Tangram Technical Note

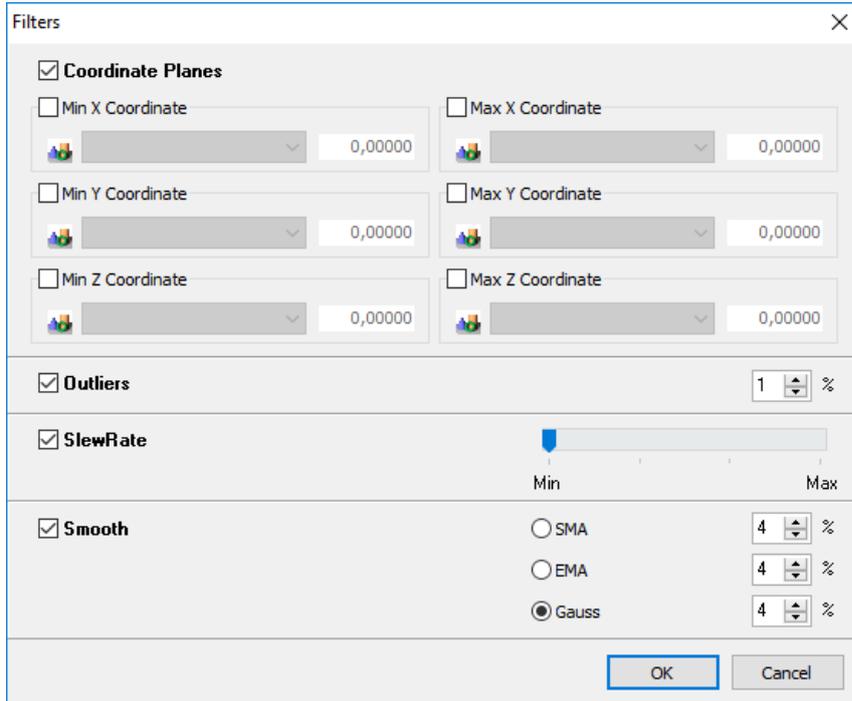# **Points Filters**
Tangram V4.2

Rev.	Date	Change Reason
1	1/10/2015	Review of Geometric filter
2	2/2/2017	Added "Spline" Filter

The Filter options form brings up when pressing the button in the "Nominal Path" tab of every measured element.

Basic filters

Measurement of **line, plane, circle, arc, cylinder, sphere and slot** have the possibility to activate one or more filters on the measure points in order to reject bad points or to compensate the measure machine statistical errors, especially when points are scanned or in general when you have many points in an element.

Coordinate Planes

It is a **Geometrical limits** filter by Coordinate planes that is available for each element type, it is a way to spatially select which points of a set have to be included for the calculation through X, Y, Z limits.
You can set X, Y, Z limits as coordinate planes that enclosed the points to be used. These limits are intended in the reference where the element is defined

This is specially used in combination with the "inherit" option.

Outliers

Outliers is used to reject the points that are far from the best fit geometry, i.e. the points that have a great form error respect the others. This should be activated to exclude spurious points of the set i.e. not reliable points.
For the **Outliers** filter you must set the percentage of points to exclude because they are supposed to be spurious.

SlewRate

SlewRate comes from electronics. It forces a maximum rate of change in the point error, thinking that, considering the manufacturing process, the change of error for length can't be over a reasonable value.
For the **Slewrate**, you have to set the raw data tolerance:
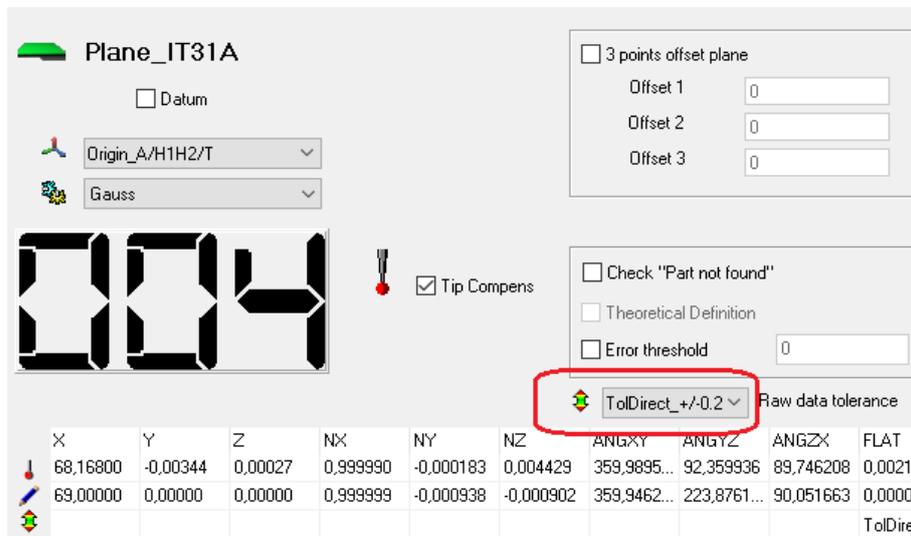
If this tolerance is missing the Slewrate option appears disabled.
The meaning of the track bar is to set the limit error rate per length.

Min stands for: 1 * tolerance /element length (or element dimension).
Max stands for : 16 * tolerance /element length (or element dimension)
This is a limit to the angle of the error derivative.

Smooth

Smooth has the purpose to compensate the statistical error of the measure machine.
The error of every points is recalculated making use also of the errors of the nearby points. There are three way to perform smoothing: SMA, EMA and Gauss.

- **SMA**, simple moving average, means that the neighbors' error have all the same weight as the considered point, and it's independent from the neighbors' distance.
- **EMA**, exponential moving average, means there is an exponential rule to evaluate the neighbor's error weight, i.e. more the points are far, smaller the weight will be according to an exponential rule.
- **Gauss** the most used, it is based on the gauss bell to evaluate the weights around the considered points.

Specifig Geometrical filters

Arcs, Lines and Curves have dedicated geometrical filter.

Arcs

The additional geometric filter for arcs works limiting the points to an arc sector in the plane and rejecting the points that are outside.

It is allowed only for 2D arcs. The sector is in the plane of the arc with center in the nominal center coordinates of the arc.

Start angle and the amplitude of the angle are the fields that the user must set.

X, Y and Z shown are the nominal X Y and Z of the arc. You cannot change them here but in the nominal tab of the element .   Only at creation time you can set them from here, but remember that the nominal fields will change in the same way.

Lines

The geometric filter for the line works limiting the used points to a space between two planes perpendicular to the line and rejecting the points that are outside.

Initial point is the intersection point between the line and the first plane. You can input coordinates directly or define them through an element chosen in the dropdown list.

Similarly the final point is defined by coordinates or a selected plane.

Cx, Cy and Cz are the nominal cosines of the line. As with the arc, you can edit these values at creation time otherwise they are kept from the nominal section of the element

You can bound the line on one side only using the checkboxes

Curves

Curves have a special filter based on spline expression.

☑ Spline   Max. Error (mm.)   1,000

The Max Error field is the radius of a limiting circle around each point.