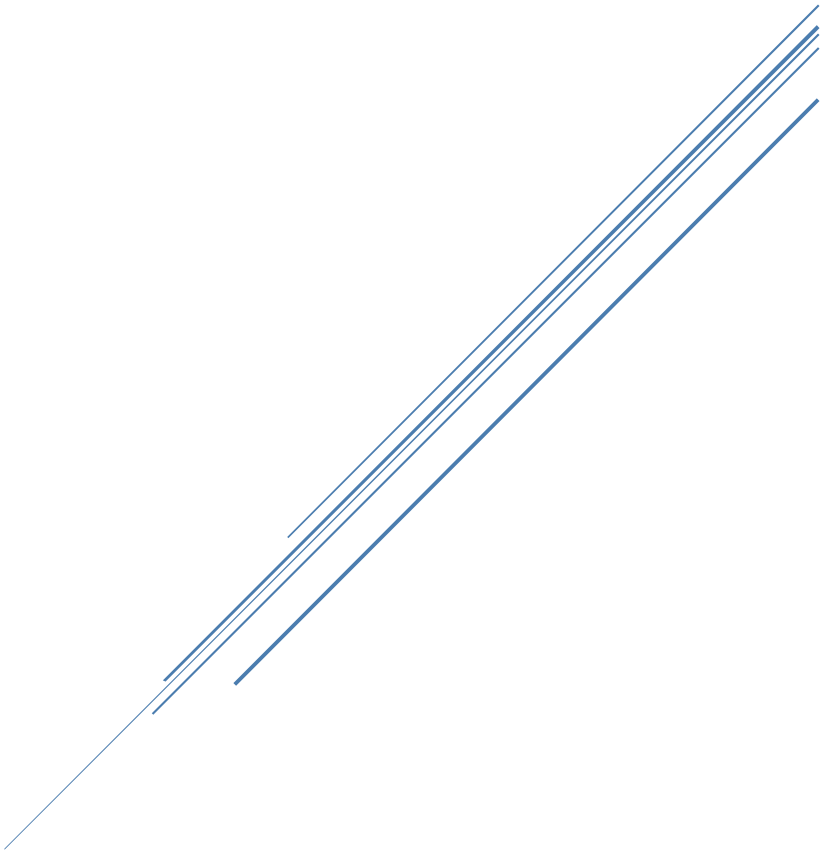
AeroSet

User Manual

Analytical System AeroSet

Basics



06.06.2017

Content

Basics

Purpose

AeroSet is an application environment for a wide range of tasks in mine ventilation. The application provides the user with following tools:

- quick schema design using standard graphic instruments;
- semi-automatic processing of ventilation surveys;
- steady-state airflow simulation, evaluation of airflow stability;
- advanced simulation of ventilation parameters (direction, temperature, humidity, gas and contaminant concentration) based on such factors as natural ventilation, air persistence, gas-, heat-, moisture-emission sources, heat exchange with rock (steady-state and non-steady state), air autocompression and devaporation.

Editions

Free and commercial AeroSet editions are available. The free edition provides tools for schema design and viewing of saved calculation results. No calculations are accessible.

The commercial edition is installed with a license key for a 60-day trial period by default. To purchase the application please contact the developers (contact information is available on http://www.aeroset.net).

Setup

To install AeroSet download a self-extracted archive from http://www.aeroset.net and launch it. The downloaded file might need to be unblocked in the Properties window.

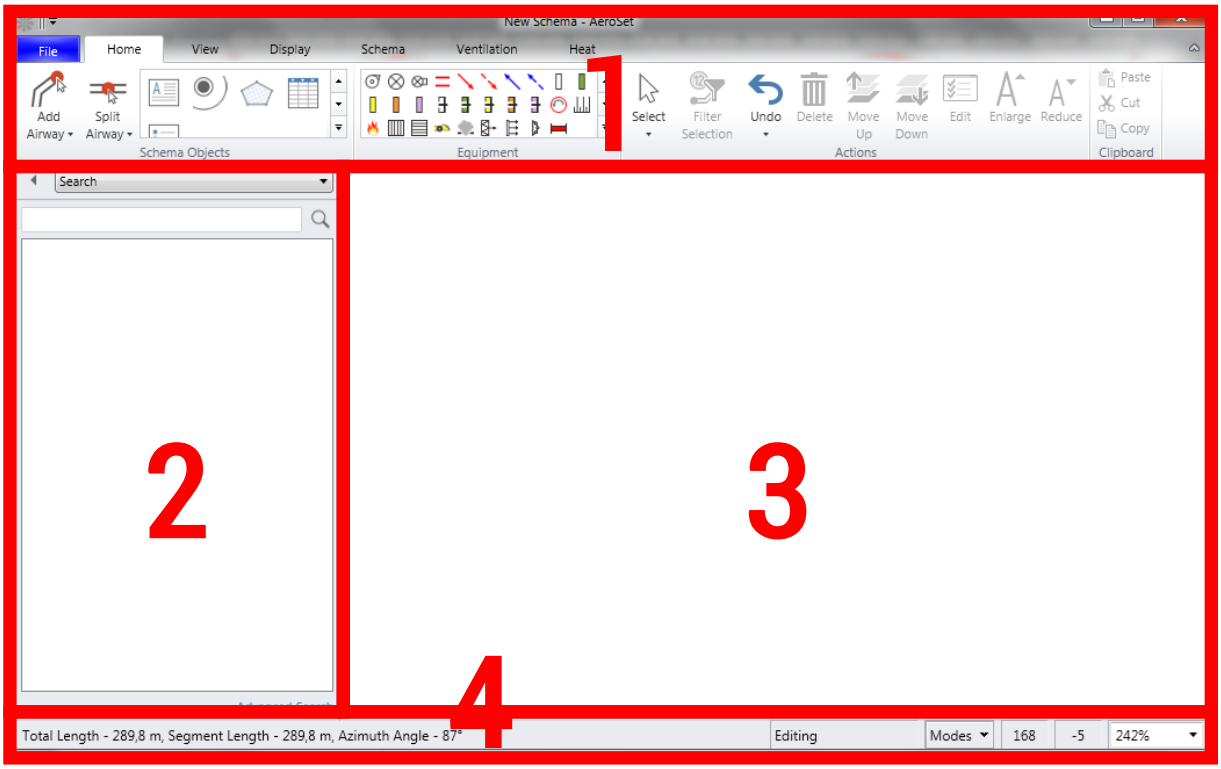
Choose a destination folder in the Setup window and press the *Install* button. Access to the folder can be restricted by Windows, so it may be required to have the administrator's permissions to complete the setup.

When the installation is completed, the special script checks if .NET Framework 4.0 (or higher) is installed. If the library is not installed, the user is asked to download it from the Internet.

After the installation the application's icon appears on the user's desktop.

User interface

Main window



The main window is divided into four regions. The first region called *Ribbon* is located at the top of the window. It contains the *File* button, which opens the main menu, and a number of pages with special commands. The second region called *Side Bar* is on the left side of the window and is used for additional interfaces. The third region in the center visualizes the schema. The fourth region at the bottom of the window called *Status Bar* displays information about the current session.

Ribbon

Commands on the ribbon are grouped into several pages.

The *Home* page contains tools for schema editing.

The *View* page controls schema navigation.

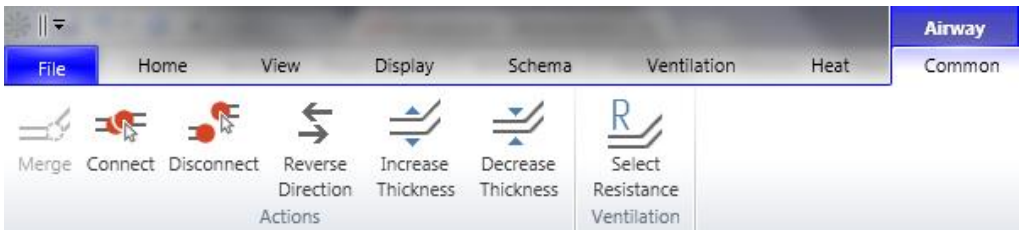
The *Display* page adjusts visualization of the schema.

The *Schema* page provides access to group operations.

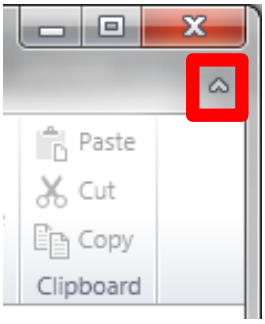
The *Ventilation* page contains different commands for ventilation survey processing, airflow simulation and optimal control.

The *Heat* page gives access to tools for heat and gas simulation.

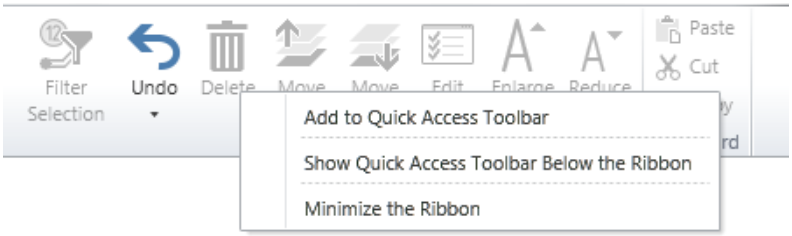
There are also context dependent pages appearing when schema objects (for example, airways) are selected.



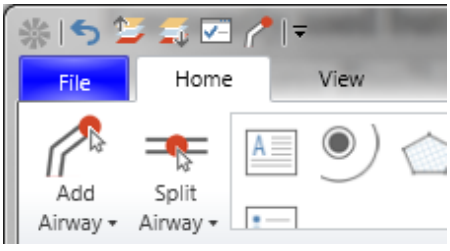
The ribbon can be minimized by the special button in the upper right corner or by using the dropdown menu.



Frequently used buttons can be placed on the quick access panel by choosing the *Add to Quick Access Toolbar* item in a button's dropdown menu.

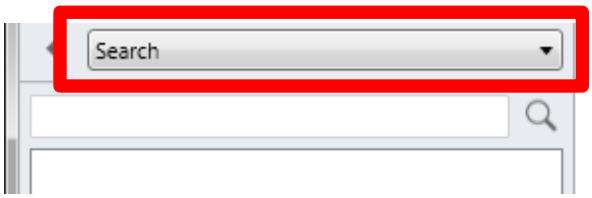


The quick access toolbar is displayed above the ribbon.



Side bar

The side bar displays additional information about schema objects. It is implemented as a multipage panel. A certain page can be selected in the field at the top of the bar.



The *Search* page provides access to locating objects by specifying certain criteria.

The *Layers* page manages the schema graphical layers.

The *Documents* page displays the list of attached documents.

The *Mine Sections* page shows the hierarchical view of the current mine.

The *Properties* page gives access to editing the selected object's properties.

The side bar can be minimized by the special button in the upper left corner.

Main menu

The main menu is accessed by the *File* button on the ribbon.

The *Open* page contains commands for opening files.

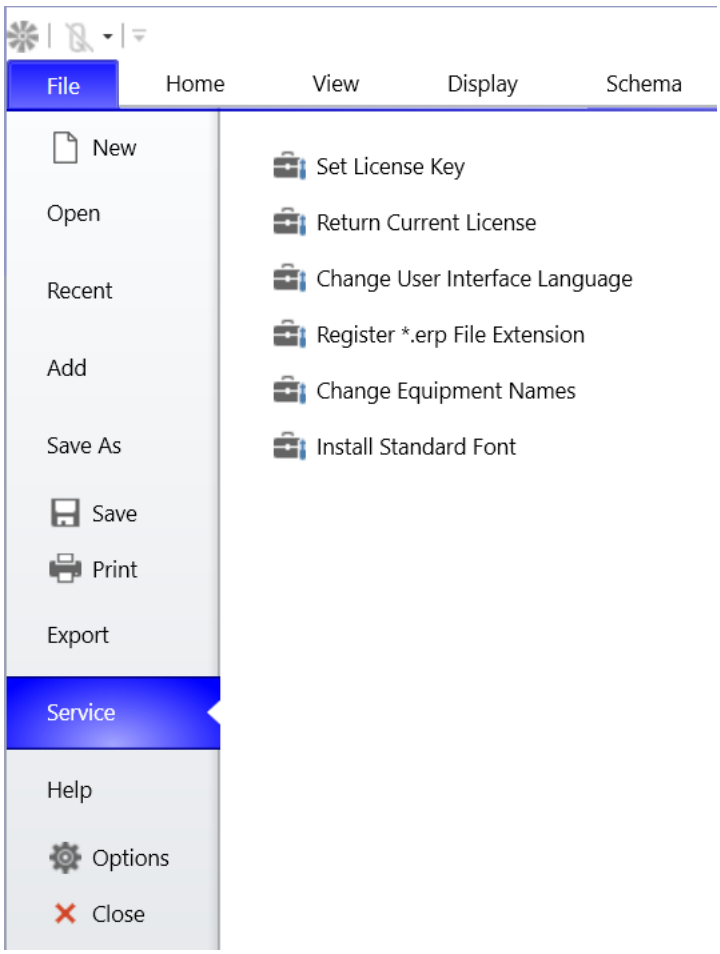
The *Recent* page displays the list of lastly modified files.

The *Add* page contains schema merging commands.

The *Save As* page enables file saving and re-saving.

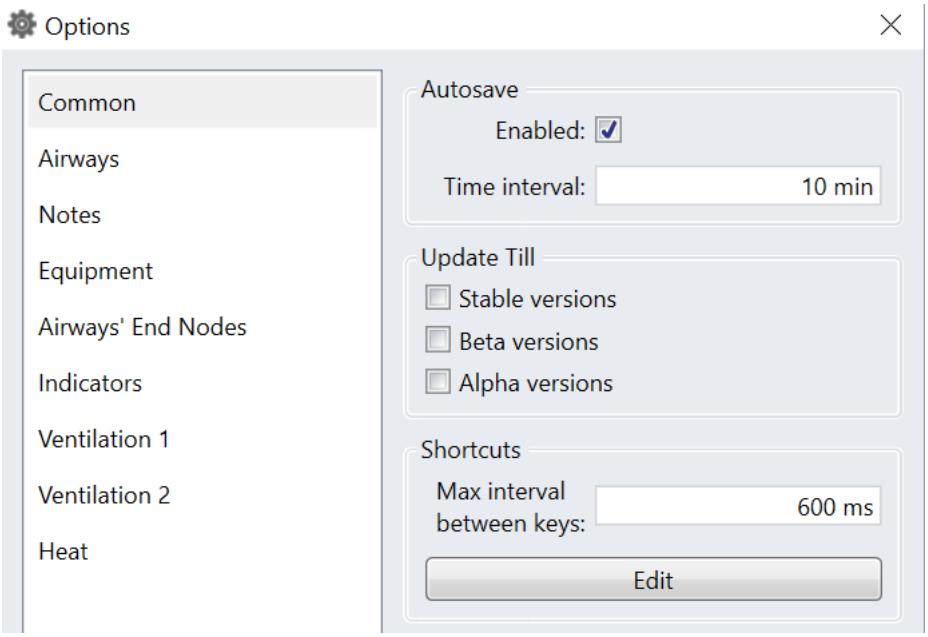
The *Service* page contains the list of supplementary commands.

The *Help* page gives access to some application info commands.



Settings

Basic application settings are edited in the *Options* window opened from the main menu.



All settings are grouped into pages.

The *Common* page contains the most important and commonly used settings.

The *Airways, Notes, Equipment, Airways' End Nodes, and Indicators* pages manage visualization of the corresponding objects.

The *Ventilation 1* and *Ventilation 2* pages control ventilation calculation parameters.

The *Heat* page manages heat and gas simulation parameters.

Working with files

Schema creation and saving

The application creates an empty schema right after launching. However, a schema can also be created by the *New* button in the main menu. If the opened schema is not saved, the user is prompted to save it. To save the schema in the same file it was opened from use the *Save* command in the main menu. To save the schema in another file run the *Save Schema to Another File* command on the *Save As* page.

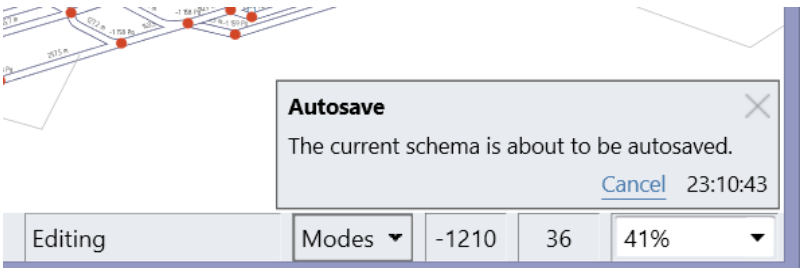
Schema opening

There are four ways to open a schema from file.

1. Select the *Open Schema From File* command on the *Open* page and choose a file.
2. Select a file from the list on the *Recent* page in the main menu.
3. Drag a file from a Windows folder to the application screen.
4. Double click on a file in a Windows folder. Previously, the *erp* extension should be registered by executing the *Register *.erp File Extension* command on the *Service* page.

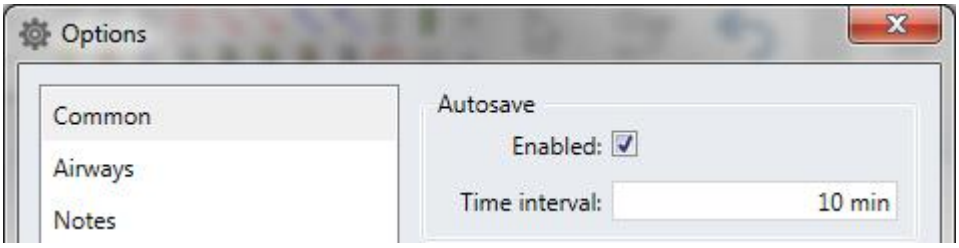
Autosaving

The autosaving is enabled by default. All changes are saved to a special file with the **.~erp* extension. Before saving changes the application informs the user with a notification message at the bottom of the window.



In a case of a correct application shutdown, the service file is deleted automatically. Otherwise, the user is prompted that the schema should be recovered at the next launch of the application.

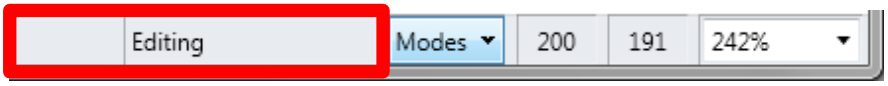
Periods of autosaving are configured on the *Common* page of the *Settings* window. Autosaving can also be completely disabled.



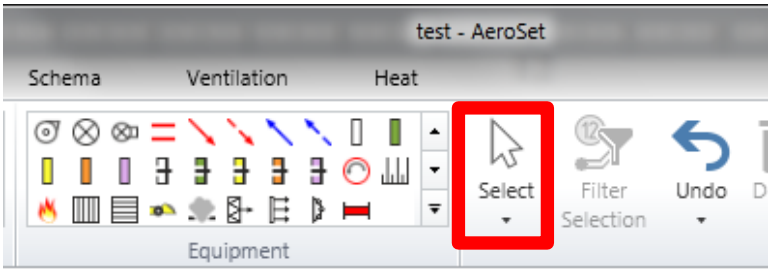
Working with schemas

Schema editing

The editing mode is enabled by default. The mode implies selecting, deleting, moving, and editing schema objects. The current mode is displayed on the status bar.



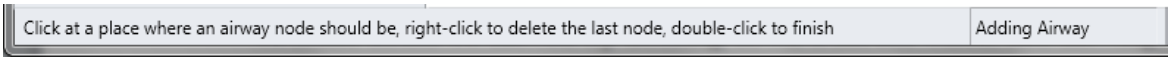
The mode is enabled by the *Select* button on the *Home* page.



Command modes

There are special command modes implemented in the application for complex operations consisting of a series of user actions. For example, in the mode of adding an airway a mouse click leads to creating a new node and a double click finishes the operation.

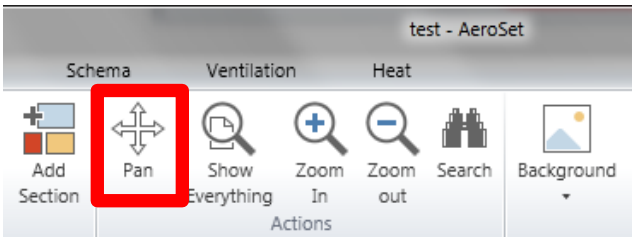
Pressing the *Escape* button always returns the application to the editing mode. The status bar displays information about available user actions and their results in the current context.



View tools

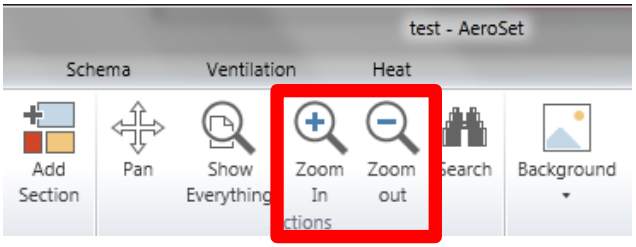
Tools for viewport moving

The viewport is moved by pressing the mouse wheel and dragging. If the mouse does not have a wheel or the monitor is sensor, the move mode can be activated by pressing the *Pan* button on the *View* page of the ribbon.

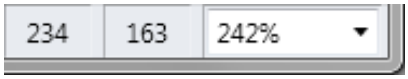


Tools for viewport scaling

The viewport is scaled by rotating the mouse wheel. The same result can be reached by using the *Zoom In* and *Zoom Out* buttons on the *View* page of the ribbon.



The current scale is always displayed in the right corner of the status bar and can be changed there. Setting the scale to 100% means that objects on the screen are the same size as on paper.

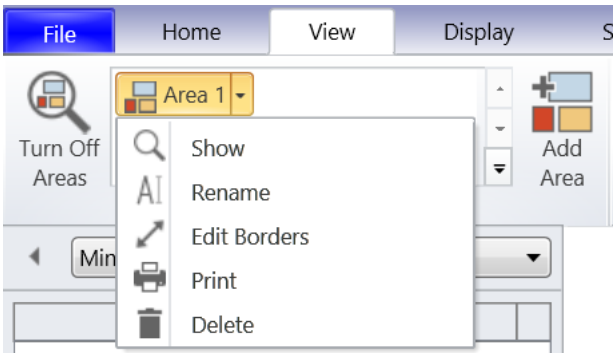


The *Show All* button on the *View* page sets the scale so that all objects can fit on the screen.

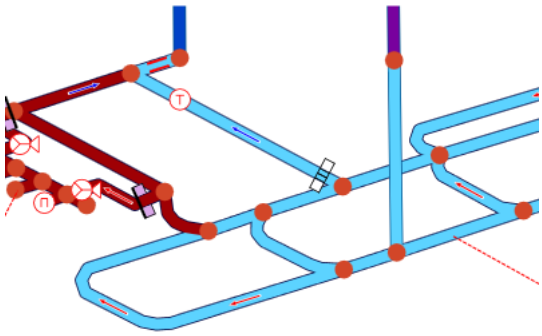
Schema trimming

Sometimes the schema size is too large, so it is very difficult to find anything. To deal with this issue the application has tools for dividing the schema into a number of named areas. To create a new area press the *Add Area* button on the *View* page.

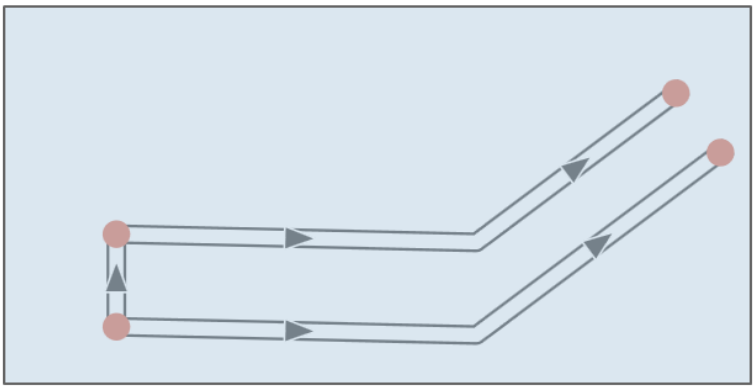
Setting the borders is accomplished by holding the left mouse button while the cursor is dragged across the screen. The creation finishes when the mouse button is released. Later the standard name can be changed using the dropdown menu.



To display an area on the screen click on the corresponding list item on the *View* page or use the *Show* command in the dropdown menu. As a result, the area will be made visible on the screen while the rest of the schema will be cut off.



The area's frame can be changed later by the *Edit Borders* command, which activates the *Editing Area* mode. The borders of the area will be highlighted. The frame can be relocated by pressing the left mouse button and dragging the cursor across the screen. To change the size of the frame place the cursor over a border, press the left mouse button and drag the cursor. Editing the frame is finished when the *Enter* key is pressed or the left mouse button is double-clicked.



Objects categories

Airways

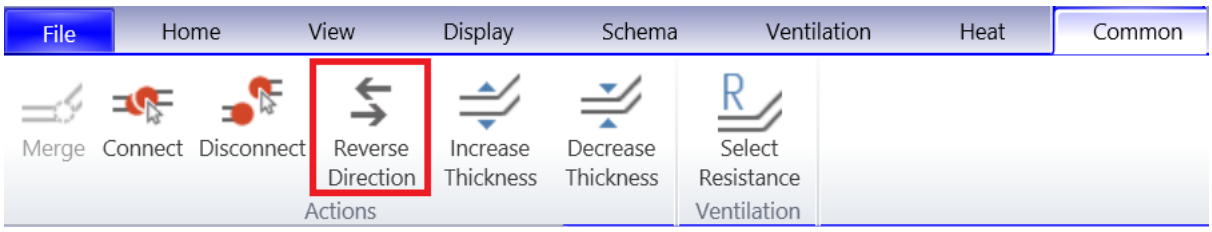
There are three categories of graphic objects:

1) airways;
2) equipment on airways;
3) objects on the schema.

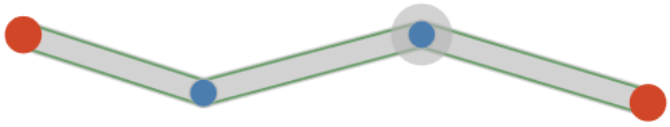
Airway parameters include length, cross-section area and others. Every airway has end nodes denoted by filled circles. These nodes can be displayed or hidden by selecting the *Common – Airways – Airways' End Nodes – End Nodes* item on the *Display* page.

End nodes can use the default color set in the *General* settings page or can use the same color as the layer they belong to (to activate the latter mode select the *Common – Airways – Airways' End Nodes – Layer color* item).

The direction of an airway can be displayed using the *Common – Airways – Airways – Directions* mode. To reverse the airway's direction execute the *Reverse Direction* command on the *Airway* page appearing after the airway is selected.

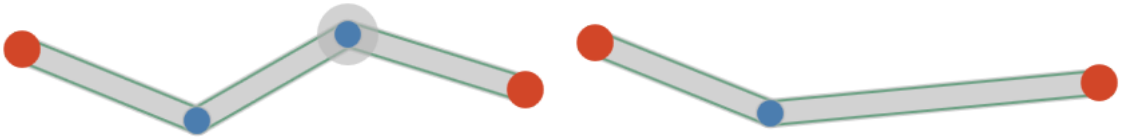


When an airway is selected, all its internal vertices are highlighted and can be selected independently.



However, end nodes are selected separately from the airway they belong to.

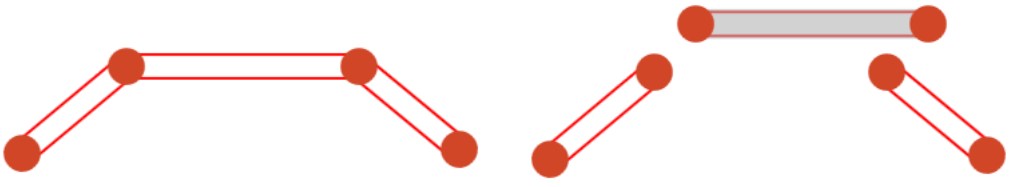
The selected end node or internal vertex is deleted by running the *Delete* command on the *Home* page that results in changing the airway geometry.



Airways can be connected by end nodes. It is considered that the air freely moves between connected airways.

An airway can be relocated on the schema by dragging the whole airway or by moving its nodes and vertices individually. An airway moves when the left mouse button is pressed on the airway itself but not on its vertices while the cursor is dragged over the schema. In this case, the geometry of airway is preserved but the geometry of connected airways might be transformed.

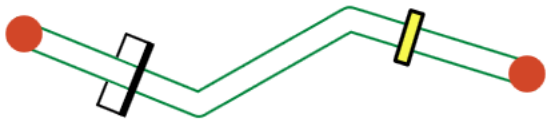
If the *Shift* key is pressed while moving an airway, it will be disconnected from other airways.



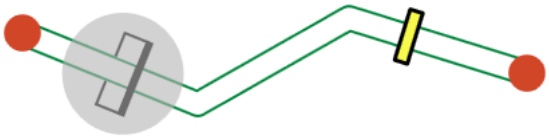
If one end node is moved closely to another, the airways are connected to each other automatically after the moving is finished.

Equipment on airways

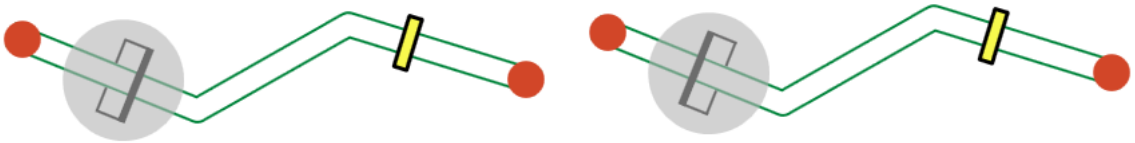
Different objects can be placed on airways, for example, bulkheads, fans and others. They are used for visualization of equipment locations and setting various parameters for mathematical models.



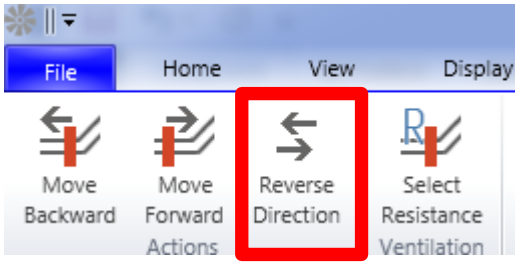
Objects on airways are selected and deleted independently from the airway they are placed on.



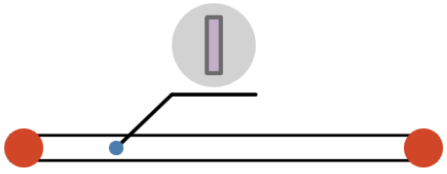
Objects on airways have their own directions, which determine their way of displaying and affect such parameters as the fan pressure's direction.



To change the direction of an airway object select it and press the *Reverse Direction* button on the *Equipment* page.



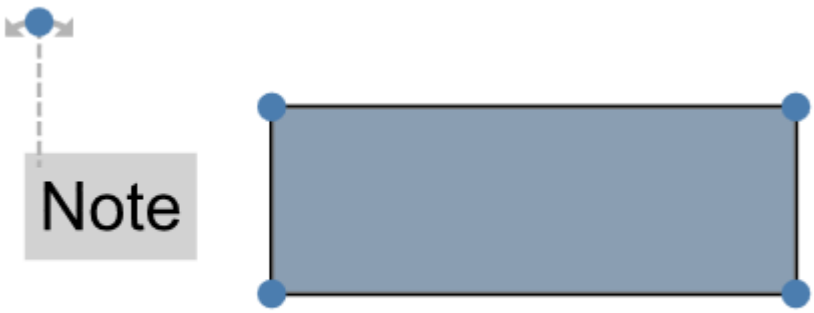
An object is moved by pressing the left mouse button while the cursor is dragged over the schema. An object can be moved either along airway segments or it can be placed between airways creating a reference line pointing to the initial object location.

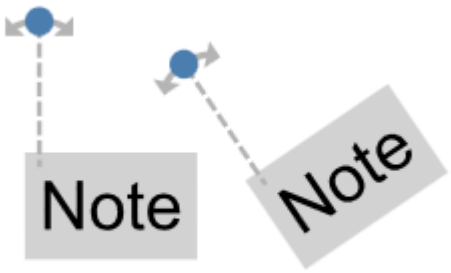


Schema objects

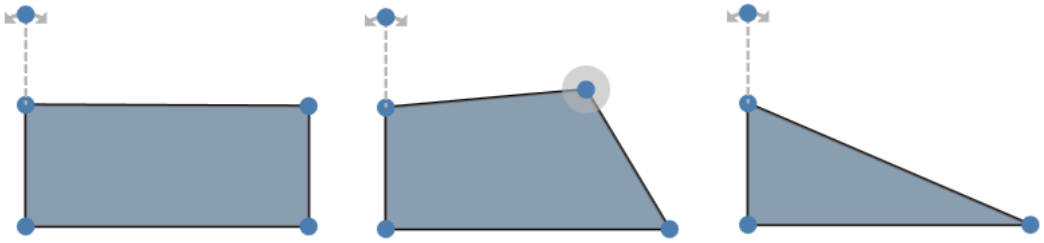
Schema objects include notes, polygons, tables, and legends. They can be added at any place of the schema.

Objects are selected by a mouse click. They are moved when the left mouse button is pressed while the cursor is dragged over the screen. The selected object may have additional visual elements. For instance, selected notes, polygons and tables are displayed with a dotted line ending in a blue circle that allows rotation of objects around their upper left corners.

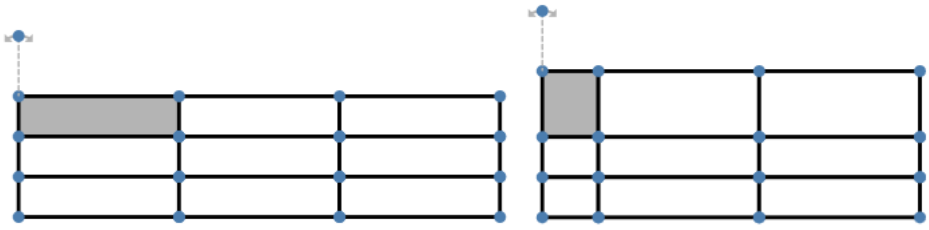




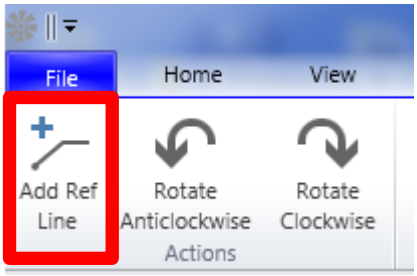
Additionally, some selected objects may have blue markers on the corners for resizing and changing their geometry.



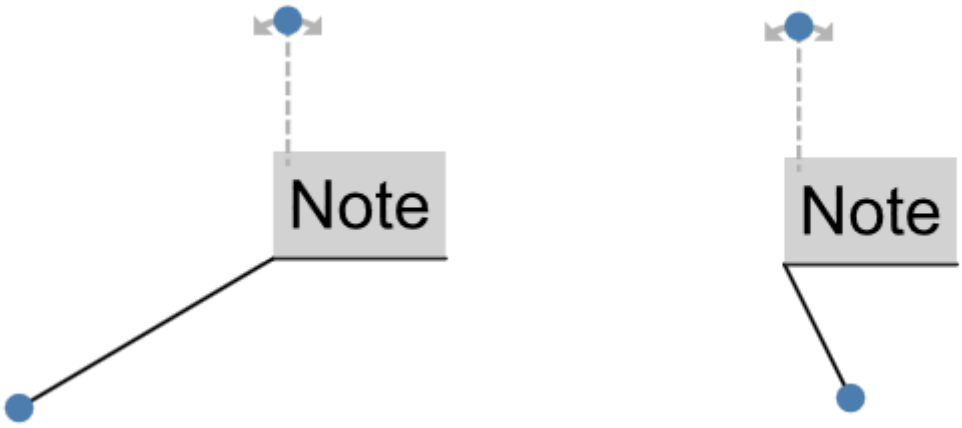
For instance, table markers enable editing cell sizes.



In addition, every schema object can be provided with a reference line. To add a reference line select an object and press the *Add Ref Line* button on the *Object – Common* page.



Reference lines end with blue markers, which can be selected, moved and deleted.

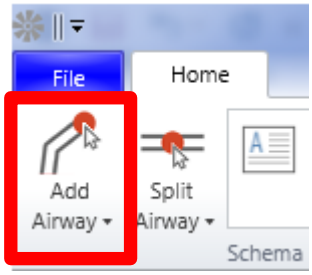


When an object is relocated, all its reference lines preserve their locations unless the *Shift* key is pressed. A reference line can be deleted by the *Delete* key if the marker is selected.

Adding objects

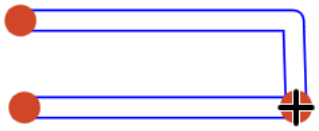
Drawing airways

Airways are created by the *Add Airway* button on the *Home* page. In this mode, mouse clicks mark vertices and end nodes' locations.

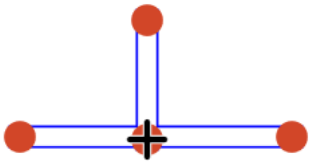


The initial airway node can be put at any place of the schema. If the cursor is positioned over the end node of another airway, that node is marked with a special plus symbol. In this case, the currently drawn airway will be connected with the airway that node belongs to.

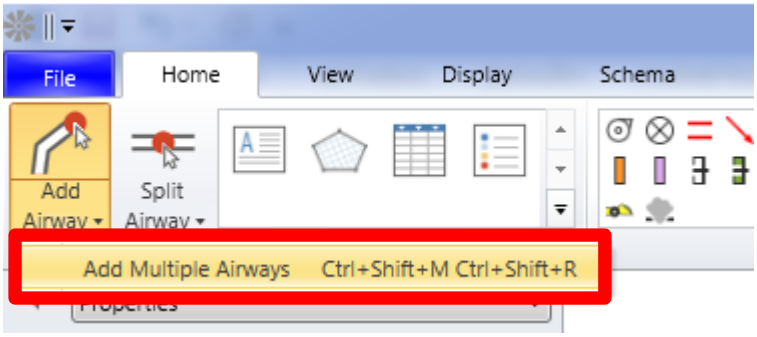
In a similar manner, the final node of the airway can be connected with the end node of an existing airway.



Moreover, the currently added airway can be connected to another at any point along one of its segments. In this case, a new end node is added automatically.

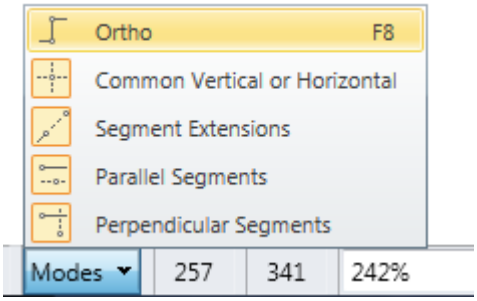


Double clicking or pressing the *Enter* key finishes drawing an airway. There is also the *Add Multiple Airways* command to add many airways at once. In this mode, drawing an airway is finished only when the *Escape* key is pressed.

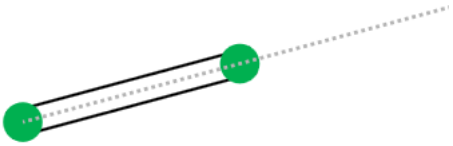


Highlighting standard airway directions

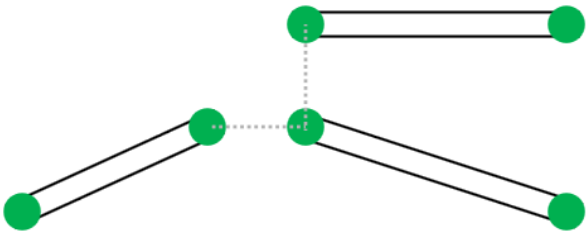
There are special modes that help drawing airways along some fixed directions.



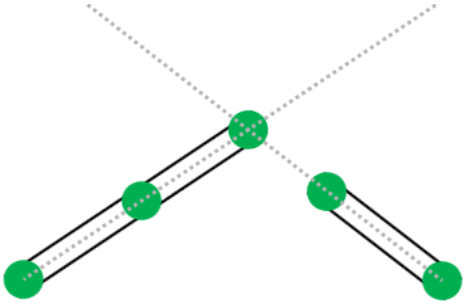
The *Ortho* mode provides an easy way of drawing airways, which form the angle of 30, 45 or 90 degrees.



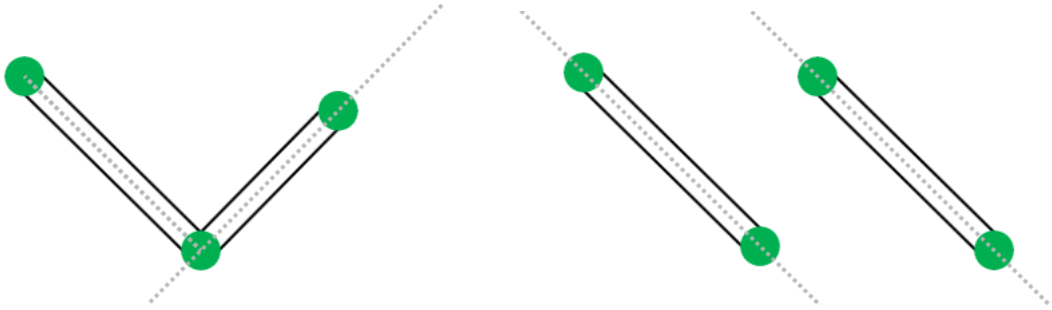
When the selected node is located on the same horizontal or vertical level as the node of another airway, these nodes are connected with dotted lines if the *Common Vertical or Horizontal* mode is on.



Directions of airway segment extensions are marked in the *Segment Extensions* mode.

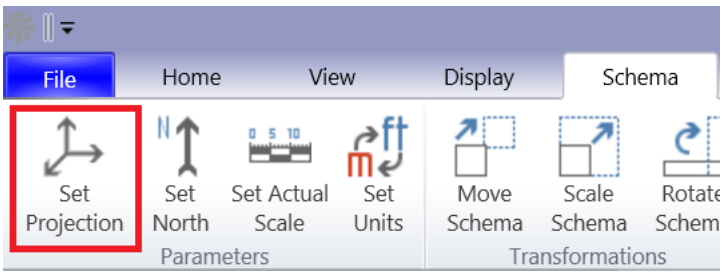


There are also modes for highlighting only parallel and orthogonal segments.

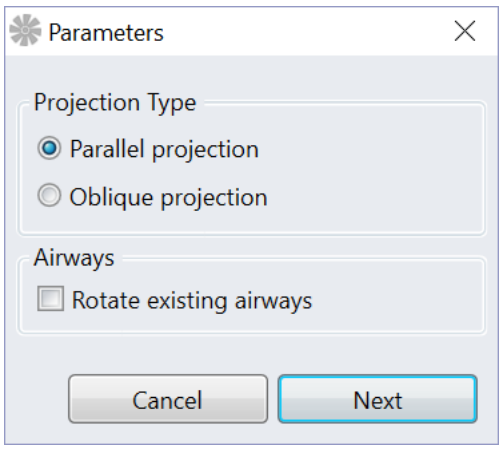


Drawing airways in 3D

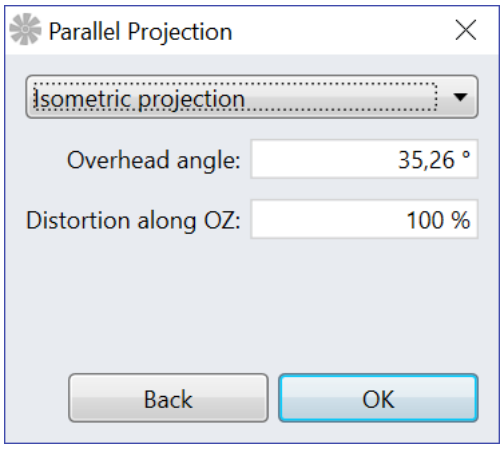
If using the mouse is not precise enough, new airways can be added by specifying their 3D parameters. But prior to that, the current projection type, scale and north direction should be set.



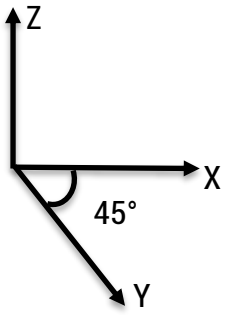
The current projection type can be changed by the *Set Projection* button on the *Schema* page, which means choosing between parallel and oblique projection types and editing parameters of the selected projection. Moreover, there is an option to rotate existing airways while setting a new projection type, which can help, for instance, to convert an axonometric schema into a horizontal one.



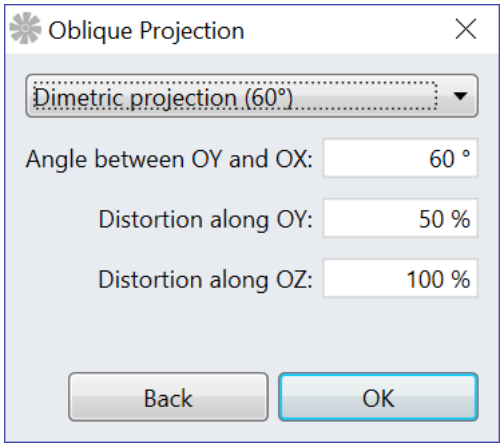
A parallel projection rotates the schema in 3D around the OX axis and discards Z coordinates after that. The result depends on the angle of such rotation called the overhead angle. This angle can be set manually or by choosing a value that corresponds to one of the standard projections.



In the case of oblique projections, there is no rotation at all. Instead, 2D coordinates are calculated by applying a set of simple rules. X and Z 3D coordinates transform into X and Y 2D coordinates directly, and Y 3D coordinates are placed along a special screen OY axis with some distortion. For instance, the oblique dimetric projection has the OY screen axis inclined at the angle of 45 degrees and distorts 3D Y coordinates by the factor of 0.5.

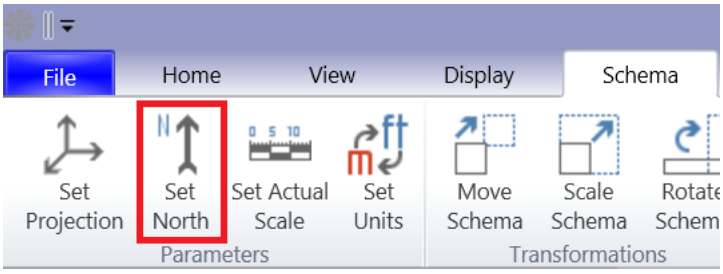


Thus, an oblique projection can be fully described by specifying the angle of its screen OY axis and the distortion factor along this axis. As in the case of parallel projections, these parameters can be set manually or by choosing from one of the standard projections.

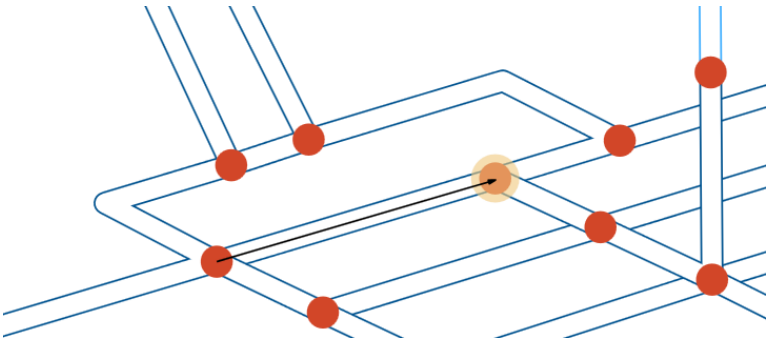


Besides, all projections allow setting the distortion along OZ axis, which can be useful to set close levels farther apart.

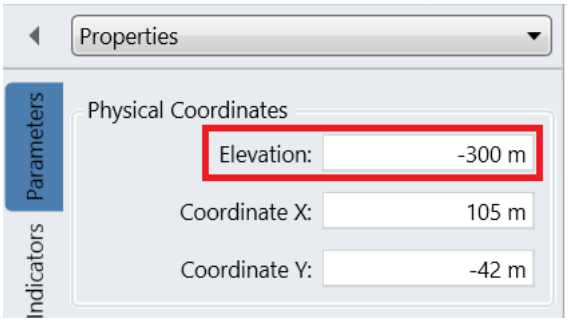
Setting the north direction on the schema is the next step after selecting a projection. This can be done by the *Set North* button on the *Schema* page.



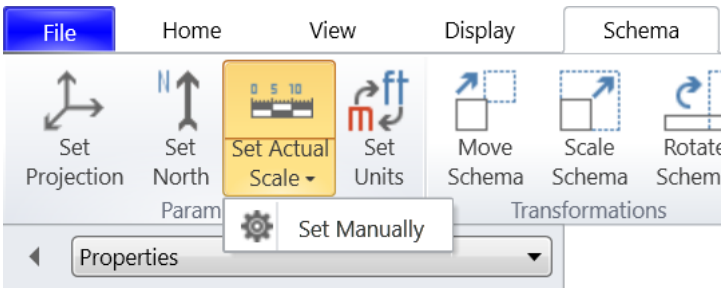
Setting the north means selecting two airway end nodes so that they form an arrow that points to the north on the schema.



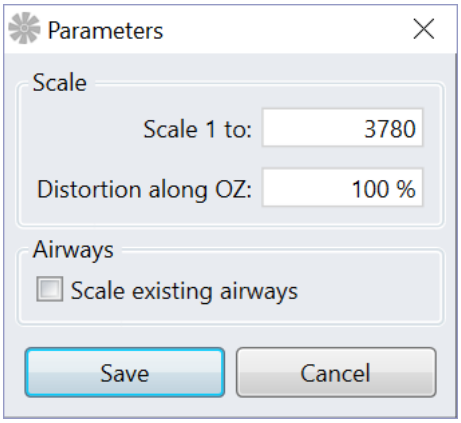
It is important to make sure that such end nodes have proper elevations before doing that. Otherwise, their 3D coordinates might be calculated wrongly.



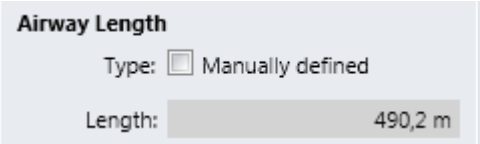
The current schema scale can be set in a similar manner (the *Set Actual Scale* button on the *Schema* page). In that case, selecting two airway end nodes creates a segment which actual length is offered to be specified manually, thus setting the scale of the whole schema. Besides, the schema scale can set manually using the corresponding command in the context menu.



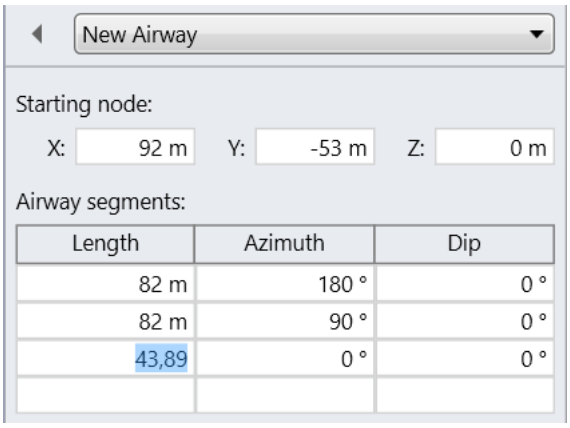
In this case, the scale is set in the format of 1:2000 or 1:4000. There is also an option to set the distortion along the OZ axis, which may help to make more readable a schema containing many layers that are located closely together. Finally, the user can specify that setting the scale should transform existing airways.



After that, all airway lengths and azimuths are recalculated. The length of an airway is displayed in the *Length* field on the *Properties* tab. All airway lengths can also be shown on the schema (*Display – Ventilation – Input Data – Airways: Indicators – Lengths*).

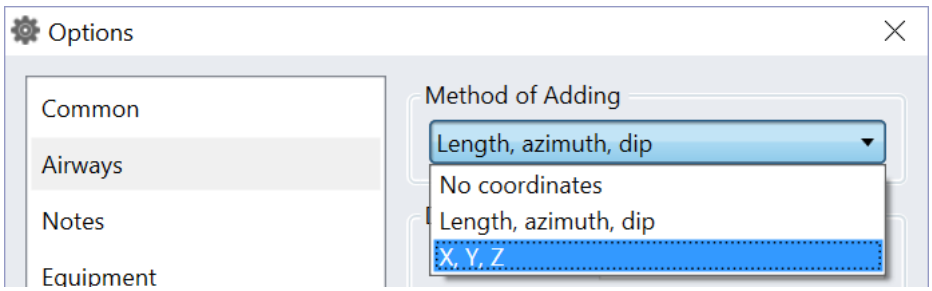


Moreover, a new airway can be added by specifying the lengths, azimuths and inclinations (dips) of its segments. These parameters are edited on the *New Airway* panel, which appears at the start of creating an airway.

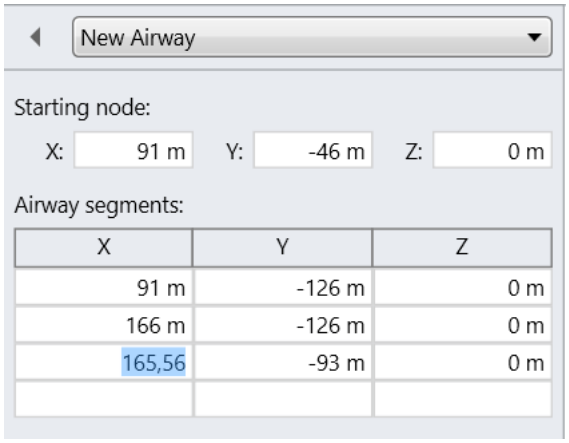


The parameters of airway segments on this panel can be changed by typing values from the keyboard and pressing the Tab key. A new airway segment can be added by specifying its length in the empty row at the bottom.

Alternatively, a new airway can be added by specifying physical coordinates of its end nodes. This mode is enabled on the *Airways* tab of the *Options* form.

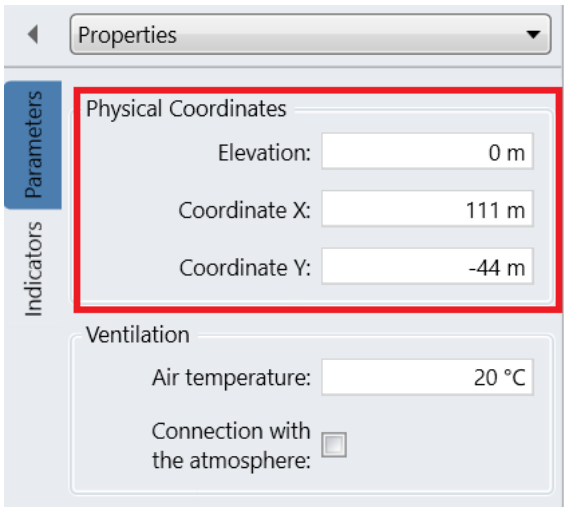


Then the latter panel changes its appearance.

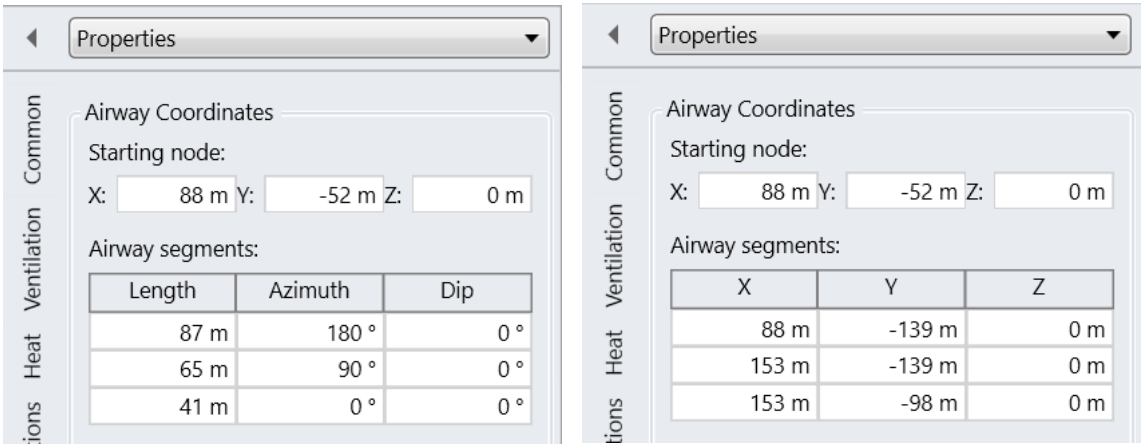


If the current mode is *No coordinates*, then the *New Airway* panel does not appear at all.

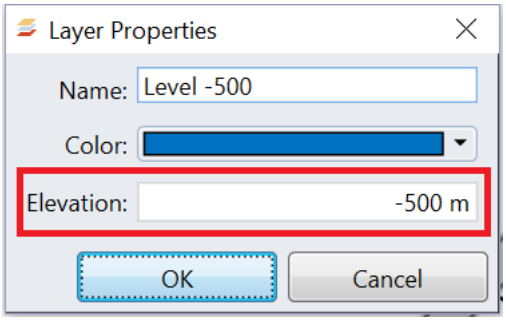
Coordinates of existing end nodes are edited on the properties panel.



Parameters of existing airway segments are displayed on the *Coordinates* tab of the airway properties panel.

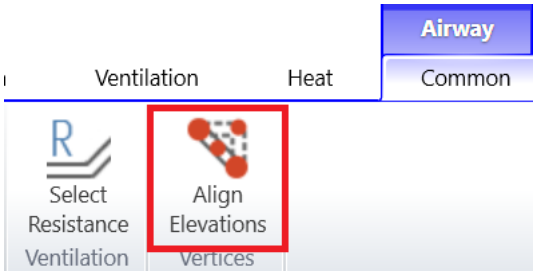


When adding a new airway starting from existing node, the new airway's elevation is copied from the one of the node. In the case of adding an airway in empty space, the elevation is taken from the properties of the selected layer.



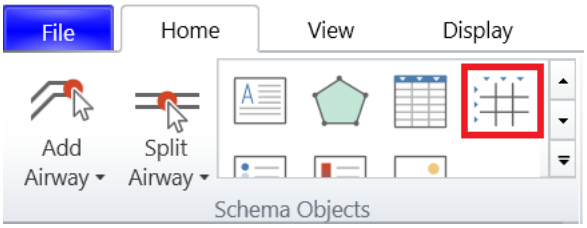
Internal airway vertices also have their elevations. They are edited on the properties panel, which is opened when one of the vertices is selected.

The alignment of airway vertices can be restored, if needed, by the corresponding button on the *Airway* contextual ribbon tab.

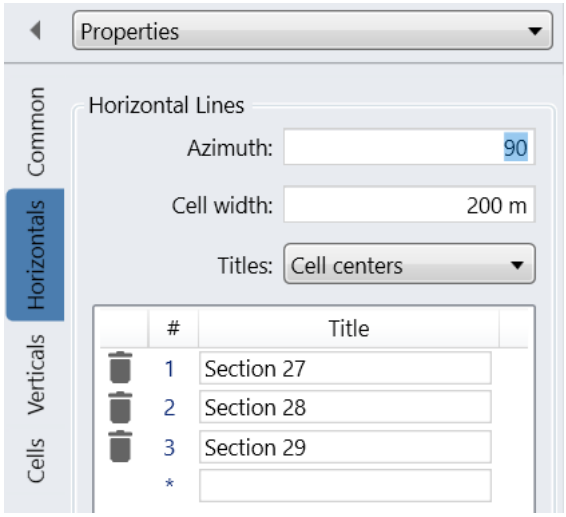


Drawing airways using grids

When a mine is designed, every level is usually divided into sections and then airways are developed along the borders of these sections. Sections often have rectangular shape, so they form a grid. To add a grid a user can use the object gallery on the *Home* ribbon tab.



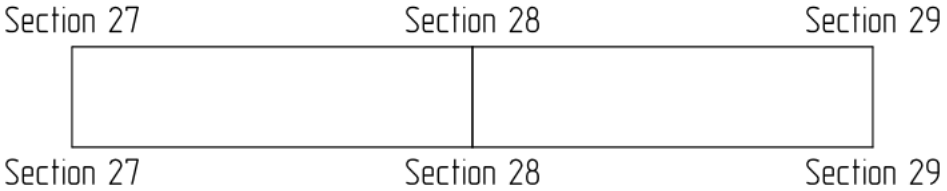
By default, a grid has only one cell, but it can be edited on the properties panel. There are two tabs (*Horizontals* and *Verticals*), each of which displays the properties of the corresponding grid lines. New lines are added by populating the list of titles.



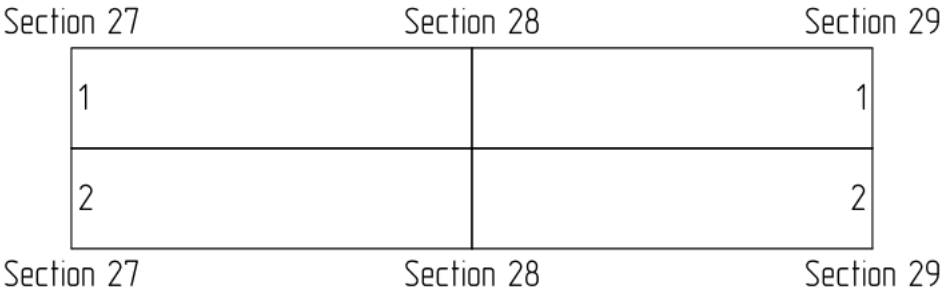
When titles are displayed by cell centers, then the number of cells is equal the number of titles.

Section 27 Section 27	Section 28 Section 28	Section 29 Section 29

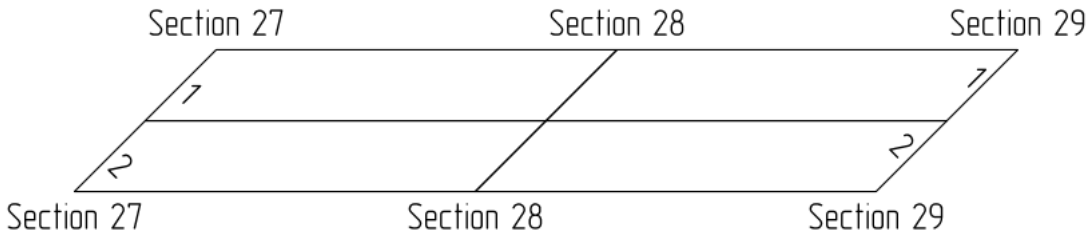
When titles are displayed by cell border lines, the number of cells is equal the number of titles minus one.



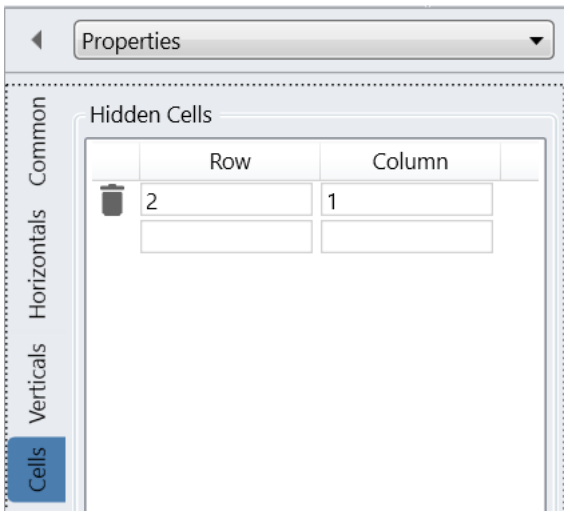
The number of vertical cells is edited the same way.

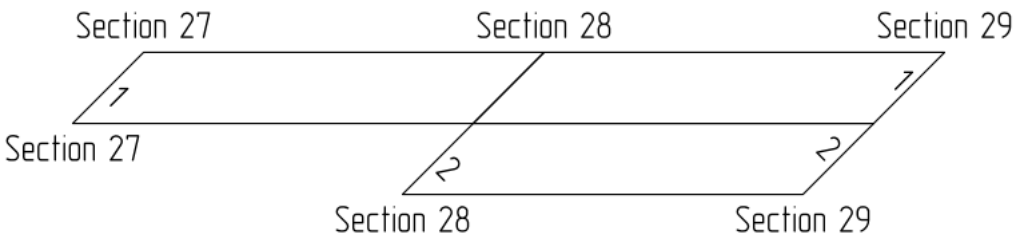


Cell size is set in physical coordinates, so when the schema scale changes, grid cells redraw themselves. Besides, grid lines are directed along physical axes, that is why grid cells become non-rectangular in some projections.

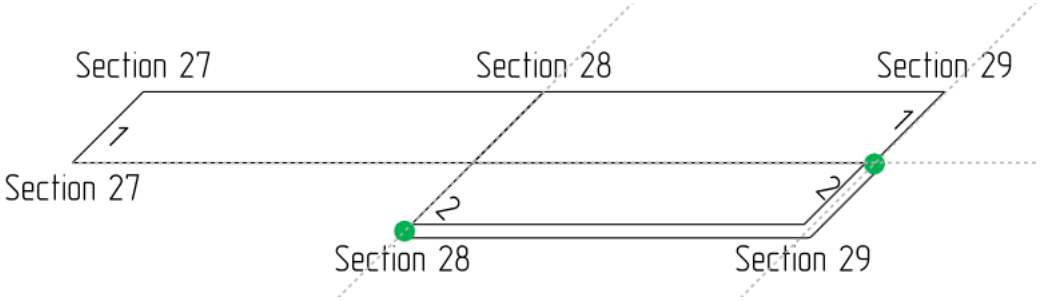


Sometimes a few cells should be hidden. It can be done on the *Cells* tab on the grid properties panel by specifying cell row and column indices.



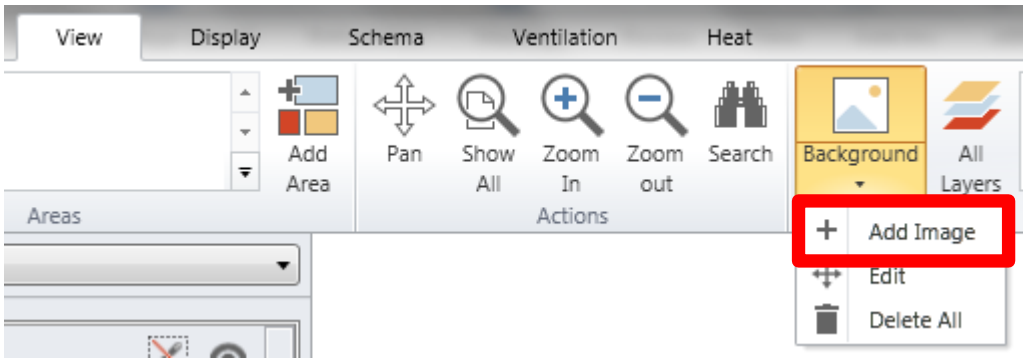


When a grid is ready, it can serve as a tool to draw airways, because end nodes of a newly created airway can be aligned to grid lines.



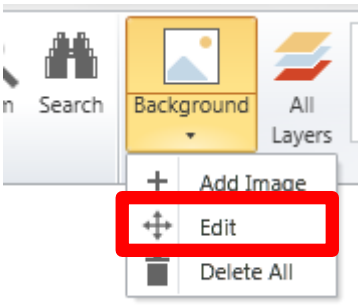
Drawing airways over background images

There are other tools for drawing airways. If the user has a bitmap image of the schema, he or she can add it on the schema and draw airways over it. For this purpose, there is the *Background* menu on the *Display* page.

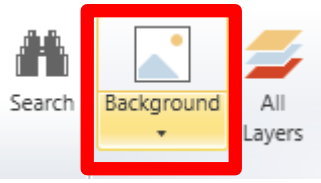


Click the *Add Image* command from the dropdown menu and select a file from disk, then place an image on the schema. Note that such an image expends much more memory than it takes on disk. For large backgrounds use PNG with a transparent color and grayscale it. In the case of memory shortage, an error message may appear or the image might just not be shown without any errors.

The new background is displayed below all graphical objects on the schema. The location of an already added image can be changed later by the *Edit Image* command.



All background images can be hidden/shown by pressing the *Background* button on the *Display* page.



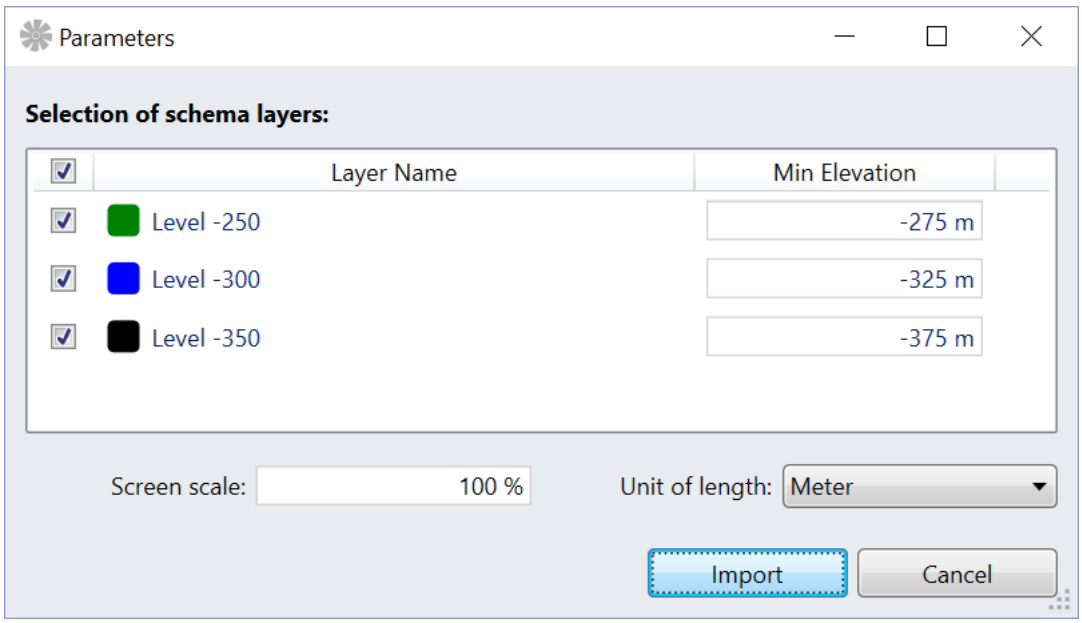
Importing airways from XML

Another way of creating a schema is importing airways from an XML file. The XML format allows using data from external software applications, for instance, CAD software used by mine surveyors. In order to be imported successfully, an XML file must conform to a certain structure, example of which is presented below.

<?xml version="1.0" encoding="utf-8"?>
<Structure>
<Nodes>
<Node><ID>371</ID><X>398,489</X><Y>-458,963</Y><Z>-189,000</Z></Node>
<Node><ID>372</ID><X>421,675</X><Y>-465,051</Y><Z>-169,000</Z></Node>
</Nodes>
<Arcs>
<Arc><ID>38356</ID><BeginNodeID>371</BeginNodeID><EndNodeID>372</EndNodeID>
<Length>161,781</Length><SectionArea>15,605</SectionArea>
<Vertices>
<Vertex><X>426,436</X><Y>-483,547</Y><Z>10,518</Z></Vertex>
<Vertex><X>426,327</X><Y>-483,658</Y><Z>-10,533</Z></Vertex>
</Vertices>
</Arc>
</Arcs>
</Structure>

All airway end nodes with their 3D coordinates are enumerated at the beginning. Then, there is a list of airways with airway lengths, cross-section areas, end nodes and inner vertices, if any.

Import from XML is done by the *Add Schema From XML* command on the *Add* page of the main menu.

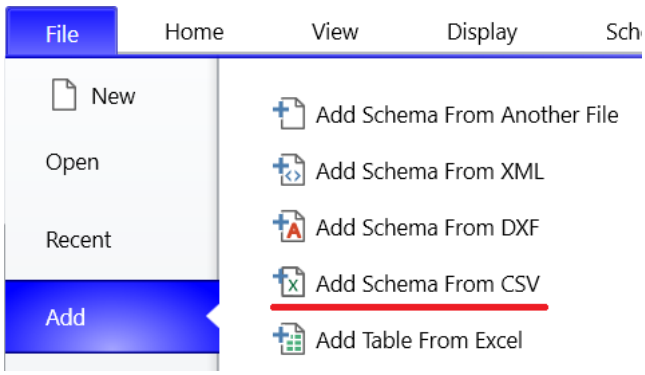


After a file path is specified, a form appears offering to select elevation ranges for the existing layers as well as to set the screen scale and the current unit of length.

As a result, a 3D schema is transformed into a 2D representation based on the current projection type.

Importing airways from CSV

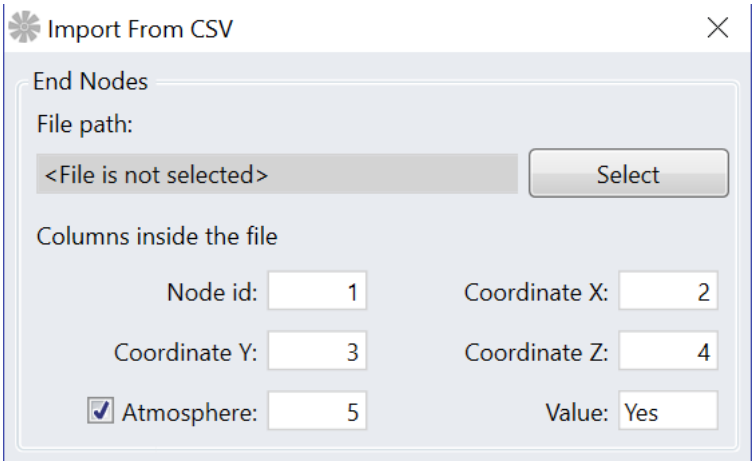
Sometimes a schema is provided in the form of an Excel file containing a list of airways and their properties. Such file can be imported by the *Add Schema From CSV* command on the *Add* tab of the main menu.



In that case, a user should provide two CSV files. The first one should contain a list of airway end nodes' coordinates. A sample file is showed below.

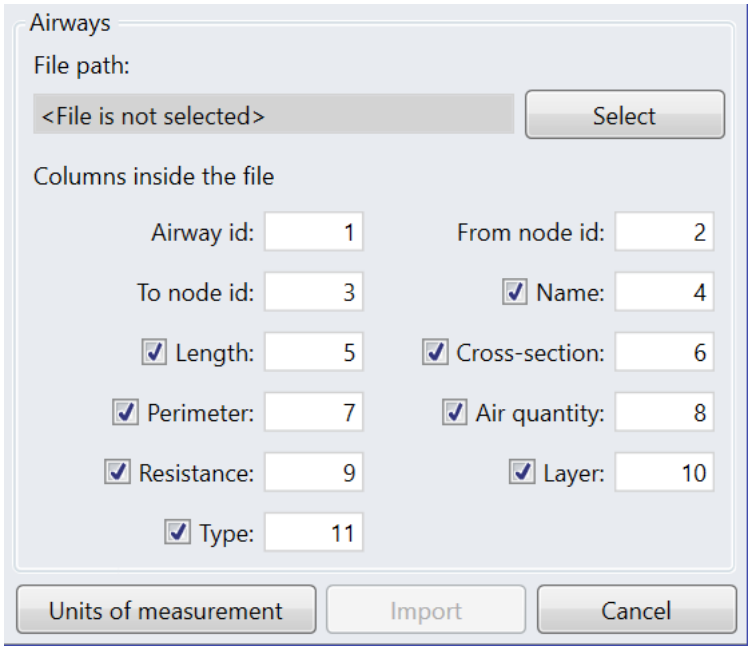
1; 10.5; 20.5; 30.5
2; -20.3; 30.8; 15.8
3; 31.8; 13.8; 22.9

In this example, the first column contains an end node id, the second, the third and the fourth columns – physical coordinates X, Y, Z. Besides the fifth column may indicate a connection with the atmosphere. The order of columns as well as the value indicating atmosphere connection are specified on the import form.

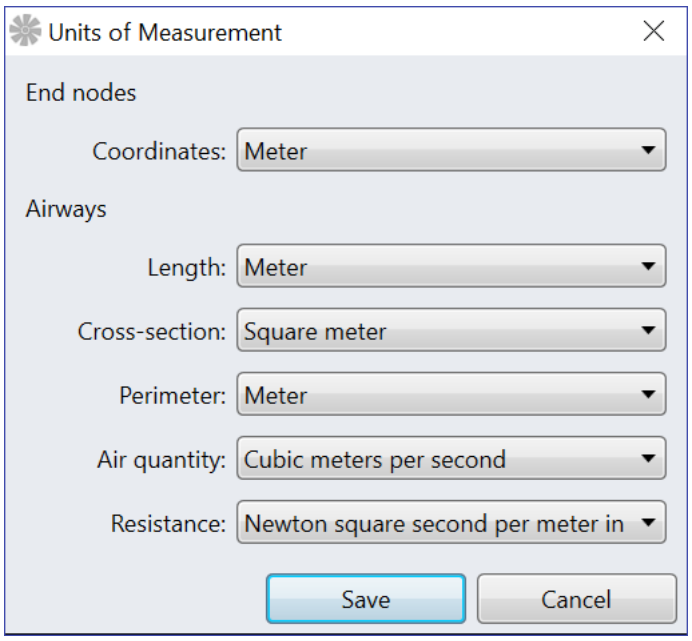


The second CSV file should contain information on how the end nodes from the first file are connected. The file can look like this.

1; 1; 2
2; 2; 3

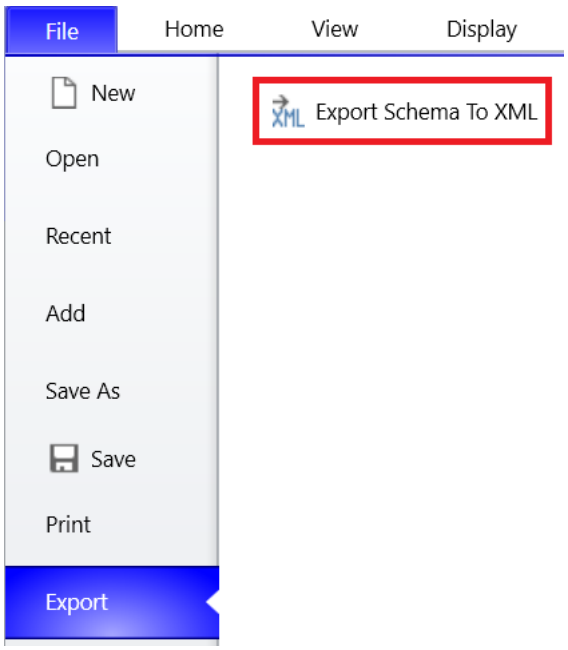


The first column specifies an airway id, the second and the third one – ids of end nodes that connect the airway. Besides, additional columns may contain some airway properties, such as a title, length, cross-sectional area, aerodynamic resistance etc. The order of columns and a set of available airway properties is set on the import form. The unit of measurements for airways properties are specified on a separate form.



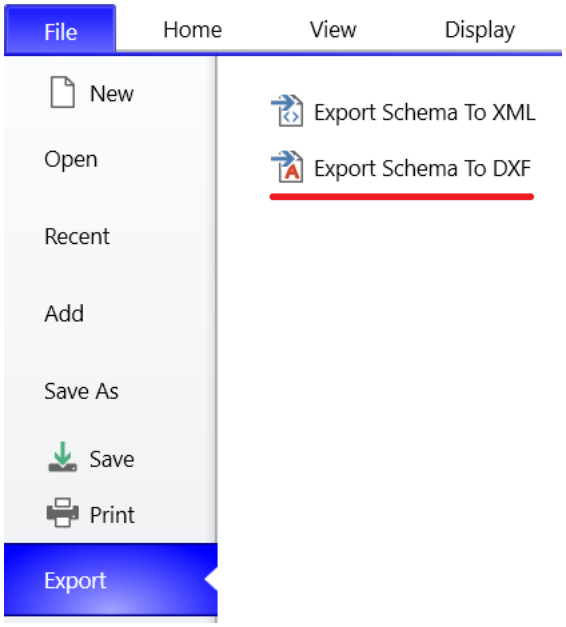
Exporting airways to XML

The current network of airways can be exported to XML. This can be useful when there is a need to transform the current 3D view of the schema. For instance, a vertical projection should be transformed into axonometry. In order to do that, a user can export the current schema to XML, create a new schema, change its projection type to axonometry and then import the data into it.



Exporting to DXF

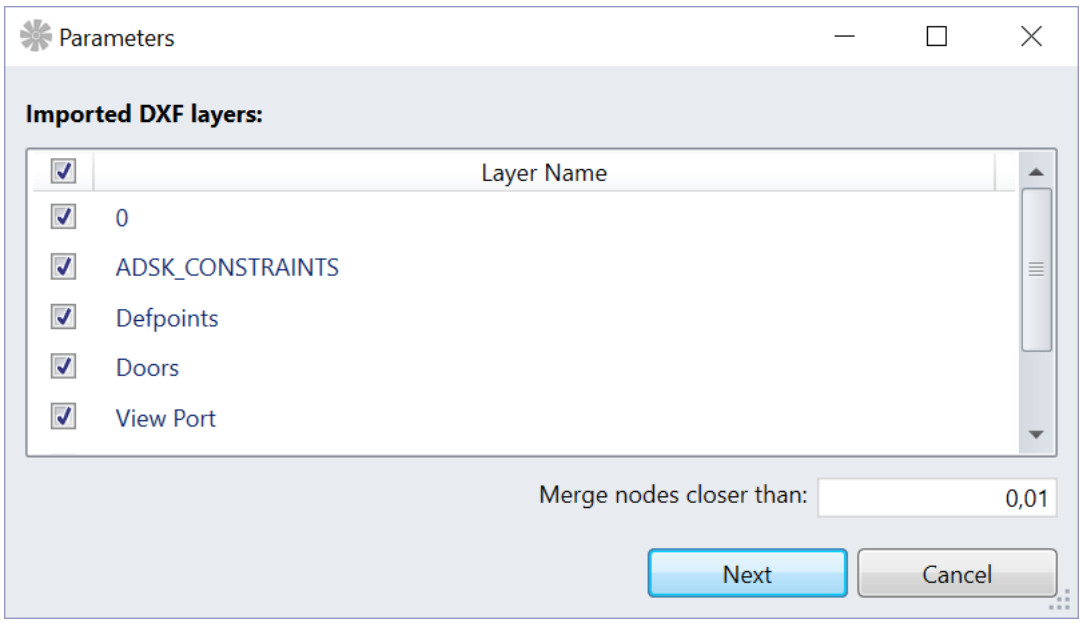
Creating a DXF file is a common way to transfer a schema to a third-party software. In that case, each airway is represented as a 3D polyline. No extra information about the schema is saved to DXF. The command of export to DXF is located on the *Export* tab of the main menu.



Importing airways from DXF

Another way of importing airways is to use a DXF file. In that case, each airway should be represented as a line or a polyline with 3D coordinates. If the end nodes of two lines have the same coordinates, then the airways are connected. Airway lengths are calculated on the basis of end node locations. As to cross-section areas, they are set to some default values.

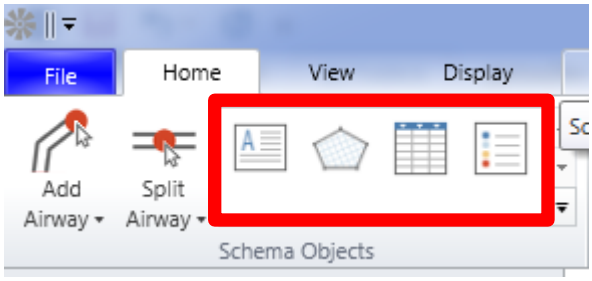
Use the *Add Schema From DXF* command on the *Add* tab of the main menu in order to import a DXF file.



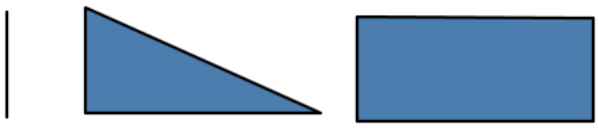
Then select DXF layers that contain lines and polylines, specify the distance of merging two end nodes and click *Next*. After that, the user interface is the same as in the case of importing from an XML file.

Adding schema objects

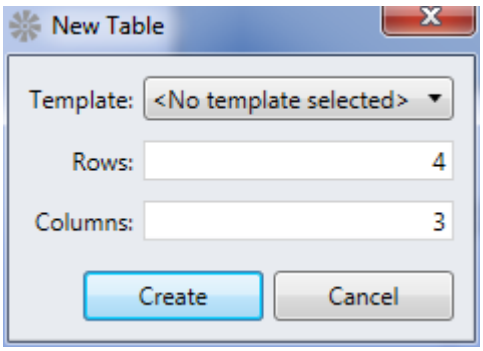
To add schema objects choose one of the icons from the gallery on the ribbon and select a position on the schema by a mouse click.



In the case of polygons, all nodes should be added sequentially.

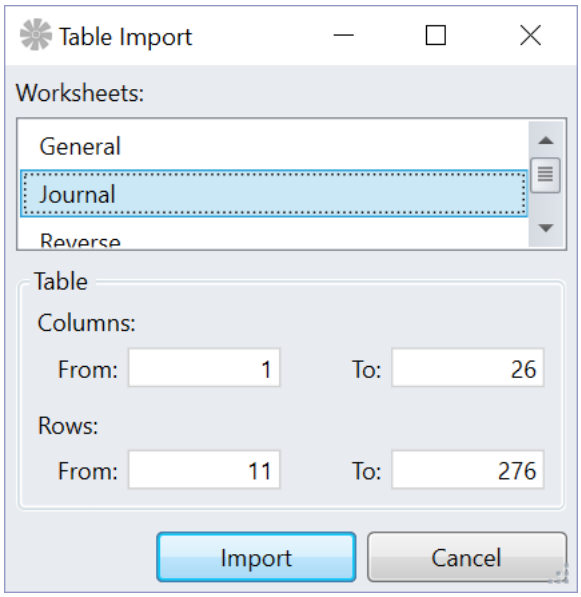


In the case of tables, the user should previously enter the number of rows and columns or choose a template in the appeared window.



Importing tables from Excel

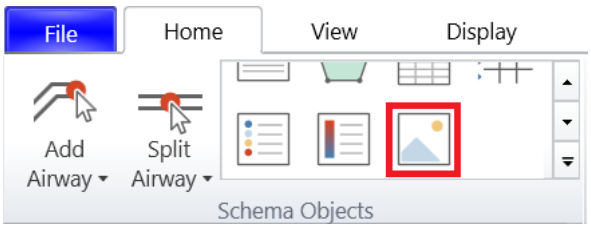
Usually a schema contains some additional tables that are initially created in Excel. In that case, it is simpler to import such tables rather than recreate them manually. In order to do that use the *Add Table From Excel* command on the *Add* tab in the main menu.



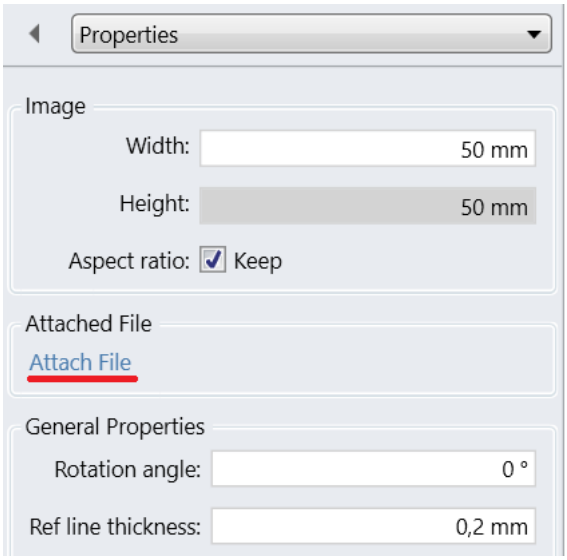
Then select the worksheet that contains the table and specify the imported cell range.

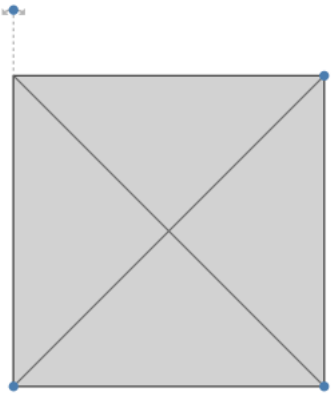
Adding images

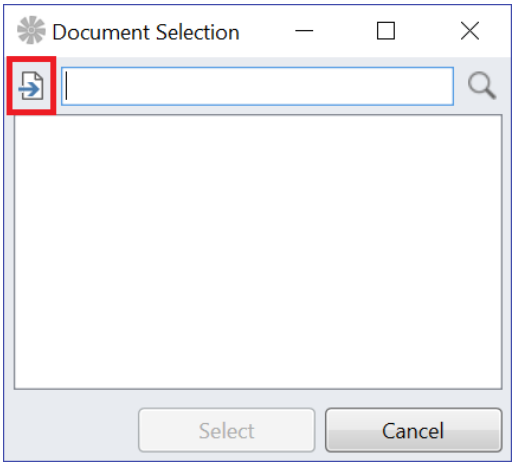
A user can add an image on the schema by the object of the same name in the gallery on the *Home* ribbon tab.



As a result, an image frame will be added, in the properties of which a user can specify an image file.





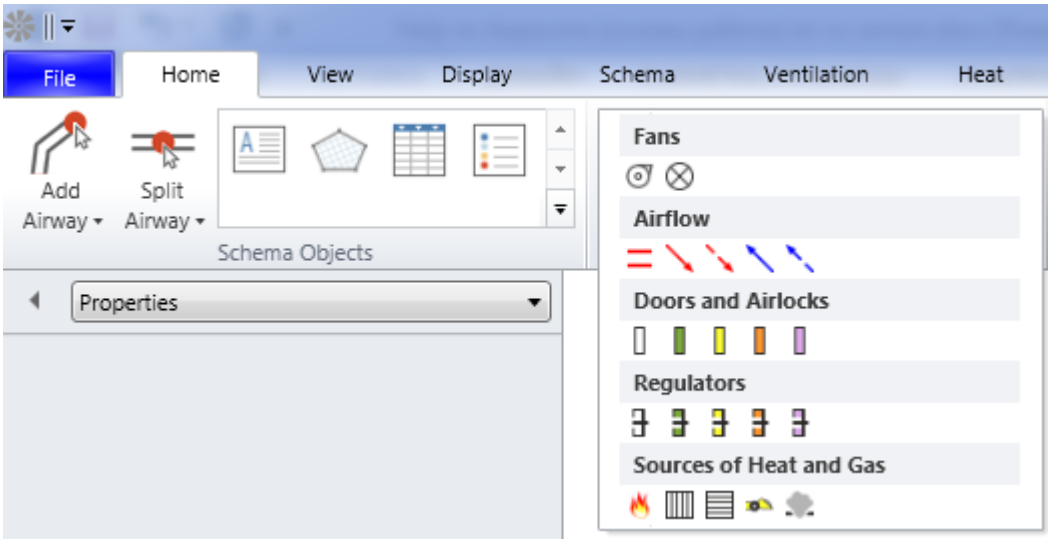


Initially the image is displayed in a one-to-one ratio; however, its size can be changed either on the properties panel or by dragging one of the blue circles of the image.

Adding equipment

To add equipment choose one of the icons from the categorized gallery on the ribbon and select a position on the schema by a mouse click.

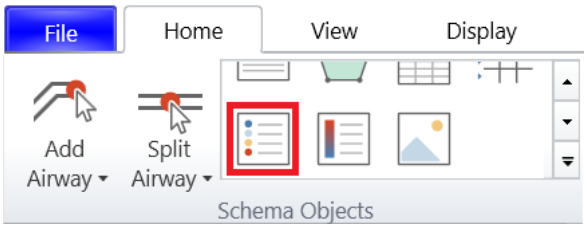
There are several groups of equipment: fans, seals, regulators, heat and gas sources, etc.



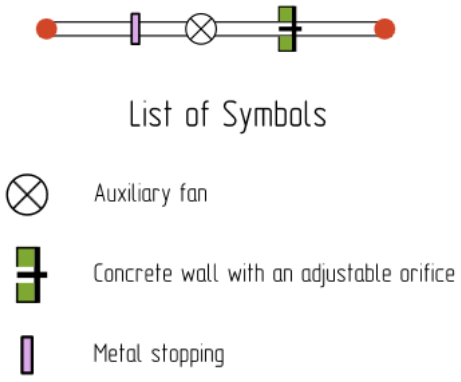
Before an object is set on an airway its direction can be altered by the *Shift* key.

Adding legends

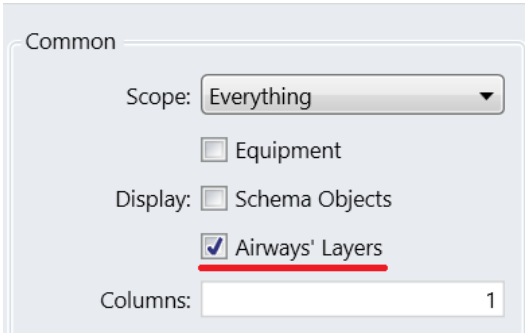
A legend is a table containing descriptions of visual objects on the schema. Such table can be added by the corresponding object in the gallery on the *Home* ribbon tab.

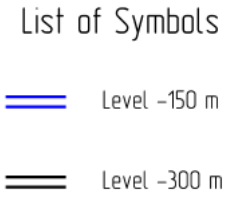


By default, a legend displays titles for objects and equipment.

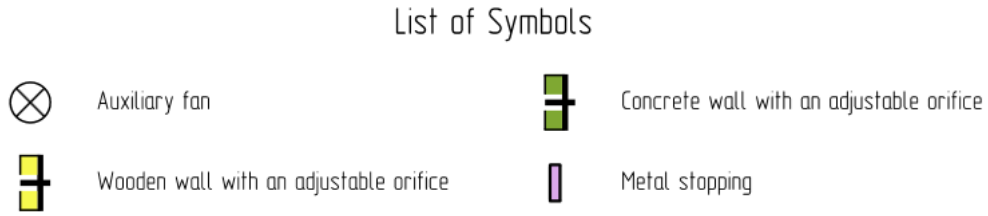


Moreover, it can display layer names if the option "Airways' Layers" is set on the properties panel.





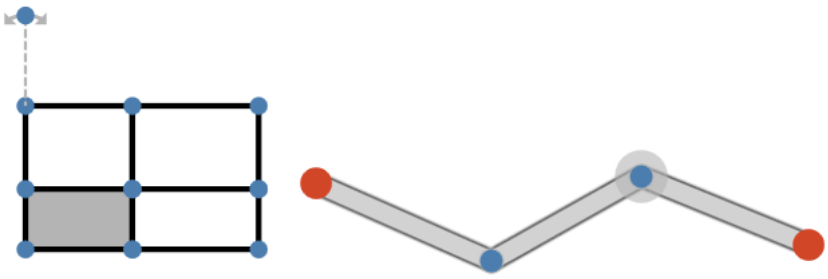
If the list of symbols is too long, it can be rearranged into multiple columns.



Selecting objects

Selecting individual objects

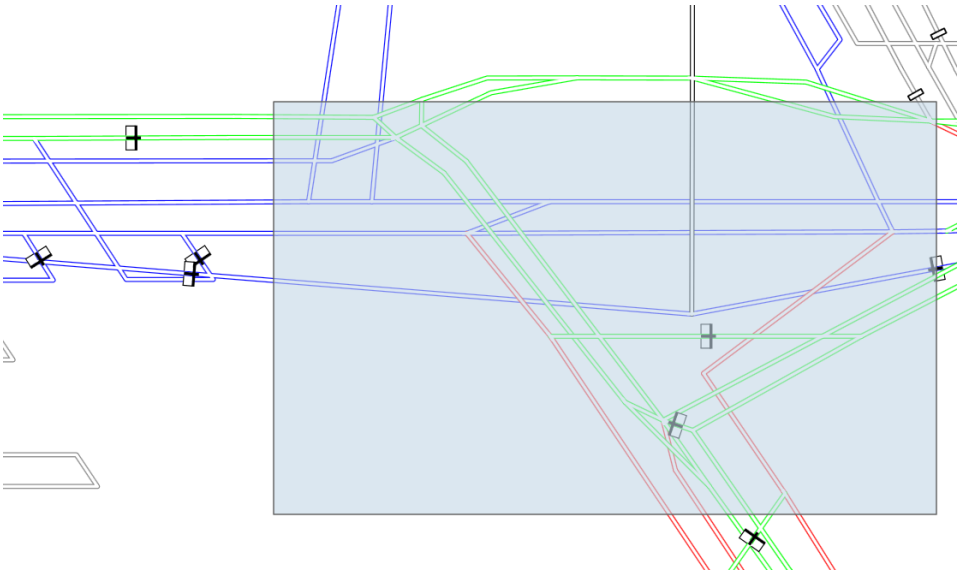
An individual object can be selected by a single mouse click. To select a group of objects hold the *Control* key while clicking. Selecting another object without the *Control* key cancels the previous selection.



Compound objects can have selectable inner components: airway internal vertices, table cells, reference lines.

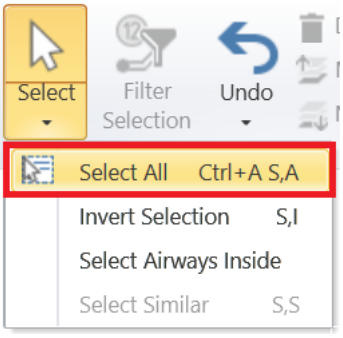
Group selection

A group of objects can be selected by a selection box. To select some objects press the left mouse button and drag the cursor across the screen. When the left mouse button is released, all objects covered by the box are selected. If a selection box is stretched from left to right, then an object is selected only if it is fully covered. However, if the direction is from right to left, then an object is selected even if only a part of it is covered.



Selecting all objects

Selecting all schema objects is done by the *Select All* command in the context menu of the *Select* button.

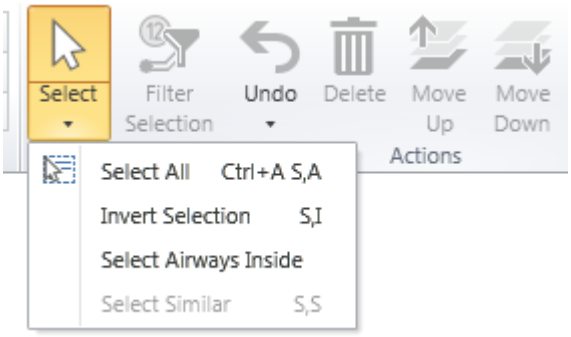


Selection inversion

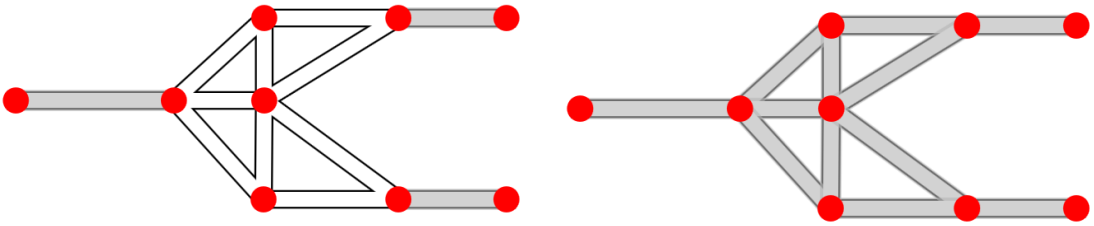
The *Invert Selection* command selects all objects except the currently selected.

Selecting airways inside closed areas

In a situation when the selection box is not precise enough and the number of airways that need to be selected is large, the method of selecting airways inside a closed area is convenient (*Select Airways Inside* in the context menu).

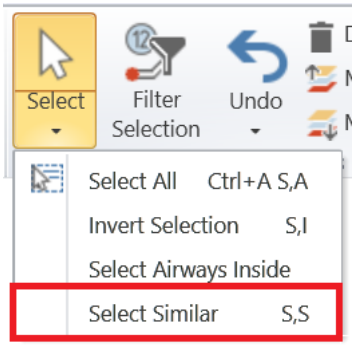


In order to select all airways inside a certain area, select airways on the borders of that area and then click on some airway inside. As a result, all airways of that area will be selected.

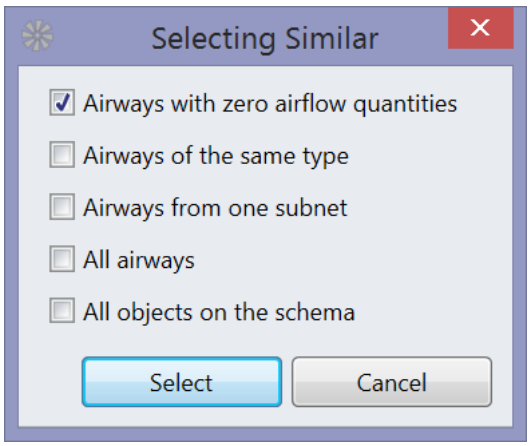


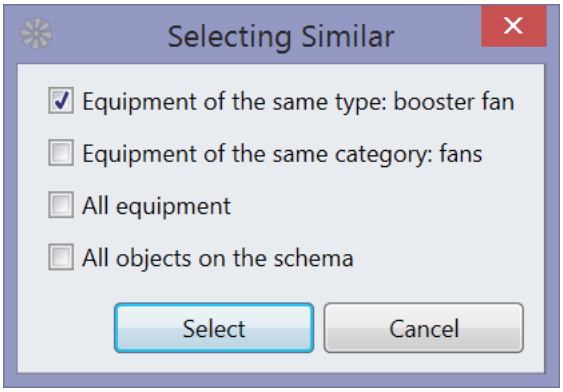
Selecting similar objects

Selecting objects of the same type can be done by the *Select Similar* command.



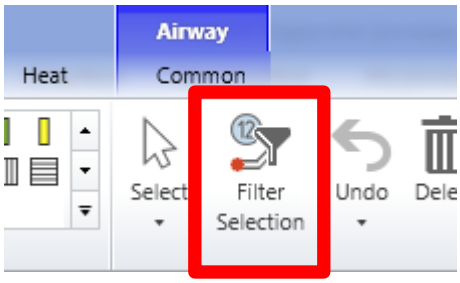
At first, select an object on the schema. Then, choose a criterion based on which other objects of the same type should be selected.



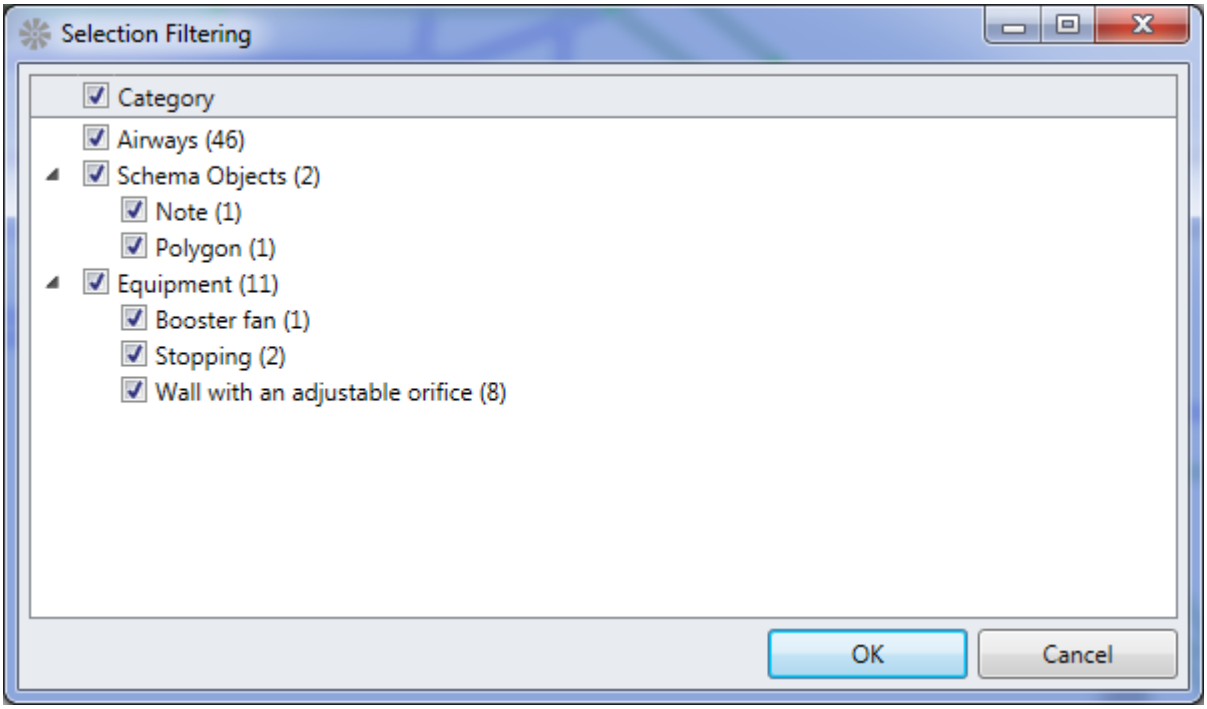


Selection filtering

All currently selected objects can be filtered by the *Filter Selection* command.

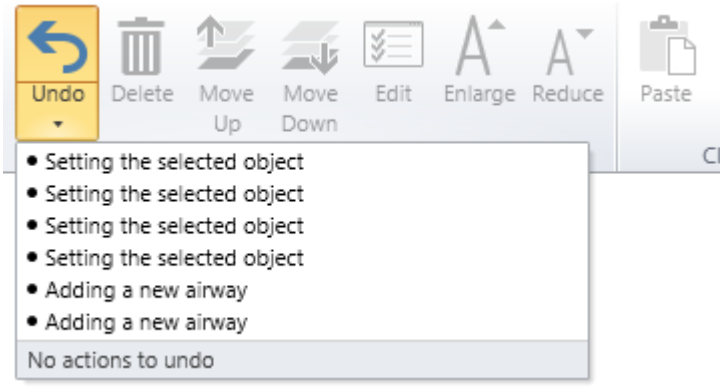


This way, the user can specify categories he or she wants to leave selected.



Selection restoring

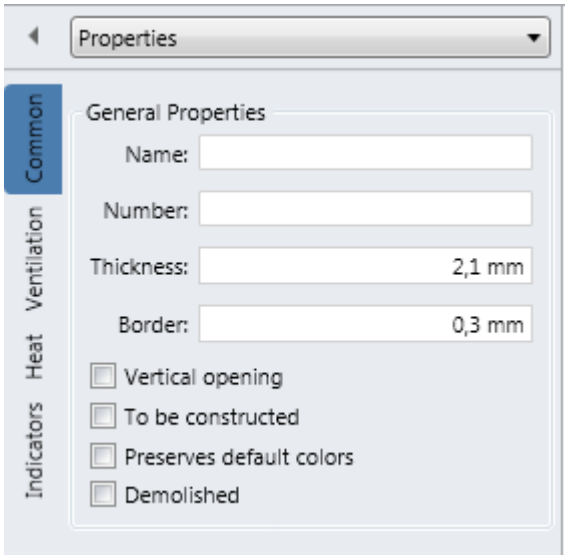
Selecting objects is one of the actions that are registered in the command history. So if at some moment the selection is lost, it can be easily restored by the *Undo* command.



Editing object properties

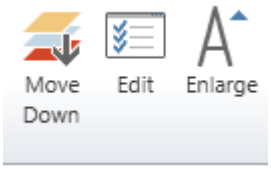
Editing properties of individual objects

Every object has a set of properties. One part of them are visualization properties; another part are parameters of mathematical models. Object properties are edited on the *Properties* tab of the side bar after the object is selected on the schema.



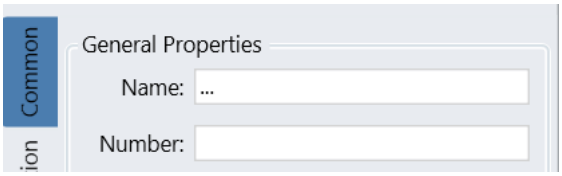
All changes are saved when the object becomes deselected.

The *Properties* tab is activated by a double click on an object or by the *Edit* button on the *Home* page.



Editing properties of multiple objects

If several objects of the same type are selected on the schema, their properties can be edited at once. Namely, the properties with the same values remain displayed on the *Properties* tab while the ones with different values become empty, although their hidden values are not lost. Except for properties that allow empty values (e.g. the name of an airway), which substitute differing values with dots not letting the hidden values to be lost too.



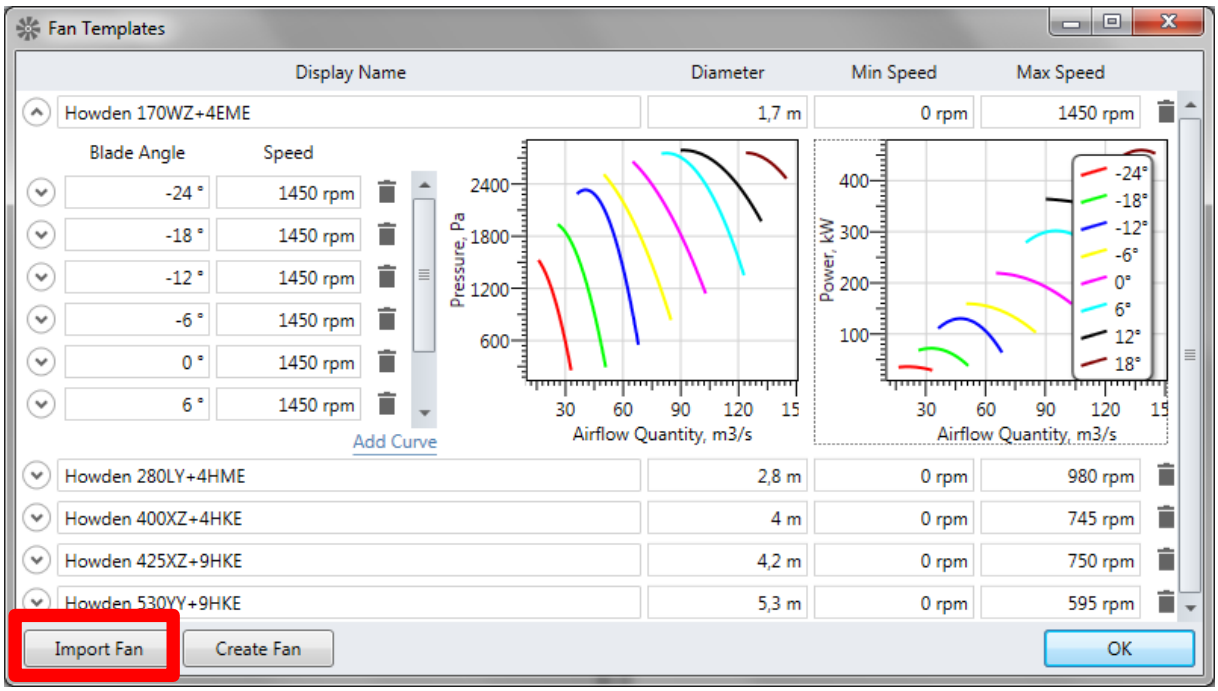
However, if these dots are deleted, the property is saved as empty.

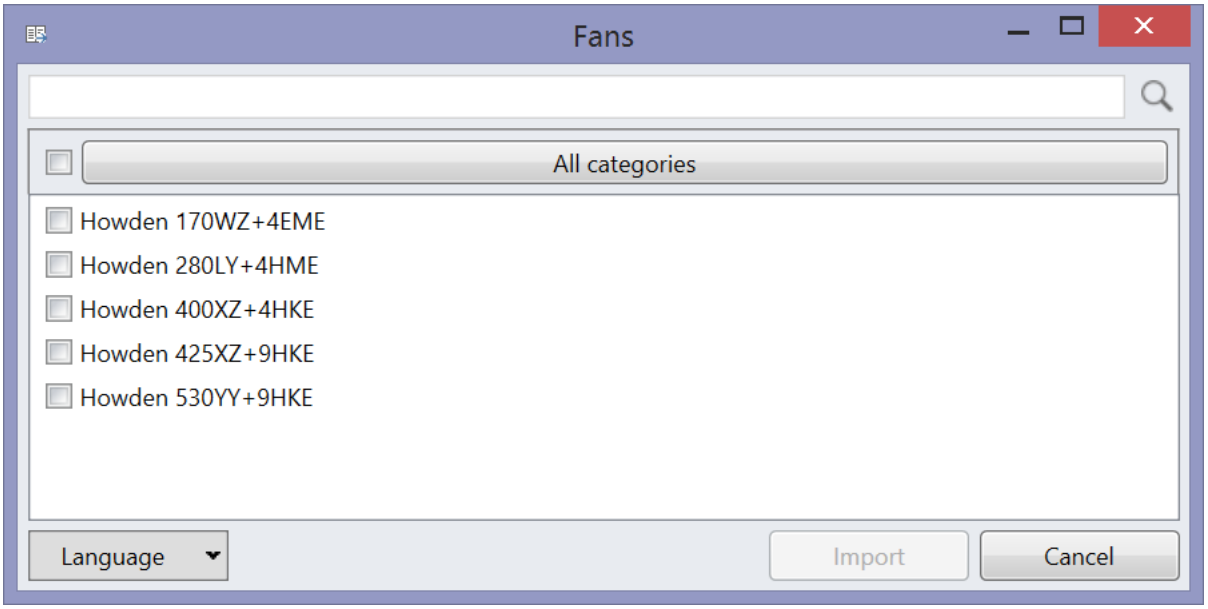
Dictionaries

Populating dictionaries

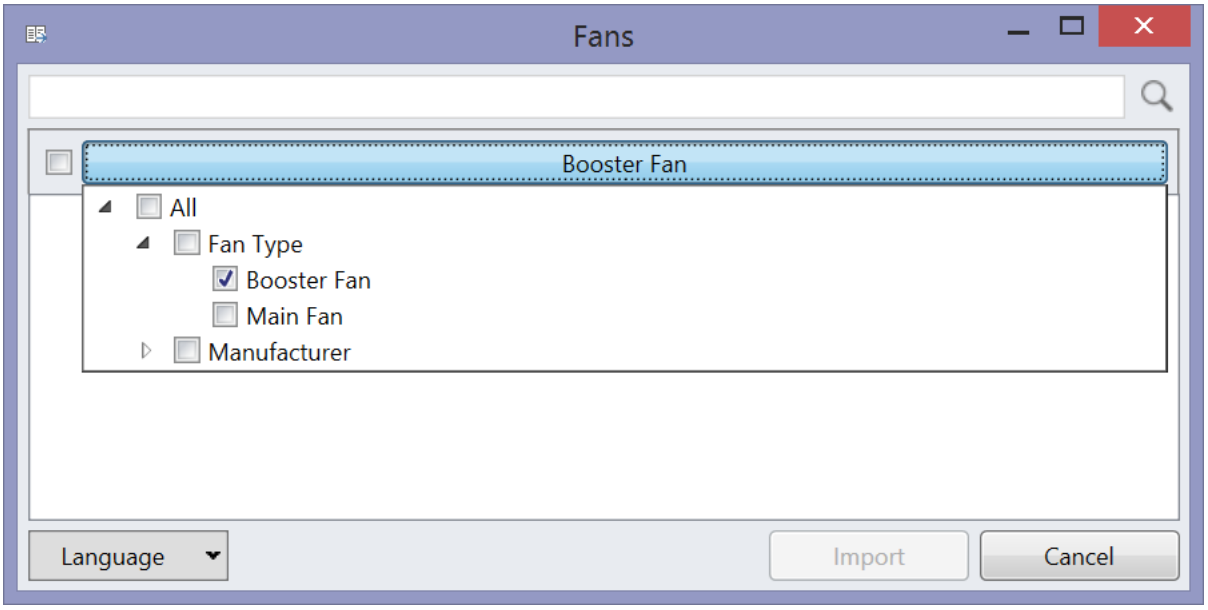
Mathematical models used in the application require many parameters. A lot of them are stored in dictionaries for future reference. For instance, fans placed on airways must have a template, which is taken from the dictionary. Populating such dictionaries can be done in two ways: manually or automatically from the central server.

The manual way implies, for instance, specifying the name, the minimal and maximal speed of a fan and all its pressure and power curves. However, a simpler way is to copy all required values from the central dictionary, which provides a categorized list of standard fans.



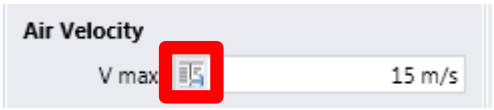


This way, many dictionary elements can be imported at the same time. The list of elements can also be searched and filtered.



Import of numeric values

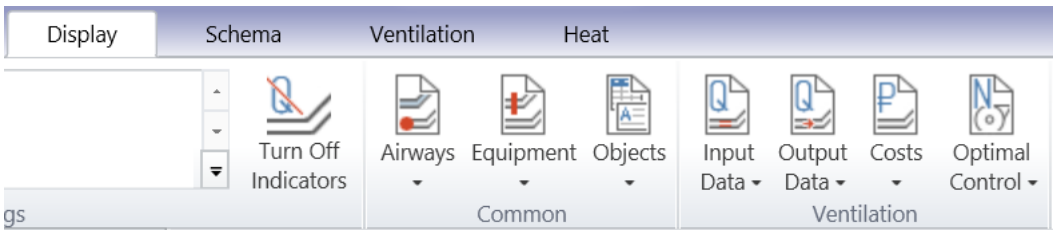
In most cases, dictionary elements represent certain named numeric values, e.g. the maximum legal air velocity. Such values can be easily imported by a special button near the corresponding fields.



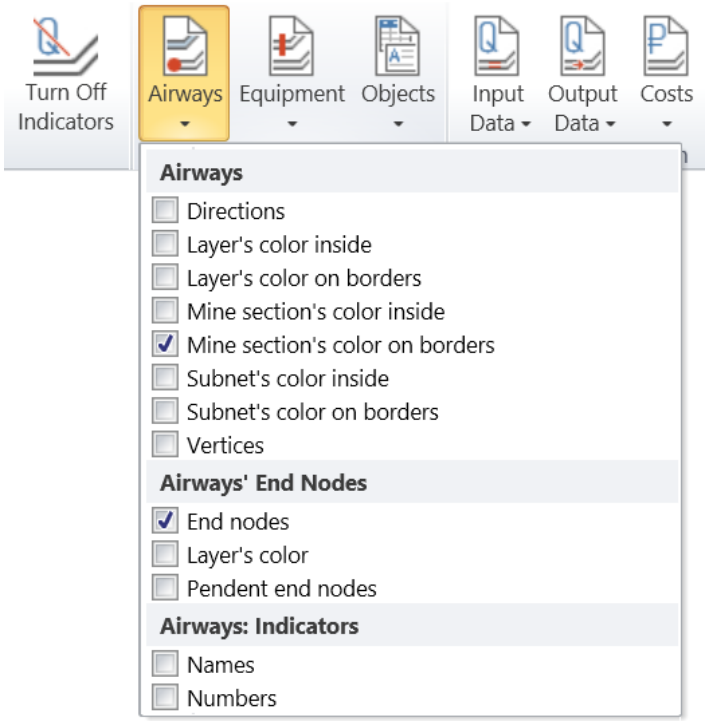
Display settings

General display settings

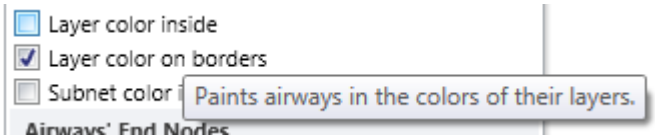
The same objects are displayed in different ways depending on display settings. All these settings are located and grouped on the *Display* page.



Settings of each group are also categorized: airways, airway indicators, end nodes, end node indicators, objects, equipment, and equipment indicators.

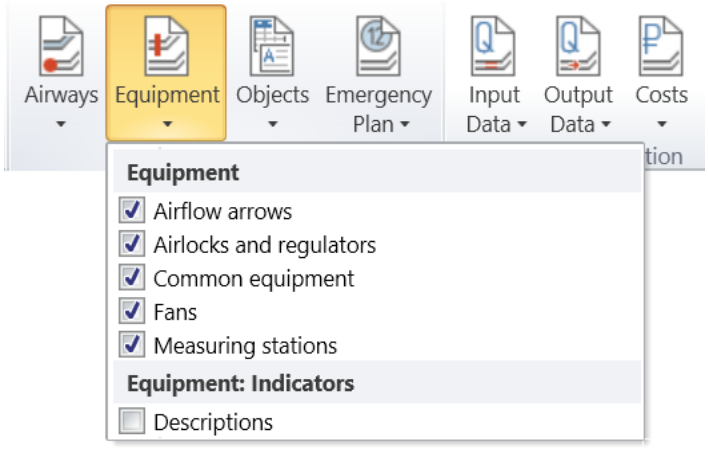


Each setting is provided with a tool tip.



Hiding and displaying objects

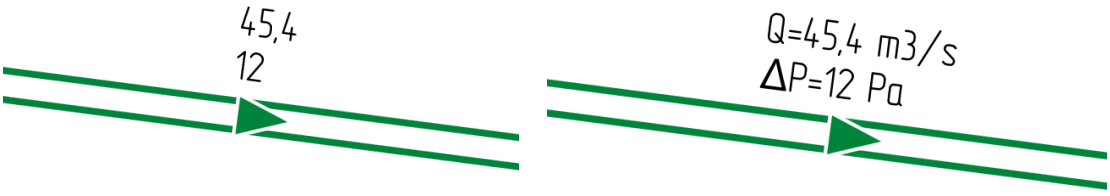
Most common settings enable or disable displaying certain objects. These settings are placed in the *Common* section.

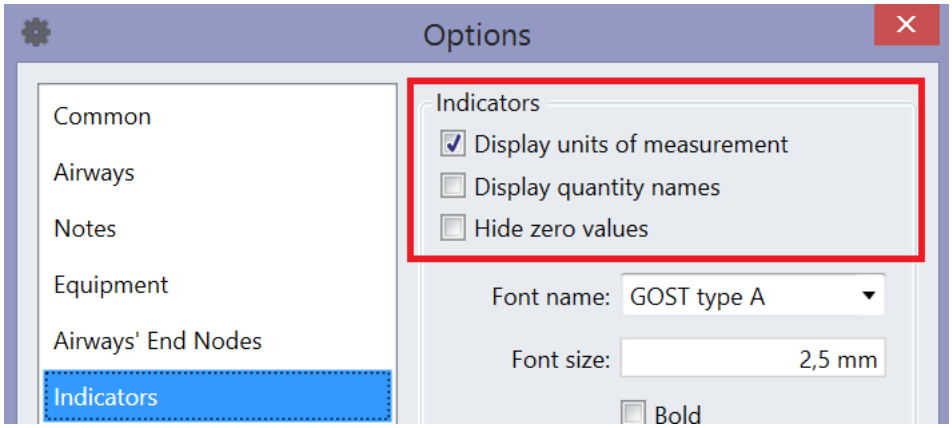


Hiding and displaying indicators

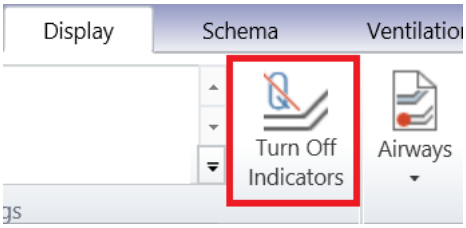
Indicators are labels displaying object parameters. Each type of objects has its own set of indicators. For instance, an airway has the name, the number, and the calculated airflow

quantity, all of which can be displayed. Depending on the current settings, indicators are displayed with units of measurement or without them.

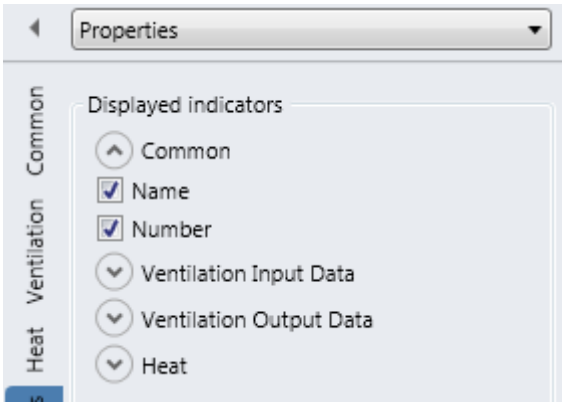




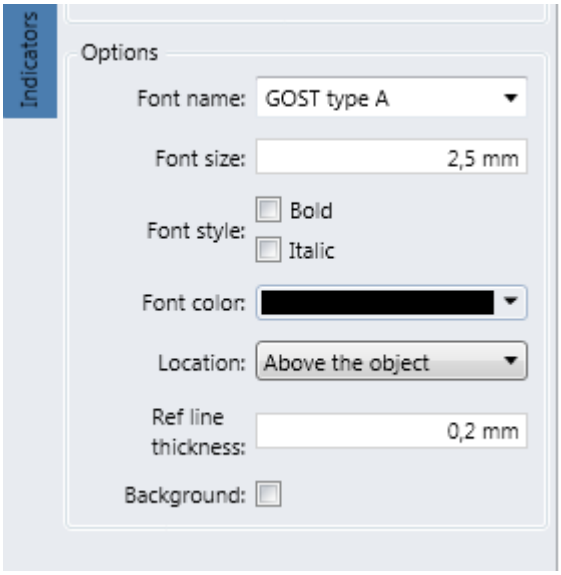
To disable all indicators the user can press the *Turn Off Indicators* button on the *Display* page.



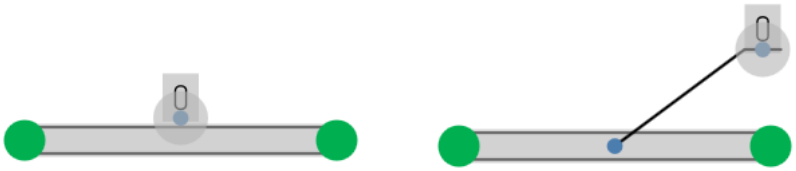
To display indicators only for particular objects use the check boxes on the *Properties* tab.



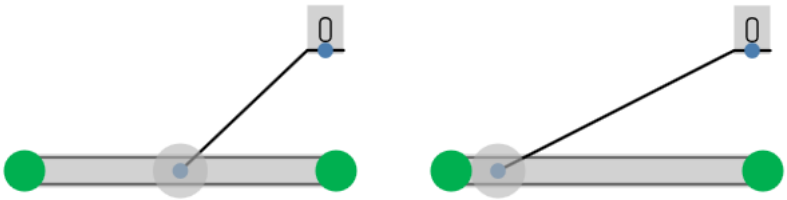
There, the indicator font can also be configured.



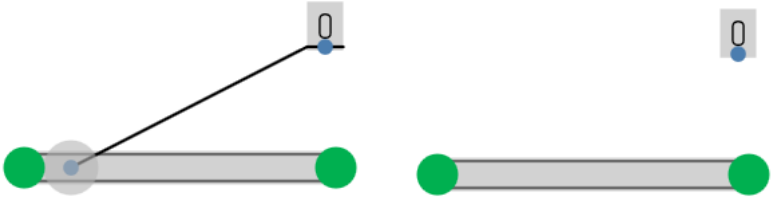
At first, indicators are placed in default locations, which sometimes results in overlapping. To change the location of an indicator select the object and drag the indicator's blue point holding the left mouse button.



As a result, a reference line will appear connecting the object with its indicator. A blue point left at the indicator's initial location can also be moved.



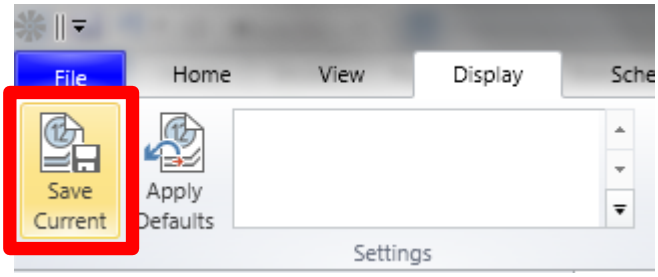
Use the *Delete* key when a blue point is selected to delete the reference line.



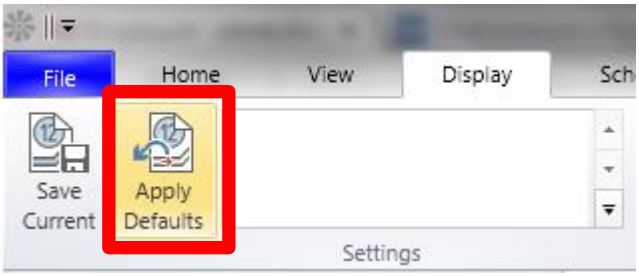
To return an indicator to a default location delete the blue point near an indicator or just drag the indicator back to the initial location. To move an indicator along an airway segment hold the *Shift* key.

Saving display settings

There might be a need to present the same schema in different ways. In that case, it is useful to save each of these display settings in order to activate them again later. It can be done by pressing the *Save Current* button, which results in saving the currently applied settings.



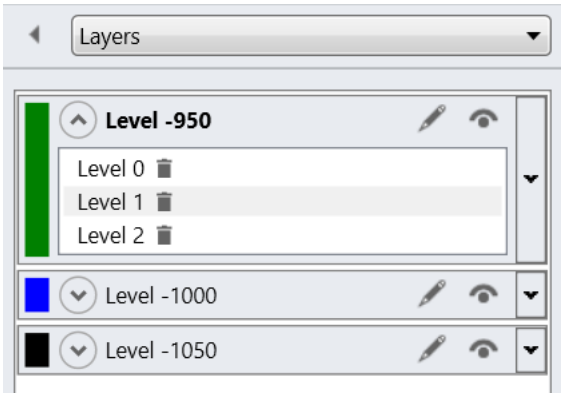
All saved settings are available in the list on the *Display* page and can be applied later by a simple mouse click. There is also the *Apply Defaults* command returning the schema to the default view.



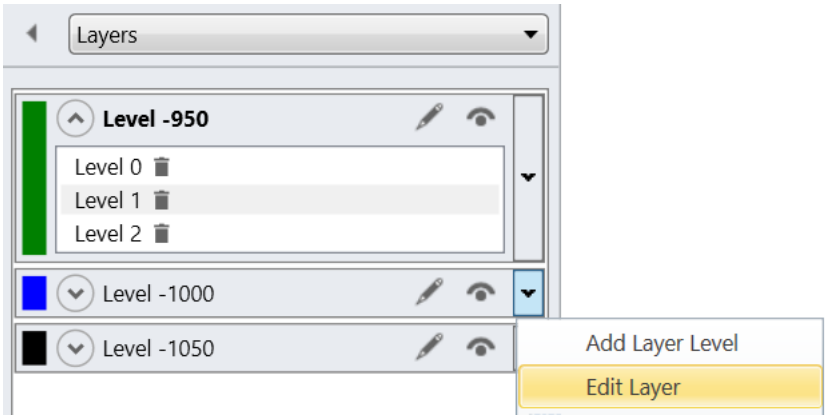
Building networks

Layers

Three-dimensional airways are displayed on a two-dimensional schema. Therefore, the concept of multilayer representation is useful to separate airways at different elevations. All such layers are displayed on the *Layers* tab on the side bar.

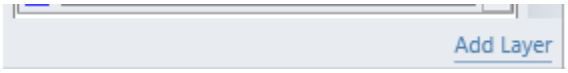


Every layer has its own name and associated color. To change these parameters use the *Edit Layer* command in the context menu or simply double click the layer itself. By default, there is only one layer on the schema.



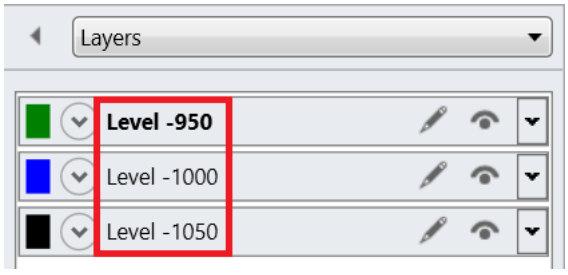
Every layer consists of one or more levels. Objects on the schema are always attached to some level of a certain layer. It determines which objects are drawn above and which are shown below. Layer levels do not have names and are used only for separating objects by their elevations inside layers.

A new layer is added by the *Add Layer* button on the *Layers* tab and is placed at the top by default.



To change the order of the layers (and as a result the order of drawing of objects) use *Move Up* and *Move Down* commands in the context menu or drag and drop layers by the mouse.

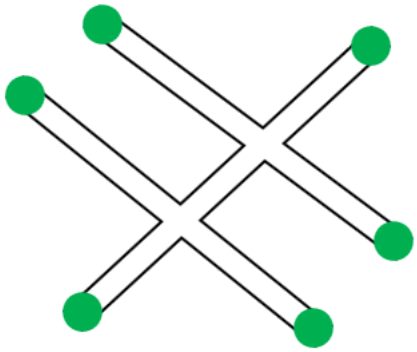
One of the layers is always selected. It is denoted by the bold font of its name. To select a layer the user should click on it. When an object on the schema is selected, the layer of that object is selected automatically.



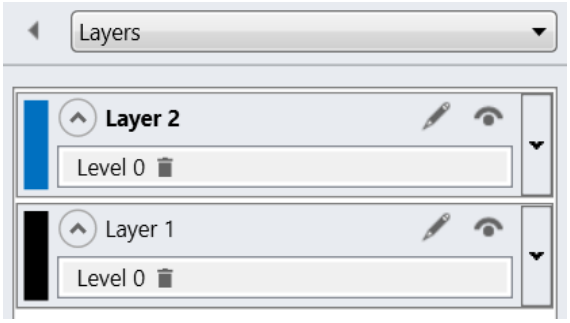
Currently added airways or objects are attached to the selected layer and level. There is a useful display setting which paints airways in the colors of the layers they belong to (*Common – Airways – Airways – Layer's color inside / Layer's color on borders*).

Any selected object can be moved between layers and levels by *Move Forward* and *Move Backward* buttons on the *Common* page.

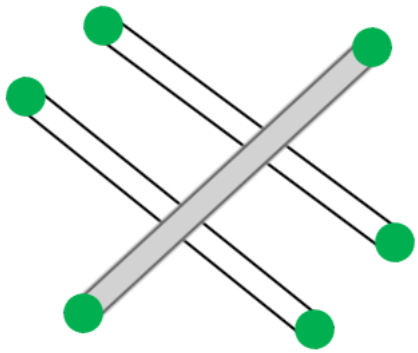
Examine the following sample.



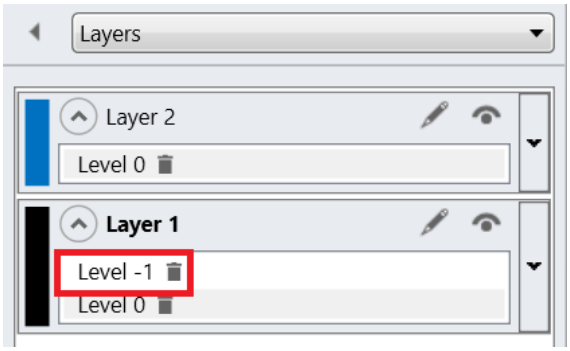
There are three airways located on the same level of the black-colored layer. There is also the blue-colored layer above.



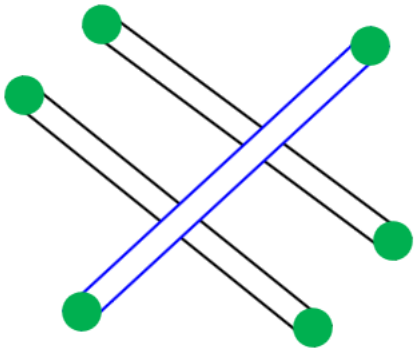
Select one of the airways and move it up.



The relocated airway will remain in the black-colored layer but a new level will be added automatically.

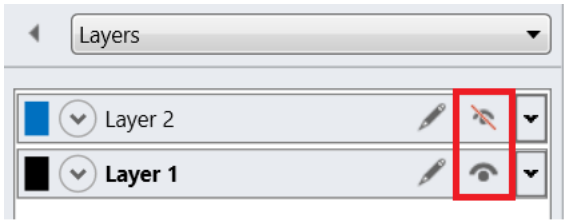


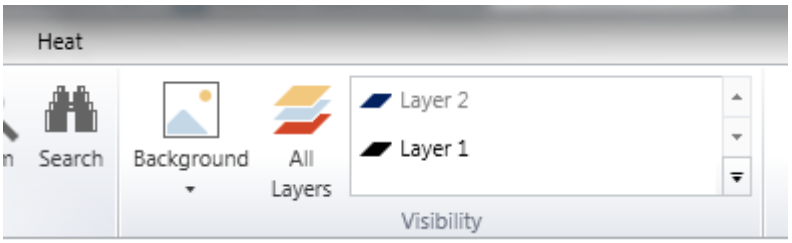
Move up the selected airway again. As a result, the airway will change its layer from black to blue.



To attach some objects to a particular layer manually select these objects, then select the layer and choose the *Bind Selected Objects* command in the context menu.

Objects of each layer can be hidden/shown on the schema by the special button on the *Layers* tab or by clicking on the layers on the *Display* page.

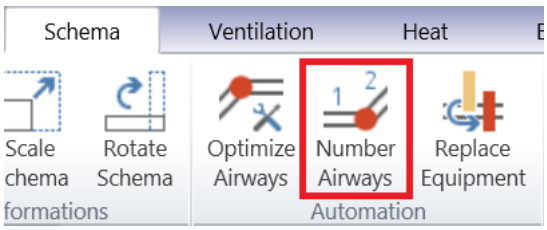




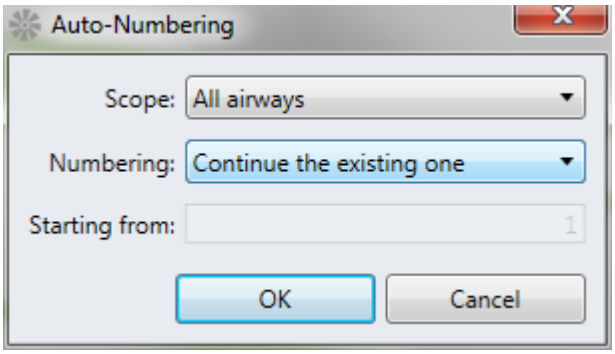
In addition, a layer can be disabled for editing (but still shown) using the second button on the *Layers* tab.

Automatic numbering

Marking all airways with unique identifiers can be done by using the *Number* field on the airway's *Properties* tab. To populate all these fields at once use automatic numbering (*Number Airways* on the *Schema* page) starting a new sequence or continuing an existing one.

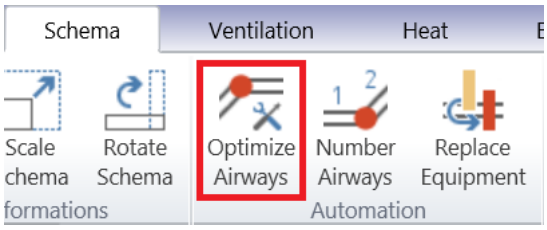


When choosing *Continue the existing one*, present numbers are preserved while numbers for newly created airways are set without repetition.

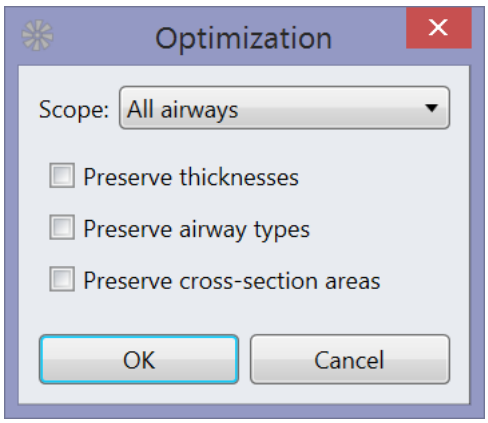


Airway network optimization

To ensure fast calculations it is important to keep airway count minimal. It can be reached by precise network construction without using any sequential airway connections. However, if a network is already designed, the number of airways can still be reduced by the *Optimize Airways* button on the *Schema* page.



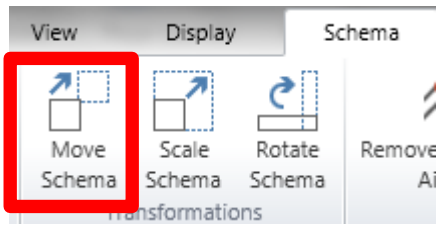
By default, all sequentially connected airways are combined. Additionally, the user can choose to skip airways with differing type or size.



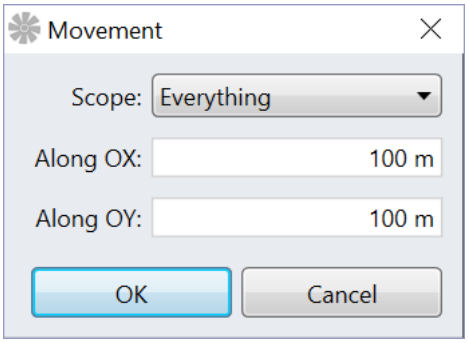
Schema transformations

Schema moving

Every object on the schema can be moved by dragging with the cursor. However, this method is easy only when the number of moving objects is relatively small. Moreover, good accuracy is not always reachable in this case. To overcome these disadvantages there is the *Move Schema* command on the *Shema* page.

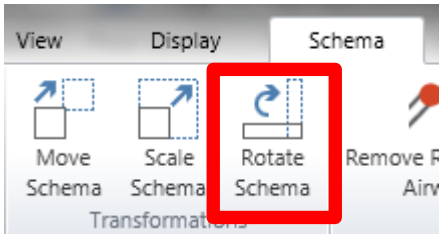


Using it, the user can move a set of objects (all objects, all selected objects or all visible objects) at once.

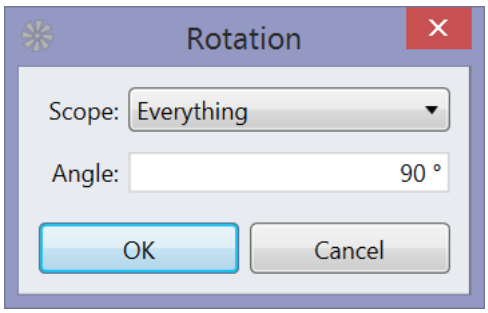


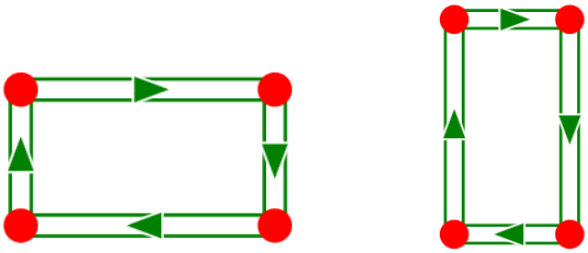
Schema rotation

Many airways can be rotated simultaneously by the *Rotate Schema* command on the *Schema* page.



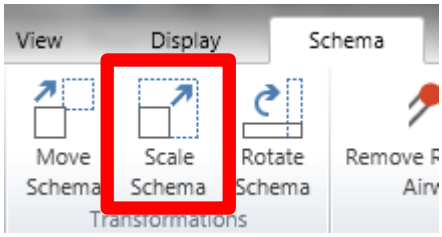
The user should specify the angle of rotation and the target set of objects (as in the previous case).

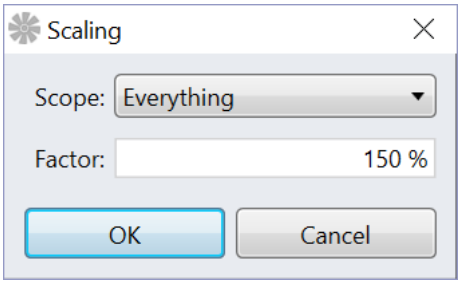


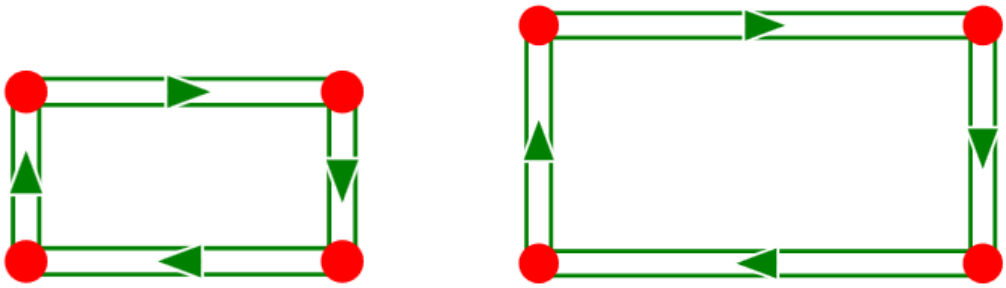


Schema scaling

The schema can be scaled by the *Scale Schema* command on the *Schema* page specifying the scale factor.

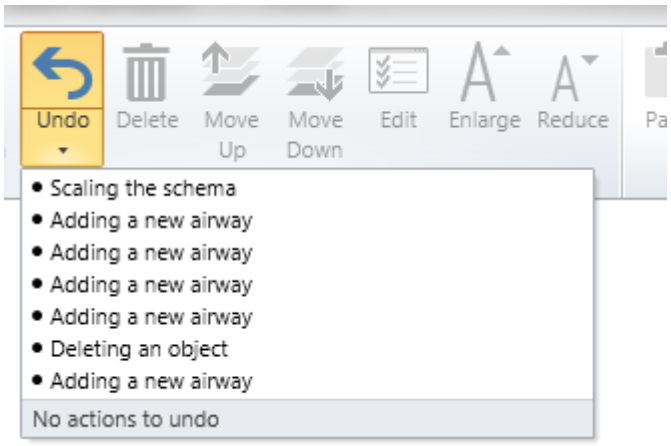




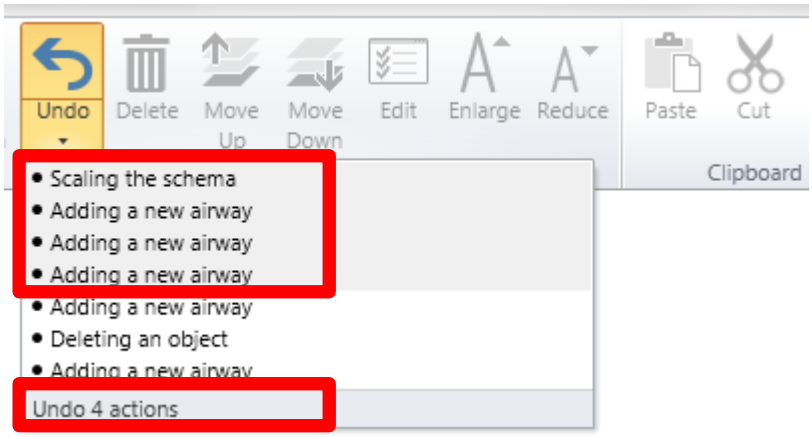


Undo

Each operation changing the schema graphical representation, except setting parameters on the *Properties* tab, is saved in the command history. The list of recent actions is available in the dropdown list of the *Undo* button on the *Home* page.



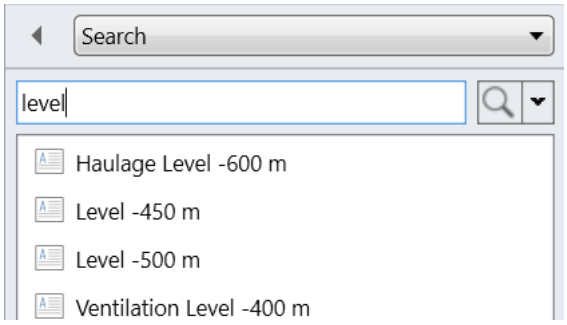
Each action from the list can be undone. To roll back the last action just click on the corresponding item. In a case of rolling back several operations, choose the last one in the list and click on it. All operations made after will be undone. The number of actions to be undone is displayed at the bottom of the list.



Search

Text search

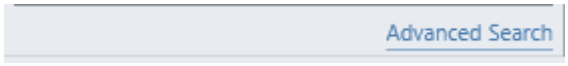
As a rule, an airway network is surrounded with a large number of notes. Moreover, each airway is usually provided with a unique number. As a result, such text labels can be an easy-to-use way of searching for certain schema locations. Text search is available on the *Search* tab on the side bar.



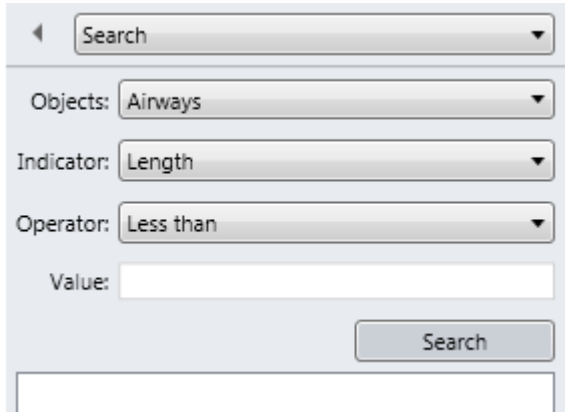
After clicking on any found object in the results list, the object is positioned in the center of the viewport.

Advanced search

Advanced search can take into account the values of object indicators. For example, the search criterion can be defined as following: "any airway with the length less than 50 meters".

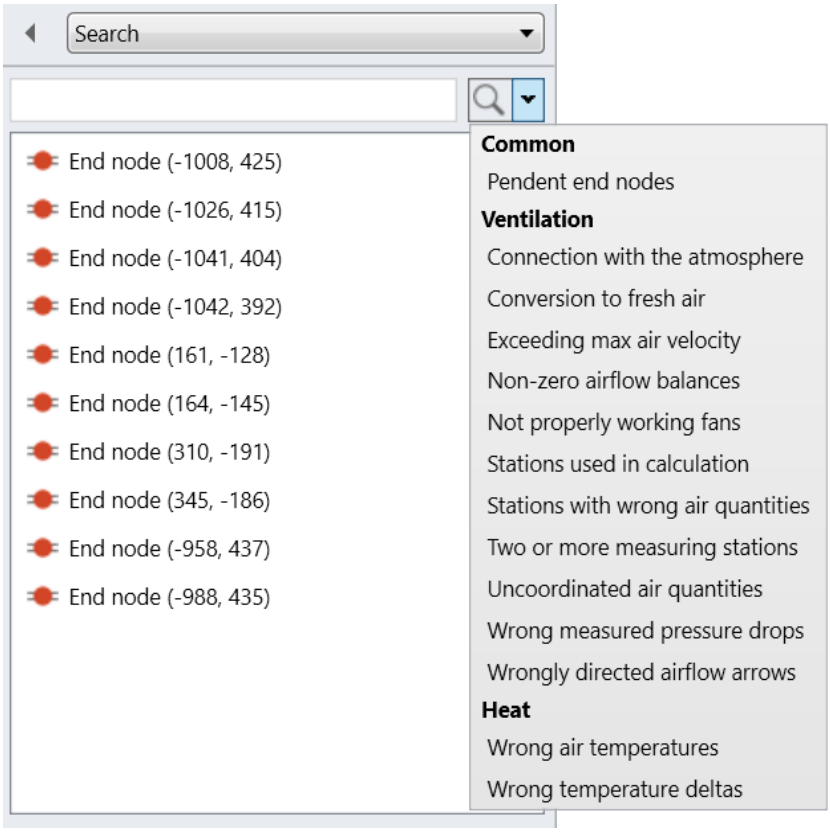


To use advanced search click on the corresponding link at the bottom of the tab.



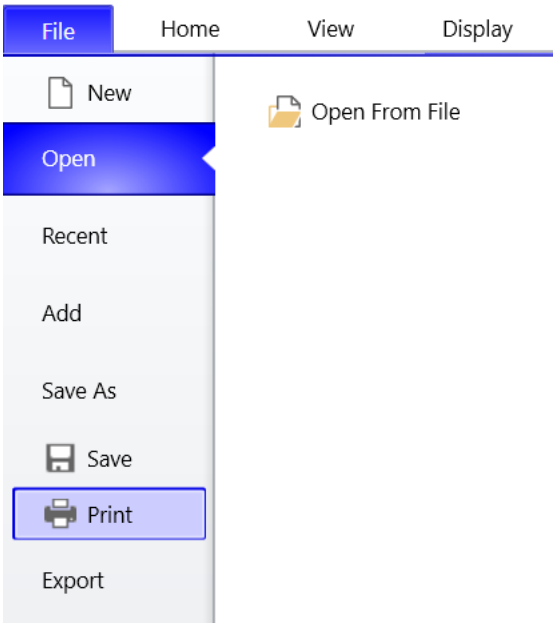
Complex search queries

Many view modes in the *Display* menu highlight different objects on the schema. For instance, a user can mark all pendent end nodes or all airways where air velocity exceeds limits. However, sometimes it is more convenient to display such objects as a list. So, on the *Search* panel there is a menu that contains search queries that correspond to view modes highlighting objects on the schema.

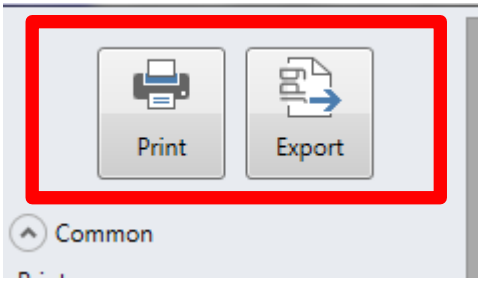


Printing

Printing and export is available via the *Print* command in the main menu.

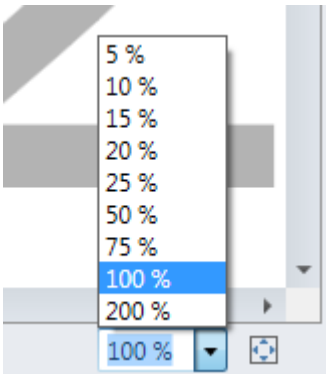


Additional settings are configured in the print preview window. The schema can be printed on paper or can be exported to a bitmap file.

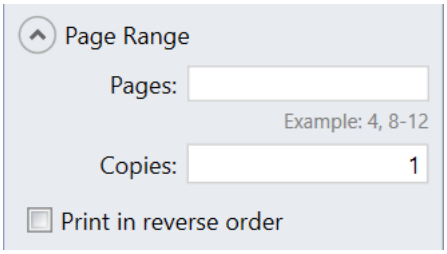


In the case of printing, the settings are applied to individual pages, while, in the case of a bitmap, the settings are applied to files that store the pages.

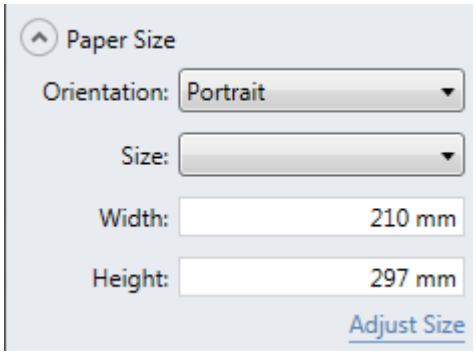
The print preview window visualizes the way the schema is divided into pages. Every page has its own number. All pages are displayed with the 100% scale by default, which can be changed in the box in the right bottom corner of the window. There is also the button on the right for fitting all pages on the screen.

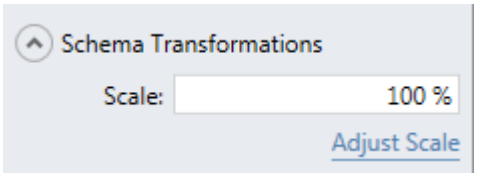


The user can choose to print only a certain range of pages, to print multiple copies of the schema or to reverse the order of printing.

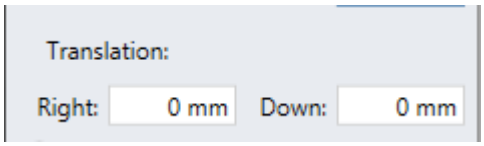


When the paper format changes, the paper size fields are populated automatically. The user can set the paper size manually letting the application to select an appropriate paper format from the list. There are also buttons to adjust the paper size to fit the schema only on one page, or to adjust the schema scale to fit it on one page without changing the paper size.

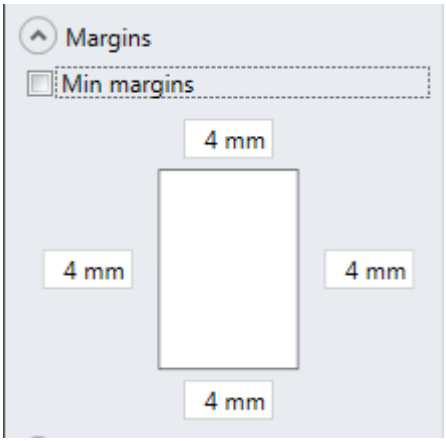




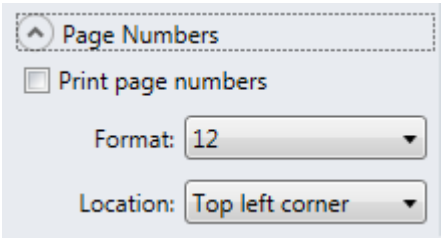
The user can also specify the vertical and horizontal schema offsets on a page.



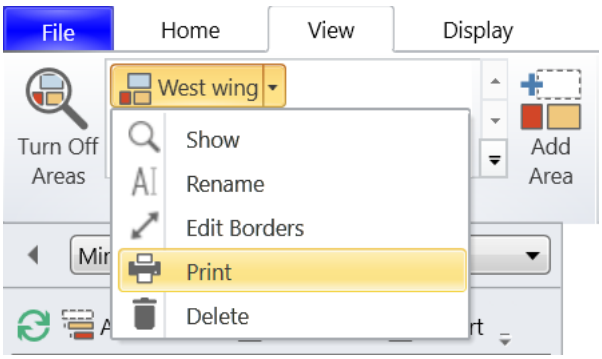
By default, the paper margins are set to satisfy the minimal requirements of the current printer but they can be edited manually.



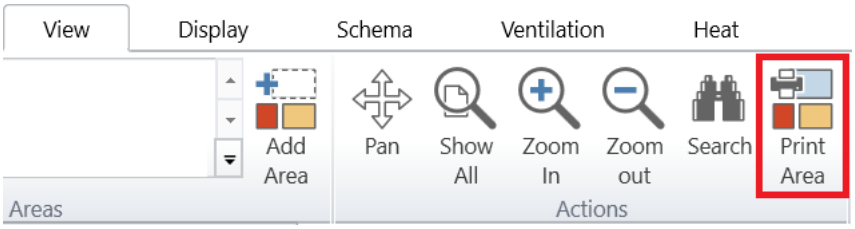
Additionally, the user can choose to print page numbers and select their placement.



Be default, the entire schema is printed; however, there is a way to print individual areas. There is the *Print* command in the drop down menu of the schema areas' list on the *View* ribbon tab.

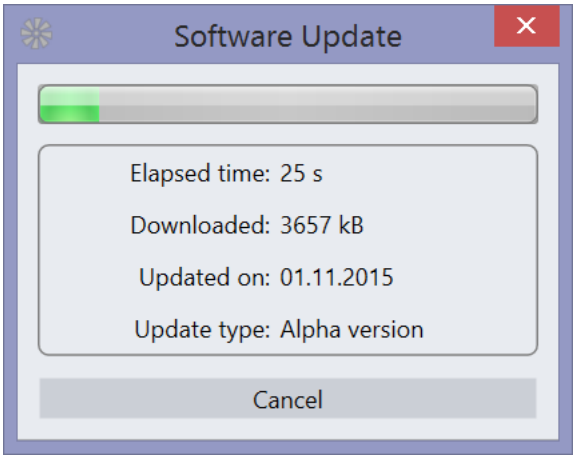


Besides, the *Print Area* command on the *View* ribbon tab allows printing a user-selected area on the schema.



Updates

New versions of the application are uploaded to the developer's server regularly. By default, the application checks for updates every time it starts and automatically downloads and installs them if necessary. The progress of downloading is displayed in the special window.

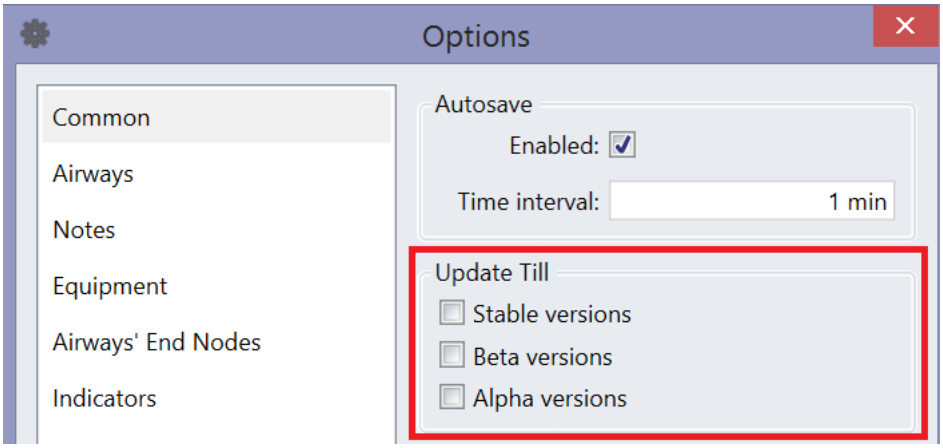


If the current user's account does not have sufficient privileges to update files in the application folder, the user is prompted to launch the application on behalf of the administrator account.

There are three types of updates.

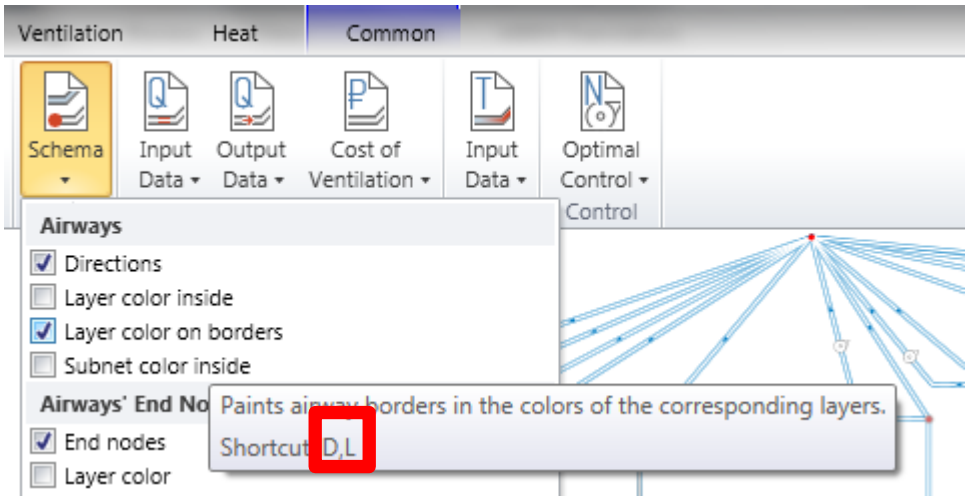
1. Updates for releases (default).
2. Updates for beta versions.
3. Updates for alpha versions.

The downloaded types of updates can be configured in the *Settings* window.

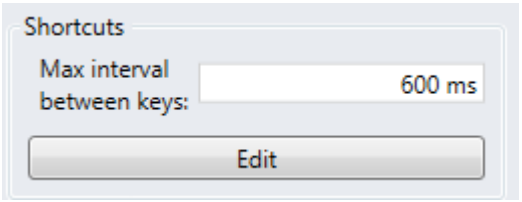


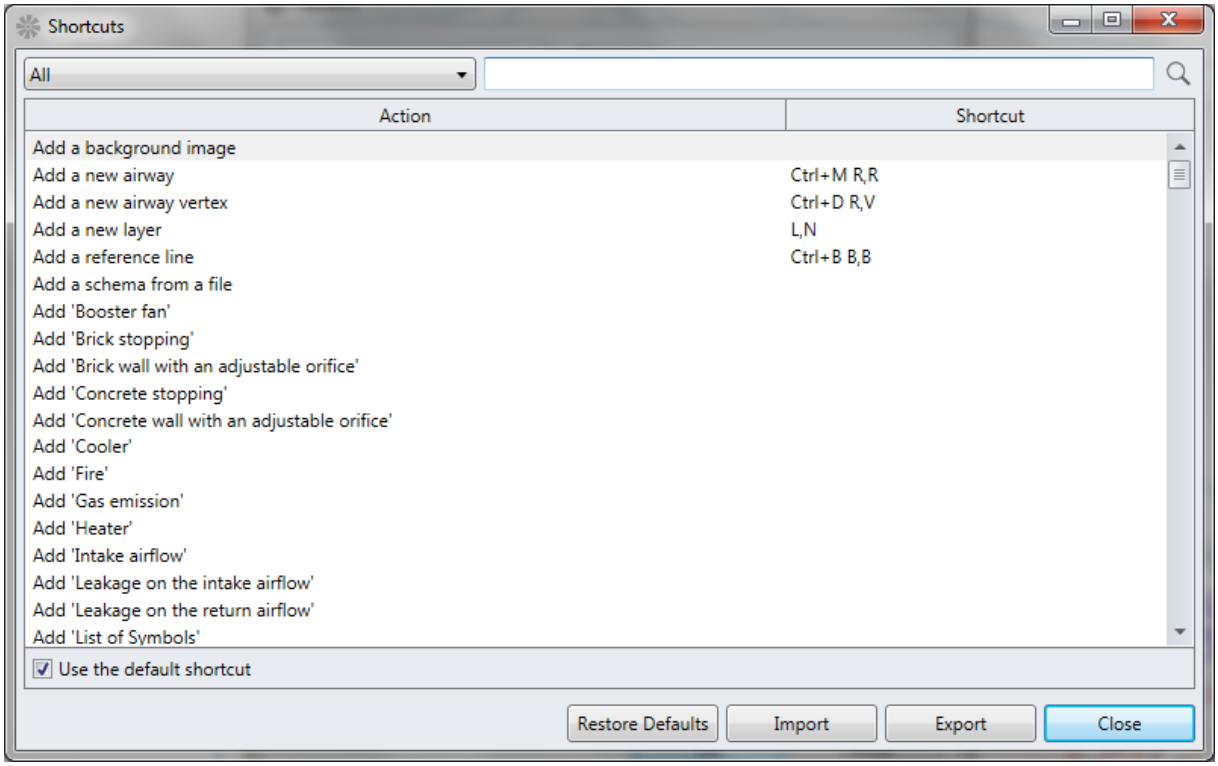
Shortcuts

Most of commands are provided with shortcuts by default, for example, Ctrl-P for printing or Ctrl-O for file opening. Current shortcuts are displayed in command tooltips.

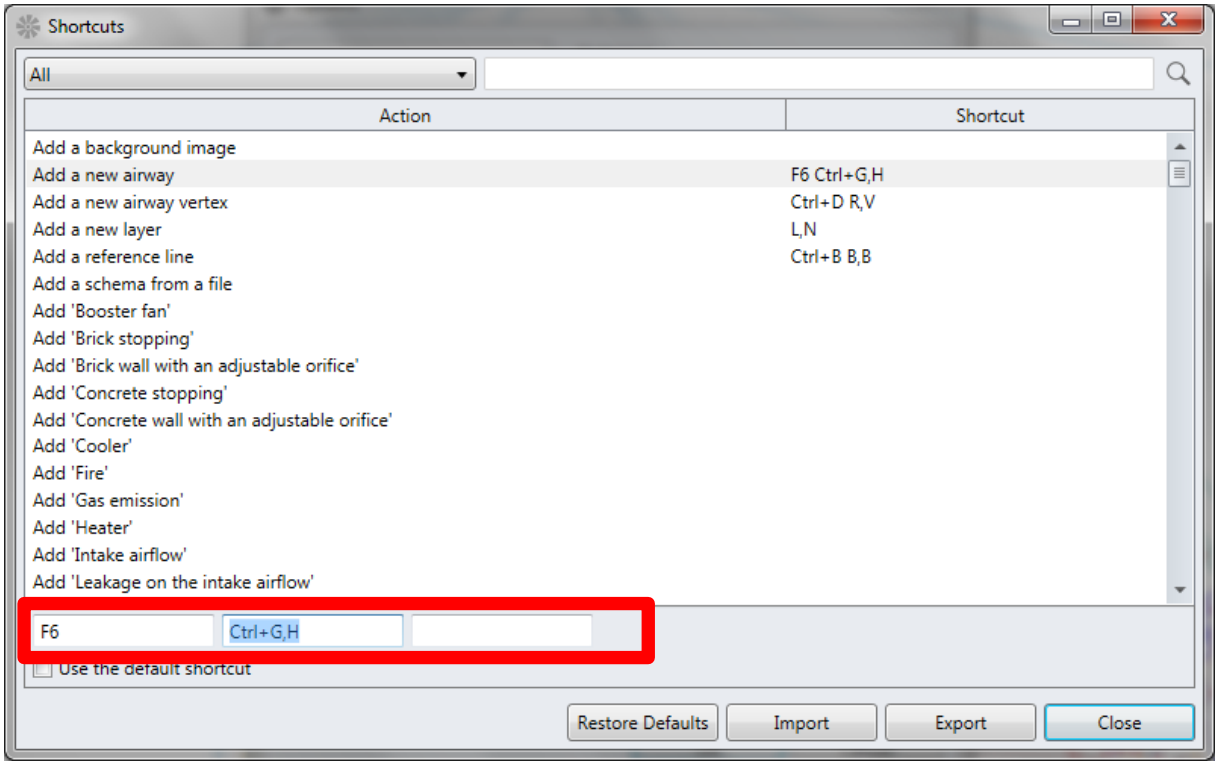


The full list of shortcuts is accessible in the special form on the *Common* tab in the *Options* window.





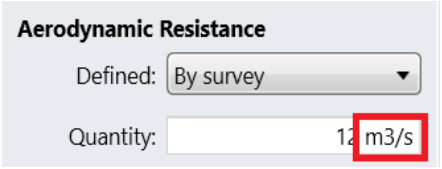
The list of commands can be filtered by category. If the user turns off the *Use the default shortcuts* option, a special panel is opened offering to specify a new shortcut for the current command by pressing some keys.



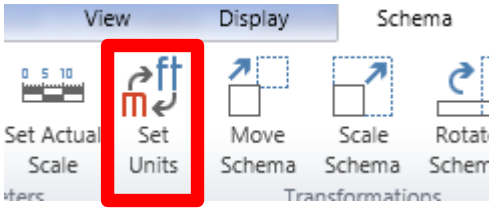
Shortcut settings can be imported/exported to/from file by the buttons at the bottom of the window. Default settings can be restored the same way at any time.

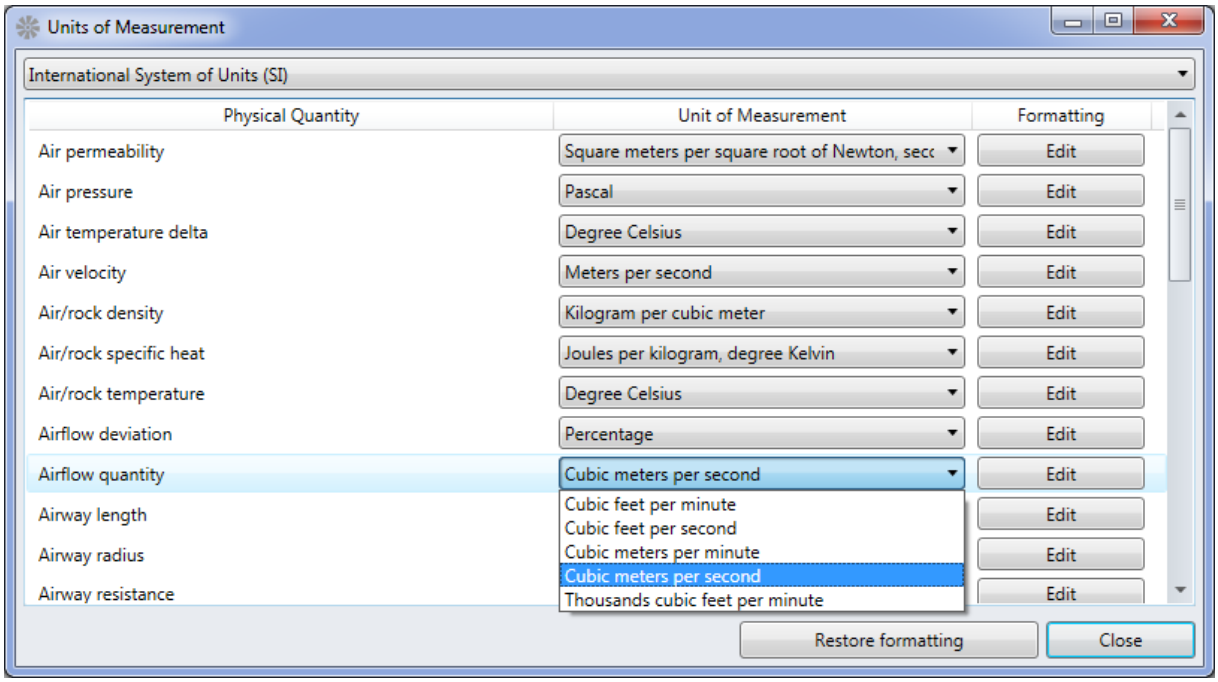
Measurement units

Current measurement units are displayed in input fields on object properties panels and in indicator values (if the *Display units of measurement* option is turned on).

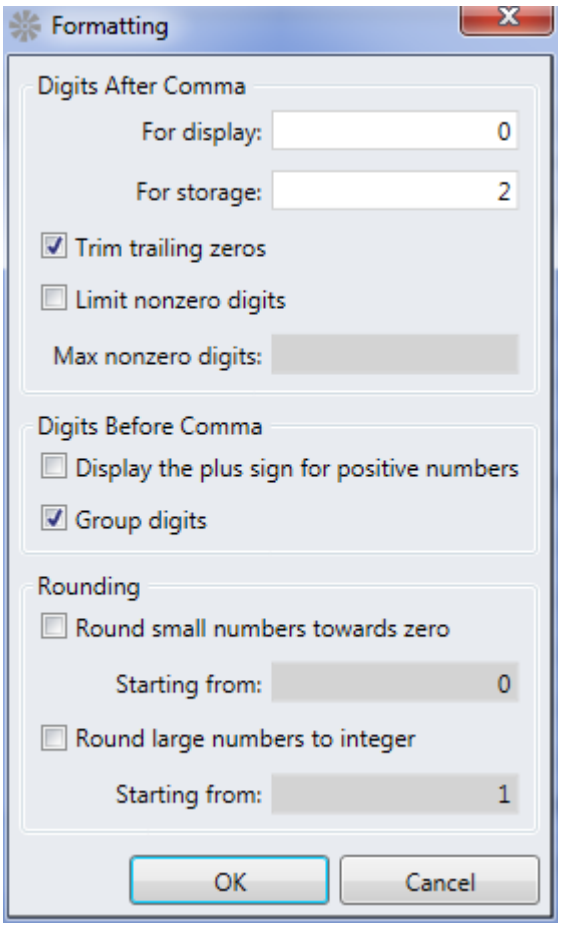


By default, the SI system is used. However, units of measurement can be configured for each quantity individually (the *Set Units* button on the *Schema* page).



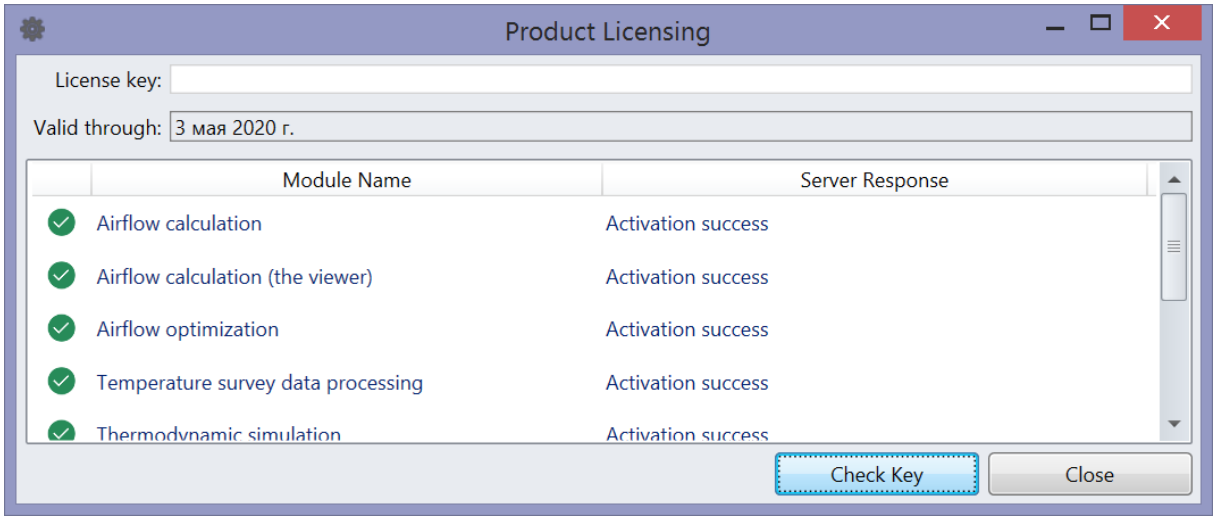


All physical quantities used in the application and their current units of measurement are presented on the form. Moreover, the user can configure the formatting of the corresponding quantity values (the *Edit* button in the *Formatting* column).

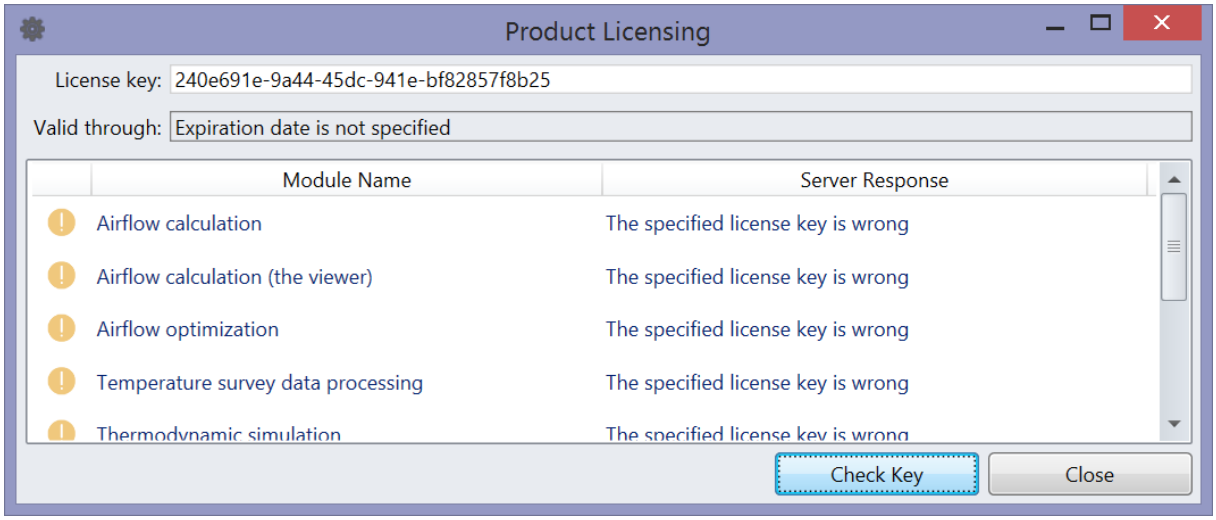


License keys

Every time the user launches the application it is activated by checking the license key on the developer's server. After installing, the application has the default license key that enables using the full version during a 60-day period. The use of the free version usage is unlimited. In a case of purchasing the application, the user should change the license key. It can be done by the *Set License Key* command from the *Service* tab in the main menu.



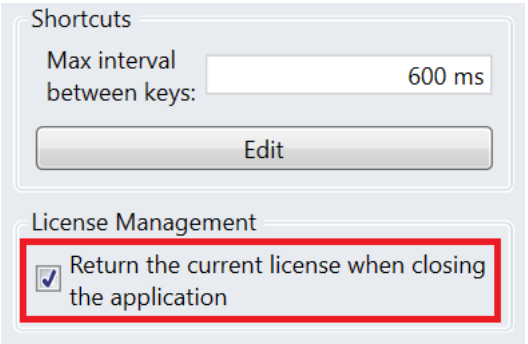
The field at the top of the window is empty when the default key is used. In the field below, the date of expiration of the specified key is displayed. All modules that need to be activated are listed in the window. Every key can activate a particular set of modules. The button *Check the key* provides verification of module activations. In a case of a valid key, activated modules are indicated with green check marks. If the key is incorrect, the modules are marked with exclamations.



Client license withdrawal

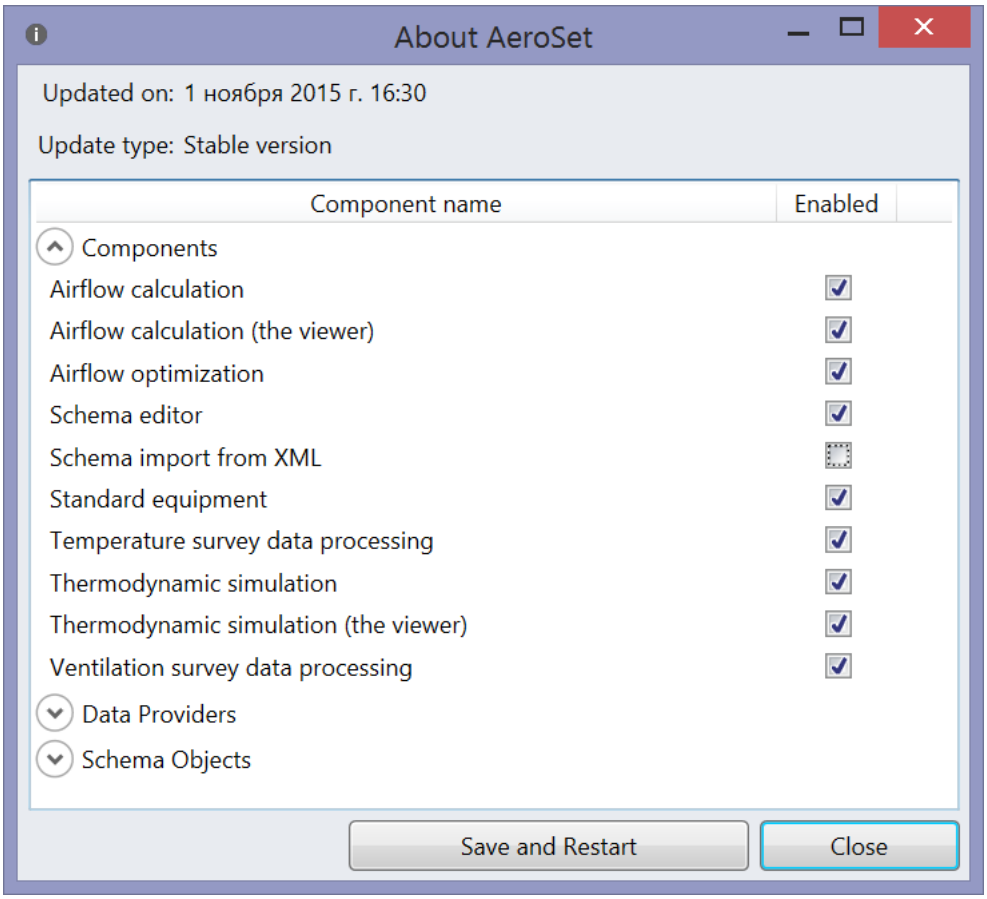
Commercial license keys are limited by the number of computers they can be activated on. However, this restriction can be mitigated. In order to do that a user should withdraw activations on those computers where the application is no longer used. This can be done by the *Return Client License* command in the *Service* tab of the main menu. Withdrawing an activation means closing the application without any further notifications.

This can be done automatically when the application closes by setting a special option on the settings form.



Enabling and disabling application modules

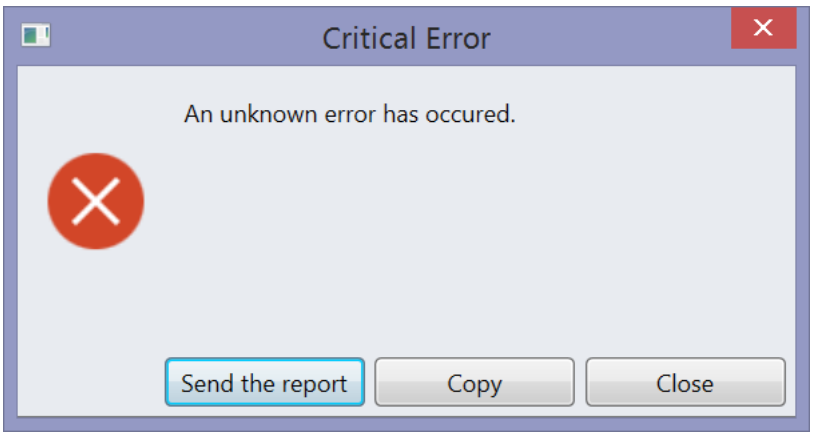
Any unnecessary functionality can be excluded from the application by turning off the corresponding modules. To turn on/off a particular module use the *About AeroSet* command from the *Help* section in the main menu.



All modules are listed in the window. When the user disables some unused modules and presses the *Save and Restart* button, the application relaunches without the menu items and panels of the excluded modules.

Error messages

There is a way to tell the developers about application errors.



When an error message appears, press the *Send Report* button, then enter your personal e-mail (for further communication) and provide any useful information about the error. This might be very important information to fix the error.