## ■Instructions and precautions for the use of coil springs

**①Always use a spring guide.**
If used without a spring guide, problems such as buckling or bending of the spring body may occur, resulting in concentrated high stress on the inside of the bend and then leading to breakage. Be sure to use a spring guide, such as a shaft or outer diameter guide.
※In general the best results are obtained by inserting a shaft all the way through the coil spring from top to bottom to serve as an inner diameter guide.

**②Clearance between spring inner diameter and shaft**
The shaft diameter should be set approximately 1.0mm smaller than the inner diameter of the coil spring. If the clearance with the shaft is too small, the spring inner diameter will become worn by the shaft, leading to breakage occurring at the worn points. If the clearance is too large, buckling or other problems may occur.
If the spring has a long free length (Free length÷Outer dia.=4 or more), add a step to the shaft as shown on the left side of Figure 1 in order to prevent inner diameter contact when the spring body is bent.

**③Clearance between spring outer diameter and counterbore hole**
The counterbore hole diameter should be set approximately 1.5 mm larger than the coil spring outer diameter. If the clearance with the counterbore hole is too small, the outer diameter becomes restrained by expansion on the outer diameter side when the spring is flexed. The resulting concentration of stress may cause the spring to break. For a spring with a long free length, a counterbore hole shape such as that shown on the right side of Figure 1 is ideal.

**④Avoid short guide lengths and shallow counterbore hole depths.**
If the guide is too short, the spring may contact the end of the guide when the spring buckles, and the resulting friction may cause the spring to break. The guide length should be to a minimum of 150% of the initial set height. Also be sure to chamfer the shaft to approximately C3.

**⑤Do not use in excess of the maximum allowable deflection (the maximum allowable deflection). (Do not use close to the solid height.)**
If the spring is used beyond the maximum allowable deflection, high stress in excess of the calculated value occurs in the cross section. This can cause the spring to break. In addition, if the coil spring is used close to its solid height, the active coils will gradually adhere to each other, increasing the spring constant value and causing the load curve to rise as shown in Fig.2. The resulting high stress may cause the spring to break. This also is a cause of strain. Do not use the coil spring in excess of the maximum allowable deflection.

**⑥Set an initial deflection.**
If there is a gap, the spring will move vertically, resulting in an impact force and causing bending of the body or buckling. Setting an initial deflection stabilizes the top and bottom ends of the spring.

**⑦Do not use when scrap or other foreign substances are caught in the spring.**
Foreign substances wihch get caught between the coils prevent that part of the coil spring from functioning as an active coil, forcing the other coils to deflect as shown in Fig.3. This effectively reduces the number of active coils, increasing the stress on the spring, and eventually causing it to break. Be careful to prevent scrap or other foreign substances from entering the coils.

**⑧Do not use in locations where the the mounting surfaces are not sufficiently parallel.**
If the mounting surfaces are insufficiently parallel, bending of the spring body occurs, resulting in concentrated high stress on the inside of the bend that may cause the spring to break. In addition, if the die is not sufficiently parallel, as shown in Figure 4, the spring may break due to bending or to exceeding the maximum allowable deflection. Ensure that the coil spring's mounting surfaces are as close to perfectly parallel as possible in order to prevent the maximum allowable deflection from being exceeded.

**⑨Do not use coil springs in series.**
If two coil springs are used in series, the springs will bend as shown in Figure 5. In some cases, the spring will ride up on the shaft or counterbore hole, causing breakage by the same mechanism described in ①. Variation in the spring load capacities will also result in the weaker spring being overcome by the stronger spring (Figure 6). This increases the deflection of the weaker spring, resulting in a difference in durability between the springs or else in breakage.In addition, when two springs are used in series, the spring constant of each is reduced by 1/2.

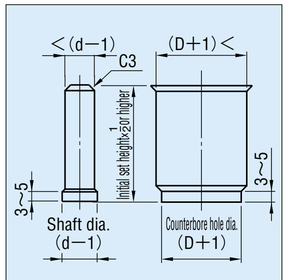
**⑩Do not use two coil springs in a double-spring arrangement.**
The use of two coil springs in a double-spring arrangement, as shown in Figure 7, may result in the inner coils being sandwiched between the outer coils (or vice versa) when the springs buckle. This can cause the coil springs to break for the same reason described in ④.

**⑪Do not use the coil spring horizontally.**
If the spring is used horizontally, the shaft will cause wear of the spring inner diameter, resulting in breakage at the points of wear.

**MISUMI endurance test conditions**

①**Spring guide type**
Inside shaft
Shaft diameter: d−1.0 mm
②**Initial deflection**
1.0mm
③**Amplitude**
Amount of deflection at the maximum allowable deflection
④**Speed**
180spm
※Durability count may vary depending on the conditions of use.

**Fig. 1**



**Shaft shape** **Counterbore hole shape**

**Fig. 2**

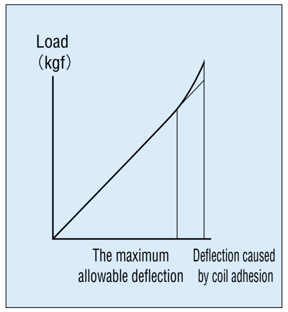



**Fig. 3**

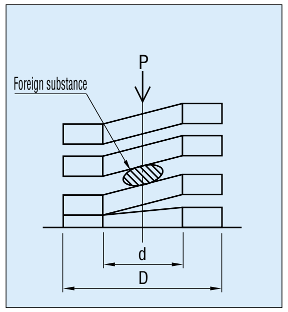



**Fig. 4**

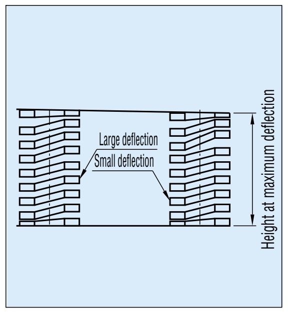



**Fig. 5**

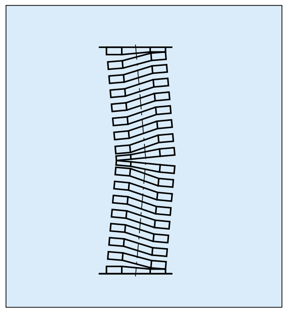


**Fig. 6**

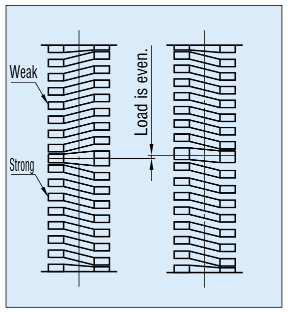
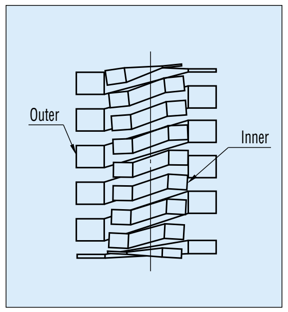



**Fig. 7**

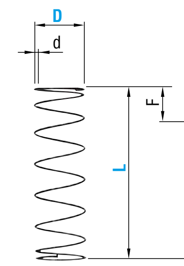





# ROUND WIRE COIL SPRINGS
## —WY (75% DEFLECTION)—



**WY**




Spring constant ±10%
Outer dia. D φ10 or less $^{\ 0}_{-0.5mm}$
φ13 or more $^{\ 0}_{-0.8mm}$
Free length L 50 or less ±1.5mm
55 or more ±2.5mm
RoHS
M SWP—A

**■Spring constant**

D12 and D14 are not available for WY type.

<table>
<tr><th>D \ Type</th><th>WY</th><th>WR</th><th>WF</th><th>WL</th><th>WT</th><th>WM</th><th>WH</th><th>WB</th></tr>
<tr><td>2</td><td></td><td></td><td></td><td>0.5 {0.05}</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td rowspan="5">N/mm 0.1 {kgf/mm} {0.01}</td><td rowspan="10">N/mm 0.3 {kgf/mm} {0.03}</td><td rowspan="10">N/mm 0.5 {kgf/mm} {0.05}</td><td rowspan="10">N/mm 1.0 {kgf/mm} {0.1}</td><td rowspan="2">1.5 {0.15}</td><td rowspan="2">2.0 {0.2}</td><td></td><td>3.9 {0.4}</td></tr>
<tr><td>4</td><td>2.9 {0.3}</td><td>4.9 {0.5}</td></tr>
<tr><td>5</td><td rowspan="8">N/mm 2.0 {kgf/mm} {0.2}</td><td rowspan="8">N/mm 2.9 {kgf/mm} {0.3}</td><td rowspan="4">N/mm 5.9 {kgf/mm} {0.6}</td><td rowspan="4">N/mm 9.8 {kgf/mm} {1.0}</td></tr>
<tr><td>6</td></tr>
<tr><td>8</td></tr>
<tr><td>10</td><td rowspan="5">N/mm 0.2 {kgf/mm} {0.02}</td></tr>
<tr><td>12</td><td rowspan="4">N/mm 9.8 {kgf/mm} {1.0}</td><td rowspan="4">N/mm 19.6 {kgf/mm} {2.0}</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>16</td></tr>
<tr><td>18</td><td></td><td rowspan="4">N/mm 0.5 {kgf/mm} {0.05}</td><td rowspan="4">N/mm 1.0 {kgf/mm} {0.1}</td><td rowspan="4">N/mm 2.9 {kgf/mm} {0.3}</td><td rowspan="4">N/mm 3.9 {kgf/mm} {0.4}</td><td rowspan="4">N/mm 4.9 {kgf/mm} {0.5}</td><td rowspan="4">N/mm 14.7 {kgf/mm} {1.5}</td><td>29.4 {3.0}</td></tr>
<tr><td>20</td><td></td><td></td></tr>
<tr><td>22</td><td></td><td rowspan="2">N/mm 29.4 {kgf/mm} {3.0}</td></tr>
<tr><td>27</td><td></td></tr>
<tr><td>Fmax.</td><td>F=L×75%</td><td>F=L×60%</td><td>F=L×45%</td><td>F=L×40%</td><td>F=L×40%</td><td>F=L×35%</td><td>F=L×30%</td><td>F=L×25%</td></tr>
</table>

Order: Catalog No. WY13—60 | Days to Ship: Quotation | Price: Quotation

**■WY : Fmax. (Maximum allowable deflection)=L×75%**

| d | Solid height | F max. | Load N {kgf} max. | Catalog No. Type D—L | Base unit price |
|---|---|---|---|---|---|
| 0.16 | 1.0 | 3.75 | 0.38 {0.04} | WY3— 5 | |
| 0.2 | 2.0 | 7.5 | 0.75 {0.08} | 10 | |
| 0.23 | 3.6 | 11.2 | 1.12 {0.11} | 15 | |
| 0.23 | 3.6 | 15 | 1.5 {0.15} | 20 | |
| 0.25 | 5.5 | 18.7 | 1.87 {0.19} | 25 | |
| 0.26 | 6.5 | 22.5 | 2.25 {0.23} | 30 | |
| 0.2 | 1.1 | 3.75 | 0.38 {0.04} | WY4— 5 | |
| 0.23 | 1.9 | 7.5 | 0.7 {0.08} | 10 | |
| 0.23 | 1.9 | 11.2 | 1.1 {0.11} | 15 | |
| 0.25 | 2.7 | 15 | 1.5 {0.15} | 20 | |
| 0.29 | 5 | 18.7 | 1.8 {0.19} | 25 | |
| 0.29 | 5 | 22.5 | 2.2 {0.23} | 30 | |
| 0.32 | 7.7 | 26.2 | 2.6 {0.26} | 35 | |
| 0.32 | 7.7 | 30 | 2.9 {0.3 } | 40 | |
| 0.25 | 1.7 | 7.5 | 0.7 {0.08} | WY5—10 | |
| 0.25 | 1.7 | 11.2 | 1.1 {0.11} | 15 | Quotation |
| 0.3 | 3.2 | 15 | 1.5 {0.15} | 20 | |
| 0.3 | 3.2 | 18.7 | 1.8 {0.19} | 25 | |
| 0.35 | 6.3 | 22.5 | 2.2 {0.23} | 30 | |
| 0.35 | 6.3 | 26.2 | 2.6 {0.26} | 35 | |
| 0.38 | 9.2 | 30 | 2.9 {0.3 } | 40 | |
| 0.38 | 9.2 | 33.7 | 3.3 {0.34} | 45 | |
| 0.38 | 9.2 | 37.5 | 3.7 {0.38} | 50 | |
| 0.3 | 2.1 | 7.5 | 0.75 {0.08} | WY6—10 | |
| 0.32 | 2.8 | 11.2 | 1.1 {0.11} | 15 | |
| 0.32 | 2.8 | 15 | 1.5 {0.15} | 20 | |
| 0.35 | 4.1 | 18.7 | 1.8 {0.19} | 25 | |
| 0.38 | 5.6 | 22.5 | 2.2 {0.23} | 30 | |
| 0.38 | 5.6 | 26.2 | 2.6 {0.26} | 35 | |
| 0.4 | 7.2 | 30 | 2.9 {0.3 } | 40 | |
| 0.4 | 7.2 | 33.7 | 3.3 {0.34} | 45 | |
| 0.4 | 7.2 | 37.5 | 3.7 {0.38} | 50 | |
| 0.45 | 12.2 | 41.2 | 4.0 {0.41} | 55 | |
| 0.45 | 12.2 | 45 | 4.4 {0.45} | 60 | |
| 0.45 | 12.2 | 48.7 | 4.8 {0.49} | 65 | |
| 0.45 | 12.2 | 52.5 | 5.1 {0.53} | 70 | |

| d | Solid height | F max. | Load N {kgf} max. | Catalog No. Type D—L | Base unit price |
|---|---|---|---|---|---|
| 0.35 | 2.1 | 7.5 | 0.75 {0.08} | WY8 —10 | |
| 0.38 | 3 | 11.2 | 1.1 {0.11} | 15 | |
| 0.4 | 3.5 | 15 | 1.5 {0.15} | 20 | |
| 0.4 | 3.5 | 18.7 | 1.8 {0.19} | 25 | |
| 0.45 | 5.7 | 22.5 | 2.2 {0.23} | 30 | |
| 0.45 | 5.7 | 26.2 | 2.6 {0.26} | 35 | |
| 0.45 | 5.7 | 30 | 2.9 {0.3 } | 40 | |
| 0.45 | 5.7 | 33.7 | 3.3 {0.34} | 45 | |
| 0.5 | 9 | 37.5 | 3.7 {0.38} | 50 | |
| 0.5 | 9 | 41.2 | 4.0 {0.41} | 55 | |
| 0.5 | 9 | 45 | 4.4 {0.45} | 60 | |
| 0.5 | 9 | 48.7 | 4.8 {0.49} | 65 | Quotation |
| 0.5 | 9 | 52.5 | 5.1 {0.53} | 70 | |
| 0.5 | 3 | 11.2 | 2.26 {0.23} | WY10—15 | |
| 0.55 | 4.6 | 15 | 2.9 {0.3 } | 20 | |
| 0.55 | 4.6 | 18.7 | 3.7 {0.37} | 25 | |
| 0.6 | 6.6 | 22.5 | 4.4 {0.45} | 30 | |
| 0.6 | 6.6 | 26.2 | 5.1 {0.52} | 35 | |
| 0.65 | 9.1 | 30 | 5.9 {0.6 } | 40 | |
| 0.65 | 9.1 | 33.7 | 6.6 {0.67} | 45 | |
| 0.65 | 9.1 | 37.5 | 7.4 {0.75} | 50 | |
| 0.7 | 12.6 | 41.2 | 8.1 {0.82} | 55 | |
| 0.7 | 12.6 | 45 | 8.8 {0.9 } | 60 | |
| 0.7 | 12.6 | 48.7 | 9.6 {0.97} | 65 | |
| 0.7 | 12.6 | 52.5 | 10.3 {1.05} | 70 | |

| d | Solid height | F max. | Load N {kgf} max. | Catalog No. Type D—L | Base unit price |
|---|---|---|---|---|---|
| 0.6 | 3.9 | 15 | 2.9 {0.3 } | WY13—20 | |
| 0.65 | 5.1 | 18.7 | 3.7 {0.37} | 25 | |
| 0.65 | 5.1 | 22.5 | 4.4 {0.45} | 30 | |
| 0.7 | 6.7 | 26.2 | 5.1 {0.52} | 35 | |
| 0.75 | 8.7 | 30 | 5.9 {0.6 } | 40 | |
| 0.75 | 8.7 | 33.7 | 6.6 {0.67} | 45 | |
| 0.8 | 11.6 | 37.5 | 7.4 {0.75} | 50 | |
| 0.8 | 11.6 | 41.2 | 8.1 {0.82} | 55 | |
| 0.8 | 11.6 | 45 | 8.8 {0.9 } | 60 | |
| 0.85 | 15.3 | 48.7 | 9.6 {0.97} | 65 | |
| 0.85 | 15.3 | 52.5 | 10.3 {1.05} | 70 | Quotation |
| 0.65 | 3.6 | 15 | 2.9 {0.3 } | WY16—20 | |
| 0.7 | 4.6 | 18.7 | 3.7 {0.37} | 25 | |
| 0.75 | 5.7 | 22.5 | 4.4 {0.45} | 30 | |
| 0.8 | 7 | 26.2 | 5.1 {0.52} | 35 | |
| 0.85 | 9 | 30 | 5.9 {0.6 } | 40 | |
| 0.85 | 9 | 33.7 | 6.6 {0.67} | 45 | |
| 0.9 | 11.3 | 37.5 | 7.4 {0.75} | 50 | |
| 0.9 | 11.3 | 41.2 | 8.1 {0.82} | 55 | |
| 0.9 | 11.3 | 45 | 8.8 {0.9 } | 60 | |
| 0.9 | 11.3 | 48.7 | 9.6 {0.97} | 65 | |
| 0.9 | 11.3 | 52.5 | 10.3 {1.05} | 70 | |

●Load calculation method: Load=Spring constant×Deflection
(SI unit) N=N/mm×Fmm
kgf=kgf/mm×Fmm
(kgf=N×0.101972)

- Neither end is ground for all WY type springs.
- The solid height values are for reference only. There may be some variation between lots.
- Operation count: 1 million
- Instructions and precautions for the use of coil springs ☞ P.1397