

Define additional custom synchronous belt and pulleys

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1. Create new folder

Use Windows Explorer and create new folder where custom data will be stored.

If all users using Inventor would like to use custom belt use installation folder

C:\Program Files\Autodesk\Inventor 2010\Design Data\Design Accelerator\Tables_Custom\

If belt is supposed to be available just for specific Inventor project, create following folder

<Project_Design_Data>\ Design Accelerator\Tables_Custom\

2. Create new belt definition file

In order to better organize files, you may create additional sub-folder structure

.._Custom\ SBelts\Belts\

Within this folder, create a new file **breco_at3.xml**, for example. You might also re-use existing file. Belts delivered with the Inventor installation are located within following folder:

C:\Program Files\Autodesk\Inventor 2010\Design Data\Design Accelerator\Tables\SBelts\Belts\

You will also need a picture for this belt. Create a picture of 60x45 pixels size within the same folder.

Name the file for example **breco_at3.jpg**.

3. Define belt data

Open **breco_at3.xml** using XML editor or simply use **NOTEPAD.EXE**.

Belt XML definition is similar to HTML however it defines specific keys and attributes.

It should start with:

```
<?xml version="1.0" encoding="UTF-8"?>
```

Followed with structure:

```
<CustomFamily category="SBELTS" >
  <Parameters>
  </Parameters>
  <Members>
    <Member moniker="GUID_1" ></Member>
    <Member moniker="GUID_2" ></Member>
    ...
  </Members>
</CustomFamily>
```

Attributes of CustomFamily

revision : revision number. It is stored within the assembly and used to reference to given version of the XML file. Basically, if anything changes within the XML file revision should be increased.

thumbnail : defines picture that is displayed within the dialog

measuresystem: it can be "metric" or "imperial"

name : Name of the belt displayed within browse for belt panel

desc : Brief description of the belt

profile : "single" – single sided belt, "symmetrical" – double sided belt with symmetrical teeth, "staggered" – double sided belt with staggered teeth

Parameters

This section defines dimensional as well as mechanical parameters for synchronous belt.

Individual parameter format is:

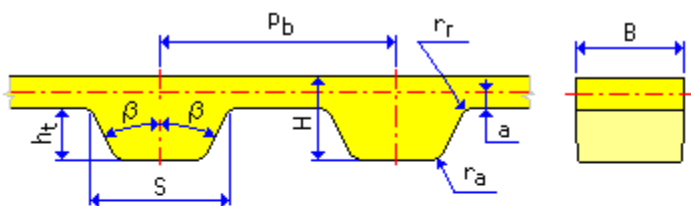
<Param_name src="fixed" dt="string" units="ul">Value</Param_name>

src : "fixed" - fixed value, "table" – value defined later for individual size within **Member** key.

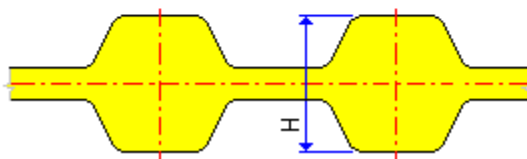
dt : data type, currently "string" or "number"

units : units (for example "ul" as unitless, "mm" millimeters etc.)

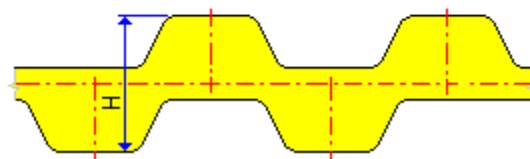
Dimensional parameters: **Pitch, S, ht, PitchOfst (a), beta (β), Height (H), ra, rr, Width (B)**



Symmetrical double-sided teeth



Staggered double-sided teeth



Specific mechanical parameters:

DisplayName : Short display name of the belt

Size : Text that describes exact designation of the belt (for example “6 AT3 / 150 SFX”)

Width0 : base width of the belt. Weight as well as maximum tension can be determined from this value with respect to actual belt width specified. So, weight as well as maximum tension does not need to be defined for each member individually.

Teeth : number of teeth. It is used for many purposes and defines belt length

MaxFlexFq : Maximum flexing frequency. Generator may display design warning if critical speed is exceeded with respect to flexing frequency. It is defined by belt manufacturer

MaxSpeed : Maximum belt speed. Generator may display design warning if critical speed is exceeded. It is defined by belt manufacturer

Weight : weight of the belt for given length (kg/m for example). It can be defined for individual belt size or with conjunction **Width0**. Generator computes weight of the belt for centrifugal forces.

Dpkmin : Minimum pulley diameter specified by belt manufacturer. Generator may display a warning if drive is using smaller then recommended pulley.

MaxTension : Maximum tension force. It can be defined for individual belt size or with conjunction **Width0**. Generator is using this property for calculation of belt power rating and it serves as a critical factor for mechanical validation of belt drive.

Members

It is collection of “**Member**” keys. Individual member defines specific belt size and length.

Member

It must have **moniker** attribute. Moniker is unique identifier of the specific belt within XML file. It is stored in the assembly for later reference.

It contains collection of individual parameters that vary of specific belt size. In most cases we consider **Size** as a designation, **Width** as a belt width, **Teeth** as a belt length.

Example of belt XML file

```
<?xml version="1.0" encoding="UTF-8"?>
<CustomFamily revision="1.0" category="SBELTS" thumbnail="breco_at3.jpg" measuresystem="metric"
name="AT3: Breco (R) Timing belt" desc="Timing Belt" profile="single">
  <Parameters>
    <DisplayName src="fixed" dt="string" units="ul">Timing Belt</DisplayName>
    <Size src="table" dt="string" units="ul"/>
    <Pitch src="fixed" dt="number" units="mm">3</Pitch>
    <S src="fixed" dt="number" units="mm">2.5</S>
    <ht src="fixed" dt="number" units="mm">1.1</ht>
    <PitchOfst src="fixed" dt="number" units="mm">0.15</PitchOfst>
    <beta src="fixed" dt="number" units="deg">25.0</beta>
    <Height src="fixed" dt="number" units="mm" >1.9</Height>
```

```

<ra src="fixed" dt="number" units="mm" >0.3</ra>
<rr src="fixed" dt="number" units="mm" >0.3</rr>
<Width0 src="fixed" dt="number" units="mm">10</Width0>
<Width src="table" dt="number" units="mm" />
<Teeth src="table" dt="number" units="ul" />
<MaxFlexFq src="fixed" dt="number" units="Hz">70</MaxFlexFq>
<MaxSpeed src="fixed" dt="number" units="m/s">85</MaxSpeed>
<Weight src="fixed" dt="number" units="kg/m">0.023</Weight>
<Dpkmin src="fixed" dt="number" units="mm">14</Dpkmin>
<MaxTension src="fixed" dt="number" units="N">400</MaxTension>
</Parameters>
<Members>
  <Member moniker="6-AT3-150" >
    <Size>6 AT3 / 150 SFX</Size>
    <Width>6.0</Width>
    <Teeth>50</Teeth>
  </Member>
  <Member moniker="6-AT3-201" >
    <Size>6 AT3 / 201 SFX</Size>
    <Width>6.0</Width>
    <Teeth>67</Teeth>
  </Member>
  <Member moniker="6-AT3-252" >
    <Size>6 AT3 / 252 SFX</Size>
    <Width>6.0</Width>
    <Teeth>84</Teeth>
  </Member>
</Members>
</CustomFamily>

```

4. Create corresponding pulley

In order to better organize files, you may create additional sub-folder structure

`.._Custom\SBelts\Pulleys\`

Within this folder, create a new file **pulley_at3.xml**, for example. You might also re-use existing file. Pulleys delivered with the Inventor installation are located within following folder:

`C:\Program Files\Autodesk\Inventor 2010\Design Data\Design Accelerator\Tables\SBelts\Pulleys\`

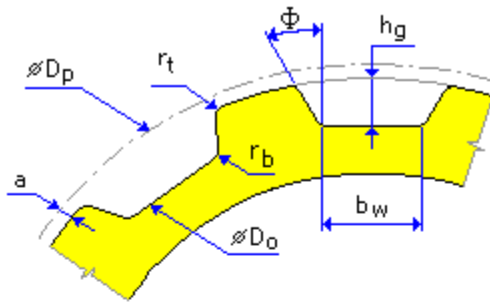
Individual file defines specific pulley. Please note that flanged, un-flanged, left-flanged, right-flanged pulley is considered as a specific pulley and thus it might be defined completely differently.

You will also need a picture for this pulley. Create a picture of 60x45 pixels size within the same folder. Name the file for example **Unflanged.jpg**.

5. Define pulley data

Format of the pulley XML is very similar to belt XML. There are dimensional parameters only. Please notice the meaning of individual parameters.

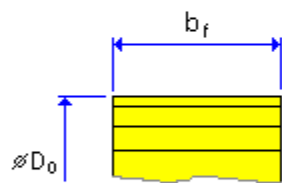
Straight-sided Teeth Pulley



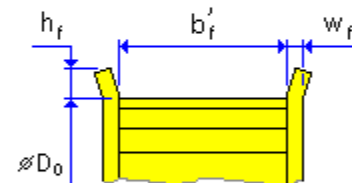
Outside pulley diameter can be determined as

$$D_o = \frac{z \cdot p_d}{\pi} - 2 \cdot a$$

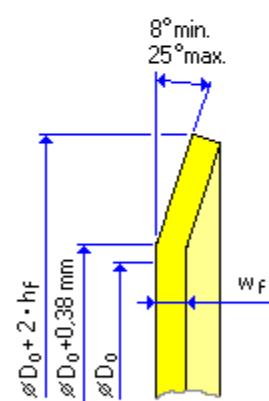
Unflanged pulley



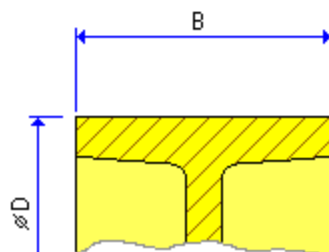
Flanged pulley



Flange detail



Flat pulley



Example of pulley XML

```
<?xml version="1.0" encoding="UTF-8"?>
<CustomFamily revision="1.0" category="SBELTSPULLEY" measuresystem="metric"
thumbnail="Unflanged.jpg" name="AT3 Unflanged Pulley" desc="Timing Pulley"
flange="none" >
  <Parameters>
    <DisplayName src="fixed" dt="string" units="ul">Timing Pulley</DisplayName>
    <Size src="table" dt="string" units="ul" />
    <z src="table" dt="number" units="ul" />
    <pb src="fixed" dt="number" units="mm">3</pb>
    <hg src="fixed" dt="number" units="mm">1.2</hg>
    <bw src="fixed" dt="number" units="mm">1.4</bw>
    <fi src="fixed" dt="number" units="deg">25.0</fi>
    <rb src="fixed" dt="number" units="mm">0.3</rb>
    <rt src="fixed" dt="number" units="mm">0.3</rt>
    <a src="fixed" dt="number" units="mm">0.15</a>
    <b src="table" dt="number" units="mm" />
    <bf src="table" dt="number" units="mm" />
    <fw src="fixed" dt="number" units="mm">1.0</fw>
    <fh src="fixed" dt="number" units="mm">1.2</fh>
  </Parameters>
  <Members>
    <Member moniker="6-AT3-15" >
      <Size>6 AT3 x 15</Size>
      <z>15</z>
      <b>6.0</b>
      <bf>10.0</bf>
    </Member>
    <Member moniker="6-AT3-16" >
      <Size>6 AT3 x 16</Size>
      <z>16</z>
      <b>6.0</b>
      <bf>10.0</bf>
    </Member>
    <Member moniker="6-AT3-18" >
      <Size>6 AT3 x 18</Size>
      <z>18</z>
      <b>6.0</b>
      <bf>10.0</bf>
    </Member>
  </Members>
</CustomFamily>
```

6. Customizing browser for belt and pulley

Using Windows Explorer copy original files

C:\Program Files\Autodesk\Inventor 2010\Design Data\Design Accelerator\Tables\SBelts\SBelts.xml
C:\Program Files\Autodesk\Inventor 2010\Design Data\Design Accelerator\Tables\SBelts\SBelts.res.xml

To

<Design Data>\Design Accelerator\Tables_Custom\SBelts\SBelts.xml
<Design Data>\Design Accelerator\Tables_Custom\SBelts\SBelts.res.xml

Where <Design Data> is C:\Program Files\Autodesk\Inventor 2010\Design Data or project design data folder.

Modify browse list of available belts and pulleys:

Open **SBelts.xml** within customized folder and add text highlighted:

```
<FDesign>
  <Table InternalName="F6EF2578-1209-435d-915D-B1950887DAF3">
    <Definition DisplayName="Synchronous Belts Category">
      <Columns>
        <File Description="" Units=""/>
      </Columns>
    </Definition>
    <Data>
      <Row><File>_Custom\SBelts\Belts\breco_at3.xml</File></Row>
    </Data>
  </Table>
  <Table InternalName="30D3CDD8-B7B9-4faf-87B3-000AD45472CB">
    <Definition DisplayName="Pulley Category">
      <Columns>
        <File Description="" Units=""/>
      </Columns>
    </Definition>
    <Data>
      <Row><File>_Custom\SBelts\Pulleys\pulley_at3.xml</File></Row>
    </Data>
  </Table>
</FDesign>
```

Remember that browser for belt or browse for pulley is using this relative path with respect to the given Design Data folder. If file does not exist in specific project design data it uses the file from installation design data folder.