STONEX

Stonex Cube-link
Software for the transfer and the management of topographic data
User Manual

cube-link

4.2

(February 2019)-Ver.4.2-Rev.1

www.stonex.it

Contents

Software Introduction

Cube-link is a free version of the software Cube--manager. It offers tools for the transferring and processing of data from GNSS receivers and total stations.

The application has a modern Microsoft interface and implements a CAD, easy to use and flexible, which allows you to view data in both 2D and 3D. It offers functions for graphical and tabular displaying of raw data and results; some COGO commands; functions for importing and exporting data, using standard file formats such as DXF or CSV and manages the most common vector entities (lines, polylines, circles, arcs, texts, ...).

The Cube-link also supports a special point entity called the Topographic Point.
Topographic points are the fundamental parts of each survey and are generated by importing data or using specific tools. These must be considered as a data structure that contains all the information acquired during the topographic survey, even if obtained from multiple surveys of the GNSS or TPS type. For example: importing a GNSS survey generates topographic points that will be represented by symbols and with different graphic properties. These must be considered as a data structure that contains all the information acquired during the topographic survey, both relative to the position, such as coordinates (east, north, height, latitude, longitude, elevation) but also related to accuracy and control (e.g. Residuals), and information on working methods (e.g. RTK differential correction).


Version 4.2.20190212
cube-link
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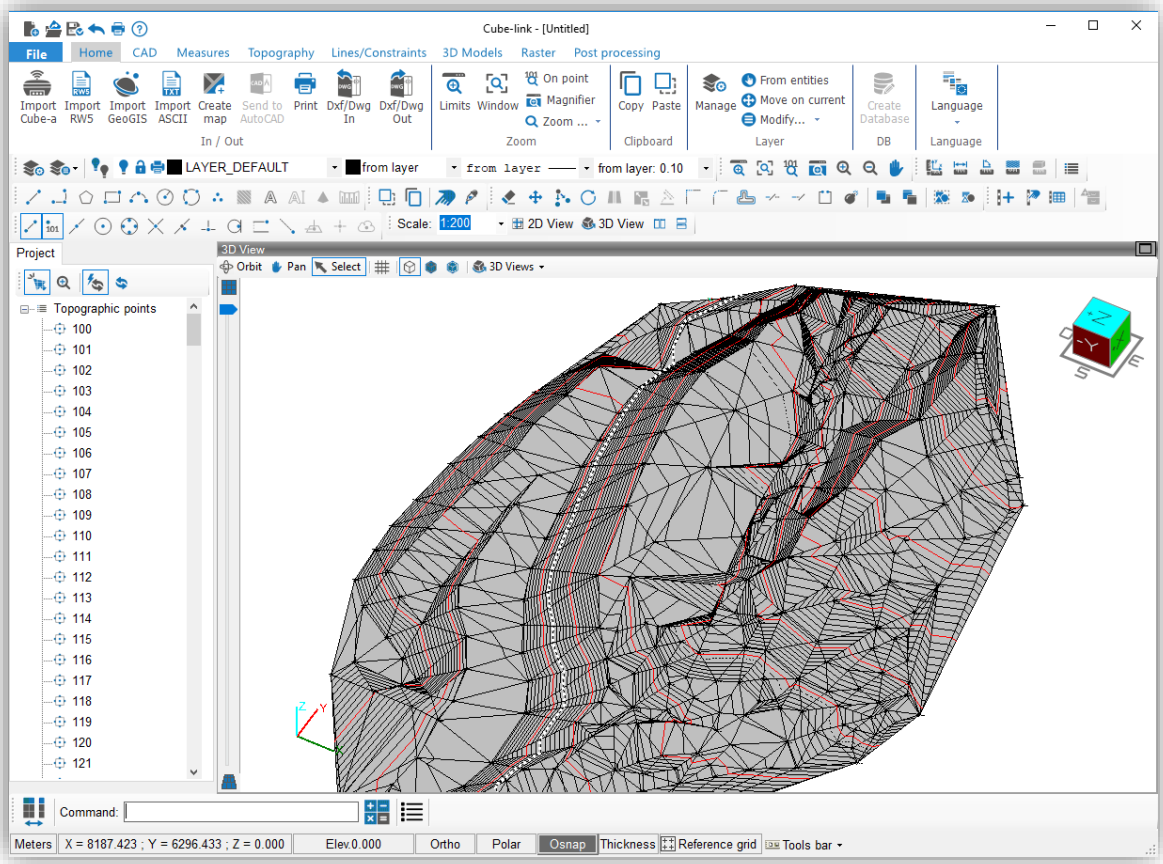

Cube-link - [Untitled]
File
Home
CAD
Measures
Topography
Lines/Constraints
3D Models
Raster
Post processing
Import Cube-a
Import RW5
Import GeoGIS
Import ASCII
Create map
Send to AutoCAD
Print
Dxf/Dwg In
Dxf/Dwg Out
In / Out
Limits
Window
On point
Magnifier
Zoom ...
Zoom
Copy
Paste
Clipboard
Manage
From entities
Move on current
Modify...
Layer
Create Database
DB
Language
Language
LAYER_DEFAULT
from layer
from layer
from layer: 0.10
Scale:
1:200
2D View
3D View
Project
3D View
Orbit
Pan
Select
3D Views
Topographic points
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
Command:
Meters
X = 8187.423 ; Y = 6296.433 ; Z = 0.000
Elev:0.000
Ortho
Polar
Osnap
Thickness
Reference grid
Tools bar

1 Installing and uninstalling Cube-link

1.1 Cube-link installation

To install the program, select the language, read and accept the user license agreement; select the folder for the location of the shortcuts and eventually set any link to the program from the desktop. Before you click the install button you can check and change the program's folder location, the start menu and the folder.

The setup is available for 32-bit and 64-bit platforms.

1.2 Cube-link uninstallation

To uninstall, go to the folder where the program is located and press the uninstall button that will execute the operation.

2 General functions

2.1 File (tab)

File is the first tab and is located at the top left of the main screen. This section contains many utility commands, including one for settings, and for import and export operations (Figure 2.1). The commands at the bottom provide general information: by clicking the Release notes command, you can access the file with a summary of all the information concerning the new versions and the updates of the program; Online Manual is the command that opens the PDF of the User Manual; Information opens the general presentation window of the software, where you can see the installed version number and the active module or modules.

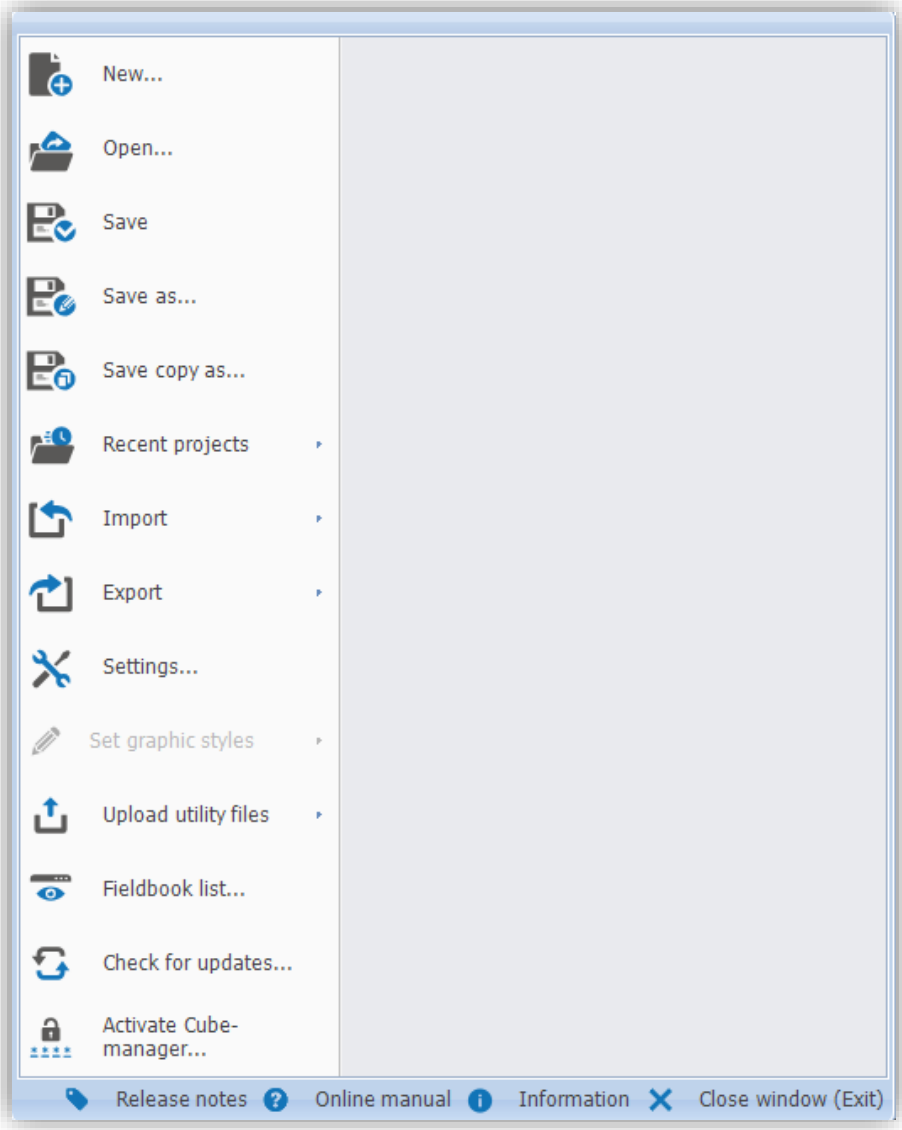


Figure 2.1

2.1.1 Create, open and save jobs

Cube-link files have .cubelnk extension and contain all the CAD and topographic entities used during processing. When you want to create a new job, the application asks if you want to create a new blank job with default variables or if you want to proceed with a new job with variables from template files, it is in fact possible to save template files (with extension .cubetpl) that contain all the settings used for a project (variable dimensions, parameter settings, levels, etc.).

Saving jobs will include the possibility to save a project file or a template file.

Recent projects are saved in a list in the File menu (Recent projects command). Selecting a project from this list and hovering the mouse over will display a preview of the job graphics.

2.1.2 Imports

Cube-link allows you to import files in different formats, including the Cube-a format. To import, just select a format from the list shown in the Import menu (Figure 2.2), each choice will open a new window (for details refer to the paragraphs related to the different imports).

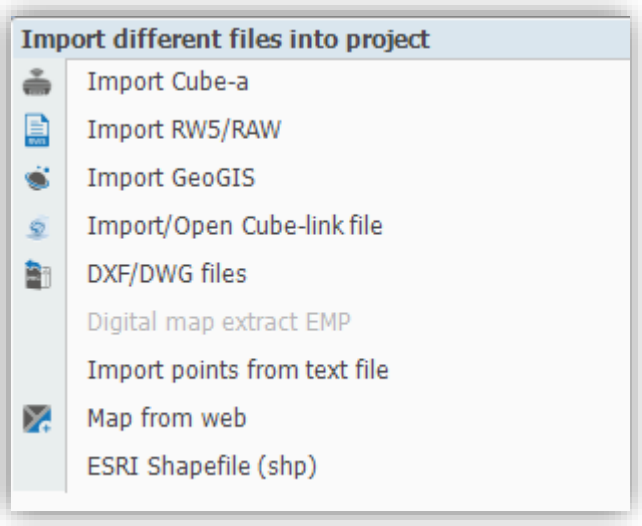


Figure 2.2

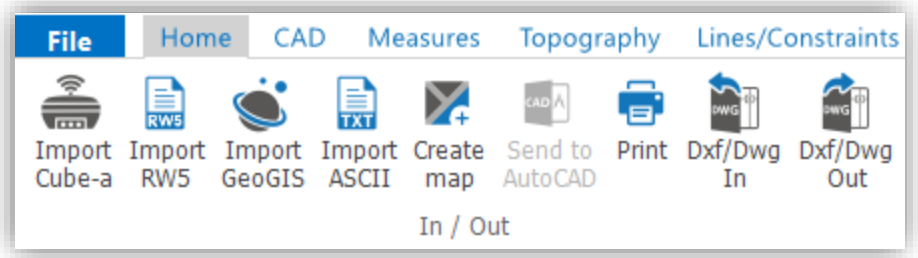


Figure 2.3

2.1.2.1 Import Cube-a

To import a Cube-a file you can select the relevant command in the File tab or you can click on the Cube-a import icon in the Home tab (Figure 2.3). In case of importing Cube-a files, the system can operate on single files or on files that are in specific folders. The second case occurs when the user has access to the entire Cube-a project folder and selects the file with the extension .pd contained in it.
In Cube-a, a job is stored in a folder that has the same name of the project and has subfolders containing all the data; the file to be imported is in the subfolder called "Data".
Copying the entire project folder allows the program to access data files such as photos and reference system information. Within Android devices, projects are always stored as subfolders of the "StonexCube/Projects" folder.
Figure 2.4 shows the main screen for exporting a Cube-a file. After selecting the file, a reference system must be set up before proceeding. You can use the reference system previously defined in the Cube-link (at start-up the program will automatically always check if a default reference system has been set) or you can use coordinates defined in the field. In addition, you can set up a local system or a default reference system, in which case the program will allow you to access the relevant windows for the settings.

If there are photos in the file, you can transform them into GeoTIFF.

For leap seconds a default value is proposed which can be changed during the import phase.

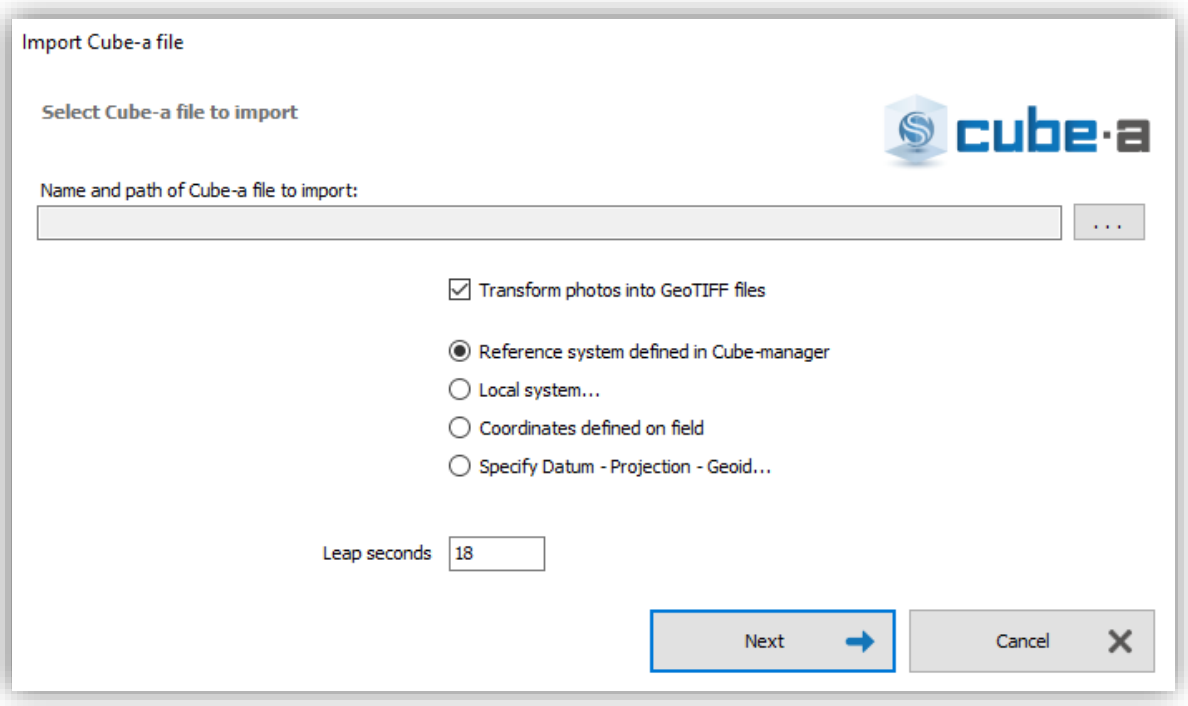


Figure 2.4

2.1.2.2 Import RW5

To import an RW5 file you can select the relevant command in the File tab or you can click on the Import RW5 icon in the Home tab (Figure 2.3). You will see a window as in Figure 2.5, where you can specify the name and path of the file you want to import. A useful feature is the ability to select the CRD file and then import only the updated data found in the field (if you import raw files, the option on CRD files will not be visible).
Also, for this type of import the coordinates can be changed by selecting a local system or a predefined system, or leave the coordinates defined in the field or use the default reference system (set by the user when the program starts).
If you want to use the USB connection to import, click on Connect USB (the connection is possible using the Windows Mobile Device Center program). The device used in the field can be connected directly to the PC and through the window in Figure 2.6, it is possible to directly download the files from the portable device to the PC or vice versa. By default, the program always shows the folder with the recorded data, but this position can be modified at will, clicking on the search button, you can then view the internal structure of the device and select the desired folder.

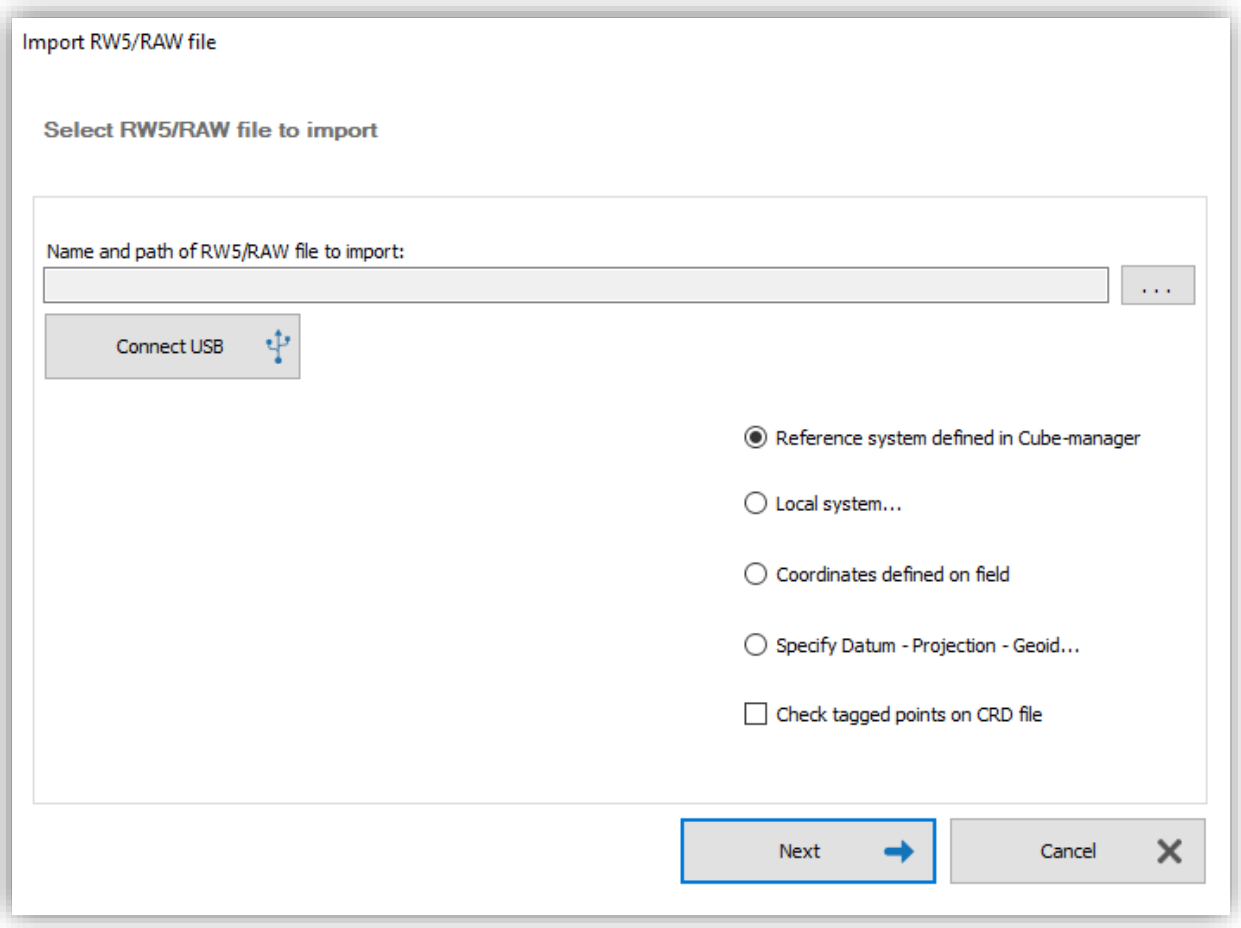


Figure 2.5

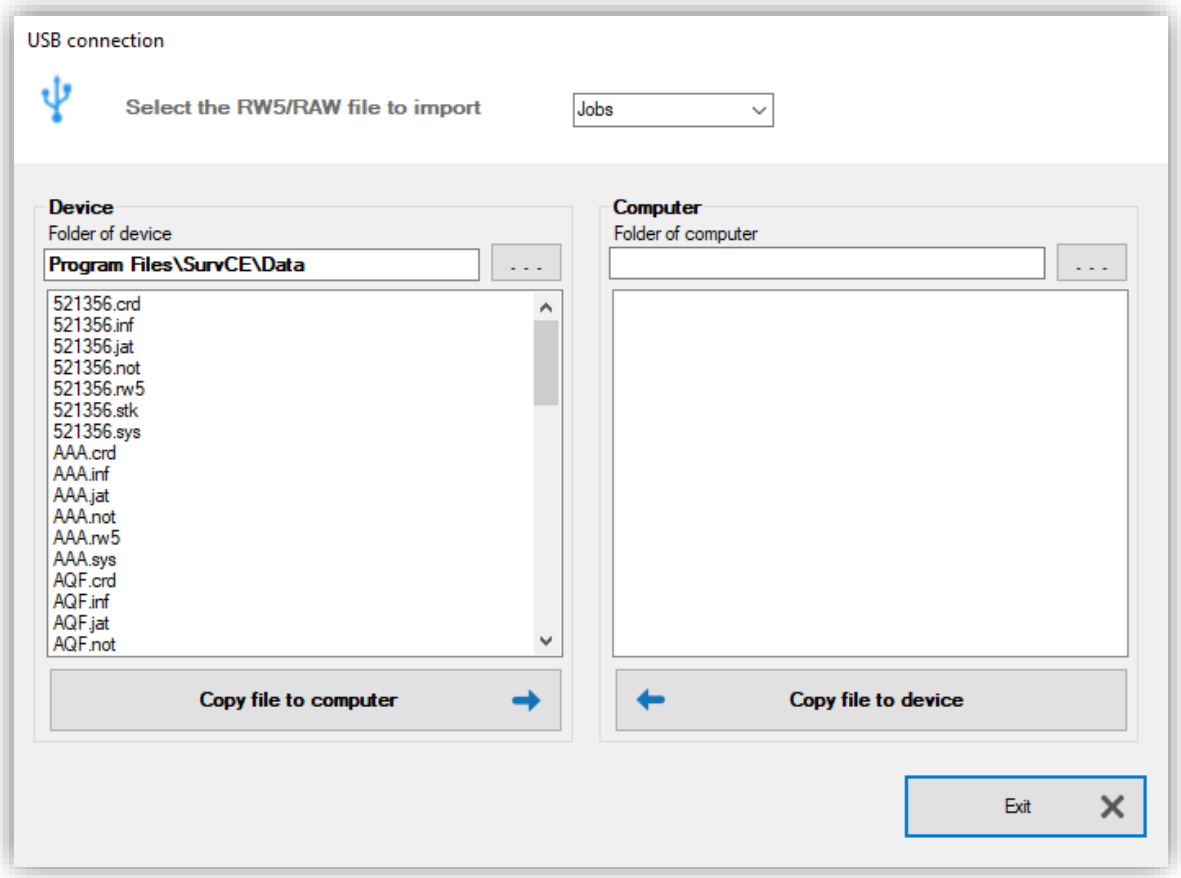

USB connection
Select the RW5/RAW file to import
Jobs
Device
Folder of device
Program Files\SurvCE\Data
. . .
521356.crd
521356.inf
521356.jat
521356.not
521356.rw5
521356.stk
521356.sys
AAA.crd
AAA.inf
AAA.jat
AAA.not
AAA.rw5
AAA.sys
AQF.crd
AQF.inf
AQF.jat
AQF.not
Computer
Folder of computer
. . .
Copy file to computer
Copy file to device
Exit

Figure 2.6

2.1.2.3 Import Geogis

To import a Geogis file, you can select the relevant command in the File tab or you can click on the Import Geogis icon in the Home tab (Figure 2.3).
If there are photos in the project, they can be transformed into GeoTIFF files. Furthermore, even for GeoGis files it is possible to connect a device to the PC via the USB connection (with the same logic and functionality illustrated in the paragraph concerning the importation of RW5 files).

With the USB connection even Raster, DXF and ESRI Shapefiles can be copied to the PC. To do this, simply select the format chosen with the drop-down menu command at the top of the screen.
For this format as well, it is possible to import the coordinates surveyed in the field or use the default reference system, a local system or select a Datum. In the last two cases you will have the possibility to access windows where to set the characteristics of these systems.

2.1.2.4 Import ASCII

To import a text file, you can select the relevant command in the File tab or you can click on the Import ASCII icon in the Home tab (Figure 2 3). This function consists of 4 steps.
In the first step (Figure 2.7), you must select the file to be imported indicating name and path, in this phase you can also edit the file by clicking on the Edit file button (this will open a simple text editor where you can change the file and to show/hide the number of lines). Before proceeding with the import, it is necessary to select whether to create topographic points or CAD points from the imported file.

In step n. 2 (Figure 2.8), you must choose the separator character, in addition you can select the columns that you want to exclude from the import and finally you can determine from which row you want to start reading the data.

In step n. 3 (Figure 2.9), you can assign the content type (Point name, X, Y, Z, Description, Code) to each column (click on the header to view the list).

In the last dialog box, step n. 4 (Figure 2.10), you can click on the Import button and define the points that will be imported.

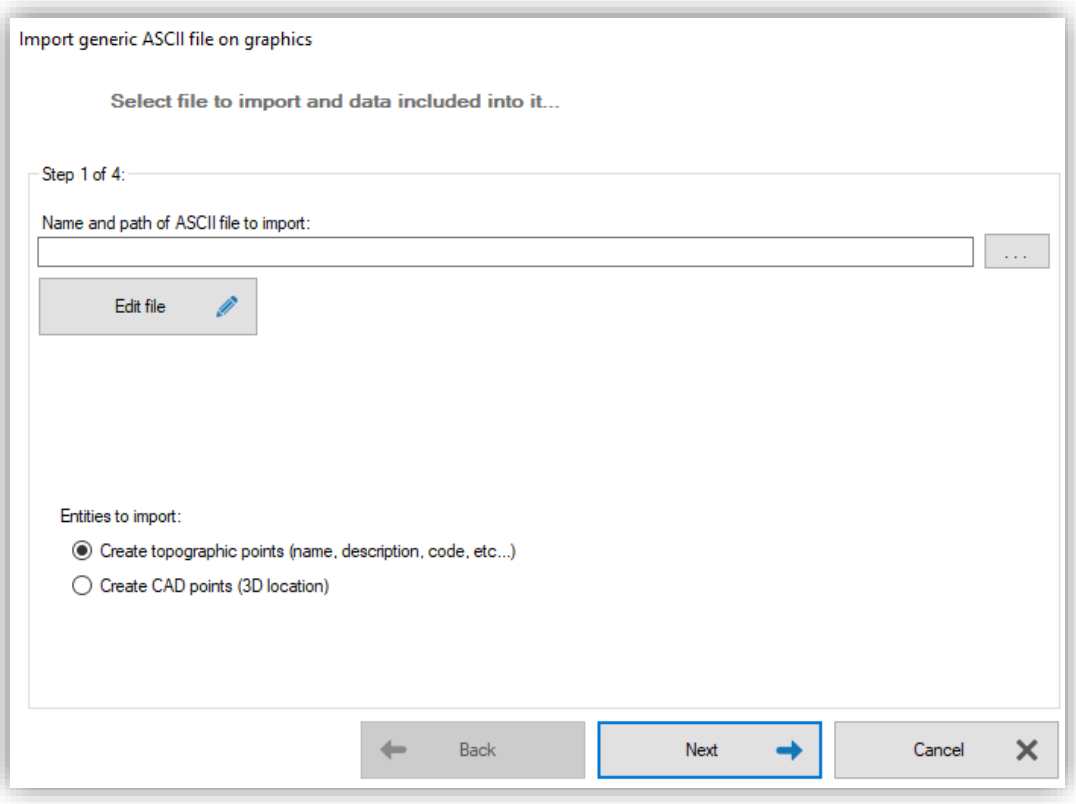


Figure 2.7

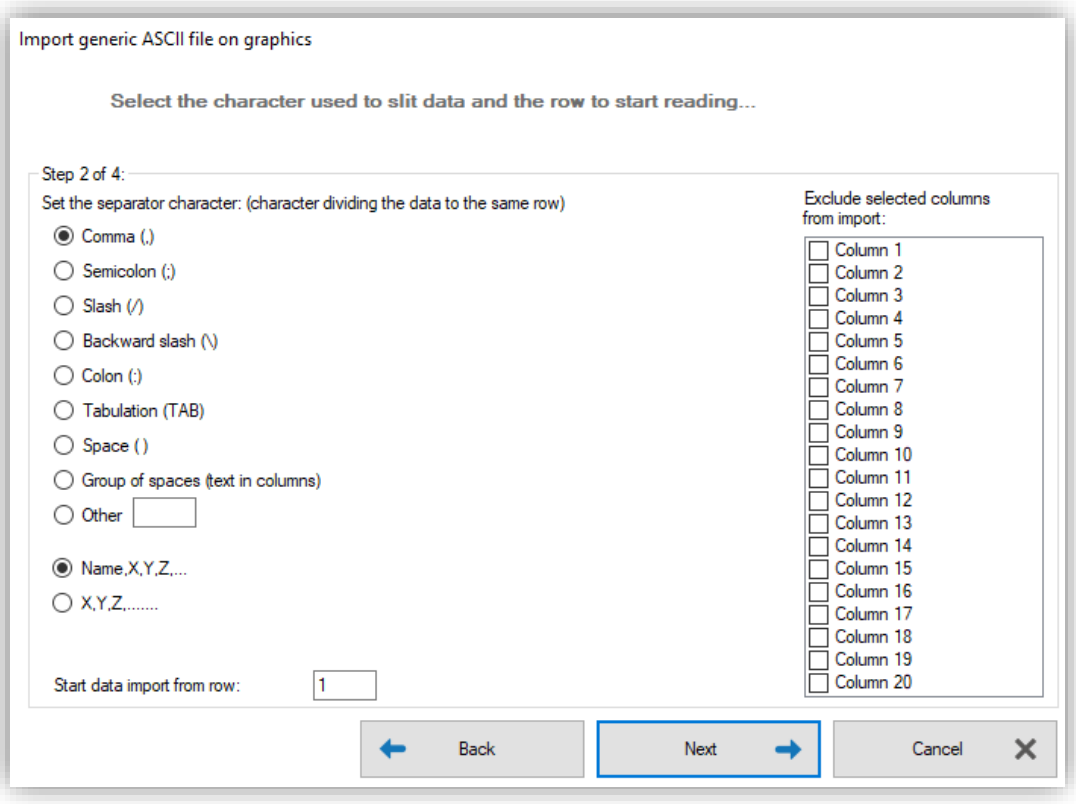


Figure 2.8

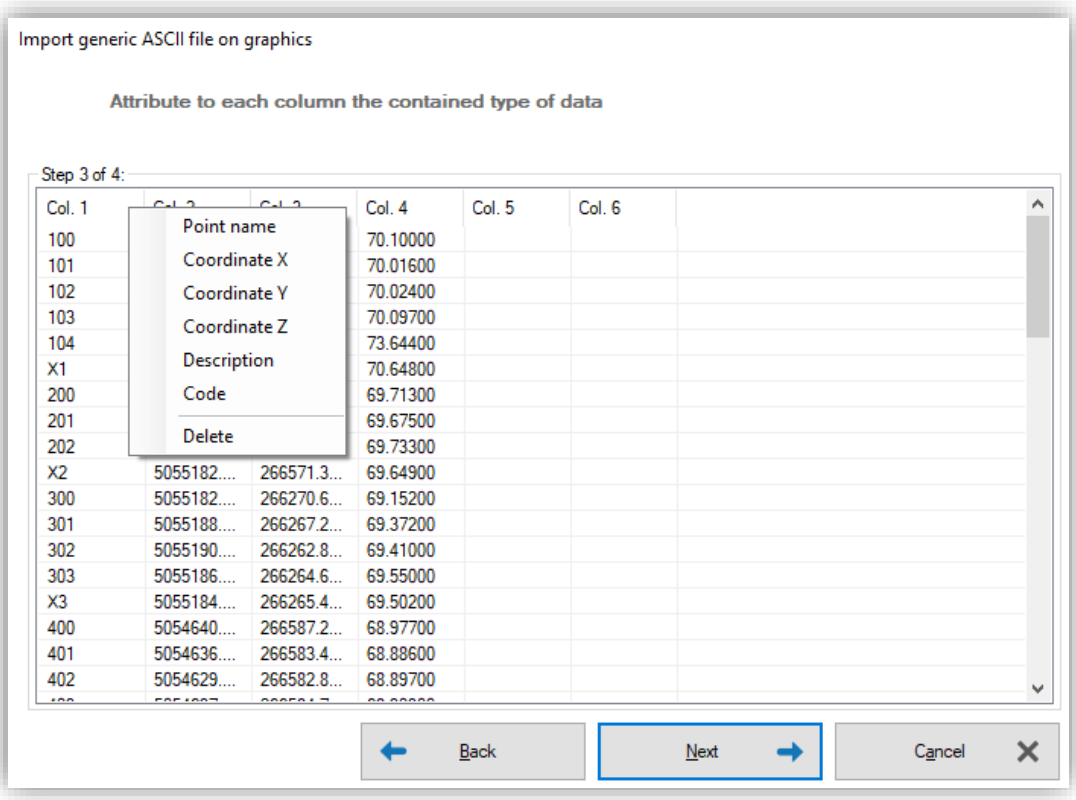


Figure 2.9

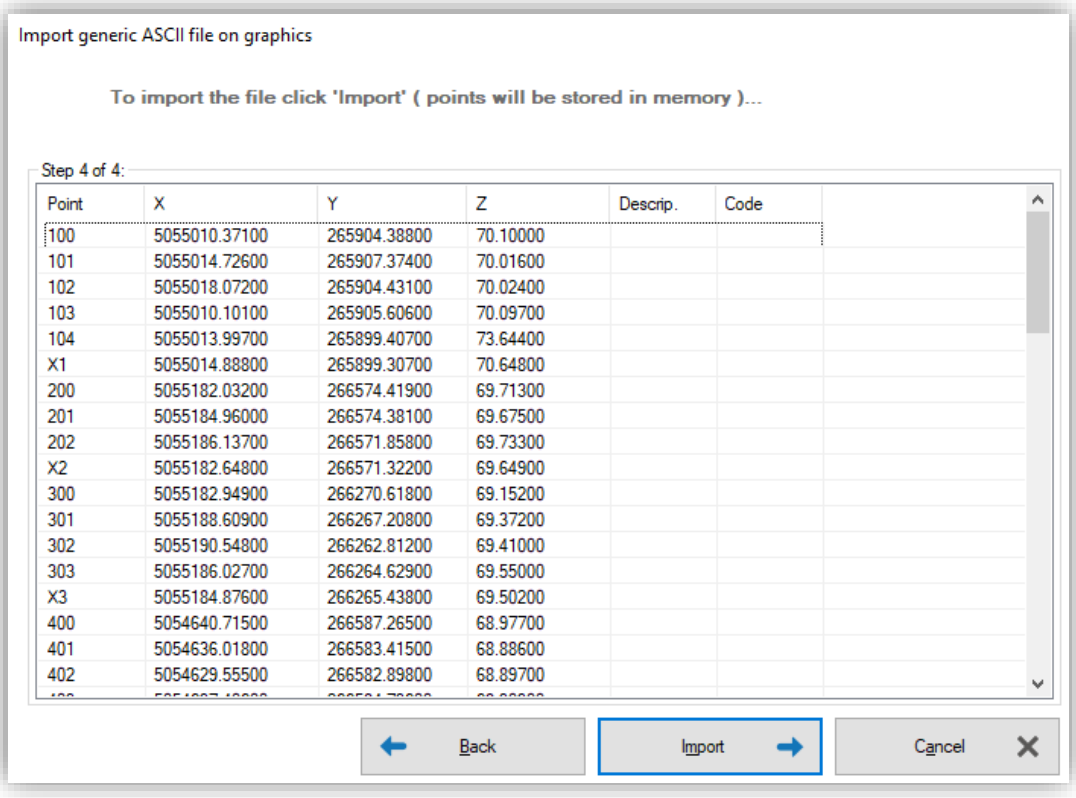


Figure 2.10

2.1.2.5 Create map

To create a map, you can click the Map from web button on the File tab or you can click on the Create Map icon in the Home tab (Figure 2 3).
This function imports a map into the project, it will require the latitude and longitude that you want to set as the center of the map. You will then see a window powered by Google Maps as in Figure 2.11. To import the map into the CAD you will need to save the image as jpeg. The services for creating maps are two: Google and Bing. The window and the creation occur, in both cases, in the same way. If the created images do not cover the area in which you want to create the map, you can increase the horizontal and vertical images, or you can proceed to create a new map in addition to the one created. The program will overlay the geo-referenced images.
The images downloaded using these services are subject to copyright and in the case of Google maps it is possible that after a quantity of free downloads the service requires a payment.

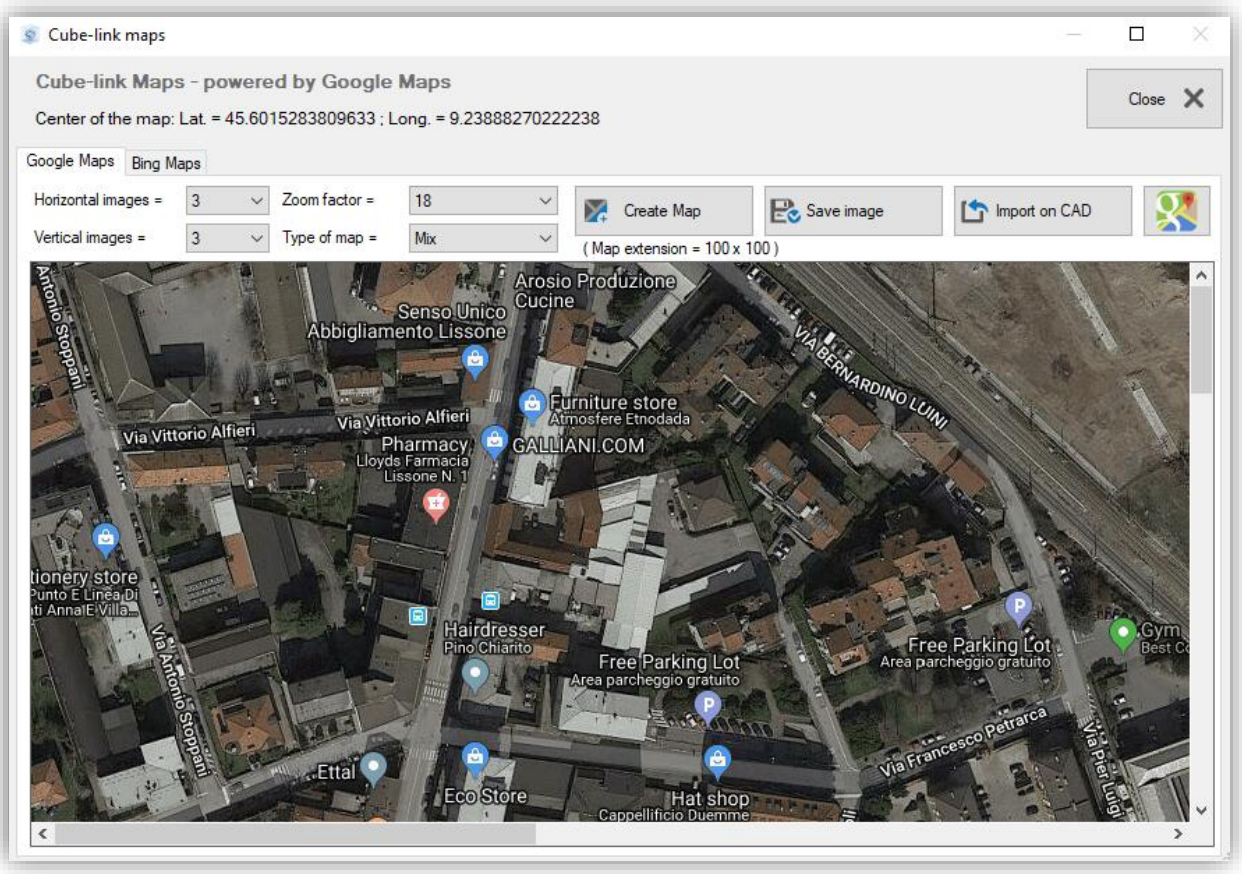


Figure 2.11

2.1.2.6 Send to AutoCAD

Availability	Module
Cube-manager	P-T-M

2.1.2.7 Print

The Print command generates a window that includes three tabs: Print settings; Printing styles; Printing tables. Print Settings (Figure 2.12) is the tab where you can set the printer you want to use and the page you want to print. Even the scale, origins, print area and print size can be set in this section.

In the Printing Styles tab, you can set the thickness, terminations and joints, using the layer settings or creating new styles. You can also import previously saved styles or save new ones (Figure 2.13).

The last tab Printing tables is dedicated to saving, deleting or loading print tables. In each of the tabs just described, you can click on the print preview button (Preview and print) to see a layout of how the file will be printed.

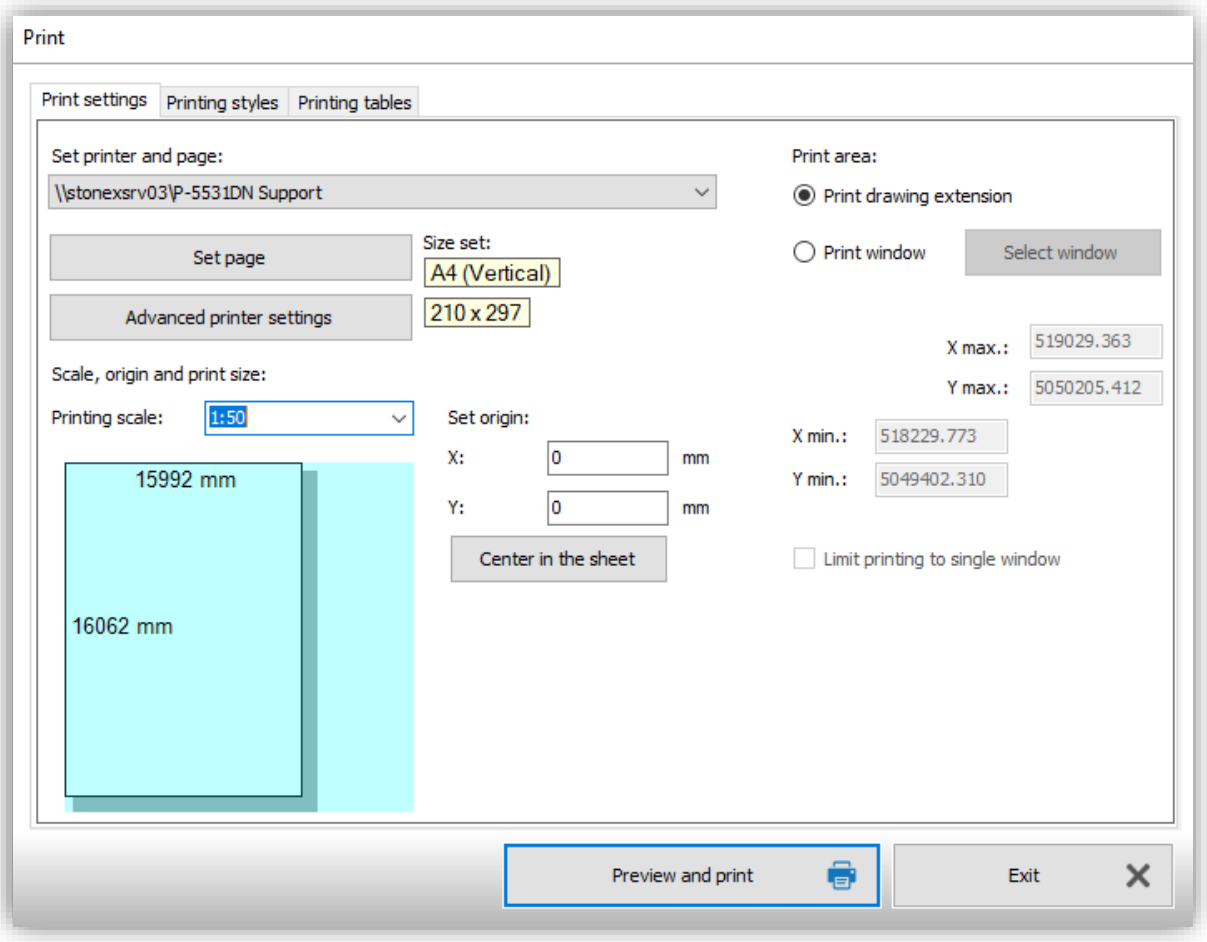

Print
Print settings
Printing styles
Printing tables
Set printer and page:
\\stonexsrv03\P-5531DN Support
Set page
Advanced printer settings
Size set:
A4 (Vertical)
210 x 297
Print area:
Print drawing extension
Print window
Select window
X max.:
519029.363
Y max.:
5050205.412
X min.:
518229.773
Y min.:
5049402.310
Scale, origin and print size:
Printing scale:
1:50
15992 mm
16062 mm
Set origin:
X:
0
mm
Y:
0
mm
Center in the sheet
Limit printing to single window
Preview and print
Exit

Figure 2.12

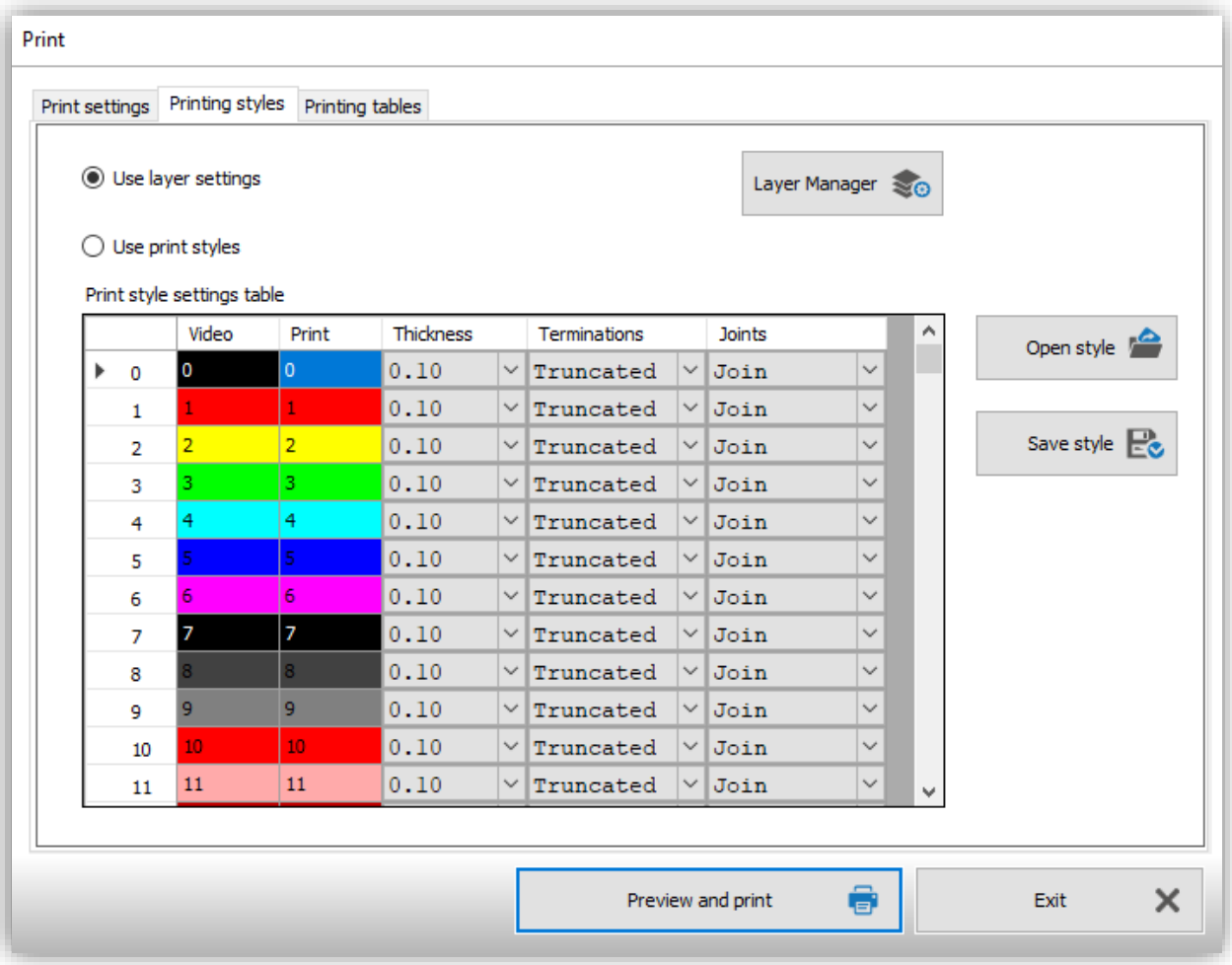


Figure 2.13

2.1.2.8 DXF/DWG

This function allows the system to import the graphic elements as they are and since there are no topographic points in this type of file it is possible to force this choice, so that the entities with attributes become topographic points (Figure 2.14).
If you decide to import by transforming the points into topographic points, you will have the possibility to establish the name (sequential) of the points and the properties of the imported block. You can also select the option to import points on a single layer, in this case the current project layer will be selected.

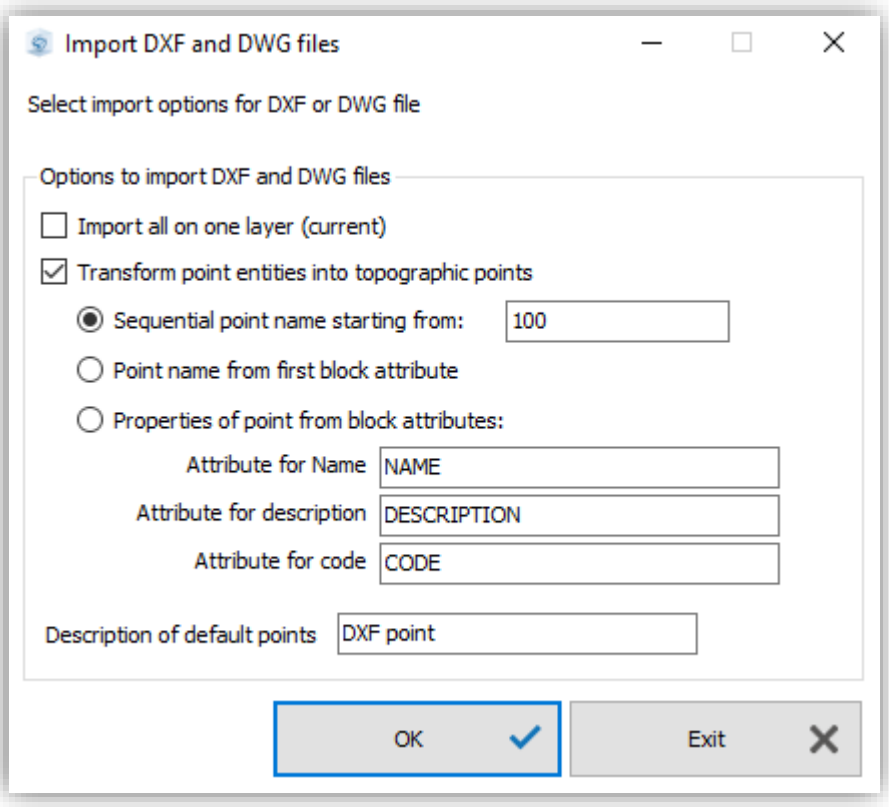


Figure 2.14

2.1.2.9 Pregeo

The program supports the processing of Pregeo files, but this function is only visible in the Italian version. To access it, just set the Italian language from the change languages button.

2.1.2.10 Digital map extract EMP

Availability	Module
Cube-manager	P-T-M

It is possible to import a file with the .EMP extension simply by indicating the name and path of the file from the screen that will be generated by clicking on the EMP Digital Extract command from the File tab (example of a project with imported EMP extract Figure 2.15). This is a Pregeo function (italian).

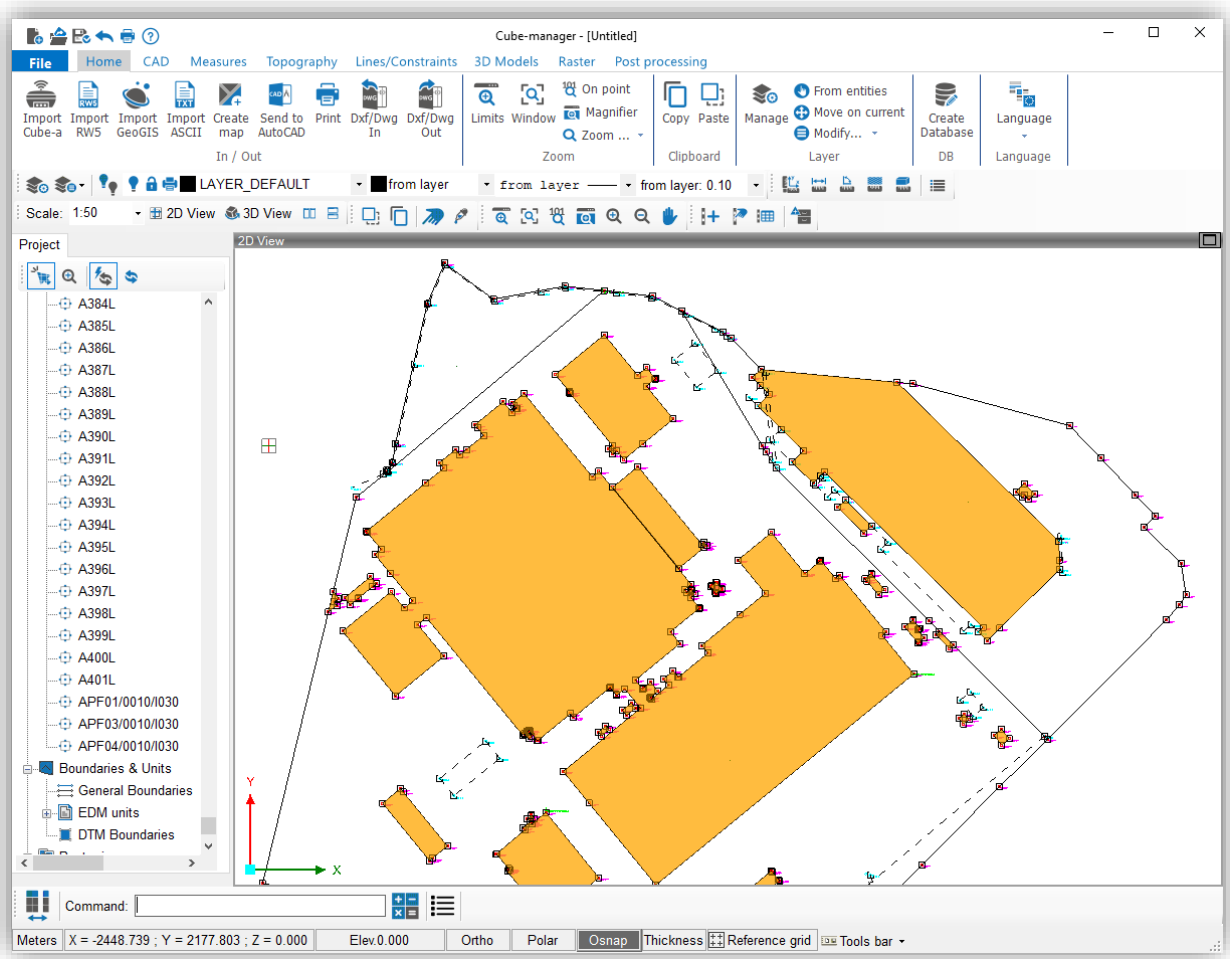


Figure 2.15

2.1.2.11 ESRI Shapefile

The import of a shapefile generates a screen like the one in Figure 2.16. Clicking Open at the top right you will see a preview of the work you are importing, on the left you will see the layers that make up the file. By clicking Import you can finish the preview and re-enter the graphic view in the main window.

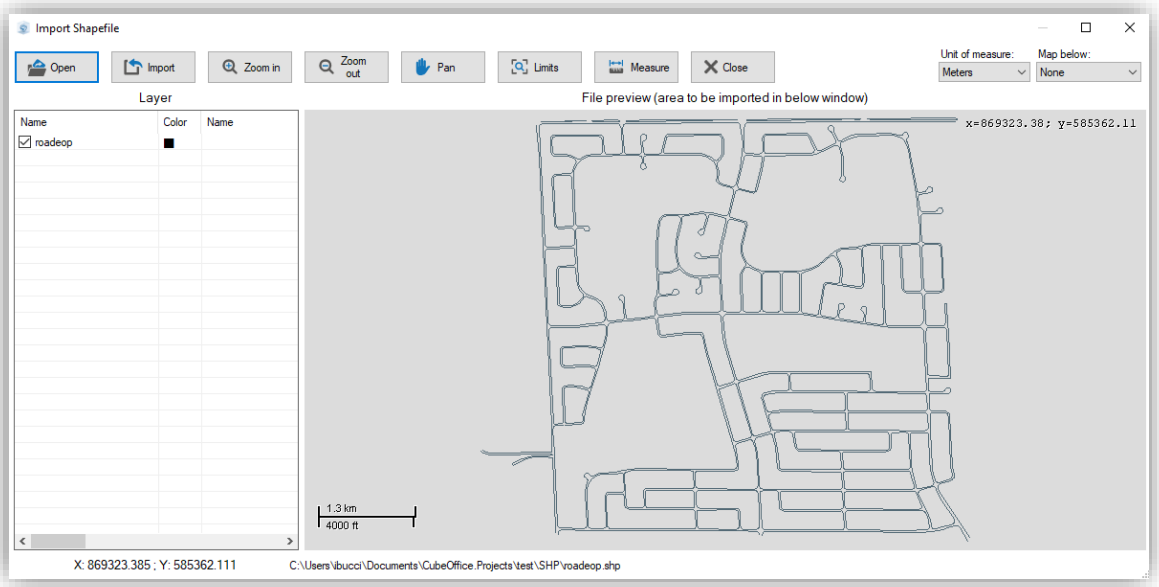


Figure 2.16

2.1.2.12 Features of GPS points

Whenever you decide to import GPS points into the program, Cube-manager will automatically display a screen, as shown in Figure 2.17.
From this window it is possible to set the graphic appearance of the points, subdividing them according to the type of solution that characterizes them. It will then be possible to set the layer, the color and the icon of the symbol, divided by type of points. The size of the symbol, the font and its color can be set for the total number of points that are being imported.
Note: GPS stations are by default positioned on a non-visible layer, however it is always possible to reactivate the layer, and set the color and icon of the symbol.

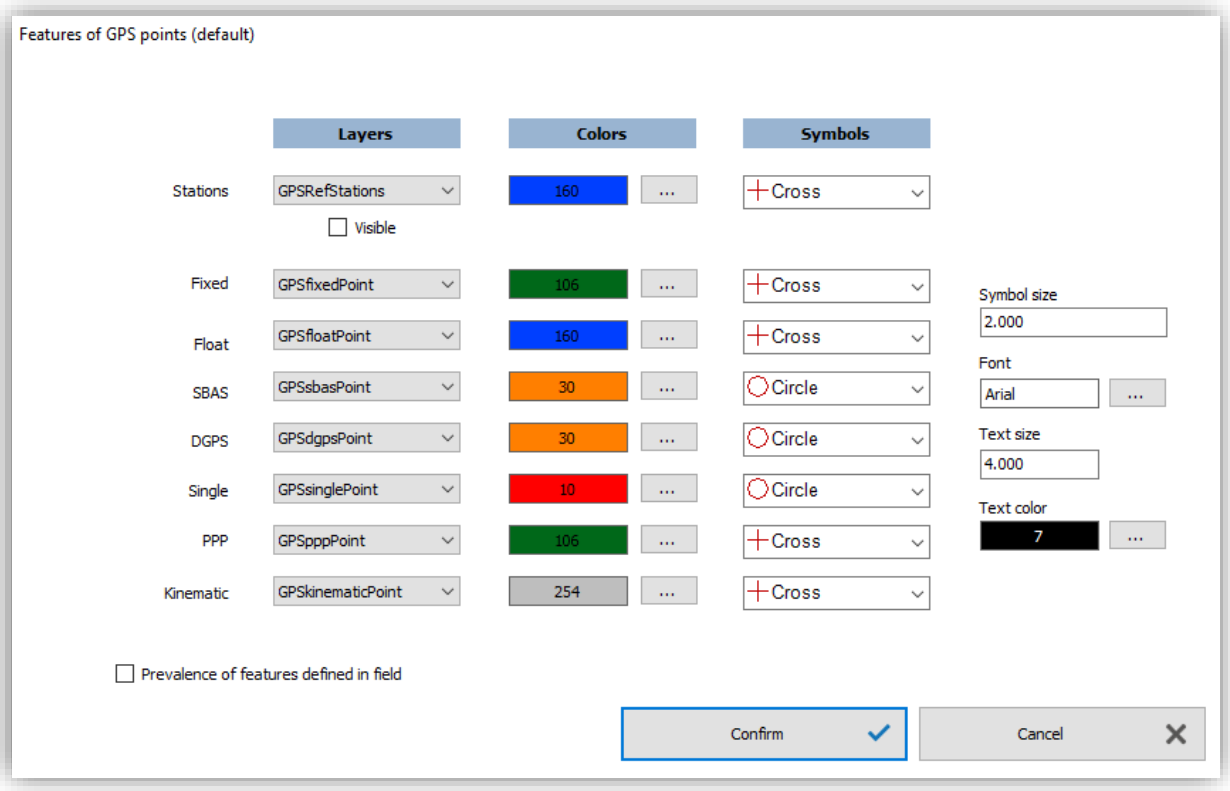


Figure 2.17

2.1.3 Export

Cube-link supports various export formats, in Figure 2.18 all possible exports are summarized. To access the exporting in various formats, click on the Export command in the File tab (Figure 2.1).

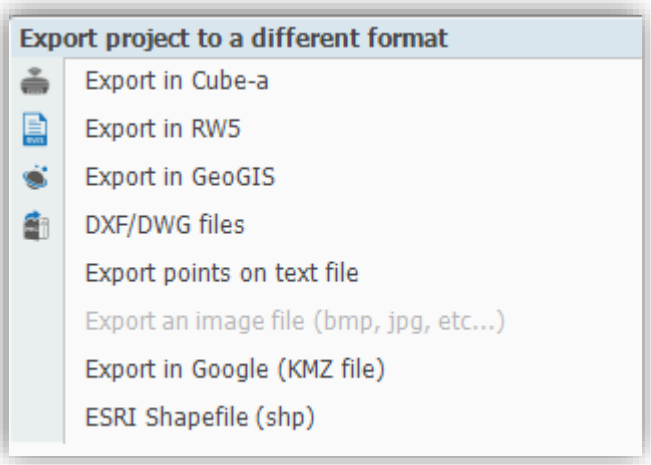


Figure 2.18

2.1.3.1 Export Cube-a

To export in Cube-a format, simply select the name and path of the file to be created, by default the program exports both graphical entities and topographic points. However, it is also possible to exclude graphical entities and to export only topographic points (Figure 2.19).

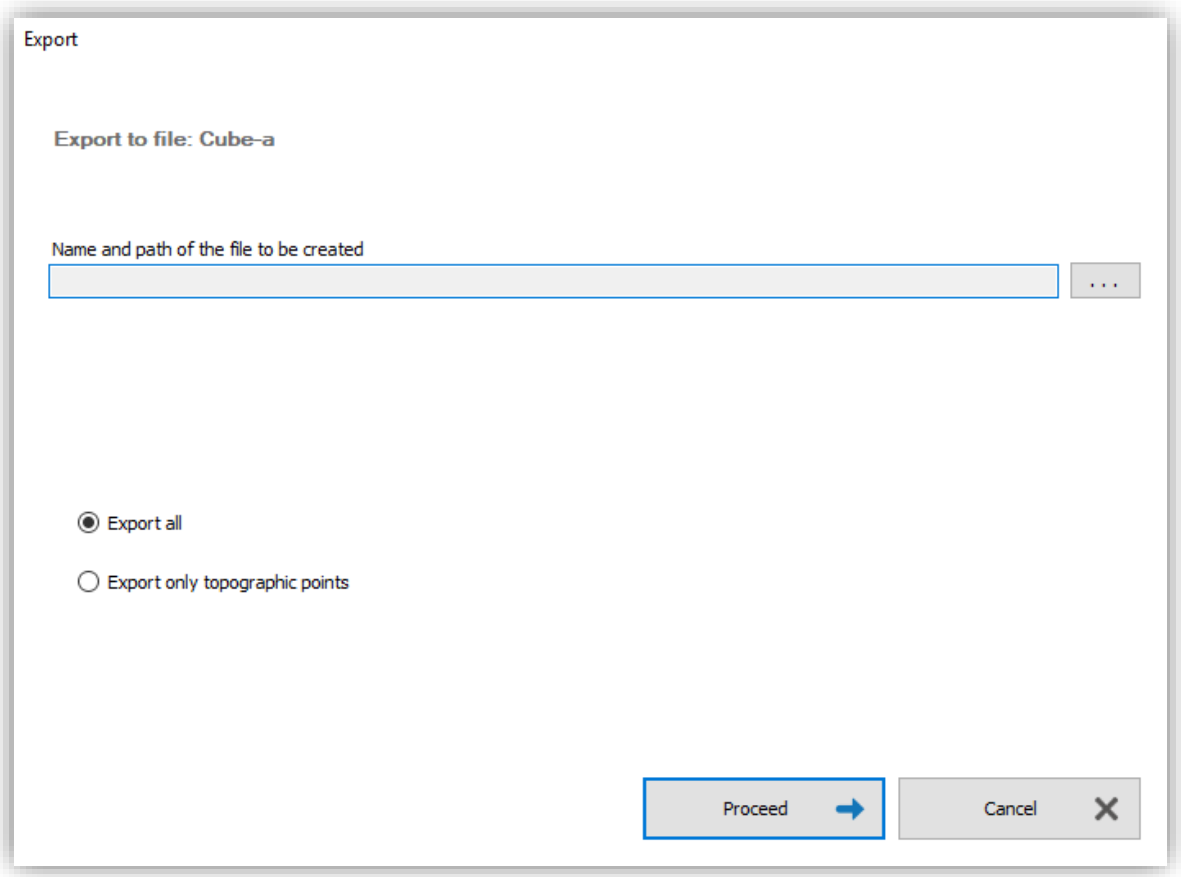


Figure 2.19

2.1.3.2 Export RW5

To export in this format, you must select a file name and path, optionally you can also create an EzSurv file, you will always need to select a file name and path. You can also create a CRD file associated with the created RW5 file (Figure 2.20).

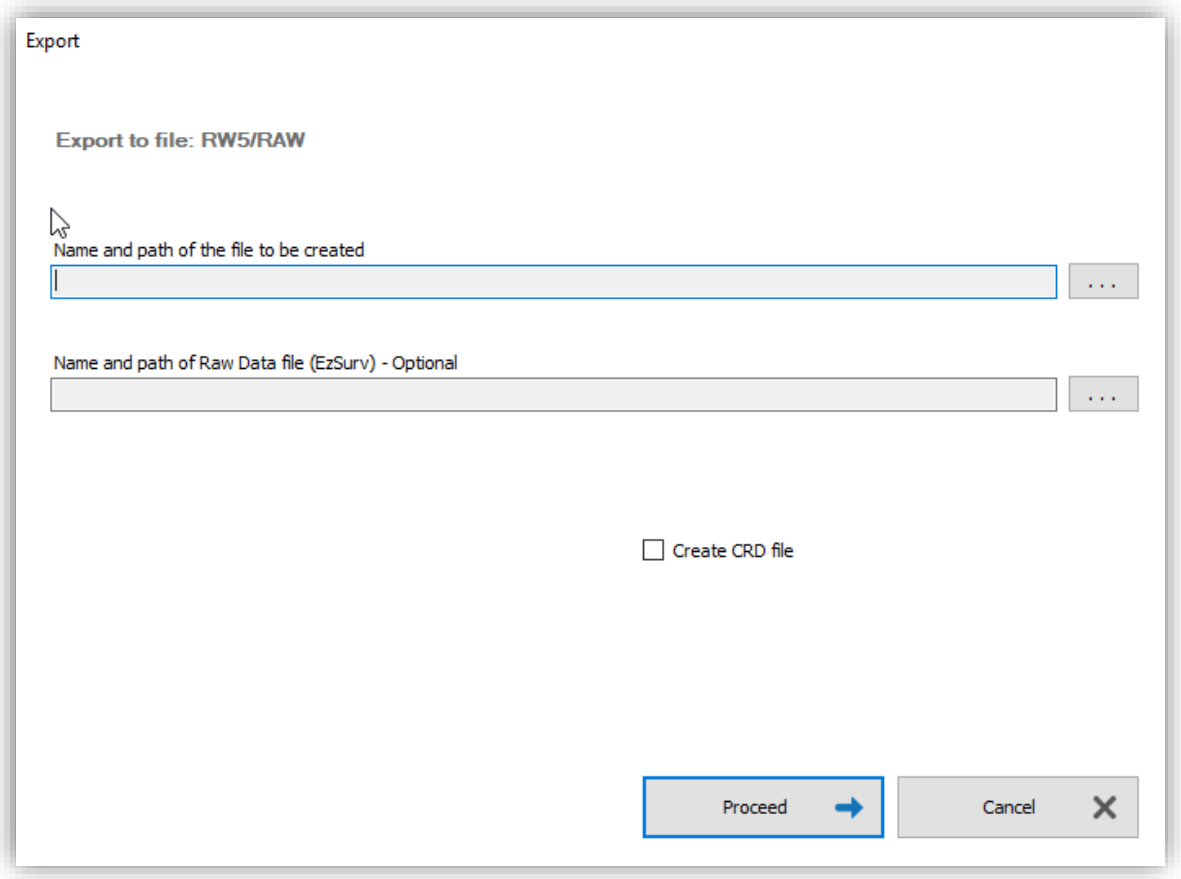


Figure 2.20

2.1.3.3 Export GeoGIS

The export of a GeoGIS file is like the export of a Cube-a, it will be necessary to set a file name and a path. By default, both points and graphic entities are exported, but it is always possible to exclude the graphic entities from the export.

2.1.3.4 DXF/DWG file

This export is the only one that can be recalled from two different commands within the program. First command is into the menu in Figure 2.18, like all other exports, the second is the Dxf/Dwg Out command in the Home tab (Figure 2.3).
For a correct exporting, the first choice to make is the version of AutoCAD® that you want to use to create the file. Then you can select the options on the entities, especially if you want to include Raster images, backgrounds and topographic points.
Finally, you need to indicate which attributes you want to define for points and how you want to get them, for example if you want to get them from the point label. In the general options section, you can enter the text size and choose to create a 2D DXF file (Figure 2.21).

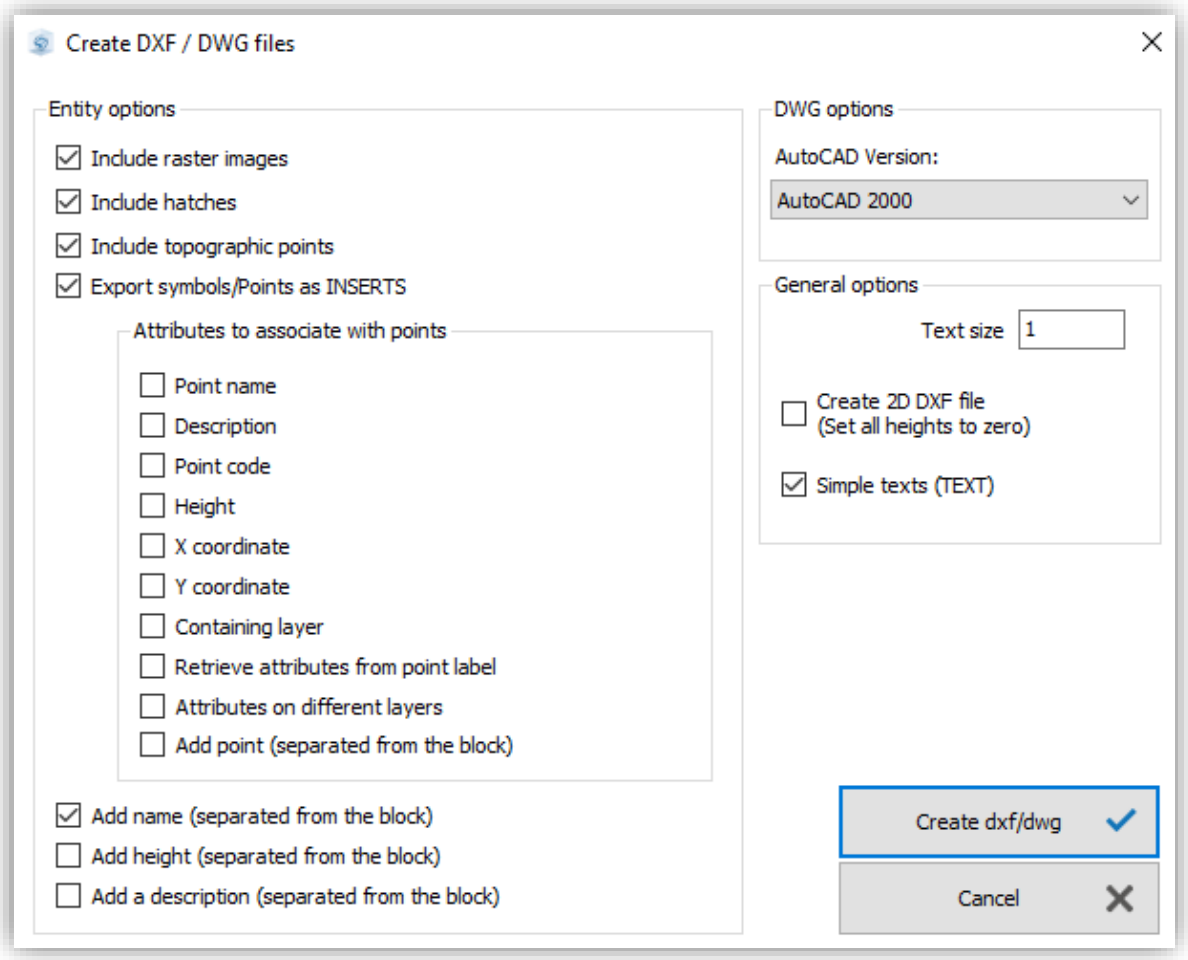


Figure 2.21

2.1.3.5 Export on text file

To create a text file just click on the Export points to text file button (Figure 2.18). The creation of the file is customizable, and it is possible to define the characteristics that you want to give to it: you can choose whether to include a header, the data to be inserted, the separator character, the format of the geographical coordinates etc.

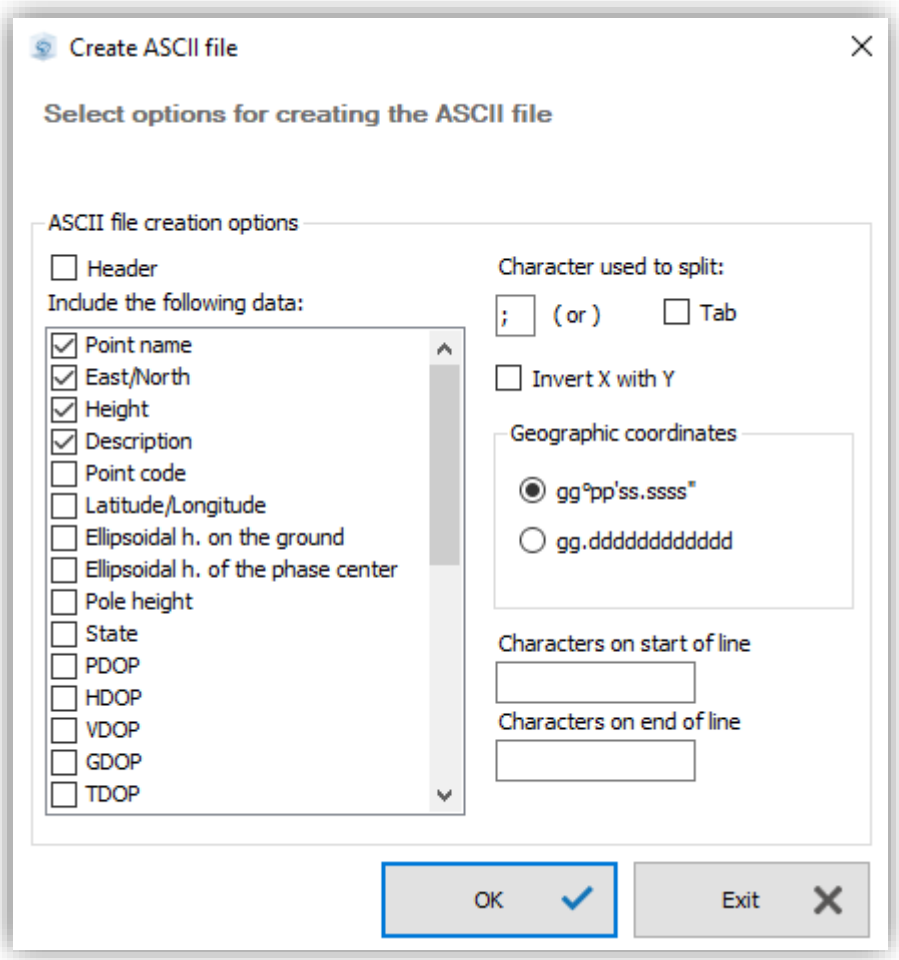


Figure 2.22

2.1.3.6 Export an image file (bmp, jpg, etc.)

Availability	Module
Cube-manager	P-T-M

2.1.3.7 Export in Google (KMZ)

By accessing the Export to Google (KMZ file) function, you can generate a KMZ file that can be viewed in Google Earth. The procedure is like the other exports of this application; first specify a name and a path for the file, then proceed with selecting the features you want to add. The structure of this window is very flexible because you can indicate which data to export; including CAD elements, GPS data, photos, database attributes. As soon as the file is created, the program will ask if you want to load it directly in Google Earth (Google Earth must have been previously installed in the PC).

2.1.3.8 ESRI Shapefile (shp)

The steps for creating an ESRI shapefile file (Figure 2.23) are like those applied to the export of other formats, once selected the name and location of the file to be exported, you can select a series of information and contents that you want attribute to the file.

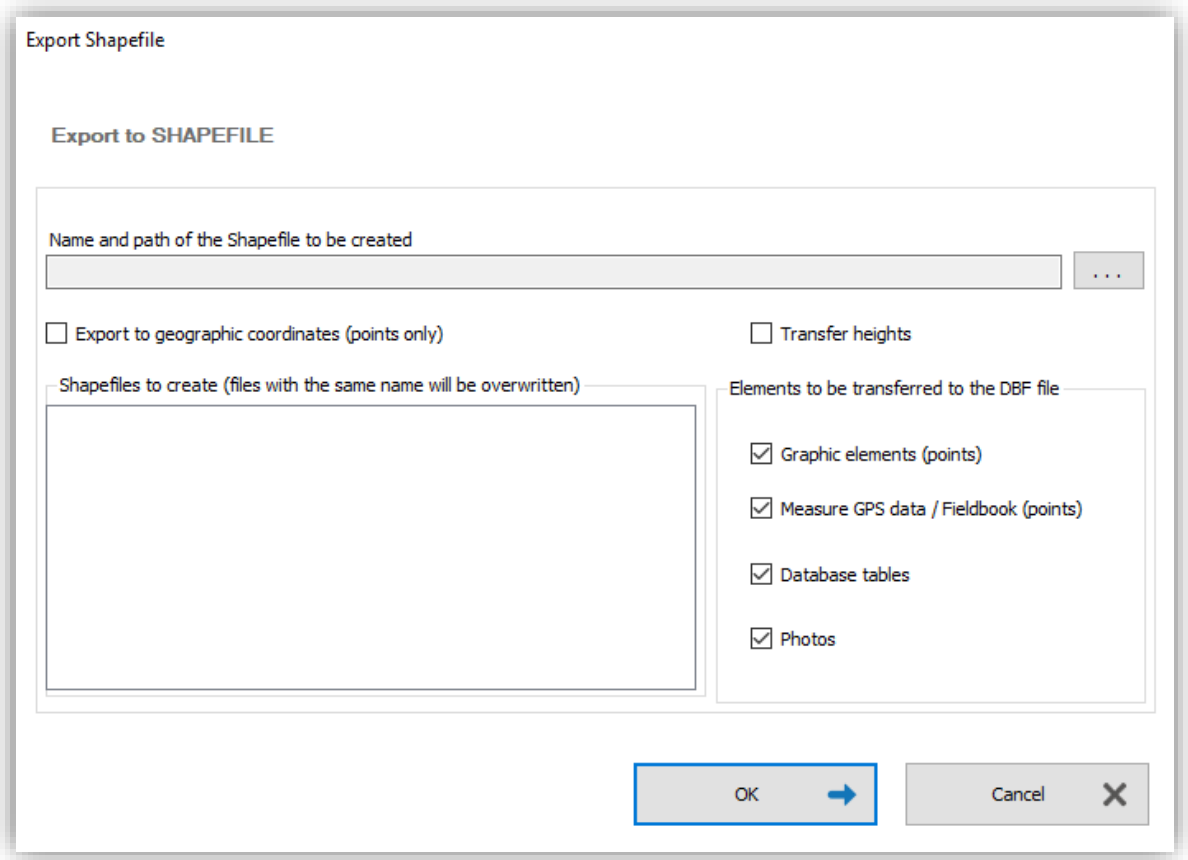


Figure 2.23

2.1.4 Settings

In Settings (command in the File tab), you can set the general program functions, such as checking for updates at startup or the version of AutoCAD® to be used (Figure 2.24). This function consists of 5 tabs that will be discussed below. It will allow you to completely customize the aesthetic, functional and practical aspects of the program. Note: to make sure that the changes are effective, after changing the settings, it is advisable to restart the program.

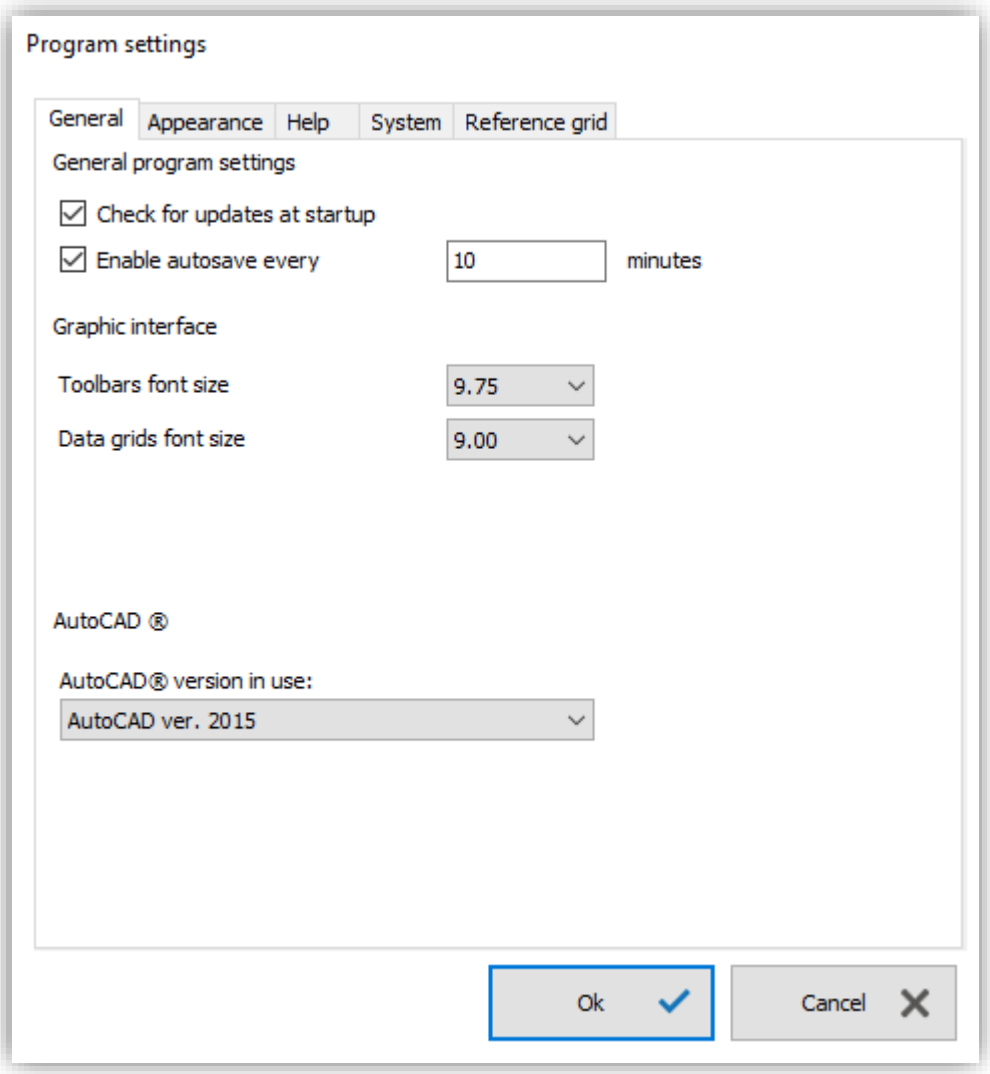


Figure 2.24

In the Appearance tab (Figure 2.25) you can determine, for example, the background color of the work area or enable dynamic information on the cursor.
Among the other functions available there is the possibility to enable/disable the dynamic list of features, the display of the thicknesses on the screen, the size of the Cartesian axes' icon.

By enabling the dynamic list of features you can read the characteristics of the elements in the project. If you hover the mouse over the elements, the application will display a popup window, like the ones below (Figure 2.26), which will describe the type element and its characteristics.

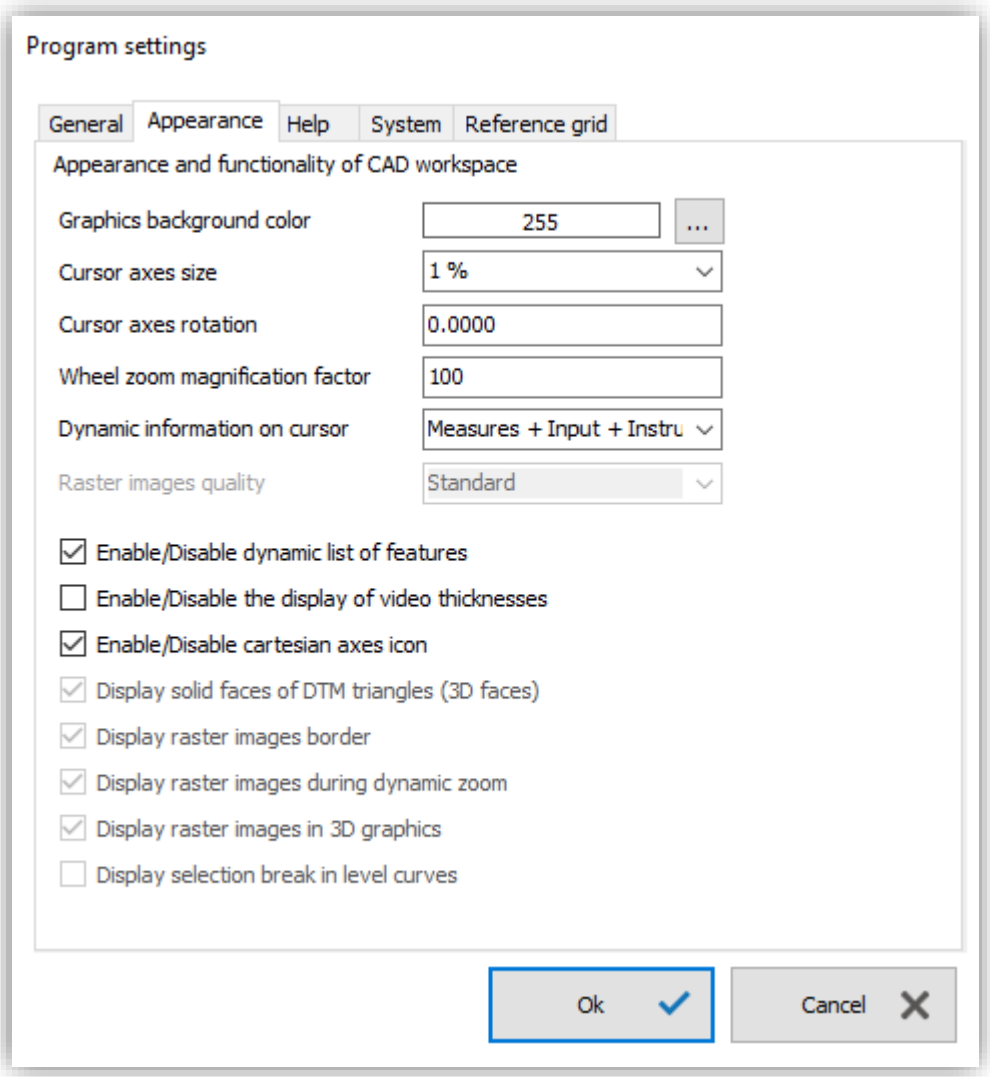


Figure 2.25

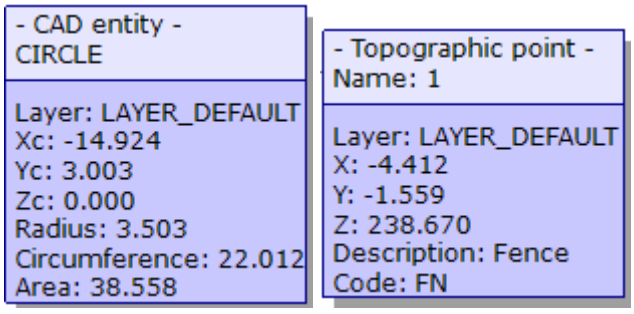


Figure 2.26

The Help tab (Figure 2.27) is useful for setting the use of the Object Snap and in which mode and whether to enable or disable polar pointing and Ortho mode. Furthermore, in this section it is possible to customize the size of the Osnap symbol and the size of the selection area when this mode is active.

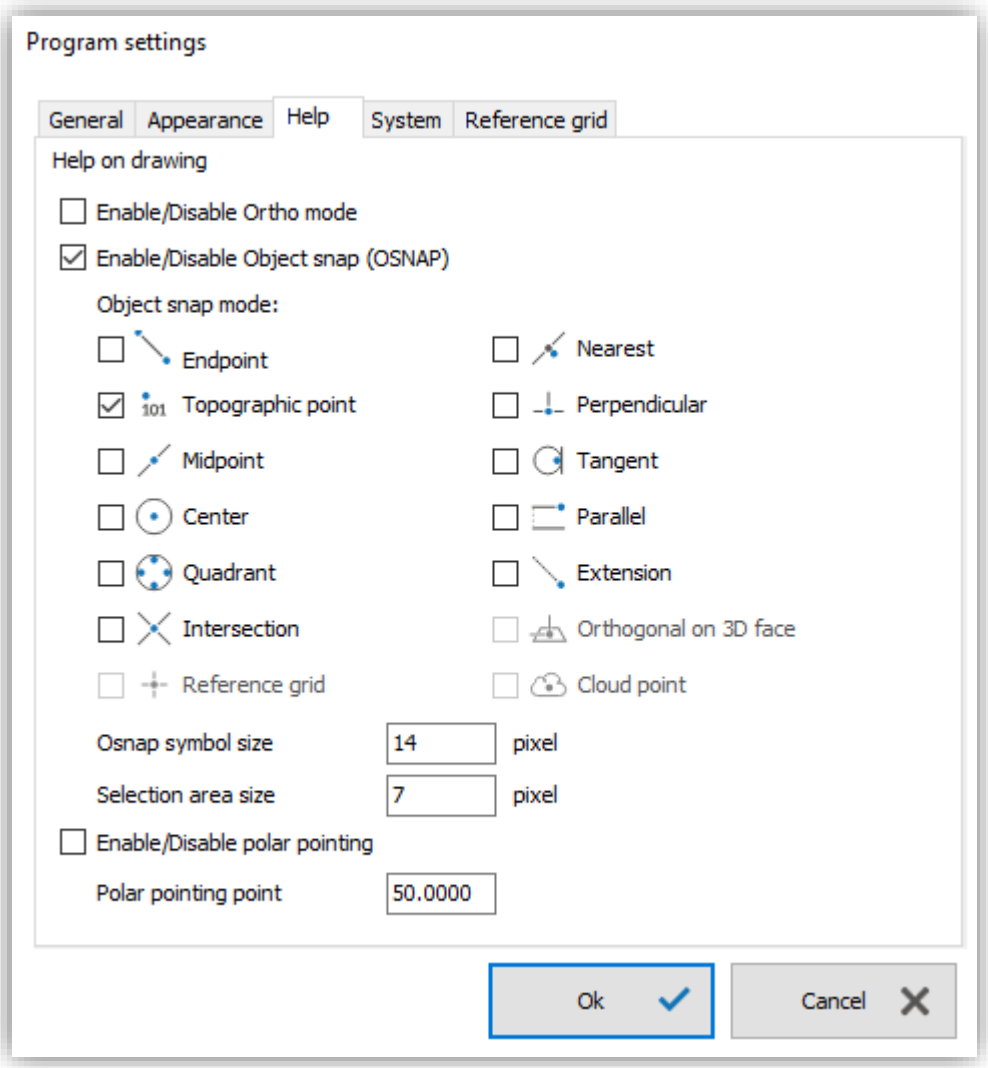


Figure 2.27

In the System tab it is possible to set the topographic unit of measure and the decimal figures for the display of parameters such as heights, coordinates, distances, etc.
Regarding the representation of the angles, which is a setting in this section, there are two possibilities: the representation of the topographic angle and GPS and the representation of the general angle, which concerns the graphics. The representation of the angle relative to the topography is set by default in Grads but when a fielbook is imported, the application will read the configurations of the job and set the representation accordingly.

In the Reference Grid tab you can indicate whether to display the reference grid and what characteristics it should have.

From the File tab, the Set Graphic Styles command (Figure 2.28, Figure 2.29) is available in the program Cube-manager.

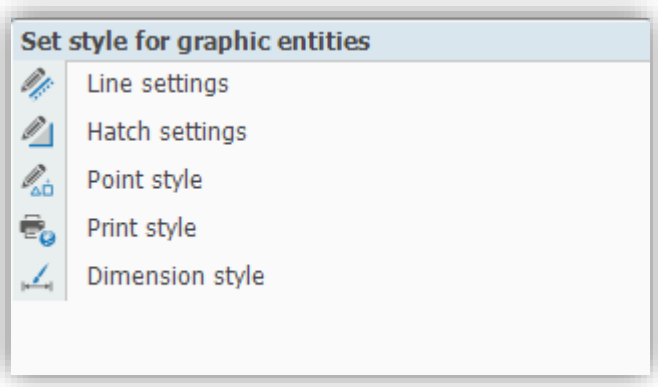


Figure 2.28

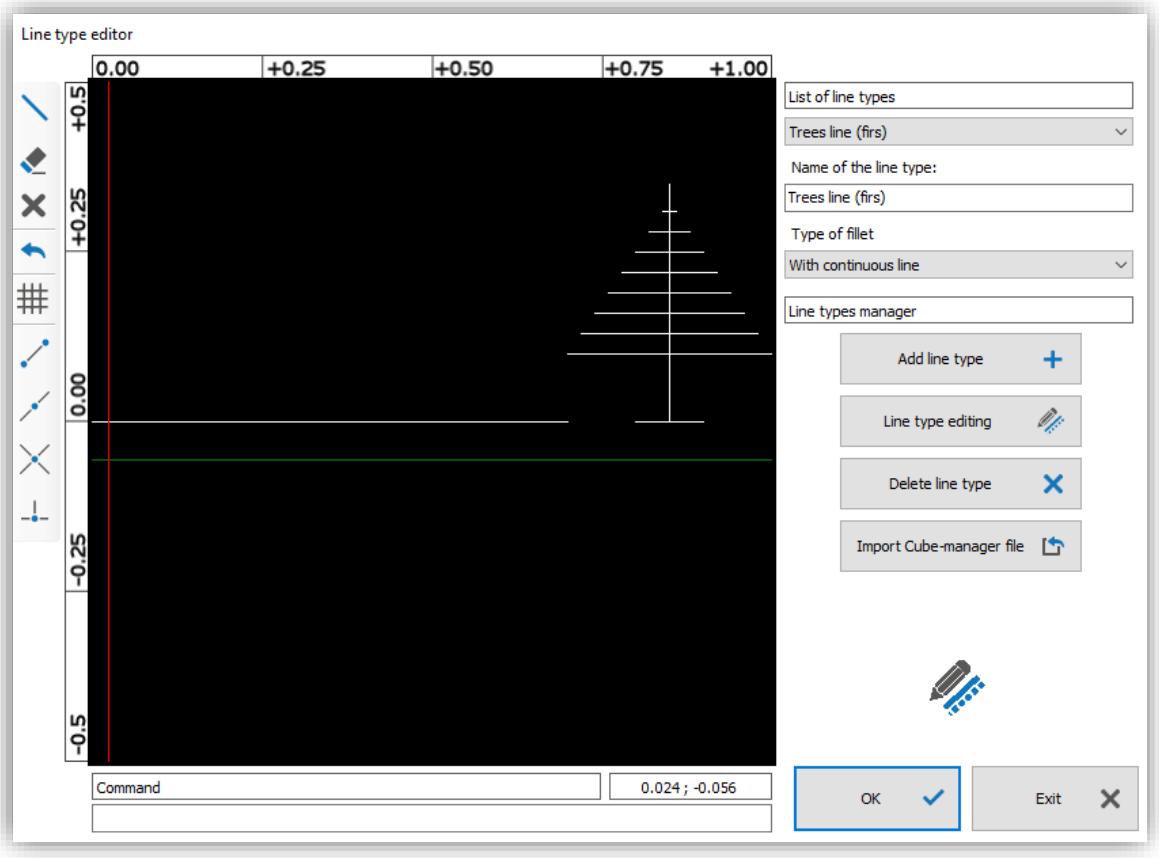


Figure 2.29

From the File Tab it is also possible to access the Upload utility files function which has the purpose of uploading files of two categories (Figure 2.30): image files and database files (the latter only available in the program Cube-manager).

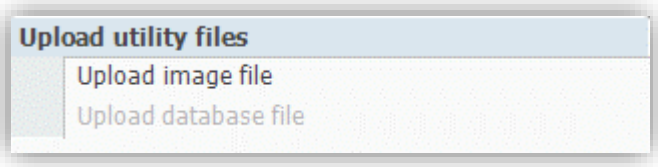


Figure 2.30

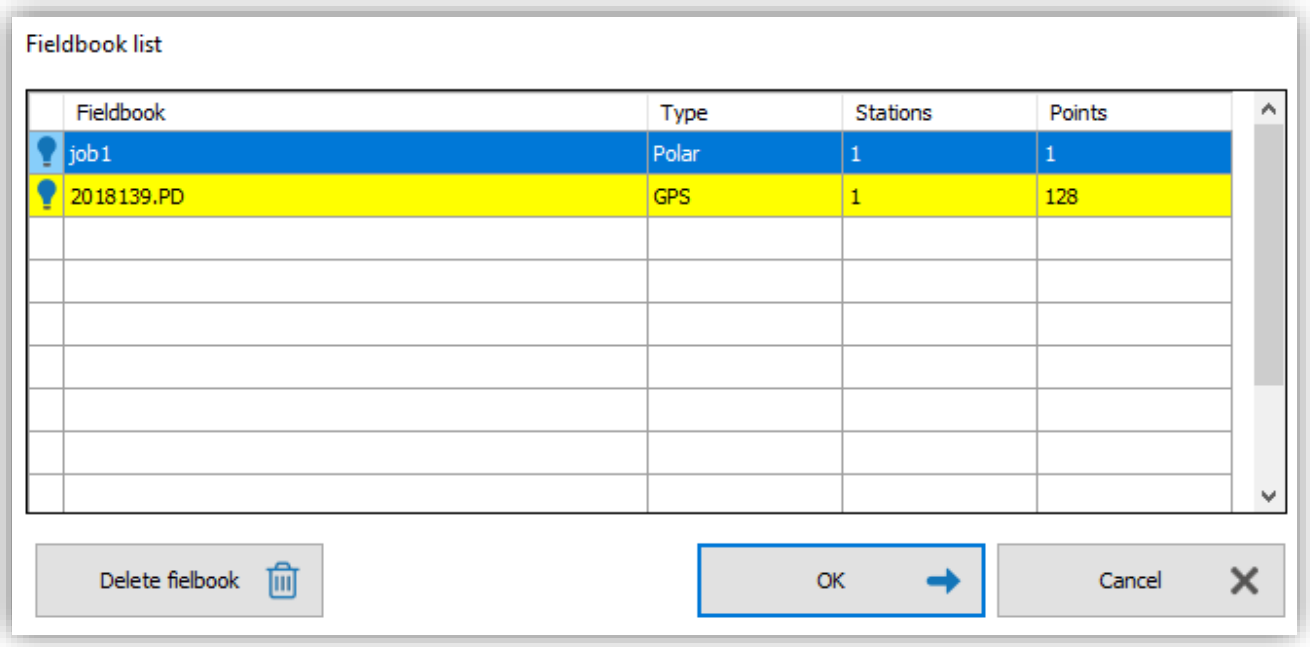


Figure 2.31

You can check how many and which fieldbooks are present in a job by accessing the Fieldbook List function. In Figure 2.31, the information displayed is: the name of the fieldbook, the type, the number of stations and the number of points. The operations that can be performed are: change the visibility of the fielbook (by clicking on the light bulb icon on the left) and delete the fielbook. By deleting a fieldbook it is also possible to delete the topographic points contained in it.

The last two commands in the File tab are: Check for updates and Activate Cube-manager. The first command is for manually check if program's updates are available. Every time the application is started, an automatic check will be carried out to check the availability of new updates (default choice, it can be changed from the Settings section). However, you can also manually check for updates by clicking the button described above. If an update is available

and you decide to download it, the program will ask you to select in which folder you want to save the executable file, after which the download will start automatically.
The Activation Cube-manager button is available only in the program Cube-manager.

2.2 Home (tab)

The Home tab is located at the top of the main screen and contains several sections (Figure 2.32), including the In/Out section (Figure 2.3) described in paragraph 2.1.2, which contains all the formats available for import into the program.

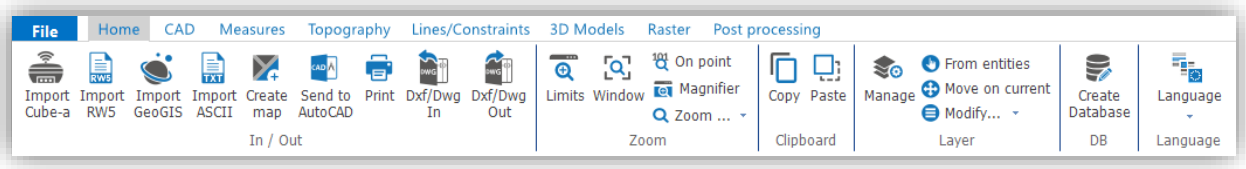


Figure 2.32

2.2.1 Zoom, Clipboard

The Zoom section contains numerous commands for zooming and selecting items in graphics. The commands are: Limits, Window, On point, Magnifier and Zoom that allows you to access a submenu to select the zoom in, zoom out or dynamic pan of the graphic (Figure 2.33). In the Clipboard section you can find the classic copy-paste function.

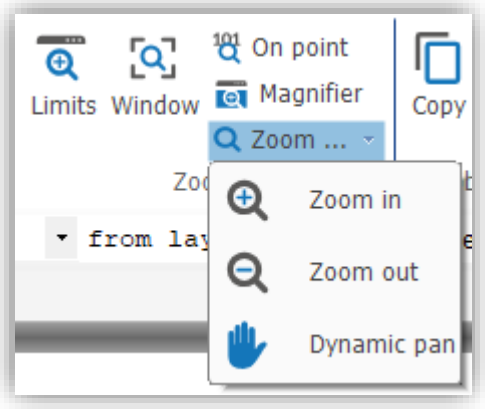


Figure 2.33

2.2.2 Layer

The Layer section is used to manage the various layers in the project. By clicking on the Modify button (Figure 2.34, red circle), you can access the window in Figure 2.35, where you can operate on layers with visibility, selection or block functions.
Layers can also be managed via the Layer Properties Management window, which can be accessed by clicking on the related icon on the main screen (Figure 2.36). In the layer properties window (Figure 2.37), you can create new layers and delete others (in order to delete a layer this must not be used and deselected, a layer is not used when it does not contain graphic elements or topographic points).
This window displays all the available layers and their classic characteristics, such as color and type of line, from here you can print the contents of a layer and decide whether to show the names and symbols present (by clicking on the eye icon). You can also operate on visibility (light bulb icon).

Figure 2.34

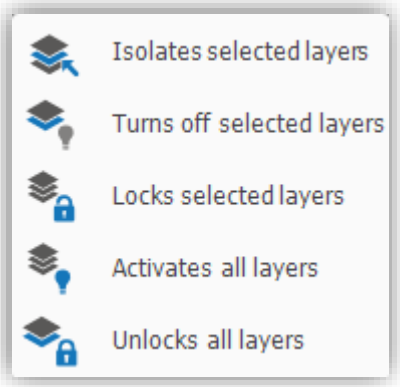


Figure 2.35

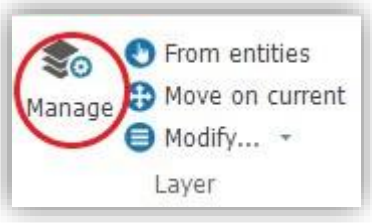


Figure 2.36

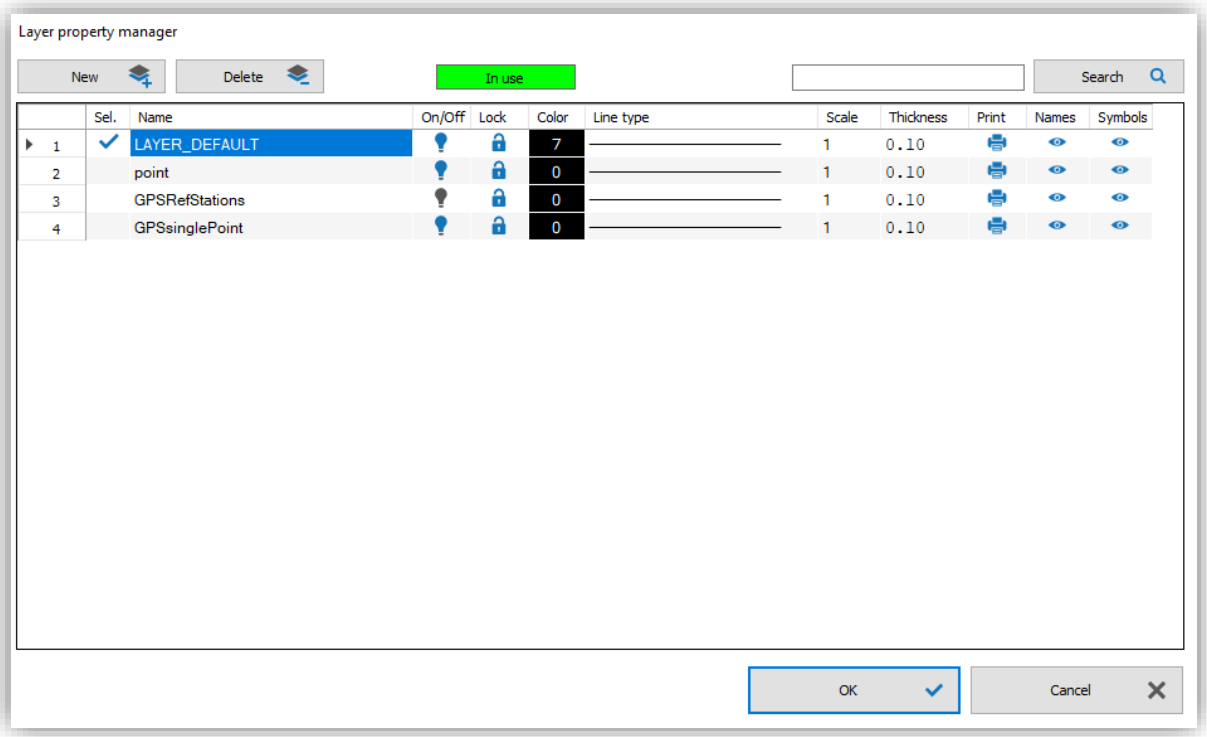

Layer property manager
New
Delete
In use
Search
Sel.
Name
On/Off
Lock
Color
Line type
Scale
Thickness
Print
Names
Symbols
1
LAYER_DEFAULT
7
1
0.10
2
point
0
1
0.10
3
GPSRefStations
0
1
0.10
4
GPSsinglePoint
0
1
0.10
OK
Cancel

Figure 2.37

2.2.3 DB

Availability	Module
Cube-manager (Figure 2.38)	P-T-M

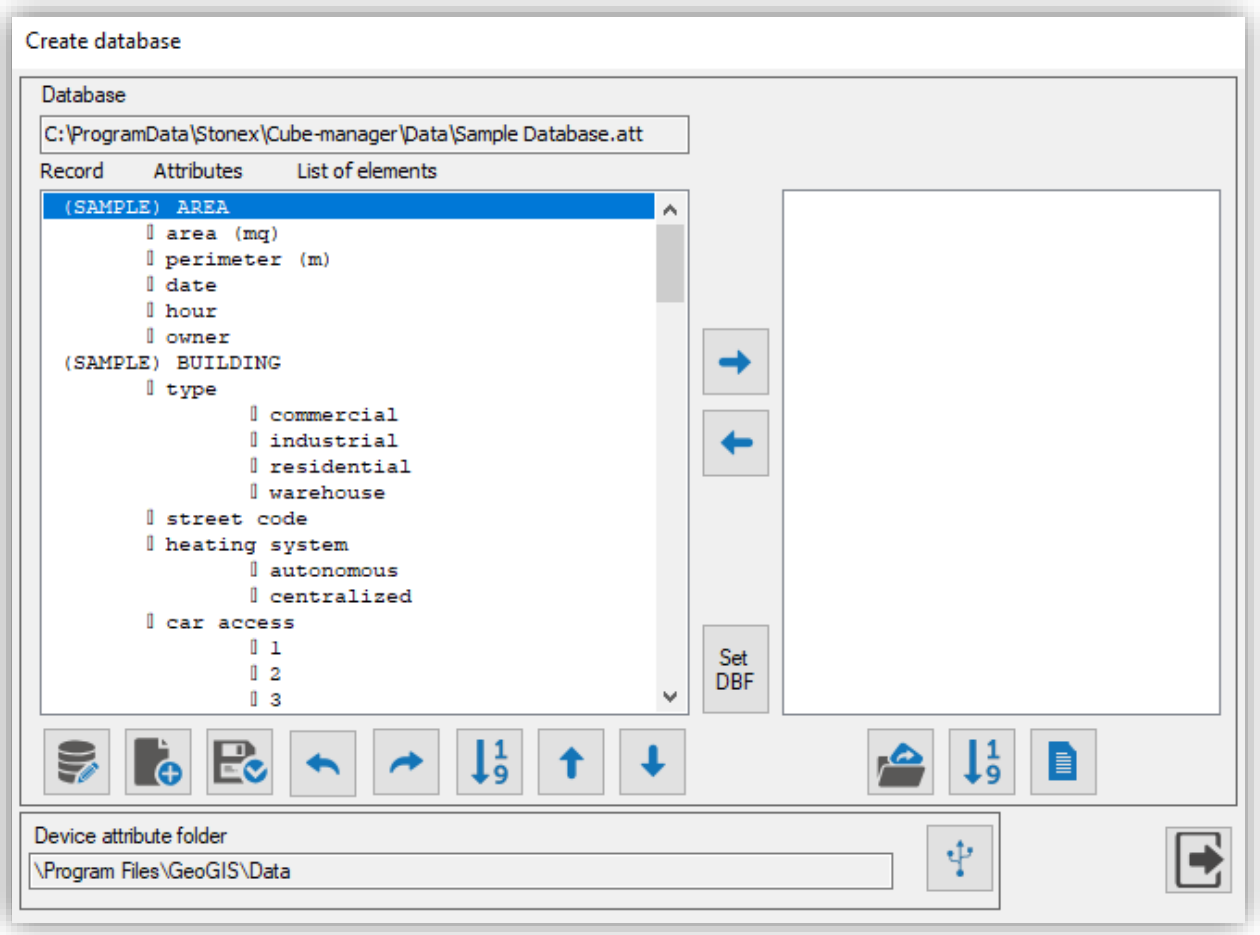


Figure 2.38

2.2.4 Language

By pressing the language button, you can select the language of the program. We recommend restarting the program after changing the language.

2.3 CAD (tab)

By clicking on the CAD tab (Figure 2.39), it is possible to access the area dedicated to design and CAD processing, which aims to support and integrate the topographic elements.
These functions are like AutoCAD® ones and its many clones. This section is divided into two parts: draw and modify. In the Draw section (Figure 2.40) you can find commands to draw CAD entities such as lines, polylines, polygons and so on. Once you have selected the element you want to draw, just follow the instructions (represented by the suggestions that will appear on the screen and/or before the command line) to complete the command (Figure 2.41, example of a suggestion on the screen for drawing a line; Figure 2.42, example of a suggestion before the command line).
Often, with the suggestions before the command line at the bottom left of the main screen, other subcommands are available (to the right of the command line). When the subcommands are visible, to use them just write them in the command line and click on enter (or simply click on them).
The subcommands are very intuitive to use, however there is a command that is worth analyzing, the 'pro' command for properties (Figure 2.43, second command from the right). This command opens the Quick entities selection window (Figure 2.44), which consists of two tabs. The first tab called 'CAD entities' allows you to select entities by referring to one feature or another, e.g. color and type of line. The second tab is called 'Topographic Points' and allows you to select the points based on their characteristics. As you can see in Figure 2.45 a wide range of attributes is available, from points with a given point symbol to point in the same fieldbook.

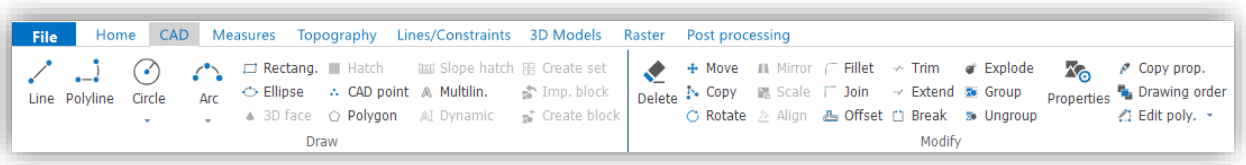


Figure 2.39

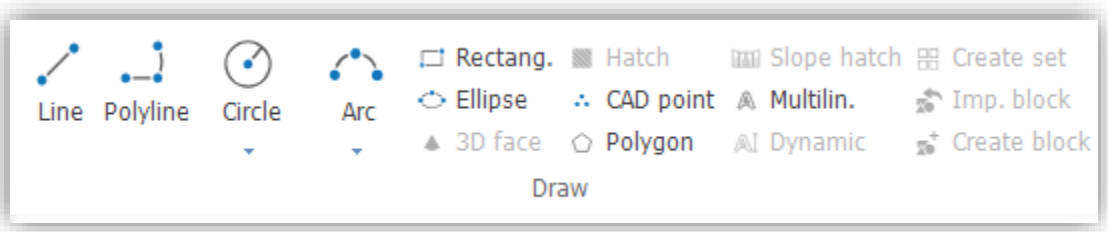


Figure 2.40

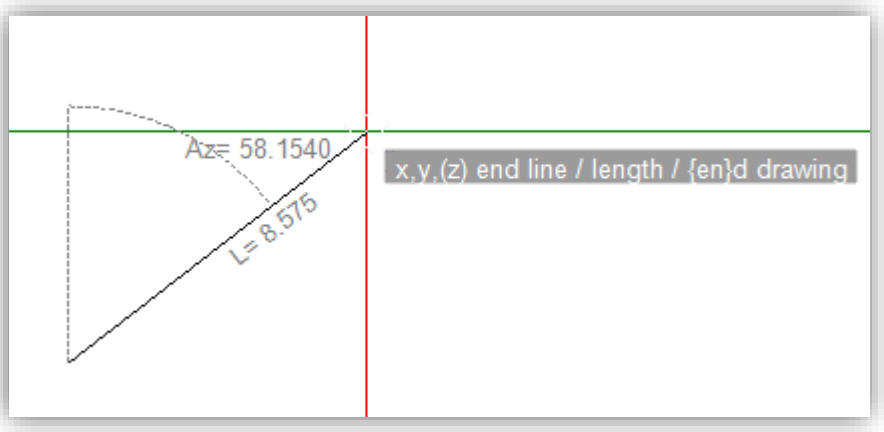


Figure 2.41

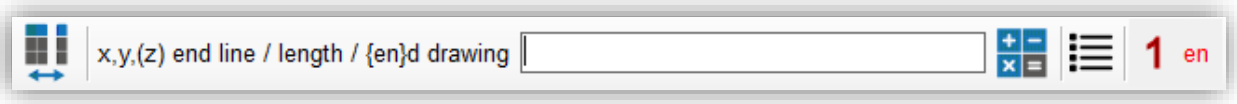


Figure 2.42

Figure 2.43

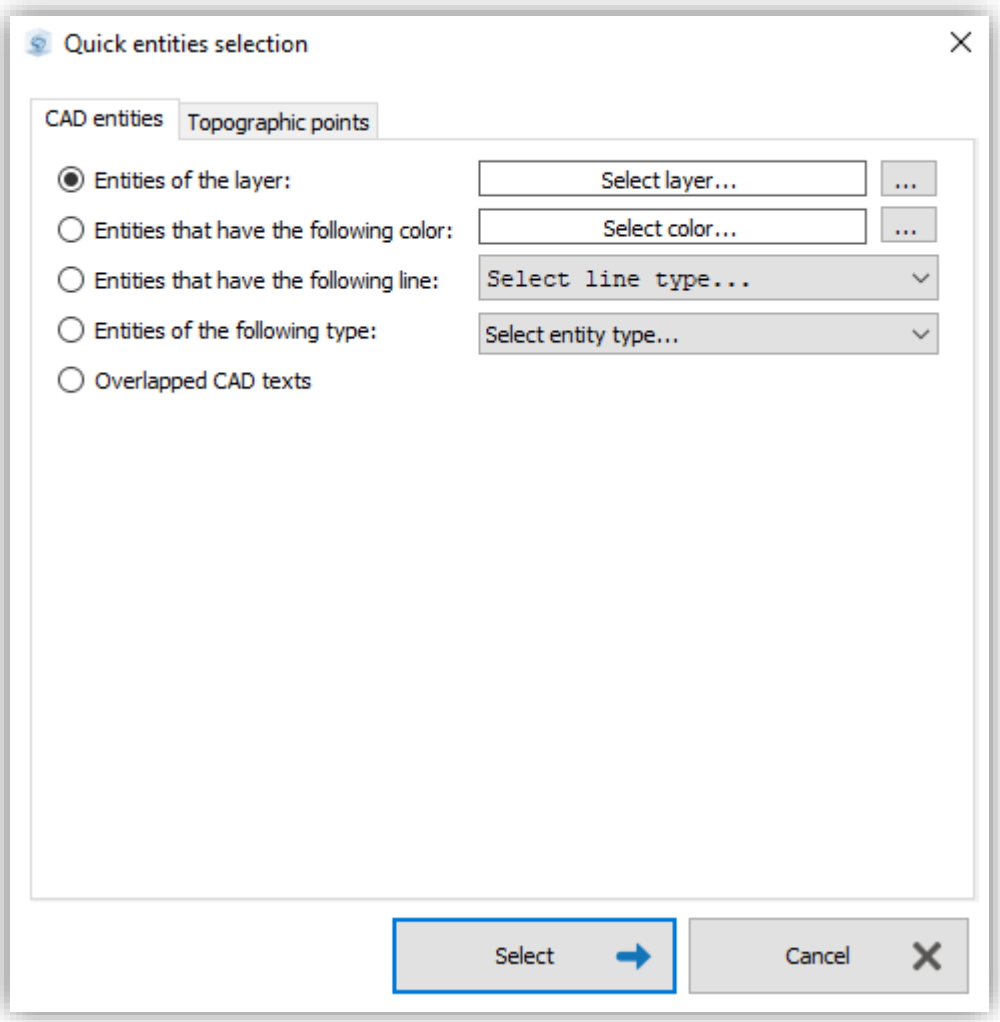

Quick entities selection
CAD entities
Topographic points
Entities of the layer:
Select layer...
...
Entities that have the following color:
Select color...
...
Entities that have the following line:
Select line type...
Entities of the following type:
Select entity type...
Overlapped CAD texts
Select
Cancel

Figure 2.44

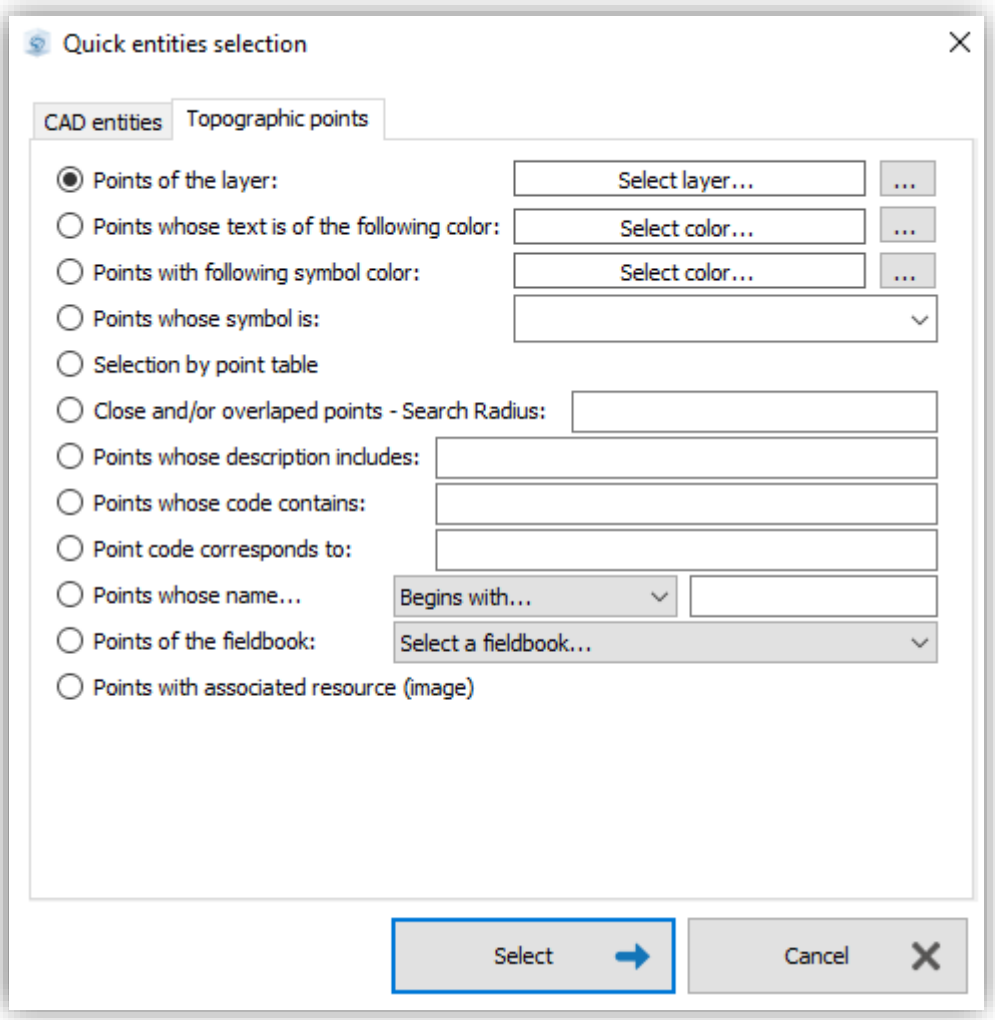


Figure 2.45

The commands in the Draw section can be used with OSNAP (object snap) functions, such as OSNAP on the ends or midpoints. Note that by default the program starts with an OSNAP active on the ends. This setting can be changed at any time by clicking on the Osnap (on/off) button at the bottom of the main screen, shown in Figure 2.46 in dark gray (active).
All the OSNAP modes are represented by the icons in Figure 2.47, passing with the mouse on them you will see a suggestion on the functionality of the command.

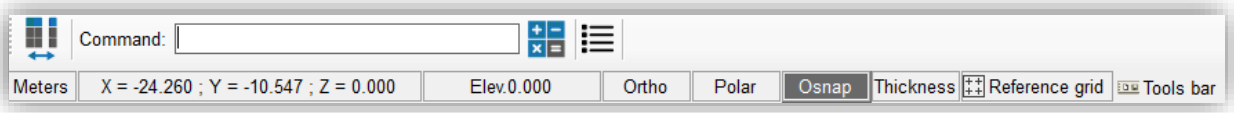


Figure 2.46

Figure 2.47

In the Modify section of the CAD tab (Figure 2.48), you can find all the functions for processing CAD entities. The names and the icons of the commands are very intuitive, and each command has a tooltip that briefly explains what its functionality is. Among the available commands there are explode, group, ungroup; these commands are useful for working with CAD entity groups.

The Properties button generates a window that summarizes the properties of the selected entity, the system recognizes what type of entity it is and at the bottom it shows this information (Figure 2.49, in this case it is the properties of a polyline).

There is also a command to copy the properties of one entity on another and a command to change the order in which the drawings are displayed.

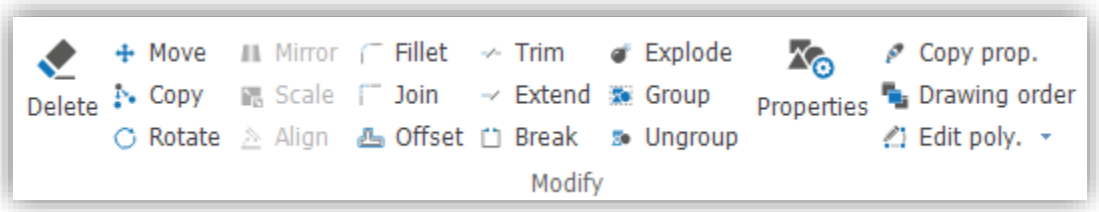


Figure 2.48

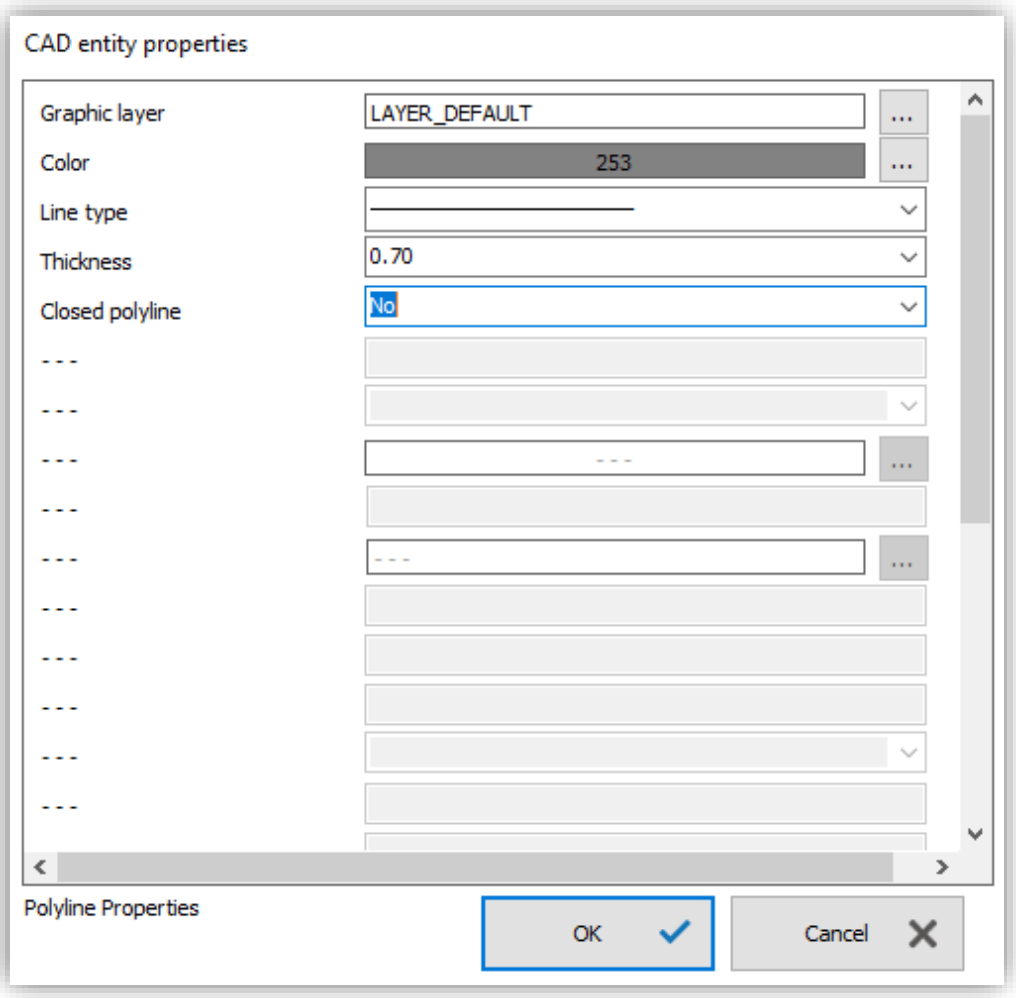


Figure 2.49

Figure 2.50 shows a popup window related to the Edit poly command. The submenu contains commands for modifing the polylines, for example by inserting a vertex or by removing it. The use is very simple and, like any other CAD command, just follow the suggestions that appear on the screen.

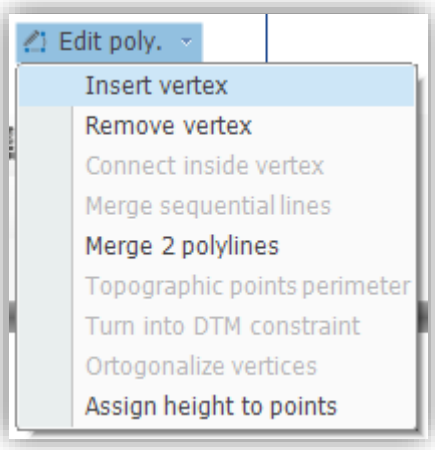


Figure 2.50

2.4 Measures (tab)

The functions in this section (Figure 2.51) are used to calculate and display information on surveys' data. This section is divided into three areas below: Measure, Calculations, Dimensions (available only in the program Cube-manager).

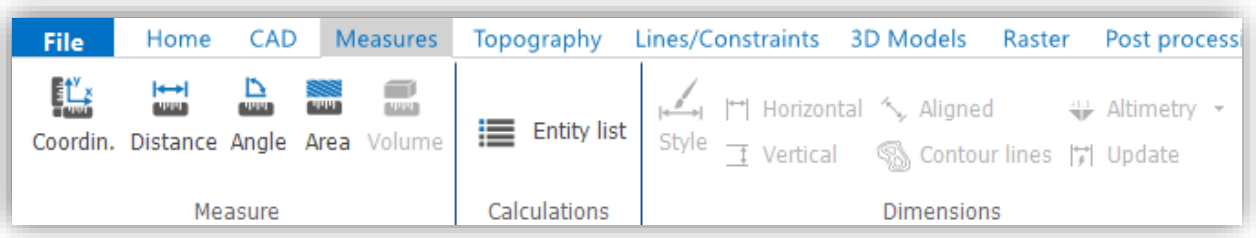


Figure 2.51

The Coordin. button will give the possibility to choose a point and then show the Cartesian coordinates (with the addition of the height) of that point, as shown in Figure 2.52.

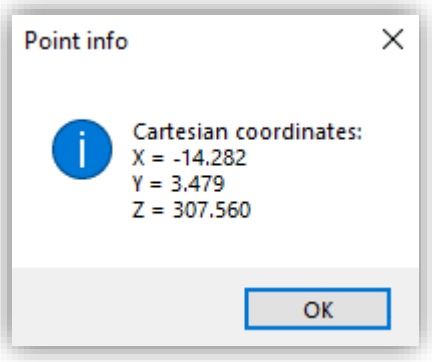


Figure 2.52

The Distance will give the possibility to select two points and measure the distance between them. The information provided by this function is the 3D distance, the horizontal distance, the components along the three axes, the azimuth angle and the zenith angle (the graphic appearance of this information is like that one shown for the Coordin command).

The Angle button will give the possibility to select 3 points: the start point, the midpoint and the end point. This function will calculate a clockwise angle and a counterclockwise angle (the graphic appearance of this information is like that shown for the Coordin command).

The Area button will allow you to insert the first point in which to start calculating the area, then the application will continue to ask to select the next point (up to n points) to draw the shape for the area measuring; after selecting the last point, just type the command "en" (in the command line, from the "end" command) so the function will compute the calculation.

The area and the perimeter of the drawn shape will then be displayed in a popup window, with a graphic like the one shown for the Coordin command.

The Entity List command, in the Calculations section, provides a list of the elements in the project, the list is presented as an editable text file. It is also possible to select just a part of the entities to display them in the list (Figure 2.53).

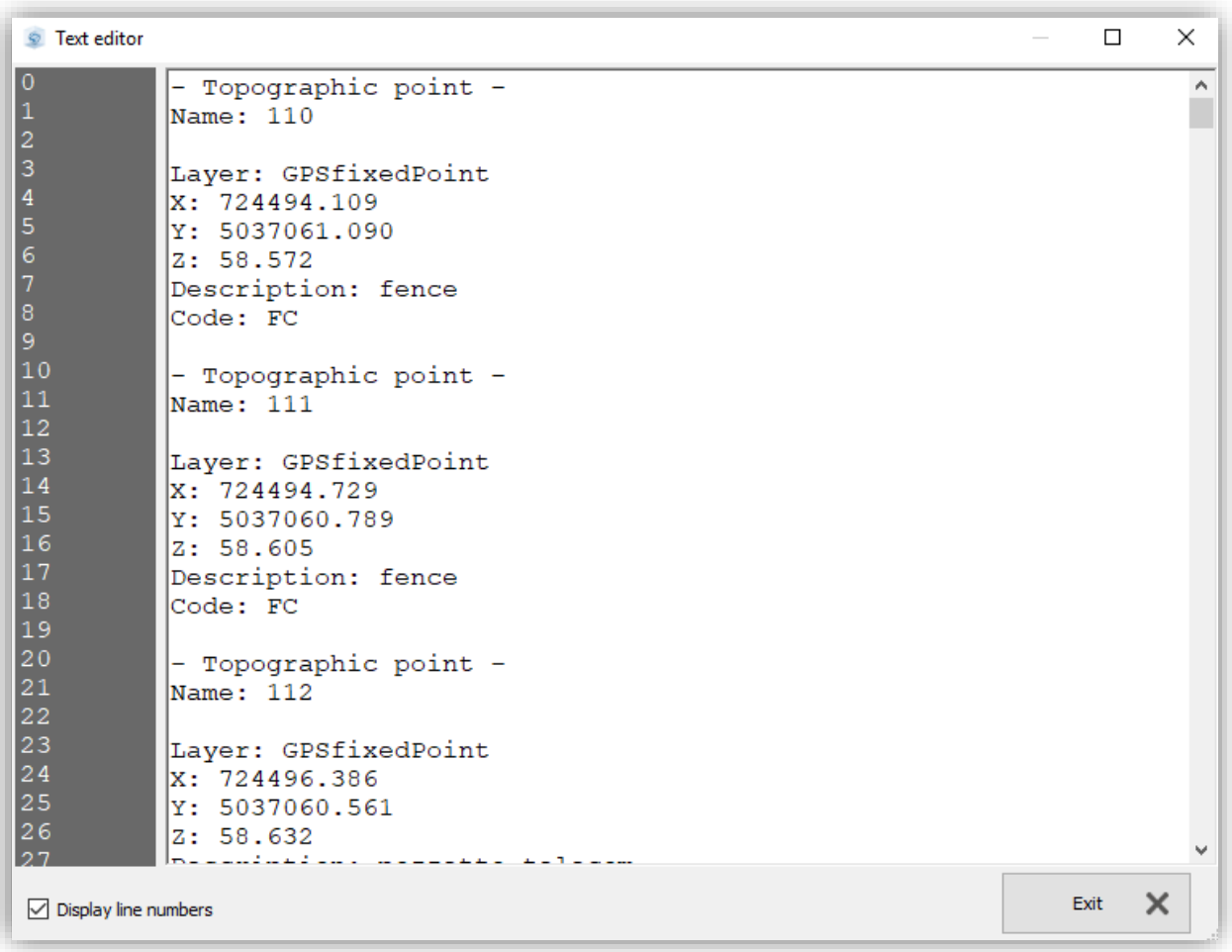


Figure 2.53

2.5 Topography (tab)

The topographic section (Figure 2.54) consists of four subsections: Topographic points, manage coordinates, Fieldbook and Fieldbook schema (available in the program Cube-manager). In the Topographic points it is possible to draw a new topographic point, to modify the characteristics of an existing one, to select the CAD entities to be used to create new points and to see all the points of the project grouped in a table. You can also create a printable file with a list of points. In the Fieldbook section there are the commands to work with polar fieldbooks. You can manually create a fieldbook, import it from the PC or import it directly from the total station and export coordinate files.

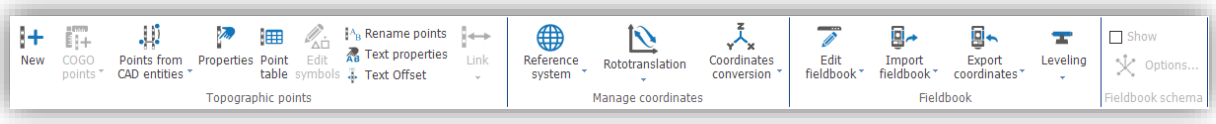


Figure 2.54

2.5.1 Topographic points

The Topographic points section is shown in Figure 2.55. The New command is used to insert new topographic points, by clicking on this button, you can access a window (Figure 2.56, Topographic point properties), where you can insert and customize the graphic properties of the created point.
The properties are completely customizable (note: it is possible to create a point with the properties that the application sets by default, e.g. the cross as symbol) and you can select the layer to which the point must belong (by clicking on search button next to the Graphic layer label). The Select Layer window (Figure 2.57) shows a list of available layers, all of which can be activated or deactivated, locked or selected. You can add new layers by clicking on the Add Layer button on the bottom left.
You can also change the name of the point and the font used. You can also change the text color selecting a new one in the window in Figure 2.58, by clicking the search button next to the Text color label. This window allows you to select a color from one of the available clusters (general colors, grayscale, main colors or layer).

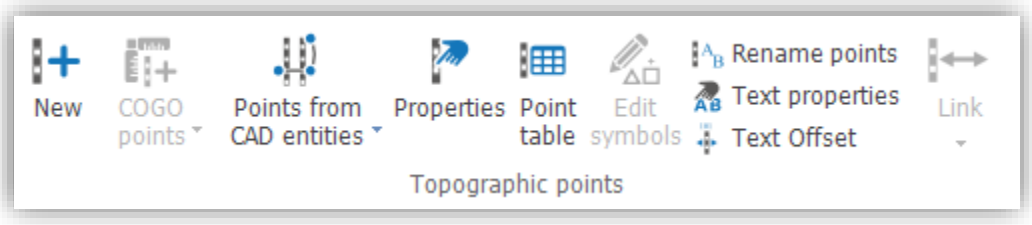


Figure 2.55

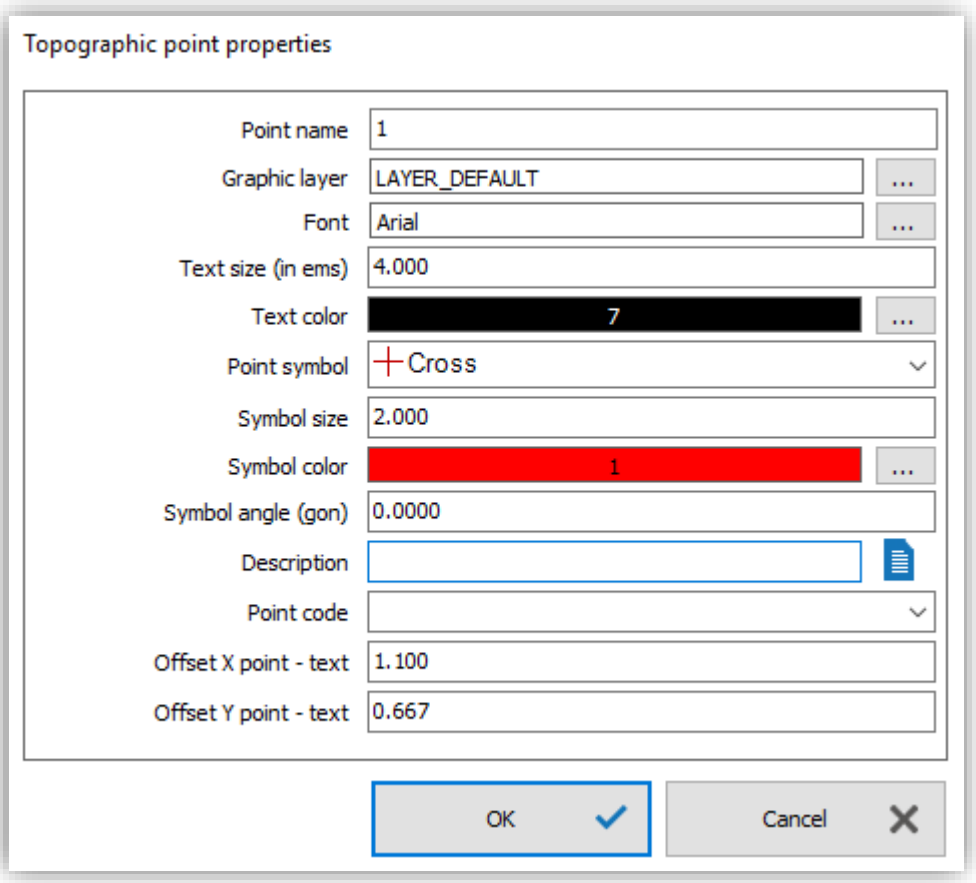

Topographic point properties
Point name
1
Graphic layer
LAYER_DEFAULT
Font
Arial
Text size (in ems)
4.000
Text color
7
Point symbol
Cross
Symbol size
2.000
Symbol color
1
Symbol angle (gon)
0.0000
Description
Point code
Offset X point - text
1.100
Offset Y point - text
0.667
OK
Cancel

Figure 2.56

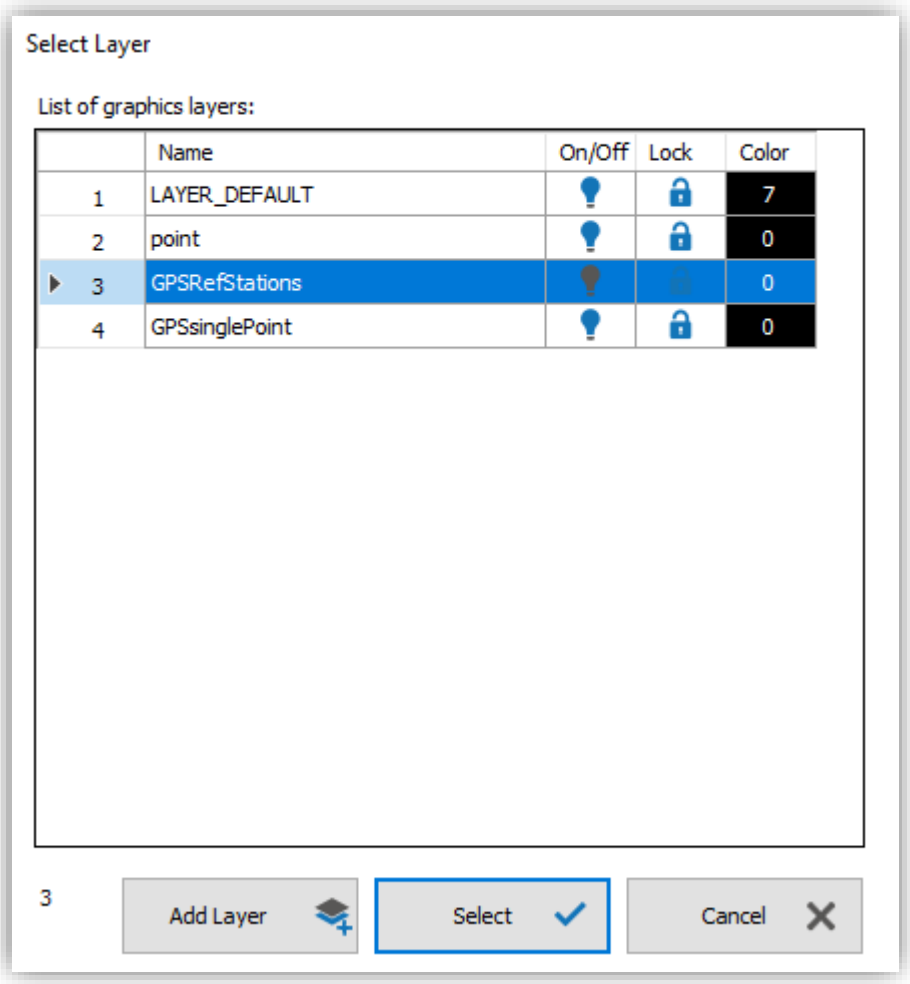

Select Layer
List of graphics layers:
Name
On/Off
Lock
Color
1
LAYER_DEFAULT
7
2
point
0
3
GPSRefStations
0
4
GPSsinglePoint
0
3
Add Layer
Select
Cancel

Figure 2.57

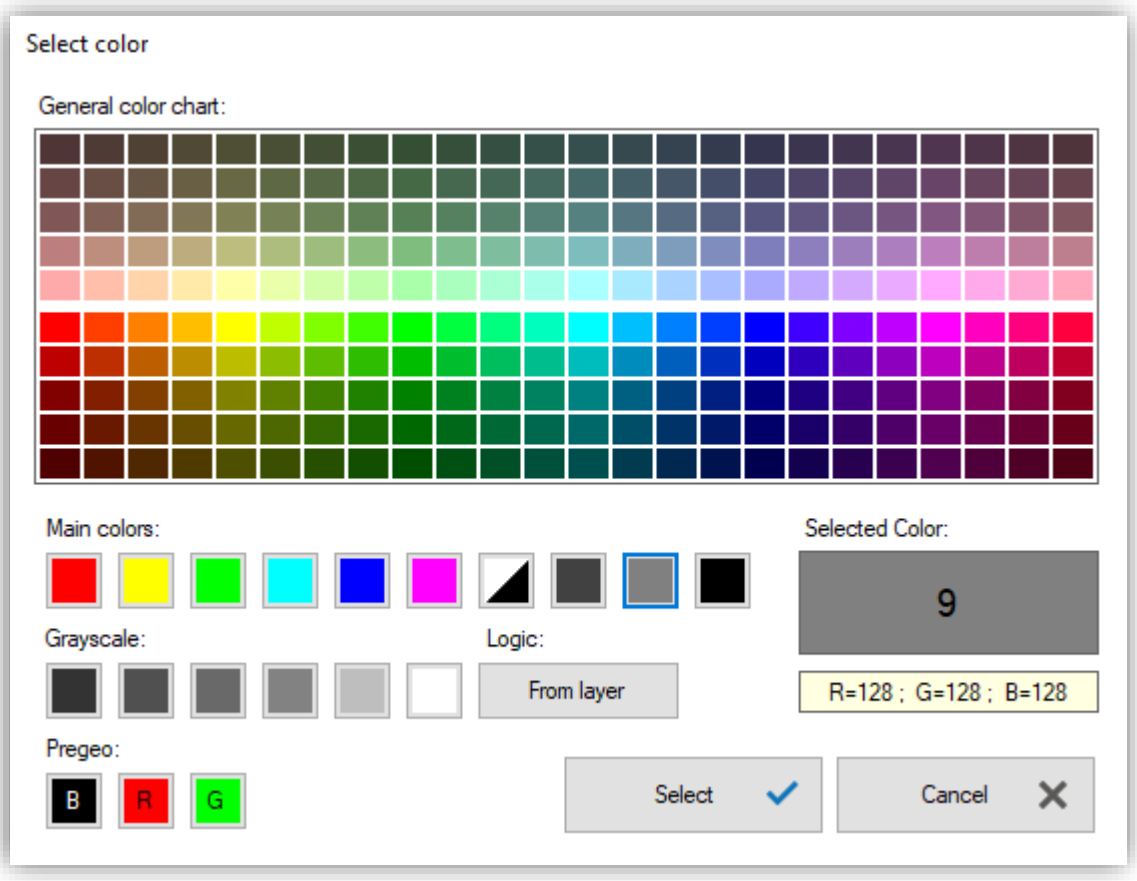


Figure 2.58

The symbol is another feature that can be customized. You can choose a symbol to assign to the point (Figure 2.59, drop-down menu for symbol selection), you can define its size, color (with a selection window equal to the text color selection) and the rotation angle of the symbol. Offset X point-text and Offset Y point-text are the positions of the text calculated from the origin of the point.
As for the Description label, by clicking on the icon next to the label you will access a window where you can view a list of possible descriptions (Figure 2 60). You can select existing descriptions or add new ones, saving the file with the destination to be specified. If a similar file has already been saved, you can select it and display it to use it.
When all the graphic properties have been set, it is possible to insert the point by identifying the position with the mouse or by manually entering the coordinates from the command line.

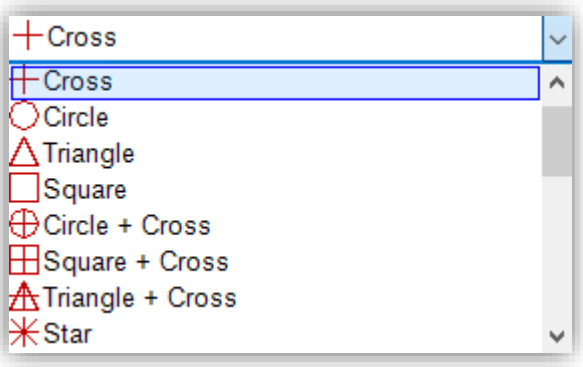


Figure 2.59

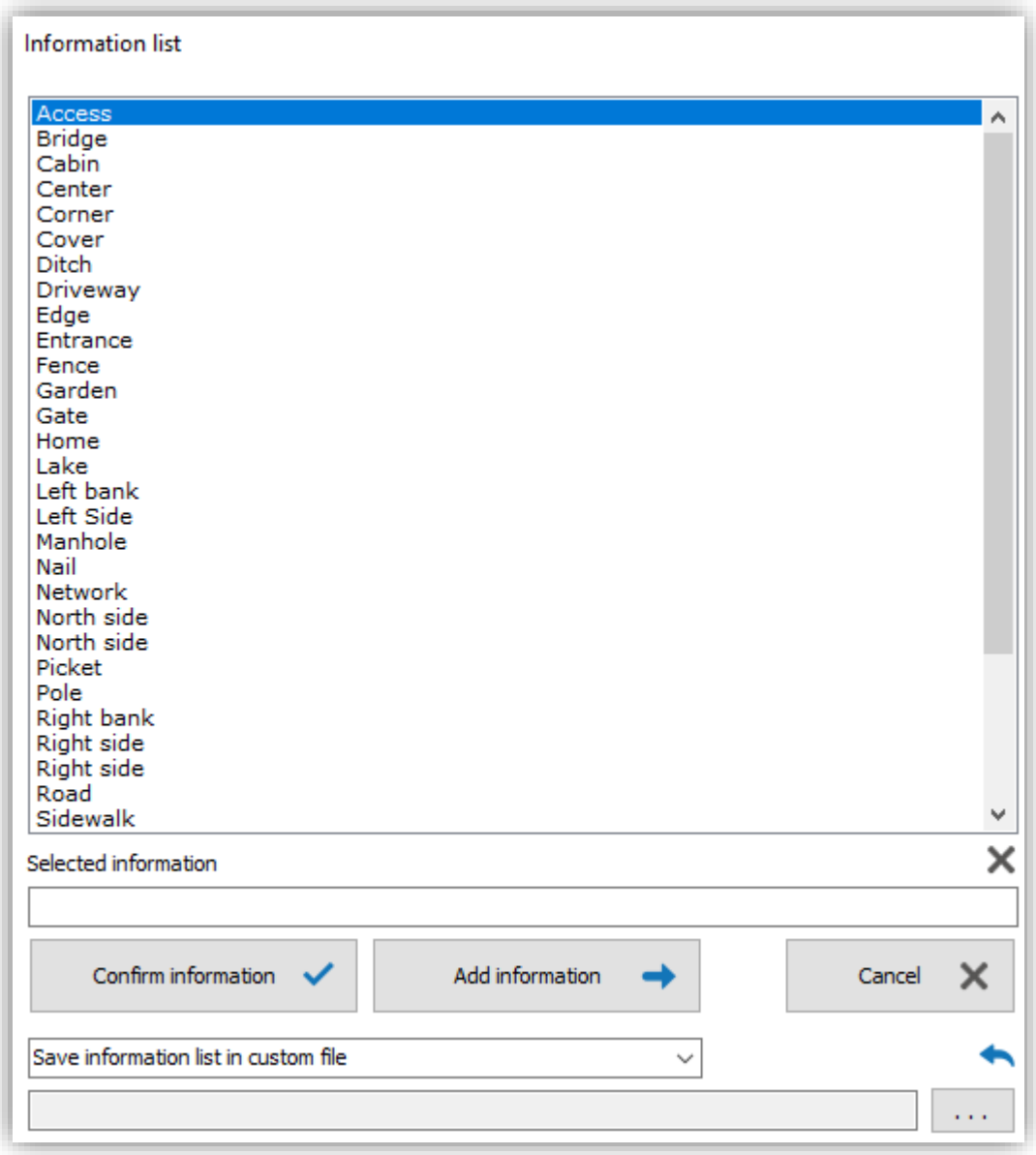


Figure 2.60

TheCOGO commands (Figure 2.61) are available in the program Cube-manager.

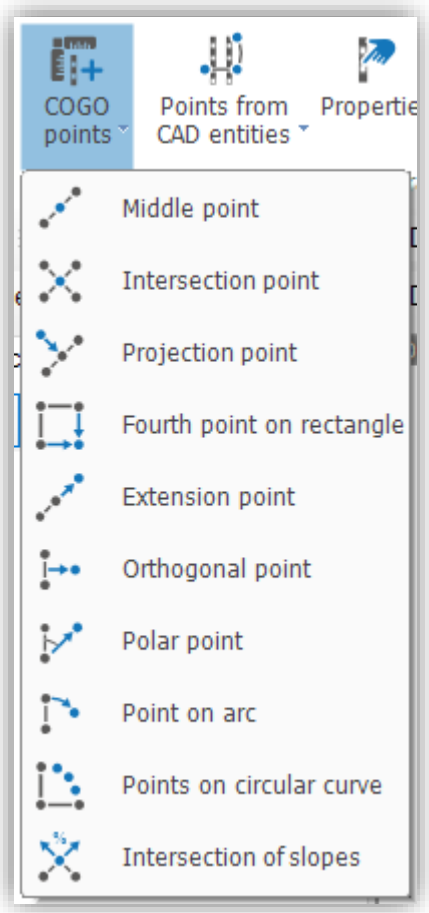


Figure 2.61

By clicking Points from CAD entities (in Figure 2.55), you can access two commands: Characteristic Points and Equidistant Points or with steps (only available in the program Cube-manager). Using the first, you can select one or more CAD entities to create topographic points. In the Characteristic Points window (Figure 2.62), you can select a layer (having access to the Select Layer window, as explained above). You can enter the name of the starting point and delete the overlapping points. Within this function you can further filter the CAD entities to be used by marking the available choices.
The second command, the Equidistant Points or with steps, can be used to create topographic points by dividing a CAD entity into equal parts or based on a step, to use the command just follow the instructions that appear next to the command line.

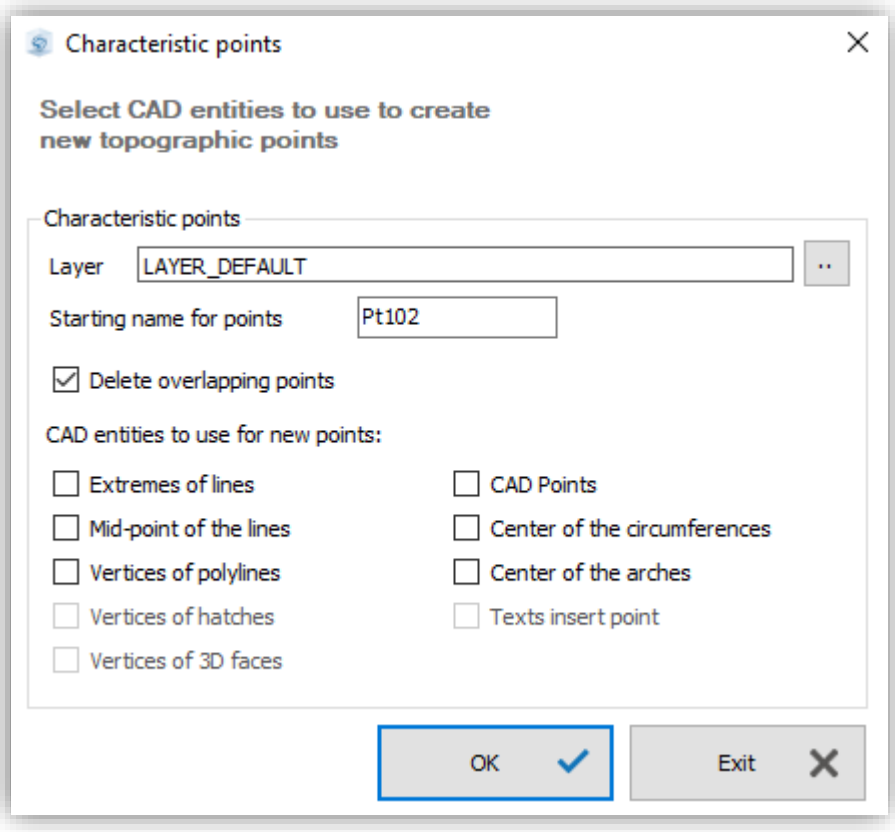


Figure 2.62

Returning to the section in Figure 2.55, the next command to explain is the Properties command (Figure 2.63), once you have selected one or more topographic points you can use this function to discover all their properties and to modify them.
This window consists of four tabs: General, Graphics, Coordinates, Image.
In the General tab you find information about the name, description, point code. From this screen you can set the information displayed in graphics as point label (point text). To change the label of the point just select the items you want to insert from the drop-down menu and press the insert button (one item at a time), you can also set the X and Y offset of the point text.
The Graphics tab provides information about the font (font, size, color) and the symbol (icon, size, color, rotation) of the point.
In the Coordinate tab (Figure 2.64), you can read the coordinates Est, North and Quota (as average of the coordinates of the various origins of the point), with the relative standard deviation. You can change the coordinates manually by selecting the fixed coordinates command. In the table called Origin of the coordinates, the origins of the selected point are shown, for each origin the name of the fieldbook, the type of origin, the station from which it is measured, and the coordinates are reported.
The buttons below the table are: Create new point from selected origin (available only in presence of multiple origin); Properties of the selected origin (opens a screen as in Figure 2.65, where you can view all the information related to the point, some are editable other read-only); Fixed coordinates from selected origin.

The Image screen allows you to see if and which images are associated with the selected point.

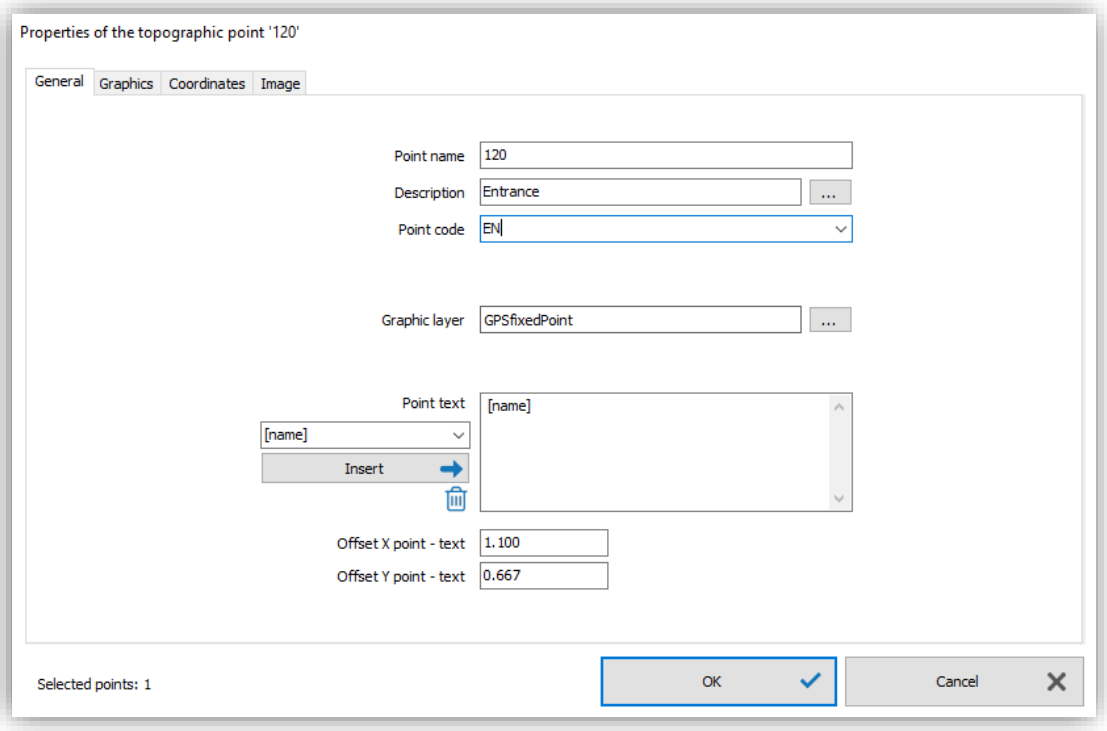


Figure 2.63

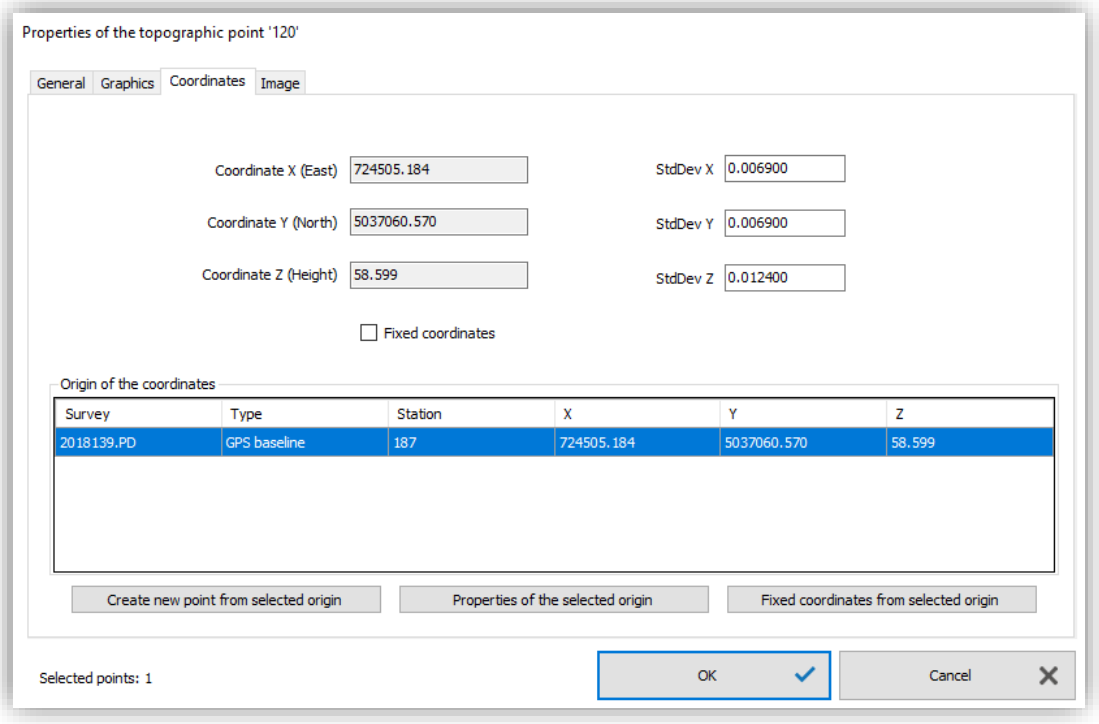


Figure 2.64

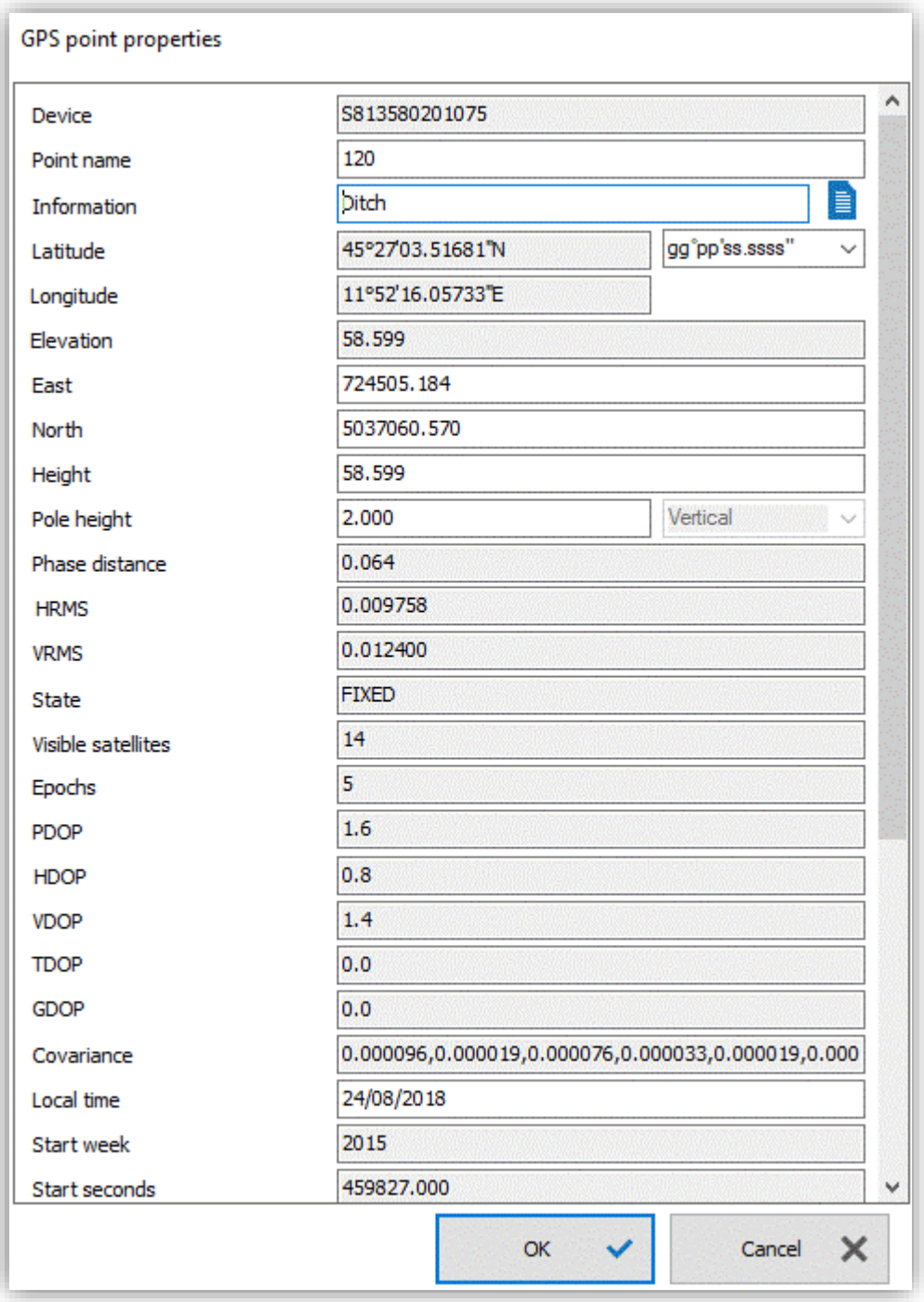


Figure 2.65

By clicking on Table points button in Figure 2.55, you can create a table with a list of all the points in the project that will be grouped together with their coordinates, names, descriptions and codes, as shown in Figure 2.66 (an example of a table with 128 points in memory).

You can also print the table with the Print button. This button will open a text file editor where the table with all the points will be visible, at this stage the table can be modified in its fields, contents and graphic appearance.

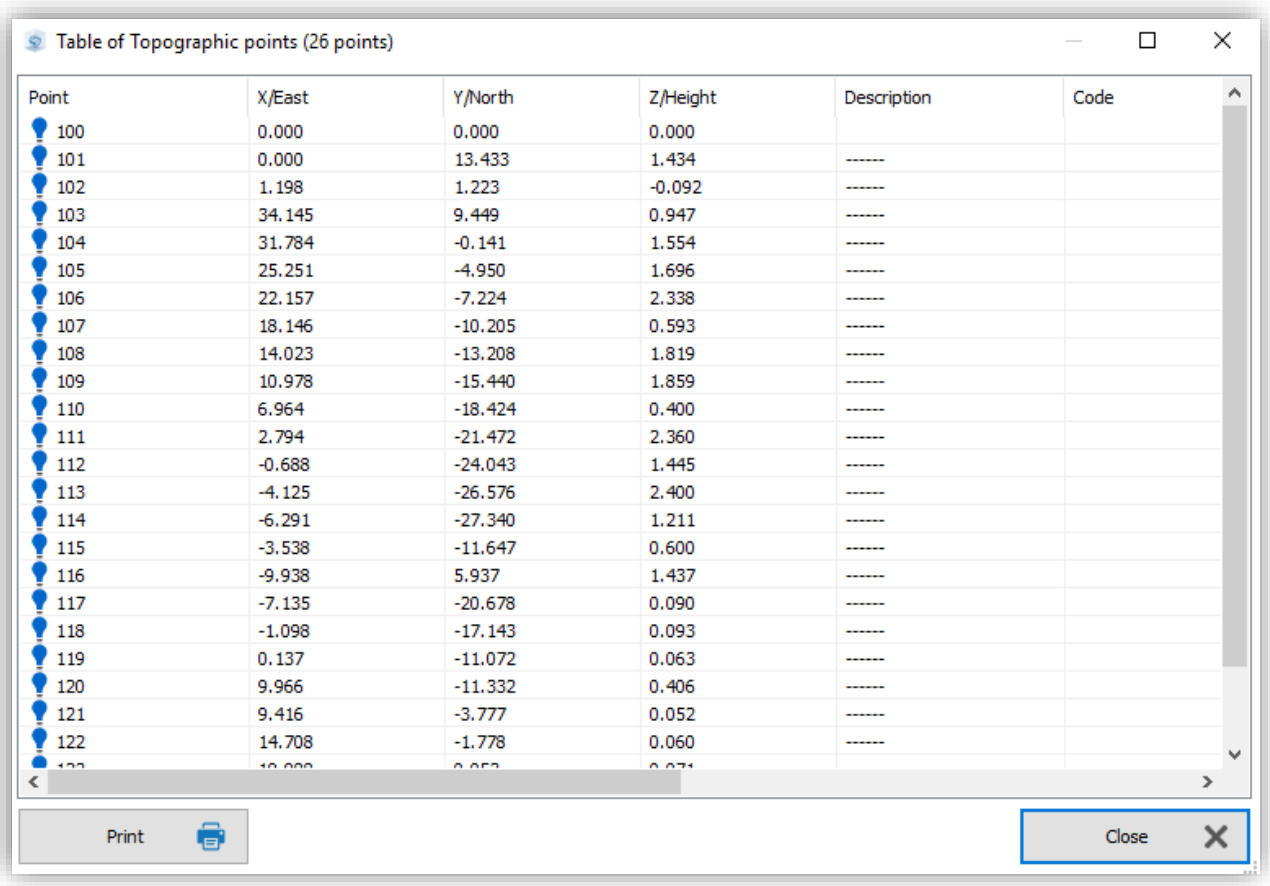


Figure 2.66

The following three commands in the Topographic points section in Figure 2.55 are: Rename points, Text properties, Text offset; their use is rather intuitive and are only the repetition for the convenience of the user of some functions already present in the Topographic Point Properties window.

2.5.2 Manage coordinates

The Manage coordinates section is shown in Figure 2.67, each of these commands opens pull-down menus with other subcommands. Below the description of all af them.

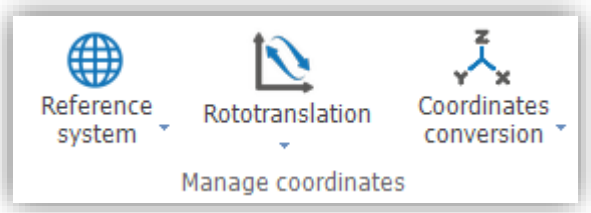


Figure 2.67

2.5.2.1 Reference system

This command consists of four subcommands, each of which opens a new screen.
Preset reference system (Figure 2.68) allows you to select a reference system and save it as a default system (the program must always have a set reference system and will automatically take the user to this window, if no reference system is set). In this screen you can select the country and and its Projections, among those available. You can also select the Geoid from the drop-down menu that will show all available ones. A Projection can be changed in its values by clicking on the Create New button, so the new edited projection can be saved (it is saved in the previously selected country, in the projections' drop-down menu, in the last position.) To delete it, press Create again, select the Projection and click delete). By clicking Show parameters, you can view the values of the chosen Projection.

The local reference system command leads to the screen in Figure 2.69. Setting a local reference system deletes the predefined reference system. To access the local reference screen, there must be at least one topographic point in the active project, considered as the origin point. Normally the program will select the first point of the list as the origin point, you can always select a new point, among those available on the left at the bottom of the list of points. On the right side of the screen you can set the Geoid, the Ellipsoid and some of its values, it can also be set the method of calculation that you intend to use in the generation of the system.

The Calculation 7 parameters command (Figure 2.70) in available only in the program Cube-manager.

Add preset system opens a screen as in Figure 2.71. This window with the relative functionalities is the same that is generated if you press the Create new button from the screen relative to the Preset reference system command.

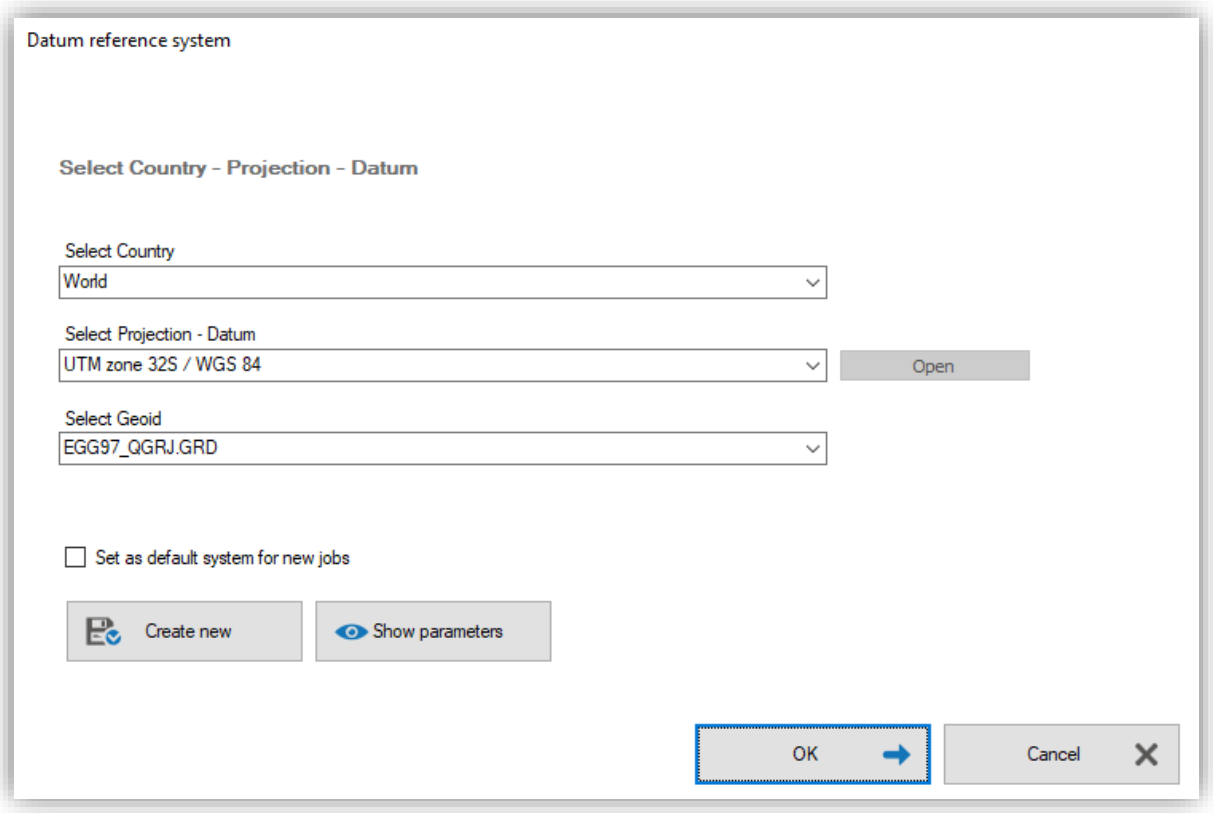


Figure 2.68

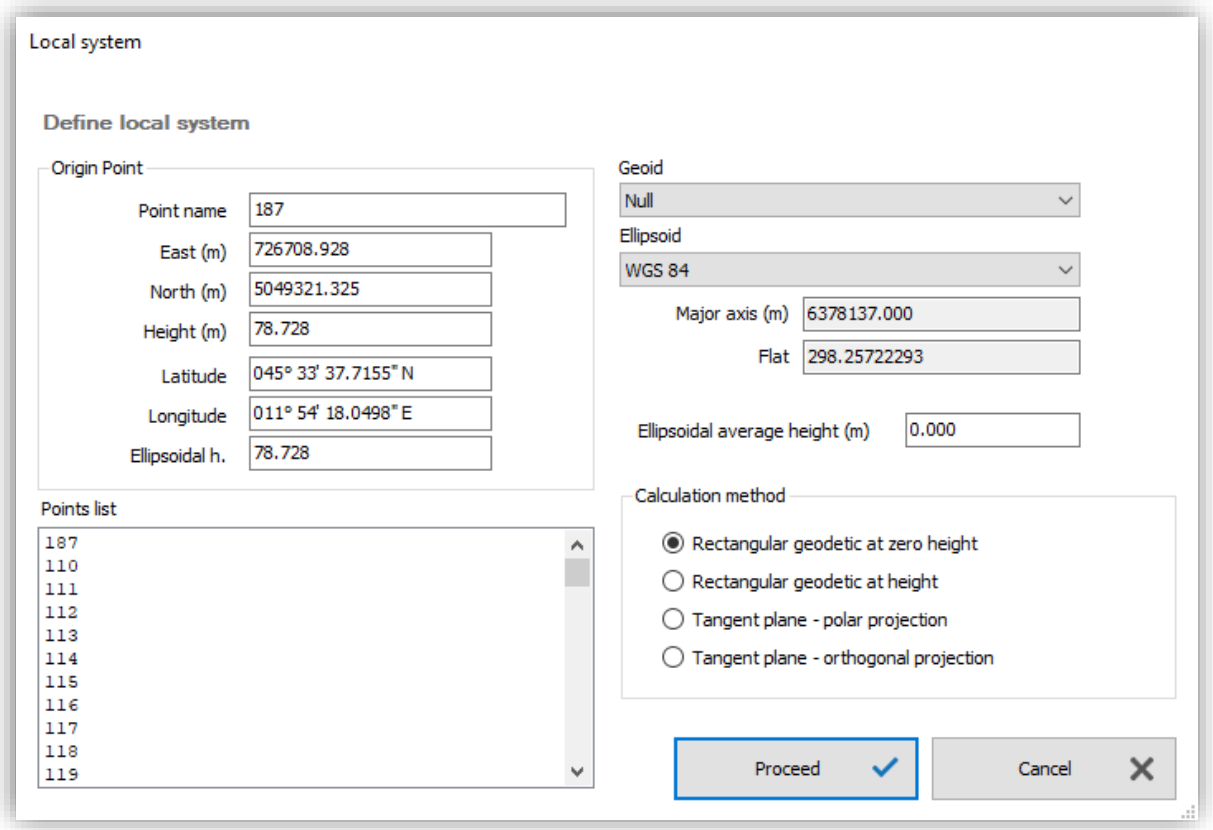


Figure 2.69

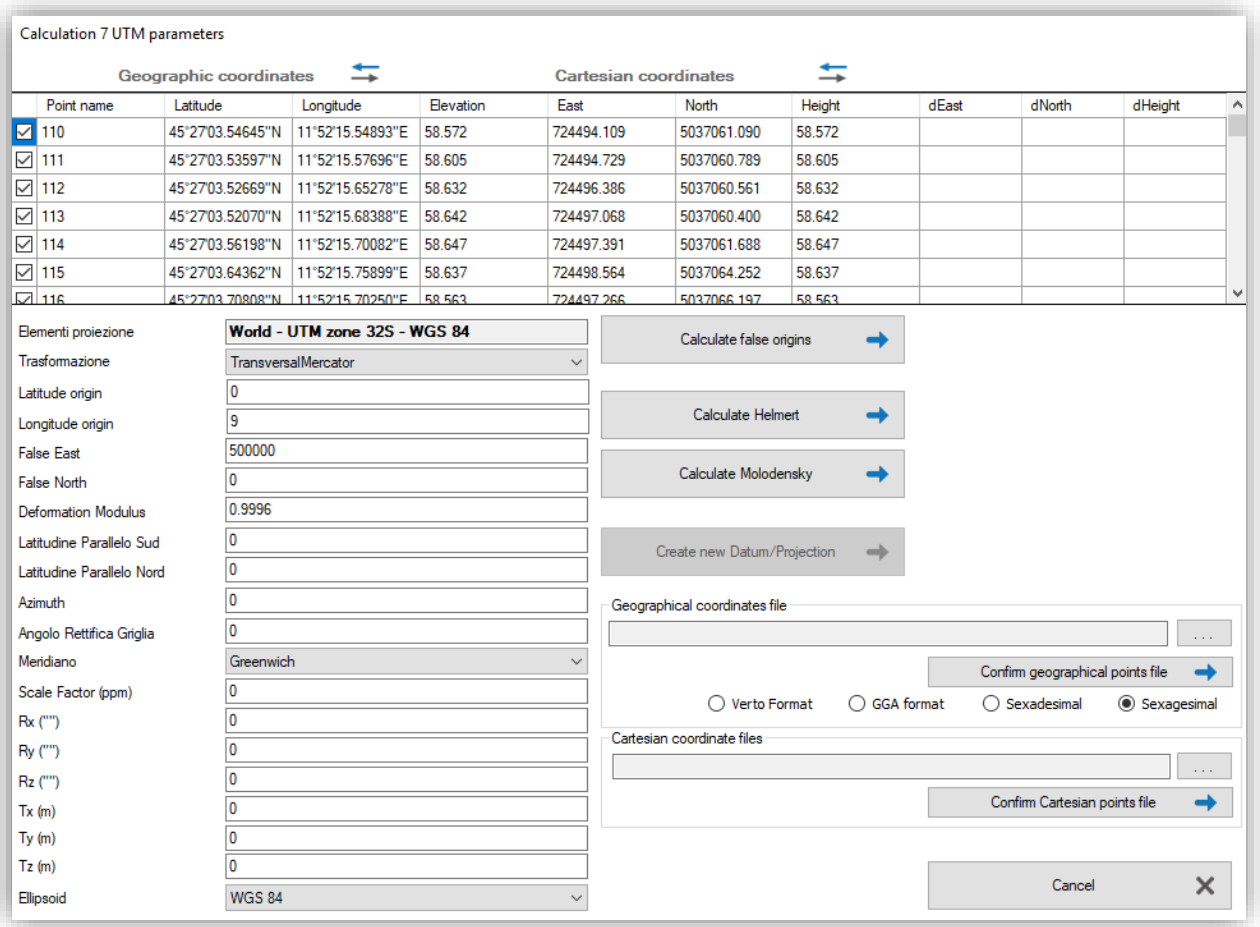

Calculation 7 UTM parameters
Geographic coordinates
Cartesian coordinates
Point name
Latitude
Longitude
Elevation
East
North
Height
dEast
dNorth
dHeight
110 45°2703.54645"N 11°52'15.54893"E 58.572 724494.109 5037061.090 58.572
111 45°2703.53597"N 11°52'15.57696"E 58.605 724494.729 5037060.789 58.605
112 45°2703.52669"N 11°52'15.65278"E 58.632 724496.386 5037060.561 58.632
113 45°2703.52070"N 11°52'15.68388"E 58.642 724497.068 5037060.400 58.642
114 45°2703.56198"N 11°52'15.70082"E 58.647 724497.391 5037061.688 58.647
115 45°2703.64362"N 11°52'15.75899"E 58.637 724498.564 5037064.252 58.637
Elementi proiezione
World - UTM zone 32S - WGS 84
Trasformazione
TransversalMercator
Latitude origin
Longitude origin
False East
False North
Deformation Modulus
Latitudine Parallelo Sud
Latitudine Parallelo Nord
Azimuth
Angolo Rettifica Griglia
Meridiano
Greenwich
Scale Factor (ppm)
Rx ("")
Ry ("")
Rz ("")
Tx (m)
Ty (m)
Tz (m)
Ellipsoid
WGS 84
Calculate false origins
Calculate Helmert
Calculate Molodensky
Create new Datum/Projection
Geographical coordinates file
Confirm geographical points file
Verto Format
GGA format
Sexadesimal
Sexagesimal
Cartesian coordinate files
Confirm Cartesian points file
Cancel

Figure 2.70

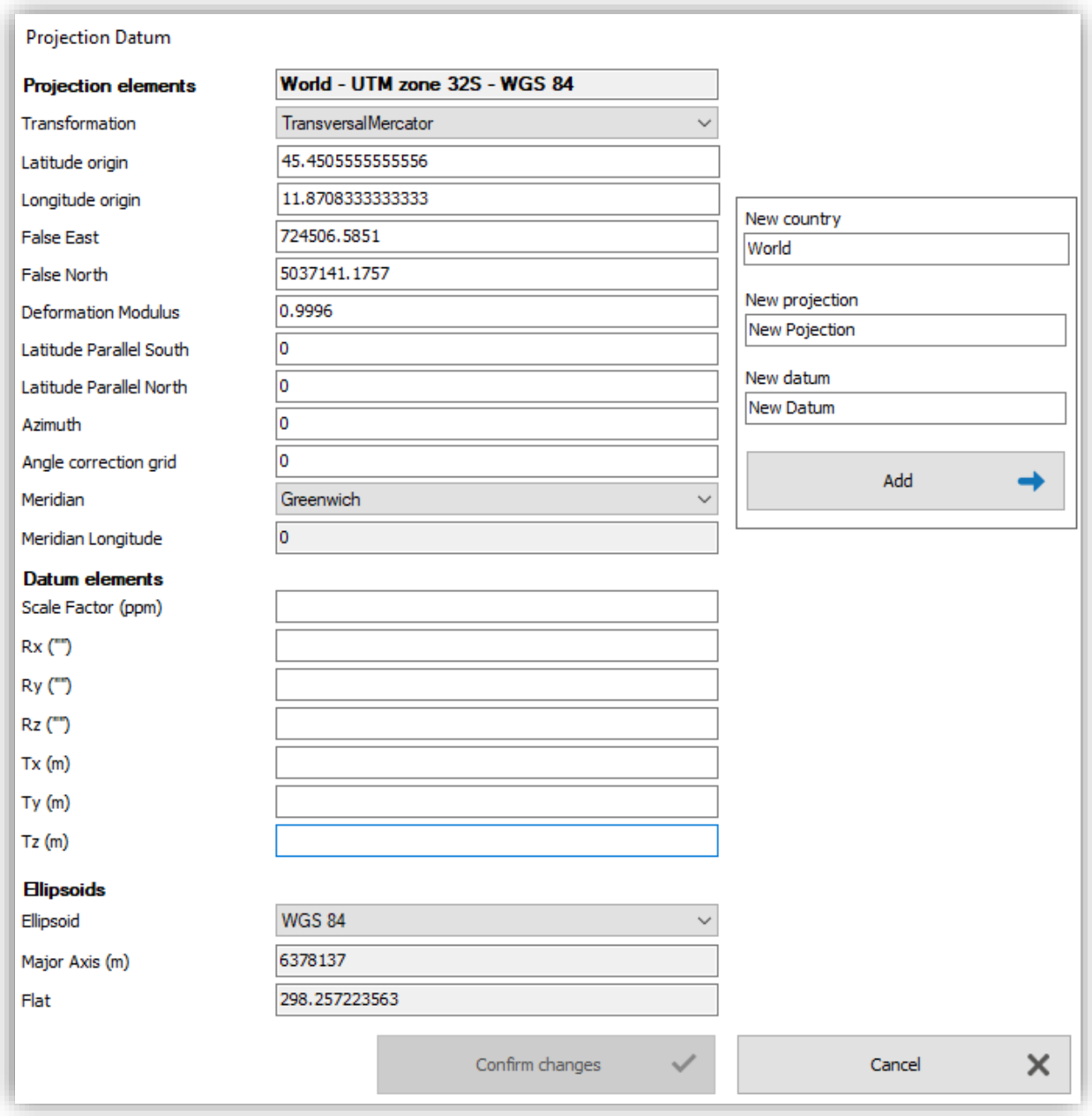

Projection Datum
Projection elements
World - UTM zone 32S - WGS 84
Transformation
TransversalMercator
Latitude origin
45.4505555555556
Longitude origin
11.8708333333333
False East
724506.5851
False North
5037141.1757
Deformation Modulus
0.9996
Latitude Parallel South
0
Latitude Parallel North
0
Azimuth
0
Angle correction grid
0
Meridian
Greenwich
Meridian Longitude
0
Datum elements
Scale Factor (ppm)
Rx ("")
Ry ("")
Rz ("")
Tx (m)
Ty (m)
Tz (m)
Ellipsoids
Ellipsoid
WGS 84
Major Axis (m)
6378137
Flat
298.257223563
New country
World
New projection
New Pojection
New datum
New Datum
Add
Confirm changes
Cancel

Figure 2.71

2.5.2.2 Rototraslation

In the Rototranslation command (Figure 2.72), there are the functions Translate points and 3D/2D Rototranslation. The second command is available in Cube-manager, M module - Modeling.
By clicking on the Translate points button you access a window in which a list of fieldbooks present in the project is displayed (Figure 2.73). The translation can be performed on all points (default choice, Select all points checked) or on selected filedbooks. It is therefore possible to set an East translation and/or a North translation and/or a Height translation with the relative scaling factors. The exchange of coordinates can also be performed (the first choice, selected by default, does not perform any exchange).

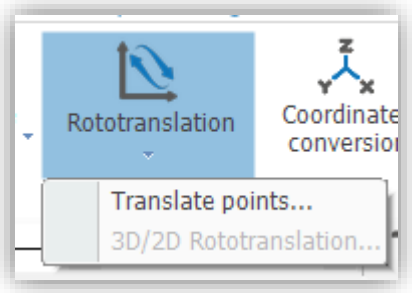


Figure 2.72

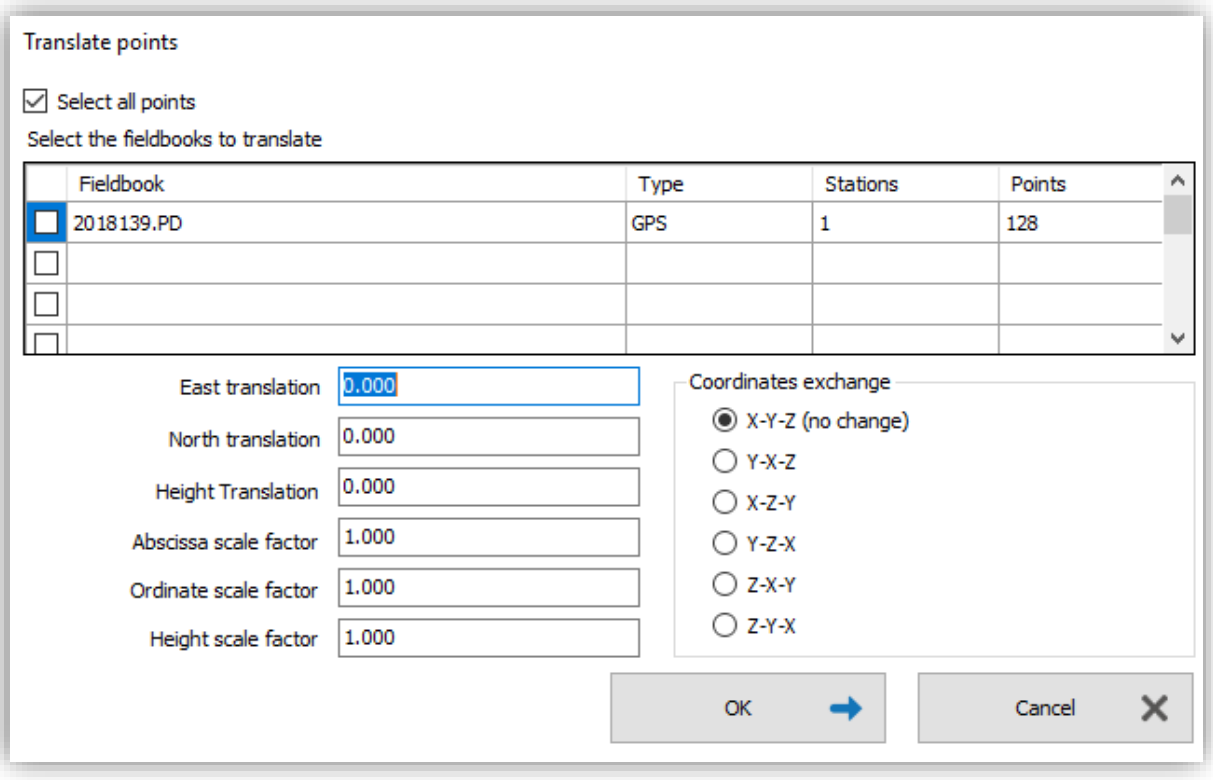


Figure 2.73

2.5.2.3 Coordinates conversion

The Coordinates Conversion command opens a submenu consisting of two commands: Stake-out and Coordinates Conversion (as in Figure 2.74). The second command is available in Cube-manager, T module - Topography.
By clicking on Stake-out, you can convert the grid coordinates to GPS geographic coordinates. After selecting the points (both CAD and topographic) that you want to convert, the program will switch to the screen as in Figure 2.75. From here you can define from what survey to calculate the stake-out (mandatory), and from which station (mandatory). The station may exist, or a new one can be created. Then you can define the options for the new topographic points (only in case of CAD points) and for the baselines.

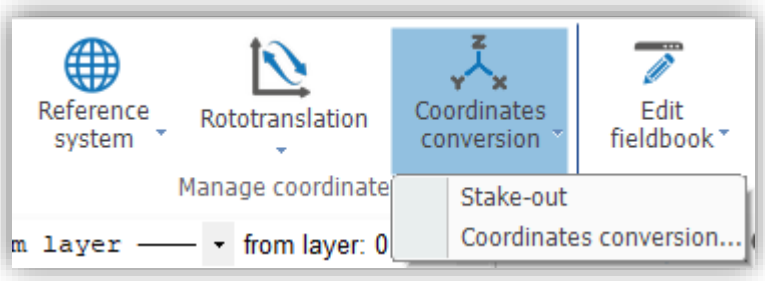


Figure 2.74

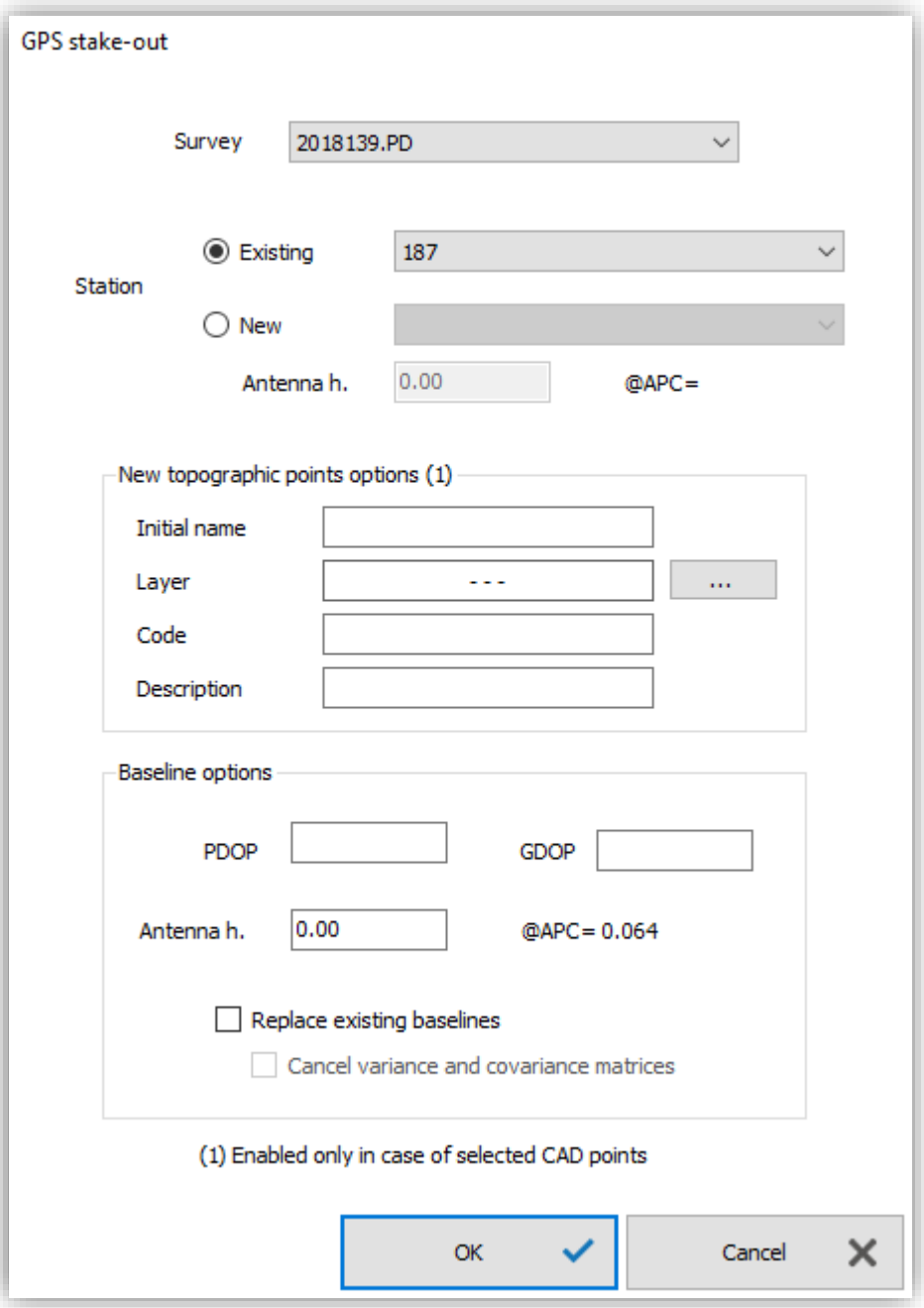

GPS stake-out
Survey
2018139.PD
Station
Existing
187
New
Antenna h.
0.00
@APC=
New topographic points options (1)
Initial name
Layer
- - -
...
Code
Description
Baseline options
PDOP
GDOP
Antenna h.
0.00
@APC= 0.064
Replace existing baselines
Cancel variance and covariance matrices
(1) Enabled only in case of selected CAD points
OK
Cancel

Figure 2.75

2.5.3 Fieldbook

In this section you can import a fielbook as a file, download it from total stations or write it manually. The operations that can be performed on the fielbook are the memorization, calculation and export of the points calculated in the CAD. The program controls the measurements of horizontal, vertical, direct and inverse readings and performs the averages. The program also checks for points with the same name measured several times within the same station and check that the measurements are averaged. Note that the information displayed, when importing a Total station file does not show the raw files, what is displayed is the result of a reading and interpretation of the data by the application.

2.5.3.1 Edit fieldbook

By clicking on the Edit fieldbook button, you access a submenu as shown in Figure 2.76.

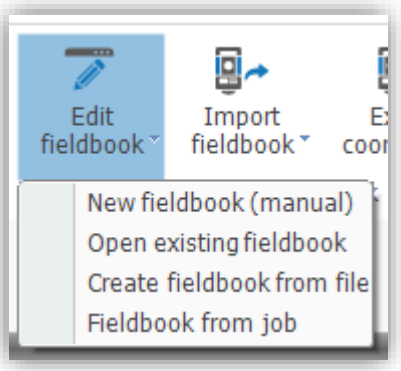


Figure 2.76

The available functions are: New fieldbook (manual), Open existing fieldbook, Create fieldbook from file (with extension from Stonex Total stations), Fieldbook from job.

By clicking on New fieldbook (manual), you can manually write a fieldbook; in the first screen that follows (Figure 2.77) you can give a name to the fiedlbook (mandatory choice, otherwise the program will not allow you to proceed), and then enter a series of other information related to the latter. All fields are left blank, only the date is set automatically by the system, but can be changed.

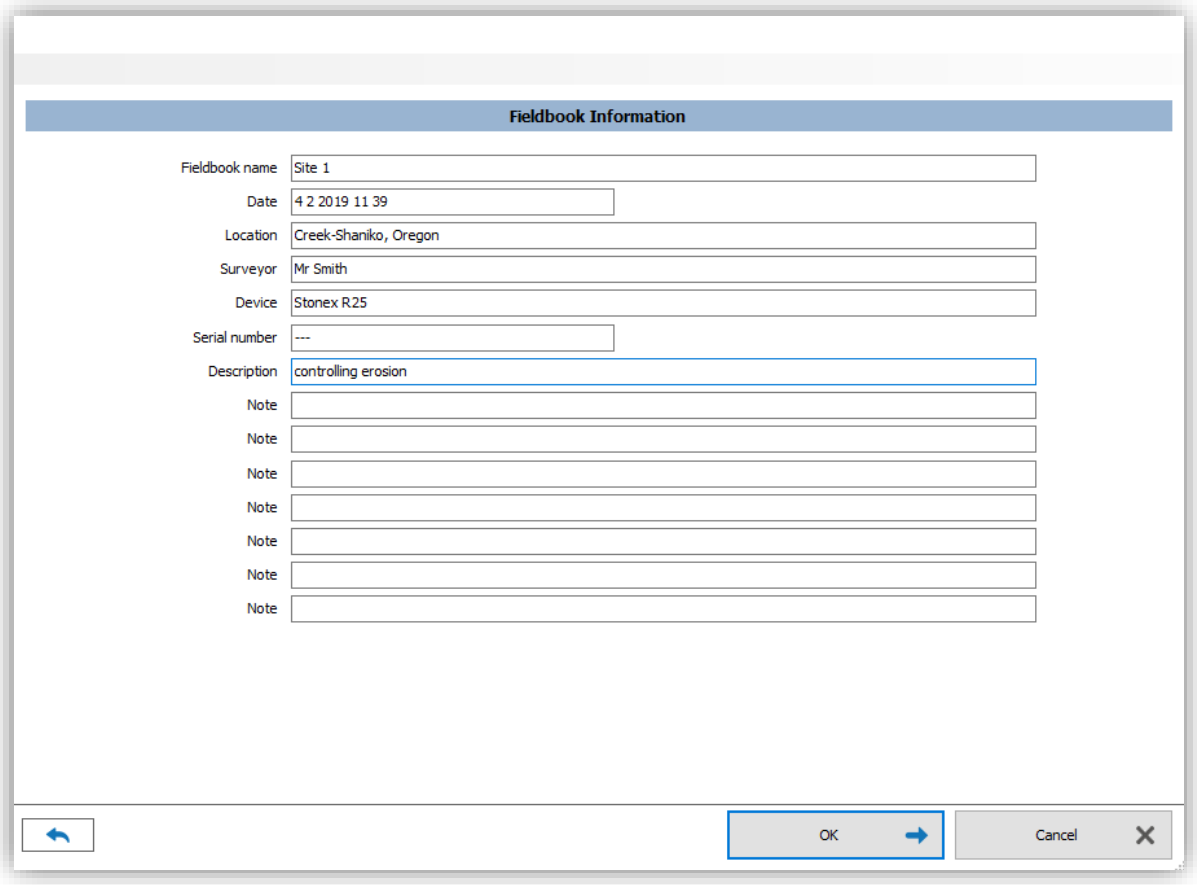


Figure 2.77

The next screen clicking OK automatically leads to the first measurement (Figure 2.78), by default the name of the first station is St1 and is defined as temporary ("Temporary" means that the coordinates have not been calculated, "Calculated" means that the coordinates have been calculated in the field and "Known" means it has known coordinates). The height of the instrument is set to 1.00 m, all other details are left blank and can be entered by the user. Even the details provided as default settings can be changed. As for the Information label, if you click on the icon next to it, you can access a function like the one described above (Figure 2.60).

In the section related to the details of the point, the default assigned name is Pn1 and its coordinates are considered temporary (with the same logic used for the stations). Other values set by default are the height of the pole, the vertical reading, the temperature and the pressure, these values can always be changed.
For horizontal readings, vertical readings and distances, the application dynamically calculates the averages and residuals, returning a correct value also based on the settings of the survey elements (right on the screen: prism constant, temperature, pressure, transverse eccentricity, horizontal eccentricity).

By clicking on the icon with the wrench on the right, you can access the list of parameters related to the fieldbook (Figure 2.88). Parameters for setting the decimals you want to display on the screen and the representation of the angles. Furthermore, it is possible to set a series of tolerances and a series (on the right) of other values, which the system will consider when calculating the measurements.

At the bottom of the screen (Figure 2.78), it is possible to read the information resulting from the calculations (considering the set parameters), relative to the horizontal distance and the height difference, including the difference in height between the height of the instrument and the height of the prism.

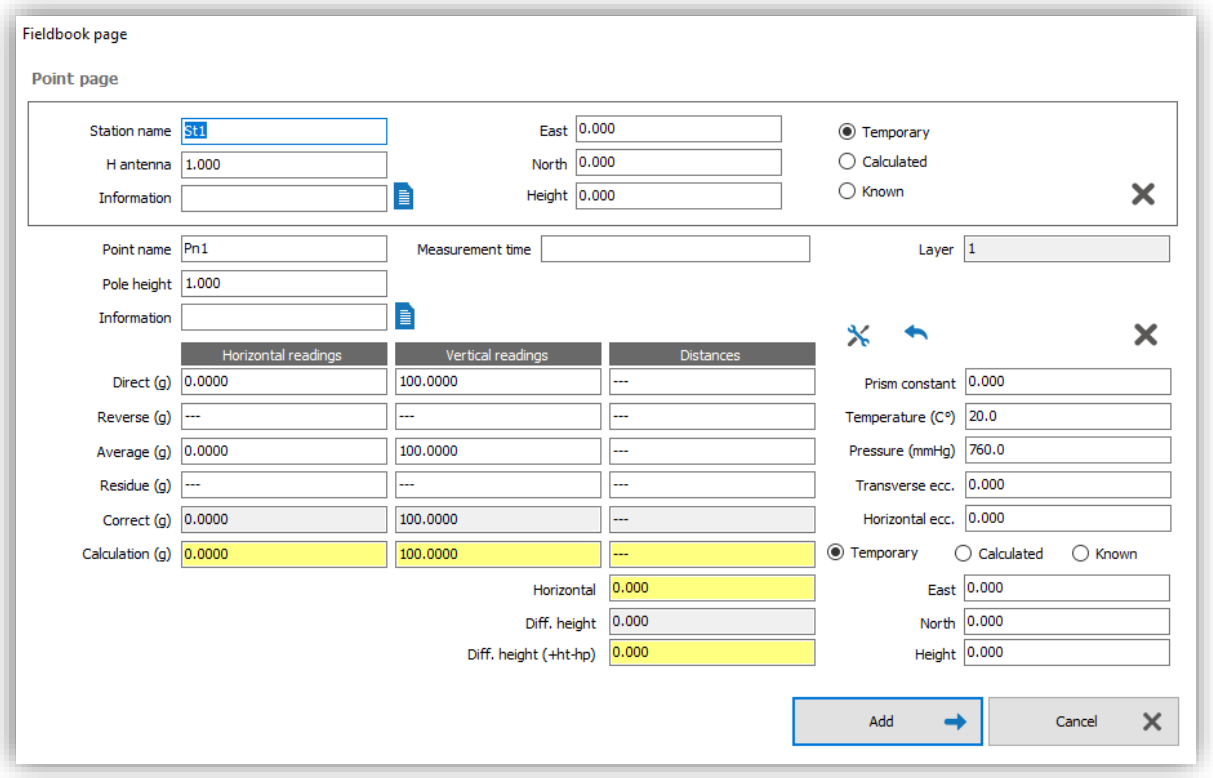


Figure 2.78

After entering the information of the new station and the new point, clicking the Add button, the application will open a new screen (Figure 2.79), where you can view a table with all the stations created and their points. The lines in the table are yellow or white, alternating each time the station changes so it will be easy to identify at a glance the passage from one station to another.

In the table screen you can enter a new station and its first measurement or a new observation. In the first case the station name will be sequential to the last one inserted and the point name will be left blank, in the second case the name of the station remains the same and the name of the point will be sequential to the last one created.

With the right-click on the table, you access a menu of options that, depending on the selection made (number of cells and position) offers a series of functions (Figure 2.80, some options seem to be disabled but they are all available, for facilitate the use of the menu some functions become dynamically active while others are deactivated).
These functions are simple to use, you can insert a new measure between the already inserted observations (Enter observation), you can add a new observation at the end of the table (Add observation), you can change the entered numerical values as well as the names of the points and the selected lines can be deleted.
These operations can be canceled by clicking the icon at the bottom left of the screen (blue undo icon).

When all the observations have been entered, it is possible to press the End of manual entry button and the screen will automatically change its appearance (Figure 2.81); you can see the table and, in at the bottom-left you can select the desired station, to place the visible part of the table on it.

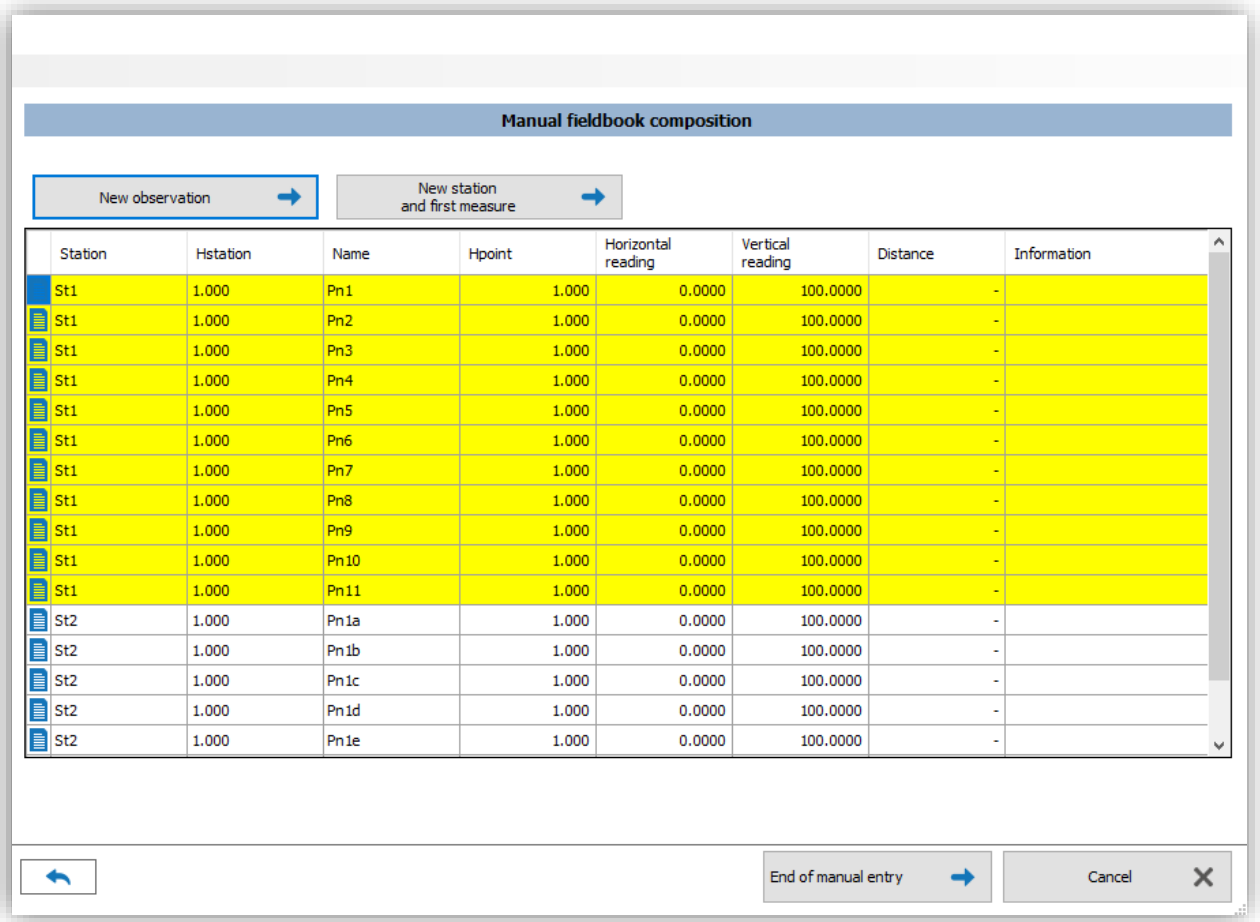


Figure 2.79

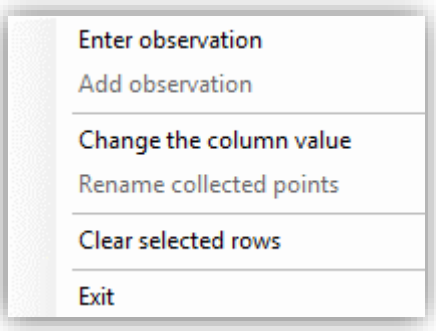
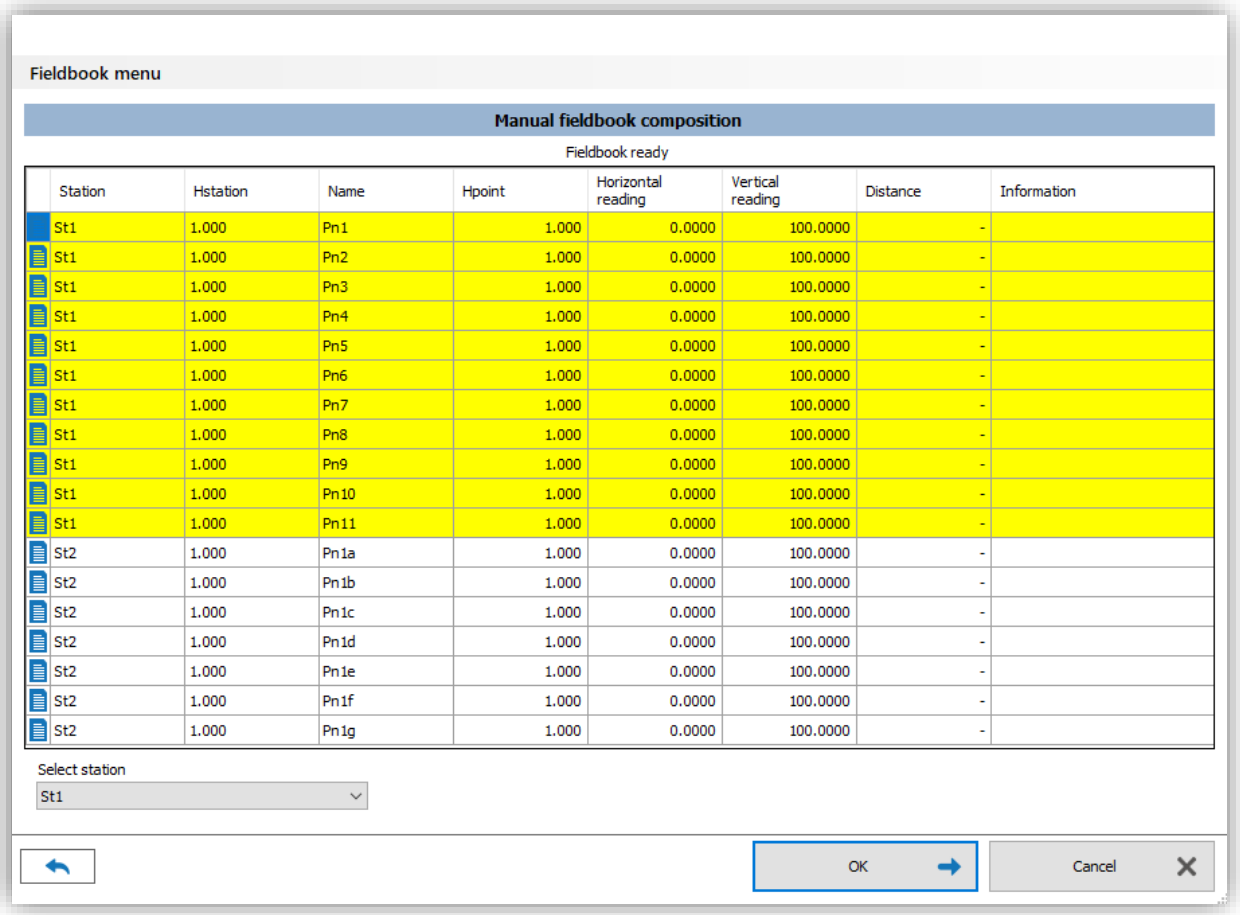


Figure 2.80



Station	Hstation	Name	Hpoint	Horizontal reading	Vertical reading	Distance	Information
St1	1.000	Pn1	1.000	0.0000	100.0000	-	
St1	1.000	Pn2	1.000	0.0000	100.0000	-	
St1	1.000	Pn3	1.000	0.0000	100.0000	-	
St1	1.000	Pn4	1.000	0.0000	100.0000	-	
St1	1.000	Pn5	1.000	0.0000	100.0000	-	
St1	1.000	Pn6	1.000	0.0000	100.0000	-	
St1	1.000	Pn7	1.000	0.0000	100.0000	-	
St1	1.000	Pn8	1.000	0.0000	100.0000	-	
St1	1.000	Pn9	1.000	0.0000	100.0000	-	
St1	1.000	Pn10	1.000	0.0000	100.0000	-	
St1	1.000	Pn11	1.000	0.0000	100.0000	-	
St2	1.000	Pn1a	1.000	0.0000	100.0000	-	
St2	1.000	Pn1b	1.000	0.0000	100.0000	-	
St2	1.000	Pn1c	1.000	0.0000	100.0000	-	
St2	1.000	Pn1d	1.000	0.0000	100.0000	-	
St2	1.000	Pn1e	1.000	0.0000	100.0000	-	
St2	1.000	Pn1f	1.000	0.0000	100.0000	-	
St2	1.000	Pn1g	1.000	0.0000	100.0000	-	

Figure 2.81

In Figure 2.81 the command on the top-left, Fieldbook menu, if clicked will offer a series of operations possible on the fieldbooks (Figure 2.82). It is mandatory to use one operation to proceed.

In the Fieldbook menu, the Calculations command consists of four subcommands: Traverse calculation, Detail calculation, Various calculations, 2D network calculation. The only

calculation available in Cube-link is the detail calculation, the others are available in Cube-manager, T module – Topography.
To carry out the detail calculation, just click on the relative command that will lead to the screen in Figure 2.83, on the left is the list of stations present in the job, you can select and calculate one or more stations by clicking on them, or you can calculate all the stations by clicking on the Transfer all button.

The list named Stations to be calculated will show the stations that you chose to calculate, when you click on Proceed, if the system does not find known points, it will generate a screen (Figure 2.84), where you can select the station and the first orientation (coordinates can be assigned/changed if necessary). To start the calculation, it is possible to click on Confirm calculation (Figure 2.85). Uncalculated stations will be displayed in the list on the right, named Stations not calculated; help messages will appear below the list (in this example, 'All stations calculate ', 'All backsights in the expected tolerance'). View report button will show an html file with the details of the calculation, the Repeat calculation button will perform the calculation again. On the right there are the differences of East, North, Height between the maximum and minimum values found in the work, this information can help to find errors. The X-gray icon will delete from the list of stations to be calculated the one selected, the trash icon will erase all stations in the list. The icon with the wrench leads to a window like the one shown in Figure 2.88.

Returning to the commands in Figure 2.82, View all measurements, View averaged measurements and Calculate averages are other available functions, the first two are display options, the last, work on the fieldbook, taking all the measures into consideration and calculating the averages.
This last function (Calculate averages) opens a screen (Figure 2.87) in which it is possible to set tolerances, text colors, layers, symbols and relative colors (for known points, detail points and stations), decimals, representation of the angles and corrections (such as atmospheric refraction), clicking Proceed the program will proceed to the average calculation.

The Load known points command opens a menu with three options: Read from file, Read from current job, Cancel known points. The first command opens a screen where you can select a text file containing the coordinates and indicate a separator character (Figure 2.86).

Work parameters will open a window as in Figure 2 87.

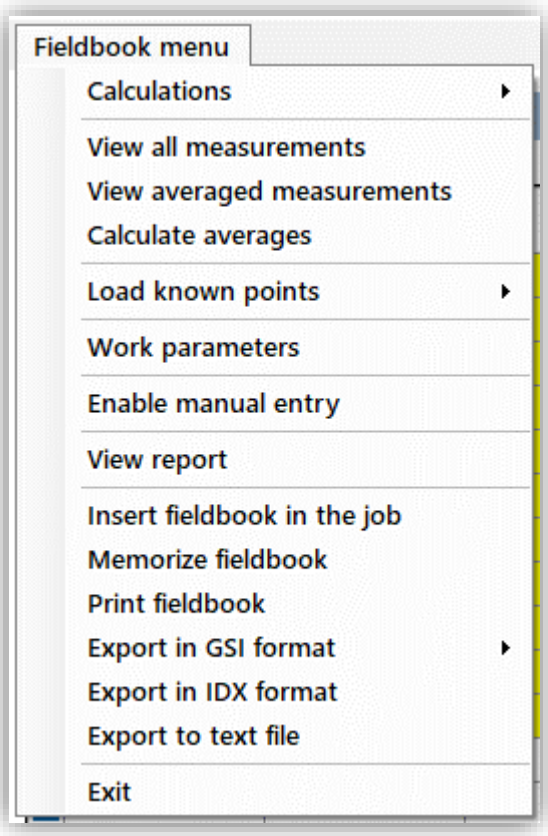


Figure 2.82

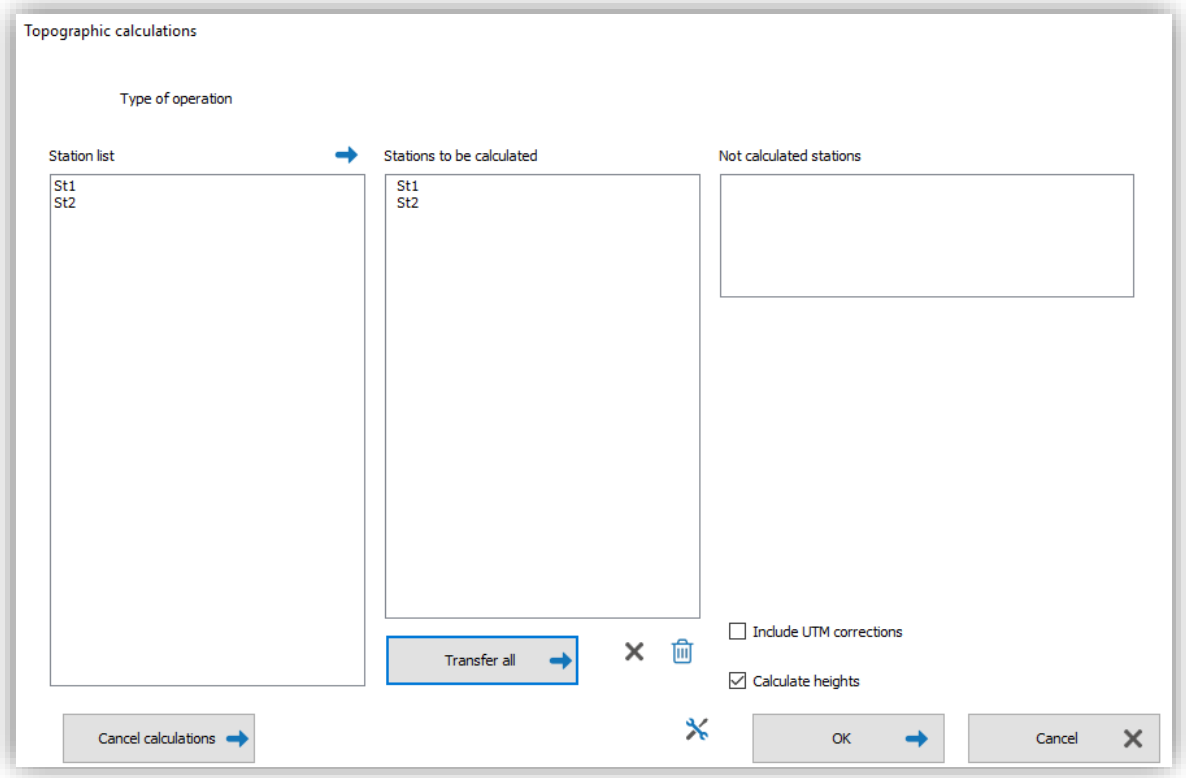


Figure 2.83

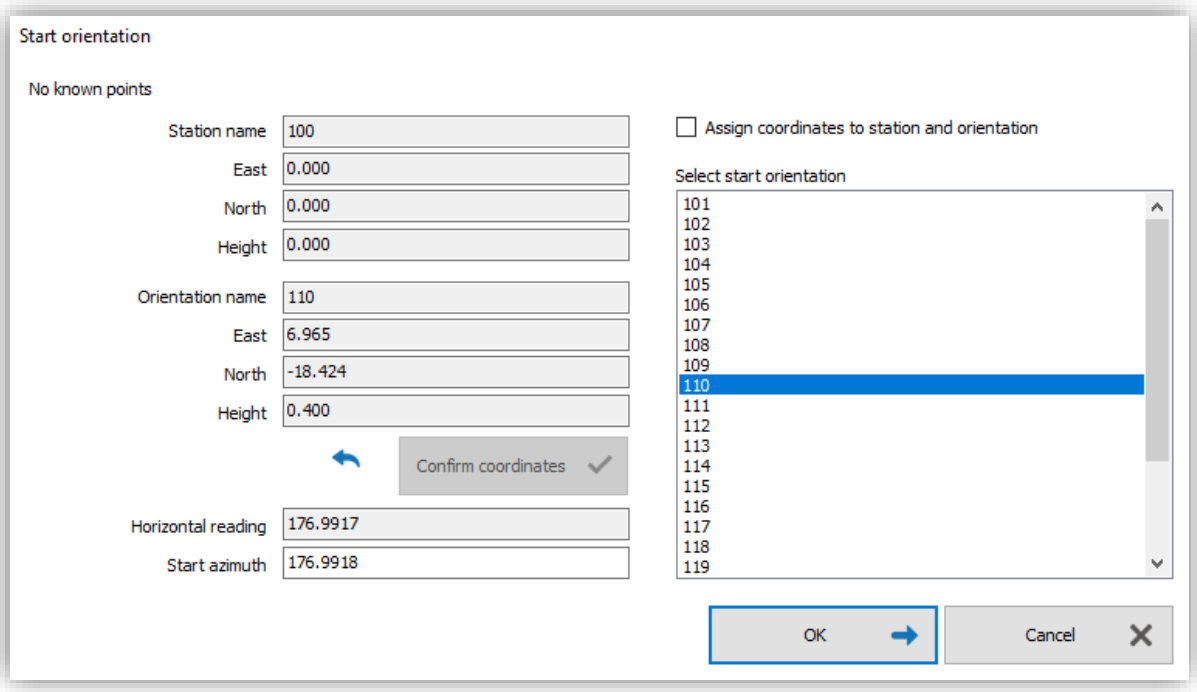


Figure 2.84

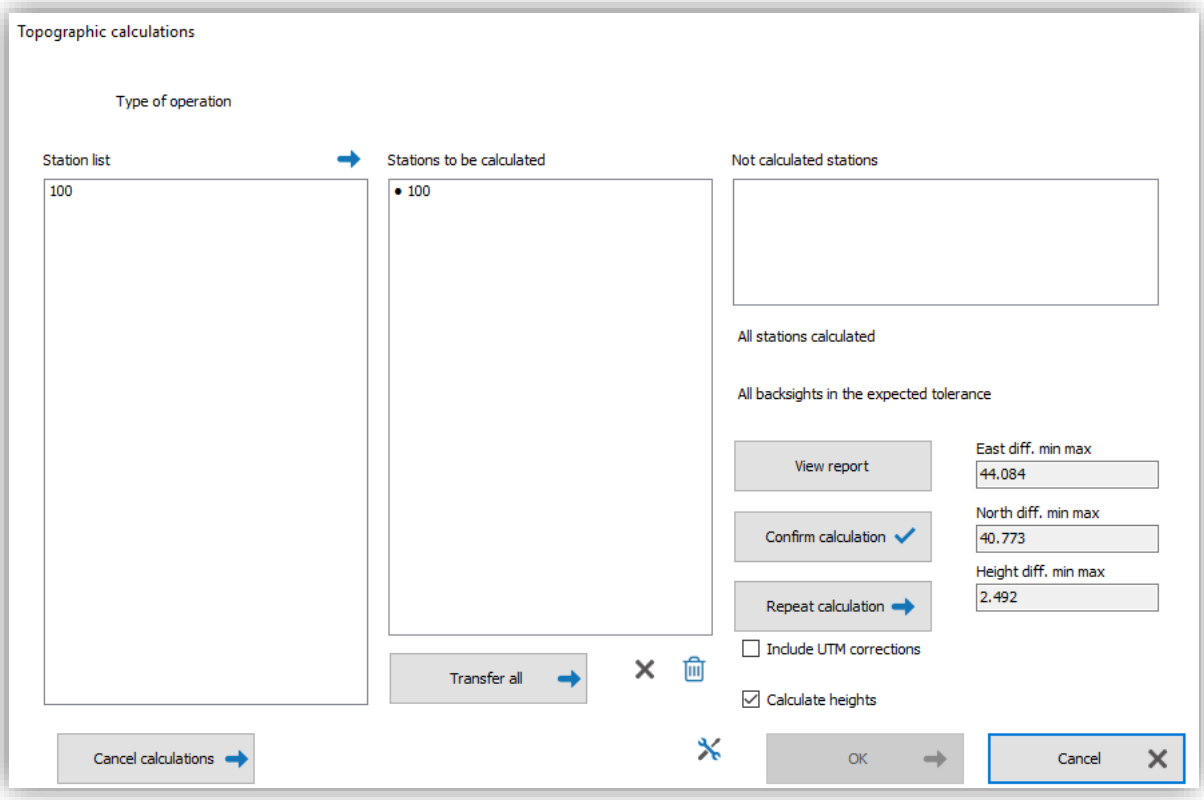


Figure 2.85

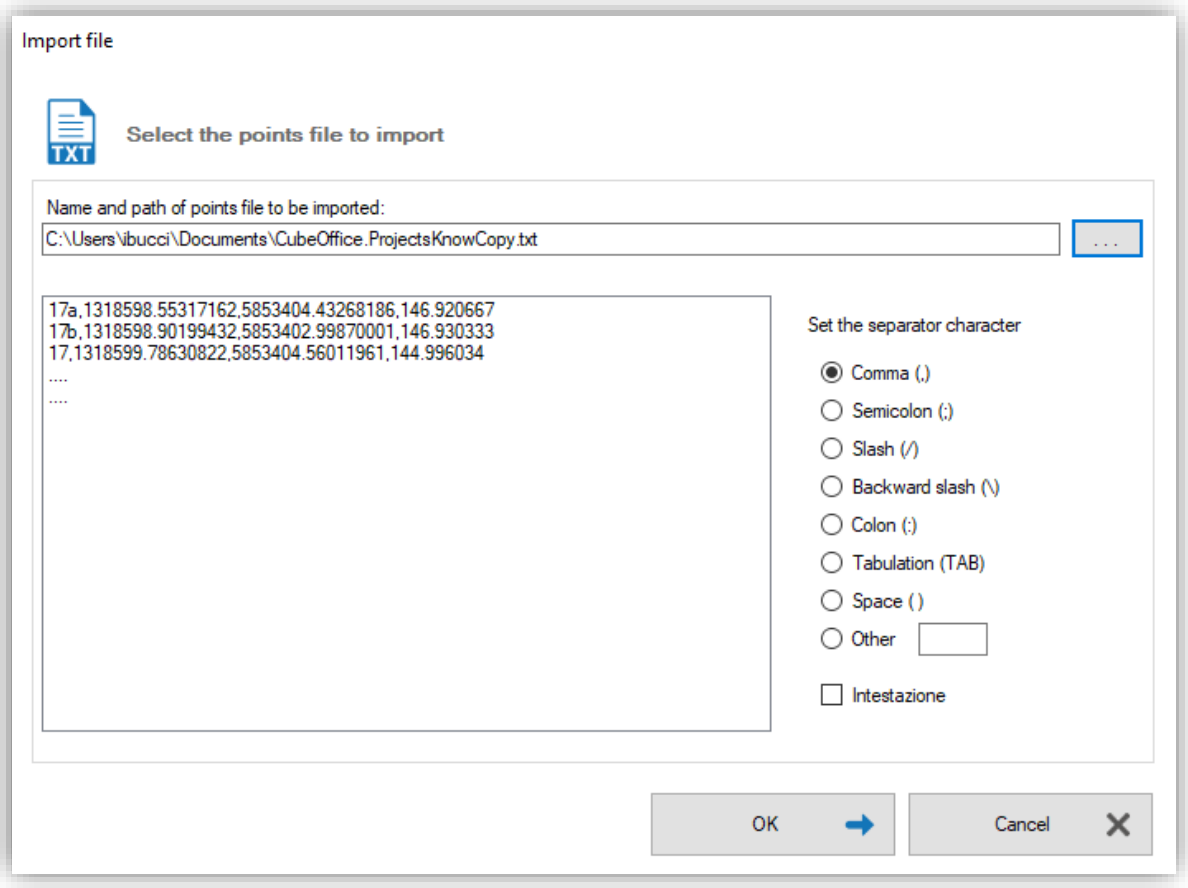

Import file
TXT
Select the points file to import
Name and path of points file to be imported:
C:\Users\ibucci\Documents\CubeOffice.ProjectsKnowCopy.txt
...
17a,1318598.55317162,5853404.43268186,146.920667
17b,1318598.90199432,5853402.99870001,146.930333
17,1318599.78630822,5853404.56011961,144.996034
....
....
Set the separator character
Comma (,)
Semicolon (;)
Slash (/)
Backward slash (\)
Colon (:)
Tabulation (TAB)
Space ( )
Other
Intestazione
OK
Cancel

Figure 2.86

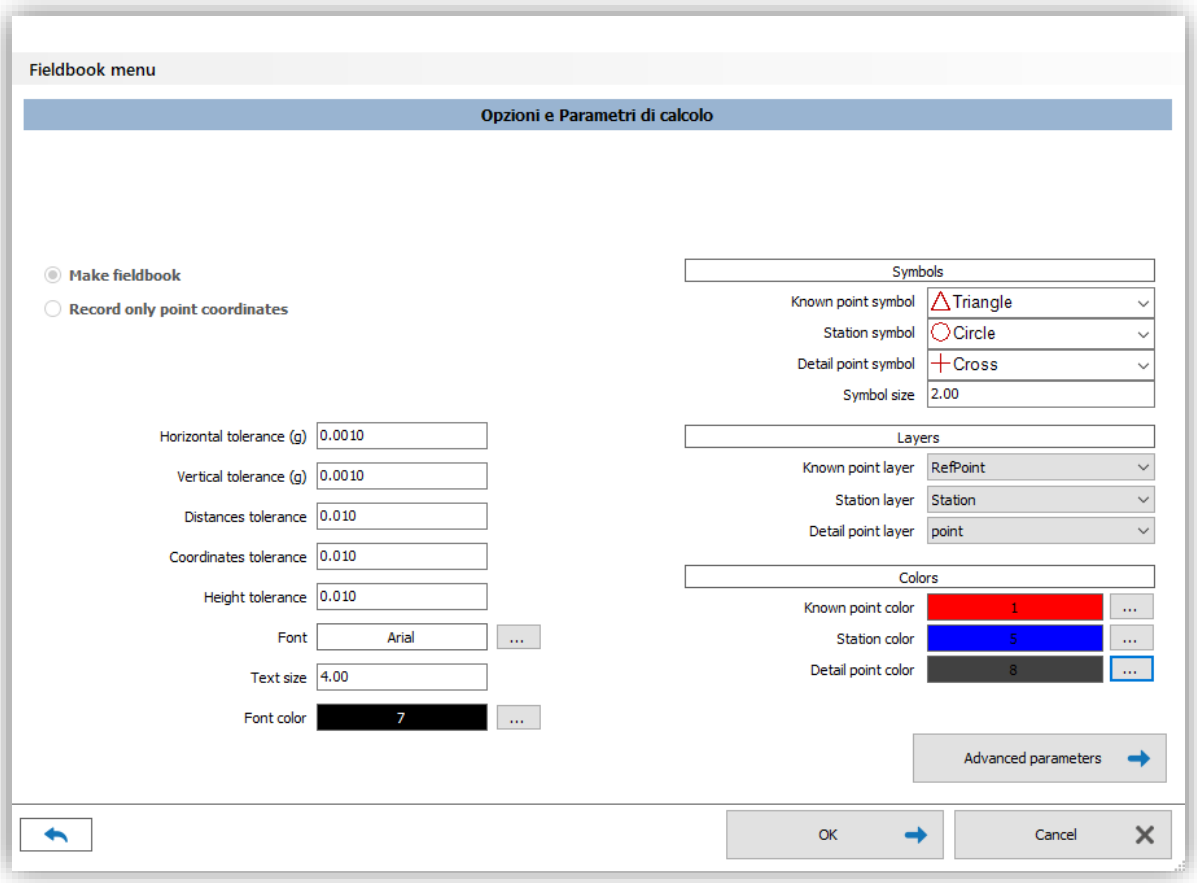

Fieldbook menu
Opzioni e Parametri di calcolo
Make fieldbook
Record only point coordinates
Symbols
Known point symbol
Triangle
Station symbol
Circle
Detail point symbol
Cross
Symbol size
2.00
Horizontal tolerance (g)
0.0010
Vertical tolerance (g)
0.0010
Distances tolerance
0.010
Coordinates tolerance
0.010
Height tolerance
0.010
Font
Arial
Text size
4.00
Font color
7
Layers
Known point layer
RefPoint
Station layer
Station
Detail point layer
point
Colors
Known point color
1
Station color
5
Detail point color
8
Advanced parameters
OK
Cancel

Figure 2.87

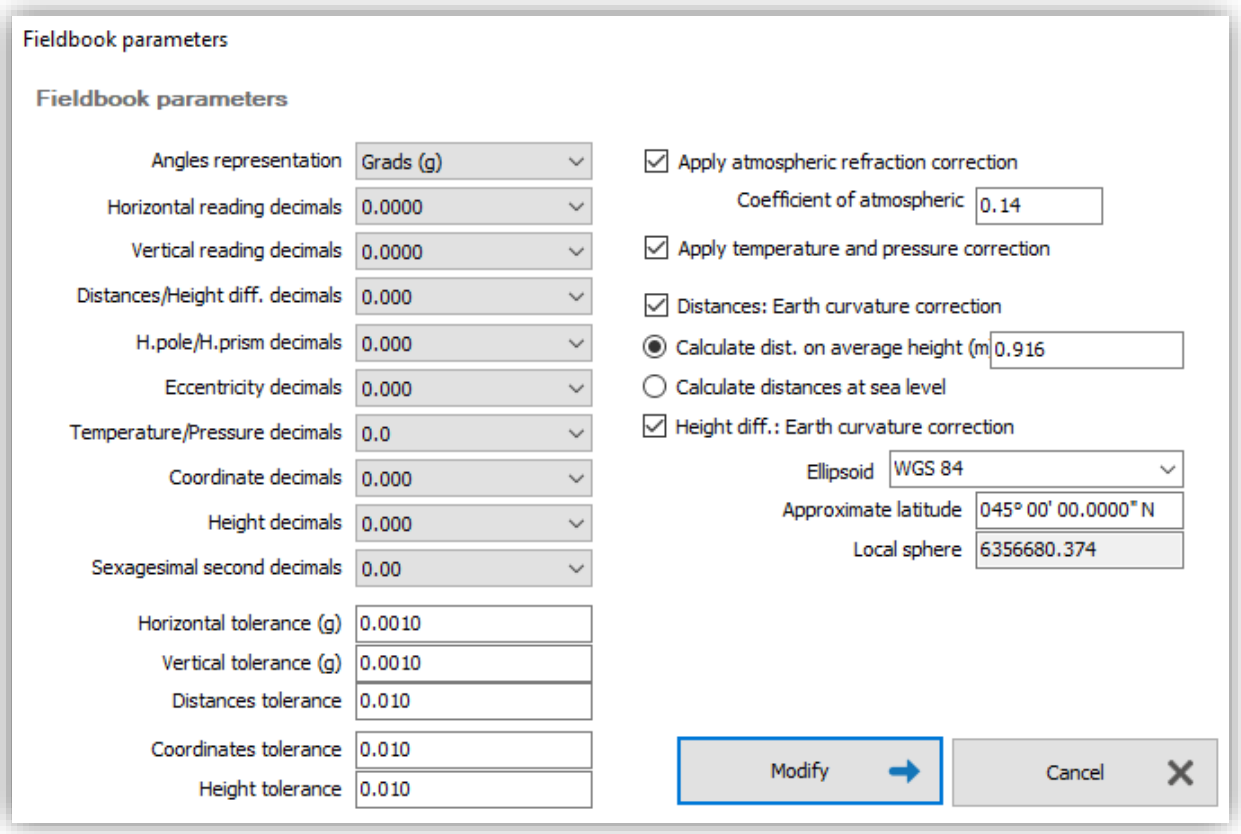


Figure 2.88

Among the commands shown in Figure 2.82, the Enable manual entry button will lead to the manual writing section of the fieldbook (described above).

The View report command will open a screen with a html file containing all the information on the current fieldbook. If the program recognizes that there are several reports present in the job, a window will open in which all the reports will be displayed so that you can select the one you want, in this screen you can also delete (one or more) reports.

Insert fieldbook in the job button will insert the fieldbook in the graphics; before proceeding, the application will check the presence of average measurements and if the calculations have been performed, then it will be possible to see again a summary of the measurements (any unaveraged measurements will be visualized on red lines, so that corrections can be made).

With the Memorize fieldbook you can save the fieldbook; after displaying the screen with general information (e.g. fieldbook name, date, location, etc.), once you have chosen the destination for saving, the application will produce a file with the .cubefbk extension.
The Print fieldbook command allows access to the general information screen on the fieldbook (as in Figure 2.77, where you can change all the fields if necessary), when you click on Proceed the application creates a html file, ready to print.

The last commands are related to the export, the fieldbooks can be exported in GSI format (18 and 6 bit), in IDX and in text files (as well as in the native format of the program .cubefbk).

2.5.3.2 Import and export fieldbooks

The Import fielbook button (Figure 2.89) allows to import fieldbooks from total stations; you can import using a USB connection by connecting directly to the total station (after clicking on the chosen device, click on the Connect USB button) or selecting a file that may be stored in the PC. Figure 2.89 shows all supported devices and extensions.
The Export coordinates button allows you to export to the total station formats and to GSI (16 bit and 8 bit).

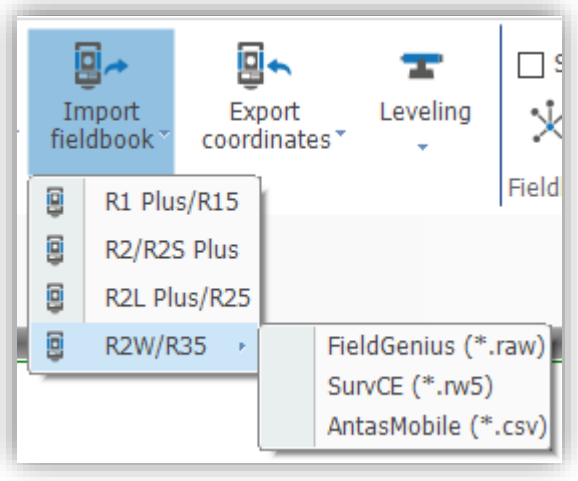


Figure 2.89

2.5.3.3 Leveling

The Leveling command consists of three subcommands: Download; Trigonometric leveling (available in Cube-manager); Geometric leveling (available in Cube-manager, Figure 2.91). The first opens a screen as in Figure 2.90.
After selecting (at the top) a data destination file and setting the data for the input port, you can download data from a digital level.

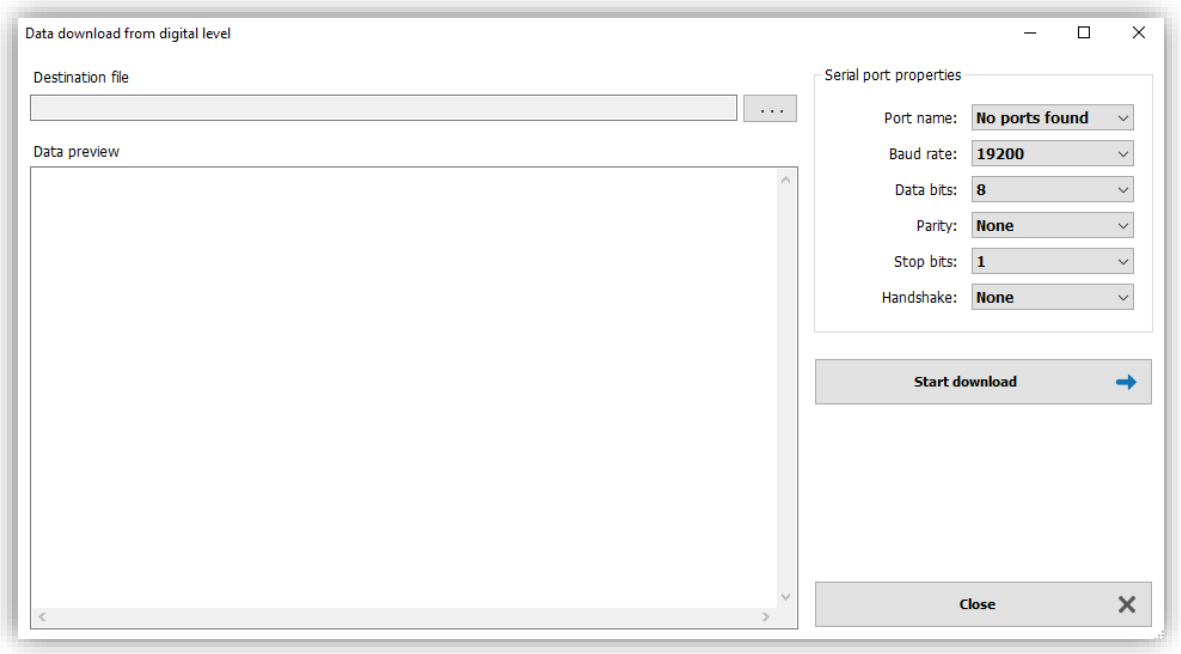


Figure 2.90

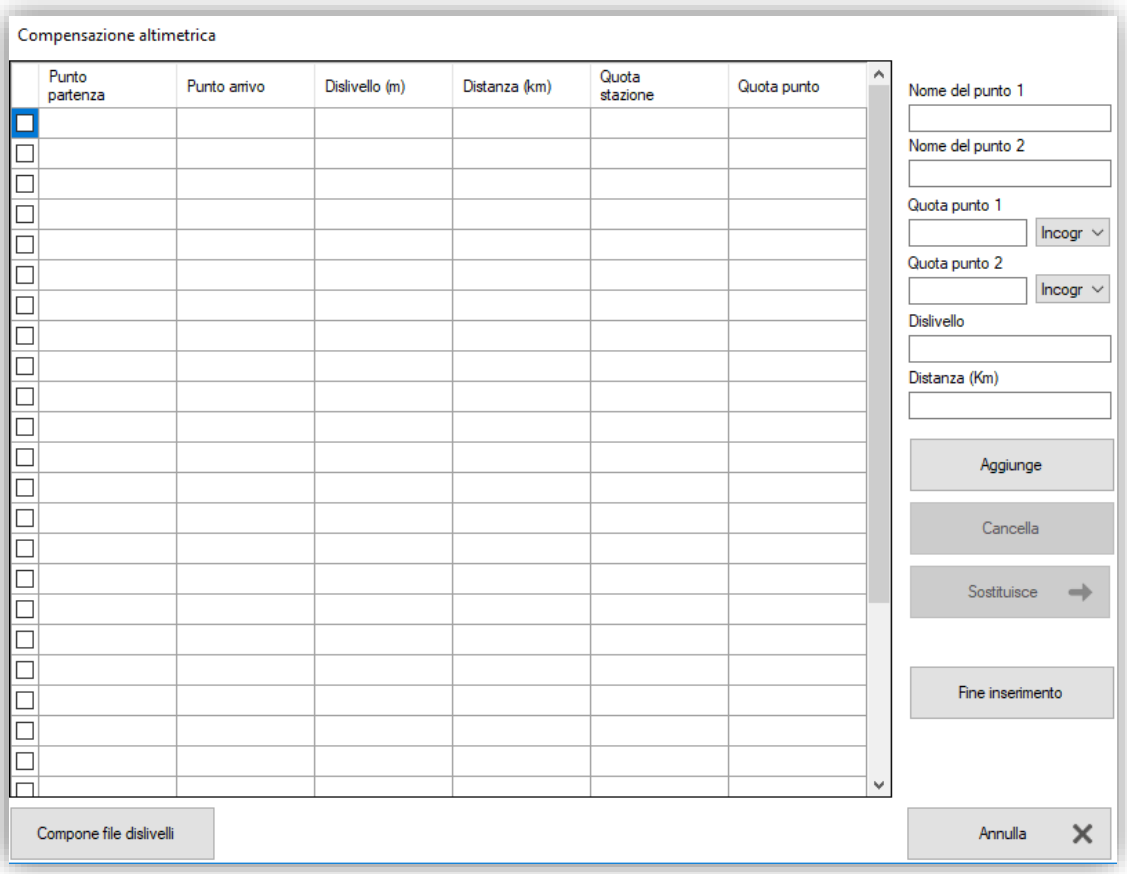


Figure 2.91

2.5.4 Fieldbook schema

Availability	Module
Cube-manager (Figure 2.92, Figure 2.93)	P-T-M

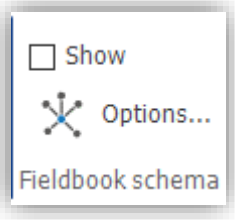


Figure 2.92

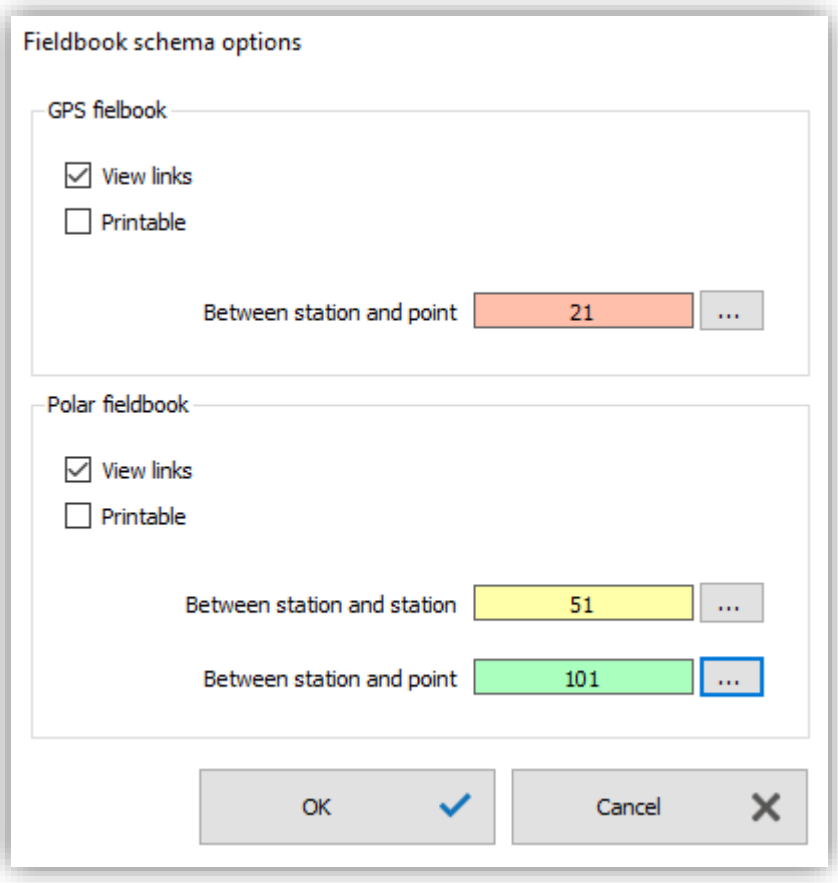

Fieldbook schema options
GPS fielbook
View links
Printable
Between station and point
21
...
Polar fieldbook
View links
Printable
Between station and station
51
...
Between station and point
101
...
OK
Cancel

Figure 2.93

3 Tool and commands

3.1 Tools and commands of the software

List of all commands that can be used by the command line (Figure 3.1) of the program:

Command	Description
OPEN	Opens projects (Cube-link files with extension .cubelnk)
SAVE	Saves the project (with extension .cubelnk for a normal file, with extension .cubetpl for a template file)
NEW	New project
DXFIN	Imports dxf/dwg files
ASCIIIN	Imports generic ASCII files
SHAPEIN	Imports ESRI Shapefiles
RW5IN	Imports RW5 files
CUBEAIN	Imports Cube-a files
GEOGISIN	Imports GeoGis files
DXFOUT	Creates dxf/dwg files
KMLOUT	Creates a KML file for Google Earth
MAPWWW	Creates a map
PRINT	Prints the drawing
CUBEAOUT	Creates a Cube-a file
RW5OUT	Creates a RW5 files
GEOGISOUT	Creates a GeoGis files
SHAPEOUT	Creates an ESRI Shapefile
COPYNOTES	Copies CAD entities to notes
PASTENOTES	Pastes the CAD entities from notes
SETTINGS	General program settings
QUIT	Closes the program
2DVIEW	Enables 2D view
3DVIEW	Enables 3D view
ZOOMLI	Zoom limits
ZOOMIN	Zoom in
ZOOMOUT	Zoom out
ZOOMWI	Zoom window
ZOOMPT	Zoom on topographic point
DYNPAN	Activates dynamic pan
ZOOMMA	Enables/disables zoom window
AERIALVIEW	Enables/disables the panoramic view
POINT	Draws a point at the selected location
LINE	Line on2 points
CIRCLE	Circle with choice of options

CIRCLECE	Center and radius circle
CIRCLE3P	3-point circle
CIRCLE2P	2-point circle
CIRCLETTR	Tangent, tangent and radius circle
ARC	Enables arc design options
ARC3P	Arc on 3 points
ARCCE	Arc center, radius, beginning and end
ARCBE	Arco beginning, end and radius
POLYLINE	Draws polylines
RECTANGLE	Draws a rectangle
POLYGON	Draws a regular polygon
ELLIPSE	Draws an ellipse
DELETE	Deletes CAD entities
MOVE	Moves CAD entities
COPY	Copies CAD entities
ROTATE	Rotates CAD entities
OFFSET	Offset of the CAD entity
JOIN	Connects to entities
FILLET	Connects with arc
EXTEND	Extends an entity to the limit
TRIM	Trims entities
BREAK	Breaks entities
GROUP	Groups CAD entities
UNGROUP	Ungroups CAD entities
EXPLODE	Explodes complex CAD entities
PROPERTIES	Modify the properties of CAD entities
COPYPROP	Copies properties from a CAD entity
DRAWINGORD	Changes view order
FOREORDER	Brings to foreground
BACKORDER	Sends to background
INSPTONPOLY	Inserts polyline vertex or profile vertex
DELPTONPOLY	Deletes a vertex from a polyline or a profile
MERGEPOLY	Joins two polylines into a single polyline
POLYINHEIGHT	Sets all the vertices of a polyline to a set height.
LAYER	Opens the layer properties manager window
LAYERFROMENT	Activates layer from entity properties
CURRLAYER	Moves on current layer the selected entities
ISOLALAYER	Isolates the layers of the selected entities
LAYEROFF	Turns off the layers of the selected entities
LOCKLAYER	Blocks the layers of the selected entities
LAYERONOFF	Turns the current layer on or off
ALLLAYERON	Enables all layers

UNLOCKLAYERS	Unlocks all layers
VIDEOTHICK	Displays video thicknesses
SYMBOSNAP	Sets the osnap symbol size
ROTAXES	Sets the cursor axes rotation
AXESSIZE	Sets the cursor axes size
VIDEOSCALE	Scales the video display
GRAPHICBGROUND	Sets the background color of the graphic window
CURSORINFO	Sets dynamic information on the cursor (values from 1 to 7)
ORTHO	Enables/disables Ortho
OSNAP	Enables/disables osnap
NEWPT	Creates a new topographic point
CHARACPT	Creates topographic points from CAD entities
PTPROP	View (edit) properties of the topographic point
PTTABLE	View topographic point table
RENAMEPT	Rename topographic point
PTOFFSET	Edit point-text offset
R1PLUS	Imports a fieldbook from a file with .dat extension
R2LPLUS	Imports a fieldbook from R2L Plus file
R2/R2SPLUS	Imports a fieldbook from R2S Plus file
R2WFG	Imports a fieldbook from Fieldgenius file
R2WSC	Imports a fieldbook from SurvCe/RW5 file
R2WAM	Imports a fieldbook from AntasMobile file
EXPR1PLUS	Exports coordinates in R1 Plus file format
EXPR2PLUS	Exports coordinates in R2 Plus file format
EXPR2LPLUS	Exports coordinates in R2LPlus file format
EXPR2PLUSRAW	Exports coordinates in RAW file format
EXPR2PLUSRW5	Exports coordinates in RW5 file format
EXPR2WCSV	Exports coordinates in AntasMobile file format
EXPGSI16	Exports coordinates in GSI 16 bit file format
EXPGSI8	Exports coordinates in GSI 8 bit file format
NEWFIELDBOOK	Opens a window where to create a new fieldbook
OPENFIELDBOOK	Imports an existing fieldbook
LOADFIELDBOOK	Imports a fieldbook in one of the supported formats
FROMFIELDBOOK	Reads fieldbook presents in the project
DOWNLOADLEVELING	Download data from a digital level
TRANSLATEPTS	Opens the window where you can translate points and exchange coordinates
PTTOGPS	Starts the GPS Stakeout function
PRESETSYSTEM	Sets predefined reference system
ADDNEWSYSTEM	Create new reference system
DELETERASTER	Delete raster image

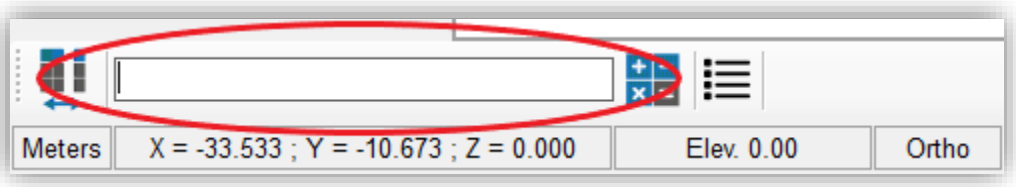


Figure 3.1

Another useful tool other than the command line is the Quick selection (Figure 3.2); in commands that involve selecting CAD entities or topographic points, with the right-click you can enter a menu that allows you to access a quick entity selection. Selection is divided into topographic and CAD entities and takes place through the choice of the respective properties. From this popup window, you can also quickly access the entity properties window.

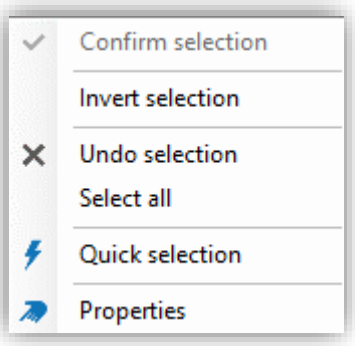


Figure 3.2

The project manager panel (Figure 3.3, middle-left part of the main screen), is a tree structure that contains all the topographic and raster entities present in the project. With the double-click on the points you can select them as an alternative to graphic selection.

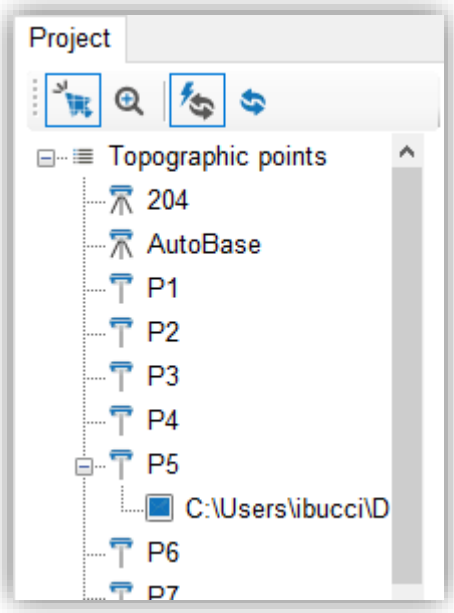


Figure 3.3

The project manager panel can be switched on or off by pressing the Show/Hide button at the bottom-left of the main screen (icon in the red circle, Figure 3.4). While the two icons to the right of the command line have the function to recall the system calculator (the first from the left) and open a file with the date, time and description of the commands entered in the current working session (the second).

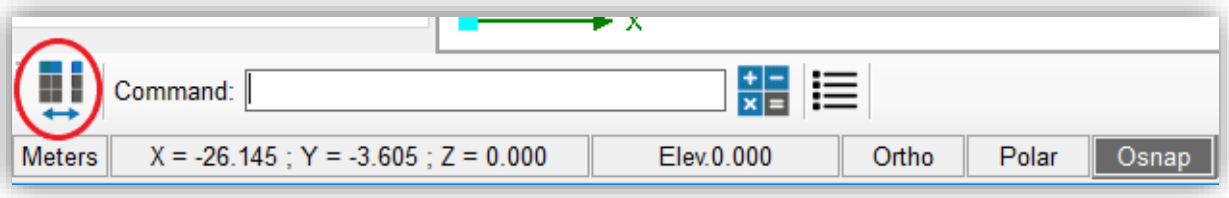


Figure 3.4

At the bottom of the screen, you can see the coordinates of the elements in the project, enable or disable the Osnap mode, the Ortho view and the Polar view. Also thicknesses and grids can be activated or deactivated. By clicking the Tools bar button (menu in the red circle, Figure 3.5), you can customize the layout and display of available shortcuts (Figure 3.6, all the entries for the available shortcuts. To reposition them on the screen, click on the 4 left-side dots, to drag and drop the commands).

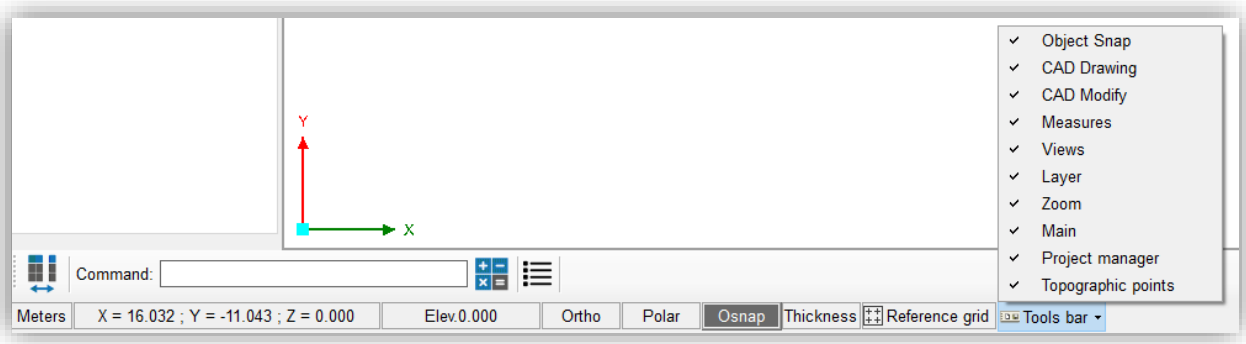


Figure 3.5

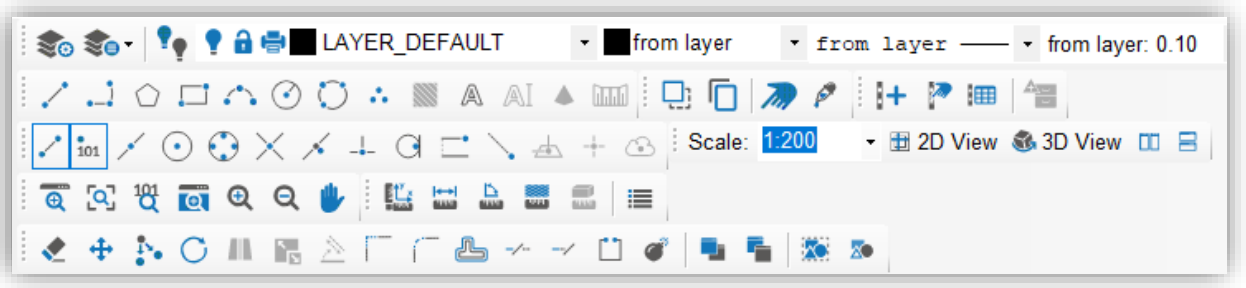


Figure 3.6

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