

SIEMENS

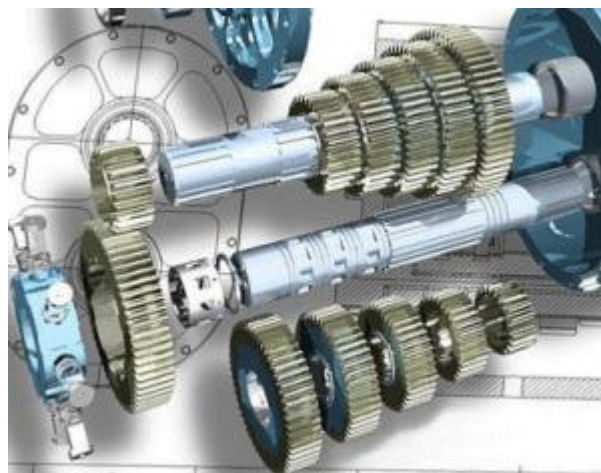
NX GC 工具箱

(齿轮建模工具)

用户手册

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NX8.5



Siemens PLM Software

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Gear Modeling Introduction

The Gear Modeling lets you create parametric geometry models of cylinder gears, bevel gears.

You can also edit gears and retain geometric relations with other entities, display gear geometric information, and translate, engage, delete, and display gears.

Precise modeling is supported for:

Cylinder gears:

- Involute straight cylindrical external gears
- Involute straight cylindrical internal gears
- Involute helical cylindrical external gears
- Involute helical cylindrical internal gears

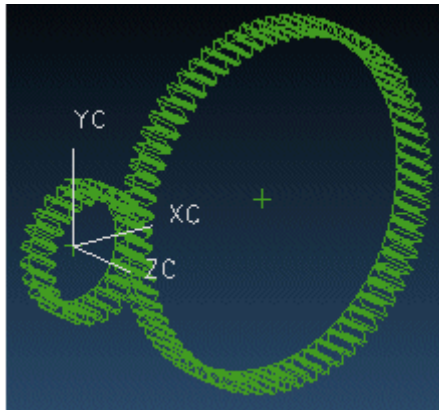
Bevel gears:

- Straight bevel gears
 - Helical bevel gears
-

Example: Gear Modeling with Addendum Modification

Coefficient

This example lets you create two involute cylinder gears using the Addendum Modified Gear method. You then use the Engage Gear and Gear Motion capabilities to relate and animate the gears.



Modeled and Engaged Gears

Start Gear Modeling from the NX Application menu and select the type of gear you want to create.



You can also pick the appropriate button on the Gear Modeling toolbar to create gear.

Create Cylinder Gears

The following text describes the processes you can use to create involute cylinder gears with addendum modification coefficients.

Create a Part

Begin by creating a part using File->New

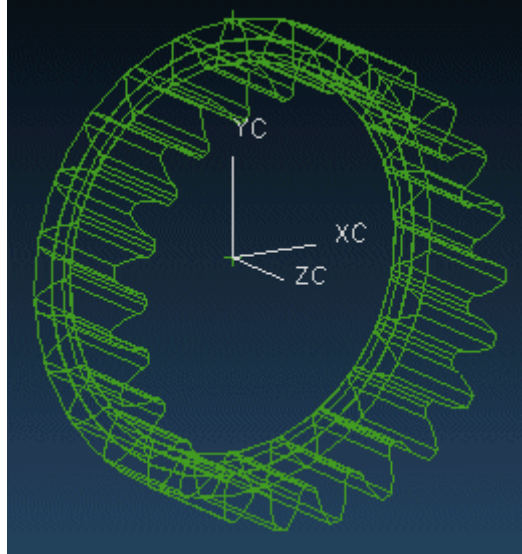
- For this example, select millimeter units.

Create a Driving Gear

The following text describes processes you use to create an involute cylinder driving gear.

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.

2. On the Involute Cylinder Gear Modeling dialog, select Create Gear as the Gear Operating Type, then pick OK to display the Involute Cylinder Gear Type dialog.
3. On the Involute Cylinder Gear Type dialog, select General Gear, Straight Gear, External Gear, and Hobbing for Machining, then click OK to display the Involute Cylinder Gear Parameter dialog.
4. Select the Addendum Modified Gear tab.
5. Click Default Values to add parameter values.
6. Specify the following parameter values for the first gear (for inch units, you would specify Root Diameter instead of Addendum Modification Coefficient):
 - Name: gear_1 (or some other unique name).
 - Module: 2.5
 - Teeth: 23
 - Face Width: 20
 - Pressure Angle: 20
 - Addendum Modification Coe.: 0.1
 - Addendum Factor: 1.0
 - Clearance: 0.25
 - Gear Fillet Radius 0.25
 - Gear Modeling Accuracy: Mid (For gear modeling, the accuracy level reflects the number of curves on a tooth surface. Low accuracy has 15 curves, mid accuracy has 30 curves, and high accuracy has 60 curves.)
 - Pitch Diameter, Estimate: Enter 67 for the number of teeth and enter -0.1 for the Addendum Modification coefficient of the matching gear. The estimated result will be 57.5.
 - Tip Diameter, Estimate: The estimated result will be 63.
 - Click OK to display the Vector Constructor dialog.
7. Enter vector parameters: 0, 0, 1.
8. Click OK to display the Point Constructor dialog.
9. Enter the Base Point: 0, 0, 0 (this is the gear center point).
10. Click OK to create the driving gear.

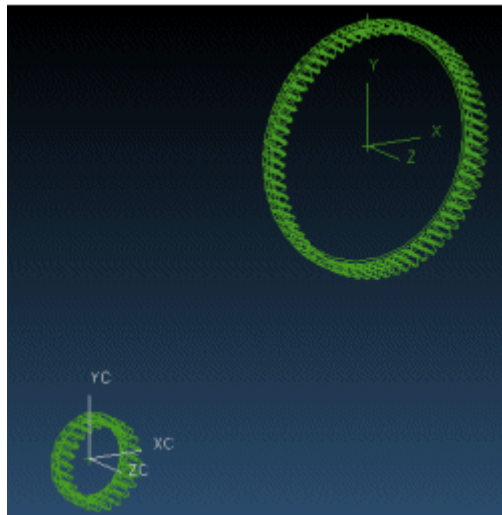


Example Driving Gear

Create a Driven Gear

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Create Gear as the Gear Operating Type, then pick OK to display the Involute Cylinder Gear Type dialog.
3. On Involute Cylinder Gear Type dialog, select General Gear, Straight Gear, External Gear, and Hobbing for Machining, then click OK to display the Involute Cylinder Gear Parameter dialog.
4. Select the Addendum Modified Gear tab.
5. Click Default Values, and specify the following parameter values:
 - Name: gear_2 (or some other unique name).
 - Module: 2.5
 - Number of Teeth: 67
 - Face Width: 20
 - Pressure Angle: 20
 - Addendum Modification Coe.: - 0.1
 - Addendum Factor: 1.0
 - Clearance: 0.25
 - Gear Fillet Radius 0.25

- Gear Modeling Accuracy: Mid (For gear modeling, the accuracy level reflects the number of curves used to create a tooth surface. Low accuracy has 15 curves, mid accuracy has 30 curves, and high accuracy has 60 curves.)
 - Pitch Diameter, Estimate: Enter 23 for the number of teeth and enter 0.1 for the Addendum Modification coefficient of the matching gear. The estimated result will be 167.5
 - Tip Diameter, Estimate: The estimated result will be approximately 172.
 - Click OK to display the Vector Constructor dialog.
6. Enter vector parameters: 0, 0, 1
 7. Click OK to display the Point Constructor dialog.
 8. Enter the Base Point: 200, 200, 50 (this is the gear center point).
 9. Click OK to create the driven gear.

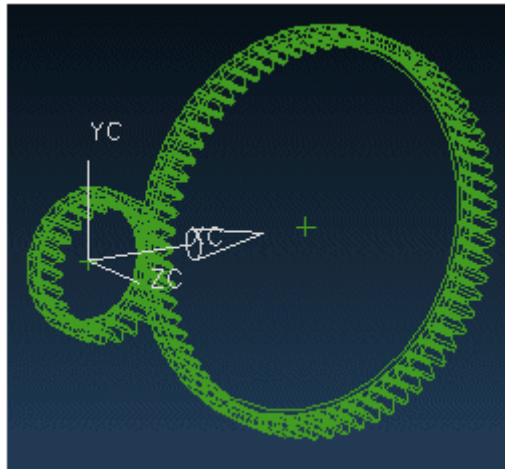


Driving gear and driven gear modeled

Engage gear

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Engage Gear for the Operating Type, then click OK to display the Select Gear To Engage dialog.
3. Select your first gear (gear_1) in the Existing Gears list, and then click the Set Driving Gear button.
4. Select your second gear (gear_2) in the Existing Gears list, and then click the Set Driven Gear button.
5. Click Apply to update the Gear Engage list. If necessary, use Select from Modeling to select the appropriate vector, XC, for the gear centerline.

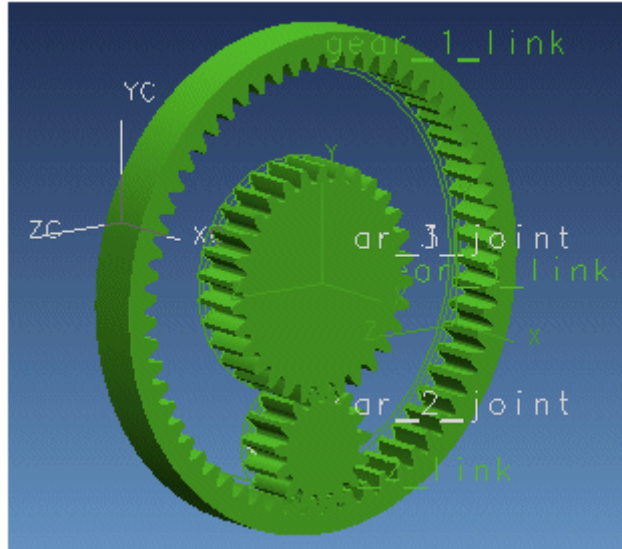
6. Click OK to reposition gear_2 to engage with gear_1.



Driving gear and driven gear engaged

Example: Engaging Gears

This example lets you create three involute cylinder gears. You then use the Engage Gear, Move Gear to relate gears.



Three Modeled and Engaged Cylinder Gears

Start Gear Modeling from the NX Application menu and select the type of gear you want to create.



You can also pick the appropriate button on the Gear Modeling toolbar to create gear.

Create three cylinder gears

The following text describes the processes you can use to create standard involute cylinder gears.

Create a part

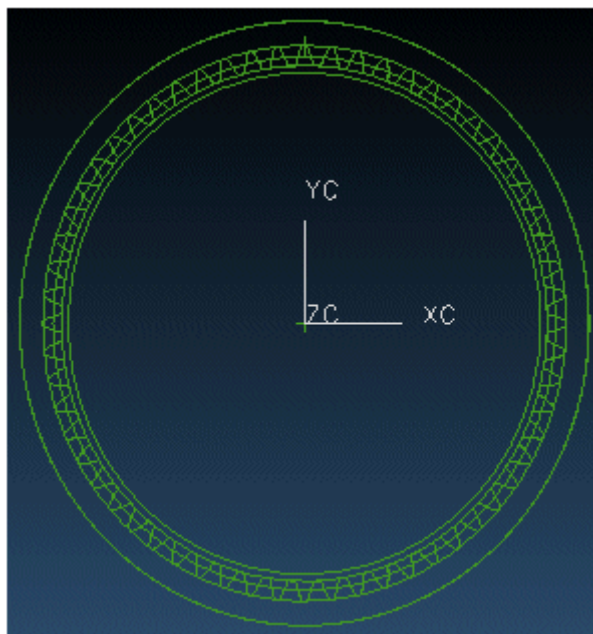
Begin by creating a part using File->New

- For this example, select millimeter units.

Create gear 1

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Create Gear as the Gear Operating Type, then pick OK to display the Involute Cylinder Gear Type dialog.

3. On Involute Cylinder Gear Type dialog, select General Gear, Straight Gear, Internal Gear, and Shaping for Machining, then click OK to display the Involute Cylinder Gear Parameter dialog.
4. Select the Standard Gear tab, click the Default Value button, and enter the following alternate parameter values for the first gear:
 - Number of Teeth: 60
 - Internal Gear Outside Diameter: 170
5. Click OK to display the Vector Constructor dialog.
6. Click OK to display the Point Constructor dialog.
7. Click OK to create the gear.



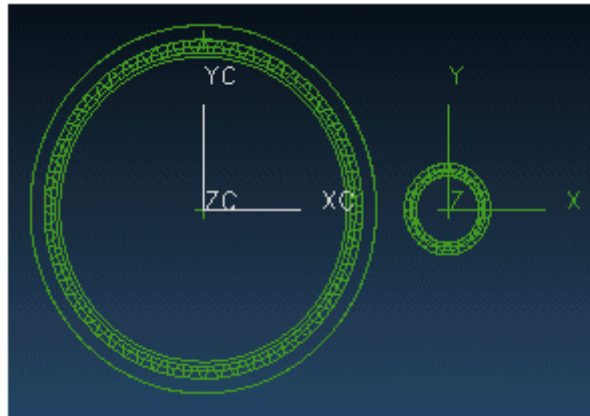
Gear 1 modeled

Create gear 2

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Create Gear as the Gear Operating Type, then pick OK to display the Involute Cylinder Gear Type dialog.
3. On Involute Cylinder Gear Type dialog, select General Gear, Straight Gear, External Gear, and Hobbing for Machining, then click OK to display the Involute Cylinder Gear Parameter dialog.
4. Select the Standard Gear tab, click the Default Value button, and enter the following alternate parameter values for the second gear:
 - Name: gear_2 (or some other unique name).

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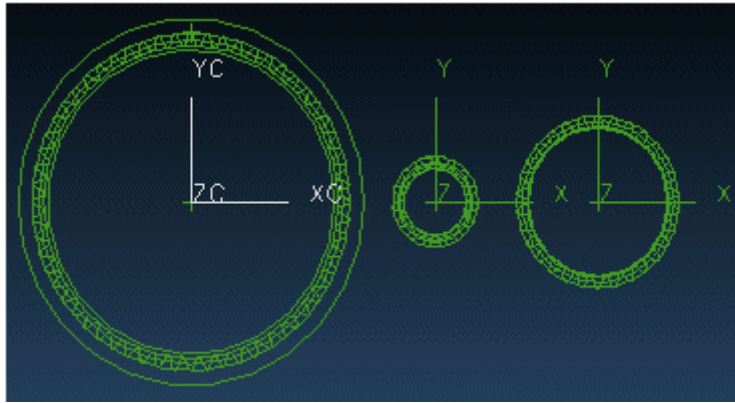
- Number of Teeth: 15.
5. Click OK to display the Vector Constructor dialog.
 6. Click OK to display the Point Constructor dialog.
 7. Enter the Base Point: 120, 0, 0.
 8. Click OK to create the second gear.



Gears 1 and 2 modeled

Create gear 3

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Create Gear as the Gear Operating Type, then pick OK to display the Involute Cylinder Gear Type dialog.
3. On Involute Cylinder Gear Type dialog, select General Gear, Straight Gear, External Gear, and Hobbing for Machining, then click OK to display the Involute Cylinder Gear Parameter dialog.
4. Select the Standard Gear tab, click the Default Value button, and enter the following alternate parameter values for the third gear:
 - Name: gear_3 (or some other unique name).
 - Number of Teeth: 30.
5. Click OK to display the Vector Constructor dialog.
6. Click OK to display the Point Constructor dialog.
7. Enter the Base Point: 200, 0, 0.
8. Click OK to create the third gear.



Gears 1, 2, and 3 modeled

Engage gear

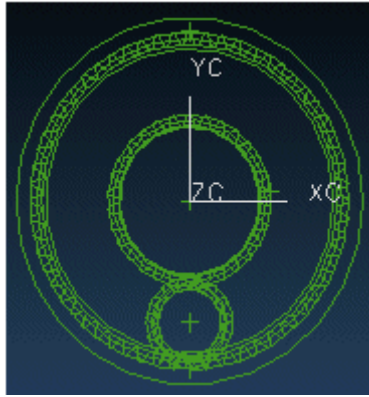
1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Engage Gear for the Operating Type, then pick OK to display the Select Gear To Engage dialog.

Create the first engaging relation

1. Select your first gear (gear_1) in the Existing Gears list, and then click the Set Driving Gear button.
2. Click the Set Driven Gear button.
 - Select your second gear (gear_2) in the Existing Gears list.
 - Enter -1 for Center Line Vec JC.
 - Click Apply to create the first gear engaging relation and update the Gear Engaging Relation List.

Create the second engaging relation

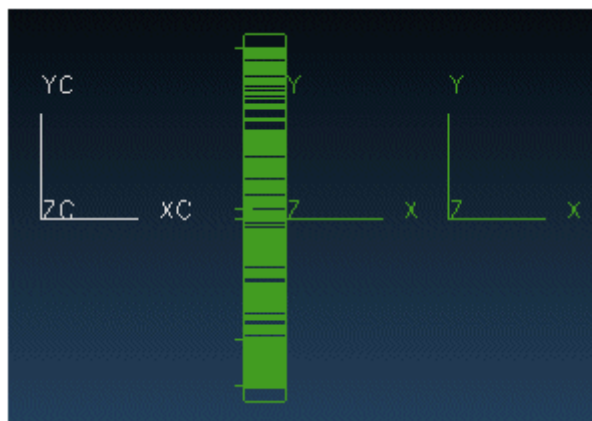
1. Select your second gear (gear_2) in the Existing Gears list, and then click the Set Driving Gear button.
2. Click the Set Driven Gear button.
 - Select your second gear (gear_2) in the Existing Gears list.
 - Enter 1 for Center Line Vec JC.
 - Click Apply to create the second gear engaging relation.
3. Click OK update the Gear Engaging Relation List and engage the gear models.



Engaged gears

Move Gear

1. Click Cylinder Gear Modeling on Gear Modeling toolbar, or select Cylinder Gear Modeling from the menu, to display the Involute Cylinder Gear Modeling dialog.
2. On the Involute Cylinder Gear Modeling dialog, select Move Gear for the Operating Type, then pick OK to display the Select Gear To Operate dialog.
3. Select the first gear (gear_1), and then click OK to display the Gear Position dialog.
4. On the Gear Position dialog, specify the following parameter values:
 - Gear Origin: (100,0,0)
 - Gear Direction: (1,0,0)
5. Click OK to move the gear models.

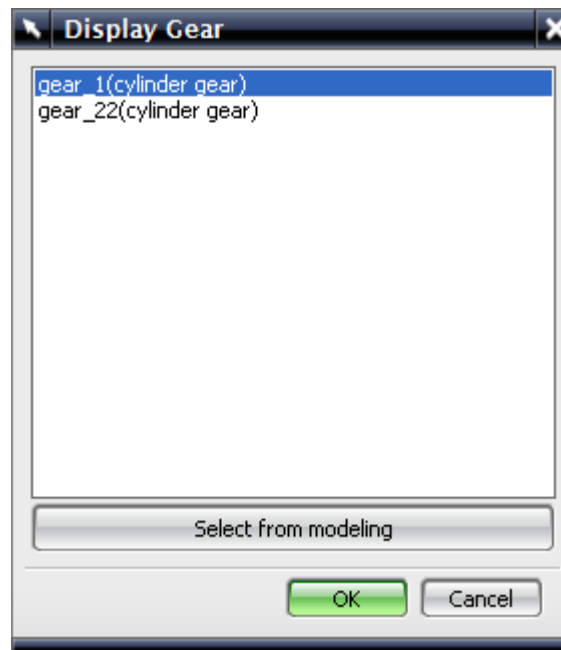


Moved gear models

Display Gear Type

You can use the Display Gear dialog to list gear names and types.

To see the Display Gear dialog choose the following from the NX menu: Gear Modeling->Display Gear Type.

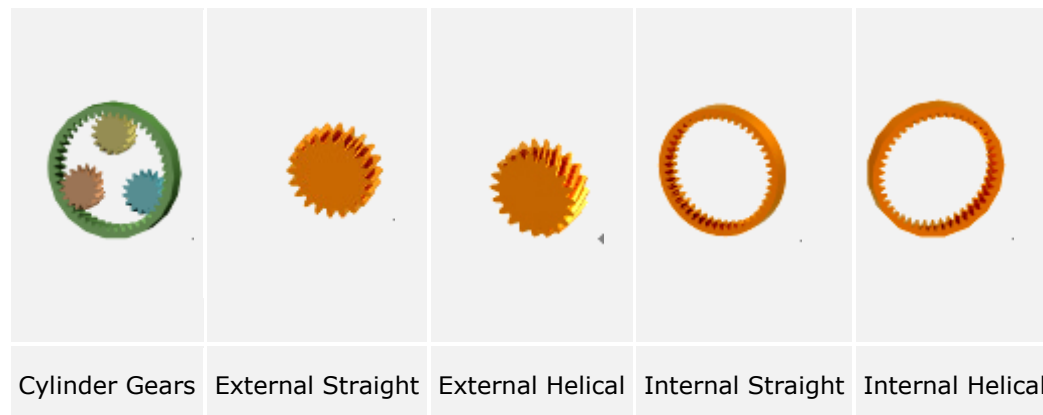


Display Gear

The Display Gear dialog lists gear names and, in parentheses, gear type: cylinder gear, bevel gear.

Click the Select from modeling button and enter a gear model name to jump to that name in the list.

Cylinder Gear Modeling



To start the cylinder gear modeling module, choose the following from the NX menu: Tools->Gear Modeling->Cylinder Gear or click Cylinder Gear Modeling on the toolbar to display the Involute Cylinder Gear Modeling dialog:



Cylinder Gear Modeling

The following process examples describe the options available with the cylinder gear modeling module.

Create Gear

1. On the Involute Cylinder Gear Modeling dialog, select the Operating Type, which in this case is Create Gear, then pick OK.
 2. On the Involute Cylinder Gear Type dialog, select the General Gear type and complete the dialog choices and click OK.
 3. On the Involute Cylinder Gear Parameter input dialog, you can select the gear type and provide required information or select default values, then click OK.
- Gear Type

Standard Gear - addendum modification coefficient is zero, addendum factor is standard value 1.0, clearance is standard value 0.25, and gear cutter top radius is standard value 0.38m.

Addendum Modified Gear - addendum modification coefficient is not zero; addendum factor, clearance, gear cutter top radius are not standard values.

- Estimate: Pitch Diameter - lets you display another dialog to input Teeth Number and Addendum Modification Coefficient parameters for the match gear. The software then can estimate the Pitch Diameter of the gear.
- Estimate: Tip Diameter - lets you display another dialog to input Teeth Number and Addendum Modification Coefficient parameters for the match gear. The software then can estimate the Tip Diameter of the gear.
- Estimate: Addendum Modification Coe. - is used with English unit systems to you do not know the Root Diameter parameter for the gear. You input Teeth Number and Addendum Modification Coefficient parameters for the match gear. The software then can estimate the Root Diameter of the gear.
- Gear Modeling Accuracy - lets you select low, mid, or high accuracy.
- Default Value - lets you use default cylinder gear parameters.

Available parameters will vary based on unit system, gear type, gear relation position, and machining method.

4. On the Vector Constructor dialog, input the gear's center axis vector. You can select an inferred vector, or input values for I, J, and K for either a Cartesian or spherical coordinate system.
5. On the Point Constructor dialog, input the gear's center point. You can select an inferred point or input values for XC, YC, and ZC for either WCS or Absolute location.

Edit Gear Parameters

1. On the Involute Cylinder Gear Modeling dialog, select Edit Gear Parameter.
2. On the Select Gear to Operate dialog, select the gear to edit from the list display. Each selection displays the name of the gear model and the gear type: general gear.
3. On the Involute Cylinder Gear Type dialog, select the new gear type.
4. Use the Involute Cylinder Gear Parameter dialog to input the new gear parameters. At this point you cannot input a Name. If the Remain the engaging relation toggle is selected, the program will automatically move all engaged gears to the new position and keep their engaging relation.

Engage Gear

1. On the Involute Cylinder Gear Modeling dialog, pick Engage Gear to establish the engaging relation for your gears.
2. From the Gear Engaging Relation List on the Select Gear to engage dialog, pick the created gear to engage.

Item	Description.
Gear Engaging Relation List	<p>Display engaging relations to help you engage the gear.</p> <p>If you click Set Driving Gear and select a gear in Existing Gears, the same gear in this list will display '=>driving gear'.</p> <p>Double click a node to expand the view.</p>
Existing Gears	<p>This dialog displays the names of all existing gears so you can select the created gear to engage.</p> <p>List items display both the name of gear model and the type of gear: general gear.</p> <p>If you do not click Set Driving Gear or Set Driven Gear, but you do click Existing Gears, the software highlights only the gear model.</p> <p>If you click Set Driving Gear, then click Existing Gears, the software highlights the gear model and makes it a driving gear with the label Driving Gear and the corresponding list item in Gear Engaging Relation List displays '=>driving gear'.</p>
Set Driving Gear	Select the driving gear.
Set Driven Gear	Select the driven gear.
Driving Gear	The selected driving gear.
Driven Gear	The selected driven gear.
Center Line Vector	Invoke the standard vector dialog to input the center line vector of the engaging gears from modeling.
Apply	Click Apply to only create the engaging relation of gear, and not update, so you can create several engaging relations before performing the update.
Ok	Click OK to create the engaging relation of the gear and update the model.

Move Gear

1. On the Involute Cylinder Gear Modeling dialog, pick Move Gear to translate and rotate the created gear.
2. On the Select Gear to Operate dialog, select the created gear to move.
3. Use the Gear Position dialog to input the new gear position based on the selected coordinate system.



The Remain the engaging relation toggle lets you automatically move all engaged gears to the new position and keep their engaging relation.

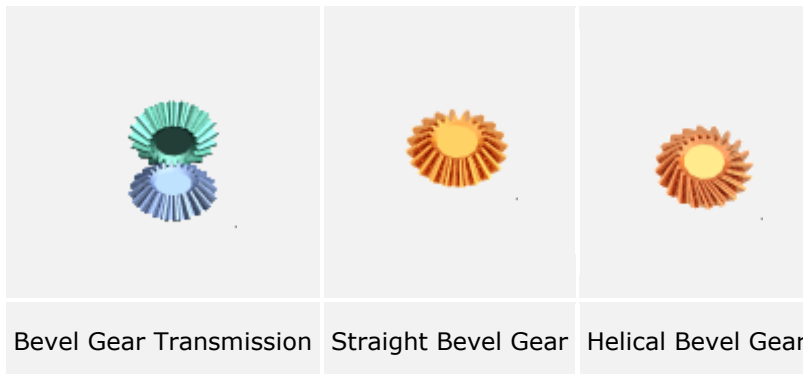
Delete Gear

1. On the Involute Cylinder Gear Modeling dialog, pick Delete Gear to delete a created gear.
2. On the Select Gear to Operate dialog, select the created gear to delete.

Information

1. On the Involute Cylinder Gear Modeling dialog, pick Information.
 2. On the Select Gear To Operate dialog, note the gear names and types listed.
-

Bevel Gear Modeling



To start the bevel gear modeling module, choose the following from the NX menu:
Tools->Gear Modeling->Bevel Gear



Bevel Gear Modeling

The following options are available on the Bevel Gear Modeling dialog:

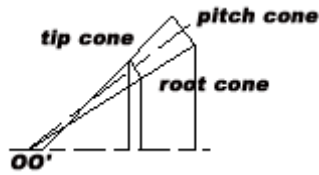
- Create Gear: create the new gear.
- Edit Gear Parameter: edit the created gear parameters and update.
- Engage Gear: establish the engaging relation of gears.
- Move Gear: translate and rotate the created gear.
- Delete Gear: delete the created gear.
- Information: display the created gear information.

Modeling a Bevel Gear

The following process examples describe the options available with the bevel gear modeling module.

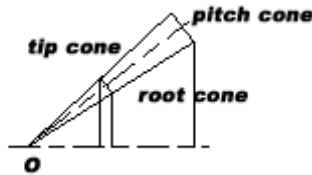
Create Gear

1. Select the Gear Operating Type, which in this case is Create Gear, and then pick OK.
2. Select the General Gear type on the Bevel Gear Type dialog, and then select the appropriate options on the rest of the form.
 - Input Type: General Gear to manually input the gear parameters.
 - Gear Type: Straight or Helical
 - Tooth Type: Equal Clearance Tooth



Equal Clearance Tooth

- Tooth Type: Non-Equal Clearance Tooth



Non-Equal Clearance Tooth

3. If you select General Gear, the parameter dialog displays the Bevel Gear Parameter form to let you enter appropriate values for:
 - Name
 - Outer Module (mm)
 - Teeth Number
 - Face Width (mm)
 - Pressure Angle (degree)
 - (Estimate) Pitch Angle (degree): Enter a value or pick the Estimate button to display a dialog and input the Shaft Angle and Match Gear Teeth Number parameters. The software then estimates the gear pitch angle.
 - (Estimate) Radial Addendum Modification Coe: Enter a value or pick the Estimate button to display a dialog and input the Match Gear Teeth Number parameter. The software then estimates the required value.

- (Estimate) Tangent Addendum Modification Coe: Enter a value or pick the Estimate button to display a dialog and input the Match Gear Teeth Number parameter. The software then estimates the required value.
- (Estimate) Addendum Factor: Enter a value or pick the Estimate button to have the software estimate the required value.
- (Estimate) Clearance: Enter a value or pick the Estimate button to have the software estimate the required value.
- (Estimate) Gear Cutter Top Radius (mm): Enter a value or pick the Estimate button to have the software estimate the required value.
- Gear Modeling Accuracy (Low, Mid, High).
- Default Value: Display the default bevel gear parameters.

The bevel gear parameters will vary based on the unit system and gear type.

4. On the Vector Constructor dialog you can select an Inferred Vector, input values I, J, K for the gear's center axis vector, select Cartesian or Spherical coordinate systems, and so on.
5. On the Point Constructor dialog, you can select an Inferred Point and input Base Point coordinate values for XC, YC, and ZC for the crossing point of two gears' shaft.

Edit Gear Parameter:

1. On the Bevel Gear Modeling dialog, select Edit Gear Parameter.
2. On the Select Gear to Operate dialog, select the gear to edit from the list display. Each selection displays the name of the gear model and the gear type: general gear.
3. On the Bevel Gear Type dialog, select the new gear type and tooth type.
4. Use the Bevel Gear Parameter dialog to input the new gear parameters and modeling accuracy. At this point you cannot input a Name. See the Create Gear section for additional information about particular parameters.

Engage Gear

1. On the Bevel Gear Modeling dialog, pick Engage Gear to establish the engaging relation for your gears.
2. From the Gear Engaging Relation List on the Select Gear to Engage dialog, pick the created gear to engage.

Item	Description.
Gear Engaging Relation List	<p>Display engaging relations to help you engage the gear.</p> <p>If you click Set Driving Gear and select a gear in Existing Gears, the same gear in this list will display '=>driving gear'.</p> <p>Double click a node to expand the view.</p>
Existing Gears	This dialog displays the names of all existing gears so you can select the

	<p>created gear to engage.</p> <p>List items display both the name of gear model and the type of gear: general gear.</p> <p>If you do not click Set Driving Gear or Set Driven Gear, but you do click Existing Gears, the software highlights only the gear model.</p> <p>If you click Set Driving Gear, then click Existing Gears, the software highlights the gear model and makes it a driving gear with the label Driving Gear and the corresponding list item in Gear Engaging Relation List displays '=>driving gear'.</p>
Set Driving Gear	Select the driving gear.
Set Driven Gear	Select the driven gear.
Driving Gear	The selected driving gear.
Driven Gear	The selected driven gear.
Center Line Vector	Invoke the standard vector dialog to input the center line vector of the engaging gears from modeling.
Apply	Click Apply to only create the engaging relation of gear, and not update, so you can create several engaging relations before performing the update.
Ok	Click OK to create the engaging relation of the gear and update the model.

Move Gear

1. On the Bevel Gear Modeling dialog, pick Move Gear to translate and rotate the created gear.
2. On the Select Gear to Operate dialog, select the general gear to move.
3. Use the Gear Position dialog to input the new gear position based on the selected coordinate system.



The Remain the engaging relation toggle lets you automatically move all engaged gears to the new position and keep their engaging relation.

Delete Gear

1. On the Bevel Gear Modeling dialog, pick Delete Gear to delete a created gear.
2. On the Select Gear to Operate dialog, select the created gear to delete.

Information

1. On the Bevel Gear Modeling dialog, pick Information.

2. On the Select Gear To Operate dialog, note the gear names and types listed.
-