# BBB (3 Series vs. 4 Series vs. 5 Series)

## 4 Series BBB - Output Section

### Output Gearset
- **Bevel Gearset**
  - Two ratio sets available:
  - 3.5:1 (actual ratio)
  - 3.2:1 (actual ratio)

### Output Connection Methods
- **Keyed Hollow Bore**: All unit sizes (4A~4F)
- **Shrink Disc**: All unit sizes (4A~4F)
- **Solid Shaft**: All unit sizes (4A~4F)
- **Taper Grip Bushing**: All unit sizes (4A~4F)

### Output Bearings
- **Tapered Roller**: All unit sizes (4A~4F)

### Output Oil Seals
- **Double Seals per Side**: All Unit sizes (4A~4F)

### Gear Housing Material
- **Ductile Iron**: All unit sizes (4A~4F)

### Technical Notes:
1. New 3.2 bevel ratio - combined in some cases with new planetary ratios - creates additional overall reduction ratios not available in 3 Series BBB. "New" nominal single reduction ratios include: 13, 14, 16, 22, 25, 35, 67, 80, 112
2. Bevel Gearing Tooth Count:
   - | Bevel Ratio | Number of Teeth |
   - | Pinion | Gear |
   - | 3.2:1 | 10 | 32 |
   - | 3.5:1 | 10 | 35 |
3. The gear geometry of the 3.2:1 Pinion Shaft is different from that of the 3.5:1 Pinion Shaft, thus, these two components are NOT interchangeable with each other.
4. Ductile iron material (JIS FCD450) now used for Bevel Gear Housing, Bevel Housing cover, and Cyclo Input Flange. Refer to EDOC1-12-004 “Cast vs. Ductile Iron Housing Material” which provides a comprehensive technical comparison between cast iron and ductile iron materials.
5. New, larger size, 4F unit has an output torque capacity of 18,000 N·m (=159,300 lb·in)
6. For details regarding those output options which are available for the 4 Series BBB (i.e.: keyed hollow bore diameters, flange, etc.) Please refer to technical document EDOC1-12-011 “Cyclo® BBB4 & 5 Series: Input & Output Options”.

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4 Series BBB - Intermediate Section

Technical Notes:

(1) For the Y2 (motor up) mounting configuration, oil remains the lubricant for both the Cyclo input and the Bevel output sections - unlike the 3 Series BBB where the Cyclo portion required grease lubrication and derating. Units supplied in the Y2 configuration will include an external oil piping/breather assembly as seen below:

(2) In the Y4 (motor down) mounting configuration, the input Cyclo portion must be grease lubricated and, subsequently, derated. Internal oil seals and collar are incorporated on the pinion shaft to prevent mixing of the oil and grease lubricants.
### Technical Notes:

1. For planetary input, new reduction ratios have been designed and are available in a larger number of frame sizes. Exact planetary ratios (per frame size) are listed as follows:

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Nominal Ratio</th>
<th>3:1</th>
<th>4:1</th>
<th>5:1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>610</td>
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</tr>
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<td>614</td>
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<tr>
<td>616</td>
<td>3.100</td>
<td>4.000</td>
<td>5.077</td>
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</tr>
<tr>
<td>617</td>
<td>3.103</td>
<td>4.091</td>
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</tr>
<tr>
<td>618</td>
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<td>4.136</td>
<td>4.914</td>
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</tr>
<tr>
<td>619</td>
<td>3.121</td>
<td>4.089</td>
<td>4.833</td>
<td></td>
</tr>
</tbody>
</table>

2. For specifics regarding various input options (i.e.: Quill motor input, "C" Face motor input, etc.) for the 4 Series BBB, refer to technical document **EDOC1-12-011 “Cyclo® BBB4 & 5 Series: Input & Output Options”**.
BBB (3 Series vs. 4 Series vs. 5 Series) - Continued

5 Series BBB – Output Section

Output Connection Methods
- Keyed Hollow Bore: Standard for SZ - SC
- Shrink Disc: Option for SZ~SC

Output Oil Seals
- Unique double lip/single seal design: Unit Sizes SZ and 5A
- Double Seal per Side: Unit Sizes 5B and 5C

Bevel Gearset
- Two ratio sets available:
  - 3.5:1 (actual ratio)
  - 3.2:1 (actual ratio)

Output Bearings:
- Deep Groove Ball: Unit Size SZ
- Tapered Roller: Unit Sizes 5A, 5B, and 5C

Gear Housing Material
- SZ: Die Cast Aluminum. JIS ADC12
- 5A, 5B, 5C: Cast Iron. JIS FC450

Technical Notes:

1. New 3.2 bevel ratio - combined in some cases with new planetary ratios - creates additional overall reduction ratios not available in 3 Series BBB. “New” nominal single reduction ratios include: 13, 14, 16, 22, 25, 35, 67, 80, 112

2. Bevel Gearing Tooth Count:

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<td>Gear</td>
</tr>
<tr>
<td>3.2:1</td>
<td>10 32</td>
</tr>
<tr>
<td>3.5:1</td>
<td>10 35</td>
</tr>
</tbody>
</table>

3. The gear geometry of the 3.2:1 Pinion shaft is different from that of 3.5:1 Pinion shaft. These two components are NOT interchangeable.

4. For details regarding those output options which are available for the 5 Series BBB (ie: keyed hollow bore diameters, flange, etc.) please refer to technical document EDOC1-12-011 “Cyclo® BBB4 & 5 Series: Input & Output Options”.

= new feature for the 4 Series/5 Series BBB not previously available in Series 3 or earlier BBB's.
### Technical Notes:

1. "One piece housing" design only applies to 5-Series BBB. 4-Series still utilizes two piece housing - specifically: Cyclo Input Flange is separate from Output Bevel Gear Housing.

2. With one-piece housing, multiple designs exist for each bevel unit size. This is required to accommodate various Cyclo input sizes.

3. For the Y2 (motor up) mounting configuration, oil remains the lubricant for both the Cyclo input and the Bevel output sections. Units supplied in the Y2 configuration will include an external oil piping/breather assembly.

4. In the Y4 (motor down) mounting configuration, the Input Cyclo portion must be grease lubricated and, subsequently, derated. Internal oil seals and collar are incorporated on the pinion shaft to prevent mixing of the oil and grease lubricants.

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**5 Series BBB – Intermediate Section**

Intermediate Housing is cast directly to output gear housing (one-piece)

Taper Roller Bearings standard on Pinion Shaft

Unified oil lubrication between input (Cyclo) portion and bevel gearing portion

See note indicator symbol "●" = new feature for the 4 Series/5 Series BBB not previously available in Series 3 or earlier BBB’s.
5 Series BBB – Input Section

Intermediate Housing is cast directly to output gear housing (one-piece).

Redesigned planetary input utilized for lower overall reduction ratios.

Standard Cyclo® input integrated into all unit sizes.

Technical Notes:

(1) For planetary input, new reduction ratios have been designed and are available in a larger number of frame sizes. Exact planetary ratios (per frame size) are listed as follows:

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Nominal Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3:1</td>
</tr>
<tr>
<td>610</td>
<td>3.000</td>
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<tr>
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<td>618</td>
<td>3.000</td>
</tr>
<tr>
<td>619</td>
<td>3.121</td>
</tr>
</tbody>
</table>

(2) For specifics regarding various Input Options (i.e.: Quill motor input, "C" Face motor input) available for the 5 Series BBB, refer to technical document EDOC1-12-001 “Cyclo® BBB4 & 5 Series: Input & Output Options”.