Stacking individual Disc Springs provides the designer with:

- A wide range of possible force/deflection combinations;
- The ability to design application specific load curves – both progressive and regressive; and
- The opportunity to design a range of dampening characteristics into the design.

Consideration needs to be given to the friction between the parallel Disc surfaces. A reasonable allowance is 2 - 3% of the force for each sliding surface – a greater force for loading and a lesser force for unloading. Discs in parallel should be well lubricated and it is suggested that the number of Discs in a parallel set be limited to a maximum of 4 to reduce the deviation from calculated to measured characteristics. Discs in parallel have increased self-dampening (hysteresis) characteristics.

It is normally desirable to have both ends rest on the larger outer edge of the Disc. With an uneven number of pairs in a stack, this is not possible. In this case, the end resting on the outer edge should be arranged to be on the end on which the force is applied – the moving end of the stack.
SPIROL offers pre-stacked Disc Springs (greased or ungreased) in custom configurations packaged in shrink wrap with a perforated tab for ease of insertion into the assembly. This saves time and helps to mistake-proof the assembly process.

Stacks need to be guided to keep the Discs in position. The preferred method is internal, such as a rod through the inside diameter. In case of external guidance, a sleeve is suggested. In either case, the guiding component should be case hardened to 58 HRC with a depth not less than 0.6mm and have a ground finish.

Since the diameter of the Discs change when compressed, the following clearance values are recommended:

<table>
<thead>
<tr>
<th>Clearance (mm)</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.8</th>
<th>1.0</th>
<th>1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (mm)</td>
<td>Up  to 16</td>
<td>Over 16 to 20</td>
<td>Over 20 to 26</td>
<td>Over 26 to 31.5</td>
<td>Over 31.5 to 50</td>
<td>Over 50 to 80</td>
<td>Over 80 to 140</td>
<td>Over 140 to 250</td>
</tr>
</tbody>
</table>

The stability of a Disc with a thickness of 1mm or less can present a problem at the bearing surfaces. In such cases, the use of intermediate flat Discs is recommended with outside diameter contact.

Progressive loading can be obtained by assembling stacks in which Discs will deflect consecutively when loaded. Generally, this is done by 1) stacking single, double and triple parallel sets in series, or 2) stacking Discs of various thickness in series. It is, however, necessary to provide a means to limit the compression of the weaker Disc to avoid overstressing while the stronger Discs are still in process of compression.
SPIROL Application Engineers will review your application needs and work with you to recommend the optimum solution. One way to start the process is to visit our Optimal Application Engineering portal at SPIROL.com.

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