STAR CIRCLIPS
NAGPUR (INDIA)
www.starcirclips.com

WORLD CLASS CIRCLIPS

Star

CIRCLIPS & ENGINEERING LTD.

An ISO TS 16949 certified company

Index

The Company

Star Circlips and Engineering Limited (SCEL), having its manufacturing unit in Nagpur, is the pioneer in the business of Circlips/Retaining Rings. SCEL came into existence in 1985 and has proven its worth in the market through its quality & innovation. We develop, produce and market our components across India and internationally. SCEL produces these components for various automobile applications and supplies to all the leading OEM's in India and abroad. The company has two manufacturing plants located in Nagpur, Maharashtra.

We manufacture a wide range of Circlips, Retaining Rings, Washers, Shims, Disc Springs, Dowel Pins, Spiral Pins, Spring Washers, Multi-formed components and other special products as per the customer requirement. The company has two state of the art tool rooms for quicker development of high quality precision tools.

SCEL is having Technical & Sales collaboration with Seeger-Orbis GmbH & Co. of Germany, which has enabled SCEL to establish a global footprint. Our parts are currently exported to Germany, USA and the UK.

The manufacturing plant is certified with
ISO / TS 16949 Quality Management System.

Overview of manufacturing plant

Quality

Star products are designed in adherance with International standards. These products, which are made from High Carbon Spring Steel, are subject to Austempering Heat Treatment process to meet the International quality requirements.

Range

Star's wide range of Circlips and Retaining Rings are made to meet DIN (Metric) and US (Inch) standards. These High Carbon Spring Steel made products are available in Phosphate coat as well as Zinc plated variants, as required by Customers. Apart from the variety of standardized products, Star Circlips also offers, on request, a large number of customer specific items.

Tool Room

Star's Tool room is fully equipped and comes fitted with the latest machinery to satisfy the varied demands of its Customers. Production and assembling of all of Star's tools are done in-house. To keep pace with the changing nature of the industry world wide, Star invests substantially in Research & Development. This is done with the best interests of its Customers in mind to ensure that their needs are always met.

Quality Control

All Star products are subject to rigorous inspection at every stage of the manufacturing process to make sure, only the best quality products are let out of the manufacturing plant. Statistical Process Control techniques are used to ensure quality of products during the manufacturing process.

Standard Packaging

Though all Retaining Rings are available in Bulk, certain Internal/External E, K and U Rings can be made available Tape stacked, Shrink wrapped, Wire or rod stacked as per Customer requirements.

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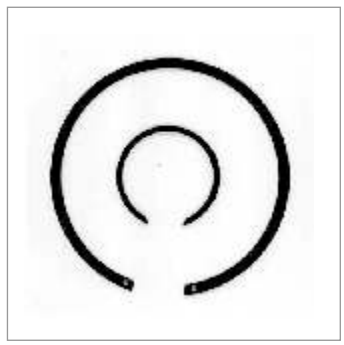
Standard Parts

External Circlip



External Snap Ring

External Circlip A Type

External Inverted Circlip

External Radial
Rings E Type

External Steering
Lock Ring

Klip Ring

Spring Washer

External Cresent Ring

Internal Circlip

Internal Steering Lock Ring

Internal Inverted Circlip

Custom Designed Parts


Hose Clamp


Lock Clamp


Lock Clip


Lock Ring


Lock Clip


Locking Clip


Metal Insert


Nut Clip

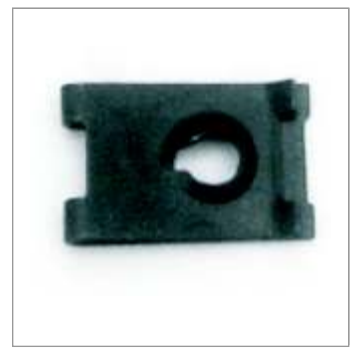


Plate Nut


Plate


PPD Gear


Pressure Plate

Custom Designed Parts


Bellevelle Spring Washer


Bush


C Ring


Clip


Clip Button


Dowel Pin


E Ring


Elastic Washer


Finger Spring


Guidekick Starter


Hinge Lid


Holding Plate

Custom Designed Parts


Splined Washer

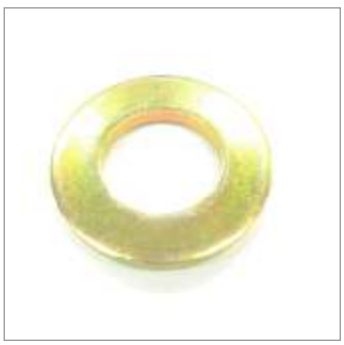

Spring


Washer


Star Washer


Wave Washer


Z Clip


Conical Washer


Plain Washer

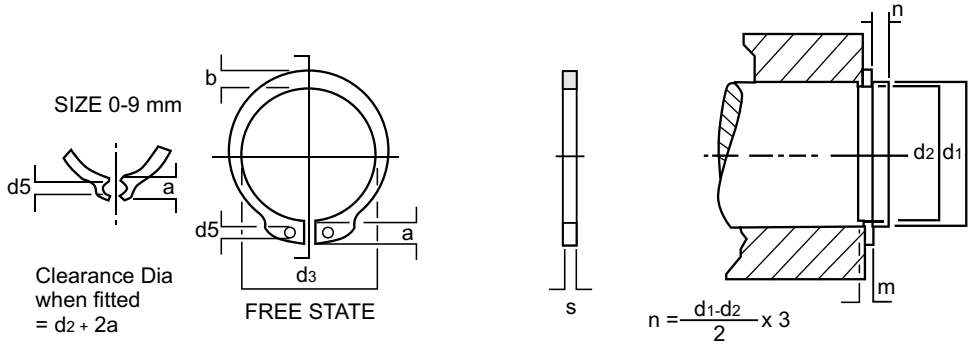

Retaining Clip


Lock Washer


Undulated Washer


Snap Ring

Standard External Circlips DIN 471



Unit : mm

	CIRCLIP DIMENSION						GROOVE DIMENSION			
Nominal Shaft Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Large Section b≈	Lug a (Max.)	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
8	7.4	+0.06	0.80	-0.05	1.5	3.2	1.2	7.6	-0.06	0.90
9	8.4	-0.18			1.7	3.3	1.2	8.6		1.10
10	9.3				1.8	3.3	1.5	9.6		1.10
11	10.2				1.8	3.3	1.5	10.5		1.10
12	11.0				1.8	3.3	1.7	11.5		1.10
13	11.9		1.00		2.0	3.4	1.7	12.4	+0.00	1.10
14	12.9				2.1	3.5	1.7	13.4		1.10
15	13.8	+0.10			2.2	3.6	1.7	14.3	-0.110	1.10
16	14.7	-0.36			2.2	3.7	1.7	15.2		1.10
17	15.7				2.3	3.8	1.7	16.2		1.10
18	16.5				2.4	3.9	2.0	17.0		1.30
19	17.5				2.5	3.9	2.0	18.0		1.30
20	18.5	+0.13			2.6	4.0	2.0	19.0		1.30
21	19.5	+0.42			2.7	4.1	2.0	20.0	+0.00	1.30
22	20.5				2.8	4.2	2.0	21.0	-0.13	1.30
23	21.5		1.20		2.9	4.3	2.0	22.0	-0.15	1.30
24	22.2				3.0	4.4	2.0	22.9		1.30
25	23.2				3.0	4.4	2.0	23.9		1.30
26	24.2	+0.21			3.1	4.5	2.0	24.9		1.30
27	24.9	-0.42			3.1	4.6	2.0	25.6	+0.00	1.30
28	25.9			-0.06	3.2	4.7	2.0	26.6	-0.210	1.60
29	26.9				3.4	4.8	2.0	27.6		1.60
30	27.9				3.5	5.0	2.0	28.6		1.60
31	28.6				3.5	5.1	2.5	29.3		1.60
32	29.6		1.50		3.6	5.2	2.5	30.3		1.60
33	30.5				3.7	5.2	2.5	31.3		1.60
34	31.5				3.8	5.4	2.5	32.3		1.60
35	32.2	+0.25			3.9	5.6	2.5	33.0		1.60
36	33.2	-0.50			4.0	5.6	2.5	34.0		1.85
37	34.2				4.1	5.7	2.5	35.0		1.85
38	35.2				4.2	5.8	2.5	36.0	+0.00	1.85
39	36.0				4.3	5.9	2.5	37.0		1.85
40	36.5				4.4	6.0	2.5	37.5	-0.250	1.85
41	37.5		1.75		4.5	6.2	2.5	38.5		1.85
42	38.5				4.5	6.5	2.5	39.5		1.85
44	40.5	+0.39			4.6	6.6	2.5	41.5		1.85
45	41.5	-0.90			4.7	6.7	2.5	42.5		1.85
46	42.5				4.8	6.7	2.5	43.5		1.85
47	43.5				4.9	6.8	2.5	44.5		1.85
48	44.5				5.0	6.9	2.5	45.5		1.85
50	45.8				5.1	6.9	2.5	47.0		2.15
52	47.8				5.2	7.0	2.5	49.0		2.15
54	49.8				5.3	7.1	2.5	51.0		2.15
55	50.8				5.4	7.2	2.5	52.0		2.15
56	51.8		2.00	-0.07	5.5	7.3	2.5	53.0		2.15
57	52.8	+0.46			5.5	7.3	2.5	54.0	-0.300	2.15
58	53.8	-1.10			5.6	7.3	2.5	55.0		2.15
60	55.8				5.8	7.4	2.5	57.0		2.15
62	57.8				6.0	7.5	2.5	59.0		2.15
63	58.8				6.2	7.6	2.5	60.0		2.15

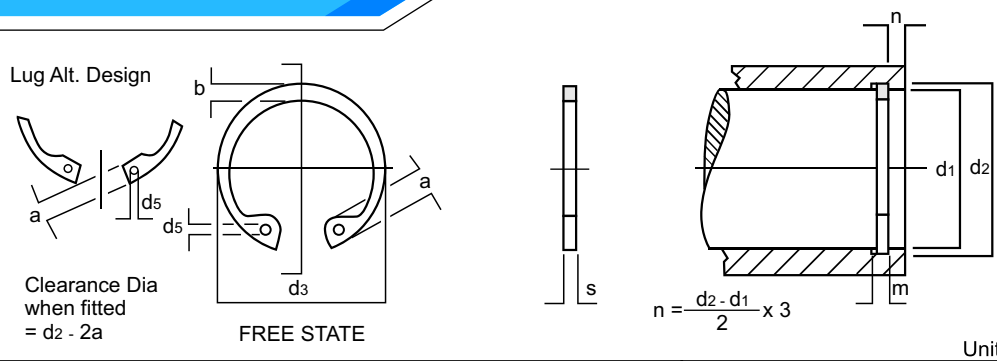
Material: Carbon Spring Steel **Finish:** Zinc Phosphating. **Hardness:** d_1- 8 to 47mm : **47/54 HRC**
d_1 ⩾ 48mm : **44/51 HRC**

Unit : mm

	CIRCLIP DIMENSION							GROOVE DIMENSION		
Nominal Shaft Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Large Section b≈	Lug a (Max.)	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
65	60.8	+0.46 -1.1	2.50	0.07	6.3	7.8	3.0	62.0	-0.300	2.65
67	62.5				6.4	7.9	3.0	64.0		2.65
68	63.5				6.5	8.0	3.0	65.0		2.65
70	65.5				6.6	8.1	3.0	67.0		2.65
72	67.5				6.8	8.2	3.0	69.0		2.65
75	70.5				7.0	8.4	3.0	72.0		2.65
77	72.5				7.2	8.5	3.0	74.0		2.65
78	73.5				7.3	8.6	3.0	75.0		2.65
80	74.5				7.4	8.6	3.0	76.5		2.65
82	76.5				7.6	8.7	3.5	78.5		2.65
85	79.5		3.00	-0.08	7.8	8.7	3.5	81.5	-0.350	3.15
87	81.5				7.9	8.8	3.5	83.5		3.15
88	82.5				8.0	8.8	3.5	84.5		3.15
90	84.5				8.2	8.8	3.5	86.5		3.15
92	86.5				8.4	9.0	3.5	88.5		3.15
95	89.5	+0.54 -1.3			8.6	9.4	3.5	91.5		3.15
97	91.5				8.8	9.4	3.5	93.5		3.15
98	91.5				8.8	9.4	3.5	94.5		3.15
100	94.5				9.0	9.6	3.5	96.5		3.15
102	95.0		4.00	-0.10	9.2	9.7	3.5	98.0	-0.540	4.15
105	98.0				9.3	9.9	3.5	101.0		4.15
107	100.0				9.5	10.0	3.5	103.0		4.15
108	100.0				9.5	10.0	3.5	104.0		4.15
110	103.0				9.6	10.1	3.5	106.0		4.15
112	105.0				9.7	10.3	3.5	108.0		4.15
115	108.0				9.8	10.6	3.5	111.0		4.15
117	110.0				10.0	10.8	3.5	113.0		4.15
118	110.0				10.0	10.8	3.5	114.0		4.15
120	113.0				10.2	11.0	3.5	116.0		4.15
122	115.0				10.3	11.2	4.0	118.0		4.15
125	118.0				10.4	11.4	4.0	121.0	-0.630	4.15
127	120.0				10.5	11.4	4.0	123.0		4.15
130	123.0				10.7	11.6	4.0	126.0		4.15
132	125.0				10.8	11.7	4.0	128.0		4.15
135	128.0				11.0	11.8	4.0	131.0		4.15
138	130.0				11.0	11.9	4.0	134.0		4.15
140	133.0				11.2	12.0	4.0	136.0		4.15
142	135.0				11.3	12.1	4.0	138.0		4.15
145	138.0				11.5	12.2	4.0	141.0		4.15
148	140.0				11.6	12.3	4.0	144.0		4.15
150	142.0				11.8	13.0	4.0	145.0		4.15
152	143.0				11.9	13.0	4.0	147.0		4.15
155	146.0				12.0	13.0	4.0	150.0		4.15
158	148.0				12.0	13.1	4.0	153.0		4.15
160	151.0				12.2	13.3	4.0	155.0		4.15
162	152.5				12.3	13.3	4.0	157.0		4.15
165	155.5	+0.63 -1.5			12.5	13.5	4.0	160.0		4.15
168	157.5				12.9	13.5	4.0	163.0		4.15
170	160.5				12.9	13.5	4.0	165.0		4.15
172	162.5				12.9	13.5	4.0	167.0		4.15
175	165.5				12.9	13.5	4.0	170.0		4.15
177	167.5				13.5	14.2	4.0	172.0		4.15
178	167.5				13.5	14.2	4.0	173.0		4.15
180	170.5				13.5	14.2	4.0	175.0		4.15
182	170.5				13.5	14.2	4.0	177.0		4.15
185	175.5				13.5	14.2	4.0	180.0	-0.720	4.15
187	177.5				14.0	14.2	4.0	182.0		4.15
188	177.5				14.0	14.2	4.0	183.0		4.15
190	180.5				14.0	14.2	4.0	185.0		4.15
192	180.5				14.0	14.2	4.0	187.0		4.15
195	185.5	+0.72 -1.7			14.0	14.2	4.0	190.0		4.15
197	187.5				14.0	14.2	4.0	192.0		4.15
198	187.5				14.0	14.2	4.0	193.0		4.15
200	190.5				14.0	14.2	4.0	195.0		4.15

Material: Carbon Spring Steel **Finish:** Zinc Phosphating. **Hardness:** d_1- 8 to 47mm : **47/54 HRC**
d_1 ⩾ 48mm : **44/51 HRC**

Standard Internal Circlips DIN 472



Unit : mm

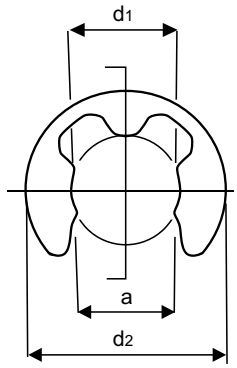
	CIRCLIP DIMENSION							GROOVE DIMENSION		
Nominal Bore Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Large Section b≈	Lug a (Max.)	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
8	8.70		0.80	-0.05	1.1	2.4	1.00	8.40	+0.09	0.9
9	9.80				1.3	2.5	1.00	9.40		0.9
9.5	10.30				1.3	3.0	1.20	9.90		1.10
10	10.80				1.4	3.2	1.20	10.40		1.10
10.5	11.30				1.5	3.2	1.20	10.90		1.10
11	11.80	+0.36			1.5	3.3	1.20	11.40	+0.110	1.10
12	13.00	-0.10			1.7	3.4	1.50	12.50		1.10
13	14.10				1.8	3.6	1.50	13.60		1.10
14	15.10				1.8	3.7	1.70	14.60		1.10
15	16.20		1.00		2.0	3.7	1.70	15.70		1.10
16	17.30				2.0	3.8	1.70	16.80		1.10
17	18.30				2.1	3.9	1.70	17.80		1.10
18	19.50				2.2	4.1	2.00	19.00		1.10
19	20.50				2.2	4.1	2.00	20.00		1.10
20	21.50				2.3	4.1	2.00	21.00		1.10
21	22.50	+0.42			2.4	4.2	2.00	22.00	+0.13	1.10
22	23.50	-0.13			2.5	4.2	2.00	23.00		1.10
23	24.60				2.5	4.2	2.00	24.10		1.30
24	25.90	+0.42			2.6	4.3	2.00	25.20		1.30
25	26.90	-0.21			2.7	4.5	2.00	26.20		1.30
26	27.90			-0.06	2.8	4.7	2.00	27.20	+0.210	1.30
27	29.10				2.9	4.7	2.00	28.40		1.30
28	30.10		1.20		2.9	4.8	2.00	29.40		1.30
29	31.10				3.0	4.8	2.00	30.40		1.30
30	32.10				3.0	4.8	2.00	31.40		1.30
31	33.40				3.1	5.2	2.50	32.70		1.30
32	34.40	+0.50			3.2	5.4	2.50	33.70		1.30
33	35.50	-0.25			3.3	5.4	2.50	34.70		1.30
34	36.50				3.3	5.4	2.50	35.70		1.60
35	37.80				3.4	5.4	2.50	37.00		1.60
36	38.80				3.5	5.4	2.50	38.00		1.60
37	39.80		1.50		3.6	5.5	2.50	39.00		1.60
38	40.80				3.7	5.5	2.50	40.00	+0.250	1.60
39	42.00				3.8	5.6	2.50	41.00		1.60
40	43.50				3.9	5.8	2.50	42.50		1.85
41	44.50				4.0	5.9	2.50	43.50		1.85
42	45.50	+0.90			4.1	5.9	2.50	44.50		1.85
43	46.50	-0.39			4.2	5.9	2.50	45.50		1.85
44	47.50		1.75		4.2	6.0	2.50	46.50		1.85
45	48.50				4.3	6.2	2.50	47.50		1.85
46	49.50				4.4	6.3	2.50	48.50		1.85
47	50.50				4.4	6.4	2.50	49.50		1.85
48	51.50				4.5	6.4	2.50	50.50		1.85
50	54.20				4.6	6.5	2.50	53.00		2.15
51	55.20				4.7	6.5	2.50	54.00		2.15
52	56.20				4.7	6.7	2.50	55.00		2.15
53	57.20				4.9	6.7	2.50	56.00		2.15
54	58.20	+1.10			5.0	6.7	2.50	57.00		2.15
55	59.20	-0.46			5.0	6.8	2.50	58.00	+0.300	2.15
56	60.20		2.00	-0.07	5.1	6.8	2.50	59.00		2.15
57	61.20				5.1	6.8	2.50	60.00		2.15
58	62.20				5.2	6.9	2.50	61.00		2.15
60	64.20				5.4	7.3	2.50	63.00		2.15
62	66.20				5.5	7.3	2.50	65.00		2.15
63	67.20				5.6	7.3	2.50	66.00		2.15

Material: Carbon Spring Steel **Finish:** Zinc Phosphating. **Hardness:** d_1- 8 to 47mm : **47/54 HRC**
d_1 ≥ 48mm : **44/51 HRC**

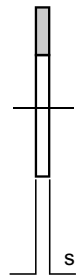
Unit : mm

	CIRCLIP DIMENSION							GROOVE DIMENSION		
Nominal Bore Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Large Section b≈	Lug a (Max.)	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
65	69.20	+1.10 -0.46	2.50	-0.07	5.8	7.6	3.00	68.00	+0.300	2.65
67	71.50				6.0	7.7	3.00	70.00		2.65
68	72.50				6.1	7.8	3.00	71.00		2.65
70	74.50				6.2	7.8	3.00	73.00		2.65
72	76.50				6.4	7.8	3.00	75.00		2.65
75	79.50				6.6	7.8	3.00	78.00		2.65
77	82.50				6.8	8.5	3.00	80.00		2.65
78	82.50				6.8	8.5	3.00	81.00	+0.350	2.65
80	85.50				7.0	8.5	3.00	83.50		2.65
81	86.50				7.0	8.5	3.00	84.50		2.65
82	87.50				7.0	8.5	3.00	85.50		2.65
85	90.50		3.00	-0.08	7.2	8.6	3.50	88.50		3.15
87	93.50				7.4	8.6	3.50	90.50		3.15
88	93.50	+1.13 -0.54			7.4	8.6	3.50	91.50		3.15
90	95.50				7.6	8.6	3.50	93.50		3.15
92	97.50				7.8	8.7	3.50	95.50		3.15
95	100.50				8.1	8.8	3.50	98.50		3.15
97	103.50				8.3	9.0	3.50	100.50		3.15
98	103.50				8.3	9.0	3.50	101.50	+0.540	3.15
100	105.50				8.4	9.2	3.50	103.50		3.15
102	108.00				8.5	9.5	3.50	106.00		4.15
105	112.00				8.7	9.5	3.50	109.00		4.15
107	115.00				8.9	9.5	3.50	111.00		4.15
108	115.00				8.9	9.5	3.50	112.00		4.15
110	117.00				9.0	10.4	3.50	114.00		4.15
112	119.00				9.1	10.5	3.50	116.00		4.15
115	122.00				9.3	10.5	3.50	119.00		4.15
117	125.00				9.6	10.7	3.50	121.00		4.15
118	125.00		4.00	-0.10	9.6	10.7	3.50	122.00	+0.630	4.15
120	127.00				9.7	11.0	3.50	124.00		4.15
122	129.00				9.8	11.0	4.00	126.00		4.15
125	132.00				10.0	11.0	4.00	129.00		4.15
127	135.00				10.0	11.0	4.00	131.00		4.15
128	135.00				10.2	11.0	4.00	132.00		4.15
130	137.00				10.2	11.0	4.00	134.00		4.15
132	139.00				10.3	11.0	4.00	136.00		4.15
135	142.00				10.5	11.2	4.00	139.00		4.15
137	145.00				10.6	11.2	4.00	141.00		4.15
138	145.00				10.6	11.2	4.00	142.00		4.15
140	147.00				10.7	11.2	4.00	144.00		4.15
142	149.00				10.8	11.3	4.00	146.00		4.15
145	152.00				10.9	11.4	4.00	149.00		4.15
148	155.00				11.1	11.8	4.00	152.00		4.15
150	158.00				11.2	12.0	4.00	155.00		4.15
152	161.00				11.3	12.0	4.00	157.00		4.15
155	164.00				11.4	12.0	4.00	160.00		4.15
158	167.00				11.5	12.3	4.00	163.00		4.15
160	169.00				11.6	13.0	4.00	165.00		4.15
162	171.50				11.7	13.0	4.00	167.00		4.15
165	174.50				11.8	13.0	4.00	170.00		4.15
168	177.50				12.1	13.5	4.00	173.00		4.15
170	179.50				12.2	13.5	4.00	175.00		4.15
172	181.50				12.5	13.5	4.00	177.00		4.15
175	184.50				12.7	13.5	4.00	180.00		4.15
178	187.50				12.9	14.2	4.00	183.00	+0.720	4.15
180	189.50				13.2	14.2	4.00	185.00		4.15
182	191.50				13.5	14.2	4.00	187.00		4.15
185	194.50				13.7	14.2	4.00	190.00		4.15
188	197.50				13.8	14.2	4.00	193.00		4.15
190	199.50				13.8	14.2	4.00	195.00		4.15
192	201.50	+1.70 -0.72			13.8	14.2	4.00	197.00		4.15
195	204.50				13.8	14.2	4.00	200.00		4.15
198	207.50				14.0	14.2	4.00	203.00		4.15
200	209.50				14.0	14.2	4.00	205.00		4.15

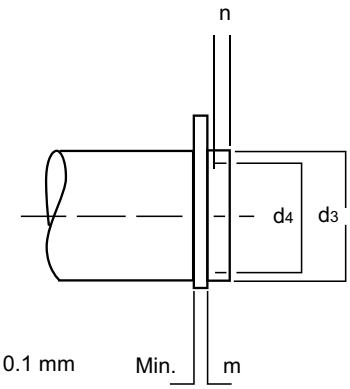
Material: Carbon Spring Steel **Finish:** Zinc Phosphating. **Hardness:** d_1- 8 to 47mm : **47/54 HRC**
d_1 ≥ 48mm : **44/51 HRC**



LOADED



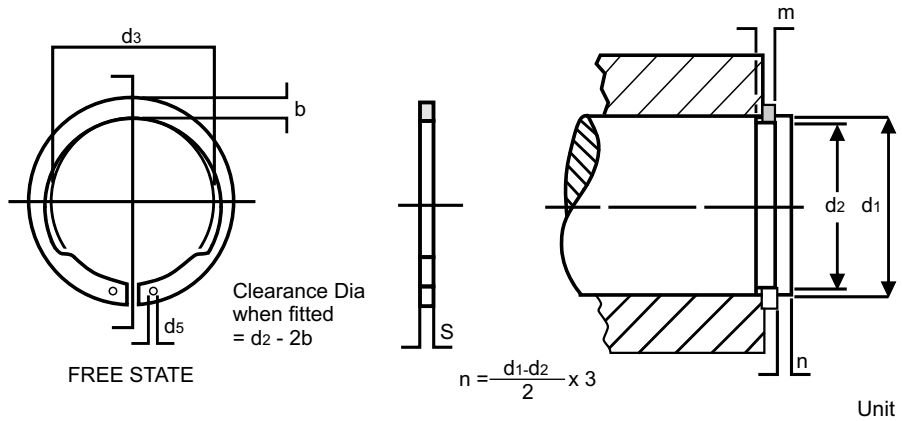
m = S + 0.1 mm



Unit : mm

	RING DIMENSION				GROOVE DIMENSION						THRUST LOAD	
Nominal Shaft Size d1	Loaded d2	a h10	S	Tolerance	d3 From	d3 To	d4 h11	m	Tolerance	n (Min.)	T5 (N)	T6 (N)
0.8	2.0	0.58	0.2		1.0	1.40	0.8	0.24		0.4	63	30
1.2	3.0	1.01	0.3		1.4	2.00	1.2	0.34		0.6	203	53
1.5	4.0	1.28	0.4		2.0	2.50	1.5	0.44		0.8	358	105
1.9	4.5	1.61	0.5		2.5	3.00	1.9	0.54		1.0	546	145
2.3	6.0	1.94	0.6	±0.02	3.0	4.00	2.3	0.64		1.0	835	260
3.2	7.0	2.70	0.6		4.0	5.00	3.2	0.64	+0.02	1.0	1070	365
4.0	9.0	3.34	0.7		5.0	7.00	4.0	0.74		1.2	1670	745
5.0	11.0	4.11	0.7		6.0	8.00	5.0	0.74		1.2	1950	870
6.0	12.0	5.26	0.7		7.0	9.00	6.0	0.74		1.2	2220	995
7.0	14.0	5.84	0.9		8.0	11.00	7.0	0.94		1.5	3400	1480
8.0	16.0	6.52	1.0		9.0	12.00	8.0	1.05		1.8	4170	1630
9.0	18.5	7.63	1.1		10.0	14.00	9.0	1.15		2.0	5250	2240
10.0	20.0	8.32	1.2		11.0	15.00	10.0	1.25	±0.06	2.0	6200	2430
12.0	23.0	10.45	1.3	±0.03	13.0	18.00	12.0	1.35		2.5	8010	3370
15.0	29.0	12.61	1.5		16.0	24.00	15.0	1.55		3.0	11900	6220
19.0	37.6	15.92	1.75		20.0	31.00	19.0	1.85		3.5	17700	10300
24.0	44.6	21.88	2.00		25.0	38.00	24.0	2.05		4.0	25000	14700

MATERIAL : Carbon Spring Steel.
Finish : Zinc Phosphating.
Hardness : 46/54 HRC.

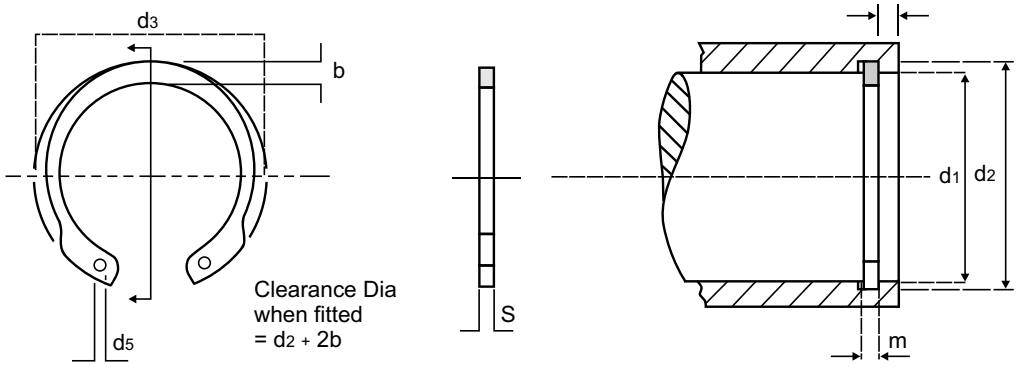


Unit : mm

	RING DIMENSION						GROOVE DIMENSION		
Nominal Shaft Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Large Section b≈	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
12	11.00	+0.10 -0.36	1.00	-0.06	2.10	1.30	11.50	-0.110	1.10
13	11.90				2.10	1.30	12.40		1.10
14	12.90				2.10	1.30	13.40		1.10
15	13.80				2.20	1.30	14.30		1.10
16	14.70				2.30	1.30	15.20		1.10
17	15.70		1.20		2.40	1.30	16.20		1.10
18	16.50				2.60	1.50	17.00		1.30
20	18.50	+0.13 -0.42			2.80	1.50	19.00	-0.150	1.30
22	20.50				3.00	1.50	21.00		1.30
23	21.50				3.10	1.50	22.00		1.30
24	22.20	+0.21 -0.42			3.20	1.50	22.90	-0.210	1.30
25	23.20				3.40	1.50	23.90		1.30
26	24.20				3.50	1.50	24.90		1.30
28	25.90		1.50		3.80	2.00	26.60		1.60
30	27.90				3.90	2.00	28.60		1.60
32	29.60	+0.25 -0.5			4.00	2.00	30.30	-0.250	1.60
34	31.50				4.10	2.00	32.30		1.60
35	32.20				4.20	2.00	33.00		1.60
40	36.50	+0.39 -0.9	1.75		4.70	2.00	37.50		1.85
42	38.50				4.70	2.00	39.50		1.85
45	41.50				4.70	2.00	42.50		1.85
47	43.50				5.00	2.00	44.50		1.85
48	44.50				5.20	2.00	45.50		1.85
50	45.80		2.00	-0.07	5.20	2.50	47.00		2.15
55	50.80				5.80	2.50	52.00	-0.300	2.15
58	53.80	+0.46 -1.10	2.50		5.80	2.50	55.00		2.15
60	55.80				5.80	2.50	57.00		2.15
65	60.80				6.00	2.50	62.00		2.65
70	65.50				6.50	2.50	67.00		2.65
72	67.50				6.50	2.50	69.00		2.65
75	70.50				6.50	2.50	72.00		2.65
80	74.50				7.00	2.50	76.50		2.65
82	76.50				7.00	2.50	78.50		2.65
85	79.50		3.00	-0.08	7.40	3.00	81.50	-0.350	3.15
87	81.50				7.40	3.00	83.50		3.15
90	84.50	+0.54 -1.30			7.40	3.00	86.50		3.15
95	89.50				8.00	3.00	91.50		3.15
100	94.50				8.00	3.00	96.50		3.15

MATERIAL : Carbon Spring Steel.
Finish : Zinc Phosphating.
Hardness : d1- 12 to 47 : 47/54 HRC
d1 ⩾ 48mm : 44/51 HRC

Inverted Internal Circlips DIN 5008



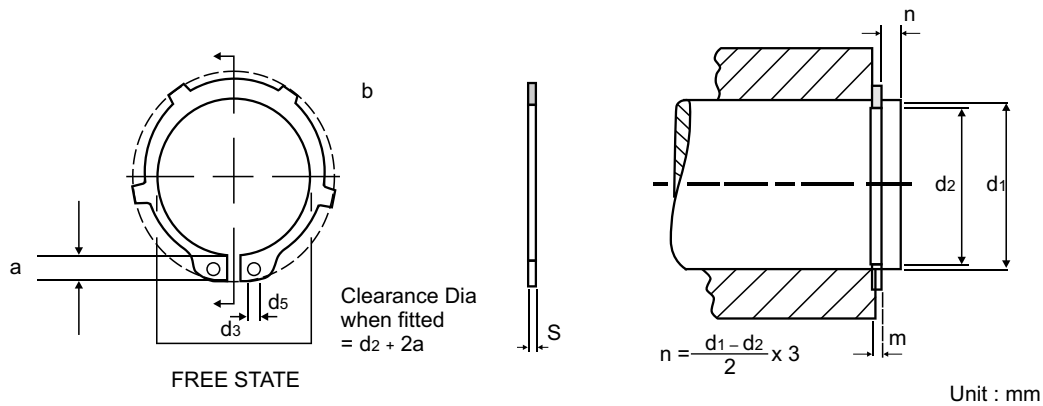
FREE STATE

$$n = \frac{d_1 - d_2}{2} \times 3$$

Unit : mm

	RING DIMENSION						GROOVE DIMENSION		
Nominal Bore Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Large Section b≈	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
16	17.30				2.10	1.30	16.80	+0.110	1.10
17	18.30				2.10	1.30	17.80		1.10
18	19.50		1.00		2.20	1.30	19.00		1.10
19	20.50	+0.42			2.20	1.30	20.00		1.10
20	21.50	-0.13			2.30	1.30	21.00	+0.150	1.10
22	23.50				2.40	1.30	23.00		1.10
24	25.90				2.80	1.50	25.20		1.30
25	26.90				2.80	1.50	26.20		1.30
26	27.90	+0.42	1.20		3.00	1.50	27.20	+0.210	1.30
27	29.10	-0.21			3.00	1.50	28.40		1.30
28	30.10			-0.06	3.10	1.50	29.40		1.30
30	32.10				3.20	1.50	31.40		1.30
32	34.40	+0.50			3.30	1.50	33.70		1.30
33	35.50	-0.25			3.30	1.50	34.70		1.30
35	37.80		1.50		3.40	1.70	37.00		1.60
36	38.80				3.60	1.70	38.00	+0.250	1.60
38	40.80				3.80	1.70	40.00		1.60
40	43.50				4.20	2.00	42.50		1.85
42	45.50	+0.90	1.75		4.20	2.00	44.50		1.85
45	48.50	-0.39			4.20	2.00	47.50		1.85
47	50.50				4.70	2.00	49.50		1.85
48	51.50				4.70	2.00	50.50		1.85
50	54.20				5.20	2.50	53.00		2.15
52	56.20		2.00		5.20	2.50	55.00		2.15
55	59.20				5.20	2.50	58.00		2.15
57	61.20	+1.10			5.20	2.50	60.00		2.15
58	62.20	-0.46			5.20	2.50	61.00	+0.300	2.15
60	64.20			-0.07	5.20	2.50	63.00		2.15
62	66.20				5.20	2.50	65.00		2.15
65	69.20		2.50		5.70	2.50	68.00		2.65
67	71.50				5.70	2.50	70.00		2.65
68	72.50				5.70	2.50	71.00		2.65
72	76.50				6.00	2.50	75.00		2.65
80	85.50				6.00	2.50	83.50		2.65
85	90.50				6.60	3.00	88.50		3.15
90	95.50	+1.30	3.00	-0.08	6.60	3.00	93.50	+0.350	3.15
95	100.50	-0.54			7.40	3.00	98.50		3.15
100	105.50				7.40	3.00	103.50		3.15

MATERIAL : Carbon Spring Steel.
Finish : Zinc Phosphating.
Hardness : d1 - 16 to 47 : 47/54 HRC
d1 ⩾ 48 : 44/51 HRC



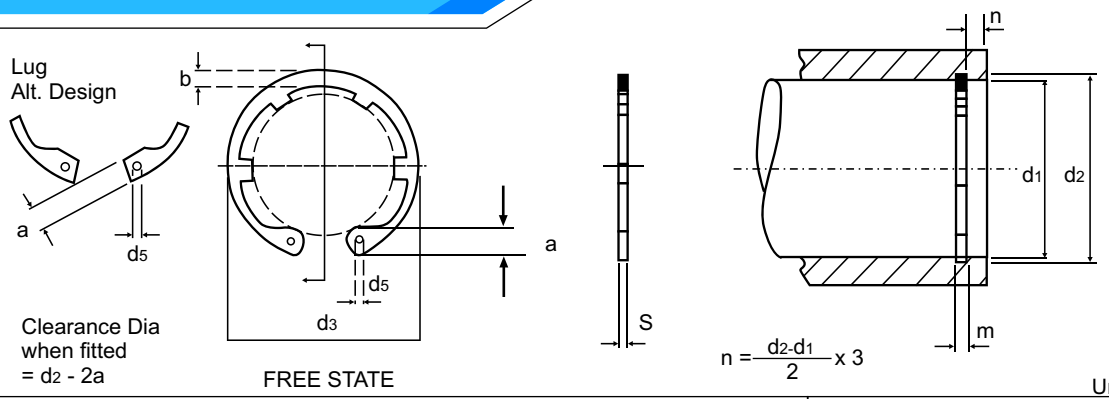
FREE STATE

Unit : mm

	CIRCLIP DIMENSION							GROOVE DIMENSION		
Nominal Shaft Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Lug a (Max.)	Large Section b≈	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
17	15.70	+0.10 -0.36	1.00	-0.06	3.6	2.4	1.70	16.20	-0.110	1.10
18	16.50		1.20		3.7	2.5	2.00	17.00		1.30
19	17.50				3.7	2.6	2.00	18.00		1.30
20	18.50	+0.13 -0.42			3.8	2.6	2.00	19.00	-0.150	1.30
22	20.50				4.0	2.8	2.00	21.00		1.30
23	21.50				4.1	2.9	2.00	22.00		1.30
24	22.20				4.2	3.0	2.00	22.90		1.30
25	23.20	+0.21 -0.42			4.3	3.0	2.00	23.90		1.30
26	24.20				4.4	3.1	2.00	24.90		1.30
28	25.90				4.5	3.3	2.00	26.60	-0.210	1.60
29	26.90		1.50		4.7	3.4	2.00	27.60		1.60
30	27.90				4.7	3.4	2.00	28.60		1.60
32	29.60				5.0	3.6	2.50	30.30		1.60
34	31.50				5.1	3.8	2.50	32.30		1.60
35	32.20	+0.25 -0.50			5.2	3.8	2.50	33.00		1.60
38	35.20		1.75		5.5	4.1	2.50	36.00		1.85
40	36.50				7.2	4.2	2.50	37.50	-0.250	1.85
42	38.50				7.2	4.5	2.50	39.50		1.85
45	41.50	+0.39 -0.90			7.2	4.6	2.50	42.50		1.85
47	43.50				7.2	4.8	2.50	44.50		1.85
48	44.50		2.00	-0.07	7.2	4.9	2.50	45.50		1.85
50	45.80				8.2	5.0	2.50	47.00		2.15
55	50.80				8.2	5.4	2.50	52.00		2.15
57	52.80				8.2	5.6	2.50	54.00		2.15
58	53.80				8.2	5.7	2.50	55.00		2.15
60	55.80				8.2	5.8	2.50	57.00		2.15
62	57.80				8.2	5.9	2.50	59.00		2.15
65	60.80	+0.46 -1.10			10.2	6.2	3.00	62.00	-0.300	2.65
67	62.50				10.2	6.4	3.00	64.00		2.65
68	63.50		2.50		10.2	6.5	3.00	65.00		2.65
70	65.50				10.2	6.6	3.00	67.00		2.65
75	70.50				10.2	7.0	3.00	72.00		2.65
80	74.50				10.2	7.4	3.00	76.50		2.65
85	79.50		3.00	-0.08	10.2	7.8	3.50	81.50	-0.35	3.15
90	84.50	+0.54 -1.30			10.2	8.2	3.50	86.50		3.15
95	89.50				10.2	8.6	3.50	91.50		3.15
100	94.50				10.2	9.0	3.50	96.50		3.15
110	103.00				12.2	9.6	3.50	106.00	-0.54	4.15
120	113.00		4.00	-0.10	14.2	10.1	3.50	116.00		4.15
140	133.00				14.2	11.2	4.00	136.00	-0.630	4.15

MATERIAL : Carbon Spring Steel.
Finish : Zinc Phosphating.
Hardness : d1 - 17 to 47 : 47/54 HRC
d1 ⩾ 48 : 44/51 HRC

K Type Internal Circlips DIN 984



Unit : mm

	CIRCLIP DIMENSION							GROOVE DIMENSION		
Nominal Bore Size d1	Free Diameter d3	Free Diameter Tolerance	Thickness S mm	Tolerance	Lug a (Max.)	Large Section b≈	Hole Dia d5 (Min.)	Diameter d2	Tolerance	Width m (Min.)
16	17.30				3.4	2.1	1.70	16.80	+0.110	1.10
17	18.30				3.7	2.2	1.70	17.80		1.10
18	19.50		1.00		4.1	2.3	2.00	19.00		1.10
19	20.50				3.8	2.3	2.00	20.00		1.10
20	21.50				3.9	2.4	2.00	21.00		1.10
21	22.50	+0.42			4.0	2.4	2.00	22.00	+0.150	1.10
22	23.50	-0.13			4.0	2.6	2.00	23.00		1.10
23	24.60				4.1	2.6	2.00	24.10		1.30
24	25.90	+0.42			4.2	2.6	2.00	25.20		1.30
25	26.90	-0.21			4.2	2.8	2.00	26.20		1.30
26	28.50		1.20		4.4	2.8	2.00	27.20	+0.210	1.30
27	29.10				4.5	2.9	2.00	28.40		1.30
28	30.10				4.9	3.0	2.00	29.40		1.30
30	32.10				4.9	3.2	2.00	31.40		1.30
31	33.40				5.0	3.2	2.50	32.70		1.30
32	34.40	+0.50		-0.06	5.1	3.3	2.50	33.70		1.30
34	36.50	-0.25			5.3	3.4	2.50	35.70		1.60
35	37.80		1.50		5.5	3.6	2.50	37.00		1.60
36	38.80				5.6	3.6	2.50	38.00	+0.250	1.60
38	40.80				6.1	3.8	2.50	40.00		1.60
40	43.50	+0.90			7.2	4.0	2.50	42.50		1.85
42	45.50	-0.39			7.2	4.1	2.50	44.50		1.85
44	47.50		1.75		7.2	4.2	2.50	46.50		1.85
45	48.50				7.2	4.3	2.50	47.50		1.85
47	50.50				7.2	4.5	2.50	49.50		1.85
48	51.50				7.2	4.5	2.50	50.50		1.85
50	54.20				8.2	4.7	2.50	53.00		2.15
52	56.20				8.2	4.7	2.50	55.00		2.15
55	59.20		2.00		8.2	5.1	2.50	58.00		2.15
57	61.20				8.2	5.2	2.50	60.00		2.15
58	62.20	+1.10			8.2	5.3	2.50	61.00		2.15
60	64.20	-0.46			8.2	5.5	2.50	63.00	+0.300	2.15
62	66.20				8.2	5.6	2.50	65.00		2.15
65	69.20				10.2	5.8	3.00	68.00		2.65
67	71.50				10.2	6.0	3.00	70.00		2.65
68	72.50				10.2	6.1	3.00	71.00		2.65
70	74.50		2.50	-0.07	10.2	6.2	3.00	73.00		2.65
72	76.50				10.2	6.4	3.00	75.00		2.65
75	79.50				10.2	6.6	3.00	78.00		2.65
80	85.50				10.2	7.0	3.00	83.50		2.65
85	90.50				12.2	7.4	3.50	88.50		3.15
90	95.50	+1.30		-0.08	12.2	7.7	3.50	93.50	+0.350	3.15
95	100.50	-0.54	3.00		12.2	8.1	3.50	98.50		3.15
100	105.50				12.2	8.5	3.50	103.50		3.15
110	117.00				12.2	9.0	3.50	114.00		4.15
115	122.00				12.2	9.3	3.50	119.00	+0.540	4.15
120	127.00		4.00	-0.10	12.2	9.6	3.50	124.00		4.15
125	132.00				12.2	9.9	4.00	129.00		4.15
130	137.00	+1.50			12.2	10.2	4.00	134.00		4.15
140	148.00	-0.63			14.2	10.7	4.00	144.00	+0.630	4.15

MATERIAL : Carbon Spring Steel.
Finish : Zinc Phosphating.
Hardness : d1 - 16 to 47 : 47/54 HRC
d1 ⩾ 48 : 44/51 HRC

Groove Dimension

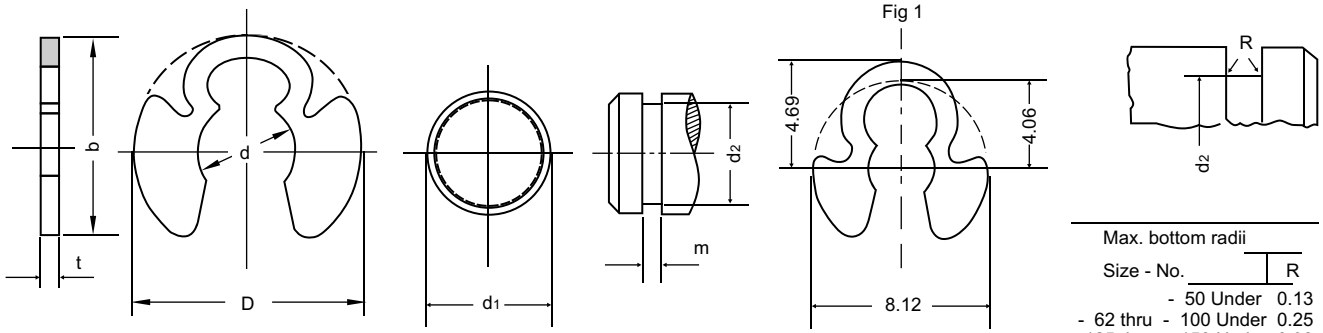


Fig 1

T5304-15 only

Max. bottom radii

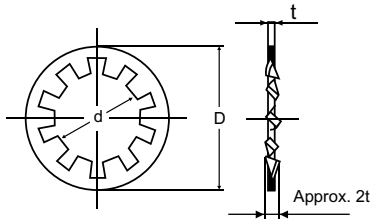
Size - No.	R
- 50 Under	0.13
- 62 thru - 100 Under	0.25
- 125 thru - 150 Under	0.38
- 175 thru - 200 Under	0.51

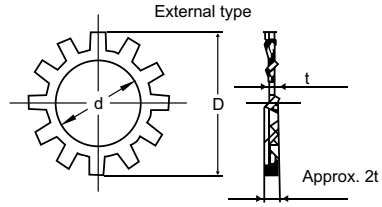
Unit : mm

Size No.	RING DIMENSION							GROOVE DIMENSIONS				THRUST LOAD		
	Shaft diameter	Inside diameter		Thickness		Outside dia	Height	Diameter		Width		Tested Shaft	Ring safety = 2½	Groove safety = 2
	d1	d	To.	t	Tol.	D/Approx	b/Approx	d2	Tol.	m	Tol.	d1	Pn(kgf)	Pg(kgf)
T5304 - 15	4 - 4.5	2.79				Fig. 1	8.00	3.05	± 0.1			4	140	40
18	4.5 - 5.5	3.56			± 0.04	10.16	9.14	3.76				4.8	190	50
25	6-7	4.78	±0.08	0.6		12.24	10.92	5.33	± 0.13	0.75		6.4	280	90
31	7.5 - 8.5	6.35				14.94	13.11	6.91			+0.15	7.9	350	110
37	9 - 10.5	7.92		0.9	± 0.05	17.27	15.09	8.41	± 0.15	1.05	0	9.5	580	130
43	11 - 12	9.53	± 0.1			19.1	16.76	9.91				11.1	830	180
50	12 - 13	10.31		1		20.98	18.34	11.18		1.15		12.7	940	270
62	15 - 17	12.70	± 0.13			24.54	21.54	13.49	± 0.2			15.9	1,120	490
75	18 - 20	15.09		1.2		27.81	24.64	16.05		1.4	+ 0.2	19	1,660	720
100	24 - 26	20.62	± 0.15			35.94	31.75	21.84	± 0.25		0	25.4	2,160	1,170
5304 - 125	31.8	26.21	± 0.15	2.36	± 0.08	45.72	39	27.69	± 0.25	2.62		31.8	4,950	1,570
150	38.1	31.75	± 0.2	2.77		52.07	44.3	33.45		3.05	+ 0.25	38.1	6,580	2,160
175	44.4	35.71	± 0.25	3.2	± 0.1	58.42	50.7	37.59	± 0.38	3.53	0	44.4	9,220	3,690
200	50.8	41.28	± 0.38			67.31	58.7	43.94				50.8	10,570	4,250

Material = Carbon Spring Steel. Hardness = HRC44 - 54
Finish = Black phosphate coating / Zn plating, Chromate dip.
Note: The data of thrust load shows the value when the Ring is tested by the shaft made of cold rolled steel.

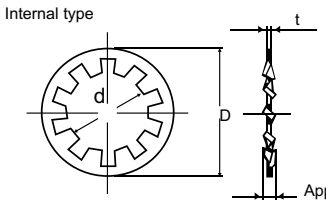
Toothed Lock Washers JIS B - 1255
(Japanese Industrial Standard)

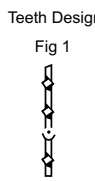




Unit : mm

Size No.		Screw size		d		D		t		No. of teeth	
Internal	External	mm	Inch	Basic	Tol.	Basic	Tol.	Basic	Tol.	Internal	External
AW-2	BW-2	2	-	2.2		4.8		0.3		7	8
2.3	2.3	2.3	-	2.5		5.3	0	0.3	±0.03	7	8
2.5	2.5	2.5 (2.6)	-	2.8		5.8	-0.3	0.3		7	8
3	3	3	-	3.2	+0.2	6.5		0.45		7	8
3.5	3.5	3.5	-	3.7	0	7.5	0	0.45	±0.04	8	8
4	4	4	-	4.3		8.5	-0.4	0.45		8	8
4.5	4.5	4.5	-	4.8		9.5		0.5		8	8
5	5	5	-	5.3		10		0.6		8	10
6	6	6	-	6.4		11		0.6		9	12
7	-	7	-	7.4	+0.3	13	0	0.7	±0.05	9	12
8	8	8	-	8.4	0	15	-0.5	0.8		9	12
3/8	3/8		3/8	9.8		17.5		0.9	±0.06	9	12
10	10	10	-	10.5		18		0.9		9	12
7/16	7/16	-	7/16	11.4		19.5		0.9		10	12
12	12	12	-	12.5	0.4	21		1		10	12
1/2	1/2	-	1/2	13	0	22.5	0	1	±0.06	10	12
14	14	14	-	14.5		23	-0.6	1		10	12
16	16	16	5/8	16.5		26		1.2		12	14
18	18	18	-	19		29		1.2		12	14
3/4	3/4	-	3/4	19.6		32	0	1.2		12	14
20	20	20	-	21	+0.5	32	-0.8	1.4	±0.07	12	14
22	22	22	7/8	23	0	35		1.4		14	16
24	24	24	-	25		38		1.6	±0.08	14	16
1"	1"	-	1"	26		41		1.6		14	16



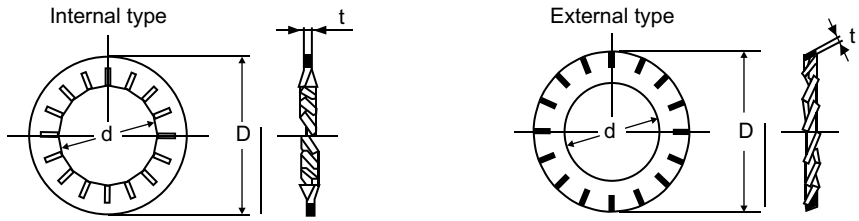


Unit : mm

Size No.	d		D		t		Nos. of teeth	Design Variation
	Basic	Tol.	Basic	Tol.	Basic	Tol.		
AW - 1811	1.9	+0.2	4.5	±0.1	0.25	±0.025	6	
6301	6.6	±0.15	10.2	±0.2	0.5	±0.03	9	
9101	9.1	+03	16.5	0 -0.4	0.9	±0.05	9	
9102	9.1	0	14.8	0 -0.5	0.5	±0.03	16	
9103	9.4	±0.15	12.9	±0.15	0.5	±0.03	16	
9501	9.9	+0.3 -0.2	17.3	+0.2 -0.5	0.9	±0.05	10	
12002	12.2	+0.2 -0.1	15.2	+0.5 0	0.5	±0.03	12	
13001	13.1	±0.2	16.3	±0.25	0.6	±0.04	20	Fig. 1
28601	29.1	+0.1 0	46.5	0 -0.8	1.6	±0.07	16	

Material = Carbon Spring Steel. Hardness = HRC40-50. Finish = Zinc Phosphated/ Zn plating,Chromate dip.

Overlapping Toothed Lock Washers

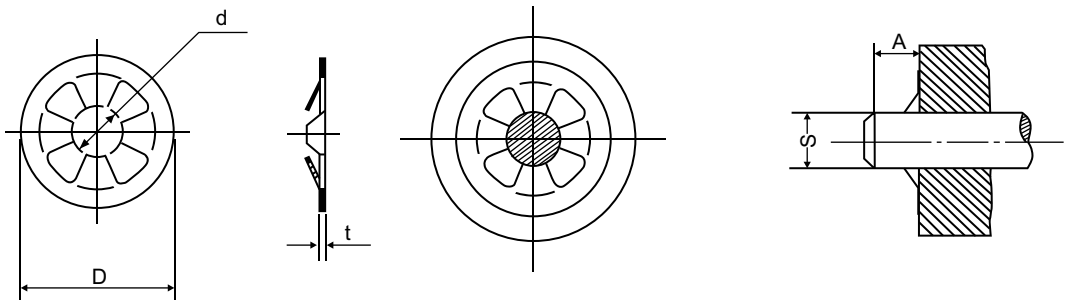


Unit : mm

Size No.		Screw size		d		D		t		No. of teeth	
Internal	External	mm	Inch	Basic	Tol.	Basic	Tol.	Basic	Tol.	Internal	External
JZ-3	AZ-3	3		3.05		6	±0.24	0.4		8	10
4	4	4	5/32	4.1	+0.3	8	±0.29	0.5		8	12
5	5	5		5.1	0	9.2		0.6	±0.03	8	12
6	6	6		6.1	+0.36	11		0.7		10	12
8	8	8	5/16	8.2	0	14	±0.35	0.8		12	14
10	10	10		10.2		18		0.9		12	16
12	12	12		12.3	+0.43	20		1		14	18
14	14	14		14.3	0	24		1.1		16	20
16	16	16	5/8	16.3		26	±0.42	1.2	±0.04	16	20
18	18	18		18.5		30		1.4		16	20
20	20	20		20.5	+0.52	32.5		1.4		16	22
22	22	22	7/8	22.5	0	35	±0.5	1.5		18	22
24	24	24		24.5		38		1.5	±0.05	20	24

Material = Carbon spring steel. Hardness = HRC40 - 50
Finish = Black phosphate coating

Circular External Nuts



Unit : mm

Size No.	Nut					Applicable stud		
	d		D		t	S		A
	Basic	Tol.	Basic	Tol.		Basic	Tol.	
CSN - 3	2.7	±0.2	12	±0.3	0.3	3	±0.05	4.8
CSN - 4	3.7		12		0.3	4		6
CSN - 5	4.7		14		0.4	5		6.6

Material = Stainless Spring Steel
Hardness = HRC 31 (Min.)
Note : This nut cannot be used with hardened stud.

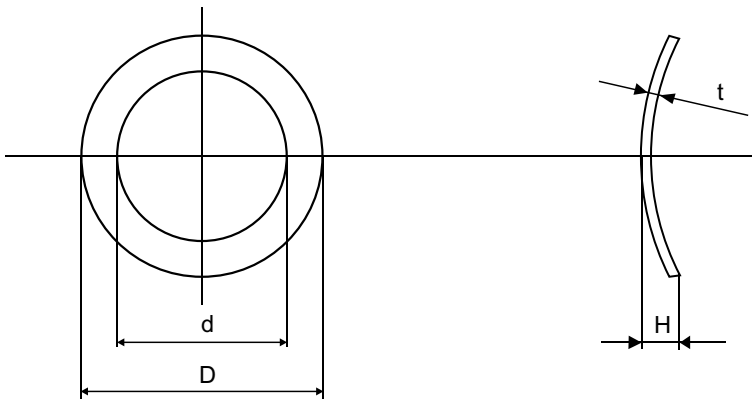
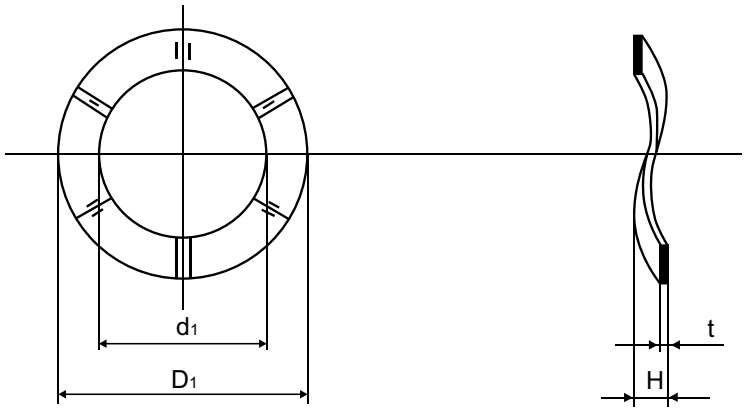


Fig. 1

Unit : mm

Size No.	d		D		H		t	Remark		
	Basic	Tol.	Basic	Tol.	Basic	Tol.		Design Variation	Material	Hardness HRC
MB-1711	1.7		3.7		0.6		0.1		C5210P	-
3212	3.2		6.5		1		0.15		SUS	31 (Min)
4001	4.1	+0.2	10		1.3		0.2			43-51
4201	4.2	-0.1	10		1.2		0.25			
4301	4.3		6.8		1		0.15			
4302	4.3		8	±0.2	1.2		0.3			
5011	5		7.9		1.2		0.15			
5211	5.2		10		1.2		0.1		C5191P	
5301	5.3		10		1.4		0.3			
6201	6.2		11		1.2	±0.2	0.2			43-51
6203	6.2		11		1.4		0.15			
6301	6.3	±0.2	11		1.5		0.4			
6411	6.4		24	±0.3	2.5		0.4		SUS	42-52
6511	6.5		9.8	±0.2	1.2		0.5		SUS	31 (Min)
6811	6.8		10.6		1.8		0.15			
8302	8.5		15		2.3		0.5			
8501	8.5		16		3		0.4			
12511	12.5		16.8		2.2	±0.3	0.4			
14501	14.8	±0.3	20	±0.3	3		0.3			
15900	15.9		20		1.3		0.25			37-43
16601	16.6		25		2		0.3	Fig. 1		38-45

Material = Carbon Spring Steel. Hardness = HRC40 - 50
Finish = Black Phosphate coating



Unit : mm

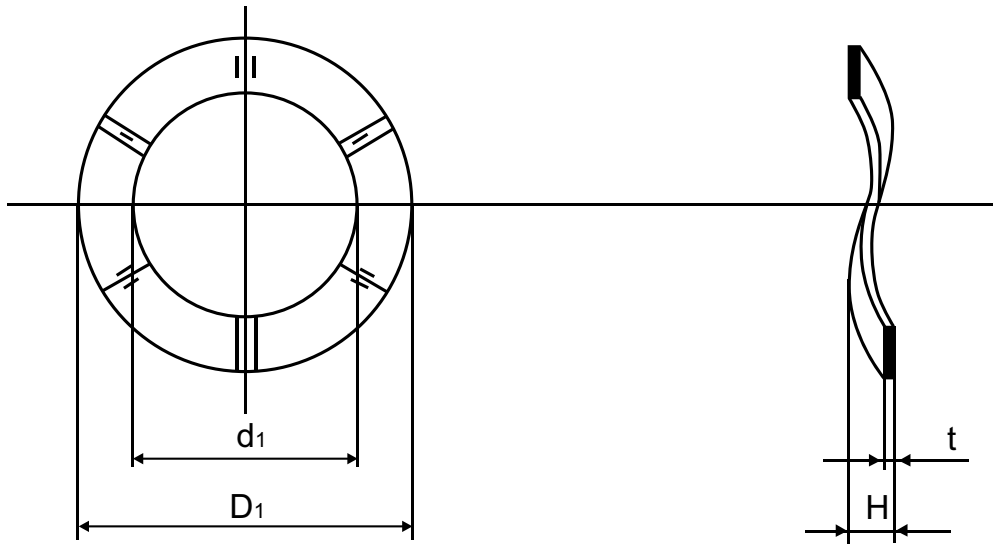
Size No.	d1		D1		H		t	
	Basic	Tol.	Basic	Tol.	Basic	Tol.	Basic	Tol.
WW - 4	4.3		8		1.5		0.2	±0.02
5	5.4		9		1.5	+0.5	0.3	
6	6.4		11		1.5	0	0.3	
8	8.5		12.5		2		0.3	
10	10.5	+0.3	14.5	0	2		0.3	
12	12.5	-0.15	17	-0.5	2.5		0.3	
14	14.5		20		2.5		0.3	
16	16.7		22.5		2.5	+0.7	0.3	±0.025
18	18.7		26		3	0	0.3	
20	20.7		29.1		3		0.3	
23	23.5		31		3.5	+1	0.3	
						0	0.3	
26	26.4	+0.5	34.2	0	3.5		0.3	
30	30.4	-0.3	39.3	-0.8	3.5		0.3	
32	33.8		46		4.5		0.3	
38	39		51		5	+1	0.3	
40	40.6		53.5		5	-0.5	0.3	
46	47.7	+0.7	61	0	5.5		0.4	
50	51.4	-0.5	67.5	-0.2	5.5		0.4	
53	54		69.8		6		0.45	±0.03
60	61.9		79		6.5		0.45	

Size No.	d1		D1		H		t		Remarks	
	Basic	Tol.	Basic	Tol.	Basic	Tol.	Basic	Tol.	Material	Hardness (HRC)
WW-6004	6.5		10.5		0.8		0.2			
6012	6.8		12.6		0.8		0.15	±0.02	SUS	43 (Min.)
8511	8.5		15.8		1.5	±0.25	0.3	±0.025	SUS	31 (Min.)
9002	9		15		1.5		0.3			38-46
11002	11.6	±0.25	14.9	±0.25	1.4		0.15	±0.02		44-52
11003	11.2		17		2.5		0.3	±0.025		
11011	11		15		1.8	+0.5	0.2			
16011	16.7		23.4		2.3	0	0.2	±0.02	SUS	42-52
17001	17.5		22.8		2.5	+0.7	0.3	±0.025		

Material = Carbon Spring Steel. Hardness = HRC40 - 50. Finish = Black Phosphate coating

Note : 1. Free height H shows when 3 waves are at the same height

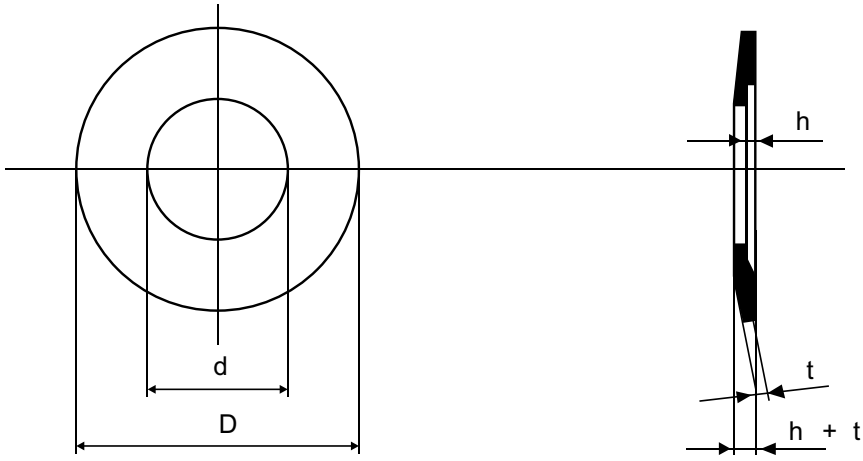
2. Internal diameter d1 shows inscribed circle and outer diameter D1 shows circumscribed circle.



Unit : mm

Size No.	Bearing out. dia.	d1	D1	H	t	Application bearing No.				
BWW-624	13	8.8	12.8	1.5	0.15	695		624	633	
625	16	12	15	2	0.15			625	694	
626	19	12.7	18.1	2.5	0.2	698	607	626	635	
628	22	14.5	21	2.4	0.2	6900	608	627	636	
629	26	19.5	24.8	3.2	0.2		6000	629	637	
6001	28	20.9	26.9	3	0.25	6902	6001		638	
6200	30	22	28.5	4.1	0.25	6903		6200	639	
6201	32	23.5	30.5	4	0.25		6002	6201		
6202	35	26.4	33.9	3.5	0.3		6003	6202	6300	
6203	40	29.8	38.3	5	0.3			6203		
6302	42	30.1	40.6	4.5	0.3	6905	6004		6302	
6303	47	33.7	45.5	5	0.3	6906	6005	6204	6303	
6304	52	37.5	49	8	0.3			6205	6304	
6305	62	47.2	60.2	6.5	0.4	6908	6607	6206	6305	6403
6306	72	55	70.5	7	0.45	6010		6207	6306	6404
6307	80	61.3	77.8	8.5	0.45	6911	6010	6208	6307	6405
6308	90	69	88.5	7	0.6	6913	6011	6210	6308	6406
6309	100	79.3	98.8	6.5	0.7	6914	6013	6211	6309	6407
6310	110	88.9	108.9	8	0.8	6916	6014	6212	6310	6408
6311	120	95.8	118.9	8.5	0.8	6917		6213	6311	6409
6312	130	108.3	128.3	11	0.8	6919	6017	6215	6312	6410
6313	140	112.4	138.4	11	0.8	6920	6018	6216	6313	6411

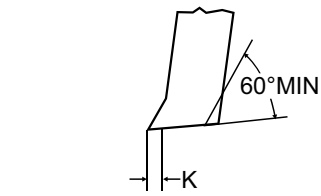
Material = Carbon Spring Steel
Hardness = HRC 40 - 50 Finish = Black Phosphate Coating
Note : 1. Free height H shows when 3 waves are at the same height
2. Internal diameter d1. Shows inscribed circle and outer diameter D1 shows circumscribed circle.



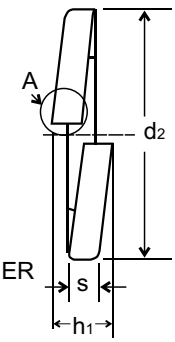
Unit : mm

Size No.	d		D		H (Heavy Duty)				L (Light Duty)			
					t		h Approx.	h + t Approx.	t		h Approx.	h + t Approx.
	Basic	Tol.	Basic	Tol.	Basic	Tol.			Basic	Tol.		
DB - 4	4.2		8		0.4	± 0.04	0.2	0.6	0.3	± 0.03	0.25	0.55
5	5.2		10		0.5		0.25	0.75	0.4		0.3	0.7
6	6.2	+ 0.3	12.5	± 0.3	0.7	± 0.05	0.3	1	0.5		0.35	0.85
7	7.2	- 0.1	14		0.8		0.3	1.1	0.5	± 0.04	0.4	0.9
8	8.2		16		0.9		0.35	1.25	0.6		0.45	1.05
9	9.2		18		1	± 0.06	0.4	1.4	0.7	± 0.05	0.5	1.2
10	10.2		20		1		0.45	1.45	0.8		0.55	1.35
11	11.2	+ 0.4	22.5	± 0.4	1.2		0.5	1.7	0.8		0.65	1.45
12	12.2	- 0.1	25		1.5	± 0.07	0.55	2.05	0.9	± 0.06	0.7	1.6
14	14.2		28		1.5		0.65	2.15	1		0.8	1.8
16	16.3		31.5		1.75		0.7	2.45	1.2		0.9	2.1
18	18.3		35.5		2	± 0.08	0.8	2.8	1.2	± 0.07	1	2.2
20	20.4	+ 0.5	40	± 0.5	2		0.9	2.9	1.5		1.15	2.65
22	22.4	- 0.2	45		2.5	± 0.1	1	3.5	1.75		1.3	3.05
25	25.4		50		3		1.1	4.1	2	± 0.08	1.4	3.4
28	28.5		56		3	± 0.12	1.3	4.3	2		1.6	3.6
30	31		63		3.5		1.4	4.9	2.5	± 0.1	1.75	4.25
35	36	+ 0.6	71	± 0.6	4		1.6	5.6	2.5		2	4.5
40	41	- 0.4	80		5		1.7	6.7	3		2.3	5.3
45	46		91		5	± 0.15	2	7	3.5	± 0.12	2.5	6
50	51	± 0.7	100	± 0.7	6		2.2	8.2	3.5		2.8	6.3

Material - Carbon Spring Steel. Hardness = HRC40 - 50.
Finish - Black Phosphate coating/ Zn plating, Chromate dip.

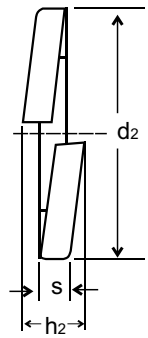


CHAIN LINE IS SHOWN
FOR FLAT END SPRING WASHER
DETAIL AT A



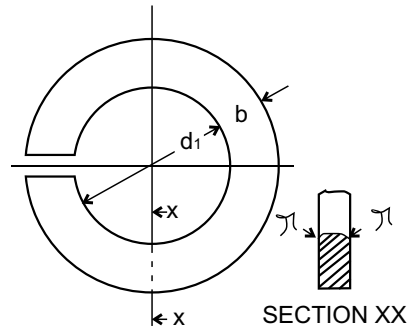
$h_1 = (2s + 2k)$

TYPE A
Washer With
Bent Ends



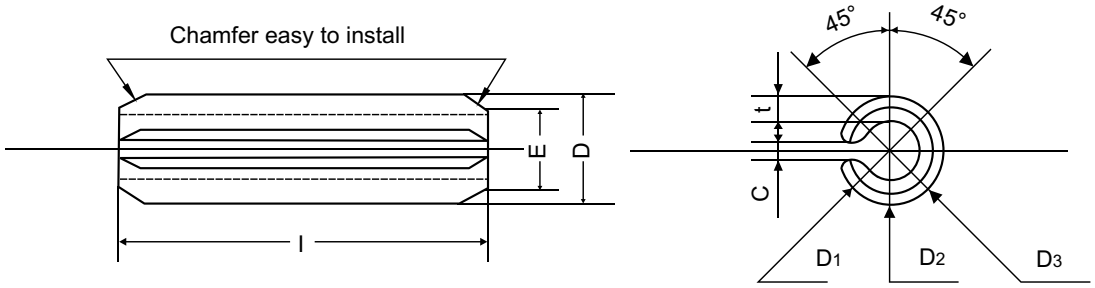
$h_2 = 2s$

TYPE B
Washer With
Flat Ends



Nominal Size	d1		d2 Max	b		s		r Nom	k°	h_2		For Bolt Nut or Screw Size
	Basic	Tol.		Basic	Tol.	Basic	Tol.			Min	Max	
2	2.1	+ 0.3	4.4	0.9	± 0.1	0.5	± 0.1	0.1	-	1	1.2	M2
2.2	2.3		4.9	1		0.6		0.1	-	1.2	1.4	M2.2
2.3	2.6		5.1	1		0.6		0.1	-	1.2	1.4	M2.5
3	3.1		6.2	1.3		0.8		0.2	-	1.6	1.9	M3
(3.5)	3.6		6.7	1.3		0.8		0.2	0.15	1.6	1.9	M3.5
4	4.1		7.6	1.5		0.9		0.2	0.15	1.6	2.1	M4
5	5.1		10.2	1.8		1.2		0.2	0.15	2.4	2.8	M5
6	6.1	+ 0.4	11.8	2.5	± 0.15	1.6		0.3	0.2	3.2	3.8	M6
(7)	7.1		12.8	2.5		1.6		0.3	0.2	3.2	3.8	M7
8	8.2		14.8	3		2		0.5	0.3	4	4.7	M8
10	10.2	+ 0.6	18.1	3.5	± 0.2	2.2	± 0.15	0.5	0.3	4.4	5.2	M10
12	12.2		21.1	4		2.5		1.0	0.4	5	5.9	M12
(14)	14.2	+ 0.8	24.1	4.5		3		1.0	0.4	6	7.1	M14
16	16.2		27.4	5		3.5		1.0	0.4	7	8.3	M16
(18)	18.2		29.4	5		3.5		1.0	0.4	7	8.3	M18
20	20.2	+ 1.0	33.6	6		4	± 0.2	1.0	0.4	8	9.4	M20
(22)	22.5		35.9	6		4		1.0	0.4	8	9.4	M22
24	24.5		40	7		5		1.6	0.5	10	11.8	M24
(27)	27.5		43	7		5		1.6	0.5	10	11.8	M27
30	30.5		48.2	8		6		1.6	0.8	12	14.2	M30
(33)	33.5	+1.2	53.2	10	± 0.25	6		1.6	0.8	12	14.2	M33
38	36.5		58.2	10		6		1.6	0.8	12	14.2	M36
(39)	39.5		61.2	10		6		1.6	0.8	12	14.2	M39
42	42.5		68.2	12		7		2	0.8	14	16.5	M42
(45)	45.5		71.2	12		7		2	0.8	14	16.5	M45
48	49	+ 1.5	75	12		7	± 0.25	2	0.8	14	16.5	M48
52	53		83	14		8		2	1	16	18.9	M52
56	57		87	14		8		2	1	16	18.9	M58
60	61		91	14		8		2	1	16	18.9	M60
64	65		95	14		8		2	1	16	18.9	M64
72	73		103	14		8		2	1	16	18.9	M72
76	77		109	14		8		2	1	16	18.9	M78
80	81		111	14		8		2	1	16	18.9	M80
90	91		121	14		8		2	1	16	18.9	M90
100	101		131	14		8		2	1	16	18.9	M98

Note : Sizes shown in brackets are of second preference.
*The bend k shall be made on the last length of the washer circumference without any sharp angle.



Unit : mm

Nominal dia			1	1.2	1.5	1.6	2	2.5	3	*3.5	4	*4.5	5	6	8	10	*12	13
Dimension	D	Max.	1.2	1.4	1.7	1.8	2.25	2.75	3.25	3.84	4.4	4.84	5.4	6.4	8.6	10.6	12.5	13.7
		Min.	1.1	1.3	1.6	1.7	2.15	2.65	3.15	3.7	4.2	4.7	5.2	6.2	8.3	10.3	12.3	13.4
	t	Basic	0.2	0.25	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.2	1.6	2	2	2.5
	E	Max.	0.9	1.1	1.4	1.5	1.9	2.4	2.9	3.4	3.9	4.3	4.8	5.8	7.8	9.8	11.7	12.7
Double Shear Strenth kfg. (KN)			70	104	158	171	281	440	633	861	1130	1425	1760	2532	4500	7030	8790	11500
			(0.69)	(1.02)	(1.55)	(1.68)	(2.76)	(4.3)	(6.2)	(8.44)	(11.08)	(13.97)	(17.25)	(24.83)	(44.13)	(68.94)	(86.2)	(112.78)
Hole Size		Basic	1	1.2	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	8	10	12	13
		Tol.	+0.08				+0.09			+0.12					+0.15		+0.2	
			0				0			0					0		0	

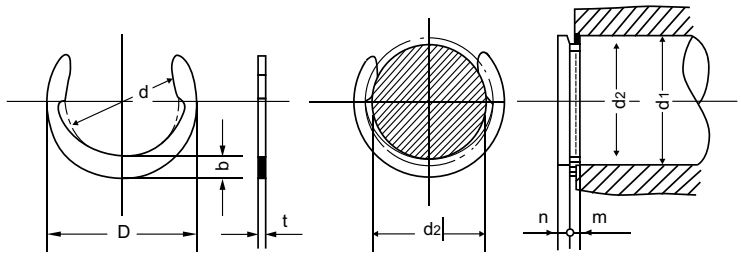
Length		Nominal Dia																
Basic	Tol.	1	1.2	1.5	1.6	2	2.5	3	3.5	4	4.5	5	6	8	10	12	13
1		0	0	0	0												
5	+0.5	0	0	0	0	0	0										
6	0	0	0	0	0	0	0	0									
8		0	0	0	0	0	0	0	0	0							
10		0	0	0	0	0	0	0	0	0	0	0					
12			0	0	0	0	0	0	0	0	0	0	0				
14				0	0	0	0	0	0	0	0	0	0				
16				0	0	0	0	0	0	0	0	0	0	0			
18						0	0	0	0	0	0	0	0	0	0		
20						0	0	0	0	0	0	0	0	0	0		
22							0	0	0	0	0	0	0	0	0	0	0
24	+ 1						0	0	0	0	0	0	0	0	0	0	0
25	0						0	0	0	0	0	0	0	0	0	0	0
28								0	0	0	0	0	0	0	0	0	0
32								0	0	0	0	0	0	0	0	0	0
36									0	0	0	0	0	0	0		0
40										0	0	0	0	0	0	0	0
45												0	0	0	0	0	0
50													0	0	0	0	0
55														0	0	0	0
56														0	0	0	0
60														0	0	0	0
63														0	0	0	0
70	+1.5														0	0	0
80	0														0	0	0
90																0	0
100																0	0
110																	0
120																	0
125																	0
140																	0

• Material = Carbon Spring Steel. Hardness = HRC45 - 50. Finish = Black Phosphate coating
• Material = Stainless Spring Steel

Note : Max. D shall be checked by a "Go" ring gauge Min. D Shall be the average of the D1, D2 and D3 diameter.
for ordering please write nominal dia and lenth as well . Example : "SPP 4x20"
* Marks are according to our Company's specification.

'C' Rings

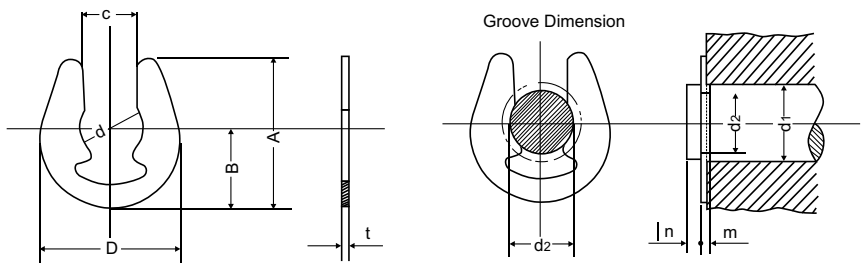
Groove Dimension



Size No.	Ring Dimensions						Grrove Dimensions					
	d		D	B	t		d1	d2		m		n
	Basic	Tol.			Basic	Tol.		Basic	Tol.	Basic	Tol.	Min
5103-12	2.59	+ 0.05	4.17	0.79	0.4	± 0.03	3.2	2.69	± 0.04	0.48	+ 0.04	0.5
18	4.09	- 0.1	6.19	1.05	0.4		4.8	4.19		0.48	0	0.6
21	4.75		6.99	1.12	0.6		5.6	4.9		0.7		0.7
25	5.36		7.9	1.27	0.6		6.4	5.59		0.7		0.8
31	6.86	+ 0.07	9.56	1.35	0.6	± 0.04	7.9	7.01		0.7		0.9
37	8.33	- 0.13	11.37	1.52	0.6		9.5	8.51	± 0.05	0.7	+ 0.06	1
40	9.12		12.32	1.6	0.6		10.3	9.25		0.7	0	1.1
43	9.8		13.1	1.65	0.6		11.1	9.98		0.7		1.1
46	10.54		14	1.73	0.6		11.9	10.69		0.7		1.2
50	11.2	±0.15	14.76	1.78	0.9	± 0.05	12.7	11.43		1		1.3
56	12.62		16.56	1.98	0.9		14.3	12.83	± 0.07	1	+ 0.08	1.4
81	18.13	± 0.18	23.23	2.46	1.4	± 0.06	20.6	18.59		1.5	0	2.3

Material = Carbon Spring Steel. Hardness = HRC44 - 52
Finish = Black phosphate coating / Zn planting, Chromate dip.

'U' Rings



Size No.	Ring Dimensions									Grrove Dimensions						
	d				C			t		d1		d2 `		m		n
	Basic	Tol.	A	D	Basic	Tol.	B	Basic	Tol.	Min.	Max.	Basic	Tol.	Basic	Tol.	Min
UTW - 3.2	3.2	+ 0.03	8.7	8	2.8	0	4.6	0.6		4	5	3.26	+ 0.05	0.7		1
4	4	- 0.1	10	9	3.6	- 0.2	5.3	0.7	±0.04	5	7	4.08	0	0.8		1.2
5	5		12.8	11.6	4.4		6.8	0.7		6	8	5.1		0.8	+ 0.1	1.2
6	6	+ 0.05	14.8	13.5	5.3		8	0.7		7	9	6.1		0.8	0	1.2
7	7	- 0.15	17	15	6.2	0	9	0.9	±0.05	8	11	7.1	+ 0.08	1		1.5
8	8	+ 0.05 - 0.2	19.5	17.5	7.1	- 0.3	10.5	1		9	12	8.1	0	1.1		1.8

Material = Carbon Spring Steel. Hardness = HRC44 - 52 **Finish** = Black phosphate coating / Zn planting, Chromate dip.

Star Circlips Retaining Rings and competitors equivalent Standard products are shown below

	STAR CIRCLIPS	ROTOR	WALDES	I.R.R	ANDERTON	PAGE NO.
	B2400	HO	N5000	3000	N1300	41-48
	A2500	SH	5100	3100	N1400	49-56
	IB2400	HOI	5008	4000	N1308	57-60
	IA2500	SHI	5108	4100	N1408	61-64
	HA2500	SHR	5160	7200	N1460	65-66
	E2600	E	5133	1000	N1500	67-68
	RE2600	RE	5144	1200	N1540	69-70

Star Circlips Retaining Rings and competitors equivalent Standard products are shown below

	STAR CIRCLIPS	ROTOR	WALDES	I.R.R	ANDERTON	PAGE NO.
	C2700	C	5103	2000	N1800	71-72
	K2800	PO	5304	-	-	73-74
	TK2800	POL	T5304	-	-	73-74
	GA2500	SHF	5555	7100	N1440	75-76
	CA2900	TY	5105	6100	-	77
	CB3000	TI	5005	6000	N1305	78
	JIS B 2805					79

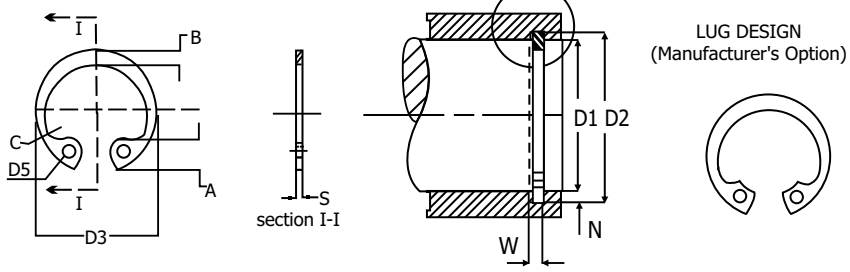
GUARANTEE : We guarantee our products against faulty material and or/workmanship, but limit our liability in all cases to the free replacement of the parts manufactured by us. Under no circumstances do we accept claims for consequential damages.

For Carbon Steel Rings (EQUIVALENT TO SAE 1060-1090)

Ring Type	Size Range	Scale	Rockwell Hardness	Rockwell 'C' Equivalent
B 2400	25 - 31 37 - 51 56 - 77 81 - 102 106 & Over	15 N 30 N 30 N 30 N C	86 - 88 69.5 - 73 67.5 - 72 66 - 71 47 - 52	51 - 55 51 - 55 49 - 54 47 - 53 Direct
A 2500	25 - 46 50 - 81 87 - 102 106 - 343 350 & Over	30 N 30 N C C C	69.5 - 73 66 - 71 47 - 53 47 - 52 45 - 50	51 - 55 47 - 53 Direct Direct Direct
IB 2400	62 - 75 81 - 100 106 - 325	30 N C C	67.5 - 75 66 - 71 47 - 52	49 - 54 47 - 53 Direct
IA 2500	50 - 81 87 - 100 106 - 325 350 & Over	30 N C C C	67.5 - 75 47 - 53 47 - 52 45 - 50	49 - 54 Direct Direct Direct
HA 2500	39 - 62 66 & Over	30 N C	67.5 - 72 47 - 52	49 - 54 Direct
RE 2600	9 - 12 15 - 31 37 & Over	15 N 30 N C	84.5 - 87 66.5 - 71 47 - 52	48 - 53 48 - 53 Direct
E 2600	6 9 - 12 14 - x 31 37 & Over	15 N 15 N 30 N C	84.5 - 87* 84.5 - 87 66.5 - 71 47 - 52	48 - 53 48 - 53 48 - 53 Direct
C 2700	12 - 18 21 - 43 50 - 81 87 & Over	15 N 30 N 30 N C	86 - 88.5* 67.5 - 72 66 - 71 47 - 52	51 - 56 49 - 54 47 - 53 Direct
K 2800	All	C	51 - 55	Direct
TK 2800	15 - 31 37 & Over	30 N C	69.5 - 73 51 - 55	51 - 55 Direct
GA 2500	6 - 9 12 - 23 25 & Over	15 N 30 N C	83.5 - 86 65 - 69.5 46 - 51	46 - 51 46 - 51 Direct
CA 2900	9 - 37 (0.010 thick) All Over 0.010	15 N 15 N	84 - 86* 84 - 86	47 - 51 47 - 51
CB 3000	31 - 62 75 & Over	15 N 15 N	84 - 86* 84 - 86	47 - 51 47 - 51

* Hardness cannot be checked with any degree of accuracy directly on these Rings.

SERIES B2400 Rings are compressed for insertion axially into a bore or housing. The tapered section design of the ring helps maintain circularity and constant pressure against groove bottom. This ring makes contact with the groove along its entire periphery ensuring high thrust load capacity.



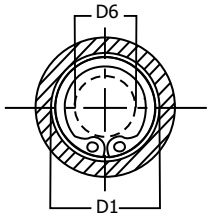
HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS													
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	B2400	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
1/4	0.250	6.4	B2400 - 25	0.280		0.015		0.08	0.025	±.002	0.015	±.002	0.065		0.031	
5/16	0.312	7.9	B2400 - 31	0.346		0.015		0.11	0.033		0.018		0.066		0.031	
3/8	0.375	9.5	B2400 - 37	0.415		0.025		0.25	0.040	±.003	0.028	±.003	0.082		0.041	
7/16	0.438	11.1	B2400 - 43	0.482		0.025		0.37	0.049		0.029		0.098	±.003	0.041	
29/64	0.453	11.5	B2400 - 45	0.498		0.025		0.43	0.050		0.030		0.098		0.047	
1/2	0.500	12.7	B2400 - 50	0.548	+.010	0.035		0.70	0.053		0.035		0.114		0.047	
--	0.512	13.0	B2400 - 51	0.560	-.005	0.035		0.77	0.053		0.035		0.114		0.047	
9/16	0.562	14.3	B2400 - 56	0.620		0.035		0.86	0.053		0.035		0.132		0.047	
5/8	0.625	15.9	B2400 - 62	0.694		0.035		1.00	0.060	±.004	0.035	±.004	0.132	0.132	0.062	
11/16	0.688	17.5	B2400 - 68	0.763		0.035		1.20	0.063		0.036		0.132		0.062	+.010 -.002
3/4	0.750	19.0	B2400 - 75	0.831		0.035		1.30	0.070		0.040		0.142		0.062	
--	0.777	19.7	B2400 - 77	0.859		0.042		1.70	0.074		0.044		0.146		0.062	
13/16	0.812	20.6	B2400 - 81	0.901		0.042		1.90	0.077		0.044		0.155		0.062	
--	0.866	22.0	B2400 - 86	0.961		0.042		2.00	0.081		0.045		0.155		0.062	
7/8	0.875	22.2	B2400 - 87	0.971	+.015 -.010	0.042		2.10	0.084	±.005	0.045	±.005	0.155		0.062	
--	0.901	22.9	B2400 - 90	1.000		0.042	±.002	2.20	0.087		0.047		0.155		0.062	
15/16	0.938	23.8	B2400 - 93	1.041		0.042		2.40	0.091		0.050		0.155		0.062	
1	1.000	25.4	B2400 - 100	1.111		0.042		2.70	0.104		0.052		0.155		0.062	
--	1.023	26.0	B2400 - 102	1.136		0.042		2.80	0.106		0.054		0.155		0.062	
1 1/16	1.062	27.0	B2400 - 106	1.180		0.050		3.70	0.110		0.055		0.180		0.078	
1 1/8	1.125	28.6	B2400 - 112	1.249		0.050		4.00	0.116		0.057		0.180	±.005	0.078	+.015 -.002
--	1.181	30.0	B2400 - 118	1.319		0.050		4.30	0.120		0.058		0.180		0.078	
1 3/16	1.188	30.2	B2400 - 118	1.319		0.050		4.30	0.120		0.058		0.180		0.078	
1 1/4	1.250	31.7	B2400 - 125	1.388	+.025	0.050		4.80	0.124		0.062		0.180		0.078	
--	1.259	32.0	B2400 - 125	1.388	-0.20	0.050		4.80	0.124	±.006	0.062	±.006	0.180		0.078	

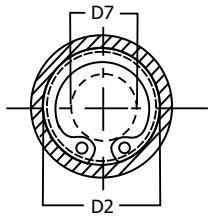
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

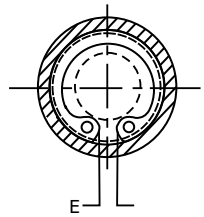
Star Ring Series B-2400 conforms to US Government standard MS-16625 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

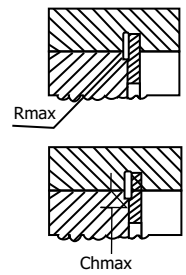




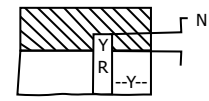
MINIMUM GAP WIDTH
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN

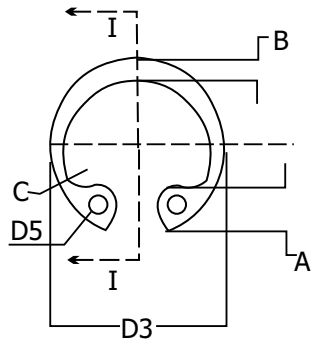


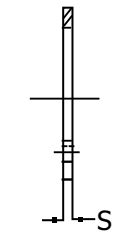
MAXIMUM BOTTOM RADII	
RING SIZE	R
-25 thru -100	.005
-102 thru -800	.010

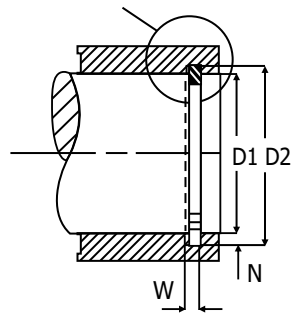
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIA		MIN. GAP WIDTH	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN
	DIAMETER		WIDTH		DEPTH	RING SPRUNG IN HOUSING	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
B2400	D2	TOL.	W	TOL.	N	D6	D7	E	PR	PG	R max	Ch max	P' R	Y
B2400 - 25	0.268	±.001	0.020	+.002	0.009	0.115	0.133	0.047	420	190	0.011	0.0085	190	0.027
B2400 - 31	0.330	.0015 T.I.R.	0.020	-.000	0.009	0.173	0.191	0.055	530	240	0.016	0.013	190	0.027
B2400 - 37	0.397	±.002	0.029		0.011	0.204	0.226	0.063	1050	350	0.023	0.018	530	0.033
B2400 - 43	0.461	.002	0.029		0.012	0.230	0.254	0.063	1220	440	0.027	0.021	530	0.036
B2400 - 45	0.477	T.I.R.	0.029		0.012	0.250	0.274	0.071	1280	460	0.027	0.021	530	0.036
B2400 - 50	0.530		0.039		0.015	0.260	0.290	0.090	1980	510	0.027	0.021	1100	0.045
B2400 - 51	0.542	±.002	0.039		0.015	0.270	0.300	0.092	2030	520	0.027	0.021	1100	0.045
B2400 - 56	0.596	.004	0.039		0.017	0.275	0.305	0.095	2220	710	0.027	0.021	1100	0.051
B2400 - 62	0.665	T.I.R.	0.039		0.020	0.340	0.380	0.104	2470	1050	0.027	0.021	1100	0.060
B2400 - 68	0.732		0.039	+.003 -.000	0.022	0.400	0.440	0.118	2700	1280	0.027	0.021	1100	0.066
B2400 - 75	0.796		0.039		0.023	0.450	0.490	0.143	3000	1460	0.032	0.025	1100	0.069
B2400 - 77	0.825		0.046		0.024	0.475	0.520	0.145	4550	1580	0.035	0.028	1650	0.072
B2400 - 81	0.862		0.046		0.025	0.490	0.540	0.153	4800	1710	0.035	0.028	1650	0.075
B2400 - 86	0.920	±.003	0.046		0.027	0.540	0.590	0.172	5100	1980	0.035	0.028	1650	0.081
B2400 - 87	0.931	.004 T.I.R.	0.046		0.028	0.545	0.600	0.179	5150	2080	0.035	0.028	1650	0.084
B2400 - 90	0.959		0.046		0.029	0.565	0.620	0.188	5350	2200	0.038	0.030	1650	0.087
B2400 - 93	1.000		0.046		0.031	0.610	0.670	0.200	5600	2450	0.038	0.030	1650	0.093
B2400 - 100	1.066		0.046		0.033	0.665	0.730	0.212	5950	2800	0.042	0.034	1650	0.099
B2400 - 102	1.091		0.046		0.034	0.690	0.755	0.220	6050	3000	0.042	0.034	1650	0.102
B2400 - 106	1.130		0.056		0.034	0.685	0.750	0.213	7450	3050	0.044	0.035	2400	0.102
B2400 - 112	1.197	±.004	0.056	+.004	0.036	0.745	0.815	0.232	7900	3400	0.047	0.036	2400	0.108
B2400 - 118	1.255	.005	0.056	-.000	0.037	0.790	0.860	0.226	8400	3700	0.047	0.036	2400	0.111
B2400 - 118	1.262	T.I.R.	0.056		0.037	0.800	0.870	0.245	8400	3700	0.047	0.036	2400	0.111
B2400 - 125	1.330		0.056		0.040	0.875	0.955	0.265	8800	4250	0.048	0.038	2400	0.120
B2400 - 125	1.339		0.056		0.040	0.885	0.965	0.290	8800	4250	0.048	0.038	2400	0.120

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

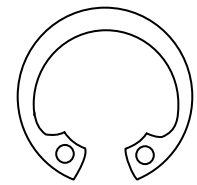
NOTE : Rings should not be contracted excessively during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been contracted excessively.







LUG DESIGN
(Manufacturer's Option)



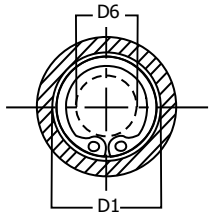
HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS													
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	B2400	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
1 5/16	1.312	33.3	B2400 - 131	1.456		0.050		5.00	0.130		0.062		0.180		0.078	
1 3/8	1.375	34.9	B2400 - 137	1.526	+.025	0.050	±.002	5.10	0.130	±.006	0.063	±.006	0.180		0.078	
-	1.378	35.0	B2400 - 137	1.526	-.020	0.050		5.10	0.130		0.063		0.180		0.078	
1 7/16	1.438	36.5	B2400 - 143	1.596		0.050		5.80	0.133		0.065		0.180		0.078	
-	1.456	37.0	B2400 - 145	1.616		0.050		6.40	0.133		0.065		0.180		0.078	
1 1/2	1.500	38.1	B2400 - 150	1.660		0.050		6.50	0.133		0.066		0.180		0.078	
1 9/16	1.562	39.7	B2400 - 156	1.734		0.062		8.90	0.157		0.078		0.220		0.078	
-	1.575	40.0	B2400 - 156	1.734	+.035	0.062		8.90	0.157		0.078		0.220		0.078	
1 5/8	1.625	41.3	B2400 - 162	1.804	-.025	0.062		10.00	0.164		0.082		0.220		0.078	
-	1.653	42.0	B2400 - 165	1.835		0.062		10.40	0.167		0.083		0.227		0.078	+.015
1 11/16	1.688	42.9	B2400 - 168	1.874		0.062		10.80	0.170		0.085	±.007	0.220		0.078	-.002
1 3/4	1.750	44.4	B2400 - 175	1.942		0.062		10.30	0.171		0.083		0.240		0.078	
1 13/16	1.812	46.0	B2400 - 181	2.012		0.062		11.50	0.170		0.084		0.240		0.093	
--	1.850	47.0	B2400 - 187	2.054	+.035	0.062		12.80	0.170		0.085		0.240	±.005	0.093	
1 7/8	1.875	47.6	B2400 - 187	2.054	-.025	0.062		12.80	0.170		0.085		0.240		0.093	
1 15/16	1.938	49.2	B2400 - 193	2.141		0.062		13.30	0.170		0.085		0.240		0.093	
2	2.000	50.8	B2400 - 200	2.210		0.062	±.003	14.00	0.170	±.007	0.085		0.240		0.093	
--	2.047	52.0	B2400 - 206	2.280		0.078		18.00	0.186		0.091		0.250		0.093	
2 1/16	2.062	52.4	B2400 - 206	2.280		0.078		18.00	0.186		0.091		0.250		0.093	
2 1/8	2.125	54.0	B2400 - 212	2.350		0.078		19.40	0.195		0.096		0.260		0.093	
--	2.165	55.0	B2400 - 218	2.415		0.078		19.60	0.199		0.098		0.260		0.093	
2 3/16	2.188	55.6	B2400 - 218	2.415	+.040	0.078		19.60	0.199		0.098		0.260		0.093	
2 1/4	2.250	57.1	B2400 - 225	2.490	-.030	0.078		21.80	0.203		0.099		0.270		0.093	
2 5/16	2.312	58.7	B2400 - 231	2.535		0.078		22.60	0.209		0.102		0.270		0.093	
2 3/8	2.375	60.3	B2400 - 237	2.630		0.078		23.20	0.207		0.102		0.270		0.093	
2 7/16	2.440	62.0	B2400 - 244	2.702		0.078		25.40	0.209		0.103		0.280		0.110	

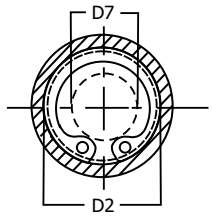
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

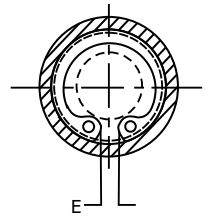
Star Ring Series B-2400 conforms to US Government standard MS-16625 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

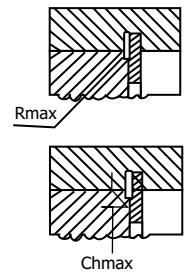




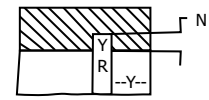
MINIMUM GAP WIDTH
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



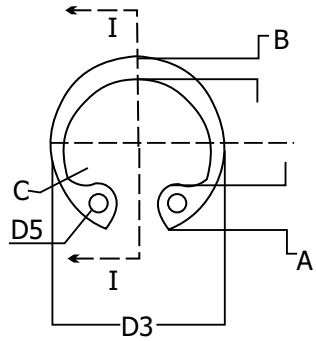
MAXIMUM BOTTOM RADII	
RING SIZE	R
-25 thru -100	.005
-102 thru -800	.010

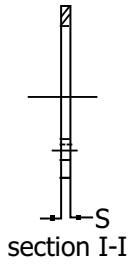
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIA		MIN. GAP WIDTH	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN
	DIAMETER		WIDTH		DEPTH	RING SPRUNG IN HOUSING	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
B2400	D2	TOL.	W	TOL.	N	D6	D7	E	PR	PG	R max	Ch max	P' R	Y
B2400 - 131	1.396	±.004	0.056		0.042	0.930	1.010	0.284	9300	4700	0.048	0.038	2400	0.126
B2400 - 137	1.461	.005	0.056		0.043	0.990	1.070	0.297	9700	5050	0.048	0.038	2400	0.129
B2400 - 137	1.464	T.I.R.	0.056	+.004	0.043	0.990	1.070	0.305	9700	5050	0.048	0.038	2400	0.129
B2400 - 143	1.528		0.056	-.000	0.045	1.060	1.150	0.313	10200	5500	0.048	0.038	2400	0.135
B2400 - 145	1.548		0.056		0.046	1.080	1.170	0.320	10300	5700	0.048	0.038	2400	0.138
B2400 - 150	1.594		0.056		0.047	1.120	1.210	0.340	10550	6000	0.048	0.038	2400	0.141
B2400 - 156	1.658		0.068		0.048	1.140	1.230	0.338	13700	6350	0.064	0.050	3900	0.144
B2400 - 156	1.671	±.005	0.068		0.048	1.150	1.240	0.374	13700	6350	0.064	0.050	3900	0.144
B2400 - 162	1.725	.005	0.068		0.050	1.150	1.250	0.339	14200	6900	0.064	0.050	3900	0.150
B2400 - 165	1.755	T.I.R.	0.068		0.051	1.170	1.270	0.348	14500	7200	0.064	0.050	3900	0.153
B2400 - 168	1.792		0.068		0.052	1.230	1.330	0.357	14800	7450	0.064	0.050	3900	0.156
B2400 - 175	1.858		0.068		0.054	1.26	1.36	0.372	15350	8050	0.064	0.050	3900	0.162
B2400 - 181	1.922		0.068		0.055	1.32	1.43	0.382	15900	8450	0.064	0.050	3900	0.165
B2400 - 187	1.962		0.068		0.056	1.34	1.45	0.360	16200	8750	0.064	0.050	3900	0.168
B2400 - 187	1.989		0.068		0.057	1.37	1.48	0.430	16450	9050	0.064	0.050	3900	0.171
B2400 - 193	2.056		0.068		0.059	1.44	1.56	0.438	17000	9700	0.064	0.050	3900	0.177
B2400 - 200	2.122		0.068		0.061	1.50	1.62	0.453	17500	10300	0.064	0.050	3900	0.183
B2400 - 206	2.171		0.086		0.062	1.52	1.64	0.428	22750	10850	0.076	0.061	6200	0.186
B2400 - 206	2.186		0.086		0.062	1.54	1.66	0.468	22750	10850	0.078	0.062	6200	0.186
B2400 - 212	2.251		0.086		0.063	1.58	1.70	0.460	23400	11350	0.078	0.062	6200	0.189
B2400 - 218	2.295		0.086		0.065	1.61	1.74	0.439	24100	12050	0.078	0.062	6200	0.195
B2400 - 218	2.318	±.006	0.086	±.005	0.065	1.64	1.77	0.489	24100	12050	0.078	0.062	6200	0.195
B2400 - 225	2.382	.006	0.086	-.000	0.066	1.69	1.82	0.478	24850	12600	0.078	0.062	6200	0.198
B2400 - 231	2.450	T.I.R.	0.086		0.069	1.75	1.88	0.486	25450	13550	0.078	0.062	6200	0.207
B2400 - 237	2.517		0.086		0.071	1.81	1.95	0.504	26150	14300	0.078	0.062	6200	0.213
B2400 - 244	2.584		0.086		0.072	1.86	2.00	0.518	26900	14900	0.078	0.062	6200	0.216

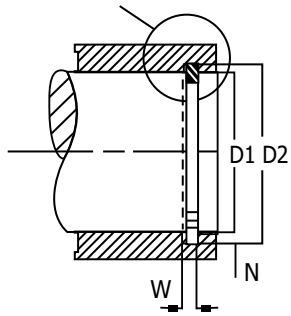
+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be contracted excessively during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been contracted excessively.

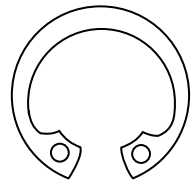
Internal Retaining Ring Series B2400







LUG DESIGN
(Manufacturer's Option)



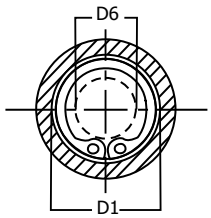
HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS											
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	B2400	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
2 1/2	2.500	63.5	B2400 - 250	2.775	+.040 -.030	0.078		25.50	0.210		0.103		0.380		0.110	
2 17/32	2.531	64.3	B2400 - 250	2.775		0.078		25.50	0.210		0.103		0.280		0.110	
2 9/16	2.562	65.1	B2400 - 256	2.844		0.093		34.00	0.222		0.109		0.290		0.110	
2 5/8	2.625	66.7	B2400 - 262	2.910		0.093		34.50	0.226		0.111		0.290		0.110	
--	2.677	68.0	B2400 - 268	2.980		0.093		35.00	0.230		0.113		0.300		0.110	
2 11/16	2.688	68.3	B2400 - 268	2.980		0.093		35.00	0.230	±.007	0.113	±.007	0.300	±.005	0.110	
2 3/4	2.750	69.8	B2400 - 275	3.050		0.093		35.50	0.234		0.115		0.300		0.110	
2 13/16	2.812	71.4	B2400 - 281	3.121		0.093		36.00	0.230		0.115		0.300		0.110	
--	2.835	72.0	B2400 - 281	3.121		0.093		36.00	0.230		0.115		0.300		0.110	
2 7/8	2.875	73.0	B2400 - 287	3.191		0.093		41.00	0.240		0.120		0.310		0.110	
--	2.953	75.0	B2400 - 300	3.325		0.093	±.003	42.50	0.250		0.122		0.310		0.110	
3	3.000	76.2	B2400 - 300	3.325		0.093		42.50	0.250		0.122		0.310		0.110	
3 1/16	3.062	77.8	B2400 - 306	3.418		0.109		53.00	0.254		0.126		0.310		0.125	+.015
3 1/8	3.125	79.4	B2400 - 312	3.488		0.109		56.00	0.259		0.129		0.310		0.125	-.002
--	3.149	80.0	B2400 - 315	3.523		0.109		57.00	0.262		0.129		0.310		0.125	
3 5/32	3.156	80.2	B2400 - 315	3.523	±.055	0.109		57.00	0.262		0.129		0.310		0.125	
3 1/4	3.250	82.5	B2400 - 325	3.623		0.109		60.00	0.269	±.008	0.135	±.008	0.342	±.008	0.125	
3 11/32	3.346	85.0	B2400 - 334	3.734		0.109		65.00	0.276		0.140		0.342		0.125	
3 15/32	3.469	88.1	B2400 - 347	3.857		0.109		69.00	0.286		0.144		0.342		0.125	
3 1/2	3.500	88.9	B2400 - 350	3.890		0.109		71.00	0.289		0.142		0.342		0.125	
--	3.543	90.0	B2400 - 354	3.936		0.109		72.00	0.292		0.142		0.342		0.125	
3 9/16	3.562	90.5	B2400 - 354	3.936		0.109		72.00	0.292		0.142		0.342		0.125	

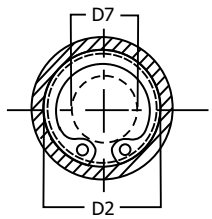
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

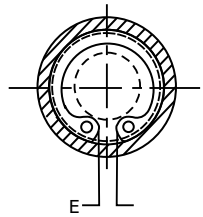
Star Ring Series B-2400 conforms to US Government standard MS-16625 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

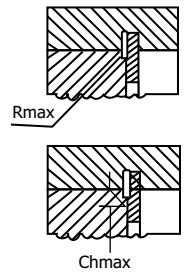




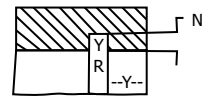
MINIMUM GAP WIDTH
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



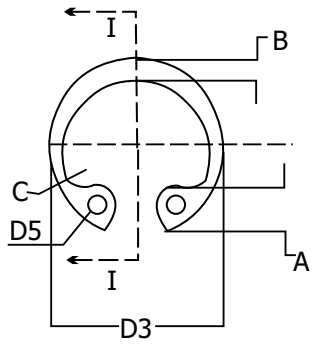
MAXIMUM BOTTOM RADII	
RING SIZE	R
-25 thru -100	.005
-102 thru -800	.010

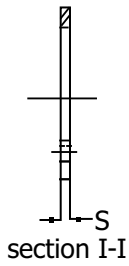
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIA		MIN. GAP WIDTH	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN
	DIAMETER		WIDTH		DEPTH	RING SPRUNG IN HOUSING	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
B2400	D2	TOL.	W	TOL.	N	D6	D7	E	PR	PG	R max	Ch max	P' R	Y
B2400 - 250	2.648		0.086		0.074	1.91	2.05	0.532	27600	15650	0.078	0.062	6200	0.222
B2400 - 250	2.681		0.086		0.075	1.94	2.09	0.597	27600	15650	0.078	0.062	6200	0.225
B2400 - 256	2.714		0.103		0.076	1.95	2.10	0.540	33700	16500	0.088	0.070	9000	0.228
B2400 - 262	2.781		0.103		0.078	2.02	2.17	0.558	34550	17350	0.088	0.070	9000	0.234
B2400 - 268	2.837		0.103		0.080	2.05	2.21	0.539	35400	18250	0.090	0.072	9000	0.240
B2400 - 268	2.848	±.006	0.103		0.080	2.06	2.22	0.568	35400	18250	0.090	0.072	9000	0.240
B2400 - 275	2.914	.006	0.103	±.005	0.082	2.12	2.28	0.590	36100	19200	0.092	0.074	9000	0.246
B2400 - 281	2.980	T.I.R.	0.103	-.000	0.084	2.18	2.34	0.615	36950	20050	0.088	0.070	9000	0.252
B2400 - 281	3.006		0.103		0.085	2.21	2.38	0.676	36950	20050	0.088	0.070	9000	0.255
B2400 - 287	3.051		0.103		0.088	2.22	2.39	0.626	37800	21500	0.092	0.074	9000	0.264
B2400 - 300	3.135		0.103		0.091	2.30	2.48	0.619	39500	23150	0.092	0.074	9000	0.273
B2400 - 300	3.182		0.103		0.091	2.35	2.53	0.738	39500	23150	0.092	0.074	9000	0.273
B2400 - 306	3.248		0.120		0.093	2.41	2.59	0.651	47100	24100	0.097	0.078	12000	0.279
B2400 - 312	3.315		0.120		0.095	2.47	2.66	0.655	48100	25200	0.099	0.079	12000	0.285
B2400 - 315	3.341		0.120		0.096	2.49	2.68	0.650	48600	25700	0.100	0.080	12000	0.288
B2400 - 315	3.348		0.120		0.096	2.50	2.69	0.669	48600	25700	0.100	0.080	12000	0.288
B2400 - 325	3.446		0.120		0.098	2.54	2.73	0.698	50000	27000	0.104	0.083	12000	0.294
B2400 - 334	3.546		0.120		0.100	2.63	2.83	0.705	51600	28300	0.108	0.086	12000	0.300
B2400 - 347	3.675		0.120		0.103	2.76	2.96	0.763	53400	30200	0.108	0.086	12000	0.309
B2400 - 350	3.710		0.120		0.105	2.79	3.00	0.774	53900	31200	0.110	0.088	12000	0.315
B2400 - 354	3.755		0.120		0.106	2.83	3.04	0.788	54600	31800	0.110	0.088	12000	0.318
B2400 - 354	3.776		0.120		0.107	2.85	3.06	0.842	54600	31800	0.110	0.088	12000	0.321

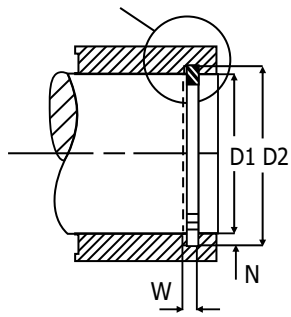
+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be contracted excessively during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been contracted excessively.

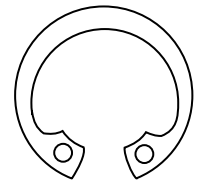
Internal Retaining Ring Series B2400







LUG DESIGN
(Manufacturer's Option)



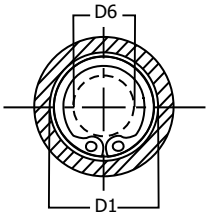
HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS													
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	B2400	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
3 5/8	3.625	92.1	B2400 - 362	4.024	±.005	0.109		73.00	0.299		0.150		0.342		0.125	
--	3.740	95.0	B2400 - 375	4.157		0.109		78.00	0.309		0.155		0.342		0.125	
3 3/4	3.750	95.2	B2400 - 375	4.157		0.109		78.00	0.309	±.008	0.155	±.008	0.342		0.125	+.015
3 7/8	3.875	98.4	B2400 - 387	4.291		0.109		87.00	0.319		0.160		0.370		0.125	-.002
3 15/16	3.938	100.0	B2400 - 393	4.358		0.109		88.00	0.324		0.161		0.370		0.125	
4	4.000	101.6	B2400 - 400	4.424		0.109		93.00	0.330		0.166		0.370	±.008	0.125	
4 1/8	4.125	104.8	B2400 - 412	4.558		0.109	±.003	97.00	0.330		0.171		0.370		0.125	
4 1/4	4.250	108.0	B2400 - 425	4.691		0.109		101.00	0.335		0.180		0.370		0.125	
--	4.331	110.0	B2400 - 433	4.756		0.109		105.00	0.343		0.180		0.405		0.156	
4 1/2	4.500	114.3	B2400 - 450	4.940		0.109		111.00	0.351		0.181		0.405		0.156	
4 5/8	4.625	117.5	B2400 - 462	5.076	±.065	0.109		117.00	0.360		0.183		0.405		0.156	
--	4.724	120.0	B2400 - 475	5.213		0.109		124.00	0.370		0.183		0.405		0.156	
4 3/4	4.750	120.6	B2400 - 475	5.213		0.109		124.00	0.370		0.183		0.405		0.156	
5	5.00	127.0	B2400 - 500	5.485		0.109		136.00	0.390		0.186		0.435		0.156	
5 1/4	5.250	133.3	B2400 - 525	5.770		0.125		174.00	0.408		0.198		0.455		0.156	
5 3/8	5.375	136.5	B2400 - 537	5.910		0.125		179.00	0.408	±.009	0.198	±.009	0.455		0.156	
5 1/2	5.500	139.7	B2400 - 550	6.066		0.125	±.004	183.00	0.408		0.198		0.455		0.156	
5 3/4	5.750	146.0	B2400 - 575	6.336		0.125		192.00	0.408		0.198		0.455		0.156	
6	6.000	152.4	B2400 - 600	6.620		0.125		201.00	0.408		0.196		0.455		0.156	
6 1/4	6.250	158.7	B2400 - 625	6.895		0.156		266.00	0.423		0.211		0.485		0.187	
6 1/2	6.500	165.1	B2400 - 650	7.170	±.080	0.156		281.00	0.438		0.219		0.485		0.187	+.020
6 5/8	6.625	168.3	B2400 - 662	7.308		0.156		305.00	0.447		0.221		0.485		0.187	-.005
6 3/4	6.750	171.4	B2400 - 675	7.445		0.156		325.00	0.456		0.224		0.530		0.187	
7	7.000	177.8	B2400 - 700	7.720		0.156		344.00	0.474		0.232		0.530		0.187	
7 1/4	7.250	184.1	B2400 - 725	7.995		0.187		428.00	0.489		0.238		0.560	±.010	0.187	
7 1/2	7.500	190.5	B2400 - 750	8.270	±.090	0.187	±.005	485.00	0.507	±.010	0.247	±.010	0.560		0.187	
7 3/4	7.750	196.8	B2400 - 775	8.545		0.187		520.00	0.523		0.255		0.560		0.187	
8	8.000	203.2	B2400 - 800	8.820		0.187		555.00	0.540		0.262		0.600		0.187	

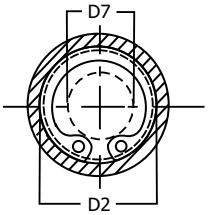
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

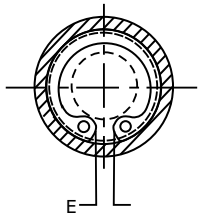
Star Ring Series B-2400 conforms to US Government standard MS-16625 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

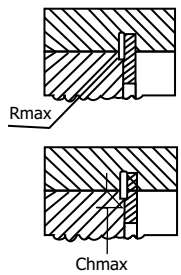




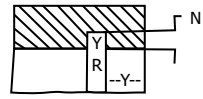
MINIMUM GAP WIDTH
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



MAXIMUM BOTTOM RADII	
RING SIZE	R
-25 thru -100	.005
-102 thru -800	.010

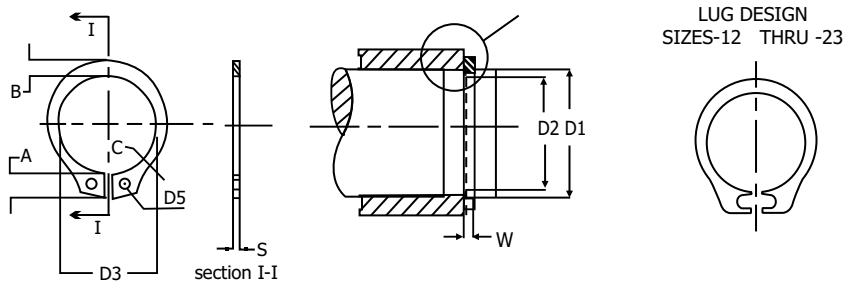
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIA		MIN. GAP WIDTH	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN
	DIAMETER		WIDTH		DEPTH	RING SPRUNG IN HOUSING	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
B2400	D2	TOL.	W	TOL.	N	D6	D7	E	PR	PG	R max	Ch max	P' R	Y
B2400 - 362	3.841		0.120		0.108	2.91	3.12	0.833	55900	33200	0.116	0.093	12000	0.324
B2400 - 375	3.964		0.120		0.112	3.02	3.24	0.844	57700	35600	0.120	0.096	12000	0.336
B2400 - 375	3.974		0.120		0.112	3.03	3.25	0.871	57700	35600	0.120	0.096	12000	0.336
B2400 - 387	4.107		0.120		0.116	3.11	3.34	0.891	59600	38000	0.123	0.098	12000	0.348
B2400 - 393	4.174		0.120		0.118	3.17	3.40	0.905	60700	39300	0.124	0.099	12000	0.354
B2400 - 400	4.240	±.006	0.120		0.120	3.23	3.47	0.918	61700	40700	0.128	0.102	12000	0.360
B2400 - 412	4.365	.006	0.120	+.005	0.120	3.36	3.60	0.940	63600	42000	0.130	0.104	12000	0.360
B2400 - 425	4.490	T.I.R.	0.120	-.000	0.120	3.48	3.72	0.960	65500	43200	0.138	0.110	12000	0.360
B2400 - 433	4.571		0.120		0.120	3.50	3.74	1.000	66600	44500	0.142	0.114	12000	0.360
B2400 - 450	4.740		0.120		0.120	3.66	3.90	0.980	69300	45800	0.146	0.117	12000	0.360
B2400 - 462	4.865		0.120		0.120	3.79	4.03	1.000	71300	47000	0.151	0.121	12000	0.360
B2400 - 475	4.969		0.120		0.122	3.88	4.12	0.960	73200	49000	0.154	0.123	12000	0.366
B2400 - 475	4.995		0.120		0.122	3.90	4.14	1.030	73200	49000	0.154	0.123	12000	0.366
B2400 - 500	5.260		0.120		0.130	4.08	4.34	0.970	77000	55000	0.158	0.126	12000	0.390
B2400 - 525	5.520		0.139		0.135	4.31	4.58	1.100	92700	60000	0.168	0.134	15000	0.405
B2400 - 537	5.650	±.007	0.139		0.135	4.41	4.68	1.120	94900	61500	0.168	0.134	15000	0.405
B2400 - 550	5.770	.006	0.139	+.006	0.135	4.53	4.80	1.090	97200	63300	0.168	0.134	15000	0.405
B2400 - 575	6.020	T.I.R.	0.139	-.000	0.135	4.78	5.05	1.110	101600	65900	0.168	0.134	15000	0.405
B2400 - 600	6.270		0.139		0.135	5.03	5.30	1.130	105900	68600	0.168	0.134	15000	0.405
B2400 - 625	6.530		0.174		0.140	5.24	5.52	1.160	137700	74100	0.177	0.142	23000	0.420
B2400 - 650	6.790		0.174		0.145	5.49	5.78	1.250	143300	79900	0.181	0.145	23000	0.435
B2400 - 662	6.925		0.174		0.150	5.60	5.90	1.280	146000	84200	0.183	0.146	23000	0.450
B2400 - 675	7.055		0.174		0.152	5.65	5.95	1.210	148800	87000	0.188	0.150	23000	0.456
B2400 - 700	7.315	±.008	0.174	+.008	0.157	5.88	6.19	1.260	154300	93100	0.196	0.157	23000	0.471
B2400 - 725	7.575	.006	0.209	-.000	0.162	6.08	6.40	1.320	191500	99600	0.202	0.162	34000	0.486
B2400 - 750	7.840	T.I.R.	0.209		0.170	6.33	6.67	1.390	198200	108100	0.208	0.166	34000	0.510
B2400 - 775	8.100		0.209		0.175	6.58	6.93	1.440	204800	115000	0.214	0.171	34000	0.525
B2400 - 800	8.360		0.209		0.180	6.75	7.11	1.500	211400	122000	0.220	0.176	34000	0.540

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be contracted excessively during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been contracted excessively.

External Retaining Ring Series A2500

SERIES A2500 Rings are expanded and fitted axially over a shaft. The tapered section design of the ring helps maintain circularity and constant pressure against groove bottom. The Ring makes contact with the groove along its entire periphery ensuring high thrust load capacity and high rotational speeds.



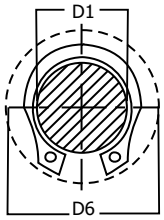
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS													
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	A2500	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
1/4	0.250	6.4	A2500- 25	0.225		0.025		0.21	0.035		0.025		0.080		0.041	
--	0.276	7.0	A2500- 27	0.250		0.025		0.23	0.035		0.024		0.081		0.041	
9/32	0.281	7.1	A2500- 28	0.256		0.025		0.24	0.038		0.0255		0.080		0.041	
5/16	0.312	7.9	A2500- 31	0.281		0.025		0.27	0.040		0.026		0.087		0.041	
11/32	0.344	8.7	A2500- 34	0.309		0.025		0.31	0.042		0.0265		0.087		0.041	
--	0.354	9.0	A2500- 35	0.320		0.025		0.35	0.046	±.003	0.029	±.003	0.087		0.041	
3/8	0.375	9.5	A2500- 37	0.338	+.002	0.025		0.39	0.050		0.0305		0.088		0.041	
--	0.394	10.0	A2500- 39	0.354	-.005	0.025		0.42	0.052		0.031		0.087		0.041	
13/32	0.406	10.3	A2500- 40	0.366		0.025		0.43	0.054		0.033		0.087		0.041	
7/16	0.438	11.1	A2500- 43	0.395		0.025		0.50	0.055		0.033		0.088	±.003	0.041	+.010 -.002
15/32	0.469	11.9	A2500- 46	0.428		0.025		0.54	0.060		0.035		0.088		0.041	
1/2	0.500	12.7	A2500- 50	0.461		0.035		0.91	0.065		0.040		0.108		0.047	
--	0.551	14.0	A2500- 55	0.509		0.035		0.90	0.053		0.036		0.108		0.047	
9/16	0.562	14.3	A2500- 56	0.521		0.035		1.10	0.072		0.041		0.108		0.047	
19/32	0.594	15.1	A2500- 59	0.550	+.005	0.035	±.002	1.20	0.076	±.004	0.043	±.004	0.109		0.047	
5/8	0.625	15.9	A2500- 62	0.579	-.010	0.035		1.30	0.080		0.045		0.110		0.047	
--	0.669	17.0	A2500- 66	0.621		0.035		1.40	0.082		0.043		0.110		0.047	
43/64	0.672	17.1	A2500- 66	0.621		0.035		1.40	0.082		0.043		0.110		0.047	
11/16	0.688	17.5	A2500- 68	0.635		0.042		1.80	0.084	±.005	0.048	±.005	0.136	±.004	0.052	

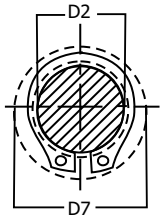
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

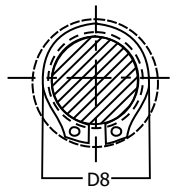
Star Ring Series A-2500 conforms to US Government standard MS-16624 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

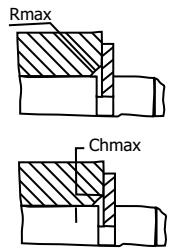




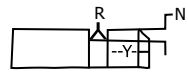
MAXIMUM
GAGING DIAMETER
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN

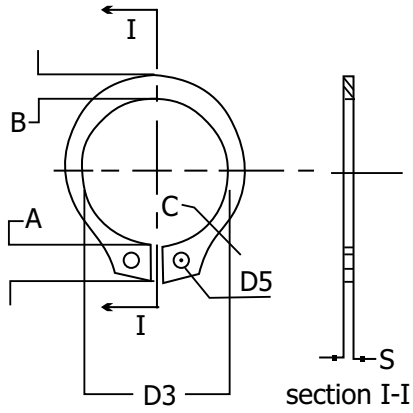


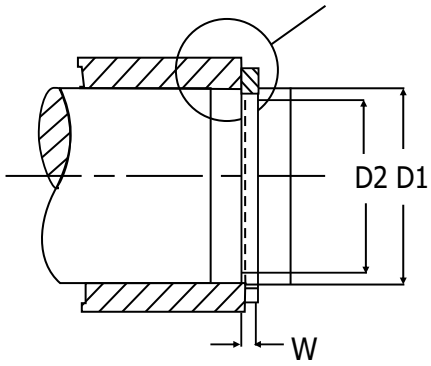
MAXIMUM BOTTOM RADII		
RING SIZE		R
-25 thru	-35	.003
-37 thru	-100	.005
-102 thru	-800	.010

STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
A2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
A2500- 25	0.230		0.029		0.010	0.450	0.430	0.290	590	175	0.018	0.011	470	0.030	80000
A2500- 27	0.255		0.029		0.010	0.480	0.460	0.315	650	195	0.0175	0.0105	470	0.031	76000
A2500- 28	0.261		0.029		0.010	0.490	0.470	0.326	660	200	0.020	0.012	470	0.030	74000
A2500- 31	0.290		0.029		0.011	0.540	0.520	0.357	740	240	0.020	0.012	470	0.033	70000
A2500- 34	0.321		0.029		0.011	0.570	0.550	0.390	800	265	0.021	0.0125	470	0.033	64000
A2500- 35	0.330	±.002	0.029		0.012	0.590	0.570	0.405	820	300	0.023	0.014	470	0.036	62000
A2500- 37	0.352	.002	0.029		0.012	0.610	0.590	0.433	870	320	0.026	0.0155	470	0.036	60000
A2500- 39	0.369	T.I.R.	0.029		0.012	0.620	0.600	0.452	940	335	0.027	0.016	470	0.037	56500
A2500- 40	0.382		0.029		0.012	0.630	0.610	0.468	950	350	0.0285	0.017	470	0.036	55000
A2500- 43	0.412		0.029		0.013	0660	0.640	0.501	1020	400	0.029	0.0175	470	0.039	50000
A2500- 46	0.443		0.029	+.003	0.013	0.680	0.660	0.540	1100	450	0.031	0.018	470	0.039	42000
A2500- 50	0.468	±.002	0.039	-.000	0.016	0.770	0.740	0.574	1650	550	0.034	0.020	910	0.048	40000
A2500- 55	0.519	.004	0.039		0.016	0.810	0.780	0.611	1800	600	0.027	0.0165	910	0.048	36000
A2500- 56	0.530	T.I.R.	0.039		0.016	0.820	0.790	0.644	1850	650	0.038	0.023	910	0.048	35000
A2500- 59	0.559	±.003	0.039		0.017	0.860	0.830	0.680	1950	750	0.0395	0.0235	910	0.052	32000
A2500- 62	0.588	.004	0.039		0.018	0.900	0.870	0.715	2060	800	0.0415	0.025	910	0.055	30000
A2500- 66	0.629	T.I.R.	0.039		0.020	0.930	0.890	0.756	2200	950	0.040	0.024	910	0.060	29000
A2500- 66	0.631		0.039		0.020	0.930	0.890	0.758	2200	950	0.040	0.024	910	0.060	29000
A2500- 68	0.646		0.046		0.021	1.010	0.970	0.779	3400	1000	0.042	0.025	1340	0.063	28000

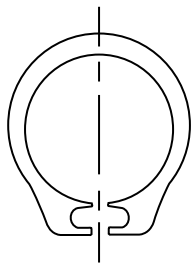
+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.





LUG DESIGN
SIZES-12 THRU -23



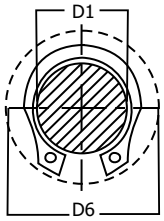
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS											
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	A2500	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
3/4	0.750	19.0	A2500- 75	0.693		0.042		2.10	0.092		0.051		0.136		0.052	
25/32	0.781	19.8	A2500- 78	0.722		0.042		2.20	0.094		0.052		0.136		0.052	+.010
13/16	0.812	20.6	A2500- 81	0.751	+.005	0.042		2.50	0.096		0.054		0.136		0.052	-.002
7/8	0.875	22.2	A2500- 87	0.810	-.010	0.042		2.80	0.104	±.005	0.057	±.005	0.137		0.052	
15/16	0.938	23.8	A2500- 93	0.867		0.042		3.10	0.110		0.063		0.166		0.078	
63/64	0.984	25.0	A2500- 98	0.910		0.042		3.50	0.114		0.0645		0.167		0.078	
1	1.000	25.4	A2500- 100	0.925		0.042		3.60	0.116		0.065		0.167		0.078	
--	1.023	26.0	A2500- 102	0.946		0.042		3.90	0.118		0.066		0.168		0.078	
1 1/16	1.062	27.0	A2500- 106	0.982		0.050		4.80	0.122		0.069		0.181		0.078	
1 1/8	1.125	28.6	A2500- 112	1.041		0.050		5.10	0.128		0.071		0.182		0.078	
1 3/16	1.188	30.2	A2500- 118	1.098		0.050		5.60	0.132		0.072		0.182		0.078	
1 1/4	1.250	31.7	A2500- 125	1.156	+.010	0.050	±.002	5.90	0.140		0.076		0.183		0.078	
1 5/16	1.312	33.3	A2500- 131	1.214	-.015	0.050		6.80	0.146	±.006	0.0765		0.183	±.004	0.078	
1 3/8	1.375	34.9	A2500- 137	1.272		0.050		7.20	0.152		0.082	±.006	0.184		0.078	
1 7/16	1.438	36.5	A2500- 143	1.333		0.050		8.10	0.160		0.086		0.184		0.078	+.015
1 1/2	1.500	38.1	A2500- 150	1.387		0.050		9.00	0.168		0.091		0.214		0.120	-.002
1 9/16	1.562	39.7	A2500- 156	1.446		0.062		12.40	0.172		0.093		0.235		0.125	
1 5/8	1.625	41.3	A2500- 162	1.503		0.062		13.20	0.180		0.097		0.235		0.125	
1 11/16	1.688	42.9	A2500- 168	1.560		0.062		14.80	0.184		0.099		0.235		0.125	
1 3/4	1.750	44.4	A2500- 175	1.618		0.062	±.003	15.30	0.188		0.101		0.237		0.125	
--	1.772	45.0	A2500- 177	1.637	+.013	0.062		15.40	0.190		0.102		0.237		0.125	
1 13/16	1.812	46.0	A2500- 181	1.675	-.020	0.062		16.20	0.192		0.102		0.238		0.125	
1 7/8	1.875	47.6	A2500- 187	1.735		0.062		17.30	0.196		0.104		0.239		0.125	
1 31/32	1.969	50.0	A2500- 196	1.819		0.062		18.00	0.200		0.106		0.245		0.125	
2	2.000	50.8	A2500- 200	1.850		0.062		19.00	0.204		0.108		0.239		0.125	

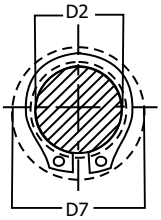
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

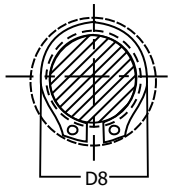
Star Ring Series A-2500 conforms to US Government standard MS-16624 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

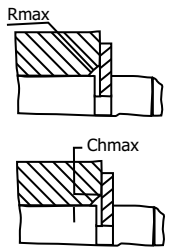




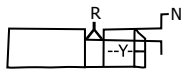
MAXIMUM
GAGING DIAMETER
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



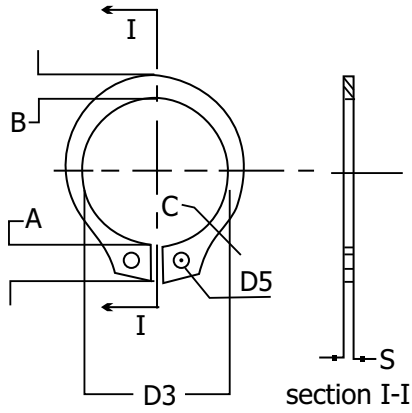
MAXIMUM BOTTOM RADII		
RING SIZE		R
-25 thru	-35	.003
-37 thru	-100	.005
-102 thru	-800	.010

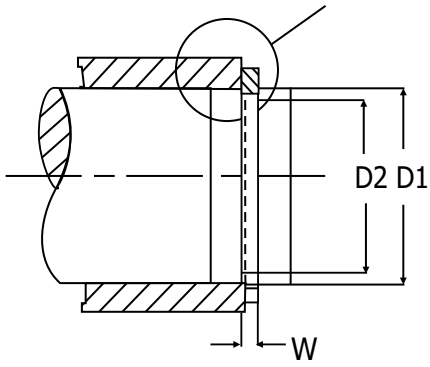
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
A2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
A2500- 75	0.704		0.046	+.003	0.023	1.090	1.050	0.850	3700	1200	0.046	0.0275	1340	0.069	26500
A2500- 78	0.733		0.046	-.000	0.024	1.120	1.080	0.883	3900	1300	0.047	0.028	1340	0.072	25500
A2500- 81	0.762	±.003	0.046		0.025	1.150	1.100	0.914	4000	1450	0.047	0.028	1340	0.075	24500
A2500- 87	0.821	.004	0.046		0.027	1.210	1.160	0.987	4300	1650	0.051	0.0305	1340	0.081	23000
A2500- 93	0.882	T.I.R.	0.046		0.028	1.340	1.290	1.054	4650	1850	0.055	0.033	1340	0.084	21500
A2500- 98	0.926		0.046		0.029	1.390	1.340	1.106	4850	2000	0.056	0.0335	1340	0.087	20500
A2500- 100	0.940		0.046		0.030	1.410	1.350	1.122	4950	2100	0.057	0.034	1340	0.090	20000
A2500- 102	0.961		0.046		0.031	1.430	1.370	1.147	5050	2250	0.058	0.035	1340	0.093	19500
A2500- 106	0.998		0.056		0.032	1.500	1.440	1.192	6200	2400	0.060	0.036	1950	0.096	19000
A2500- 112	1.059		0.056		0.033	1.550	1.490	1.261	6600	2600	0.063	0.038	1950	0.099	18800
A2500- 118	1.118		0.056		0.035	1.61	1.54	1.325	7000	2950	0.064	0.0385	1950	0.105	18000
A2500- 125	1.176	±.004	0.056		0.037	1.69	1.62	1.396	7350	3250	0.068	0.041	1950	0.111	17000
A2500- 131	1.232	.005	0.056		0.040	1.75	1.67	1.458	7750	3700	0.068	0.041	1950	0.120	16500
A2500- 137	1.291	T.I.R.	0.056		0.042	1.80	1.72	1.529	8100	4100	0.072	0.043	1950	0.126	16000
A2500- 143	1.350		0.056		0.044	1.87	1.79	1.600	8500	4500	0.076	0.045	1950	0.132	15000
A2500- 150	1.406		0.056		0.047	1.99	1.90	1.668	8800	5000	0.079	0.047	1950	0.141	14800
A2500- 156	1.468		0.068	+.004	0.047	2.10	2.01	1.740	11400	5200	0.082	0.049	3000	0.141	14000
A2500- 162	1.529		0.068	-.000	0.048	2.17	2.08	1.812	11850	5500	0.087	0.052	3000	0.144	13200
A2500- 168	1.589	±.005	0.068		0.049	2.24	2.15	1.877	12350	5850	0.090	0.054	3000	0.148	13000
A2500- 175	1.650	.005	0.068		0.050	2.31	2.21	1.945	12800	6200	0.091	0.054	3000	0.150	12200
A2500- 177	1.669	T.I.R.	0.068		0.051	2.33	2.23	1.967	12950	6400	0.092	0.055	3000	0.154	11700
A2500- 181	1.708		0.068		0.052	2.38	2.28	2.010	13250	6650	0.092	0.055	3000	0.156	11500
A2500- 187	1.769		0.068		0.053	2.44	2.34	2.076	13700	7000	0.094	0.056	3000	0.159	11000
A2500- 196	1.857		0.068		0.056	2.54	2.43	2.170	14350	7800	0.094	0.056	3000	0.168	10500
A2500- 200	1.886		0.068		0.057	2.55	2.44	2.205	14600	8050	0.096	0.057	3000	0.171	10000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

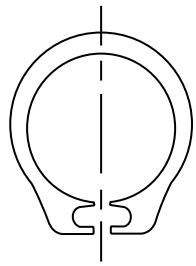
NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

External Retaining Ring Series A2500





LUG DESIGN
SIZES-12 THRU -23



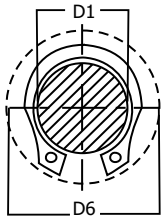
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS											
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	A2500	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
2 1/16	2.062	52.4	A2500- 206	1.906		0.078		25.00	0.208		0.111		0.266		0.125	
2 1/8	2.125	54.0	A2500- 212	1.964		0.078		26.10	0.212		0.113		0.266		0.125	
2 5/32	2.156	54.8	A2500- 215	1.993		0.078		26.30	0.212		0.113		0.266		0.125	
2 1/4	2.250	57.1	A2500- 225	2.081	+.015	0.078		27.70	0.220		0.116		0.267		0.125	
2 5/16	2.312	58.7	A2500- 231	2.139	-.025	0.078		28.00	0.222		0.118		0.267		0.125	
2 3/8	2.375	60.3	A2500- 237	2.197		0.078		29.20	0.224		0.119		0.267		0.125	
2 7/16	2.438	61.9	A2500- 243	2.255		0.078		29.50	0.228		0.120		0.268		0.125	
2 1/2	2.500	63.5	A2500- 250	2.313		0.078		29.70	0.232	±.007	0.122	±.007	0.268		0.125	
--	2.559	65.0	A2500- 255	2.377		0.078		33.90	0.238		0.125		0.268		0.125	
2 5/8	2.625	66.7	A2500- 262	2.428		0.078		35.00	0.242		0.127		0.268		0.125	
2 11/16	2.688	68.3	A2500- 268	2.485		0.078		36.00	0.246		0.129		0.268		0.125	
2 3/4	2.750	69.8	A2500- 275	2.543		0.093		42.50	0.248		0.131		0.310		0.125	+.015
2 7/8	2.875	73.0	A2500- 287	2.659		0.093	±.003	48.50	0.256		0.133		0.308		0.125	-.002
2 15/16	2.938	74.6	A2500- 293	2.717		0.093		50.00	0.260		0.136		0.308		0.125	
3	3.000	76.2	A2500- 300	2.775		0.093		52.00	0.264		0.138		0.308	±.005	0.125	
3 1/16	3.062	77.8	A2500- 306	2.832		0.093		47.50	0.252		0.131		0.298		0.125	
3 1/8	3.125	79.4	A2500- 312	2.892		0.093		58.00	0.272		0.141		0.308		0.125	
3 5/32	3.156	80.2	A2500- 315	2.920	+.020	0.093		59.00	0.274		0.143		0.308		0.125	
3 1/4	3.250	82.5	A2500- 325	3.006	-.030	0.093		62.00	0.280		0.145		0.308		0.125	
3 11/32	3.346	85.0	A2500- 334	3.092		0.093		64.00	0.286		0.147		0.308		0.125	
3 7/16	3.438	87.3	A2500- 343	3.179		0.093		66.00	0.292	±.008	0.148	±.008	0.308		0.125	
3 1/2	3.500	88.9	A2500- 350	3.237		0.109		72.00	0.285		0.148		0.328		0.125	
--	3.543	90.0	A2500- 354	3.277		0.109		73.00	0.288		0.149		0.328		0.125	
3 5/8	3.625	92.1	A2500- 362	3.352		0.109		76.00	0.296		0.153		0.328		0.125	
3 11/16	3.688	93.7	A2500- 368	3.410		0.109		80.00	0.302		0.156		0.330		0.125	

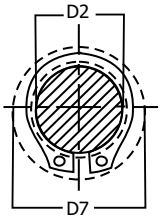
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

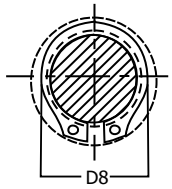
Star Ring Series A-2500 conforms to US Government standard MS-16624 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

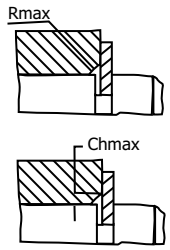




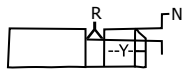
MAXIMUM
GAGING DIAMETER
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN

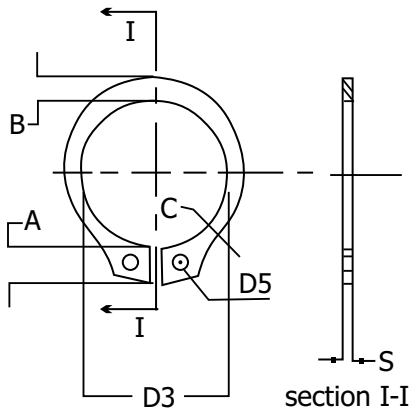


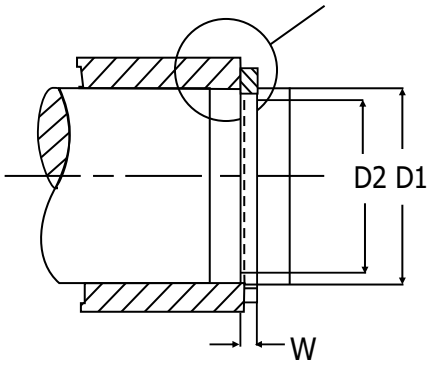
MAXIMUM BOTTOM RADII	
RING SIZE	R
-25 thru -35	.003
-37 thru -100	.005
-102 thru -800	.010

STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
A2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
A2500- 206	1.946		0.086		0.058	2.68	2.57	2.275	18950	8450	0.098	0.059	5000	0.174	9600
A2500- 212	2.003		0.086		0.061	2.75	2.63	2.337	19500	9150	0.098	0.059	5000	0.183	9500
A2500- 215	2.032		0.086		0.062	2.78	2.66	2.366	19800	9450	0.097	0.058	5000	0.186	9400
A2500- 225	2.120		0.086		0.065	2.87	2.74	2.466	20700	10350	0.100	0.060	5000	0.195	9200
A2500- 231	2.178		0.086		0.067	2.94	2.81	2.528	21200	10950	0.100	0.060	5000	0.201	9000
A2500- 237	2.239		0.086		0.068	3.01	2.88	2.591	21800	11400	0.100	0.060	5000	0.204	8800
A2500- 243	2.299		0.086		0.069	3.07	2.94	2.657	22400	11900	0.102	0.061	5000	0.207	8600
A2500- 250	2.360		0.086	+.005	0.070	3.12	2.98	2.724	23000	12350	0.104	0.062	5000	0.210	8400
A2500- 255	2.419		0.086	-.000	0.070	3.18	3.04	2.792	23500	12650	0.108	0.065	5000	0.210	8200
A2500- 262	2.481		0.086		0.072	3.25	3.11	2.860	24100	13350	0.1095	0.066	5000	0.216	8000
A2500- 268	2.541		0.086		0.073	3.32	3.18	2.926	24700	13850	0.1115	0.067	5000	0.219	7900
A2500- 275	2.602		0.103		0.074	3.45	3.31	2.992	30100	14400	0.112	0.067	7350	0.222	7600
A2500- 287	2.721		0.103		0.077	3.57	3.42	3.122	31500	15650	0.115	0.069	7350	0.231	7300
A2500- 293	2.779		0.103		0.079	3.64	3.49	3.187	32200	16400	0.116	0.070	7350	0.237	7200
A2500- 300	2.838	±.005	0.103		0.081	3.69	3.53	3.252	32900	17200	0.117	0.070	7350	0.243	6700
A2500- 306	2.898	.005	0.103		0.082	3.74	3.58	3.294	33500	17750	0.107	0.064	7350	0.246	6600
A2500- 312	2.957	T.I.R.	0.103		0.084	3.82	3.66	3.383	34300	18550	0.120	0.072	7350	0.252	6600
A2500- 315	2.986		0.103		0.085	3.85	3.68	3.415	34600	18950	0.1205	0.072	7350	0.255	6500
A2500- 325	3.076		0.103		0.087	3.95	3.78	3.515	35600	20000	0.123	0.074	7350	0.261	6400
A2500- 334	3.166		0.103		0.090	4.04	3.87	3.613	36700	21000	0.126	0.076	7350	0.270	6000
A2500- 343	3.257		0.103		0.090	4.14	3.96	3.712	37700	21900	0.129	0.077	7350	0.270	5900
A2500- 350	3.316		0.120		0.092	4.25	4.07	3.764	44900	22800	0.122	0.073	10500	0.276	5900
A2500- 354	3.357		0.120		0.093	4.29	4.11	3.809	45500	23300	0.123	0.074	10500	0.279	5800
A2500- 362	3.435		0.120		0.095	4.37	4.18	3.898	46600	24300	0.127	0.076	10500	0.285	5700
A2500- 368	3.493		0.120		0.097	4.43	4.24	3.966	47300	25300	0.1295	0.078	10500	0.291	5600

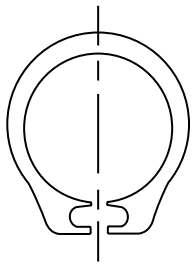
+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.





LUG DESIGN
SIZES-12 THRU -23



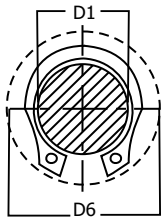
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS													
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	A2500	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
3 3/4	3.750	95.2	A2500- 375	3.468		0.109		83.00	0.310		0.160		0.332		0.125	
3 7/8	3.875	98.4	A2500- 387	3.584		0.109		88.00	0.318	±.008	0.163	±.008	0.330	±.008	0.125	
3 15/16	3.938	100.0	A2500- 393	3.642		0.109		95.00	0.318		0.163		0.342		0.125	
4	4.000	101.6	A2500- 400	3.700	+.020 -.030	0.109	±.003	101.00	0.318		0.163		0.352		0.125	
4 1/4	4.250	108.0	A2500- 425	3.989		0.109		112.00	0.318		0.176		0.395		0.125	+.015 -.002
4 3/8	4.375	111.1	A2500- 437	4.106		0.109		115.00	0.318		0.181		0.395		0.125	
4 1/2	4.500	114.3	A2500- 450	4.223		0.109		101.00	0.285		0.128		0.404		0.125	
4 3/4	4.750	120.6	A2500- 475	4.458		0.109		113.00	0.303		0.136		0.429		0.125	
5	5.000	127.0	A2500- 500	4.692		0.109		149.00	0.360	±.010	0.194	±.010	0.450	±.008	0.156	
5 1/4	5.250	133.3	A2500- 525	4.927		0.125		190.00	0.372		0.211		0.472		0.156	
5 1/2	5.500	139.7	A2500- 550	5.162	+.020 -.040	0.125	±.004	202.50	0.390		0.209		0.497		0.156	
5 3/4	5.750	146.0	A2500- 575	5.396		0.125		220.00	0.408		0.220		0.518		0.156	
6	6.000	152.4	A2500- 600	5.631		0.125		210.00	0.381		0.171		0.540		0.156	
6 1/4	6.250	158.7	A2500- 625	5.866		0.156		282.00	0.396		0.176		0.561		0.156	
6 1/2	6.500	165.1	A2500- 650	6.100	+.020 -.050	0.156		330.00	0.438		0.236		0.586		0.156	+.020 -.005
6 3/4	6.750	171.4	A2500- 675	6.335		0.156	±.005	356.00	0.456		0.246		0.608	±.012	0.187	
7	7.000	177.8	A2500- 700	6.570		0.156		371.00	0.474		0.256		0.530		0.187	
7 1/4	7.250	184.2	A2500- 725	6.775		0.187		510.00	0.490	±.015	0.267	±.015	0.660		0.187	
7 1/2	7.500	190.5	A2500- 750	7.009	+.050 -.130	0.187		534.00	0.507		0.277		0.676		0.187	
7 3/4	7.750	196.9	A2500- 775	7.243		0.187		545.00	0.523		0.285		0.660		0.187	
8	8.000	203.2	A2500- 800	7.478		0.187		640.00	0.540		0.294		0.735		0.187	

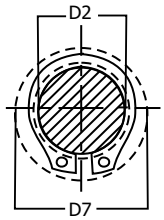
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

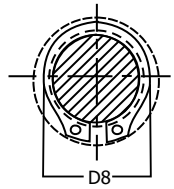
Star Ring Series A-2500 conforms to US Government standard MS-16624 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

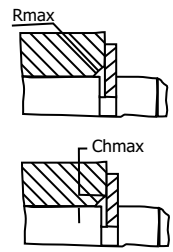




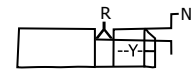
MAXIMUM
GAGING DIAMETER
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



MAXIMUM BOTTOM RADII	
RING SIZE	R
-25 thru -35	.003
-37 thru -100	.005
-102 thru -800	.010

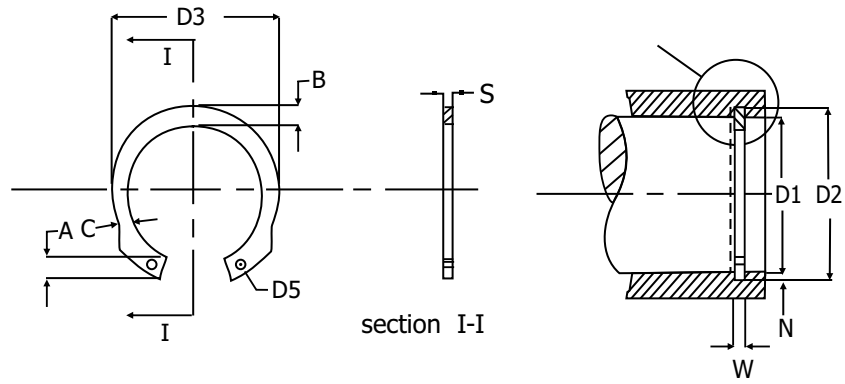
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
A2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
A2500- 375	3.552	±.006	0.120		0.099	4.50	4.31	4.037	48100	26200	0.133	0.080	10500	0.297	5500
A2500- 387	3.673	.006	0.120	+.005	0.101	4.60	4.40	4.169	49700	27700	0.137	0.082	10500	0.303	5100
A2500- 393	3.734	T.I.R.	0.120	-.000	0.102	4.70	4.50	4.230	50600	28400	0.137	0.082	10500	0.306	5200
A2500- 400	3.792		0.120		0.104	4.78	4.58	4.288	51400	29400	0.135	0.081	10500	0.312	5000
A2500- 425	4.065		0.120		0.092	5.09	4.91	4.558	54600	27600	0.146	0.088	10500	0.276	4800
A2500- 437	4.190		0.120		0.092	5.22	5.04	4.683	56200	28400	0.146	0.088	10500	0.276	4700
A2500- 450	4.310		0.120		0.095	5.37	5.18	4.730	57800	30200	0.102	0.061	10500	0.285	4500
A2500- 475	4.550		0.120		0.100	5.67	5.47	4.996	61000	33600	0.115	0.069	10500	0.300	4200
A2500- 500	4.790		0.120		0.105	5.96	5.75	5.346	64200	37100	0.165	0.099	10500	0.315	4000
A2500- 525	5.030	±.007	0.139	+.006	0.110	6.27	6.05	5.605	77300	40800	0.169	0.101	13500	0.330	3900
A2500- 550	5.265	.006	0.139	-.000	0.117	6.57	6.34	5.867	81000	45500	0.175	0.105	13500	0.351	3700
A2500- 575	5.505	T.I.R.	0.139		0.122	6.86	6.62	6.134	84700	49600	0.184	0.110	13500	0.366	3500
A2500- 600	5.745		0.139		0.127	7.16	6.91	6.302	88300	53800	0.143	0.086	13500	0.381	3400
A2500- 625	5.985		0.174		0.132	7.46	7.20	6.568	114800	58300	0.148	0.089	21000	0.396	3100
A2500- 650	6.225		0.174		0.137	7.87	7.60	6.905	119400	62900	0.191	0.114	21000	0.411	3000
A2500- 675	6.465		0.174	+.008	0.142	8.06	7.78	7.712	124000	67700	0.200	0.120	21000	0.426	3000
A2500- 700	6.705	±.008	0.174	-.000	0.147	8.15	8.07	7.439	128600	72700	0.208	0.125	21000	0.441	2900
A2500- 725	6.942	.006	0.209		0.154	7.85	8.39	7.700	159700	78900	0.214	0.128	30000	0.460	2800
A2500- 750	7.180	T.I.R.	0.209		0.160	8.96	8.64	7.963	165200	84800	0.220	0.132	30000	0.480	2700
A2500- 775	7.420		0.209		0.165	9.20	8.87	8.228	170700	90450	0.227	0.136	30000	0.495	2600
A2500- 800	7.660		0.209		0.170	9.60	9.26	8.493	176200	96100	0.235	0.141	30000	0.510	2500

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

Internal Retaining Ring Series IB2400

SERIES IB2400 Rings are a modification of series B 2400 basic Internal Retaining Ring. Higher section height and small inverted lugs of the ring helps form a high circular shoulder to accommodate parts having large corner radii or chamfer and allows greater ring clearance diameter within grooved housings than basic Internal Retaining Ring.



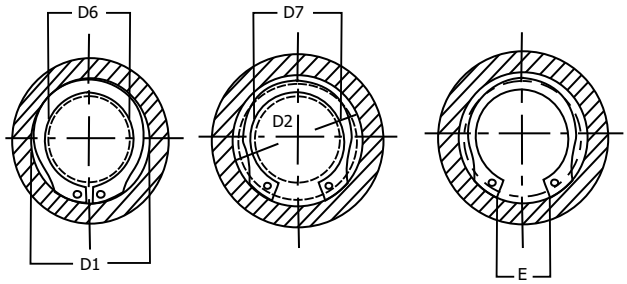
HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS									
				FREE DIAMETER		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LUG & LARGE SEC.		SMALL SEC.		LUG HOLE DIA
FRAC.	DEC.	MM											
D1	D1	D1	IB2400	D3	TOL.	S	TOL.		A & B	TOL.	C	TOL.	D5	TOL.
5/8	0.625	15.9	IB2400- 62	0.675		0.025		0.7	0.072	±.004	0.036	±.004	0.030	
3/4	0.750	19.0	IB2400- 75	0.808		0.035		1.3	0.085		0.042		0.042	
13/16	0.812	20.6	IB2400- 81	0.877		0.042		2.0	0.092		0.044		0.042	
7/8	0.875	22.2	IB2400- 87	0.944	+.010	0.042		2.2	0.099	±.005	0.047	±.005	0.042	
15/16	0.938	23.8	IB2400- 93	1.015	-.005	0.042		2.8	0.106		0.051		0.042	+.010 -.002
1	1.000	25.4	IB2400- 100	1.081		0.042		2.9	0.113		0.054		0.042	
1 1/16	1.062	27.0	IB2400- 106	1.150		0.050	±.002	3.8	0.120		0.057		0.050	
1 1/8	1.125	28.6	IB2400- 112	1.217		0.050		4.4	0.123		0.059		0.050	
1 3/16	1.188	30.2	IB2400- 118	1.283	+.015	0.050		4.9	0.126		0.060		0.050	
1 1/4	1.250	31.7	IB2400- 125	1.351	-.010	0.050		5.0	0.129	±.006	0.061	±.006	0.050	
1 5/16	1.312	33.3	IB2400- 131	1.418		0.050		5.3	0.132		0.063		0.050	
1 3/8	1.375	34.9	IB2400- 137	1.486		0.050		5.9	0.135		0.065		0.050	
1 7/16	1.438	36.5	IB2400- 143	1.552		0.050		6.3	0.144		0.069		0.076	
1 1/2	1.500	38.1	IB2400- 150	1.622		0.050		6.8	0.148		0.070		0.076	
1 9/16	1.562	39.7	IB2400- 156	1.688		0.062		8.9	0.158		0.074		0.076	+.015 -.002
1 5/8	1.625	41.3	IB2400- 162	1.756		0.062		10.4	0.162		0.077		0.076	
1 11/16	1.688	42.9	IB2400- 168	1.823	+.020	0.062	±.003	11.9	0.166	±.007	0.079	±.007	0.076	
1 3/4	1.750	44.4	IB2400- 175	1.891	-.013	0.062		11.8	0.170		0.082		0.076	
1 7/8	1.875	47.6	IB2400- 187	2.025		0.062		14.8	0.188		0.090		0.076	
2	2.000	50.8	IB2400- 200	2.160		0.062		17.4	0.208		0.100		0.076	

Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

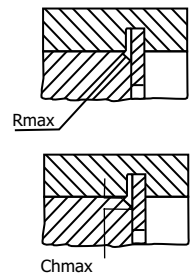
Star Ring Series IB-2400 conforms to US Government standard MS-16627 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

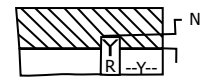


MINIMUM GAP WIDTH
(Ring installed in groove)

MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



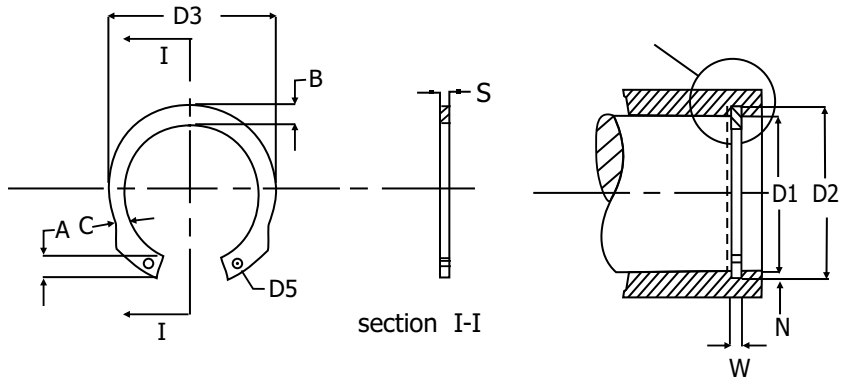
MAXIMUM BOTTOM RADII	
RING SIZE	R
-62 thru -100	.005
-106 thru -400	.010

STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIA		MIN. GAP WIDTH	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN
	DIAMETER		WIDTH		DEPTH	RING SPRUNG IN HOUSING	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
IB2400	D2	TOL.	W	TOL.	N	D6	D7	E	PR	PG	R max	Ch max	P' R	Y
IB2400- 62	0.665	±.002	0.029	+.003	0.020	0.47	0.510	0.160	1000	450	0.042	0.0280	400	0.060
IB2400- 75	0.796	.004TIR	0.039	-.000	0.023	0.56	0.605	0.165	1650	600	0.050	0.031	850	0.069
IB2400- 81	0.862		0.046		0.025	0.62	0.665	0.180	2600	700	0.054	0.034	1250	0.075
IB2400- 87	0.931	±.003	0.046		0.028	0.65	0.705	0.190	2850	850	0.057	0.036	1250	0.084
IB2400- 93	1.000	.004TIR	0.046		0.031	0.70	0.755	0.220	3100	1000	0.060	0.038	1250	0.093
IB2400- 100	1.066		0.046		0.033	0.75	0.810	0.235	3300	1150	0.064	0.040	1250	0.099
IB2400- 106	1.130		0.056		0.034	0.80	0.870	0.220	4150	1250	0.069	0.043	1800	0.102
IB2400- 112	1.197		0.056		0.036	0.86	0.930	0.245	4400	1400	0.070	0.044	1800	0.108
IB2400- 118	1.262	±.004	0.056		0.037	0.91	0.980	0.260	4650	1600	0.071	0.045	1800	0.111
IB2400- 125	1.330	.005	0.056		0.040	0.97	1.050	0.280	4900	1750	0.071	0.045	1800	0.120
IB2400- 131	1.396	T.I.R.	0.056		0.042	1.02	1.100	0.290	5150	1950	0.072	0.045	1800	0.126
IB2400- 137	1.461		0.056	+.004	0.043	1.08	1.160	0.330	5400	2100	0.074	0.046	1800	0.129
IB2400- 143	1.528		0.056	-.000	0.045	1.13	1.220	0.350	5650	2300	0.079	0.050	1800	0.135
IB2400- 150	1.594		0.056		0.047	1.18	1.270	0.330	5850	2500	0.081	0.051	1800	0.141
IB2400- 156	1.658		0.068		0.048	1.21	1.300	0.360	7600	2650	0.088	0.055	2900	0.144
IB2400- 162	1.725	±.005	0.068		0.050	1.27	1.370	0.385	7900	2850	0.090	0.056	2900	0.150
IB2400- 168	1.792	.005	0.068		0.052	1.32	1.420	0.405	8250	3100	0.091	0.057	2900	0.156
IB2400- 175	1.858	T.I.R.	0.068		0.054	1.38	1.490	0.420	8550	3300	0.093	0.058	2900	0.162
IB2400- 187	1.989		0.068		0.057	1.47	1.580	0.440	9150	3750	0.105	0.066	2900	0.171
IB2400- 200	2.122		0.068		0.061	1.55	1.670	0.480	9750	4300	0.118	0.074	2900	0.183

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be contracted excessively during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been contracted excessively.

Internal Retaining Ring Series IB2400



HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS									
				FREE DIAMETER		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LUG & LARGE SEC.		SMALL SEC.		LUG HOLE DIA
FRAC.	DEC.	MM											
D1	D1	D1	IB2400	D3	TOL.	S	TOL.		A & B	TOL.	C	TOL.	D5	TOL.
2 1/16	2.062	52.4	IB2400- 206	2.224		0.078		23.2	0.218		0.106		0.094	
2 1/8	2.125	54.0	IB2400- 212	2.295		0.078		24.3	0.223		0.108		0.094	
2 3/8	2.375	60.3	IB2400- 237	2.567	+.025	0.078		28.6	0.243	±.007	0.115	±.007	0.094	+.015
2 7/16	2.438	61.9	IB2400- 243	2.634	-.015	0.078		30.6	0.248		0.117		0.094	-.002
2 1/2	2.500	63.5	IB2400- 250	2.700		0.078		32.1	0.254		0.120		0.094	
2 5/8	2.625	66.7	IB2400- 262	2.840		0.093	±.003	45.6	0.266		0.128		0.109	
2 3/4	2.750	69.8	IB2400- 275	2.975		0.093		47.8	0.278		0.134		0.109	
2 13/16	2.812	71.4	IB2400- 283	3.063		0.093		49.5	0.286		0.139		0.109	
--	2.835	72.0	IB2400- 283	3.063		0.093		49.5	0.286		0.139		0.109	
2 7/8	2.875	73.0	IB2400- 287	3.105	+.030	0.093		50.1	0.290		0.139		0.109	
3	3.000	76.2	IB2400- 300	3.245	-.020	0.093		52.6	0.302		0.143		0.109	
3 5/32	3.156	80.2	IB2400- 315	3.408		0.109		69.4	0.314		0.149		0.125	
3 1/4	3.250	82.5	IB2400- 325	3.509		0.109		72.6	0.318		0.151		0.125	
3 11/32	3.346	85.0	IB2400- 334	3.611		0.109		75.6	0.321	±.008	0.155	±.008	0.125	
3 1/2	3.500	88.9	IB2400- 350	3.780		0.109		80.2	0.324		0.154		0.125	
3 9/16	3.562	90.5	IB2400- 356	3.850		0.109		82.4	0.326		0.155		0.125	
4	4.000	101.6	IB2400- 400	4.350		0.109		97.4	0.338		0.161		0.125	

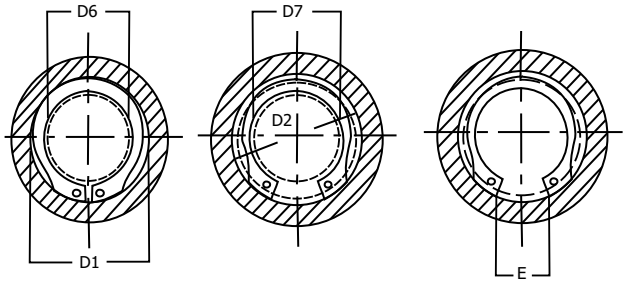
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

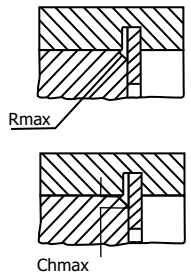
Star Ring Series IB-2400 conforms to US Government standard MS-16627 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

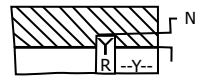
MINIMUM GAP WIDTH
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



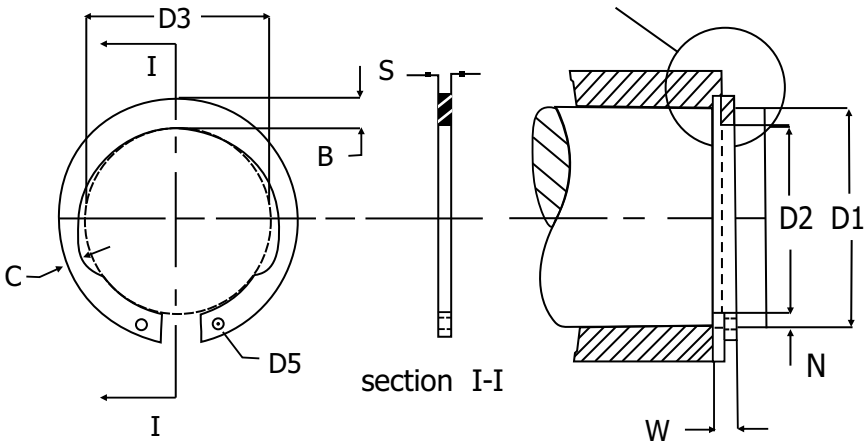
MAXIMUM BOTTOM RADII	
RING SIZE	R
-62 thru -100	.005
-106 thru -400	.010

STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIA		MIN. GAP WIDTH	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN
	DIAMETER		WIDTH		DEPTH	RING SPRUNG IN HOUSING	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
IB2400	D2	TOL.	W	TOL.	N	D6	D7	E	PR	PG	R max	Ch max	P' R	Y
IB2400- 206	2.186		0.086		0.062	1.59	1.710	0.485	12650	4500	0.125	0.078	4600	0.186
IB2400- 212	2.251		0.086		0.063	1.65	1.770	0.490	13050	4700	0.128	0.080	4600	0.189
IB2400- 237	2.517		0.086		0.071	1.86	2.000	0.550	14500	5900	0.138	0.086	4600	0.213
IB2400- 243	2.584		0.086		0.072	1.91	2.050	0.570	14900	6200	0.141	0.088	4600	0.216
IB2400- 250	2.648		0.086		0.074	1.96	2.100	0.590	15300	6500	0.144	0.090	4600	0.222
IB2400- 262	2.781		0.103	+.005	0.078	2.06	2.210	0.600	19200	7200	0.150	0.094	6700	0.234
IB2400- 275	2.914	±.006	0.103	-.000	0.082	2.16	2.320	0.630	20000	7900	0.157	0.098	6700	0.246
IB2400- 283	2.980	.006	0.103		0.084	2.21	2.370	0.610	20500	8300	0.162	0.102	6700	0.252
IB2400- 283	3.006	T.I.R.	0.103		0.086	2.23	2.390	0.670	20500	8550	0.162	0.102	6700	0.258
IB2400- 287	3.051		0.103		0.088	2.26	2.430	--	21000	8900	0.162	0.101	6700	0.264
IB2400- 300	3.182		0.103		0.091	2.36	2.530	0.705	21900	9600	0.169	0.106	6700	0.273
IB2400- 315	3.348		0.120		0.096	2.50	2.690	0.760	27000	10600	0.174	0.109	9000	0.288
IB2400- 325	3.446		0.120		0.098	2.58	2.770	--	27800	11200	0.176	0.110	9000	0.294
IB2400- 334	3.546		0.120		0.100	2.67	2.870	0.810	28600	11700	0.177	0.111	9000	0.300
IB2400- 350	3.710		0.120		0.105	2.82	3.030	0.840	29900	12900	0.175	0.110	9000	0.315
IB2400- 356	3.776		0.120		0.107	2.88	3.090	0.860	30500	13400	0.175	0.110	9000	0.321
IB2400- 400	4.240		0.120		0.120	3.29	3.530	0.930	34200	16900	0.174	0.108	9000	0.360

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be contracted excessively during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been contracted excessively.

SERIES IA2500 Rings are a modification of series A 2500 basic External Retaining Ring. Higher section height and small inverted lugs of the ring helps form a high circular shoulder to accommodate parts having large corner radii or chamfers and allows greater ring clearance diameter than basic External Retaining Rings.



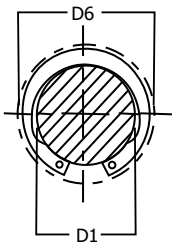
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS									
				FREE DIAMETER		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LUG & LARGE SEC.		SMALL SEC.		LUG HOLE DIA
FRAC.	DEC.	MM											
D1	D1	D1	IA2500	D3	TOL.	S	TOL.		A & B	TOL.	C	TOL.	D5	TOL.
1/2	0.500	12.7	IA2500- 50	0.461		0.035		1.0	0.080		0.041		0.042	
9/16	0.562	14.3	IA2500- 56	0.521		0.035		1.4	0.088	±.004	0.043	±.004	0.042	
19/32	0.594	15.1	IA2500- 59	0.550		0.035		1.6	0.092		0.046		0.042	+.010
5/8	0.625	15.9	IA2500- 62	0.579	+.005	0.035		1.6	0.096		0.048		0.042	-.002
11/16	0.688	17.5	IA2500- 68	0.635	-.010	0.042		2.5	0.104		0.052		0.042	
3/4	0.750	19.0	IA2500- 75	0.693		0.042		2.8	0.112		0.056		0.042	
25/32	0.781	19.8	IA2500- 78	0.722		0.042		3.1	0.116		0.057		0.042	
13/16	0.812	20.6	IA2500- 81	0.751		0.042	±.002	3.3	0.120	±.005	0.060	±.005	0.050	
7/8	0.875	22.2	IA2500- 87	0.810		0.042		3.8	0.128		0.064		0.050	
15/16	0.938	23.8	IA2500- 93	0.867		0.042		4.5	0.136		0.068		0.050	
63/64	0.984	25.0	IA2500- 100	0.925		0.042		4.8	0.144		0.072		0.050	
1	1.000	25.4	IA2500- 100	0.925		0.042		4.8	0.144		0.072		0.050	
1 1/16	1.062	27.0	IA2500- 106	0.982		0.050		6.2	0.147		0.073		0.078	
1 1/8	1.125	28.6	IA2500- 112	1.041	+.010	0.050		6.7	0.150		0.075		0.078	
1 3/16	1.188	30.2	IA2500- 118	1.098	-.015	0.050		7.2	0.153		0.076		0.078	
1 1/4	1.250	31.7	IA2500- 125	1.156		0.050		7.6	0.157		0.079		0.078	
1 5/16	1.312	33.3	IA2500- 131	1.214		0.050		8.2	0.161	±.006	0.080	±.006	0.078	
1 3/8	1.375	34.9	IA2500- 137	1.272		0.050		8.4	0.165		0.082		0.078	+.015
1 7/16	1.438	36.5	IA2500- 143	1.333		0.050		9.1	0.169		0.085		0.078	-.002
1 1/2	1.500	38.1	IA2500- 150	1.387		0.050		9.8	0.173		0.086		0.078	

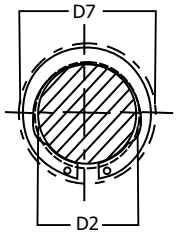
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

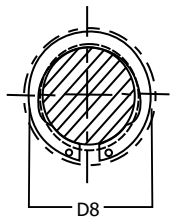
Star Ring Series IA-2500 conforms to US Government standard MS-3217 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

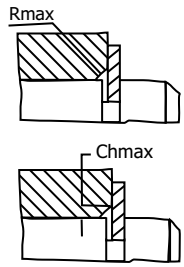




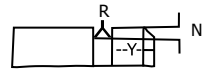
MAXIMUM
GAGING DIAMETER
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



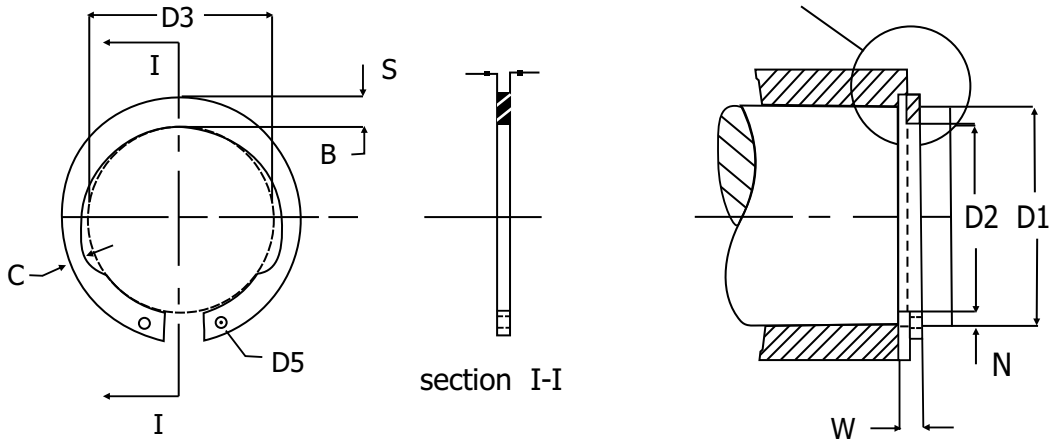
MAXIMUM BOTTOM RADII	
RING SIZE	R
-50 thru -100	.005
-106 thru -400	.010

STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
IA2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
IA2500- 50	0.468	±.002	0.039		0.016	0.67	0.645	0.640	1100	280	0.051	0.0320	680	0.048	40000
IA2500- 56	0.530	.004TIR	0.039		0.016	0.75	0.720	0.715	1250	320	0.057	0.036	680	0.048	35000
IA2500- 59	0.559		0.039	+.003	0.017	0.79	0.760	0.750	1300	370	0.059	0.037	680	0.052	32000
IA2500- 62	0.588		0.039	-.000	0.018	0.83	0.800	0.790	1400	400	0.062	0.039	680	0.055	30000
IA2500- 68	0.646		0.046		0.021	0.91	0.870	0.870	2300	500	0.066	0.042	1000	0.063	28000
IA2500- 75	0.704	±.003	0.046		0.023	0.99	0.950	0.945	2500	600	0.071	0.045	1000	0.069	26500
IA2500- 78	0.733	.004	0.046		0.024	1.04	1.000	0.980	2600	650	0.073	0.046	1000	0.072	25500
IA2500- 81	0.762	T.I.R.	0.046		0.025	1.08	1.030	1.020	2650	700	0.076	0.048	1000	0.075	24500
IA2500- 87	0.821		0.046		0.027	1.15	1.100	1.095	2850	850	0.080	0.051	1000	0.081	23000
IA2500- 93	0.882		0.046		0.028	1.23	1.180	1.170	3100	900	0.086	0.054	1000	0.084	21500
IA2500- 100	0.926		0.046		0.029	1.30	1.250	1.240	3300	1000	0.091	0.057	1000	0.087	20000
IA2500- 100	0.940		0.046		0.030	1.31	1.260	1.250	3300	1050	0.091	0.057	1000	0.090	20000
IA2500- 106	0.998		0.056		0.032	1.38	1.320	1.310	4150	1200	0.092	0.058	1460	0.096	19000
IA2500- 112	1.059		0.056		0.033	1.45	1.390	1.380	4400	1300	0.093	0.059	1460	0.099	18800
IA2500- 118	1.118		0.056		0.035	1.52	1.460	1.450	4650	1450	0.094	0.059	1460	0.105	18000
IA2500- 125	1.176	±.004	0.056		0.037	1.59	1.520	1.520	4900	1600	0.096	0.060	1460	0.111	17000
IA2500- 131	1.232	.005	0.056		0.040	1.66	1.580	1.580	5150	1850	0.097	0.061	1460	0.120	16500
IA2500- 137	1.291	T.I.R.	0.056		0.042	1.73	1.650	1.650	5400	2050	0.098	0.061	1460	0.126	16000
IA2500- 143	1.350		0.056	+.004	0.044	1.80	1.720	1.715	5650	2200	0.100	0.063	1460	0.132	15000
IA2500- 150	1.406		0.056	-.000	0.047	1.87	1.780	1.775	5850	2500	0.100	0.063	1460	0.141	14800

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

External Retaining Ring Series IA2500



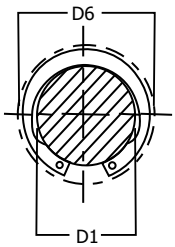
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS									
				FREE DIAMETER		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LUG & LARGE SEC.		SMALL SEC.		LUG HOLE DIA	
FRAC.	DEC.	MM												
D1	D1	D1	IA2500	D3	TOL.	S	TOL.		A & B	TOL.	C	TOL.	D5	TOL.
1 9/16	1.562	39.7	IA2500- 156	1.446		0.062		12.9	0.178		0.089		0.078	
1 5/8	1.625	41.3	IA2500- 162	1.503		0.062		13.4	0.183		0.092		0.078	
1 3/4	1.750	44.4	IA2500- 177	1.637	+.013	0.062		16.1	0.196	±.006	0.098	±.006	0.078	
--	1.772	45.0	IA2500- 177	1.637	-.020	0.062		16.1	0.196		0.098		0.078	+.015
1 13/16	1.812	46.0	IA2500- 181	1.675		0.062		17.3	0.199		0.100		0.078	-.002
1 31/32	1.969	50.0	IA2500- 196	1.819		0.062		20.5	0.212		0.106		0.078	
2	2.000	50.8	IA2500- 200	1.850		0.062		207	0.216		0.108		0.078	
2 1/8	2.125	54.0	IA2500- 215	1.993	+.015	0.078	±.003	30.0	0.229		0.117		0.120	
2 5/32	2.156	54.8	IA2500- 215	1.993	-.025	0.078		30.0	0.229		0.117		0.120	
2 1/2	2.500	63.5	IA2500- 250	2.313		0.078		43.5	0.259	±.007	0.130	±.007	0.120	
2 3/4	2.750	69.8	IA2500- 275	2.543		0.093		57.9	0.280		0.140		0.120	
2 7/8	2.875	73.0	IA2500- 287	2.659		0.093		64.5	0.290		0.145		0.120	
3 5/32	3.156	80.2	IA2500- 315	2.920	+.020	0.093		77.0	0.316		0.159		0.120	
3 1/4	3.250	82.5	IA2500- 325	3.006	-.030	0.093		77.5	0.324		0.162		0.120	
3 1/2	3.500	88.9	IA2500- 350	3.237		0.109		107.0	0.345	±.008	0.173	±.008	0.125	
3 15/16	3.938	100.0	IA2500- 393	3.642		0.109		123.0	0.368		0.183		0.125	

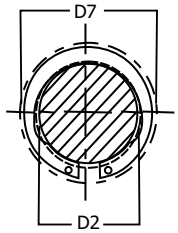
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

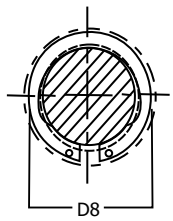
Star Ring Series IA-2500 conforms to US Government standard MS-3217 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

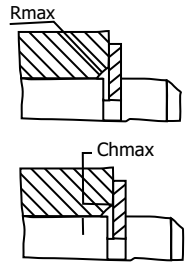




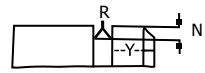
MAXIMUM
GAGING DIAMETER
(Ring installed in groove)



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



MAXIMUM BOTTOM RADII	
RING SIZE	R
-50 thru -100	.005
-106 thru -393	.010

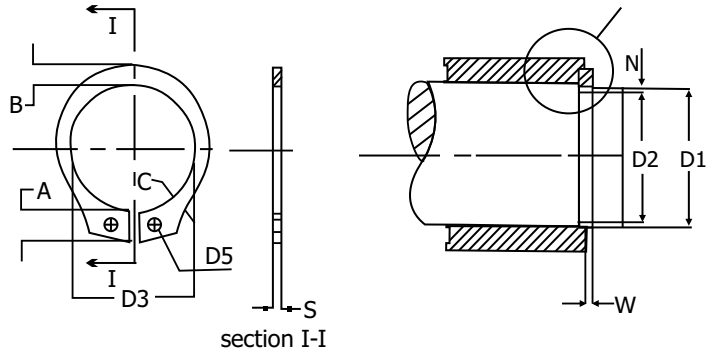
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
IA2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
IA2500- 156	1.468		0.068		0.047	1.95	1.860	1.850	7600	2600	0.104	0.066	2250	0.141	14000
IA2500- 162	1.529		0.068		0.048	2.02	1.930	1.920	7900	2750	0.108	0.067	2250	0.144	13200
IA2500- 177	1.650	±.005	0.068	+.004	0.050	2.18	2.080	2.070	8500	3100	0.116	0.073	2250	0.150	11700
IA2500- 177	1.669	.005	0.068	-.000	0.051	2.20	2.100	2.090	8500	3200	0.116	0.073	2250	0.153	11700
IA2500- 181	1.708	T.I.R.	0.068		0.052	2.24	2.140	2.130	8850	3300	0.117	0.074	2250	0.156	11500
IA2500- 196	1.857		0.068		0.056	2.43	2.320	2.310	9550	3900	0.124	0.078	2250	0.168	10500
IA2500- 200	1.886		0.068		0.057	2.47	2.360	2.350	9750	4000	0.127	0.080	2250	0.171	10000
IA2500- 215	2.003		0.086		0.061	2.62	2.500	2.490	13000	4550	0.133	0.084	3750	0.183	9400
IA2500- 215	2.032		0.086		0.062	2.65	2.530	2.520	13000	4700	0.133	0.084	3750	0.186	9400
IA2500- 250	2.360		0.086		0.070	3.05	2.920	2.910	15300	6200	0.151	0.095	3750	0.210	8400
IA2500- 275	2.602	±.006	0.103	+.005	0.074	3.34	3.200	3.190	20100	7200	0.165	0.103	5500	0.222	7600
IA2500- 287	2.721	.006	0.103	-.000	0.077	3.49	3.340	3.330	21000	7800	0.170	0.107	5500	0.231	7300
IA2500- 315	2.986	T.I.R.	0.103		0.085	3.82	3.660	3.650	23100	9400	0.185	0.116	5500	0.255	6500
IA2500- 325	3.076		0.103		0.087	3.93	3.760	3.750	23700	10000	0.190	0.118	5500	0.261	6400
IA2500- 350	3.316		0.120		0.092	4.22	4.040	4.030	29900	11500	0.202	0.127	7850	0.276	5900
IA2500- 393	3.734		0.120		0.102	4.71	4.510	4.500	33700	14000	0.212	0.133	7850	0.306	5200

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

External Retaining Ring Series HA2500

SERIES HA2500 Rings are a modification of series A 2500 basic External Retaining Ring. Extra thickness allows the ring to withstand higher thrust loads and greatly increased section height allows it to accommodate parts having extra large corner radii and chamfer.



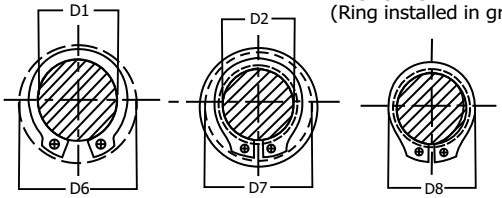
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS													
				FREE DIA		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.		SMALL SEC.		LUG		LUG HOLE DIA	
FRAC.	DEC.	MM														
D1	D1	D1	HA2500	D3	TOL.	S	TOL.		B	TOL.	C	TOL.	A	TOL.	D5	TOL.
--	0.394	10.0	HA2500- 39	0.362	+.003	0.035		0.70	0.068		0.039		0.101		0.042	
--	0.428	10.9	HA2500- 42	0.394	-.008	0.035		0.86	0.076	±.004	0.043	±.004	0.101		0.042	
--	0.473	12.0	HA2500- 47	0.435		0.042		1.40	0.088		0.053		0.101	±.004	0.042	
1/2	0.500	12.7	HA2500- 50	0.460		0.050	±.002	1.60	0.090		0.050		0.120		0.050	+.010
-	0.591	15.0	HA2500- 59	0.543		0.050		2.20	0.102	±.005	0.057	±.005	0.130		0.050	-.002
5/8	0.625	15.9	HA2500- 62	0.575		0.050		2.30	0.106		0.059		0.130		0.050	
--	0.669	17.0	HA2500- 66	0.616	+.005	0.050		2.60	0.112		0.062		0.130		0.050	
3/4	0.750	19.0	HA2500- 75	0.689	-.010	0.078		5.60	0.127		0.077		0.180		0.078	
--	0.787	20.0	HA2500- 75	0.689		0.078		5.60	0.127		0.077		0.180		0.078	
7/8	0.875	22.2	HA2500- 87	0.804		0.078		7.50	0.148	±.006	0.083	±.006	0.180		0.078	
63/64	0.984	25.0	HA2500- 98	0.906		0.078		7.80	0.151		0.084		0.180		0.078	
1	1.000	25.4	HA2500- 98	0.906		0.078		7.80	0.151		0.084		0.180		0.078	
1 1/16	1.062	27.0	HA2500- 106	0.978		0.093		11.5	0.161		0.090		0.220		0.093	
1 1/8	1.125	28.6	HA2500- 112	1.036		0.093	±.003	12.50	0.169		0.095		0.220		0.093	
--	1.181	30.0	HA2500- 118	1.087		0.093		13.50	0.176		0.098		0.220		0.093	
1 3/16	1.188	30.2	HA2500- 118	1.087	+.010	0.093		13.50	0.176	±.007	0.098	±.007	0.220	±.005	0.093	
1 1/4	1.250	31.7	HA2500- 125	1.150	-.015	0.093		14.90	0.185		0.103		0.220		0.093	+.015
1 5/16	1.312	33.3	HA2500- 131	1.208		0.093		16.00	0.192		0.106		0.220		0.093	-.002
1 3/8	1.375	34.9	HA2500- 137	1.268		0.093		17.80	0.200		0.110		0.220		0.093	
--	1.378	35.0	HA2500- 137	1.268		0.093		17.80	0.200		0.110		0.220		0.093	
1 1/2	1.500	38.1	HA2500- 150	1.380		0.109		27.00	0.218		0.123		0.280		0.109	
1 9/16	1.562	39.7	HA2500- 156	1.437		0.109		31.00	0.228		0.127		0.280		0.109	
-	1.575	40.0	HA2500- 156	1.437		0.109		31.00	0.228		0.127		0.280		0.109	
1 3/4	1.750	44.4	HA2500- 175	1.608	+.013	0.109		33.40	0.254	±.008	0.140	±.008	0.290		0.109	
--	1.772	45.0	HA2500- 175	1.608	-.020	0.109		33.40	0.254		0.140		0.290		0.109	
1 15/16	1.938	49.2	HA2500- 193	1.782		0.125		48.00	0.280		0.154		0.314	±.006	0.125	
1 31/32	1.969	50.0	HA2500- 193	1.782		0.125	±.004	48.00	0.280		0.154		0.314		0.125	
2	2.000	50.8	HA2500- 200	1.840		0.125		50.60	0.290		0.160		0.314		0.125	

Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

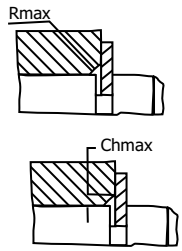
Star Ring Series HA-2500 conforms to US Government standard MS-3217 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

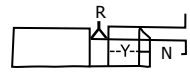


MAXIMUM GAGING DIAMETER (Ring installed in groove)

MAXIMUM ALLOWABLE CORNER RADIUS(Rmox) AND CHAMFER (Chmox)

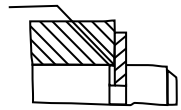


ENLARGED DETAIL OF GROOVE PROFILE AND EDGE MARGIN



MAXIMUM BOTTOM RADII	
RING SIZE	R
-39 thru -98	.005
-106 thru -200	.010

SHARP CORNER ABUTHENT

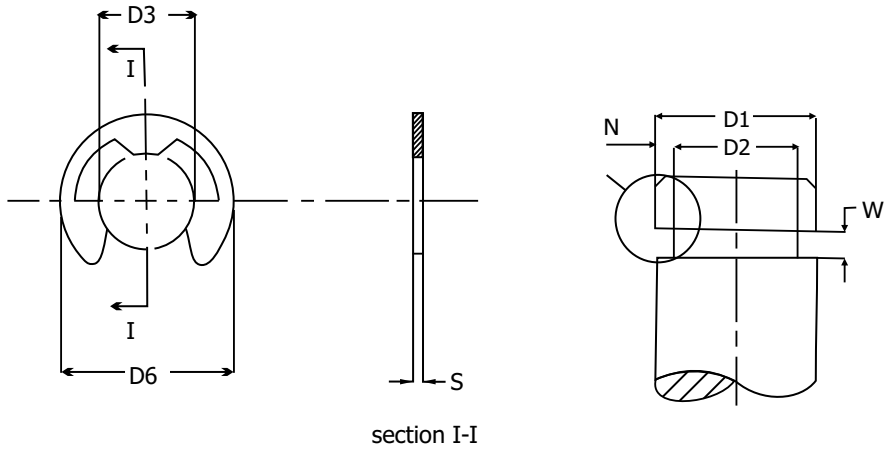


STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA									
						RING CLEARANCE DIA		MAX. GAGING DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING IN GROOVE	RING SAFETY FACTOR 4 - 4	GROOVE SAFETY FACTOR 2 - 2					
HA2500	D2	TOL.	W	TOL.	N	D6	D7	D8	PR	PG	R max	Ch max	P' R	Y	
HA2500- 39	0.368	+0.001	0.039	+.003	0.013	0.61	0.58	0.479	2000	700	0.047	0.039	450	0.039	80000
HA2500- 42	0.402	-.002	0.039	-.000	0.013	0.65	0.62	0.525	2300	800	0.057	0.046	530	0.039	72000
HA2500- 47	0.444	.002	0.046		0.015	0.69	0.66	0.589	3000	1000	0.070	0.058	550	0.045	69000
HA2500- 50	0.468	T.I.R.	0.056	+.004	0.016	0.75	0.72	0.613	3900	1100	0.070	0.058	650	0.048	65000
HA2500- 59	0.555		0.056	-.000	0.018	0.86	0.83	0.719	4500	1500	0.070	0.058	750	0.054	52500
HA2500- 62	0.588		0.056		0.019	0.90	0.86	0.758	4800	1600	0.074	0.062	750	0.057	49000
HA2500- 66	0.629	+0.001	0.056		0.020	0.94	0.90	0.808	5200	1900	0.077	0.064	900	0.060	45000
HA2500- 75	0.704	-.003	0.086		0.023	1.12	1.08	0.913	9000	2400	0.089	0.074	2500	0.069	40500
HA2500- 75	0.740	.002	0.086		0.024	1.16	1.12	0.949	9000	2400	0.089	0.074	2500	0.072	38000
HA2500- 87	0.821	T.I.R.	0.086		0.027	1.25	1.20	1.056	10400	3300	0.100	0.083	2500	0.081	34000
HA2500- 98	0.925		0.086		0.030	1.36	1.30	1.164	11500	4000	0.100	0.083	2500	0.090	30000
HA2500- 98	0.938		0.086		0.031	1.37	1.31	1.177	11500	4000	0.100	0.083	2500	0.093	30000
HA2500- 106	0.998		0.103		0.032	1.52	1.46	1.256	15000	4800	0.106	0.088	4000	0.096	27000
HA2500- 112	1.059		0.103		0.033	1.58	1.52	1.329	16000	5200	0.112	0.093	4000	0.099	26000
HA2500- 118	1.111	+.002	0.103	+.005	0.035	1.64	1.57	1.391	16500	5600	0.112	0.093	4000	0.105	24000
HA2500- 118	1.111	-.004	0.103	-.000	0.038	1.64	1.57	1.391	16500	5600	0.112	0.093	4000	0.114	24000
HA2500- 125	1.174	.004	0.103		0.038	1.70	1.63	1.468	17500	6500	0.112	0.093	4000	0.114	23000
HA2500- 131	1.234	T.I.R.	0.103		0.039	1.77	1.69	1.538	18000	7400	0.128	0.107	4000	0.117	21500
HA2500- 137	1.291		0.103		0.042	1.83	1.75	1.607	19500	8200	0.128	0.107	4000	0.126	20500
HA2500- 137	1.291		0.103		0.044	1.83	1.75	1.607	19500	8200	0.128	0.107	4000	0.132	20500
HA2500- 150	1.406		0.120		0.047	2.08	1.98	1.752	24500	10000	0.128	0.107	5000	0.141	18500
HA2500- 156	1.468		0.120		0.047	2.14	2.05	1.829	26000	10400	0.128	0.107	5000	0.141	17000
HA2500- 156	1.480	+.003	0.120		0.048	2.15	2.06	1.841	26000	10400	0.128	0.107	5000	0.144	17000
HA2500- 175	1.650	-.004	0.120		0.050	2.34	2.25	2.050	29000	12400	0.128	0.107	5000	0.150	15500
HA2500- 175	1.669	.004	0.120		0.052	2.37	2.27	2.069	29000	12400	0.128	0.107	5000	0.156	15500
HA2500- 193	1.826	T.I.R.	0.139	+.006	0.056	2.58	2.48	2.265	37000	15300	0.153	0.128	6000	0.168	14300
HA2500- 193	1.850		0.139	-.000	0.060	2.61	2.50	2.289	37000	15300	0.153	0.128	6000	0.180	14100
HA2500- 200	1.880		0.139		0.060	2.64	2.53	2.334	38000	17000	0.153	0.128	6000	0.180	14000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

SERIES E2600 Rings provide large shoulder on small diameter grooved shafts and is snapped into position radially. Three heavy prongs make contact with the deep groove bottom and provides exceptional thrust loading.



section I-I

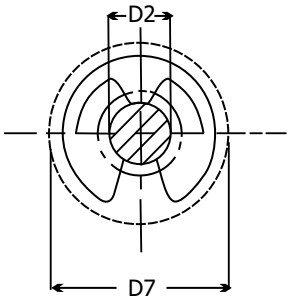
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS				
				FREE DIAMETER		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)
FRAC.	DEC.	MM						
D1	D1	D1	E2600	D3	TOL.	S	TOL.	
1/16	0.062	1.59	E2600- 6	0.051		0.010	±.001	0.03
3/32	0.094	2.38	E2600- 9	0.073		0.015		0.06
7/64	0.110	2.78	E2600- X11	0.076		0.015		0.25
1/8	0.125	3.18	E2600- 12	0.094	+.001	0.015		0.09
9/64	0.140	3.57	E2600- 14	0.102	-.003	0.025		0.20
5/32	0.156	3.97	E2600- 15	0.114		0.025		0.21
3/16	0.188	4.76	E2600- X18	0.122		0.025		0.41
7/32	0.218	5.56	E2600- X21	0.185		0.025		0.44
1/4	0.250	6.35	E2600- 25	0.207		0.025		0.75
5/16	0.312	7.94	E2600- X31	0.243		0.025	±0.002	0.62
3/8	0.375	9.53	E2600- 37	0.300	+.002	0.035		1.35
7/16	0.437	11.11	E2600- X43	0.375	-.004	0.035		0.87
1/2	0.500	12.70	E2600- 50	0.392		0.042		2.50
5/8	0.625	15.88	E2600- 62	0.480		0.042		3.06
3/4	0.750	19.05	E2600- 75	0.574	+.003 -.005	0.050		5.45
7/8	0.875	22.23	E2600- 87	0.668		0.050		7.50
1	1.000	25.40	E2600- X98	0.822		0.050		9.38
1 3/16	1.188	30.16	E2600- X118	1.066	+.006	0.062	±0.003	10.50
1 3/8	1.375	34.93	E2600- X137	1.213	-.010	0.062		15.20

Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

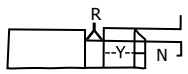
Standard Finish : Black Phosphated

Star Ring Series E-2600 conforms to US Government standard MS-16633 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

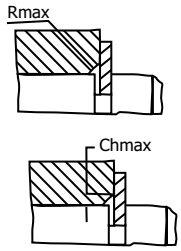


ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



MAXIMUM BOTTOM RADII		
RING SIZE		R
-4 thru	-6	.003
-9 thru	-25	.005
-31 thru	x-43	0.10
-50 thru	x-137	.015

MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



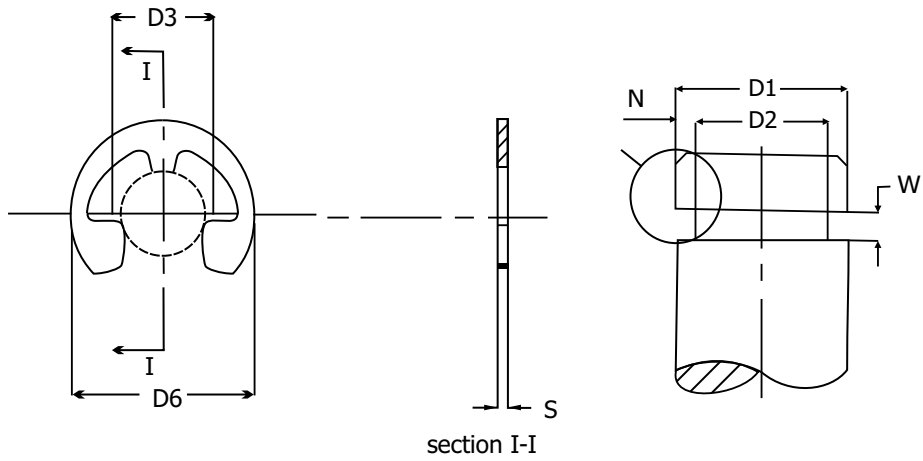
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIAMETER		+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE RIAL
	DIAMETER		WIDTH		DEPTH	FREE OUT SIDE DIA OF RING SPRUNG OVER SHAFT	RING SPRUNG INTO GROOVE	RING SAFETY FACTOR 3	GROOVE SAFETY FACTOR 2					
HA2500	D2	TOL.	W	TOL.	N	D6	D7	PR	PG	R max	Ch max	P' R	Y	
E2600- 6	0.052		0.012		0.005	0.156	0.165	20	7	0.030	0.020	20	0.010	40000
E2600- 9	0.074		0.018	+.002	0.010	0.187	0.200	45	20	0.040	0.030	45	0.020	36000
E2600- X11	0.079		0.018	-.000	0.015	0.375	0.390	55	40	0.080	0.060	60	0.030	35000
E2600- 12	0.095	+.002	0.018		0.015	0.230	0.240	65	45	0.040	0.030	65	0.030	35000
E2600- 14	0.105	-.000	0.029		0.017	0.270	0.285	150	55	0.060	0.045	170	0.034	32000
E2600- 15	0.116		0.029		0.020	0.282	0.295	165	70	0.060	0.045	175	0.040	31000
E2600- X18	0.125		0.029		0.031	0.375	0.390	195	135	0.060	0.045	200	0.062	30000
E2600- X21	0.188		0.029		0.015	0.437	0.450	225	75	0.060	0.045	225	0.030	26000
E2600- 25	0.210		0.029		0.020	0.527	0.540	260	115	0.060	0.045	255	0.040	25000
E2600- X31	0.250		0.029	+0.003 -.000	0.031	0.500	0.520	325	225	0.060	0.045	325	0.062	22000
E2600- 37	0.303		0.039		0.036	0.660	0.680	685	315	0.065	0.050	690	0.072	20000
E2600- X43	0.380	+.003	0.039		0.029	0.600	0.620	800	290	0.050	0.035	800	0.058	16500
E2600- 50	0.396	-.000	0.046		0.052	0.800	0.820	1100	600	0.080	0.060	1110	0.104	14000
E2600- 62	0.485		0.046		0.070	0.940	0.960	1370	1040	0.080	0.060	1420	0.140	12000
E2600- 75	0.580		0.056		0.085	1.120	1.140	1960	1500	0.085	0.065	2000	0.170	10500
E2600- 87	0.675		0.056		0.100	1.300	1.320	2200	2050	0.085	0.065	2350	0.200	9000
E2600- X98	0.835		0.056		0.082	1.500	1.530	2620	1900	0.077	0.057	2700	0.164	6500
E2600- X118	1.079	+.005	0.068	+.004	0.054	1.626	1.670	3400	1500	0.090	0.070	3450	0.108	5500
E2600- X137	1.230	-.000	0.068	-.000	0.072	1.875	1.920	4100	2300	0.090	0.070	4100	0.144	4000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

External Retaining Ring Series Re2600

SERIES RE2600 Rings provide design features similar to Series E 2600 except that it has been reinforced with tapered web section which provides five times greater gripping strength and 50% higher rpm limits than conventional E-Rings Series E2600.



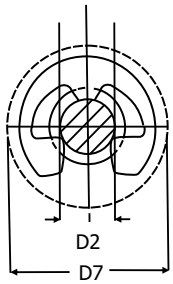
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS				
								APPRX.WEIGHT PER 1000 RINGS (LBS.)
FRAC.	DEC.	MM		FREE DIAMETER		# THICKNESS		
D1	D1	D1	RE2600	D3	TOL.	S	TOL.	
3/32	0.094	2.4	RE2600- 9	0.072	+.001 -.003	0.015		0.07
1/8	0.125	3.2	RE2600- 12	0.093		0.015		0.13
5/32	0.156	4.0	RE2600- 15	0.113	+.002 -.003	0.025		0.31
3/16	0.188	4.8	RE2600- 18	0.143	±.003	0.025	±0.002	0.39
7/32	0.219	5.6	RE2600- 21	0.182		0.025		0.54
1/4	0.250	6.3	RE2600- 25	0.204		0.025		0.71
5/16	0.312	7.9	RE2600- 31	0.242		0.025		0.85
3/8	0.375	9.5	RE2600- 37	0.292	±.004	0.035		1.50
7/16	0.438	11.1	RE2600- 43	0.332		0.035		1.90
1/2	0.500	12.7	RE2600- 50	0.385		0.042		3.20
9/16	0.562	14.3	RE2600- 56	0.430		0.042		3.50

Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

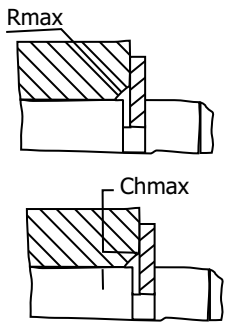
Standard Finish : Black Phosphated

Star Ring Series RE-2600 conforms to US Government standard MS-3215 and government specifications MIL-R-21248B

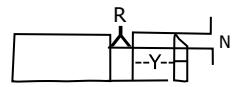
Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).



MAXIMUM ALLOWABLE
CORNER RADIUS(Rmox)
AND CHAMFER (Chmox)



ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN



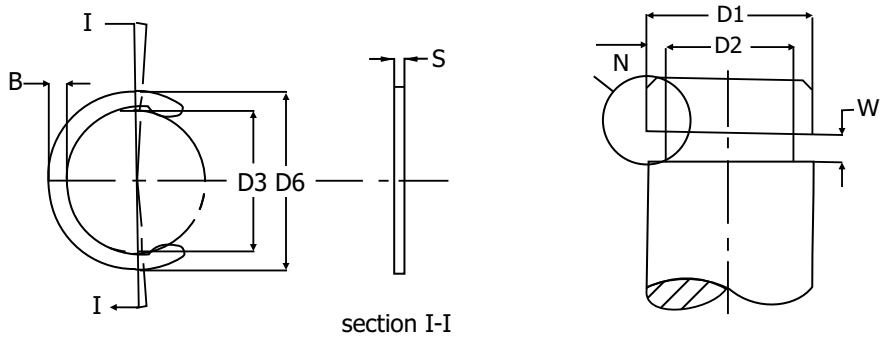
MAXIMUM BOTTOM RADII		
RING SIZE		R
-9 thru	-25	.005
-31 thru	-43	.010
-50 thru	-56	.015

STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIAMETER		+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE-RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG INTO GROOVE	RING SAFETY FACTOR 3	GROOVE SAFETY FACTOR 2					
RE2600	D2	TOL.	W	TOL.	N	D6	D7	PR	PG	R max	Ch max	P' R	Y	
RE2600- 9	0.074	+.002	0.020	+.002	0.010	0.206	0.219	50	13	0.045	0.033	50	0.020	90000
RE2600- 12	0.095	-.000	0.020	-.000	0.015	0.270	0.283	75	25	0.045	0.033	75	0.030	70000
RE2600- 15	0.116	.0015 T.I.R.	0.029		0.020	0.335	0.35	150	40	0.065	0.050	150	0.040	60000
RE2600- 18	0.147		0.029		0.020	0.375	0.39	180	50	0.065	0.050	180	0.040	50000
RE2600- 21	0.188	±.002 .002T.I.R	0.029		0.015	0.446	0.46	220	50	0.065	0.050	220	0.031	43000
RE2600- 25	0.210		0.029		0.020	0.516	0.53	250	75	0.065	0.050	250	0.040	38000
RE2600- 31	0.250	±.003	0.029	+.003 -.000	0.031	0.588	0.61	300	135	0.070	0.055	300	0.062	32000
RE2600- 37	0.303	.003	0.039		0.036	0.660	0.68	520	190	0.070	0.055	520	0.072	28000
RE2600- 43	0.343	T.I.R.	0.039		0.047	0.746	0.77	600	285	0.070	0.055	600	0.094	24000
RE2600- 50	0.396	±.003	0.046		0.052	0.810	0.83	820	360	0.080	0.060	820	0.104	20000
RE2600- 56	0.437	.004T.I.R.	0.046		0.062	0.870	0.89	930	480	0.080	0.060	930	0.124	17000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

SERIES C2700 Rings are applied radially on a grooved shaft, with its narrow section, height and uniform shoulder the ring is ideal for assemblies in which clearance dimensions are critical and suitable against moderate thrust-load and vibration.



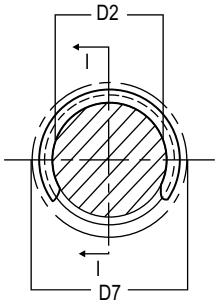
SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS						
				FREE DIA		# THICKNESS PER 1000		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SECTION	
FRAC.	DEC.	MM								
D1	D1	D1	C2700	D3	TOL.	S	TOL.		B	TOL.
1/8	0.125	3.2	C2700- 12	0.102	+.002 -.004	0.015		0.030	0.031	
5/32	0.156	4.0	C2700- 15	0.131		0.015		0.052	0.037	
3/16	0.188	4.8	C2700- 18	0.161		0.015		0.062	0.042	±.003
7/32	0.219	5.6	C2700- 21	0.187		0.025		0.120	0.044	
15/64	0.236	6.0	C2700- 23	0.203		0.025		0.150	0.046	
1/4	0.250	6.4	C2700- 25	0.211		0.025		0.157	0.050	
9/32	0.281	7.1	C2700- 28	0.242	+.003 -.005	0.025		0.190	0.051	
5/16	0.312	7.9	C2700- 31	0.270		0.025		0.226	0.053	±.004
3/8	0.375	9.5	C2700- 37	0.328		0.025		0.300	0.060	
13/32	0.406	10.3	C2700- 40	0.359		0.025		0.352	0.063	
7/16	0.438	11.1	C2700- 43	0.386		0.025		0.359	0.065	
1/2	0.500	12.7	C2700- 50	0.441	±.006	0.035	±.002	0.671	0.070	
9/16	0.562	14.3	C2700- 56	0.497		0.035		0.710	0.078	
5/8	0.625	15.9	C2700- 62	0.553		0.035		0.937	0.081	
11/16	0.688	17.5	C2700- 68	0.608		0.042		1.300	0.086	
3/4	0.750	19.0	C2700- 75	0.665		0.042		1.500	0.090	±.005
13/16	0.812	20.6	C2700- 81	0.721	±.007	0.042		1.700	0.097	
7/8	0.875	22.2	C2700- 87	0.777		0.042		2.000	0.105	
15/16	0.938	23.8	C2700- 93	0.830		0.042		2.300	0.112	
1	1.000	25.4	C2700- 100	0.887		0.042		2.700	0.120	
1 1/8	1.125	28.6	C2700- 112	0.997		0.050		4.000	0.135	
1 1/4	1.250	31.7	C2700- 125	1.110	±.008	0.050		5.100	0.150	
1 3/8	1.375	34.9	C2700- 137	1.220		0.050		6.100	0.165	±.007
1 1/2	1.500	38.1	C2700- 150	1.331		0.050		7.600	0.180	
1 3/4	1.750	44.4	C2700- 175	1.555		0.062		12.900	0.210	
2	2.000	50.8	C2700- 200	1.777	±.010	0.062	±.003	16.200	0.240	

Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

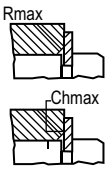
Standard Finish : Black Phosphated

Star Ring Series C-2700 conforms to US Government standard MS-16632 and government specifications MIL-R-21248B

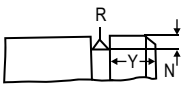
Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).



Maximum Allowable
Corner Radius (Rmax)
And Chamfer (Chmax)



Enlarged Detail
of Groove Profile
and Edge Margin



Maximum Bottom Radii	
Ring Size	R
-12 thru -43	.005
-50 thru -100	.010
-112 thru -200	.015

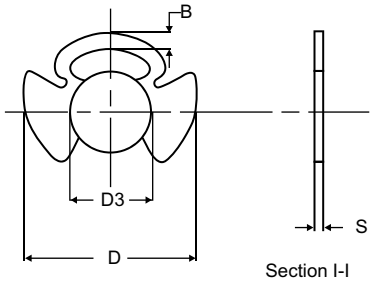
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA								
						RING CLEARANCE DIAMETER		+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STD. RING MATE-RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SPRUNG IN GROOVE	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2					
C2700	D2	TOL.	W	TOL.	N	D6	D7	PR	PG	R max	Ch max	P' R	Y	
C2700- 12	0.106	±.0015 .0015 T.I.R.	0.020	+.002 -.000	0.0095	0.165	0.18	85	45	0.014	0.011	85	0.020	80000
C2700- 15	0.135		0.020		0.0105	0.205	0.22	100	55	0.018	0.014	100	0.020	75000
C2700- 18	0.165	±.002 .0015 T.I.R.	0.020		0.011	0.244	0.25	130	70	0.021	0.016	110	0.022	73000
C2700- 21	0.193		0.029		0.013	0.275	0.29	260	100	0.021	0.016	260	0.026	71000
C2700- 23	0.208		0.029		0.014	0.295	0.31	280	115	0.022	0.017	275	0.028	62000
C2700- 25	0.220	±.002 .002 T.I.R.	0.029	+.003 -.000	0.015	0.311	0.33	290	130	0.023	0.018	290	0.030	60000
C2700- 28	0.247		0.029		0.017	0.346	0.36	330	165	0.021	0.016	310	0.034	56000
C2700- 31	0.276		0.029		0.018	0.376	0.39	370	200	0.024	0.018	310	0.036	52000
C2700- 37	0.335		0.029		0.020	0.448	0.47	440	270	0.026	0.020	310	0.040	43000
C2700- 40	0.364		0.029		0.021	0.486	0.50	480	300	0.027	0.021	310	0.042	40000
C2700- 43	0.393	±.003 .004 T.I.R.	0.029		0.022	0.517	0.53	520	350	0.029	0.022	310	0.044	31000
C2700- 50	0.450		0.039		0.025	0.581	0.60	830	450	0.030	0.023	610	0.050	25000
C2700- 56	0.507		0.039		0.028	0.653	0.67	930	550	0.033	0.025	610	0.056	22000
C2700- 62	0.563		0.039		0.031	0.715	0.74	1030	700	0.033	0.025	610	0.062	20000
C2700- 68	0.619		0.046		0.034	0.784	0.80	1700	800	0.034	0.026	880	0.068	18500
C2700- 75	0.676	±.004 .005 T.I.R.	0.046		0.037	0.845	0.87	1850	1000	0.036	0.027	880	0.074	17500
C2700- 81	0.732		0.046		0.040	0.915	0.94	2010	1150	0.038	0.029	880	0.080	16000
C2700- 87	0.789		0.046		0.043	0.991	1.01	2170	1300	0.040	0.031	880	0.086	15000
C2700- 93	0.843		0.046		0.047	1.058	1.08	2320	1550	0.043	0.033	880	0.094	14000
C2700- 100	0.900		0.046		0.050	1.130	1.15	2480	1800	0.046	0.035	880	0.100	12500
C2700- 112	1.013	±.005 .005 T.I.R.	0.056	+.004 -.000	0.056	1.267	1.30	3320	2200	0.052	0.040	1250	0.112	11500
C2700- 125	1.126		0.056		0.062	1.415	1.44	3680	2700	0.057	0.044	1250	0.124	10500
C2700- 137	1.237		0.056		0.069	1.555	1.58	4050	3350	0.062	0.048	1250	0.138	9500
C2700- 150	1.350		0.056		0.075	1.691	1.72	4420	4000	0.069	0.053	1250	0.150	8500
C2700- 175	1.576		0.068		0.087	1.975	2.01	6430	5300	0.081	0.062	1920	0.174	7500
C2700- 200	1.800		0.068		0.100	2.257	2.30	7300	7000	0.091	0.070	1920	0.200	6000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

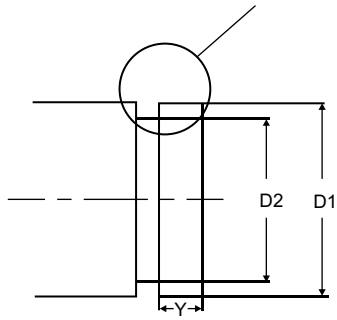
External Retaining Ring Series K2800 & TK2800

SERIES K2800 Rings are installed radially in a deep groove which combined with its higher thickness and tapered section gives it high thrust load and impact capacity as compared to conventional E-Rings. Series TK 2800 Rings offer the same characteristics of Series K 2800 but it is less thick and more economical to use as it can be seated in the same width grooves as basic E-Rings.



Sizes - 1B
Thru - 5D

Section I-I

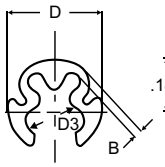


SHAFT DIAMETER			STAR RING NO.	RING DIMENSIONS						
				FREE DIAMETER		# THICKNESS		APPRX.WEIGHT PER 1000 RINGS (LBS.)	LARGE SEC.	OUTER DIA
FRAC.	DEC.	MM								
D1	D1	D1	2800	D3	TOL.	S	TOL.		B	D
5/32	0.156	4.0	K2800- 15	0.110	±0.003	0.035	±0.002	0.42	0.042	0.320
3/16	0.188	4.8	K2800- 18	0.140	±0.003	0.035	±0.002	0.63	0.048	0.400
1/4	0.250	6.4	K2800- 25	0.188	±0.003	0.035	±0.002	0.84	0.056	0.482
5/16	0.312	7.9	K2800- 31	0.250	±0.003	0.042	±0.002	1.46	0.074	0.588
3/8	0.375	9.5	K2800- 37	0.312	±0.004	0.042	±0.002	1.92	0.081	0.680
7/16	0.438	11.1	K2800- 43	0.375	±0.004	0.050	±0.002	2.66	0.081	0.752
1/2	0.500	12.7	K2800- 50	0.406	±0.004	0.050	±0.002	3.30	0.097	0.826
5/8	0.625	15.9	K2800- 62	0.500	±0.005	0.050	±0.002	4.65	0.086	0.966
3/4	0.750	19.0	K2800- 75	0.594	±0.005	0.062	±0.003	7.48	0.095	1.095
1	1.000	25.4	K2800- 100	0.812	±0.006	0.078	±0.003	13.80	0.115	1.415
1-1/4	1.250	31.8	K2800- 125	1.032	±0.006	0.093	±0.003	29.00	0.180	1.800
1-1/2	1.500	38.1	K2800- 150	1.250	±0.008	0.109	±0.003	37.10	0.208	2.050
1-3/4	1.750	44.4	K2800- 175	1.406	±0.010	0.125	±0.004	58.60	0.235	2.300
2	2.000	50.8	K2800- 200	1.625	±0.015	0.125	±0.004	59.20	0.250	2.650
5/32	0.156	4.0	TK2800- 15	0.110	±0.003	0.025	±0.002	0.30	0.042	0.320
3/16	0.188	4.8	TK2800- 18	0.140	±0.003	0.025	±0.002	0.45	0.048	0.400
1/4	0.250	6.4	TK2800- 25	0.188	±0.003	0.025	±0.002	0.60	0.056	0.482
5/16	0.312	7.9	TK2800- 31	0.250	±0.003	0.025	±0.002	0.87	0.074	0.588
3/8	0.375	9.5	TK2800- 37	0.312	±0.004	0.035	±0.002	1.60	0.081	0.680
7/16	0.438	11.1	TK2800- 43	0.375	±0.004	0.035	±0.002	1.86	0.081	0.752
1/2	0.500	12.7	TK2800- 50	0.406	±0.004	0.042	±0.002	2.77	0.097	0.826
5/8	0.625	15.9	TK2800- 62	0.500	±0.005	0.042	±0.002	3.91	0.086	0.966
3/4	0.750	19.0	TK2800- 75	0.594	±0.005	0.050	±0.002	6.03	0.095	1.095
1	1.000	25.4	TK2800- 100	0.812	±0.006	0.050	±0.002	8.80	0.115	1.415

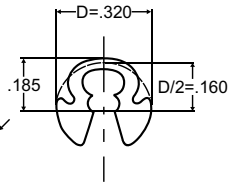
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

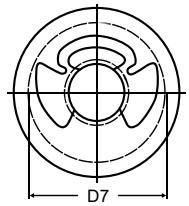
Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).



Sizes - 62
thru - 100

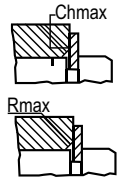


K2800-15
TK2800-15

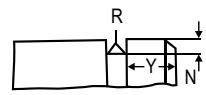


Ring seated in groove

Maximum Allowable
Corner Radius (Rmax)
And Chamfer (Chmax)



Enlarged Detail
of Groove Profile
and Edge Margin



Maximum Bottom Radii	
Ring Size	**R**
-15 thru -50	**.005**
-62 thru -100	**.010**
-125 thru -150	**.015**
-175 thru X-200	**.020**

STAR RING NO.	GROOVE DIMENSIONS						APPLICATION DATA							
							RING CLEAR-ANCE DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		MAXIMUM ALLOWABLE ASSEMBLY LOAD WITH R max Ch max (in Lbs)	EDGE MARGIN	RPM LIMITS STEEL RING
	DIAMETER			WIDTH		DEPTH	RING SPRUNG IN GROOVE	RING SAFETY FACTOR 2.5	GROOVE SAFETY FACTOR 9.2					
2800	D2	TOL.	T.I.R.	W	TOL.	N	D7	PR	PG	R max	Ch max	P' R	Y	
K2800- 15	0.120	±0.004	0.002	0.039	+0.006	0.018	0.39	450	110	0.050	0.040	250	0.036	80000
K2800- 18	0.148	±0.005	0.002	0.039	+0.006	0.020	0.42	600	130	0.050	0.040	270	0.040	80000
K2800- 25	0.210	±0.006	0.003	0.039	+0.006	0.020	0.52	900	200	0.050	0.040	310	0.040	65000
K2800- 31	0.272	±0.006	0.003	0.046	+0.006	0.020	0.63	1300	250	0.065	0.050	400	0.040	65000
K2800- 37	0.331	±0.006	0.003	0.046	+0.006	0.022	0.72	1550	300	0.065	0.050	430	0.044	65000
K2800- 43	0.390	±0.008	0.003	0.056	+0.006	0.024	0.79	2200	400	0.080	0.060	600	0.048	60000
K2800- 50	0.440	±0.008	0.004	0.056	+0.006	0.030	0.89	2500	600	0.080	0.060	630	0.060	50000
K2800- 62	0.531	±0.008	0.004	0.056	+0.006	0.047	1.03	3000	1100	0.080	0.060	720	0.094	45000
K2800- 75	0.632	±0.010	0.004	0.068	+0.008	0.059	1.17	4600	1600	0.085	0.065	1000	0.118	38000
K2800- 100	0.860	±0.010	0.004	0.086	+0.008	0.070	1.51	7500	2600	0.090	0.065	1800	0.140	25000
K2800- 125	1.090	±0.010	0.006	0.103	+0.008	0.080	1.90	11000	3500	0.090	0.065	2750	0.160	11000
K2800- 150	1.317	±0.015	0.008	0.120	+0.010	0.091	2.18	15300	4800	0.100	0.070	3800	0.182	9000
K2800- 175	1.480	±0.015	0.010	0.139	+0.010	0.135	2.45	20500	8200	0.120	0.090	5100	0.270	7000
K2800- 200	1.730	±0.015	0.012	0.139	+0.010	0.135	2.83	23500	9450	0.130	0.100	5100	0.270	5000

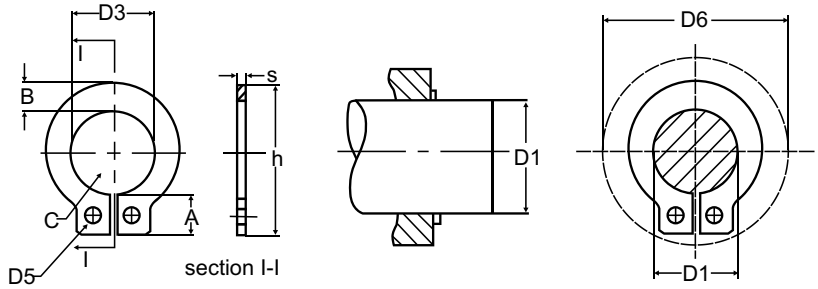
K2800- 15	0.120	±0.004	0.002	0.029	+0.006	0.018	0.39	320	110	0.050	0.040	130	0.036	80000
K2800- 18	0.148	±0.005	0.002	0.029	+0.006	0.020	0.42	430	130	0.050	0.040	140	0.040	80000
K2800- 25	0.210	±0.006	0.003	0.029	+0.006	0.020	0.52	640	200	0.050	0.040	150	0.040	65000
K2800- 31	0.272	±0.006	0.003	0.029	+0.006	0.020	0.63	780	250	0.050	0.040	150	0.040	65000
K2800- 37	0.331	±0.006	0.003	0.039	+0.006	0.022	0.72	1300	300	0.065	0.050	200	0.044	65000
K2800- 43	0.390	±0.008	0.003	0.039	+0.006	0.024	0.79	1850	400	0.065	0.050	300	0.048	60000
K2800- 50	0.440	±0.008	0.004	0.046	+0.006	0.030	0.89	2100	600	0.080	0.060	450	0.060	50000
K2800- 62	0.531	±0.008	0.004	0.046	+0.006	0.047	1.03	2500	1100	0.080	0.060	500	0.094	45000
K2800- 75	0.632	±0.010	0.004	0.056	+0.008	0.059	1.17	3700	1600	0.090	0.070	650	0.118	38000
K2800- 100	0.860	±0.010	0.004	0.056	+0.008	0.070	1.51	4800	2600	0.090	0.070	740	0.140	25000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

External Retaining Ring Series GA2500

SERIES GA2500 Rings are fitted axially on ungrooved shafts, tubes & studs. The tapered section of the ring provides large radial frictional hold against moderate axial thrust in either direction. It is easily assembled and disassembled.



SHAFT DIAMETER				STAR RING NO.	RING DIMENSIONS													
									APPRX. WEIGHT PER 1000 RINGS (LBS.)	RING HEIGHT	LARGE SECTION		SMALL SECTION		LUG		LUG HOLE	
FRAC.	DEC.		MM		FREE DIA		# THICKNESS											
D1	D1		D1	GA2500	D3	TOL.	S	TOL.		h	B	TOL.	C	TOL.	A	TOL.	D5	TOL.
	FROM	TO																
--	0.058	0.060	1.5	GA2500-6	0.055		0.015		0.03	0.145	0.075		0.049		0.066	±.005	0.035	
5/64	0.078	0.080	2.0	GA2500-7	0.074	+.002	0.025		0.08	0.184	0.041		0.027		0.071		0.034	±.004
3/32	0.092	0.096	2.4	GA2500-9	0.089	-.003	0.025	±.002	0.10	0.207	0.045		0.028		0.074	±.003	0.034	
1/8	0.123	0.127	3.2	GA2500-12	0.120		0.025		0.24	0.268	0.070	±.004	0.048	±.004	0.078		0.042	
5/32	0.154	0.158	4.0	GA2500-15	0.150		0.025		0.30	0.307	0.079		0.051		0.078		0.042	+.010 -.002
3/16	0.185	0.189	4.8	GA2500-18	0.181	+.002 -.004	0.035		0.55	0.364	0.086		0.052		0.097		0.051	
15/64	0.234	0.238	6.0	GA2500-23	0.224	±.003	0.035		0.76	0.422					0.098	±.003	0.051	±.004
1/4	0.248	0.252	6.3	GA2500-25	0.238	+.002 -.004	0.035	±.003	0.74	0.437	0.101		0.057		0.097		0.051	+.010 -.002
5/16	0.310	0.316	7.9	GA2500-31	0.298	+.003	0.042		1.39	0.553	0.114	±.005	0.073	±.005	0.141		0.078	
3/8	0.373	0.379	9.5	GA2500-37	0.354	-.005	0.042		1.72	0.620	0.125		0.075		0.141		0.078	
7/16	0.434	0.440	11.0	GA2500-43	0.412		0.050		2.61	0.701	0.138		0.083		0.151	±.004	0.078	+.015
1/2	0.497	0.503	12.7	GA2500-50	0.470	+.004	0.050		2.91	0.768	0.140		0.082		0.158		0.078	-.002
5/8	0.622	0.628	15.9	GA2500-62	0.593	-.006	0.062	±.004	5.70	0.948	0.175	±.006	0.100	±.006	0.180		0.078	
3/4	0.745	0.755	19.0	GA2500-75	0.706		0.062		6.88	1.115	0.176		0.104		0.233		0.120	

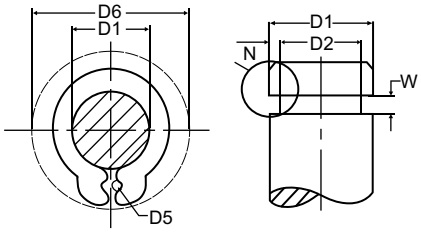
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

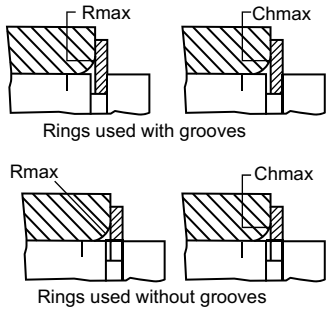
Star Ring Series GA-2500 conforms to US Government standard MS-90707 and government specifications MIL-R-21248B

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

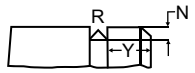
LUG DESIGN
(Manufacturer's option)



Maximum Allowable
Corner Radius (Rmax)
And Chamfer (Chmax)



Enlarged detail of
Groove Profile and
Edge Margin



Maximum Bottom Radii	
Ring Size	R
-23 thru -31	.003
-37 thru -75	.005

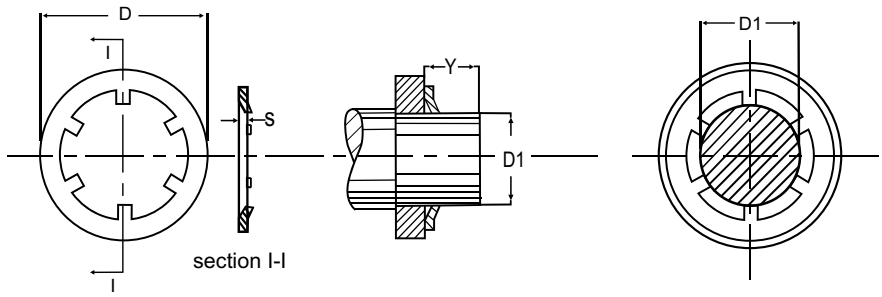
STAR RING NO.	GROOVE DIMENSIONS					APPLICATION DATA						
						RING CLEAR-ANCE DIA	+STATIC THRUST LOAD (LBS.) SHARP CORNER ABUTMENT		MAXIMUM ALLOWABLE CORNER RADII & CHAMFER OF RETAINED PART		EDGE MARGIN	RPM LIMITS STEEL RING MATE-RIAL
	DIAMETER		WIDTH		DEPTH	RING SPRUNG OVER SHAFT	RING SAFETY FACTOR 4	GROOVE SAFETY FACTOR 2				
GA2500	D2	TOL.	W	TOL.	N	D6	PR	PG	R max	Ch max	Y	
GA2500-6 GA2500-7 GA2500-9 GA2500-12 GA2500-15	SIZES GA2500-6 through GA2500-18 are not recommended for use with grooves.					0.21 0.24 0.26 0.33 0.36	5 8 8 10 12		0.025 0.036 0.042 0.054 0.059	0.015 0.022 0.025 0.032 0.035		OVER 80000
GA2500-18						0.44	20		0.063	0.038		
GA2500-23	0.228	+.0005 -.0015	0.041	+.003 -.000	0.004	0.48	22	70	0.070	0.042	0.030	
GA2500-25	0.240		0.041		0.005	0.49	23	90	0.072	0.043	0.030	77000
GA2500-31	0.303		0.048		0.005	0.68	25	110	0.080	0.048	0.030	58000
GA2500-37	0.361	+.001 -.002	0.048		0.007	0.74	30	180	0.086	0.051	0.030	51000
GA2500-43	0.419		0.056		0.009	0.81	40	290	0.093	0.056	0.030	44000
GA2500-50	0.478		0.056	+.004 -.000	0.011	0.90	45	390	0.100	0.060	0.040	40000
GA2500-62	0.599		0.069		0.013	1.06	60	570	0.120	0.072	0.045	32000
GA2500-75	0.718	+.002 -.003	0.069		0.016	1.32	65	850	0.125	0.075	0.050	25000

+ For Static Thrust Load calculations contact Star Circlips engineering department.
T.I.R. - Total Indicator Reading.

NOTE : Rings should not be overexpanded during installation since this may lead to ring failure. Provided the groove diameter matches recommended dimensions, play between the ring and groove after installation indicates the ring has been overexpanded.

External Retaining Ring
Series CA2900

SERIES CA2900 Rings are circular push-on type external self-locating retaining rings which are easily installed axially over shafts by hand or a piece of tubing. It's prongs spread to accommodate the shaft and then 'digs' and 'locks' into the shaft when reverse force is applied. It provides flat contact shoulder on shafts of unhardened steel, cast materials and plastics. It offers speedy, low cost solutions against moderate thrust loads, impacts and vibration. It is not reusable.



SHAFT DIAMETER				STAR RING NO.	RING DIMENSIONS			APPLICATION DATA				
								# THICKNESS		+STATIC THRUST LOAD (LBS.)	APPRX. WEIGHT PER 1000 RINGS (LBS.)	EDGE MARGIN
FRAC.	DEC.		MM		OUT SIDE DIAMETER		NO. OF PRONGS					
D1	D1		D1	CA2900	D	TOL.		S	TOL.			Y
	FROM	TO										
3/32	0.093	0.095	2.39	CA2900-9	0.250	±.005	3	0.010	±.001	13	0.09	0.040
1/8	0.124	0.126	3.17	CA2900-12	0.325		4			20	0.14	0.040
5/32	0.155	0.157	3.96	CA2900-15	0.356		4			25	0.20	0.040
3/16	0.187	0.189	4.77	CA2900-18	0.387		6			35	0.22	0.040
1/4	0.249	0.251	6.35	CA2900-25	0.450		6			40	0.25	0.040
5/16	0.311	0.313	7.92	CA2900-31	0.512		6			45	0.28	0.040
3/8	0.374	0.376	9.53	CA2900-37	0.575		6			45	0.31	0.040
7/16	0.437	0.440	11.10	CA2900-43	0.638		6	0.015	±.002	50	0.50	0.060
1/2	0.498	0.502	12.70	CA2900-50	0.750		6			50	0.75	0.060
9/16	0.560	0.564	14.27	CA2900-56	0.812	±.010	6			50	0.78	0.060
5/8	0.623	0.627	15.88	CA2900-62	0.875		7			50	0.88	0.060
3/4	0.748	0.752	19.05	CA2900-75	1.000		8			55	1.00	0.060
7/8	0.873	0.877	22.23	CA2900-87	1.125		10			60	1.13	0.060
1	0.998	1.002	25.40	CA2900-100	1.250		10			65	1.31	0.060

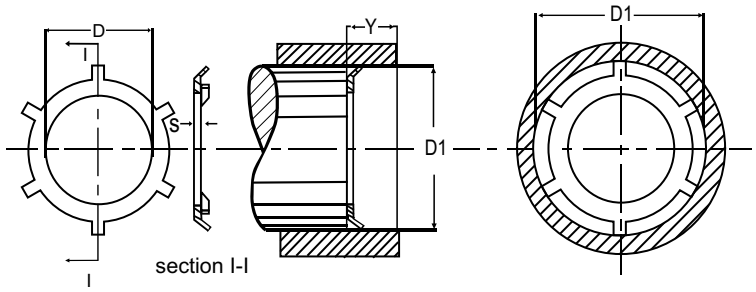
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish : Black Phosphated

Indicated thickness (S) for unplated rings. For plated ring add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

+ For Static Thrust Load calculations contact Star Circlips engineering department.

SERIES CB3000 Rings are circular push-on type internal self-locking retaining rings which are easily installed axially in housing and bores and function the same as series Ca2900.



HOUSING DIAMETER			STAR RING NO.	RING DIMENSIONS			APPLICATION				
							# Thickness		+ Static Thrust Load. (LBS)	Apprrox weight per 1000 Ring (LBS)	EDGE marginv
FRAC.	DEC.		MM.		INSIDE DIAMETER		NO OF PRONGS				
D1	D1		D1	CB3000	D	TOL.		S	TOL.			Y
	FROM	TO										
5/16	0.311	0.313	7.92	CB3000-31	0.136	±.005	6			80	0.11	0.040
3/8	0.374	0.376	9.53	CB3000-37	0.175		6			75	0.16	0.040
7/16	0.437	0.439	11.13	CB3000-43	0.237		6			70	0.20	0.040
-	0.440	0.442	11.20	CB3000-44	0.258		6	0.010	±0.01	40	0.18	0.040
1/2	0.498	0.502	12.70	CB3000-50	0.258		6			60	0.24	0.040
9/16	0.560	0.564	14.27	CB3000-56	0.312		6			50	0.29	0.040
5/8	0.623	0.627	15.85	CB3000-62	0.390		6			45	0.30	0.040
3/4	0.748	0.752	19.05	CB3000-75	0.500		8			75	0.62	0.060
7/8	0.873	0.877	22.23	CB3000-87	0.625		8			70	0.75	0.060
15/16	0.936	0.940	23.83	CB3000-93	0.687		10	0.015	±.002	70	0.85	0.060
1	0.998	1.002	25.40	CB3000-100	0.750	±.010	10			75	0.91	0.060
1 1/8	1.123	1.127	28.62	CB3000-112	0.813		10			60	1.30	0.060
1 1/4	1.248	1.252	31.80	CB3000-125	0.938		10			60	1.50	0.060
1 7/16	1.436	1.440	36.57	CB3000-143	1.117		12			60	1.173	0.060
1 1/2	1.498	1.502	38.15	CB3000-150	1.188		12			60	1.80	0.060
1 3/4	1.748	1.752	44.50	CB3000-175	1.438		12			55	2.10	0.060
2	1.998	2.002	50.80	CB3000-200	1.600		14			55	3.00	0.060

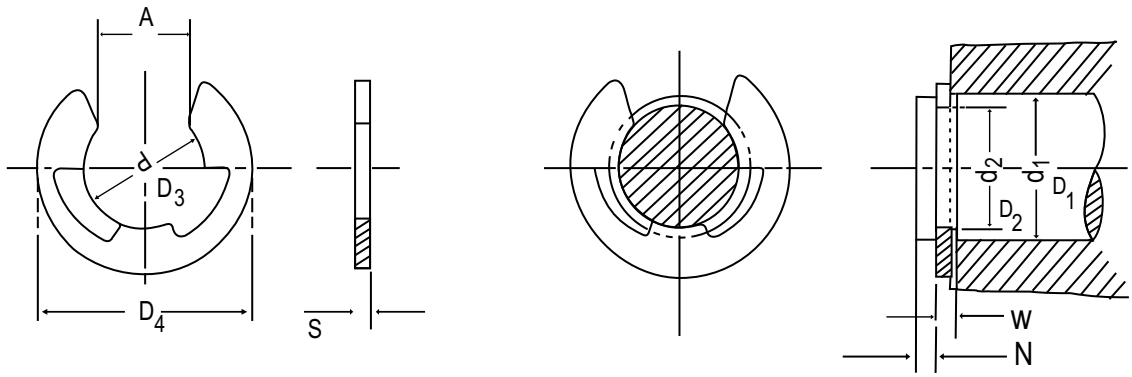
Standard Material : Carbon Spring Steel corresponding to SAE 1060 - 1090

Standard Finish: Black Phosphated

+ For Static Thrust Load calculations contact Star Circlips engineering department.

Indicated Thickness (S) for unplated rings. For plated rings add 0.002" to listed maximum thickness. Maximum ring thickness will be at least 0.0002" less than the listed minimum groove width (W).

External Retaining Ring
Series JIS B2805



	RING DIMENSIONS								GROOVE DIMENSIONS						
	D3		D4		A		S		D4		D2		W		N
Size No.	Basic	Tol.	Basic	Tol.	Basic	Tol.	Basic	Tol.	Min	Max	Basic	Tol.	Basic	Tol.	Min
ETW - * 0.6	0.6	±.004	1.5		0.45	±0.02	0.2		0.8	1	0.65		0.3		0.4
* 0.7	0.67	0	2	±0.1	0.55	- 0.10	0.2	±0.02	0.9	1.2	0.7	+ 0.05 0	0.3		0.4
0.8	0.8	- 0.08	2		0.7		0.2		1	1.4	0.82		0.3		0.4
* 1	0.98		2.8		0.88		0.2		1.3	1.7	1		0.3		0.5
1.2	1.2		3		1		0.3	±0.025	1.4	2	1.23		0.4	+ 0.05	0.6
1.5	1.5		4		1.3	0	0.4		2	2.5	1.53		0.5	0	0.8
* 1.9	1.9	0	4.5		1.7	- 0.25	0.4		2.5	3	1.93	+ 0.06 0	0.5		1
2	2	- 0.09	5		1.7		0.4	±0.03	2.5	3.2	2.05		0.5		1
* 2.3	2.3		6		2		0.4		3	4	2.35		0.5		1
2.5	2.5		6		2.1		0.4		3.2	4	2.55		0.5		1
3	3		7	±0.2	2.6		0.6		4	5	3.05		0.7		1
* 3.2	3.2		7		2.8		0.6		4	5	3.25		0.7		1.2
4	4	0	9		3.5	0	0.6		5	7	4.05	+ 0.075 0	0.7		1.2
5	5	- 0.12	11		4.3	- 0.30	0.6		6	8	5.05		0.7	+ 0.1	1.2
6	6		12		5.2		0.8	±0.04	7	9	6.05		0.9	0	1.2
7	7		14		6.1		0.8		8	11	7.1		0.9		1.5
8	8	0	16		6.9	0	0.8		9	12	8.1	+ 0.09 0	0.9		1.8
9	9	- 0.15	18		7.8	- 0.35	0.8		10	14	9.1		0.9		2
10	10		20		8.7		1	±0.05	11	15	10.15		1.15		2
12	12	0	23	±0.3	10.4		1		13	18	12.15	+ 0.11 0	1.15	+ 0.14 0	2.5
15	15	- 0.18	29		13	0	1.5	±0.06	16	24	15.15		1.65		3
19	19	0	37		16.5	- 0.45	1.5		20	31	19.15	+ 0.13 0	1.65		3.5
24	24	- 0.21	44		20.8	0 - 0.5	2	±0.07	25	38	24.15		2.2		4

Material - Carbon Spring Steel. Hardness - HRc 44 - 52
Finish - Black Phosphate Coating, Znplating, Chrome dip
D3 - according to our company's specification.
* Mark is not according to JIS specification.

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