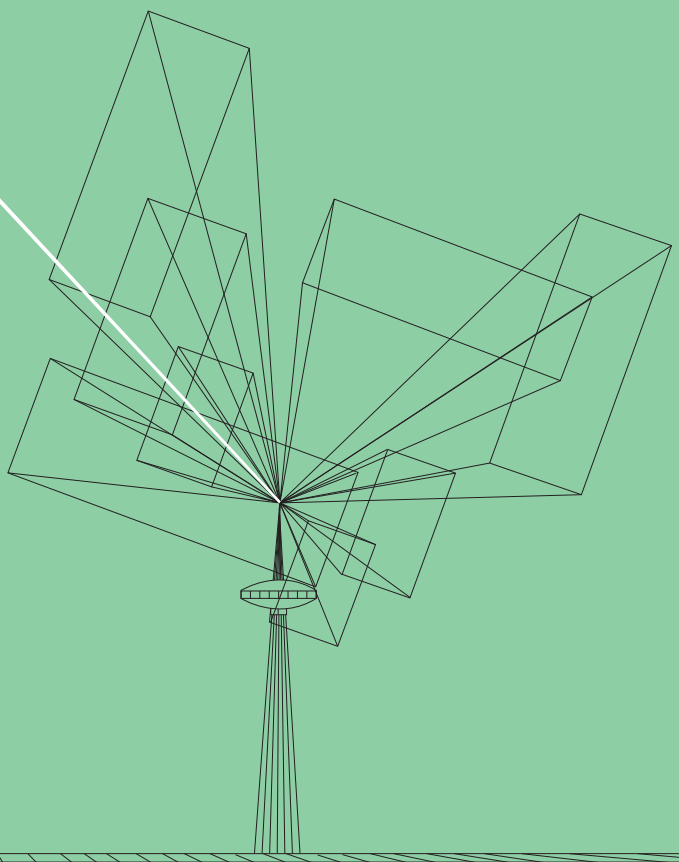
STANDARD PRODUCTS GUIDE

TAIYO
Stainless Spring Co.,Ltd.



J-VAC Japan Value-Added Certification Co. Ltd. Quality system

J-VAC Japan Value-Added Certification Co. Ltd. Environmental management system

TAIYO Stainless Spring Co.,Ltd.

NO.46
Vol. 3

Using This Catalog

- Products contained in this guide are for General Purpose/General Duty applications. For a listing of Taiyo Products, please refer to the table of contents. Please confirm stock availability prior to placing your order. Production of Insert Bushing are available on request (make to order).

- Dimensional Tolerance is based on Japan Industrial Standard (JIS). External diameter measurements are noted as a maximal value. Internal diameter measurements are noted as minimal values. For Geometric Tolerance requirements (parallelism, straightness, etc), please contact Taiyo Stainless Spring Co., Ltd. for specific information.
  (Note: JIS B 0024 Technical Drawings — Fundamental Tolerance Principle)

- Taiyo Stainless Spring Co., Ltd. has received certification for and maintains Quality and Environmental management system in accordance with ISO 900l and lSO 14001.

- Taiyo standardized products are manufactured to comply to the standardized products under JIS, JASO (Japanese Automobile Standards Organization) and DIN (Deutsche Industrie Normen).

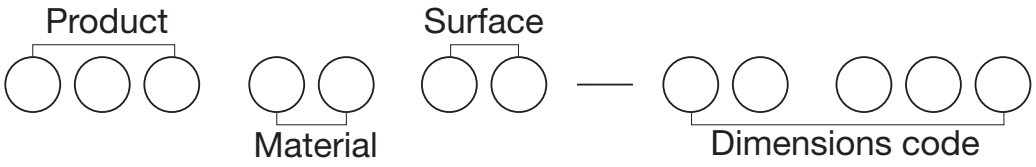
- Products causing the hydrogen embrittlement are not available after galvanizing.

- The description for plating is based on our original notation system, and is not described in compliance with JIS.

- All information contained in this guide are subject to change without previous notice. Please contact Taiyo Stainless Spring Co., Ltd. when specifying your application requirements.

Part Number Structure (Standardized Product Code)

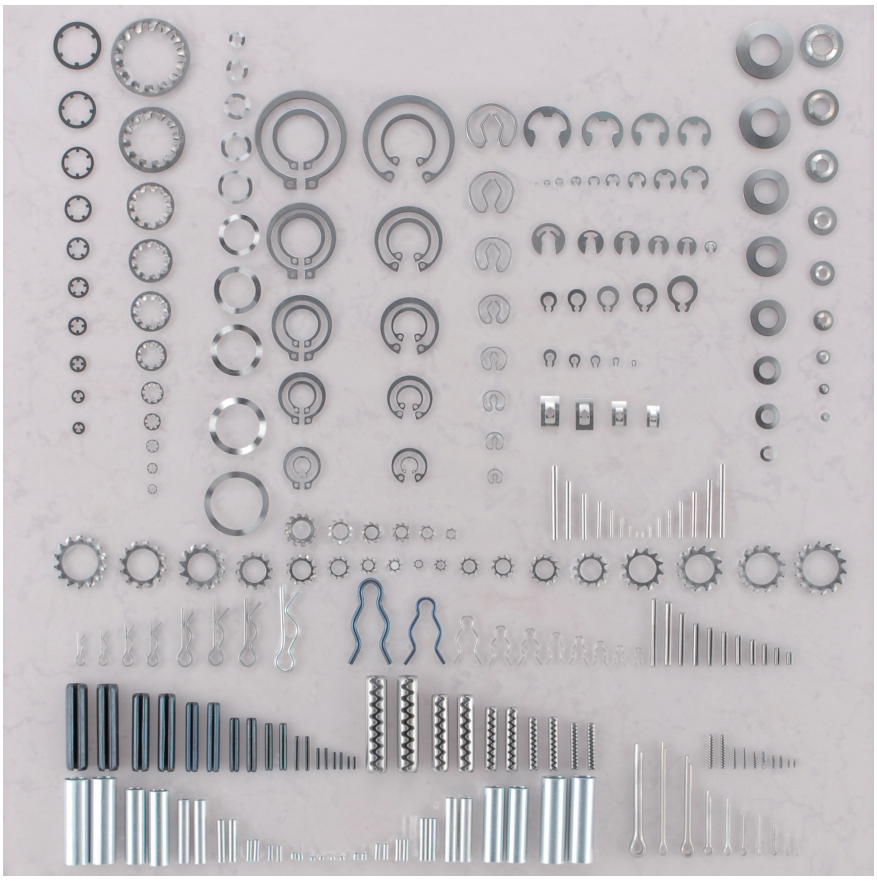
Each standardized product uses a twelve digits of part number (code). Please confirm the part number when placing your order.



Printed on Recycled Paper.

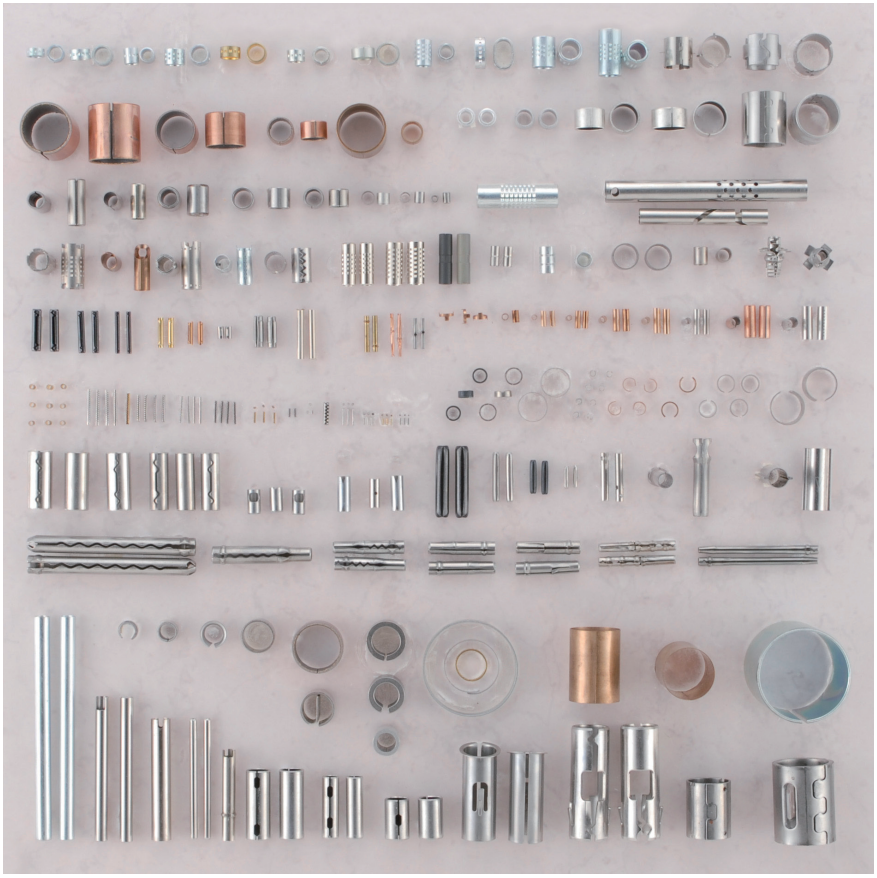
Standardized products

TAIYO Stainless Spring Co.,Ltd.



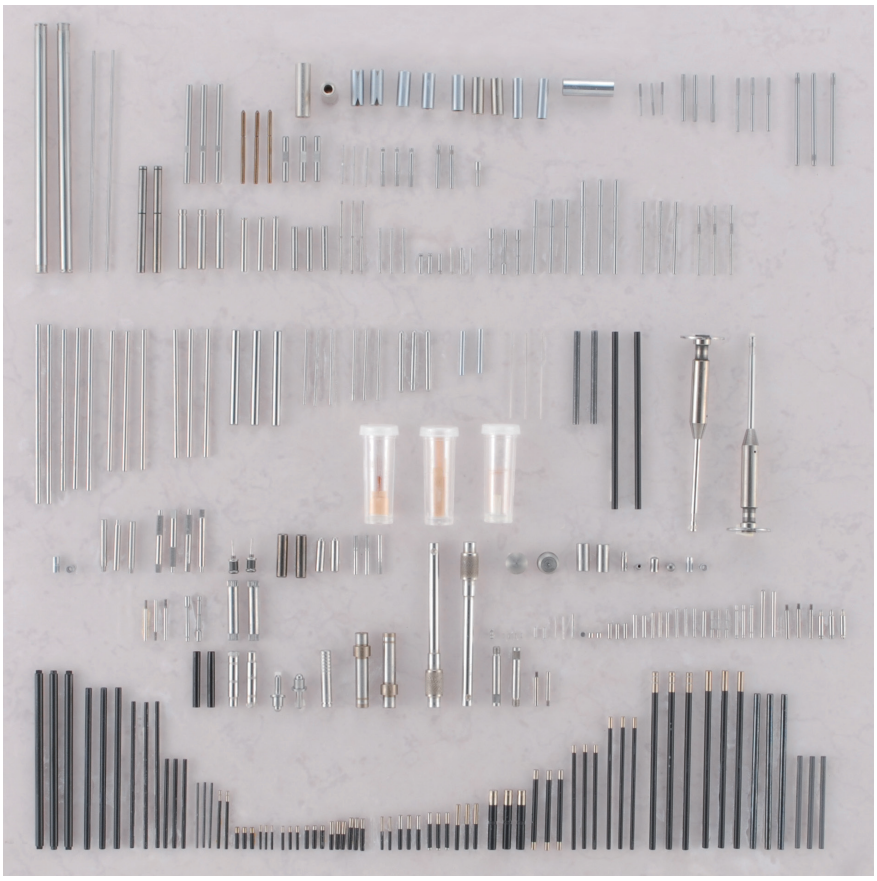
Custom-made products

Formed Product (Roll Bending)



TAIYO Stainless Spring Co.,Ltd.

Shaft Product



Formed Product (Press Work)

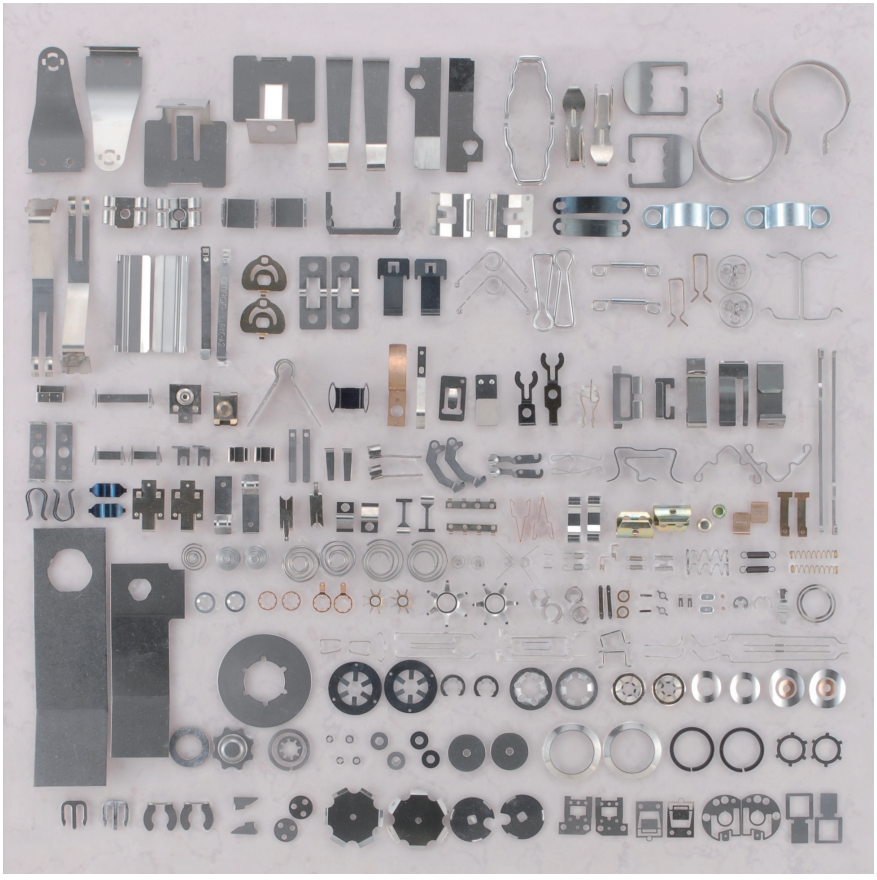


Table of Contents

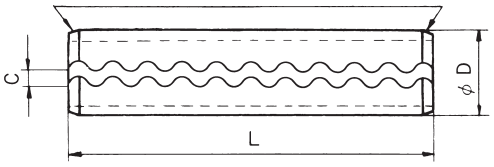
TAIYO Stainless Spring Co.,Ltd.

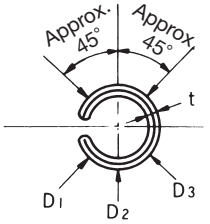
Toothed Slotted Spring Pins For General Purpose

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

TAIYO Stainless Spring Co.,Ltd.

Chamfer shapes per Taiyo's standard





Slot width "C" should be chosen safe from closely contact when spring pins are inserted. (exception: both ends of spring pins)

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	+1 0	○	○	○	○	○	○	○	○	○	○	○	○						
12		○	○	○	○	○	○	○	○	○	○	○	○	○					
13			○	○	○	○	○	○	○	○	○	○	○	○					
14			○	○	○	○	○	○	○	○	○	○	○	○	○	○			
15				○	○	○	○	○	○	○	○	○	○	○	○	○			
16				○	○	○	○	○	○	○	○	○	○	○	○	○	○		
17				○	○	○	○	○	○	○	○	○	○	○	○	○	○		
18				○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
19							○	○	○	○	○	○	○	○	○	○	○		
20							○	○	○	○	○	○	○	○	○	○	○	○	
22								○	○	○	○	○	○	○	○	○	○	○	○
23								○	○	○	○	○	○	○	○	○	○	○	○
24								○	○	○	○	○	○	○	○	○	○	○	○
25								○	○	○	○	○	○	○	○	○	○	○	○
26									○	○	○	○	○	○	○	○	○	○	○
27									○	○	○	○	○	○	○	○	○	○	○
28									○	○	○	○	○	○	○	○	○	○	○
30									○	○	○	○	○	○	○	○	○	○	○
32									○	○	○	○	○	○	○	○	○	○	○
34									○	○	○	○	○	○	○	○	○	○	○
36									○	○	○	○	○	○	○	○	○	○	○
38									○	○	○	○	○	○	○	○	○	○	○
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 at the end of this book "page T6".

Notes 1. Please ask our stock even described "○". Stock is changeable depending on supply and demand.
2. Customer specified dimensioning and material available upon request.
3. Scant supply of Stainless Steel over 2.5mm thick, Please confirm availability.

Product code	101	Material code	08···SUS420J2 70···Spring Steel
Surface code	01···Burnished (SUS420J2) 03···Temper Color (Spring Steel)	Hardness	HRC42 ~ 48 (SUS420J2) HRC45 ~ 53 (Spring Steel)

Part Number Structure (Standardized Product Code)

Example: φ4 × ℓ10

Product ① ⓪ ① Surface ○ ○ ○ ○ — ④ ⓪ ⓪ ① ⓪

Material Nominal Diameter Length

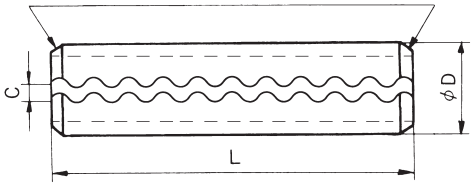
φ 10 leads nominal diameter 90.

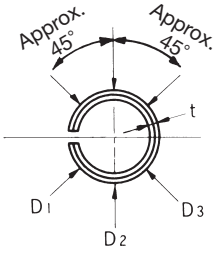
Toothed Slotted Spring Pins For Light Duty Use

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

TAIYO Stainless Spring Co.,Ltd.

Chamfer shapes per Taiyo's standard





Slot width "C" should be chosen safe from closely contact when spring pins are inserted. (exception: both ends of spring pins)

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
	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
Applicable Holes (Ref.)	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	+1 0	○	○	○	○	○	○	○	○	○	○	○	○	
12		○	○	○	○	○	○	○	○	○	○	○	○	○
13			○	○	○	○	○	○	○	○	○	○	○	○
14			○	○	○	○	○	○	○	○	○	○	○	○
15				○	○	○	○	○	○	○	○	○	○	○
16				○	○	○	○	○	○	○	○	○	○	○
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19							○	○	○	○	○	○	○	○
20							○	○	○	○	○	○	○	○
22							○	○	○	○	○	○	○	○
24							○	○	○	○	○	○	○	○
25							○	○	○	○	○	○	○	○
26							○	○	○	○	○	○	○	○
28							○	○	○	○	○	○	○	○
30							○	○	○	○	○	○	○	○
32									○	○	○	○	○	○
35										○	○	○	○	○
36										○	○	○	○	○
40											○	○	○	○
45												○	○	○
50													○	○
56	+1.5 0													○
60														○
63														○

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 at the end of this book "page T6".

Notes 1. Please ask our stock even described "○". Stock is changeable depending on supply and demand.
2. Customer specified dimensioning and material available upon request.

Product code	102	Material code	02…SUS304-CSP
Surface code	01…Burnished	Hardness	HRC 36 ～ 46

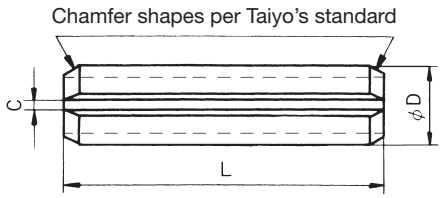
Part Number Structure (Standardized Product Code)

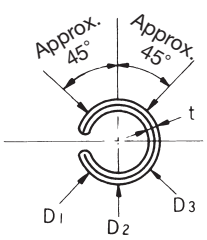
Example: φ4 × ℓ10

Product 102 — Surface 02 — Material 01 — Nominal Diameter 4 — Length 010

Straight Slotted Spring Pins For General Purpose

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





TAIYO Stainless Spring Co.,Ltd.

Slot width "C" should be chosen safe from closely contact when spring pins are inserted. (exception: both ends of spring pins)

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	+1 0	○	○	○	○	○	○	○	○	○	○	○	○	○					
12		○	○	○	○	○	○	○	○	○	○	○	○	○					
13		○	○	○	○	○	○	○	○	○	○	○	○	○					
14		○	○	○	○	○	○	○	○	○	○	○	○	○	○				
15				○	○	○	○	○	○	○	○	○	○	○	○	○			
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17					○	○	○	○	○	○	○	○	○	○	○	○	○		
18					○	○	○	○	○	○	○	○	○	○	○	○	○	○	
19							○	○	○	○	○	○	○	○	○	○	○	○	
20							○	○	○	○	○	○	○	○	○	○	○	○	
21								○	○	○	○	○	○	○	○	○	○	○	○
22								○	○	○	○	○	○	○	○	○	○	○	○
24								○	○	○	○	○	○	○	○	○	○	○	○
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26									○	○	○	○	○	○	○	○	○	○	○
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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 at the end of this book "page T6".

Notes 1. Please ask our stock even described "○". Stock is changeable depending on supply and demand.
2. Customer specified dimensioning and material available upon request.
3. Scant supply of Stainless Steel over 2.5mm thick, Please confirm availability.

Product code	103	Material code	08···SUS420J2 70···Spring Steel
Surface code	01···Burnished (SUS420J2) 03···Temper Color (Spring Steel)	Hardness	HRC42 ~ 48 (SUS420J2) HRC45 ~ 53 (Spring Steel)

Part Number Structure (Standardized Product Code)

Example: φ4 × ℓ10

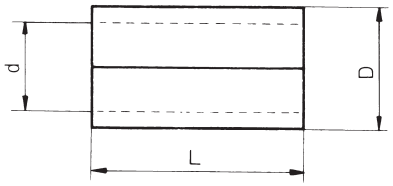
Product ① ⓪ ③ Surface ○ ○ ○ ○ — ④ ⓪ ⓪ ① ⓪

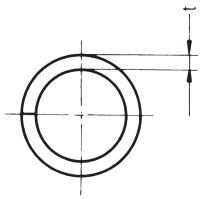
Material Nominal Diameter Length

φ 10 leads nominal diameter 90.

Spacer Parts (Rolled Bushing / Spacer Tube)

TAIYO Stainless Spring Co.,Ltd.





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 1. Internal diameter are measured by Pin Guage.

Notes 1. Please ask our stock even described "○". Stock is changeable depending on supply and demand.
2. Customer specified dimensioning and material available upon request.

Product code	338	Material code	23···SPC
Surface code	30···Ep-Fe ／ Zn 5 ／ trivalent CM 2 (trivalent chromate)	Hardness	

Part Number Structure (Standardized Product Code)

Example: ϕ4 × ℓ10

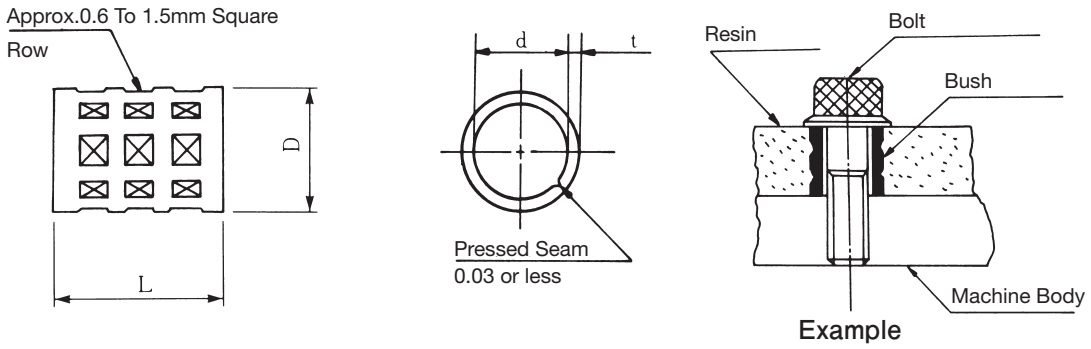
Product ③③⑧ Surface ②③③⓪ — ④⓪①⓪⓪

Material ② Nominal Diameter ④⓪ Length ①⓪⓪

ϕ 10 leads nominal diameter 90.

Insert Bushing (Make To Order)

TAIYO Stainless Spring Co.,Ltd.



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		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	4
12				4	4	4	4
13					5	5	5
14					5	5	5
15					6	6	6
16					6	6	6
17						7	7
18						7	7
19						8	8
20						8	8

Remarks
1. Indents are shaped square (fig.) usually, and 1/4t~1/2t in depth..
2. Nominal diameter also represents bolt's diameter.
3. Internal diameter are measured by pin gauge.
4. Rows are listed above.

Notes
1. Production of Insert Bushing are available on request (build to order).
2. Meshed or hick-joint indents are availabe.

Product code	139	Material code	23···SPC 44···Aℓ
Surface code	30···Ep-Fe ／ Zn 5 ／ trivalent CM 2 (trivalent chromate) (SPC) 01···Material texture (Aℓ)	Hardness	

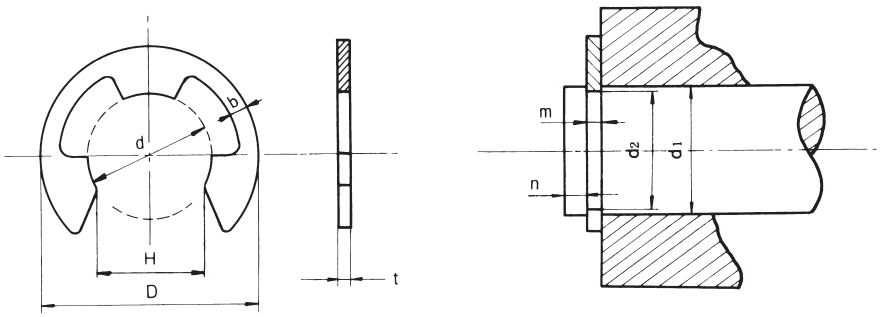
Part Number Structure (Standardized Product Code)

Product ① ③ ⑨ Surface ○ ○ ○ ○ — ○ ○ ○ ○ ○
Material Nominal Diameter Length

E-Type Retaining Rings / JIS / Stainless-Steel

JIS B 2804 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

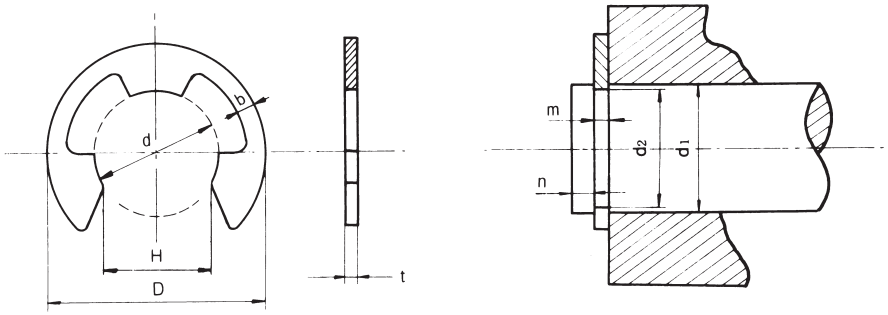
	Dimensions Code	Nominals	Applicable Shafts d_1	Dimensions of Retaining Rings									Groove Dimensions (Ref.)				
				Internal Diameter d		External Diameter D		H		Thickness t		b Approx.	Groove Diameter D		Groove Width m		n Min.
※	11008	0.8	1～1.4	0.8	0 −0.08	2	±0.1	0.7	0 −0.25	0.2	±0.02	0.3	0.8	+0.05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

Notes ※: Stacked package versions are also available (product code is 145 and first two digit of dimensions code change into 45)

Product code	111	**Material code**	02…SUS304-CSP 04…SUS316	**Part Number Structure (Standardized Product Code)**
Surface code	01…Burnished	**Hardness**	HRC37 ～ 46 (SUS304-CSP) HRC35 ～ 46 (SUS316)	Product: ①①① Surface: ⓪① — Material: ◯◯ Dimensions code: ◯◯◯◯◯

E-Type Retaining Rings / JIS / Spring Steel

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

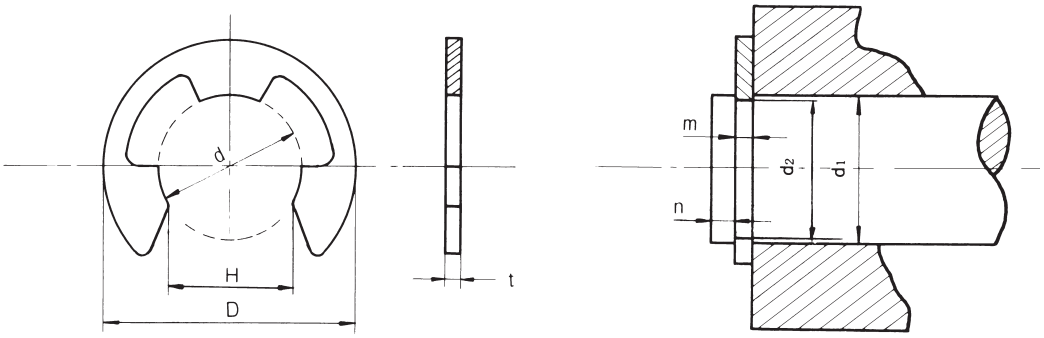
	Dimensions Code	Nominals	Applicable Shafts d_1	Dimensions of Retaining Rings									Groove Dimensions (Ref.)				
				Internal Diameter d		External Diameter D		H		Thickness t		b Approx.	Groove Diameter D		Groove Width m		n Min.
	11008	0.8	1～1.4	0.8	$^{0}_{-0.08}$	2	±0.1	0.7	$^{0}_{-0.25}$	0.2	±0.02	0.3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

NOTES ※: Stacked package versions are also available (product code is 245 and first two digit of dimensions code change into 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 ② ① ① Material ⑦ ⓪ Surface ○ ○ — ○ ○ ○ ○ ○ Dimensions code	

E-Type Retaining Rings / Taiyo Standard-A

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

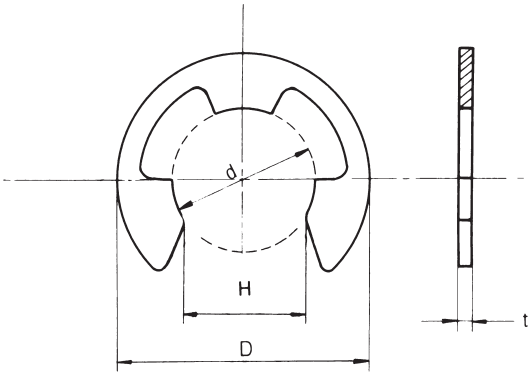
	Dimensions Code	Nominals	Applicable Shafts d_1	Dimensions of Retaining Rings								Groove Dimensions (Ref.)			
				Internal Diameter d		External Diameter D		H		Thickness t		Groove Diameter d_2		With m	n Min.
※	12013	1.3	1.5～2	1.3	0 −0.07	5	±0.1	1	±0.05	0.4	±0.05	1.3	+0.05 0	0.5	1
※	12913	1.3S	1.5～2	1.3		3.7		1		0.25	±0.03	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		1.5	±0.05	0.5	±0.05	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	±0.2	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	0 −0.1	7.2		2.3	±0.1	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		0.5		3.6		0.6	
	12037	3.7	5～7	3.7		8.5		3		0.65	±0.05	3.7		0.75	
	12038	3.8	5～7	3.8		10.5		2.4	±0.1	0.5		3.8	+0.1 0	0.6	1.2
※	12040	4.0	6～8	4		10		3.3		0.6		4		0.7	
	12041	4.1	7～9	4.1		11	±0.3	3.6		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	0 −0.12	12		4.9		0.6		6		0.7	
	12070	7.0	8～11	7	0 −0.13	14		5.7		0.9		7		1	1.5
	12076	7.6	9～12	7.6		16.8		6.2	±0.15	0.7		7.6		0.8	
	12080	8.0	9～12	8		16		6.5		1		8		1.2	1.8
	12090	9.0	10～14	9		18.5		7.7		1		9		1.2	
	12120	12.0	13～18	12		24		10.4		1		12		1.2	
	12146	14.6	15.5～20	14.6	0 −0.15	28.4		12.5		1.2	±0.06	14.7	+0.15 0	1.4	2
	12209	20.9	22～26	20.9		38		17		1.2		21		1.4	

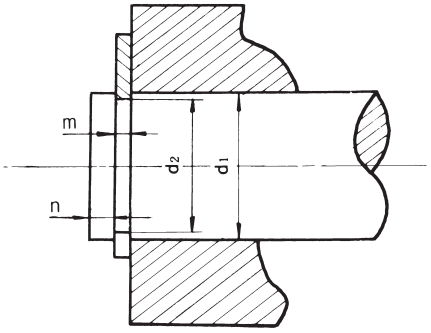
Notes ※: Stacked package versions are also available (product code is 146 and first two digit of dimensions code change into 46)

Product code	112	**Material code**	02…SUS304-CSP	**Part Number Structure (Standardized Product Code)**
Surface code	01…Burnished	**Hardness**	HRC 37 ～ 46	Product ① ① ② Surface ⓪ ② ⓪ ① — ○ ○ ○ ○ ○ Material / Dimensions code

E-Type Retaining Rings / Taiyo Standard-B

TAIYO Stainless Spring Co.,Ltd.





Unit : mm

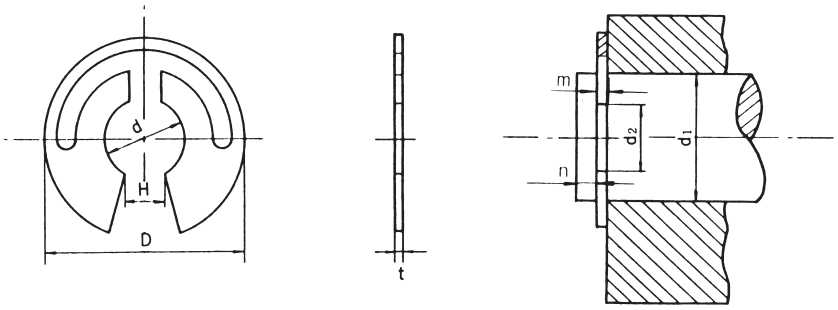
	Dimensions Code	Nominals	Applicable Shafts d_1	Dimensions of Retaining Rings							Groove Dimensions (Ref.)				
				Internal Diameter d		External Diameter D	H		Thickness t		Groove Diameter d_2		With m		n Min.
	13007	0.7	1～1.2	0.65	+0.02 −0.07	2	0.59	+0.02 −0.15	0.2	±0.03	0.7	+0.05 0	0.25	+0.05 0	0.4
※	13010	1	1.3～1.7	0.95	+0.05 −0.07	2.8	0.86		0.2		1		0.25		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	+0.02 −0.18	0.4		1.7		0.45		0.8
※	13020	2	2.4～3	1.95		4.6	1.7		0.5		2		0.55		1
※	13024	2.4	2.9～3.8	2.35		6	2		0.6	±0.04	2.4		0.68	+0.07 0	1
※	13028	2.8	3.3～4.2	2.74		6.5	2.44	+0.02 −0.2	0.6		2.8		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		0.7		3.7		0.78		1.2
※	13040	4	4.8～6.3	3.93	+0.07 −0.1	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	+0.05 −0.25	0.7		5		0.78		1.2
	13058	5.8	6.6～8.2	5.73		12	5		0.7		5.8		0.78		1.2
	13060	6	6.9～8.6	5.93		12.7	5.2		0.9	±0.05	6	+0.07 0	1	+0.08 0	1.2
※	13064	6.4	7.3～9.1	6.32		13.5	5.6	+0.08 −0.25	0.9		6.4		1		1.2
	13074	7.4	8.4～10.3	7.31		15	6.3	+0.1 −0.3	0.9		7.4		1		1.5
	13080	8	9.2～11.3	7.91		16.5	6.9		1		8		1.1		1.7

Notes ※: Stacked package versions are also available (product code is 147 and first two digit of dimensions code change into 47)

Product code	113	**Material code**	02…SUS304-CSP	**Part Number Structure (Standardized Product Code)**	
Surface code	01…Burnished	**Hardness**	HRC 37～46	Product: ①①③ Surface: ⓪②⓪① Material: ⓪② — ○○○○○ Dimensions code	

TAIYO Stainless Spring Co.,Ltd.

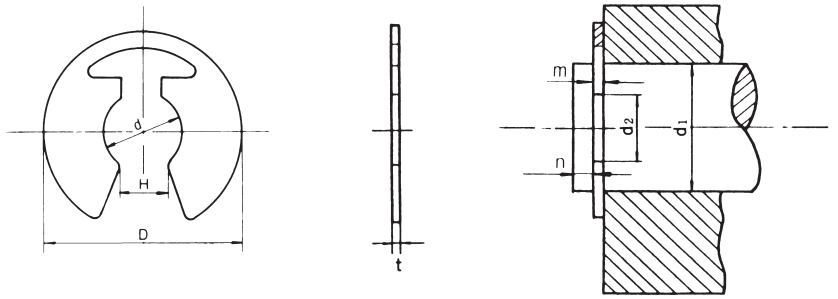
Model-A



Unit : mm

Dimensions Code	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	$1.5\ ^{0}_{-0.1}$	$5\ \pm0.2$	$1.07\ ^{0}_{-0.25}$	$0.4\ \pm0.03$	$1.5\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1
14020	2	2.5~4	$2\ ^{0}_{-0.1}$	$6\ \pm0.2$	$1.45\ ^{0}_{-0.25}$		$2\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1
14064	6.4	7.3~9	$6.3\ \pm0.1$	$16\ \pm0.2$	$5.6\ ^{0}_{-0.3}$		$6.4\ ^{+0.07}_{0}$	$0.5\ ^{+0.1}_{0}$	1.2

Model-B



Unit : mm

Dimensions Code	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	$1.3\ ^{0}_{-0.1}$	$6\ \pm0.2$	$1.1\ \pm0.05$	$0.4\ \pm0.03$	$1.3\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1
14016	1.6	2~3	$1.6\ ^{0}_{-0.1}$	$6\ \pm0.2$	$1.2\ ^{+0.1}_{0}$		$1.6\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1
14025	2.5	3.2~4	$2.5\ ^{0}_{-0.1}$	$9.5\ \pm0.2$	$2.3\ ^{0}_{-0.1}$		$2.5\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1
14030	3	4~5	$3\ ^{0}_{-0.1}$	$10\ \pm0.2$	$2.7\ \pm0.05$		$3\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1
14040	4	5~7	$4\ ^{0}_{-0.1}$	$12.5\ \pm0.2$	$3.2\ \pm0.07$		$4\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1.2
14043	4.3	5~7	$4.3\ ^{0}_{-0.1}$	$12.5\ \pm0.2$	$4\ \pm0.07$		$4.3\ ^{+0.06}_{0}$	$0.5\ ^{+0.1}_{0}$	1.2

Product code	114	Material code	02…SUS304-CSP
Surface code	01…Burnished	Hardness	HRC 37 ~ 46

Part Number Structure (Standardized Product Code)

Product Surface

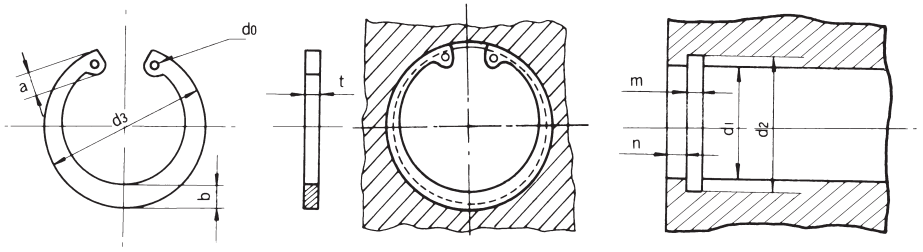
① ① ④ 0 ② 0 ① — ○ ○ ○ ○ ○

Material Dimensions code

C-Type Retaining Rings For Holes （Nominals φ10 ～ φ63）

JIS B 2804 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

Dimensions Code	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	+0.14 0	1.5
17011	11	11.8					3.2		5.22	11.4				
17012	12	13					3.3	1.5	5.69	12.5				
17013	13	14.1					3.5		6.16	13.6				
17014	14	15.1				2	3.6	1.7	6.67	14.6				
17015	15	16.2					3.6		7.18	15.7				
17016	16	17.3					3.7		7.65	16.8				
17017	17	18.3	±0.2				3.8		8.08	17.8				
17018	18	19.5				2.5	4.0		8.55	19	+0.21 0			
17019	19	20.5					4.0	2	9.10	20				
17020	20	21.5					4.0		9.57	21				
17021	21	22.5					4.1		10.20	22				
17022	22	23.5					4.1		12.71	23				
17024	24	25.9		1.2	±0.06		4.3		13.81	25.2		1.35		
17025	25	26.9				3	4.4		14.59	26.2				
17026	26	27.9					4.6		15.38	27.2				
17028	28	30.1	±0.25				4.6		16.24	29.4				
17030	30	32.1					4.7		17.26	31.4	+0.25 0			
17032	32	34.4				3.5	5.2		19.30	33.7				2
17034	34	36.5		1.5			5.2		24.32	35.7		1.65		
17035	35	37.8					5.2		25.11	37				
17036	36	38.8					5.2		25.89	38				
17037	37	39.8					5.2		26.83	39				
17038	38	40.8				4	5.3		27.46	40				
17040	40	43.5	±0.4	1.75	±0.07		5.7		32.01	42.5		1.90		
17042	42	45.5					5.8		35.70	44.5				
17045	45	48.5				4.5	5.9		37.78	47.5				
17047	47	50.5	±0.45				6.1	2.5	39.62	49.5				
17048	48	51.5					6.2		40.80	50.5	+0.3 0			
17050	50	54.2		2			6.5		48.05	53		2.2		
17052	52	56.2				5.1	6.5		50.21	55				
17055	55	59.2					6.5		53.35	58				
17056	56	60.2					6.6		54.52	59				
17058	58	62.2					6.8		56.09	61				
17060	60	64.2				5.5	6.8		57.66	63				
17062	62	66.2					6.9		60.41	65				
17063	63	67.2					6.9		61.98	66				

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TAIYO Stainless Spring Co.,Ltd.

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Unit : mm

Dimensions Code	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	+0.3 0	2.7	+0.14 0	2.5
17068	68	72.5				6	7.4		81.59	71				
17070	70	74.5					7.4		84.34	73				
17072	72	76.5				6.6	7.4		86.30	75				
17075	75	79.5					7.8		91.01	78				
17078	78	82.5	±0.55				8		94.14	81	+0.35 0			
17080	80	85.5				7	8		96.50	83.5				
17082	82	87.5					8	3	98.85	85.5				
17085	85	90.5		3	±0.09		8		122.39	88.5		3.2	+0.18 0	3
17088	88	93.5				7.6	8.2		127.09	91.5				
17090	90	95.5					8.3		130.23	93.5				
17092	92	97.5				8	8.3		131.80	95.5				
17095	95	100.5					8.5		138.86	98.5				
17098	98	103.5				8.3	8.7		141.22	101.5				
17100	100	105.5					8.8		142.00	103.5				
17102	102	108		4	±0.10	8.9	9		196.13	106	+0.54 0	4.2		4
17105	105	112					9.1		200.84	109				
17108	108	115					9.5		210.25	112				
17110	110	117					10.2		211.82	114				
17112	112	119					10.2		214.96	116				
17115	115	122	±0.65			9.5	10.2		221.24	119				
17120	120	127					10.7		231.44	124	+0.63 0			
17125	125	132				10	10.7	3.5	240.07	129				
17130	130	137	+1.26 −0.63				10.7		252.62	134			+0.2 0	6
17135	135	142				10.8	11		258.90	139				
17140	140	147					11		271.45	144				
17145	145	152					11		279.29	149				
17150	150	158				11.5	11.8		290.28	155				7.5
17155	155	164					11.8		299.69	160				
17160	160	169				12	12.5		307.54	165				
17165	165	174.5					12.7		320.09	170				
17170	170	179.5						4.0	333.43	175				
17175	175	184.5	+1.44 −0.72			12.5			337.35	180	+0.72 0			
17180	180	189.5				13			345.19	185				
17185	185	194.5				13.5			356.96	190				
17190	190	199.5							368.73	195				
17195	195	204.5							373.44	200				
17200	200	209.5				14			376.58	205				

Remarks 1. Thrust load will change according to material and Hardness of shafts.
2. Thrust load are calculated by safe factor 4.

Notes 1. Equate quality of stainless material with SUS-304CSP when thickness was not specified within JIS (JIS G 4313 Stainless Spring Steels).

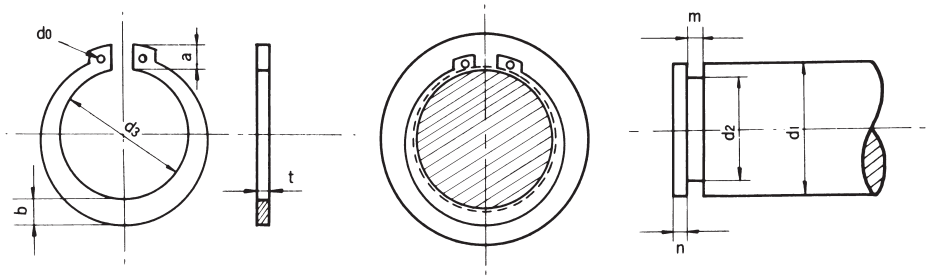
Product code	117	Material code	02…SUS304-CSP
Surface code	01…Burnished	Hardness	HRC 37 ～ 46

Part Number Structure (Standardized Product Code)

Product 1 1 7 — Surface 0 2 — Material 0 1 — ○ ○ ○ ○ ○ Dimensions code

C-Type Retaining Rings For Shafts （Nominals ϕ10 ～ ϕ63） JIS B 2804 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

Dimensions Code	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	0 −0.09	1.15	+0.14 0	1.5
18011	11	10.2				1.8	3.1		5.27	10.5	0 −0.11			
18012	12	11.1	±0.18				3.2	1.5	5.69	11.5				
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		8.24	15.2				
18017	17	15.7					3.7		8.39	16.2				
18018	18	16.5		1.2	±0.06	2.6	3.8		10.71	17		1.35		
18019	19	17.5				2.7	3.8	2	11.22	18				
18020	20	18.5	±0.2				3.9		11.61	19	0 −0.21			
18021	21	19.5					4		12.16	20				
18022	22	20.5					4.1		12.94	21				
18024	24	22.2				3.1	4.2		13.89	22.9				
18025	25	23.2					4.3		14.51	23.9				
18026	26	24.2					4.4		14.98	24.9				
18028	28	25.9		1.5			4.6		20.40	26.6		1.65		
18029	29	26.9				3.5	4.7		21.14	27.6				
18030	30	27.9					4.8		21.93	28.6				
18032	32	29.6					5		23.14	30.3				
18034	34	31.5	±0.25			4	5.3		24.63	32.3				
18035	35	32.2					5.4		25.50	33				
18036	36	33.2		1.75	±0.07		5.4		31.38	34		1.90		2
18038	38	35.2				4.5	5.6		32.17	36				
18040	40	37.0	±0.4				5.8		33.73	38	0 −0.25			
18042	42	38.5					6.2		36.48	39.5				
18045	45	41.5				4.8	6.3		37.78	42.5				
18048	48	44.5					6.5	2.5	40.80	45.5				
18050	50	45.8		2		5	6.7		48.05	47		2.2		
18052	52	47.8					6.8		50.21	49				
18055	55	50.8	±0.45				7		53.35	52	0 −0.3			
18056	56	51.8					7		54.52	53				
18058	58	53.8				5.5	7.1		56.09	55				
18060	60	55.8					7.2		57.66	57				
18062	62	57.8					7.2		60.41	59				
18063	63	58.8					7.3		61.19	60				

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TAIYO Stainless Spring Co.,Ltd.

Continued from previous page

Unit : mm

Dimensions Code	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.
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	7.9		87.08	69				
18075	75	70.5					7.9		90.22	72				
18078	78	73.5				7.4	8.1		94.14	75				
18080	80	74.5					8.2		96.50	76.5				
18082	82	76.5					8.3	3	98.85	78.5				
18085	85	79.5		3	±0.09	8	8.4		122.39	81.5	0 −0.35	3.2	+0.18 0	3
18088	88	82.5	±0.55				8.6		127.09	84.5				
18090	90	84.5					8.7		130.23	86.5				
18095	95	89.5				8.6	9.1		138.86	91.5				
18100	100	94.5				9	9.5		142.00	96.5				
18105	105	98.0		4	±0.10	9.5	9.8		200.84	101	0 −0.54	4.2		4
18110	110	103					10		211.82	106				
18115	115	108					10.5		221.24	111				
18120	120	113				10.3	10.9		231.44	116				
18125	125	118					11.3	3.5	240.07	121	0 −0.63			
18130	130	123	+0.63 −1.26			11	11.5		252.62	126			+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	11.8		279.29	141				
18150	150	142					12.3		290.28	145				7.5
18155	155	146				12.2	12.7		299.69	150				
18160	160	151					12.9		307.54	155				
18165	165	155.5				12.9	13.1		320.09	160				
18170	170	160.5						4.0	333.43	165				
18175	175	165.5							337.35	170				
18180	180	170.5				13.5			345.19	175				
18185	185	175.5	+0.72 −1.44						356.96	180				
18190	190	180.5				14			368.73	185	0 −0.72			
18195	195	185.5							376.58	190				
18200	200	190.5							388.34	195				

Remarks 1. Thrust load will change according to material and Hardness of shafts.
2. Thrust load are calculated by safe factor 4.

Notes 1. Equate quality of stainless material with SUS-304CSP when thickness was not specified within JIS (JIS G 4313 Stainless Spring Steels).

Product code	118	Material code	02…SUS304-CSP
Surface code	01…Burnished	Hardness	HRC 37 ～ 46

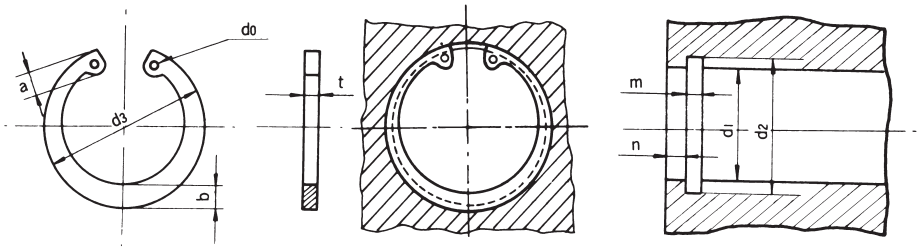
Part Number Structure (Standardized Product Code)

Product ① ① ⑧ 0 ② 0 ① — ○ ○ ○ ○ ○ Surface

Material Dimensions code

Small Diameter C-Type Retaining Rings For Holes

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

Dimensions Code	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.
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		0.6		1.0	2.1	1.0	3,138	10.0	±0.05	0.7		

Product code	150	Material code	02···SUS304-CSP
Surface code	01···Burnished	Hardness	HRC 37 ～ 46

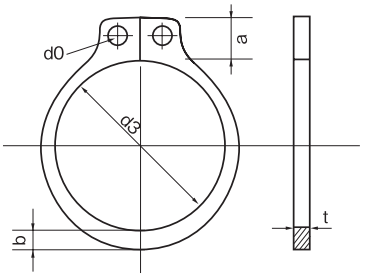
Part Number Structure (Standardized Product Code)

Product ① ⑤ ⓪ Material ⓪ ② Surface ⓪ ① — ○○○○○ Dimensions code

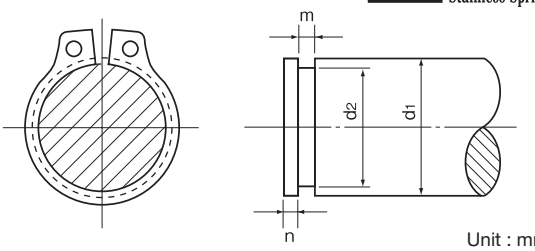
Small Diameter C-Type Retaining Rings For Shafts

Nominals 3.2 ～ 8

Nominals 9.0



TAIYO Stainless Spring Co.,Ltd.



Unit : mm

Dimensions Code	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.
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	1.0
51015	4.0	3.6				0.7	1.4		471	3.8	±0.06			
51018	4.8	4.2		0.4	±0.04	1.1	1.4		785	4.5		0.45		1.5
51019	5.0	4.5				0.7	1.4		863	4.7				
51023	6.0	5.5				0.8	2.0		1,098	5.7				
51027	7.0	6.3		0.65		0.9	2.0		2,275	6.5		0.7		
51031	8.0	7.1				1.0	2.2		2,589	7.4				
51035	9.0	8.1					2.2	1.0	2,903	8.4				

Product code	151	Material code	02···SUS304-CSP
Surface code	01···Burnished	Hardness	HRC 37 ～ 46

Part Number Structure (Standardized Product Code)

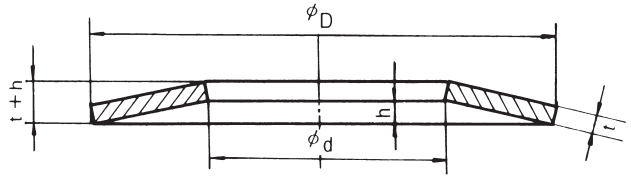
Product ① ⑤ ① Material ⓪ ② Surface ⓪ ① — ○○○○○ Dimensions code

Remarks 1. Thrust load are calculated by safe factor 4.

Disc Springs For Heavy Duty

DIN 2093
JIS B 2706 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



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

Unit : mm

	Nominals JIS	Dimensions Code	Nominals No.	Nominals now-defunct JIS	Internal Diameter d	Tolerance	External Diameter D	Tolerance	Thickness t	Height h	Height t+h	Tolerance	f=0.75h(Ref.) Spring Force P N	Deformed Length =0.75h mm	Maximam Stress σ N / mm²
	8	22001	1	4	4.2	+0.15 0	8	0 −0.15	0.4	0.2	0.6	±0.1	205.9	0.15	1,216.0
	10	22002	2	5	5.2		10		0.5	0.25	0.75		323.6	0.19	1,216.0
	12.5	22003	3	6	6.2		12.5	0 −0.2	0.7	0.3	1		657.1	0.22	1,382.7
	14	22004	4	7	7.2		14		0.8	0.3	1.1		794.3	0.22	1,304.3
	16	22005	5	8	8.2		16		0.9	0.35	1.25		1,029.7	0.26	1,333.7
	18	22006	6	9	9.2		18		1	0.4	1.4	±0.15	1,274.9	0.3	1,323.9
	20	22007	7	10	10.2	+0.2 0	20	0 −0.25	1.1	0.45	1.55		1,520	0.34	1,284.7
※	22.5	22008	8	11	11.2		22.5		1.25	0.5	1.75		1,931.9	0.37	1,294.5
※	25	22009	9	12	12.2		25		1.5	0.55	2.05		2,922.4	0.41	1,422.0
※	28	22010	10	14	14.2		28		1.5	0.65	2.15		2,843.9	0.49	1,274.9
※	31.5	22011	11	16	16.3		31.5	0 −0.3	1.75	0.7	2.45		3,873.6	0.52	1,294.5
	35.5	22012	12	18	18.3	+0.25 0	35.5		2	0.8	2.8		5,197.5	0.6	1,333.7
※	40	22013	13	20	20.4		40		2.25	0.9	3.15		6,501.8	0.67	1,323.9
	45	22014	14	22	22.4		45		2.5	1	3.5	±0.2	7,698.2	0.75	1,294.5
	50	22015	15	25	25.4		50		3	1.1	4.1		11,964	0.82	1,422.0
	56	22016	16	28	28.5		56	0 −0.35	3	1.3	4.3		11,376	0.97	1,265.1
	63	22017	17	30	31	+0.3 0	63		3.5	1.4	4.9		15,004	15	1,294.5
	71	22018	18	—	36	+0.5 0	71	0 −0.5	4	1.6	5.6	+0.4 −0.2	20,545	1.2	1,333.7
	80	22019	19	—	41		80		5	1.7	6.7		33,588	1.3	1,451.4
	90	22020	20	—	46		90		5	2	7		31,411	1.5	1,294.5
	100	22021	21	—	51	+0.6 0	100	0 −1	6	2.2	8.2	+0.55 −0.25	48,013	1.65	1,422.0
	112	22022	22	—	57		112		6	2.5	8.5		43,757	1.9	1,235.6
	125	22023	23	—	64		125		8	2.6	10.6	+0.6 −0.25	85,975	1.9	1,471.0
	140	22024	24	—	72	+1 0	140		8	3.2	11.2		85,347	2.4	1,372.9
	160	22025	25	—	82		160	0 −1.2	10	3.5	13.5	+0.7 −0.35	138,333	2.5	1,480.8
	180	22026	26	—	92		180		10	4	14		125,623	3	1,294.5

Remarks
1. Spring force of SUS304 will be approx. 90% of above mentioned of Spring Steel.
2. Maximum stress is determined by the value of the maximal tensile stress that occurs at the bottom fringe of the disc spring.
3. ※: Height, thickness and other specifications are different from JIS.
4. Refer to technical information at the end of this book "page T3 and 4".

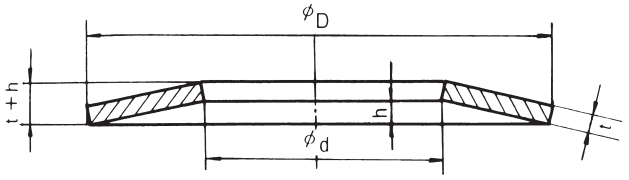
Notes
1. Equate quality of stainless material with SUS-304CSP when thickness was not specified within JIS (JIS G 4313 Stainless Spring Steels).
2. Please contact us if any inquiry of Stainless Steel over 6 mm thickness. This thickness is a special supply.

Product code	122	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) HRC43～50 (Spring Steel)	Product ①②② Surface ○○○○ — ○○○○○ Material / Dimensions code

Disc Springs For Light Duty

DIN 2093
JIS B 2706 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



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

Unit : mm

	Nominals	Dimensions Code	Nominals	Nominals now-defunct	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	Maximam Stress σ N / mm²
	JIS	23001	No.	JIS	4.2	+0.15 0	8	0 −0.15	0.3	0.25	0.55	±0.1	117.7	0.19	1,314.1
	10	23002	2	5	5.2		10		0.4	0.3	0.7		205.9	0.22	1,284.7
	12.5	23003	3	6	6.2		12.5	0 −0.2	0.5	0.35	0.85		294.2	0.26	1,108.2
	14	23004	4	7	7.2		14		0.5	0.4	0.9		274.6	0.3	1,098.3
	16	23005	5	8	8.2		16		0.6	0.45	1.05		411.9	0.34	1,108.2
	18	23006	6	9	9.2		18		0.7	0.5	1.2		568.8	0.37	1,108.2
	20	23007	7	10	10.2	+0.2 0	20	0 −0.25	0.8	0.55	1.35		745.3	0.41	1,118.0
	22.5	23008	8	11	11.2		22.5		0.8	0.65	1.45		706.1	0.49	1,078.7
	25	23009	9	12	12.2		25		0.9	0.7	1.6		863.0	0.52	1,019.9
	28	23010	10	14	14.2		28		1	0.8	1.8	±0.15	1,127.8	0.6	1,108.2
※	31.5	23011	11	16	16.3	+0.25 0	31.5	0 −0.3	1.25	0.9	2.15		1,912.3	0.67	1,186.6
※	35.5	23012	12	18	18.3		35.5		1.25	1	2.25		1,696.6	0.75	1,068.9
※	40	23013	13	20	20.4		40		1.5	1.15	2.65		2,618.4	0.86	1,137.6
※	45	23014	14	22	22.4		45		1.75	1.3	3.05		3,648.1	0.97	1,147.4
	50	23015	15	25	25.4		50		2	1.4	3.4		4,765.2	1.05	1,147.4
	56	23016	16	28	28.5		56	0 −0.35	2	1.6	3.6		4,462.0	1.2	1,098.3
	63	23017	17	30	31	+0.3 0	63		2.5	1.75	4.25	±0.2	7,207.9	1.3	1,088.5
	71	23018	18	35	36		71		2.5	2	4.5		6,717.6	1.5	1,049.3
	80	23019	19	40	41		80		3	2.3	5.3		10,493	1.7	1,137.6
	90	23020	20	45	46		90	0 −0.4	3.5	2.5	6		14,122	1.87	1,108.2
	100	23021	21	50	51		100		3.5	2.8	6.3		13,092	2.1	1,049.3
	112	23022	22	—	57	+0.6 0	112	0 −1	4	3.2	7.2	+0.55 −0.25	17,770	2.4	1,088.5
	125	23023	23	—	64		125		5	3.5	8.5		29,930	2.6	1,147.4
	140	23024	24	—	72	+1 0	140		5	4	9	+0.6 −0.25	27,949	3	1,098.3
	160	23025	25	—	82		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	+1.2 0	200	0 −1.5	8	5.6	13.6	+0.8 −0.45	76,364	4.2	1,147.4
	225	23028	28	—	112		225		8	6.5	14.5		70,706	4.8	1,078.7
	250	23029	29	—	127		250		10	7	17		118,955	5.2	1,137.6

Remarks
1. Spring force of SUS304 will be approx. 90% of above mentioned of Spring Steel.
2. Maximum stress is determined by the value of the maximal tensile stress that occurs at the bottom fringe of the disc spring.
3. ※: Height, thickness and other specifications are different from JIS.
4. Refer to technical information at the end of this book "page T3 and 4".

Notes
1. Equate quality of stainless material with SUS-304CSP when thickness was not specified within JIS (JIS G 4313 Stainless Spring Steels).
2. Please contact us if any inquiry of Stainless Steel over 6 mm thickness. This thickness is a special supply.

Product code	123	**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) HRC43～50 (Spring Steel)	Product ①②③ Surface ○○○○ — ○○○○○ Material Dimensions code	

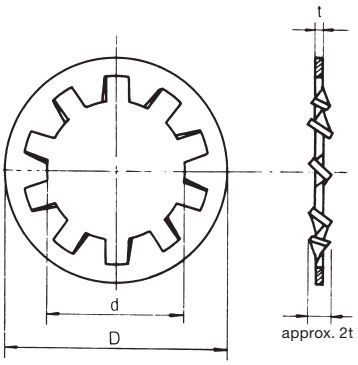
Toothed Lock Washers For General Purpose

JIS B 1251 (Ref.)

TAIYO Stainless Spring Co.,Ltd.

Unit : mm

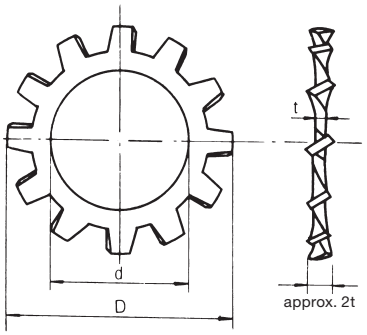
Internal



Dimensions Code		Nominals		d		D		t		Teeth	
Internal	External	Metric	Whit-worth	Basic Size	Toler-ance	Basic Size	Toler-ance	Basic Size	Toler-ance	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		0.6	±0.04	8	10
25060	26060	6	—	6.4		11	0 −0.5	0.6		9	10
		7	—	7.4	+0.3 0	13		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	+0.4 0	18		0.9		9	12
25110		—	7/16	11.4		19.5	0 −0.6	0.9		10	12
25120	26120	12	—	12.5		21		1	±0.055	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		1.2	±0.065	12	14
25180		18	—	19	+0.5 0	29	0 −0.8	1.2		12	14
25190		—	3/4	19.6		32		1.2		12	14
25200		20	—	21		32		1.4	±0.07	12	14
25220		22	7/8	23		35		1.4		14	16
25240		24	—	25		38		1.6	±0.08	14	16
25254		—	1	26		41		1.6		14	16

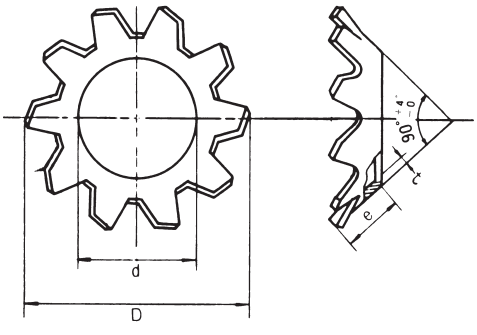
Remarks 1. Number of teeth is a standard.
2. Avoid using the external toothed lock washer for Diameters less than 2.3mm

External



Countersunk

Unit : mm



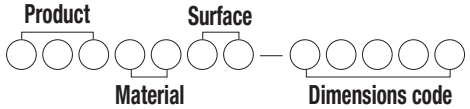
Dimensions Code	Nominals	d		D	e	t		Teeth
		Basic Size	Toler-ance	Approx.	Max.	Basic Size	Toler-ance	
27030	3	3.2	+0.2 0	6	1.8	0.4	±0.03	8
27035	3.5	3.7		7	2.1	0.4		8
27040	4	4.3		8	2.5	0.4		8
27045	4.5	4.8		9	2.7	0.5	±0.035	9
27050	5	5.3		10	3.1	0.5		9
27060	6	6.4	+0.3 0	12	3.8	0.5		10
27080	8	8.4		16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

Remarks 1. Number of teeth is a standard.

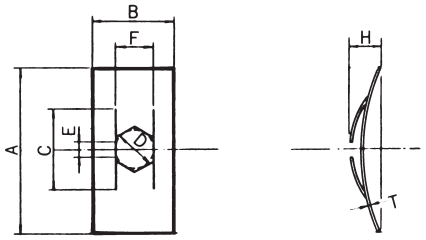
Notes 1. SUS304-CSP only.

Product code	125···Internal 126···External 127···Countersunk	**Material code**	02···SUS304-CSP 70···Spring Steel
Surface code	01···Burnished (SUS304-CSP) 30···Ep-Fe / Zn 5 / trivalent CM 2 (trivalent chromate) (Spring Steel)	**Hardness**	HRC37～46 (SUS304-CSP) HRC40～50 (Spring Steel)

Part Number Structure (Standardized Product Code)



Speed Nuts



Unit : mm

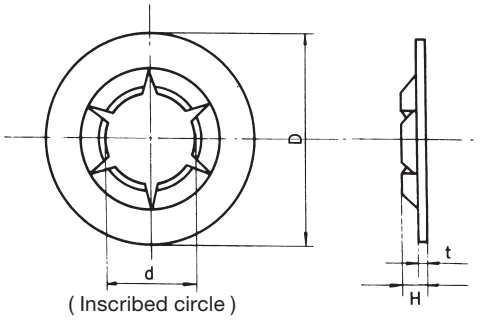
Dimensions Code	Nominals	D		A		B		C	E	F	T		H	
		Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance				Basic Size	Tolerance	Basic Size	Tolerance
32018	1.8	1.5	+0.08 −0.05	12	±0.4	6	±0.2	7	0.8	3	0.4	±0.03	2.5	±0.45
32020	2	1.8		12		6		7	0.8	3	0.4		2.5	
32025	2.5	2.3		14		7		8	0.8	3.5	0.4		2.7	±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	3	

Product code	132	Material code	02···SUS304-CSP
Surface code	01···Burnished	Hardness	HRC 37 ～ 46

Part Number Structure (Standardized Product Code)

Product ① ③ ② Material 0 ② Surface 0 ① — ○○○○○ Dimensions code

Push Nuts



Unit : mm

Dimensions Code	Nominals	d		D	H	t		Applicable Shafts (w)		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		2.4		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	±0.04	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

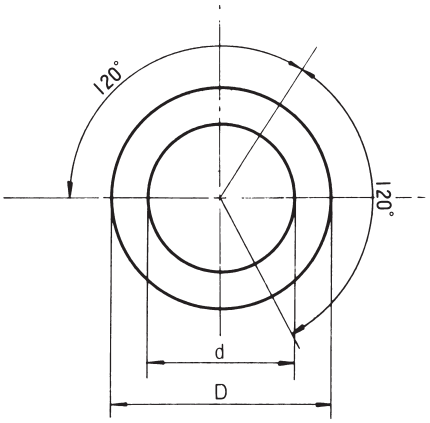
Remarks 1. Thrust Load listed above is for SUS304-CSP material.
2. Thrust Load measured using Cold Drawn Low carbon steel shaft.

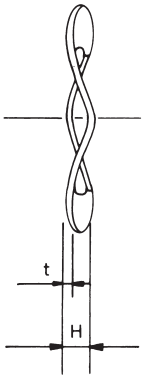
Product code	133	Material code	02···SUS304-CSP 70···Spring Steel
Surface code	01···Burnished (SUS304-CSP) 05···Phosphate Coating (Spring Steel)	Hardness	HRC37 ～ 46 (SUS304-CSP) HRC42 ～ 50 (Spring Steel)

Part Number Structure (Standardized Product Code)

Product ① ③ ③ Material ○○ Surface ○○ — ○○○○○ Dimensions code

TAIYO Stainless Spring Co.,Ltd.





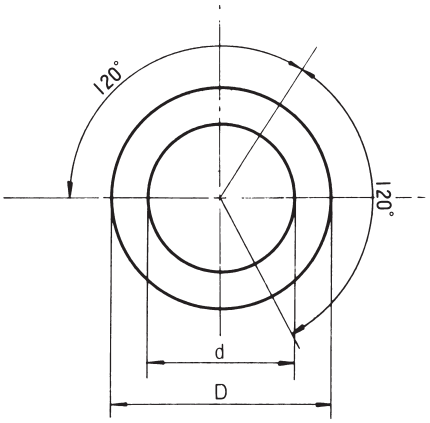
Unit : mm

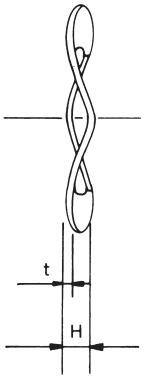
Dimensions Code	Nominals	Internal Diameter (d)		External Diameter (D)		Thickness (t)		Free Height (H)	
		Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance
41004	4	4.3	+0.20 0	8	0 −0.35	0.15	±0.020	0.6	+0.4 0
41005	5	5.4		10		0.15		0.8	
41905	5L	5.4		12	0 −0.40	0.15		1	
41006	6	6.4	+0.25 0	11		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		0.25	±0.025	1.4	
	10L	10.6		21	0 −0.50	0.25		2	+0.5 0
41012	12	13		17	0 −0.40	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		0.4	±0.030	2.5	
	18L	19		34	0 −0.60	0.4		3.4	+0.6 0
41020	20	21.5	+0.35 0	28	0 −0.50	0.4		3.1	
	20L	21.5		38	0 −0.60	0.4		4.2	

Remarks 1. Specificaton is based on Automotive statndard JASO F302; Adjustable wave washer ver. 3.
2. Internal and External dimensions represents before molding.
3. Refer to technical information at the end of this book “page T5”.

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 ① ④ ① Surface ○ ○ ○ ○ — ○ ○ ○ ○ ○ Material / Dimensions code	

TAIYO Stainless Spring Co.,Ltd.





Unit : mm

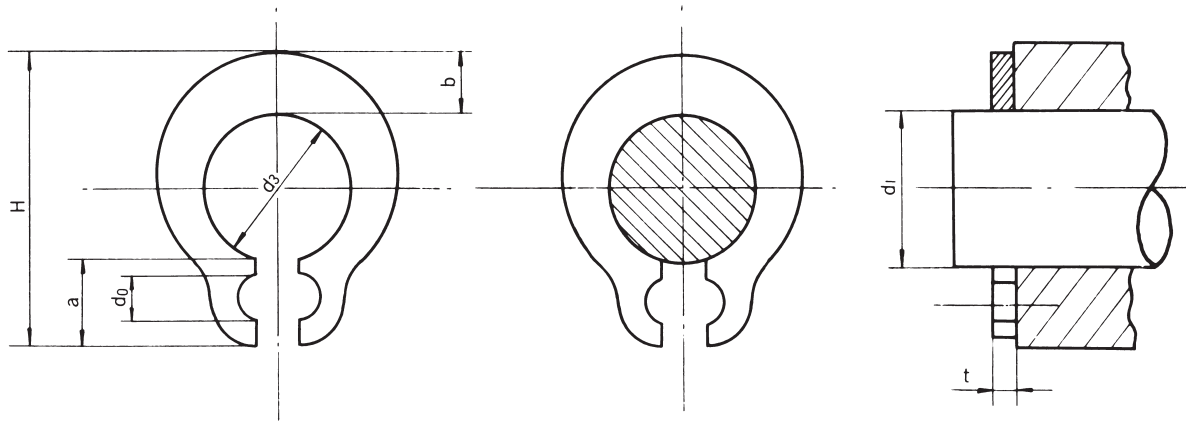
Dimensions Code	Nominals	Internal Diameter (d)		External Diameter (D)		Thickness (t)		Free Height (H)	
		Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance	Basic Size	Tolerance
41004	4	4.3	+0.20 0	8	0 −0.35	0.15	±0.020	0.6	+0.4 0
41005	5	5.4		10		0.15		0.8	
41905	5L	5.4		12	0 −0.40	0.15		1	
41006	6	6.4	+0.25 0	11		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		0.25	±0.025	1.4	
	10L	10.6		21	0 −0.50	0.25		2	+0.5 0
41012	12	13		17	0 −0.40	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		0.4	±0.030	2.5	
	18L	19		34	0 −0.60	0.4		3.4	+0.6 0
41020	20	21.5	+0.35 0	28	0 −0.50	0.4		3.1	
	20L	21.5		38	0 −0.60	0.4		4.2	

Remarks 1. Specificaton is based on Automotive statndard JASO F302; Adjustable wave washer ver. 3.
2. Internal and External dimensions represents before molding.
3. Refer to technical information at the end of this book “page T5”.

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 ① ④ ① Surface ○ ○ ○ ○ — ○ ○ ○ ○ ○ Material / Dimensions code	

Grip Retaining Rings

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

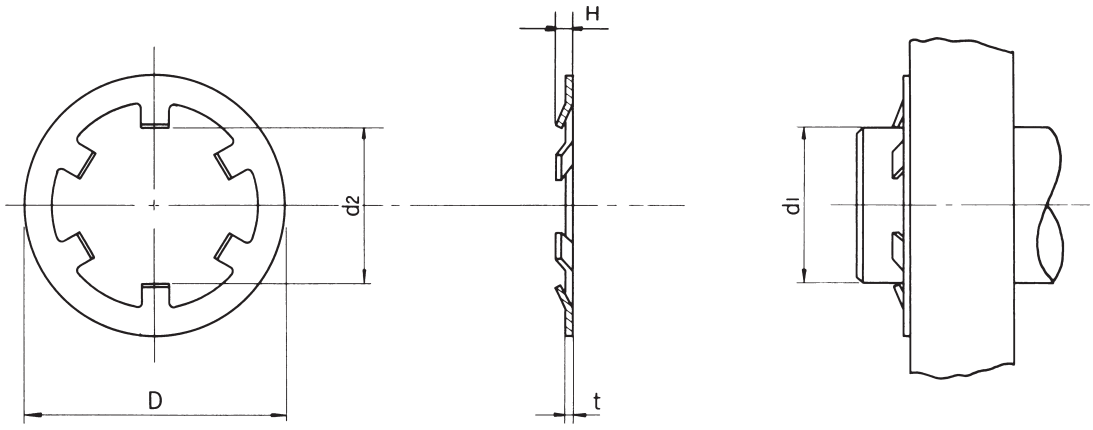
Dimensions Code	Nominals	Grip Retaining Ring Dimensions								Thrust Loading	d_1 Applicable Shafts	
		d_3	Tolerance	t	Tolerance	b	a	d_0	(H)	N	Basic Size	Tolerance
52015	1.5	1.40	+0.05 −0.08	0.3	±0.04	0.7	1.3	0.5	3.3	19.61	1.5	±0.025
52020	2	1.90		0.5		1	1.8	0.8	4.6	19.61	2	
52022	2.2	2.05		0.5		1.1	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	±0.03
52035	3.5	3.30		0.6		1.6	2	0.9	6.8	49.03	3.5	
52040	4	3.80	+0.05 −0.1	0.8		1.8	2.8	1.2	8.3	58.84	4	
52045	4.5	4.25		0.8		2	2.9	1.3	9	68.65	4.5	
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		2.2	2.9	1.3	9.7	78.45	5	
52060	6	5.70		1	±0.05	2.4	3.1	1.4	11.1	93.16	6	
52063	6.3	6.05	±0.1	1		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	±0.06	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 Load listed above is for SUS304-CSP material.
2. Thrust Load measured using Cold Drawn Low carbon steel shaft.

Product code	152	**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) HRC46～51 (Spring Steel)	Product ①⑤② Surface ○○○○ — ○○○○○ Material Dimensions code	

CA Retaining Rings For Shafts

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

Dimensions Code	Nominal Diameter	CA Retaining Ring for Shaft Dimensions							Thrust Loading N	Applicable Shafts d_1	
		d_2		D		H	t	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	+0.1 0	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	±0.3	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 Load listed above is for SUS304-CSP material.
2. Thrust Load measured using Cold Drawn Low carbon steel shaft.

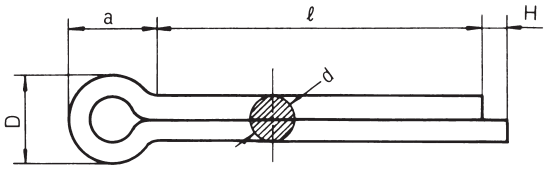
Notes 1. Customer specified dimension and material are available upon request.

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 ①④⑧ Surface ○○ — ○○○○○ Material / Dimensions code	

Split Pins

JIS B 1351 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



Unit : mm

Nominals			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
Applicable Bolt and Pin Diameter	Bolts	Min.	—	2.5	3.5	4.5	5.5	7	9	11	11	14	20
		Max.	2.5	3.5	4.5	5.5	7	9	11	14	14	20	27
	Clevis Pins	Min.	—	2	3	4	5	6	8	9	9	12	17
		Max.	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 ℓ		4	±0.5										
		5		±0.5									
		6			±0.5								
		8				±0.5							
		10					±0.8						
		12						±0.8					
		14							±0.8				
		15								±0.8			
		16									±0.8		
		18										±1.2	
		20											±1.2
		22											
		25											
		28											
		30											
		32											
		35											
		36											
		40											
		45											
		50											
		55											
		56											
		60											
		63											

Remarks
1. Nominal diameter is relative to diameter of pin hole diameter.
2. Value of "d" is measured between Head and 1/2 ℓ .
3. Standard lengths (ℓ) represented in Bold Border. Please contact Taiyo for customer spcified lengths.
4. When properly sized, there should be no noticeable wobble of Split Pin.

Product code	137	Material code	49···SUS304-W1
Surface code	01···Burnished	Hardness	

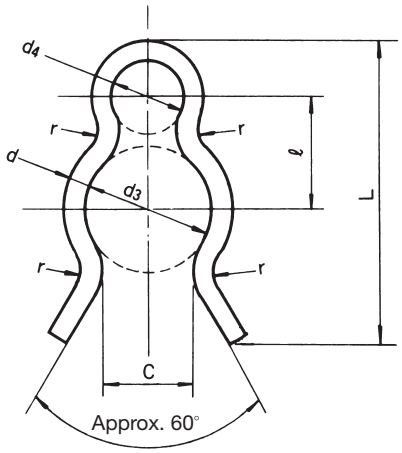
Part Number Structure (Standardized Product Code)

Example: Φ4 × ℓ20

Product 137 — Surface 01 — Material 49 — Nominal Diameter 040 — Length 020

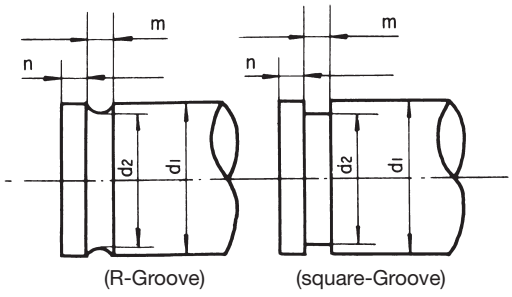
Snap Retainers

TAIYO Stainless Spring Co.,Ltd.



Free Angle

r ≒ 2d



Applicable Shafts

Unit : mm

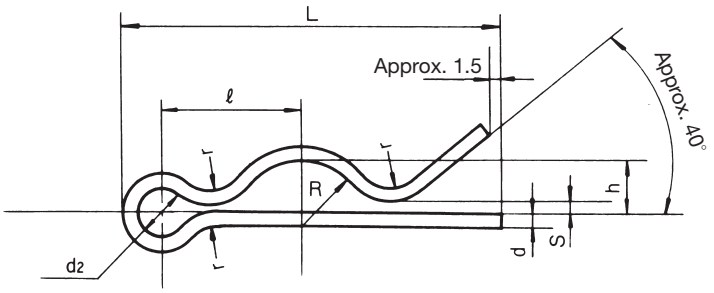
Dimensions Code	Nominals	Snap Retainers Dimensions								Applicable Shafts (Ref.)			
		d_3		d		d_4	ℓ	C	L	d_1	d_2	m	n
		Basic Dimension	Tolerance	Basic Dimension	Tolerance	Approx.	Approx.	Max.	Approx.				Min.
30030	3	1.8	±0.2	0.6	±0.01	2.2	3	1	8.6	3	2.5	0.8	1.5
30040	4	2.7	0 −0.4	0.6	±0.02	1.4	2.9	1.9	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				2.7	5.3	3.8	14.1	7	5.9		
30080	8	6.3		0.9		3.2	6.1	4.4	16.3	8	6.8	1.1	
30090	9	7.3				3.7	6.8	5.1	18.2	9	7.8		
30100	10	7.7	0 −0.7	1		3.9	7.3	5.4	19.5	10	8.7	1.2	
30120	12	9.4		1.2		4.7	8.9	6.6	23.7	12	10.4	1.4	
30140	14	11.1		1.4	±0.03	5.6	10.4	7.8	27.8	14	12.1	1.6	
30160	16	12.6	0 −1	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		2.6		7.5	15.2	10.5	40.5	20	16.5	2.9	3.0
30220	22	16.6		2.9	±0.04	8.3	16.8	11.6	44.8	22	18.1	3.2	
30250	25	18.7	0 −1.5	3		9.4	18.8	13.1	50.2	25	20.7	3.7	4.0
30280	28	21.7				10.9	21.1	15.2	56.3	28	23.7		

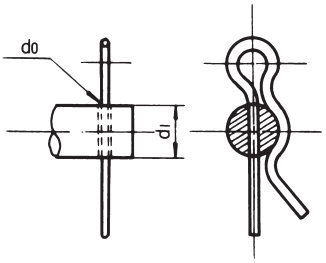
Remarks 1. The tolerance of "m" should be applicable to middle level of JIS B 0405.
2. Tolerance of "d" refers the diameter before forming.

Product code	130	Material code	48···SUS304-WPB (φ12 and below) 58···SWB (φ14 and above)	Part Number Structure (Standardized Product Code)
Surface code	01···Burnished (SUS304-WPB) 03···Temper Color (SWB)	Hardness		Product ① ③ ⓪ Surface ○ ○ ○ ○ — ○ ○ ○ ○ ○ Material / Dimensions code

Snap Pins

TAIYO Stainless Spring Co.,Ltd.





r ≒ 1.5d

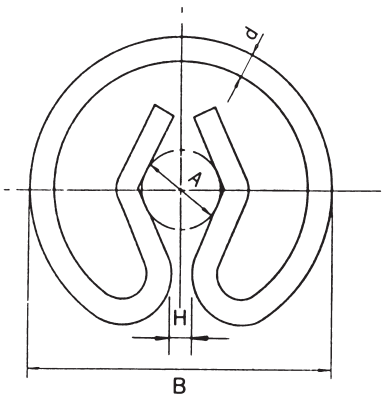
Unit : mm

Dimensions Code	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		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		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		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	

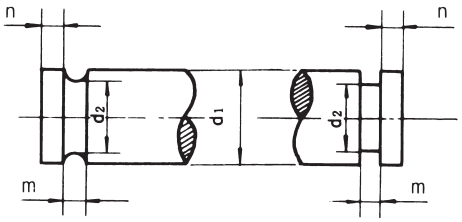
Remarks 1. Tolerance of "d" refers the diameter before forming.

Product code	331···ϕ12 and below 131···ϕ14 and above	**Material code**	48···SUS304-WPB 58···SWB	**Part Number Structure (Standardized Product Code)**
Surface code	01···Burnished (SUS304-WPB) 30···Ep-Fe / Zn 5 / trivalent CM 2 (trivalent chromate) (SWB) 03···Temper Color	**Hardness**		Product ○○○ Surface ○○○○ — ○○○○○ Material ○○ Dimensions code ○○○

TAIYO Stainless Spring Co.,Ltd.



Example of Shafts and Groove



(R-Groove) (Square-Groove)

Unit : mm

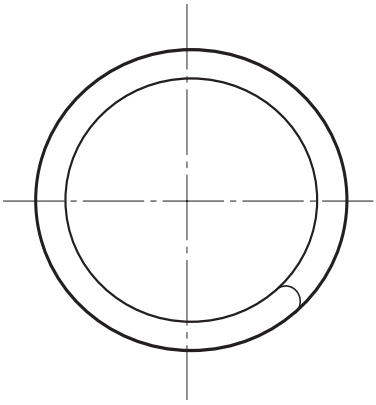
Dimensions Code	Nominals No.	d_1 Applicable Shafts	A		B		H		d	d_2	Applicable Shafts	
			Basic Dimension	Tolerance	Basic Dimension	Tolerance	Basic Dimension	Tolerance			m	n
29001	1	3	1.5	±0.3	7.5	±0.5	0.5	±0.25	0.7	2	0.8	2
29002	2	4	2		9.5		0.75	±0.35	0.8	2.5	0.9	2
29003	3	5	2.75		11.3	±0.8	0.75		0.9	3.5	1	2.5
29004	4	6	3	±0.4	13		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

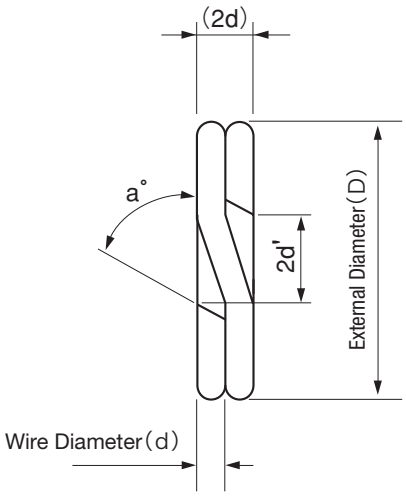
Remarks 1. You can insert this product either longitudinally or laterally.
2. This product is made from wire rod and fit groove face well.

Product code	129	Material code	08…SUS420J2	Part Number Structure (Standardized Product Code)
Surface code	01…Burnished	Hardness	HV 400～460	Product ① ② ⑨ Surface ⓪ ⑧ ⓪ ① — ○○○○○ Material Dimensions code

Split Rings

TAIYO Stainless Spring Co.,Ltd.





Unit : mm

Dimensions Code	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. Forming rings stick together.

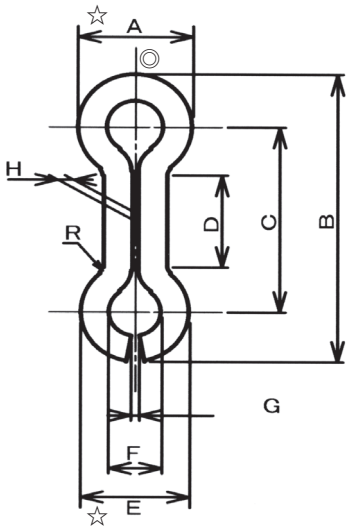
Product code	128	Material code	48···SUS304-WPB
Surface code	01···Burnished 40···Black Coloring (No.00-3 only)	Hardness	

Part Number Structure (Standardized Product Code)

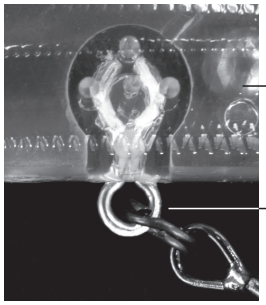
Product ① ② ⑧ Material ④ ⑧ Surface ⓪ ① — ○○○○○ Dimensions code

Hachinoji Ring

TAIYO Stainless Spring Co.,Ltd.



Usage example



Hachinoji Ring is put in fishing goods (Lure) and join Sprit Ring

Unit : mm

Dimensions Code	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			4−R0.3
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	0.5	0.3	

Remarks 1. Dimensions of ☆ ⇨ the widest position of 90 degree from ◎ line.

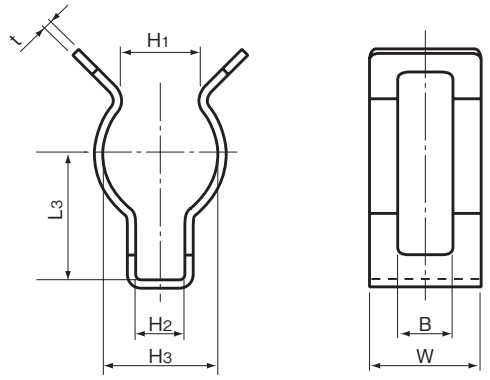
Product code	134	Material code	49…SUS304 - W1
Surface code	01…Burnished	Hardness	

Part Number Structure (Standardized Product Code)

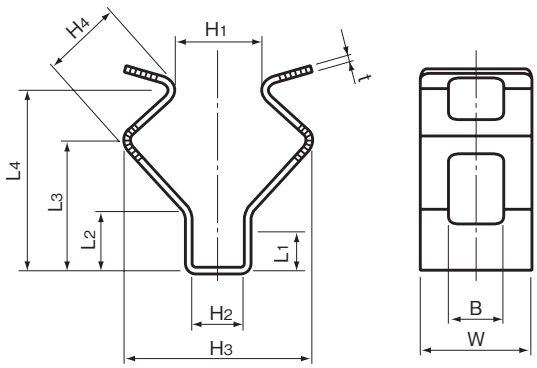
Product ① ③ ④ | Material ④ ⑨ | Surface ⑩ ① — Dimensions code ③ ④ ⑩ ① ⑩

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

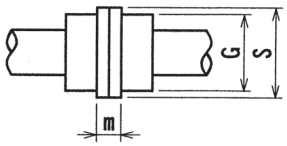
TAIYO Stainless Spring Co.,Ltd.



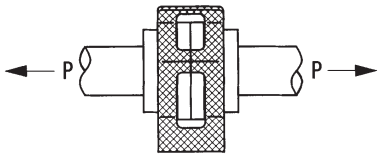
Type-R



Type-S



Applicable Shafts



Thrust Loading

Type-R (Product Code: 171)

Unit : mm

Dimensions Code	Nominals No.	Dimensions																	Applicable Shafts			Thrust Loading N
		t		H_1		H_2	H_3	H_4		L_1	L_2		L_3	L_4	B		W					
		Basic Dimension	Tolerance	Basic Dimension	Tolerance			Basic Dimension	Tolerance		Basic Dimension	Tolerance			Basic Dimension	Tolerance	Basic Dimension	Tolerance	G	S	m	
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 Code	Nominals No.	Dimensions																	Applicable Shafts			Thrust Loading N
		t		H_1		H_2	H_3	H_4		L_1	L_2		L_3	L_4	B		W					
		Basic Dimension	Tolerance	Basic Dimension	Tolerance			Basic Dimension	Tolerance		Basic Dimension	Tolerance			Basic Dimension	Tolerance	Basic Dimension	Tolerance	G	S	m	
70060	6	0.7	±0.03	8.2	+0.3 −1.0	5	18.3	8.0	+0.45 −0.15	4.6	6.3	±0.4	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			6.4		14.2	19.9					15.0	17.0		4,942.6
70100	10			11.2		8	23.9	9.7		4.0			14.7	20.8					17.0	20.0		4,746.4
70127	12.7	0.8		14.5	+0.5 −1.5	8.8	30.0	12.75		5.1	7.1		18.4	26.5			14		22.0	25.0		6,786.2
70160	16A			16.4			34.5	14.1		4.1	6.1		19.5	28.6					26.0	30.0		6,864.7
71016	16B	0.9	±0.04	18.4	+0.7 −1.7	10	38.5	16.0		5.7	8.5		23.5	33.7					28.0	34.0		7,649.2
70222	22.2			21.7	+0.7 −1.8		44.5	17.0			7.9		26.2	37.3					32.0	38.0		8,777.0
70254	25.4			24.7	+0.8 −2.0		51.8	19.6		5.3	7.2		30.2	42.9			16		38.0	44.0		12,474.1

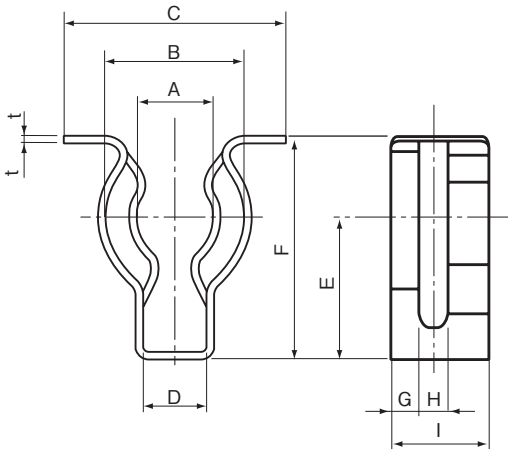
Remarks 1. Thrust load measured using Taiyo measurement methodology.

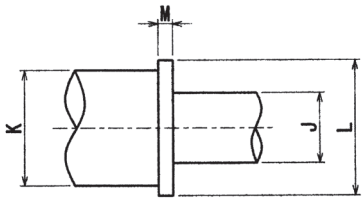
Notes 1. Nominal No.4 is type-R, 171 product code.

Product code	170 (Type-S) 171 (Type-R)	**Material code**	02…SUS304-CSP	**Part Number Structure (Standardized Product Code)**
Surface code	01…Material texture	**Hardness**		Product ① ⑦ ⓪ Surface ⓪ ② ⓪ ① — ⑦ ⓪ ① ② ⑦ (Material ⓪ ②, Dimensions ⑦ ⓪ ① ② ⑦) Example: Nominal 12.7

Joint Clips Different Diameter Type

TAIYO Stainless Spring Co.,Ltd.





Applicable Shafts

Unit : mm

Dimensions Code	Nominals No.	Dimensions																Applicable Shafts			Thrust Loading N
		t		H_1		H_2	H_3	H_4		L_1	L_2		L_3	L_4	B		W				
		Basic Dimension	Tolerance	Basic Dimension	Tolerance			Basic Dimension	Tolerance		Basic Dimension	Tolerance			Basic Dimension	Tolerance	Basic Dimension	Tolerance	G	S	m	
04010	4–10	0.5	±0.012	3.0	±0.8	9.0	±0.8	19.2	4.0	12.5	18.15	4.0	±0.1	2.0	±0.1	12.0	±0.1	4.0	10.0	14.0	1.5	1,015.0
06013	6–13	0.8	±0.03	5.0		12.0		22.45	5.2	14.0	22.14	3.0		4.0		13.0		6.0	13.0	17.0	3.5	2,490.9
10017	10–17			8.6		15.6		25.7	7.2	16.3	25.33							10.0	17.0	20.0		2,481.1
14023	12.7–22	1.0	±0.04	11.0	±1.0	20.0	±1.0	31.8	9.2	21.0	32.96	4.0				14.0		12.7	22.0	26.0		4,207.1
	14–23																	14.0	23.0	27.0		
16025	16–25			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. Nominal No.12.7-22 and 14-23 is a same item.
2. Nominal No.18-28 ; Make To Order.

Product code	172	Material code	02…SUS304-CSP-H
Surface code	01…Material texture	Hardness	

Part Number Structure (Standardized Product Code)

Example: Nominal 12.7

Product Surface

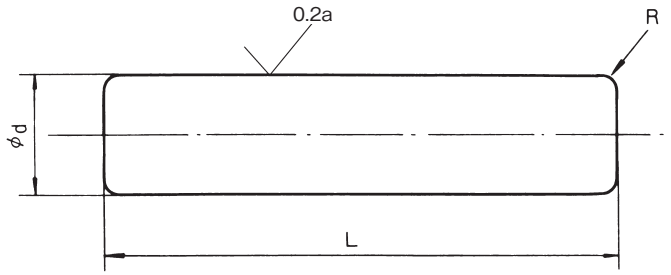
① ⑦ ② ⓪ ② ⓪ ① — ⓪ ④ ⓪ ① ⓪

Material Dimensions

Parallel Pins

JIS B 1354 (Ref.)

TAIYO Stainless Spring Co.,Ltd.



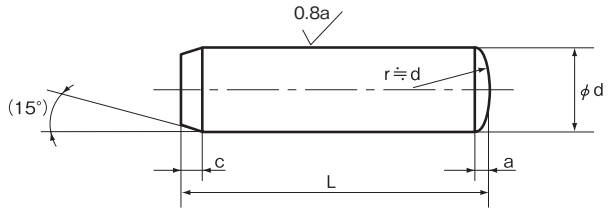
Unit : mm

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	3	±0.1	○	○					
	4		○	○	○	○			
	5		○	○	○	○	○	○	
	6		○	○	○	○	○	○	○
	8	±0.2	○	○	○	○	○	○	○
	10		○	○	○	○	○	○	○
	12		○	○	○	○	○	○	○
	14		○	○	○	○	○	○	○
	15		○	○	○	○	○	○	○
	16			○	○	○	○	○	○
	18				○	○	○	○	○
	20				○	○	○	○	○
	22					○	○	○	○
	25						○	○	○
	28						○		○
	30								○
	32	±0.3							○
	35								○

Notes 1. We prepare soft-Type pins and or hard-Type ones. Please specify the type when placing orders.
2. Customer specified dimension and material are available upon request.

Product code	**161**···Hard **162**···Soft	**Material code**	**51**···SUS301 or 201 (Hard) **47**···SUS304 (Soft)	**Part Number Structure (Standardized Product Code)**	
Surface code	**01**···Burnished	**Hardness**	Hard HV450 and above Soft HV300 less or equal	Product ○○○ Surface ○○ 01 — 1610 0	Example: φ1.6 × ℓ10 Material ○○○ Nominal Diameter 1610 Length 0

Parallel Pins Model-A （m6）



TAIYO Stainless Spring Co.,Ltd.

Unit : mm

Nominal Diameter			4			5			6		
d	Basic Dimension		4			5			6		
	Tolerance	Model-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	±0.25			※						
	6			○	○			○			
	8		○	○	○		○	○		○	○
	10		○	○	○	○	○	○	○	○	○
	12	±0.5	○	○	○	○	○	○	※	○	○
	14			○	○	○	○	○	※	○	○
	15		○	○	○	○	○	○	○	○	○
	16			○	○	○	○	○	○	○	○
	18			○	○	○	○	○	○	※	○
	20		○	○	○	○	○	○	○	○	○
	22			○	○		○	○		○	○
	24									○	
	25		○	○	○	○	○	○	○	○	○
	28			○	○		※	○		○	○
	30		○	○	○	○	○	○	○	○	○
	32		※	○	○	※	※	○		○	○
	35		○	○	○	※	○	○	※	○	○
	40		○	○	○	○	○	○	○	○	○
	45			○	○	※	○	○	※	※	○
	50			○	○	○	○	○	○	○	○
	55	±0.75					※	○		○	
	60						○	○		○	
	65									※	○
	70									○	
	80									※	
	100									※	

Notes
1. ○: in inventory. ※: not in stock, but available if ordered.
2. We prepare soft-Type pins and or hard-Type ones. Please specify the type when placing orders.
3. Customer specified dimension and material are available upon request.

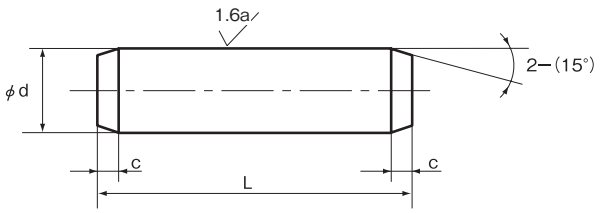
Product code	163…Model-A・Hard 164…Model-A・Soft	**Material code**	61…S45C-Q (Hard) 55…SUS303 (Soft) 60…S45C-A
Surface code	01…Material texture	**Hardness**	Hard S45C-Q HV255 and above Soft SUS303 HV208 and above S45C-A HV125 and above

Part Number Structure (Standardized Product Code)

Example : Hard (S45C-Q) 4×8

Product			Surface						
1	6	3	6	1	0	1	—	4	0	0	8	0
Material								Nominal Diameter		Length		

Parallel Pins Model-B （h7）



TAIYO Stainless Spring Co.,Ltd.

Unit : mm

Nominal Diameter			4			5			6		
d	Basic Dimension		4			5			6		
	Tolerance	Model-B h7	0 −0.012								
	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	±0.25			※						
	6			○	※						
	8		○	○	○		○	○		○	
	10		○	○	○	○	○	○	※	○	○
	12	±0.5	○	○	○	○	○	○	※	○	○
	14			○	○	○	※	○	※	※	○
	15		○	○	○	○	○	○	○	○	○
	16			○	○	○	○	○	○	※	○
	18			○	○	○	○	○	○	※	○
	20		○	○	○	○	○	○	○	○	○
	22			○	○		※	※	※	※	※
	24									※	
	25		○	○	○	○	○	○	○	○	○
	28			※	○		○	※	※	○	※
	30		○	○	○	○	○	○	○	○	○
	32		※	※	※	※	※	※		※	※
	35		○	○	○	※	※	※	※	※	※
	40		○	○	○	○	○	○	○	○	○
	45			※		※	※	※	※	※	※
	50			※		○	○	○	○	○	○
	55	±0.75					※			※	※
	60						※			※	○
	65									※	
	70									※	
	80									※	
	100									※	

Notes
1. ○: in inventory. ※: not in stock, but available if ordered.
2. We prepare soft-Type pins and or hard-Type ones. Please specify the type when placing orders.
3. Customer specified dimension and material are available upon request.

Product code	165…Model-B・Hard 166…Model-B・Soft	**Material code**	61…S45C-Q (Hard) 55…SUS303 (Soft) 60…S45C-A
Surface code	01…Material texture	**Hardness**	Hard S45C-Q HV255 and above Soft SUS303 HV208 and above S45C-A HV125 and above

Part Number Structure (Standardized Product Code)

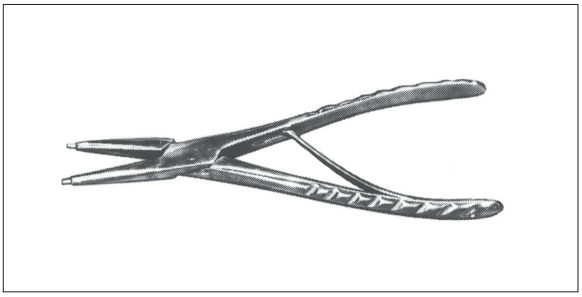
Example : Hard (S45C-Q) 4×8

Product			Surface							
1	6	3	6	1	0	1	—	4	0	0	8	0
Material								Nominal Diameter		Length		

C-Type Retaining Ring Jig

TAIYO Stainless Spring Co.,Ltd.

C-Type Retaining Rings for Holes Plier (Type-i)

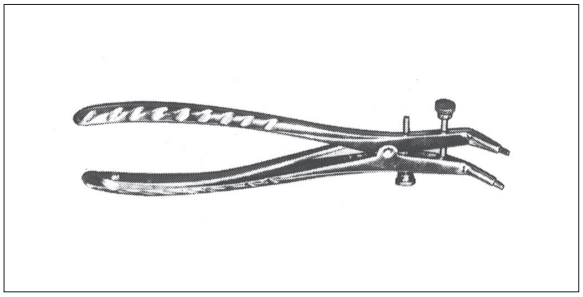


Dimensions Code	No.	Length	Tips	Applicable C-Type Rings
21011	i#1	130	φ0.6～1.2	6～ 11
21012	i#2	165	1.4	12～ 30
21013	i#3	187	2.3	32～ 48
21113	i#3-1	260	2.3	50～ 80
21014	i#4	320	2.8	82～120

C-Type Retaining Rings for Holes and Shafts Plier (Type-S)

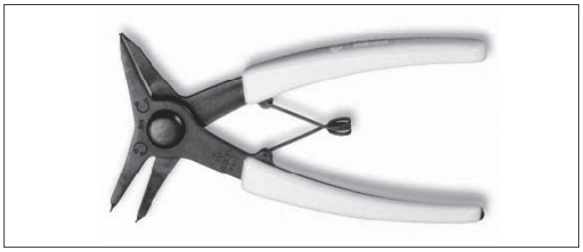
Dimensions Code	No.	Length	Applicable C-Type Rings
21900	S-025	125	4～ 9
21901	S-026	143	10～ 40

C-Type Retaining Rings for Shafts Plier (Type-a)



Dimensions Code	No.	Length	Length	Applicable C-Type Rings
21003	a#3	195	2.3	32～ 80
21004	a#4	320	2.8	82～120

C-Type Retaining Rings for Holes and Shafts Plier (Type-S)



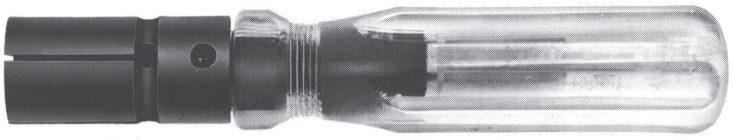
Product code	521	Material code	
Surface code		Hardness	

Part Number Structure (Standardized Product Code)

Product: ⑤②① Surface: ⓪⓪⓪⓪ — Material: ⓪ Dimensions code: ○○○○○

Push Nut Jig

TAIYO Stainless Spring Co.,Ltd.



Remarks 1. Place push nuts to the bottom of tool cavity before applying to mating shaft.

Push Nuts	
Dimensions Code	Nominals
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	
Surface code		Hardness	

Part Number Structure (Standardized Product Code)

Example: Nominal 2 Push Nuts Jig

Product: ⑤⑤⑥ Surface: ⓪⓪⓪⓪ — Material: ⓪ Dimensions code: ③③⓪②⓪

Grip Retaining Ring Jig

Grip Retaining Rings	
Dimensions Code	Nominals
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 1. Please use nominal dimension when ordering Grip Retaining Ring Jig.

Product code	521	Material code		
Surface code		Hardness		

Part Number Structure (Standardized Product Code)

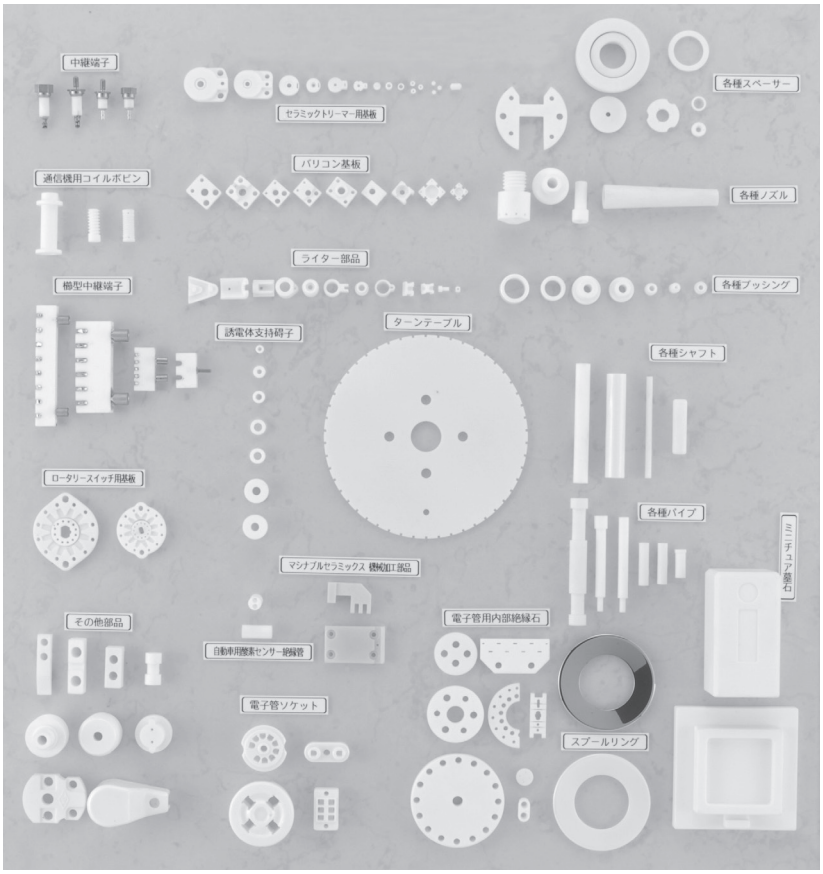
Example: Nominal 2

Product ⑤②① Surface ⓪⓪⓪⓪ — ⑤②⓪②⓪

Material ⓪⓪⓪⓪

Dimensions code ⑤②⓪②⓪

Ceramic product



Notes 1. Ceramic products are available on request (make to order).

TAIYO Stainless Spring Co.,Ltd.

Stainless-Steel Spring

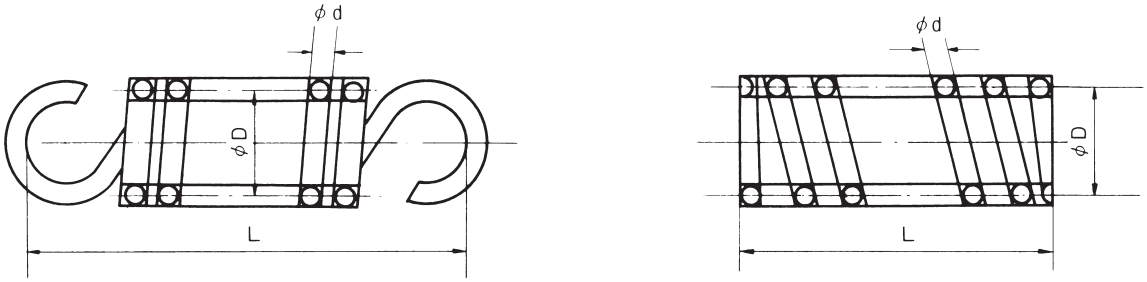
We have corrected the existing defects of surface treatment to the springs made from steel or alloyed metal, as well as other various mechanistic faults.We are proud to say that our products have therefore won the popularity among our customers. Please adopt our excellent products and technique.

Material / Elastic Coefficient	SUS304	SUS631	Piano Wire	White Metal Wire	Phosphor Bronze Wire
Shear Modulus (G)	73,550N/mm²	76,492N/mm²	78,453N/mm²	38,246N/mm²	41,188N/mm²
Modulus Of Elasticity (E)	186,320N/mm²	196,133N/mm²	205,940N/mm²	101,989N/mm²	107,873N/mm²

Age Hardening Heat Treatment processable High-Tension Stainless Steel SUS631 (Precipitation Hardening) Mechanical Property

HRC	Pre-Hardening Mechanical Property					Post-Hardening Mechanical Property			
	Processing	Tensile Test		Bend Test		Tensile Test		Flexure Strength Test	Hardness
		Tensile Strength N/mm²	Elongation %	Degree Of The Angle	Internal Radius	Tensile Strength N/mm²	Elongation %	Threshold Limit Kb N/mm²	HRC
22	R.H	892～1,030	8～13	180°	Twice As Cohesive Thickness	1,481	6～12	588	47
38	C.H	1,206以上	6～10	180°		1,589	5～ 9	834	51

General Formula for Spring Design



d , Wire Diameter　D , Diameter(Center To Center)　N , Active Number Of Adjacent Turns　W , Load　δ , Deflection

G , Elastic Coefficient　(Stainless Steel Wire = 73,550N/ mm²)

	d	b / b	c / b	b / c	
			b≦2C	b>2C	
Load Deflection	$\delta=\frac{8WND^3}{Gd^4}$	$\delta=\frac{5.6WND^3}{Gb^4}$	$\delta=\frac{2.79WND^3(b^2+c^2)}{Gb^3c^3}$	$\delta=\frac{2.35WND^3}{Gc^3(b-0.63c)}$	
Deflection From Internal Force	$\delta=\frac{\pi fsND^2}{Gd}$	$\delta=\frac{2.35fsND^2}{Gb}$	$\delta=\frac{3.5fsND^2(b^2+c^2)}{Gbc(2b+c)}$	$\delta=\frac{2.9fsND^2b^2}{Gc(2b+c)(b-0.63c)}$	
Load Deflection	$fs=\frac{8WD}{\pi d^3}$	$fs=\frac{2.38WD}{b^3}$	$fs=\frac{0.8WD(2b+c)}{b^2c^2}$	$fs=\frac{0.8WD(2b+c)}{b^2c^2}$	
Internal Deflection Force	$fs=\frac{\delta Gd}{\pi ND^2}$	$fs=\frac{0.425\delta Gb}{ND^2}$	$fs=\frac{0.28\delta G(2b^2c+bc^2)}{ND^2(b^2+c^2)}$	$fs=\frac{0.34\delta Gc(2b+c)(b-0.63c)}{ND^2b^2}$	
Calculate Loading From Fixed Internal Force	$W=\frac{fs\pi d^3}{8D}$	$W=\frac{0.42fsb^3}{D}$	$W=\frac{1.25fsb^2c^2}{D(2b+c)}$	$W=\frac{1.23fsb^2c^2}{D(2b+c)}$	
Internal Deflection Force	$W=\frac{\delta d^4G}{8ND^3}$	$W=\frac{\delta Gb^4}{5.6ND^3}$	$W=\frac{\delta Gb^3c^3}{2.79ND^3(b^2+c^2)}$	$W=\frac{\delta Gc^3(b-0.63c)}{2.35ND^3}$	
Calculate Active Number Of Adjacent Turns	$N=\frac{\delta Gd^4}{8WD^3}$	$N=\frac{\delta Gb^4}{5.6WD^3}$	$N=\frac{\delta Gb^3c^3}{2.79WD^3(b^2+c^2)}$	$N=\frac{\delta Gc^3(b-0.63c)}{2.35WD^3}$	

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

Formula for Initial Tension Calculation

$$\delta=\frac{\pi(fs-fso)ND^2}{Gd}$$　Po:Initial Tension　fso:Initial Stress

$$Po=\frac{\pi fsod^3}{8D}\qquad fs=\frac{\delta Gd}{\pi ND^2}+fso$$

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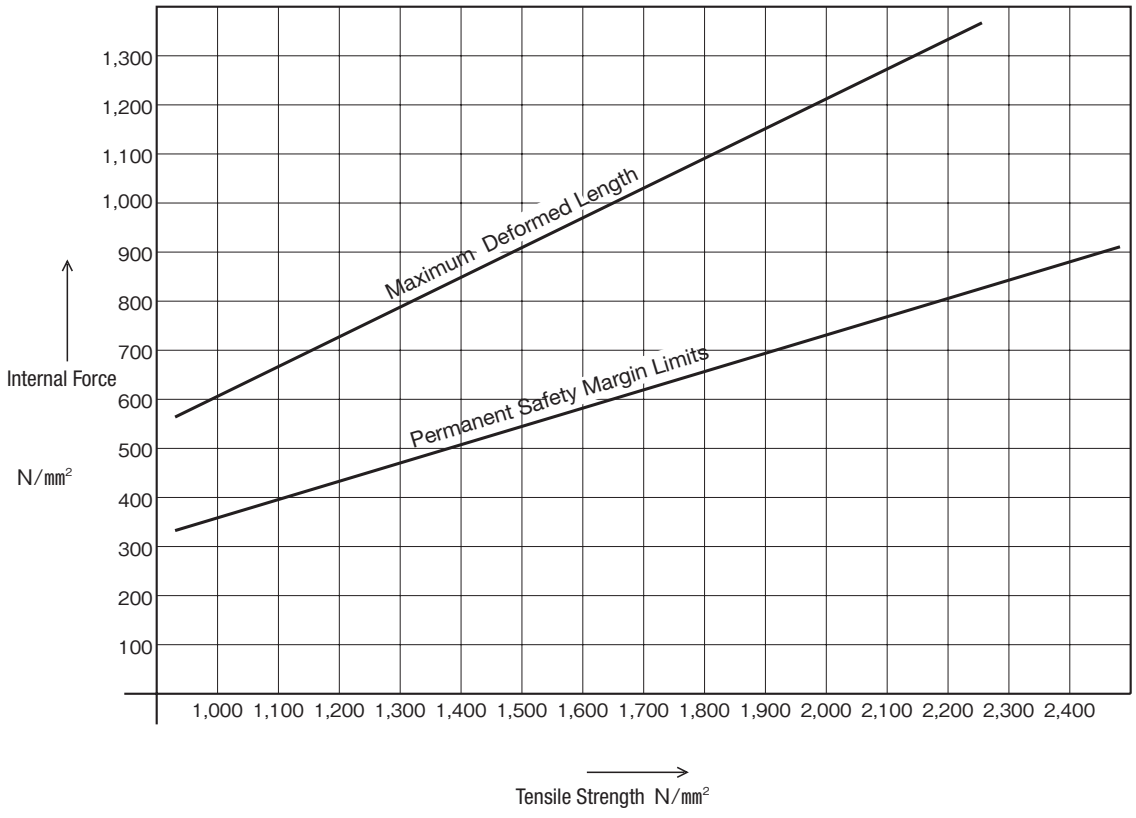
Tensile Strength of Spring Stainless-Steel (Type-B)

Wire Diameter	Tensile Strength N/㎟	Wire Diameter	Tensile Strength N/㎟	Wire Diameter	Tensile Strength N/㎟
㎜	Hard Drawn Steel Wires	㎜	Hard Drawn Steel Wires	㎜	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	1,850～2,100	2.90	1,450～1,700
0.20		0.70		3.20	
0.23	2,050～2,300	0.80		3.50	
0.26		0.90		4.00	
0.29		1.00		4.50	1,350～1,600
0.32		1.20	1,750～2,000	5.00	
0.35		1.40		5.50	
0.40		1.60	1,650～1,900	6.00	

Correlation Between Tensile Strength And Permanent Safety Margin Limits, Maximum Deformed Length

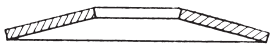


Disc Springs

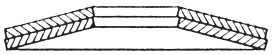
Disc springs (Belleville washer) are formed springs with a center hole. Disc Springs are able to withstand heavy loading within a small area. Disc Springs may be used independently or in combination to achieve the desired load and deflection characteristics.

1. Example of Use

1) Single usage

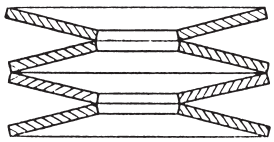


2) Parallel Stacking

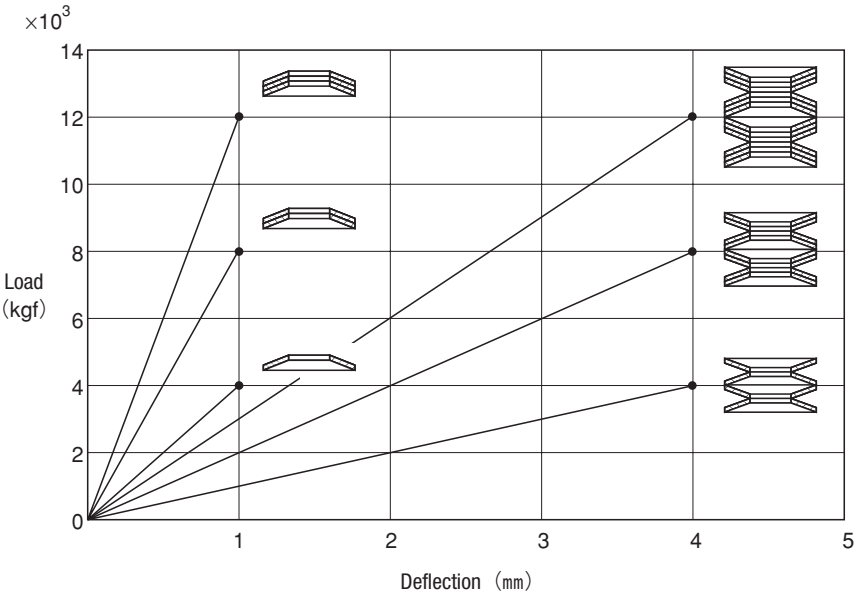


Use with applications requiring heavy loading with small deflection. Loading increases in proportiom to number of stacked Disc Springs.

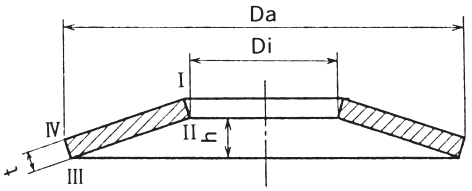
3) Series Stacking



Use with applications requiring lighter loading with greater deflection. Deflection increases in proportion to the number of stacked Disc Springs.



Loading characterization of disc spring stacking



2. Disc Spring Calculation

1) Formula for Loading and Deflection Calculation

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

$$= 92300 \frac{t^4}{\alpha Da^2} \cdot \frac{f}{t} \left\{ \left(\frac{h}{t} - \frac{f}{t}\right)\left(\frac{h}{t} - \frac{f}{2t}\right) + 1 \right\} \text{ kgf}$$

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

(Spring Steels)

E: Young's modulus	206,000 N/mm²
μ: Poisson's ratio	0.3
$4E/1-\mu^2$:	905,000 N/mm²

f : Deflection

α : Coefficient of the diameter ratio Da/Di

δ : Da/Di

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2) Stress and static load

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

β, γ : Coefficient of the 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 value serves as the tolerance level of stress σI at the point I.

f=0.75h 1,900～2,500 N/mm²

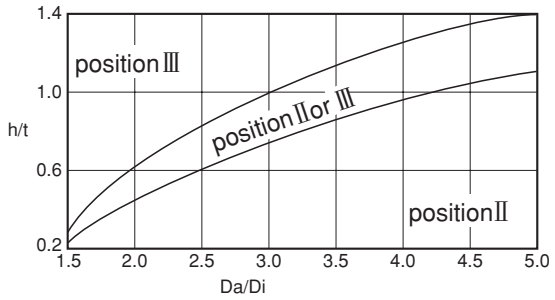
f=h 2,500～3,200 N/mm²

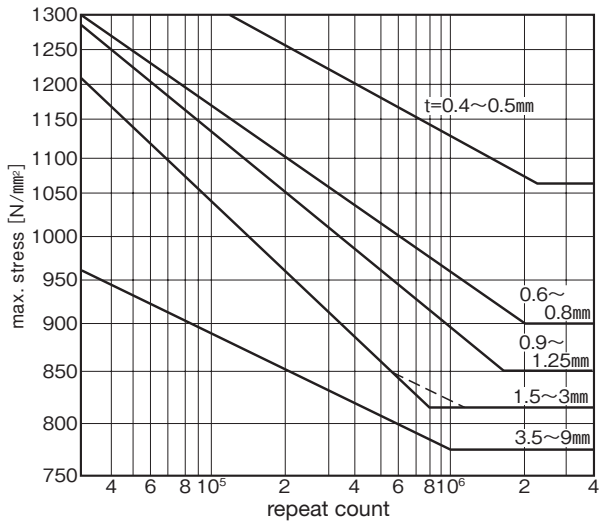
3) Stress and dynamic load

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

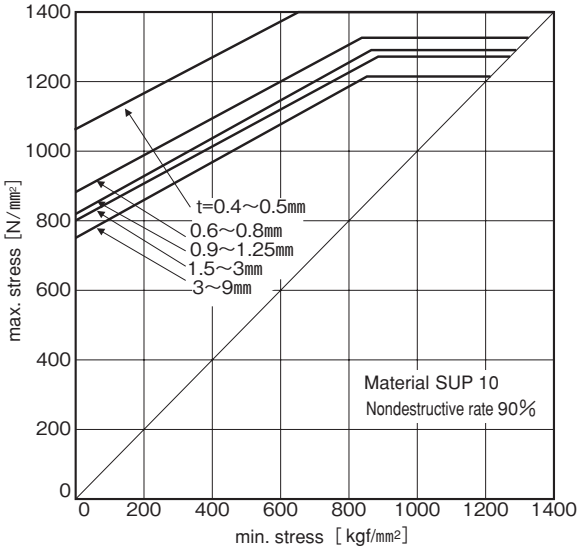
$$\sigma III = 905{,}000 \frac{t^2}{\alpha \cdot Da^2} \cdot \frac{f}{t} \cdot \frac{1}{\delta} \left\{ \left(2\gamma - \beta \right) \left(\frac{h}{t} - \frac{f}{2t} \right) + \gamma \right\}$$

Find out stress range that occur at the position II or III in the right figure. Calculate the stress value by using the above formula. Since the number of iterations before its breakage depends on the maximal stress and amplitude , tolerance stress should be set carefully. Example of the result of fatigue test is below.





Out-of-plane fatigue test S-N curve (SUP 10 Nondestructive rate 90%)



Dynamic working stress (2×10⁶)

Ref. material: Spring by SSR(Japan Society for Spring Research). Published by MARUZEN CO., LTD. 1995-2004

Wave Washers

TAIYO Stainless Spring Co.,Ltd.

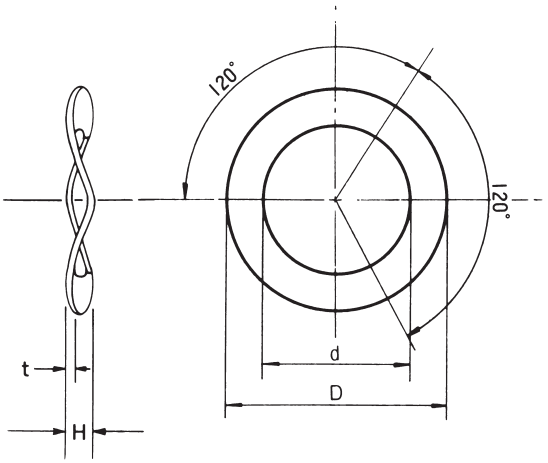
Wave Washers are thin, ringed metal plates with a formed undulating wave. This allows Wave Washers load bearing capability within a small area. Taiyo Wave Washers comply with Slotted Lock washers specified under Automotive standard JASO F302 (Adjustable slotted lock washers).

Formula of Wave washer

Actual values may vary from the calculated load and deflection values. We recommend using a prototype modes of your application to confirm the calculated values.

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

K：Constant（N/mm）
W：Load（N）
δ：Deflection（mm）
E：Modulus Of Elasticity（N/mm²）
b：Width（mm）$= \frac{D-d}{2}$
t：Thickness（mm）
N：Convexity
dm：Mean Diameter（mm）$= \frac{D+d}{2}$
σ：Bend Stress（N/mm²）
D：External Diameter（mm）
d：Internal Diameter（mm）



Initial height (H) in this catalog was calculated by above formula with appressed stress set at 4,000N／mm².

On the occasion of actual use, it is desirable to set the stress which allows for initial height (its standard stress is 1,800N／mm²).

Attention should be paid when using at higher stress, because the declining of initial height will occur by the settling of washers.

Ref. material: by Society of Automotive Engineers of Japan, Inc. JASO F302 automotive wave washers

Spring Pins

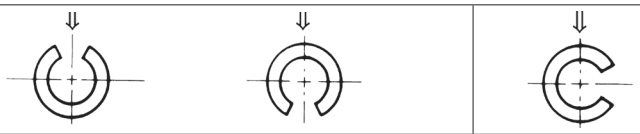
TAIYO Stainless Spring Co.,Ltd.

Spring Pins are manufactured from Flat Stock and formed into a loop. Spring Pins are heat treated to help maintain their deflection forces. The Radial pressure applies force to the internal surfaces of the cavity where applied giving superior performance against vibration.

When one ends fixation is required, consider the safety rate enough and safe from double shear load.

1. NOTE

1) When fastening parts individually, do not chamfer the drill hole, which will receive the Shear Load forces.
2) Avoid pin axis parallel to vibration source.
3) Shear plane of pins should be measured from its end to the diameter as the minimal length.
4) The diameter of holes should be determined based on pins will be inserted, and misalignment of central axis should be safe from closely contact of pin's slot when drilling the fastening parts separately.
5) Please contact Taiyo before designing for impact loading across the Spring Pin.
6) Breaking force of pins are stronger (about 6%) when we set pins against force direction than they are set at the right angle to force direction. Therefore, in setting where shear force are the potential problem, installation instructions are required.

Shearing force direction		
Comparison	Approx. 106%	100%

7) Please contact Taiyo before double-pin usage (combine usage below).

2. Combine usage

You can combine pins so as to increase their shear strength. Combinations of pins add up each shear strength. It is better not to arrange the clearances in the same direction in combining two pins.

How to combine pins

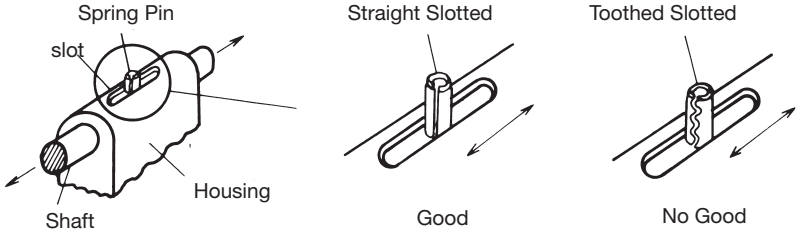
3. Shear strength comparison

(1) Static shear strength

Toothed slotted spring pins are inferior to straight slotted spring pins by about 2% with respect to intensity, because stress concentrates on the portion of gum of toothed slot when shear plane areas are set similarly.

(2) Dynamic shear strength and Impact load

When you use pins as stoppers, you have to use straight slotted spring pins. Toothed slotted spring pins have the possibility of breaking with a crack by very weak force because of load along toothed crack causing concentration of stress.



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