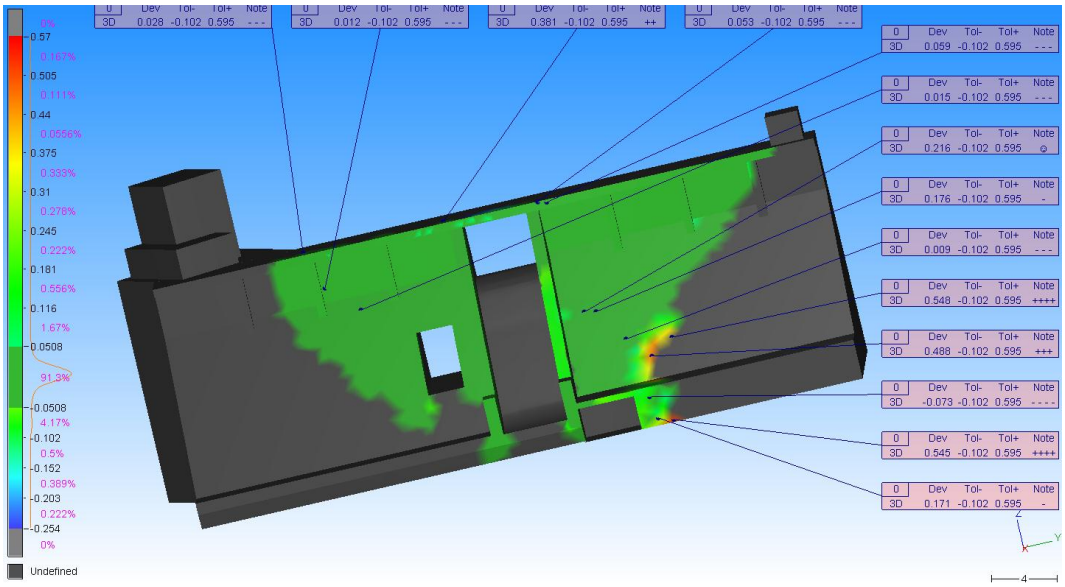
Exercise 3: Best-Fit and 3D Comparison Reshaper V7...



Comparing two shapes or two contours to know the gap or distance between them is required when you want to inspect an imported theoretical geometry with the corresponding measured model or when you want to compare two objects at different times (a DTM for instance).

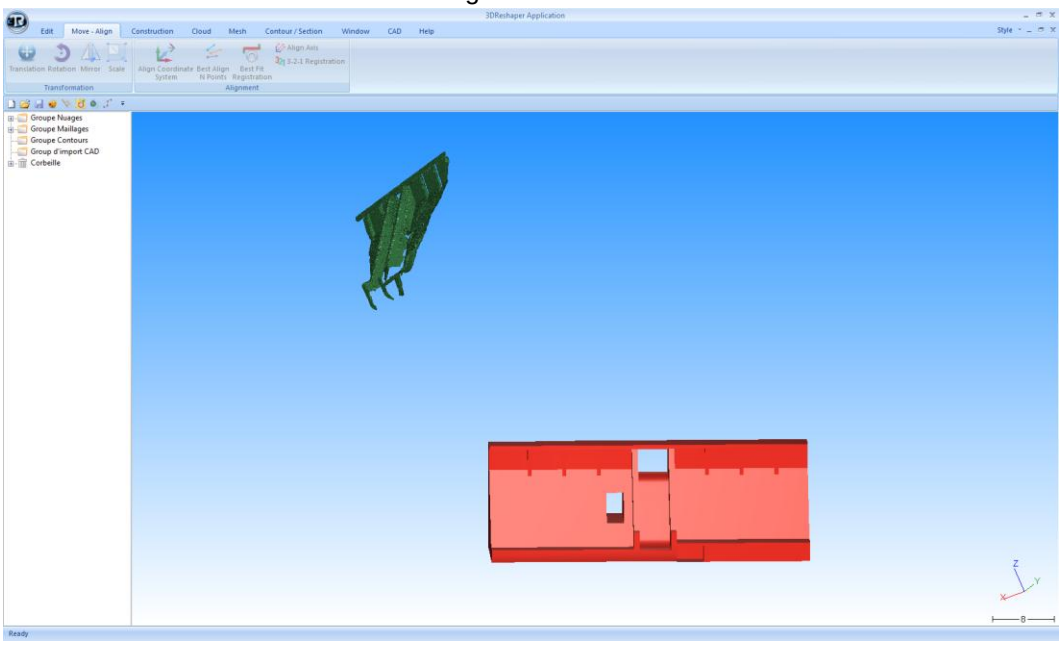
In this exercise, we will see how to align and place two objects in the same coordinate system in order to make a 3D comparison. The process will be as follows:

- Reading the theoretical model inside the software (in case of CAD model, through the IGES or STEP interface).
- Reading the "as built" model from the digitization.
- Alignment or registration of the scan data on the CAD model or the model to compare.
- Performing distance computation and color texture mapping.
- Adding flags or labels.
- 3D inspection report edition or export.

➢ Open the file or Drag and Drop *: 3DReshaper-Practise/3DComparison/HydraulicDam.rsh*

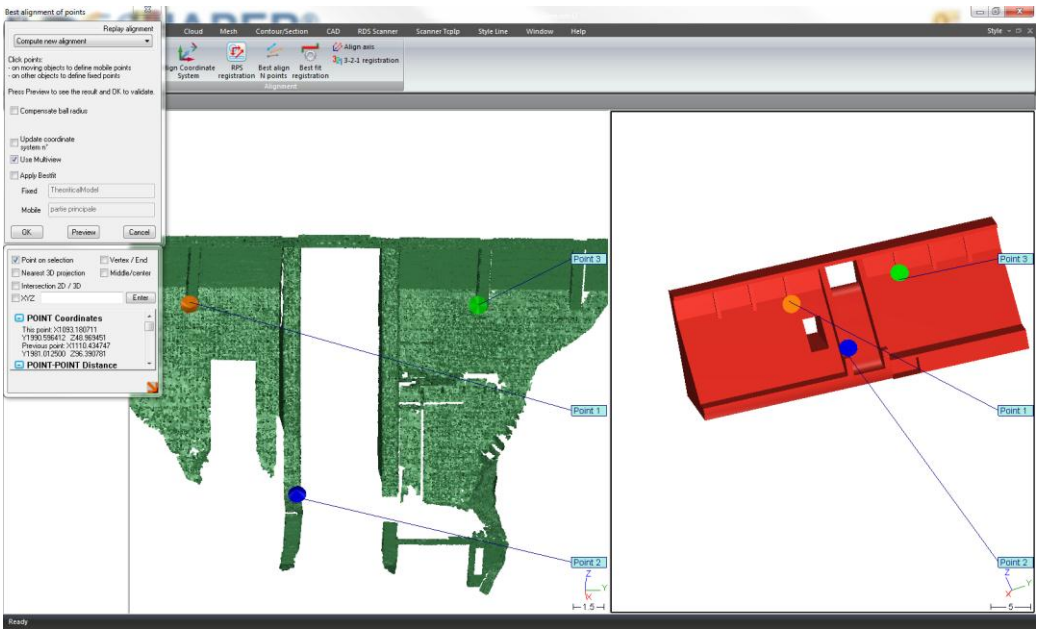
➢ Import the mesh or Drag and Drop*: 3DReshaper-Practise/3DComparison/TheoriticalModel.stl*

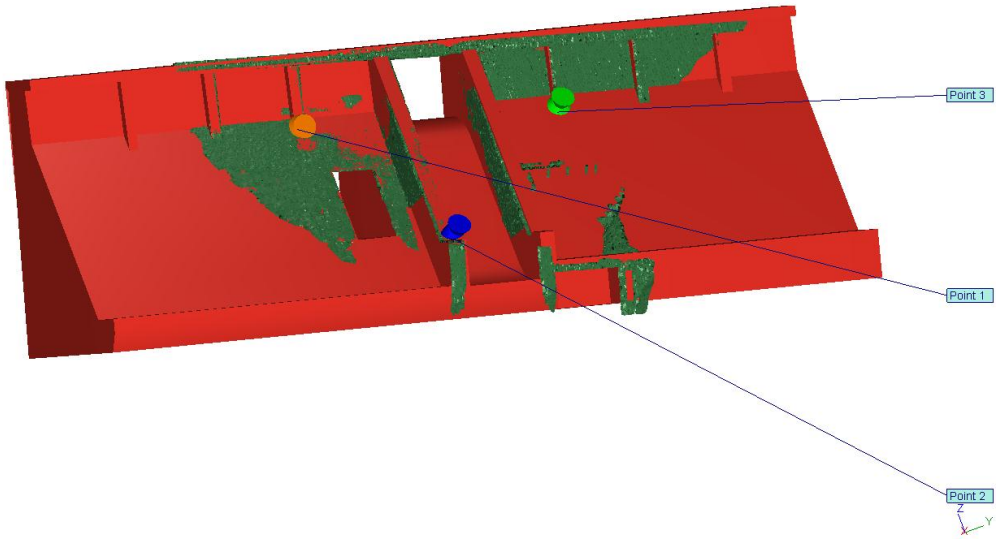
As you can see, the two objects need to be placed in the same coordinate system to be compared. This is why you must do first a manual alignment or a coarse pre-positioning registration and then "Best Fit" that is used to make the fine registration.



➢ Select the point cloud to move / Go to “Move – Align” Menu and “Best align N Points”

This command waits point couples (departure, target) and computes the transformation that minimizes the distance between each departure point and the corresponding target.
With the multi-view mode activated by default, display both objects in easier position to do the coupling (vertical or horizontal view). Make a preview, valid, apply the best-fit (see hereafter) or modify your rough positioning.





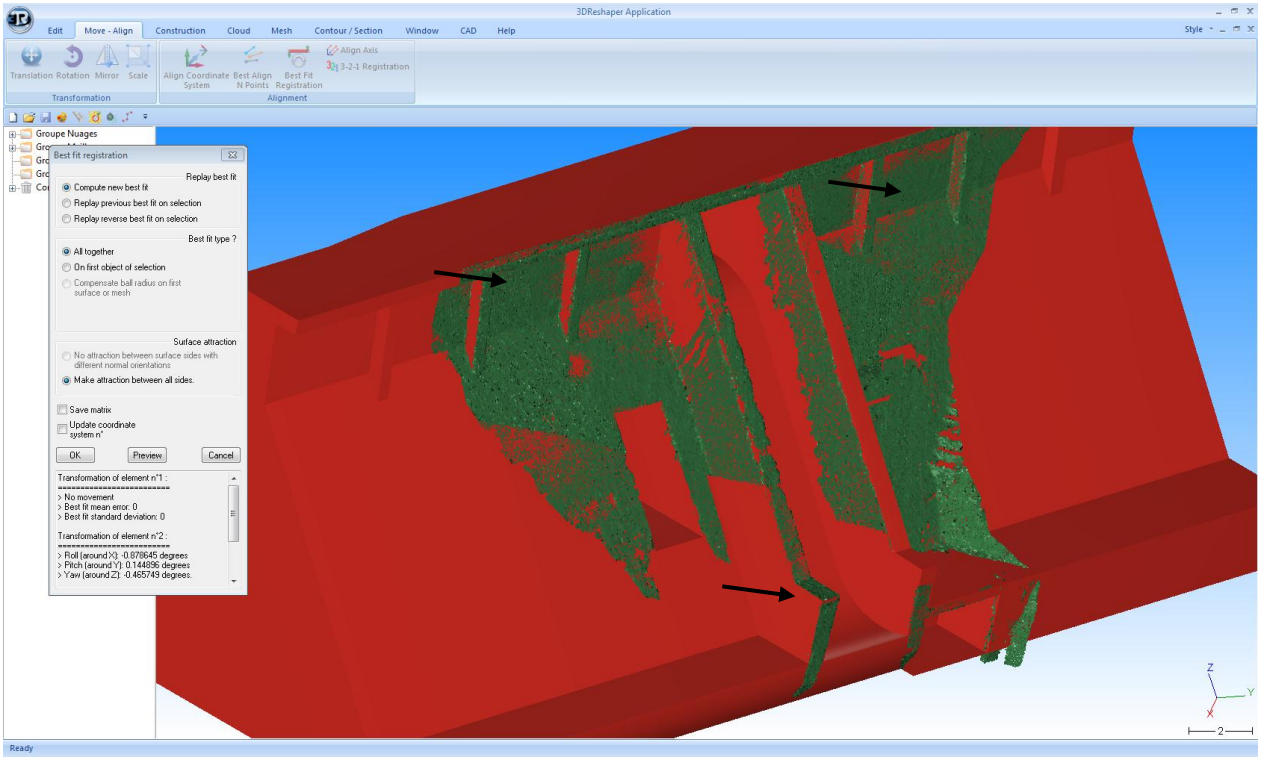
Manual alignment result (the multi-view mode has been disabled)

➢ Apply Best-fit within the “Best align N points” dialog box or Select the two objects and launch the “Best-Fit Registration” command

Once the two objects are approximately registered (there are enough” acceptable” overlapping zones), you can automatically compute the best registration.

This command analyses the overlap of selected objects to calculate the best fit of these objects. Best-fit means the transformation that minimizes the distance with other objects in a least squares sense.

Best-fit registration (the preview displays the transformation information – the arrows clearly shows that the cloud has moved).

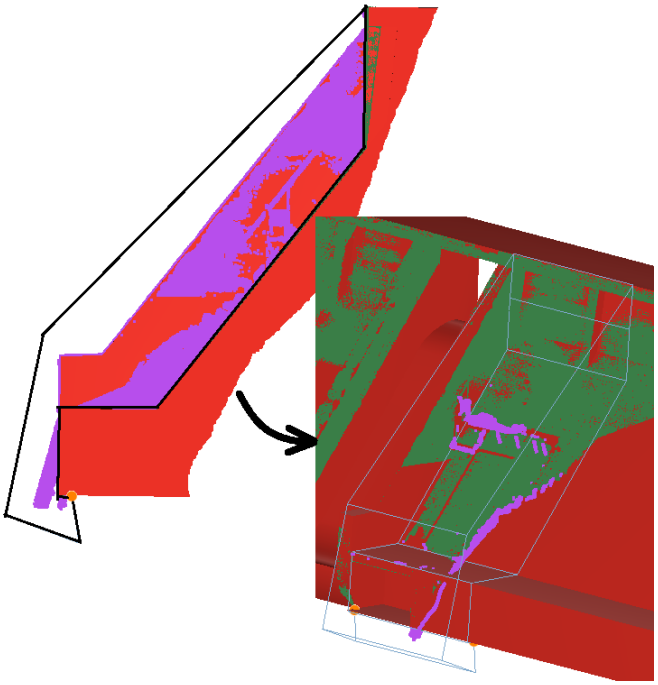


➢ Clean the cloud to remove the aberrant zones.

Once the two objects are in the same coordinate system, we can see clearly that the cloud contains some parts that are not present on the model.

These zones must be removed because they influence the best fit in a wrong way.

- Orient the view with the right button in a grazing direction like on the right picture. To adjust more closely, you can press the ALT key during the view rotation to lower the speed.
- Select your point cloud and launch the command "**Cloud -> Clean**".
- Select the option "Delete inside".
- Make a contour like on the right screen.



- Rotate the view and drag the orange ball to take only the aberrant point inside a certain extrusion distance.
- Validate your cleaning with "**OK**".

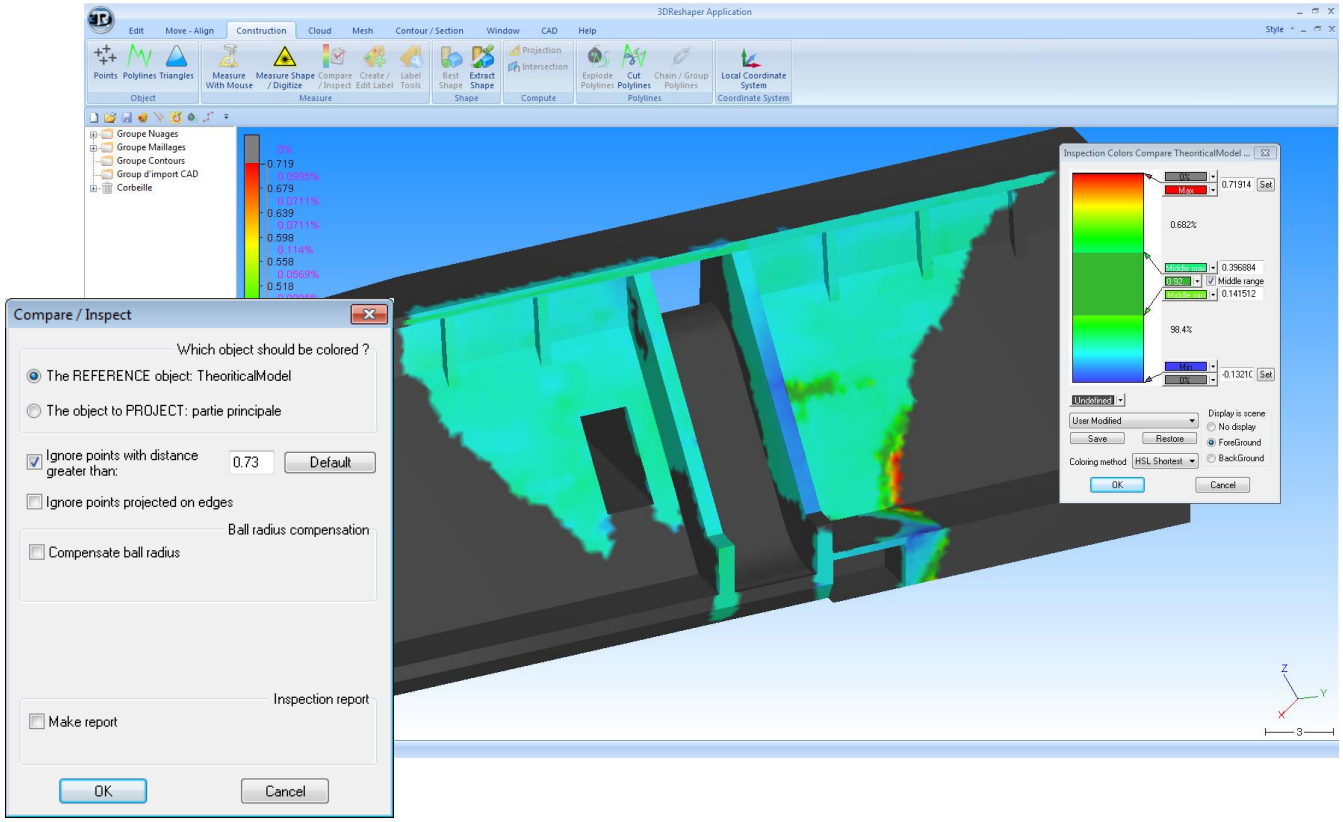
Now the best fit must be executed again and we will obtain a better result after this cleaning.

- Select the STL model first, because it must stay immobile, and the point in second.
- Launch the command "**Move-Align -> Best fit**"
- Select the option "Compute new best fit" and click the button "**preview**" then "**OK**".

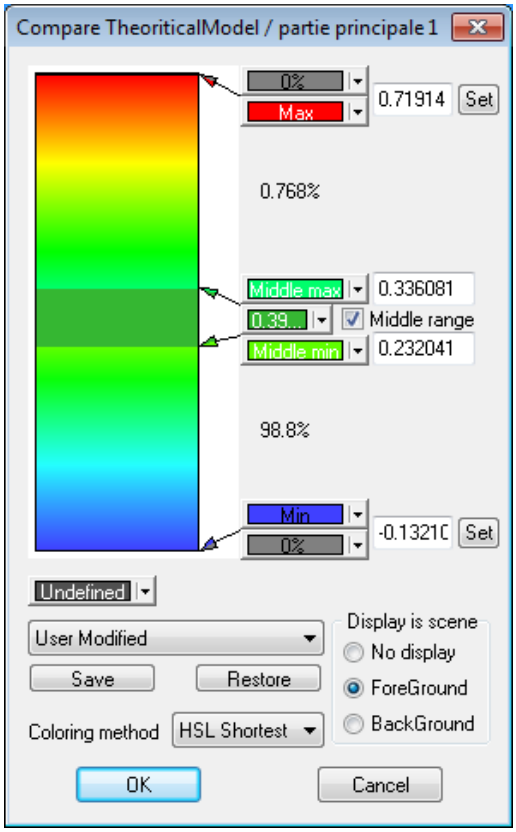
➢ Select the two objects – Go to the Measure menu and launch "Compare and Inspect".

Once the two objects are correctly registered, the 3D comparison can be run. The first entity selected is considered as the reference object. However, you cannot compare two point clouds together (one of them must be meshed).

Choose the objects on which the deviation color map will be (in this case you want to see if the theoretical model fits with the point cloud).



The colored deviation map dialog box displays the following information:



Maximum tolerance (this value corresponds to the maximum point distance), Middle range tolerance and Lowest tolerance).

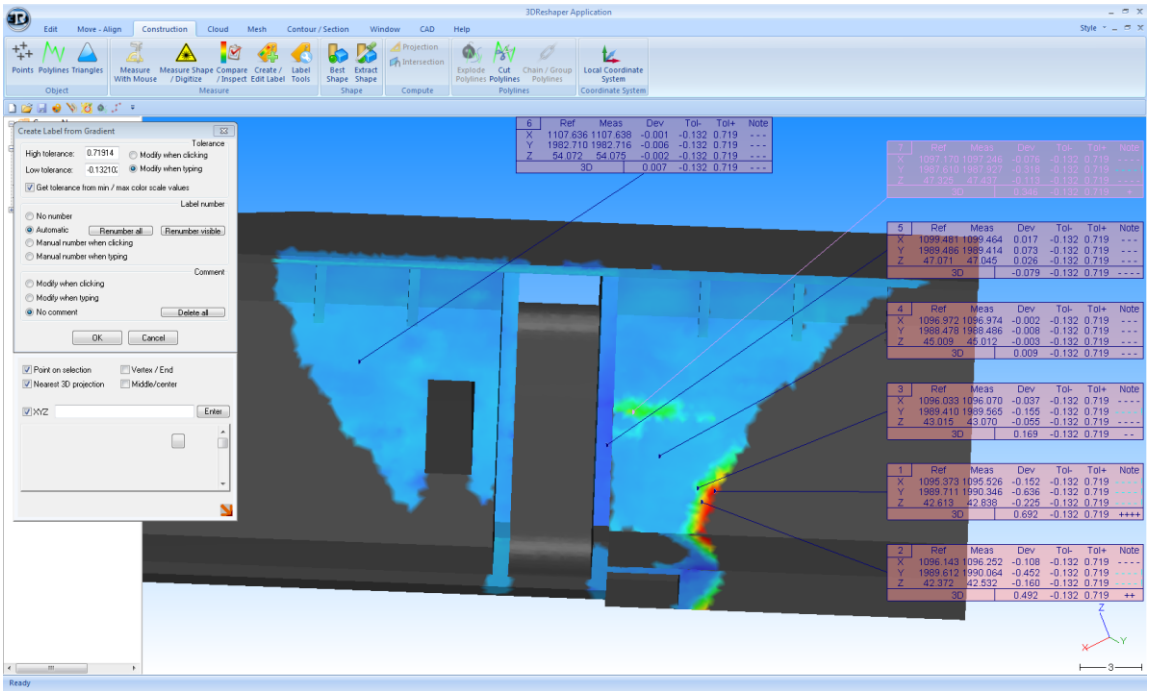
You can adjust each value (using the arrow or entering the value).

You can modify the color or/and reduce the number of graduated colors.

Display the distribution graphic.

➢ Launch “Create – Edit Label” then click on the colored object where you wish to create deviation information labels.

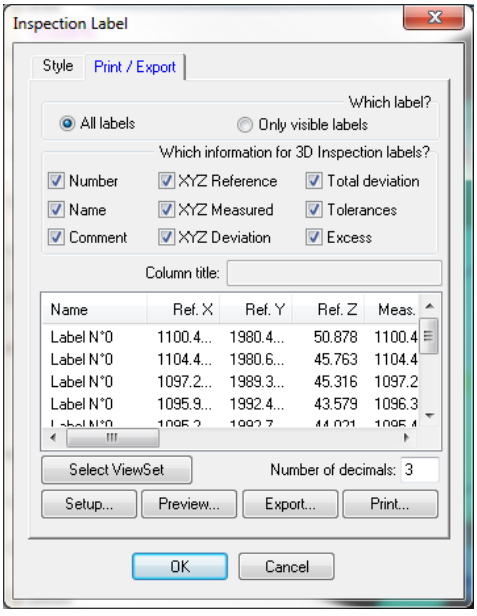
The system searches the reference coordinates, the measured coordinates, the 3D distance. This information of coordinate and distance are completed by the tolerance, label number and comment (depending on the label style).



If you want to **modify several labels together**, for example to set a new tolerance or comment, then, select all the labels you want to modify using the CTRL key or (and) the selection by window and then launch again the command "***Create/Edit Label***".

➢ Launch “Label Tools” to customize, print or export labels.

You can modify the aspect of the labels: size, color, layout …with the tab “Style”.
In the “Print / Export” tab, you can set up the information that will be displayed in the output, customize a report (with the selected data and with one or several views of the inspection, defined beforehand in the Windows menu / Create View set) or export the data.



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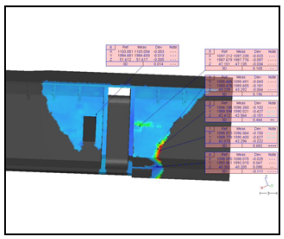

Customer	|?Customer ??|	Product name	|?Product name?|
Drawing number	|?Drawing number?|	Controller name	|?Your name?|

N°	Ref. X	Ref. Y	Ref. Z	Meas. X	Meas. Y	Meas. Z	Dev. X	Dev. Y	Dev. Z	Dev.	Hi.tol	Lo.tol	Excess
1	1095.913	1989.773	42.073	1096.064	1990.400	42.296	0.150	0.627	0.222	0.682	0.719	-0.132	+ + + +
2	1096.158	1989.594	42.412	1096.260	1990.021	42.564	0.102	0.427	0.151	0.464	0.719	-0.132	+ +
3	1095.448	1989.475	43.228	1095.491	1989.655	43.292	0.043	0.181	0.064	0.196	0.719	-0.132	-
4	1098.050	1992.061	40.303	1098.075	1992.015	40.205	0.025	-0.047	-0.098	-0.111	0.719	-0.132	- - - -
5	1097.212	1987.679	47.101	1097.235	1987.776	47.135	0.023	0.097	0.034	0.105	0.719	-0.132	- -
6	1103.051	1984.681	51.612	1103.054	1984.693	51.617	0.003	0.013	0.005	0.014	0.719	-0.132	- - -

You can find more explanation in the help menu (installed beforehand).