



Cube-link  
Data Transfer Software  
**User Manual**



**cube-link**

v4.1



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## Software Introduction

Cube-link is a free version of Cube-manager which offers tools for basic data transfer from GNSS receivers and Total Stations, graphical and tabular display of raw data and results, some COGO commands, import and export of data using industry standard file formats like DXF, CSV. The application has a modern ribbon-based interface and implements an easy to use and flexible CAD which allows to display data either in 2D or in 3D views.

The CAD engine handles common vector entities (lines, polylines, circles, arcs, texts, ...) and, being it designed to support topographic elements, it implements also a special point entity called Topographic Point.

Topographic points are the fundamental pieces of any survey and they are generated either by importing data or using specific insertion tools.

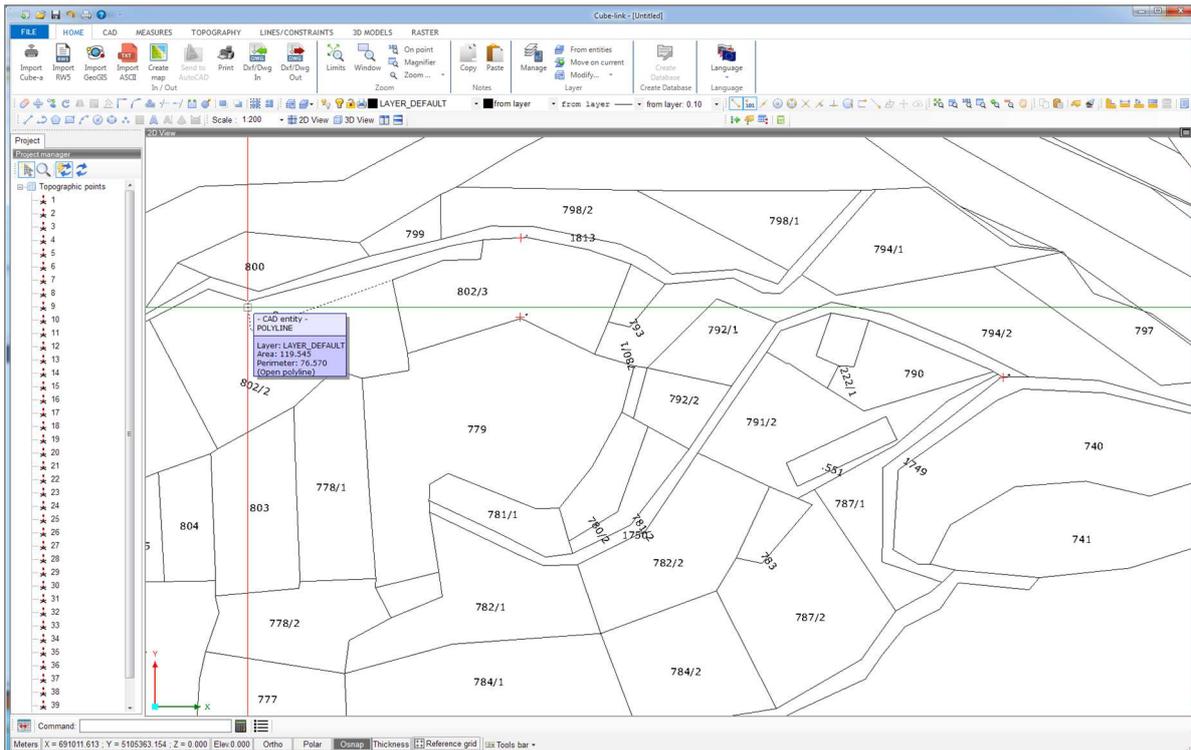
Those topographic points collected in the field, together with all accessory data, when imported in the application form a different “set of data” and each of such sets is called fieldbook.

For example: importing a GNSS survey generates topographic points which will be represented by symbols and with different graphic properties. However, these must be considered as a data structure that contains all the information gained during topographical survey, regarding the position such as coordinates (easting, northing, height, latitude, longitude, elevation), but also regarding accuracy and control (e.g. residuals) as well as information on working modes (e.g. RTK differential correction).

Cube-link work phases can be summarized in:

- Data input (imports from devices or files);
- Editing or creation of graphic elements required to complete the project;
- Data output to data-recorder devices (e.g. for stakeout operations), or printing.





## 1 Installing and uninstalling Cube-link

### 1.1 Cube-link installation

To install the program just launch the installer, select the language (which can be changed at any time even to the installed program), 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 eventually change the program's folder location, the start menu folder and any additional task such as the link from the desktop.

The setup is available for 32 bit and 64 bit platforms (please note: the two versions cannot coexist on the same computer because of incompatibilities in some shared files).

Once the installation is completed, the first time you launch the program you will be asked to register yourself. The registration is simple, just enter your data in the form fields (Figure 1.1), following the instructions on the screen and then press the SEND data to Stonex button.

If you are not online at the time of the registration, simply contact by phone (or fax) the Stonex Srl and communicate the code that will appear on the screen (in this image the space is left blank). You will receive another code to enter in the box under the word Enable, click on the Activate button and start discovering the features of this useful program.

## 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 (Figure 1.2).

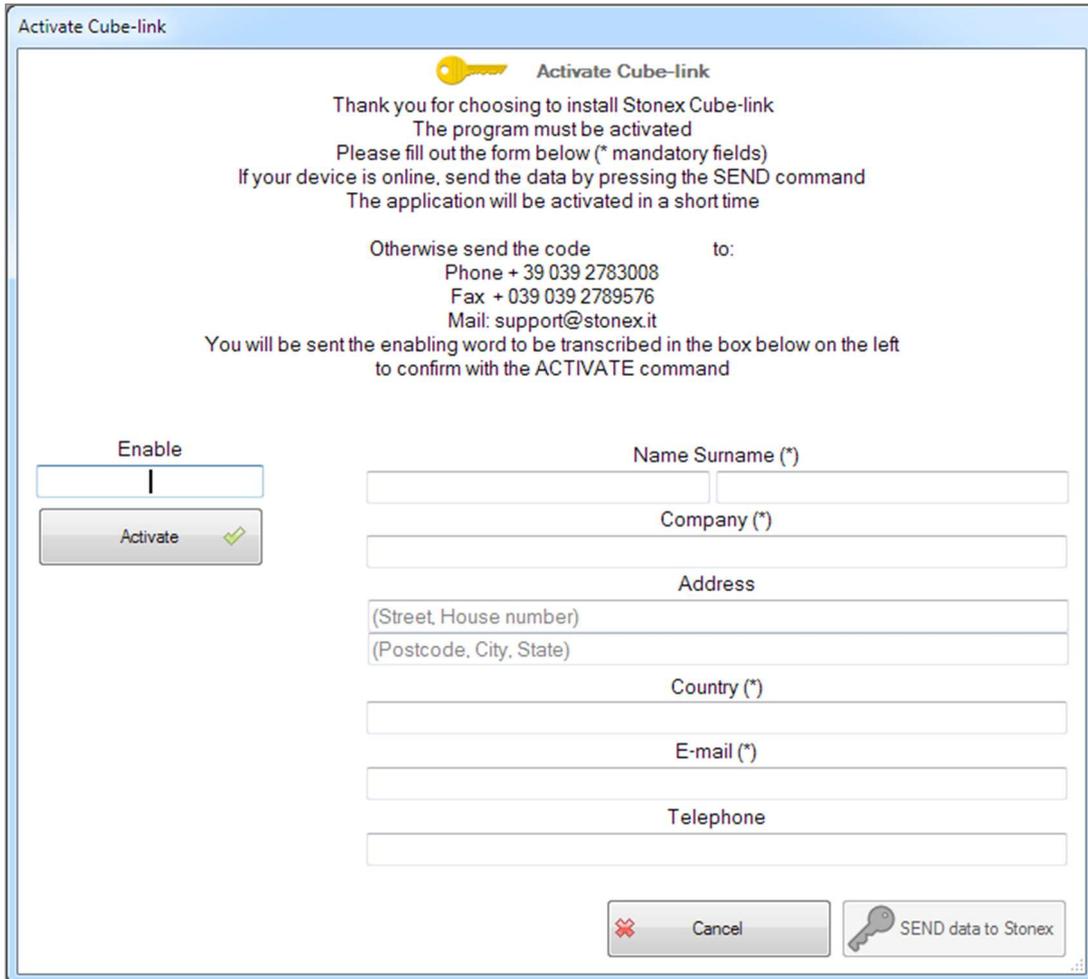


Figure 1.1



Figure 1.2

## 2 File

**File** is the first tab located at the top-left of the main screen. This section contains many utility commands, the settings command and all commands for import and export.

### 2.1 Open and save projects

The Cube-link project files have .cubelnk file extension and within them contain all the CAD and topographic entities used to work. It is possible to save template files (.cubetpl file extension) that contain all the settings used for a project (size variables, parameter settings, layers, etc.) so that for a new job it is possible to select a template file with the settings that are already appropriate to the type of work you are going to do.

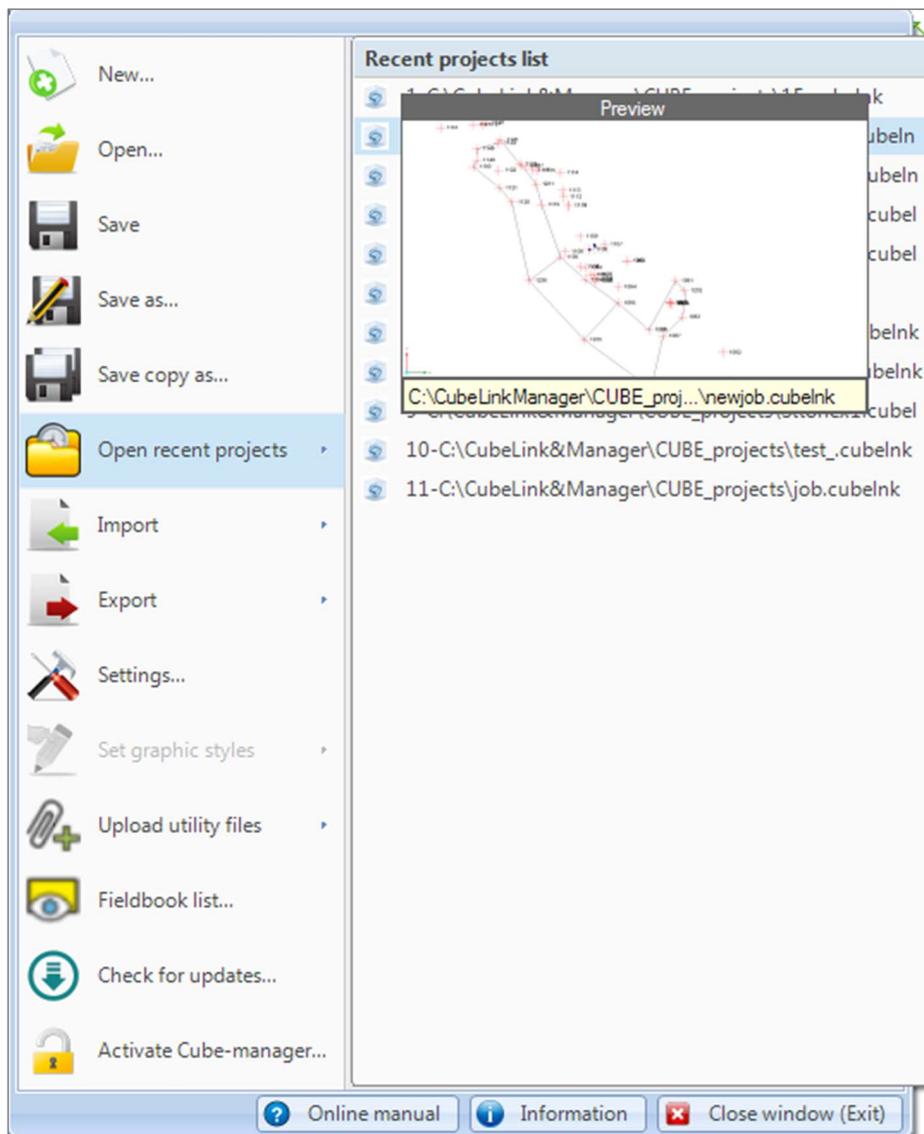


Figure 2.1

Recent projects are saved in a list (Recent projects button) in the File menu. Selecting a project from this list and hovering it over with the mouse will display a preview of the graphic works (Figure 2.1).

## 2.2 Import and Export files

Cube-link allows you to import and export files in many formats, including the Cube-a format. To import, select a format from the list shown in Import menu (Figure 2.2), each choice will open a new window (look at the relevant sections for details, par. 3.1 In/Out). The import for Cube-link files will act as a normal opening of the files.

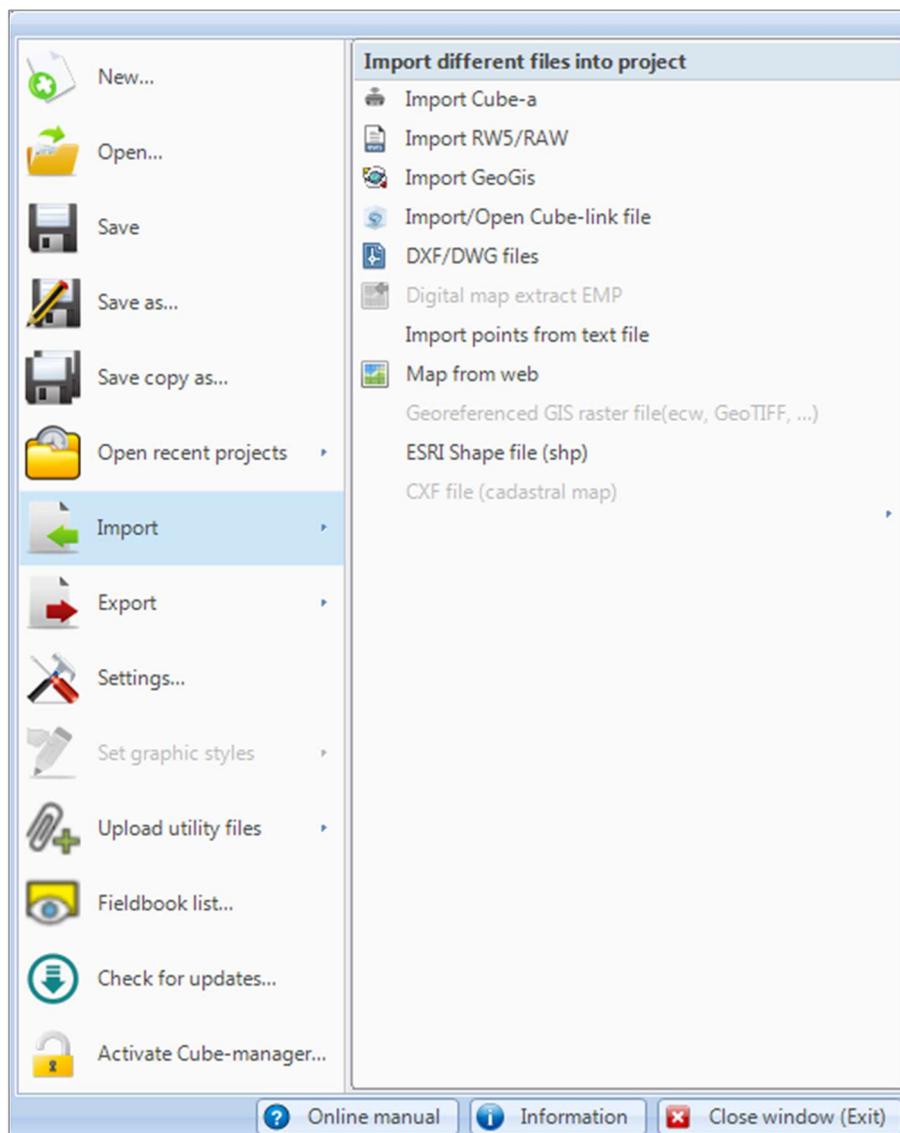


Figure 2.2

The import of a Shapefile is rather simple, the screen will show a preview of the selected file and clicking the Import button you can transfer the job in the current project (Figure 2.3).

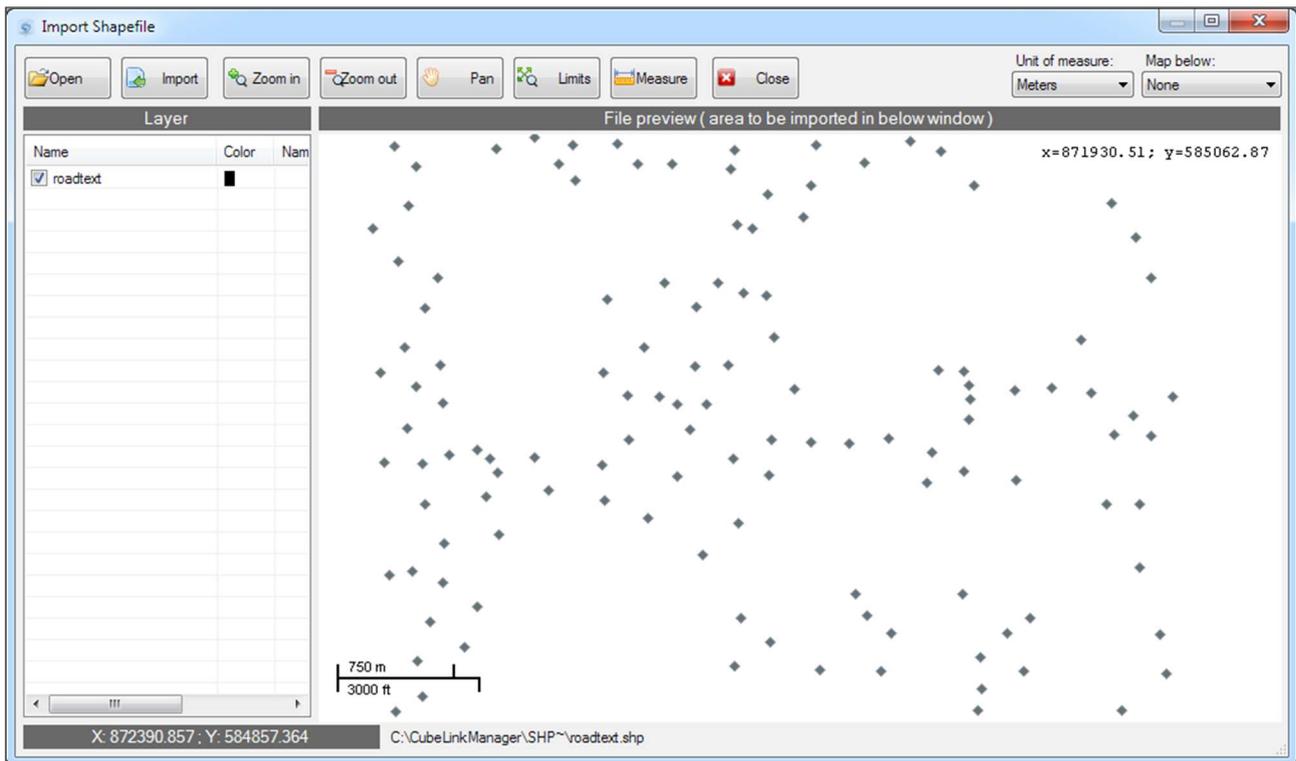


Figure 2.3

To export click on the relevant format in Export menu window (Figure 2.4), set and enter the correct information, e.g. name and path of the file.

In the export of a Cube-a format you need to declare the name and path of the file, after that, choose whether to export any content or just topographic points and then click Proceed (Figure 2.5).

For exporting the RW5 file after defining its name and path, if you are going to do a post-processing you can also enter a name and path of the Raw Data file (EzSurv by Effigis). In addition, you can create a CRD file from the project (Figure 2.6).

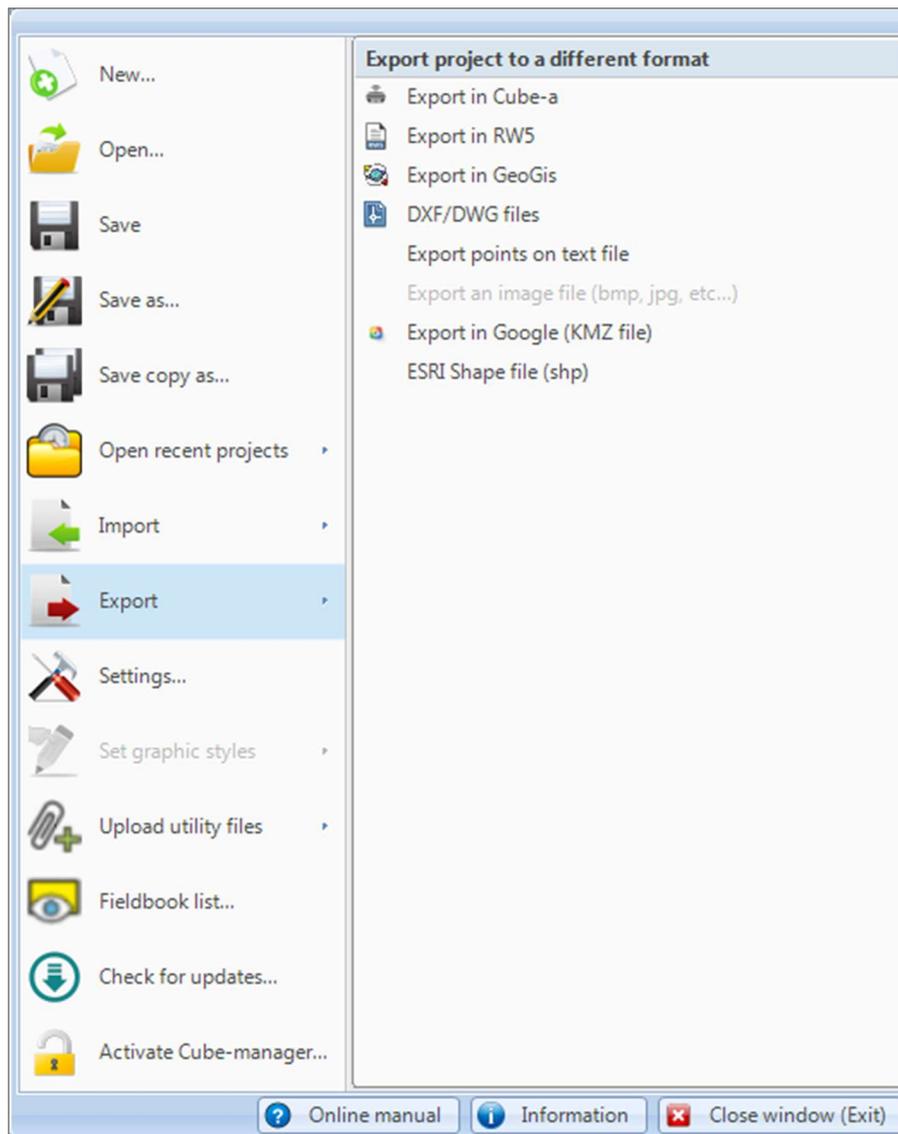


Figure 2.4

The GeoGis file export window looks the same as the Cube-a file export window and also has the same functionality. After setting the name and path to follow, you can choose whether to export the entire file or just the topographic points.

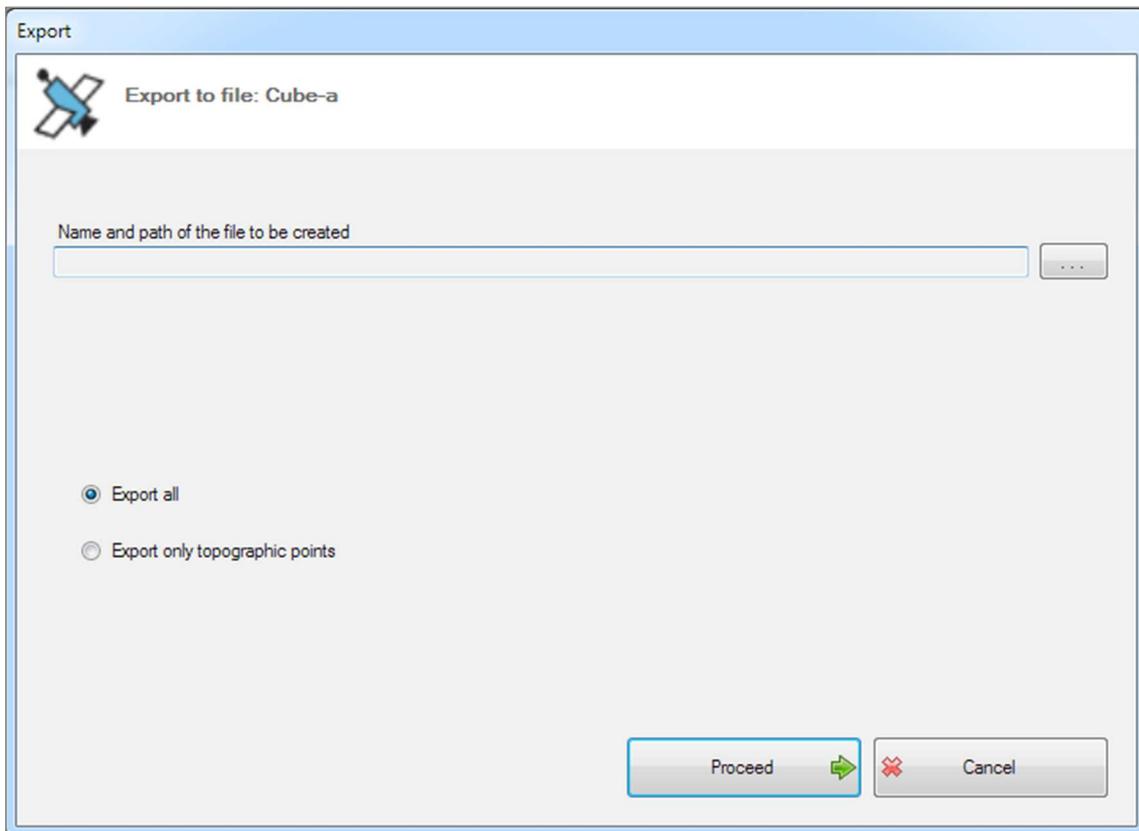


Figure 2.5

To create a text file just click on the Export points on text file button, the first thing you will be asked is the selection of the elements you want to export. If you want to export all the elements present in the project you can right-click on the graphics and choose the Select all option (Figure 2.7).

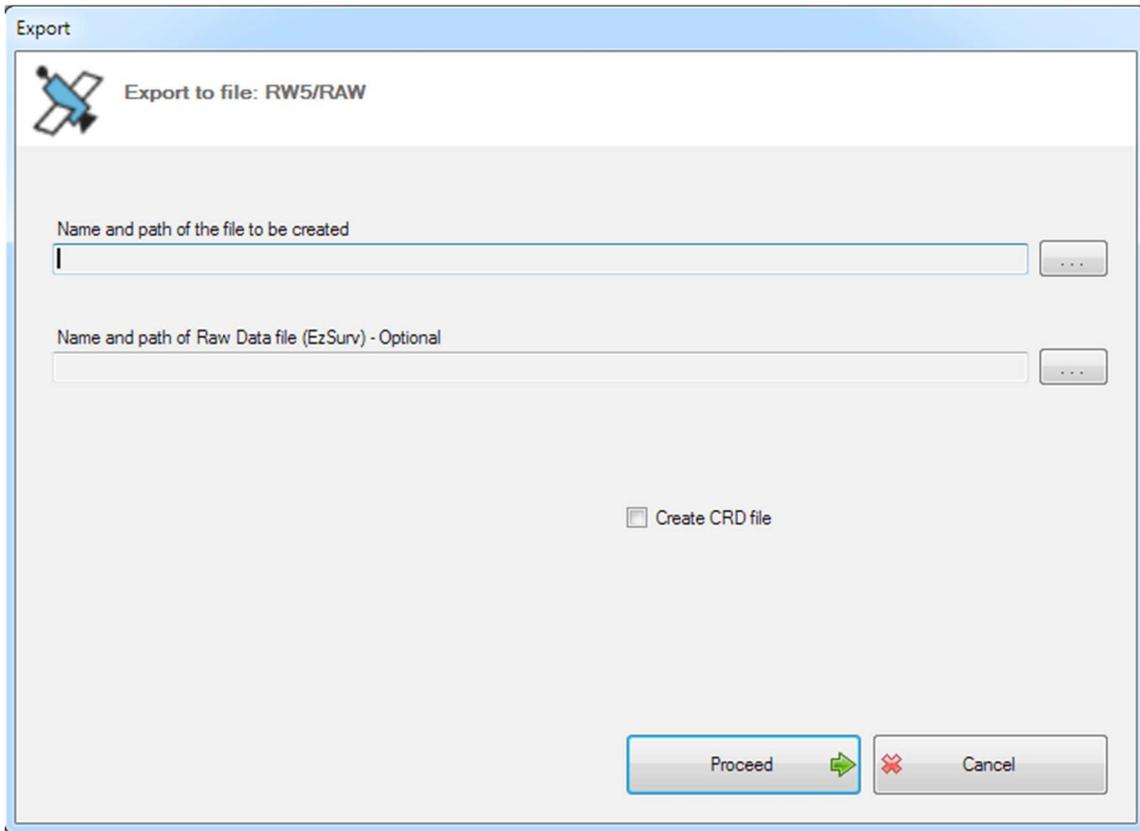


Figure 2.6

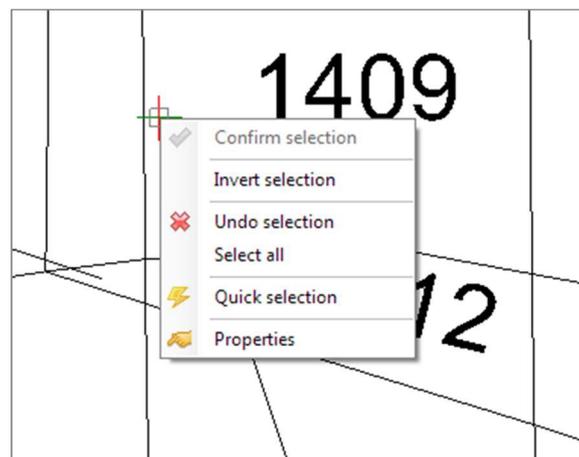


Figure 2.7

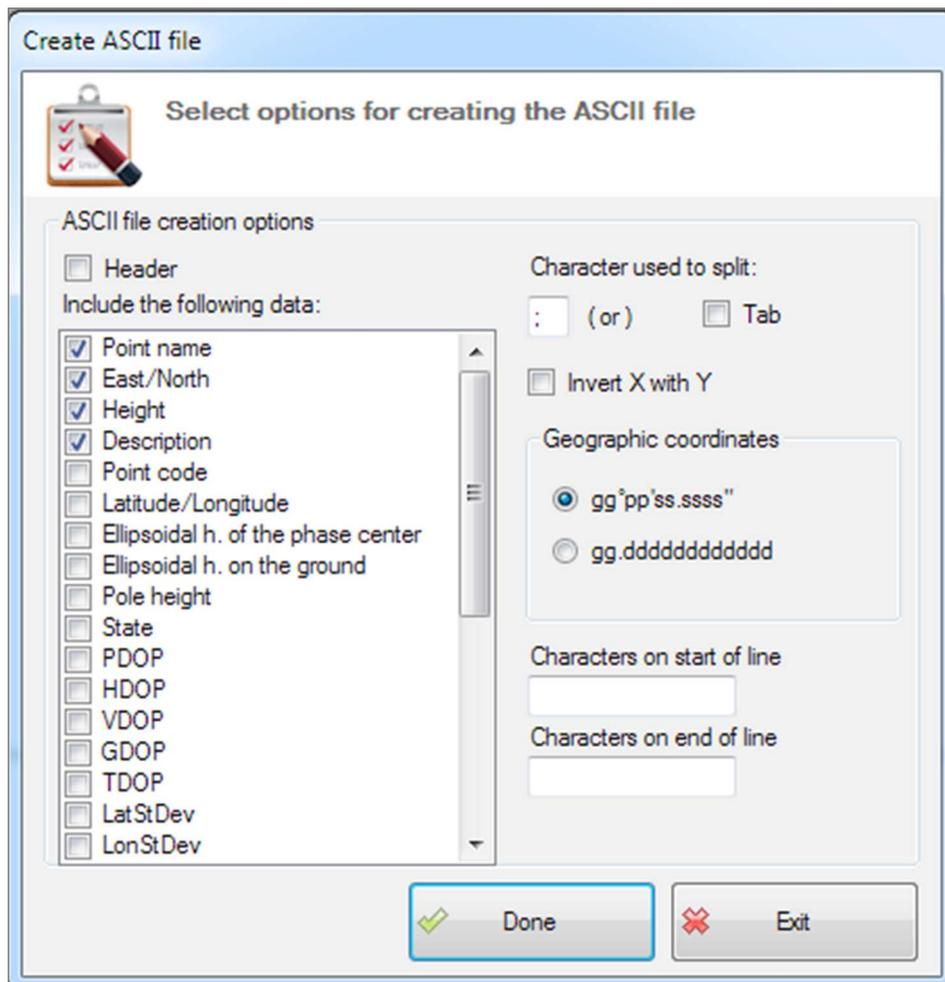
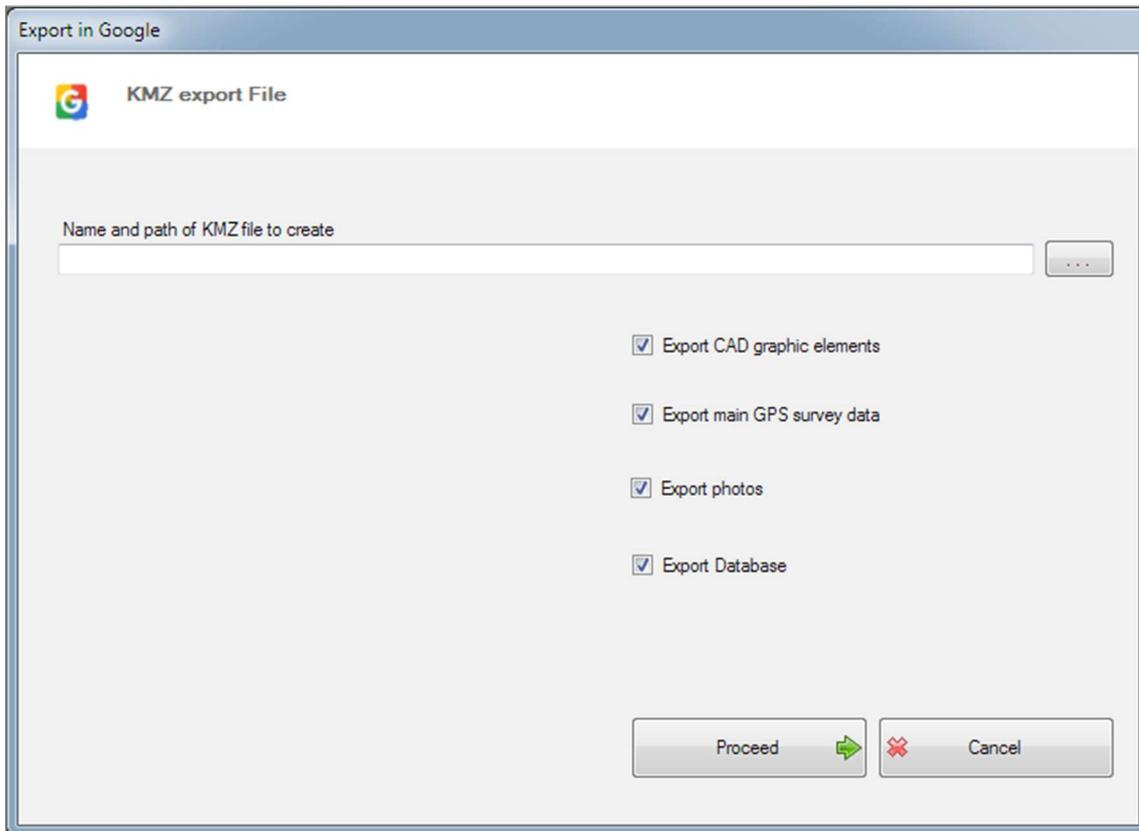


Figure 2.8

Once the selection is done, click the enter button on the keyboard and start to define what features you want to give to the file. You can choose whether to include a header and decide which and how many data the file should contain. In addition to that, you can define the format of the geographic coordinates, the character to be used as the separator, and the characters at the beginning and end of the line (Figure 2.8).

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 similar to the other exports of this application; first specify a name and a path for the file and then proceed with the selection of the features you want it to have. The structure of this window is very convenient because you can indicate which data you want to export: CAD elements; GPS data; photo; database attributes (Figure 2.9). As soon as the file is created, the program will ask if you want to upload it directly to Google Earth.



*Figure 2.9*

The raster management for Cube-link is not implemented, however, if you enter the Raster tab you can find an active command that will perform the function of deleting the raster file.

The logic for the export in shapefile format is the same that has been applied to other formats, once you have selected the name and location of the file to be created, you can select a series of information and contents that you want to attribute to the file (Figure 2.10).

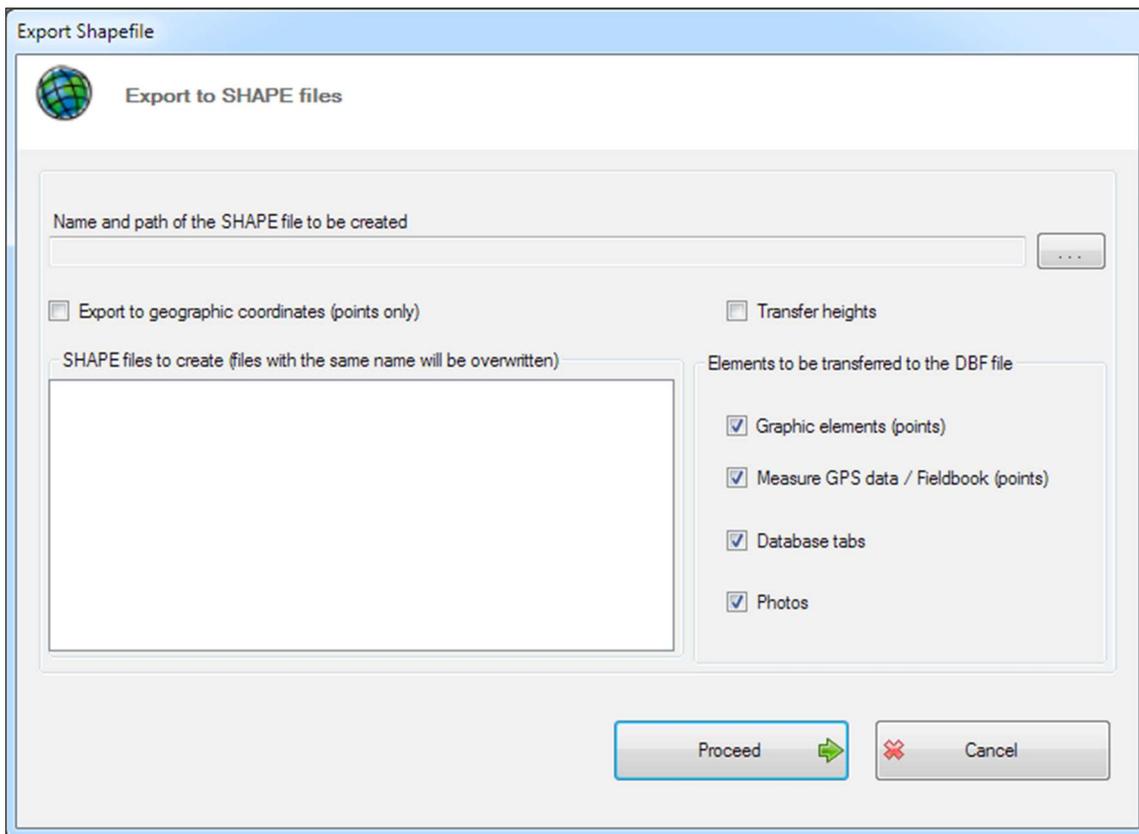


Figure 2.10

## 2.3 Settings

In Settings, you can set the general program functions such as checking for updates on startup or the AutoCAD® version to use (Figure 2.11). This feature is made up of 5 tabs that will be discussed below. The features available will allow you to fully customize the aesthetic, functional and practical aspects of the program.

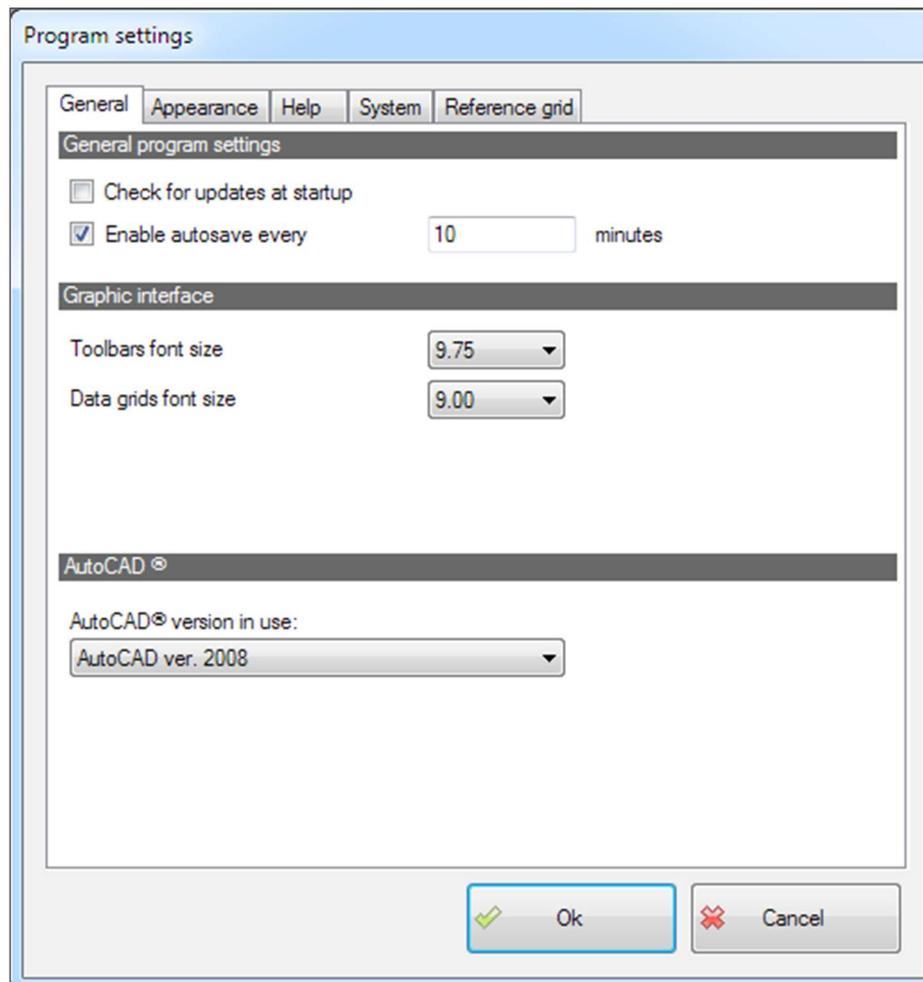


Figure 2.11

In the Appearance tab (Figure 2.12) of the program settings it is also possible to determine, for example, the background color of the workspace or enable the dynamic information on the cursor. Among the other available functions in Cube-link, there is the possibility to enable/disable the dynamic list of features, the visualization of the thicknesses on the screen, the icon of the Cartesian axes.

By enabling the dynamic list of features, you can read the characteristics of the elements in the project by hovering over the elements with the mouse, the application will display a popup window, like the ones below (Figure 2.13), that will describe the element type and its characteristics.

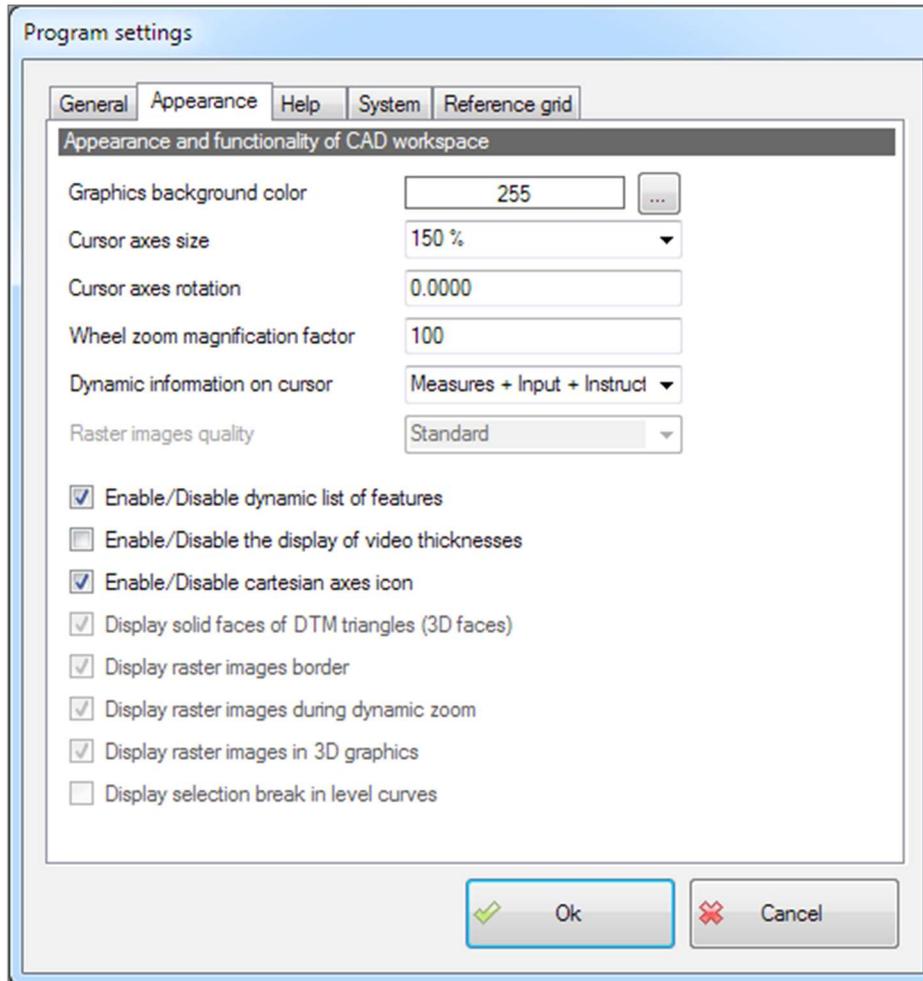


Figure 2.12

- CAD entity - CIRCLE	- Topographic point - Name: PT9
Layer: LAYER_DEFAULT Xc: 4.372 Yc: 3.992 Zc: 0.000 Radius: 4.575 Circumference: 28.747 Area: 65.760	Layer: LAYER_DEFAULT X: 6.114 Y: 4.002 Z: 0.000 Description: Stake Code: AL

Figure 2.13

The Help tab (Figure 2.14) is useful for setting whether to use the object snap and in which mode, and if enable or disable the polar pointing and the Ortho mode. Also in this section, you can customize the size of the Osnap symbol and the size of the selection area when this mode is active.

In the System tab, it is possible to set topographic measurement units and decimal digits for the program to display parameters such as heights, coordinates, distances, etc. (Figure 2.15)

As for the angle representation, which is a setting that can be done in this section, there are two possibilities: the topographic and GPS angle representation and the general angle representation, which concerns the graphics. The angle representation related to the topography is set by default in Grads, but when a fielbook is imported, the system will read the job settings and set itself accordingly.

In the last tab, the Reference grid (Figure 2.16), you can indicate whether to display the reference grid and what features should have.

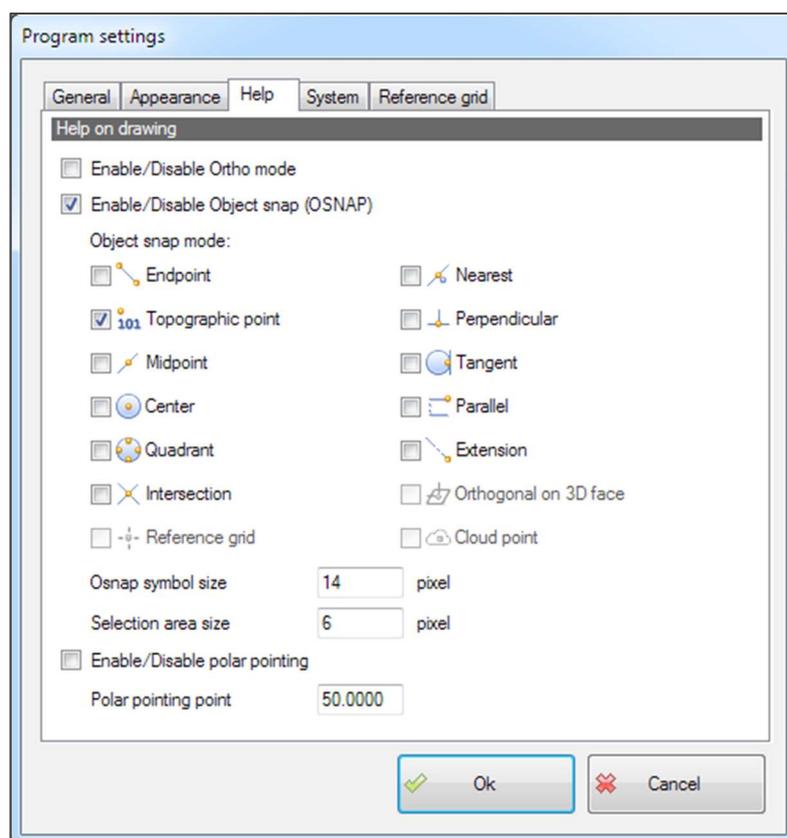


Figure 2.14

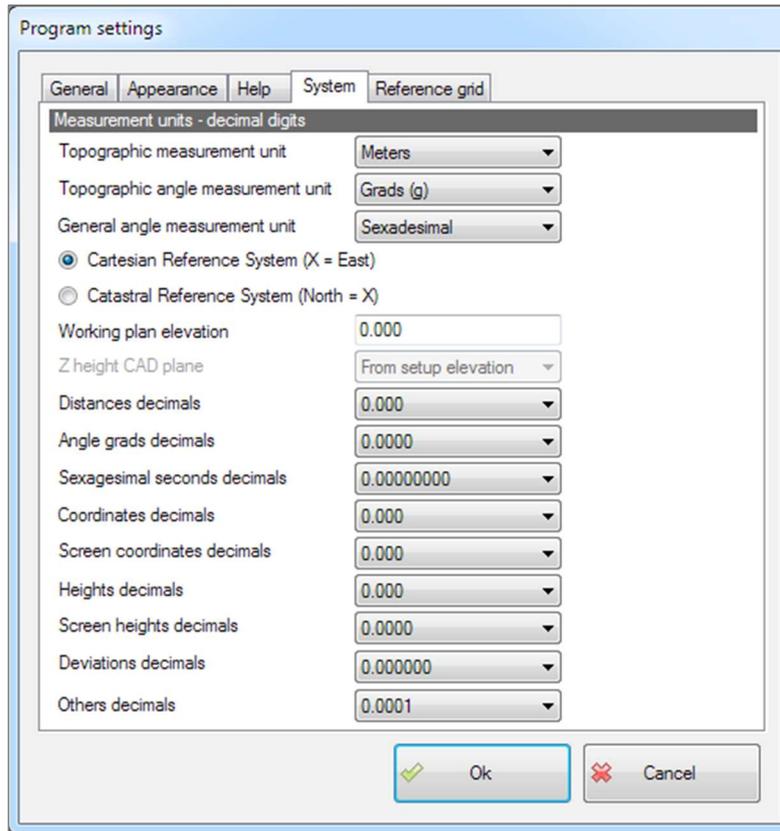


Figure 2.15

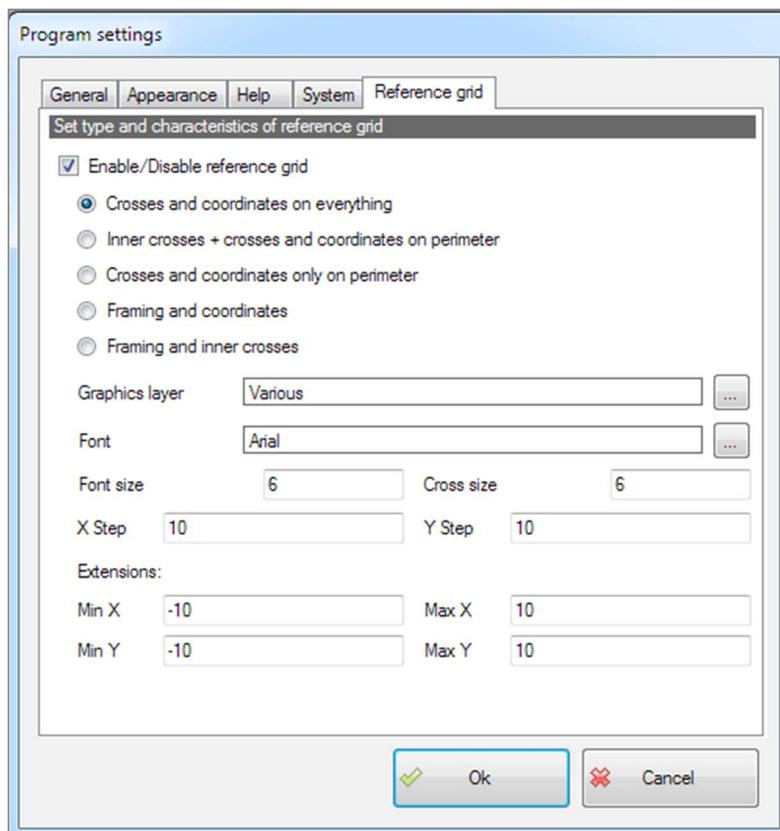


Figure 2.16

## 2.4 Upload utility files

In the application, it is possible to import utility files (in Cube-link only images). Just click on the Upload utility files button which will open a window (Figure 2.17), where you can select the path of the file you want to upload.

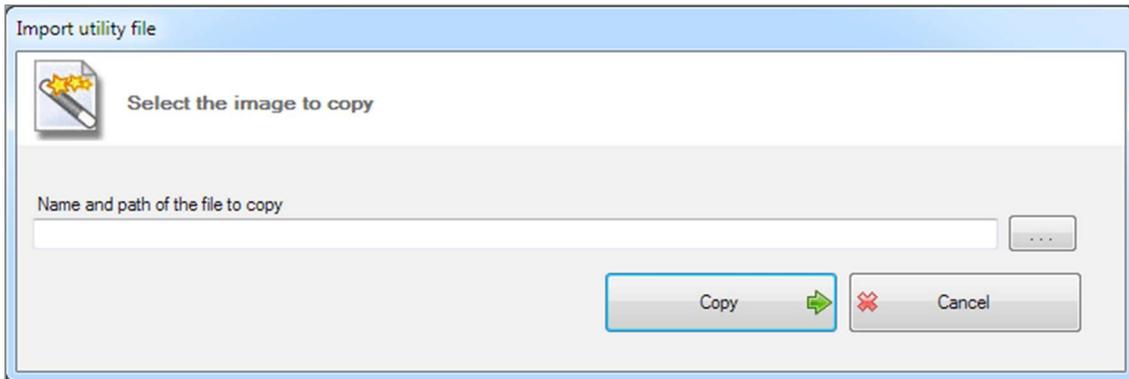


Figure 2.17

## 2.5 Fieldbook list

The Fieldbook List command opens up a window that will allow you to view in a table all the fieldbooks present in the project (Figure 2.18).

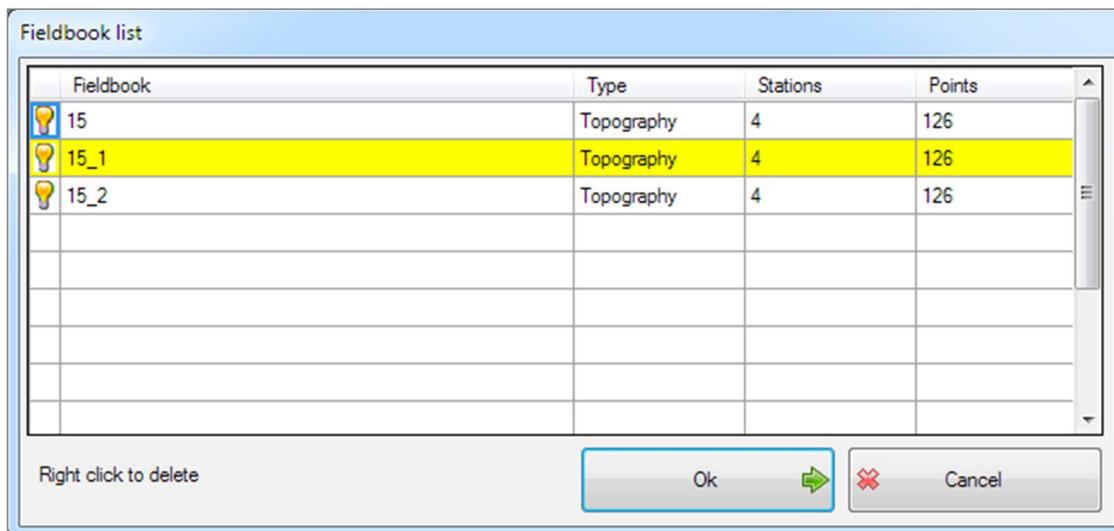


Figure 2.18

The information displayed are: the name of the fieldbook, its type, the number of stations and number of points. The operations that can be performed are: change the visibility of the fieldbook (by clicking on the light-bulb icon on the left) and delete the fieldbook (right-click on the fieldbook to be deleted).

## 2.6 Check for updates

Every time the application is launched a check is made to verify the availability of updates (default choice, can be changed from Settings section). You can also manually check for updates by pressing the Check for updates button. 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, whereupon the download will start automatically.

## 2.7 Activate Cube-manager

Cube-link is a free program that performs a part of Cube-manager functions. In Cube-link almost all the functions are visible but some are in gray and disabled (Pregeo commands are only visible when the Italian language is set), to have all the available features of Cube-manager, you can purchase a full version of it; contact Stonex Srl for more details.

### 3 Home

#### 3.1 In/Out

In the second tab at the top of the main screen, named Home, you can find the In/Out section (Figure 3.1) where are collected all the formats available for importing into the program (with the exception of the ESRI shape format that can be imported and exported by accessing the command in the File tab). Each command in this section opens a window in which the characteristics of the import can be set.

The import is about data recorded on field, if there are graphic elements related to them, these will be imported as CAD entities. No data transformations will be made at this stage unless you select it before the import.

In this section, you can select the command to export Dxf/Dwg files, all exports for other formats are available in the File tab.

Here is also the command to print, this will open a series of windows for the print settings, which will be illustrated below.

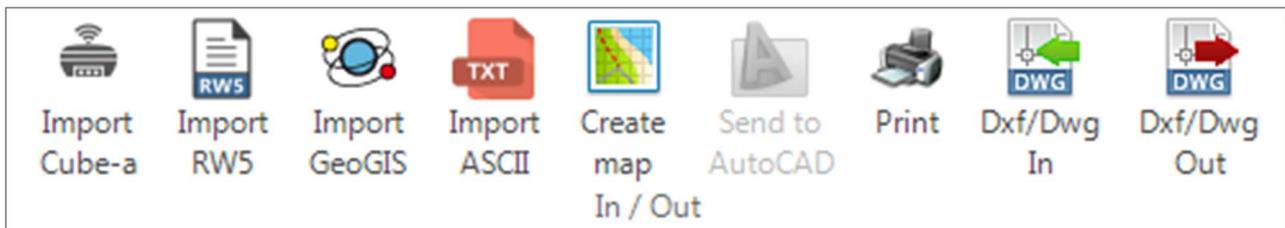


Figure 3.1

##### 3.1.1 Import Cube-a

In the case of importing Cube-a files (Figure 3.2), the system can work 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.

A Cube-a job is stored in a folder that has the same name as the project name and subfolders with all data, the file to be imported is located in the "Data" subfolder.

Copying the entire project folder allows the program to access data files such as photos and information on the reference system. Within the Android devices the projects are always stored as subfolders of the "StonexCube/Projects" folder.

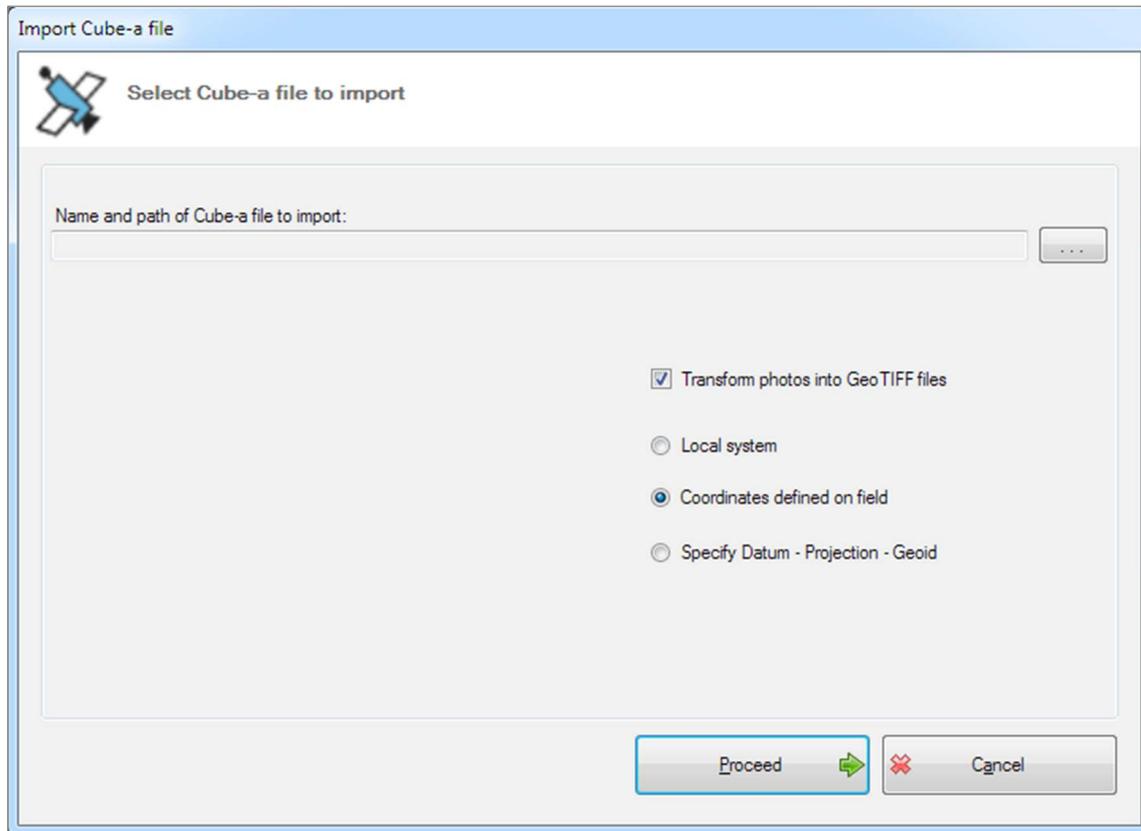


Figure 3.2

If the application finds photos in the project you have the possibility to transform them into GeoTIFF files. In Cube-a import as well as in Rw5 and GeoGis, you can import the file with the coordinates defined in the field (default choice), change the local system or assign a Datum, in these last two cases new windows will be opened for the settings (Figure 3.3 and Figure 3.4).

To define a local system just select a point of origin (the points present in the job are summarized in a list in the window), then a Geoid and an Ellipsoid, finally select how to calculate the distances and at what average height.

Otherwise you can select a Datum, in the window of competence you can select a Country, this will provide a list of Projection and Datum where you can select the one wanted and finally you can select a Geoid.

In this last window is also available a Show parameters command that opens another window (Figure 3.5). In the parameter display you can read in detail the data related to the chosen Projection.

Local system

**Local system definition**

Origin Point

Point name Pt1

East (m) 0

North (m) 0

Height (m) 36.035

Geoid  
AUSGeoid09\_V1.01.geo

Ellipsoid  
WGS 84

Major axis (m) 6378137

Flat 298.257223563

Average height  Rectangular geodetic at zero height  
30  Rectangular geodetic at height  
 Tangent plane - polar projection  
 Tangent plane - orthogonal projection

Points list

Pt1  
Pt2  
Pt3  
Pt4  
Pt5  
Pt6  
Pt7  
Pt8  
Pt9  
Pt10  
Pt11  
Pt12  
Pt13  
Pt14

Proceed   Cancel

Figure 3.3

Datum reference system

**Select Country - Projection - Datum**

Select Country  
United Kingdom

Select Projection - Datum  
Guemsey Grid / ETRS89

Select Geoid  
Hungary9.ggf

 Show parameters

Proceed   Cancel

Figure 3.4

Projection elements	World - UTM zone 33N / WGS 84
Transformation	TransversalMercator
Latitude origin	0
Longitude origin	15
False East	500000
False North	0
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	

Figure 3.5

### 3.1.2 Import RW5

To import a RW5 file, specify the file name and path and click on the search button (Figure 3.6). A utility feature is the ability to select the CRD file and therefore only import the updated data recorded in field (If you import Raw files the option on the CRD files will not be visible).

Also for this import, the coordinates can be modified selecting a local system or a Datum, the working windows are the same ones that are found in the case of Cube-a file (for information, par. 3.1.1 Import Cube-a).

If you want to use the USB connection click on Connect USB (using Windows Mobile Device Center). The data-recorder used in field can be directly connected to the PC and through the dialog box (Figure 3.7), you can directly download files from the portable device to the PC, or vice versa. By default, the system always sits in the recorded data folder, this location can be changed at will by clicking on the 3-dot button. You can select from which folder to take files; the structure is made to nodes and it is the representation of the actual device's aspect (Figure 3.8, example of structure by clicking on the device structure).

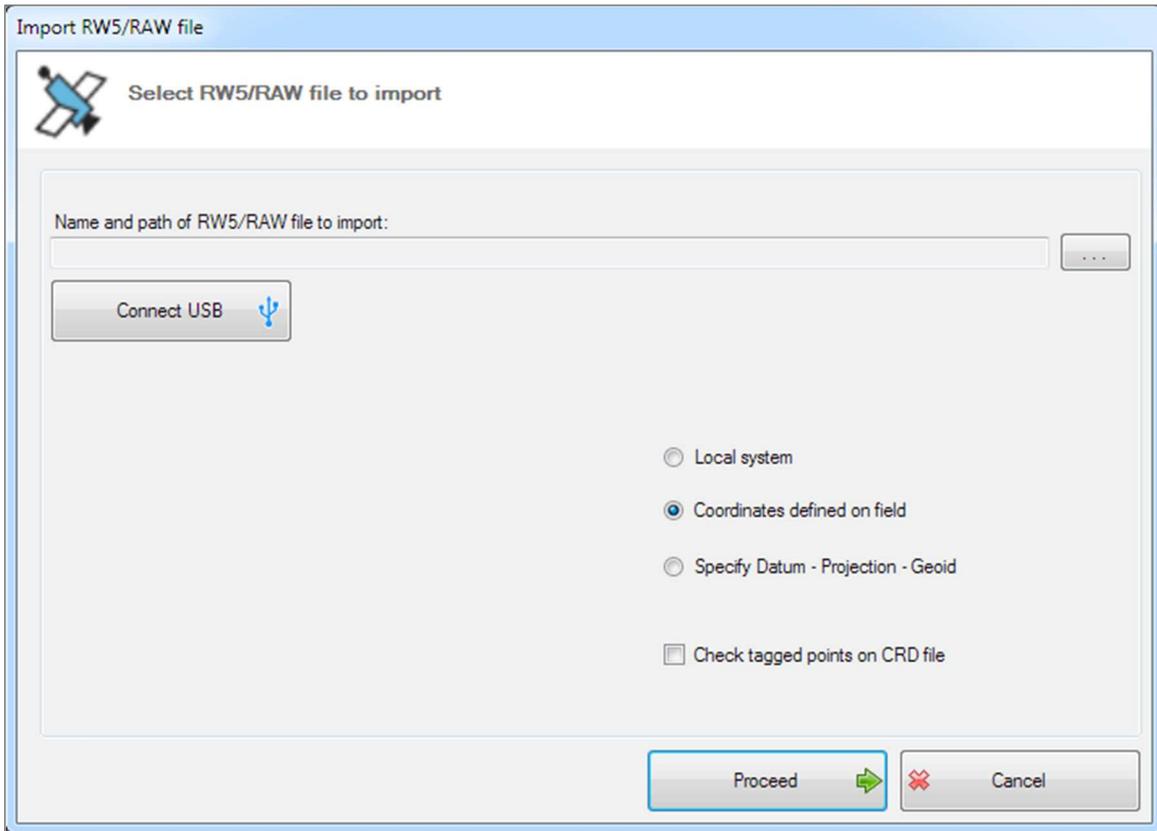


Figure 3.6

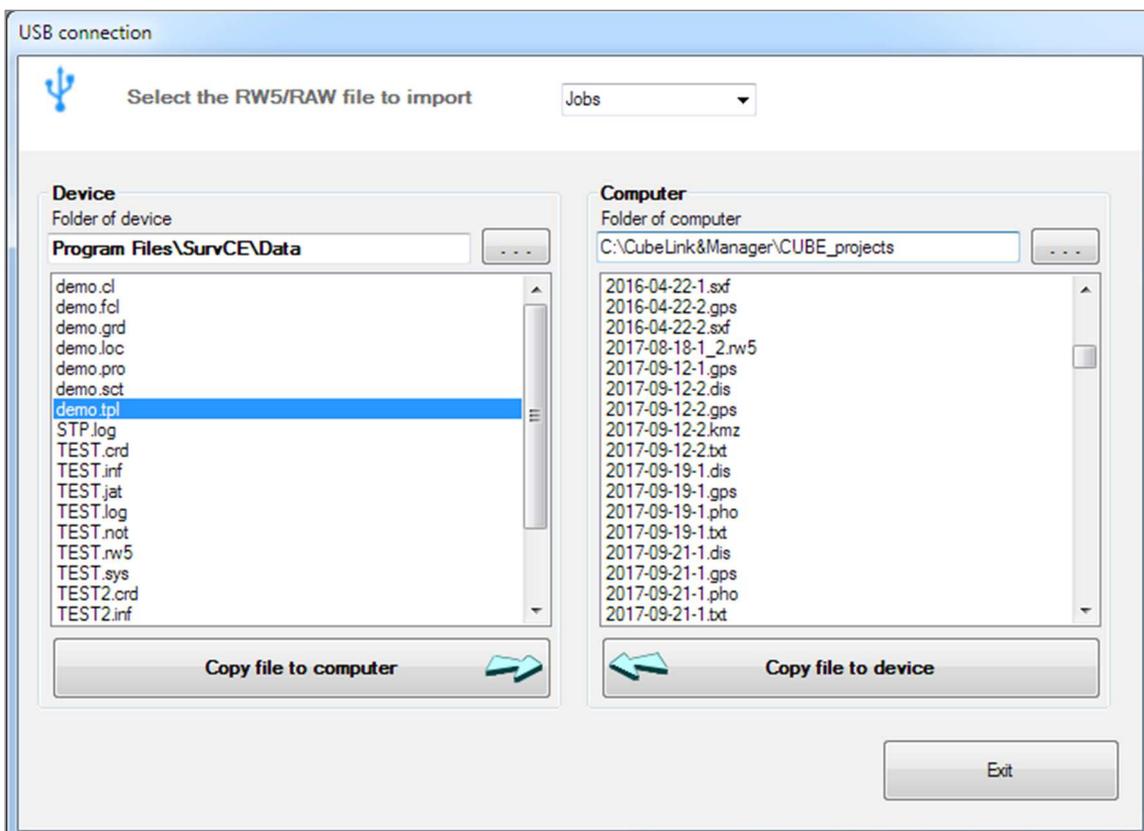


Figure 3.7

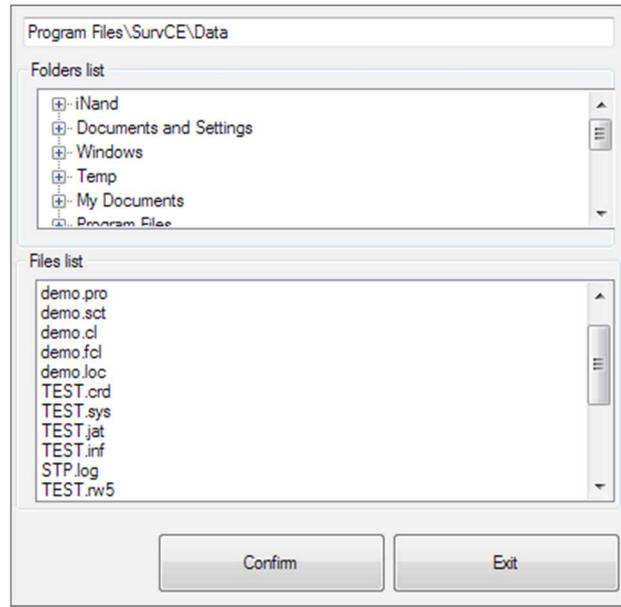


Figure 3.8

### 3.1.3 Import GeoGIS

The Import of GeoGIS format provides all the features described in par. 3.1.2 Import RW5 (Figure 3.9).

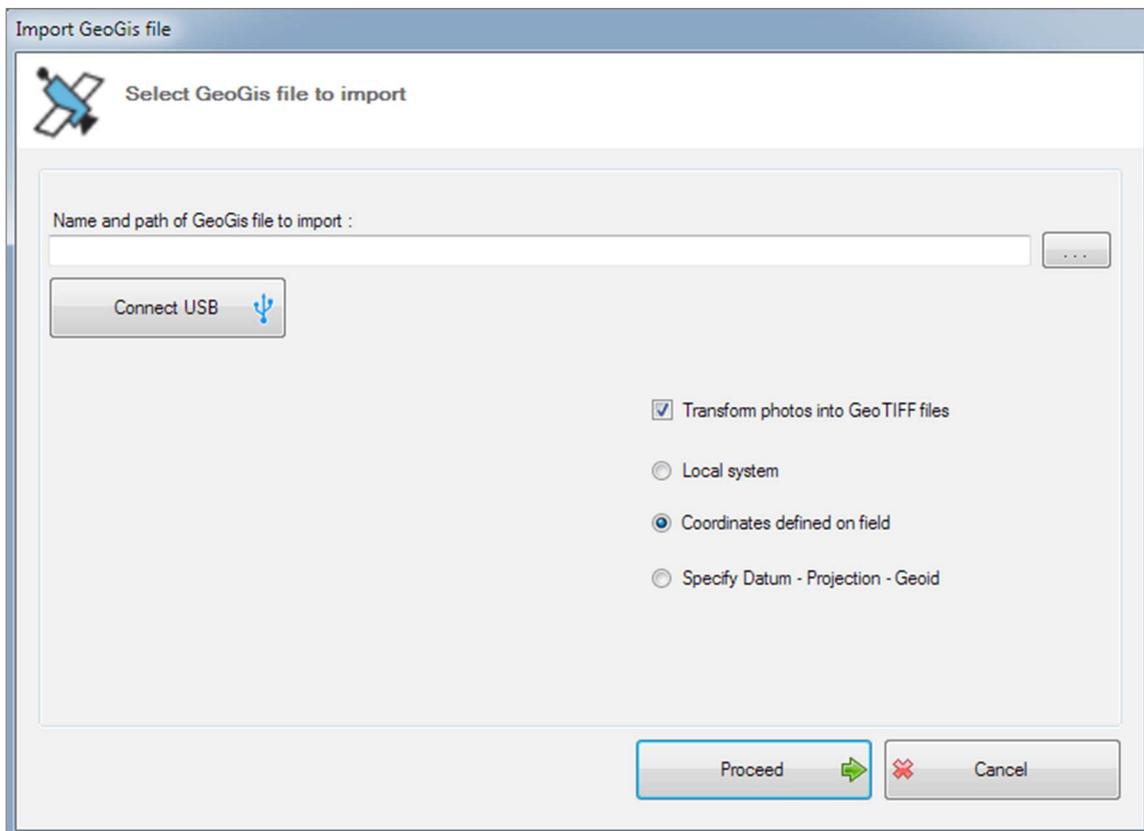


Figure 3.9

If there are photos in the project these can be transformed into GeoTIFF files. Also in case of GeoGis files you can connect a device to the PC and connect it via the USB connection (for information on the commands and windows, par. 3.1.2 Import RW5).

In this case, Raster files, Dxf and Esri Shapefiles can also be copied to the PC (Figure 3.10). To do this, select the chosen format with the command in the upper window.

Also for this format, you can import the coordinates surveyed on field, use a local system or select a Datum. In this case the windows are similar to those explained in par. 3.1.1 Import Cube-a.

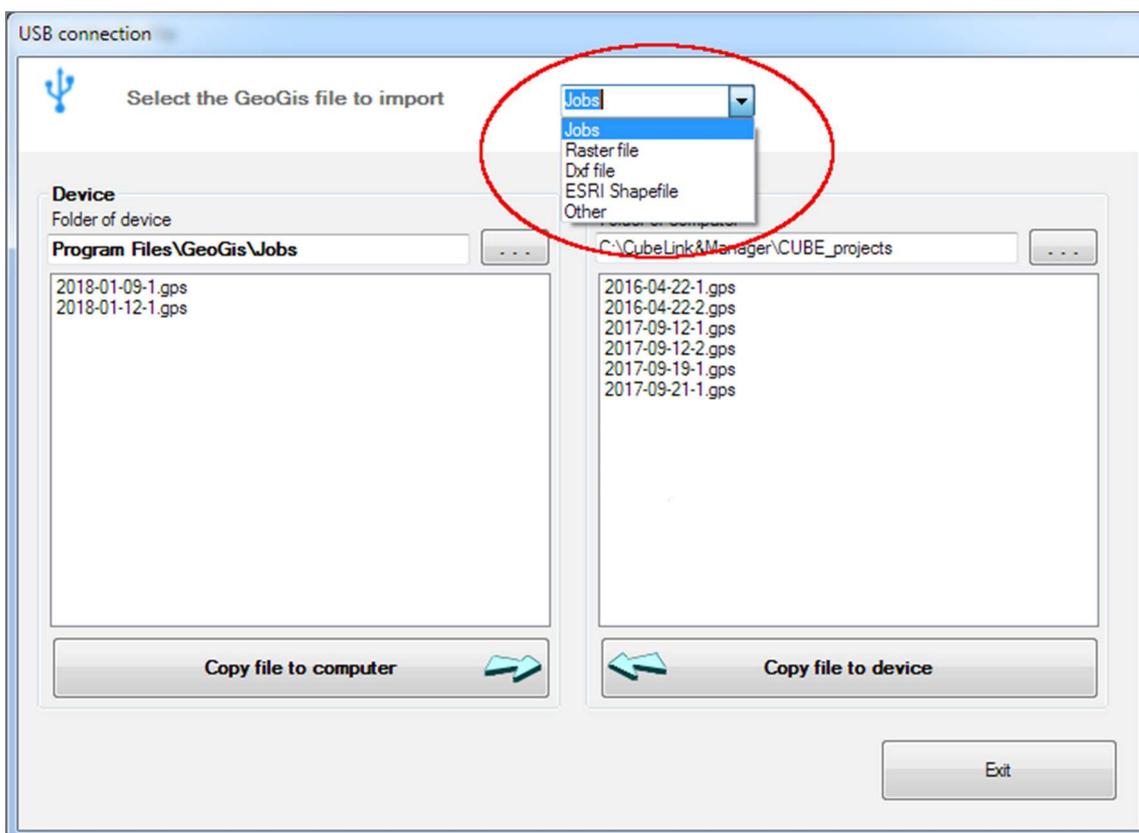


Figure 3.10

### 3.1.4 Import ASCII

Click the Import ASCII button to import ASCII files or generic text files. This function is composed of 4 steps.

In the first (Figure 3.11), you have to search for the file to import by name and path, at this stage you can also edit the file by clicking the button Edit file (Figure 3.12). This choice will open a text editor where you can edit the file, the number of lines can be displayed or hidden.

Before proceeding the import, you must select whether to create topographic points or CAD points from the imported file.

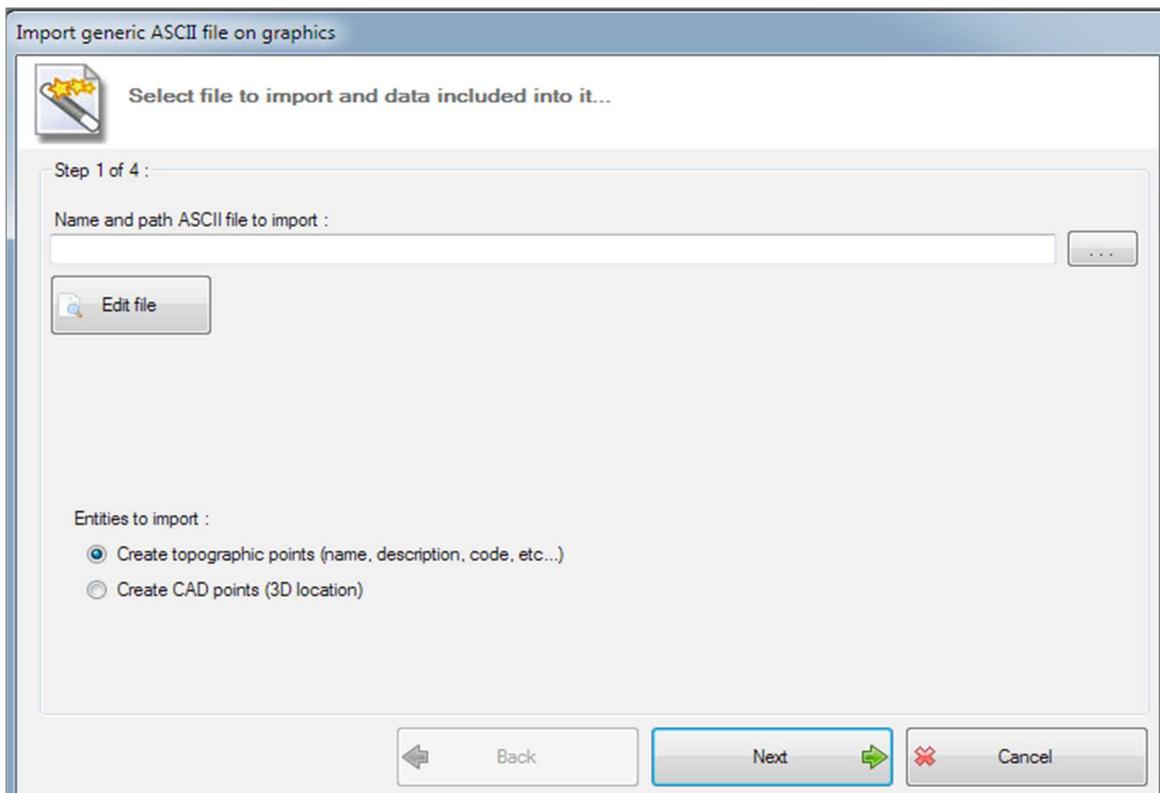


Figure 3.11

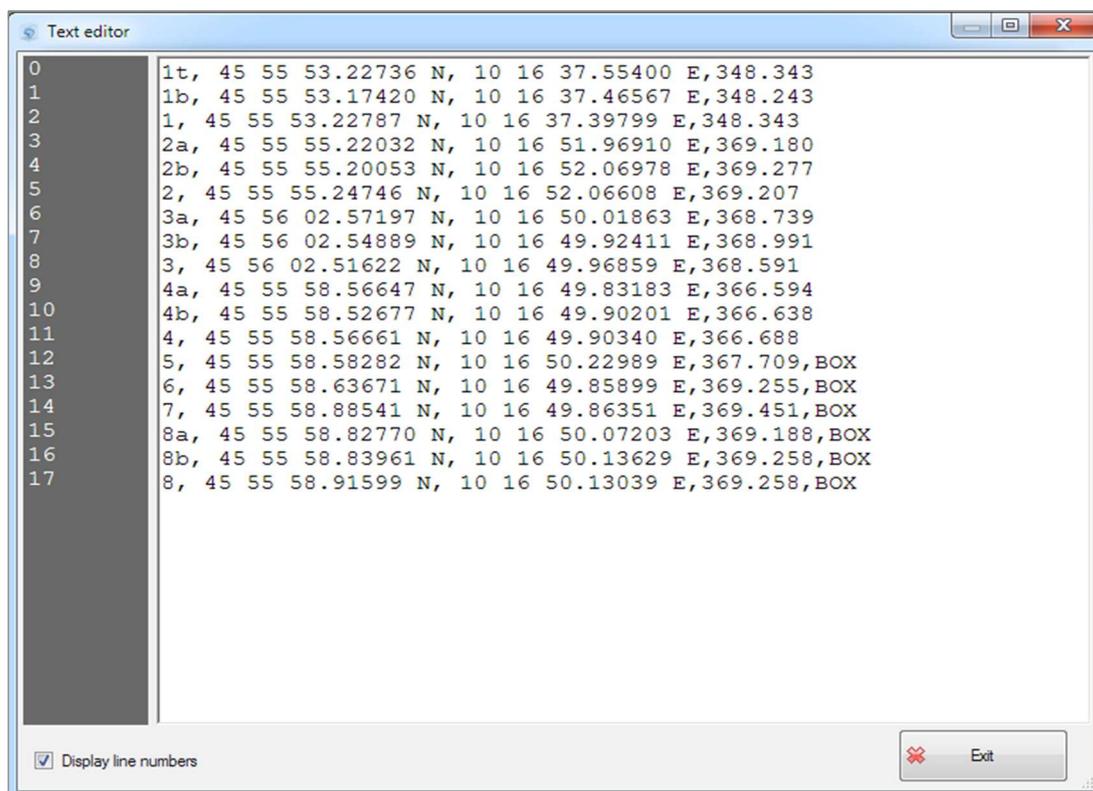


Figure 3.12

In step 2 (Figure 3.13), you can choose a character to use to divide the data on the same row, in addition you can select the columns you want to exclude from the import and finally you can determine from which row you want to start reading data.

In step 3 (Figure 3.14), you can attribute the content type (Point name; Coordinate X, Y, Z; Description; Code) to each column (click on the header to see the list, Figure 3.15).

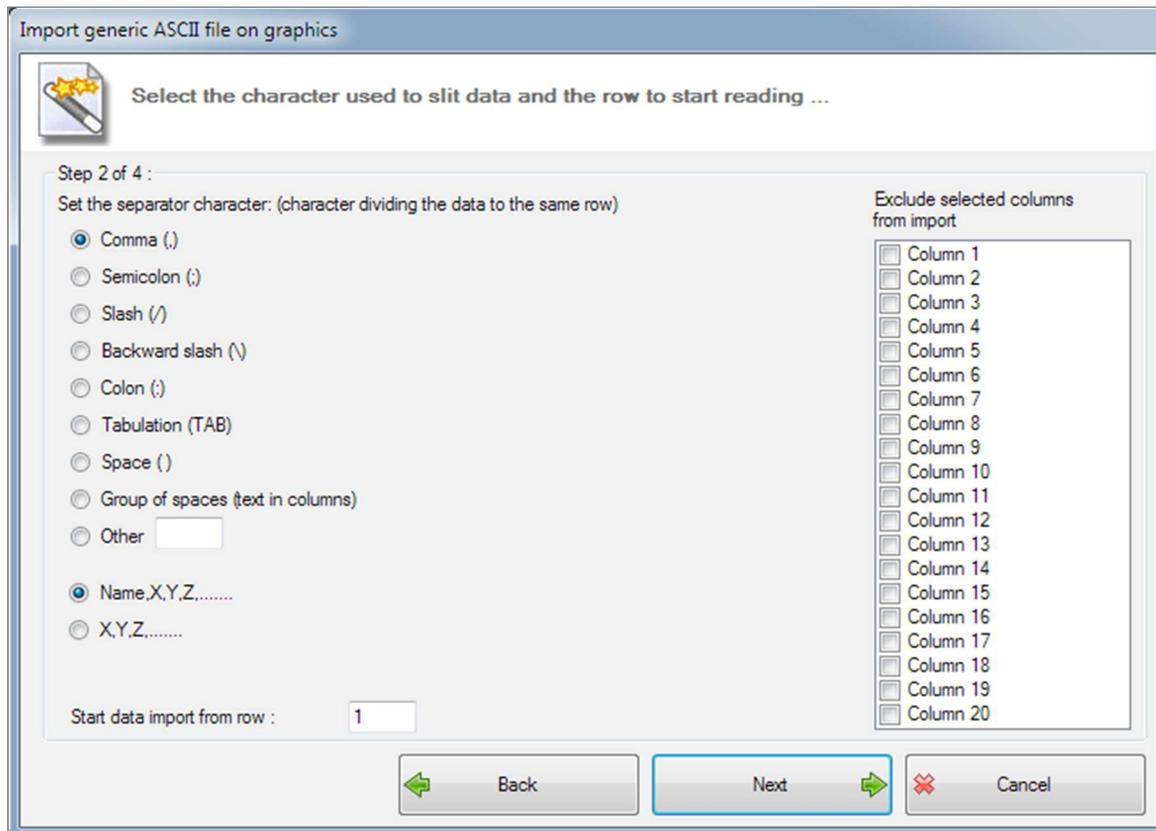


Figure 3.13

In the last dialog box, step number 4 (Figure 3.16), you can click on the Import button, and defined points that will be stored in memory.

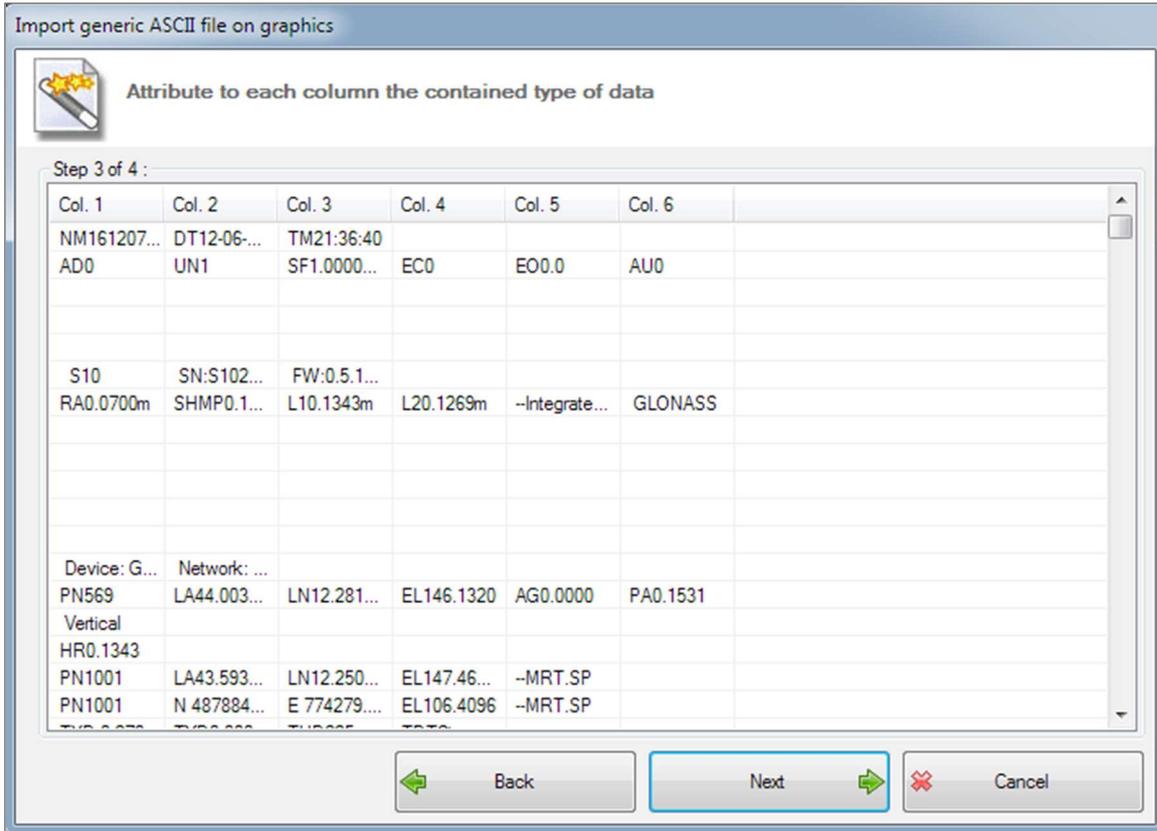


Figure 3.14

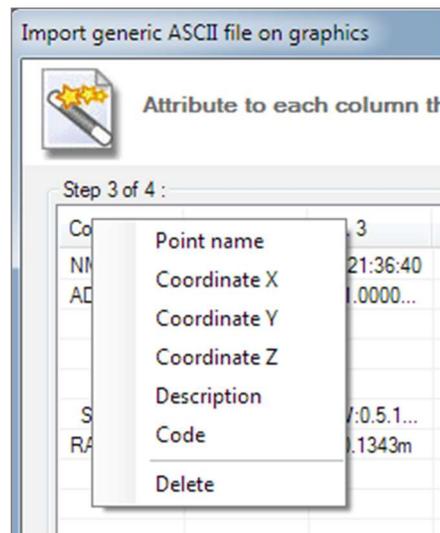


Figure 3.15

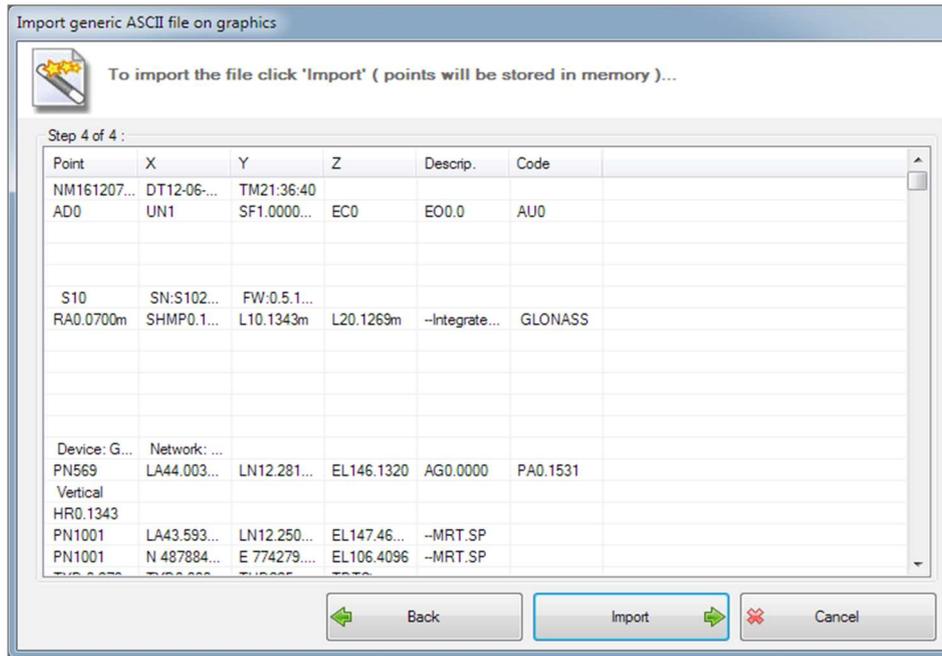


Figure 3.16

### 3.1.5 Create map

The Create map function creates a map, you will be asked for the latitude and longitude that you want to set as the center of the map. Then you will see a screen powered by Google Maps where the map will be downloaded. To import the map in the CAD it will be necessary to save the map image as jpeg (Figure 3.17).

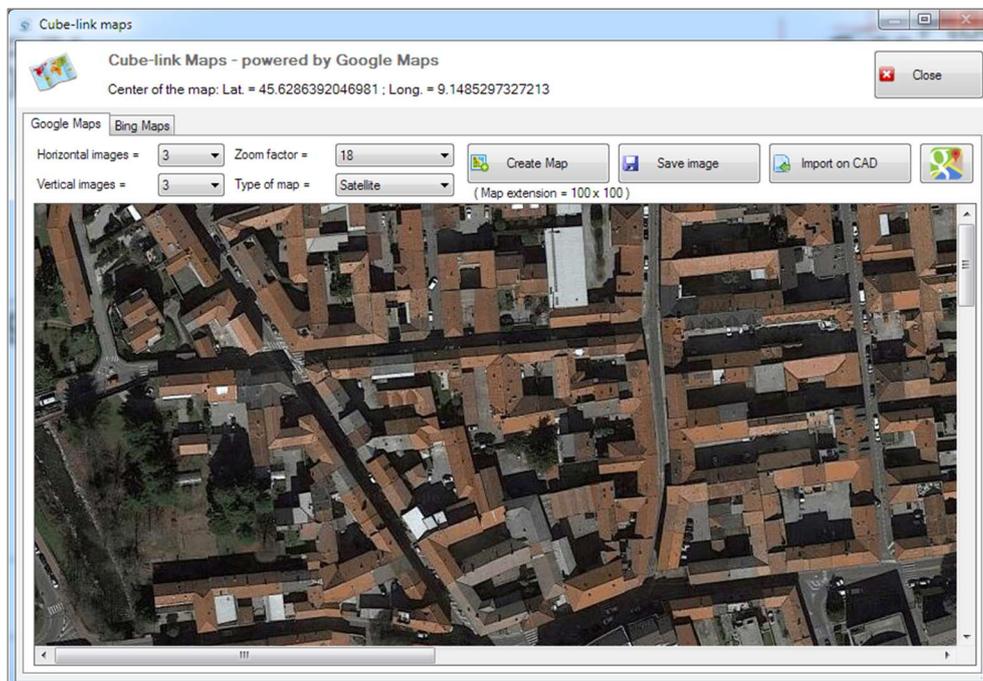


Figure 3.17

In Figure 3.18 you can see an example of a survey in red with a map imported into the graphics.

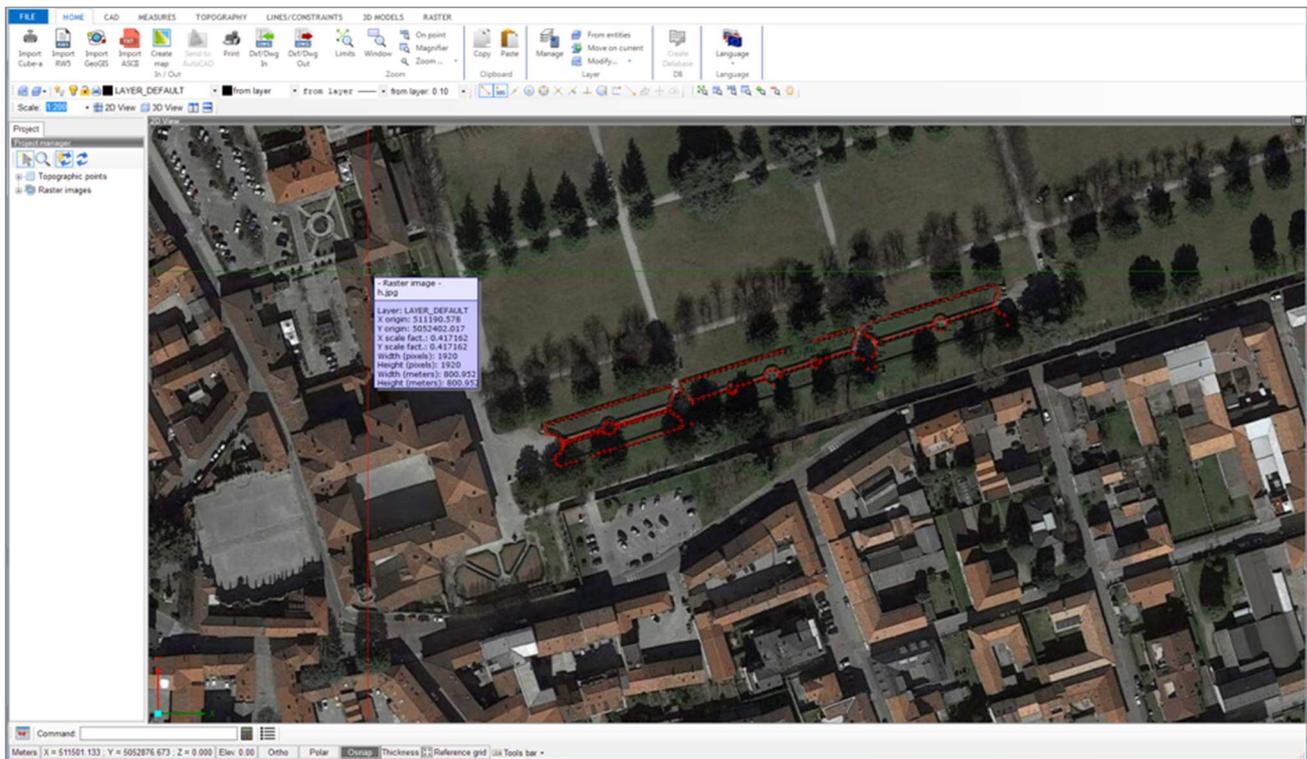


Figure 3.18

### 3.1.6 Print

The Print command opens a window that includes three tabs: print settings; printing styles; printing tables. Print Settings (Figure 3.19) is the tab where you can set the printer you want to use as well as the page to print. Scale, origin, print area, and print sizes can be set here.

In the Printing Styles tab, you can choose whether to set styles including thickness, terminations, joints using layer settings or choosing them as new ones. You can also import previously saved styles or save new ones (Figure 3.20).

The last tab, the Printing tables is dedicated to saving, deleting or loading print tables. In each of the tabs just described, you can click the print preview button (Preview and print) to see a layout of how it will print (Figure 3.21).

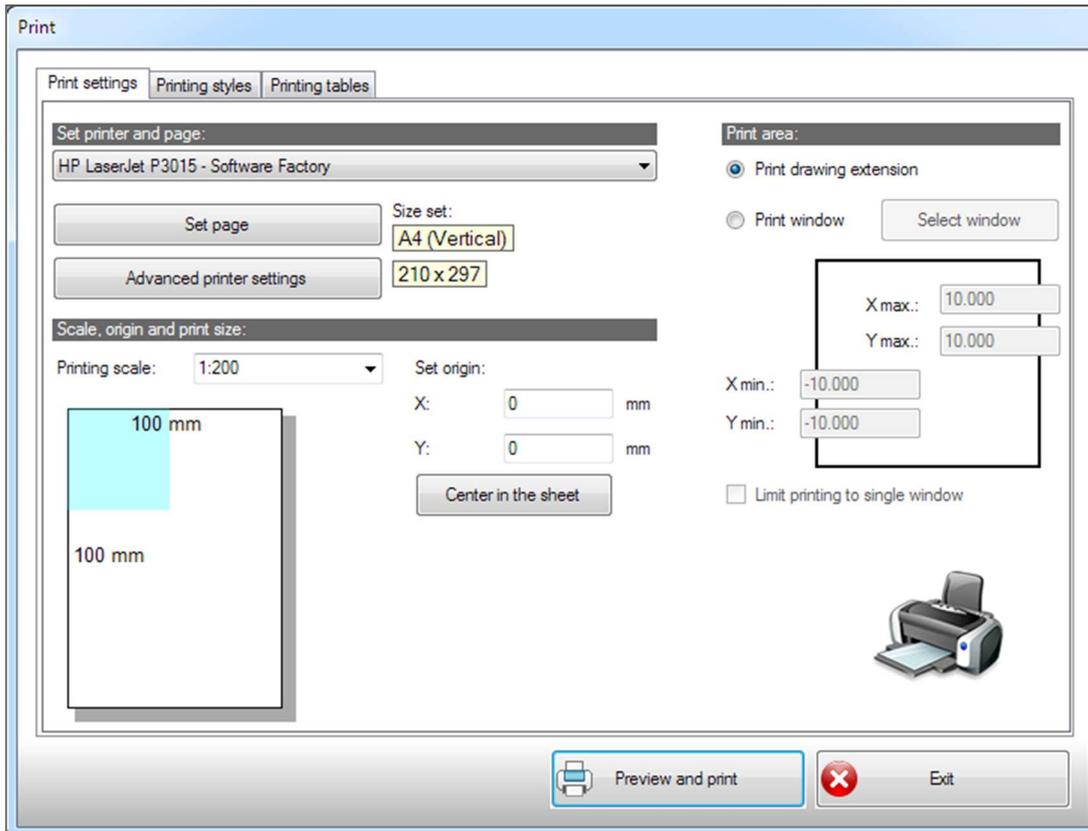


Figure 3.19

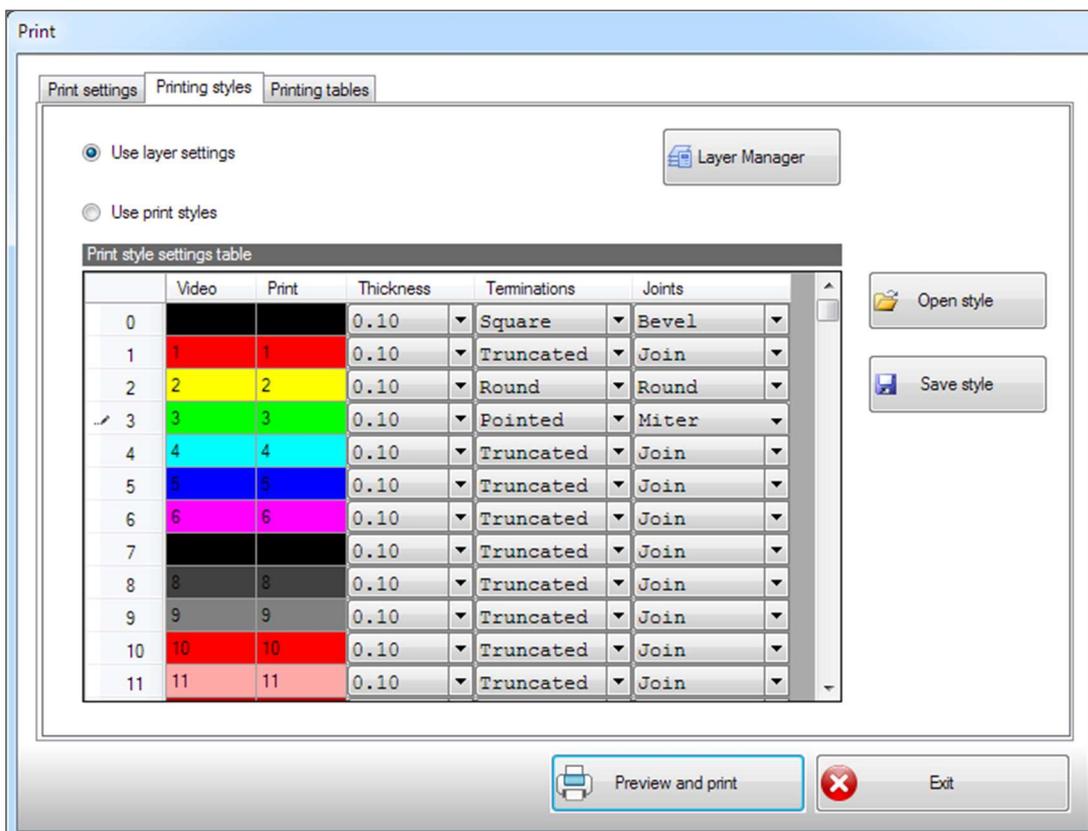


Figure 3.20

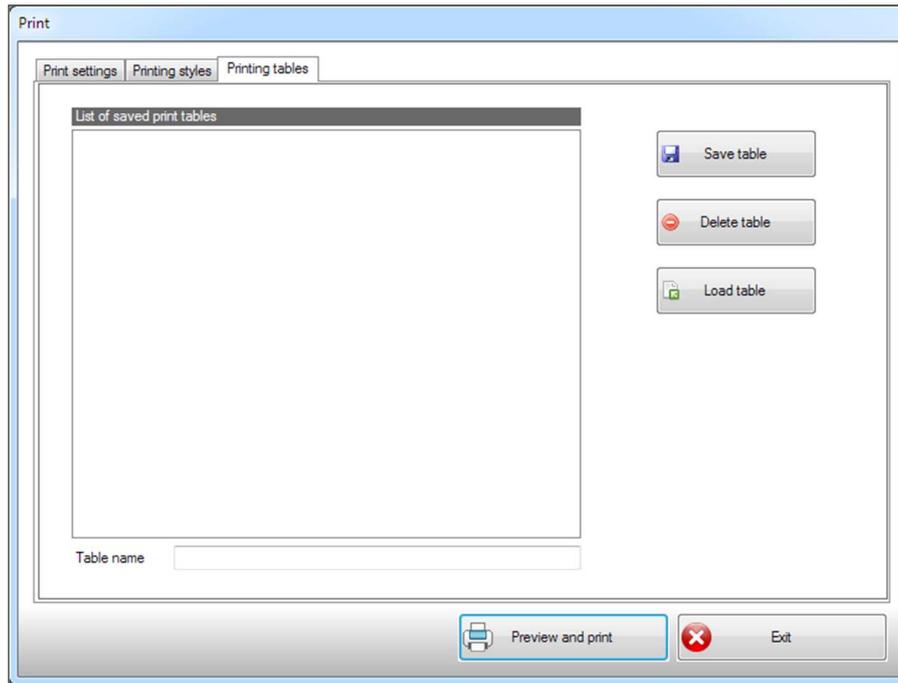


Figure 3.21

### 3.1.7 Dxf/Dwg In

This function allows the system to import graphic elements as they are and since there are no topographic point entities in these type of files, you can force this choice, so that entities with attributes become topographic points (Figure 3.22).

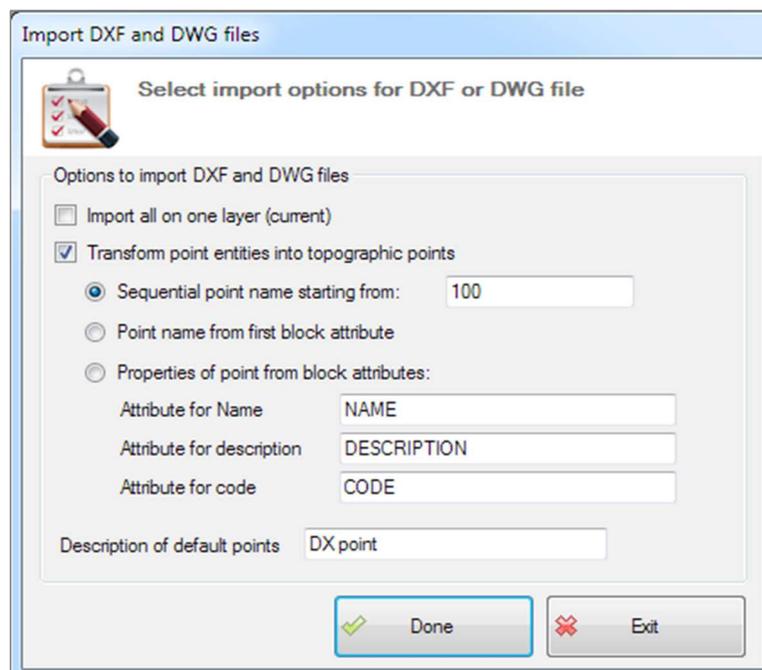


Figure 3.22

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 will be selected the current layer in the project.

### 3.1.8 Dxf/Dwg Out

The program also has the ability to create a DXF/DWG file (Figure 3.23), the first important choice to make is the version of AutoCAD® that you want to use to create the file. Then you can select entity options, especially if you want to include raster images, hatches and topographic points. Finally, you need to indicate what attributes you want to define for the points and also how you want to obtain 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 you can also choose whether to create a 2D DXF file.

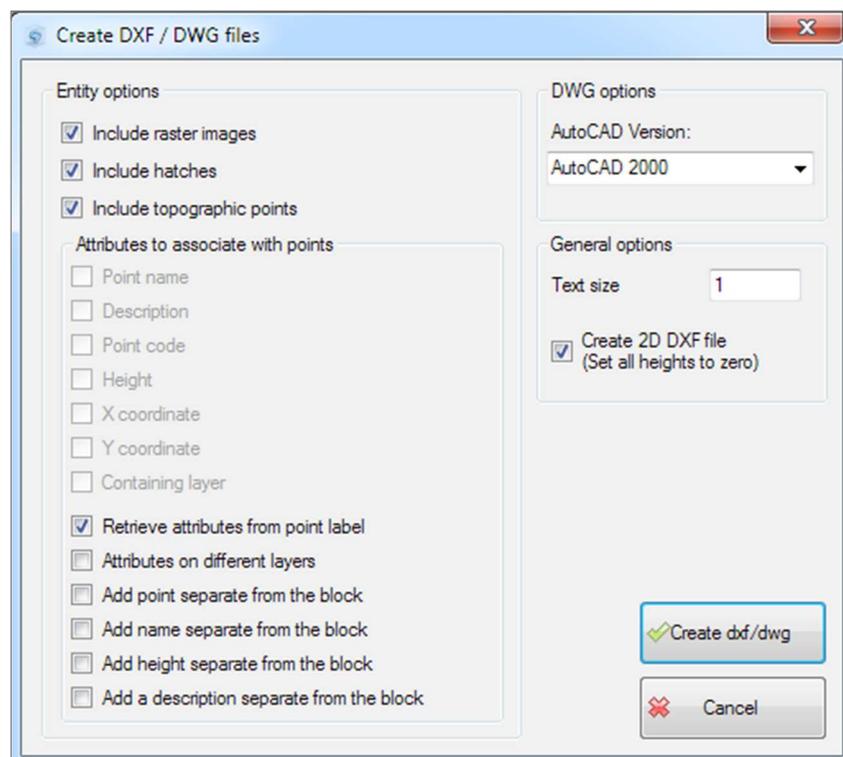


Figure 3.23

## 3.2 Zoom, Clipboard, Layer and Language

The zoom, clipboard and layer sections (Figure 3.24) are located close to the In/Out section because they are useful in the file processing. The zoom has a number of magnification and screen-view features (F

igure 3.25). In the clipboard section, you will find the classic copy-paste function.

The layer function is used to manage the various layers that are in the project. By clicking the Modify button (Figure 3.26) you can access the window in the Figure 3.27 in which you can operate on layers with visibility, selection or block functions.

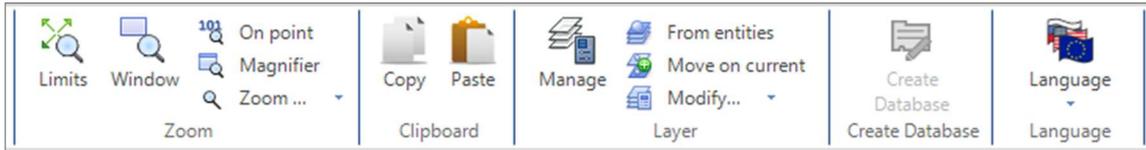
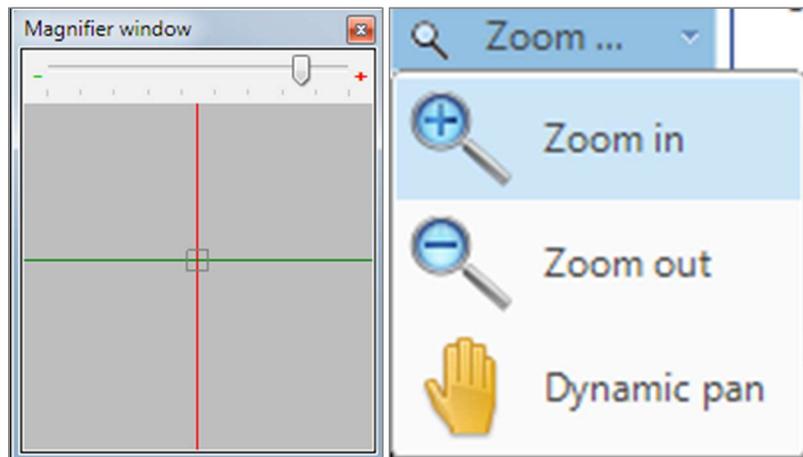


Figure 3.24



F

igure 3.25

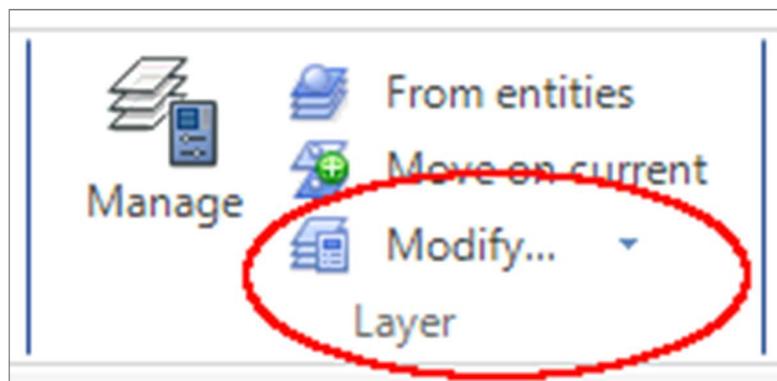


Figure 3.26

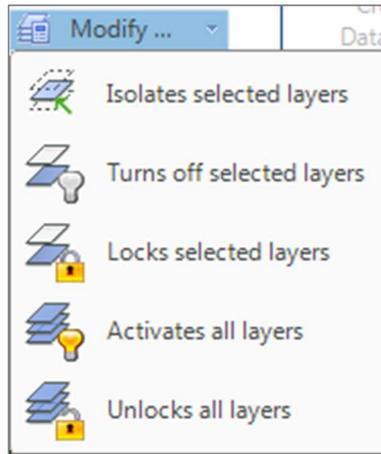


Figure 3.27

Layers can also be managed through the Layer property manager window by clicking the related icon in the main screen (Figure 3.28, icon in red circle). In this window (Figure 3.29), you can create new layers and delete others. There are all the available layers displayed and their classic features such as color and line type. From this window, you can print the contents of a layer and decide whether or not to show present names and symbols (clicking on the eye icon). You can also operate on visibility (light-bulb icon).

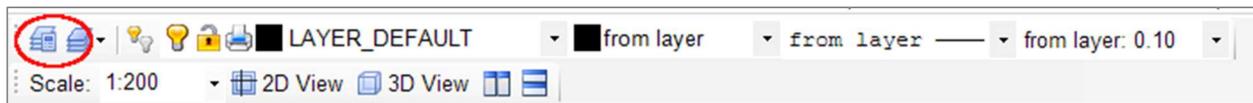


Figure 3.28

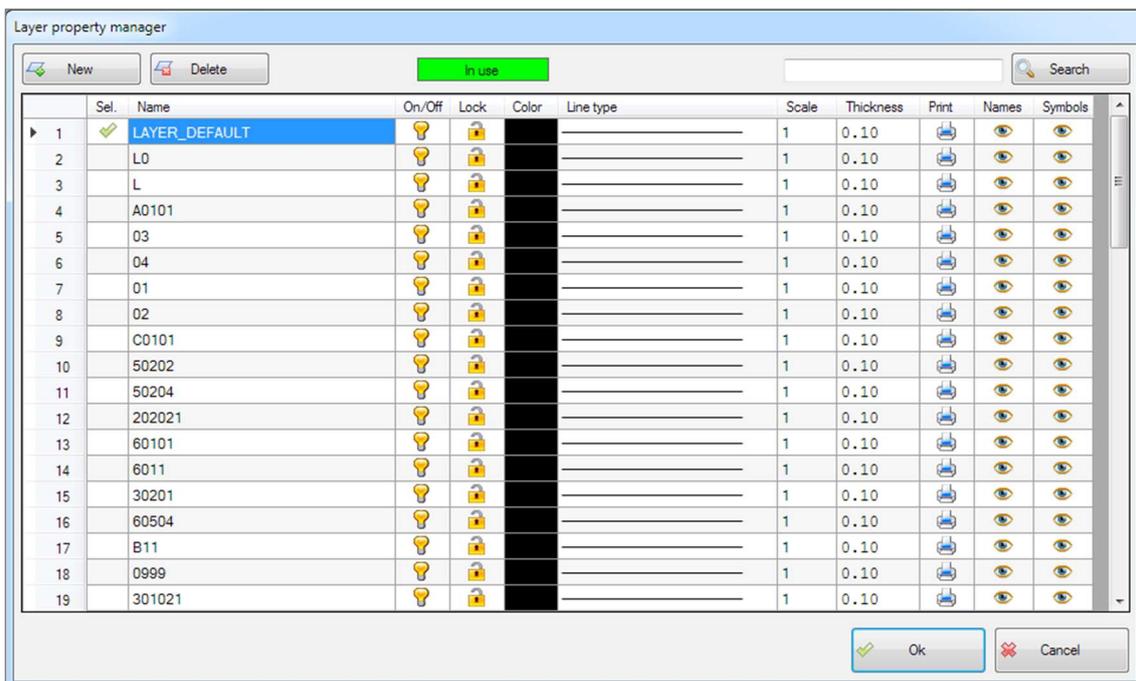


Figure 3.29

In the section we are describing (Zoom, Clipboard, etc.), there are two other buttons, the first one in gray is not enabled in Cube-link. The second concerns the change of language, you can change it at any time but to make sure to see all the commands correctly translated, it is advisable to restart the program.

## 4 CAD

Clicking on the CAD tab (Figure 4.1), it is possible to enter the area dedicated to CAD design and processing, which is intended to support and complement the topographic features.



Figure 4.1

These functions are similar to those of AutoCAD® and the numerous CAD clones. These functions can be used in combination with OSNAP (object snap) modes (such as OSNAP on endpoints or on midpoints). Note that by default the program starts with an active OSNAP on endpoints. This setting can be switched at any time by clicking on the Osnap button (on/off), shown in Figure 4.2 in dark gray (that means to be active).

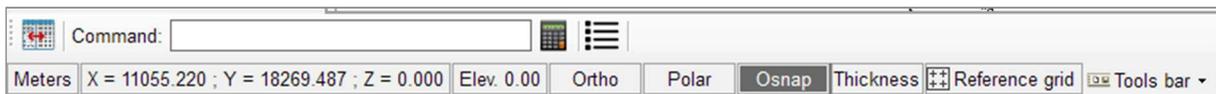


Figure 4.2

All the OSNAP modes are represented by the icons in the Figure 4.3, hover over with the mouse and you will see a tooltip that suggests the functionality of the command.

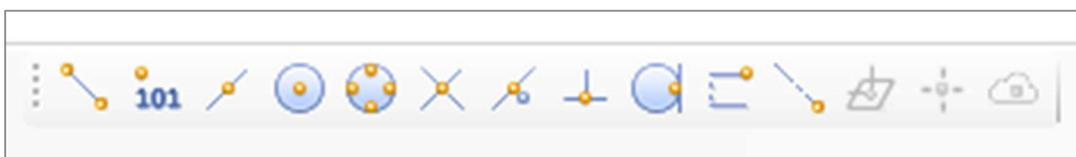


Figure 4.3

## 4.1 Draw CAD entities

In Draw section, you can find commands for drawing CAD entities such as lines, polylines, polygons, and so on. Once you select an item you want to draw, just follow the instructions (represented as tooltips, that will appear on the screen, and commands to enter in the command line) to complete the command (Figure 4.4, example of a tooltip on the screen; Figure 4.5, example of a tooltip before the command line).

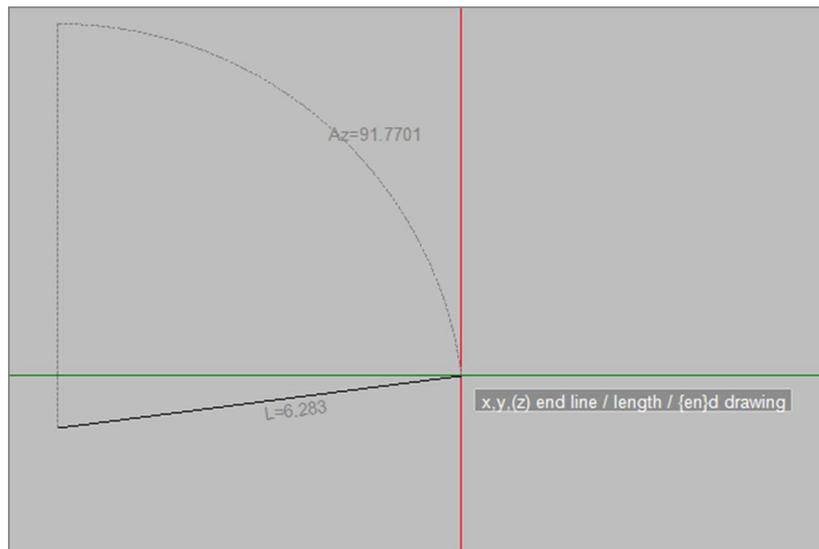


Figure 4.4



Figure 4.5

Often with the suggestions before the command line at bottom-left of the main screen, some other subcommands are available (on the right of the command line). When the subcommands are visible, to use them just type them in the command line and click enter (or just 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 4.6).



Figure 4.6

This command takes you to the Quick entities selection window (Figure 4.7), which consists of two tabs. The first, CAD entities, allows you to select entities by referring to a characteristic or another, e.g. color and line type.

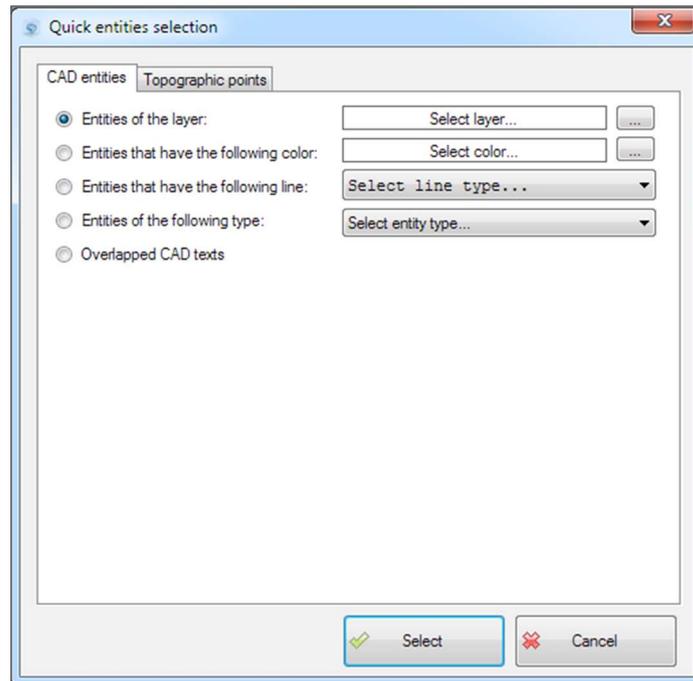


Figure 4.7

The second tab is called Topographic points and allows a selection of them according to the selected characteristic, as you can see in the Figure 4.8, there is a wide range of characteristics to select, from points with a given symbol to points on the same fieldbook.

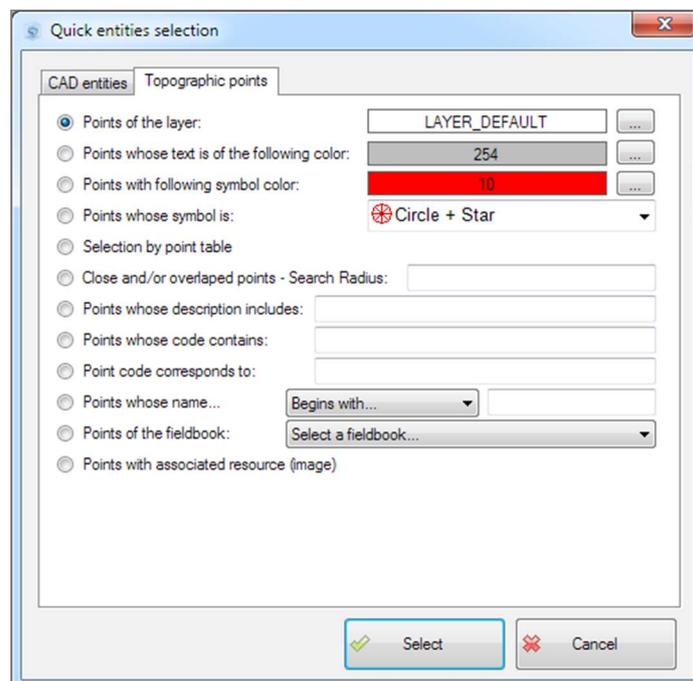


Figure 4.8

Two commands for drawing entities, in this CAD section, also have subcommands, these are: Circle and Arc (Figure 4.9). Subcommands are intended to provide alternative choices for drawing these two elements; for the circle for example, you can decide whether to draw it using 3 points, 2 points, or tangents and radius.

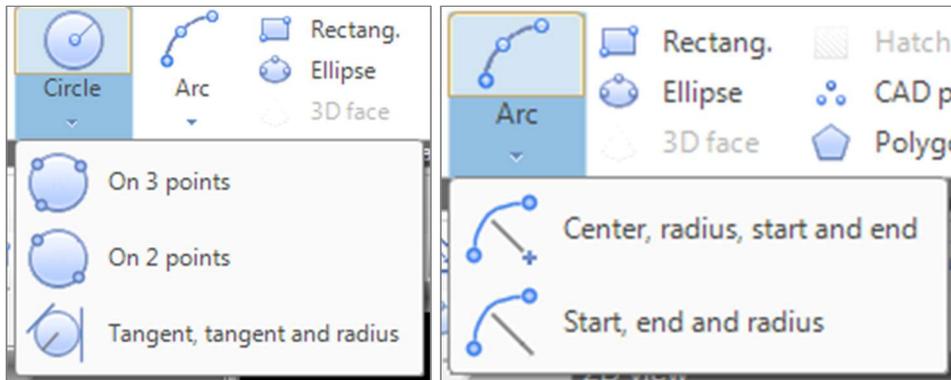


Figure 4.9

## 4.2 Modify CAD entities

In the Modify section, you can find all the functions for processing the CAD entities. Command names and icons are very intuitive, and each command has a tooltip that briefly explains what its functionality is. Among the available commands are fillet, join, explode and group, these commands are useful in working with CAD entity groups.

The Properties button opens a window that summarizes the properties of the selected entity, the system recognizes what kind of entity it is and down the window returns the entity type (Figure 4.11, in this case it is the properties of a polyline).

There is also a command to copy the properties of an entity to another and a command to change the display order of the drawings (Figure 4.10).

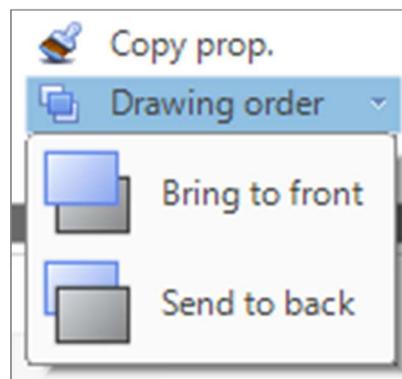


Figure 4.10

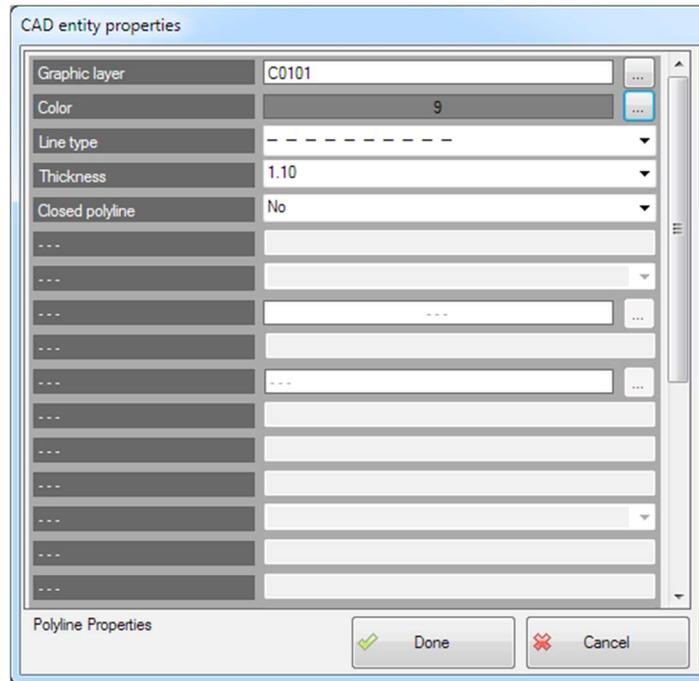


Figure 4.11

In Figure 4.12 you can see a popup window relative to the Edit poly. command. The commands contained are used to modify polylines, for example by inserting a vertex or removing it. The use is very simple, and like any other CAD command just follow the suggestions that appear on the screen.

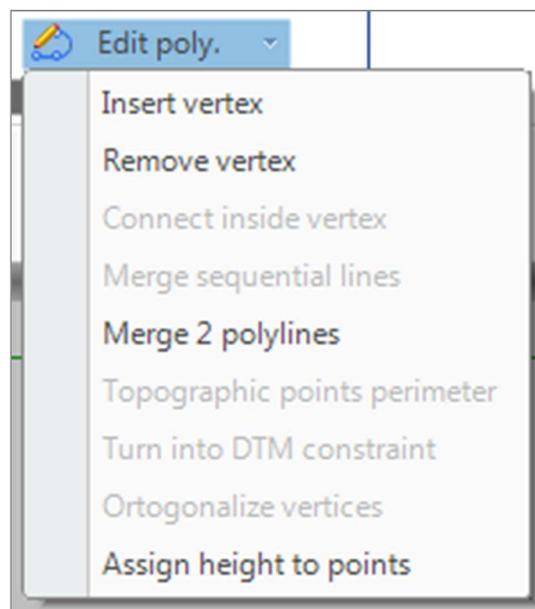


Figure 4.12

## 5 Measures

These functions (Figure 5.1) are used to calculate and to have a set of information about survey data recorded.

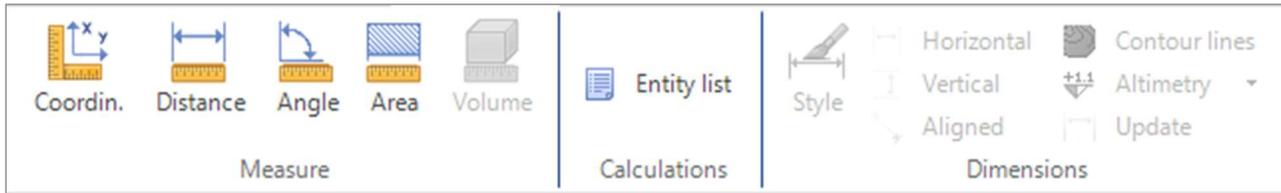


Figure 5.1

### 5.1 Measure and calculations

The Coordin. button when clicked will give you the option of choosing a point and then it will display the Cartesian coordinates (with the addition of the height) of that point, as shown in the Figure 5.2.

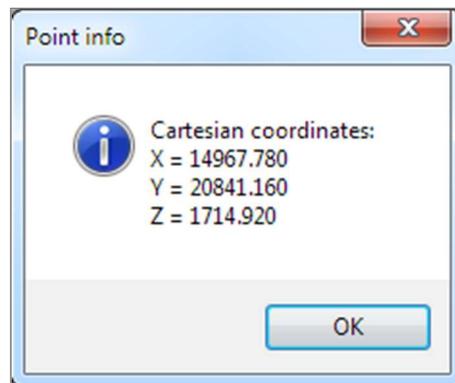


Figure 5.2

The Distance button when clicked will give you the option to select two points and it will measure the distance between the two. The information provided by this function are the 3D distance, the horizontal distance, the components along the three axes, the azimuth angle and the zenith angle (Figure 5.3).

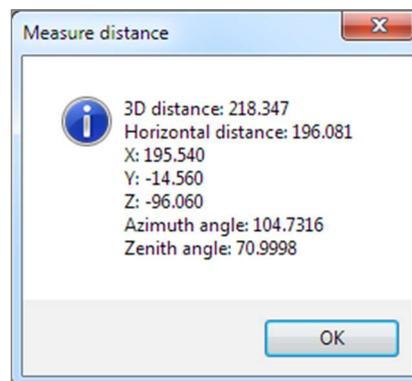


Figure 5.3

The Angle button when clicked will give you the option to select 3 points, the starting point, the midpoint, and the end point. This function will calculate a clockwise angle and a counterclockwise angle and these measurements will then be displayed on screen as shown in Figure 5.4.

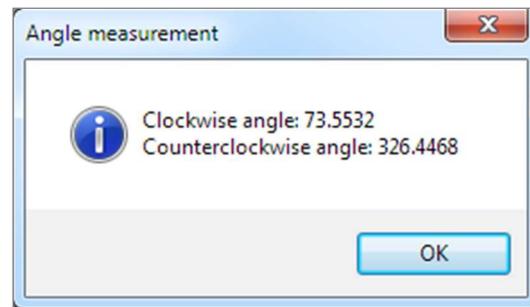


Figure 5.4

The Area button when clicked will allow you to enter the first point where to start calculating the area, then the application will continue to ask you to select the next point (up to n points) to draw the shape of which you want to measure the area, after selecting the last point, just type the command en (from end command, in the command line) for the function to make up the calculation. The area and perimeter of the shape will then be displayed in the popup window (Figure 5.5).

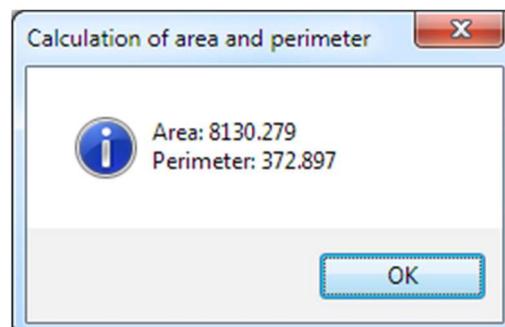


Figure 5.5

The Entity list button provides a list with the elements in the project, the list is presented as an editable text file. You can also select only few entities to be displayed in the list (Figure 5.6).

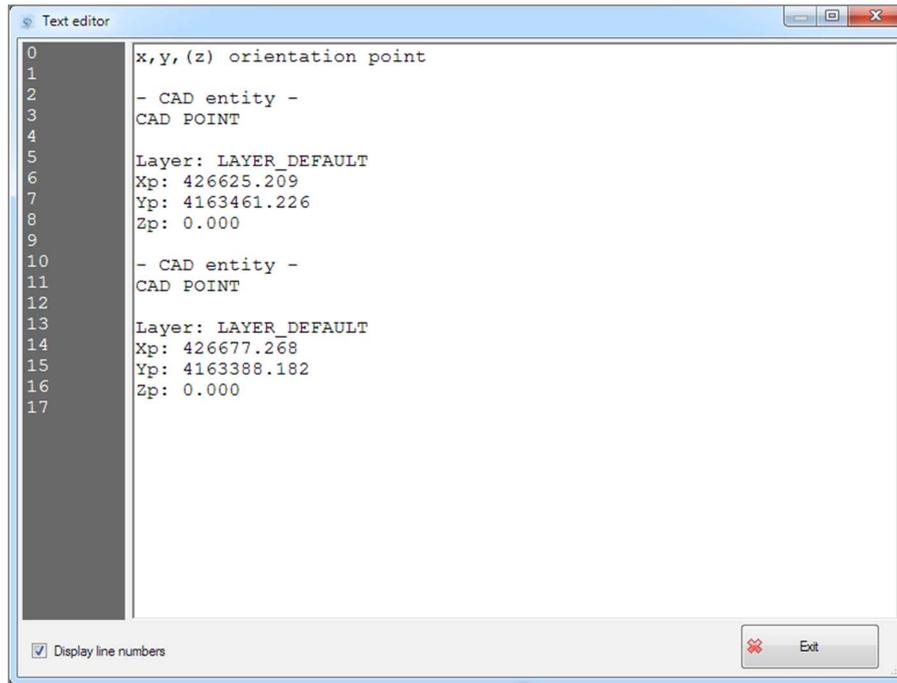


Figure 5.6

## 6 Topography

The topography section consists of three subsections; one relative to the topographic points, one for managing coordinates and one related to the fieldbooks (Figure 6.1). In the topographic points, you can draw a new topographic point, change the features of an existing one, select the CAD entities to use to create new points and 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 perform works on fieldbooks. You will be able to create a fieldbook manually, or import it from your PC, or import it directly from the total station and export files of coordinates.



Figure 6.1

### 6.1 Topographic points

The New command is used to insert new topographic points. By clicking on this button, you can open a working window (Figure 6.2, Topographic point properties) and in this you can insert and customize the graphic properties you want the new point to have.

The properties are completely customizable (note that you can also create a point with the properties that the application sets by default, such as the cross as a symbol) and you can select the layer that you want the point to belong to (clicking on the search button beside the Graphic layer label). The Select layer window (Figure 6.3) displays a list of available layers, all can be turned on or

off, locked and selected. You can also add new layers by clicking on the Add Layer button at the bottom left.

You can change the name of the point and the font used. You can also change the color of the text by selecting the choices in the window (Figure 6.4, Select color window) that opens when you click the search button beside the Text color label.

This window allows you to select a color from one of the available clusters, such as the grayscale or the work area background, or from the layer.

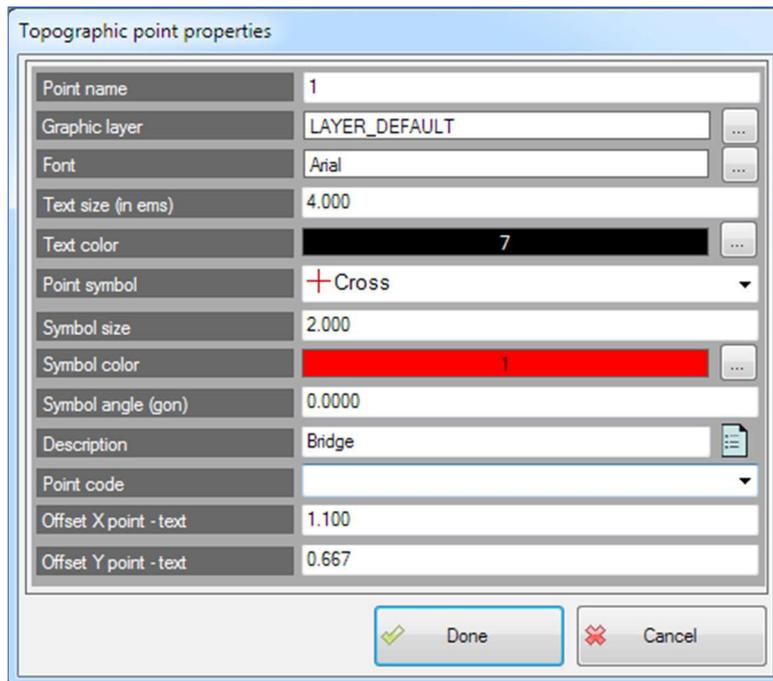


Figure 6.2

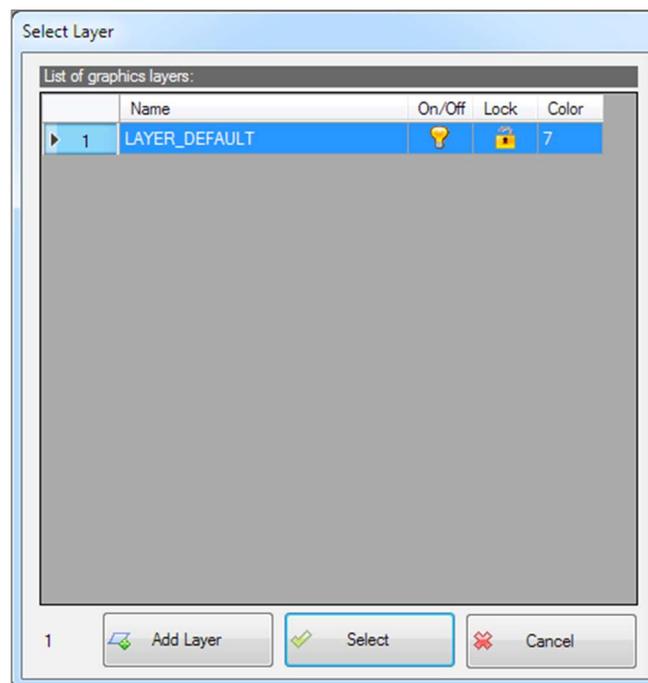


Figure 6.3

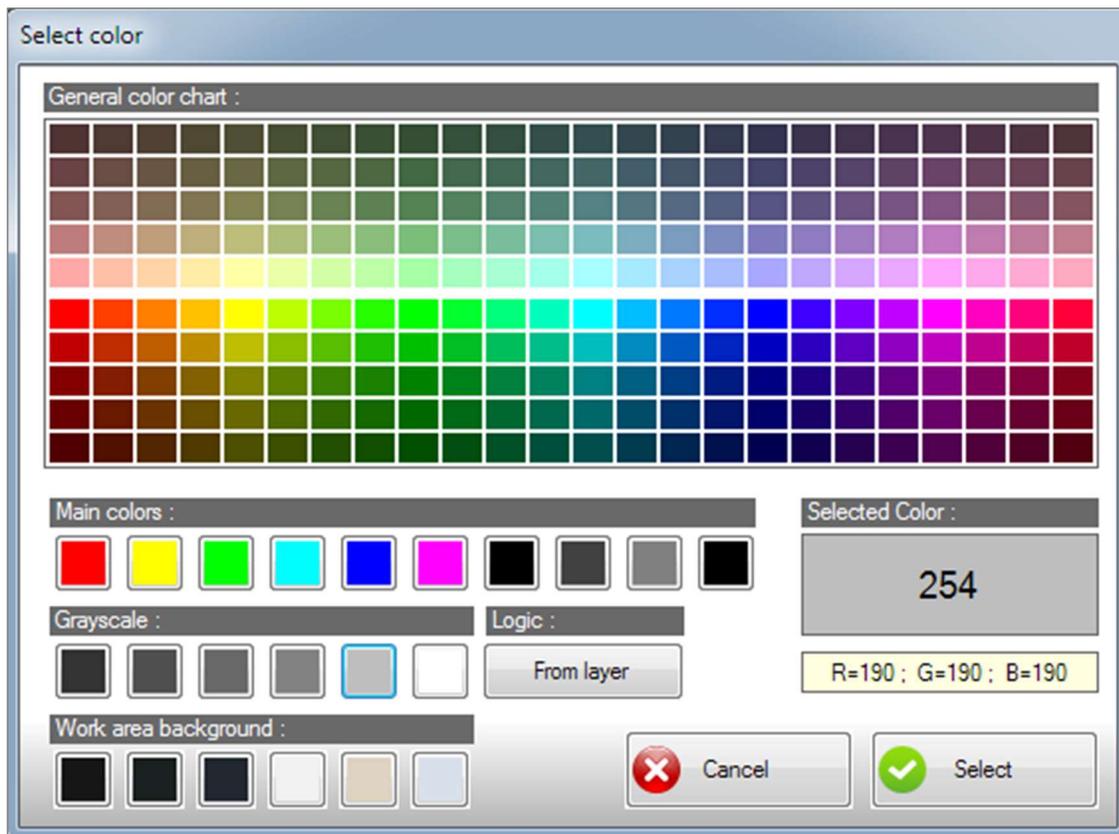


Figure 6.4

The symbol is another characteristic that can be personalized. You can choose an icon to attribute to the point (Figure 6.5), you can define the size of the symbol, the 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 point origin.

For what concerns the description, by clicking on the icon (sheet-of-paper icon) on the side, you access a window where you can view a list of possible descriptions. In there, you can select existing descriptions or add new ones by 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 be used (Figure 6.6).

When all the graphic properties are set according to your needs, you can enter the point by locating the position with the mouse or entering the coordinates manually from the command line.

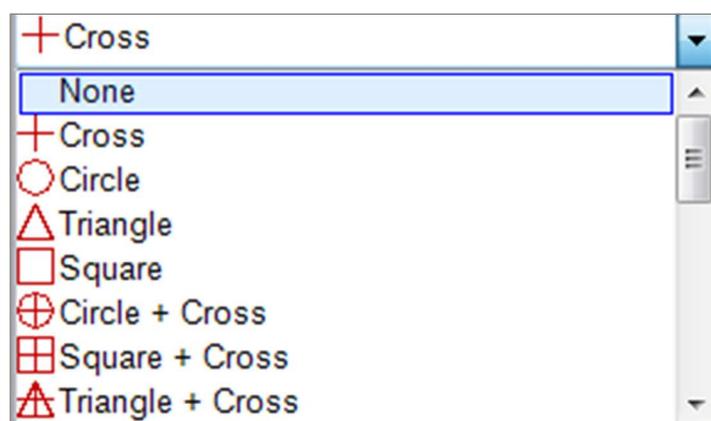


Figure 6.5

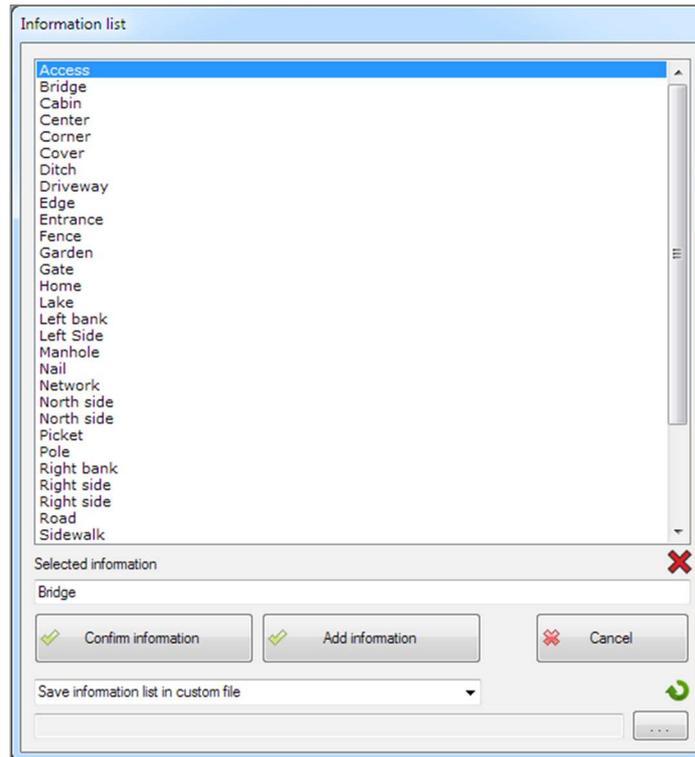


Figure 6.6

By clicking the Characteristic points button, you can select one or more CAD entities to create topographic points. In the Characteristic points window (Figure 6.7), you can select a layer (having access to the Select layer window, as previously explained). You can enter the starting point name and delete the overlapping points. Within this feature you can filter even more thoroughly the CAD entities to use, you can do this by flagging the available choices.

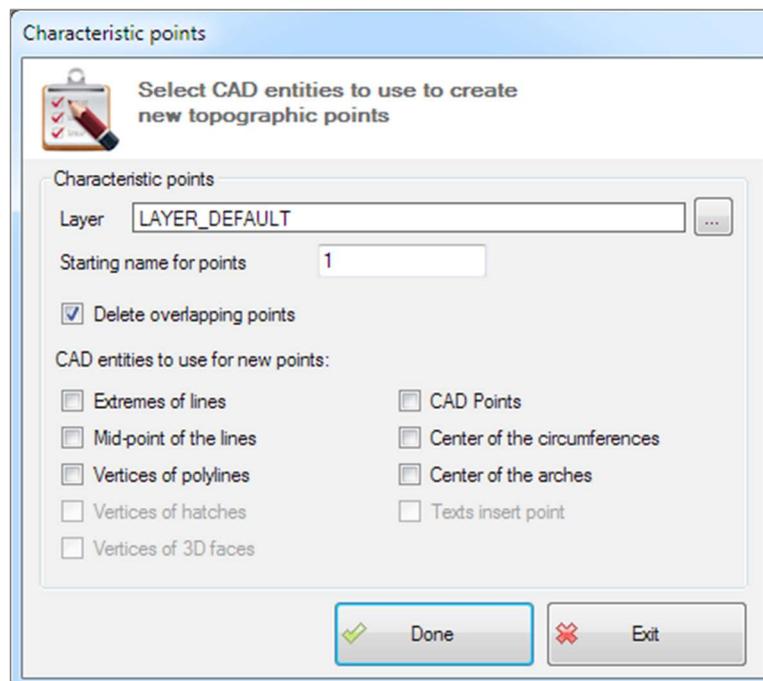


Figure 6.7

Particularly convenient is the Properties button (Figure 6.8), once you select one or more topographic points you can use this feature to find out all their properties and also to modify them.

The graphic aspect of this window is similar to that we encountered in creating a new point, but this also represents all the point coordinates and it will provide the possibility to change all the characteristics.

You also have the opportunity to see if and what images are linked to a particular point (Linked image function). At the bottom of this window, there is the possibility to click on the fieldbook measures to access the property window of the GPS point, some properties are editable other are read only (Figure 6.9).

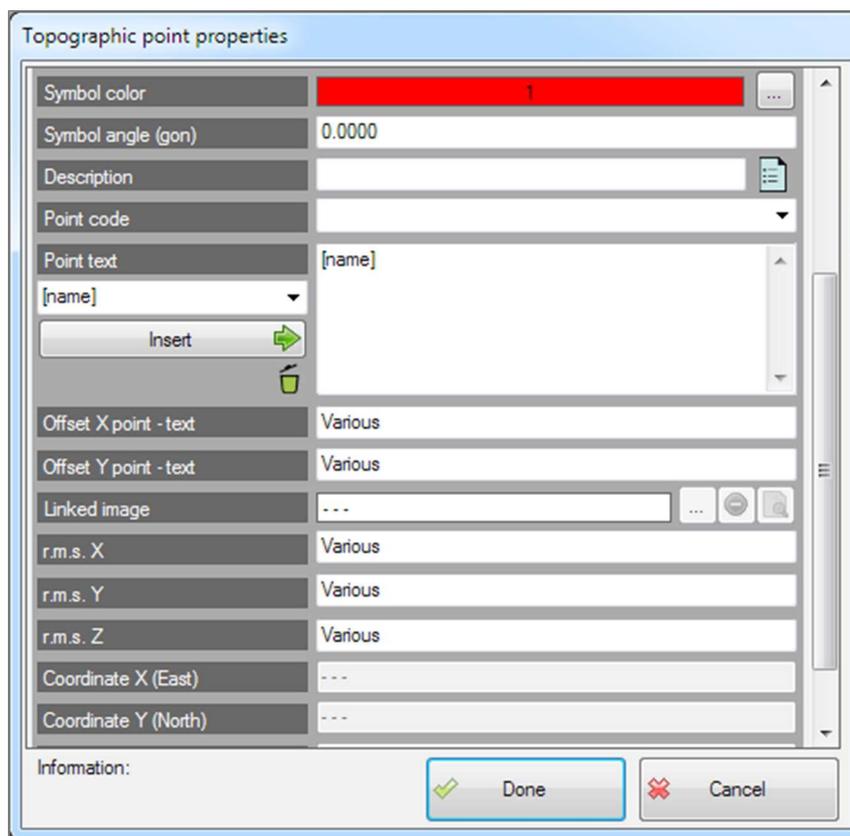


Figure 6.8

By clicking Point table, you can create a table with all the points in the project that will be grouped together along with their coordinates, names, descriptions, codes, as shown in Figure 6.10 (an example of a table with 5 points in memory).

You can print the table with the Print button. This button will give you access to a text file editor where you will find the table with all the points (Figure 6.11), at this stage the table can be changed in its fields, contents and graphic appearance.

GPS point properties

Device	StonexS10	
Point name	1187	
Information	CDT	
Latitude	43°59'43.43108"N	gg'gg'ss.ssss"
Longitude	12°25'01.48147"E	
Elevation	142.018	
East	774097.923	
North	4878991.743	
Height	98.975	
Pole height	2.134	Vertical
Phase distance	0.134	
HRMS	0.012728	
VRMS	0.021000	
State	FIXED	
Visible satellites	17	
Epochs	1	
PDOP	1.2	
HDOP	0.7	
VDOP	1.0	
TDOP	0.7	
GDOP	0.7	
Covariance	---	
Local time	---	
Start week	1926	
Start seconds	213144.000	

Done Cancel

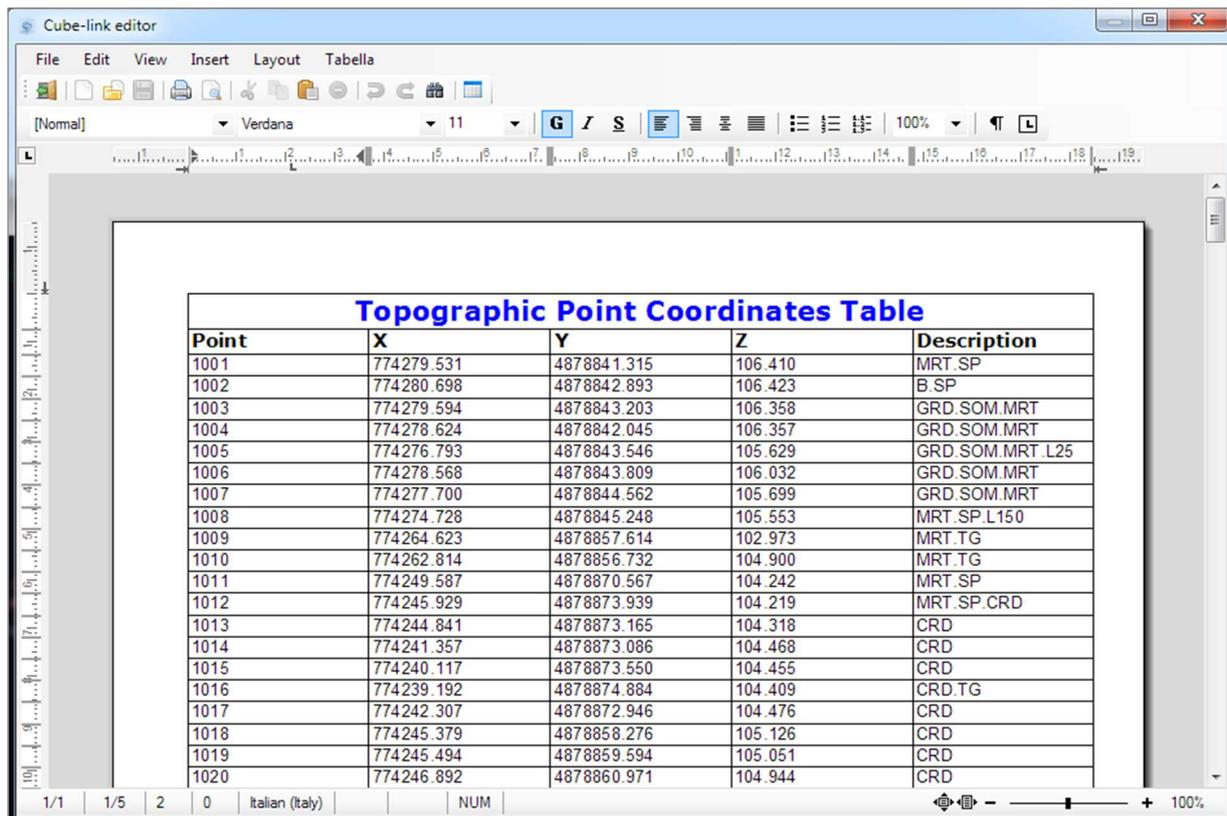
Figure 6.9

Topographic points table in memory (5 points)

Point	X/East	Y/North	Z/Height	Description	Code
1	605767.614	5146874.880	1210.436		Fixed
2	605778.556	5146873.112	1210.300		Fixed
3	605800.002	5146871.970	1210.226		Fixed
4	605793.370	5146878.019	1209.994		Fixed
5	605781.887	5146873.739	1210.595		Fixed

Print Close

Figure 6.10



The screenshot shows the 'Cube-link editor' window with a menu bar (File, Edit, View, Insert, Layout, Tabella) and a toolbar. The main area displays a table titled 'Topographic Point Coordinates Table' with the following data:

Point	X	Y	Z	Description
1001	774279.531	487884.1315	106.410	MRT.SP
1002	774280.698	487884.893	106.423	B.SP
1003	774279.594	487884.203	106.358	GRD.SOM.MRT
1004	774278.624	487884.045	106.357	GRD.SOM.MRT
1005	774276.793	487884.3546	105.629	GRD.SOM.MRT.L25
1006	774278.568	487884.3809	106.032	GRD.SOM.MRT
1007	774277.700	487884.562	105.699	GRD.SOM.MRT
1008	774274.728	487884.5248	105.553	MRT.SP.L150
1009	774264.623	487885.614	102.973	MRT.TG
1010	774262.814	487885.6732	104.900	MRT.TG
1011	774249.587	487887.0567	104.242	MRT.SP
1012	774245.929	487887.3939	104.219	MRT.SP.CRD
1013	774244.841	487887.3165	104.318	CRD
1014	774241.357	487887.3086	104.468	CRD
1015	774240.117	487887.3550	104.455	CRD
1016	774239.192	487887.4884	104.409	CRD.TG
1017	774242.307	487887.2946	104.476	CRD
1018	774245.379	487885.8276	105.126	CRD
1019	774245.494	487885.9594	105.051	CRD
1020	774246.892	487886.971	104.944	CRD

Figure 6.11

It will not be necessary to explain the operation of the last three commands Rename points, Text properties, Text Offset because their use is rather intuitive and they are only the repetition for user's convenience of some functions already present in the properties window of the topographic point.

## 6.2 Manage coordinates

### 6.2.1 Rototranslation

In the Rototranslation button (Figure 6.12), the operation enabled in Cube-link is the Translate points. By clicking on this command, you access a window where there is a list of fieldbooks present in the project (Figure 6.13). The translation can be made on all points (default choice, on Select all points on the top of the screen) or on some fieldbooks. You can then set an East or North or Height translation with the related scale factors. Also coordinates exchange can be performed (the first choice selected by default does not carry out any exchange).

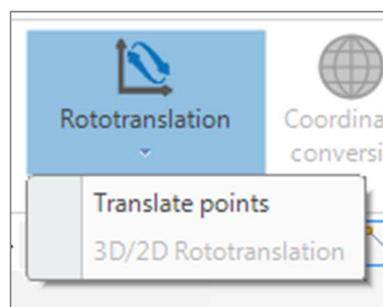


Figure 6.12

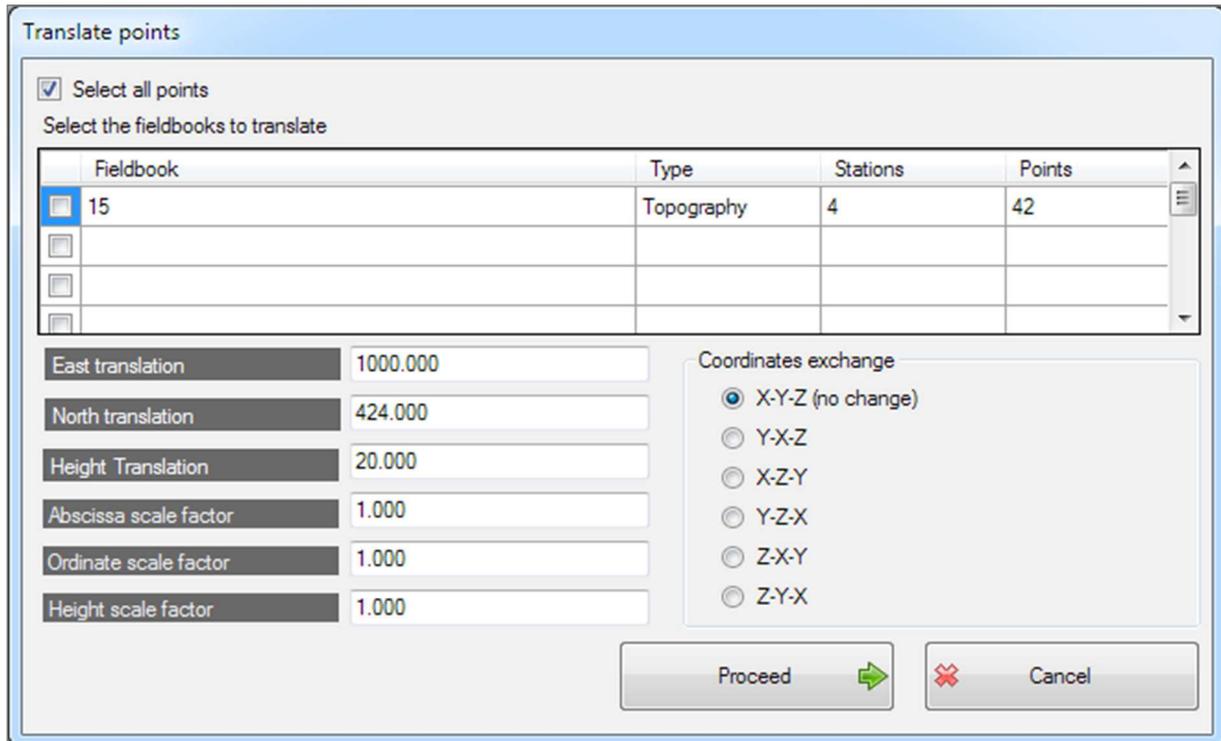


Figure 6.13

## 6.3 Fieldbook

In this section, you can import a fieldbook as a single file, download it from total stations or you can write it manually. The operations that can be performed on the fieldbooks are the memorization, the calculation, the export of the points calculated in the CAD. The system checks the measurements of horizontal, vertical, direct and reverse readings and performs the averages. Checks the presence of points with same name measured several times within the same station and checks that the measurements are on average.

### 6.3.1 Edit fieldbook

When you click on the Edit fieldbook button you access a submenu as shown in the Figure 6.14.

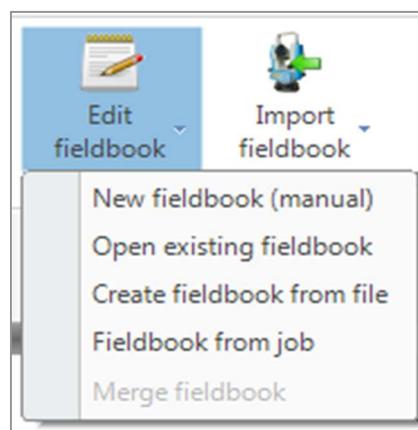


Figure 6.14

If you click on New fieldbook (manual) you can write a fieldbook manually; in the first screen (Figure 6.15) you can give a name to the fieldbook (mandatory choice, otherwise the program will not let you 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 this can also be edited.

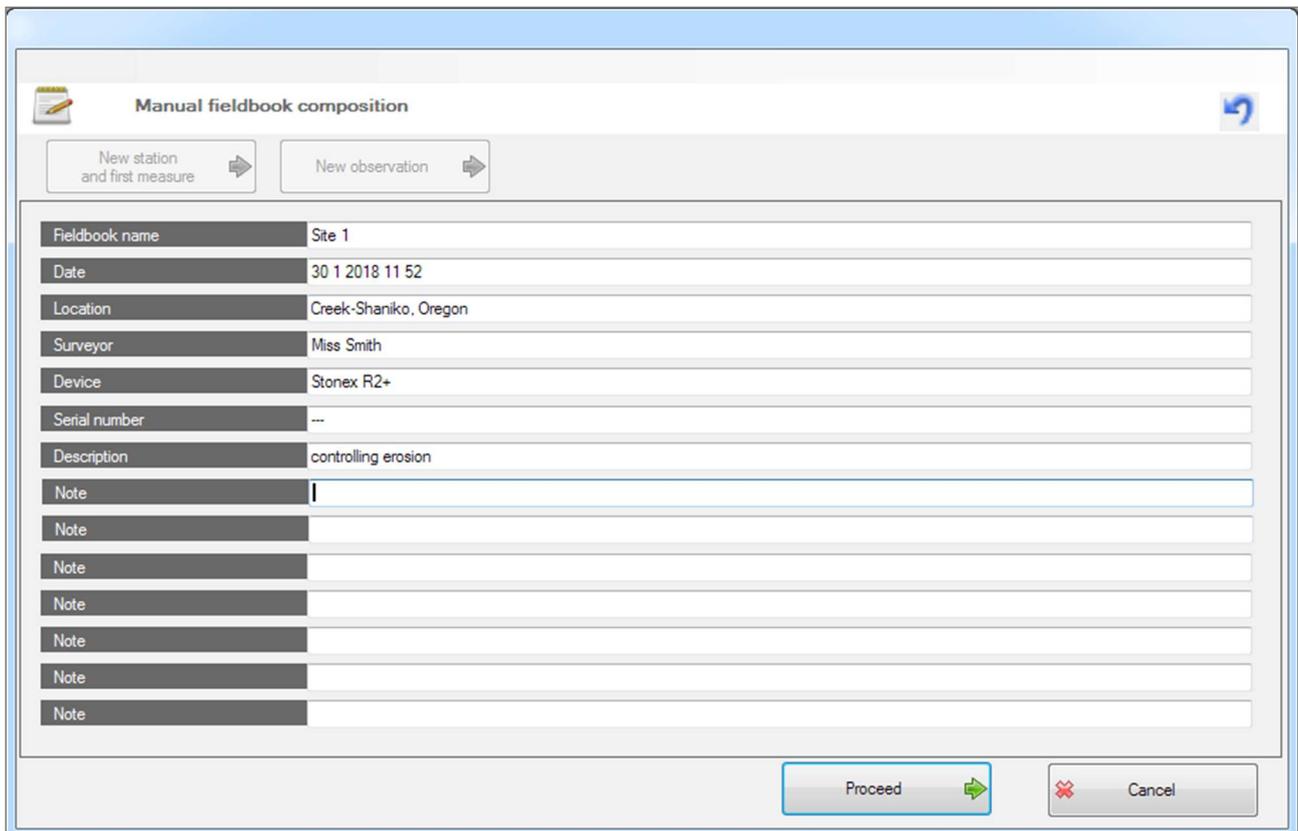


Figure 6.15

The next screen automatically takes you to the first measurement (Figure 6.16), by default the name of the first station is St1 and is defined as temporary ('temporary' means that the coordinates have not been calculated, otherwise 'calculated' means that the coordinates have been calculated on the field and 'known' means that it references to known coordinates). The tool height is set as 1.00 meters, all other station's details are left blank and can be entered by the user. The details provided by default can also be changed. Regarding the information, if you click on the icon next to it you can access a function similar to the one described above (Figure 6.6).

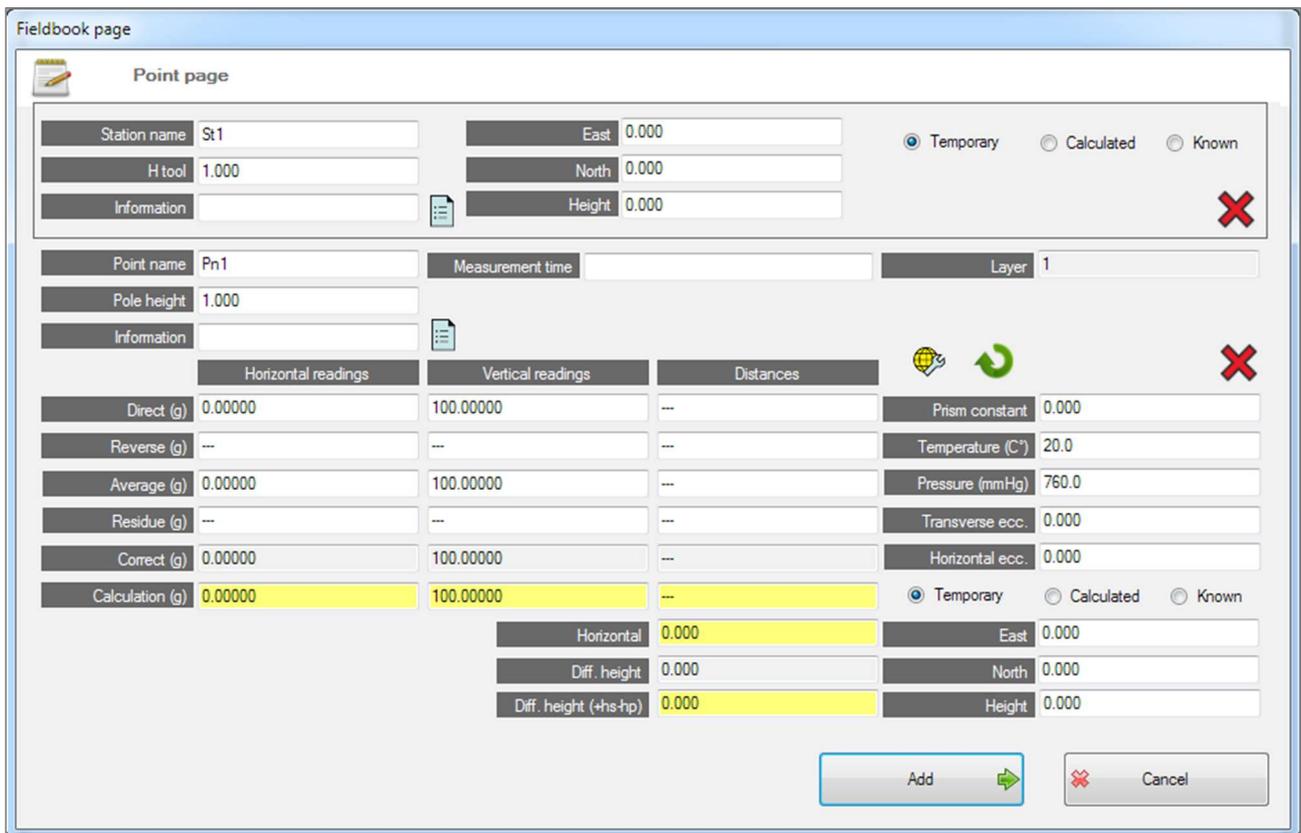
In the part related to the details of the point, the default assigned name is Pn1 and its coordinates are considered temporary (with the same logic used for the stations). Other values set by default are the height of the pole, the vertical reading, the temperature and the pressure, these details can always be modified.

For the horizontal readings, the vertical readings and the distances the application dynamically calculates the averages and residuals, returning a correct value also based on the settings of the

survey elements (on the right in the screen: prism, temperature, pressure, transverse eccentricity, horizontal eccentricity).

By clicking on the yellow-with-the-wrench icon you can access the list of parameters related to the fieldbook (Figure 6.17). By parameters we mean the decimal digits that you want to display on the screen and the representation of the angles. Furthermore, a series of tolerances can be set, as well as a series (on the right) of other settings, that the calculation of the measures will take into account.

Below in the screen you can read the information resulting from the calculations (takes into account the parameters set) related to the horizontal distance and the difference in height, including the difference in height between the height of the tool and the height of the prism.



The screenshot shows the 'Fieldbook page' software interface. The main window is titled 'Fieldbook page' and contains a 'Point page' sub-window. The 'Point page' has several sections:

- Station information:** Station name (St1), East (0.000), North (0.000), Height (0.000). Includes a 'Temporary' radio button (selected), 'Calculated', and 'Known' options. A red 'X' icon is present.
- Point information:** Point name (Pn1), Measurement time, Layer (1), Pole height (1.000). Includes a red 'X' icon.
- Readings and Calculations:** A table with columns for 'Horizontal readings', 'Vertical readings', and 'Distances'.
 

	Horizontal readings	Vertical readings	Distances
Direct (g)	0.00000	100.00000	---
Reverse (g)	---	---	---
Average (g)	0.00000	100.00000	---
Residue (g)	---	---	---
Correct (g)	0.00000	100.00000	---
Calculation (g)	0.00000	100.00000	---
- Parameters:** Prism constant (0.000), Temperature (C°) (20.0), Pressure (mmHg) (760.0), Transverse ecc. (0.000), Horizontal ecc. (0.000). Includes 'Temporary' radio button (selected), 'Calculated', and 'Known' options. A red 'X' icon is present.
- Final Calculations:** Horizontal (0.000), Diff. height (0.000), Diff. height (+hs-hp) (0.000). East (0.000), North (0.000), Height (0.000).

At the bottom, there are 'Add' and 'Cancel' buttons.

Figure 6.16

Once you have finished entering the new station's and the new point's information, press the Add button, this will take you to a new screen (Figure 6.19) where you can see all the stations created and their points, with the most important information in the grid. The grid lines are alternating color, they alternate each time the station changes, so it will be easy to see at a glance the passage from one station to another.

In this screen, you can enter a new station and its first measurement or a new observation. In the first case the name of the station will be sequential to the last inserted and the name of the point will be left blank, in the second case the name of the last station will be taken and the point will have sequential name with respect to the last inserted.

With the right-click of the mouse on the grid you will access an option menu that, depending on the selection made (number of cells in the grid and position) offers a series of functions (Figure 6.18, some options seem to be disabled but they are all available in Cube-link, to facilitate the use of the menu some functions dynamically become active while others are deactivated).

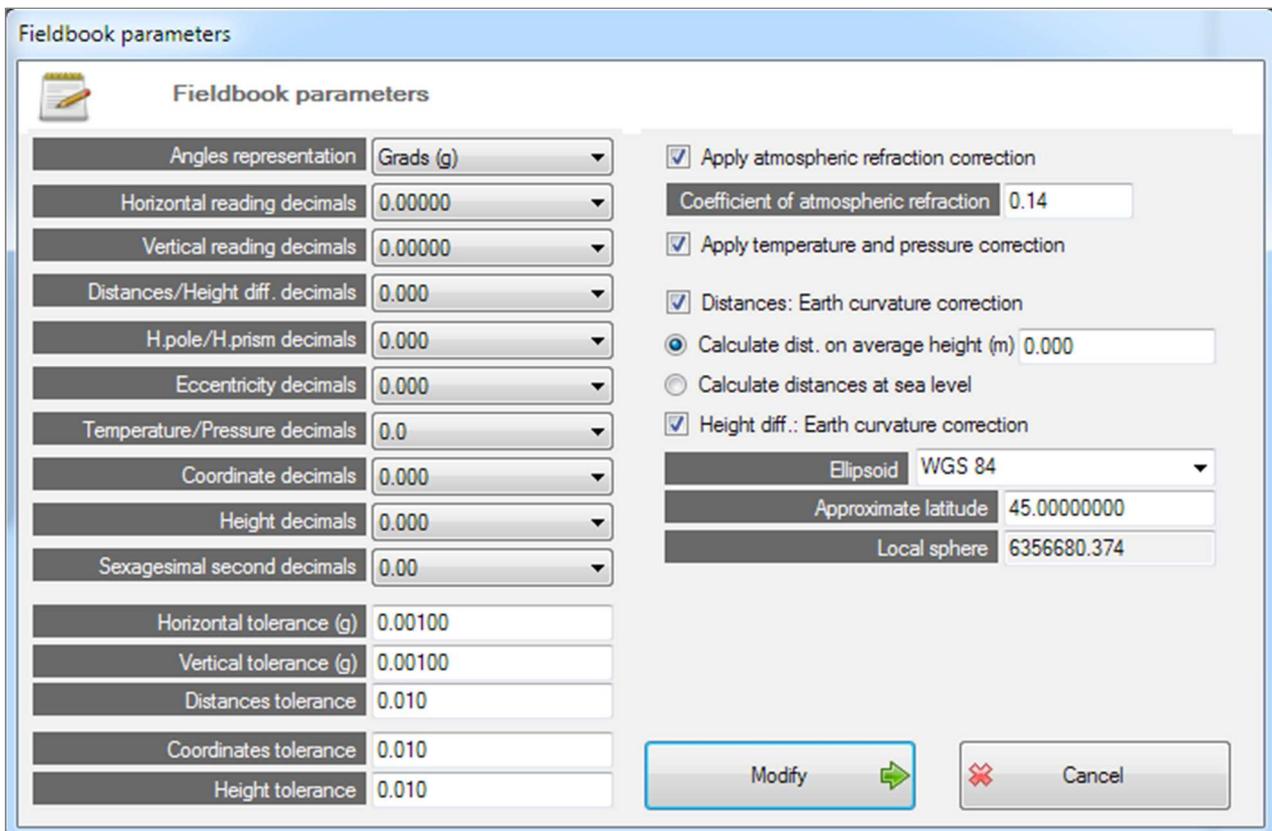


Figure 6.17

The functions are simple to understand, you can insert a new measurement between the observations already inserted (Enter observation), you can add a new observation at the end of the grid (Add observation), you can change the numeric values entered as well as the names of the points and eventually you can delete selected lines.

These operations can be canceled by pressing the undo button at the top-right of the screen (main screen Figure 6.19).

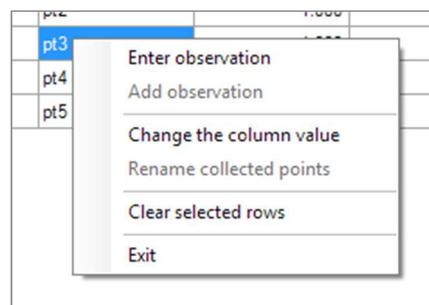


Figure 6.18

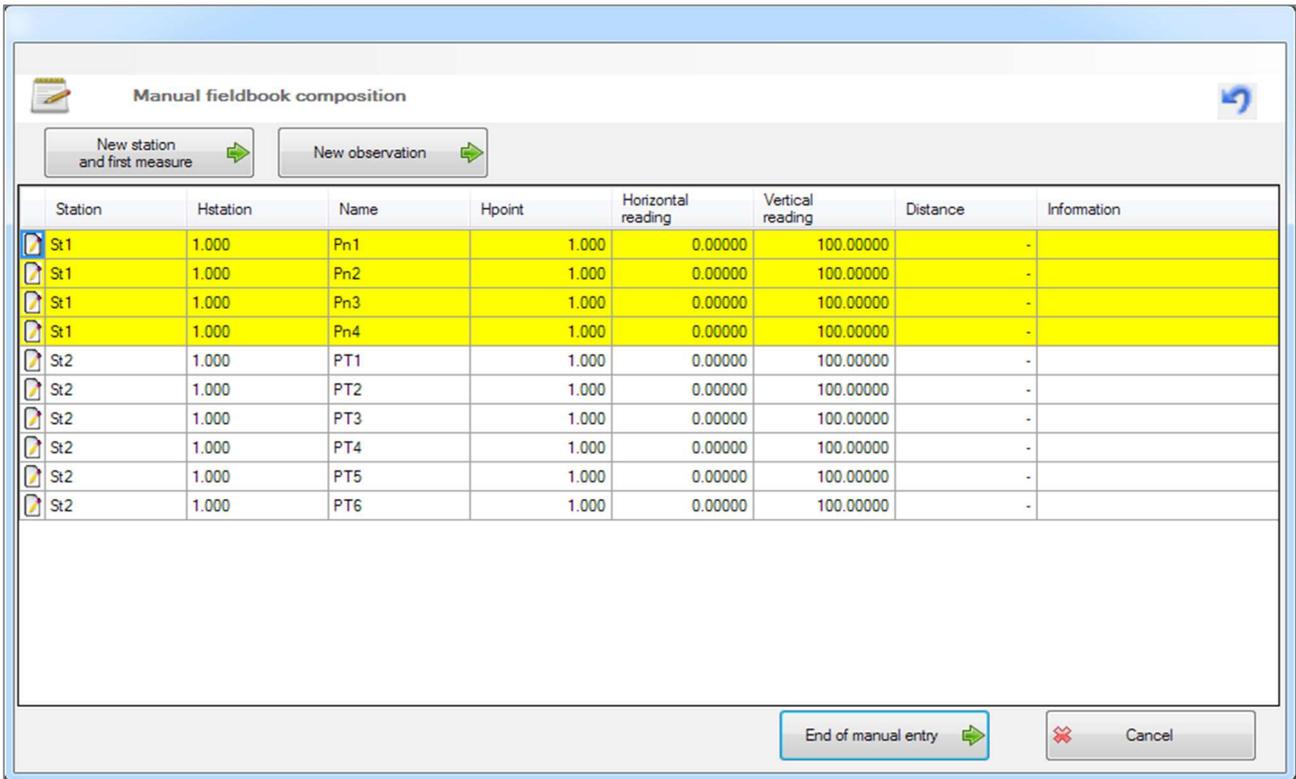


Figure 6.19

When all entries have been completed, you can press the button End of manual entry. Automatically the screen changes appearance (Figure 6.20), you can see the grid and in the bottom-left you can select the desired station, to place the visible part of the grid on it.

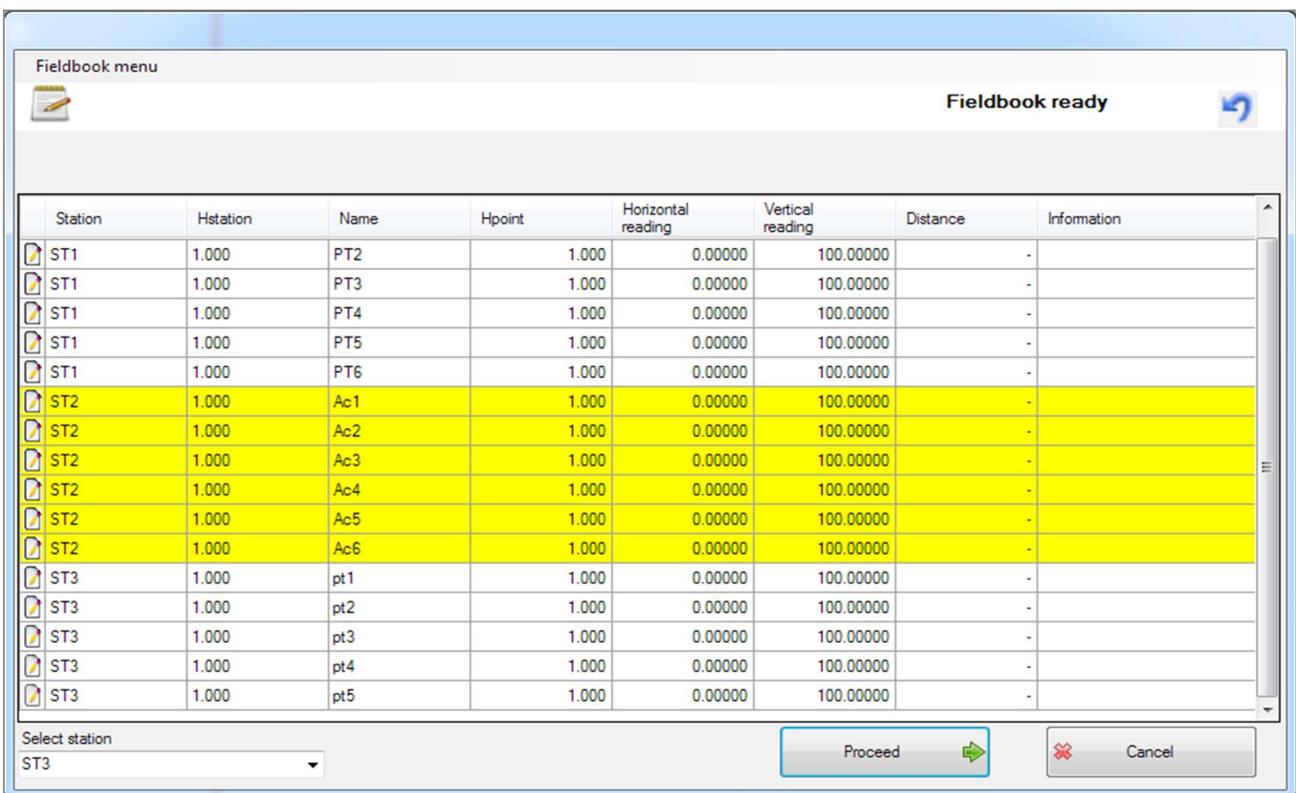


Figure 6.20

At this point on the top-left you will see a button (Fieldbook menu) that when clicked will offer you a series of operations possible on the fieldbooks (Figure 6.21).

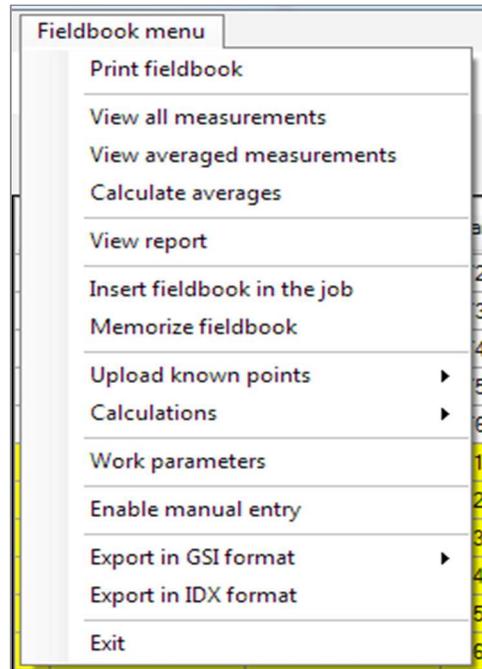


Figure 6.21

The button Print fieldbook gives you access to the general information screen on the fieldbook (as in Figure 6.15, where you can edit all fields if necessary), when you click on Proceed the application creates an editable file like the one in Figure 6.22, ready for printing.

View all measurements, View averaged measurements and Calculate averages are other available functions, the first two are view options, the last one reviews the fieldbook taking all measurements into account and calculates averages.

This last function opens a screen (Figure 6.24) where you can set tolerances, text colors, layers, symbols and their colors (for known points as well as detail points and stations), decimal digits, angle representation, corrections (such as atmospheric refraction correction).

The View report button will open a screen with an editable file similar to the one created with the Print fieldbook button, with all the details of the current fieldbook. If the program recognizes that there are reports present in the job, a window will open where all the reports will be shown so that you can select the one chosen (Figure 6.23, in this example: a print report, a detailed calculation report and a generic one has been saved beforehand). In this window, you can also delete (one or more) reports.

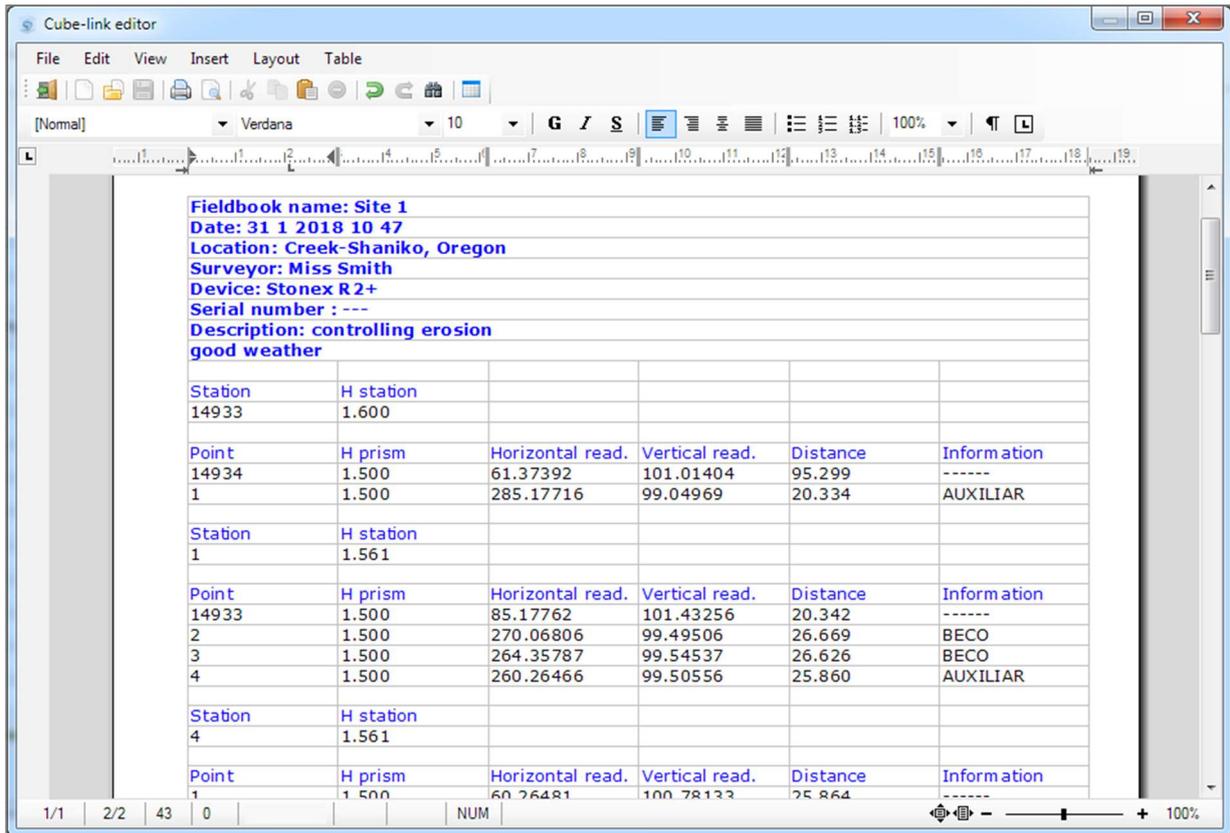


Figure 6.22

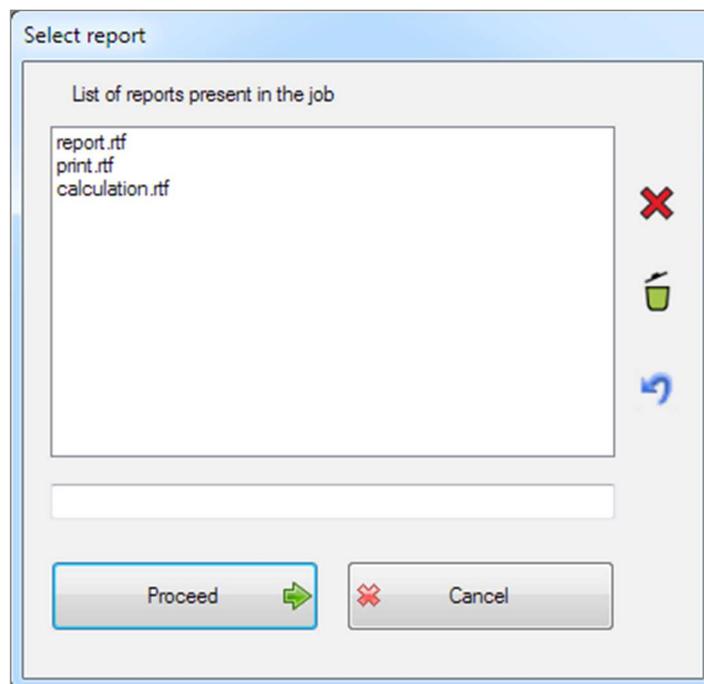


Figure 6.23

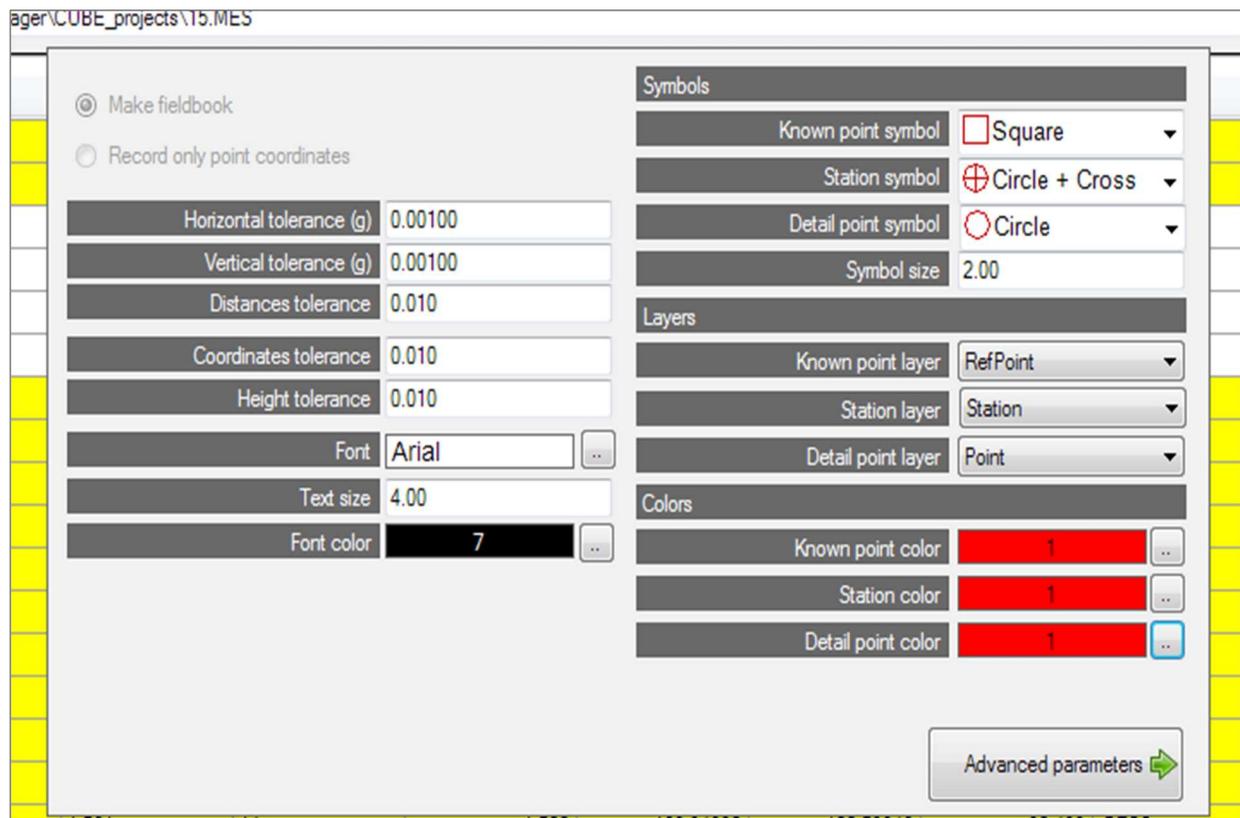


Figure 6.24

Insert fieldbook in the job if pressed inserts the fieldbook in graphics, before proceeding the system will check if there are not averaged measures and if calculations have been performed, then you will again see a summary of the measures (any not averaged measures will be on red lines, you can thus do the corrections). If no calculations were made and double points were not averaged, the system will take the first point.

With the command Memorize fieldbook you can save the fieldbook, you can again see the screen with the general information (i.e. name, date, location, etc.) and once you have chosen the destination where to save, the application will produce a file with the extension .cubefbk.

The Upload known points command expands in a menu with three options: Read from file, Read from the current project, 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 6.25) to read them. The second function instead is able to detect known points from the currently open project.

In the Calculations command, you can perform the calculations on the fieldbook, in Cube-link the only available calculation is the Detail calculation. This operation is visible on the screen in Figure 6.26, on the left there is the list of stations present in the job; you can select one or more stations by clicking on them, or can calculate all the stations by clicking on the Transfer all button.

The list named Station to be calculated will show the stations you have chosen to calculate, when you click on Proceed, if the system does not find known points will open a screen (Figure 6.27), where you can select the station and the first orientation (you can assign/edit the coordinates if needed). To start the calculation (Figure 6.26), you can click on Confirm calculation. Not calculated stations will be shown in the list on the right, named Not calculated stations; below the list, help messages will appear (in this example 'All stations calculated', 'All backsights in the expected tolerance').

The View report button will show an editable text with the details of the calculation, Repeat calculation will perform the calculation again.

On the right there are the East, North, Height differences between the maximum and minimum values found in the job, this information can help to find errors.

The red-X icon will delete from the list of stations to be calculated the one selected, the basket icon will erase all the stations in the list. The yellow-with-wrench icon leads to a window like the one shown in Figure 6.17.

Going back to explain the menu on the functions available on the fieldbooks (Figure 6.21), after Calculations there is the command Work parameters that will open a window like the one already encountered (Figure 6.24).

Enable manual entry will take you to the manual writing function of the fieldbook, (described in the par. 6.3.1 Edit fieldbook)

The last two commands regard exporting. The fieldbooks can be exported in two formats (as well as in the native format of the program .cubefbk): these are GSI (18 and 6 bit) and IDX.

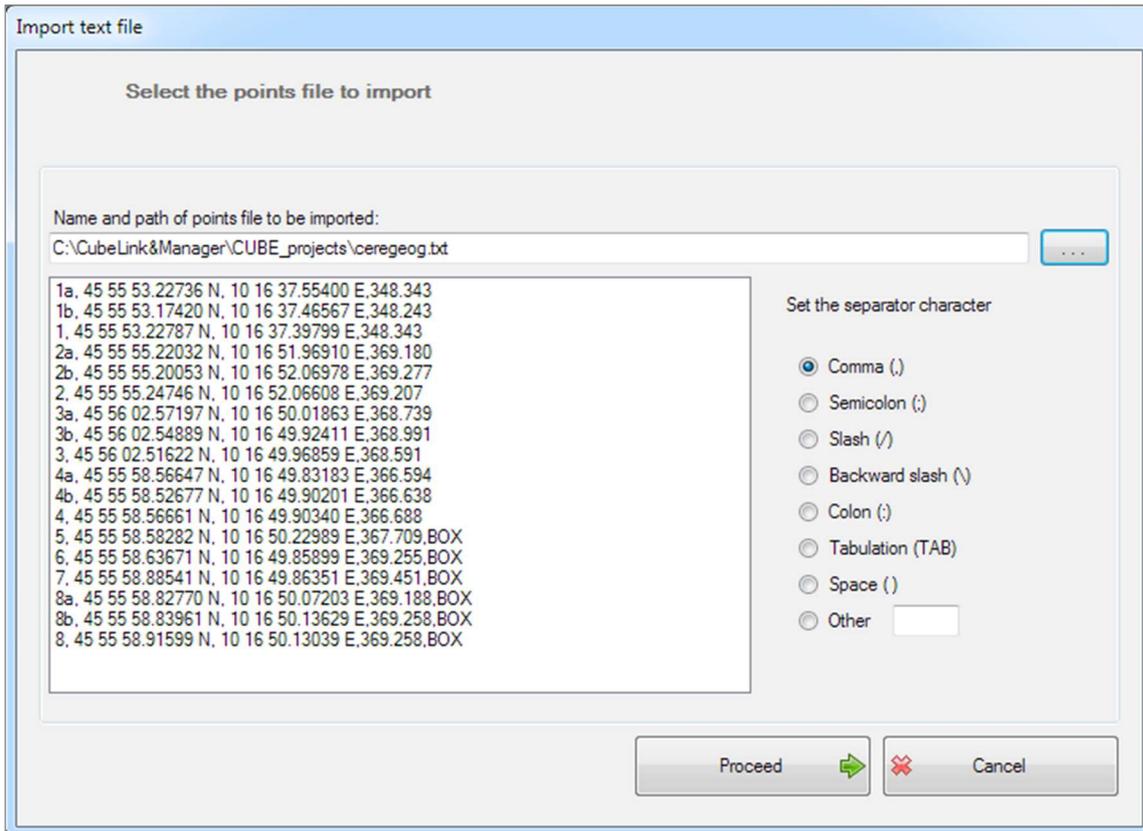


Figure 6.25

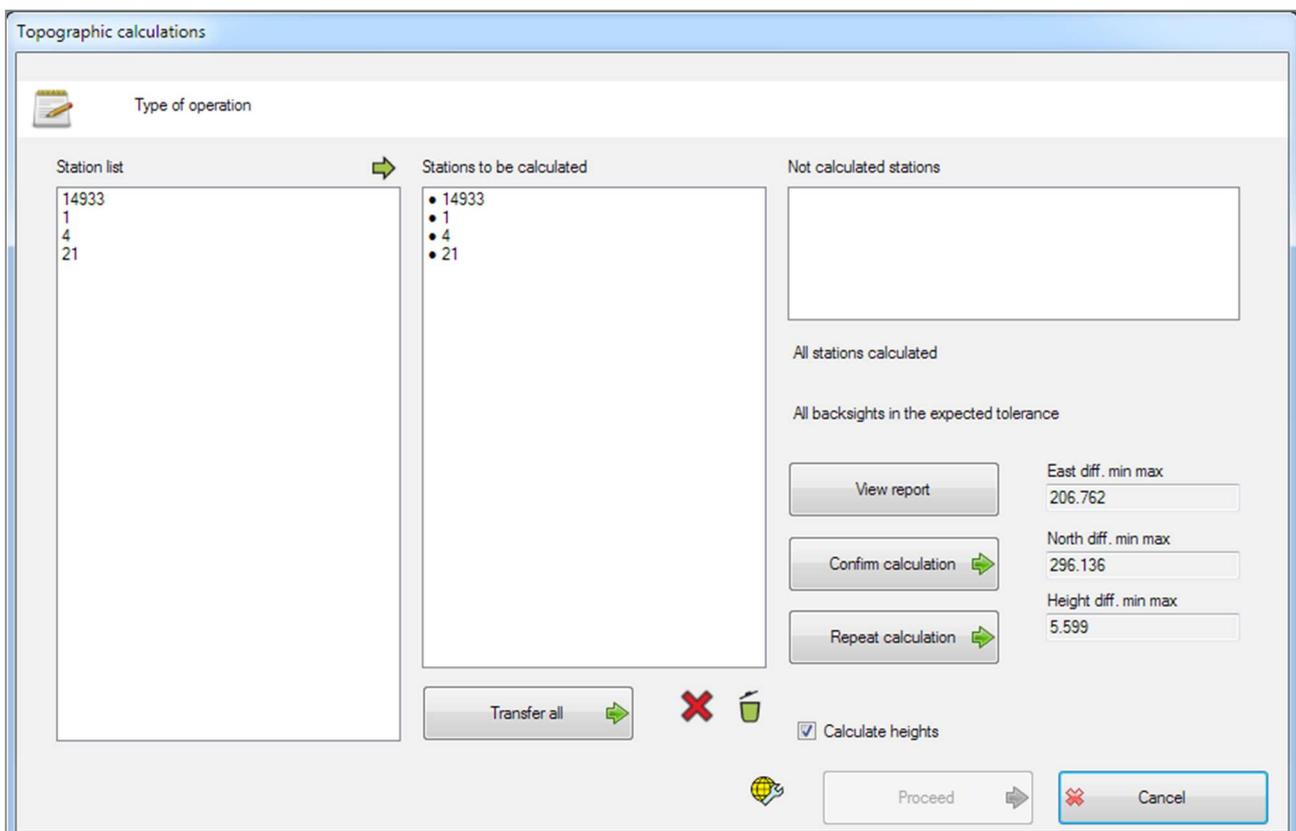


Figure 6.26

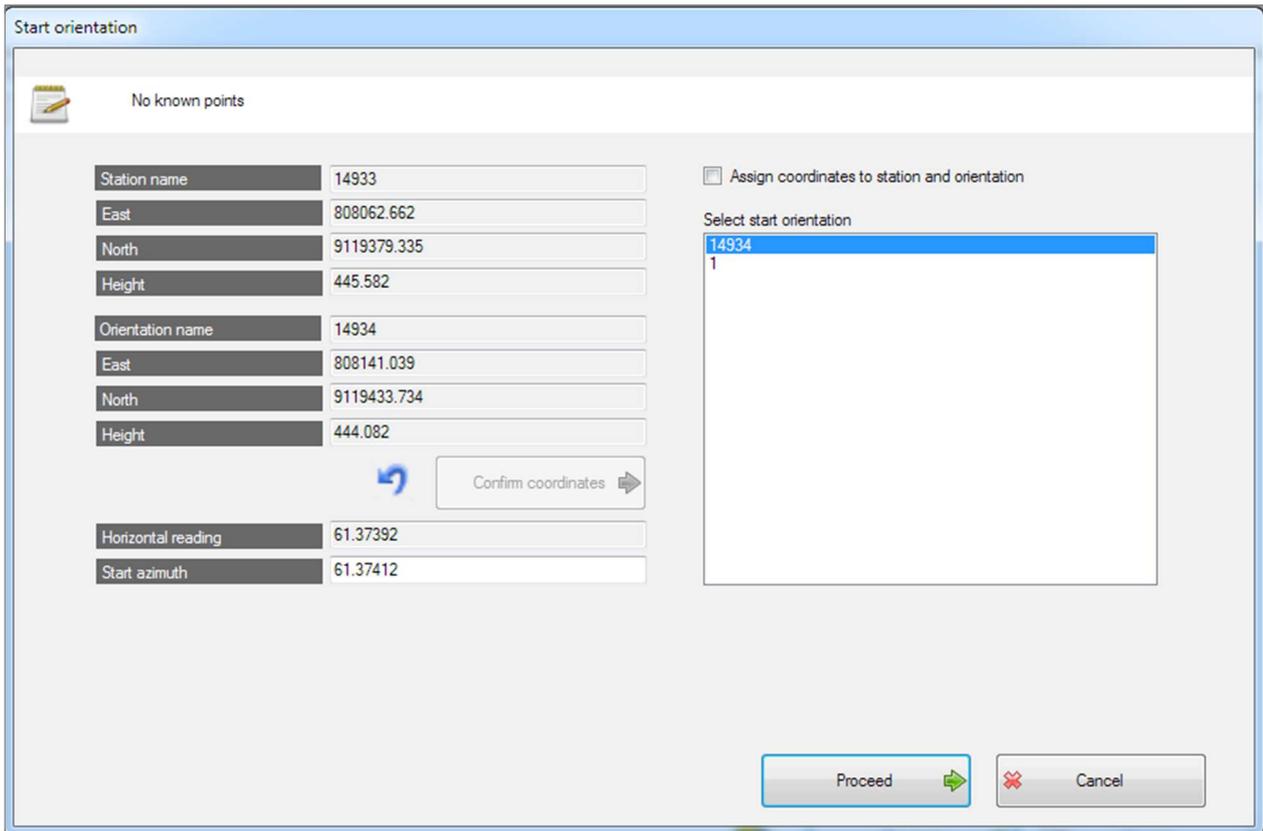


Figure 6.27

### 6.3.2 Import fieldbook

The Import fieldbook button (Figure 6.28) leads to an import of fieldbooks from the total stations; you can import using a USB connection by connecting to the total station directly (after clicking on the chosen device, click on the Connect USB button) or by selecting a file that may be present in the PC. The Figure 6.28 shows all supported devices and extensions.

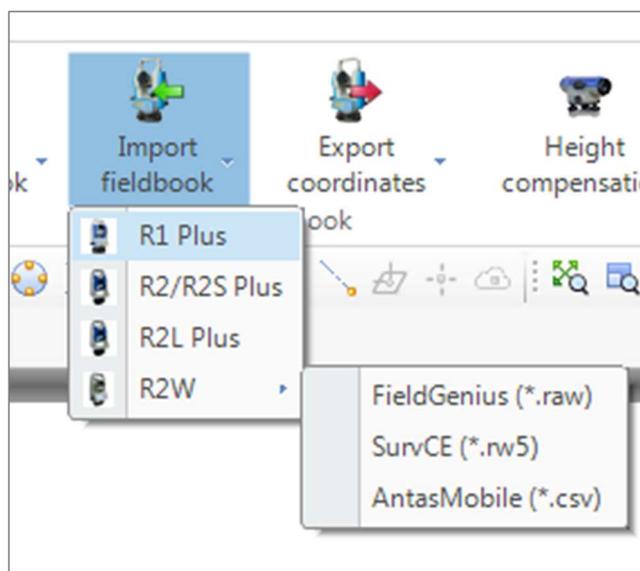


Figure 6.28

### 6.3.3 Export coordinates

The Export coordinates button (Figure 6.29) allows to export in total station and in GSI (16 and 8 bit) formats.

The Height compensation button although visible is not available in its functionality in Cube-link.

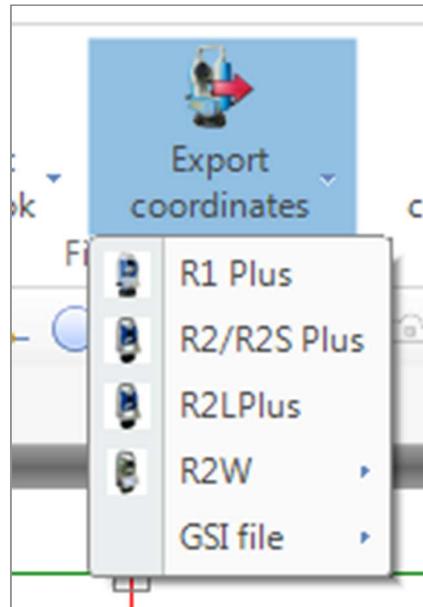


Figure 6.29

## 7 Tools and commands

### 7.1 Tools and commands of the software

List of commands that can be typed in the command line (Figure 7.1) of the program, recognition of commands is case-insensitive:

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
ASCIIN	Imports generic ASCII files
SHAPEIN	Imports Esri Shape files
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
CUBEAOUT	Exports a Cube-a file
RW5OUT	Exports a RW5 file

GEOISOUT	Exports a GeoGis file
PRINT	Prints the drawing
COPYCLIPBOARD	Copies CAD entities to clipboard
PASTECLIPBOARD	Pastes the CAD entities from clipboard
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 on 2 points
CIRCLE	Circle with choice of options
CIRCLECE	Center and radius circle
CIRCLE3P	3-point circle
CIRCLE2P	2-point circle
CIRCLETR	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 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	Modifies 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
GRAPHICBACKGROUND	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
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
TRANSLATEPTS	Opens the window where you can translate points and exchange coordinates

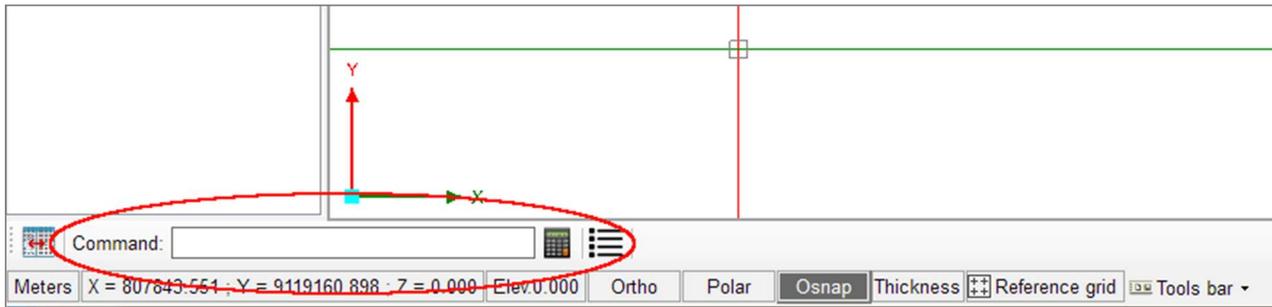


Figure 7.1

Another useful tool other than the command line is the Quick selection (Figure 7.2); 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.

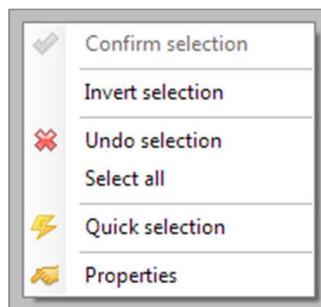


Figure 7.2

The project manager panel (Figure 7.3, 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.

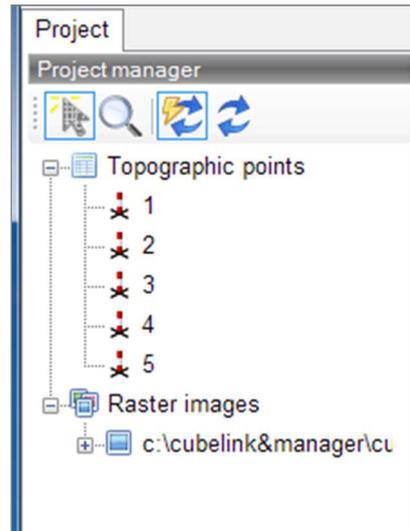


Figure 7.3

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 7.4). 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 7.4

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 7.5), you can customize the layout and display of available shortcuts (Figure 7.6, 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).

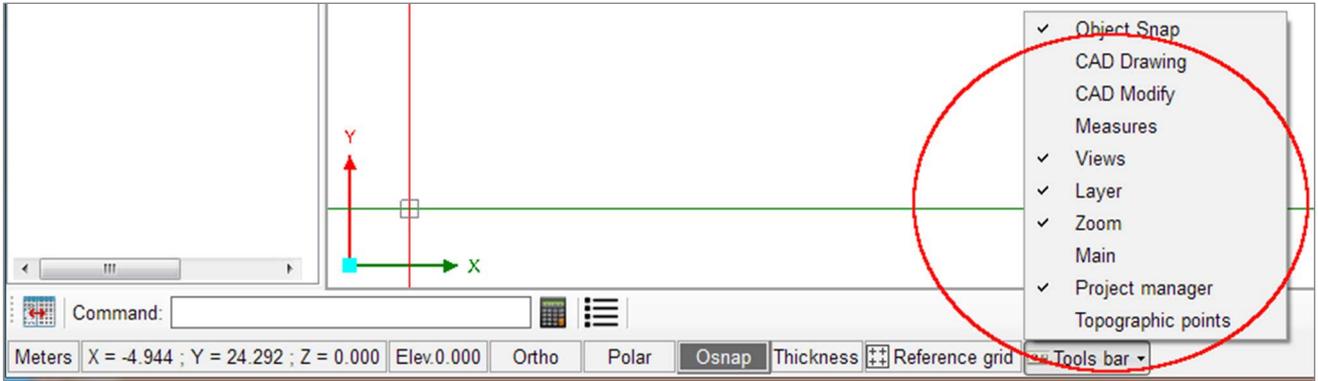


Figure 7.5

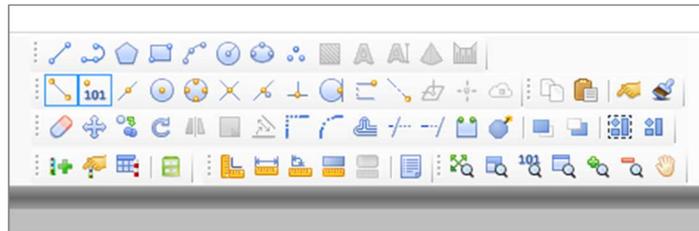


Figure 7.6

A vertical dotted line consisting of 15 small white dots, positioned to the left of the contact information.

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