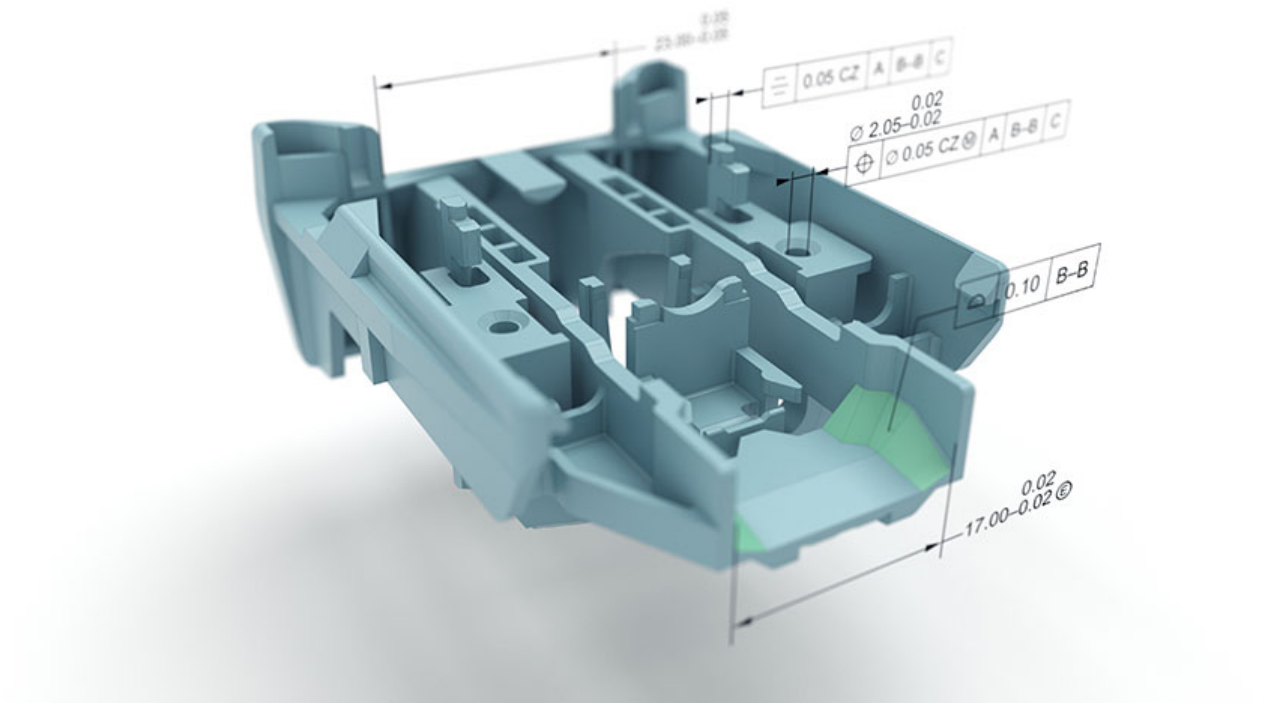

CALYPSO

Option 09

CALYPSO VAST navigator

Operating Instructions

The design and delivered components of the CMM, its options, the program packages, and the relevant documentation are subject to change.

This manual must not be circulated or copied, or its contents utilized and disseminated, without our express written permission. Persons misusing this manual are subject to prosecution.

This manual is subject to modification. All rights pertaining to changes in the CMM and its options reserved.

Although utmost care has been taken in preparing the information given in this manual, we cannot assume any liability for its completeness and correctness, except in case of willful intent.

CALYPSO
Version 2023
Operating Instructions
2023-04-28
61212-2792102

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Preface

Information about these operating instructions

The CALYPSO program consists of a base module and additional options for special purposes. You can customize the scope of program to fit your requirements.

These operating instructions describe an option of CALYPSO and are based on the assumption that the user is familiar with the operating instructions for the base module of CALYPSO.

NOTE

The additional CALYPSO options are described in separate manuals.

Reference information about the windows and dialogs can be found in the dialog reference in the CALYPSO Online Help.

Simply Measure – And what you should know to do it right, A metrology primer

Carl Zeiss, Industrial Metrology Division,

Order no.: 612302-9002

Text conventions

The following text conventions are used in these instructions.

Example	Description
Features	Text element of the graphics screen display.
Comment	The **Comment** button on the screen.
<machine name>	Variable text or dummy for a name.
C:\windows\w.ini	The w.ini file in the windows directory on the C:\ drive.
For this section...	A passage containing important information.

Example	Description
➢ *Preface [⇨ Preface-1]*	This is a cross reference. When viewing this manual on the screen, you will be guided to the indicated text passage by clicking the reference.
Plan → CNC-Start → Run	The **Run** command in the **CNC-Start** submenu of the **Plan** menu.
CTRL+A	Press the CTRL key and the letter A at the same time.

Icons

Three special symbols containing important information are used in this manual. The icons appear in the marginal column next to the respective text.

You will find a detailed explanation of the safety instructions under Configuration of safety instructions.

Configuration of safety instructions

Safety instructions indicate a personal health hazard. We distinguish three different levels: Danger, warning and caution. All three safety instructions are marked with the same warning symbol. The designation of the safety instruction is shown beside the symbol. The safety instructions used are described below.

Configuration of a safety instruction

A safety instruction may have the following components:

- Warning symbol and designation of the safety instruction (signal word): Danger, warning or caution.
- Source and cause of the danger
- Consequences for the user due to non-observance of the safety instruction
- Required measures to be taken by the user to avoid possible consequences
- A measure may cause an intermediate result.
- At the end of all measures, a final result may be caused.

Personal health hazard

⚠ DANGER

A »danger« indicates an imminent risk to life and limb.
Non-observance of this safety instruction when the described risk occurs causes death or serious injuries.
Example: Electric shock due to high electric voltage.

⚠ WARNING

A »warning« indicates a possible risk to life and limb.
Non-observance of this safety instruction when the described risk occurs may cause death or serious injuries.
Example: Risk of severe crushing of the body caused by heavy loads.

⚠ CAUTION

A »caution« indicates a personal health hazard.
Non-observance of this safety instruction when the described risk occurs may cause slight to moderate injuries.
Example: Risk of minor crushing of the limbs caused by small loads.

Risk of material damage

If there is no personal health hazard, but the CMM or components may get damaged, this is pointed out by the following notice.

This symbol refers to possible damage to the CMM.
Non-observance of this safety instruction when the event occurs may cause damage to the CMM or one of its components.
Example: Collision of the ram with a workpiece.

1 CALYPSO VAST navigator (Option)

This chapter contains:

Introduction: VAST Navigator (option) 1-2

Basics about the VAST Navigator 1-3

Optimum scanning speed 1-7

Dynamic stylus qualification 1-12

Tangential probing 1-19

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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.

NOTE

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

Basics about the 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.

NOTE

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.

Versions

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.

You can also set the VAST Navigator version to be used for the measurement plan in the **Measurement Plan Editor Features**.

NOTE

To use the VAST Navigator functions, you must set up the connection to the CMM or the simulation mode (stop light available).

What are the capabilities of the VAST Navigator 1?

Using CALYPSO with the CALYPSO VAST navigator 1 option will give you the following additional options for the measurement of shafts and bores:

– ➢ *Optimum scanning speed [▷ 1-7]*

  The VAST Navigator 1 automatically calculates the optimum scanning speed based on different parameters and makes sure that this speed is maintained.

  In addition, you can manually change the optimally calculated parameters, depending on the characteristic.

– ➢ *Dynamic stylus qualification [▷ 1-12]*

  Dynamic stylus qualification produces stylus data that allows scanning to take place at a higher speed while maintaining the required accuracy.

– ➢ *Tangential probing [⇨ 1-19]*

  During tangential approaches, the probe transitions from the clearance path to the probing process without abrupt stops and starts.

– ➢ *Helical path generation [⇨ 1-23]*

  With the helix scanning method, a cylinder can be scanned in a helical line and, if necessary, in several circular lines.

– ➢ *Rounding-off of detour [⇨ 1-26]*

  The rounding-off of detour produces a continuous movement of the probe, thus reducing the travel time between the features to be measured.

What are the capabilities of the VAST Navigator 2?

Using CALYPSO with the CALYPSO VAST navigator 2 option will give you the following options in addition to those of the VAST navigator 1:

– ➢ *Optimal scanning speed depending on the tolerances [⇨ 1-7]*

  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.

  In addition, you can manually change the optimally calculated parameters, depending on the characteristic.

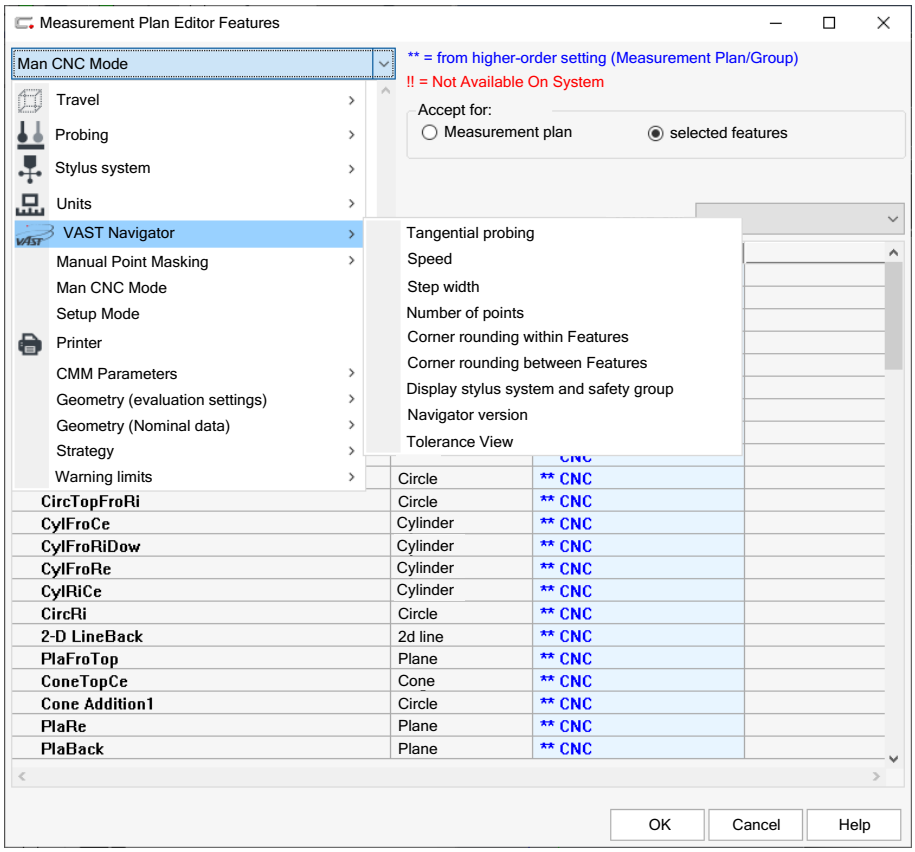
– Qualification of smaller styli

  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 probe

VAST parameters in the Measurement Plan Editor Features

If you have the VAST Navigator, you can view and change additional settings in the **Measurement Plan Editor Features**. Select **Resources → Features Settings Editor**.



The **VAST Navigator** menu contains the following setting options:

Menu item	Meaning
Tangential probing	Switches tangential probing on and off.
Speed	Specification of the desired speed or setting the automatic calculation of the optimum speed.
Step Width	Specification of the desired increment or setting of the automatic ideal increment calculation.
Number of Points	Specification of the desired number of points or setting of the automatic calculation of the optimum number of points.
Corner rounding within Features	Sets rounding-off of corners to a value between 0 and 100 for measurement of a feature.
Corner rounding between Features	Sets rounding-off of corners to a value between 0 and 100 for moving between features.
Display stylus system and safety group	Shows the styli and safety group assigned to each feature.
Scanning with small deviations	Sets the “Scanning with small deviations” mode which allows a higher scanning speed. The diameter, position and form errors altogether may not exceed 0.1 mm.

Menu item	Meaning
Navigator Version	(additionally for Navigator 2) Sets the version of the VAST Navigator for this measurement plan.
Tolerance View	(additionally for Navigator 2) Sets the calculation of the optimum speed to **Tolerance-dependent** or **Not tolerance-dependent** for this measurement plan. The default setting is taken from the system settings.

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.

NOTE

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

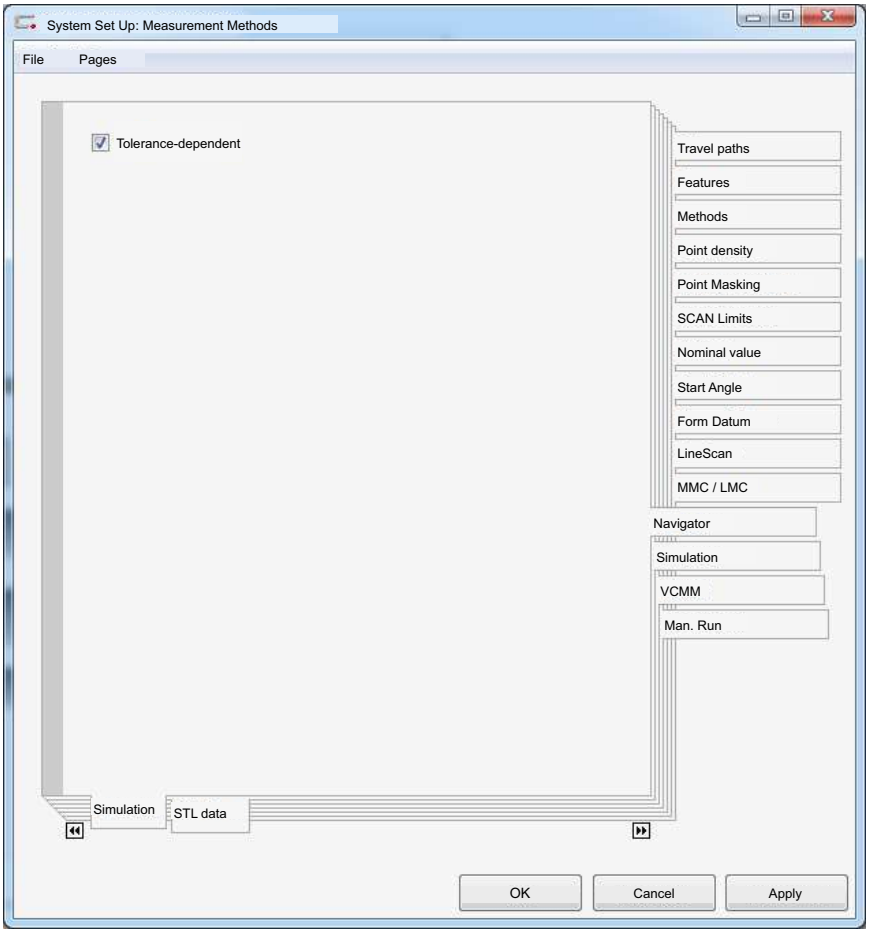
The highest-possible scanning speed for a cylindrical feature depends on various factors:

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), maximum inscribed)

The VAST Navigator takes these factors into account when selecting the speed:

- You define the diameter, characteristic, evaluation method (only for VAST Navigator 2) and tolerances (only for VAST Navigator 2).
- The type of qualification (Tensor or dynamic) is identified automatically.
- The stylus system is automatically weighed when it is picked up.
- The rigidity of the stylus is determined during stylus qualification in the **Tensor** mode (see Qualifying the styli in the Basic Operating Instructions).

– 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.

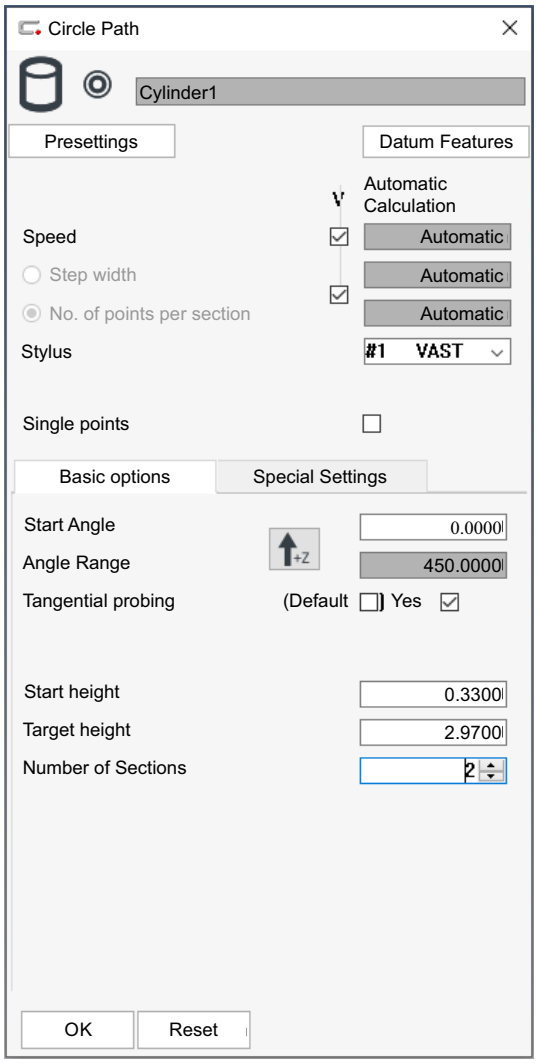


This presetting can still be changed for the individual measurement plan in the **Measurement Plan Editor Features**.

Of course, you also have the option of setting your choice of speed at any time.

Scanning at optimum speed

The use of the optimum scanning speed is set in the strategy window for path generation. Tick the check boxes for **Speed** or for **Step Width** / **No. of points per section**. In the fields **Speed**, **Step Width** and **No. of points per section**, CALYPSO will display the text “Automatic“ instead of numerical values.



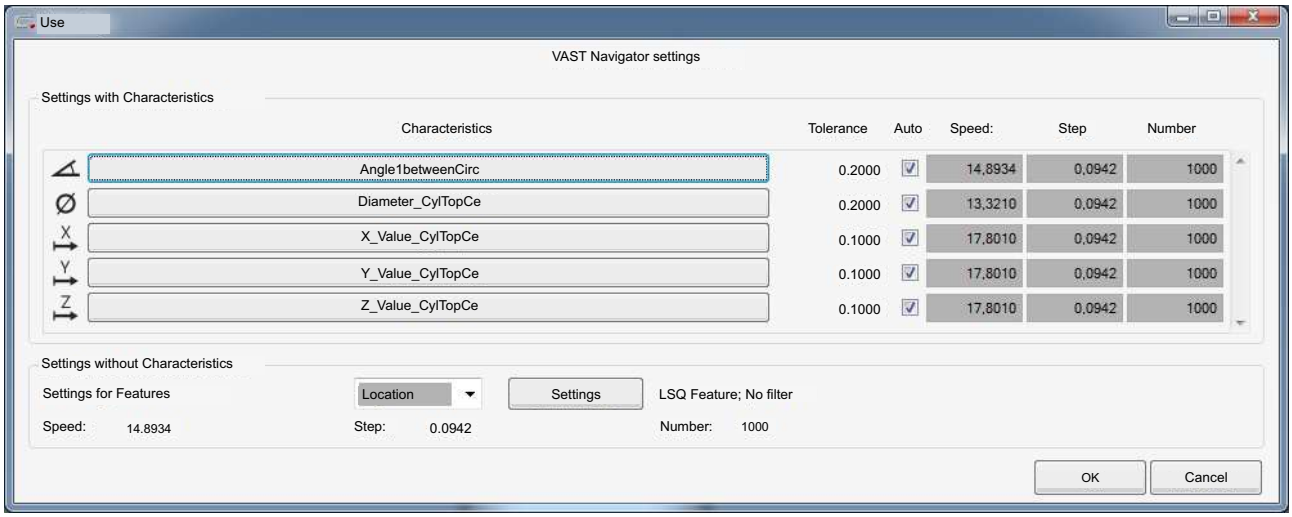
CALYPSO does not calculate and determine the optimum speed until immediately after the start of the CNC run, because the scope of measurement (number of characteristics to be tested) is not determined until that point.

Calculation of the optimum speed

CALYPSO considers the characteristics containing the current feature and which of them are active in the current run. Based on this consideration, Calypso selects the optimum values for speed, increment and number of points for this configuration.

The **Datum Features** dialog box lists all characteristics in which the feature is used, together with their settings that are relevant for calculation of the optimum speed.

You call the **Reference** dialog box by opening the strategy window in the definition template of the feature and the definition template of the corresponding path generation method and by clicking the **Datum Features** button.



In this window, you can check and, if necessary, change the speed-relevant settings in the characteristics and in the feature. To do so, click the buttons and change the previously valid setting in the new dialog box.

If you use the VAST Navigator 2 and you have activated the tolerance-dependent speed calculation, you can change the speed and trace the following change of the speed.

Speed subsequently too high

In certain cases, it may happen that the measurement results to be used for characteristic evaluation were recorded at an excessive speed. As a result, it was not possible to achieve the desired accuracy.

This can occur in the following cases:

– You create a new characteristic after a measurement has already taken place.

– You would like to evaluate a characteristic that is not contained in the list of characteristics of the measurement.

CALYPSO checks the speed at which the measurement was performed. If this speed is too high for the new characteristic, the following message will appear:

```
The speed used is too
high for this Characteristic evaluation! Please measure the
Feature again!
```

In this case, you will have to repeat the CNC run including the characteristic in question. The optimum speed will be redetermined taking the characteristic into consideration.

Reducing measuring time by adjusting measurement parameters

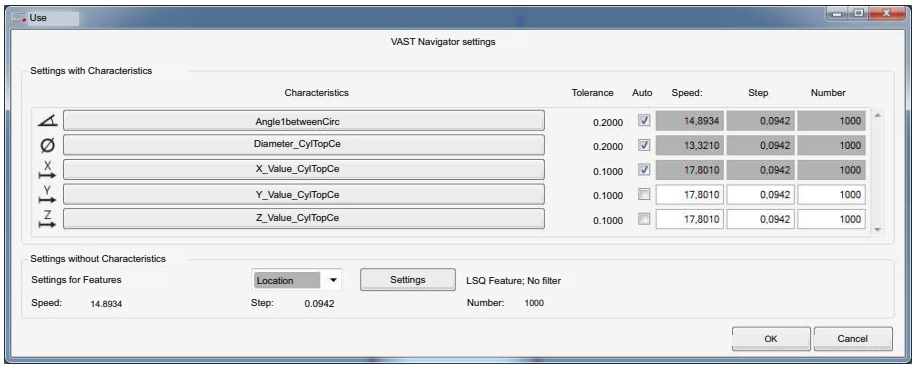
In case of large quantities, even a minor reduction of measuring time may lead to desirable effects during measuring operations. Therefore, the VAST navigator allows you to manually increase the optimum speed even if this will slightly worsen the accuracy.

You yourself must determine in practice which losses of accuracy are acceptable and justifiable.

Changing measurement parameters for optimum speed manually

The **Datum Features** dialog box lists all characteristics in which the feature is used, together with their settings that are relevant for calculation of the optimum speed.

You call the **Reference** dialog box by opening the strategy window in the definition template of the feature and the definition template of the corresponding path generation method and by clicking the **Datum Features** button.



If you untick the **Auto** check box for a specific characteristic, then you can manually change speed-relevant settings in this window.

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).

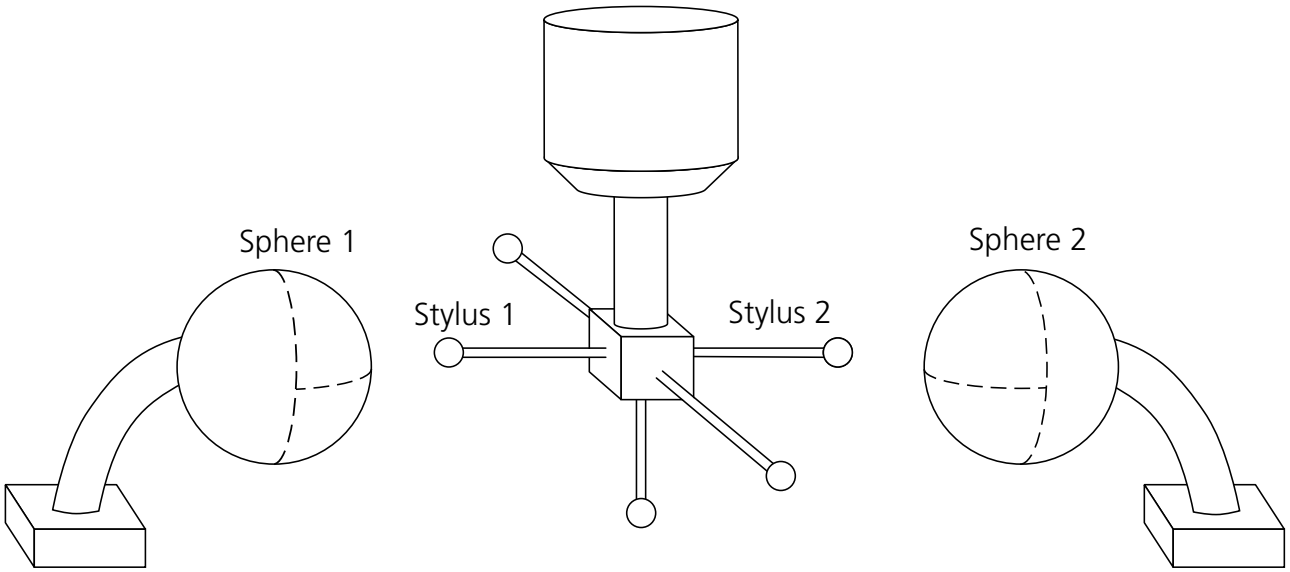
Special aspects of dynamic qualification

During the dynamic stylus qualification, the reference sphere is scanned with the stylus at two different speeds (slow and fast).

NOTE

If you use the VAST Navigator 1, you require a reference sphere with 30 mm diameter for the dynamic stylus qualification. Other spheres are only permitted when using the VAST Navigator 2.

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.



To ensure complete CNC qualification, you may need even a greater number of reference spheres – this depends on the quantity and arrangement of the styli to be qualified. When using "virtual reference spheres", one single real qualification sphere is sufficient (see ➢ *Working with virtual reference spheres [⇨ 1-13]*).

Validity

The dynamic stylus parameters remain valid for as long as the stylus remains physically unchanged. Regular re-qualification (approx. every three months) is however recommended.

Thus, it is not necessary to carry out the dynamic stylus qualification each time when qualifying a stylus. If changes in the stylus geometry (e.g. due to a temperature change) have to be compensated, select the **Geometry Re-qualification** or **Tensor Re-qualification** each time when qualifying styli.

Dynamic stylus qualification can be performed as a measurement plan in the CNC run.

Working with virtual reference spheres

Virtual reference spheres

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?

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**. This is where you can also change the shaft direction ➢ *Creating a virtual reference sphere [⇨ 1-14]*). The spheres created in this way only exist in the **Reference sphere management**, but not in reality.

Procedure for stylus qualification

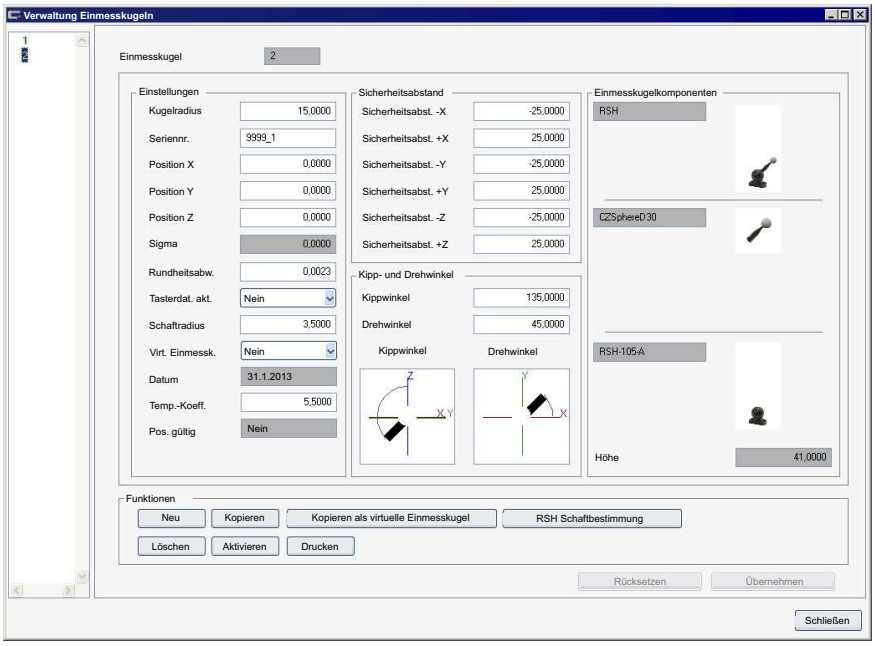
In reality, the real reference sphere must be applied to the correct position and turned in the direction which corresponds to the current virtual reference sphere.

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.

Creating a virtual reference sphere

1 Click in the Probing system qualification window the **Reference sphere management** icon.

2 The **Reference sphere management** dialog opens.



3 Select the number of the corresponding reference sphere to the left and click the **Copy as virtual reference sphere** button.

4 Enter in the dialog the number under which this new reference sphere is to be saved.

Another reference sphere is entered in **Reference sphere management** and **Yes** appears in the "virtual reference sphere" line. Under **X**, **Y** and **Z Offset**, the same data as in the column for the real reference sphere appears at first.

Note: The position to which the real reference sphere is applied is entered only after probing from the shaft direction during the dynamic stylus qualification.

5 Enter under **Tilt** and **Rotation** the correct angles according to the desired shaft direction and click **Apply**.

6 Repeat steps 3 through 5 if you want to create additional virtual reference spheres for other measurement positions and shaft directions.

When using a virtual reference sphere, you must probe this manually in the shaft direction (also in the CNC run). The position of the sphere is then automatically determined during the qualification process.

How to perform dynamic stylus qualification

Dynamic stylus qualification must be performed in addition to conventional (static) stylus qualification (see Qualifying the styli in the Basic Operating Instructions) and *after* conventional stylus qualification.

The following applications arise due to the special requirements of dynamic stylus qualification on the positioning of the reference sphere:

– With regard to position and shaft direction, the reference sphere is suitable for dynamic stylus qualification.

  You can perform both qualifications in a single step (**Dyn. tensor** mode) or separately.

– With regard to position and shaft direction, the reference sphere is *not* suitable for dynamic stylus qualification.

  The static and dynamic stylus qualification procedures *must* be performed separately.

  – You first determine the static tensor on the reference sphere – for all styli one after the other when there is more than one stylus.
  – You then rotate and move the reference sphere, make it known as a virtual sphere to CALYPSO without special qualification and subsequently perform dynamic stylus qualification in **Dyn. Tensor Re-qualification** mode for all concerned styli.

Performing dynamic stylus qualification

1 Click the **Stylus system** icon on the **CMM** tab in the measurement plan area.

The Probing system qualification window appears on the screen.

2 If it is not already displayed, select the name of the stylus system from the **Stylus system** selection list.

3 Select the name of the stylus you want to qualify from the **Stylus name / no.** selection list.

The values that have already been determined for the stylus radius and the most recent qualification date are displayed automatically.

The current number of the reference sphere is pre-assigned.

Note: If you use the VAST Navigator 1, you require a reference sphere with 30 mm diameter for the dynamic stylus qualification. Other spheres are only permitted when using the VAST Navigator 2.

4 Under **Geometry**, select **Sphere** as the shape of the stylus tip.

5 Select the **Dynamic tensor** qualification mode from the **Mode** selection list.

6 Click the **Qualify Stylus** button.

7 Specify in mN the measuring force you want to use with the stylus.

If you want to use a particularly long and thin stylus or if the material to be probed is soft, enter a value for dynamic probing in %.

Here, the discrete-point probing dynamic is reduced (during qualification and later measurements). This helps to avoid that, for example, thin styli break (only with the VAST Navigator 2).

Note: The settings in this dialog box do not have any influence on the dynamic stylus qualification.

Note: This information is stored with the stylus data and can be viewed in the **Measurement Plan Editor Features** and overwritten for individual features.

8 After prompting, probe in the shaft direction.

CALYPSO carries out the static stylus qualification.

CALYPSO checks the qualification routes for possible collisions with the reference sphere post.

The following message will appear if a collision is possible:

```
"The current stylus cannot be qualified with the reference
sphere
in this position. Please rotate the
reference sphere so that the entire equator can be probed
without a collision occurring."
```

9 In this case, select a reference sphere in a different location and restart qualification.

- or -

Change the reference sphere position, select the corresponding virtual reference sphere as the reference sphere and start in the **Dyn. Tensor Repeat Measurement** mode.

CALYPSO qualifies the stylus according to the set mode. The results are saved.

Note: By proceeding according to the virtual reference sphere procedure, you first measure all styli statically in one position of the reference sphere and only thereafter rotate the sphere to carry out the dynamic stylus qualification. Otherwise, you would have to re-qualify the sphere each time again.

10 Click **OK** to return to the work area.

The stylus has now been statically and dynamically qualified. This allows the VAST Navigator to achieve higher scanning speeds with the stylus without affecting accuracy.

Results of stylus qualification

Stylus system management

The stylus data management indicates that the stylus has been dynamically qualified. The static and dynamic scatter are also shown.

NOTE

An excessive scatter value is a sign of possible shaft probing during qualification or indicates adhering dirt.

Soft styli

If the qualified stylus is too soft (rigidity < 7 N/mm), the system will indicate this with the following message:

```
Important!

You are using a very soft stylus with a rigidity of XX,
XX N/mm. The automatically calculated ideal scanning speed may
possibly
be too fast. For additional information, please
read the operating instructions or press the F1 key.
```

The dynamic correction is also enabled for measurements with this stylus and the measuring results are more precise than without dynamic correction. However, you should check this stylus.

To do so, carry out a slow (reference) and a fast scanning measurement on a known diameter and check whether the result of the fast scanning measurement corresponds to the required accuracy.

Otherwise, you must reduce the proposed ideal scanning speed manually by deactivating the ideal scanning speed and defining a slow scanning speed.

NOTE

Alternatively, you can replace the stylus with a more rigid one. In this case, the automatically calculated ideal scanning speed applies again.

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.

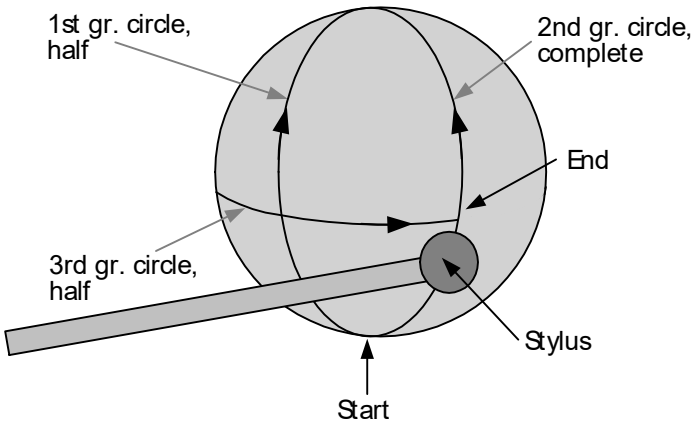
CALYPSO will then independently perform all necessary probing actions.

– 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.



After probing with a reduced scanning speed, the entire process is repeated with a higher scanning speed.

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.

Path angle

Since inaccuracies are possible during approach and departure movements, the VAST Navigator always scans circle paths with a certain amount of overlap. The VAST Navigator automatically determines the size of the overlap.

- The path angle is always 450° in the case of outside diameters (shafts).
- In case of inside diameters (bores), the travel angle is variable, ranging from 380° for large diameters and up to 500° for small diameters.

This adjusts the overlap optimally to the inside/outside feature and to the diameter and reduces the measuring time for large diameters.

Check of the angle range

When switching tangential probing on, CALYPSO checks the current angle range. If this value is to small, you will be asked the question:

```
"The angle range is too small for the Tangential probing! Do
you want to change the
angle range?" Yes/No
```

If you answer this question with **Yes**, the minimum angle range will be calculated based on the diameter of the circle and this value will be used. If you answer this question with **No**, tangential probing will be deactivated again.

NOTE

The value you originally entered for the value range will be retained for subsequent measurements performed without tangential probing.

Activating tangential probing

Tangential probing can be activated in two ways:

- Activate tangential probing for one or all features in the **Measurement Plan Editor Features** and select **Tangential probing (default)** in the strategy window of the respective path generation method.
- You activate tangential probing exclusively in the strategy window for the individual path generation method.

Deliberately activate tangential probing When activating tangential probing for a circle segment, the angle range will be set to 380° or more without any further message.

Switching tangential probing on in the measurement plan editor

1 Select **Resources → Features Settings Editor**.

The **Measurement Plan Editor Features** dialog box appears on the screen. For detailed information, please refer to Measurement Plan Editor Features in the CALYPSO dialog reference in the Online Help.

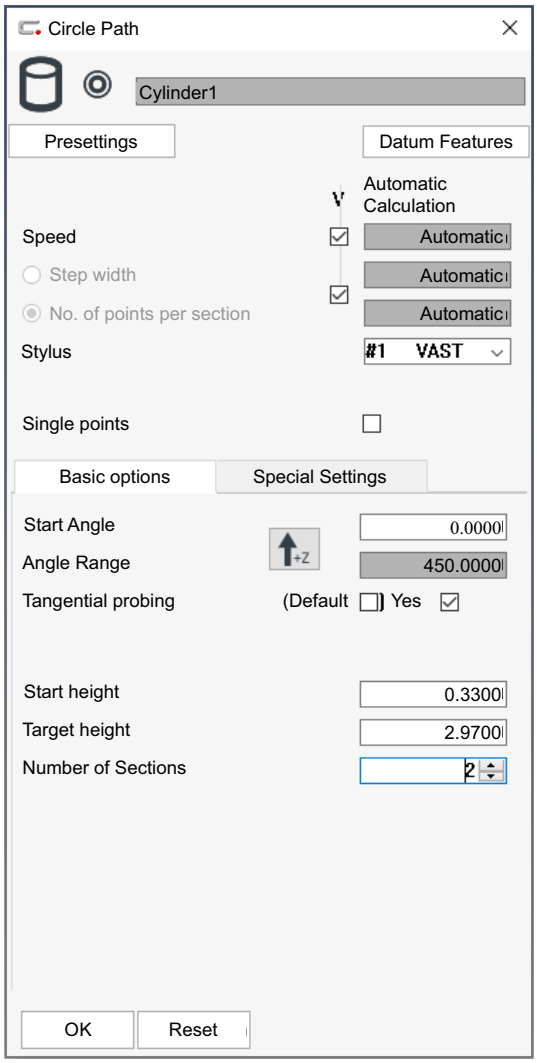
2 Define the features for which you wish to activate tangential probing (either **for the measurement plan** or **for selected features**) and, if necessary, select the features in question.

3 Select **VAST Navigator → Tangential probing** in the selection list and set the value to **On**.

Activating tangential probing in the strategy window

1 Click **Strategy** in the definition template for the feature in question.

2 Open the strategy window for path generation of the circle section.

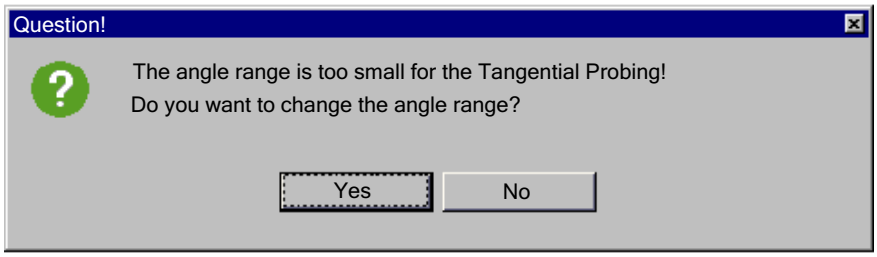


3 Tick the **Tangential probing (default)** check box if you want to use the settings from the **Measurement Plan Editor Features**.

Depending on the setting in the measurement plan editor, tangential probing is now activated or not.

4 Tick the **Tangential probing Yes** check box if you want to activate tangential probing independently of the settings in the **Measurement Plan Editor Features**.

If the set angle range is too small for tangential probing, you will be asked the question:

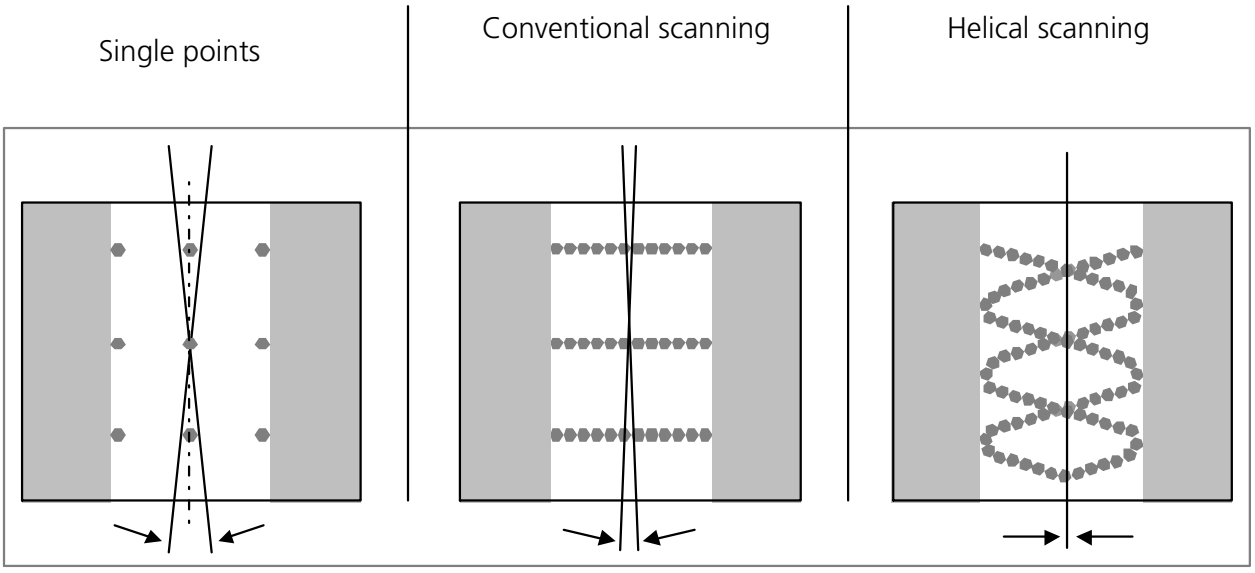


5 By clicking **Yes**, the angle range will be adapted to the required value.

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.



With this method, the scanned points are much more uniformly distributed in space. CALYPSO can thus very rapidly make valid statements concerning the diameter, shape and position of the cylinder.

The other possibilities of the VAST Navigator are available here as well.

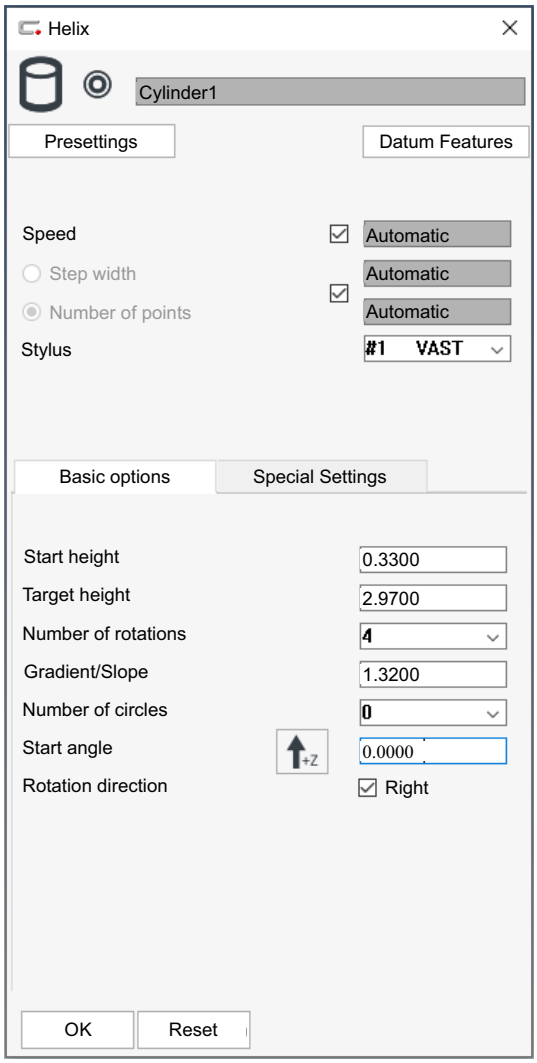
– You can have the optimum speed and/or increment and number of points calculated automatically.
– You can achieve higher scanning speeds with a dynamically qualified stylus.

Probing cylinders with the helical method

1 Open the definition template for the cylinder and click **Strategy**.

2 Click the symbol for the helical line in the strategy window.
A “Helix (variable)” path element is added to the list of paths.

3 Open the strategy window for the helical line by double-clicking, or click the **Edit strategy** icon.



4 Define your settings for **Speed**:

Specify the speed or select automatic calculation.

5 Define your settings for **Step Width** and **Number of Points**:

Select one of the two values or have the ideal values calculated automatically.

The ideal numbers of points are selected so that there is sufficient information for the respective mode and the computing time for evaluation is kept to a minimum.

Note: If you change the **Diameter**, **Section height**, **Number of rotations** or **Number of circles**, this will affect the ideal number of points via the measurement length.

6 Define your settings for **Number of circles**:

Defines the number of additional circles to be measured. This selection has the following effect:

0: only the helical line is scanned.

2: a semicircle is scanned at the top, a circle is scanned at the bottom, and the supplementary semicircle is then scanned at the top.

4: a full circle at the starting height, helical line forward up to target height, two circles there, helical line back to starting height, another full circle there.

Note: Additional circles are useful especially for short cylinders – this increases the accuracy in determining the cylinder axis.

7 Click **OK** to confirm the entries.

Edge deviation

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.

NOTE

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

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

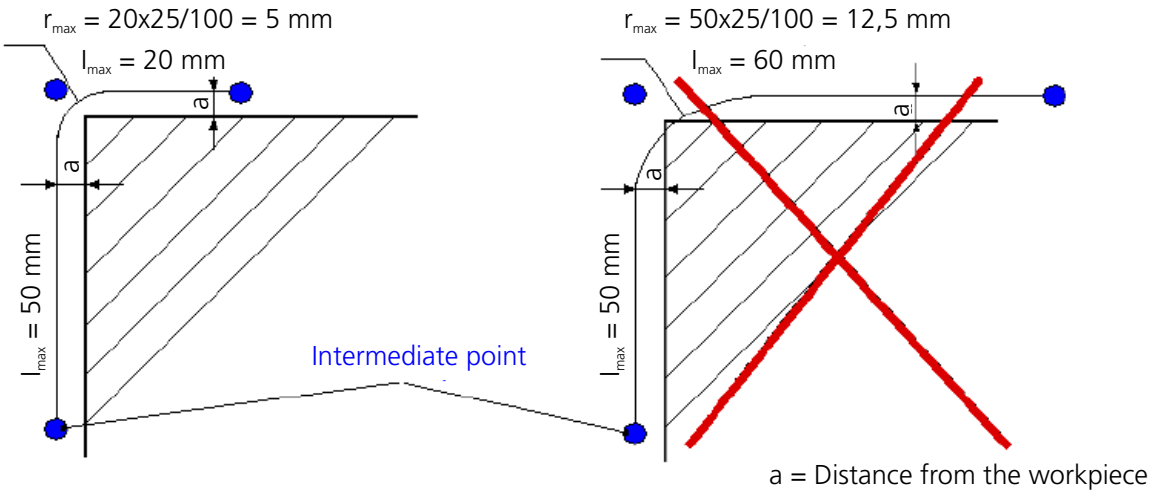
Rounding-off of corners enables a continuous movement of the probe to reduce the travel time between the features to be measured.

With the VAST Navigator, you activate the desired type of rounding-off of corners for the entire measurement plan.

- **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”.

Enter the radius of rounding-off. If this value is too large, this will be limited automatically by the VAST Navigator: The rounding-off radius may not exceed 25% of the shortest travel path (between two consecutive intermediate points).

Example: You enter 500 and the shortest travel path is 20 mm. Result: The value “5” is used for rounding-off of corners.



There is a risk of collision in case of long travel paths. Collisions can be avoided by increasing the distance a in the clearance planes or default range.

Activating rounding-off of corners

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

Activating rounding-off of corners in the Measurement Plan Editor Features

1 Select **Resources → Features Settings Editor**.

The **Measurement Plan Editor Features** dialog box appears on the screen. For detailed information, please refer to Measurement Plan Editor Features in the CALYPSO dialog reference in the Online Help.

2 To activate rounding-off of corners between features, select **VAST Navigator → Corner rounding between Features** from the selection list.

- or -

To activate rounding-off of corners within features, select **VAST Navigator → Corner rounding within Features** from the selection list.

The **apply to complete Measurement Plan** option is selected automatically.

3 Select under **set to** the desired radius (1 to 500 mm) or "** Default" and confirm with **OK**.

"** Default" accepts the default setting from CALYPSO.

The next time that you run the measurement plan, the set rounding-off of corners will be effective.

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