VAST Navigator

C.Chandler
Lunch and Learn
Fishers, IN October 14, 2015

VAST Navigator

1. Introduction to VAST Navigator
2. Optimum Scanning Speed
3. Dynamic Stylus Qualification
4. Tangential Probing
5. Helical Path Generation
6. Edge Deviation (Corner Rounding)

VAST Navigator

Introduction to VAST Navigator

Introduction: VAST Navigator (option)

The VAST Navigator makes recording measured values when scanning cylindrical features (bores and shafts) much faster and more convenient.

Stylus movements and probing methods are faster and more harmonious. At the same time, the interplay between sensors, control technology, processes and software ensures maximum accuracy.

The VAST Navigator includes two different expansion stages, VAST Navigator 1 and VAST Navigator 2. CALYPSO automatically selects the maximum usable stage depending on the firmware version of the CMM.

NOTICE

Any description of the VAST Navigator in the present operating instructions applies to both, the VAST Navigator 1 and the VAST Navigator 2.

Introduction to VAST Navigator

What is the VAST Navigator?

The VAST Navigator is an enhancement of the known scanning method for cylindrical parts.

It offers the advantages of improved movement dynamics and higher measuring speed without their drawbacks. This is realized through a clever system comprising equipment technology, sensors, control technology and software.

NOTICE

By using the VAST Navigator, the measuring time is considerably reduced without affecting the accuracy – or, when measuring in the usual time, the measuring certainty can be decisively increased.

VAST Navigator

VAST Navigator 1

Optimum Scanning Speed	The VAST Navigator 1 automatically calculates the optimum scanning speed based on different parameters and makes sure that this speed is maintained.
Dynamic Stylus Qualification	Dynamic stylus qualification produces stylus data that allows scanning to take place at a higher speed while maintaining the required accuracy.
Tangential Probing	During tangential approaches, the probe transitions from the clearance path to the probing process without abrupt stops and starts.

VAST Navigator

VAST Navigator 1

Helical Path Generation	With the helix scanning method, a cylinder can be scanned in a helical line and, if necessary, in several circular lines.
Rounding-off of Corners(detour)	The rounding-off of detour produces a continuous movement of the probe, thus reducing the travel time between the features to be measured.

VAST Navigator

VAST Navigator 2

Optimum Scanning Speed depending on the Tolerances	You can define that the VAST Navigator 2 additionally considers the tolerance for the determination of the optimum speed. Higher tolerances permit higher scanning speeds.
Qualification of Smaller Styli	The VAST Navigator 2 can also be used to qualify small styli with short shafts. The limitation of the reference spheres to spheres of a diameter of 30 mm does not apply to the VAST Navigator 2.
Integration of the VAST XT Gold sensor	Useable with XT Gold

VAST Navigator

1	Introduction to VAST Navigator
2	Optimum Scanning Speed
3	Dynamic Stylus Qualification
4	Tangential Probing
5	Helical Path Generation
6	Edge Deviation (Corner Rounding)

Optimum Scanning Speed

Basics about the optimum scanning speed

If you have the VAST Navigator option, you can have Calypso calculate the optimum speed, increment and number of points.

NOTICE

You may only use the optimum scanning speed if the stylus has been qualified beforehand in the Tensor mode or dynamically.

VAST Navigator

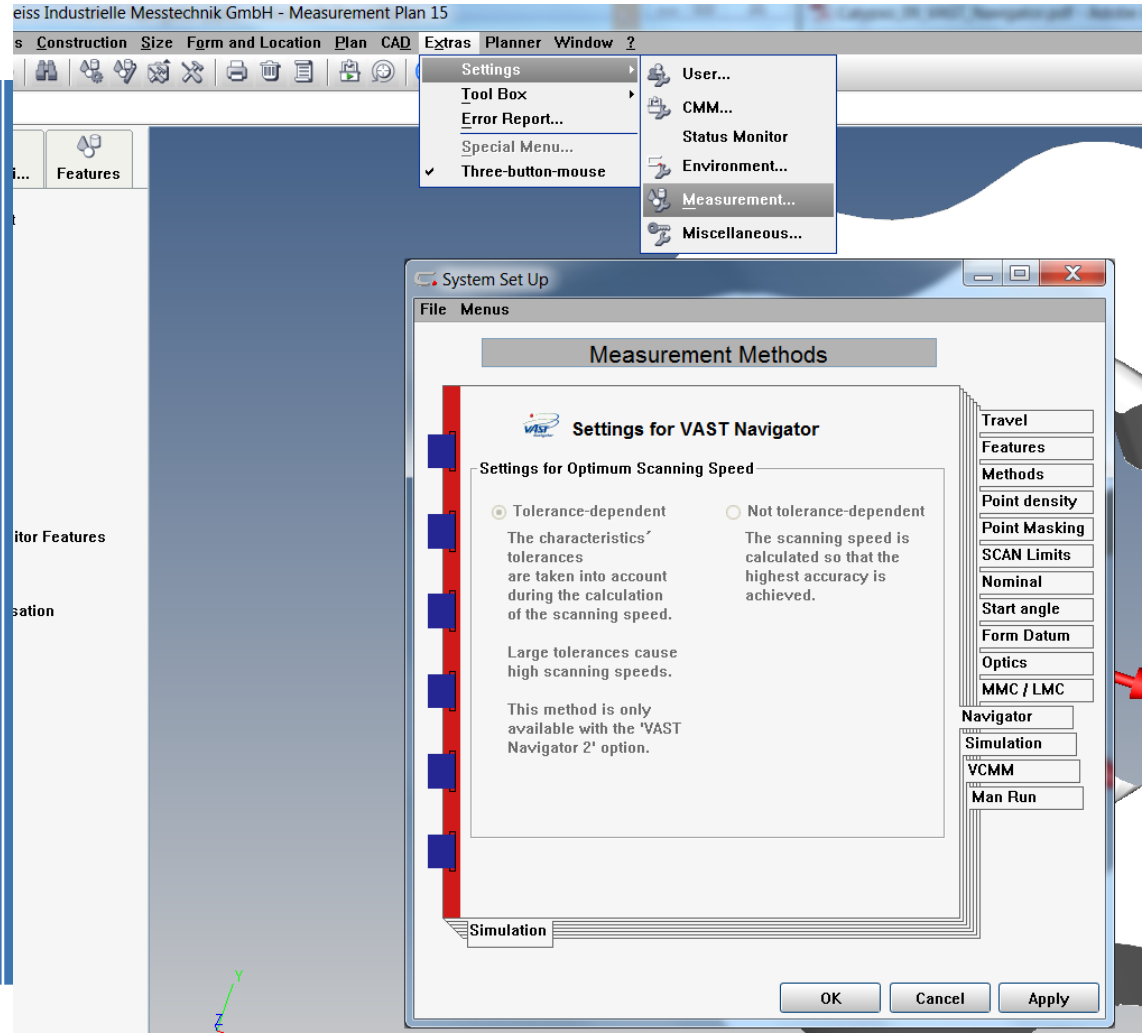
Optimum Scanning Speed

Navigator 1	Navigator 2
characteristic to be evaluated (Form, Size, Location)	characteristic to be evaluated (Form, Size, Location)
diameter of the feature	diameter of the feature
weight of the stylus system	weight of the stylus system
rigidity of the stylus	rigidity of the stylus
type of qualification (Tensor or dynamic)	type of qualification (Tensor or dynamic)
	values of the tolerances
	inside or outside circle
	evaluation method (Gauss (LSQ feature), inscribed)

VAST Navigator

Optimum Scanning Speed

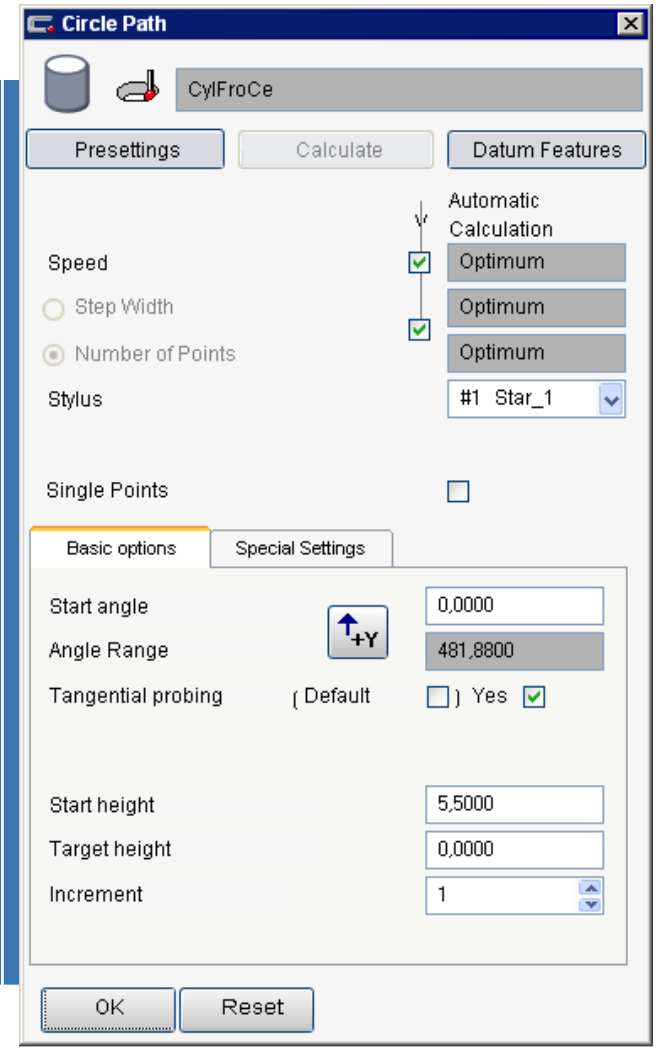
With the VAST Navigator 2, you can choose to have the tolerance sizes taken into account, too. To do so, carry out this setting independent of the measurement plan under Extras > Settings > Measurement on the Navigator notebook page.



VAST Navigator

Optimum Scanning Speed

The use of the optimum scanning speed is set in the strategy window for path generation. Tick the check box under Automatic Calculation. CALYPSO then shows the text “Optimum” instead of numerical values in the Speed, Step Width and Number of Points fields.



VAST Navigator

1	Introduction to VAST Navigator
2	Optimum Scanning Speed
3	Dynamic Stylus Qualification
4	Tangential Probing
5	Helical Path Generation
6	Edge Deviation (Corner Rounding)

VAST Navigator

Dynamic Stylus Qualification

Basics about dynamic stylus qualification

The position, diameter and statistic bending characteristics of a stylus are determined in the conventional static stylus qualification process. This permits highly accurate measurement in discrete-point mode and during low-speed scanning.

Dynamic effects arise during high-speed scanning, however. They can be compensated only if the dynamic properties of the stylus are known.

You will therefore have to perform *in addition* a *dynamic stylus qualification* after static stylus qualification. Select the **Dyn. tensor** mode (see Selection of the qualification method in the Basic Operating Instructions).

The reference sphere must be positioned so that the stylus can scan the entire sphere at the "equator" (the direction of the stylus determines the axis of the sphere). This means that you must use two reference spheres in different locations for two styli that point in opposite directions.

VAST Navigator

Dynamic Stylus Qualification

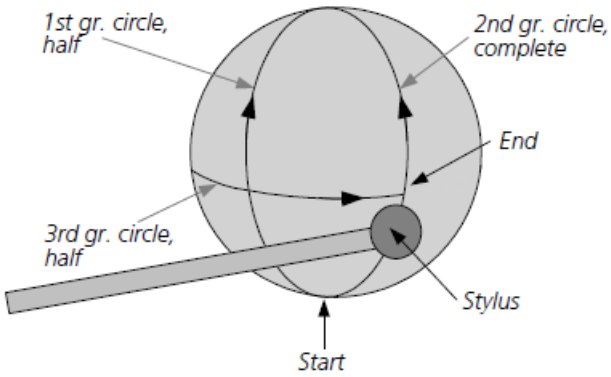
Travel paths during dynamic stylus qualification

You perform a probing in the direction of the stylus shaft at the beginning of dynamic stylus qualification. CALYPSO uses this probing and the known shaft direction to determine the location of the reference sphere automatically.

CALYPSO will then independently perform all necessary probing actions.

- The stylus moves in a semicircle from the equator over the pole and back to the equator.
- The equator is then scanned over a path angle of 450°. This produces an offset of 90° with respect to the starting point.
- The stylus then moves through another semicircle over the pole of the sphere.

The illustration shows the scanning movements for dynamic stylus qualification.



VAST Navigator

Dynamic Stylus Qualification

Advantage of virtual reference spheres	For dynamic stylus qualification, you may need even a greater number of reference spheres to ensure complete CNC qualification – this depends on the quantity and arrangement of the styli to be qualified. The “virtual reference sphere” procedure, however, only requires one single real reference sphere.
What is a virtual reference sphere?	
Procedure for stylus Qualification	

VAST Navigator

Dynamic Stylus Qualification

Advantage of virtual reference spheres	
What is a virtual reference sphere?	The virtual reference sphere procedure is based on the premise that the position of the reference sphere for the dynamic stylus qualification does not have to be known as precisely as for the determination of the stylus geometry. You can therefore replace the necessary additional reference spheres required for dynamic stylus qualification with “virtual” spheres you create by copying in the Reference sphere management.
Procedure for stylus qualification	

VAST Navigator

Dynamic Stylus Qualification

Advantage of virtual reference spheres	
What is a virtual reference sphere?	
Procedure for stylus qualification	In reality, the real reference sphere must be applied to the correct position and turned in the direction which corresponds to the current virtual reference sphere. Prior to dynamic stylus qualification, you must therefore manually reposition the shaft direction of the real reference sphere, roughly determine the position of the virtual sphere by probing and then carry out the dynamic stylus qualification using this position data.

VAST Navigator

1	Introduction to VAST Navigator
2	Optimum Scanning Speed
3	Dynamic Stylus Qualification
4	Tangential Probing
5	Helical Path Generation
6	Edge Deviation (Corner Rounding)

VAST Navigator

Tangential Probing

Basics about tangential probing

Tangential probing is probing without an intermediate stop. This means that the navigation speed is reduced to the defined or calculated scanning speed just prior to probe contact. This optimizes the approach movement and saves time by reducing the number of intermediate stops.

Only for circles

Tangential probing is possible only for circle measurements, and it may be activated or deactivated as desired. Tangential probing is *not* possible:

- when scanning with a rotary table
- for discrete-point measurement

Not for segments!

Tangential probing *must not* be activated:

- for circle segments

Reason: CALYPSO automatically increases the angle range to 380° or more.

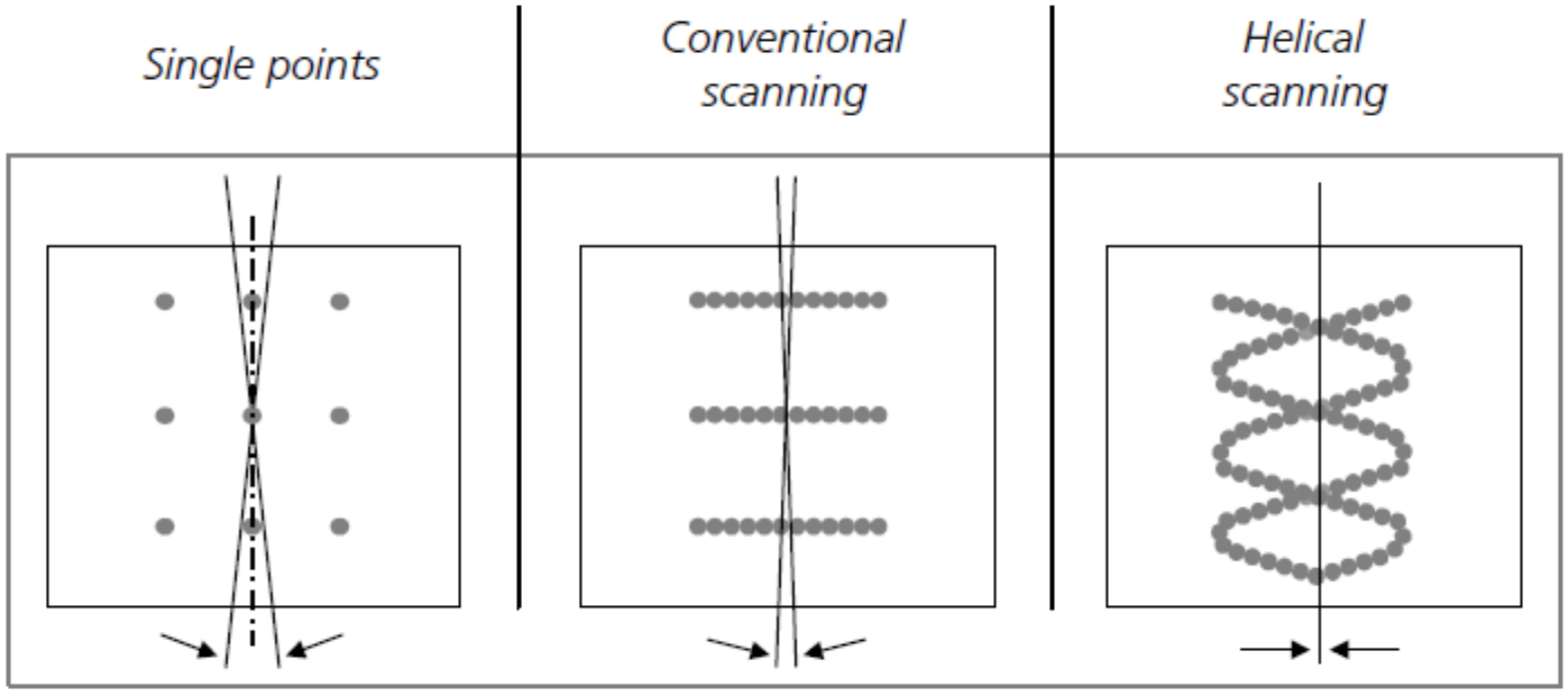
VAST Navigator

VAST Navigator

Helical Path Generation

Basics about helical path generation

You can use the VAST Navigator to scan cylinders using a special helical scanning method. With this method, the cylinder is continuously scanned in a helical line – first forward and then back. You can also add two or four circles to this continuous scanning method.



VAST Navigator

Edge Deviation (Corner Rounding)

Basics about rounding-off of corners

You can use the VAST Navigator to activate rounding-off of corners - for the movements when measuring a feature as well as for the movements between features.

Rounding-off of corners is always used for the entire measurement plan and not for individual features.

NOTICE

Rounding-off of corners is also called rounding-off of detour.

VAST Navigator

Edge Deviation (Corner Rounding)

What is rounding-off of corners?	Without rounding-off of corners activated, the probe approaches directly the defined intermediate points, stops and continues to move in the new direction. When rounding-off of corners is activated, the concerned intermediate points are not approached. Instead, the probe begins to make an arc movement according to a predefined radius shortly before the intermediate point and then continues to move in the new direction.
Advantage	

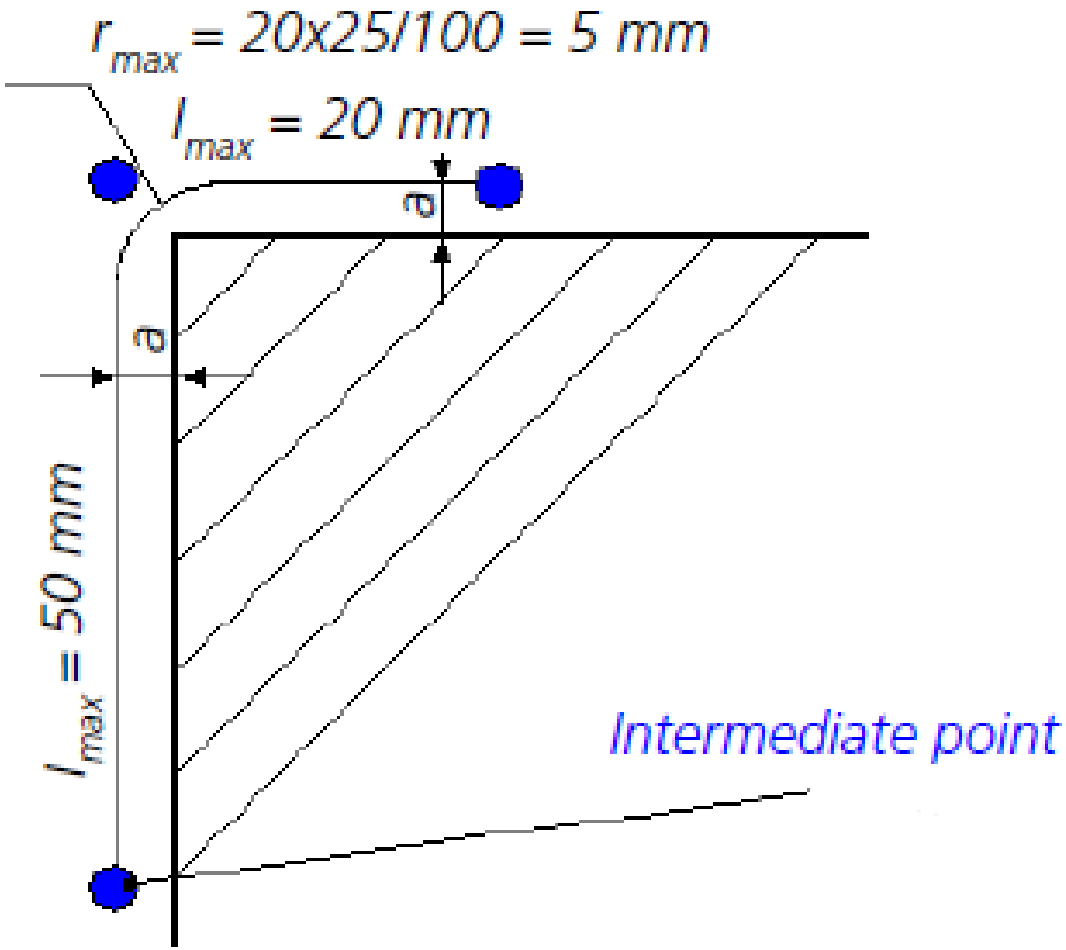
VAST Navigator

Edge Deviation (Corner Rounding)

What is rounding-off of corners?	
Advantage	Rounding-off of corners enables a continuous movement of the probe to reduce the travel time between the features to be measured. 2 Types: – **Corner rounding within Features**: Each feature has one probing detour point (intermediate point) before and one after the feature. These are “rounded off”. – **Corner rounding between Features**: There may be additional probing detour points (intermediate points) between the individual features. These are “rounded off”.

VAST Navigator

Edge Deviation (Corner Rounding)



We make it visible.