



MeteorCalc SL

SOFTWARE FOR DESIGNING THE ELECTRICAL PART OF STREET LIGHTING INSTALLATIONS

meteorcalc.com

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1. Brief Description

MeteorCalc SL is a revolutionary new approach to designing electrical part of outdoor lighting networks such as street and tunnel lighting installations.

The software fully automates all electrotechnical calculations, computations of specifications and drawing of electrical schemes.

MeteorCalc SL supports the 400/230V (TN) 50Hz voltage systems in street lighting networks and the metric system of units in dwg-files.

Supported CAD platforms

AutoCAD® and most Autodesk vertical products, BricsCAD®, GstarCAD.

MeteorCalc SL main features

MeteorCalc SL version 2.0 provides the following main features:

- Simulation of street lighting networks of any level of complexity;
- **Calculation of short-circuit currents.** The short-circuit currents are calculated according to IEC60909 (last edition 2016);
- **Calculation of voltage losses.** Voltage losses in street lighting feeders with an unbalanced load are calculated for each phase individually taking into account a voltage loss in the neutral conductor;
- **Calculation of power sum and load currents.** Load currents in street lighting feeders are calculated separately for each phase and for a neutral conductor;
- **Specifications and explications of equipment.** The following specifications are available: street lighting poles, pole foundations, luminaries, cables, cable tracks, earthing devices, electrical equipment and internal wiring;
- Obtaining **data tables of street lighting units** used in the project. Multi language output into the drawing;
- Automated **drawing of detailed single-line schemes** of street lighting feeders;

MeteorCalc SL additional features

- Assigning data to a single object or to multiple objects in a feeder. Automated numbering of street lighting units. Automated distribution by phases;
- Automatic display of street lighting unit data and cable data on information markers;
- External reports with results of specification and explications. External report can be created as text file or exported as csv-file to an external spreadsheet application;
- Customizable Data Library of street lighting units. Shared Data Repository allows use data of street lighting units for several users;
- Integrated power cables data library. The cables database is destined to support actually any electrical power cable type used in street lighting networks;
- Creating 3D-models of street lighting units located in the simulated street lighting network;
- Detailed reports of calculation procedure. An external report can be created as text file and it includes detailed descriptions of all steps of the calculation procedure;
- Build-in Help system. Automatic audit of street lighting models. Build-in commands for management of program layers. There are many auxiliary commands that increase the speed and convenience of your work.

Supported system of units

MeteorCalc SL uses the metric system in dwg-files and the SI-system for electrotechnical units.

Learn more about MeteorCalc SL

Program website <https://meteorcalc.com>

The easiest way to evaluate the effectiveness of MeteorCalc SL is to watch the video with overview of the main features of MeteorCalc SL

<https://www.youtube.com/watch?v=1qN6aVMzKe8>

We recommend watching the MeteorCalc SL presentation for more information about product

<https://www.youtube.com/watch?v=iMfw-dPFL2c>

All videos have English narration.

Your advantage

MeteorCalc SL will help you to create high quality projects, including accurate schemes, precise specifications and detailed descriptions of equipment. The complex of electrical calculations carried out by MeteorCalc SL allows design the safe electrical installations.

The productivity of outdoor lighting designers increases several times when using this plugin.

MeteorCalc SL is a perfect tool for any electrical engineer designing outdoor lighting networks in CAD.

Technical support

We provide free online support for all our products, including trial versions.

If you have any questions about MeteorCalc SL or you need to add a new cable type to the cable DB, contact our support staff at one of the addresses shown on the program website.

Trial version

To download a trial version of MeteorCalc SL refer to the program website <https://meteorcalc.com>

The fully functional 30 day trial version has only one restriction: the number of street lighting unit blocks in a dwg-file should not exceed 50 pcs.

Purchase

To buy MeteorCalc SL licenses write info@meteorcalc.com or contact your local distributor.

2. Quick User Guide

2.1 After installation

Check the main settings

We recommend you to check the main settings of the program and, if necessary, to change them according to your regional standards. To do this use the “**Program Options**” command and call the “General Settings” window.

Output language. Set the output language which MeteorCalc SL will use in information tables in dwg-files.

Prefix for distribution panel boards. MeteorCalc SL will add this prefix automatically to the name of a distribution panel board on plans and tables.

Prefix for earthing devices. MeteorCalc SL will use this prefix to designate earthing devices on plans.

Check the calculation settings

We strongly recommend you to check and set the settings of electrotechnical calculations. Use the “**Program Options**” command and call the “Calculation Settings” window.

Voltage tolerance in street lighting networks. This parameter defines the voltage factors used in short-circuit calculations. A voltage factor (as the part of an equivalent voltage source) directly affects the results of short-circuit currents calculations.

Voltage factors c according to the IEC 60909-0 (2016) are shown in the table.

Nominal voltage U_n	c_{\max}	c_{\min}
Low-voltage systems (up to 1kV) with a tolerance of $\pm 6\%$	1,05	0,95
Low-voltage systems (up to 1kV) with a tolerance of $\pm 10\%$	1,10	0,90

Default value of a conductor temperature for max SCC calculations. According to the IEC 60909-0, a conductor temperature of 20 °C is assumed for the calculation of the maximum short-circuit current.

Default value of a conductor temperature for min SCC calculations. According to the IEC 60909-0, when calculating minimum short-circuit currents, the value of the cable resistance has to be introduced at a higher temperature. This temperature usually is defined by regional standards.

Default value of a conductor temperature for voltage losses calculations. This temperature usually is defined by regional standards. The long-term permissible operating temperature of power cable may be used in the absence of such a standard.

Also you can set **default values of additional cable length** and select cable designation mode on plans and schemes. For this purpose, use the “**Program Options**” command and call the “Cables Settings” window.

When MeteorCalc SL is installed, a new panel is added to the CAD ribbon and a new item is added to the CAD main menu. The ribbon is a main interface element of the program. In case the User does not use the ribbon, it is possible to run the program through the main menu or the command line.

2.2 Video tutorials and brochures

The easiest way to start with the MeteorCalc SL is to watch the video tutorials on our website <https://meteorcalc.com/videos> before you start to work. These videos are available on youtube too. (Please, watch in full screen mode with quality set to 1080p). All videos have English narrations.

We especially recommend watching the following video:

MeteorCalc SL features overview	https://www.youtube.com/watch?v=1qN6aVMzKe8
Creation of a street lighting model	https://www.youtube.com/watch?v=7jThjPSh53w
Audit a street lighting model	https://www.youtube.com/watch?v=YIn6IzBFH2M
Data Library Manager. Add new item	https://www.youtube.com/watch?v=26xxEryU594

You can find useful information papers on the <https://meteorcalc.com/resources> web-page.

We recommend use the MeteorCalc SL help system.

Please, learn the "Getting started with MeteorCalc SL" -> "Basic steps of using MeteorCalc SL" topic. For reference, use the "**MeteorCalc SL Help**" command or press the "**Help**" button in the active dialog window.

2.3 To start work

For first start you can use the "**MeteorCalc_SL_Example_1_Street_Lighting.dwg**" file. This step by step example is adapted for the trial version. The street lighting model in this file is made according to the Method A. (Model of street lighting network is directly in DWG file of the street lighting project). Please, refer to the "**Getting Started**" section to study the example #1.

The work with MeteorCalc SL can be organized by two different ways:

- **Method A.** Model of street lighting network is directly in DWG file of the street lighting project.
- **Method B.** Model of street lighting network is in the separate DWG file (this method is recommended for large projects).

In order to start work, you should receive a template file of the program in both cases. For this purpose, enter the "MTR-GET-TEMPLATE" command to the command line and save the file under the appropriate name (this command is used very rarely; therefore, it is not in the ribbon and menu).

2.4 Method A. Model of street lighting network is directly in the project DWG file

Template file of the street lighting network plan

We advise you to add all elements (blocks, layers and styles) required to work with MeteorCalc SL to the template file of the street lighting plan of your company.

You will find them in the program template file on the "Objects for template" tab. Just copy and insert them in the appropriate place of your street lighting plan template.

Usage of blocks of poles and street lighting luminaries

At the beginning, your work with the street lighting network plan hardly differs from the usual course of the designing. The only difference is that the special blocks extracted from the program template file should be used to designate the poles and luminaries on the plan. The blocks of street lighting units, with which the program works, should have the „MTR-„ prefix and should be located on the "mtr-calc-sl-units" layer.

Note: To accelerate the works at this stage, we recommend using the following program commands: "Insert Block" and "Multi Insert".

The User can (having taken the block from the program template file as a basis) define any new blocks to model the street lighting units, taking into account the following:

- ✓ A new block should have all attributes that the original block has;
- ✓ A block name should begin with the „MTR-„ characters;
- ✓ A base point of the block should be designated within the block body (a logical position of the base point is a pole axis).

When the blocks of street lighting units (they are a part of the both street lighting plan and model) and the cable run are mainly ready, one can go on creating the network model.

Main stage of the network model creating

The model of street lighting network is created by the following simple rules:

- ✓ All model elements (excluding the blocks of street lighting units) should be on the "mtr-calc-sl-model" layer;
- ✓ The distance between the neighboring blocks of street lighting units should be at least 1m;
- ✓ The model is created in compliance with the real tree structure of the street lighting feeder. Each street lighting unit should have one and only power cable and can have an unlimited number of branches. The block of street lighting units should be at the end of each cable line.
- ✓ Each distribution panel board should have one transformer power cable. One distribution panel board can have up to 10 feeders.

The distribution panel boards are modeled with the special „MTR_SL_CABINET" blocks when the transformers are modeled with the „MTR_SL_TRANSFORMER" blocks. In order to insert the blocks, we recommend using the "Insert Block" command. The block will be immediately inserted into the required layers using this command.

The cables are modeled on the plan with LW polylines on the "mtr-calc-sl-model" layer. In order to draw the polylines, we recommend using the "Draw Model Line" command. The polylines will be drawn on the required layer using this command.

Note: The length of the modeling polyline is equal to the length of the cable routing on the plan. The cable data has a special "Additional Length" field that allows taking into account the vertical runs of cable, assembly and other reserves for every section. MeteorCalc SL always uses the value of full cable length ($L_{pline} + L_{add}$) when calculating specifications and making electric calculations.

Use the “**Isolate Program Layers**” command and “**Turn All Layers On**” command for quick managing layers in the drawing.

Use the “**Audit SL-Model**” command to check and correct the model structure.

Data assignment

When all model elements (street lighting units, distribution panel boards, power sources and cables) are installed, one can begin to assign data in accordance with the design option. For the individual data assignment (and view or change), use the “**Object Data**” command.

In order to assign data to all feeder objects (street lighting units and cables) at once, use the “**Feeder Objects Data**” command. Using this command, one can assign data to the objects of main line and branch lines individually.

In order to accelerate the work, we recommend using the “**Copy Data**” command. Using this command, you can copy the data from the sourcing object to a great number of similar objects.

Note: All model elements (with/without data) can be moved and copied with the CAD platform in-built tools regardless of the program operation (including to other files using Copy-Paste).

Numeration of street lighting units of feeder

You can number the street lighting units in the feeder and assign a number to the feeder only if all feeder objects have data.

The “**Feeder Numbering**” command allows numbering the street lighting units in the feeder and distributes them by the phases evenly. The numbers are assigned to the elements of the main line of the feeder in the first place and then to all branches.

Electrotechnical calculations

It is possible to make electrotechnical calculations only if all feeder objects have data, are numbered and distributed by the phases.

Use the “**End Point Calculation**” command to calculate the minimum SC current and voltage loss at the feeder end points.

Use the “**Feeder Calculation**” command to calculate power and operating current of the feeder.

Use the “**DPB Calculation**” command to calculate maximum and minimum SC currents at the buses of the distribution panel board and to calculate voltage loss in the power cable of the distribution panel board.

The feeder configuration is adjusted and/or the cable cross-sections are specified at this stage when the calculation results are analyzed.

Note: In order to control the course of the calculation process step-by-step, use the “**Detailed report**” option in the appropriate calculation window.

Drawing of the street lighting feeder schemes

Use the “**Draw Scheme**” command to draw the single-line schemes of the street lighting feeders. It is recommended to begin with the drawing of the main line of the feeder and then draw branch lines. When drawing, the program calculates SC current and voltage loss in the specified end point.

We advise you to begin to draw schemes only when the feeder configurations and all parameters of the model elements will be completely determined. If any changes are introduced in the model or feeder scheme, one should delete it and draw a new one.

Reports

Use the “**Feeder Specification**”, “**DPB Specification**” or “**All Objects Specification**” command to receive the specifications and explanations of the model elements.

Use the “**Used Units**” command to receive the tables with the detailed descriptions of the street lighting units used in the model file.

Data library of street lighting units

The data of the street lighting units planned to be used in the project should be determined and saved in the Data Library. Use the **"Data Library"** command to edit the Data Library. The street lighting unit code assignment recommendations are provided in the „MeteorCalc_SL_units_coding.pdf“.

If the descriptions of the street lighting units used in the current drawing were changed in the Data Library, use the **"Update Data"** command to update the street lighting unit data of the current drawing.

Note: The database of street lighting units with examples is installed on the User's computer in the course of the first installation.

Note: When the User applies to the street lighting unit Data Library for the first time, the User will be offered to register his/her name. The registered user name is preferred to include only English characters.

Help system

For reference, use the **"MeteorCalc SL Help"** command or press the "Help" button in the active dialog window. Video tutorials and examples are available on the MeteorCalc SL website.

2.5 Method B. Model of street lighting network is in the separate DWG file

Template file of the street lighting network plan

When using Method B, we advise you to create a separate template file of the street lighting model where all required elements (blocks, layers, tabs, styles, etc.) of your company and all elements (blocks, layers and styles) required to works with MeteorCalc SL are located.

Your work with the street lighting network plan does not differ from the ordinary designing course. When the blocks of poles and luminaries and the cable runs are mainly ready, you can begin to create the network model.

For this purpose, open the model template file and save it in the project fold under the appropriate name. The further work will be performed in the model file.

Import of post blocks from the project file

At first, place the blocks of street lighting units in the model file in accordance with the project file. You can do it manually or automatically. To import the blocks automatically, you should do the following:

- Switch to Model Space. It is desirable that there would be no entities in the Model Space.

- Attach the street lighting network plan as an external reference (overlay Xref). You can also add the external references of the road project plan and geo basis. We recommend leaving visible only those layers that help to better understand the drawing.
- Use the **"Import SL Blocks"** command and determine from which external reference one should import the objects (for this purpose, specify any entity in the appropriate external reference).
- Select the block from the list that will replace the blocks of poles from the external reference file in the model file. We recommend using the **"MTR-UNIT"** block that has only the base point and attributes for the data indication (such block will not cover the pole block on the street lighting plan).
- When **OK** button is pressed, the post blocks from the external reference will be doubled in the model file by the selected block, saving X and Y coordinates and rotation angles. If the block of street lighting unit is present in the model file in any place, the block will not be inserted again.

Note: The program works only with those blocks of street lighting units that have the „MTR-„ prefix. It

is referred to the both blocks of street lighting units in the model and blocks of poles in the street lighting plan file, from which it is supposed to import the blocks. If required, use the CAD “**Rename**” command to rename the blocks in the plan file (you should add 4 „**MTR-**„ characters to the beginning of the block name).

The blocks will be successfully imported if the following conditions are met:

- ✓ the blocks of poles and luminaries in the street lighting plan file should have the „**MTR-**„ prefix;
- ✓ The word coordinate system (WCS) must be set in the both files;
- ✓ the blocks of poles and luminaries in the street lighting plan file should be determined so that the block base point will be within the block body;
- ✓ the blocks of poles and luminaries in the street lighting plan file should not be dynamic blocks.

In the model file, the blocks of street lighting units should always be on the “**mtr-calc-sl-units**” layer. In the street lighting plan file, the imported blocks of poles and luminaries can be placed on any layers.

Import of cables from project file

Use the “**Import SL Cables**” command. When using the command for the first time, you should designate the external reference and layer on which the program will search for polylines, determining the cable run. For this purpose, you should specify any polyline, being in the required file on the required layer. From now, you can always change the search parameter by clicking the “**Set**” button.

The command has 2 operation modes:

1. The User specifies the start block and finish block every time,

2. The User specifies the start block only once and then only the next block.

In both cases, the program tries to find a path on the cable run between the specified blocks in the external reference file and to draw the polyline on the found path in the model file.

If the distances between the blocks of street lighting units in the street lighting plan file is not very long (for example, in the case of park lighting), we recommend reducing the search area radius. For this purpose, select “Small” or “Very Small” values in the “**Search Area**” list.

There are some configurations of cable network of street lighting not supported by this command. It can be connected with the fact that the cable runs in the external reference are placed on the different layers or there are numerous concurrences of polylines, etc.

If the command cannot determine the cable run between the specified blocks, use the “**Draw Model Line**” command and draw this cable section manually.

Creation of network model

When the blocks of street lighting units are imported in the model file, you can continue creating the network model. The further steps of work with the program do not differ from the steps provided in the description of Method A, beginning with the “Main stage of network model creation” section.

Note: Using Method B, it is very easy to create an auxiliary package of drawings called “Schematic plan of street lighting network”. It is a separate file, containing all model elements with the results of calculations, explication and equipment specification, as well as a description of street lighting units. Besides, the street outlines and land plot boundaries are visible.

In the next chapter we’ll consider a very simple example of a street lighting installation. This is a simplistic picture of how MeteorCalc SL works but it’s no different from the approach you should be taking to your subsequent real projects.

3. Getting Started

3.1 To start work with an example

For first start we recommend you use the **MeteorCalc_SL_Example_1_Street_Lighting.dwg** file. This step by step example is adapted for the trial version.

The street lighting model in this file is made according to the Method A. (A model of street lighting network is directly in dwg-file of the street lighting project).

You can freely download this file from the **Resources** web-page.

Open the dwg-file and switch to the Model Space. There are the plan of a small street lighting network

and the MeteorCalc SL street lighting model in the file.

Let's take a look the example #1.

If you turn the layer **"mtr-calc-sl-model"** off, you will see the street lighting network plan only. If you call the **"Isolate Program Layers"** command, you will see only all the elements of a street lighting model.

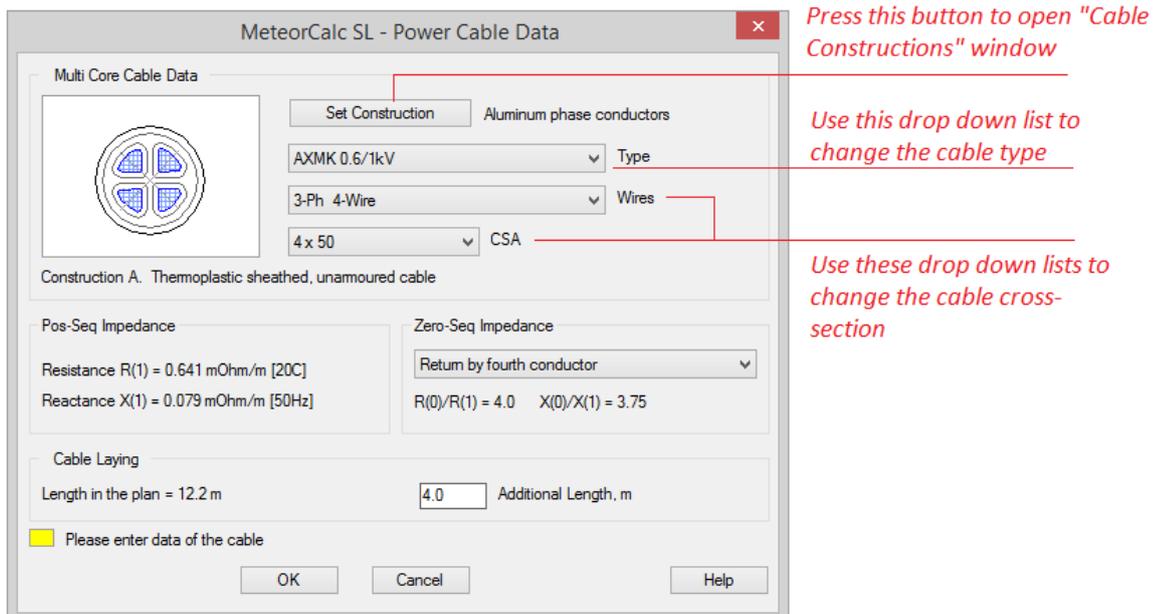
Blocks of street lighting units are the part of street lighting plan and, at the same time, the part of street lighting model.

3.2 "Object Data" command

This universal command is intended for viewing, setting and changing data of all objects of a street lighting model.

Data of cable line

Call the **"Object Data"** command and select any cable span in the model. The main data of a cable are a cable type and a cross-section. To learn all the components of this dialog window, press the **"Help"** button on the window.

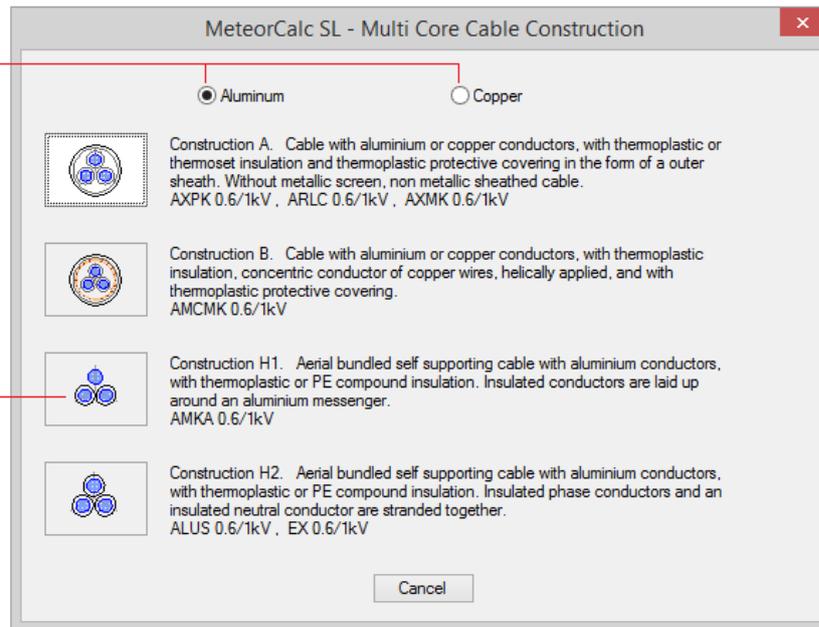


Cables in the database are structured according to cable constructions. To change a cable construction, press the **"Set Construction"** button.

The “Cable Construction” dialog-window shows you all the cable types in your cable database.

Use these radiobuttons to change material of phase conductors

Click on an image to select the cable construction



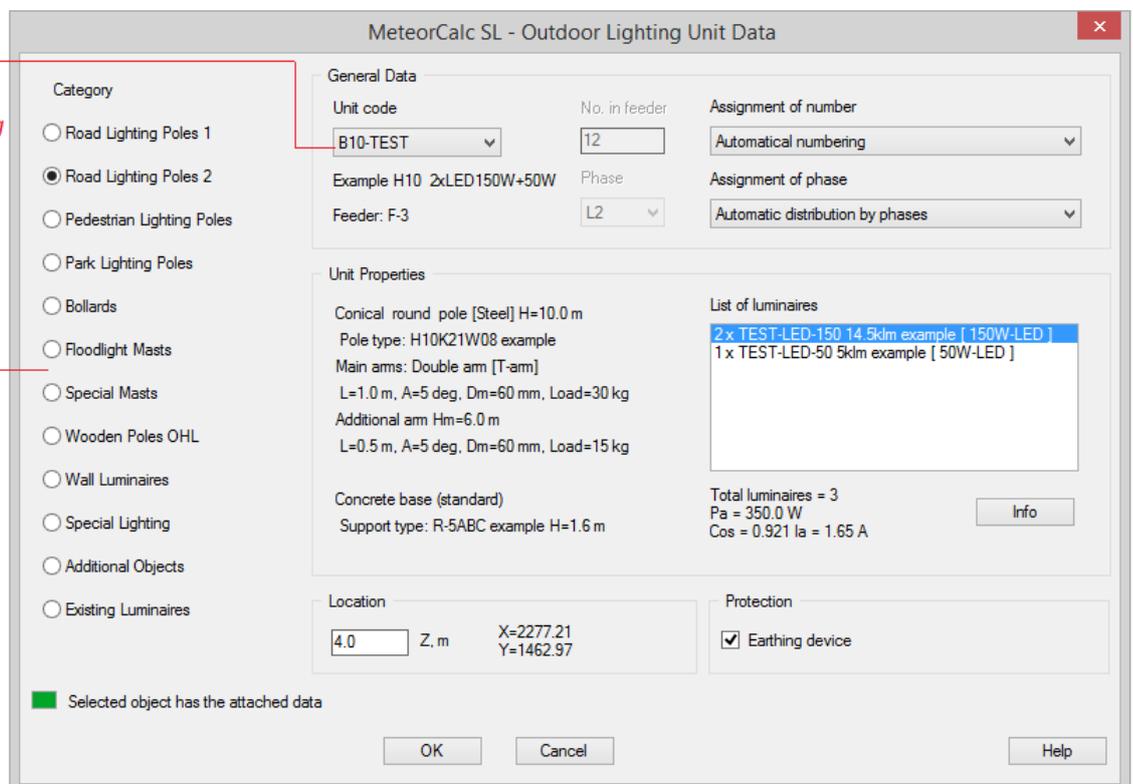
Try changing the data of any cable spans in the example file.

Data of street lighting unit

Call the “Object Data” command again and select any block of street lighting unit in the model. The main data of a street lighting unit is a SL-unit code and it fully defines a street lighting unit in the Data Library.

Use this drop down list to select a street lighting unit

Use these radiobuttons to change the category of street lighting units



If the MeteorCalc SL detects an unknown code of street lighting unit, it generates the "Add to Data Library" button bottom of the dialog window. Just press this button to add all the data of the selected street lighting unit to a corresponding category of your Data Library.

Try changing the data of any street lighting units in the example file.

Data of transformer

Call the “Object Data” command again and select the block of a transformer in the model. To learn all the components of this dialog window, press the “Help” button on the window.

The screenshot shows the "MeteorCalc SL MV/LV Transformer Data" dialog window. It is divided into several sections:

- Supply Network Data:** Includes "Un = 10.0 kV" and "3-Phase Supply Network, 50 Hz". A "Set Data ..." button is highlighted with a red line and the annotation: "Press this button to change data of the supply network".
- Transformer Data:** Includes a dropdown menu for transformer type (set to "3-phase MV/LV 2-wind. oil-immersed distribution transformer"), "Sr, kVA" (set to 500.0), "Voltage Range: 1..12kV", and a "Name" field (set to "TR-1").
- Windings:** Includes two dropdown menus for winding schemes (set to "Y" and "Yn") and a "Set Voltage ..." button. Annotations point to these dropdowns: "Use this drop down list to set power of the transformer" and "Use these drop down lists to set the winding scheme of the transformer".
- Losses:** Includes input fields for "SC-Voltage uk, %" (4.0) and "Total loss Pk, kW" (5.2), and a "Show Ur,% drop" checkbox.
- Zero-Seq Impedance:** Includes input fields for "R(0)/R(1) = 1.0" and "X(0)/X(1) = 9.0", and a "Set Z(0) ..." button. An annotation points to the "Name" field: "Enter the name of the transformer or substation".
- Low Side Network Data:** Includes "Un, kV" (0.4) and "Earthing arrangement" (TN).
- Buttons:** "OK", "Cancel", and "Help" buttons are at the bottom.

The main data of a transformer are transformer power, a winding scheme, $u_k\%$, a total loss in the windings and data of a medium voltage supply network. If you simulate the real transformer and the SC-voltage and the total loss in the windings are known, you must enter these values on the “Losses” panel.

Data of distribution panel board

Call the “Object Data” command again and select the block of a distribution panel board in the model.

The screenshot shows the "MeteorCalc SL - Distribution Panel Board Data" dialog window. It is divided into several sections:

- General Data:** Includes a "Name" field (set to "1"), "Description", "Neutral arrangement" (set to "TN-C"), and summary statistics: "Total power demand = 6.044 kW", "Summarized power factor = 0.921", "Phase current = 9.47 A", and "Total units with data = 25".
- Pos-Seq Impedance:** Includes input fields for "Resistance [20C] R(1), mOhm" (0.5) and "Reactance [50Hz] X(1), mOhm" (0.5).
- Zero-Seq Impedance:** Includes input fields for "R(0)/R(1)" (2.0) and "X(0)/X(1)" (2.0).
- Buttons:** "OK", "Cancel", and "Help" buttons are at the bottom.

A red annotation points to the "Name" field: "Enter the name or number of the distribution panel board. The prefix will be added to a block automatically."

You can view the power sum and load current of a distribution panel board on the “General Data” panel.

3.3 Continue creating the a street lighting model

Let's try to extend the street lighting feeders in the drawing. Call the **"Isolate Program Layers"** command to see only the objects of the model.

Use the CAD's "Copy" command and replicate any block of street lighting unit along the street on the plan (for example, with a step of 25m for a distance of 100-200 m in each direction). You can copy any object of a MeteorCalc SL model with data (or without data) using usual commands of a CAD platform (also you can use Copy-Paste).

Another way to extend the street lighting feeder is to insert blocks of street lighting units using the program commands **"Insert Block"** or **"Multi Insert"**. In this case, new blocks do not have any data, and you must to assign them. Use the **"Object Data"** command and/or the **"Copy Data"** command to do this.

Then you must to simulate cable spans between street lighting unit blocks. The easiest way to do it – use the **"Draw Model Line"** command. The polylines will be drawn on the required layer using this command. Select the start SL-block, then you may specify any number of intermediate points and finally specify a point near the end block. Joining with the end block will happen automatically.

Assign data to new cable spans. Use the **"Object Data"** command and/or the **"Copy Data"** command. Please, check that structure of extended feeders is always tree-shaped. If you use the Trial version of MeteorCalc SL, control that the number of street lighting unit blocks in the file not exceed 50 pcs.

3.4 Numbering of objects in a feeder and distribution them on phases

Call the **"Feeder Numbering"** command and select the **first cable** of a street lighting feeder. You can number (or renumber) the street lighting units in the feeder and assign a number to the feeder only if all feeder objects have data.

Use this drop down list to set or change the feeder number

Select the "Automatic Distribution by Phases" option to distribute all the SL-units in the feeder

Select the "Select new main line" option to change the main line in the feeder

MeteorCalc SL - Numbering and Distribution by Phases

Feeder Data

F-3 Feeder number DPB: DPB - 1
Total units with data = 25

Keep the existing numbering Units numbering mode
Keep the existing distribution Phase distribution mode
Distribution by phases:
L1 = 9, L2 = 8, L3 = 8

Feeder Main Line

Keep the existing main line Main line detect mode
Main line found as line from DPB to node:
F3-15 [B10-TEST]

Change color of the main line sections
 Change color of the branch lines
Total length from DPB L = 230.2 m
Total cable sections in main line = 15

All units in this feeder are numbered and distributed by phases

OK Cancel Help

You can use this command for changing the feeder number for all street lighting units in the selected feeder. Also you use this command to redistribute street lighting units in a feeder by phases.

A street light feeder usually consists of the main feeder line and several branches. After the numbering, the main line and branches have different colors. If you want to set the new main line in the feeder, select the

corresponding option in the “Main line detect mode” drop down list, press the “OK” button and select the end SL-unit block of the new main line.

Good! If all feeder objects have data, are numbered, distributed by phases and structure of feeders is correct, we can start electrotechnical calculations.

3.5 Electrotechnical calculations

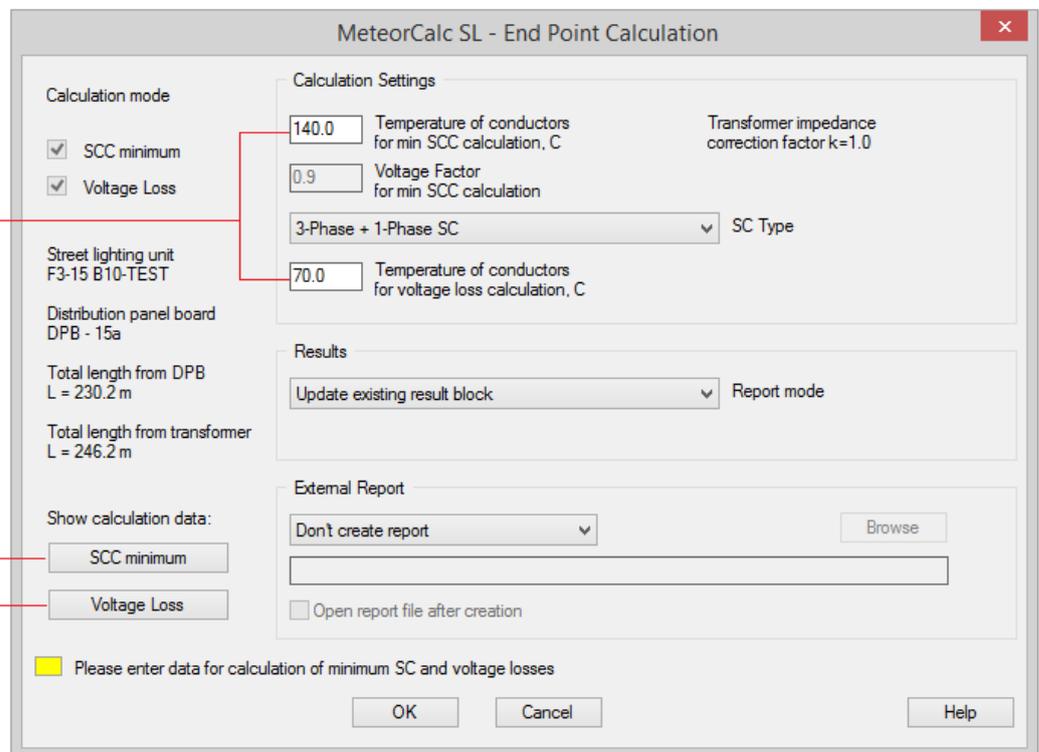
MeteorCalc SL allows you to do all complicated and time-consuming calculations “by two clicks” - just select a point where you want to calculate, and then specify a point where to insert the result of calculations.

“End Point Calculation” command

Use the “End Point Calculation” command to calculate the minimum SC current and voltage loss at feeder’s end points. Call this command and select the end street lighting unit block where you want to implement calculations.

You can correct the values of conductors temperature for calculations

Press these buttons to view the initial data for calculations



Use results of this calculation to validate cross-sections of cables in the feeder line (voltage loss) and to choose a protection device of the feeder (minimum SC current). Refer to the program Help (Appendix 1) for more information about choosing protection devices of street lighting feeders.

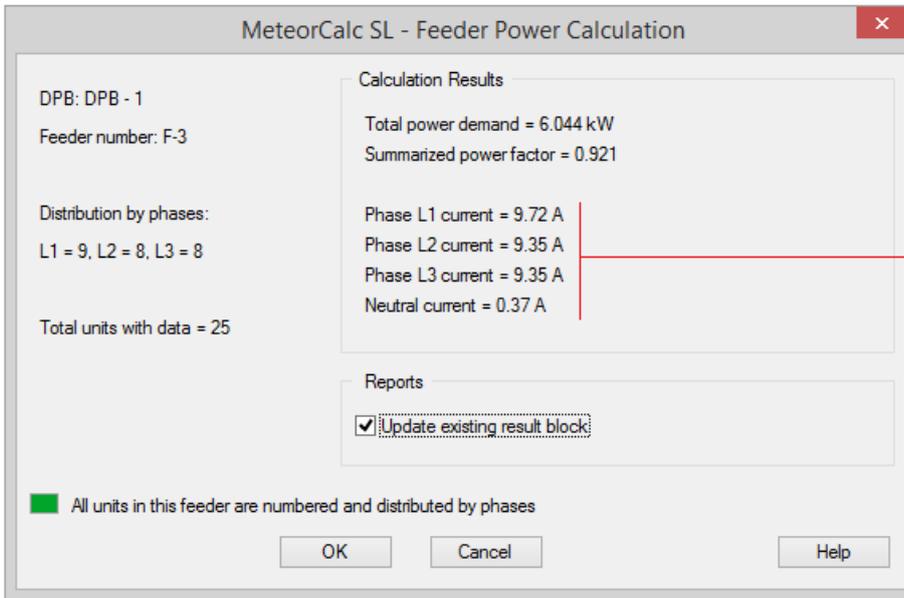
“DPB Calculation” command

The “DPB Calculation” command is similar to the “End Point Calculation” command. The difference is that the calculations of the maximum SCC, the minimum SCC and the power sum need to be carried out separately. All results of calculations will be stored in the common result-block.

Call this command and select the distribution panel board block where you want to implement calculations. To learn all the components of this dialog window, press the “Help” button on the window.

“Feeder Calculation” command

Use the **“Feeder Calculation”** command to calculate the power sum and load currents at the start point of the feeder. Call this command and select [the first cable](#) of the feeder where you want to implement calculations.



Load currents in street lighting feeders with an unbalanced load are calculated for each phase individually.

Use results of this calculation to check the symmetry of the feeder load, to validate cross-sections of cables and to choose a protection device of the feeder.

3.6 Computations of specifications

Now you can leave behind and forget all the stresses inherent in the calculations of specifications. MeteorCalc SL calculates all equipment specifications for you fast and accurate.

Changing the project is no longer a problem for designers now. Do the necessary changes in the street lighting model, and right away print the new specifications and schemes.

Specifications can be calculated separately for each feeder, for each distribution panel board, or for all the objects in a current space.

The **“Feeder Specification”** command and the **“DPB Specification”** command are very similar. These commands count only those objects that are connected to the selected feeder or street lighting cabinet. You have to select the owner, then choose the category of equipment in the dialog window and then specify a point where to print the result table.

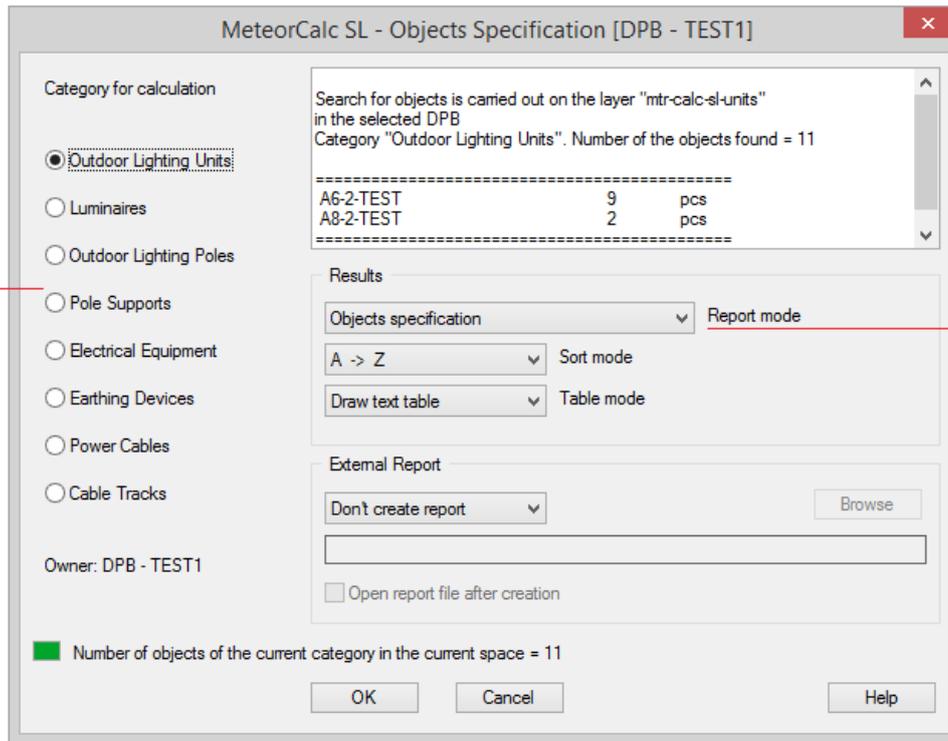
“Feeder Specification” command

Use the **“Feeder Specification”** command to calculate the any specifications of all objects in a feeder. Call this command and select [the first cable](#) of the feeder where you want to count specifications.

“DPB Specification” command

Call this command and select the [block of a distribution panel board](#) where you want to count specifications.

Use these radio buttons to select the category of equipment for a specification



Use this drop down list to select the report mode. You can get a specification table or an explication table as a list of equipment.

"All Objects Specification" command

The "All Objects Specification" command is intended to count all the objects in a current space.

3.7 Descriptions of street lighting equipment

Only one click in a CAD's graphical window is required to get detailed descriptions of all street lighting units in the project.

"Used Units" command

Use the "Used Units" command to get the tables with the detailed descriptions of the street lighting units used in the current space.

This command is very easy to use, but it does a great job for you. Just, specify a first point of all the result tables. Reserve the empty space below the selected point, all tables with equipment data will be printed top down.

3.8 Drawing schemes

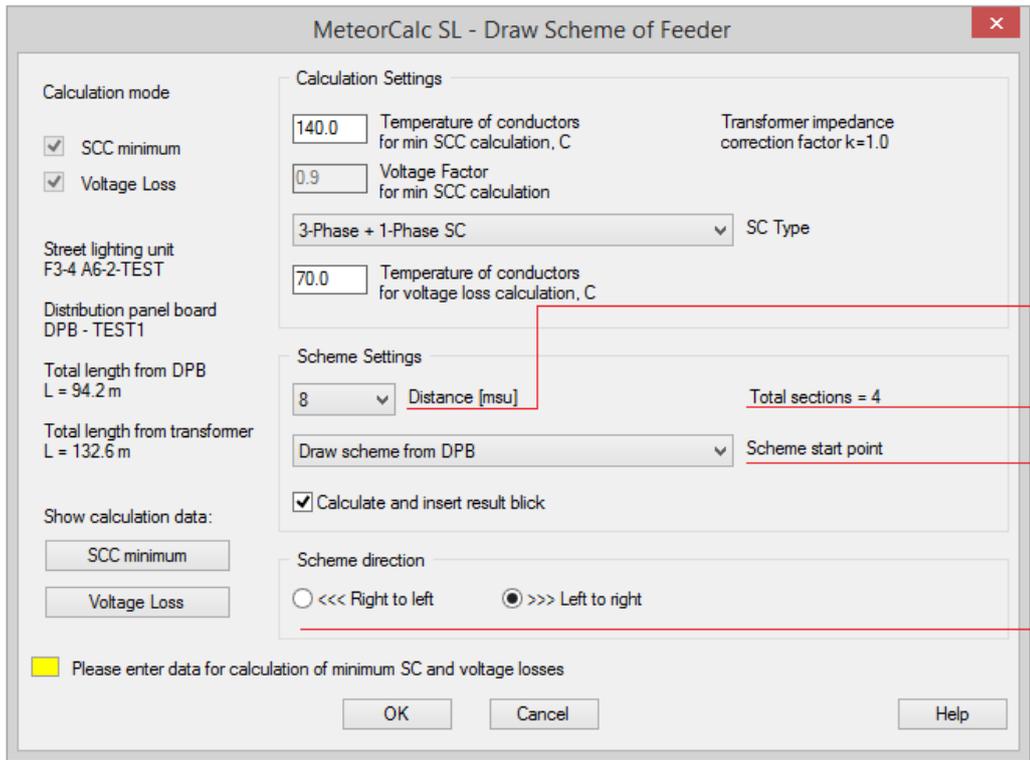
Tedious and painstaking work to draw electrical schemes manually is excluded now.

"Draw scheme" command

Use the "Draw Scheme" command to draw the single-line schemes of the street lighting feeders. Call this command and select the [end street lighting unit block](#) to draw a scheme.

The first line of the scheme will be drawn from a DPB to the selected SL-unit block. Begin drawing of the main line of the feeder and then draw branch lines.

The calculations of short circuit currents and voltage losses will be performed at the selected endpoint while drawing scheme, therefore the “**Calculation Settings**” panel is identical to the same panel on the “End Point Calculation” window.



Use this drop down list to change distance between SL-units on the scheme

Number of scheme sections will be drawn

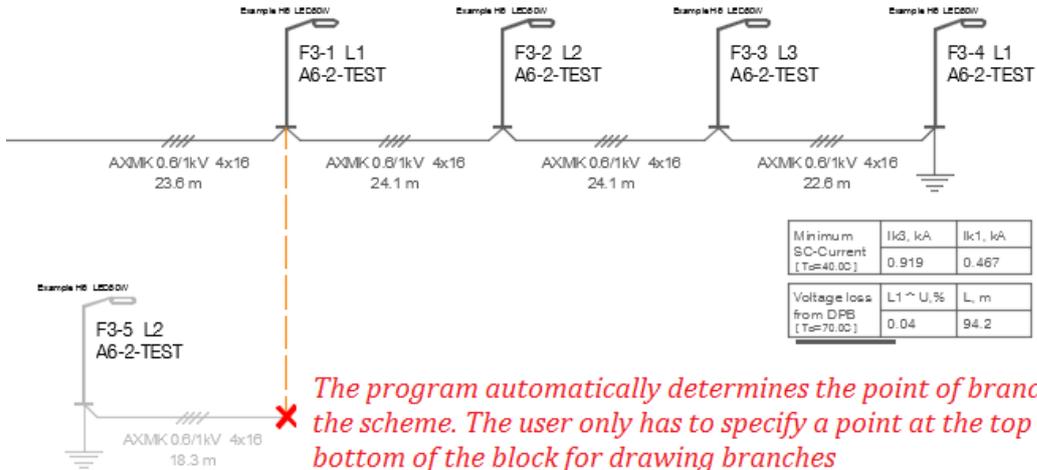
Use this drop down list to check and change the initial point of the scheme

Use these radiobuttons to change direction of the scheme

Let’s draw the scheme of the feeder F3 main line.

- Call the “**Draw Scheme**” command;
- Select the street lighting unit block on the end of the main line;
- Check calculation conditions and scheme options in the dialog window;
- Specify the first point of a scheme and then (when the scheme line is complete) specify the insertion point of the calculation result block near the scheme last block.

Continue to draw the scheme of branch lines. You must perform the above procedure for each branch. The difference is how the program determines the initial point of a branch line.



The program automatically determines the point of branching on the scheme. The user only has to specify a point at the top or the bottom of the block for drawing branches

We advise you to begin to draw schemes only when the feeder configurations and all parameters of the model elements will be completely determined, but if any changes are introduced in the model of feeder, you may delete its scheme and quickly draw a new one.

3.9 Data Library of street lighting units

A street lighting unit is a pole (mast) with several luminaires or a single luminaire, or any other consumer in the outdoor lighting network (for example, waiting pavilion or outdoor advertisement).

The Data Library is intended to store descriptions of street lighting units and it has 12 categories. Use the “**Road Lighting Poles 1**” category to store data of street lighting units with a pole (mast) which has one console (or without a console). Use the “**Road Lighting Poles 2**” category to store data of street lighting units with a pole (mast) which has two and more consoles. Use the others 10 categories to store data of street lighting units according to the name of a category.

“Data library” command and “Data library Manager” dialog window

Use the “**Data Library**” command to edit the Data Library.

Use this listbox to select a street lighting unit

Use these radio buttons to change a category of street lighting units

Use these buttons to add a new SL-unit to Data Library or to edit an existing description

You can send to Archive seldom used street lighting units

The outdoor lighting projects usually contain street lighting units of different types that are applied to different traffic situations. In each category you can define any number of street lighting units according to the needs and tasks to be solved. Most of these street lighting units you will use repeatedly, from a project to a project.

On the next page are shown data of the street lighting unit B10-TEST. This unit is defined as an example in the Data Library. You can use examples as a basis to define new street lighting units and then remove them from the Data Library.

"Outdoor Lighting Unit Definition" dialog window

This is the most complicated window of the program and we will consider it in more detail.

The unique code defines the street lighting units in Data Library. The brief description provides additional information about the street lighting unit.

Use the controls on this panel to define construction of the pole

Use the controls on these panels to define construction of main and additional consoles

Use these buttons to define (or edit data) luminaires mounted to SL-unit

Use the controls on this panel to define construction of the pole support

Use the controls on this panel to define the internal equipment and wiring of the pole

Let's define a new street lighting unit with a pole height 12m with two main consoles 2 m long and with two different LED- luminaires 150W ($\cos\varphi=0.92$) and 200W($\cos\varphi=0.95$).

Choose the "Road Lighting Poles 2" category in the "Data Library Manager" dialog window and press the "New Unit" button.

Now you need to describe all the data of new street lighting unit in the "Outdoor Lighting Unit Definition" dialog window.

The main data of a street lighting unit

Unit phase: 1-Phase

Unit code: B12-K2

Unit description: H12 200W+150W LED

At first you need to enter a code of the street lighting unit into the "Unit code" field. Enter the new code, for example "B12-K2". Don't use the following symbols: double quotes ["], backslash [\], colon [:] and question mark [?]

The street lighting unit code assignment recommendations are provided in the „Street lighting units coding system“ section.

Then you fill in the "Unit description" field, for example "H12 200W+150W LED". This very brief description will be shown on SL-unit blocks in plans and schemes.

The "Pole Data" panel

Pole Data

TF12K2-S Pole type Conical round pole Design Double handhole

12.0 Pole height, m Steel Material

Conical steel pole Flange fixing

"**Pole type**" field. Enter a type of the pole from a catalog or describe the pole as you want to see it in specifications. This property will be used as a basis for calculation of specifications.

"**Pole height**" field. Enter the height of a street lighting pole from a ground surface.

"**Pole design**" and "**Pole material**" drop down lists. Use these controls to define pole design and pole material.

Use additional controls on this panel to clarify pole construction. If the pole is painted, you can describe the color of pole surface.

The "Main Arm" and the "Additional Arm" panels

These panels are identical and are intended to describe constructions of consoles and luminaires mounted on them.

Main Arm and List of Luminaires

Double arm [T-arm] Arm type

L=2.0 m, A=10 deg, Dm=60 mm, Load=30 kg

1 x LMTFR-4K-200-OP2-M [200W-LED]

1 x LMTFR-4K-150-OP4XL [150W-LED]

"**Arm type**" drop down list. Use this drop down list to select construction of console(s). The list of console constructions depends on the category.

"**Adjust arm**" button. Click on this button opens the "**Arm Data**" dialog window, where you can clarify construction of the console(s).

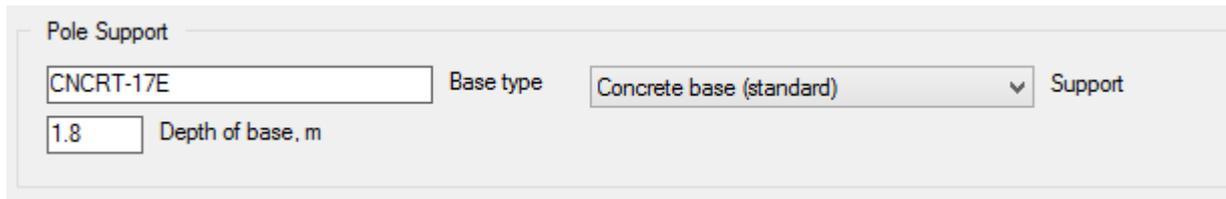
"**List of Luminaires**" list box. This field shows a list of luminaires mounted on the console(s). Select a luminaire from the list and then press the "**Edit**" button to view or change data of a luminaire.

Click on the "**Add**" or the "**Edit**" buttons opens the "**Luminaire Data**" dialog window that will be considered next.

Use the controls on the "**Additional Arm**" panels to define an auxiliary console and luminaires installed on it. Usually an auxiliary console is located below the main console(s). It may be a small console or a bracket for a decorative luminaire or a bracket for an additional floodlight and etc.

You can define the main and auxiliary console and install any luminaires on them. In total, you can describe 5 various types of luminaires on the SL-unit and determine 10 luminaires of each type. So, the maximum number of luminaires on a street lighting unit is 50. This is theoretical limit defined by data structure, but in practice there are usually 1-2-3, maximum 5 luminaires on a pole.

The "Pole Support Data" panel

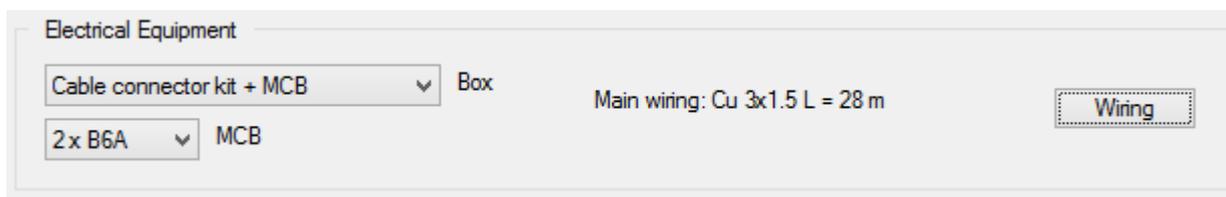


"**Base type**" field. Enter a type of the street lighting pole support (base) from a catalog or describe the pole support as you want to see it in specifications. This property will be used as a basis for calculation of specifications.

"**Depth of base**" field. The height of a street lighting pole base.

"**Support**" drop down list. Use this drop down list to select construction of pole support (base).

The "Electrical equipment" panel

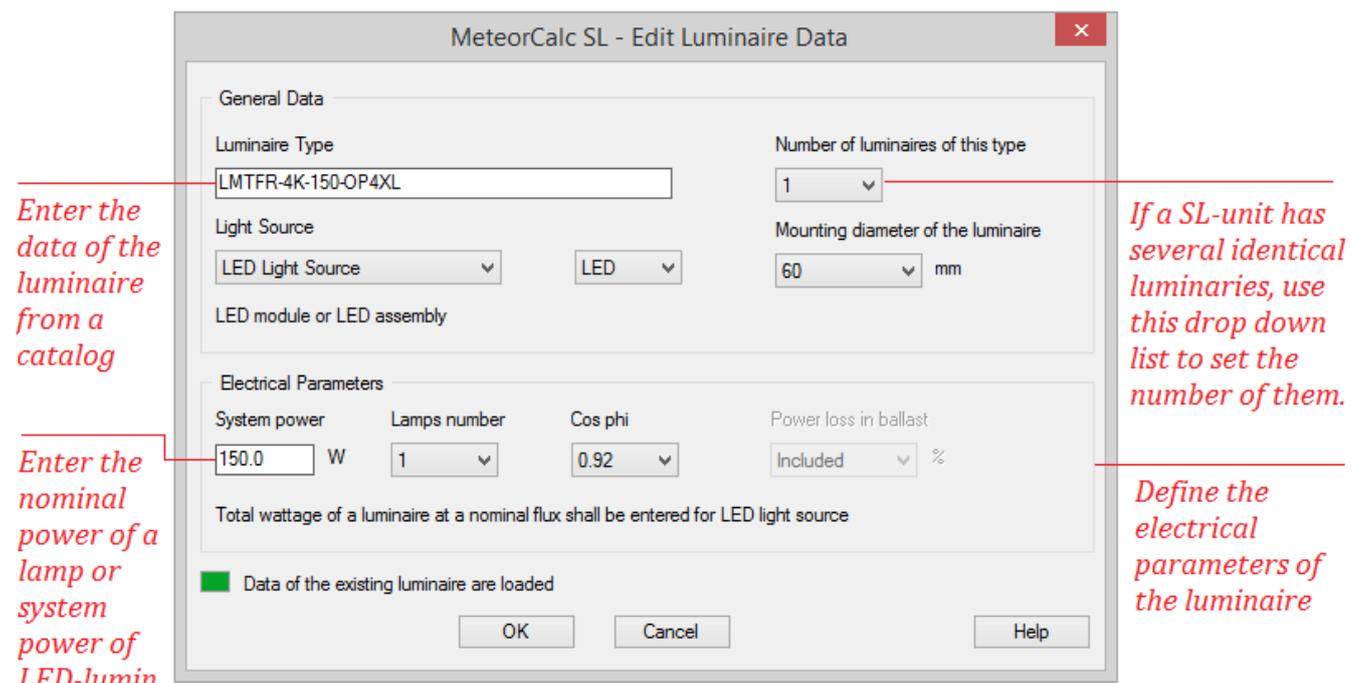


"**Box**" drop down list. Use this drop down list to select protection devices and cable connectors mounted in the street lighting unit.

"**MCB**" or "**Fuse**" drop down list. Use this drop down list to select the rated current of the protection device.

"**Wiring**" button. Click on this button opens the "**Internal Wiring**" dialog window, where you can define the internal wiring installed in the street lighting unit.

"Luminaire Data" dialog window



Enter the data of the luminaire from a catalog

Enter the nominal power of a lamp or system power of LED-lumin

If a SL-unit has several identical luminaries, use this drop down list to set the number of them.

Define the electrical parameters of the luminaire

"**Luminaire type**" field. Enter a type of the luminaire from a catalog or describe the luminaire as you want to see it in specifications. This property will be used as a basis for calculation of specifications.

"**Light source**" drop down list. Use this drop down list to select type of a lamp or type of a light source.

"**Number of luminaires of this type**" drop down list. If there are several identical luminaries on a SL-unit, you can describe the luminaire only one time and then set the number of them.

"**Lamp power**" or "**System power**" field. Enter here the nominal power of a street lighting luminaire lamp or system power of LED-luminaire.

We finish the description of this complicated street lighting unit!

Press the "Add" button on the "Main Arm" panel and describe the first 200W LED-luminaire. Then press the "Add" button again and describe the second 150W LED-luminaire.

If all the fields are filled, you can see the following complete window.

MeteorCalc SL - Outdoor Lighting Unit Definition

Road Lighting Poles 2

Unit phase: 1-Phase, Unit code: B12-K2

Unit description: H12 200W+150W LED

Total power demand= 350.0 W
Summarized power factor= 0.938

Pole Data

Pole type: TF12K2-S, Conical round pole, Design: Conical steel pole, Pole height, m: 12.0, Material: Steel

Double handhole
 Flange fixing

Main Arm and List of Luminaires

Arm type: Double arm [T-arm], L=2.0 m, A=10 deg, Dm=60 mm, Load=30 kg

List of Luminaires:
1 x LMTFR-4K-200-OP2-M [200W-LED]
1 x LMTFR-4K-150-OP4XL [150W-LED]

Additional Arm and List of Luminaires

Arm type: No arm, Additional arm located below main arm

Pole Support

Base type: CNCRT-17E, Concrete base (standard), Support: 1.8, Depth of base, m

Electrical Equipment

Box: Cable connector kit + MCB, Main wiring: Cu 3x1.5 L = 28 m

MCB: 2 x B6A

Please enter data of outdoor lighting unit

Press the "Save" button and a description of a new a street lighting unit will be appeared in the Data Library. You have now successfully created your first street lighting unit!

Try to assign data of a new street lighting unit to any street lighting blocks. Calculate specifications again. Execute the "Used Units" command to see a description of new SL-unit in the dwg-file.

4. Street lighting units coding system

4.1 Designation of street lighting units

The outdoor lighting projects usually contain street lighting units of different types that are applied to different traffic situations. A street lighting unit is a pole (mast) with several luminaires or a single luminaire, or any other consumer in the outdoor lighting network (for example, waiting pavilion or outdoor advertisement).

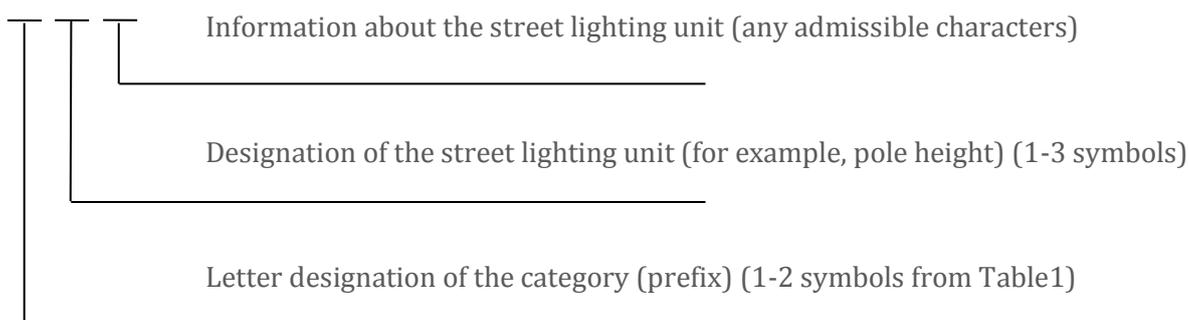
There are two parameters to determine the street lighting unit:

- **A street lighting unit code.** The main parameter is used to identify the street lighting units in the Data Library and in project files (it should be unique for each street lighting unit);
- **A street lighting unit brief description.** The auxiliary parameter is used to provide additional information about the street lighting unit on the plans and schemes.

4.2 Street lighting unit code

To assign the codes to the street lighting units, it is recommended to use the designation system below. The street lighting unit code should consist of the combination of symbols, numbers, and service digits. Each category has its own letter prefix (see Table 1).

A 12



Note. It is allowed to use only English alphabet characters, numbers, and service digits in the codes of the street lighting units, except for the following ones:

double quotes < " >, backslash < \ >, two-spot < : >, and question mark < ? >.

The letter prefixes recommended for designation of street lighting unit categories are shown in the Table 1.

The examples of street lighting unit designations are shown in the Table 2.

Letter prefixes recommended to designate the categories

Table 1

Street lighting unit category.	Recommended prefix	Explanation	Note
Road Lighting Poles 1	A	Street lighting units for roads. Pole (mast) has one/no console	One pole (mast) can contain up to 50 luminaires
Road Lighting Poles 2	B	Street lighting units for roads. Pole (mast) has two and more consoles	
Pedestrian Lighting Poles	C	Street lighting units for sidewalks. Pole with/without consoles	
	D	Special street lighting units for pedestrian crossings. Pole with/without consoles	
Park Lighting Poles	E	Street lighting units for parks. Pole with/without consoles	
	H	Street lighting units for general lighting with the pole of decorative design	
Bollards	G	Bollards and luminaires on the supports	
Floodlight Masts	F	Floodlight masts	One pole (mast) can contain up to 50 luminaires
Special Masts	M	Poles (masts) of special purpose with/without consoles (for example, signal, trolley, or tram masts with luminaires)	
Overhead Line Poles	P	Wooden (or concrete) overhead line poles with luminaires	
Wall Luminaires	K	Luminaires with/without consoles to be mounted on the wall	
Special Lighting	U	Suspended luminaires	Single luminaire or group of them
	T	Tunnel luminaires	
	S	Embedded luminaires	
	L	Single floodlights (for example, architectural lighting)	
	D*	Special luminaires for pedestrian crossing lighting	
Additional Objects	O	Waiting pavilions	
	R	Outdoor advertisement	
Existing Luminaires	Y	Existing luminaires	Single luminaire or group of them
	Z	Replaceable luminaires	

Examples of street lighting unit designations

Table 2

Street lighting unit code	Brief description of the street lighting unit	Explanation
A12K25b+	H12 LED200W	<p>A - category of street lighting unit; 12 - pole height of 12m; K25 - console length of 2.5m; b - additional character used to designate main luminaires; + - street lighting unit has an additional luminaire of decorative lighting</p> <p>H12 - pole height of 12m; LED200W - power demand of main luminaire</p>
B8KK1a	H8 2xLED50W	<p>B - category of street lighting unit; 8 - pole height of 8m; KK1 - console length of 2x1m; a - additional character used to designate main luminaires;</p> <p>H8 – pole height of 8m; 2xLED50W – power demand of main luminaire</p>
R1	200W	<p>R – category of street lighting unit “Outdoor advertisement“; 200W - power demand</p>

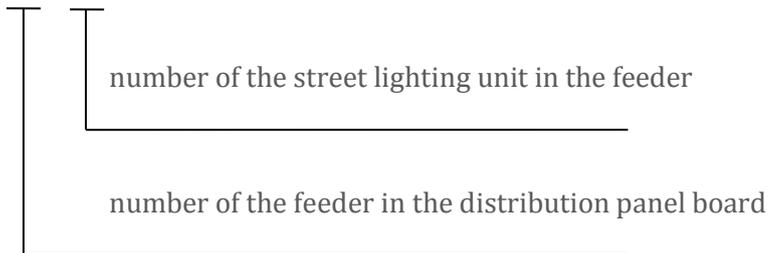
Notes:

1. The above designation system is only recommended. The user can use any street lighting unit designation system suitable for local conditions.
2. It is recommended to include the tables with the detailed descriptions of the street lighting units together with the description of the applied designation system to the street lighting project.

4.3 Numeration of street lighting unit blocks on plans and schemes

The following system is used to number the blocks of street lighting units in the outdoor lighting feeders:

F1 - 2



5. Summary

The purpose of this guide was to show you how the MeteorCalc SL can enhance performance of a street lighting designer. You have to perform only a small preparatory work for the creation of a street lighting model, and then you get all the benefits for automatic renumbering, data assignment and data changing, electrical calculations, obtaining specifications, drawing schemes, and so on.

We wish you productive work with the MeteorCalc SL!

We provide free online support for all our products, including trial versions. If you have any questions about the MeteorCalc SL, please contact support: support@meteorcalc.com

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