PC-DMIS Bevel Gear

Version 1.3.1

by

Wilcox Associates, Inc.

http://www.wilcoxassoc.com

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PC-DMIS Bevel Gear

Welcome to PC-DMIS Bevel Gear

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- Explore the features offered in the software
- Visit WAI's web-site
- Contact us

PC-DMIS Bevel Gear: Introduction

PC-DMIS Bevel Gear is a special software for the measurement and evaluation of spiral bevel gears.

Measurement results are displayed graphically.

PC-DMIS Bevel Gear includes the following features:

- Manual input of the gear parameters (teeth number, module,part cone angle,etc) - See "Editing Measurement Parameters".
- Generation of master flanks by measurement - See "Defining Master Flank Data".
- Topography Measurement - See "Defining Topography Data".
- Pitch/RunOut Inspection - See "Defining Pitch/Runout Data".
- Building Alignment with Wizard Mode - See "Creating a Gear Alignment".
- Full Probe Solution Strategy - The program automatically selects the appropriate pin for each measurement.

Getting Started

To begin using PC-DMIS Bevel Gear, complete the following steps:

1. Install PC-DMIS Bevel Gear
2. Launch PC-DMIS Bevel Gear
3. Define Geometry Parameters
4. Calibrate Probes
5. Create an Alignment
6. Measure the Master Flank
7. Measure a Gear
8. Analyze Measured Data and Create Report

Install PC-DMIS Bevel Gear

To install PC-DMIS Bevel Gear:

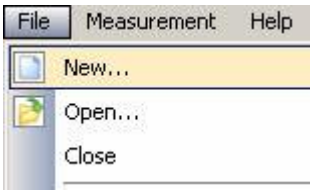
1. Attach the portlock that is programmed with the **PC-DMIS Bevel Gear** option enabled. This is required to run PC-DMIS Bevel Gear.
2. Download the current version of PC-DMIS Bevel Gear from the WAI ftp-site at ftp://ftp.wilcoxassoc.com/SpiralBevelGear/ if you have not already done so. The file is named SpiralBevelGear_Setup_<version>.zip
3. Install PC-DMIS Bevel Gear by double-clicking Setup.exe. Follow the instructions given by the install wizard.

Launch PC-DMIS Bevel Gear

Double-click the program shortcut on the desktop to launch PC-DMIS Bevel Gear. The **New File** dialog box will appear automatically. Specify the name of the new file and click **OK**, or click **Close** to cancel the creation of a new file.

Creating a New File:

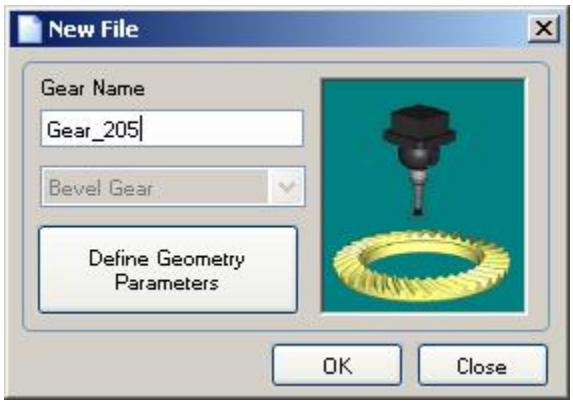
Select ...



or click ...

to open the **New File** dialog box.

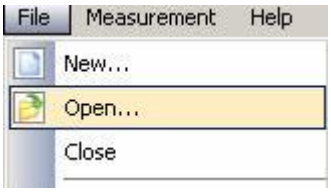
Open the **New File** dialog box by selecting the **File | New** menu option. You can also open this dialog box by clicking the **New** toolbar icon.



Type the name of the new file in the **Bevel Gear Name** box. If the file already exists you will be prompted to verify that you want to overwrite the old file. You can also click **Define Geometry Parameters** to provide the Geometry Parameters for your gear. See the "Defining Geometry Parameters" topic.

Opening an Existing File:

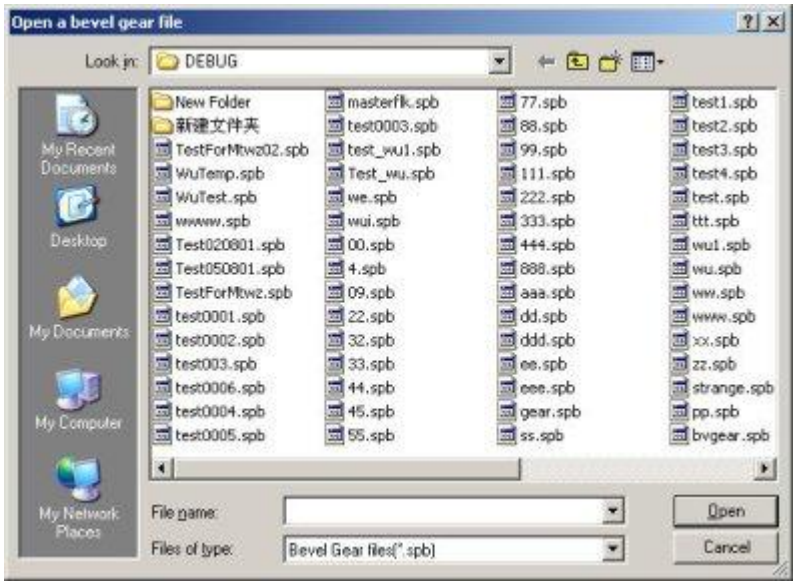
Select ...



or click ...

to open the **Open a bevel gear** dialog box.

Open the **Open a bevel gear** dialog box by selecting the **File | Open** menu option. You can also open this dialog box by clicking the **Open** toolbar icon. Browse to select the needed Bevel Gear (.spb) file and click **Open**.

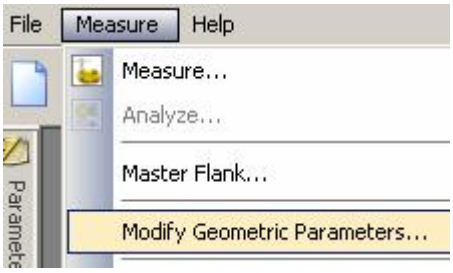


Define Geometry Parameters

Once you have created a new file or opened an existing file, you can modify the Geometry Parameters for your Bevel Gear file.

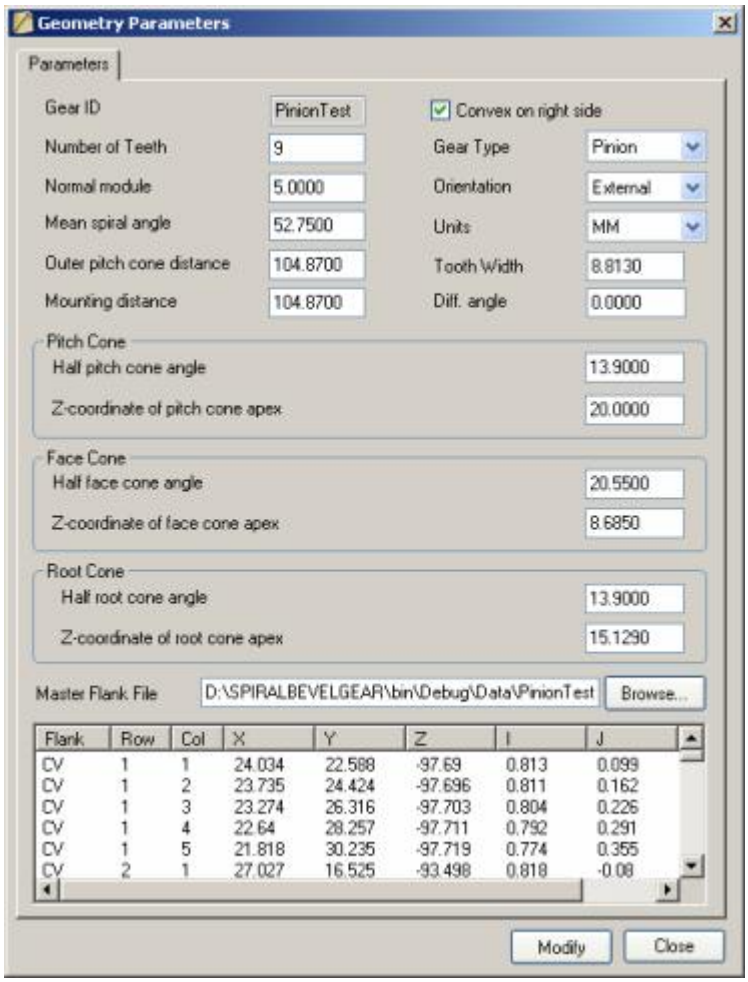
To Define Geometry Parameters:

1. Select the **Measure | Modify Geometric Parameters** menu option...



... or the **Modify Parameters** toolbar icon...

... to open the **Geometry Parameters** dialog box.



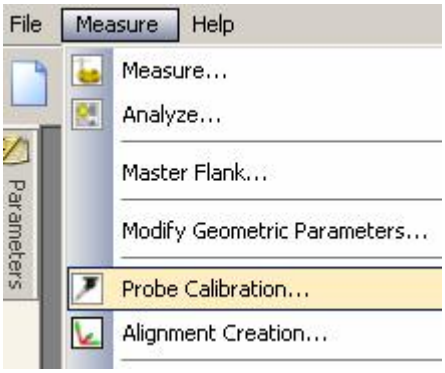
2. Make the needed changes to the values in the dialog box. See the "Editing Geometry Parameters" topic for more information on the available options.
3. Click **Modify** to update the changes that have been made or **Close** to cancel any changes.

Calibrate Probes

In order to measure your bevel gear, you must first calibrate your probe.

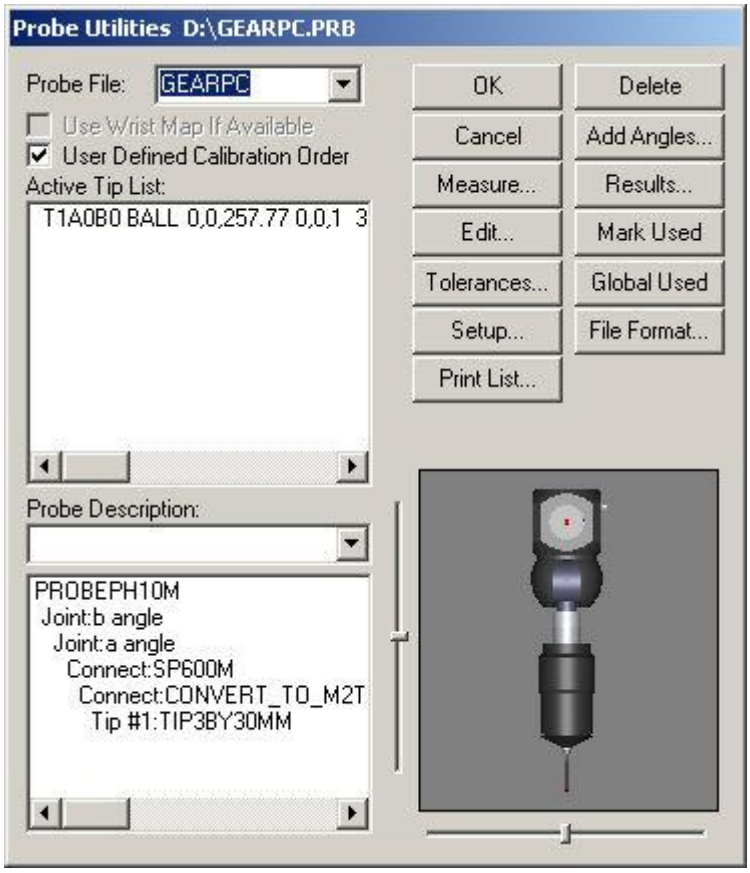
To Calibrate you probe:

1. Select the **Measure | Probe Calibration** menu option...



... or the **Probe Calibration** toolbar icon...

... to open the **Probe Utilities** dialog box. PC-DMIS launches in the background to allow you to use the **Probe Utilities** dialog box.



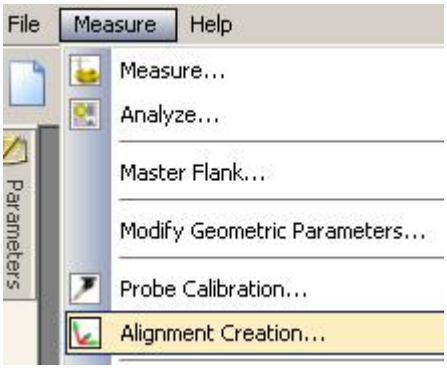
2. Calibrate your probe. If needed, see the core PC-DMIS help file for information on calibrating probes.
3. Click **OK** when you have finished the probe calibration.

Create an Alignment

Prior to measuring your gear, you need to create an alignment.

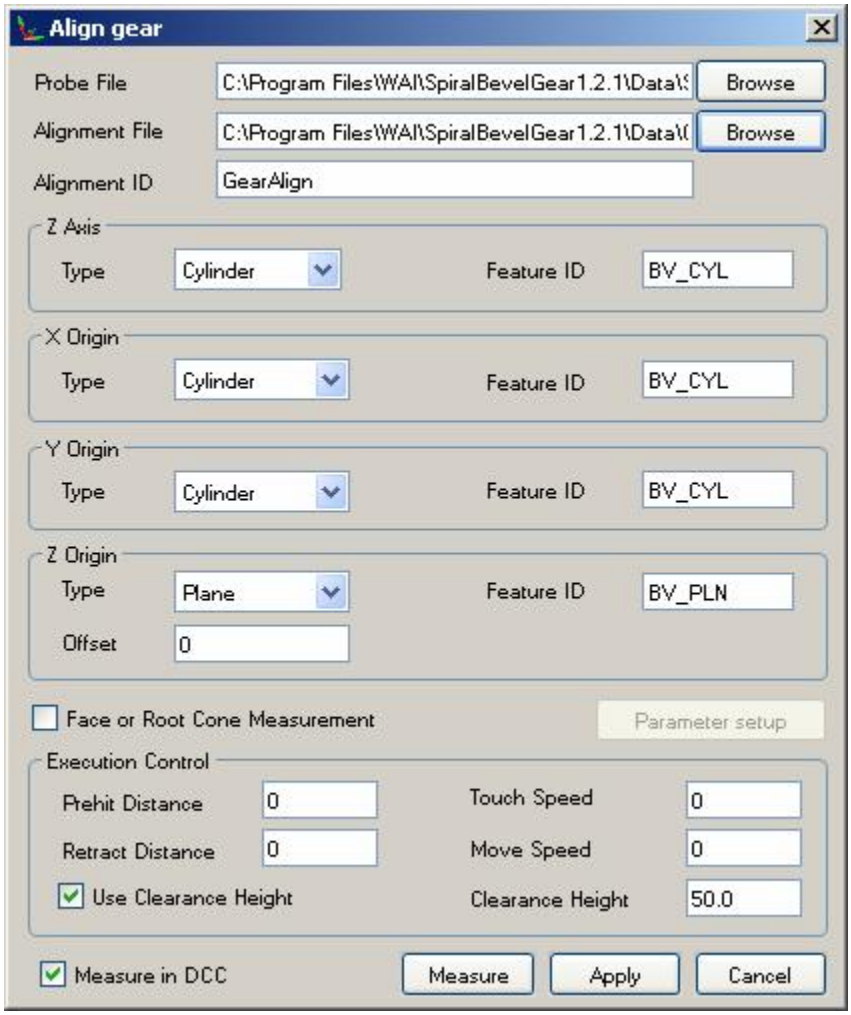
To Create an Alignment:

1. Select the **Measure | Alignment Creation** menu option...



... or the **Alignment Creation** toolbar icon...

... to open the **Align Gear** dialog box.



2. Make the needed changes to the values in the dialog box. See the "Creating a Gear Alignment" topic for more information on the available options.
3. Click **Start** to begin the Alignment Wizard. You are prompted whether of not you are ready to start Measurement.

4. Click **Yes** to continue measurement, using the Alignment Wizard. PC-DMIS launches in the background to execute each of the measurements.

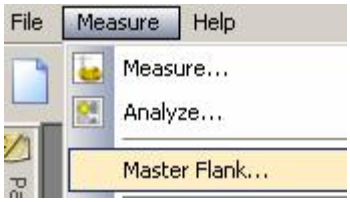
5. Follow the instructions and measure the specified features to establish the alignment. For each feature, select the **Active Tip** that will be used to measure the feature.
6. When each feature has been measured, click **Next**. You will be directed to measure the next feature. Click **Back** to measure the previous feature or **Cancel** to exit out of the alignment wizard. If you are not satisfied with a hit, click **Del Hit** to remove the last hit.

Measure the Master Flank

If you did not provide a Gleason file during the "Define Geometry Parameters" step, you will need to measure the Master Flank to create a Gleason file. Otherwise, you can skip to the next step and "Measure a Gear".

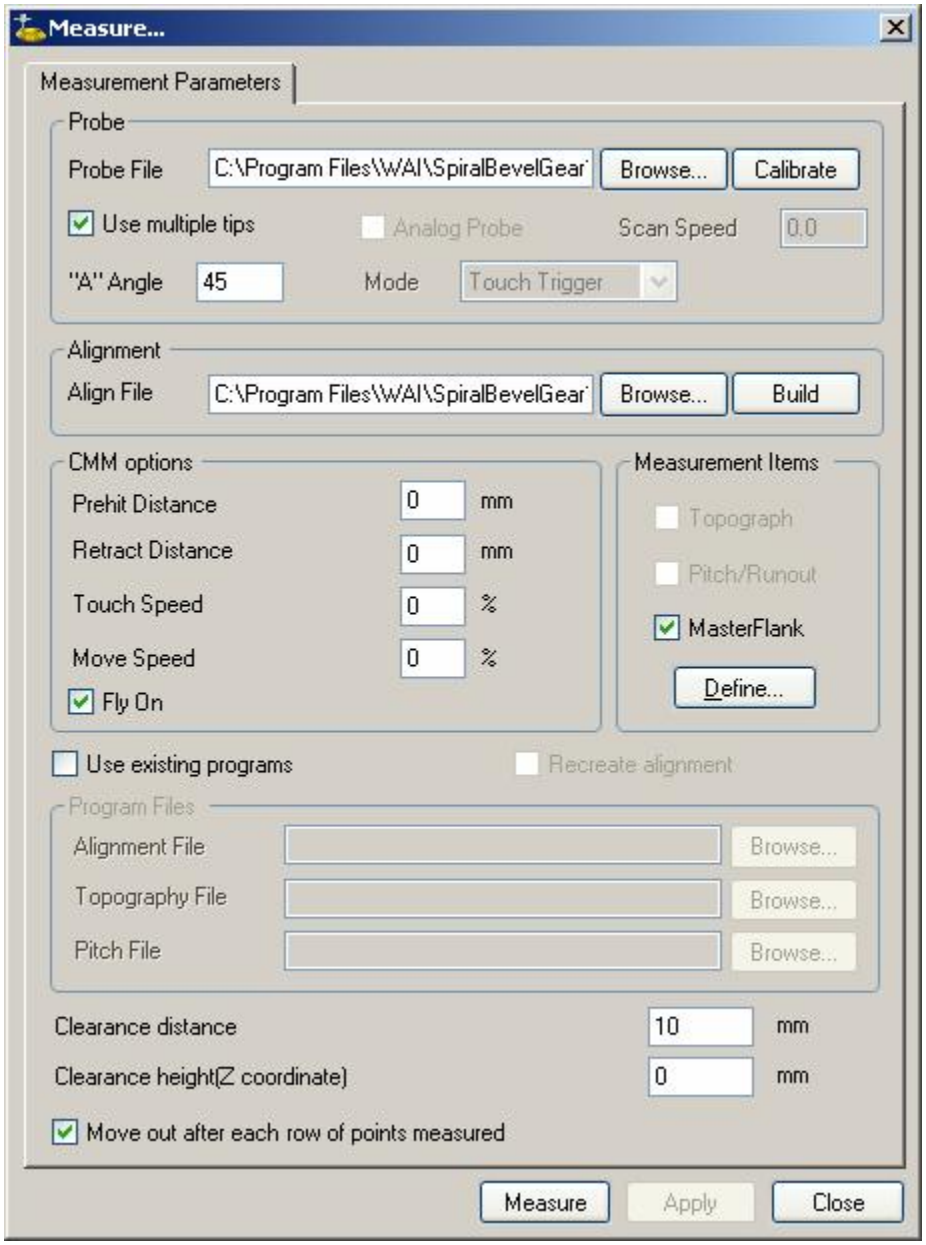
To Measure the MasterFlank:

1. Select the **Measure | Master Flank** menu option...

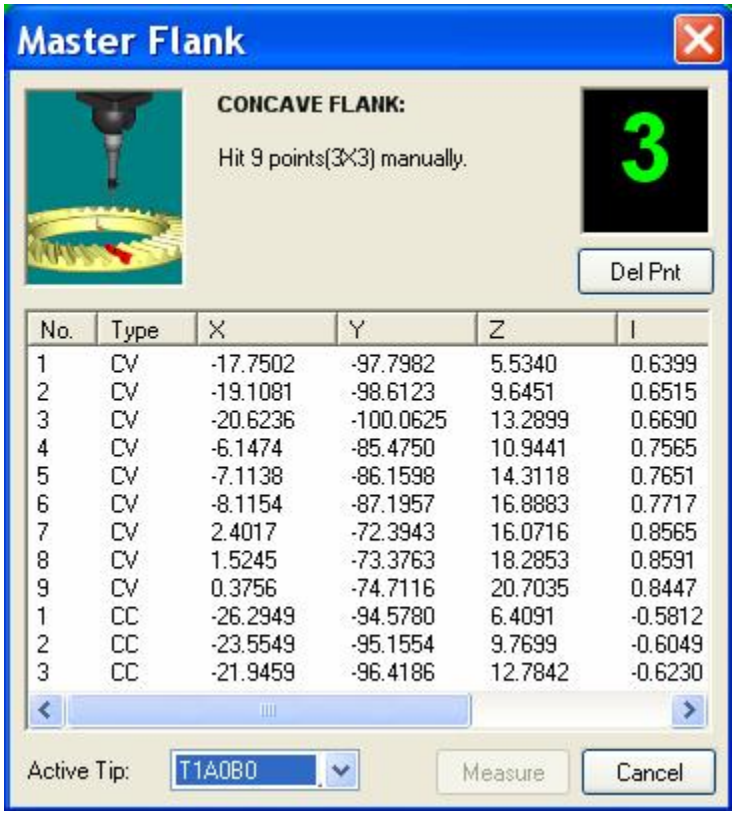


... or the **Create Master Flank** toolbar icon...

... to open the **Measure** dialog box. By default, the **MasterFlank** Measurement Item is selected.

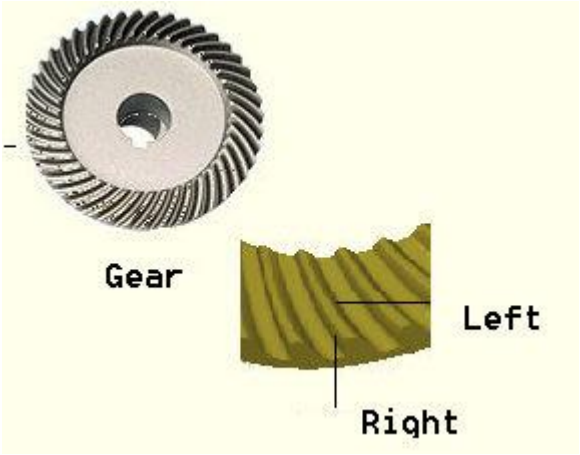


2. Make the needed changes to the values in the dialog box. See the "Editing Measurement Parameters" topic for more information on the available options.
3. Click **Define** to edit the Master Flank Data. See the "Defining Master Flank Data" topic.
4. Click **Apply** to save any changes that you have made, or **Close** to exit without saving your changes.
5. Click **Measure** to begin the **Master Flank Measurement** wizard. PC-DMIS launches in the background to execute each of the measurements.



No.	Type	X	Y	Z	I
1	CV	-17.7502	-97.7982	5.5340	0.6399
2	CV	-19.1081	-98.6123	9.6451	0.6515
3	CV	-20.6236	-100.0625	13.2899	0.6690
4	CV	-6.1474	-85.4750	10.9441	0.7565
5	CV	-7.1138	-86.1598	14.3118	0.7651
6	CV	-8.1154	-87.1957	16.8883	0.7717
7	CV	2.4017	-72.3943	16.0716	0.8565
8	CV	1.5245	-73.3763	18.2853	0.8591
9	CV	0.3756	-74.7116	20.7035	0.8447
1	CC	-26.2949	-94.5780	6.4091	-0.5812
2	CC	-23.5549	-95.1554	9.7699	-0.6049
3	CC	-21.9459	-96.4186	12.7842	-0.6230

6. Select the **Active Tip** that will be used to measure the specified hits. Follow the instructions and measure the specified hits to establish the Master Flank. The left and right flanks of a gear are defined as shown in the image below.



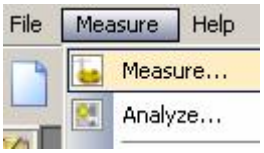
7. If you are not satisfied with a hit, click **Del Pnt** to remove the last hit.
8. When you have finished taking hits, click **Measure**. The software will create a program and take 5*9 points on each flank automatically.

Measure a Gear

There are two parts to measuring a bevel gear. First, measure the MasterFlank, Second, perform general gear measurement.

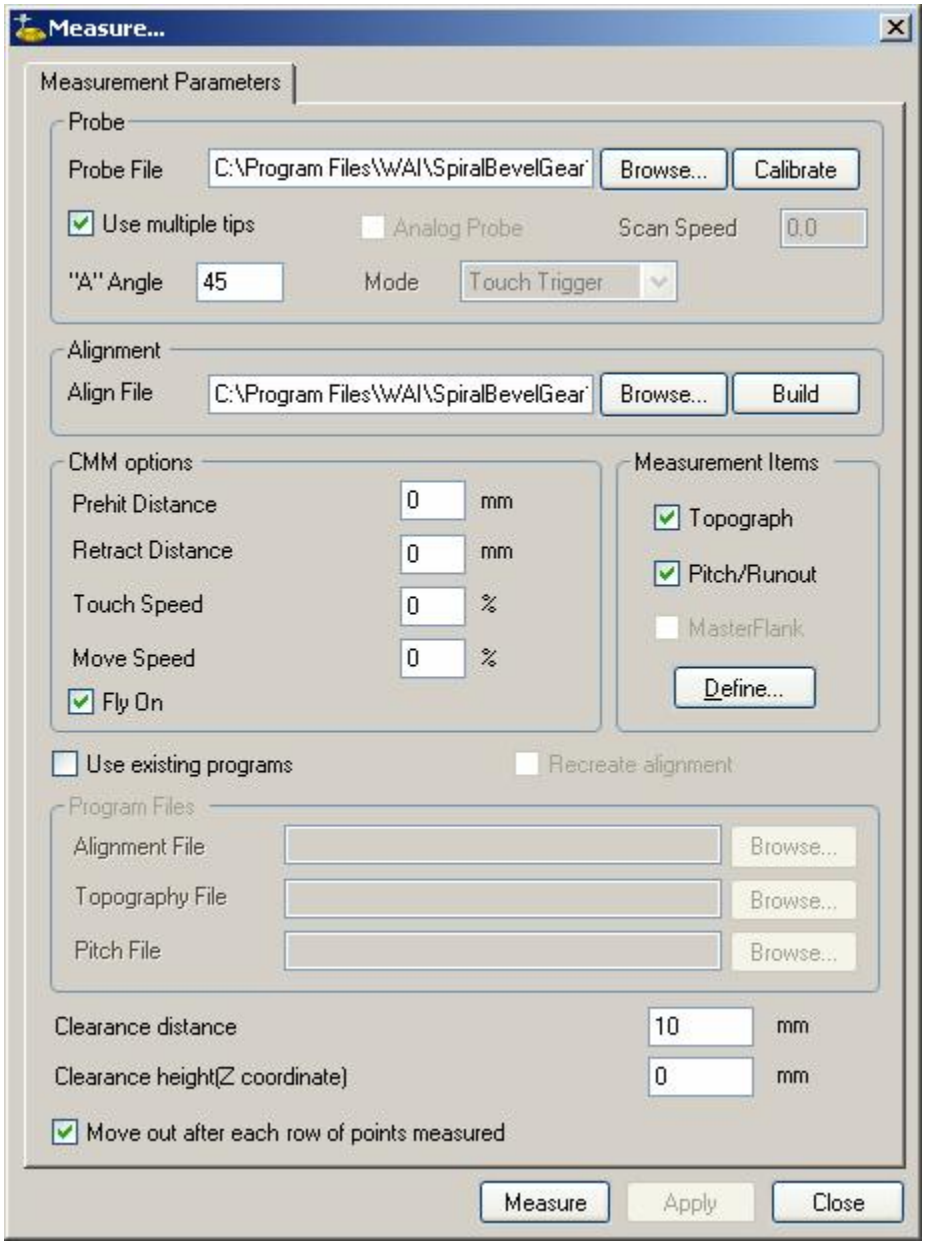
To Measure a Gear:

1. Select the **Measure | Measure** menu option...

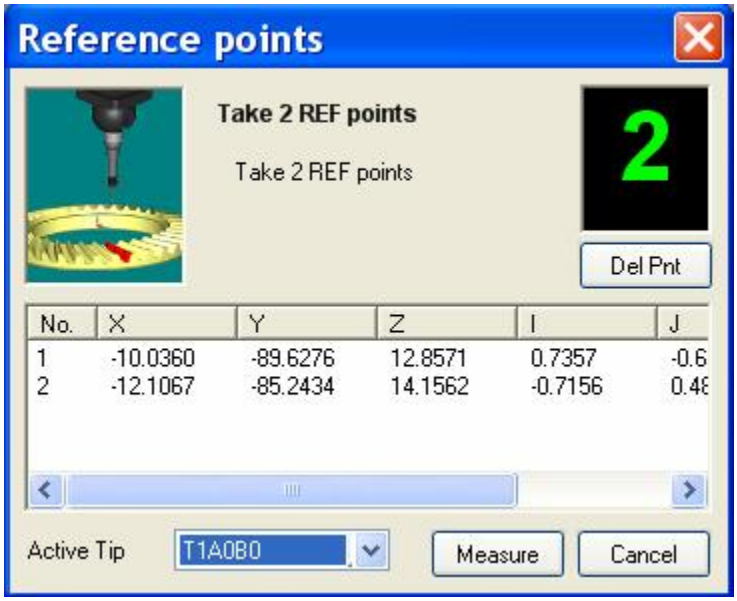


... or the **Measure** toolbar icon...

... to open the **Measure** dialog box. By default, the **Topograph** and **Pitch/Runout** Measurement Items are selected.



2. Make the needed changes to the values in the dialog box. See the "Editing Measurement Parameters" topic for more information on the available options.
3. Click **Define** to edit the Topograph and Pitch/Runout Flank Data. See the "Defining Topograph Data" and "Defining Pitch/Runout Data" topics.
4. Click **Apply** to save any changes that you have made, or **Close** to exit without saving your changes.
5. Click **Measure** to begin the gear measurement process. PC-DMIS launches in the background to execute each of the measurements.



6. Follow the instructions and take two manual hits on each flank of one tooth. Click **Del Pnt** to remove the last hit.

Note: Reference points (clocking points) can be taken in ANY order on the tooth or in the gap between the teeth, and it doesn't matter if hits are taken clockwise or not.

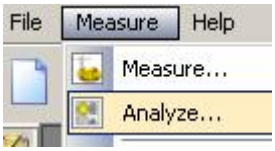
7. Select the **Active Tip** and click **Measure** (or click **Cancel** to cancel gear measurement). PC-DMIS will create a part program and measure your gear automatically.

Analyze Gear Data and Create Report

Once you have finished measuring your gear, you can analyze the data and create a **Topography** and/or **Pitch and Runout** report.

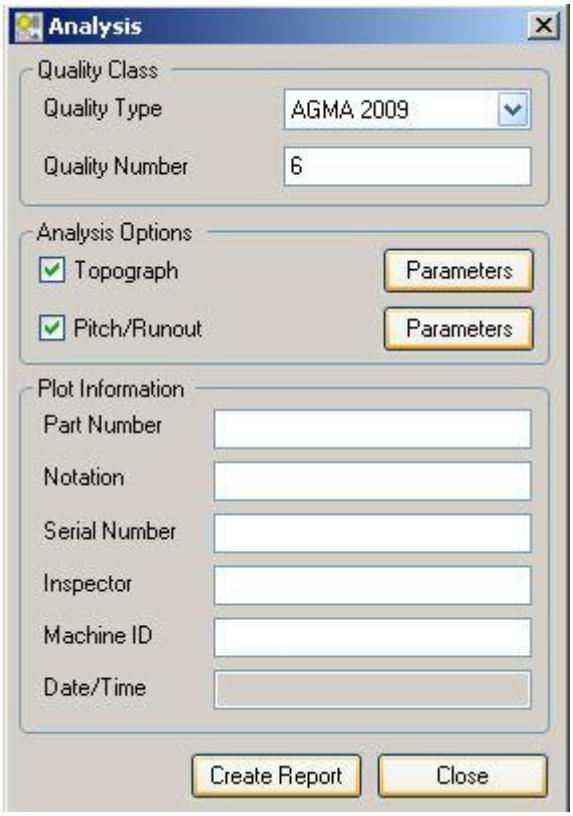
To Create a Report:

1. Select the **Measure | Analyze** menu option...



... or the **Analyze** toolbar icon...

... to open the **Analysis** dialog box.



2. Select the **Quality Type** from the drop-down list and provide a **Quality Number**.
3. Select **Topograph** and/or **Pitch/Runout** options and set the **Parameters** for these **Analysis Options**. See the "Defining Topography Data" and "Defining Pitch/Runout Data" topics.
4. Provide **Plot Information** that will be included in the header of your report.
5. Click **Create Report**, or click **Close** to cancel report creation.

Once you click **Create Report**, the measurement data is spooled to the **Quindos PageViewer** application where you can view and print your report(s).

User Interface

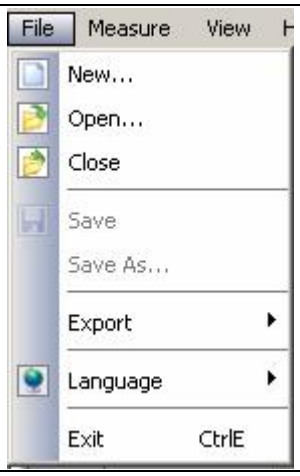
User interface elements for PC-DMIS Bevel Gear are discussed in the following topics:

- Menu Options
- Toolbar
- Parameters Tree Window
- Status Window
- Status Bar

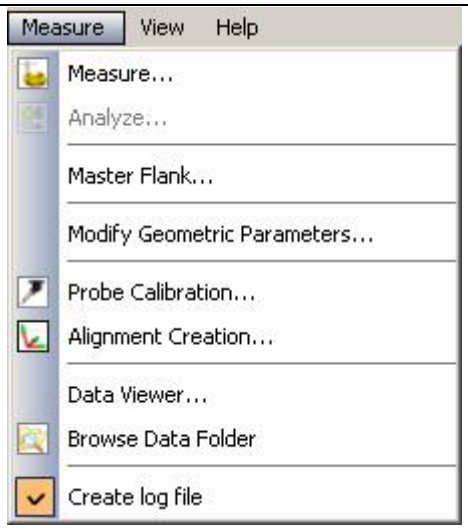
Menu Options

The following menu options are available in PC-DMIS Bevel Gear:

File Menu

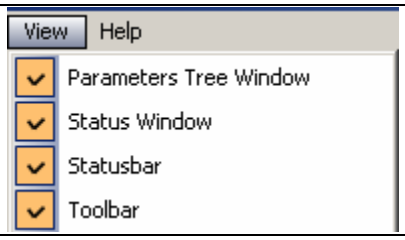
	• **New:** Create a new Bevel Gear file. • **Open:** Open an existing Bevel Gear file. You will be prompted to save your work before the current file is closed and the selected file is opened. • **Close:** Close the current Bevel Gear file. • **Save:** Save the current Bevel Gear file with the current file name and file type (*.bevel). • **Save as:** Save the current Bevel Gear file with a specified name. • **Language:** Select the language that will be used for the PC-DMIS Bevel Gear application. • **Exit:** Exit PC-DMIS Bevel Gear.

Measure Menu



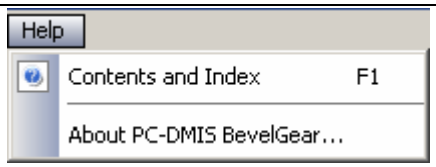
- **Measure:** Measure your gear. See "Measure a Gear".
- **Analyze:** Analyze the measured results for your gear. See "Analyze Measured Data and Create Report".
- **Master Flank:** Measure the Master Flank to create a Gleason file. See "Measure the Master Flank".
- **Modify Geometric Parameters:** Set geometry parameters for your gear. See "Modifying Geometry Parameters".
- **Probe Calibration:** Calibrate your Probe. See "Calibrating Your Probe".
- **Alignment Creation:** Create alignment for the gear you want to measure. See "Editing Alignment Values".
- **Data Viewer:** View the nominal and actual data for your measured gear. See "Viewing Feature Data".
- **Browse Data Folder:** Open the **Data** folder inside the PC-DMIS Bevel Gear install directory.
- **Create Log File:** Selecting this option will cause debug information to be collected for troubleshooting problems. Debug information is stored in the BvGear.log file in the PC-DMIS Bevel Gear install directory.

View Menu



- **View Menu Items:** Toggles the display of the respective SBG application elements: **Parameters Tree Window**, **Status Window**, **Statusbar**, & **Toolbar**.

Help Menu

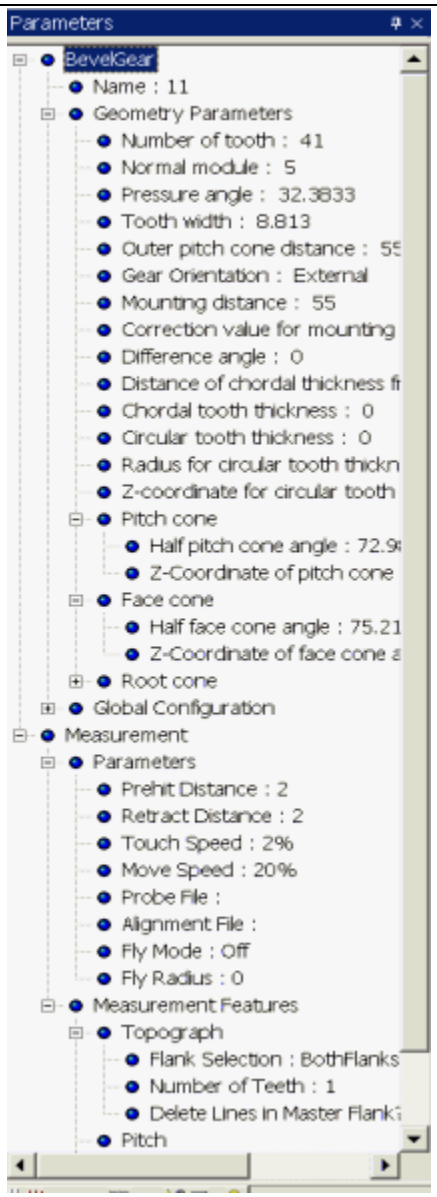


- **Contents and Index:** Open the PC-DMIS Bevel Gear help file.
- **About PC-DMIS BevelGear:** Displays information about your version of PC-DMIS Bevel Gear.

Toolbar

1. **New:** Create a new Bevel Gear file.
2. **Open:** Open an existing Bevel Gear file. You will be prompted to save your work before the current file is closed and the selected file is opened.
3. **Close:** Close the current Bevel Gear file.
4. **Save:** Save the current Bevel Gear file with the current file name and file type (*.spb).
5. **Probe Calibration:** Calibrate your Probe. See "Calibrating Your Probe".
6. **Alignment Creation:** Create alignment for the gear you want to measure. See "Editing Alignment Values".
7. **Measure:** Measure your gear. See "Measure a Gear".
8. **Analyze:** Analyze the measured results for your gear. See "Analyze Measured Data and Create Report".
9. **Modify Parameters:** Set geometry parameters for your gear. See "Modifying Geometry Parameters".
10. **Create Master Flank:** Measure the Master Flank to create a Gleason file. See "Measure the Master Flank".
11. **Browse Data Folder:** Open the **Data** folder inside the PC-DMIS Bevel Gear install directory.
12. **Change Language:** Click the small arrow next to the icon and select the language that will be used for the PC-DMIS Bevel Gear application.
13. **Help:** Open the PC-DMIS Bevel Gear help file. Click the arrow next to this icon and select either "Contents and Index" to open the help file, or select "About PC-DMIS BevelGear" to view Application build information.

Parameters Tree Window

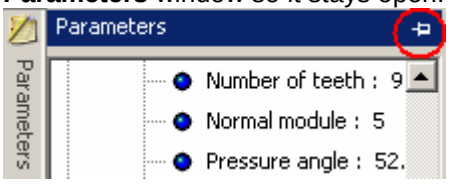


The Parameters Tree Window is only used to display the detail information for parameters. It is only a reference and you can not modify it.

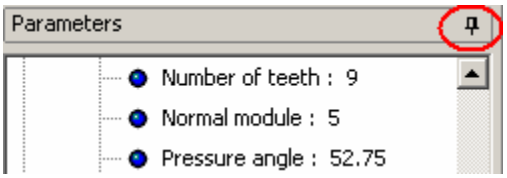
Click

to open the **Parameters** window.

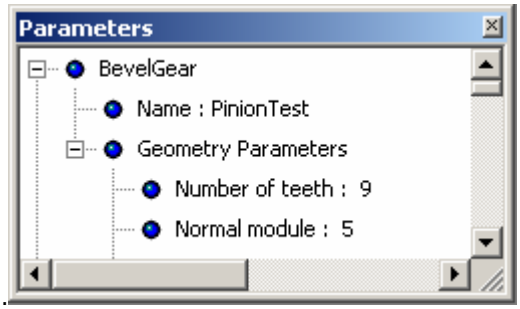
Click the thumbtack icon to anchor the **Parameters** window so it stays open.



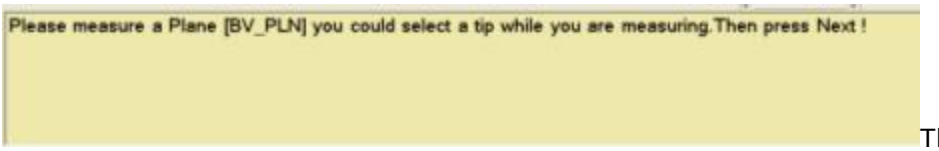
Likewise, click the black thumbtack icon to close the **Parameters** window.



You can also click and grab the title bar of the fixed **Parameters** window to cause it to float above the main window. In this way you can size and position the window wherever you want. You can also dock this window to the any side of the main PC-DMIS Bevel Gear window by dragging it to the desired position. Click the **X** in the corner to close this window.



Status Window



The Status Window dynamically describes the process messages or gives prompts during your measurement. You can open and close this window by clicking the up or down buttons in the middle of the top border of this window.

Status Bar

The **Status Bar** does the following:

- Provides status information
- Displays the name of the current active part program in PC-DMIS.
- You can control the visibility of PC-DMIS by clicking the **INVISIBLE** or **VISIBLE** button in the status bar.
- Displays the units of the current part program.
- Displays the XYZ coordinates of your probe. You can also click anywhere in the XYZ area to open a **Readout** window. To close the **Readout** window, just click in the XYZ area again.

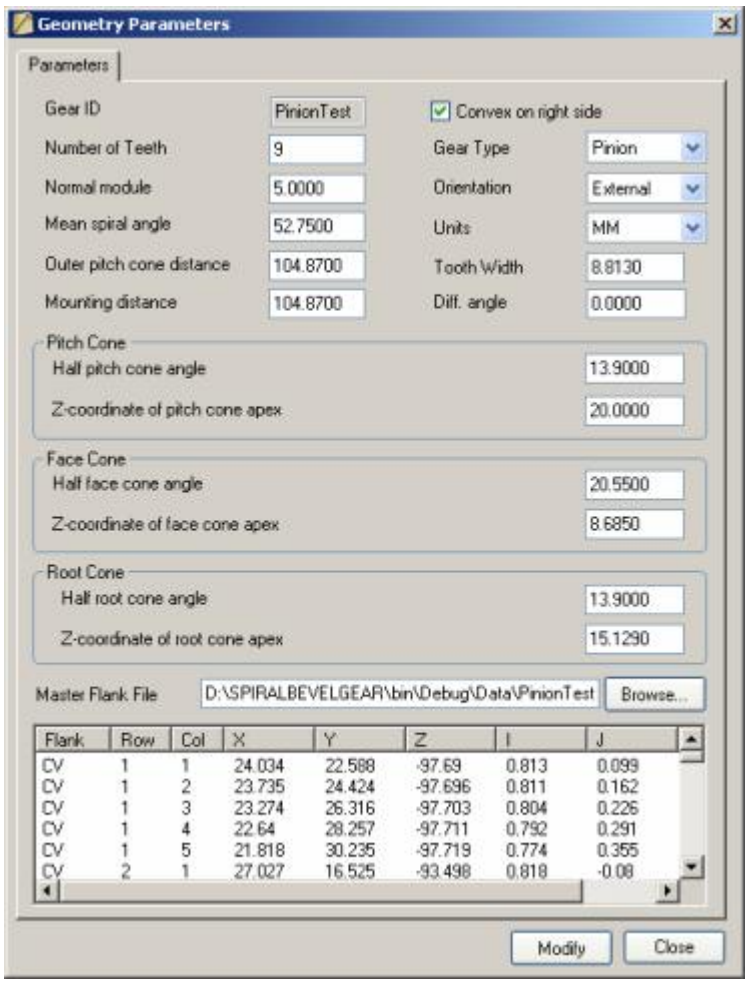
Using PC-DMIS Spiral Bevel Gear

The following topics discuss the parameters and usage of the various dialog boxes found in PC-DMIS Bevel Gear:

- Modifying Geometry Parameters
- Calibrating Your Probe - See "Calibrate Probes".
- Creating a Gear Alignment
- Defining Master Flank Data
- Editing Measurement Parameters
- Viewing Feature Data
- Analyzing Gear Data

Geometry Parameters are used to define the geometry for the gear that is to be measured. Most of these values can be found in the drawing for the gear. If some of parameters are not provided from the drawing or if their value does not yet correspond to the drawing, the corresponding value can be estimated in order to make the measurement possible.

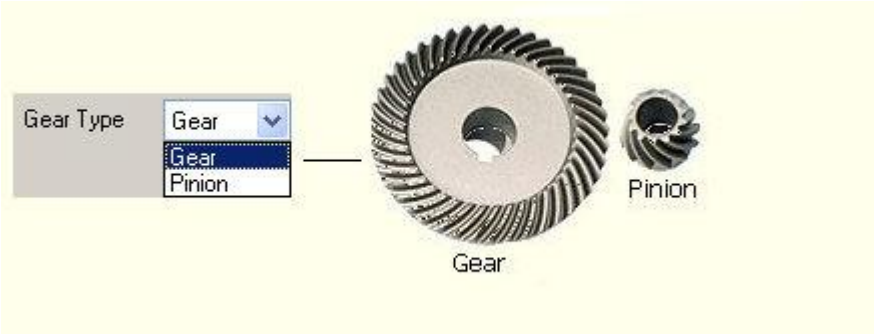
Select the **Measure | Modify Geometric Parameters** menu option or the **Probe Calibration** toolbar icon to open the **Geometry Parameters** dialog box.



Edit the following values to define the gear geometry:

- **Number of Teeth:** Provide the number of teeth for your gear.

- **Normal Module(MM)/Diametrical Pitch(INCH):** The heading for this box changes between "Diametrical Pitch (Inch)" and "Norm Module (MM)" depending on whether you selected **INCH** or **MM** as your **Units** of Measurement. Normal Module or diametrical pitch should be defined as part of the gear specification.
- **Mean Spiral Angle:** Determines the mean angle of the teeth.
- **Outer pitch cone distance:** Provides the shortest distance from the original alignment to the pitch point along the pitch cone.
- **Mounting Distance:** Provides the distance from the original alignment to the mounting point.
- **Convex on right side:** When this option is selected the right side of the gear teeth as viewed from the center of the gear is convex. If the convex side is on the left (see the large gear in the image below), then this option should not be selected.
- **Gear Type:** Select either "Gear" or "Pinion" as depicted below.



- **Orientation:** Select **External** for gears where the teeth are on the outside of the gear, or **Internal** for gears where the teeth are on the inside of the gear.
- **Units:** Select from either **INCH** or **MM** to define the units for your gear.
- **Tooth Width:** Defines the width of the tooth.
- **Diff. Angle:** Defines the angle difference from one tooth to the next.

Pitch Cone

- **Half pitch cone angle:** Defines the half cone angle for the *pitch* cone.
- **Z-coordinate for pitch cone apex:** The z-coordinate of the *pitch* cone apex is used to define the location of the pitch cone.

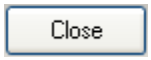
Face Cone

- **Half face cone angle:** Defines the half cone angle for the *face* cone.
- **Z-coordinate of face cone apex:** The z-coordinate of the *face* cone apex is used to define the location of the pitch cone.

Root Cone

- **Half root cone angle:** Defines the half cone angle for the *root* cone.
- **Z-coordinate of root cone apex:** The z-coordinate of the *root* cone apex is used to define the location of the pitch cone.

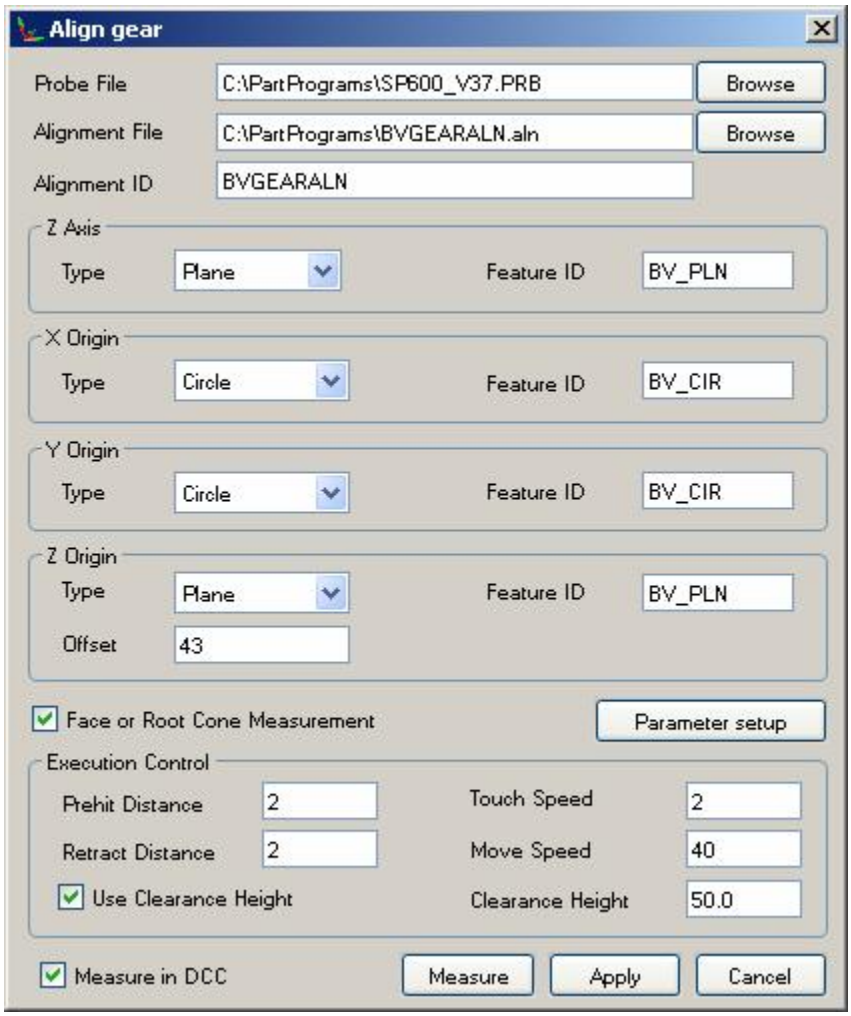
Applies the changes that have been made in the dialog box.



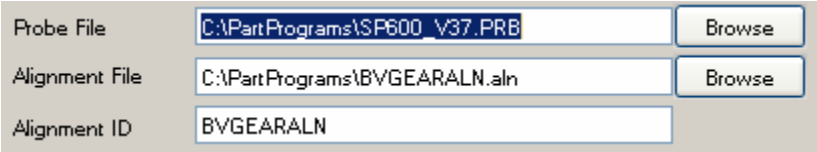
Cancels any changes and closes the dialog box.

Creating a Gear Alignment

Select the **Measure | Alignment Creation** menu option or the **Alignment Creation** toolbar icon to open the **Create Alignment** dialog box.



To Create a Gear Alignment:

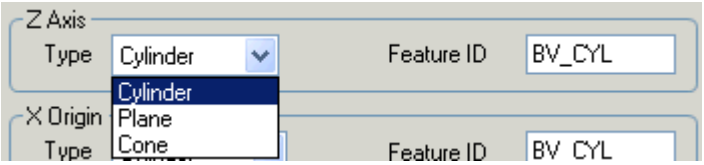


1. **Browse** to or type the path and name for the **Probe File**.

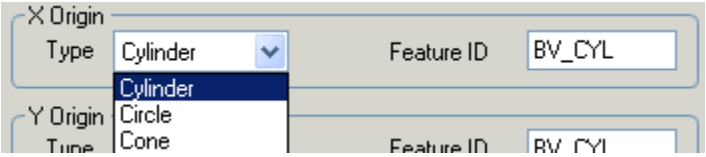
2. **Browse** to or type the path and name for the **Alignment File**. You can create a new file or replace an existing alignment file.
3. The **Alignment ID** field is read-only. The value is automatically added after you have selected the **Alignment File**.

Note: You must choose a valid probe file, otherwise you will get a warning message.

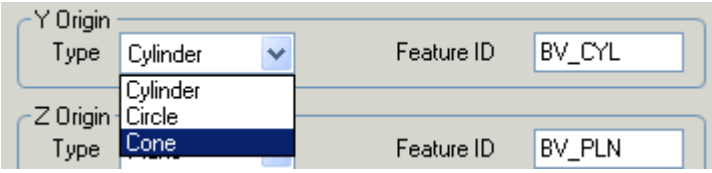
4. If you have selected the **Face or Root Cone Measurement** option, you can then click the **Parameter setup** button that is now available. See "Face or Root Cone Measurement Parameters".
5. Specify the feature **Type** (Cylinder, Plane, Cone) for the **Z Axis** and change the **Feature ID** if needed.



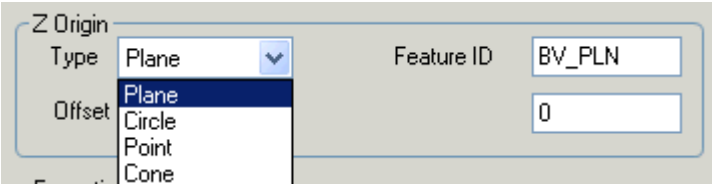
6. Specify the feature **Type** (Cylinder, Plane, Cone) for the **X Origin** and change the **Feature ID** if needed.



7. Specify the feature **Type** (Cylinder, Plane, Cone) for the **Y Origin** and change the **Feature ID** if needed.

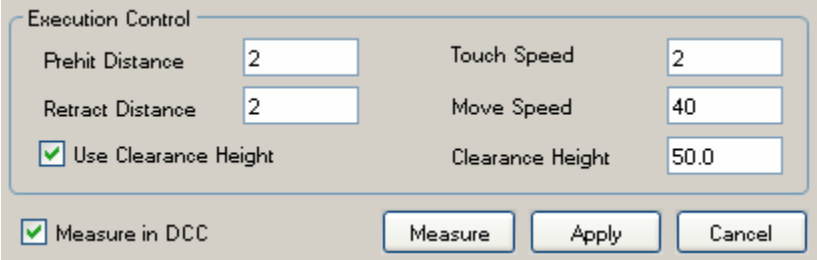


8. Specify the feature **Type** (Plane, Circle, Point, Cone) for the **Z Origin** and change the **Feature ID** if needed.



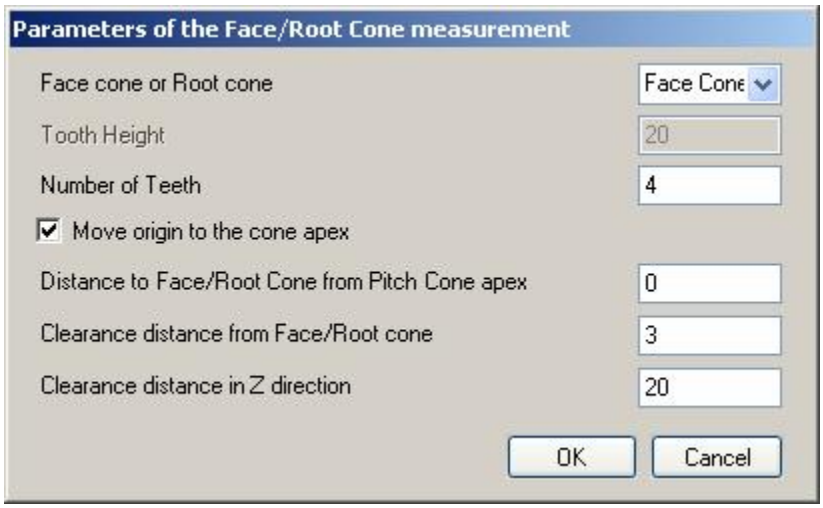
9. Select the **Face or Root Cone Measurement** option if you want to create the alignment accurately by face/root cone. See the "Face or Root Cone Measurement Parameters" topic for more information on the Parameter Setup.

10. Specify the machine parameters for **Prehit Distance**, **Retract Distance**, **Touch Speed**, and **Move Speed**. See the Core PC-DMIS documentation for more information on these values.



11. Select the **Use Clearance Height** option and specify the **Clearance Height** to provide the clearance height. This is used to define a safe height to avoid a probe crash. After measurement of each element has completed, the probe will move to this clearance height and then proceed to another element.
12. Select the **Measure in DCC** option to execute the alignment in DCC mode.
13. Click **Apply** to save any changes or **Cancel** to close the **Align gear** dialog box without saving changes.
14. Click **Measure** to begin the alignment **Wizard**. See the "Executing a Basic Alignment" or "Executing an Accuracy Alignment" topic.

Face or Root Cone Measurement Parameters



To set the **Face/Root Parameters** for the measurement of cone:

1. Select whether you want to measure a **Face Cone** or **Root Cone**.

2. For a **Root** cone you must specify the probable **Tooth Height** (available to edit if Root is selected).
3. Define the **Number of teeth** to measure.
4. If you want to move origin point to the cone apex check the **Move Origin point to the cone apex** option.
5. If you checked the **Move origin point to the cone apex**, you need to provide the **Distance to Face/Root Cone from Pitch Cone apex**.
6. Specify the **Clearance distance from Face/Root cone** for the distance you want the probe to retract after measuring each tooth.
7. Specify the **Clearance distance in Z direction** for the distance you want the probe to retract after measuring the entire face/root cone.
8. To accept the parameters and go back to **Create Alignment** dialog box, click **OK**. Click **Cancel** to close without saving changes.

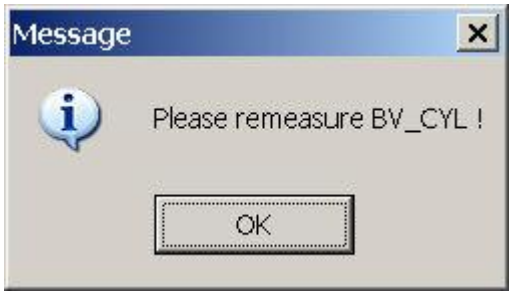
Executing a Basic Alignment

A Basic Alignment is executed when you have *not* selected **Face or Root Cone Measurement** option from the **Create Alignment** dialog box. Otherwise the "Accuracy Alignment" is executed.

To Execute a Basic Alignment:

1. Follow the instructions given in the **Wizard** to complete the **Basic Alignment**:

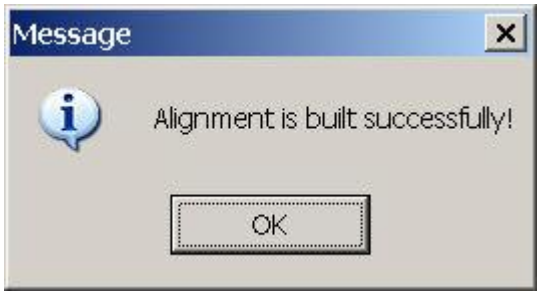
2. After each measurement you can click **Next** to continue to the next measurement.
3. If you are not satisfied with the step that you just completed you can click **Back** to go to the last step. Also before you go to the next step the **Back** button will display as **Delete**; click it to delete the feature you just measured.
4. During measurement, if the hit point you have taken is not good enough to fit a feature needed, the software will warn you to remeasure it. You can click **OK** and continue.



Note: The last step can always be undone!

5. After you have measured all alignment features this **Execution** box will appear. Click **Cancel** to cancel the auto measure or click **OK** to proceed with the measurement.

6. When automatic alignment process has completed following message box will appear.



7. The Basic Alignment is now complete.

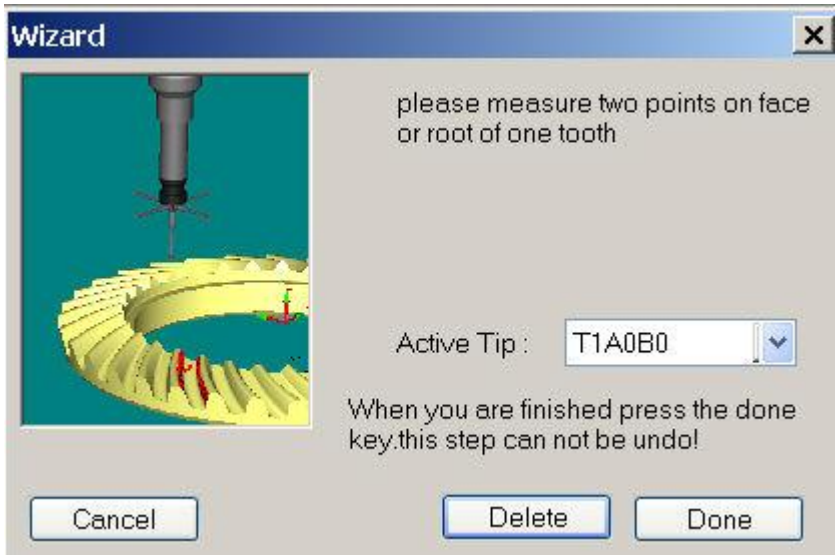
Executing Accuracy Alignment

The Accuracy Alignment is executed when you have selected **Face or Root Cone Measurement** option from the **Create Alignment** dialog box. Otherwise the "Basic Alignment" is executed.

Some blueprints require a more accurate alignment that is created using a face/root cone.

To Execute an Accuracy Alignment:

1. Follow the instructions given in the **Wizard** to complete the **Accuracy Alignment**:

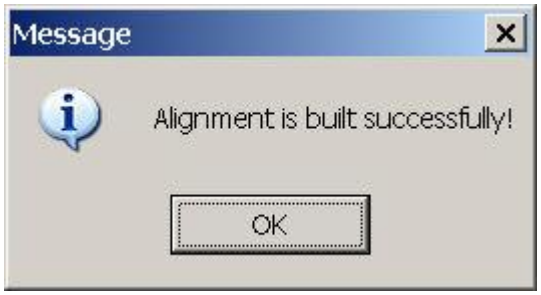


2. You will always need to take 2 hits on the face/root cone of the bevel gear, and the PC-DMIS part program for face/root cone will be built automatically.
3. Click **Delete** to delete the points that were just taken, if you are not stisfied with the result.
4. Click **Done** to measure the face/root cone.

Important: *The alignment can not be undone after you click* ***Done*** *button.*

5. Same as Basic alignment, After you have measured all points this **Execution** box will appear. Click **Cancel** to cancel the auto measure or click **OK** to proceed with the measurement.

6. When automatic alignment process has completed following message box will appear.



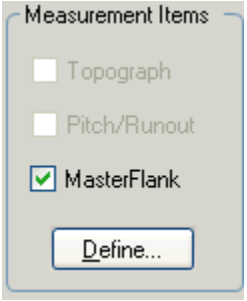
The Accuracy Alignment is now complete.

Defining Master Flank Data

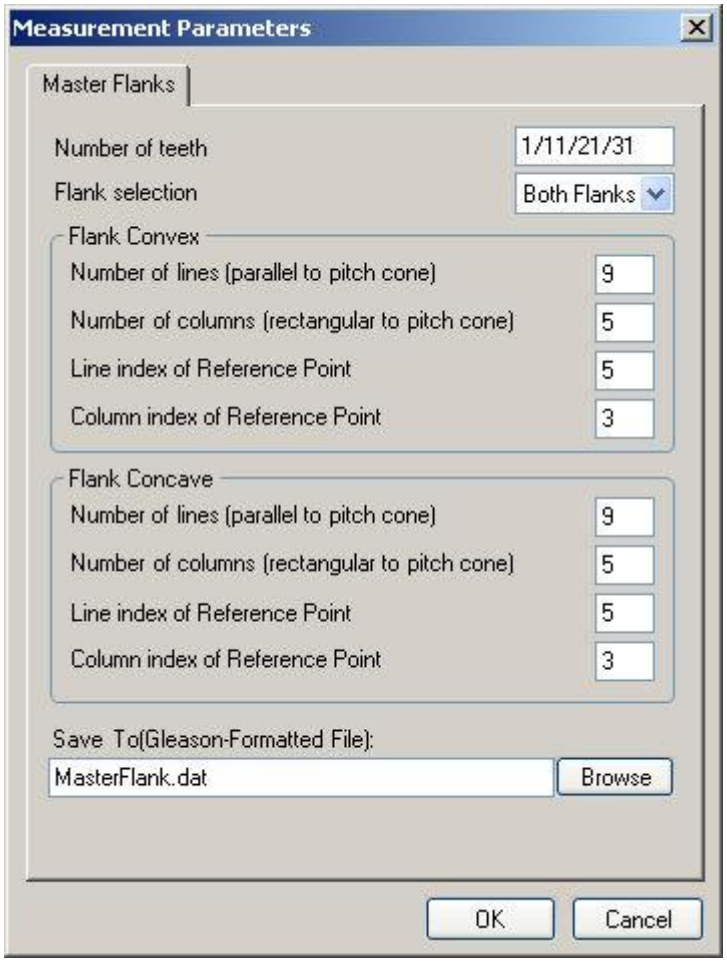
If you don't have a Gleason File, you should measure the Master Flank before you measure your gear.

To Define Master Flank Data:

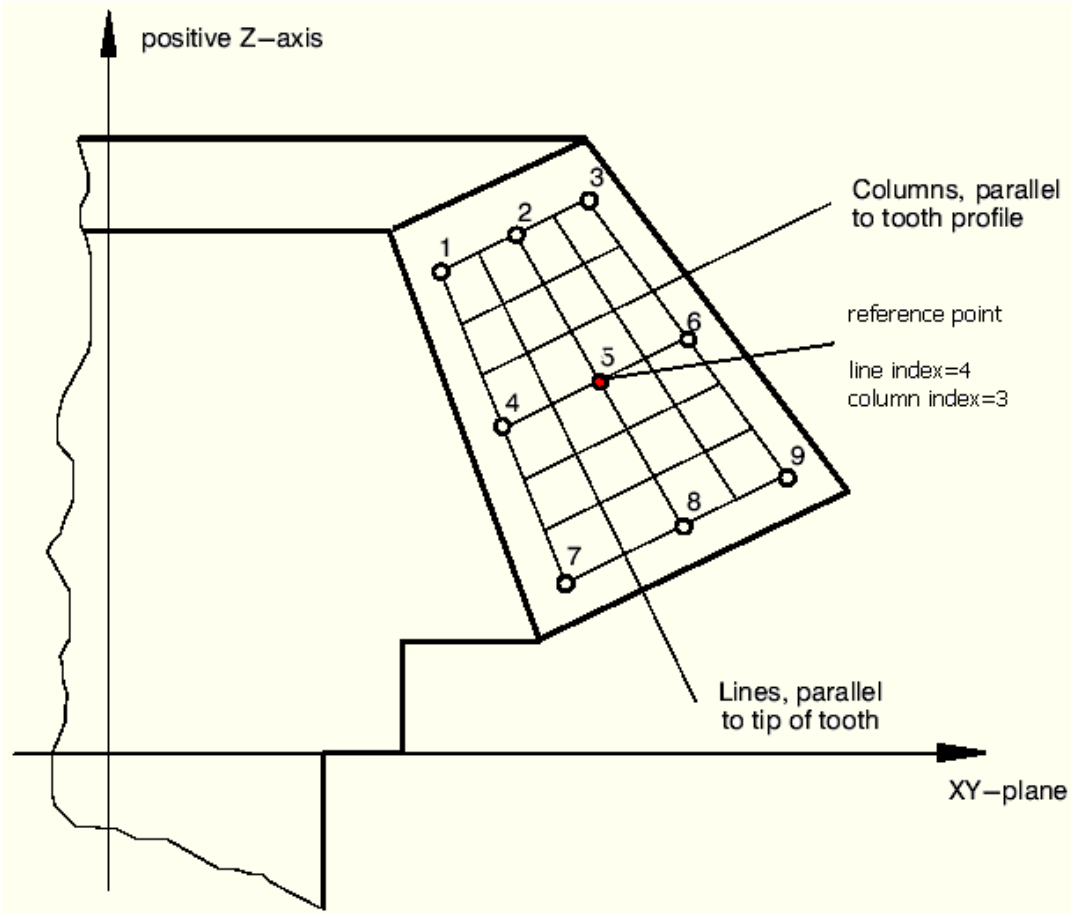
1. Select the **Measure | Master Flank** menu option or the **Create Master Flank** toolbar icon to open the **Measurement Parameters** dialog box with the **MasterFlank** option selected.



2. Click **Define** to open the **Measurement Parameters (Master Flanks)** dialog box.



3. Provide the **Number of teeth** that will be measured to define the Master Flank. This value is required. For example a value of 1/11/21/31 will measure teeth 1, 11, 21, and 31. Type "*" to measure all teeth. The calculation of the Master Flank uses an average from all measured flanks.
4. For **Flank Selection**, select whether the **Concave Flanks**, **Convex Flanks** or **Both Flanks** will be measured.
5. Specify the parameters for the measurement of the Convex and Concave Flanks of the Master Flank. These include **Number of lines**, **Number of columns**, **Line index of Reference Point**, and **Column index of Reference Point**. A minimum of "4" is required for the **Number of lines** and **Number of columns** values. The meaning of these values is depicted in the image below:



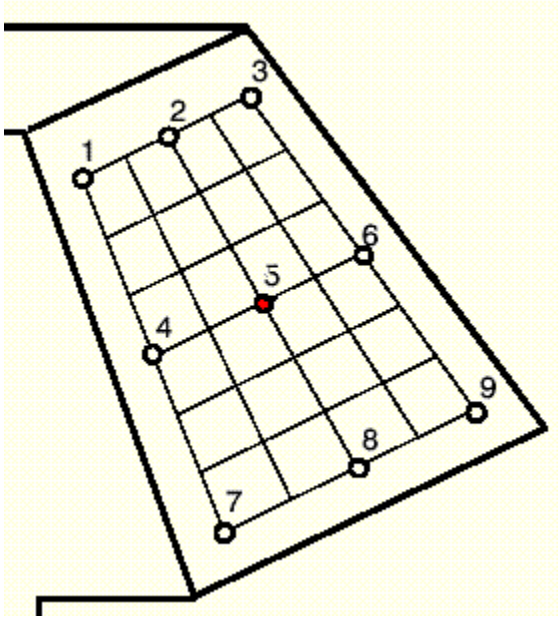
6. Click **Browse** to specify the location where the **Gleason-Formatted File** will be **Saved To**. This opens a **Save As** dialog box. Type the name of the file in the **File Name** box and click **Save**.
7. Click **OK** to save your changes or **Cancel** to close the dialog box without saving
8. Edit any other **Measurement Parameters** as described in the "Editing Measurement Parameters" topic.
9. After you have changed all the needed parameters, Click **Apply** to save your changes to the gear file.
10. Click **Measure** to begin the Master Flank measurement process. All probing points and the machine movement is generated by PC-DMIS Bevel Gear. You will be prompted to start measurement.

11. Click **Yes** to start and **No** to Cancel. PC-DMIS will run your part program automatically. See the "Master Flank Measurement" topic for information on the measurement procedure.

Master Flank Measurement

The following describes the process of measuring the Master Flank:

1. After all the parameters for the Master Flank have been set, and you have clicked **Measure**, you have to execute 9 manual hits in a specific order. These hits serve as a start value for the calculation of the probing points of the master grid to be measured and define the corner points of the grid.



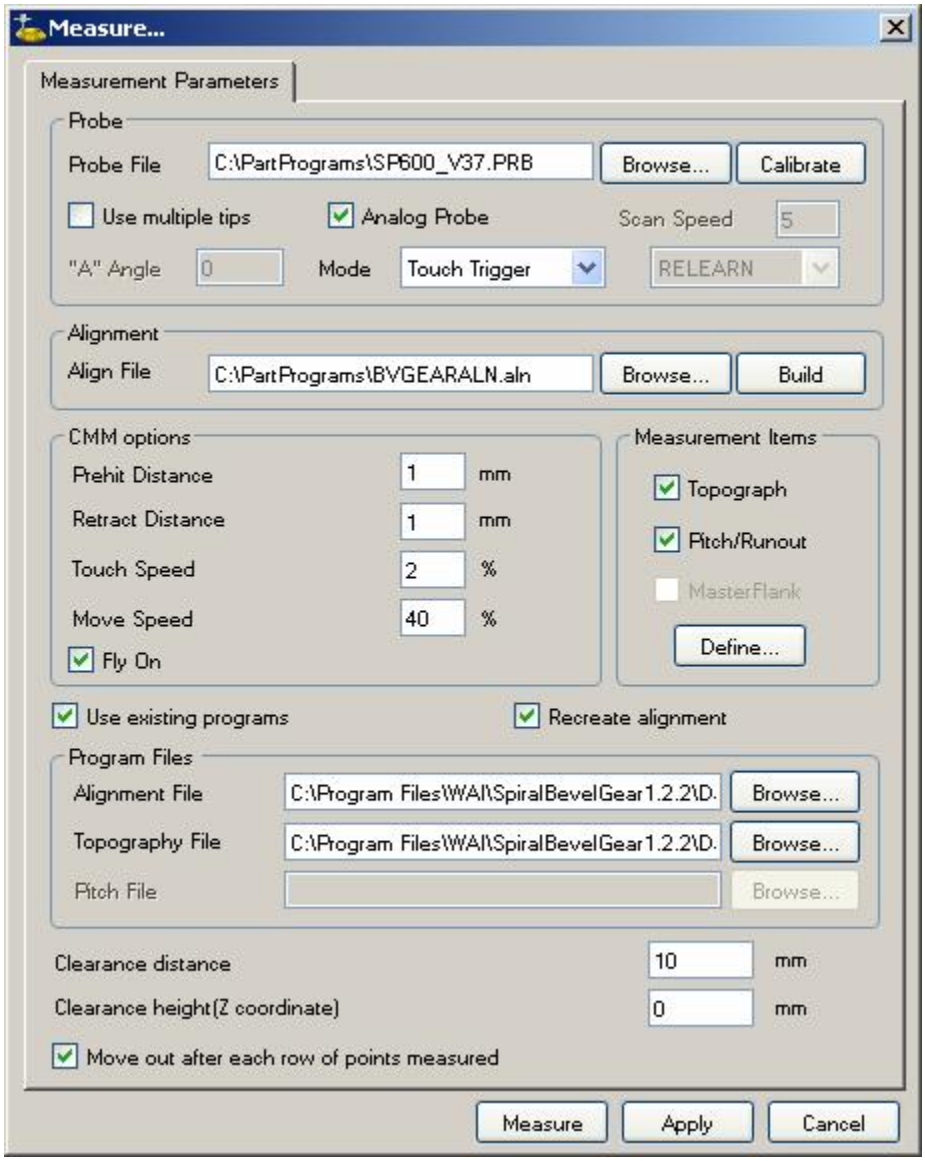
2. Beginning at the root of the tooth in the direction to the tooth head, take three points, inside, in the middle and on the outside on the tooth (9 points total). This determines the material direction. You must establish a clearance position before measuring the first point and all further measurements can be taken without a clearance position.
3. PC-DMIS Spiral Bevel Gear computes the probing points for the measurement of the master grid according to the number of lines and columns based on the previously taken manual hits.
4. The points on the corner determine the size of the master grid .For the Computation of the grid points the program performs a linear interpolation of the Z coordinates and the radius according to the column and line numbers. The columns of the grid are parallel to the tooth profile and the lines are parallel to the head of the tooth.
5. The measurement of the master flank then is executed in two automatic runs.
6. After the measurement, the program computes an average master from all measured master flanks. The computed grid points are stored in the element as NPT's in meandering columns in such a way that the first column lies inwards on the tooth flank (first point at the root) and the last column outwards.

Note: This procedure will be executed on either the Convex, Concave or Both Flanks according to the **Flanks selection** value in the **Master Flanks** tab. See "Defining Master Flank Data".

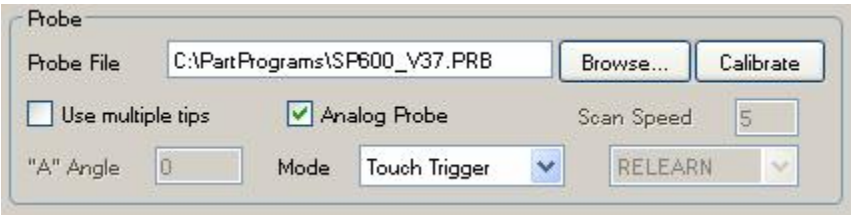
Editing Measurement Parameters

This topic discusses the various **Measurement Parameters** that are used to measure your gear.

Select the **Measure | Measure** menu option or the **Measure** toolbar icon to open the **Measurement Parameters** dialog box with the **Topograph** and **Pitch/Runout** options selected.

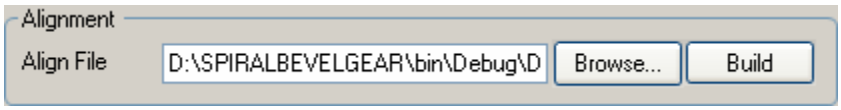


Probe Area



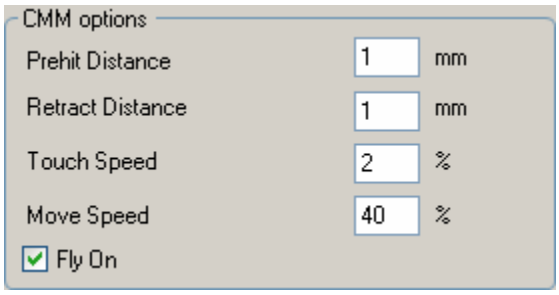
- **Probe File:** Browse to or type the path and name of the probe file.
- **Calibrate:** Clicking this button will launch PC-DMIS and allow you calibrate your probe. See "Calibrate Probes".
- **Use multiple tips:** Select this option when using multiple tip angles to measure the gear, instead of single angle. For example, when you select **Use multiple tips**, and set **"A" Angle** to 90, SBG will find all of A90BXX angles to measure the gear.
- **"A" Angle:** Provides the "A" angle that will be used to determine the tips angles that will be used to measure your gear.
- **Analog Probe:** Select this option if you will be using an Analog Probe.
- **Mode:** Select either **Touch Trigger** or **Analog Scan** to determine how measurement will be taken. The **Analog Scan** option is only available when the **Analog Probe** option is selected.
- **Scan Speed:** Provides the speed at which **Analog Scans** will be performed.

Alignment Area



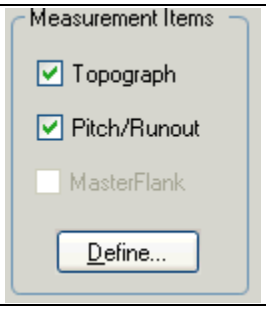
- **Align File:** Browse to or type the path and name of the alignment file.
- **Build:** Click this button to open the Create Alignment dialog box. See the "Creating a Gear Alignment" topic for information on building your alignment.

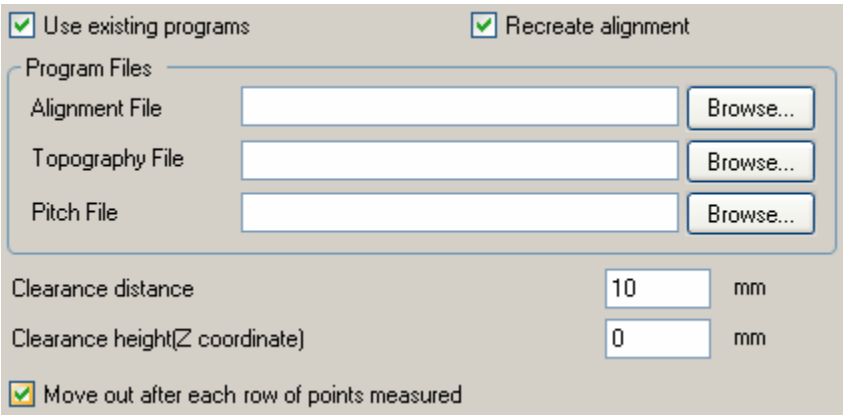
CMM Options Area



- **Prehit Distance:** Provides the distance away from the surface where PC-DMIS starts searching for the part.
- **Retract Distance:** Provides the distance the probe retracts from the surface after taking a hit.
- **Touch Speed:** Provides the speed at which the CMM takes hits. The value that is entered is a percentage of the maximum machine speed, and cannot exceed twenty percent.
- **Move Speed:** Provides the point to point positioning speed of the CMM. The value that is entered is a percentage of the maximum machine speed. It can be set to any value between 1 and 100% of full machine speed.
- **Fly Mode:** If you select this option the CMM will move the probe around the part in a smooth and round motion. This option depends on the capability of your controller being able to execute circular moves.

Measure Items Area

	• **Topograph:** Select this option and click **Define** to edit the Topograph parameters. See "Defining Topography Data". • **Pitch/Runout:** Select this option and click **Define** to edit the Pitch/Runout parameters. See "Defining Pitch/Runout Data". • **Master Flank:** This option is available when you have selected the **Measure | Master Flank** menu option have been selected. See "Defining Master Flank Data"



- **Use existing programs:** Select this option if you plan to use existing Alignment, Topography, and Pitch files.
- **Recreate alignment:** When this option is selected, the alignment process will be executed again to recreate the gear alignment. See "Creating a Gear Alignment".
- **Program Files:** Browse to or type the path and name of the Alignment, Topography, and Pitch part program files. Using an existing SBG program allows you to measure the gear without needing to take time to generate programs again.
- **Clearance distance:** Specifies the distance the probe will retract after measuring each flank.
- **Clearance height(Z coordinate):** This determines the location above the gear that is considered safe for the probe to change angles.
- **Move out after each row of points measured:** This causes the probe to move out to the specified **Clearance distance** from the gear after each row has been measured.

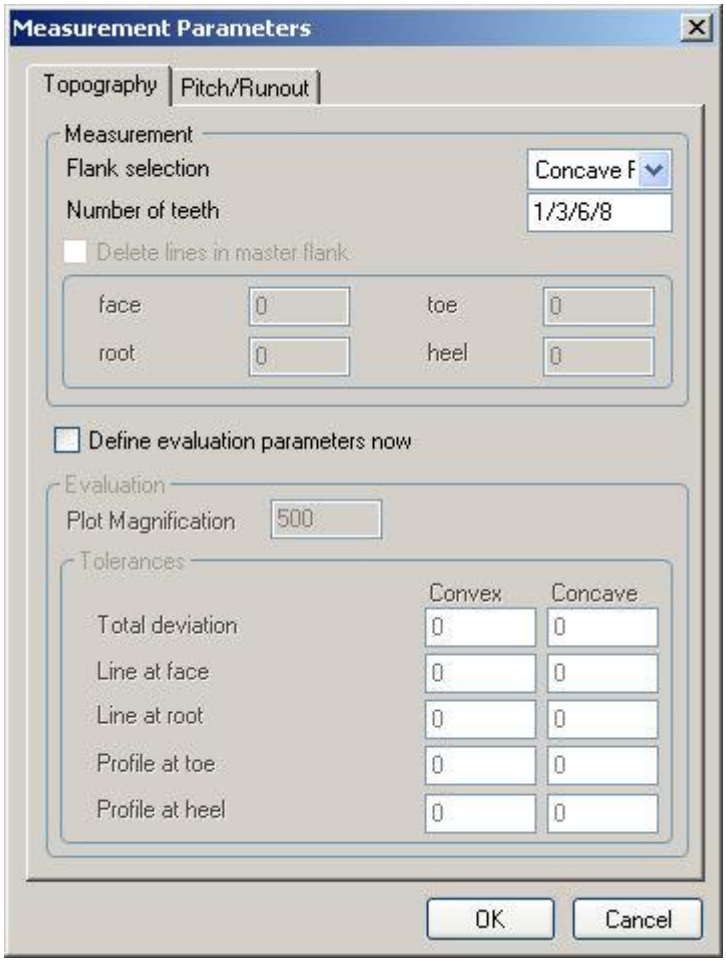
- **Apply:** Click this button to save your changes to the gear file.
- **Close:** Click this button to close the Measurement Properties dialog box without saving changes.
- **Measure:** Click **Measure** to begin the gear measurement process. All probing points and the machine movement is generated by PC-DMIS Bevel Gear. You will be prompted to start measurement.

Click **Yes** to start and **No** to Cancel. PC-DMIS will run your part program automatically.

Defining Topography Data

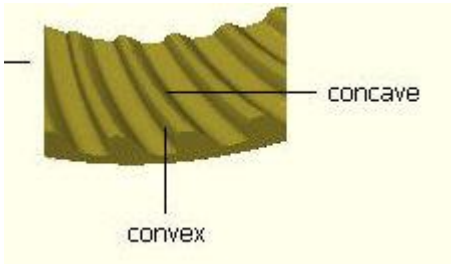
The **Topography** tab is used to define all values necessary for the description of topography measurement.

Topography measurement uses single point probing to take measurements. All probing points and the machine movement is generated automatically by PC-DMIS Bevel Gear.



Measurement Area

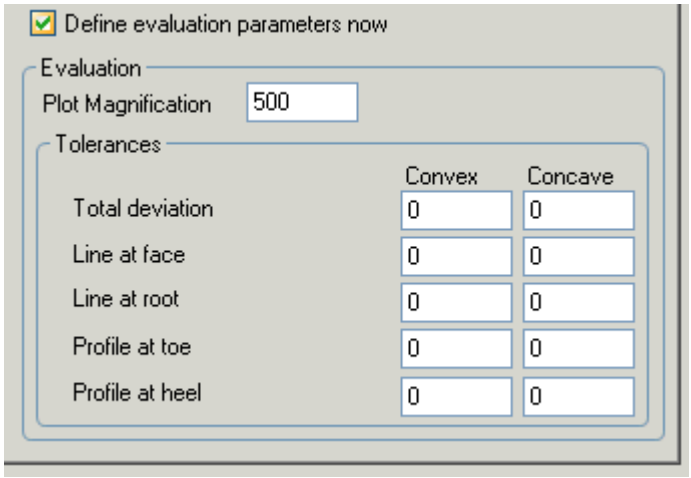
- **Flank Selection:** Select whether the **Concave Flanks**, **Convex Flanks** or **Both Flanks** will be measured.



- **Number of Teeth:** This determines which teeth will be measured. This value is required. For example a value of 1/3/6/8 will measure teeth 1, 3, 6, and 8. Type "*" to measure all teeth.

Evaluation Area

- **Define evaluation parameters now:** If you want to define evaluation parameters, select this value and the evaluation options will be available for editing.



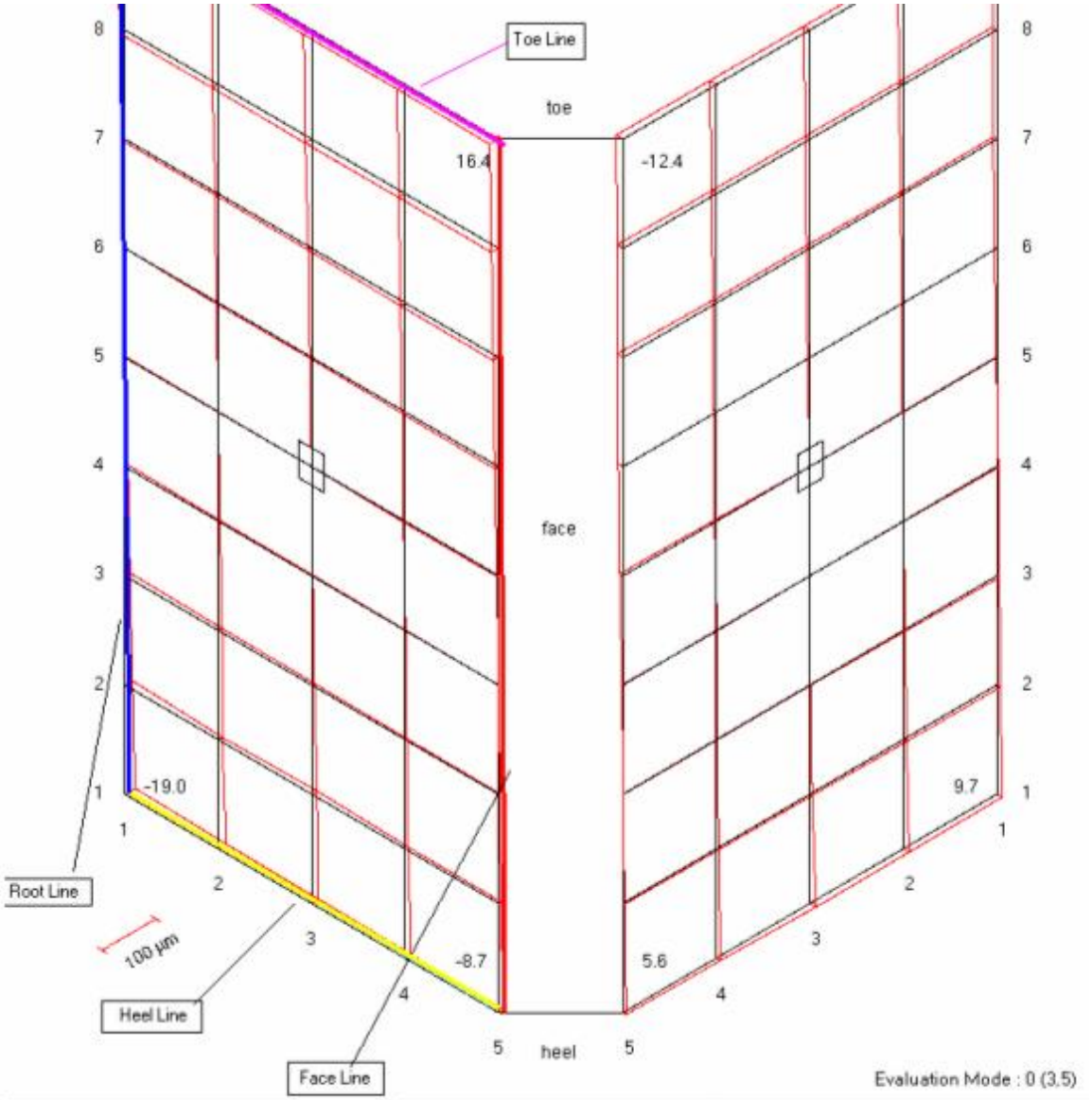
- **Plot Magnification:** This value is used to define magnification scale for the created report in plot server. If you specify ‘0’, the evaluation is carried out, but no plot output will be created; however, the evaluation parameters are stored in the measurement result.

Tolerances

- **Total deviation:** Defines the total tolerance for all grid points.
- **Line at face:** Defines the tolerance for the face line.
- **Line at root:** Defines the tolerance for the root line.

- **Profile at toe:** Defines the tolerance for the profile at the toe line.
- **Profile at heel:** Defines the tolerance for the profile at the heel line.

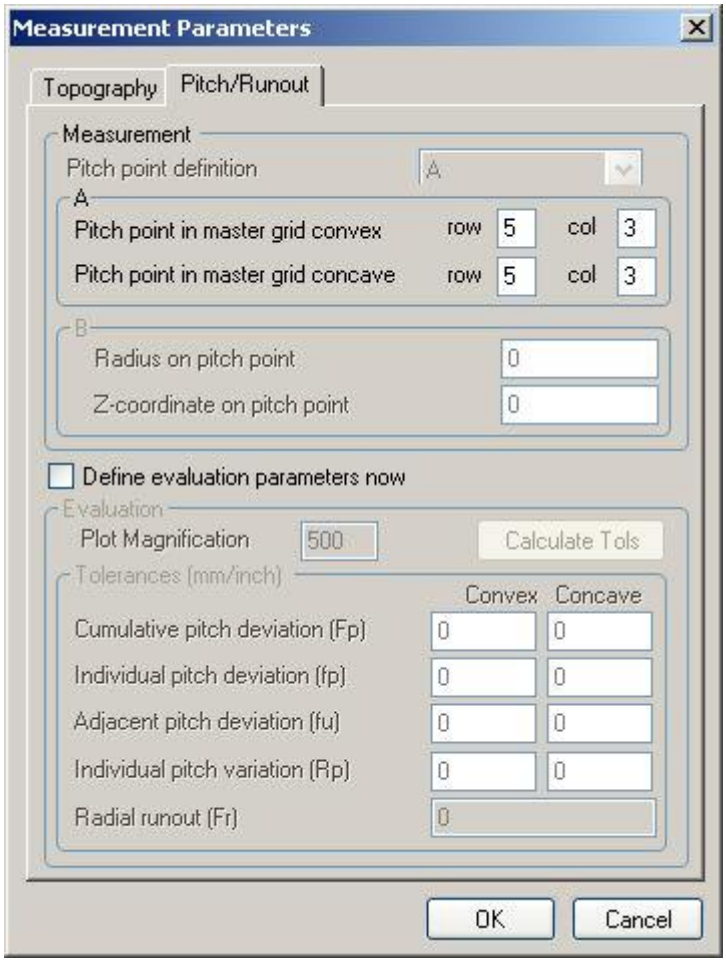
The graphic below provides an example of the topography tolerances and shows how the tolerance values are reported in the footer.



	right flank		left flank	
	meas. dev.	Tolerance	meas. dev.	Tolerance
Total deviation	35.4	0.0	23.8	0.0
Line at face	25.1	0.0	17.9	0.0
Line at root	30.6	0.0	17.9	0.0
Profile at toe	4.8	0.0	4.6	0.0
Profile at heel	10.3	0.0	5.8	0.0

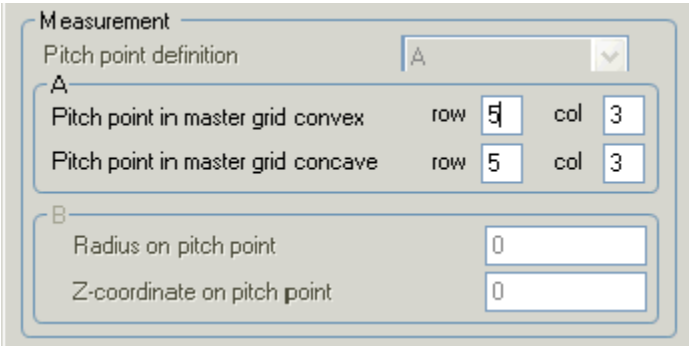
Defining Pitch/Runout Data

The **Pitch/Runout** tab is used to define all values necessary for the description of pitch/runout measurement.



Measurement Area

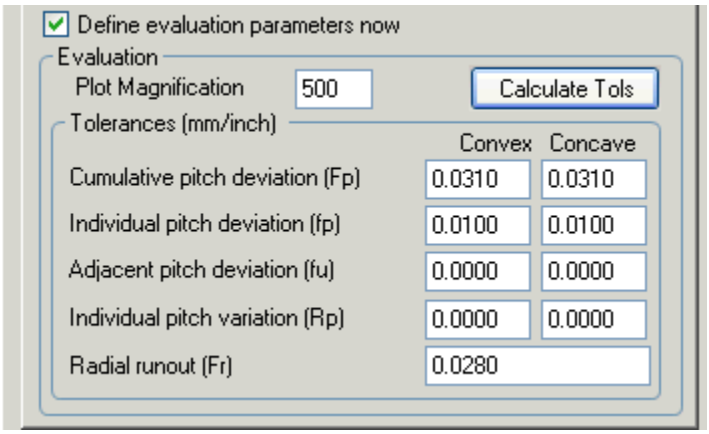
There are 2 options for the definition of the pitch point which establishes the probing points for the measurement:



- **Pitch point definition:** Select the Definition that you want to define.
- **A:** Selection of a master grid point by entering the line and column number. This is the default option with"reference point on master grid " is offered as pitch point. All probing points and machine paths are generated automatically by the program.
- **B:** Numeric input of radius and z coordinate of the pitch point.

Evaluation Area

Define evaluation parameters now: If you want to define evaluation parameters, select this value and the evaluation options will be available for editing.



- **Plot Magnification:** This value is used to define magnification scale for the created report in plot server. If you specify ‘0’, the evaluation is carried out, but no plot output will be created; however, the evaluation parameters are stored in the measurement result.
- **Calculate Tols:** Click this button to calculate the Tolerances. If the gear quality was specified in the Geometry Parameters dialog box, the tolerances Fp, fp and fu are computed and automatically added to the Tolerance values according to the standard you selected. If no gear quality was specified, the tolerances will not be calculated.

Tolerances (mm/inch)

This section allows you to define the following tolerances for evaluating pitch and runout.

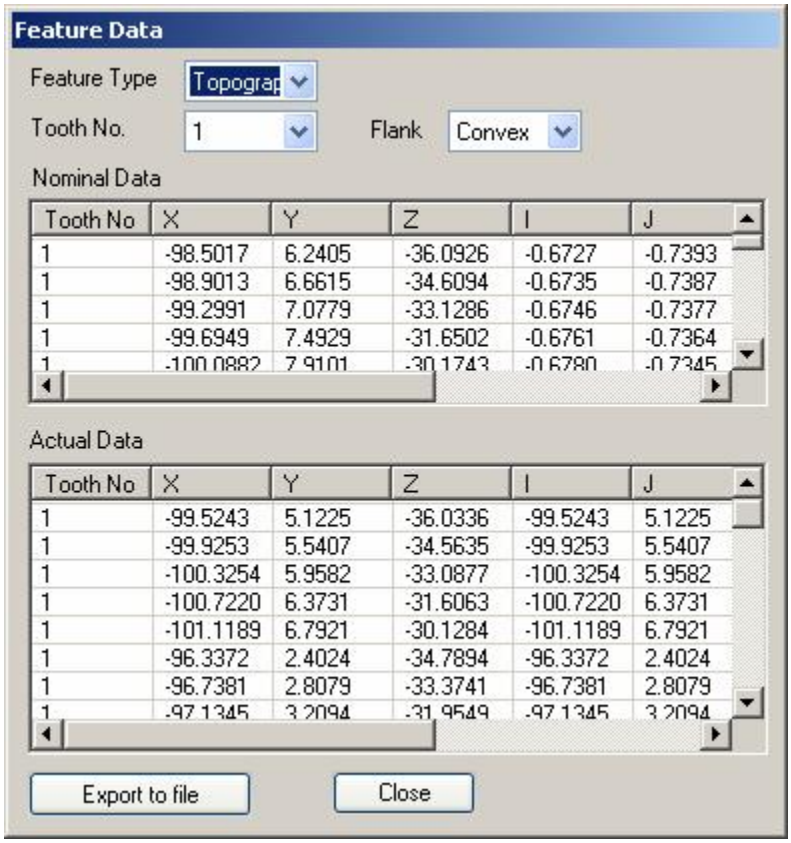
- **Cumulative pitch deviation (Fp)**
- **Individual pitch deviation (fp)**
- **Adjacent pitch deviation (fu)**
- **Individual pitch deviation (Rp)**
- **Radial runout (Fr)**

Note: With the measured pitch points, a runout evaluation can also be executed.

Viewing Feature Data

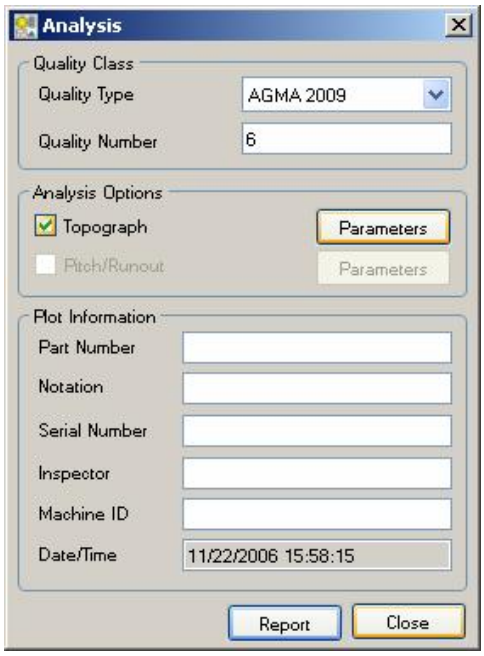
Once your gear has been measured you can view the **Feature Data** information.

Select the **Measure | Data** Viewer menu option to open the **Feature Data** dialog box.



- **Feature Type:** Select either **Topography** or **Pitch** to display the **Nominal** and **Actual Data** for that feature type.
- **Tooth No.:** Select the Tooth number from the drop-down list to view data for that tooth.
- **Flank:** Select either Convex or Concave to view the data for that side of the tooth.
- **Nominal Data:** Displays the **Nominal Data** for the specified tooth number and flank side.
- **Actual Data:** Displays the **Actual Data** for the specified tooth number and flank side.
- **Export to file:** Click this to export an XML file for report creation.
- **Close:** Click to exit.

Analyzing Gear Data



Quality Class

- **Quality Type:** Select the quality type from AGMA 2009, AGMA 390.03a, or DIN 3965. PC-DMIS Bevel Gear automatically determines the tolerances Fp, fp, fu and Fr from the given gear quality number and quality type and inserts these tolerances into the corresponding values (see evaluation of pitch and runout in the "Defining Pitch/Runout Data" topic). If you don't specify the gear quality the tolerances will not be determined.
- **Quality Number:** This number specifies the quality grade.

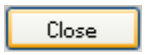
Analysis Options

- **Topopragh:** Select this option for Topography output to be created. Click **Parameters** to make changes to the Topography Parameters. See "Defining Topography Data".
- **Pitch Runout:** Select this option for Pitch/Runout output to be created. Click **Parameters** to make changes to the Pitch/Runout Parameters. See "Defining Pitch/Runout Data".

Plot Information

Provide **Plot Information** for Part Number, Notation, Serial Number, Inspector, and Machine ID that will be included in the header of your report. The Date/Time value is supplied automatically based on the time of the gear measurement.

Click this button to send your measurement data to the Quindos PageViewer. The measurement data for the measured teeth of your gear is then available in Quindos PageViewer for analysis and printing.



Click this button to close with saving any changes.

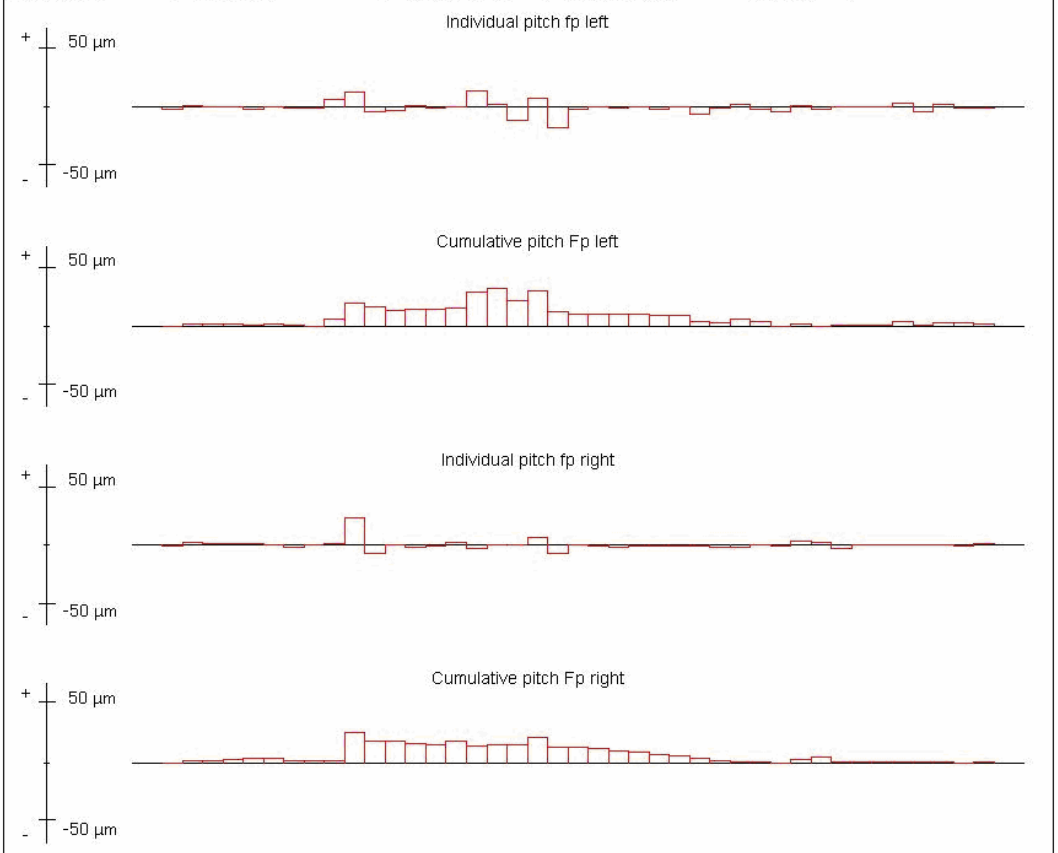
See the "Sample Pitch & Runout Report" and "Sample Topography Report" topic for examples of the reports that are created by PC-DMIS Bevel Gear.

Sample Pitch & Runout Report

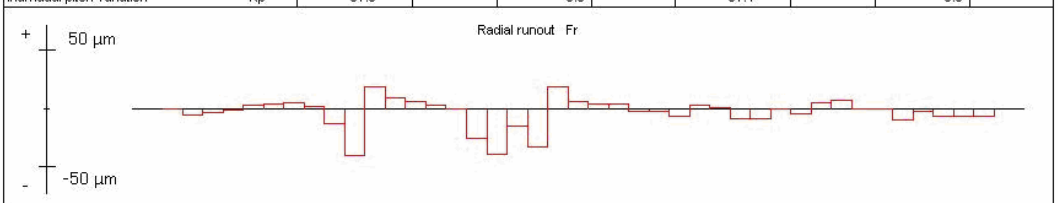
The Pitch/Runout report for the spiral bevel gear is represented in the form of a step curve. The evaluation corresponds to the typical plots of helical gears.

Spiral Bevel Gear Pitch & Runout

Orientation	: External	Face Cone (a,z)	:	Part No.	: 20041104_00001
No. of Teeth	: 41	Root Cone (a,z)	: 75.217,52.781	Machine	: CMM Global575
Normal Module	: 5	Outer Pitch Cone Di	: 55	Serial No.	: 00001
Meam Spiral Angle	: 32.3833	Tooth Width	: 8.813	Notation	: Spiral Bevel Gear Test Re
Thickness (d,c,t,r,z)	: 0,0,0,0,0	Mounting Dist./Value	: 55,-0.008	Inspector	: Dominic.wu
Pitch Cone (a,z)	: 72.983,52.753	Standard/Class/Unit	: AGMA 2009,6,mm	Date Time	:



		left flank				right flank			
		meas.dev.	Qual.	Toler.	Qual.	meas.dev.	Qual.	Toler.	Qual.
Individual pitch deviation	fp	17.7	B 8	0.0	B 6	23.6	B 9	0.0	B 6
Cumulative pitch deviation	Fp	32.2	B 7	0.0	B 6	26.2	B 6	0.0	B 6
Adjacent pitch deviation	fu	26.1		0.0		30.7		0.0	
Individual pitch variation	Rp	31.6		0.0		31.4		0.0	



Radial runout	Fr	59.3	B 9	0.0	B 6

	nom	max-min	max		min		Average

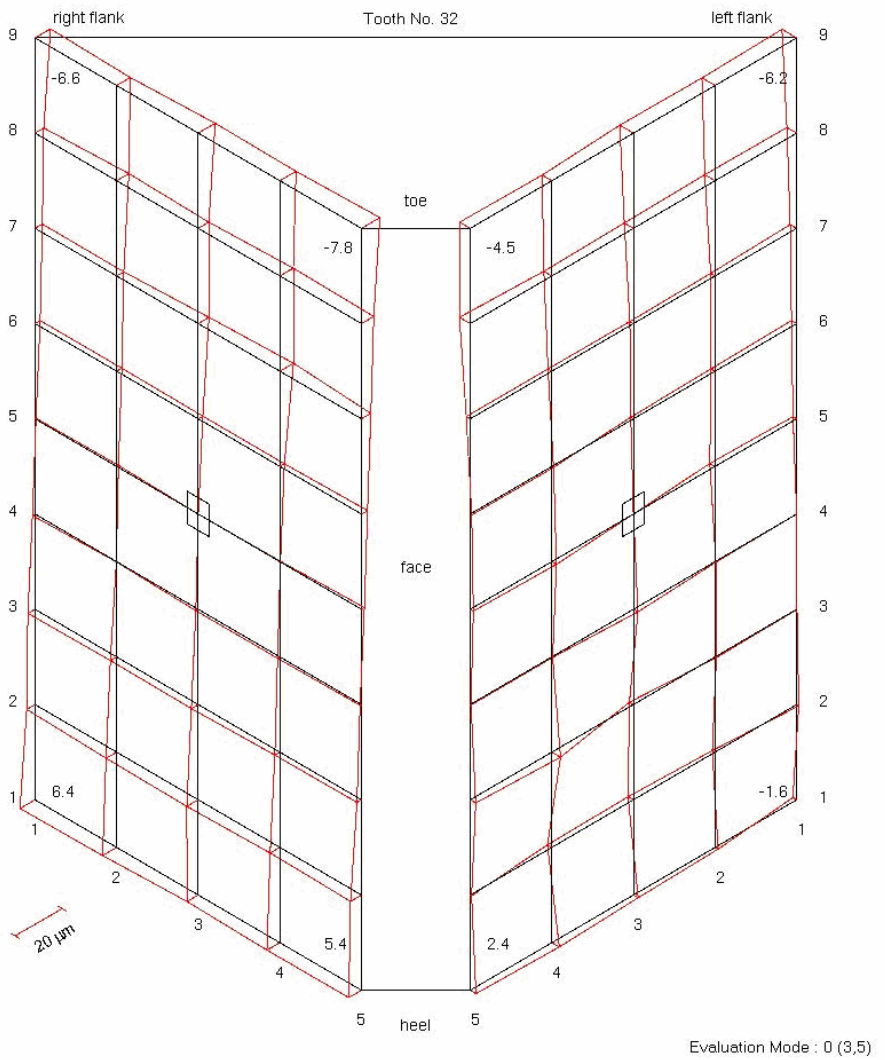
Sample Topography Report

The Topography report for the Spiral Bevel Gear provides the topographical image of the deviations as presented with the points arranged in grids on the tooth flanks. The deviations are shown vertically to the surface in true value .

The plotting display is chosen in such a way that you look on an external gear from the outside of the tooth or the gap. The +z axis is upward .

Spiral Bevel Gear Topography

Orientation	: External	Face Cone (a,z)	:	Part No.	:
No. of Teeth	: 41	Root Cone (a,z)	: 75.217,-2.095	Machine	:
Normal Module	: 5	Outer Pitch Cone Di	: 55	Serial No.	:
Mean Spiral Angle	: 32.4333	Tooth Width	: 8.813	Notation	:
Thickness (d,c,t,r,z)	: 0,0,0,0,0		: 55,-0.008	Inspector	:
Pitch Cone (a,z)	: 75.25,-3.52	Standard/Class/Unit	: AGMA 2009,6,mm	Date Time	: 12/13/2005 14:48:54



	right flank		left flank	
	meas. dev.	Tolerance	meas. dev.	Tolerance
Total deviation	14.2	0.0	9.9	0.0
Line at face	13.2	0.0	7.0	0.0
Line at root	13.0	0.0	7.1	0.0
Profile at toe	2.0	0.0	2.1	0.0
Profile at heel	1.6	0.0	4.8	0.0

Glossary

S

SBG: Spiral Bevel Gear

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