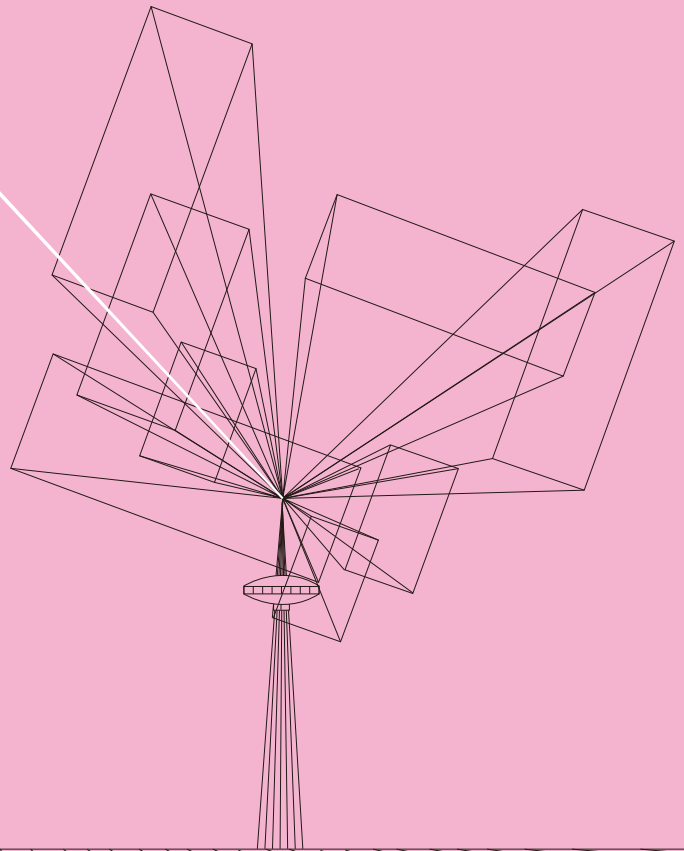


STANDARD PRODUCTS GUIDE



TAIYO
Stainless Spring Co., Ltd.



TAIYO Stainless Spring Co., Ltd.

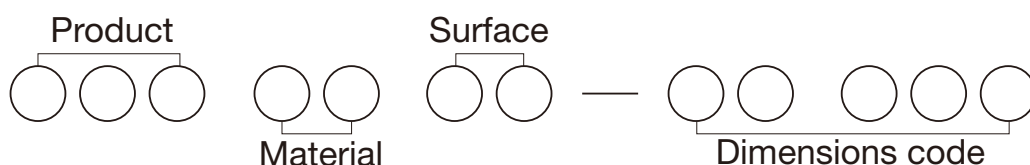
NO.47
Vol. 4

Using This Guide

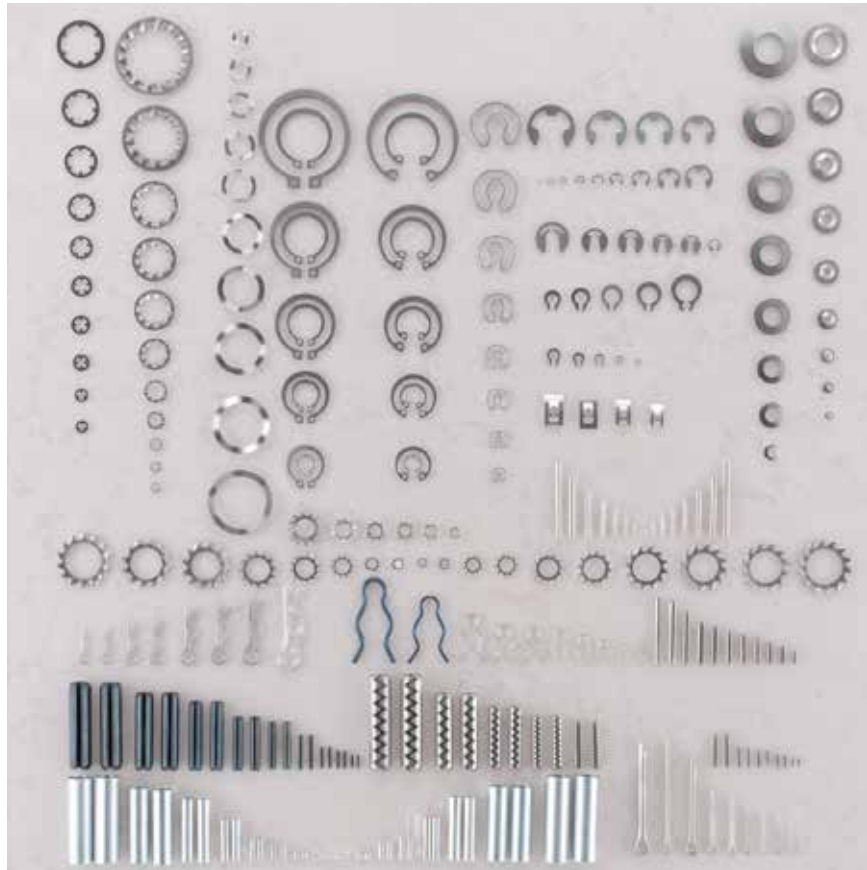
- The products described in this Guide are for general purpose/duty applications. For a list of our products, please refer to the table of contents.
Please confirm stock availability prior to placing your order, as this Guide is mainly prepared for exhibiting dimension tables, and in some cases there may be shortages in stock, or production may not be yet achieved. For Insert Bushing, all sizes are manufactured only upon request.
- The dimensional tolerance is based on Japan Industrial Standard (JIS)*. Length and outside diameter are described in maximum values and inside diameter in minimum value. In cases where geometric tolerancing (parallelism, roundness, squareness, etc.) is required, we will accept it as a custom-made order, so please contact us. Since our Standard Products are made for general applications, please contact and discuss with us prior to using them to where possible defects of products may cause a threat to life or may result in critical incidents.
 *JIS B 0024 Technical Drawings — Fundamental Tolerancing Principle
- We carry out quality and environment management systems in compliance with the ISO 9001 and ISO 14001 standards. However, this shall not be taken as a guarantee to conform with every item of the customer's product requirements.
- We have set standards as a company for substances requiring environmental control, such as RoHS, and we manage these standards as well. For details on the standards, or if any examination is necessary, please contact us.
- The Standard Product is designed and produced employing our original technologies while complying with JIS, JASO (Japanese Automotive Standards Organization), DIN (Deutsche Industrie Normen), and other standards. However, the products do not necessarily fulfill all requirements of the standards.
- We do not make or stock any galvanized parts that are at risk of fracture due to hydrogen embrittlement.
- For the description on plating, we use our original notation system, not the JIS standard.
- Dimensions, standards, or others contained in this guide are subject to change without prior notice. Please use the latest version when specifying your application requirements.

Part Number Structure (Standardized Product Code)

Standard Products are composed of 12-digit part numbers. Please confirm the part number when placing your order.



Standardized Products

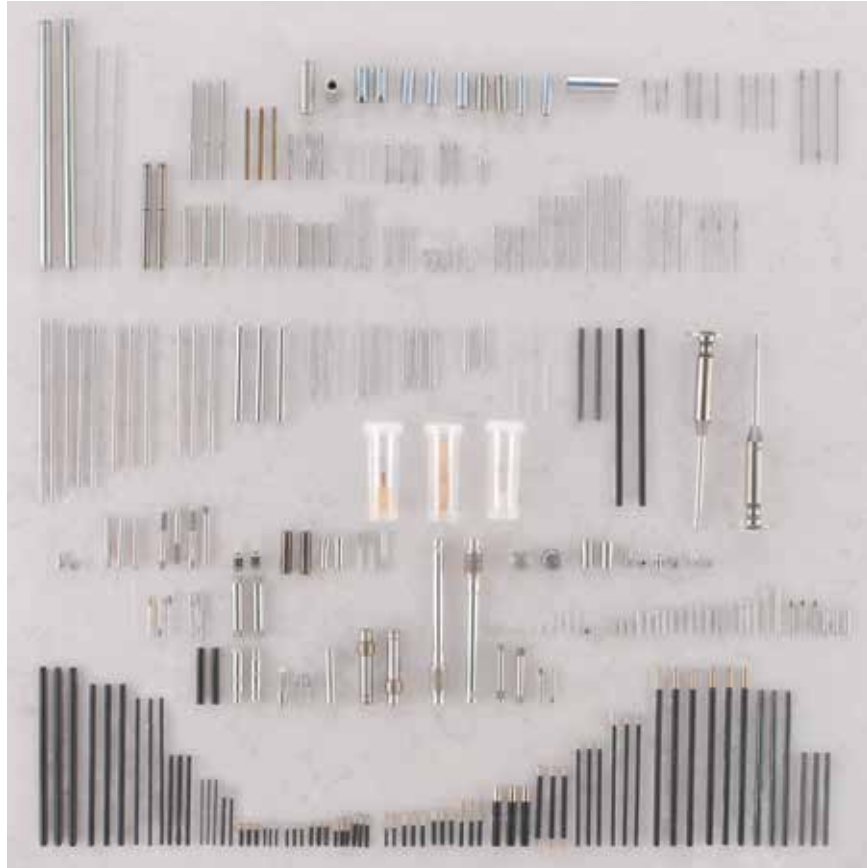


Custom-made Products

Formed Products (Roll Bending)



Shaft Products



Formed Products (Press Work)

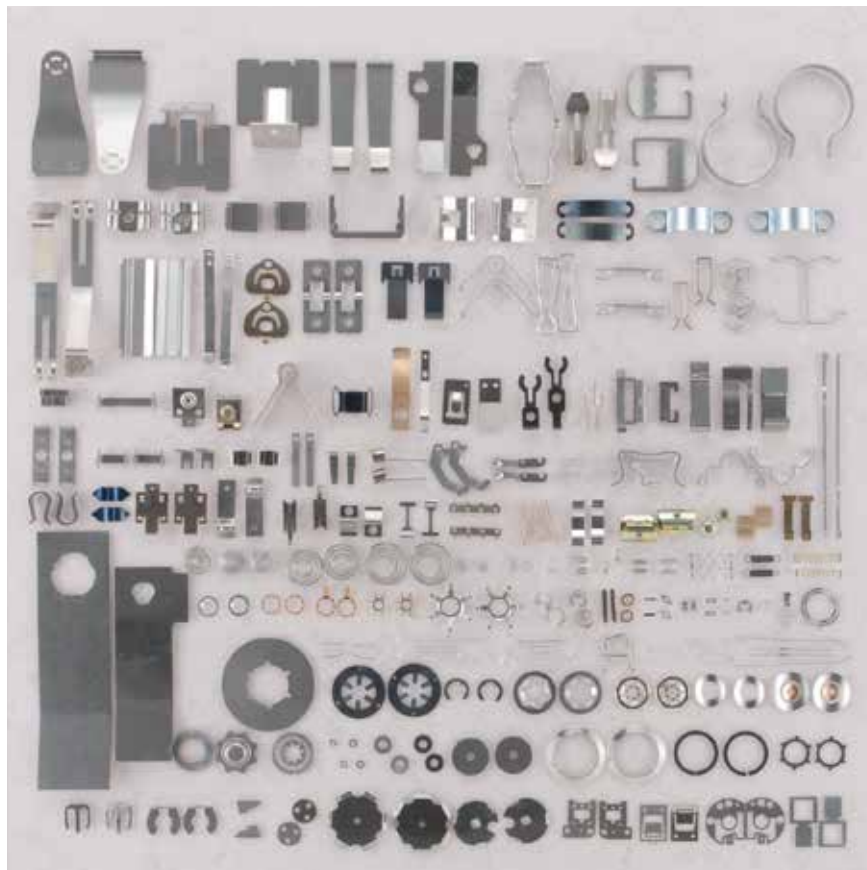

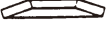




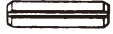



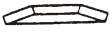












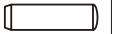












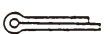


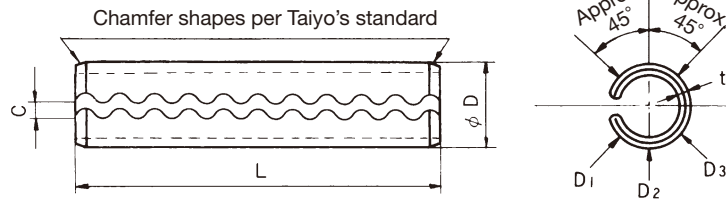


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Toothed Slotted Spring Pins for General Purposes

JIS B 2808:1999 (Annex) (ref.)



The slot C shall be the dimension that does not fully close when the spring pin is inserted into a hole. (Except for both ends of the pin.)

Unit: mm

Nominal Diameter		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	7	8	10	12	13	
Spring Pins	External Diameter D	Max.	1.2	1.4	1.6	1.7	1.8	2.25	2.75	3.25	3.9	4.4	4.9	5.4	6.4	7.6	8.6	10.6	12.6	13.7
		Min.	1.1	1.3	1.5	1.6	1.7	2.15	2.65	3.15	3.7	4.2	4.7	5.2	6.2	7.3	8.3	10.3	12.3	13.4
	t(Ref.)	0.2	0.25	0.28	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.2	1.4	1.6	2	2	2.5	
Double Shear Load	kN	0.69	1.02	1.35	1.55	1.68	2.76	4.31	6.20	8.45	10.80	13.96	17.25	24.83	33.83	44.13	68.94	86.22	112.78	
Applicable Holes (Ref.)	Diameter	1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	7	8	10	12	13	
	Tolerance	+0.08 0			+0.09 0			+0.12 0			+0.15 0			+0.2 0						
Length L	Tolerance	Nominal Diameter																		
		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	7	8	10	12	13	
4	+0.5 0	○	○	○	○	○	○	○	○											
5		○	○	○	○	○	○	○	○											
6		○	○	○	○	○	○	○	○											
7		○	○	○	○	○	○	○	○											
8		○	○	○	○	○	○	○	○	○										
9		○	○	○	○	○	○	○	○	○	○									
10		○	○	○	○	○	○	○	○	○	○	○								
11		○	○	○	○	○	○	○	○	○	○	○	○							
12		○	○	○	○	○	○	○	○	○	○	○	○	○						
13		○	○	○	○	○	○	○	○	○	○	○	○	○	○					
14	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○					
15	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○				
16	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			
17	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
18	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
19	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
20	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
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24	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
25	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
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30	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
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38	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
40	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
45	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
50	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
55	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
56	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
60	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
63	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
70	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
75	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
80	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
85	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
90	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
95	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
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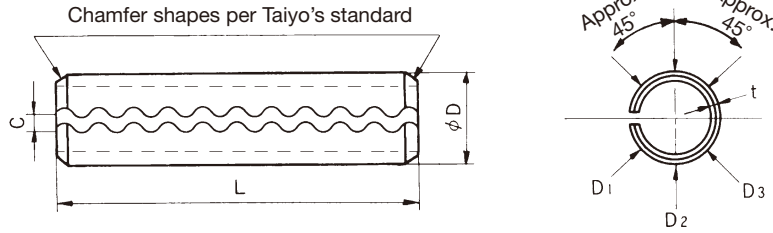
Remarks: 1. The maximal measurement for "D" is the maximal measurement of the circumference of the pin. The minimum measurement is: 1/3 (D1 + D2 + D3) of the pin.
2. Refer to Technical Information page T6 for instructions for use.

Notes: 1. Please contact us for stock availability even if it is described as "○". Availability of stock changes depending on supply and demand.
2. Customer-specified dimensioning and material available upon request.
3. There is a limited supply of Stainless Steel over 2.5mm thick. Please confirm availability.

Product code	101	Material code	08 ···SUS420J2 70 ···Spring Steel	Part Number Structure (Standardized Product Code)	
Surface code	01 ···Burnished (SUS420J2) 03 ···Temper Color (Spring Steel)	Hardness	HRC42 - 48 (SUS420J2) HRC45 - 53 (Spring Steel)	Example: $\phi 4 \times \ell 10$ Product Surface: (1)(0)(1)○○○○ - (4)(0)(0)(1)(0) Material Nominal Diameter Length For $\phi 10$, Nominal Diameter becomes 90.	

Toothed Slotted Spring Pins for Light Duty Use

JIS B 2808:1999 (Annex) (ref.)



The slot C shall be the dimension that does not fully close when the spring pin is inserted into a hole. (Except for both ends of the pin.)

Unit: mm

Nominal Diameter		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6								
Spring Pins	External Diameter D	Max.	1.2	1.4	1.6	1.7	1.8	2.25	2.75	3.25	3.9	4.4	4.9	5.4	6.4							
		Min.	1.1	1.3	1.5	1.6	1.7	2.15	2.65	3.15	3.7	4.2	4.7	5.2	6.2							
	t(Ref.)	0.1	0.12	0.15	0.15	0.15	0.2	0.25	0.3	0.32	0.4	0.45	0.5	0.6								
Applicable Holes (Ref.)	Double Shear Load	kN	0.38	0.56	0.80	0.87	0.93	1.55	2.42	3.49	4.76	6.21	7.86	9.70	13.96							
	Diameter		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6							
	Tolerance		+0.08 0				+0.09 0				+0.12 0											
Length L	Tolerance	Nominal Diameter																				
		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6								
4	+0.5 0	○	○	○	○	○																
5		○	○	○	○	○	○	○														
6		○	○	○	○	○	○	○	○													
7		○	○	○	○	○	○	○	○	○												
8		○	○	○	○	○	○	○	○	○	○											
9		○	○	○	○	○	○	○	○	○	○	○										
10		○	○	○	○	○	○	○	○	○	○	○	○									
11		○	○	○	○	○	○	○	○	○	○	○	○	○								
12		○	○	○	○	○	○	○	○	○	○	○	○	○	○							
13			○	○	○	○	○	○	○	○	○	○	○	○	○							
14			○	○	○	○	○	○	○	○	○	○	○	○								
15				○	○	○	○	○	○	○	○	○	○	○								
16					○	○	○	○	○	○	○	○	○	○								
17						○	○	○	○	○	○	○	○	○								
18							○	○	○	○	○	○	○	○								
19								○	○	○	○	○	○	○								
20									○	○	○	○	○	○								
22	+1 0								○	○	○	○	○	○								
24										○	○	○	○	○								
25											○	○	○	○								
26												○	○	○								
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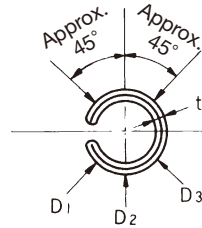
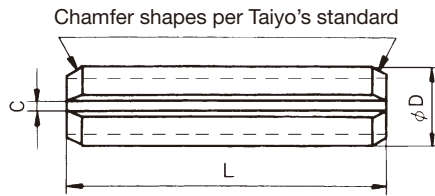
Remarks: 1. The maximal measurement for "D" is the maximal measurement of the circumference of the pin. The minimum measurement is: 1/3 (D1+ D2 + D3) of the pin.
2. Refer to Technical Information page T6 for instructions for use.

Notes: 1. Please contact us for stock availability even if it is described as "○". Availability of stock changes depending on supply and demand.
2. Customer-specified dimensioning and material available upon request.

Product code	102	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)						
					Product	Surface	Example: φ 4 × ℓ 10				
Surface code	01...Burnished	Hardness	HRC 36 - 46		①	②	②	①	④	①	①
					Material	Nominal diameter	Length				

Straight Slotted Spring Pins for General Purposes

JIS B 2808:1999 (Annex) (ref.)



The slot C shall be the dimension that does not fully close when the spring pin is inserted into a hole. (Except for both ends of the pin.)

Unit: mm

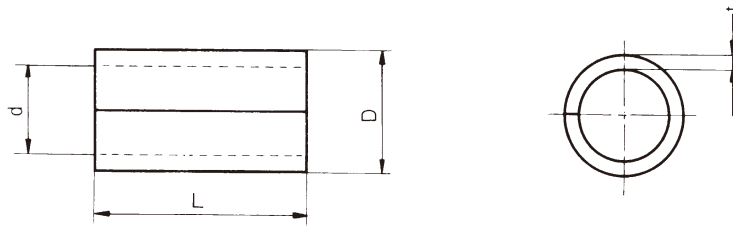
Nominal Diameter		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	7	8	10	12	13												
Spring Pins	External Diameter D	Max.	1.2	1.4	1.6	1.7	1.8	2.25	2.75	3.25	3.9	4.4	4.9	5.4	6.4	7.6	8.6	10.6	12.6	13.7											
		Min.	1.1	1.3	1.5	1.6	1.7	2.15	2.65	3.15	3.7	4.2	4.7	5.2	6.2	7.3	8.3	10.3	12.3	13.4											
	t(Ref.)	0.2	0.25	0.28	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.2	1.4	1.6	2	2	2.5												
Double Shear Load	kN	0.69	1.02	1.35	1.55	1.68	2.76	4.31	6.20	8.45	10.80	13.96	17.25	24.83	33.83	44.13	68.94	86.22	112.78												
Applicable Holes (Ref.)	Diameter	1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	7	8	10	12	13												
	Tolerance	+0.08 0			+0.09 0			+0.12 0			+0.15 0			+0.2 0																	
Length L	Tolerance	Nominal Diameter																													
		1	1.2	1.4	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	7	8	10	12	13												
4	+0.5 0	○	○	○	○	○	○																								
5		○	○	○	○	○	○	○																							
6		○	○	○	○	○	○	○	○																						
7		○	○	○	○	○	○	○	○	○																					
8		○	○	○	○	○	○	○	○	○	○																				
9		○	○	○	○	○	○	○	○	○	○	○																			
10		○	○	○	○	○	○	○	○	○	○	○	○																		
11		○	○	○	○	○	○	○	○	○	○	○	○	○																	
12		○	○	○	○	○	○	○	○	○	○	○	○	○	○																
13		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○															
14	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○															
15			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○														
16				○	○	○	○	○	○	○	○	○	○	○	○	○	○	○													
17					○	○	○	○	○	○	○	○	○	○	○	○	○	○	○												
18						○	○	○	○	○	○	○	○	○	○	○	○	○	○												
19							○	○	○	○	○	○	○	○	○	○	○	○	○												
20								○	○	○	○	○	○	○	○	○	○	○	○												
21									○	○	○	○	○	○	○	○	○	○	○												
22										○	○	○	○	○	○	○	○	○	○												
24	+1 0									○	○	○	○	○	○	○	○	○	○												
25											○	○	○	○	○	○	○	○	○												
26												○	○	○	○	○	○	○	○												
27													○	○	○	○	○	○	○												
28														○	○	○	○	○	○												
29															○	○	○	○	○												
30																○	○	○	○												
32																	○	○	○												
35																		○	○												
36																			○												
40																			○												
45																				○											
50																					○										
55																						○									
56	+1.5 0																						○								
60																								○							
63																									○						
70																										○					
75																											○				
80																												○			
85																													○		
90																														○	
95																															○
100																															○

Remarks: 1. The maximal measurement for "D" is the maximal measurement of the circumference of the pin. The minimum measurement is: 1/3 (D1 + D2 + D3) of the pin.
2. Refer to Technical Information page T6 for instructions for use.

Notes: 1. Please contact us for stock availability even if it is described as "○". Availability of stock changes depending on supply and demand.
2. Customer-specified dimensioning and material available upon request.
3. There is a limited supply of Stainless Steel over 2.5mm thick. Please confirm availability.

Product code	103	Material code	08 ···SUS420J2 70 ···Spring Steel	Part Number Structure (Standardized Product Code)		
Surface code	01 ···Burnished (SUS420J2) 03 ···Temper Color (Spring Steel)	Hardness	HRC42 - 48 (SUS420J2) HRC45 - 53 (Spring Steel)	Example: $\phi 4 \times \ell 10$ Product Surface: (1)(0)(3)○○○○ - (4)(0)(0)(1)(0) Material Nominal Diameter Length For $\phi 10$, Nominal Diameter becomes 90.		

Spacer Parts (Rolled Bushing/Spacer Tube)



Unit: mm

Nominal Diameter	2	2.3	2.6	3	4	5	6	8	10	
Internal Diameter d	2	2.35	2.65	3	4.1	5.1	6.2	8.2	10.2	
Tolerance	+0.05 0					±0.05				
External Diameter D	3	3.35	3.65	4	5.3	6.3	7.8	10	12.2	
Tolerance	+0.2 -0.1						+0.3 -0.1			
Thickness t	0.5				0.6		0.8	0.9	1.0	
Length L	Tolerance	Nominal Diameter								
		2	2.3	2.6	3	4	5	6	8	10
1.6	±0.05	○	○	○	○					
2		○	○	○	○	○				
2.5		○	○	○	○	○	○			
3		○	○	○	○	○	○	○		
3.5		○	○	○	○	○	○	○		
4		○	○	○	○	○	○	○	○	
4.5		○	○	○	○	○	○	○	○	
5		○	○	○	○	○	○	○	○	○
5.5		○	○	○	○	○	○	○	○	○
6		○	○	○	○	○	○	○	○	○
6.5		○	○	○	○	○	○	○	○	○
7		○	○	○	○	○	○	○	○	○
7.5		○	○	○	○	○	○	○	○	○
8		○	○	○	○	○	○	○	○	○
8.5		○	○	○	○	○	○	○	○	○
9		○	○	○	○	○	○	○	○	○
9.5		○	○	○	○	○	○	○	○	○
10		○	○	○	○	○	○	○	○	○
10.5		±0.1	○	○	○	○	○	○	○	○
11			○	○	○	○	○	○	○	○
11.5	○		○	○	○	○	○	○	○	
12	○		○	○	○	○	○	○	○	
12.5	○		○	○	○	○	○	○	○	
13	○		○	○	○	○	○	○	○	
14	○		○	○	○	○	○	○	○	
15	○		○	○	○	○	○	○	○	
16	○		○	○	○	○	○	○	○	
17	○		○	○	○	○	○	○	○	
18	○	○	○	○	○	○	○	○		
19	○	○	○	○	○	○	○	○		
20	○	○	○	○	○	○	○	○		
22	±0.15		○		○	○	○	○	○	
25			○		○	○	○	○	○	
28			○		○	○	○	○	○	
30			○		○	○	○	○	○	
32	±0.2				○	○	○	○	○	
35					○	○	○	○	○	
40					○			○	○	
45								○	○	
50								○	○	

Remarks: Internal diameters are measured by pin guage.

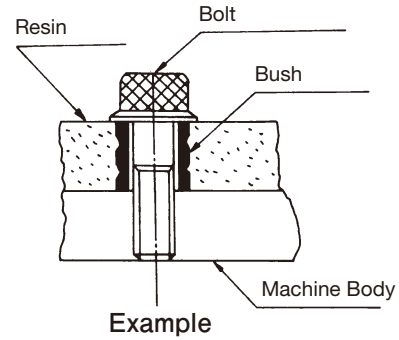
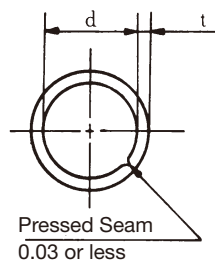
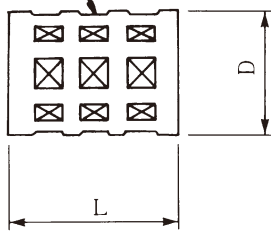
- Notes: 1. Please contact us for stock availability even if it is described as “○”. Availability of stock changes depending on supply and demand.
2. Customer-specified dimensioning and material available upon request.

Product code	338	Material code	23...SPC	Part Number Structure (Standardized Product Code)		
				Product	Surface	Example: $\phi 4 \times \ell 10$
Surface code	30...Ep-Fe/Zn 5/trivalent CM 2 (trivalent chromate)	Hardness		(3)(3)(8)(2)(3)(3)(0) — (4)(0)(1)(0)(0)		
				Material	Nominal Diameter	Length
				For $\phi 10$, Nominal Diameter becomes 90.		

Insert Bushing (Made to Order)



Square Size: approx. 0.6 to 1.5mm
Number of rows (outside)



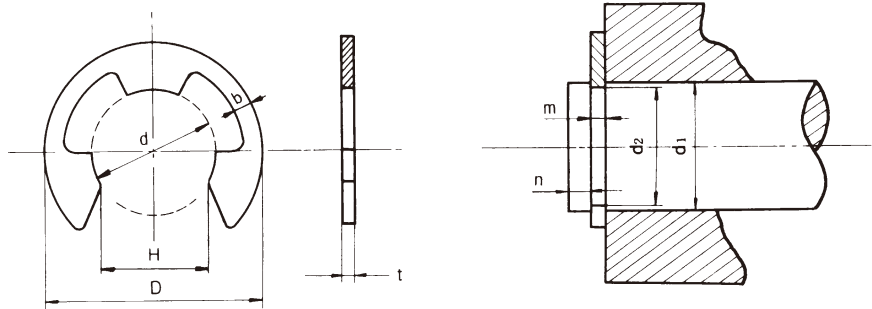
Unit: mm

Nominal Diameter	4	5	6	8	10	12
Internal Diameter d	4.3	5.3	6.5	8.5	10.5	12.5
Tolerance Of ID	+0.1 0		+0.1 -0.05			
External Diameter D	5.7	7.1	8.5	10.9	13.5	16.1
Thickness t	0.7	0.9	1.0	1.2	1.5	1.8
Length L	Number of Rows					
4	±0.1	1				
4.5		1				
5		1				
5.5		1				
6		2	2	2		
6.5		2	2	2		
7		2	2	2		
7.5		2	2	2		
8	±0.15	2	2	2	2	2
8.5		2	2	2	2	2
9			3	3	3	3
9.5			3	3	3	3
10			3	3	3	3
11	±0.2			4	4	4
12				4	4	4
13					5	5
14					5	5
15					6	6
16					6	6
17						7
18						7
19						8
20						8

- Remarks:**
1. Indents are shaped square by standard (see fig.) and 1/4t to 1/2t in depth.
 2. Nominal diameter also represents bolt diameter.
 3. Internal diameters are measured by pin gauge.
 4. Numbers in the table represent numbers of rows.

- Notes:**
1. Production of Insert Bushing is available on request (made-to-order).
 2. Diamond, straight, or other knurling patterns also available for indents.

Product code	139	Material code	23...SPC 44...A ℓ	Part Number Structure (Standardized Product Code)		
Surface code	30... Ep-Fe/Zn 5/trivalent CM 2 (trivalent chromate) (SPC) 01...Material texture (A ℓ)	Hardness		Product	Surface	
				① ③ ⑨ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○
				Material	Nominal Diameter	Length

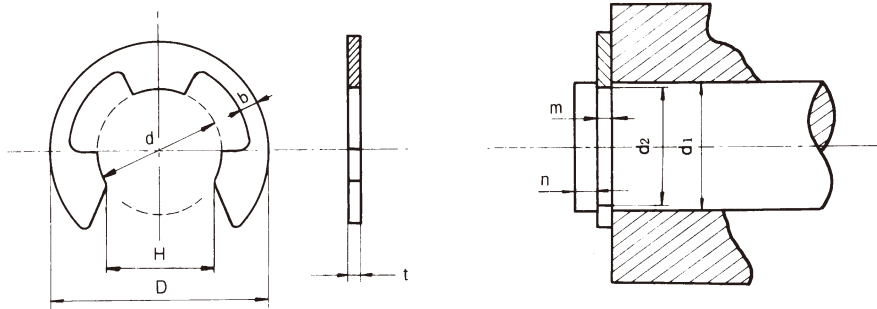


Unit: mm

Dimensions Codes	Nominals	Applicable Shafts d ₁	Dimensions of Retaining Rings						Groove Dimensions (Ref.)						
			Internal Diameter d		External Diameter D	H	Thickness t		b Approx.	Groove Diameter D		Groove Width m	n Min.		
※ 11008	0.8	1~1.4	0.8	⁰ / _{-0.08}	2	±0.1	0.7	0	0.2	±0.02	0.3	0.8	^{+0.05} / ₀	0.3	0.4
※ 11012	1.2	1.4~2	1.2	0	3		1		0.3	±0.025	0.4		1.2		
※ 11015	1.5	2~2.5	1.5		0	4	±0.2	1.3	-0.25	0.4	±0.03	0.6	1.5	^{+0.05} / ₀	0.5
※ 11020	2	2.5~3.2	2	5		1.7		0.4		0.7		2		^{+0.06} / ₀	0.5
※ 11025	2.5	3.2~4	2.5	0	6	±0.2	2.1	0	0.4	±0.04	0.8	2.5	0	0.5	1
※ 11030	3	4~5	3		7		2.6		0.6		0.9			3	0.7
※ 11040	4	5~7	4	0	9	±0.2	3.5	-0.3	0.6	±0.04	1.1	4	^{+0.075} / ₀	0.7	1.2
※ 11050	5	6~8	5		11		4.3		0.6		1.2		5	0.7	1.2
※ 11060	6	7~9	6	0	12	±0.2	5.2	-0.35	0.8	±0.04	1.4	6	0	0.9	^{+0.1} / ₀
※ 11070	7	8~11	7		14		6.1		0.8		1.6			7	0.9
※ 11080	8	9~12	8	0	16	±0.2	6.9	-0.35	0.8	±0.04	1.8	8	0	0.9	1.8
※ 11090	9	10~14	9		18		7.8		0.8		2.0			9	0.9
※ 11100	10	11~15	10	0	20	±0.3	8.7	-0.45	1	±0.05	2.2	10	0	1.15	2
11120	12	13~18	12		23		10.4		1		2.4			12	
11150	15	16~24	15	29	13	1.5	2.8	15	±0.06	1.65	^{+0.14} / ₀	3			
11190	19	20~31	19	0	37	±0.3	16.5	-0.5	1.5	±0.06	4.0	19	0	1.65	3.5
11240	24	25~38	24		44		20.8		2		±0.07			5.0	24

Notes: Items marked with ※ are also available as stacked package versions (change product code to 145 and first two digits of dimensions code to 45).

Product code	111	Material code	O2...SUS304-CSP		Part Number Structure (Standardized Product Code)				
			O4...SUS316						
Surface code	O1...Burnished	Hardness	HRC37 - 46 (SUS304-CSP)		Product: (1)(1)(1) Surface: (0)1 — () () () () () Material: Dimensions code				
			HRC35 - 46 (SUS316)						



Unit: mm

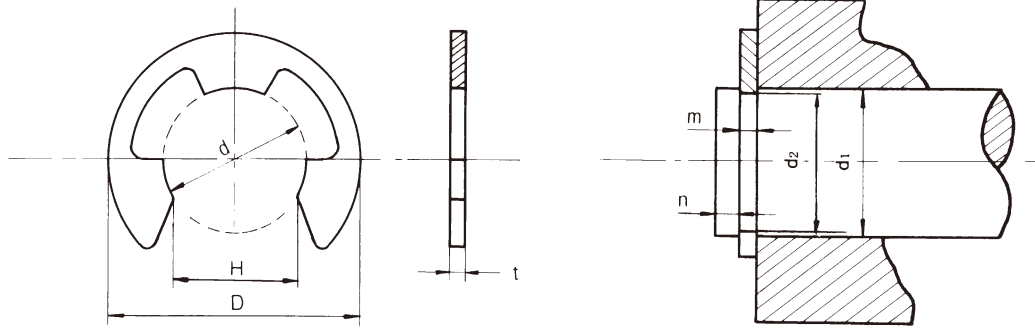
Dimensions Codes	Nominals	Applicable Shafts d_1	Dimensions of Retaining Rings					Groove Dimensions (Ref.)								
			Internal Diameter d		External Diameter D	H	Thickness t		b Approx.		Groove Diameter D	Groove Width m	n Min.			
11008	0.8	1~1.4	0.8	0 -0.08	2	± 0.1	0.7		0.2	± 0.02	0.3	0.8	$+0.05$ 0	0.3		0.4
* 11012	1.2	1.4~2	1.2		3		1		0.3	± 0.025	0.4	1.2		0.4		0.6
* 11015	1.5	2~2.5	1.5		4		1.3		0.4		0.6	1.5		0.5	$+0.05$ 0	0.8
* 11020	2	2.5~3.2	2	0 -0.09	5		1.7	0 -0.25	0.4	± 0.03	0.7	2	$+0.06$ 0	0.5		1
* 11025	2.5	3.2~4	2.5		6		2.1		0.4		0.8	2.5		0.5		1
* 11030	3	4~5	3		7		2.6		0.6		0.9	3		0.7		1
* 11040	4	5~7	4		9	± 0.2	3.5		0.6		1.1	4		0.7		1.2
* 11050	5	6~8	5	0 -0.12	11		4.3	0 -0.3	0.6		1.2	5	$+0.075$ 0	0.7		1.2
* 11060	6	7~9	6		12		5.2		0.8	± 0.04	1.4	6		0.9	$+0.1$ 0	1.2
* 11070	7	8~11	7		14		6.1		0.8		1.6	7		0.9		1.5
* 11080	8	9~12	8	0 -0.15	16		6.9	0 -0.35	0.8		1.8	8	$+0.09$ 0	0.9		1.8
* 11090	9	10~14	9		18		7.8		0.8		2.0	9		0.9		2
* 11100	10	11~15	10		20		8.7		1	± 0.05	2.2	10		1.15		2
11120	12	13~18	12	0 -0.18	23		10.4		1		2.4	12	$+0.11$ 0	1.15		2.5
11150	15	16~24	15		29	± 0.3	13	0 -0.45	1.5	± 0.06	2.8	15		1.65	$+0.14$ 0	3
11190	19	20~31	19		37		16.5		1.5		4.0	19		1.65		3.5
11240	24	25~38	24	0 -0.21	44		20.8	0 -0.5	2	± 0.07	5.0	24	$+0.13$ 0	2.2		4

Notes: Items marked with * are also available as stacked package versions (change product code to 245 and first two digits of dimensions code to 45).

Product code	211	Material code	70...Spring Steel	Part Number Structure (Standardized Product Code)					
Surface code	03...Temper Color 05...Phosphate Coating 30...Ep-Fe/Zn 5/trivalent CM 2 (trivalent chromate)	Hardness	HRC 44 - 53	Product		Surface			
				②	①	①	⑦	⑦	
				Material			Dimensions code		

E-Type Retaining Rings/Taiyo Standard-A

Taiyo Standard



Unit: mm

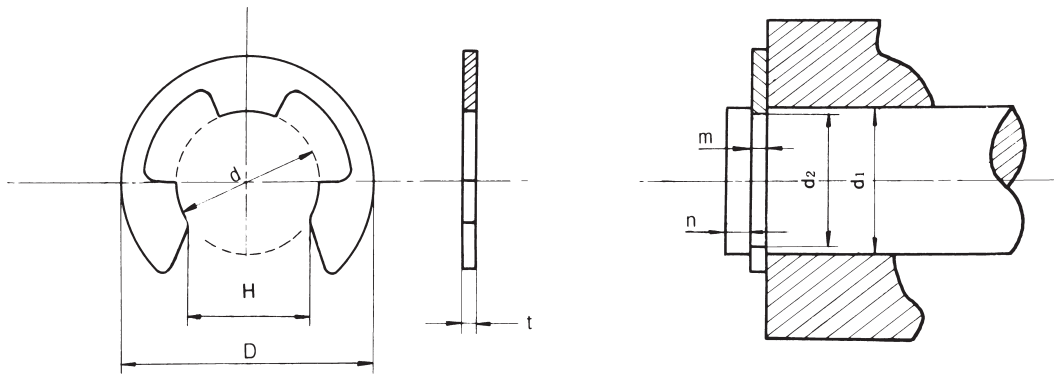
Dimensions Codes	Nominals	Applicable Shafts d ₁	Dimensions of Retaining Rings				Groove Dimensions (Ref.)							
			Internal Diameter d	External Diameter D	H	Thickness t	Groove Diameter d ₂	With m	n _{Min.}					
※ 12013	1.3	1.5~2	1.3	0 -0.07	5	±0.1	1	±0.05	0.4	±0.03	1.3	+0.05 0	0.5	1
※ 12913	1.3S	1.5~2	1.3		3.7		1		0.25		1.3		0.3	
※ 12014	1.4	2~2.5	1.4		3.5		1.1		0.3		1.4		0.4	
※ 12016	1.6	2~2.8	1.6		3.5		1.2		0.3		1.6		0.4	
※ 12019	1.9	2.5~3	1.9	0 -0.08	6.5	±0.05	1.5	±0.05	0.5	±0.03	1.9	+0.08 0	0.6	
12819	1.9S	2.5~3	1.9		4.7		1.5		0.4		1.9		0.5	
※ 12020	2.0	3~4	2		6.5		1.6		0.4		2		0.5	
※ 12023	2.3	3~4	2.3		5.6		1.8		0.4		2.3		0.5	
※ 12024	2.4	3.5~4.5	2.4	5.8	1.9	0.4	2.4	0.5						
12025	2.5	4~5	2.5	5.2	2	±0.08	0.4	2.5	0.5					
12029	2.9	4.5~6	2.9	7.2	2.3	±0.08	0.65	2.9	0.75					
※ 12030	3.0	4.5~6	3	8	2.4		0.5	3	0.6					
※ 12031	3.1	4.5~6	3.1	9.5	2.5		0.5	3.1	0.6					
12033	3.3	5~7	3.3	10.5	2.7		0.5	3.3	0.6					
12036	3.6	5~7	3.6	10.5	2.9	±0.1	0.5	3.6	0.6					
12037	3.7	5~7	3.7	8.5	3		0.65	3.7	0.75					
12038	3.8	5~7	3.8	10.5	2.4		0.5	3.8	0.6					
※ 12040	4.0	6~8	4	10	3.3		0.6	4	0.7					
12041	4.1	7~9	4.1	11	3.6	±0.1	0.4	4.1	0.5					
12045	4.5	7~9	4.5	10.5	3.8		0.5	4.5	0.6					
12047	4.7	7~9	4.7	11	3.8		0.6	4.7	0.7					
※ 12060	6.0	7~9	6	12	4.9		0.6	6	0.7					
12070	7.0	8~11	7	14	5.7	±0.05	0.9	7	1					
12076	7.6	9~12	7.6	16.8	6.2		0.7	7.6	0.8					
12080	8.0	9~12	8	16	6.5		1	8	1.2					
12090	9.0	10~14	9	18.5	7.7		1	9	1.2					
12120	12.0	13~18	12	24	10.4	±0.15	1	12	1.2					
12146	14.6	15.5~20	14.6	28.4	12.5		1.2	14.7	1.4					
12209	20.9	22~26	20.9	38	17		1.2	21	1.4					

Notes: Items marked with ※ are also available as stacked package versions (change product code to 146 and first two digits of dimensions code to 46).

Product code	112	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)									
					Product	Surface	Material		Dimensions code					
Surface code	01...Burnished	Hardness	HRC 37 - 46		①	①	②	②	①	○	○	○	○	○

E-Type Retaining Rings/Taiyo Standard-B

Taiyo Standard



Unit: mm

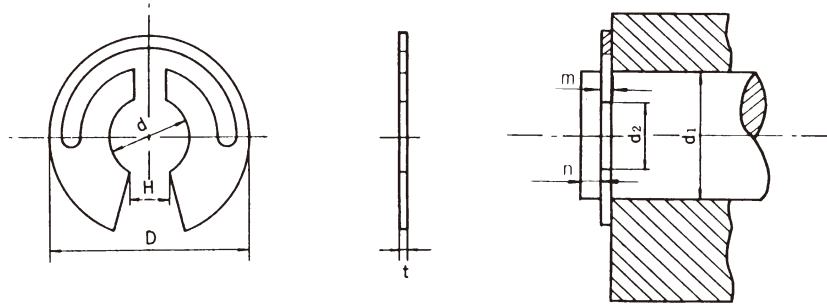
Dimensions Codes	Nominals	Applicable Shafts d_1	Dimensions of Retaining Rings						Groove Dimensions (Ref.)					
			Internal Diameter d		External Diameter D	H	Thickness t		Groove Diameter d_2		With m	n Min.		
13007	0.7	1~1.2	0.65	$+0.02$ -0.07	2	0.59		0.2		0.7		0.25		0.4
※ 13010	1	1.3~1.7	0.95	$+0.05$ -0.07	2.8	0.86	$+0.02$ -0.15	0.2	± 0.03	1	$+0.05$ 0	0.25	$+0.07$ 0	0.6
※ 13013	1.3	1.6~2.1	1.25		3.3	1.03		0.3		1.3		0.35		0.6
※ 13017	1.7	2~2.6	1.65		4.2	1.5		0.4		1.7		0.45		0.8
※ 13020	2	2.4~3	1.95		4.6	1.7	$+0.02$ -0.18	0.5		2		0.55		1
※ 13024	2.4	2.9~3.8	2.35	6	2		0.6	2.4	0.68	1				
※ 13028	2.8	3.3~4.2	2.74	6.5	2.44		0.6	2.8	$+0.05$ 0	0.68	1			
※ 13032	3.2	3.8~4.7	3.14	7.2	2.7		0.6	3.2	0.68	1				
※ 13037	3.7	4.3~5.3	3.64	8	3.1	$+0.02$ -0.2	0.7	3.7	0.78	1.2				
※ 13040	4	4.8~6.3	3.93	10	3.47		0.7	4	0.78	1.2				
13042	4.2	5~6.4	4.13	10	3.6		0.7	4.2	0.78	1.2				
※ 13050	5	5.8~7.3	4.93	11	4.4		0.7	5	0.78	1.2				
13058	5.8	6.6~8.2	5.73	12	5	$+0.05$ -0.25	0.7	5.8	0.78	1.2				
13060	6	6.9~8.6	5.93	12.7	5.2		0.9	6	1	1.2				
※ 13064	6.4	7.3~9.1	6.32	13.5	5.6	$+0.08$ -0.25	0.9	6.4	$+0.07$ 0	1	$+0.08$ 0	1.2		
13074	7.4	8.4~10.3	7.31	15	6.3		0.9	7.4	1	1.5				
13080	8	9.2~11.3	7.91	16.5	6.9	$+0.1$ -0.3	1	8	1.1	1.7				

Notes: Items marked with ※ are also available as stacked package versions (change product code to 147 and first two digits of dimensions code to 47).

Product code	113	Material code	02...SUS304-CSP	Part Number Structure (Standardized Product Code)			
Surface code	01...Burnished	Hardness	HRC 37 - 46	Product	Surface		
				①①③①②①	①①①①①①		
				Material		Dimensions code	



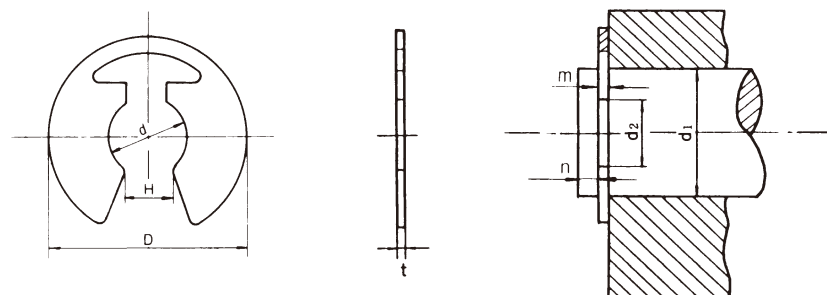
Model - A



Unit: mm

Dimensions Codes	Nominals	Applicable Shafts d_1	Dimensions of C-Type Rings				Groove Dimensions (Ref.)		
			Internal Diameter d	External Diameter D	H	Thickness t	d_2	m	n
14015	1.5	2~3	1.5 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	5 ± 0.2	1.07 $\begin{smallmatrix} 0 \\ -0.25 \end{smallmatrix}$	0.4 ± 0.03	1.5 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1
14020	2	2.5~4	2 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	6 ± 0.2	1.45 $\begin{smallmatrix} 0 \\ -0.25 \end{smallmatrix}$		2 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1
14064	6.4	7.3~9	6.3 ± 0.1	16 ± 0.2	5.6 $\begin{smallmatrix} 0 \\ -0.3 \end{smallmatrix}$		6.4 $\begin{smallmatrix} +0.07 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1.2

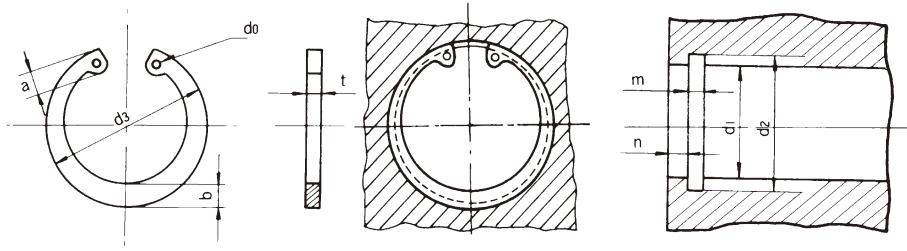
Model - B



Unit: mm

Dimensions Codes	Nominals	Applicable Shafts d_1	Dimensions of C-Type Rings				Groove Dimensions (Ref.)		
			Internal Diameter d	External Diameter D	H	Thickness t	d_2	m	n
14013	1.3	2~3	1.3 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	6 ± 0.2	1.1 ± 0.05	0.4 ± 0.03	1.3 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1
14016	1.6	2~3	1.6 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	6 ± 0.2	1.2 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$		1.6 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1
14025	2.5	3.2~4	2.5 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	9.5 ± 0.2	2.3 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$		2.5 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1
14030	3	4~5	3 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	10 ± 0.2	2.7 ± 0.05		3 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1
14040	4	5~7	4 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	12.5 ± 0.2	3.2 ± 0.07		4 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1.2
14043	4.3	5~7	4.3 $\begin{smallmatrix} 0 \\ -0.1 \end{smallmatrix}$	12.5 ± 0.2	4 ± 0.07		4.3 $\begin{smallmatrix} +0.06 \\ 0 \end{smallmatrix}$	0.5 $\begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	1.2

Product code	114	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)				
					Product	Surface	Material		Dimensions code
Surface code	01...Burnished		Hardness	HRC 37 - 46		①①④②①		①①①①①①	



Unit: mm

Dimensions Codes	Nominals d_1	Dimensions of Retaining Rings							Thrust Loading Allowance (Ref.) kN	Groove Dimensions (Ref.)					
		d_3		t		b	a	d_0		d_2		m		n	
		Basic	Tolerance	Basic	Tolerance	Approx.	Approx.	Min.		Basic	Tolerance	Basic	Tolerance	Min.	
17010	10	10.7	±0.18	1	±0.05	1.8	3.1	1.2	4.71	10.4	+0.11 0	1.15	1.5		
17011	11	11.8					3.2		5.22	11.4					
17012	12	13					3.3	5.69	12.5						
17013	13	14.1				3.5	6.16	13.6	2	1.7				7.65	16.8
17014	14	15.1				3.6	6.67	14.6							
17015	15	16.2				3.6	7.18	15.7	2.5	2				9.10	20
17016	16	17.3				3.7	7.65	16.8							
17017	17	18.3				3.8	8.08	17.8							
17018	18	19.5				4.0	8.55	19	3	2				13.81	25.2
17019	19	20.5				4.0	9.10	20							
17020	20	21.5	4.0	9.57	21										
17021	21	22.5	±0.2	1.2	±0.06	3	4.1	2	10.20	22	+0.21 0	1.35	2		
17022	22	23.5					4.1		12.71	23					
17024	24	25.9					4.3	13.81	25.2	3.5				2.5	19.30
17025	25	26.9				4.4	14.59	26.2							
17026	26	27.9				4.6	15.38	27.2	4						
17028	28	30.1				4.6	16.24	29.4							
17030	30	32.1				4.7	17.26	31.4	4.5	2.5				25.11	37
17032	32	34.4				5.2	19.30	33.7							
17034	34	36.5				5.2	24.32	35.7							
17035	35	37.8				5.2	25.11	37							
17036	36	38.8	±0.25	1.5	±0.07	4	5.2	2.5	26.83	39	+0.25 0	1.65	2		
17037	37	39.8					5.3		27.46	40					
17038	38	40.8					5.2	28.83	41	4.5				2.5	29.46
17040	40	43.5				5.7	32.01	42.5	5.1						
17042	42	45.5				5.8	35.70	44.5							
17045	45	48.5				5.9	37.78	47.5		5.5				2.5	39.62
17047	47	50.5				6.1	39.62	49.5	5.1						
17048	48	51.5				6.2	40.80	50.5							
17050	50	54.2				6.5	48.05	53		5.1				2.5	48.05
17052	52	56.2				6.5	50.21	55	5.1						
17055	55	59.2	6.5	53.35	58										
17056	56	60.2	6.6	54.52	59	5.1	2.5	54.52		59					
17058	58	62.2	6.8	56.09	61				5.5		2.5	56.09	61		
17060	60	64.2	6.8	57.66	63	5.5	2.5	57.66		63					
17062	62	66.2	6.9	60.41	65				5.5		2.5	60.41	65		
17063	63	67.2	6.9	61.98	66	5.5	2.5	61.98		66					

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Unit: mm

Dimensions Codes	Nominals d_1	Dimensions of Retaining Rings							Thrust Loading Allowance (Ref.) kN	Groove Dimensions (Ref.)				
		d_3		t		b	a	d_0		d_2		m		n
		Basic	Tolerance	Basic	Tolerance	Approx.	Approx.	Min.		Basic	Tolerance	Basic	Tolerance	Min.
17065	65	69.2	±0.45	2.5	±0.08	5.5	7	2.5	79.24	68	2.7	+0.14 0	2.5	
17068	68	72.5				6	7.4		81.59	71				
17070	70	74.5				6	7.4		84.34	73				
17072	72	76.5				6.6	7.8		86.30	75				
17075	75	79.5				8	8		91.01	78				
17078	78	82.5	±0.55	3	±0.09	8	8	3	94.14	81	3.2	+0.35 0	3	
17080	80	85.5				7	8		96.50	83.5				
17082	82	87.5				7.6	8.3		98.85	85.5				
17085	85	90.5				8	8.3		122.39	88.5				
17088	88	93.5				8	8.5		127.09	91.5				
17090	90	95.5	±0.65	4	±0.10	8.3	8.7	4.0	130.23	93.5	4.2	+0.54 0	6	
17092	92	97.5				8.3	8.8		131.80	95.5				
17095	95	100.5				9	9.1		138.86	98.5				
17098	98	103.5				8.9	9.5		141.22	101.5				
17100	100	105.5				10	10.7		142.00	103.5				
17102	102	108	±1.26 -0.63	4	±0.10	9	9.5	4.0	196.13	106	4.2	+0.63 0	7.5	
17105	105	112				8.9	10.2		200.84	109				
17108	108	115				10.2	10.7		210.25	112				
17110	110	117				10.2	10.7		211.82	114				
17112	112	119				10.7	10.7		214.96	116				
17115	115	122	±1.44 -0.72	4	±0.10	9.5	11	4.0	221.24	119	4.2	+0.72 0	7.5	
17120	120	127				10.8	11		231.44	124				
17125	125	132				11	11		240.07	129				
17130	130	137				11.5	11.8		252.62	134				
17135	135	142				11.8	11.8		258.90	139				
17140	140	147	±0.20	4	±0.10	12.5	12.5	4.0	271.45	144	4.2	+0.20 0	7.5	
17145	145	152				12	12.7		279.29	149				
17150	150	158				12.5	12.7		290.28	155				
17155	155	164				13	13		299.69	160				
17160	160	169				13.5	13.5		307.54	165				
17165	165	174.5	±0.72	4	±0.10	14	14	4.0	320.09	170	4.2	+0.72 0	7.5	
17170	170	179.5				12.5	12.5		333.43	175				
17175	175	184.5				13	13		337.35	180				
17180	180	189.5				13.5	13.5		345.19	185				
17185	185	194.5				13.5	13.5		356.96	190				
17190	190	199.5	±0.72	4	±0.10	14	14	4.0	368.73	195	4.2	+0.72 0	7.5	
17195	195	204.5							13.5	13.5				373.44
17200	200	209.5	14	14	376.58	205								

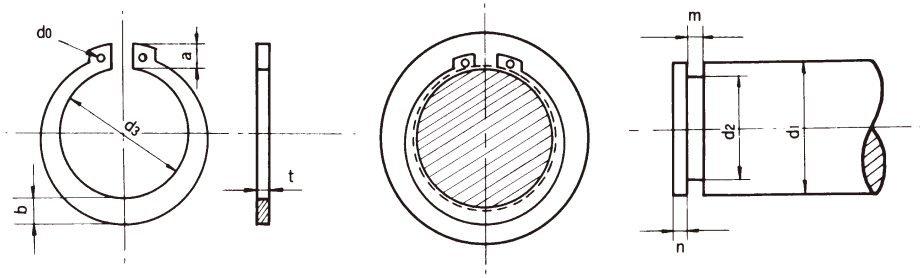
Remarks: 1. Allowable thrust load varies according to the material types and hardness of mating axial components, and also with the shear strength of retaining rings.
2. Allowable thrust load is calculated with safety factor 4.

Notes: The stainless steel products that deviate from the JIS standard (JIS G 4313: Cold Rolled Stainless Steel Strip for Springs) in thickness are classified into SUS304-CSP.

Product code	117	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)									
					Product	Surface	Material		Dimensions code					
Surface code	01...Burnished	Hardness	HRC 37 - 46		①	①	⑦	②	①	○	○	○	○	○

C-Type Retaining Rings for Shafts (Nominals $\phi 10 - \phi 63$)

JIS B 2804 (Ref.)



Unit: mm

Dimensions Codes	Nominals d_1	Dimensions of Retaining Rings							Thrust Loading Allowance (Ref.) kN	Groove Dimensions (Ref.)														
		d_3		t		b	a	d_0		d_2		m		n										
		Basic	Tolerance	Basic	Tolerance	Approx.	Approx.	Min.		Basic	Tolerance	Basic	Tolerance	Min.										
18010	10	9.3	±0.15	1	±0.05	1.6	3	1.2	4.81	9.6	1.15	1.5	1.5											
18011	11	10.2				1.8	3.1		1.5	5.27				10.5										
18012	12	11.1	±0.18			1.2	±0.06	1.8	3.2	1.5				5.69	11.5	±0.11	1.35	1.5						
18013	13	12							3.3					6.41	12.4									
18014	14	12.9						2	3.4	1.7				6.86	13.4									
18015	15	13.8						2.1	3.5					7.41	14.3									
18016	16	14.7						2.2	3.6	2				8.24	15.2				±0.21	1.65	+0.14 0			
18017	17	15.7							3.7					8.39	16.2									
18018	18	16.5						±0.2	1.5	±0.06				2.6	3.8				2	10.71	17	±0.25	1.90	2
18019	19	17.5												2.7	3.8					2.5	11.22			
18020	20	18.5	3.1	3.9	2	11.61	19																	
18021	21	19.5		4		12.16	20																	
18022	22	20.5	4.2	4.1	2	12.94	21				±0.25	1.90	2											
18024	24	22.2		4.3		13.89	22.9																	
18025	25	23.2	4.4	1.5	±0.06	3.1	4.4				2	14.51	23.9	±0.25	1.90	2								
18026	26	24.2					4.6					14.98	24.9											
18028	28	25.9	4.7	1.75	±0.07	3.5	4.6				2.5	20.40	26.6	±0.25	1.90	2								
18029	29	26.9					4.7					21.14	27.6											
18030	30	27.9	4.8	1.75	±0.07	3.5	4.8	2.5	21.93	28.6	±0.25	1.90	2											
18032	32	29.6					5		23.14	30.3														
18034	34	31.5	4	1.75	±0.07	4	5.3	2.5	24.63	32.3	±0.25	1.90	2											
18035	35	32.2					5.4		25.50	33														
18036	36	33.2	4.5	1.75	±0.07	4	5.4	2.5	31.38	34	±0.25	1.90	2											
18038	38	35.2					5.6		32.17	36														
18040	40	37.0	4.8	1.75	±0.07	4.5	5.8	2.5	33.73	38	±0.25	1.90	2											
18042	42	38.5					6.2		36.48	39.5														
18045	45	41.5	5	1.75	±0.07	4.8	6.3	2.5	37.78	42.5	±0.25	1.90	2											
18048	48	44.5					6.5		40.80	45.5														
18050	50	45.8	5	2	±0.07	5	6.7	2.5	48.05	47	±0.3	2.2	2											
18052	52	47.8					6.8		50.21	49														
18055	55	50.8	5.5	2	±0.07	5	7	2.5	53.35	52	±0.3	2.2	2											
18056	56	51.8					7		54.52	53														
18058	58	53.8	5.5	2	±0.07	5.5	7.1	2.5	56.09	55	±0.3	2.2	2											
18060	60	55.8					7.2		57.66	57														
18062	62	57.8	5.5	2	±0.07	5.5	7.2	2.5	60.41	59	±0.3	2.2	2											
18063	63	58.8					7.3		61.19	60														

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C-Type Retaining Rings for Shafts (Nominals $\phi 65 - \phi 200$)

JIS B 2804 (Ref.)



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Unit: mm

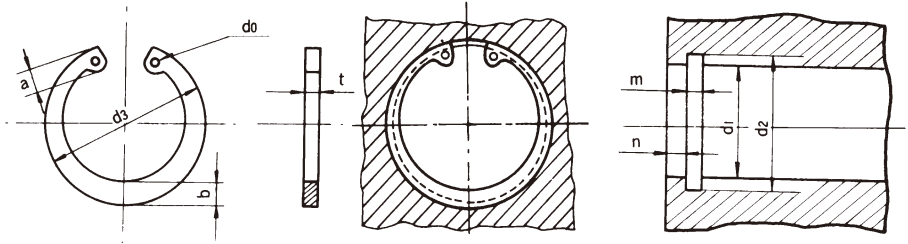
Dimensions Codes	Nominals d_1	Dimensions of Retaining Rings							Thrust Loading Allowance (Ref.) kN	Groove Dimensions (Ref.)												
		d_s		t		b	a	d_0		d_2		m		n								
		Basic	Tolerance	Basic	Tolerance	Approx.	Approx.	Min.		Basic	Tolerance	Basic	Tolerance	Min.								
18065	65	60.8	±0.45	2.5	±0.08	6.4	7.4	2.5	79.24	62	0 -0.3	2.7	+0.14 0	2.5								
18068	68	63.5					7.8		81.20	65												
18070	70	65.5					7.8		83.94	67												
18072	72	67.5					7.9		87.08	69												
18075	75	70.5				7.9	90.22		72													
18078	78	73.5				8.1	94.14		75													
18080	80	74.5				8.2	96.50		76.5													
18082	82	76.5				8.3	98.85		78.5													
18085	85	79.5				8.4	122.39		81.5													
18088	88	82.5				±0.55	3		±0.09	8					8.6	3	127.09	84.5	0 -0.35	3.2	+0.18 0	3
18090	90	84.5	8.7	130.23	86.5																	
18095	95	89.5	8.6	138.86	91.5																	
18100	100	94.5	9	142.00	96.5																	
18105	105	98.0	9.8	200.84	101																	
18110	110	103	±0.63 -1.26	4	±0.10	9.5	10	3.5	211.82	106	0 -0.54	4.2	+0.2 0	4								
18115	115	108					10.5		221.24	111												
18120	120	113					10.9		231.44	116												
18125	125	118					11.3		240.07	121												
18130	130	123				±0.72 -1.44	4		±0.10	11					11.5	4.0	252.62	126	0 -0.63	4.2	+0.2 0	6
18135	135	128													11.5		258.90	131				
18140	140	133								11.8					271.45		136					
18145	145	138								11.6					279.29		141					
18150	150	142								12.3					290.28		145					
18155	155	146								12.2					299.69		150					
18160	160	151	12.9	13.1	13.5	13.1	4.0	307.54	155	0 -0.72	4.2	+0.2 0	7.5									
18165	165	155.5						12.9	13.1					13.5	13.1	4.0	320.09	160	0 -0.72	4.2	+0.2 0	7.5
18170	170	160.5															13.5	14				
18175	175	165.5						14	14					14	14	4.0			337.35	170	0 -0.72	4.2
18180	180	170.5	14	14	14	14	4.0			345.19	175	0 -0.72	4.2				+0.2 0	7.5				
18185	185	175.5						14	14	14	14			4.0	356.96	180			0 -0.72	4.2	+0.2 0	7.5
18190	190	180.5	14	14	14	14	4.0					368.73	185		0 -0.72	4.2	+0.2 0	7.5				
18195	195	185.5						14	14	14	14	4.0	376.58	190					0 -0.72	4.2	+0.2 0	7.5
18200	200	190.5	14	14	14	14	4.0						388.34	195	0 -0.72	4.2	+0.2 0	7.5				

Remarks: 1. Allowable thrust load varies according to the material types and hardness of mating axial components, and also with the shear strength of retaining rings.
2. Allowable thrust load is calculated with safety factor 4.

Notes: The stainless steel products that deviate from the JIS standard (JIS G 4313: Cold Rolled Stainless Steel Strip for Springs) in thickness are classified into SUS304-CSP.

Product code	118	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)				
					Product		Surface		
Surface code	01...Burnished	Hardness	HRC 37 - 46						
					Material		Dimensions code		

Small Diameter C-Type Retaining Rings for Holes



Unit: mm

Dimensions Codes	Nominals d_1	Dimensions of Retaining Rings							Thrust Loading Allowance (Ref.) kN	Groove Dimensions (Ref.)				
		d_3		t		b	a	d_0 Min.		d_2		m		n
		Basic	Tolerance	Basic	Tolerance					Approx.	Approx.	Basic	Tolerance	
50025	6.4	6.9	±0.15	0.4	±0.04	0.65	1.6	0.8	1,255	6.7	±0.03	0.45	+0.10 0	1.0
50031	8.0	8.6				0.84	1.7		1,569	8.4				
50037	9.5	10.3				1.0	2.1		3,138	10.0				

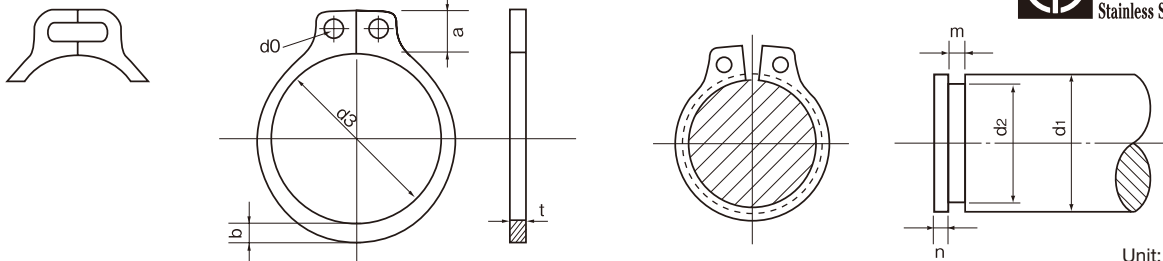
Product code	150	Material code	02...SUS304-CSP	Part Number Structure (Standardized Product Code)			
Surface code	01...Burnished	Hardness	HRC 37 - 46	Product Surface ①⑤①①①②①① — ○○○○○○ Material Dimensions code			

Small Diameter C-Type Retaining Rings for Shafts



Nominals 3.2 - 8

Nominals 9.0



Unit: mm

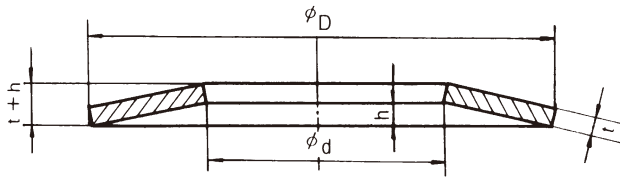
Dimensions Codes	Nominals d_1	Dimensions of Retaining Rings							Thrust Loading Allowance (Ref.) kN	Groove Dimensions (Ref.)				
		d_3		t		b	a	d_0 Min.		d_2		m		n
		Basic	Tolerance	Basic	Tolerance					Approx.	Approx.	Basic	Tolerance	
51012	3.2	2.8	±0.1	0.25	±0.03	0.5	1.2	Oval	392	3.0	±0.04	0.3	+0.10 0	1.5
51015	4.0	3.6				0.7	1.4		471	3.8				
51018	4.8	4.2				1.1	1.4		785	4.5				
51019	5.0	4.5				0.7	1.4		863	4.7				
51023	6.0	5.5		±0.04	0.65	0.8	2.0		1,098	5.7	±0.06	0.7		
51027	7.0	6.3				0.9	2.0		2,275	6.5				
51031	8.0	7.1				1.0	2.2		2,589	7.4				
51035	9.0	8.1				1.0	2.2		2,903	8.4				

Product code	151	Material code	02...SUS304-CSP	Part Number Structure (Standardized Product Code)			
Surface code	01...Burnished	Hardness	HRC 37 - 46	Product Surface ①⑤①①①②①① — ○○○○○○ Material Dimensions code			

Remarks: Thrust load is calculated with safe factor 4.

Disc Springs for Heavy Duty

DIN 2093
JIS B 2706 (Ref.)



Series $\frac{D}{t} \approx 18$, $\frac{h}{t} \approx 0.4$

Unit: mm

Nominals JIS	Dimensions Codes	Nominals No.	Internal Diameter		External Diameter		Thickness t	Height			f=0.75h(Ref.)				
			d	Tolerance	D	Tolerance		h	t+h	Tolerance	Spring Force P N	Deformed Length =0.75h mm	Maximum Stress σ N/mm ²		
8	22001	1	4.2	+0.15 0	8	0	0.4	0.2	0.6	±0.1	205.9	0.15	1,216.0		
10	22002	2	5.2		10	-0.15	0.5	0.25	0.75		323.6	0.19	1,216.0		
12.5	22003	3	6.2		12.5	0	0.7	0.3	1		657.1	0.22	1,382.7		
14	22004	4	7.2		14		0	0.8	0.3		1.1	794.3	0.22	1,304.3	
16	22005	5	8.2		16		-0.2	0.9	0.35		1.25	1,029.7	0.26	1,333.7	
18	22006	6	9.2		18	0	1	0.4	1.4		1,274.9	0.3	1,323.9		
20	22007	7	10.2	+0.2 0	20	0	1.1	0.45	1.55	±0.15	1,520	0.34	1,284.7		
22.5	22008	8	11.2		22.5		-0.25	1.25	0.5		1.75	1,931.9	0.37	1,294.5	
25	22009	9	12.2		25		0	1.5	0.55		2.05	2,922.4	0.41	1,422.0	
28	22010	10	14.2		28		-0.25	1.5	0.65		2.15	2,843.9	0.49	1,274.9	
31.5	22011	11	16.3		31.5		0	1.75	0.7		2.45	3,873.6	0.52	1,294.5	
35.5	22012	12	18.3		35.5		0	2	0.8		2.8	5,197.5	0.6	1,333.7	
40	22013	13	20.4		40			-0.3	2.25		0.9	3.15	6,501.8	0.67	1,323.9
45	22014	14	22.4		45			0	2.5		1	3.5	7,698.2	0.75	1,294.5
50	22015	15	25.4		50		+0.25 0	3	1.1		4.1	±0.2	11,964	0.82	1,422.0
56	22016	16	28.5		56			0	3		1.3		4.3	11,376	0.97
63	22017	17	31	63	-0.35	3.5		1.4	4.9	15,004	1.5		1,294.5		
71	22018	18	36	71	0	4		1.6	5.6	20,545	1.2		1,333.7		
80	22019	19	41	80	+0.5 0	5	1.7	6.7	+0.4 -0.2	33,588	1.3	1,451.4			
90	22020	20	46	90		0	5	2		7	31,411	1.5	1,294.5		
100	22021	21	51	100		0	6	2.2		8.2	+0.55 -0.25	48,013	1.65	1,422.0	
112	22022	22	57	112	-1		6	2.5	8.5	43,757		1.9	1,235.6		
125	22023	23	64	125	+0.6 -0.25		8	2.6	10.6	+0.6 -0.25	85,975	1.9	1,471.0		
140	22024	24	72	140			0	8	3.2		11.2	85,347	2.4	1,372.9	
160	22025	25	82	160	+1 0	10	3.5	13.5	+0.7 -0.35	138,333	2.5	1,480.8			
180	22026	26	92	180		0	10	4		14	125,623	3	1,294.5		

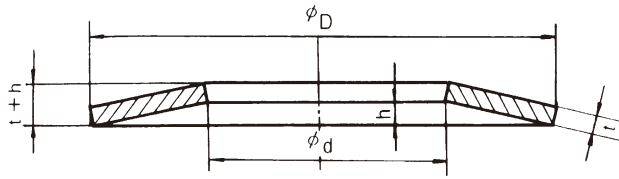
- Remarks: 1. The spring force of spring steel is as shown in the table. For SUS 304 products, the values are approx. 90% of shown.
2. Maximum stress represents the maximum tensile stress that occurs at bottom fringe of disc springs.
3. Items marked with ※ have thickness, height, or other specifications that differ from JIS.
4. Please refer to pages T3 & T4 for technical information.

- Notes: 1. The stainless steel products that deviate from the JIS standard (JIS G 4313: Cold Rolled stainless Steel Strip for Springs) are classified as SUS304-CSP.
2. Product availability of spring steels 6mm or more in thickness is subject to material supply and demand situations. Please contact us for more information.

Product code	122	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)
			70...Spring Steel		
Surface code	01...Burnished (SUS304-CSP)		Hardness	HRC37 - 46 (SUS304-CSP)	①②②○○○○○○○○○○
	03...Temper Color(Spring Steel)			HRC43 - 50 (Spring Steel)	

Disc Springs for Light Duty

DIN 2093
JIS B 2706 (Ref.)



Series $\frac{D}{t} \approx 28, \quad \frac{h}{t} \approx 0.75$

Unit: mm

Nominals JIS	Dimensions Codes	Nominals No.	Internal Diameter		External Diameter		Thickness		Height		f=0.75h(Ref.)		
			d	Tolerance	D	Tolerance	t	h	t+h	Tolerance	Spring Force P N	Deformed Length =0.75h mm	Maximum Stress σ N/mm ²
8	23001	1	4.2	+0.15 0	8	0	0.3	0.25	0.55	±0.1	117.7	0.19	1,314.1
10	23002	2	5.2		10	-0.15	0.4	0.3	0.7		205.9	0.22	1,284.7
12.5	23003	3	6.2		12.5	0 -0.2	0.5	0.35	0.85		294.2	0.26	1,108.2
14	23004	4	7.2		14		0.5	0.4	0.9		274.6	0.3	1,098.3
16	23005	5	8.2		16		0.6	0.45	1.05		411.9	0.34	1,108.2
18	23006	6	9.2		18	0.7	0.5	1.2	568.8		0.37	1,108.2	
20	23007	7	10.2	+0.2 0	20	0 -0.25	0.8	0.55	1.35	±0.15	745.3	0.41	1,118.0
22.5	23008	8	11.2		22.5		0.8	0.65	1.45		706.1	0.49	1,078.7
25	23009	9	12.2		25		0.9	0.7	1.6		863.0	0.52	1,019.9
28	23010	10	14.2		28		1	0.8	1.8		1,127.8	0.6	1,108.2
※ 31.5	23011	11	16.3	+0.25 0	31.5	0 -0.3	1.25	0.9	2.15	±0.15	1,912.3	0.67	1,186.6
※ 35.5	23012	12	18.3		35.5		1.25	1	2.25		1,696.6	0.75	1,068.9
※ 40	23013	13	20.4		40		1.5	1.15	2.65		2,618.4	0.86	1,137.6
※ 45	23014	14	22.4		45		1.75	1.3	3.05		3,648.1	0.97	1,147.4
50	23015	15	25.4		50		2	1.4	3.4		4,765.2	1.05	1,147.4
56	23016	16	28.5	+0.3 0	56	0 -0.35	2	1.6	3.6	±0.2	4,462.0	1.2	1,098.3
63	23017	17	31		63		2.5	1.75	4.25		7,207.9	1.3	1,088.5
71	23018	18	36		71		2.5	2	4.5		6,717.6	1.5	1,049.3
80	23019	19	41		80		3	2.3	5.3		10,493	1.7	1,137.6
90	23020	20	46	+0.6 0	90	0 -0.4	3.5	2.5	6	+0.55 -0.25	14,122	1.87	1,108.2
100	23021	21	51		100		3.5	2.8	6.3		13,092	2.1	1,049.3
112	23022	22	57		112		4	3.2	7.2		17,770	2.4	1,088.5
125	23023	23	64	+1 0	125	0 -1	5	3.5	8.5	+0.6 -0.25	29,930	2.6	1,147.4
140	23024	24	72		140		5	4	9		27,949	3	1,098.3
160	23025	25	82	+1.2 0	160	0 -1.2	6	4.5	10.5	+0.7 -0.35	41,011	3.3	1,108.2
180	23026	26	92		180		6	5.1	11.1		37,569	3.8	1,039.5
200	23027	27	102		200		8	5.6	13.6		76,364	4.2	1,147.4
225	23028	28	112	+0.8 -0.45	225	0 -1.5	8	6.5	14.5	+0.8 -0.45	70,706	4.8	1,078.7
250	23029	29	127		250		10	7	17		118,955	5.2	1,137.6

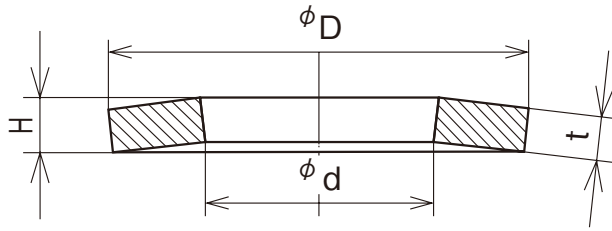
- Remarks:**
- The spring force of spring steel is as shown in the table. For SUS 304 products, the values are approx. 90% of shown.
 - Maximum stress represents the maximum tensile stress which occurs at bottom fringe of disc springs.
 - Items marked with ※ have thickness, height, or other specifications that differ from JIS.
 - Please refer to pages T3 & T4 for technical information.

- Notes:**
- The stainless steel products that deviate from the JIS standard (JIS G 4313: Cold Rolled stainless Steel Strip for Springs) in thickness are classified as SUS304-CSP.
 - Product availability of spring steels 6mm or more in thickness is subject to material supply and demand situations. Please contact us for more information.

Product code	123	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)									
			70...Spring Steel		Product		Surface							
Surface code	01...Burnished (SUS304-CSP)		Hardness	HRC37 - 46 (SUS304-CSP)	①	②	③	○	○	○	○	○	○	○
	03...Temper Color (Spring Steel)			HRC43 - 50 (Spring Steel)	Material			Dimensions code						

Disc Spring Washers for Heavy Duty (1H)

JIS B 1251 (Ref.)



Unit: mm

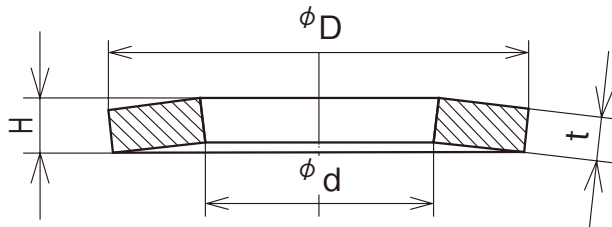
Nominals JIS	Dimensions Codes	Nominals No.	Internal Diameter		External Diameter		Thickness		Height		Spring Function	
			d	Tolerance	D	Tolerance	t	Tolerance	H	Tolerance	Height After Test H(min.)	Testing Load(kN)
6	75006	6	6.4	+0.25 0	12.5	0 -0.30	1.2	±0.065	1.6	±0.1	1.3	8.24
8	75008	8	8.4		17.0		1.8		±0.085		2.15	1.95
10	75010	10	10.5	+0.30 0	21.0	0 -0.40	2.2	±0.1	2.65	±0.12	2.4	23.5
12	75012	12			24.0		2.5		±0.1		3.05	2.7
14	75014	14			28.0		3.0	±0.11	3.65	±0.14	3.25	47.1
16	75016	16			30.0		3.5		4.1		3.7	63.7

Remarks: "Height after testing" is a measured value of the free height after loading with the testing load 3 times in a row.

Product code	175	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)										
					Product	Surface	Material			Dimensions code					
Surface code	01...Burnished		Hardness	HRC 37 - 46		①	⑦	⑤	②	①	○	○	○	○	○

Disc Spring Washers for Light Duty (1L)

JIS B 1251 (Ref.)



Unit: mm

Nominals JIS	Dimensions Codes	Nominals No.	Internal Diameter		External Diameter		Thickness		Height		Spring Function	
			d	Tolerance	D	Tolerance	t	Tolerance	H	Tolerance	Height After Test H(min.)	Testing Load(kN)
5	76005	5	5.3	+0.20 0	10	0 +0.25	0.8	±0.05	1.1	±0.1	0.9	2.94
6	76006	6	6.4	+0.25 0	12.5	0 -0.30	1.0	±0.055	1.35		1.15	4.21
8	76008	8	8.4		17		1.4	±0.07	1.85	±0.12	1.6	7.45
10	76010	10	10.5	+0.30 0	21	0 -0.40	1.8	±0.085	2.3		2	11.8
12	76012	12	13		24		2.2	±0.1	2.7	2.45	17.7	
14	76014	14	15		28		2.5		3.15	±0.14	2.8	23.5
16	76016	16	17		30		2.8	3.5	3.1		32.4	

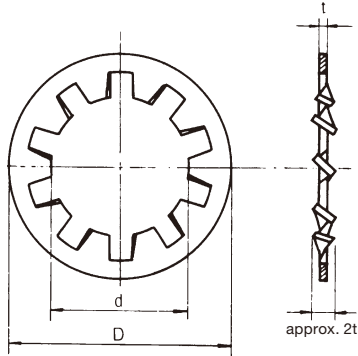
Remarks: "Height after testing" is a measured value of the free height after loading with the testing load 3 times in a row.

Product code	176	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)										
					Product	Surface	Material		Nominal Diameter	Length					
Surface code	01...Burnished		Hardness	HRC 37 - 46		①	⑦	⑥	②	①	○	○	○	○	○

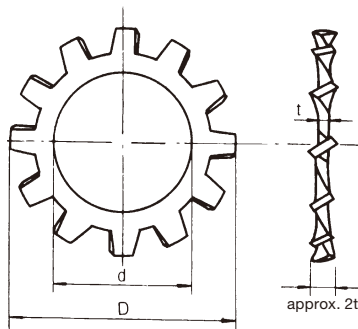


Unit: mm

Internal



External

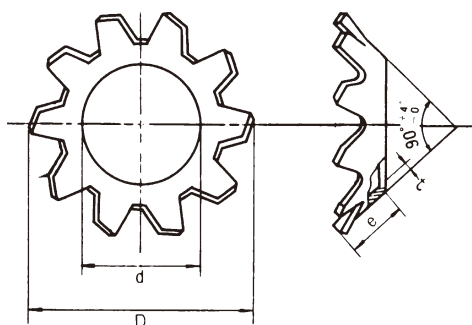


Dimensions Codes		Nominals		d		D		t		Number of Teeth	
Internal	External	Metric	Whitworth	Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance	Internal	External
25020		2	—	2.2	+0.2 0	4.8	0 -0.3	0.3	±0.025	7	
25023		2.3	—	2.5		5.3		0.3		7	
25026	26026	2.6	—	2.8		5.8	0.3	7		8	
25030	26030	3	—	3.2		6.5	0 -0.4	0.45	±0.035	7	8
25035	26035	3.5	—	3.7		7.5		0.45		8	8
25040	26040	4	—	4.3		8.5		0.45		8	9
25045	26045	4.5	—	4.8		9.5	0.5	8		9	
25050	26050	5	—	5.3		10	±0.04	0.6	8	10	
25060	26060	6	—	6.4		11		0.6	9	10	
		7	—	7.4		13	0 -0.5	0.8	±0.05	9	12
25080	26080	8	—	8.4	15	0.8		9		12	
25095	26095	—	3/8	9.8	17.5	0.9		9		12	
25100	26100	10	—	10.5	18	0.9	9	12			
25110		—	7/16	11.4	19.5	0 -0.6	0.9	±0.055	10	12	
25120	26120	12	—	12.5	21		1		10	12	
25127	26127	—	1/2	13	22.5		1		10	12	
25140	26140	14	—	14.5	23	1	10		12		
25160	26160	16	5/8	16.5	26	±0.065	1.2	12	14		
25180		18	—	19	29		1.2	12	14		
25190		—	3/4	19.6	32	0 -0.8	1.2	±0.07	12	14	
25200		20	—	21	32		1.4		12	14	
25220		22	7/8	23	35		1.4		14	16	
25240		24	—	25	38		1.6		14	16	
25254		—	1	26	41	±0.08	1.6	±0.08	14	16	

Remarks: 1. Number of teeth indicates basic numbers.
2. Nominals 2.3 or below are not available in external type.

Unit: mm

Countersunk



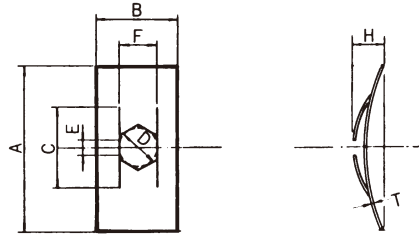
Dimensions Codes	Nominals	d		Approx.	Max.	t		Number of Teeth
		Basic Size	Tolerance			Basic Size	Tolerance	
27030	3	3.2	+0.2 0	6	1.8	0.4	±0.03	8
27035	3.5	3.7		7	2.1	0.4		8
27040	4	4.3		8	2.5	0.4		8
27045	4.5	4.8		9	2.7	0.5	±0.035	9
27050	5	5.3		10	3.1	0.5		9
27060	6	6.4	+0.3 0	12	3.8	0.5	10	
27080	8	8.4		16	5.1	0.6	±0.04	12

Remarks: Number of teeth indicates basic numbers.

Notes: SUS304-CSP only.

Product code	125...Internal	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)			
	126...External		70...Spring Steel					
Surface code	01...Burnished (SUS304-CSP)	Hardness	HRC37 - 46 (SUS304-CSP)					
	30... (trivalent chromate) (Spring Steel)		HRC40 - 50 (Spring Steel)					

Speed Nuts

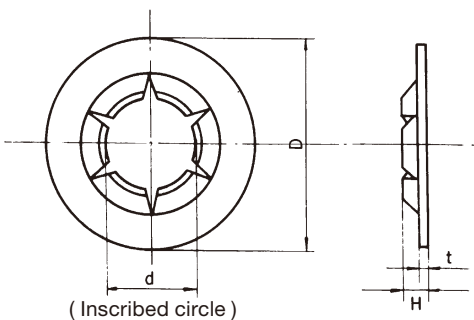


Unit: mm

Dimensions Codes	Nominals	D		A		B		C	E	F	T		H	
		Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance				Basic Size	Tolerance	Basic Size	Tolerance
32018	1.8	1.5	+0.08 -0.05	12	±0.4	6	±0.2	7	0.8	3	0.4	±0.03	2.5	±0.45
32020	2	1.8		12		6		7	0.8	3	0.4		2.5	
32025	2.5	2.3		14		7		8	0.8	3.5	0.4		2.7	±0.5
32030	3	2.8		14		7		8	0.8	3.5	0.4		2.7	
32035	3.5	3.3		15		8.5		10	0.8	4.5	0.4		2.8	
32040	4	3.8		16		9		9.6	1	4.5	0.5		±0.035	

Product code	132	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)				
Surface code	01...Burnished	Hardness	HRC 37 - 46		Product: ①③②① Surface: ②②① Material: Dimensions code				

Push Nuts

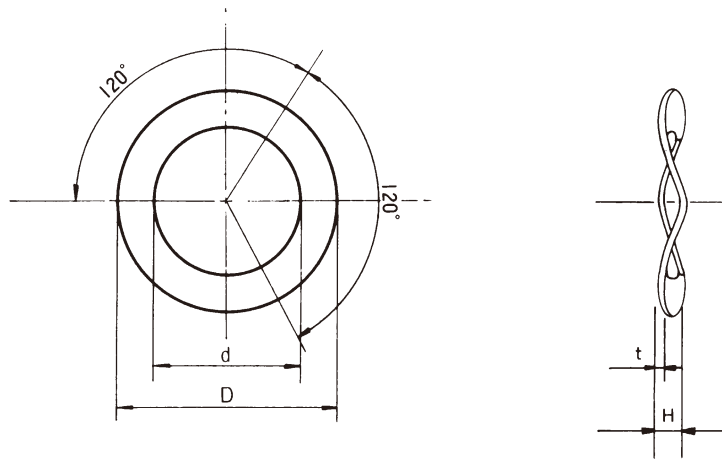


Unit: mm

Dimensions Codes	Nominals	d		D	H	t		Applicable Shafts (Ref.)		Thrust Loading N
		Basic Size	Tolerance			Basic Size	Tolerance	Basic Size	Tolerance	
33012	1.2	1.1	0 -0.1	4.5	0.6	0.25	±0.03	1.2	+0.05 0	196
33015	1.5	1.4		5.2	0.65	0.25		1.5		196
33020	2	1.9		6	0.7	0.25		2		245
33024	2.4	2.3	0 -0.15	7	0.8	0.25	±0.04	2.4	+0.05 0	343
33030	3	2.9		10	1.3	0.3		3		785
33040	4	3.9		12	1.4	0.3		4		981
33050	5	4.9		14	1.55	0.4		5		1,471
33060	6	5.9		16	1.75	0.4		6		1,667
33080	8	7.9		17.5	1.8	0.5		8		2,157
33100	10	9.9	21	2.2	0.7	±0.05	10	3,138		
33120	12	11.9	27	2.8	0.9	±0.06	12	4,903		

Remarks: 1. Thrust loading is measured with SUS304-CSP.
2. Thrust loading measured using steel shaft with hardness HV300 or less.

Product code	133	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)					
Surface code	01...Burnished (SUS304-CSP) 05...Phosphate Coating (Spring Steel)	Hardness	70...Spring Steel		Product: ①③③ Surface: ①①① Material: Dimensions code					
			HRC37 - 46 (SUS304-CSP) HRC42 - 50 (Spring Steel)							

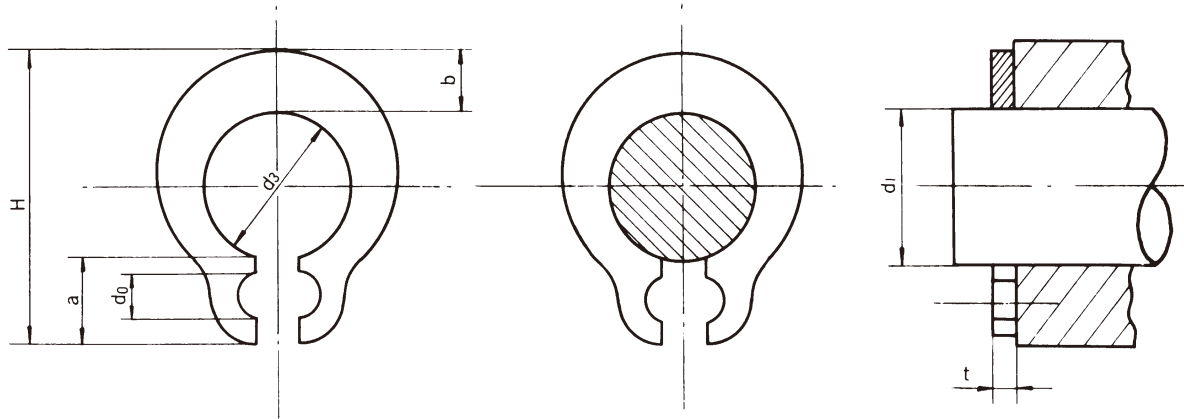


Unit: mm

Dimensions Codes	Nominals	Internal Diameter (d)		External Diameter (D)		Thickness (t)		Free Height (H)			
		Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance		
41004	4	4.3	+0.20 0	8	0 -0.35	0.15	±0.020	0.6	+0.4 0		
41005	5	5.4		10		0.15		0.8			
41905	5L	5.4		12		0.15		1			
41006	6	6.4	+0.25 0	11	0 -0.40	0.15		1			
41906	6L	6.4		14		0.15		1.3			
41007	7	7.5		12		0.2		1			
41008	8	8.5		13		0.2		1.2			
41908	8L	8.5	17	0.2	1.6						
41010	10	10.6	+0.30 0	15	0 -0.50	0.25		±0.025		1.4	+0.5 0
	10L	10.6		21		0.25				2	
41012	12	13		17		0.25	1.8				
	12L	13		24		0 -0.50	0.25		2.6		
41014	14	15		20			0.3		2		
	14L	15		26			0.3		2.6		
41016	16	17		23			0.3		2.5		
	16L	17		30		0.3	3.3				
41018	18	19	25	0 -0.60	0.4	±0.030	2.5	+0.6 0			
	18L	19	34		0.4		3.4				
41020	20	21.5	28		0.4		3.1				
	20L	21.5	38	0.4	4.2						

Remarks: 1. According to JASO F 302 Automotive Standard Waved Spring Washers: Wave Washers for Adjustment, Type 3.
 2. Internal and External dimensions represent before molding.
 3. Please refer to page T5 for technical information.

Product code	141	Material code	02 ...SUS304-CSP 70 ...Spring Steel	Part Number Structure (Standardized Product Code)	
Surface code	01 ...Burnished (SUS304-CSP) 03 ...Temper Color (Spring Steel)	Hardness	HRC37 - 46 (SUS304-CSP) HRC42 - 50 (Spring Steel)	Product	Surface
				① ④ ① ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○
				Material	Dimensions code



Unit: mm

Dimensions Codes	Nominals	Grip Retaining Ring Dimensions								Thrust Loading N	d ₁ : Applicable Shafts	
		d _s	Tolerance	t	Tolerance	b	a	d ₀	(H)		Basic Size	Tolerance
52015	1.5	1.40	+0.05 -0.08	0.3	±0.04	0.7	1.3	0.5	3.3	19.61	1.5	±0.025
52020	2	1.90		0.5		1	1.8	0.8	4.6	19.61	2	
52022	2.2	2.05		0.5		1.1	1.9	0.8	4.9	24.52	2.2	
52024	2.4	2.25		0.5		1.1	1.9	0.9	5.1	24.52	2.4	
52025	2.5	2.35		0.5		1.2	1.9	0.9	5.3	24.52	2.5	
52028	2.8	2.65		0.5		1.3	1.9	0.9	5.7	34.32	2.8	
52030	3	2.85		0.6		1.4	1.9	0.9	6	39.23	3	
52032	3.2	3.05		0.6		1.5	2	0.9	6.4	44.13	3.2	
52035	3.5	3.30		0.6		1.6	2	0.9	6.8	49.03	3.5	
52040	4	3.80		0.8		1.8	2.8	1.2	8.3	58.84	4	
52045	4.5	4.25	+0.05 -0.1	0.8	±0.05	2	2.9	1.3	9	68.65	4.5	±0.03
52048	4.8	4.60		0.8		2.1	2.9	1.3	9.5	73.55	4.8	
52050	5	4.75	±0.08	0.8	±0.05	2.2	2.9	1.3	9.7	78.45	5	±0.036
52060	6	5.70		1		2.4	3.1	1.4	11.1	93.16	6	
52063	6.3	6.05	±0.1	1	±0.05	2.5	3.1	1.4	11.5	93.16	6.3	±0.036
52070	7	6.70		1		2.7	3.3	1.4	12.6	93.16	7	
52080	8	7.70		1		3	3.5	1.4	14.1	112.78	8	
52090	9	8.65		1.2		3.3	4.7	1.5	16.5	147.10	9	
52100	10	9.65	1.2	3.5	4.7	2	17.7	156.91	10			

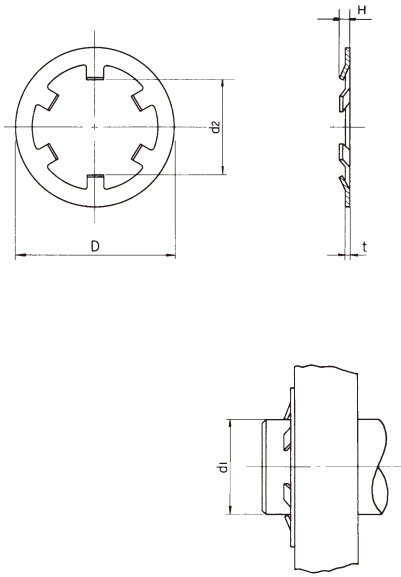
Remarks: 1. Thrust loading is measured with SUS304-CSP
 2. Thrust loading measured using steel shafts with hardness HV300 or less.

Product code	152	Material code	02...SUS304-CSP		Part Number Structure (Standardized Product Code)			
			70...Spring Steel		Product Surface ① ⑤ ② ○ ○ ○ ○ — ○ ○ ○ ○ ○ ○ Material Dimensions code			
Surface code	01...Burnished (SUS304-CSP)	Hardness	HRC37 - 46 (SUS304-CSP)					
	05...Phosphate Coating (Spring Steel)		HRC46 - 51 (Spring Steel)					

CA Retaining Rings for Shafts



Unit: mm



Dimensions Codes	Nominal Diameter	CA Retaining Ring for Shafts Dimensions							Thrust Loading N	Applicable Shafts d ₁	
		d ₂		D		H	t	Number of Teeth		Basic Dimension	Tolerance
		Basic Dimension	Tolerance	Basic Dimension	Tolerance						
48015	1.5	1.4	±0.05	5.2	±0.2	0.6	0.25	3	78	1.5	±0.03
48020	2	1.9		6		0.6	0.25	3	118	2	
48024	2.4	2.2	6.4	0.7		0.25	3	118	2.4		
48030	3	2.8	8	0.7		0.25	4	147	3		
48040	4	3.8	9	0.7		0.25	4	177	4		
48050	5	4.8	10	0.7		0.25	5	245	5		
48060	6	5.8	11	0.8		0.25	5	245	6		
48080	8	7.8	13	0.8		0.25	5	294	8		
48100	10	9.8	15.4	0.8		0.25	6	294	10		
48120	12	11.8	17.8	1.0		0.4	6	343	12	±0.05	
48160	16	15.8	22.8	1.0	0.4	6	392	16			
48180	18	17.8	25	1.0	0.4	8	392	18			
48200	20	19.8	28	1.0	0.4	8	392	20			

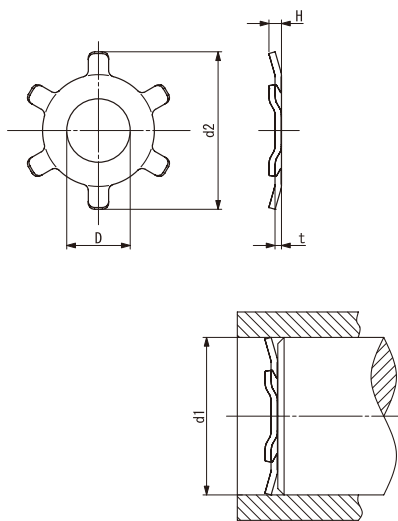
Remarks: 1. Thrust loading is measured with SUS304-CSP.
 2. Thrust loading measured using steel shaft with hardness HV300 or less.
 Notes: Customer-specified dimensions and materials are available upon request.

Product code	148	Material code	02...SUS304-CSP 70...Spring Steel	Part Number Structure (Standardized Product Code)	
Surface code	01...Burnished (SUS304-CSP) 05...Phosphate Coating (Spring Steel)	Hardness	HRC37 - 46 (SUS304-CSP) HRC45 - 53 (Spring Steel)	Product: ① ④ ⑧ ○ ○ ○ ○ ○ ○ ○ ○ Surface: ○ ○ ○ ○ ○ ○ ○ ○ Material: Material Dimensions code	

CI Retaining Rings for Holes

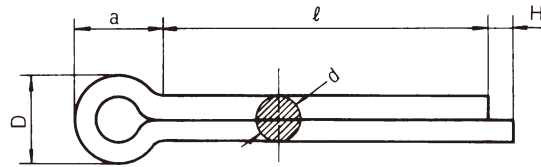


Unit: mm



Dimensions Codes	Nominal Diameter	CI Retaining Rings for Holes Dimensions						Applicable Hole Size d ₁		
		d ₂		D		H	t	Number of Teeth	Basic Dimension	Tolerance
		Basic Dimension	Tolerance	Basic Dimension	Basic Dimension					
49050	5	5.2	+0.1	2.0	0.7	0.25	6	5	±0.03	
49060	6	6.2		2.5	0.7			6		
49080	8	8.2		3.5	0.55			6		

Product code	149	Material code	02...SUS304-CSP	Part Number Structure (Standardized Product Code)	
Surface code	01...Burnished	Hardness	HRC 37 - 46	Product: ① ④ ⑨ ① ② ① ○ ○ ○ ○ ○ ○ ○ ○ Surface: ○ ○ ○ ○ ○ ○ ○ ○ Material: Material Dimensions code	



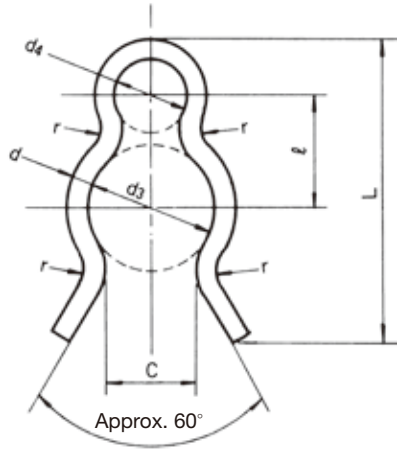
Unit: mm

Nominal Diameter		0.6	0.8	1	1.2	1.6	2	2.5	3	3.2	4	5					
d	Basic Dimension	0.5	0.7	0.9	1	1.4	1.8	2.3	2.7	2.9	3.7	4.6					
	Tolerance	0 -0.1						0 -0.2									
D	Basic Dimension	1	1.4	1.8	2	2.8	3.6	4.6	5.5	5.8	7.4	9.2					
	Tolerance	0 -0.1	0 -0.2		0 -0.3	0 -0.4		0 -0.6	0 -0.7		0 -0.9	0 -1.2					
a	Approx.	2	2.4	3	3	3.2	4	5	6	6.4	8	10					
H	Approx.	1.6	1.6	1.6	2.5	2.5	2.5	2.5	3.2	3.2	4	4					
Diameters of Applicable Bolts & Pins	Bolt	Over	—	2.5	3.5	4.5	5.5	7	9	11	11	14	20				
		Or Under	2.5	3.5	4.5	5.5	7	9	11	14	14	20	27				
	Clevis Pin	Over	—	2	3	4	5	6	8	9	9	12	17				
		Or Under	2	3	4	5	6	8	9	12	12	17	23				
Pin Hole Diameter	(Ref.)	0.6	0.8	1	1.2	1.6	2	2.5	3	3.2	4	5					
Length <i>l</i>	4																
	5	±0.5															
	6		±0.5														
	8			±0.5													
	10				±0.5												
	12					±0.5											
	14						±0.5										
	15							±0.8									
	16								±0.8								
	18									±0.8							
	20										±0.8						
	22											±0.8					
	25												±0.8				
	28													±0.8			
	30														±0.8		
	32															±0.8	
	35																±1.2
	36																±1.2
	40																
	45																
50																	
55																	
56																	
60																	
63																	

- Remarks:
- Nominal diameter shall be in accordance with the diameter of the pin hole.
 - “d” shall be the value between the end and the point 1/2 of “*l*” from the end.
 - The length “*l*” shall be restricted to those given in the area outlined in bold. The values in the frame indicate tolerances.
 - The head shall not be inclined significantly from the center of axis.

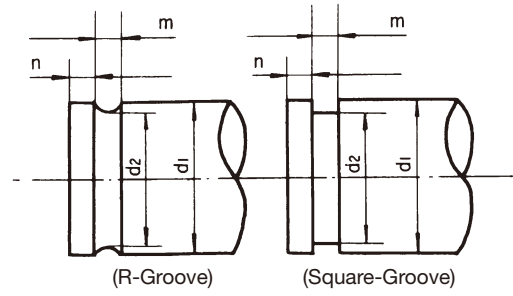
Product code	137	Material code	49...SUS304-W1	Part Number Structure (Standardized Product Code)		
				Product	Surface	Example: $\phi 4 \times l 20$
Surface code	01...Burnished	Hardness		①③⑦④⑨① — ④①②① Material Nominal Diameter Length		

Snap Retainers



Free State

$$r \approx 2d$$



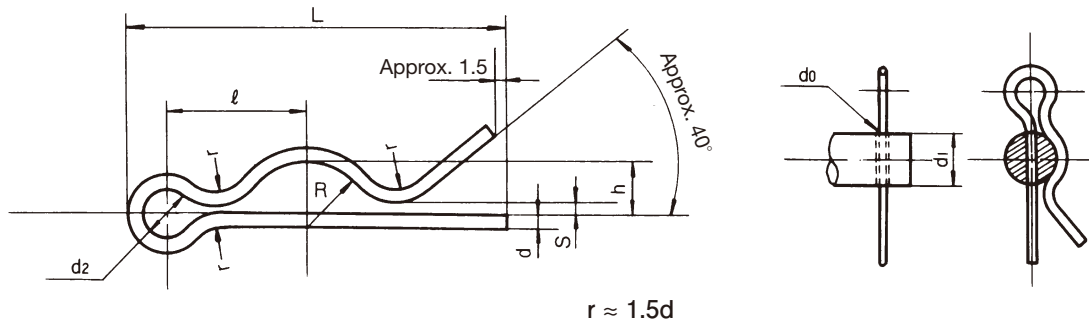
Applicable Shafts

Unit: mm

Dimensions Codes	Nominals	Snap Retainers Dimensions								Applicable Shafts (Ref.)				
		d ₃		d		d ₄	ℓ	C	L	d ₁	d ₂	m	n	
		Basic Dimension	Tolerance	Basic Dimension	Tolerance	Approx.	Approx.	Max.	Approx.				Min.	
30030	3	1.8	±0.2	0.6	±0.01	2.2	3	1	8.6	3	2.5	0.8	1.5	
30040	4	2.7	0 -0.4	0.6	±0.02	1.4	2.9	1.9	7.8	4	3.2	0.8		
30050	5	3.6		0.7		1.8	3.8	2.5	10.1	5	4.1	0.9		
30060	6	4.4	0 -0.5	0.8		2.2	4.5	3.1	12.0	6	4.9	1.0		
30070	7	5.4		0.9	2.7	5.3	3.8	14.1	7	5.9	1.1			
30080	8	6.3		0.9	3.2	6.1	4.4	16.3	8	6.8				
30090	9	7.3	0 -0.7	1	±0.03	3.7	6.8	5.1	18.2	9	7.8	1.2		
30100	10	7.7				3.9	7.3	5.4	19.5	10	8.7			
30120	12	9.4		1.2		4.7	8.9	6.6	23.7	12	10.4	1.4		
30140	14	11.1	0 -1	1.4	±0.04	5.6	10.4	7.8	27.8	14	12.1	1.6		
30160	16	12.6		1.8		6.3	12.2	8.8	32.5	16	13.6	2.1		2.0
30180	18	13.4		2.3		6.7	13.5	9.4	36.0	18	14.9	2.6		2.5
30200	20	15	0 -1.5	2.6	±0.04	7.5	15.2	10.5	40.5	20	16.5	2.9		3.0
30220	22	16.6		2.9		8.3	16.8	11.6	44.8	22	18.1	3.2		
30250	25	18.7		3		3	9.4	18.8	13.1	50.2	25	20.7		3.7
30280	28	21.7	10.9		21.1		15.2	56.3	28	23.7				

- Remarks: 1. The tolerance of "m" shall be in accordance with the middle class of JIS B 0405 standard (general tolerances).
2. The tolerance of "d" represents the tolerance of wire diameter before forming.

Product code	130	Material code	48...SUS304-WPB (φ12 or below)		Part Number Structure (Standardized Product Code)								
			58...SWB (φ14 or above)		Product	Surface							
Surface code	01...Burnished (SUS304-WPB)	Hardness			①	③	①	①	①	①	①	①	①
	03...Temper Color (SWB)				Material		Dimensions code						



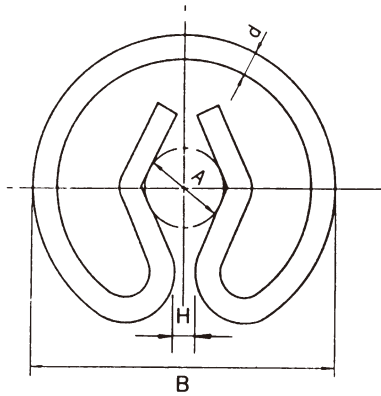
Unit: mm

Dimensions Codes	Nominals	Snap Pin Dimensions								Applicable Shafts (Ref.)	
		d		d ₂	ℓ	R	h	S	L	Shafts	Holes
		Basic Dimension	Tolerance	Approx.	Approx.	Approx.	Approx.	Max.	Approx.	d ₁	d ₀
31040	4	1.0	±0.02	3.0	6.0	2.0	1.0	0.5	16.3	4.0	1.2
31050	5				6.5	2.5	1.5		17.9	5.0	
31060	6	1.2	±0.03	3.6	7.8	3.0	1.8	0.6	21.2	6.0	1.5
31070	7				8.3	3.5	2.3		22.8	7.0	
31080	8	1.6	±0.03	4.8	10.4	4.0	2.4	0.8	27.7	8.0	1.9
31090	9				10.9	4.5	2.9		29.3	9.0	
31100	10	1.8	±0.03	5.4	12.2	5.0	3.2	0.9	32.6	10.0	2.2
31120	12				13.2	6.0	4.2		35.8	12.0	
31140	14	2.0	±0.03	6.0	15.0	7.0	5.0	1.0	40.6	14.0	2.4
31160	16				16.0	8.0	6.0		43.8	16.0	

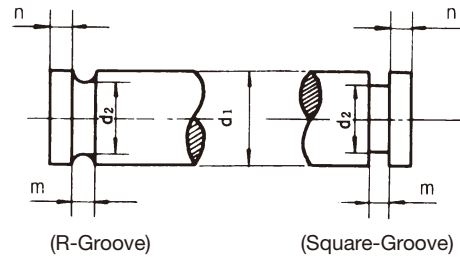
Remarks: The tolerance of "d" represents the tolerance of wire diameter before forming.

Product code	331... φ 12 or below	Material code	48...SUS304-WPB		Part Number Structure (Standardized Product Code)			
	131... φ 14 or above		58...SWB					
Surface code	01...Burnished (SUS304-WPB)		Hardness					
	30...Ep-Fe/Zn 5/trivalent CM 2 (trivalent chromate) (SWB)							
	03...Temper Color							

Clip Rings



Example of Grooves on Shafts



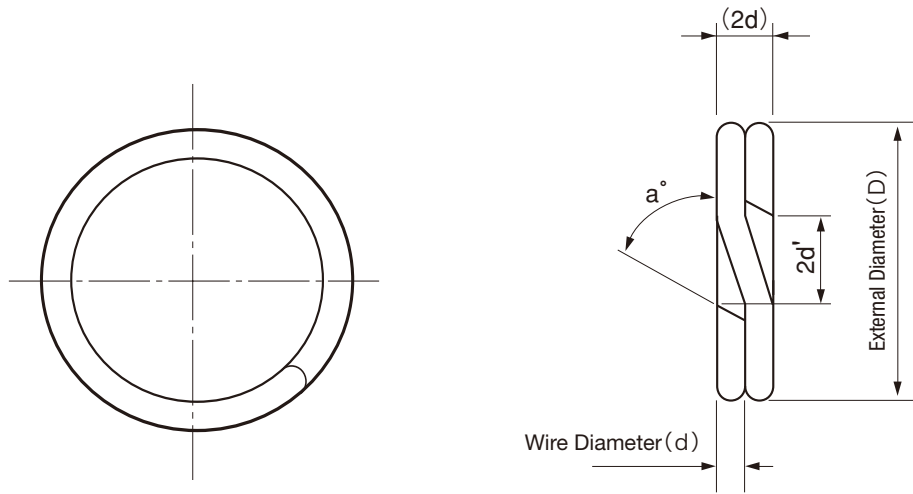
Unit: mm

Dimensions Codes	Nominals No.	d ₁ Applicable Shafts	A		B		H		d	d ₂	Applicable Shafts		
			Basic Dimension	Tolerance	Basic Dimension	Tolerance	Basic Dimension	Tolerance			m	n	
29001	1	3	1.5	±0.3	7.5	±0.5	0.5	±0.25	0.7	2	0.8	2	
29002	2	4	2		9.5		0.75		±0.35	0.8	2.5	0.9	2
29003	3	5	2.75		11.3		0.75			0.9	3.5	1	2.5
29004	4	6	3	±0.4	13	±0.8	0.75	±0.45	1	4	1.1	2.5	
29005	5	8	4.75	±0.5	15.8		1.25		±0.55	1.2	6	1.3	3
29006	6	10	5.5	±0.6	18.5		2	1.4		7	1.6	3.5	
29007	7	13	7		22		2.5	1.6		9	1.9	4	
29008	8	16	8		±0.7		24	2.5		2	10	2.4	4

- Remarks: 1. You can insert the product into shafts either lengthwise or sideways.
 2. The product is made from wire rods and easily fits into grooves without any play.

Product code	129	Material code	08...SUS420J2		Part Number Structure (Standardized Product Code)										
					Product				Surface						
Surface code	01...Burnished	Hardness	HV 400-460		①	②	⑨	⑩	⑧	①	○	○	○	○	○
					Material				Dimensions code						

Split Rings



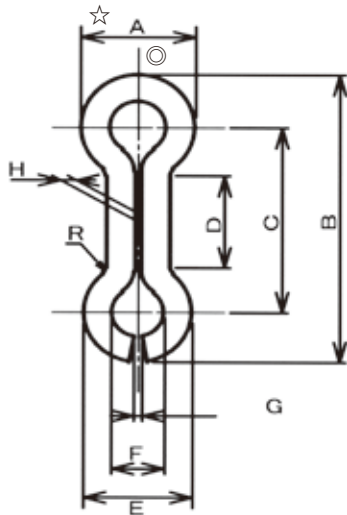
Unit: mm

Dimensions Codes	Nominals No.	Wire Diameter (d)		External Diameter (D)		a Ref.	2d Ref.	2d' Ref.
		Basic Dimension	Tolerance	Basic Dimension	Tolerance			
28100	00	0.40	±0.01	3.2	±0.2	45°	0.8	0.8
28000	0	0.45		3.6			0.9	0.9
28001	1	0.55		4.4			1.1	1.1
28002	2	0.65		5.0			1.3	1.3
28003	3	0.75		6.0			1.5	1.5
28004	4	0.90	±0.015	7.2	±0.3	75°	1.8	1.8
28005	5	1.10		8.1			2.2	2.2
28006	6	1.20		9.0			2.4	2.4

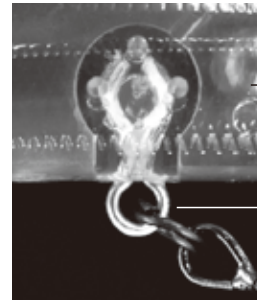
Remarks: 1. Coils shall be closed.
2. Black colored Split Rings are also available (Surface code is 40 - Oxidation Coloring SS Bronze finish).

Product code	128	Material code	48...SUS304-WPB		Part Number Structure (Standardized Product Code)										
					Product		Surface		Material		Dimensions code				
Surface code	01...Burnished	Hardness			①	②	⑧	④	⑧	①	○	○	○	○	○
	40...Black Coloring				Material		Dimensions code								

Hachinoji Rings



Usage example



Lure body (plastic, etc.)

Hachinoji Ring

A Hachinoji Ring is mounted in a fishing lure to connect a Split Ring and other parts

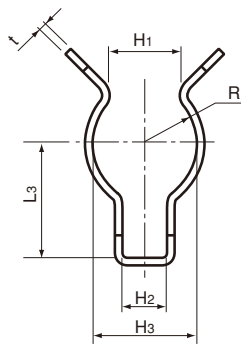
Unit: mm

Dimenslons Codes	Wire Diameter	A		B		(C)	(D)	E	(F)	(G)	(H)	(R)
		Dimension	Tolerance	Dimension	Tolerance							
34010	φ0.6	φ2.8	±0.2	6.7	±0.2	4.1	1.9	MAX2.8	φ1.5	0.3	0.2	4-R0.2
34020	φ0.7	φ3.2		8.7		5.4	2.6	MAX3.3	φ1.6			
34030	φ0.8	φ3.7		9.8		6.1	2.8	MAX3.8	φ2.1			
34040	φ1.0	φ4.0		11		7.0	3.5	MAX4.0	φ1.8			
34050	φ1.0	φ4.3		9.5		5.5	1.8	MAX4.3	φ2.0			
34060	φ1.2	φ5.2		15		±0.25	9.4	4.7	MAX5.7			φ3.3

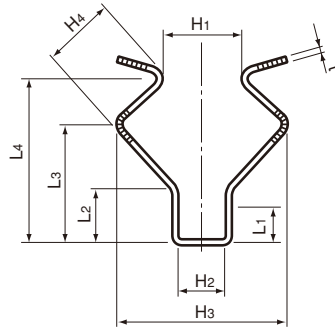
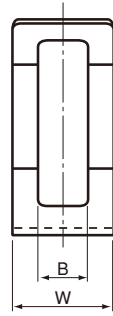
Remarks: The dimensions of “☆” shall be measured at the position 90 degrees from the line “◎”.

Product code	134	Material code	49...SUS304 - W1		Part Number Structure (Standardized Product Code)	
					Product	Surface
Surface code	01...Burnished	Hardness			①③④④⑨①①	③④①①①
			Material	Dimensions code		

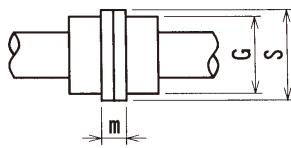
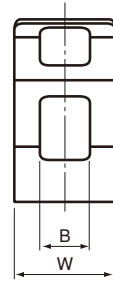
Joint Clips (Type-R) (Type-S) Same Diameter Type



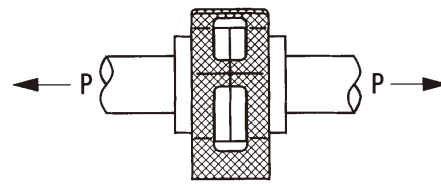
Type-R



Type-S



Applicable Shafts



Thrust Loading

Type-R (Product Code: 171)

Unit: mm

Dimensions Code	Nominals No.	Dimensions														Applicable Shafts			Thrust Load N				
		t		H ₁		H ₂	H ₃	H ₄		L ₁	L ₂		L ₃	L ₄	B		W			G	S	m	
		Basic Dimension	Tolerance	Basic Dimension	Tolerance			Basic Dimension	Tolerance		Basic Dimension	Tolerance			Basic Dimension	Tolerance	Basic Dimension	Tolerance					Basic Dimension
71040	4	0.5	±0.012	5.0	—	4.0	9.0	—	—	—	—	—	—	11.0	—	5.5	±0.1	11.5	±0.1	11.0	13.0	5.5	2,128.0

Type-S (Product Code: 170)

Unit: mm

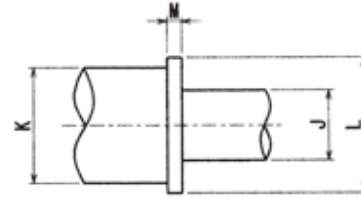
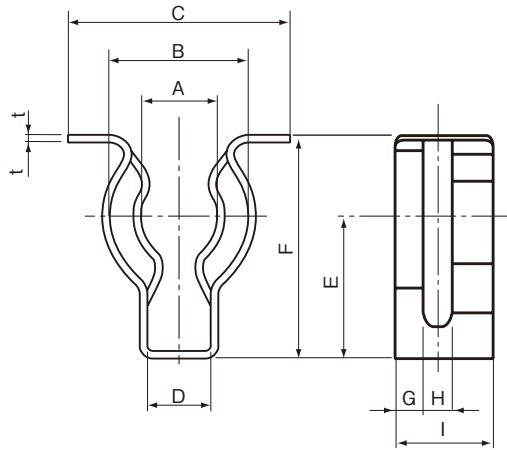
Dimensions Codes	Nominals No.	Dimensions														Applicable Shafts			Thrust Load N								
		t		H ₁		H ₂	H ₃	H ₄		L ₁	L ₂		L ₃	L ₄	B		W			G	S	m					
		Basic Dimension	Tolerance	Basic Dimension	Tolerance			Basic Dimension	Tolerance		Basic Dimension	Tolerance			Basic Dimension	Tolerance	Basic Dimension	Tolerance					Basic Dimension	Tolerance			
70060	6	0.7	±0.03	8.2	+0.3 -1.0	5	18.3	8.0	4.6	6.3	+0.45 -0.15	13.2	18.2	6.0	±0.1	12	±0.1	13.0	16.0	5.5	5,070.0						
70080	8			9.7		6	21.1	8.8										14.2	19.9		15.0	17.0	4,942.6				
70100	10			11.2		8	23.9	9.7										14.7	20.8		17.0	20.0	4,746.4				
70127	12.7	0.8	±0.04	14.5	+0.5 -1.5	8.8	30.0	12.75	+0.45 -0.15	5.1	7.1	+0.4	18.4	26.5	6.0	±0.1	14	±0.1	22.0	25.0	5.5	6,786.2					
70160	16A			16.4															8.8	34.5		14.1	19.5	28.6	26.0	30.0	6,864.7
71016	16B			18.4															+0.7 -1.7	38.5		16.0	23.5	33.7	28.0	34.0	7,649.2
70222	22.2	0.9	±0.04	21.7	+0.7 -1.8	10	44.5	17.0	+0.45 -0.15	5.7	7.9	26.2	37.3	6.0	±0.1	14	±0.1	32.0	38.0	5.5	8,777.0						
70254	25.4			24.7														+0.8 -2.0	51.8		19.6	30.2	42.9	38.0	44.0	12,474.1	

Remarks: The value of thrust load represents the average of measured values under our measurement methodology.

Notes: The nominal size No. 4 is applicable only for Type-R. The product code is 171.

Product code	170 (Type-S)	Material code	02...SUS304-CSP	Part Number Structure (Standardized Product Code)			
	171 (Type-R)			Product	Surface	Example: Nominal 12.7	
Surface code	01...Material Texture		Hardness	① ⑦ ⑦ ⑦ ② ⑦ ① — ⑦ ⑦ ① ② ⑦			
				Material		Dimensions	

Joint Clips Different Diameter Type



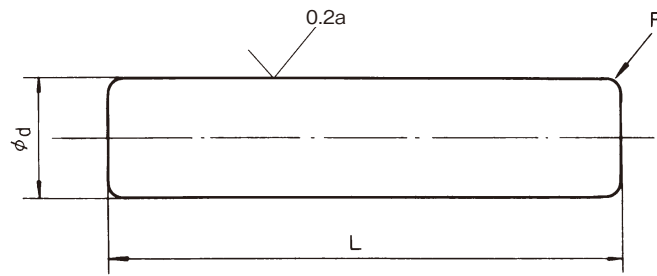
Applicable Shafts

Unit: mm

Dimensions Codes	Nominals No.	Dimensions														Applicable Shafts				Thrust Load N			
		t		A		B		C	D	E	F	G		H		I		J	K		L	M	
		Basic Dimension	Tolerance	Basic Dimension	Tolerance	Basic Dimension	Tolerance					Basic Dimension	Tolerance	Basic Dimension	Tolerance	Basic Dimension	Tolerance						Basic Dimension
04010	4-10	0.5	±0.012	3.0		9.0		19.2	4.0	12.5	18.15	4.0		2.0		12.0		4.0	10.0	14.0	1.5	1,015.0	
06013	6-13			5.0	±0.8	12.0	±0.8	22.45	5.2	14.0	22.14							6.0	13.0	17.0		2,490.9	
10017	10-17	0.8	±0.03	8.6		15.6		25.7	7.2	16.3	25.33					13.0		10.0	17.0	20.0		2,481.1	
14023	12.7-22			11.0		20.0		31.8		21.0	32.96		±0.1	±0.1		±0.1		12.7	22.0	26.0		3.5	4,207.1
	14-23			±1.0		±1.0		9.2				4.0			14.0			14.0	23.0	27.0			
16025	16-25	1.0	±0.04	13.0		22.0		40.3		21.5	33.46							16.0	25.0	29.0		4,364.0	
-	18-28			16.7		26.7		45.65	10.0	26.4	41.65	5.0			16.0			18.0	28.0	34.0		4,471.8	

Notes: 1. The nominal sizes 12.7-22 and 14-23 are both the same size products.
2. The nominal size 18-28 is available upon request.

Product code	172	Material code	02...SUS304-CSP-H			Part Number Structure (Standardized Product Code)									
						Product					Surface				
Surface code	01...Material texture			Hardness	①⑦②①②①①					①④①①①①①					
					Material					Dimensions					



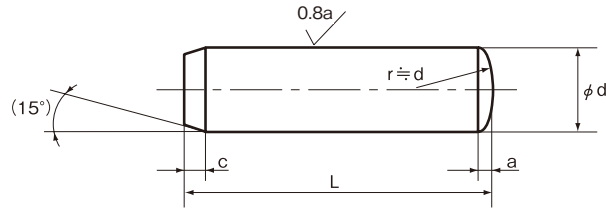
Unit: mm

Nominal Diameter		1	1.2	1.5	1.6	2	2.5	3	
d	Basic Dimension	1	1.2	1.5	1.6	2	2.5	3	
	Tolerance	m6	Soft						+0.008 +0.002
		h7	Hard						0 -0.01
	Surface Roughness		0.2a						
R	Approx.	0.2							
Length L	±0.1	3	○	○					
		4	○	○	○	○			
		5	○	○	○	○	○	○	
		6	○	○	○	○	○	○	○
	±0.2	8	○	○	○	○	○	○	○
		10	○	○	○	○	○	○	○
		12	○	○	○	○	○	○	○
		14	○	○	○	○	○	○	○
		15	○	○	○	○	○	○	○
		16		○	○	○	○	○	○
		18			○	○	○	○	○
		20			○	○	○	○	○
		22				○	○	○	○
		25					○	○	○
	28						○	○	
	±0.3	30							○
		32							○
		35							○

- Notes: 1. Material available in two different types: hard-type for SUS301 or SUS201 and soft-type for SUS304.
 2. Custom orders are available for different materials and sizes other than the dimensions specified on the table. In this case, please note that the quality of custom-ordered products will vary from that of the standard product (hardness, etc.), as shapes and specifications will be different.

Product codes	161...Hard	Material codes	51...SUS301 or 201 (Hard)		Part Number Structure (Standardized Product Code)			
	162...Soft		47...SUS304 (Soft)					
Surface code	01...Burnished		Hardness	Hard HV450 or above	Example: ϕ 1.6 × ℓ 10 			
				Soft HV300 or below	Material	Nominal Diameter	Length	

Parallel Pins Type A(m6)



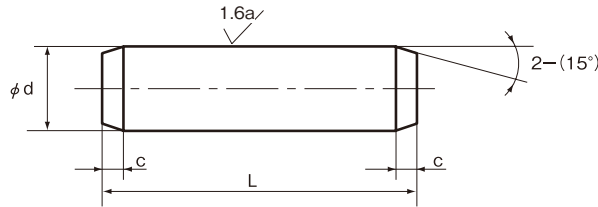
Unit: mm

Nominal Diameter		4	5	6						
d	Basic Dimension	4	5	6						
	Tolerance	Type A m6	+0.012 +0.004							
	Surface Roughness	0.8a								
a	Approx.	0.5	0.63	0.8						
c	Approx.	0.63	0.8	1.2						
Material		S45C-Q	S45C-A	SUS303	S45C-Q	S45C-A	SUS303	S45C-Q	S45C-A	SUS303
Length L	5			*						
	6		○	○			○			
	8	○	○	○		○	○		○	○
	10	○	○	○	○	○	○	○	○	○
	12	○	○	○	○	○	○	*	○	○
	14		○	○	○	○	○	*	○	○
	15	○	○	○	○	○	○	○	○	○
	16		○	○	○	○	○	○	○	○
	18		○	○	○	○	○	○	*	○
	20	○	○	○	○	○	○	○	○	○
	22		○	○		○	○		○	○
	24								○	
	25	○	○	○	○	○	○	○	○	○
	28		○	○		*	○		○	○
	30	○	○	○	○	○	○	○	○	○
	32	*	○	○	*	*	○		○	○
	35	○	○	○	*	○	○	*	○	○
	40	○	○	○	○	○	○	○	○	○
	45		○	○	*	○	○	*	*	○
	50		○	○	○	○	○	○	○	○
55					*	○		○		
60			○		○	○		○		
65								*	○	
70								○		
80								*		
100								*		

- Notes: 1. "○" indicates products that are in stock. "*" indicates products that are available but not kept in stock.
 2. Material available in two different types: hard-type for S45C-Q and soft-type for SUS303 or S45C-A.
 3. We accept different materials and sizes as custom orders.

Product codes	163...Type A · Hard	Material codes	61...S45C-Q (Hard)	Part Number Structure (Standardized Product Code)
	164...Type A · Soft		55...SUS303 (Soft) 60...S45C-A	
Surface code	01...Material texture		Hardness	Example : Hard (S45C-Q) 4×8 ①⑥③⑥①①①—④①①⑧① Material Nominal Diameter Length

Parallel Pins Type B(h7)



Unit: mm

Nominal Diameter		4	5	6						
d	Basic Dimension	4	5	6						
	Tolerance	Type B h 7								
	Surface Roughness	1.6a								
c	Approx.	0.63	0.8	1.2						
Material		S45C-Q	S45C-A	SUS303	S45C-Q	S45C-A	SUS303	S45C-Q	S45C-A	SUS303
Length L	5			*						
	6		○	*						
	8	○	○	○		○	○		○	
	10	○	○	○	○	○	○	*	○	○
	12	○	○	○	○	○	○	*	○	○
	14		○	○	○	*	○	○	*	○
	15	○	○	○	○	○	○	○	○	○
	16		○	○	○	○	○	○	○	○
	18		○	○	○	○	○	○	○	○
	20	○	○	○	○	○	○	○	○	○
	22		○	○	○		○	*	*	*
	24								*	
	25	○	○	○	○	○	○	○	○	○
	28		*	○		*	*	*	○	*
	30	○	○	○	○	○	○	○	○	○
	32	*	*	○	*	○	*		*	*
	35	○	○	○	*	○	○	*	*	*
	40	○	○	○	○	○	○	○	○	○
	45		*		*	*	*	*	*	*
	50		*		○	○	○	○	○	○
55					*			*	*	
60					*			*	○	
65								*		
70								*		
80								*		
100								*		

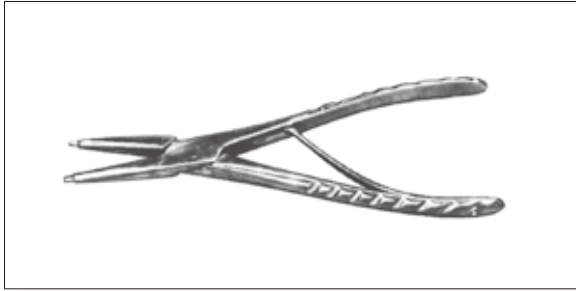
- Notes: 1. "○" indicates products that are in stock. "*" indicates products that are available but not kept in stock.
 2. Material available in two different types: hard-type for S45C-Q and soft-type for SUS303 or S45C-A.
 3. We accept different materials and sizes as custom orders.

Product codes	165...Type B · Hard	Material codes	61...S45C-Q (Hard)	Part Number Structure (Standardized Product Code)
	166...Type B · Soft		55...SUS303 (Soft) 60...S45C-A	
Surface code	01...Material texture	Hardness	Hard S45C-Q HV255 or above Soft SUS303 HV208 or above S45C-A HV125 or above	Example: Hard (S45C-Q) 4×8 Product Surface: ①⑥③⑥①①① — ④①①①①① Material Nominal Diameter Length

C-Type Retaining Ring Jigs



Internal Type Pliers (Type-i)

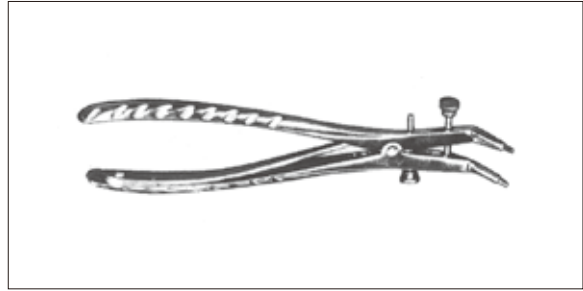


Dimensions Codes	No.	Length	Tip Size	Applicable Ring Size
21011	i#1	130	φ 0.6~1.2	6-11
21012	i#2	165	1.4	12-30
21013	i#3	187	2.3	32-48
21113	i#3-1	260	2.3	50-80
21014	i#4	320	2.8	82-120

(Type-S)

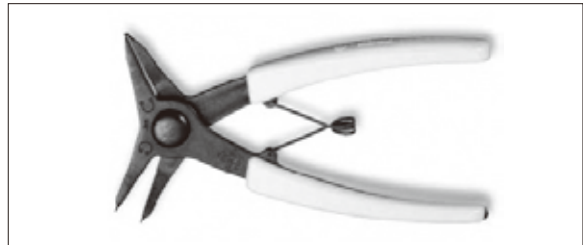
Dimensions Codes	No.	Length	Applicable Ring Size
21900	S-025	125	4-9
21901	S-026	143	10-40

External Type Pliers (Type-a)



Dimensions Codes	No.	Length	Length	Applicable Ring Size
21003	a#3	195	2.3	32-80
21004	a#4	320	2.8	82-120

Internal & External Dual Use Pliers (Type-S)



Product code	521	Material code	Part Number Structure (Standardized Product Code)																
			Product	Surface															
Surface code		Hardness	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Push Nut Jigs



Remarks: 1. Insert a push nut into the cavity at the bottom.
2. Install into a mating shaft by holding the grip.

Push Nuts	
Dimensions Codes	Nominal Size
33012	1.2
33015	1.5
33020	2
33024	2.4
33030	3
33040	4
33050	5
33060	6
33080	8
33100	10
33120	12

Product code	556	Material code	Part Number Structure (Standardized Product Code)																
			Product	Surface	Example: push nut jig for nominal size 2														
Surface code		Hardness	5	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Grip Retaining Rings	
Dimensions Codes	Nominal Size
52015	1.5
52020	2
52025	2.5
52030	3
52040	4
52045	4.5
52050	5
52060	6
52070	7
52080	8
52100	10

Notes: Please use the nominal dimension when ordering Grip Retaining Ring Jigs.

Product code	521	Material code				Part Number Structure (Standardized Product Code)	
						Product	Surface
Surface code				Hardness		⑤②①①①①① — ⑤②①②① Material Dimensions code	

Ceramics



High Purity Alumina Al ₂ O ₃	Alumina Al ₂ O ₃	Zirconia ZrO ₂
<p>Properties Alumina, or aluminum oxide, has excellent abrasion resistance and insulation properties. It is used in a wide range of applications as one of the iconic advanced ceramics.</p> <p>Applications</p> <ul style="list-style-type: none"> • insulation parts for various types of lamps • insulation parts for various types of sensors • various types of precision shafts • and others 	<p>Applications</p> <ul style="list-style-type: none"> • thermal resistant or insulation parts • high-voltage insulators • insulation parts for electron tubes • and others 	<p>Properties Zirconia, or zirconium dioxide, obtains incomparable strength and fracture toughness through partial stabilization.</p> <p>Applications</p> <ul style="list-style-type: none"> • various types of abrasion-resistant parts • various types of chemical-resistant parts • various types of precision shafts • and others

Notes: Ceramics are manufactured upon request. Please contact our sales personnel for more information.

Technical Information



Stainless Steel Springs

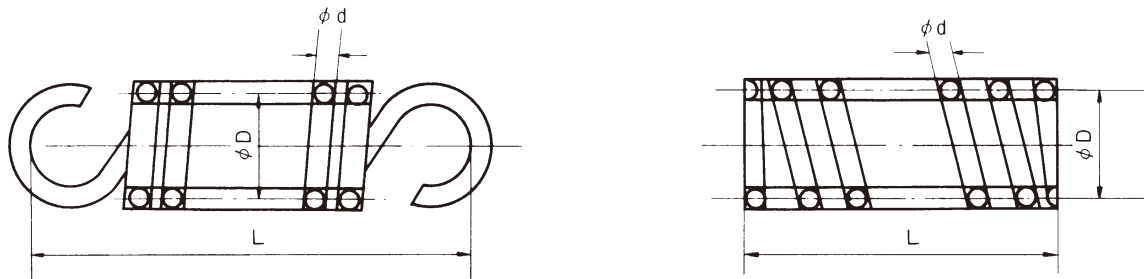
We have corrected the existing defects of surface treatments given to springs made from steel or alloyed metal, as well as other various mechanistic faults. As a result, we are proud to provide products that have earned customers' trust and praise. We hope that you will also appreciate our superior products and technology.

Type of Material	SUS304	SUS631	Piano Wire	Nickel Silver Wire	Phosphor Bronze Wire
Elastic Coefficient					
Shear Modulus (G)	73,550N/mm ²	76,492N/mm ²	78,453N/mm ²	38,246N/mm ²	41,188N/mm ²
Young's Modulus (E)	186,320N/mm ²	196,133N/mm ²	205,940N/mm ²	101,989N/mm ²	107,873N/mm ²

Mechanical Properties of Age-Hardened High-Tension Stainless Steel SUS631 - Precipitation Hardening

HRC	Pre-Hardening Mechanical Properties					Post-Hardening Mechanical Properties			
	Treatment	Tensile Test		Bend Test		Tensile Test		Flexural Strength Test	Hardness
		Tensile Strength N/mm ²	Elongation %	Bend Angle	Inside Radius	Tensile Strength N/mm ²	Elongation %	Threshold Limit Kb N/mm ²	HRC
22	R.H	892 - 1,030	8 - 13	180°	2 × Material Thickness	1,481	6 - 12	588	47
38	C.H	1,206 or over	6 - 10	180°		1,589	5 - 9	834	51

General Formula for Spring Design



d: Wire diameter D: Mean diameter N: Number of active coils W: Axial load δ: Deflection
G: Shear modulus (Stainless Steel Wire = approx. 70,000N/mm²)

Finding...				
			b ≤ 2c	b > 2c
Deflection from load	$\delta = \frac{8WND^3}{Gd^4}$	$\delta = \frac{5.6WND^3}{Gb^4}$	$\delta = \frac{2.79WND^3(b^2+c^2)}{Gb^3c^3}$	$\delta = \frac{2.35WND^3}{Gc^3(b-0.63c)}$
Deflection from shear stress	$\delta = \frac{\pi fsND^2}{Gd}$	$\delta = \frac{2.35fsND^2}{Gb}$	$\delta = \frac{3.5fsND^2(b^2+c^2)}{Gbc(2b+c)}$	$\delta = \frac{2.9fsND^2b^2}{Gc(2b+c)(b-0.63c)}$
Shear stress from load	$fs = \frac{8WD}{\pi d^3}$	$fs = \frac{2.38WD}{b^3}$	$fs = \frac{0.8WD(2b+c)}{b^2c^2}$	$fs = \frac{0.8WD(2b+c)}{b^2c^2}$
Shear stress from deflection	$fs = \frac{\delta Gd}{\pi ND^2}$	$fs = \frac{0.425\delta Gb}{ND^2}$	$fs = \frac{0.28\delta G(2b^2c+bc^2)}{ND^2(b^2+c^2)}$	$fs = \frac{0.34\delta Gc(2b+c)(b-0.63c)}{ND^2b^2}$
Load from estimated shear stress	$W = \frac{fs\pi d^3}{8D}$	$W = \frac{0.42fsb^3}{D}$	$W = \frac{1.25fsb^2c^2}{D(2b+c)}$	$W = \frac{1.23fsb^2c^2}{D(2b+c)}$
Load from deflection	$W = \frac{\delta d^4 G}{8ND^3}$	$W = \frac{\delta Gb^4}{5.6ND^3}$	$W = \frac{\delta Gb^3c^3}{2.79ND^3(b^2+c^2)}$	$W = \frac{\delta Gc^3(b-0.63c)}{2.35ND^3}$
The number of active coils	$N = \frac{\delta Gd^4}{8WD^3}$	$N = \frac{\delta Gb^4}{5.6WD^3}$	$N = \frac{\delta Gb^3c^3}{2.79WD^3(b^2+c^2)}$	$N = \frac{\delta Gc^3(b-0.63c)}{2.35WD^3}$

With respect to tension springs, the initial tension is set to 0.

Initial tension calculations

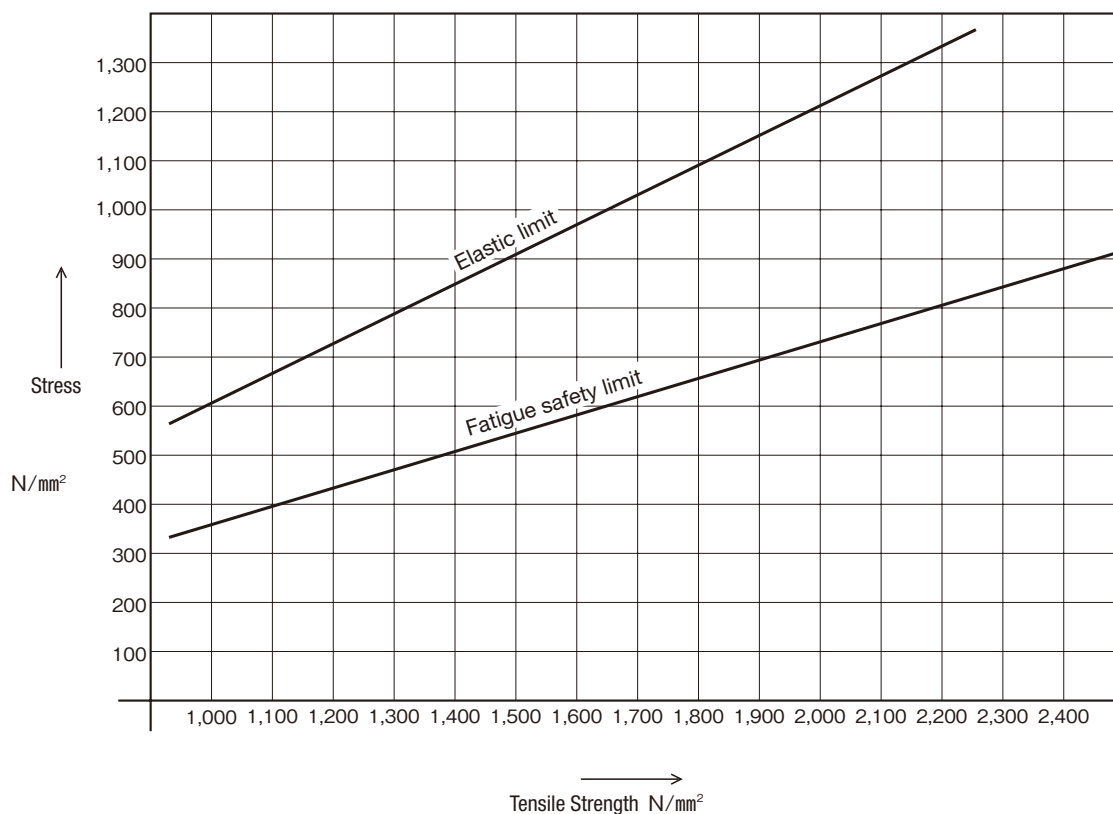
$$\delta = \frac{\pi(fs-fs_0)ND^2}{Gd} \quad P_0: \text{Initial tension} \quad fs_0: \text{Residual stress} \left(\frac{G}{100c}\right) \quad c: \text{Spring index} \left(\frac{D}{d}\right)$$

$$P_0 = \frac{\pi fs_0 d^3}{8D} \quad fs = \frac{\delta Gd}{\pi ND^2} + fs_0$$

Tensile Strength of Stainless Steel Wires for Springs (Type-B)

Wire Diameter	Tensile Strength N/mm ²	Wire Diameter	Tensile Strength N/mm ²	Wire Diameter	Tensile Strength N/mm ²
mm	Hard Drawn Steel Wires	mm	Hard Drawn Steel Wires	mm	Hard Drawn Steel Wires
0.10	2,150 - 2,400	0.45	1,950 - 2,200	1.80	1,650 - 1,900
0.12		0.50		2.00	
0.14		0.55		2.30	1,550 - 1,800
0.16		0.60		2.60	
0.18		0.65	2.90	1,450 - 1,700	
0.20		0.70	3.20		
0.23	2,050 - 2,300	0.80	1,850 - 2,100		3.50
0.26		0.90		4.00	
0.29		1.00		4.50	
0.32		1,750 - 2,000	1.20	5.00	
0.35			1.40	5.50	
0.40			1.60	6.00	

Spring Elastic Limit and Fatigue Safety Limit vs. Tensile Strength

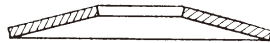


Disc Springs

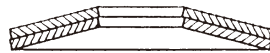
Disc springs (Belleville washers) are formed springs with a center hole. Disc springs are able to withstand heavy loads within a small area. Disc springs may be used independently or in combination to achieve desired loading capacities and spring characteristics.

1. Usage Examples

1) Single usage

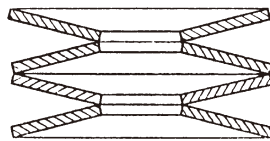


2) Stacking in parallel

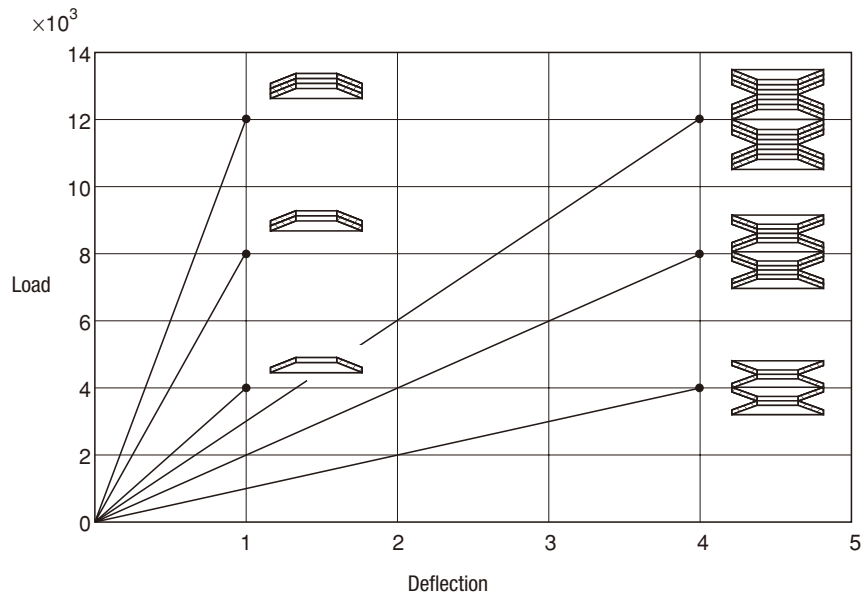


Suitable for applications that require high loading capacity with small deflection. Loading capacity increases in proportion to the number of disc springs stacked.

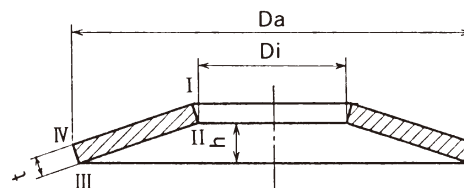
3) Stacking in series



Suitable for applications that require lower loading capacity with greater deflection. Deflection increases in proportion to the number of disc springs stacked.



Load/deflection characteristics of disc spring stacking



2. Disc Spring Calculation

1) Load and deflection calculations

$$P = \frac{4E}{1-\mu^2} \cdot \frac{t^4}{\alpha Da^2} \cdot \frac{f}{t} \left[\left(\frac{h}{t} - \frac{f}{t} \right) \left(\frac{h}{t} - \frac{f}{2t} \right) + 1 \right]$$

$$= 905,000 \frac{t^4}{\alpha Da^2} \cdot \frac{f}{t} \left[\left(\frac{h}{t} - \frac{f}{t} \right) \left(\frac{h}{t} - \frac{f}{2t} \right) + 1 \right] \text{ N}$$

$$\alpha = \frac{1}{\pi} \frac{\left(\frac{\delta-1}{\delta} \right)^2}{\frac{\delta+1}{\delta-1} - \frac{2}{\log \delta}}$$

	(Spring Steels)
E : Young's modulus	206,000 N/mm ²
μ : Poisson's ratio	0.3
$4E/1-\mu^2$:	905,000 N/mm ²
f : Deflection	
α : Calculation coefficient of the diameter ratio Da/Di	
δ : Da/Di	

2) Static Loading and Stress

$$\sigma I = 905,000 \frac{t^2}{\alpha \cdot Da^2} \cdot \frac{f}{t} \left[-\beta \left(\frac{h}{t} - \frac{f}{2t} \right) - \gamma \right]$$

β, γ : Calculation coefficient on diameter ratio Da/Di

$$\beta = \frac{1}{\pi} \cdot \frac{6}{\log_e \delta} \left(\frac{\delta - 1}{\log_e \delta} - 1 \right)$$

$$\gamma = \frac{1}{\pi} \cdot \frac{6}{\log_e \delta} \cdot \frac{\delta - 1}{2}$$

The following values serve as the allowable range of calculational stress “ σI ” at the point I.

1,900 to 2,500 N/mm² when $f=0.75h$

2,500 to 3,200 N/mm² when $f=h$

3) Dynamic Loading and Stress

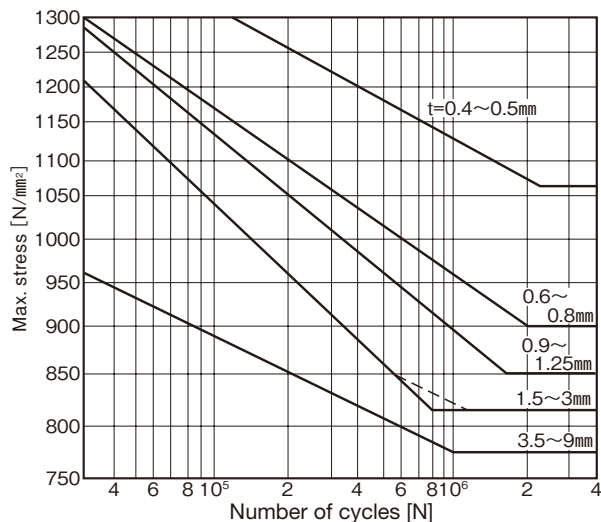
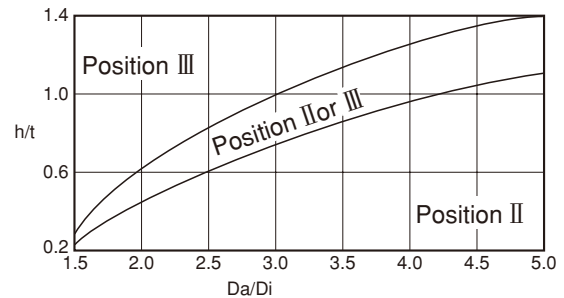
$$\sigma II = 905,000 \frac{t^2}{\alpha \cdot Da^2} \cdot \frac{f}{t} \left[-\beta \left(\frac{h}{t} - \frac{f}{2t} \right) + \gamma \right]$$

$$\sigma III = 905,000 \frac{t^2}{\alpha \cdot Da^2} \cdot \frac{f}{t} \cdot \frac{1}{\delta} \left[(2\gamma - \beta) \left(\frac{h}{t} - \frac{f}{2t} \right) + \gamma \right]$$

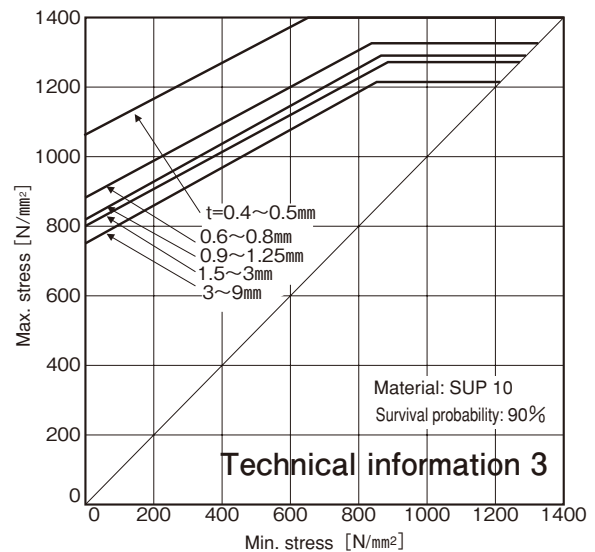
Find the stress range that occurs in “Position II or III” in the diagram to the right and calculate the value of stress using the formula above.

Since the number of stress cycles before fracture depends on maximum stress or stress amplitude, carefully determine the permissible stress.

A fatigue test result example is shown in the diagrams below.



S-N curve of pulsating fatigue test (SUP10; survival probability is 90%)



Permissible stress for dynamic loading [2×10⁶ times]

Wave Washers

Wave washers are ring-shaped, thin metal washers made with wave-like forms designed to achieve spring characteristics against compression; this enables gaining load capacity in limited spaces.

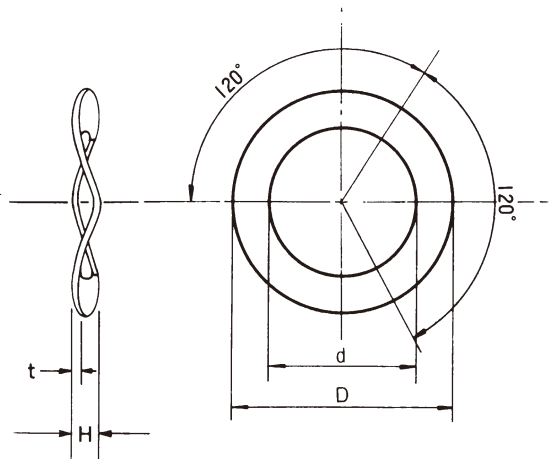
Our Wave Washers comply with JASO F302 Automotive Standard - Wave Washers (Wave Washers for Adjustments).

Calculations for Wave Washers

In wave washer calculations, a significant difference between calculated values and measured values usually exists. The number of waves or the inside-to-outside diameter ratio considerably affects the calculation, as well as the nonlinear change of spring rate of wave washers that occurs when close to their solid height, which makes it difficult to determine values at given points. If a wave washer is assumed to be a continuous beam and its number of waves is 3 or more, the following equation is given to describe the relation between deflection (δ) and load (W), and the stress(σ):

$$K = \frac{W}{\delta} = \frac{Ebt^3N^4}{1.94(dm)^3} \quad \sigma = \frac{12EtN^2\delta}{\pi^2(dm)^2}$$

K : Spring Rate (N/mm) N : Number of Waves
 W : Load (N) dm : Mean diameter (mm) = $\frac{D+d}{2}$
 δ : Deflection (mm) σ : Bend stress (N/mm²)
 E : Young's Modulus (N/mm²) D : External diameter (mm)
 b : Width (mm) = $\frac{D-d}{2}$ d : Internal diameter (mm)
 t : Thickness (mm)



Nevertheless, it is recommended to prepare and test a prototype to verify the calculated values.

- Free Height (H) in this Guide is calculated with the above formula with the stress at its solid height set as 4,000 N/mm².

- For actual applications, it is recommended to stay within the stress that ensures the free height. The suggested value of stress is 1800 N/mm².

- Attention shall be paid in use cases with greater stress, because the free height may be reduced as the spring settles.

Reference: Society of Automotive Engineers of Japan, *JASO F302 Automotive Standard - Wave Washers*

Spring Pins

Spring pins are pins made by rolling a strip of metal into a cylinder with a slot running along its length, which is then heat-treated. The free diameter of the pins is designed to be larger than the size of the holes where the pins are installed; in that way, spring force applies pressure radially to the interior wall of the hole when installed, providing its excellent retaining function against vibrations.

Their fine mechanical strength and light weight are some of the advantages of spring pins.

However, spring pins run the risk of fracture or breaking if the instructions for use shown below are not followed. Fixing both ends of a pin is a key rule. In usage cases where they are fixed on only one end, safety factors must be carefully considered to avoid double shear loads.

1. Instructions for Use

- 1) When making holes in components in which pins are to be installed, do not chamfer holes where shear load is to be applied.
- 2) Avoid using a pin to where the direction of vibration is parallel to the pin's axis.
- 3) For the shear plane of the pins, a minimum length must be maintained from the pin's end, equal to the diameter of the pin.
- 4) Mounting holes are, as a general rule, prepared by making holes in the parts in which pins are mounted. When drilling each part individually, diameter size variations shall be restricted to the amount by which the pin slots do not fully close.
- 5) Make sure to perform tests before use in places where significant impact load is expected.
- 6) The breaking strength of pins is slightly greater (approx. 6%) when the pin's slot is placed in line with the force than when pin's slot is placed square to it. As a result, be sure to take the direction the pin's slot faces into account when shearing strength is a consideration.

Shearing force direction			
Comparison	Approx. 106%		100%

- 7) Please contact us before use as a double-pin usage (two pins combined). (Refer to the next section.)

2. Using in Combination

You can combine pins so as to increase their shear strength. The shear strength of both pins is combined. It is best not to align the slots in the same direction in combining two pins.

How to combine pins



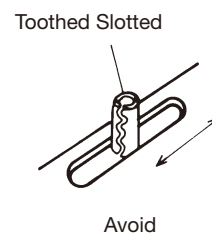
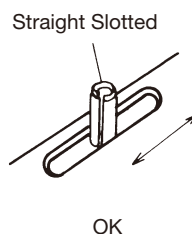
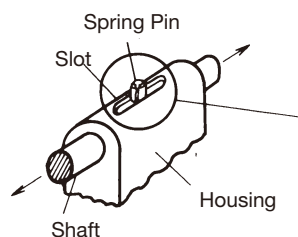
3. Comparison of Shear Strength

(1) Static Shear Strength

When comparing static shear strength of straight and toothed types, provided that the shear plane area is the same, the stress concentration at the base of the teeth causes a reduction in the shear strength of toothed type pins. However, this reduction is only by 2 to 3%.

(2) Dynamic Shear Strength and Load

Toothed type slotted pins are not suitable for use as stoppers, because the stress concentration caused by the load along the teeth tends to cause fractures even with extremely small amounts of force. Use straight type slotted pins to prevent this from happening.



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