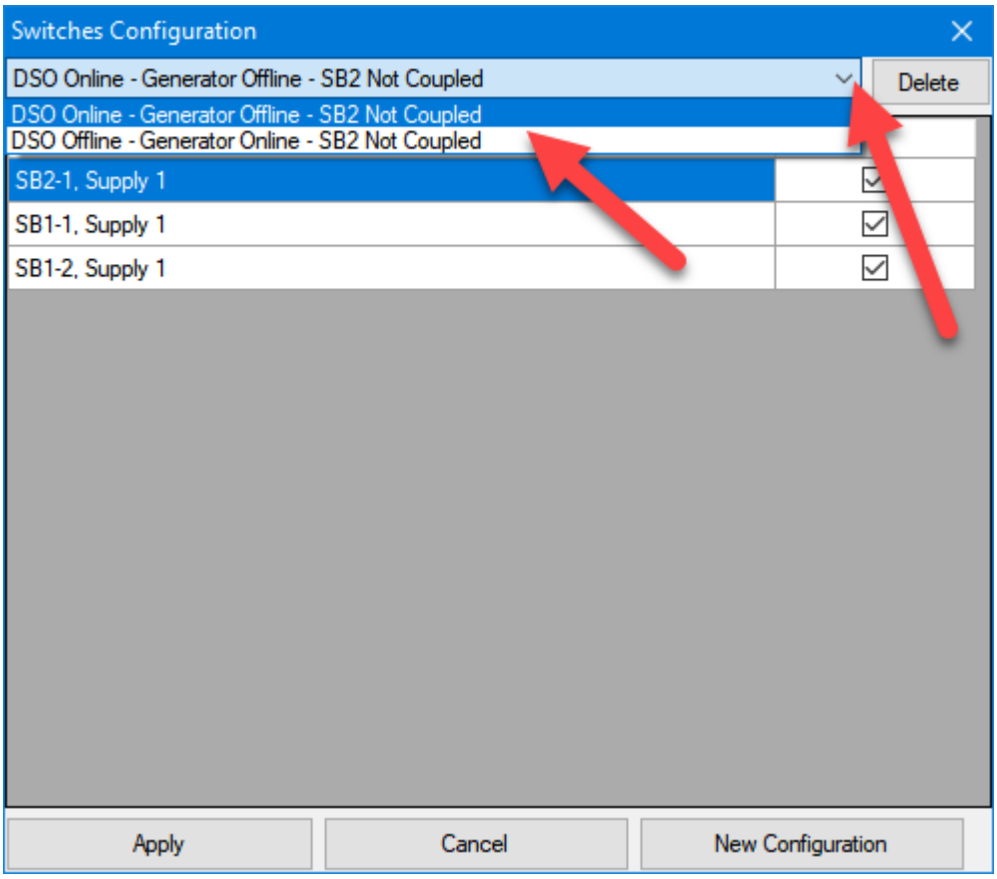


The same system as above is reconfigured as below using the switches and the new configuration is saves the same way as described above.

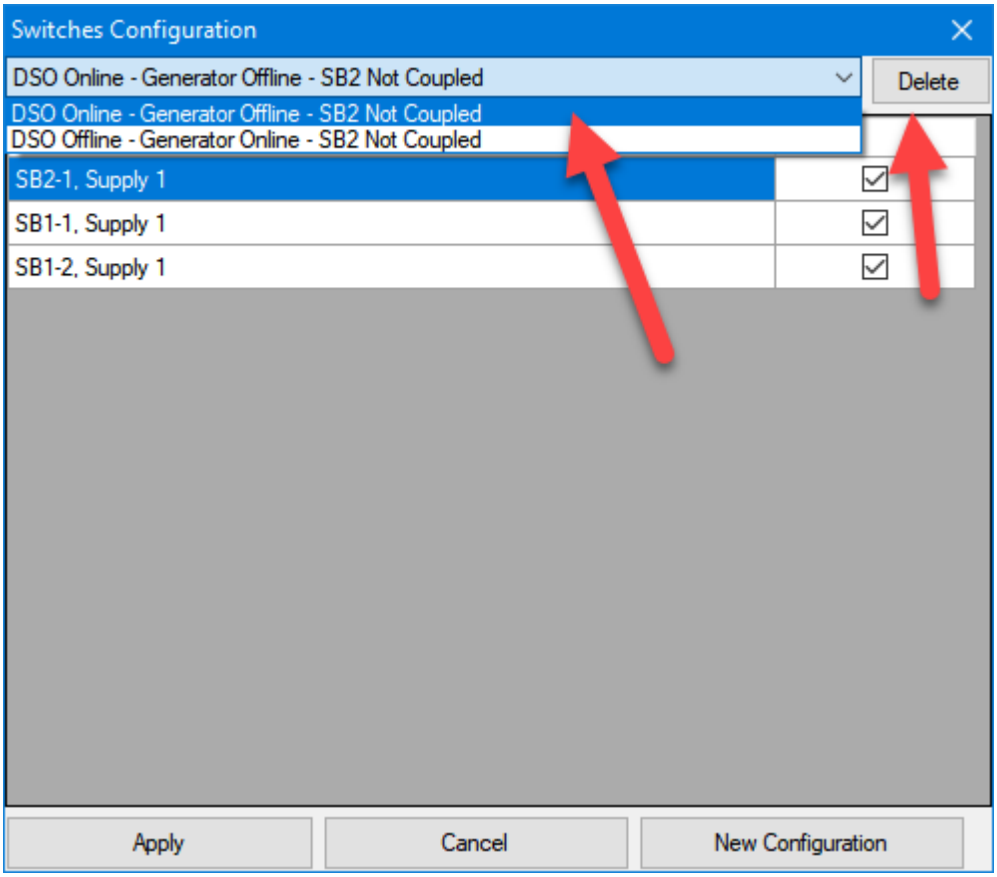

Generator
Switch2
Supply from DSO
Switch3
Switch1


Switches Configuration
DSO Online - Generator Offline - SB2 Not Coupled
Delete
Switch
Applied
SB2-1, Supply 1
SB1-1, Supply 1
SB1-2, Supply 1
New Switches Configuration
Please specify the name of the configuration:
DSO Offline - Generator Online - SB2 Not Coupled
Save
Cancel
Apply
Cancel
New Configuration

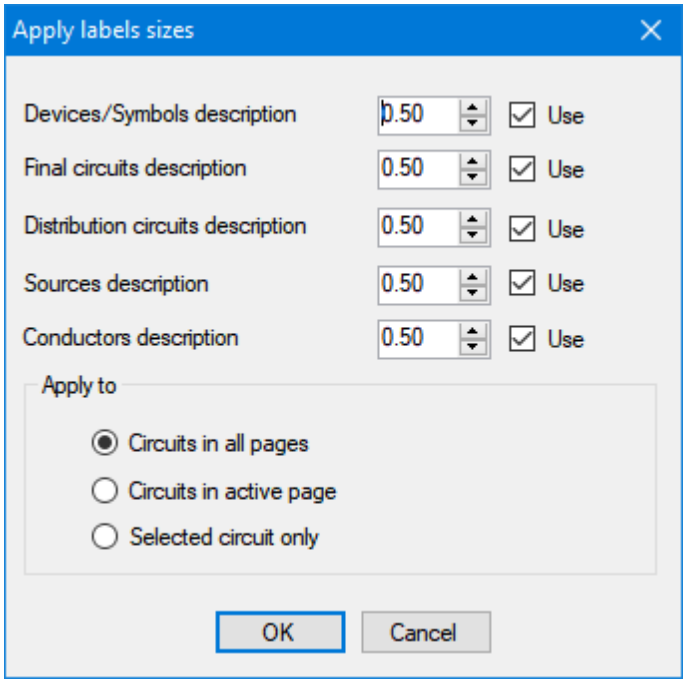
Switch configurations are saved as a drop down list by ElectricalOM and can be selected by click on the arrow next to the description area. Once the required switch configuration scenario is selected, clicking *Apply* will set the switches as saved.



If the user wants to delete a specific configuration, then the configuration wanted to be deleted shall be selected prior to clicking on *Delete* button. Deleting a configuration cannot be undone.

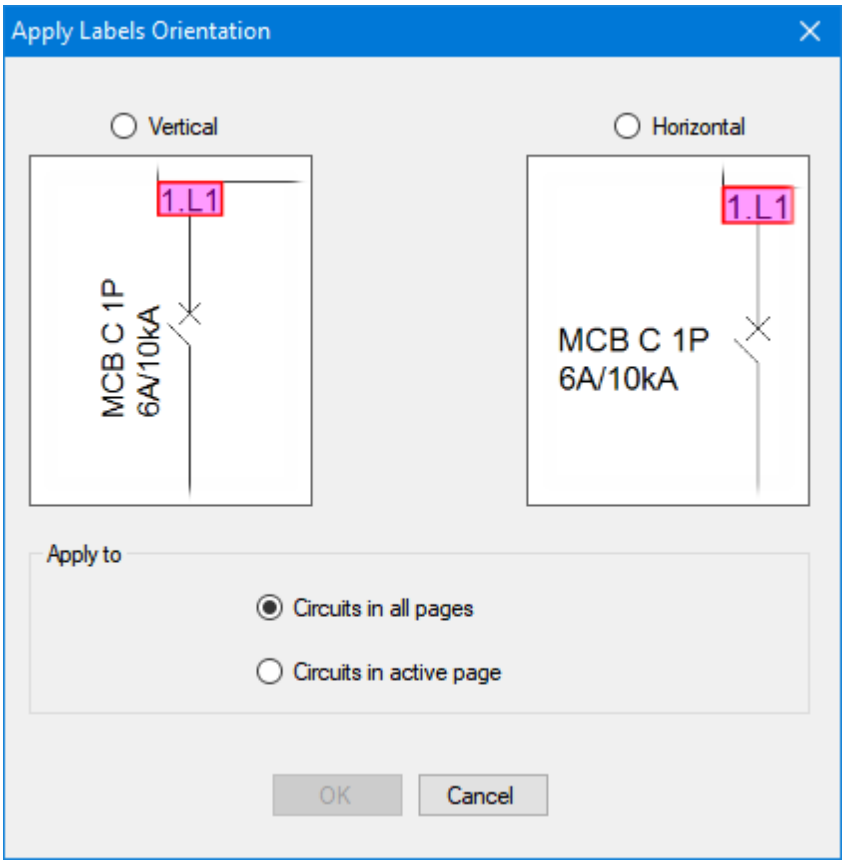


- Apply labels sizes:This option is used to change the font size of the labels. Changes can be applied to objects on the current page, or object on all pages, or selected circuit only.



- Apply labels orientation: This option will help the user to modify the orientation of the labels. Changes can be applied to the current page or all pages. This is similar to *Reverse label*

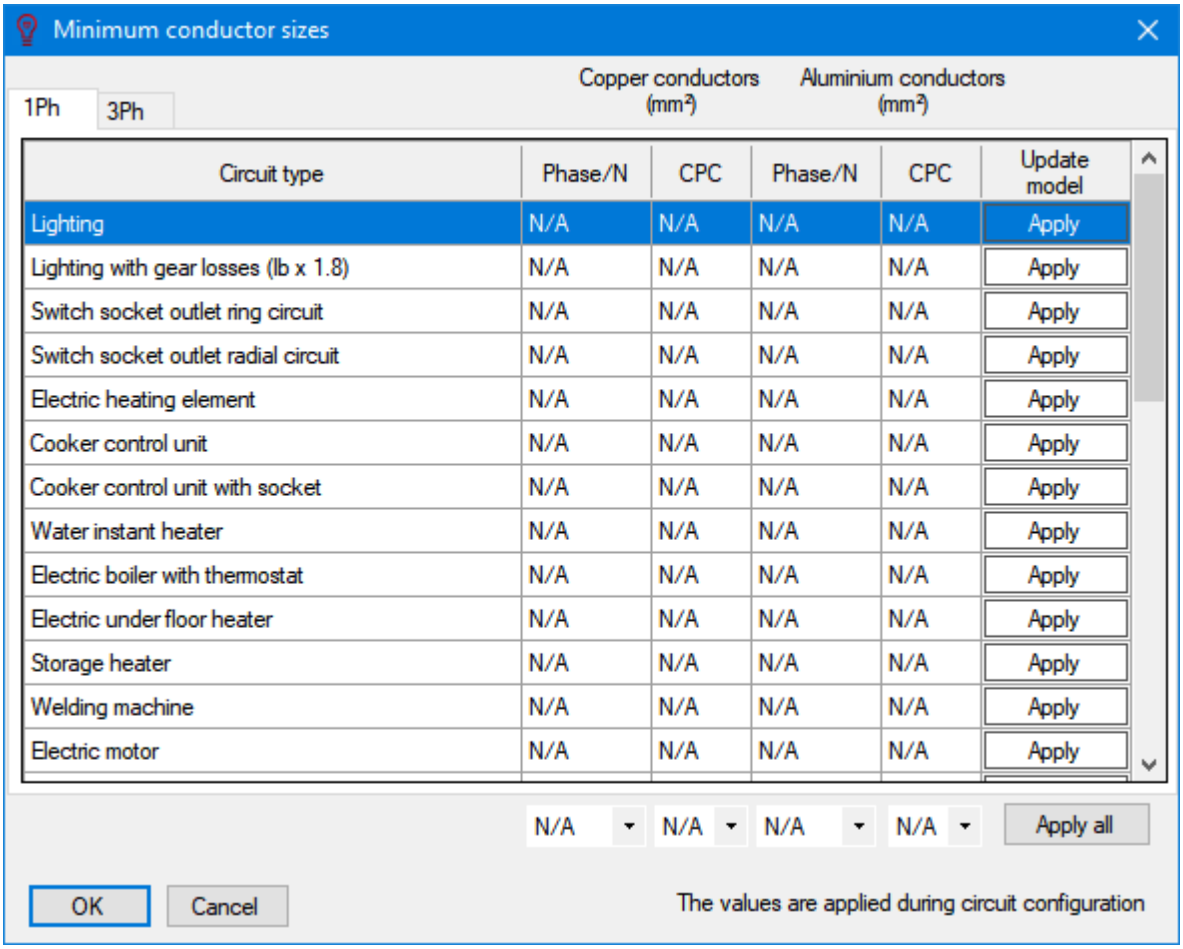
orientation option but for multiple objects, refer to Schematic Functions.



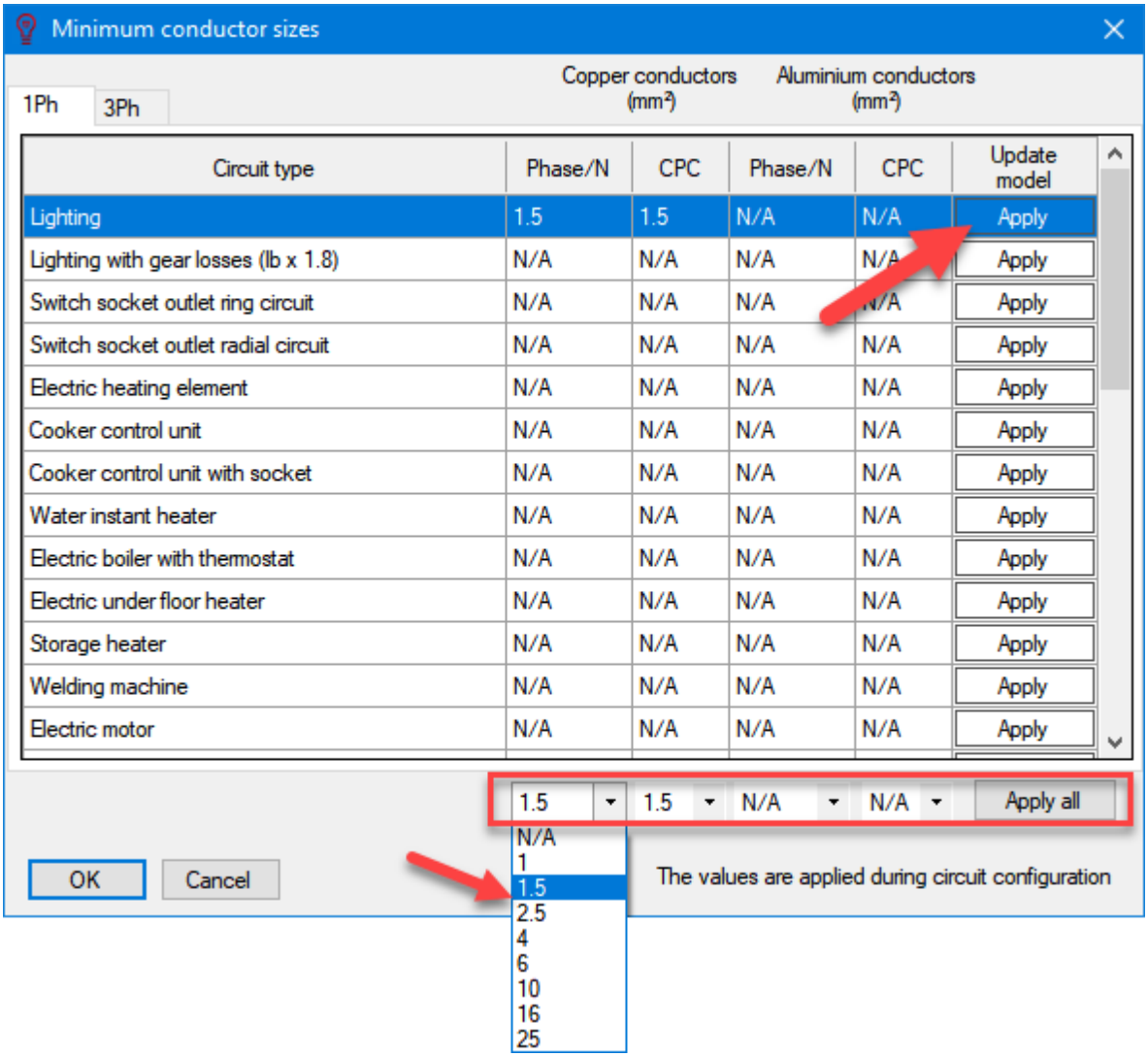
Minimum conductor sizes...

Minimum conductor sizes...

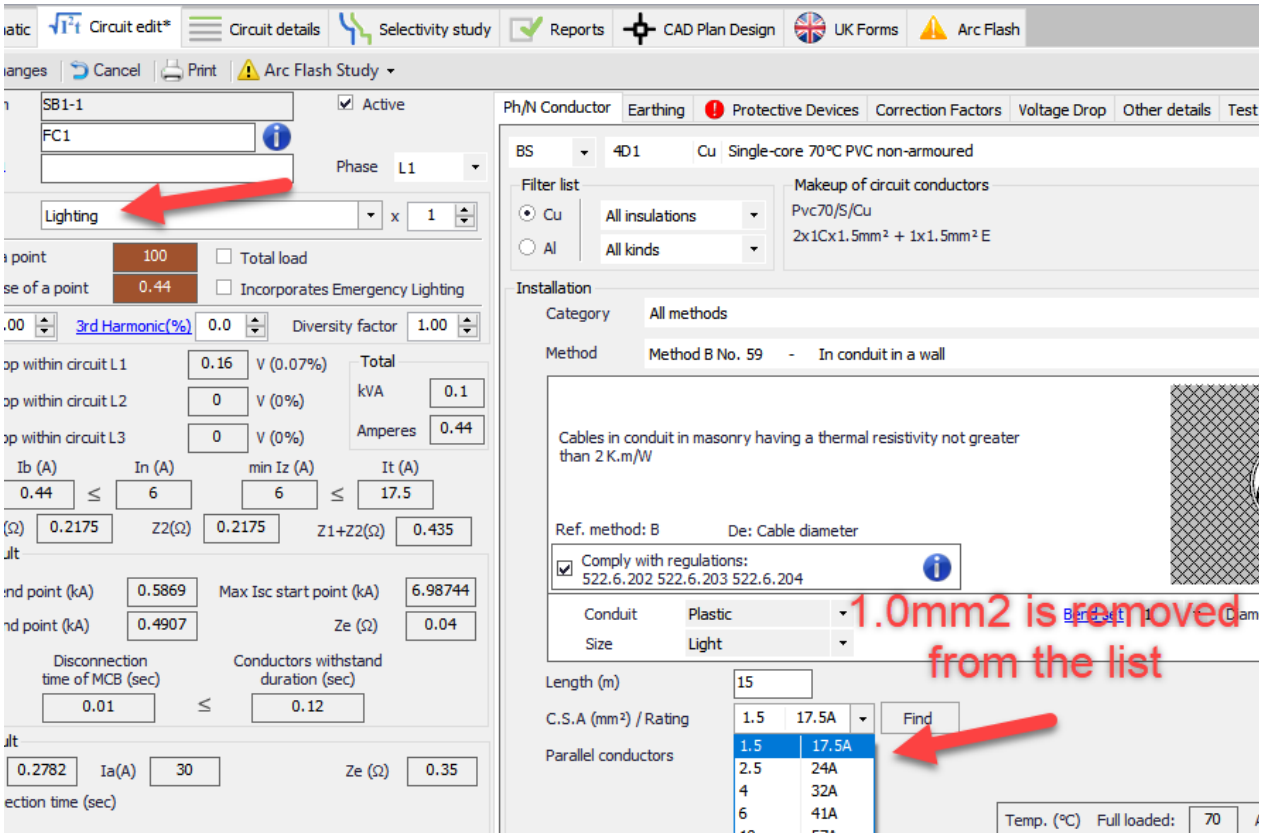
ElectrcialOM lets the users to set minimum conductor sizes for each type of circuits both single phase and three phase, see Final Circuits - 3Ph & 1Ph section for final circuit types. As default, there are no minimum size is set and all the data will be shown as N/A when *Minimum conductor sizes...* table is displayed.



User can select different minimum conductor sizes (in mm²) for Phase&Neutral (Phase/N) and circuit protection conductor (CPC) individually, and also, different minimum conductor sizes can be set for copper and aluminium conductors for the same final circuit. Each column has a drop down menu at the bottom where standard conductor sizes are listed according to the material (copper or aluminium). Once the required values are set using the drop down menus, then *Apply* must be clicked to apply the new settings. If multiple rows will be manipulated, the user can chose to set all the values and click on *Apply all* to apply all the settings instead if applying each row separately.



If a value is set for a circuit, then, values less than the set value will not be displayed in the *C.S.A (mm²) / Rating* menu under Circuit edit module.



Once *Apply* or *Apply all* button clicked ElecterialOM will update the conductor sizes to the minimum conductor size set by the user regardless of connected load or protection device rating. So, if there are issues with regards to the connected load, the protection device rating, and minimum conductor size, then, ElectricalOM will display warnings indicating the related circuits.

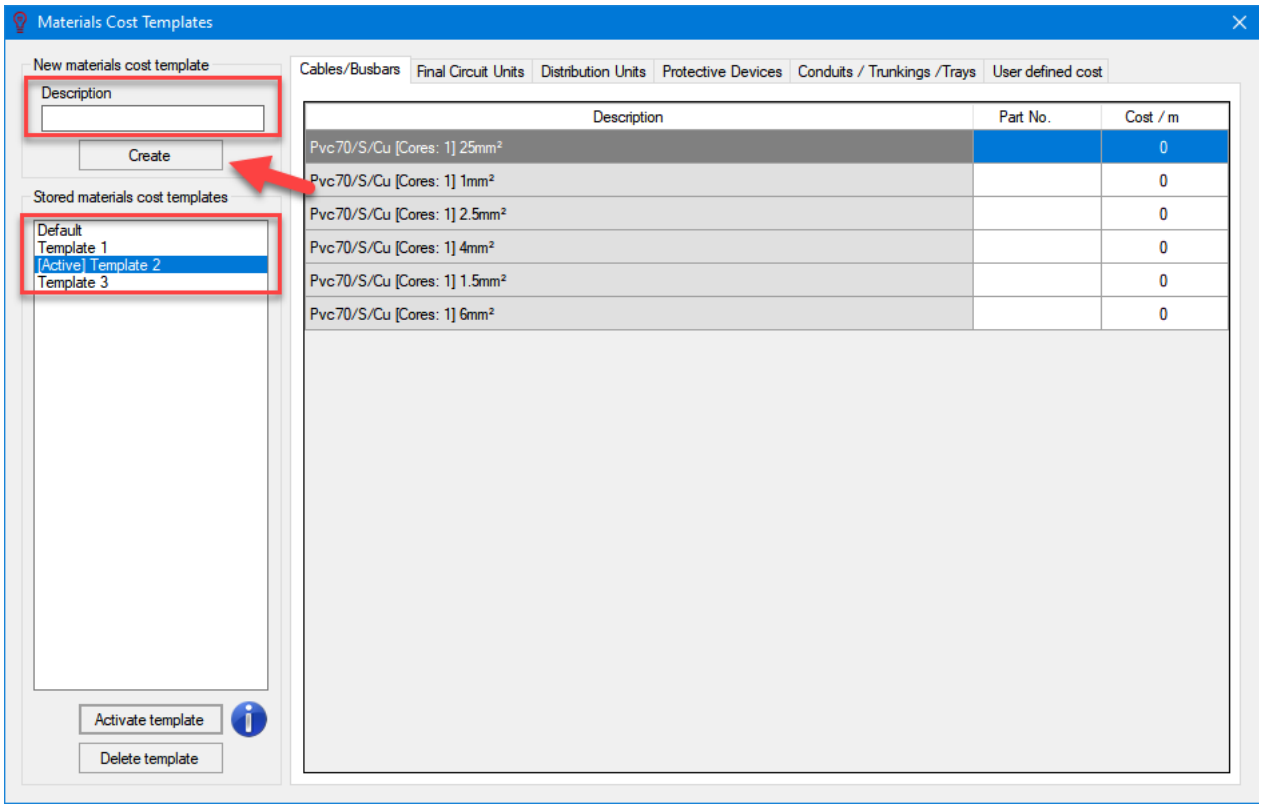
Material cost...

Materials cost...

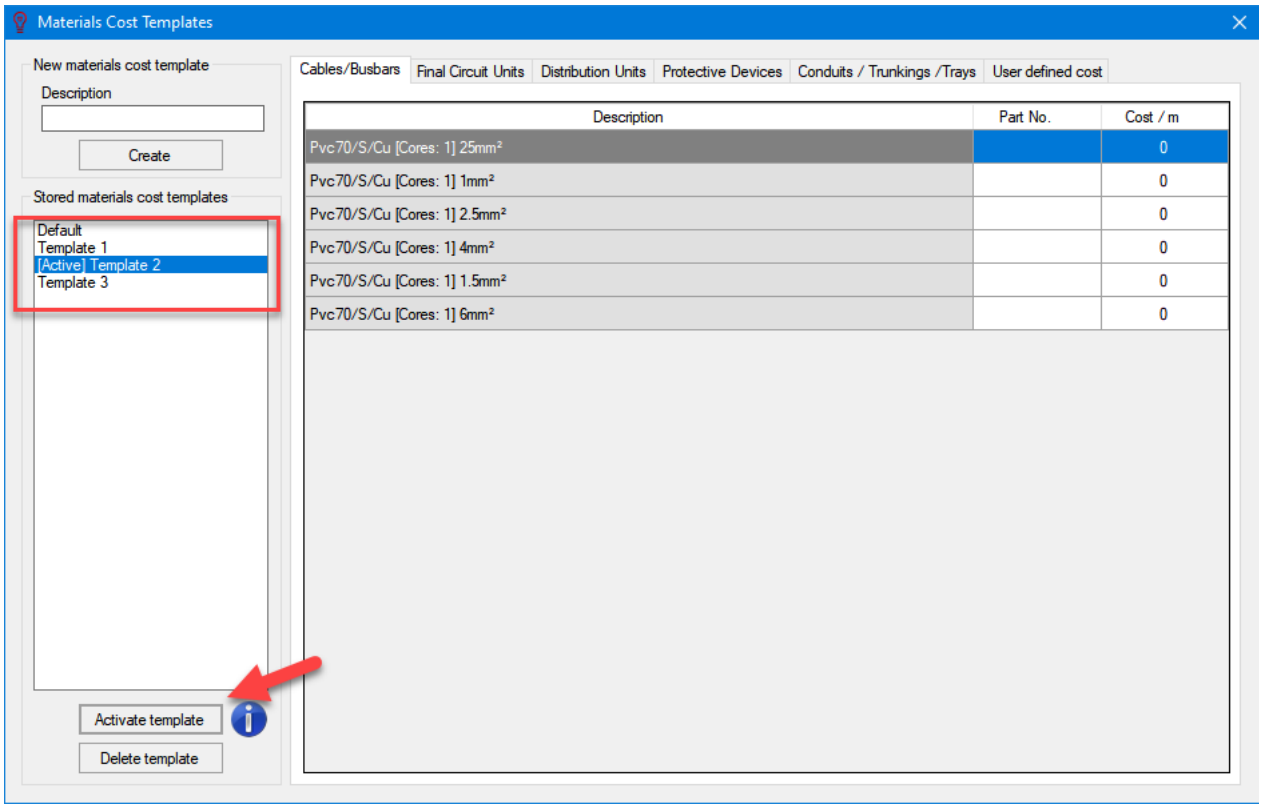
User can create multiple database for material prices used within a project. These templates will be available for every project, and can be recalled and used to create Bill of Quantities, see Reports Module Tab.

When *Materials Costs Templates* menu opened, a window similar to a spreadsheet will be displayed. This spreadsheet will list all the equipment used within the active project under separate tabs according to the type of the equipment. User may fill *Part No.* and *Cost* columns for each item. Any changes will be saved without any further warnings hence there is no *Save* button.

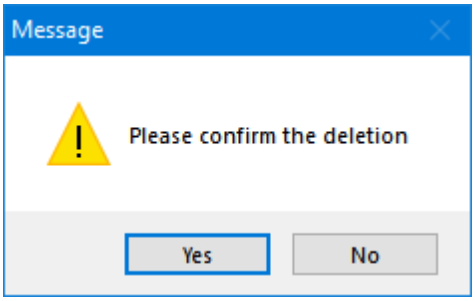
Once the user enters data for required fields, the template can be saved by typing a name in *Description* box and clicking *Create* button. Newly created template will be listed under *Stored materials cost templates*.



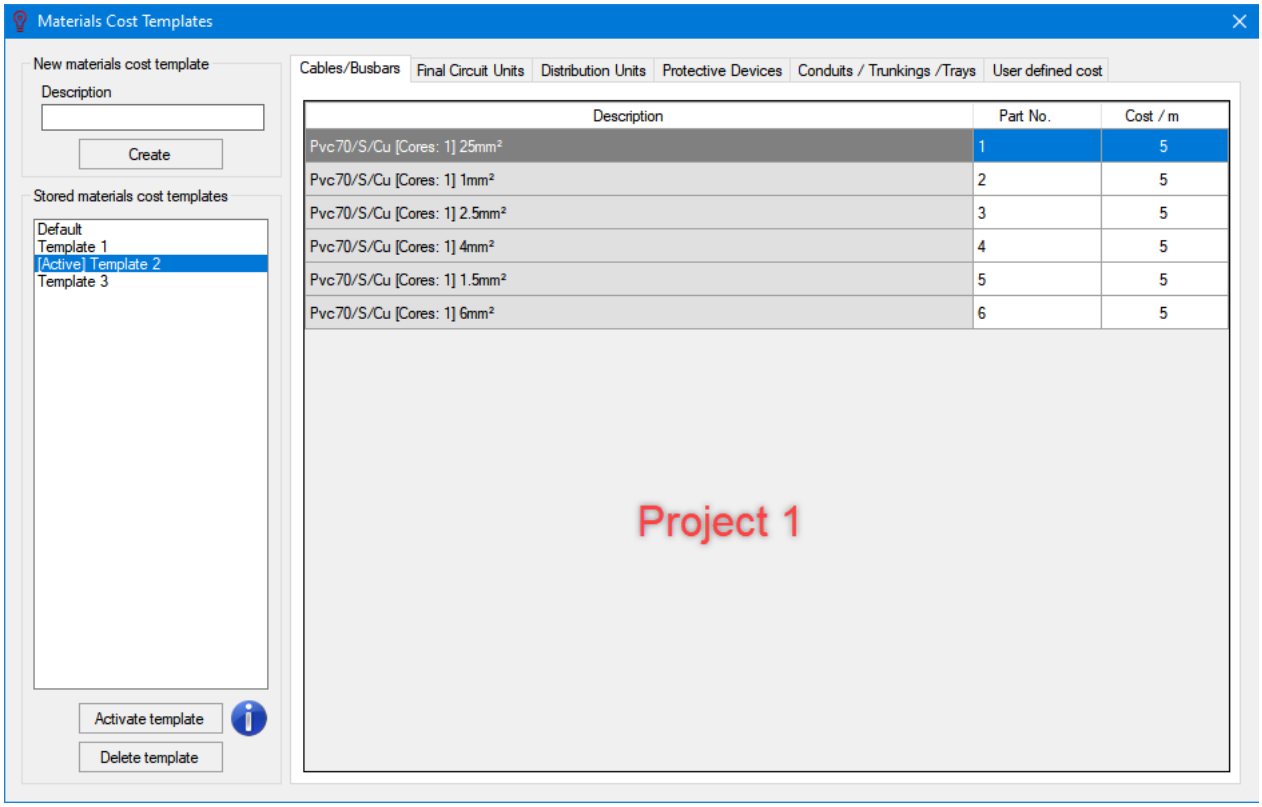
Active template will be used to create BOQ report, so, the template which is desired to be used has to be activated before creating BOQ. To do this, user must select the template required from the list and click on *Activate template* button. The activated template will be indicated by the *[Active]* prefix. Generally a single template is used to continuously expand the database to cover more items but in some cases user might need multiple templates to accommodate price variations between different brands, different suppliers and/or the user may require to create a BOQ for different currencies.

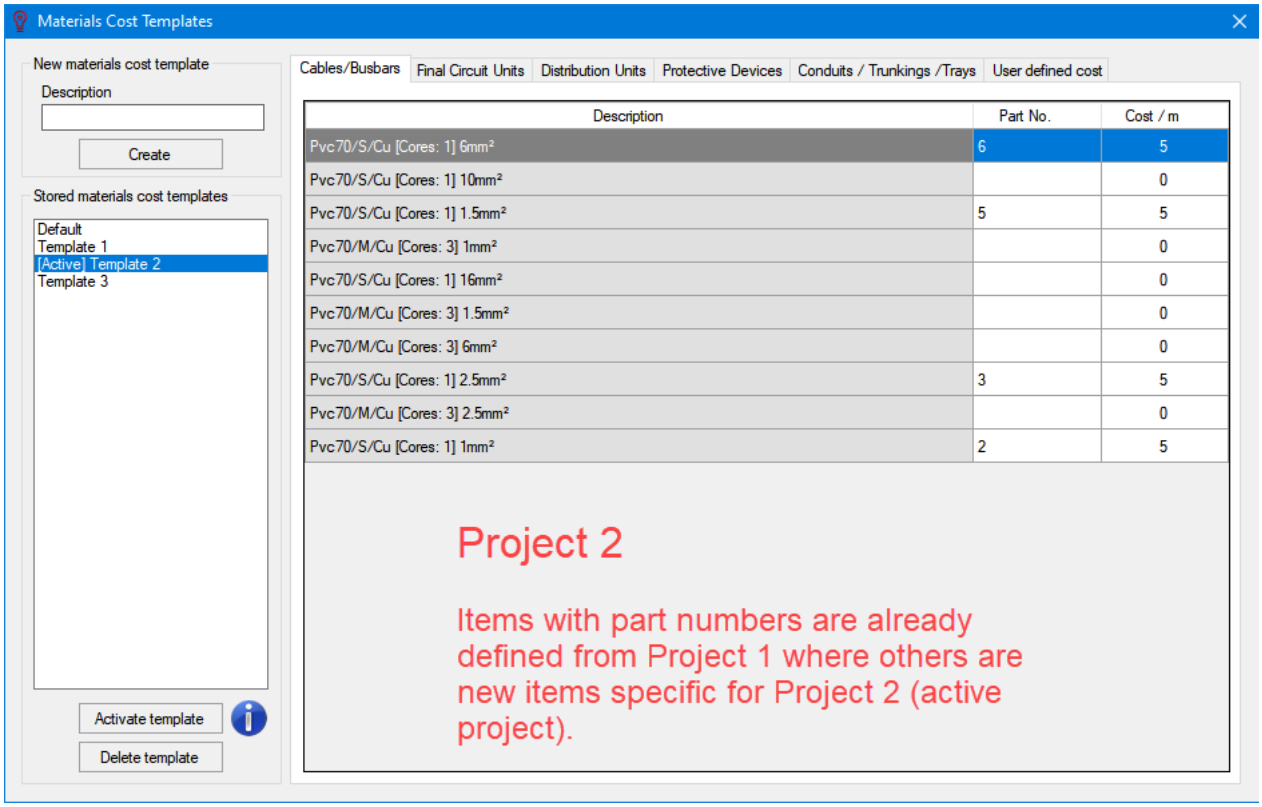


To delete a template, user needs to select a template and click on *Delete template* button. ElectrcialOM will display a warning window for user to approve deletion. Deleting a template is not a reversible action.



If a template does not contain all the items which is used, or it has extra items which are not used on the active project, then, the list will be automatically updated to suit the active project. Updated templates does not cause any change in the database, i.e. an item exists in the database but not shown on the active project as it is not used does not mean this item is deleted, It is simply hidden because it is not required. As the user defines new items the database will expand which may cover all the items usually used within a certain type of projects in time.



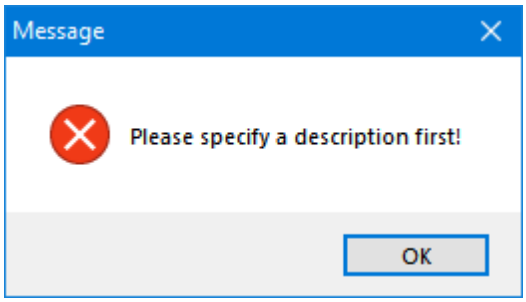


Operation scenarios...

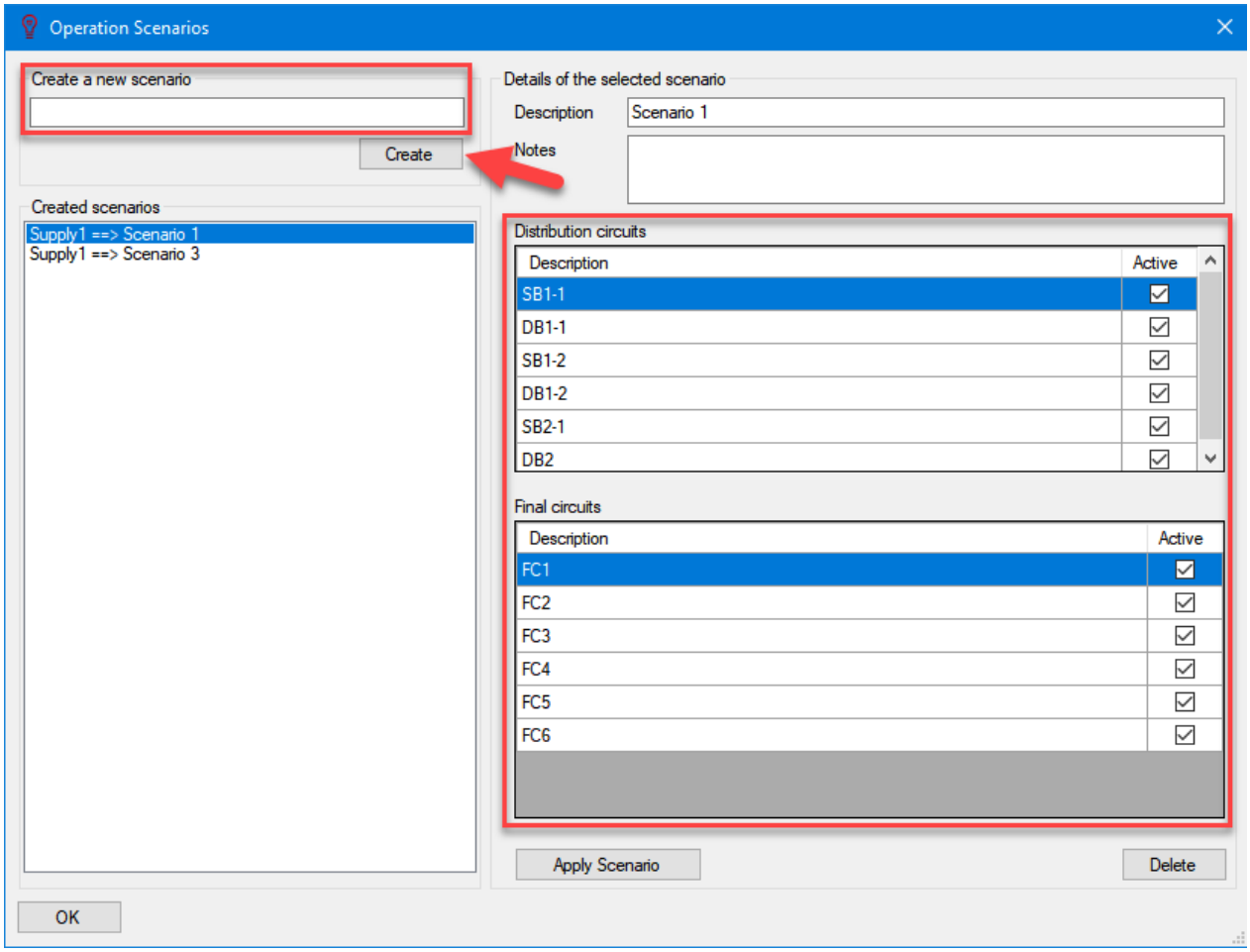
Operation scenarios...

ElectrcialOM provides this option to provide the user to set up different configurations to be saved and activated quickly. First, a description needed to be typed in *Create new scenario* text box and then *Create* button can be clicked. If Create button is clicked without entering a name ElectrcialOM will display a

warning window to instruct the user o type in a name for the scenario.

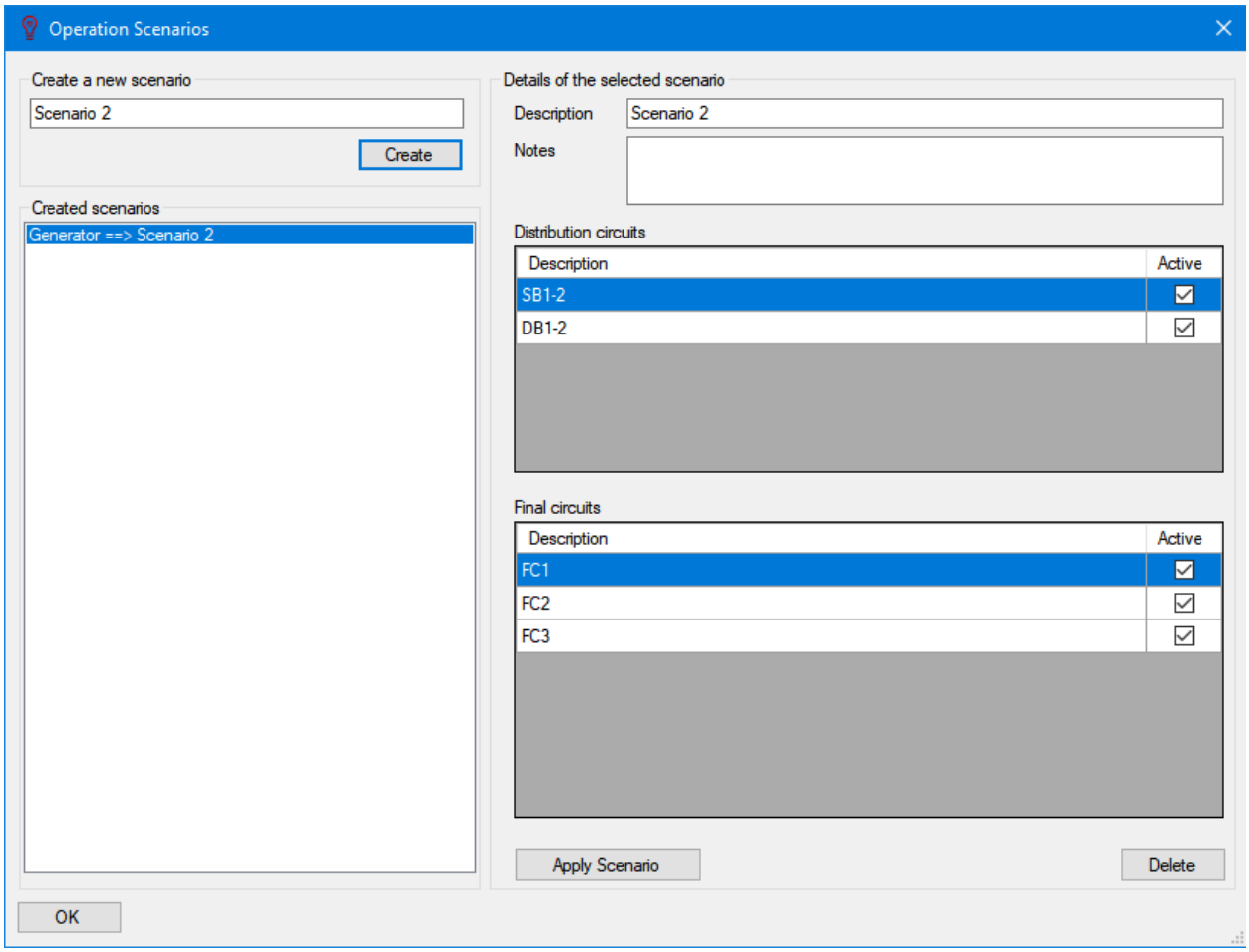


Once the *Create* button is clicked, the ElectrcialOM will list all the distribution circuits, and final circuits under the selected distribution circuit in related list boxes with a tick box next to them. After creating a scenario, then, the user can select the circuits required to be active and offline according to the scenario by using the tick boxes. A scenario can be applied by selecting the required scenario from the *Created Scenarios* list and clicking the *Apply Scenario* button which will set the circuits as active or offline according to the scenario settings.

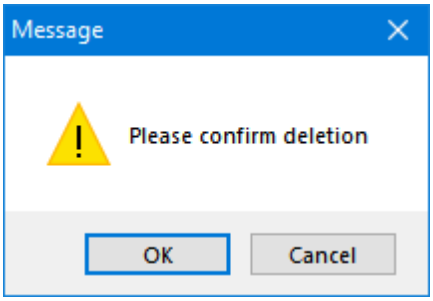


It shall be noted that scenarios will consider the active source as the only source which means if there are multiple sources within the system, then ElectricalOM will take the active source into account only and will

not see the other sources. Above picture shows a system fed from Supply1, so, all the scenarios (Scenario 1 and Scenario 3) will be created using this source and saved with it. If the active source is changed, to Generator in this case, Scenario 1 and Scenario 3 will not appear under *Created scenarios* list, but Scenario 2 will appear as it is a scenario saved with active source Generator.



To delete a scenario, Delete button can be used following the selection of the desired scenario. This action cannot be reverted.



Parallel source operation...

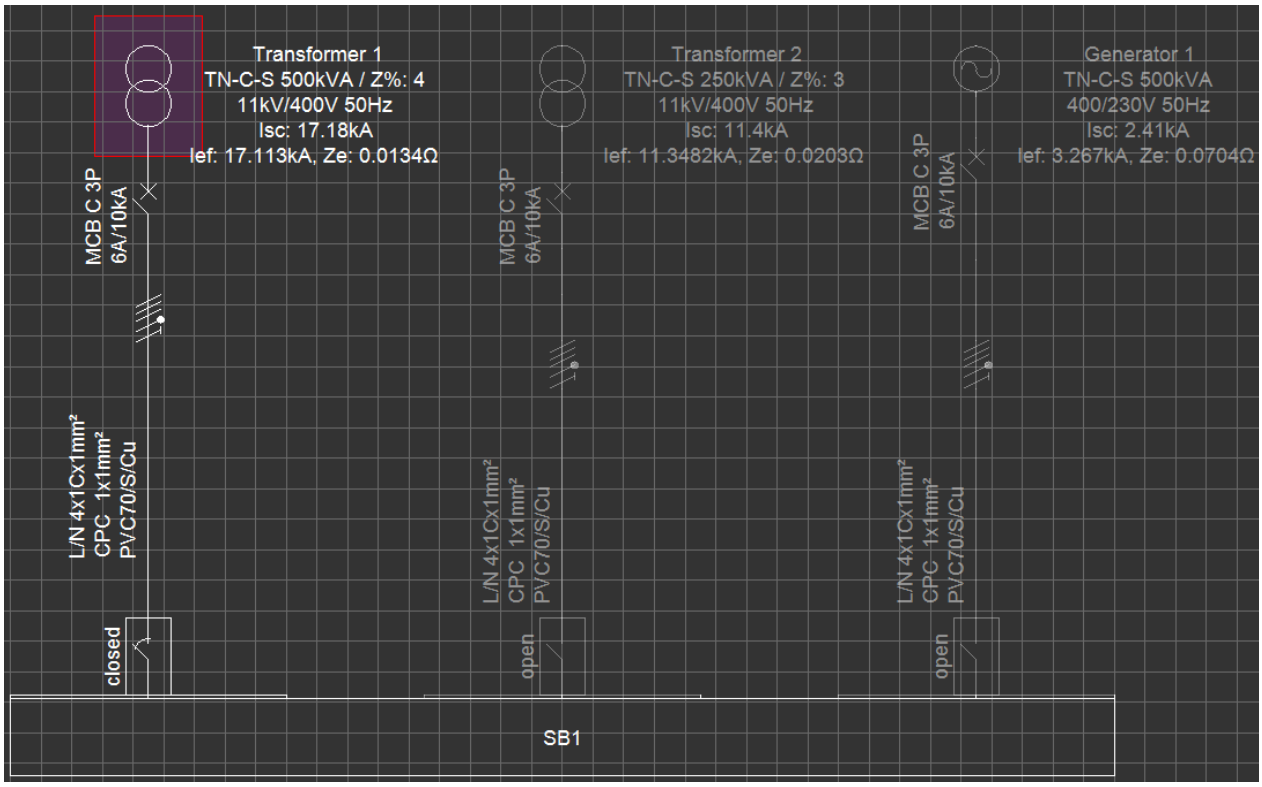
Parallel source operation...

ElectricalOM lets:

- *Multiple sources to be modelled as parallel if they are connected to certain components:*

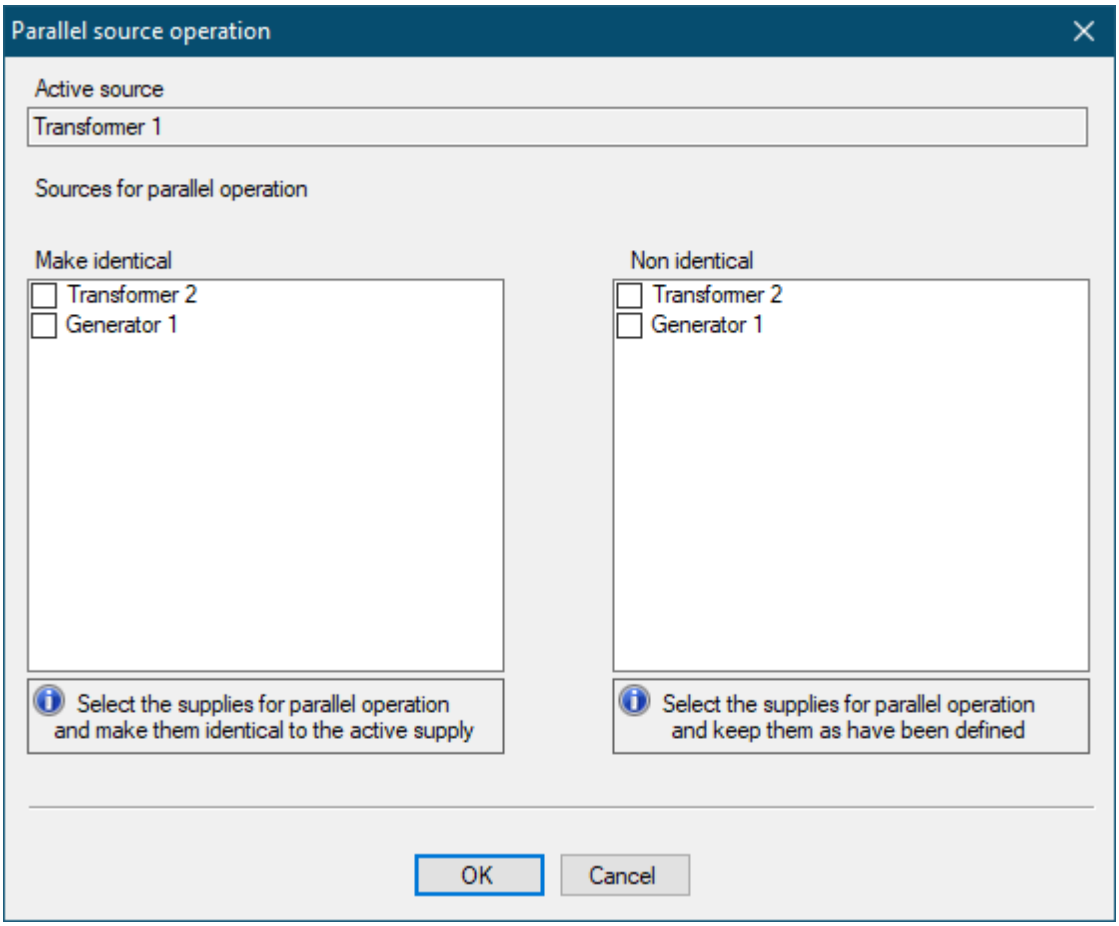
Switchboard, Junction Board, and Transfer Switch

First, the user must make sure the active source is one of the sources which are going to be modelled as parallel. In the case shown below, Transformer 1 is the active source, and it is going to be one of the parallel sources.

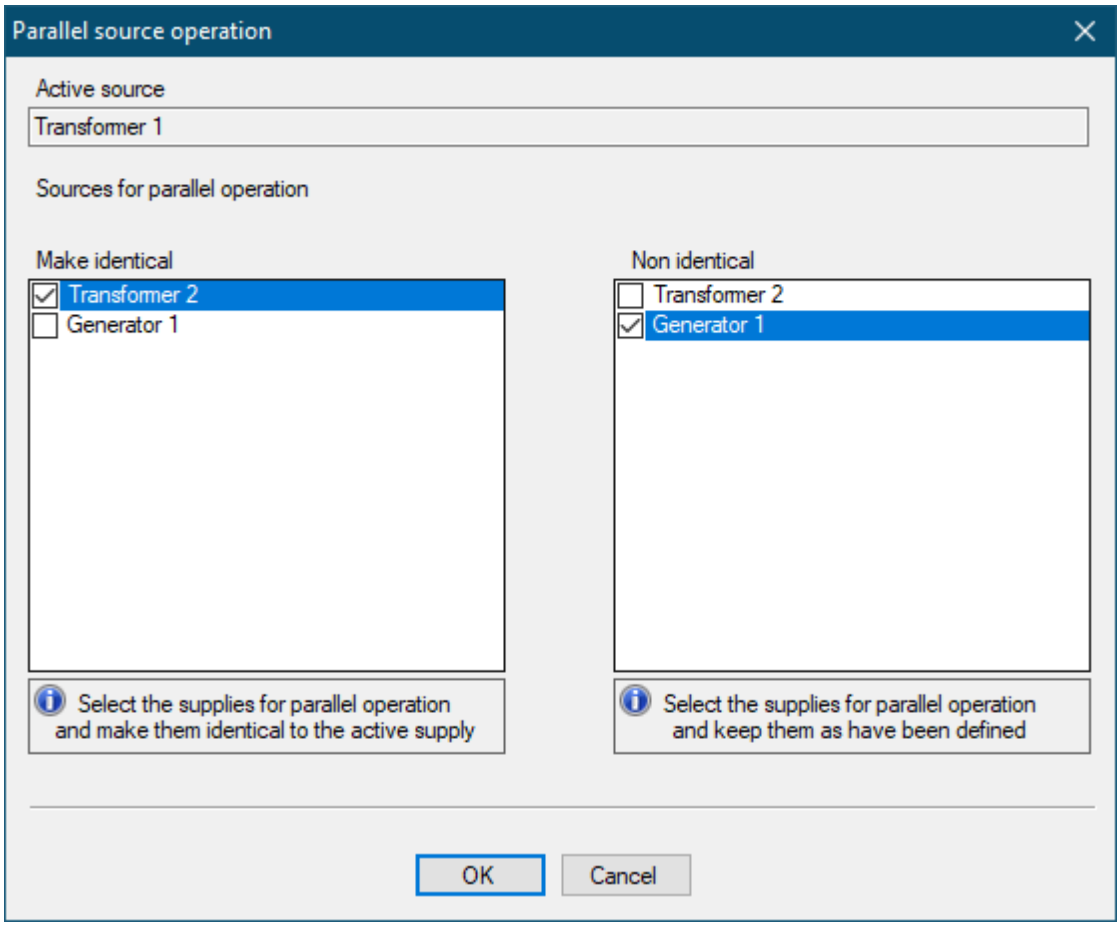


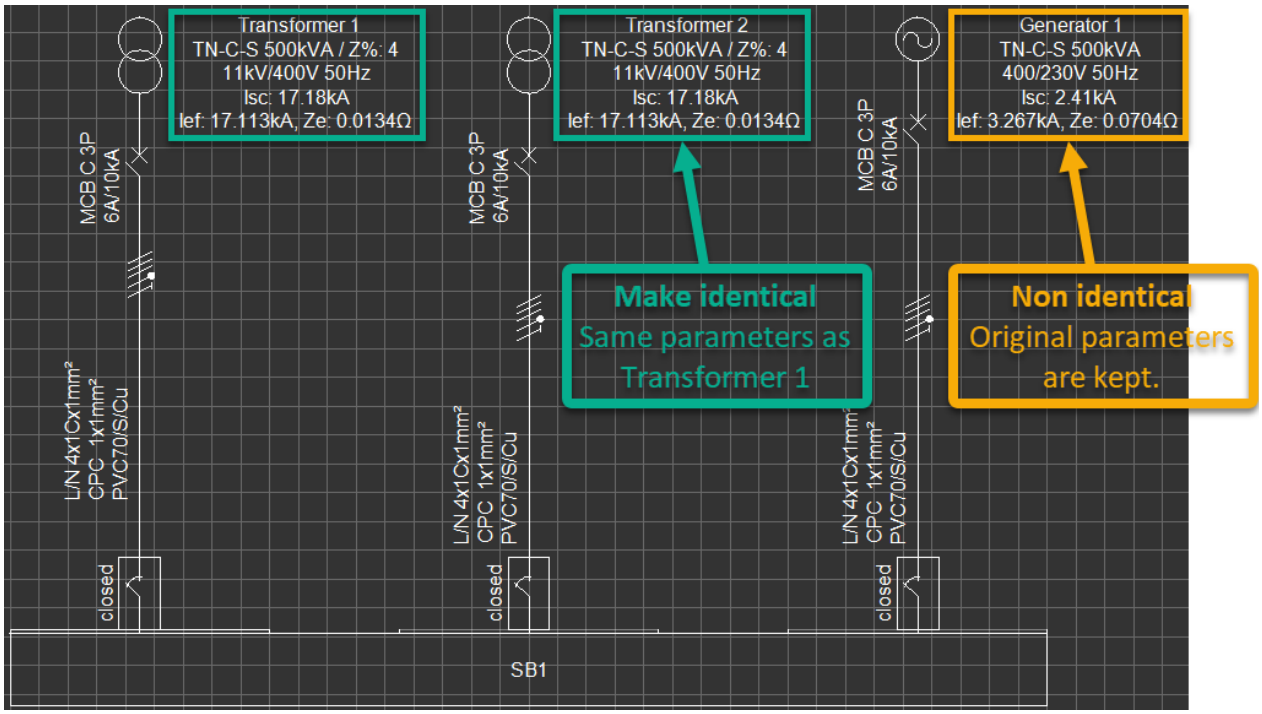
When *Parallel source operation...* option is selected, ElectricalOM will list all the sources which are possible to run in parallel together with the active source on two separate fields: *Make identical*, and *Non identical*.

In the case below, the active source is Transformer 1 and possible sources which can be run in parallel are Transformer 2 and Generator 1. Each source has different characteristics; Transformer 1 is a 500KVA transformer, Transformer 2 is 250 KVA transformer and the third source, Generator 1, is a 500KVA generator.



Once the required sources are selected and OK button is clicked, all the sources will be shown as active, with related switches in closed position, and all the settings will be identical except the given names for the sources.



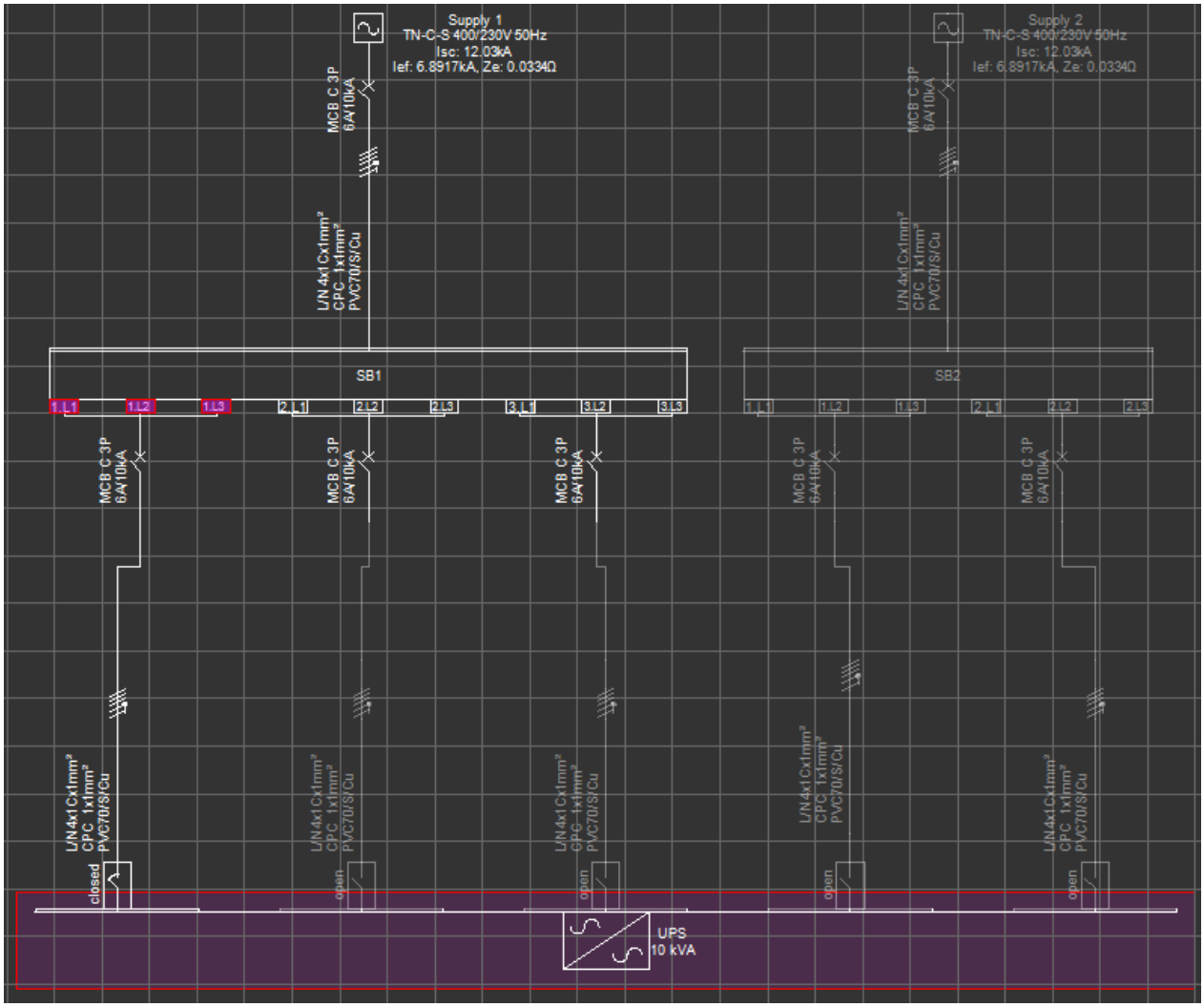


To remove a source from parallel operation, *Parallel source operation...* can be used again. The source needed to be removed from the parallel operation can be deselected from the*Sources for parallel operation* list, and ElectrcialOM will remove this source from parallel operation.

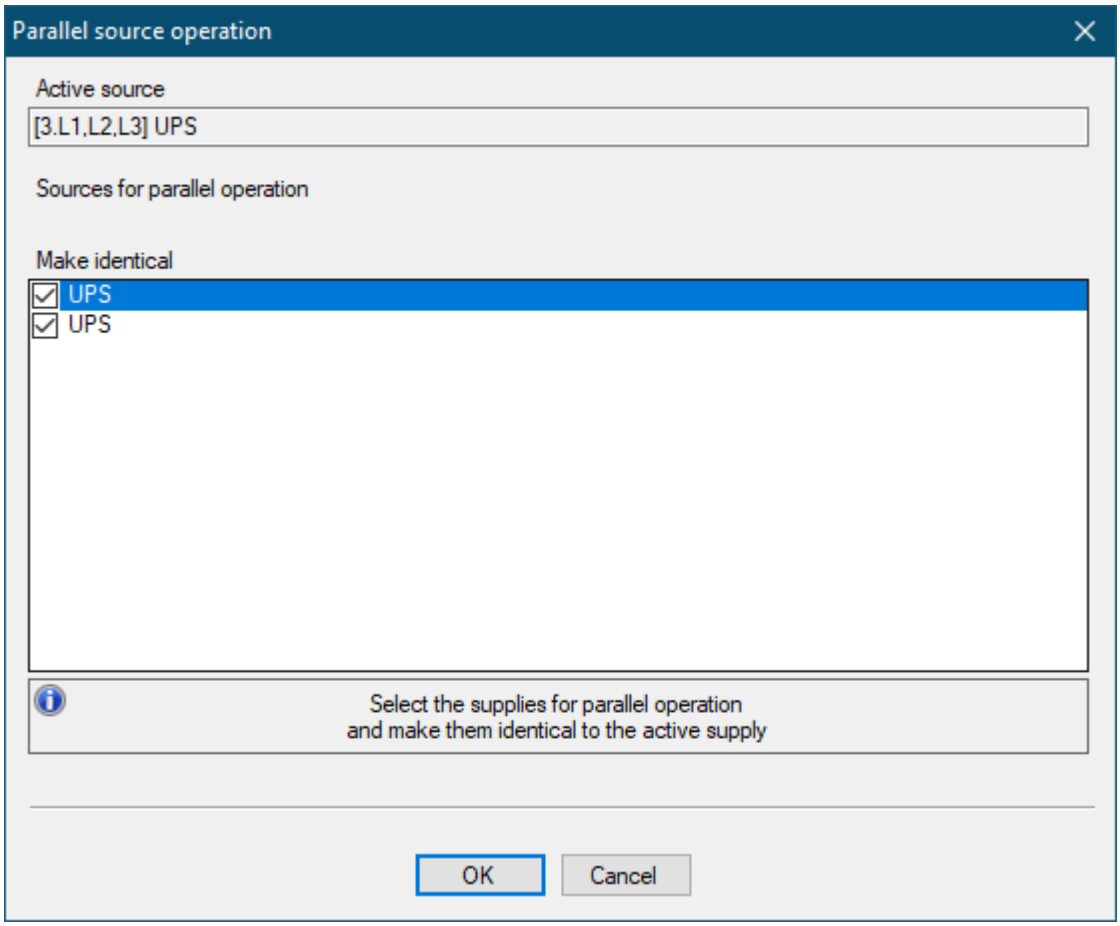
- *Multiple feeder circuits to be modelled as parallel supplies as long as the feeders are originated from the same distribution node*

This option is available for Switchboards, Junction Boxes, Transfer Switches, Transformers, UPSes, and Converters only. In order to model a component with parallel feeds, a component with multiple feeders must have already been established.

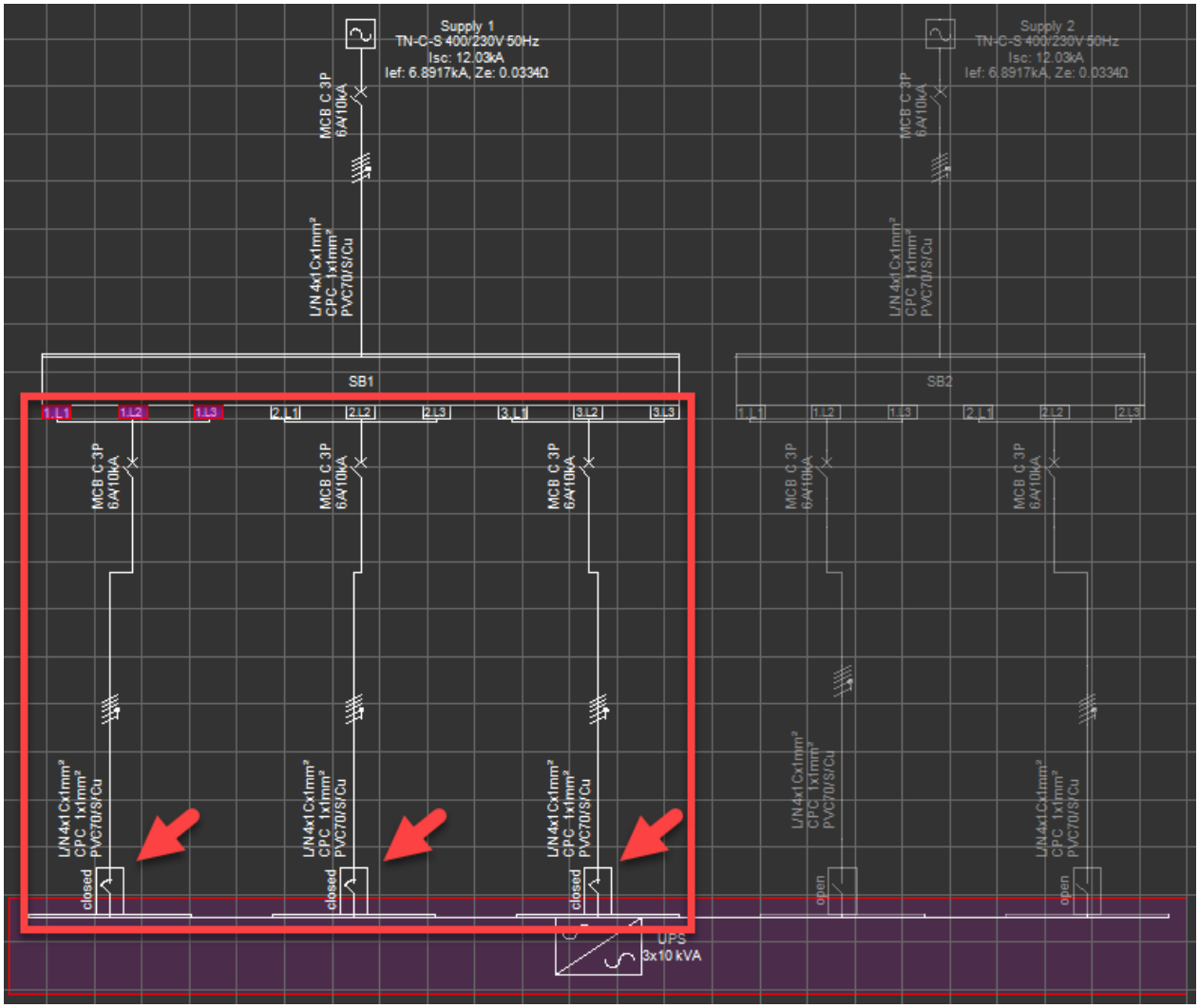
As an example we will consider a UPS fed by the panels, SB1 and SB2, which are also fed by two separate sources, Supply 1 and Supply 2. By default, only one supply (unless they are set as parallel sources) and only one feeder can be active at a time. In the case shown below way no.1 of SB1 of Supply 1 (switch in closed position) is the active supply to the UPS.



We will select the UPS, which will also select the active feed, and call the *Parallel source operation...* window. ElectricalOM will list all the supply points which are available to work in parallel with the active supply circuit. In the case below, the active supply circuit is 1.L1, 1.L2, 1.L3 of DB1 (3 phase connection) and possible parallel circuits are way no.2 and way no.3 of DB1. The circuits from DB2 are not listed since Supply 2 is not the active supply and SB2 is inactive. Now, we can tick the ways we want to set as parallel with our original feed, SB1 way no.1, and click the OK button.

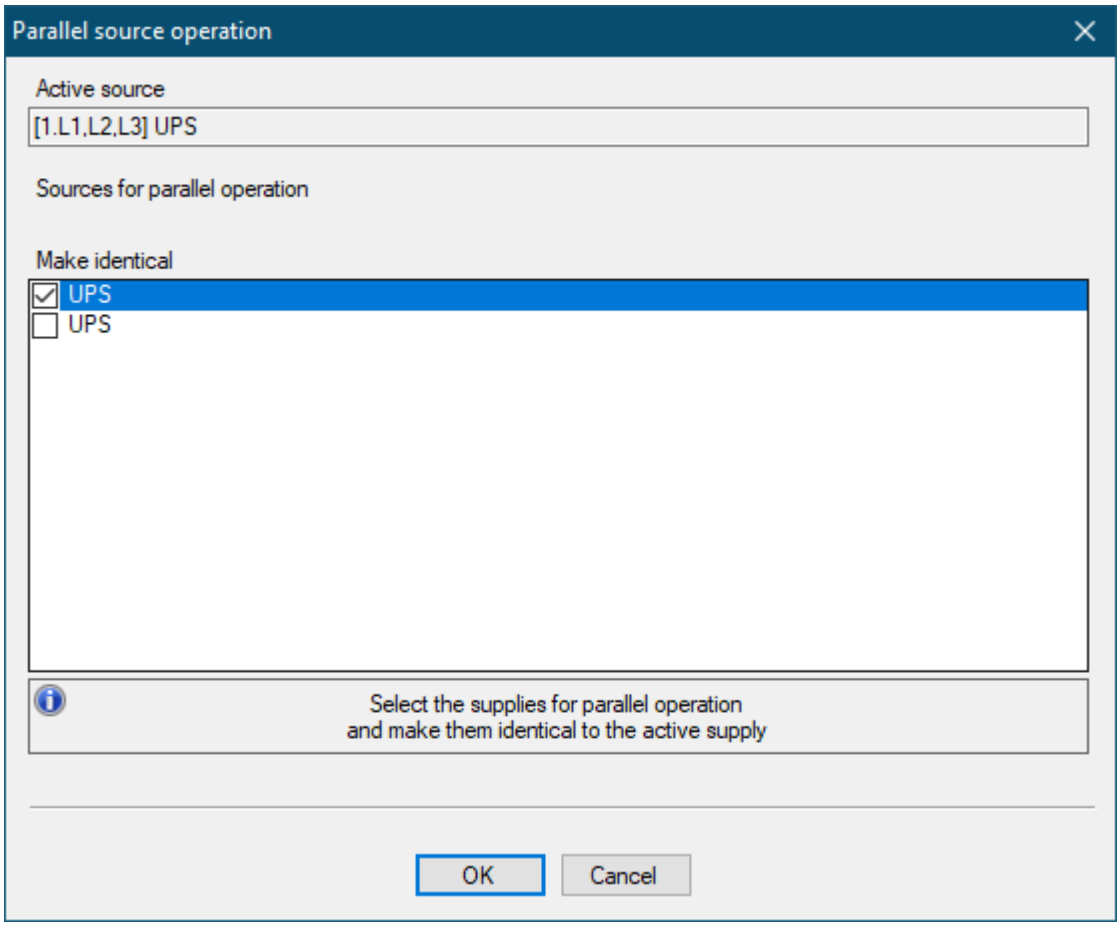


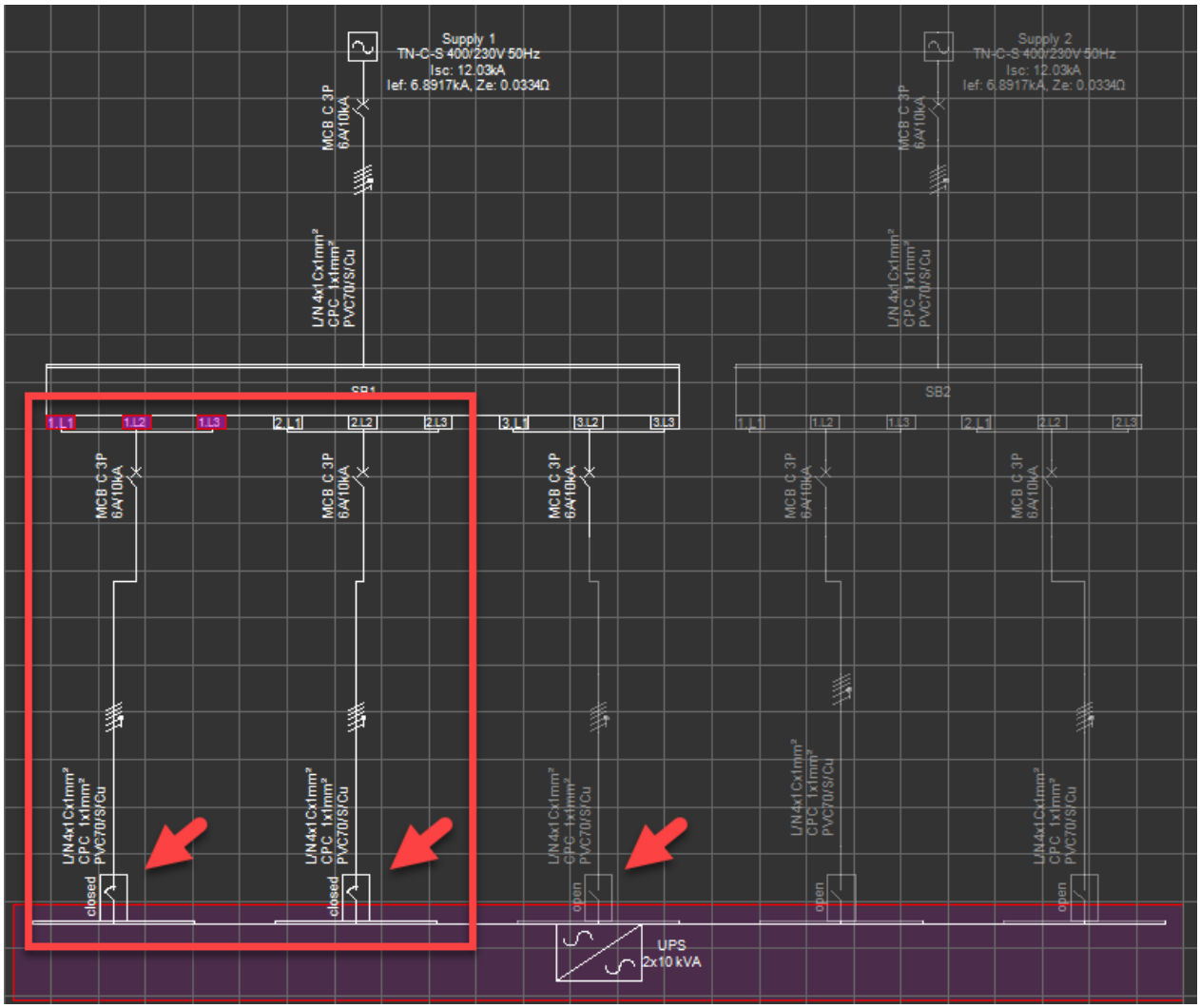
As can be seen from the picture below, SB1 way no.s 1, 2, and 3 are all running in parallel and feeding the UPS after the parallel source operation setting.



In order to set circuits originated from SB2 to feed UPS in parallel too, we need to activate the Supply 2, and repeat the procedure. Bear in mind this will not activate both panels. In order to achieve this, sources Supply 1 and Supply 2 must be set as parallel too.

The user may select as many circuits as required to work in parallel by simply ticking the tick boxes next to the circuits. Once the OK button is clicked, all the supplies selected will be active and related switches will be in closed position. Circuits which are not selected will not be included in the parallel source operation scheme.

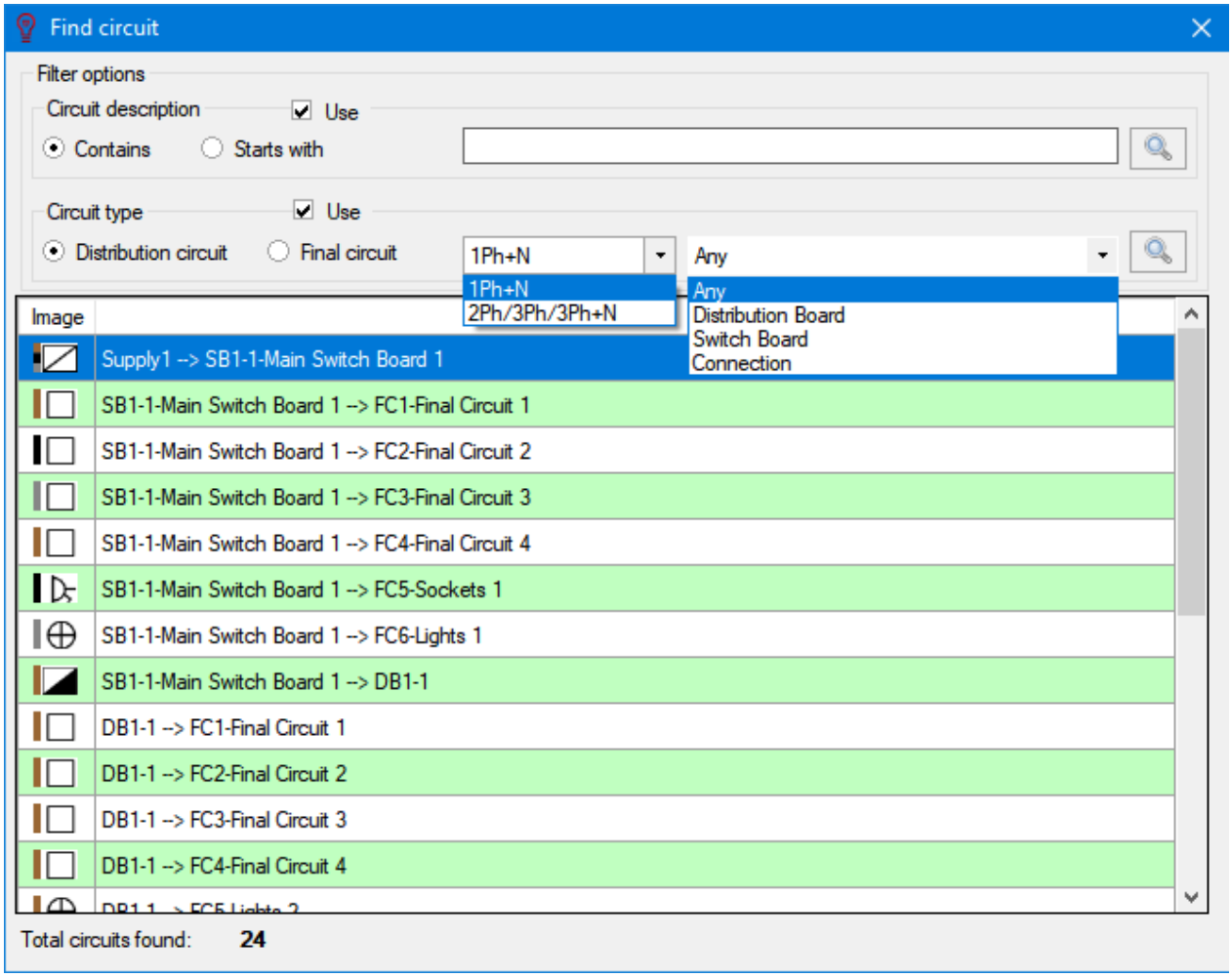

Parallel source operation
Active source
[1.L1,L2,L3] UPS
Sources for parallel operation
Make identical
UPS
UPS
Select the supplies for parallel operation
and make them identical to the active supply
OK
Cancel

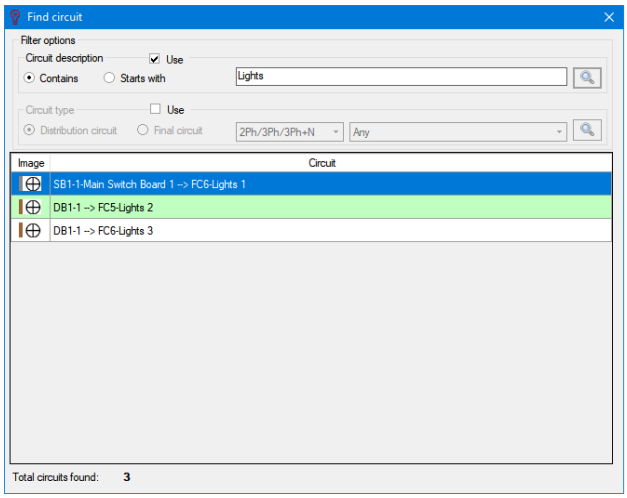


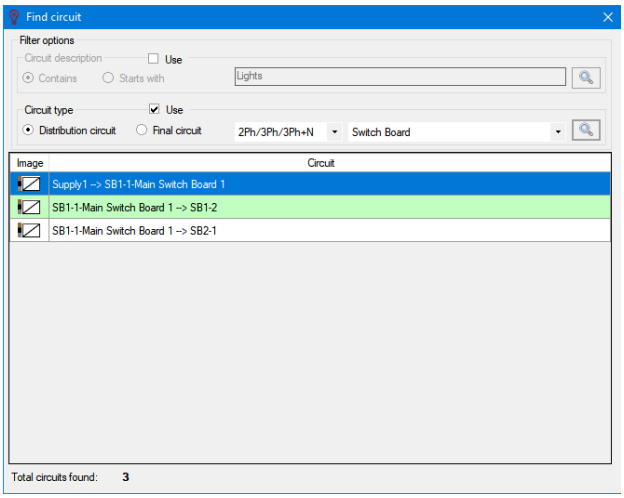
Find circuit...

Find circuit...

The user can search for circuits within an active project. *Find Circuit* windows has multiple selection options to make it easy to find specific circuits by providing options to make a text search within descriptions, or according to circuit type, or both.







Auto Cable ID and Auto BTS sections numbering

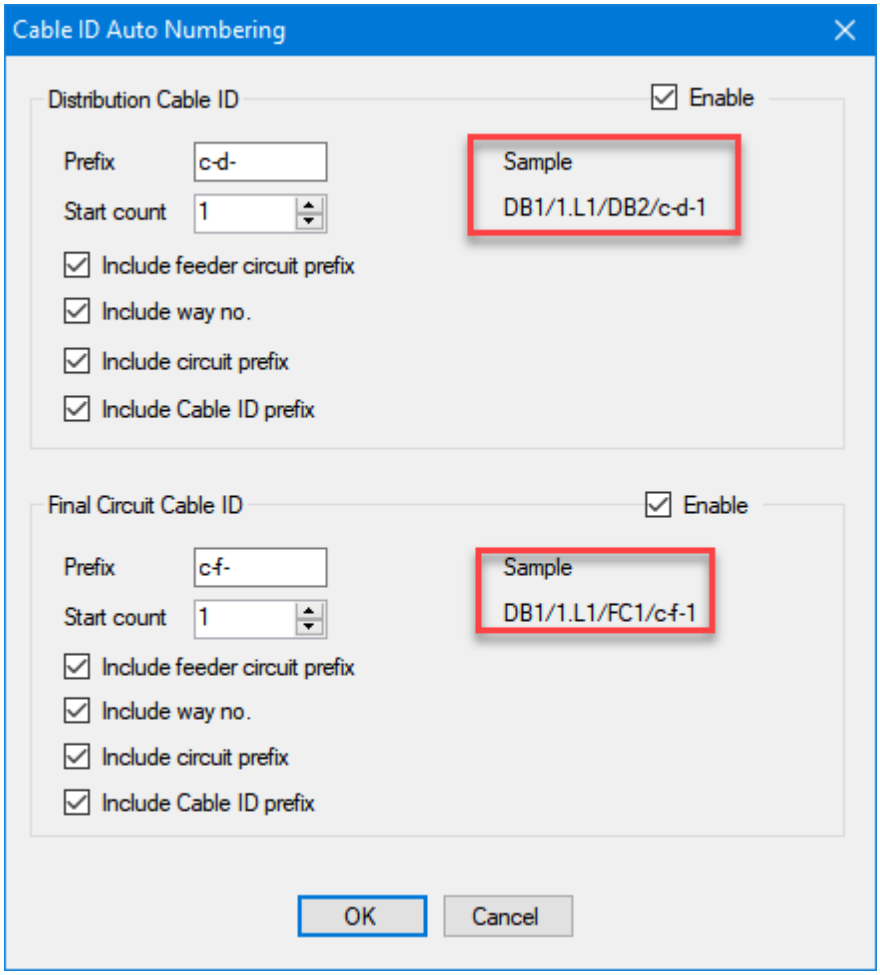
Auto Cable ID numbering...

By default, ElectrcialOM creates cable IDs as follows:

- For distribution cables: c-d-#
- For final circuit cables: c-f-#

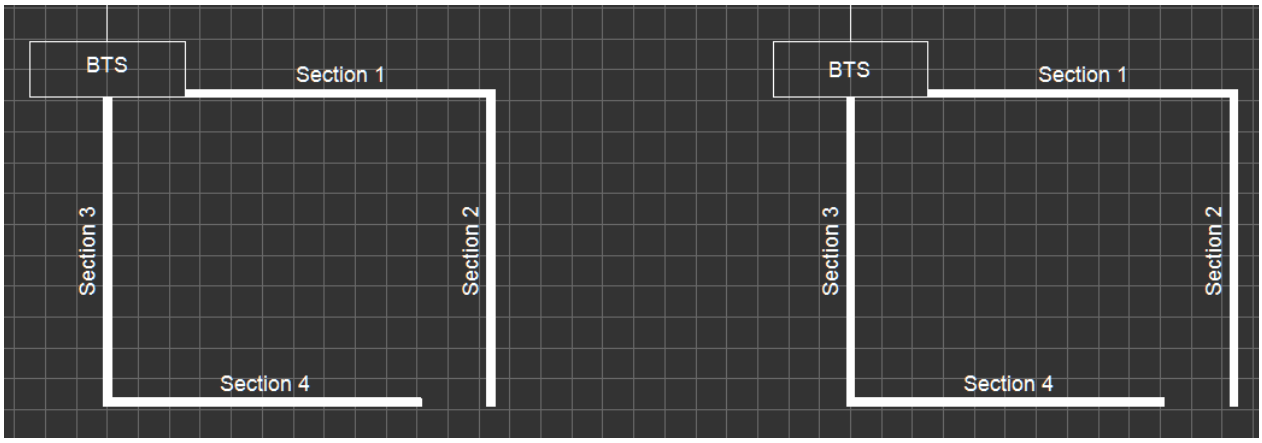
The user can set a specific way of ID creation using the *Auto Cable ID numbering...* menu. Distribution circuit cable and final circuit cable numbering rules can be defined independently. If *Enable* box next to each

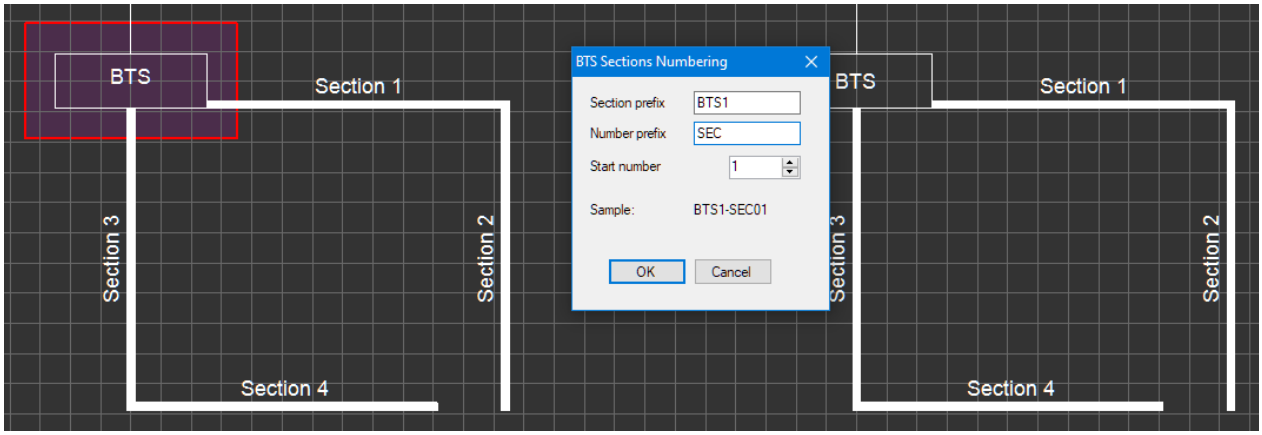
title is checked , then, the rule defined will be applied to the related type of circuit cables within the project. If it is unchecked, then, ElectrcialOM will still use default numbering system. User can preview the cable ID created by the rules defined under *Sample* section.

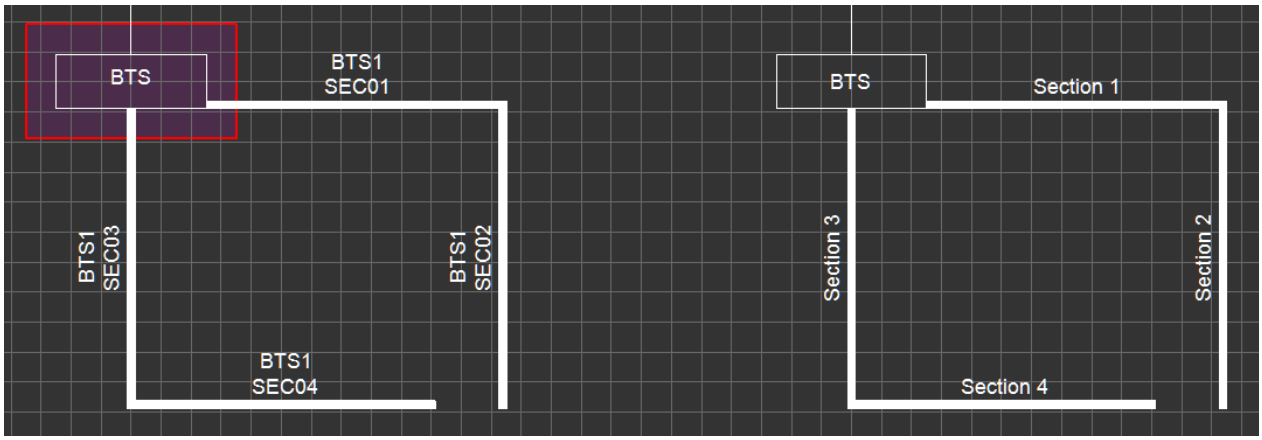


Auto BTS sections numbering...

By default, ElectrcialOM creates BTS section IDs as Section 1, Section 2, etc, but the user can set a specific way of ID creation using the *Auto BTS sections numbering...* menu. The rule defined will be applied to the selected BTS. There are two BTS below. User selects the one on the left hand side and defines a rule for auto numbering sections.





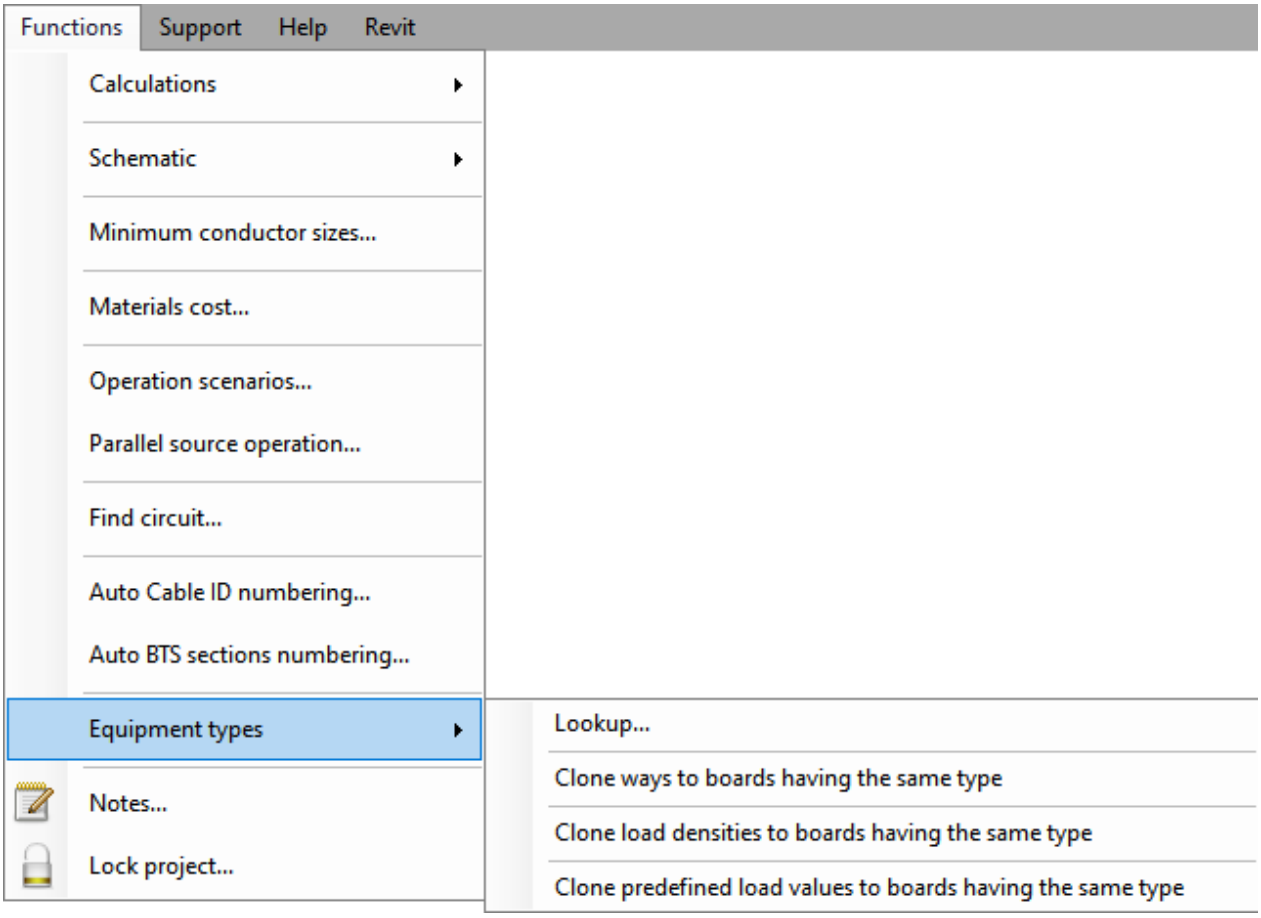


BTS sections connected to the selected BTS box are renumbered where the sections connected to the BTS box on the right are not affected.

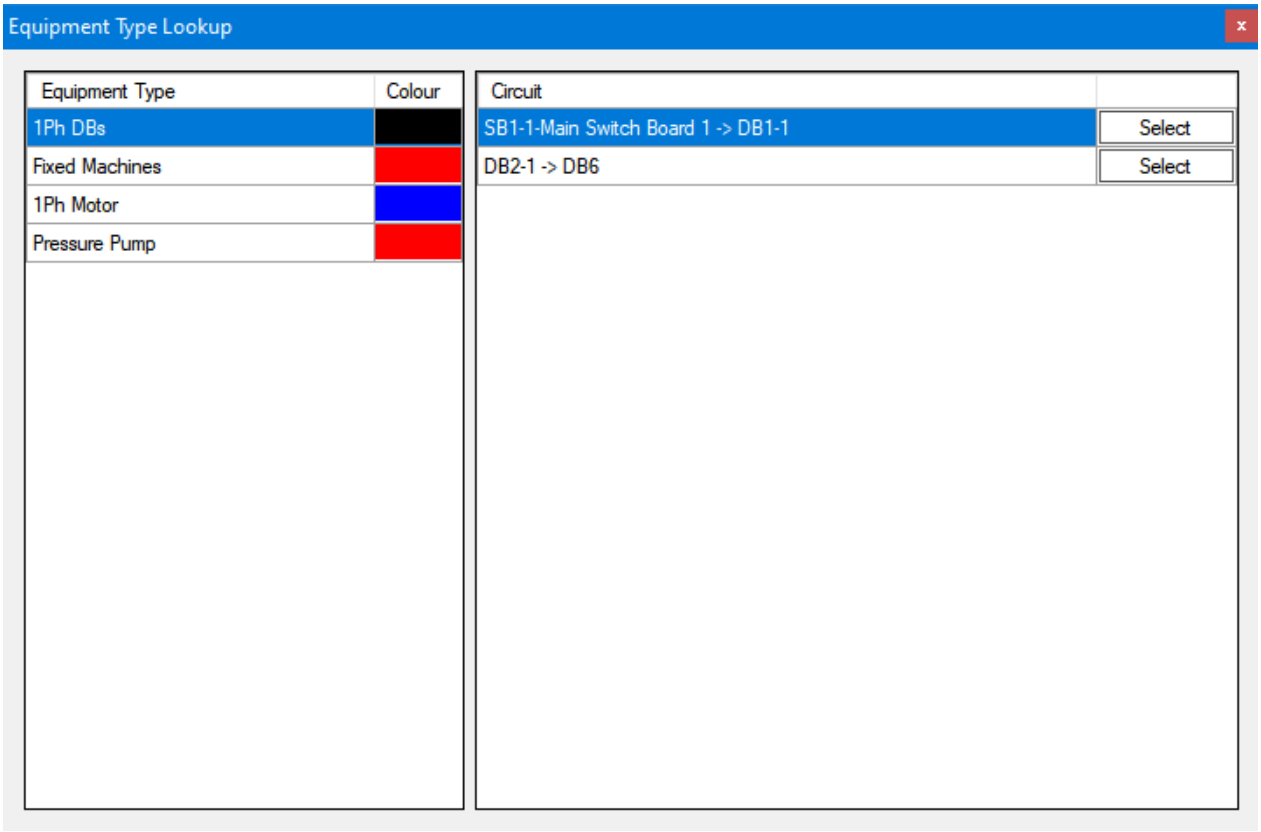
Equipment Types Menu

Equipment Types

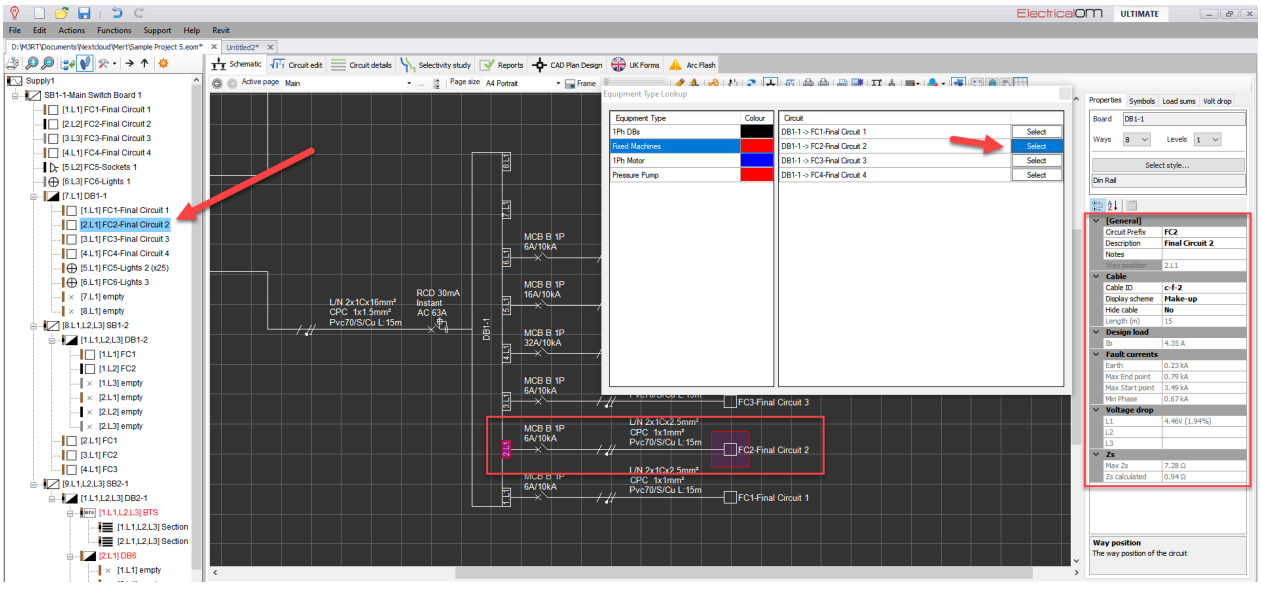
This menu will provide a shortcut to view existing equipment types in the project, to copy the loads of a board to another board, and to copy load densities to another board.



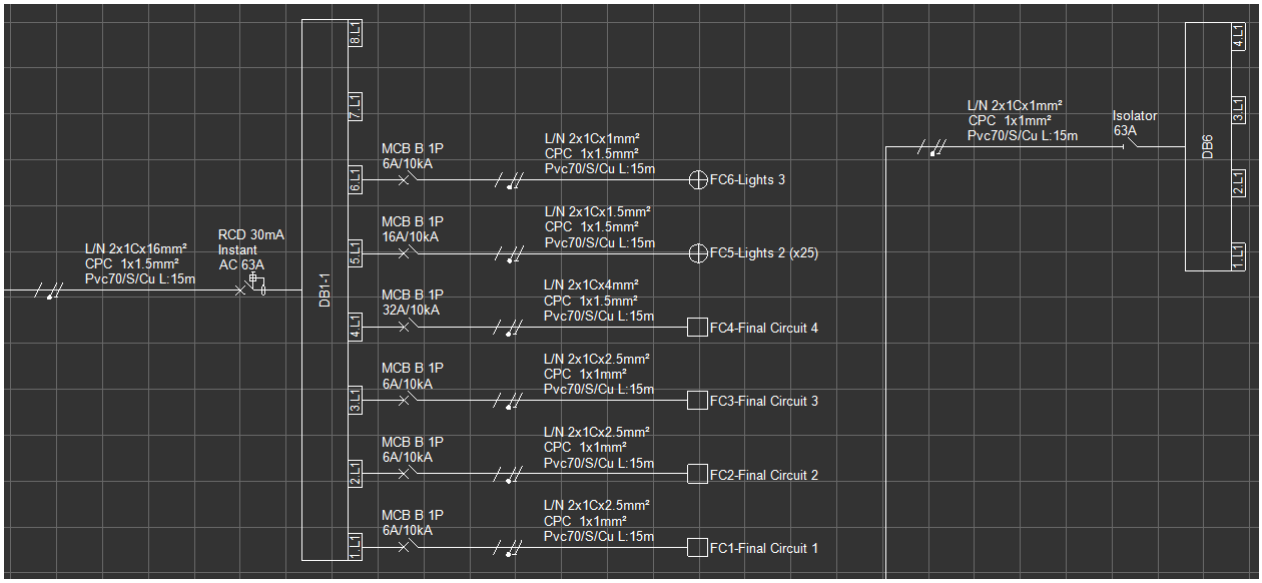
In order to use this menu efficiently, equipment types should already been defined by the user during the circuit creation phase. Equipment types can be defined under *Other details* tab of *Circuit Edit* module, see Other details Tab for details. Once the equipment types are defined, then user can click on *Lookup...* to see a list of all equipment types within the active project.

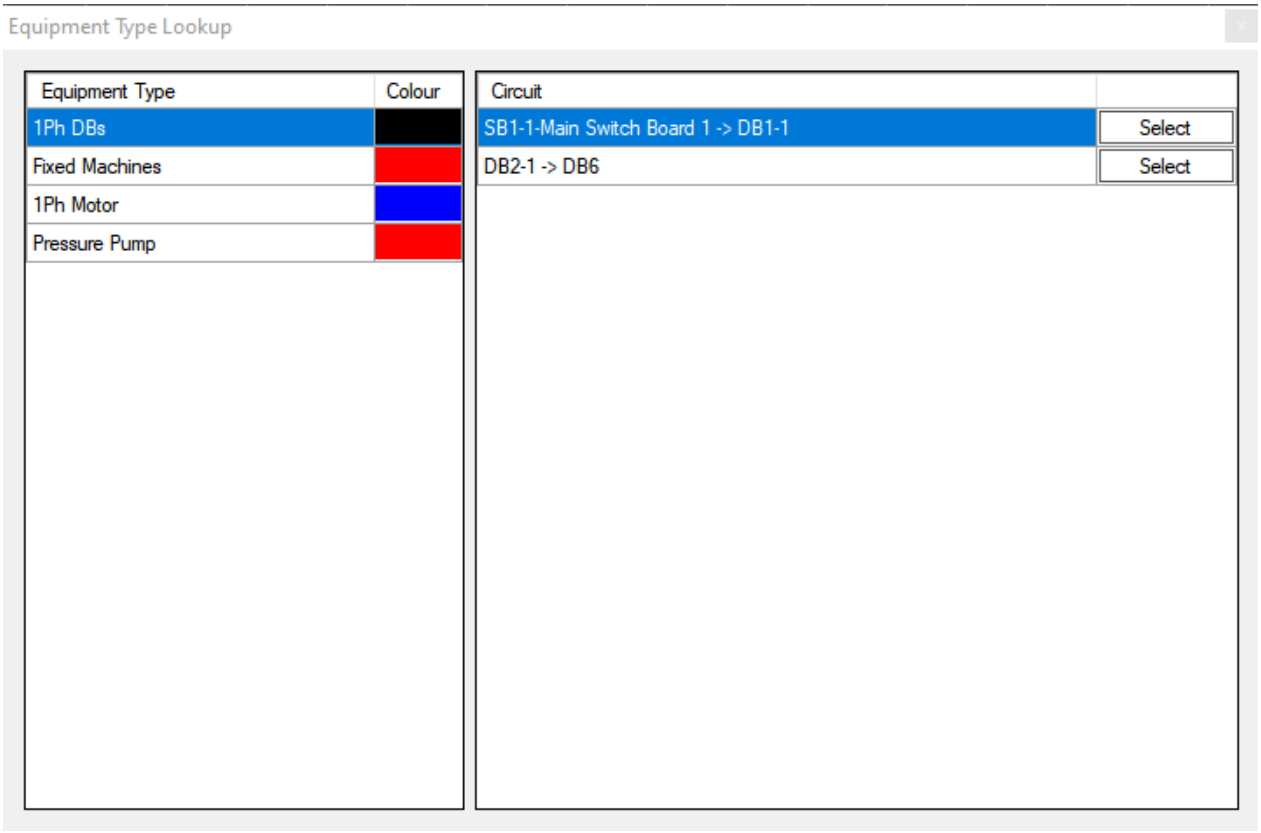


By clicking on *Select*, ElectricalOM will highlight the selected circuit on the system tree and also navigate to the selected circuit and display related data on the selected module.

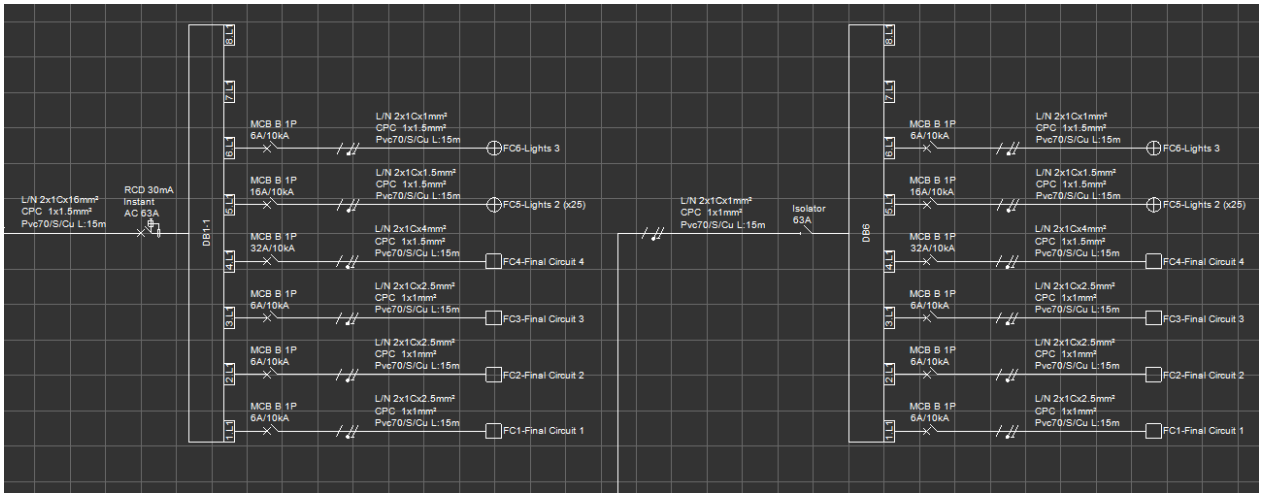


It is also possible to copy the loads and load densities of a board to other boards as long as they all have the same equipment type and they are all single or three phase. As an example, below, DB1-1 and DB6 have the same equipment type.





By selecting DB1-1 and using *Clone ways to boards having the same types* option, all the loads are copied to DB6. In this example there were only two boards but this action would apply to all the boards with the same equipment type as DB1-1 as it is the selected board to be copied, which means, if there were five boards with the same equipment type as DB1-1, then all six boards would be identical in terms of loads.

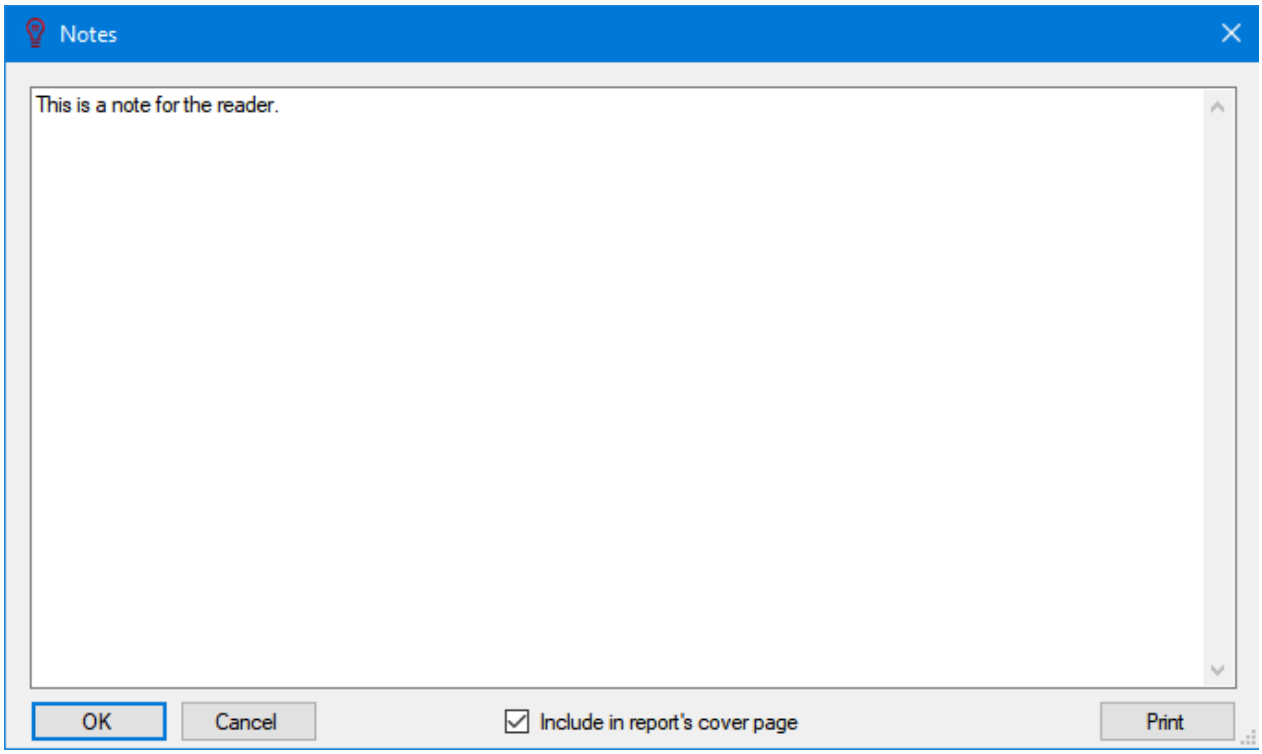


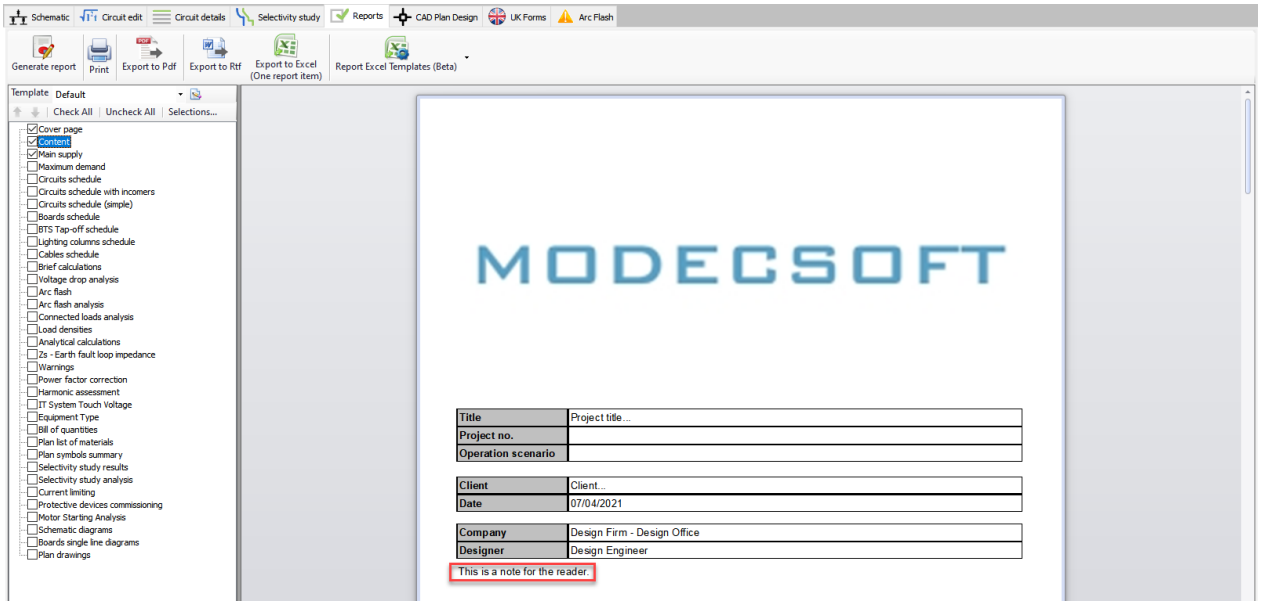
Likewise, if a new circuit is added, or the circuits rearranged, *Clone ways to boards having the same type* option will reflect the changed to all other boards having the same equipment type. Similarly, *Clone Load Densities to boards having the same type* and *Clone predefined load values to boards having the same type* options copies, or reflects changes made to, load densities and predefined load values respectively to other boards.

Notes...

Notes...

User can take notes about the active project using the *Notes* menu and can also print this note on the cover page of reports. After typing the note, *OK* button must be clicked to save it. If needed notes can be printed using the *Print* button as well.

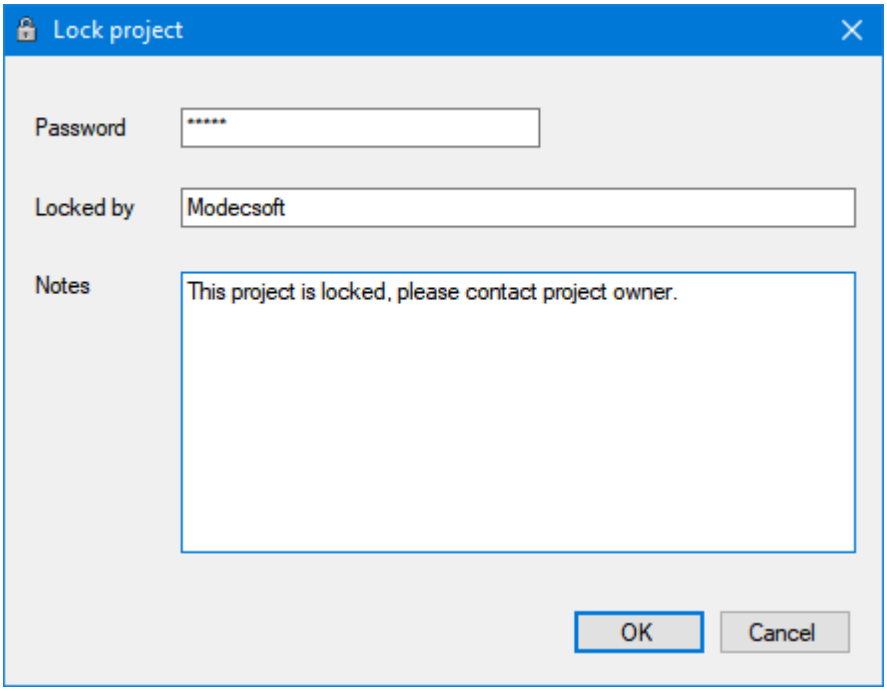




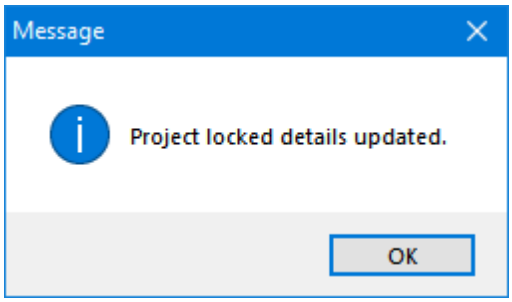
Lock project...

Lock project...

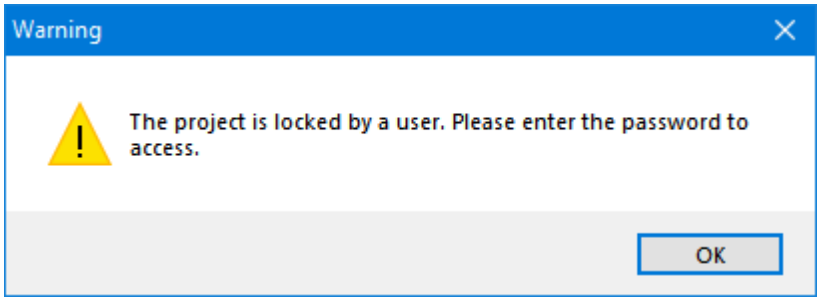
A project can be locked to avoid others to access the project. Lock project windows will be displayed once *Lock project...* is selected. User must enter a password and if needed users can also enter a description, to indicate who locked the project. There is also an extra space for further explanation if needed (Notes). After entering a password, user can clock on *OK* to lock the project.



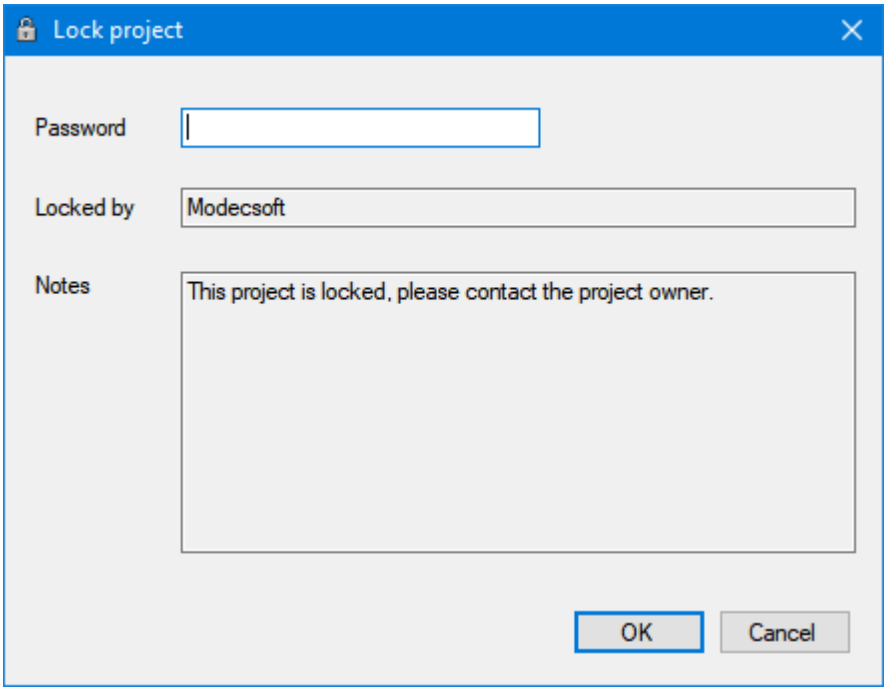
ElectricalOM will display a message window to indicate the password is set but, this will only be permanent only if the project is saved after setting a password. If the user closes the project without saving, then, the project will not be locked.



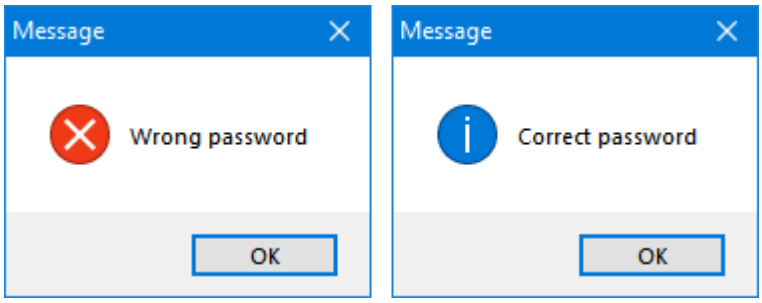
Opening a locked project will generate a warning letting the user to know that the project is locked and a password is needed.



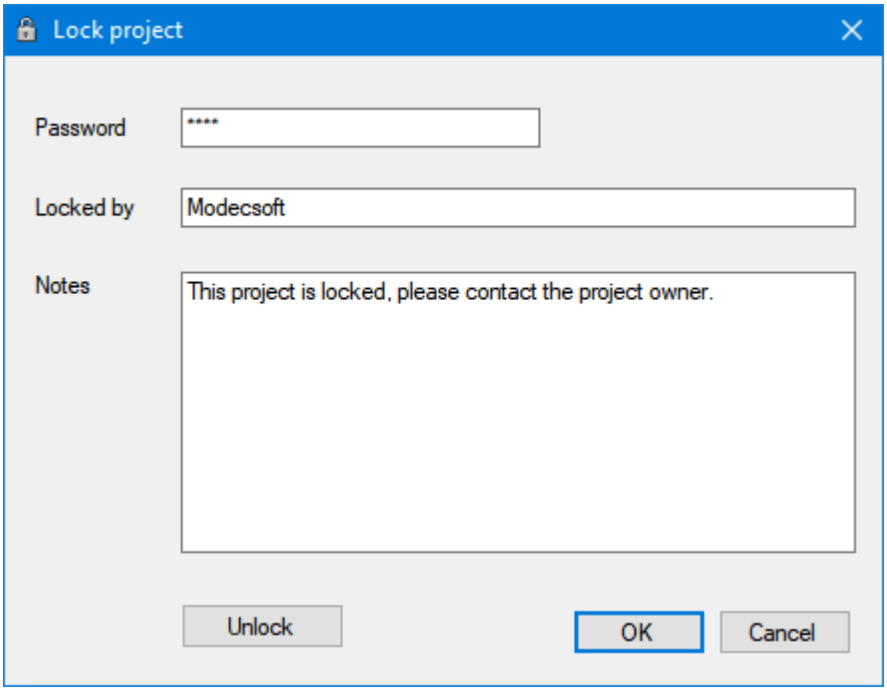
Clicking on *OK* will display the *Lock project* window.



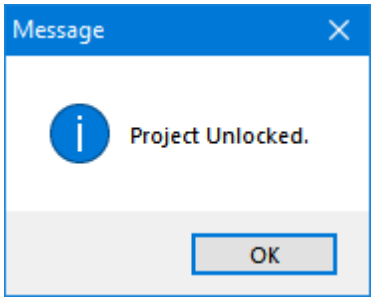
If the user enters a wrong password, *Wrong password* windows will be displayed. *OK* button will take the user back to *Lock project* window. If a correct password is entered then the project will be opened.



Once a project is opened, the lock can be removed using the *Lock project* window. First windows will ask the user to enter the password, then a *Correct password* windows will be displayed, and *Lock project* windows will be displayed again with an *Unlock* button.



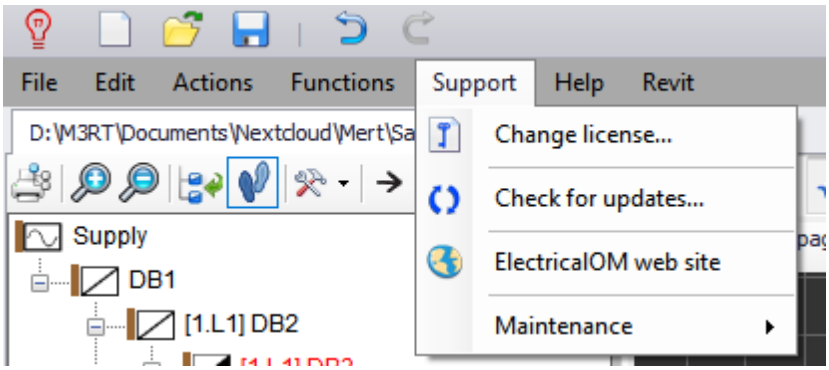
If the correct password is entered and *Unlock* button is clicked, the password will be removed. Again, in order to make this permanent then the project must be saved.



Support Menu

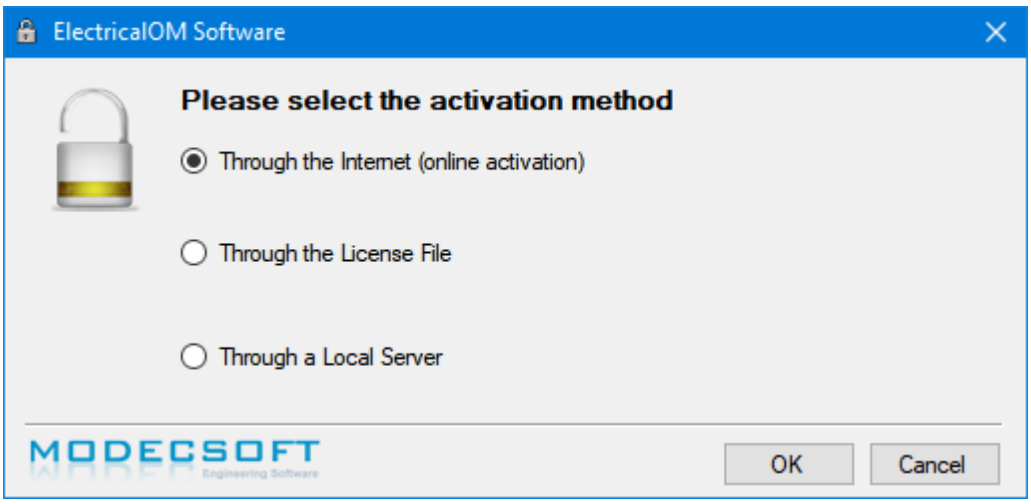
Support menu includes options where the user can solve licence issues, can check if there is any updates are available, and can surf to official ElectrcialOM web page. Apart from these options, *Maintenance* sub

menu is located under this tab which is mainly used only there is a software installation related problems.



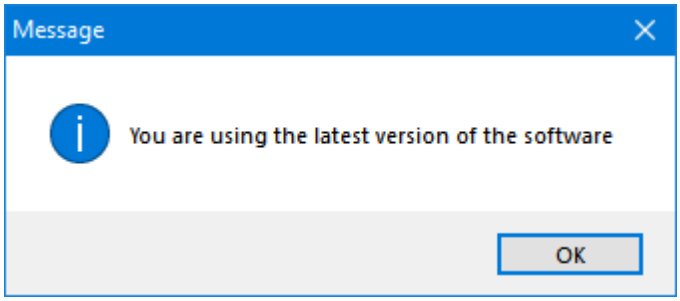
- **Change Licence...**

If the user wants to deactivate the active licence or wants to activate a different licence other than the active one, then, this menu is used. For more details please refer to section *Activating Your Licence*.



- **Check for updates...**

Mostly, if there is an update available, ElectrcialOM will prompt the user at the startup with a pop up window, but this option is used when a manual check is needed. Once clicked on, ElectrcialOM will display a pop up window which will indicate if an update is available or not.

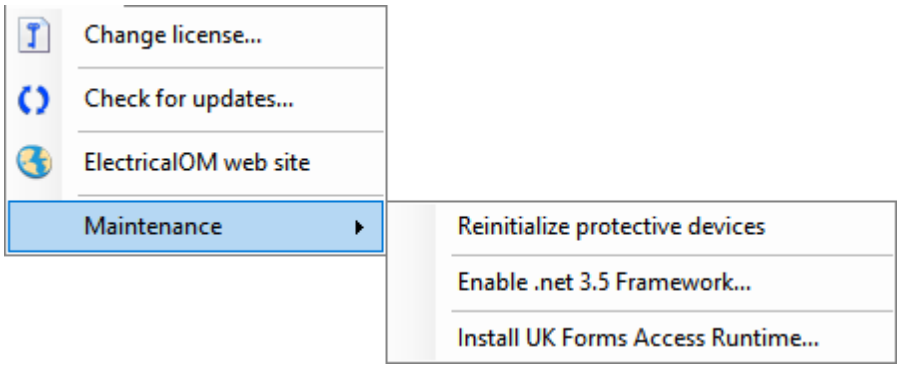


- **ElectrcialOM web site**

This directs the user to official ElectricalOM web page using the default internet browser,

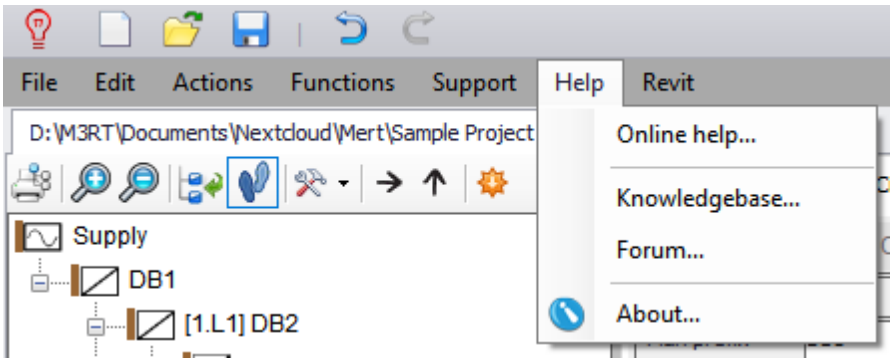
- **Maintenance**

This is a sub menu rather than an option and it contains options which are needed to be used after contacting support at support@modecsoft.com.



Help Menu

Help menu is used to seek assistance from online help (this document), articles posted on our website, and ElectricalOM community.



- **Online help...**

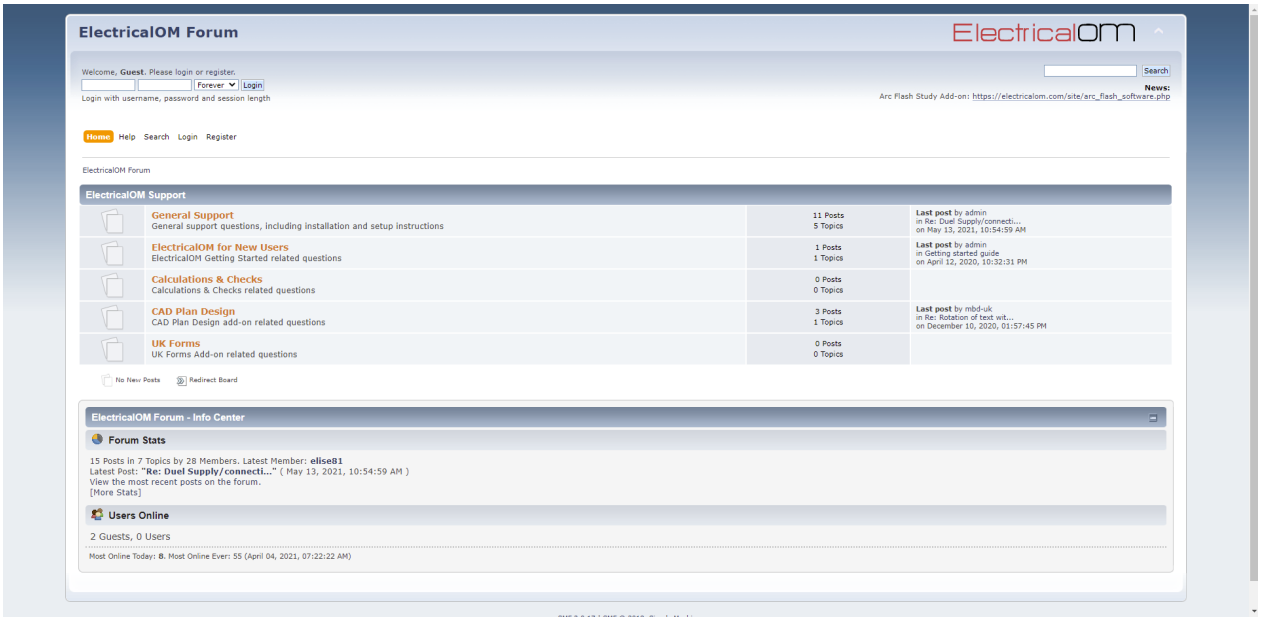
When clicked, the user is directed to online help page using the default internet browser.

- **Knowledgebase...**

ElectricalOM team will be posting guidance notes or similar articles on our Knowledgebase portal and this option will direct the user to this portal using the default internet browser.

- **Forum...**

The user will be directed to ElectricalOM Forum using the default internet browser.

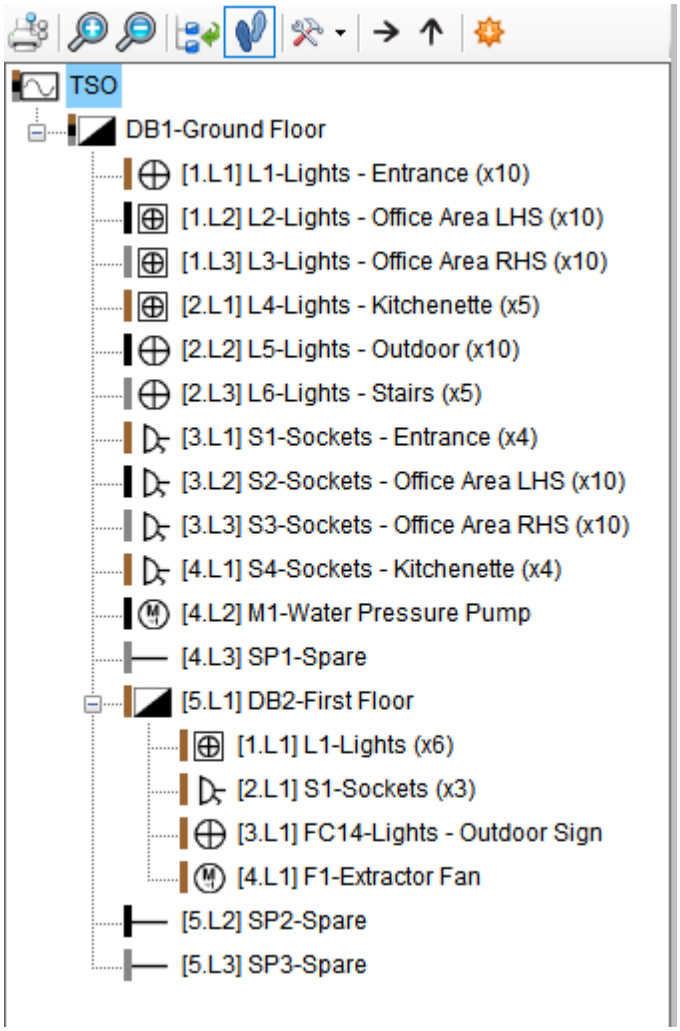


Revit Menu

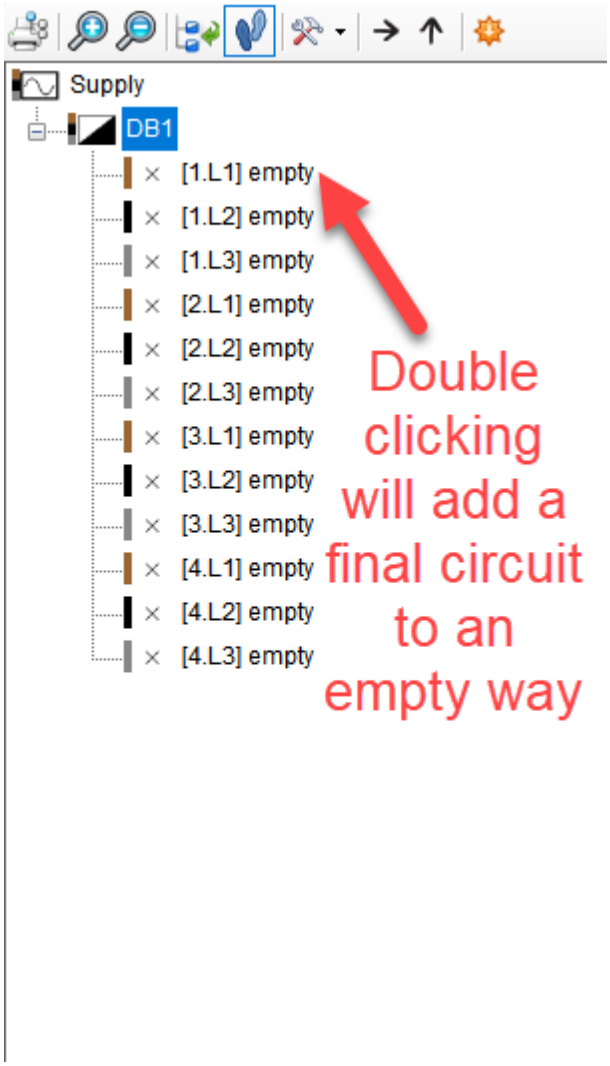
Please refer to Revit Manual for details.

System Tree Section

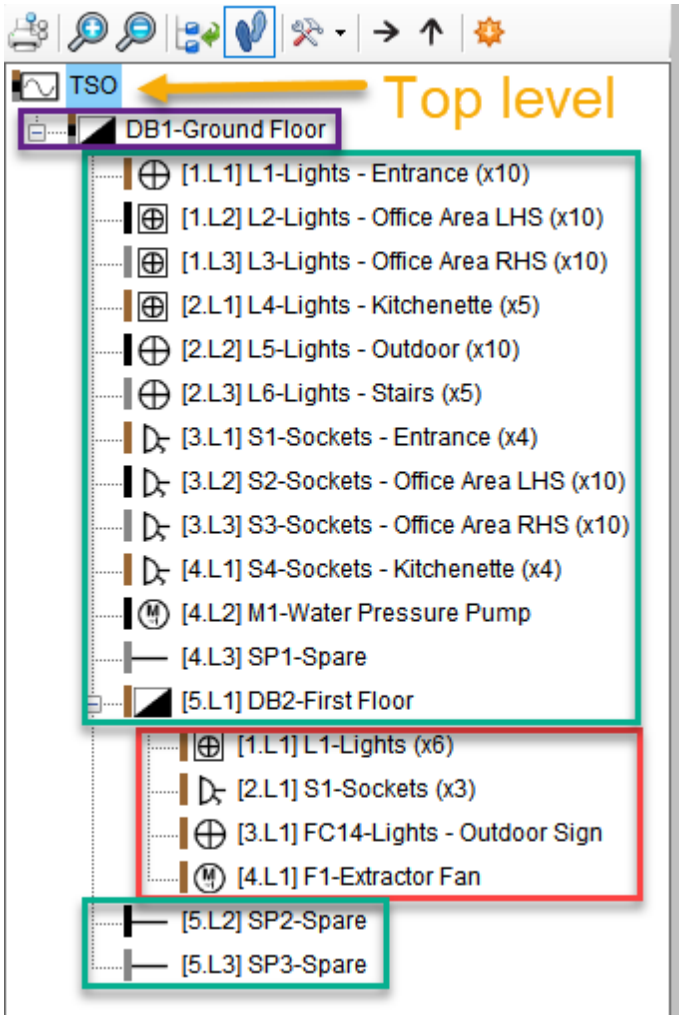
System Tree Section is located at the left hand side of ElectrcialOM's main screen and it represents the designed system as a tree as shown below.



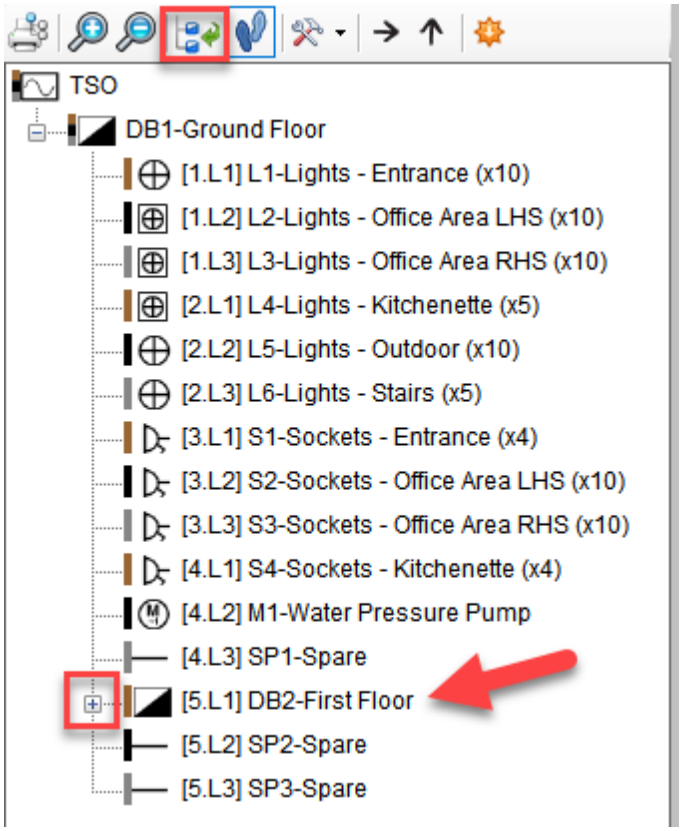
As mentioned before, modelling in ElectrcialOM involves inserting circuits and connecting them to each other. Mainly the Insert menu is used for this purpose and it can be accessible from the System Tree Section via right mouse click, however, for final circuits which are shown as *empty* in ElectrcialOM by default, double clicking will also add a circuit to the distribution way.



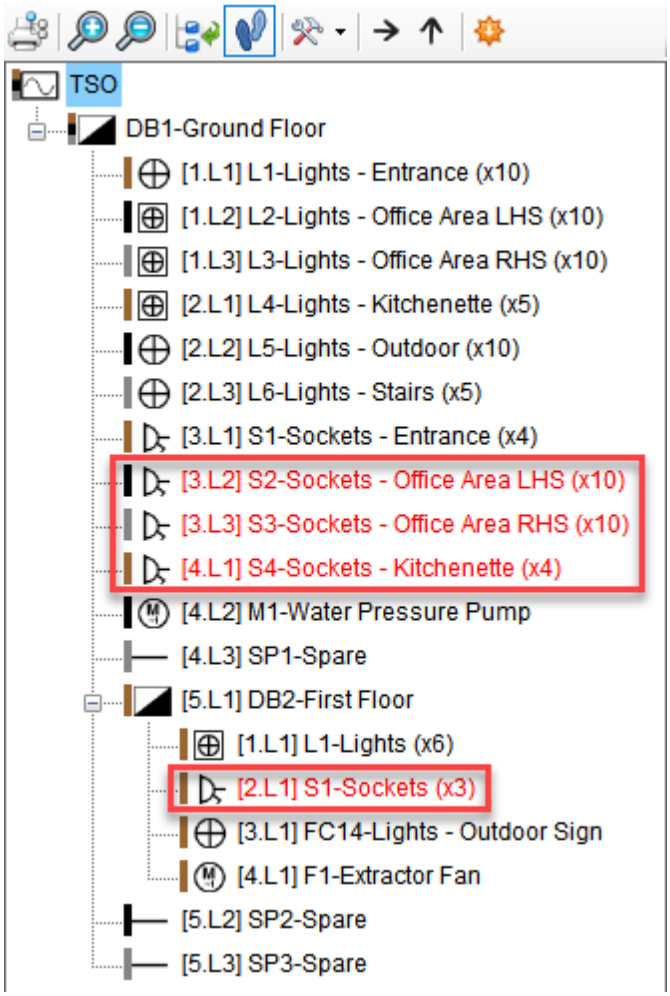
Circuits are grouped according to their types and where they are fed. For example, DB1 is fed from the source, TSO, and DB2 is fed from DB1. As a result, TSO is at the upper most level, then DB1 is at level 1, where final circuits and DB2 which are fed from DB1 are at level 2, and finally, final circuits fed from DB2 are at level 3.



If there is a circuit(s) fed from a circuit, then, next to this distribution circuit ElectrcialOM will convert this point to a node and display an expansion point represented by + or - inside a square. Using this toggle switch, the user can hide or unhide the circuits which are fed from the related distribution circuit. If there are multiple distribution circuits within the designed system and the user wants to contract all the distribution circuits at once, then, *Collapse tree nodes* button can be used. This button is located at the System Tree section toolbar.



If there are any warnings (depending on the state of the warning type -visible/ignored-) with regards to a circuit, this particular circuit will be indicated as red.



All copy/cut/paste, delete, etc. options, selection actions except multiple selection, and right click menu are available and can be accessed from System Tree section. Also a toolbar is available for some shortcuts on top of the system tree section (left to right):

- Print network tree

Refer to Print network tree

- Zoom In/Out

This will set the font used in the system tree area larger/smaller.

- Collapse tree nodes

See above.

- Zoom to selection

When the user selects an object from the system tree, ElectrcialOM will zoom to the selected object if the Schematic module is selected.

- Tree network options menu

Refer to Tree network options menu.

- Show selected element

Refer to Show selected element.

- Select the upstream circuit

Refer to Select the upstream circuit.

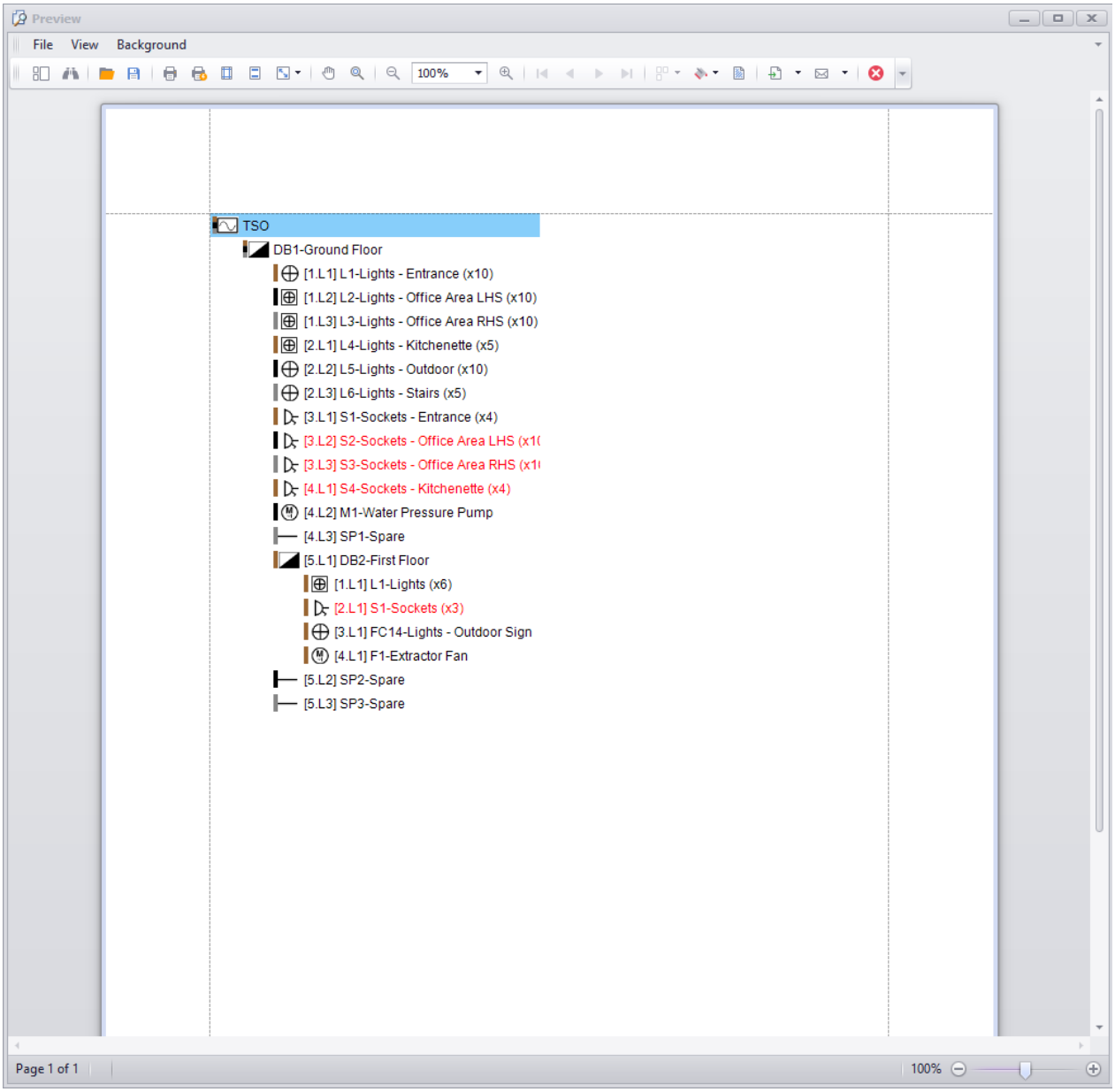
- Templates

Refer to Templates.

Print network tree

Print network tree

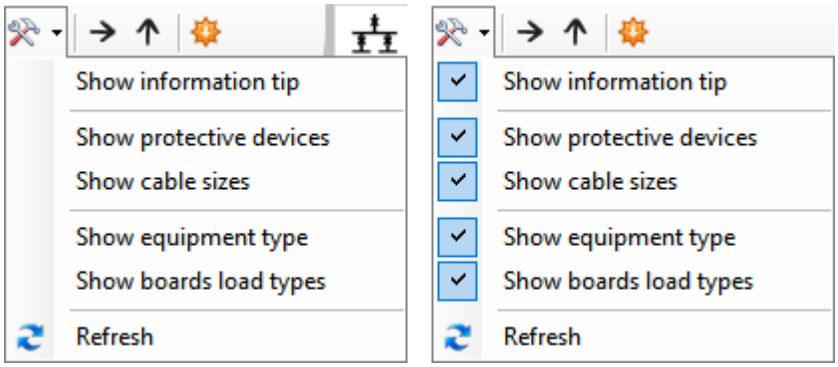
This button is used to print the system tree. Once this button is clicked, a print preview window will be displayed. This window is similar to a generic print preview window and the user can set parameters and preint the system tree as well as export the document as a PDF or various image files (BMP, EMF, WMF, GIF, JPEG, PNG. TIFF), send the exported file as an email, etc.



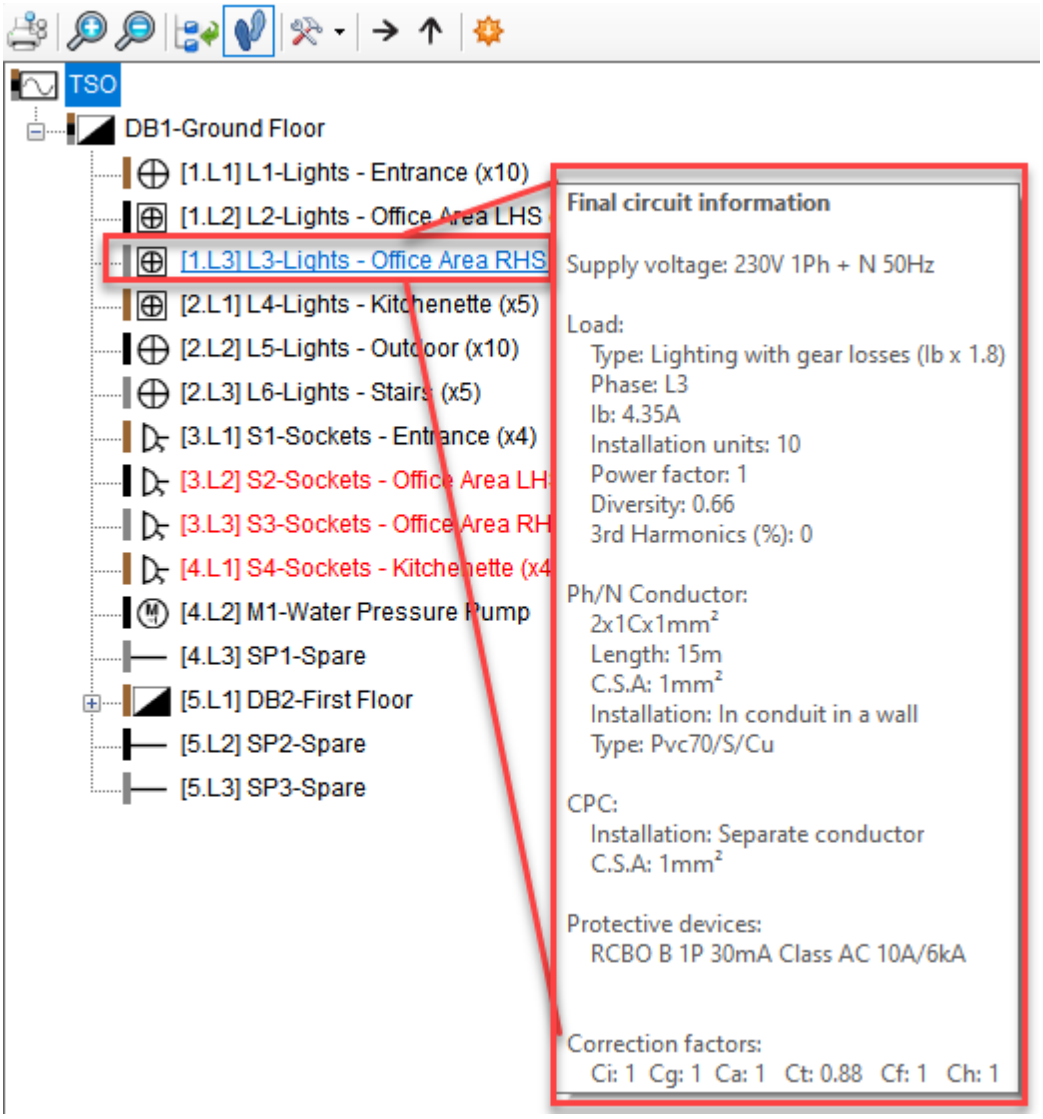
Tree network options menu

Tree network options menu

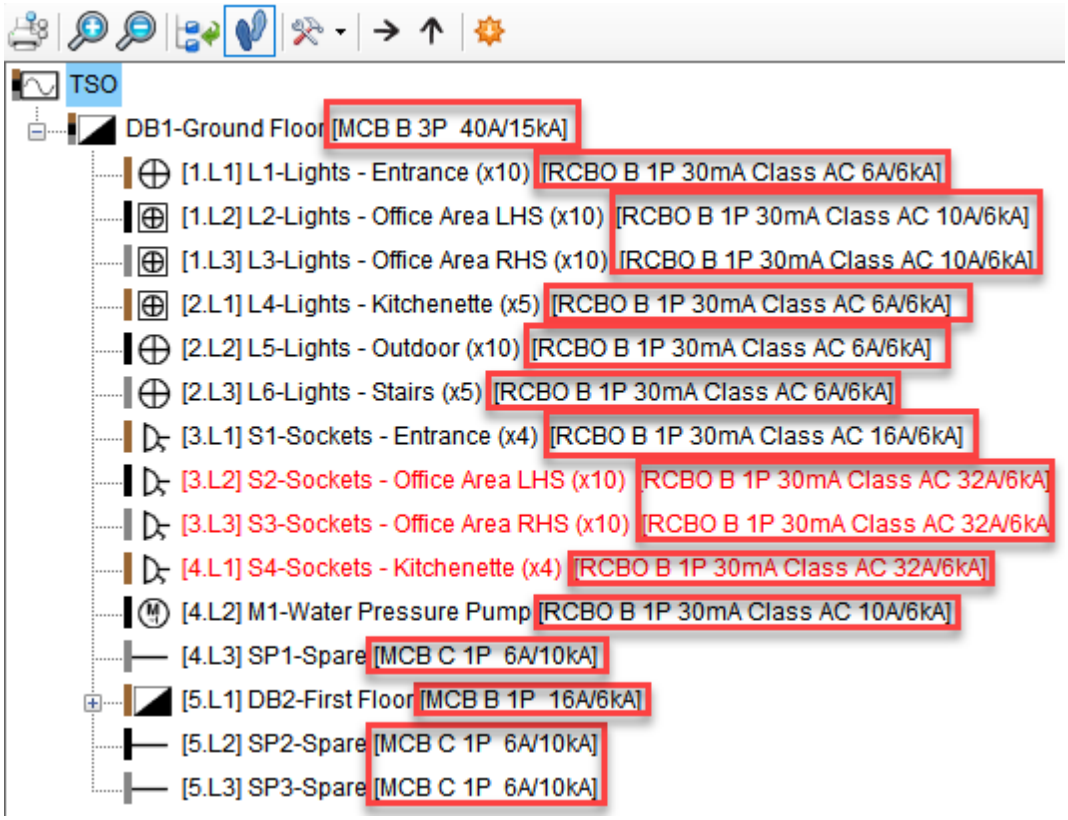
There are a few options that can be selected from this menu to quickly refer to some properties of the circuits without the need for any additional steps. The user can toggle these options on or off by clicking on them and ElectricalOM will display a tick next to the options set as on.



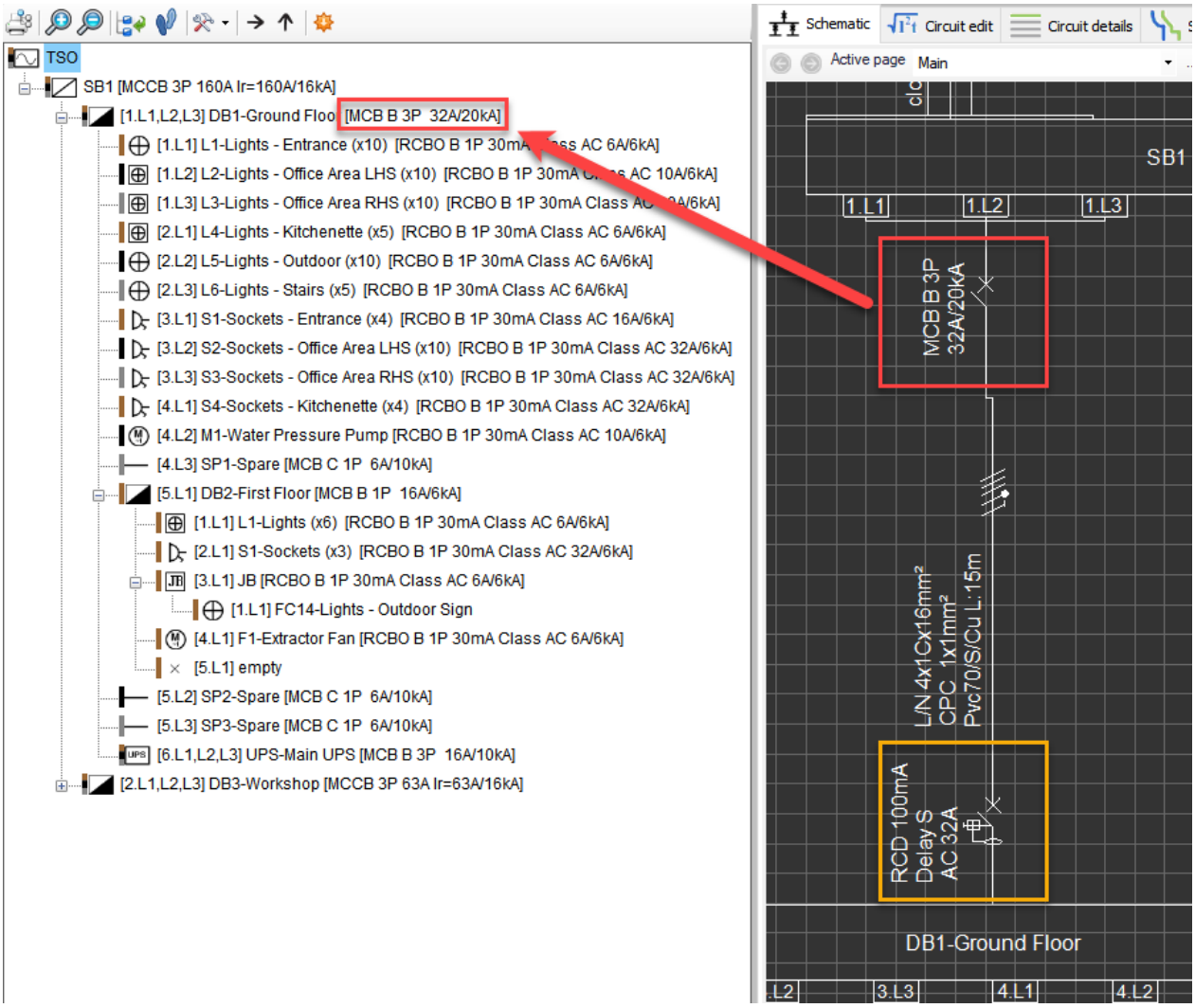
- Show information tip: Information tip box will be displayed when the user pauses on a circuit. The circuit which the information is shown will be highlighted with a blue underlined font by ElectrcialOM.



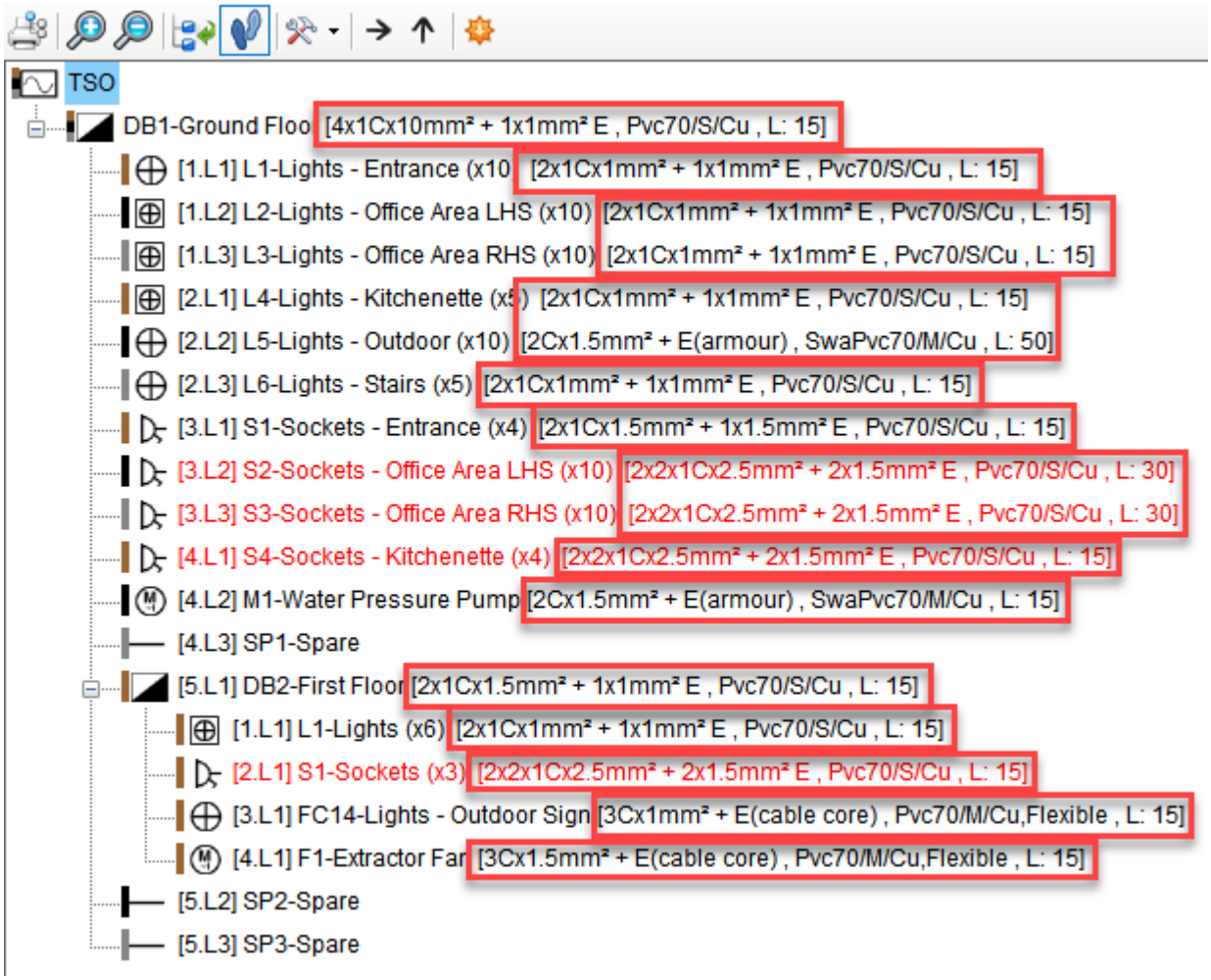
- Show protective devices: will display the protective device information for the circuits after their descriptions in square brackets.



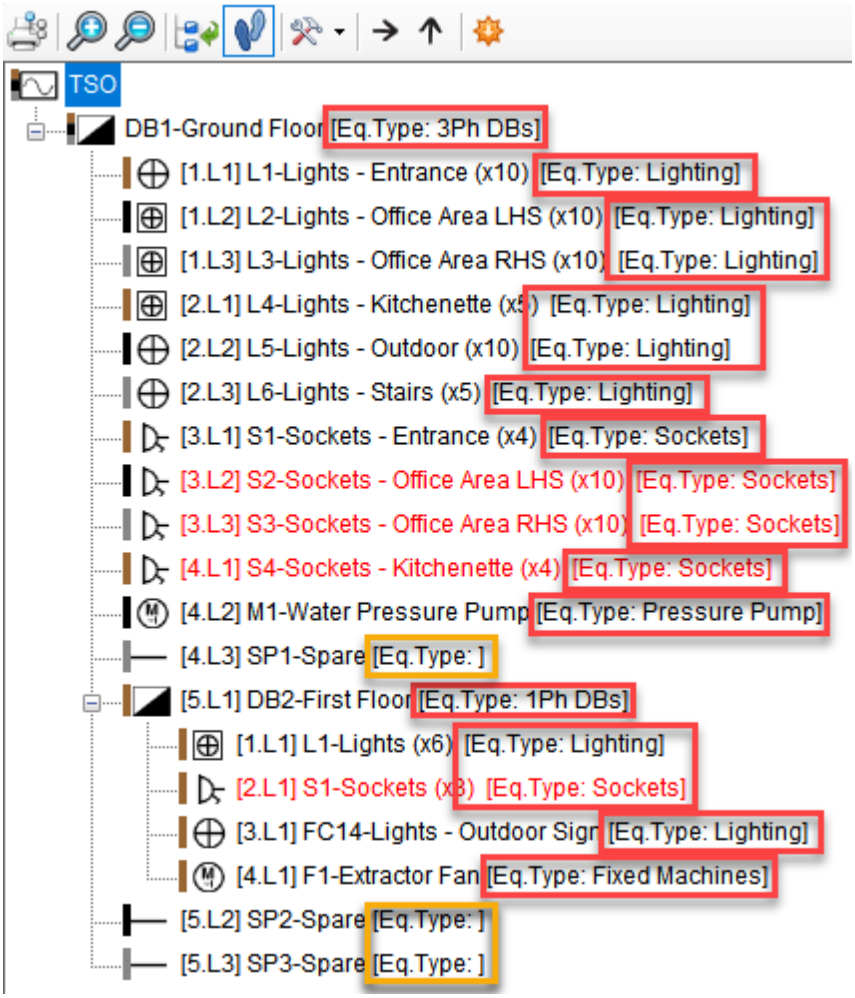
If the circuit is a distribution circuit,only the device at the origin of this circuit will be shown and the incomer device will not be shown.



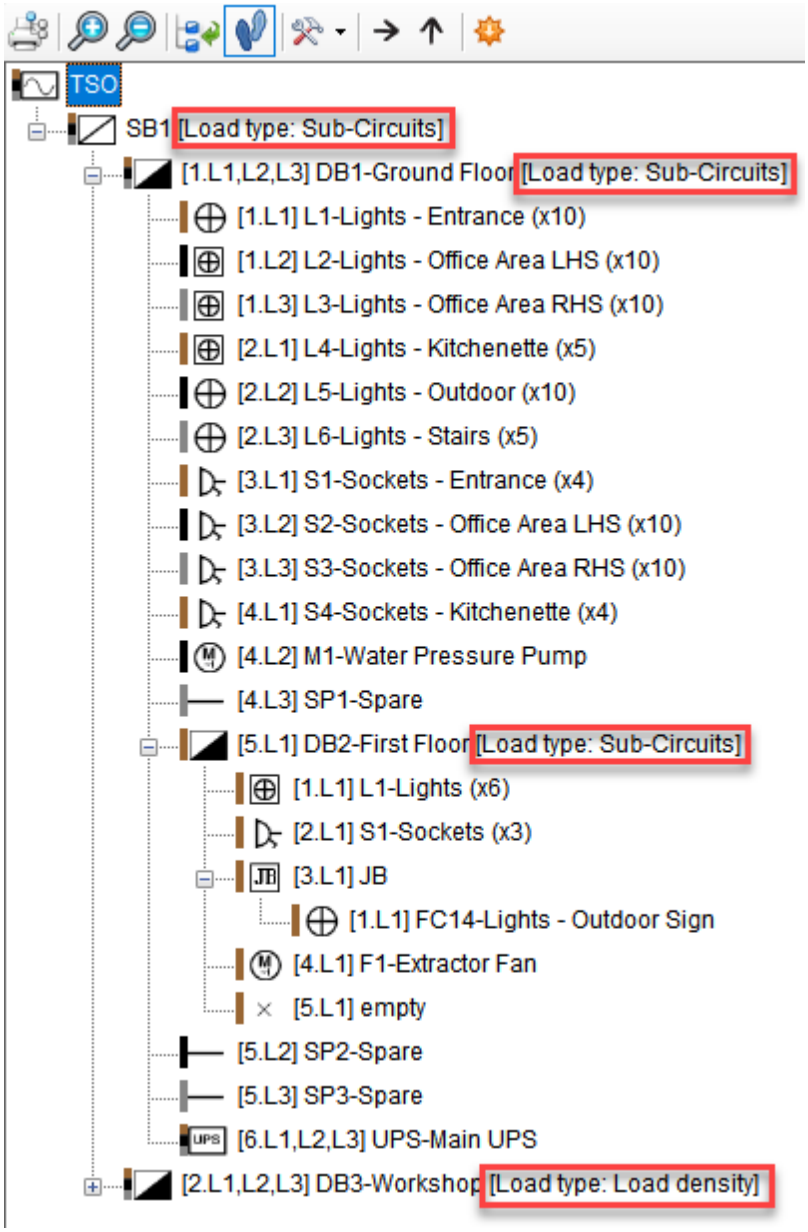
- Show cable sizes: will display the cable information for the circuits after their descriptions in square brackets.



- Show equipment type: will display the equipment type for the circuits after their descriptions in square brackets. If no equipment type is defined, then, no type description will be visible (in yellow below). See Other details Tab for details about equipment types.



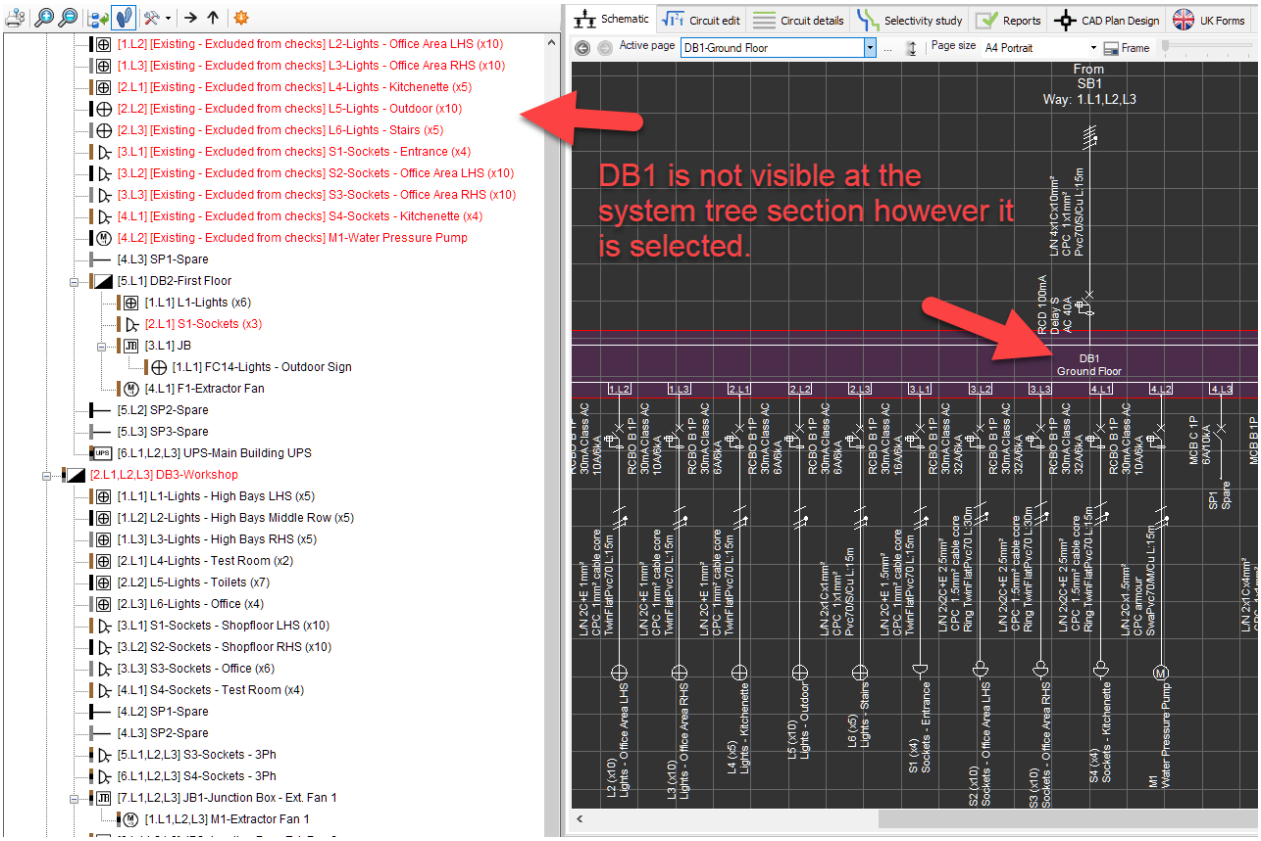
- Show load type: will display the load type for the distribution circuits after their descriptions in square brackets. Load types can be selected from Circuit Edit module.

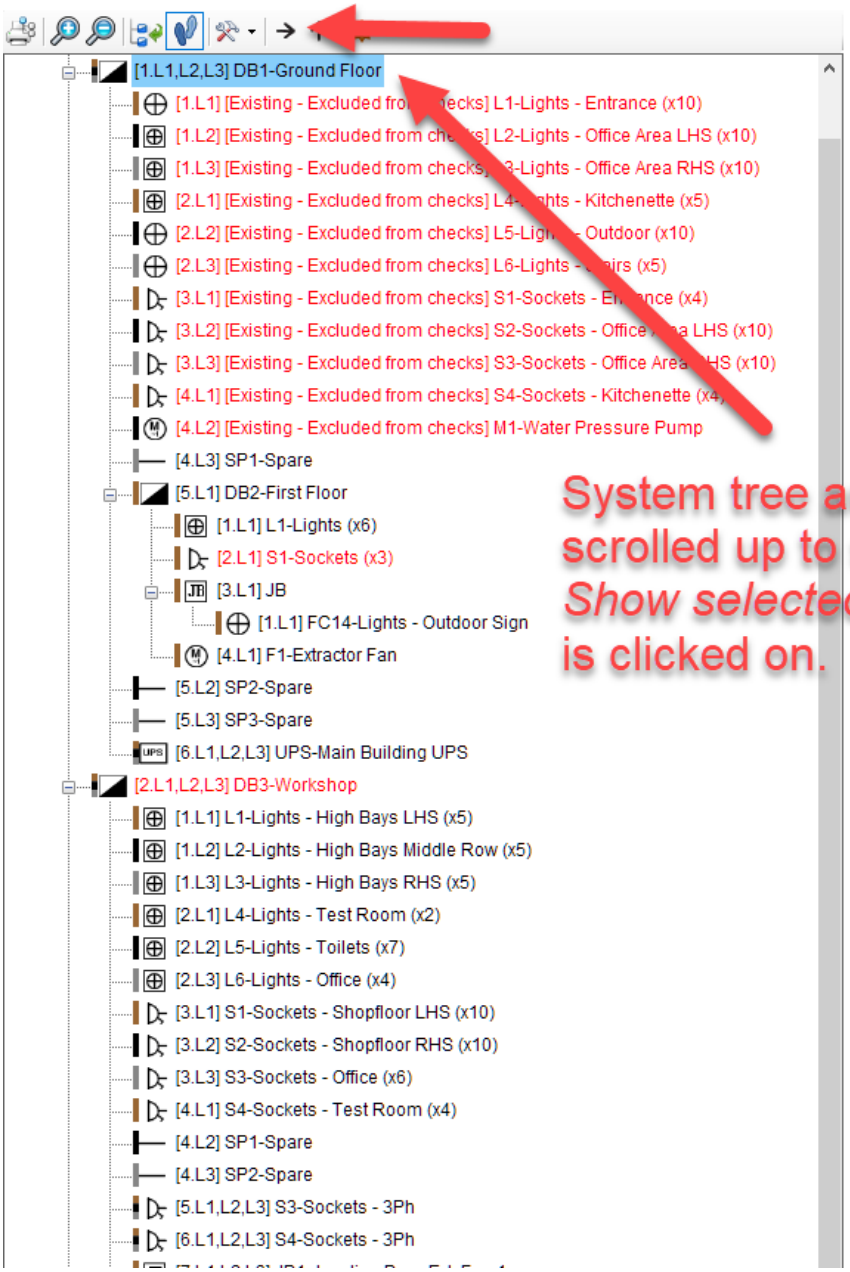


Show selected element

Show selected element

This button will scroll to the currently selected circuit if it is out of the visible area of the System Tree section.

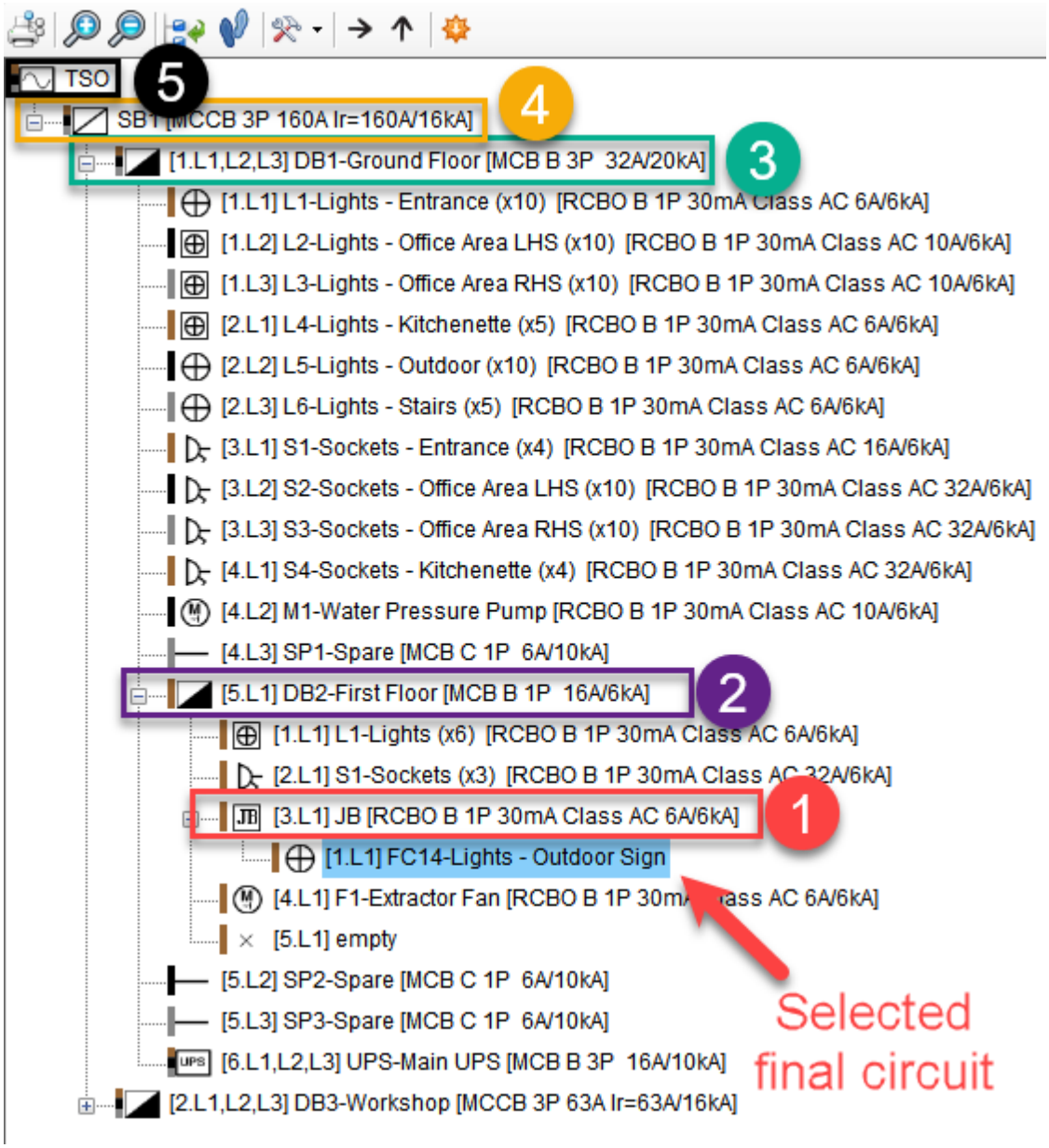

[1.L2] [Existing - Excluded from checks] L2-Lights - Office Area LHS (x10)
[1.L3] [Existing - Excluded from checks] L3-Lights - Office Area RHS (x10)
[2.L1] [Existing - Excluded from checks] L4-Lights - Kitchenette (x5)
[2.L2] [Existing - Excluded from checks] L5-Lights - Outdoor (x10)
[2.L3] [Existing - Excluded from checks] L6-Lights - Stairs (x5)
[3.L1] [Existing - Excluded from checks] S1-Sockets - Entrance (x4)
[3.L2] [Existing - Excluded from checks] S2-Sockets - Office Area LHS (x10)
[3.L3] [Existing - Excluded from checks] S3-Sockets - Office Area RHS (x10)
[4.L1] [Existing - Excluded from checks] S4-Sockets - Kitchenette (x4)
[4.L2] [Existing - Excluded from checks] M1-Water Pressure Pump
[4.L3] SP1-Spare
[5.L1] DB2-First Floor
[1.L1] L1-Lights (x6)
[2.L1] S1-Sockets (x3)
[3.L1] JB
[1.L1] FC14-Lights - Outdoor Sign
[4.L1] F1-Extractor Fan
[5.L2] SP2-Spare
[5.L3] SP3-Spare
[6.L1,L2,L3] UPS-Main Building UPS
[2.L1,L2,L3] DB3-Workshop
[1.L1] L1-Lights - High Bays LHS (x5)
[1.L2] L2-Lights - High Bays Middle Row (x5)
[1.L3] L3-Lights - High Bays RHS (x5)
[2.L1] L4-Lights - Test Room (x2)
[2.L2] L5-Lights - Toilets (x7)
[2.L3] L6-Lights - Office (x4)
[3.L1] S1-Sockets - Shopfloor LHS (x10)
[3.L2] S2-Sockets - Shopfloor RHS (x10)
[3.L3] S3-Sockets - Office (x6)
[4.L1] S4-Sockets - Test Room (x4)
[4.L2] SP1-Spare
[4.L3] SP2-Spare
[5.L1,L2,L3] S3-Sockets - 3Ph
[6.L1,L2,L3] S4-Sockets - 3Ph
[7.L1,L2,L3] JB1-Junction Box - Ext. Fan 1
[1.L1,L2,L3] M1-Extractor Fan 1
DB1 is not visible at the system tree section however it is selected.
Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Forms
Active page
DB1-Ground Floor
Page size
A4 Portrait
Frame
From SB1
Way: 1,L1,L2,L3
DB1
Ground Floor



Select the upstream circuit

Select the upstream circuit

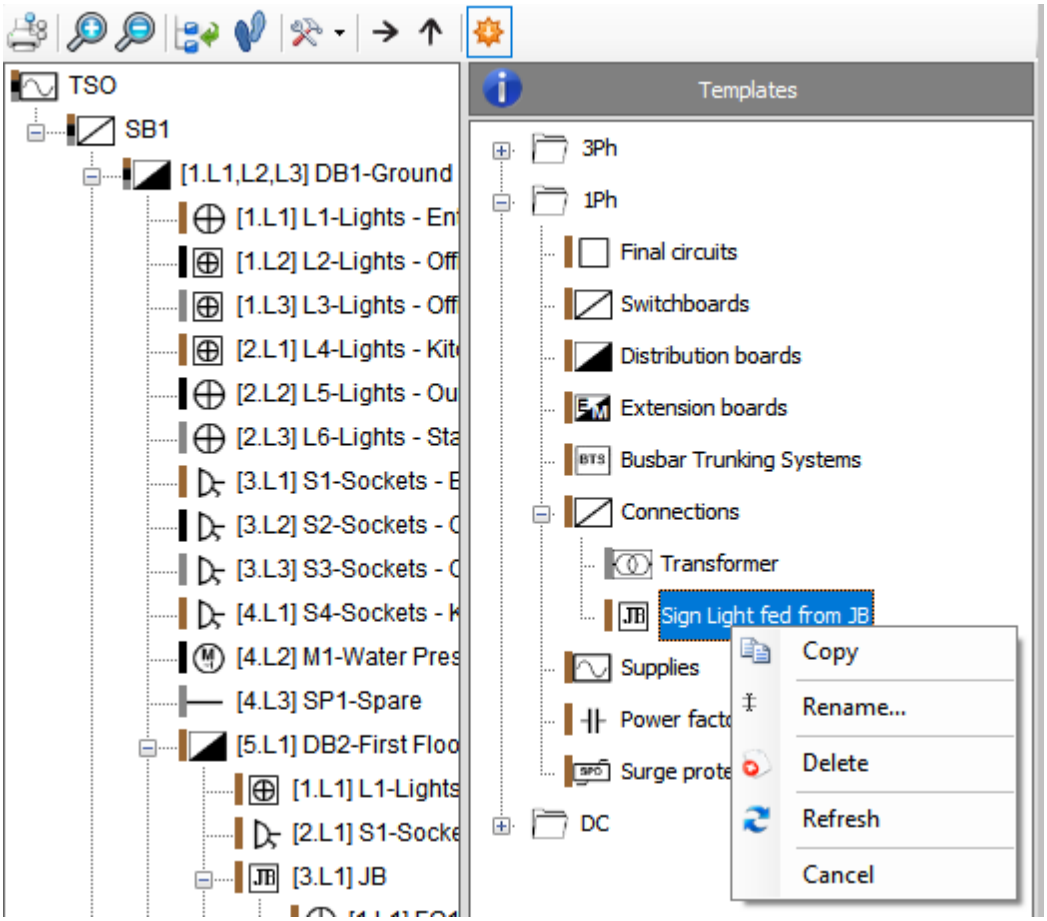
This button navigates to the feeder node of the selected circuit. If the selected circuit is s final circuit fed from a Distribution Board, then. once this button clicked ElectrciaOM will select the distribution board. If the distribution board is fed from a switch board, then clicking to this button for the second time will select the switchboard. This will continue until the source is reached.

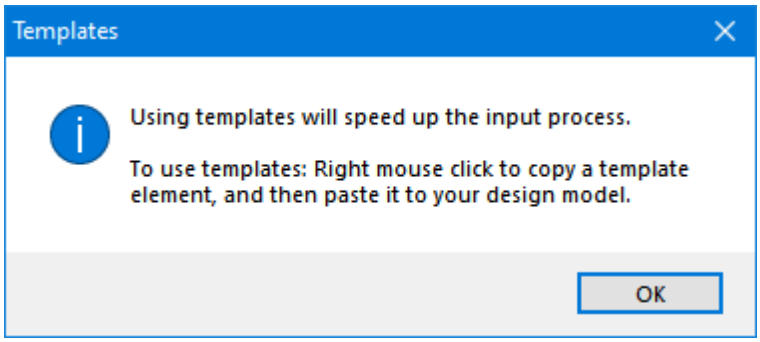


Templates

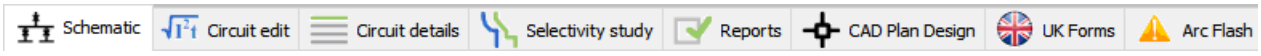
Templates

This button will display a list of templates saved by the user previously. The user can right click on a template and copy to paste it, rename it, delete it, and can also refresh the templates list.



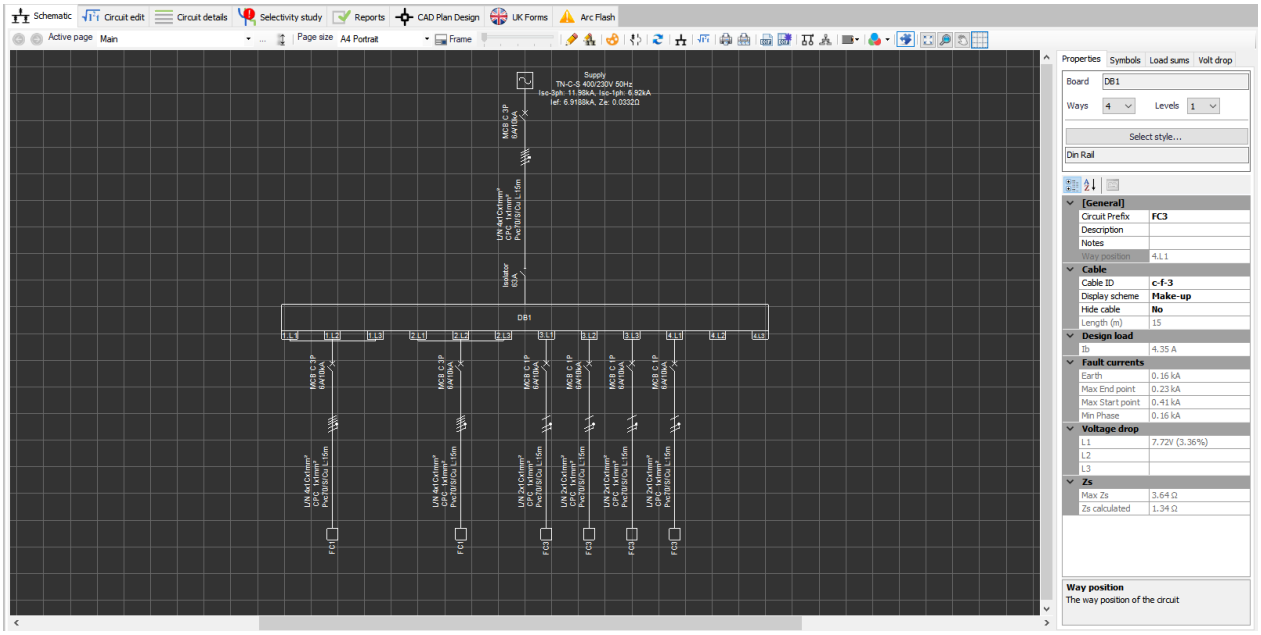


Module Selection Bar

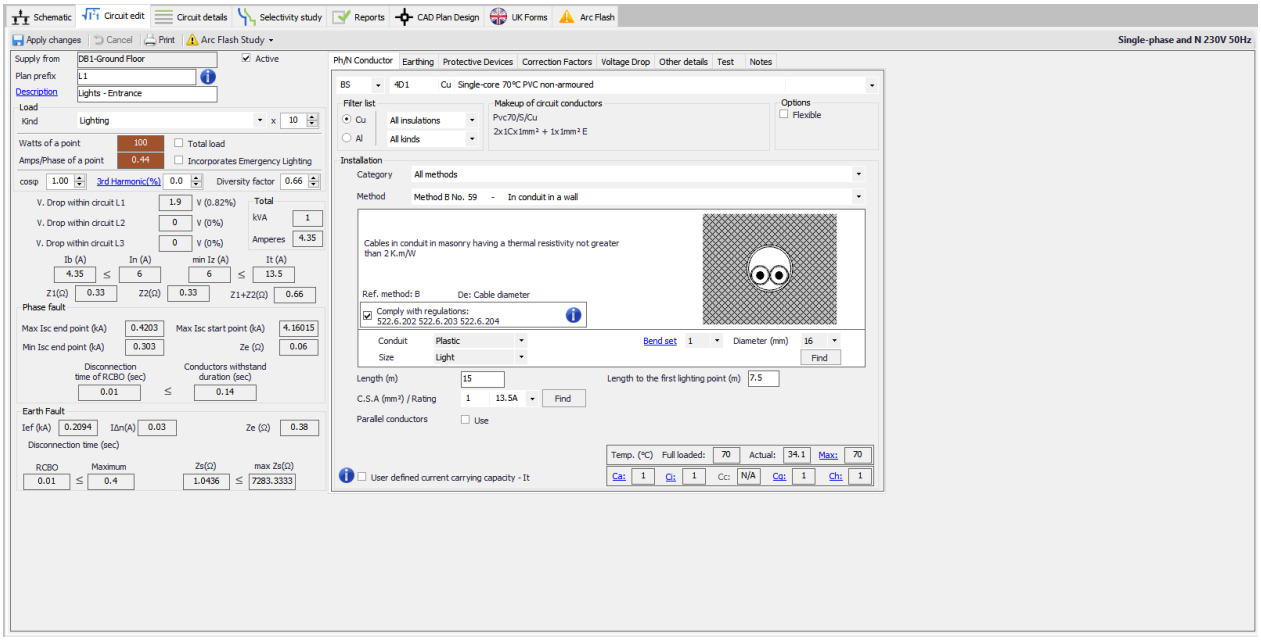


Module Selection Bar contains available module tabs. Available modules will differ depending on your installation and add-on modules purchased, however, all versions will have the first five modules as default. Other modules (CAD Plan Design, UK Forms, Arc Flash) will be discussed in their own sections, please refer to related sections for these modules.

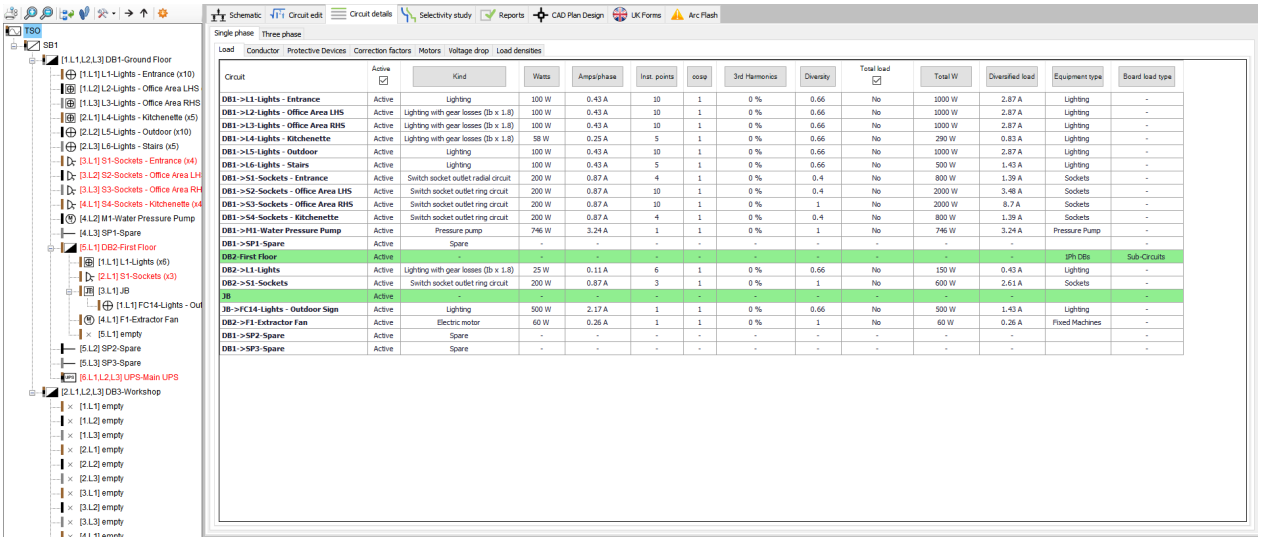
- **Schematic:** This module is mainly used to display the designed system similar to a wiring schematic, which will be consist of switchboards, distribution boards, circuit breakers, cables, etc.



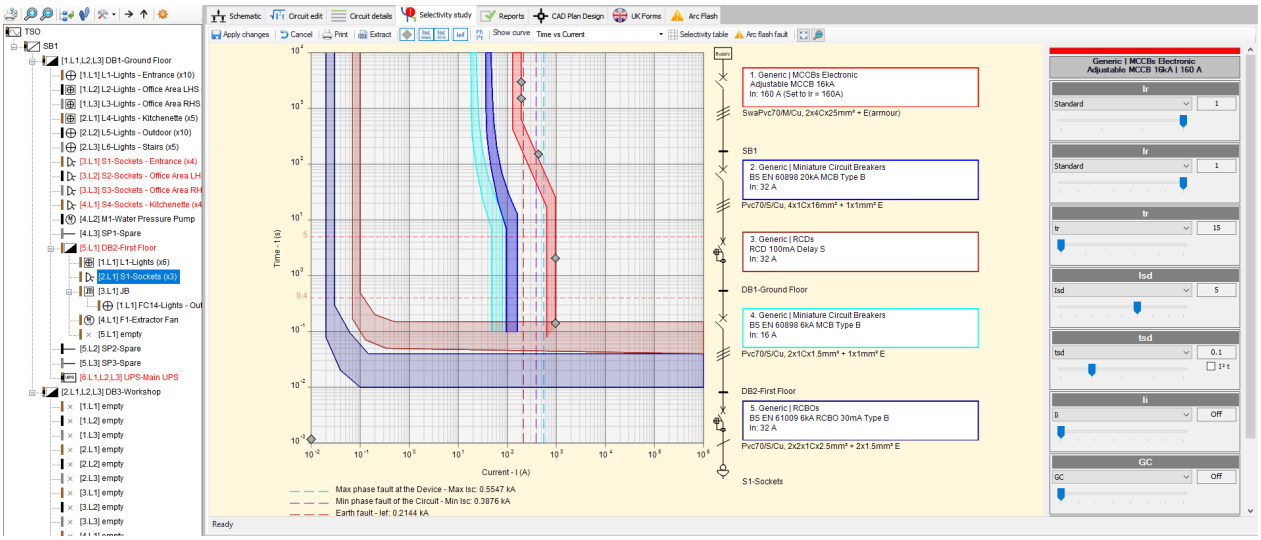
- **Circuit edit:** This module is the main module which the user will mostly interact. It is divided into two sections which one if them is mainly reserved for calculated values such as voltage drop, design current value, disconnection time, etc. where the other section is mainly used to set circuit variables according to the design criteria.



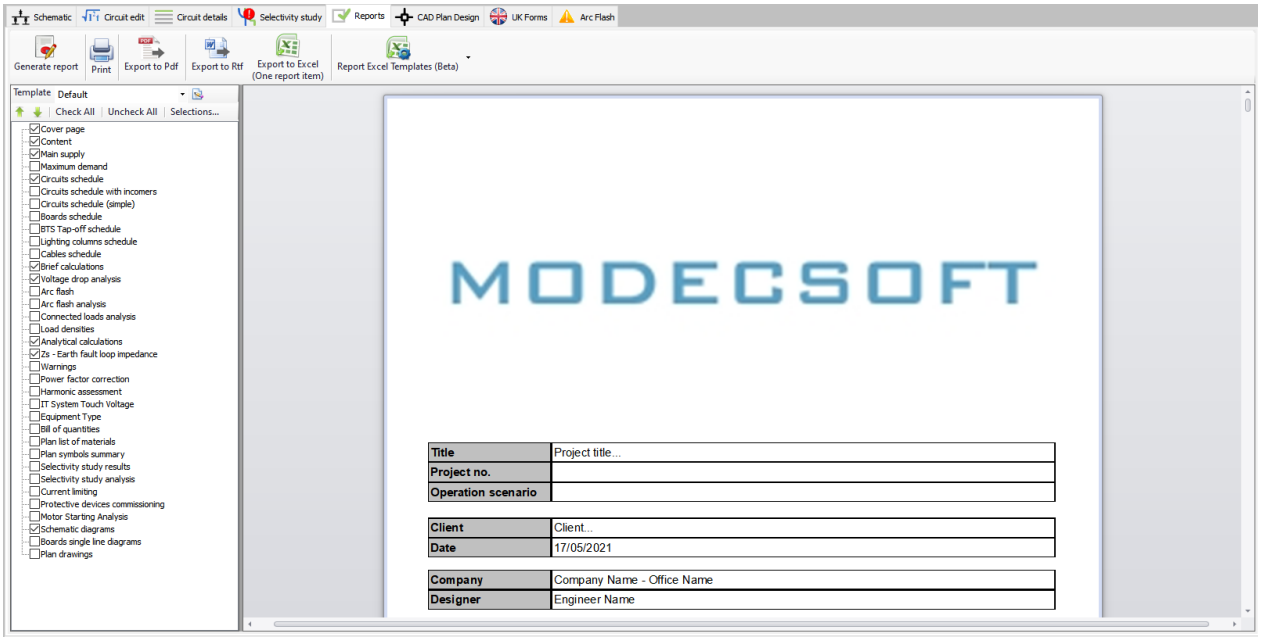
- **Circuit details:** This module is similar to a spreadsheet format and it is used to list various components of a selected circuit. It works in conjunction with the System Tree Section in terms of selection of the circuits and also has several tabs that can be selected depending of the filtering criterion.



- **Selectivity study:** The selectivity of used protective devices can be seen as a visual representation at the main screen of this module. It also lets the user to modify settings of a protective device if it is available. Selection works in conjunction with the System Tree Section.

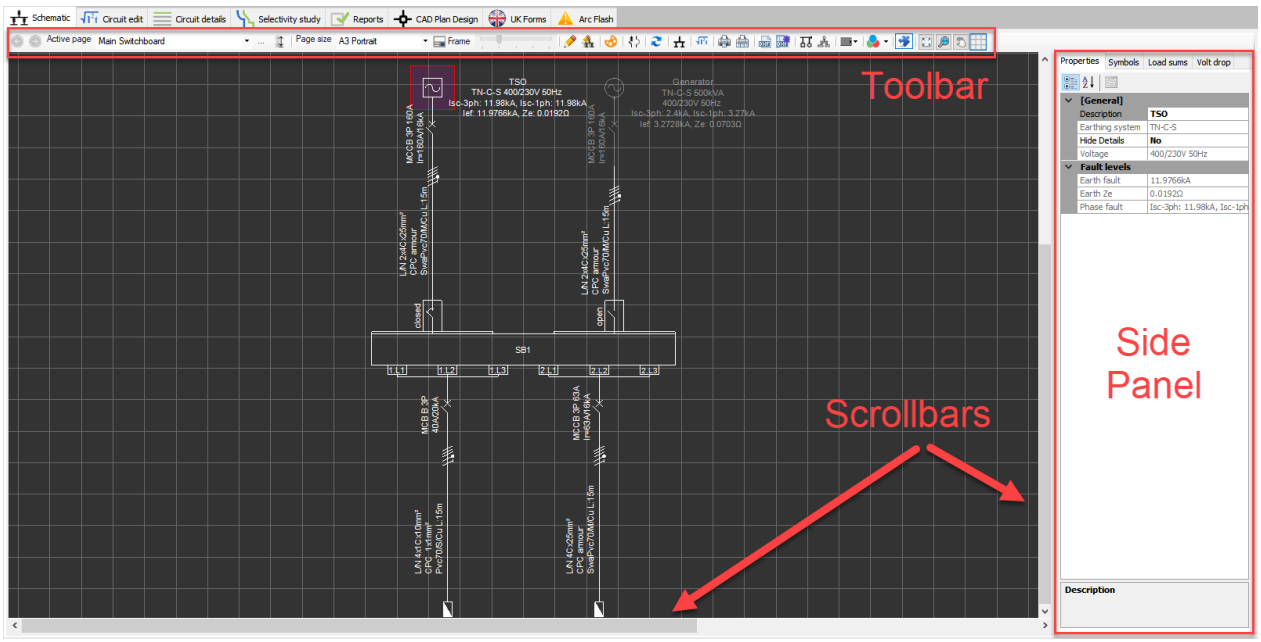


- **Reports:** Reports module is the part of ElectricalOM where the users can generate reports according to the requirements. This module has a panel where the user can select which reports are required.



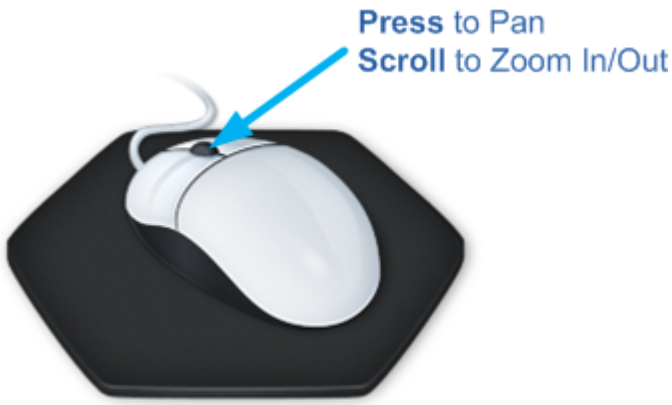
Schematic Module Tab

This module is mainly used to display the designed system similar to a wiring schematic Even though some interaction with the user still exist, drawing action is mainly automated, and it is dictated by the user's selections and input data. Apart from that, components can be selected from the module's main screen. Schematic module consists of a drawing area, a toolbar, scrollbars, and a side panel each having their own functions and features.

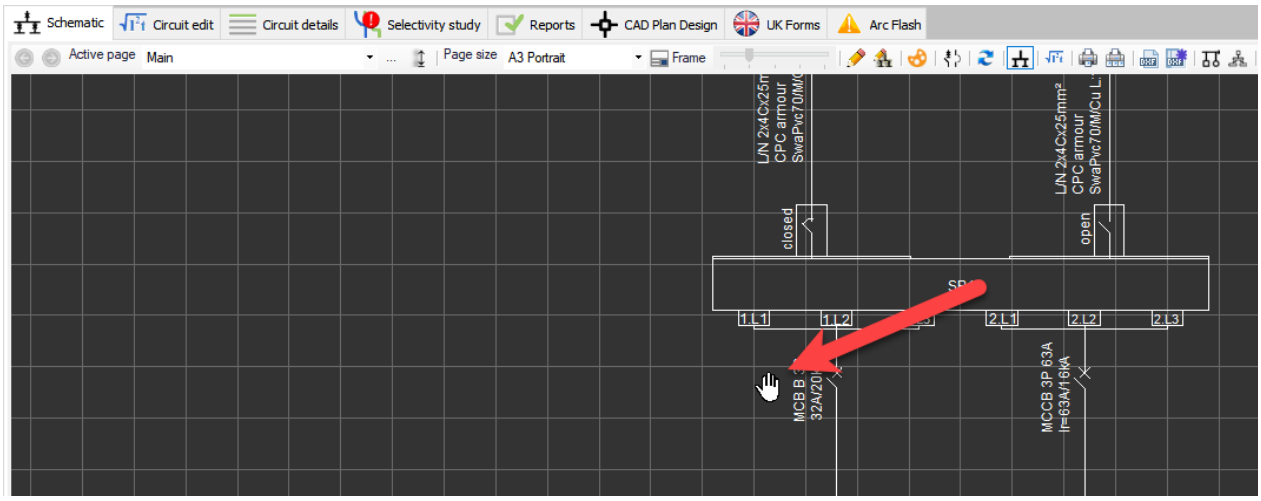


Drawing area is similar to any CAD software in terms of navigating around the schematic. Scroll bars, located at the bottom and right hand side of the drawing area, are used to navigate around the schematic. Mouse wheel can also be used for panning but also for zooming in or out. When the mouse wheel is rotated, the view will be zoomed in or out where the direction is determined by the users system settings. If the

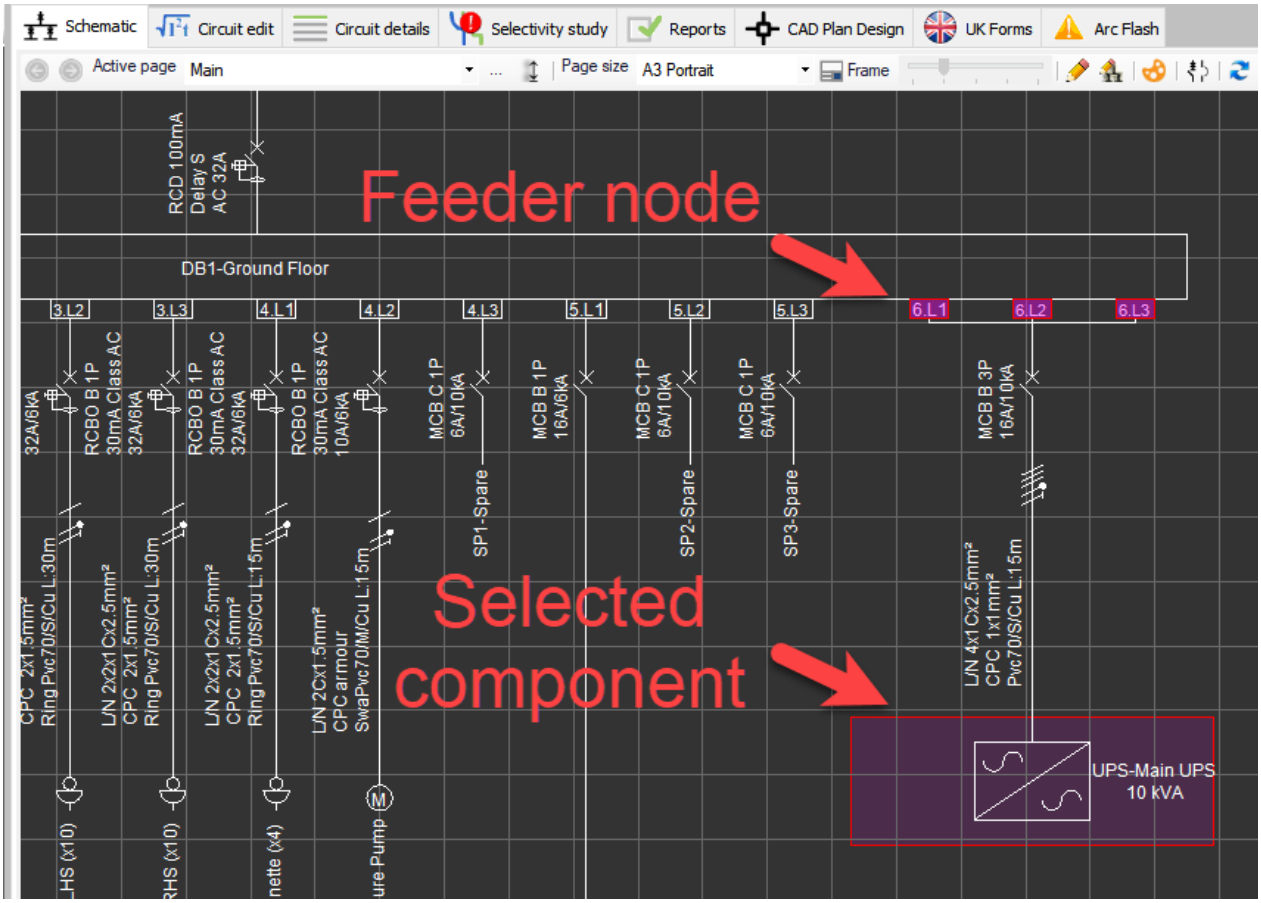
mouse wheel is double clicked, the view will be zoomed out or in to drawings extends.



Zoom In action is location sensitive which means ElectricalOM will try to zoom in towards where the mouse pointer is located. When the wheel is pressed and hold, the mouse pointer will be displayed as a hand and the pan action will be activated. As long as the mouse wheel is kept pressed, moving the mouse will cause the schematic to move with the mouse pointer.

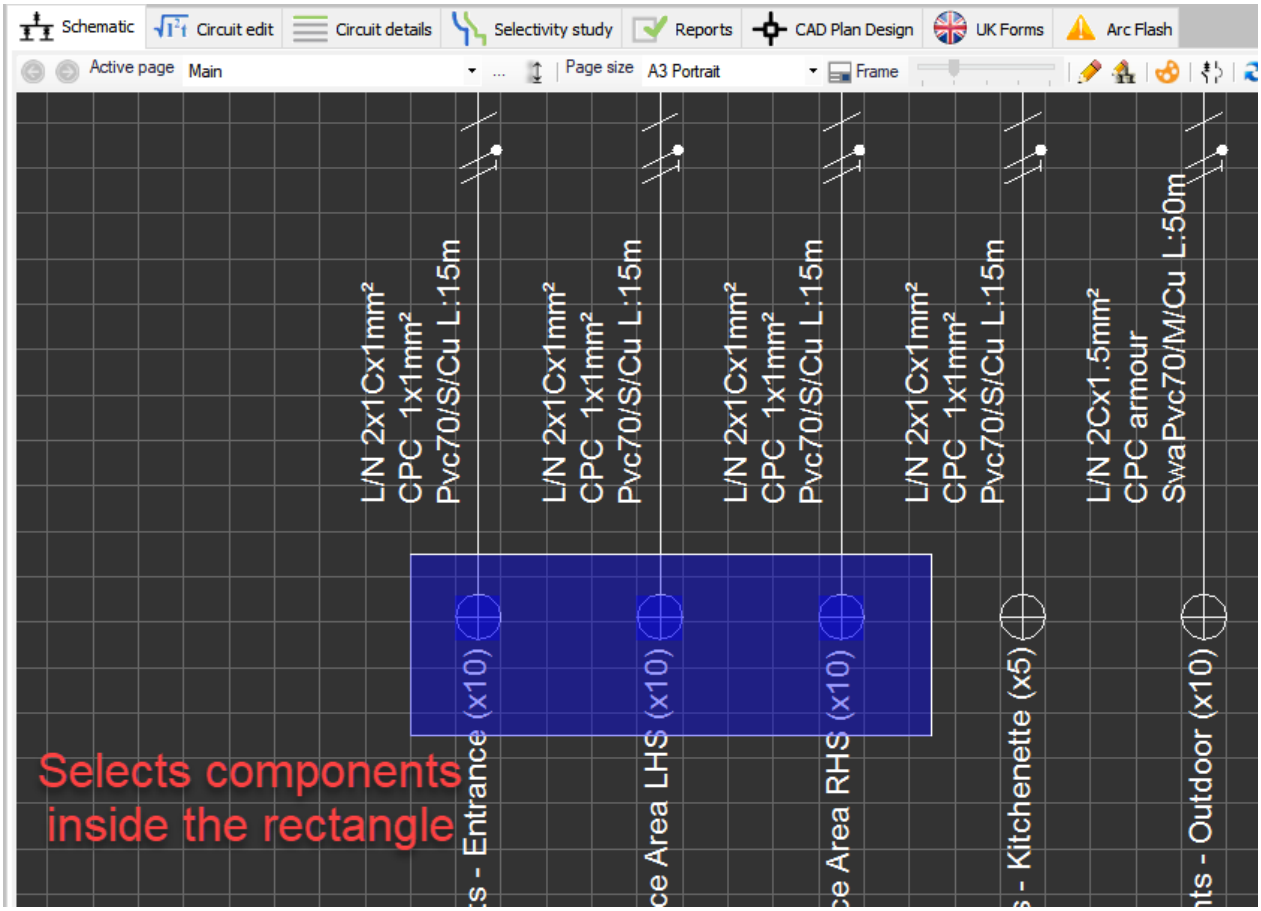


User can select components by using the left button of the mouse. When a component is selected, ElectricalOM will highlight the selected component with a red rectangle filled with purple colour. Selecting a component will include the related circuit as well, so, the feeder node will also be selected.

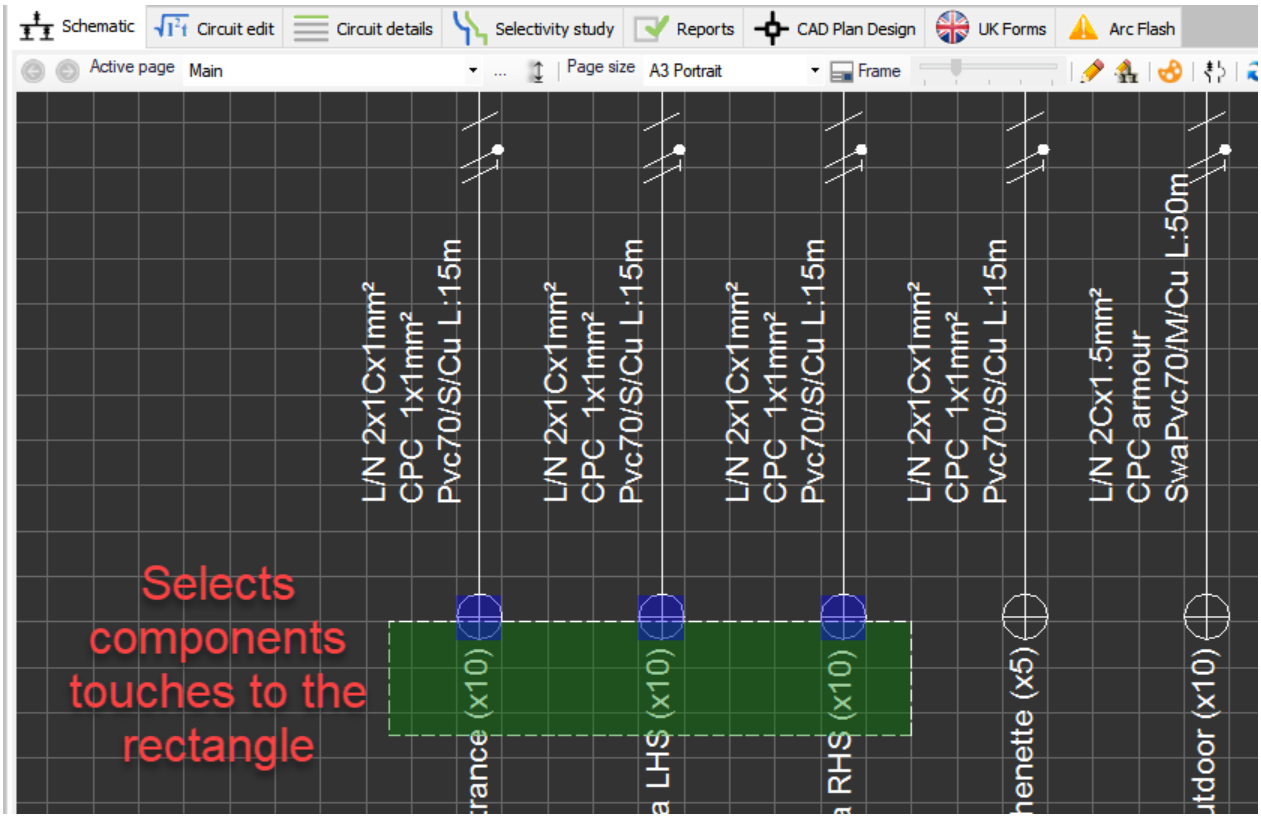


If the *Zoom to selection* option is enabled (see System Tree Section) then selecting a component from the system tree will cause the drawing area of the Schematic module to navigate to the selected component if it is not in view.

Multiple selection is also available (It should be mentioned that multiple selection in not available at the system tree area.). There are two ways to select multiple components, extending the selection area towards left or right. Left-extended selection will select the components inside the square only, where right extended selection will select any component which is touched by the rectangle. ElectricalOM will represent left-extended selection by a rectangle with white solid border line and blue fill in colour. Selected components will be highlighted with blue.



ElectricalOM will represent right-extended selection by a rectangle with white dashed border line and green fill in colour.



Schematic Module Toolbar

ElectricalOM's Schematic Module toolbar provides various options to format the layout and format of the designed system, add data tables to the drawings, modify the drawing in some extend, an so on.

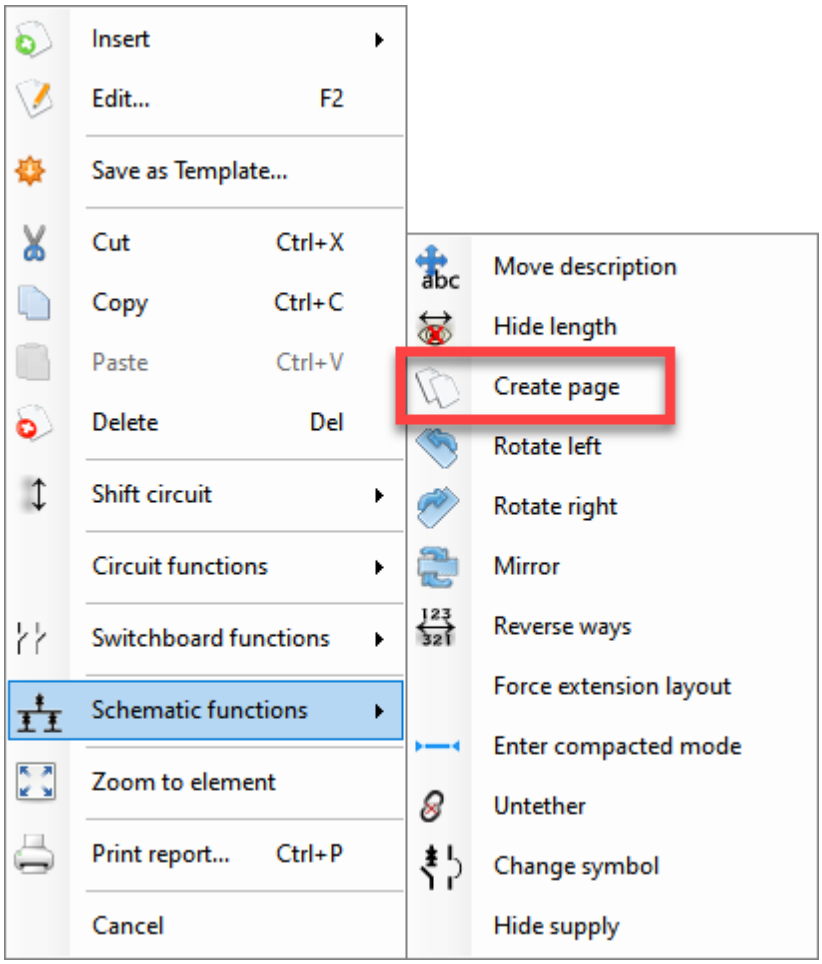
The toolbar consists of (from left to right):

- Active page arrows
- Active Page drop-down list
- Page details and Frame style
- Reorder pages
- Page size drop-down list
- Frame
- Frame size slider
- Drawing Mode
- Draw on Entity Mode
- Palette options
- Default Symbols
- Refresh Layout
- Auto Layout Mode
- Show Calculations
- Print Page
- Print With Settings
- Export active page
- Export Selected Pages
- Distribution Circuits Single Line Diagram
- Distribution Circuits Layout
- Cable Schedules
- Colouring Method
- Show/Hide Side Panel
- Zoom All
- Zoom Window
- Pan
- Grid On/Off

Creating multiple sheets and Setting a Custom Page Size

Creating multiple sheets

ElectricalOM lets the user to create multiple sheets and move parts of the design to these sheets. It is essential to know that each sheet has to have a distribution node associated with it, otherwise ElectrcialOM will not make this option available to the user. So, to create a new sheet, *Create page* option is used which is available at the Schematic Function menu.



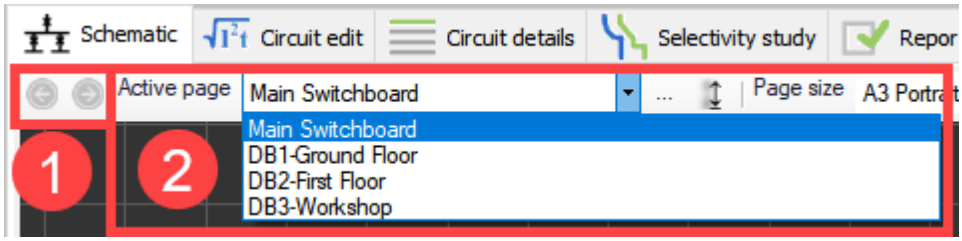
ElectricalOM will move the selected distribution node to a new sheet once the *Create page* is selected. If the user wants to move the distribution node back to the original sheet, the intended distribution node needs to be selected prior to accessing to the Schematic functions menu. This time ElectricalOM will display a *Restore page* option instead of *Create page*. If Restore page is clicked then the selected distribution node will be moved back to its original sheet and the sheet previously created to accommodate the distribution node will be removed.

Navigation between the sheets is available in two ways: *history recall buttons* and *Active page* drop down list.

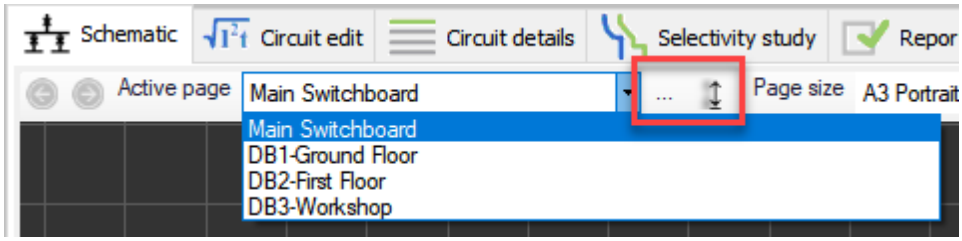
1. History recall buttons will let the user to navigate the doc set in the order of the sheets are accessed by the user. So, a sheet viewed by the user before the active sheet will be displayed once the reverse arrow button is clicked, for example. Originally they are greyed out, but as soon as the user navigates to a

sheet other than the sheet which has the active source on it, they become available.

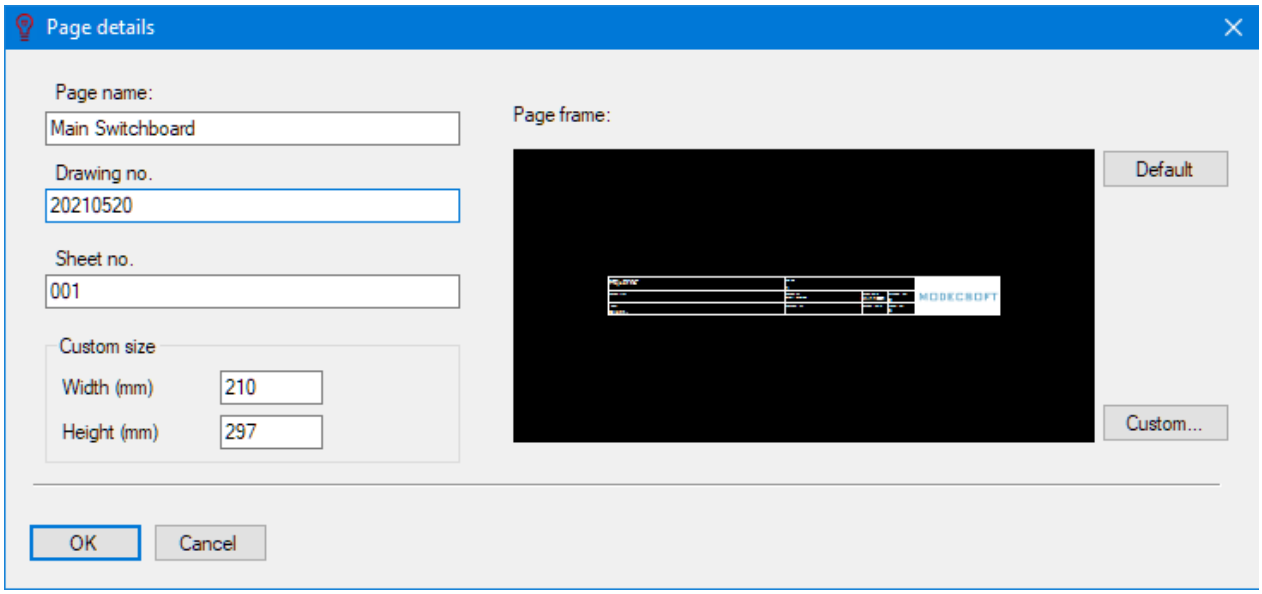
2. The Active page list is the primary way of navigation through the doc set. User can navigate any of the sheets displayed on the list by clicking on the name of the sheet.



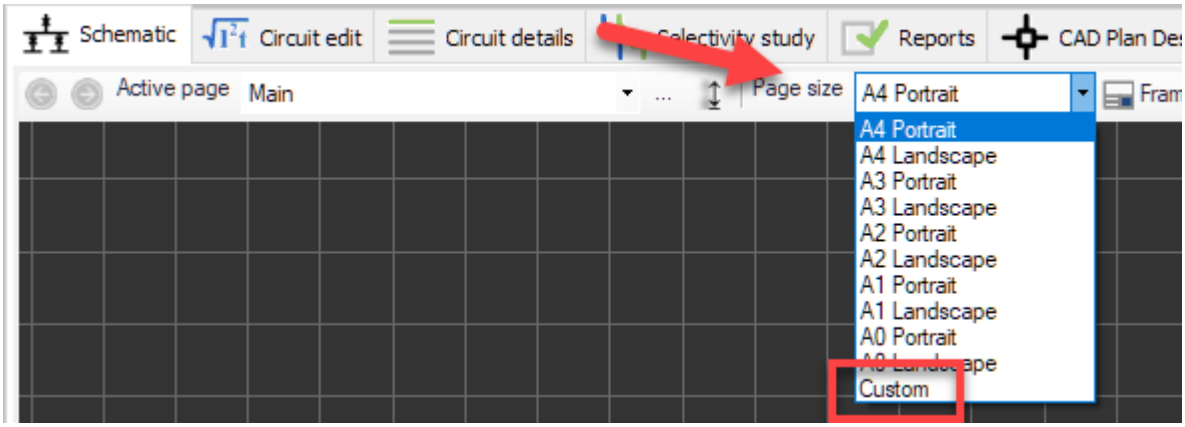
There are also two more option that can be used to modify the doc set. One is the *Page details* button which is represented by three dots and the other one is the *Reorder pages* button which is represented by a vertical two way arrow.



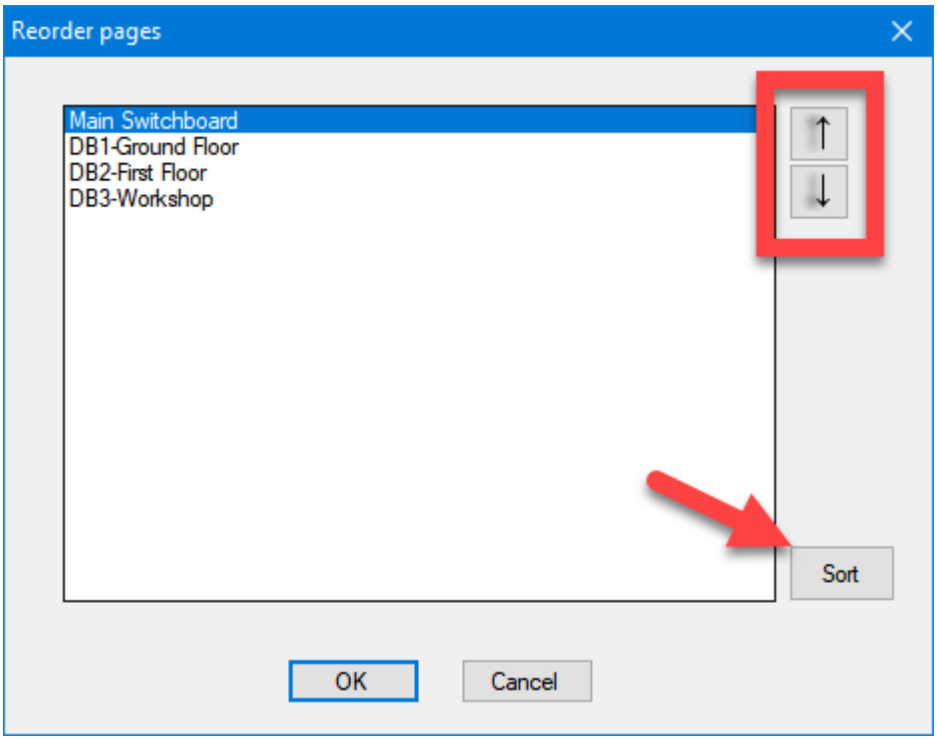
Page details button will display a window where the user can define a name, a drawing number, a sheet number, a custom page size, and a frame for the active sheet. *OK* button must be clicked to save changes.



Custom size option lets the user to define a custom page size for the active page and it only applied if the user selects *Custom* option from the *Page size* list, otherwise it does not have an affect.



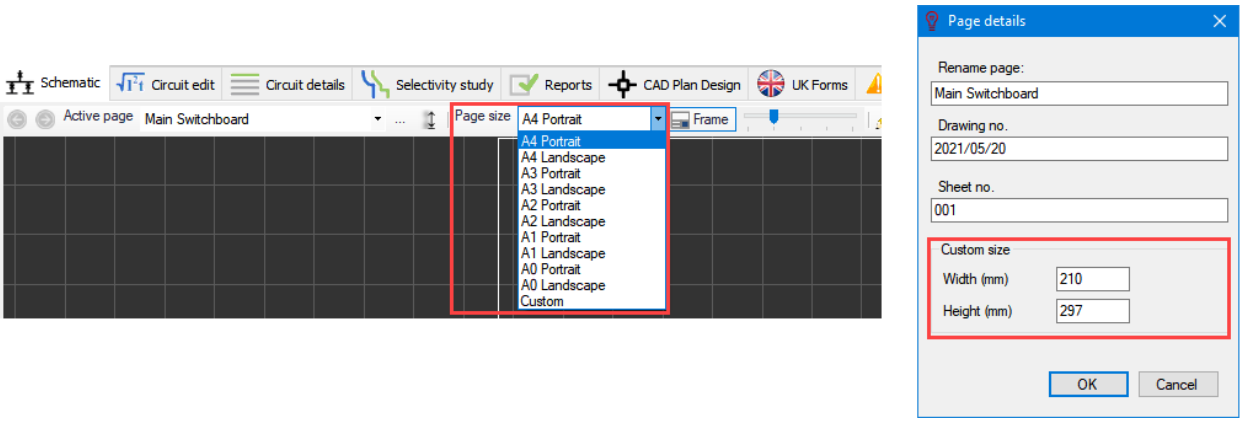
Page frame section, which is located on the right hand side of the window, lets the user to define a frame for the current page, see Enabling The Frame. Default button sets the default ElectricalOM frame as active but the user may wish to select a custom frame using the *Custom...* button which will initiate the *Custom Frame Library*. For further details about custom frames, please refer to Predefined Frame Section.
Reorder pages button will call the Reorder pages menu. User can rearrange the order of the sheets using the up and down arrows on the right hand size. In order to move a sheet up or down, the sheet in interest must be selected before using up or down buttons, this will be indicated by highlighting the sheet's name with blue by ElectricalOM. The sheets can also be arranged in alphabetical order using the *Sort* button. *OK* button must be clicked to save changes.



Setting a custom page size

A page size can be selected using the *Page size* drop down list. ElectricalOM provides standard sizes of A0, A1, A2, A3, and A4 with landscape and portrait orientation options as well as a custom option which the

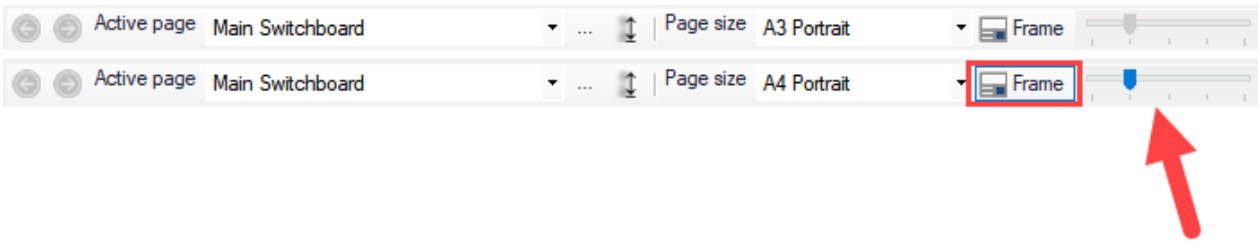
used can define a custom size. Defining a custom size is discussed above.



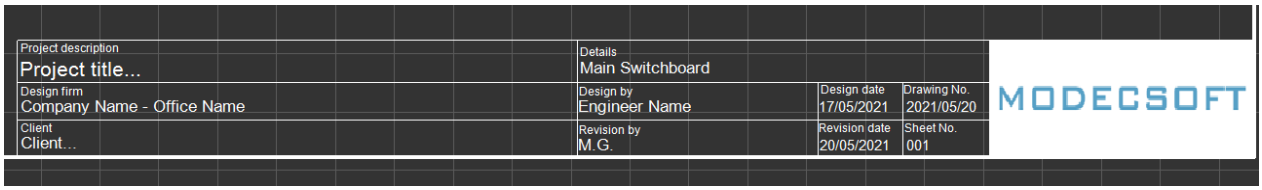
Enabling The Frame

Enabling the frame

ElectricalOM lets the user to add a frame to the schematics which also accommodates the title block. *Frame* button is used to display or hide the frame, and the frame size and orientation can be modified using the slider next to the *Frame* button. When the Frame is enabled, the Frame button will be highlighted with a blue rectangle round it and the slider will be activated indicated by blue colour. Depending on the page setting, the frame will also switch to landscape or portrait orientation. Slider will re-scale the frame keeping the page size the same, which might be helpful when trying to fit the whole screen to a set page size.



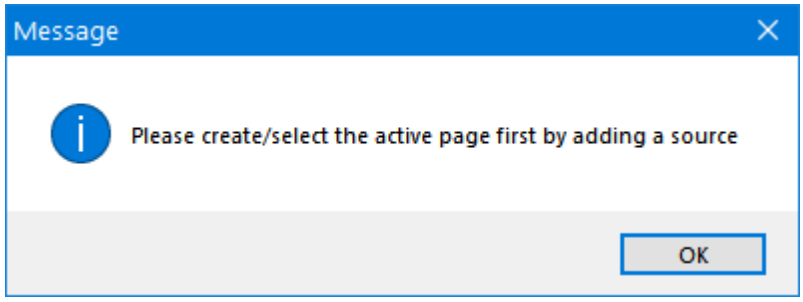
As mentioned above, the frame also accommodate the title block located at the lower right corner of the frame. The data displayed on the title block is gathered from both the *Page details*, see above, and the *Project info* tab, please refer to Project info and options... Menu.



For custom frames, please see Predefined Frame Section.

Manual Drawing Modes

ElectricalOM provides a manual drawing mode if there is a need to add something on the schedules. Drawing modes can only be activated if there is an existing source, if there is no existing source then ElectrcialOM will warn the user with a pop up window.

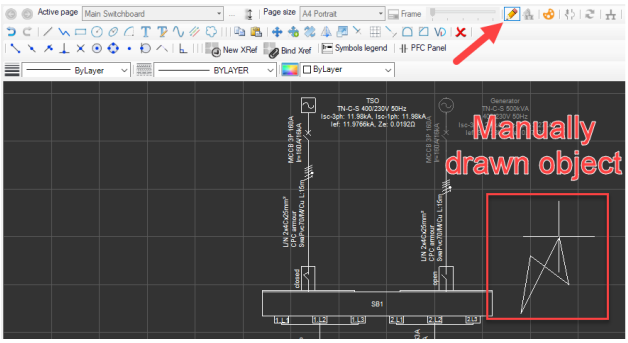


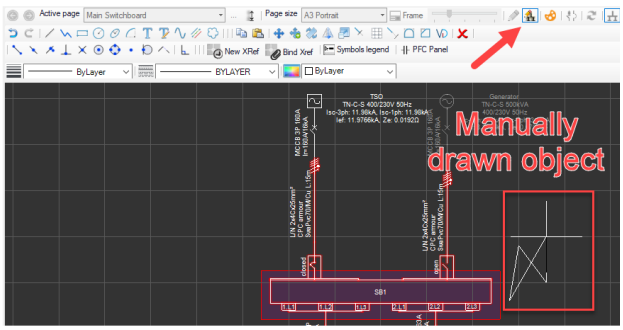
Two types of drawing modes are available depending o the intended purpose:

- *Drawing Mode,* and,
- *Drawing mode on entity*

The buttons associated with the drawing modes work like a ON/OFF switches and once click they will activate the related modes until clicked on again which will deactivate the drawing mode. Both *Drawing mode* and *Drawing mode on entity* will display additional toolbars and a command bar when activated.
The difference between the two modes:

- *Drawing mode* will save the manually drawn objects at the location where they are drawn and they become non-movable. Only way to move these manually drawn objects is again via the *Drawing mode*.
- *Drawing mode on entity* requires the user to select a component beforehand and will associate the manually drawn object with this selected component. Associated component will be highlighted by a red rectangle with purple fill colour. This drawing mode will move the manually drawn object together with its associated component.

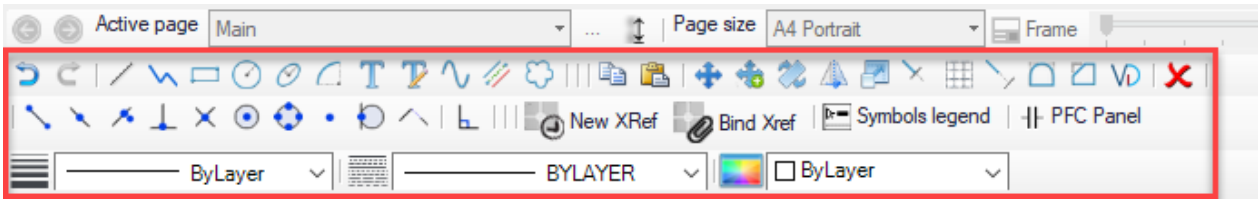


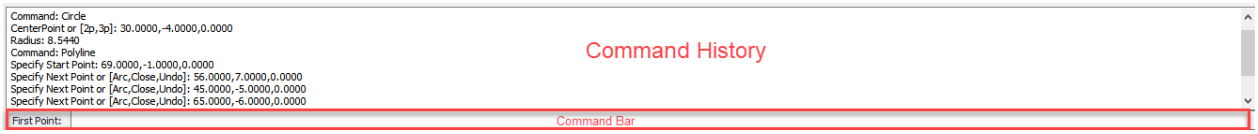


If the user wants to modify a manually added object, it can be done so by activating the same drawing mode used while drawing it.

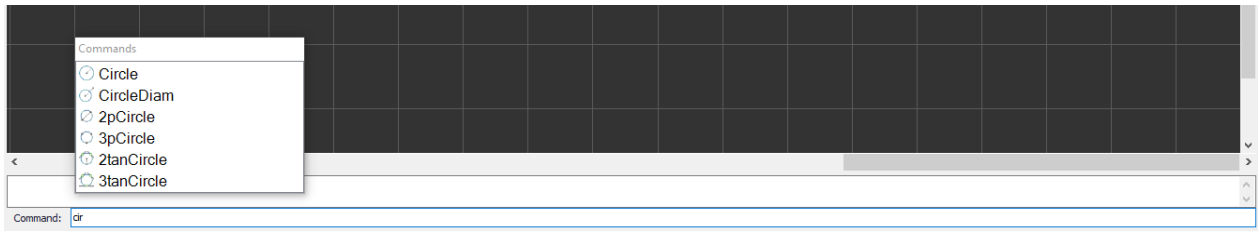
Drawing Mode Toolbars and Command Bar

When a drawing mode is activated, three additional toolbars at the top of the drawing area and a command bar at the bottom of the drawing area will be displayed.





Any command can be initiated from the toolbars as well as from the command bar by typing in commands. As the user types in, ElectricalOM will suggest commands by a dynamic pop up list. Double clicking on an option or selecting it (the option will be highlighted by blue colour) by either up/down arrow keys or by left mouse button following Enter key will initiate the command.

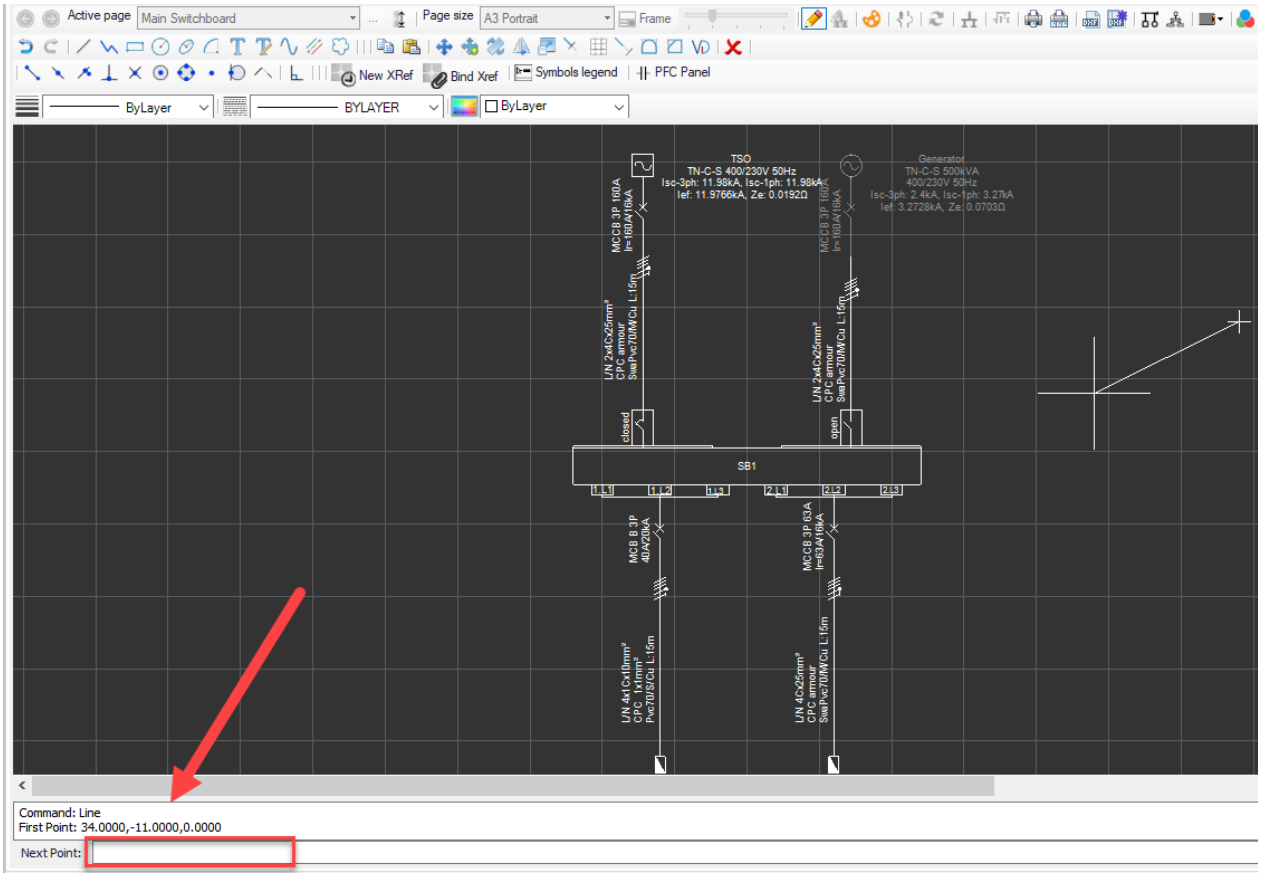


For detailed descriptions of toolbars please refer to following sections.

Top toolbar

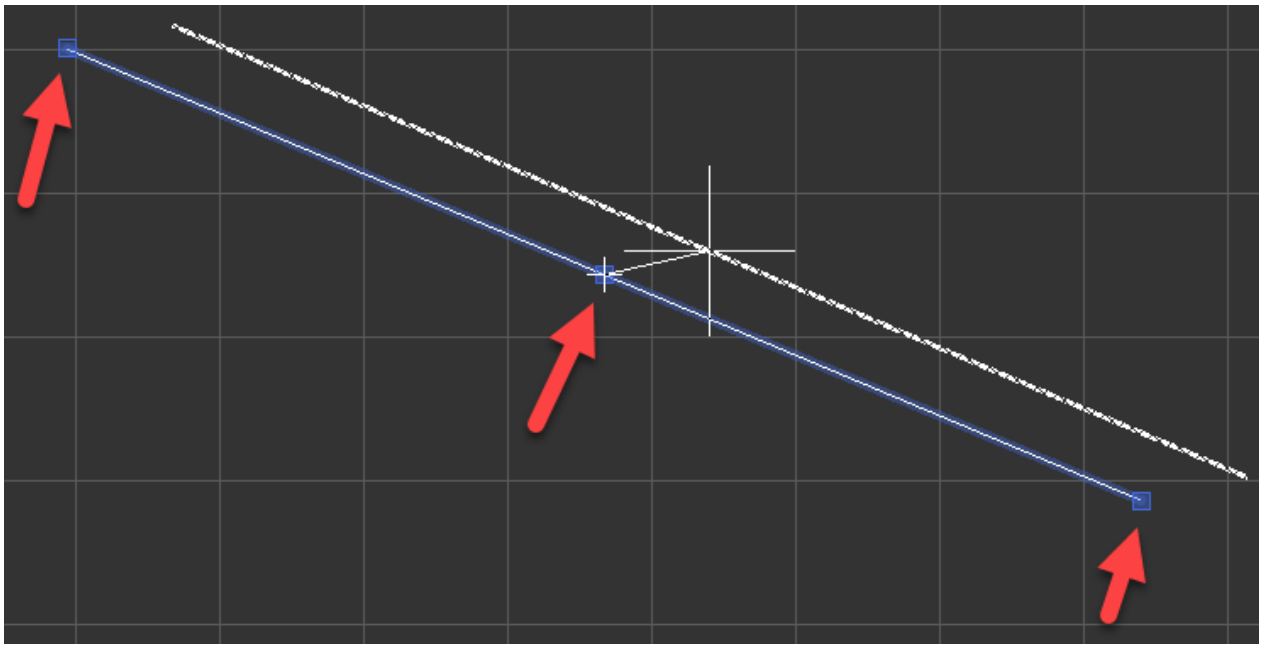
Top toolbar consists of:

- Undo/Redo: These will reverse the action of an earlier action/restores an action previously undone.
- Draw line: This will let the user to draw a line. First left click will mark the start point of the line where a second left click will mark the end point. This action is continuous and ElectricalOM will continue drawing lines connected to the previously drawn line. Right click or Esc key will stop the drawing action. Points can also be defined by using the command line below the drawing area. The point format is set as X,Y,Z coordinates separated by a comma where Z coordinates will be ignored within the Schematic module.

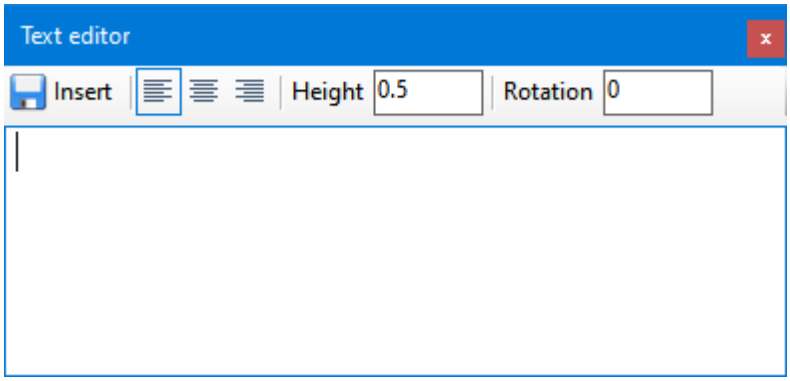


After the first line is drawn, *Undo* option, and after the second line is drawn, *Close* option will be available to the user. Typing *Undo* will cause the cursor to move to the previous point without drawing a line. *Close* command will tell ElectricalOM to close the shape by drawing a line between the first point and the last point.

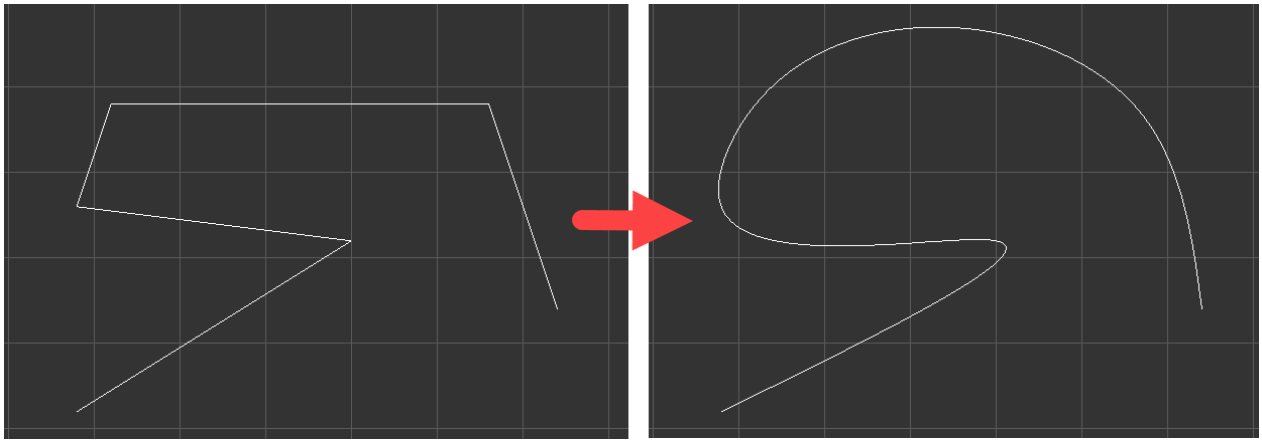
When a line is selected catch points will be displayed, as blue squares, which the user may click on them and modify the line. End points will deform the line where the mid catch point will move the line with the mouse cursor. The catch points are also available for every item.



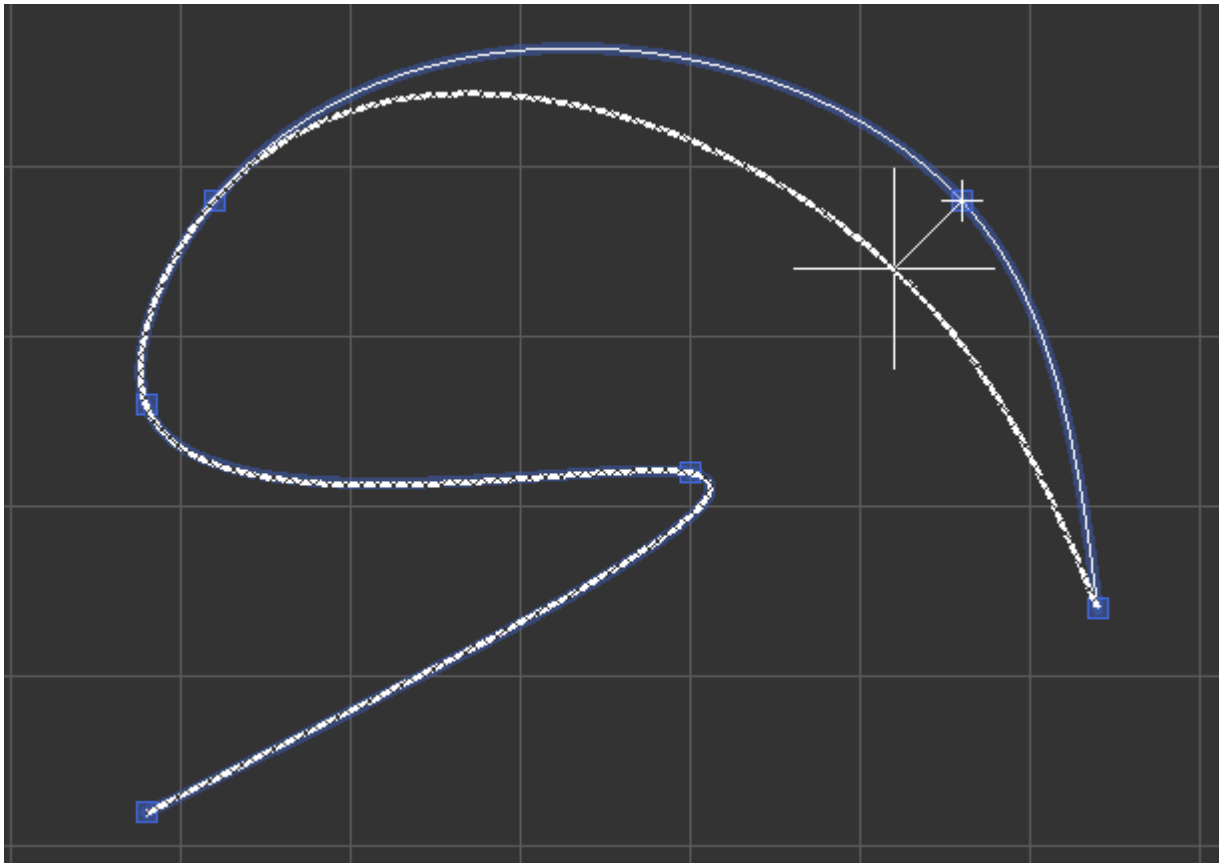
- Draw polyline: This option is used to draw a polyline. Drawing a polyline is similar to drawing lines but the final shape will be considered as a single item by ElectricalOM unlike lines drawn one after the other where each line will be considered as individual items.
- Draw rectangle: This option is used to draw a rectangle. Start and end points can also be defined by typing in the coordinates into the *Command* area.
- Draw circle: A circle can be drawn by three ways. Centre point, 2 point, and 3 point. Centre point is the default option and it requires the user to select a point or type in a coordinate to represent the centre point of the circle, and then, defining the radius by typing the required value in to command bar, or clicking to a point with left mouse button within the drawing area. 2 point and 3 point options are simply the idea of specifying 2 or 3 points of a circle.
- Draw ellipse. This option is used to draw an ellipse. The first point will decide the centre point of the ellipse. The second point will represent the co-vertex of the ellipse. Then, the user must either click on the point which will represent the major axis distance or simply type in the value to the command bar.
- Draw arc: Drawing an arc can be done in three ways, centre point, and two types of 3 point. Centre point option requires a centre point, a radius, and a start angle to be specified, then, the cursor will draw a circle from the selected start angle. 3 point option has two versions, 3p and E3p. Both of the options requires the user to specify two points which represent
- Add text: will add a text to the schematics without using a text editor. Once this button is clicked, user must specify an insertion point and then a text height. Once these two parameter is specified, then the user can type in desired text. Right mouse button will end the session.
- Add text via Text editor: will display the *Text editor* window where the user can type in. Once desired text is formatted, then insert button must be clicked to close Text editor windows and return back to the drawing area where the user will specify the location of the text.



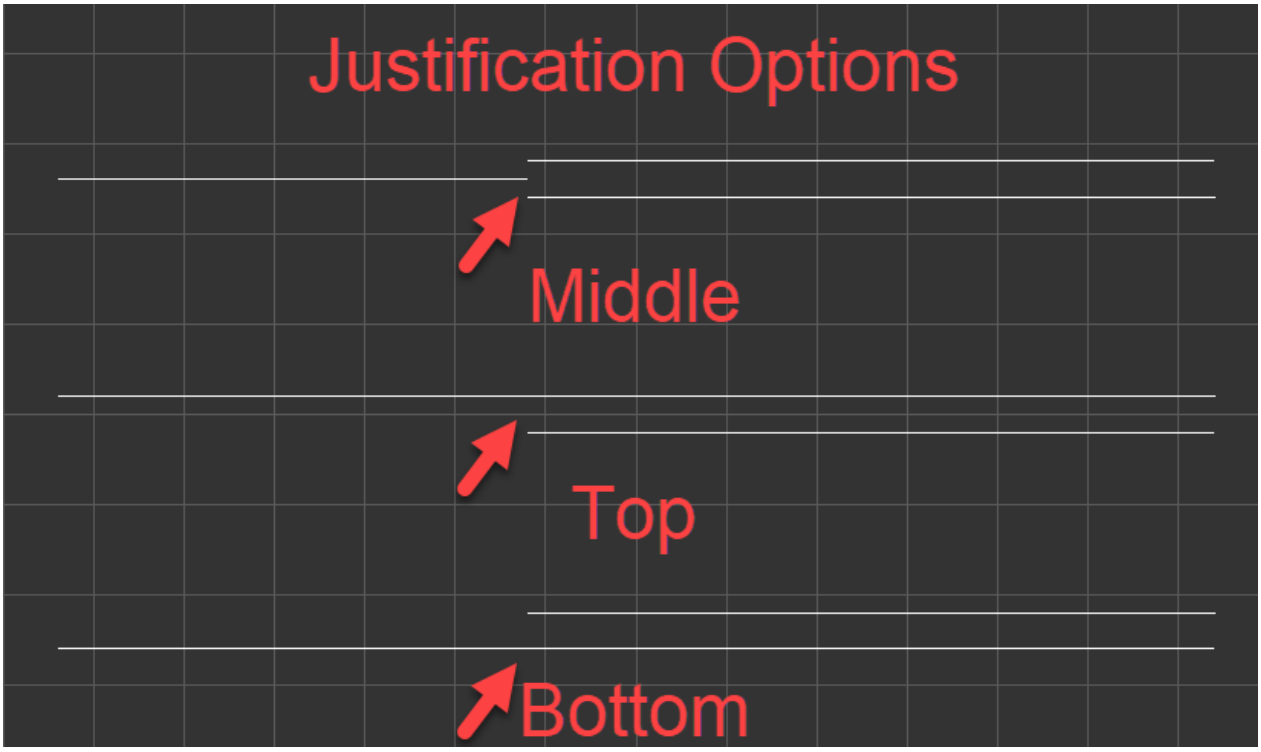
- Draw curved polyline (spline): This option is very similar to a polyline, but at the end it will smooth the lines to form a spline.



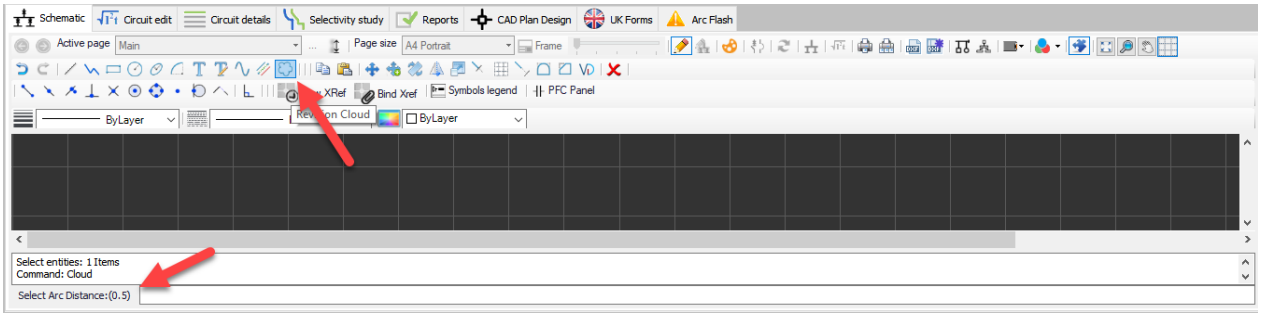
When selected, the catch points will be displayed (as squares), so, the user can modify the shape by dragging these points.



- Draw multiline: is very similar to a polyline but it draws two lines at the same time. There are three settings associated with multiline: Justification, Scale and Style. Justification indicates which line is taken as the reference. If this is set to *Top* then the top line is the reference, if *Bottom* is set then the bottom line is the reference, and if *Middle* is set then the reference is takes an the middle of the two lines.



- Draw revision cloud: Revision cloud is simply selecting a start point and tracing an area the user wishes. The only parameter that can be set is the arc length and this must be specified before the first point is selected.



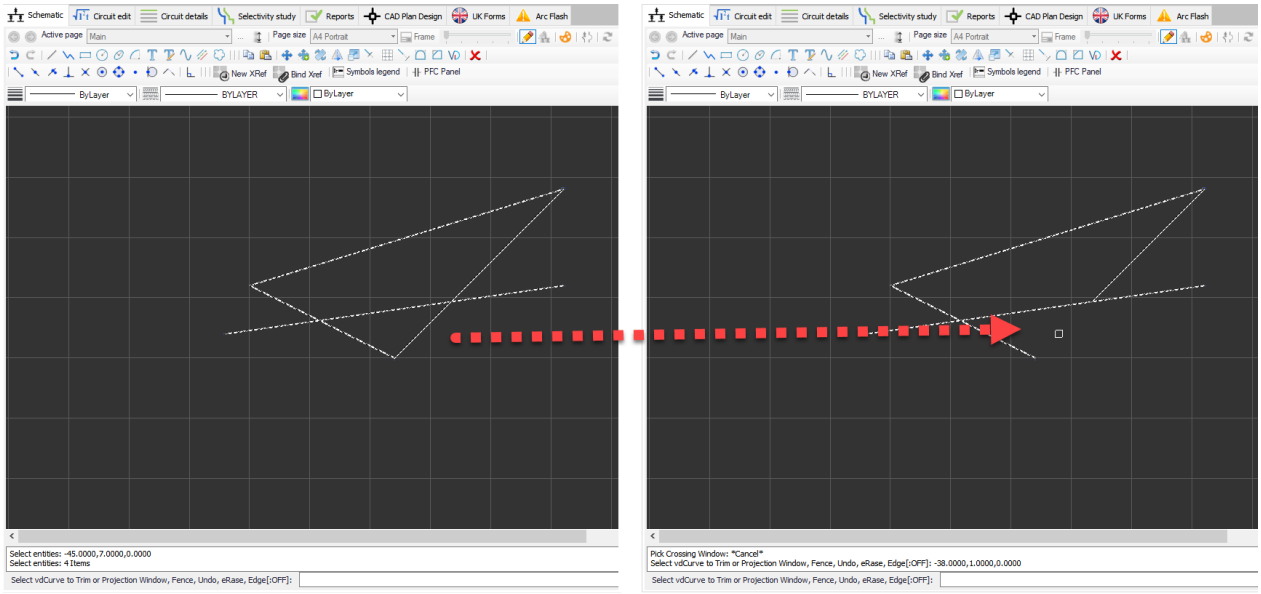
- Copy/Paste: These two options are very generic and they are used to copy and paste an object. The user must select an object before copying.
- Move: This will move the selected object to another location. The user must select an object before moving.
- Move Copy: This is similar to copying and pasting an object with a single click. The user must select an object before using this command.
- Rotate: Rotate option is used to rotate an object or group of objects. Objects can be selected prior to clicking on *Rotate* button or after the first click on *Rotate* button. If no object is selected prior to the first click, after the first click required objects must be selected following either pressing the right mouse button or Enter key on the keyboard to initiate rotate action.
- Mirror: Mirror option will create a mirror image of selected objects. Similar to rotate, object can be

selected before or after the *Mirror* button click.

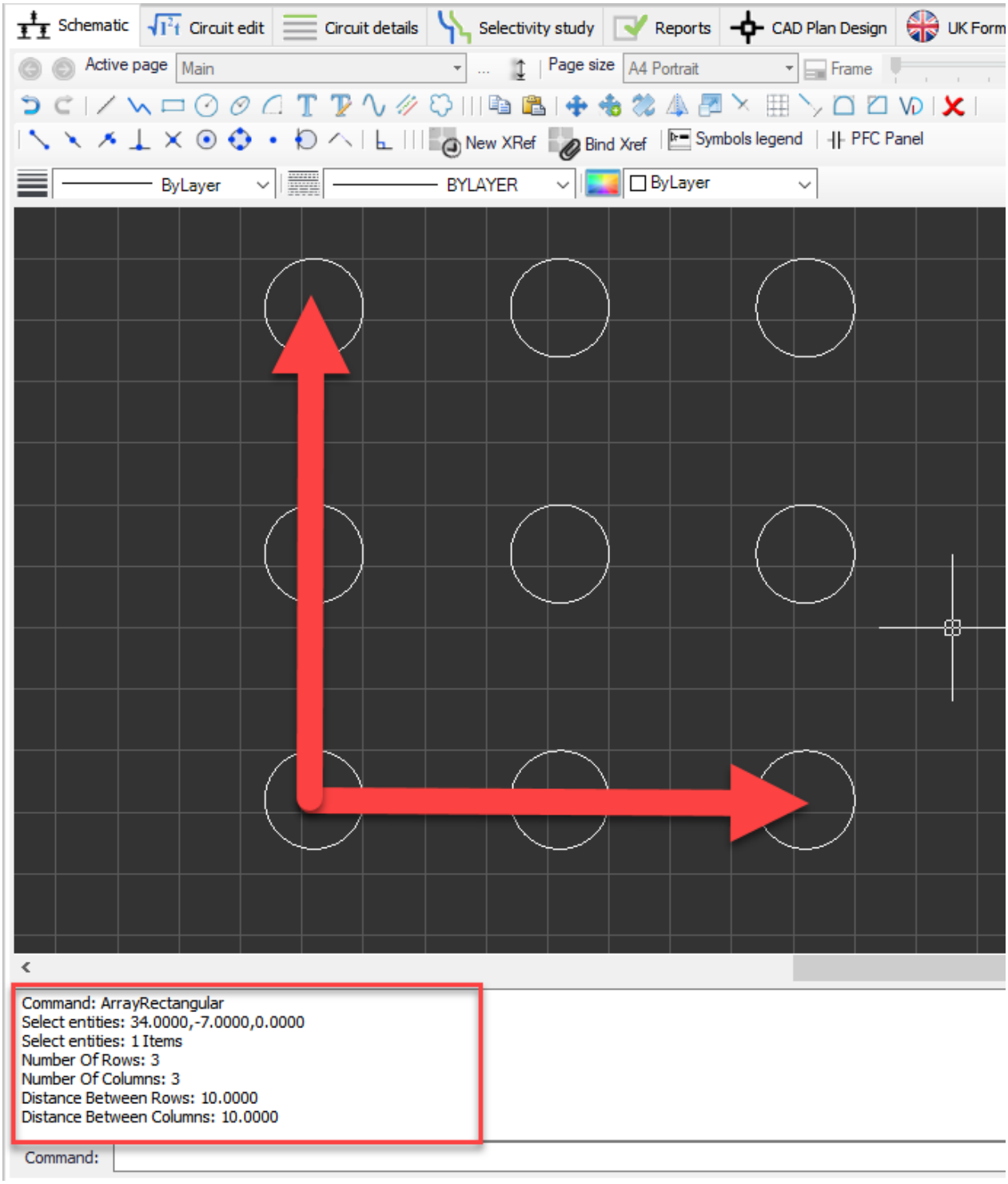
- Scale: Scale option will scale the selected objects according to a value either typed in to the command bar or with mouse clicks. A scale value can be entered after the selection of object directly to the command bar.
- Trim: Trim will remove the objects which meet the edges of other objects. In order to trim an object, two ways can be followed.

  First, the user selects all the objects and then clicks *Trim* button, then, selects the part which will required to be trimmed.

  Second, the user clicks on *Trim* button, then, selects all the objects and clicks right mouse button, then, selects the part which will required to be trimmed.



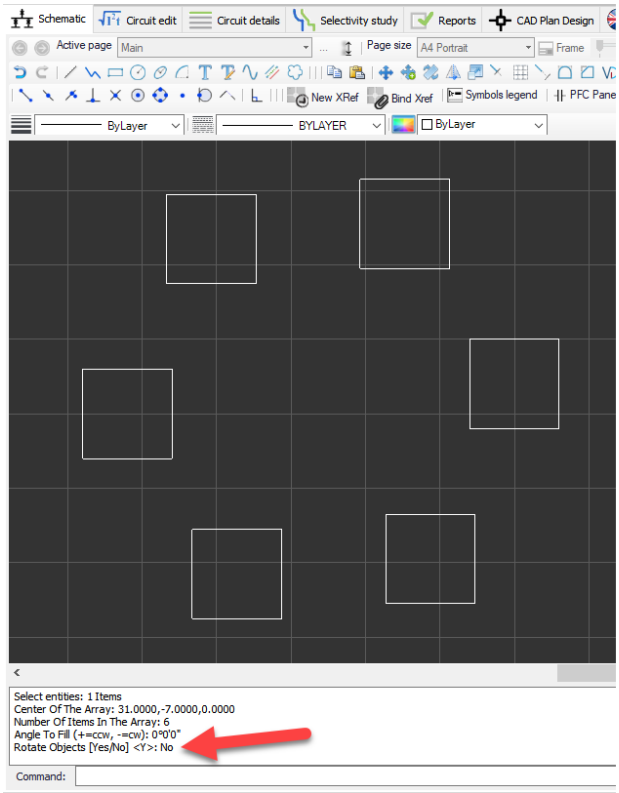
- Create array: This option will create a rectangular array of a selected object. Once the Create array button is clicked, then the procedure is as follows:
  - Select entities
  - Number of rows
  - Number of columns
  - Distance between rows
  - Distance between columns

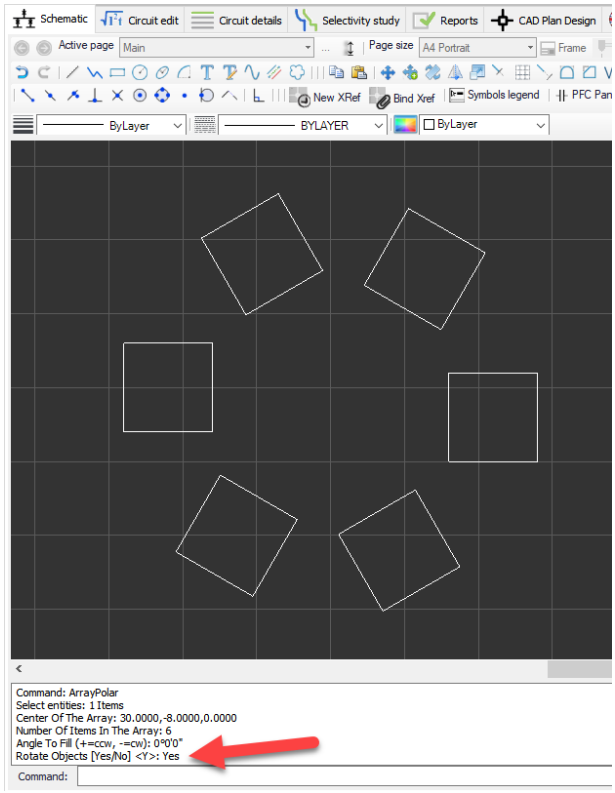


There is also a polar array option which is not available via the toolbar. It can be initiated by typing in *ArrayPolar* in to the *Command Bar*. This time the procedure is as follows:

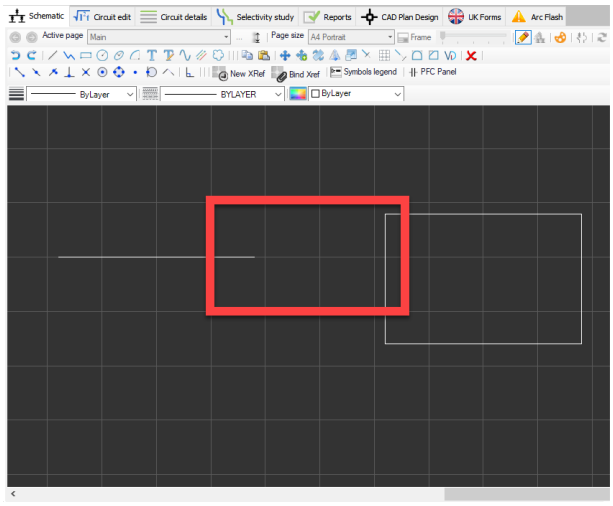
- Select entities
- Centre of the array
- Number of the items in the array
- Angle to fill
- Rotate objects

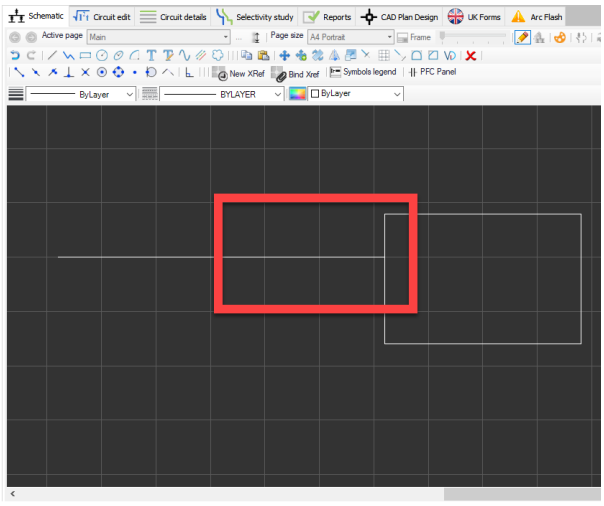
Rotating the objects in polar array is shown below:



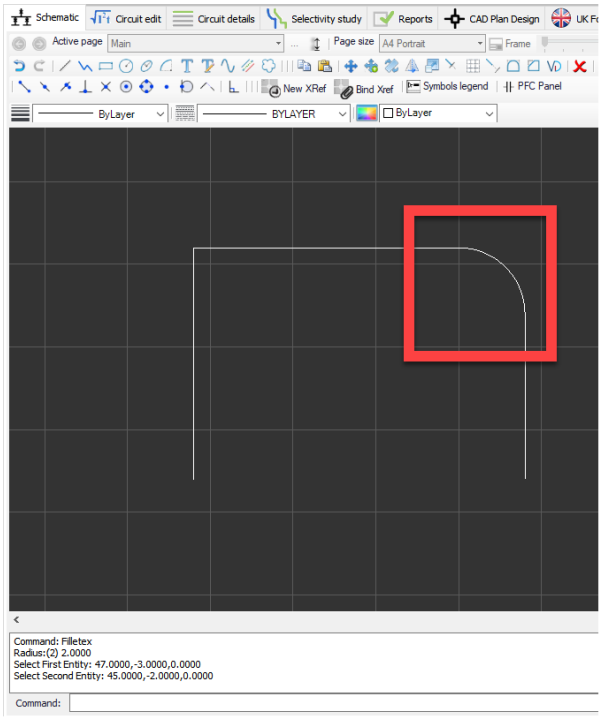


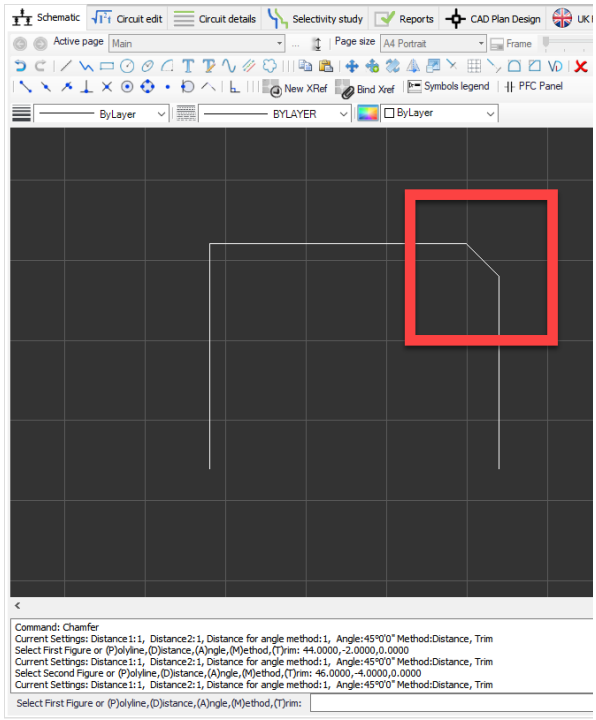
- Extend: This option is used to extend a part of an object to meet with another object. The procedure is similar to the *Trim* option.



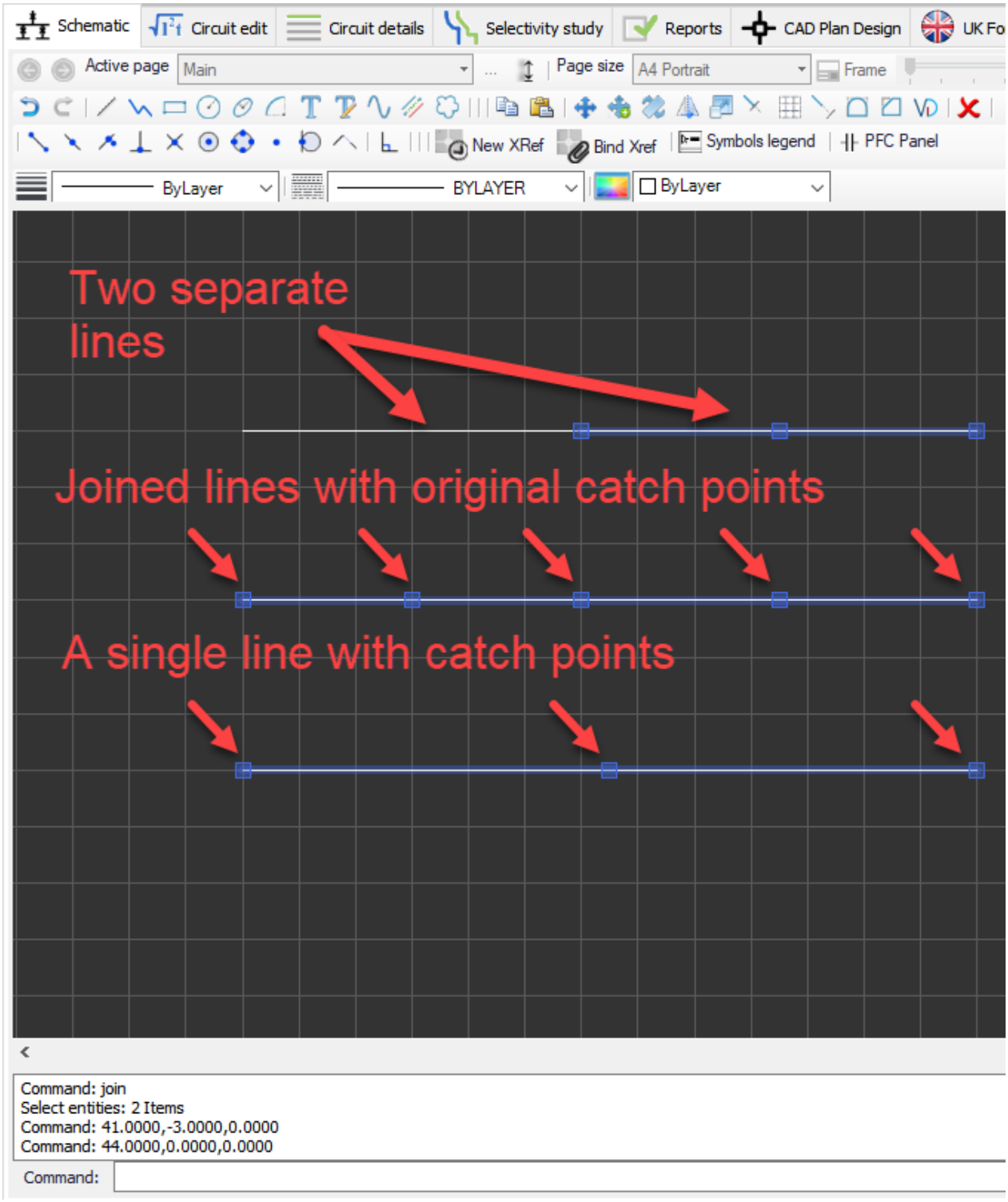


- Fillet/Chamfer: These two options are used to modify the corners. Fillet will round the corners where Chamfer will replace the corner with an angled edge.





- Join: In order to join two lines touching each other, *Join* button is used. This will retain the catch points of original lines.

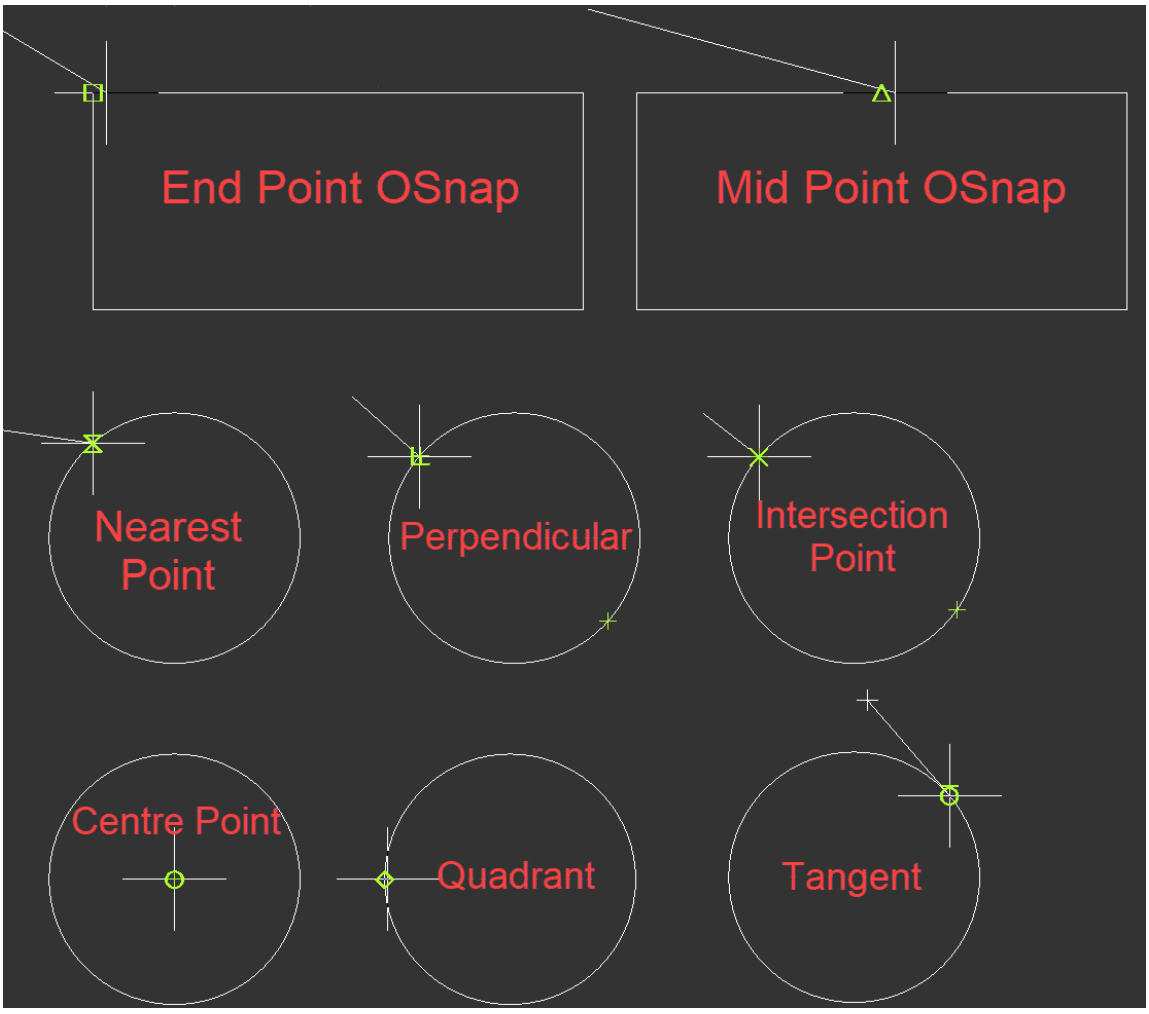


- Erase: Erase button will delete the selected object.

Middle toolbar

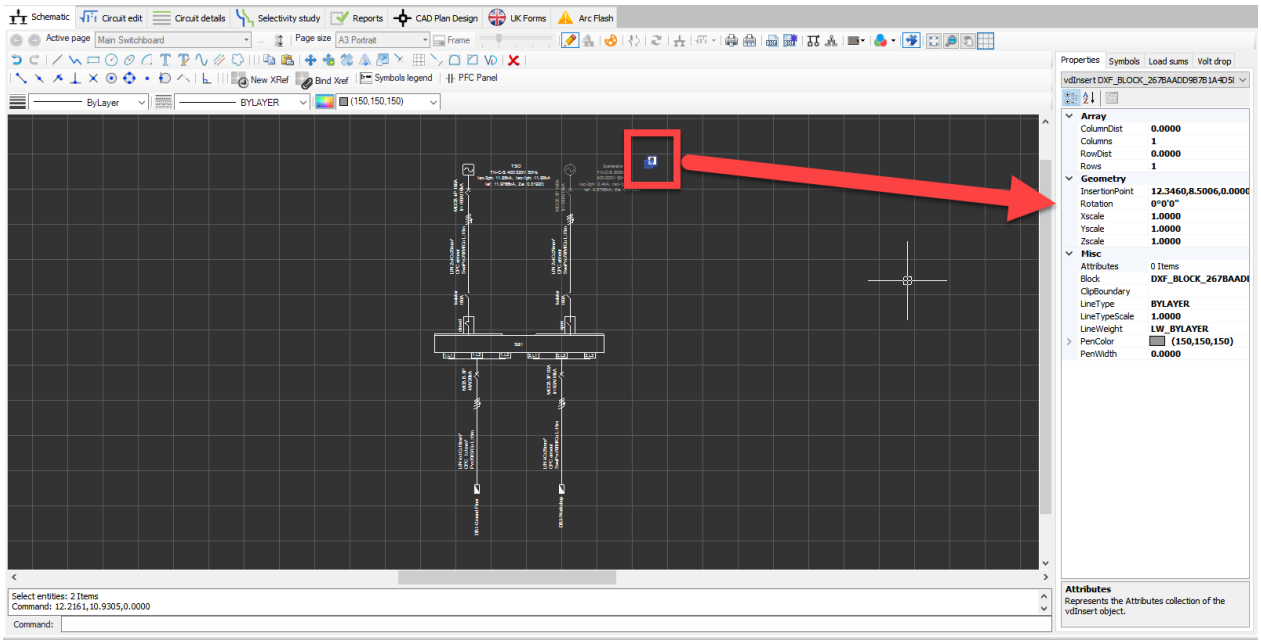
Middle toolbar consists of:

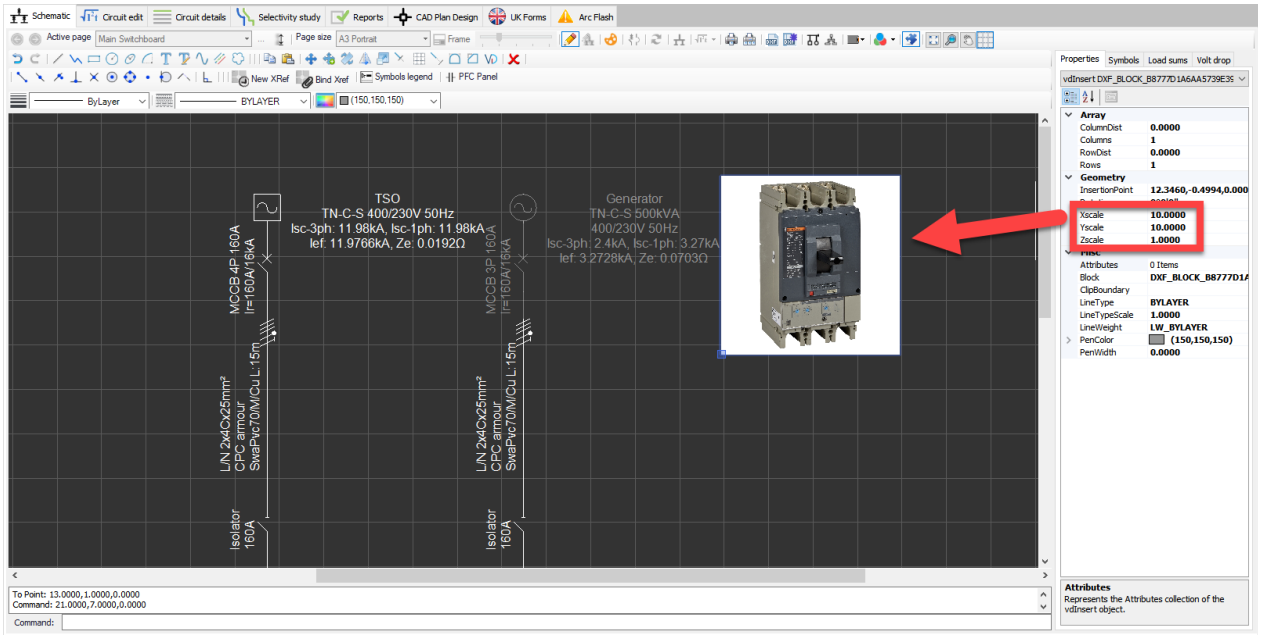
- OSnap Options (End Point/Mid Point/Nearest Point/Perpendicular/Intersection/Centre Point/Quadrant/Node/Tangent/Extension): OSnap feature helps the user to select specific points of objects by moving the mouse cursor to specified point automatically when the muse cursor is close. This action will be highlighted with a different green shape (triangle for mid pint, for example) by ElectricalOM. When the green shape appears, left mouse button will select the related point of an object. Each OSnap button will act like a toggle buttons and will stay active until they are disabled with a second mouse click.



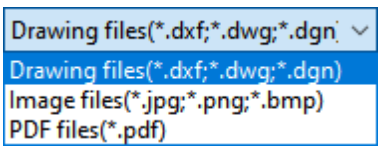
- Ortho Mode: Ortho mode will let the user to move in orthogonal directions only. This way it is easier to draw straight lines.
- XRef Options (New/Bind): ElectrcialOM lets the user to place external references to the schematics. In order to do this, the user must select an external reference by clicking on New Xref button. This will initiate the Xref file browser where the use can browse and select the external reference document to insert to the schematics. Once the XRef is selected, ElectricalOM will place it n the schematic, and when selected, side panel will display data related with it. The user can manipulate any property as

required, for example, the scale (X, Y, and Z separately).





Supported file type are:

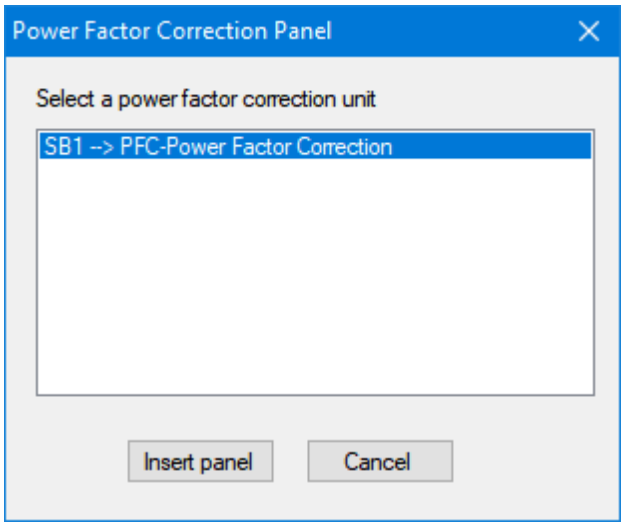


XRef still maintains the link to the original file, so, if the original file is missing, then the XRef within the ElectrciualOM will also disappear. Binding the XRef will remove the link with the original file and converts the XRef to a geometry within the ElectricalOM itself. Bind XRef button is used for this purpose.

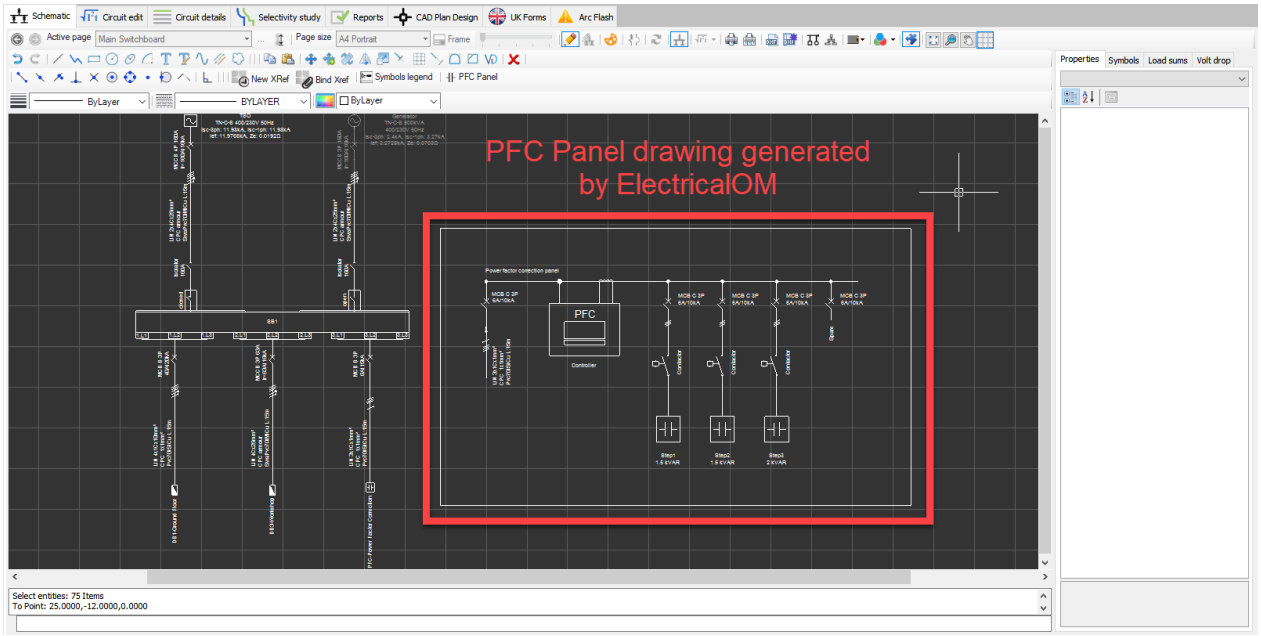
- Symbols Legend: ElectricalOM has a facility to create a legend for the symbols used on the active sheet automatically. In order to create the legend, *Symbols legend* button can be used. Once clicked,

the mouse cursor will show the created legend and will wait the user to pick a location for the it. If the user wants to move or delete the legend, the D*rawing mode* must be enabled.

- PFC Panel: Sometimes a power factor correction system is needed due to a lower power factor value. When the user wants to insert a brief PFC panel drawing, PFC Panel button is very useful. The button will initiate the *Power Factor Correction Panel* window and will ask the user to select a PFC panel which has to be on the drawing already. After the user selects the PFC panel, ElectricalOM will generate the drawing and wait for the user to select a location for it. To modify or delete the drawing, the *Drawing Mode* must be enabled.



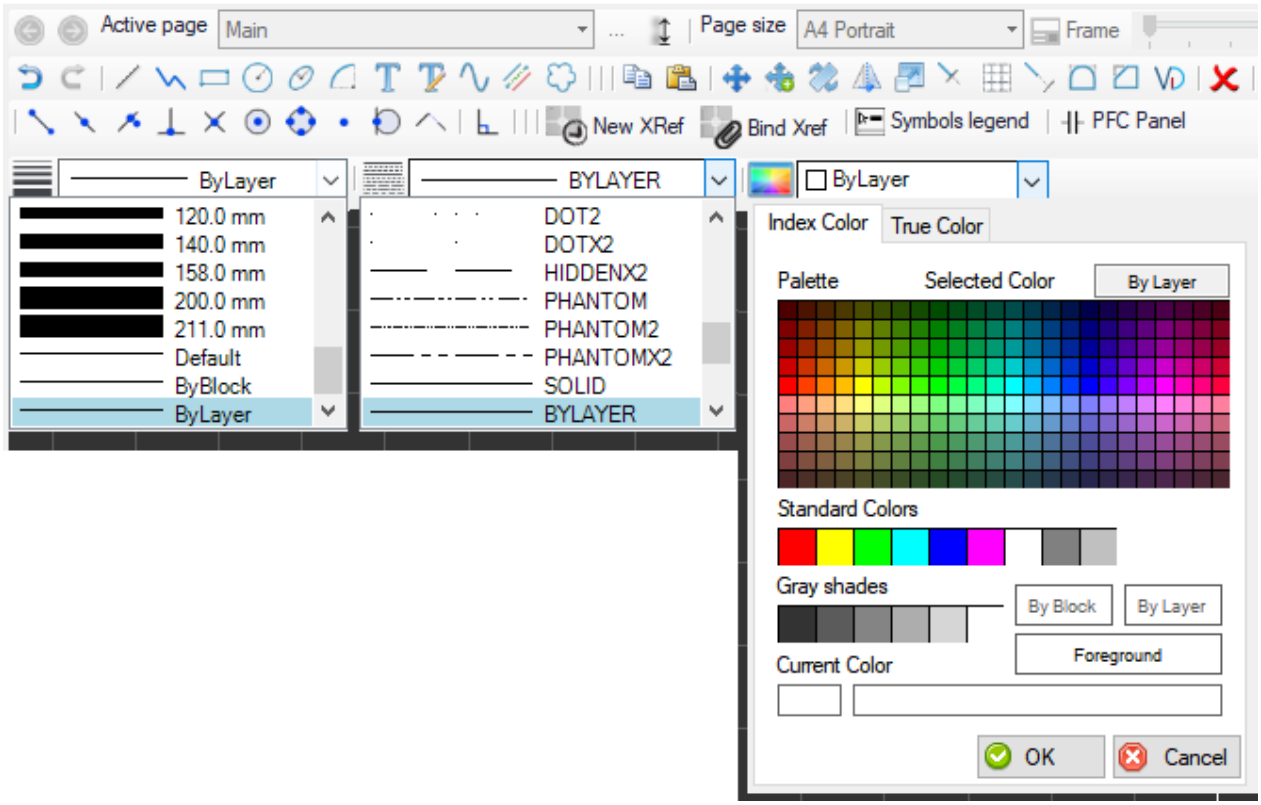
ElectricalOM will use data from *Cosϕ Correction* tab of the Circuit Edit module to generate the drawing.



Bottom toolbar

Bottom toolbar consists of: three drop down lists where the user may modify a selected component's line properties. In order to use them, firstly the user must select the component required to be modified. Then click on the down arrow next to the drop down list and select an option from the list. In the case of *Line Colour*, after selecting a colour, *OK* button needs to be clicked to apply the changes.

- Line weights: This option is used to modify the line thickness of the selected component.
- Line types: This option modifies the lime type of the selected component.
- Line Colour: This option will modify the colour of the selected component.



Palette Options

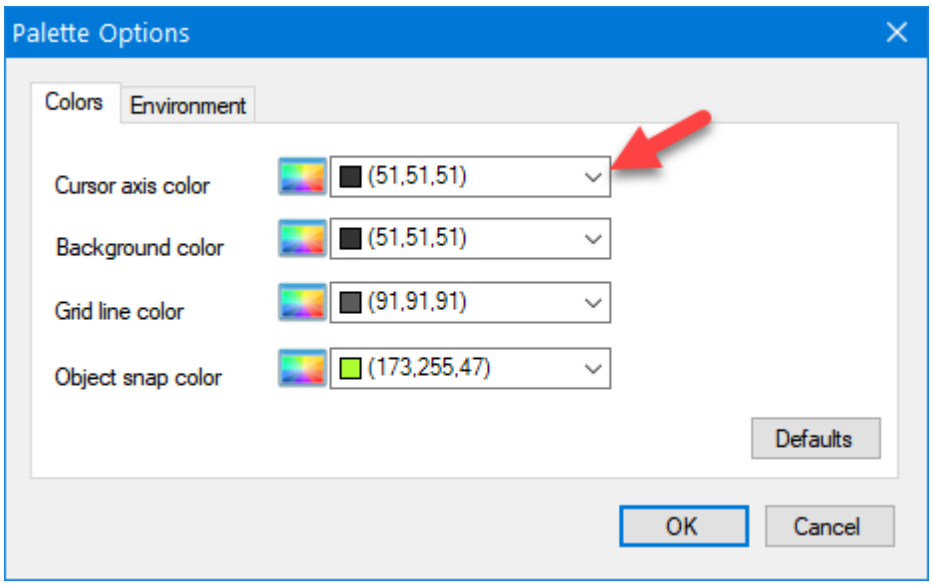
Palette options

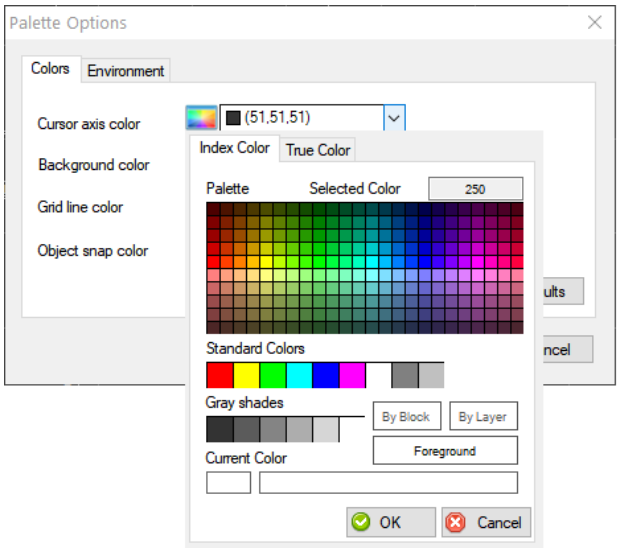
The user have the options to select desired colour for:

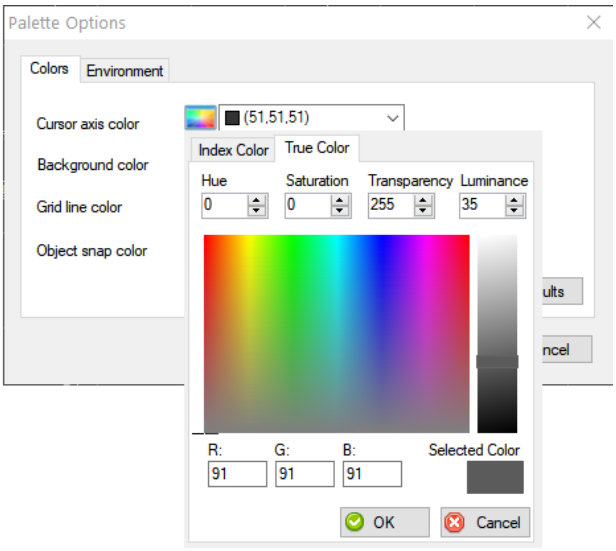
- Mouse cursor
- Background
- Grid lines
- Object snap point

When Palette options button is clicked, Palette Options windows will be displayed where the user can

change the default colours by clicking on the arrows next to the colour code. Colours can be selected from Index Colour table or True Colour table.





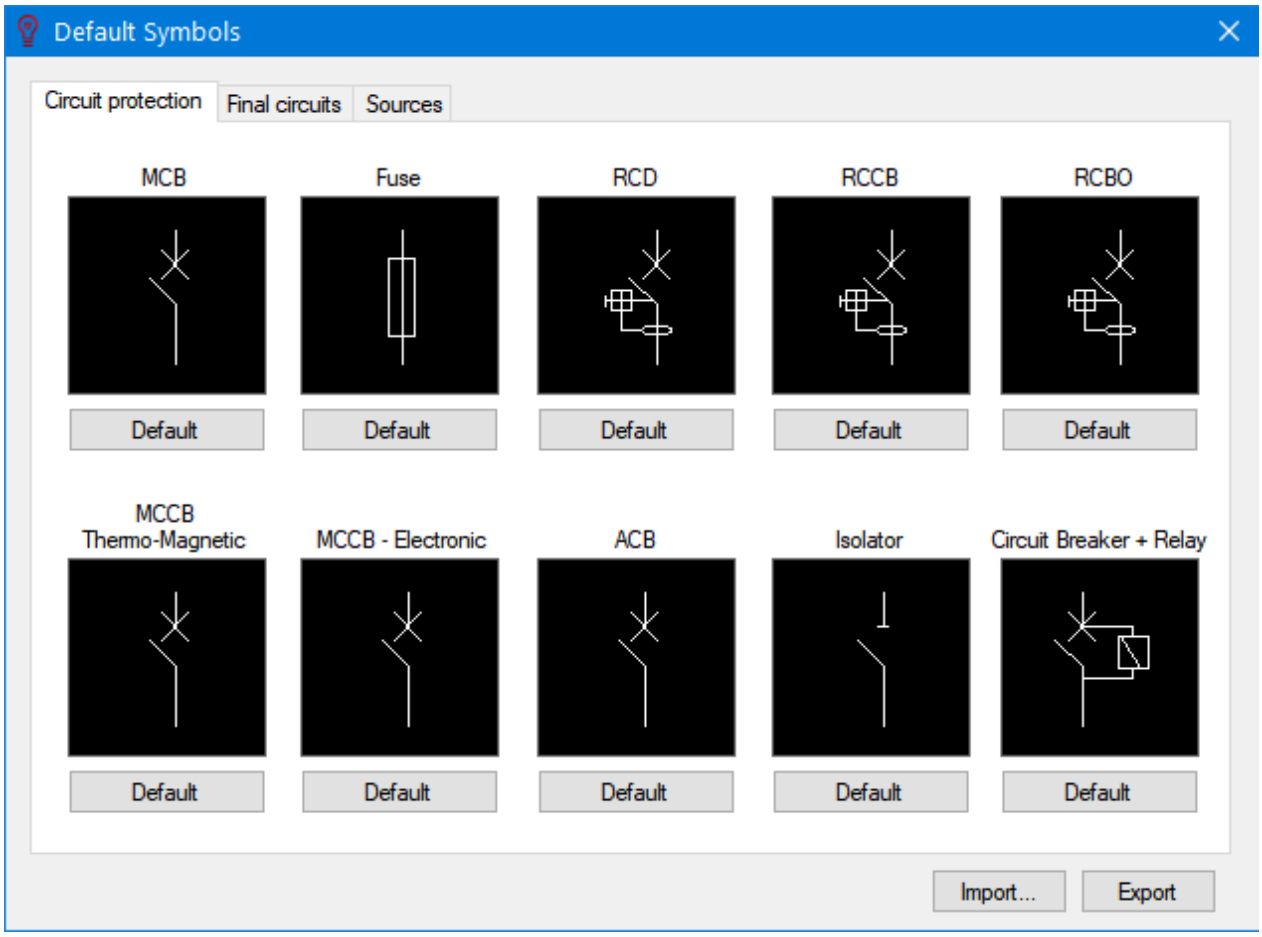


Default Symbols

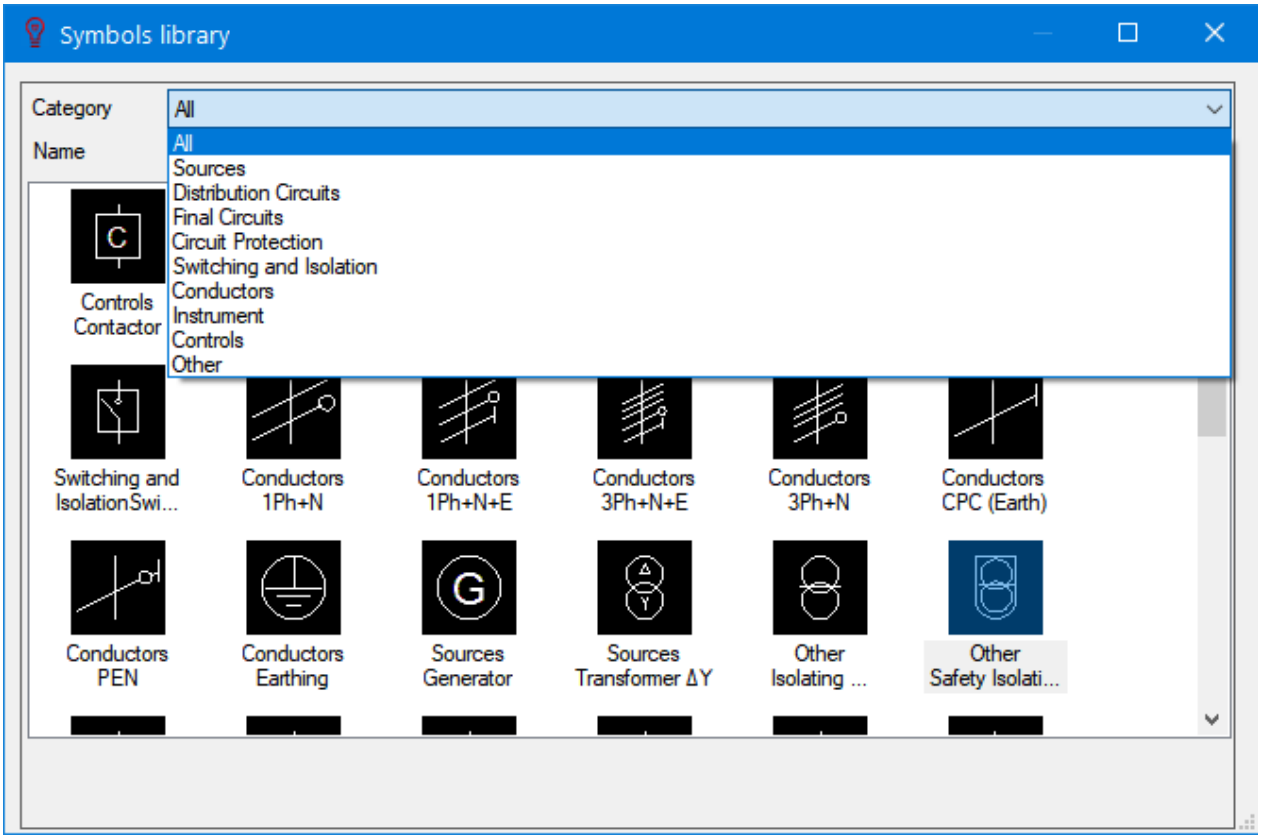
Default symbols

ElectricaOM has also a facility where the user can change the default symbols. This is accessed by clicking on *Default symbols* button on the Schematic Module Toolbar. There are three categories:

- Circuit protection,
- Final circuits, and
- Sources



The default symbol can be changed by clicking on the picture of the symbol and selecting a symbol from the *Symbols library*. Clicking on the *Default* button under the picture of a symbol will revert the changes and set the original symbol as default. To create new symbols please refer to Creating and Editing a Symbol.



The user can also save the settings made as a file and transfer it to another system using *Export* and *Import* buttons. The files will be saved as *.eom_settings* extension.

Refresh Layout and Auto Layout Mode

Refresh layout

Sometimes the screen may have some remainings of deleted objects or some objects might look misaligned, in this case refresh layout will clear the screen and realign the objects. This button works as per distribution node, it aligns only the components connected to the selected node.

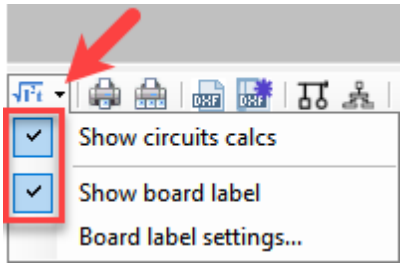
Auto layout mode

This function is enable by default. It forces the distribution components to follow a default layout. If the used wants to move a distribution component to another location than ElectricalOM placed then this option can be disabled so the component can be moved any location desired. In fact, moving a component will automatically disable this option, but once re-enabled all the distribution component will be relocated to their original locations. It is indicated by a blue rectangle if enabled.

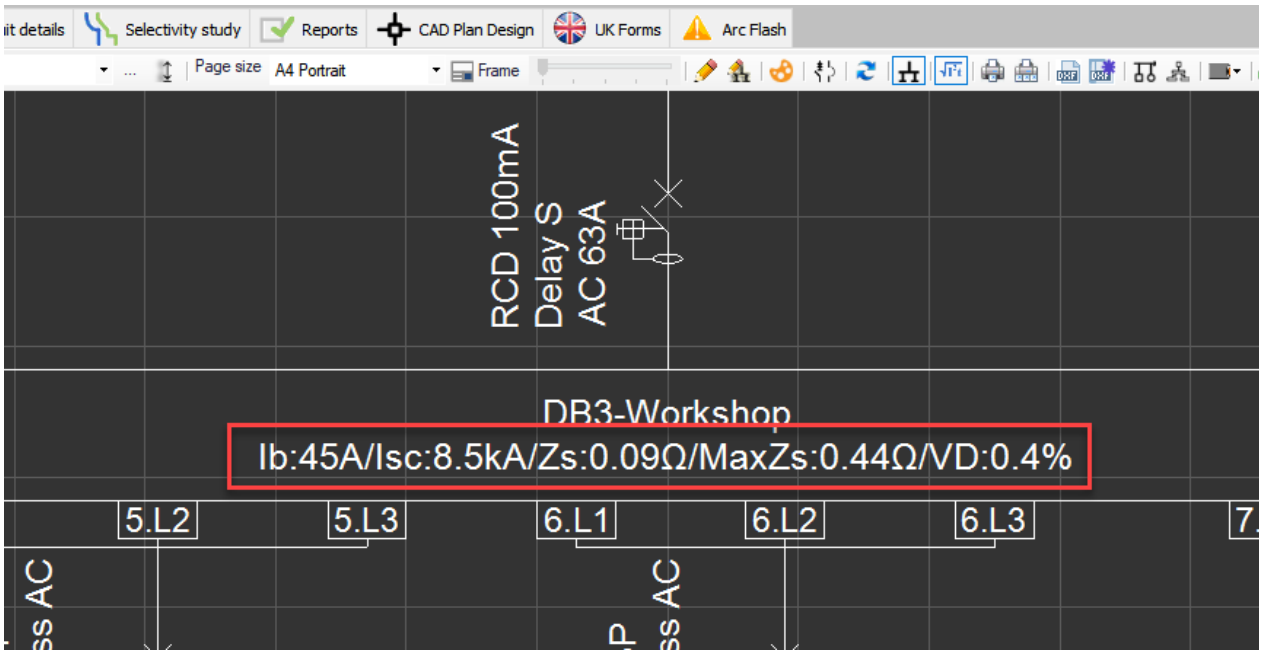
Show Calculations

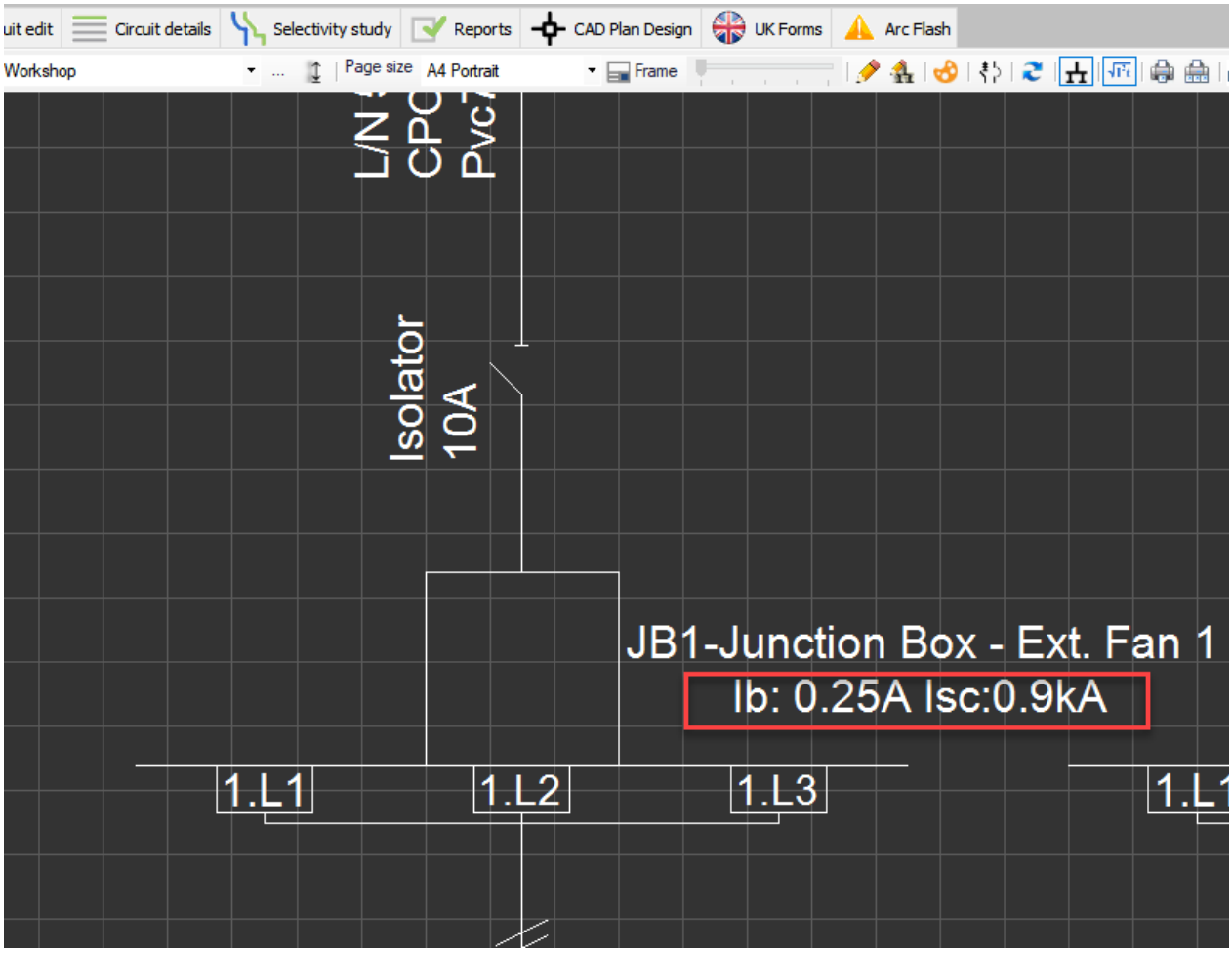
Show calculations

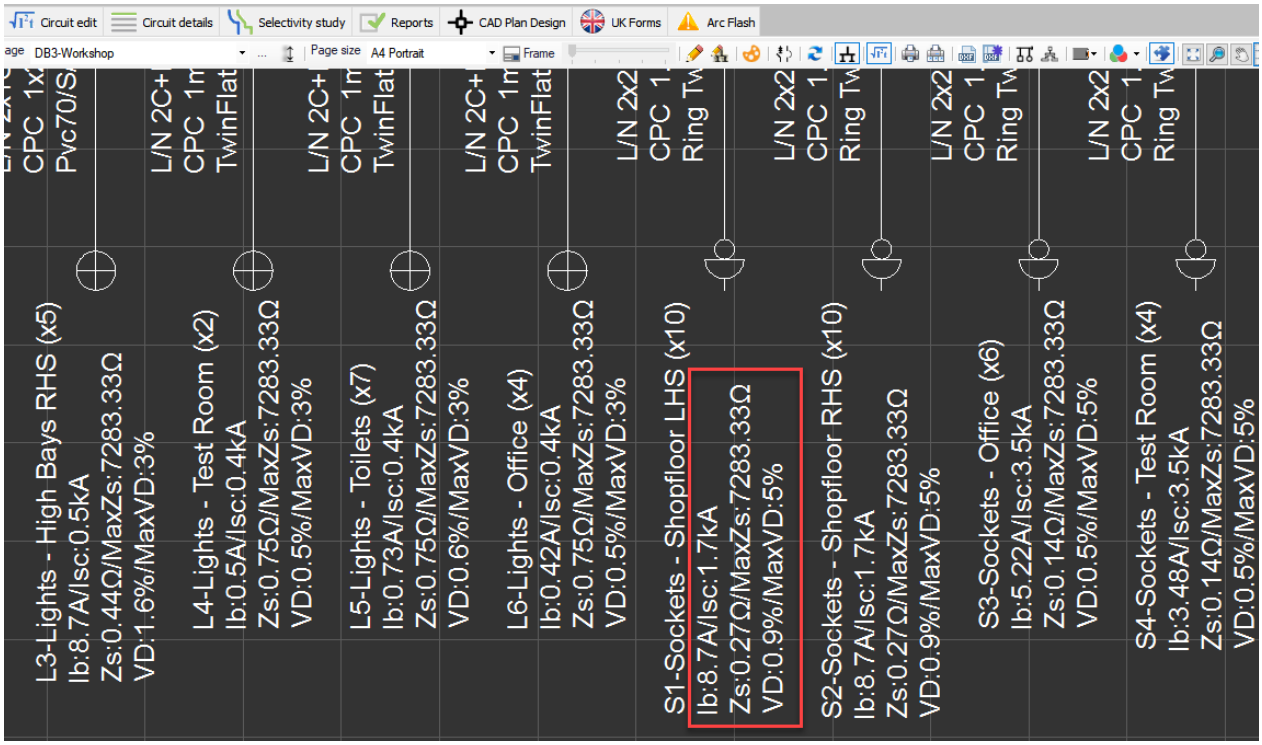
This button accommodates two options *Show circuit calcs,* and *Show boards label.* The user can enable the option desired first by clicking on the down arrow next to the *Show calculations* button and then selecting the option desired. Enabled option will be indicated by a tick next to the option.



Circuit calculations include, design current, prospective short circuit current, earth fault loop impedance, max. earth fault loop impedance, voltage drop percentage, and max. voltage drop limit percentage of the associated circuit which may be both a distribution and a final circuit.

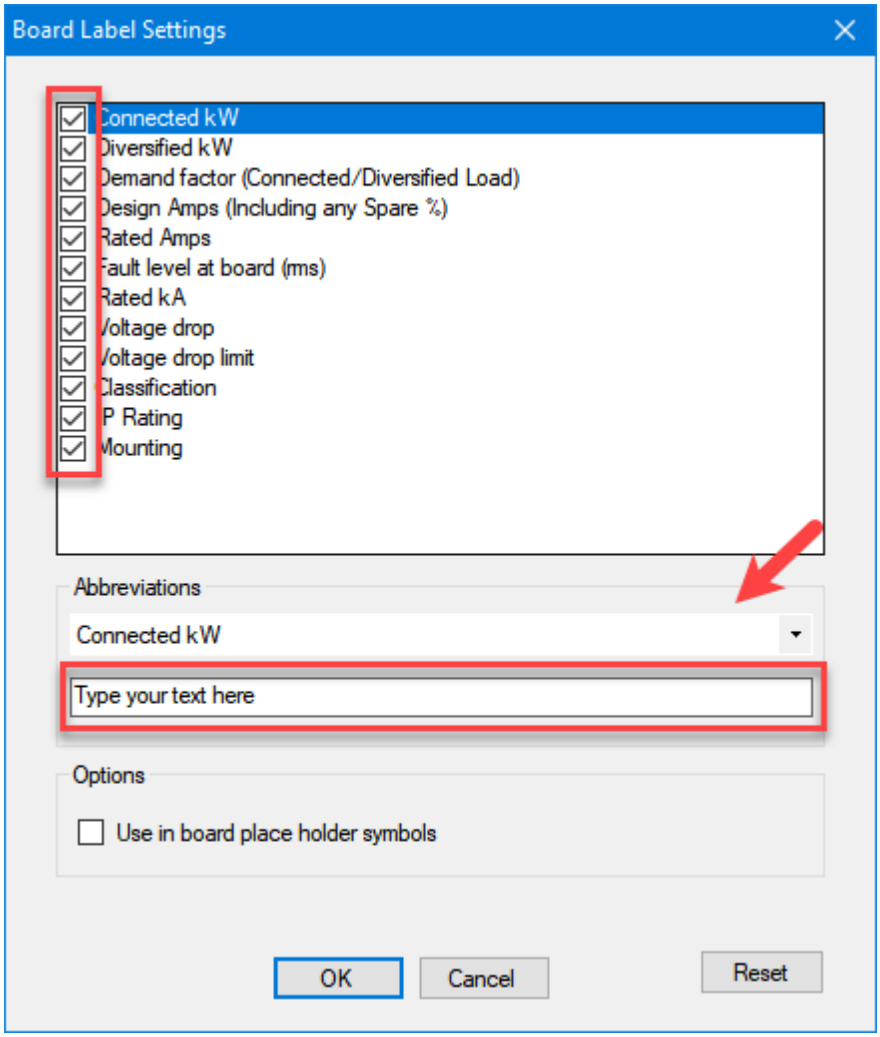




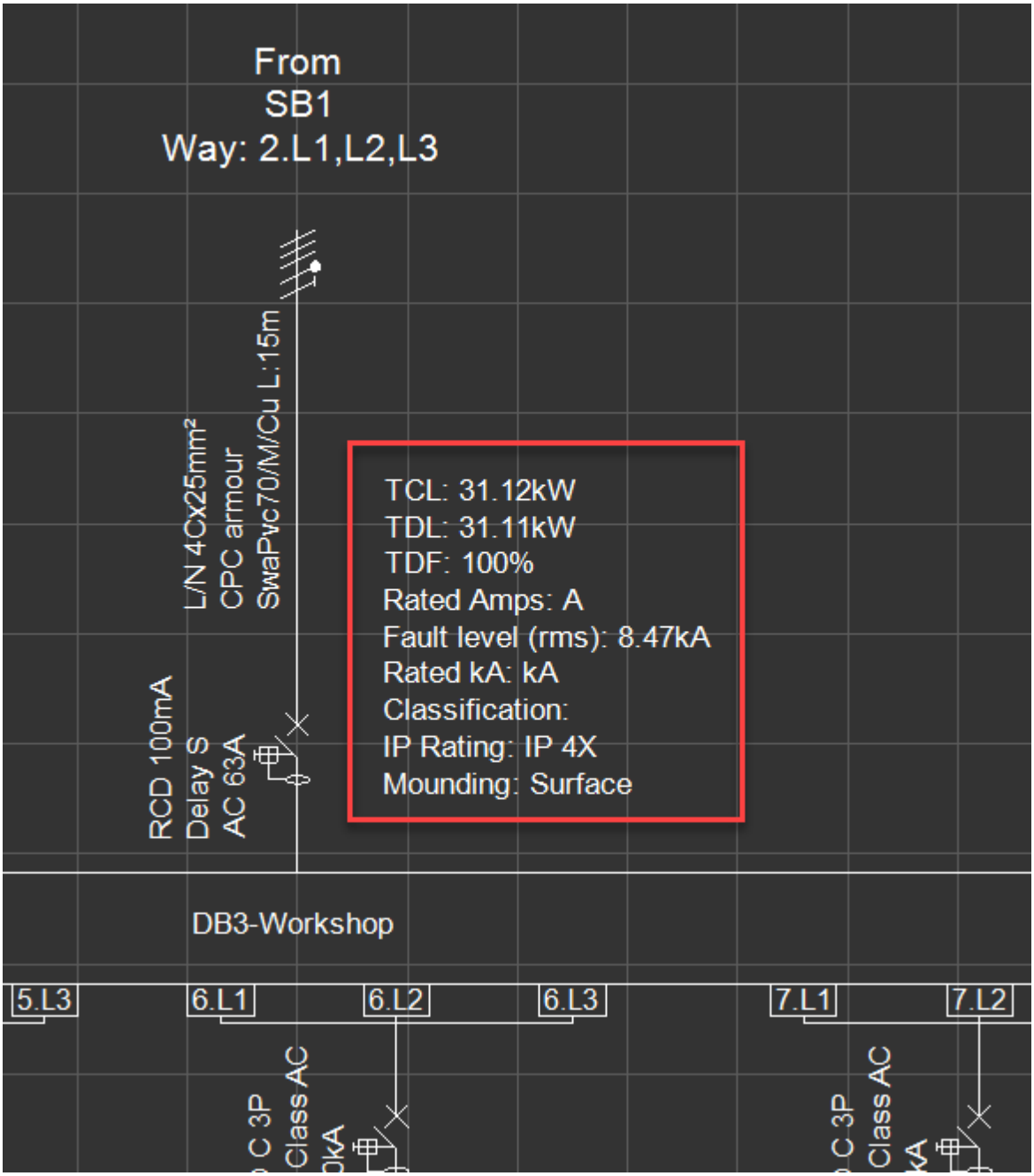


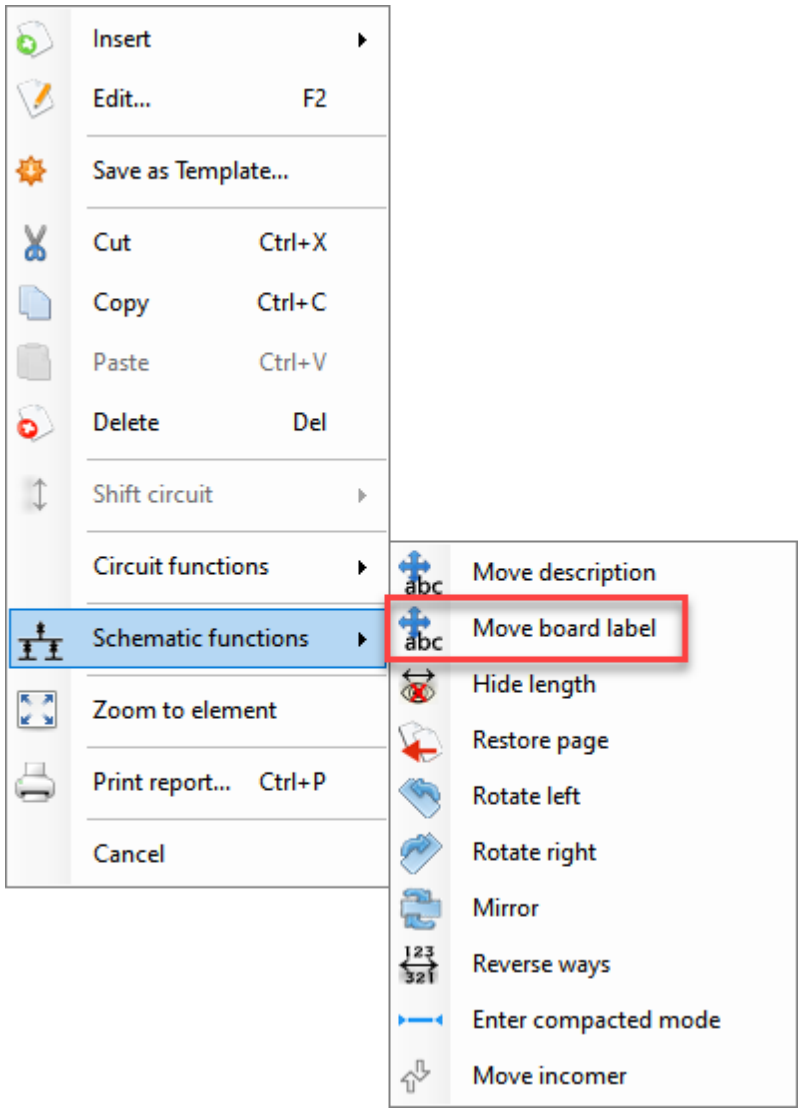
On the other hand, board labels will display various data, which can be selected by the user, with regard to the associated board.Board calculations can be formatted by the user with the help of *Boards label*

settings... menu. Board Label Settings windows will display all the options that can be displayed within the board label with tick boxes next to each option. The user can select the options required by ticking these boxes. ElectricalOM also lets the user to define abbreviations manually; to define new abbreviations, the user can type in desired text into the text box below once an abbreviation is selected from the *Abbreviations* drop down list. Values displayed by *Boards label settings* menu are gathered from various menus and also from calculations done by ElectricalOM, the user cannot modify any value directly from this menu.

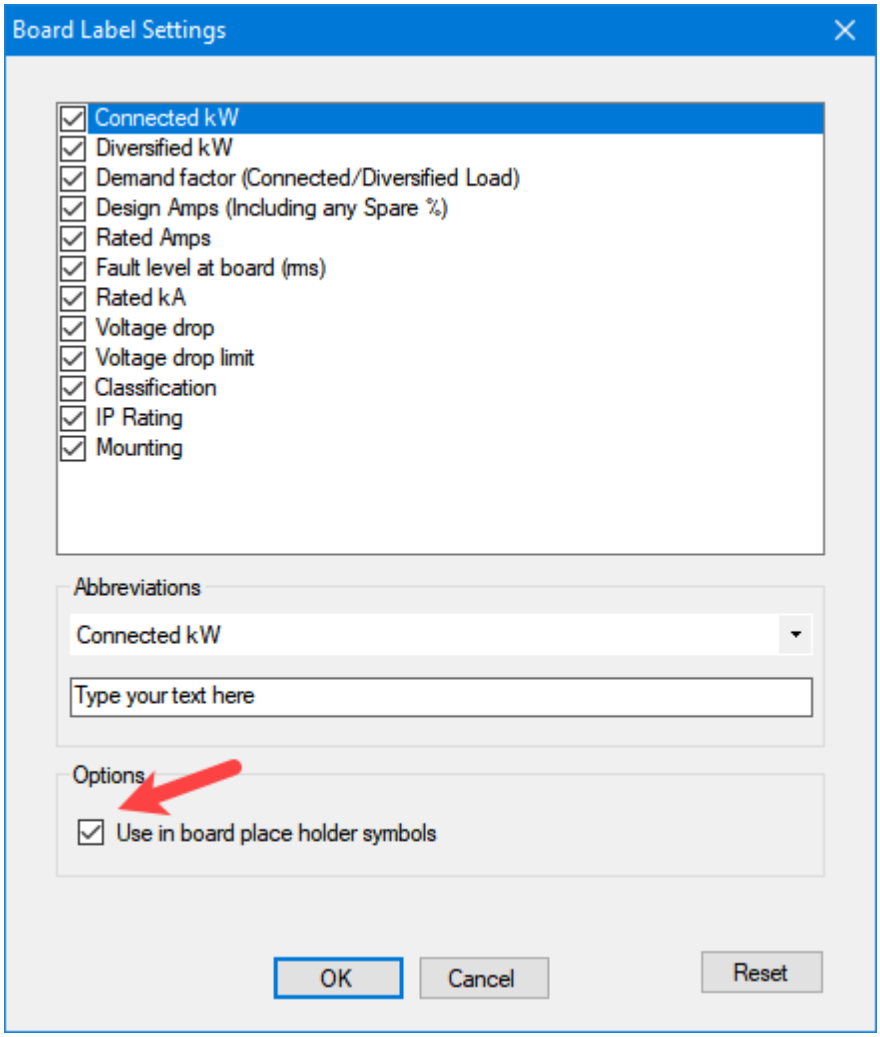


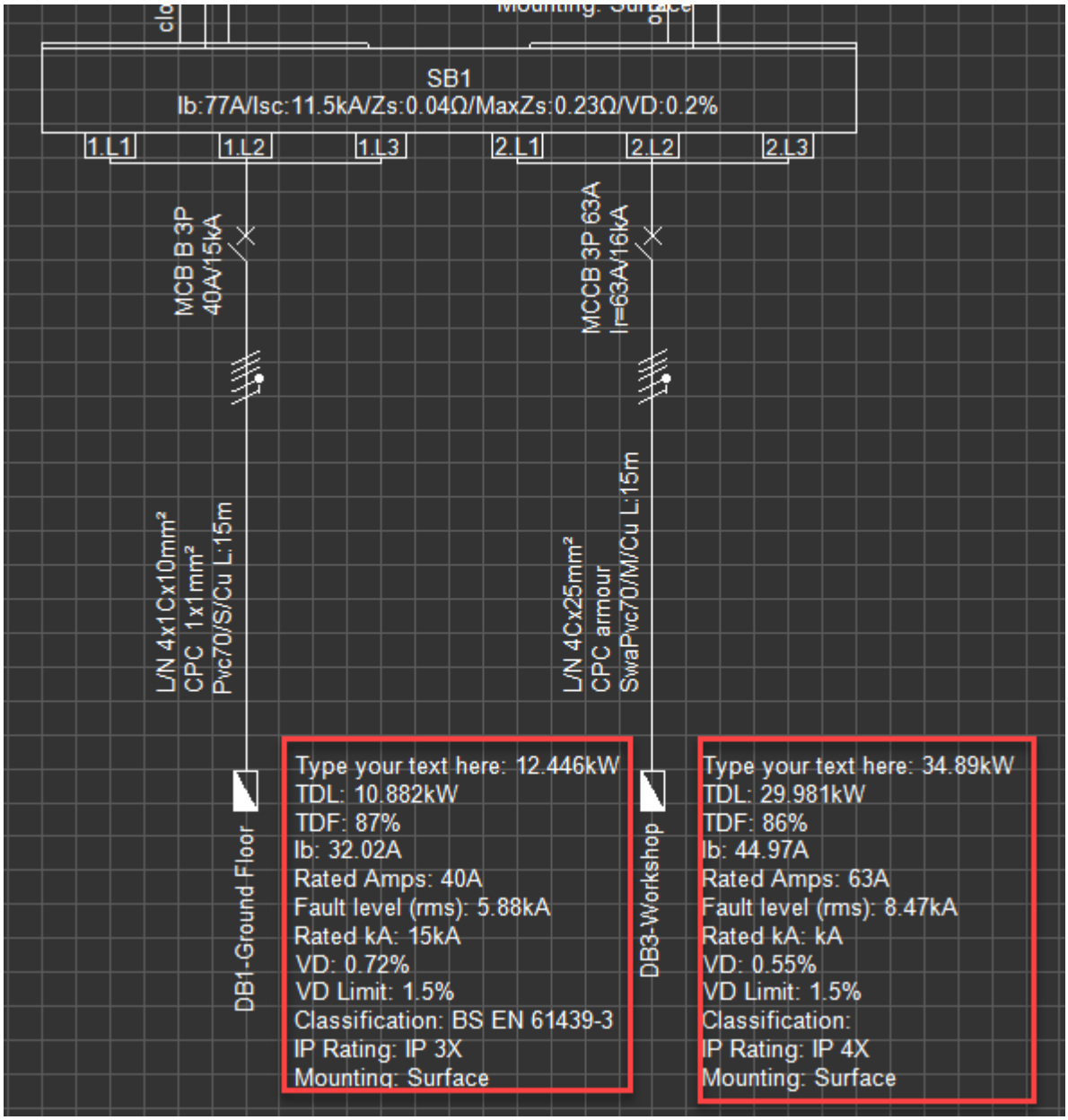
When a label is set to be displayed, the location can also be defined by the user by the help of the *Move board label* option under the Schematic functions menu.


From
SB1
Way: 2.L1,L2,L3
L/N 4Cx25mm²
CPC armour
SwaPvc70/M/Cu L:15m
RCD 100mA
Delay S
AC 63A
TCL: 31.12kW
TDL: 31.11kW
TDF: 100%
Rated Amps: A
Fault level (rms): 8.47kA
Rated kA: kA
Classification:
IP Rating: IP 4X
Mounding: Surface
DB3-Workshop
5.L3
6.L1
6.L2
6.L3
7.L1
7.L2



Sometimes the user may have opted to show a board on a different sheet other that the distribution circuit it is fed from. In this case the board label will only be shown next to the board, however, if the *Use in board place holder symbols* option is selected by the user from the *Board Label Settings* window, then, ElectricalOM will also display the board label next to the board icon which represent the aforementioned board.

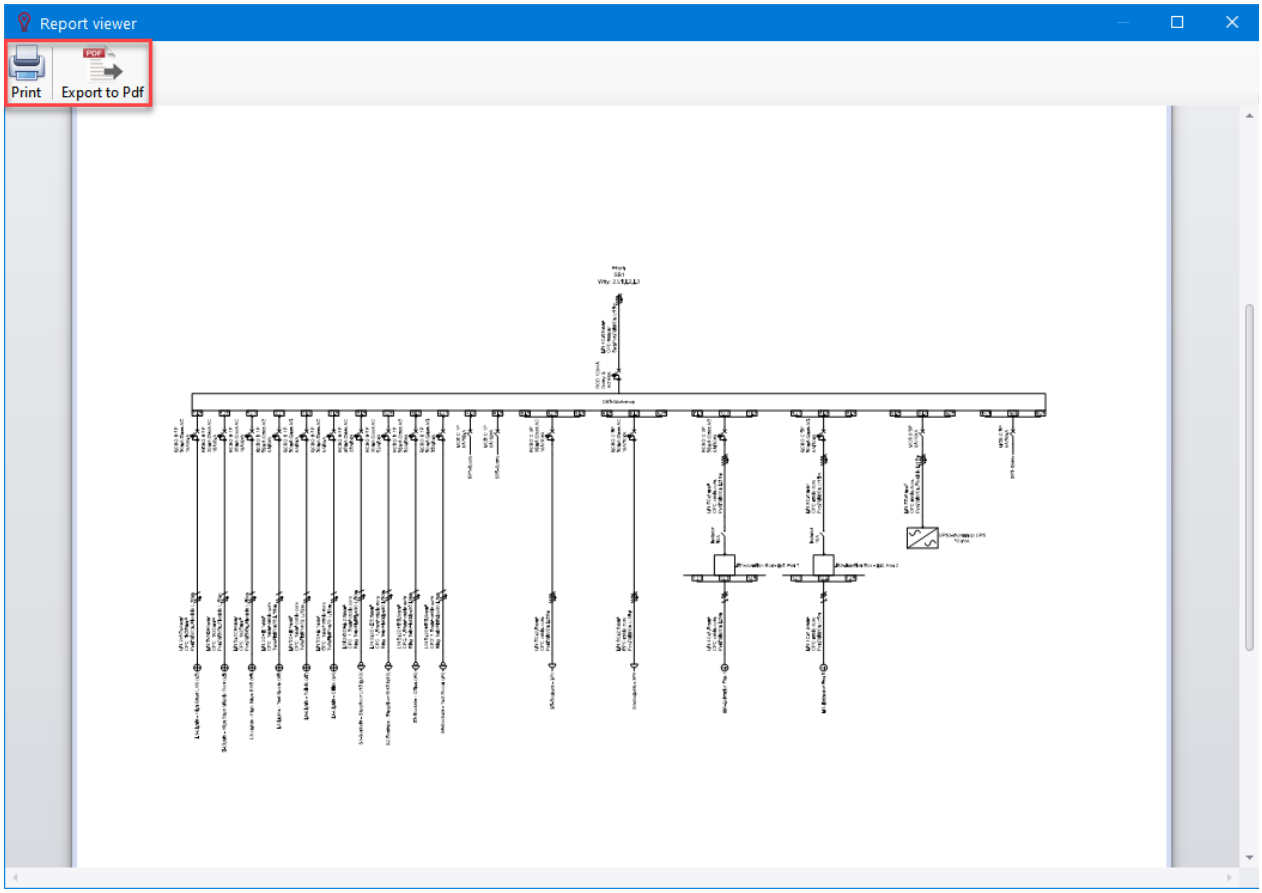

Board Label Settings
Connected kW
Diversified kW
Demand factor (Connected/Diversified Load)
Design Amps (Including any Spare %)
Rated Amps
Fault level at board (rms)
Rated kA
Voltage drop
Voltage drop limit
Classification
IP Rating
Mounting
Abbreviations
Connected kW
Type your text here
Options
Use in board place holder symbols
OK
Cancel
Reset



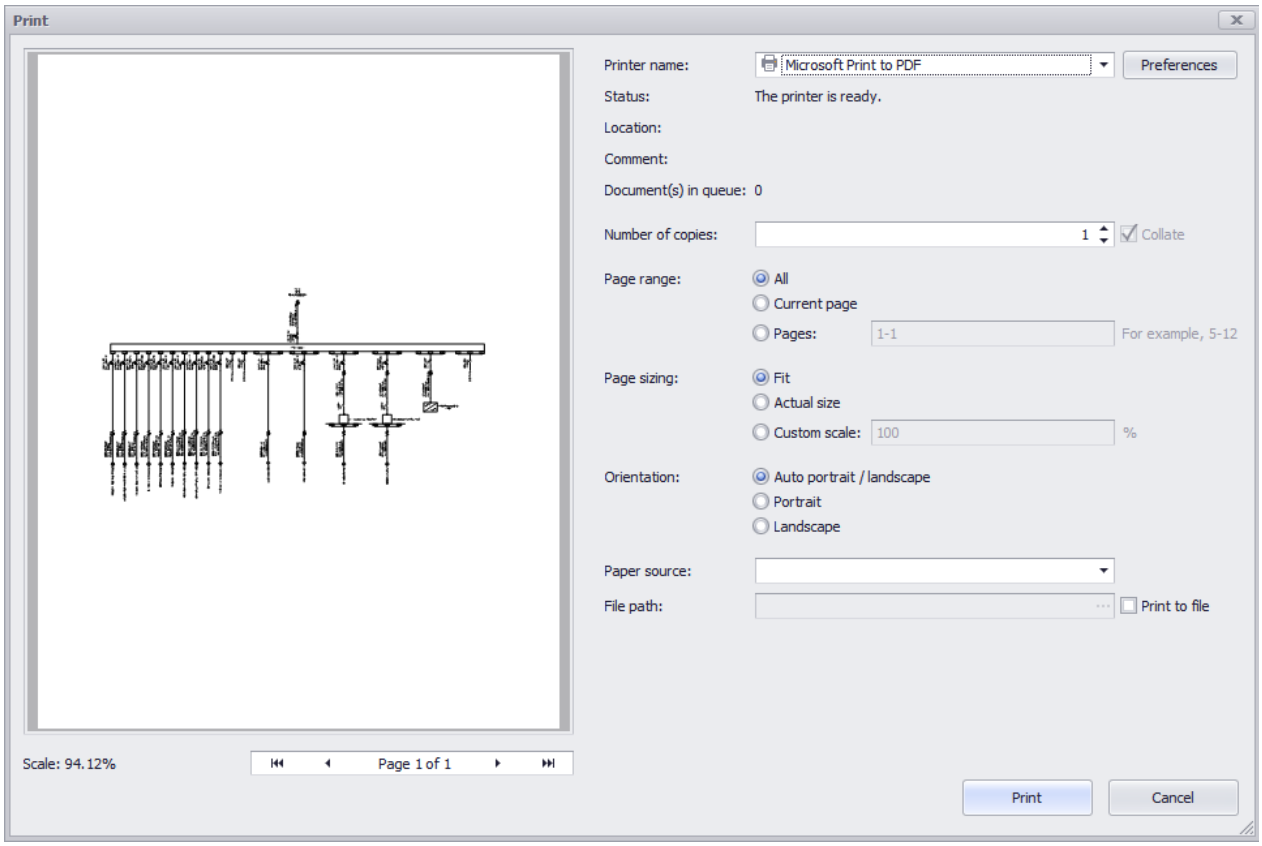
Print Page and Print with Settings

Print page

This option is used to print the current page quickly without any settingsWHen this button clicked, a print preview window will pop. There are two options available from this screen: Print or Export to PDF.



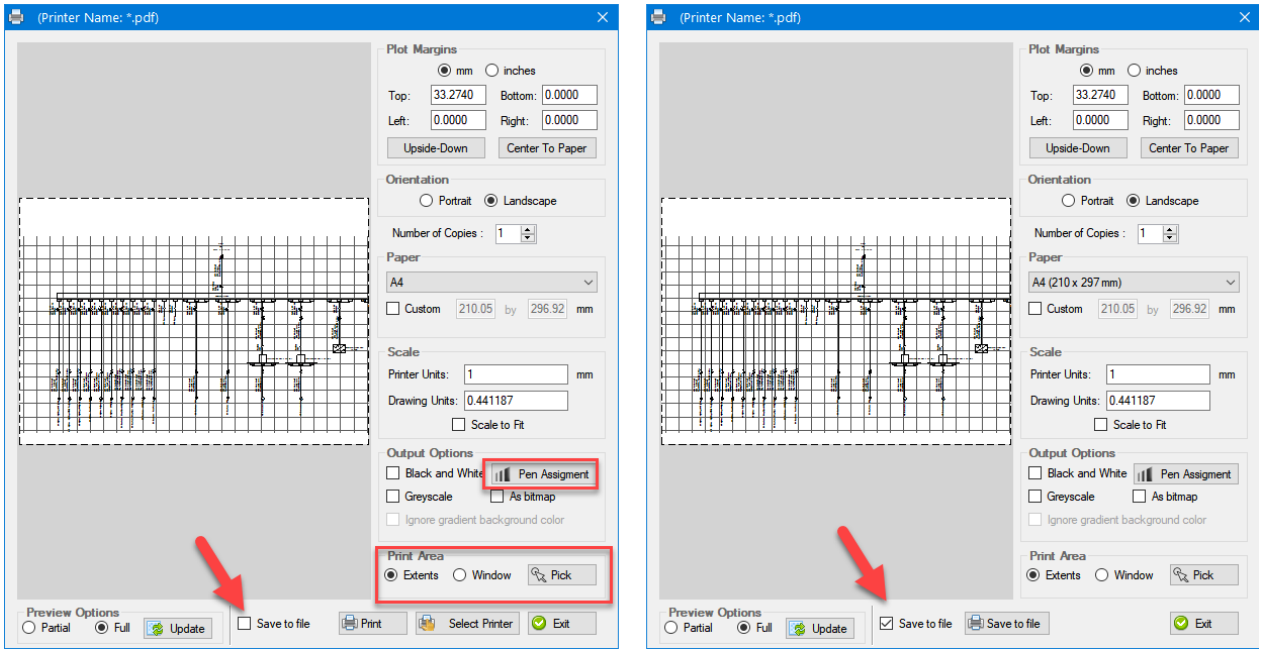
Print button will call ElectricalOM's *Print* settings window where the user may change print settings to suit the requirements.



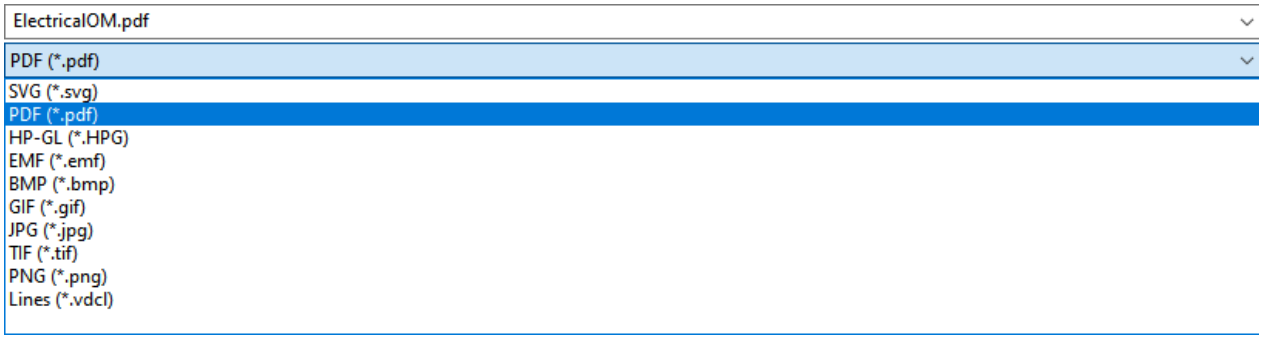
Export to PDF button will initiate the *Save As...* action with PDF as the selected file type.

Print with settings

Unlike *Print page*, *Print with settings* will call a different printing settings window there the user can also set pen assignments, print area. Also, the output can alaso be exported as PDF by ticking the *Save to file* check box. This will remove the *Print* and *Select Printer* buttons and add a *Save to file button*.



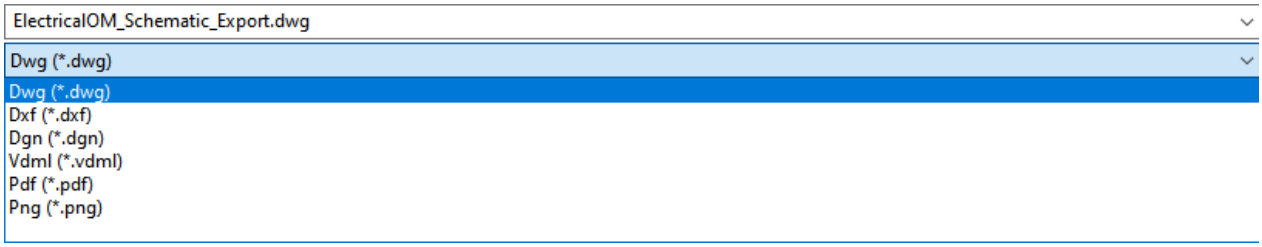
Unlike with *Print page* option, *Print with settings* option's *Save to file* have various file type options to select, not only PDF.



Export active page and Export selected pages

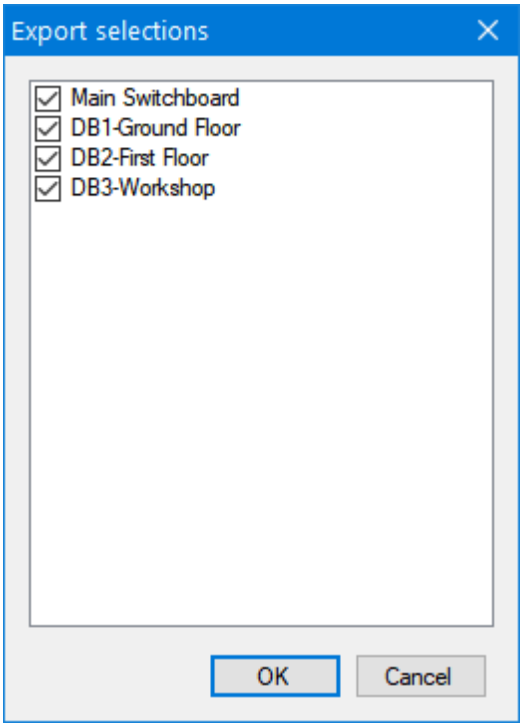
Export active page

Active page can be exported to various file formats using *Export active page*. Once clicked, *Save as...* window will be displayed, and the user can select the required file type from the drop down list. Please see Exporting to DXF Problem section for any issues.

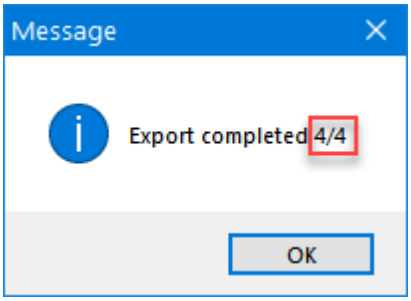


Export selected pages

The user can select multiple pages to export by using *Export selected pages* option but it shall be noted that this will export to DWG only. Once clicked, *Export selection* window, a list of available pages, will be displayed with a tick box next to each page, so, the user can select required pages to export to DWG. Please see Exporting to DXF Problem section for any issues.



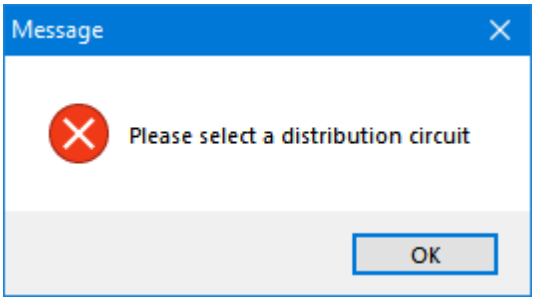
When OK button is clicked ElectricalOM will ask the user to define a location for the exported files, after the user selects the location ElectricalOM will start working on each sheet and once finished a message window will be displayed indicating drawing quantity exported.



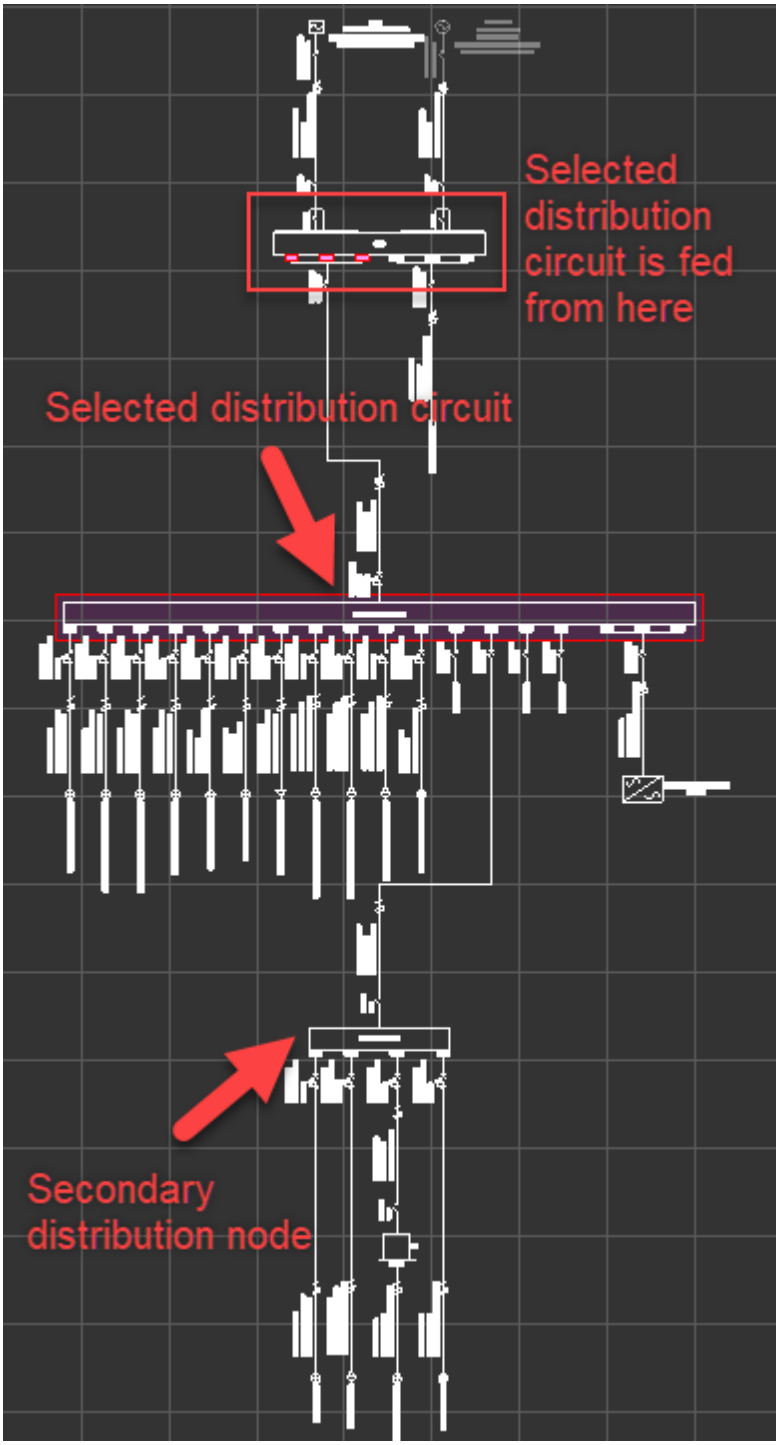
Distribution circuits single line diagram and layout

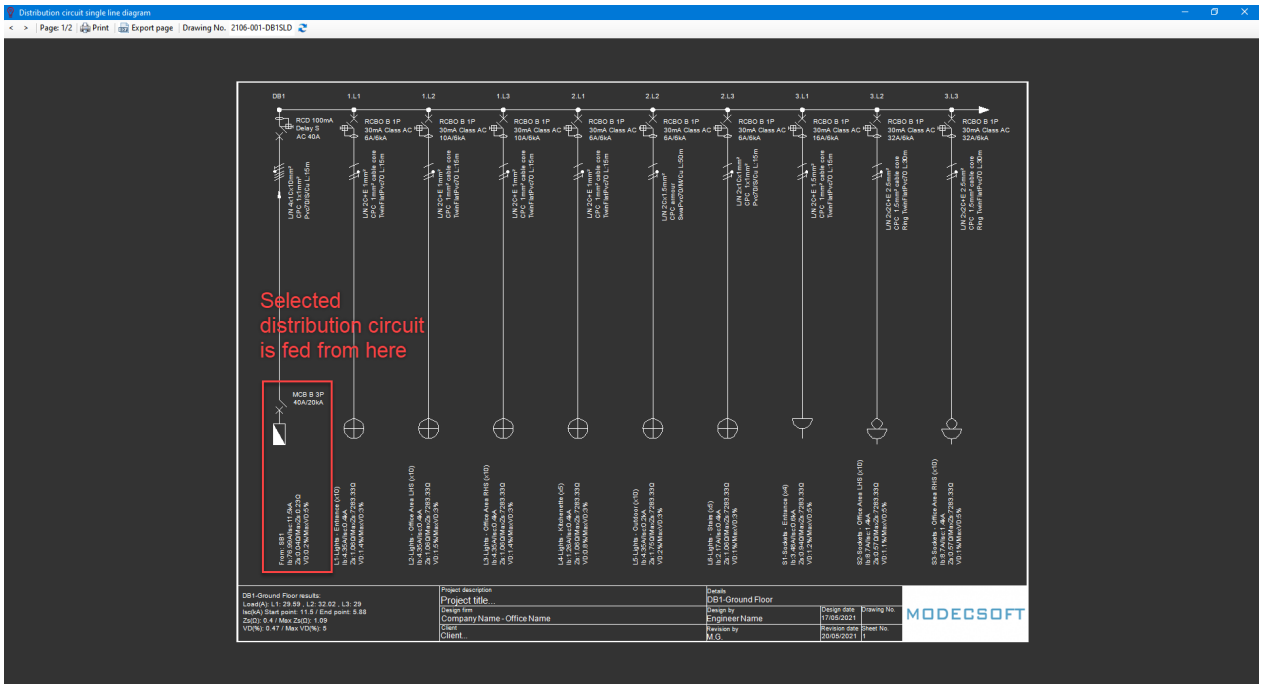
Distribution circuit single line diagram

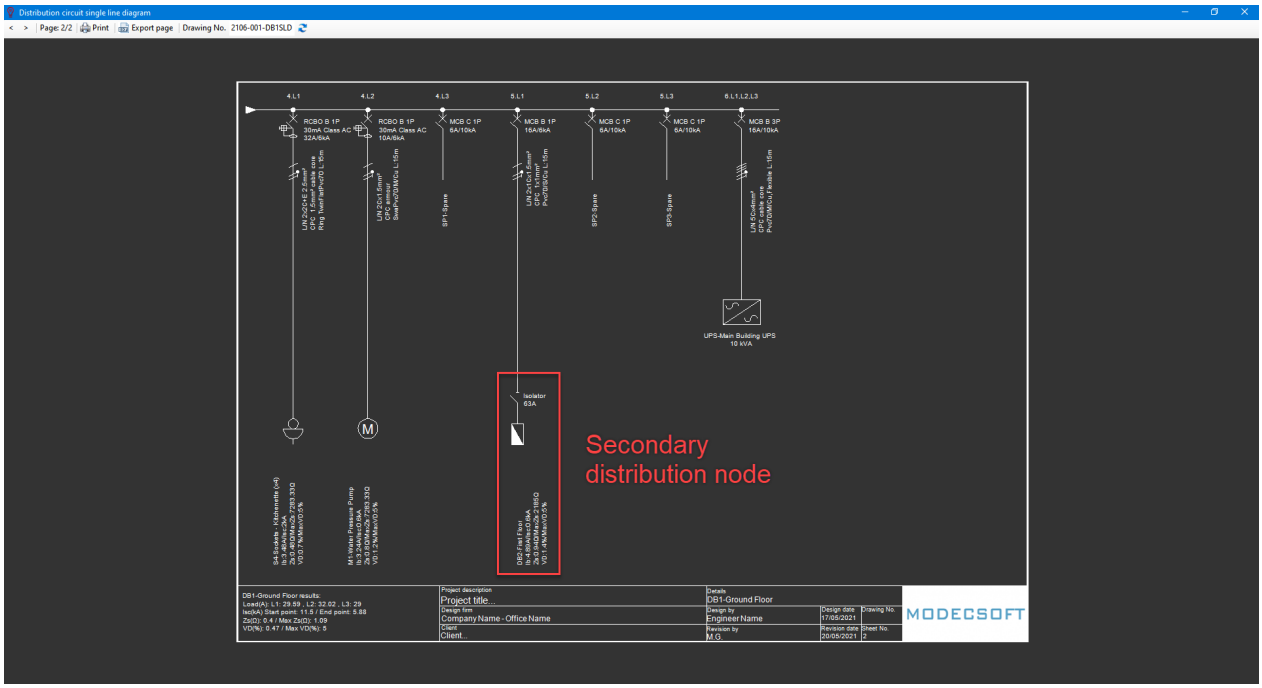
ElectricalOM can create an SLD which will show the circuits fed from the selected distribution circuits only. As *Distribution circuit SLD* is a distribution circuit based command, the user must select a distribution circuit before running this command. If any circuit other than a distribution circuit is selected, ElectricalOM will display a message window to warn the user that the selected circuit is not a distribution circuit.



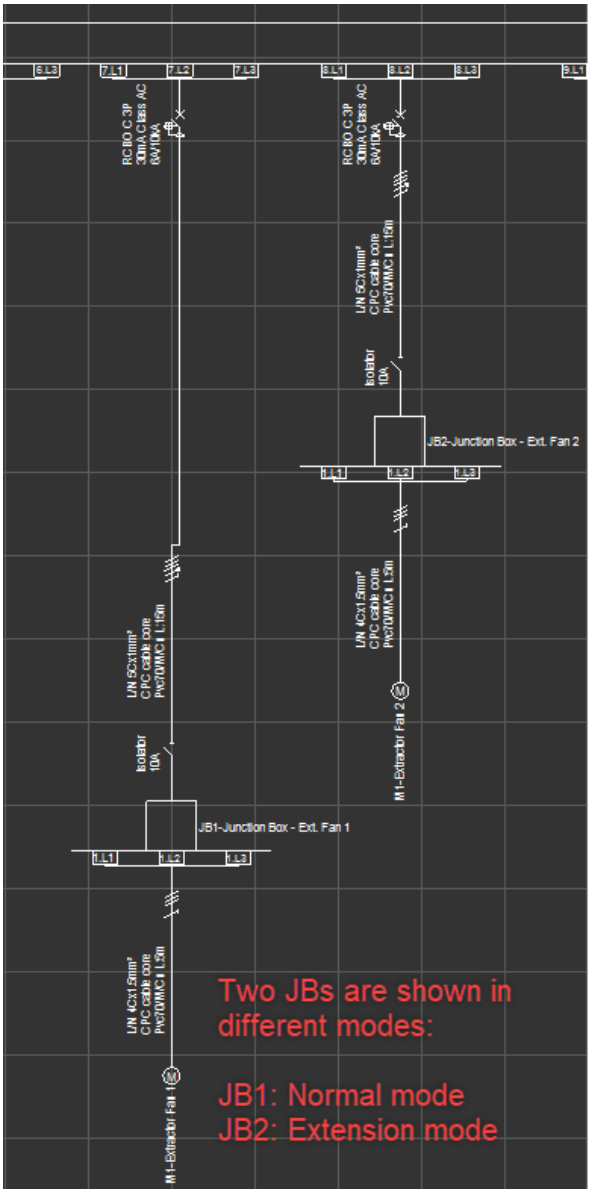
The SLD will be created based on the selected distribution circuit, which means the resulting SLD will have the origin being the distribution node which the selected distribution circuit is fed. Also, it is a single level command which means it will show a distribution node fed from the selected distribution circuit as a single load without any further details.

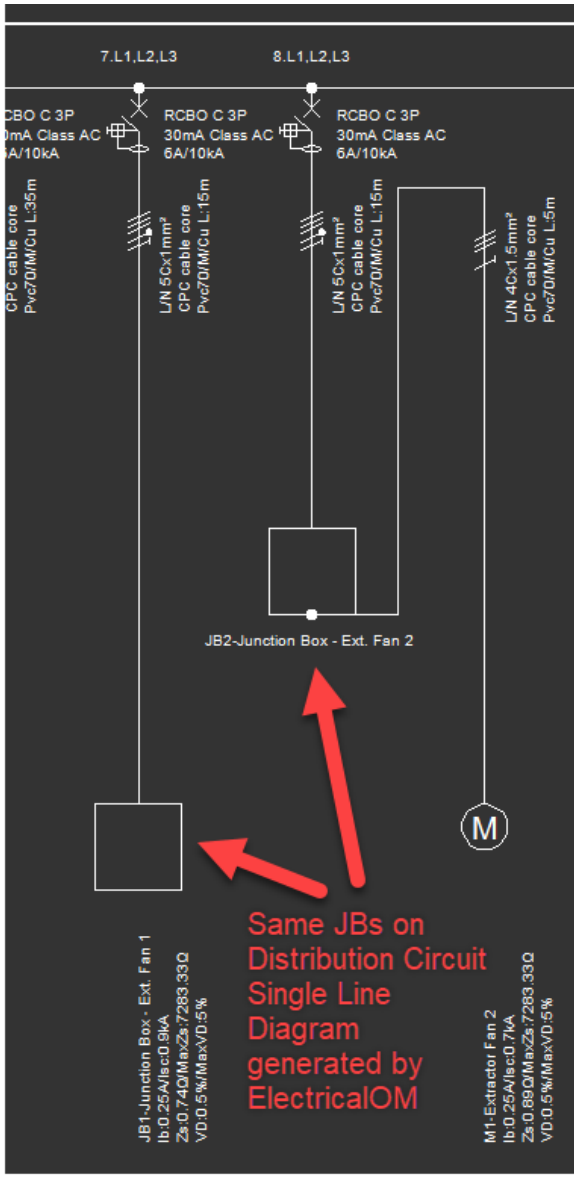

Selected distribution circuit is fed from here
Selected distribution circuit
Secondary distribution node





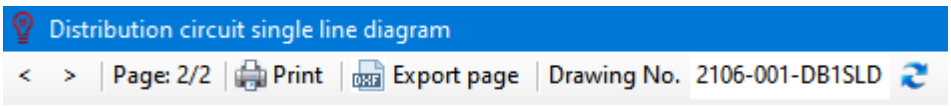
When *Force extension mode* is used for a node, then, this circuit will be shown on the same SLD as the selected distribution circuit, however, if normal mode is used to show a node then this node will be regarded as a secondary node and circuits fed from this node will not be shown.





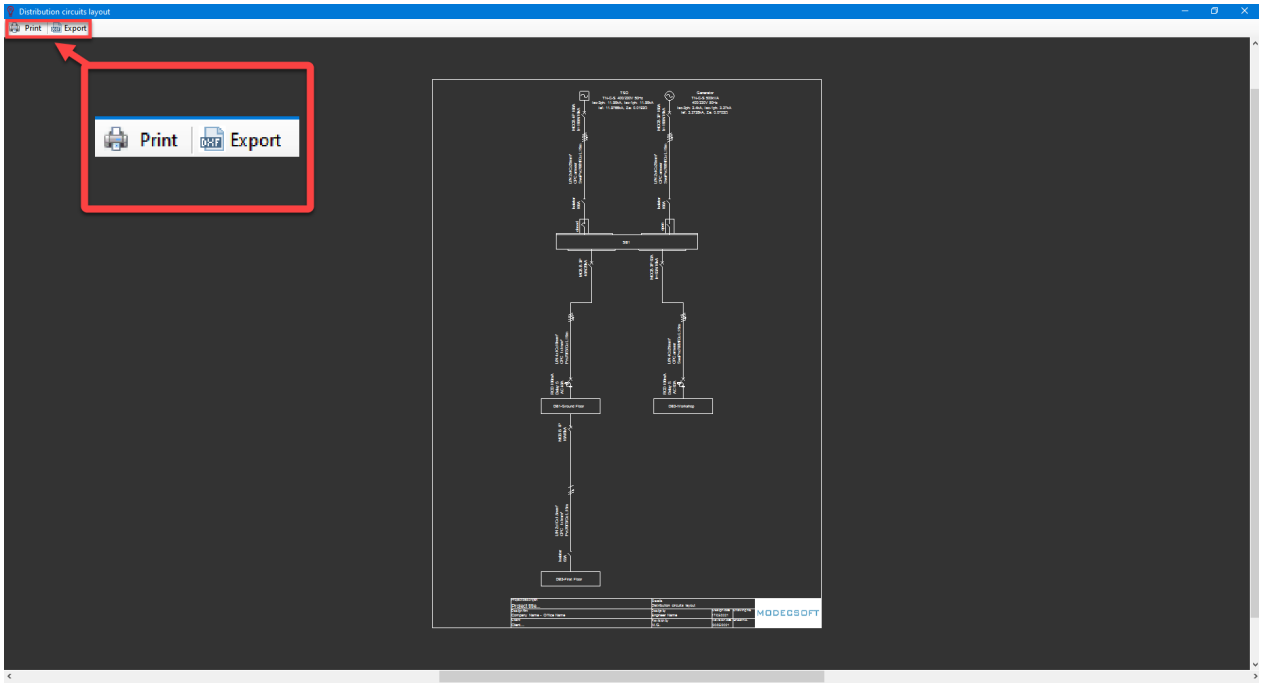
The toolbar of Distribution circuit single line diagram has:

- Navigation buttons to navigate between pages of the generated SLD,
- Print button which acts the same as described under *Print Page* title above
- Export page button which is the same as described under the title of *Export active page*
- Drawing No. text field where the user can type in the desired drawing number which will appear on the title block. The rest of the data is generated from project properties and page descriptions.
- Refresh button to apply changes made to the drawing number by refreshing the title block.

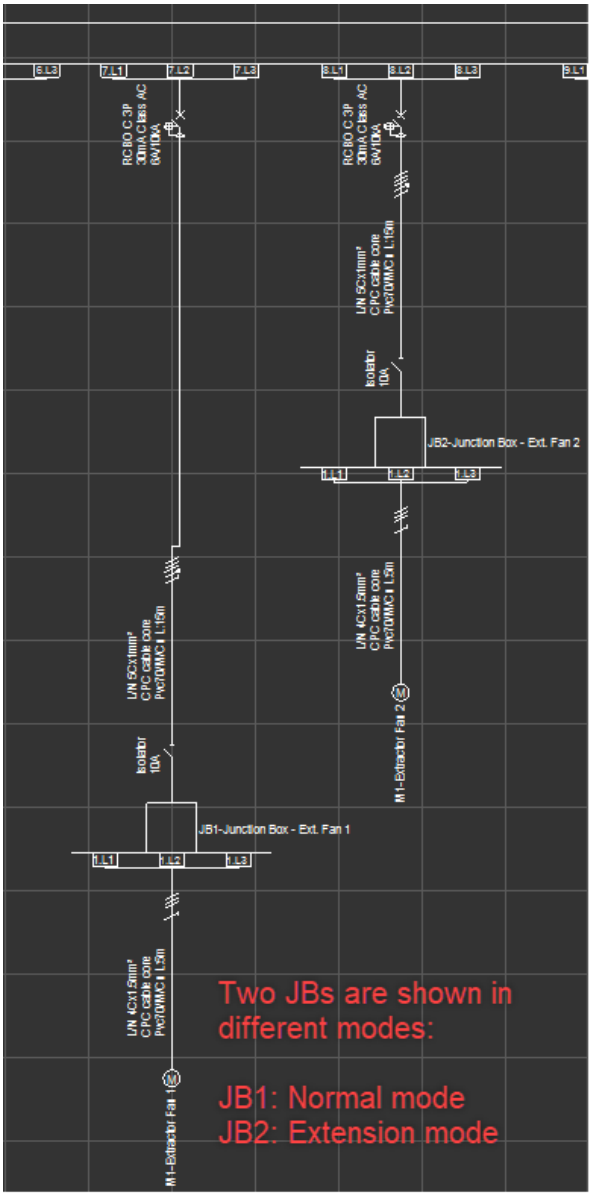


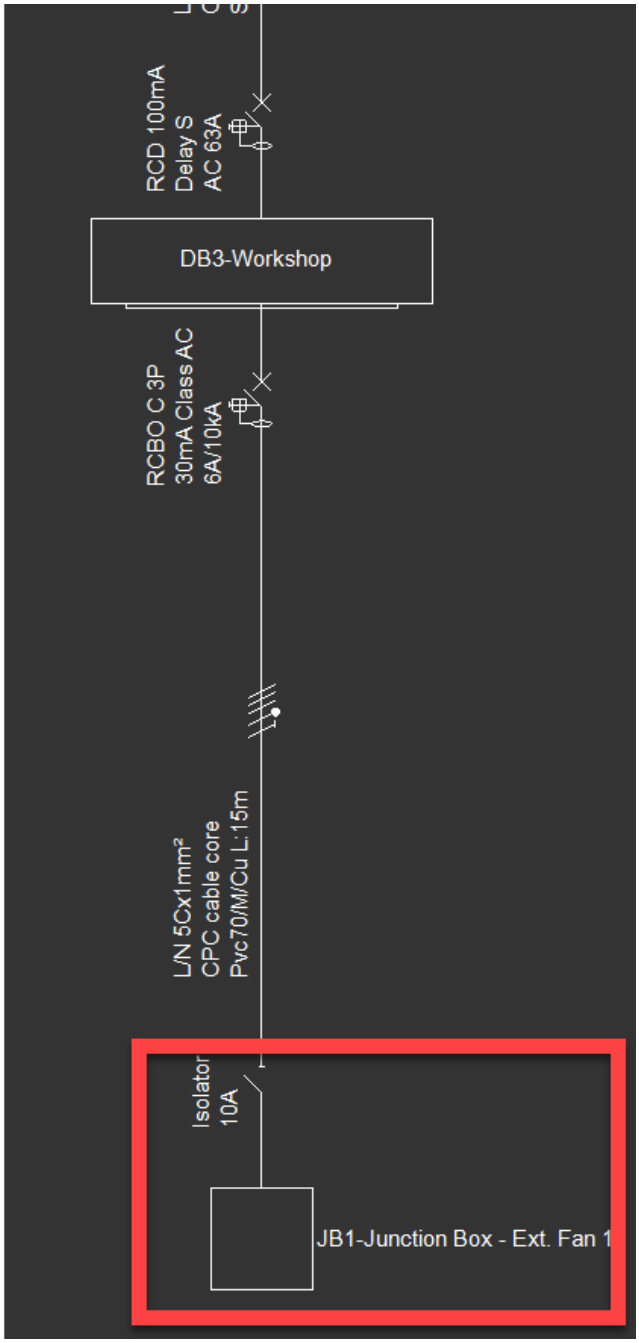
Distribution circuits layout

ElectricalOM can also produce block cable diagrams, but, this is a system wide option and will generate the BCD for the whole system. The BCD will be displayed inside a print preview window where the user may choose to print or export the BCD.



When *Force extension mode* is used for a node, then, this circuit will not be shown on the BCD, however, if normal mode is used for a node, then, it will be shown as a block on the BCD.

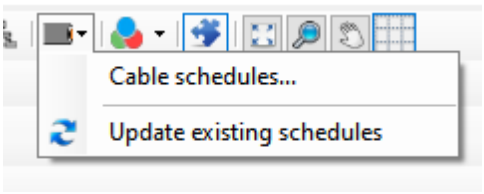




Cable Schedules

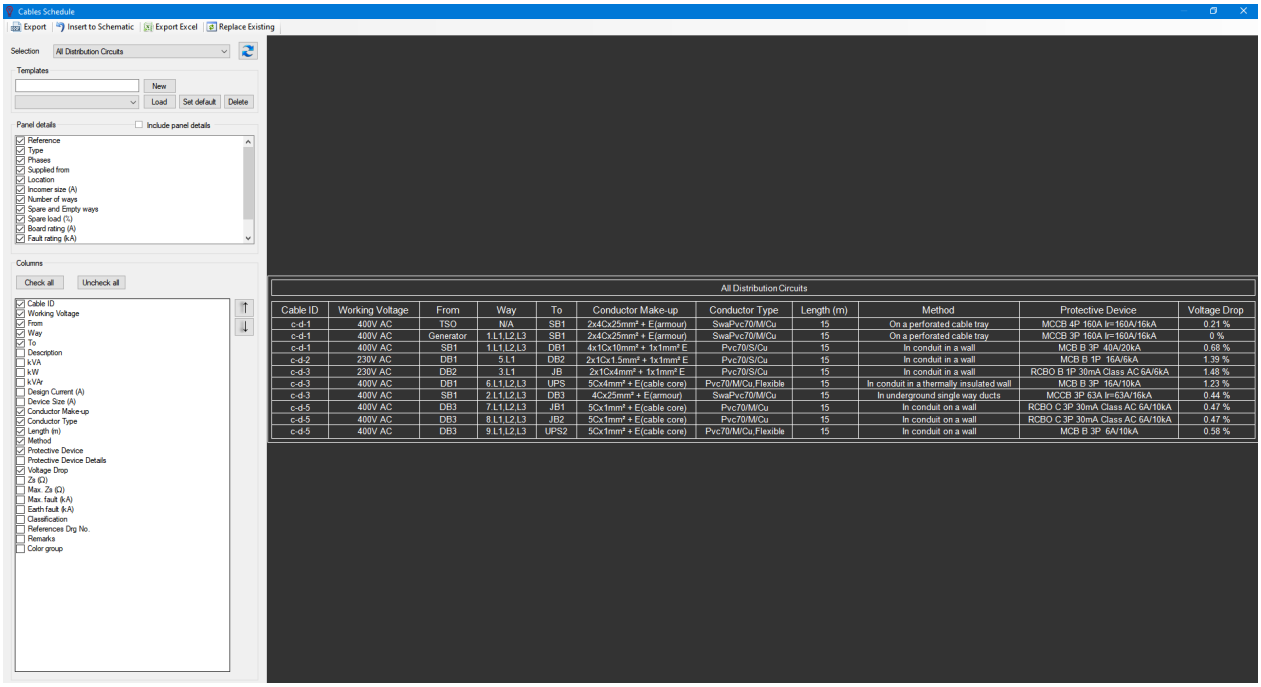
Cable schedules

ElectricalOM can generate cables schedules to use on drawings. In order to launch the cable schedules window, *Cable schedules...* option must be selected.



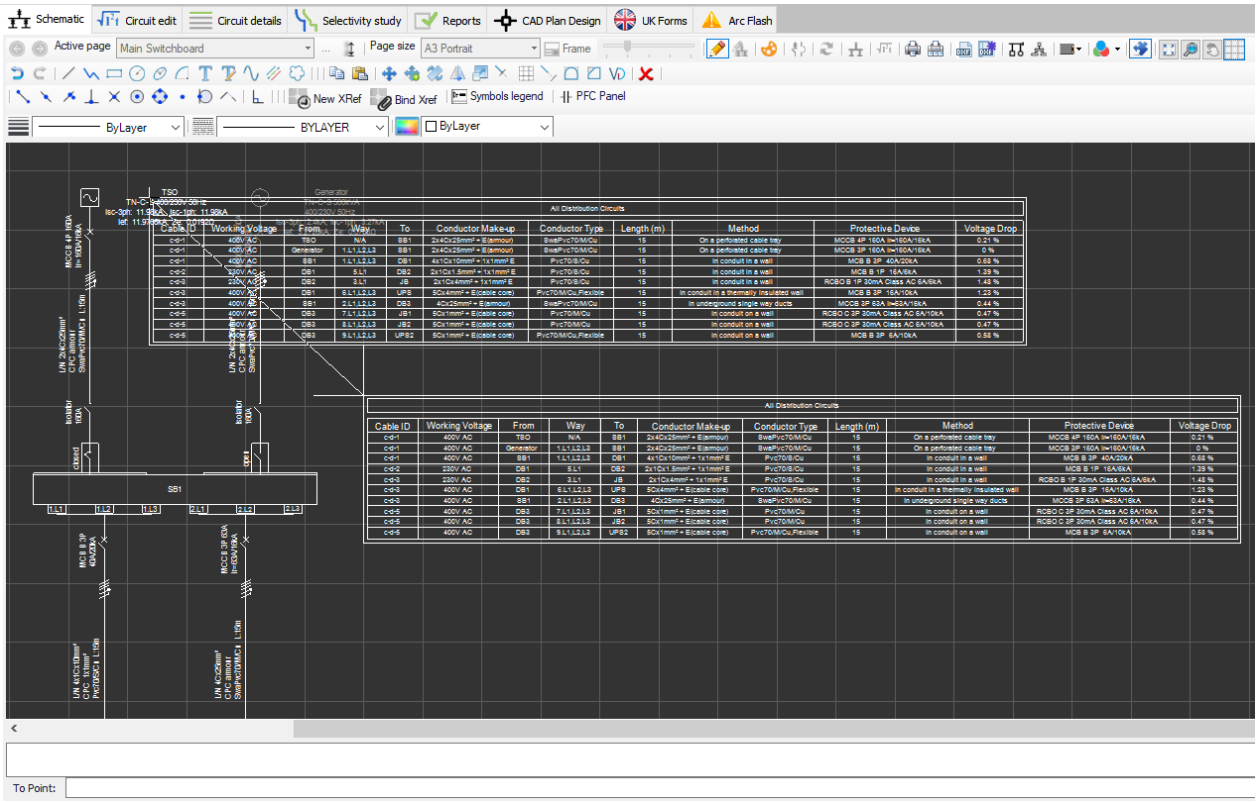
Cable Schedule window has a toolbar at the top, and a side panel on the left hand side which the user can

decide which cables will be included in the cable schedule table. As default, *All Distribution Circuits* is selected.



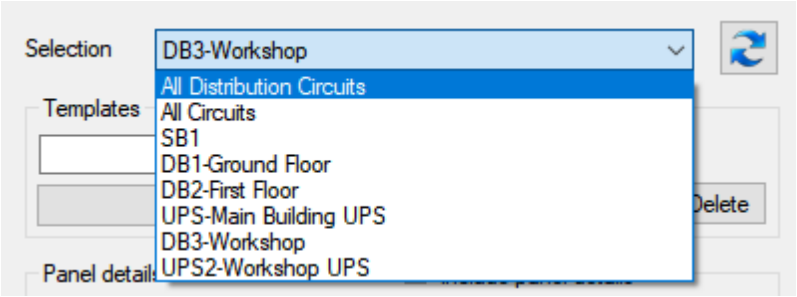
Cable schedule window toolbar has Export and Export Excel facilities to export the cable schedule table to CAD or MS Excel format. Export Excel button will run MS Excel instead of saving the schedule as a file directly, the user must have MS Excel installed on the system before running this command.

Insert to Schematic button will switch to the Schematic Module's drawing area with *Drawing mode* enabled and will let the user to select a location for the cable schedule. Once the left mouse button is clicked, ElectricalOM will place the cable schedule table to this location on the schematic. In or der to delete an inserted cable schedule table, Drawing mode must be used.

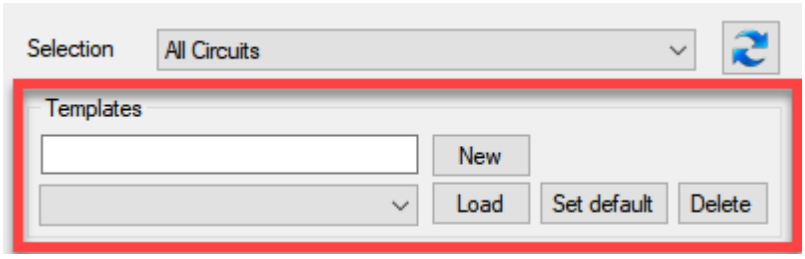


Replace Existing button is used to replace an existing cable schedule table with a new cable schedule table after changes has been made to the existing one.

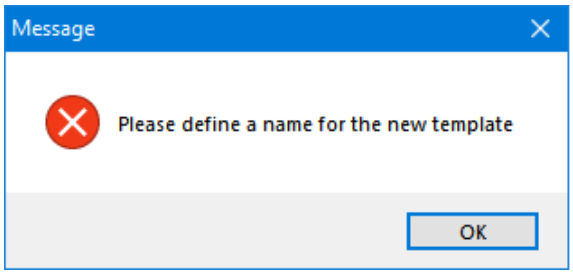
The user can use the *Selection* drop down list to select to show all cables, all cables associated by a distribution circuit or cables associated by any distribution node on the cable schedule table. Refresh button is used to apply any changes made, not only the selection but all settings, and view them on the print preview area.

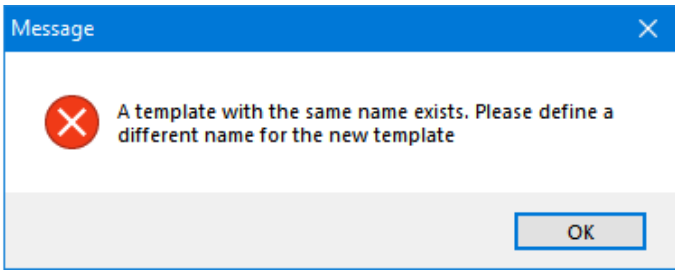


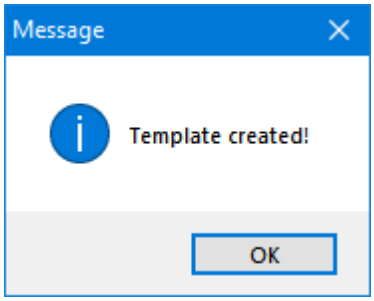
Under this section, *Templates* section is located. *Templates* are used to save the settings regard to *Panel Details* and *Columns* (but not *Selection*) and recall them as needed. New button will save the current settings to a new template.



The user must type a unique name for the new template into the box next to the New button. If no name is entered or there is another template with the same name, then, ElectricalOM will warn the user with a pop up window.

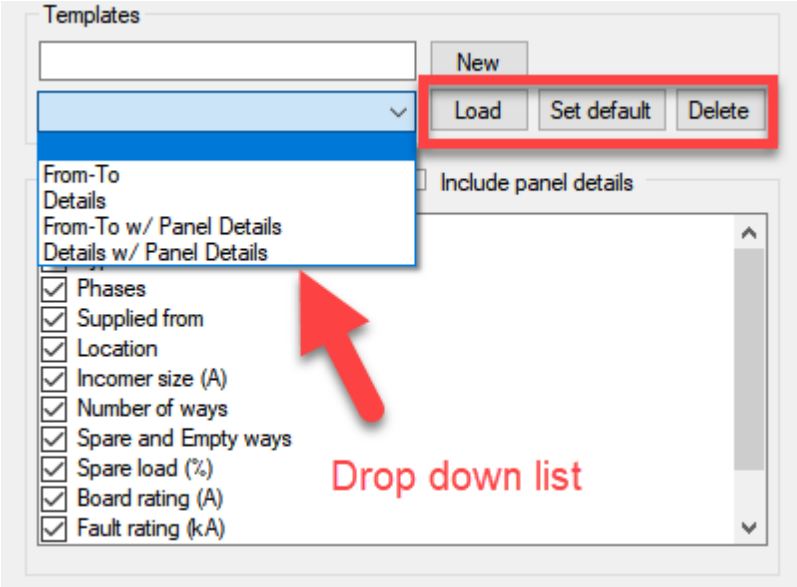


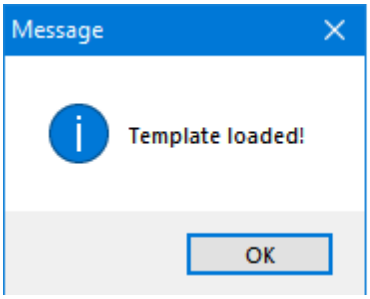


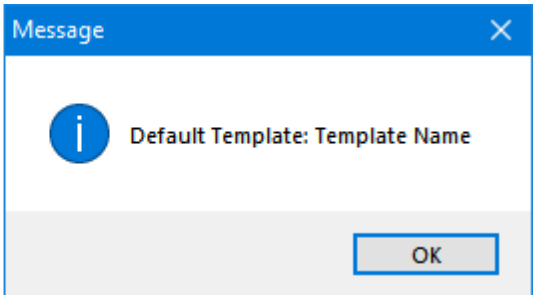


Once a template is saved, it can be:

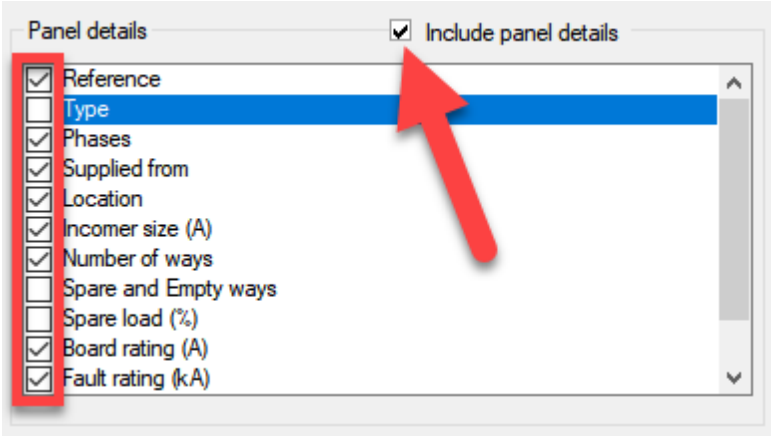
- recalled by selecting it using the drop down menu and clicking on the *Load* button.
- set as the default setting arrangement by selecting it using the drop down menu and clicking on the *Set default* button.
- deleted by selecting it using the drop down menu and clicking on the *Delete* button.



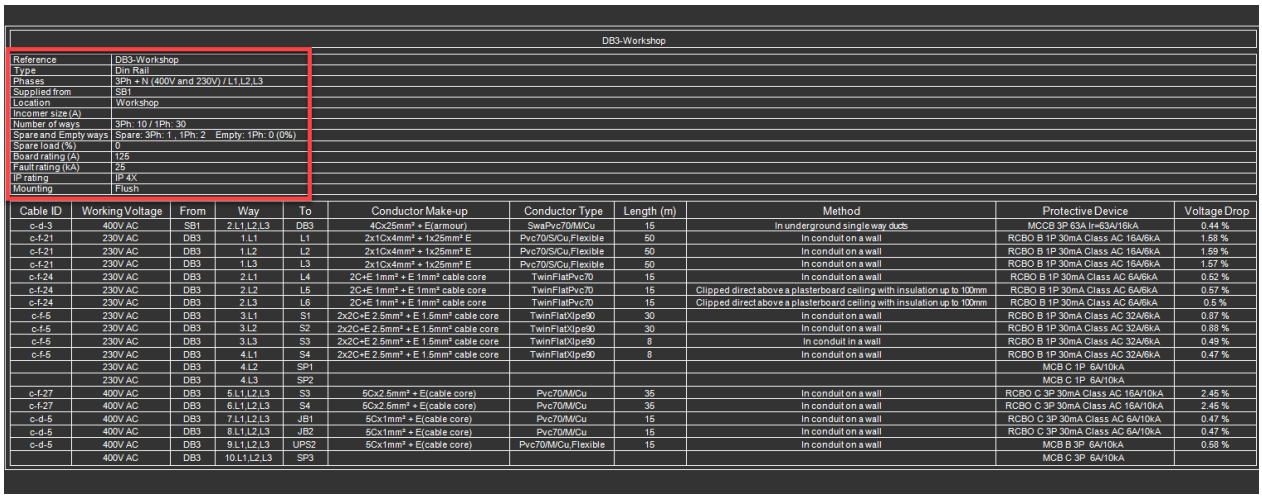




Panel details section has a tick box to enable or disable it. This is available only for distribution circuits and it will add distribution panel details to the top of the cable schedule table. The user can also select which data to appear on the table by using the tick boxes next to the options.



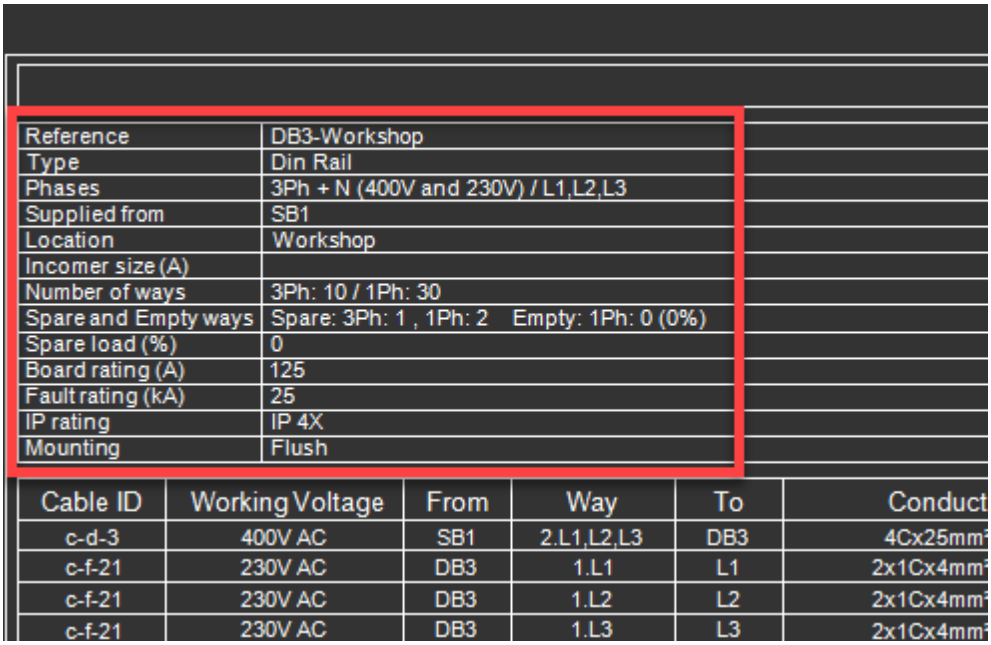
Data options for panel details are gathered from various parts of ElectricalOM but mainly from *Other options* tab under *Circuit edit* module.



DB3-Workshop

Reference	DB3-Workshop
Type	Din Rail
Phases	3Ph + N (400V and 230V) / L1,L2,L3
Supplied from	SB1
Location	Workshop
Incomer size (A)	
Number of ways	3Ph: 10 / 1Ph: 30
Spare and Empty ways	Spare: 3Ph: 1 , 1Ph: 2 Empty: 1Ph: 0 (0%)
Spare load (%)	0
Board rating (A)	125
Fault rating (kA)	25
IP rating	IP 4X
Mounting	Flush

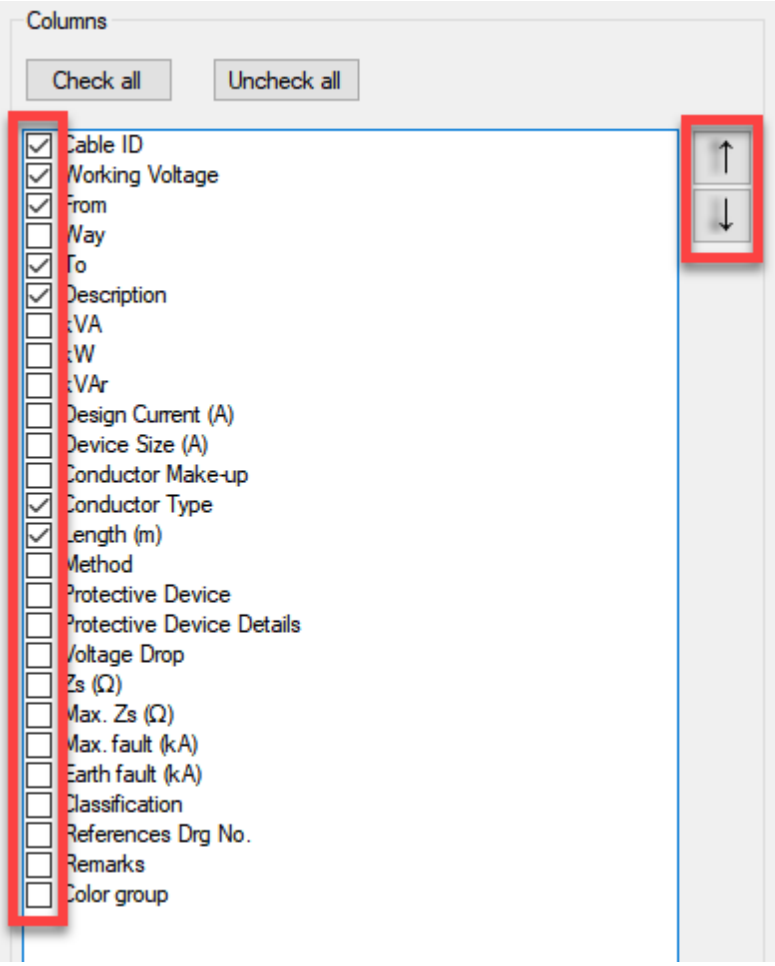
Cable ID	Working Voltage	From	Way	To	Conductor Make-up	Conductor Type	Length (m)	Method	Protective Device	Voltage Drop
c-d-3	400V AC	SB1	2.L1,L2,L3	DB3	4Cx25mm² + E(armour)	SwaPvc70/M/Cu	15	In underground single way ducts	MCCB 3P 63A Ir=63A/16kA	0.44 %
c-f-21	230V AC	DB3	1.L1	L1	2x1Cx4mm² + 1x25mm² E	Pvc70/S/Cu,Flexible	50	In conduit on a wall	RCBO B 1P 30mA Class AC 16A/6kA	1.58 %
c-f-21	230V AC	DB3	1.L2	L2	2x1Cx4mm² + 1x25mm² E	Pvc70/S/Cu,Flexible	50	In conduit on a wall	RCBO B 1P 30mA Class AC 16A/6kA	1.59 %
c-f-21	230V AC	DB3	1.L3	L3	2x1Cx4mm² + 1x25mm² E	Pvc70/S/Cu,Flexible	50	In conduit on a wall	RCBO B 1P 30mA Class AC 16A/6kA	1.57 %
c-f-24	230V AC	DB3	2.L1	L4	2C+E 1mm² + E 1mm² cable core	TwinFlatPvc70	15	In conduit on a wall	RCBO B 1P 30mA Class AC 6A/6kA	0.52 %
c-f-24	230V AC	DB3	2.L2	L5	2C+E 1mm² + E 1mm² cable core	TwinFlatPvc70	15	Clipped direct above a plasterboard ceiling with insulation up to 100mm	RCBO B 1P 30mA Class AC 6A/6kA	0.57 %
c-f-24	230V AC	DB3	2.L3	L6	2C+E 1mm² + E 1mm² cable core	TwinFlatPvc70	15	Clipped direct above a plasterboard ceiling with insulation up to 100mm	RCBO B 1P 30mA Class AC 6A/6kA	0.5 %
c-f-5	230V AC	DB3	3.L1	S1	2x2C+E 2.5mm² + E 1.5mm² cable core	TwinFlatXlpe90	30	In conduit on a wall	RCBO B 1P 30mA Class AC 32A/6kA	0.87 %
c-f-5	230V AC	DB3	3.L2	S2	2x2C+E 2.5mm² + E 1.5mm² cable core	TwinFlatXlpe90	30	In conduit on a wall	RCBO B 1P 30mA Class AC 32A/6kA	0.88 %
c-f-5	230V AC	DB3	3.L3	S3	2x2C+E 2.5mm² + E 1.5mm² cable core	TwinFlatXlpe90	8	In conduit in a wall	RCBO B 1P 30mA Class AC 32A/6kA	0.49 %
c-f-5	230V AC	DB3	4.L1	S4	2x2C+E 2.5mm² + E 1.5mm² cable core	TwinFlatXlpe90	8	In conduit on a wall	RCBO B 1P 30mA Class AC 32A/6kA	0.47 %
	230V AC	DB3	4.L2	SP1					MCB C 1P 6A/10kA	
	230V AC	DB3	4.L3	SP2					MCB C 1P 6A/10kA	
c-f-27	400V AC	DB3	5.L1,L2,L3	S3	5Cx2.5mm² + E(cable core)	Pvc70/M/Cu	35	In conduit on a wall	RCBO C 3P 30mA Class AC 16A/10kA	2.45 %
c-f-27	400V AC	DB3	6.L1,L2,L3	S4	5Cx2.5mm² + E(cable core)	Pvc70/M/Cu	35	In conduit on a wall	RCBO C 3P 30mA Class AC 16A/10kA	2.45 %
c-d-5	400V AC	DB3	7.L1,L2,L3	JB1	5Cx1mm² + E(cable core)	Pvc70/M/Cu	15	In conduit on a wall	RCBO C 3P 30mA Class AC 6A/10kA	0.47 %
c-d-5	400V AC	DB3	8.L1,L2,L3	JB2	5Cx1mm² + E(cable core)	Pvc70/M/Cu	15	In conduit on a wall	RCBO C 3P 30mA Class AC 6A/10kA	0.47 %
c-d-5	400V AC	DB3	9.L1,L2,L3	UPS2	5Cx1mm² + E(cable core)	Pvc70/M/Cu,Flexible	15	In conduit on a wall	MCB B 3P 6A/10kA	0.58 %
	400V AC	DB3	10.L1,L2,L3	SP3					MCB C 3P 6A/10kA	



Reference	DB3-Workshop
Type	Din Rail
Phases	3Ph + N (400V and 230V) / L1,L2,L3
Supplied from	SB1
Location	Workshop
Incomer size (A)	
Number of ways	3Ph: 10 / 1Ph: 30
Spare and Empty ways	Spare: 3Ph: 1 , 1Ph: 2 Empty: 1Ph: 0 (0%)
Spare load (%)	0
Board rating (A)	125
Fault rating (kA)	25
IP rating	IP 4X
Mounting	Flush

Cable ID	Working Voltage	From	Way	To	Conduct
c-d-3	400V AC	SB1	2.L1,L2,L3	DB3	4Cx25mm²
c-f-21	230V AC	DB3	1.L1	L1	2x1Cx4mm²
c-f-21	230V AC	DB3	1.L2	L2	2x1Cx4mm²
c-f-21	230V AC	DB3	1.L3	L3	2x1Cx4mm²

Columns section accommodates all the options related with the cables and they can be sleeted using the tick boxes next to the options, and rearranged by using the up and down arrow buttons. *Check all* and *Uncheck all* buttons will automatically select or unselect the options in one click.

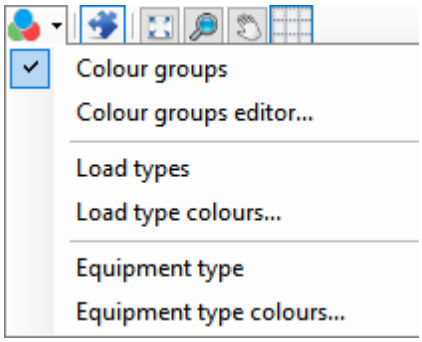


It is useful to remember that every time a change has been made, the user must click on Refresh button to apply these changes and also visually see the changes at the preview area.

Colouring Method

Colouring method

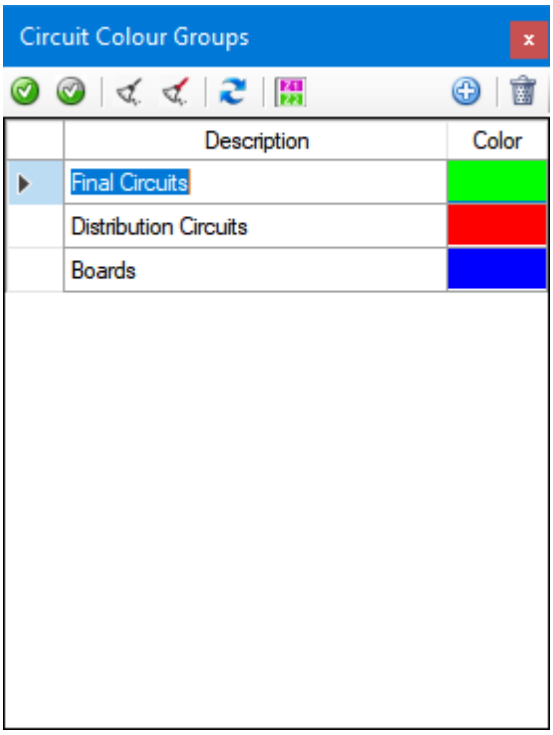
The user may want to indicate different types of circuits by using colours. Circuits can be categorised by: colour group, load type, or equipment type. User must define associated properties before enabling the desired option, otherwise there will be no colours visible on the schematic.



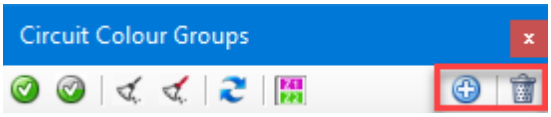
- *Colour groups method*

Colour groups option is the first option on the drop down list. First of all, the user has to define groups using

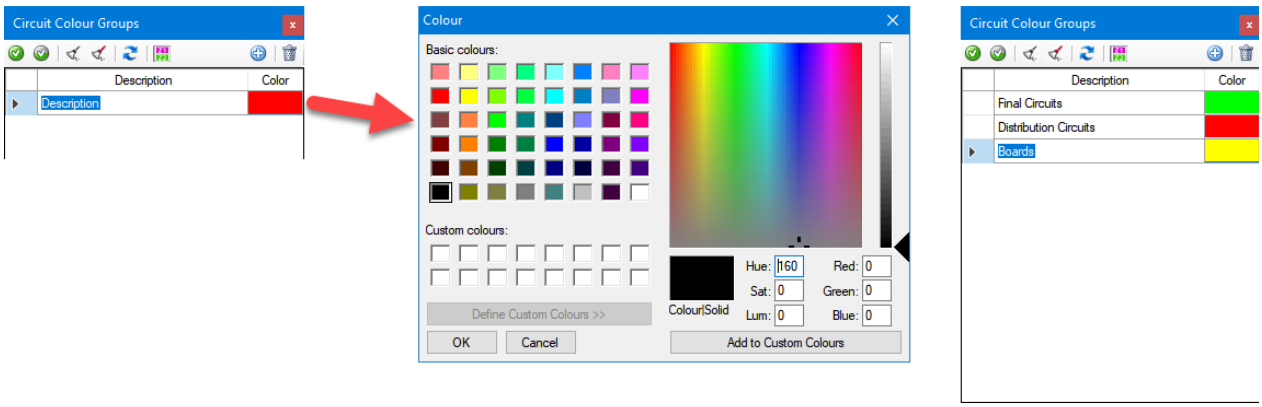
the *Circuit Colour Groups Editor* window which will appear when clicked on *Colour groups editor...* option.



Colour groups can be created using the Add button, and can be deleted by the Delete button located on the top right corner. Circuit Colour Groups windows is a floating windows which the user still have access to the drawing area and make selections.

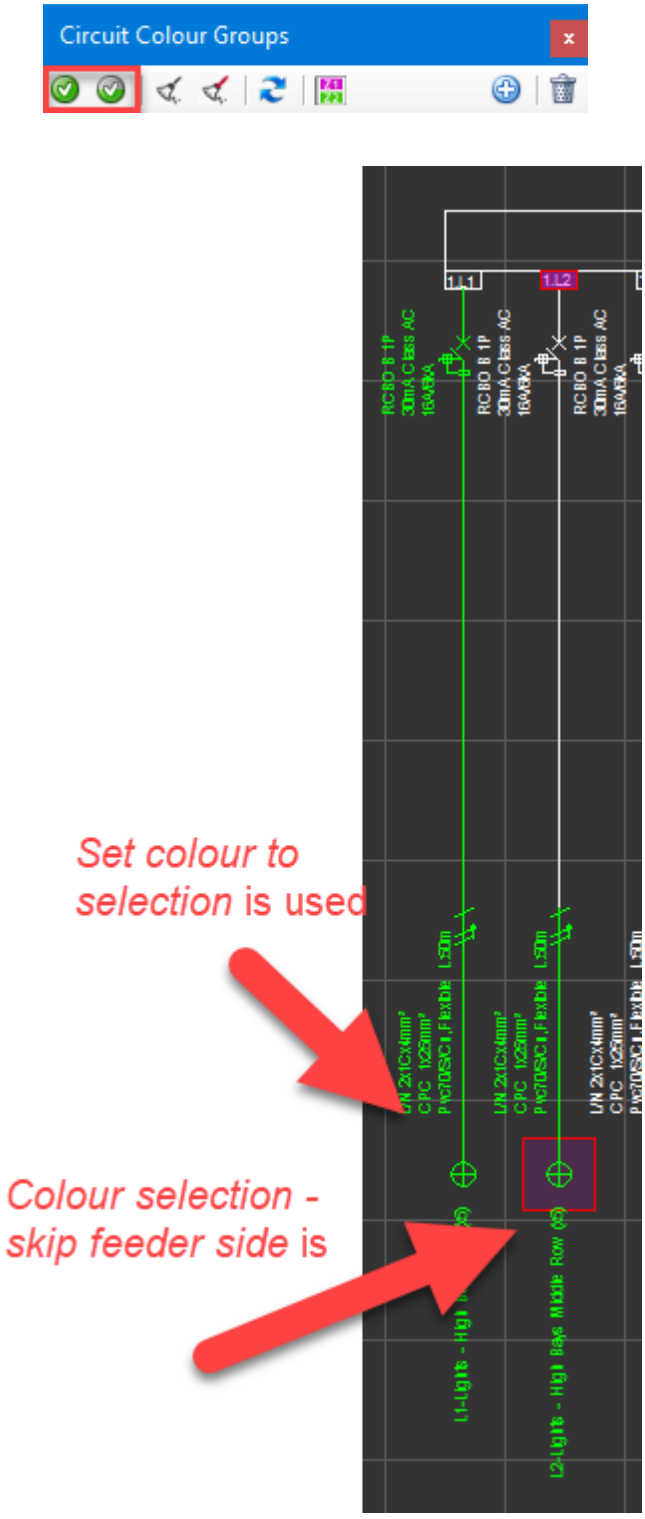


When Add button is clicked, a new row will be created by ElectricalOM which the user can type in a desired description. The colour can be changed by clicking on the rectangle fill with a set colour under the Colour column. This will open the colour palette. Groups can be created as many as the user requires.

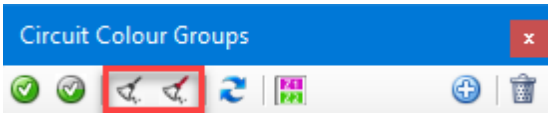


Once the groups are created, the user can select components and assign the selection to a colour group by

using either *Set colour to selection* or *Colour selection -skip feeder side* button. *Colour selection - skip feeder side* option will set the selected colour to the selected components leaving the feeder circuit unaffected by the colouring.

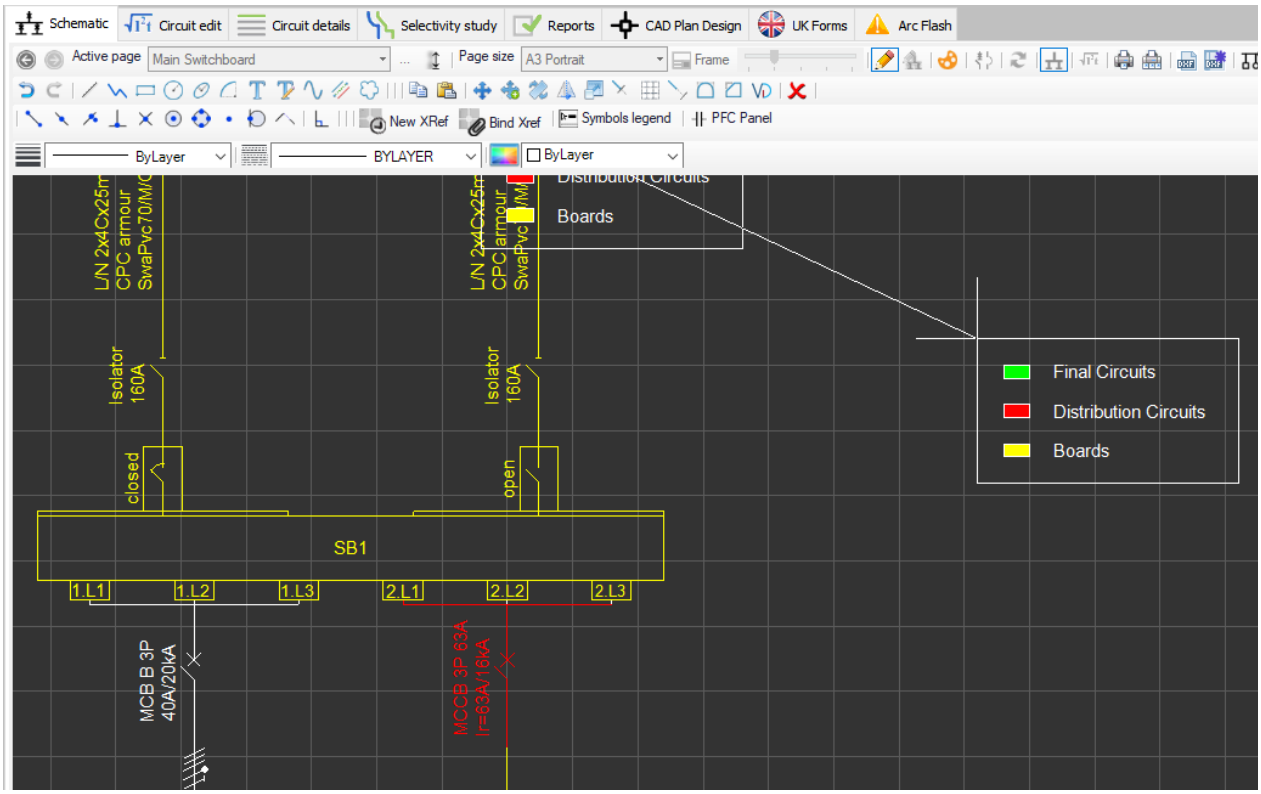


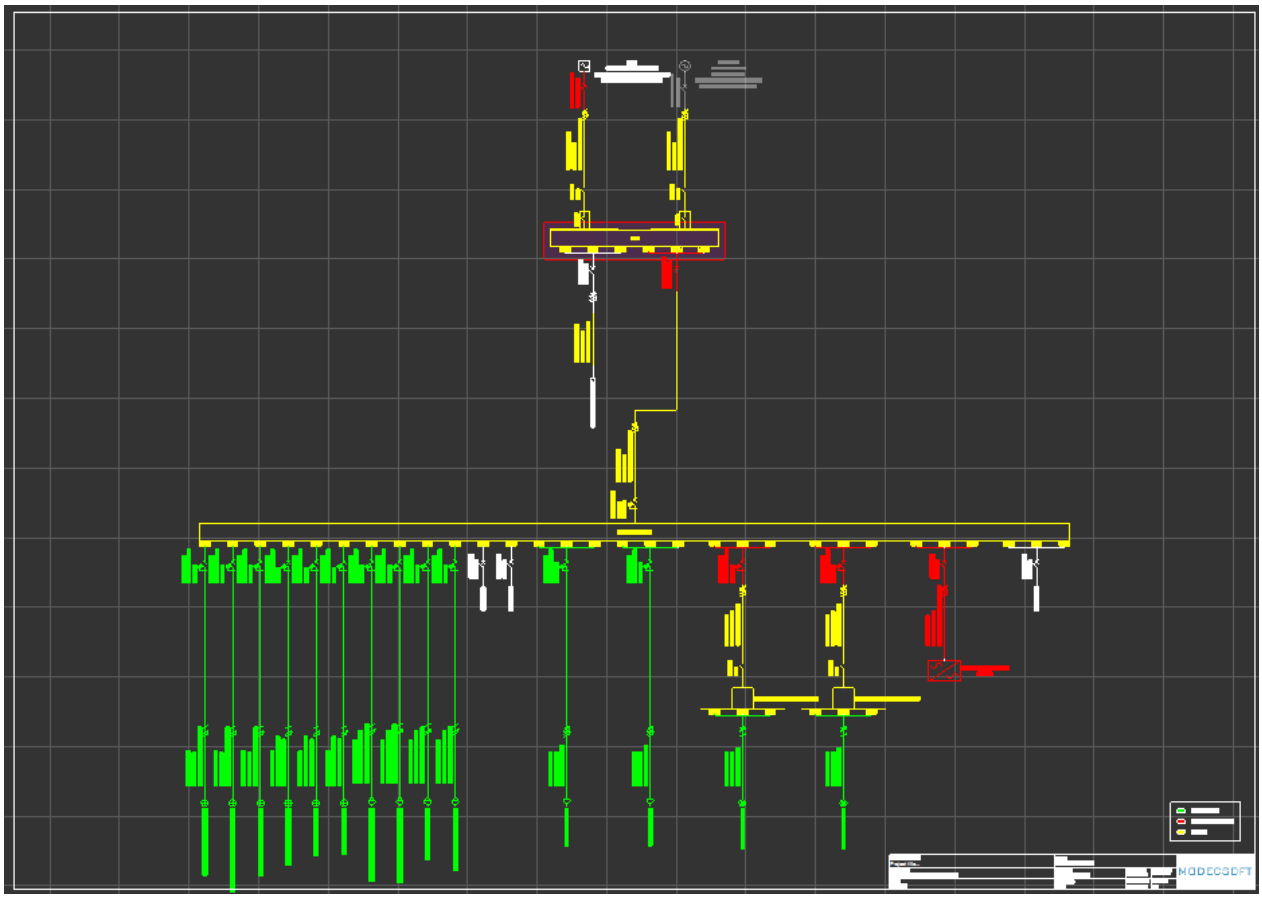
When a colour assigned it can also be removed by using *Uncolour selection* and *Uncolour selection - skip feeder side* buttons.



Similar to above options, the user must select the components wished to remove colours and click one of the options. *Uncolour the selection - Skip feeder side* option will leave the feeder colour unaffected by the options.

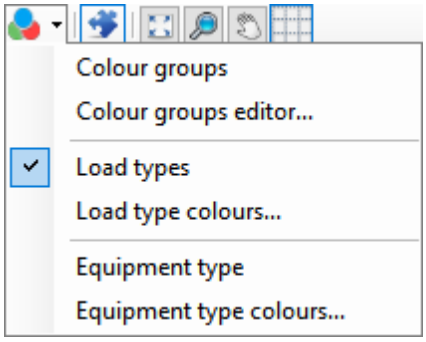
Refresh button will refresh the drawing area to apply the changes made by the user after the last refresh, and *Insert Colour Legend* will switch to the drawing area enabling the drawing mode and waiting for the user to pick a location for colours legend.



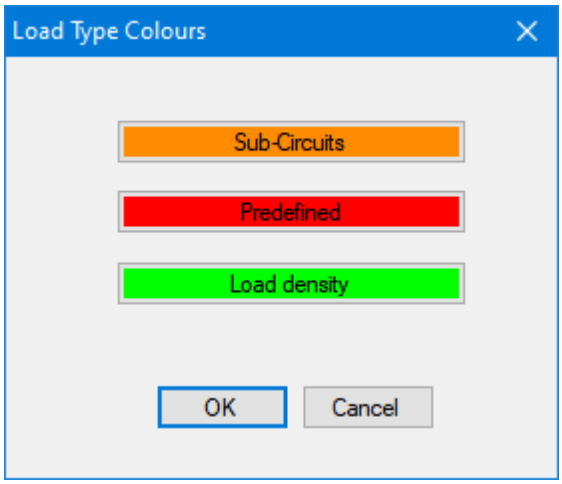


- *Load types method*

Second option is the load type method. This method will colour only the boards and not other circuits.

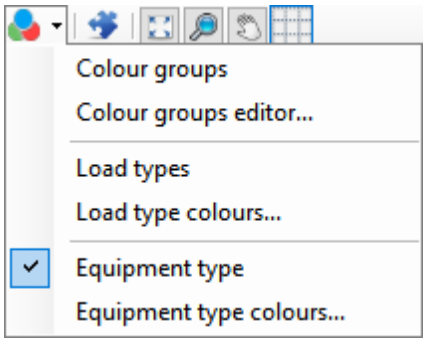


Load types can be selected from Circuit Edit module, where colours for each type can be selected by clicking on *Load type colours...* option. Once the Load Type Colours window is displayed, then, clicking of the load type will call the colour palette window. The user can associate a colour from this menu to a load type which ElectrcialOM will use to represent associated load type on the schematic.

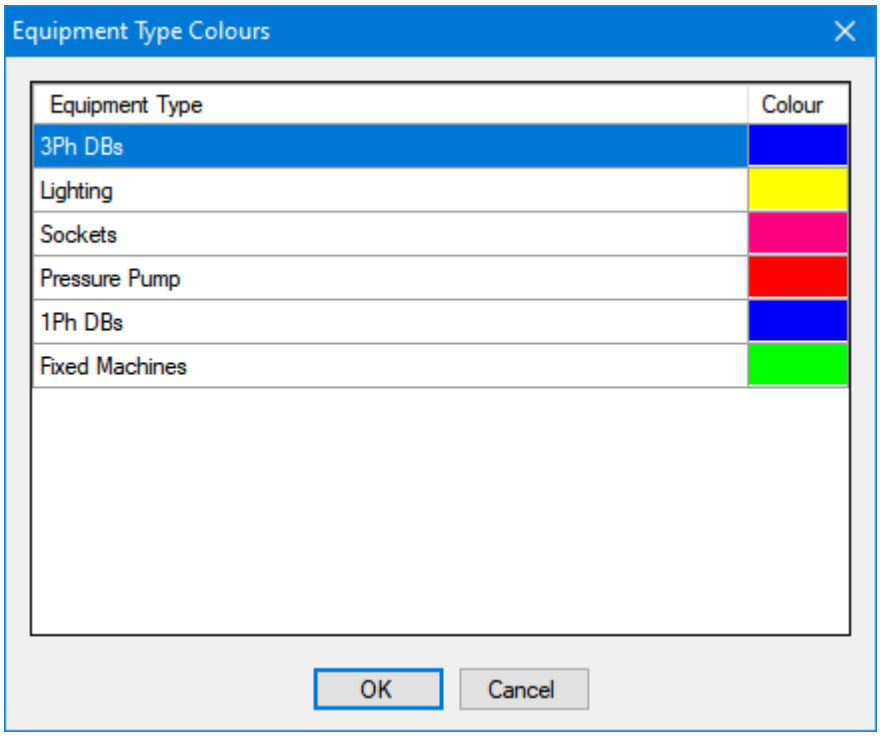


- *Equipment types method*

Third option will let the user to colour the circuits according to their equipment types. Equipment types can be defined by following the steps specified under *Equipment Types* title in Other details Tab section and will not be discussed here. The user must use *Equipment type colours...* option to define colours for each equipment type.



Equipment Type Colours window will list the equipment types defined by the user with a colour box in front of each row. Clicking on the colour box will call the colour palette windows which displays colour options for the user to select.



Show/Hide Side Panel

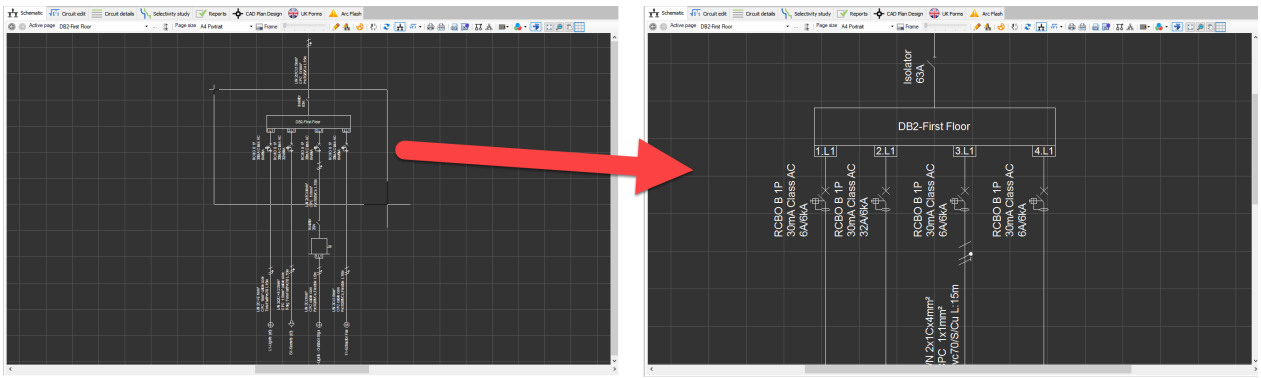
Show symbols/properties area

This is a toggle button which displays or hides the side panel.

Zoom/Pan and Grid

Zoom All/Zoom Window

Zoom All button will rescale the drawing area to the extends of the schematic where *Zoom Window* button will let the user to specify the area which will be zoomed in by ElectricalOM. Only one click is enough for *Zoom All* but the user must specify a rectangular area by clicking on the drawing area for *Zoom Window*. *Zoom Window* will use this rectangle to zoom in.



Pan

Pan button will switch the mouse cursor to a hand and will initiate the pan action. See Schematic Module Tab. Using the Esc key on the keyboard or using the left mouse button without moving the cursor will exit the pan mode.

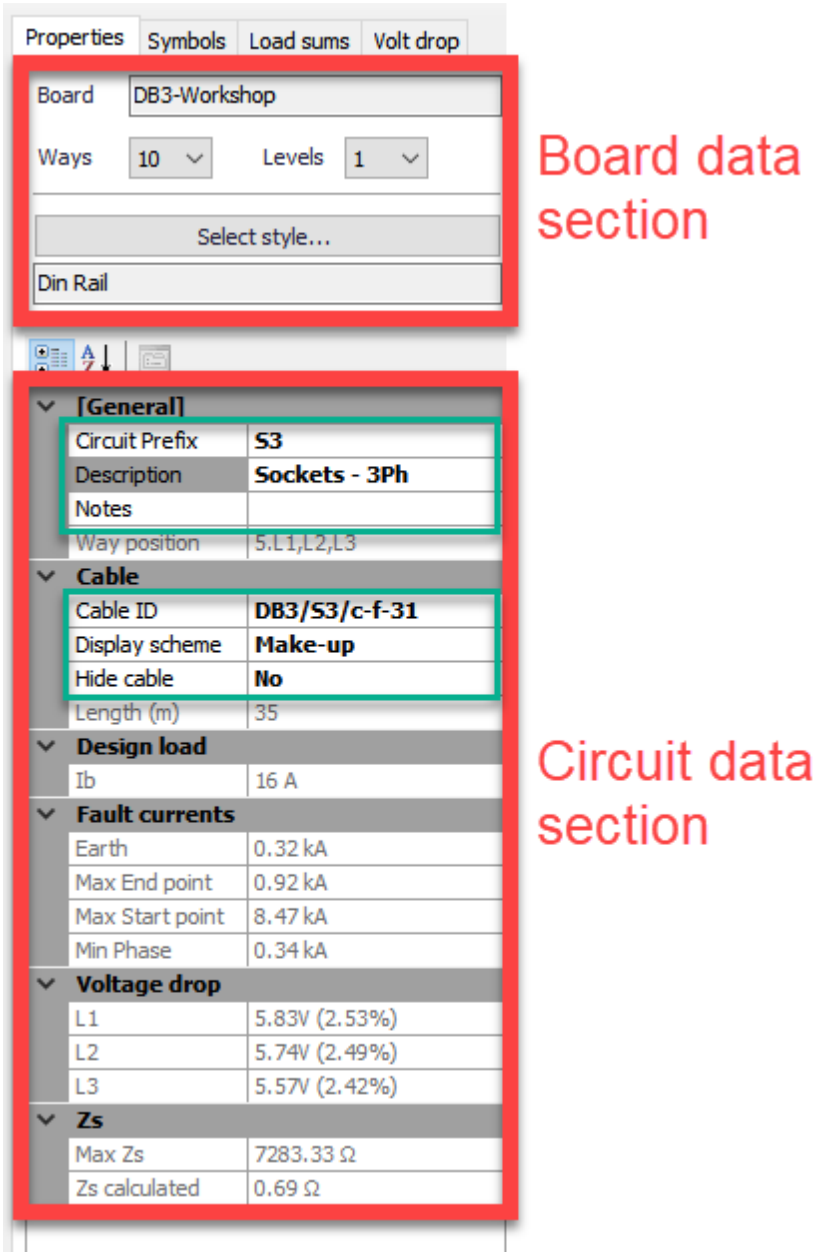
Grid

This button will display or hide the grid. It must be noted that *Grid* button is also controlling the *Snap to grid* feature.

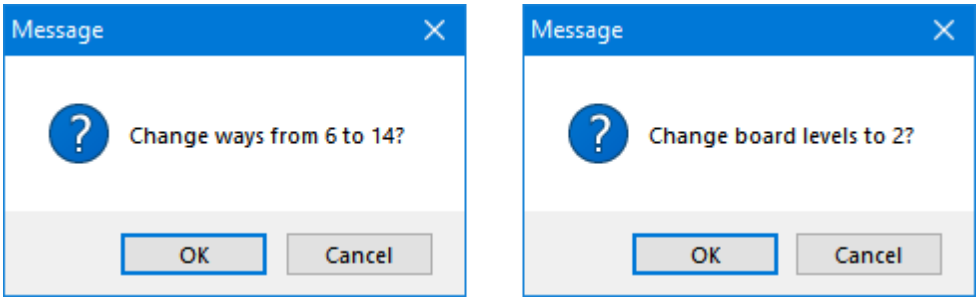
Schematic Module Side Panel

Schematic Module Side Panel is where the user can see various details about a selected circuit or item, and also can modify some of the settings. The side panel has four main tabs located on top of the screen, Properties, Symbols, Load sums, ad Volt drop.

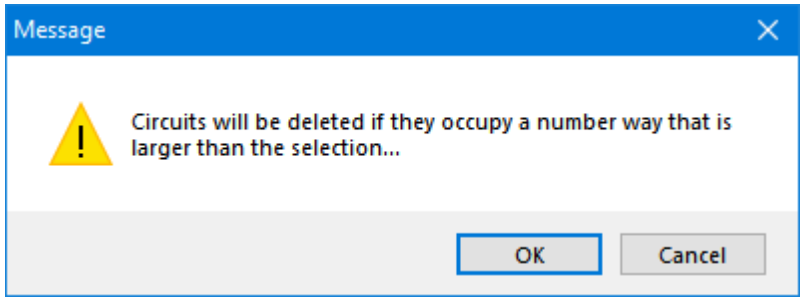
- *Properties*: This tab is divided into two sections: board data and circuit data. Board data section is reserved for the distribution board's details. Even if the user selects a final circuit, ElectrcialOM will still display the corresponding (the circuit feeding the selected final circuit) distribution board details, but, if a distribution node other than a DB is selected, board data section will not be shown.



- *Board Data Section*: The user can modify the Board's number of ways, number of levels, and visual representation style of the board by using the *Ways* and *Levels* drop down lists, and *Select style...* button. If the user attempt to change the number of ways or levels, ElectricalOM will ask the user to approve with a message window.

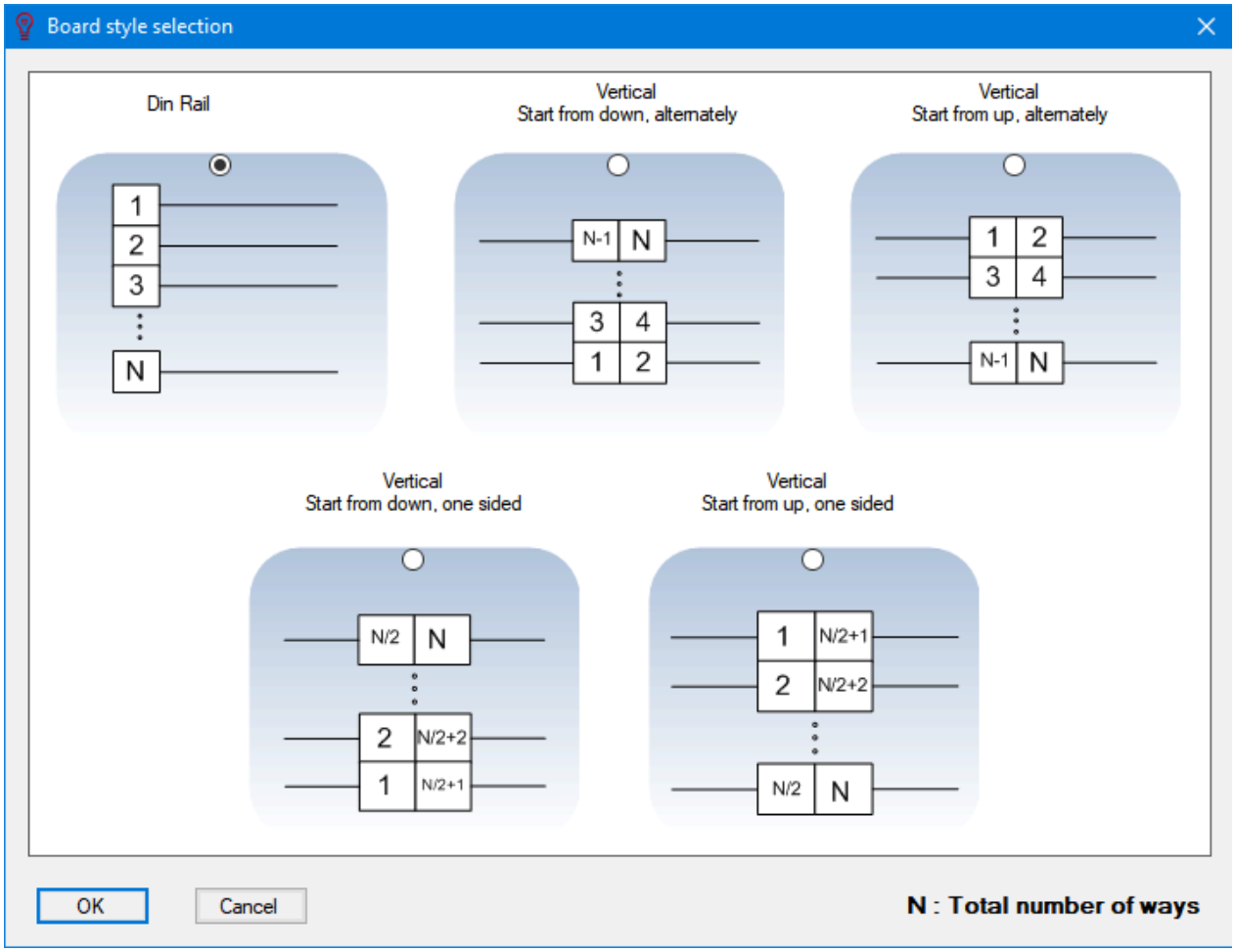


If the number of ways are being set to a lower value than they are already set, then, ElectricalOM will warn the user before proceeding and if the user clicks on OK will remove the higher numbered ways from the board.



For more details about changing number of ways of a distribution board please refer to Distribution Board section.

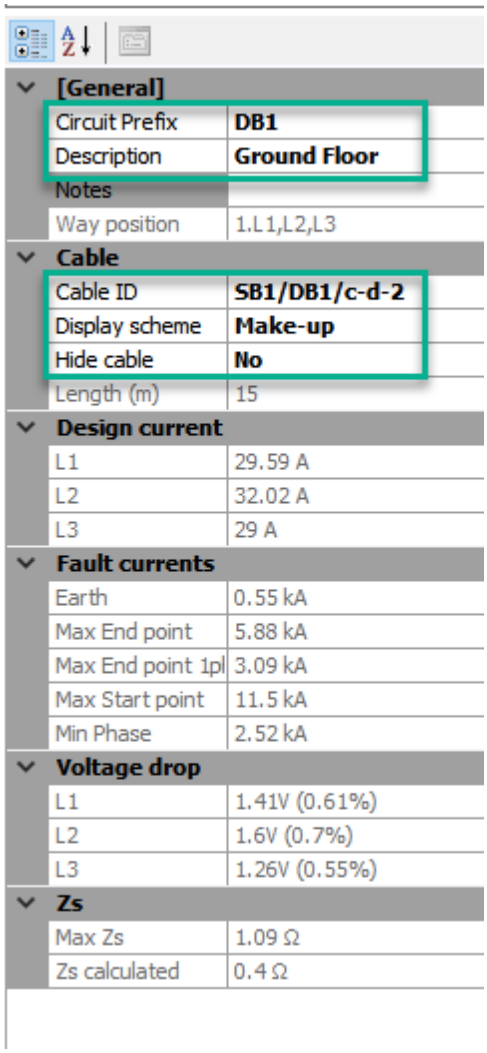
Board representation style can be changed by using the *Select style...* button. There are 5 styles available as shown below:



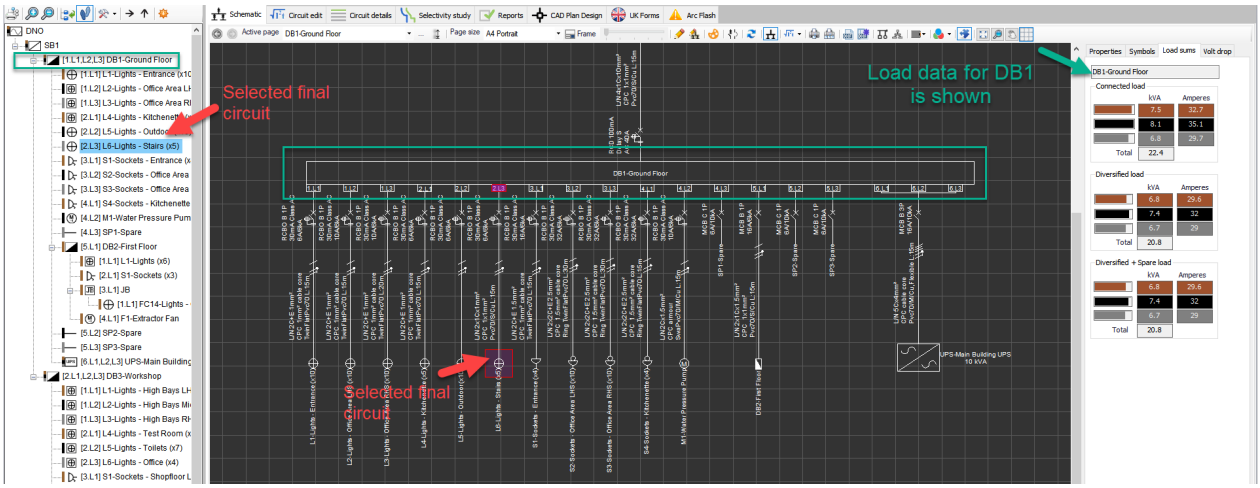
- *Circuit Data Section:* Below *Board data* section, *Circuit data* section is located where *General*, *Cable*, *Design current*, *Fault current*, *Voltage drop*, and *Zs* data are displayed under related

titles.

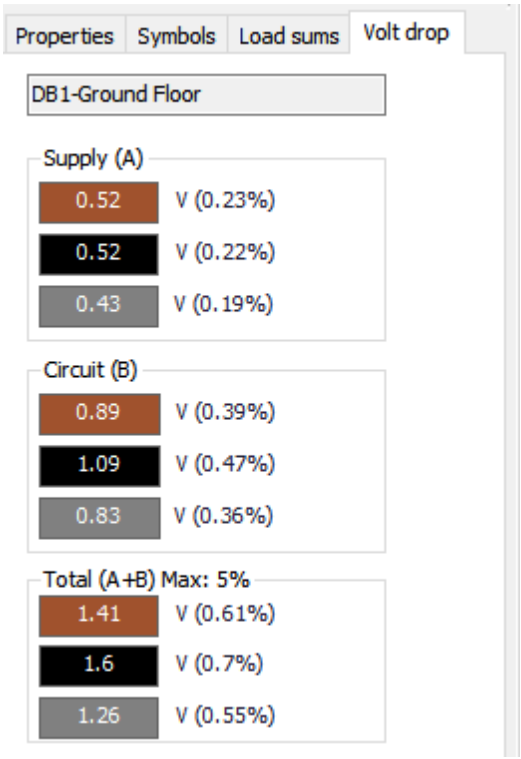
Some of these can be modified directly from here by the user (marked with green rectangles below) but some of them are based on calculations and for information only, and cannot be modified directly from schematic module side panel. The user needs to click on the text field next to the title to modify any data. Display scheme and Hide cable data fields are drop down lists which the user may pick an option from where others are text field in which the user may type required data. For Circuit Prefix, Description, and Notes, see Circuit Edit Module Tab section. For Cable ID, Display scheme, see Other details Tab section, and for Hide cable, see Conductor Tab in Circuit Details Module section.



- *Symbols*: Please refer to Symbols section.
- *Load sums:* This tab will display load data of the related distribution node of a selected circuit. So, if a final circuit is selected, this tab will still display the load data of the distribution node of the selected final circuit.



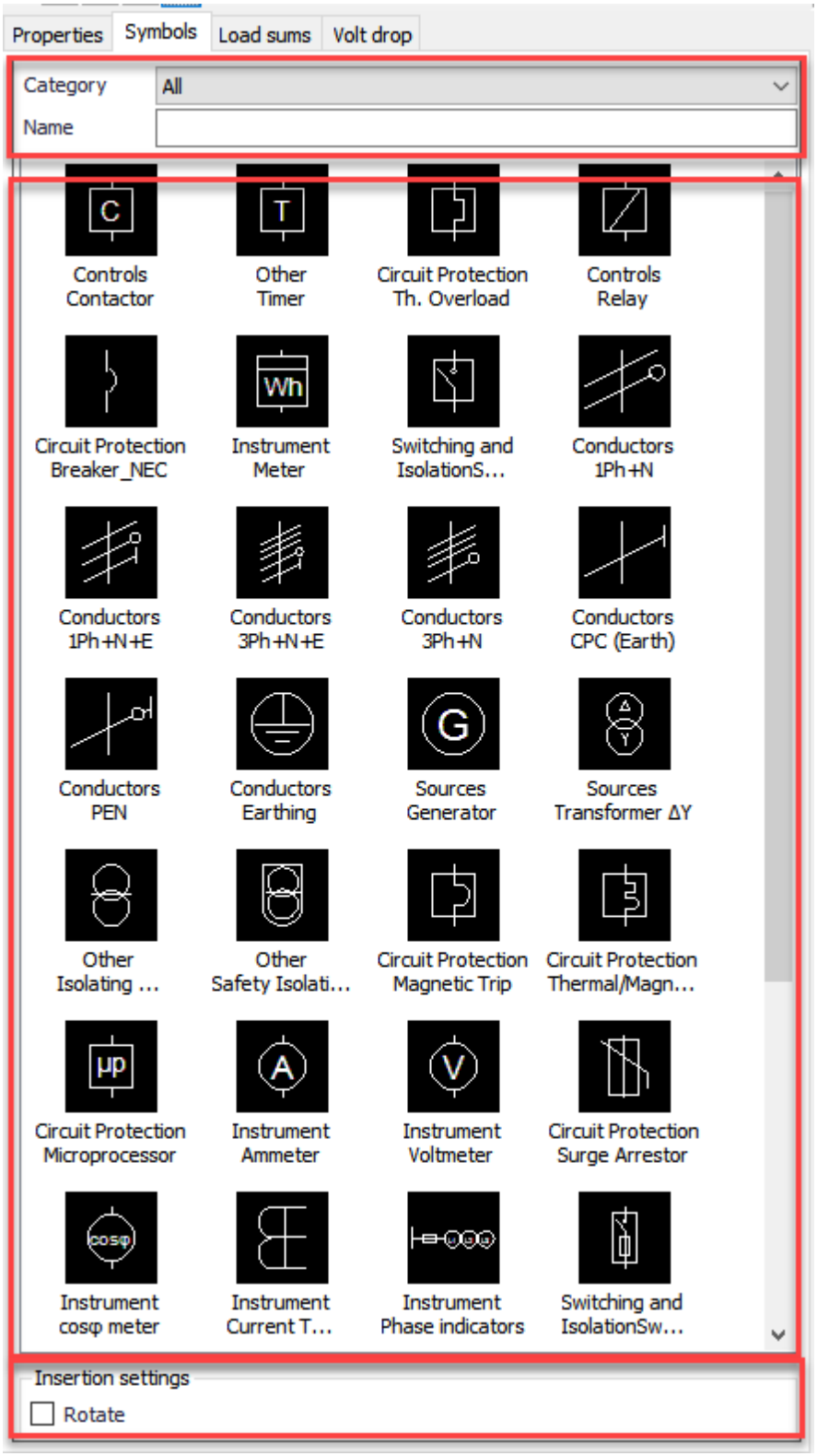
- *Volt drop:* This tab displays voltage drop data of the selected circuit. Colour coded fields, represent each phase, displays the voltage drop in Volts and next to these ElectrcialOM also displays the voltage drop in percentage.



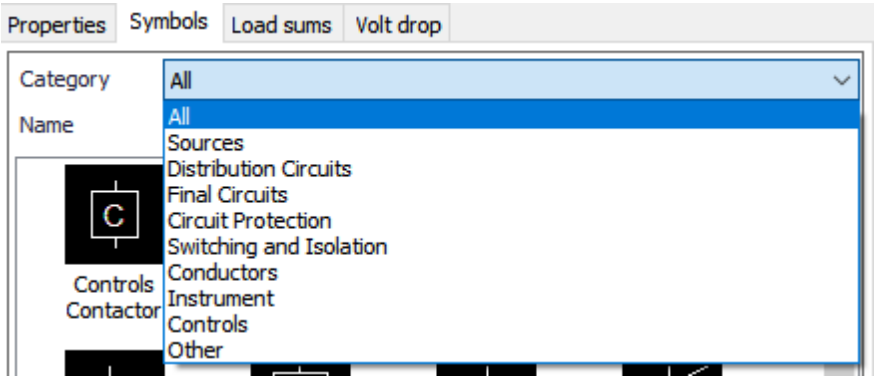
  - *Supply (A)* section will display associated distribution circuit's voltage drop from the origin to the feeding point of the selected circuit,
  - *Circuit (B)* displays the selected circuit's voltage drop after the distribution circuit which id from the feeding point to the end point of the selected circuit, and
  - *Total (A+B)* displays the total voltage drop associated with the selected circuit from the origin to the end point. The maximum percentage value will change according to the circuit type and voltage drop settings. See Voltage Drop Tab and Source.

Symbols Tab

Symbols tab of the Schematic module is not only used to insert symbols to the schematics but also used to create, edit, delete, etc. new symbols. The tab mainly is divided into three sections: Selection section, Symbol icons area and Insertion settings area.

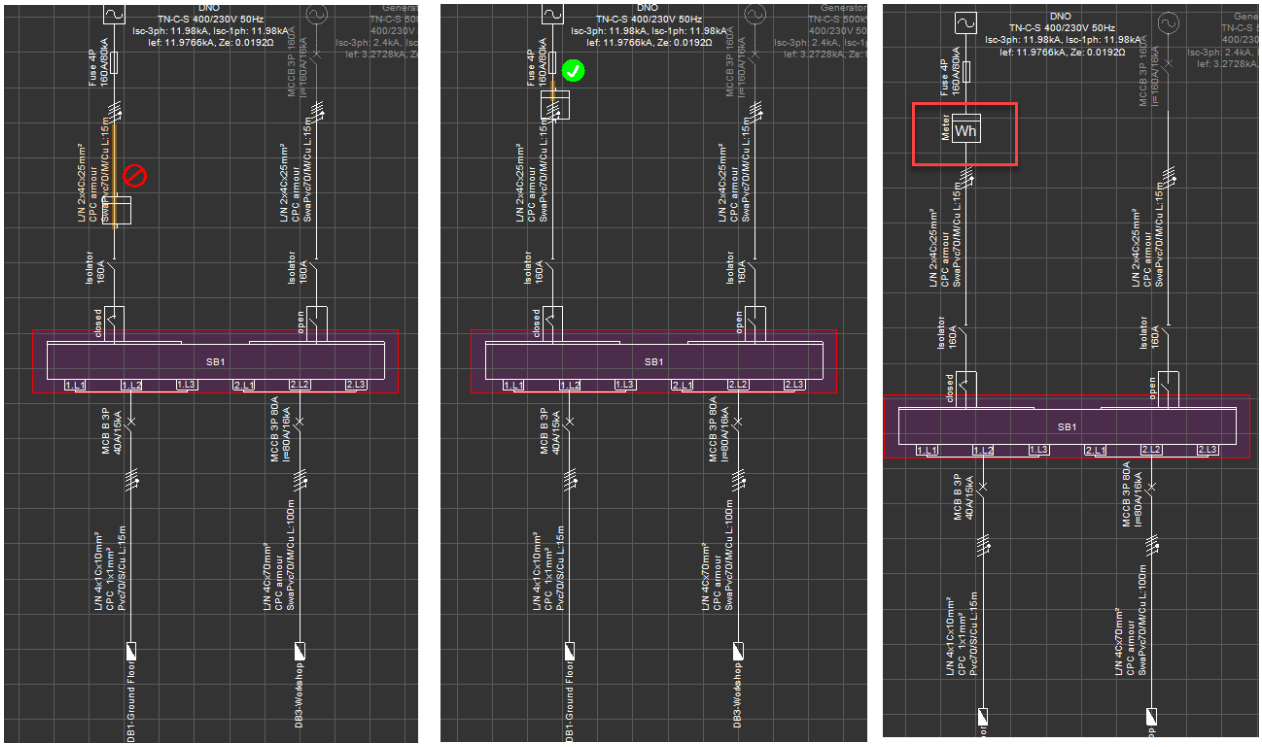


The *Category* drop down menu can be used to narrow down the selection of the symbols displayed in the symbols area. There are multiple categories to select from the list as shown below:

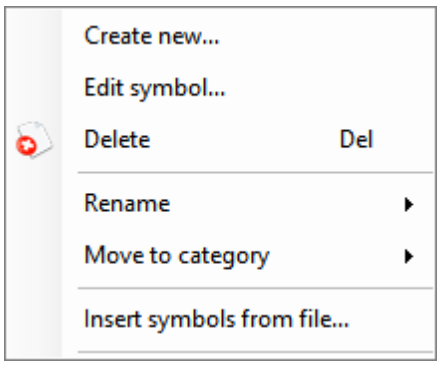


Name field can be used to perform a search by typing in a text into the text filed and using the enter key of the keyboard.

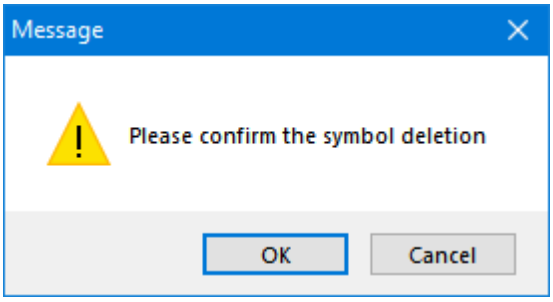
The user may also chose to scroll the symbols area and drag the symbol required into the schematic area. In order to drag a symbol, first, the user must click and drag the symbol icon towards the schematic area while holding the left mouse button. After the symbol icon is within the schematic area, left mouse button must be released. ElectricalOM will display possible insertion points for the selected symbol as the user moves the symbol on the schematic. Red cross denotes the point is not suitable for insertion where a green tick denotes the point is suitable for the selected symbol to be inserted. ElectrcialOM will also highlight insertion points with yellow as the user moves the symbol. Once the user selects a green tick location using the left mouse button. the symbol will be inserted. To cancel insertion, right mouse button can be used.



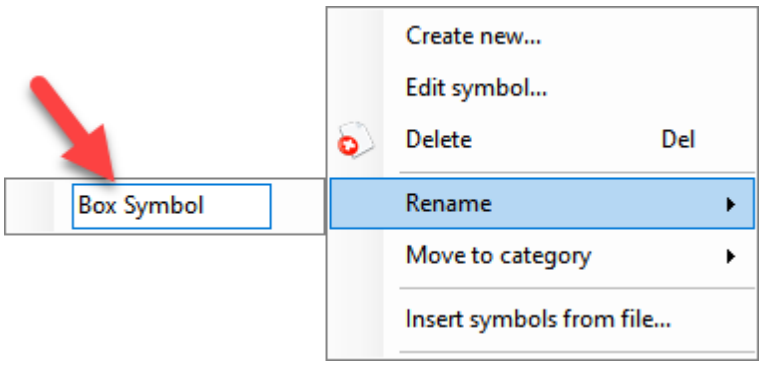
Rest of the actions can be initiated by using the right-click menu.



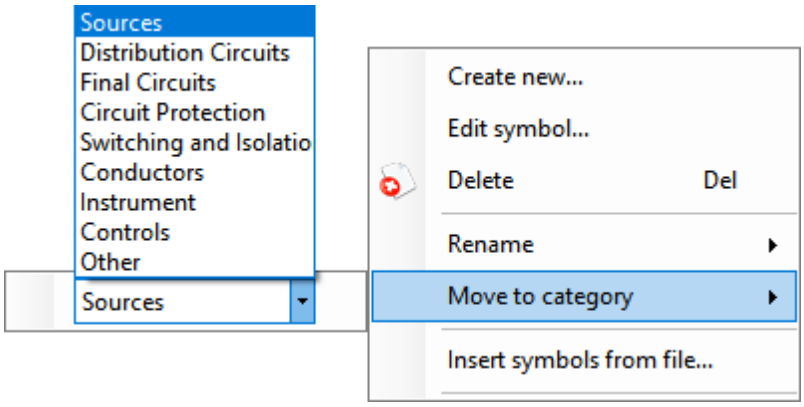
- Create new... and Edit symbol...: Refer to Creating and Editing a Symbol.
- Delete: The user may delete an existing symbol by selecting its icon from the symbol icons area and choosing Delete from the right-click menu. ElectricalOM will confirm the deleting via a warning message window.



- Rename: This option is used to rename an existing symbol. Once selected, a sub menu will open where the user can click inside the text field and type in a new name for the selected symbol.

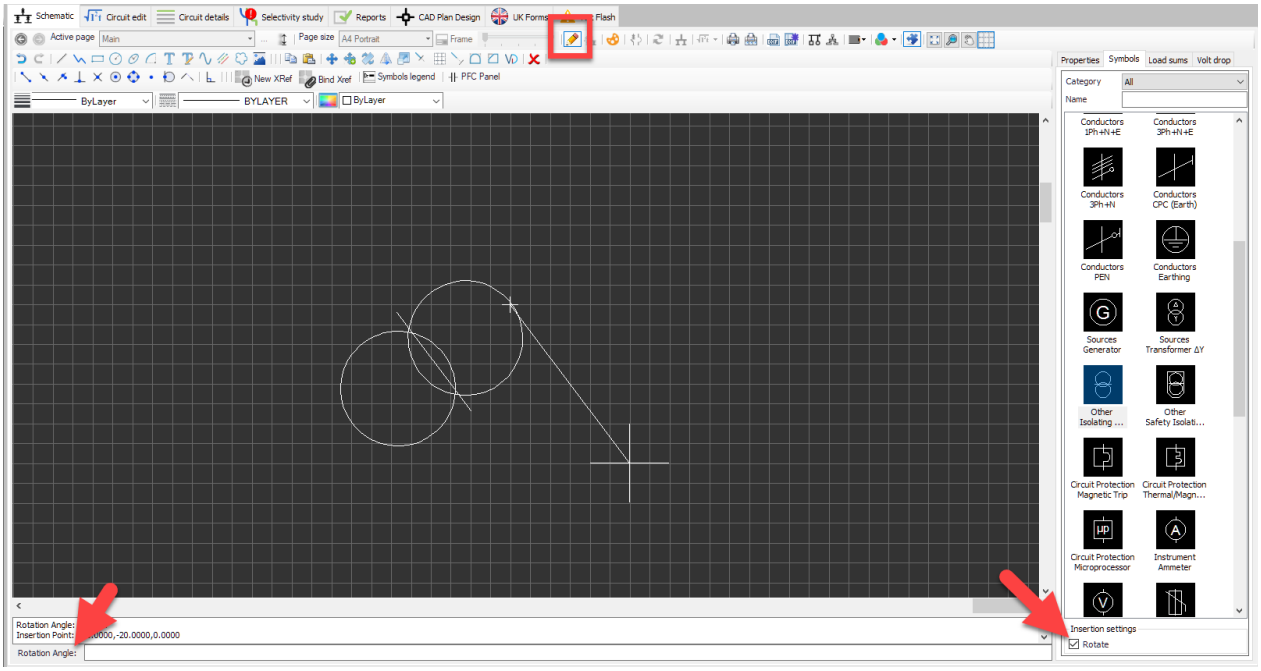


- Move to category: This option is used to move an existing symbol from one category to another. Once selected a sub menu will open where a drop down list can be used to select a new category.



- Insert symbols from file...: Refer to Insert symbols from file....

Insertion settings section which is located under the symbol icons area contains the *Rotate* tick box. This option is only usable when the user is in Manual Drawing Mode and it will enable the user to rotate any symbol inserted to the schematics area as soon as the symbol is inserted.

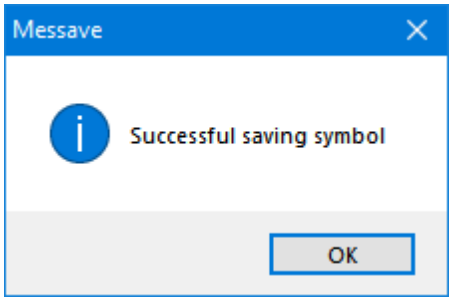


Creating and Editing a Symbol - Symbol Builder

Create new... and Edit symbol... Options

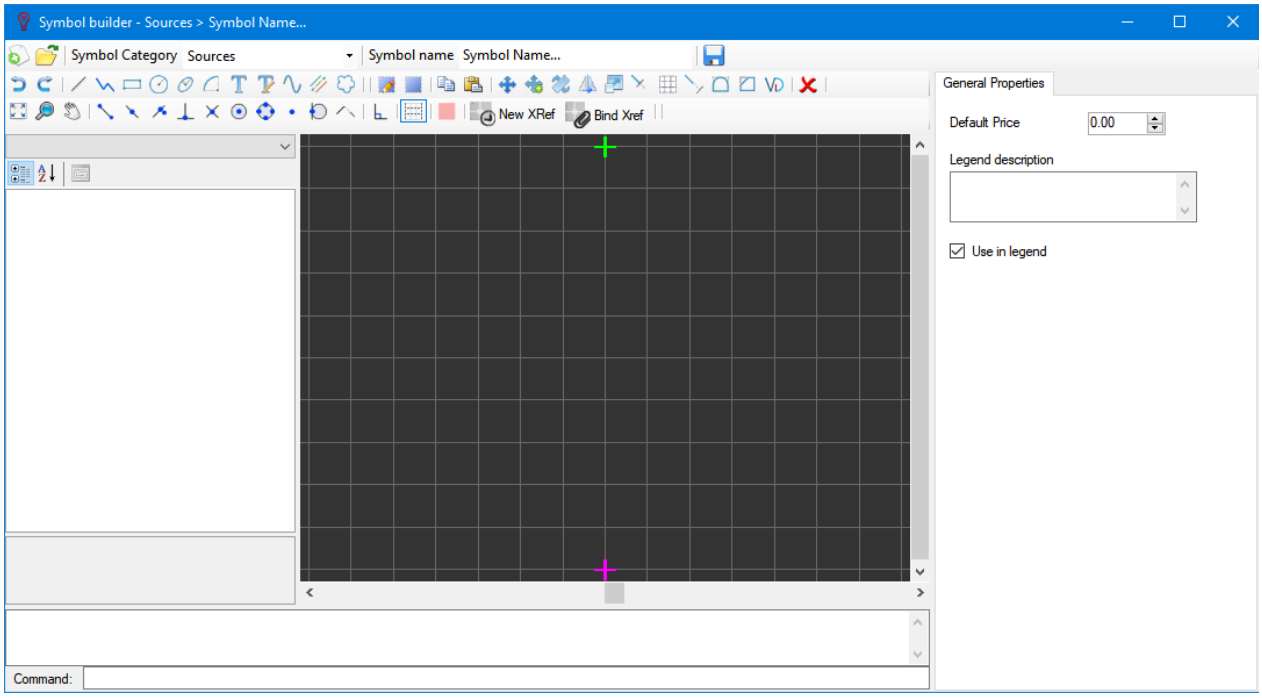
These options will initialise the Symbol Builder applet which is used to create new symbols and edit existing symbols. Top row of the Symbol Builder is reserved for general actions New symbol, Open symbol, Symbol category, and Symbol name.

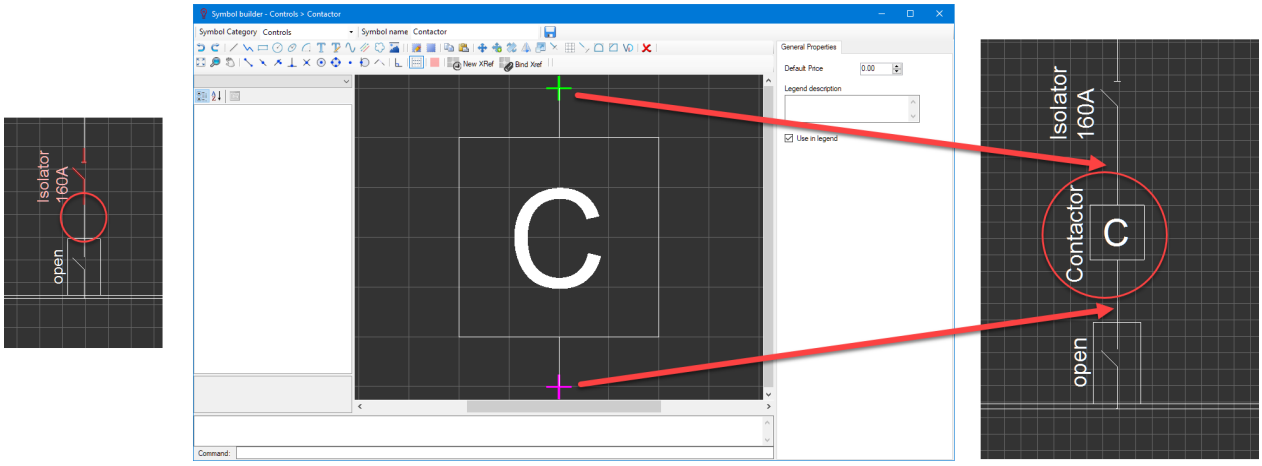
- New symbol button will open a new symbol project.
- Open symbol button will open the symbols library so the user can double clink on an existing symbol icon to edit it.
- Symbol Category: This drop down lost contains available categories for symbols. If the user is working on a new symbol, then this selection will place the created symbol into the selected category. If the user is working on an existing symbol, then changing the category will move the symbol from the original category to the newly selected category.
- Symbol name: This is a text field where the user may type in a name for a new symbol or modify the name of an existing symbol.
- Save button will permanently save all the changes done since the last save and display a message pop up window.



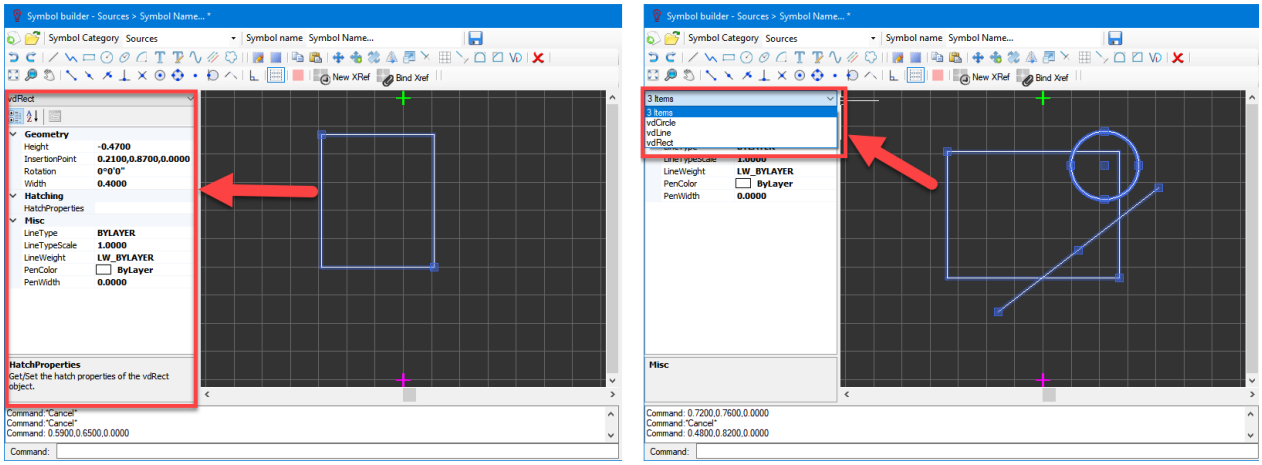
Symbol Builder has almost the same toolbars and behaviour as the manual drawing modes, so, please refer to this section for more details regarding toolbars. Symbol builder's drawing area contains two cross-hairs.

- Green cross-hair: represents the incomer point of a symbol. When the symbol is inserted into a schematic, this point will be used to indicate the incomer side of the symbol while splitting the line representing the conductor.
- Violet cross-hair: represents the outgoing point of a symbol. When the symbol is inserted into a schematic, this point will be used to indicate the outgoing side of the symbol while splitting the line representing the conductor.



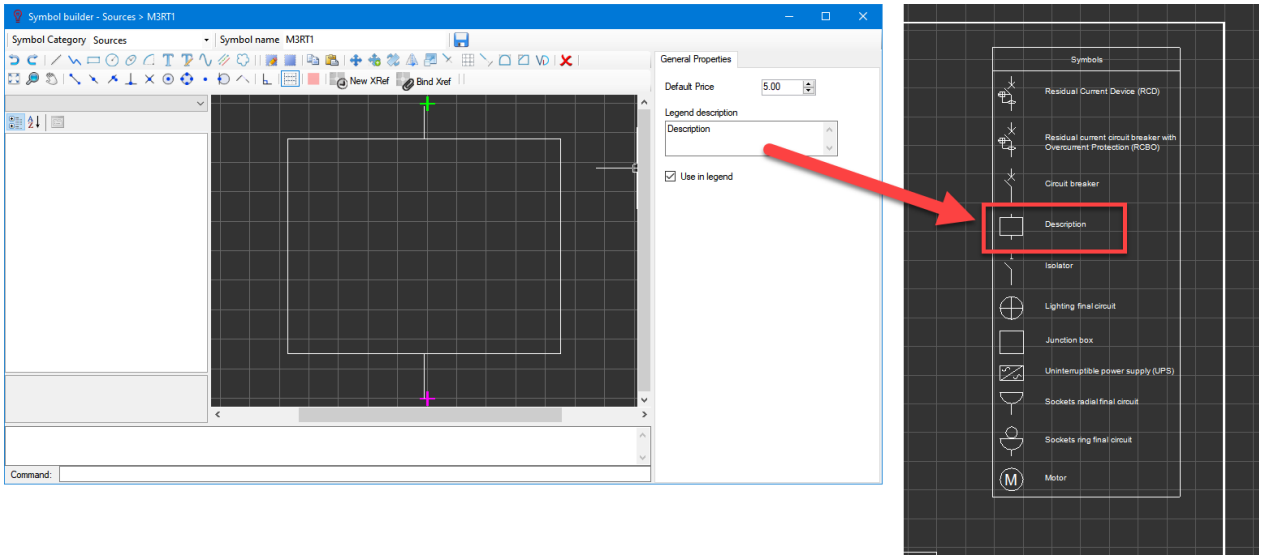


Left panel is reserved to display any information regards the selected item. The drop down list at the top of the side panel is used to list the items selected by the user if multiple items are selected.



Right panel is reserved for the information related with the item that the symbol represents.

- *Default Price* is used to define a unit price for the item which is used on Bill of Quantity report, see.Reports Module Tab.
- *Legend description:* This text box is used to type in a description for the symbol and it will be displayed next to the symbol on the legend.

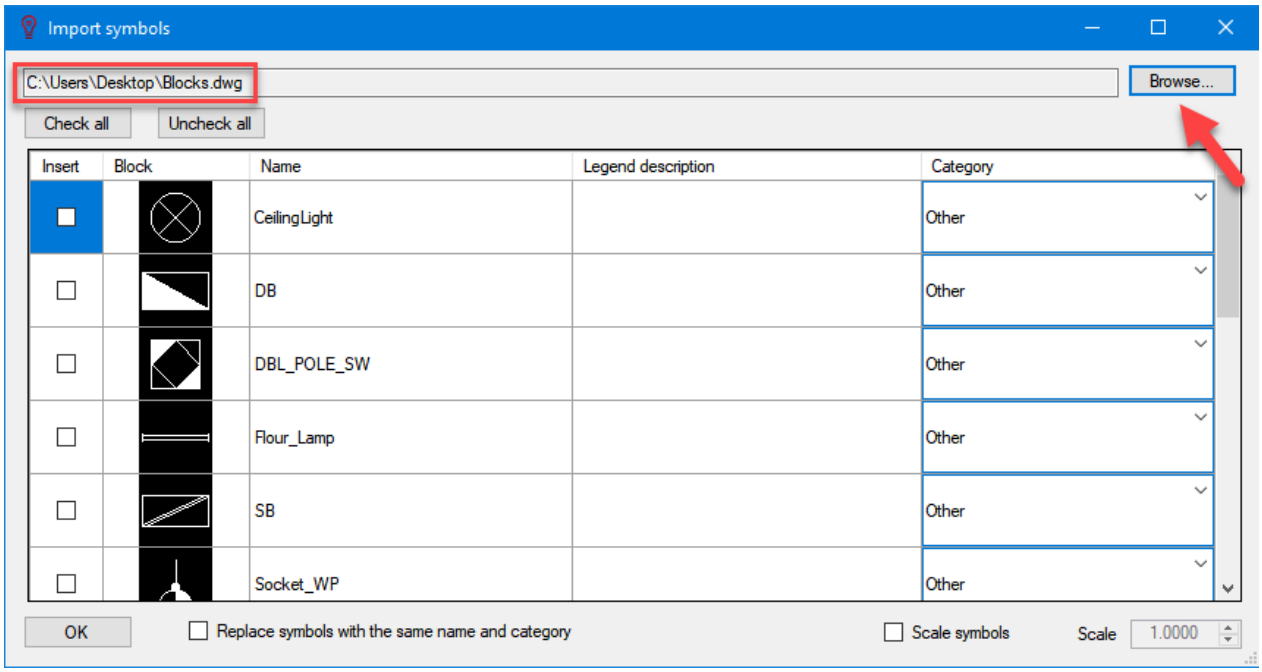


- *Use in Legend tick box:* If this tick box is ticked, then, the symbol will be included in the list of symbols within symbols legend, otherwise it will not be displayed but still be visible o bill of quantities report.

Insert symbols from file...

Insert symbols from file...

In some cases the users may want to import symbols to ElectrcialOM. This can be done by using this option. ElectricalOM will accept DWG, DXF, DGN, and VDML files. When a file is selected by using the Browse... window, ElectricalOM will extract existing blocks within the drawing and list them for the user to pick the ones required to be imported to ElectricalOM database. Using the Import symbols windows, the user can modify the Name, Legend description and Category fields which will be used once the symbol is imported. The selected symbols will be imported once the users clicks on OK button.

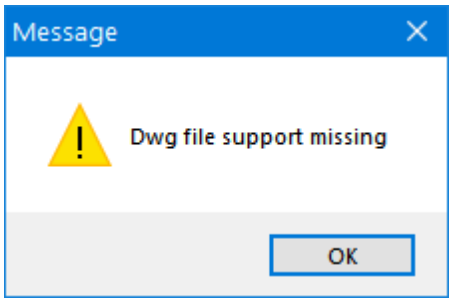


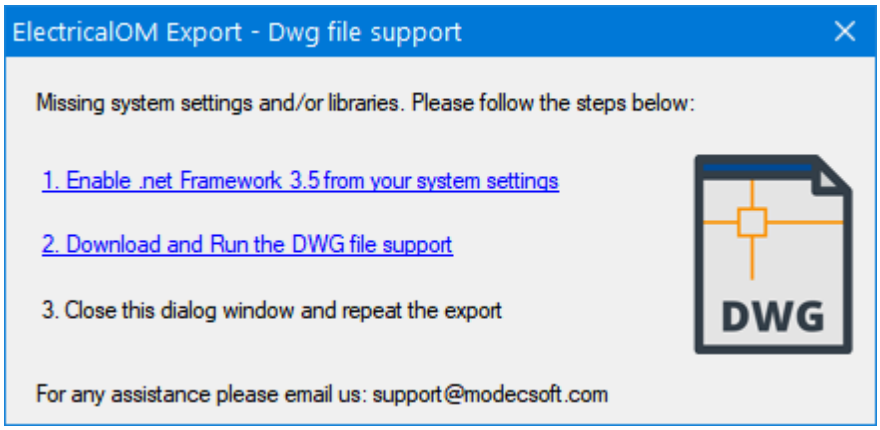
- Replace symbols with the same name and category tick box can be used to replace an existing symbol with an imported one as long as the name and the category fields are identical.
- Scale symbols tick box will use the scale value to resize the imported symbols with respect to their original size.

After the symbol is imported, it will appear within the symbol icons area immediately.

Exporting to DXF Problem

There are some preliminary settings and add-on needed to be done and installed prior to be able to export a sheet to CAD format. If a warning windows appears when clicked on *Export active page* or *Export selected page* button, OK button will call another informative window.

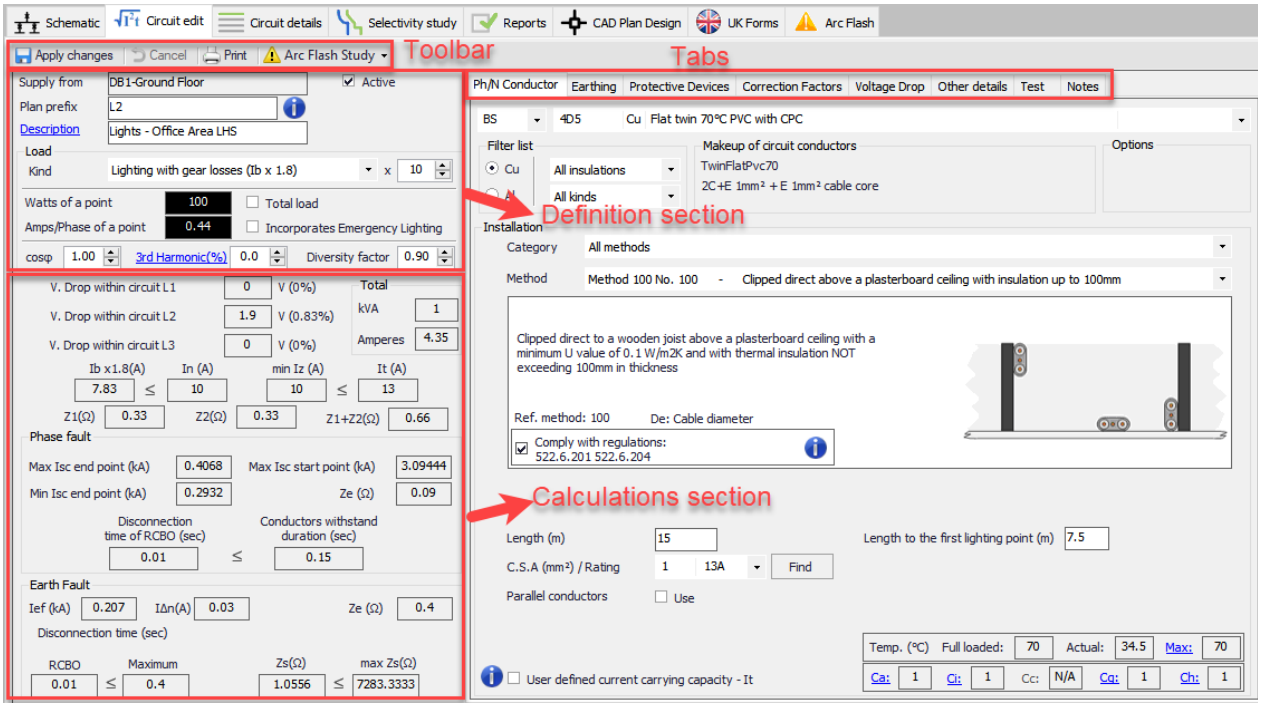




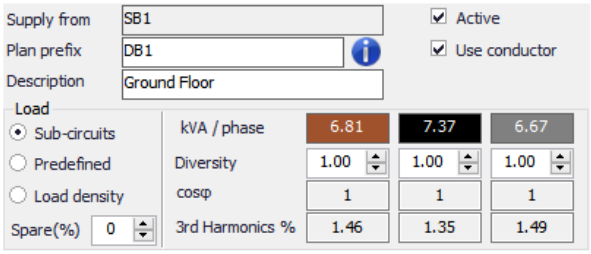
Please follow the given instructions to solve this problem or contact with support@modecsoft.com.

Circuit Edit Module Tab

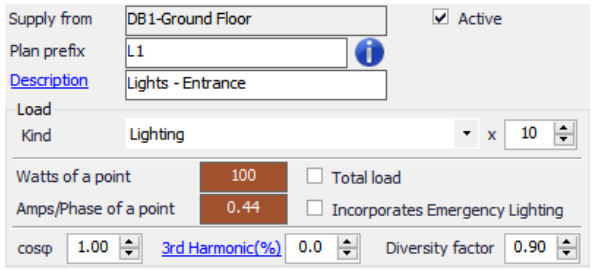
Circuit Edit Module is the most important and the main module of ElectrcialOM. It is the module which the user defines most of the system variables and component properties. The module window consists of a toolbar, sub module tabs, definition section, and calculations section. After adding a new circuit via the system tree area, or inserting a new circuit by using the *Insert Menu*, the Circuit Edit Module will display data related with the selected circuit.



Definition Section, is reserved for user defined data. This section will differ depending on the circuit type; distribution circuit or final circuit.

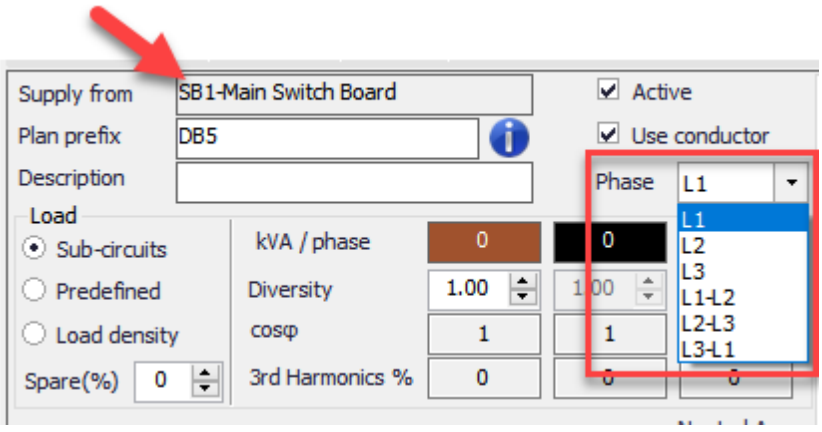


Definition Section - Distribution Circuit

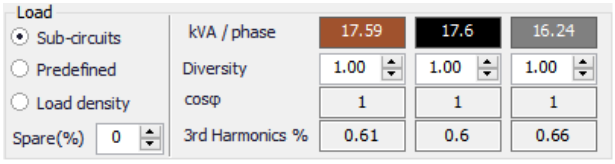


Definition Section - Final Circuit

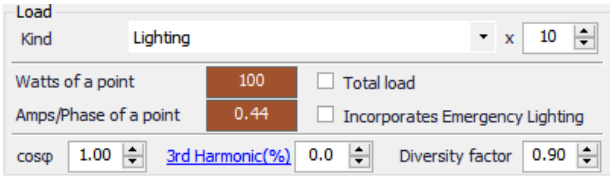
- *Supply from* field will be automatically filled in by ElectricalOM and cannot be changed by the user.
- *Active tick box*, will set the circuit to be active or will set the circuit to be passive, which means the circuit will still be shown but will not affect the system in any way.
- *Use conductor (Only distribution circuits)* tick box will tell ElectricalOM weather a conductor is used or not feeding the selected distribution circuit. If this box is unticked, ElectrciaOM will not consider a conductor between the selected distribution point and the feeder point.
- *Plan prefix* is reserved to assign a prefix for the circuits however there is no restriction of usage.
- *Description* is reserved to provide a short description of the circuit but again there is no restriction of usage.
- *Phase (Only for 1ph components fed from a 3Ph switchboards)* is used to chance the connection of single phase circuits fed from a three phase switch board. The user may choose to connect a single phase component as a Ph-N (L1, L2, or L3) or Ph-Ph (L1-L2, L1-L3, or L2-L3) connection by using this drop down list. ElectricalOM will automatically relevant parameters if a component is connected between two phases.



- *Load* section is also differs depending on the selected circuit.

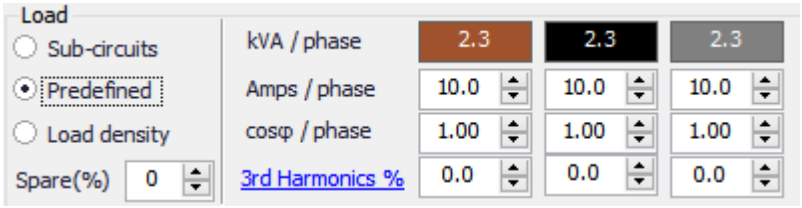


Load Section - Distribution Circuit

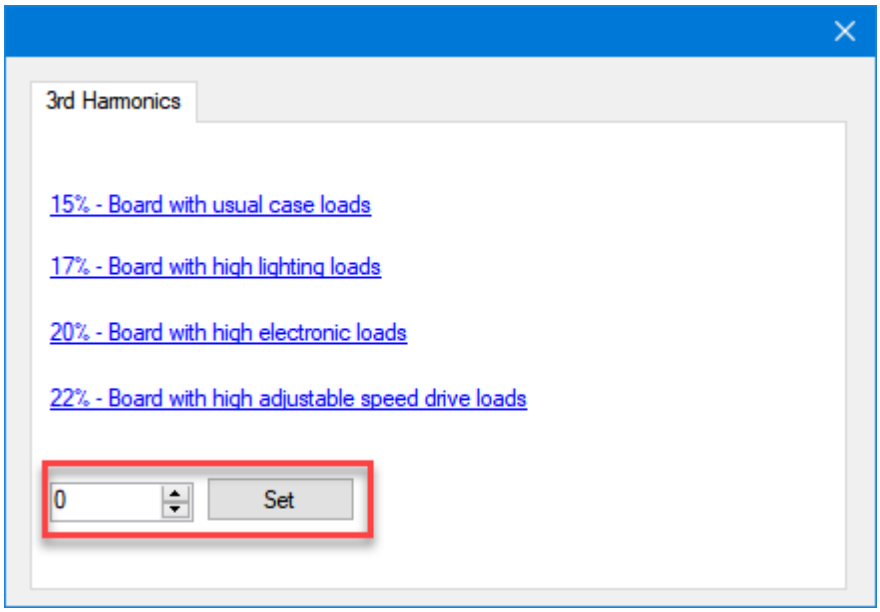


Load Section - Final Circuit

- Distribution Circuit
  - *Sub-circuits/Predefined/Load density* selection buttons defines how the power of the distribution circuit will be calculated by ElectrcialOM.
    - *Sub-circuits* option will consider individual circuits' data to calculate the total power. Right pane of the *Load* section will display total KVA/phase, diversity multiplier per phase, and power factor per phase of the selected distribution circuit. Only the diversity multiplier can be modified by the user, and others will be automatically calculated using data from connected circuits by ElectricalOM. The diversity setting here will have an effect on the distribution node meaning the total load of the selected distribution node will be multiplied by this diversity multiplier. Also see *Apply board diversity to the upstream board* in Functions Menu section.
    - *Predefined* option will ignore any connected circuits, if any, and use the user defined current value to calculate the total power of the distribution node.



If *Predefined* option is selected, *3rd Harmonics %* and *cosφ* fields will also be activated, so, the user can define any 3rd harmonics or power factor per phase for the selected distribution node. ElectricalOM will consider these values while calculating power, cable size, etc. Clicking on the *3rd Harmonics %* hyperlink will bring up a short informative window to help the user to define a value. Any hyperlink selected from this window will automatically set the defined percentage, or the user may define any value using the text field at the bottom and clicking on *Set* button.



- *Load density* option will let the user to use predefined load density values from various bodies. When this option is selected only the diversity multiplier option will be enabled fore the user to modify and the rest of the data will be pulled from the Load density tab selection. Load density option is not available for Busbar Trunking System component. Please refer to Load Density Tab for more details.
- *Spare(%)* will tell ElectricalOM to leave a set percentage of the total load as a spare and do the calculations and checks accordingly taking into account the spare load set.
- *KVA/phase:* This row of values will display the power connected to each phase and cannot be changed by the user. The values are calculated by the data available from the connected circuits and data from other fields like *Diversity*, *cos*φ, and *Spare (%)*.
- *Amps/phase:* This option will only be visible if *Predefined* is selected as load type. It allows the user to define a current value for each phase so a power value (KVA/phase) can be calculated.
- *Diversity:* User can define a diversity multiplier of each phase using this text fields. This option is not available if *Predefined* is selected as load type.
- *cos*φ*/phase and 3rd Harmonics:* These fields are used to define a power factor and a 3rd harmonic component percentage to each phase of the selected distribution circuit. They are only available if *Predefined* is selected as load type.
- Final Circuit

Load section of a final circuit has two data fields; *Kind* and *x. Kind* defines the circuit type and will affect various calculations, for example, diversity calculations. Also, some of the kinds have specific checks and additional settings. So, it is important to select an appropriate circuit type depending on the load characteristics. A brief description of circuit kinds having special features are listed below:

Lighting	In-rush Current tab is available for in-rush current parameters.

Lighting with gear losses (Ib x 1.8)	
Socket-outlet ring circuits	Conductor and protective device sizing is altered due to parallel cabling. Param options... menu.
Electric motor	Motor Settings tab is available for motor parameters.
Electric motor 3Ph	
Electric motor 3Ph + N	
Pressure pump	
Pressure system for water	
Hot water return pump	
Other ring circuits	Conductor and protective device sizing is altered due to parallel cabling.
Industrial Device (EN 60204)	Disconnection time is increases to 5 seconds as per EN 60204.
Industrial Device 3ph (EN 60204)	
Industrial Device 3ph and N (EN 60204)	
Industrial Motor (EN 60204)	
Industrial Motor 3ph (EN 60204)	
Industrial Motor 3ph and N (EN 60204)	
Electric Vehicle Charging Equipment	RCD is required, and if an MCB is used 2P or 4P device must be used.
Renewable resource	Circuit power is used for sizing circuit components, but is not added to total loa
Renewable resource 3ph	
Renewable resource 3ph + N	
Spare	Conductor is not available. Circuit power is displayed under spare load value.
Other circuit 2ph	Rated voltage will be set to Line-to-line voltage of the system.
Lighting circuit 2ph	

x field defines the number of load connected to the selected circuit. If a value other than 1 is defines, the power or amperage of the load will be multiplied by the defined number.

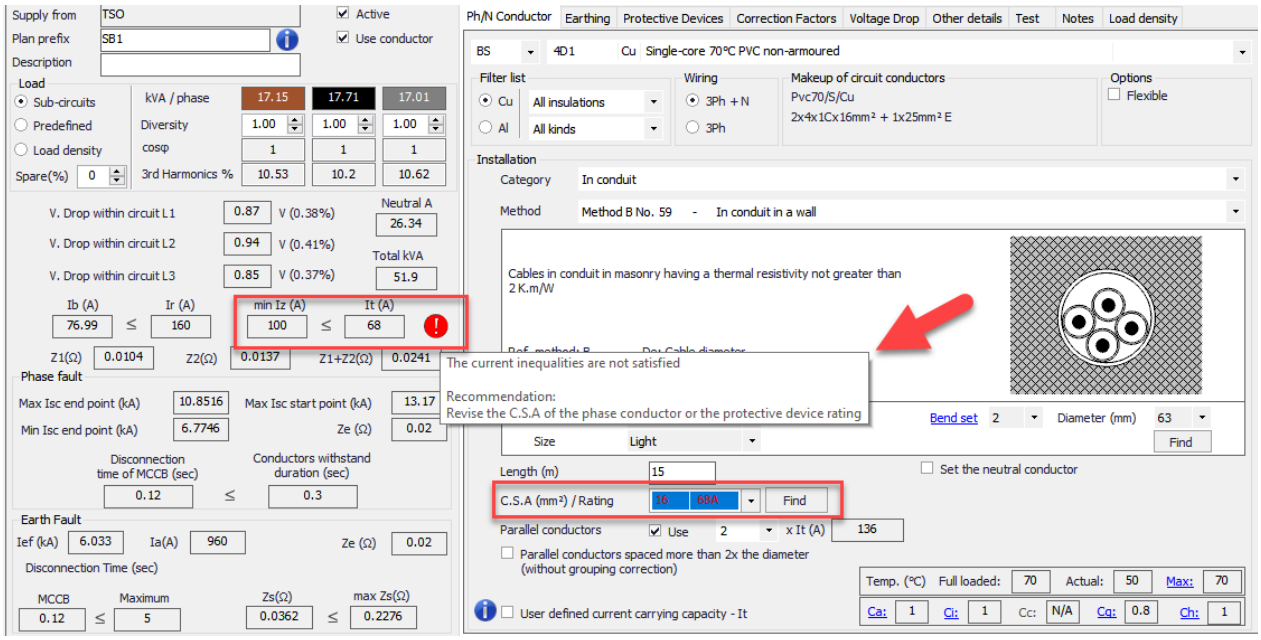
- *Watts of a point* defines the power of the load. This value will be multiplied by *x* field to calculate the total power of the circuit.
- *Total load tick box* indicates if the defined *Watts of a point* or *Amps/phase of a point* value is going to be takes as a total power for the circuit instead of the power of a point. If this box is ticked then *x* filed will be ignored.
- *Amp/phase of a point* is another way to get ElectricalOM to calculate the power of a point. Defining a drawn current value will enable ElectrcialOM to calculate the power of the circuit by using the voltage and amperage data.
- *Incorporates Emergency Lighting tick box* will add an extra core same size as the live conductor for emergency lighting control but this will not affect calculations in any way.
- $\cos\varphi$ is used to define a power factor for the selected circuit. If this is a three phase final circuit, the set value will be applied to all phases.

- *3rd Harmonic %* is used to define 3rd harmonic current as percentage for the selected circuit. If this is a three phase final circuit, the set value will be applied to all phases.
- *Diversity factor* is for defining diversity multiplier for the selected circuit. If this is a three phase final circuit, the set value will be applied to all phases.

Calculations section is reserved for the calculations and checks done by ElectricalOM and none of the fields can be modified directly by the user. All the calculations and checks displayed in this area will automatically be recalculated and rechecked as the user makes any modifications to the system. If any issues detected, ElectrcialOM will flag this in the *Warnings* section and also mark the issue with a white exclamation mark inside a red circle.

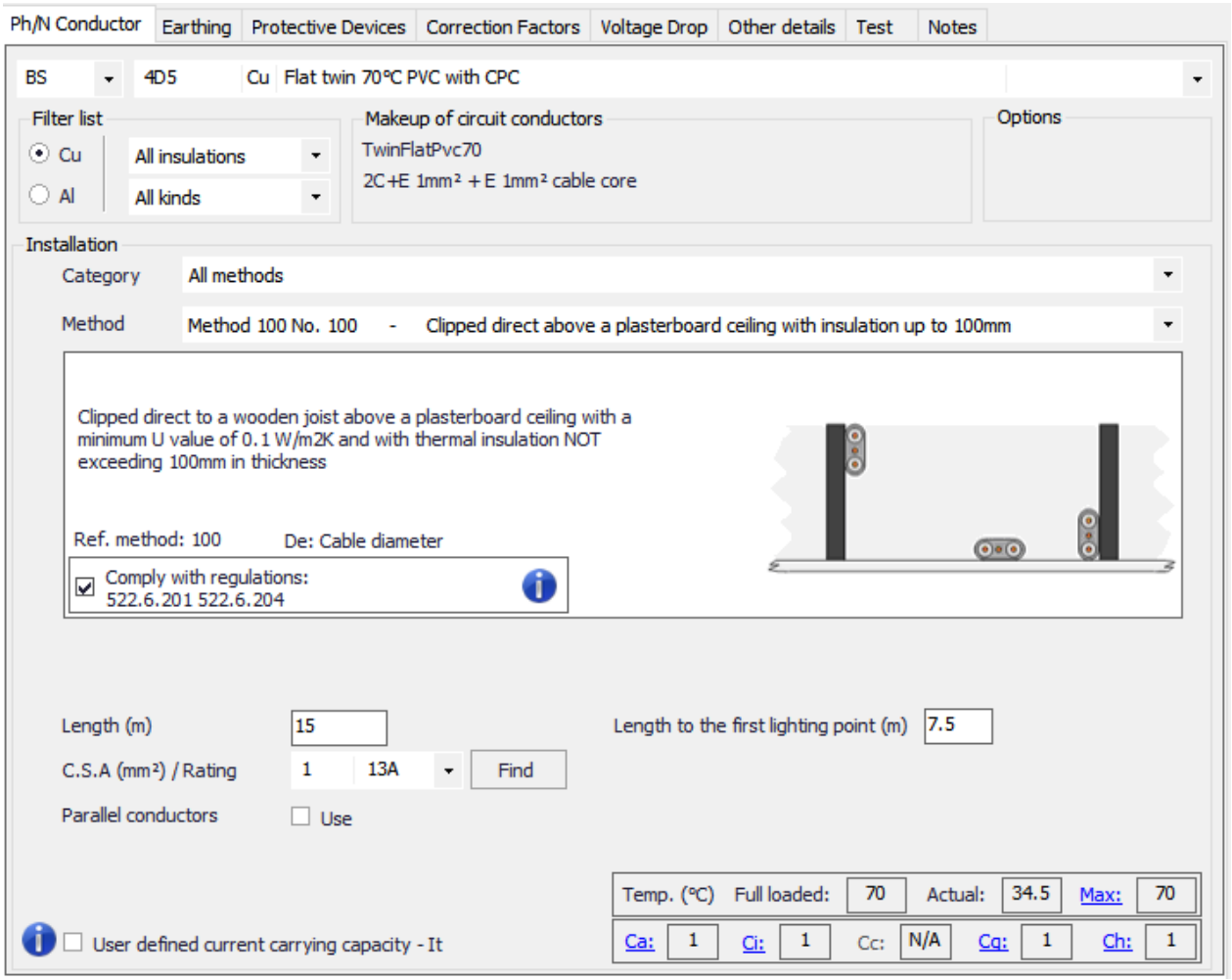
As mentioned above, right hand side of the module screen is divided into various tabs and each tab screen is displayed below the tabs. Each tab will be discussed in its own section, please refer to these sections for details.

In general ElectrcialOM will warn the user in various ways; and one of the ways is by white exclamation mark in red circles placed next to where the issue is. This is also true for *Circuit Edit Module*, the user can use these indicators to get a detailed explanation of the issue by moving the mouse cursor on to the marker.

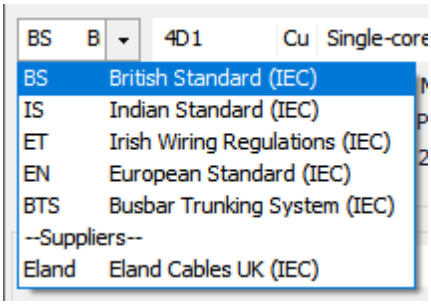


Ph/N Conductor Tab

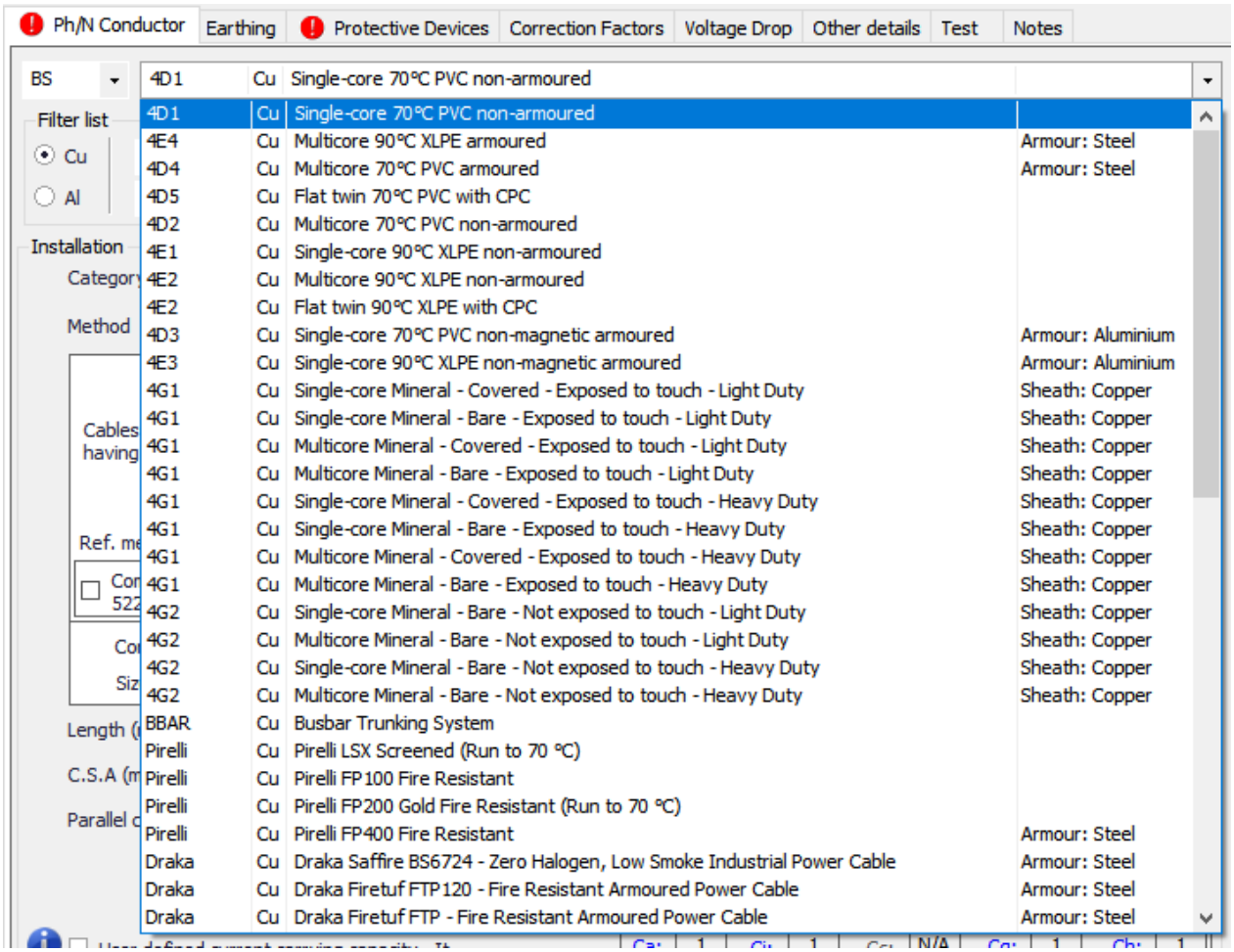
Ph/N Conductor tab accommodates data in regards to the phase and neutral conductors of the selected circuit. The user can select various options by using the drop-down menus and check boxes, and can type in the length of the conductors. A table, which shows some calculated data related with the cable or conductors, will be displayed at the bottom right corner of the Ph/N Conductor Tab screen.



At top level, the user can select which standard, or which manufacturer will be used for the selected circuit's conductors. ElectrcialOM mainly focuses on BS standard but Indian, Irish and European standards are also covered briefly however not completely.

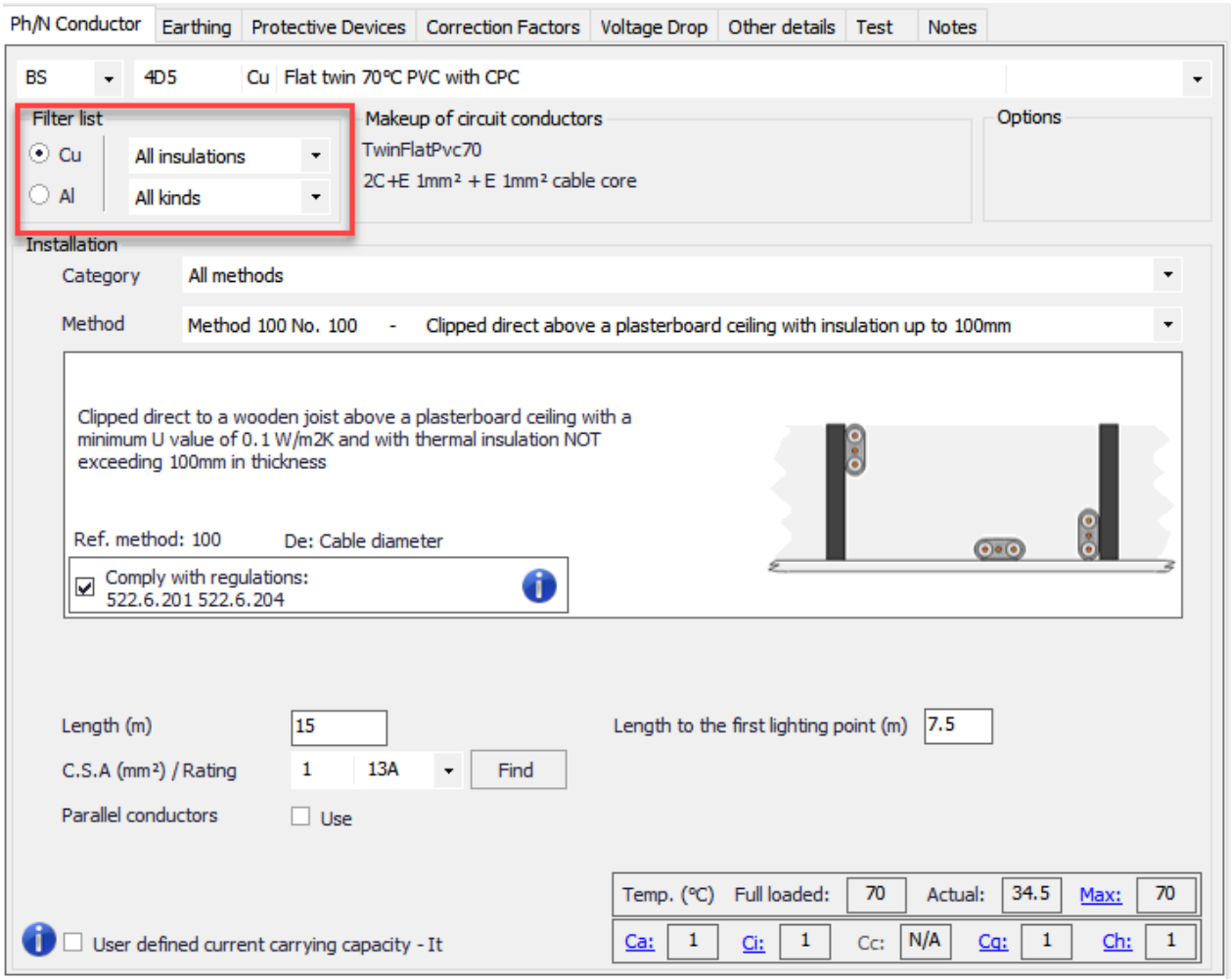


Next to the standard selection menu is the Conductor Type menu. The conductor types are dynamic and will change according to the standard or manufacturer selected but after this point we will focus on British Standard options. This list will have all the conductor types defined in BS7671 and the table reference no.s (e.g. 4D5) are also presented on the left hand side of the conductor list. On the right hand side ElectrcialOM also indicates any extra data about the conductor/cable like armour material, or sheath material. Selecting a conductor or cable type will assign it to the selected circuit as the feeder conductor or cable.



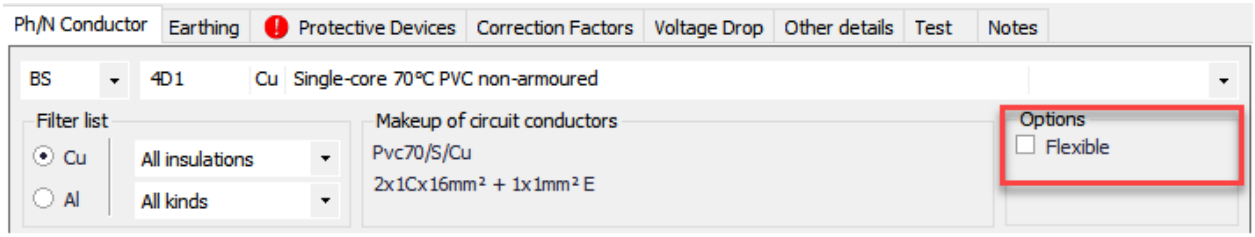
The list will change according to the filter applied. The conductor material filter is a selection between copper or aluminium where the user cannot see both at the same time, however, other filters are drop-down lists which include *All* option. Available insulation types are PVC, XLPE, and Mineral. Available cable variants are armoured, non-armoured, busbar, and flexible.

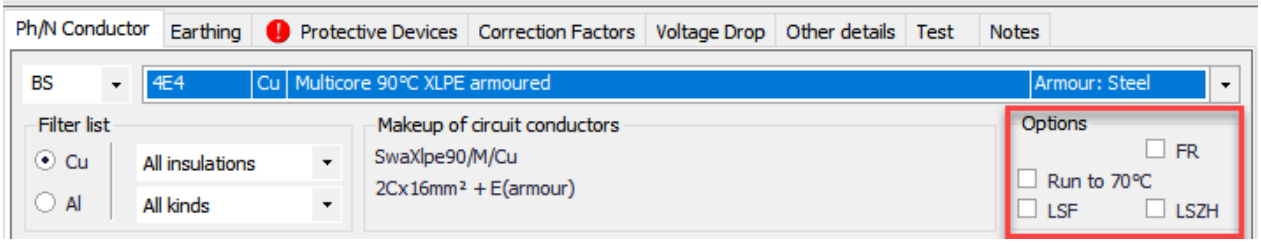
Depending on the selected option, ElectricalOM will show the structure of the selected conductor or cable under the title *Makeup of circuit conductors.*



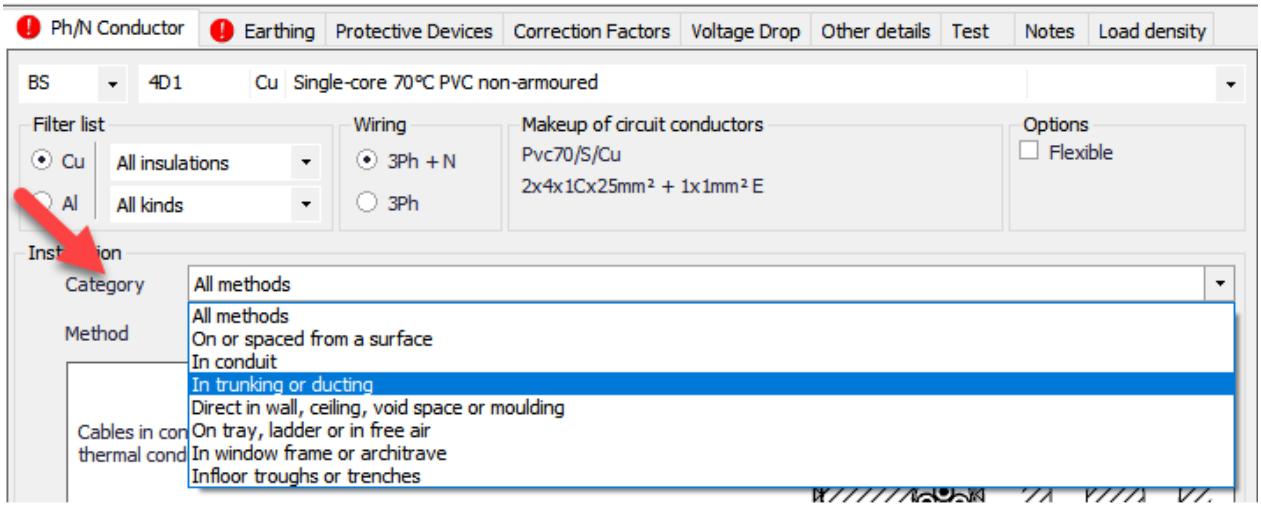
If there is an option in regards to the selected cable or conductor type, then, each of these options will be listed below the *Options* title as check boxes. The user may click on these check boxes to mark the option as applicable for the selected cable or conductor.

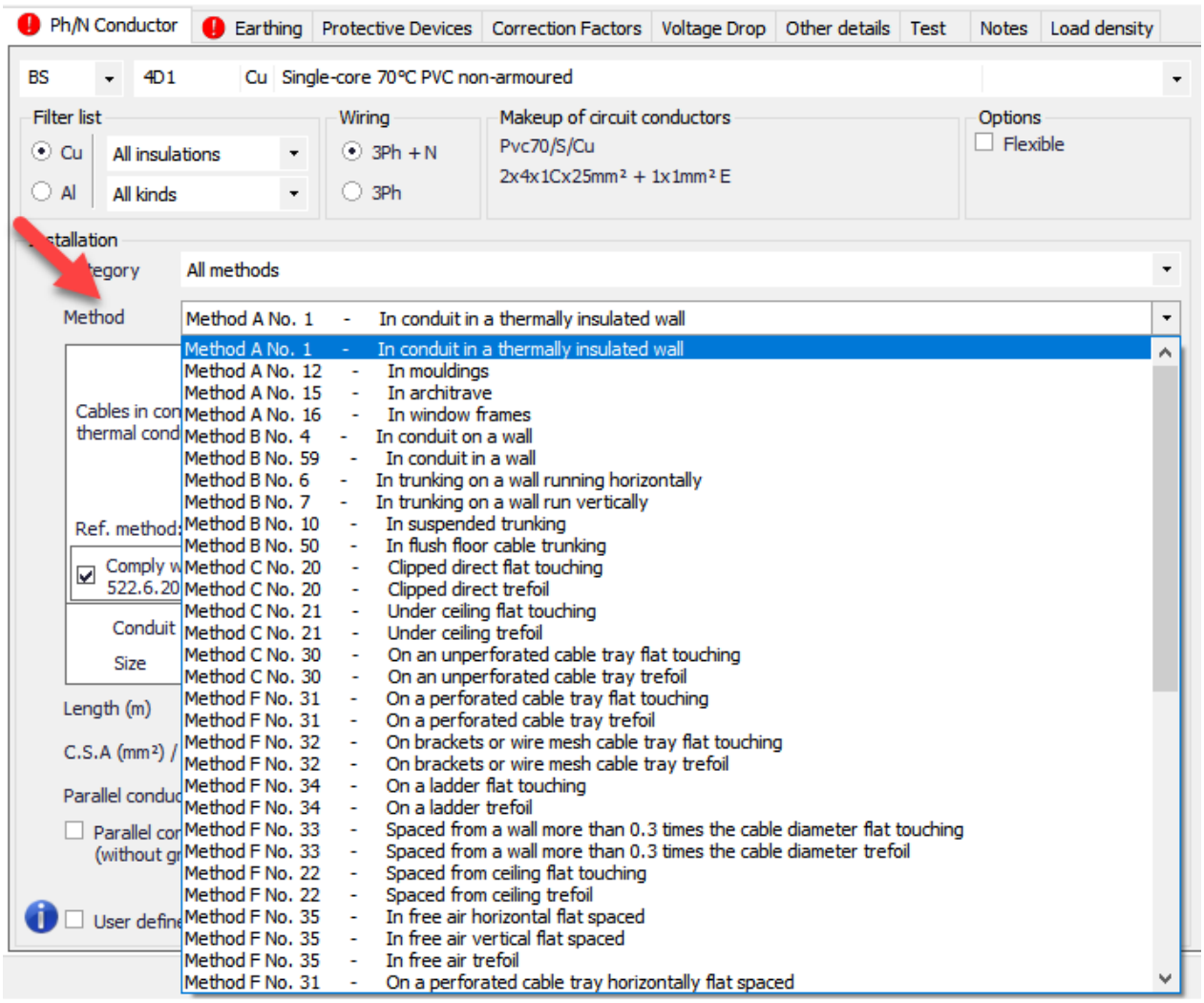
- Flexible: refers to stranded, continuous flexible cables/conductors.
- Run to 70°C: will set the max. running temperature of the selected cable to 70 °C even if it can go higher by its specification.
- FR: refers to Fire Resistant
- LSF: refers to Low Smoke and Fume
- LSZH: refers to Low Smoke and Zero Halogen



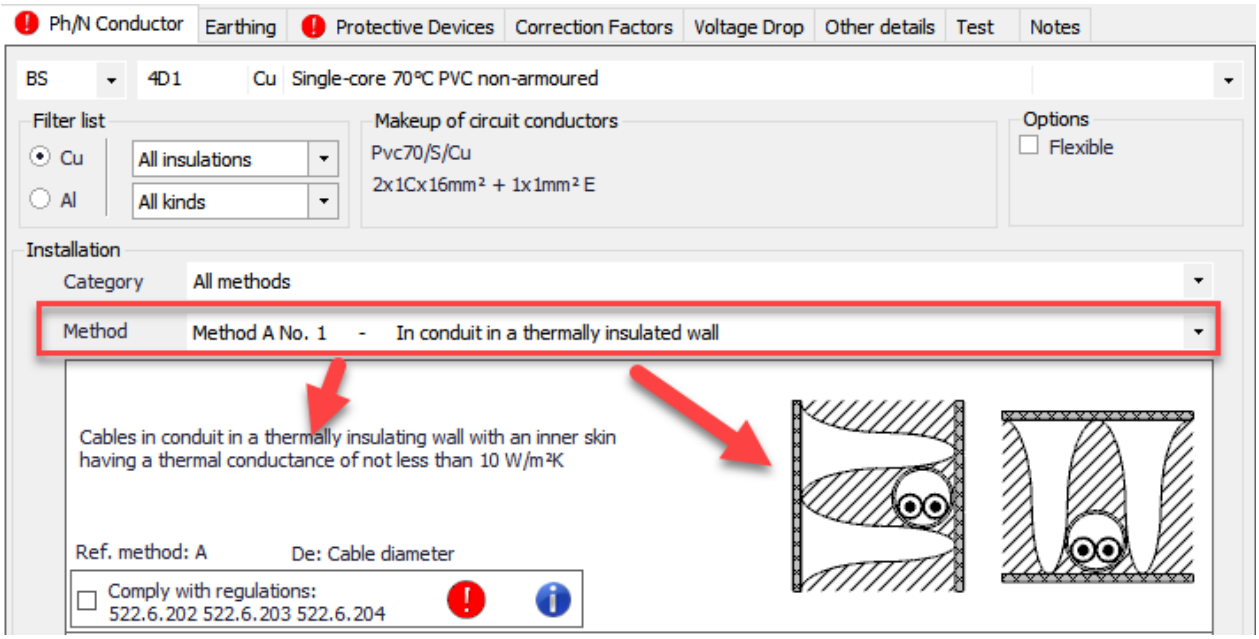


Middle section is reserved for the installation characteristics, e.g. category ,and method. ElectricalOM will only make the installation methods available for the selected cable or conductor according to BS7671. The category menu lists similar methods in groups and depending on the group the method menu lists the installation method in that group. If *All methods* option is selected at *Category* menu, then. all the methods available for the selected cable or conductor will be listed on the *Methods* menu list. ElectricalOM also lists the methods with their references according to BS7671.

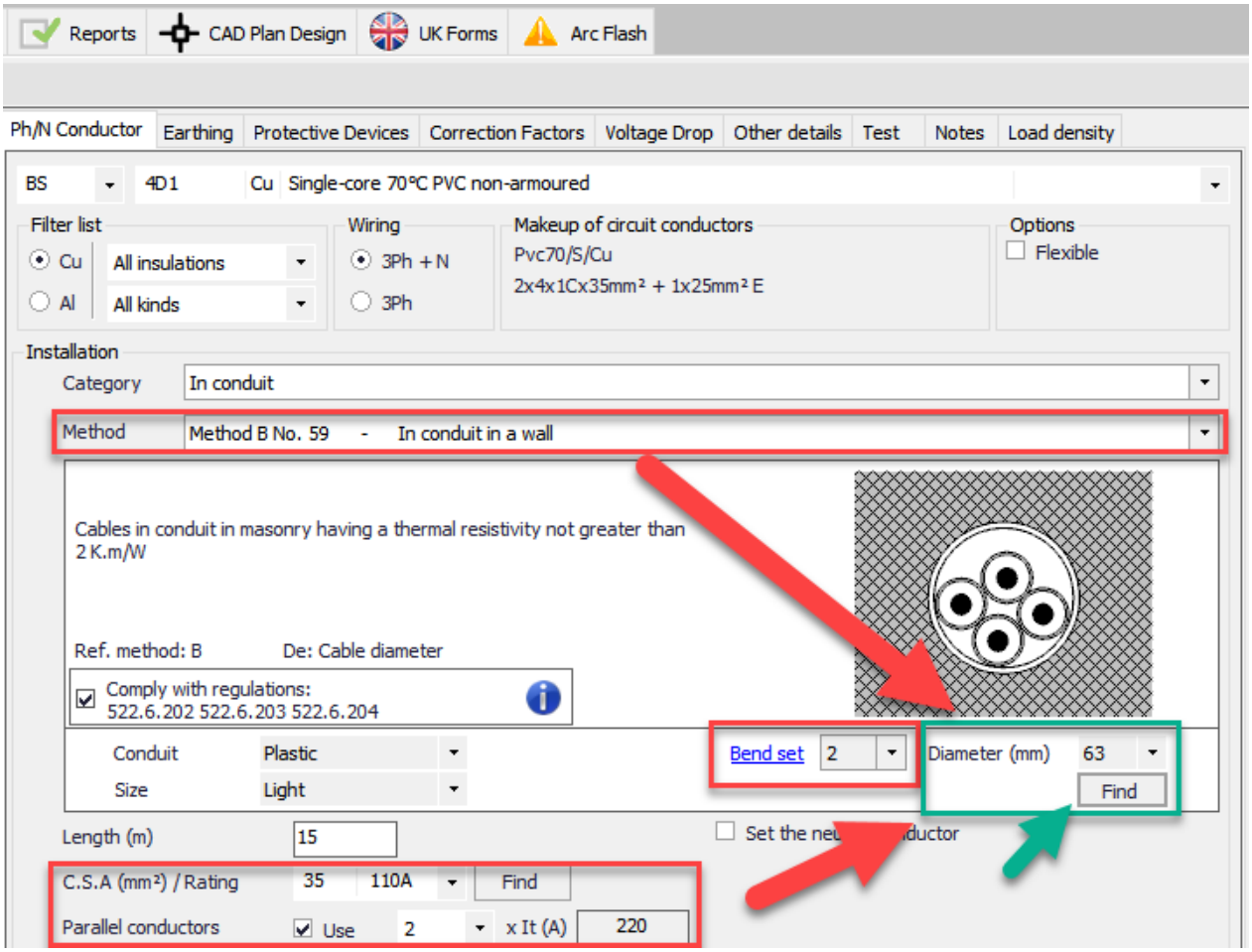




Below the *Method* section, ElectricalOM will also describe the method in detail, and represent the installation method with a figure. Within the details area, there is also a tick box which will remind the designer to comply with regulations 522.6.201, 522.6.202, 522.6.203, and 522.6.204 of BS7671 if the installation method is subject to any of the aforementioned regulations. This tick box must be ticked to remove the warning form the *Warnings Section*.

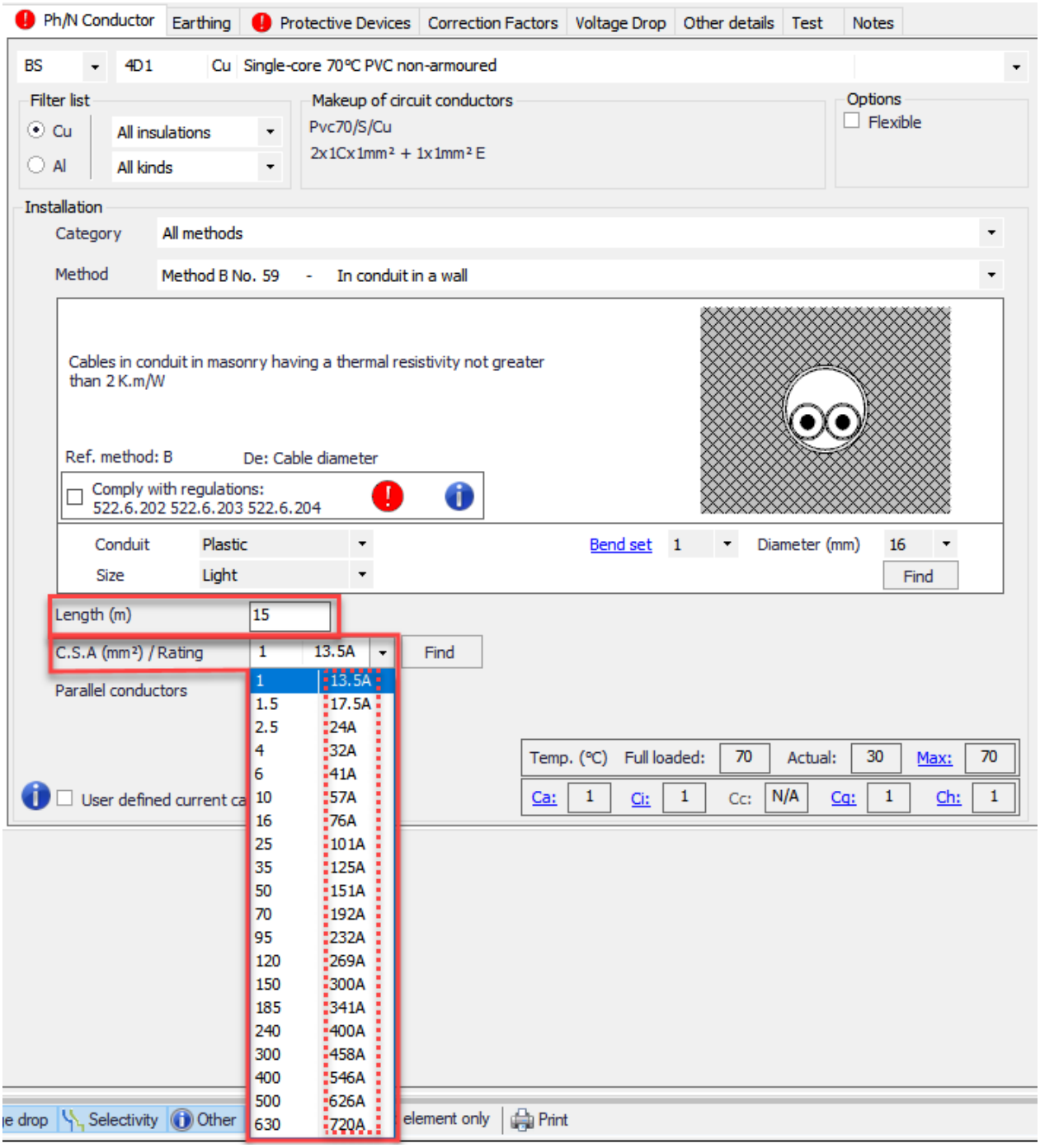


If the selected installation method involves a conduit or a trunking, ElectricalOM will provide additional options below the tick box, where the user can define the material, and let ElectricalOM to find the required size for the conduit or trunking. This calculation will consider the number of bends (if conduit), and the cable properties (A *Bend set* represent a set of two 90 degree bends). The user must click on the *Find* button to calculate the conduit or trunking size when all settings are set..

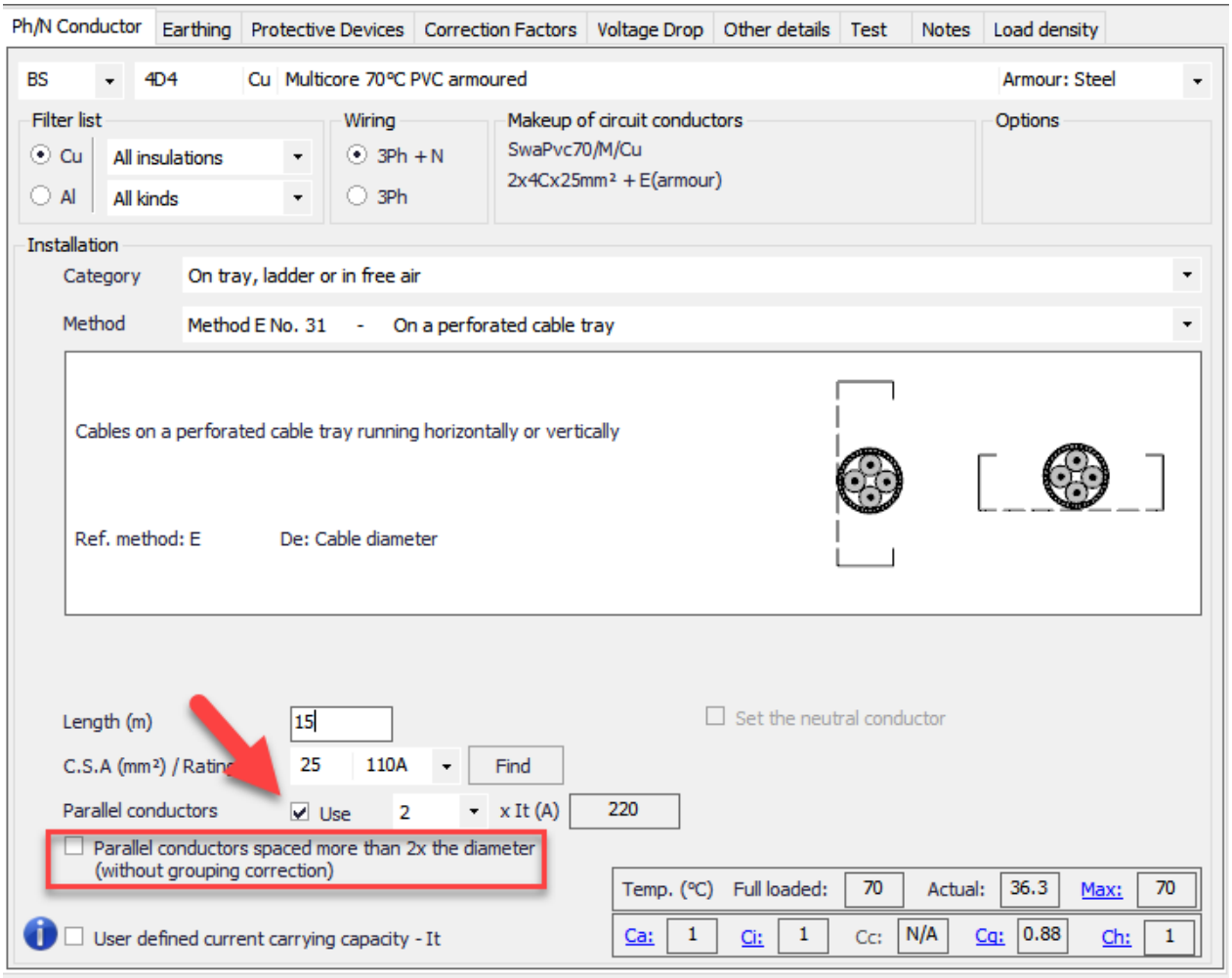


The last part of the Ph/N Conductor Tab is related with the physical details about the cable or conductor which includes the length, the cross section, etc. When a new circuit is inserted, the default conductors are set to 4D1, default installation method is set to Method B No.59, default length is set to 15 metres, and the default cross section is set to 1mm^2.

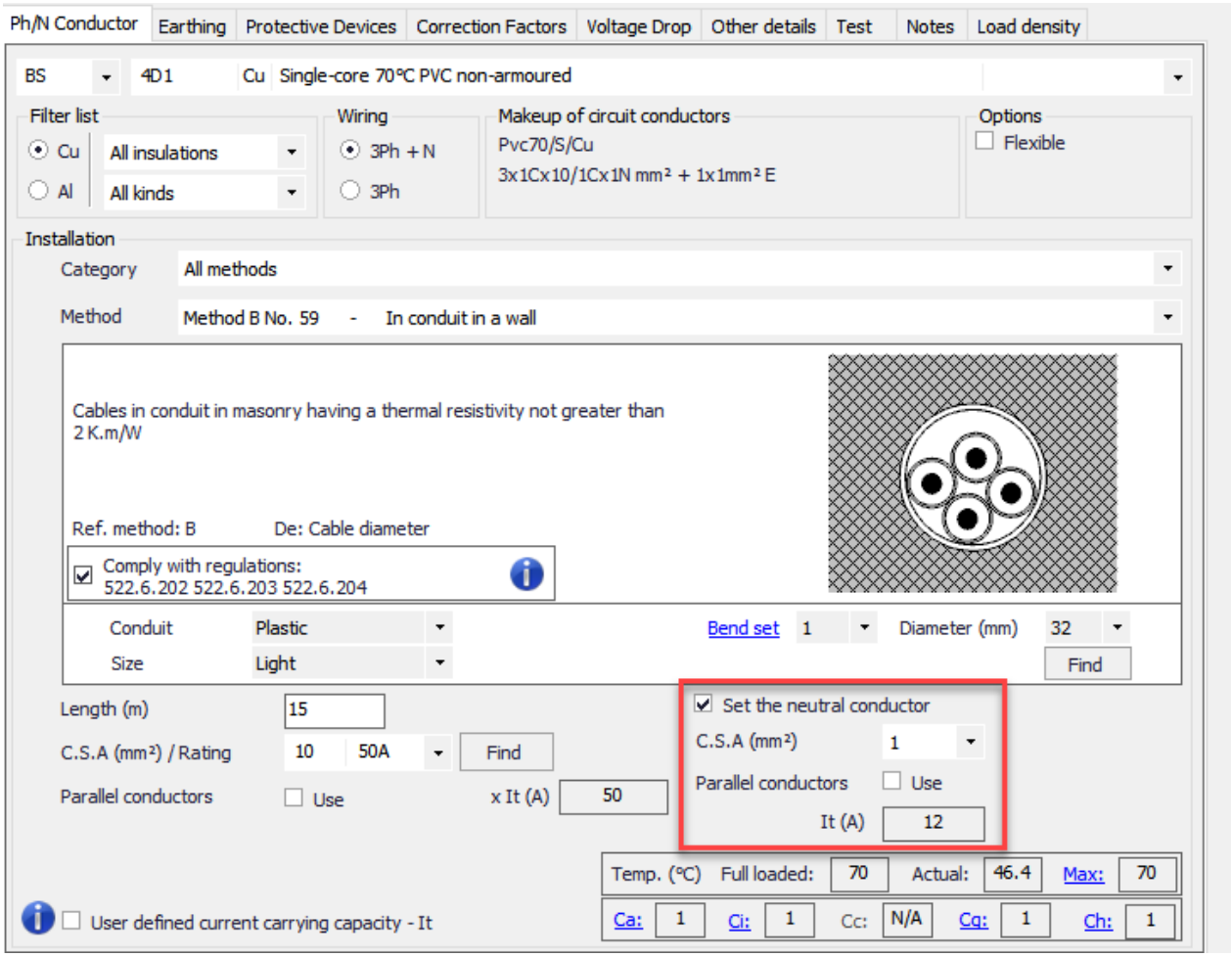
The user can type in the length into the text field next to Length (m), ElectrcialOM will take the entered value as if it is in metres. Cross section area of the conductors can be selected using the drop down menu where the current carrying capacities are also shown next to the cross section area. All the current carrying capacity values are based on BS7671 and take the selected cable or conductor type, the installation method, and any other options ticked into consideration. *Find* button will let ElectricalOM to pick the possible lowest cross section area according to the defined values and options, but it must be noted that cross section area calculations are based on the protective device selected by the user (See Protective Devices Tab) and not on the load defined.



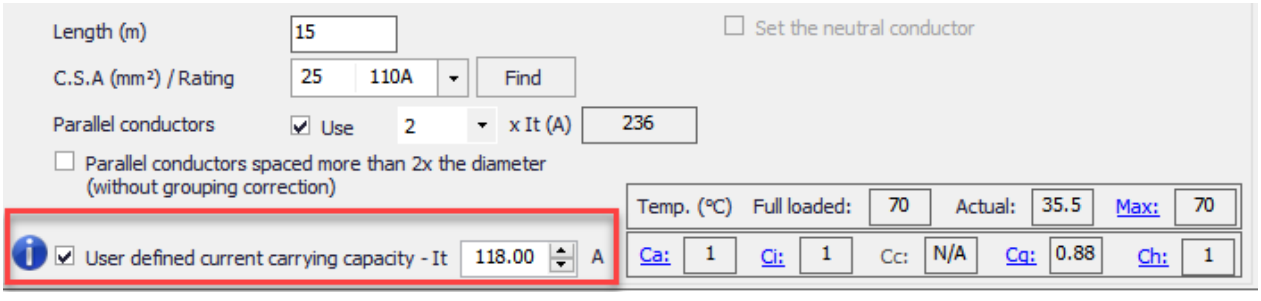
ElectricalOM also can work with parallel conductors as well. The user can tick the box next to *Parallel conductors* to enable parallel conductor options where the number of conductors can be selected from the drop-down menu. When using parallel conductors is in consideration, ElectricalOM will also modify the grouping correction factor according to the number of conductors selected by the user (See Correction Factors Tab). The total tabulated current carrying capacity is displayed next to the conductor quantity drop down list. If the conductors will be spaced to each other more than the twice of their diameters, then, the user must check the *Parallel conductors spaced more than 2x the diameter (without grouping correction)* option located below the *Parallel conductors* check box. Checking this box will set ElectricalOM, not to use the correction factor for grouping for this feeder.



ElectricalOM will also let the user to define a neutral conductor with different cross section area as long as the feeder is three phase, consists of single core cables and is not a final circuit. If all the prerequisites are met, then, ElectricalOM will enable the check box *Set the neutral conductor*, which lets the user to set the neutral conductor size different then the phase conductor. If this box is checked, new options will appear under the check box area which includes the drop down list to set the cross section area of the neutral conductor, check box to enable parallel cables option for neutral conductor, and the box which displays the tabulated current carrying capacity of the selected neutral conductor arrangement.

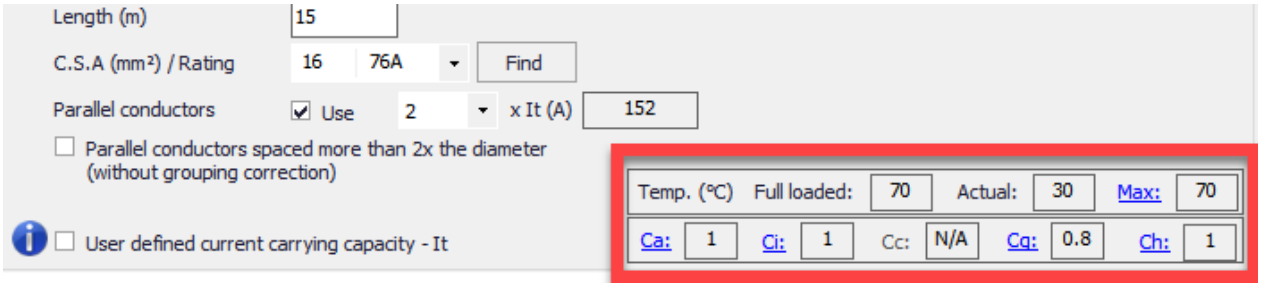


Sometimes defining a custom current carrying capacity other than the ElectricalOM values (which are basically BS7671 values) might be needed. In order to accommodate this, ElectricalOM has a check box at the bottom of Ph/N Conductor tab. When this check box is ticked, any value can be typed in to the text field, but this option must only be used if the manufacturer data is available as the entered value will override the BS7671 values.

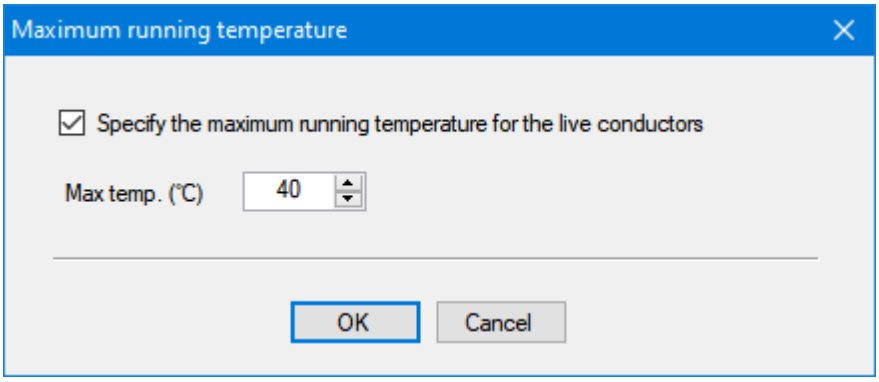


Lastly, a table which shows various data regards to the cable or conductor defined is located at the bottom right corner. It provides a quick review for the suitability of the defined cable or conductor. The data includes:

- The temperature of the cable at full load, at current load, and the maximum running temperature allowed.
- The correction factors associated with the cable or conductor.

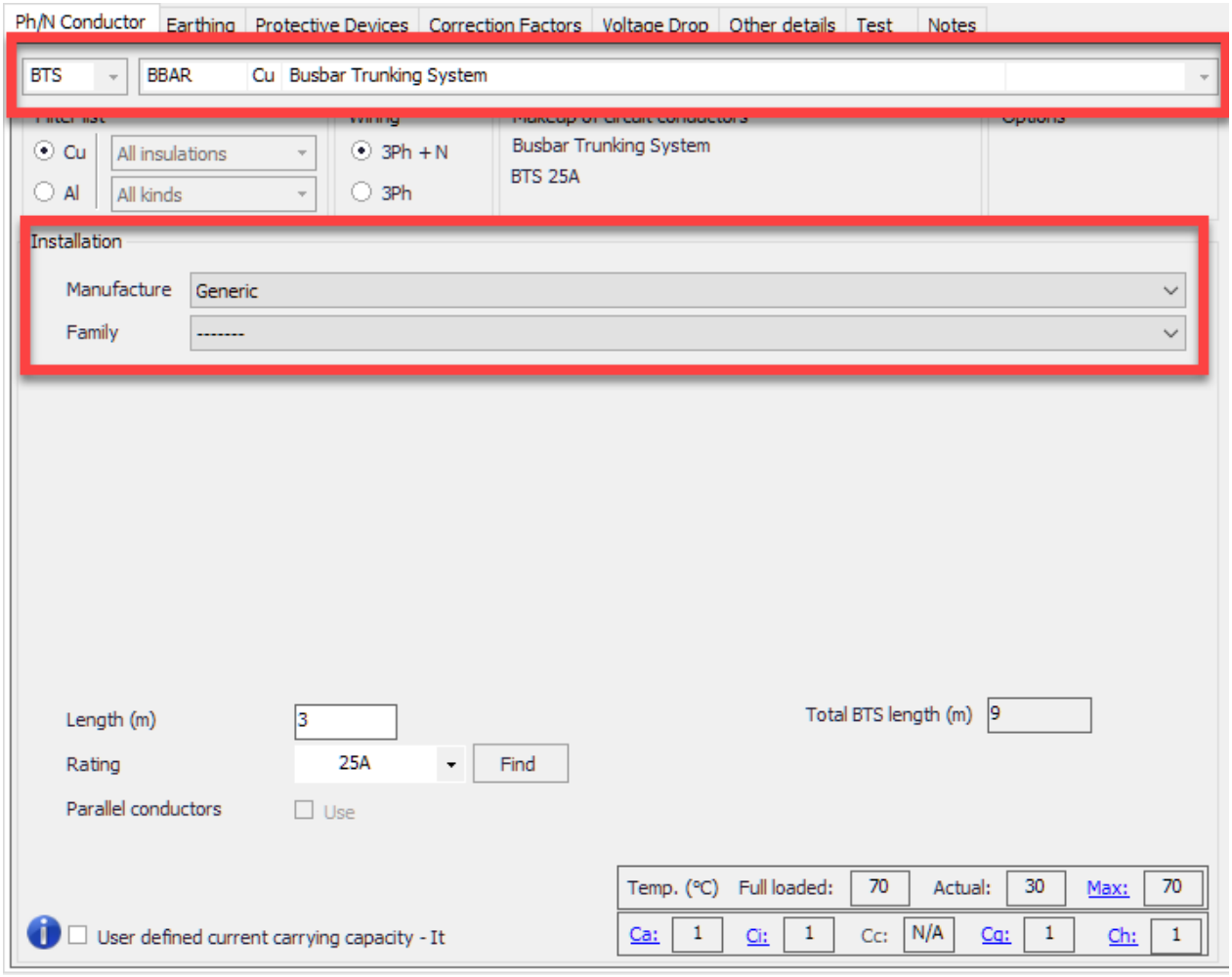


Clicking on *Max* link will launch the *Maximum running temperature* window where the user can define a maximum permissible temperature the selected cable can run. If the *Specify the maximum running temperature for the live conductors* tick box is not ticked then the max. temperature will be set to the default value for the selected cable or conductor type. If this box is ticked then the text filed below will be activated and the user will be able to type in a value to be used as the max. temperature,

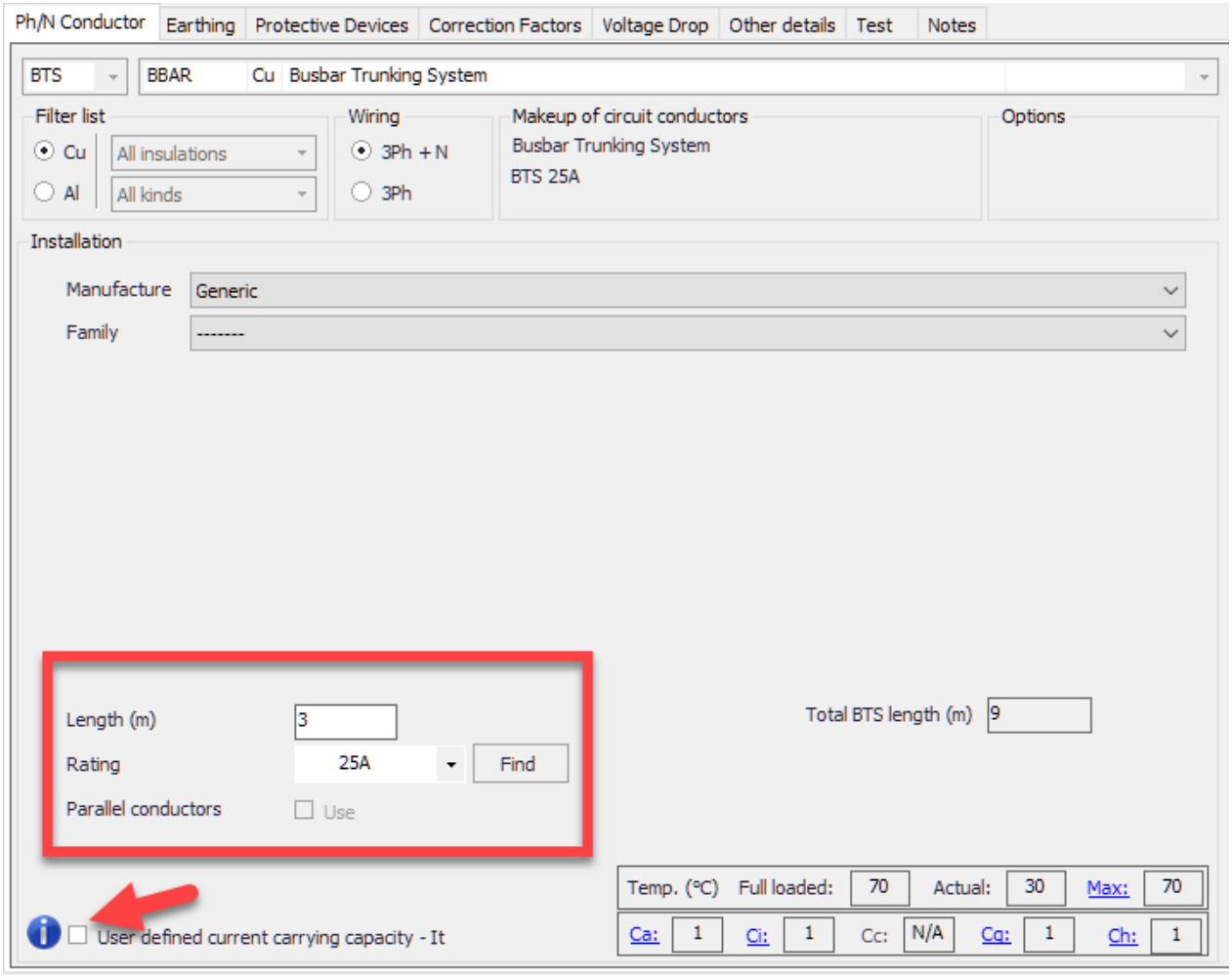


Clicking on any of the the correction factors will activate the Correction Factors tab.

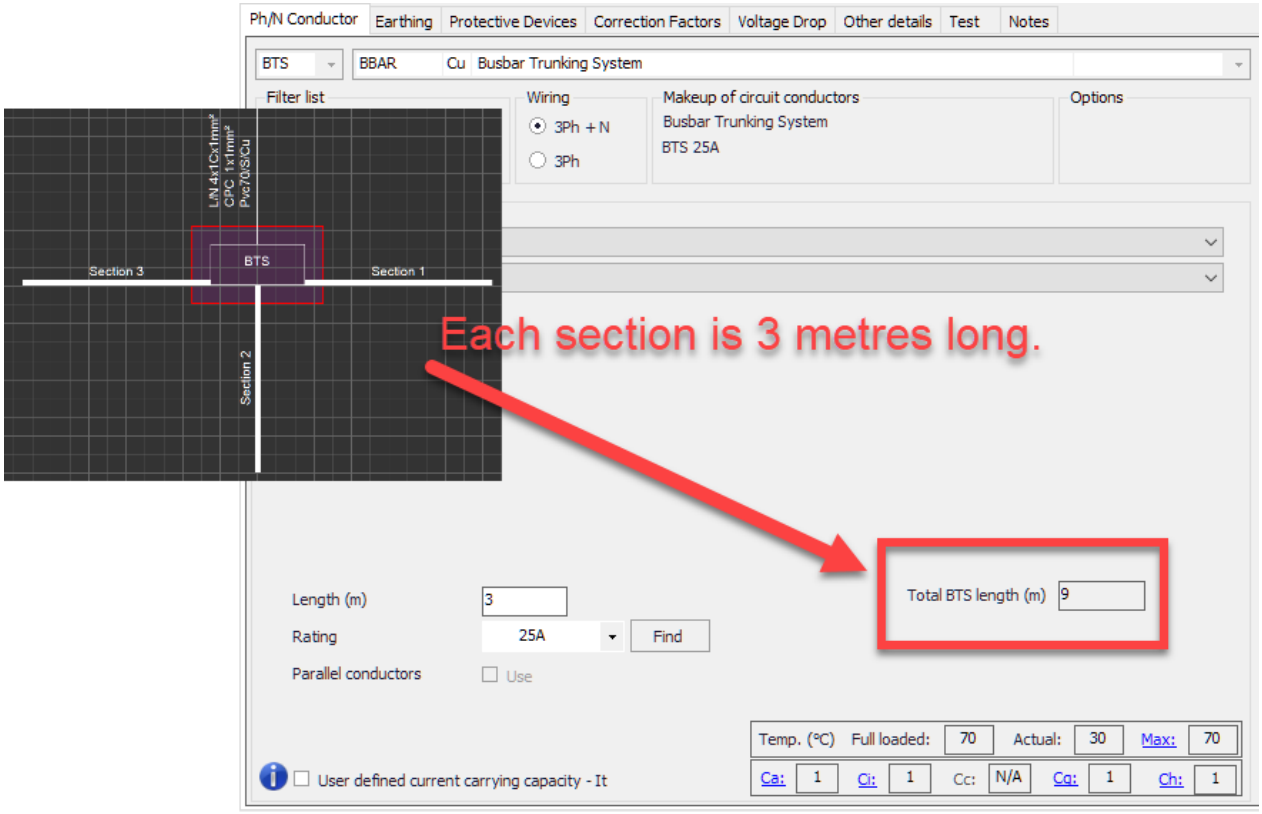
Ph/N Conductor tab is slightly different in case of a Busbar Trunking System. The conductor is set to BTS which cannot be altered, and installation section displays *Manufacturer* and *Family* drop-down lists which can be used to define the busbar trunking system used.



Bottom section is used used to define the length and the rating of the section. User also can define a manual current carrying capacity by ticking the *User defined current carrying capacity - It* tick box.

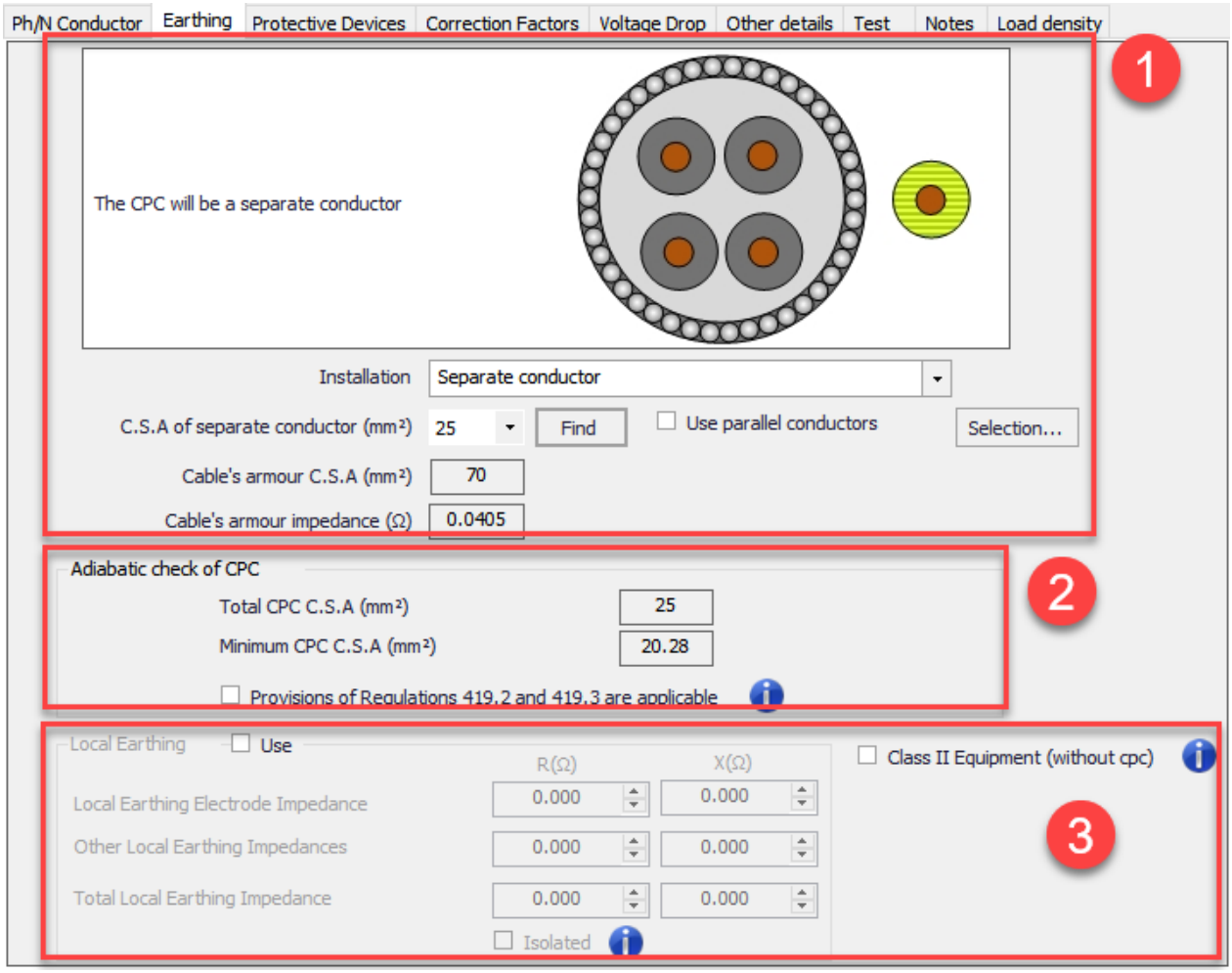


On the right hand side, ElectrcialOM will display the total BTS length. Total BTS length will display the total length of all the sections connected to the BTS box irrespective of their orientation, etc.

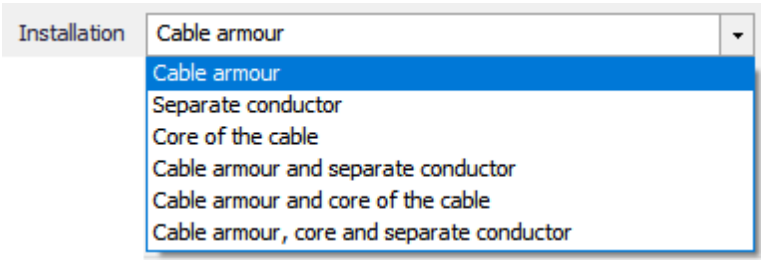


Earthing Tab

Earthing tab is used to set the protective conductor and earthing details for the selected circuit. The screen is divided into three main sections: 1- CPC settings, 2- Adiabatic check data, and 3- Local earthing settings which is available only for distribution nodes.



Depending on the feeder cable or conductor settings, CPC options will vary. For example, if the feeder is a cable type without an armour, then, using the cable armour as a CPC will not be an option. The CPC arrangement can be selected by using the *Installation* drop down list which is a dynamic list and contents will vary depending on the cable or conductor type selected by the user.

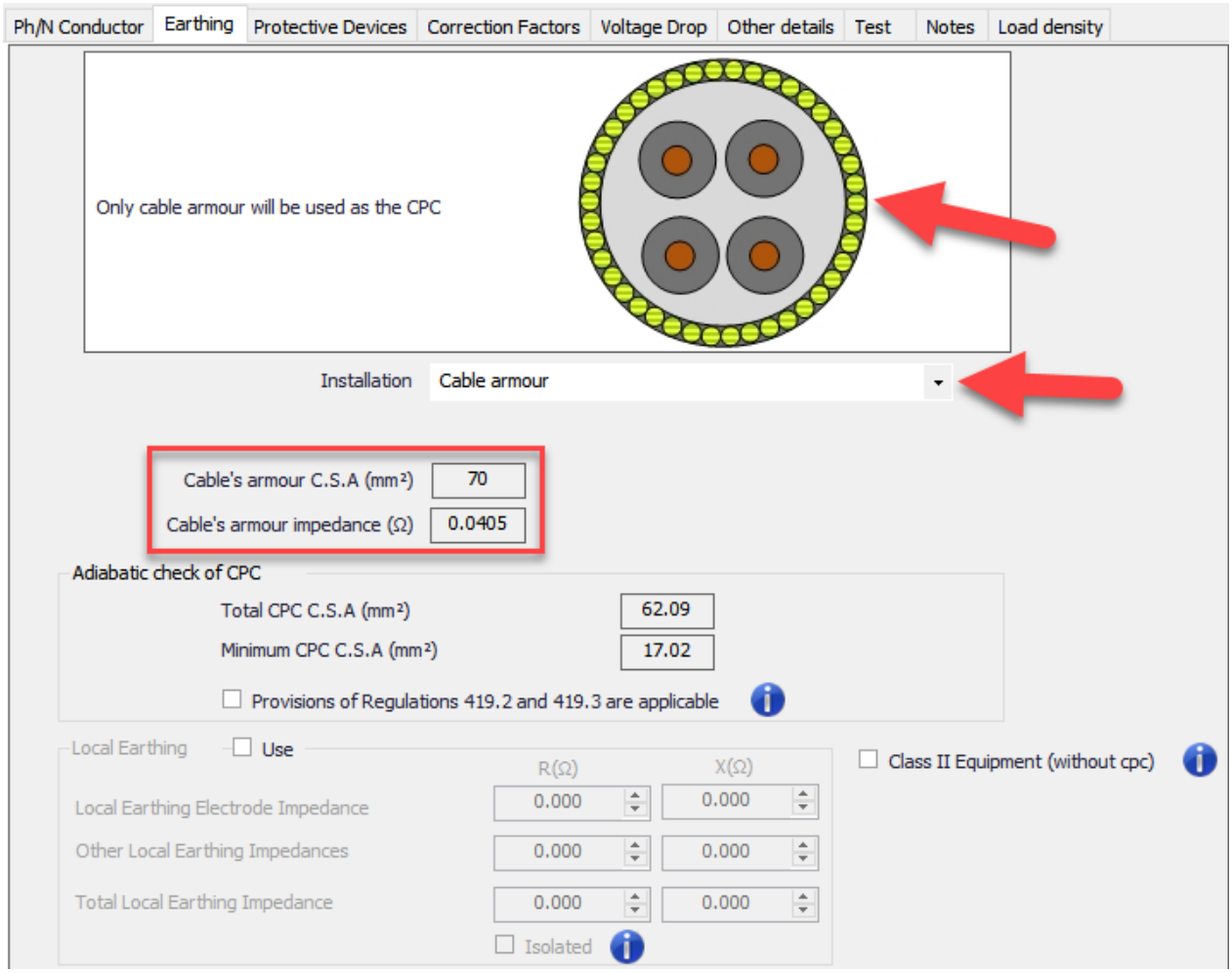


- **CPC Settings**

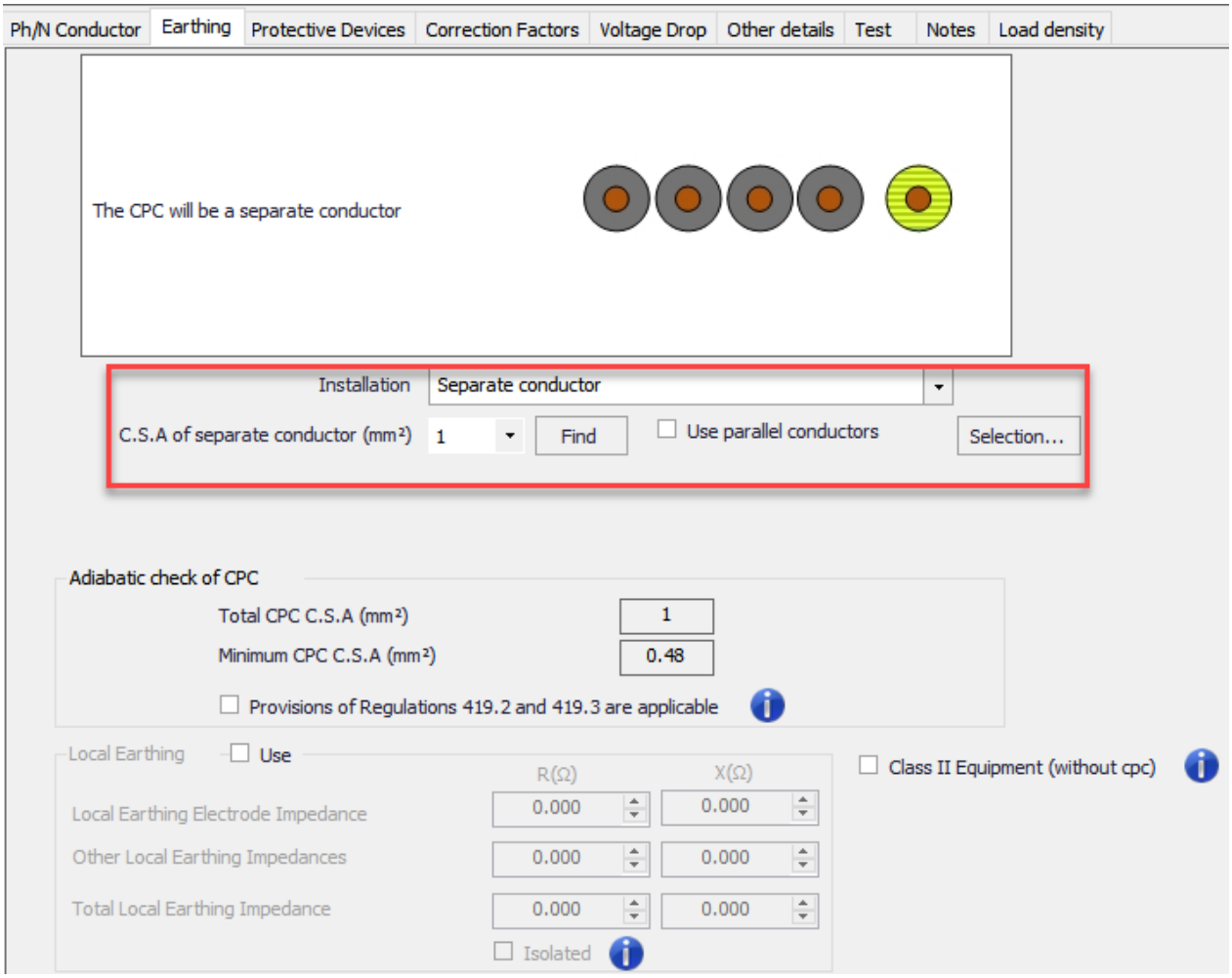
The CPC installation type can be selected using the *Installation* drop down menu. Installation options will vary depending on the selected cable or conductor. After selecting an installation option, ElectrcialOM will do various things depending on the selection.

  - **Cable armour/Cable sheath** options will set the armour or the sheath of the selected cable to be used as a CPC. In this case, ElectricalOM will calculate the copper equivalent cross section

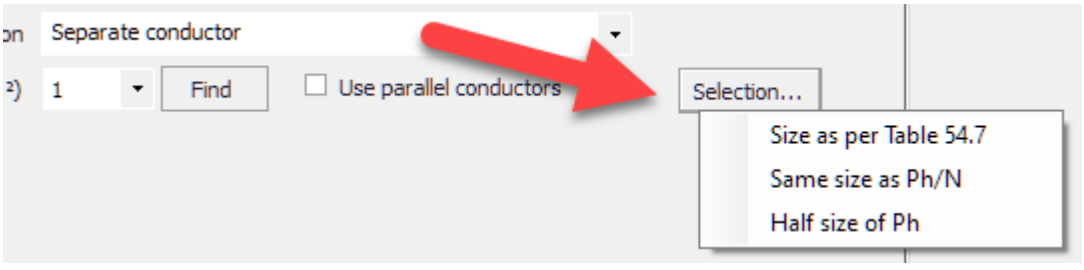
area and the impedance of the armour or sheath, and display it under the *Installation* drop down list.



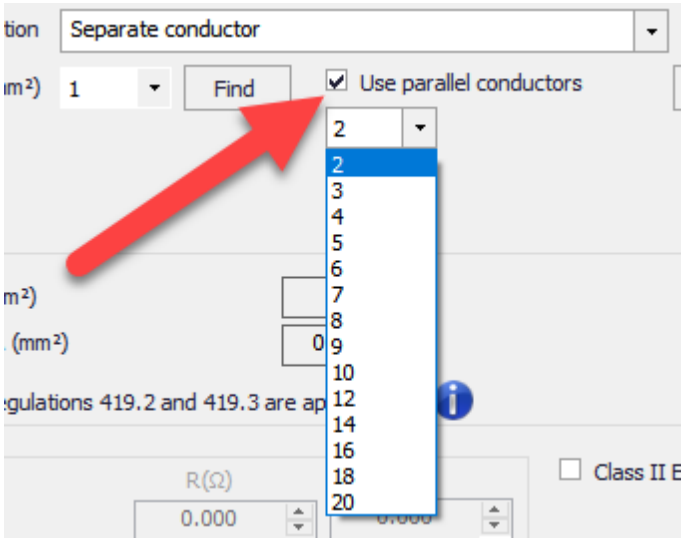
- **Separate conductor** option will create a separate conductor external to the cable, or as an extra cable to single phase conductors, and use this as a CPC. When this option is selected, ElectricalOM will display a selection list to set the cross section area of the separate conductor. The user can select a cross section area manually or let ElectrcialOM to select a suitable size based on calculations by using the *Find* button next to the drop down list.



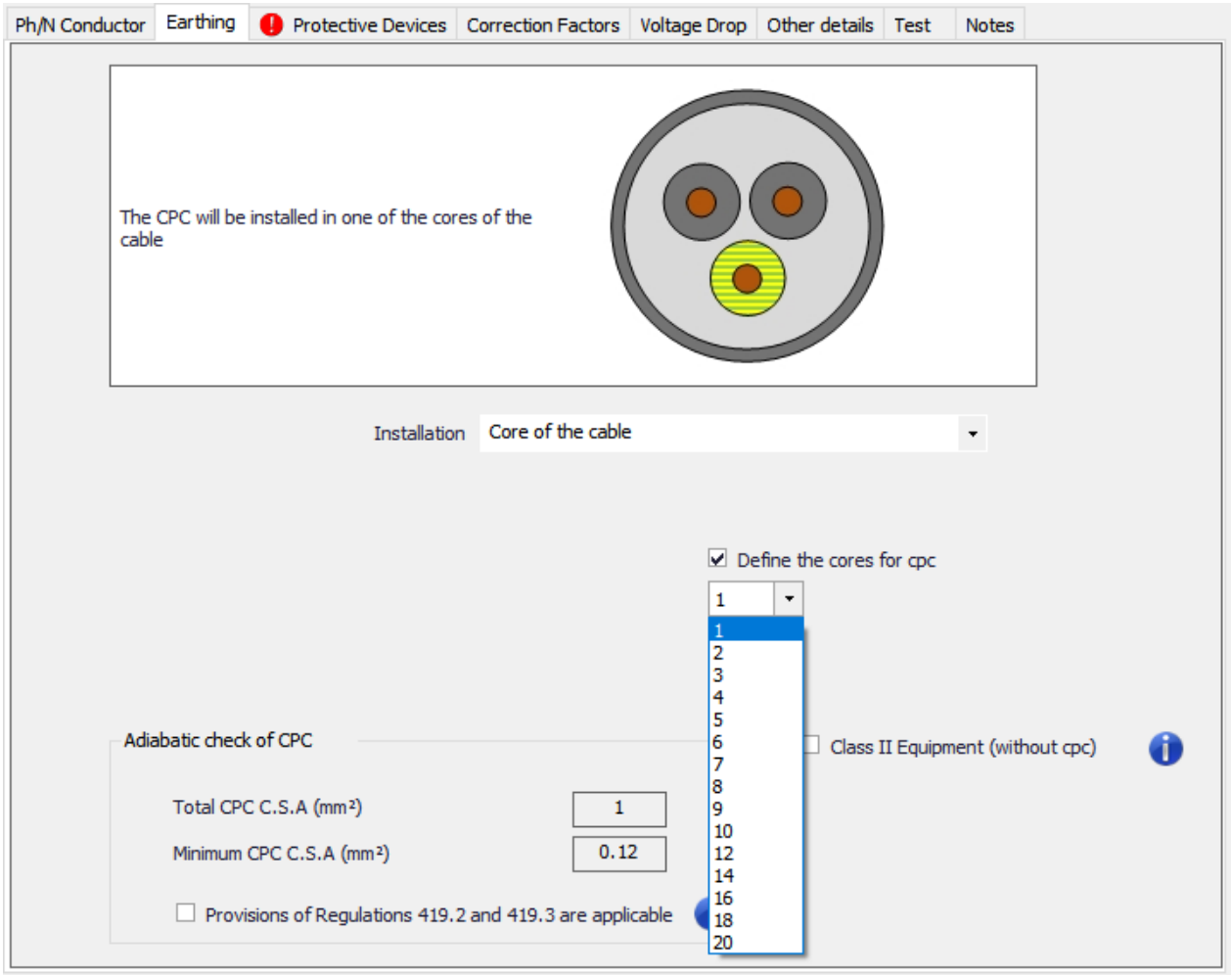
The user may not want to base the CPC cross section area on calculations but can opt to select the size the same as/half the size of the line conductors, or according to *Table 54.7 Minimum cross-sectional are of protective conductor in relation to the cross-section area of associated line conductor* of BS7671. In this case, *Selection...* button will help the user to select the CPC size accordingly and automatically

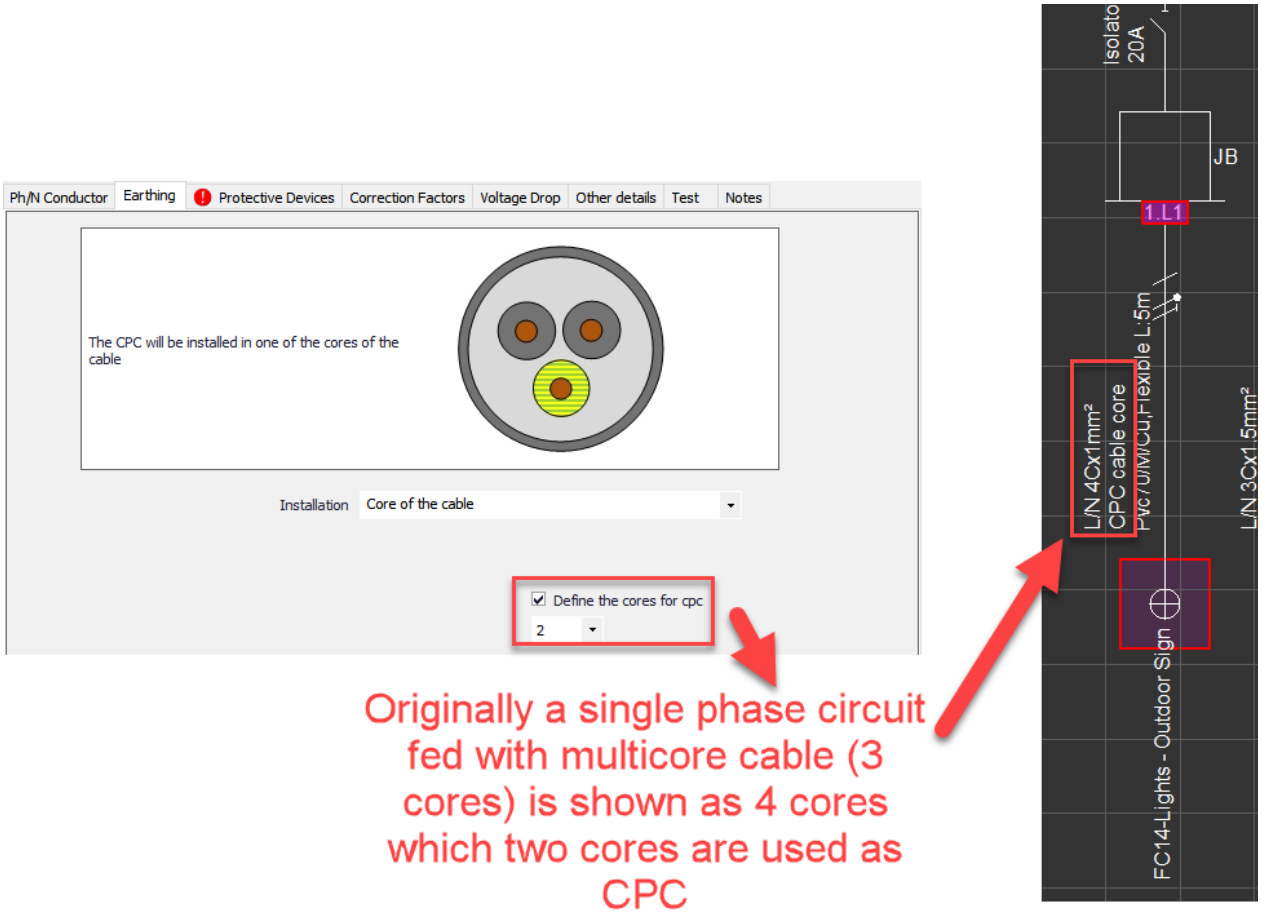


It is also possible to use multiple parallel conductors as CPC. This option is initiated by ticking the *Use parallel conductors* check box and choosing the quantity by the help of the drop down list.

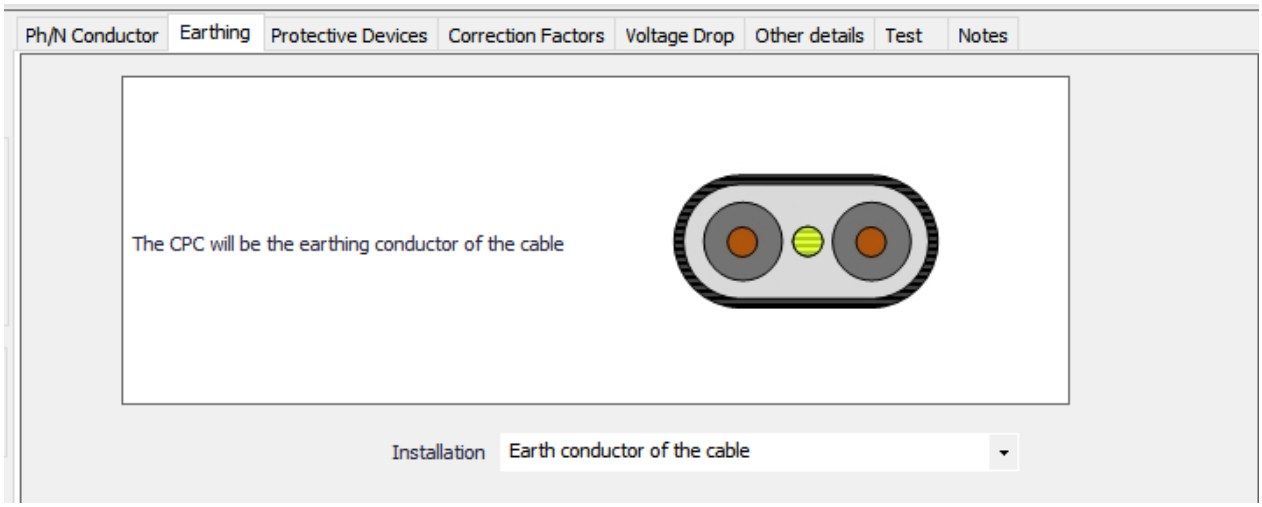


- **Core of the cable** option will set one of the cores of the selected multicore cable as a CPC. The cross section setting will not be available with this option however the number of the cores associated with CPC can be set by ticking the *Define the cores for CPC* box and selecting a number from the drop down list. Selecting multiple cores for CPC will also increase the core number of the cable and will be indicated on the schematics.



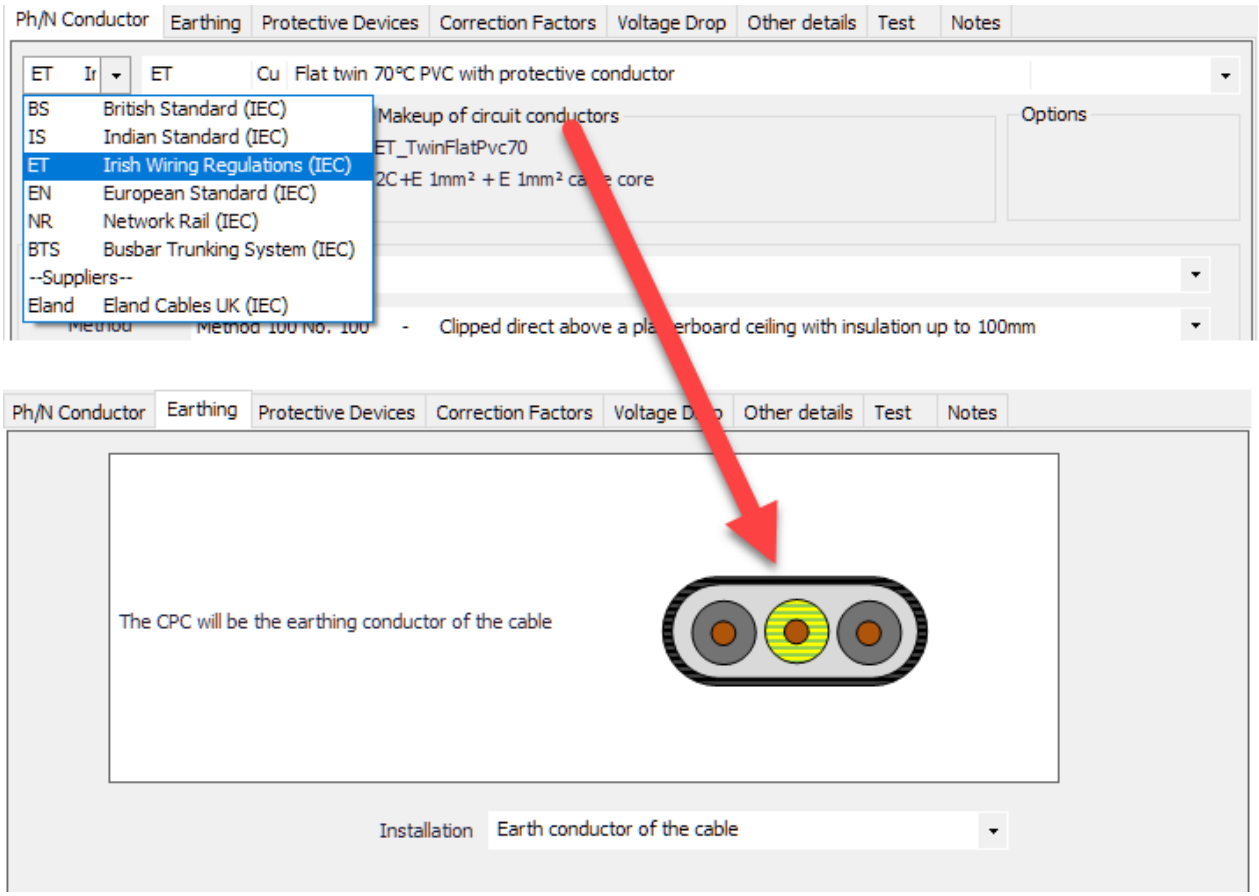


- **Earth conductor of the cable** option will be available with cables which already have an associated earth conductor, like twin flat cables. There will be no settings available for this option and ElectricalOM will set the CPC cross sections as shown below:



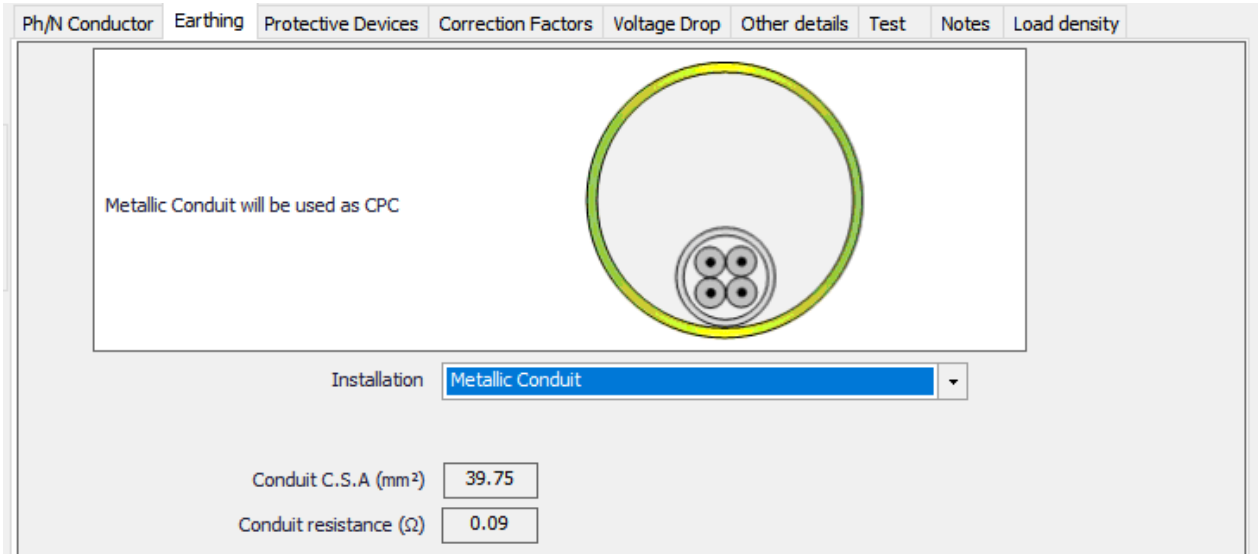
ElectricalOM's cross-section area settings for earth conductor of a Flat twin 70C PVC with CPC cable	
Line conductor cross-section area	***Earth conductor cross-section area***
1mm^2	1mm^2
2.5mm^2	1.5mm^2
4mm^2	1.5mm^2
6mm^2	2.5mm^2
10mm^2	4mm^2
16mm^2	6mm^2

However, if the user selects a flat twin cable to Irish Wiring Regulations, then the CPC will be set to the same cross-section as the live conductors.



- **Metallic Conduit** option will be available only when a cable or conductor is run within a metallic conduit (See Ph/N Conductor Tab). ElectrcialOM will calculate the copper cross section area

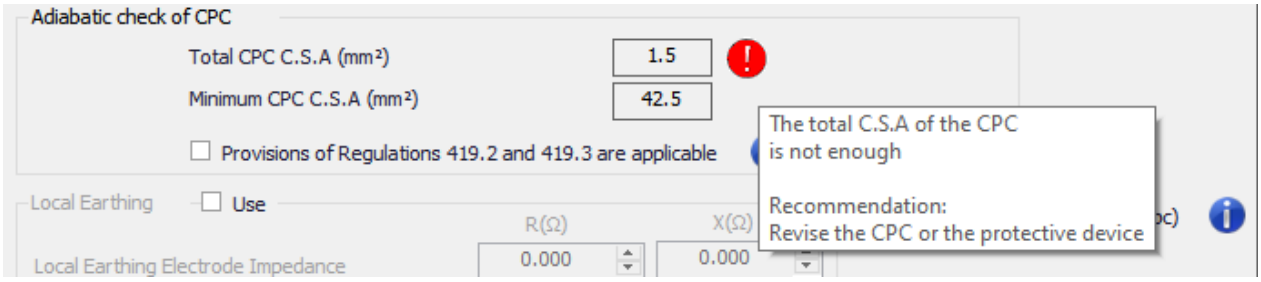
equivalent, and the resistance of the metallic conduit and display it under the *Installation* drop down menu



- Other CPC arrangement options include:
  - Cable armour and separate conductor
  - Cable armour and core of the cable
  - Cable armour, core, separate conductor
  - Core of the cable and separate conductor
  - Earth conductor and separate conductor
  - Metallic conduit and separate conductor

- **Adiabatic check data**

This section does not include any settings but is purely informative where the calculated minimum CPC cross section area and the actual cross section area of the selected circuit is shown and compared. ElectricalOM will calculate the required minimum CPC cross section area, and will display the result next to the *Minimum CPC C.S.A (mm^2)*. ElectricalOM will also consider all the components set as CPC by the user, and calculate a total cross section area and display it in the box next to the *Total CPC C.S.A. (mm^2)*. Any issues will be indicated by a red marker.



In the case of regulations 419.2, and 419.3, the user must tick the box next to *Provisions of Regulations 419.52 and 419.3 area applicable* so ElectrcialOM will not classify the warning associated with the CPC of

the selected circuit as *Critical* but reduce it to *Simple,* however, the warning will still be visible on the *Warnings* page of a report.

Critical warnings in project

Critical element	Warning description
TSO > SB1	Critical error in the circuit's checks
There are errors in 'SB1'. Please edit the circuit CPC adiabatic check error (cpc = 6 mm² < Adiabatic check min cpc required = 9.45mm²)	

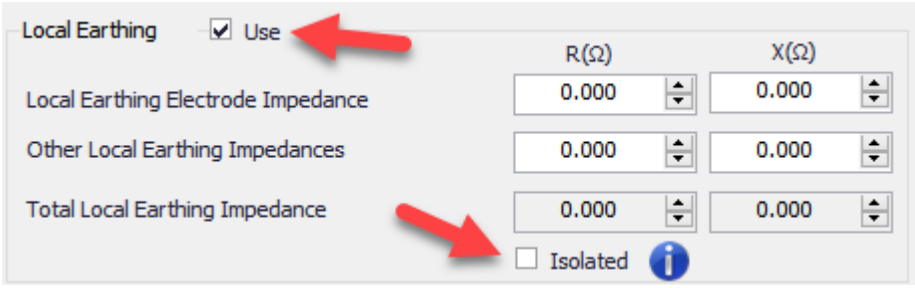
Project title...
Client: Client... | Revision: A| Revision by: M.G. | Revision date: 20/05/2021

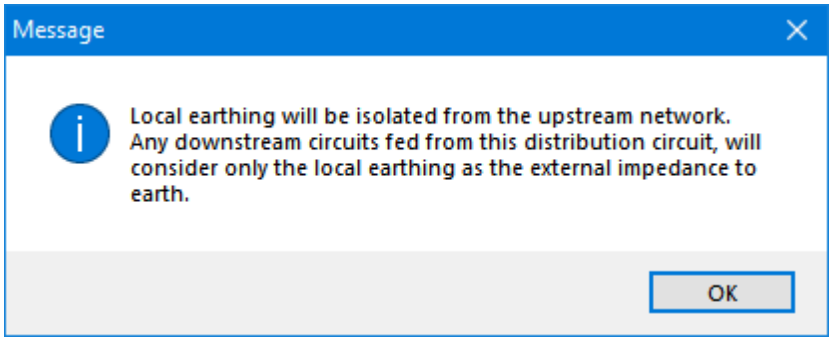
Warnings: SB1

Description	Warnings	Notes
SB1	Simple: 1) The provisions of regulation BS 7671:2018 419 are applicable. The circuit's earth fault related errors are not reported	

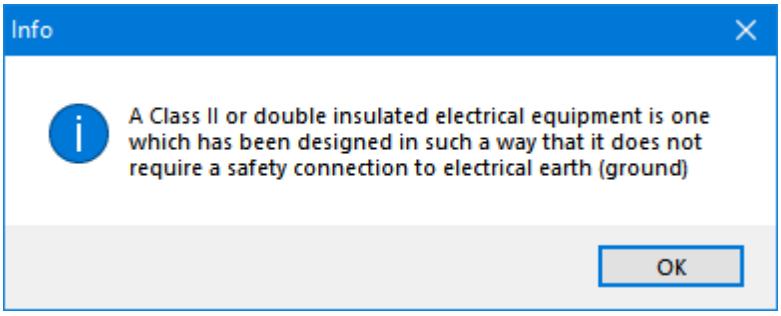
- **Local Earthing Settings**

Sometimes, especially in TT systems, a distribution node may be earthed locally and further more, it can be isolated from the feeder side. ElectricalOM's *Local Earthing* tick box is designed to model this occasions. Once ticked, the resistance and reactance settings becomes available, so, the user can type in the values in to calculate the impedance at the point of local earthing. If the distribution node is not isolated from the feeder side then this value will be considered together with the rest of the system during the calculations, however, if the Isolated box is ticked, ElectricalOM will consider only the local earthing value for the rest of the system fed from this node ignoring the feeder side value.

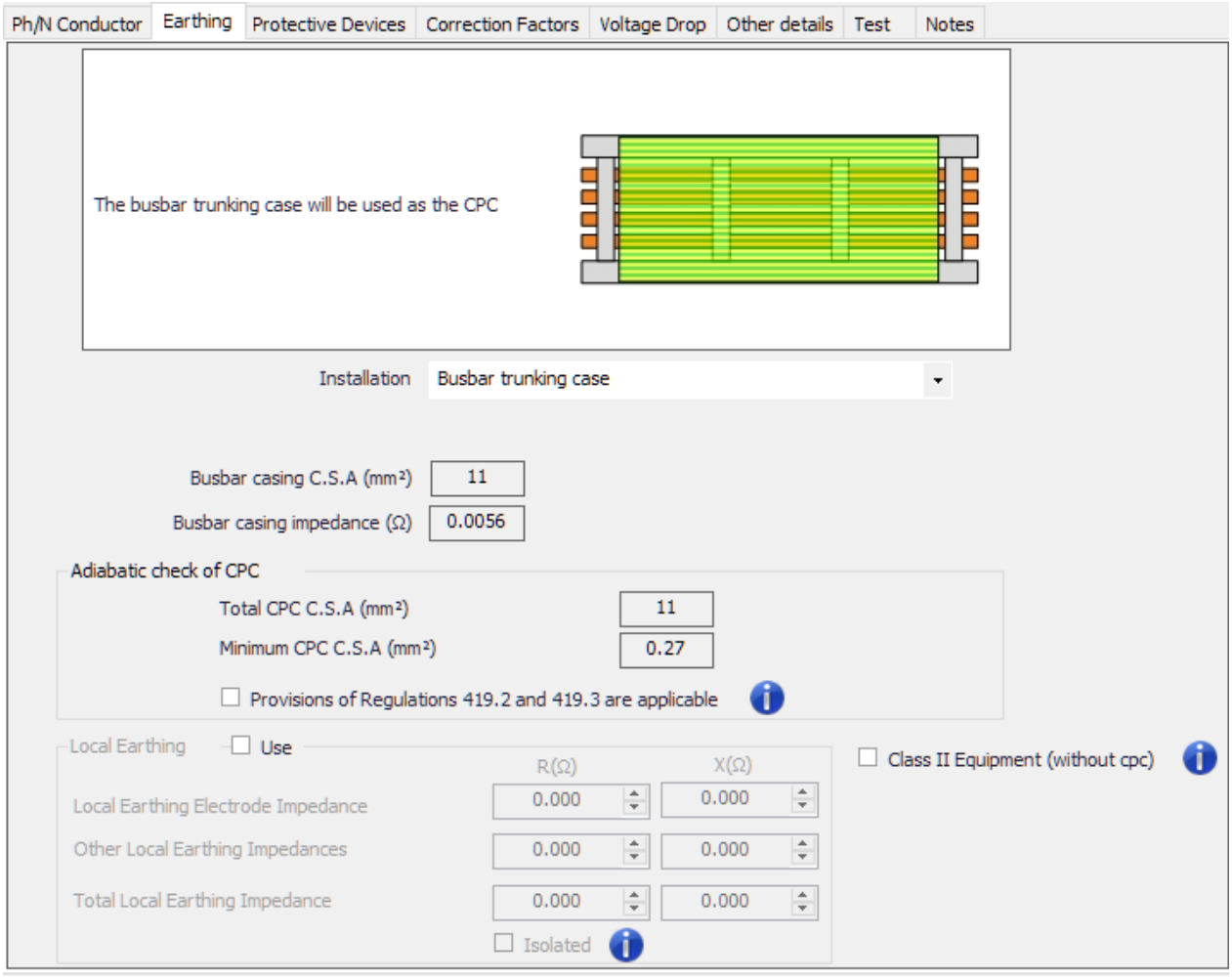




Local Earthing section also accommodates the setting for the Class II Equipment. When this box is ticked, Earthing settings will be completely removed.

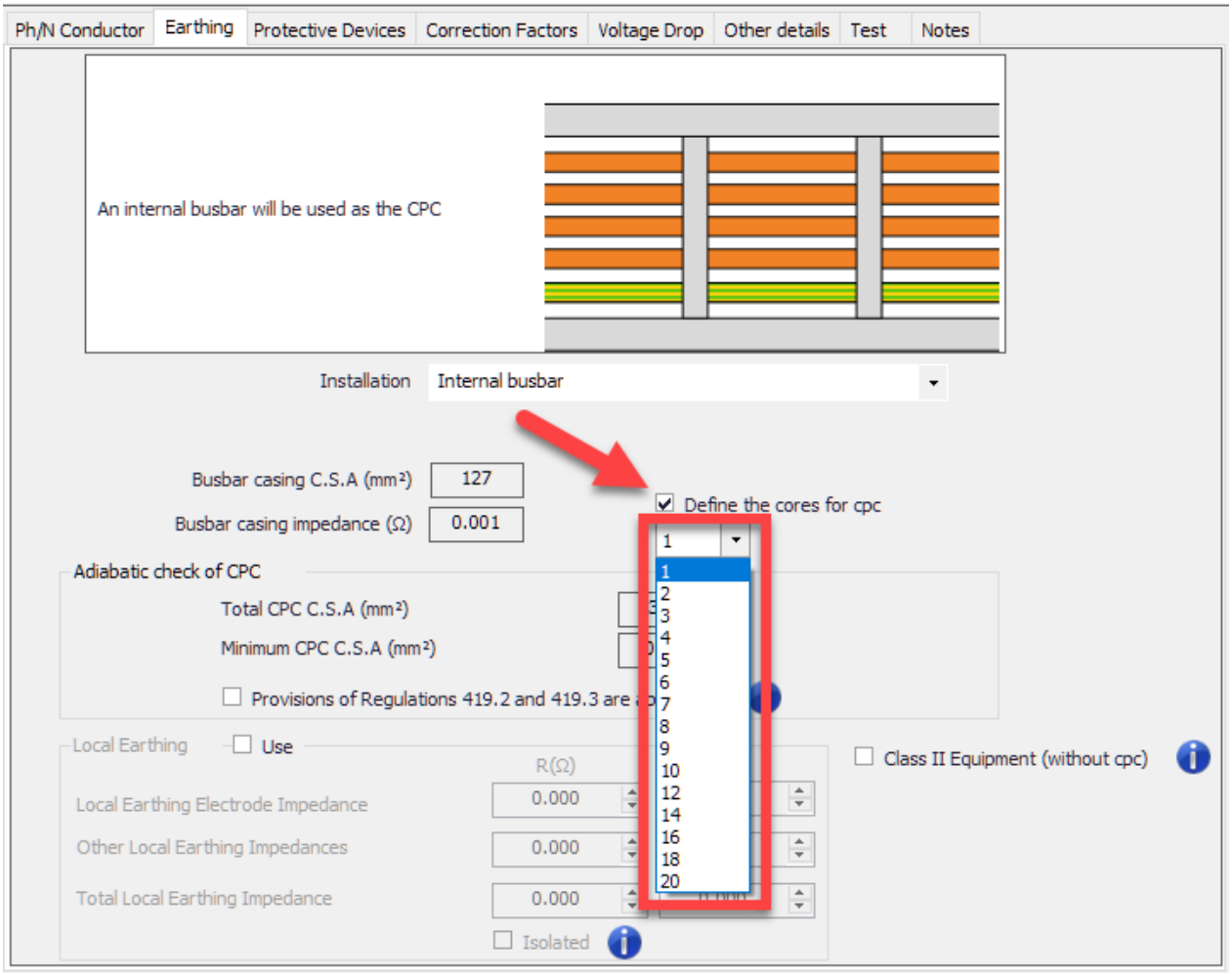


Similar to Ph/N Conductor tab, Busbar Trunking System component also has a special Earthing tab, however, options below are only for *Generic* busbar trunking systems.



Installation drop-down list has three options:

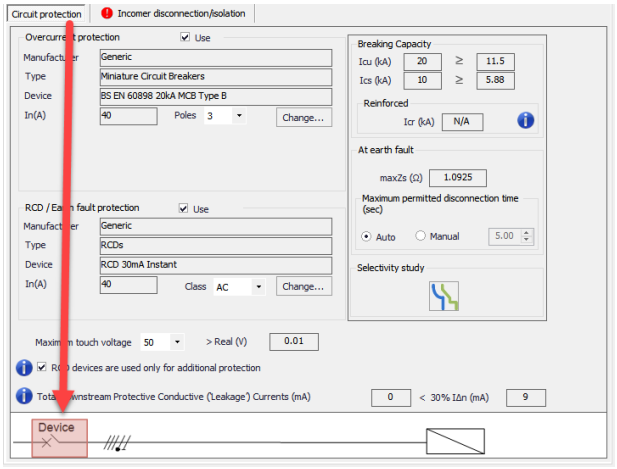
- Busbar trunking case option will use the casing as the protective conductor.
- Internal busbar option will use one of the busbars as the protective conductor. The user may choose the quantity of busbars will be used for earthing by ticking the *Define cores for cpc* tick box.

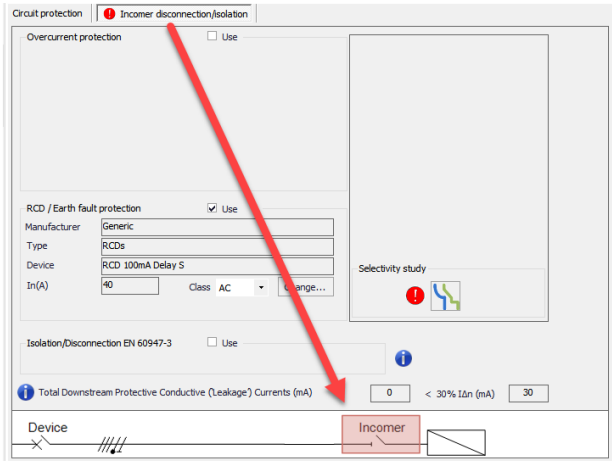


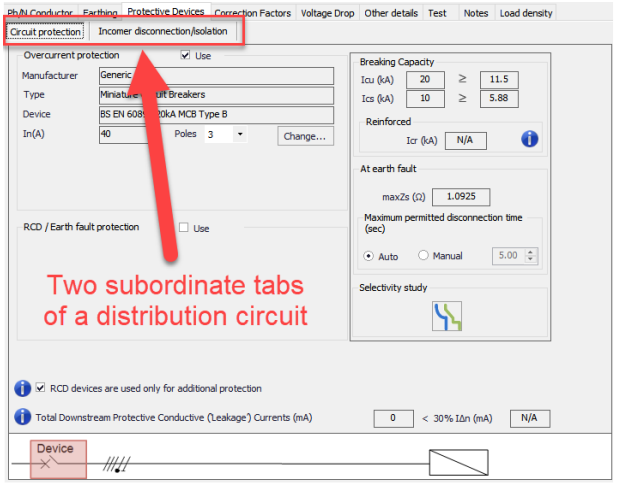
- Busbar trunking case and Internal busbar option will consider both options used at the same time. The user may choose the quantity of busbars will be used for earthing by ticking the *Define cores for cpc* tick box.

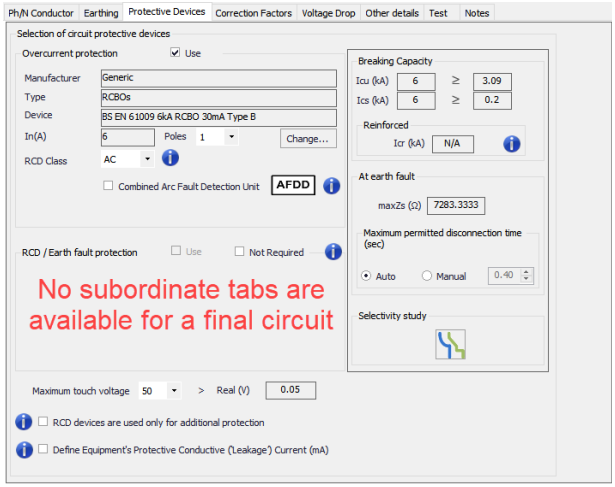
Protective Devices Tab

Protective Devices tab accommodates settings and options in regards to any protective device used in the selected circuit. It has two versions depending on the type of the selected circuit. If the selected circuit is a distribution circuit then there are two subordinate tabs available. These two subordinate tabs are *Circuit protection*, and *Incomer disconnection/isolation*, former being the outgoing part of the feeder mode which feeds the selected circuit, and the latter being the incoming part of the selected circuit. If the selected circuit is a final circuit, then, only the circuit protection settings are available.



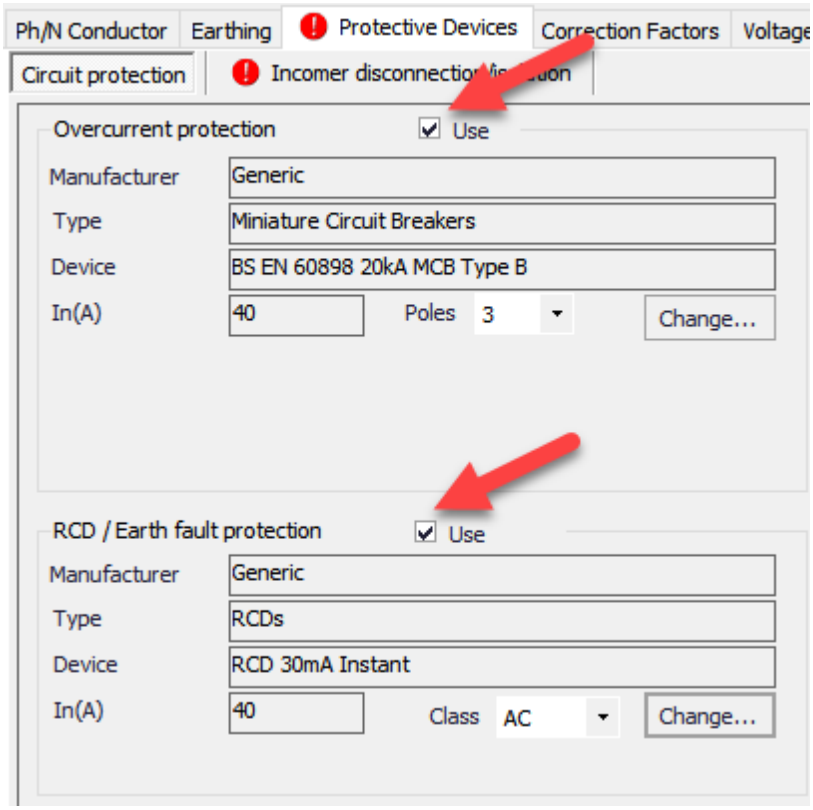




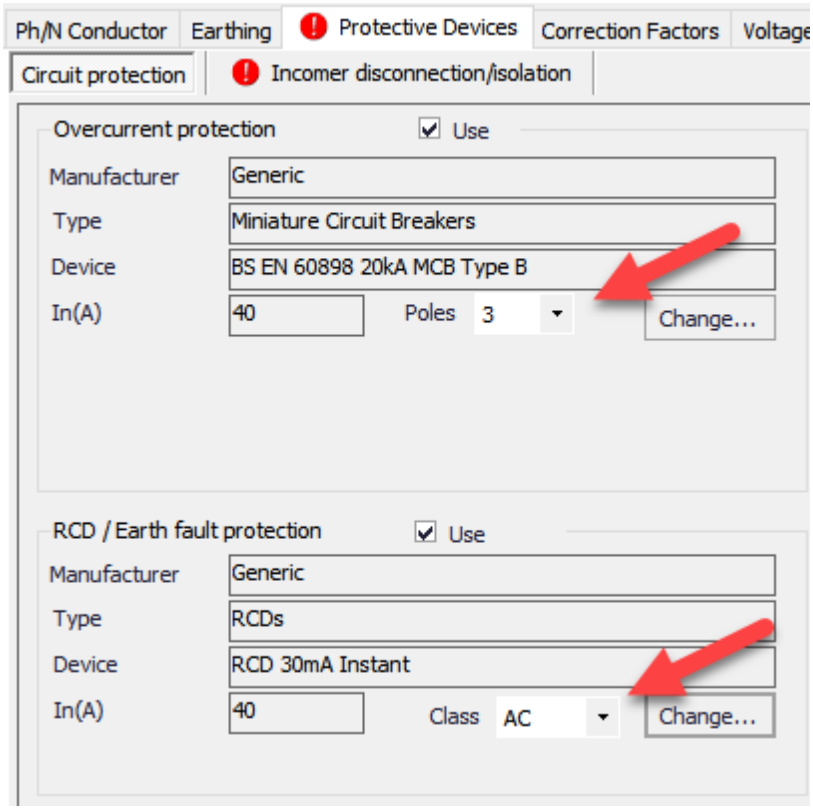


- **Circuit protection**

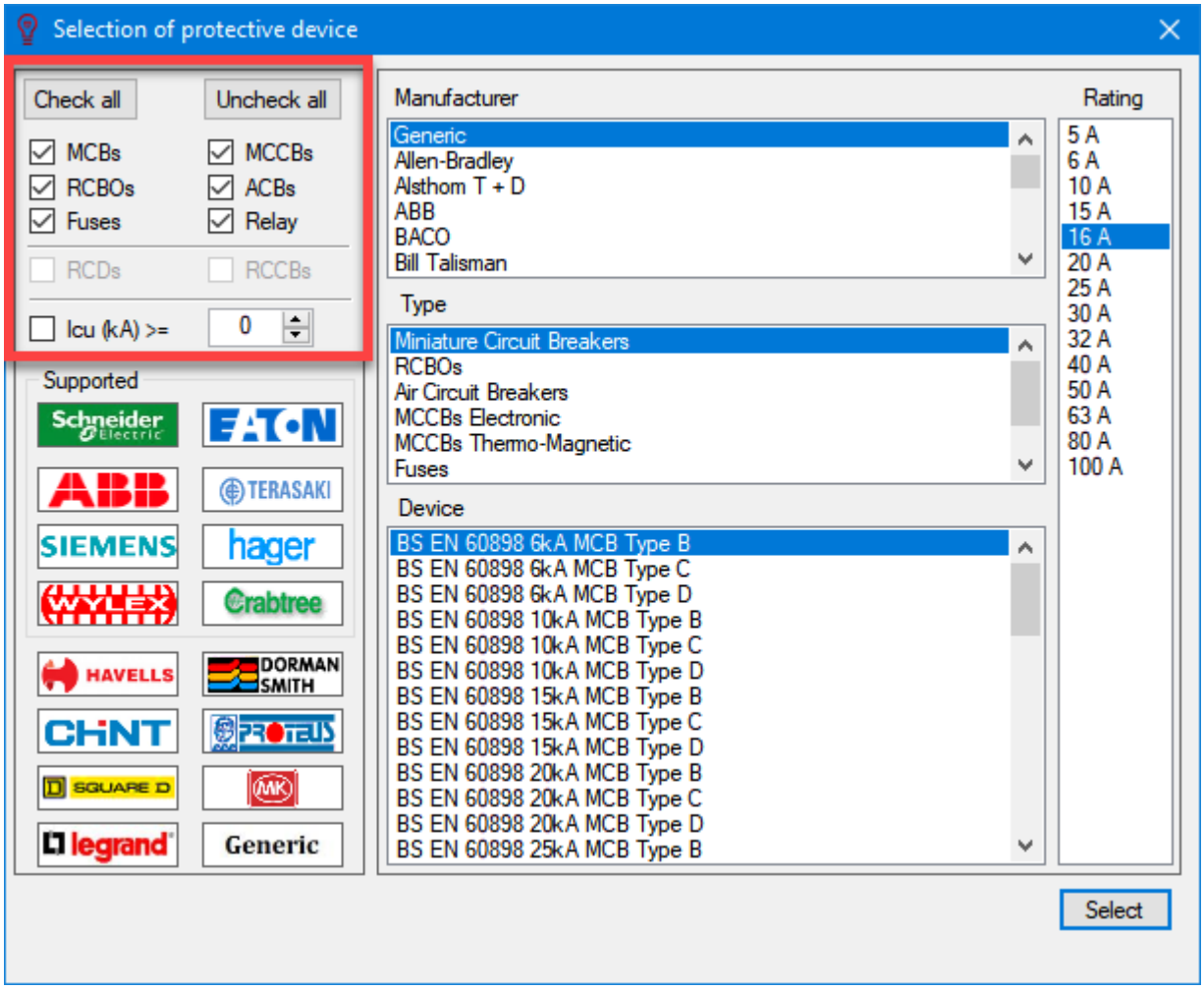
The user has two device options to use with the selected circuit, an overcurrent protection device and an earth fault protection device. The devices can be enabled by ticking the *Use* tick boxes next to the respective title. Once ticked, related option and setting fields will be displayed under the title, so the user can select and modify those.



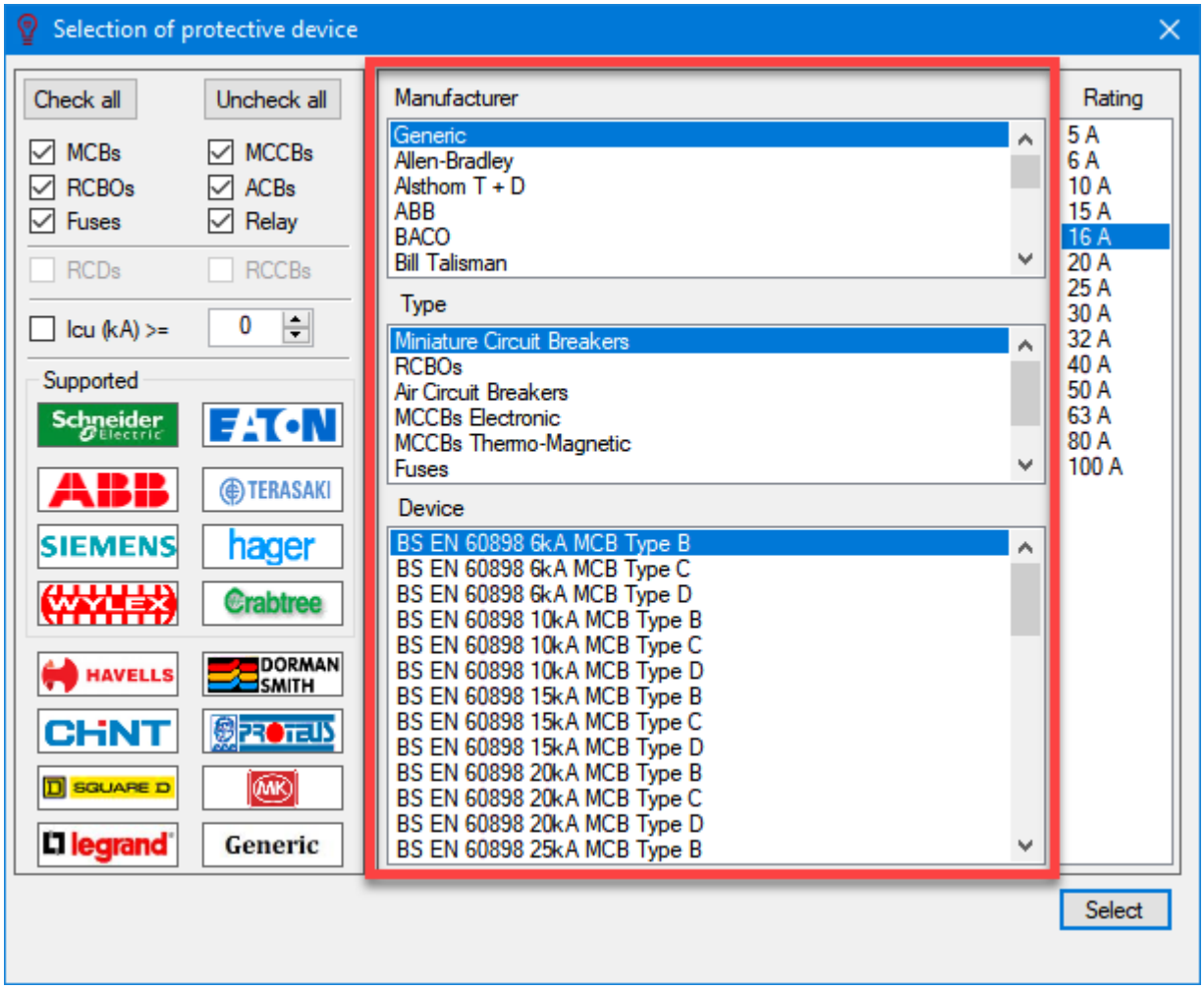
Overcurrent Protection section has a drop down list for number of poles which will indicate if the neutral conductor will also be run through the protective device. If the circuit is a three phase circuit, the drop down list will have 3 and 4 as options, and if the circuit is a single phase circuit then the option will be 1 and 2.
Change... button is used to modify the protective device as the user's preference.
RCD/Earth Fault Protection section has also a drop down list but it is for the class of the protective device which are AC, A, B, F, B+.



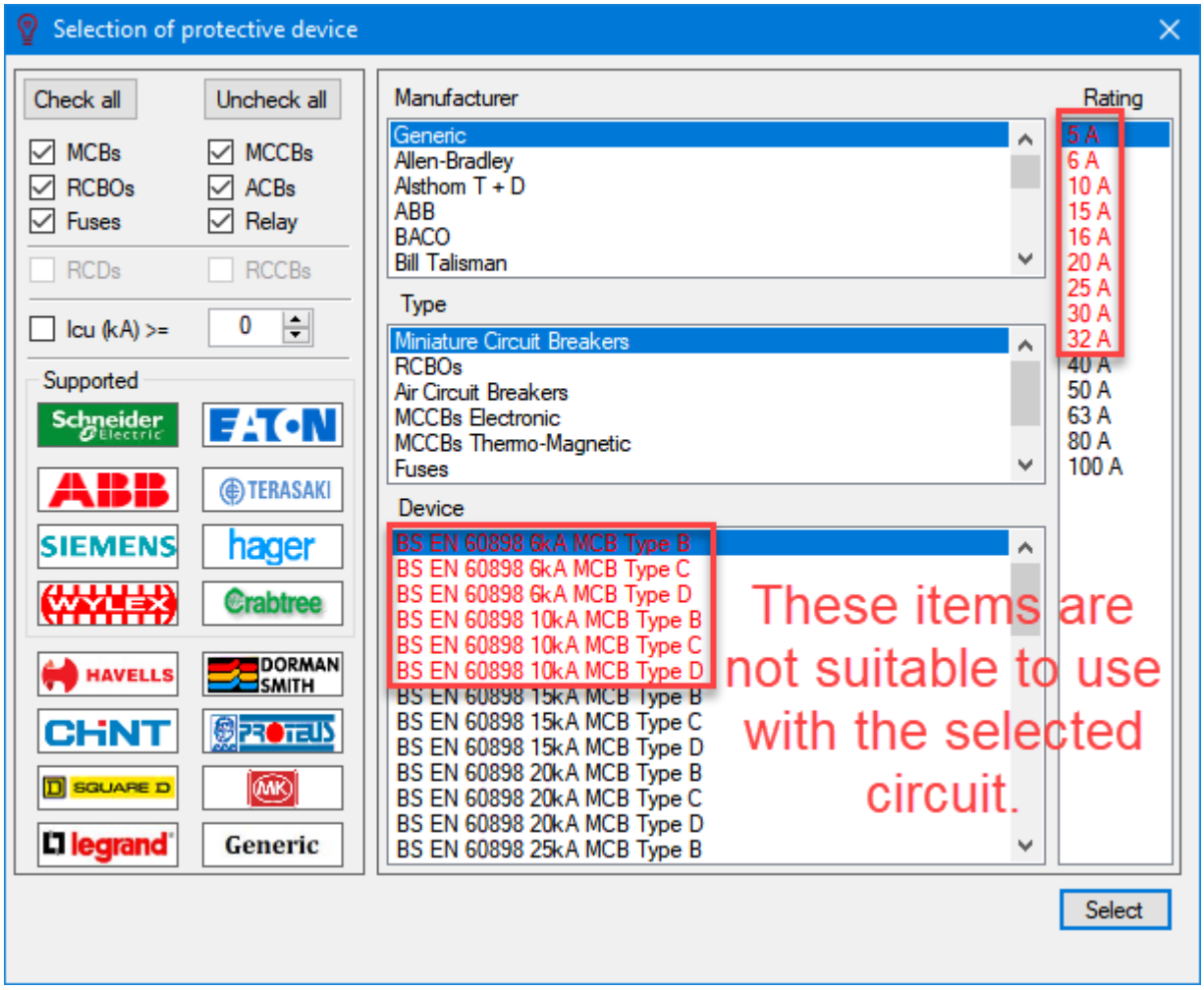
Change... buttons will initiate the *Selection of protective device* window which has various sections. Left top region is reserved for the filtering options which the user may select to see only the selected device types. If the device is a overcurrent protective device, the MCBs (miniature circuit breakers), MCCBs (moulded case circuit breakers), RCBOs (residual current circuit breakers with overload), ACBs (air circuit breakers), Fuses, and Relays options will be available, but if the device is an earth fault protective devise then RCDs (residual current devices), and RCCBs (residual current circuit breakers) options will be available. Underneath those, ultimate short circuit breaking capacity (I_{CU}) filtering check box is placed which the user can define a value by typing in to the text field and refine the filtering further.



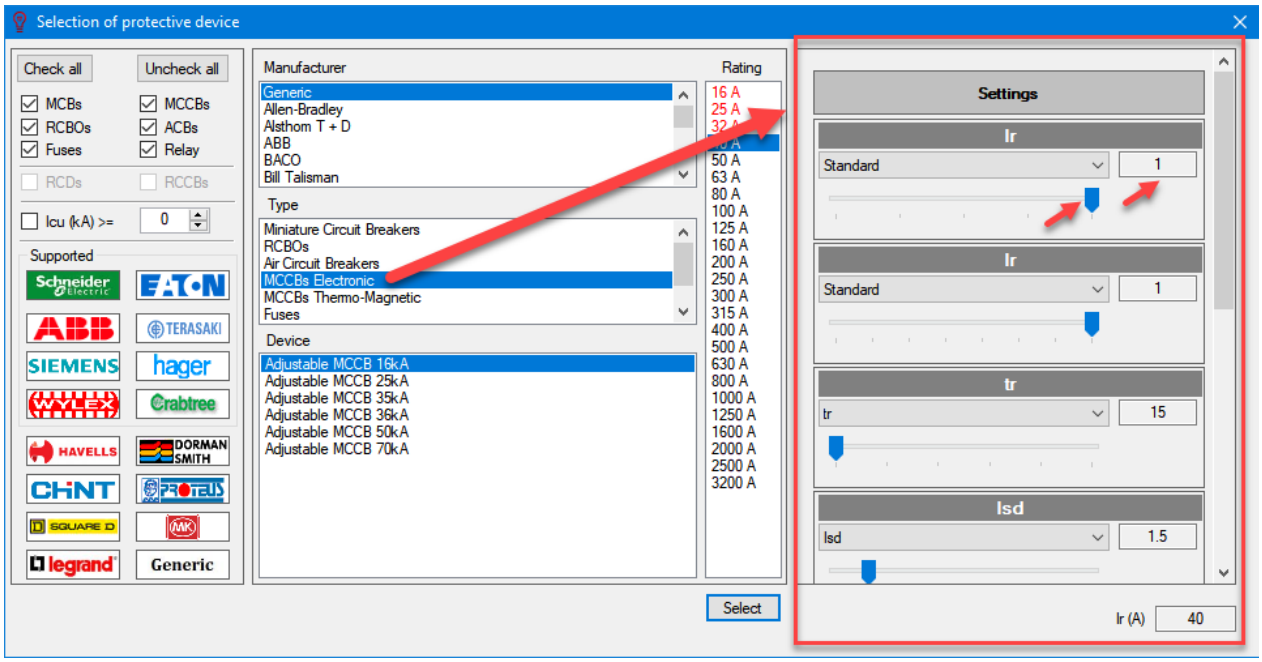
Middle section consists of three scrollable lists which are used select a manufacturer, a device type, and a device. If there is no manufacturer data, the user can use the generic data by selecting the Generic option from the manufacture list. The type and device lists will be updated accordingly depending the selected options. The device list will also consider the selected circuit data and marks the unsuitable items in red as a visual indication, however they are still selectable options.



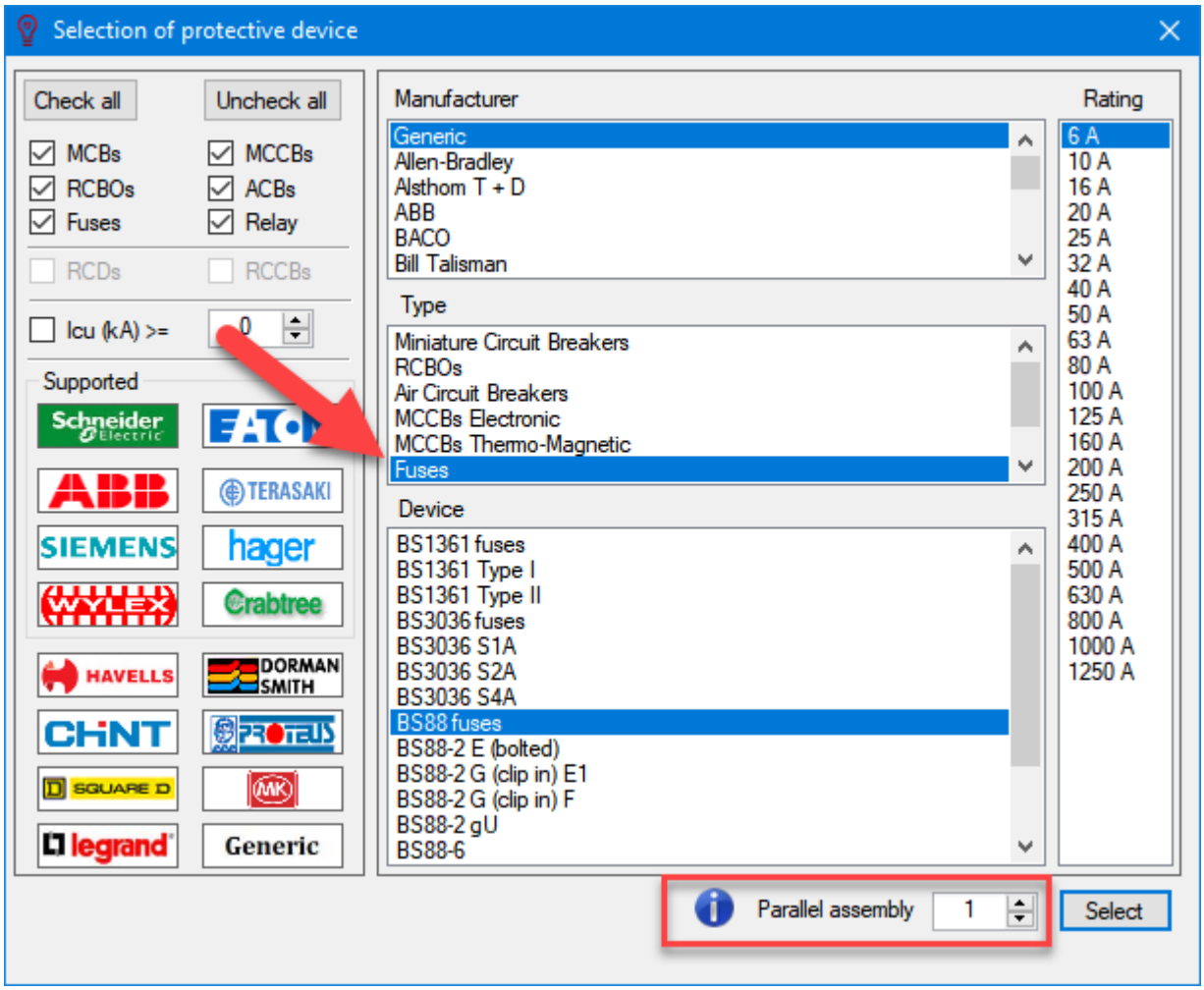
Right hand side is for selecting the rating of the selected device type. The list is also updates itself depending on the selection and also the selected circuit data and unsuitable items will be highlighted in red, however they are still selectable options.

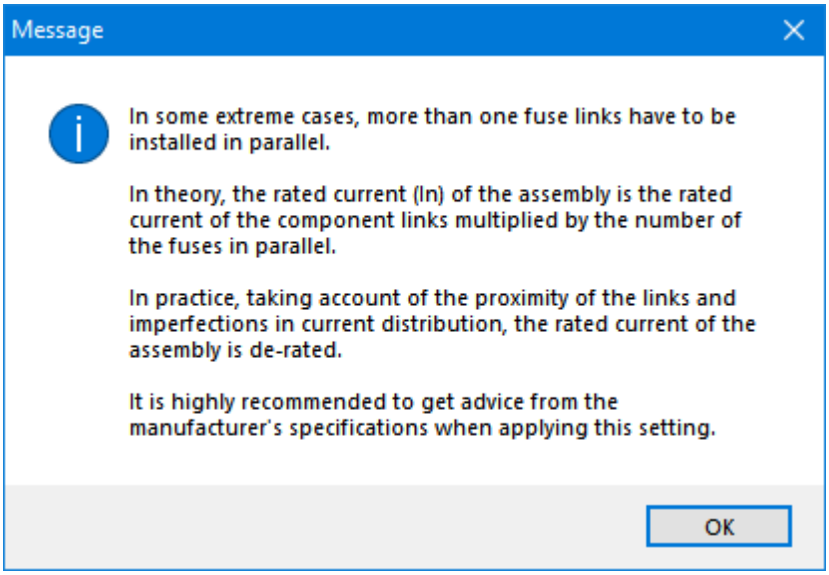


If the selected device has extra setting options due to its type such as an MCCB, then, an extra settings pane will be show on the right hand side of the *Selection of protective device* window. The variables can be set by using the sliders or by typing in a value to the related text fields.



If the selected protective device is a fuse, then ElectricalOM will let the user to use parallel fuses. *Parallel assembly* option can be enabled by ticking the tick box next to the *Select* button. The user needs t be careful before using such an arrangement and seek manufacturers' recommendations.



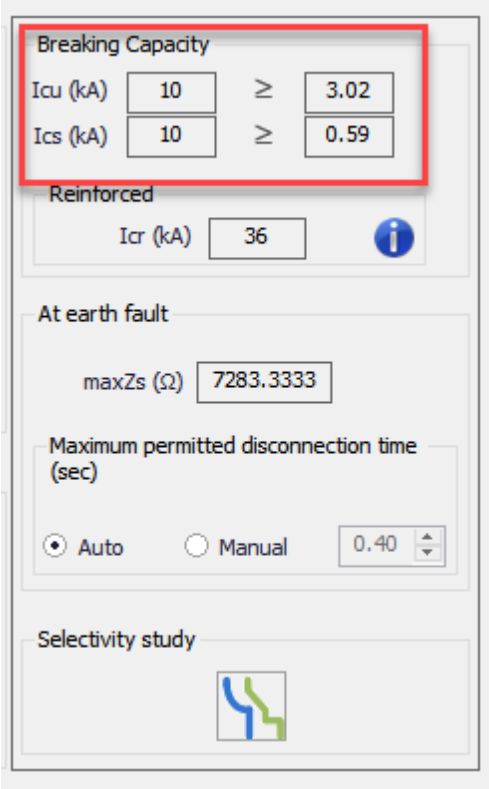


Right hand side of the *Circuit protection* tab is reserved for breaking capacity, earth fault data, and selectivity data of the selected circuit.

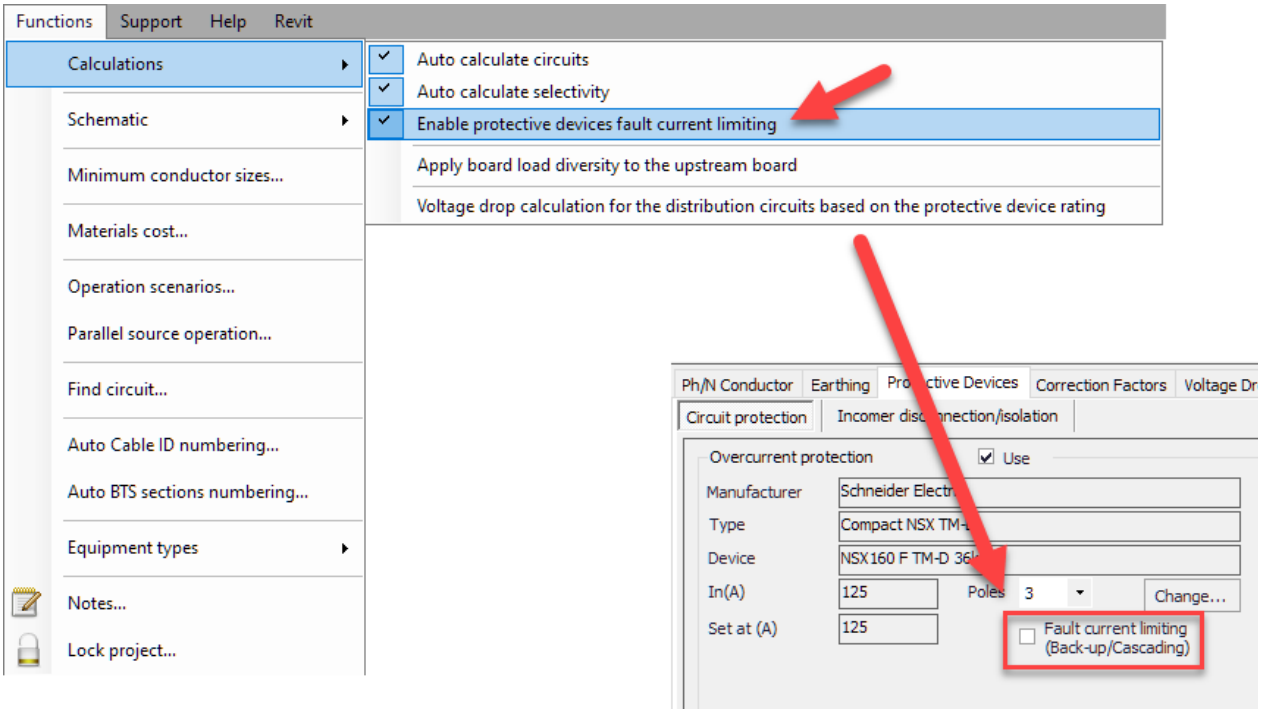
The *Breaking Capacity* section will display the comparisons of:

- *ultimate short circuit breaking capacity* versus maximum short circuit current at origin of the circuit, and
- *service short circuit breaking capacity* versus maximum short circuit current at the end of the circuit

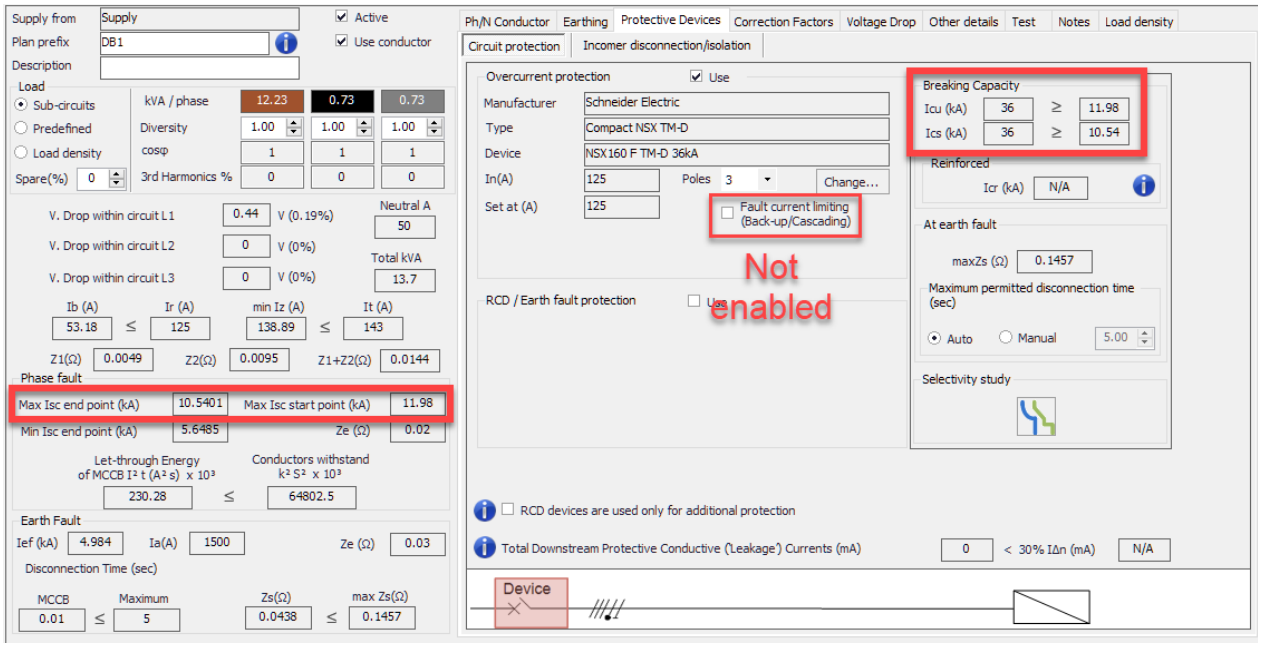
for the selected device. Any warnings will be indicated by red markings.

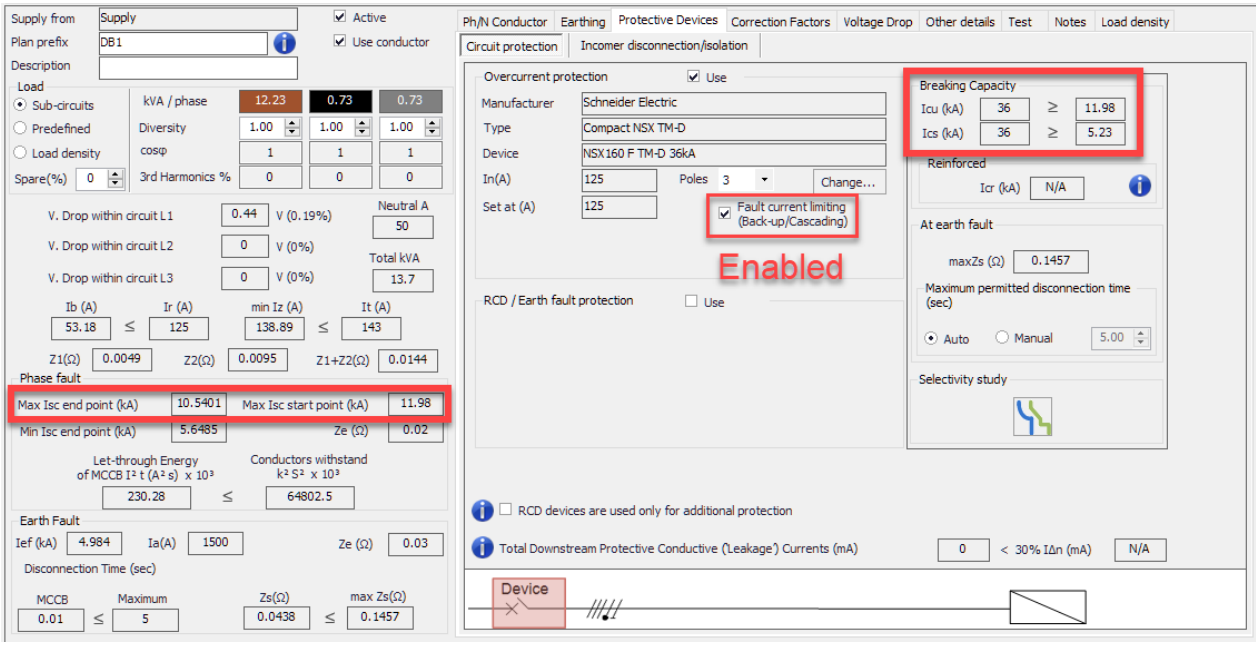


In many cases maximum short circuit current values under Breaking Capacity area are the same as the ones within the Calculations section, however, in some instances where the user enables the current limiting feature and selects a device from a manufacturer having current limiting feature, ElectricalOM will use the manufacturer's data to calculate fault current taking the limiting effect in consideration. This feature can be enabled from Functions menu. If *Enable protective devices fault current limiting* option is ticked, then another tick box will be displayed under *Overcurrent protection* section: *Fault current limiting (Back-up/Cascading)*.

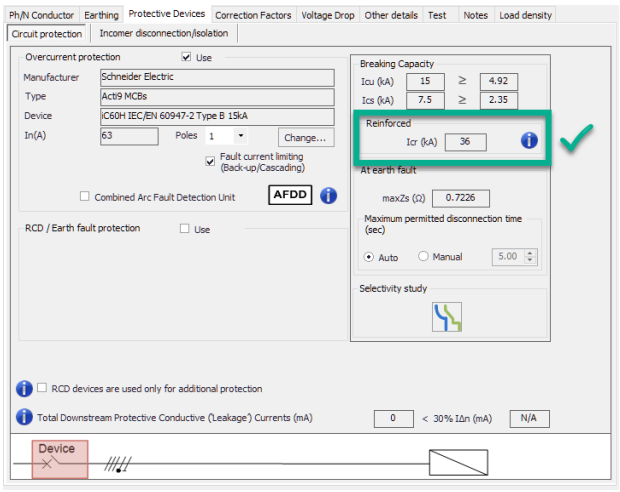


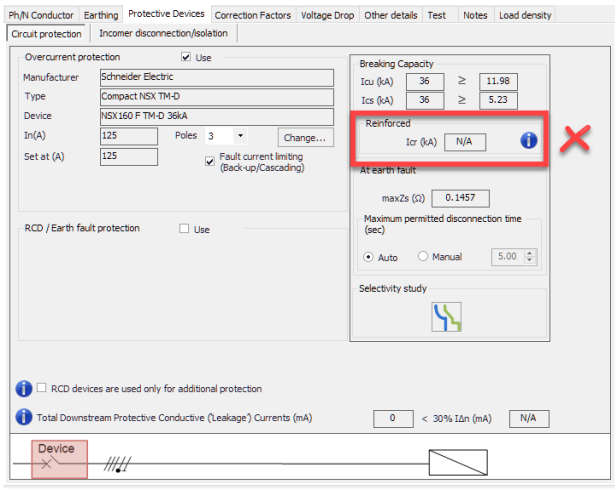
In cases *Fault current limiting* is enabled, the values within the *Breaking Capacity* section and the *Calculations* section will not be the same, the former being the fault current values taking into consideration the limiting effect, and the latter being the actual fault current values regardless of any device property or feature.

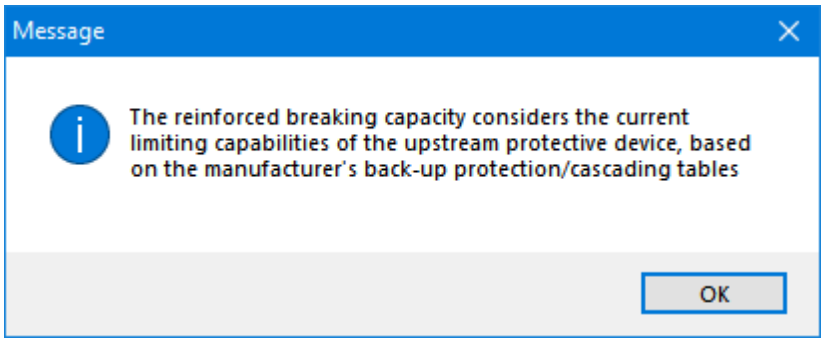




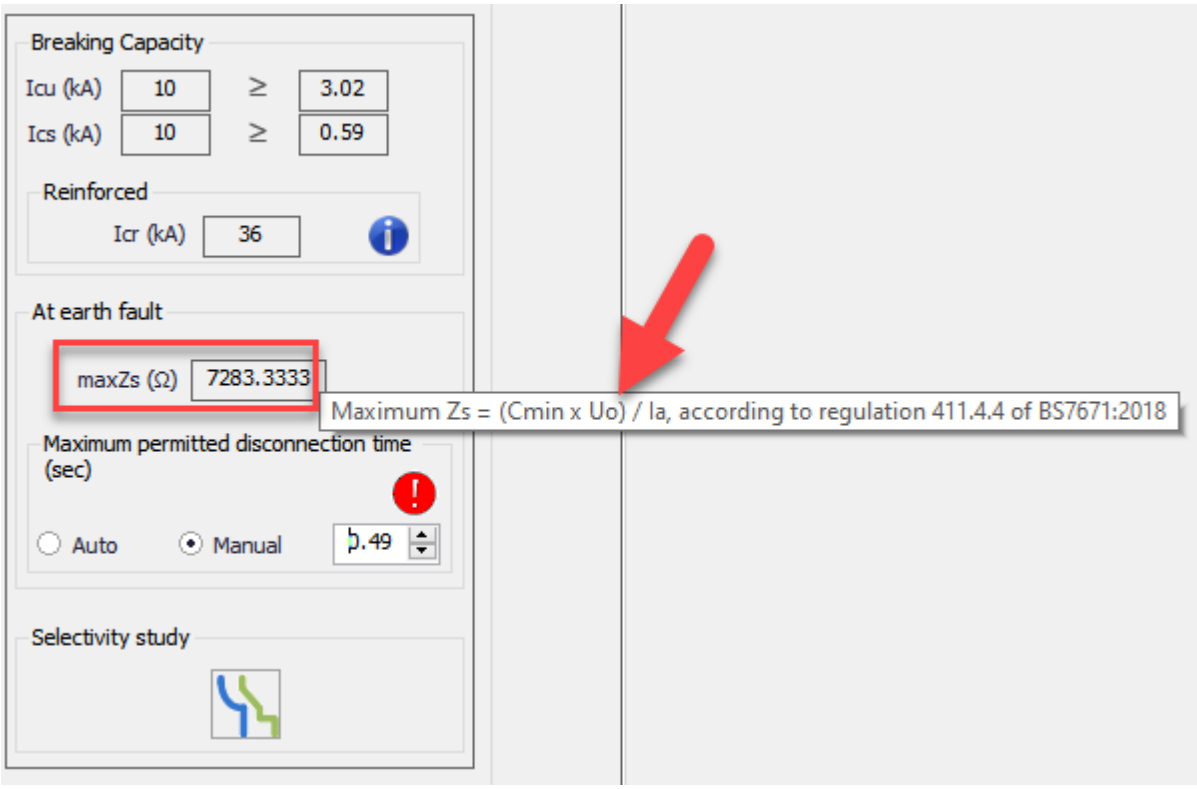
However ElectricalOM displays values for limited fault currents, it is not enough to achieve a current limiting assembly, and this option must be used with caution. A sub-section titled as *Reinforced* is also related with fault current limiting feature of protective devices and it is an indication fault current limiting effect is in fact achieved. ElectricalOM will display a reinforced breaking capacity value for a device only if the manufacturers' data is available. If no data is available for selected protective devices, the reinforced breaking capacity will be N/A and this means the limited fault current values are only tabulated and are not guaranteed by neither the manufacturer nor ElectrcialOM.



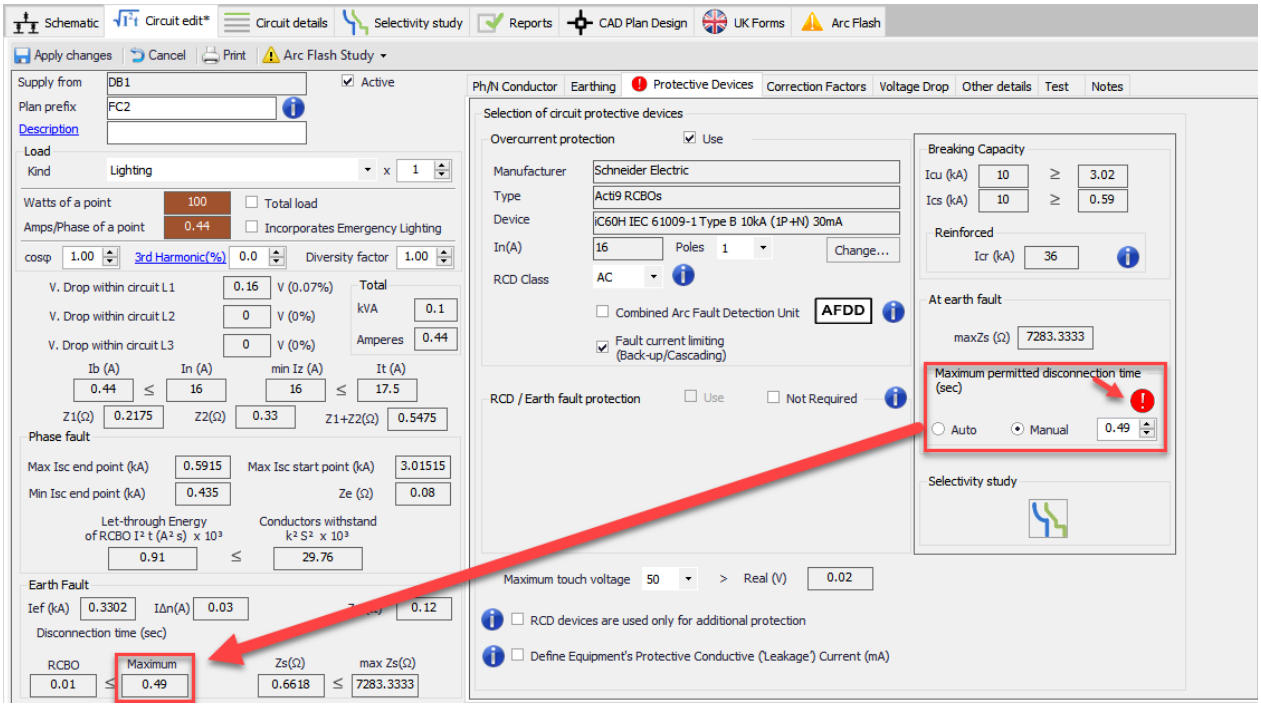




Next section named as *At earth fault* is used to display the calculated maximum earth fault loop impedance of the selected circuit by ElectrcialOM, take into account user defined variables (e.g. cable length, etc.) and regulation 411.4.4 of BS7671.



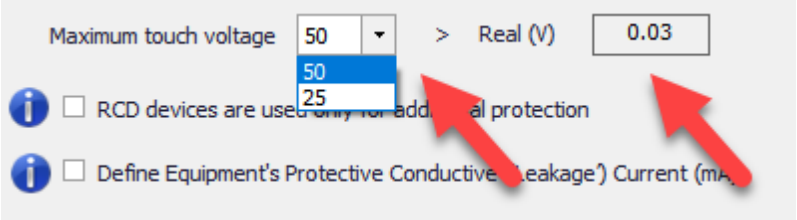
Underneath is the section where the user may select a value for disconnection time for selected circuit. If Auto is selected, ElectrialOM will assign the value which is defined in BS7671 for the selected circuit type automatically, where if Manual is selected, the text field will be enabled for the user to type in a manual value. If a manual value is entered, then, ElectricalOM will use this value as the disconnection time threshold for the selected circuit. In case of a higher value than BS7176 allows, then ElectrcialOM will warn the user with a red marking.



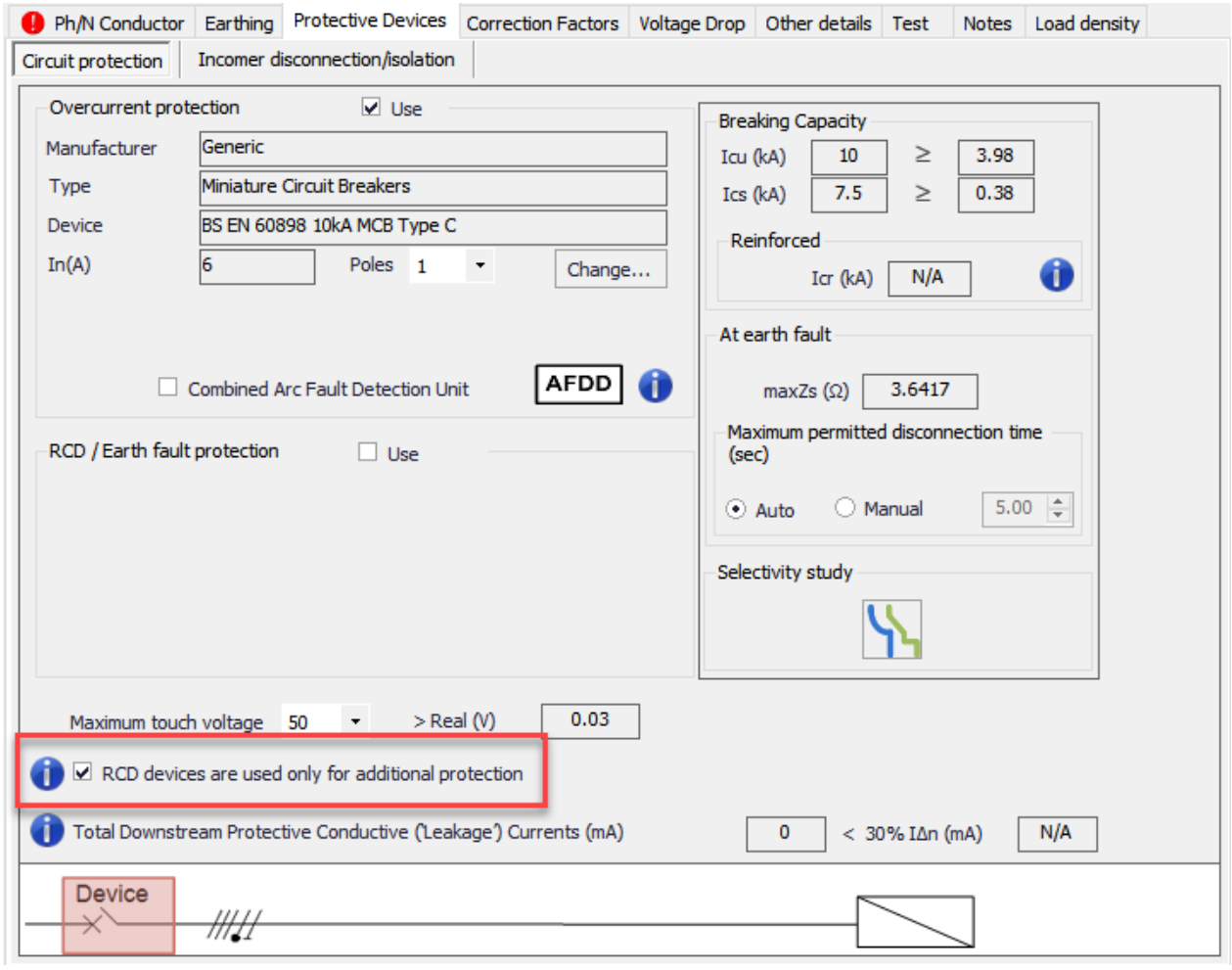
The next section, *Selectivity study*, accommodates a shortcut button for Selectivity Study Module tab. This section is used to indicate any issues with selectivity in case of an overcurrent or an earth fault. Red markings will appear if any issues detected by ElectricalOM. For details please refer to Selectivity Study Module Tab section.

Bottom part of the *Protective Devices* tab is reserved for maximum touch voltage setting, RCD usage setting, and leakage current setting.

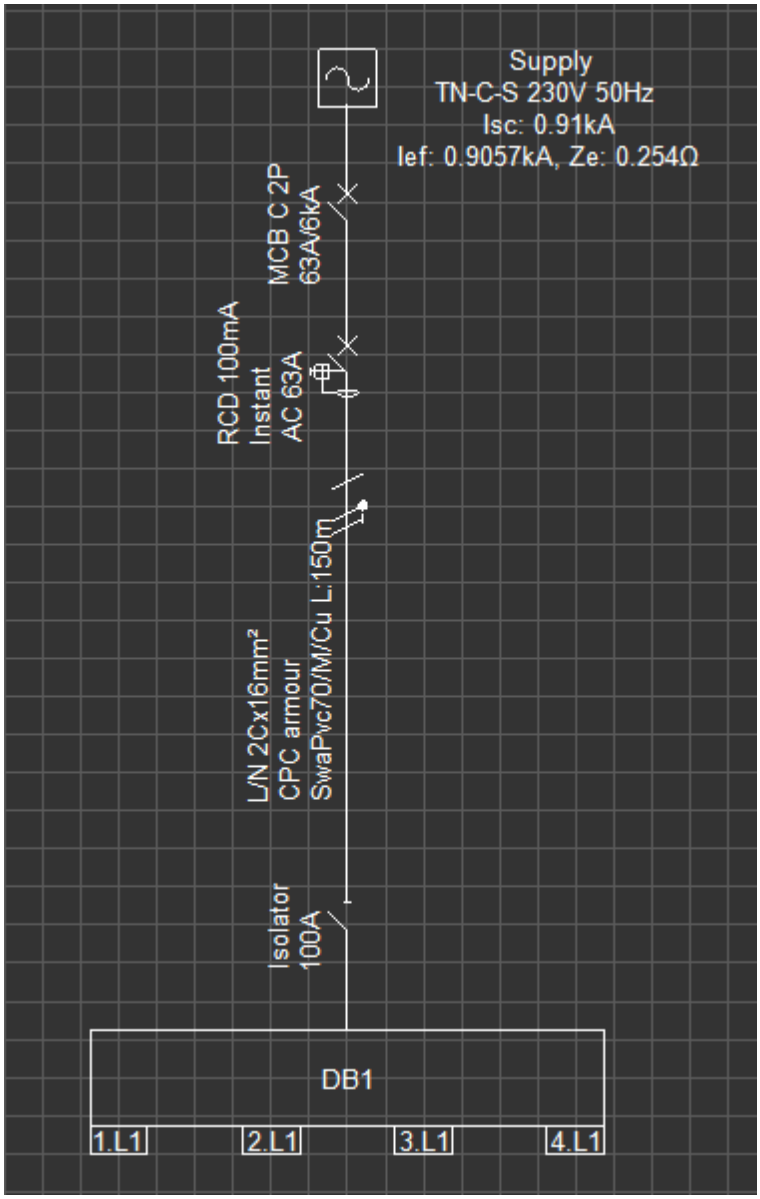
- *Maximum touch voltage* setting will only be available if the selected circuit is a final circuit and a residual current device is used as a protective device upstream or with the selected circuit. There are two options to select from the drop down list; 25V or 50V. ElectricalOM will also show the actual touch voltage of the selected circuit in the text box next to > *Real (V).* It is also useful to know that this option will be unavailable if the distribution circuit is set to 24VAC, see Other details Tab.



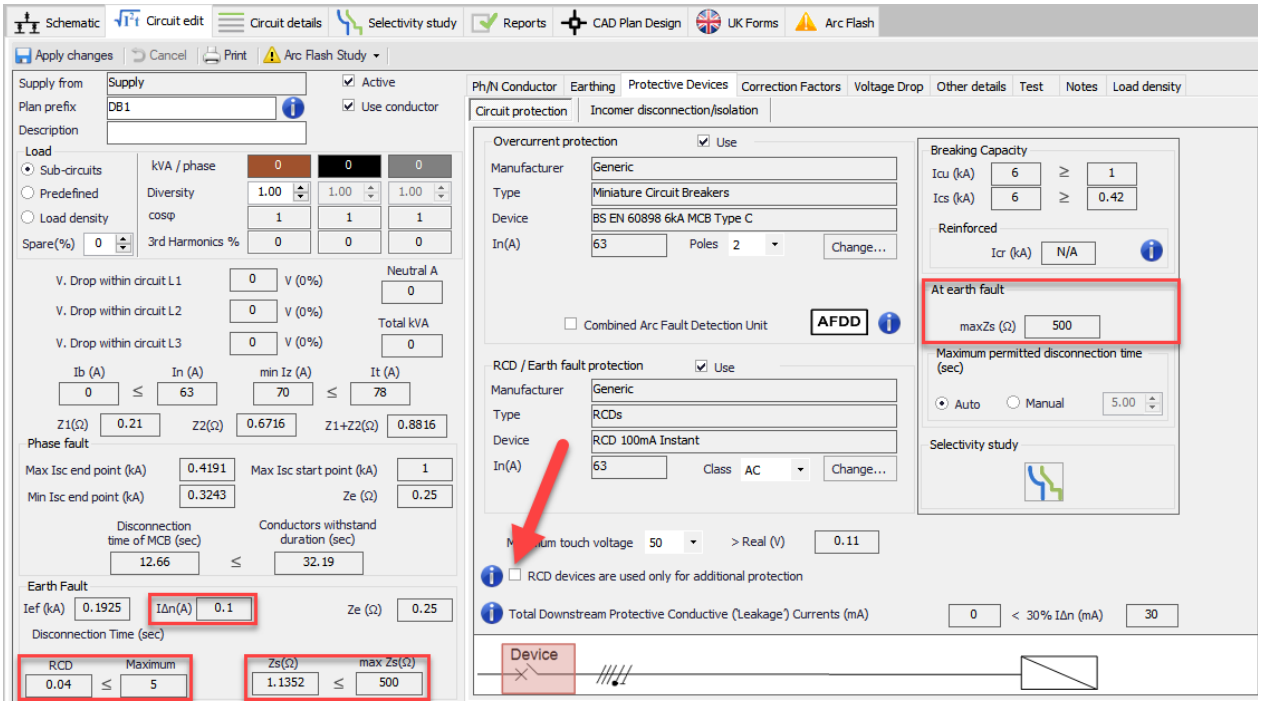
- *RCD usage setting* is located under the *Maximum touch voltage* setting. This is used to indicate that an RCD used on the selected circuit is only for additional protection which cause ElectricalOM to base calculations (e.g. max. Zs, max. disconnection time, etc.) on the overcurrent protective device instead of the residual current device. It is also worth mentioning that this option will not be available if the designed system is a TT system.



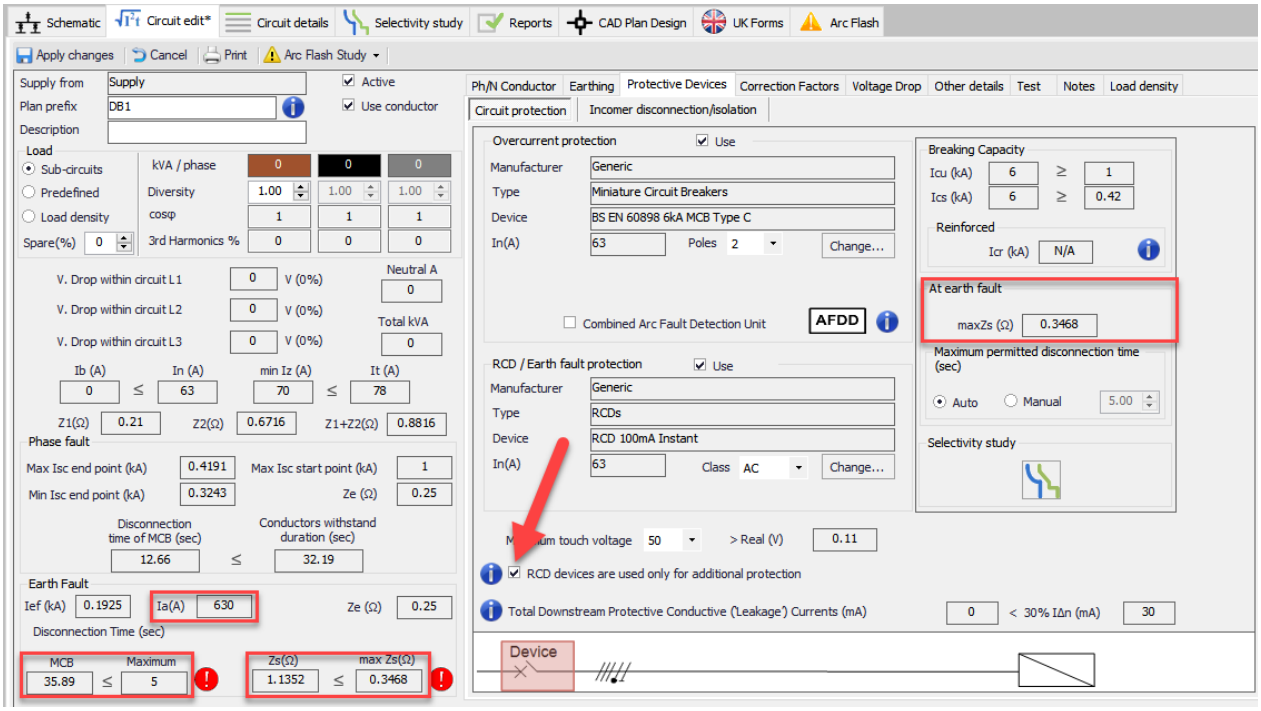
- The DB1 below is fed from a single phase source, and an MCB and an 100mA Instant RCD are places between the source and the DB1.



In first instance RCD is set as the primary protection against earth fault. ElectrcialOM calculated the earth fault disconnection time taking the RCD into account and displayed RCD's response time in case of an earth fault because it would act faster than the MCB at that fault level.



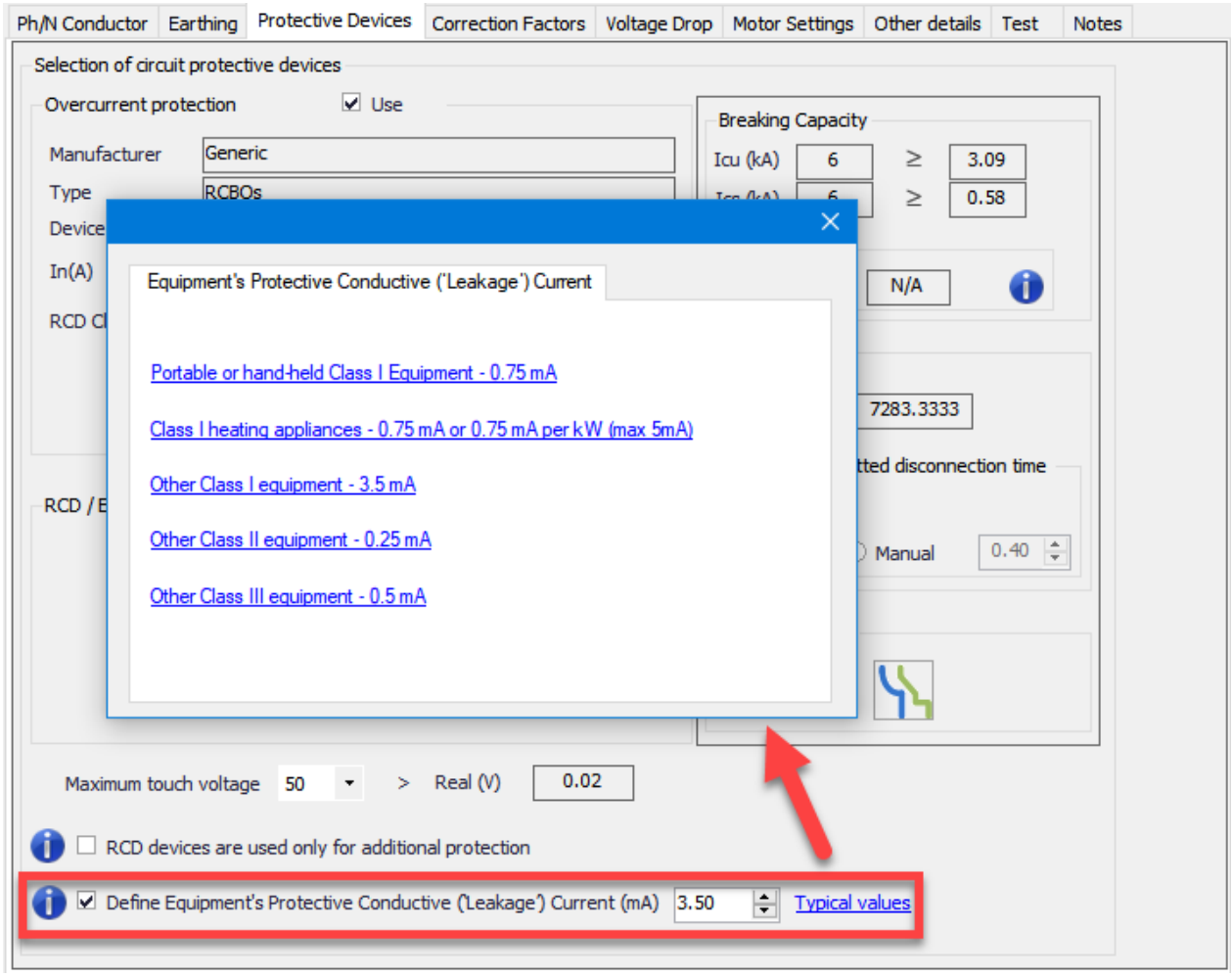
Where in the second case, the RCD is set as an additional protection. This time ElectrcialOM calculated and displayed the maxZs accordingly. Also, the disconnection time is based on the MCB's parameters. As the disconnection time fails with MCB, ElectricalOM flagged up relative warnings in the *Warnings* area.



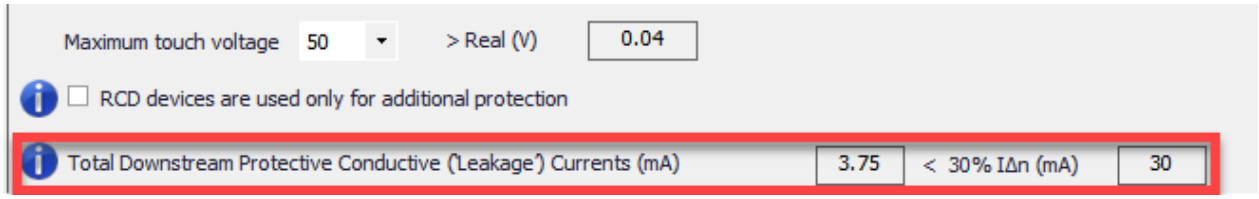
In a case where the MCB is still faster than the RCD, even if the RCD is set to be as a primary protection device against earth fault, ElectricalOM will use the MCB parameters rather than tehRCD for disconnection time and related calculations.

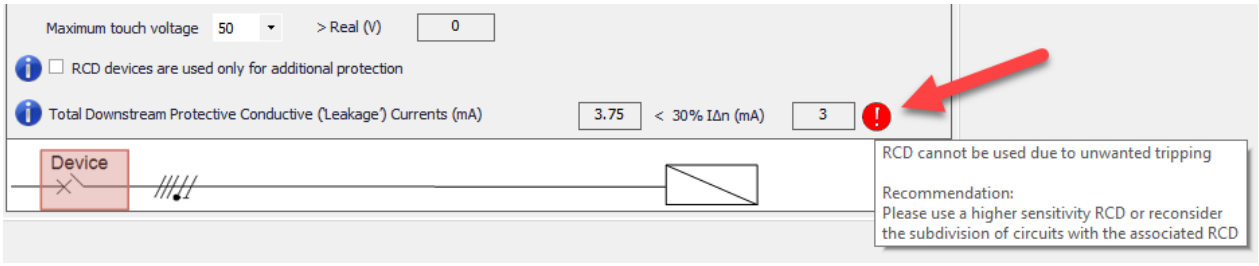
Leakage current settings are is a dynamic one and will change according to the type of the circuit. If the

circuit is a final circuit, the ElectrcialOM will have a tick box to let the user to enter a value for the leakage current for the selected circuit. The user can tick the box to enable the text field to type in a value. ElectrcialOM will provide some typical values when the user clicks on *Typical values* link, which are borrowed from BS EN 60355-1.



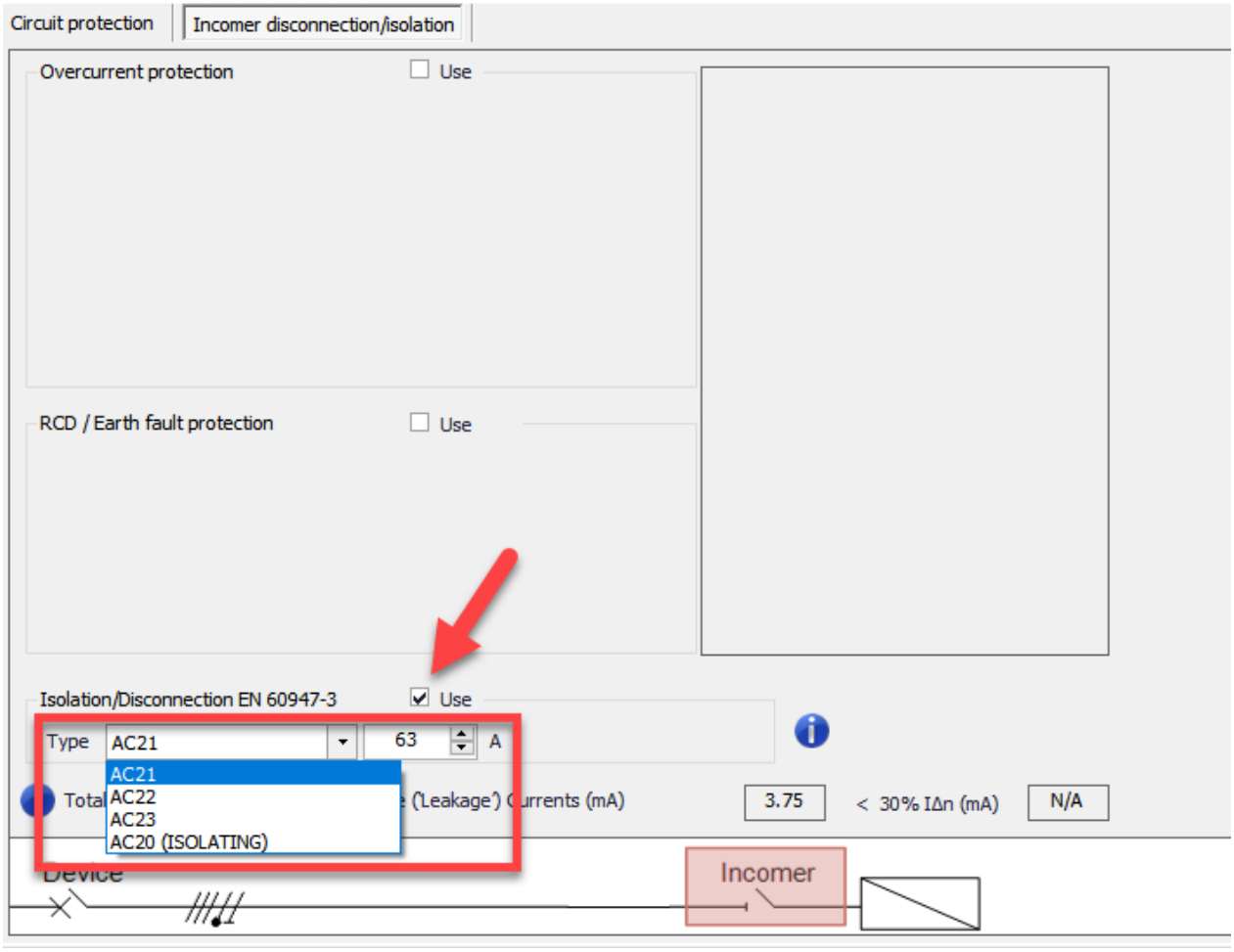
On the other hand, if the circuit is a distribution circuit. then, ElectrcialOM will just display total leakage current at the selected distribution node taking into account connected circuit data. If the total downstream leakage current is higher than the 30% of the RCD's IΔn then a red marking will indicate the issue.



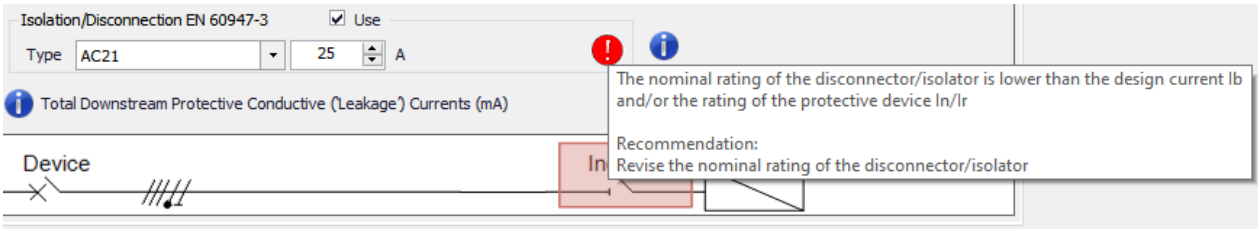


- **Incomer Disconnection/Isolation**

This tab is very similar to *Circuit Protection* tab except an extra option of using an isolator is presented. The tick box must be ticked by the user in order to enable the usage of an isolator. ElectricalOM lets the user to define the type, and the rating of the isolator by selecting a type from a drop box list and typing in a rating in the text box.

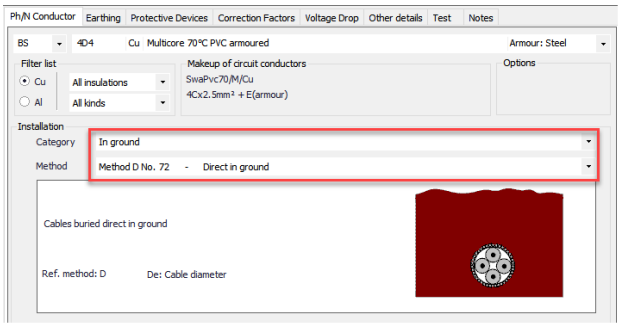


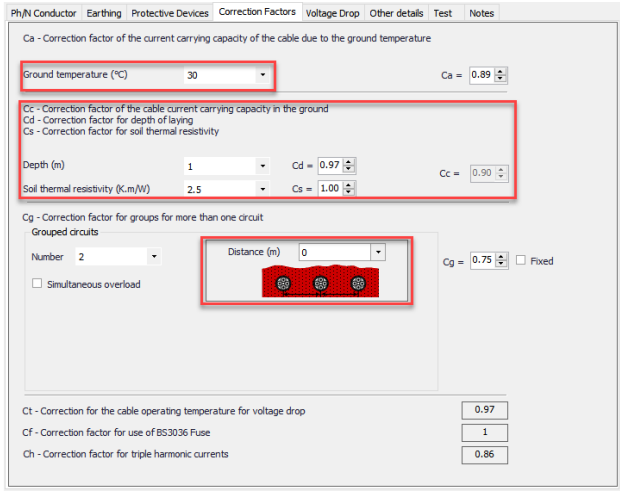
There is nothing automated in case of an isolator and the user needs to define the rating manually, however, if the rating is not suitable, ElectrcialOM will still indicate the issue and warn the user.

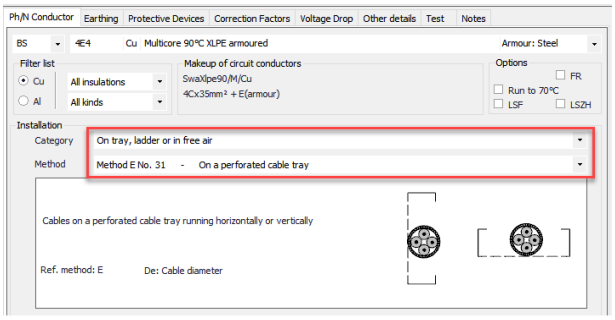


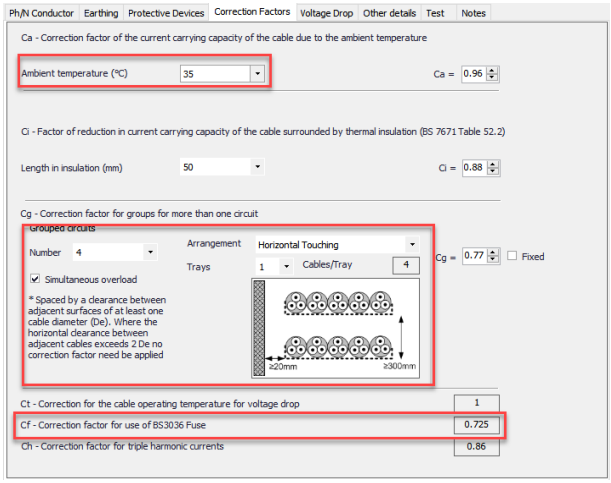
Correction Factors Tab

Correction factors tab is where the user can set correction factors (will be referred as rating factors from now on) to suit the condition of the selected circuit. As many other tabs of ElectrcialOM, Correction Factors tab has also a dynamic behaviour, so, contents will change according to various other factors within the design, for example cable installation method.







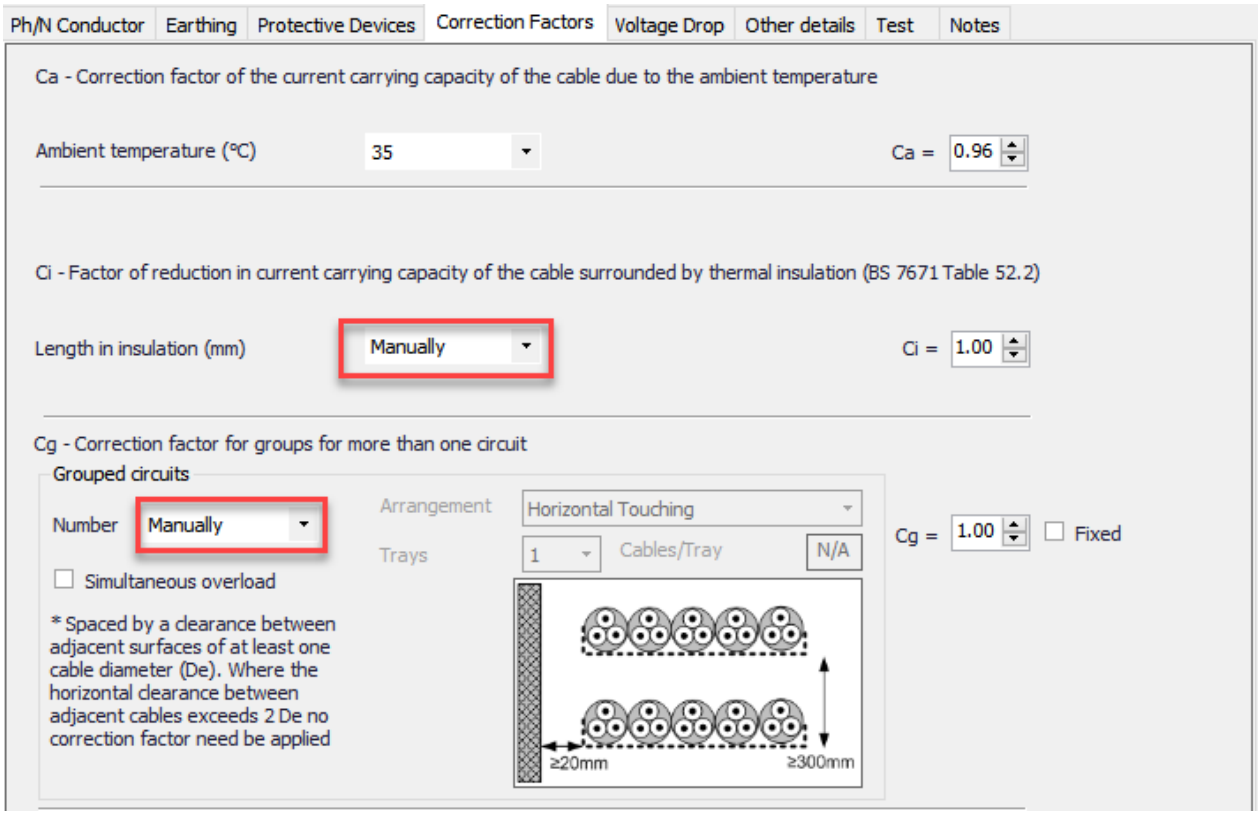


All the rating factor values are based on BS7671 unless otherwise specified and related tables are also given below in case the user needs to refer to the tables. Rating factors which are used by ElectricalOM are as follows:

- **Ca :** Ambient temperature - Tables 4B1 and 4B2
- **Cc :** Circuits buried in the ground. Cc = 0.9 for installation methods *in a duct in the ground* or *buried direct* and is equal to 1 otherwise.

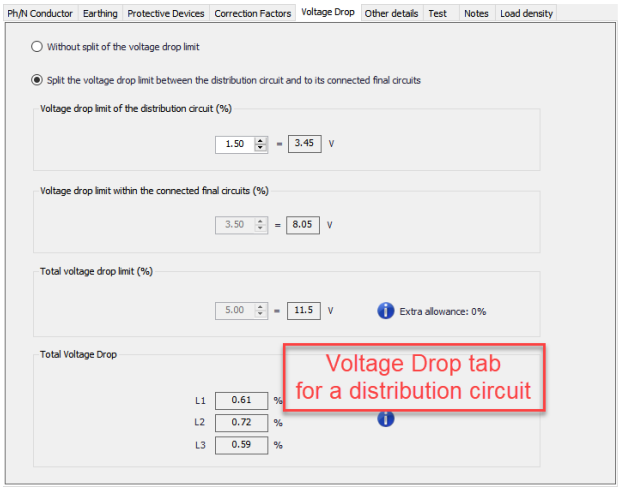
- **Cd** : Depth of burial for direct buried cables and cable in buried ducts - Table 4B4. Cd = 1 for cables installed above ground.
- **Cf** : Semi-enclosed fuse to BS3036. Cf = 0.725 if a fuse to BS3036 is used and is equal to 1 otherwise.
- **Cg** : Grouping - Tables 4C1 to 4C6
- **Ch** : Higher harmonic currents in line conductors - Table 4A4
- **Ci** : Conductors embedded in thermal insulation - Table 52.2
- **Cs** : Thermal resistivity of soil - Table 4B3. Cs = 1 for cables installed above ground.
- **Ct** : Operating temperature of conductor (affects voltage drop calculations, not current carrying capacity). This option is for cases where a conductor is not running near its maximum permitted operating temperature. This generally happens when a cable size is increased due to voltage drop, so, the design current becomes significantly lower than the effective current-carrying capacity of the conductor. This is applied by ElectricalOM as per Appendix 4 of BS7671 (see Equation 6 of BS7671).

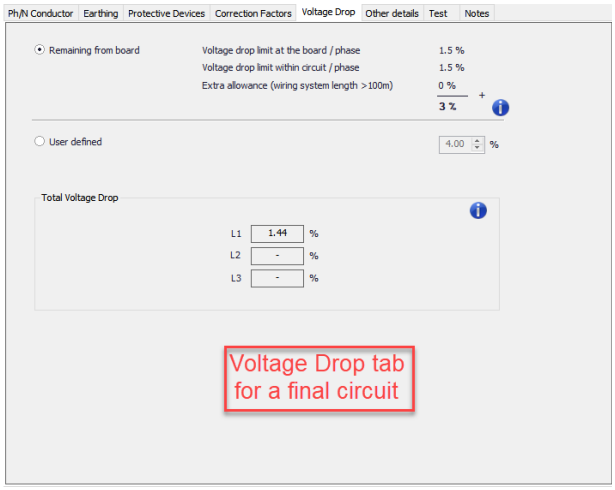
If user wants to define a manual value at any point, then, *Manual* option must be selected from the related drop down list. On the other hand, if the user types in any value in the related text box, then the drop down list will automatically be reset to *Manual* by ElectricalOM.



Voltage Drop Tab

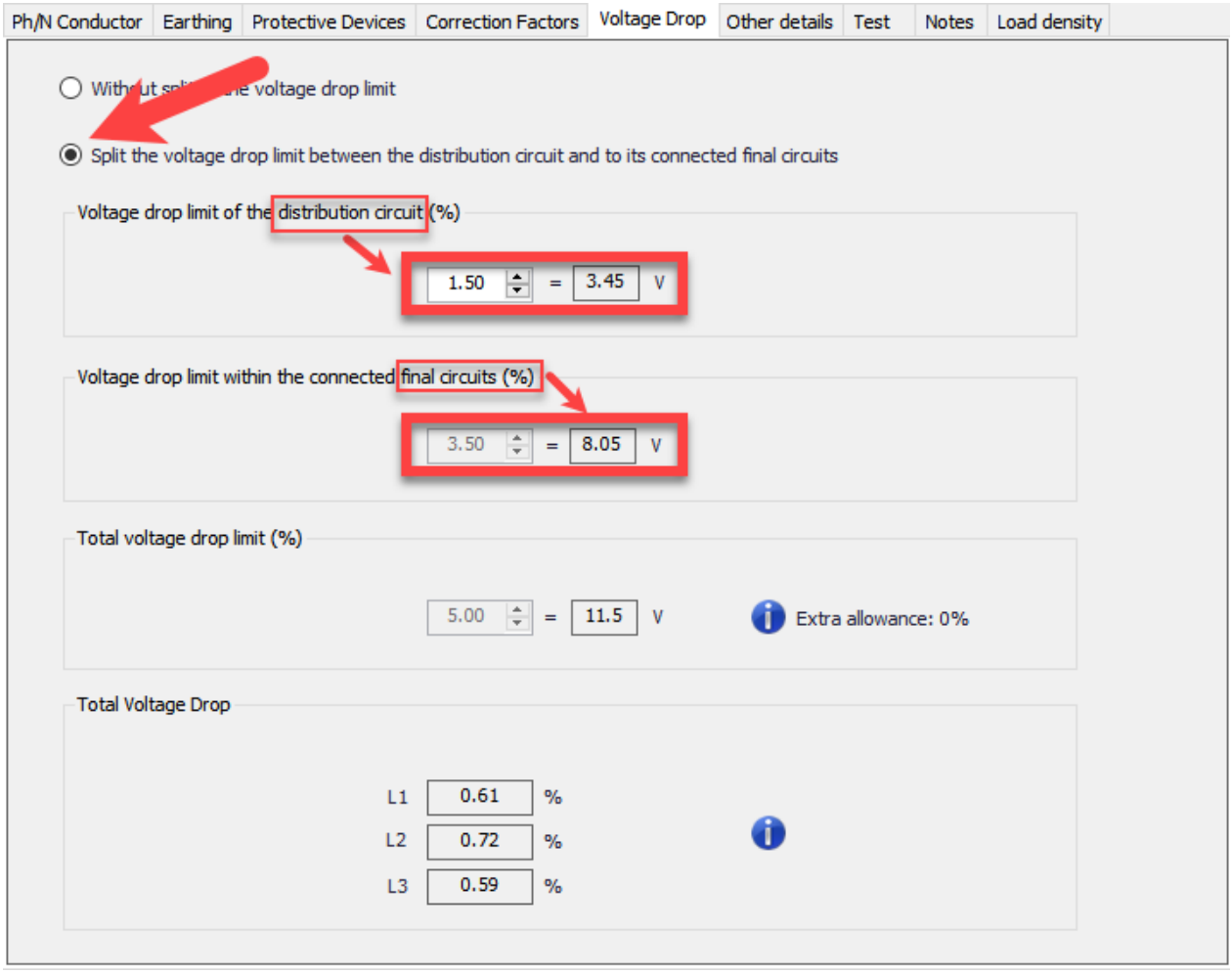
Voltage drop tab contains variables and settings about voltage drop calculations for the selected circuit. It has to be reminded that the voltage drop limit value is set at *Edit Source* window, see Source. The contents of the Voltage Drop tab varies depending on the circuit being a distribution circuit of a final circuit.



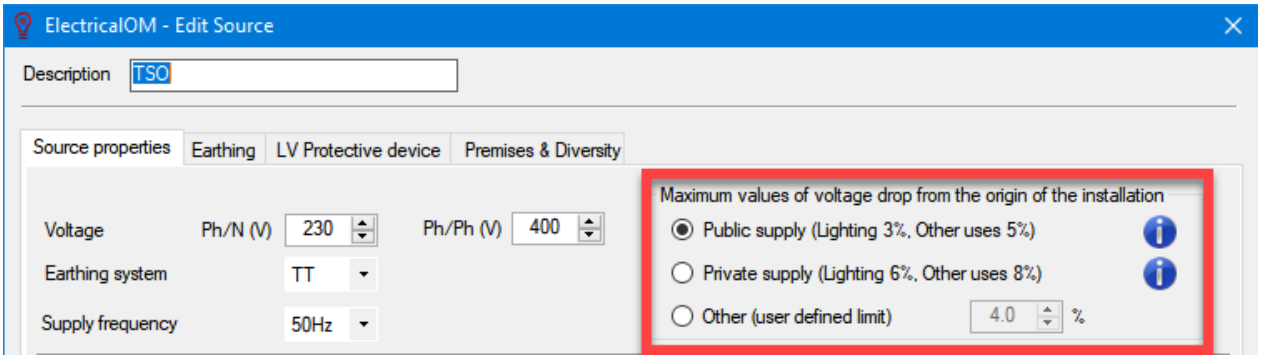


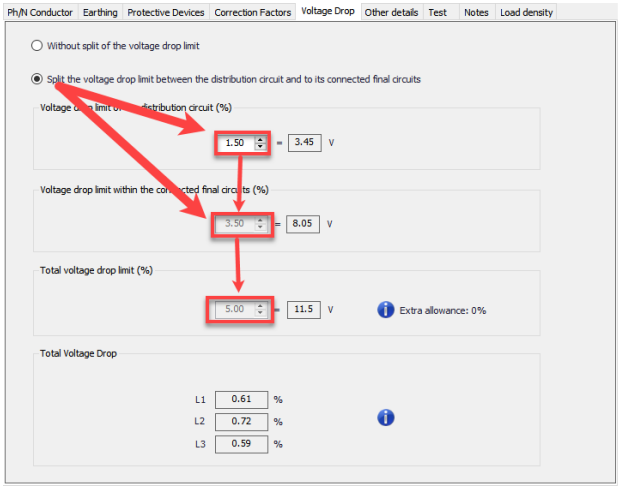
If the selected circuit is a distribution circuit, then, the user can opt to split the voltage drop limit between the distribution circuit and the final circuit or to take the voltage drop limit as a single value for the whole circuit including the distribution circuit and the final circuit.

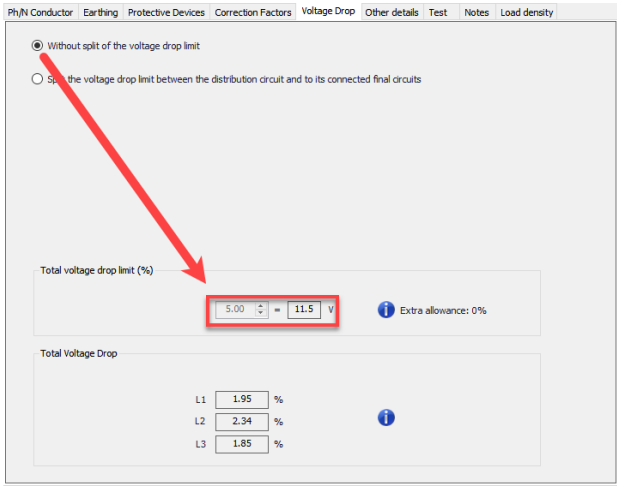
If the user decides to split the limit between distribution and the final circuit then a percentage must be set to reserve for the distribution circuit.This is done by typing in a percentage to the text box below *Voltage drop limit for the distribution circuit (%)* to reserve for the distribution circuit and leave the rest to the final circuit. ElectricalOM will also display the corresponding voltage to the percentage set by the user next to the percentage box. If a distribution circuit is fed from another distribution circuit and both are set to split the voltage drop limit, then, ElectricalOM will let the voltage drop to go as low as the set value for the distribution circuits individually and leave the remaining part for the final circuits connected to the related distribution circuit



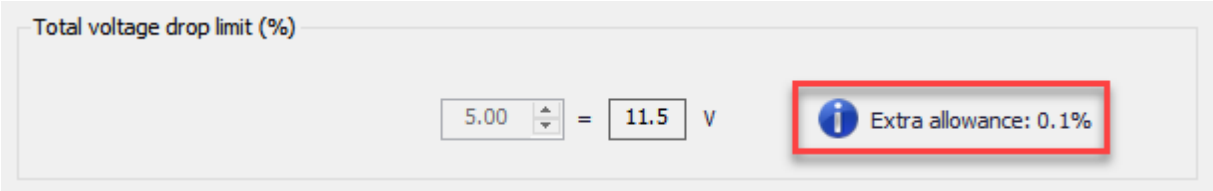
The final circuit part depends on the *Source* settings, for example, if the source is a public supply, then, the total voltage drop for a lighting circuit will be set as 3%. ElectricalOM will display remaining part under *Voltage drop limit within the connected final circuits (%).* If the user has already set a value manually for the voltage drop, than ElectricalOM will display this value as the total voltage drop limit percentage but otherwise it will assume a total of 5% voltage drop limit at the voltage drop tab for a distribution circuit.

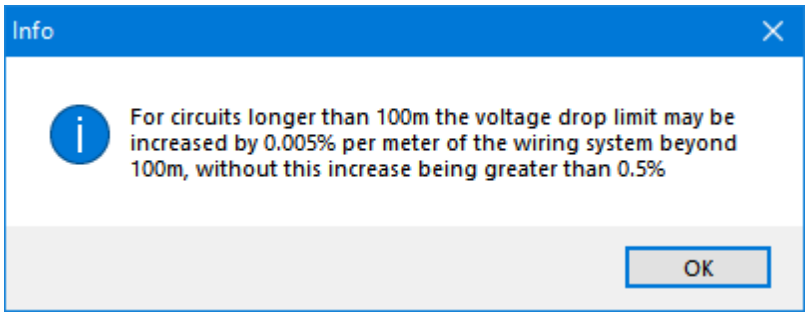






ElectricalOM will also take into consideration of the length of the feeding conductor of the selected circuit. If the length is greater than 100 metres, then ElectricalOM will allow an extra 0.005% per metre, and this will be shown as "Extra allowance" under *Total voltage drop limit (%)* section.



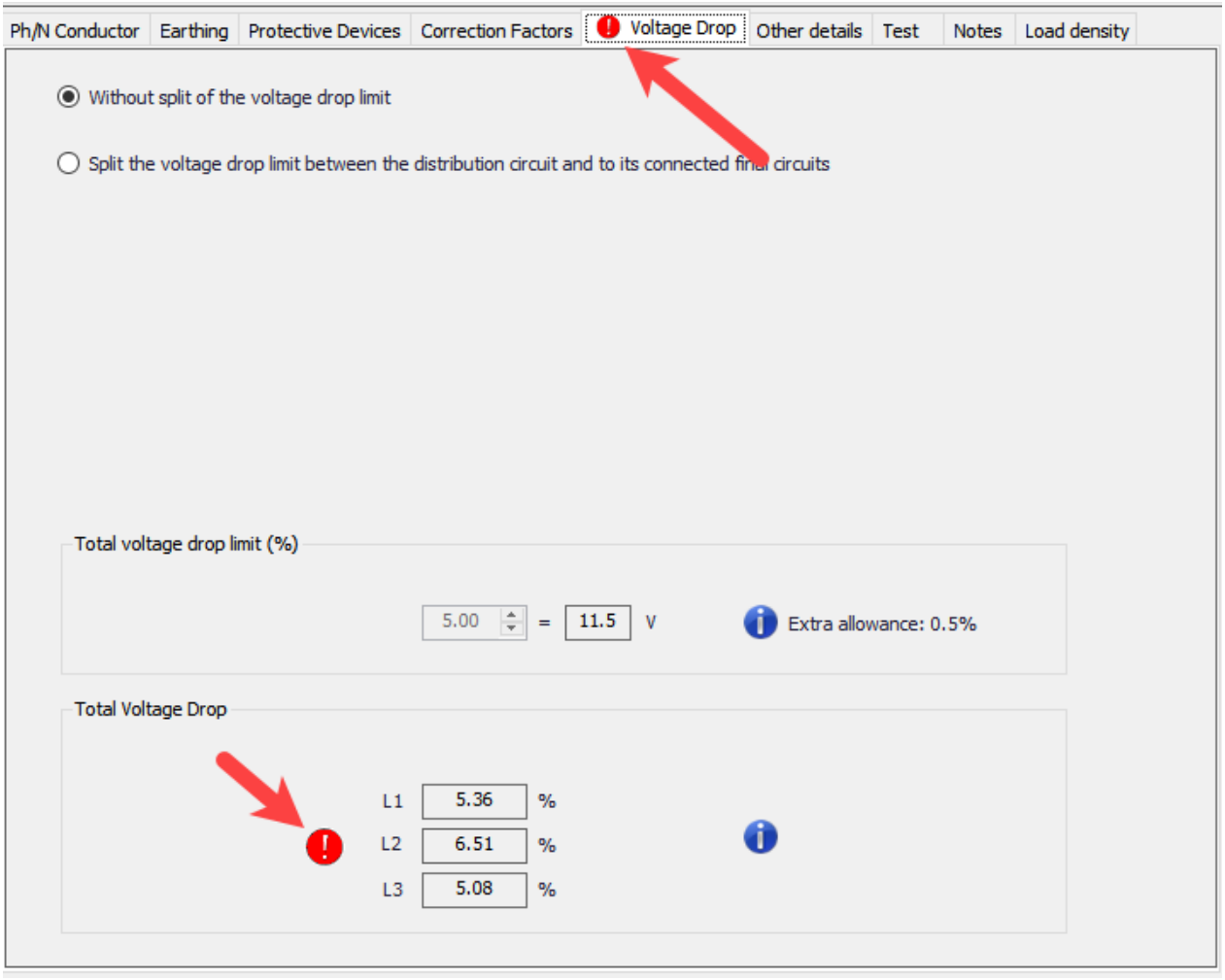


If the selected circuit is a final circuit, then, the user can opt to use the remaining part of the voltage drop limit from the distribution circuit or to set a new total voltage drop percentage for the selected circuit manually. If the user sets a manual limit using the *User defined* option, then there will be two consequences:

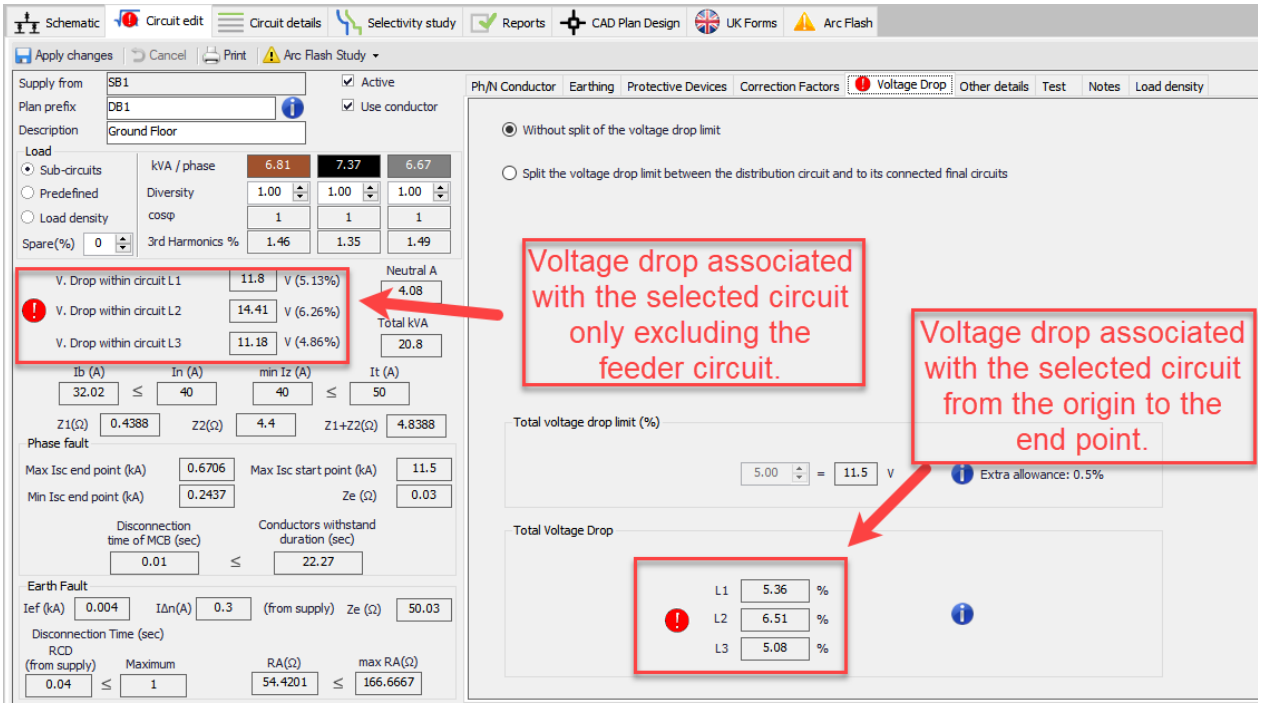
- If the distribution circuit is set to *Without the split of the voltage drop limit,* then, ElectricalOM will define the total voltage drop limit to be the manually set value for the selected circuit including the distribution circuit and the final circuit parts.
- If the distribution circuit is set to *Split the voltage drop limit between the distribution circuit and to its connected final circuits,* then, ElectricalOM will still reserve the *Voltage drop limit of the distribution circuit (%)* value for the distribution circuit and leave the rest of the manually set limit for the selected final circuit.

The lower part of the Voltage Drop tab is reserved for the *Total Voltage Drop* data for the circuit selected.

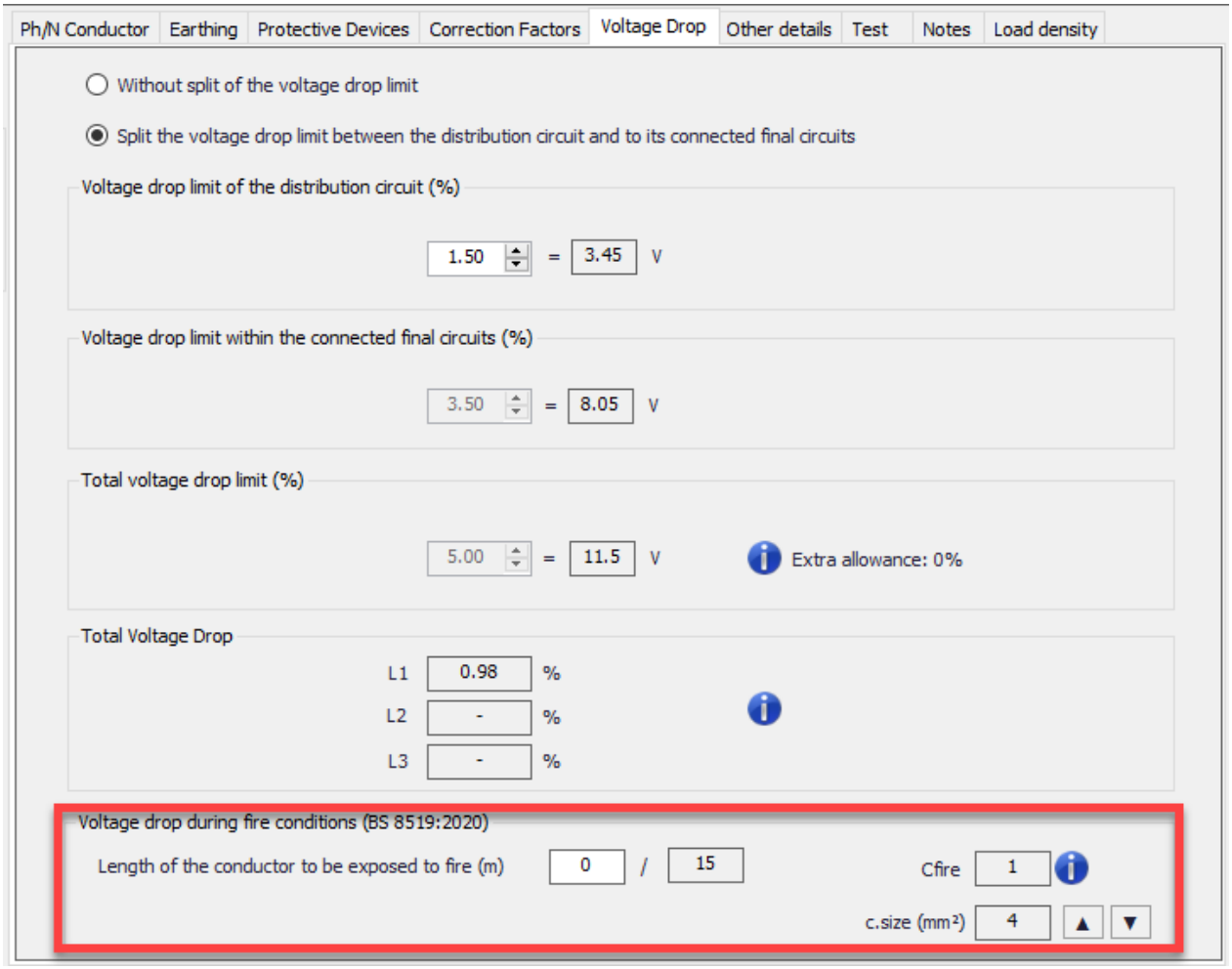
ElectricalOM will display the total voltage drop on the selected circuit on percentage and if there is an issue a red mark will be displayed. Red mark will be placed both on the Voltage Drop tab and next to the phase(s) which has the issue.



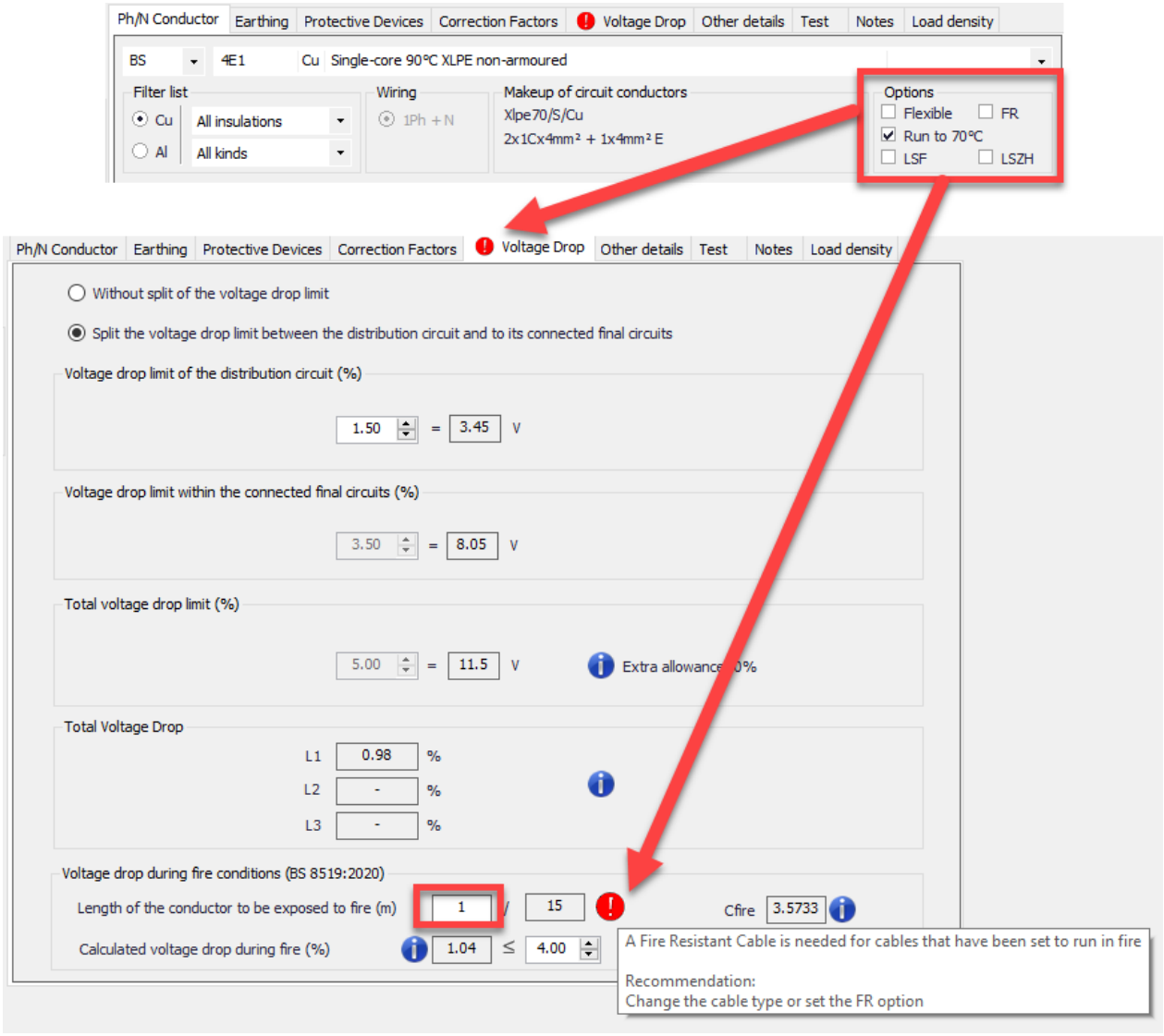
It should be noted that *Total Voltage Drop* section is for the voltage drop at the end of the selected circuit, distribution or final, inducing the distribution circuit which the selected circuit s connected. It also important to note that a distribution circuit can be fed from another distribution circuit, so a final circuit's total voltage drop may include multiple distribution circuits. If the user wants to see the voltage drop associated only with the selected circuit from its origin and end point, then, left hand side of the *Circuit Edit Module* shall be checked where the calculations and checks are located.

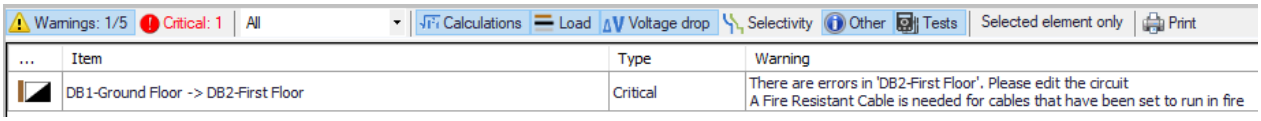


Voltage drop during fire conditions (BS 8519:2020): Increased ambient temperature under fire conditions will affect the cable performance as the temperature will be much higher that the cable's normal maximum ambient temperature. ElectricalOM takes this temperature as 842 °C in accordance with BS8491 and calculates a rating factor as per Annex F of BS8519:2020, then, updates the voltage drop accordingly. In order to de-rate the cable, the user must specify the length of the conductor to be exposed to fire in metres.

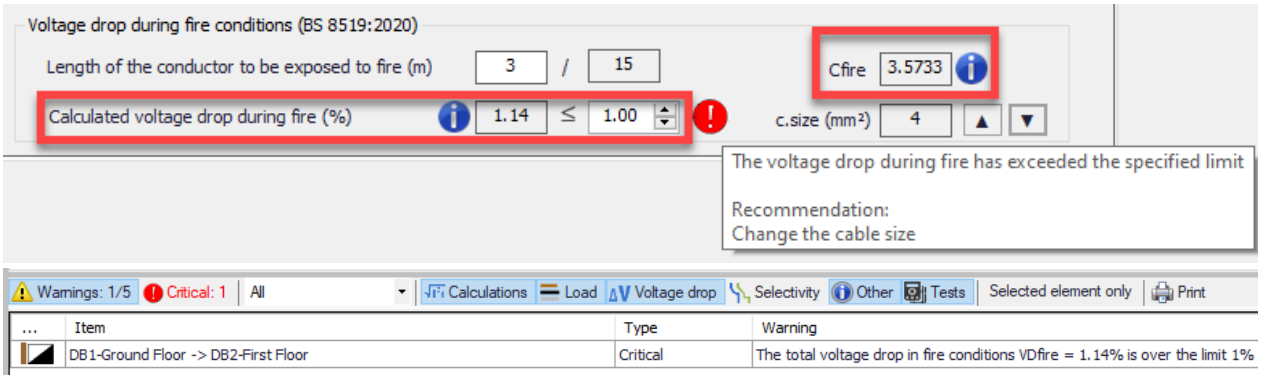


When a length is set, ElectricalOM will check if the cable used is a fire resistant cable, and if not, warnings will be displayed.

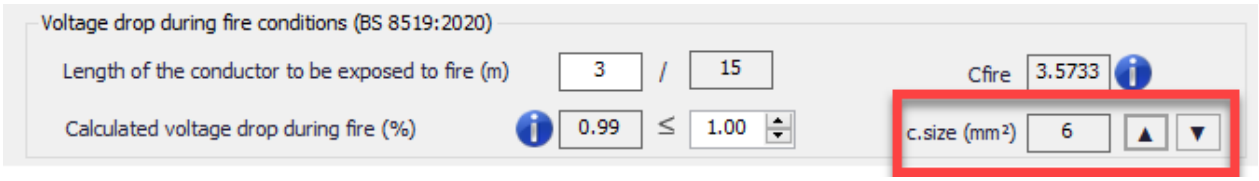




ElectricalOM will calculate the rating factor, *Cfire*, and display it as *Calculated voltage drop during fire (%)*. ElectricalOM will compare the calculated voltage drop with the voltage drop limit and if the inequality is not met, display a warning.

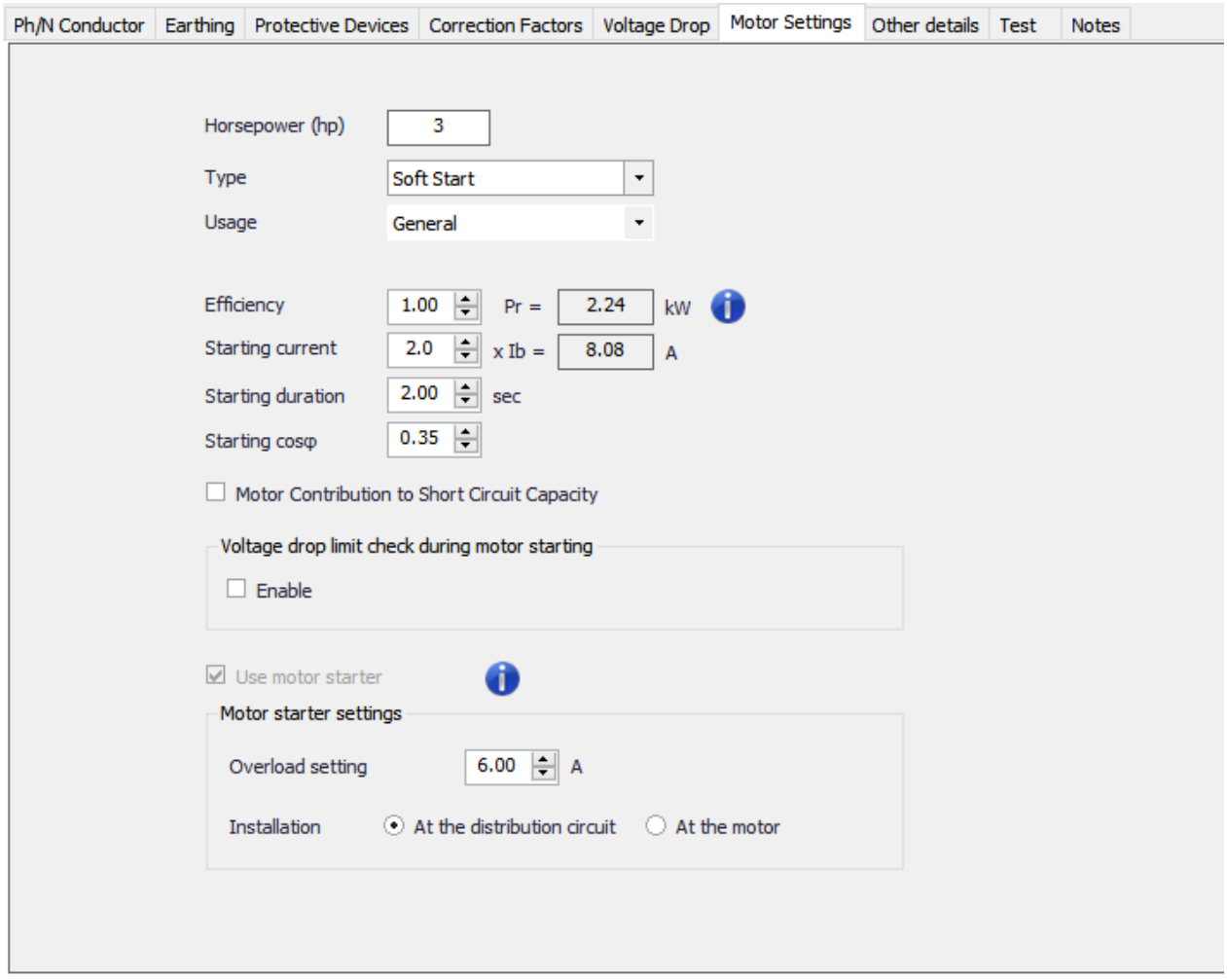


Current cross-section of the conductor is also displayed on the right hand side where the user may modify it by using the up and down arrow buttons. This action will update the cable cross-section.



Motor Settings Tab

Motor settings is a tab where motor related settings are located. If the user selects a load type contains a motor, the this tab will be displayed amongst other tabs, if the circuit does not have a motor then this tab will not be visible.

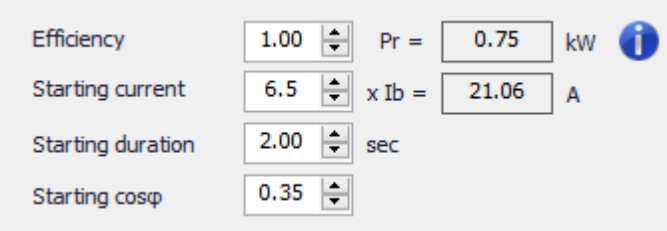


The user can define the power of a motor directly by using the Horsepower (hp) field which in turn will redefine the *Output Watts/point* field, which is located in calculations section of the Circuit edit module, accordingly. In the same manner, defining *Output Watts/point* field will update the *Horsepower (hp)* field. There are various types of connections the user can pick using the *Type* drop down list which are listed

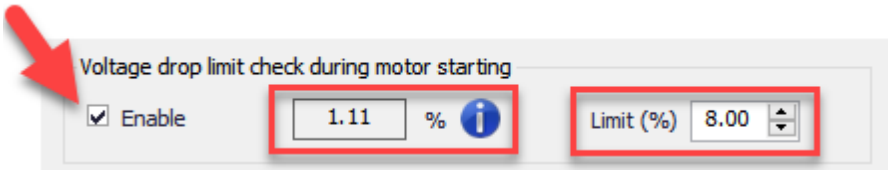
below. Direct On Line option is selected, the user may opt not to use a motor starter and so the calculations will be based on the design current. All other options will automatically tick the *Use motor starter* tick box and let the user to set an overload current and a location for the starter. In the case of a motor starter is used, the calculations will be based on overload setting. The location od the motor starter is only important when a Star Delta starter is used.

- Direct On Line
- Soft Start
- Auto Transformer (Only available for three phase motors)
- Start Delta (Only available for three phase motors)
- VSD (Only available for three phase motors)

Usage drop down list contains General and Lift options which will affect the diversity settings only.
The motor specifications are defined at the Specifications and Calculations area by the user. The rated power and starting current of the motor will also be calculated and displayed by ElectricalOM using the user set data.

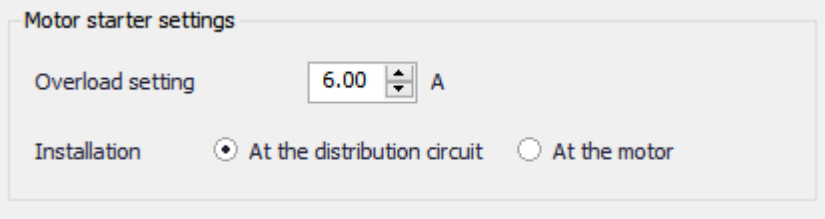


Motor Contribution to Short Circuit Capacity tick box (Only available for three phase motors) is accommodated in the Specifications and Calculations area. If this option is enabled, then, ElectrcialOM will recalculate the *Max Isc end point (kA)* value (see, Circuit edit module's Calculations section) accounting for the motor contribution.
Voltage drop limit check during motor starting, if enabled, will ensure the voltage drop during the starting of the motor will stay below a set value. When the user ticks the *Enable* box, ElectricalOM will display voltage drop percentage under current conditions and also enable the *Limit (%)* field for the user to define a voltage drop limit for this circuit during the motor start. This voltage drop limit will only be considered for the starting duration of the motor, which is set by the user above, and will not affect the voltage drop limit of the circuit under normal conditions.

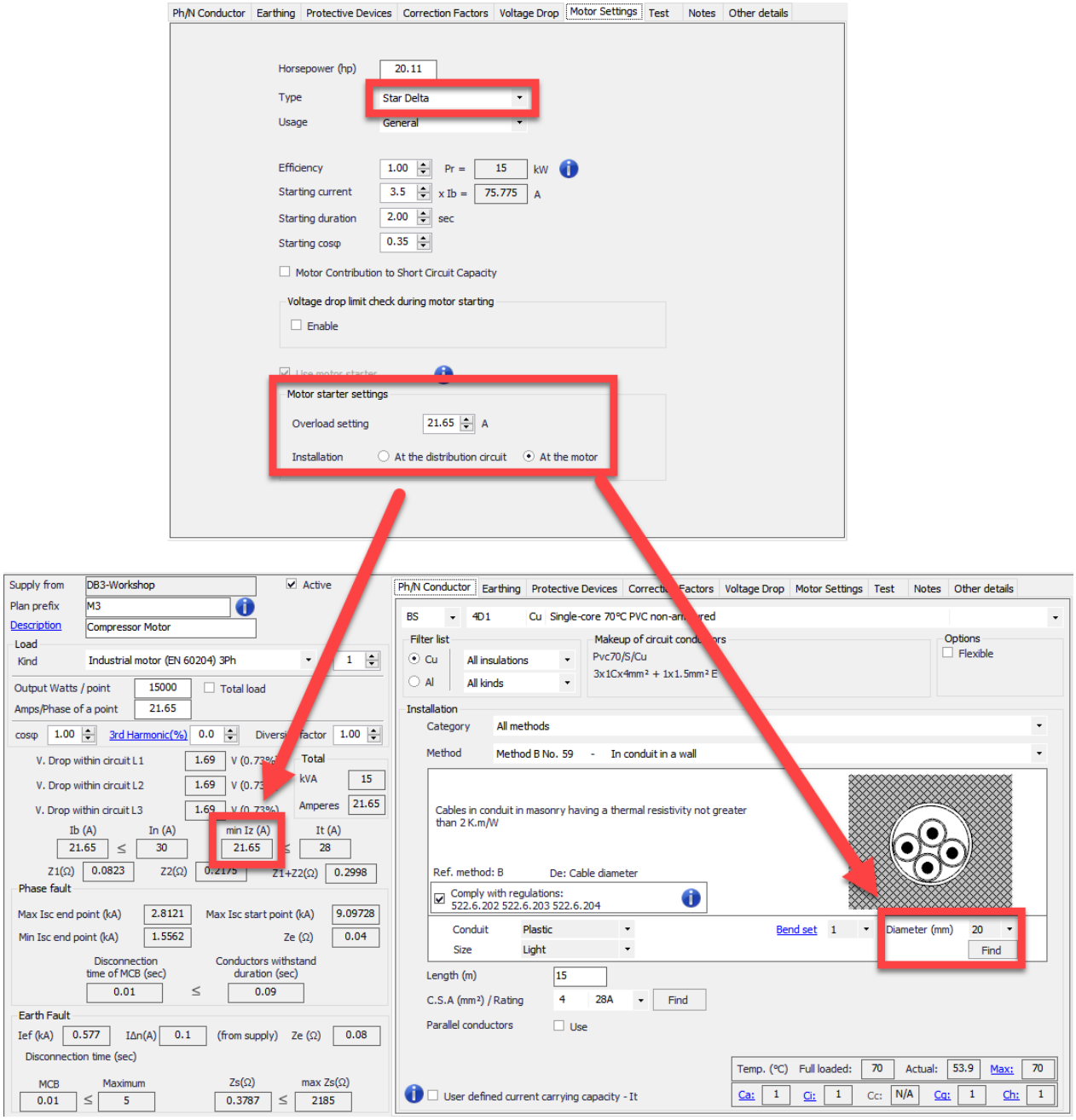


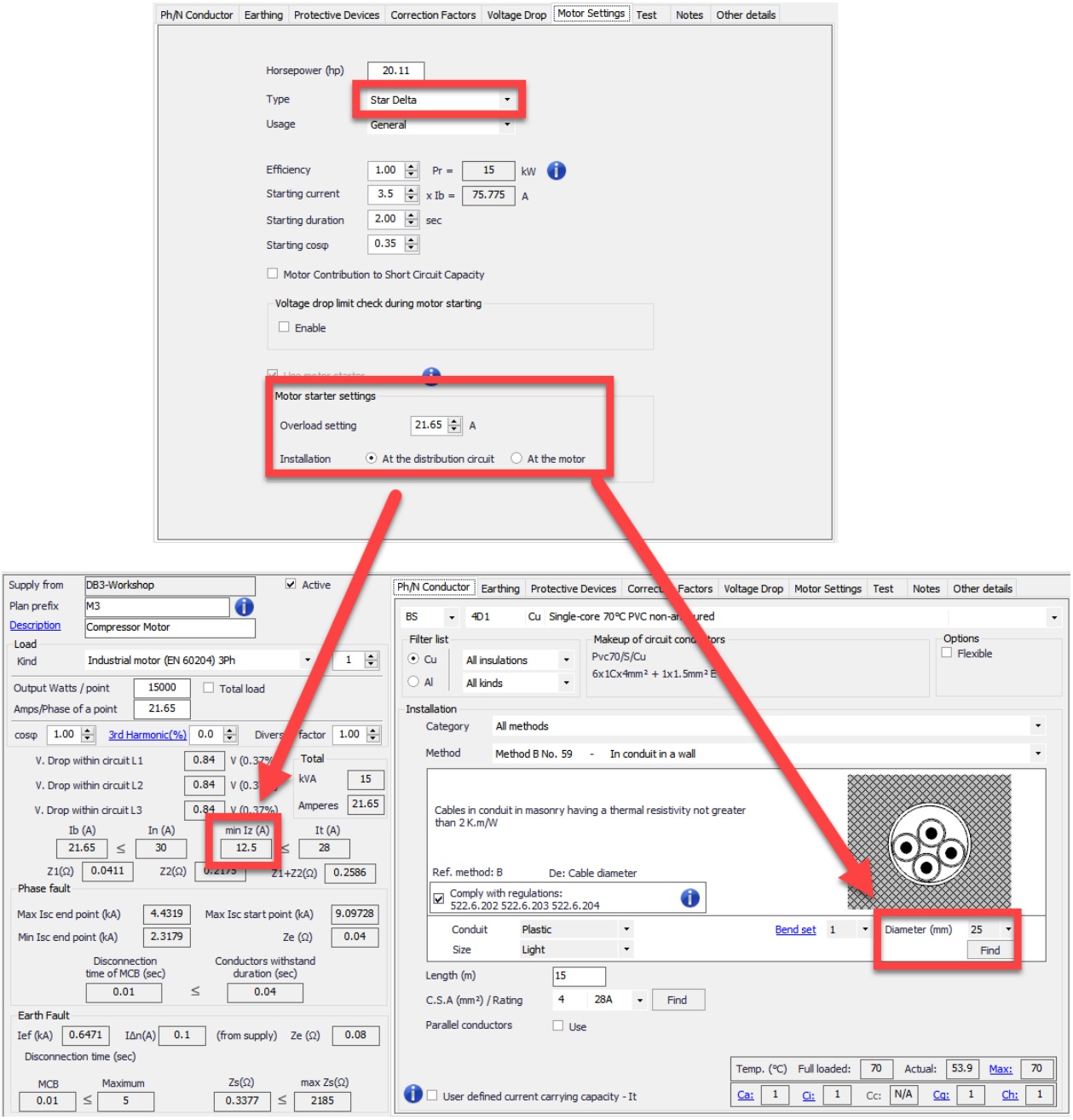
Motor starter settings section accommodates an overload setting and a location setting for the starter. The overload setting represents the setting on the motor starter itself and it will be used for cable sizing

calculations instead of the rating of the circuit protective device. *Installation* which represents the location of the motor starter is only required if the motor starter is a Star Delta starter. The user must to select the correct location for the motor starter.



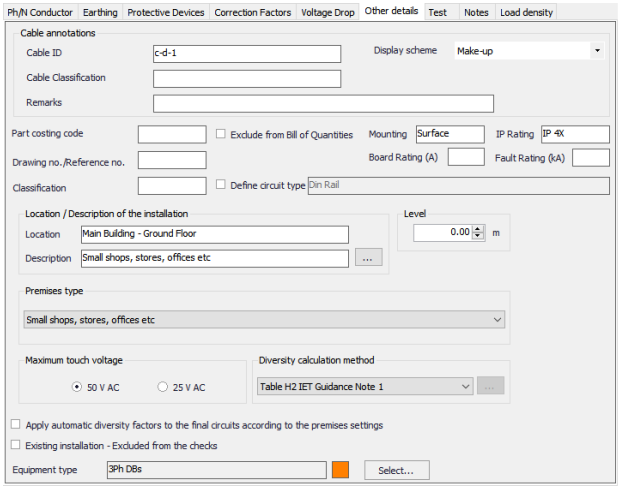
The reason the user must specify the location of the starter when Star Delta motor starter is used is because ElectricalOM will use this setting to calculate the *min Iz* value and required conduit diameter. If the starter is located at the distribution node, then, ElectricalOM will assume two sets of cables/conductors running to the motor location from the origin of the motor circuit which will share the drawn current by the motor. If the starter is located at the motor location, then, ElkectrcialOM will assume only a single cable/ a single set of conductors running from the origin of the motor circuit to the motor location.

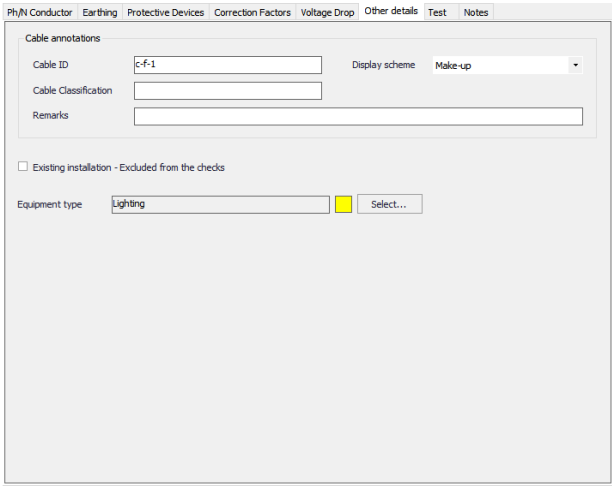

Ph/N Conductor
Earthing
Protective Devices
Correction Factors
Voltage Drop
Motor Settings
Test
Notes
Other details
Horsepower (hp)
20.11
Type
Star Delta
Usage
General
Efficiency
1.00
Pr =
15
kW
Starting current
3.5
x Ib =
75.775
A
Starting duration
2.00
sec
Starting cosφ
0.35
Motor Contribution to Short Circuit Capacity
Voltage drop limit check during motor starting
Enable
Motor starter settings
Overload setting
21.65
A
Installation
At the distribution circuit
At the motor
Supply from
DB3-Workshop
Active
Plan prefix
M3
Description
Compressor Motor
Load
Kind
Industrial motor (EN 60204) 3Ph
Output Watts / point
15000
Total load
Amps/Phase of a point
21.65
cosφ
1.00
3rd Harmonic(%)
0.0
Diversity factor
1.00
V. Drop within circuit L1
1.69
V. Drop within circuit L2
1.69
V. Drop within circuit L3
1.69
Total
kVA
15
Amperes
21.65
Ib (A)
In (A)
min Iz (A)
It (A)
21.65
30
21.65
28
Z1(Ω)
0.0823
Z2(Ω)
Z1+Z2(Ω)
0.2998
Phase fault
Max Isc end point (kA)
2.8121
Max Isc start point (kA)
9.09728
Min Isc end point (kA)
1.5562
Ze (Ω)
0.04
Disconnection time of MCB (sec)
0.01
Conductors withstand duration (sec)
0.09
Earth Fault
Ief (kA)
0.577
IΔn(A)
0.1
(from supply)
Ze (Ω)
0.08
Disconnection time (sec)
MCB
Maximum
Zs(Ω)
max Zs(Ω)
0.01
5
0.3787
2185
BS
4D1
Cu
Single-core 70°C PVC non-armoured
Filter list
Cu
Al
All insulations
All kinds
Makeup of circuit conductors
Pvc70/S/Cu
3x1Cx4mm² + 1x1.5mm² E
Options
Flexible
Installation
Category
All methods
Method
Method B No. 59 - In conduit in a wall
Cables in conduit in masonry having a thermal resistivity not greater than 2 K.m/W
Ref. method: B
De: Cable diameter
Comply with regulations:
522.6.202 522.6.203 522.6.204
Conduit
Plastic
Size
Light
Bend set
1
Diameter (mm)
20
Find
Length (m)
15
C.S.A (mm²) / Rating
4
28A
Find
Parallel conductors
Use
Temp. (°C)
Full loaded:
70
Actual:
53.9
Max:
70
Ca:
1
Ci:
1
Cc:
N/A
Cg:
1
Ch:
1
User defined current carrying capacity - It



Other details Tab

Other Details Tab accommodates multiple settings and selections related with the selected circuit. This tab has two versions, one for a distribution circuit and one for a final circuit.



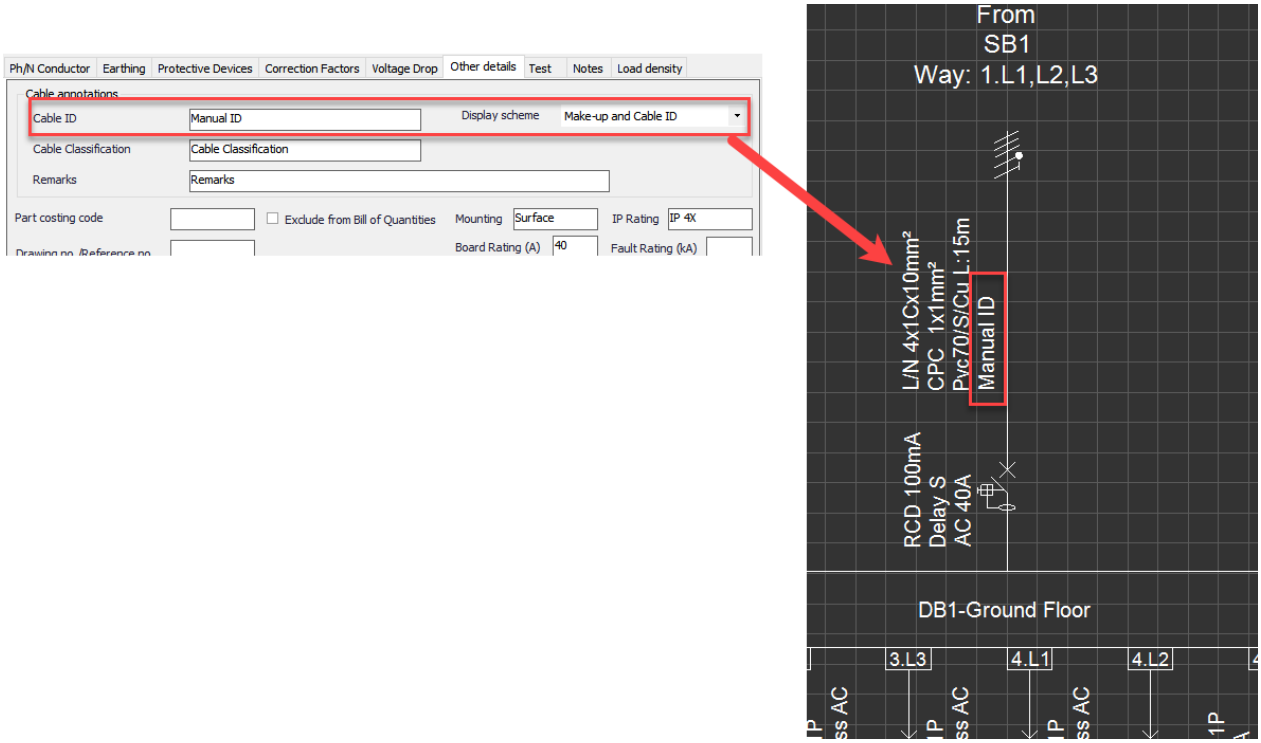


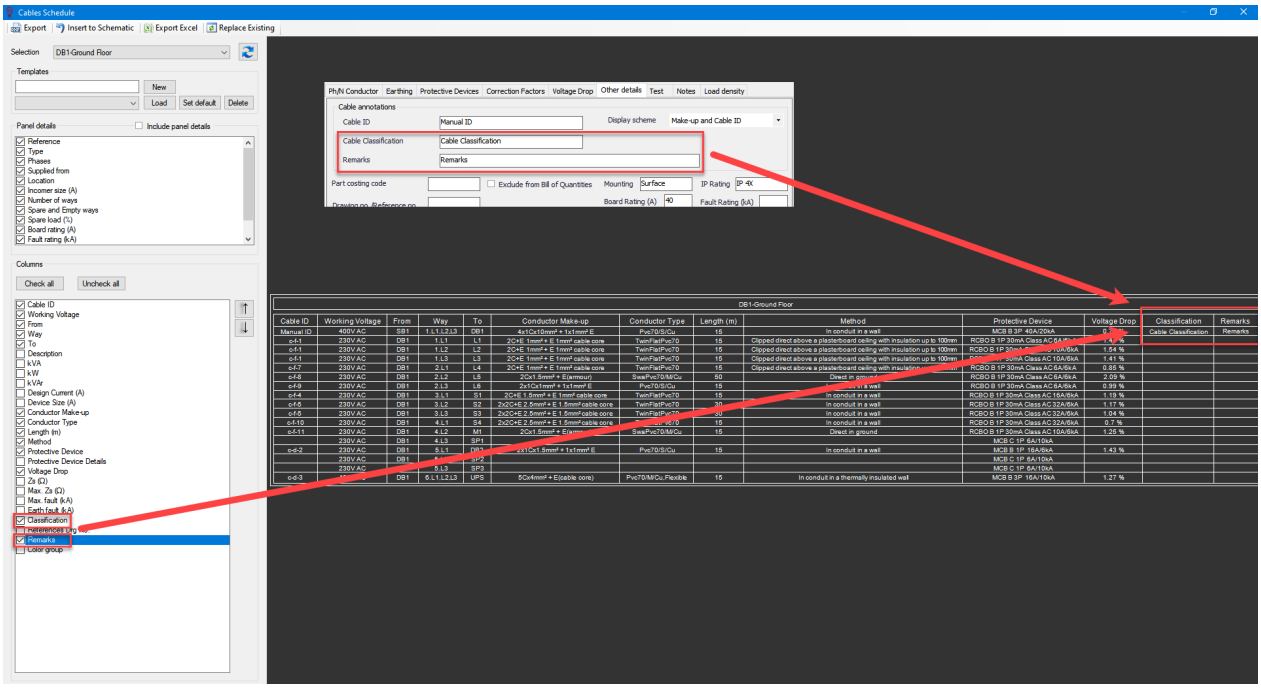
Other Details Tab for a final circuit has three sections: Cable annotations, Existing installation check box, and Equipment type. Distribution circuit. Distribution circuit version has extra sections which regard to some details about the item used at the distribution circuit, location and premises settings, maximum touch voltage settings, and diversity settings.

- **Cable annotations**

ElectricalOM follows a default rule to tag the cables: A number following the *c-d-* prefix for distribution circuit cables and the *c-f-* prefix final circuits. If the user sets a different rule using the *Auto Cable ID Numbering...* option under Functions Menu. The current cable ID for the selected circuit cable will be shown here on *Other details* tab, in Cable annotations section with *Cable ID* title. However, using *Other details* tab, the user can re-tag the selected circuit's cable manually. Apart being able to re-tag the selected cable, the user can also change the display scheme (See *Predefine Cable Display Scheme* in *Project info and options... Menu* section) by using the drop down menu, can define a cable class by typing in to the text field next to the *Cable Classification* title, and can add some notes using the *Remark* text field. *Cable ID* and *Display Scheme* will affect the schematic where *Cable Classification* and *Remarks* will be shown on cable schedule if selected, see *Cable Schedules* in section *Schematic Module Toolbar*.

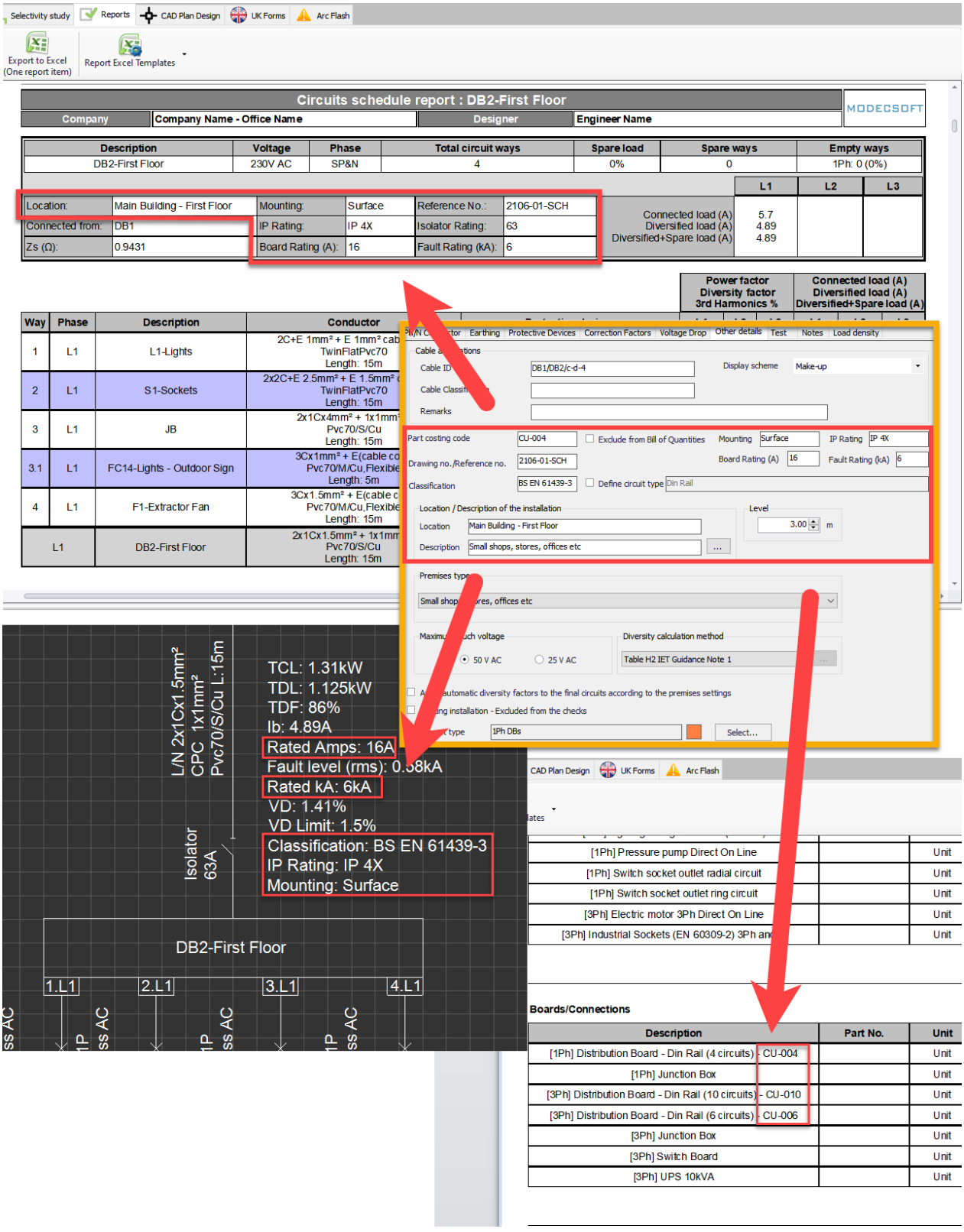
All these settings and options will affect the selected circuit only and will not change any global settings or other circuits.





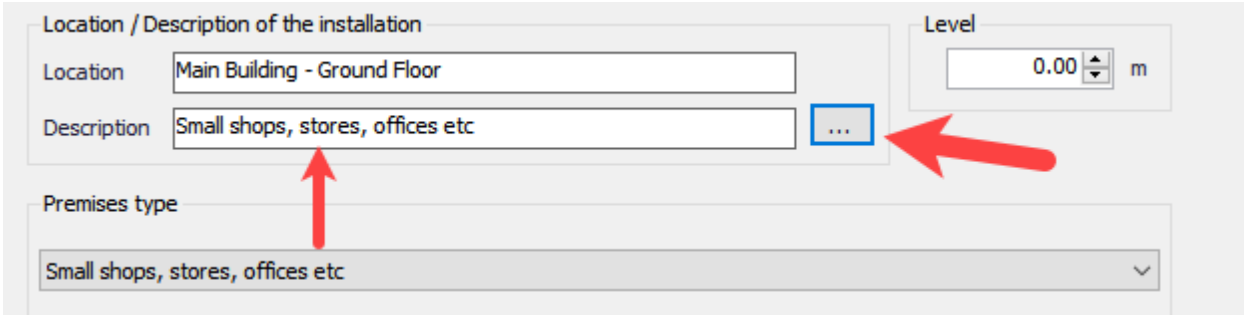
- **Part identification data and Location/Description of the installation**

Entries on these sections are used to populate related fields within the *Reports* but some items will be displayed within the *Board Label* also. Some examples are shown below:



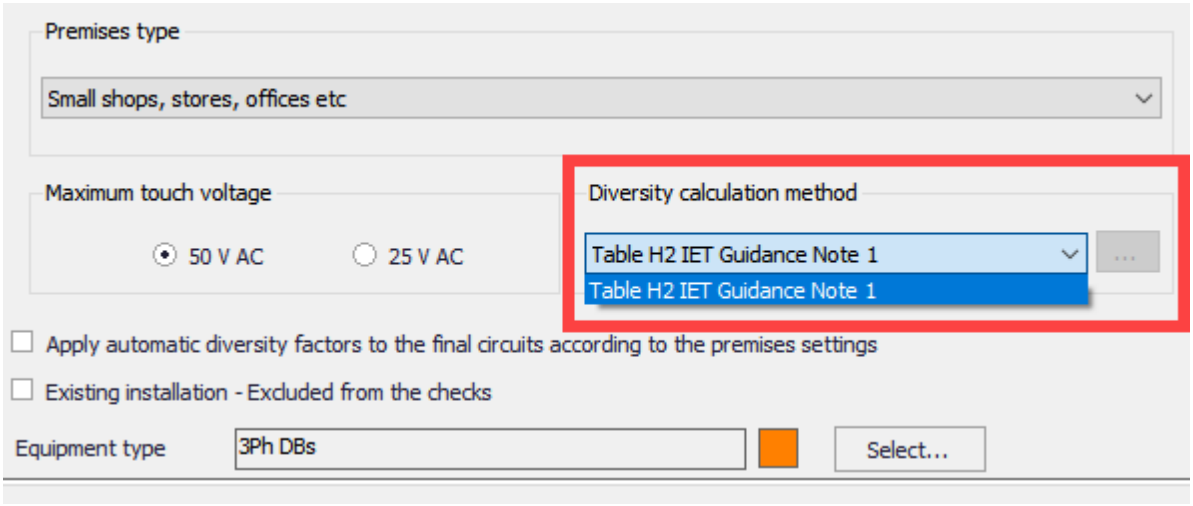
Level is used to indicate the height of the selected distribution node form a reference point, where reference is completely left to the user.

Description field under *Location /Description of the installation* section works together with *Premises type* section. The user can type in any description desired into this field, but also, using the three dots next to the text box, it is possible to automatically copy the *Premises type* into the *Description* field.

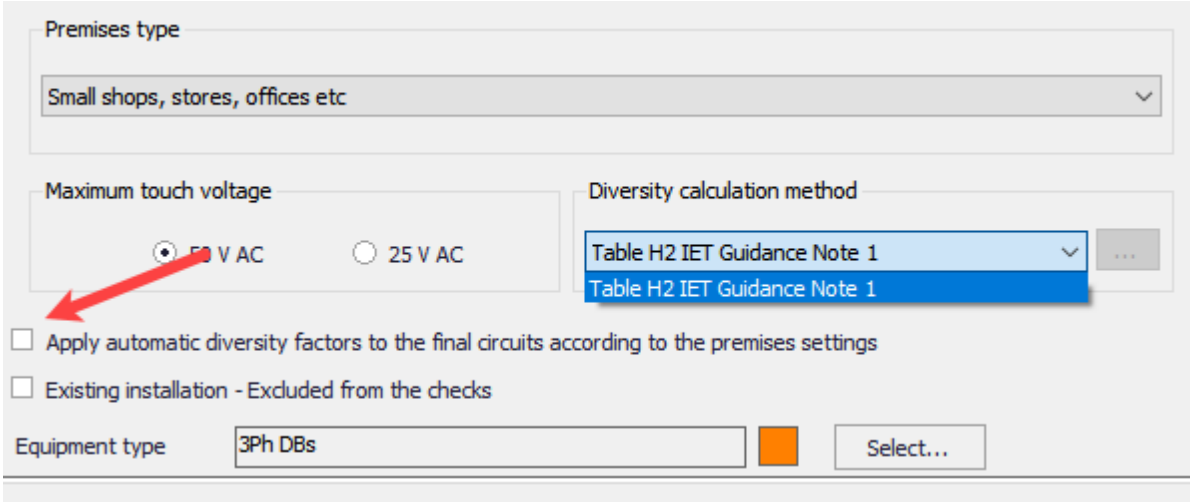


- **Premises type, Diversity calculation method list, and Apply diversity factors option**

ElectricalOM can apply diversity factors according to the user's settings. Each distribution node can be set to a premises type using the drop down list. After defining a premises type, the user may select a calculation method for diversity, however, only option is IET's Guidance Note 1 Table H2 at the moment using the drop down list, *Diversity calculation method*.

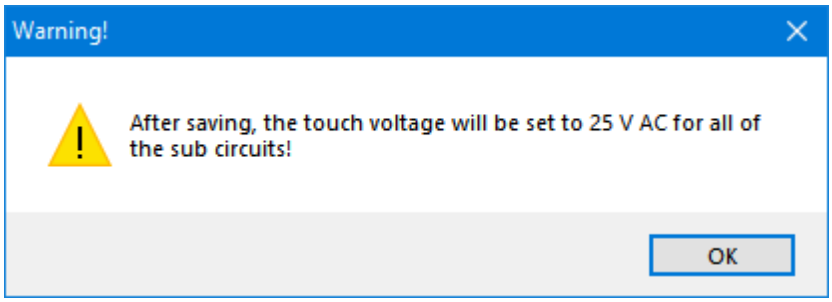


Once these two options are set, the user may enable the *Apply automatic diversity factors to the final circuits according to the premises settings* options and so let ElectrcialOM to apply diversity factors associated with the premises type automatically without needing manual execution, see Circuit Functions.

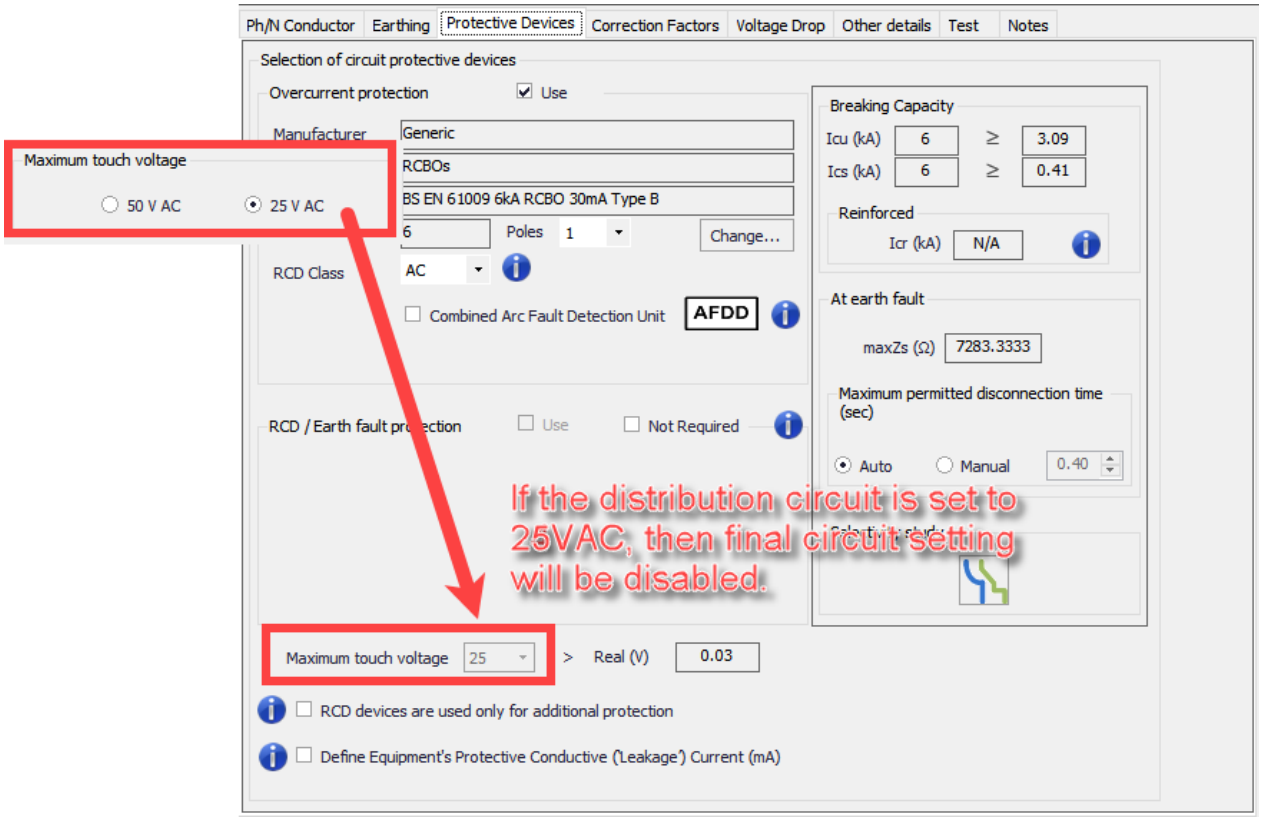


- **Maximum touch voltage setting**

This section is only available with distribution circuits and it is used to select required maximum touch voltage level for the final circuits fed from the selected circuit. The user may select 50VAC or 25VAC by clicking to the circular selection buttons. If the setting is accessed via a distribution node, then, the selected option will be applied to selected distribution circuit and all the sub circuits connected to this node. ElectricalOM will warn the user about the effects of the setting by a pop up warning window.

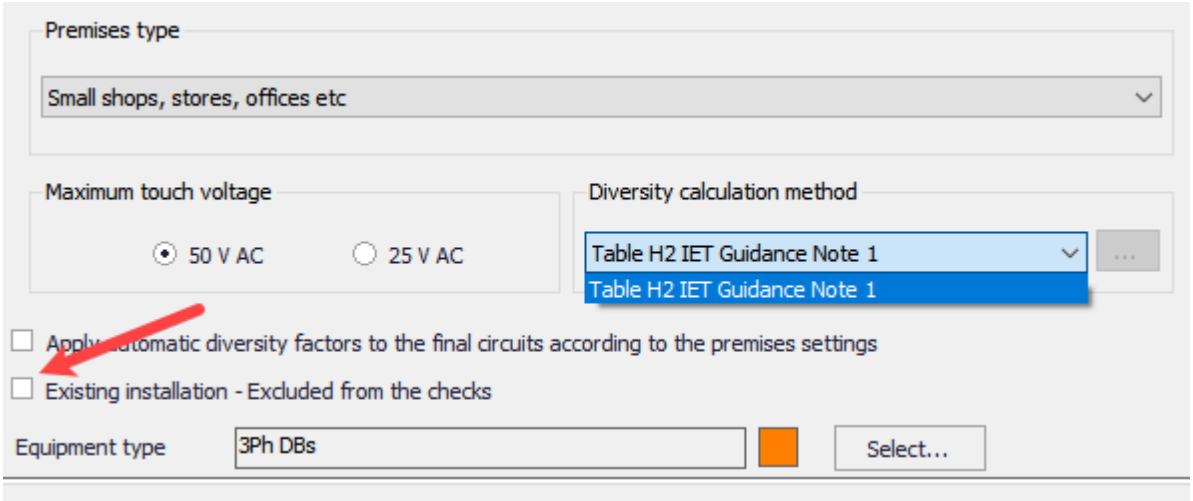


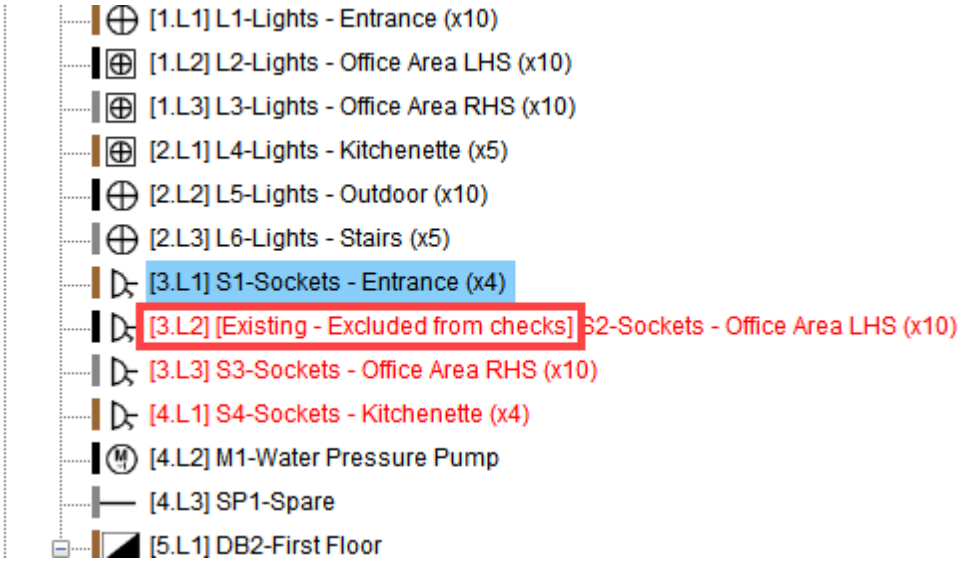
If the maximum touch voltage is set to 50VAC, the the user is able to change the touch voltage of a final circuit via its own settings, however, if the maximum touch voltage of a distribution circuit is set to 25VAC, then maximum touch voltage setting for final circuits fed from the aforementioned distribution circuit will be set to 25VAC and will not be available to change.



- **Existing installation - Excluded from checks**

If a circuit is required to excluded from ElectrcialOM calculations and checks, like if it is an already existing circuit, this tick box can be used to exclude the selected circuit from calculation and checks. In this case, the circuit will be marked as *[Existing - Excluded from checks]* on the system tree. If there is an issue with the circuit it still be indicated with red highlighting and red markings, but these warnings will not be listed in *Warnings* section or on *Reports*.

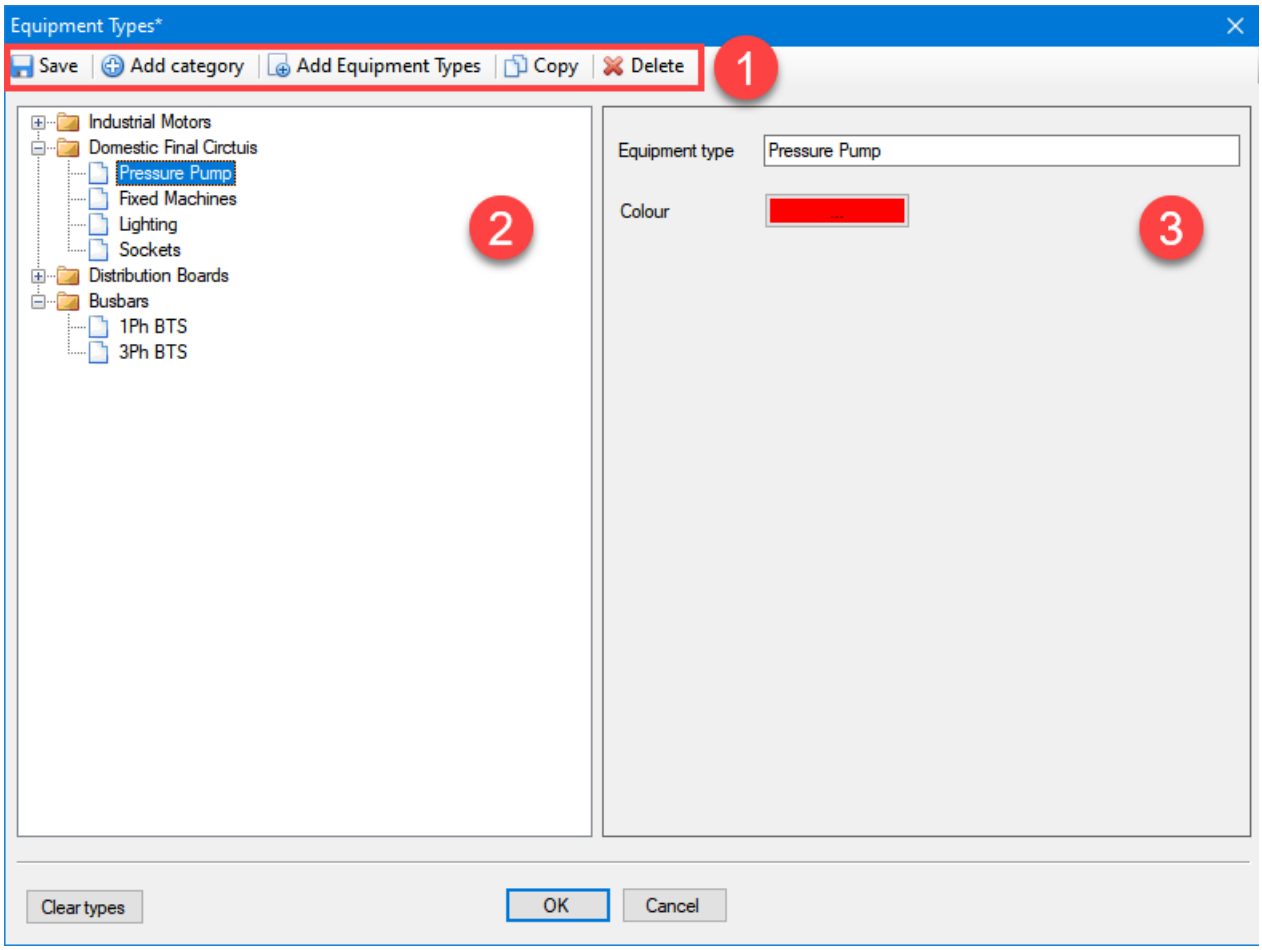




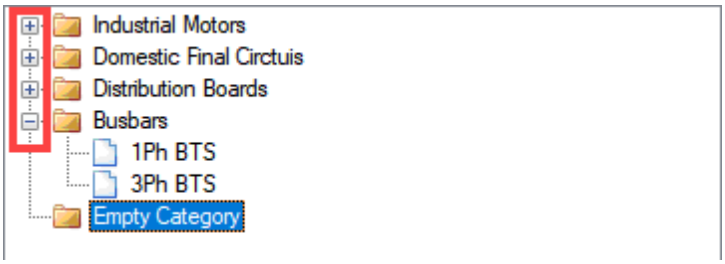
- **Equipment types**

The user can assign an equipment type to a circuit using this section. Equipment types usage is mainly discussed in Functions Menu, so, here we will only introduce how to create, save, delete categories, and equipment types. When *Select...* button is clicked, *Equipment Types* window will be displayed by ElectricalOM. The window has a:

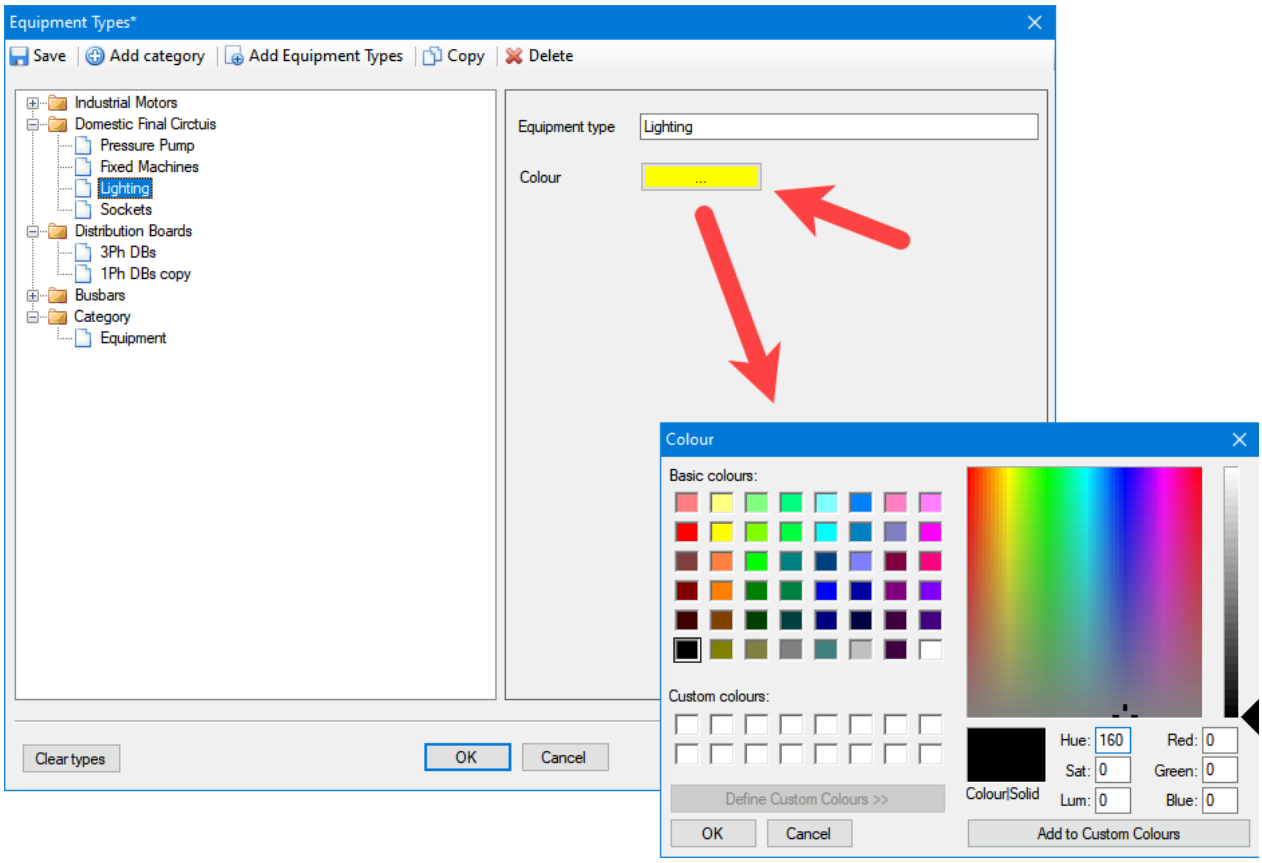
1. toolbar where the user can save any changes, create new categories, add new equipment types, copy a equipment type, and delete an equipment type or category,
2. left panel which contains the equipment categories and types, and
3. right panel which name and colour selection for the equipment type or category will be displayed and can be modified.



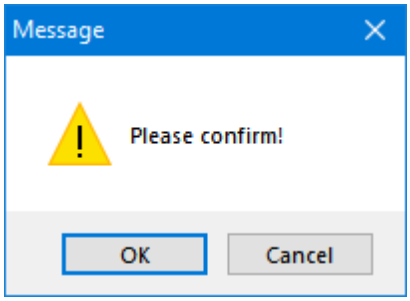
Categories are displayed as folders and if they include any equipment type, there will be a +/- box to extract or to retract the category folder to show or to hide the contents of the category.



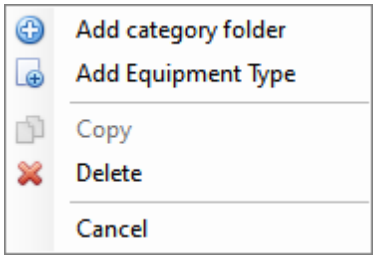
Add category button is used to add a new category folder to the bottom of the list. The default name is Category but the user may choose to rename the folder by using the text field at the right panel to type in a name. Similarly, *Add Equipment Types* button will add a new type under the selected category folder. The default name for a new equipment type is Equipment, and the default colour is black which both can be changed by the user using the right panel. Clicking on the colour box will initiate the Colour window which the user can pick a colour for the selected equipment type.



Copy button will copy a selected equipment type (will not work with a category) within the same equipment category. *Delete* button will delete any item selected, and ElectricaOM will confirm the delete action before deleting the item. If a category is selected to be deleted, then all the equipment types under the selected category will also be deleted.



Same actions can also be access with the right-click within the left panel area.

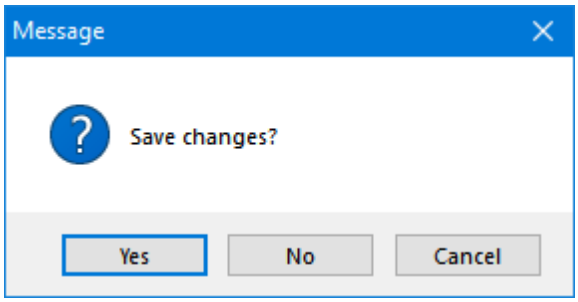


Once all required settings are specified, *Save* button will save all the settings.

The bottom part of the Equipment Types window has three buttons: *Clear types, OK*, and *Cancel*. *OK* button

will not be activated until an equipment type is selected for the selected circuit. Once an equipment type is selected *OK* button can be used to assign the selected type to the selected circuit and close the *Equipment Types* window. *Cancel* button will revert the changes made to the equipment type selection for the selected circuit and close the window, this button will not revert any additions made to the categories or types.

Clear types button will clear the equipment type setting for the selected circuit, and close the window. If there are any unsaved changed made, ElectricalOM will warn the user before closing the window.

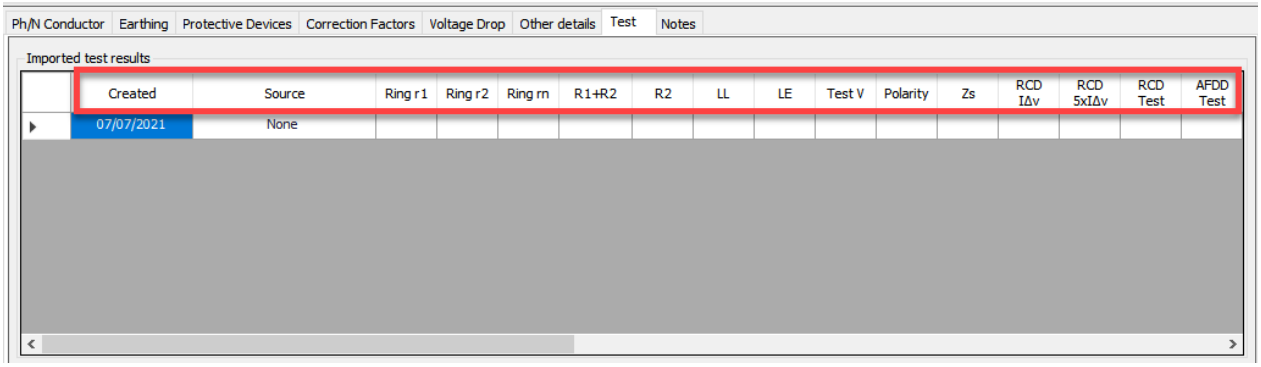


It is important to notice that all these settings are applied to the selected circuit only.

Test Tab

Test Tab is where the user can provide test results related with the selected circuit. This can be done manually for each circuit, or the data can be pulled from the test forms created previously by UK Forms Tab. In this section manual method will be discussed only, UK Forms Tab and its functionality is discussed in UK Forms Tab section.

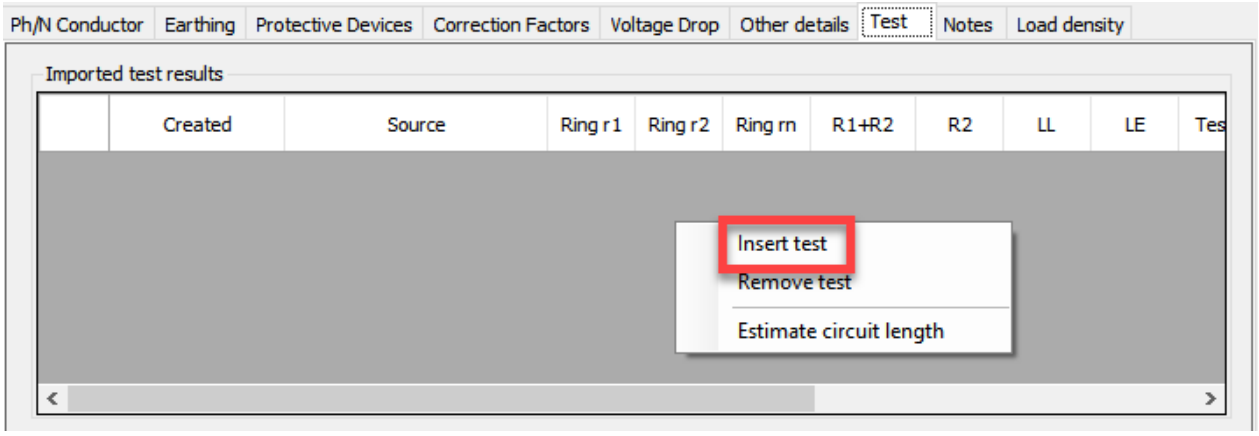
The Test Tab is similar to a spreadsheet divided to 17 columns with a title row. The columns are similar to BS7671's generic schedule in Appendix 6. The first column has no title and it is only an indicative column to indicate if there are any unsaved changes to the test results. The user can add as many raw, which may represent different test results conducted on different dates, as desired.



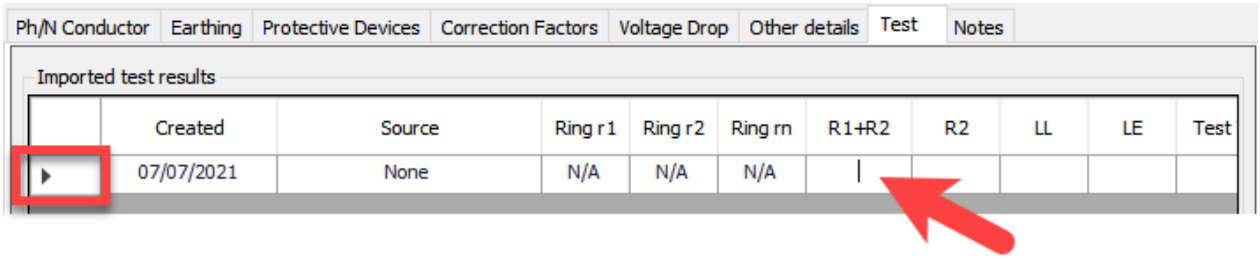
- Created: date the test results raw is created
- Source: reference to the source of the results. If results are provided manually this is marked as *None*.
- Ring r1: end-to-end resistance value of the phase conductor of a ring circuit in Ω
- Ring r2: end-to-end resistance value of the protective conductor of a ring circuit in Ω

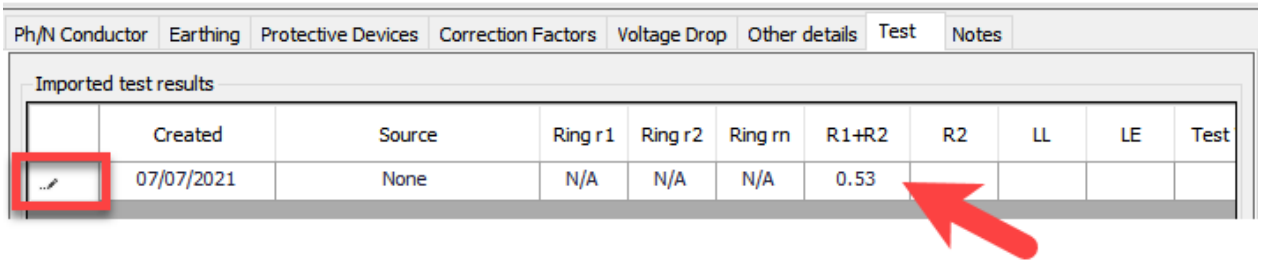
- Ring rn: end-to-end resistance value of the neutral conductor of a ring circuit in Ω
- R1+R2: total resistance of the line conductor and the CPC of a circuit in Ω
- R2: resistance of the CPC of a circuit
- LL: Live-to-Live insulation resistance value in MΩ
- LE: Live-to-Earth insulation resistance value in MΩ
- Test V: test voltage used for the insulation tests
- Polarity: polarity check
- Zs: Maximum measured earth fault loop impedance value in Ω
- RCD IΔn : RCD trip time for a test current of the rated residual operating current of the same RCD
- RCD 5xIΔn: RCD trip time for a test current of five times the rated residual operating current of the same RCD
- RCD Test: RCD test button operation
- AFDD Test: Manual arc fault detection device test button operation

Test results for a selected circuit can be defined by right-clicking within the *Imported test results* area and selecting the *Insert test* option.

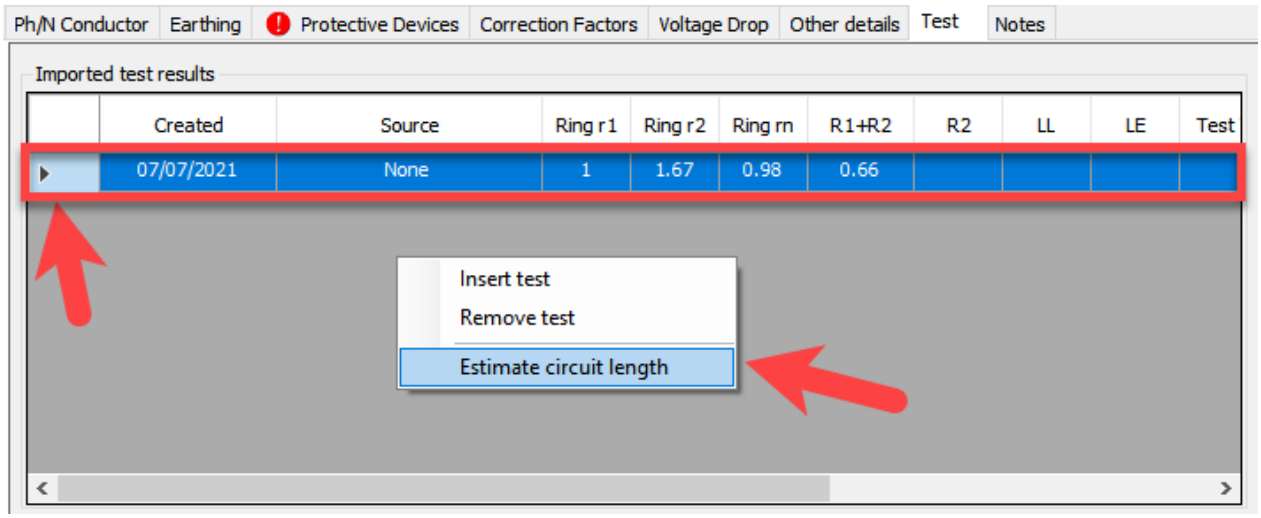


Once this option is selected, ElectricalOM will create a row and assign the current date for it. Cells can be modified by clicking on the desired cell and typing in any comments. When a cell is modified the arrow icon in the first cell will change to a pen icon until the save action is initiated by either using the enter button on the keyboard or selecting a different cell by using the mouse. If the selected circuit is not a ring circuit, columns associated with *Ring* circuits will be marked as N/A automatically.

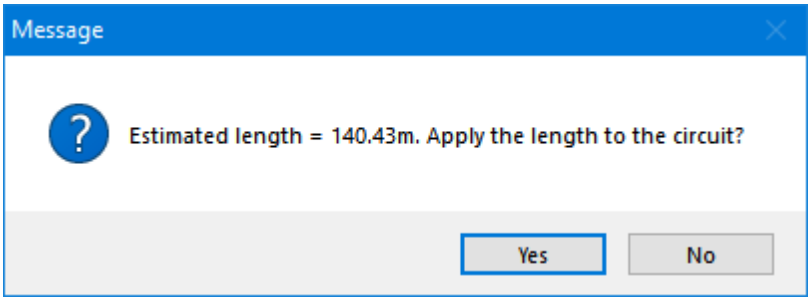




As long as R1+R2 value is provided, ElectricalOM can estimate the circuit length for the selected circuit. First, the test raw required for the estimation must be selected from the first column. Selected raw will be highlighted by blue colour. Then, using the right-click menu, *Estimate circuit length* option can be selected to get ElectricalOM to estimate the circuit conductor lengths.



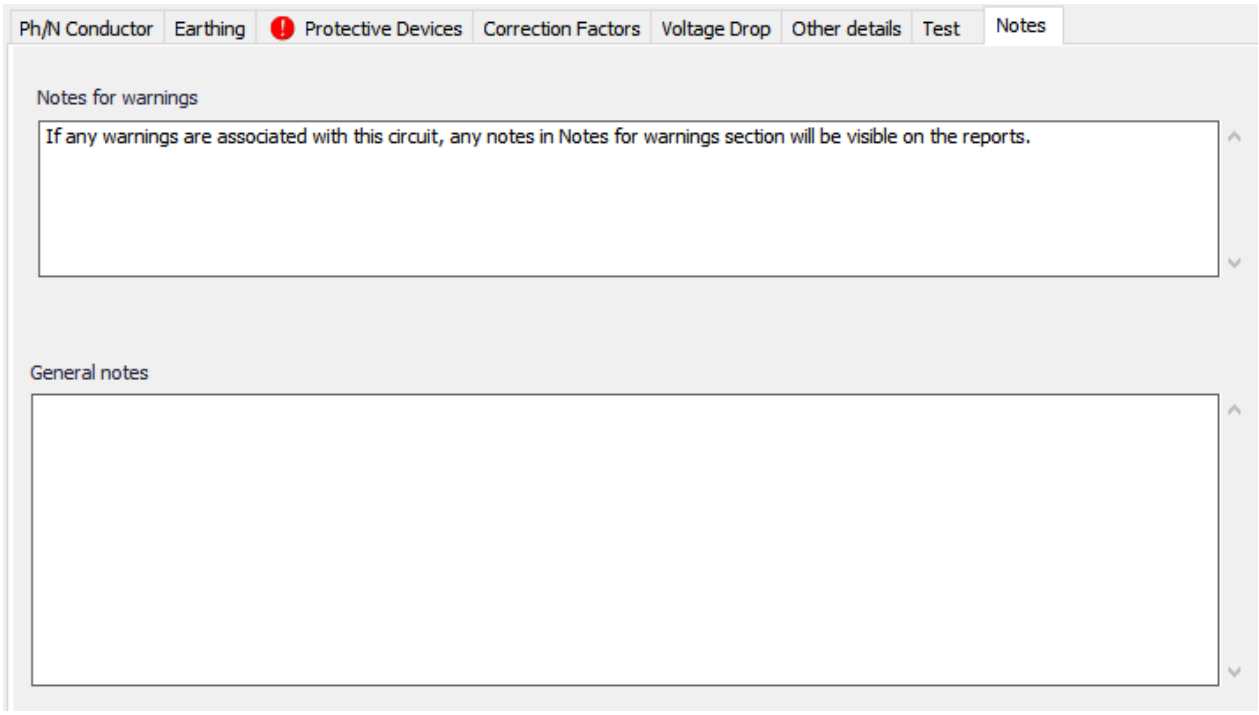
The user can choose to reflect that estimated length to the design by selecting *Yes* option from the pop up window which displays the estimated length. *Yes* option will replace the design value with the estimated value of the selected circuit. If *No* option is selected, then, the estimated length will be ignored. This is useful to cross-check the design values with actual conductor lengths.



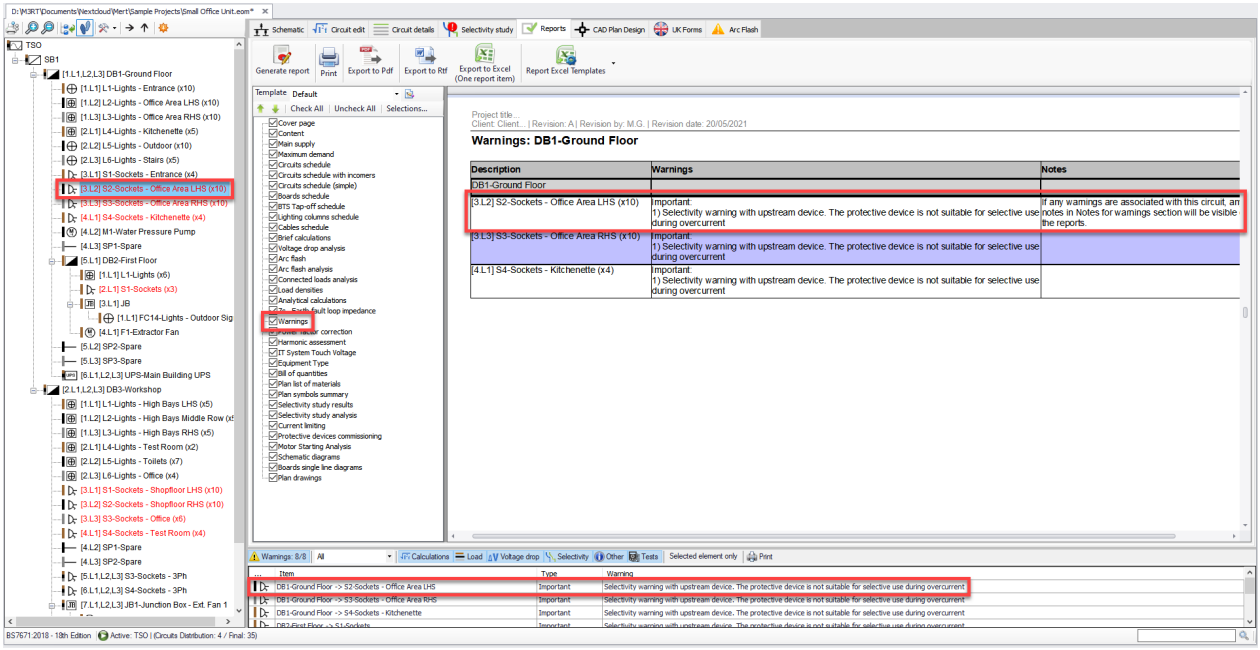
It is also possible to delete any test results raw form the *Imported test results* list, which is also initiated from the right-click menu. First, the raw the user wants to delete must be selected, and then, *Remove test* option can be selected to remove the selected raw. There is not user approval for this action.

Notes Tab

The last tab of *Circuit Edit Module* is the *Notes T*ab. It is divided into two sections: *Notes for warnings*, and *General notes*.

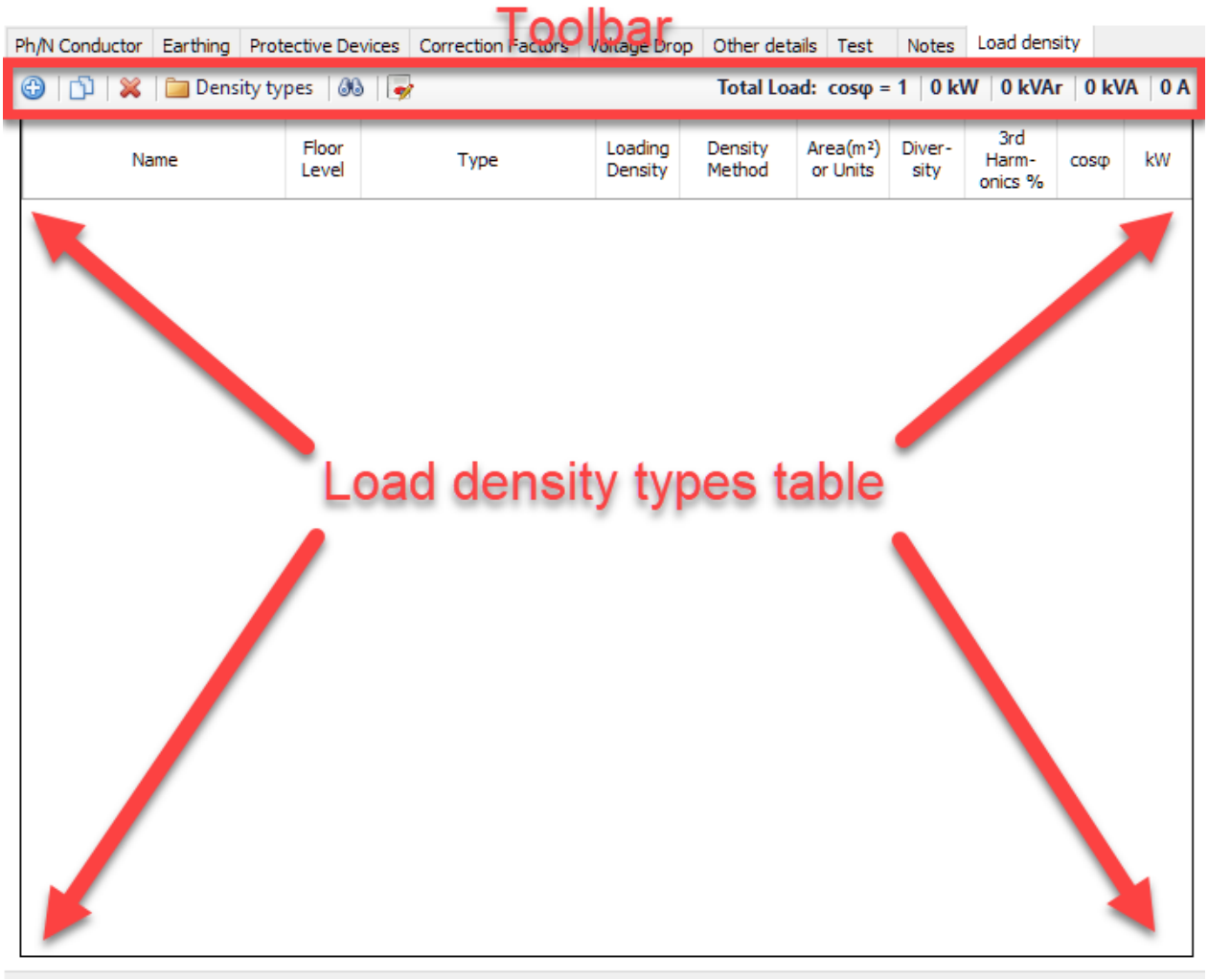


Notes for warnings section is reserved for the notes related with any warnings related with the selected circuit and this will be visible in *Warnings* section of the *Reports*, if generated. General notes section is for any notes the user wants to take related with the selected circuits and it will only be accessible via Notes tab and will not be used in any other parts.

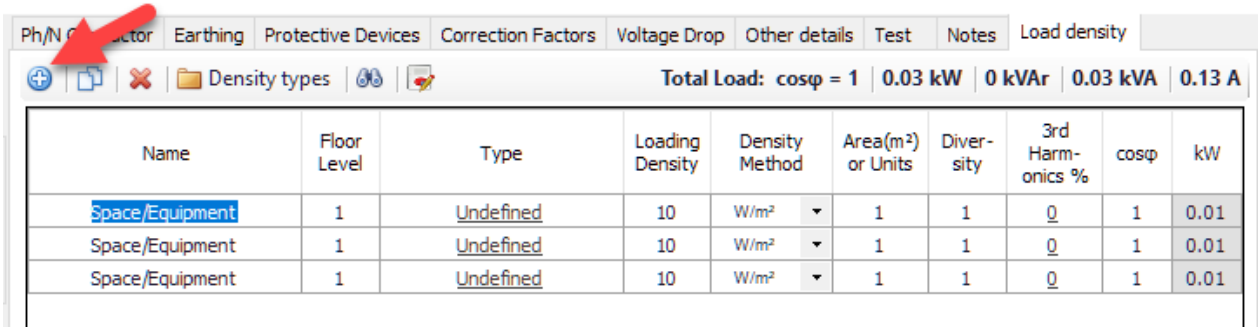


Load density Tab

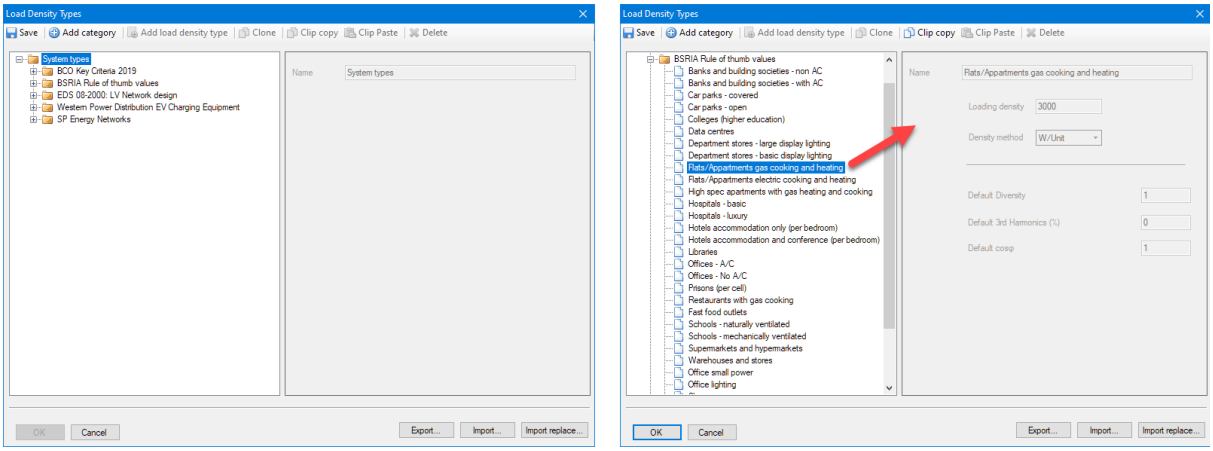
Load densities are used to predict load of a distribution circuit. It is generally used for early design stage where the actual load is not known but a preliminary design is needed. ElectccialOM allow the user to assign load densities gathered from various bodies like BRSIA, or BCO, or etc. Load density tab consists of a toolbar at the top and a load density table below it.



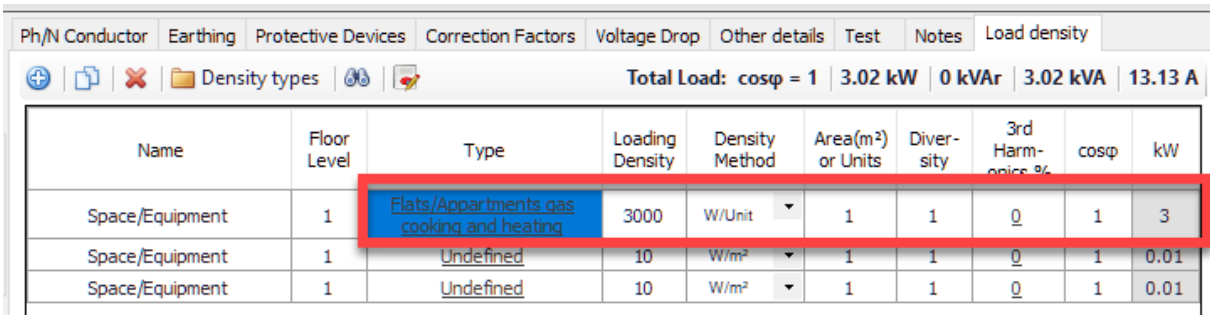
- *Add* button is used to add a load density row to the table. Each time this button is clicked, a new row will be added to the table.



The user can rename the load by clicking inside the *Name* cell and typing in. *Floor Level* can also be modified similarly. *Type* cell is used to assign a predefined load density type from the *Load Density Types* list. When the user clicks on the load density type, which appears as a link, Load Density Types window will be displayed. The System Types tree can be expanded to see various load density folders which are based on documentation of indicated bodies.Each folder can be further expanded by using the + boxes.



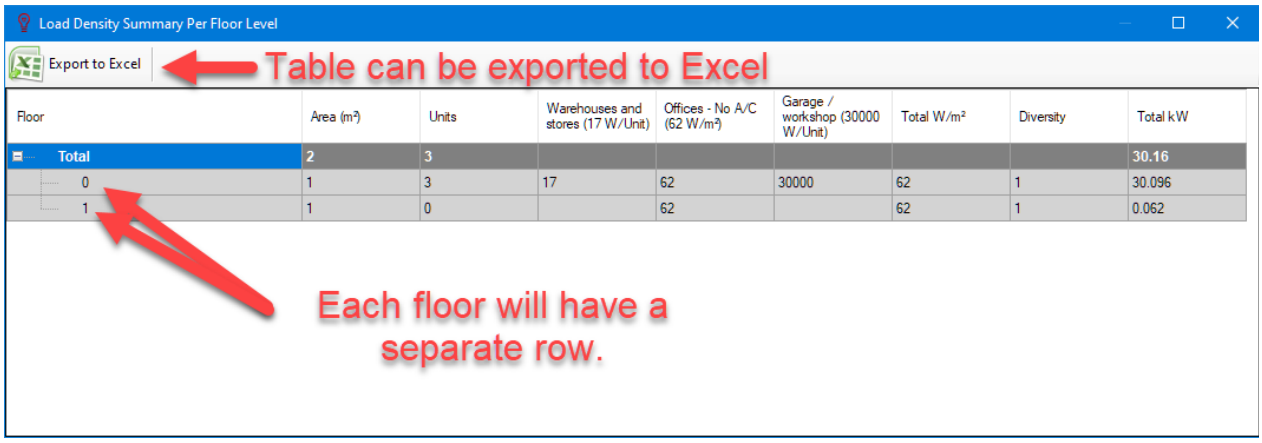
Once an appropriate load density type is clicked on, related data will be displayed on the right hand side. The selected type can be assigned to the active row by clicking on OK button.



Load density value can still be modified by the user by clicking inside the cell and typing in the required value. This is a unit value and total load will be calculated using the remaining cells and will be displayed in *kW* cell. Density Method can be changed by means of the drop-down list. It has two options as W/Unit or W/m^2.

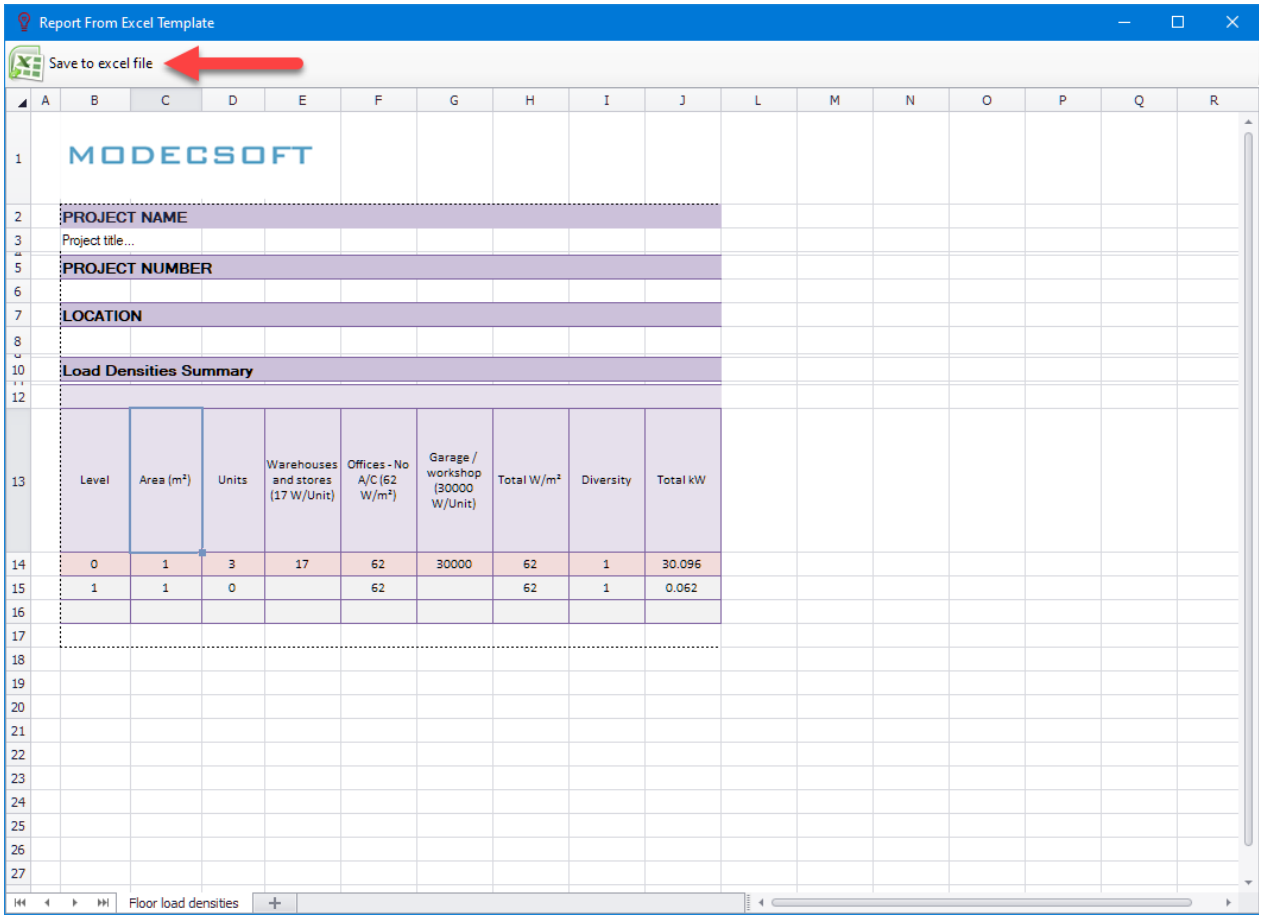
It is possible to add multiple rows and assign different load types for each row which is useful while estimating a load value for a distribution load which is planned to feed multiple areas.

- *Copy* button will copy the selected row. The new row will be created at the bottom of the table.
- *Delete* button will delete the selected row.
- *Density Types* will display the Load Density Types window. Selecting any item will not have any effect on the table.
- *Find* button works with Revit. Please refer to Revit Menu for details.
- *Summary report* button will display the *Load Density Summary Per Floor Level* window. This will include all load densities within the project and will create a separate row for each floor level. This table can also be exported to Excel by using *Export to Excel* button.



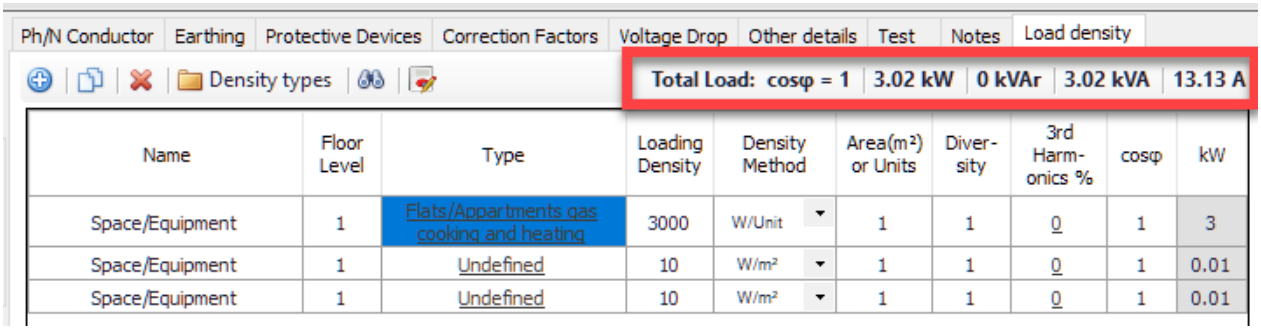
Floor	Area (m²)	Units	Warehouses and stores (17 W/Unit)	Offices - No A/C (62 W/m²)	Garage / workshop (30000 W/Unit)	Total W/m²	Diversity	Total kW
Total	2	3						30.16
0	1	3	17	62	30000	62	1	30.096
1	1	0		62		62	1	0.062

Export to Excel button will initiate ElectricalOM's Excel interface. The created spreadsheet can be saved as Excel file by clicking on Save to excel file button.

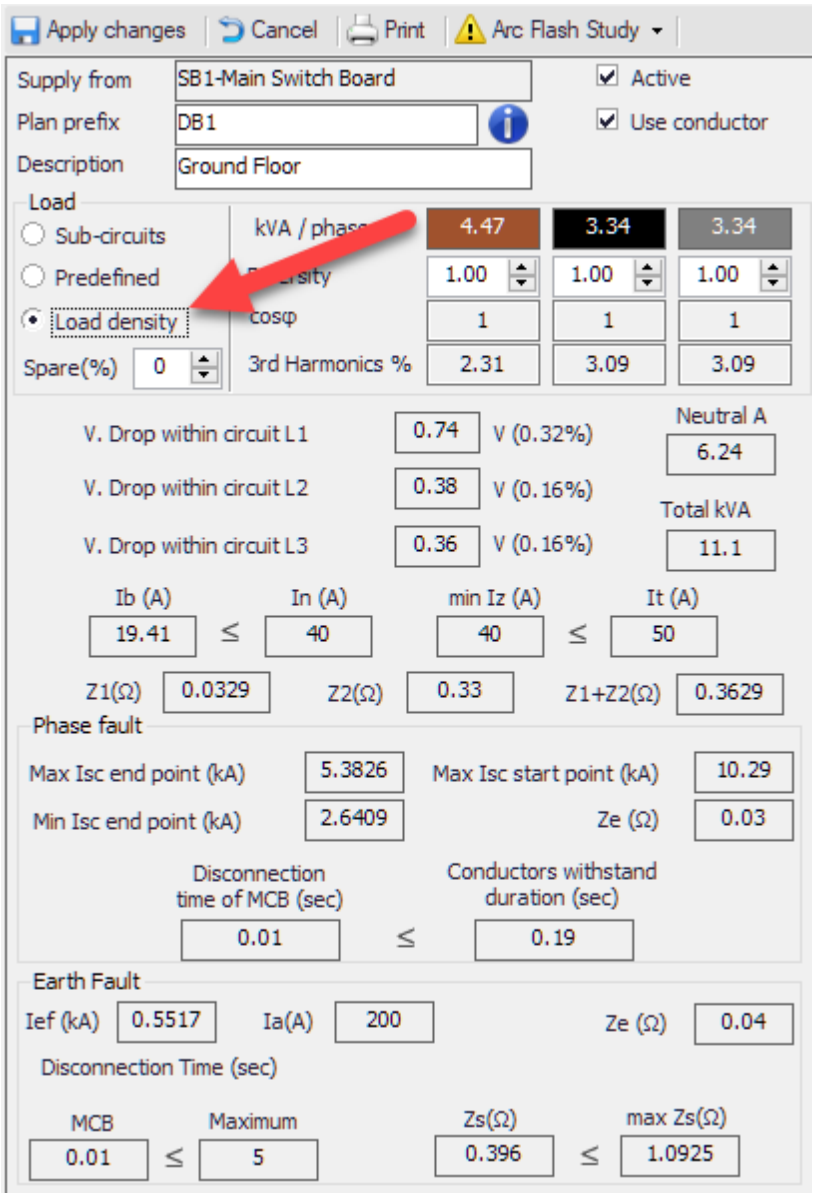


Level	Area (m²)	Units	Warehouses and stores (17 W/Unit)	Offices - No A/C (62 W/m²)	Garage / workshop (30000 W/Unit)	Total W/m²	Diversity	Total kW
0	1	3	17	62	30000	62	1	30.096
1	1	0		62		62	1	0.062

- Total Load data will be displayed on the right hand side for the selected distribution circuit.

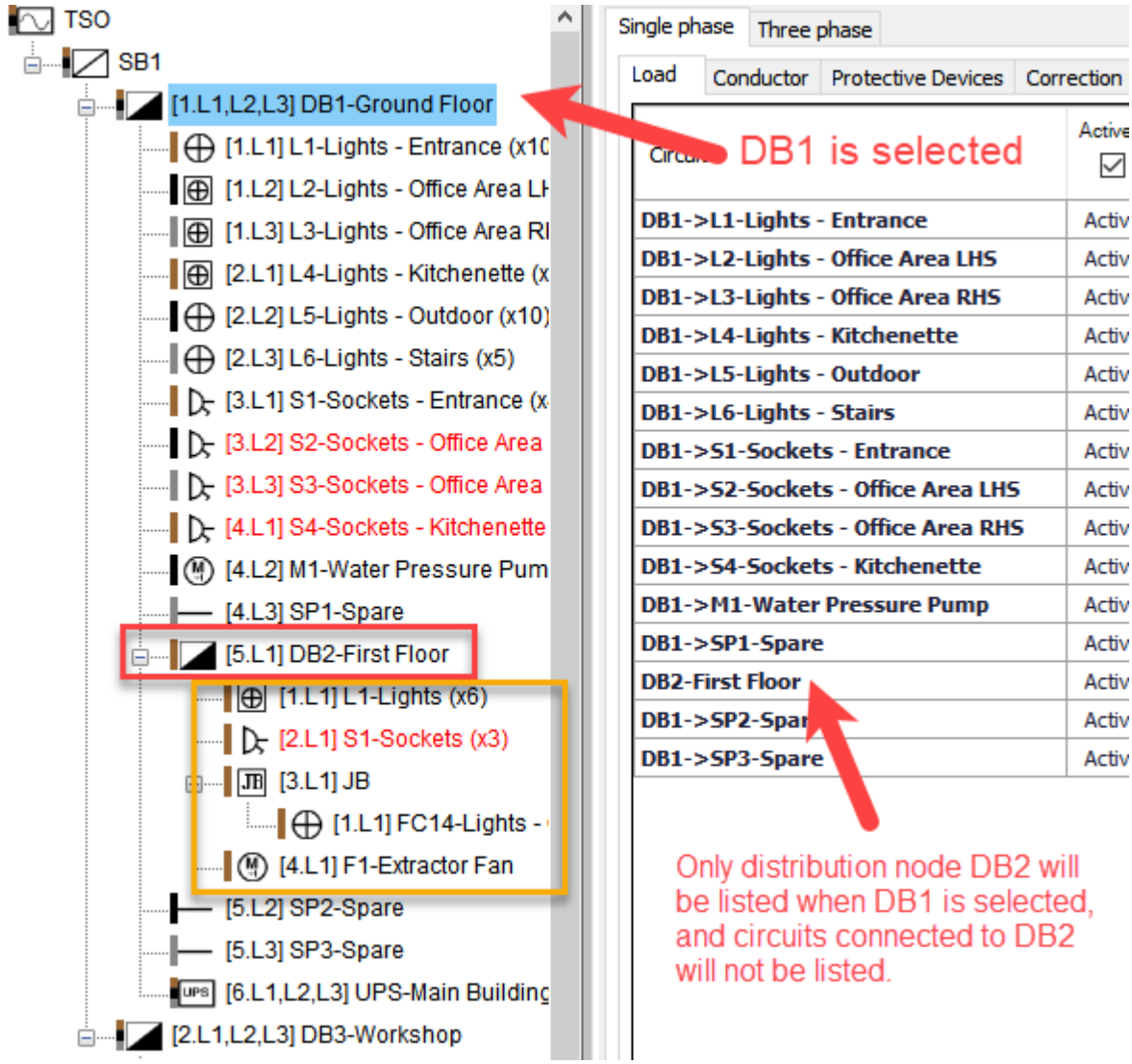


The most important part to use the load densities is to enable the usage of load densities for ElectrcialOM calculations. In order to use load density values for calculations, the user must select *Load density* option from the *Load* selection of *Definitions* section. Without selecting this option. ElectricalOM will ignore the load density settings.

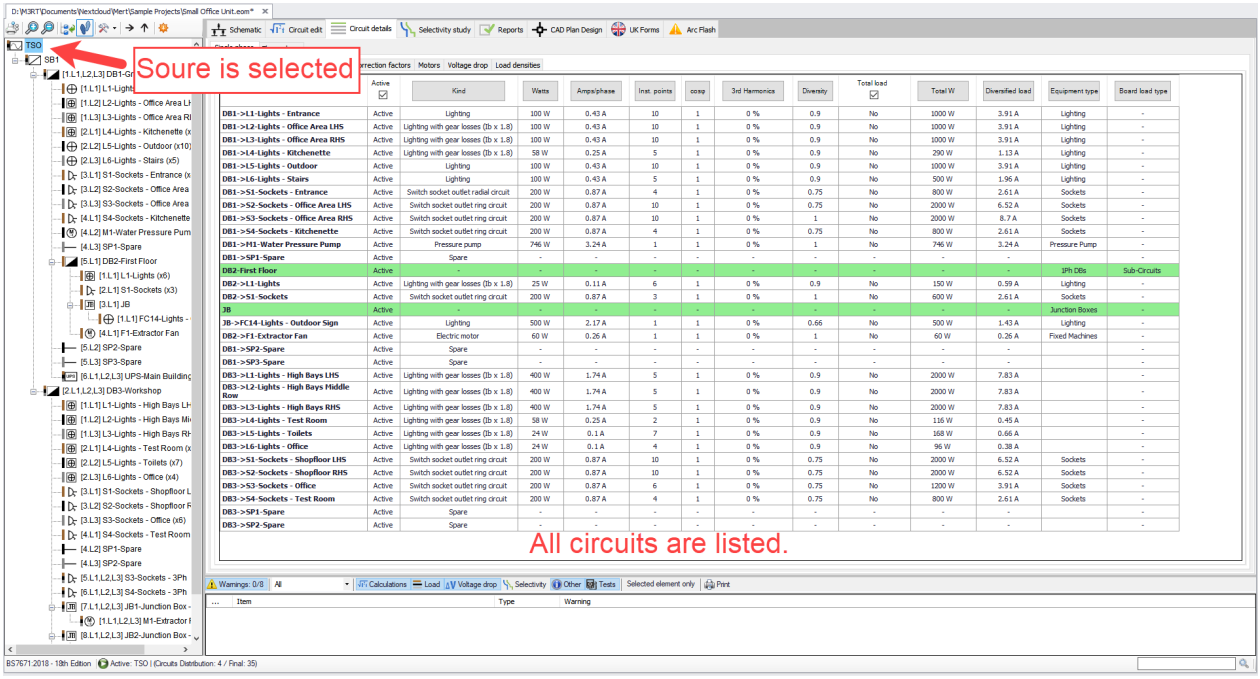


Circuit Details Module Tab

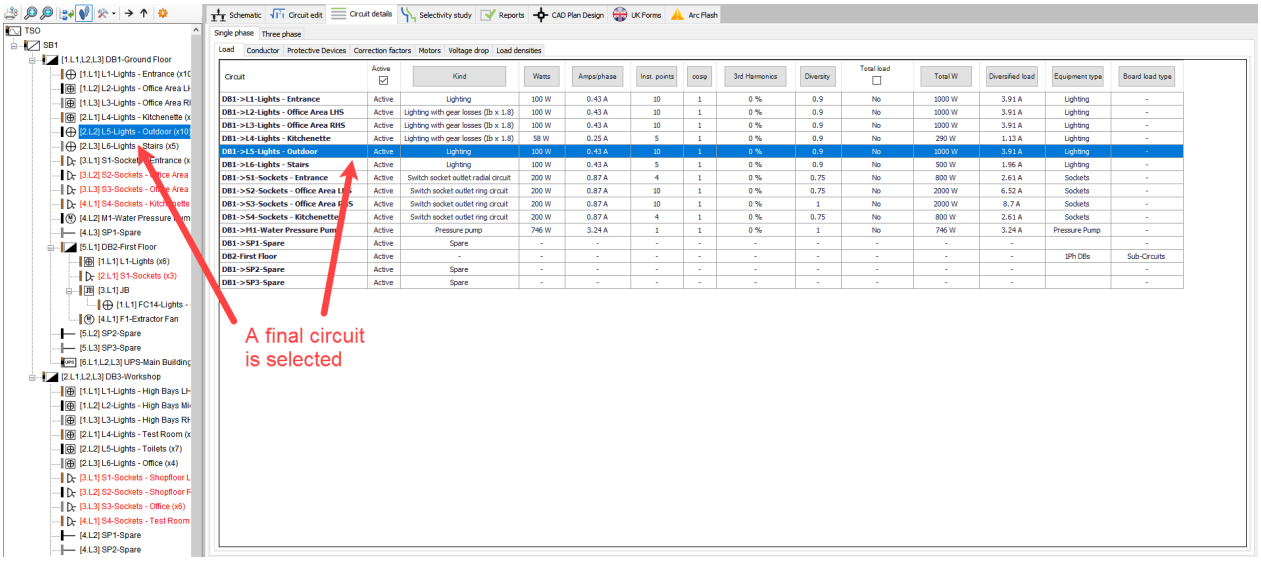
Circuit Details Tab will list the circuits connected to a selected distribution node as a list where the user can see various settings at once and can manipulate them if necessary. If another distribution circuit is connected to the selected distribution node, then, circuits connected to the secondary distribution node will not be displayed on the list.



However, if a Source is selected, then, ElectricalOM will list all of the circuits connected to the selected source. Double clicking a row will automatically navigate to the Circuit Edit Tab of the selected circuit.



If a final circuit is selected, then, all the circuits connected to the same distribution circuit will be listed and the selected final circuit will be highlighted.



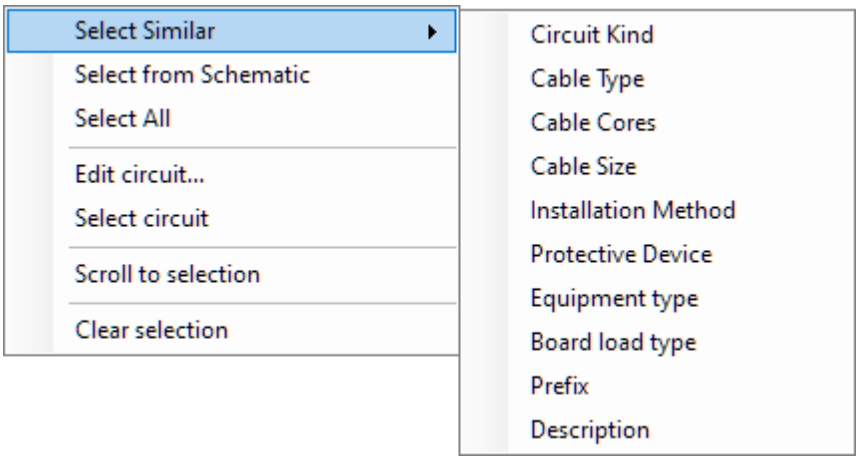
The Circuit Details Module's lists accept multiple selection in order to enable the user to be able to apply changes to the selected circuits at once. This can be done in various ways:

- by selecting a circuit and using *Up/Down Arrow*keys while holding the shift key,
- by selecting a circuit, holding the *Shift* key and selecting another circuit. ElectricalOM will select the circuits between two selection automatically,
- by selecting multiple circuits while holding the *Ctrl* key. ElectricalOM will select each circuit clicked on individually.

Apart from above, the user may also chose to initiate the right-click menu to access further quick selection

options:

- *Select Similar:* This option will give the opportunity to select circuits sharing same properties at once. First, the user needs to select a reference circuit and then initiate the right click menu. Any selection from Select Similar list will cause ElectricalOM to select all circuits with the same property as the reference circuit from the listed items.



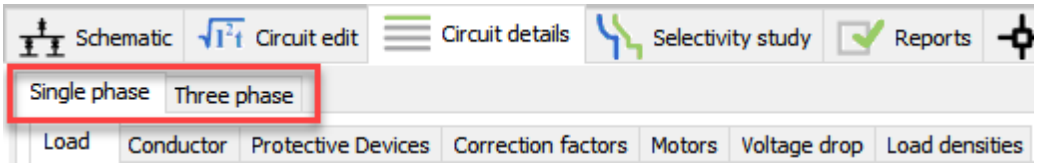
- *Select from Schematic:* If the user wants to select circuits from the schematic rather than the list, then, *Select from Schematic* option can be used. First, the user needs to select the circuits required from the *Schematics* module and navigate back to Circuit details module. In order to be able to use the right click menu, the user must select one random item from the list and then, from the right click menu, once the *Select from the Schematic* option is selected, ElectrcialOM will select the circuits that were previously selected by the user.
- Select All: This option will select all the items currently listed.

Circuit details Module's right click menu also provides some other quick actions:

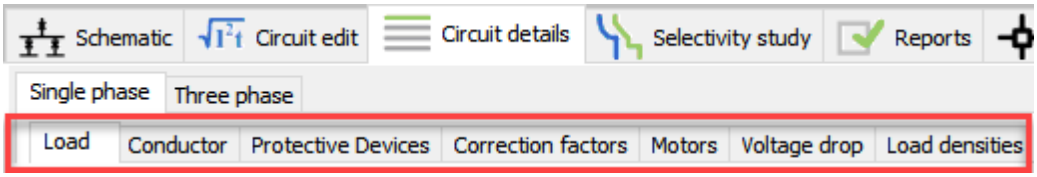
- Edit circuit...: This will cause ElectricalOM to navigate to the *Circuit edit Module* and display data related with the selected circuit. If multiple circuits are selected, then, the last item will be shown.
- Select circuit: When a circuit is selected from the *Circuit details* Module's list, this selection does not affect the selection at the System Tree Section. If *Select circuit* option is selected, after a selection from the list, then, ElectricalOM will also select the same circuit from the System Tree Section. If multiple circuits are selected, only the last selected item will be selected from the system tree.
- Scroll to selection:
- Clear selection: This will clear the list and remove any selection done previously.

The structure of the Circuit Details Module is similar to other modules of ElectricalOM. It has two layered tabs row, first row being reserved for two main tabs which will dictate which circuits will be displayed by the subordinate tabs:

- Single phase: will only list single phase circuits connected to the selected node
- Three phase: will only list three phase circuits connected to the selected node



Subordinate tabs are located at the lower row:

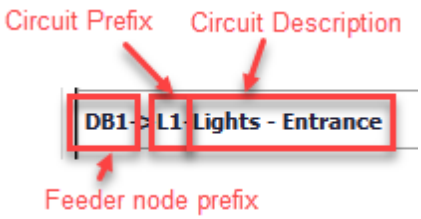


See following sections for more details on tabs.

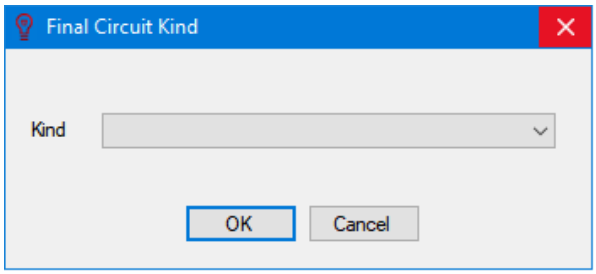
Load Tab

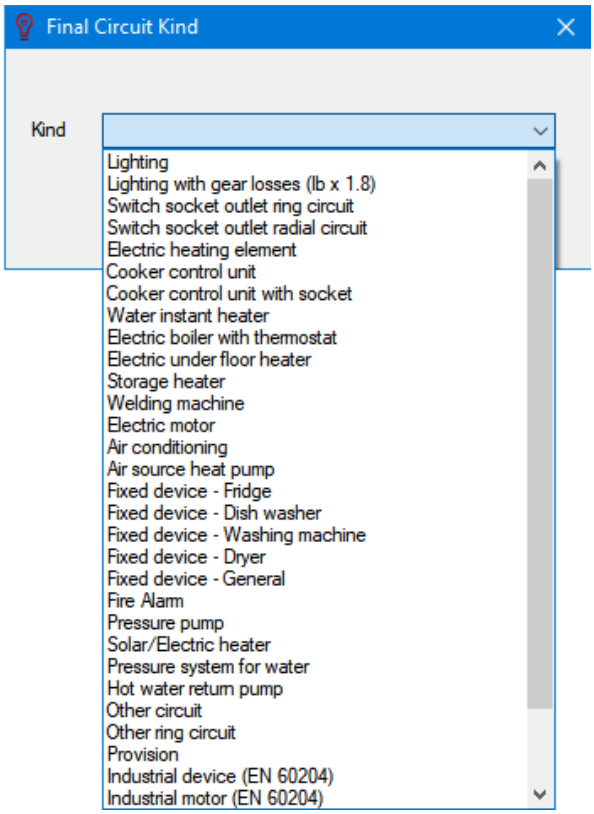
Load tab will list the loads connected to the selected node. This tab has 14 columns:

- *Circuit:* This column displays the circuits' description including the feeder nodes' prefixes.

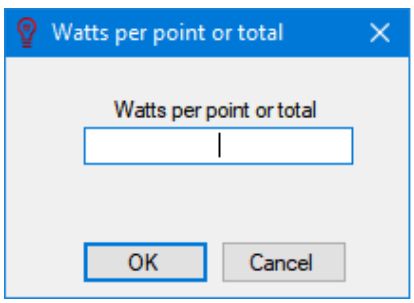


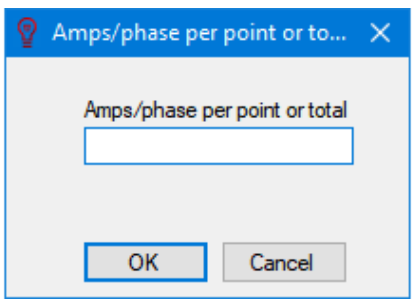
- *Active tick box:* This column indicates if the circuit is active or not. The tick box next to the title is used to activate or deactivate the selected circuits at once. If the user selects multiple items, clicking on the tick box will affect all the selected circuits.
- *Kind:* This column will indicate the circuit types. The column title is actually a button that can be used to change the circuit type of a selected circuit. Once clicked on, *Final Circuit Kind* widow will pop up with a drop down list so the user can select a circuit type and click on OK to change the circuit type.

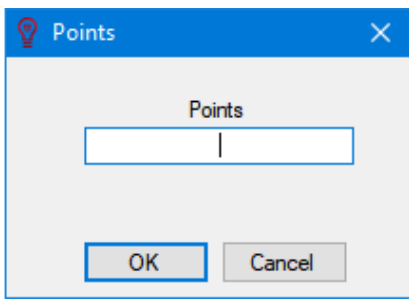




- *Watts, Amps/phase, Inst. points, Total load tick box, and Total W:* These columns are somehow related with each other and are used to determine the circuit's total power which is displayed on *Total W* column. In order to change any one of them, except the *Total load tick box*, the user must click on the title button and use the pop up window. Also, it is important to note that the *Total W* column cannot be modified by the user, but is calculated by ElectricalOM using related data. *Total load tick box* can be ticked (enabled) or unticked (disabled) by clicking on the tick box which is located below the title. Changing the *Watts* column will affect the *Amps/phase* column or vice versa. *Inst. points* defines the insertion points (see Definition Section in Circuit Edit Module Tab) and this value will be multiplied by the *Watts* value to determine *Total W* of the circuit. If the *Total load* is enabled, then, ElectricalOM will set the *Total W* column to the value set on the *Watts* column value for this circuit and will ignore the *Inst. points* column.

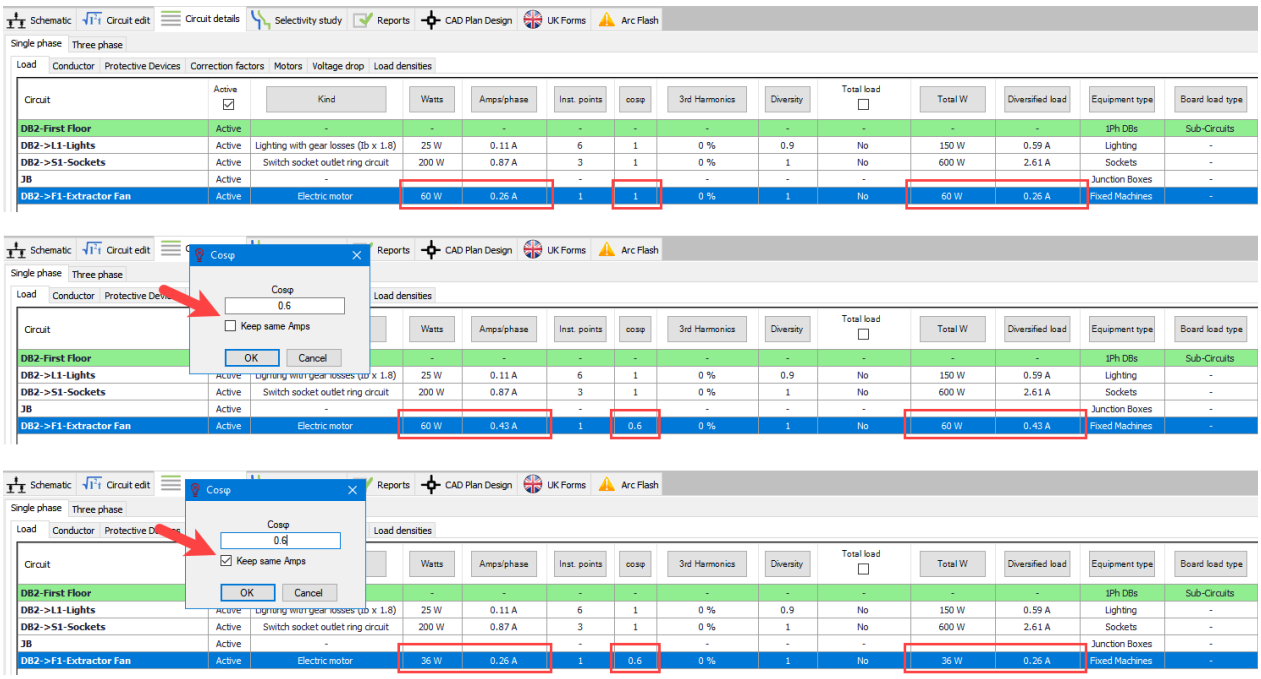




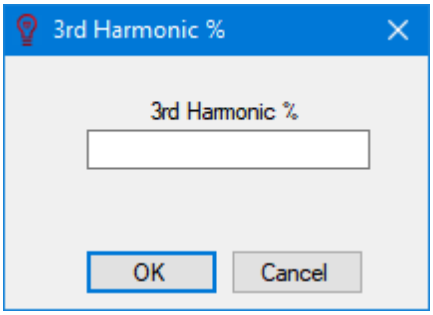


- *cosϕ:* This column displays the power factor. See Definition Section in Circuit Edit Module Tab. Also, there is a *Keep same Amps* feature provided with *cosϕ* dialogue box which gives the user ability to get

ElectrcialOM to calculate corresponding power (*Watts* column) for a set power factor value while keeping the current drawn by the load (*Amps/phase* column) fixed.

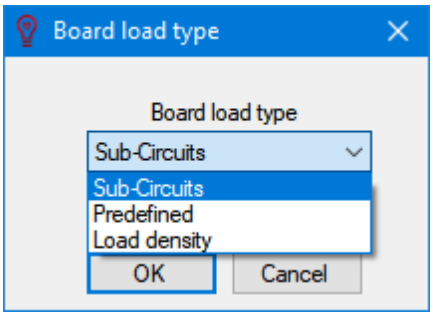


- *3rd Harmonics:* This column displays any 3rd harmonic content if any set by the user. See Definition Section in Circuit Edit Module Tab



- *Diversity:* The Diversity column displays the diversity multiplier. See Definition Section in Circuit Edit Module Tab

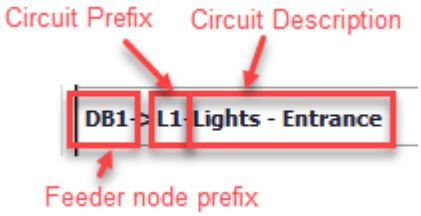
- *Diversified Load:* This column displays the current drawn by the related circuit after diversity is applied. The values under this columns cannot be changed by the user.
- *Equipment type:* This column defines the equipment type for the circuit. See Other details Tab
- *Board load type:* This column displays the load type set by the user for the related circuit. See Definition Section in Circuit Edit Module Tab



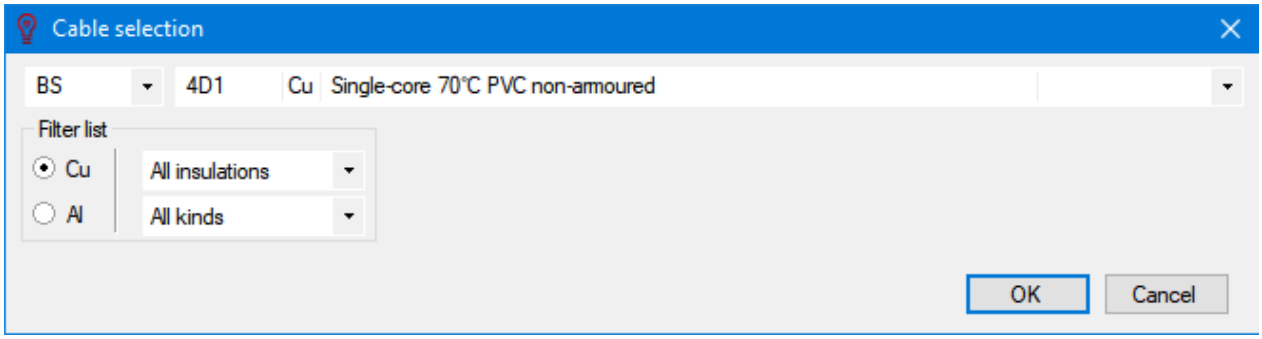
Conductor Tab

Conductor tab will list the circuits displaying conductors and various information related with the conductors connected to the selected node. There are 17 columns associated with Conductor tab.

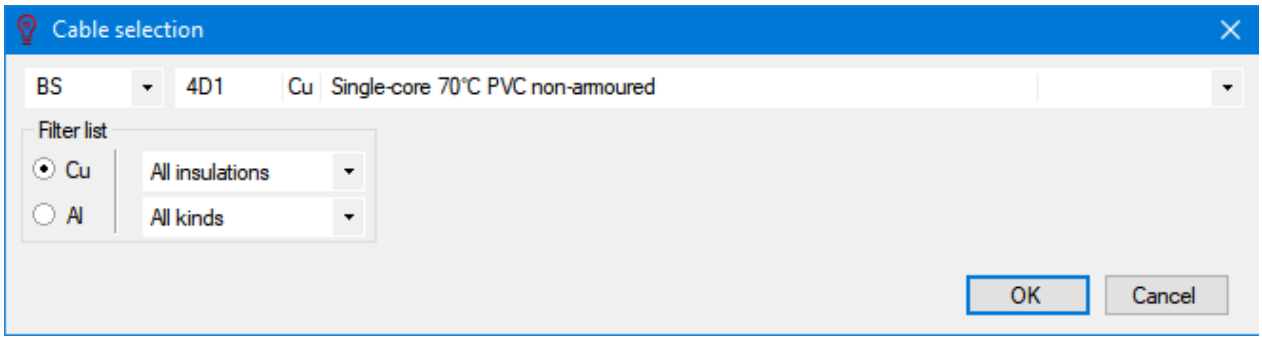
- *Circuit:* This column displays the circuits' description including the feeder nodes' prefixes.



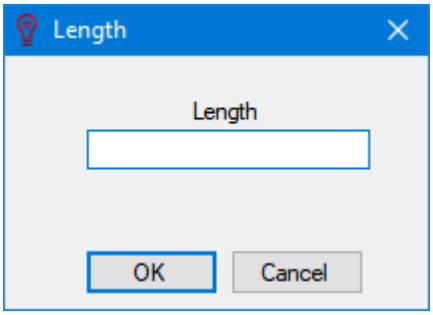
- *Conductor:* This column displays the conductor/cable type and cross-section information of a circuit. The title button can be used to modify the conductor/cable type but not the cross-section. The dialogue window is similar to the Circuit edit module's Ph/N Conductor tab.



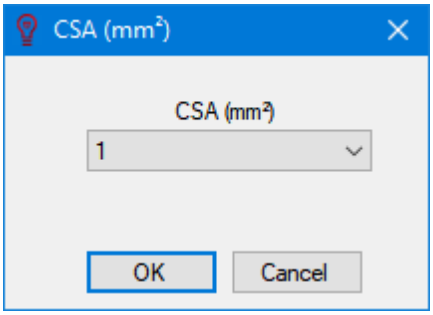
- *Inst. method:* This column displays the installation method of the conductor/cable of a circuit. The title button can be used to modify the method and the dialogue window is similar to the Circuit edit module's Ph/N Conductor tab.



- *Length:* This column displays the length of the conductor/cable of a circuit. The user can type in required value in to the text field at the opening dialogue window once the title button is clicked.

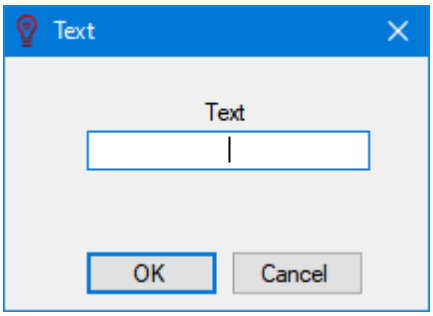


- *Show L tick box:* This column will enables or disables the length data which can be displayed on schematics. The tick box under the title has an effect on the selected row only but not on the whole column, so, in order to modify multiple items, the user needs to select those items first.
- *Phase CSA (It)* and *Sepr. CPC:* These columns display cross-section areas of the live and protective conductors of a circuit. Title buttons can be used to modify cross-section areas of selected circuit's conductors. *Sepr. CPC* column will have options only if a separate circuit protective conductor is defined at the *Circuit edit* module's *Earthing* tab. and if not, selecting any option from *Sepr. CPC* list will not have any effect.

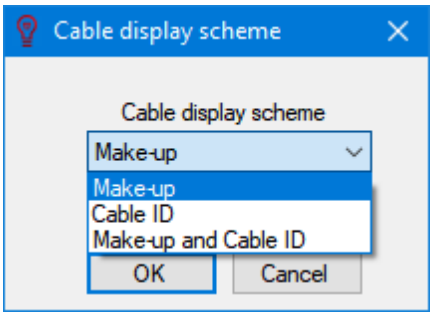


- *minIz(A):* This column will display the *minimum effective capacity of the phase conductor* and this cannot be modified by the user. This is also shown on Circuit edit module's Calculation Section.
- *CableID:* This column displays the ID of the cable of a circuit. The user may modify the value by clicking on the title button. For more details about the cable identification, please refer to *Auto Cable ID*

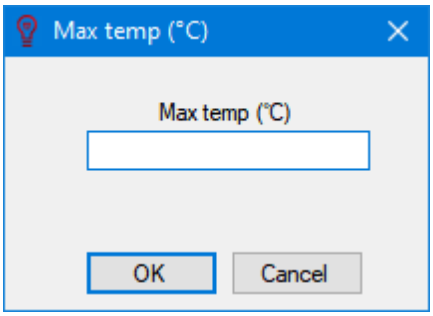
numbering... option at Functions menu and Circuit edit module's Other details tab.



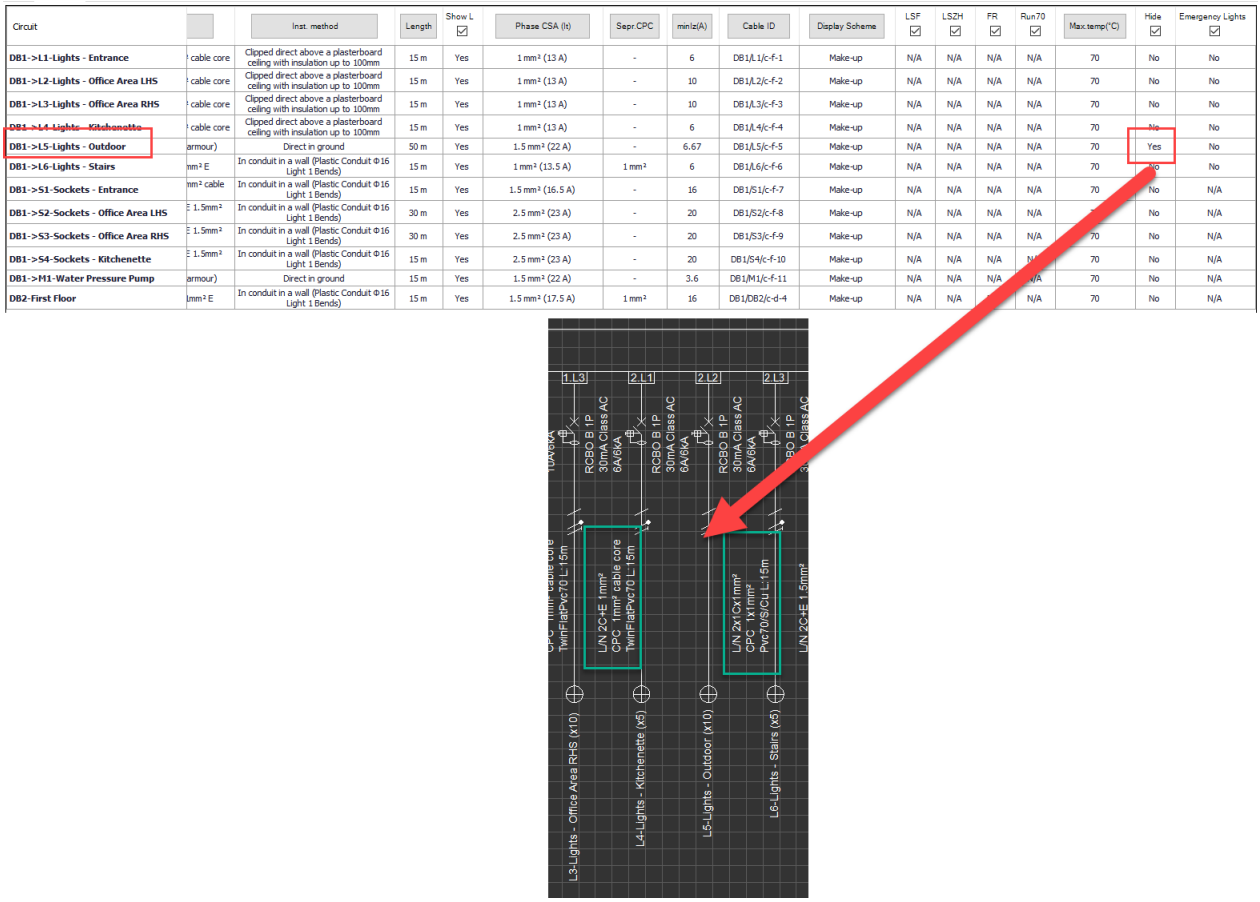
- *Display scheme:* The display scheme of cables can be modified using the title button of this column. More details can be found under title *Predefine Cable Display Scheme* at Project info and options... Menu and at Circuit edit module's Other details tab.



- *LSF/LSZH/FR/Run70 tick boxes:* These will define if a cable is a Low Smoke & Fume, Low Smoke Zero Halogen or a Fire rated/resistant cable. *Run70* will set the selected cable(s) to be calculated as it will run up to 70°C rather than any other higher value which may have been defined by the type of the cable (e.g. an XLPE insulated cable may be run up to 90°C.). The tick box will have effect on only the selected rows but not on the whole column.
- *Max. temp (°C):* This column displays the set maximum temperature, see Ph/N Conductor tab.



- *Hide tick box:* If this box is ticked, then, the data related with selected cable(s) will be hidden on the schematics.

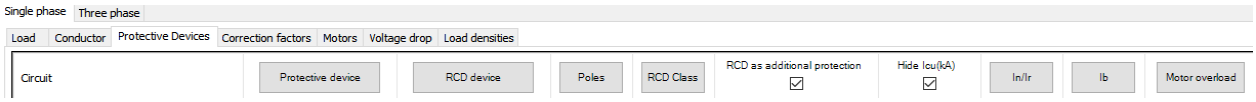


Circuit		Inst. method	Length	Show L	Phase CSA (It)	Sepr.CPC	minIz(A)	Cable ID	Display Scheme	LSF	LSZH	FR	Run70	Max.temp(°C)	Hide	Emergency Lights
DB1->L1-Lights - Entrance	cable core	Clipped direct above a plasterboard ceiling with insulation up to 100mm	15 m	Yes	1 mm² (13 A)	-	6	DB1/L1/c-f-1	Make-up	N/A	N/A	N/A	N/A	70	No	No
DB1->L2-Lights - Office Area LHS	cable core	Clipped direct above a plasterboard ceiling with insulation up to 100mm	15 m	Yes	1 mm² (13 A)	-	10	DB1/L2/c-f-2	Make-up	N/A	N/A	N/A	N/A	70	No	No
DB1->L3-Lights - Office Area RHS	cable core	Clipped direct above a plasterboard ceiling with insulation up to 100mm	15 m	Yes	1 mm² (13 A)	-	10	DB1/L3/c-f-3	Make-up	N/A	N/A	N/A	N/A	70	No	No
DB1->L4-Lights - Kitchenette	cable core	Clipped direct above a plasterboard ceiling with insulation up to 100mm	15 m	Yes	1 mm² (13 A)	-	6	DB1/L4/c-f-4	Make-up	N/A	N/A	N/A	N/A	70	No	No
DB1->L5-Lights - Outdoor	armour)	Direct in ground	50 m	Yes	1.5 mm² (22 A)	-	6.67	DB1/L5/c-f-5	Make-up	N/A	N/A	N/A	N/A	70	Yes	No
DB1->L6-Lights - Stairs	mm² E	In conduit in a wall (Plastic Conduit Φ16 Light 1 Bends)	15 m	Yes	1 mm² (13.5 A)	1 mm²	6	DB1/L6/c-f-6	Make-up	N/A	N/A	N/A	N/A	70	No	No
DB1->S1-Sockets - Entrance	mm² cable	In conduit in a wall (Plastic Conduit Φ16 Light 1 Bends)	15 m	Yes	1.5 mm² (16.5 A)	-	16	DB1/S1/c-f-7	Make-up	N/A	N/A	N/A	N/A	70	No	N/A
DB1->S2-Sockets - Office Area LHS	E 1.5mm²	In conduit in a wall (Plastic Conduit Φ16 Light 1 Bends)	30 m	Yes	2.5 mm² (23 A)	-	20	DB1/S2/c-f-8	Make-up	N/A	N/A	N/A	N/A	70	No	N/A
DB1->S3-Sockets - Office Area RHS	E 1.5mm²	In conduit in a wall (Plastic Conduit Φ16 Light 1 Bends)	30 m	Yes	2.5 mm² (23 A)	-	20	DB1/S3/c-f-9	Make-up	N/A	N/A	N/A	N/A	70	No	N/A
DB1->S4-Sockets - Kitchenette	E 1.5mm²	In conduit in a wall (Plastic Conduit Φ16 Light 1 Bends)	15 m	Yes	2.5 mm² (23 A)	-	20	DB1/S4/c-f-10	Make-up	N/A	N/A	N/A	N/A	70	No	N/A
DB1->M1-Water Pressure Pump	armour)	Direct in ground	15 m	Yes	1.5 mm² (22 A)	-	3.6	DB1/M1/c-f-11	Make-up	N/A	N/A	N/A	N/A	70	No	N/A
DB2-First Floor	mm² E	In conduit in a wall (Plastic Conduit Φ16 Light 1 Bends)	15 m	Yes	1.5 mm² (17.5 A)	1 mm²	16	DB1/DB2/c-d-4	Make-up	N/A	N/A	N/A	N/A	70	No	N/A

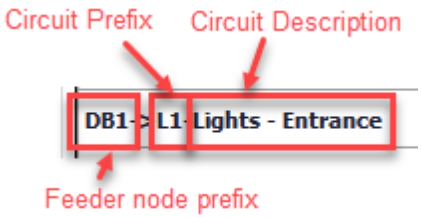
- *Emergency Lights tick box: See Incorporates Emergency Lighting tick box* which is located in Definition section of the Circuit Edit module tab.

Protective Devices Tab

Protective Devices tab displays protective devices and related options for a circuit. There are 10 columns:

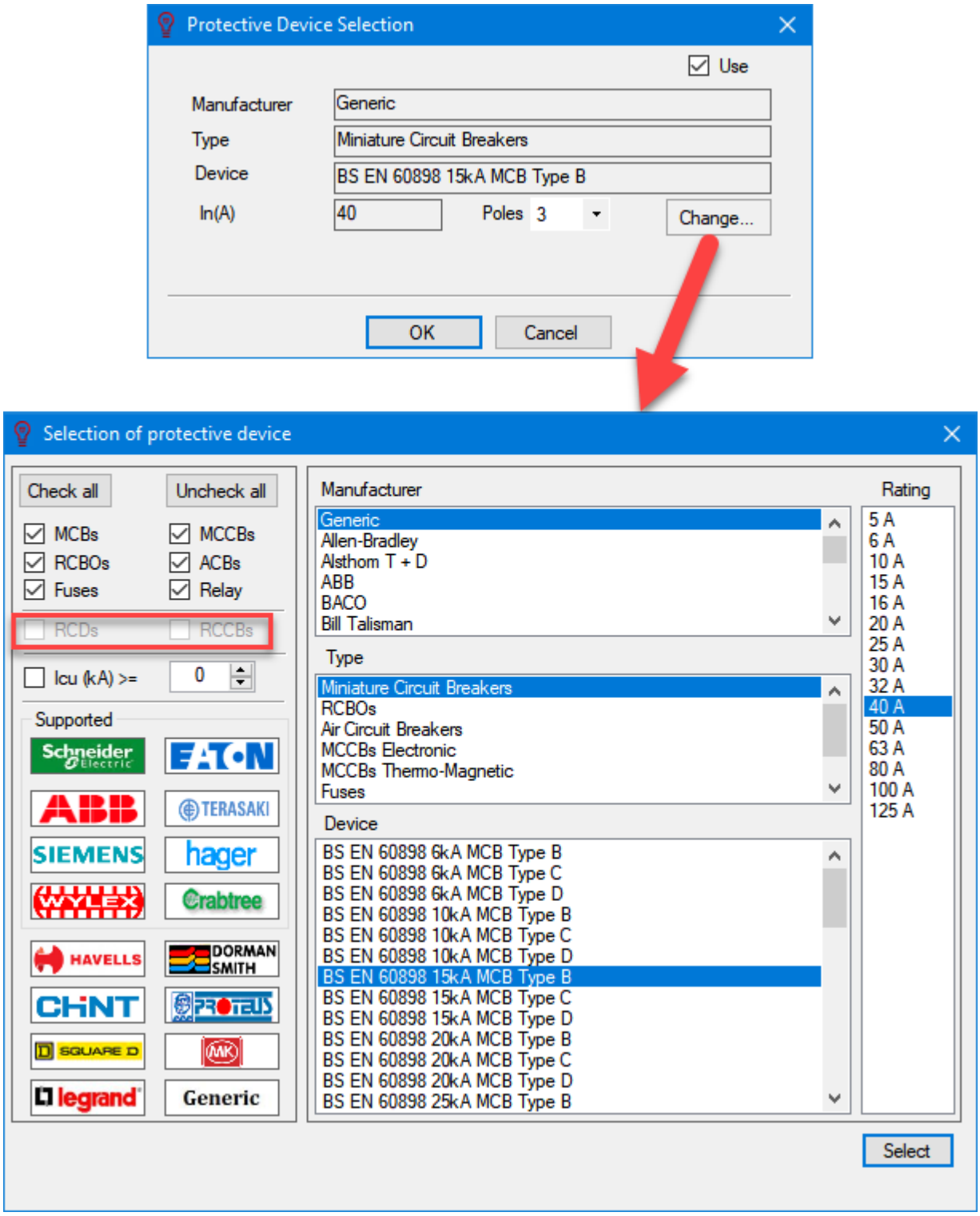


- *Circuit:* This column displays the circuits' description including the feeder nodes' prefixes.

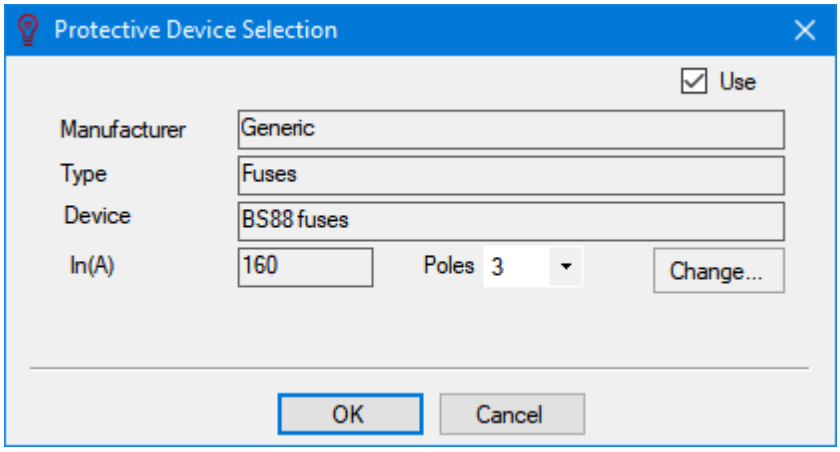


- *Protective device:* This column displays the circuit protection device of a circuit. It is important to notice an RCD is not considered as a circuit protection device and is displayed under the RCD device column. Also for information, this column represents the *Circuit Protection* subordinate tab (not *Incomer disconnection/Isolation* tab) of Protective Devices tab of the Circuit Edit module for distribution circuits.

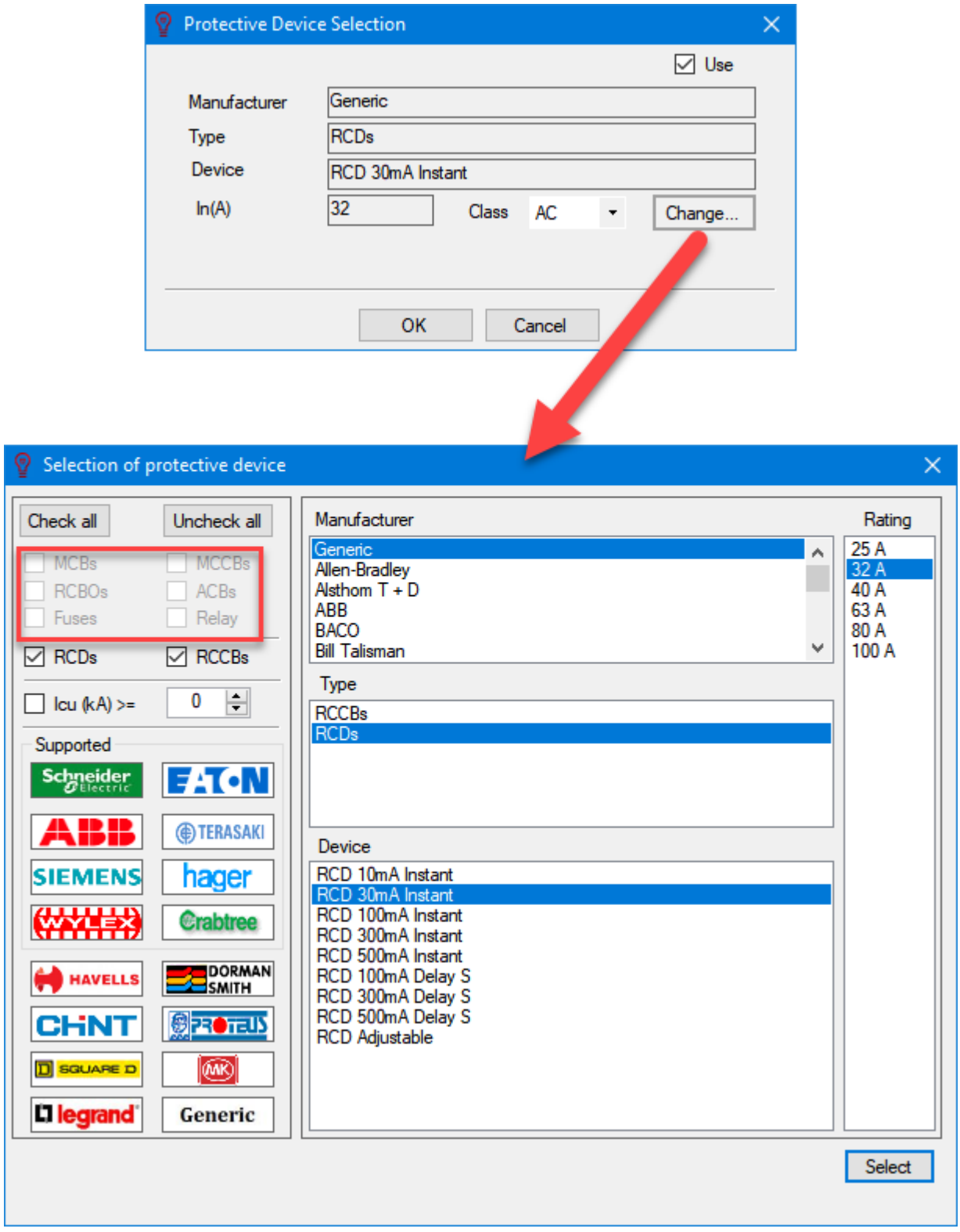
Once clicked on the title button, Protective Device Selection window is displayed where the user may modify the device by using the *Change...* button or may chose not to use one using the *Use* tick box. Change button will initiate the *Selection of protective device* window. RCD and RCCB options are disabled.



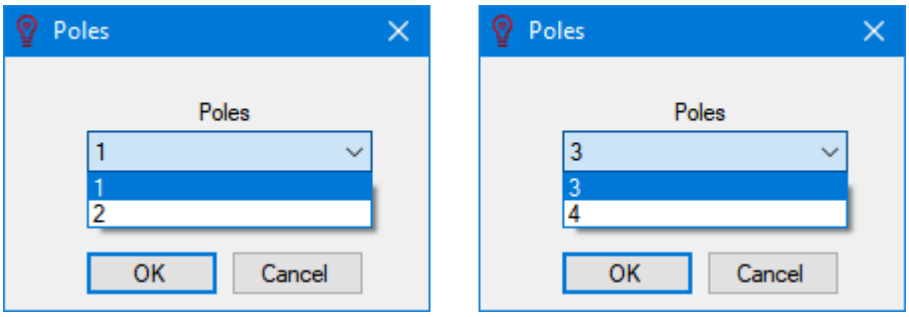
If there was no circuit protective device defined, then, once the title button is clicked, a default selection of 160A BS88 fuse will be displayed. The user may select the required device using the *Change...* button.



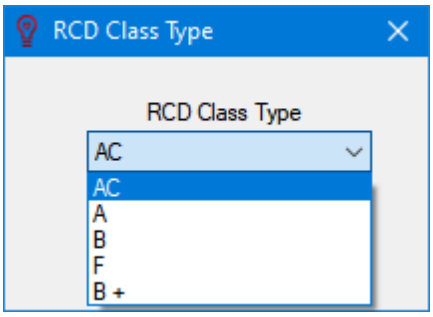
- *RCD device:* This column displays any RCDs used for a circuits. The title button will initiate the *Protective Device Selection* window and *Change...* button will initiate the *Selection of protective device* window where this time options other than RCD and RCCB will be unavailable.



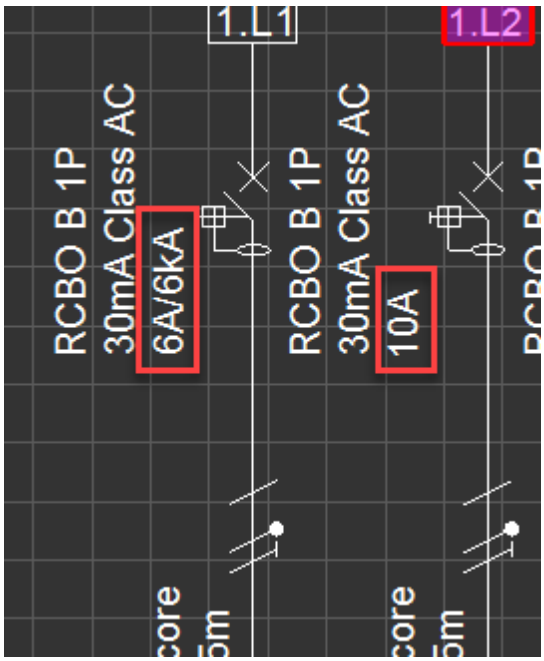
- *Poles:* This column displays the number of poles of the protective device used. The user may choose to modify this value by using the title button. The options will differ if the selected circuit is a single- or three-phase circuit.



- *RCD Class:* This column displays the class if the RCD used with a circuit. This can be modified by using the title button.



- *RCD as additional protection:* The user can mark an RCD as additional protection device by selected required circuits and ticking this tick box.
- *Hide Icu(kA)*: This column displays the visual state of breaking capacity if the protective device. If it is hidden then the Icu of the selected protective device(s) will be visible on schematics.



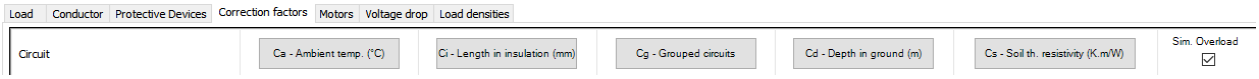
- *In/Ir:* This column displays the rating of the protective device. If an adjustable device is used this column

will display the set value. This column cannot be modified by the user.

- *Ib:* This column displays the design current of a circuit. This column cannot be modified by the user.
- *Motor overload:* This column will display the overload current due to a motor on a circuit. This value will be the current set for a motor starter (see, Motor settings) or if no starter is used, it will be equal to the design current. This column cannot be modified by the user.

Correction factors (Rating factors) Tab

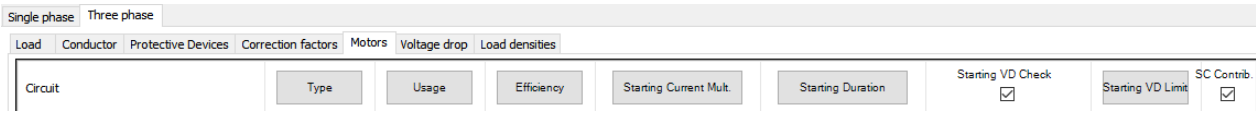
Correction factors tab will help the user to see and modify the rating factors of all circuits connected to a selected node by using this tab. There are 7 columns which title buttons can be used to modify the selected values:



- *Circuit:* This column displays the circuits' description including the feeder nodes' prefixes.
- *Ca - Ambient temp (°C)*
- *Ci - Length in insulation (mm)*
- *Cg - Grouped circuits*
- *Cd - Depth in ground (m)*
- *Cs - Soil thermal resistivity (K.m/W)*
- *Sim. Overload:* This column has a tick box under the title and represents a simultaneous overload condition if cables/conductors of a circuit is grouped. If the related cable/conductor is not grouped then the setting has no effect.

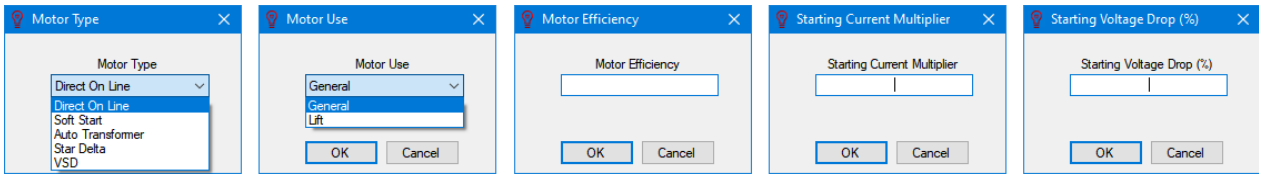
Motors Tab

Motors tab displays setting related with the motor circuits connected to the selected node. This tab has 8 columns which can be used to modify the settings using the title buttons and check box:



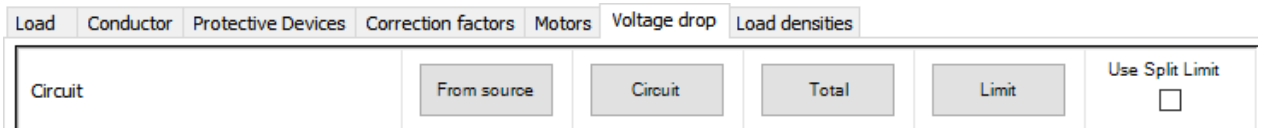
- *Circuit:* This column displays the circuits' description including the feeder nodes' prefixes.
- *Type:* This column displays the connection type of the motor circuit. For more detailed definition please check Motor Settings.
- *Usage:* The user can select between *General* and *Lift* options. For more detailed definition please check Motor Settings.
- *Efficiency:* This column displays the efficiency of a motor.
- *Starting Current Mult.:* This column displays the starting current multiplier of a motor.
- *Starting Duration:* This column displays the starting duration of a motor.

- *Starting VD check tick box:* This column displays if ElectrcialOM will check voltage drop during the start of a motor. For more detailed definition please check Motor Settings.
- *SC Contrib. tick box:* This column will display if ElectrcialOM will assume the motor to be contribute to a short circuit condition. This is only for three-phase motors. For more detailed definition please check Motor Settings.



Voltage drop Tab

Voltage drop tab can be used to review the voltage drop settings of the circuits connected to the selected node. The values cannot be changed by the user directly from this list except the *Use Split Limit* column. In order to change any setting, the user must use the Voltage Drop tab of the Circuit Edit Module. There are 6 columns in total:



- *Circuit:* This column displays the circuits' description including the feeder nodes' prefixes.
- *From source:* This column displays the voltage drop from the source up to the distribution node which the related circuit is connected.
- *Circuit (with a title button):* This column displays the voltage drop from the distribution node up to the end of a circuit.
- *Total:* This is total voltage drop related with a circuit which is basically an addition of *From source* and *Circuit* columns.
- *Limit:* This column displays the total voltage drop limit associated with a circuit.
- *Use Split Limit check box:* This column displays if a circuit's voltage drop is set to be a split percentage between the distribution circuit and the final circuit or a single total value for the whole circuit. This options is opnly availabe for distribtuion circuits and final circuits are marked as N/A. See Voltage Drop tab of the Circuit Edit Module for more details.

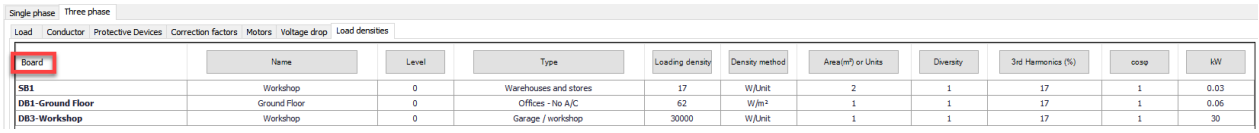
Single phase | Three phase

Load | Conductor | Protective Devices | Correction factors | Motors | Voltage drop | Load densities

Circuit	From source	Circuit	Total	Limit	Use Split Limit ☑
DB1->L1-Lights - Entrance	0.61 %	0.83 %	1.44 %	3 %	N/A
DB1->L2-Lights - Office Area LHS	0.7 %	0.83 %	1.52 %	3 %	N/A
DB1->L3-Lights - Office Area RHS	0.55 %	0.83 %	1.37 %	3 %	N/A
DB1->L4-Lights - Kitchenette	0.61 %	0.24 %	0.85 %	3 %	N/A
DB1->L5-Lights - Outdoor	0.7 %	1.37 %	2.07 %	3 %	N/A
DB1->L6-Lights - Stairs	0.55 %	0.41 %	0.95 %	3 %	N/A
DB1->S1-Sockets - Entrance	0.61 %	0.57 %	1.18 %	5 %	N/A
DB1->S2-Sockets - Office Area LHS	0.7 %	0.45 %	1.15 %	5 %	N/A
DB1->S3-Sockets - Office Area RHS	0.55 %	0.45 %	1 %	5 %	N/A
DB1->S4-Sockets - Kitchenette	0.61 %	0.09 %	0.7 %	5 %	N/A
DB1->M1-Water Pressure Pump	0.7 %	0.53 %	1.23 %	5 %	N/A
DB2-First Floor	0.61 %	0.81 %	1.42 %	1.5 %	Yes
DB2->L1-Lights	1.42 %	0.12 %	1.55 %	3 %	N/A
DB2->S1-Sockets	1.42 %	0.07 %	1.49 %	5 %	N/A
JB	1.42 %	0.09 %	1.52 %	5 %	No
JB->FC14-Lights - Outdoor Sign	1.52 %	0.2 %	1.71 %	3 %	N/A

Load densities Tab

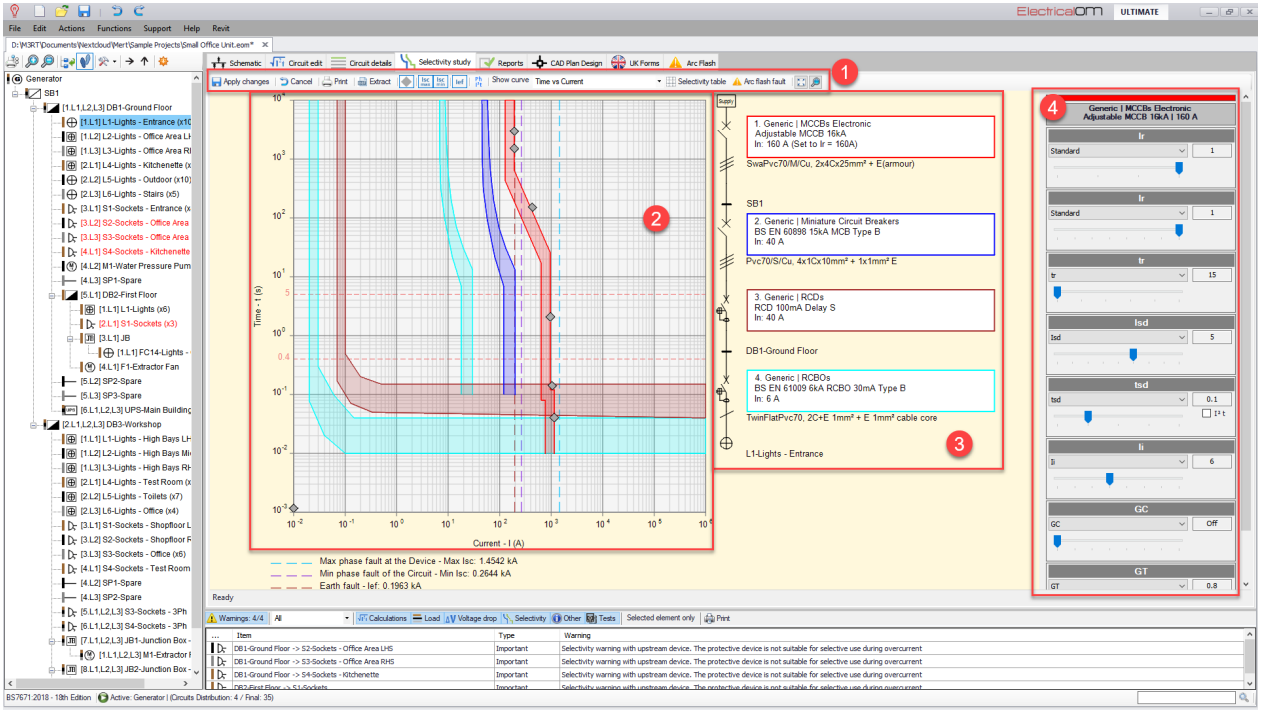
Load densities tab displays load density settings for the boards which are connected to the selected node. It has 11 columns which details can be found in Load density Tab section.



Selectivity Study Module Tab

Selectivity Study Module is used to visualise the related curves and modify the settings of or the protective device itself directly. The module screen consists of:

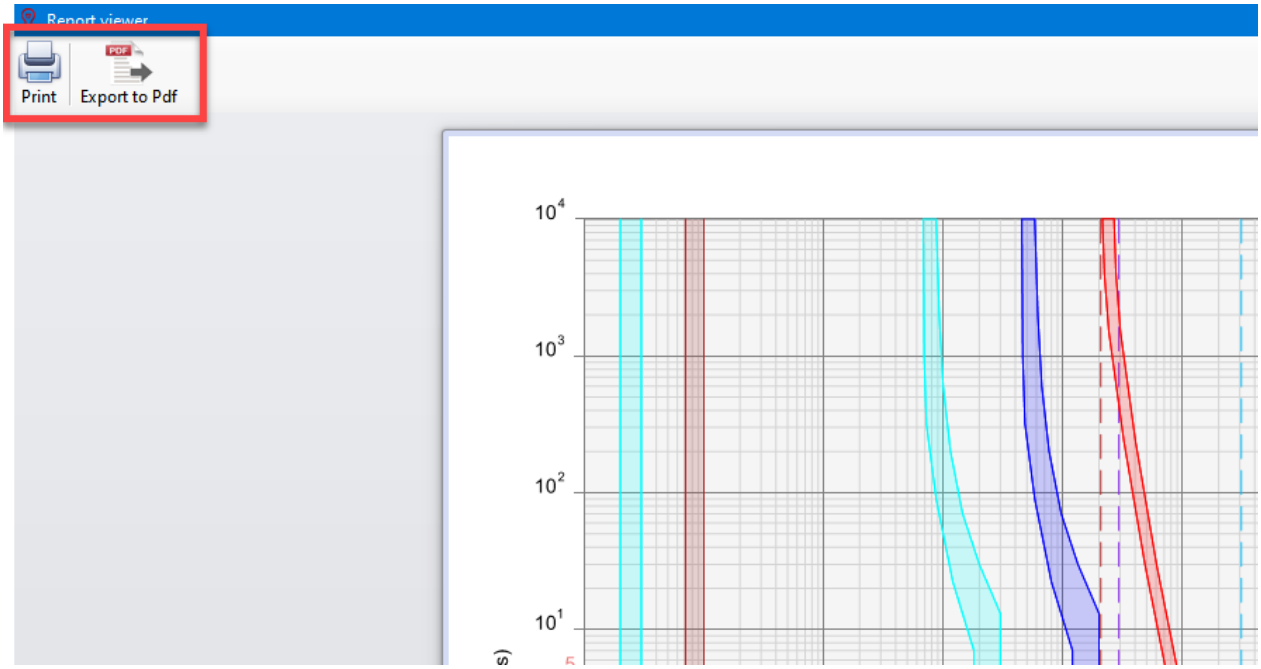
1. a toolbar at the top, see Toolbar.
2. the graphs area, see Graphs and Single Line Diagram Areas.
3. single line diagram area, see Graphs and Single Line Diagram Areas.
4. the side panel on the right, see Side Panel.



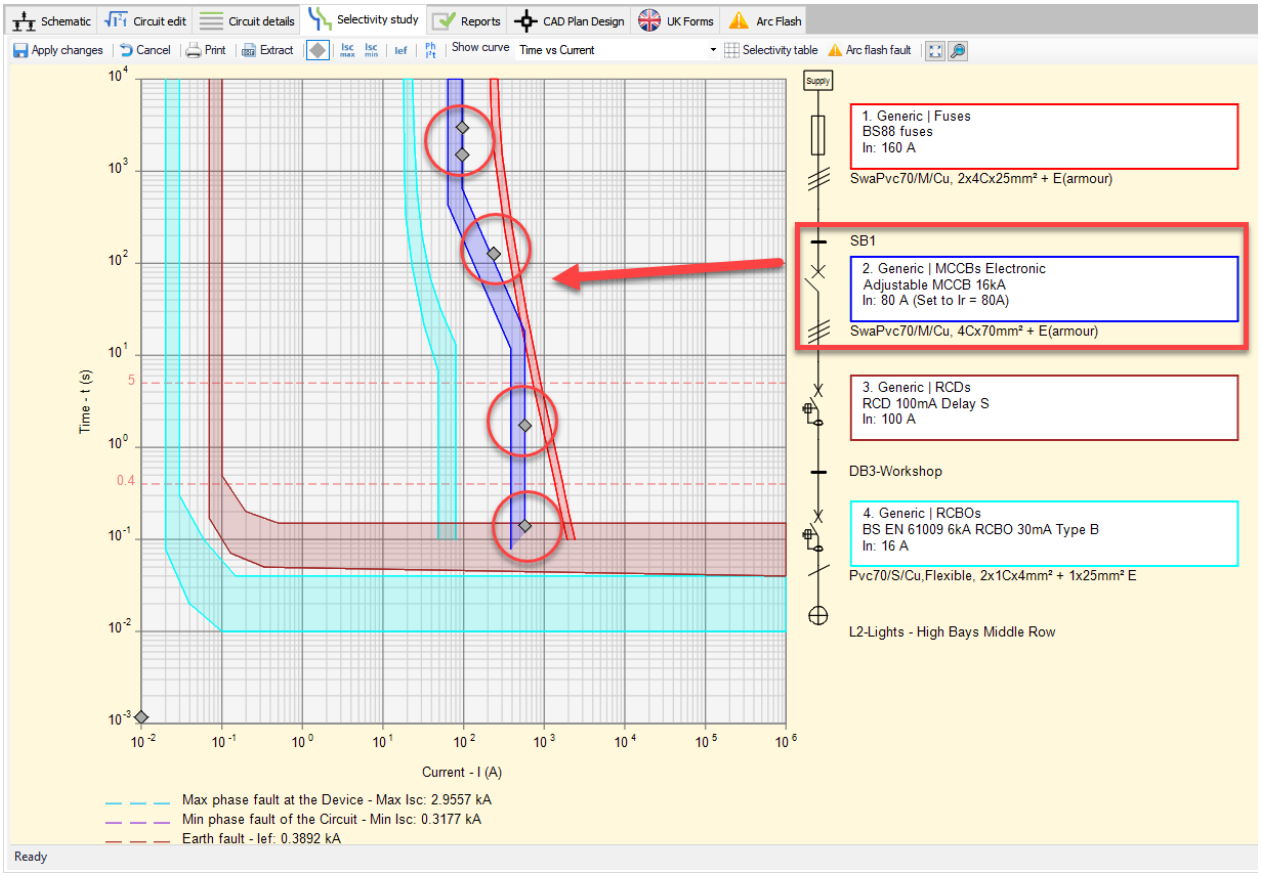
Toolbar

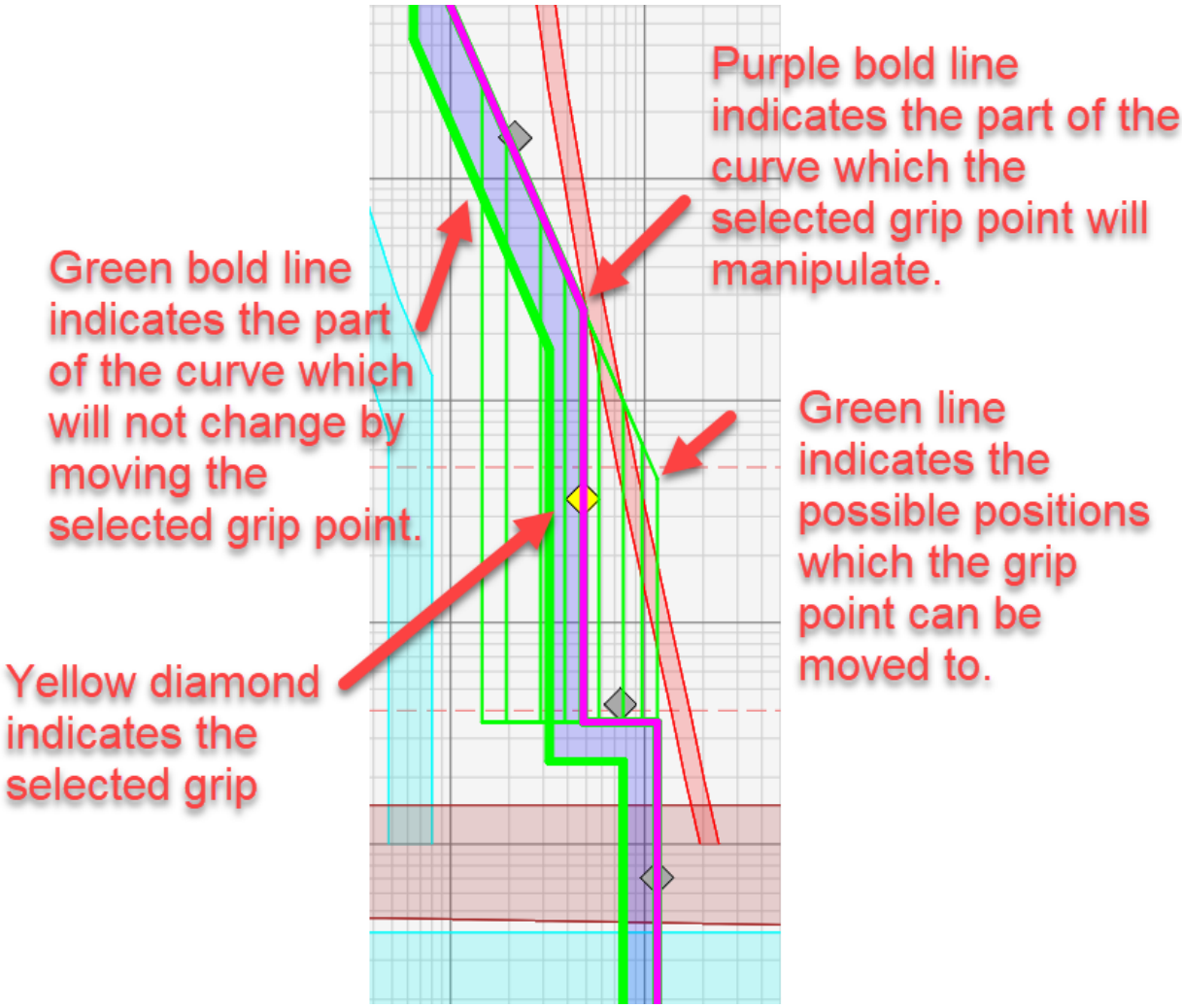
The toolbar has both common buttons like Apply changes, Cancel, Print, and Extract, and module specific buttons and drop down lists.

- *Apply changes* will apply the changes made by the user so ElectricalOM will finalise the calculations and check according to new settings.
- *Cancel* will revert back the changes done by the user to its previous state.
- *Print* button will initialise the print preview screen. This will create a minimum of a two page document which the first page contains the graphs are and the single line diagram area, and the following pages contain any protective device settings if applicable. The user may chose to print the document by using the *Print* button, or to export the document to a PDF file by using the *Export to Pdf* button.

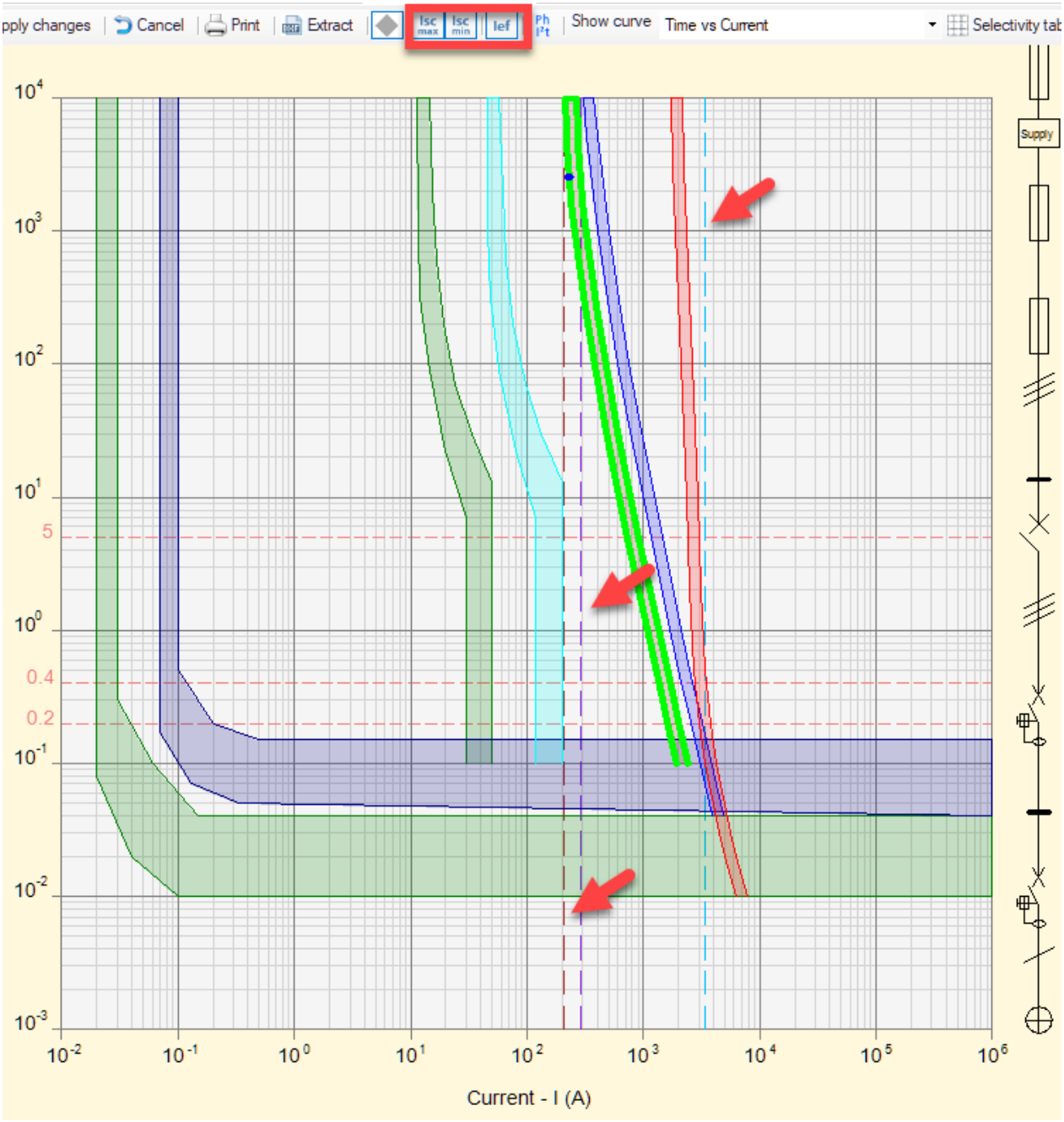


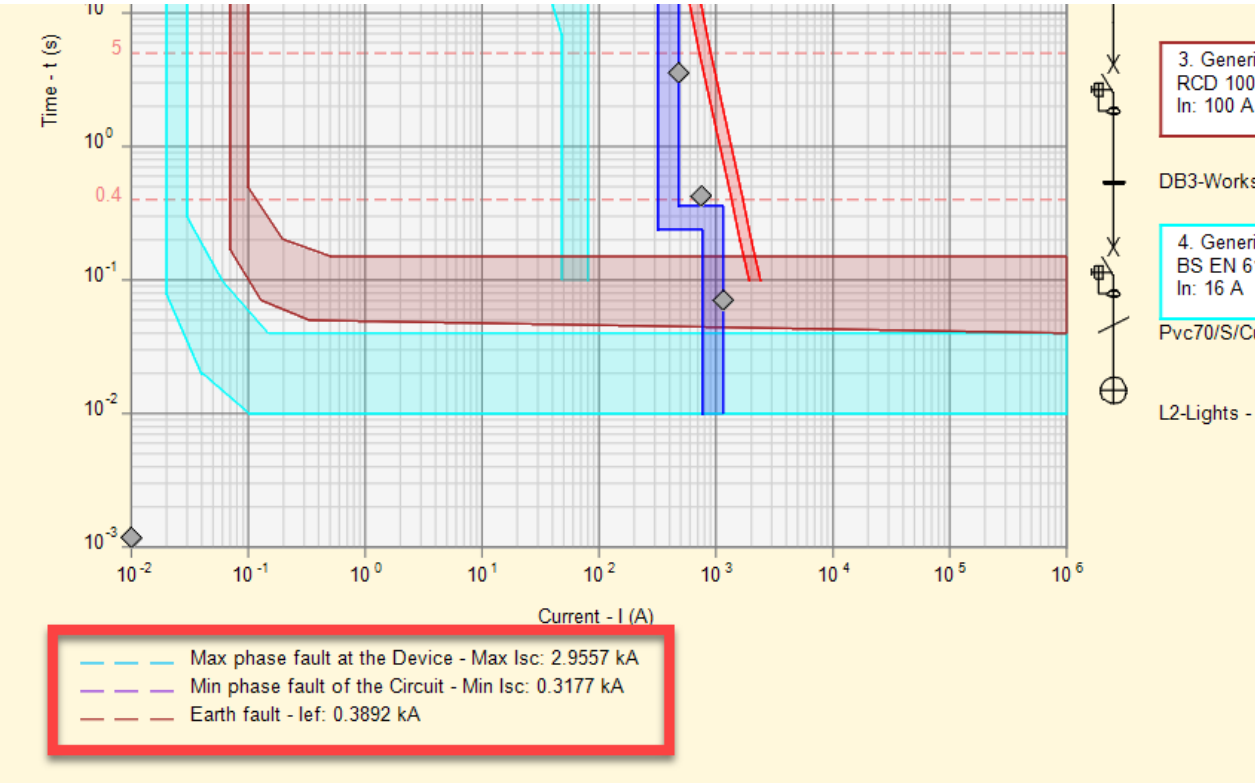
- *Extract* button lets the user to export the contents of the graphs area and the single line diagram area into a CAD format. The pdf option within *Extract* context is not the same as the *Export to Pdf* the latter being a picture format rather than a CAD based drawing.
- *Show/Hide Device Settings Grips:* If a protective device, which settings are adjustable, is selected, then, various diamond shaped grip point will be displayed on the related curve to represent the adjustable values of the protective device. The use can use these grip points to manipulate the related setting by simply by holding left mouse button depressed and moving the grip point. Allowed position which correspond to allowed values will be highlighted by ElectricalOM with green colour when the grip point is selected. It is also need pointing out that these grips will only available on the Time vs Current graph, see below.


Schematic
Circuit edit
Circuit details
Selectivity study
Reports
CAD Plan Design
UK Forms
Arc Flash
Apply changes
Cancel
Print
Extract
Show curve
Time vs Current
Selectivity table
Arc flash fault
Time - t (s)
Current - I (A)
Max phase fault at the Device - Max Isc: 2.9557 kA
Min phase fault of the Circuit - Min Isc: 0.3177 kA
Earth fault - Ief: 0.3892 kA
Supply
1. Generic | Fuses
BS88 fuses
In: 160 A
SwaPvc70/M/Cu, 2x4Cx25mm² + E(armour)
SB1
2. Generic | MCCBs Electronic
Adjustable MCCB 16kA
In: 80 A (Set to Ir = 80A)
SwaPvc70/M/Cu, 4Cx70mm² + E(armour)
3. Generic | RCDs
RCD 100mA Delay S
In: 100 A
DB3-Workshop
4. Generic | RCBOs
BS EN 61009 6kA RCBO 30mA Type B
In: 16 A
Pvc70/S/Cu,Flexible, 2x1Cx4mm² + 1x25mm² E
L2-Lights - High Bays Middle Row
Ready

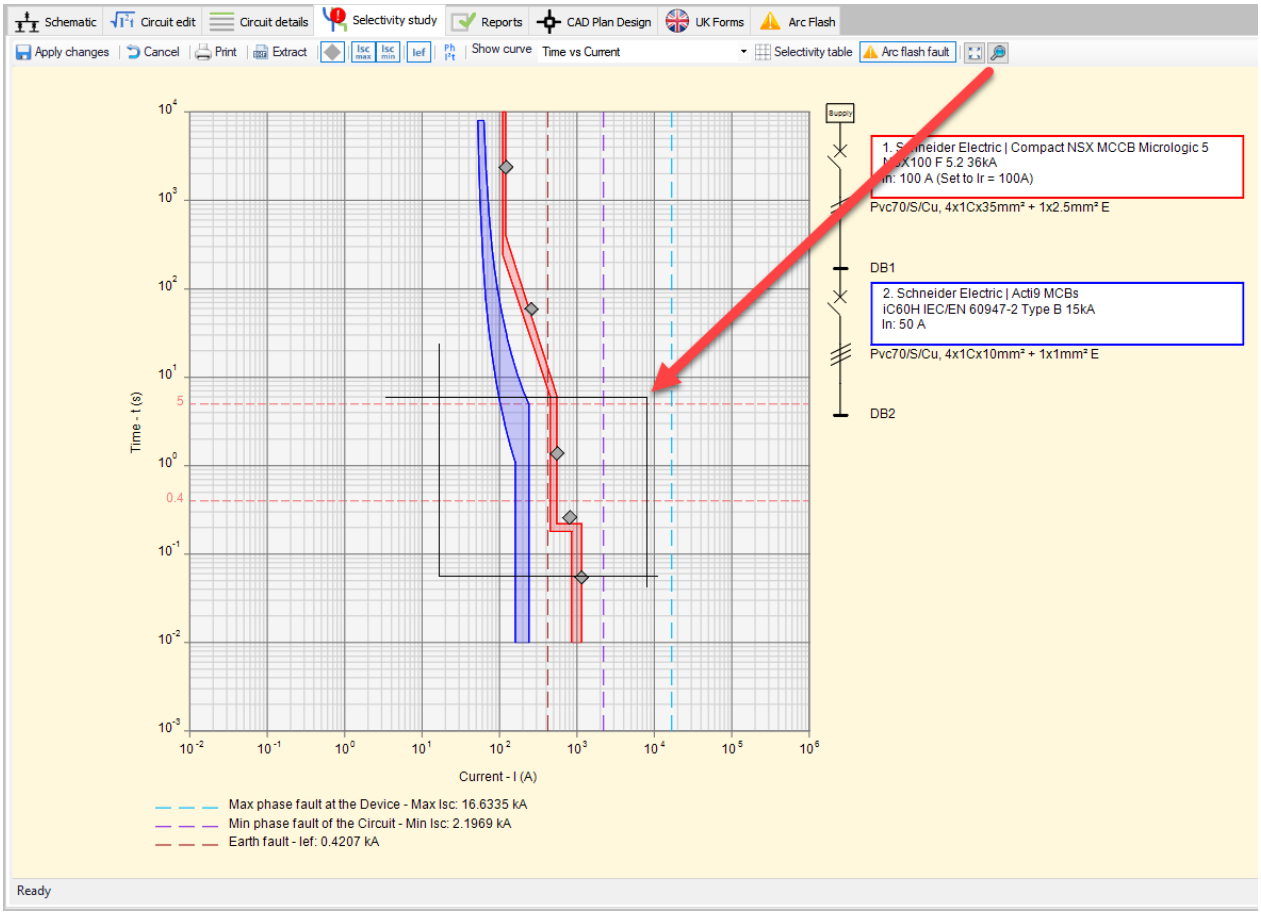


- *maxIsc/minIsc/Ief/Phase conductor withstand energy*: These buttons will show or hide the corresponding values on the graph with dashed lines. They are colour coded and a legend is available under the graph to describe used colours and the corresponding line together with corresponding values.


pply changes
Cancel
Print
Extract
Isc max
Isc min
Ief
Ph I²t
Show curve
Time vs Current
Selectivity tab
Supply
10⁴
10³
10²
10¹
5
10⁰
0.4
0.2
10⁻¹
10⁻²
10⁻³
10⁻²
10⁻¹
10⁰
10¹
10²
10³
10⁴
10⁵
10⁶
Current - I (A)

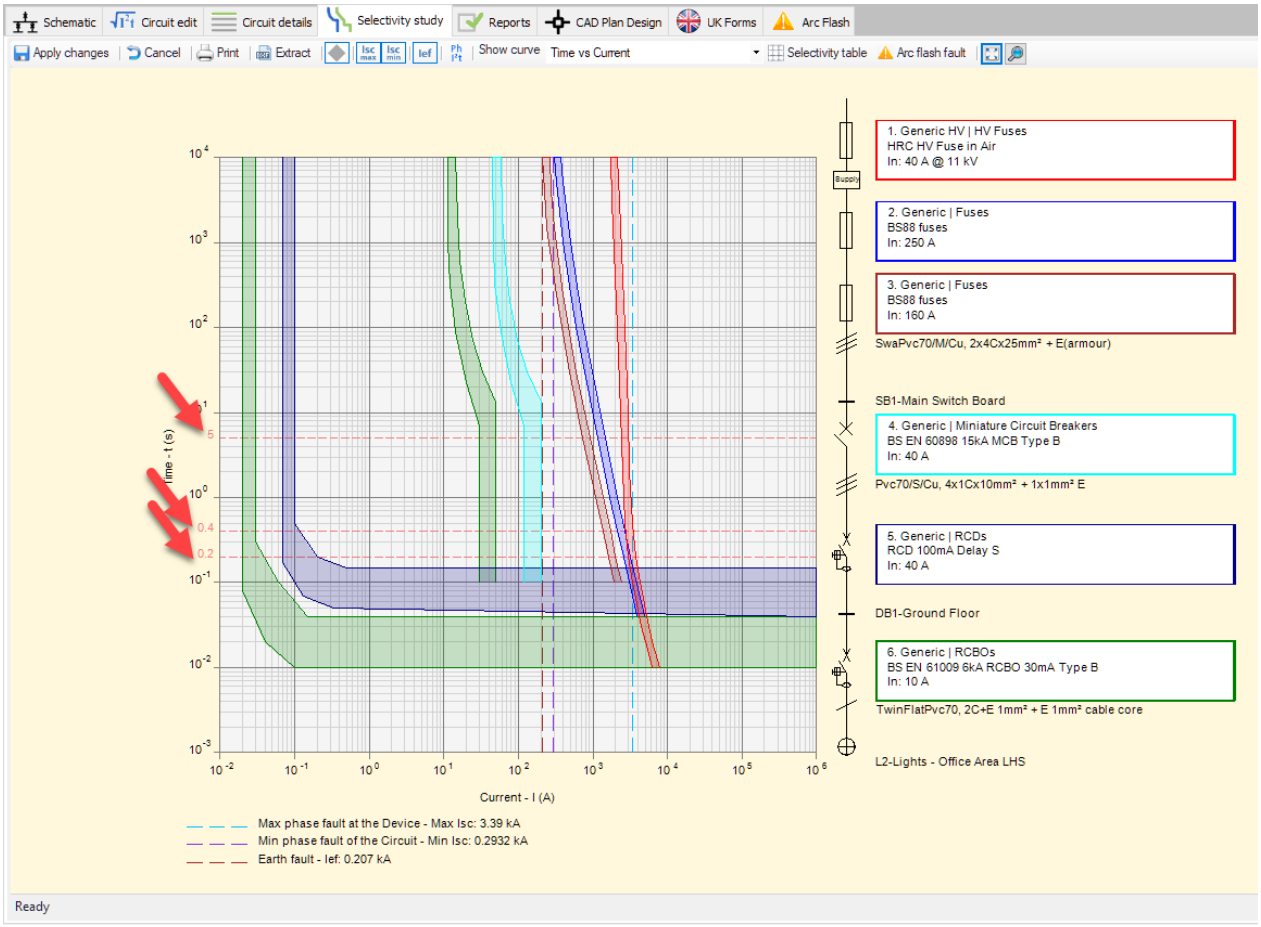


- *Show curve* drop down list is used to select which graph will be shown in the graphs area. There are three graph options available:
  - Time vs Current, see Time vs Current Graph.
  - Let-through Energy vs Current, see Let-through Energy vs Current Graph.
  - Limited Current vs Current, see Limited Current vs Current Graph.
- *Selectivity table* button, see Selectivity table section.
- *Arc Flash fault* button, see Arc Flash Tab section.
- *Zoom to extends* button will zoom in or out to fit the graphs and the single time diagram to the screen.
- *Zoom* button will let the user to select the area to zoom in. In order to use the function, the user need to click on this button and then select an area from the graph or single line diagram area by clicking the left mouse button within the area and dragging the mouse cursor to select the region and clicking again with the left mouse button.



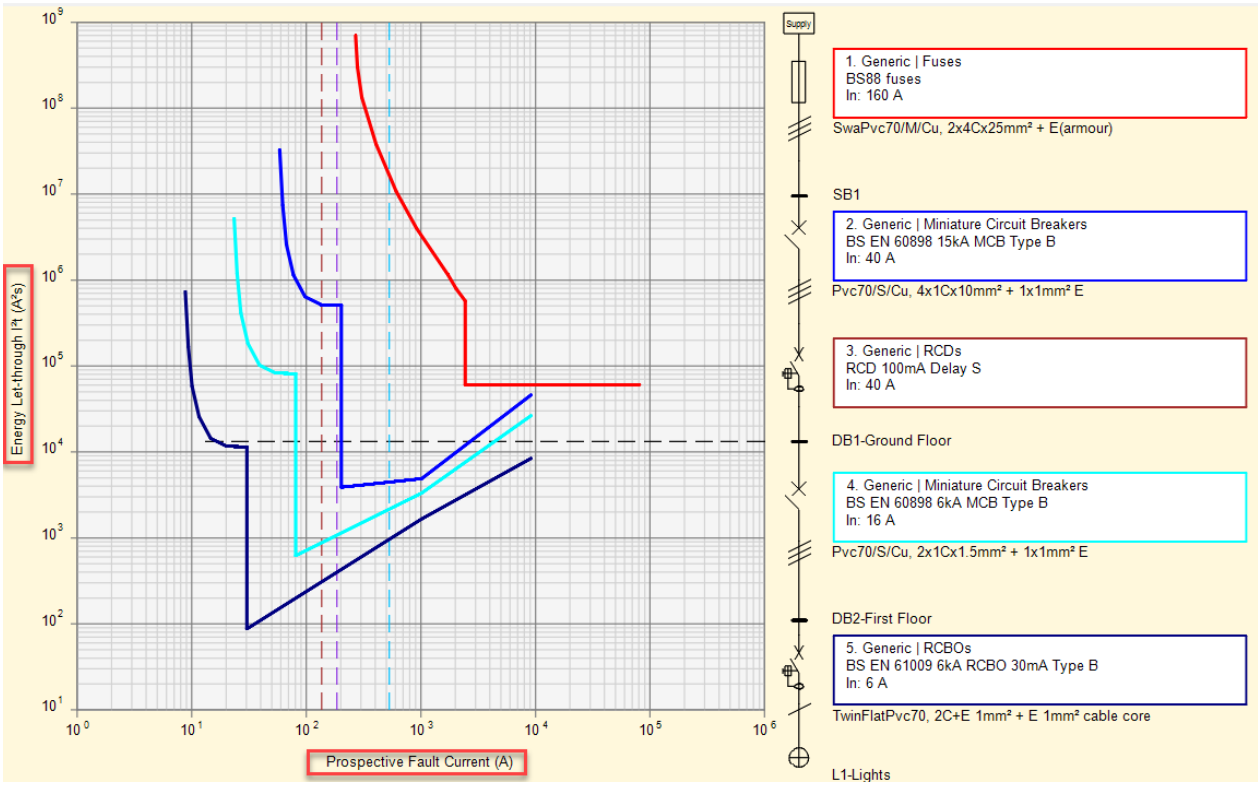
Time vs Current Graph

Time versus Current graph has *Current - I (A)* as x-axis and *Time -t (sec)* as y-axis and displays data for all protective devices used on the selected circuit based on either BS7671 if a generic device is used, or manufacturer's data if a brand is selected. ElectricalOM will also display relevant disconnection time thresholds as red dashed lines on the graph parallel to x-axis.



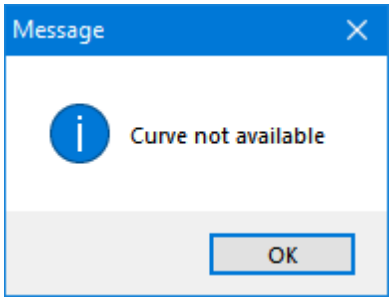
Let-through Energy vs Current Graph

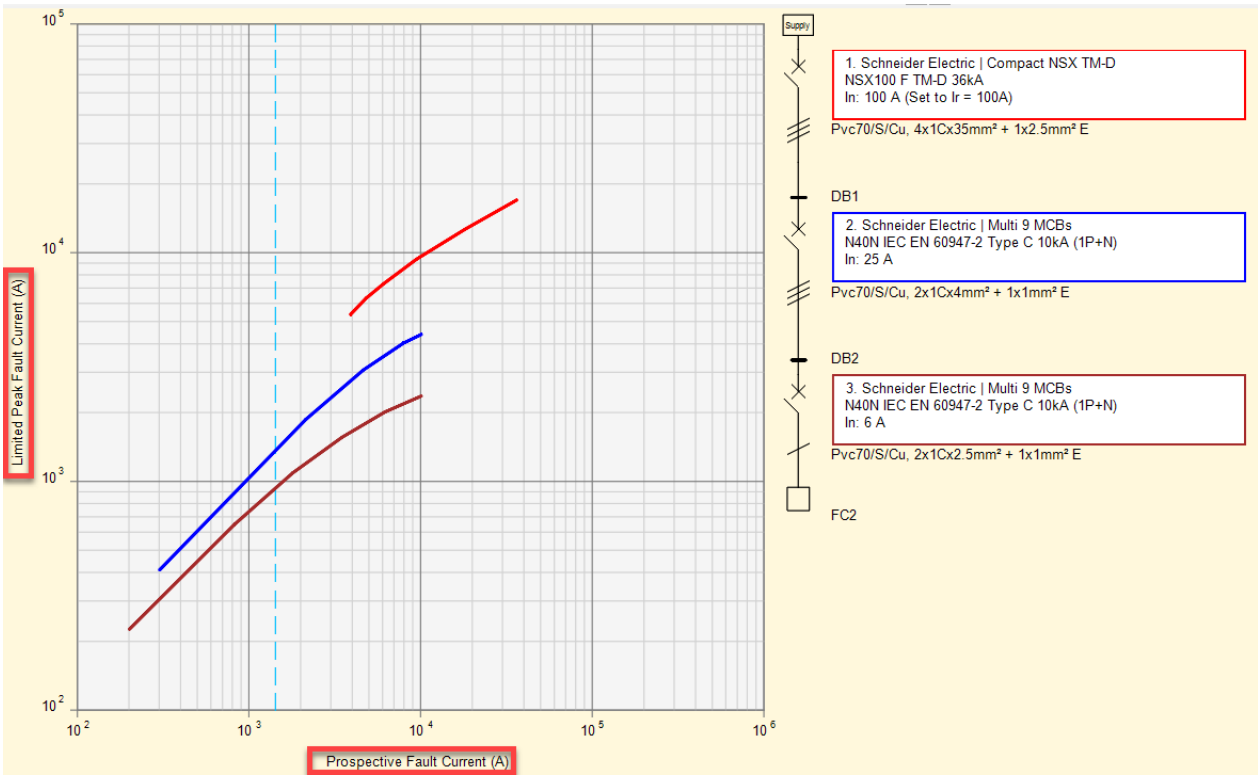
Let-through Energy versus Current graph's x-axis is marked as *Prospective Fault Current (A)* where the y-axis is marked as *Energy Let-through I^2t (A^2s)*. This graph also uses BS7671 data if a generic device is selected, or manufacturer's data if a brand is selected for any protection device on the circuit.



Limited Current vs Current

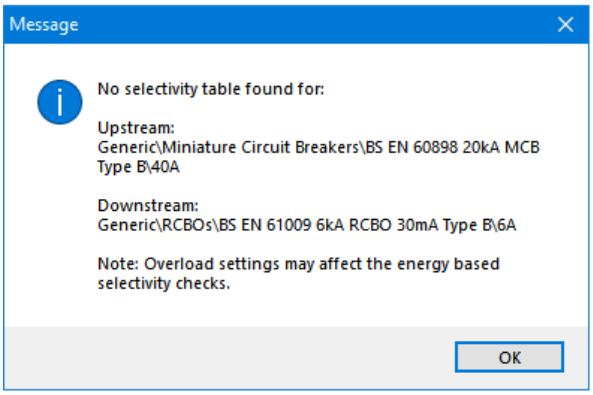
Limited Current versus Current graph will show the curves of protective devices used on the selected circuit only if branded devices used. If a generic device is used on the circuit, as there is no curve exists for a generic device, the graph will not be available and ElectricalOM will warn the used with a pop up window. This graph's x-axis is marked as *Limited Peak Fault Current (A)* where the y-axis is marked as *Prospective Fault Current (A)*.

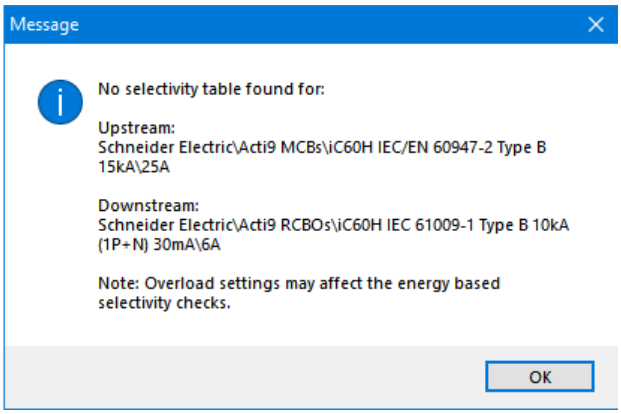




Selectivity table

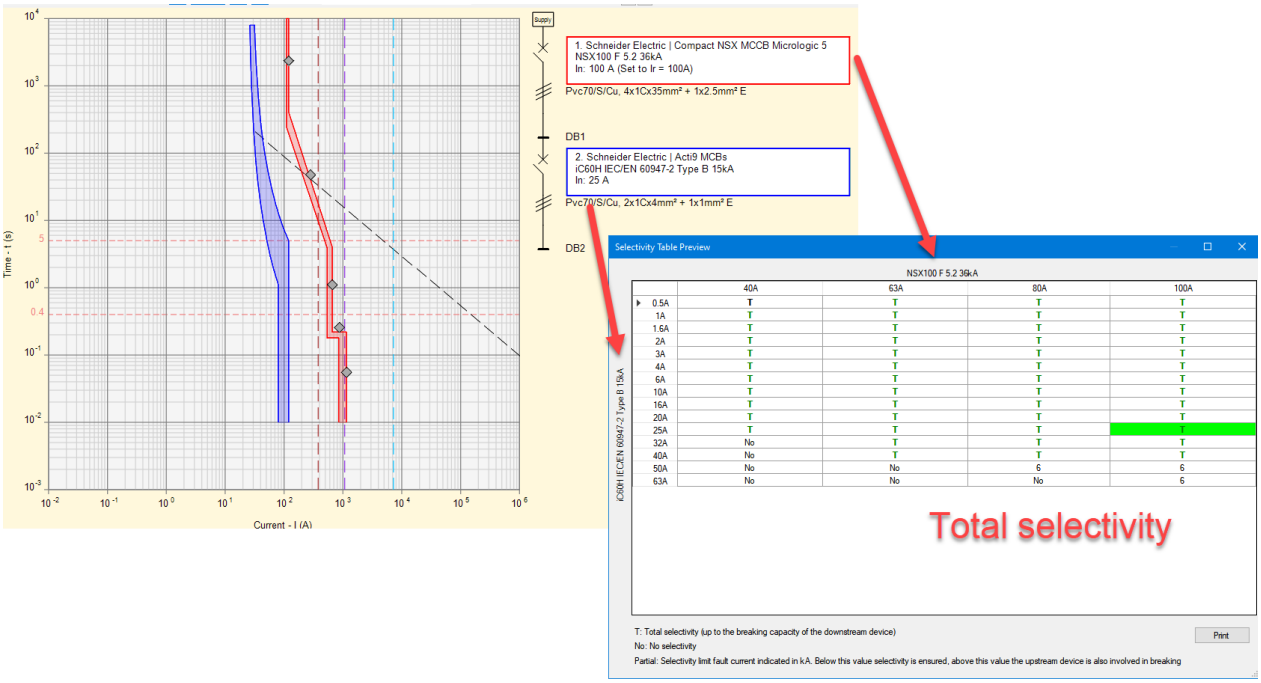
Selectivity table button will display manufacturer's selectivity tables if available. If there is no data provided by the manufacturer for the protective devices used on the selected circuit in regards to the selectivity, or a generic device is used, then, ElectricalOM will inform the user by means of a pop up window.



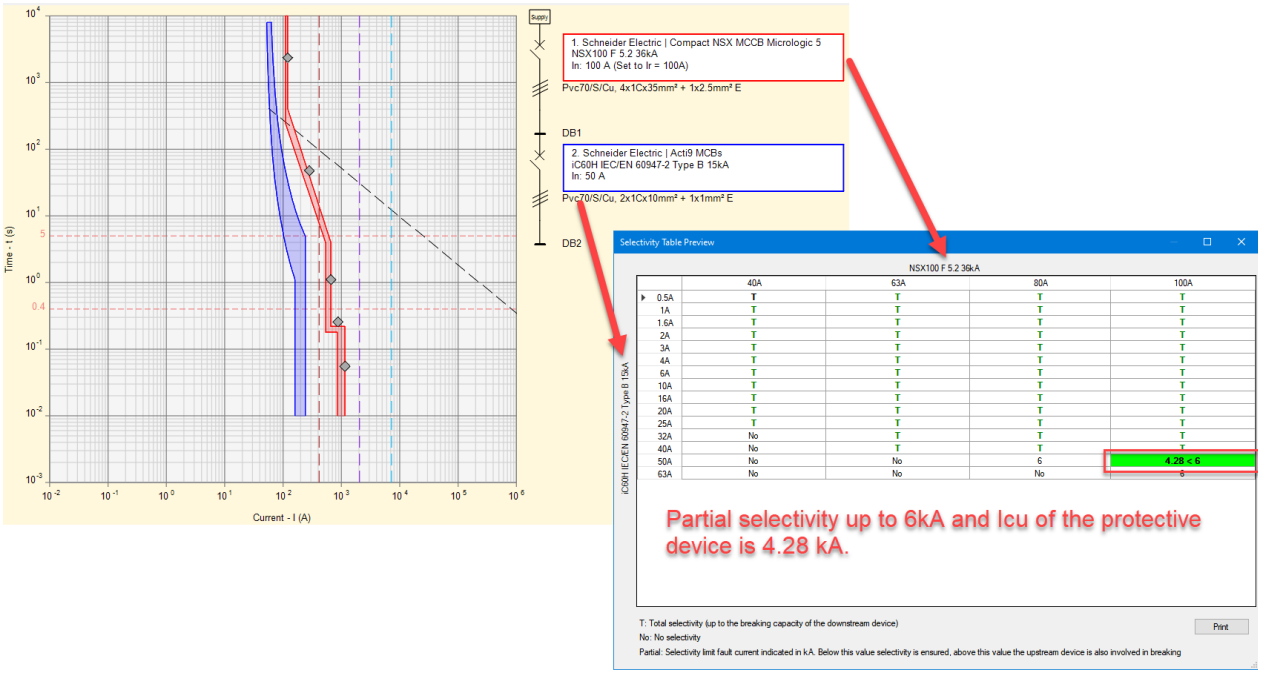


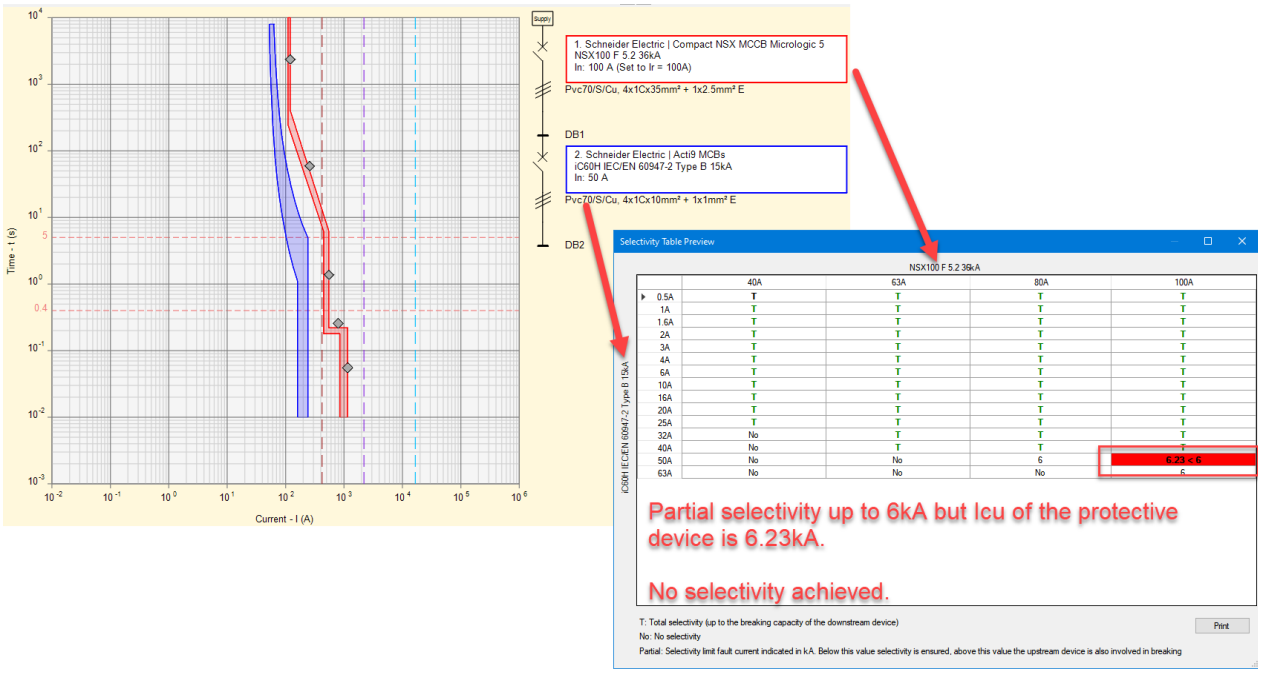
If the manufacturer data is available then ElectricalOM will display the Selectivity Table Preview window. Columns will correspond to the current rating of the upstream device where the rows correspond to the current rating of the downstream device. The cells of the selectivity table will have 3 different values:

- *T* means total selectivity is achieved up to the breaking capacity of the downstream device,
- *No* means there is no selectivity between the upstream and downstream device, or
- A number which represents a partial selectivity. The value is the maximum fault current in kA which selectivity is achieved. Any fault level above this value, selectivity is not achieved.

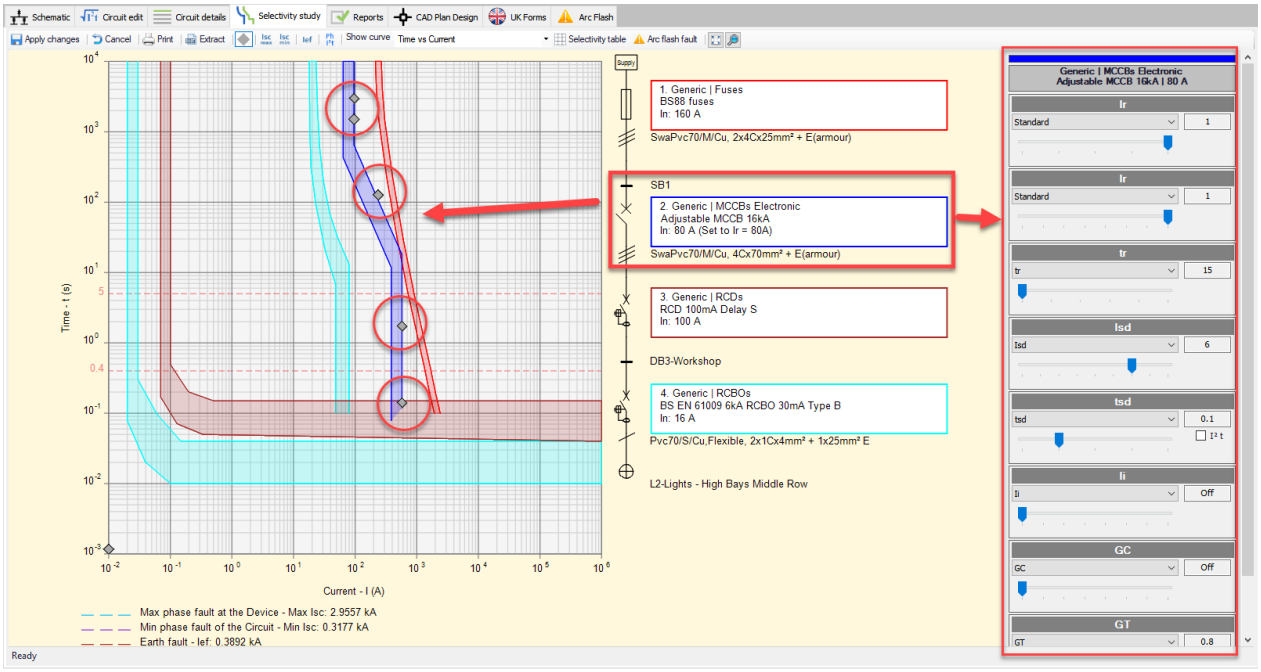


If two device is selected where a partial selectivity is achieved, then ElectrcialOM will display the actual breaking capacity of the downstream device and the max. fault current limit for partial selectivity. If the cell is highlighted in green, which means selectivity is achieved up to the breaking capacity of the downstream device, then the user may opt to use the modelled combination at the users own risk. If the cell is highlighted in red, which means the breaking capacity of the downstream device is higher than the max. fault current which selectivity is achieved, then the combination is not achieving any selectivity within required region and should not be used.





Icu of the protective device is also shown on Circuit Edit module's Protective Devices tab.

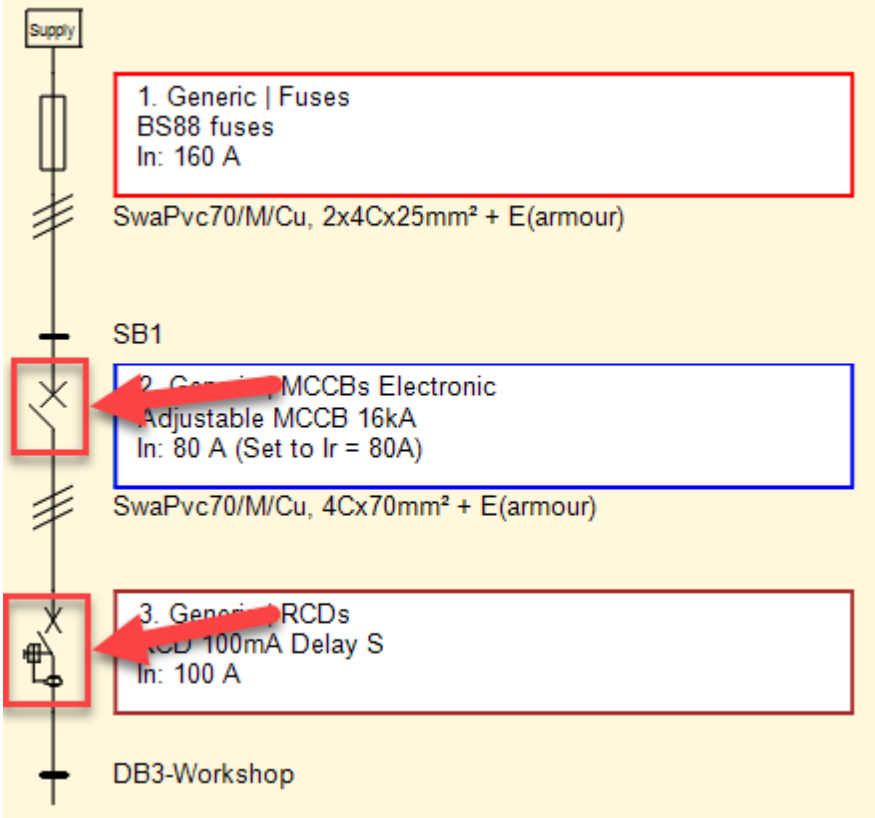


Single line diagram will dynamically change as the user selects different circuits and nodes on the system tree section.

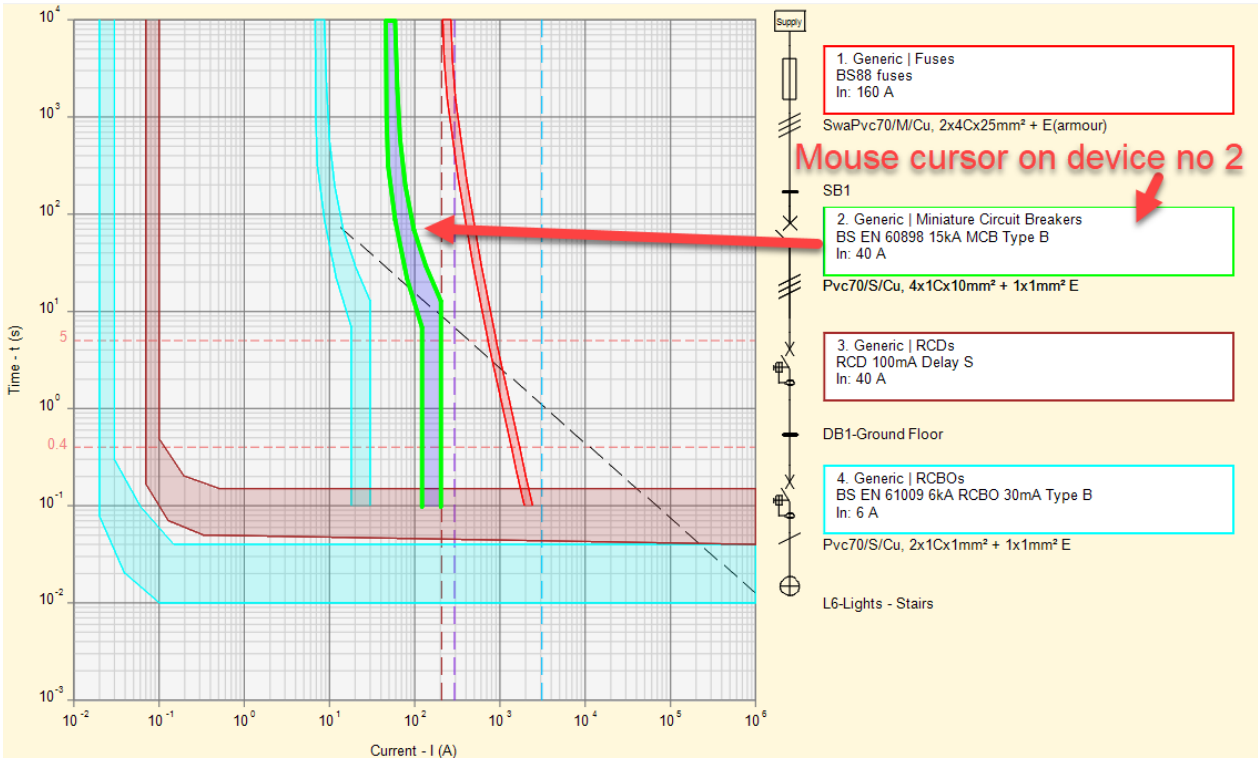
Graphs and Single Line Diagram Areas

Graphs area and *Single Line Diagram* area are where the selected graphs from the toolbar is shown together with a single line diagram of the selected node originated from the active source. This region is reactive to mouse activity: Depressing the mouse wheel and dragging the screen will let the user to navigate, and using the mouse wheel will zoom in or zoom out.

Single Line Diagram will dynamically change as the user selects different nodes from the System Tree Section. The diagram will indicate if a device is an overload device or an RCD with different symbols, and will also indicate if the conductor/cable is a three phase or a single phase.

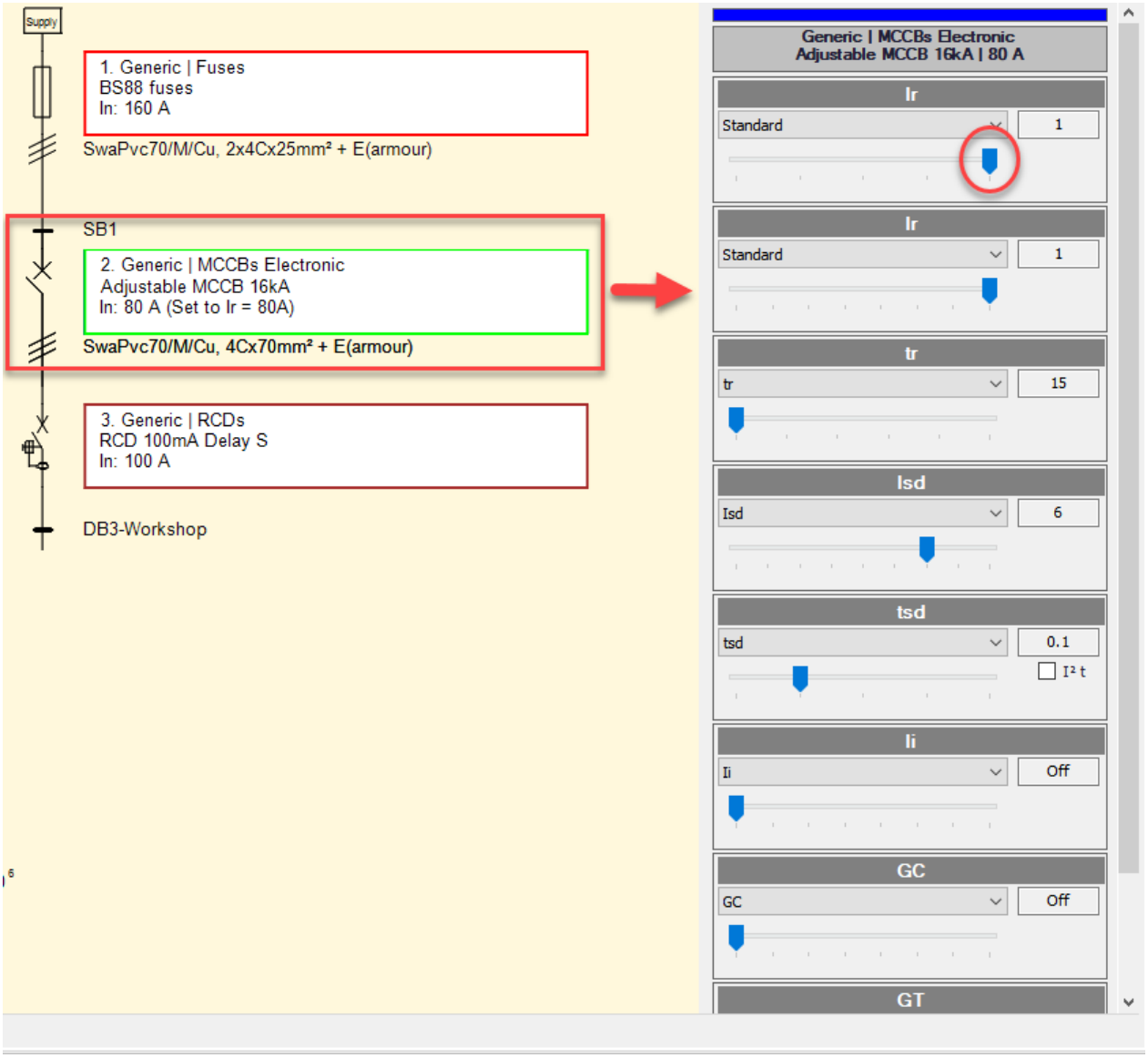


The data boxes next to the protective devices are colour coded and they are matched with the curves shown on the graphs. As teh user hovers on these boxes, ElectricalOM will highlight the data box and the corresponding curve with green.



Side Panel

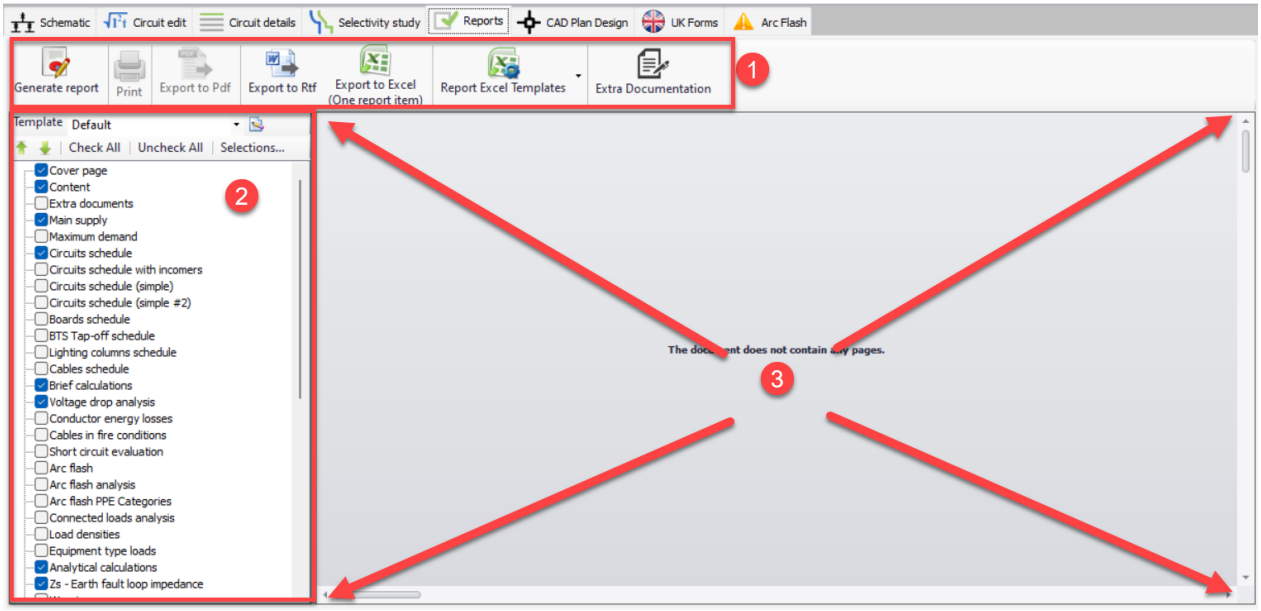
The side panel will display protective device data too, but moreover, if a device with adjustable settings is selected, the side panel will also display these settings where the user can use the sliders to change any value. Changing values will affect the curves at the graphs area and corresponding change will be reflected to the curve of the related protective device.



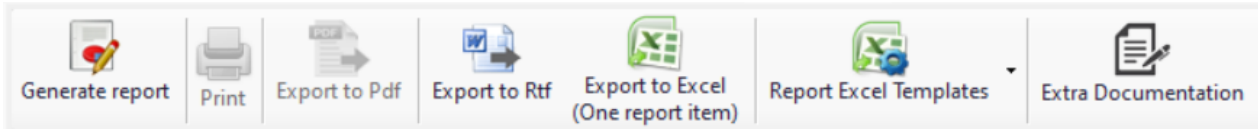
Reports Module Tab

Reports Module is used to generate, print, and export the report for the modelled system. The module screen consists of:

1. Toolbar, see Toolbar
2. Sections Panel, see Sections Panel
3. Print Preview Area

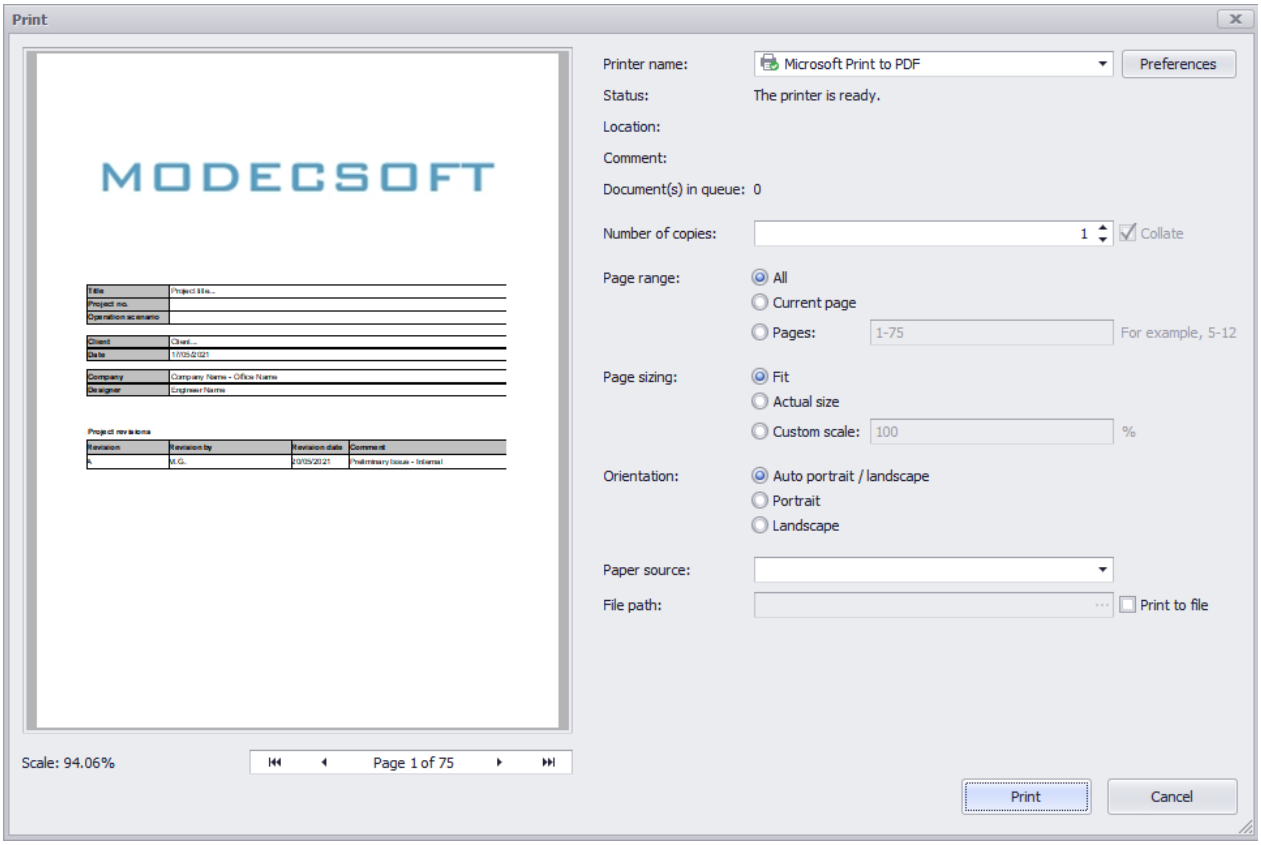


Toolbar

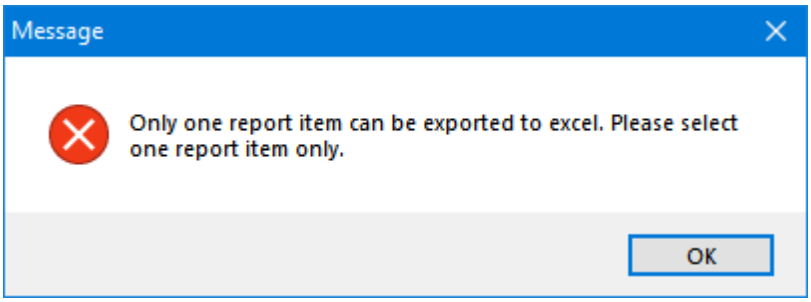


Toolbar is where the user initiate actions.

- *Generate report:* This button will populate data from ElectricalOM calculations and checks for selected sections, which are selected from the Sections *Panel* by the user, and displays the report as a single document in the *Print Preview Area*.
- *Print:* This button will initiate ElectrcialOM's native print window.



- *Export to Pdf/Export to Rtf:* These buttons will initiate the Save as... window so the user can save the report as a PDF or an RTF file.
- *Export to Excel:* This button will initiate the Save as... window so the user can save the report as an XLSX file. Unlike Export to Pdf or Export to Rtf options, Export to Excel can export a report containing only a single section from the Section Selection Pane. If the user tries to export multiple sections ElectricalOM will display a warning window and ask the user to select only one section.

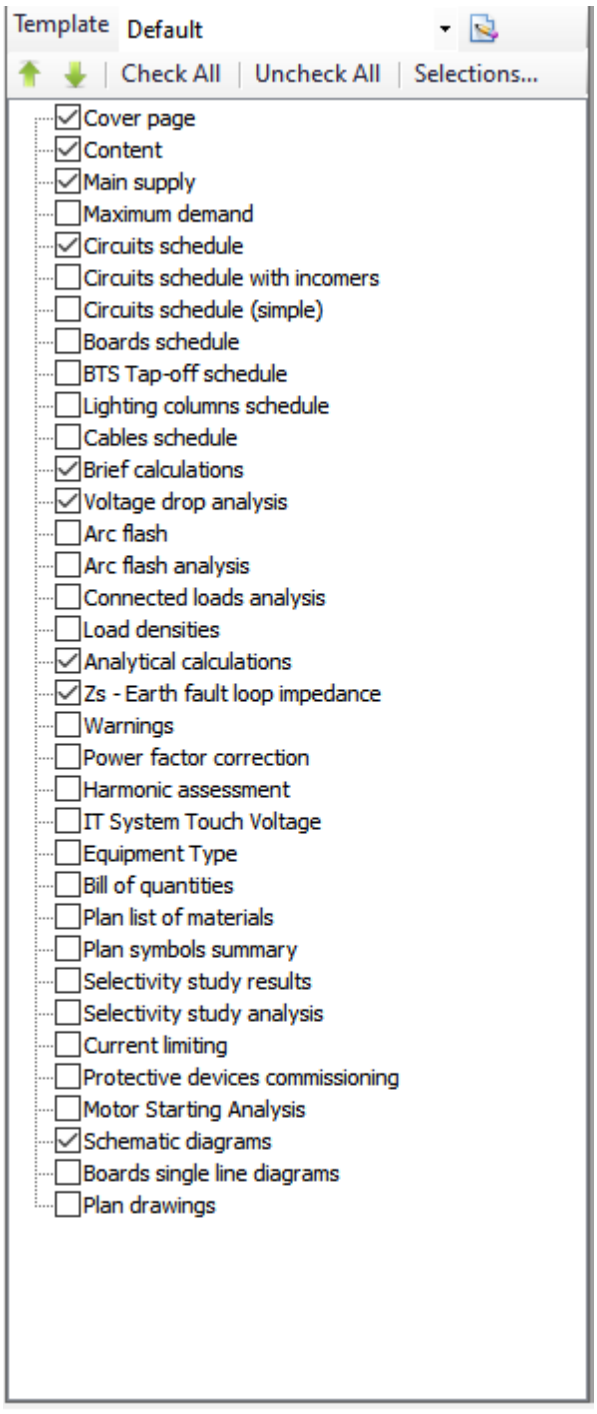


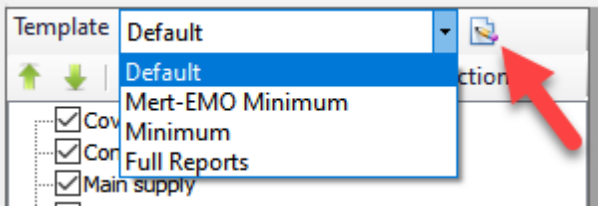
- *Extra Documentation:* If the user needs to add extra documentation to a report, this button may be used. Please see Extra Documentation section for details.

Sections Panel

Sections Panel has a toolbar itself at the top and a list of sections with tick boxes under the toolbar. Top row of the toolbar is reserved for templates which are quick selection options. By using the drop down list, the user can select a template and ElectrcialOM will automatically select the sections saved within the

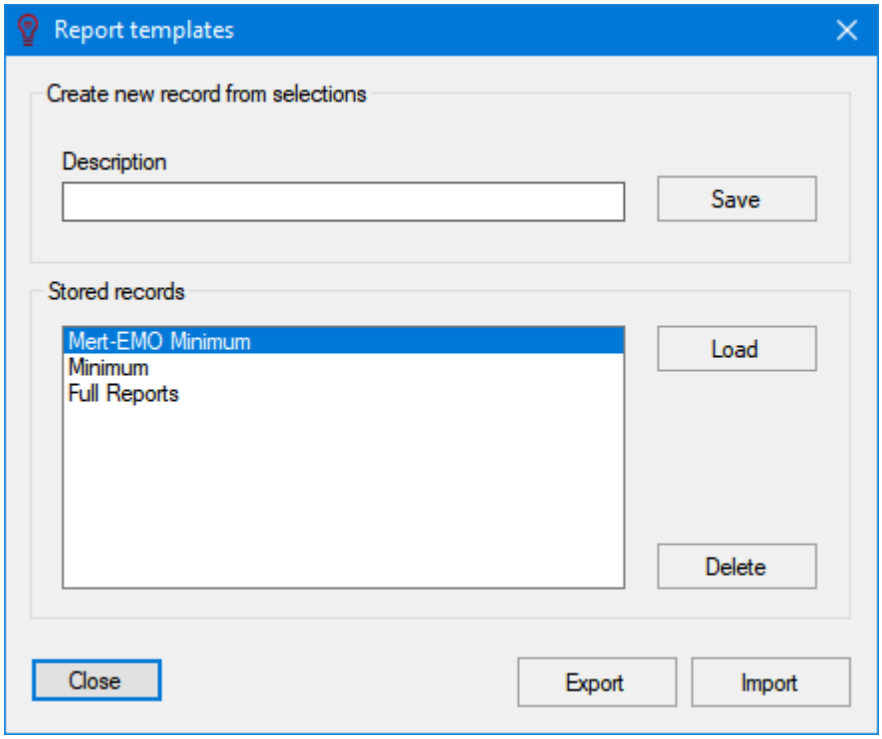
templates. Templates can be created, deleted, exported and imported by the use of *Manage Templates* button next to the *Templates* drop down list.



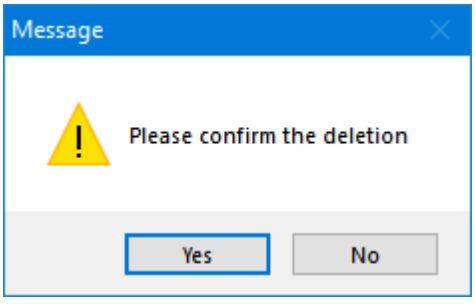


Manage templates button will initiate the Report templates window. In order to create a new template, the

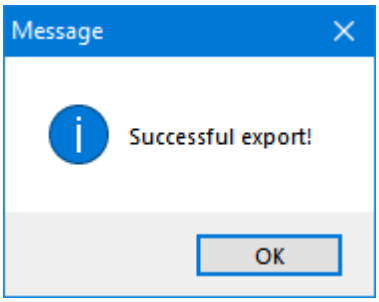
user needs to select the section which are required before initiating the Report templates window. Once the Report templates window is initiated, the user may type in a name for the new template to the Description area following a left click on the Save button.



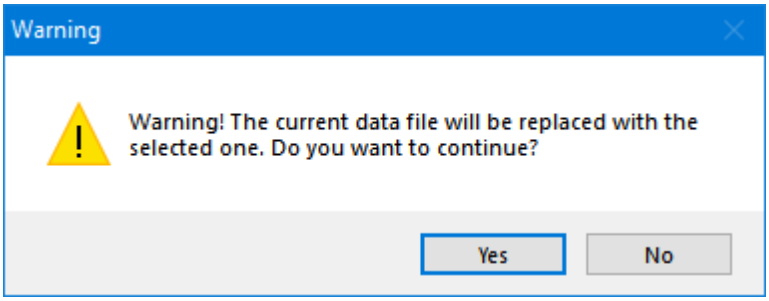
The new template will be added to the Stored records list. Stored records list is used to select an existing template to perform various actions. Once a template is selected, the user can:
Load a template. This has the same affect as selecting a template from the drop down list.
Delete a template: ElectricalOM will confirm this action with a pop up window.



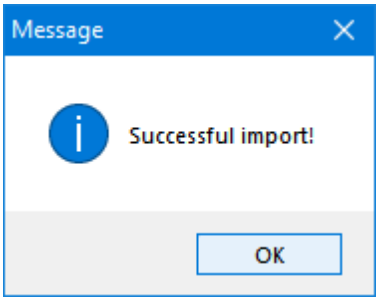
ElectrcialOM also allows the user to export and import *Stored records*. In order to export, a left click on the *Export* button is suffice. A Save as... windows will appear where the user can select a location for the exported file. ElectricalOM will display a pop up message window to confirm export.



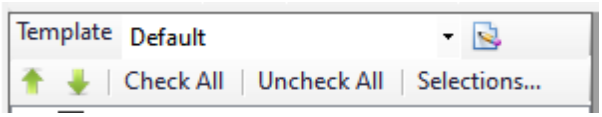
Import button is used to import a *Stored records* file into ElectricalOM. It should be noted that if an import is initiated, this will remove all existing data.



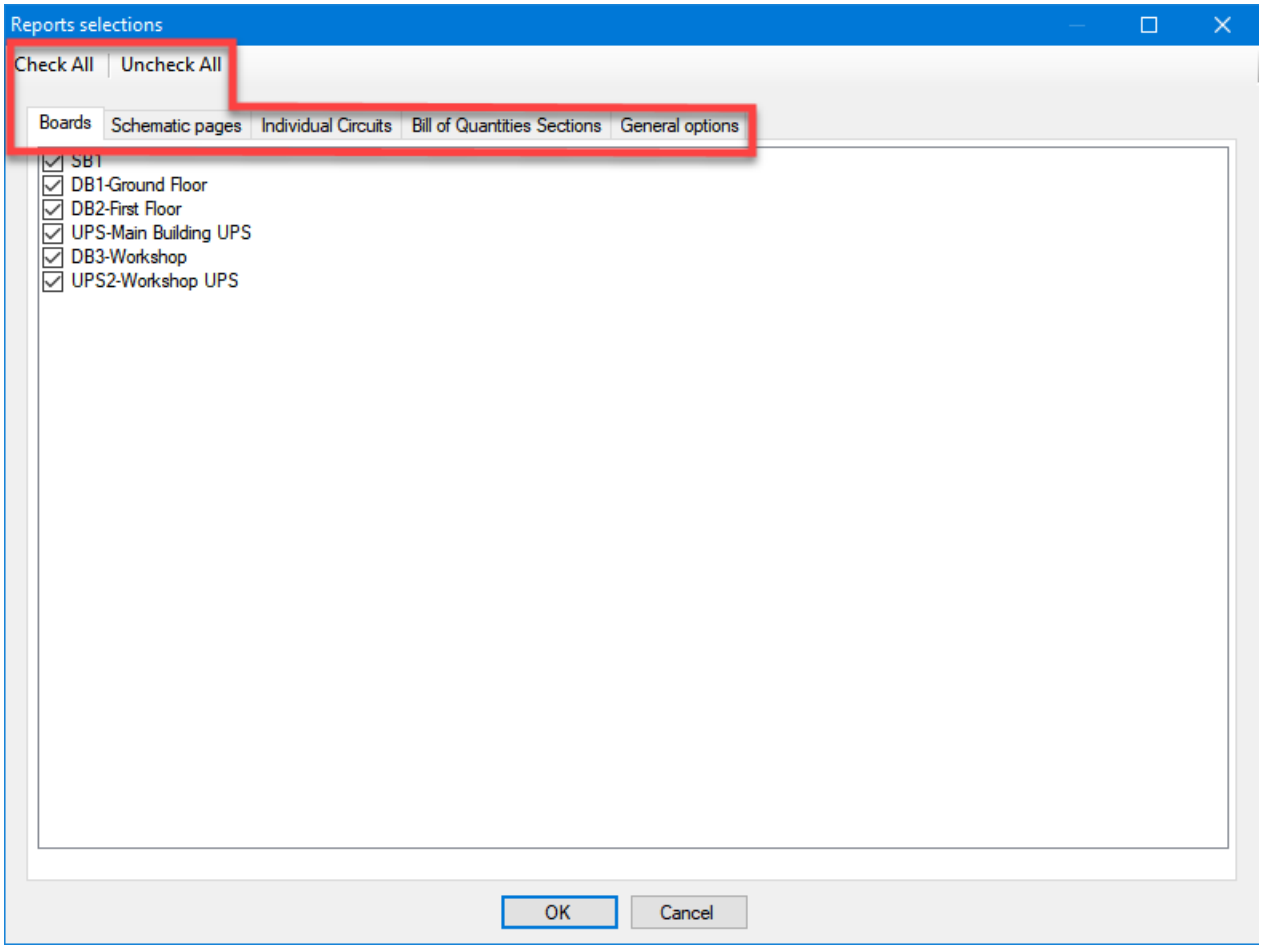
After import ElectricalOM will confirm the import.



Lower row of the toolbar is used to interact with the *Section Selection Pane*. The final report will follow the order of the sections as it is listed in the Section *Selection Pane*, however, the user may use Up and Down arrows to rearrange the list, so the final report will follow the user's order of sections.
Check All and Uncheck All button will select all or deselect all of the options.



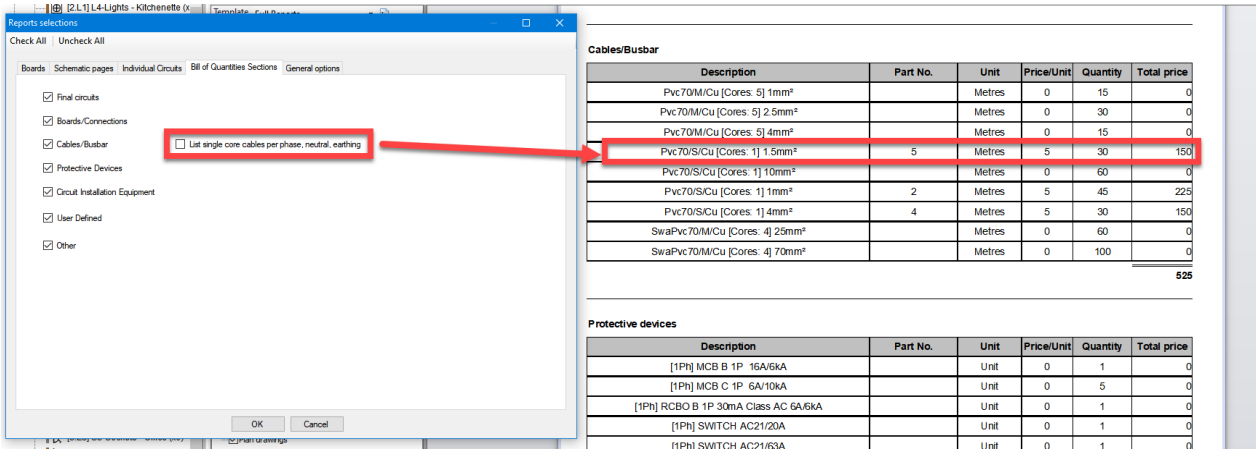
Selections... button will initiate the *Report selections* window. Reports selection window has two global button at the top, Check All and Uncheck All which tick or untick all the tick boxes boxes displayed below. Various tabs are located below these buttons:

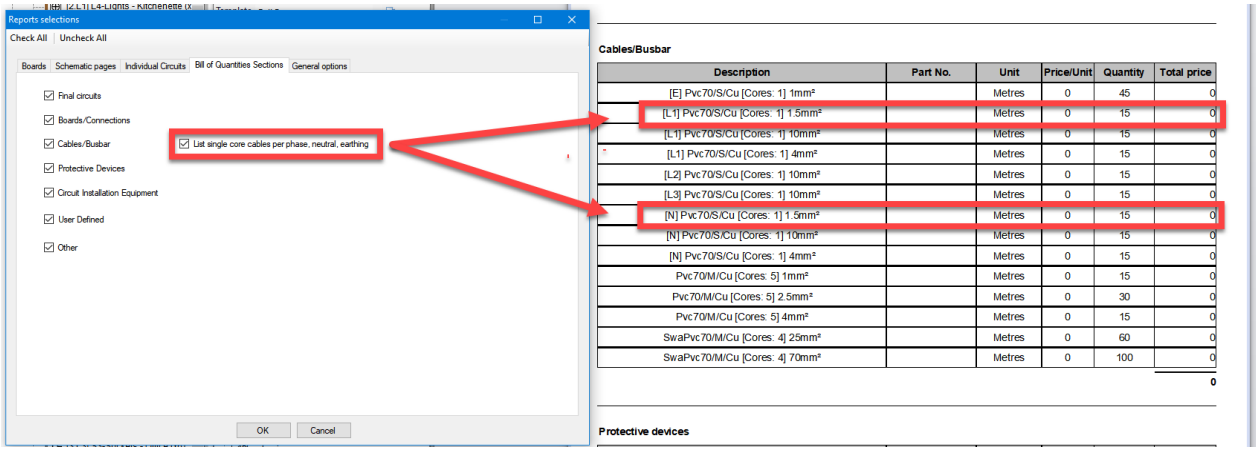


- *Boards* tab will list all the boards within the system. The user may select required boards to appear on reports. This tick box will not affect other tab selections, so if a board is selected, the user still needs to select related circuits from the *Individual Circuits* and *Schematics pages* tab. Boards tab will affect the options below:
    - Circuits schedule
    - Circuits schedule with incomers
    - Circuits schedule (simple)
    - Brief calculations
    - Voltage drop analysis
    - Earth fault loop impedance
    - Protective devices commissioning
    - Boards single line diagrams
- *Schematic pages* tab is used to include schematic diagrams to the reports. Even if the user selects a board from *Boards* tab no schematic diagrams will appear in reports without selecting the related board from the *Schematics pages* tab as well.
- *Individual Circuits* tab lists all the circuits, both distribution and final, so the user can select required circuits. This tab is related with *Analytical calculations* option of the *Topic Selection Pane*. If the users selects a board from the *Boards* tab, only the *Brief calculations* option will contain related circuits, so,

in order to add *Analytical calculations*, the user still needs to select these circuits from the *Individual circuits* tab.

- Bill of Quantities Sections tab will list carious item categories which can be listed separately. The user can select the required items using the tick boxes.
    - List single core cables per phase, neutral, earthing option will let the user to list single core cables with same cross-section separately. The purpose of usage will be shown in brackets as L1, L2, L3, N, and E.





- *General options* contains options listed below:
    - *Exclude critical warnings from the cover page:* ElectrcialOM displays any critical warning on the cover page if this option is not selected which is the default setting.

Title	Project title...
Project no.	
Operation scenario	

Client	Client...
Date	17/05/2021

Company	Company Name - Office Name
Designer	Engineer Name

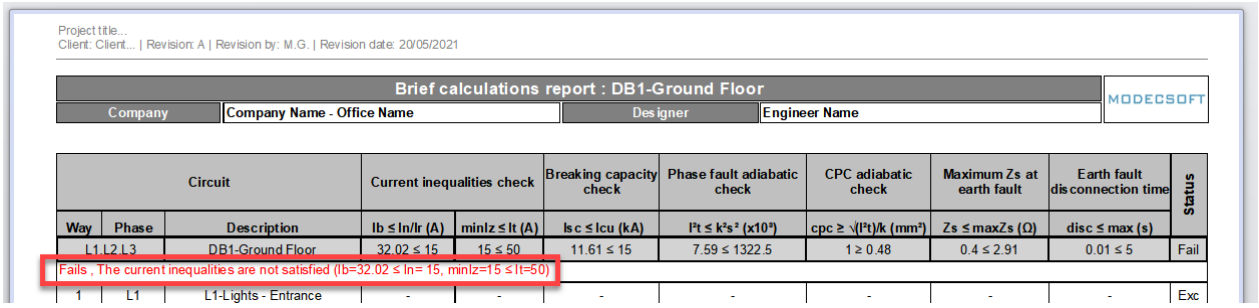
Critical warnings in project

Critical element	Warning description
SB1 -> DB1-Ground Floor	Critical error in the circuit's checks
There are errors in 'DB1-Ground Floor'. Please edit the circuit The current inequalities are not satisfied (Ib=32.02 ≤ In= 15, minIz=15 ≤ It=50)	

Project revisions

Revision	Revision by	Revision date	Comment
A	M.G.	20/05/2021	Preliminary Issue - Internal

If this tick box is ticked, then, ElectricalOM will not display any critical warnings on the cover page, however the warnings will still be listed on the reports under the related title.



Project title...
Client: Client... | Revision: A | Revision by: M.G. | Revision date: 20/05/2021

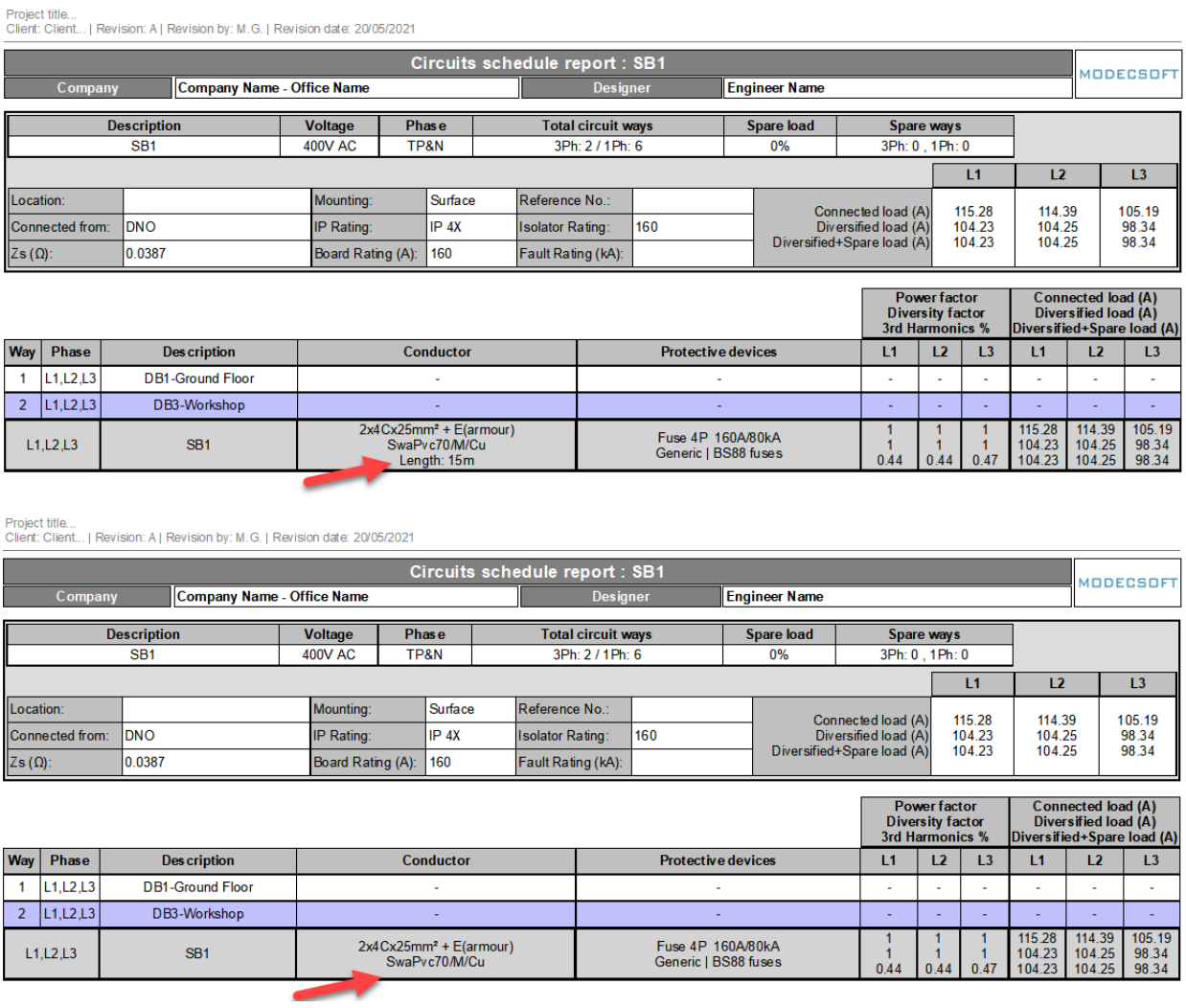
Brief calculations report : DB1-Ground Floor

Company	Company Name - Office Name	Designer	Engineer Name

MODECSOFT

Circuit			Current inequalities check		Breaking capacity check	Phase fault adiabatic check	CPC adiabatic check	Maximum Zs at earth fault	Earth fault disconnection time	Status
Way	Phase	Description	Ib ≤ In/Ir (A)	minIz ≤ It (A)	Isc ≤ Icu (kA)	I²t ≤ k²s² (x10⁶)	cpc ≥ √(I²t)/k (mm²)	Zs ≤ maxZs (Ω)	disc ≤ max (s)	
L1,L2,L3		DB1-Ground Floor	32.02 ≤ 15	15 ≤ 50	11.61 ≤ 15	7.59 ≤ 1322.5	1 ≥ 0.48	0.4 ≤ 2.91	0.01 ≤ 5	Fail
Fails , The current inequalities are not satisfied (Ib=32.02 ≤ In= 15, minIz=15 ≤ It=50)										
1	L1	L1-Lights - Entrance	-	-	-	-	-	-	-	Exc

- *Exclude length from circuit schedules:* As default, ElectricalOM will display the feeder cable length on Circuit schedules. The user may tick this box to omit the feeder cable length from the report.



Project title...
Client: Client... | Revision: A | Revision by: M.G. | Revision date: 20/05/2021

Circuits schedule report : SB1

Company	Company Name - Office Name	Designer	Engineer Name

Description	Voltage	Phase	Total circuit ways	Spare load	Spare ways
SB1	400V AC	TP&N	3Ph: 2 / 1Ph: 6	0%	3Ph: 0 , 1Ph: 0

							L1	L2	L3
Location:		Mounting:	Surface	Reference No.:		Connected load (A)	115.28	114.39	105.19
Connected from:	DNO	IP Rating:	IP 4X	Isolator Rating:	160	Diversified load (A)	104.23	104.25	98.34
Zs (Ω):	0.0387	Board Rating (A):	160	Fault Rating (kA):		Diversified+Spare load (A)	104.23	104.25	98.34

Way	Phase	Description	Conductor	Protective devices	Power factor / Diversity factor / 3rd Harmonics % L1	L2	L3	Connected load (A) / Diversified load (A) / Diversified+Spare load (A) L1	L2	L3
1	L1,L2,L3	DB1-Ground Floor	-	-	-	-	-	-	-	-
2	L1,L2,L3	DB3-Workshop	-	-	-	-	-	-	-	-
L1,L2,L3		SB1	2x4Cx25mm² + E(armour) SwaPvc70/M/Cu Length: 15m	Fuse 4P 160A/80kA Generic | BS88 fuses	1 1 0.44	1 1 0.44	1 1 0.47	115.28 104.23 104.23	114.39 104.25 104.25	105.19 98.34 98.34

Project title...
Client: Client... | Revision: A | Revision by: M.G. | Revision date: 20/05/2021

Circuits schedule report : SB1

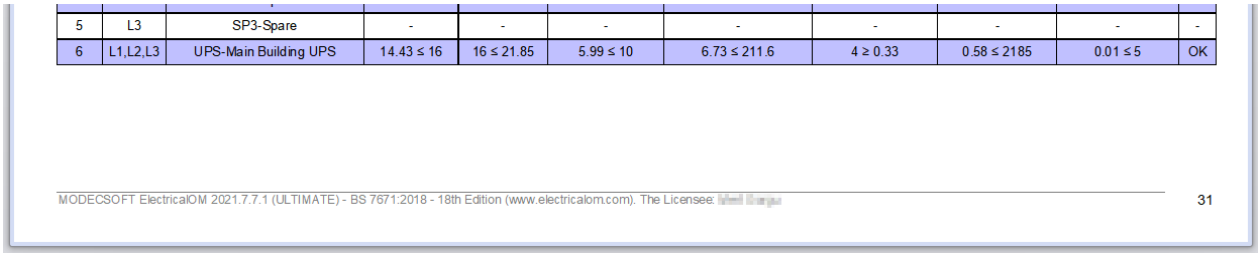
Company | Company Name - Office Name | Designer | Engineer Name

Description | Voltage | Phase | Total circuit ways | Spare load | Spare ways
SB1 | 400V AC | TP&N | 3Ph: 2 / 1Ph: 6 | 0% | 3Ph: 0 , 1Ph: 0

Location: | | Mounting: | Surface | Reference No.: | | Connected load (A) | 115.28 | 114.39 | 105.19
Connected from: | DNO | IP Rating: | IP 4X | Isolator Rating: | 160 | Diversified load (A) | 104.23 | 104.25 | 98.34
Zs (Ω): | 0.0387 | Board Rating (A): | 160 | Fault Rating (kA): | | Diversified+Spare load (A) | 104.23 | 104.25 | 98.34

Way | Phase | Description | Conductor | Protective devices | Power factor / Diversity factor / 3rd Harmonics % L1 | L2 | L3 | Connected load (A) / Diversified load (A) / Diversified+Spare load (A) L1 | L2 | L3
1 | L1,L2,L3 | DB1-Ground Floor | - | - | - | - | - | - | - | -
2 | L1,L2,L3 | DB3-Workshop | - | - | - | - | - | - | - | -
L1,L2,L3 | | SB1 | 2x4Cx25mm² + E(armour) SwaPvc70/M/Cu | Fuse 4P 160A/80kA Generic \| BS88 fuses | 1
1
0.44 | 1
1
0.44 | 1
1
0.47 | 115.28
104.23
104.23 | 114.39
104.25
104.25 | 105.19
98.34
98.34

- *Exclude length from circuit schedules:* If there are circuits marked as existing circuits, see *Existing installation - Excluded from checks* in Other details Tab of Circuit Editor Module, the use may like to remove them from the report as they are excluded from checks. This tick box will remove these circuits from *Analytic calculations* only and they will still appear in other sections of the report.
- *Use watermark:* The user may want to place a watermark to the report for any reason. This tick box will place a watermark in red to the centre of each page of the report. The text box is used to type in any text required to be used as the watermark text.
- *Hide footer:* This option will hide the footer. The footer contains data about the version of the ElectricalOM used, the edition of the wiring regulation used, and the name of the licencee.



5	L3	SP3-Spare	-	-	-	-	-	-	-	-
6	L1,L2,L3	UPS-Main Building UPS	14.43 ≤ 16	16 ≤ 21.85	5.99 ≤ 10	6.73 ≤ 211.6	4 ≥ 0.33	0.58 ≤ 2185	0.01 ≤ 5	OK

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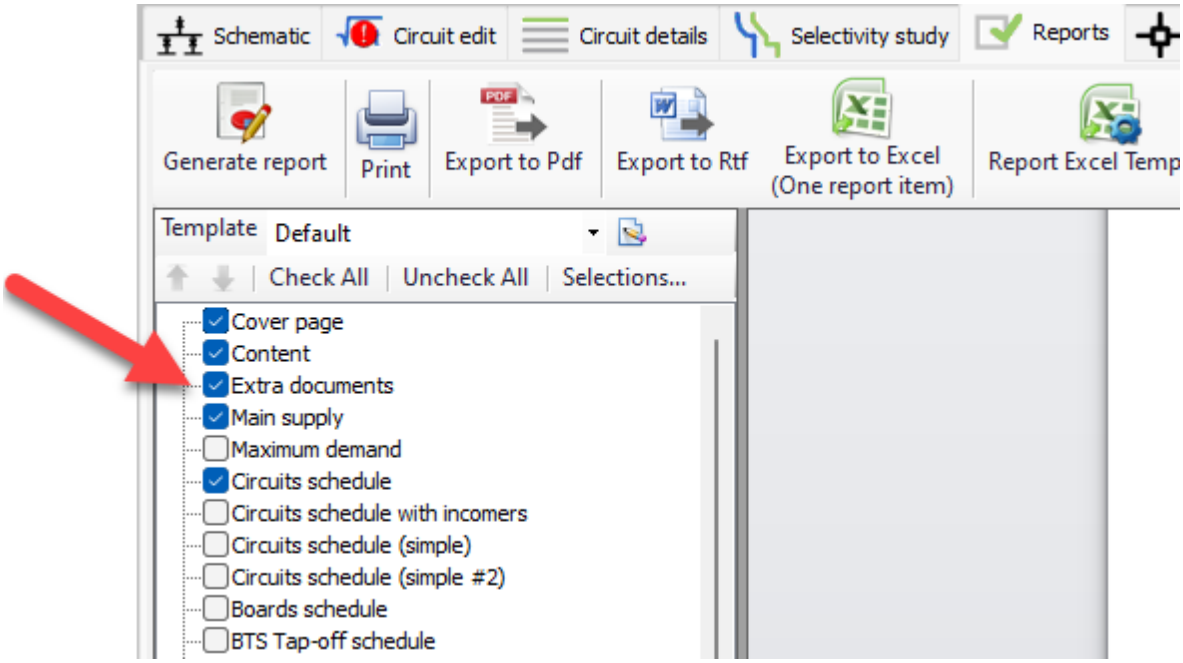
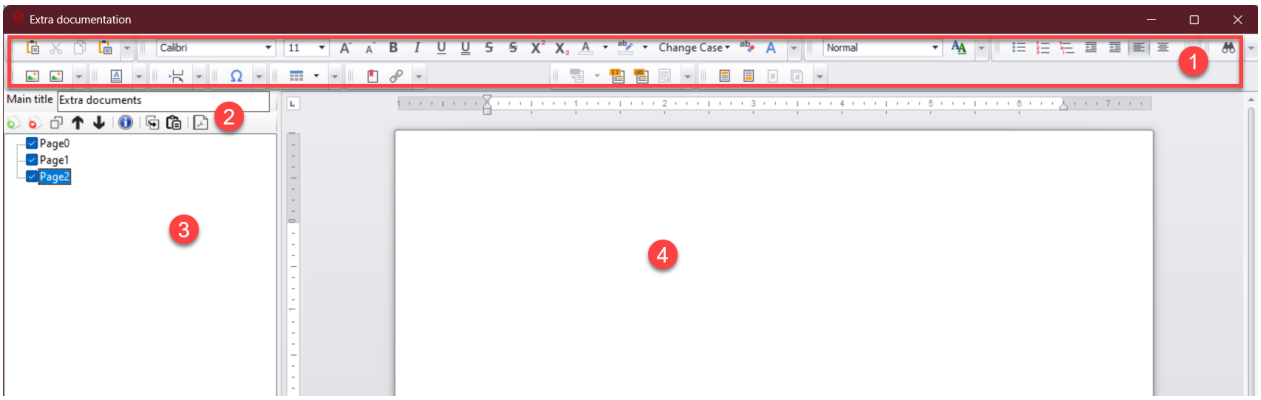
Extra Documentation

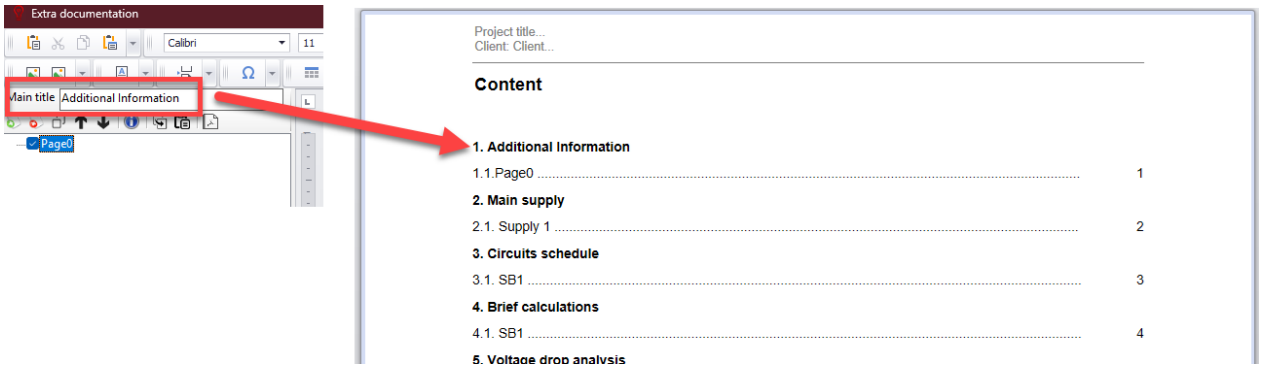
This facility is basically a word processor which enables the user to add an additional section to a report. In order to add this section, Extra Documents option must be ticked from the selection list on the left hand side of the Reports tab.



The toolbar (shown as 1 below) is a default toolbar which accommodates basic functions of a word processor, like changing a font to bold or italic, or adding a numbering system. On the left, there is a panel (shown as 2 & 3 below) where user can add or remove pages, and also rename them.

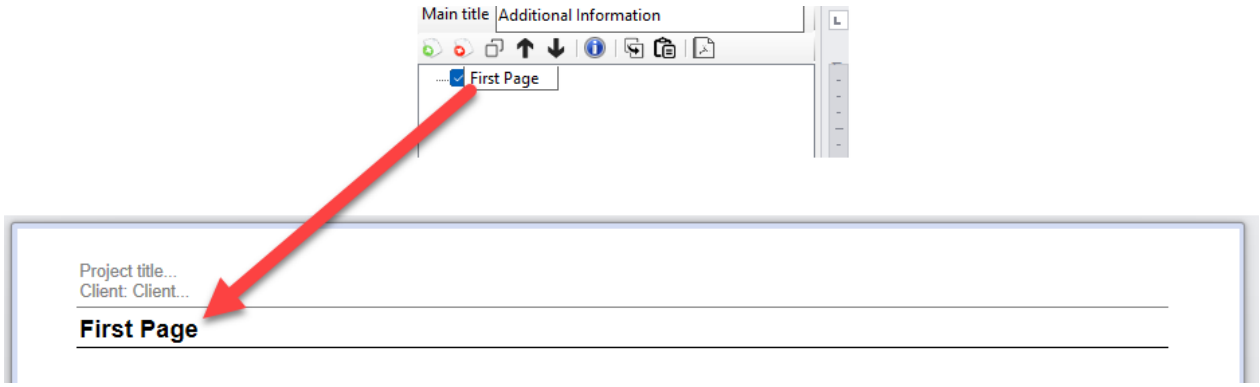


Main title field can be used to change the title for the section of the report by clicking inside the text field and typing in the required text. This text will be used as the of this section in the generated report.



Mini toolbar below this section accommodates the functions to add/remove pages and also to arrange them.

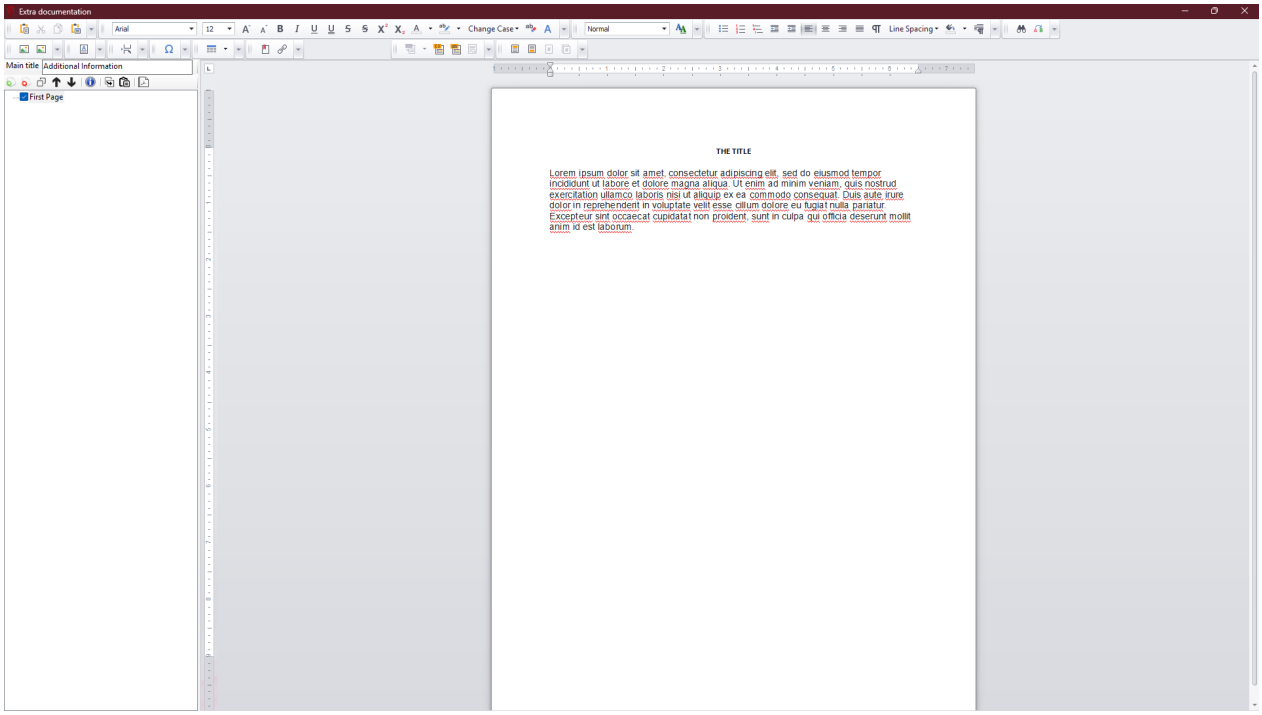
- Add/remove pages: First two button are used to add or remove pages to the section. As a new page added, the tree representation will be displayed below (shown as 4 above). Once a new page added, the title of the page can be modified by clicking on its name (Page0 by default) and typing in a new text. This will appear on the report as the title of this page.



- Copy page: This copy the selected page and add it as a new page at the end of the section.
- Move up/down: This will move selected page up or down.
- Insert abbreviations page: This will add a page with abbreviations used by ElectricalOM within the full report.
- Copy all pages: This will copy all the pages but will not add them automatically.

- Paste all pages: This will paste all pages copied by the button described above.
- Export to PDF: This will export the section as a pdf file.

Once a page added, area 4 will be enabled. User can click inside and start using this facility as a standard word processor.



CAD Plan Design Tab

This section will be available soon.

UK Forms Tab

This section will be available soon.

Arc Flash Tab

This section will be available soon.

Status Bar

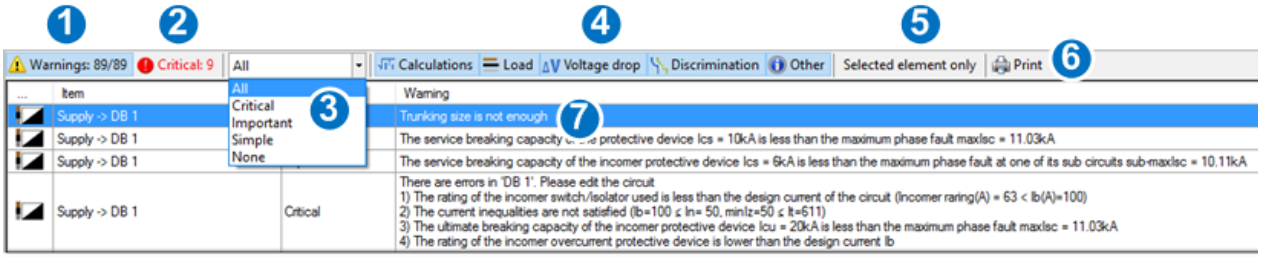
The status bar is located at the bottom of ElectricalOM screen and it accommodates project data on the left hand side and a search box on the right hand side.

On the left, the active edition of the wiring regulations, the active source, and total number of distribution and final circuits is displayed.

On the right, the user can perform a search by typing in a text and clicking on the magnifying glass icon. If ElectricalOM find multiple occasions, then the *Next* button is used to cycle through the occasions. Each occasion will be highlighted by ElectricalOM in the *System Tree Section*.

Warnings

Problems with the current implementation of the model are indicated in the Warnings Environment .



The warnings environment can be filtered easily, so that the engineer can focus on warnings of a particular type, or so that only the warnings associated with the selected circuit appear. The environment gives the user the option of filtering warnings by severity (critical, important, simple) (3) and/or the type (load, voltage drop, discrimination, other) (4). The user can choose to display only the warnings associated with the node that is selected in the tree view, by clicking on the **Selected element only** (5) option.

The total number of warnings is given by (1). The total number of critical warnings is given by (2).

Each of the warnings appearing in the list (7) indicates the originating circuit, the severity of the problem, and is accompanied by a brief description. With a double-click on a particular warning the user is brought to the configuration of the originating circuit to make changes and resolve the problem. Also the engineer is able to print the warnings list by clicking the **Print** button (6). Note that an element that has a warning associated with it is marked in red in the tree network view.

Warnings are grouped into three severity categories: Critical, Important and Simple.

Critical

Important

Simple

Critical

Critical warnings are those that have to be resolved. The user will not be able to move forward to the completion of the study if critical warnings are outstanding. These warnings have primarily to do with errors found by checks to the model, and for project configurations out of compliance with regulation.

Voltage Drop Check

Voltage Drop Within Final Circuit for a Private Supply

Touch Voltage Limit Check

Ring Sockets Check

RCD Device Required for Circuit Check

Maximum Permitted Disconnection Time at Earth Fault Check

CPC Adiabatic Check

Maximum Earth Fault Loop Impedance Check

Design Current and Current Curring Capacity Checks

Phase Conductor Adiabatic Check

Busbar Trunking System Short-Circuit Peak Withstand Check

Ultimate Breaking Capacity of the Circuit's Protective Device Check

Ultimate Breaking Capacity of the Incomer Protective Device Check

Rating of the Incomer Switch/Isolator Check

Rating of the Incomer Overcurrent Protective Device Check

Neutral Conductor Current Carrying Capacity Check

Neutral Current Protective Device Rating Check

Motor Starter Overload Check

UPS Power Rating Check

Transfer Switch Load Rating Check

Source Load Capacity Check

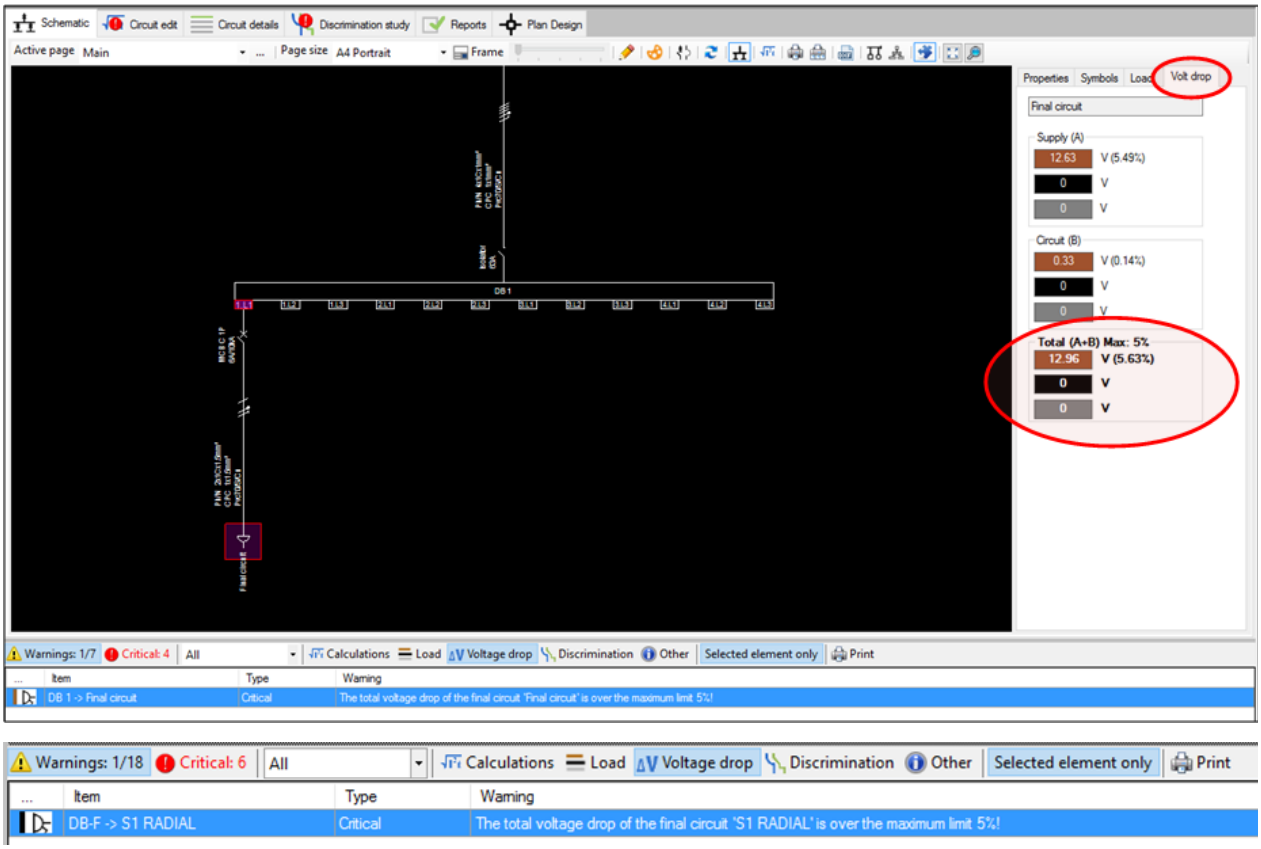
Source Earthing Conductor Adiabatic Check

Voltage Drop Check

Voltage drop warnings will appear when the voltage drop between the Main Supply and a downstream circuit exceeds the voltage drop limit. To correct the problem, reconsider the cable sizes of the offending circuit, or the cable sizes of circuits upstream from it. Values that affect the voltage drop calculation are the design current (I_b), the circuit length and the cable size. The power factor and other correction factors such as circuit grouping and ambient temperature also take part in the voltage drop calculation. Note that you can change the voltage drop limit for each circuit under the **Volt drop** tab in the circuit editor.

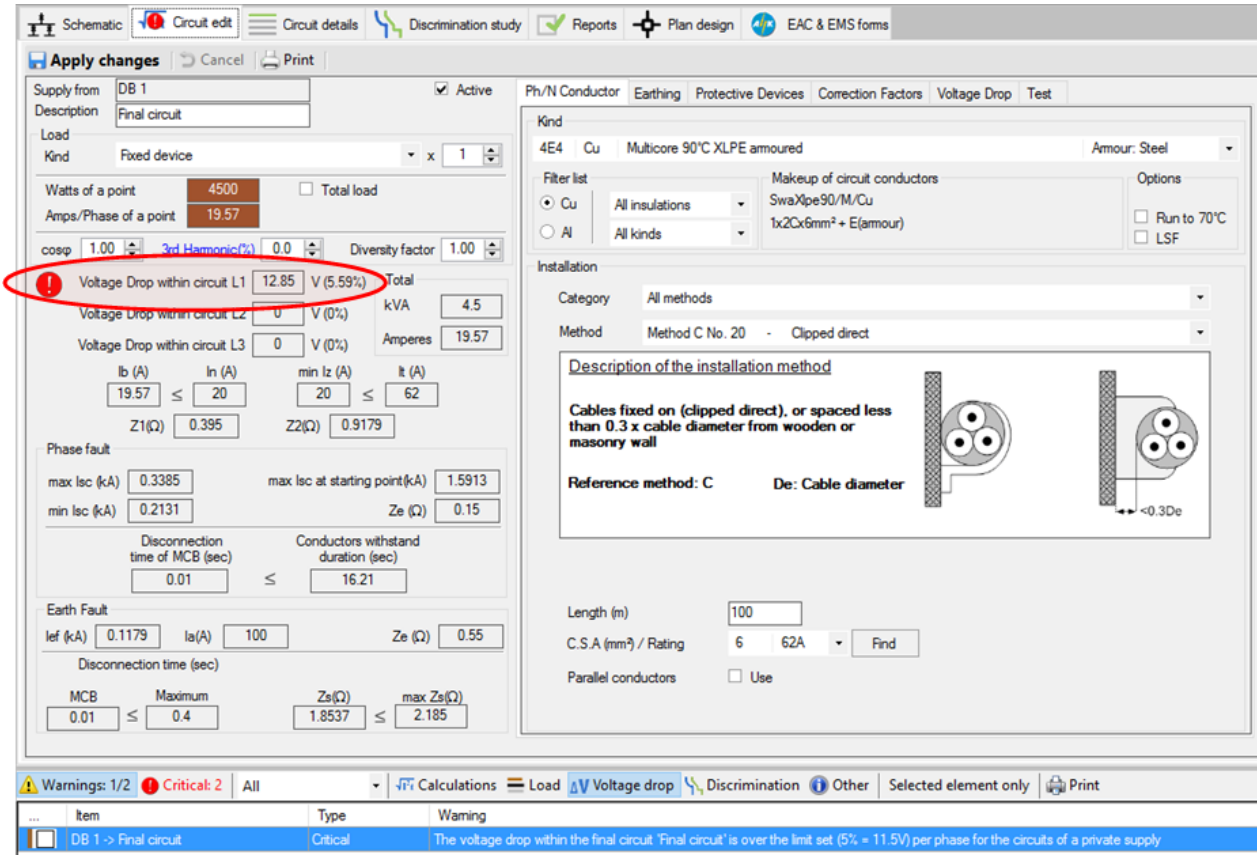
See the Voltage drop calculations

To examine the voltage drop calculations go to the Volt drop tab at the properties area as shown below:



Voltage Drop Within Final Circuit for a Private Supply

When the voltage drop limits selected during the main source editing are for a private low voltage supply, the software checks the voltage drop within a final circuit according to Table 4Ab in Appendix 4 of BS7671:2008 + A3:2015.



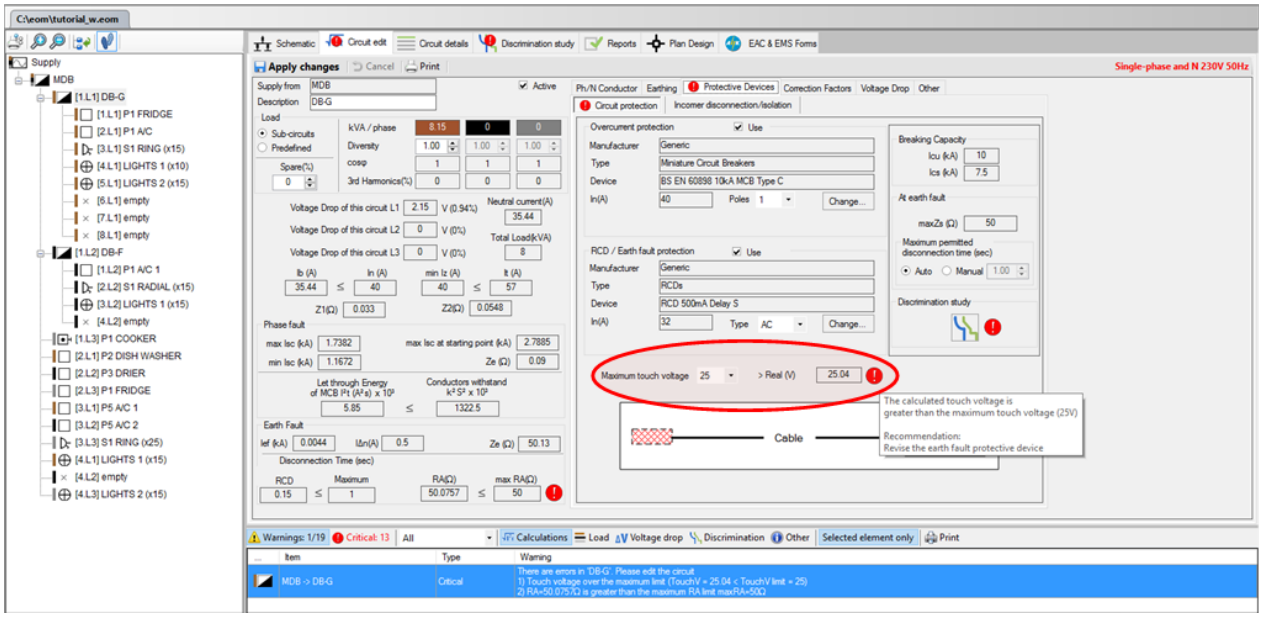
Touch Voltage Limit Check

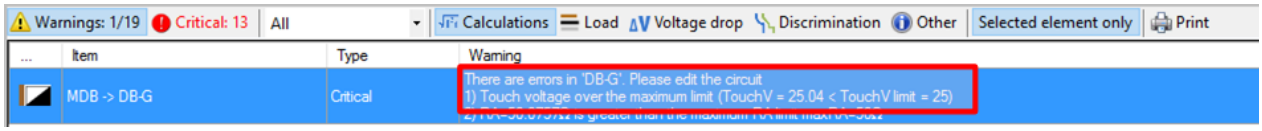
The touch voltage is used to determine the magnitude of the voltage to which the person at risk would be subjected in the event of an earth fault occurring in an installation. By assuming values of body resistance, the touch voltage concept can be extended to give an indication of the severity of the electric shock that could be experienced by that person.

The connection of all exposed- and extraneous-conductive-parts, either directly or indirectly, to a common terminal, i.e. the main earthing terminal of the installation, leads to the creation of touch voltages in the event of an earth fault and hence to the shock risk. In a correctly designed and erected electrical installation such a shock risk is not eliminated. Where the protective measure is automatic disconnection of supply then in the event of an earth fault, the speed of disconnection should be such that should the person at risk experience an electric shock it will not be a harmful one.

In order to resolve touch voltage warnings, it recommended that the engineer revise the CPC or the protective device. It is also recommended that the user make sure that the upstream circuits have been set correctly.

See the touch voltage calculations





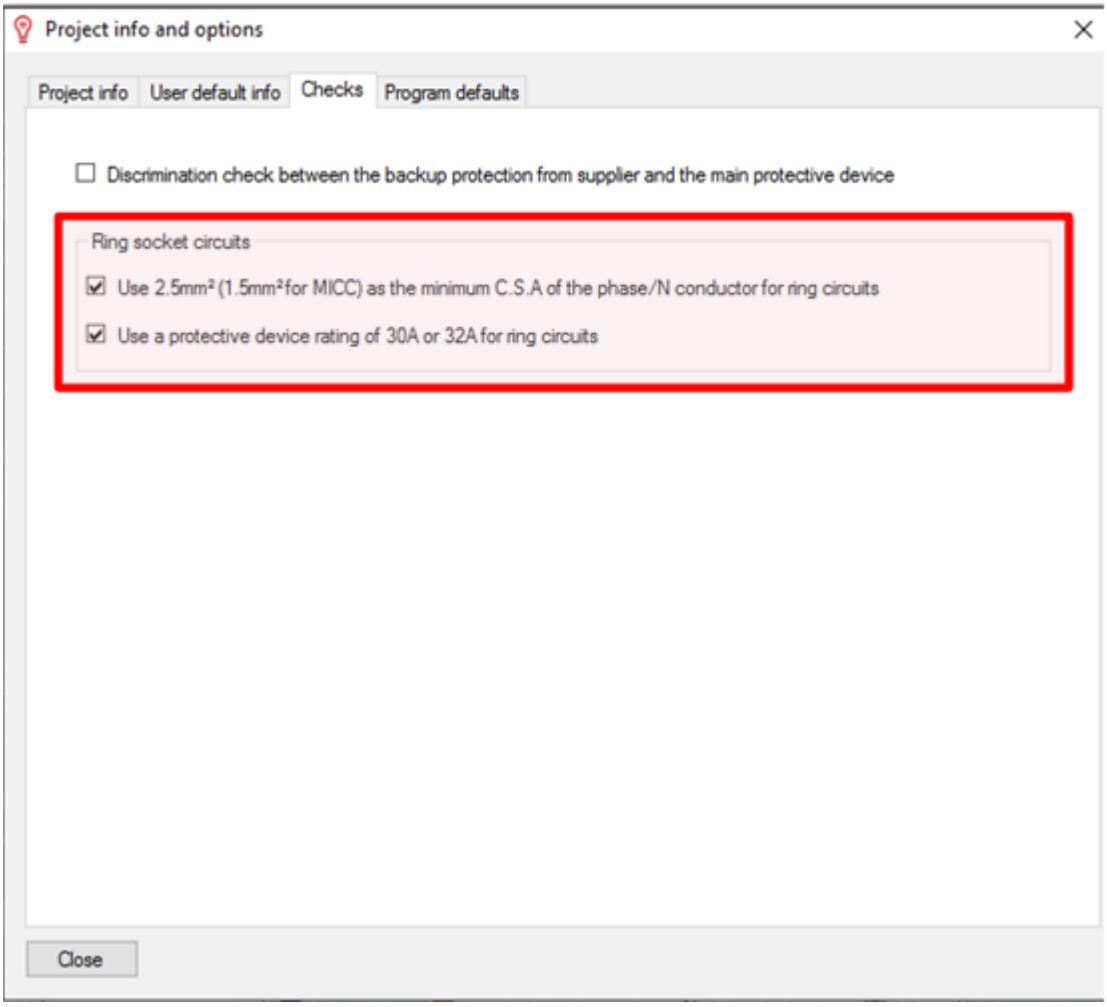
Ring Sockets

For ring sockets, special check settings that consider the cross sectional area of the phase and neutral conductor and the protective device rating are applied by default. The designer can omit these checks through the project info and options, under the **Checks** tab, as shown below.

Checks related to ring socket circuits:

Protective device rating check

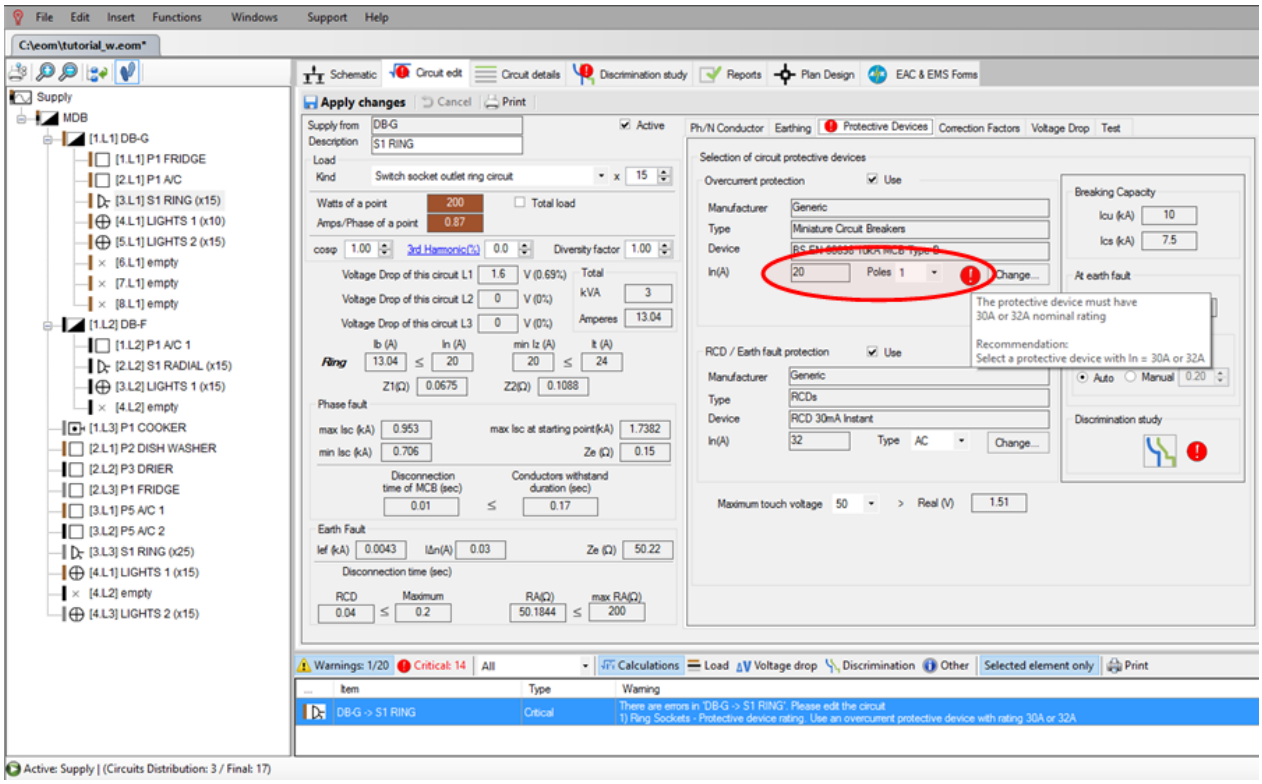
Ph/N conductor C.S.A check

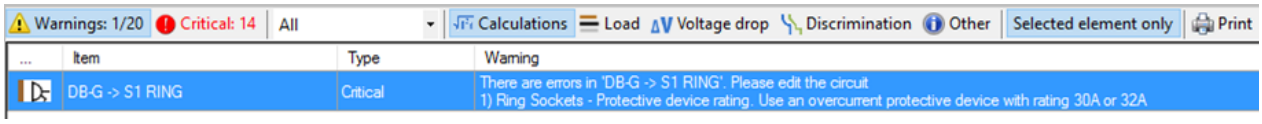


Protective Device Rating Check

Ring sockets require 30A or 32A protective device. To bypass the check and accept any rating see the ring sockets check options.

Recommendation to resolve the error:
Use a 30A or 32A protective device.

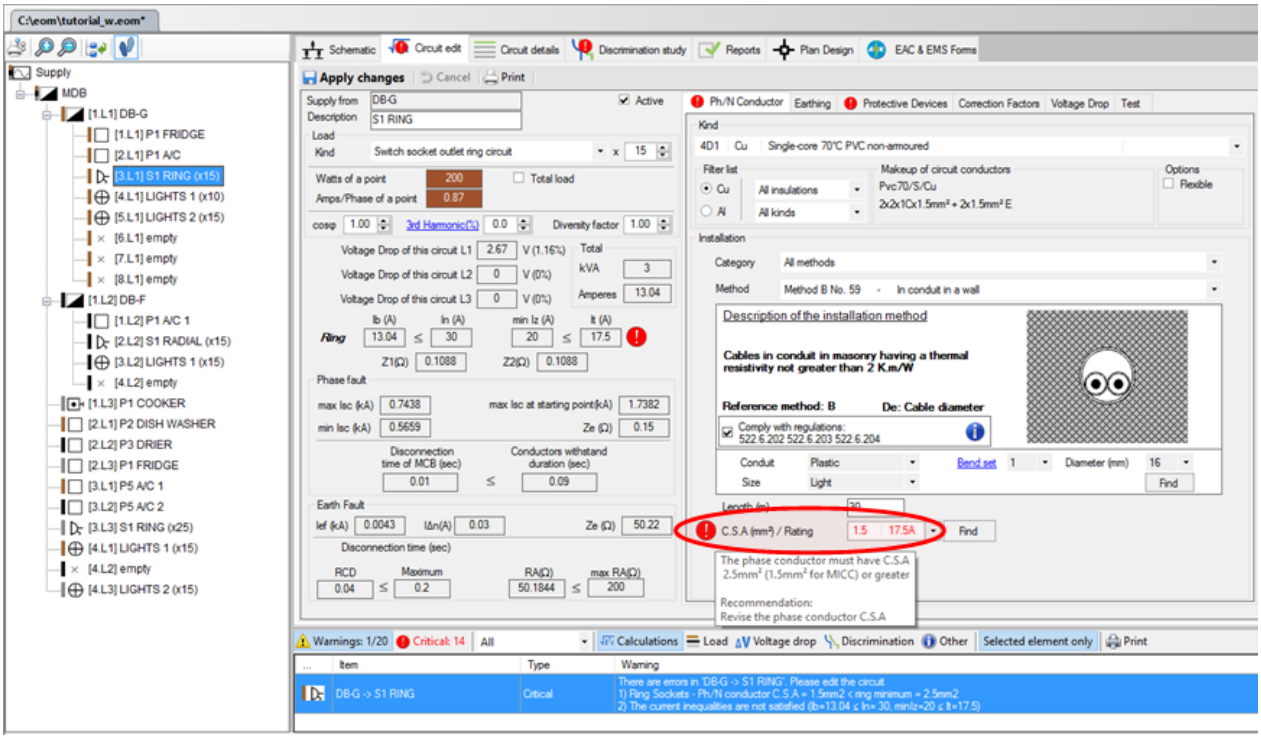


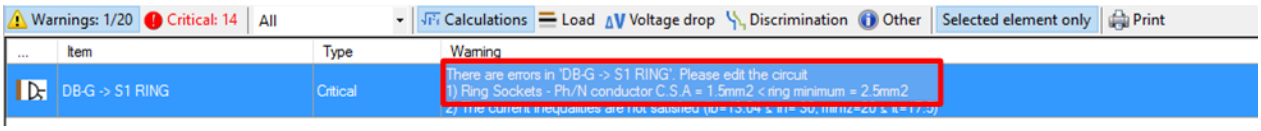


Ph/N Conductor C.S.A Check

Ring sockets require 2.5mm^2 phase conductor (or 1.5mm^2 for MICC). To bypass the check and accept any rating see the ring sockets check options.

Recommendation to resolve the error:
Use a 2.5mm^2 phase conductor (or 1.5mm^2 for MICC).





RCD Device Required for Circuit Check

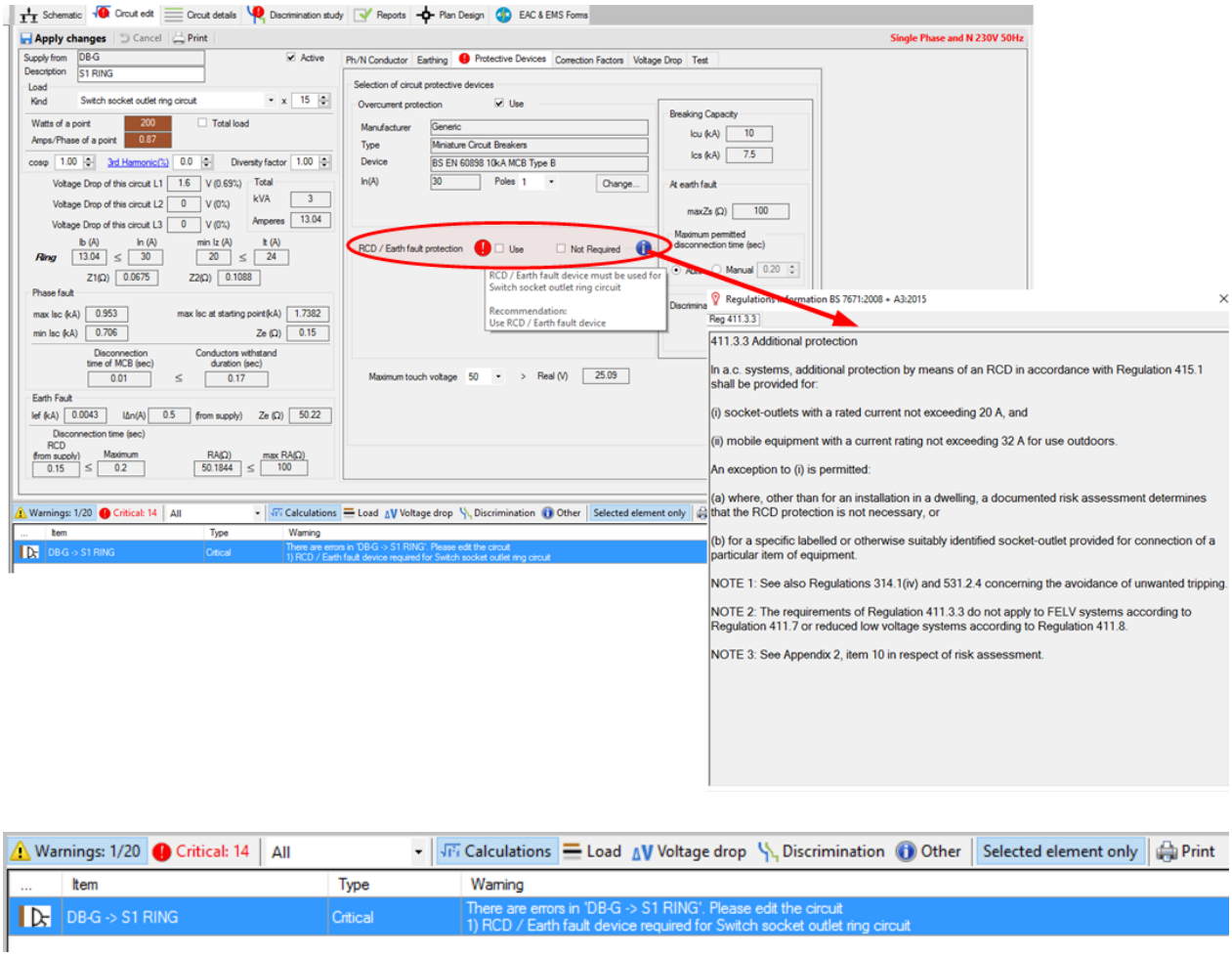
For RCD use, BS7671 states the following regulation:

411.3.3 Additional protection.

In alternating current systems, additional protection by means of an RCD in accordance with Regulation 415.1 shall be provided for:
(i) socket-outlets with a rated current not exceeding 20 A, and
(ii) mobile equipment with a current rating not exceeding 32 A for use outdoors.

An exception to (i) is permitted:
(a) where, other than for an installation in a dwelling, a documented risk assessment determines that the RCD protection is not necessary, or
(b) for a specific labelled or otherwise suitably identified socket-outlet provided for connection of a particular item of equipment.

NOTE 1: See also Regulations 314.1(iv) and 531.2.4 concerning the avoidance of unwanted tripping.
NOTE 2: The requirements of Regulation 411.3.3 do not apply to FELV systems according to Regulation 411.7 or reduced low voltage systems according to Regulation 411.8.
NOTE 3: See Appendix 2, Item 10 with respect to risk assessment.

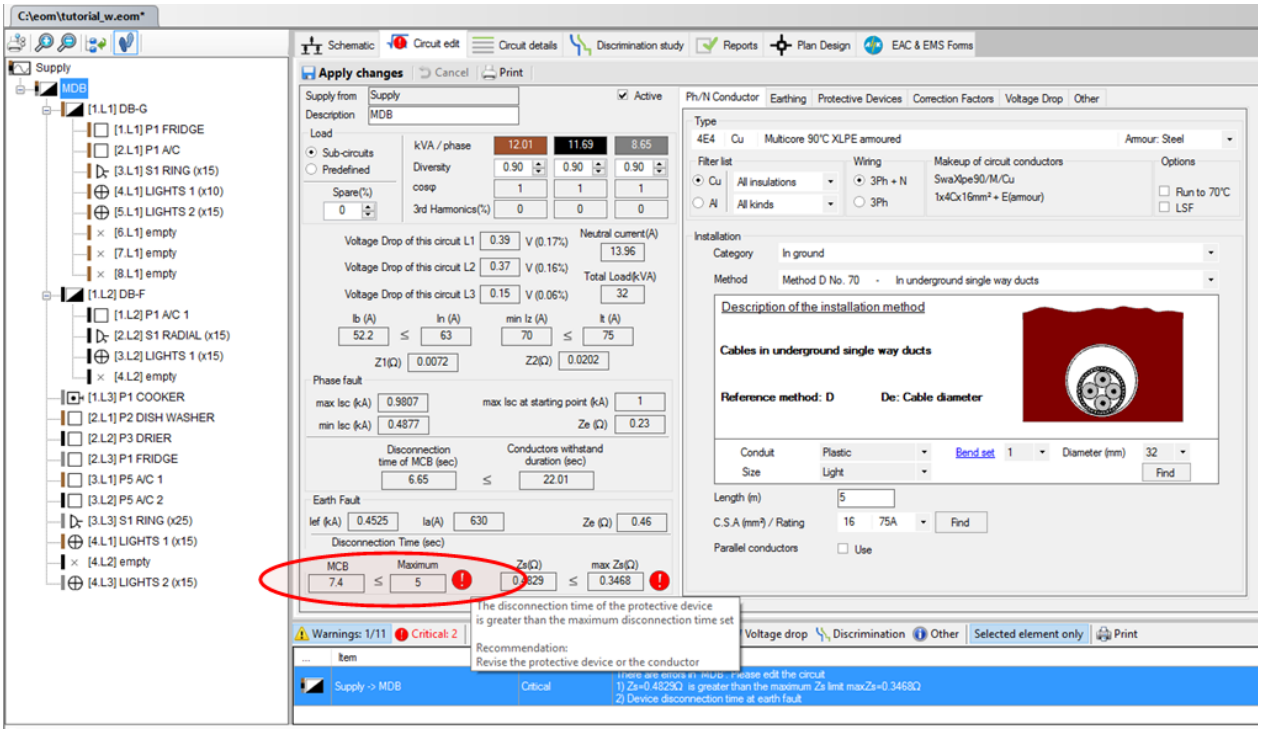


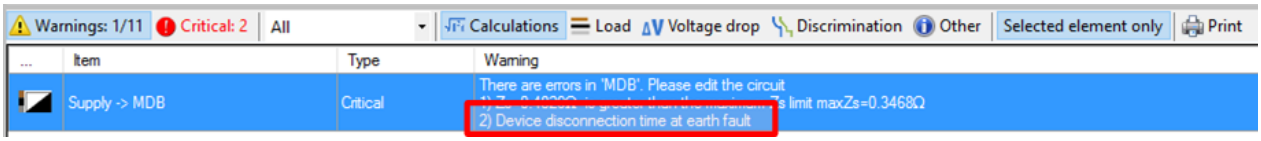
Maximum Permitted Disconnection Time at Earth Fault Check

The software checks that the protective device operates within the maximum permitted disconnection time in the event of an earth fault.

Recommendation to resolve the error:
Revise the CPC or the protective device. Also make sure the upstream circuits have been set correctly.

See Protective device disconnection time at Earth Fault



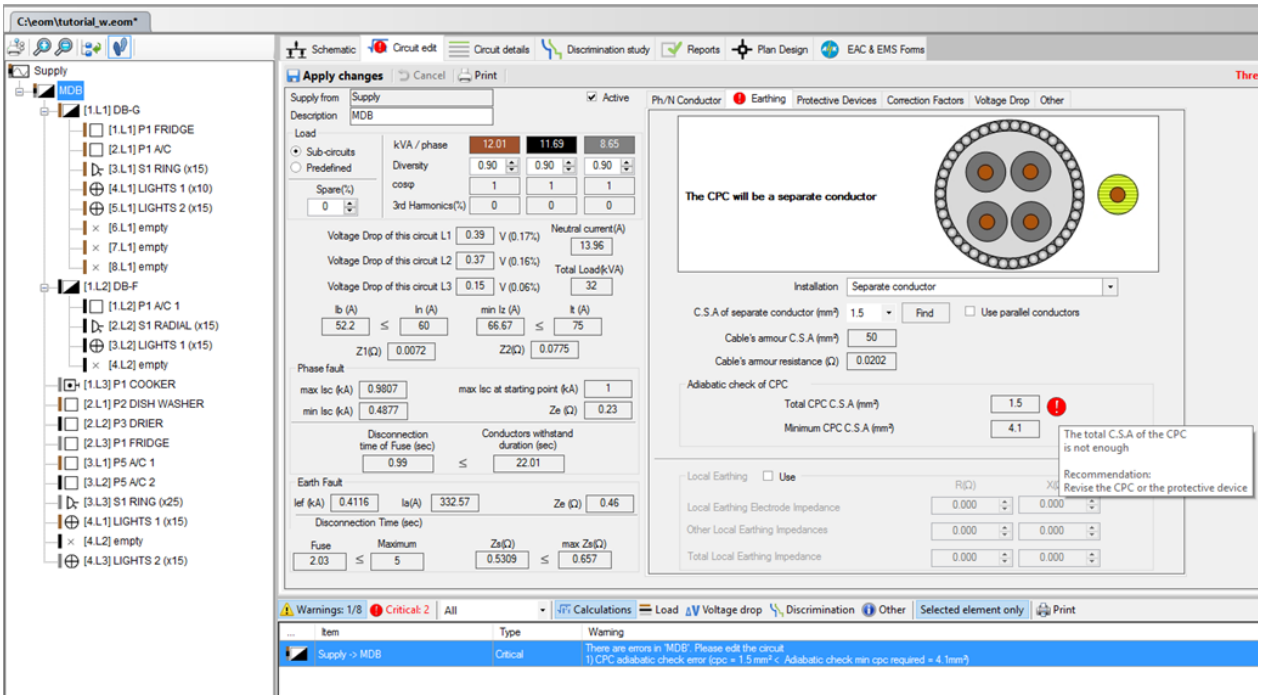


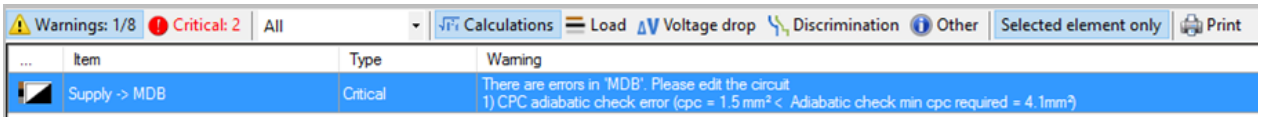
CPC Adiabatic Check

The software checks that the cross sectional area of the protective conductor is large enough that the protective device functions within time limits in the event of an earth fault.

See Earth Fault Current Calculation

Recommendation to resolve the error:
Revise the CPC or the protective device. Also make sure the upstream circuits have been set correctly.



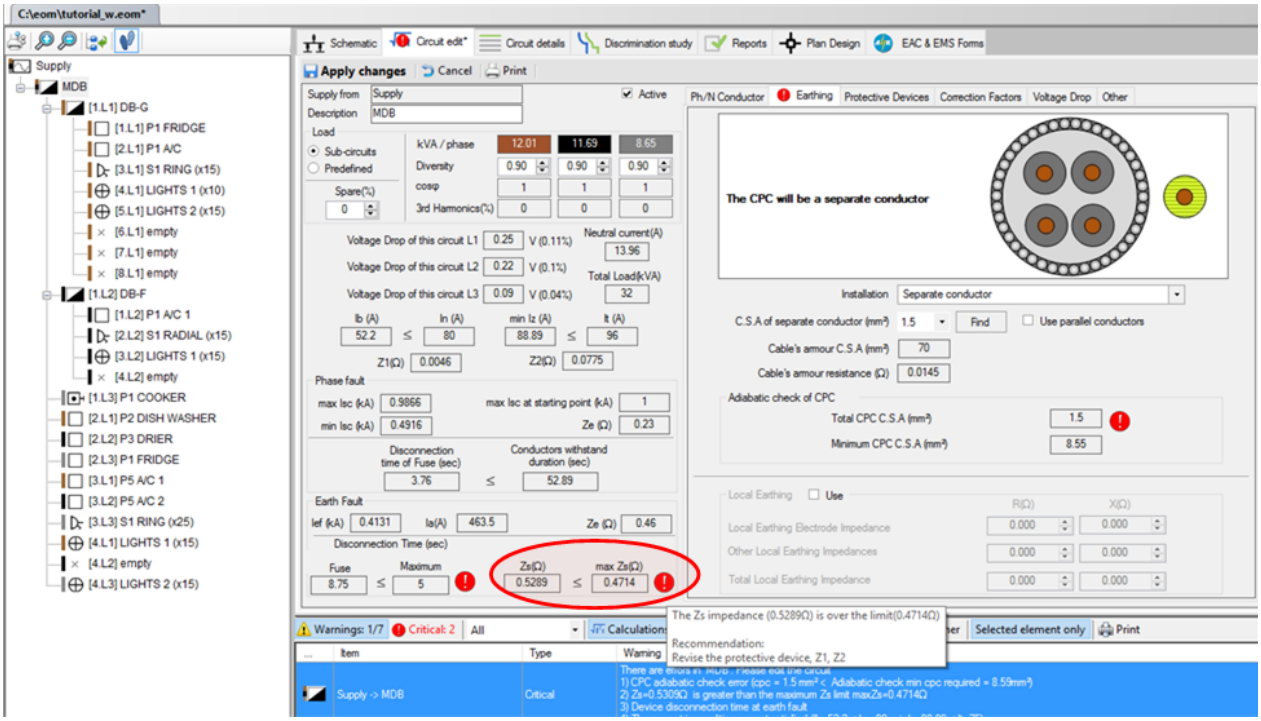


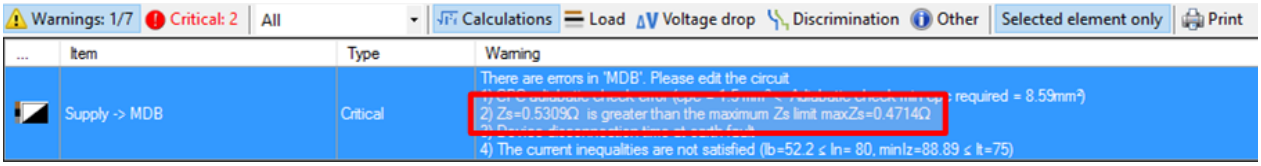
Maximum Earth Fault Loop Impedance Check

The software calculates the maximum loop impedance to check that the protective device functions within time limits in the event of an earth fault.

See Maximum Earth Fault Loop Impedance (max Z_s) Calculation

Recommendation to resolve the error:
Revise the protective device, Z1 (impedance of the phase conductor), Z2 (impedance of the CPC). Also make sure the upstream circuits have been set correctly.



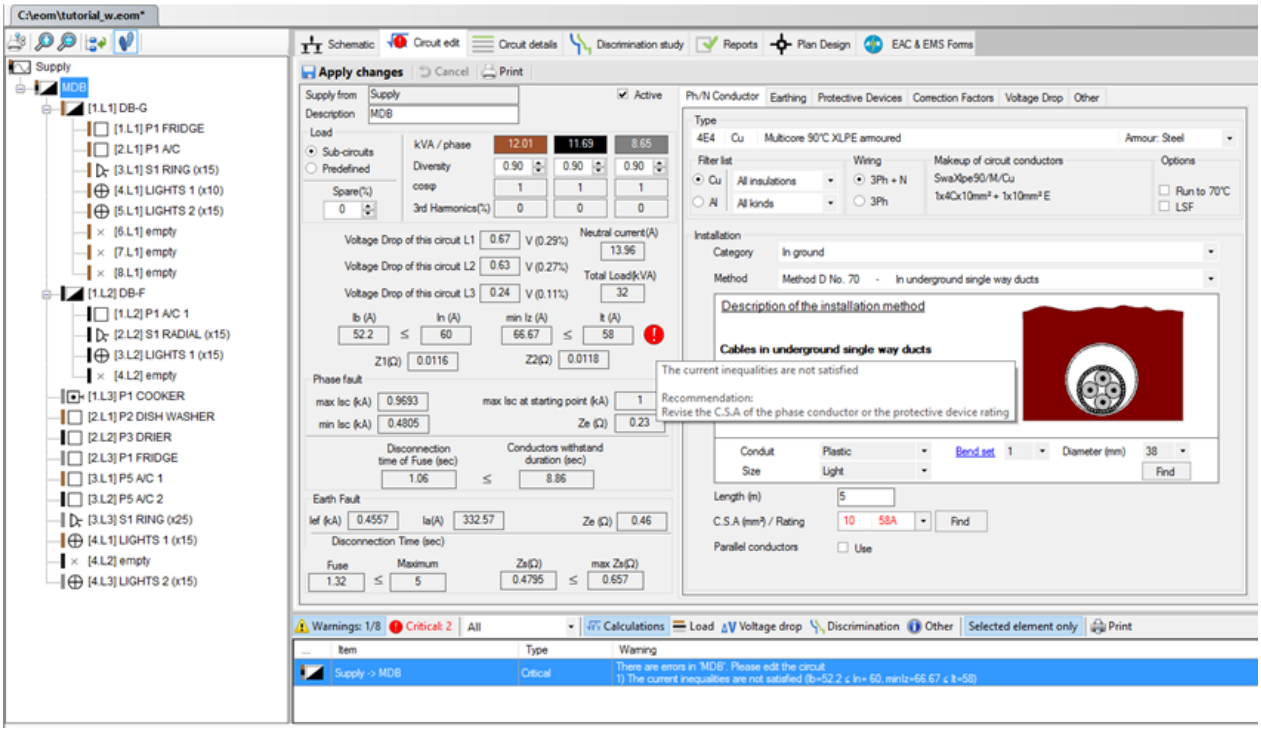


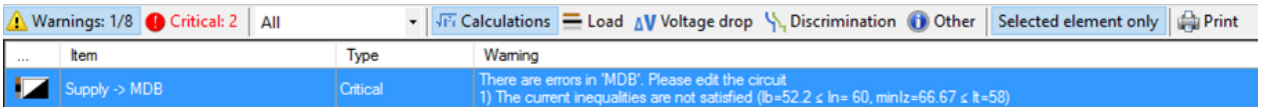
Design Current and Current Carrying Capacity Checks

The software checks that the phase conductor has a current carrying capacity not less than the design current.

See the Design Current and Current Carrying Capacity Calculations

Recommendation to resolve the error:
Revise the C.S.A of the phase conductor or the protective device rating. Also make sure that correction factors are applied correctly.



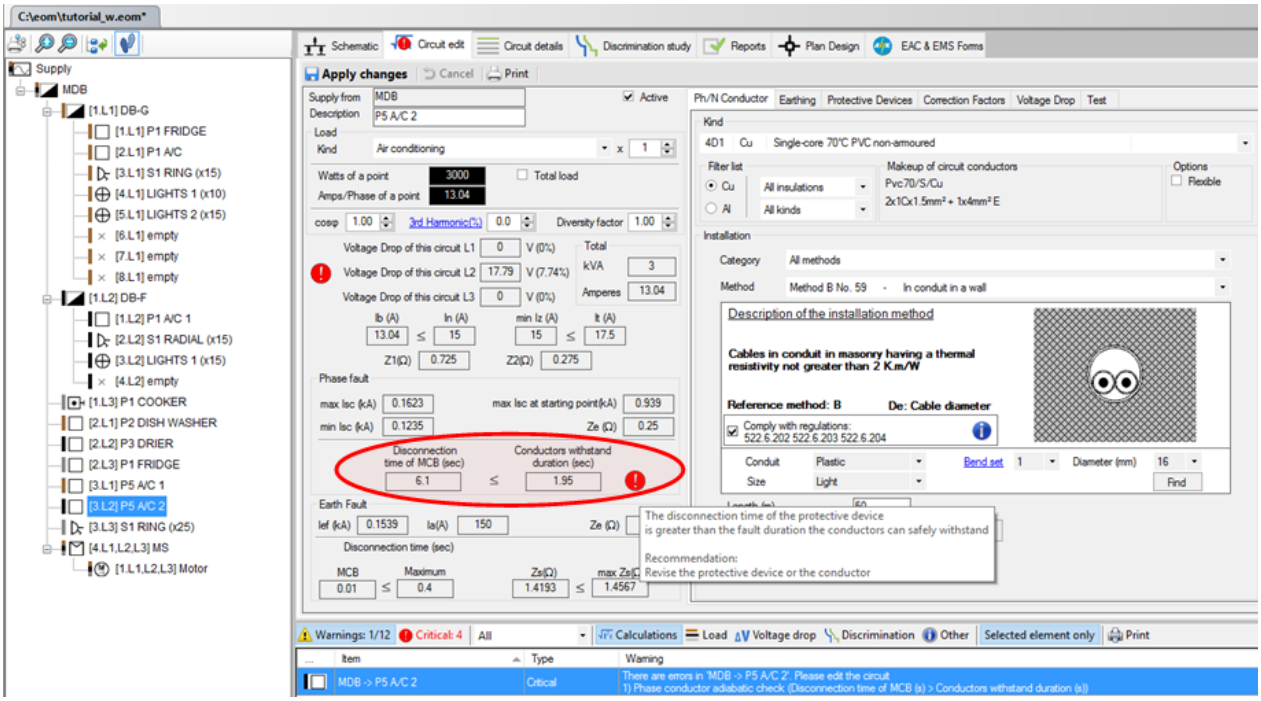


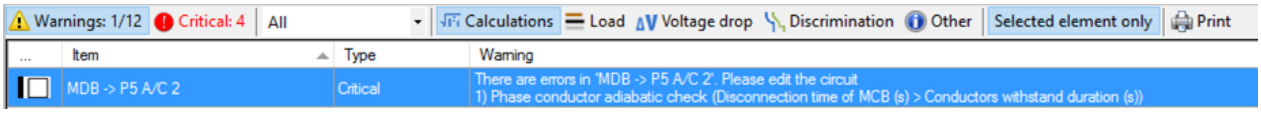
Phase Conductor Adiabatic Check

The software checks that the circuit protective device has a disconnection time satisfying the phase conductor adiabatic check.

See Minimum Phase Fault Current Calculation

Recommendation to resolve the error:
Revise the phase conductor or the protective device. Also make sure the upstream circuits have been set correctly.



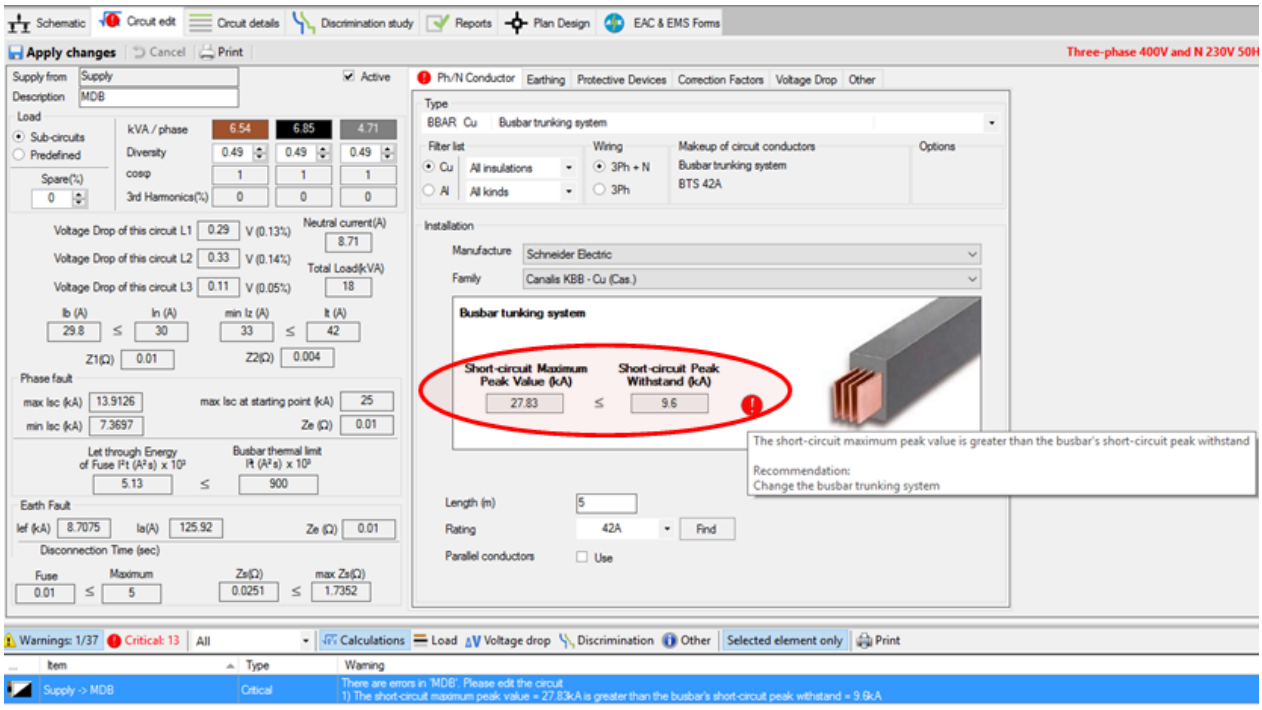


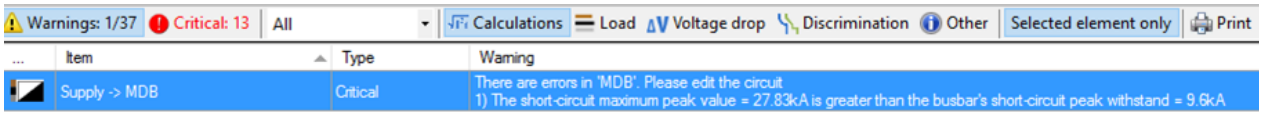
Busbar Trunking System Short-Circuit Peak Withstand Check

Where a manufacturer specific busbar trunking system is used, the software checks that the short-circuit maximum peak value is not greater than the withstand value given by the manufacturer.

See Short-Circuit Maximum Peak Value for Busbar Trunking Systems

Recommendation to resolve the error:
Revise the selection of the busbar trunking system. Also make sure the upstream circuits have been set correctly.



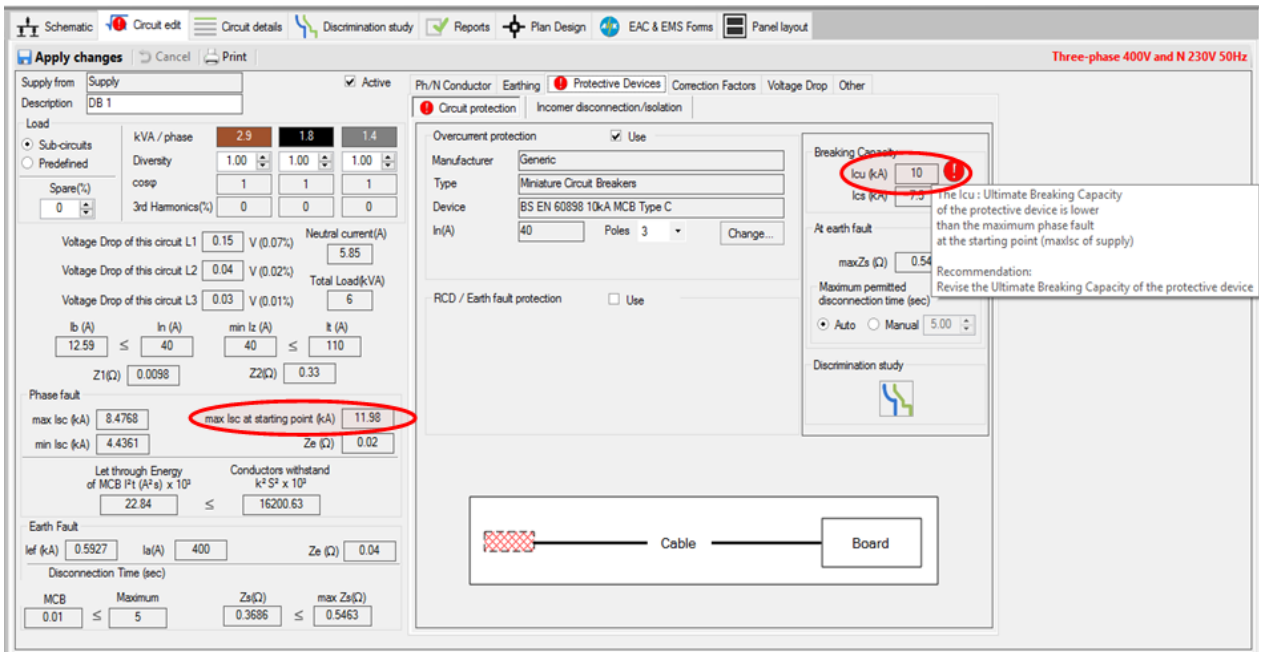


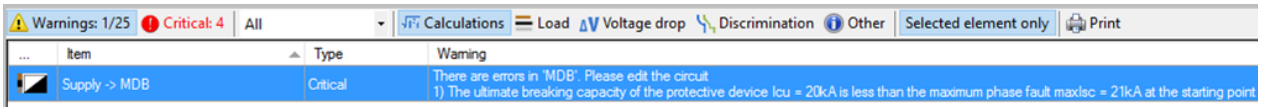
Ultimate Breaking Capacity of the Circuit's Protective Device Check

The software checks that the ultimate breaking capacity of the circuit's protective device (I_{cu}) is not less than the maximum phase fault current at the starting point.

Recommendation to resolve the error:
Revise the circuit's protective device breaking capacity. Also make sure the upstream circuits have been set correctly.

[See the calculation details]

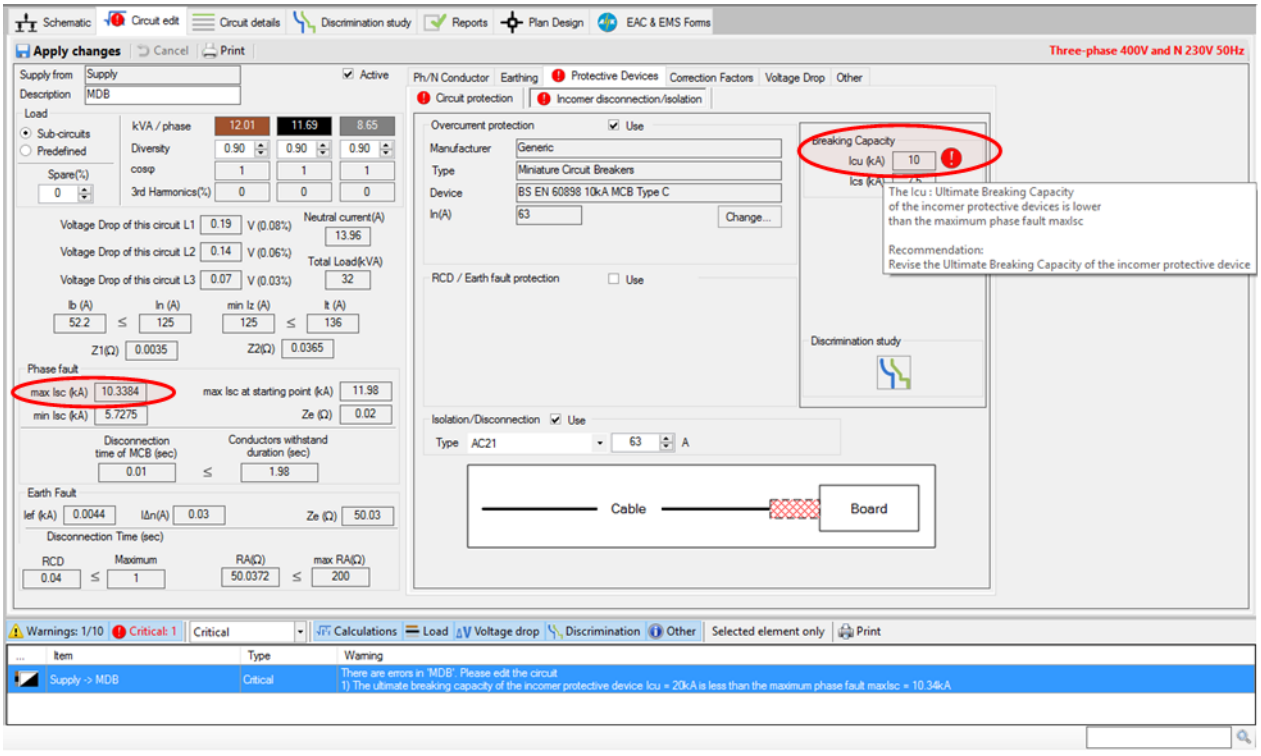


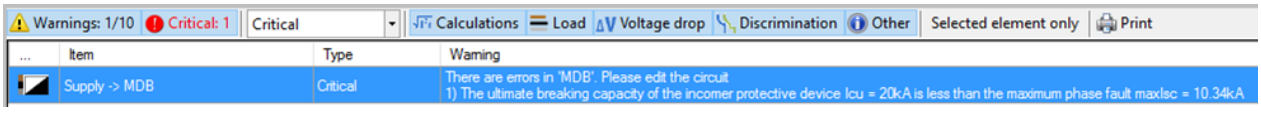


Ultimate Breaking Capacity of the Incomer Protective Device Check

The software checks that the ultimate breaking capacity of the incomer protective device (I_{cu}) is not less than the maximum phase fault current.

Recommendation to resolve the error:
Revise the incomer protective device breaking capacity. Also make sure the upstream circuits have been set correctly.

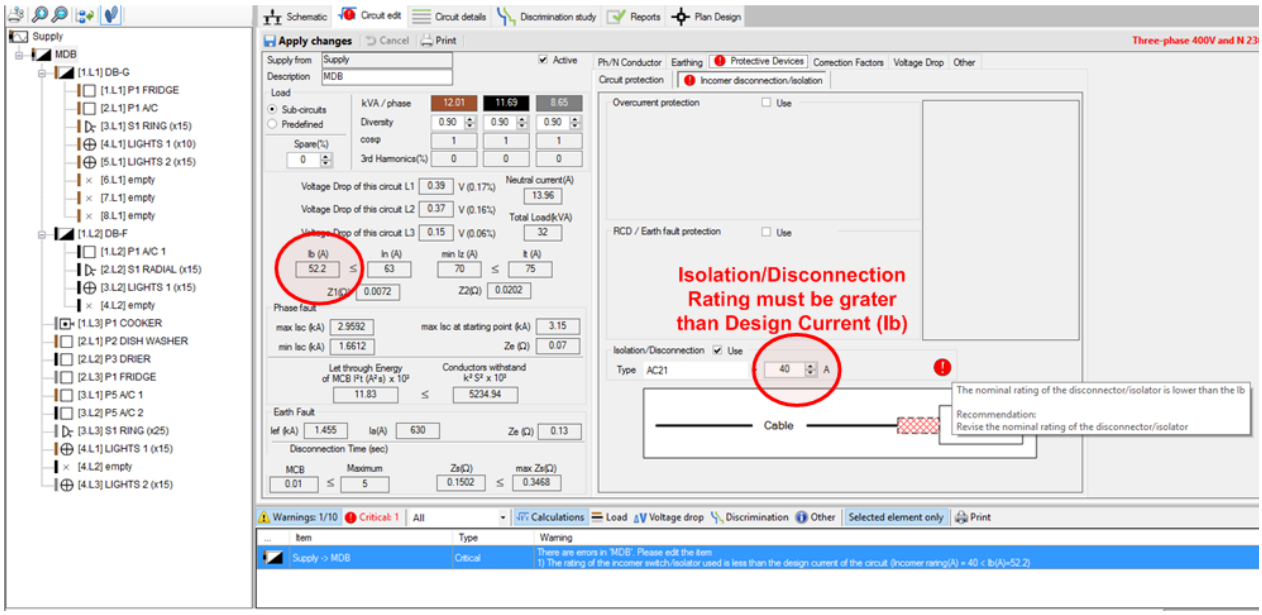


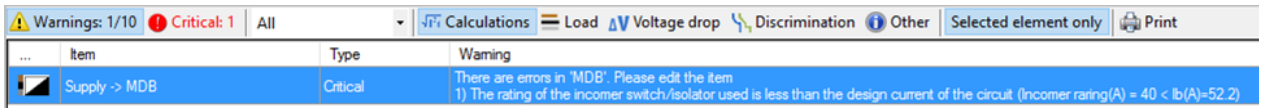


Rating of the Incomer Switch/Isolator Check

The software checks that the incomer isolation/disconnection device rating is greater than or equal to the design current (I_b).

Recommendation to resolve the error:
Select an incomer with rating greater than or equal to the design current value (I_b).

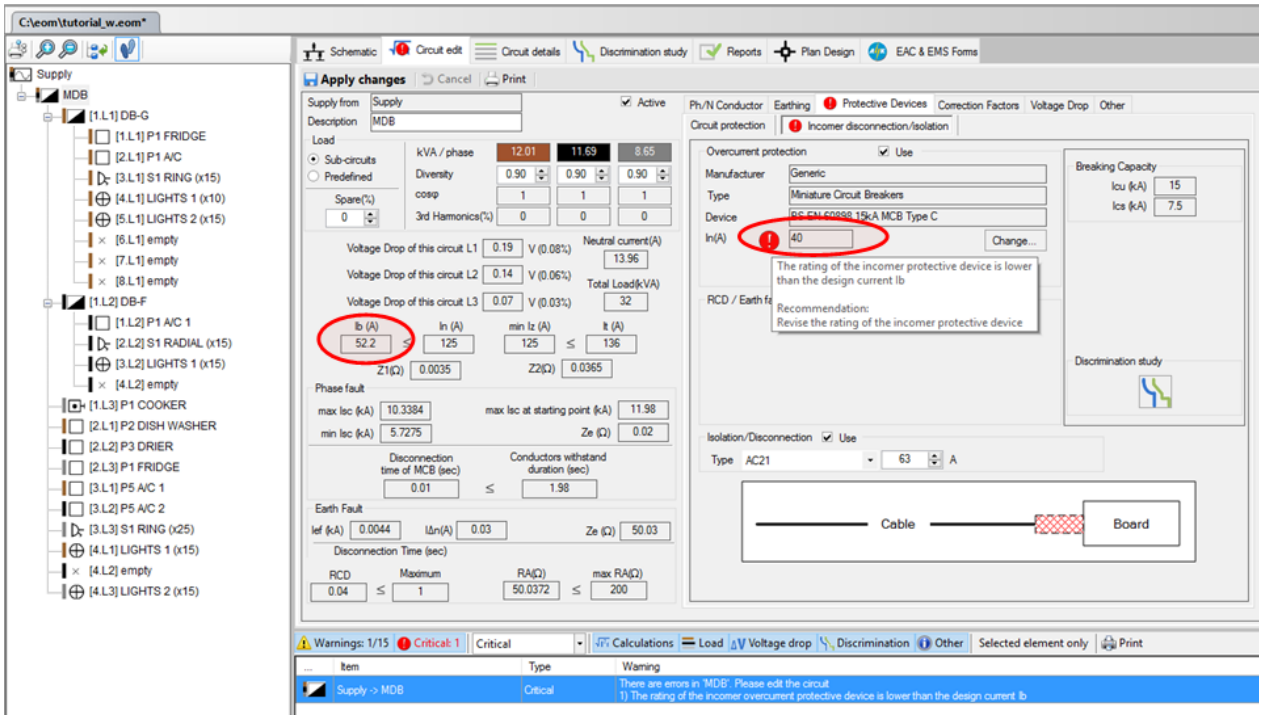


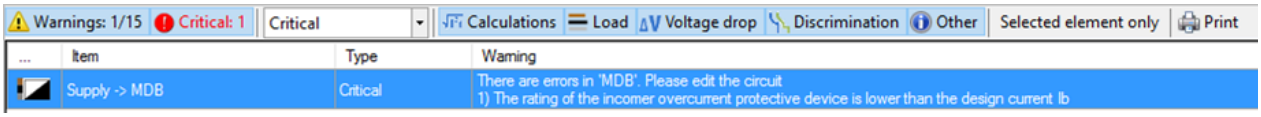


Rating of the Incomer Overcurrent Protective Device Check

The software checks that the rating of the incomer overcurrent protective device is not lower than the design current (I_b).

Recommendation to resolve the error:
Revise the rating of the incomer overcurrent protective device.

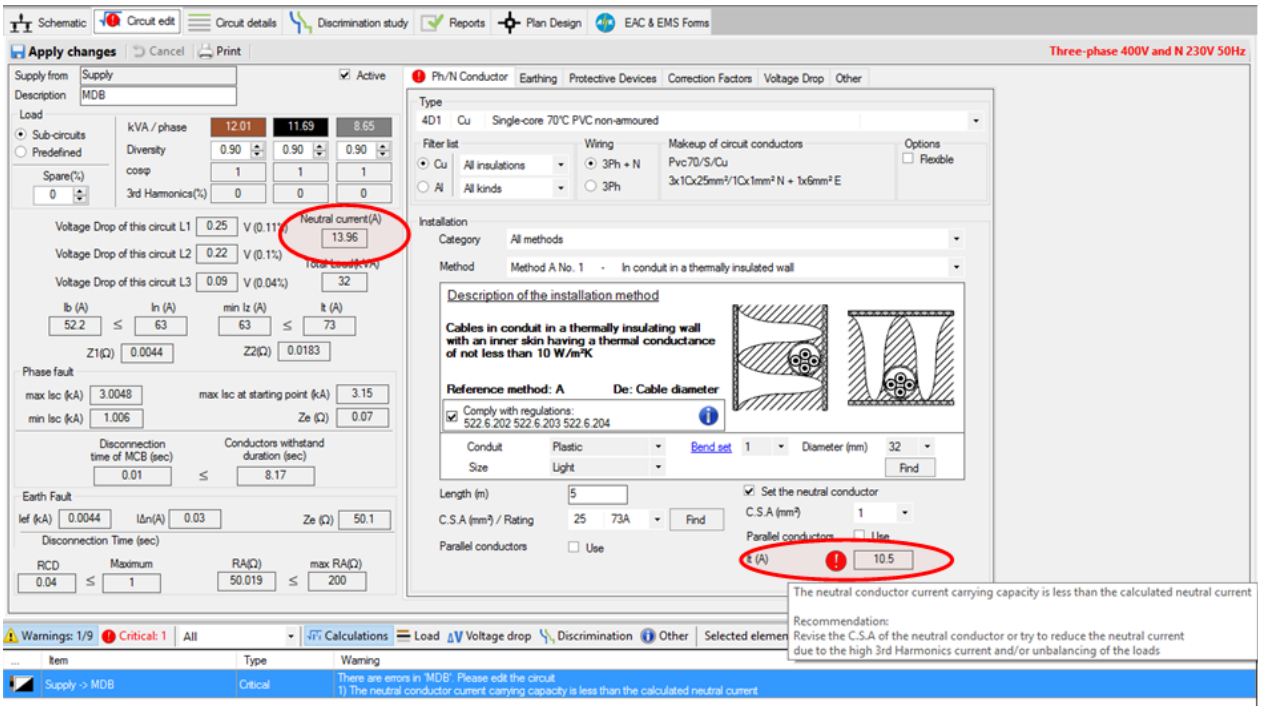


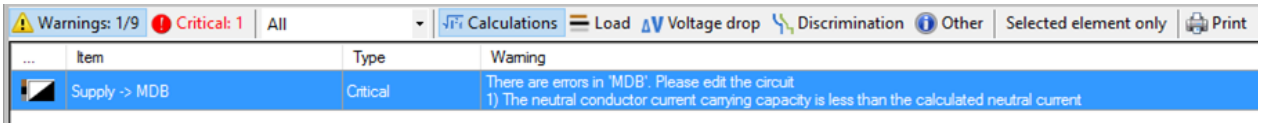


Neutral Conductor Current Carrying Capacity Check

When the engineer chooses to size the neutral conductor separately, in a three-phase + neutral single-core cable, the software checks if the neutral conductor's current carrying capacity is equal to or greater than the calculated neutral current.

Recommendation to resolve the error:
Revise the C.S.A of the neutral conductor or try to reduce the high neutral current due to the high third harmonics current and/or unbalancing of the loads.

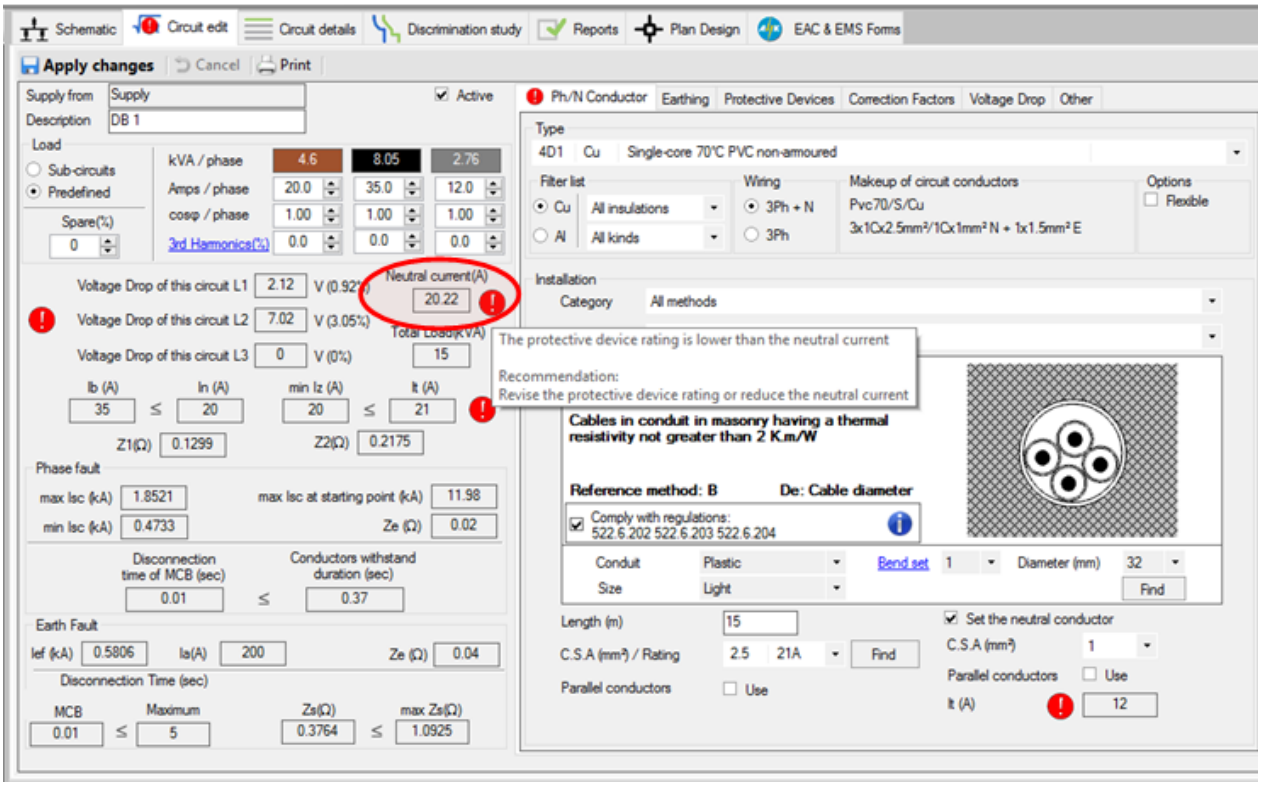


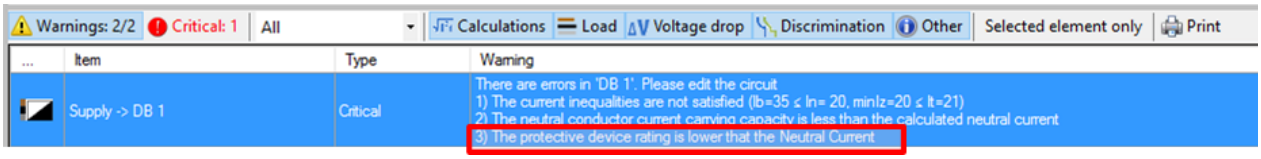


Neutral Current Protective Device Rating Check

The software checks whether the neutral current is over the circuit's protective device rating due to high third harmonics current and/or unbalancing of the loads.

Recommendation to resolve the error:
Revise the protective device rating or try to reduce the high neutral current due to the high third harmonics current and/or unbalancing of the loads.

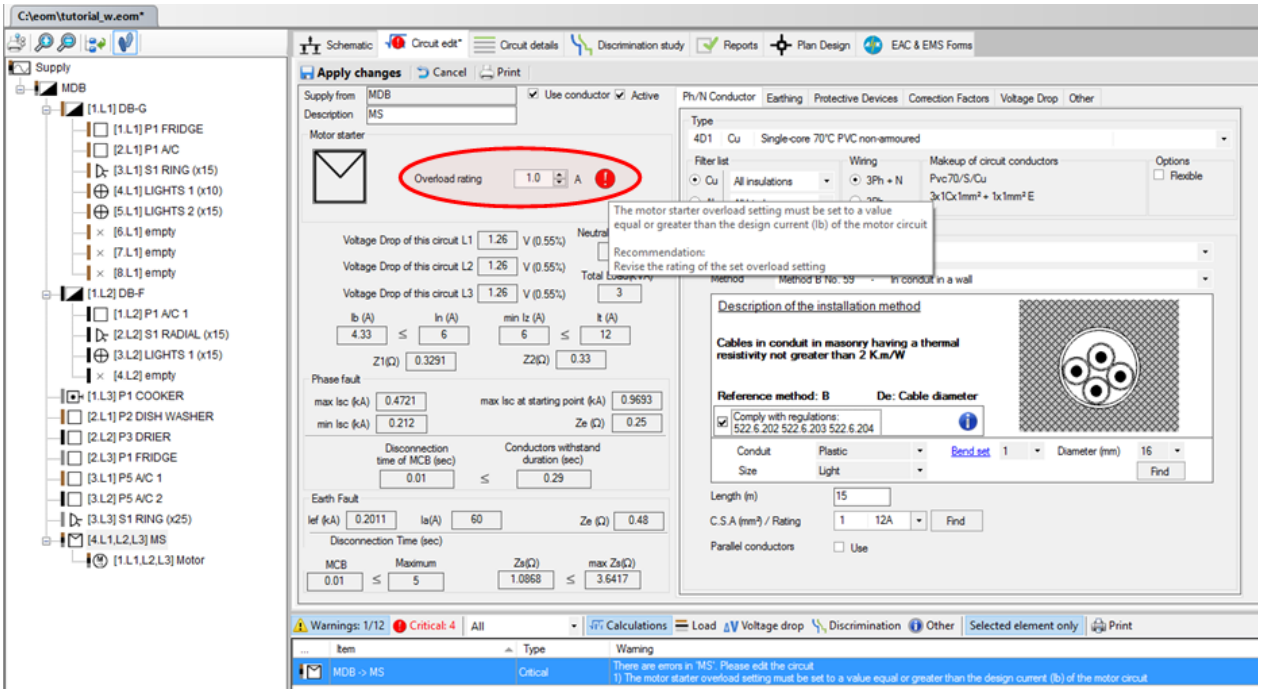


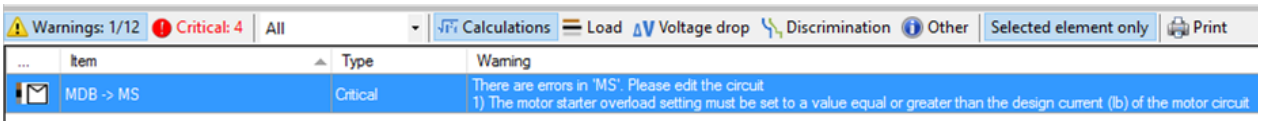


Motor Starter Overload Setting Check

The software checks that the motor starter overload rating is greater than or equal to the design current (I_b) of the motor circuit.

Recommendation to resolve the error:
Revise the motor starter overload rating to a value greater than or equal to the design current (I_b) of the motor circuit.

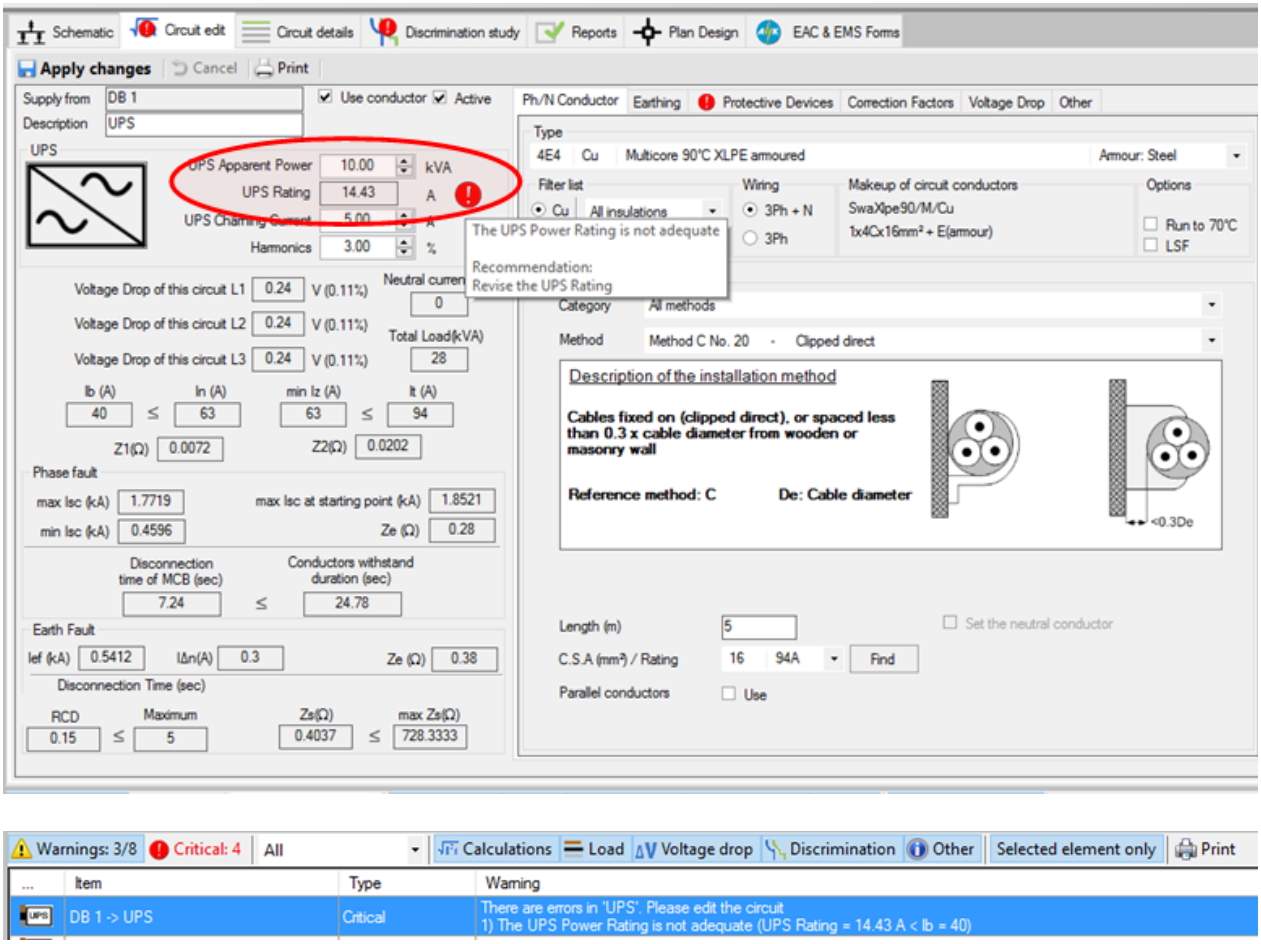




UPS Power Rating Check

The software checks the UPS rating and provides a warning when this is lower than the design current of the circuit.

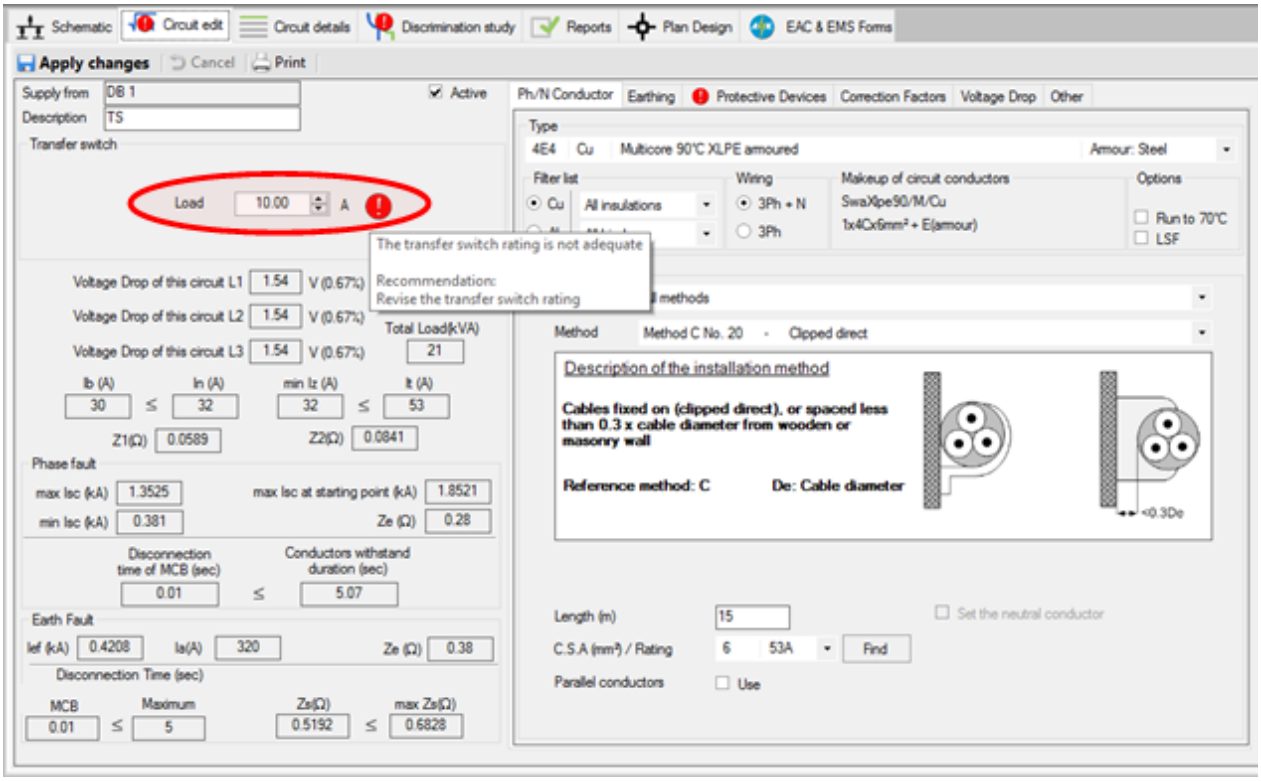
Recommendation to resolve the error:
Revise the UPS apparent power value.

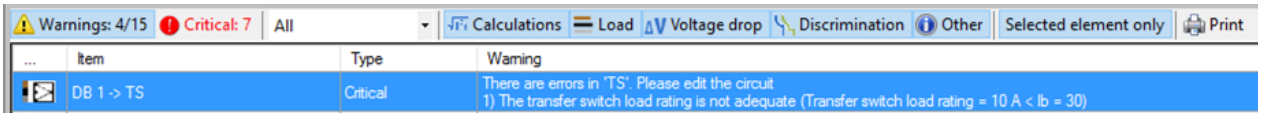


Transfer Switch Load Rating Check

The software checks the transfer switch load rating and provides a warning when this is lower than the design current of the circuit.

Recommendation to resolve the error:
Revise the transfer switch load rating.

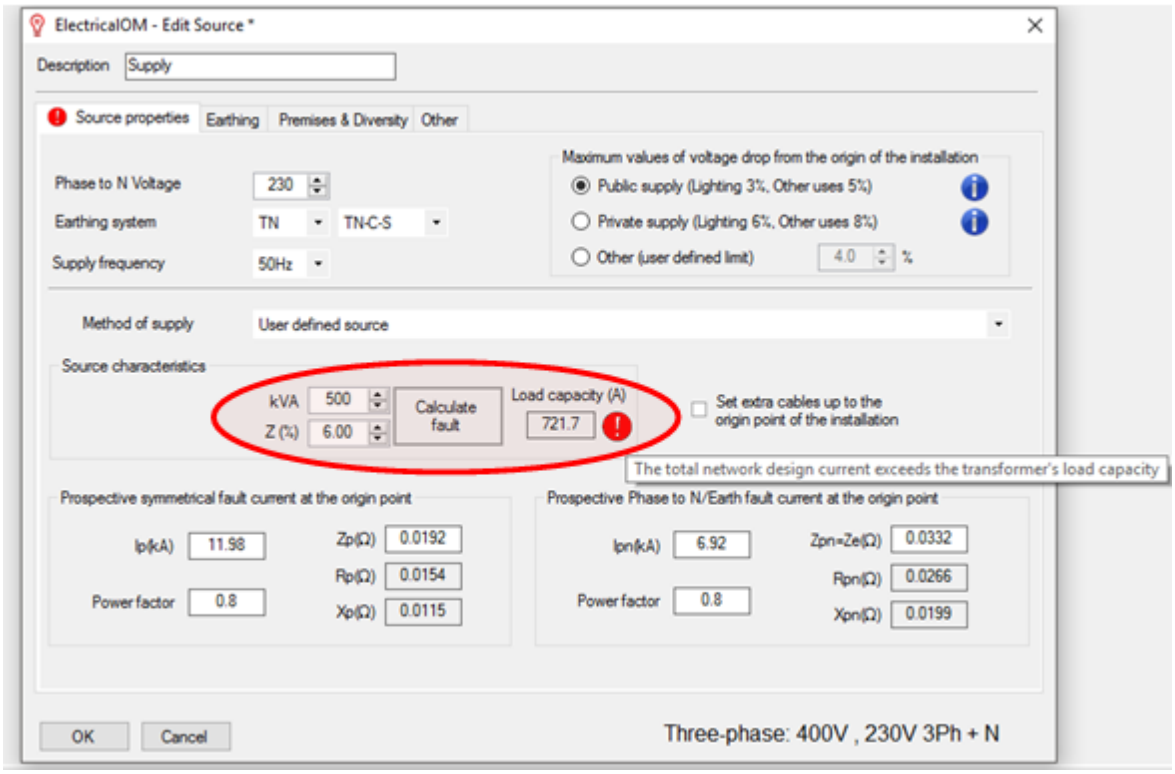


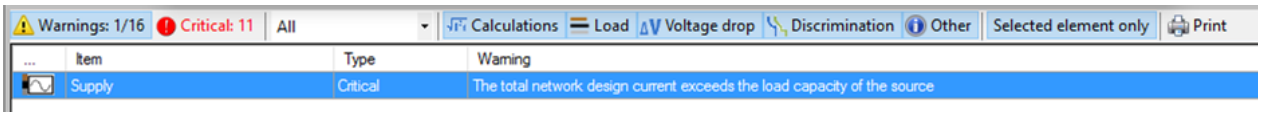


Source Load Capacity Check

The software checks the active source load capacity and provides a warning when this is lower than the active network's total design current.

Recommendation to resolve the error:
Increase the source load capacity or apply more diversity to the total design current.

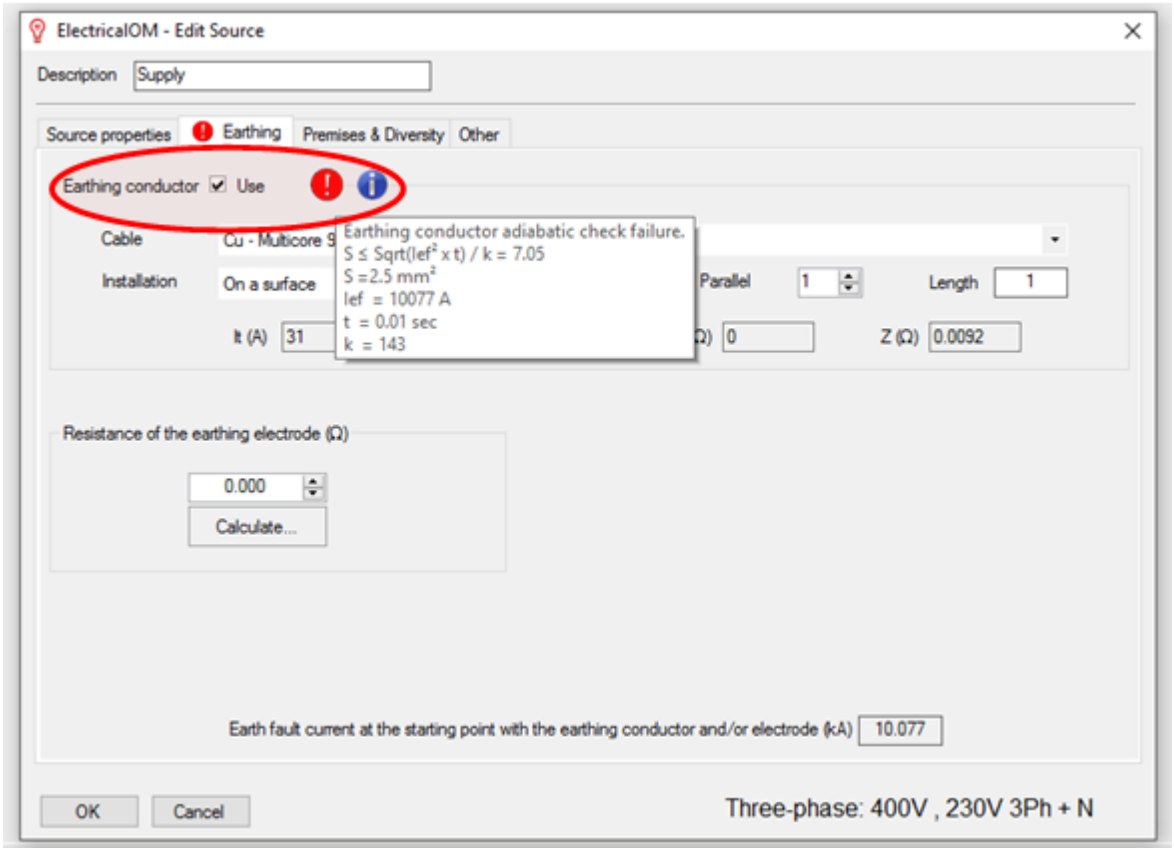


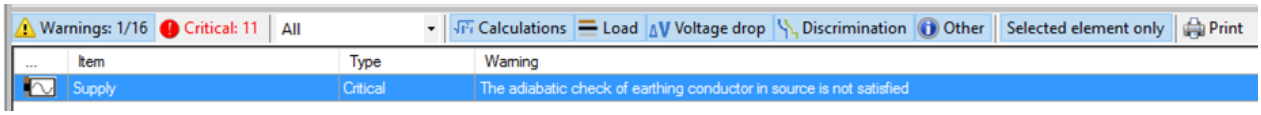


Source Earthing Conductor Adiabatic Check

If the engineer has chosen to set the earthing conductor at the source level (the starting point of the installation), the software checks that the earthing conductor has a cross-sectional area satisfying the adiabatic check.

Recommendation to resolve the error:
Revise the earthing conductor.





Important

Important warnings should be resolved in good practice but can be left unresolved for the completion of the study. They are warnings about potential hazards to the installation.

Voltage Drop over the Split Limit Set Check

Energy Based Discrimination Check

Discrimination During Overcurrent Check

Discrimination During Earth Fault Check

Motor Starting Check

Service Breaking Capacity of the Circuit Protective Device Check

Service Breaking Capacity of the Incomers Protective Device Check

Installation in Conduit Check

Installation in Trunking Check

Installation Compliance with Regulations Check

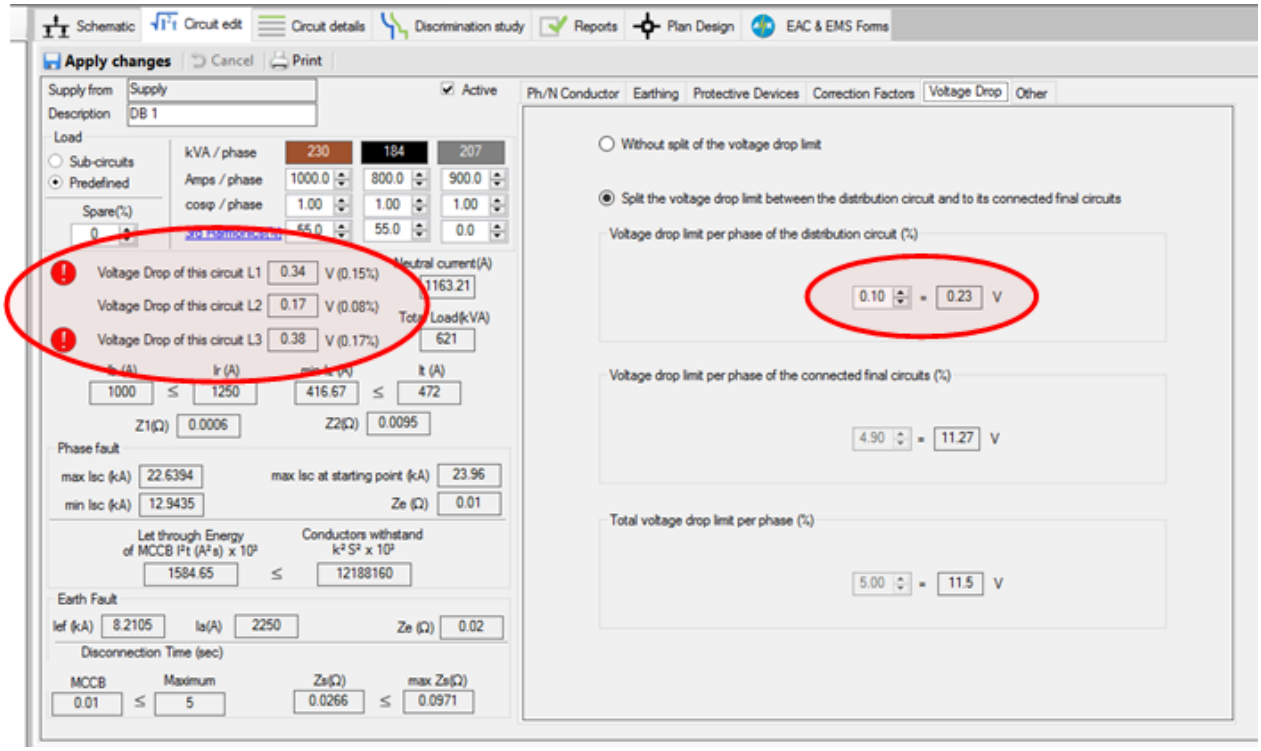
Harmonic Content in Circuit Check

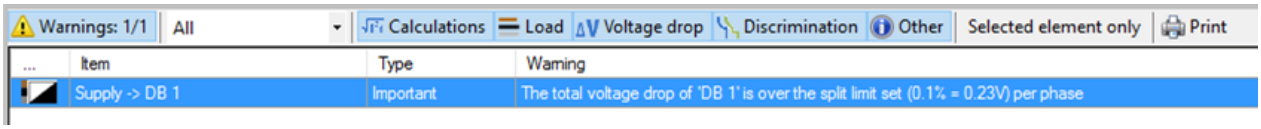
Current Carrying Capacity of the Tails Conductor Check

Voltage Drop over the Split Limit Set Check

For distribution circuits there is an option to split the voltage drop limit between the distribution circuit and its final circuits. This split limit is not a regulation requirement but is set by the designer to warn him or her about circuits exceeding the specified voltage drop percentage value, allowing for finer control of the voltage drop across circuits. The software provides a warning when the voltage drop of the circuit is over the split limit set.

Recommendation to resolve the error:
Revise the conductor or set a higher voltage drop split limit for the particular circuit.

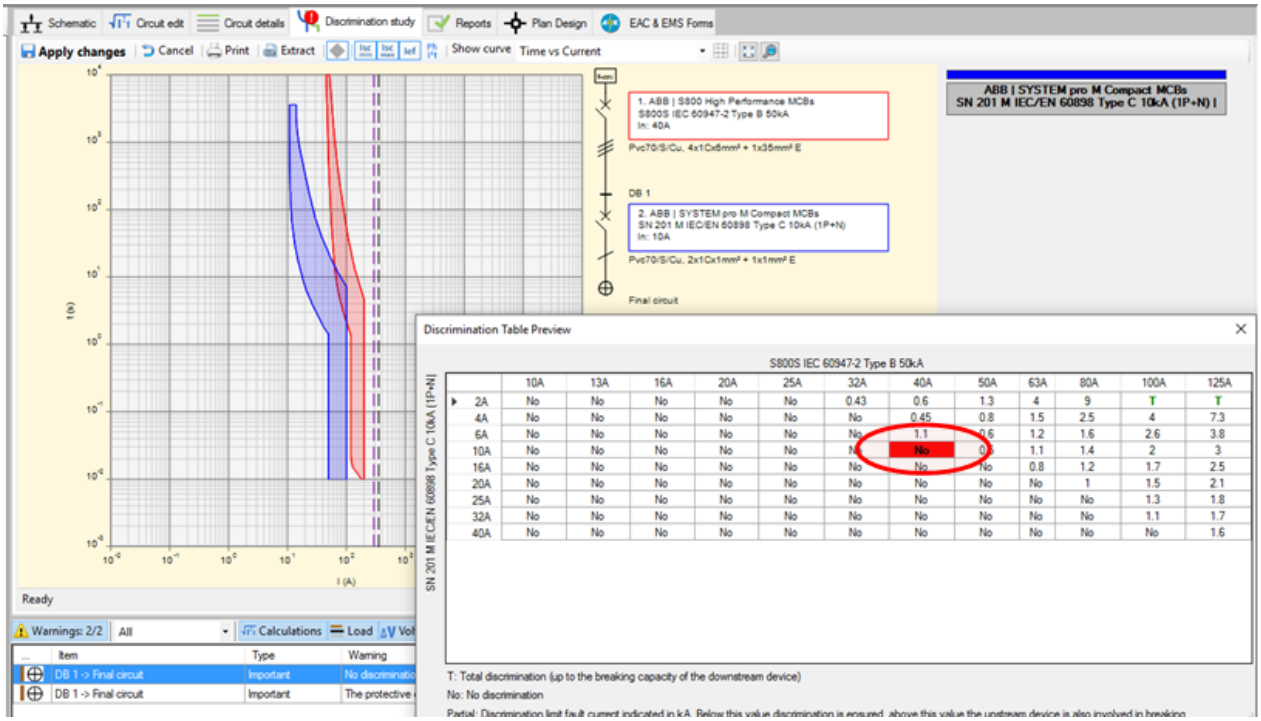


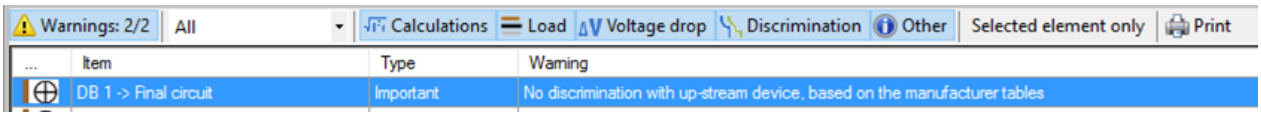


Energy Based Discrimination Check

When the manufacturer's energy-based discrimination data are available and the fault condition is causing operation of the protective device below 0.1 sec, the checks are performed based on the manufacturer's discrimination tables. The software provides a warning when the discrimination check fails against an up-stream device.

Recommendation to resolve the error:
Revise the protective device.

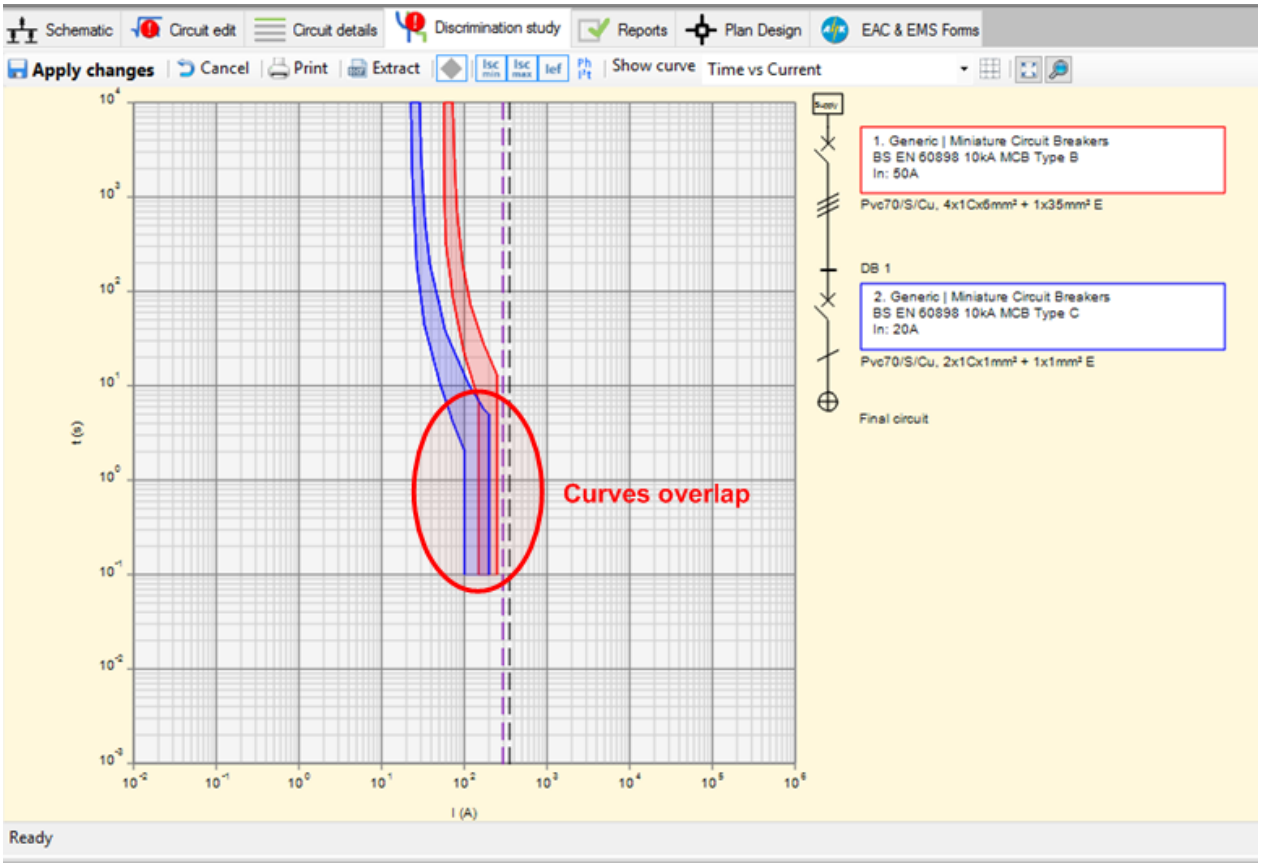


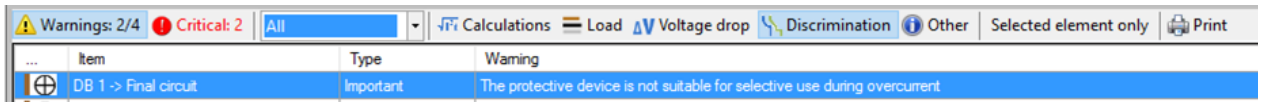


Discrimination During Overcurrent Check

When the manufacturer's energy-based discrimination data are not available or the fault condition is causing operation of the protective device over 0.1 sec, ElectricalOM performs discrimination checks between the time-amperes curves of the protective devices, where overlapping curves indicate a discrimination problem. The check is made up to the value of the maximum prospective short-circuit current at the downstream protective device.

Recommendation to resolve the error:
Revise the protective device so the curves are not overlapping.





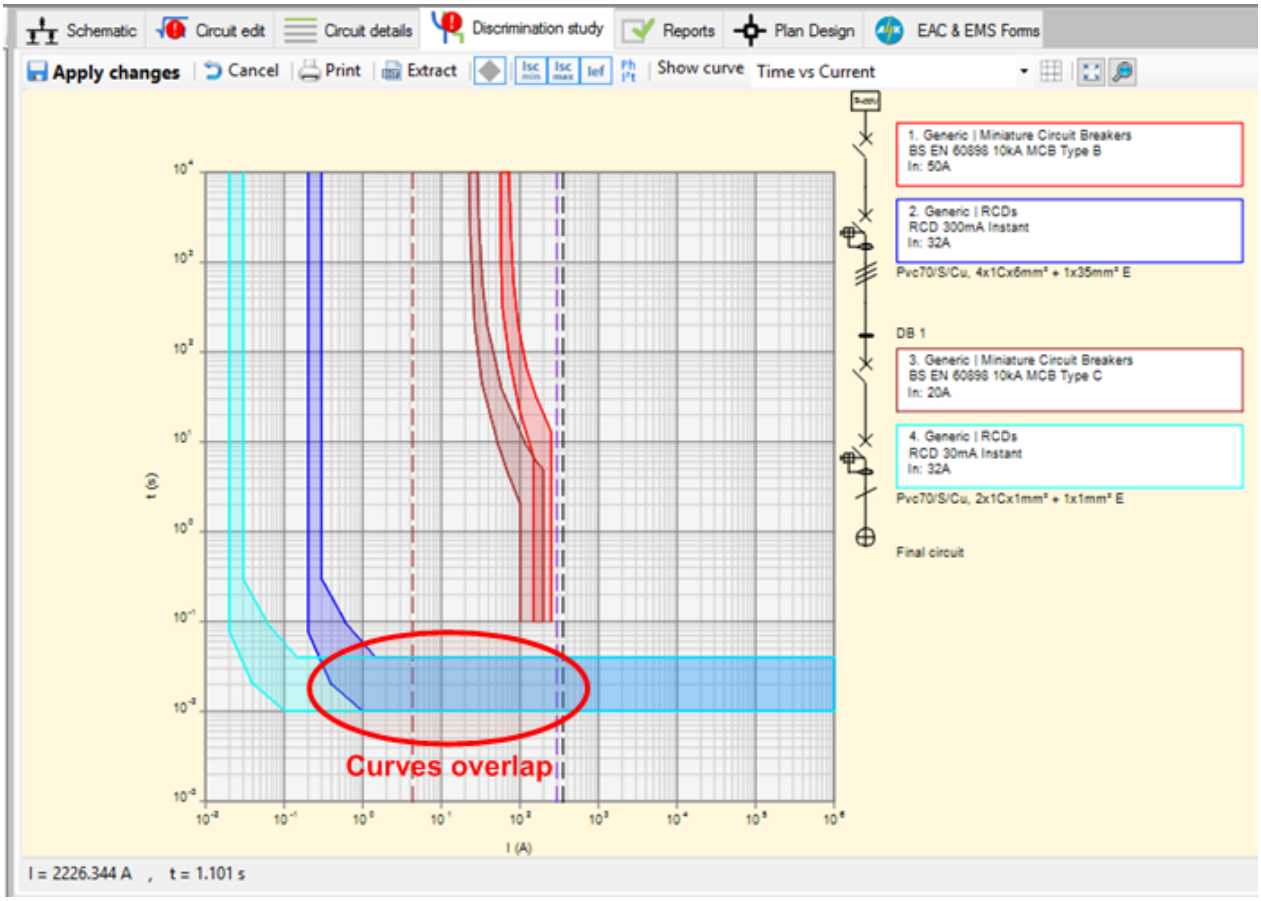
Incomer Protective Device Discrimination During Overcurrent Check

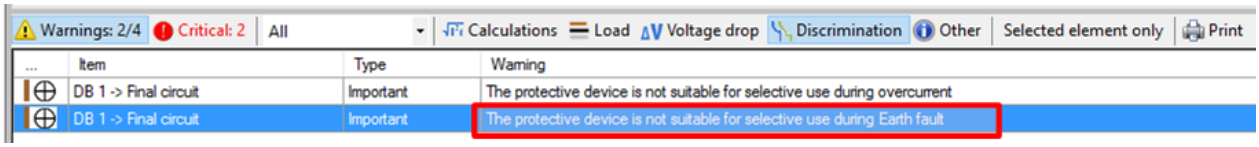
Discrimination checks are also made for incomer ele protective devices. See Discrimination During Overcurrent.

Discrimination During Earth Fault Check

Where an RCD device has not been installed, the check is performed in the same way as for the overcurrent protective device, but considering the earth fault levels. Otherwise the check is made comparing the RCD curves.

Recommendation to resolve the error:
Revise the protective device so the curves are not overlapping.





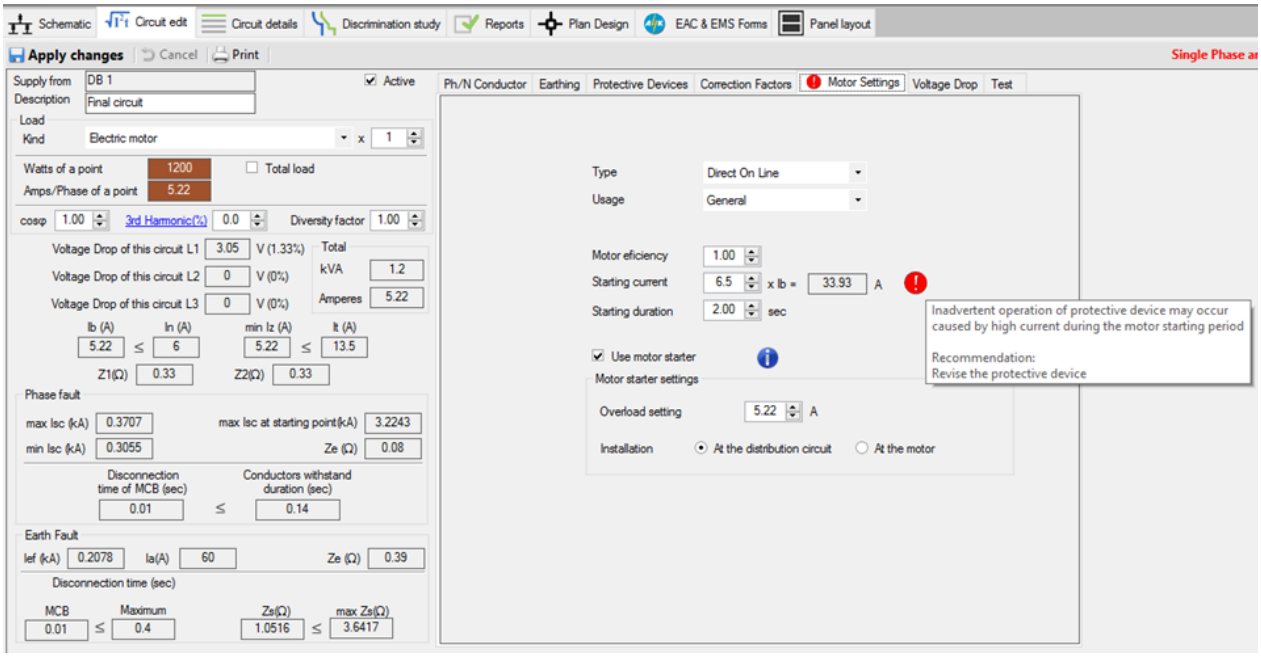
Incomer Protective Device Discrimination During Earth Fault Check

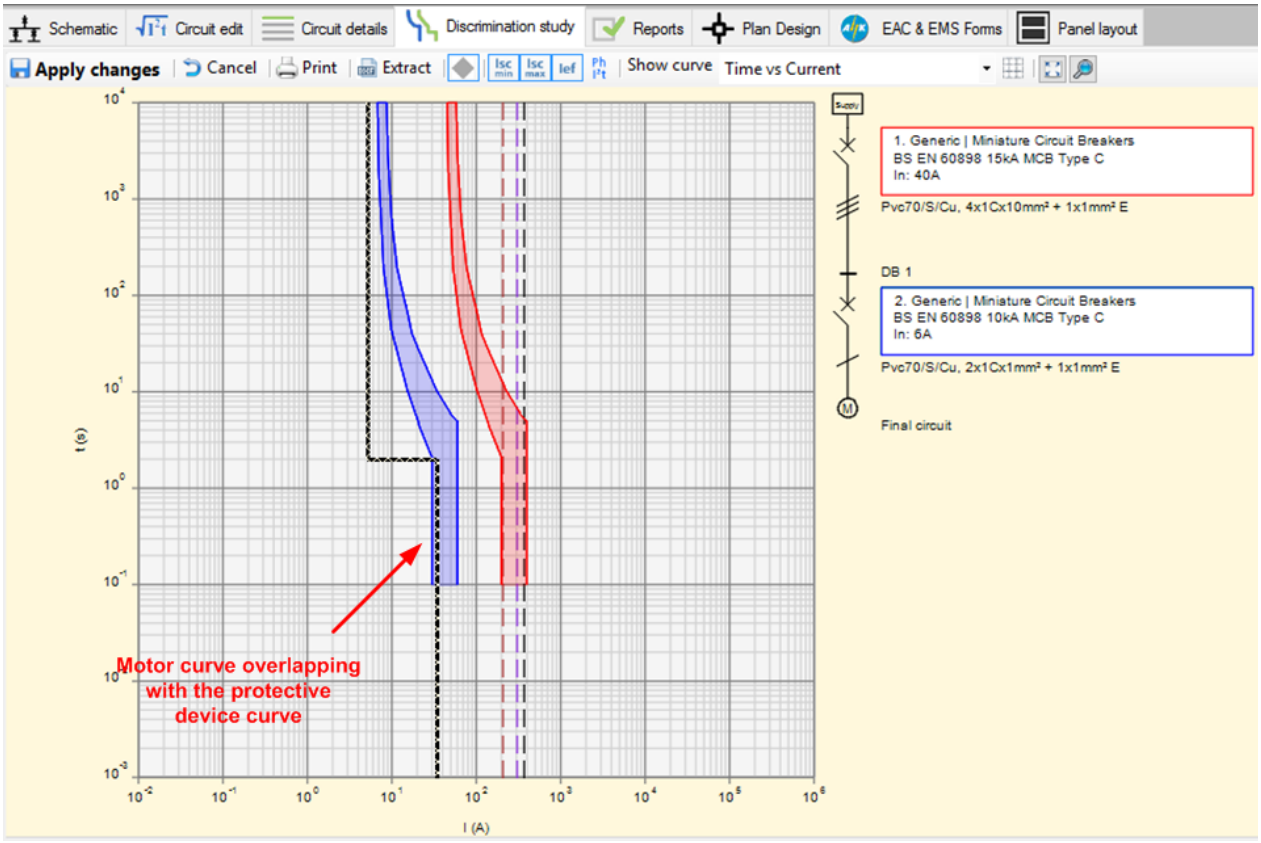
Discrimination checks are also made for incomer RCD devices. See Discrimination During Earth Fault.

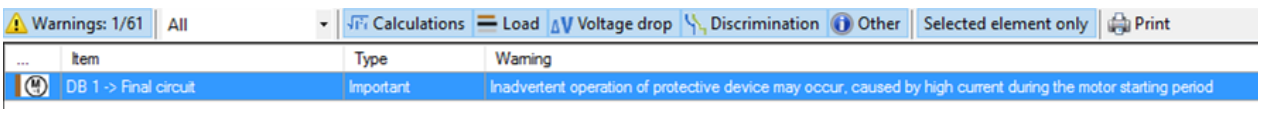
Motor Starting Check

Motor circuits require that their protective devices have specific characteristics to avoid inadvertent operation during the motor starting period. The check made is based on the selected protective device and the motor's starting current and starting duration settings. Based on these parameters the motor starting curve is calculated and compared to the protective device curve. Overlapping between the curves indicates inadvertent operation.

Recommendation to resolve the error:
Revise the protective device so the motor and protective device curves are not overlapping.





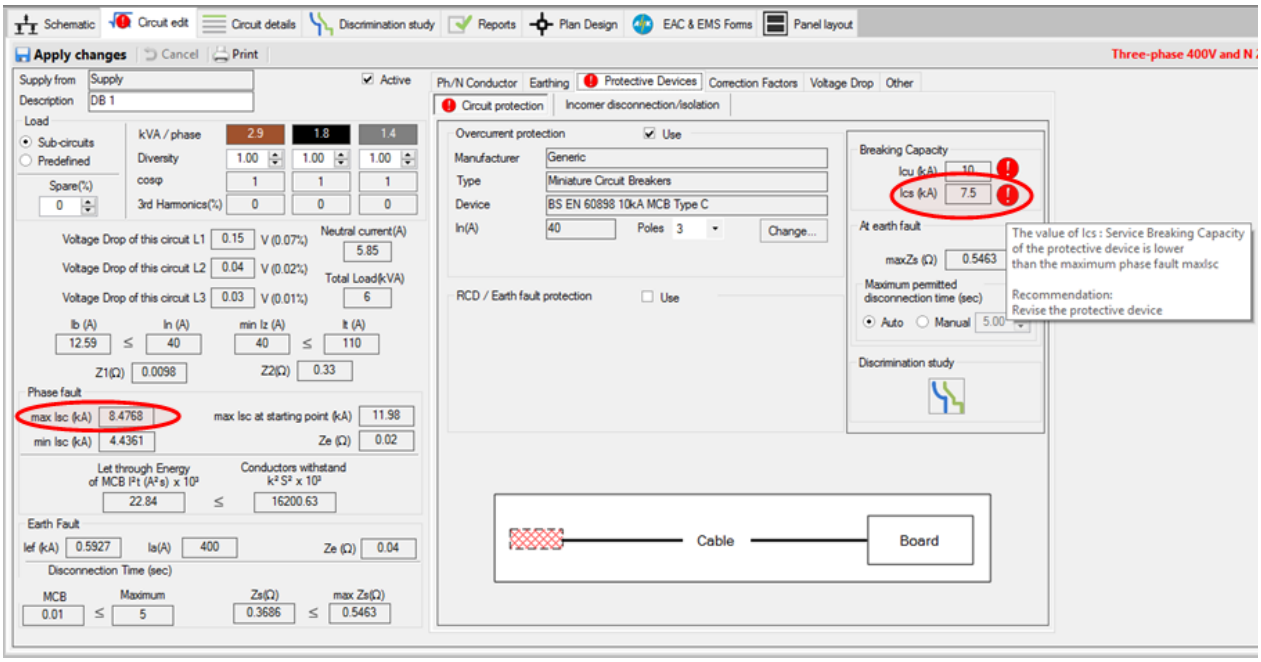


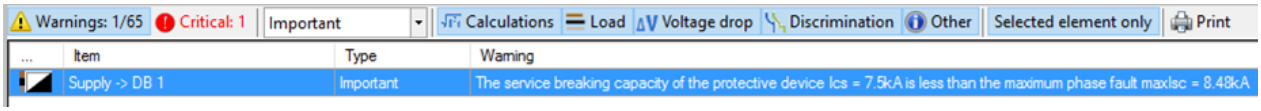
Service Breaking Capacity of the Circuit Protective Device Check

The software checks that the service breaking capacity of the protective device (I_{cs}) is not less than the circuit's maximum phase fault current.

Recommendation to resolve the error:

Revise the circuit's protective device I_{cs}. Also make sure the upstream circuits have been set correctly.

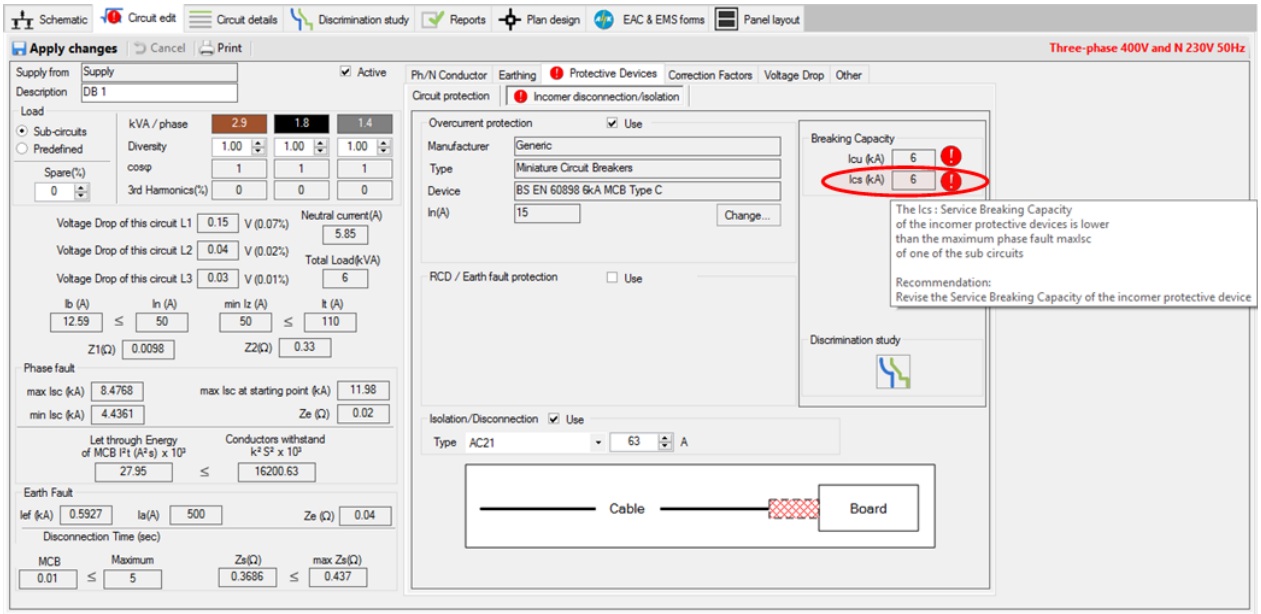


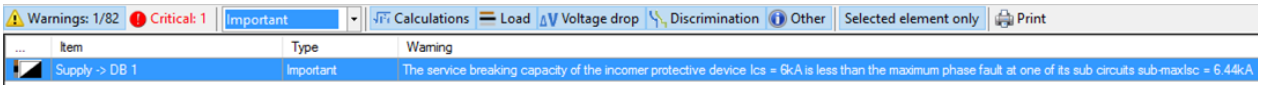


Service Breaking Capacity of the Incomers Protective Device Check

The software checks that the service breaking capacity of the incomer protective device (I_{cs}) is not less than the maximum phase fault current of one of the sub circuits.

Recommendation to resolve the error:
Revise the incomer protective device I_{cs}.

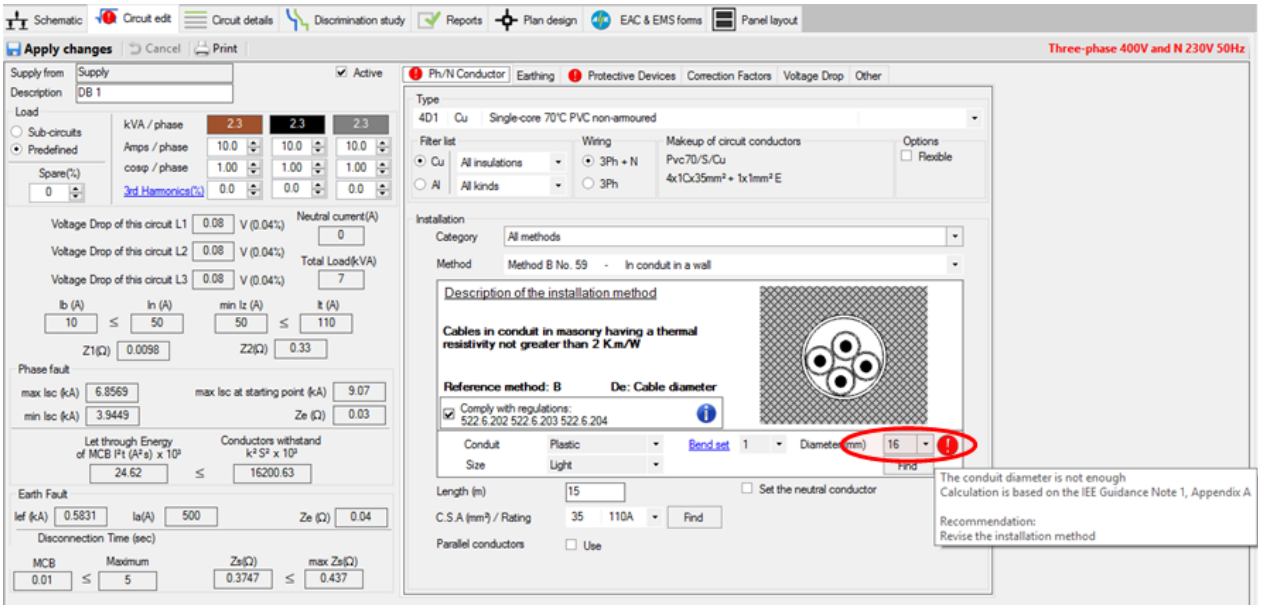


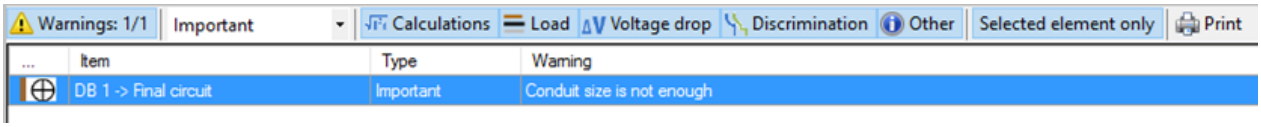


Installation in Conduit Check

Where the installation incorporates conduit, a check is made that the conduit is sized to accommodate the makeup of the conductors. *Calculation is based on the IET Guidance Note 1, Appendix A.*

Recommendation to resolve the error:
Revise the conduit size.

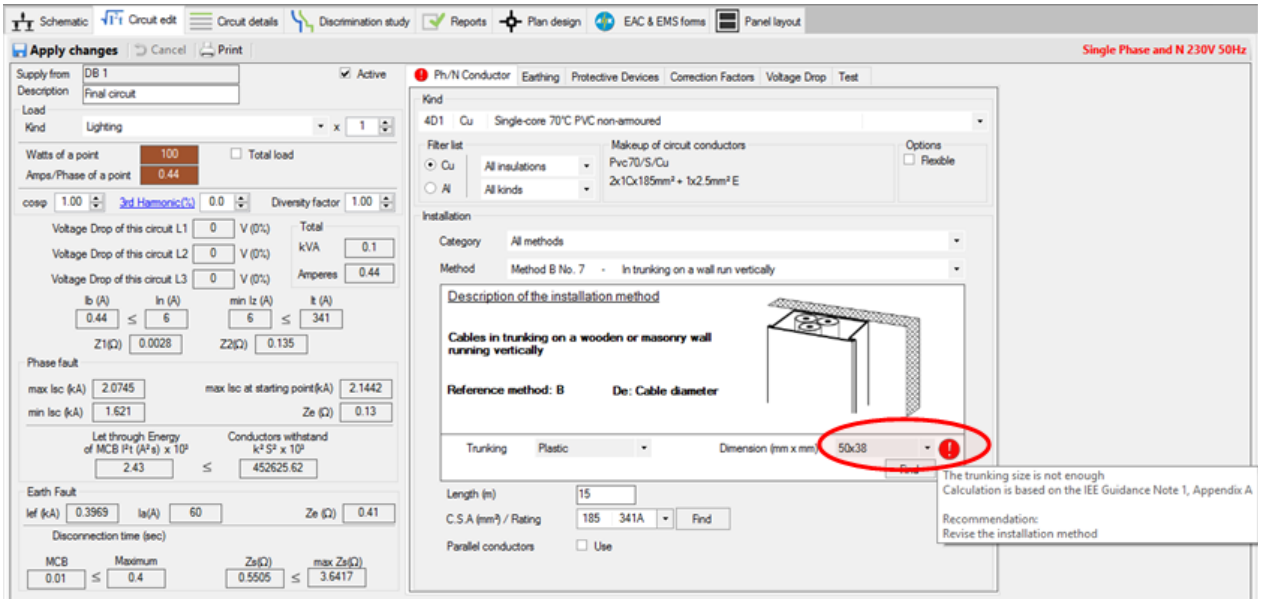


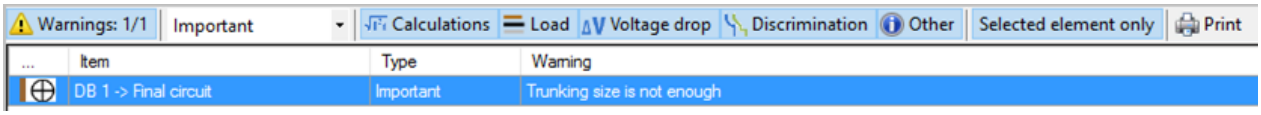


Installation in Trunking Check

Where the installation incorporates trunking, a check is made that the trunking is sized to accommodate the makeup of the conductors. *Calculation is based on the IET Guidance Note 1, Appendix A.*

Recommendation to resolve the error:
Revise the trunking size.

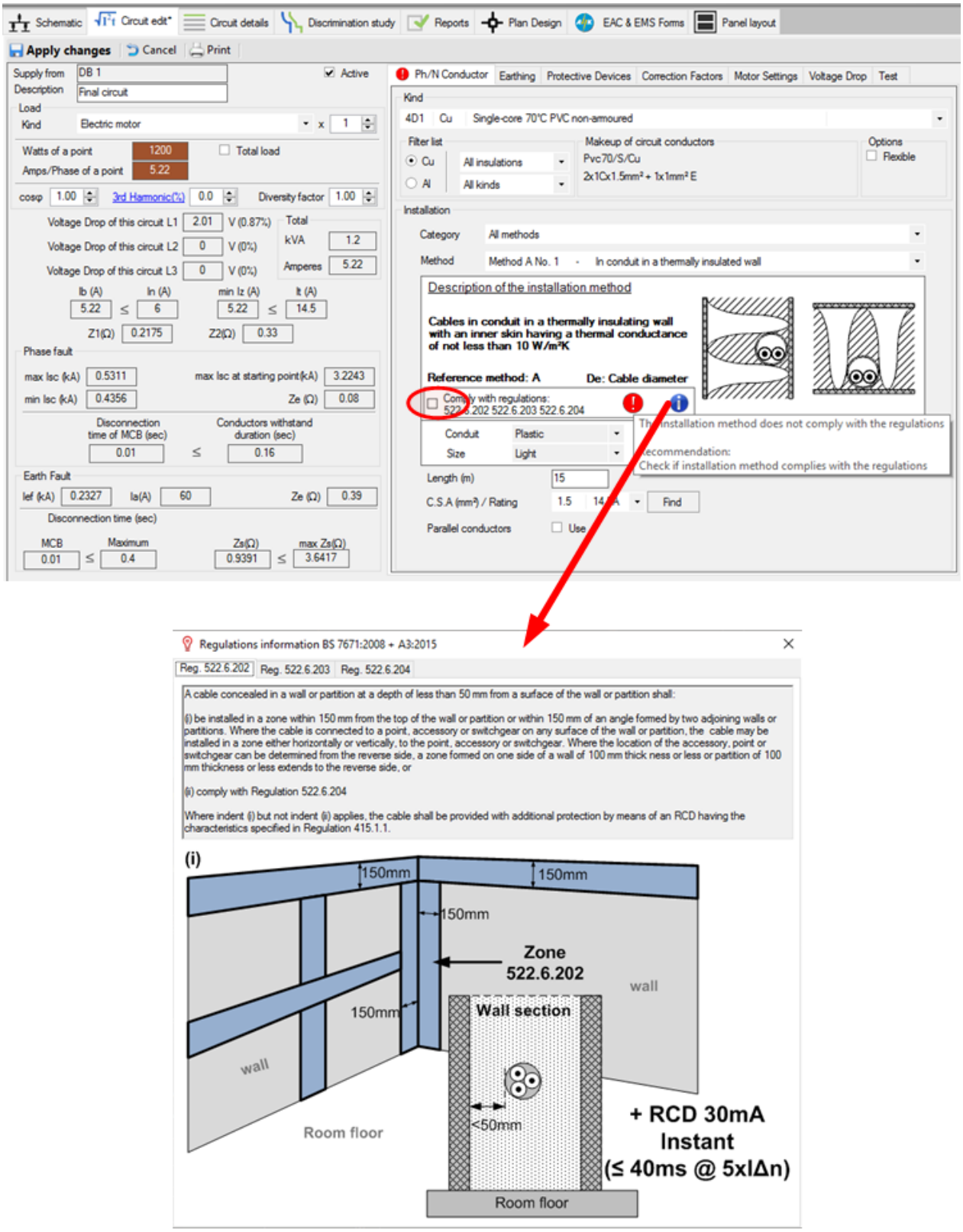




Installation Compliance with Regulations Check

Installations in wall, floor, or ceiling must comply with the regulations 522.6.202,522.6.203,522.6.204 in BS 7671:2008 (2015).

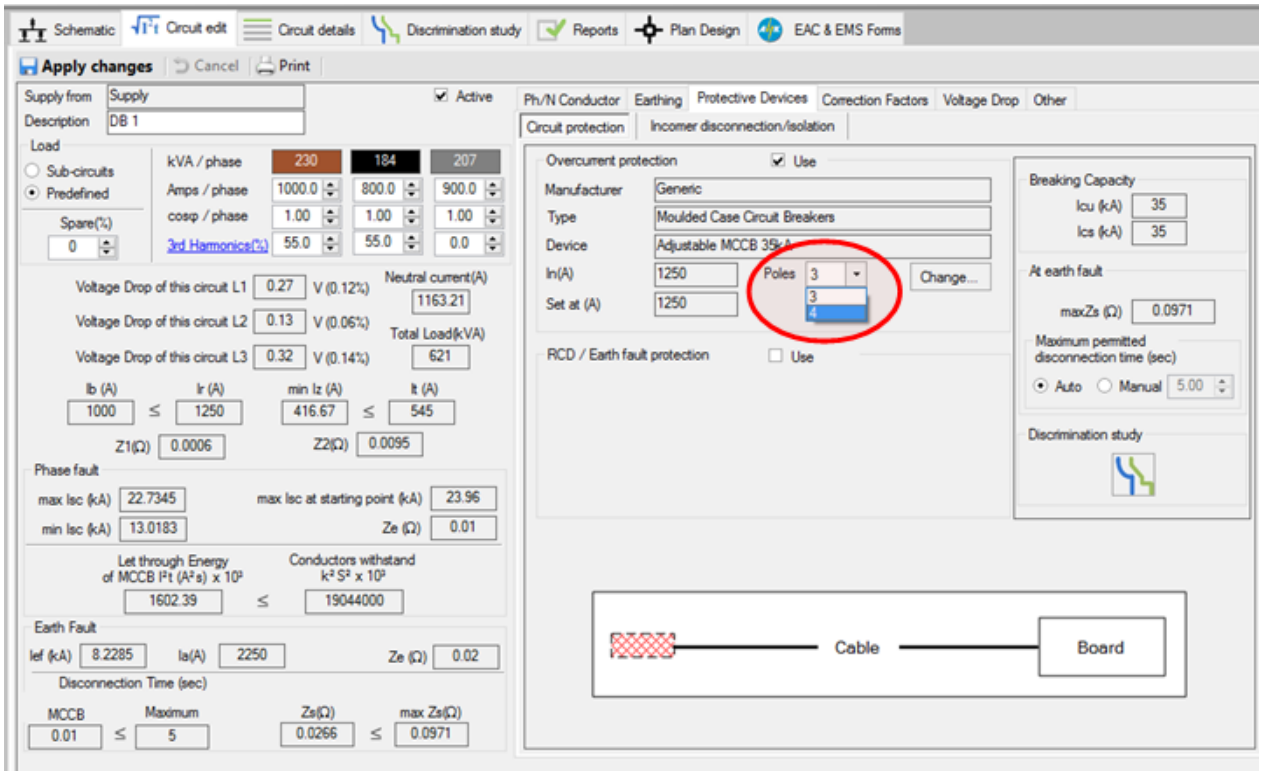
Recommendation to resolve the error:
Check the **Comply with regulations** box, to declare awareness about the specific regulations.

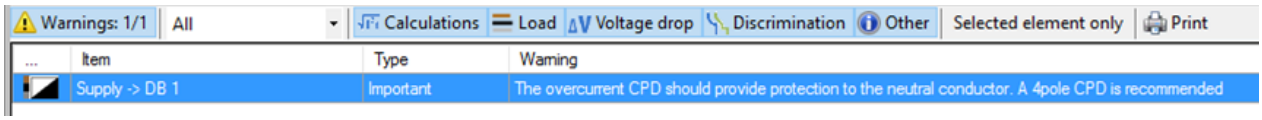


Harmonic Content in Circuit Check

When high harmonic content is present in the circuit, the software checks that overcurrent protection is provided for the neutral conductor (BS 7671 Reg. 431.2.3).

Recommendation to resolve the error:
Use a 4 pole CPD.

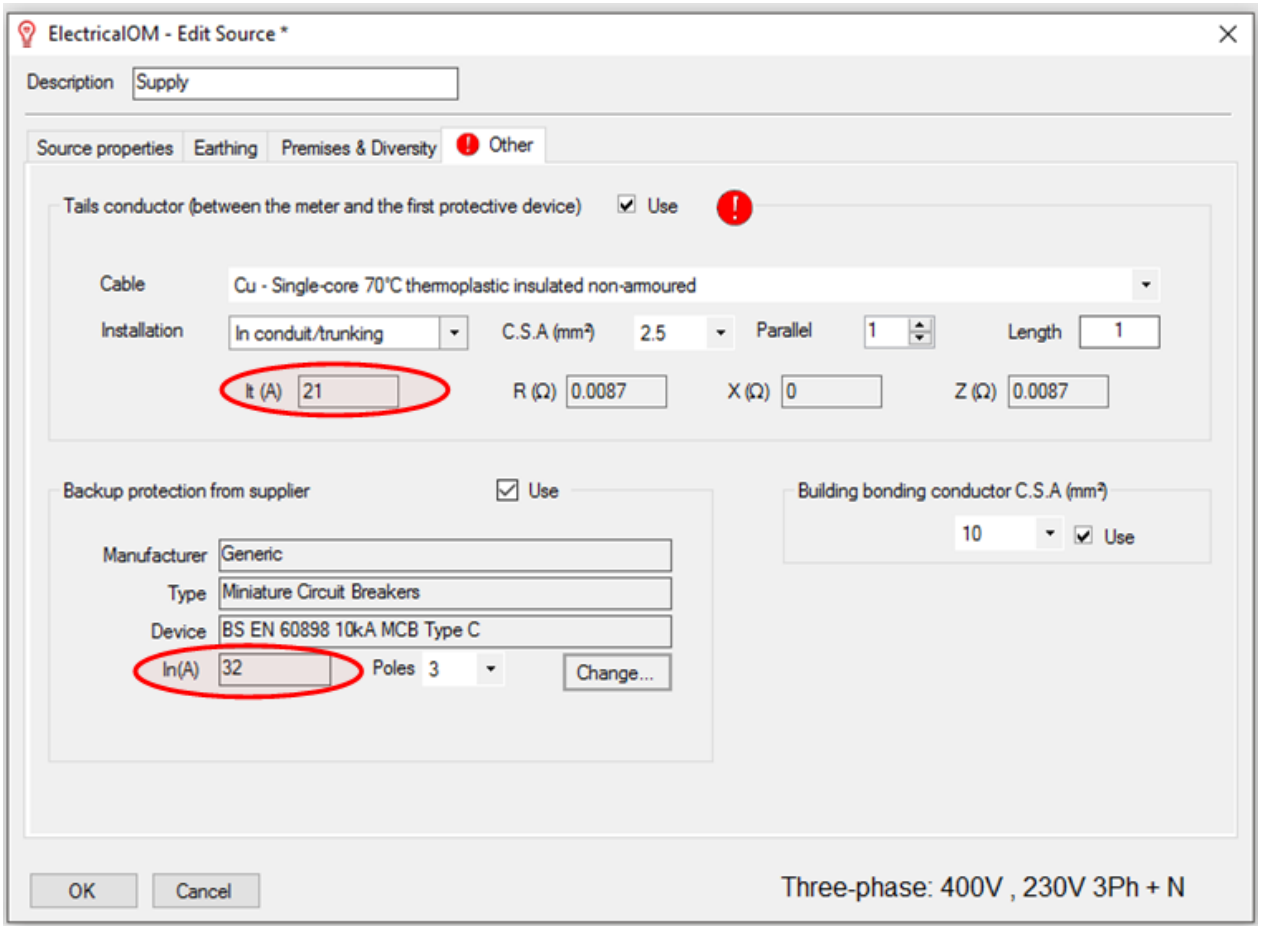


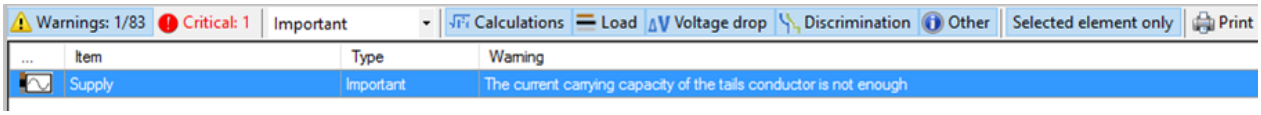


Current Carrying Capacity of the Tails Conductor Check

If the engineer chooses to set the tails conductor and use the protection device from the supplier, the software checks that the current carrying capacity of the tails conductor agrees with the rating of the supplier's protective device.

Recommendation to resolve the error:
Revise the tails conductor so that It >= In.





Simple

Simple warnings have to do with minor issues that won't cause serious problems to the project and that do not have to be resolved, but that could indirectly bring about more serious issues in the later stages of implementation.

Load Balance Check

Power Factor Correction Unit Usage Check

Existing Installation - Exclude from the Checks

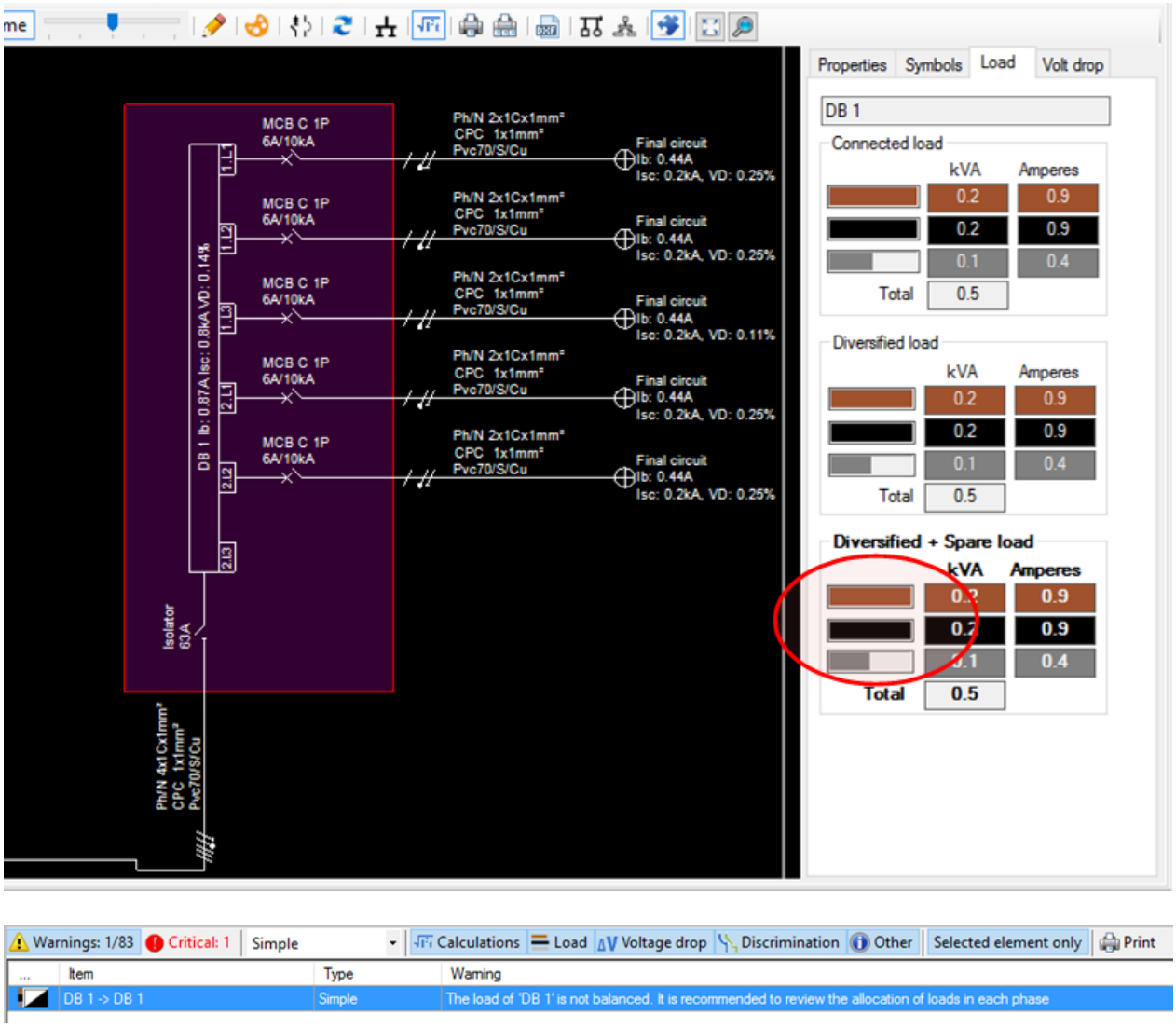
Inactive Circuit Check

Load Balance Check

The software provides a warning if the load in the distribution circuit is not balanced.

Recommendation to resolve the error:
Review the allocation of loads in each phase.

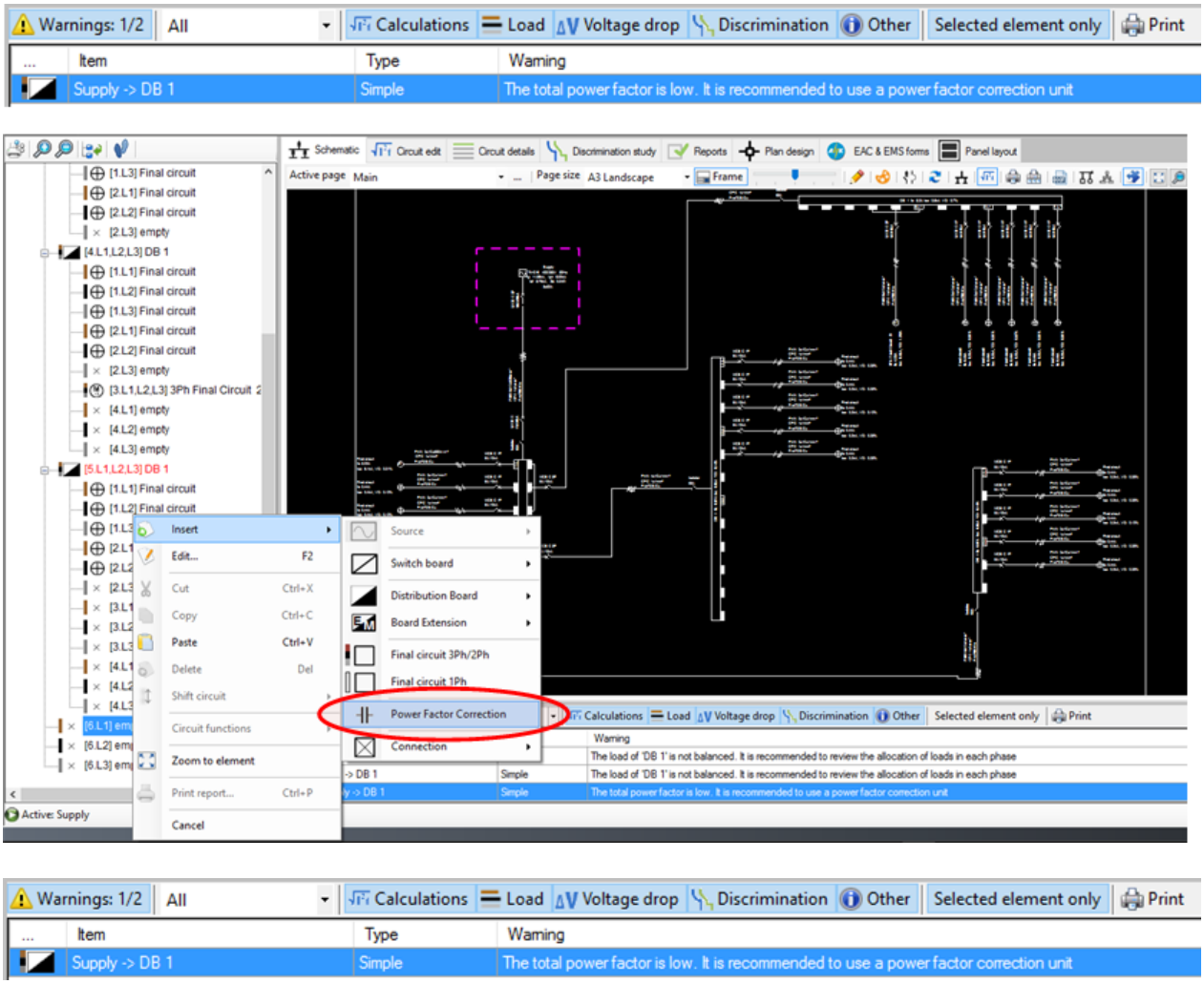
See more details here



Power Factor Correction Unit Usage Check

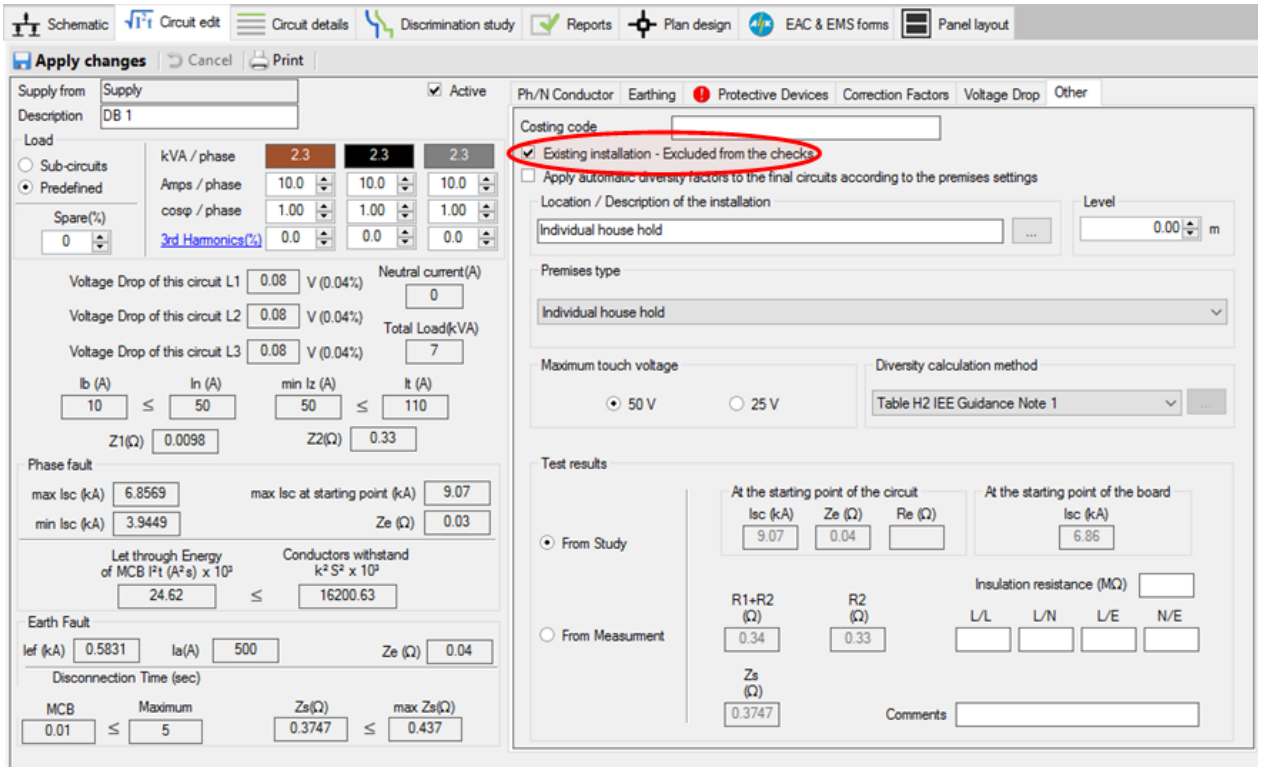
When the calculated power factor (cos ϕ) at the main distribution circuit is calculated to be less than 0.85, the software notifies the designer that it is appropriate to install a power factor correction unit.

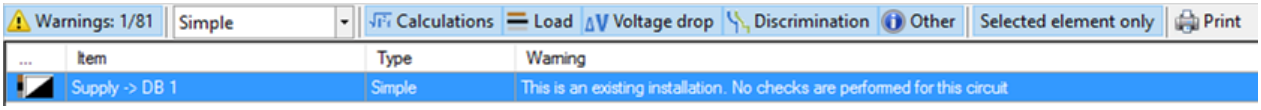
Recommendation to resolve the error:
Install a power factor correction unit to correct the total power factor (cos ϕ).



Existing Installation Warning

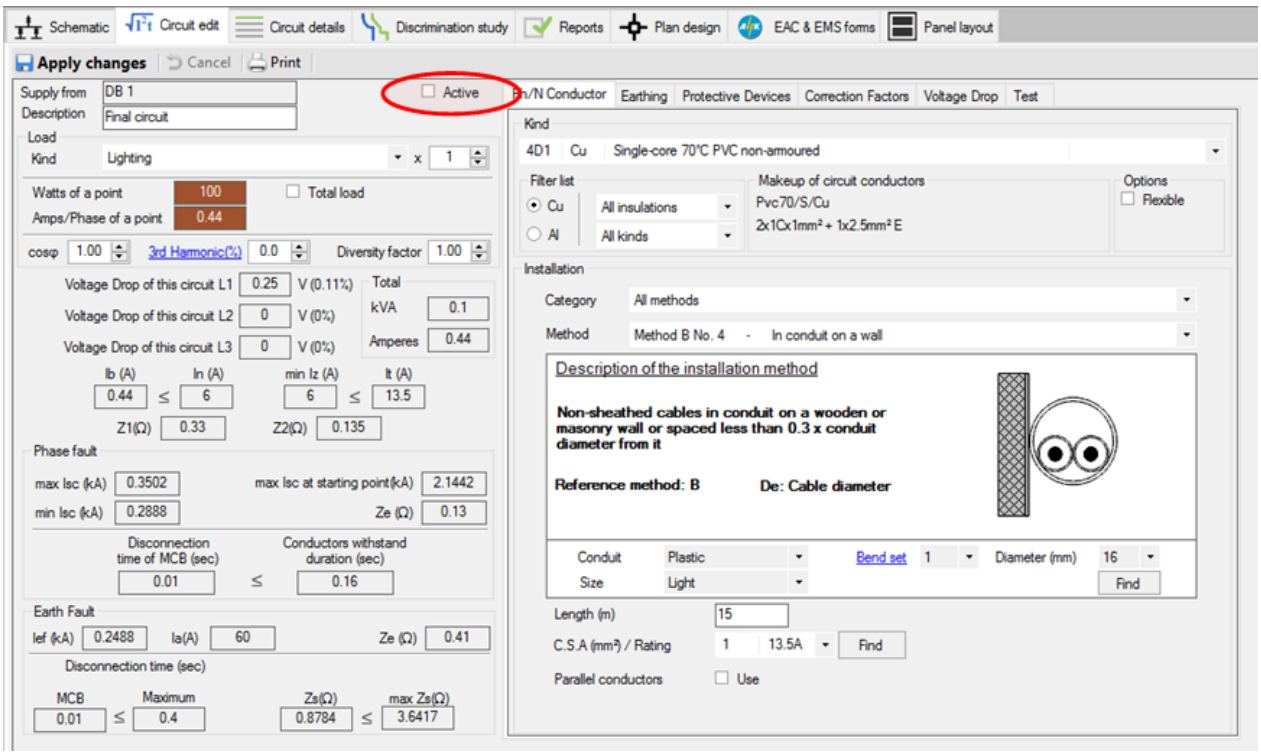
If the user sets a distribution circuit as an existing installation then no checks are performed. A warning indicates that this distribution circuit has been excluded from calculations and checks.

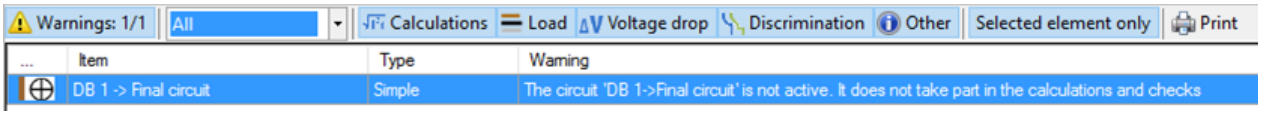




Inactive Circuit Warning

When a circuit is marked as inactive, the softwares warns the engineer about this state. Inactive circuits are excluded from the load summations, calculations and checks. This functionality allow the designer to model the on/off state of a circuit for a particular scenario.




Warnings: 1/1
All
Calculations
Load
Voltage drop
Discrimination
Other
Selected element only
Print
...
Item
Type
Warning
DB 1 -> Final circuit
Simple
The circuit 'DB 1->Final circuit' is not active. It does not take part in the calculations and checks