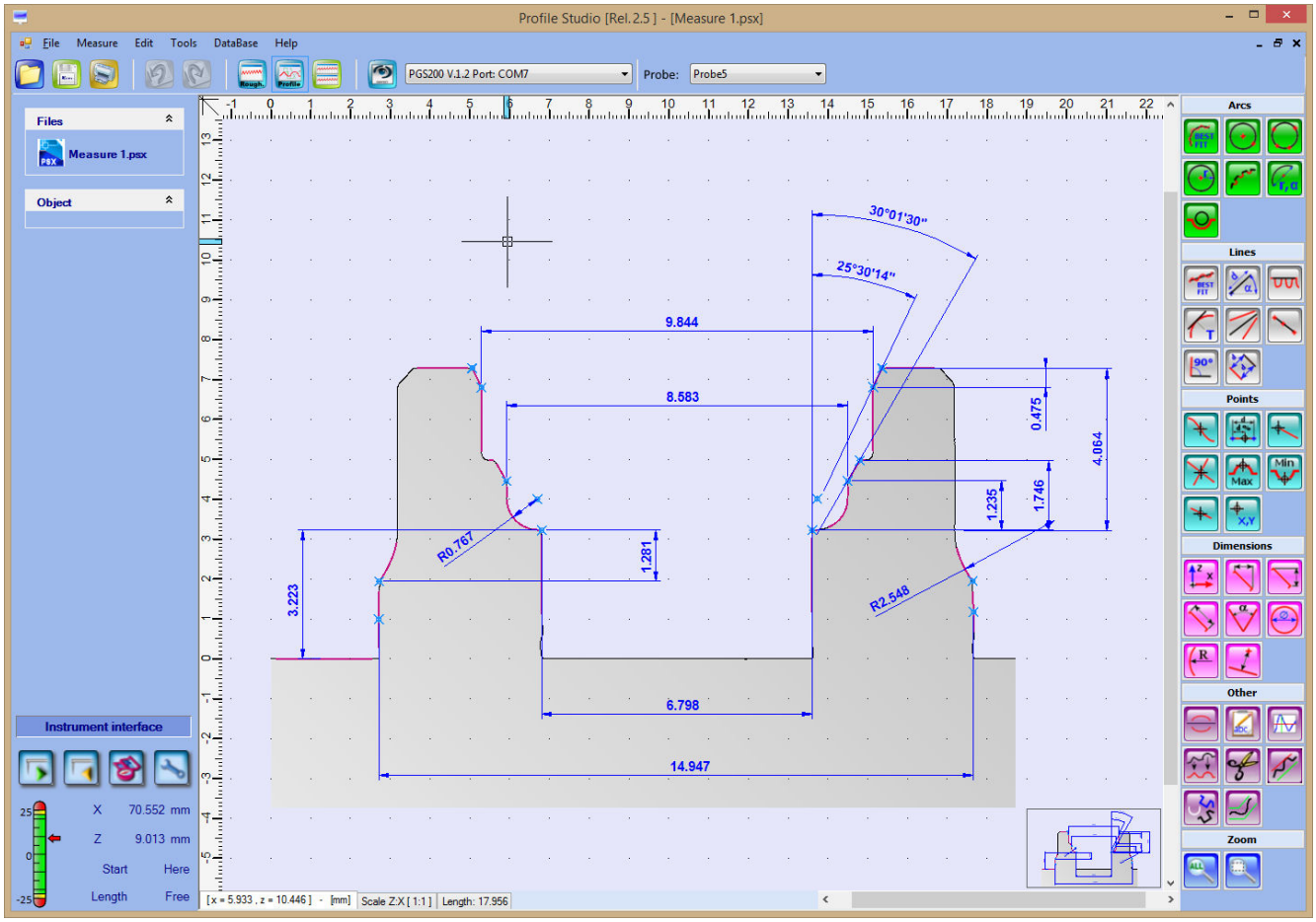
Profile Studio manual v 2.29



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Summary

Part 1

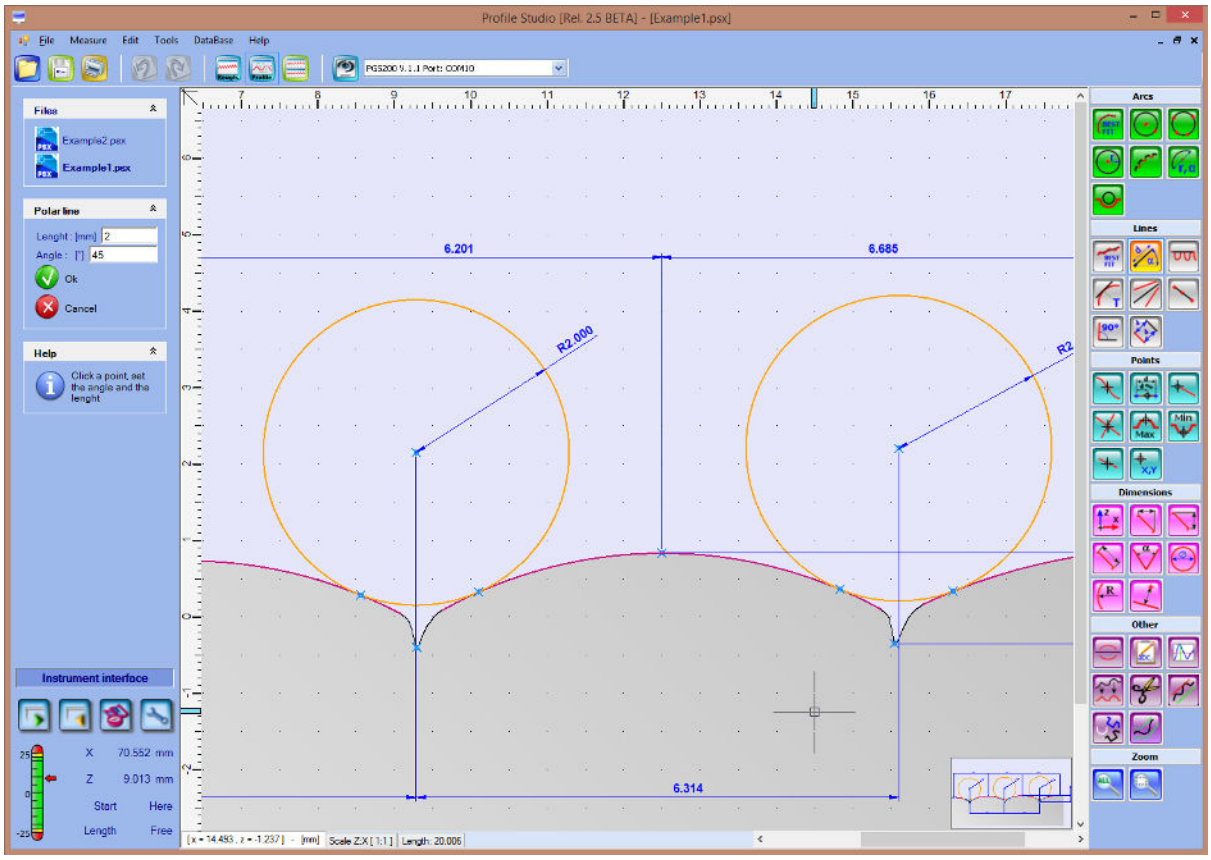
Introduction

1.1 About the program

The software Profile Studio can be used in combination with various instruments, ranging from portable roughness-testers to more advanced measurement stations and has been created with the purpose to ease the control of particular mechanical profiles. In fact it is a system with the ability of analyzing the measured profile and of archiving profile and measure settings data. Over that, performed measures, including the analysis, can be printed on any printer connected to the computer and compatible with the Windows operating system.

There are automatic procedures that make more easy the serial control while the program automatically corrects measurement errors.

It is possible to use special pickups that permit the exploration of "particularly hard" pieces.



1.2 Minimum requirements

Supported operating systems:

Windows® XP
Windows® Vista
Windows® 7
Windows® 8
Windows® 8.1

Hardware:

1.5 GHZ Intel Pentium 4 or AMD Athlon XP processor, 128 MB RAM, 16bit color depth with 1024x768 display resolution and 1 available USB port.

1.3 Installation

1 - Insert the Installation CD in the CD/DVD unit of the computer.

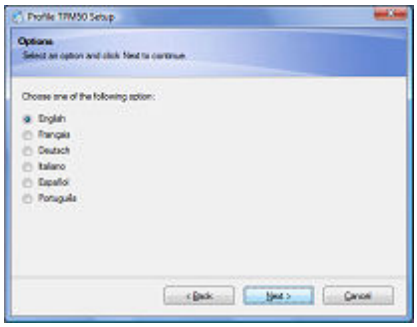
2 - The Installation program should start automatically. If this not happens you have to follow this procedure:

1 - From the windows desktop click on the button **START**.
2 - Select the item **Run**.
3 - In the file run window click on **Browse**.
4 - Select the unit letter that represents the CD/DVD unit and then when you have found the contents of the Installation CD select the **Setup.exe** file then press open to close the browsing window.
5 - Click on OK to confirm and launch the Installation program.

3 - Here is the welcome screen:

press **next**

4 - Select the language to be used for the installation procedure:

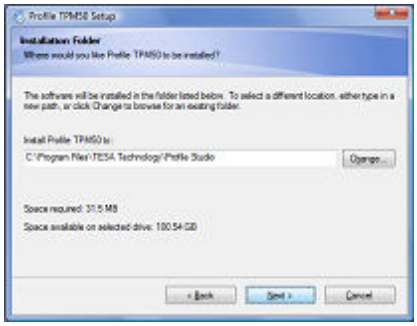


press **next.**

5 - The installation program will search for a previous version of the software already installed on the system, if a previous version is found, it will prompt the following message:

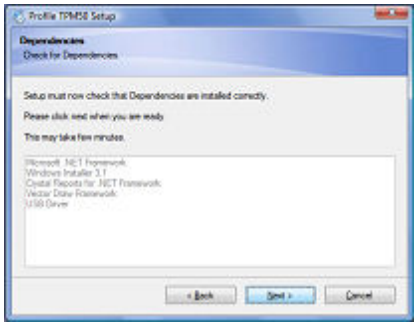
Press **Next** to start the uninstalling procedure.

6 - Select the folder to which the software will be installed or leave the predefined one:



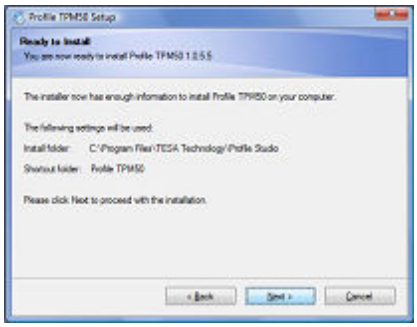
press **next.**

7 - The installation program now requires some external dependencies followed by the usb drivers:



if they are not found on the system, they will be automatically installed.
Press **Next.**

8 - Here is the confirmation screen:

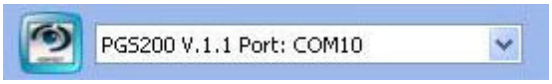


check your previous selections and if you're sure press **Next.**
The main program module will be installed.

1.4 Connection with the instrument

Usually the connection is automatically activated when the program is started. If for some reason the connection is not active, press the button in the connection panel.

The software will automatically search through the available USB ports then, if it founds the attached instrument, its name and version will be displayed in the label inside the connection panel.



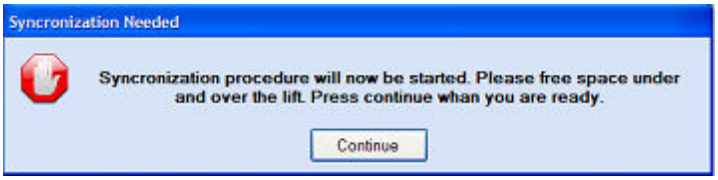
The connection panel

If more instruments are connected at the same time, the program adds then automatically to the list and activates the first available instrument. If you want to select another instrument simply activate the list by clicking on the button on the right side of label then select the desired instrument by clicking on the associated item.

1.5 First run

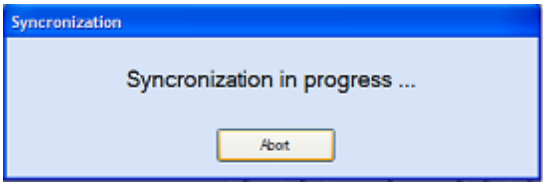
Switch on the instrument, connect the usb cable respectively to the instrument and to the USB PC port then wait some seconds that the operating system requires to correctly recognize the plugged cable. After that, launch the program by double clicking on the icon in the Windows desktop and the **Main program window** is displayed.

If the connected instrument is a PGS200 a message stating that the vertical positioning synchronization procedure of the rod is ready to be launched, will be displayed :

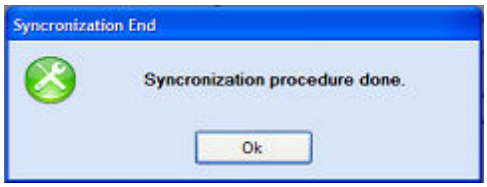


As indicated in the message leave the rod free to move up and down for all its range, when you have done press **Continue** to start the procedure.

The following message is indicating that the procedure is being performed:



During the synchronization procedure the rod is raised and then lowered for two times then the following message is displayed:



Now you can start working with the program.

1.6 Enabled functions

Profile Studio is distributed in different flavours, depending on the instrument.
They are summarized in this table.

Instrument	SM **PGS200**	SM **PGS200** with roughness kit	SM **RT120**	SM **RTP80** **RT90**	Mitutoyo **CA41** **CA42**	Mitutoyo **CP400 / CP200**	Zeiss **Flex50**	Hommel **LV50**
Functionalities								
Profilometry	✔	✔	✔	✔	✔	✔	✔	✘

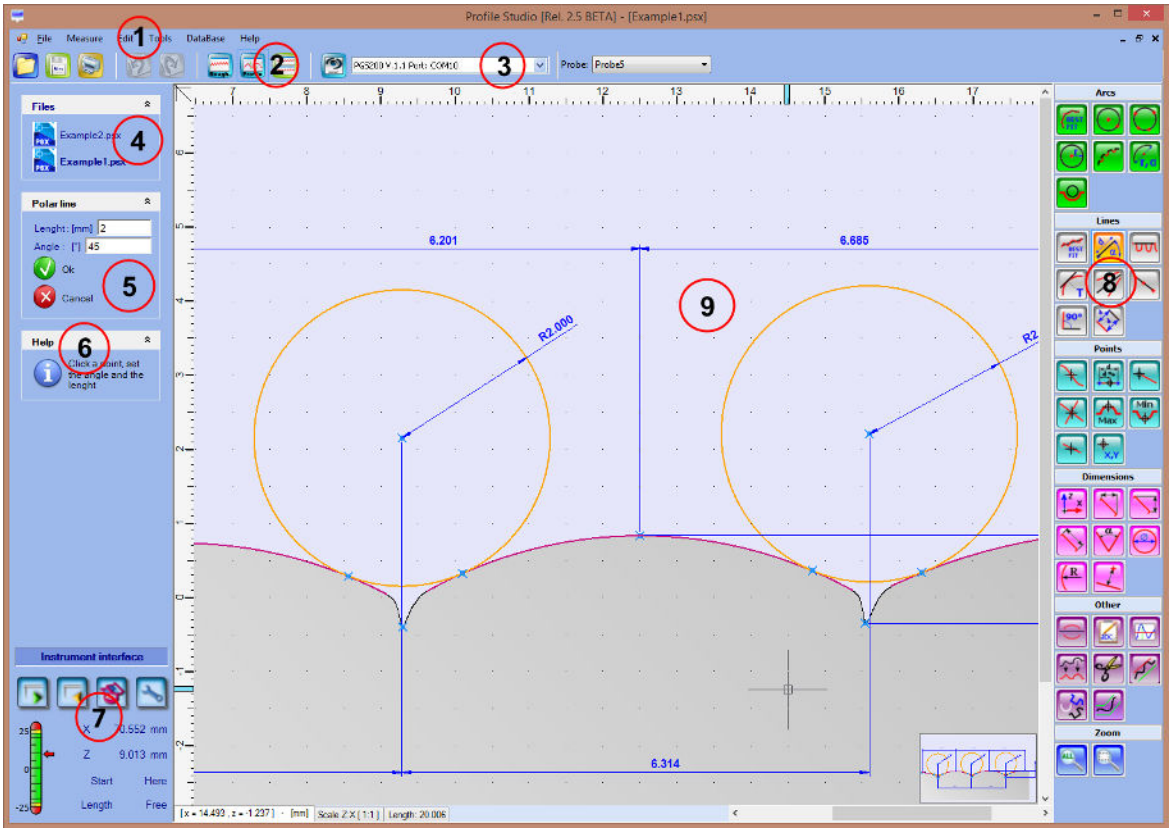
Roughness	✗	✓	✓	✗	✗	✗	✗	✓
Protection								
Hardware key	✗	✗	✗	✓	✗	✓	✓	✗

Part 2

Program interface

2.1 Main program window

The main program screen is divided in 9 areas:



1. **Menu bar:** contains the following items: File, Edit, Measure, Tools, Help.
2. **Toolbar:** contains buttons linking to some frequently used functions of the program
3. **Connection panel:** activates a connection between the software and the instrument (see also making a connection with the instrument)
4. **Profile list**: let us select and display a profile between those loaded by the program,
5. **Interactive option functions panel**: let us select the options for the various functions of the program.
6. **Quick help panel.** Displays some indications about the insertion of the objects for the current selected function.
7. **Measure panel:** let us interact with the connected instrument.
8. **Functions panel:** let us select the graphical functions of the program.
9. **Profile graph displaying zone.**

There is also a little status area containing the cursor coordinates at the bottom of the screen.

2.2 Toolbar

Has the following items

1  **Load profile**: opens a dialog window through which select a profile to be loaded from disk.

2  **Save profile**: opens a dialog window through which selecting a new name and a new destination location on disk for the current selected profile.

3  **Print profile:** launches the Print dialog

4  **Undo:** cancel the last performed operation.

5  **Redo:** repeat the last canceled operation.

6 

Functions panel selector: shows/hides the functions panel.

7  **Align windows:** display at the same time all the profiles loaded by the program.

8  **Protect instrument calibration:** Allows to lock instrument management operations like the calibration.

2.3 Menu

2.3.1 File Menu

Open:

lets you load from disk the data of the profiles previously saved.

Save:

writes on disk the measured profile data with embedded all the added elements. The profile is saved with the name displayed on the title bar. If a message declaring that a profile with this name is already stored you can choose if overwrite it or saving it with a different name.

Save as:

write on disk the measured profile with a new name and eventually in a different destination location.

Import document:

lets you load from disk a profile with DXF extension. (AutoCAD ® and compatible CAD software) and with ASC extension (a simple text format containing data in form of X,Z coordinates)

In case of DXF estension the imported profile must meet those conditions:

a it must contains only lines and arcs
b lines and arc must be continuously connected
c there must not be present vertical lines.

Export:

lets you save the current profile in various formats so you can made data available for a large number of external programs. Here is the list:

1 - PDF file (one of the most used interchange data format)

2 - BMP file, GIF file, JPG file, PNG file (common used image files)

3 - DXF12 file, DXF14 FILE, DXF2000 file, DXF2004 file, DXF2007 file (used by AutoCAD ® and lot of other CAD programs).

4 - VDML file, VDF file (VectorDraw graphic formats)

6 - ASC file (a simple text format containing data in form of X,Z coordinates)

2.3.2 Edit Menu

Undo:

Cancel last performed operation.

Redo:

Repeat last canceled operation.

***Note*:** the program stores a maximum of 50 operations.

2.3.3 Measure menu

Start measure:

make the instrument perform a measure.

Return:

move the traverse unit to the start of measure position (Only for Rugosurf 90G).

Positioning:

1. **Rugosurf90G** - activates the positioning screen on the instrument.
2. **PGS 200 -** launches the positioning window

Calibration:

launches the calibration procedure.

2.3.4 Tools Menu

Options:

Activates the program options window

Export dims to Excel:

Allows the user to export to an Excel file all the dimensions to which a tolerance has been applied. If the file already exists, the dimensions values are appended to the existing table; this is useful to save the dimensions of several identical pieces.

Note: In order to get the append mode to work properly with existing files, correspondent dimensions have to be assigned to the same ID, which can be accomplished by assigning tolerances in the same order or by means of autocomparison.

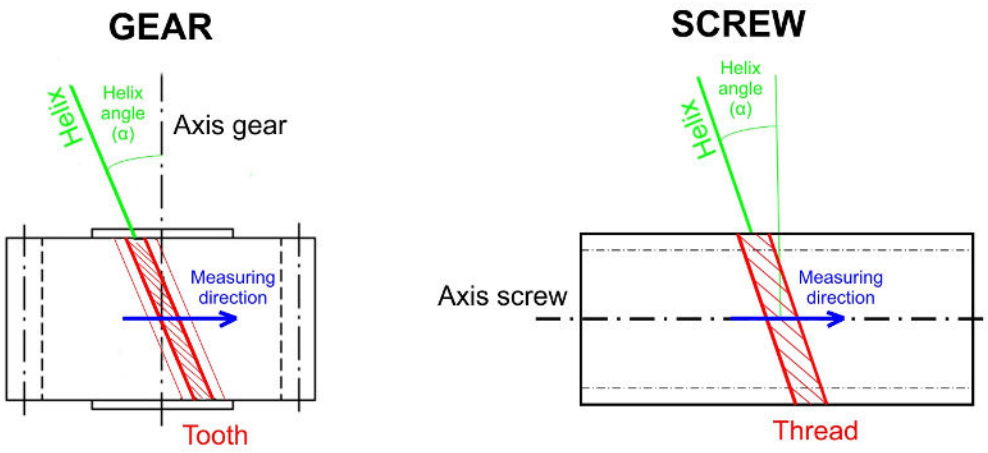
Export shape error to Excel:

Opens the window to export the shape error to a CSV file, which can be opened with

Excel. The window allows to fill some header fields (e.g. operator, lot number etc.) that are saved along with the shape error profile.

Helix angle compensation:

This functionality allows to measure a gear's tooth or a screw's thread parallel to the piece's axis. Providing the nominal helix angle (the gear's or the screw's), the software compensates the acquired profile as if it was measured orthogonally to the helix.

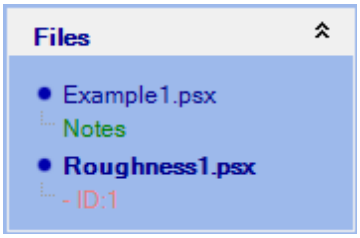


Add note:

Adds a note file to the current measure: the file is in Excel format and is saved in the same folder of the profile; this file can contain every element that an Excel file can be made of.

This function can be used to store additional information about the measure, for example the measure conditions, the angle of the positioner, or also a photo of the instrument with the measured piece.

When the note file is added, a green text is added in the list of the open profiles: if you click on it, the note file is opened with an external editor.



2.3.5 Cycles Menu

Editor

Activates the measurement cycles creation/editing window .

Run

Activates the measurement cycles load and run window.

2.3.6 Help Menu

Index:

Opens the index of the topics of this document.

Search:

Opens the search tab of this document.

Summary:

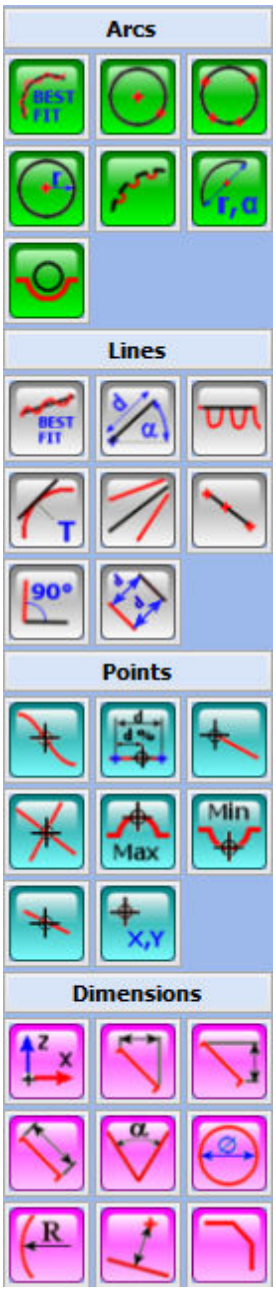
Opens the summary tab of this document.

About:

Displays some informations about the program.

2.4 CAD Functions

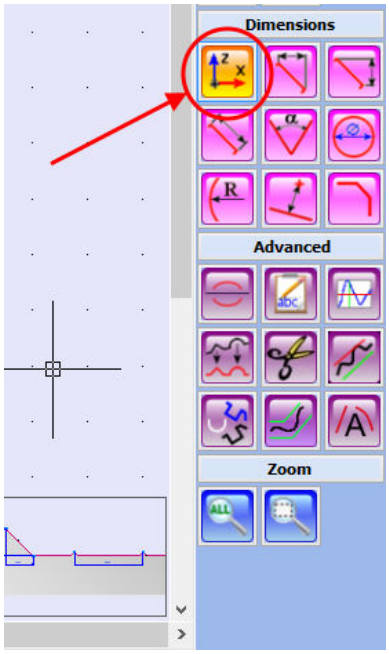
2.4.1 Functions Panel



The functions panel contains all the program graphic functions grouped by categories.

You can hide or show a category by simply making double click on its title.

To activate a function simply click on the respective button inside a category, the background button color become yellow to indicate that the function is now active.

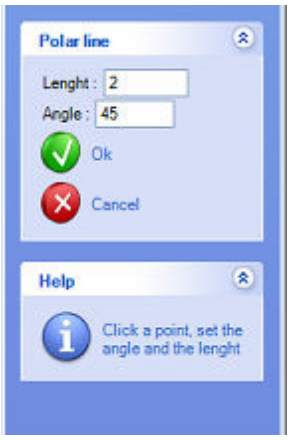


To deactivate a function you can operate in the following different ways:

1. press ESC key
2. Click again on the function button
3. Select another function

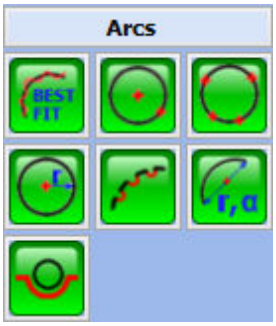
4. Double click on an empty area of the main screen

Some functions when activated have further options that can be selected in the left panel:



2.4.2 Arcs

2.4.2.1 Arc functions panel



The arc functions panel contains all the arc related functions buttons

2.4.2.2 Best Fit arc

Bestfit Arc: *inserts an arc on the profile.*

From the options panel you can choose if you want to construct the bestfit selecting one or two points; to choose the point(s) you have to click on the profile with the left button of the mouse.
If you select one point, the arc is automatically created by searching the best curved path around the selected point; if you select two points, the arc is created between them.
It is also possible to create a bestfit between two constructed points, for example a point on the profile or an intersection point: in this mode, updating the point determines the update of the bestfit.

It can be extended or reduced (see modify elements).

2.4.2.3 Circle by two points

Circle by two points: *inserts a circle by defining a point as its center and another point as the distance center-radius.*

Mark first point by selecting a point on the profile or an acquired point belonging to a previously inserted element to define the center of the circle, then mark the second point by also selecting in this case a point on the profile or an acquired point, the distance between the second and first point will be considered as the value of the radius of the new circle.

2.4.2.4 Circle by three or more points

Circle between three or more points: *inserts a circle by selecting three or more points on the profile or on other elements.*

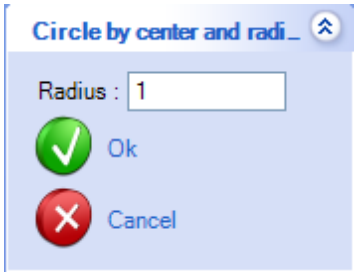
Mark three or more points by selecting those on the profile or those acquired, after that press Enter.

2.4.2.5 Circle by point and radius

Circle by point and radius: *inserts a circle by defining a first point as its center*

and a value for its radius.

Place the mouse cursor on an existing point and click with the left mouse button to select it, the following options panel will be displayed:



insert the appropriate value for the radius in the box labeled "radius" then press to confirm the insertion of the arc or press to cancel the operation.

2.4.2.6 Interrupted arc

Interrupted arc: *Rebuilds an arc from the union of many existing separated arcs*

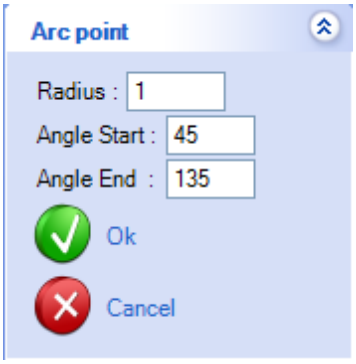
Select a sequence of bestfit arcs then press ENTER. The program will rebuild the complete arc by using the bestfit arcs previously selected.

If you extent or reduce the related bestfit arcs the size of the interrupted arc will vary depending on your modifications.

2.4.2.7 Arc by radius and angle

Arc by radius and angle: *inserts an arc by defining a point as its center then a value for its radius and the starting and ending angle.*

Place the mouse cursor on the profile on an existing point then click with the left mouse button to define the center of the arc, the following options panel will be displayed:



insert the appropriate value for the radius in the box labeled "radius", for the first delimiting angle in the box labeled "angle start" and finally for the last delimiting angle in the box labeled "angle stop". Press  to confirm the insertion of the arc or press  to cancel the operation.

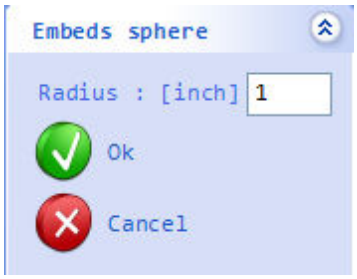
Angle values are considered as starting from the horizontal axe counterclockwise.

It can be extended or reduced (see modify elements).

2.4.2.8 Embedded sphere

Embedded sphere: *inserts a circle by fitting it on the profile.*

Before inserting the sphere you can define the sphere radius in the appropriate options panel to the left:



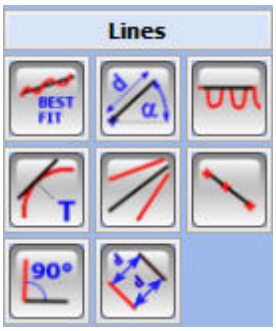
With the first click you set the falling point on the profile, with the second click you set the falling angle of the sphere.

Insert the appropriate value in the text box labeled "Radius" then press  to confirm or

 to leave the previous defined value.

2.4.3 Lines

2.4.3.1 Line functions panel



The line functions panel contains all the line related functions buttons

2.4.3.2 Best Fit line

Bestfit Line: *inserts a line on the profile.*

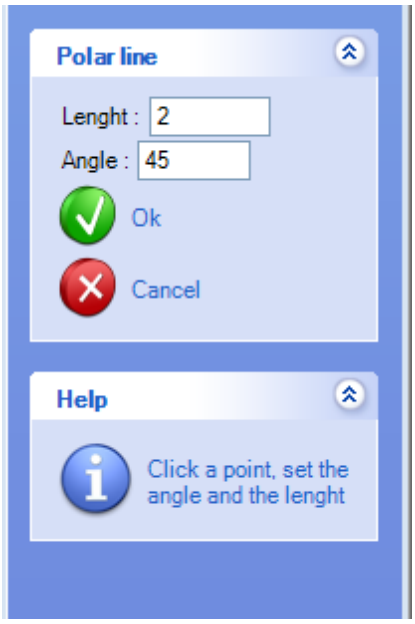
From the options panel you can choose if you want to construct the bestfit selecting one or two points: to choose the point(s) you have to click on the profile with the left button of the mouse.
If you select one point, the line is automatically created by searching the best linear path around the selected point; if you select two points, the line is created between them.
It is also possible to create a bestfit between two constructed points, for example a point on the profile or an intersection point: in this mode, updating the point determines the update of the bestfit.

It can be extended or reduced (see modify elements).

2.4.3.3 Polar line

Polar line: *inserts a line of a specific length and angle.*

Place the cursor on an existing point then click with the left mouse button, the following options panel is displayed:



Insert the desired line length value in the box labeled "Length" then the desired angle value in the box labeled "angle". Press  to confirm the insertion of the line, press  to cancel the operation.

2.4.3.4 Interrupted line

Interrupted Line: *Rebuilds a line from the union of many existing separated lines.*

Select a sequence of best fit lines then press ENTER. The program will rebuild the complete line by using the best fit lines previously selected. The procedure is carried out minimizing the square deviation.

It can be extended or reduced (see modify elements).

2.4.3.5 Tangent line

Tangent line: *insert a line tangent to an arc and a point or two arcs.*

Place the cursor on an existing arc or circle or point and click with the left mouse button to confirm the selection then click on another point of another arc or circle or point.

The line so created is always the external tangent between elements.

2.4.3.6 Bisecting line

Bisecting line: *insert the bisecting line of two existing lines.*

Place the cursor on an existing line and click with left mouse button to define the first reference line then place the cursor on another line and click again with left mouse button to define the second reference line.

It can be extended or reduced (see modify elements).

2.4.3.7 Line between 2 or more points

Line between 2 or more points: *inserts a line by defining a set of points.*

Click on 2 points or more and then press Enter: the software will create the line that minimizes the square deviation.
In case of exactly two points, the line will join them.

It can be extended or reduced (see modify elements).

2.4.3.8 Perpendicular line

perpendicular line: *inserts a line perpendicular to another existing line.*

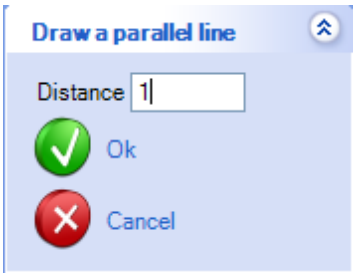
Place the cursor on an existing line and click with the left mouse button to define the reference line then select one of the two extremes point of the line through which the perpendicular line have to pass by clicking on it with the left mouse button.

It can be extended or reduced (see modify elements).

2.4.3.9 Parallel line

parallel line: *inserts a line parallel to another line.*

Place the cursor on an existing line and click with the left mouse button to define the reference line. then you define a fixed distance from the first reference line with the following panel:



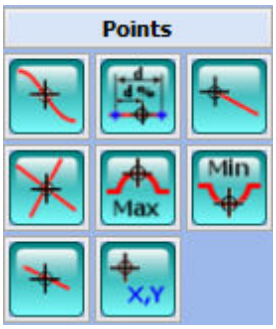
insert the appropriate value in the box labeled "distance" then Press  to confirm the insertion of the line or press  to cancel the operation.

If you want to generate a line that will be placed under the reference line insert a negative value in the box.

It can be extended or reduced (see modify elements).

2.4.4 Points

2.4.4.1 Point functions panel



The point functions panel contains all the point related functions buttons

2.4.4.2 Point on profile

Point on profile: *inserts a point constrained to the profile.*

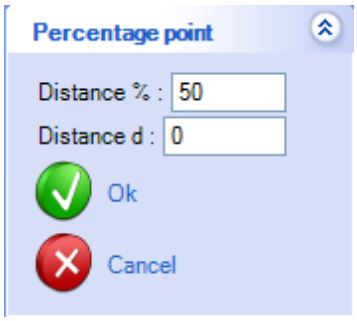
Place the mouse cursor in the desired point on the profile graph then click with the left mouse button to terminate the insertion of the point.

It can be moved along the profile (see modify elements).

2.4.4.3 Percentual point

Percentage Point: *inserts a point at a specific percentage of distance between two existing points.*

Place the mouse cursor on a point and click with the left mouse button to define the first reference point then place the mouse cursor on another point and click with the left mouse button to define the second reference point. The following options panel is displayed:



You can define the distance from the first reference point in an absolute mode inserting the appropriate absolute value in the box labeled "Distance d"; or define the distance in a percentage mode by inserting the appropriate percentage value in the box labeled "Distance %".

Note: The distance value can be positive or negative and the percentage can be greater than 100 % or lower than 0 %.

Press  to confirm the insertion of the point or press  to cancel the operation.

2.4.4.4 Limit point

Limit point: *inserts a point on the extremes of a line or arc.*

Place the mouse cursor on a line or on an arc then click with the left mouse button on the left half for the left limit point or on the right half for the right limit point to confirm the insertion.

2.4.4.5 Intersection point

Intersection point: *inserts a point that represents the intersection between two elements.*

Place the mouse cursor on a line and click with the left mouse button to define the first reference line then place the mouse cursor on another line and click with the left mouse button to define the second reference line. The profile can be selected as well.

2.4.4.6 Max point

Max point: *inserts a point that represents the maximum point inside an area.*

In the options panel you can select if the maximum has to be searched in X or in Z, depending if you want to find the point with maximum abscissa or maximum ordinate.
Place the mouse cursor on the profile then click with the left mouse button to confirm the starting point of the area of which you want to find the maximum, move the cursor until you reach the end of the area and finally press again the left mouse button to select the ending point.

You can also find the maximum on a circle or arc.

2.4.4.7 Min point

Min point: *inserts a point that represents the Minimum point inside an area.*

In the options panel you can select if the minimum has to be searched in X or in Z, depending if you want to find the point with minimum abscissa or minimum ordinate.
Place the mouse cursor on the profile then click with the left mouse button to confirm the starting point of the area of which you want to find the minimum, move the cursor until you reach the end of the area and finally press again the left mouse button to select the ending point.

You can also find the minimum on a circle or arc.

2.4.4.8 Middle point

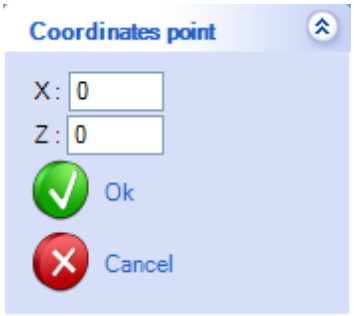
Middle point: *inserts a point that represents the Middle point of a line or arc.*

Place the mouse cursor on a line or on an arc then click with the left mouse button to confirm the insertion of the point.

2.4.4.9 Cartesian point

Cartesian point: *inserts a point at a specific position.*

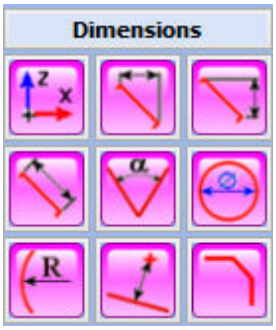
The following options panel is displayed:



There are two ways to create a cartesian point: you can insert the X and Z coordinates in the options panel, or you can click with the mouse in the point where you want to insert it. In order to confirm, click **Ok** or press Enter.

2.4.5 Dimensions

2.4.5.1 Dimensions panel

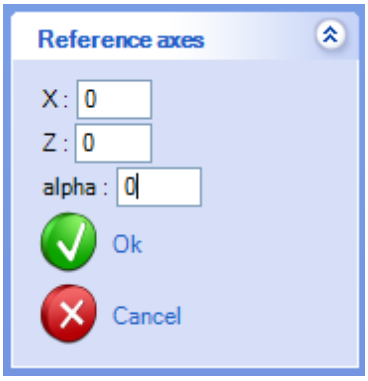


The dimensions panel contains all the dimension related functions buttons

2.4.5.2 Reference axes

Reference axes: *allows to rototraslate the profile to align it to a new coordinate system*

The following options panel is displayed:



You have to select a reference line and optionally a point; if you don't select a point, the function will use the first point of the profile.
Then you have to set the values of the destination point and the angle on the options panel. When you select the function, in the angle text box appears the text "Auto": if you leave that value, the rotation is done to 0° or 90° depending to which one is closer the reference line.

The function rotates the profile so that the reference line's angle with the X axis coincides with the one you inserted, and traslates it so that the selected point (or the first point of the profile if you selected no point) coincides with the X and Z values inserted.

2.4.5.3 Horizontal dimension

Horizontal dimension: *measures the horizontal distance between two points.*

Select with the mouse the two points of which you want to know the horizontal distance, then click on a point in the space where you want the value to appear.
Before the last click, it's possible to cancel the insertion by pressing ESC.

After the dimension is created, it's possible to insert the tolerances values.

2.4.5.4 Vertical dimension

Vertical dimension: *measures the vertical distance between two points.*

Select with the mouse the two points of which you want to know the vertical distance, then click on a point in the space where you want the value to appear.
Before the last click, it's possible to cancel the insertion by pressing ESC.

After the dimension is created, it's possible to insert the tolerances values.

2.4.5.5 Linear dimension

Linear dimension: *measures the euclidean distance between two points.*

Select with the mouse the two points of which you want to know the linear distance, then click on a point in the space where you want the value to appear.
Before the last click, it's possible to cancel the insertion by pressing ESC.

After the dimension is created, it's possible to insert the tolerances values.

2.4.5.6 Angular dimension

Angular dimension: *performs the measure of the angles generated by two "line elements".*

Select the two lines of which you want to measure the angle, move the mouse cursor to choose where to put the dimension, then click with left mouse button to confirm or ESC to cancel the insertion.
If the two lines intersect or you enable the "4 quadrant" option from the options panel, it's possible to measure each of the 4 angles created by the lines (extending them virtually); otherwise, if the two lines do not intersect and the "4 quadrant" option is disabled, it is possible to insert the measure in the quadrant between the two lines or in the complementary one, which is the sum of the other three.

After the dimension is created, it's possible to insert the tolerances values.

2.4.5.7 Diameter dimension

Diameter dimension: *measures the circle diameter length.*

You have to insert a circle, then mark a point on the circle and move the cursor to extent the measurement line until the desired point and angle, finally click with left mouse button to confirm or ESC to cancel the insertion.

After the dimension is created, it's possible to insert the tolerances values.

2.4.5.8 Radial dimension

Radial dimension: *measures the arc radius length.*

You have to insert an arc, then mark a point on the arc and move the cursor to extent the measurement line until the desired point and angle, finally click with left mouse button to confirm or ESC to cancel the insertion.

After the dimension is created, it's possible to insert the tolerances values.

2.4.5.9 Line-point dimension

Line-point dimension: *measures the perpendicular distance between a line and a point.*

You have to insert a line and a point, then mark the line and the point and move the cursor to extent the measurement line until the desired point, finally click with left mouse button to confirm or ESC to cancel the insertion.

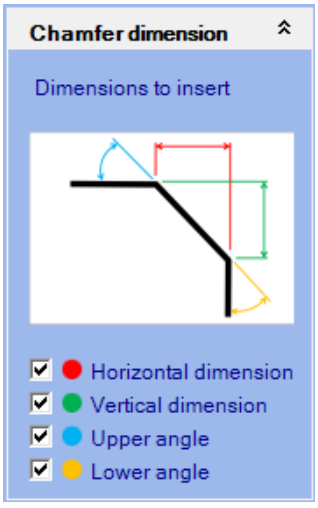
After the dimension is created, it's possible to insert the tolerances values.

2.4.5.10 Chamfer dimension

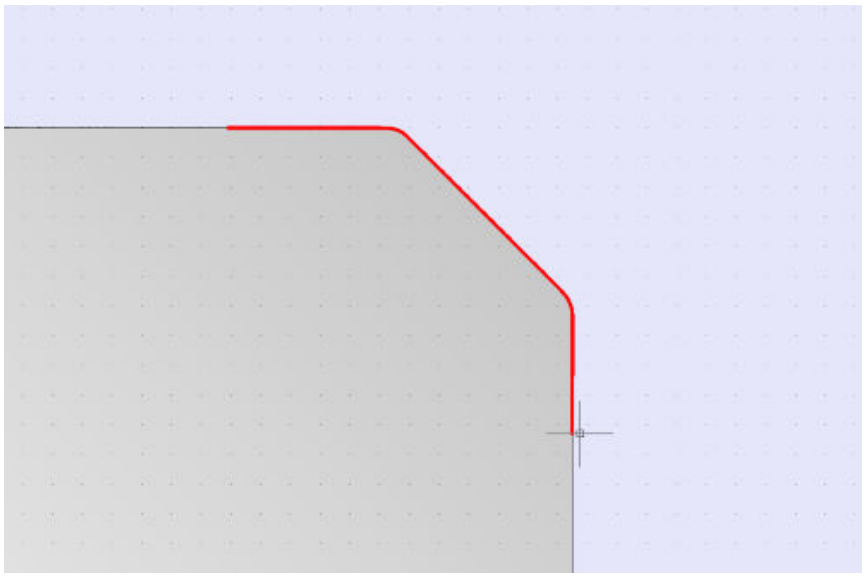
Chamfer dimension: *allows to automatically insert bestfits and dimensions on chamfers.*

This function allows to insert dimensions in a chamfer, or more generally the intersection of three consecutive line segments.

In the options panel it is possible to choose which dimensions to insert.



When the function is enabled, you have to click on each of the two segments next to the chamfer. When you select the area of the chamfer, the three bestfit lines and the two intersections are automatically created and the functions switches to the insert mode.



Once you select the chamfer area, the software iterates on the selected dimensions and draws them one by one; each dimension can be dragged to the desired point and inserted with the left mouse button, or it can be skipped by clicking the right button. When the last dimension is processed, the graphical elements are saved to the CAD.

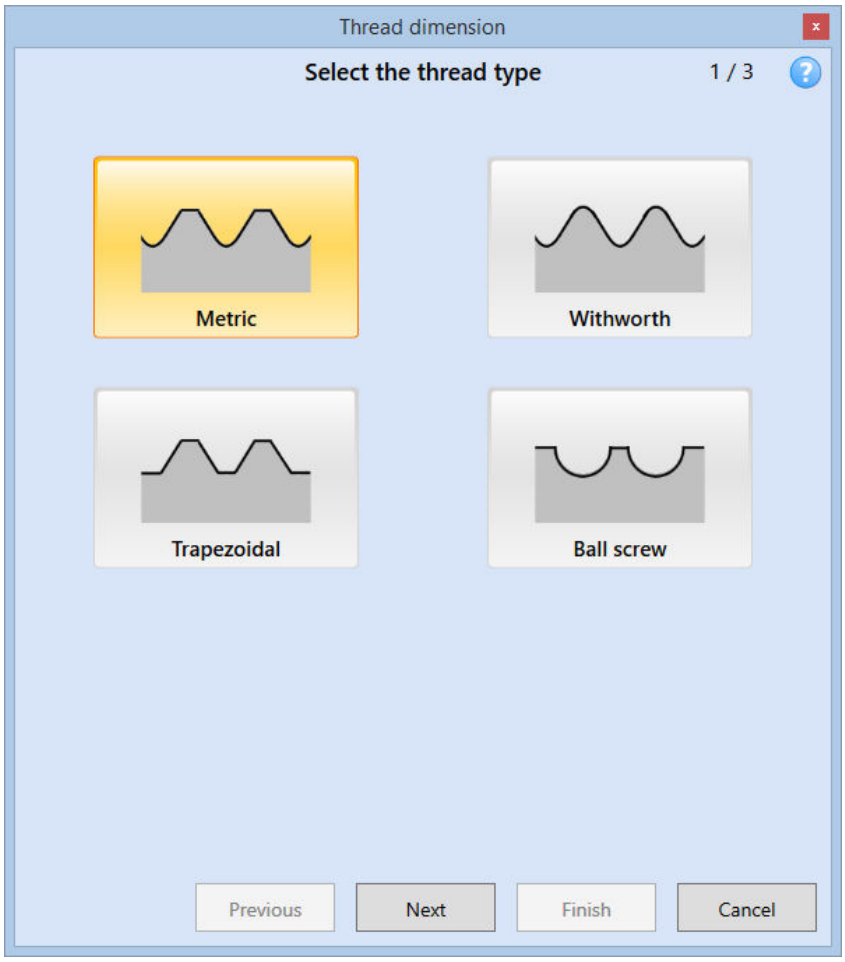
2.4.5.11 Thread dimension

Thread dimension: *allows to automatically insert bestfits and dimensions on threads.*

In presence of a thread profile, this function automates the construction of dimensions related to pitches, steps and angles.
The dimension of a thread is made in three main steps plus a fourth optional.

Step 1 - thread type selection

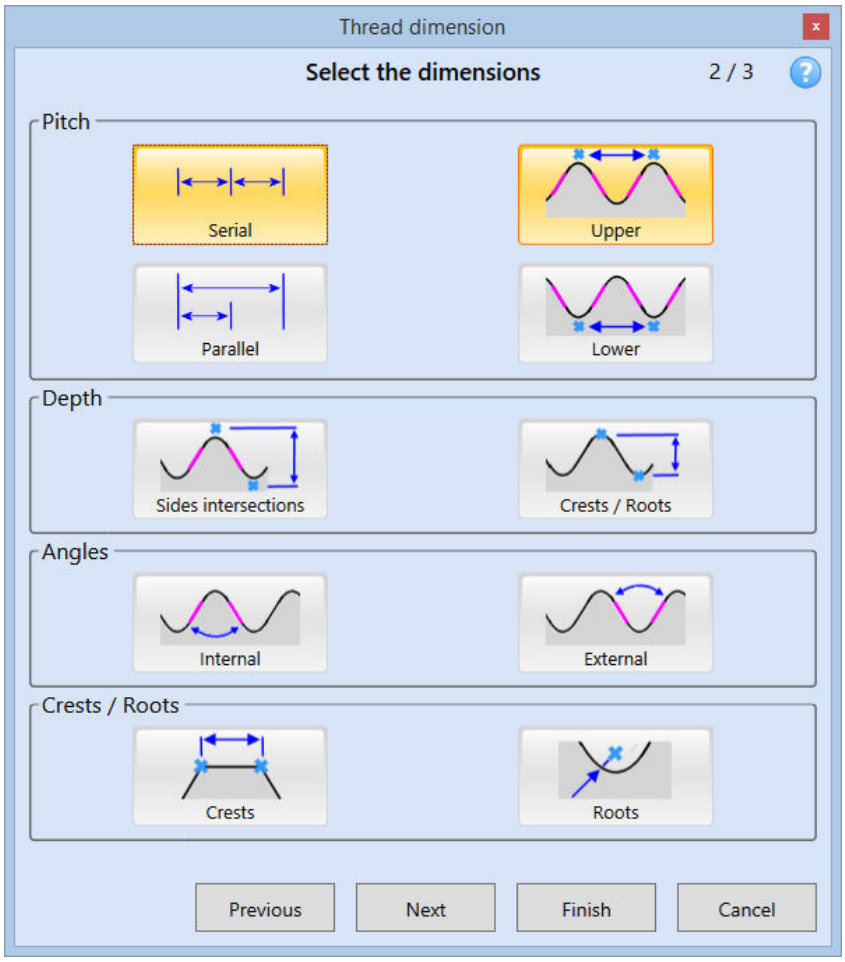
The following window is displayed:



First select the thread type to be dimensioned, where each type changes according to the crests and roots shape, then press **Next** to go to next step or **Cancel** to leave the dimensioning procedure.

Step 2 - dimension type selection

If **Metric, Withworth** or **Trapezoidal** thread type is selected**,** in the second step the following window will be displayed:



Where it is possible to select various dimension categories: **Pitch**, **Depth, Angles** and **Crests / Roots** .

for **Pitch** category we have only a dimension type with two options:

a. **Serial, Parallel:** graphical representation of the dimensions.
b. **Upper**, **Lower**: for the calculation are considered respectively two consecutives crests or roots.

For **Depth** category there are two types available:

a. **Sides intersections:** for depth calculation are considered the two points obtained from the intersection of bestfit lines applied on the sides of the thread and on the side of the adjacent one.
b. **Crests/Roots**: for depth calculation are considered respectively the highest point and the lowest point of adjacent crest and root.

For **Angles** category there are two types available:

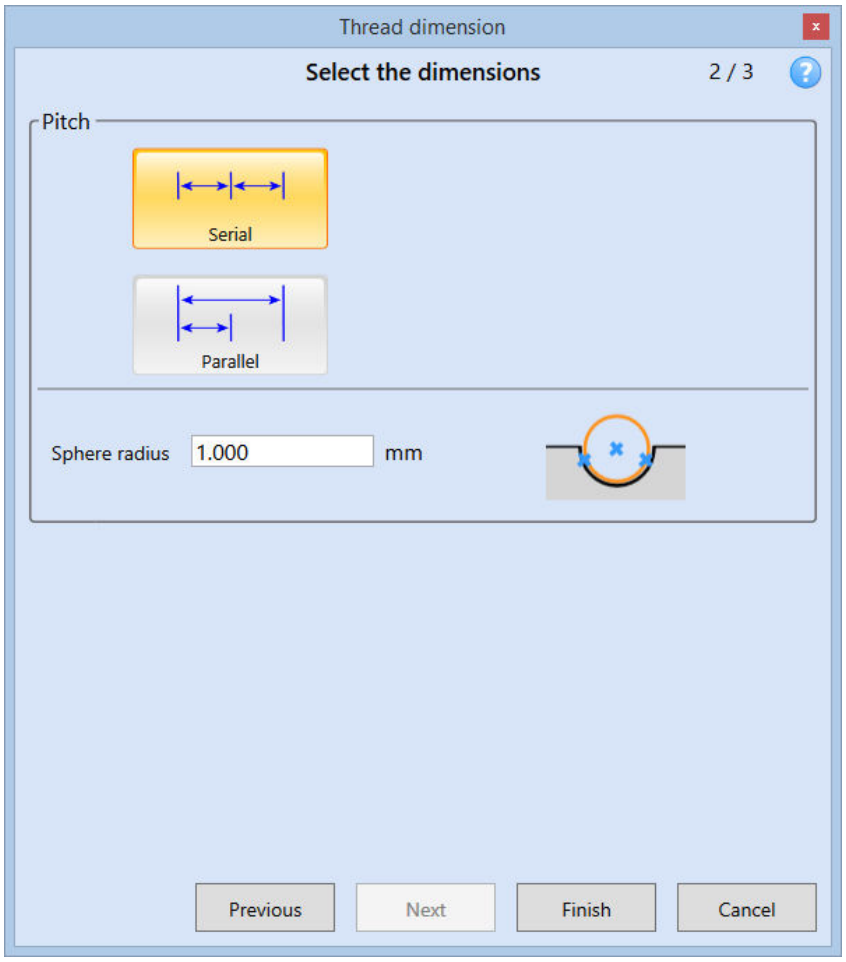
a. **Internal:** for calculation is considered the angle between bestfit lines applied on the sides of the thread.
b. **External**: for calculation is considered the angle between bestfit lines applied on the right side of the thread and left side of the adjacent one.

For **Crests/Roots categories** there are two types available:

a. **Crests:** is calculated the crest width with flat crest or radius with circular shape crest.
b. **Roots**: as previous type except that are considered roots for calculation.

At the end of the selection press **Next** to go to next step, **Finish** to go to the profile dimension insertion step, **Previous** to go back to previous step or **Cancel** to leave the dimensioning procedure.

If **Ball screw** is selected in the second step the following options will be available:



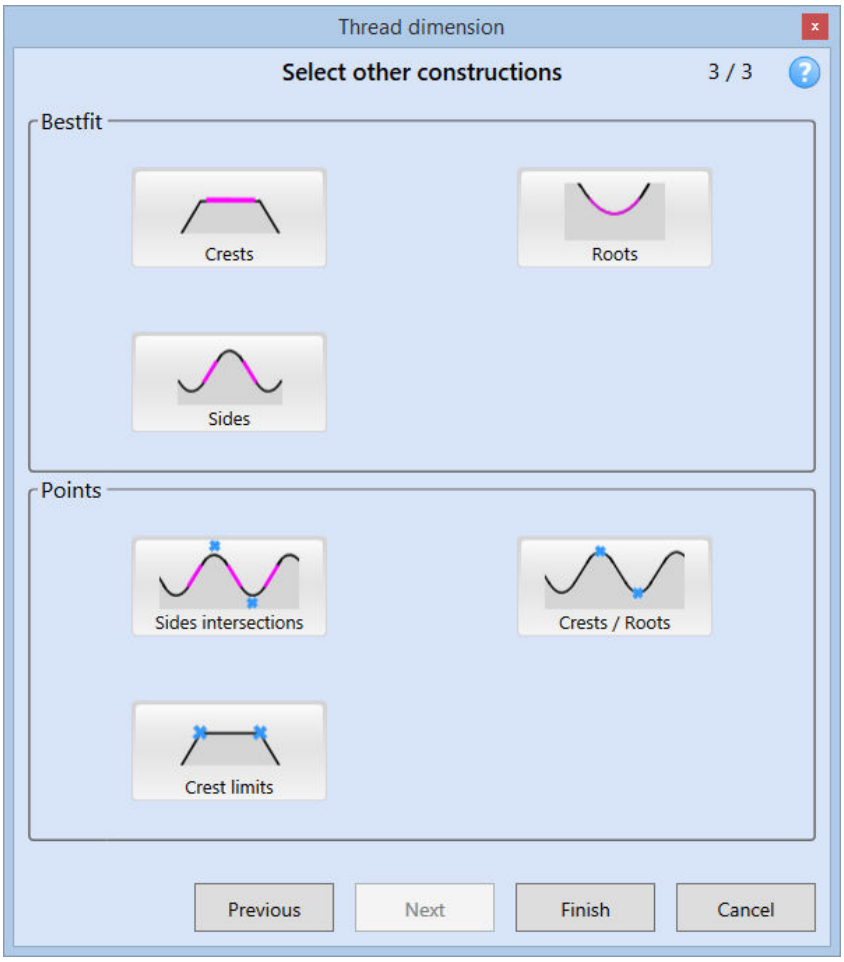
we have only the **Pitch** category with only one dimension type and two options:

a. **Serial, Parallel:** representation of the dimension on graphic.
b. **Sphere radius**: nominal value of the profile root radius, used to calculate the pitch considering the distance between the center of two bestfit circles obtained in a similar way to what already seen in Embedded sphere function and applied on two consecutive roots.

At the end of the selection press **Finish** to go to the profile dimension insertion step, **Previous** to go back to previous step or **Cancel** to leave the dimensioning procedure.

Step 3 (optional) - Additional elements selection

The following screen appears:



Where it is possible to insert additional elements to the profile with **BestFit** and **Points** categories**.**

For **BestFit** category there are three types available:

a. **Crests:** inserts a bestfit line (or best-fit circle, according to the selected thread type) on the thread peak.
b. **Roots**: inserts a bestfit line (or bestfit circle, according to the selected thread type) on the thread root.
c. **Sides:** inserts a bestfit line on the thread side.

For **Points** category there are three types available

a. **Sides intersections:** the two points obtained from the intersection of the bestfit lines applied to the thread sides and to the side of the adjacent one, are inserted on

the profile.

b. **Crests/Roots**: respectively the highest and lowest points of adjacent crest and root are inserted on the profile .

c. **Crest limit:** inserts two points at the extremes of the thread flattened crest.

At the end of the selection press **Finish** to go to the profile dimension insertion step, **Previous** to go back to the previous step or **Cancel** to leave the dimensioning procedure.

Step 4 - Inserting dimensions on the profile

Dimensions are inserted on the profile in two phases:

1. **Dimensioning area definition:** click on the profile with left mouse button to define the dimensioning starting area, then drag the mouse until the ending point of the dimensioning area, the dimensioning area will be highlighted in red on the profile. Finally click with the left mouse button to confirm the dimension area or with ESC key to cancel the operation.
2. **Dimension characteristics definition and insertion:** proceed then with the mouse scrolling to define size and position of the dimension on the graphic and press again the left mouse button to confirm insertion or right mouse button to cancel the operation. If previously more dimensions types for the insertion on the profile have been selected, each time that the insertion of a type is completed, the software automatically proposes the next type according to the order in which they have been previously selected. If the insertion of a type is canceled, the insertion sequence isn't stopped but goes on with next type, to stop the whole sequence and go back to dimensioning area definition mode you have to press the ESC key.

2.4.5.12 Bearings analysis

Bearings analysis: *allow to perform a quick bearing trace analysis*

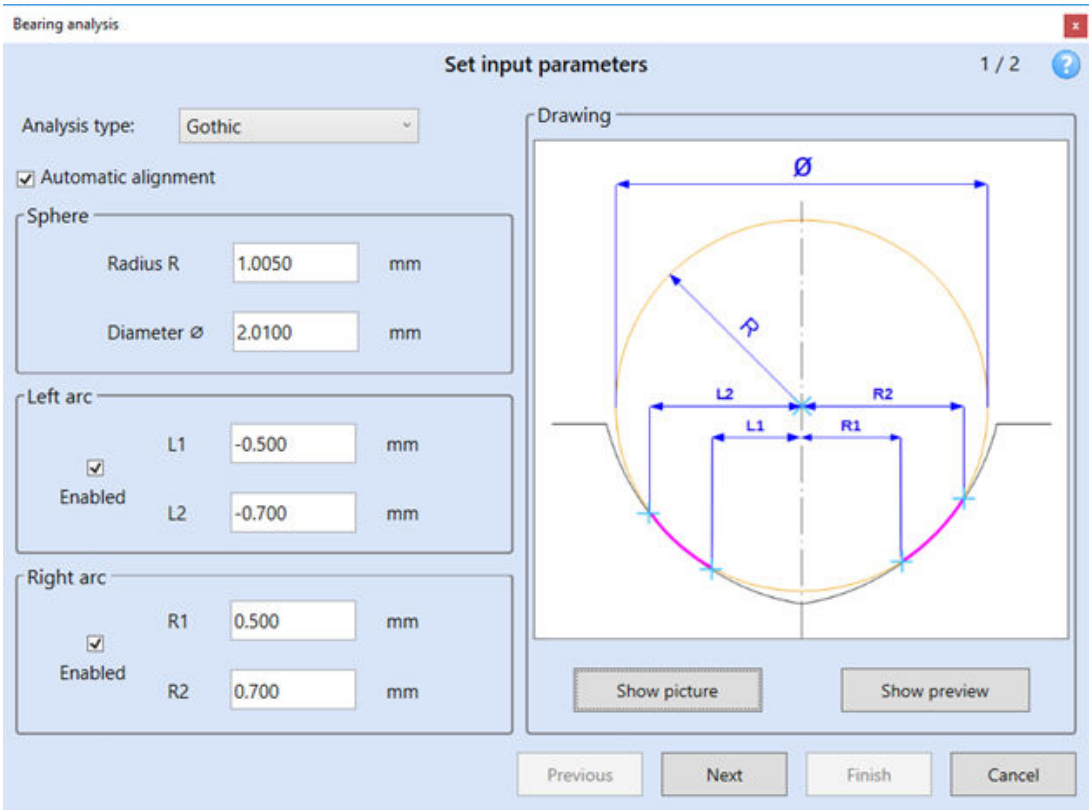
In presence of a bearing trace profile, this function automates the construction of

dimensions related to radius and lengths.

The operation is made in three steps:

Step 1 – Set input data

The following window is displayed.
Allows to set the input parameters that will be used to perform the bearing analysis.



Analysis type: Gothic or Spherical

Automatic alignment: perform a profile alignment before elaborate it.

Sphere radius R (Gothic): is the sphere radius that falls in bearing trace.

Sphere diameter Ø (Gothic): is the sphere diameter that falls in bearing trace.

Left limit (Spherical): left limit from which will be made the bestfit in order to found the circle.

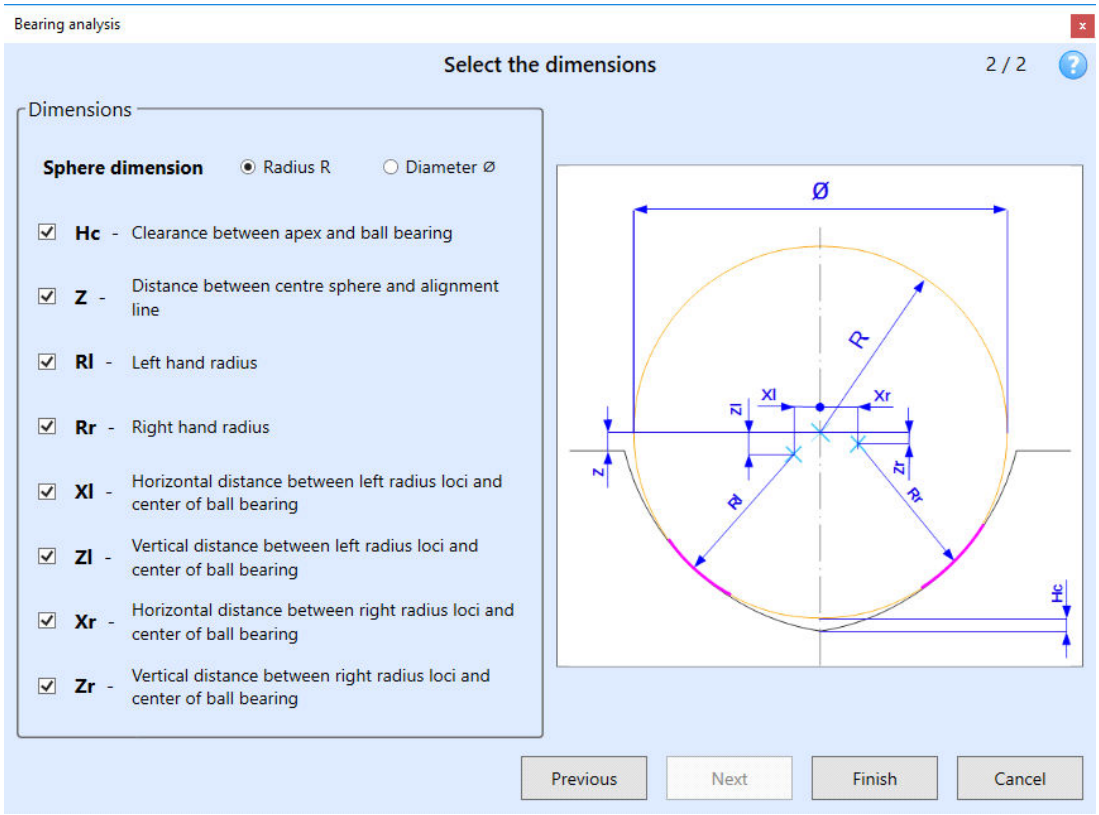
Right limit (Spherical): right limit until which will be made the bestfit in order to found the circle.

Left arc L1, Left arc L2, Right arc R1, Right arc R2: are the distances from the vertical line that pass from sphere center.

Press **Next** to go to next step or **Cancel** to leave the dimensioning procedure.

Step 2 – Select dimensions

Choose which dimensions you want to display.



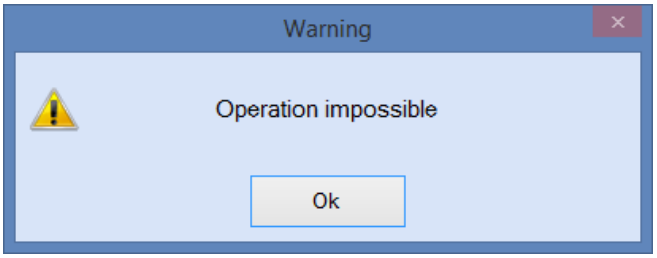
Check\Uncheck the parameters in the left according to what you need.

Press **Finish** to go to the profile dimension insertion step, **Previous** to go back to previous step or **Cancel** to leave the dimensioning procedure.

Step 3 – Inserting dimensions on the profile

Dimensions are inserted on the profile in two phases:

1.**Dimensioning area definition:** click on the profile with left mouse button to define the dimensioning starting area, then drag the mouse until the ending point of the dimensioning area, the dimensioning area will be highlighted in red on the profile. Finally click with the left mouse button to confirm the dimension area or with ESC key to cancel the operation. When area is defined the software checks if the evaluation is possible. If the operation is not possible the following message is shown:

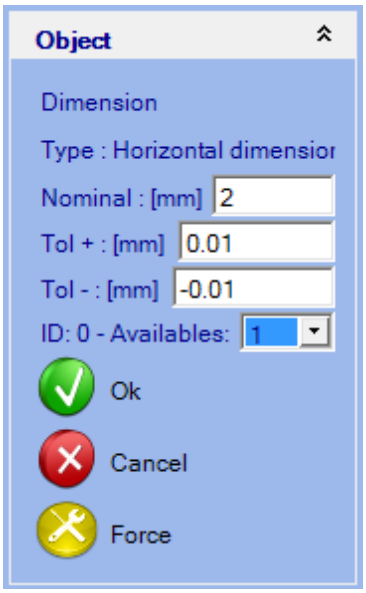


2. **Dimension characteristics definition and insertion:** proceed then with the mouse moving to define size and position of the dimension on the graphic and press again the left mouse button to confirm insertion. Every time that an insertion is completed, the software automatically proposes the next type according to the order in which they have been previously selected. If you want to stop the whole sequence and go back to dimensioning area definition mode you have to press the ESC key.

2.4.5.13 Inserting tolerances

Tolerances can be applied on dimension elements.

To activate tolerances on an element, select a dimension element already inserted on the profile, the related options panel is displayed as usually to the left of the main screen:



Insert respectively the dimension's **nominal value**, the **positive tolerance limit** and the **negative tolerance limit** related to the nominal value; the ID field is used to identify a dimension in the print context in both the drawing and the tolerances table.

When you are done inserting the values you can press to confirm or to cancel the operation.

If the measured value is inside the tolerances range its value in the dimension element will be displayed in green, otherwise it will be displayed in red.

If necessary, it's possible to force the value for the horizontal or vertical dimensions: insert the value you want to force as the nominal value, then click Force : the software will rotate the profile so that the dimension will be equal to the requested one.

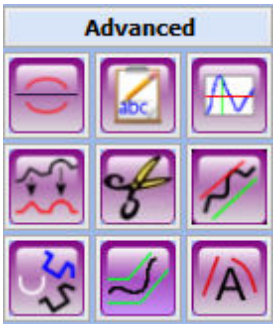
2.4.5.14 Export dimensions

The dimensions can be exported in an excel file from the menu **File → Export dims**.
First of all, you need to assign an ID to all the dimensions you want to save (see the paragraph inserting tolerances), then export to excel from the menu and all the dimensions with their tolerances will be inserted in the file.

You can concatenate dimensions of different measures in the same file, if correspondent dimensions have the same ID: in this case, when you select the menu Export dims you have to select the previously created file and the dimensions of the current measure will be appended to the existing ones.

2.4.6 Advanced functions

2.4.6.1 Advanced functions panel

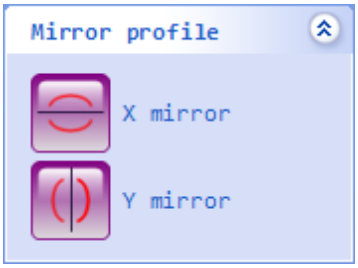


The advanced functions panel gives access to additional calculation functions

2.4.6.2 Mirror

Mirror: *inverts the profile coordinates.*

activates the following options panel:



Press  (**X mirror**) button to invert the Z coordinates of the profile.

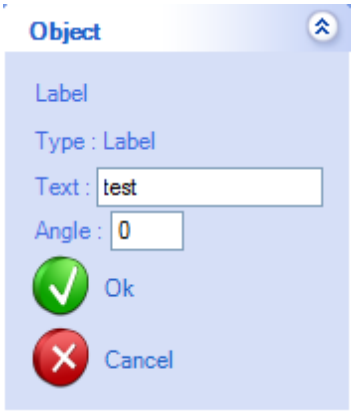
Press  (**Y mirror**) button to invert the X coordinates of the profile.

All the elements associated to the profile will be lost when you apply the mirror function.

2.4.6.3 Label

Label: *inserts a label on the drawing area*.

Click on the main window to mark the initial position of the label, the following options panel is displayed:

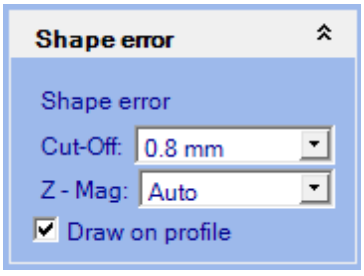


insert the appropriate characters in the box labeled "text" then insert the appropriate value in the box labeled "angle" to define the label rotation angle and finally press to confirm the insertion of the label or press to cancel the operation.

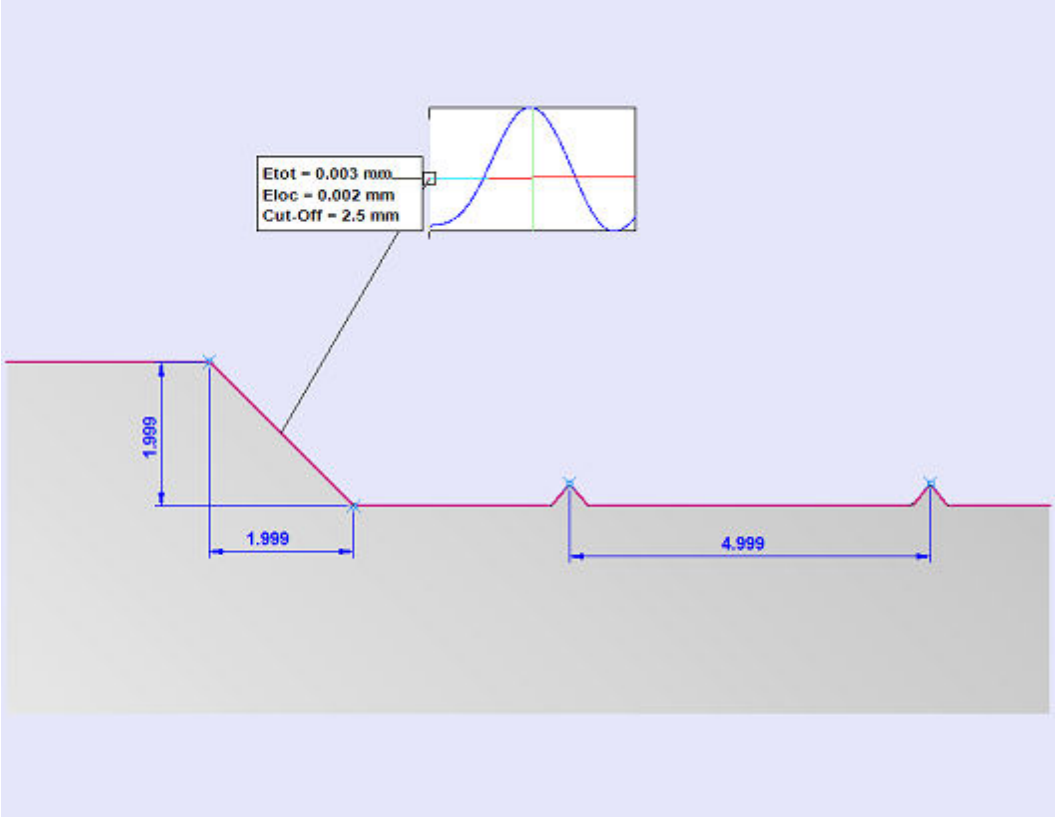
2.4.6.4 Shape error

Shape error: *inserts two floating windows with the representation of the shape error and its related parameters for the selected bestfit line or bestfit arc.*

The following options panel is activated



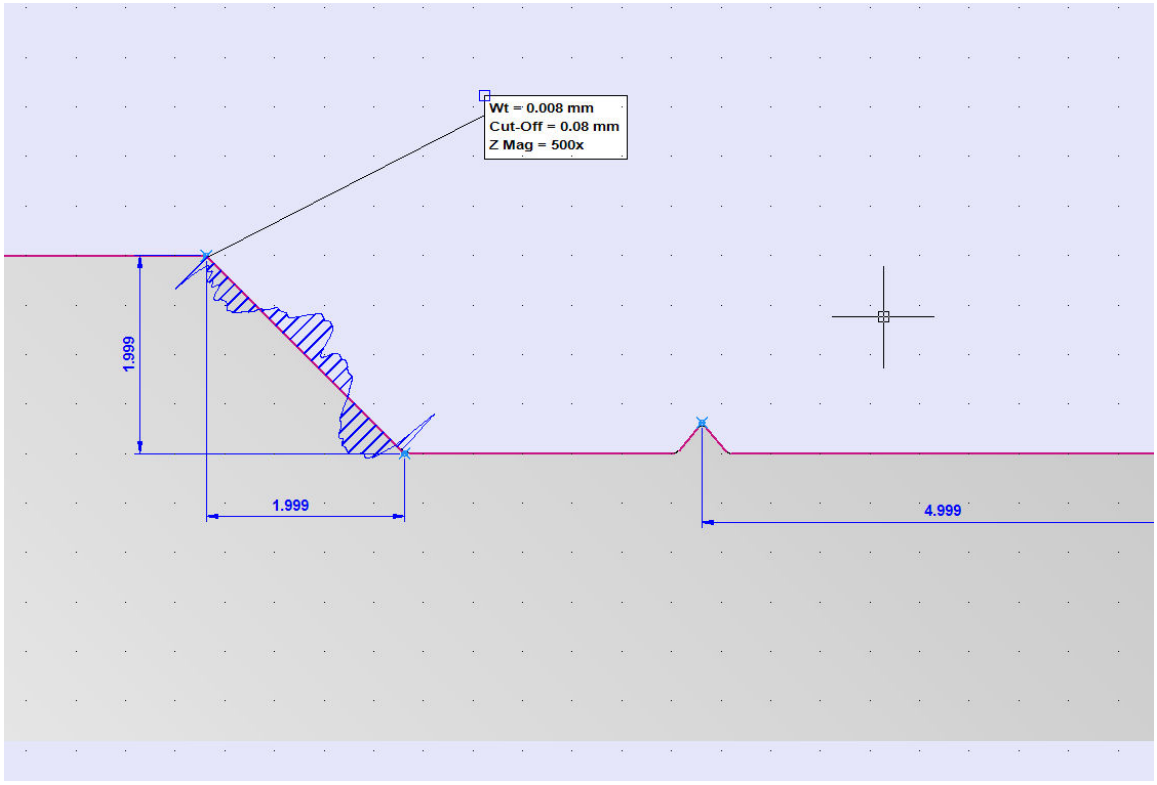
First select a bestfit line or arc by clicking on it with left mouse button, then click with left mouse button on any position on the drawing area, shape error graph and shape error parameters window are displayed:



Shape error graph represents the difference between the measured profile and the bestfit.
This difference is filtered with the **Cut-off** value selected in the options panel. If you choose the option "No filter" it will not applied any filter to the profile.

Note: The bigger is the cut-off, the higher it will affect the profile surface.

The graph magnification can be chosen with the parameter **Z mag**.
With the option **Draw on profile** is possible to draw the shape error on profile.



Shape error parameter window contains respectively:

1. **Etot - total shape error:** the shape error calculated for all the length of the selected element.

2. **Eloc - local shape error:** the shape error calculated in the point marked by the green vertical line inside the shape error graph window. To examine the shape error on another point on the graph, simply select the graph window then click on any point inside the window.

3. **Cut-off**: represents the filtering level applied to the profile.

Each window can be moved separately by activating its **grip points.** Graph window can also be resized.

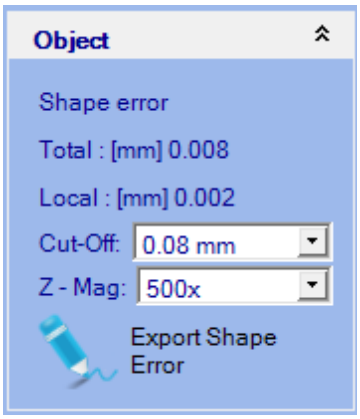
To activate windows grip points simply click on the window with left mouse button, the respective grip points are automatically displayed.

To move any window click on the grip point at the upper left corner of the window so it is locked then move the mouse until you reach the desired position, finally click again with left mouse button to release the grip point.

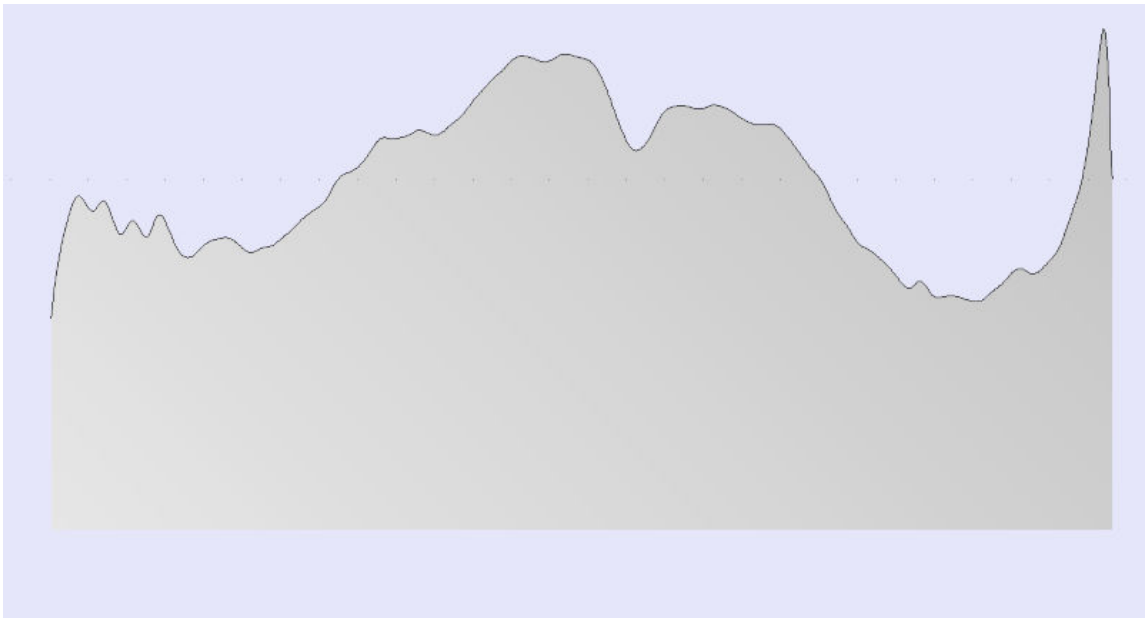
To resize graph window click on the grip point at the lower right corner of the window so it is locked then move the mouse until you reach the desired dimension, finally click again with left

mouse button to release the grip point.

If you select the shape error window after the insertion, the option panel that appears is slightly different.



Non You can not edit the option Draw on profile, but an option to export the shape error is added. This option creates another file with the shape error profile.
In order to export the profile, you can also double click on the shape error windows
Here is an example of exported profile



2.4.6.5 Profile comparison

Profile comparison: *import in the current profile all of the objects constructed*

on a reference profile.

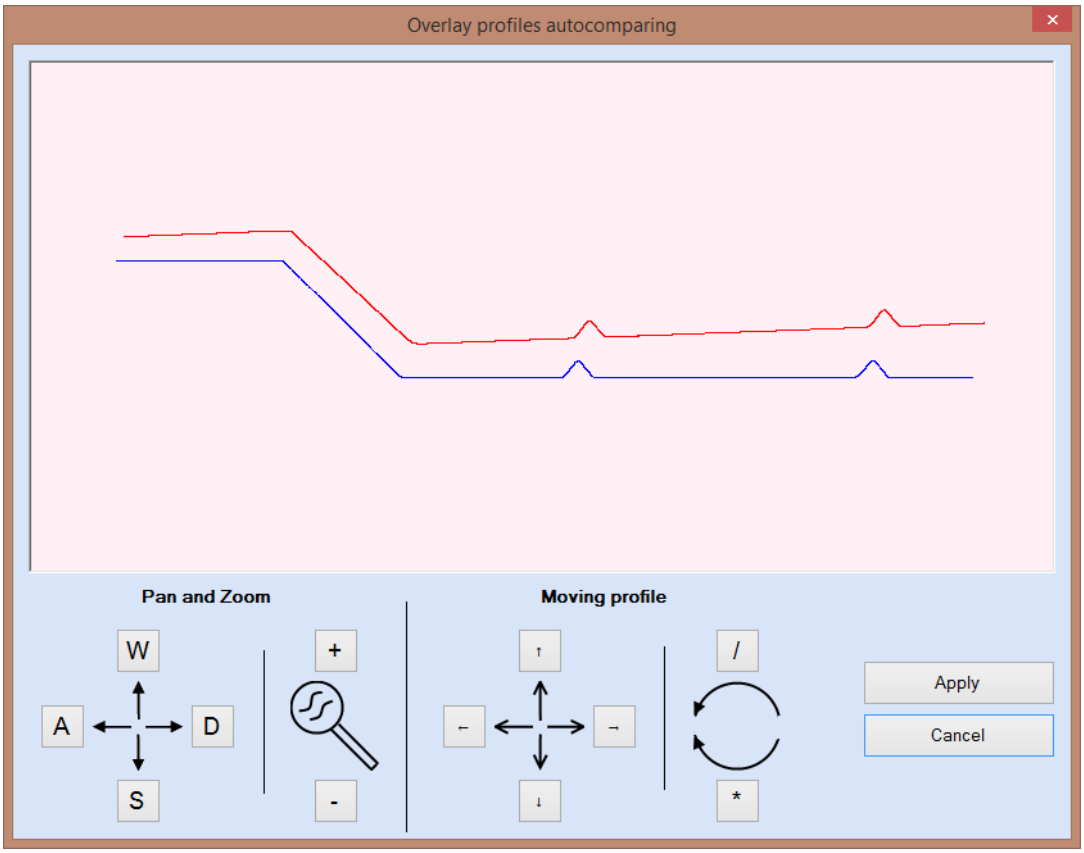
Proceed in the following way:

1. Generate the reference profile by performing a measure then applying all the elements required for a correct valutation and finally by saving and closing it.

2 Perform a measure.

3 Press the button to activate this function, then it will appear a window to choose the reference profile.

4 The software compares the two profiles and it superimposes them, after that it will show a window with the result of the comparison



If the profiles do not exactly match, you can use the commands inside the window or the correspondent keyboard shortcuts (written in the buttons) to rototraslate the profile and superimpose it with the current one. The commands in the section **Pan and Zoom** are used to change the point of view of the profiles, while the section **Moving profile** are used to rototraslate the reference profile. When you are done, press **Apply**.

The elements will be automatically calculated and inserted on the new profile basing on the reference profile elements.

If there is too much difference between the profiles the program will display a warning message about that, however if you want, you have the option to force the program to calculate the comparison.

2.4.6.6 Cut profile

Cut profile: *allows to eliminate unwanted parts of the profile*

First of all, the function warns that it will remove all the entities constructed on the profile.

Then, you have to select two points that delimit the area to be cut:
If one of the two points coincide with one of the extremities of the profile, the selected zone will be wiped and the profile will be shortened; otherwise, if both the points are inside the profile, the selected zone will be flattened with a straight line.

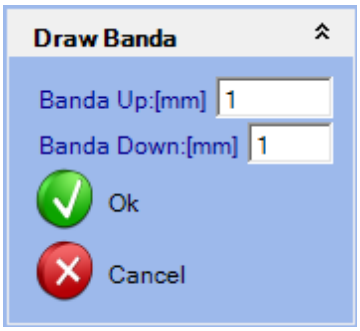
The options panel allows to perform the cut in two ways:

- **interpolation**
  the profile isn't actually interrupted, but instead the segment that joins the cut extremities is sampled as if it is a regular part of the profile
- **removal**
  the profile is actually split in two parts, a white line is drawn between the two cut extremities, so the profile will have no point inside the cut area

2.4.6.7 Band

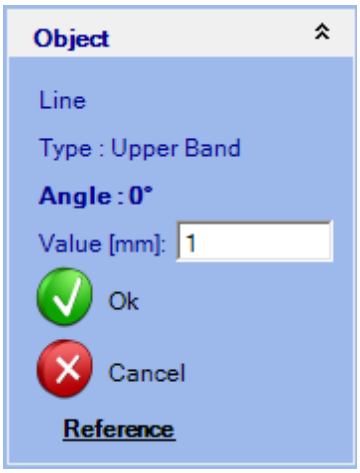
Band: *allows to see graphically if the profile stays within a tolerance band on a bestfit.*

The following options panel is displayed:



Selezionare Select one or more bestfit, insert the values of the bands in the panel, at last press  to confirm or  to cancel.
The band is green if the profile stays inside it, red otherwise.

It's possible to edit the value of the single band by clicking on it and then editing the value in the option panel:

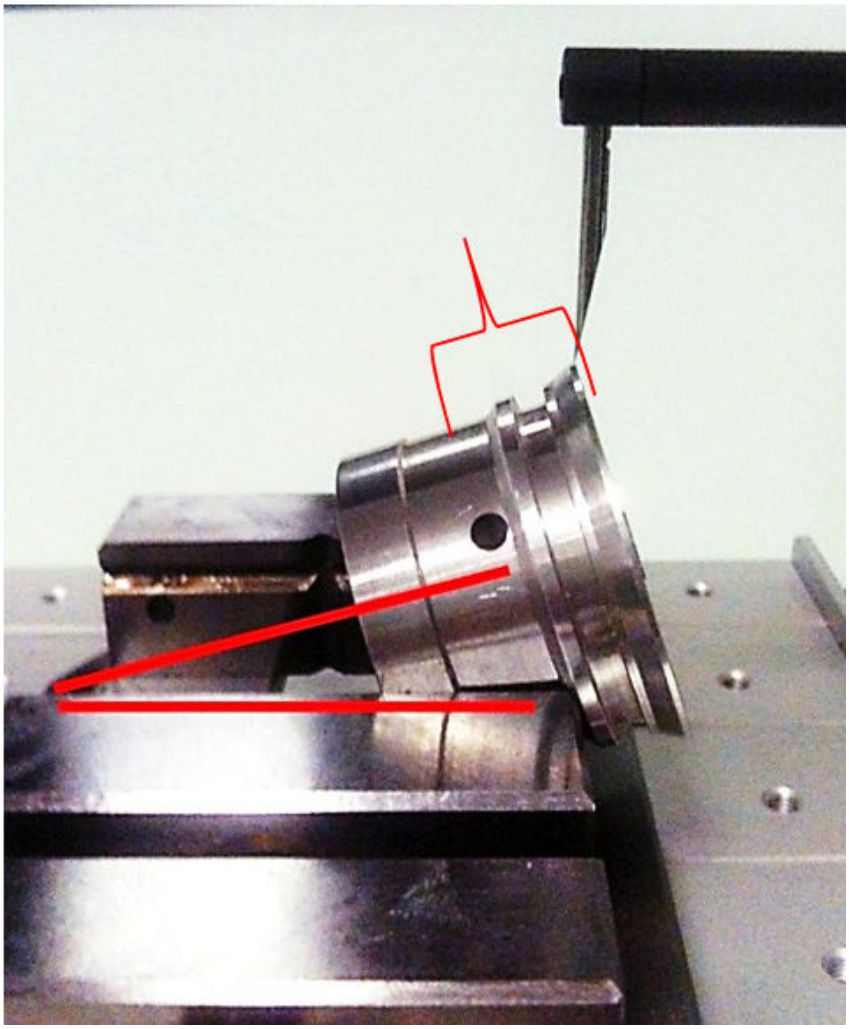


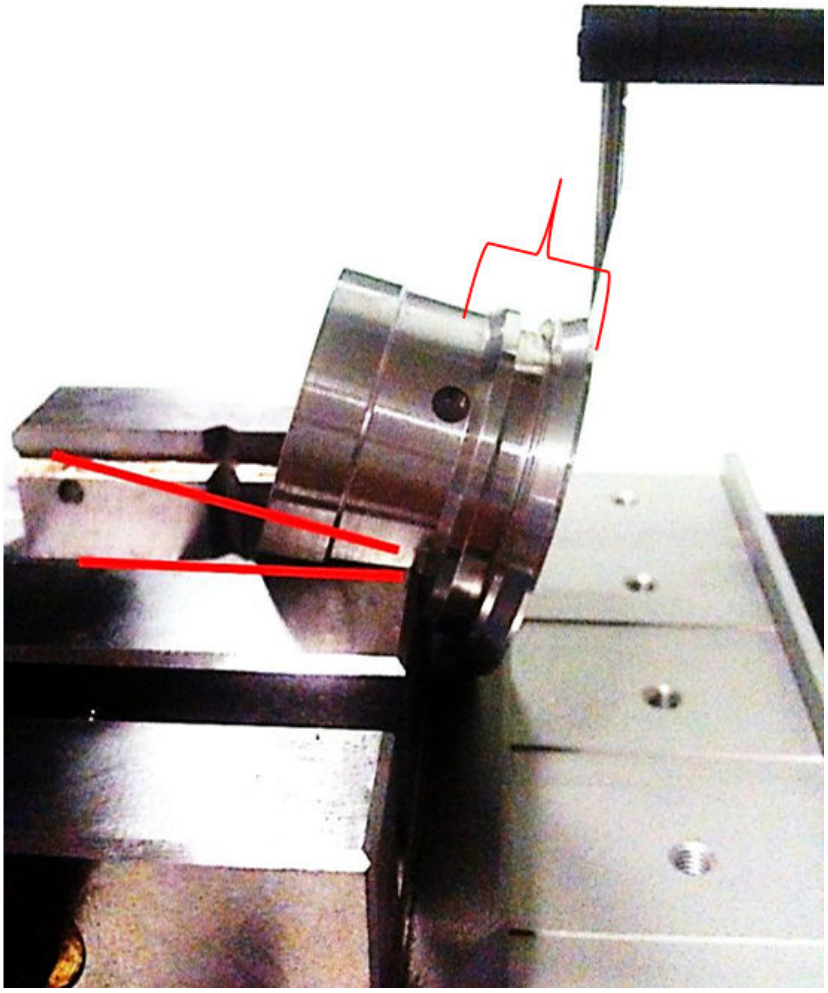
2.4.6.8 Profile union

Profile union: *allows to measure throats with 90° angles.*

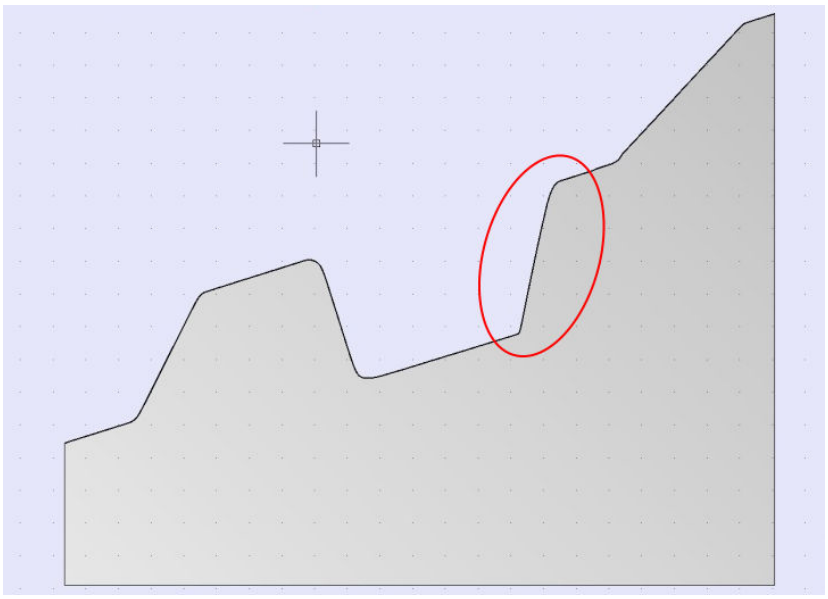
This function allows to measure an object with throats made up with 90° angles. These pieces cannot be measured directly by the profilometer with a single measure.
The basic idea of this function is to perform two measures, each of the two measures one of the vertical walls of the throat; at last the two measures are merged to obtain a single measure with the complete profile

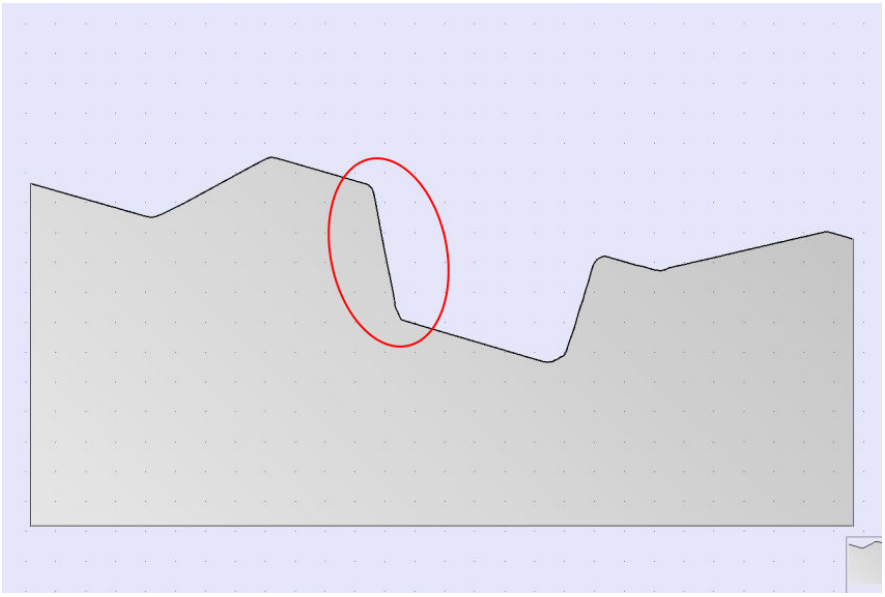
You need to execute two measures of the profile with opposite inclination, here is an example (the curly bracket shows the measured part):



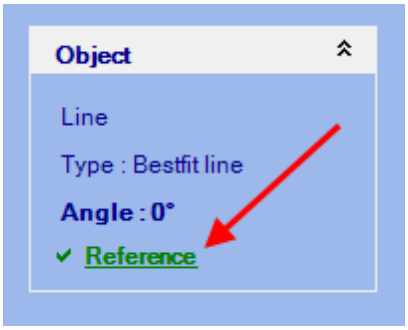


Because of the nature of the tip, the profiles acquired will look like this (the red parts are the ones that the profilometer can not measure correctly):

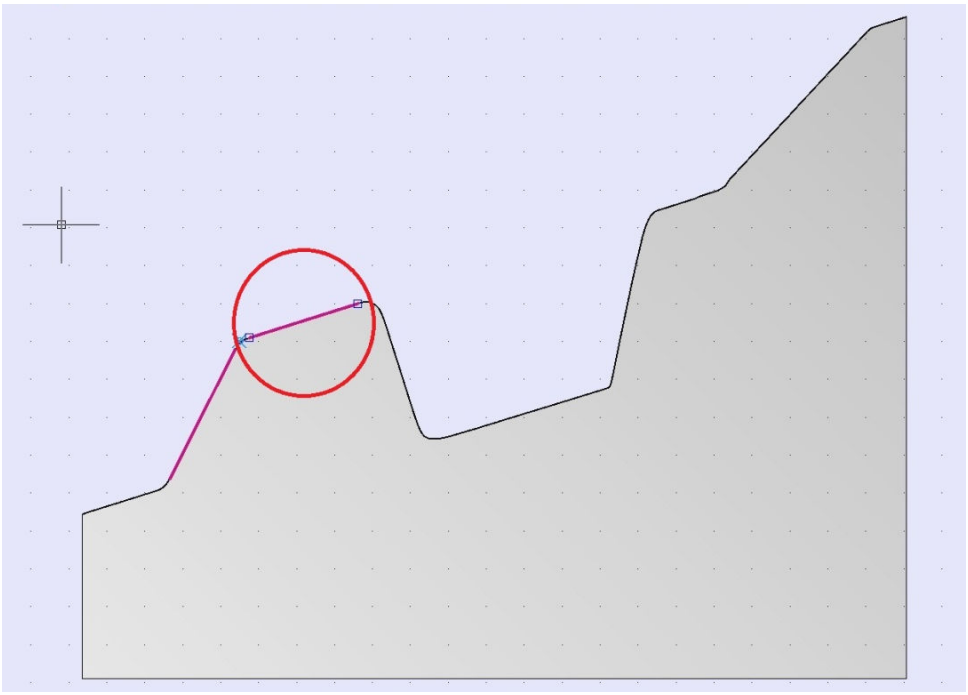


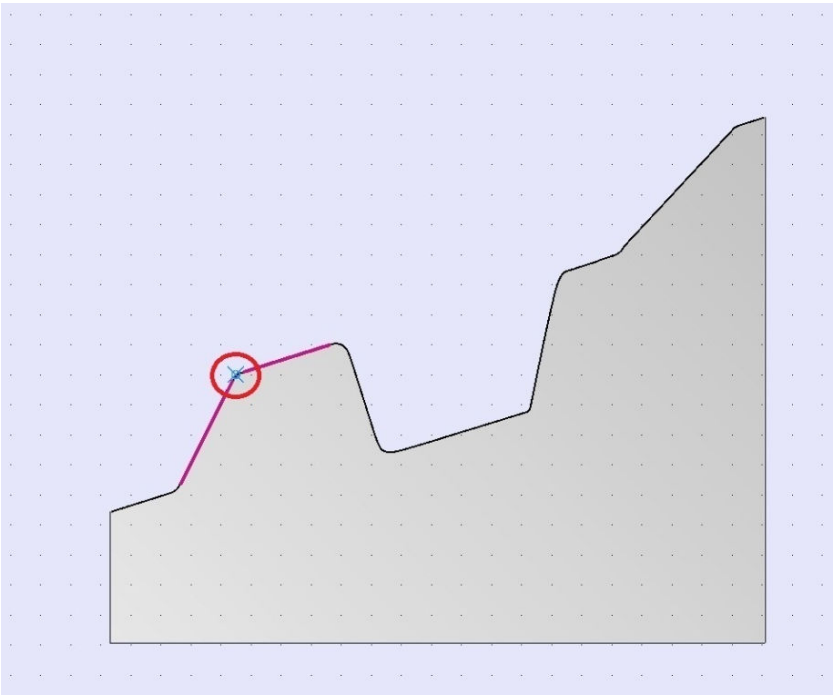


The join process needs the two profiles to have geometric references, so that the function knows how to superimpose the two profiles before joining them; the references must be a line and a point, or alternatively a point and an arc.
In order to achieve this, select the desired objects and mark the reference attribute that appears on the options panel.



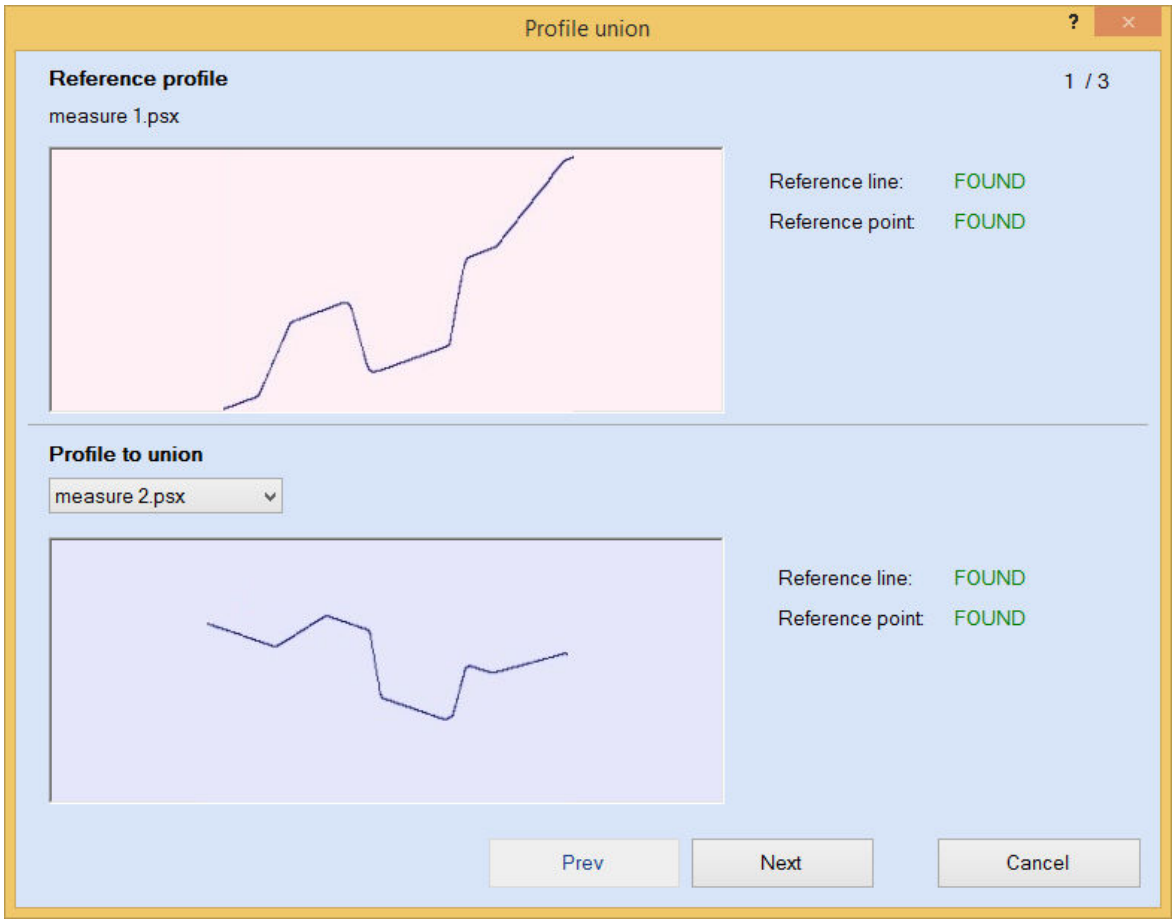
In the example the reference line and point are these (there are only the references object of the first profile):



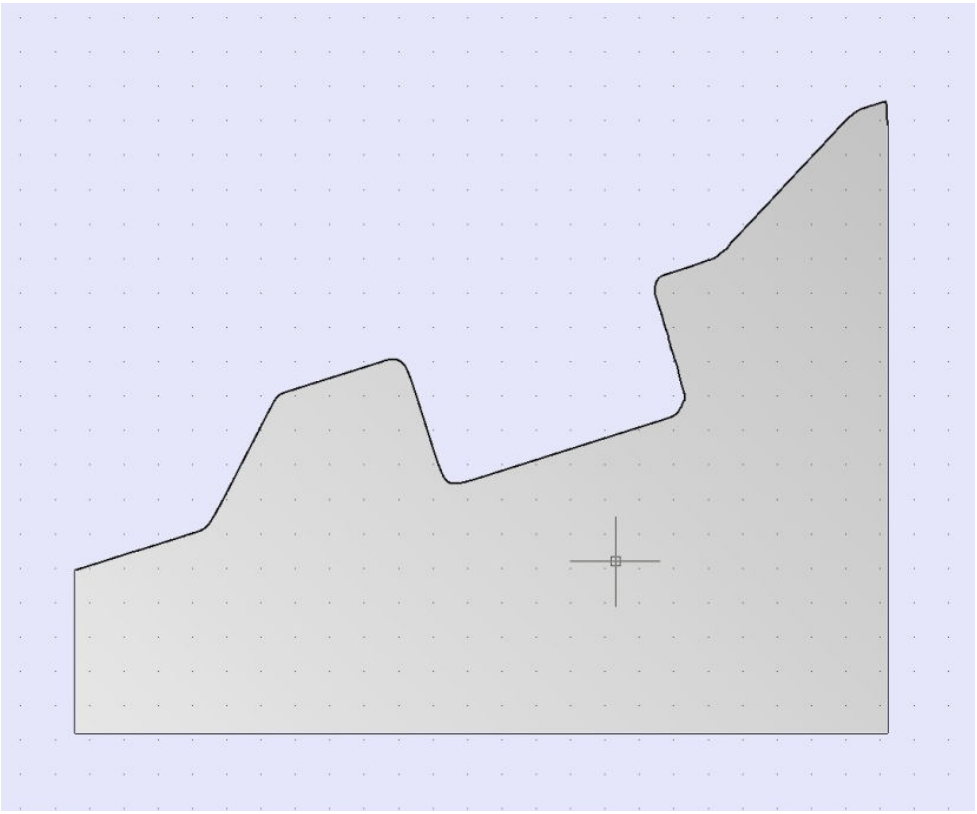


Now, we can proceed with the union of the profiles: open the CAD of the first measure and select the function profile union  .

In the form that appears you can select the second profile and then press **Union** to merge them to a single file.



The output file will look like this (notice the throat)



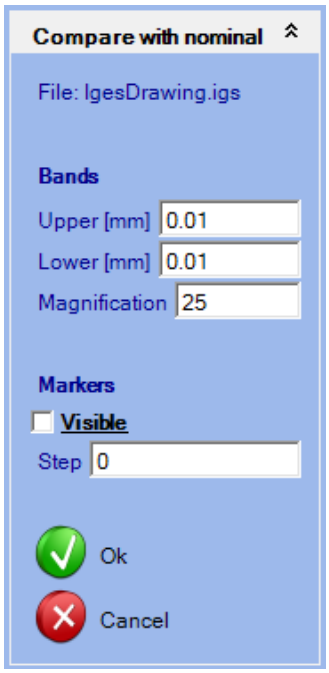
Now you have a single file representing the whole object, and you can save it and put bestfits and dimensions like you normally would.

2.4.6.9 Compare with nominal

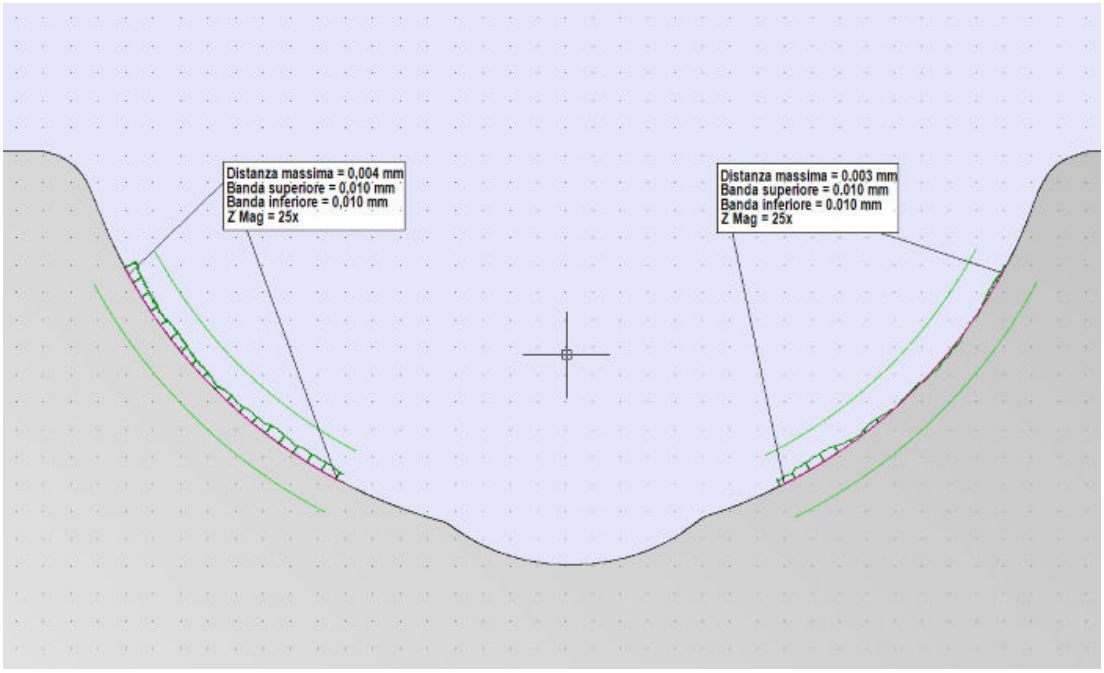
Compare with nominal: *allows to superimpose a nominal profile to the measured one to evaluate the differences.*

When you select the function, it will appear a window to let you choose the file to use as nominal.
The supported file format for this function are ".dxf", ".igs" and ".psx". From dxf and igs file you can import lines, arcs and polylines.

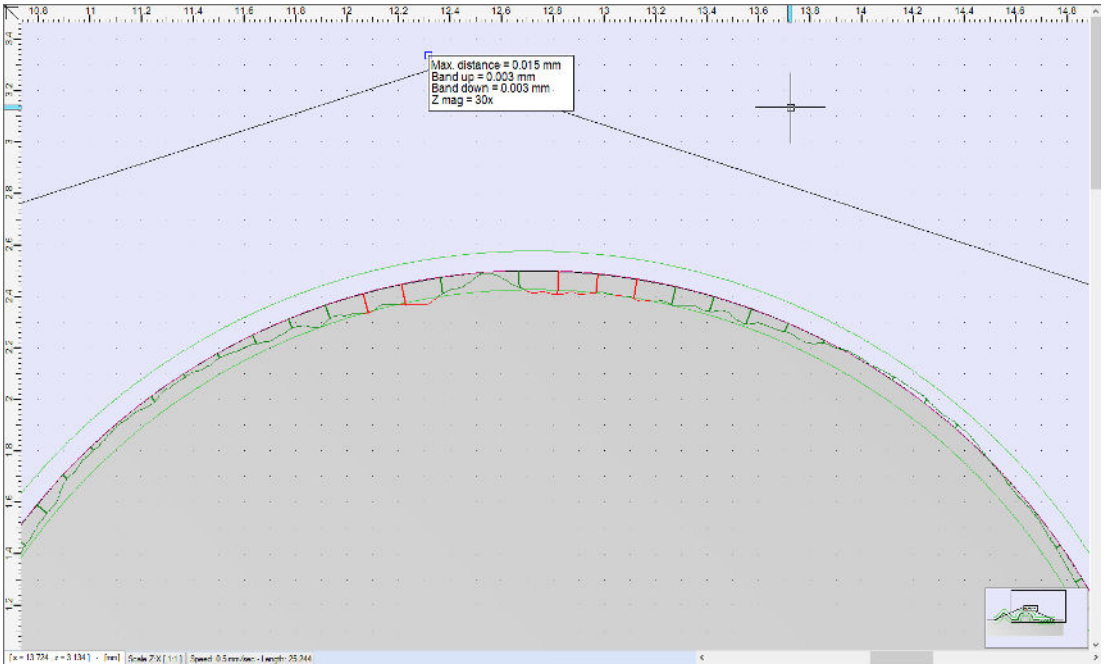
The option panel looks like this:



You can set the values of the two bands and the magnification factor; you can also view the values of the differences from the nominal profile by checking the Visible field, the Step tells the distance between the points.
Using the mouse is possible to select on the CAD the areas where you want to perform the calculation, and at the end you can click  to confirm the insert or  to cancel the operation and delete the calculation that you have already done.
Here is an example of the result:



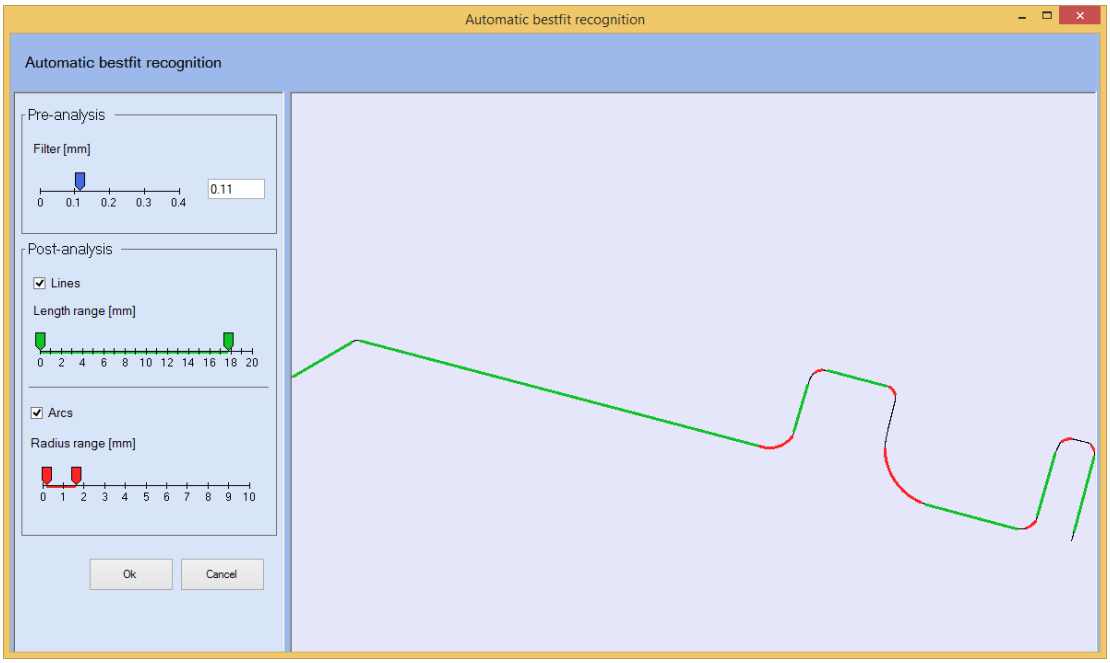
To edit the parameters of the functions, select the box created in the CAD and the options panel will show up again; the nominal profile can not be changed, if you want to change the file of the nominal profile you have to delete this object and create another one.
The values of the profile that fall within the tolerance are green, the others are red.



2.4.6.10 Automatic bestfit recognition

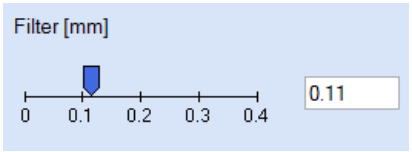
Automatic bestfit recognition: *allows the user to automatically place bestfits on the profile.*

When you click the icon, it will appear a windows where you can tune the parameters for the recognition.

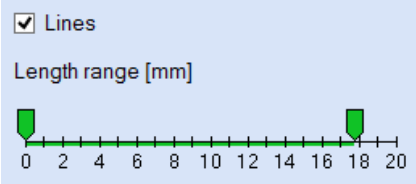


From the **filter** section you can specify the value that the function uses to filter the profile before the analysis.

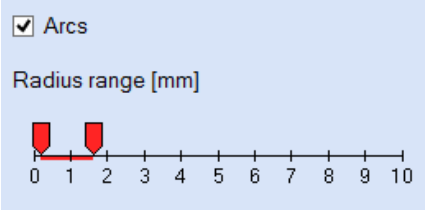
Note: noisier profiles require stronger filter, but keep in mind that noisier profiles are harder to process.



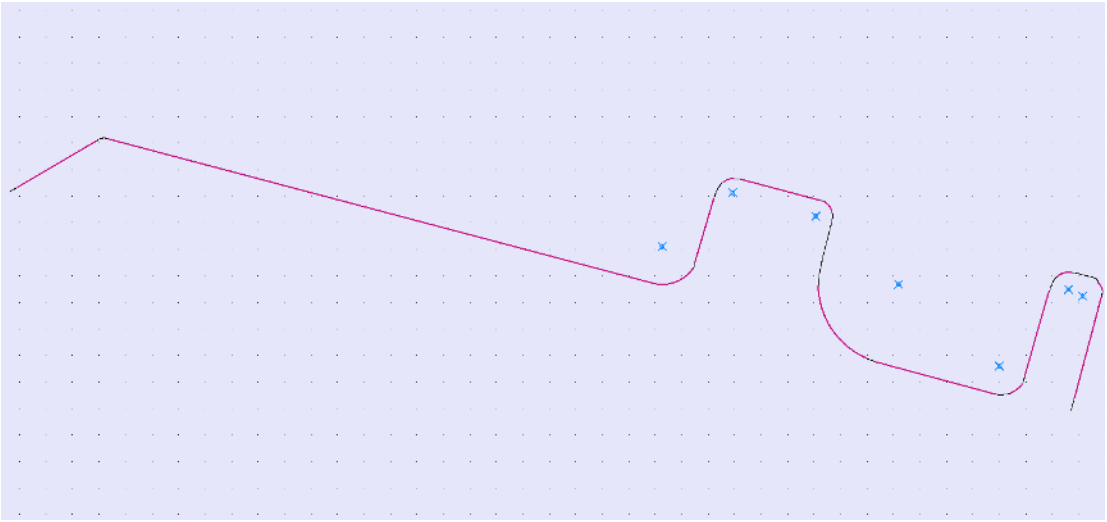
The **lines** section allows to filter the range of the lengths of the bestfit that the user wants to recognize.



The **arcs** section allows to filter the range of the radius of the bestfit that the user wants to recognize.

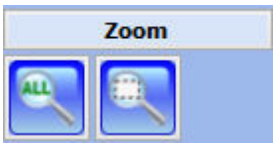


The preview updates in real time, so you can see which bestfits are recognized with the parameters you have set.
When you are satisfied with the parameters you can click Ok to actually place the bestfits on the profile.



2.4.7 Zoom functions

2.4.7.1 Zoom functions panel



The zoom functions panel contains all zoom related functions buttons

2.4.7.2 Zoom all

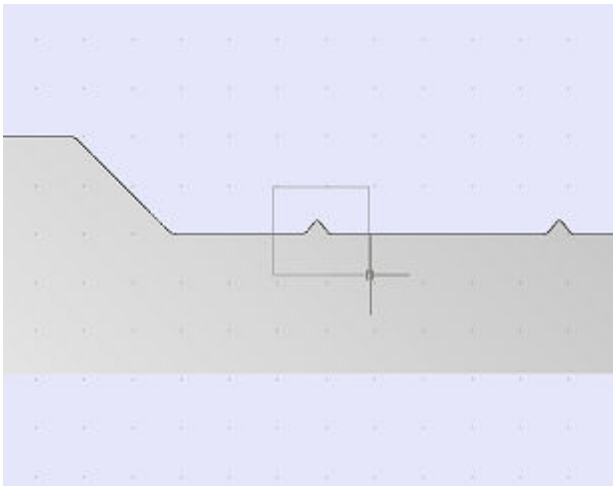
Zoom all: displays all the objects present on screen (ie profile + dimensions) by using the more appropriated scale.

2.4.7.3 Zoom window

Zoom window: perform an enlargement of a selected area of the screen.

1. move the cursor to the desired position. Click with the left mouse button. In the status bar the coordinates are displayed.

2. Drag the cursor so that you have the desired area marked and then click again the left mouse button.



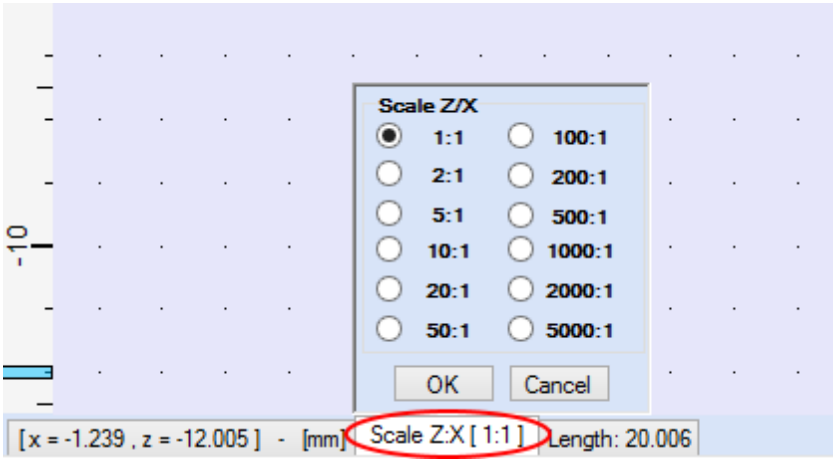
Alternatively you can enlarge or reduce the zoom level by pressing respectively the up arrow key or the down arrow key or scrolling using the mouse wheel up and down. To scroll horizontally the enlarged profile use the left and right arrow keys respectively.

The enlargement is automatically centered on the profile and remains also centered on it when you scroll horizontally.

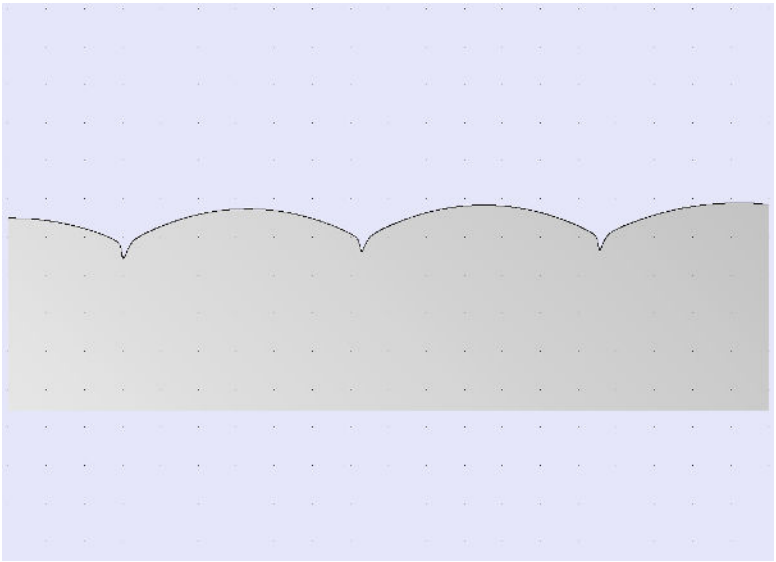
The maximum zoom level is about 200x.

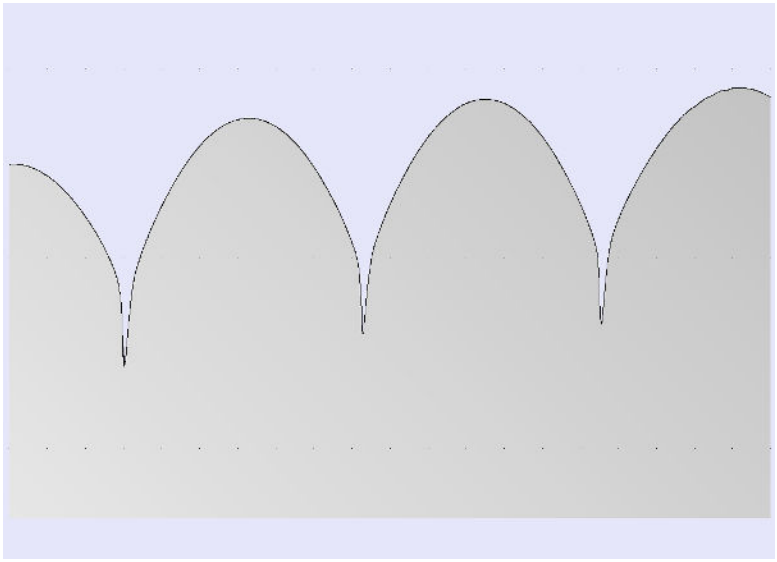
2.4.7.4 Scale ratio

In the bottom of the CAD there is an option to set the scales of X axis and Z axis on different values.



If you click on the highlighted button you see a menu to change the ratio between the scale of the X axis and the scale of the Z axis.
Here is an example of ratio changing from 1:1 to 5:1





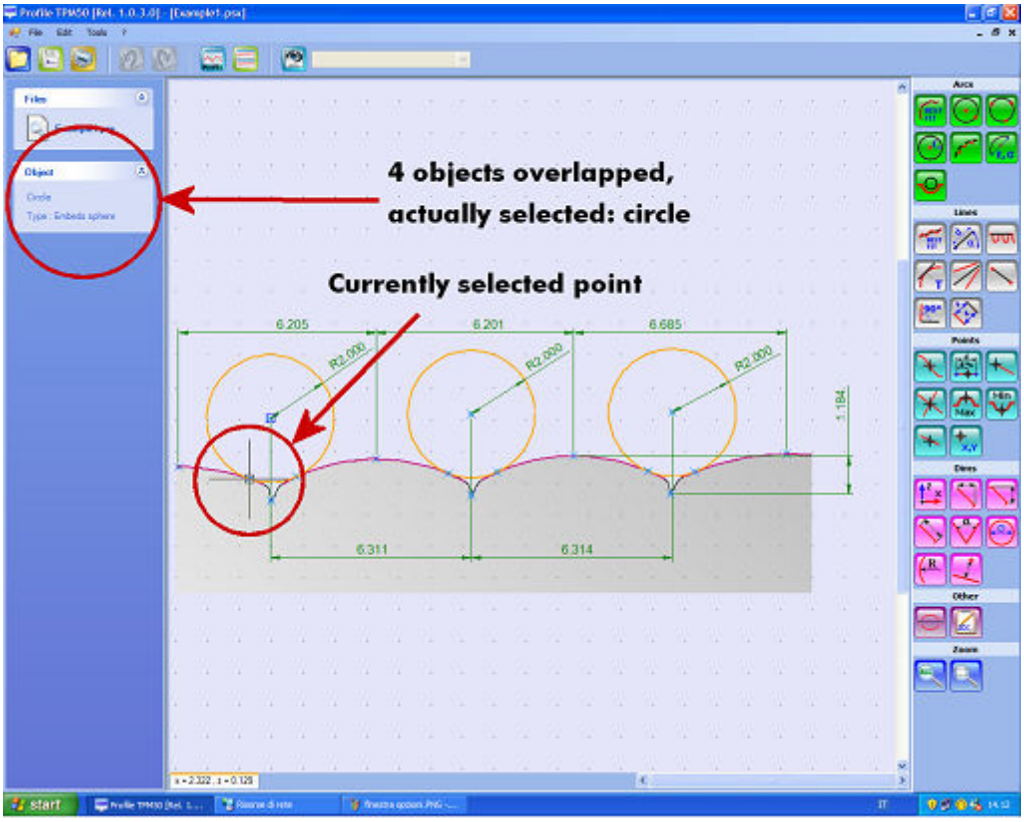
2.4.8 Howto

2.4.8.1 Deleting elements

To delete an element, select first the element by positioning the cursor over it, then press the left mouse button to confirm the selection, finally press DEL or right mouse button to delete it.

If there are more overlapped elements, move the mouse cursor over the element to select, then click repeatedly with left mouse button until you see the name of the required object displayed on

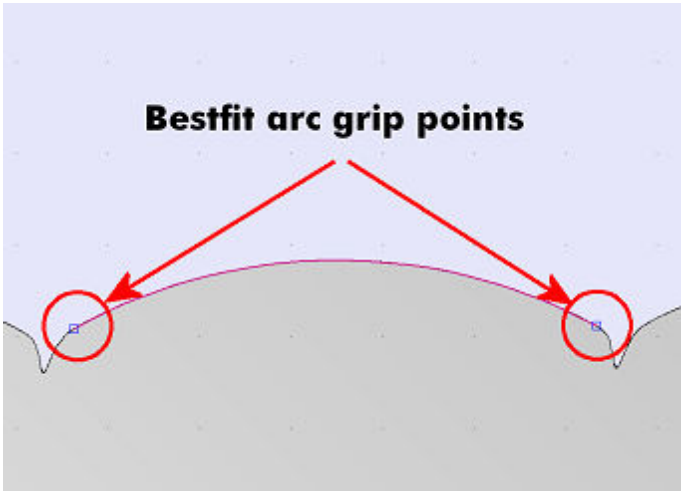
the left options panel:



and finally press DEL or right mouse button. Alternatively if this method should not work it is possible, as already seen to select the enlargement area (see Zoom Window), select with the cursor the area containing only the element to be deleted so that you have it automatically selected and subsequently you can delete it.

2.4.8.2 Modify elements

Some elements like **lines** or **bestfit arcs** can be modified after the insertion, in fact you can extend them in the following way: click with left mouse button until you have them activated (see the figure in Deleting elements: **object selection info**) then click with left mouse button on one of their extremes to activate their **grip points**:



then move the cursor until desired and finally click again with left mouse button to confirm the operation or ESC to restore their previous size settings.

The **point on profile** can be moved along the profile, use the usual method for selecting **lines** or **arcs**, then click again with left mouse button to activate its **grip point** (see figure), then move the cursor to move the point in the desired position and finally click again with left mouse button to confirm the operation, otherwise click ESC to restore its previous position.

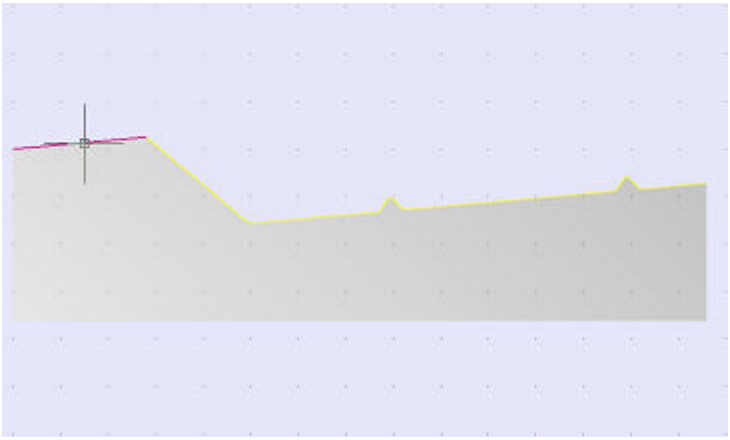
All dimension elements can also be modified after their insertion: click with left mouse button on the element to activate it then click again with left mouse button on one of its grip points, finally move the mouse up/down or left/right to modify its attributes depending on the element type.

2.4.8.3 Straighten the profile

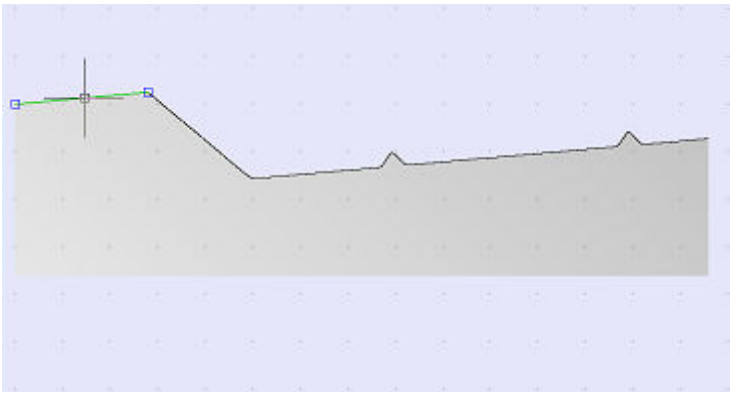
This operation is performed in the following way. It consist of inserting a line constrained to the profile(best fit line), then modifying the inclination angle of the line constrained to the profile.

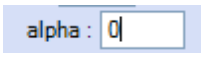
You have to select the best fit line function through the button 

. Click with the left mouse button on a point of the profile on which you wish to place the best fit line and the new reference axle X is automatically created by the program.



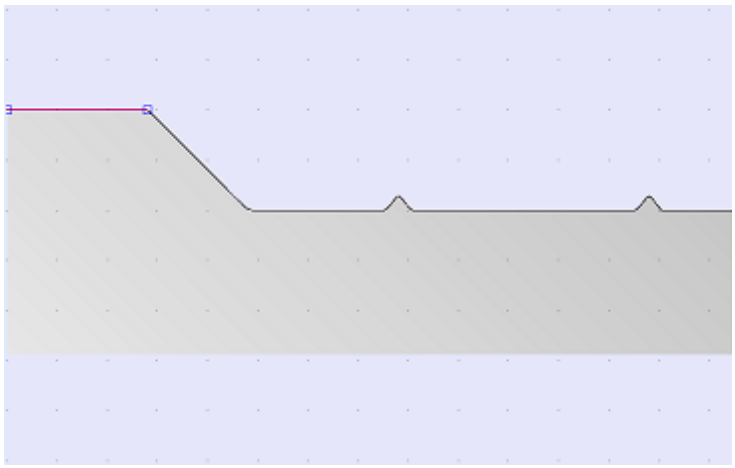
After having inserted the reference line you have to select the reference axes function through the  button.



The rotation to the profile is applied by setting the angle value to **0** in the appropriate box 

then clicking on **Ok** on the interactive options panel.

After having modified the angular value, the program draws again the profile rotated so that the new axle is perfectly horizontal:

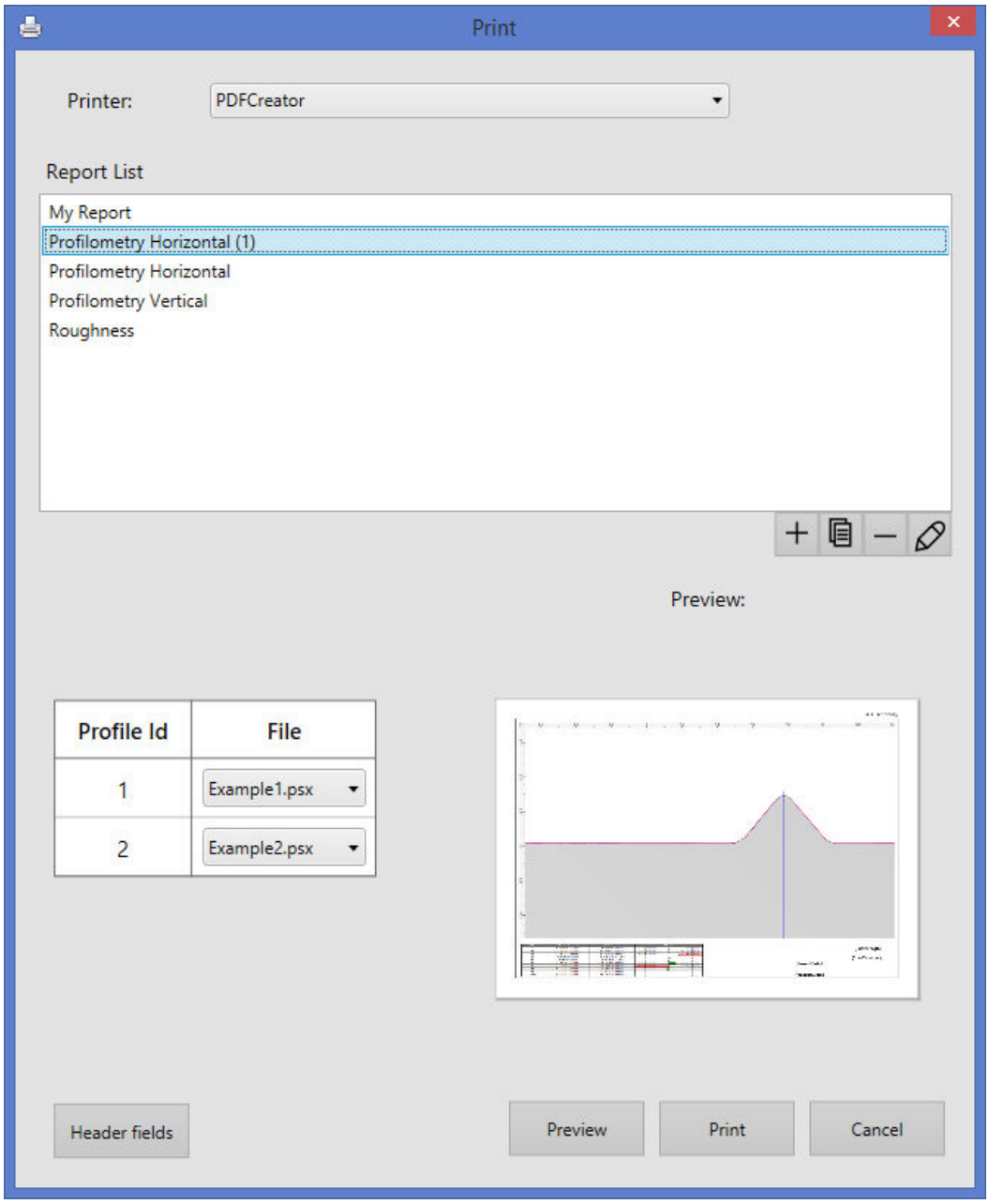


The rotation can be performed more times in the whole 360° range. So, for example,a piece that should be explored vertically can be positioned and measured horizontally and then after rotated of 90° so that you can easily compare it with the original drawing.

The displayed coordinates after the rotation have their origin in the beginning of the line.

2.5 Print

2.5.1 Print dialog

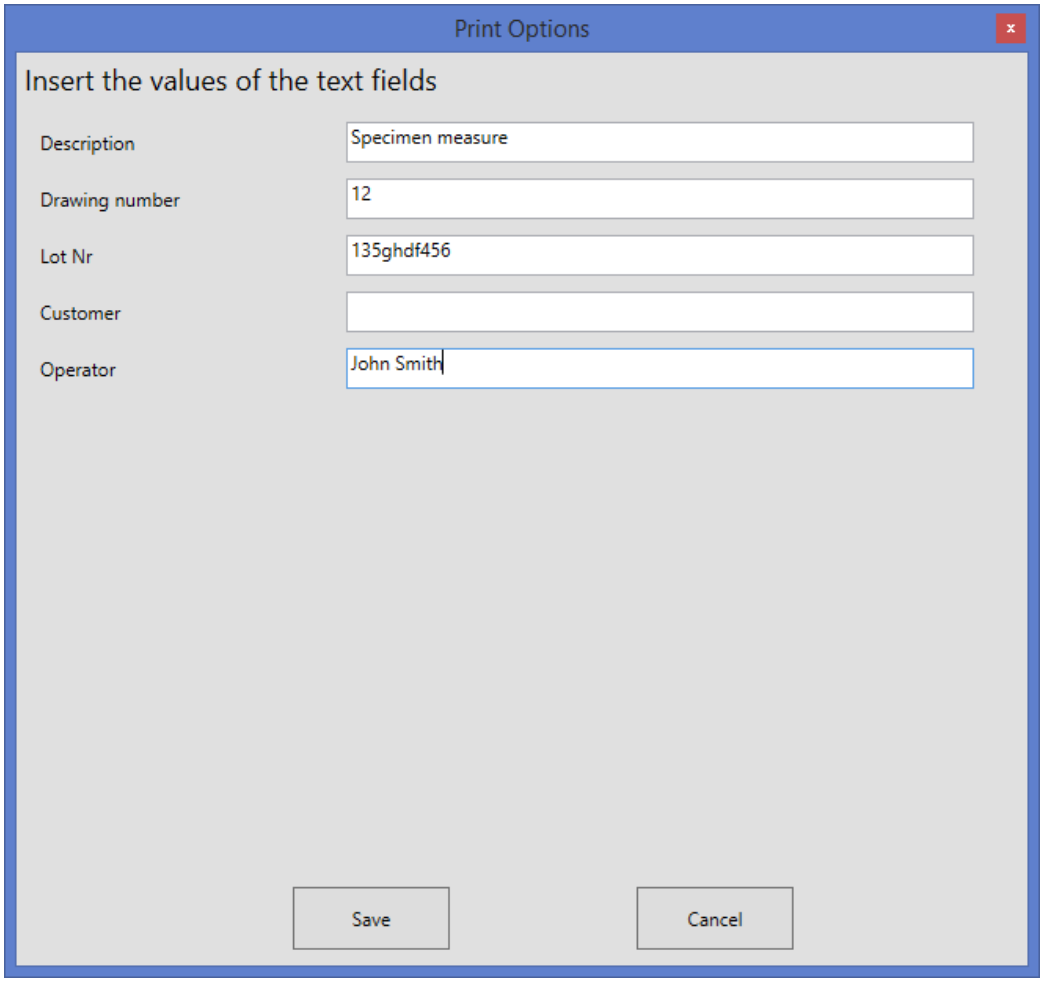


The print dialog is displayed by activating the **Print** menu or pressing the related button  (primary toolbar).

In the list there are the available print reports.
The buttons below the list allow to create new reports or to edit the existing ones.

The reports contain elements like the profile drawing that have to be associated to a file in order to be printed: the table next to the preview allows to associate the Profile Id (chosen in the report designer) and the file name (to be chosen among the open files)

The reports also contain editable fields; press the Header fields button to set them in the Print options window.



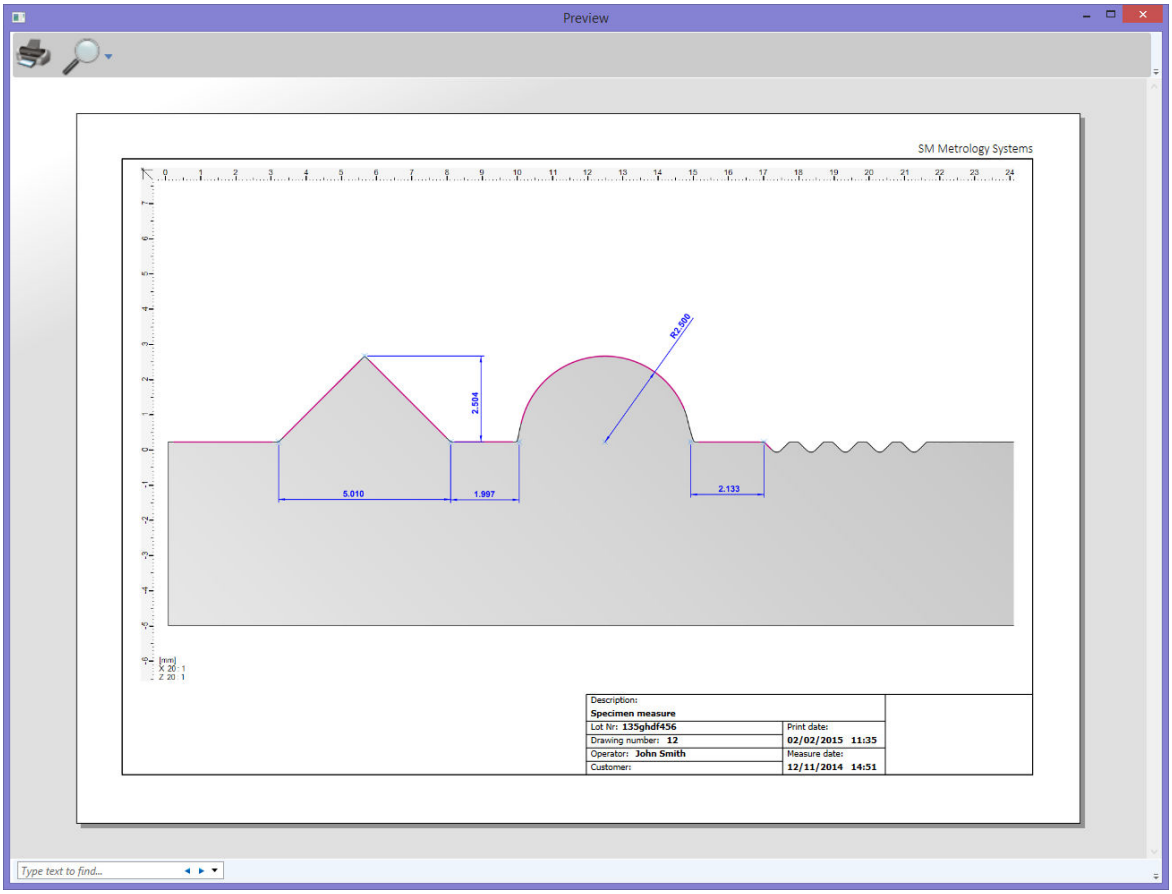
When you're done, click on **Save** to save the changes and go back to the print dialog or **Cancel** to discard the changes.
The changes are inserted in the measure: the measure file has been modified, so if you want to keep these informations for the next time you open the file, you have to save the measure after making the changes, like you would do to save any other CAD change.

Press **Preview** to activate the print preview, or **Print** to print directly.

To quit from the print dialog press **Cancel** or the Esc button.

2.5.2 Print preview

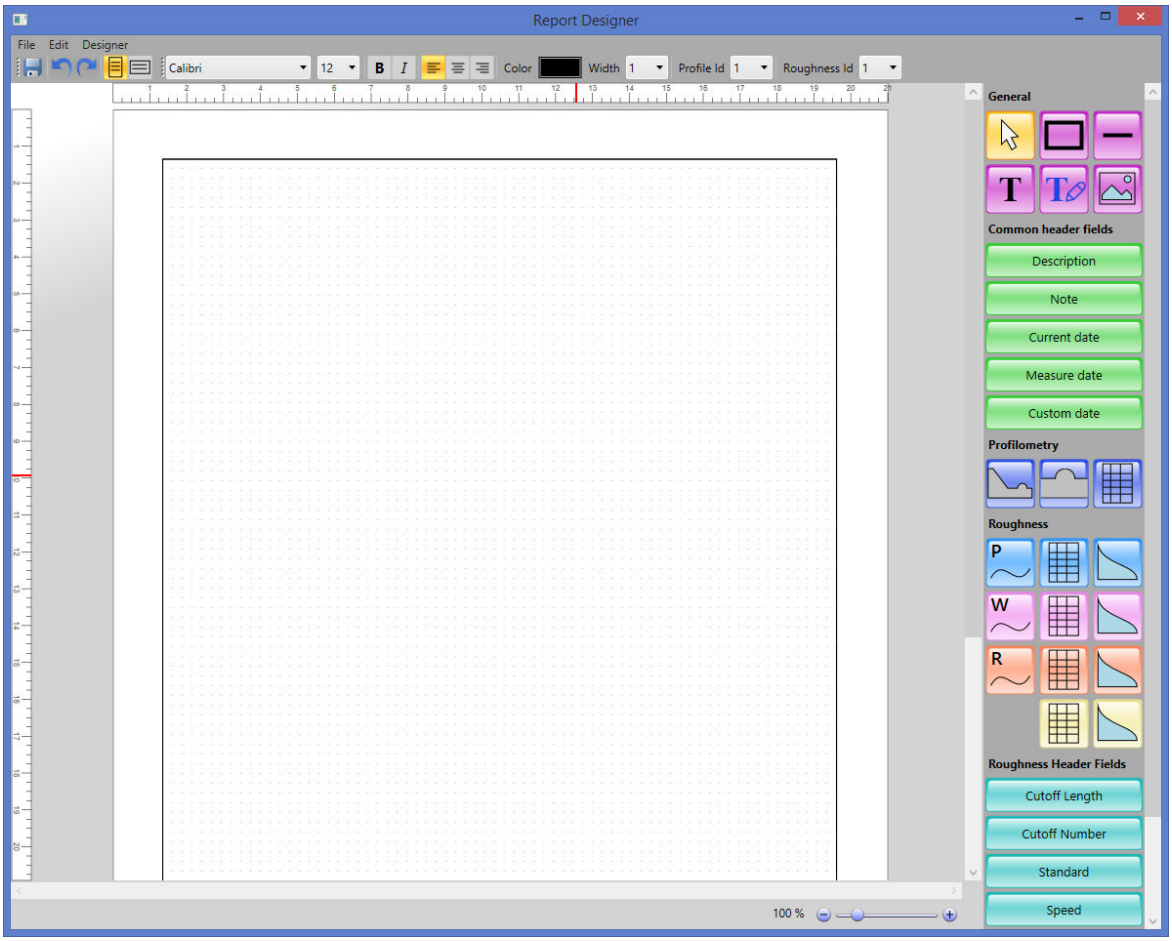
The print preview is activated when you press the **Preview** button on the print dialog. It is used to verify how the print is going to look like before printing on paper.



You can zoom in or out by clicking on the magnifying lens or pressing Ctrl + Mouse wheel. If you want to launch the actual print on the selected printer, click on the printer icon.

2.5.3 Report designer

Print reports are customizeable, you can choose the objects you want to print and the layout. This window can be reached from the print management wondow, from which is possible to choose if you want to edit an existing report or to create a new one.



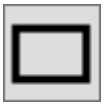
First of all, you have to decide if you want an horizontal or vertical report and select it in the toolbar  or from the menu **Designer**.

The right sidebar contains all the elements that can be added to the report: some of them are drawing tools to create frames and tables, some are tools to create text, others are tools to insert profile images.

Note: Charts and tables are shown in the editor with sample images; they will be substituted with the real images during the print.

General section

Pointer: selection tool



Rectangle: draws a rectangle in the report

Line: draws a line in the report

Static text: draws a static text, that will be printed as it is

Dynamic text: draws a dynamic text, that will be manually substituted by a dynamic value before the print

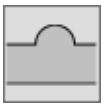
Static image: draws a static image, can be used for the company logo

Common fields section, contains the header fields commonly used

Description: measure description
Note: measure notes
Current date: print date
Measure date: date on which the measurement was carried out
Custom date: date inserted manually by the user before printing

Profilometry section

Full profile: inserts an image of the CAD that contains the whole profile



Zoomed profile: inserts an image of the CAD that contains the profile with the zoom level you see in the CAD

Dimensions table: inserts a table with all the dimensions with the tolerance set

Roughness section

Primary profile: draws the chart of the primary profile

Parameters of the primary profile: draws the table of the parameters of the primary profile

Bearing curves of the primary: draws the Abbott chart and the ordinates

distribution related to the primary profile

Waviness profile: draws the chart of the waviness profile

Parameters of the waviness profile: draws the table of the parameters of the waviness profile

Bearing curves of the waviness: draws the Abbott chart and the ordinates distribution related to the waviness profile

Roughness profile: draws the chart of the roughness profile

Parameters of the roughness profile: draws the table of the parameters of the roughness profile

Bearing curves of the roughness: draws the Abbott chart and the ordinates distribution related to the roughness profile

Parameters of the Rk profile: draws the table of the parameters of the Rk profile (ISO 13565)

Bearing curves of the Rk profile: draws the Abbott chart and the ordinates distribution related to the Rk profile (ISO 13565)

Roughness fields section, contains header fields related to the roughness measures

Cutoff length: it's the cutoff wavelength used by the gaussian filter
Cutoff number: it's the number of parts in which the profile is divided with the current cutoff length
Standard: it's the standard used for the parameters calculation
Speed: it's the speed at which the measure has been carried out
Filter: it's the filter used to determinate the waviness
Measure length: the total length of the measure
Motif: motif length used to calculate the paarmeters of the standard ISO 12085

The toolbar contains tools to edit the style of textual fields and geometrical figures:

Select the font family

Select the font size

Select if the text has to be bold and/or italic

Select the text alignment

Select the color for text and geometrical shapes

Select the width of geometrical shapes

Select the Id of the profile from which the data will be extracted

Select the Id of the roughness from which the data will be extracted (it will match with the roughness Id of the CAD)

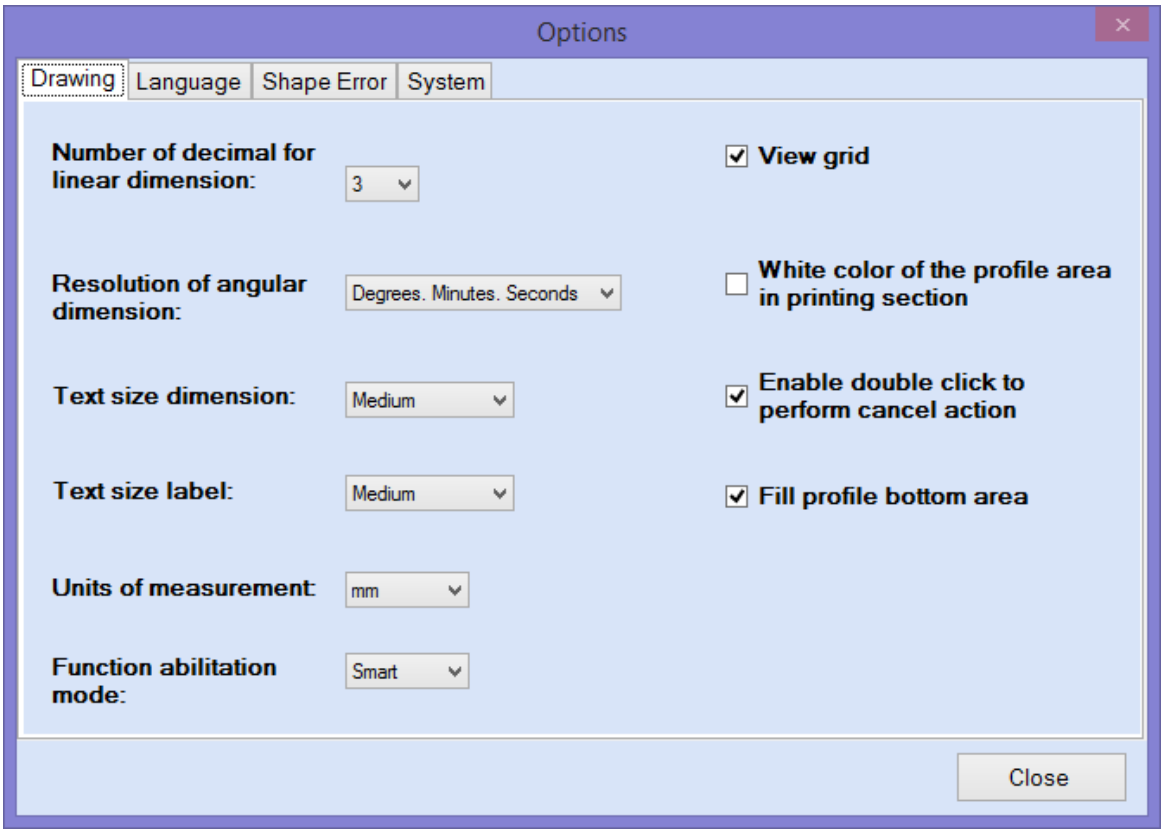
The buttons Undo and Redo  allow to undo or redo the last edit.

When you are done with the drawing you can save the report  . If the report has not been saved yet, you will be asked to input a name for it.

Here is an example of complete report

2.6 Program options

2.6.1 Window overview



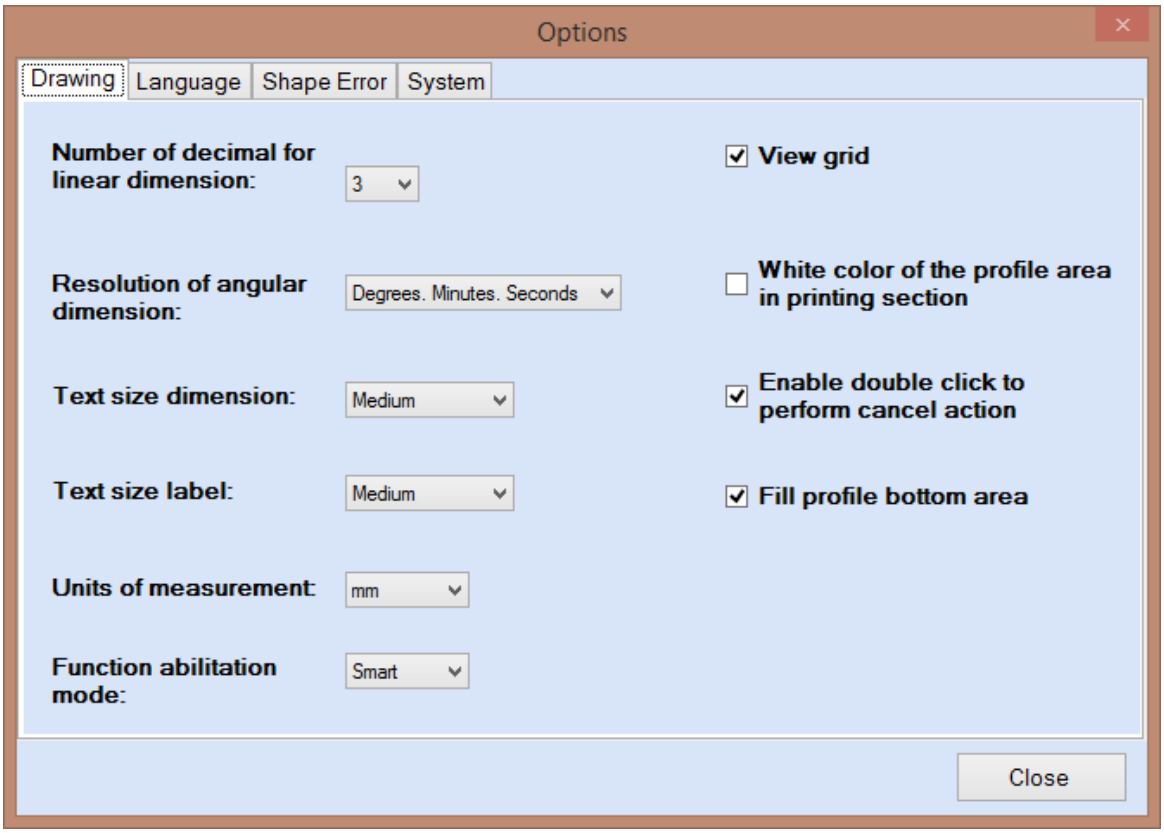
This window gives access to all the program options and is organized in tabs, each tab representing a program options category.

There are four tabs:

1. **Drawing**: contains all the drawing related options.
2. **Language**: contains all the language related options.
3. **Shape error**: contains the options related to the CAD function shape error.
4. **System**: contains the options related to the Profile Studio environment.

To display a category simply click on the corresponding tab at the top of the window.

2.6.2 Drawing options



You can set the following options:

1. **Number of decimal for linear Dimension:** you can modify the number of decimal digits the measured value must display by choosing between **0** and **4** in the drop-down list. This option applies to ***Horizontal dimension, vertical dimension, linear dimension, diameter dimension, radius dimension, line-point dimension***.

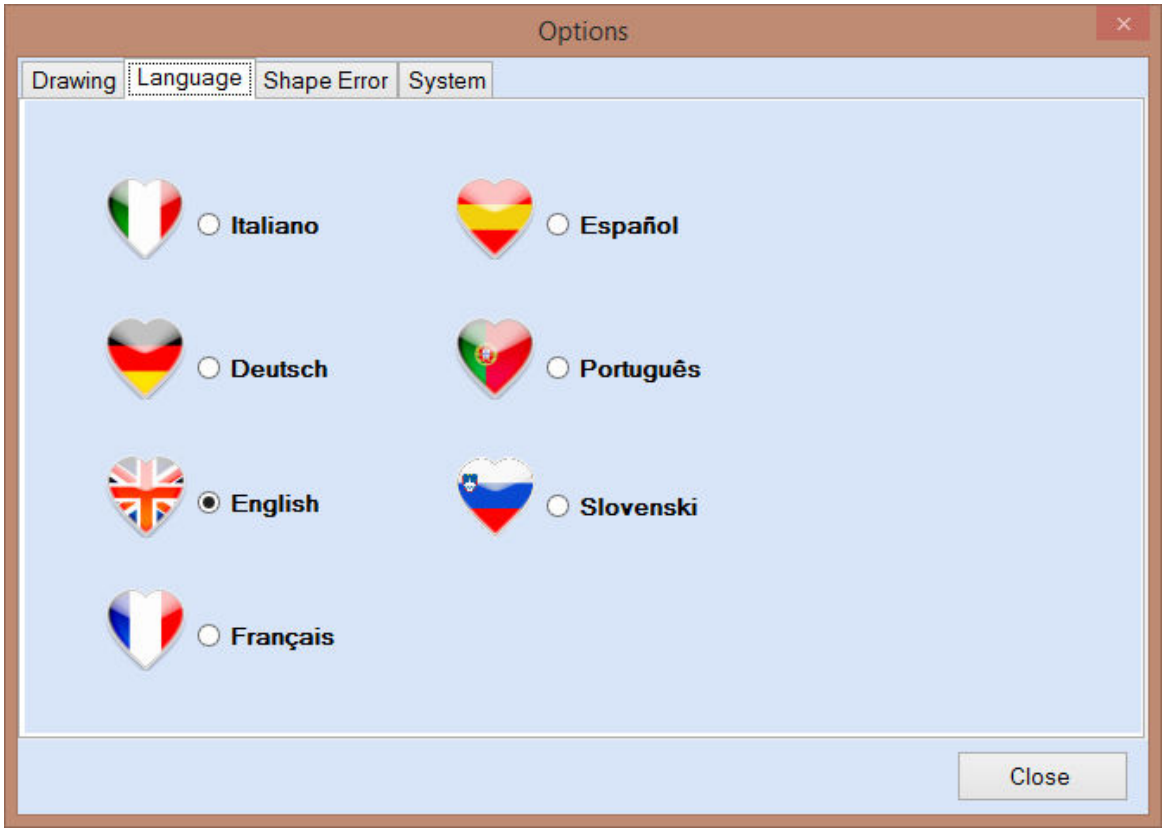
2. **Resolution of angular Dimension:** you can modify the angular dimension resolution by choosing between **degrees, degrees minutes** or **degrees,minutes,seconds** in the drop-down list**.** This option applies to ***angular dimension*.**

3. **Text Size Dimension**: you can modify the text dimension by choosing between **small medium** or **large** size in the drop-down list. This option applies to ***Horizontal dimension, vertical dimension, linear dimension, angular dimension, diameter dimension, radius dimension, line-point dimension***.

4. **Text size label**: you can modify the text dimension in the label by choosing between **small medium** or **large** size in the drop-down list. This option applies to ***label.***

5. **Measurement unit:** you can change the measurement unit used to display all the numerical values in the program by choosing between **inch** and **millimeters** in the drop-down list.
6. **Function abilitation mode**: [...]
7. **View grid**: enable or disable the grid in the CAD
8. **White color of the profile area in the printing section**: enable or disable the filling color of the area below the profile in the printing context
9. **Enable double click to perform cancel action**: check if you want to use the double click to disable the selected function in the CAD
10. **Fill profile bottom area**: check to see the filling color below the profile

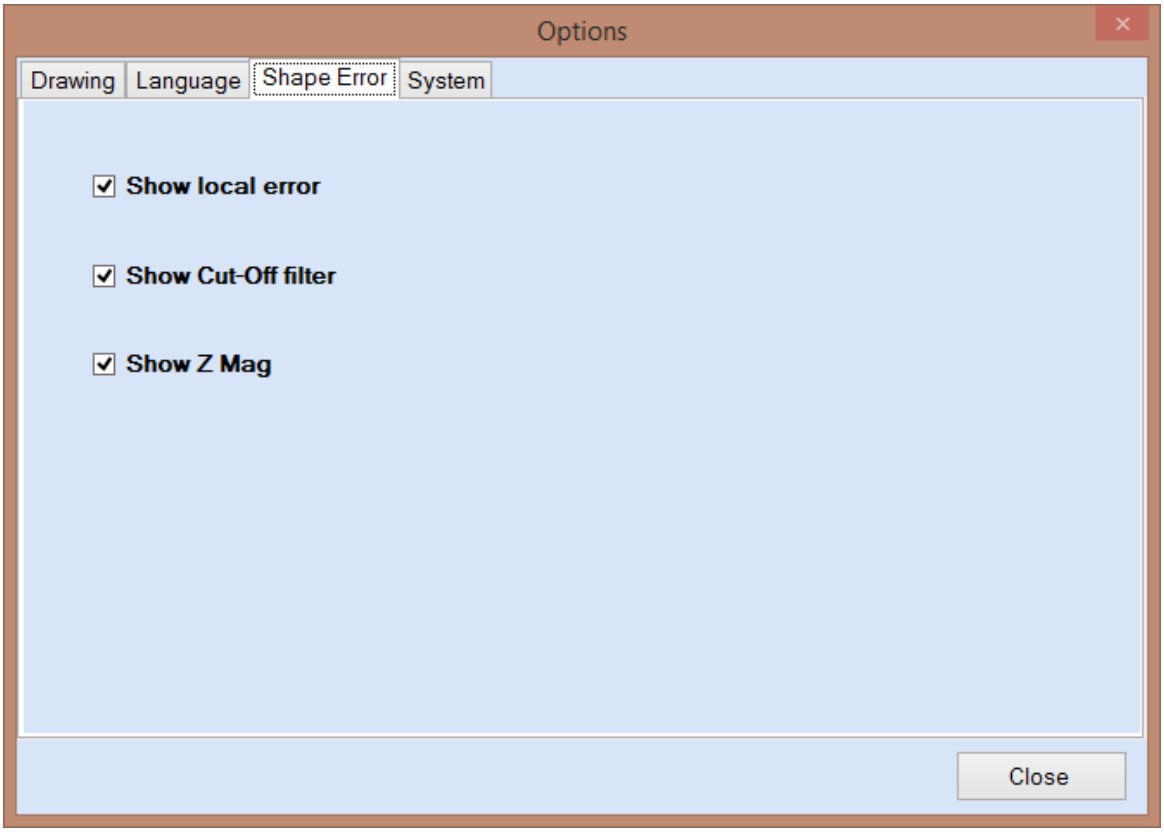
2.6.3 Language options



In this tab you can set the language of the program, the change is performed immediately without

confirm.

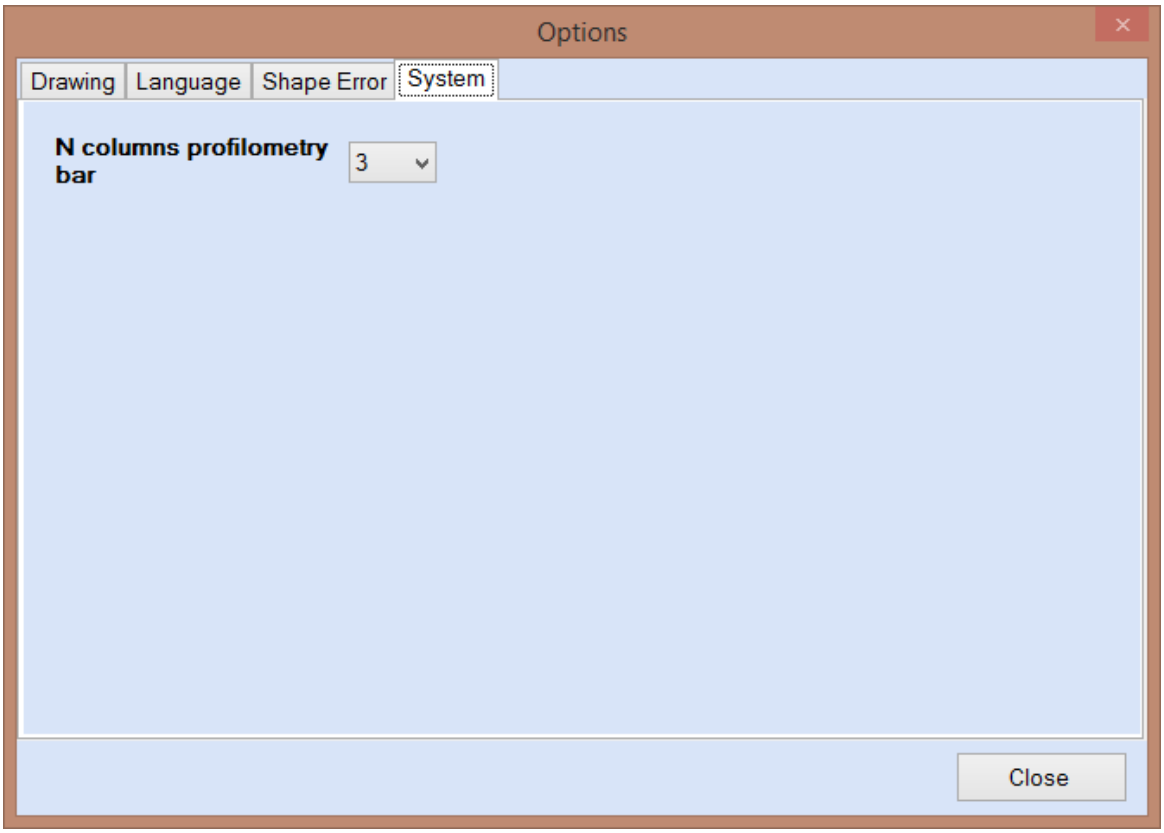
2.6.4 Shape error options



In this tab you can set some options related to the shape error box in the CAD
In questa scheda potete impostare alcune opzioni relative al riquadro della funzione CAD "Errore di forma".

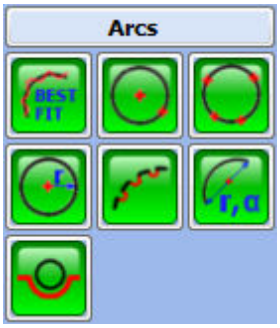
1. **Show local error**, shows the error in the selected point of the profile
2. **Show Cut-Off filter**, show the value of the cutoff length used in the filter
3. **Show Z Mag**, show the magnification level of the shape error profile

2.6.5 System options



In this tab you can set some options related to the Profile Studio environment.

N columns profilometry bar, changes the number of columns in the sidebar with the profilometry tools



2.7 Roughness

Profile Studio allows to calculate the roughness on the profiles: it is possible to use different standards, like ISO 4287, ISO 12085 and VDA 2007.

It is also possible to plug it to some roughness testers to perform measure on which is possible to calculate the roughness.

Note: This guide has the purpose of illustrating how to use roughness features in the Profile Studio, but do not explain concepts like the gaussian filter, the waviness or the meaning of the parameters. For more details on these, please check a roughness reference.

2.7.1 Functions panel

The functions panel contains actions to create and show a roughness object on the profile.

2.7.2 Zone

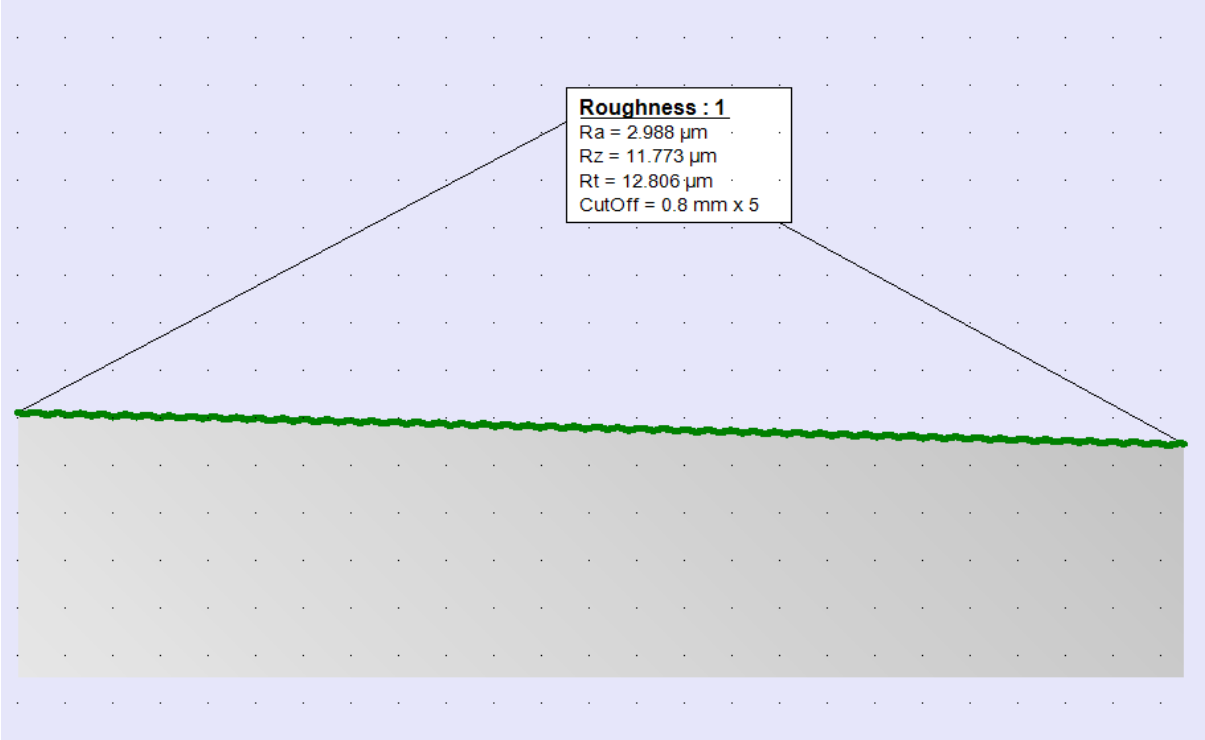
In this section is possible to create a roughness object on the profile:

Create the roughness on the profile portion contained in a bestfit.
The first click is to select the bestfit, the second one is to place the roughness box.

Creates the roughness on a profile portion that the user can manually select directly on the CAD
After you have selected the button, you have to click twice on the profile to estabilish the start position and the end position of the roughness to be calculated.

Creates a roughness on all the profile
You have to click on the CAD to place the roughness box.

When you're done placing the roughness, on the CAD you will see a drawing like this



It is possible to create many roughness objects in a single profile.

Note: If you calculate a roughness on a profile portion that includes edges (a step etc.) the result will most likely be numbers with no sense, because of the filter applied to calculate the waviness.
To get significant results, the roughness has to be calculated on plain profiles, like the example, or on curves with constant radius; in the roughness object you have to choose if the surface is plain or curved because it is an options used during calculations (see Settings)

2.7.3 Settings

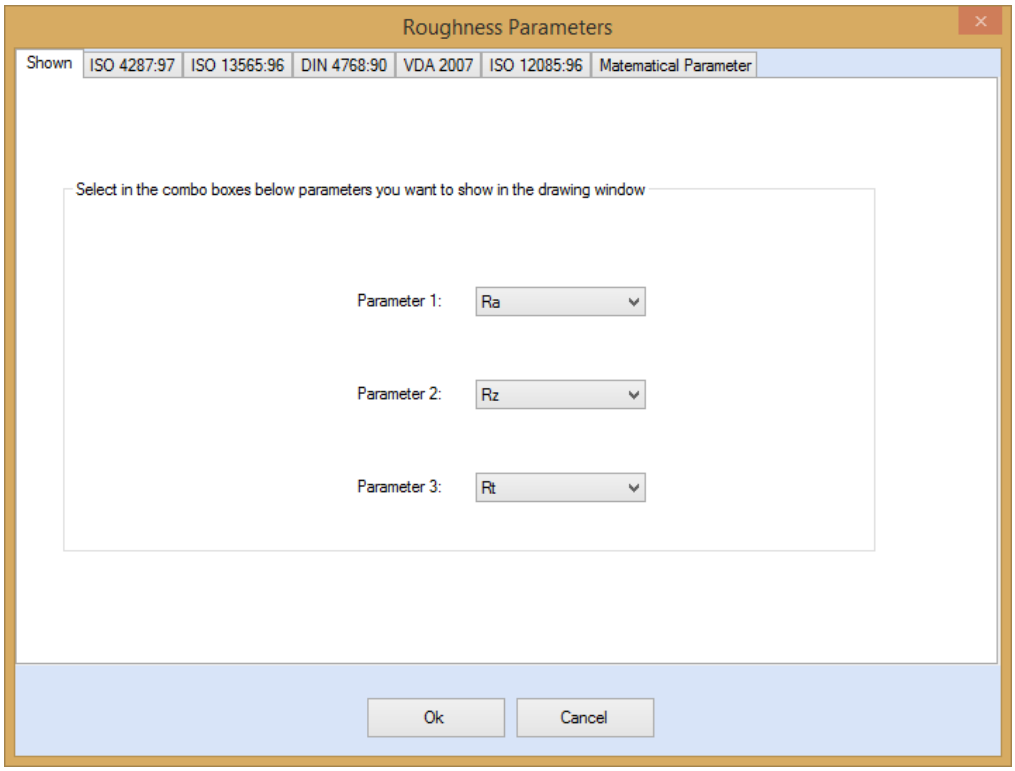
This panel allows to change the standard for the roughness objects, to select the parameters that will be shown and the cutoff length (or motif length for the ISO 12085).

The first row of buttons allows to change the standard used for roughness calculation.
You can select the standard before selecting the zone, or if you already have a roughness object on the profile you can select it and change the standard.
The standards available are:

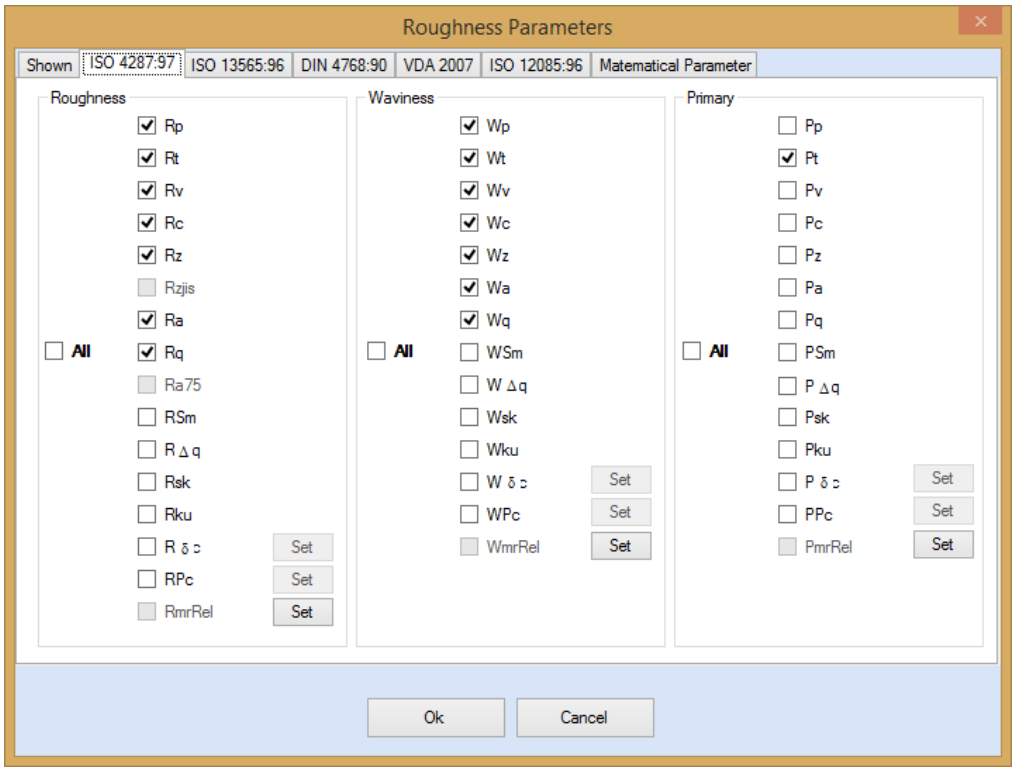
- *ISO 4287* European standard
- *VDA 2007* German automotive standard
- *ISO 12085* French standard

The button in the second row opens a dialog from which you can select the parameters that will be shown in the roughness box, the parameters that will be shown in the roughness window and a few other calculation settings.

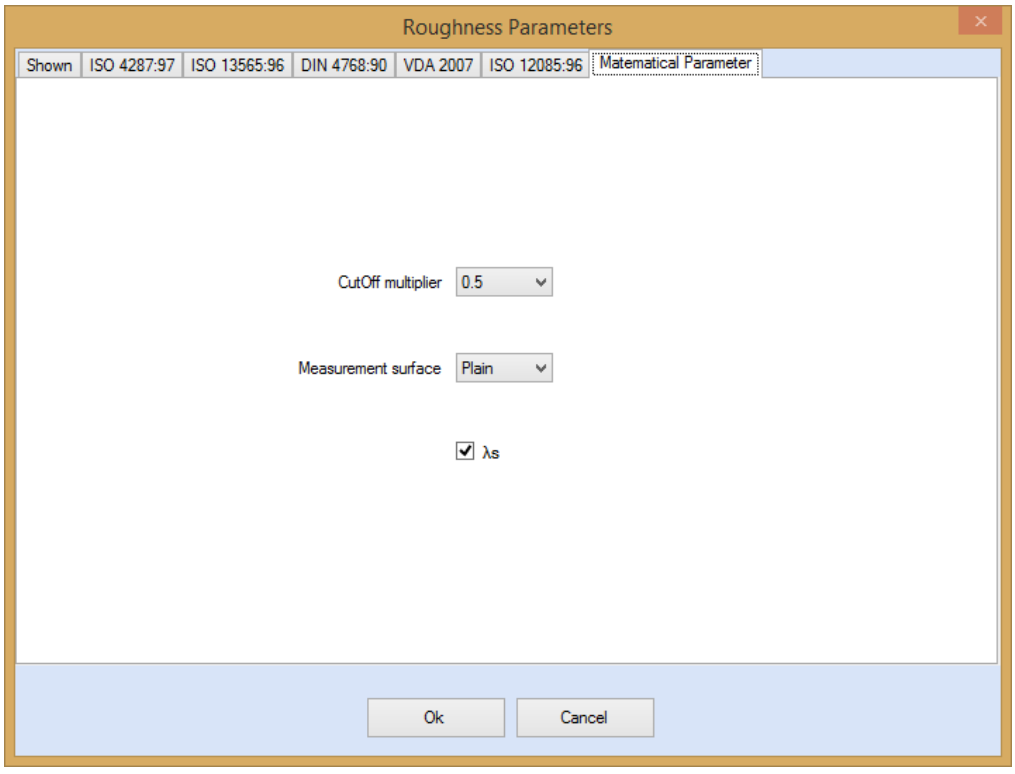
In the first tab you can select the parameters that will appear in the roughness box on the CAD.



In the tabs with a standard name (ISO 4287 etc.), you can select which parameters will be shows in the tables (for both the roughness window and the print)



In the mathematical parameter tab you can find some calculation options



- Cutoff multiplier: choose the pre-post run length
- Measurement surface: tells the main shape of the surface on which the roughness has to be calculated
- λs: tells if you have to apply the λs filter to remove the noise before calculating the roughness.

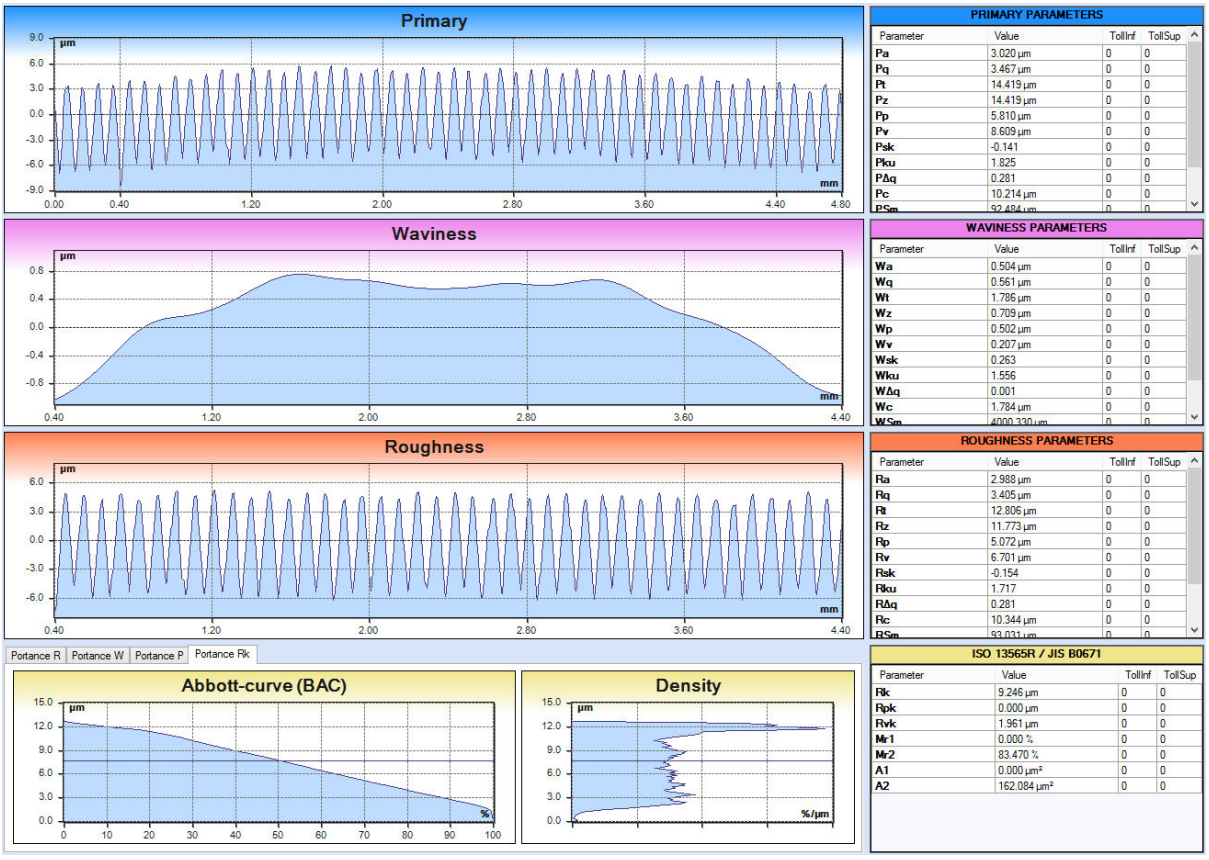
The last option, **L cutoff**, is the option that allows you to change the cutoff length.
If you change it with a roughness box selected the change will affect that particular object, otherwise it will affect the default value.

2.7.4 Visualization

This panel allows to choose which elements have to be displayed in the roughness window.

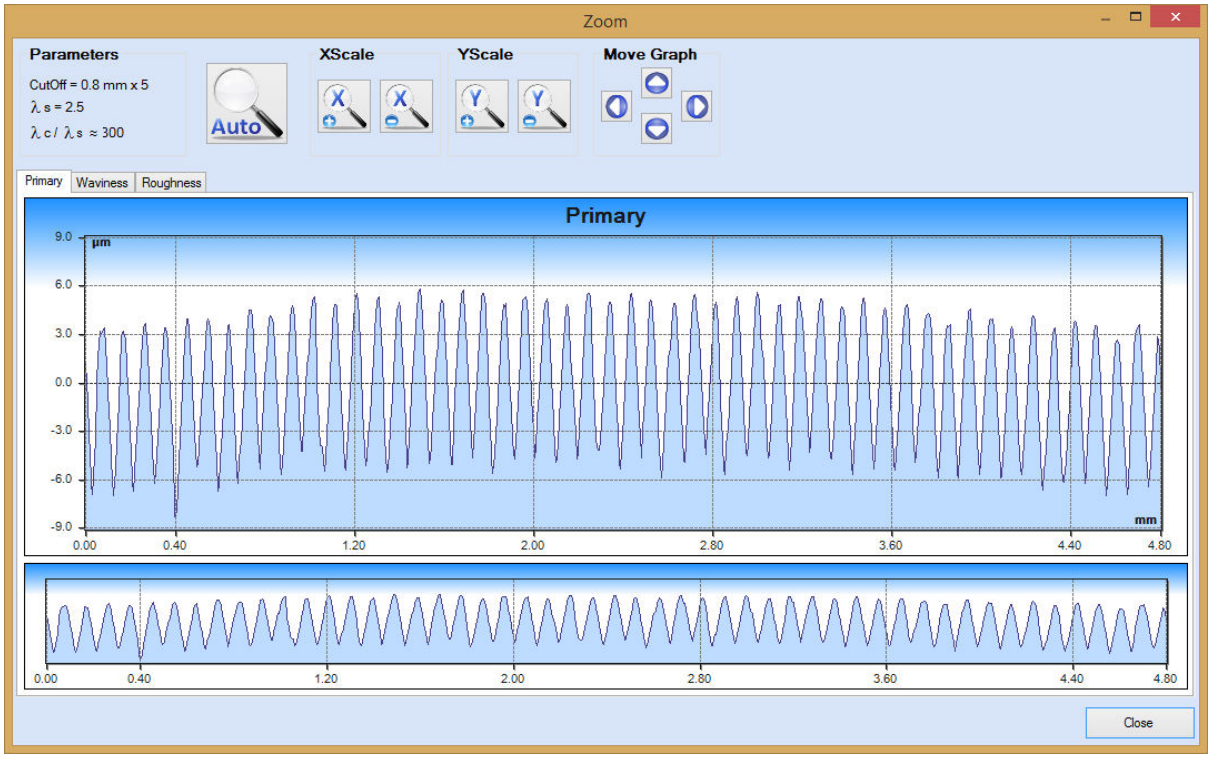
2.7.5 Roughness window

If you doubleclick on a roughness box it will appear the roughness.



In this window you see the charts and parameters for the selected roughness. You can select which elements to display from the functions panel.

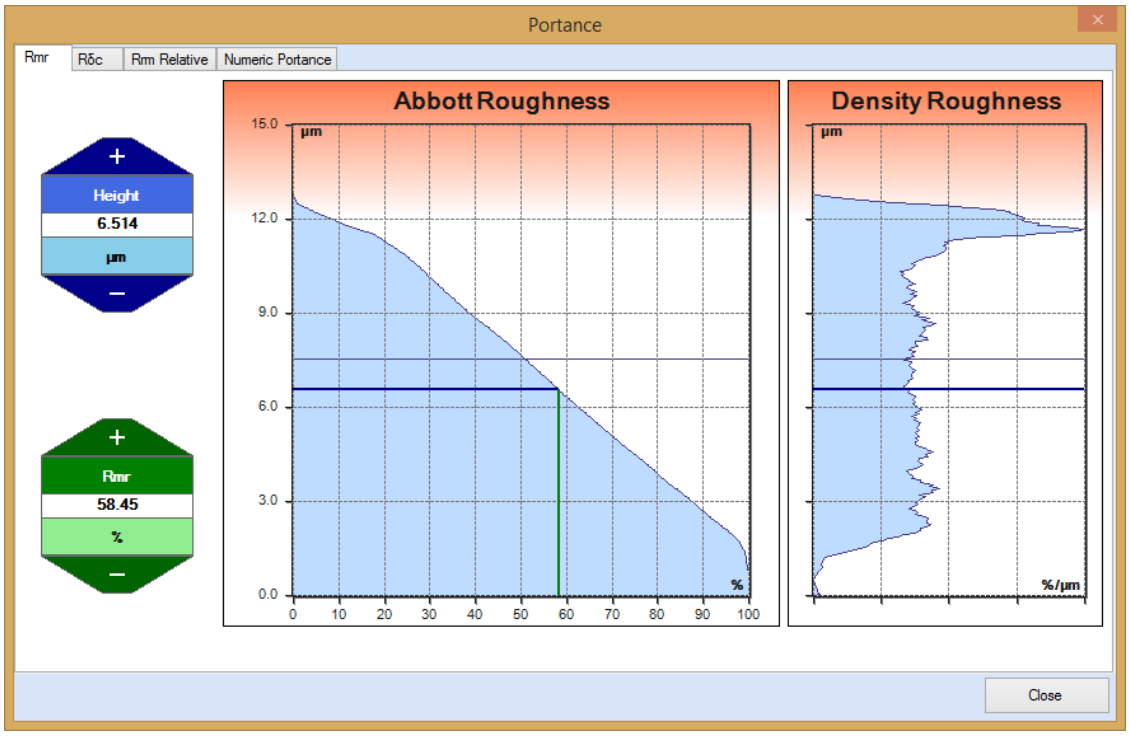
If you want to zoom in a chart you can perform a double click on it and it will appear a window with the selected chart.



This window allows to zoom in a certain part of the chart.
In order to pan and zoom you can use the buttons on the top or the keyboard shortcuts:

+	Zoom in Y
-	Zoom out Y
*	Zoom in X
/	Zoom out X
Arrows	Pan

If you perform a double click on a portance chart it will appear a window that will give more information on the **Rmr** parameters.



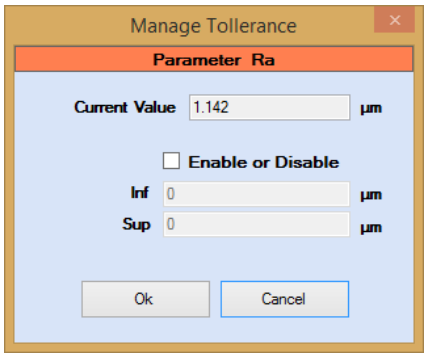
In this view you can click and drag the two lines in the abbott chart and you will see the values on the left panels being updated accordingly.
You can also change the values in the text fields on the left, either textually or using the plus and minus buttons; this way the lines in the chart will be updated.

The first tab shows the Abbott chart's punctual values; the second tab allows to choose two percentages and calculates automatically the Rδc between them.
The third tab allows to calculate the relative material ratio.

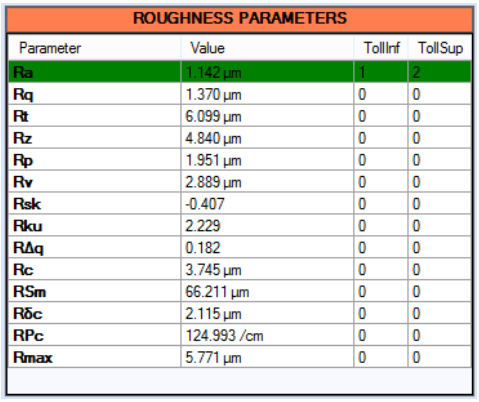
2.7.6 Tolerances

It is possible to add tolerances to the parameters that appear on the tables.
In order to achieve this you can perform a double click on the parameter of which you want to insert a tolerance.

It will pop up a window to manage the tolerances



In order to insert the tolerance you have to tick the check box, at that point the two input boxes will become editable.
You can insert the upper and lower limit for the parameter and then click Ok to confirm.
At this point the parameter in the table will change color: the row becomes green if the parameter is inside the tolerance range, otherwise red.



ROUGHNESS PARAMETERS

Parameter	Value	TollInf	TollSup
Ra	1.142 µm	1	2
Rq	1.370 µm	0	0
Rt	6.099 µm	0	0
Rz	4.840 µm	0	0
Rp	1.951 µm	0	0
Rv	2.889 µm	0	0
Rsk	-0.407	0	0
Rku	2.229	0	0
RΔq	0.182	0	0
Rc	3.745 µm	0	0
RSm	66.211 µm	0	0
Rδc	2.115 µm	0	0
RPc	124.993 /cm	0	0
Rmax	5.771 µm	0	0

Part 3

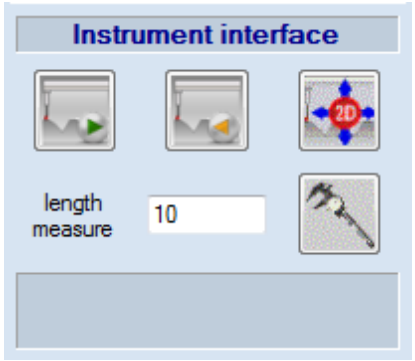
Measurement functions

3.1 Measure Management

3.1.1 90G

3.1.1.1 90G measure panel

Once the instrument is connected the related measure panel is displayed in the bottom left side of the screen:



Starting from the left we have:

 Starts the measure.

Moves the traverse unit to the position of start of the measure.

Activates the positioning screen in the instrument.

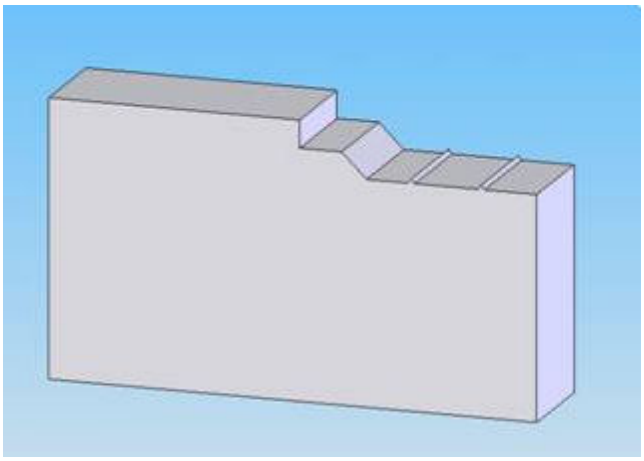
Starts the instrument calibration procedure.

There is also a text box displaying the measure length actually defined in the instrument. You can directly set a different value by typing the new value inside the text box.

3.1.1.2 Calibration

This function is fundamental because the measures correctness depend on it. Is a good practice to perform it always after having replaced the pickup.

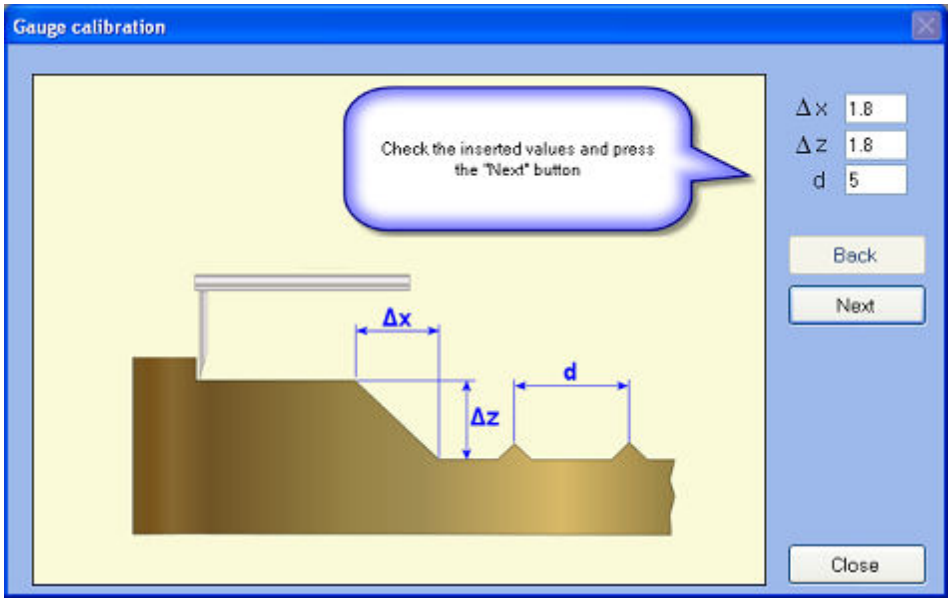
For the execution you must have the appropriate calibration sample with inclined ramp of about 1.8x1.8 millimeters



then:

a Activate the item **Calibration** of the **MEASURE** menu (**F5**) or through  (measure panel).

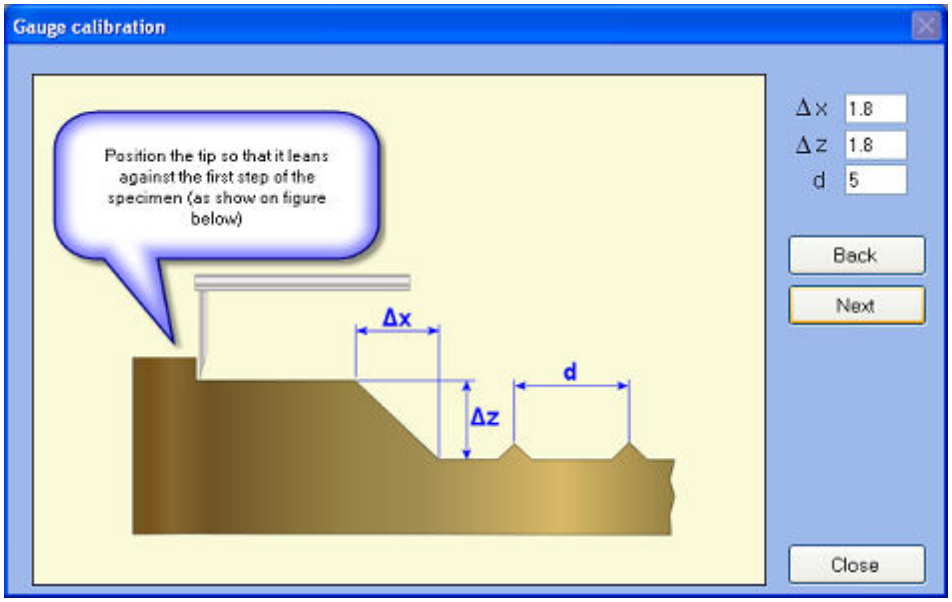
b The window of the first pickup calibration phase is displayed:



Insert in the boxes respectively the length, height and distance values to be measured on the sample (Delta X , DeltaZ and D, indicated on the certificate attached to the measurement standard) following the scheme illustrated in figure, then press **Next.**

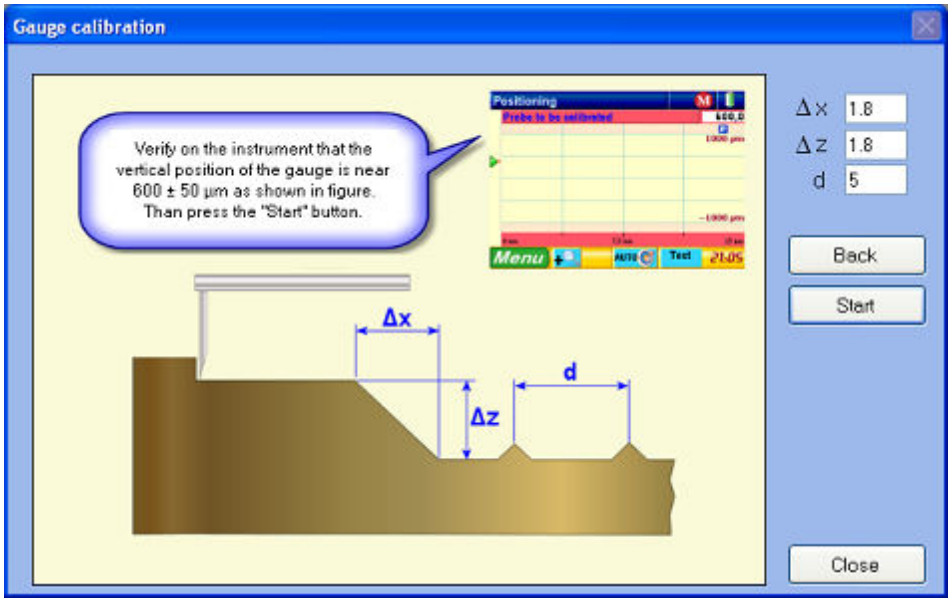
c We go to the second calibration phase. Also in this case following the graphic schema

displayed in figure:



move the pickup tip to the left edge of the sample to define the starting point of the trait to be explored, then press **Next.**

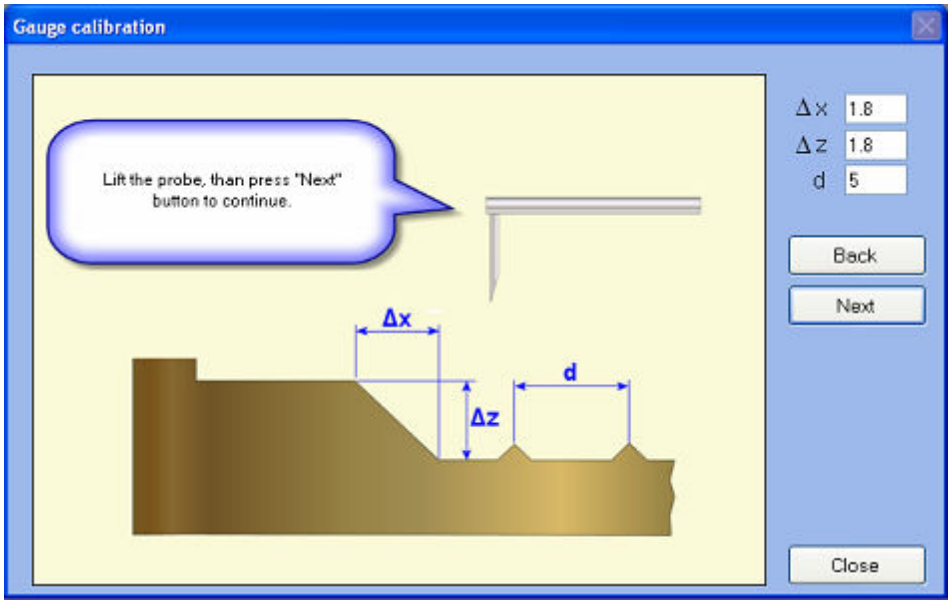
d We go to the third calibration phase. Following the graphic schema displayed in figure:



adjust the vertical pickup position of the instrument so the arrow reaches the correct position, then press **Start.**

e Now the last calibration phase for the first measure is activated, the instrument performs the measure.

f Following the schema in figure:



manually raise the pickup then press **Next,** the traverse unit will be automatically repositioned to the point of start of measure previously defined. Remember to maintain raised the pickup during the repositioning phase and release it when the traverse unit reaches the top of the standard.

g Repeat step **d** following the same graphic schema.

h Now the last calibration phase for the second measure is activated, the instrument performs the measure. At the end, if the calibration has been correctly performed, a confirmation message is displayed.

It is possible to interrupt in any moment the operation by pressing **Cancel** or go back to the previous phase by pressing **Back.**
In case of error, the probable cause and, when possible, some useful indications for its solution are signalled to the operator.

3.1.1.3 Preparing the measure

It is possible to perform the measure only after the instrument has been calibrated (see 90G Calibration).

Define the measure length in the 90G measure panel (valid acceptable values are between **0.08** and **50**mm).

Mount if necessary, the pickup more suited to measure the interested zone, then move the pickup to the start of measure point by pressing  in the measure panel.

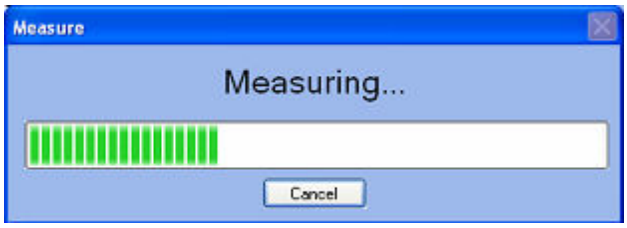
Performed the piece and pickup positioning, it is advisable to check that the pickup inside the measurement trait don't be pressed over its limit, that lost contact with the surface or that it remains blocked (with complex profiles move in small traits). To do so activate the positioning screen of the instrument by pressing  in the measure panel or the **F3** key.

3.1.1.4 Performing the measure

When the piece is in position and all settings have been performed you can start the measure; there are 3 ways to do so:

1° pressing **F2** key.
2° from the measure menu select the **start measure** item.
3° pressing  from the measure panel**.**

During the measure, a new window is displayed:



As you can see the main part represents a measure progress bar indicator that grows synchronized with the movement of the traverse unit.

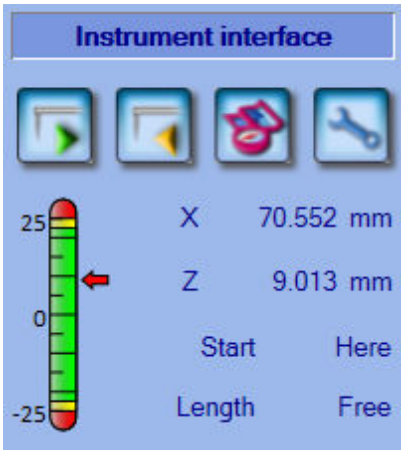
If some problems may arise you can interrupt the operation with the **Cancel** button or by pressing the **start/stop** measure button on the instrument.

At the end of the measure the profile is displayed with the indication related to the current zoom level and other of service in the status bar.

3.1.2 PGS 200

3.1.2.1 PGS 200 measure panel

Once the instrument is connected the related measure panel is displayed in the bottom left side of the screen:



Starting from the left we have:

Starts the measure.

Moves the traverse unit to the position of start of the measure.

Activates the PGS 200 positioning window.

Starts the instrument calibration procedure.

There are also the indication of the x and z rod tip coordinates position, of the start of measure

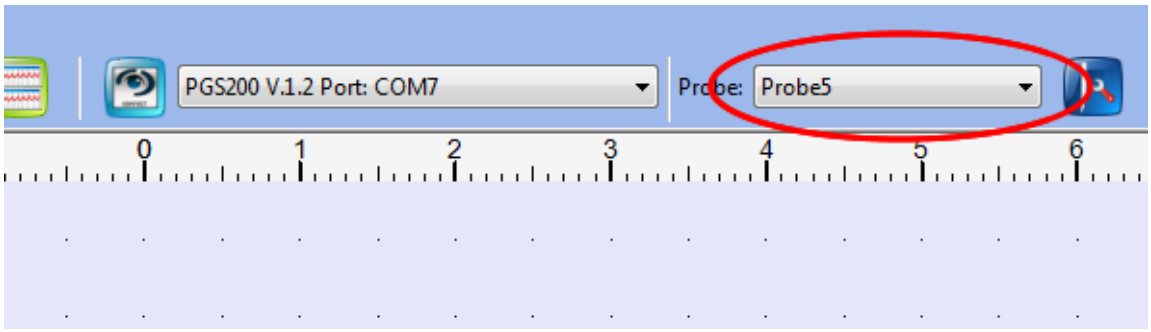
and end of measure positions and of the measure length actually defined.

If the free length mode has been activated (see measure settings in the positioning window, the length is indicated by the word **"Free"**.

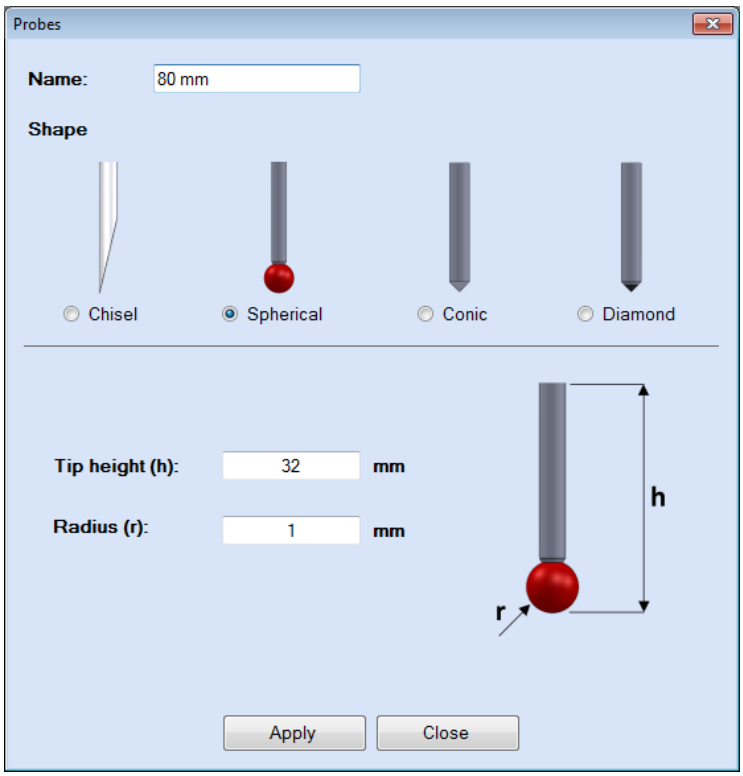
3.1.2.2 Probe selection

In the Profile Studio is possible to select a probe configuration.

When you plug a PGS 200 to the computer, a drop-down menu appears that allows to choose this configuration.



Configurations can be edited from the button next to the drop down menu.



In the **Shape** section you can choose the tip shape:

1. the *chisel* tip is typically used for profilometry and allows to measure small radius
2. the *spherical* one is typically used for profilometry, it filters mechanically the profile
3. the *conic tip* is used for profilometry
4. the *diamond* is the tip used to measure the roughness.

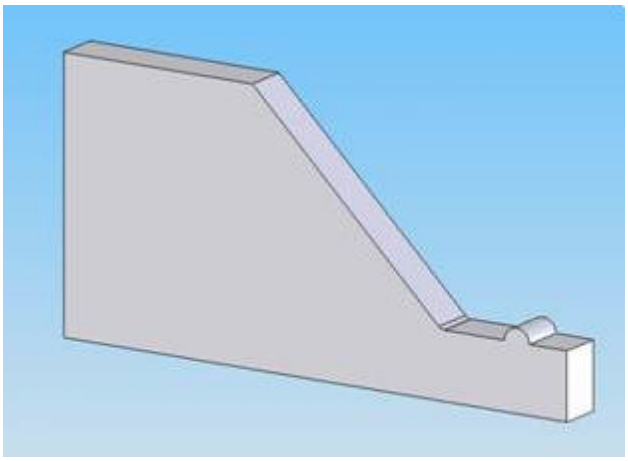
In the **Tip height** box you have to insert the height of the tip body.
The **Radius** option is used only for the spherical tip.

Once you inserted all the desired values, click **Apply** to save the changes.
To close the window click **Close**.

3.1.2.3 Calibration

This function is fundamental because the measures correctness depend on it. Is a good practice to perform it always after having replaced the pickup or periodically (once every 6 months) for security.

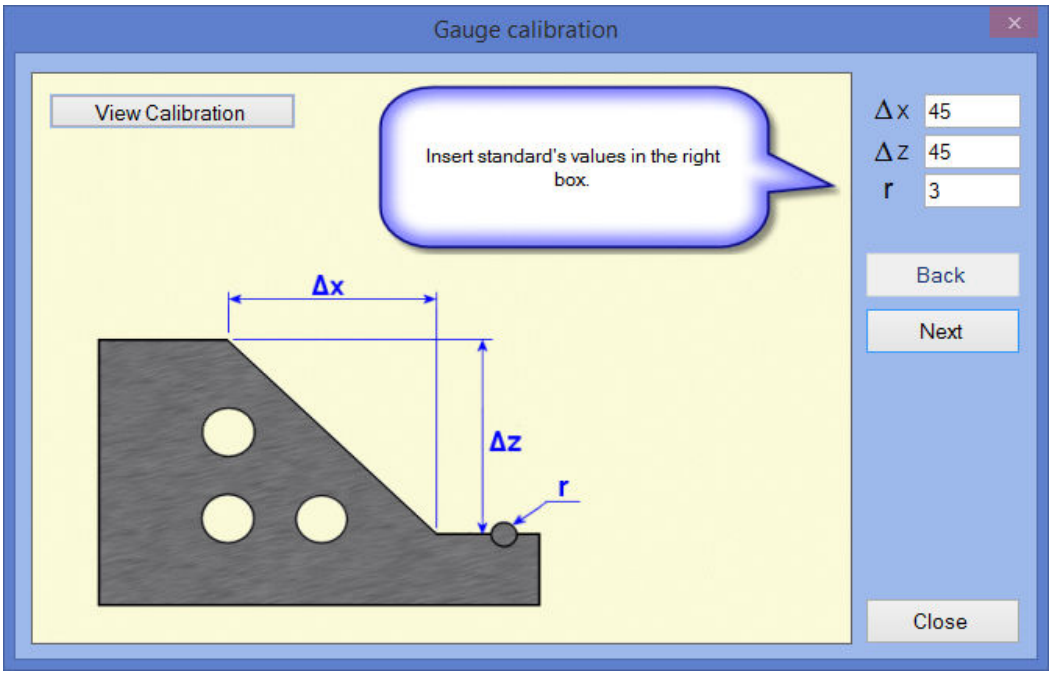
For the execution you must have the appropriate calibration sample with inclined ramp of about 45x45 millimeters



then:

a Activate the item **calibration** of the **MEASURE** menu (**F5**) or through  (measure panel).

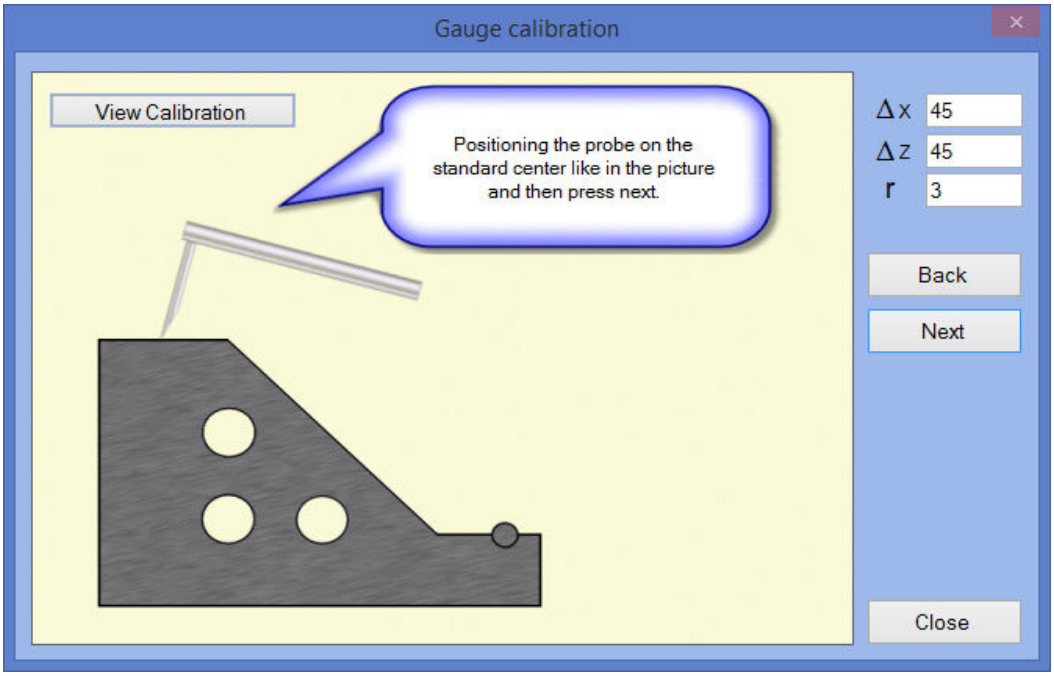
b The window of the first pickup calibration phase is displayed:



Insert in the boxes respectively the length, height and radius values to be measured on the sample (Delta X , DeltaZ and r indicated on the certificate attached to the measurement

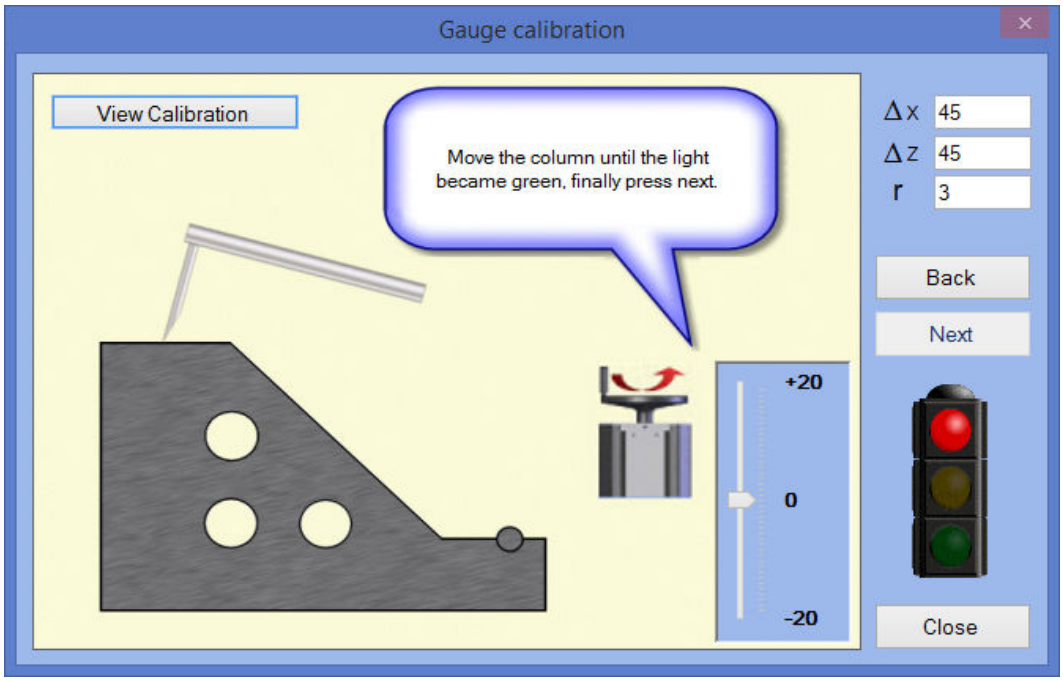
standard) following the scheme illustrated in figure, then press **Next.**

c We go to the second calibration phase. Also in this case following the graphic schema displayed in figure:



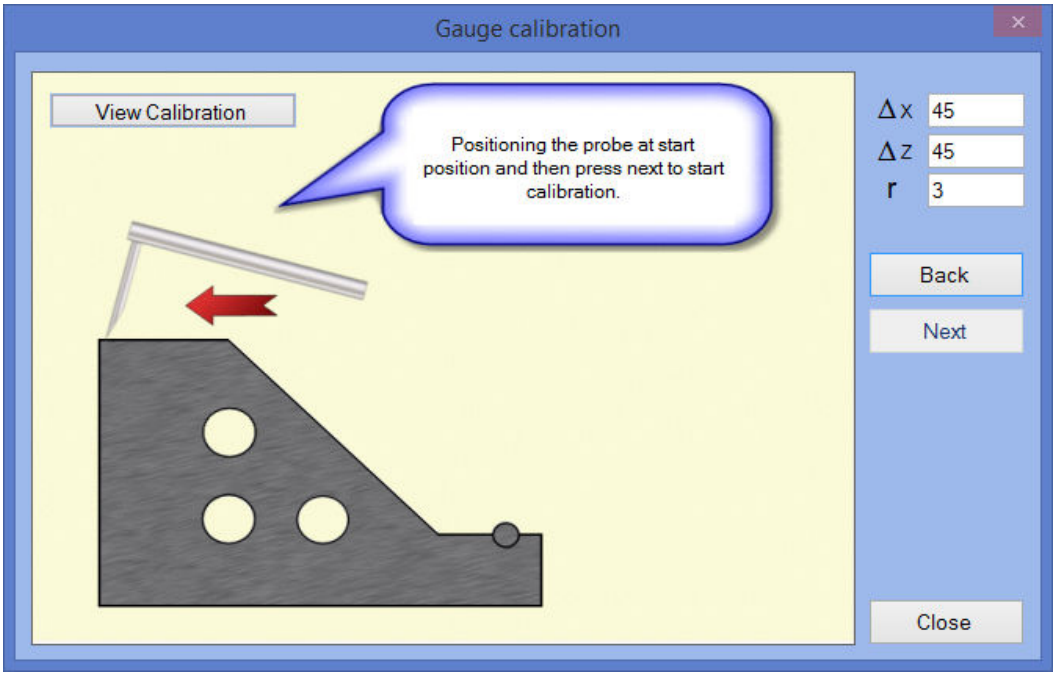
move the pickup tip to the middle point of the first zone of the sample then press **Next.**

d We go to the third calibration phase. Following the graphic schema displayed in figure:



adjust the vertical pickup position in the instrument by moving the column, so that the light indicator becomes green, then press **Start.**

e Also in this case following the graphic schema displayed in figure:



move the pickup tip to the left edge of the sample to define the starting point of the trait to

be explored, then press **Next.**

f Now the last calibration phase for the first measure is activated, the instrument performs the measure for the first zone.

g Repeat step **d** following the **same** graphic schema then press **next.**

h Now the last calibration phase for the second measure is activated, the instrument performs the measure. At the end, if the calibration has been correctly performed, a confirmation message is displayed.

It is possible to interrupt in any moment the operation by pressing **Cancel** or go back to the previous phase by pressing **Back.**

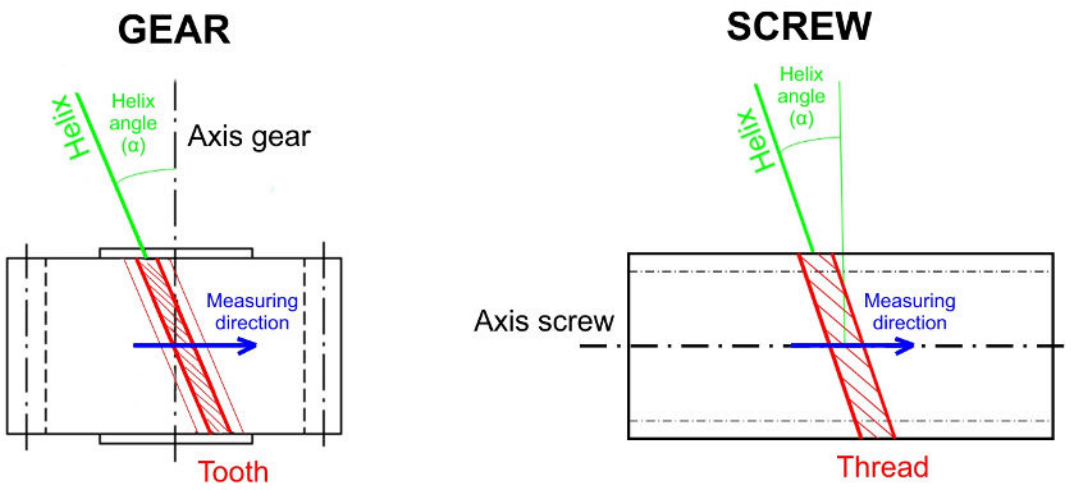
In case of error, the probable cause and, when possible, some useful indications for its solution are communicated to the operator.

It's possible to show the previous calibration by clicking on the button **View calibration**: the calibration file is opened in an external spreadsheet viewer (MS Excel, OpenOffice Calc or Libre Office Calc)

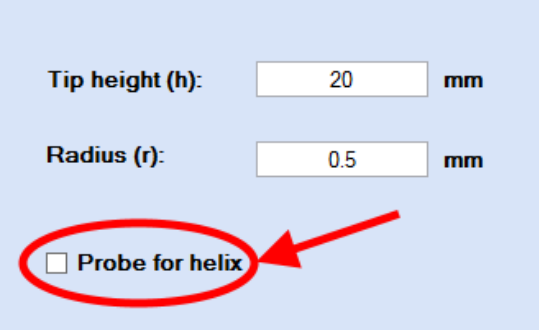
3.1.2.4 Calibration for helix

This calibration allows to measure the throats of the helixes by placing it with axis aligned with the translator instead of rotating the helix.

A compensation algorithm takes care of showing the data as if the measure has been done along the throat axis.



In order to enable this kind of measures, it is necessary to enable an option in the probe window.



The specific calibration for helix measurement will be automatically prompted after the calibration on the 45 degrees specimen.

Preliminar phase

a. Tip choice

In order to get a correct calibration it is recommended to use a spherical tip with 1 mm diameter.

Suggested arms:

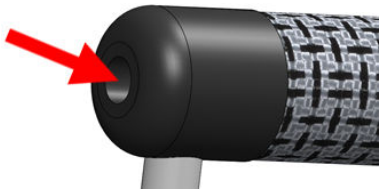
- **3.311** - Arm for helix
- **3.318** - Miniaturized arm for helix

Suggested tips:

- **3.306** - Metal sphere Ø=1 - l=32
- **3.307** - Ruby sphere Ø=1 - l=32
- **3.319** - Ruby sphere Ø=1 - l=8

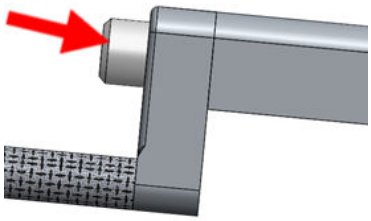
b. Grub screw

Make sure that the grub screw is well screwed. The tip must not move.



c. Knob

Make sure that the knob that holds still the measuring arm is well closed.



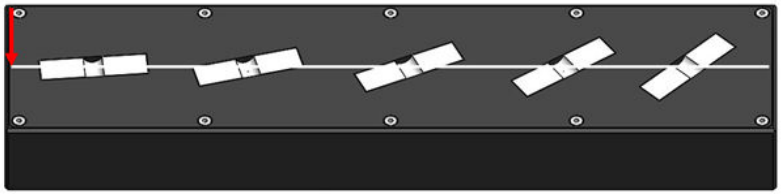
Specimen positioning

In order to calibrate on the specimen, the operator must place it in the translator run.

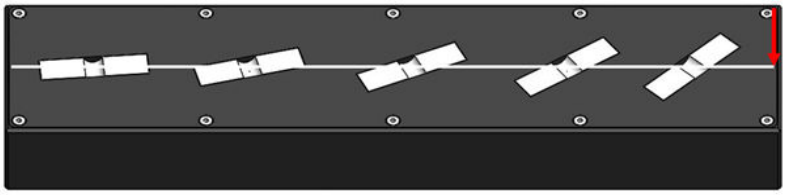
It is recommended to:

- Take the arm to the left limit switch;
- Place the specimen and verify that the first throat (angle of 5°) is on the right of the

spherical tip;



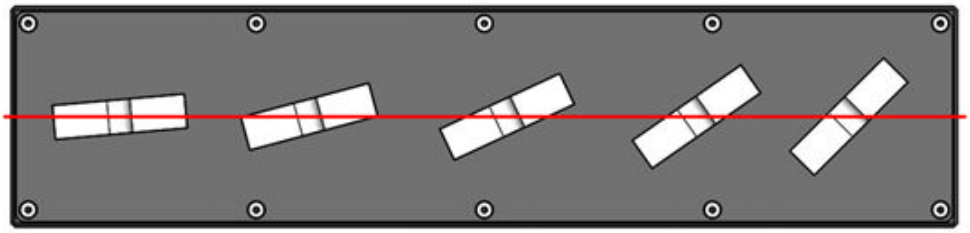
- Take the arm to the right limit switch and verify that the last throat (angle of 45°) is on the left of the spherical tip.



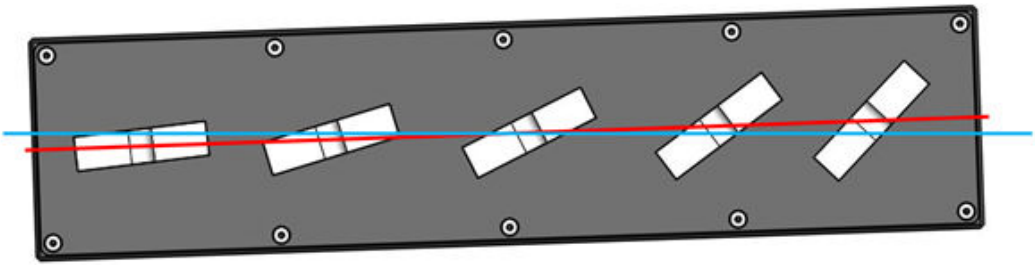
Angle between the specimen's axis and the measuring axis

The specimen's throats axis (white line on the upper surface) and the translator's axis must be collinear as much as possible.

Introducing an angle between the two axis, would generate an error on the calibration.



Correct position

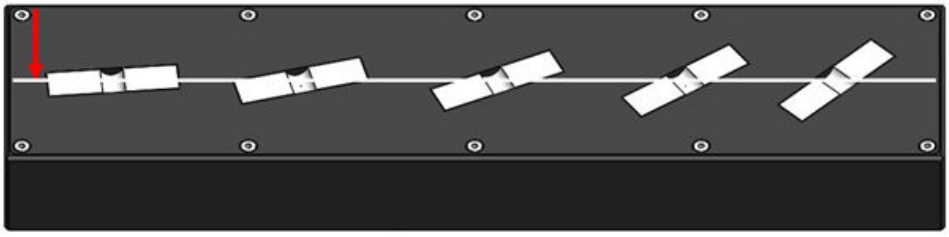


Incorrect position

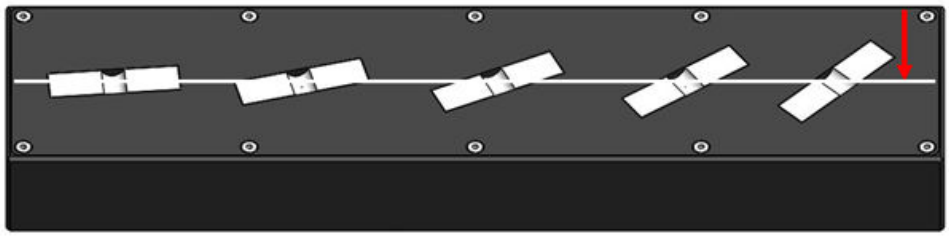
This axis must be the reference for the following measures.

In order to align it is suggested to:

- take the spherical tip on the upper surface of the specimen at the left of the first throat (angle of 5°) , center the terminal on the specimen axis (white line);



- take the spherical tip on the upper surface of the specimen at the right of the last throat (angle of 45°) , center the terminal on the specimen axis (white line);

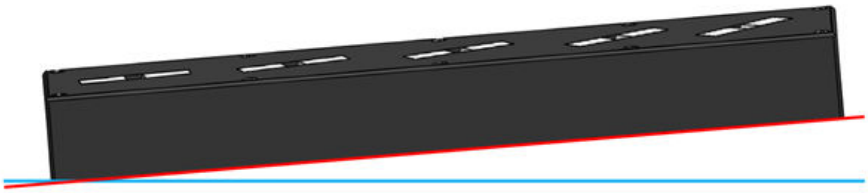


- repeat the two previous passages until you center the spherical tip on the measurement axis on all the specimen's run.

Leveling the specimen

The upper surface of the specimen must be leveled with the translator axis. Introducing an angle between the two axis would generate an error on the next measures. For this reason it is recommended to orientate the translator's axis.

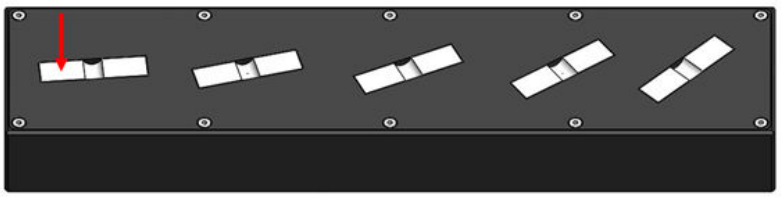
Correct position



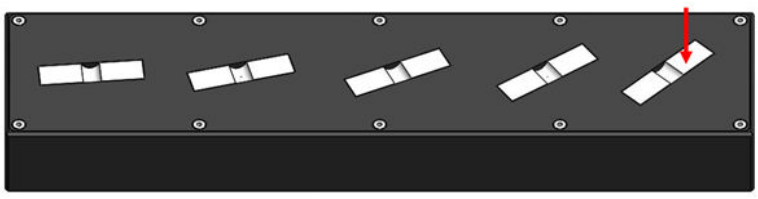
Incorrect position

In order to level the specimen the procedure is as follow:

- take the spherical tip on the left side of the first throat (angle of 5°) and verify the height of the z axis;



- take the spherical tip on the right side of the last throat (angle of 45°) and verify the height of the z axis;



- the difference of the two heights must be lower than 0,2 mm.

Calibration execution

When the specimen is placed correctly, it is possible to proceed with the calibration. It is an automatic procedure in which the profilometer analyzes the five throats in order to determine correction to apply at the different angles.

If the profilometer has a manual column, the software will ask the operator to place it at the correct height.

At the beginning of the calibration the machine looks for the first throat, then it performs the analysis of the five throats; the procedure lasts about five minutes.

Tip shape

Once the calibration procedure terminates, The software will show the tip shape for every angle.
It is possible to repeat the calibration of a single throat, which is suggested when the tip shape is deformed respect to the average radius (peak or valley).

If this problem is present in the second measure as well, it can be better to verify that the specimen and/or the tip are not damaged or dirty.

Measuring conditions

The angle compensation of the helix works well in specific conditions:

- The measuring range must be between +10 mm and -10 mm.
- The recommended measuring speed is 0,5 mm/s
- The helix angle inserted at the end of the measure must be as precise as possible, it is suggested

to insert the seconds as well

3.1.2.5 Preparing the measure

Before placing the piece to be measured on the base it is advisable to move the pickup away, above all to avoid damaging it; to do so move toward up the pickup and make the pickup rod reenter by using the lever selector. Mount if necessary, the pickup more suited to measure the interested zone, then activate the positioning window by pressing  in the measure panel.

Unless you have to enter in a hole, it is good to raise the pickup rod by using the button  ; besides, in this condition you can then move the pickup to the point nearest to the start of measure manually (above all if it is the first measure after having turned on) controlling in the screen the positioning.

Performed the piece and pickup positioning, you can lower the rod with  button and eventually correct its position.

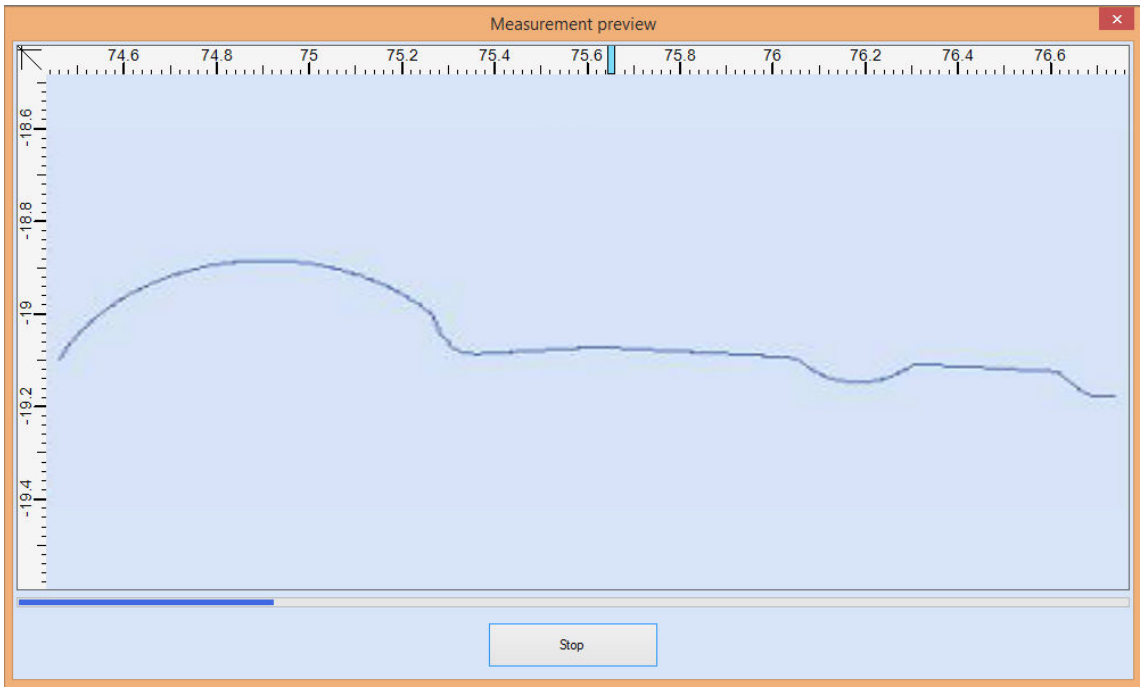
It is advisable to check , by manually moving the traverse unit, that the pickup inside the measurement trait don't be pressed over its limit, that lost contact with the surface or that it remains blocked (with complex profiles move in small traits). So you define the entity of the course.

3.1.2.6 Performing the measure

When the piece is in position and all settings have been performed you can start the measure; there are 4 ways to do so:

1° pressing **F2** key.
2° from the measure menu select the **start measure** item.
3° pressing  from the measure panel**.**
4° pressing the external start/stop measure button

During the measure, a new window is displayed:



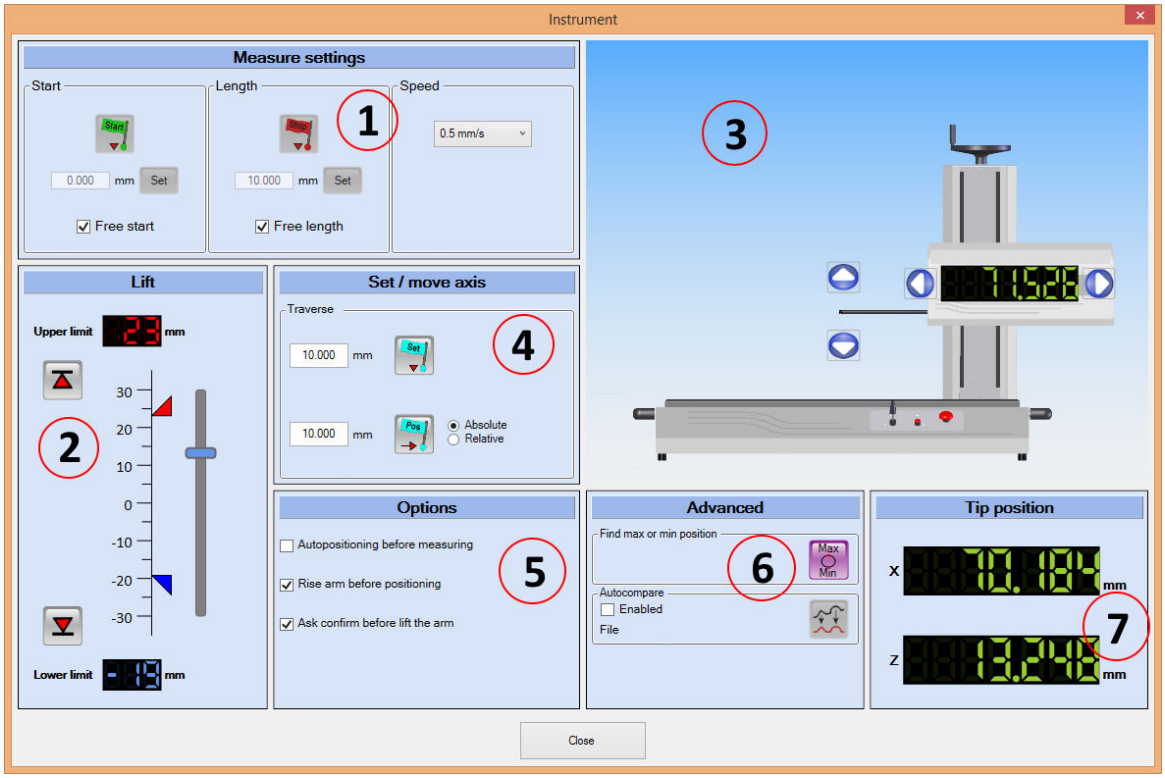
As you can see the main part represents a real-time preview of the acquired points together with a measure progress bar indicator that grows synchronized with the movement of the traverse unit.

If some problems may arise you can interrupt the operation with the **Stop** button or by pressing the **start/stop** measure button on the instrument.

At the end of the measure the profile is displayed with the indication related to the current zoom level and other of service in the status bar.

3.1.2.7 Positioning window

3.1.2.7.1 Main window overview



The positioning window is used to manage all the horizontal and vertical movements related to the traverse unit, to the lifting rod and to the measure parameters.

It is activated from the PGS 200 measure panel by pressing the  button.

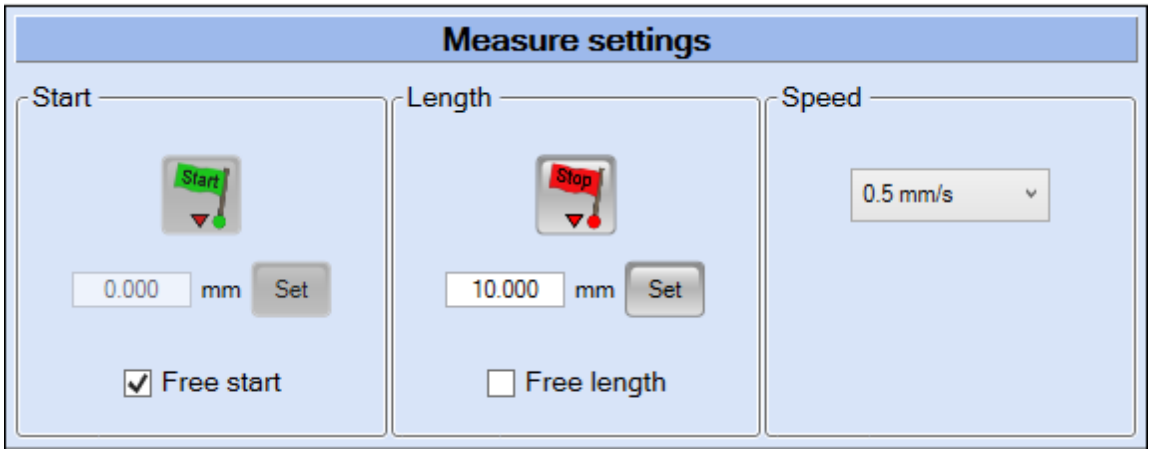
As we can see it can be divided in 7 main areas:

1. Measure settings
2. Lift control
3. Instrument view
4. Set / move axis
5. Options

6. Advanced

7. Tip position

3.1.2.7.2 Measure settings



The interface is divided into three sections:

Start

The start point can be set from the current position with the button 

It is also possible to insert it manually in the text box and click 

to confirm.
If the **Free start** option is enabled, the measure will start where the rod is located at that time.

Length

The length can be determined from the current position with the button 

, the length is calculated from the start point.

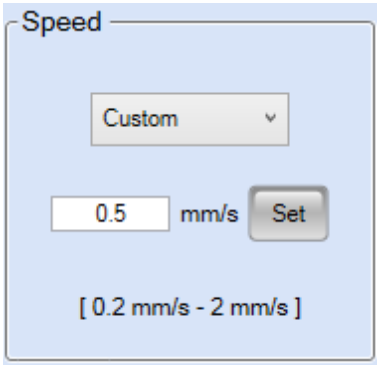
It is also possible to insert it manually in the text box and click 

to confirm.
If the **Free length** option is enabled, the measure has to be stopped manually.

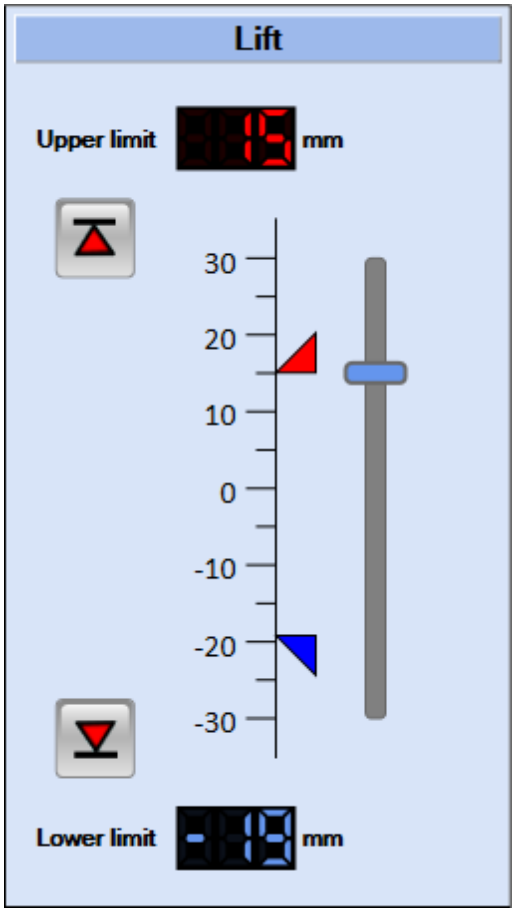
Speed

The speed value can be chosen from the drop down menu.

It is also possible to insert manually a value by choosing the option **Custom**



3.1.2.7.3 Lift control



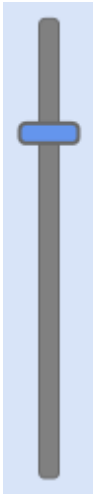
 moves the rod to its upper limit.

 moves the rod to its lower limit.

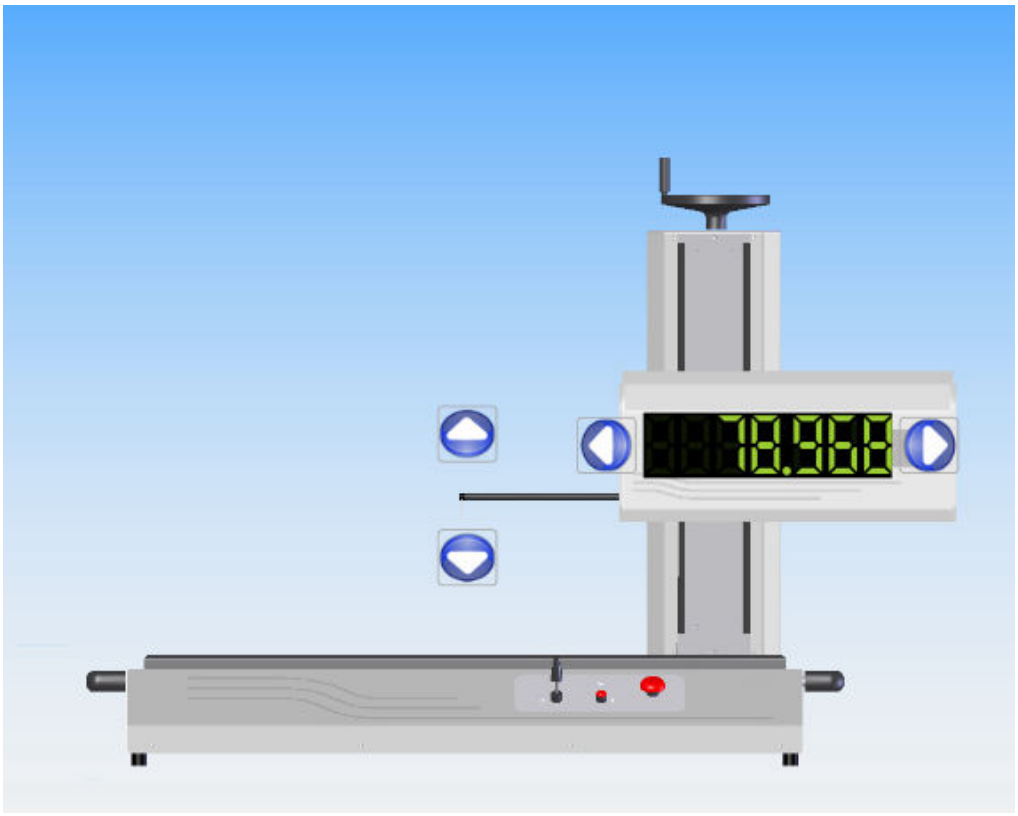
 **current upper range limit:** press and hold the left mouse button to lock the cursor then move it to redefine the upper range limit.

 **current upper range limit:** press and hold the left mouse button to lock the cursor then move it to redefine the lower range limit.

This function is useful when you want to limit the range inside holes.

 changes current vertical position of the rod tip

3.1.2.7.4 Instrument view



 moves the traverse unit right. Press and hold left mouse button to move the traverse unit, release the button to stop the traverse unit.

 moves the traverse unit left. Press and hold left mouse button to move the traverse unit, release the button to stop the traverse unit.

 raises the rod. Press and hold left mouse button to raise the rod, release the button to stop the rod.

 lowers the rod. Press and hold left mouse button to lower the rod, release the button to stop the rod.

3.1.2.7.5 Set / move axis

From this interface is possible to set the value of the current position of the translation unit or to move it to a given position:

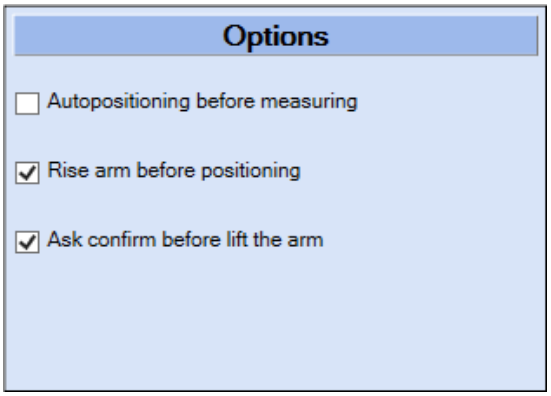
With the text box next to the button 

is possible to set the value of the current position. Insert the value then click the button to confirm.

With the text box next to the button 

is possible to move the axis to a given position. Insert the value, then choose if the value is relative or absolute, then click the button to move the translation unit.

3.1.2.7.6 Options



Autopositioning before measuring: the rod is repositioned automatically to the start of measure point before starting the measure.

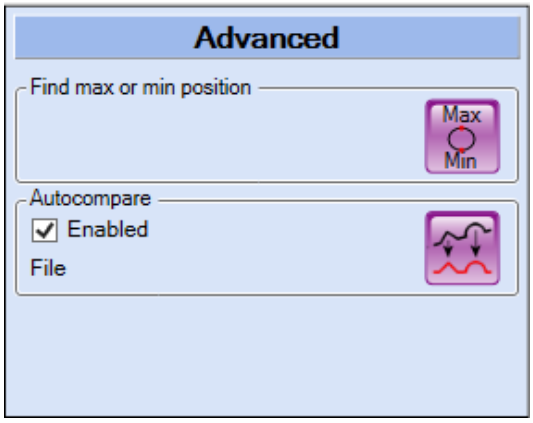
Rise arm before positioning: the rod is rised to its upper position before making the movement of the traverse unit.

Ask confirm before lift the arm: the program will ask the operator if he want the rod to be rised before moving the traverse unit.

Append measurements: when this option is enabled, it allows to insert many measurements in the same file. When the measurements end, the program asks if the next one has to be appended to the current one. The file will contain all the appended measurements in a single file.

Note: When this option is enabled in a profilometer with motorized vertical translator, the vertical translator movement is disabled until the user terminates to append measurements.

3.1.2.7.7 Advanced



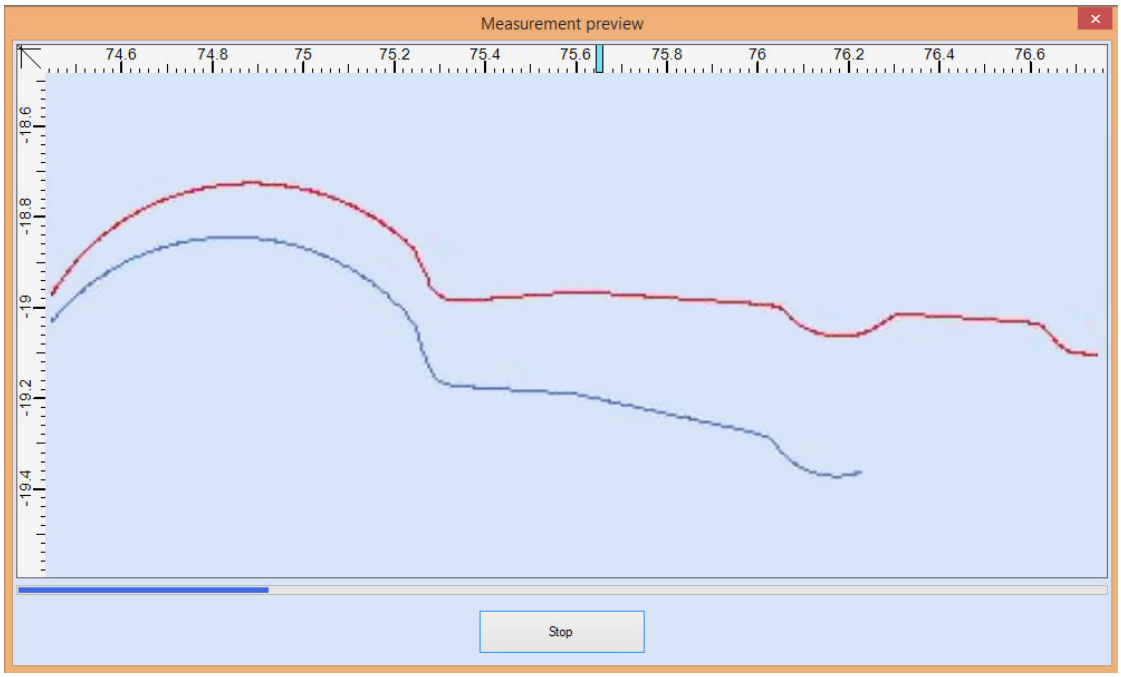
Autocompare: activates the **auto-compare** function. It works in this way:

1. Click on the check-box to activate this option.

   Select the file that you want to set as the reference profile: press the  button and search and select the reference file by pressing Load button.

2. The name of the file you've just chosen will be displayed under the option check box.

Every time you perform a measure, the preview will change reflecting the new option that you have activated:



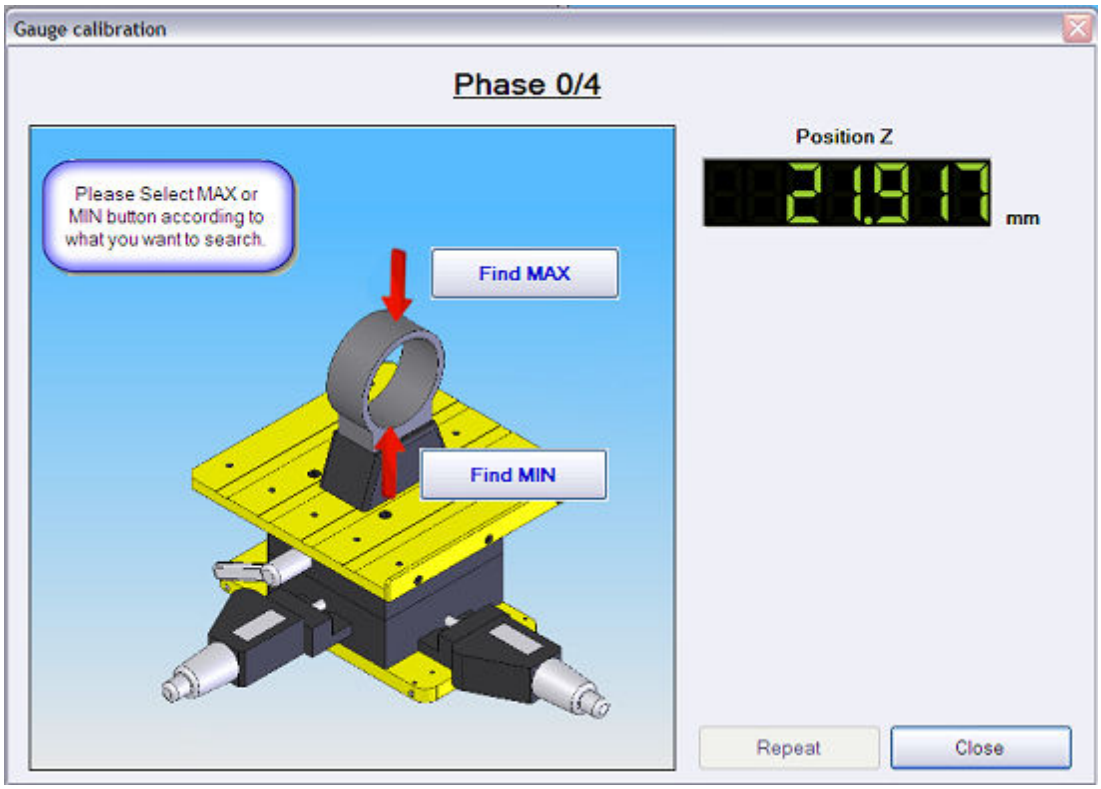
In this case the reference profile is also displayed (in red) so you can see the difference between it and the new profile being acquired.

At the end of the measure the new profile data and the reference profile data will be automatically compared. (see profile comparison function).

Find max or min position: this function is useful when you make measurement on curved surfaces like for example ring pieces. To perform this function you need to use a linear stage with X-Y micrometrical axial movement then follow these steps:

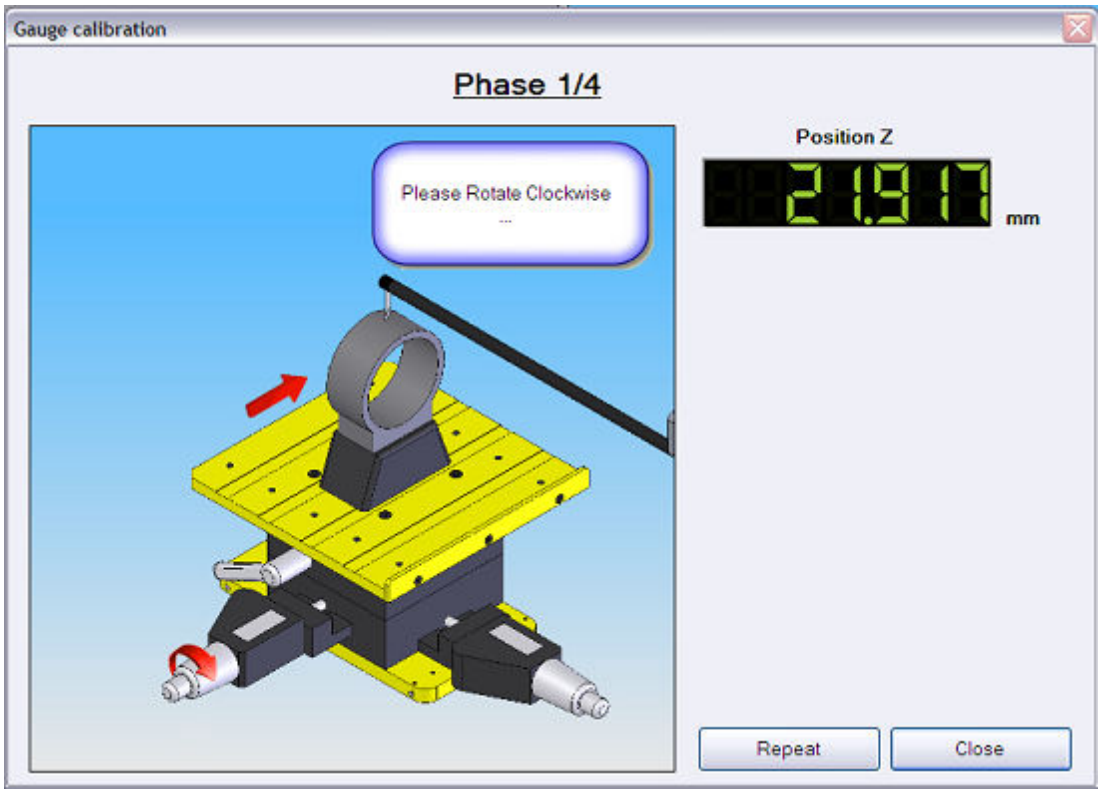
1. press the button 

to activate the function.
2. The following window will be displayed:



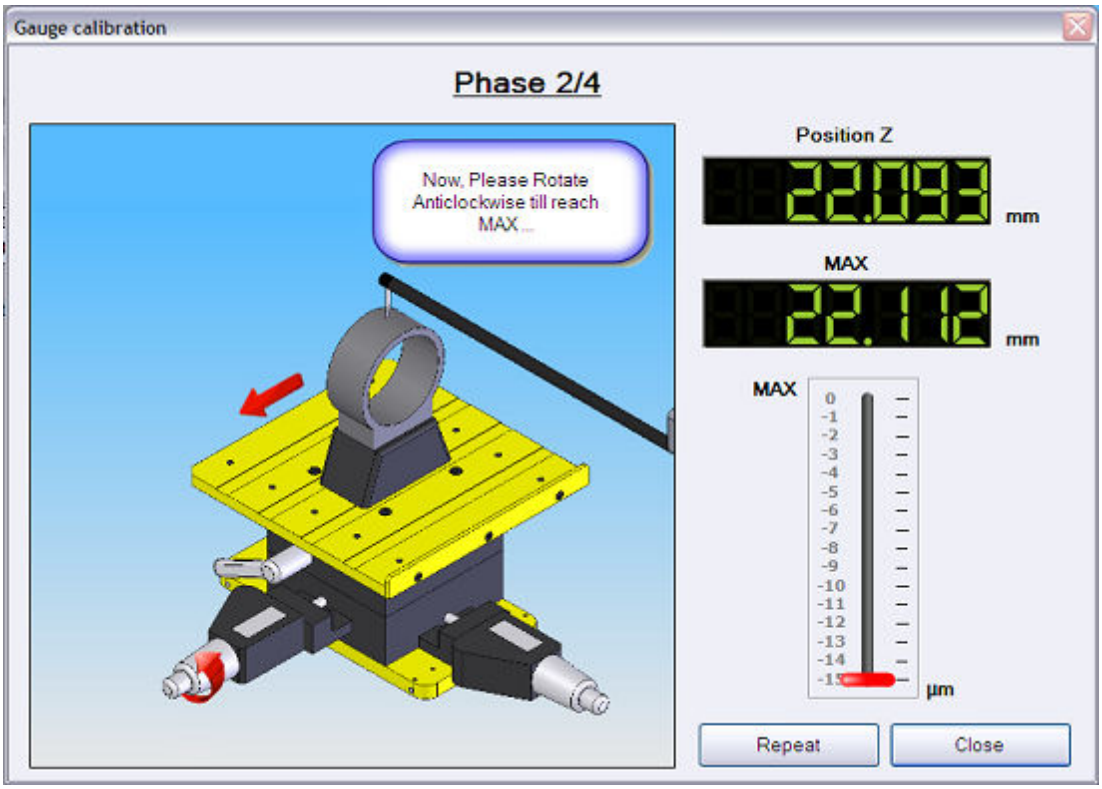
Press the **find MAX** button if you want to select the find max point procedure, otherwise press **find MIN** button if you want to select the find min point procedure.

3 If you select the first option the following window will be displayed:

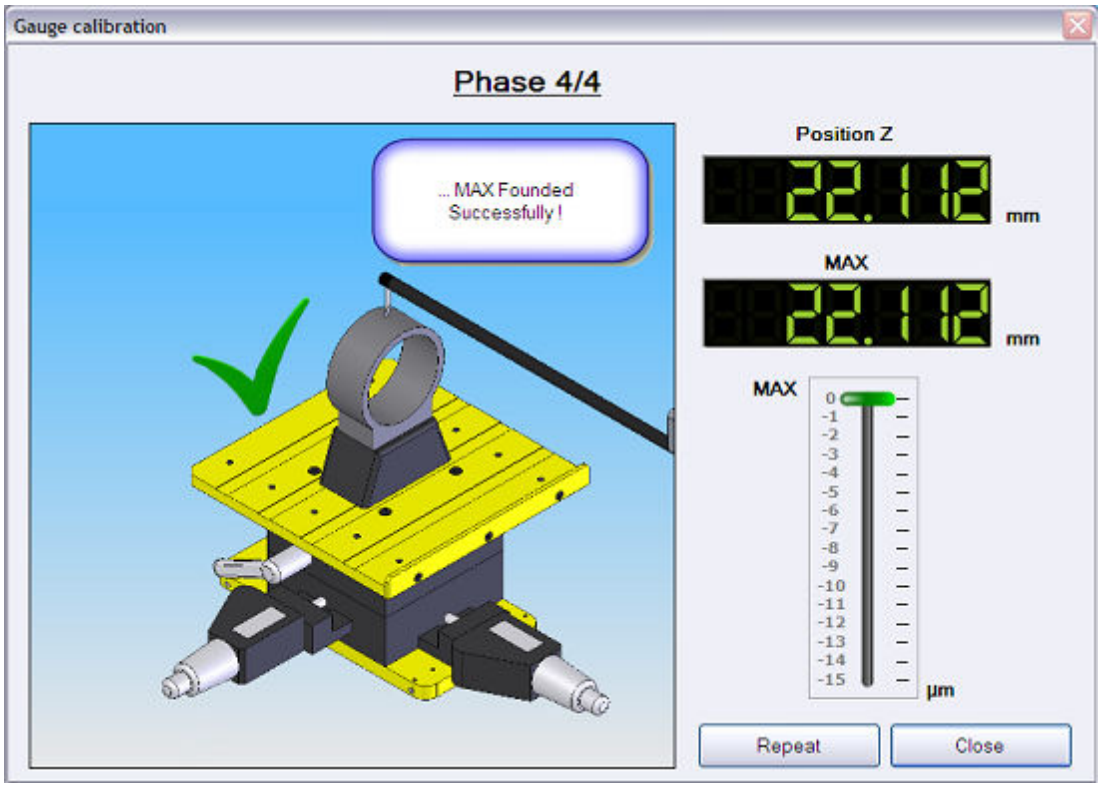


Position the stage and the rod tip as in figure, the rod tip must be near the piece max point and at the left of it. Move the stage toward right by rotating clockwise the proper knob, when the correct position has been reached the following window will be displayed:

4



Move the stage back toward left by rotating anticlockwise the proper knob, when the indicator reaches the **MAX** position the procedure is completed and the following window will be displayed:

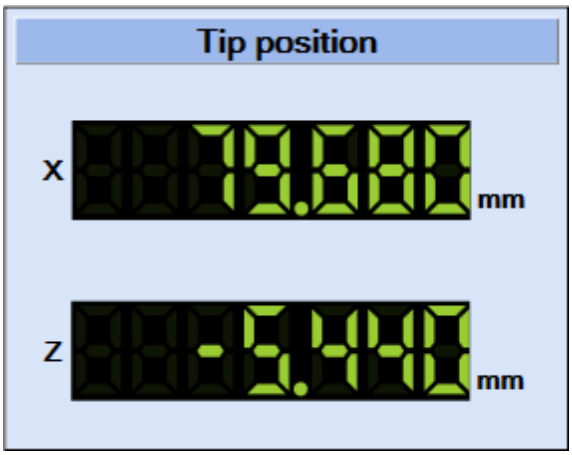


Press **Close** to terminate the procedure.

If you want to search for the MIN point you have to follow the same procedure except the position of the rod tip that, if we use for example the same piece, must be inside the ring near its lower point and at the left of it.

If you want to exit from this procedure at any time you can press **Close.**
If you want to repeat the procedure from the start at any time you can press **Repeat.**

3.1.2.7.8 Tip position



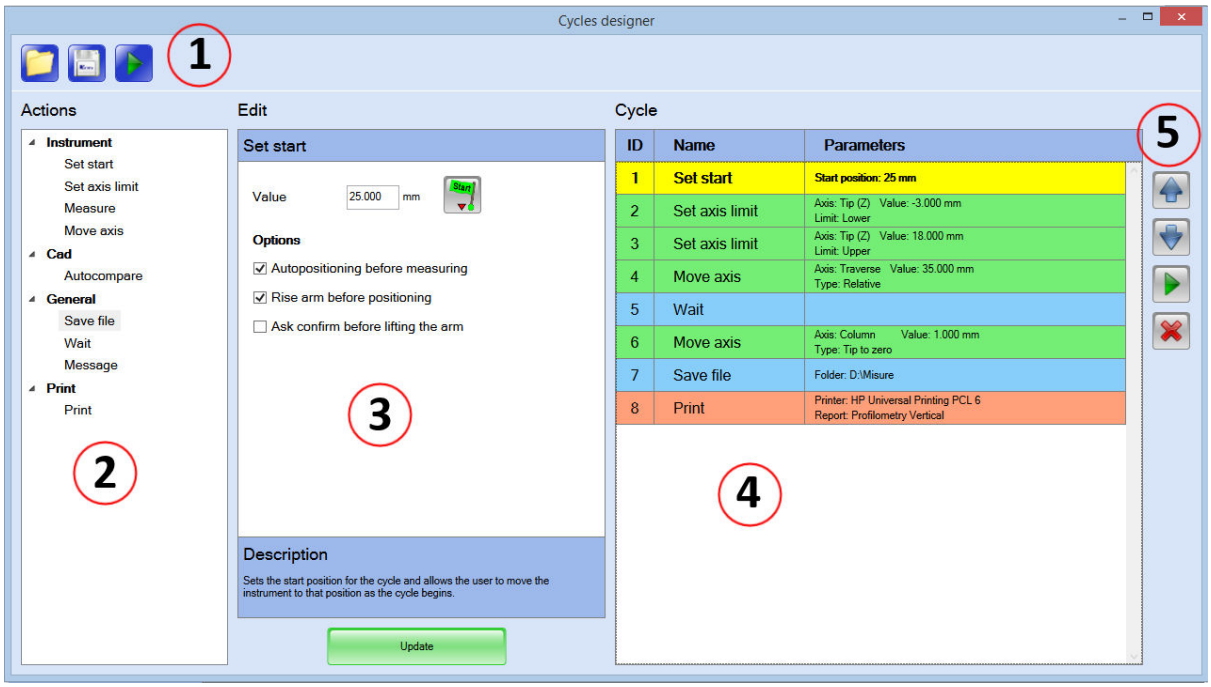
These are respectively the X and Z position of the rod tip.

3.2 Measurement Cycles

Through the measurement cycles it is possible to create fully automatized sequences of events to speed up as much as possible the repetitive data acquisition operations.

Measure cycles management is performed in two steps: first the cycle is created with the designer, then with the execute cycles window it is possible to run a previously created cycle.

3.2.1 Designer



The editor window is used to manage the creation of a measurement cycle.

It is composed of essentially four main areas (as indicated in figure):

1. Toolbar
2. Actions list
3. Actions editor
4. Actions sequence
5. Actions sequence control buttons

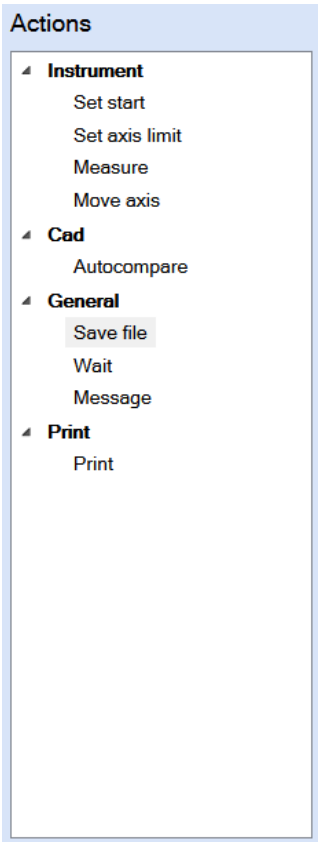
3.2.1.1 Toolbar

 Lets the user load a measurement cycle previously saved so it can be modified.

 Lets the uset save on disk the current measurement cycle.

 Lets the user to run the current measurement cycle to verify its functioning before saving it.

3.2.1.2 Actions list

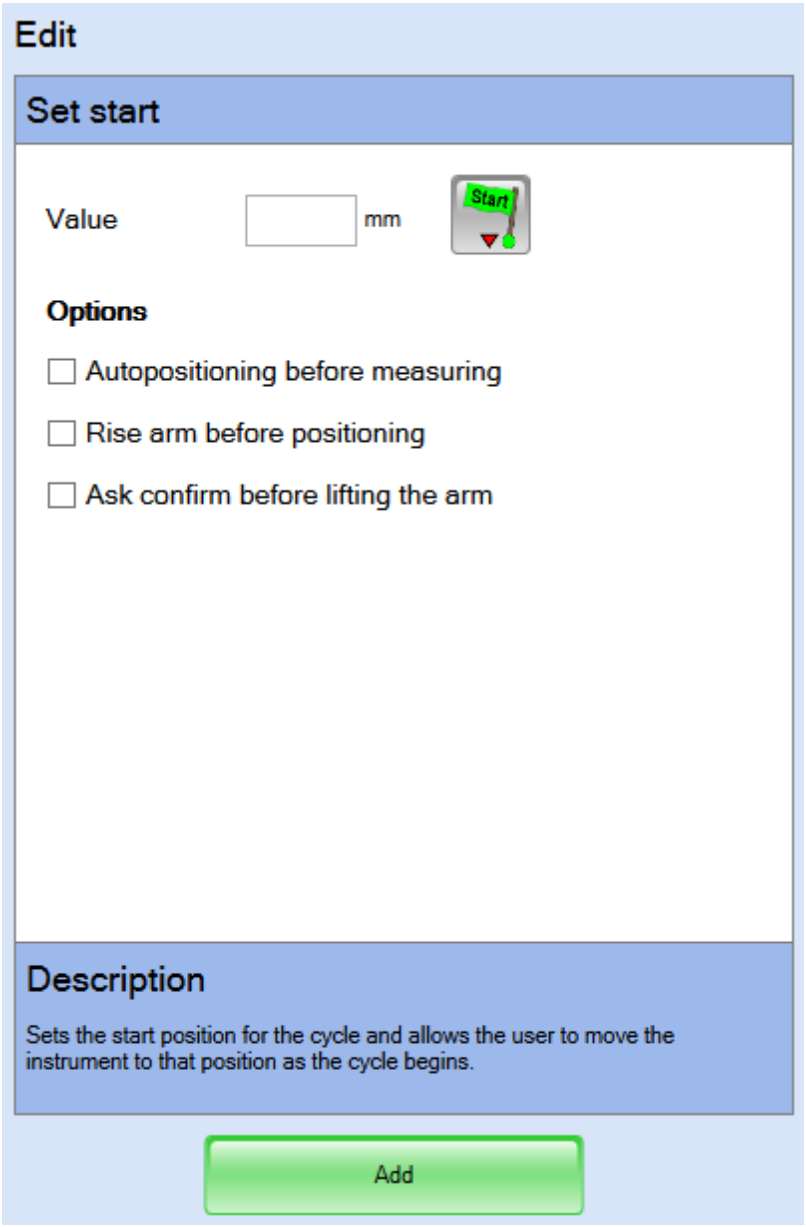


Each measurement cycle is composed by one or more actions, the actions list is used to insert actions inside the measurement cycle. When an action to be inserted is selected, the parameters belonging to that action are automatically displayed inside the actions editor.

The actions that can be inserted are grouped by categories: **Instrument**, **CAD**, **General** and **Print.**

1. Set start
2. Set axis limits
3. Measure
4. Move axis
5. Autocompare
6. Save file
7. Wait
8. Message
9. Print

3.2.1.2.1 Set start



Set the starting position of the next measure and gives the operator the possibility to choose if he wants to move or not to that position before measuring.

For this action we have the following parameters:

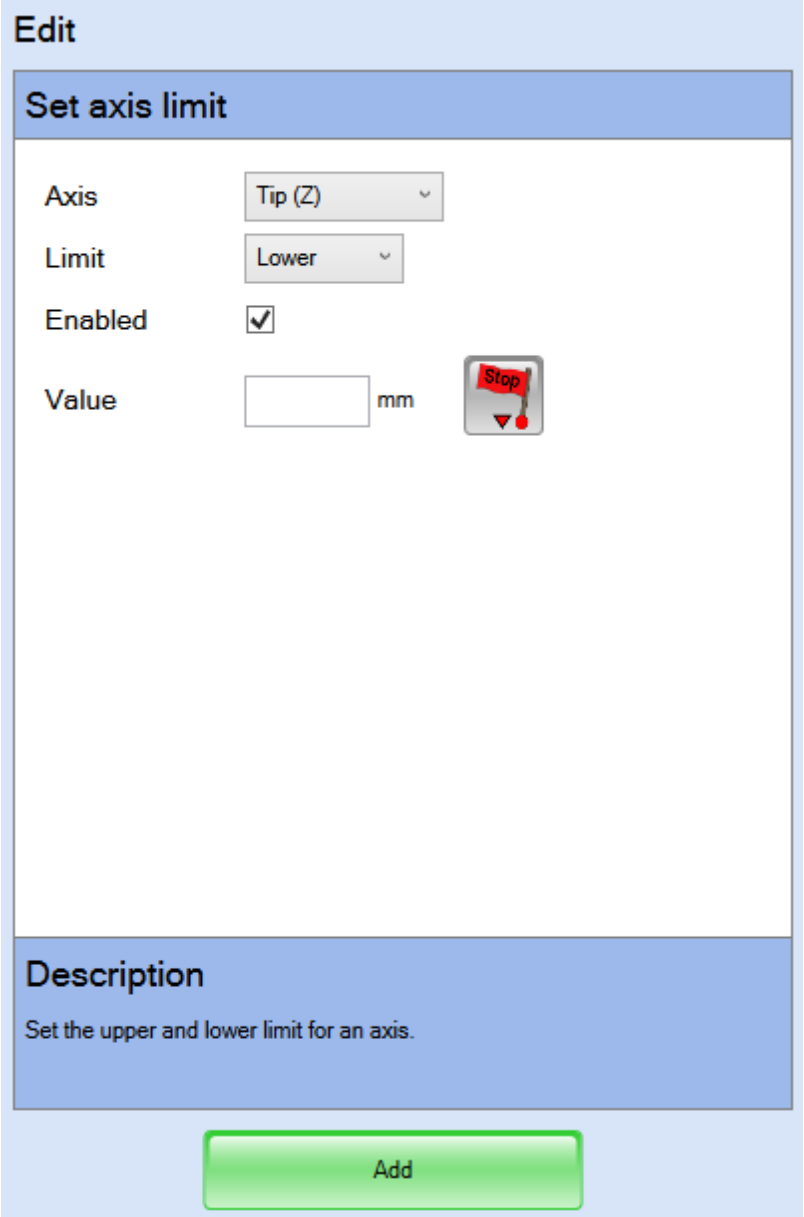
1. **Value -** represents the value of the measure starting position, it is possible to manually insert the value in the appropriate text box or establish automatically the value according to the current

traverse unit position by pressing 

button.

2. **Autopositioning before measuring -** make the traverse unit moving automatically to the start measure position before starting the measure without asking anything to the operator.
3. **Rise arm before positioning -** shall ensure that the arm will be automatically raised before performing the positioning of the traverse unit.
4. **Ask confirm before lifting the arm -** a message is displayed to the operator where is asked to confirm to proceed with the arm lifting.

3.2.1.2.2 Set axis limits



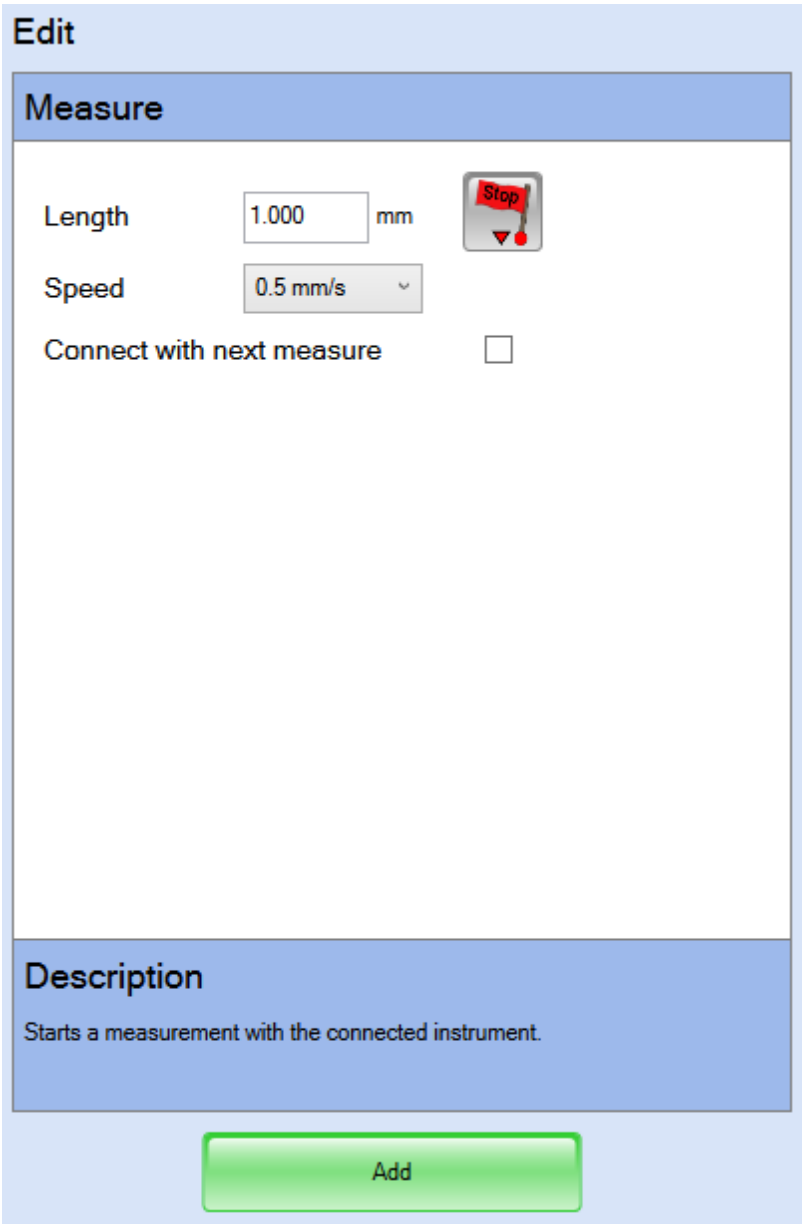
Lets the user to apply physical limits on an axis: these are the limits that will be respected during positioning and the next measures.

For this action we have the following parameters:

- **Axis -** represents the measurement axis on which we will apply the limit.
- **Limit -** inferior or superior.
- **Enabled -** enables/disables the limit for the selected axis.
- **Value -** represents the value of the limit, it is possible to manually insert the value in the

appropriate text box or establish automatically the value according to the current arm position by pressing  button.

3.2.1.2.3 Measure



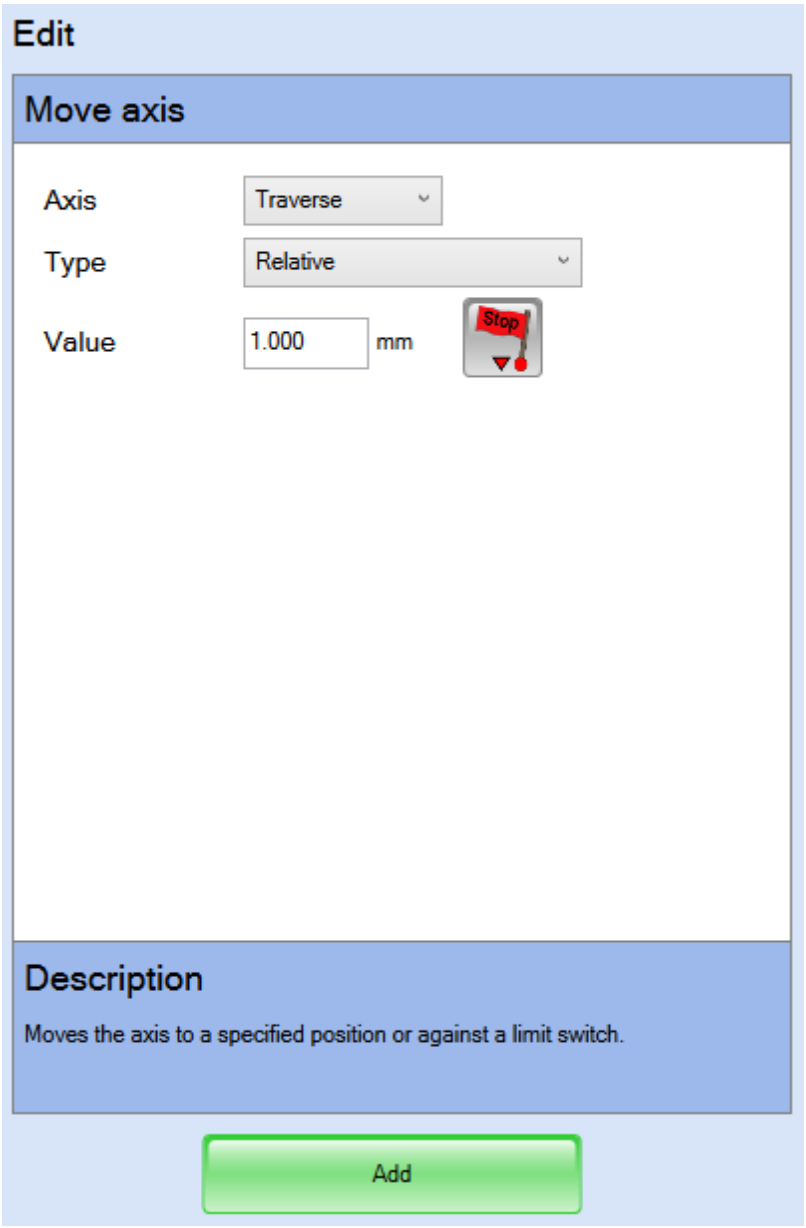
Lets the user performing a measure, at the end of which a CAD file will be generated as at the end of the measurements started from the instrument interface.

For this action we have the following parameters:

- **Length -** represents the value of the measure length, it is possible to insert manually the value in the appropriate text box or calculate automatically the value starting from the current position by pressing 

button: it is considered as starting position the position of the traverse unit reached after the last action and as end of measure point the current traverse unit position.
- **Speed -** the measuring speed.
- **Connect with next measure -** this measure and next measure will be treated as a single measure.

3.2.1.2.4 Move axis



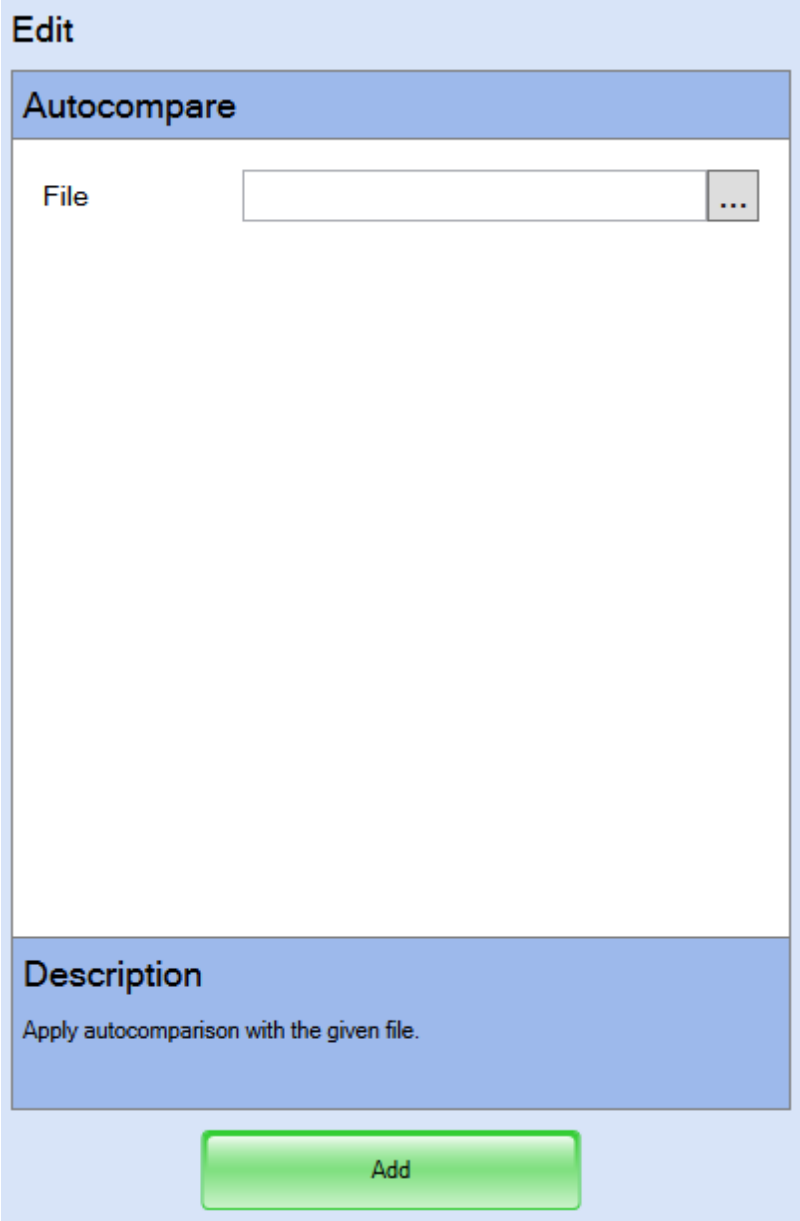
Lets the user perform a positioning for a given axis.

For this action we have the following parameters:

- **Axis -** represents the measure axis on which we will perform the positioning.
- **Type -** represents the movement type, it is possible to choose between absolute, relative against the positive and negative limit switch and, when the measuring column is selected, also the movement in contact with the piece (tip to zero). If you choose absolute the selected axis will be moved in the position defined by the **value** parameter**,** if you choose relative the selected axis will be moved of a value equivalent to the position defined by the **value** parameter, starting from the last position of the axis before the movement. If you choose the movement against the positive or negative limit switch the selected axis will be moved automatically in the position corresponding to one of the two limit switches. If you choose the movement in contact, the column will be moved to the position where the arm tip will be in contact with the piece to be measured.
- **Value -** represents the measure of the axis movement, it is possible to insert manually the value in the appropriate text box or establish automatically the value of end of measure according to the axis actual position by pressing 

button.

3.2.1.2.5 Autocompare

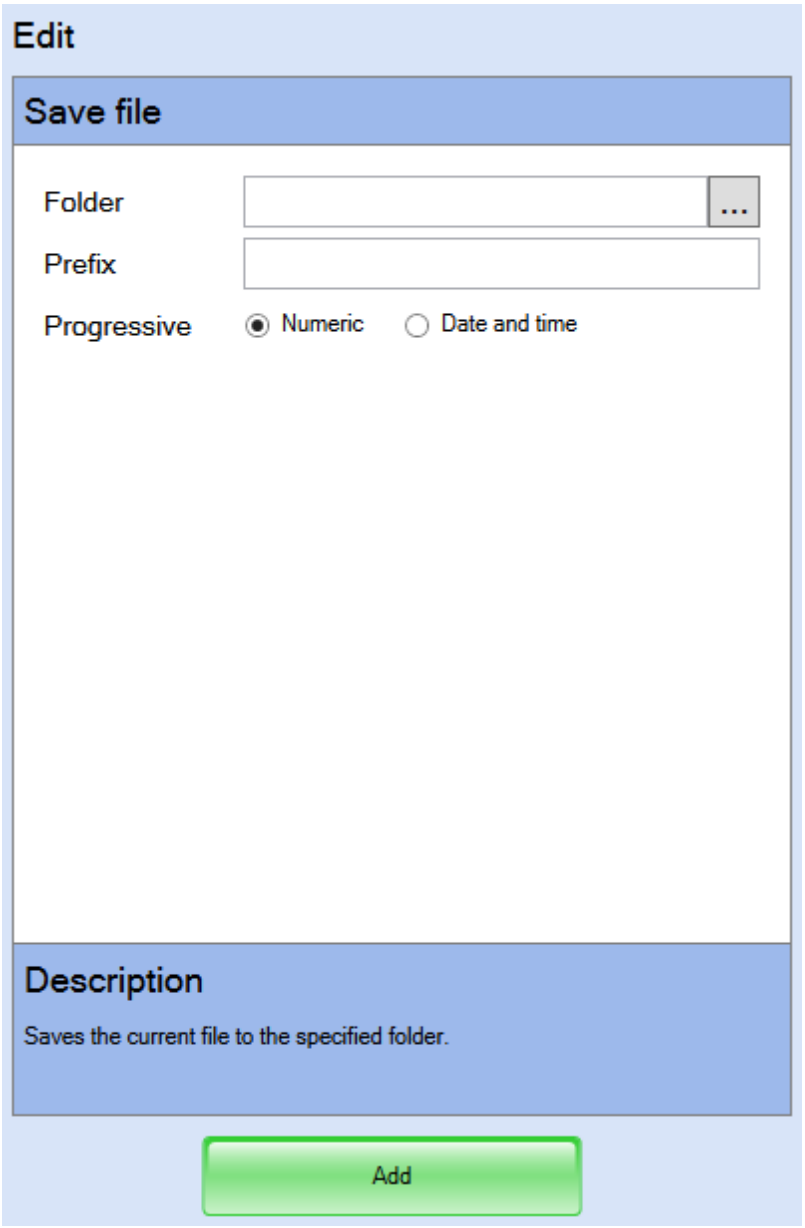


This action lets the user perform the same function on the current CAD: in case of a measurement cycle it is typically used after a measure.

For this action we have the following parameters:

- **File -** represents the profile file that is used as reference for the autocompare function.

3.2.1.2.6 Save file



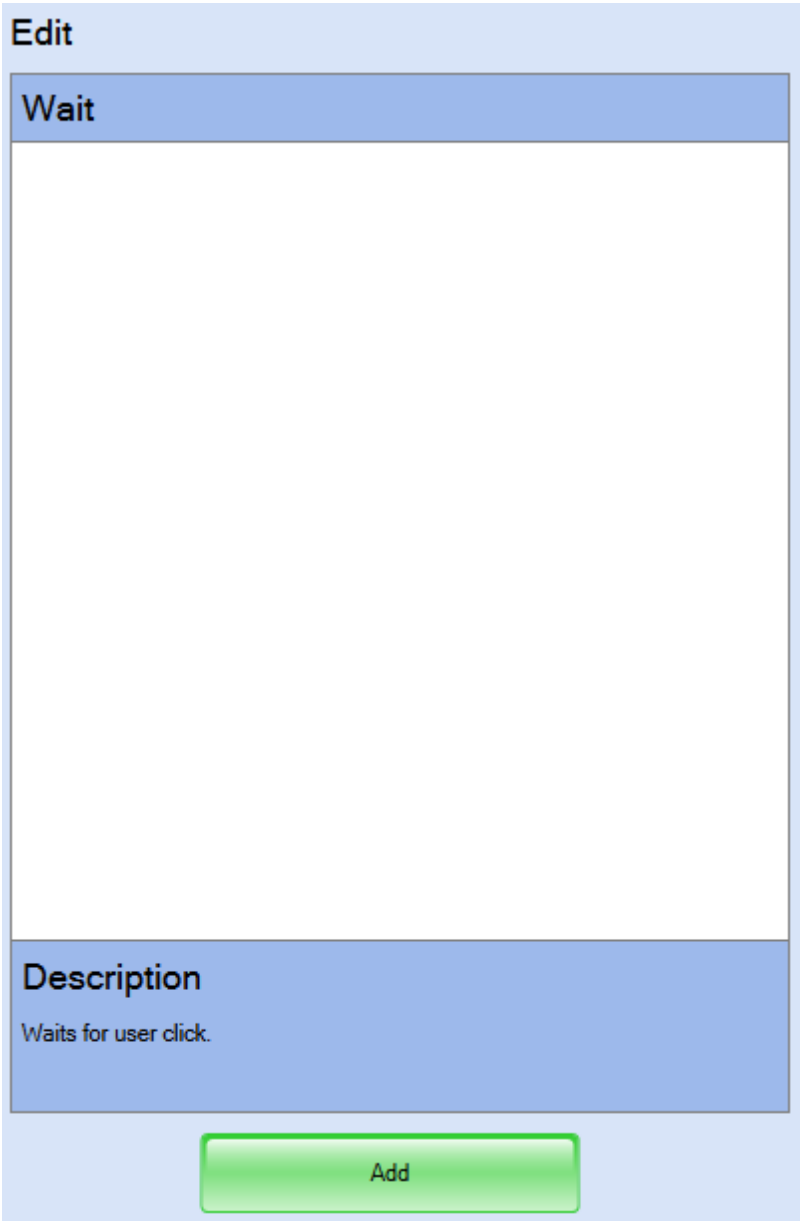
Saves current file in a specified folder; this action is typically used after a measure.

For this action we have the following parameters:

- **Folder -** represents the position on disk where the measured data will be saved.
- **Prefix -** the first part of the file name.
- **Progressive -** the second and last part of the file name, it is automatically generated by the software and is possible to choose between **Numeric,** where an increasing progressive number is automatically assigned **,** or **Date and time,** where current date and time are automatically

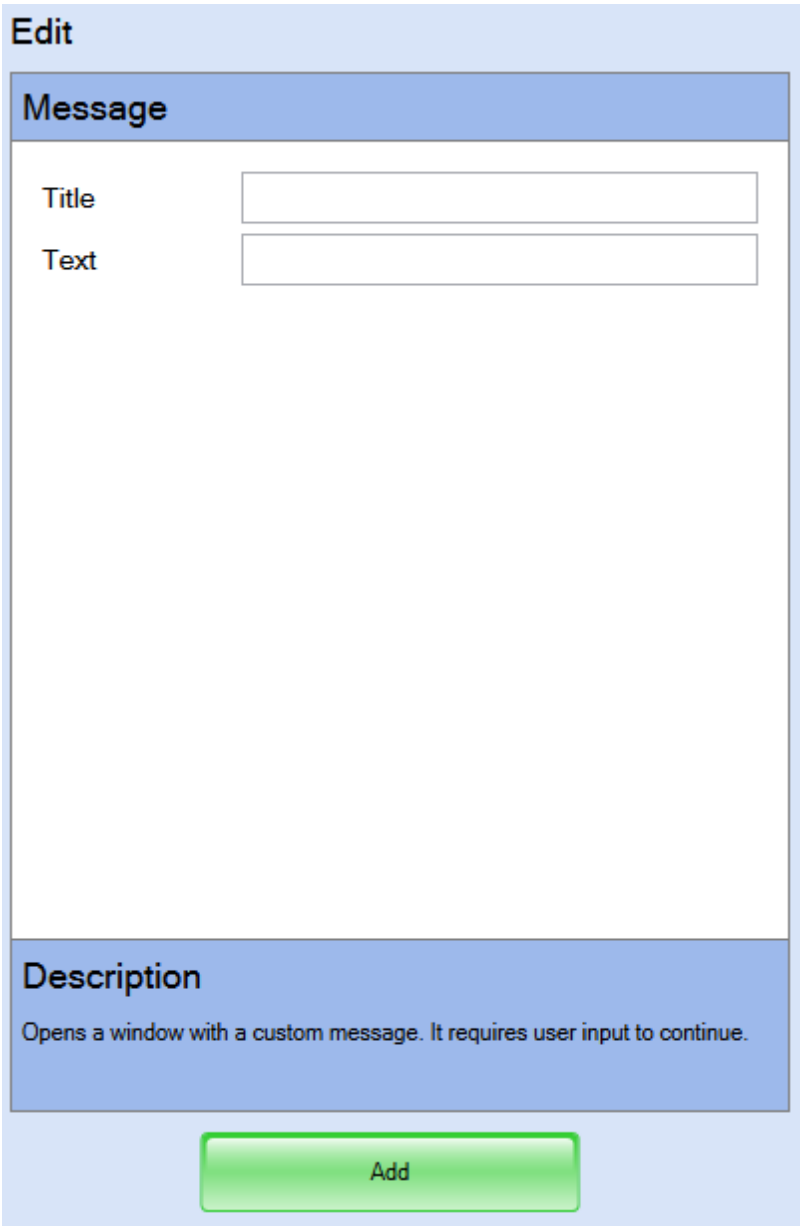
inserted.

3.2.1.2.7 Wait



This action displays a message window and is used to take a break inside the cycle, i.e. for replace a piece. The break is terminated when the operator clicks on the button. This action does not involves any parameters.

3.2.1.2.8 Message



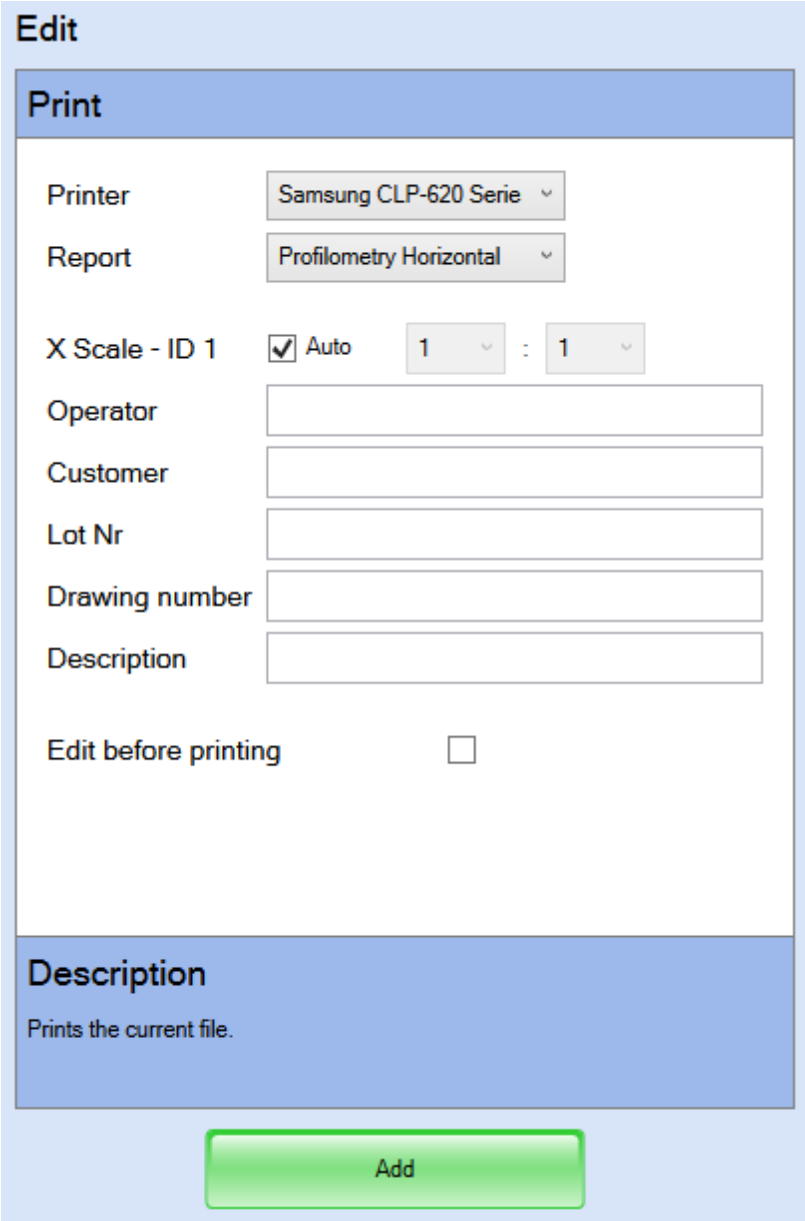
This action opens a window showing a customized message to the operator: it can be used to give informations to the operator before measuring or positioning, i.e. to move or replace the piece to be measured.

For this action we have the following parameters:

- **Text -** the text contained in the message.
- **Caption -** the title of the message.

Also in this case a confirmation by the user is necessary to proceed with the cycle.

3.2.1.2.9 Print

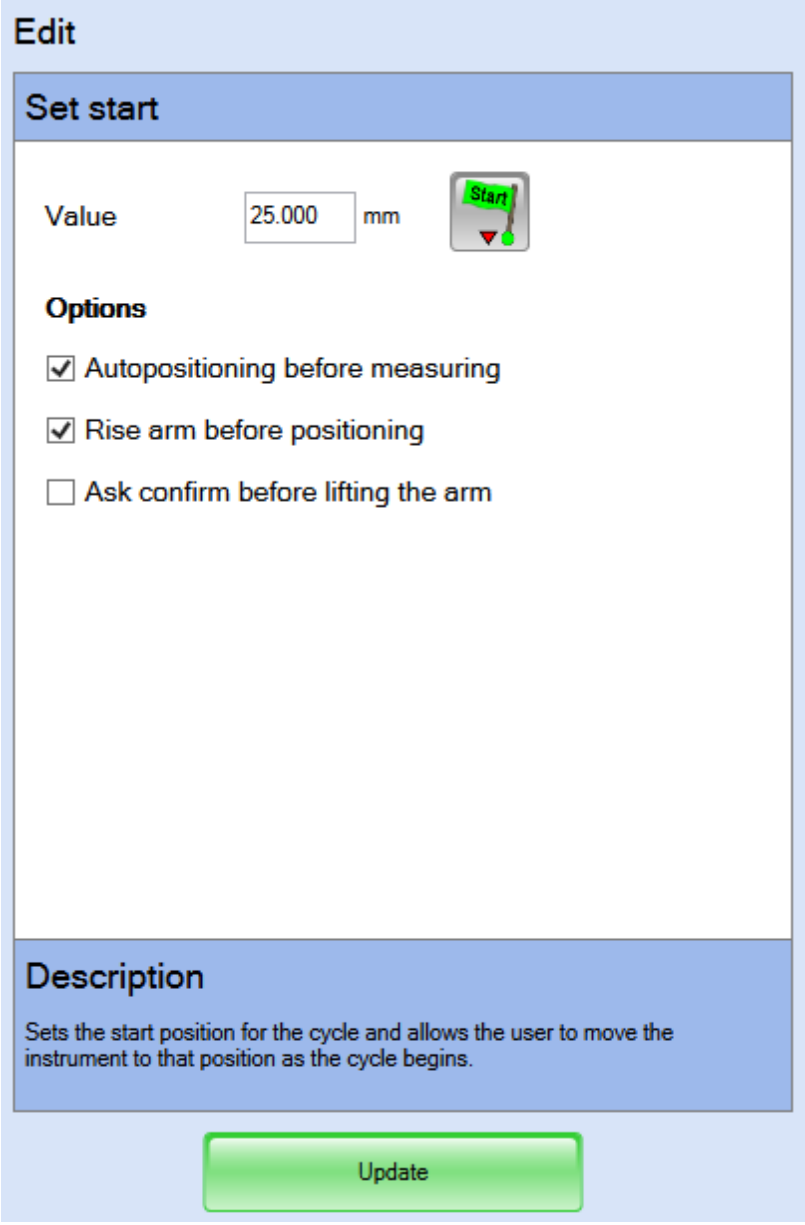


It is used to print the report of one or more cycle measurements. If the selected report contains more than one measure (see print dialog), the system uses those belonging to the cycle following the order in which they have been performed.
If no measurements have been done before the printing action, the current CAD report is printed.

For this action we have the following parameters:

- **Printer -** represents the printer to which the print report will be sent.
- **Report -** the print reports list, is referring to the list in print dialog.
- **List** of print heading parameters contained in the selected report (depends on the previous choice) .
- **Edit before printing -** if active, before starting the printing, a window is displayed to the user in which the user can modify again the print report heading parameters.

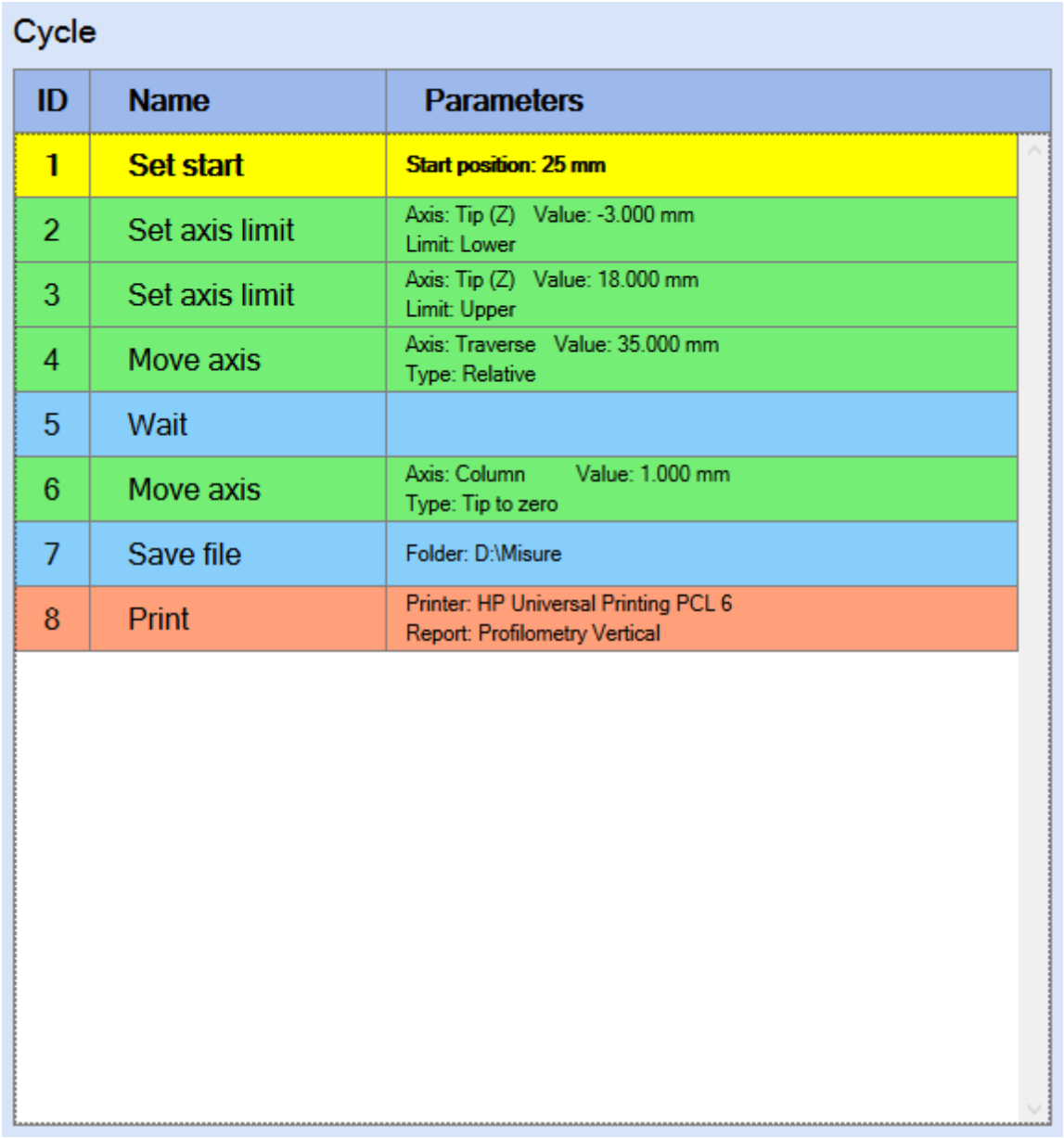
3.2.1.3 Actions editor



The actions editor lets the user to modify the parameters of the selected action. It is mainly composed of two areas: the upper area that is the main body of the editor and contains all the action

parameters, while in the lower part we find a short description of the operation performed by the action itself and a command button that has dual functionality, depending on whether you are inserting a new action in the actions sequence or that you are modifying the parameters of a previously inserted action. In the first case the button lets the user to add the selected action to the existing actions sequence, instead of simply updating the parameters of the selected action inside the actions sequence in the other case.

3.2.1.4 Actions sequence



The actions sequence represents the set of actions that make up the measurement cycle.
Actions are represented inside the list with different colors, according to the category in which they belongs to, as already seen in the actions list.

By using the proper command buttons it is possible to perform some operations on the selected action, such as moving it downward or upward of one position inside the sequence, delete it or directly execute it. To perform any operation on an action it necessary to first select it, by clicking on the desired action with the left mouse button, in this way the selected action will assume a yellow background color indicating that the selection has been done.

3.2.1.5 Actions sequence control buttons

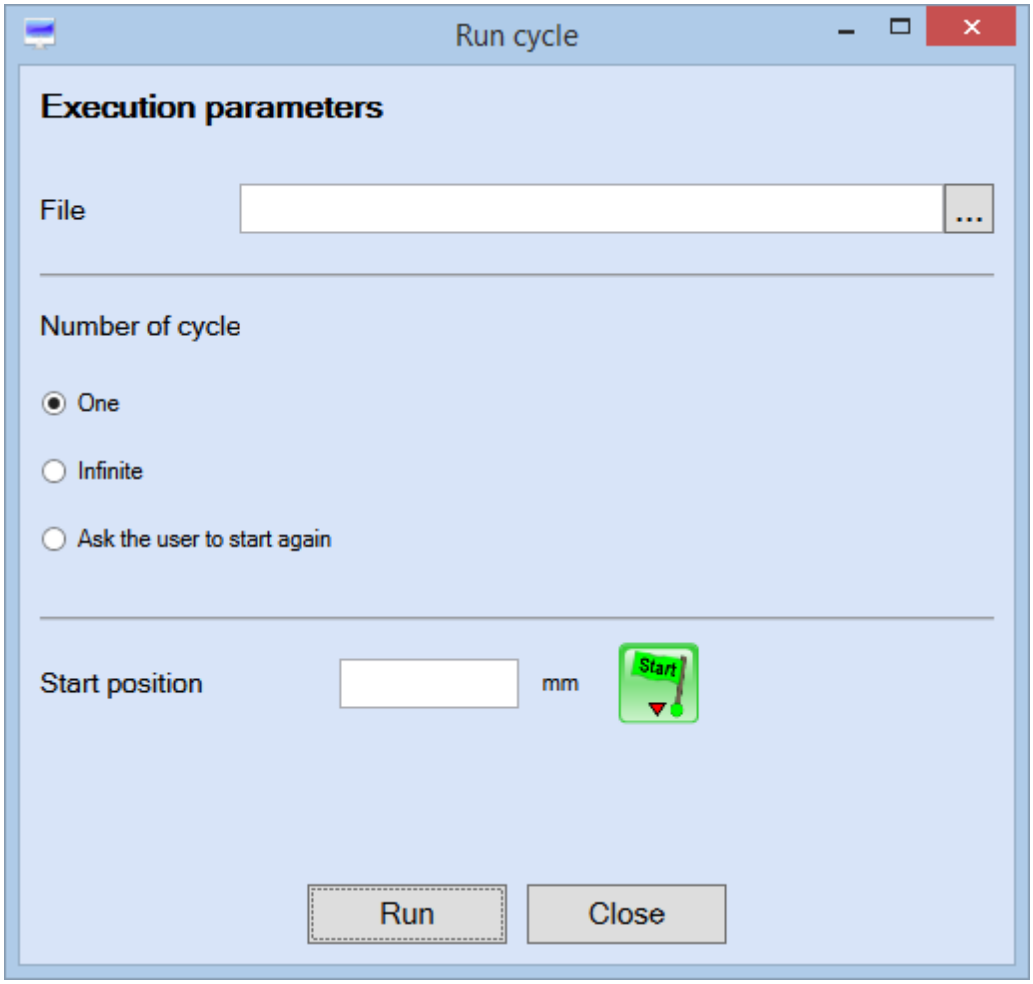
 Lets the user to move upward of one position the currently selected action inside the actions sequence.

 Lets the user to move downward of one position the currently selected action inside the actions sequence.

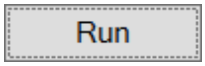
 Lets the user to execute the currently selected action.

 Lets the user to delete the currently selected action.

3.2.2 Run Cycles



The procedure of loading and execution of the cycle is divided in three main phases:

- **Loading -** the previously saved measuring cycle is loaded from disk by pressing  button.
- **Choice of the number of cycles to be executed -** it is possible to choose whether to execute the measuring cycle only once, infinite times or by asking the operator if he wish to execute again the cycle when the cycle itself is finished.
- **Starting the cycle** - by clicking on  button.

Plus a fourth optional that, if defined, replaces the start measure setting previously defined inside the

Set start action**:**

- **Start position -** represents the value of the start measure position, it is possible to insert manually the value in the appropriate text box or establish automatically the value according to the current traverse unit position by pressing 

button.